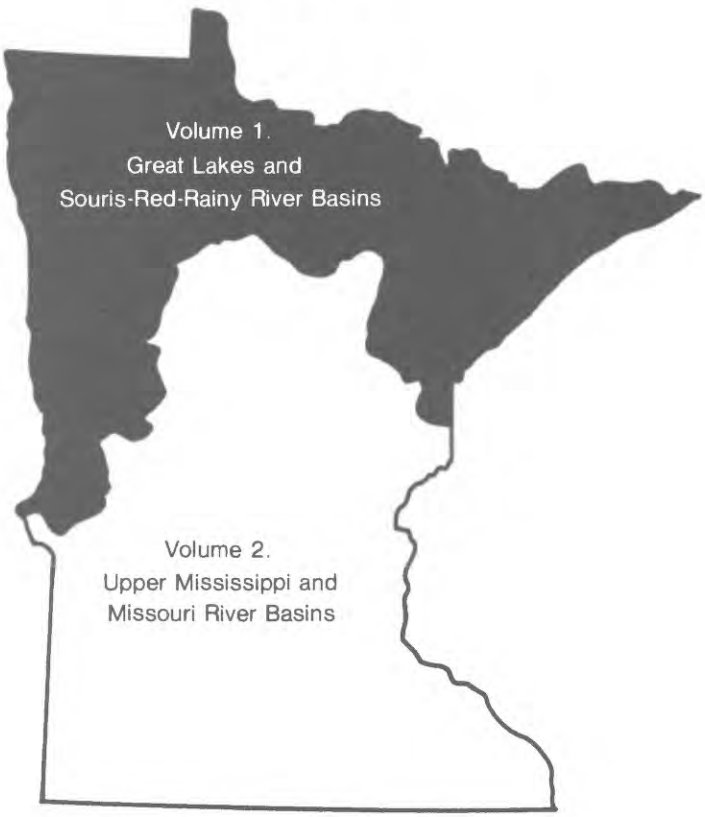
Water Resources Data Minnesota Water Year 1984

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



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-84-1
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 1984

1983

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1984

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Water Resources Data Minnesota Water Year 1984

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-84-1
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

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

1986

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:

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

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Water-resources data for the 1984 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 50 gaging stations; stage-only records for 1 gaging station; stage and contents for 5 lakes and reservoirs; water quality for 16 gaging stations, 10 partial-record stations, and 29 wells; and water levels for 39 observation wells. Also included are 41 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.

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CONTENTS

ILLUSTRATIONS

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-chemcial, or pesticides; (b) biological or micro-biological; (p) physical (water temperature, sediment, or specific conductance)]

SURFACE-WATER STATIONS, IN DOWNSTREAM ORDER--Continued

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, 1984

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 und erstanding 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 1984 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 50 gaging stations; stage only records for 1 gaging station; stage and contents for 5 lakes and reservoirs; water quality for 16 gaging stations, 10 partial-record stations, and 29 wells; and water levels for 39 observation wells. Also included are 41 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-84-1. 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. Meintsma, chairman

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

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

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

Red Lake Watershed District, Truman Sandland, president.

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

City of Eagan, Beatta Blomquist, mayor.

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 15 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 waters adjacent to the international boundary, are maintained by the United States (or Canada) under agreement with Canada (or the United States), and the records are obtained and compiled in a manner equally acceptable in both countries. These stations are designated herein as "International gaging stations."

SUMMARY OF HYDROLOGIC CONDITIONS

PRECIPITATION

Precipitation during the 1984 water year varied from 6 inches below normal in the northwest to 8 inches above normal in the central and southeastern parts of Minnesota (fig. 1). Normal annual precipitation in Minnesota ranges from 19 inches in the northwest to 32 inches in the southeast. Precipitation was above normal statewide during the first quarter of the 1984 water year. The greatest total snowfall in November in more than 100 years of record occurred in the Twin Cities area ---30.4 inches. The previous record was 26.3 inches in 1940. The second quarter of 1984 began with precipitation below normal over the entire State, but precipitation during the quarter increased to normal or above normal except in the north. Precipitation was below normal in much of northern and central Minnesota during the third quarter until June. Several storms covering large areas swept through Minnesota in June, producing above-normal rainfall over most of the State. Rainfall in several areas in the southwest was greater than 10 inches for June, which exceeded the value for the 100-year recurrence interval. During the fourth quarter, precipitation generally was below normal. However, precipitation in small areas in central and southern Minnesota was above normal some months of the fourth quarter.

STREAMFLOW

Average annual runoff in Minnesota ranges from about 2 inches in the west to 14 inches in the northeast. Annual runoff in 1984 ranged from 1.3 inches in the northwest to about 20 inches in the northeast, and varied from 50 percent of average in parts of the northwest to 420 percent of average in parts of the southwest where the annual runoff was about 10 inches. Generally, annual streamflow in the northwest ranged from 50 to 130 percent of the long-term average, while that in the north-central and northeast parts of the State ranged from 100 to 130 percent. In the central part of Minnesota, the degree of exceedance of the long-term average was considerably greater, ranging from 150 to 300 percent. Annual streamflow in the southwest was even greater, ranging from 250 to about 400 percent of the long-term average. In the remainder of southern Minnesota, streamflow ranged from 150 to 300 percent of the long-term average, similar to central Minnesota.

Records for stations in northern Minnesota in 1984 indicate variation in annual runoff from almost deficient in the west to above average in the east. Runoff in the Roseau River at Ross, in northwestern Minnesota, was only 1.87 inches, about 64 percent of the 57-year average annual runoff of 2.91 inches (below 1.54 inches is deficient). Monthly mean discharge for September 1984 was 0.94 ft^3/s, the lowest September flow in the 57-year period of record. Farther east in northern Minnesota, runoff in the Little Fork River at Littlefork was 9.43 inches, about 14 percent higher than the 61-year average annual runoff of 8.28 inches. In northeastern Minnesota, runoff in the Baptism River near Beaver Bay was 20.23 inches and 23 percent higher than the 57-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 2.

Gaging stations on several tributaries to the Red River of the North recorded record, or near record, monthly flow volumes during 1984. However, no peaks of record were exceeded at any station on streams for which records are published in this volume. Monthly flows at the previously mentioned tributaries also were deficient later in the year, so that average annual runoff was only normal to somewhat above normal.

WATER QUALITY

The two NASQAN stations in the Great Lakes Basin, Baptism River near Beaver Bay and St. Louis River at Scanlon, had below average concentrations of dissolved solids (fig. 3). The Red Lake River at Crookston in the western part of the State had higher than average dissolved solids during the first half of 1984 and average concentrations during the second half. The remaining station in figure 3, Little Fork River at Littlefork had near average dissolved-solids concentrations.

Trends of specific conductance, percent saturation of dissolved oxygen, dissolved solids, chloride, and suspended sediment were plotted for the NASQAN stations. No hydrologically-significant trends were defined.

Some ground-water samples collected from wells in northern and western Minnesota had properties or concentrations of chemical constituents that exceeded State limits recommended for raw water used for domestic consumption (Minnesota Pollution Control Agency, 1978). Limits were exceeded for iron in five samples, manganese in seven, nitrate in one, and zinc in two samples.

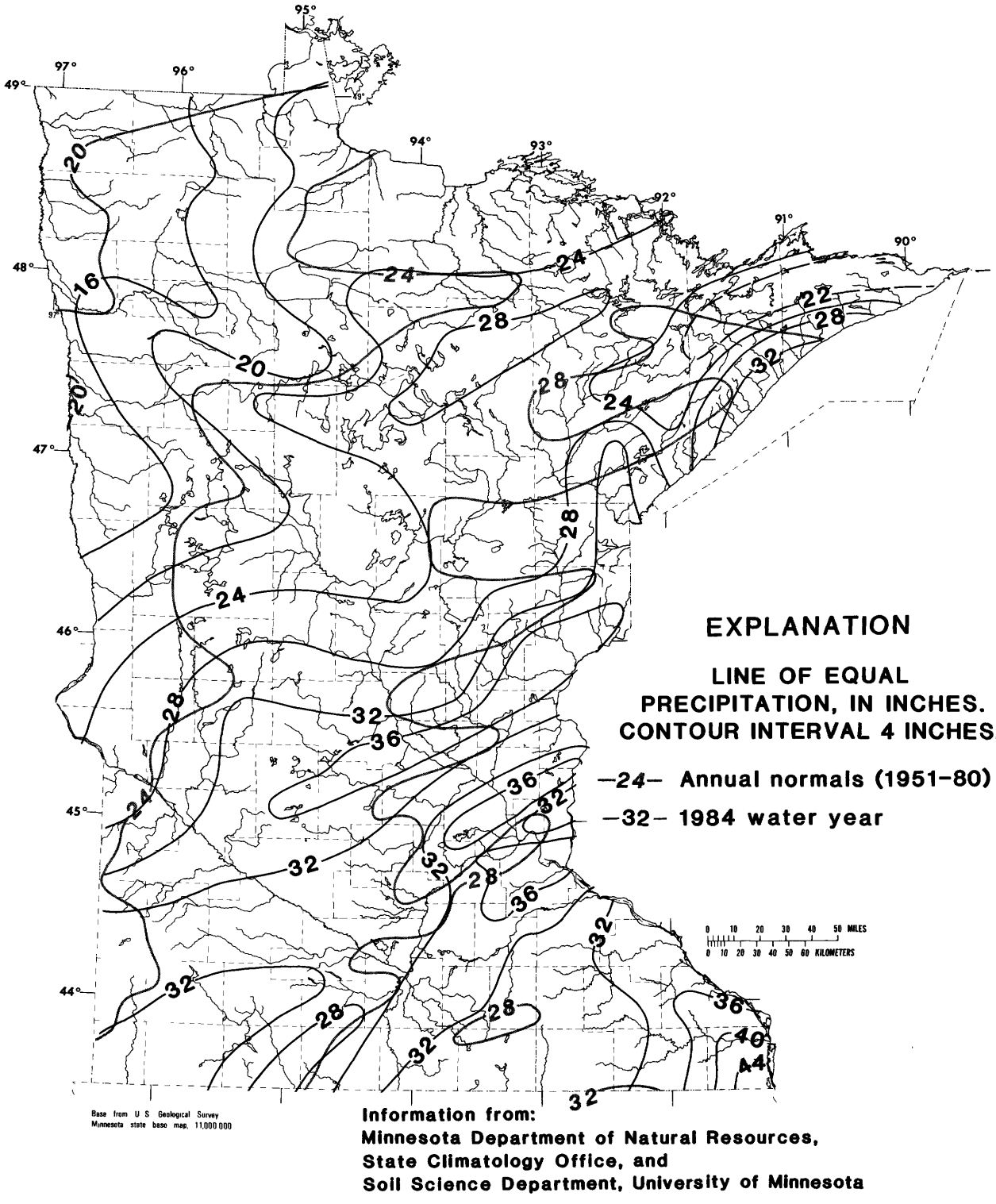


Figure 1.--Precipitation, in inches, during 1984 water year compared with normal annual precipitation for Minnesota

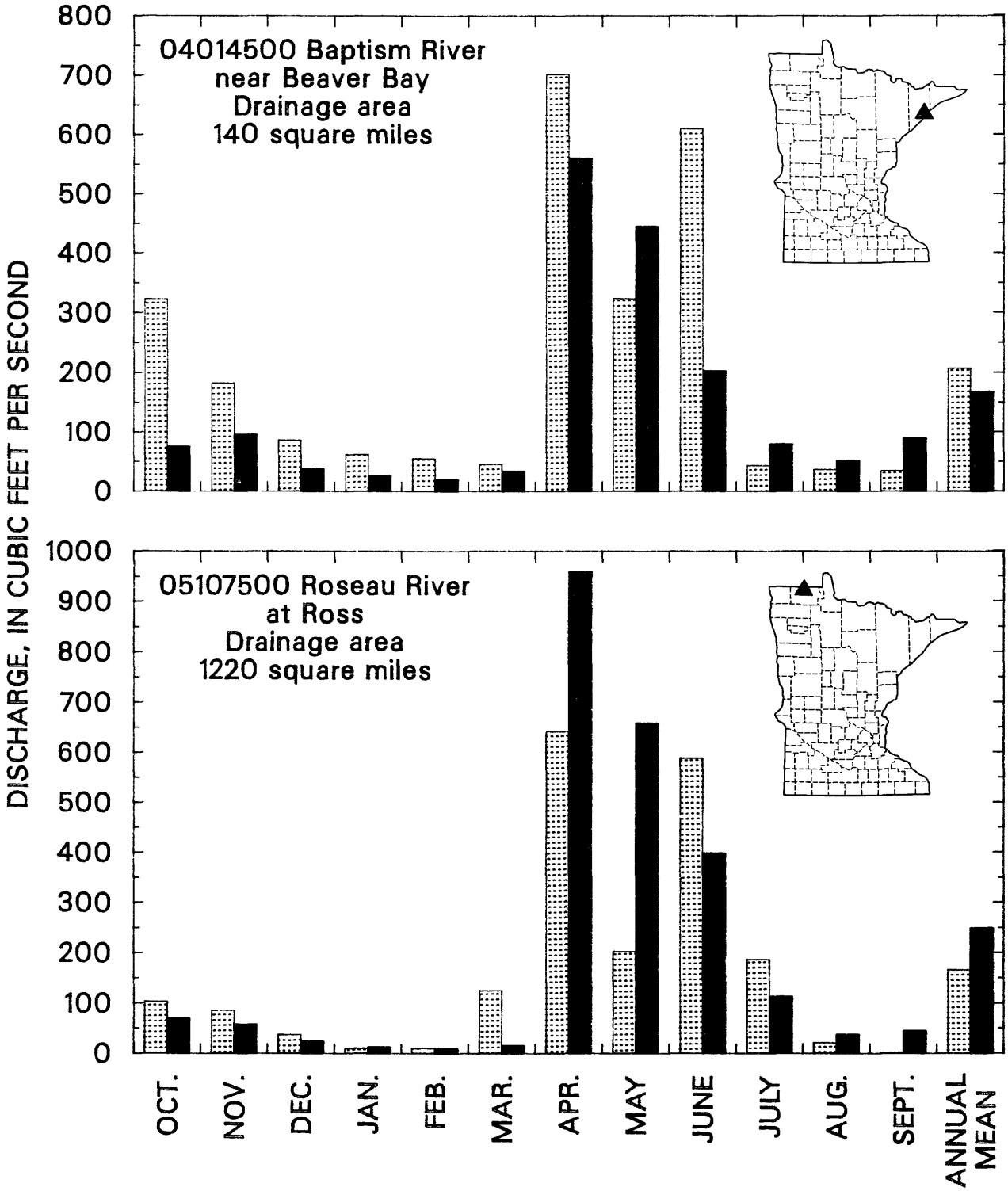
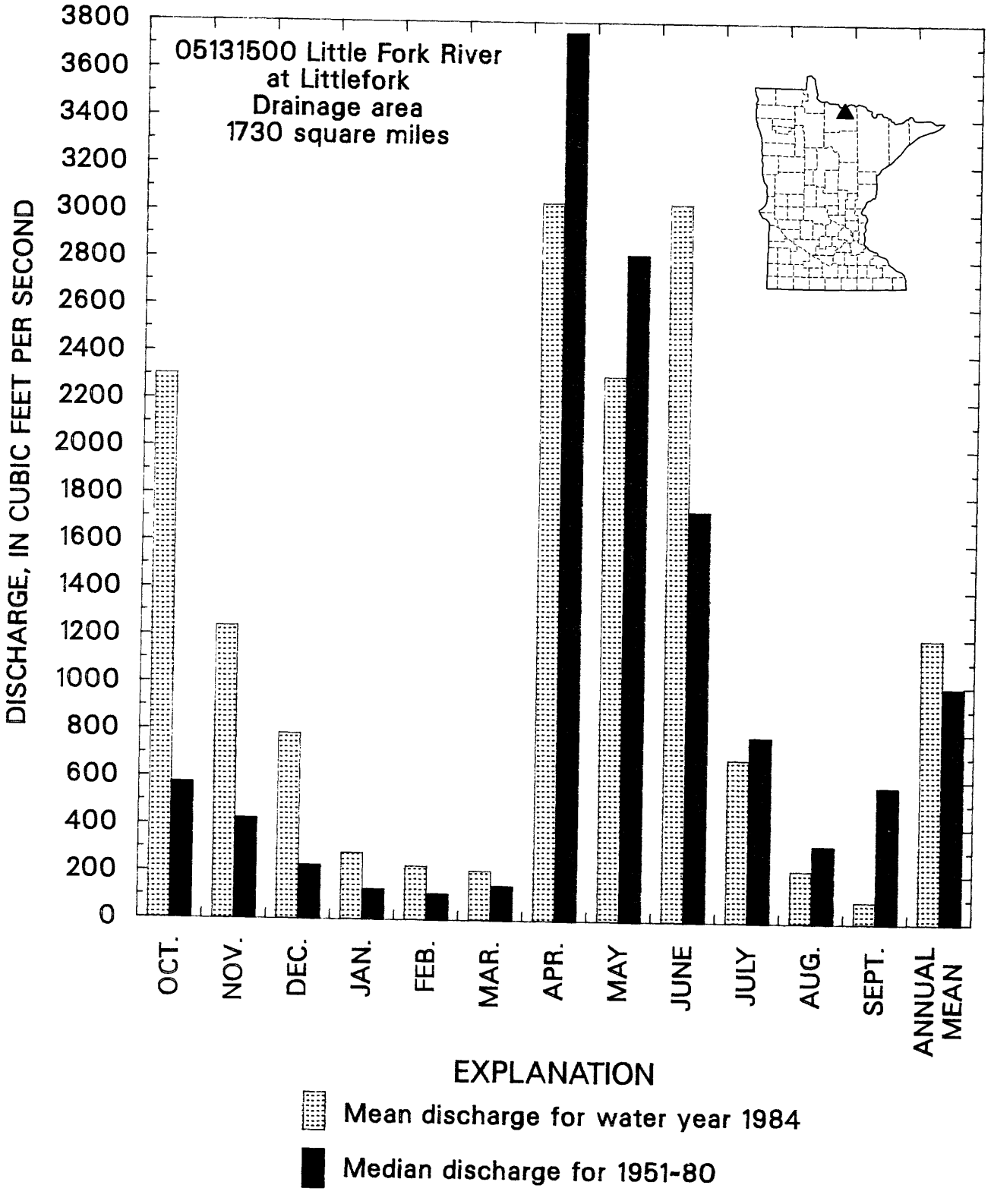


Figure 2.--Comparison of discharges at three long-term representative gaging



stations for the 1984 water year with median discharges for a 30-year base period

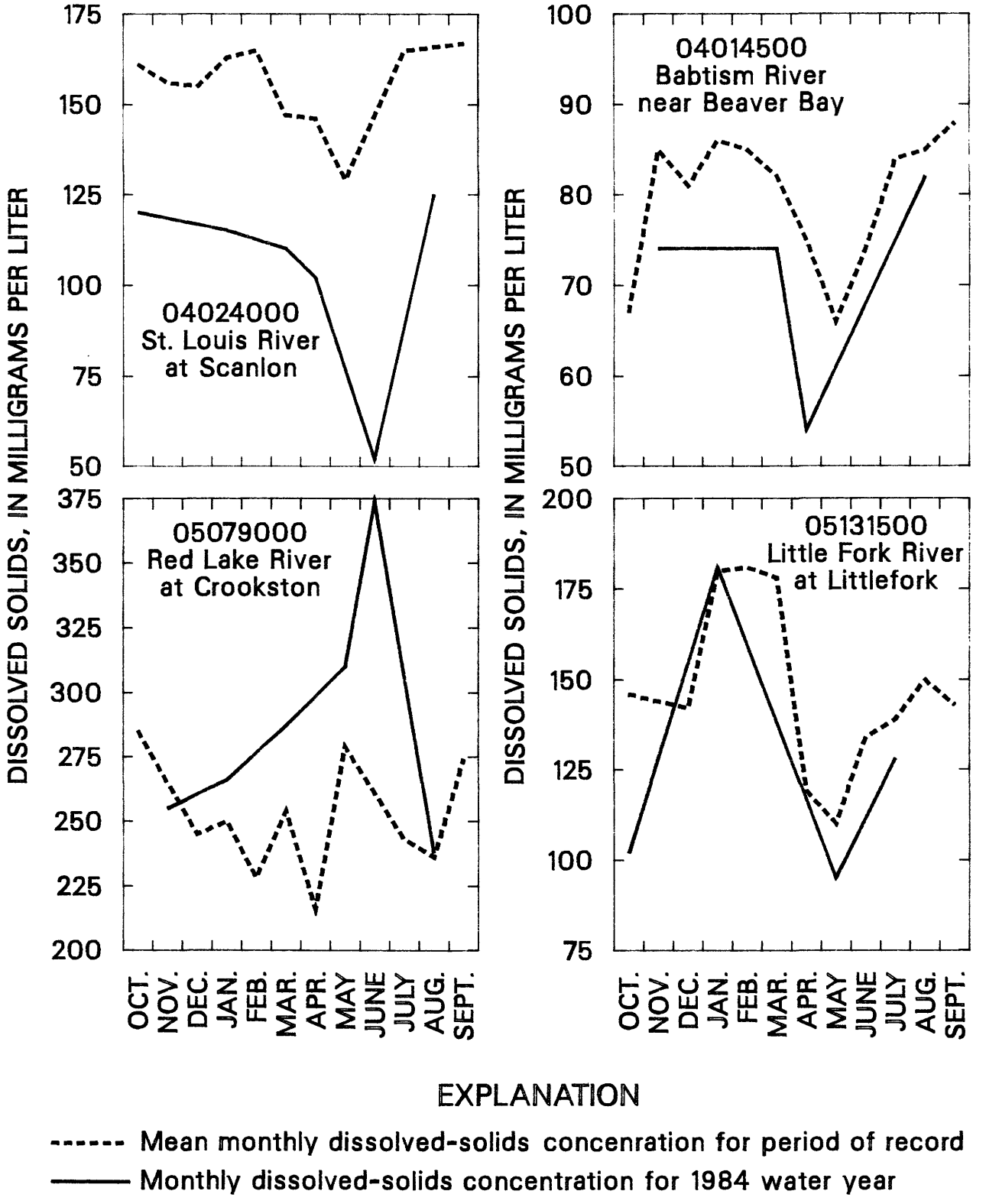


Figure 3.--Comparison of dissolved-solids concentrations for 1984 water year with mean monthly values for the period of record

GROUND-WATER LEVELS

Water levels in unconfined (water-table) aquifers generally were normal in 53 percent of the 126 observation wells at the beginning of the 1984 water year. Water levels rose during the winter and spring so that in spring 1984 water levels were above normal in 58 percent of the observation wells. New monthly record-high-water levels were recorded in 40 percent of the 126 observation wells during the months of April, May and June. Unconfined water levels declined seasonally during the summer, but water levels remained above normal in 52 percent of the 126 observation wells. Unusually heavy rains in late fall and again in spring in many areas of the State resulted in above-normal recharge to the aquifers. Figure 4 shows how water levels relate seasonally to normal levels, based on water-level fluctuations in 126 wells. Levels for the 1984 water year are compared to the long-term normal for each month and grouped by seasons. Water levels in eastern Minnesota were consistently above normal throughout the 1984 water year. Water levels in part of west-central Minnesota were consistently below normal.

Water levels in confined drift and bedrock aquifers generally were normal or above during the first quarter of the 1984 water year (October through December 1983). Water levels rose during winter and spring followed by a seasonal decline in summer 1984 (fig. 5). Confined water levels in 94 observation wells were compared seasonally to long-term normal levels. In fall 1983 (October through December) above normal levels were recorded in 47 percent of the wells, normal levels in 33 percent of the wells, and below-normal levels in 20 percent of the wells. Water levels rose during winter and spring, so that above-normal water levels were recorded during the months of April, May, and June 1984 in 62 percent of the observation wells in confined aquifers, normal levels in 25 percent of the wells, and below-normal levels in only 13 percent of the wells. Numerous seasonal record-high water levels were recorded in northeastern, east-central, central, and southern Minnesota. During the spring, new monthly record-high water levels were recorded in 38 percent of the observation wells in confined aquifers. Water levels declined seasonally during the summer, but remained above normal in 59 percent of the observation wells. New monthly record-high water levels in summer were recorded in 37 percent of the observation wells in confined aquifers. 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 designed 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).

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 1984 water year that began October 1, 1983, and ended September 30, 1984. 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 7, 8, and 10. The following sections of the introductory text are presented to provide users with a

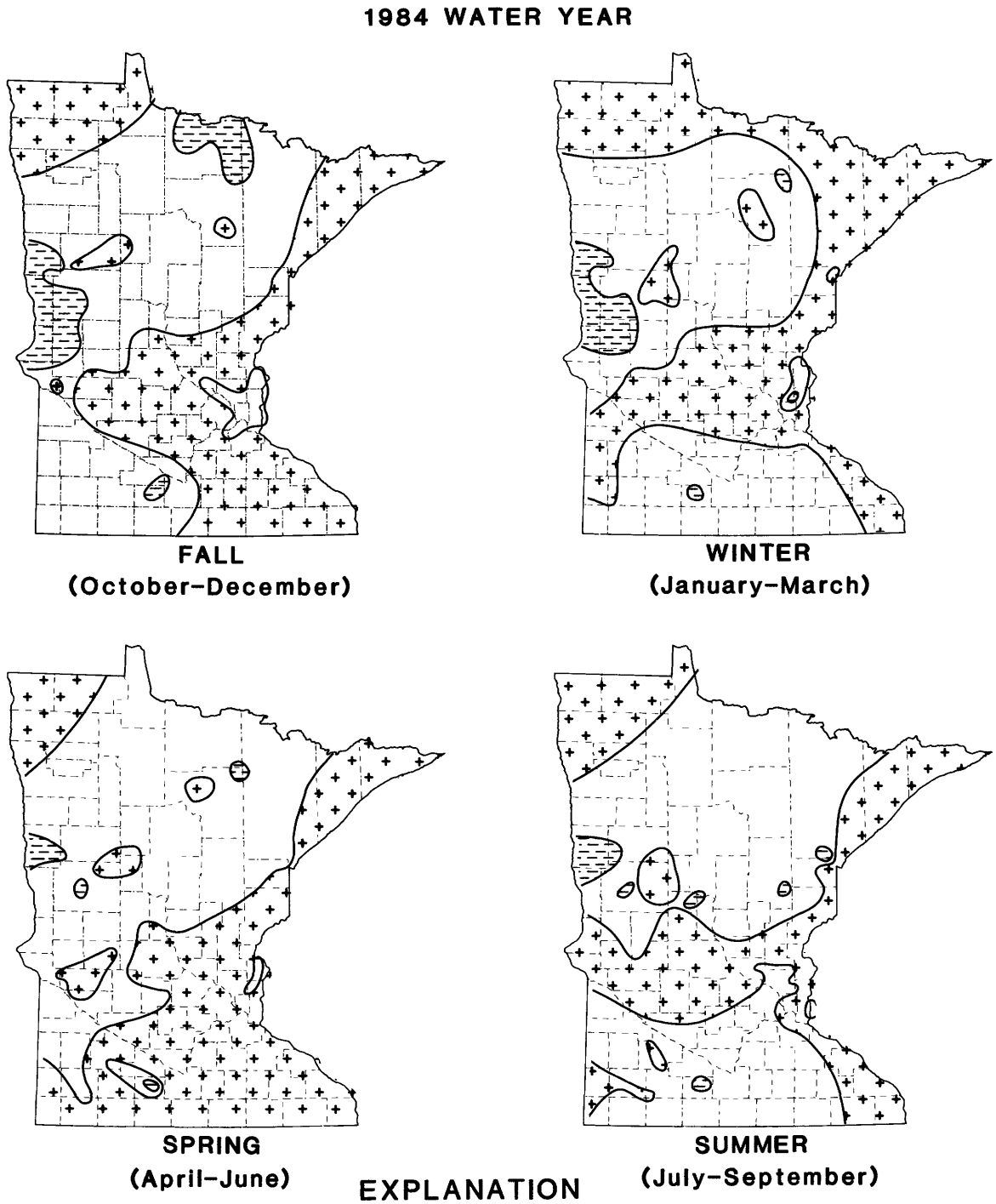


Figure 4.--Relationship of seasonal water-table levels to long-term mean levels

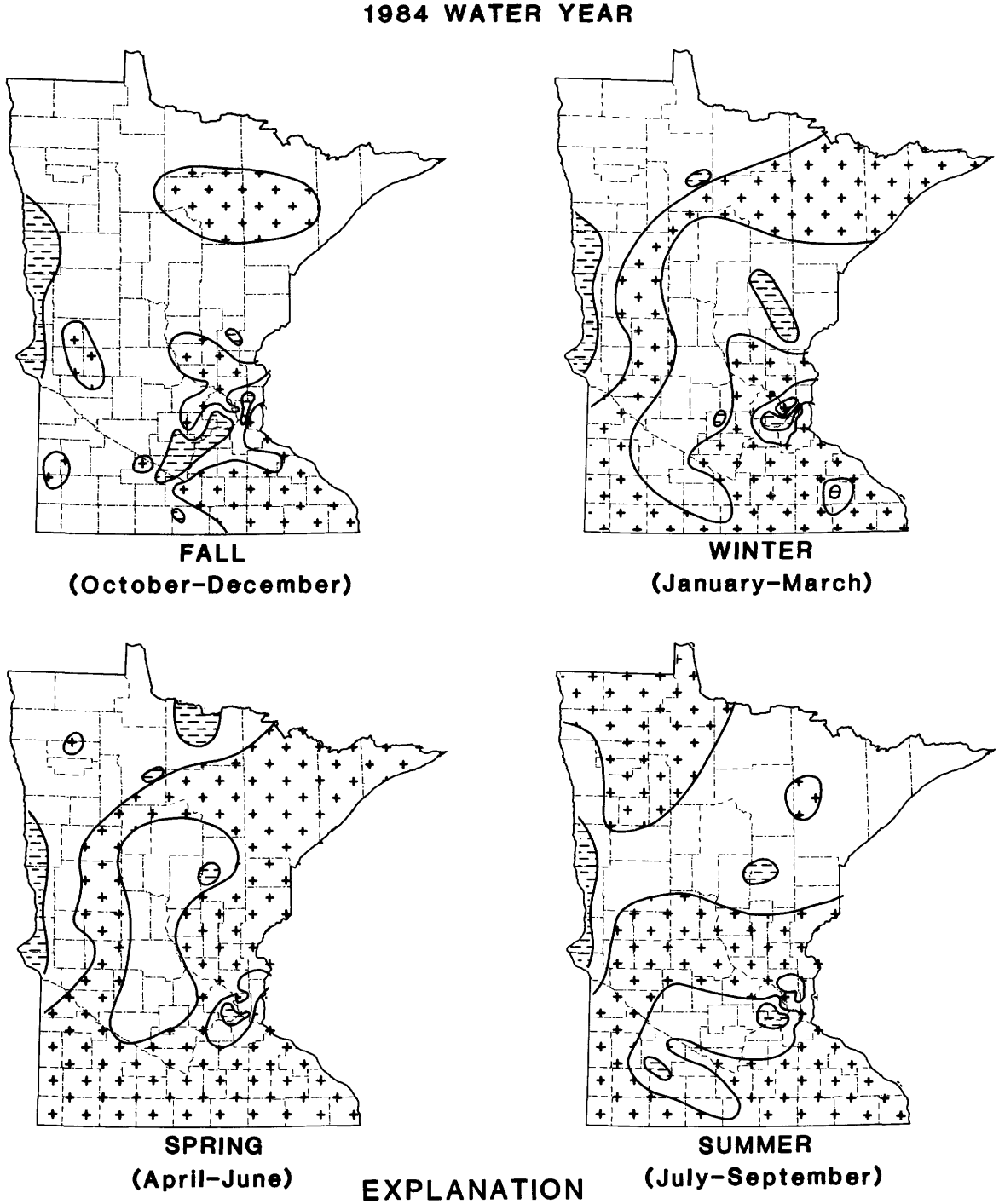


Figure 5.--Relationship of seasonal water levels in confined aquifers to long-term mean levels

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 asssigned 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 6 below. Each well site is also identified by a local well number which consists of township, range, and section numbers, three letters designating 1/4, 1/4, 1/4 section location, and a two-digit sequential number.

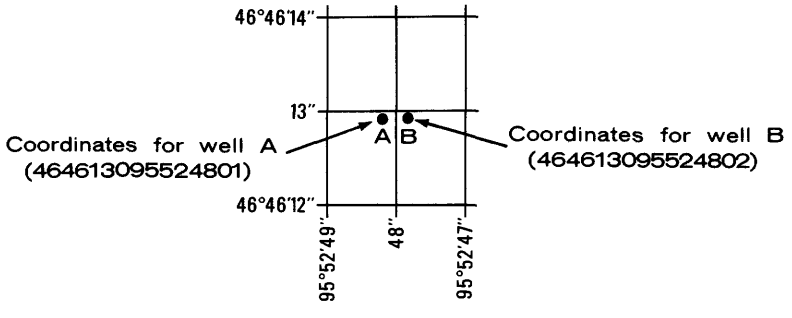


Figure 6.--Example of system for numbering well and miscellaneous sites

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 7 and 9.

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.

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

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.

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 8.

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. 25 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 10.

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 22 representative wells; 1 bedrock, 12 surficial sand, and 1 peat well.

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:

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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.

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

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

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

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

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

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

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

Hardness of water is a physical-chemical characteristic that is commonly recognized by the increased quantity of soap required to produce lather. It is attributable to the presence of alkaline earths (principally calcium and magnesium) and is expressed as equivalent calcium carbonate ($CaCO_3$).

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.

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 milliters (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.

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

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

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

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

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

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

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

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

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

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

Specific conductance is a measure of the ability of a water to conduct an electrical current. It is expressed in micromhos per centimeter at 25°C. Specific conductance is related to the type and concentration of ions in solution and can be used for 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 streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

Substrate is the physical surface upon which an organism lived.

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

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

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

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.

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

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

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

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

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS

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

NOTE: When ordering any of these publications, please give the title, book number, chapter number, and "U.S. Geological Survey Techniques of Water-Resources Investigations".

1-D1. *Water temperature--influential factors, field measurement, and data presentation*, by H. H. Stevens, Jr., J. F. Ficke, and G. F. Smoot: USGS--TWRI Book 1, Chapter D1. 1975. 65 pages.

1-D2. *Guidelines for collection and field analysis of ground-water samples for selected unstable constituents*, by W. W. Wood: USGS--TWRI Book 1, Chapter D2. 1976. 24 pages.

2-D1. *Application of surface geophysics to ground-water investigations*, by A. A. R. Zohdy, G. P. Eaton, and D. R. Mabey: USGS--TWRI Book 2, Chapter D1. 1974. 116 pages.

2-E1. *Application of borehole geophysics to water-resources investigations*, by W. S. Keys and L. M. MacCary: USGS--TWRI Book 2, Chapter E1. 1971. 126 pages.

3-A1. *General field and office procedures for indirect discharge measurements*, by M. A. Benson and Tate Dalrymple: USGS--TWRI Book 3, Chapter A1. 1967. 30 pages.

3-A2. *Measurement of peak discharge by the slope-area method*, by Tate Dalrymple and M. A. Benson: USGS--TWRI Book 3, Chapter A2. 1967. 12 pages.

3-A3. *Measurement of peak discharge at culverts by indirect methods*, by G. L. Bodhaine: USGS--TWRI Book 3, Chapter A3. 1968. 60 pages.

3-A4. *Measurement of peak discharge at width contractions by indirect methods*, by H. F. Matthai: USGS--TWRI Book 3, Chapter A4. 1967. 44 pages.

3-A5. *Measurement of peak discharge at dams by indirect methods*, by Harry Hulsing: USGS--TWRI Book 3, Chapter A5. 1967. 29 pages.

3-A6. *General procedure for gaging streams*, by R. W. Carter and Jacob Davidian: USGS--TWRI Book 3, Chapter A6. 1968. 13 pages.

3-A7. *Stage measurements at gaging stations*, by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A7. 1968. 28 pages.

3-A8. *Discharge measurements at gaging stations*, by T. J. Buchanan and W. P. Somers: USGS--TWRI Book 3, Chapter A8. 1969. 65 pages.

3-A9. *Measurement of time of travel and dispersion in streams by dye tracing*, by E. F. Hubbard, F. A. Kilpatrick, L. A. Martens, and J. F. Wilson, Jr.: USGS--TWRI Book 3, Chapter A9. 1982. 44 pages.

3-A11. *Measurement of discharge by moving-boat method*, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 3, Chapter A11. 1969. 22 pages.

3-B1. *Aquifer-test design, observation, and data analysis*, by R. W. Stallman: USGS--TWRI Book 3, Chapter B1. 1971. 26 pages.

3-B2. *Introduction to ground-water hydraulics, a programed text for self-instruction*, by G. D. Bennett: USGS--TWRI Book 3, Chapter B2. 1976. 172 pages.

3-B3. *Type curves for selected problems of flow to wells in confined aquifers*, by J. E. Reed: USGS--TWRI Book 3, Chapter B3. 1980. 106 pages.

3-C1. *Fluvial sediment concepts*, by H. P. Guy: USGS--TWRI Book 3, Chapter C1. 1970. 55 pages.

3-C2. *Field methods for measurement of fluvial sediment*, by H. P. Guy and V. W. Norman: USGS--TWRI Book 3, Chapter C2. 1970. 59 pages.

3-C3. *Computation of fluvial-sediment discharge*, by George Porterfield: USGS--TWRI Book 3, Chapter C3. 1972. 66 pages.

4-A1. *Some statistical tools in hydrology*, by H. C. Riggs: USGS--TWRI Book 4, Chapter A1. 1968. 39 pages.

4-A2. *Frequency curves*, by H. C. Riggs: USGS--TWRI Book 4, Chapter A2. 1968. 15 pages.

4-B1. *Low-flow investigations*, by H. C. Riggs: USGS--TWRI Book 4, Chapter B1. 1972. 18 pages.

4-B2. *Storage analyses for water supply*, by H. C. Riggs and C. H. Hardison: USGS--TWRI Book 4, Chapter B2. 1973. 20 pages.

4-B3. *Regional analyses of streamflow characteristics*, by H. C. Riggs: USGS--TWRI Book 4, Chapter B3. 1973. 15 pages.

4-D1. *Computation of rate and volume of stream depletion by wells*, by C. T. Jenkins: USGS--TWRI Book 4, Chapter D1. 1970. 17 pages.

5-A1. *Methods for determination of inorganic substances in water and fluvial sediments*, by M. W. Skougstad and others, editors: USGS--TWRI Book 5, Chapter A1. 1979. 626 pages.

5-A2. *Determination of minor elements in water by emission spectroscopy*, by P. R. Barnett and E. C. Mallory, Jr.: USGS--TWRI Book 5, Chapter A2. 1971. 31 pages.

5-A3. *Methods for analysis of organic substances in water*, by D. F. Goerlitz and Eugene Brown: USGS--TWRI Book 5, Chapter A3. 1972. 40 pages.

5-A4. *Methods for collection and analysis of aquatic biological and microbiological samples*, edited by P. E. 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-C1. *Laboratory theory and methods for sediment analysis*, by H. P. Guy: USGS--TWRI Book 5, Chapter C1. 1969. 58 pages.

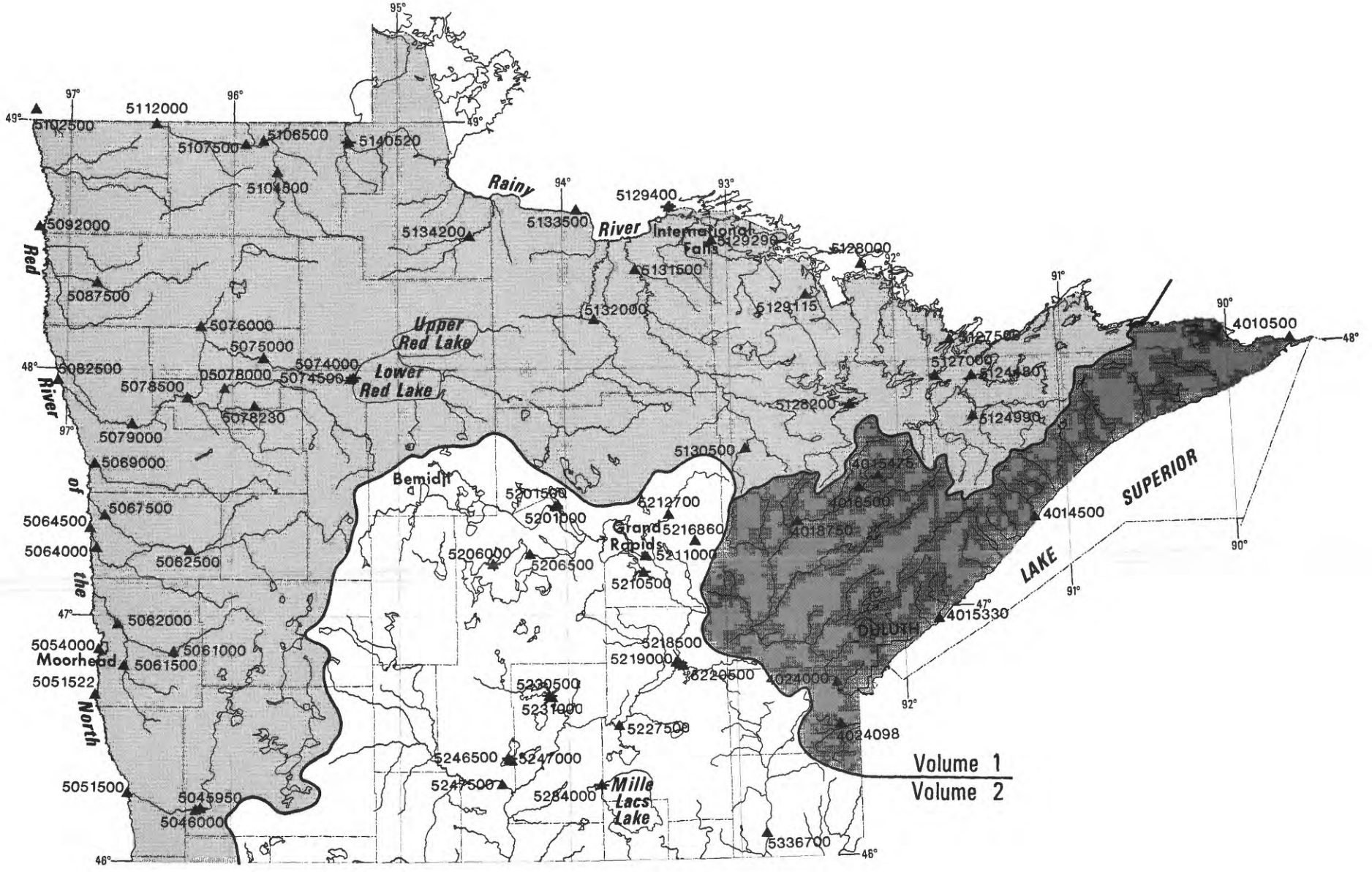
7-C1. *Finite difference model for aquifer simulation in two dimensions with results of numerical experiments*, by P. C. Trescott, G. F. Pinder, and S. P. Larson: USGS--TWRI Book 7, Chapter C1. 1976. 116 pages.

7-C2. *Computer model of two-dimensional solute transport and dispersion in ground water*, by L. F. Konikow and J. D. Bredehoeft: USGS--TWRI Book 7, Chapter C2. 1978. 90 pages.

7-C3. *A model for simulation of flow in singular and interconnected channels*, by R. W. Schaffranek, R. A. Baltzer, and D. E. Goldberg: USGS--TWRI Book 7, Chapter C3. 1981. 110 pages.

8-A1. *Methods of measuring water levels in deep wells*, by M. S. Garber and F. C. Koopman: USGS--TWRI Book 8, Chapter A1. 1968. 23 pages

8-B2. *Calibration and maintenance of vertical-axis type current meters*, by G. F. Smoot and C. E. Novak: USGS--TWRI Book 8, Chapter B2. 1968. 15 pages.


Red River of the North
Rainy River
Upper Red Lake
Lower Red Lake
Lake Superior
Bemidji
Grand Rapids
Moorhead
Mille Lacs Lake
International Falls
DULUTH
5112000
5102500
5107500
5106500
5140520
5104500
5092000
5134200
5133500
5129400
5129290
5128000
5131500
5132000
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Volume 1
Volume 2

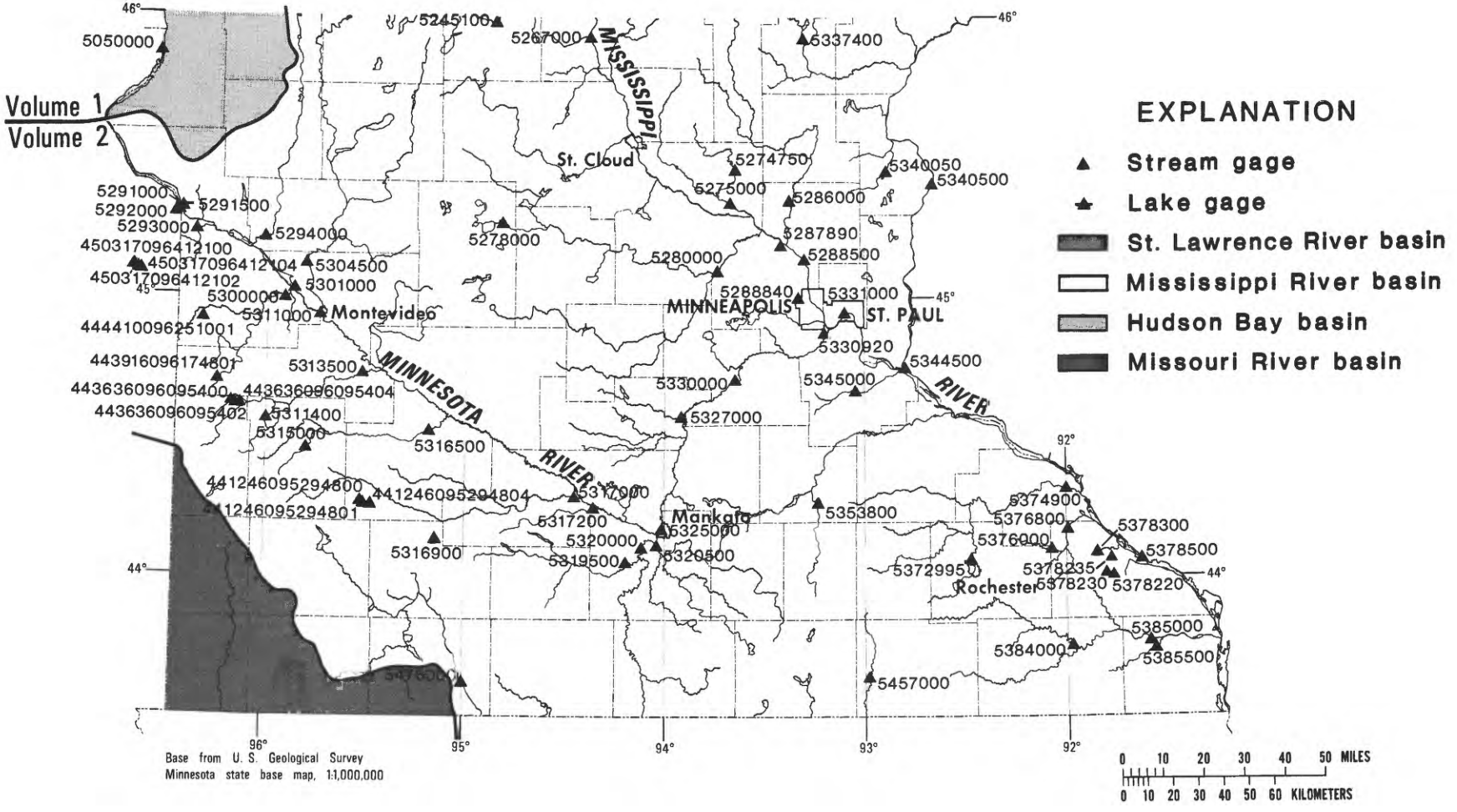


Figure 7.--Location of water-discharge stations

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	[a]77	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	[a]91	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	[a]750	1909-17
04023500	St. Louis River near Cloquet, MN	[a]3,400	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	[a]1,230	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."

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	[a]1,690	1909-10†
05046500	Otter Tail River near Breckenridge, MN	[a]2,040	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	[a]1,540	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	[a]1,100	1948-54
*05063500	South Branch Wild Rice River near Borup, MN	254	1944-49
05067000	Marsh River below Ada, MN	-	1948-52
05067500	Marsh River near Shelly, MN	151	1944-83
05068000	Sand Hill River at Beltrami, MN	[a]324	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	[a]3,450	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	31,200	1936-37, 1941-43, 1945-60, 1973-78
05085500	Snake River at Warren, MN	[a]175	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	[a]320	1945, 1953-55
05092500	Two Rivers (Middle Fork Two Rivers) near Hallock, MN	131	1931-38
05093000	South Branch (South Fork) Two Rivers near Pelan, MN	281	1928-38, 1953-56
*05094000	South Branch Two Rivers at Lake Bronson, MN	444	1928-36, 1937, 1941-43, 1944, 1945-47, 1953-81

"See footnotes at end of table."

DISCONTINUED GAGING STATIONS

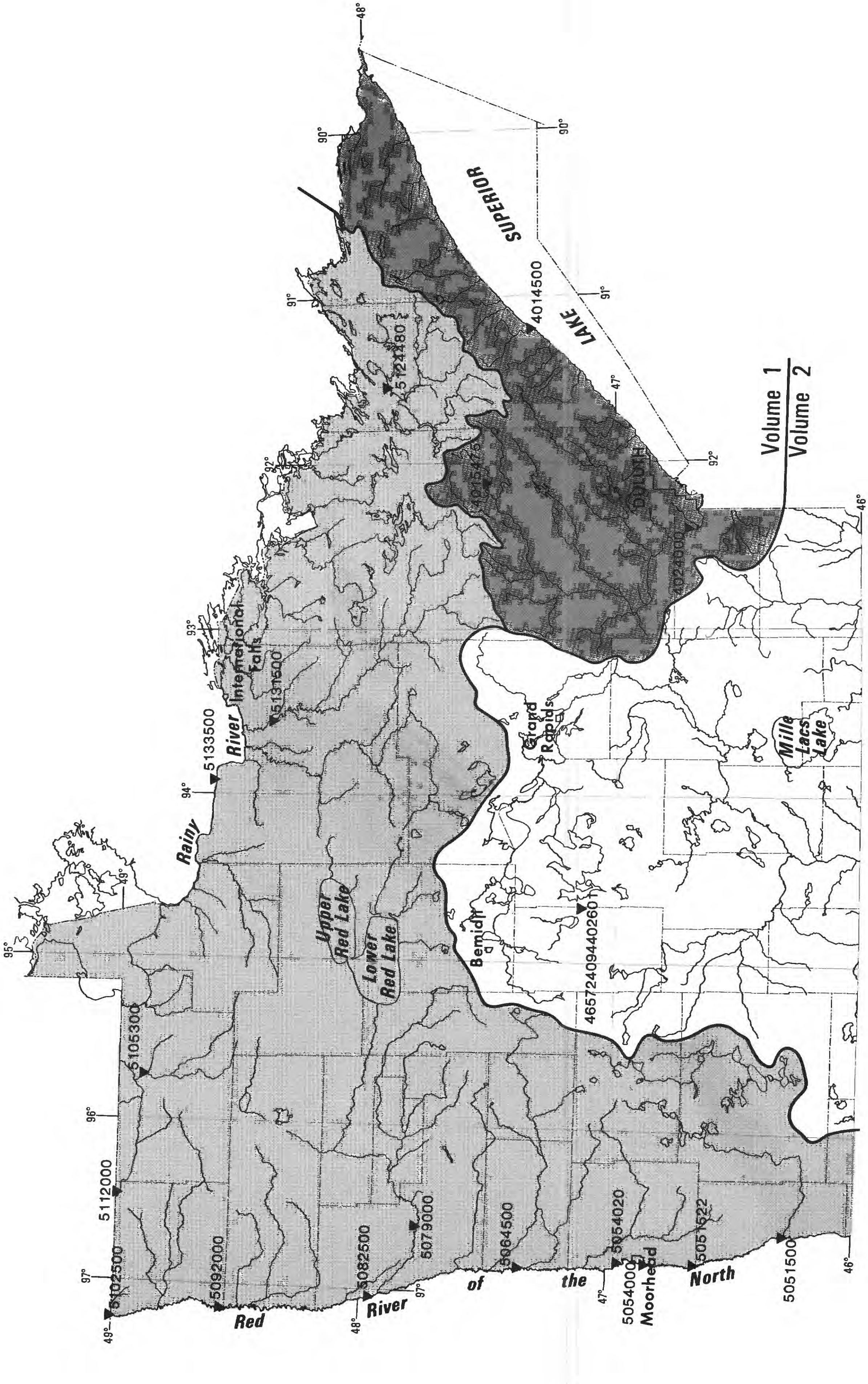
Station number	Station name	Drainage area (mi^2)	Period of record
	Red River of the North Basin--Continued		
05094500	South Branch Two Rivers (Two Rivers) at Hallock, MN	-	1940-47
05095000	Two Rivers (South Branch Two Rivers) at Hallock, MN	625	1911-14 1929-30 1938-39 1941-43
05095500	Two Rivers below Hallock, MN	644	1945-55
05096000	North Branch (North Fork) Two Rivers near Lancaster, MN	[a]32	1929-38, 1941-55
05096500	State Ditch 85 near Lancaster, MN	[a]95	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	[a]1,060	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	[a]2.2	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	[a]1,590	1933-69
	Lake of the Woods basin		
05124500	Isabella River near Isabella, MN	341	1953-61, 1976-77
05125000	South Kawishiwi River near Ely, MN	-	1953-61, 1976-78
05125500	Stony River near Isabella, MN	180	1953-64
05125550	Stony River near Babbitt, MN	219	1975-80
05126000	Dunka River near Babbitt, MN	53.4	1951-62, 1975-80
05126210	South Kawishiwi River above White Iron Lake near Ely, MN		1975-78
05126500	Bear Island River near Ely, MN	68.5	1953-62, 1975-77
05127205	Burntside River near Ely, MN	-	1967-78
05127207	Bjorkman's Creek near Ely, MN	1.36	1972-78
05127210	Armstrong Creek near Ely, MN	5.29	1967-78
05127215	Longstorff Creek near Ely, MN	8.84	1967-78
05127219	Shagawa Lake tributary at Ely, MN	1.84	1971-78
05127220	Burgo Creek near Ely, MN	3.04	1967-78

"See footnotes at end of table."

DISCONTINUED GAGING STATIONS

Station number	Station name	Drainage area (mi^2)	Period of record
	Lake of the Woods basin--Continued		
05127230	Shagawa River near Ely, MN	99	1967-78
05128340	Pike River near Biwabik, MN	-	1977-79
05128500	Pike River near Embarrass, MN	115	1953-64, 1976-79
05129000	Vermilion River below Vermilion Lake near Tower, MN	483	1911-17, 1928-81
05129500	Rainy River at International Falls, MN	14,900	1905-60
05130000	Sturgeon River (Lake) at Side Lake, MN	-	1938-47
05131000	Dark River near Chisholm, MN	50.6	1942-61, 1965-79
05131800	Deer Lake outlet (Deer Lake) near Effie, MN	-	1937-39, 1940-46
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.


LAKE SUPERIOR
Volume 1
Volume 2
DULUTH
International Falls
Rainy River
Upper Red Lake
Lower Red Lake
Bemidji
Grand Rapids
Mille Lacs Lake
Red River of the North
Moorhead
4014500
4015475
4024000
5124480
5131500
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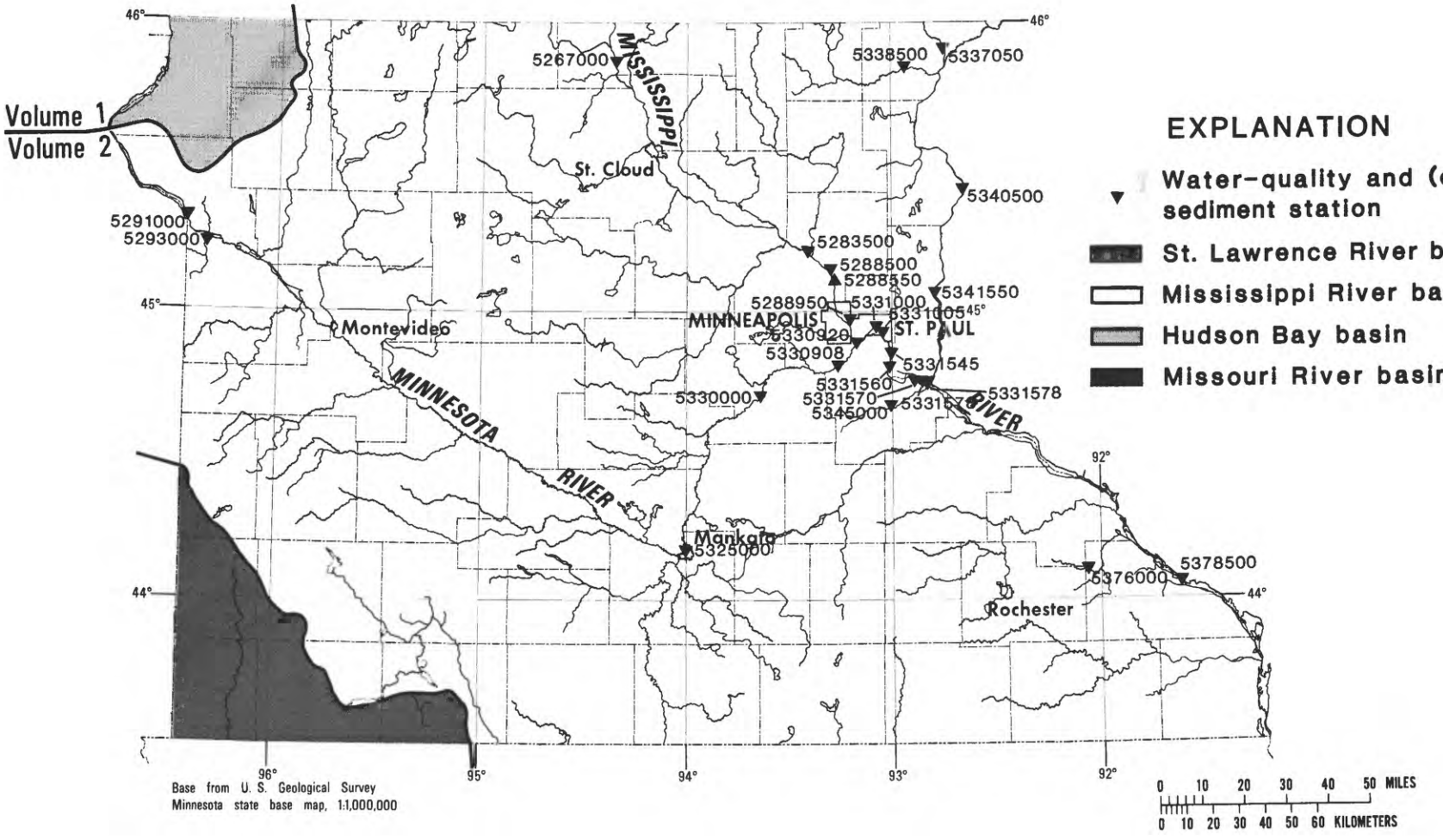


Figure 8.--Location of water-quality stations

HYDROLOGIC-DATA STATION RECORDS

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

LOCATION.--Lat 48°00'44", long 89°36'58", in 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 (122 m) upstream from Middle Falls, 2.5 mi (4.0 km) upstream from Grand Portage Port of Entry, 3.5 mi (5.6 km) upstream from mouth, and 4.7 mi (7.6 km) northeast of village of Grand Portage.

DRAINAGE AREA.--600 mi^2 (1,554 km^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 (240.054 m), National Geodetic Vertical Datum of 1929. Prior to Sept. 30, 1940, nonrecording gage at International Bridge, 5.8 mi (9.3 km) upstream at datum 102.24 ft (31.163 m) higher. Oct. 1, 1940, to Dec. 31, 1975, at present site at datum 2.00 ft (0.610 m) higher.

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

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

AVERAGE DISCHARGE.--61 years (water years 1924-84), 507 ft^3/s (14.36 m^3/s), 11.48 in/yr (292 mm/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 3,510 ft^3/s (99.4 m^3/s) Apr. 28, gage height, 8.63 ft (2.630 m), no other peak above base of 3,000 ft^3/s (85.0 m^3/s); maximum gage height, 9.13 ft (2.783 m) probably occurred Apr. 16, from highwater mark (backwater from ice); minimum discharge, 76 ft^3/s (2.15 m^3/s) Sept. 23, 24, gage height, 2.51 ft (0.765 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	740	399	560	260	230	190	210	2170	620	688	250	136
2	622	386	530	260	230	185	225	1960	1000	649	244	133
3	910	369	500	260	230	180	240	1960	940	629	235	126
4	990	356	480	260	230	175	260	1960	870	604	227	122
5	802	343	450	260	220	175	290	1880	930	586	221	117
6	680	339	430	250	220	175	350	1790	960	584	226	111
7	588	336	400	250	220	175	450	1810	1000	563	251	107
8	580	332	380	250	220	175	500	2370	1500	529	363	106
9	564	329	370	250	220	170	500	2700	1800	496	595	120
10	510	323	360	250	220	170	500	2410	2000	470	445	122
11	502	317	350	250	220	170	550	2090	2000	451	352	133
12	686	293	340	250	220	160	600	1890	2000	435	297	142
13	716	317	330	250	220	160	700	1720	2000	452	260	152
14	793	317	320	250	220	160	900	1590	1800	464	280	145
15	939	295	310	250	220	160	1500	1480	1500	449	311	138
16	1230	293	300	240	210	160	2500	1380	1350	431	287	130
17	1310	323	300	240	210	160	2000	1300	1200	437	258	120
18	1090	281	290	240	210	150	1790	1230	1100	432	241	110
19	926	267	290	240	210	150	1610	1170	1000	415	224	101
20	810	778	290	240	210	150	1500	1140	940	395	208	93
21	731	1300	280	240	210	150	1470	1100	895	373	206	87
22	667	1160	280	240	210	150	1370	1180	837	347	213	79
23	616	1100	270	240	210	150	1270	1180	804	330	201	77
24	577	970	270	240	200	150	1210	1050	770	317	191	87
25	546	870	270	240	200	150	1180	940	740	314	180	102
26	524	790	270	230	200	155	1200	850	710	310	171	117
27	503	700	270	230	200	160	2060	800	770	294	165	120
28	479	650	270	230	200	165	3440	740	819	282	161	115
29	453	620	260	230	200	170	3100	690	801	269	156	110
30	437	590	260	230	---	180	2600	670	743	259	149	103
31	418	---	260	230	---	190	---	650	---	259	141	---
TOTAL	21939	15743	10540	7580	6220	5120	36075	45850	34399	13513	7709	3461
MEAN	708	525	340	245	214	165	1203	1479	1147	436	249	115
MAX	1310	1300	560	260	230	190	3440	2700	2000	688	595	152
MIN	418	267	260	230	200	150	210	650	620	259	141	77
CFSM	1.18	.88	.57	.41	.36	.28	2.01	2.47	1.91	.73	.42	.19
IN.	1.36	.98	.65	.47	.39	.32	2.24	2.84	2.13	.84	.48	.21
AC-FT	43520	31230	20910	15030	12340	10160	71550	90940	68230	26800	15290	6860

CAL YR 1983 TOTAL 202117 MEAN 554 MAX 3120 MIN 145 CFSM .92 IN 12.53 AC-FT 400900
WTR YR 1984 TOTAL 208149 MEAN 569 MAX 3440 MIN 77 CFSM .95 IN 12.91 AC-FT 412900

STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN

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

DRAINAGE AREA.--140 mi^2 (363 km^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 (187.041 m) 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 (113 m) downstream and at datum 3.68 ft (1.122 m) lower.

REMARKS.--Records good except those for winter period, and those for period of no gage height record, June 8-19, which are fair.

AVERAGE DISCHARGE.--57 years, 170 ft^3/s (4.814 m^3/s), 16.49 in/yr (419 mm/yr).

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

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

Date	Time	Discharge (ft^3/s)	Discharge (m^3/s)	Gage height (ft)	Gage height (m)
Apr. 13	2030	1,690	47.9	9.69	2.954
Apr. 27	1700	1,620	45.9	9.44	2.877
June 8	unknown	*1,990	56.4	*9.86	3.005

Minimum discharge, 11 ft^3/s (0.31 m^3/s) July 30, Aug. 4, 5, gage height, 5.42 ft (1.652 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	475	97	125	73	49	53	75	632	104	66	13	12
2	403	96	120	72	49	53	90	545	475	61	13	12
3	587	91	115	72	49	50	110	550	379	155	12	13
4	621	87	110	74	49	47	140	520	252	123	12	23
5	507	84	105	73	48	47	170	465	413	90	51	26
6	371	84	100	74	48	48	200	441	427	75	66	22
7	327	84	100	74	48	46	250	485	540	66	52	19
8	355	83	95	73	44	43	300	649	1700	63	147	22
9	286	83	95	69	42	39	354	638	1700	57	148	26
10	255	84	90	68	42	39	396	556	1650	53	95	26
11	615	76	90	64	43	38	465	525	1600	47	66	25
12	558	70	85	63	47	34	644	450	1600	41	52	32
13	449	79	85	67	55	36	1360	375	1500	46	42	50
14	336	82	80	69	60	40	1610	316	1300	47	34	39
15	344	79	80	69	70	44	1450	269	1200	42	32	34
16	565	77	80	69	70	45	1350	228	700	38	27	29
17	461	74	80	69	70	46	1160	206	500	36	24	24
18	365	74	80	64	70	45	1070	194	350	33	21	21
19	289	141	80	59	67	44	945	170	250	29	20	18
20	242	768	80	58	61	44	828	151	191	26	18	16
21	206	798	80	55	59	43	762	158	162	23	22	15
22	187	545	75	50	58	42	678	255	209	21	21	15
23	169	409	75	50	65	41	588	218	235	20	18	16
24	156	309	75	51	67	41	535	183	183	18	17	82
25	146	230	75	52	61	45	510	165	144	16	16	96
26	136	200	75	52	62	49	540	153	127	17	17	84
27	127	180	75	52	62	52	1250	138	130	16	20	74
28	119	160	75	52	55	53	1440	121	109	14	17	67
29	110	140	75	52	55	54	1010	109	92	13	15	57
30	103	130	75	52	---	58	780	100	76	12	14	49
31	99	---	75	50	---	65	---	89	---	12	12	---
TOTAL	9969	5494	2705	1941	1625	1424	21060	10054	18298	1376	1134	1044
MEAN	322	183	87.3	62.6	56.0	45.9	702	324	610	44.4	36.6	34.8
MAX	621	798	125	74	70	65	1610	649	1700	155	148	96
MIN	99	70	75	50	42	34	75	89	76	12	12	12
CFSM	2.30	1.31	.62	.45	.40	.33	5.01	2.31	4.36	.32	.26	.25
IN.	2.65	1.46	.72	.52	.43	.38	5.60	2.67	4.86	.37	.30	.28
AC-FT	19770	10900	5370	3850	3220	2820	41770	19940	36290	2730	2250	2070

CAL YR 1983 TOTAL 69261 MEAN 190 MAX 1880 MIN 18 CFSM 1.36 IN 18.40 AC-FT 137400
WTR YR 1984 TOTAL 76124 MEAN 208 MAX 1700 MIN 12 CFSM 1.49 IN 20.23 AC-FT 151000

STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

WATER-QUALITY RECORDS

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

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
NOV , 1983											
01...	1245	95	62	70	7.6	7.5	9.0	6.0	2.0	749	12.0
MAR , 1984											
07...	1100	46	103	86	7.1	7.2	-21.0	.0	2.0	748	14.9
APR											
25...	0845	520	48	43	7.4	7.1	7.0	7.5	2.5	735	11.7
AUG											
21...	1030	23	103	105	6.2	7.6	22.0	22.0	.50	735	7.8

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)
NOV , 1983											
01...	99	5	340	8.7	2.7	2.5	.30	27	10	2.4	.30
MAR , 1984											
07...	104	24	36	11	3.4	3.3	.30	34	5.7	4.2	.20
APR											
25...	101	K14	K12	5.2	1.7	1.4	.40	14	5.5	1.5	.10
AUG											
21...	93	--	190	13	4.0	3.7	.50	45	10	3.4	.20

STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

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)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV , 1983											
01...	9.9	74	<.10	.290	.90	<.010	.010	<.010	1	.26	89
MAR , 1984											
07...	14	74	.35	<.010	1.4	.070	<.010	<.010	1	.12	100
APR											
25...	7.7	54	.22	.400	1.9	.020	<.010	<.010	1	1.4	92
AUG											
21...	7.0	82	<.10	.020	.60	<.010	<.010	<.010	2	.12	100

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)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)
NOV , 1983											
01...	1245	80	1	14	<.5	<1	20	<3	2	260	3
MAR , 1984											
07...	1100	50	1	13	<.5	<1	4	<3	1	250	3
APR											
25...	0845	70	1	9	<.5	1	10	<3	1	160	2
AUG											
21...	1030	40	2	12	<.5	3	7	<3	5	71	1

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
NOV , 1983										
01...	4	3	<.1	<10	1	<1	<1	25	<6	3
MAR , 1984										
07...	8	2	<.1	<10	1	<1	<1	29	<6	8
APR										
25...	<4	3	<.1	<10	<1	<1	<1	16	<6	16
AUG										
21...	<4	5	.7	<10	<1	<1	<1	40	<6	47

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 (183 m) downstream from bridge on U.S. Highway 61, 0.5 mi (0.8 km) upstream from bridge on County Highway 102, in town of Knife River, 0.8 mi (1.3 km) upstream from Lake Superior, and 7.8 mi (12.6 km) southwest of Two Harbors.

DRAINAGE AREA.--85.6 mi^2 (221.7 km^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. Altitude of gage is 640 ft (195 m), from topographic map.

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

AVERAGE DISCHARGE.--10 years, 90.5 ft^3/s (2.563 m^3/s), 14.36 in/yr (365 mm/yr).

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

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

Date	Time	Discharge (ft^3/s)	Discharge (m^3/s)	Gage height (ft)	Gage height (m)	Date	Time	Discharge (ft^3/s)	Discharge (m^3/s)	Gage height (ft)	Gage height (m)
Oct. 16	0130	888	25.1	5.24	1.597	June 8	0615	832	23.6	5.06	1.542
Nov. 20	1130	1,400	39.6	5.87	1.789	June 10	1115	*2,630	74.5	*7.29	2.222
Apr. 13	1800	1,060	30.0	5.39	1.643	June 26	1830	1,240	35.1	5.73	1.747
Apr. 27	1800	1,190	33.7	5.57	1.698						

Minimum discharge, 5.6 ft^3/s (0.16 m^3/s) July 30, 31, gage height, 2.62 ft (0.799 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	180	37	115	23	21	19	280	302	42	38	7.5	7.6
2	174	37	105	23	21	18	360	274	85	33	7.5	9.0
3	149	38	96	23	21	18	450	222	78	82	7.1	13
4	167	37	90	23	21	18	490	168	54	58	6.4	20
5	135	35	84	23	20	18	540	136	222	35	9.4	25
6	110	36	80	23	20	18	560	116	274	29	22	20
7	97	36	74	23	20	18	500	121	236	26	14	15
8	141	34	68	23	20	18	480	174	636	22	105	14
9	99	36	62	23	20	18	466	157	338	21	299	14
10	101	38	58	23	20	18	522	126	1260	20	123	12
11	558	38	54	22	20	18	551	146	672	19	63	11
12	306	38	50	22	21	18	623	119	395	16	39	15
13	180	38	47	22	22	18	844	160	420	15	27	45
14	131	38	44	22	23	19	761	160	193	21	22	30
15	236	39	42	22	25	20	539	114	116	18	21	22
16	654	39	38	22	28	21	415	103	116	16	19	17
17	330	40	36	22	29	22	318	174	110	15	15	14
18	202	41	35	21	29	21	243	123	85	14	13	12
19	151	118	34	21	28	20	186	91	61	13	12	10
20	119	1190	32	21	26	20	160	73	49	11	10	8.8
21	97	654	31	21	25	20	136	82	40	9.9	11	7.9
22	83	333	30	21	24	21	114	266	312	9.3	15	7.5
23	75	280	29	21	22	21	99	163	271	11	12	8.1
24	68	230	28	21	21	22	85	114	124	8.5	10	394
25	61	200	27	21	20	25	78	99	69	7.1	9.5	294
26	57	180	27	21	20	30	95	87	317	8.1	10	184
27	52	160	26	21	19	45	748	75	375	7.6	16	112
28	48	150	25	21	19	60	594	64	143	7.1	14	81
29	43	135	25	21	19	90	318	53	73	6.5	12	58
30	40	125	24	21	---	150	342	48	49	6.0	9.0	44
31	38	---	24	21	---	210	---	43	---	6.3	8.2	---
TOTAL	4882	4430	1540	678	644	1072	11897	4153	7215	609.4	968.6	1524.9
MEAN	157	148	49.7	21.9	22.2	34.6	397	134	241	19.7	31.2	50.8
MAX	654	1190	115	23	29	210	844	302	1260	82	299	394
MIN	38	34	24	21	19	18	78	43	40	6.0	6.4	7.5
CFSM	1.83	1.73	.58	.26	.26	.40	4.64	1.57	2.82	.23	.36	.59
IN.	2.12	1.93	.67	.29	.28	.47	5.17	1.80	3.14	.26	.42	.66
AC-FT	9680	8790	3050	1340	1280	2130	23600	8240	14310	1210	1920	3020

CAL YR 1983 TOTAL 36221.0 MEAN 99.2 MAX 1190 MIN 4.5 CFSM 1.16 IN 15.74 AC-FT 71840
WTR YR 1984 TOTAL 39613.9 MEAN 108 MAX 1260 MIN 6.0 CFSM 1.26 IN 17.22 AC-FT 78570

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

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

DRAINAGE AREA.--106 mi^2 (275 km^2) of which 6.0 mi^2 (15.5 km^2) is noncontributing.

WATER-DISCHARGE RECORDS

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

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

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

AVERAGE DISCHARGE.--6 years, 90.9 ft^3/s (2.574 m^3/s), 11.65 in/yr (296 mm/yr).

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

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 617 ft^3/s (17.5 m^3/s) Apr. 15, gage height, 8.25 ft (2.515 m); minimum, 6.1 ft^3/s (0.17 m^3/s) Sept. 3, gage height, 5.07 ft (1.545 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	95	78	80	23	18	26	50	288	47	108	13	7.6
2	151	73	75	23	18	26	62	268	69	93	11	6.6
3	293	73	70	22	18	26	80	251	96	129	9.2	6.7
4	399	69	65	22	18	26	99	248	100	167	8.4	10
5	467	65	60	21	18	26	127	251	94	169	9.9	12
6	497	60	55	21	18	26	177	239	96	145	11	13
7	476	56	50	20	18	26	227	225	110	122	12	13
8	419	53	47	20	18	25	268	246	136	104	15	12
9	355	51	45	20	18	25	304	301	185	93	22	11
10	305	49	44	19	18	25	342	348	227	93	33	10
11	293	47	42	19	17	24	371	377	256	90	38	9.7
12	289	43	40	19	18	24	398	383	288	78	38	10
13	280	40	38	19	19	23	461	365	345	69	37	10
14	263	39	37	19	21	23	538	322	404	66	34	13
15	241	38	36	18	22	22	609	270	426	66	32	17
16	248	38	34	18	22	22	613	218	395	63	30	19
17	267	38	33	18	24	21	562	183	325	59	26	18
18	278	38	32	18	24	21	516	160	253	56	22	17
19	269	39	31	18	24	20	445	141	196	53	19	16
20	240	80	30	18	25	19	377	127	152	50	17	16
21	204	177	29	18	25	18	312	110	122	45	20	18
22	178	222	28	18	25	18	263	110	115	40	21	17
23	156	241	27	18	25	17	227	108	129	34	20	17
24	138	190	26	18	26	18	196	97	136	28	16	17
25	125	160	26	18	26	19	169	87	115	23	14	18
26	115	140	25	18	26	21	154	81	102	21	12	21
27	108	120	25	18	26	23	173	77	120	19	11	27
28	103	110	25	18	26	27	229	67	160	17	11	32
29	97	100	24	19	26	29	286	59	167	17	11	33
30	92	90	24	19	---	33	296	51	136	17	9.9	34
31	86	---	24	18	---	40	---	47	---	16	8.6	---
TOTAL	7527	2617	1227	595	627	739	8931	6105	5502	2150	592.0	481.6
MEAN	243	87.2	39.6	19.2	21.6	23.8	298	197	183	69.4	19.1	16.1
MAX	497	241	80	23	26	40	613	383	426	169	38	34
MIN	86	38	24	18	17	17	50	47	47	16	8.4	6.6
CFSM	2.29	.82	.37	.18	.20	.23	2.81	1.86	1.73	.66	.18	.15
IN.	2.64	.92	.43	.21	.22	.26	3.13	2.14	1.93	.75	.21	.17
AC-FT	14930	5190	2430	1180	1240	1470	17710	12110	10910	4260	1170	955

CAL YR 1983 TOTAL 34485.1 MEAN 94.5 MAX 497 MIN 6.5 CFSM .89 IN 12.10 AC-FT 68400
WTR YR 1984 TOTAL 37093.6 MEAN 101 MAX 613 MIN 6.6 CFSM .95 IN 13.02 AC-FT 73580

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

WATER-QUALITY RECORDS

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

PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: February 1976 to current year.
WATER TEMPERATURES: February 1976 to current year.

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

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

EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE (water year 1980,1984): Maximum, 268 micromhos Aug. 28 and 29, 1980; minimum, 39 micromhos April 15-17, 1984.
WATER TEMPERATURES (water years 1979-80,1984): Maximum, 27.5°C June 25, 1980; minimum, 0.0°C on many days during winter periods.

EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum, 233 micromhos Sep. 26; minimum, 39 micromhos Apr. 15-17.
WATER TEMPERATURE: Maximum, 26.0°C Aug. 6; minimum, 0.0°C on many days during winter period.

SPECIFIC CONDUCTANCE, MICROSIEMENS PER CENTIMETER AT 25, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	121	112	118	81	77	79	72	70	71	---	---	---
2	111	91	101	83	81	82	74	71	72	---	---	---
3	90	61	75	83	80	82	75	73	74	---	---	---
4	61	53	56	80	77	79	78	75	76	92	91	91
5	53	50	51	78	76	76	79	77	78	92	91	92
6	51	50	50	81	78	79	80	79	79	91	88	90
7	51	50	50	85	81	83	79	74	77	90	88	89
8	52	50	51	88	85	87	75	70	72	93	90	92
9	54	52	53	89	87	88	70	66	68	93	92	92
10	55	53	54	87	84	86	66	65	65	96	92	93
11	55	54	55	84	81	83	67	65	66	101	97	99
12	55	54	54	81	79	80	74	66	70	101	99	100
13	56	55	56	79	77	78	---	---	---	100	97	98
14	57	56	56	77	75	76	---	---	---	98	96	97
15	60	56	57	75	73	74	---	---	---	99	97	98
16	57	56	57	74	73	73	---	---	---	99	98	99
17	57	55	56	74	72	73	---	---	---	99	97	98
18	55	52	54	74	72	73	---	---	---	97	96	96
19	53	50	51	73	71	73	---	---	---	98	96	97
20	52	50	51	73	70	71	---	---	---	98	97	97
21	55	51	53	71	68	69	---	---	---	---	---	---
22	58	56	57	74	70	72	---	---	---	99	97	98
23	62	58	60	70	65	68	---	---	---	99	98	99
24	64	61	63	65	61	63	---	---	---	100	99	99
25	65	64	65	60	56	58	---	---	---	101	99	100
26	71	70	71	63	59	60	---	---	---	106	100	101
27	71	70	70	68	64	65	---	---	---	101	99	100
28	71	69	70	71	68	70	---	---	---	101	100	101
29	71	69	70	71	69	71	---	---	---	103	101	102
30	74	71	73	72	71	71	---	---	---	105	102	103
31	77	74	76	---	---	---	---	---	---	107	104	106
MONTH	121	50	62	89	56	75	---	---	---	---	---	---

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 1983 TO SEPTEMBER 1984

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		FEBRUARY			MARCH			APRIL			MAY	
1	111	107	109	102	101	101	128	110	117	46	44	45
2	113	111	112	104	101	103	115	111	114	45	44	45
3	115	112	114	107	104	106	113	98	105	46	44	45
4	118	115	117	115	107	110	98	83	90	47	45	46
5	122	117	119	131	116	124	83	73	77	48	46	47
6	121	119	120	145	131	138	72	64	69	50	48	49
7	120	119	120	160	145	153	64	55	59	51	49	50
8	119	117	118	171	161	166	55	51	53	50	48	49
9	118	117	117	179	171	176	51	48	49	50	47	49
10	118	117	118	181	179	180	48	45	47	47	43	45
11	120	118	119	182	181	182	45	43	44	45	43	44
12	121	120	121	183	182	183	43	41	43	46	44	45
13	122	121	122	184	182	183	42	40	41	48	46	47
14	122	121	121	185	183	184	41	40	40	49	47	48
15	124	121	123	187	185	186	40	39	39	53	50	51
16	124	121	123	188	184	186	40	39	39	54	52	53
17	121	119	120	183	173	178	41	39	40	55	54	54
18	121	120	120	178	171	173	49	41	42	56	54	55
19	121	119	120	193	178	186	43	41	42	57	55	56
20	121	117	120	201	193	198	48	43	44	60	57	58
21	118	114	115	205	201	203	48	44	46	64	59	61
22	114	112	113	207	205	206	49	45	47	67	64	65
23	113	110	111	208	207	207	50	46	48	67	66	66
24	110	107	109	207	202	206	57	47	49	71	68	69
25	108	107	107	202	191	198	57	49	51	75	71	73
26	107	104	106	191	174	182	52	50	51	76	75	75
27	106	100	102	173	169	171	50	48	49	76	75	76
28	101	100	100	168	147	159	49	45	47	76	75	75
29	102	101	101	146	134	138	47	44	45	78	75	76
30	---	---	---	142	134	138	48	46	47	81	77	79
31	---	---	---	142	129	138	---	---	---	84	81	82
MONTH	124	100	115	208	101	166	128	39	56	84	43	57

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	85	82	84	79	77	78	134	133	133	171	170	171
2	84	81	82	82	79	80	134	133	134	172	171	172
3	81	78	80	85	80	82	135	132	134	173	169	172
4	86	81	84	87	83	85	135	133	134	170	168	169
5	86	80	83	84	75	79	133	130	131	174	170	171
6	79	71	75	75	72	73	132	130	131	176	173	175
7	71	69	70	72	71	72	132	127	130	178	177	177
8	68	60	63	74	72	73	130	128	129	178	176	177
9	65	60	62	76	73	74	131	129	130	177	176	176
10	66	65	65	79	75	77	137	131	134	176	174	176
11	65	61	63	82	78	80	138	136	137	175	173	174
12	60	55	56	86	81	83	141	136	138	175	172	174
13	57	54	56	91	85	88	142	137	141	173	173	173
14	56	53	54	94	92	93	138	135	136	174	172	173
15	53	52	53	94	91	93	146	138	142	179	173	176
16	55	52	53	92	90	91	156	146	151	187	178	183
17	58	54	56	91	90	90	157	155	156	202	189	196
18	62	58	60	95	91	93	158	156	157	211	202	207
19	66	62	64	99	95	97	157	155	156	218	210	214
20	69	65	67	103	99	101	157	154	156	221	217	219
21	72	69	71	109	103	106	156	153	155	223	221	222
22	75	72	73	113	108	110	157	156	156	222	217	219
23	79	74	77	116	112	114	161	157	159	219	217	218
24	81	78	80	118	116	117	164	161	162	219	217	218
25	81	79	80	119	117	118	167	164	165	225	219	222
26	81	78	79	122	119	121	168	166	168	233	226	230
27	78	74	76	125	122	124	170	168	169	232	224	228
28	75	72	73	128	125	126	172	171	172	224	216	220
29	78	76	77	131	127	129	173	171	172	215	205	210
30	77	76	77	134	130	132	172	170	171	206	201	203
31	---	---	---	133	131	132	171	170	171	---	---	---
MONTH	86	52	70	134	71	97	173	127	149	233	168	194

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	14.5	14.0	14.5	6.5	6.0	6.0	.5	.0	.0	---	---	---
2	14.0	13.5	14.0	7.0	6.5	6.5	.5	.0	.0	---	---	---
3	13.5	12.5	13.5	6.5	4.5	5.5	.5	.0	.0	---	---	---
4	12.5	11.5	12.0	4.5	3.5	4.5	.5	.0	.0	.5	.0	.0
5	11.0	10.5	11.0	4.0	3.5	4.0	.5	.0	.0	.5	.0	.0
6	10.5	9.5	10.0	5.0	4.0	4.5	.5	.0	.0	.5	.0	.5
7	9.5	8.5	9.0	5.5	4.5	5.0	.5	.0	.0	.5	.0	.5
8	8.5	7.5	8.0	5.5	5.0	5.0	.5	.0	.0	.5	.0	.5
9	8.0	7.0	7.5	5.0	3.0	4.0	.5	.0	.5	.5	.0	.5
10	7.5	7.5	7.5	3.0	2.0	2.5	.5	.0	.5	.5	.0	.5
11	8.0	7.5	8.0	2.0	1.5	2.0	.5	.0	.0	.5	.0	.5
12	7.5	7.0	7.0	2.0	1.0	1.5	.5	.0	.0	.5	.0	.5
13	7.0	6.5	6.5	1.5	1.5	1.5	---	---	---	.5	.0	.5
14	7.0	6.0	6.5	1.5	1.0	1.0	---	---	---	.5	.0	.5
15	6.5	5.5	5.5	1.0	1.0	1.0	---	---	---	.5	.0	.5
16	5.5	5.5	5.5	1.5	.5	1.0	---	---	---	.5	.0	.5
17	6.0	5.0	5.5	1.0	.5	1.0	---	---	---	.5	.0	.5
18	5.5	5.0	5.0	1.0	1.0	1.0	---	---	---	.5	.0	.5
19	5.0	4.5	5.0	1.0	1.0	1.0	---	---	---	.5	.0	.5
20	6.0	4.5	5.0	1.0	1.0	1.0	---	---	---	.5	.0	.5
21	6.0	4.5	5.5	.5	.5	.5	---	---	---	.5	.0	.5
22	7.0	5.5	6.0	.5	.0	.0	---	---	---	.5	.0	.5
23	7.0	6.0	6.5	.5	.0	.0	---	---	---	.5	.0	.5
24	7.0	6.5	6.5	.5	.0	.0	---	---	---	.5	.0	.5
25	6.5	5.5	6.0	.5	.0	.0	---	---	---	.5	.0	.5
26	6.0	5.0	5.5	.5	.0	.0	---	---	---	.5	.0	.5
27	6.5	5.5	6.0	.5	.0	.0	---	---	---	.5	.5	.5
28	6.5	6.0	6.0	.5	.0	.0	---	---	---	.5	.0	.5
29	6.0	5.0	5.5	.0	.0	.0	---	---	---	.5	.0	.5
30	6.0	5.0	5.5	.0	.0	.0	---	---	---	.5	.0	.5
31	6.0	5.0	5.5	---	---	---	---	---	---	.5	.0	.5
MONTH	14.5	4.5	7.5	7.0	.0	2.0	---	---	---	---	---	---

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

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

TEMPERATURE, WATER (DEG. C), WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	18.5	17.5	18.0	22.5	21.0	22.0	25.5	22.0	23.5	18.0	16.0	17.0
2	19.0	16.5	18.0	23.0	21.5	22.0	25.0	22.0	23.5	16.0	15.5	16.0
3	20.0	17.0	18.5	23.0	21.5	22.0	25.0	22.0	23.5	17.0	15.0	15.5
4	20.0	18.5	19.5	22.5	21.0	22.0	24.5	22.0	23.5	16.5	14.0	15.0
5	20.5	17.5	19.0	21.5	20.5	21.0	24.5	23.0	24.0	16.0	13.5	15.0
6	20.0	19.5	19.5	20.5	19.0	19.5	26.0	22.5	23.5	17.0	13.5	15.0
7	21.5	19.0	20.5	20.5	18.0	19.5	24.5	23.0	23.5	16.5	15.0	15.5
8	20.5	19.0	19.5	20.5	19.0	19.5	25.5	22.5	23.5	16.0	15.0	15.5
9	20.5	18.0	19.0	22.0	19.5	21.0	23.5	22.0	22.5	15.5	14.5	15.0
10	19.5	16.5	18.0	22.5	20.5	21.5	22.5	21.0	21.5	16.0	14.0	15.0
11	17.5	15.5	16.5	23.0	20.5	22.0	21.5	20.5	21.0	15.5	14.0	14.5
12	16.5	16.0	16.5	24.0	21.5	22.5	22.5	19.5	21.0	14.5	13.5	14.0
13	17.0	16.0	16.5	25.0	22.0	23.5	22.5	21.0	22.0	14.5	13.5	14.0
14	17.0	15.5	16.5	24.0	22.0	22.5	25.0	22.0	23.5	14.0	13.0	13.5
15	16.0	15.5	16.0	22.5	20.5	21.5	25.0	23.0	24.0	13.0	12.0	12.5
16	15.5	15.0	15.5	20.5	19.5	20.0	25.0	22.5	23.5	14.5	11.5	13.0
17	16.5	15.5	16.0	19.5	18.5	19.0	24.5	22.0	23.0	15.5	12.0	13.5
18	19.5	16.0	17.5	21.0	18.0	19.5	24.0	21.0	22.5	17.0	13.5	15.0
19	19.0	17.5	18.5	22.5	19.5	21.0	24.5	21.0	22.5	17.5	14.0	15.5
20	19.0	17.5	18.0	23.5	20.5	22.0	24.0	22.0	23.0	17.0	14.5	15.5
21	21.0	17.5	19.0	24.5	21.0	22.5	24.5	21.5	22.5	16.5	14.5	15.5
22	21.0	19.0	20.0	25.5	23.0	24.0	22.0	19.5	20.5	16.0	15.0	15.5
23	21.5	20.0	20.5	25.5	23.0	24.0	21.5	18.0	19.5	15.0	12.5	13.5
24	21.0	19.0	20.0	25.0	22.5	23.5	22.0	18.5	20.0	12.5	10.5	11.5
25	21.5	18.5	20.0	24.5	21.5	23.0	22.5	19.5	21.0	10.5	9.0	10.0
26	21.0	20.0	20.0	24.0	21.0	22.5	23.5	20.5	22.0	9.0	8.0	8.5
27	21.0	19.0	20.0	24.0	20.5	22.0	25.0	21.5	23.0	8.5	8.0	8.5
28	21.5	19.0	20.5	24.0	20.5	22.0	25.5	22.5	24.0	8.5	7.5	8.0
29	22.5	19.5	21.0	24.0	20.5	22.0	24.0	20.5	22.0	9.0	6.5	7.5
30	23.0	20.0	21.5	24.5	22.0	23.0	20.5	19.0	19.5	9.5	7.0	8.0
31	---	---	---	24.0	22.0	23.0	19.0	18.0	18.5	---	---	---
MONTH	23.0	15.0	18.5	25.5	18.0	22.0	26.0	18.0	22.5	18.0	6.5	13.5

STREAMS TRIBUTARY TO LAKE SUPERIOR

04016500 ST. LOUIS RIVER NEAR AURORA, MN

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

DRAINAGE AREA.--290 mi^2 (751 km^2) of which 13.3 mi^2 (34.4 km^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 (417.954 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 26, 1944, nonrecording gage at same site and datum.

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

AVERAGE DISCHARGE (adjusted for storage and diversion).--42 years, 250 ft^3/s (7.080 m^3/s), 11.71 in/yr (297 mm/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,070 ft^3/s (30.3 m^3/s) June 14, gage height, 3.67 ft (1.119 m); minimum daily, 30 ft^3/s (0.85 m^3/s) Sept. 21.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	211	312	315	125	80	90	185	766	201	357	62	37
2	309	294	300	120	80	90	210	752	246	334	58	37
3	586	266	290	120	75	90	250	735	248	371	55	38
4	759	244	280	115	75	85	310	714	254	412	54	46
5	869	231	270	115	75	85	360	692	264	414	69	48
6	903	218	260	110	75	85	461	671	275	380	67	51
7	916	209	250	110	75	80	580	680	314	347	72	54
8	901	199	240	110	75	80	680	738	396	317	96	56
9	851	199	230	105	75	80	727	802	506	293	114	59
10	789	196	225	105	75	75	725	858	618	272	111	58
11	797	192	220	105	75	75	744	899	711	254	108	52
12	782	182	215	100	75	75	753	916	818	234	103	49
13	772	175	205	100	80	75	791	906	1020	235	97	47
14	745	173	195	100	80	75	817	858	1070	215	83	43
15	723	167	190	95	80	75	844	793	1040	200	74	40
16	765	161	185	95	80	75	885	716	1010	190	68	40
17	786	157	180	95	80	75	984	636	943	175	66	39
18	778	153	175	90	85	75	996	567	847	165	67	37
19	757	161	175	90	90	75	969	495	748	151	66	34
20	717	280	170	90	95	75	910	447	660	141	65	31
21	639	378	165	90	100	75	842	417	581	131	77	30
22	601	458	160	90	100	80	771	393	572	124	66	31
23	562	465	155	85	100	80	707	365	542	113	64	32
24	524	426	150	85	100	80	641	339	503	102	61	40
25	489	410	145	85	100	85	579	314	455	93	57	45
26	452	390	145	80	100	90	540	296	429	85	53	41
27	419	375	140	80	95	100	577	274	462	78	49	40
28	388	360	135	80	95	115	645	255	442	72	45	41
29	366	345	135	80	95	125	702	234	428	66	43	40
30	343	335	130	80	---	140	742	214	402	62	41	42
31	328	---	125	80	---	160	---	195	---	66	37	---
TOTAL	19827	8111	6155	3010	2465	2720	19927	17937	17005	6449	2148	1278
MEAN	640	270	199	97.1	85.0	87.7	664	579	567	208	69.3	42.6
MAX	916	465	315	125	100	160	996	916	1070	414	114	59
MIN	211	153	125	80	75	75	185	195	201	62	37	30
†	+11.3	+13.7	+7.8	+12.2	+12.0	+11.6	+54.1	+22.6	+21.6	+21.0	+12.4	+10.1
MEAN ‡	651	284	207	109	97.0	99.3	718	602	589	229	81.7	52.7
CFSM ‡	2.24	.98	.71	.38	.33	.34	2.48	2.08	2.03	.72	.28	.18
IN. ‡	2.59	1.09	.82	.43	.36	.40	2.76	2.39	2.26	.91	.32	.20

CAL YR 1983 TOTAL 99325 MEAN 272 MAX 916 MIN 44 MEAN ‡ 291 CFSM ‡ 1.00 IN. ‡ 13.64
WTR YR 1984 TOTAL 107032 MEAN 292 MAX 1070 MIN 30 MEAN ‡ 310 CFSM ‡ 1.07 IN. ‡ 14.55

† 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, 0.5 mi (0.8 km) downstream from Eveleth Taconite Company dam, 0.6 mi (1.0 km) south of Forbes, 1.8 mi (2.9 km) upstream from Elbow Creek.

DRAINAGE AREA.--713 mi^2 (1,847 km^2).

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

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

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

AVERAGE DISCHARGE.--20 years, 559 ft^3/s (15.83 m^3/s), 10.65 in/yr (271 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,200 ft^3/s (176 m^3/s) Apr. 25, 1979, gage height, 17.71 ft (5.398 m); minimum daily, 8.0 ft^3/s (0.23 m^3/s) Sept. 11, 1984, gage height, 5.05 ft (1.539 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,810 ft^3/s (79.6 m^3/s) June 14, gage height, 12.11 ft (3.691 m); minimum daily, 8.0 ft^3/s (0.23 m^3/s) Sept. 11, gage height, 5.05 ft (1.539 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	480	650	850	300	190	230	500	1410	353	820	149	161
2	531	635	800	290	190	220	600	1420	580	741	235	156
3	1160	602	750	290	190	220	700	1400	566	722	159	154
4	1410	552	700	280	190	220	800	1350	444	749	211	166
5	1520	524	670	280	190	220	1000	1300	556	730	70	168
6	1620	524	640	270	190	210	1200	1260	566	703	159	173
7	1680	494	620	270	190	210	1500	1270	804	507	265	168
8	1740	467	600	270	190	210	1640	1360	1270	620	227	173
9	1700	464	580	260	190	200	1750	1420	1510	577	176	176
10	1600	454	560	260	190	200	1810	1470	1650	524	311	108
11	1720	438	540	260	190	200	1840	1520	1610	365	300	8.0
12	1730	409	520	250	195	200	1880	1550	1850	494	279	10
13	1660	425	500	250	200	190	1910	1600	2070	473	128	106
14	1570	412	480	250	140	190	1980	1600	2260	460	288	117
15	1510	406	470	240	180	190	1920	1540	2280	409	244	12
16	1550	396	460	240	180	200	1910	1490	2220	406	271	117
17	1570	387	450	240	180	200	1920	1470	2100	371	279	211
18	1530	380	440	230	180	200	1960	1360	1950	416	244	14
19	1470	387	430	230	250	120	1950	1220	1760	300	238	22
20	1430	524	414	230	250	160	1830	1100	1580	365	263	314
21	1360	768	400	220	250	140	1760	960	1360	368	227	16
22	1250	844	390	220	250	140	1650	972	1290	300	233	18
23	1180	840	380	220	250	130	1520	896	1300	257	214	178
24	1100	726	370	210	250	190	1400	749	984	329	203	166
25	1020	900	360	210	250	200	1290	780	1050	186	193	18
26	952	1000	350	210	250	210	1220	692	1040	244	186	52
27	884	1100	340	200	250	230	1220	556	1100	302	180	300
28	832	1000	330	200	240	250	1380	628	1060	277	176	16
29	776	950	320	200	240	300	1380	425	960	137	171	19
30	730	900	310	190	---	350	1380	570	888	246	168	252
31	628	---	300	190	---	450	---	501	---	249	164	---
TOTAL	39893	18558	15324	7460	6075	6580	44800	35839	39011	13647	6611	3569.0
MEAN	1287	619	494	241	209	212	1493	1156	1300	440	213	119
MAX	1740	1100	850	300	250	450	1980	1600	2280	820	311	314
MIN	480	380	300	190	140	120	500	425	353	137	70	8.0
CFSM	1.81	.87	.69	.34	.29	.30	2.09	1.62	1.82	.62	.30	.17
IN.	2.08	.97	.80	.39	.32	.34	2.34	1.87	2.04	.71	.34	.19
AC-FT	79130	36810	30400	14800	12050	13050	88860	71090	77380	27070	13110	7080

CAL YR 1983 TOTAL 225997.0 MEAN 619 MAX 1740 MIN 55 CFSM .87 IN 11.79 AC-FT 448300
WTR YR 1984 TOTAL 237367.0 MEAN 649 MAX 2280 MIN 8.0 CFSM .91 IN 12.38 AC-FT 470800

STREAMS TRIBUTARY TO LAKE SUPERIOR

04021530 STONEY BROOK AT BROOKSTON, MN

LOCATION.--Lat 46°51'42", long 92°36'17", in NW¼SE¼ sec.34, T.51 N., R.18 W., St. Louis County, Hydrologic Unit 04010201, on Fond Du Lac Indian Reservation, on left bank 80 ft (24 m) upstream from bridge on County Highway 31, 0.8 mi (1.3 km) upstream from mouth and 0.4 mi (0.6 km) south of Brookston.

DRAINAGE AREA.--97.3 mi^2 (252 km^2).

PERIOD OF RECORD.--Occasional low-flow measurements, water years 1970-71, 1973-77, July 1983 to September 1984 (discontinued).

GAGE.--Water-stage recorder. Altitude of gage is 1,228 ft (374 m), from topographic map.

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

EXTREMES FOR PERIOD OF RECORD--Maximum discharge, 571 ft^3/s (16.2 m^3/s) June 10, 1984, gage height, 3.95 ft (1.204 m); minimum observed, 3.1 ft^3/s (0.088 m^3/s) August 31, 1976.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 571 ft^3/s (16.2 m^3/s) June 10, gage height, 3.95 ft (1.204 m); minimum, 9.1 ft^3/s (0.26 m^3/s) Aug. 30 to Sept. 1, gage height, 1.38 ft (0.421 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	81	59	54	39	34	30	50	217	59	109	19	9.1
2	90	55	52	39	34	30	80	222	59	94	17	11
3	90	50	51	39	33	30	130	207	48	94	13	12
4	92	50	50	38	33	30	170	185	43	89	11	10
5	92	49	49	38	33	30	230	177	55	90	10	10
6	86	49	48	38	33	30	300	175	127	77	11	10
7	80	49	47	38	33	30	333	200	220	62	12	11
8	78	49	47	38	33	30	351	232	217	55	21	11
9	72	49	46	38	33	30	333	230	260	50	21	10
10	69	50	46	37	32	30	330	230	453	45	22	10
11	101	49	45	37	32	30	330	210	423	41	21	10
12	103	50	45	37	32	30	330	187	423	38	19	12
13	96	47	45	37	32	30	339	170	393	34	17	14
14	92	46	44	37	32	30	330	175	363	30	15	14
15	94	46	44	37	32	30	345	165	291	26	14	13
16	120	46	44	36	32	30	324	147	252	23	14	13
17	120	45	43	36	31	30	297	137	232	22	11	12
18	111	43	43	36	31	30	265	140	207	23	10	12
19	107	43	43	36	31	30	240	137	175	24	10	12
20	103	66	42	36	31	30	217	130	150	23	12	11
21	99	125	42	36	31	30	197	122	128	22	17	9.4
22	94	135	42	35	31	30	177	116	272	19	15	10
23	90	125	41	35	31	30	160	127	346	16	12	10
24	88	88	41	35	30	30	145	130	299	24	11	28
25	83	150	41	35	30	30	140	120	242	25	16	30
26	78	100	40	35	30	30	132	109	219	25	16	32
27	72	75	40	35	30	30	135	101	217	24	15	31
28	69	65	40	34	30	30	200	92	186	24	12	29
29	64	60	40	34	30	30	210	92	159	23	10	26
30	60	56	39	34	---	30	207	75	130	20	9.4	23
31	60	---	39	34	---	33	---	64	---	20	9.1	---
TOTAL	2734	1969	1373	1129	920	933	7027	4821	6648	1291	442.5	455.5
MEAN	88.2	65.6	44.3	36.4	31.7	30.1	234	156	222	41.6	14.3	15.2
MAX	120	150	54	39	34	33	351	232	453	109	22	32
MIN	60	43	39	34	30	30	50	64	43	16	9.1	9.1
CFSM	.91	.67	.46	.37	.33	.31	2.41	1.60	2.28	.43	.15	.16
IN.	1.05	.75	.52	.43	.35	.36	2.69	1.84	2.54	.49	.17	.17
AC-FT	5420	3910	2720	2240	1820	1850	13940	9560	13190	2560	878	903

WTR YR 1984 TOTAL 29743.0 MEAN 81.3 MAX 453 MIN 9.1 CFSM .84 IN 11.37 AC-FT 59000

STREAMS TRIBUTARY TO LAKE SUPERIOR

04023150 SIMIAN CREEK NEAR BROOKSTON, MN

LOCATION.--Lat 46°48'17", long 92°30'47", in SE¼NE¼ sec.20, T.50 N., R.17 W., St. Louis County, Hydrologic Unit 04010201, on Fond Du Lac Indian Reservation, on right bank 10 ft (3 m) upstream from bridge on county road, 2.2 mi (3.5 km) upstream from mouth and 6.1 mi (9.8 km) southeast of Brookston.

PERIOD OF RECORD.--July 1983 to September 1984 (no winter records), (discontinued).

GAGE.--Water-stage recorder. Altitude of gage is 1,238 ft (377 m), from topographic map.

REMARKS.--Records good.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 143 ft^3/s (4.05 m^3/s) June 11, 1984, gage height, 3.18 ft (0.969 m); minimum, 0.28 ft^3/s (0.008 m^3/s) Aug. 30, 31, 1984, gage height, 0.61 ft (0.186 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 143 ft^3/s (4.05 m^3/s) June 11, gage height, 3.18 ft (0.969 m); minimum, 0.28 ft^3/s (0.008 m^3/s) Aug. 30, 31, gage height, 0.61 ft (0.186 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	6.1					13	47	5.0	14	.76	.34
2	34	5.7					18	46	5.2	12	.76	.76
3	31	6.1					25	41	4.7	12	.60	.55
4	29	6.1					30	34	4.4	11	.55	.55
5	26	6.1					41	29	11	10	.82	.60
6	22	6.1					60	27	14	9.3	.76	.55
7	18	6.5					80	30	30	8.6	.88	.60
8	17	6.6					81	37	67	8.1	.88	.70
9	14	---					78	38	72	7.3	.70	.65
10	14	---					80	33	99	6.1	.65	.76
11	24	---					81	27	134	5.2	.55	.70
12	25	---					80	23	115	4.7	.55	1.1
13	20	---					84	24	101	4.2	.82	1.4
14	17	---					84	21	80	3.5	.60	1.4
15	20	---					78	18	59	3.1	.60	1.4
16	31	---					71	16	48	2.9	.50	1.1
17	29	---					61	15	40	3.5	.50	1.0
18	23	---					51	14	33	3.2	.46	.82
19	20	---					42	12	28	2.9	.42	.94
20	18	---					35	11	22	2.6	.38	.94
21	16	---					26	11	18	2.3	.65	.94
22	14	---					20	12	29	1.9	.46	.88
23	13	---					16	12	43	1.7	.38	1.1
24	12	---					14	12	37	1.5	.38	8.1
25	21	---					12	11	27	1.4	.38	15
26	20	---					12	9.5	25	1.3	.42	12
27	13	---					23	8.6	29	1.3	.38	8.8
28	10	---					46	7.9	30	1.1	.38	6.6
29	9.0	---					48	7.0	30	.94	.38	5.5
30	9.0	---					46	5.9	20	.82	.31	4.8
31	5.9	---					---	5.2	---	.82	.28	---
TOTAL	609.9	---					1436	645.1	1260.3	149.28	17.14	80.58
MEAN	19.7	---					47.9	20.8	42.0	4.82	.55	2.69
MAX	35	---					84	47	134	14	.88	15
MIN	5.9	---					12	5.2	4.4	.82	.28	.34
AC-FT	1210	---					2850	1280	2500	296	34	160

STREAMS TRIBUTARY TO LAKE SUPERIOR

04023600 SQUAW CREEK NEAR CLOQUET, MN

LOCATION.--lat 46°44'55", long 92°29'43", in NE¼NE¼ sec.9, T.49 N., R.17 W., Carlton County, Hydrologic Unit 04010201, on Fond Du Lac Indian Reservation, on right bank 10 ft (3 m) upstream from culvert on Reservation Road, 0.3 mi (0.5 km) upstream from mouth and 2.5 mi (4.0 km) from the junction of State Highways 33 and 45 in Cloquet.

PERIOD OF RECORD.--July 1983 to September 1984 (no winter records), (discontinued).

GAGE.--Water-stage recorder. Altitude of gage is 1,205 ft (367 m), from topographic map.

REMARKS.--Records fair.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge 78 ft^3/s (2.21 m^3/s) June 11,1984, gage height, 8.79 ft (2.679 m); maximum gage height, 8.82 ft (2.688 m) Apr. 8, 1984 (backwater from ice); minimum discharge, 0.12 ft^3/s (0.003 m^3/s) Aug 4, 1984, gage height, 6.62 ft (2.018 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 78 ft^3/s (2.21 m^3/s) June 11, gage height, 8.79 ft (2.679 m); maximum gage height, 8.82 ft (2.688 m) Apr. 8 (backwater from ice); minimum discharge, 0.12 ft^3/s (0.003 m^3/s) Aug. 4, gage height, 6.62 ft (2.018 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	3.3					9.0	30	2.3	7.8	.80	.35
2	15	3.4					12	29	4.3	6.6	.50	.50
3	13	3.8					15	26	3.1	10	.30	.70
4	13	4.1					20	22	3.0	8.1	.15	.60
5	11	3.3					27	20	14	6.6	.30	.45
6	9.9	3.3					45	20	15	7.6	.40	.40
7	8.8	3.3					63	23	26	5.9	.40	.38
8	8.1	5.1					56	26	53	4.1	.40	.40
9	7.6	---					51	24	43	3.3	.40	.55
10	7.6	---					48	22	64	3.6	.40	.45
11	13	---					47	22	69	3.6	.40	.37
12	12	---					46	18	51	2.5	.45	.70
13	10	---					47	16	35	2.5	.40	1.1
14	8.8	---					43	16	26	2.4	.38	.90
15	11	---					38	14	21	2.3	.38	.60
16	16	---					31	6.6	19	1.8	.35	.45
17	15	---					26	8.4	18	2.8	.29	.40
18	12	---					20	8.6	15	2.3	.28	.45
19	11	---					18	13	13	1.8	.27	.50
20	10	---					15	5.7	12	2.0	.26	.40
21	11	---					9.9	5.7	11	.70	.80	.50
22	9.6	---					8.4	10	13	.58	.70	.65
23	8.1	---					9.6	10	13	.76	.60	1.0
24	7.4	---					11	8.1	13	.58	.45	6.0
25	6.6	---					10	7.1	11	.58	.30	13
26	6.4	---					9.6	6.1	12	.83	.26	11
27	6.4	---					20	5.1	13	.42	.27	10
28	5.7	---					34	3.8	12	.38	.26	7.0
29	5.1	---					33	3.0	9.9	.35	.26	5.0
30	4.1	---					31	2.5	9.4	.35	.26	3.0
31	3.3	---					---	2.4	---	.30	.30	---
TOTAL	303.5	---					853.5	434.1	624.0	93.43	11.97	67.80
MEAN	9.79	---					28.5	14.0	20.8	3.01	.39	2.26
MAX	17	---					63	30	69	10	.80	13
MIN	3.3	---					8.4	2.4	2.3	.30	.15	.35
AC-FT	602	---					1690	861	1240	185	24	134

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 (1.0 km) downstream from Minnesota Power Co. powerplant, 3 mi (5 km) upstream from Thomson Reservoir, and 3.2 mi (5.1 km) upstream from Midway River.

DRAINAGE AREA.--3,430 mi^2 (8,880 km^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 (335.655 m) National Geodetic Vertical Datum of 1929. Oct. 5, 1909, to Sept. 5, 1914, nonrecording gage 3 mi (5 km) downstream and 50 ft (15 m) below powerplant at datum about 420 ft (128 m) lower. Sept. 6, 1914, to Aug. 4, 1953, powerplant record at Thomson hydroelectric plant.

REMARKS.--Records good except those for winter period and those for period of no gage-height record, June 30 to Aug. 21, 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 (410 hm^3); the water-discharge table shows the monthly change in contents (†).

AVERAGE DISCHARGE (UNADJUSTED).--76 years, 2,323 ft^3/s (65.79 m^3/s), 9.20 in/yr (234 mm/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 15,600 ft^3/s (442 m^3/s) June 11, gage height, 9.00 ft (2.743 m); minimum daily, 639 ft^3/s (18.1 m^3/s) Sept. 22.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2380	2020	3920	2400	2000	2300	3200	4650	1710	4500	1100	915
2	2620	2250	3730	2400	2000	2200	3800	4570	1870	3500	1100	967
3	2990	2080	3350	2300	2000	2200	4500	4410	2460	3000	1100	992
4	3480	2350	3400	2500	2000	2100	5500	4270	2770	2500	1100	923
5	4850	2080	3360	2500	2000	2000	6500	3770	2430	2500	1100	932
6	4930	2200	3360	2400	1900	1860	8500	3770	2490	2400	1050	910
7	5010	2030	3130	2400	1900	1800	9750	3810	3500	2300	1050	940
8	4930	1950	3080	2300	1900	1700	10200	4870	6800	2200	1100	965
9	4890	2020	3140	2260	1900	1600	9820	5070	9880	2100	1200	937
10	4770	2030	2860	2200	1900	1600	8590	5120	12000	2000	1300	958
11	5040	2020	2890	2100	1900	1600	8290	4610	15500	1900	1200	895
12	6260	2020	2860	2200	1900	1500	8140	4640	14400	1800	1250	958
13	6540	1880	2890	2100	1900	1700	8340	4170	13000	1800	1300	962
14	6340	1940	2930	2100	2000	1900	8300	4230	12200	1700	1300	854
15	6090	2130	2900	2100	2000	1950	7840	3980	11200	1700	1400	812
16	6290	2100	2600	2100	2100	1950	7170	3730	10300	2000	1100	667
17	6620	2050	2500	2000	2150	1750	6600	3980	9580	2000	1400	750
18	6190	2050	2400	2200	2200	1650	6030	4870	8560	1800	1200	750
19	5540	2100	2100	1900	2250	1900	5440	4330	7300	1700	1100	1010
20	5460	2810	2400	2000	2300	1950	4880	3680	6120	1600	1200	1040
21	5190	3740	2500	2000	2400	1950	4670	3300	5120	1500	1100	828
22	4950	4320	2700	2000	2500	1900	4150	3290	6690	1400	1130	639
23	4320	4190	2600	2000	2600	1600	3950	3220	10600	1600	1060	749
24	3710	2910	2400	2000	2700	1700	3500	3060	9190	1400	1020	953
25	3530	2710	2500	2000	2450	1800	3320	2880	6740	1300	1030	1360
26	3570	3380	2500	1900	2400	1900	2950	2530	5560	1200	1010	1240
27	2640	3890	2600	1900	2400	2000	3360	2560	6660	1300	986	763
28	2780	3970	2500	1900	2200	2100	4450	2150	7390	1200	1010	819
29	2470	3900	2400	1900	2300	2400	4840	1960	6340	1200	951	739
30	2250	4020	2600	1900	---	2800	4800	2070	5000	1200	948	823
31	2110	---	2300	1900	---	3000	---	1600	---	1200	914	---
TOTAL	138740	79140	87400	65860	62150	60360	181380	115150	223360	59500	34809	27050
MEAN	4475	2638	2819	2125	2143	1947	6046	3715	7445	1919	1123	902
MAX	6620	4320	3920	2500	2700	3000	10200	5120	15500	4500	1400	1360
MIN	2110	1880	2100	1900	1900	1500	2950	1600	1710	1200	914	639
†	182	-158	-729	-1220	-1050	-971	2162	1262	578	-406	-555	-520
MEAN ‡	4657	2480	2090	905	1093	976	8208	4977	8023	1513	568	382
CFSM ‡	1.36	.72	.61	.26	.32	.28	2.39	1.45	2.34	.44	.17	.11
IN. ‡	1.57	.81	.70	.30	.34	.33	2.67	1.67	2.61	.51	.19	.12

CAL YR 1983 TOTAL 1055396 MEAN 2891 MAX 10500 MIN 758 MEAN ‡ 2828 CFSM ‡ .82 IN. ‡ 11.19
WTR YR 1984 TOTAL 1134899 MEAN 3101 MAX 15500 MIN 639 MEAN ‡ 2980 CFSM ‡ .87 IN. ‡ 11.83

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

‡ Adjusted for change in contents.

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

WATER-QUALITY RECORDS

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

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT , 1983												
31...	1245	--	2150	137	132	7.7	7.6	12.0	6.0	2.9	739	12.3
JAN , 1984												
09...	1415	--	2260	110	119	7.4	7.0	-20.0	.5	3.0	735	12.2
MAR												
06...	1245	--	2240	154	141	7.1	7.2	-21.0	.0	3.5	732	13.6
APR												
24...	0830	3500	--	115	106	7.2	7.1	9.0	9.5	2.5	720	10.3
JUN												
19...	1015	--	7450	100	100	9.5	7.2	17.0	17.5	3.0	732	8.4
AUG												
22...	1045	--	1230	155	155	6.4	7.5	17.0	22.0	3.0	730	7.4

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)
OCT , 1983											
31...	102	19	K990	14	7.0	3.9	1.2	48	24	3.5	.30
JAN , 1984											
09...	88	K13	K21	13	6.0	3.6	.90	50	13	3.4	.10
MAR											
06...	97	K12	--	15	7.0	4.4	.90	57	8.7	5.2	.10
APR											
24...	95	K2	K18	11	5.6	3.1	1.4	39	14	3.2	.10
JUN											
19...	92	20	110	12	5.3	2.9	.80	39	10	3.6	.10
AUG											
22...	89	K17	65	15	7.9	4.7	1.0	58	17	3.8	.20

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

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)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT , 1983											
31...	8.7	120	.12	.060	.50	.020	.020	<.010	13	75	32
JAN , 1984											
09...	9.7	115	.23	.110	.90	.030	.030	.010	2	12	80
MAR											
06...	11	110	.31	.970	1.3	.020	<.010	<.010	3	18	100
APR											
24...	6.8	102	.12	.730	1.2	<.010	<.010	<.010	12	113	82
JUN											
19...	6.2	52	.13	.160	1.2	.050	.050	.050	19	382	97
AUG											
22...	6.8	125	<.10	.010	.60	.010	<.010	<.010	10	33	85

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)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)
OCT , 1983											
31...	1245	70	1	29	<.5	<1	10	<3	1	650	1
APR , 1984											
24...	0830	20	2	18	<.5	<1	7	3	2	470	2
JUN											
19...	1015	90	2	21	<.5	<1	4	<3	3	570	4
AUG											
22...	1045	40	2	19	<.5	<1	7	<3	5	340	2

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
OCT , 1983										
31...	4	32	<.1	<10	2	<1	<1	42	<6	6
APR , 1984										
24...	<4	23	<.1	<10	3	<1	<1	35	<6	11
JUN										
19...	<4	28	.3	<10	3	<1	<1	37	<6	28
AUG										
22...	<4	26	<.1	<10	1	<1	<1	50	<6	9

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024015 OTTER CREEK NEAR CLOQUET, MN

LOCATION.--Lat 46°41'38", long 92°30'58", in SE¼SE¼ sec.29, T.49 N., R.17 W., Carlton County, Hydrologic Unit 04010201, on Fond Du Lac Indian Reservation on right bank 10 ft (3 m) upstream of culvert on road in Cloquet Experimental Forest and 3.5 m (5.6 km) from junction of State Highways 33 and 45 in Cloquet.

PERIOD OF RECORD.--July 1983 to September 1984 (no winter records), (discontinued).

GAGE.--Water-stage recorder. Altitude of gage is 1,228 ft (374 m), from topographic map.

REMARKS.--Records fair.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 54 ft^3/s (1.53 m^3/s) June 10, 1984, gage height, 7.21 ft (2.198 m); minimum, 0.18 ft^3/s (0.005 m^3/s) Aug. 17, 1984, gage height, 5.13 ft (1.564 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 54 ft^3/s (1.53 m^3/s) June 10, gage height, 7.21 ft (2.198 m); minimum, 0.18 ft^3/s (0.005 m^3/s) Aug. 17, gage height, 5.13 ft (1.564 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	3.4					9.0	22	2.3	6.1	.48	.35
2	16	3.5					11	21	3.4	4.8	.48	.73
3	14	3.6					14	17	3.4	10	.48	.93
4	13	3.8					15	13	5.7	6.8	.48	.56
5	12	3.9					17	11	7.2	6.4	.56	.41
6	11	4.0					20	11	10	5.7	.64	.48
7	10	4.2					25	14	23	4.2	.64	.41
8	9.2	4.5					30	15	36	3.6	.93	.48
9	8.5	---					34	16	33	3.6	.64	.64
10	8.6	---					34	13	44	8.4	.41	.56
11	15	---					35	11	35	2.7	.48	.35
12	14	---					35	11	36	1.9	.56	1.2
13	12	---					35	12	30	1.3	.48	1.6
14	11	---					34	11	23	7.2	.41	.83
15	13	---					32	7.2	18	.56	.48	.93
16	18	---					31	7.2	15	.35	.41	.64
17	16	---					28	9.3	13	1.2	.26	.41
18	15	---					24	7.6	13	2.3	.30	.64
19	13	---					21	6.4	11	3.6	.26	.73
20	11	---					17	5.1	9.3	2.7	.22	.48
21	10	---					11	6.8	7.2	1.8	.93	.48
22	9.5	---					9.3	12	17	1.6	.64	.73
23	8.6	---					8.9	8.4	13	1.2	.35	.93
24	8.0	---					8.0	8.9	11	.93	.30	15
25	7.8	---					6.8	11	10	.73	.26	15
26	7.2	---					9.3	7.2	15	.64	.26	12
27	6.4	---					26	5.4	13	.64	.30	8.0
28	5.6	---					27	4.4	15	.56	.26	5.7
29	4.9	---					23	3.6	13	.41	.26	4.2
30	3.9	---					24	2.9	9.3	.41	.26	3.4
31	3.4	---					---	2.5	---	.41	.26	---
TOTAL	334.6	---					654.3	313.9	494.8	92.74	13.68	78.80
MEAN	10.8	---					21.8	10.1	16.5	2.99	.44	2.63
MAX	19	---					35	22	44	10	.93	15
MIN	3.4	---					6.8	2.5	2.3	.35	.22	.35
AC-FT	664	---					1300	623	981	184	27	156

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 (54.6 m) west of State Highway No. 23, 0.9 mi (1.4 km) upstream from mouth and 4.0 mi (6.4 km) north of Holyoke.

DRAINAGE AREA.--7.77 mi^2 (20.1 km^2).

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

GAGE.--Water-stage recorder. Datum of gage is 786.14 ft (239.615 m) National Geodetic Vertical Datum of 1929.

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

AVERAGE DISCHARGE.--8 years, 6.81 ft^3/s (0.193 m^3/s), 11.90 in/yr (302 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,010 ft^3/s (28.6 m^3/s) Nov. 20, 1982, gage height, 21.38 ft (6.517 m), from floodmarks, from rating curve extended above 150 ft^3/s (4.2 m^3/s) on basis of flow through culvert computations; minimum discharge, 0.20 ft^3/s (0.006 m^3/s) Aug. 13, 16, 1982.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 646 ft^3/s (18.3 m^3/s) June 10, gage height, 18.70 ft (5.700 m), from floodmarks, from rating curve extended above 150 ft^3/s (4.2 m^3/s) on basis of flow through culvert computations; minimum discharge, 1.0 ft^3/s (0.028 m^3/s) Sept. 17, 18; minimum gage height, 11.20 ft (3.414 m) July 19, 22, Aug. 10, 15, 16, 18, 19, Sept. 17, 18.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	3.4	5.4	2.4	2.4	2.9	32	30	2.4	2.4	1.9	1.3
2	14	3.4	5.0	2.4	2.4	2.6	48	18	2.7	2.4	1.7	2.0
3	9.4	3.4	4.8	2.4	2.4	2.3	47	11	2.0	16	1.7	1.8
4	8.6	3.4	4.6	2.4	2.4	2.1	49	8.0	2.2	4.6	1.5	1.6
5	7.8	3.4	4.4	2.4	2.4	2.0	62	9.0	7.8	9.3	2.2	1.5
6	6.5	3.6	4.3	2.4	2.4	2.0	67	9.7	5.5	12	2.0	1.4
7	5.8	3.4	4.2	2.4	2.4	2.0	51	17	23	3.7	1.6	1.3
8	6.4	3.4	4.0	2.4	2.4	2.0	36	14	96	2.4	1.6	1.3
9	4.6	4.4	3.8	2.4	2.4	1.9	32	8.7	16	2.2	1.7	1.3
10	6.7	5.4	3.7	2.4	2.4	1.9	32	6.6	219	2.1	1.5	1.3
11	26	4.9	3.6	2.4	2.5	2.0	31	5.3	43	2.0	1.4	1.3
12	12	3.9	3.5	2.4	2.8	2.0	34	4.3	57	1.9	1.4	1.8
13	8.2	3.9	3.4	2.4	3.3	2.0	38	8.9	30	1.9	1.4	1.9
14	7.1	4.2	3.3	2.4	4.0	2.0	30	7.8	10	1.9	1.5	1.4
15	20	4.6	3.2	2.4	5.2	2.1	22	5.3	9.0	1.9	1.4	1.3
16	28	5.4	3.1	2.4	6.3	2.0	17	12	12	1.9	1.3	1.3
17	12	5.4	2.9	2.4	7.4	2.0	12	15	7.8	2.1	1.4	1.3
18	8.2	5.1	2.8	2.4	8.3	2.0	9.7	7.5	5.2	2.1	1.4	1.3
19	7.1	36	2.8	2.4	8.7	2.0	8.3	5.1	3.4	1.8	1.4	1.6
20	7.7	61	2.7	2.4	9.0	2.1	7.4	4.1	3.5	1.7	1.2	1.6
21	6.1	23	2.6	2.4	9.2	2.1	5.9	16	3.3	1.7	1.4	1.6
22	5.2	13	2.6	2.4	9.3	2.0	5.4	30	8.0	1.8	1.3	1.6
23	4.7	10	2.5	2.4	9.4	2.0	5.2	9.7	5.3	1.7	1.3	2.0
24	4.2	8.8	2.5	2.4	8.3	3.5	5.2	6.1	3.3	1.6	1.3	67
25	3.9	8.0	2.4	2.4	7.0	4.0	4.9	4.8	2.8	1.6	1.4	18
26	3.6	7.4	2.4	2.4	4.7	3.5	14	4.3	3.6	1.8	1.4	8.7
27	3.4	6.9	2.4	2.4	4.0	5.4	115	3.3	4.0	1.9	1.5	4.7
28	3.1	6.5	2.4	2.4	3.7	5.9	38	2.9	3.0	1.7	1.4	3.5
29	3.4	6.1	2.4	2.4	3.4	5.9	18	2.7	2.4	1.7	1.2	3.1
30	3.4	5.7	2.4	2.4	---	8.7	41	2.7	2.2	1.7	1.2	2.8
31	3.4	---	2.4	2.4	---	18	---	2.4	---	1.7	1.2	---
TOTAL	265.5	267.0	102.5	74.4	140.5	102.9	918.0	292.2	595.4	95.2	45.8	142.6
MEAN	8.56	8.90	3.31	2.40	4.84	3.32	30.6	9.43	19.8	3.07	1.48	4.75
MAX	28	61	5.4	2.4	9.4	18	115	30	219	16	2.2	67
MIN	3.1	3.4	2.4	2.4	2.4	1.9	4.9	2.4	2.0	1.6	1.2	1.3
CFSM	1.10	1.15	.43	.31	.62	.43	3.94	1.21	2.55	.40	.19	.61
IN.	1.27	1.28	.49	.36	.67	.49	4.39	1.40	2.85	.46	.22	.68
AC-FT	527	530	203	148	279	204	1820	580	1180	189	91	283

CAL YR 1983 TOTAL 3032.8 MEAN 8.31 MAX 131 MIN 1.8 CFSM 1.07 IN 14.52 AC-FT 6020
WTR YR 1984 TOTAL 3042.0 MEAN 8.31 MAX 219 MIN 1.2 CFSM 1.07 IN 14.56 AC-FT 6030

RED RIVER OF THE NORTH BASIN

05045950 ORWELL LAKE NEAR FERGUS FALLS, MN

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

DRAINAGE AREA.--1,830 mi^2 (4,740 km^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 (326 m) (maximum operating stage) is 14,100 acre-ft (17.4 hm^3) of which 13,100 acre-ft (16.2 hm^3) is controlled storage above elevation 1,048 ft (319 m) (minimum operating stage). Dead storage, 210 acre-ft (0.259 hm^3). Figures given herein represent total contents. Reservoir is used for flood control and to increase low flow for water supply and pollution abatement.

COOPERATION.--Records furnished by Corps of Engineers.

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

EXTREMES FOR CURRENT YEAR.--Maximum contents, 11,190 acre-ft (13.8 hm^3) Apr. 1, elevation, 1,067.10 ft (325.252 m); minimum, 2,320 acre-ft (2.86 hm^3) Mar. 12, elevation, 1,052.76 ft (320.881 m).

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,069.15	13,160	
Oct. 31	1,067.24	11,320	-1,840
Nov. 30	1,063.90	8,520	-2,800
Dec. 31	1,060.32	5,960	-2,560
CAL YR 1983			+300
Jan. 31	1,057.22	4,210	-1,750
Feb. 29	1,054.68	3,070	-1,140
Mar. 31	1,066.75	10,880	+7,810
Apr. 30	1,061.82	6,970	-3,910
May 31	1,056.40	3,830	-3,140
June 30	1,060.61	6,150	+2,320
July 31	1,055.05	3,220	-2,930
Aug. 31	1,054.98	3,190	-30
Sept. 30	1,057.54	4,370	+1,180
WTR YR 1984			-8,790

RED RIVER OF THE NORTH BASIN

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

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

DRAINAGE AREA.--1,830 mi^2 (4,740 km^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 (313.837 m), adjustment of 1912 (levels by Corps of Engineers). Oct. 11, 1930, to Nov. 17, 1933, at same site at datum 2.00 ft (0.61 m) higher; Nov. 18, 1933, to Mar. 21, 1953, at site 6.1 mi (9.8 km) upstream at datum 40.30 ft (12.283 m) higher.

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

AVERAGE DISCHARGE.--54 years, 305 ft^3/s (8.638 m^3/s), 221,000 acre-ft/yr (272 hm^3/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 808 ft^3/s (22.9 m^3/s) June 15, gage height, 3.64 ft (1.109 m) result of regulation; maximum gage height, 4.60 ft (1.402 m) Feb. 5 (backwater from ice); minimum, 14 ft^3/s (0.40 m^3/s) Sept. 28, gage height, 1.78 ft (0.543 m) result of regulation.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	310	311	278	241	306	415	639	690	476	674	276	191
2	309	311	272	240	306	413	738	690	494	640	357	190
3	300	303	261	238	300	415	732	683	491	608	334	187
4	306	300	261	235	300	415	720	678	490	600	330	175
5	311	300	261	235	320	414	709	674	489	585	328	161
6	311	300	262	235	310	409	703	669	524	576	310	162
7	311	300	262	238	308	406	685	666	582	569	287	165
8	311	300	261	240	306	401	680	665	693	554	286	165
9	311	300	261	246	306	390	674	662	513	438	288	165
10	311	300	264	290	306	390	668	656	339	445	287	168
11	311	295	265	299	300	390	668	652	350	513	285	168
12	311	294	261	300	300	390	656	649	442	511	278	167
13	311	294	261	300	300	390	656	649	625	445	144	169
14	336	294	259	301	312	390	656	647	703	451	82	167
15	351	294	259	299	332	390	656	647	765	450	172	139
16	352	294	258	296	335	412	651	647	799	441	262	107
17	350	290	256	316	360	429	651	644	792	438	239	108
18	350	289	256	298	372	429	647	643	782	428	219	92
19	350	289	256	272	371	429	644	641	772	424	219	100
20	350	291	256	272	373	429	635	640	761	421	225	116
21	350	289	256	272	375	429	632	617	755	417	228	80
22	350	289	254	261	379	434	629	593	751	416	228	112
23	348	289	253	256	379	462	621	592	748	409	228	113
24	345	288	252	266	400	479	621	585	743	405	228	113
25	346	278	252	271	419	490	611	581	735	403	225	80
26	343	278	252	271	415	278	610	577	726	399	226	46
27	339	278	251	294	414	86	609	570	718	394	224	52
28	339	278	251	322	415	48	616	564	702	385	223	39
29	339	278	249	311	410	49	616	497	691	381	222	36
30	338	278	246	311	---	130	653	449	683	356	224	42
31	325	---	245	311	---	412	---	451	---	339	204	---
TOTAL	10225	8772	7991	8537	10029	11443	19686	19268	19134	14515	7668	3775
MEAN	330	292	258	275	346	369	656	622	638	468	247	126
MAX	352	311	278	322	419	490	738	690	799	674	357	191
MIN	300	278	245	235	300	48	609	449	339	339	82	36
CFSM	.18	.16	.14	.15	.19	.20	.36	.34	.35	.26	.14	.07
IN.	.21	.18	.16	.17	.20	.23	.40	.39	.39	.30	.16	.08
AC-FT	20280	17400	15850	16930	19890	22700	39050	38220	37950	28790	15210	7490

CAL YR 1983 TOTAL 113417 MEAN 311 MAX 443 MIN 88 CFSM .17 IN 2.31 AC-FT 225000
WTR YR 1984 TOTAL 141043 MEAN 385 MAX 799 MIN 36 CFSM .21 IN 2.87 AC-FT 279800

RED RIVER OF THE NORTH BASIN

05050000 BOIS DE SIOUX RIVER NEAR WHITE ROCK, SD

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

DRAINAGE AREA.--1,160 mi^2 (3,004 km^2), approximately.

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

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

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

AVERAGE DISCHARGE.--43 years, 76.8 ft^3/s (2.175 m^3/s), 55,640 acre-ft/yr (68.6 hm^3/yr); median of yearly mean discharges, 50 ft^3/s (1.42 m^3/s), 36,200 acre-ft/yr (45 hm^3/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 978 ft^3/s (27.7 m^3/s) Apr. 14, gage height, 11.00 ft (3.353 m); maximum gage height, 11.03 ft (3.362 m) June 25; no flow on many days.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.00	.00	.00	.00	.00	1.6	18	345	272	584	.14	1.2
2	.00	.00	.00	.00	.00	1.1	355	341	191	568	.21	.96
3	.00	.00	.00	.00	.00	.75	784	340	44	558	.03	.80
4	.00	.00	.00	.00	.00	.72	793	340	6.9	540	.04	.72
5	.00	.00	.00	.00	.00	.75	788	342	129	439	.00	.72
6	.00	.00	.00	.00	.00	.70	774	342	249	374	.08	.78
7	.00	.00	.00	.00	.00	.70	753	356	270	363	19	.68
8	.00	.00	.00	.00	.00	.68	738	354	352	354	194	.75
9	.00	.00	.00	.00	.00	.60	719	342	384	308	264	.58
10	.00	.00	.00	.00	.00	.60	807	340	408	270	258	.58
11	.00	.00	.00	.00	.00	.58	805	345	323	273	246	.58
12	.00	.00	.00	.00	.00	.58	818	339	157	278	237	.62
13	.00	.00	.00	.00	.00	.60	894	344	87	282	188	.68
14	.00	.00	.00	.00	.00	.65	972	338	252	291	138	.75
15	.00	.00	.00	.00	.00	.70	965	334	502	291	155	.75
16	.00	.00	.00	.00	.00	.75	952	330	540	197	162	.75
17	.00	.00	.00	.00	.00	.80	950	340	526	147	152	.70
18	.00	.00	.00	.00	.00	.90	948	344	562	240	144	.78
19	.00	.02	.00	.00	.00	1.0	941	344	602	291	132	1.1
20	.00	.03	.00	.00	.00	1.5	932	338	618	296	131	1.0
21	.00	.02	.00	.00	.00	2.0	914	297	629	300	132	1.3
22	.00	.00	.00	.00	.00	2.5	892	242	644	310	95	.96
23	.00	.00	.00	.00	.00	4.0	746	240	671	316	48	1.1
24	.00	.00	.00	.00	5.4	6.0	580	244	669	316	40	.58
25	.00	.00	.00	.00	12	10	567	252	648	351	74	.65
26	.00	.00	.00	.00	10	15	563	252	631	175	72	.50
27	.00	.00	.00	.00	10	25	466	254	611	4.2	69	.35
28	.00	.00	.00	.00	13	34	358	258	609	.48	75	.21
29	.00	.00	.00	.00	6.0	30	354	262	606	.27	79	.19
30	.00	.00	.00	.00	---	26	360	264	594	.21	79	.21
31	.00	---	.00	.00	---	21	---	264	---	.17	34	---
TOTAL	.00	.07	.00	.00	56.40	191.76	21506	9667	12786.9	8717.33	3217.50	21.53
MEAN	.000	.002	.000	.000	1.94	6.19	717	312	426	281	104	.72
MAX	.00	.03	.00	.00	13	34	972	356	671	584	264	1.3
MIN	.00	.00	.00	.00	.00	.58	18	240	6.9	.17	.00	.19
CFSM	.000	.000	.000	.000	.002	.005	.62	.27	.37	.24	.09	.001
IN.	.00	.00	.00	.00	.00	.01	.69	.31	.41	.28	.10	.00
AC-FT	.00	.1	.00	.00	112	380	42660	19170	25360	17290	6380	43

CAL YR 1983	TOTAL	292.74	MEAN	.80	MAX 11	MIN .00	CFSM .001	IN .01	AC-FT 581			
WTR YR 1984	TOTAL	56164.49	MEAN	153	MAX 972	MIN .00	CFSM .13	IN 1.80	AC-FT 111400			

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 (244 m) downstream from confluence of Bois de Sioux and Otter Tail Rivers and at mile 548.6 (882.7 km).

DRAINAGE AREA.--4,010 mi^2 (10,390 km^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 (287.417 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 6, 1943, U.S. Weather Bureau nonrecording gage 800 ft (244 m) upstream, converted to present datum. Aug. 6, 1943, to Oct. 27, 1950, nonrecording gage at present site and datum.

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

AVERAGE DISCHARGE.--41 years (1943-84), 524 ft^3/s (14.84 m^3/s), 376,000 acre-ft/yr (468 hm^3/yr); median of yearly mean discharges, 470 ft^3/s (13.3 m^3/s), 341,000 acre-ft/yr (420 hm^3/yr).

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

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,710 ft^3/s (133 m^3/s) Mar.28, gage height, 13.43 ft (4.093 m) (backwater from ice); minimum daily, 40 ft^3/s (1.13 m^3/s) Sept. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	291	331	205	250	310	500	2990	1110	639	1560	402	288
2	285	313	245	260	305	495	2540	1150	662	1520	333	244
3	281	309	245	265	298	485	2240	1160	687	1460	402	219
4	278	304	235	278	292	490	2140	1150	673	1390	418	202
5	276	296	250	288	210	510	2020	1130	644	1360	405	191
6	282	301	250	282	145	480	1890	1140	627	1260	391	168
7	285	300	250	280	242	440	1810	1120	696	1160	371	162
8	286	301	250	252	285	448	1750	1120	1940	1100	342	164
9	287	329	250	240	292	445	1690	1120	3580	1060	380	166
10	282	325	250	215	298	450	1620	1120	4090	904	488	166
11	288	281	250	205	302	442	1660	1090	3760	795	499	167
12	291	277	250	235	300	435	1810	1080	3230	844	491	176
13	293	277	250	265	310	430	2020	1070	2590	846	456	170
14	293	275	250	272	320	430	2040	1060	1970	786	336	166
15	307	275	220	270	330	435	1970	1050	1660	760	183	165
16	335	273	190	265	360	430	1870	1030	1990	772	241	154
17	338	271	165	265	360	440	1800	1010	2060	725	368	110
18	336	273	200	260	370	470	1750	999	1880	612	374	100
19	346	293	240	270	380	495	1710	981	1730	651	349	91
20	341	290	260	270	385	500	1690	979	1690	687	371	86
21	336	265	240	258	405	495	1680	978	1670	688	405	97
22	335	250	228	260	415	500	1650	928	2020	685	371	79
23	334	245	215	260	425	560	1620	821	2590	681	359	90
24	332	198	210	258	430	780	1510	789	2960	678	311	112
25	338	165	198	282	450	1550	1340	777	2910	675	270	108
26	339	230	230	288	465	3000	1300	784	2600	686	272	102
27	338	268	260	262	480	4150	1300	781	2220	666	309	59
28	337	265	245	282	495	4500	1230	779	1930	536	302	47
29	339	220	230	300	498	3900	1140	792	1750	483	297	48
30	336	195	238	300	---	3750	1110	752	1630	460	298	40
31	336	---	240	300	---	3500	---	656	---	439	301	---
TOTAL	9701	8195	7239	8237	10157	35935	52890	30506	59078	26929	11095	4137
MEAN	313	273	234	266	350	1159	1763	984	1969	869	358	138
MAX	346	331	260	300	498	4500	2990	1160	4090	1560	499	288
MIN	276	165	165	205	145	430	1110	656	627	439	183	40
AC-FT	19240	16250	14360	16340	20150	71280	104900	60510	117200	53410	22010	8210

CAL YR 1983 TOTAL 122274 MEAN 335 MAX 880 MIN 80 AC-FT 242530
WTR YR 1984 TOTAL 264099 MEAN 722 MAX 4500 MIN 40 AC-FT 523800

RED RIVER OF THE NORTH BASIN

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

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	HARD-NESS (MG/L AS CACO3) (00900)	HARD-NESS NONCAR-BONATE (MG/L AS CACO3) (95902)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
OCT 03...	1555	279	450	--	13.0	12.0	--	--	--	--	--
NOV 18...	1000	272	480	--	3.5	2.5	--	--	--	--	--
JAN 04...	1435	276	450	--	1.0	.0	--	--	--	--	--
FEB 15...	1140	329	635	--	4.5	.0	--	--	--	--	--
APR 04...	1015	2160	505	7.4	11.5	6.0	210	75	46	24	12
MAY 11...	1015	1090	595	--	12.0	13.5	--	--	--	--	--
JUN 14...	1010	2020	555	--	12.0	17.0	--	--	--	--	--
JUL 25...	1240	676	560	--	29.0	25.0	--	--	--	--	--
AUG 30...	1305	295	562	8.5	24.0	21.5	290	76	52	38	26

DATE	PERCENT SODIUM (00932)	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE, FET-LAB (MG/L AS HCO3) (95440)	CAR-BONATE, FET-LAB (MG/L AS CO3) (95445)	ALKA-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)
APR 04...	11	.4	6.9	170	.000	140	11	84	5.9	.20	13	301
AUG 30...	16	.7	15	260	.000	210	1.3	85	19	.20	16	366

DATE	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	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)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
APR 04...	280	.41	1760	3	50	40	1	22	30	.0	0	140
AUG 30...	380	.50	292	5	100	20	0	26	100	.0	1	180

RED RIVER OF THE NORTH BASIN

05051522 RED RIVER OF THE NORTH AT HICKSON, ND

LOCATION.--Lat 46°39'35", long 96°47'44", in SW¼ sec.19, T.137 N., R.48 W., Clay County, MN, Hydrologic Unit 09020104, on right bank 60 ft (18 m) downstream from bridge on township road, and 1 mi (1.6 km) southeast of Hickson, ND.

DRAINAGE AREA.--4,300 mi^2 (11,100 km^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 (267.328 m) National Geodetic Vertical Datum of 1929.

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

AVERAGE DISCHARGE.--9 years, 511 ft^3/s (14.47 m^3/s), 370,200 acre-ft/yr (456 hm^3/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,100 ft^3/s (144 m^3/s) Mar. 31, gage height, 25.58 ft (7.797 m) (backwater from ice); minimum daily, 66 ft^3/s (1.87 m^3/s) Sept. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	326	328	240	260	320	505	5050	1100	721	1640	499	335
2	332	324	225	265	320	510	4900	1080	663	1560	476	336
3	335	313	235	282	325	515	4500	1100	650	1490	436	323
4	332	306	250	290	322	515	3950	1120	688	1430	413	285
5	328	298	270	298	315	500	3450	1110	732	1370	460	257
6	323	295	270	298	285	470	2730	1100	740	1330	474	239
7	319	291	270	295	250	465	2240	1090	725	1280	463	225
8	322	291	270	298	195	450	1920	1080	855	1190	450	206
9	324	286	265	290	260	415	1770	1080	1440	1140	423	201
10	324	282	270	250	310	420	1680	1080	2520	1100	405	202
11	326	306	270	232	315	410	1620	1090	3260	1040	477	200
12	321	313	260	230	320	405	1620	1060	3650	919	534	205
13	317	298	270	230	320	400	1740	1050	3680	901	541	210
14	318	295	272	240	325	408	1920	1050	3350	913	528	212
15	325	291	270	270	345	395	2000	1030	2690	892	468	205
16	330	282	260	275	350	388	1970	1020	2010	852	339	201
17	339	282	245	280	370	398	1870	1010	1820	847	248	202
18	339	282	210	285	380	410	1770	996	2010	846	319	190
19	350	282	260	275	385	412	1690	978	1940	768	403	153
20	339	280	290	275	405	422	1650	967	1770	732	402	125
21	343	285	280	280	415	440	1620	961	1670	759	401	121
22	343	285	272	282	430	465	1590	961	1640	767	428	101
23	339	200	270	280	465	570	1570	942	1780	760	429	105
24	331	150	272	270	495	800	1530	876	2130	760	407	108
25	331	140	280	280	500	1340	1470	822	2510	760	387	101
26	328	150	270	290	480	2080	1330	803	2760	760	351	122
27	331	205	250	290	480	2700	1250	795	2750	754	325	131
28	331	280	230	300	480	3750	1230	798	2480	775	330	129
29	328	280	260	305	495	4050	1210	796	2100	681	343	97
30	324	275	280	310	---	4500	1130	796	1810	577	339	66
31	328	---	270	320	---	5000	---	800	---	542	335	---
TOTAL	10226	8175	8106	8625	10657	34508	63970	30541	57544	30135	12833	5593
MEAN	330	273	261	278	367	1113	2132	985	1918	972	414	186
MAX	350	328	290	320	500	5000	5050	1120	3680	1640	541	336
MIN	317	140	210	230	195	388	1130	795	650	542	248	66
AC-FT	20280	16220	16080	17110	21140	68450	126900	60580	114100	59770	25450	11090

CAL YR 1983 TOTAL 134575 MEAN 369 MAX 823 MIN 140 AC-FT 266900
WTR YR 1984 TOTAL 280913 MEAN 768 MAX 5050 MIN 66 AC-FT 557200

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

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	COLOR (PLAT-INUM-COBALT UNITS) (00080)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)
OCT 06...	1135	318	415	8.2	10.5	11.0	15	17	10.6	99
NOV 28...	1545	277	580	--	- .4	.0	--	--	--	--
JAN 05...	1110	295	620	--	4.0	.0	--	--	--	--
FEB 13...	1345	319	535	7.2	2.0	.0	<1	3.1	11.8	80
MAR 22...	1410	462	275	--	5.5	.5	--	--	--	--
APR 03...	1305	4440	475	--	10.5	3.0	--	--	--	--
MAY 10...	0955	1060	585	7.8	15.0	11.5	60	28	8.7	83
JUN 26...	1345	2770	610	--	22.0	20.0	--	--	--	--
JUL 26...	1545	755	585	--	33.0	25.0	--	--	--	--
SEP 05...	0920	258	555	8.5	13.5	16.5	60	33	8.0	84

DATE	HARD-NESS (MG/L AS CACO3) (00900)	HARD-NESS NONCAR-BONATE (MG/L AS CACO3) (95902)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	PERCENT SODIUM (00932)	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	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)
OCT 06...	200	5	35	28	9.8	9	.3	5.3	198	2.4	24	8.9
FEB 13...	240	0	43	33	12	9	.3	6.0	248	30	27	10
MAY 10...	280	93	50	37	20	13	.5	6.9	184	5.6	140	13
SEP 05...	270	58	50	36	20	13	.5	16	215	1.3	88	17

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)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, TOTAL (MG/L AS N) (00600)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N) (00605)
OCT 06...	.20	14	261	240	.36	224	<.020	<.10	<.10	.040	--	1.3
FEB 13...	.20	18	292	300	.40	251	.010	.30	.28	.280	1.0	.42
MAY 10...	.20	6.1	409	380	.56	1170	<.010	<.10	<.10	.040	--	.86
SEP 05...	.20	16	391	370	.53	272	.020	<.10	.13	.010	--	1.2

DATE	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, TOTAL (MG/L AS NO3) (71887)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS TOTAL (MG/L AS PO4) (71886)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, TOTAL (MG/L AS P) (70507)	PHOS-PHORUS, HYDRO-LYZABLE TOTAL (MG/L AS P) (00669)	PHOS-PHORUS, HYDRO. + ORTHO TOTAL (MG/L AS P) (00678)	PHOS-PHORUS, ORGANIC TOTAL (MG/L AS P) (00670)	BORON, DIS-SOLVED (UG/L AS B) (01020)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)
OCT 06...	1.3	--	.060	.18	.020	.060	.00	.06	.00	70	8.7	.6
FEB 13...	.70	4.4	.050	.15	.020	.050	.00	.05	.00	50	8.8	.4
MAY 10...	.90	--	.130	.40	.050	.040	.00	.04	.09	80	8.7	.5
SEP 05...	1.2	--	.150	--	.050	.060	.04	.10	.05	110	11	--

RED RIVER OF THE NORTH BASIN

05054000 RED RIVER OF THE NORTH AT FARGO, ND

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

DRAINAGE AREA.--6,800 mi^2 (17,600 km^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 (262.68 m) National Geodetic Vertical Datum of 1929. Oct. 1, 1960 to Sept. 30, 1962, water-stage recorder at present site at datum 5.6 ft (1.71 m) higher. See WSP 1728 or 1913 for history of changes prior to Oct. 1, 1960.

REMARKS.--Records good except those for loop ratings, which are poor. Flow regulated by Orwell Reservoir, capacity, 14,100 acre-ft (17.4 hm^3) at elevation 1,070 ft (326.136 m) National Geodetic Vertical Datum of 1929, adjustment of 1912; Lake Traverse, capacity, 137,000 acre-ft (169 hm^3), 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).--83 years, 557 ft^3/s (15.77 m^3/s), 403,500 acre-ft/yr (498 hm^3/yr); median of yearly mean discharges, 443 ft^3/s (12.5 m^3/s), 321,000 acre-ft/yr (396 hm^3/yr).

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

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 9,550 ft^3/s (270 m^3/s) Apr. 1, gage height, 28.27 ft (8.671 m); minimum daily, 87 ft^3/s (2.46 m^3/s) Sept. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	309	348	220	248	280	640	9450	1390	890	1870	494	306
2	301	338	208	250	290	635	9350	1360	817	1760	463	328
3	305	333	202	250	285	610	8520	1360	769	1660	431	317
4	299	324	220	232	285	590	7550	1390	796	1590	388	285
5	292	316	240	235	285	510	6430	1400	838	1530	392	257
6	282	310	242	250	315	500	5370	1400	887	1460	418	226
7	281	308	235	252	320	485	4370	1400	938	1400	408	213
8	282	301	232	260	270	470	3480	1350	1790	1350	394	196
9	283	299	230	260	210	430	2700	1310	2330	1260	371	189
10	284	299	230	255	250	405	2450	1300	2780	1200	343	181
11	279	305	230	235	295	395	2330	1290	3330	1140	357	173
12	278	333	230	245	300	385	2250	1280	3820	1020	463	201
13	278	326	236	220	290	380	2240	1250	4050	909	503	192
14	278	305	238	215	275	375	2350	1230	3880	894	504	191
15	301	301	232	245	295	360	2470	1210	3250	898	492	191
16	316	297	212	235	310	330	2470	1180	2350	877	402	191
17	299	293	195	240	330	330	2380	1150	1990	850	273	187
18	299	297	222	260	360	330	2260	1140	2070	843	223	183
19	331	305	252	245	365	330	2150	1110	2150	803	306	168
20	338	308	252	262	380	330	2070	1090	2000	704	379	137
21	339	312	250	278	400	360	2020	1100	1840	691	386	120
22	344	313	250	295	415	450	1990	1070	1740	785	383	102
23	347	305	248	255	430	600	1960	1060	1780	746	416	88
24	340	239	248	270	460	1180	1930	1020	2050	738	404	99
25	334	157	260	262	490	2000	1870	954	2300	733	385	92
26	332	140	270	250	470	3050	1770	921	2500	732	360	93
27	335	150	250	250	450	4900	1660	906	2580	732	316	100
28	335	182	212	270	500	5500	1560	920	2470	738	283	103
29	337	240	212	262	540	6520	1540	917	2250	725	290	103
30	336	242	228	255	---	7930	1470	918	2060	620	304	87
31	339	---	242	275	---	8850	---	921	---	541	294	---
TOTAL	9633	8526	7228	7816	10145	50160	100410	36297	63295	31799	11825	5299
MEAN	311	284	233	252	350	1618	3347	1171	2110	1026	381	177
MAX	347	348	270	295	540	8850	9450	1400	4050	1870	504	328
MIN	278	140	195	215	210	330	1470	906	769	541	223	87
AC-FT	19110	16910	14340	15500	20120	99490	199200	72000	125500	63070	23450	10510
(+)	1294	1262	1259	1285	1188	1257	1271	1552	1381	2079	2408	1461
MEAN*	332	305	254	273	371	1638	3368	1196	2133	1060	420	202
AC-FT*	20400	18170	15600	16780	21310	100750	200430	73550	126930	65150	25870	11970

CAL YR 1983 TOTAL 140970 MEAN 386 MAX 1620 MIN 140 AC-FT 279600 MEAN* 406 AC-FT* 294555
WTR YR 1984 TOTAL 342433 MEAN 936 MAX 9450 MIN 87 AC-FT 679200 MEAN* 963 AC-FT* 696917

+ 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

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	HARD-NESS (MG/L AS CACO3) (00900)	HARD-NESS NONCAR-BONATE (MG/L AS CACO3) (95902)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
MAR 30...	1045	7820	288	7.7	5.0	1.0	120	11	27	12	10
SEP 05...	1240	263	550	8.6	22.0	19.0	270	49	47	36	19

DATE	PERCENT SODIUM (00932)	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE, FET-LAB (MG/L AS HCO3) (95440)	CAR-BONATE, FET-LAB (MG/L AS CO3) (95445)	ALKA-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)
MAR 30...	15	.4	7.1	130	.000	110	4.1	34	4.5	.20	10	176
SEP 05...	13	.5	15	270	.000	220	1.1	75	22	.20	16	368

DATE	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	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)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
MAR 30...	170	.24	3720	13	270	40	0	100	100	.0	1	650
SEP 05...	360	.50	261	5	100	20	0	26	10	.0	1	180

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 north of North Dakota State University campus in Fargo, and 12 mi above mouth of Sheyenne River.

DRAINAGE AREA.--6,820 mi^2, approximately.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	COLOR (PLAT-INUM-COBALT UNITS) (00080)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)
OCT 07...	0955	284	480	8.4	8.0	12.0	40	--	--
NOV 22...	1550	307	490	8.0	- .9	1.0	5	--	--
JAN 06...	0935	253	640	7.2	- .9	1.0	<1	--	--
FEB 16...	0955	310	620	7.5	3.0	1.5	40	12.1	84
MAY 10...	1450	1300	700	8.0	17.5	15.5	50	8.5	89
JUN 12...	1305	3860	450	8.3	28.0	19.0	350	7.9	89
AUG 01...	1330	493	520	8.3	31.5	26.0	100	7.1	90

DATE	HARD-NESS (MG/L AS CACO3) (00900)	HARD-NESS NONCAR-BONATE (MG/L AS CACO3) (95902)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	PERCENT SODIUM (00932)	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	CARBON DIOXIDE DIS-SOLVED (MG/L AS CO2) (00405)
OCT 07...	210	8	36	29	10	9	.3	4.3	202	1.5
NOV 22...	220	4	38	30	13	11	.4	6.1	215	4.1
JAN 06...	260	15	47	35	18	13	.5	6.7	247	30
FEB 16...	260	14	48	33	45	27	1	7.8	242	15
MAY 10...	310	109	60	39	25	15	.6	7.6	202	3.9
JUN 12...	180	76	41	19	14	14	.5	5.2	105	1.0
AUG 01...	270	60	52	35	20	13	.5	5.4	214	2.1

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)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)
OCT 07...	25	7.9	.20	11	257	240	.35	197	<.10	.040
NOV 22...	31	10	.20	11	295	270	.40	245	<.10	.080
JAN 06...	35	17	.20	17	345	320	.47	236	.30	.220
FEB 16...	49	58	.20	17	393	400	.53	329	.52	.220
MAY 10...	150	14	.30	7.3	488	420	.66	1710	<.10	.050
JUN 12...	91	5.1	.20	12	260	250	.35	2710	.82	.120
AUG 01...	100	11	.20	17	387	370	.53	515	<.10	.140

RED RIVER OF THE NORTH BASIN

05054020 RED RIVER OF THE NORTH BELOW FARGO, ND--CONTINUED

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	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)	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 07...	--	--	--	60	--	--	--	--	--	--
NOV 22...	--	--	--	60	--	--	--	--	--	--
JAN 06...	<10	2	86	80	1	<10	<1	5	57	<1
FEB 16...	--	--	--	70	--	--	--	--	--	--
MAY 10...	--	--	--	100	--	--	--	--	--	--
JUN 12...	40	2	230	150	<1	<10	<1	7	54	<1
AUG 01...	--	--	--	100	--	--	--	--	--	--

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)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)	CYANIDE TOTAL (MG/L AS CN) (00720)
JAN 06...	20	17	<.1	6	1	<1	160	<1	50	<.01
JUN 12...	25	6	<.1	1	5	<1	160	7	29	<.01

RED RIVER OF THE NORTH BASIN

05061000 BUFFALO RIVER NEAR HAWLEY, MN

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

DRAINAGE AREA.--322 mi^2 (834 km^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 (338.910 m) National Geodetic Vertical Datum of 1929. Prior to Jan. 29, 1953, nonrecording gage at bridge 1,800 ft (549 m) upstream at datum 3.17 ft (0.97 m) lower.

REMARKS.--Records good.

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

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

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

EXTREMES FOR CURRENT PERIOD:--October to November 1983 and February to September 1984: Maximum discharge during period, 846 ft^3/s (24.0 m^3/s) June 10, gage height, 8.10 ft (2.469 m); minimum discharge, 7.9 ft^3/s (0.22 m^3/s) Sept. 21, 22; minimum gage height, 3.07 ft (0.936 m) Sept. 22.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	36	58			---	93	666	123	40	65	21	9.5
2	47	57			---	100	595	115	38	60	20	10
3	56	55			---	90	523	109	38	56	19	10
4	59	52			---	76	427	102	39	54	18	10
5	58	50			---	87	355	97	39	50	18	11
6	57	50			---	107	314	93	39	47	17	11
7	51	51			---	98	283	96	43	44	17	10
8	48	48			---	89	254	104	178	41	17	10
9	45	48			---	72	232	105	583	39	16	11
10	47	47			---	64	215	100	838	37	15	11
11	47	46			---	60	208	94	803	35	14	11
12	50	46			---	58	221	88	778	34	13	12
13	47	45			---	58	238	83	750	32	12	11
14	43	45			---	63	242	79	684	32	12	12
15	43	46			---	74	234	75	604	30	11	11
16	50	47			---	71	219	73	518	30	10	11
17	66	46			---	71	201	70	428	30	10	10
18	79	45			---	72	185	66	336	29	9.6	10
19	81	48			---	75	166	63	280	28	9.1	9.9
20	78	54			---	78	149	60	233	28	8.9	9.3
21	79	67			---	75	135	60	208	27	9.4	10
22	78	67			---	77	124	62	182	27	9.8	9.2
23	80	63			62	109	121	61	163	27	10	9.6
24	77	70			61	176	117	61	140	25	10	11
25	74	75			63	310	113	59	120	25	10	13
26	75	75			94	385	111	56	104	24	10	13
27	70	60			99	712	113	52	94	23	10	14
28	68	58			107	801	125	49	88	23	10	12
29	65	68			115	783	133	47	79	22	10	12
30	62	70			---	749	131	44	71	21	9.8	13
31	60	---			---	714	---	42	---	21	9.6	---
TOTAL	1876	1657			---	6447	7150	2388	8538	1066	396.2	327.5
MEAN	60.5	55.2			---	208	238	77.0	285	34.4	12.8	10.9
MAX	81	75			---	801	666	123	838	65	21	14
MIN	36	45			---	58	111	42	38	21	8.9	9.2
CFSM	.19	.17			---	.65	.74	.24	.89	.11	.04	.03
IN.	.22	.19			---	.74	.83	.28	.99	.12	.05	.04
AC-FT	3720	3290			---	12790	14180	4740	16940	2110	786	650

RED RIVER OF THE NORTH BASIN

05061500 SOUTH BRANCH BUFFALO RIVER AT SABIN, MN

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

DRAINAGE AREA.--522 mi^2 (1,351 km^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 (275.05 m) National Geodetic Vertical Datum of 1929 (levels by Soil Conservation Service). Prior to Aug. 17, 1948, nonrecording gage at site 1 mi (1.6 km) downstream at different datum.

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

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

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

EXTREMES FOR CURRENT PERIOD.--October to November 1983 and February to September 1984: Maximum discharge during period, 2,090 ft^3/s (59.2 m^3/s) Mar. 26, gage height, 13.94 ft (4.249 m) from highwater mark; no flow for many days.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.3	14			---	310	515	83	3.4	17	.42	.00
2	2.5	15			---	285	409	75	7.7	16	.00	.00
3	3.7	16			---	270	274	64	7.8	13	.00	.00
4	4.5	16			---	260	216	58	7.9	12	.00	.00
5	4.8	17			---	250	194	51	15	10	.00	.00
6	4.8	16			---	235	185	45	47	12	.00	.00
7	3.5	15			---	210	178	39	77	8.9	.00	.00
8	3.7	13			---	210	140	37	204	7.5	.00	.00
9	4.0	12			---	205	110	40	592	6.3	.00	.00
10	4.3	9.4			---	195	104	37	526	6.1	.00	.00
11	3.5	12			---	190	104	33	462	5.6	.00	.00
12	3.2	12			---	180	148	30	397	4.2	.00	.00
13	3.5	12			---	175	249	27	310	3.8	.00	.00
14	3.6	12			---	165	276	25	223	1.8	.00	.00
15	4.5	13			---	165	237	22	159	5.5	.00	.00
16	5.5	14			---	155	208	22	122	6.1	.00	.00
17	7.4	13			---	140	171	22	110	5.6	.00	.00
18	11	13			---	140	141	19	104	5.1	.00	.00
19	13	13			---	140	116	17	83	3.3	.00	.00
20	12	18			---	150	101	15	70	2.8	.00	.02
21	13	22			---	200	85	14	60	2.1	.00	.12
22	13	28			---	210	75	11	52	.50	.00	.02
23	13	27			---	290	63	13	45	.00	.00	.05
24	13	24			5.0	422	54	9.6	42	.38	.00	.12
25	12	22			5.0	685	48	7.4	38	4.1	.00	.09
26	13	20			5.0	1760	50	7.1	32	3.6	.00	.52
27	12	18			5.4	1940	52	6.6	28	2.5	.00	.88
28	12	17			10	1600	53	5.0	22	1.5	.00	.80
29	11	16			140	1120	65	3.5	21	3.5	.00	1.1
30	12	15			---	784	82	3.4	18	4.2	.00	1.1
31	13	---			---	646	---	3.4	---	3.6	.00	---
TOTAL	241.3	484.4			---	13687	4703	845.0	3885.8	178.58	.42	4.82
MEAN	7.78	16.1			---	442	157	27.3	130	5.76	.014	.16
MAX	13	28			---	1940	515	83	592	17	.42	1.1
MIN	1.3	9.4			---	140	48	3.4	3.4	.00	.00	.00
CFSM	.02	.03			---	.85	.30	.05	.25	.01	.000	.000
IN.	.02	.03			---	.98	.34	.06	.28	.01	.00	.00
AC-FT	479	961			---	27150	9330	1680	7710	354	.8	9.6

RED RIVER OF THE NORTH BASIN

05062000 BUFFALO RIVER NEAR DILWORTH, MN

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

DRAINAGE AREA.--1,040 mi^2 (2,690 km^2), approximately.

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

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

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

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

AVERAGE DISCHARGE.--53 years, 130 ft^3/s (3.682 m^3/s), 94,180 acre-ft/yr (116 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,600 ft^3/s (385 m^3/s) July 2, 1975, gage height, 2/.10 ft (8.260 m); no flow at times in 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,940 ft^3/s (83.3 m^3/s) Mar. 29, gage height, 19.27 ft (5.873 m); minimum, 4.4 ft^3/s (0.12 m^3/s) Sept. 24, gage height, 2.84 ft (0.866 m); minimum gage height, 2.47 ft (0.753 m) Aug. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	41	79	78	31	29	200	2020	231	56	128	23	9.5
2	42	77	76	31	29	330	1680	224	54	117	22	10
3	45	75	74	30	29	470	1380	211	51	108	22	10
4	56	74	72	30	30	480	1130	195	52	97	23	11
5	67	73	70	30	31	405	927	181	63	90	22	11
6	72	71	68	30	32	345	740	171	109	83	20	12
7	74	70	65	30	33	290	605	165	381	77	19	13
8	75	70	60	29	34	245	517	162	815	72	18	12
9	70	68	55	29	35	220	453	166	1250	67	18	12
10	65	65	50	29	36	200	408	166	1360	60	17	12
11	64	63	47	29	36	180	384	154	1430	57	14	12
12	66	61	45	29	36	170	390	142	1500	53	13	13
13	66	60	43	29	37	155	411	133	1420	51	13	14
14	70	60	42	29	40	150	459	125	1250	49	11	13
15	66	59	40	29	48	150	490	119	1080	47	9.4	12
16	65	60	39	29	53	150	466	112	921	45	9.4	12
17	68	60	38	29	52	150	418	107	788	44	9.3	12
18	78	61	37	29	50	150	369	103	671	45	8.4	11
19	97	61	36	28	50	150	328	99	577	46	8.0	9.8
20	106	62	35	28	54	155	294	94	491	41	8.4	8.7
21	104	67	34	28	57	160	268	91	417	37	8.4	8.2
22	99	73	34	28	62	170	244	91	365	36	8.8	8.2
23	97	82	33	27	64	240	223	91	327	35	10	5.1
24	100	87	33	27	80	400	208	87	294	34	10	4.7
25	104	84	33	27	125	710	199	83	262	31	10	6.8
26	100	81	32	27	150	960	190	80	234	30	10	9.0
27	96	82	32	28	145	1350	190	74	208	29	11	10
28	94	82	31	28	150	2450	206	68	185	27	10	12
29	89	82	31	28	165	2890	221	65	167	26	9.0	14
30	86	80	31	28	---	2740	228	61	145	25	7.9	15
31	83	---	31	29	---	2340	---	58	---	23	8.8	---
TOTAL	2405	2129	1425	892	1772	19155	16046	3909	16923	1710	411.8	323.0
MEAN	77.6	71.0	46.0	28.8	61.1	618	535	126	564	55.2	13.3	10.8
MAX	106	87	78	31	165	2890	2020	231	1500	128	23	15
MIN	41	59	31	27	29	150	190	58	51	23	7.9	4.7
CFSM	.08	.07	.04	.03	.06	.59	.51	.12	.54	.05	.01	.01
IN.	.09	.08	.05	.03	.06	.69	.57	.14	.61	.06	.01	.01
AC-FT	4770	4220	2830	1770	3510	37990	31830	7750	33570	3390	817	641

CAL YR 1983 TOTAL 53743.0 MEAN 147 MAX 1970 MIN 23 CFSM .14 IN 1.92 AC-FT 106600
WTR YR 1984 TOTAL 67100.8 MEAN 183 MAX 2890 MIN 4.7 CFSM .18 IN 2.40 AC-FT 133100

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 (0.8 km) east of Hendrum and 4 mi (6.4 km) upstream from mouth.

DRAINAGE AREA.--1,600 mi^2 (4,140 km^2), approximately.

PERIOD OF RECORD.--March 1944 to September 1984 (discontinued as a continuous-record station; converted to a crest-stage partial-record station).

REVISED RECORDS.--WSP 1728: 1958.

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

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

AVERAGE DISCHARGE.--40 years, 260 ft^3/s (7.363 m^3/s), 188,400 acre-ft/yr (232 hm^3/yr); median of yearly mean discharges, 219 ft^3/s (6.20 m^3/s), 159,000 acre-ft/yr (196 hm^3/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,400 ft^3/s (153 m^3/s) June 11, 12, gage height, 25.00 ft (7.620 m); minimum daily, 13 ft^3/s (0.37 m^3/s) Sept.2, 19-22.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	79	161	122	70	61	340	2100	429	102	280	37	15
2	97	155	118	68	61	350	1850	380	97	260	33	13
3	97	152	115	68	60	340	1550	350	96	230	30	15
4	119	154	114	68	60	330	1400	319	93	215	29	16
5	140	153	113	66	60	320	1300	308	110	200	27	15
6	152	170	111	66	60	310	1200	305	113	190	26	17
7	153	183	109	66	60	290	1100	301	327	175	26	14
8	153	194	106	66	60	280	1050	303	2030	164	25	14
9	169	195	104	66	60	270	984	307	4060	156	23	14
10	169	189	102	66	61	265	975	313	4950	150	27	15
11	172	175	100	66	64	260	970	283	5350	136	36	15
12	170	177	98	66	66	255	974	259	5350	128	28	14
13	169	166	96	65	70	255	1010	259	4980	126	26	14
14	181	169	94	65	78	250	974	253	4270	114	23	15
15	176	163	92	65	84	250	902	242	3250	108	22	15
16	186	178	90	64	92	250	839	267	2050	98	22	15
17	190	165	88	64	100	250	799	276	1390	97	20	14
18	196	160	86	64	110	250	714	245	1070	90	19	14
19	214	158	84	64	120	250	660	246	981	83	19	13
20	230	154	82	64	136	250	628	245	907	80	18	13
21	228	152	82	63	150	260	593	221	804	70	16	13
22	228	150	80	63	165	300	521	197	700	68	18	13
23	221	147	80	62	180	450	484	179	629	61	16	14
24	217	144	78	62	195	700	455	178	557	64	16	14
25	213	140	78	62	220	1400	423	175	497	56	17	14
26	208	138	76	62	250	2200	408	160	455	55	22	14
27	198	135	74	61	280	2800	410	144	421	54	23	15
28	193	131	74	61	310	3000	416	143	362	50	19	15
29	181	129	72	61	320	2850	423	126	319	45	18	16
30	135	126	72	61	---	2600	427	117	303	41	16	16
31	166	---	70	61	---	2350	---	112	---	39	16	---
TOTAL	5400	4763	2860	1996	3593	24525	26539	7642	46623	3683	713	434
MEAN	174	159	92.3	64.4	124	791	885	247	1554	119	23.0	14.5
MAX	230	195	122	70	320	3000	2100	429	5350	280	37	17
MIN	79	126	70	61	60	250	408	112	93	39	16	13
CFSM	.11	.10	.06	.04	.08	.49	.55	.15	.97	.07	.01	.009
IN.	.13	.11	.07	.05	.08	.57	.62	.18	1.08	.09	.02	.01
AC-FT	10710	9450	5670	3960	7130	48650	52640	15160	92480	7310	1410	861

CAL YR 1983	TOTAL	99289	MEAN 272	MAX 2230	MIN 41	CFSM .17	IN 2.31	AC-FT	196900	
WTR YR 1984	TOTAL	128771	MEAN 352	MAX 5350	MIN 13	CFSM .22	IN 2.99	AC-FT	255400	

RED RIVER OF THE NORTH BASIN

05064500 RED RIVER OF THE NORTH AT HALSTAD, MN

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

DRAINAGE AREA.--21,800 mi^2 (56,500 km^2), approximately, including 3,800 mi^2 (9,840 km^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 (251.963 m) National Geodetic Vertical Datum of 1929. Prior to July 17, 1961, nonrecording gage at same site and datum.

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

AVERAGE DISCHARGE.--23 years (1961-84), 1,740 ft^3/s (49.84 m^3/s), 1,275,000 acre-ft/yr (1.57 km^3/yr); median of yearly mean discharges, 1,540 ft^3/s (43.6 m^3/s), 1,116,000 acre-ft/yr (1.4 km^3/yr).

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

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 21,900 ft^3/s (620 m^3/s) Apr. 1, gage height, 29.99 ft (9.141 m) (backwater from ice); minimum daily, 148 ft^3/s (4.19 m^3/s) Sept. 29.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	535	817	720	494	444	1500	21500	3000	1360	2950	897	378
2	590	811	710	505	441	1590	21800	2900	1360	2600	811	400
3	641	809	700	512	445	1690	21500	2820	1320	2360	752	421
4	638	807	700	515	446	1840	20800	2770	1240	2210	712	444
5	660	811	695	516	430	1940	19700	2750	1160	2100	668	439
6	676	788	690	519	415	1990	18300	2740	1200	2030	622	405
7	686	777	691	525	410	1940	16500	2690	1300	1960	604	372
8	693	785	692	529	400	1780	14500	2650	4610	1880	623	346
9	697	793	677	539	398	1590	12400	2610	10900	1820	620	320
10	699	789	668	550	387	1460	10200	2590	12800	1730	600	305
11	702	777	660	563	352	1300	8280	2540	13000	1650	589	304
12	686	769	651	575	340	1200	7050	2450	12600	1580	563	293
13	655	769	647	569	373	1080	6710	2370	12100	1490	541	286
14	649	775	636	570	419	1050	6690	2320	11200	1370	598	302
15	651	782	625	565	452	1040	6470	2250	10100	1280	649	312
16	671	777	616	560	477	1000	6290	2200	8550	1250	661	297
17	713	778	603	550	505	980	6080	2180	6950	1240	640	292
18	749	757	593	535	556	970	5720	2110	5590	1220	575	290
19	746	755	581	520	578	960	5260	2010	4890	1180	468	279
20	771	756	561	500	600	920	4830	1920	4570	1170	377	268
21	836	779	535	474	620	1000	4500	1840	4120	1110	386	255
22	877	790	508	462	634	1040	4220	1770	3640	1050	471	226
23	894	776	505	450	693	1200	3990	1730	3220	1050	515	203
24	874	770	513	448	793	1880	3810	1690	2970	1080	518	184
25	854	765	508	455	890	4300	3650	1680	2970	1080	537	173
26	834	760	492	455	1040	8100	3500	1620	3190	1050	530	164
27	830	755	488	450	1120	12600	3370	1530	3430	1040	514	164
28	837	750	487	450	1200	14700	3220	1460	3600	1020	481	149
29	846	740	489	445	1370	17500	3110	1420	3580	1010	429	148
30	837	730	489	445	---	19100	3030	1390	3320	1000	385	156
31	830	---	489	443	---	20700	---	1370	---	984	376	---
TOTAL	22857	23297	18619	15688	17228	129940	276980	67370	160840	46544	17712	8575
MEAN	737	777	601	506	594	4192	9233	2173	5361	1501	571	286
MAX	894	817	720	575	1370	20700	21800	3000	13000	2950	897	444
MIN	535	730	487	443	340	920	3030	1370	1160	984	376	148
CFSM	.03	.04	.03	.02	.03	.19	.42	.10	.25	.07	.03	.01
IN.	.04	.04	.03	.03	.03	.22	.47	.11	.27	.08	.03	.01
AC-FT	45340	46210	36930	31120	34170	257700	549400	133600	319000	92320	35130	17010

CAL YR 1983	TOTAL	521968	MEAN 1430	MAX	7050	MIN 270	CFSM .07	IN 0.89	AC-FT	1035000	
WTR YR 1984	TOTAL	805650	MEAN 2201	MAX	21800	MIN 148	CFSM .10	IN 1.37	AC-FT	1598000	

RED RIVER OF THE NORTH BASIN

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

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
OCT											
24...	1020	877	650	8.0	9.5	9.0	22	10.2	90	32	760
JAN											
12...	1355	575	780	8.3	- .9	.0	5.0	8.8	65	--	--
FEB											
22...	1325	647	598	7.8	1.0	.0	3.5	7.8	56	280	1500
MAY											
22...	1405	1860	692	6.7	21.5	18.4	70	7.7	85	20	85
JUL											
30...	1335	1010	595	8.3	27.0	27.5	480	6.9	90	550	900
SEP											
27...	1240	164	790	9.2	3.0	8.7	2.0	13.9	122	5	20

DATE	HARD-NESS (MG/L AS CACO3) (00900)	HARD-NESS NONCAR-BONATE (MG/L AS CACO3) (95902)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	PERCENT SODIUM (00932)	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	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)
JAN												
12...	300	0	60	37	40	22	1	9.2	302	2.9	80	17
FEB												
22...	290	10	58	34	28	17	.7	7.1	275	8.4	59	19
MAY												
22...	310	90	64	36	32	18	.8	8.0	219	85	150	16
JUL												
30...	290	63	57	35	22	14	.6	8.7	224	2.2	110	14
SEP												
27...	320	91	64	40	52	25	1	8.6	234	.3	160	30

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)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4) (71846)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS TOTAL (MG/L AS PO4) (71886)
JAN											
12...	.20	16	460	440	.63	714	.31	.44	1.3	.130	.40
FEB											
22...	.20	19	385	390	.52	673	.57	.39	1.2	.100	.31
MAY											
22...	.30	6.7	458	450	.62	2300	.40	.21	2.5	.300	--
JUL											
30...	.20	17	413	400	.56	1130	.29	.08	1.0	.330	--
SEP											
27...	.40	9.1	518	510	.70	229	<.10	.06	1.2	.370	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4) (00660)	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)
JAN											
12...	.100	.080	.25	--	--	--	--	--	--	--	--
FEB											
22...	.070	.050	.15	10	3	77	<1	<1	<3	1	17
MAY											
22...	.160	.100	.31	<10	2	93	<1	<1	<3	2	13
JUL											
30...	.170	.120	.37	--	--	--	--	--	--	--	--
SEP											
27...	.260	.250	.77	<10	4	70	<1	<1	<3	3	9

RED RIVER OF THE NORTH BASIN

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

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)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
FEB											
22...	<1	28	38	<.1	<10	<1	<1	<1	200	<6	14
MAY											
22...	2	47	5	.1	<10	4	<1	<1	260	<6	23
SEP											
27...	5	56	8	<.1	<10	7	<1	<1	280	<6	4

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT					
24...	1020	877	45	107	98
FEB					
22...	1325	647	7	12	--
MAY					
22...	1710	1860	171	859	99
JUL					
30...	1335	1010	247	674	--
SEP					
27...	1130	164	26	12	--

DATE	TIME	SAMPLE LOC-ATION, CROSS SECTION (FT FM L BANK) (00009)	DEPTH TO TOP OF SAMPLE INTER-VAL (FT) (72015)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	OXYGEN, DIS-SOLVED (MG/L) (00300)
FEB							
22...	1125	14.0	1.6	.0	588	7.6	7.1
22...	1127	22.0	1.6	.0	590	7.7	7.6
22...	1129	30.0	1.6	.0	597	7.6	8.1
22...	1131	38.0	1.6	.0	597	7.7	7.8
22...	1133	46.0	1.6	.0	599	7.7	7.8
22...	1135	54.0	1.6	.0	597	7.7	7.8
22...	1137	62.0	1.6	.0	597	7.8	8.2
22...	1139	70.0	1.6	.0	596	7.8	8.6
22...	1141	78.0	1.6	.0	599	7.8	7.5
22...	1142	86.0	1.6	.0	599	7.8	7.5
22...	1143	94.0	1.6	.0	597	7.8	8.3
22...	1145	102	1.6	.0	600	7.8	7.7
22...	1147	110	1.6	.0	599	7.8	7.4
22...	1149	110	3.2	.0	600	7.8	7.4
22...	1151	118	1.6	.0	599	7.8	7.5
22...	1153	126	1.6	.0	599	7.8	7.9
22...	1155	126	3.2	.0	599	7.8	7.9
22...	1157	134	1.6	.0	599	7.9	7.8
22...	1159	142	1.6	.0	598	7.9	8.0
22...	1200	150	1.6	.0	596	7.9	7.6
22...	1201	150	3.2	.0	597	7.9	7.4
22...	1202	158	1.6	.0	595	7.9	7.9
22...	1203	158	3.2	.0	596	7.9	7.9
22...	1205	166	1.6	.0	596	7.9	8.3
22...	1207	166	3.2	.0	596	7.9	8.2
22...	1210	174	1.6	.0	586	7.9	7.4
MAY							
22...	1445	209	1.6	18.1	690	--	7.3
22...	1447	209	3.3	18.2	696	--	7.4
22...	1448	191	1.6	18.4	690	7.3	7.7
22...	1449	191	3.3	18.3	691	--	10.1
22...	1450	177	1.6	18.4	693	--	7.4
22...	1452	177	3.3	18.4	692	--	7.4
22...	1454	177	6.6	18.4	691	--	7.3
22...	1456	165	1.6	18.4	690	--	7.4
22...	1458	165	3.3	18.4	691	--	7.4
22...	1500	165	6.6	18.4	690	--	7.3
22...	1502	153	1.6	18.4	695	--	7.5
22...	1504	153	3.3	18.4	693	--	7.4
22...	1506	141	6.6	18.4	691	--	7.4

RED RIVER OF THE NORTH BASIN

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

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 (UMHOS) (00095)	PH (STANDARD UNITS) (00400)	OXYGEN, DISSOLVED (MG/L) (00300)
MAY							
22...	1508	141	1.6	18.4	691	--	7.4
22...	1510	141	3.3	18.4	690	--	7.4
22...	1512	129	1.6	18.3	674	6.7	7.5
22...	1513	129	3.3	18.4	669	--	7.4
22...	1515	106	1.6	18.4	696	--	7.9
22...	1516	106	3.3	18.4	693	--	8.0
22...	1517	94.0	1.6	18.4	610	--	8.1
22...	1518	94.0	3.3	18.5	620	--	8.3
22...	1519	82.0	1.6	18.4	692	--	7.5
22...	1520	82.0	3.3	18.5	691	--	7.4
22...	1521	68.0	1.6	18.4	695	7.0	7.6
22...	1523	52.0	1.6	18.4	693	--	7.6
22...	1524	52.0	3.3	18.5	691	--	7.6
22...	1525	44.0	1.6	18.4	697	--	7.8
22...	1526	44.0	3.3	18.5	694	--	7.8
22...	1527	34.0	1.6	18.5	693	--	7.9
22...	1528	34.0	3.3	18.5	692	--	7.6
22...	1529	24.0	1.6	18.4	694	--	8.8
22...	1534	24.0	3.3	18.5	687	--	9.2
SEP							
27...	1130	10.0	1.5	8.8	774	9.3	13.9
27...	1131	20.0	1.8	8.7	779	9.2	14.0
27...	1132	30.0	1.7	8.7	782	9.2	14.3
27...	1133	40.0	1.4	8.7	786	9.2	14.6
27...	1134	50.0	1.0	8.7	788	9.2	14.1
27...	1135	60.0	1.2	8.6	789	9.2	13.5
27...	1136	70.0	1.0	8.7	791	9.2	13.8
27...	1137	80.0	1.5	8.7	794	9.2	14.0
27...	1138	90.0	1.0	8.7	795	9.2	14.2
27...	1139	100	1.0	8.7	794	9.2	14.0
27...	1140	110	1.1	8.7	796	9.2	13.9
27...	1141	120	1.2	8.7	796	9.2	13.9
27...	1142	130	1.4	8.8	796	9.1	13.8
27...	1143	140	1.6	8.8	796	9.1	13.5
27...	1144	150	1.7	8.8	796	9.1	13.0

RED RIVER OF THE NORTH BASIN

05069000 SAND HILL RIVER AT CLIMAX, MN

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

DRAINAGE AREA.--426 mi^2 (1,103 km^2).

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

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

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

REMARKS.--Records fair except those for the winter period and for period of backwater from Red River of the North, which are poor.

AVERAGE DISCHARGE.--38 years (water years 1947-84), 71.8 ft^3/s (2.033 m^3/s), 52,020 acre-ft/yr (64.1 hm^3/yr); median of yearly mean discharges, 52 ft^3/s (1.47 m^3/s), 37,700 acre-ft/yr (46 hm^3/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,850 ft^3/s (80.7 m^3/s) June 9, gage height, 15.60 ft (4.755 m); maximum gage height, 16.49 ft (5.026 m) Mar. 31 (backwater from ice); minimum discharge, 8.7 ft^3/s (0.25 m^3/s) Sept. 24, gage height, 4.11 ft (1.253 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	52	68	45	29	25	68	1500	94	26	113	17	11
2	53	65	44	29	25	66	1380	84	23	98	17	12
3	50	61	43	28	25	64	1100	97	23	91	18	13
4	52	58	42	28	25	62	850	89	24	81	19	13
5	51	54	41	28	25	61	650	77	23	73	18	16
6	52	49	41	28	25	60	500	75	48	68	18	15
7	54	48	40	27	25	58	400	82	71	63	21	13
8	60	48	40	27	25	56	300	73	2160	58	19	12
9	63	46	39	27	25	55	215	71	2770	54	28	12
10	69	45	39	27	25	55	123	69	2110	52	24	12
11	72	44	38	29	25	55	176	63	1540	49	19	12
12	70	42	38	28	25	55	326	60	1380	46	17	12
13	72	43	37	28	30	55	374	57	1080	44	18	13
14	72	46	37	27	35	55	250	55	860	39	18	13
15	71	46	36	27	40	55	196	52	681	36	19	13
16	74	46	35	27	45	55	179	51	613	38	19	12
17	74	47	35	27	50	55	162	48	530	36	17	12
18	77	46	34	26	55	55	92	46	461	34	15	11
19	79	49	34	26	60	55	142	42	454	31	13	10
20	79	52	33	26	65	56	130	40	388	29	16	9.5
21	82	53	33	26	70	60	124	42	355	27	16	8.9
22	84	53	32	26	74	80	111	45	389	28	17	8.8
23	84	52	32	26	78	100	106	43	384	25	16	8.8
24	86	51	32	26	79	150	101	39	330	24	16	8.7
25	85	50	31	26	80	200	95	37	277	23	15	11
26	85	49	31	26	78	300	97	34	236	23	16	10
27	81	48	31	26	76	400	112	33	200	22	14	13
28	79	47	30	26	73	501	110	32	171	20	13	14
29	74	46	30	25	70	700	105	31	143	18	12	13
30	71	45	30	25	---	1100	97	30	124	21	11	12
31	70	---	29	25	---	1500	---	28	---	19	11	---
TOTAL	2177	1497	1112	832	1358	6247	10103	1719	17874	1383	527	354.7
MEAN	70.2	49.9	35.9	26.8	46.8	202	337	55.5	596	44.6	17.0	11.8
MAX	86	68	45	29	80	1500	1500	97	2770	113	28	16
MIN	50	42	29	25	25	55	92	28	23	18	11	8.7
CFSM	.17	.12	.08	.06	.11	.47	.79	.13	1.40	.11	.04	.03
IN.	.19	.13	.10	.07	.12	.55	.88	.15	1.56	.12	.05	.03
AC-FT	4320	2970	2210	1650	2690	12390	20040	3410	35450	2740	1050	704

CAL YR 1983 TOTAL 37444.0 MEAN 103 MAX 1210 MIN 17 CFSM .24 IN 3.27 AC-FT 74270
WTR YR 1984 TOTAL 45183.7 MEAN 123 MAX 2770 MIN 8.7 CFSM .29 IN 3.95 AC-FT 89620

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 (21 km) northwest of village of Red Lake.

DRAINAGE AREA.--1,950 mi^2 (5,050 km^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 (356.311 m), adjustment of 1912 (levels by Corps of Engineers); gage readings have been reduced to elevations based on adjustment of 1912. May 1933 to Sept. 6, 1934, nonrecording gage at same site and datum. Nonrecording gages at Waskish and Redby at datum 69.00 ft (21.031 m) lower.

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

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

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 1175.54 ft (358.305 m) July 13; maximum daily, 1174.92 ft (358.116 m) June 21; minimum, 1173.08 ft (357.555 m) Sept. 22; minimum daily, 1173.49 ft (357.680 m) Sept. 22.

MONTHEND ELEVATION, IN FEET, OCTOBER 1983 TO SEPTEMBER 1984

Oct. 31 ..... 1174.37	Feb. 29 ..... 1174.07	June 30 ..... 1174.71
Nov. 30 ..... 1174.26	Mar. 31 ..... 1174.08	July 31 ..... 1174.45
Dec. 31 ..... 1174.19	Apr. 30 ..... 1174.16	Aug. 31 ..... 1174.02
Jan. 31 ..... 1174.08	May 31 ..... 1174.33	Sept.30 ..... 1173.67

NOTE.--Mean daily gage heights are available.

RED RIVER OF THE NORTH BASIN

05074500 RED LAKE RIVER NEAR RED LAKE, MN

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

DRAINAGE AREA.--1,950 mi^2 (5,050 km^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 (355.702 m), adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 7, 1934, nonrecording gage at site 50 ft (15 m) upstream at datum 2.00 ft (0.610 m) higher. Sept. 7, 1934, to Nov. 26, 1951, water-stage recorder at present site at datum 2.00 ft (0.610 m) higher.

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

AVERAGE DISCHARGE.--51 years, 495 ft^3/s (14.02 m^3/s), 358,600 acre-ft/yr (442 hm^3/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,100 ft^3/s (31.2 m^3/s) July 13, gage height, 6.28 ft (1.914 m); maximum gage height, 6.34 ft (1.932 m) July 26; minimum daily discharge, 60 ft^3/s (1.70 m^3/s) Sept. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	254	348	810	800	790	780	357	505	381	1040	961	662
2	249	730	810	800	790	780	354	488	387	1040	957	658
3	249	770	810	800	790	780	454	481	372	1060	949	652
4	247	774	810	800	790	780	567	491	366	1050	946	649
5	254	778	807	800	790	780	570	495	381	1060	938	644
6	245	782	805	800	790	780	564	491	369	1050	938	635
7	245	778	805	800	790	780	550	519	363	1050	938	634
8	247	774	805	790	790	780	553	522	419	1050	938	630
9	233	774	805	790	790	780	539	491	320	1050	930	637
10	229	770	800	780	790	780	539	481	118	1050	930	643
11	249	759	800	780	790	780	532	458	89	1040	927	642
12	233	752	800	780	790	780	536	432	85	1040	919	644
13	229	752	800	780	790	780	542	435	162	1050	900	646
14	227	756	800	780	790	780	550	432	279	1040	778	648
15	220	759	800	780	790	780	546	422	284	1040	734	644
16	247	752	800	780	790	780	539	425	284	1030	716	637
17	245	748	800	780	790	774	532	464	289	1030	705	635
18	229	752	800	780	790	778	532	478	304	1020	698	641
19	229	759	800	780	790	774	529	448	422	1010	691	642
20	229	782	800	780	790	782	532	432	648	1010	680	632
21	229	785	800	780	780	782	525	441	438	996	687	550
22	227	815	800	780	780	782	525	441	416	988	680	458
23	223	810	800	780	780	644	529	432	412	976	673	426
24	231	810	800	780	780	331	532	451	406	968	669	428
25	227	810	800	780	780	323	525	422	397	957	669	421
26	221	810	800	780	780	325	505	416	542	961	666	368
27	225	810	800	780	780	331	502	403	915	961	666	230
28	229	810	800	780	780	337	542	397	980	953	666	181
29	214	810	800	790	780	337	508	397	1010	946	666	76
30	207	810	800	790	---	345	529	384	1020	946	651	60
31	205	---	800	790	---	351	---	366	---	957	651	---
TOTAL	7227	22929	24867	24370	22820	20476	15639	13940	12858	31419	24517	16053
MEAN	233	764	802	786	787	661	521	450	429	1014	791	535
MAX	254	815	810	800	790	782	570	522	1020	1060	961	662
MIN	205	348	800	780	780	323	354	366	85	946	651	60
CFSM	.12	.39	.41	.40	.40	.34	.27	.23	.22	.52	.41	.27
IN.	.14	.44	.47	.46	.44	.39	.30	.27	.25	.60	.47	.31
AC-FT	14330	45480	49320	48340	45260	40610	31020	27650	25500	62320	48630	31840

CAL YR 1983	TOTAL	215259	MEAN 590	MAX 946	MIN 140	CFSM .30	IN 4.11	AC-FT	427000	
WTR YR 1984	TOTAL	237115	MEAN 648	MAX 1060	MIN 60	CFSM .33	IN 4.52	AC-FT	470300	

RED RIVER OF THE NORTH BASIN

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

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

DRAINAGE AREA.--2,300 mi^2 (6,000 km^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 (347.951 m), adjustment of 1912 (levels by Corps of Engineers). See WSP 1308 or 1738 for history of changes prior to Oct. 1, 1949.

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

AVERAGE DISCHARGE.--55 years, 554 ft^3/s (15.69 m^3/s), 401,400 acre-ft/yr (495 hm^3/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 2,210 ft^3/s (62.6 m^3/s) June 9, gage height, 10.03 ft (3.057 m); minimum daily, 166 ft^3/s (4.70 m^3/s) Sept. 30; minimum gage height, 2.40 ft (0.732 m) Sept. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	528	483	870	790	780	850	857	748	516	1090	962	627
2	530	631	840	790	780	840	845	748	506	1110	954	638
3	531	930	820	790	780	840	840	734	502	1100	949	642
4	536	1030	810	790	780	830	942	720	504	1090	944	634
5	540	1050	800	790	780	830	1000	705	531	1090	942	631
6	558	1040	800	780	800	820	993	707	531	1070	939	638
7	552	1040	800	780	800	810	980	730	543	1070	946	642
8	627	1030	800	780	800	800	959	723	884	1060	965	640
9	627	1020	800	780	800	790	939	730	2150	1070	962	636
10	608	1020	800	780	800	780	924	718	1760	1050	959	634
11	592	1010	800	770	800	780	929	663	993	1040	965	638
12	577	1000	800	770	800	770	1030	650	723	1020	965	646
13	560	989	800	770	800	770	1080	640	636	1020	965	644
14	545	977	800	770	800	760	1010	638	570	1010	965	642
15	543	969	800	770	800	760	965	636	680	983	896	644
16	700	967	800	760	800	760	932	634	657	983	821	646
17	762	964	800	760	800	760	899	619	644	983	769	646
18	727	958	800	760	810	760	869	606	625	972	718	638
19	696	959	800	760	820	770	843	604	594	962	687	638
20	676	1000	800	760	820	780	826	610	669	959	678	638
21	652	1010	800	760	830	800	809	612	852	959	685	650
22	629	961	800	760	840	860	792	610	734	965	667	638
23	615	929	800	760	850	900	778	604	627	962	659	545
24	598	810	800	760	860	900	766	602	589	954	657	498
25	598	852	800	760	860	900	760	589	573	954	652	483
26	585	1000	800	780	860	900	762	587	543	954	648	468
27	570	1000	800	780	860	900	773	585	619	959	644	439
28	548	950	800	780	860	900	764	575	867	962	640	334
29	532	950	800	780	860	904	762	570	1020	962	634	258
30	512	900	800	780	---	867	755	566	1060	959	627	166
31	494	---	790	780	---	867	---	541	---	970	623	---
TOTAL	18348	28429	24930	23980	23630	25558	26383	20004	22702	31292	25087	17261
MEAN	592	948	804	774	815	824	879	645	757	1009	809	575
MAX	762	1050	870	790	860	904	1080	748	2150	1110	965	650
MIN	494	483	790	760	780	760	755	541	502	954	623	166
CFSM	.26	.41	.35	.34	.35	.36	.38	.28	.33	.44	.35	.25
IN.	.30	.46	.40	.39	.38	.41	.43	.32	.37	.51	.41	.28
AC-FT	36390	56390	49450	47560	46870	50690	52330	39680	45030	62070	49760	34240

CAL YR 1983 TOTAL 285608 MEAN 782 MAX 1470 MIN 183 CFSM .34 IN 4.62 AC-FT 566500
WTR YR 1984 TOTAL 287604 MEAN 786 MAX 2150 MIN 166 CFSM .34 IN 4.65 AC-FT 570500

RED RIVER OF THE NORTH BASIN

05076000 THIEF RIVER NEAR THIEF RIVER FALLS, MN

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

DRAINAGE AREA.--959 mi^2 (2,484 km^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 (339.038 m) National Geodetic Vertical Datum of 1929 (levels by Minnesota Department of Transportation). Prior to May 4, 1939, nonrecording gages at same site and datum.

REMARKS.--Records good except those for winter period and those for periodof no gage-height record, May 22 to July 10, which are poor. Some regulation by Thief and Mud Lakes.

AVERAGE DISCHARGE.--66 years (water years 1910-17, 1921, 1923-24, 1929-81, 1983-84), 161 ft^3/s (4.560 m^3/s), 116,600 acre-ft/yr (144 hm^3/yr); median of yearly mean discharges, 110 ft^3/s (3.12 m^3/s), 79,700 acre-ft/yr (98 hm^3/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,520 ft^3/s (43.0 m^3/s) June 9, gage height, 9.80 ft (2.987 m) from highwater mark; minimum, 0.16 ft^3/s (0.005 m^3/s) Sept. 19, gage height, 4.06 ft (1.237 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	145	211	120	27	14	28	860	314	85	480	98	3.4
2	140	206	113	26	14	27	900	332	75	440	96	3.4
3	135	200	105	25	14	26	855	308	70	400	94	3.4
4	135	197	98	24	14	25	802	208	80	370	95	3.3
5	130	160	93	23	15	24	756	287	100	350	95	3.1
6	141	134	88	23	15	23	726	281	250	330	95	2.4
7	148	131	83	22	15	22	690	287	400	310	95	1.7
8	206	131	78	22	15	21	661	296	800	295	95	1.4
9	246	129	75	21	16	20	604	281	1500	280	94	1.2
10	240	127	72	20	16	19	487	269	1200	270	86	1.0
11	231	129	68	20	16	18	487	258	1000	252	79	.99
12	335	122	65	19	17	18	684	246	800	245	79	.78
13	341	127	62	19	18	18	865	243	700	248	81	.65
14	317	127	59	18	19	18	772	237	640	246	66	.56
15	320	124	56	18	20	18	658	211	580	237	37	.49
16	515	122	53	17	21	18	578	206	500	239	26	.43
17	584	113	50	17	23	19	527	197	450	246	23	.35
18	530	127	48	17	24	20	493	194	400	235	21	.23
19	472	122	45	16	25	22	438	192	360	229	16	15
20	428	136	43	16	26	27	308	189	320	216	13	28
21	371	146	41	15	27	30	249	192	300	206	12	27
22	347	176	39	15	28	37	237	175	275	201	9.3	26
23	332	211	38	15	28	46	228	165	250	193	7.4	21
24	320	200	37	15	29	60	223	155	230	184	6.1	19
25	314	185	36	15	30	80	228	145	210	179	9.8	18
26	308	170	34	15	30	110	272	135	260	172	6.2	18
27	299	155	33	14	30	150	299	125	400	111	4.3	18
28	302	145	32	14	29	220	416	115	700	90	4.0	16
29	302	135	31	14	29	350	425	110	600	91	3.4	13
30	284	125	29	14	---	500	386	100	530	93	3.0	12
31	266	---	28	14	---	730	---	95	---	98	3.1	---
TOTAL	9184	4523	1852	570	617	2744	16114	6548	14065	7536	1452.6	259.78
MEAN	296	151	59.7	18.4	21.3	88.5	537	211	469	243	46.9	8.66
MAX	584	211	120	27	30	730	900	332	1500	480	98	28
MIN	130	113	28	14	14	18	223	95	70	90	3.0	.23
CFSM	.31	.16	.06	.02	.02	.09	.56	.22	.49	.25	.05	.009
IN.	.36	.18	.07	.02	.02	.11	.63	.25	.55	.29	.06	.01
AC-FT	18220	8970	3670	1130	1220	5440	31960	12990	27900	14950	2880	515

CAL YR 1983 TOTAL 108816.54 MEAN 298 MAX 1400 MIN .73 CFSM .31 IN 4.22 AC-FT 215800
WTR YR 1984 TOTAL 65465.38 MEAN 179 MAX 1500 MIN .23 CFSM .19 IN 2.54 AC-FT 129900

RED RIVER OF THE NORTH BASIN

05078000 CLEARWATER RIVER AT PLUMMER, MN

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

DRAINAGE AREA.--512 mi^2 (1,326 km^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 (335.012 m), adjustment of 1912 (levels by Corps of Engineers). Prior to Nov. 10, 1939, nonrecording gage at site 100 ft (30 m) upstream at same datum.

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

AVERAGE DISCHARGE.--42 years (water years 1940-79, 1983-84), 178 ft^3/s (5.041 m^3/s), 129,000 acre-ft/yr (159 hm^3/yr).

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

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

Date	Time	Discharge (ft^3/s)	Discharge (m^3/s)	Gage height (ft)	Gage height (m)
Mar. 27	----	640	18.1	ice jam	
June 9	0915	*1,880	53.2	9.07	2.765

Minimum daily discharge, 16 ft^3/s (0.45 m^3/s) Mar. 6; minimum gage height, 2.32 ft (0.707 m) June 1.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	63	101	88	56	55	52	380	149	24	125	114	27
2	80	98	86	56	55	54	340	136	65	106	130	25
3	101	95	84	56	55	45	290	112	72	103	148	25
4	111	91	82	56	55	35	240	112	72	100	144	26
5	120	84	80	56	55	19	200	83	59	92	124	25
6	117	74	80	56	55	16	176	76	57	84	93	25
7	130	72	78	56	55	40	161	80	87	90	99	25
8	140	76	76	56	55	50	137	114	973	97	149	24
9	150	69	74	55	55	60	118	130	1820	95	152	23
10	145	56	72	55	55	70	94	114	1660	103	122	25
11	140	48	72	55	56	65	86	148	1370	110	102	25
12	135	43	70	55	58	60	114	158	1080	110	83	25
13	132	45	70	55	60	55	195	167	931	130	72	25
14	128	61	68	55	62	55	201	167	777	130	61	29
15	126	63	68	55	64	60	193	155	611	114	50	33
16	150	60	66	55	66	65	185	140	491	112	47	32
17	200	57	66	55	68	75	155	131	442	108	43	28
18	230	66	64	55	70	75	110	125	468	146	37	25
19	220	76	64	55	74	75	103	118	400	136	33	25
20	200	90	62	55	78	80	106	114	339	136	34	25
21	178	87	62	55	82	95	112	94	306	116	34	27
22	188	80	62	55	88	120	112	95	269	108	47	30
23	181	74	60	55	94	170	110	84	252	107	49	25
24	165	66	60	55	90	250	87	90	222	104	41	24
25	155	70	60	55	80	400	74	80	193	118	37	25
26	144	80	58	55	68	520	81	70	174	108	34	23
27	139	100	58	55	58	620	91	66	198	110	33	29
28	125	100	58	55	47	580	130	84	213	116	30	27
29	115	95	58	55	50	520	148	74	176	112	29	28
30	102	90	58	55	---	480	149	36	146	97	29	29
31	107	---	58	55	---	430	---	29	---	92	28	---
TOTAL	4417	2267	2122	1713	1863	5291	4678	3331	13947	3415	2228	789
MEAN	142	75.6	68.5	55.3	64.2	171	156	107	465	110	71.9	26.3
MAX	230	101	88	56	94	620	380	167	1820	146	152	33
MIN	63	43	58	55	47	16	74	29	24	84	28	23
CFSM	.28	.15	.13	.11	.13	.33	.31	.21	.91	.22	.14	.05
IN.	.32	.16	.15	.12	.14	.38	.34	.24	1.01	.25	.16	.06
AC-FT	8760	4500	4210	3400	3700	10490	9280	6610	27660	6770	4420	1560

CAL YR 1983	TOTAL	65741	MEAN 180	MAX 1100	MIN 15	CFSM .35	IN 4.78	AC-FT	130400	
WTR YR 1984	TOTAL	46061	MEAN 126	MAX 1820	MIN 16	CFSM .25	IN 3.35	AC-FT	91360	

RED RIVER OF THE NORTH BASIN

05078230 LOST RIVER AT OKLEE, MN

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

DRAINAGE AREA.--266 mi^2 (689 km^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 (343.391 m), adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 9, 1960, reference points at same site at datum 8.00 ft (2.438 m) higher. Sept. 9, 1960, to Sept. 30, 1964, nonrecording gage at same site at datum 8.00 ft (2.438 m) higher.

REMARKS.--Records poor.

AVERAGE DISCHARGE.--23 years, 73.6 ft^3/s (2.084 m^3/s), 53,320 acre-ft/yr (65.7 hm^3/yr).

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

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 626 ft^3/s (17.7 m^3/s) June 9, gage height, 9.13 ft (2.783 m); maximum gage height, 9.48 ft (2.890 m) Mar. 26 (backwater from ice); minimum daily discharge, 0.09 ft^3/s (0.003 m) Aug. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	38	46	27	14	14	43	300	31	2.1	15	11	.15
2	41	43	26	14	14	41	290	26	2.4	16	6.5	.27
3	28	38	25	14	14	38	239	22	2.4	14	7.8	.21
4	44	32	24	14	14	36	192	18	3.3	11	4.0	.24
5	43	32	23	14	14	33	166	27	18	8.6	3.1	.37
6	43	34	23	14	14	30	154	30	21	11	2.3	.37
7	45	36	22	14	14	28	136	50	39	19	.21	.37
8	45	38	21	14	14	27	116	51	230	9.9	2.1	.51
9	48	39	20	14	14	26	106	43	582	17	2.1	.51
10	45	36	20	14	14	25	104	36	453	6.2	3.6	.37
11	41	33	19	14	14	24	110	30	310	5.8	4.2	.37
12	43	25	19	14	14	23	124	29	227	6.0	4.2	.58
13	58	31	18	14	15	23	132	22	173	6.5	4.2	.58
14	53	27	18	14	15	24	125	17	140	9.3	3.5	.72
15	36	18	17	14	16	25	114	15	114	11	.15	.58
16	59	8.3	17	14	17	27	104	13	94	17	1.3	.72
17	69	16	16	14	18	28	86	15	92	20	.65	1.0
18	63	38	14	14	21	29	81	12	108	21	.44	1.0
19	65	30	11	14	24	31	56	9.9	107	19	.44	1.1
20	66	48	16	14	27	34	45	7.1	96	13	.44	1.4
21	48	30	15	14	34	39	42	11	83	12	2.1	2.8
22	50	36	15	14	40	50	41	19	89	24	.79	3.8
23	58	35	14	14	50	70	26	27	75	21	1.3	4.6
24	60	34	14	14	55	90	21	22	72	20	1.1	6.2
25	57	33	14	14	54	110	21	20	59	18	.79	5.6
26	58	32	14	14	52	150	25	21	56	23	.86	5.0
27	59	31	14	14	49	200	31	16	56	19	.93	4.6
28	59	30	14	14	48	250	45	12	39	18	.51	3.3
29	56	29	14	14	46	270	37	11	24	18	.37	1.9
30	53	28	14	14	---	300	34	9.6	22	14	.09	3.0
31	52	---	14	14	---	300	---	9.9	---	8.0	.12	---
TOTAL	1583	966.3	552	434	749	2424	3103	682.5	3389.2	451.3	71.19	52.22
MEAN	51.1	32.2	17.8	14.0	25.8	78.2	103	22.0	113	14.6	2.30	1.74
MAX	69	48	27	14	55	300	300	51	582	24	11	6.2
MIN	28	8.3	11	14	14	23	21	7.1	2.1	5.8	.09	.15
CFSM	.19	.12	.07	.05	.10	.29	.39	.08	.43	.06	.009	.007
IN.	.22	.14	.08	.06	.10	.34	.43	.10	.47	.06	.01	.01
AC-FT	3140	1920	1090	861	1490	4810	6150	1350	6720	895	141	104

CAL YR 1983 TOTAL 20957.60 MEAN 57.4 MAX 500 MIN 7.8 CFSM .22 IN 2.93 AC-FT 41570
WTR YR 1984 TOTAL 14457.71 MEAN 39.5 MAX 582 MIN .09 CFSM .15 IN 2.02 AC-FT 28680

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 (12 m) downstream from Great Northern Railroad bridge in Red Lake Falls, 1.4 mi (2.3 km) upstream from mouth, and 3 mi (5 km) downstream from Badger Creek.

DRAINAGE AREA.--1,370 mi^2 (3,550 km^2), approximately.

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

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

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

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

AVERAGE DISCHARGE.--57 years (1910-17, 1935-81, 1983-84), 315 ft^3/s (8.921 m^3/s), 228,200 acre-ft/yr (281 hm^3/yr); median of yearly mean discharges, 283 ft^3/s (8.01 m^3/s), 205,000 acre-ft/yr (253 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,300 ft^3/s (292 m^3/s) Apr. 25, 1979, gage height, 12.38 ft (3.773 m); maximum gage height, 15.85 ft (4.831 m) 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, 5,450 ft^3/s (154 m^3/s) June 9, gage height, 8.85 ft (2.697 m); maximum gage height, 9.47 ft (2.886 m) Mar. 25, from high-water mark (backwater from ice); minimum discharge, 17 ft^3/s (0.48 m^3/s) Sept. 22, gage height, 1.65 ft (0.503 m).

REVISIONS.--The daily discharge, in cubic feet per second, for Jan. 7, 1983 has been revised to 105, superseding that shown in the 1983 report.

JANUARY 1983	TOTAL 3095	MEAN 99.8	MAX 105	MIN 90	CFSM .07	IN .08	AC-FT 6140
WTR YR 1983	TOTAL 139168	MEAN 381	MAX 3000	MIN 60	CFSM .28	IN 3.77	AC-FT 276000

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	115	242	175	95	90	220	1160	324	71	259	125	29
2	138	235	170	95	90	210	1100	320	64	233	143	29
3	173	225	165	95	90	200	1100	280	90	209	150	28
4	200	216	160	95	90	190	1020	254	113	200	168	26
5	223	206	155	95	90	170	836	242	128	186	159	26
6	226	192	150	95	90	150	741	210	117	173	137	26
7	247	183	145	95	90	140	676	210	169	160	162	24
8	258	182	140	90	90	140	608	222	2390	169	151	23
9	293	179	140	90	90	150	544	267	5170	186	184	23
10	287	173	135	90	90	170	501	260	3800	173	170	22
11	271	162	135	90	92	180	479	248	2680	176	142	22
12	281	150	130	90	95	170	567	270	2010	174	121	24
13	253	140	130	90	95	160	676	273	1650	167	104	26
14	242	141	125	90	100	150	672	270	1410	184	93	23
15	235	157	125	90	105	150	628	260	1160	169	80	22
16	244	150	120	90	115	160	586	242	947	155	67	27
17	370	128	120	90	125	180	547	216	822	149	63	29
18	447	126	120	90	135	200	465	196	844	149	57	27
19	432	155	115	90	150	220	404	188	833	184	47	24
20	396	171	115	90	160	240	355	188	758	171	50	20
21	373	213	110	90	180	270	336	186	717	166	54	19
22	360	196	110	90	200	330	318	171	653	148	44	18
23	372	196	110	90	280	450	308	166	620	141	49	19
24	358	123	105	90	300	600	285	157	565	145	62	26
25	344	121	105	90	290	900	247	159	498	139	57	23
26	331	150	105	90	270	1200	241	155	442	150	49	21
27	318	200	100	90	260	1350	263	141	396	138	43	19
28	300	190	100	90	250	1390	307	132	426	141	40	19
29	278	185	100	90	240	1320	346	148	373	140	34	22
30	258	180	100	90	---	1240	343	130	303	139	30	25
31	241	---	100	90	---	1280	---	90	---	133	29	---
TOTAL	8864	5267	3915	2825	4342	13880	16659	6575	30219	5206	2864	711
MEAN	286	176	126	91.1	150	448	555	212	1007	168	92.4	23.7
MAX	447	242	175	95	300	1390	1160	324	5170	259	184	29
MIN	115	121	100	90	90	140	241	90	64	133	29	18
CFSM	.21	.13	.09	.07	.11	.33	.41	.16	.74	.12	.07	.02
IN.	.24	.14	.11	.08	.12	.38	.45	.18	.82	.14	.08	.02
AC-FT	17580	10450	7770	5600	8610	27530	33040	13040	59940	10330	5680	1410

CAL YR 1983	TOTAL 136238	MEAN 373	MAX 3000	MIN 60	CFSM .27	IN 3.70	AC-FT 270200
WTR YR 1984	TOTAL 101327	MEAN 277	MAX 5170	MIN 18	CFSM .20	IN 2.75	AC-FT 201000

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 (30 m) upstream from Sargent Street bridge in Crookston, 0.3 mi (0.5 km) downstream from Interstate Power Co.'s dam, 0.6 mi (1.0 km) downstream from bridge on U.S. Highway 75, and 53 mi (85 km) upstream from mouth.

DRAINAGE AREA.--5,280 mi^2 (13,680 km^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 (253.813 m) National Geodetic Vertical Datum of 1929. May 18, 1901, to June 30, 1909, nonrecording gage at bridge 300 ft (91 m) upstream at same datum. July 1, 1909, to Sept. 25, 1911, nonrecording gage, Sept. 26, 1911, to Sept. 30, 1919, water-stage recorder, Oct. 1, 1919, to Sept. 30, 1930, nonrecording gage, at present site and datum.

REMARKS.--Records good except those for winter period, which are fair. Diurnal fluctuation prior to 1975 caused by powerplant 1,000 ft (300 m) upstream. Runoff from 1,950 mi^2 (5,050 km^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.--83 years, 1,134 ft^3/s (32.11 m^3/s), 821,600 acre-ft/yr (1,010 hm^3/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 14,400 ft^3/s (408 m^3/s) June 10, gage height, 20.71 ft (6.312 m); minimum, 340 ft^3/s (9.63 m^3/s) Sept. 28, gage height, 3.45 ft (1.052 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	980	1110	1170	980	970	1150	4700	1690	742	1770	1000	571
2	921	1100	1140	980	970	1130	4500	1610	702	1760	1010	558
3	897	1020	1110	980	970	1100	3980	1510	682	1730	1010	600
4	852	1080	1080	980	970	1080	3310	1490	721	1690	1010	592
5	954	1400	1060	980	970	1050	3090	1320	743	1650	1010	586
6	893	1490	1050	980	970	1050	2920	1330	778	1590	1000	568
7	978	1430	1040	980	970	1020	2790	1330	797	1530	1030	592
8	1070	1420	1030	970	980	1010	2650	1350	2400	1530	1140	616
9	1170	1400	1020	970	980	1000	2450	1360	10500	1570	1030	608
10	1350	1390	1010	970	980	1000	2310	1400	14200	1510	1080	606
11	1380	1410	1010	970	980	990	2170	1350	11800	1460	1010	562
12	1330	1360	1010	970	980	990	2400	1320	8440	1440	970	594
13	1340	1370	1010	970	990	990	3580	1250	6460	1380	960	621
14	1360	1350	1000	970	990	980	3600	1230	5510	1380	890	613
15	1380	1320	1000	970	990	980	3020	1230	4570	1360	933	562
16	1280	1330	1000	960	1000	980	2590	1140	3900	1310	906	589
17	2220	1350	1000	960	1000	990	2380	1110	3420	1220	813	601
18	2480	1250	1000	960	1010	1000	2160	1070	3110	1300	753	621
19	2230	1290	1000	960	1020	1020	2000	989	2970	1250	650	583
20	1960	1410	1000	960	1040	1080	1880	979	2740	1240	696	577
21	1780	1500	1000	960	1060	1200	1670	1000	2480	1220	696	626
22	1630	1600	1000	960	1080	1300	1550	1060	2470	1180	627	576
23	1600	1390	1000	960	1110	1500	1500	953	2410	1140	603	615
24	1520	1150	1000	960	1170	1900	1510	961	2180	1140	595	629
25	1420	864	1000	960	1200	2400	1400	935	1940	1120	596	620
26	1420	687	990	960	1200	2900	1340	917	1740	1100	587	493
27	1420	800	990	960	1200	3700	1470	858	1580	1100	589	476
28	1360	1000	990	960	1200	4500	1520	889	1540	1040	584	427
29	1290	1200	990	960	1180	5200	1690	862	1610	998	577	458
30	1260	1200	990	960	---	5200	1770	840	1810	996	568	420
31	1220	---	990	960	---	5000	---	807	---	1010	551	---
TOTAL	42945	37671	31680	29980	30130	55390	73900	36140	104945	41714	25474	17160
MEAN	1385	1256	1022	967	1039	1787	2463	1166	3498	1346	822	572
MAX	2480	1600	1170	980	1200	5200	4700	1690	14200	1770	1140	629
MIN	852	687	990	960	970	980	1340	807	682	996	551	420
CFSM	.26	.24	.19	.18	.20	.34	.47	.22	.66	.26	.16	.11
IN.	.30	.27	.22	.21	.21	.39	.52	.25	.74	.29	.18	.12
AC-FT	85180	74720	62840	59470	59760	109900	146600	71680	208200	82740	50530	34040

CAL YR 1983 TOTAL 609886 MEAN 1671 MAX 6860 MIN 687 CFSM .32 IN 4.30 AC-FT 1210000
WTR YR 1984 TOTAL 527129 MEAN 1440 MAX 14200 MIN 420 CFSM .27 IN 3.71 AC-FT 1046000

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

WATER-QUALITY RECORDS

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

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
NOV , 1983											
15...	1245	1340	385	409	8.7	8.1	.0	2.0	3.6	745	--
JAN , 1984											
10...	1600	970	422	399	--	7.5	-20.0	.0	12	745	8.9
MAR											
06...	1600	1050	385	408	7.3	7.9	-16.0	.5	3.0	740	11.2
MAY											
01...	1130	1680	440	444	8.4	8.1	7.0	6.5	1.0	737	11.7
JUN											
26...	1715	1870	475	493	8.5	8.1	20.0	23.0	20	729	8.0
AUG											
14...	0930	866	366	363	8.3	8.2	27.0	25.5	6.5	734	7.6

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)
NOV , 1983											
15...	--	24	40	53	19	4.8	2.5	176	40	4.3	.20
JAN , 1984											
10...	62	21	23	53	18	4.4	2.6	194	20	3.4	.20
MAR											
06...	80	K13	27	54	19	5.7	3.5	189	24	5.8	<.10
MAY											
01...	99	K16	170	58	22	5.1	3.2	179	63	5.6	.10
JUN											
26...	98	210	--	62	22	5.5	3.2	190	66	5.0	.20
AUG											
14...	97	120	280	46	17	3.8	2.6	166	25	3.0	.10

RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

WATER QUALITY DATA, WATER YEAR OTOBER 1983 TO SEPTEMBER 1984

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)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
NOV , 1983											
15...	2.0	255	<.10	.080	1.4	.050	.020	.010	7	25	96
JAN , 1984											
10...	4.3	266	.12	.120	.90	.040	.030	<.010	8	21	83
MAR											
06...	5.3	287	.32	.230	1.3	.040	<.010	.010	37	105	97
MAY											
01...	2.0	310	<.10	<.010	2.0	.030	<.010	<.010	19	86	90
JUN											
26...	8.5	374	<.10	<.010	1.9	.090	.070	.050	49	247	94
AUG											
14...	7.6	238	<.10	.040	1.1	.070	.020	.040	33	77	97

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)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)
NOV , 1983											
15...	1245	10	1	59	<.5	<1	<1	<3	2	11	4
MAR , 1984											
06...	1600	<10	2	66	<.5	<1	7	<3	<1	40	1
MAY											
01...	1130	<10	2	56	<1.0	<1	5	<3	<1	31	2
AUG											
14...	0930	10	4	63	<.5	<1	8	<3	1	21	1

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
NOV , 1983										
15...	<4	8	<.1	<10	1	<1	<1	110	<6	5
MAR , 1984										
06...	10	38	.1	<10	1	<1	<1	110	<6	16
MAY										
01...	<4	17	<.1	<10	2	<1	<1	130	<6	13
AUG										
14...	8	6	.1	<10	2	<1	<1	110	<6	15

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 (0.6 km) downstream from Red Lake River, and at mile 293.8 (472.7 km).

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

WATER-DISCHARGE RECORDS

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

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

GAGE.--Water-stage recorder. Datum of gage is 778.35 ft (237.241 m) National Geodetic Vertical Datum of 1929. Apr. 14, 1965 to Sept. 30, 1983, water-stage recorder 1.9 mi (3.1 km) downstream at a datum of 778.35 ft (237.241 m). Nov. 3, 1933, to Apr. 13, 1965, water-stage recorder 0.3 mi (0.5km) upstream at 778.35 ft (237.241m) datum. See WSP 1728 or 1913 for history of changes prior to Nov. 3, 1933.

REMARKS. Records good.

AVERAGE DISCHARGE.--102 years, 2,575 ft^3/s, (72.92 m^3/s), 1,866,000 acre-ft/yr (2.30 km^3/yr); median of yearly mean discharge, 2,170 ft^3/s (61.5 m^3/s), 1,570,000 acre-ft/yr (1.9 km^3/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, 32,300 ft^3/s (915 m^3/s) Apr. 2, gage height, 37.06 ft (11.30 m); minimum daily, 634 ft^3/s (18.0 m^3/s) Sept. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1640	2190	1750	1780	1630	2700	31500	5410	2400	5680	1960	929
2	1560	2090	1930	1770	1640	2760	32200	5310	2340	5300	1920	953
3	1530	2060	2020	1760	1630	2860	32000	5140	2320	4870	1830	969
4	1520	2010	2030	1770	1630	2940	31200	4980	2280	4530	1760	1050
5	1520	2010	2020	1770	1640	2990	29700	4840	2260	4230	1740	1070
6	1560	2250	2070	1770	1630	3000	28000	4670	2250	4040	1710	1050
7	1590	2370	2120	1760	1620	3060	26500	4580	2440	3890	1780	1040
8	1620	2330	2130	1730	1600	3040	24900	4530	10100	3760	1750	1050
9	1700	2330	2130	1730	1620	2910	23100	4500	13300	3680	1770	1050
10	1770	2320	2090	1730	1620	2790	20900	4460	22500	3520	1760	1030
11	1960	2310	2050	1710	1600	2660	18200	4440	28900	3390	1770	1010
12	2010	2310	2010	1700	1560	2550	15300	4360	29300	3240	1730	960
13	2050	2300	2020	1700	1540	2410	13400	4230	29400	3100	1660	962
14	2000	2260	2020	1700	1540	2240	12800	4080	25700	2950	1610	999
15	2020	2250	2040	1690	1590	2170	12300	3980	23200	2780	1580	1020
16	2100	2250	2040	1670	1610	2160	11800	3890	20900	2650	1640	1030
17	1960	2230	2000	1670	1620	2120	10900	3740	18400	2530	1670	986
18	2500	2250	1940	1650	1620	2070	10100	3630	15800	2440	1640	1010
19	3110	2180	1930	1620	1700	2030	9100	3520	13200	2430	1510	1020
20	3170	2220	1910	1620	1730	2020	8310	3370	11800	2380	1340	1010
21	2950	2320	1880	1630	1770	2040	7760	3270	9760	2410	1180	996
22	2790	2360	1850	1600	1820	2160	7160	3150	8180	2280	1090	965
23	2700	2260	1820	1590	1890	2450	6680	3110	7480	2190	1060	944
24	2650	1800	1800	1590	1950	3200	6300	3000	6910	2110	1080	897
25	2580	1230	1780	1590	2250	5090	6070	2920	6230	2100	1110	912
26	2480	979	1770	1600	2580	10400	5760	2900	5800	2280	1130	918
27	2420	1060	1770	1630	2610	12100	5620	2840	5660	2110	1130	822
28	2390	1220	1770	1630	2640	14700	5520	2710	5640	2090	1090	710
29	2360	1360	1770	1630	2700	18400	5390	2630	5720	2040	1040	649
30	2290	1510	1770	1630	---	23400	5430	2550	5720	1970	984	634
31	2250	---	1770	1630	---	28400	---	2480	---	1950	931	---
TOTAL	66750	60619	60000	52050	52580	173820	463900	119220	345890	94920	45955	28645
MEAN	2153	2021	1935	1679	1813	5607	15460	3846	11530	3062	1482	955
MAX	3170	2370	2130	1780	2700	28400	32200	5410	29400	5680	1960	1070
MIN	1520	979	1750	1590	1540	2020	5390	2480	2250	1950	931	634
CFSM	.07	.07	.06	.06	.06	.19	.51	.13	.38	.10	.05	.03
IN.	.08	.07	.07	.06	.06	.21	.57	.15	.43	.12	.06	.04
AC-FT	132400	120200	119000	103200	104300	344800	920100	236500	686100	188300	91150	56820

CAL YR 1983 TOTAL 1314549 MEAN 3602 MAX 14200 MIN 979 CFSM .12 IN 1.63 AC-FT 2607000
WTR YR 1984 TOTAL 1564349 MEAN 4274 MAX 32200 MIN 634 CFSM .14 IN 1.93 AC-FT 3103000

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

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	HARD-NESS (MG/L AS CACO3) (00900)	HARD-NESS NONCAR-BONATE (MG/L AS CACO3) (95902)
OCT									
21...	1005	2870	585	8.3	7.0	6.5	--	300	93
DEC									
21...	1640	1840	555	--	-2 .9	.0	--	--	--
JAN									
25...	1420	1550	550	--	-1 .9	.0	--	--	--
FEB									
24...	1630	1980	462	--	- .9	.0	--	--	--
MAR									
29...	0830	17800	305	--	.0	.5	--	--	--
31...	0940	28200	325	--	6.0	1.0	--	--	--
APR									
02...	1030	32200	345	--	10.0	1.5	--	--	--
06...	1215	28100	430	--	11.0	4.0	--	--	--
10...	1120	21000	450	--	9.0	6.0	--	--	--
13...	1530	13100	530	8.2	14.0	7.5	--	240	74
19...	1015	9190	620	--	15.0	9.5	--	--	--
25...	0910	5870	660	--	9.5	12.5	--	--	--
MAY									
25...	1100	2880	655	--	14.0	16.0	--	--	--
JUN									
11...	1210	28200	465	--	21.5	18.0	--	--	--
13...	1240	29300	385	--	18.0	17.0	--	--	--
19...	1055	13300	520	--	18.0	21.0	--	--	--
22...	0845	8320	595	--	22.0	21.5	--	--	--
25...	1205	6250	615	--	25.0	22.0	--	--	--
JUL									
26...	1225	2180	504	--	24.5	24.5	--	--	--
AUG									
28...	1155	1110	420	--	25.5	23.5	--	--	--
SEP									
27...	1640	795	500	--	6.0	8.0	--	--	--

DATE	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	PERCENT SODIUM (00932)	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	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)
OCT											
21...	69	31	11	7	.3	5.9	210	2.0	94	10	.20
APR											
13...	56	24	16	12	.5	7.0	170	1.9	81	8.5	.10

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4) (00660)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BORON, DIS-SOLVED (UG/L AS B) (01020)
OCT											
21...	10	400	360	.54	3100	--	--	--	4	--	50
APR											
13...	12	311	310	.42	11000	1.2	.060	.18	2	68	50

DATE	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	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)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
OCT											
21...	--	--	20	2	20	10	.2	1	0	220	--
APR											
13...	<1	4	33	<1	25	10	<.1	2	<1	170	10

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 (9 m) upstream of bridge on County Highway 4 in Argyle and 14 mi (22 km) upstream from mouth.

DRAINAGE AREA.--265 mi^2 (686 km^2).

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

GAGE.--Water-stage recorder. Datum of gage is 828.53 ft (252.536 m) National Geodetic Vertical Datum of 1929. Prior to Nov. 8, 1951, nonrecording gage and Nov. 8, 1951, to Sept. 18, 1952, water-stage recorder at site 800 ft (240 m) downstream at datum 1.0 ft (0.30 m) higher. Sept. 19, 1952, to June 28, 1982, recording gage at site 800 feet (240 m) downstream at present datum. June 29, 1982, to Sept. 20, 1983, nonrecording gage at present site and datum.

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

AVERAGE DISCHARGE.--33 years (water years 1951-81, 1983-84), 41.2 ft^3/s (1.167 m^3/s), 29,850 acre-ft/yr (36.8 hm^3/yr); median of yearly mean discharges, 40 ft^3/s (1.13 m^3/s), 29,000 acre-ft/yr (36 hm^3/yr).

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

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 513 ft^3/s (14.5 m^3/s) June 12, gage height, 9.10 ft (2.774 m); maximum gage height, 9.44 ft (2.877 m) Mar. 29 (backwater from ice); no flow Sept. 3, 4, 17-30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.39	12	6.9	2.3	1.0	1.0	350	49	7.1	9.3	.39	.01
2	.41	11	6.0	2.3	1.0	1.0	299	44	6.4	8.6	.39	.01
3	.38	10	5.6	2.2	1.0	.95	239	38	5.8	7.8	.36	.00
4	.36	8.6	5.7	2.2	.95	.90	197	35	5.1	7.3	.24	.00
5	.38	7.4	5.6	2.1	.95	.90	167	32	5.4	6.0	.32	.01
6	.64	6.7	5.6	2.1	.90	.85	150	32	5.6	5.1	.32	.02
7	.64	6.7	5.8	2.0	.90	.80	131	28	5.8	4.6	.22	.03
8	.47	6.0	5.4	2.0	.90	.75	111	26	9.3	4.4	.26	.02
9	.39	5.7	4.8	1.9	.85	.70	94	26	14	3.8	.43	.02
10	.43	5.1	4.6	1.9	.85	.70	79	29	68	4.3	.26	.03
11	.50	4.6	4.5	1.8	.85	.65	77	27	329	3.8	.18	.05
12	.55	4.8	4.5	1.8	.85	.65	92	25	492	3.5	.13	.05
13	.55	5.0	4.3	1.7	.90	.60	135	24	432	4.3	.13	.04
14	.50	4.8	4.0	1.7	.90	.60	165	23	309	4.5	.09	.03
15	.50	4.8	3.8	1.6	.95	.55	173	22	236	2.8	.07	.02
16	.53	5.1	3.6	1.6	1.0	.55	150	22	186	2.2	.08	.01
17	.47	5.0	3.5	1.5	1.1	.55	122	21	151	2.0	.04	.00
18	.53	5.0	3.4	1.5	1.1	.55	96	19	108	1.6	.03	.00
19	.45	5.1	3.3	1.5	1.2	.55	79	17	75	1.5	.03	.00
20	.39	6.0	3.2	1.4	1.2	.55	67	17	57	1.2	.03	.00
21	6.4	6.5	3.1	1.4	1.3	.57	55	17	42	1.1	.07	.00
22	9.7	6.9	3.0	1.4	1.3	.60	49	18	35	1.1	.05	.00
23	9.7	7.3	2.9	1.3	1.3	.65	46	17	27	.95	.04	.00
24	12	7.6	2.8	1.3	1.3	.70	41	15	23	.79	.04	.00
25	13	8.2	2.7	1.3	1.3	3.0	39	13	20	.69	.05	.00
26	12	8.8	2.6	1.2	1.2	20	35	12	17	.64	.09	.00
27	12	8.6	2.6	1.2	1.2	200	35	11	15	.53	.08	.00
28	11	8.4	2.5	1.2	1.1	350	34	10	13	.47	.06	.00
29	11	7.8	2.5	1.1	1.1	400	34	9.7	11	.23	.04	.00
30	9.9	7.4	2.4	1.1	---	400	42	8.8	9.5	.27	.02	.00
31	13	---	2.4	1.1	---	400	---	8.0	---	.38	.02	---
TOTAL	129.16	206.9	123.6	50.7	30.45	1789.87	3383	695.5	2720.0	95.75	4.56	.35
MEAN	4.17	6.90	3.99	1.64	1.05	57.7	113	22.4	90.7	3.09	.15	.012
MAX	13	12	6.9	2.3	1.3	400	350	49	492	9.3	.43	.05
MIN	.36	4.6	2.4	1.1	.85	.55	34	8.0	5.1	.23	.02	.00
CFSM	.02	.03	.02	.006	.004	.22	.43	.09	.34	.01	.001	.000
IN.	.02	.03	.02	.01	.00	.25	.47	.10	.38	.01	.00	.00
AC-FT	256	410	245	101	60	3550	6710	1380	5400	190	9.0	.7

CAL YR 1983 TOTAL 16348.96 MEAN 44.8 MAX 950 MIN .04 CFSM .17 IN 2.30 AC-FT 32430
WTR YR 1984 TOTAL 9229.84 MEAN 25.2 MAX 492 MIN .00 CFSM .10 IN 1.30 AC-FT 18310

RED RIVER OF THE NORTH

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 (2.4 km) northeast of Drayton, and at mile 206.7 (332.6 km).

DRAINAGE AREA.--34,800 mi^2 (90,130 km^2), approximately, includes 3,800 mi^2 (9,840 km^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 (230.124 m) National Geodetic Vertical Datum of 1929 (Minnesota Department of Transportation benchmark). Prior to Nov. 30, 1954, nonrecording gage at site 1.5 mi (2.4 km) upstream at datum 1.59 ft (0.485 m) higher.

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

AVERAGE DISCHARGE.--35 years (1949-84), 3,818 ft^3/s (108.1 m^3/s), 2,766,000 acre-ft/yr (3.41 km^3/yr); median of yearly mean discharges, 2,890 ft^3/s (81.8 m^3/s), 2,094,000 acre-ft/yr (2.6 km^3/yr).

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

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 32,400 ft^3/s (918 m^3/s) Apr. 6; maximum gage height, 35.33 ft (10.77 m) Apr. 7; minimum daily, 834 ft^3/s (23.6 m^3/s) Sept. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1860	2250	1320	1590	1550	2410	22500	5500	2450	5590	1850	1080
2	1780	2190	1430	1570	1540	2460	25100	5500	2370	5570	1830	1060
3	1700	2150	1580	1590	1540	2530	28300	5430	2310	5420	1820	1020
4	1640	2070	1730	1620	1520	2620	30200	5390	2260	5190	1780	999
5	1600	1990	1870	1620	1470	2690	32000	5220	2260	4990	1720	999
6	1590	1940	1950	1640	1470	2740	32400	5180	2240	4780	1650	1020
7	1610	1960	1970	1660	1480	2840	31900	5060	2370	4580	1620	1030
8	1630	2100	2020	1650	1480	2910	31600	5000	2420	4320	1610	1040
9	1660	2200	2040	1590	1480	3000	30500	4900	3360	4130	1630	1040
10	1690	2210	2040	1590	1460	3000	29400	4850	10000	3980	1630	1040
11	1730	2210	2040	1570	1440	2860	28300	4820	16500	3860	1610	1040
12	1860	2210	2040	1570	1420	2740	27000	4810	20500	3730	1580	1020
13	1990	2210	2020	1570	1410	2600	25600	4790	23100	3590	1560	985
14	2040	2210	1970	1570	1410	2490	23900	4700	24600	3420	1530	970
15	2050	2210	1920	1570	1440	2320	22200	4670	25500	3210	1480	950
16	2050	2210	1910	1570	1450	2270	20400	4490	25900	3020	1450	961
17	2080	2200	1910	1560	1460	2270	18600	4300	26000	2840	1410	953
18	2090	2170	1910	1560	1490	2270	16600	4160	24500	2680	1420	954
19	2220	2150	1870	1560	1490	2270	14500	4040	22100	2540	1450	943
20	2800	2150	1850	1560	1520	2240	12600	3900	19800	2450	1430	945
21	3210	2120	1810	1560	1560	2040	11000	3790	17300	2390	1360	962
22	3240	2110	1780	1570	1600	1950	9850	3620	14700	2350	1290	954
23	3090	2020	1740	1570	1640	1980	8690	3500	12400	2280	1210	930
24	2930	1680	1710	1600	1670	2100	7650	3370	10800	2230	1130	930
25	2800	1560	1660	1570	1680	2480	6920	3280	9280	2130	1090	928
26	2720	1380	1660	1540	1760	4020	6400	3160	7910	2070	1080	930
27	2640	1390	1660	1540	1950	7620	6100	3080	6870	2040	1090	930
28	2520	1420	1660	1570	2180	11800	5890	3000	6170	2030	1100	919
29	2460	1370	1640	1590	2320	14900	5650	2850	5880	1990	1100	892
30	2400	1300	1620	1570	---	17400	5520	2710	5610	1960	1100	834
31	2350	---	1620	1550	---	19900	---	2560	---	1900	1100	---
TOTAL	68030	59340	55950	49010	45880	137720	577270	131630	357460	103260	44710	29258
MEAN	2195	1978	1805	1581	1582	4443	19240	4246	11920	3331	1442	975
MAX	3240	2250	2040	1660	2320	19900	32400	5500	26000	5590	1850	1080
MIN	1590	1300	1320	1540	1410	1950	5520	2560	2240	1900	1080	834
CFSM	.06	.06	.05	.05	.05	.13	.55	.12	.34	.10	.04	.03
IN.	.07	.06	.06	.05	.05	.15	.62	.14	.38	.11	.05	.03
AC-FT	134900	117700	111000	97210	91000	273200	1145000	261100	709000	204800	88680	58030

CAL YR 1983 TOTAL 1531290 MEAN 4195 MAX 21300 MIN 1260 CFSM .12 IN 1.64 AC-FT 3037000
WTR YR 1984 TOTAL 1659518 MEAN 4534 MAX 32400 MIN 834 CFSM .13 IN 1.77 AC-FT 3292000

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

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	HARD-NESS (MG/L AS CACO3) (00900)	HARD-NESS NONCAR-BONATE (MG/L AS CACO3) (95902)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
OCT											
13...	1205	1660	671	8.3	1.5	8.0	290	69	65	30	34
NOV											
22...	1135	2260	700	--	-4.0	.5	--	--	--	--	--
JAN											
03...	1315	1600	605	--	2.0	.0	--	--	--	--	--
FEB											
03...	1220	1420	550	--	.0	.0	--	--	--	--	--
APR											
02...	1455	25500	362	--	11.5	1.0	--	--	--	--	--
05...	1340	32300	380	--	16.0	4.0	--	--	--	--	--
09...	1250	30500	412	--	11.0	6.0	--	--	--	--	--
16...	1540	20100	656	--	16.0	9.0	--	--	--	--	--
19...	1550	14200	740	8.2	--	9.5	290	103	67	30	39
25...	1120	6920	700	--	14.0	13.0	--	--	--	--	--
30...	1225	5550	775	--	8.0	7.5	--	--	--	--	--
JUN											
11...	1120	16500	430	--	16.0	17.5	--	--	--	--	--
13...	1210	23100	358	--	22.0	17.5	--	--	--	--	--
15...	1255	25500	400	--	19.5	17.5	--	--	--	--	--
18...	1105	24500	535	--	25.5	20.0	--	--	--	--	--
22...	1300	14600	710	--	28.0	22.0	--	--	--	--	--
27...	1200	6880	690	--	23.5	23.0	--	--	--	--	--
AUG											
14...	1245	1630	580	--	26.0	25.5	--	--	--	--	--

DATE	PERCENT SODIUM (00932)	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE, FET-LAB (MG/L AS HCO3) (95440)	CAR-BONATE, FET-LAB (MG/L AS CO3) (95445)	ALKA-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												
13...	20	.9	6.6	270	.000	220	2.1	82	42	.20	8.6	432
APR												
19...	22	1	8.0	230	.000	190	2.3	120	46	.20	13	458

DATE	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	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)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
OCT												
13...	400	.59	1940	5	80	10	4	30	20	.1	0	270
APR												
19...	440	.62	17600	3	60	20	0	40	20	.0	1	280

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 (457 m) downstream from Canadian National Railway bridge in Emerson, 0.8 mi (1.3 km) downstream from international boundary, 3.6 mi (5.8 km) downstream from Pembina River, and at mile 154.3 (248.3 km).

DRAINAGE AREA.--40,200 mi^2 (104,100 km^2), approximately, includes 3,800 mi^2 (9,840 km^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 (213.360 m) National Geodetic Vertical Datum of 1929, by Geodetic Survey of Canada. See WSP 1728 or 1913 for history of changes prior to Apr. 10, 1953.

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

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

AVERAGE DISCHARGE.--71 years (water years 1913-84), 3,326 ft^3/s (94.19 m^3/s), 2,400,000 acre-ft/yr (2.97 km^3/yr); median of yearly mean discharges, 2,760 ft^3/s (78.2 m^3/s), 1,910,000 acre-ft/yr (2.4 km^3/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 30,200 ft^3/s (855 m^3/s) Apr. 8; minimum daily, 862 ft^3/s (24.4 m^3/s) Sept. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2040	2300	1920	1470	1260	1970	13500	5620	2630	5830	2000	1100
2	1930	2250	1920	1470	1260	2110	15900	5580	2540	5830	1950	1080
3	1840	2200	1910	1470	1260	2190	19300	5580	2460	5690	1910	1040
4	1760	2170	1900	1460	1260	2240	23200	5540	2410	5440	1900	1000
5	1700	2110	1900	1460	1260	2300	27000	5400	2370	5090	1840	985
6	1660	2050	1890	1460	1260	2360	29100	5260	2380	4770	1820	975
7	1650	2010	1890	1460	1250	2430	29400	5120	2490	4450	1730	985
8	1660	2010	1880	1460	1250	2490	30200	4980	2610	4240	1700	996
9	1670	2090	1880	1450	1240	2550	30100	4870	3120	4030	1720	1020
10	1690	2170	1870	1450	1230	2600	30000	4770	5300	3880	1750	1030
11	1710	2200	1850	1440	1210	2610	29800	4700	10700	3710	1740	1030
12	1770	2210	1840	1430	1190	2560	29700	4660	14400	3600	1710	1020
13	1860	2210	1810	1420	1180	2490	29500	4590	17500	3520	1660	1010
14	1980	2210	1780	1400	1180	2410	29300	4560	20000	3400	1640	982
15	2050	2200	1750	1390	1170	2320	27000	4450	21400	3230	1590	957
16	2080	2200	1720	1380	1160	2200	24300	4340	22700	3100	1540	936
17	2100	2180	1710	1370	1150	2070	22300	4200	23600	2950	1500	929
18	2120	2180	1690	1370	1150	1950	20100	4100	23900	2810	1480	922
19	2120	2160	1690	1360	1170	1860	17900	3990	23600	2670	1490	925
20	2210	2160	1670	1350	1190	1800	15600	3880	22600	2560	1500	918
21	2510	2160	1650	1330	1210	1750	13300	3780	21000	2480	1480	918
22	2780	2150	1620	1320	1230	1720	11300	3640	19000	2420	1410	918
23	2860	2080	1600	1320	1270	1700	9680	3510	16800	2380	1350	918
24	2820	1650	1580	1310	1310	1710	8330	3390	14000	2320	1270	893
25	2740	1930	1560	1300	1360	1760	7380	3300	11500	2270	1180	883
26	2660	2110	1530	1300	1410	1960	6710	3230	9460	2200	1120	890
27	2580	2020	1500	1290	1480	2550	6430	3140	7950	2150	1090	890
28	2510	1980	1490	1280	1610	4180	6180	3050	6920	2120	1090	883
29	2460	1940	1480	1270	1790	6800	5900	2980	6250	2110	1090	879
30	2400	1930	1470	1270	---	9150	5690	2880	5930	2080	1100	862
31	2350	---	1470	1270	---	11000	---	2750	---	2050	1100	---
TOTAL	66270	63220	53420	42780	36950	89790	574100	131840	347520	105380	47450	28774
MEAN	2138	2107	1723	1380	1274	2896	19140	4253	11580	3399	1531	959
MAX	2860	2300	1920	1470	1790	11000	30200	5620	23900	5830	2000	1100
MIN	1650	1650	1470	1270	1150	1700	5690	2750	2370	2050	1090	862
IN.	.06	.06	.05	.04	.03	.08	.53	.12	.32	.10	.04	.03
AC-FT	131400	125400	106000	84850	73290	178100	1139000	261500	689300	209000	94120	57070

CAL YR 1983 TOTAL 1564540 MEAN 4286 MAX 24600 MIN 1180 AC-FT 3103000
WTR YR 1984 TOTAL 1587494 MEAN 4337 MAX 30200 MIN 862 AC-FT 3149000

05102500 RED RIVER AT EMERSON, MANITOBA--CONTINUED

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)
OCT 27...	1345	2590	683	8.4	10.0	7.5	22	11.4	99
JAN 10...	1225	E1600	605	--	-1 .9	.0	4.5	10.5	73
FEB 21...	1350	1500	480	7.6	4.0	.0	--	10.4	74
APR 10...	1410	30600	408	8.1	8.0	6.0	160	--	--
JUL 10...	1310	4040	648	8.2	30.5	24.0	120	6.8	85
AUG 14...	1530	E1630	585	8.6	27.0	25.5	58	6.2	79

DATE	HARD-NESS (MG/L AS CACO3) (00900)	HARD-NESS NONCAR-BONATE (MG/L AS CACO3) (95902)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	PERCENT SODIUM (00932)	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	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)
OCT 27...	310	94	70	32	30	17	.8	5.6	213	1.6	120	42
JAN 10...	260	21	59	28	26	17	.7	5.6	242	--	55	21
APR 10...	170	49	43	16	12	12	.4	7.9	124	1.9	57	11
JUL 10...	290	89	67	31	23	14	.6	6.9	206	2.5	110	18
AUG 14...	240	45	53	26	29	20	.8	5.4	195	.9	58	36

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)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS NH4) (71846)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS TOTAL (MG/L AS PO4) (71886)
OCT 27...	.20	9.6	461	440	.63	3220	.30	.03	1.5	.160	.49
JAN 10...	.20	8.1	370	350	.50	--	.26	.64	1.4	.200	.61
APR 10...	.20	13	251	240	.34	20700	2.2	.70	2.1	.420	1.3
JUL 10...	.20	15	414	400	.56	4520	.35	.05	2.0	.380	--
AUG 14...	.20	12	353	340	.48	--	.13	.09	1.2	.150	--

DATE	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P) (00671)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4) (00660)	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)
OCT 27...	.110	.120	.37	20	2	59	<1	<1	<3	2	12
JAN 10...	.170	.190	.58	--	--	--	--	--	--	--	--
APR 10...	.420	.100	.31	--	--	--	--	--	--	--	--
JUL 10...	.120	.120	.37	--	--	--	--	--	--	--	--
AUG 14...	.060	.060	.18	10	3	62	<1	<1	<3	6	<3

RED RIVER OF THE NORTH BASIN

05102500 RED RIVER AT EMERSON, MANITOBA--CONTINUED

WATER QUALITY DTA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

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)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
OCT											
27...	4	34	2	<.1	<10	7	<1	<1	240	<6	8

...	<1	19	8	<.1	<10	2	<1	<1	140	<6	36
AUG											
14...	4	32	2	<.1	<10	7	<1	<1	200	<6	12

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)
OCT				
27...	1345	2590	70	490
JAN				
10...	1225	E1600	8	--
APR				
10...	1410	30600	246	20300
JUL				
10...	1310	4040	288	3140

DATE	TIME	SAMPLE LOC-ATION, CROSS SECTION (FT FM L BANK) (00009)	DEPTH TO TOP OF SAMPLE INTER-VAL (FT) (72015)	TEMPER-ATURE (DEG C) (00010)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	PH (STAND-ARD UNITS) (00400)	OXYGEN, DIS-SOLVED (MG/L) (00300)
FEB							
21...	1350	20.0	1.6	.0	480	7.6	10.4
21...	1351	20.0	3.2	.0	496	7.6	10.4
21...	1352	30.0	1.6	.0	492	7.6	10.9
21...	1353	30.0	3.2	.0	494	7.7	10.7
21...	1354	40.0	1.6	.0	497	7.7	11.6
21...	1355	40.0	3.2	.0	499	7.7	11.7
21...	1356	50.0	1.6	.0	499	7.7	12.4
21...	1357	50.0	3.2	.0	499	7.7	12.4
21...	1358	50.0	6.4	.0	499	7.7	12.2
21...	1359	60.0	1.6	.0	500	7.8	12.4
21...	1400	60.0	3.2	.0	501	7.7	12.0
21...	1401	60.0	6.4	.0	500	7.7	12.1
21...	1402	70.0	1.6	.0	501	7.8	12.4
21...	1403	70.0	3.2	.0	501	7.8	12.1
21...	1404	70.0	6.4	.0	501	7.8	12.1
21...	1405	80.0	1.6	.0	502	7.9	12.6
21...	1406	80.0	3.2	.0	502	7.8	12.5
21...	1407	80.0	6.4	.0	502	7.8	12.5
21...	1408	90.0	1.6	.0	502	7.9	12.8
21...	1409	90.0	3.2	.0	502	7.9	12.6
21...	1410	90.0	6.4	.0	502	7.8	12.6
21...	1411	90.0	9.6	.0	502	7.9	12.6
21...	1412	100	1.6	.0	502	7.9	12.9
21...	1413	100	3.2	.0	502	7.9	13.0
21...	1414	100	6.4	.0	502	7.9	13.0
21...	1415	100	9.6	.0	502	7.9	13.1
21...	1416	110	1.6	.0	503	8.0	13.8
21...	1417	110	3.2	.0	503	7.9	13.6
21...	1418	110	6.4	.0	503	7.9	13.6
21...	1419	110	9.6	.0	503	7.9	13.6
21...	1420	120	1.6	.0	504	7.9	12.7
21...	1421	120	3.2	.0	504	7.9	12.6
21...	1422	120	6.4	.0	504	7.9	12.6
21...	1423	120	9.6	.0	504	7.9	12.4
21...	1424	130	1.6	.0	504	7.9	12.9
21...	1425	130	3.2	.0	504	7.9	12.8
21...	1426	130	6.4	.0	504	7.9	12.9
21...	1427	140	1.6	.0	504	7.9	12.9
21...	1428	140	3.2	.0	504	7.9	12.8

RED RIVER OF THE NORTH BASIN

05102500 RED RIVER AT EMERSON, MANITOBA--CONTINUED

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

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 (UMHOS) (00095)	PH (STANDARD UNITS) (00400)	OXYGEN, DISSOLVED (MG/L) (00300)
FEB							
21...	1429	140	6.4	.0	504	7.9	12.7
21...	1430	150	1.6	.0	505	7.9	13.5
21...	1431	150	3.2	.0	505	8.0	13.4
21...	1432	150	6.4	.0	505	8.0	13.4
21...	1433	160	1.6	.0	505	8.0	12.8
21...	1434	160	3.2	.0	505	8.0	12.7
21...	1435	160	6.4	.0	505	8.0	12.7
21...	1436	170	1.6	.0	505	8.0	12.8
21...	1437	170	3.2	.0	505	8.0	12.7
21...	1438	170	6.4	.0	505	8.0	12.6
21...	1439	180	1.6	.0	505	8.0	13.0
21...	1440	180	3.2	.0	505	8.0	13.0
21...	1441	180	6.4	.0	505	8.0	13.1
21...	1442	190	1.6	.0	506	8.0	12.9
21...	1443	190	3.2	.0	506	8.0	12.7
21...	1444	190	6.4	.0	506	8.0	12.7
21...	1445	200	1.6	.0	506	8.0	12.8
21...	1446	200	3.2	.0	506	8.0	12.8
MAY							
15...	1130	15.0	1.6	9.3	720	8.4	--
15...	1131	15.0	3.3	9.2	696	8.5	--
15...	1132	30.0	1.6	8.9	685	8.5	--
15...	1133	30.0	3.3	8.9	700	8.5	--
15...	1134	30.0	6.6	8.8	713	8.5	--
15...	1135	45.0	1.6	8.8	655	8.4	--
15...	1136	45.0	3.3	8.8	615	8.5	--
15...	1137	45.0	6.6	8.9	590	8.6	--
15...	1138	60.0	1.6	8.7	620	8.6	--
15...	1140	60.0	3.3	8.7	600	8.6	--
15...	1141	60.0	6.6	8.6	600	8.7	--
15...	1142	75.0	1.6	8.6	600	8.7	--
15...	1143	75.0	3.3	8.4	570	8.8	--
15...	1144	95.0	1.6	8.9	610	8.7	--
15...	1145	95.0	3.3	9.1	600	8.7	--
15...	1146	95.0	6.6	8.5	565	8.8	--
15...	1147	110	1.6	7.7	630	8.6	--
15...	1148	110	3.3	7.7	610	8.7	--
15...	1150	110	6.6	7.8	600	8.7	--
15...	1151	110	9.9	7.9	580	8.7	--
15...	1152	125	1.6	8.1	620	8.6	--
15...	1153	125	3.3	8.3	615	8.6	--
15...	1154	125	6.6	8.6	600	8.7	--
15...	1155	125	9.9	8.4	560	8.7	--
15...	1156	140	1.6	8.5	645	8.5	--
15...	1157	140	3.3	8.5	640	8.5	--
15...	1158	140	6.6	8.7	635	8.5	--
15...	1200	140	9.9	8.7	615	8.5	--
15...	1202	140	13	9.0	590	8.3	--
15...	1204	155	1.6	8.5	630	8.3	--
15...	1206	155	3.3	8.5	615	8.4	--
15...	1208	155	6.6	8.7	600	8.4	--
15...	1210	155	9.9	7.0	540	8.6	--
15...	1212	180	1.6	9.0	300	8.3	--
15...	1214	180	3.3	8.6	300	8.4	--
15...	1216	180	6.6	8.5	295	8.5	--
15...	1218	180	9.9	7.9	450	8.4	--
15...	1220	180	13	7.0	300	8.4	--
15...	1222	195	1.6	8.6	350	8.6	--
15...	1224	195	3.3	8.0	350	8.5	--
15...	1226	195	6.6	8.4	190	8.5	--
15...	1228	195	9.9	8.6	160	8.4	--
15...	1230	195	13	8.5	150	8.3	--
15...	1232	210	1.6	8.5	190	8.5	--
15...	1234	210	3.3	8.8	180	8.4	--
15...	1236	210	6.6	7.6	180	8.5	--
15...	1238	210	9.9	9.5	160	8.4	--
15...	1240	225	1.6	9.1	630	8.6	--
15...	1242	225	3.3	7.8	620	8.6	--
15...	1244	225	6.6	7.3	600	8.6	--
15...	1246	240	1.6	7.3	150	8.4	--
15...	1248	240	3.3	7.3	150	8.4	--
15...	1250	240	6.6	7.0	130	8.4	--
15...	1252	260	1.6	8.6	140	8.3	--
15...	1254	260	3.3	7.9	140	8.2	--

RED RIVER OF THE NORTH BASIN

05102500 RED RIVER AT EMERSON, MANITOBA--CONTINUED

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

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 (UMHOS) (00095)	PH (STANDARD UNITS) (00400)	OXYGEN, DISSOLVED (MG/L) (00300)
JUL							
10...	1400	15.0	3.3	24.0	633	8.2	6.8
10...	1401	35.0	3.3	23.7	642	8.2	7.0
10...	1402	35.0	3.3	23.7	642	8.2	7.0
10...	1403	50.0	6.6	23.8	645	8.2	7.0
10...	1404	50.0	3.3	23.8	644	8.2	7.0
10...	1405	65.0	6.6	23.8	648	8.2	6.8
10...	1406	50.0	6.6	23.8	645	8.2	7.0
10...	1407	95.0	3.3	23.7	648	8.2	6.8
10...	1408	65.0	3.3	23.5	648	8.2	6.9
10...	1409	110	6.6	23.8	648	8.2	6.8
10...	1410	65.0	6.6	23.8	648	8.2	6.8
10...	1411	118	6.6	23.8	648	8.2	6.7
10...	1412	78.0	3.3	23.8	648	8.2	6.9
10...	1413	128	3.3	23.7	649	8.2	6.9
10...	1414	95.0	3.3	23.7	648	8.2	6.8
10...	1415	128	9.9	23.8	648	8.2	6.7
10...	1416	110	3.3	23.8	648	8.2	6.9
10...	1417	152	6.6	23.8	648	8.2	6.8
10...	1418	110	6.6	23.8	648	8.2	6.8
10...	1419	160	3.3	23.8	649	8.2	6.9
10...	1420	118	3.3	23.8	649	8.2	6.8
10...	1421	160	9.9	23.8	648	8.2	6.5
10...	1422	118	6.6	23.8	648	8.2	6.7
10...	1423	167	6.6	23.8	649	8.2	6.8
10...	1424	118	9.9	23.8	648	8.2	6.6
10...	1425	175	3.3	23.8	649	8.2	6.8
10...	1426	128	3.3	23.7	649	8.2	6.9
10...	1427	175	9.9	23.8	649	8.2	6.9
10...	1428	128	6.6	23.8	648	8.2	6.8
10...	1429	185	3.3	23.8	649	8.2	6.9
10...	1430	128	9.9	23.8	648	8.2	6.7
10...	1431	185	9.9	23.8	649	8.2	6.8
10...	1432	185	13	23.8	648	8.2	6.8
10...	1433	191	3.3	23.8	649	8.2	6.9
10...	1434	191	6.6	23.8	648	8.2	6.9
10...	1435	191	9.9	23.8	648	8.2	6.9
10...	1436	199	3.3	23.9	648	8.2	6.9
10...	1437	199	6.6	23.9	648	8.2	6.9
10...	1438	199	9.9	23.8	648	8.2	6.8
10...	1439	206	3.3	23.9	648	8.1	6.9
10...	1440	206	6.6	23.9	648	8.1	6.8
10...	1441	206	9.9	23.8	648	8.1	6.7
10...	1442	217	3.3	23.9	648	8.2	6.8
10...	1443	217	6.6	23.9	648	8.1	6.7
10...	1444	217	9.9	23.9	648	8.2	6.7
10...	1445	228	3.3	23.8	649	8.2	7.1
10...	1446	228	6.6	23.9	648	8.1	7.2
10...	1447	242	3.3	23.9	647	8.1	7.0
10...	1448	262	3.3	23.9	648	8.2	7.0

RED RIVER OF THE NORTH BASIN

05104500 ROSEAU RIVER BELOW SOUTH FORK NEAR MALUNG, MN

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

DRAINAGE AREA.--573 mi^2 (1,484 km^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 (313.843 m), adjustment of 1912.

REMARKS.--Records good except those for the winter period, which are fair. Some flow bypasses the gaging station through a natural overflow channel 0.8 mi (1.3 km) upstream and returns to river 0.5 mi (0.8 km) downstream. Overflow begins at stage of about 13.0 ft (4.0 m), discharge, 1,800 ft^3/s (51.0 m^3/s). These records include any flow in the overflow channel.

AVERAGE DISCHARGE.--38 years, 142 ft^3/s (4.021 m^3/s), 102,900 acre-ft/yr (127 hm^3/yr); median of yearly mean discharges, 114 ft^3/s (3.23 m^3/s), 82,600 acre-ft/yr (102 hm^3/yr).

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, about 1,250 ft^3/s (35.4 m^3/s) Mar. 27, gage height, 12.88 ft (3.926 m) from highwater mark (backwater from ice); minimum, 0.05 ft^3/s (0.001 m^3/s) Sept. 23, 24, gage height, 3.81 ft (1.161 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	69	51	13	5.5	8.2	465	261	33	234	11	.24
2	26	65	46	13	5.3	7.4	414	241	29	193	9.3	.25
3	26	61	42	13	5.5	7.7	388	216	28	153	7.8	.25
4	34	59	42	13	5.5	7.7	324	192	24	124	7.1	.22
5	51	57	40	13	5.3	7.7	288	173	24	103	6.7	.19
6	57	101	38	13	5.1	6.7	245	154	26	87	6.1	.18
7	66	84	36	12	5.1	6.1	226	144	42	74	7.0	.20
8	81	54	32	11	5.1	5.7	216	149	112	66	6.8	.22
9	83	35	29	9.5	5.1	5.1	204	184	362	67	7.1	.24
10	86	30	29	8.7	5.5	4.8	198	198	668	78	7.0	.21
11	85	29	28	8.2	5.3	4.3	192	192	824	73	6.5	.18
12	82	46	26	7.7	5.5	4.3	207	181	928	59	6.5	.16
13	79	63	26	7.2	5.5	4.6	251	167	912	55	6.1	.13
14	76	99	26	6.9	5.5	4.8	296	156	776	67	6.2	.12
15	74	101	24	6.9	6.1	4.6	288	141	630	67	6.3	.11
16	90	97	22	6.5	6.7	4.3	261	132	506	59	4.8	.10
17	108	92	21	6.3	7.2	4.2	235	123	410	54	4.0	.10
18	116	85	20	6.0	7.4	4.2	213	108	350	48	3.0	.10
19	121	80	19	5.5	7.7	4.2	190	99	310	40	2.0	.10
20	114	80	18	5.0	7.7	4.6	175	92	264	34	1.4	.09
21	108	78	18	4.6	8.2	5.4	159	90	213	29	1.2	.08
22	101	57	17	4.8	8.7	7.7	146	86	175	25	1.0	.08
23	97	82	17	4.9	9.0	20	134	85	141	20	.90	.06
24	93	64	16	4.4	8.7	100	123	85	119	17	.70	.06
25	88	60	16	4.9	8.2	450	116	80	102	15	.60	.08
26	85	84	15	4.9	7.9	1000	110	76	93	14	.50	.08
27	84	74	15	5.1	8.2	1200	114	68	99	13	.45	.08
28	79	64	14	5.3	9.5	1100	141	61	175	13	.40	.08
29	74	59	14	5.3	8.7	900	204	58	276	12	.34	.09
30	72	54	13	5.3	---	700	261	50	275	12	.32	.10
31	69	---	13	5.3	---	550	---	42	---	12	.27	---
TOTAL	2425	2063	783	240.2	194.7	6144.3	6784	4084	8926	1917	129.38	4.18
MEAN	78.2	68.8	25.3	7.75	6.71	198	226	132	298	61.8	4.17	.14
MAX	121	101	51	13	9.5	1200	465	261	928	234	11	.25
MIN	20	29	13	4.4	5.1	4.2	110	42	24	12	.27	.06
CFSM	.14	.12	.04	.01	.01	.35	.39	.23	.52	.11	.007	.000
IN.	.16	.13	.05	.02	.01	.40	.44	.27	.58	.12	.01	.00
AC-FT	4810	4090	1550	476	386	12190	13460	8100	17700	3800	257	8.3

CAL YR 1983	TOTAL	42067.10	MEAN	115	MAX	880	MIN 3.0	CFSM .20	IN 2.73	AC-FT	83440
WTR YR 1984	TOTAL	33694.76	MEAN	92.1	MAX	1200	MIN .06	CFSM .16	IN 2.19	AC-FT	66830

RED RIVER OF THE NORTH BASIN

05106500 ROSEAU RIVER AT ROSEAU LAKE, MN

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

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

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

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

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

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,030.68 ft (314.151 m) Mar. 28; minimum observed, 1,020.98 ft (311.195 m) Aug. 30.

GAGE HEIGHT (FEET ABOVE DATUM), WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21.76	---				---	30.25	25.09	22.15	25.49	---	---
2	21.79	---				---	30.06	25.05	22.09	25.19	---	---
3	21.89	---				---	29.78	24.84	22.01	24.83	---	---
4	---	---				---	29.46	24.57	21.89	24.31	---	---
5	---	---				---	29.15	24.24	21.82	23.75	---	---
6	---	---				---	28.83	24.01	21.82	23.26	---	---
7	---	---				---	28.50	23.98	22.10	22.94	---	---
8	---	---				---	28.06	23.98	22.97	22.67	---	---
9	---	---				---	27.64	24.00	25.81	23.12	---	---
10	---	---				---	27.23	24.12	28.09	23.71	---	---
11	---	---				---	26.86	24.20	28.65	23.62	---	---
12	---	---				---	26.80	24.12	28.86	23.27	---	21.67
13	---	---				---	26.87	23.95	28.96	23.44	---	21.70
14	---	---				---	26.84	24.01	28.87	24.21	---	21.72
15	---	---				---	26.69	23.61	28.70	24.51	---	21.76
16	---	---				---	26.44	23.41	28.58	24.23	---	21.80
17	---	---				---	26.21	23.30	28.50	23.75	---	21.84
18	---	---				---	25.93	23.20	28.44	23.35	---	21.86
19	---	---				---	25.64	23.06	28.30	22.95	---	21.87
20	---	---				21.75	25.40	22.86	28.06	22.57	---	21.91
21	---	---				---	25.12	22.79	27.75	22.27	---	21.98
22	---	---				---	24.81	22.79	27.37	22.08	---	21.98
23	---	---				---	24.46	22.78	26.96	21.98	---	21.98
24	---	---				---	24.09	22.73	26.49	21.93	---	22.00
25	---	---				25.57	23.79	22.68	26.02	21.91	---	22.02
26	---	---				29.32	23.63	22.59	25.59	21.85	---	22.04
27	---	---				30.39	23.64	22.61	25.51	21.80	---	22.05
28	---	---				30.61	23.97	22.45	25.51	21.74	---	22.07
29	---	22.98				30.64	24.41	22.33	25.66	21.72	---	22.08
30	---	---				30.44	24.84	22.28	25.74	21.71	20.99	22.10
31	---	---				30.39	---	22.19	---	---	---	---
MEAN	---	---				---	26.51	23.48	25.98	---	---	---
MAX	---	---				---	30.25	25.09	28.96	---	---	---
MIN	---	---				---	23.63	22.19	21.82	---	---	---

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

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 (91 m) downstream from highway bridge, 0.2 mi (0.3 km) north of Ross, and 2.3 mi (3.7 km) downstream from Pine Creek.

DRAINAGE AREA.--1,220 mi^2 (3,160 km^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 (310.42 m), adjustment of 1928 (levels by Geodetic Survey of Canada). Prior to Mar. 13, 1929, nonrecording gage at same site and datum.

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

AVERAGE DISCHARGE.--56 years, 261 ft^3/s (7.392 m^3/s), 189,100 acre-ft/yr (233 hm^3/yr); median of yearly mean discharges, 231 ft^3/s (6.54 m^3/s), 167,000 acre-ft/yr (206 hm^3/yr).

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

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,260 ft^3/s (35.7 m^3/s) Apr. 2, gage height, 10.36 ft (3.158 m); maximum gage height, 10.61 ft (3.234 m) Mar. 30, (backwater from ice); minimum discharge, 0.28 ft^3/s (0.008 m^3/s) Sept. 12, gage height, 0.80 ft (0.244 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	32	89	89	16	7.6	14	1200	385	66	476	42	1.1
2	34	81	82	15	7.8	14	1220	382	61	435	41	.88
3	39	78	75	15	8.0	13	1240	356	57	388	40	.68
4	44	74	69	15	8.2	13	1190	321	52	321	42	.66
5	53	71	63	14	8.4	13	1130	285	48	253	40	.52
6	66	68	58	14	8.4	12	1060	258	48	199	34	.45
7	77	85	54	14	8.6	12	988	248	61	166	28	.36
8	85	89	50	14	8.8	11	908	248	126	142	27	.35
9	97	74	47	14	9.0	11	824	253	485	174	31	.35
10	105	57	44	13	9.2	11	746	265	855	236	30	.35
11	109	47	40	12	9.4	10	683	272	963	234	29	.35
12	113	41	38	12	9.8	10	670	263	998	200	26	.32
13	111	48	36	11	10	9.0	674	244	1020	209	24	.36
14	108	64	34	11	10	9.0	661	230	1020	293	25	.44
15	104	86	32	10	11	8.8	634	210	1000	336	25	.60
16	108	97	30	9.6	11	8.8	594	193	994	309	25	.53
17	129	99	29	9.0	11	8.8	555	179	985	255	24	.49
18	150	97	28	9.0	12	8.8	512	167	971	208	20	.56
19	152	93	27	9.0	12	9.0	470	156	949	170	18	.69
20	155	93	26	8.8	13	9.4	436	143	909	135	19	.59
21	153	92	25	8.6	13	9.8	396	133	855	107	17	.52
22	145	95	23	8.4	14	11	359	132	789	87	12	1.1
23	137	108	22	8.2	14	13	314	129	713	74	9.2	1.8
24	130	126	21	8.0	14	35	267	125	637	61	7.2	1.8
25	126	128	20	7.8	15	60	229	121	563	55	11	1.8
26	123	116	19	7.6	15	200	210	114	496	50	8.8	1.9
27	121	114	18	7.4	15	300	211	115	480	48	6.0	2.1
28	113	110	18	7.2	14	500	243	103	478	45	4.3	2.2
29	105	100	17	7.2	14	700	296	93	494	43	3.8	2.1
30	98	96	17	7.2	---	850	349	84	508	40	2.2	2.1
31	94	---	16	7.4	---	1000	---	76	---	40	1.5	---
TOTAL	3216	2616	1167	330.4	321.2	3894.4	19269	6283	17681	5789	673.0	28.05
MEAN	104	87.2	37.6	10.7	11.1	126	642	203	589	187	21.7	.94
MAX	155	128	89	16	15	1000	1240	385	1020	476	42	2.2
MIN	32	41	16	7.2	7.6	8.8	210	76	48	40	1.5	.32
CFSM	.09	.07	.03	.009	.009	.10	.53	.17	.48	.15	.02	.001
IN.	.10	.08	.04	.01	.01	.12	.59	.19	.54	.18	.02	.00
AC-FT	6380	5190	2310	655	637	7720	38220	12460	35070	11480	1330	56

CAL YR 1983 TOTAL 90282.50 MEAN 247 MAX 1300 MIN 6.9 CFSM .20 IN 2.75 AC-FT 179100
WTR YR 1984 TOTAL 61268.05 MEAN 167 MAX 1240 MIN .32 CFSM .14 IN 1.87 AC-FT 121500

RED RIVER OF THE NORTH BASIN

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

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

DRAINAGE AREA.--1,570 mi^2 (4,070 km^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 (305.452 m), adjustment of 1928, (levels by Geodetic Survey of Canada). Prior to Apr. 1, 1929, nonrecording gage at site at Caribou 0.6 mi (1.0 km) upstream at datum 0.95 ft (0.290 m) lower.

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

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

AVERAGE DISCHARGE.--27 years (water years 1921-30, 1933, 1937, 1941-43, 1973-84), 280 ft^3/s (7.930 m^3/s), 202,900 acre-ft/yr (250 hm^3/yr).

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

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

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,230 ft^3/s (34.8 m^3/s) Apr. 3, gage height, 9.28 ft (2.829 m) (backwater from ice); minimum discharge, 0.31 ft^3/s (0.009 m^3/s) Sept. 30; minimum gage height, 1.22 ft (0.372 m) part of each day Sept. 23-30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	PEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	42	104	130	21	11	23	1000	399	83	582	53	6.5
2	42	108	120	20	12	22	1100	435	68	569	51	6.0
3	42	99	110	20	12	22	1200	442	58	536	50	5.4
4	43	89	100	19	12	22	1180	428	52	484	48	4.9
5	48	83	90	19	12	21	1170	396	49	416	46	4.3
6	50	80	85	18	13	21	1160	363	48	337	53	3.3
7	64	73	80	18	13	20	1150	334	52	265	46	2.8
8	79	83	75	18	13	20	1150	318	93	219	42	2.3
9	88	99	70	17	13	19	1140	313	340	227	40	2.4
10	102	84	65	17	13	19	1120	311	606	252	36	2.1
11	113	66	60	17	13	18	1100	319	805	299	38	1.9
12	118	60	55	16	14	18	1090	332	888	301	36	1.7
13	120	55	50	15	14	17	1040	330	924	283	34	1.6
14	118	60	47	15	14	17	990	309	938	321	33	1.4
15	115	70	44	14	15	16	948	292	951	401	31	1.1
16	113	90	42	13	15	16	892	270	968	433	29	.96
17	113	110	40	13	15	15	827	245	980	418	27	.95
18	129	120	38	12	15	15	760	227	983	365	25	.96
19	156	120	36	11	16	15	695	221	979	308	22	.85
20	164	120	35	11	16	14	633	204	975	252	22	.73
21	167	115	33	11	16	14	579	188	967	204	21	.64
22	164	110	32	10	17	14	527	174	957	167	18	.56
23	156	120	30	10	18	14	478	168	933	134	17	.40
24	150	140	29	9.5	19	15	425	161	899	110	15	.36
25	140	160	28	10	20	20	371	158	850	91	14	.38
26	132	170	26	10	21	35	326	148	800	78	12	.35
27	132	170	25	10	23	100	303	140	742	68	11	.37
28	131	165	24	10	24	250	290	137	675	63	10	.37
29	123	160	23	11	24	500	317	125	622	59	9.1	.36
30	113	146	22	11	---	700	354	108	593	58	8.6	.35
31	107	---	21	11	---	850	---	95	---	57	7.6	---
TOTAL	3374	3229	1665	437.5	453	2882	24315	8090	18878	8357	905.3	56.29
MEAN	109	108	53.7	14.1	15.6	93.0	811	261	629	270	29.2	1.88
MAX	167	170	130	21	24	850	1200	442	983	582	53	6.5
MIN	42	55	21	9.5	11	14	290	95	48	57	7.6	.35
CFSM	.07	.07	.03	.009	.01	.06	.52	.17	.40	.17	.02	.001
IN.	.08	.08	.04	.01	.01	.07	.58	.19	.45	.20	.02	.00
AC-FT	6690	6400	3300	868	899	5720	48230	16050	37440	16580	1800	112

CAL YR 1983 TOTAL 116318.70 MEAN 319 MAX 1390 MIN 7.8 CFSM .20 IN 2.76 AC-FT 230700
WTR YR 1984 TOTAL 72642.09 MEAN 198 MAX 1200 MIN .35 CFSM .13 IN 1.72 AC-FT 144100

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

WATER-QUALITY RECORDS

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

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT , 1983											
04...	1130	43	355	382	8.2	7.8	9.0	9.5	7.6	731	7.8
JAN , 1984											
17...	1415	13	680	646	7.7	7.1	-26.0	.0	12	796	--
MAY											
15...	0945	293	380	371	7.0	8.0	10.0	13.0	4.0	740	9.0
AUG											
28...	1045	10	400	390	8.6	8.7	24.0	21.5	34	721	7.6

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)
OCT , 1983											
04...	71	--	--	46	20	7.6	2.8	190	10	1.8	.20
JAN , 1984											
17...	--	K13	20	83	33	11	2.5	341	20	5.0	.20
MAY											
15...	88	K2	74	50	17	4.4	1.7	180	18	2.3	.10
AUG											
28	91	30	220	48	23	7.2	1.4	207	9.3	2.6	.20

RED RIVER OF THE NORTH BASIN

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

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)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT , 1983											
04...	5.6	388	<.10	.010	.70	.040	.030	.010	17	2.0	94
JAN , 1984											
17...	21	423	.12	.250	1.1	.110	.050	.050	5	.17	94
MAY											
15...	2.7	255	<.10	.220	4.1	.050	.010	<.010	17	13	98
AUG											
28...	7.4	300	<.10	<.080	1.3	.060	.060	.020	25	.68	94

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)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)
OCT , 1983											
04...	1130	10	3	44	<.5	<1	<1	<3	5	30	1
JAN , 1984											
17...	1415	<10	2	74	<.5	<1	3	<3	2	140	1
MAY											
15...	0945	10	<1	45	<1.0	<1	30	<3	2	32	3
AUG											
28...	1045	30	4	52	<.5	<1	1	<3	3	15	2

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
OCT , 1983										
04...	5	6	<.1	<10	2	<1	<1	110	<6	39
JAN , 1984										
17...	14	250	<.1	<10	1	<1	<1	180	<6	6
MAY										
15...	9	8	<.1	<10	4	<1	<1	93	<6	18
AUG										
28...	13	31	1.0	<10	2	<1	<1	120	<6	4

LAKE OF THE WOODS BASIN

05124480 KAWISHIWI RIVER NEAR ELY, MN

(Hydrologic bench-mark station)

LOCATION.--Lat 47°55'22", long 91°32'06", in SE¼SE¼ sec.24, T.63 N., R.10 W., Lake County, Hydrologic Unit 09030001, in Superior National Forest, on left bank upstream from rapids, 2 mi (3 km) upstream from South Kawishiwi River, 2.2 mi (3.5 km) southwest of Fernberg Lookout Tower and 14 mi (23 km) east of Ely.

DRAINAGE AREA.--253 mi^2 (655 km^2).

WATER-DISCHARGE RECORDS

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

GAGE.--Water-stage recorder. Altitude of gage is 1,450 ft (442 m), from topographic map.

REMARKS.--Records good except those for period of no gage-height record Oct.27 to Feb. 14, which are poor.

AVERAGE DISCHARGE.--18 years, 221 ft^3/s (6.259 m^3/s), 11.86 in/yr (301 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,720 ft^3/s (48.7 m^3/s) Apr. 24, 1976, gage height, 5.92 ft (1.804 m); minimum 4.5 ft^3/s (0.13 m^3/s) Jan. 30 to Feb. 2, 1977, gage height, 2.14 ft (0.652 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 960 ft^3/s (27.2 m^3/s) May 12, gage height, 5.24 ft (1.597 m); minimum, 22 ft^3/s (0.62 m^3/s) Sept. 30, gage height, 2.60 ft (0.792 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	192	470	350	220	115	80	58	643	450	349	103	39
2	197	450	350	215	110	79	58	656	450	336	100	37
3	213	440	350	210	110	78	59	670	428	331	96	35
4	225	430	350	210	110	77	62	682	402	308	91	37
5	244	410	350	205	105	76	63	693	390	291	91	40
6	258	400	350	200	105	75	67	701	378	275	91	37
7	279	390	345	195	105	74	72	723	375	258	88	36
8	304	370	340	190	100	73	73	808	394	247	90	34
9	308	360	335	185	100	72	76	837	402	236	86	34
10	322	350	330	180	100	71	81	877	402	229	84	34
11	344	340	325	175	98	70	88	925	402	216	79	33
12	354	330	320	170	97	69	99	938	421	206	77	32
13	359	320	315	170	96	68	116	946	440	216	74	31
14	383	310	310	165	95	68	132	945	443	213	72	30
15	407	300	305	160	94	68	150	928	443	197	70	29
16	459	290	300	160	92	67	170	907	443	186	68	28
17	480	280	295	155	91	66	190	891	443	182	67	27
18	502	275	290	150	90	65	210	858	442	176	64	25
19	513	270	285	150	88	65	230	830	434	169	62	25
20	519	280	280	145	88	64	250	822	429	163	58	24
21	520	290	275	145	86	64	280	795	422	156	63	24
22	520	300	270	140	86	63	310	768	430	150	62	22
23	525	310	265	140	86	60	340	716	428	144	59	22
24	530	320	260	135	85	59	380	695	417	137	57	23
25	536	330	255	135	84	59	420	660	402	130	53	24
26	536	340	250	130	83	59	459	621	397	127	52	24
27	525	350	245	130	82	59	536	587	407	122	51	23
28	520	350	240	125	81	59	549	552	392	116	48	23
29	510	350	235	120	80	58	569	536	378	113	46	22
30	500	350	230	120	---	58	607	498	363	108	43	22
31	480	---	225	115	---	57	---	472	---	107	41	---
TOTAL	12564	10355	9225	5045	2742	2080	6754	23180	12447	6194	2186	876
MEAN	405	345	298	163	94.6	67.1	225	748	415	200	70.5	29.2
MAX	536	470	350	220	115	80	607	946	450	349	103	40
MIN	192	270	225	115	80	57	58	472	363	107	41	22
CFSM	1.60	1.36	1.18	.64	.37	.27	.89	2.96	1.64	.79	.28	.12
IN.	1.85	1.52	1.36	.74	.40	.31	.99	3.41	1.83	.91	.32	.13
AC-FT	24920	20540	18300	10010	5440	4130	13400	45980	24690	12290	4340	1740

CAL YR 1983 TOTAL 87318 MEAN 239 MAX 614 MIN 69 CFSM .95 IN 12.84 AC-FT 173200
WTR YR 1984 TOTAL 93648 MEAN 256 MAX 946 MIN 22 CFSM 1.01 IN 13.77 AC-FT 185800

LAKE OF THE WOODS BASIN

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

WATER-QUALITY DATA

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

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT , 1983											
25...	1310	536	30	29	7.1	6.9	4.0	7.0	4.2	727	11.9
FEB , 1984											
15...	1130	94	30	30	6.6	6.9	3.0	.5	1.4	723	12.5
JUN											
13...	1200	438	26	27	6.7	6.4	16.5	17.0	1.0	736	8.8
AUG											
07...	1215	88	34	30	7.1	6.7	28.0	25.0	.50	719	7.1

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)
OCT , 1983											
25...	103	3	82	3.1	1.5	1.1	.20	11	2.9	.80	.20
FEB , 1984											
15...	91	K2	38	3.1	1.5	1.1	.30	11	3.1	1.2	<.10
JUN											
13...	94	5	110	2.8	1.3	.90	.30	9.0	2.8	.80	<.10
AUG											
07...	91	1	K1500	3.0	1.3	1.0	.30	10	3.3	.80	<.10

LAKE OF THE WOODS BASIN

05124480 KAWISHIWI RIVER NEAR ELY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

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)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT , 1983											
25...	4.1	36	<.10	.310	.80	.060	.010	<.010	1	1.4	92
FEB , 1984											
15...	5.3	50	<.10	.010	.80	<.010	<.010	<.010	5	1.3	96
JUN											
13...	4.8	44	.10	.370	.70	.020	.020	.020	5	5.9	83
AUG											
07...	3.8	33	<.10	.040	.50	.020	.020	.010	3	.71	71

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)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)
FEB , 1984											
15...	1130	60	1	16	<.5	<1	2	<3	3	220	3
JUN											
13...	1200	70	1	14	1.0	<1	7	<3	2	170	1

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
FEB , 1984										
15...	<4	7	.1	<10	2	<1	<1	13	<6	56
JUN										
13...	5	4	.3	<10	<1	<1	<1	12	<6	6

LAKE OF THE WOODS BASIN

05124990 FILSON CREEK NEAR ELY, MN

LOCATION.--Lat 47°50'05", long 91°40'27", in SE¼SW¼ sec.24, T.61 N., R.10 W., Lake County, Hydrologic Unit 09030001, in Superior National Forest, on right bank 25 ft (7.6 m) upstream from culverts on Forest Route 181, also known as Spruce Road, 0.8 mi (1.3 km) upstream from mouth, and 10 mi (16 km) southeast of Ely.

DRAINAGE AREA.--9.66 mi^2 (25.02 km^2).

PERIOD OF RECORD.--October 1974 to current year.

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

GAGE.--Water-stage recorder. Altitude of gage is 1,440 ft (439 m), from topographic map.

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

AVERAGE DISCHARGE.--10 years, 7.70 ft^3/s (0.218 m^3/s), 10.82 in/yr (275 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 426 ft^3/s (12.1 m^3/s) Sept. 13, 1980, gage height, 8.87 ft (2.704 m); no flow at times most years.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 68 ft^3/s (1.93 m^3/s) Apr. 15, gage height, 6.20 ft (1.890 m); maximum gage height, 6.77 ft (2.063 m) Mar. 15, (backwater from ice); minimum discharge, 0.14 ft^3/s (0.004 m^3/s) Sept. 9-11, 22, 23; minimum gage height, 4.58 ft (1.396 m) Sept.22, 23.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	7.1	10	3.2	1.2	1.6	3.0	21	3.4	1.9	1.3	.30
2	16	6.6	10	3.1	1.2	1.5	4.0	20	4.7	2.2	1.3	.25
3	23	6.0	9.5	2.9	1.2	1.5	5.0	21	5.5	5.0	1.3	.25
4	30	5.5	9.0	2.8	1.2	1.5	7.0	21	5.0	5.7	1.2	.40
5	32	5.2	9.0	2.7	1.2	1.4	9.0	20	4.7	4.7	1.3	.35
6	32	5.2	8.5	2.6	1.2	1.4	11	21	5.2	4.3	1.4	.30
7	29	4.7	8.0	2.5	1.2	1.4	14	23	6.3	3.6	1.5	.25
8	28	4.5	8.0	2.5	1.2	1.3	17	36	9.3	3.1	1.9	.21
9	28	4.3	7.5	2.4	1.2	1.3	23	56	11	2.7	2.1	.17
10	25	4.1	7.0	2.3	1.2	1.3	28	60	11	2.4	2.1	.14
11	24	3.8	7.0	2.2	1.2	1.3	33	61	11	2.2	1.7	.14
12	24	3.6	6.5	2.2	1.2	1.3	40	52	12	1.9	1.3	.17
13	23	3.4	6.5	2.1	1.3	1.3	50	43	14	2.9	1.1	.25
14	22	3.4	6.0	2.1	1.3	1.2	57	36	14	3.4	1.1	.25
15	23	3.6	6.0	2.0	1.3	1.2	66	29	12	3.4	1.0	.21
16	30	3.6	5.8	1.9	1.3	1.2	64	24	9.6	3.4	.82	.21
17	35	3.6	5.6	1.9	1.4	1.2	55	20	8.3	3.2	.74	.21
18	33	3.4	5.4	1.8	1.4	1.2	48	17	7.1	2.7	.66	.25
19	30	3.4	5.3	1.8	1.5	1.2	43	14	5.7	2.4	.59	.25
20	25	5.5	5.1	1.7	1.5	1.2	35	13	5.0	2.2	.46	.21
21	22	10	5.0	1.7	1.5	1.2	28	12	4.3	1.9	.90	.17
22	20	11	4.8	1.6	1.6	1.2	25	11	3.6	1.9	.90	.14
23	17	11	4.6	1.6	1.6	1.2	23	9.6	3.6	2.5	.90	.17
24	15	15	4.4	1.5	1.6	1.2	20	9.0	3.1	2.5	.74	.59
25	14	14	4.2	1.5	1.6	1.2	17	8.3	2.5	2.2	.66	.82
26	12	13	4.0	1.4	1.6	1.3	15	7.1	2.4	1.9	.59	.90
27	11	12	3.8	1.4	1.6	1.4	18	6.0	2.9	1.9	.59	.52
28	10	12	3.7	1.4	1.6	1.6	21	5.0	3.1	1.9	.46	.40
29	9.0	11	3.6	1.3	1.6	1.9	21	4.3	2.5	1.8	.35	.40
30	8.0	11	3.5	1.3	---	2.2	21	3.8	2.1	1.3	.35	.35
31	7.4	---	3.4	1.3	---	2.5	---	3.6	---	1.3	.35	---
TOTAL	672.4	210.5	190.7	62.7	39.7	43.4	821.0	687.7	194.9	84.4	31.66	9.23
MEAN	21.7	7.02	6.15	2.02	1.37	1.40	27.4	22.2	6.50	2.72	1.02	.31
MAX	35	15	10	3.2	1.6	2.5	66	61	14	5.7	2.1	.90
MIN	7.4	3.4	3.4	1.3	1.2	1.2	3.0	3.6	2.1	1.3	.35	.14
CFSM	2.25	.73	.64	.21	.14	.15	2.84	2.30	.67	.28	.11	.03
IN.	2.59	.81	.73	.24	.15	.17	3.16	2.65	.75	.32	.12	.04
AC-FT	1330	418	378	124	79	86	1630	1360	387	167	63	18

CAL YR 1983 TOTAL 2970.52 MEAN 8.14 MAX 45 MIN .52 CFSM .84 IN 11.44 AC-FT 5890
WTR YR 1984 TOTAL 3048.29 MEAN 8.33 MAX 66 MIN .14 CFSM .86 IN 11.74 AC-FT 6050

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 (2.9 km) east of Winton.

DRAINAGE AREA.--1,229 mi^2 (3,183 km^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.--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).--65 years (water years 1906, 1916-17, 1919, 1924-84), 1,036 ft^3/s (29.34 m^3/s), 11.45 in/yr (291 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 16,000 ft^3/s (453 m^3/s) May 18, 1950; no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 4,530 ft^3/s (128 m^3/s) May 14; minimum daily, 21 ft^3/s (0.59 m^3/s) Sept. 18.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1190	1650	1400	897	692	428	394	3220	1150	1390	595	32
2	1160	1400	1600	930	527	429	394	3410	1190	1390	429	32
3	1460	1410	1470	897	495	495	394	3430	1300	1620	349	135
4	1730	1280	1470	865	495	495	394	3330	1480	1780	97	200
5	2000	1310	1540	962	463	678	449	3590	1540	1580	226	200
6	2240	1370	1330	930	615	633	600	3650	1640	1160	266	132
7	2430	1340	1380	930	635	663	596	3580	1580	895	444	200
8	2420	1410	1130	928	665	631	669	3810	1700	895	334	200
9	2400	1240	1450	928	562	631	805	3740	1770	928	399	200
10	2640	1150	1120	895	428	631	789	3920	1740	1150	399	135
11	3230	1060	1060	863	461	596	1050	3300	1900	1060	350	200
12	3300	960	1020	928	463	629	1080	4400	2340	994	1790	200
13	3110	1030	992	895	648	596	1240	4400	2370	962	348	135
14	2940	962	960	863	600	724	1370	4530	3410	865	302	168
15	2920	913	992	863	610	594	1470	4170	3480	930	367	32
16	2970	912	960	893	591	578	1710	4170	3450	833	367	64
17	2790	914	960	861	644	459	1830	3840	3580	962	334	218
18	2750	848	928	877	697	459	1970	3750	3540	994	350	21
19	2590	845	786	790	697	544	2110	3820	3540	930	1110	182
20	2590	1010	948	790	729	465	2140	3250	3400	865	283	118
21	2620	1180	1100	693	513	627	2290	3050	3260	806	399	165
22	2620	1520	1020	725	526	480	2680	2770	3070	700	284	32
23	2660	1810	1030	790	607	522	2350	2230	2770	859	200	65
24	2620	2040	1030	725	632	394	2560	2070	2640	536	200	85
25	2440	1840	932	528	695	394	2610	2100	2370	727	65	182
26	2120	1800	932	493	695	329	2440	2140	1860	695	65	118
27	2270	1760	932	557	662	351	2600	2070	1520	679	200	215
28	2050	1670	932	526	511	277	2540	1760	1570	428	200	150
29	1990	1670	932	495	493	445	2900	1860	1480	493	200	150
30	1890	1350	898	647	---	362	2900	1700	1540	583	168	150
31	1820	---	897	568	---	394	---	1510	---	617	168	---
TOTAL	73960	39654	34131	24532	17051	15933	47324	98570	68180	29306	11288	4116
MEAN	2386	1322	1101	791	588	514	1577	3180	2273	945	364	137
MAX	3300	2040	1600	962	729	724	2900	4530	3580	1780	1790	218
MIN	1160	845	786	493	428	277	394	1510	1150	428	65	21
†	-18	+24	-3	-296	-162	-246	+721	-41	+13	-98	-17	+2
MEAN ‡	2368	1346	1098	495	426	268	2298	3139	2286	847	347	139
CFSM ‡	1.93	1.10	.89	.40	.35	.22	1.87	2.55	1.86	.69	.28	.11
IN. ‡	2.22	1.22	1.03	.46	.37	.25	2.09	2.94	2.08	.80	.33	.13

CAL YR 1983 TOTAL 446289.00 MEAN 1223 MAX 3510 MIN .00 MEAN ‡ 1223 CFSM ‡ 1.00 IN ‡ 13.51
WTR YR 1984 TOTAL 464045.00 MEAN 1268 MAX 4530 MIN 21 MEAN ‡ 1257 CFSM ‡ 1.02 IN ‡ 13.92

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

LAKE OF THE WOODS BASIN

05127500 BASSWOOD RIVER NEAR WINTON, MN

(International gaging station)

LOCATION.--Lat 48°04'57", long 91°39'09", in SE¼SE¼ sec.30, T.65 N., R.10 W., Lake County, Hydrologic Unit 09030001, in Superior National Forest, on island in Jackfish Bay of Basswood Lake, used to determine discharge at outlet [lat 48°06'21", long 91°38'51", in sec.19, T.65 N., R.10 W., on international boundary 14 mi (23 km) northeast of Winton].

DRAINAGE AREA.--1,740 mi^2 (4,510 km^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 (395.265 m), adjustment of 1928, (levels by Geodetic Survey of Canada). Prior to Oct. 27, 1938, nonrecording gages at several sites in vicinity of gage, at datum 3.0 ft (0.914 m) higher. Oct. 28, 1938, to Sept. 30, 1966, water-stage recorder at datum 3.0 ft (0.914 m) higher.

REMARKS.--Records good. Some regulation by powerplant on Kawishiwi River at Winton, MN, and by many lakes located upstream from station.

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

AVERAGE DISCHARGE.--56 years (water years 1926, 1927, 1931-84), 1,403 ft^3/s (39.73 m^3/s), 10.95 in/yr (278 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 15,600 ft^3/s (442 m^3/s) May 24, 1950, gage height 9.94 ft (3.030 m), present datum; minimum, 55 ft^3/s (1.56 m^3/s) Nov. 18, 1976, gage height, 1.67 ft (0.509 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 5,050 ft^3/s (143 m^3/s) May 16, gage height, 5.97 ft (1.820 m); minimum, 219 ft^3/s (6.20 m^3/s) Sept. 30, gage height, 2.28 ft (0.695 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1310	2680	2070	1410	1060	908	766	2910	3190	2900	1100	383
2	1330	2640	2040	1400	1050	893	756	3030	3070	2770	1070	367
3	1350	2540	2040	1390	1040	879	747	3140	2920	2650	1020	356
4	1370	2430	2020	1380	1020	864	743	3250	2800	2540	990	360
5	1430	2350	2010	1380	1010	864	742	3390	2730	2490	960	355
6	1520	2280	2000	1370	986	860	747	3530	2700	2460	910	349
7	1640	2220	2000	1360	968	860	762	3680	2670	2360	890	337
8	1750	2140	1970	1360	960	861	784	3920	2720	2260	880	327
9	1850	2100	1970	1350	962	870	808	4140	2730	2180	848	320
10	1940	2040	1940	1340	964	876	840	4300	2700	2100	830	314
11	2100	1970	1940	1330	952	887	891	4450	2670	2010	798	307
12	2240	1910	1910	1320	947	895	964	4600	2700	1930	767	309
13	2400	1860	1880	1320	957	908	1050	4720	2840	1930	738	302
14	2540	1800	1860	1310	953	923	1130	4820	2940	1880	708	297
15	2700	1740	1810	1310	950	939	1200	4910	3070	1790	682	291
16	2840	1680	1790	1300	948	948	1260	4990	3190	1750	663	286
17	2940	1630	1750	1300	937	948	1310	5010	3300	1700	636	279
18	2990	1590	1720	1290	924	937	1370	4990	3370	1650	614	269
19	2990	1570	1700	1290	919	920	1440	4930	3480	1600	597	264
20	2990	1610	1650	1280	926	907	1530	4890	3570	1570	575	256
21	2990	1610	1620	1270	932	902	1630	4830	3640	1530	592	257
22	3010	1610	1600	1250	930	899	1720	4730	3730	1490	560	253
23	3020	1670	1570	1240	920	904	1820	4550	3710	1430	546	244
24	3040	1840	1530	1220	910	894	1940	4360	3680	1400	530	253
25	3040	1900	1510	1200	909	883	2070	4190	3620	1360	510	247
26	3040	1940	1500	1190	909	867	2210	4000	3530	1320	491	243
27	3020	1980	1490	1170	919	846	2400	3860	3480	1290	475	237
28	2960	2040	1470	1150	920	830	2510	3730	3340	1250	459	231
29	2920	2080	1450	1120	919	809	2620	3610	3180	1210	440	226
30	2840	2080	1440	1090	---	789	2760	3460	3040	1160	412	222
31	2750	---	1430	1070	---	777	---	3320	---	1120	391	---
TOTAL	74850	59530	54680	39760	27701	27347	41520	128240	94310	57080	21682	8741
MEAN	2415	1984	1764	1283	955	882	1384	4137	3144	1841	699	291
MAX	3040	2680	2070	1410	1060	948	2760	5010	3730	2900	1100	383
MIN	1310	1570	1430	1070	909	777	742	2910	2670	1120	391	222
CFSM	1.39	1.14	1.01	.74	.55	.51	.80	2.38	1.81	1.06	.40	.17
IN.	1.60	1.27	1.17	.85	.59	.58	.89	2.74	2.02	1.22	.46	.19
AC-FT	148500	118100	108500	78860	54940	54240	82350	254400	187100	113200	43010	17340

CAL YR 1983 TOTAL 601806 MEAN 1649 MAX 3040 MIN 684 CFSM .95 IN 12.87 AC-FT 1194000
WTR YR 1984 TOTAL 635441 MEAN 1736 MAX 5010 MIN 222 CFSM 1.00 IN 13.59 AC-FT 1260000

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 (4.0 km) east of Campbell's Camp].

DRAINAGE AREA.--5,170 mi^2 (13,390 km^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.--Records excellent.

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

AVERAGE DISCHARGE.--62 years (water years 1923-84), 3,833 ft^3/s (108.6 m^3/s), 10.07 in/yr (256 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 28,200 ft^3/s (799 m^3/s) May 31 to June 2, 1950, elevation, 1,193.30 ft (363.718 m); minimum, 535 ft^3/s (15.2 m^3/s) at times in February, March and April 1924, elevation, 1,181.50 ft (360.121 m).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 10,500 ft^3/s (297 m^3/s) May 24, elevation, 1,187.48 ft (361.944 m); minimum, 1,440 ft^3/s (40.8 m^3/s) Sept. 30, elevation, 1,182.66 ft (360.475 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3050	5230	4570	4060	3110	2540	2110	5170	9730	8900	4650	2500
2	3080	5250	4570	4020	3080	2520	2090	5360	9600	8830	4540	2420
3	3150	5260	4580	3960	3080	2500	2110	5560	9460	8690	4450	2370
4	3160	5220	4580	3920	3060	2470	2100	5730	9300	8550	4340	2360
5	3170	5180	4580	3900	3030	2460	2110	5910	9130	8460	4240	2340
6	3190	5140	4580	3870	3010	2460	2120	6100	9080	8320	4120	2290
7	3240	5110	4580	3840	2980	2440	2140	6310	8960	8190	4070	2220
8	3270	5000	4560	3800	2960	2420	2150	6700	8890	8070	4030	2160
9	3310	4990	4540	3780	2920	2410	2180	7080	8970	7890	3920	2120
10	3340	4910	4540	3720	2890	2400	2220	7420	8920	7740	3860	2110
11	3430	4840	4580	3690	2860	2380	2280	7680	8850	7530	3790	2080
12	3470	4770	4580	3690	2860	2360	2360	8060	8840	7360	3710	2060
13	3570	4700	4580	3670	2860	2350	2470	8380	8820	7400	3650	1980
14	3640	4620	4590	3620	2850	2340	2600	8670	8810	7160	3560	1970
15	3780	4550	4570	3580	2830	2320	2750	8940	8780	6910	3460	1910
16	3860	4500	4560	3540	2810	2320	2910	9210	8760	6770	3420	1880
17	3960	4430	4510	3500	2800	2300	3050	9420	8740	6660	3340	1840
18	4110	4350	4480	3480	2760	2280	3190	9570	8700	6510	3260	1780
19	4240	4320	4480	3440	2740	2280	3320	9800	8740	6350	3180	1760
20	4360	4380	4450	3410	2730	2260	3460	10000	8770	6200	3130	1730
21	4470	4360	4450	3380	2700	2240	3590	10200	8760	6080	3190	1750
22	4570	4390	4450	3360	2670	2230	3720	10300	8820	5910	3100	1680
23	4680	4400	4410	3340	2650	2210	3840	10300	8730	5730	3060	1580
24	4770	4430	4410	3310	2650	2190	3970	10400	8710	5610	3000	1620
25	4870	4460	4370	3270	2640	2170	4110	10400	8740	5470	2930	1580
26	4950	4510	4360	3240	2620	2180	4290	10400	8710	5350	2880	1550
27	5040	4510	4300	3220	2590	2150	4510	10400	8910	5200	2820	1520
28	5030	4520	4240	3220	2570	2150	4620	10300	9010	5080	2750	1490
29	5120	4550	4190	3190	2570	2140	4760	10100	9030	4930	2670	1470
30	5170	4560	4150	3170	---	2120	4950	9990	9000	4820	2570	1450
31	5210	---	4090	3150	---	2120	---	9860	---	4730	2520	---
TOTAL	124260	141440	138480	110340	81880	71710	92080	263720	268270	211400	108210	57570
MEAN	4008	4715	4467	3559	2823	2313	3069	8507	8942	6819	3491	1919
MAX	5210	5260	4590	4060	3110	2540	4950	10400	9730	8900	4650	2500
MIN	3050	4320	4090	3150	2570	2120	2090	5170	8700	4730	2520	1450
CFSM	.78	.91	.86	.69	.55	.45	.59	1.65	1.73	1.32	.68	.37
IN.	.89	1.02	1.00	.79	.59	.52	.66	1.90	1.93	1.52	.78	.41
AC-FT	246500	280500	274700	218900	162400	142200	182600	523100	532100	419300	214600	114200

CAL YR 1983 TOTAL 1582020 MEAN 4334 MAX 7000 MIN 2490 CFSM .84 IN 11.38 AC-FT 3138000
WTR YR 1984 TOTAL 1669360 MEAN 4561 MAX 10400 MIN 1450 CFSM .88 IN 12.01 AC-FT 3311000

LAKE OF THE WOODS BASIN

05128200 VERMILION LAKE NEAR SOUDAN, MN

LOCATION.--Lat 47°49'52", long 92°16'20", in SW¼SE¼ sec.20, T.62 N., R.15 W., St. Louis County, Hydrologic Unit 09030002, on south shore of Vermilion Lake, 2 mi (3.2 km) northwest of Soudan.

PERIOD OF RECORD.--October 1913 to July 1915, July 1941 to November 1942, June 1946 to current year (fragmentary during 1947).

GAGE.--Water-stage recorder. Datum of gage is 1,355.10 ft (413.034 m) National Geodetic Vertical Datum of 1929. October 1913 to July 1915, nonrecording gage at Tower, 2 mi (3.2 km) southwest of present gage, at datum about 1,354.60 ft (412.882 m). July 1941 to November 1942, and June 1946 to June 1951, nonrecording gage approximately 13 mi (20.9 km) northwest at Vermilion Dam near Tower, at same datum. All gage readings have been reduced to elevations NGVD.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation observed, 1,359.52 ft (414.382 m) May 16, 1950; minimum observed, 1,356.02 ft (413.315 m) Jan. 29, 1942; minimum 1,355.96 ft (413.297 m) Dec. 14, 1976, result of wind action.

EXTREMES OUTSIDE PERIOD OF RECORD.--Elevation on June 6, 1913, was 1,359.94 ft (414.510 m), determined from reference point set by local observers.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,358.30 ft (414.010 m) June 18, result of wind action; maximum daily, 1,358.25 ft (413.995 m) June 18; minimum, 1,356.68 ft (413.516 m) Sept. 21, result of wind action; minimum daily, 1,356.77 ft (413.543 m) Sept. 21.

MONTHEND ELEVATION, IN FEET NGVD, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

Oct. 31 ..... 1,357.54	Feb. 29 ..... 1,357.25	June 30 ..... 1,358.04
Nov. 30 ..... 1,357.69	Mar. 31 ..... 1,357.15	July 31 ..... 1,357.45
Dec. 31 ..... 1,357.49	Apr. 30 ..... 1,357.99	Aug. 31 ..... 1,357.05
Jan. 31 ..... 1,357.33	May 31 ..... 1,357.80	Sept.30 ..... 1,356.79

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 (107 m) downstream from bridge on Forest Route 491, 3.5 mi (5.6 km) upstream from mouth, and 3.5 mi (5.6 km) west of village of Crane Lake.

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

GAGE.--Water-stage recorder. Altitude of gage is 1,180 ft (360 m), from topographic map.

REMARKS.--Records fair.

AVERAGE DISCHARGE.--5 years, 601 ft^3/s (17.02 m^3/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,100 ft^3/s (87.8 m^3/s) Apr. 25, 1982, gage height, 13.04 ft (3.975 m); minimum, 38 ft^3/s (1.08 m^3/s) Aug. 13, 14, 1980, gage height, 3.68 ft (1.122 m).

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1979 reached a stage of 15.15 ft (4.618 m), from high-water mark, discharge, about 4,600 ft^3/s (130 m^3/s).

EXTREMES FOR CURRENT YEAR.--Maximum 2,090 ft^3/s (59.2 m^3/s) Apr. 13, gage height, 11.30 ft (3.444 m); minimum daily, 63 ft^3/s (1.78 m^3/s) Sept. 30.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	451	751	851	568	390	324	332	1260	748	1170	402	170
2	505	723	851	563	390	318	376	1240	757	1100	383	165
3	588	694	838	560	390	315	442	1220	734	1050	365	160
4	675	680	832	560	384	315	522	1180	700	991	349	155
5	720	672	823	555	382	315	629	1140	697	948	336	150
6	723	651	814	546	378	310	787	1100	686	911	325	145
7	708	635	802	538	372	297	974	1130	754	882	318	140
8	769	619	790	524	368	292	1150	1260	948	848	320	135
9	793	588	763	505	370	284	1400	1440	1480	823	323	130
10	796	565	737	489	370	279	1570	1550	1750	802	330	120
11	908	553	731	471	370	270	1760	1590	1810	769	335	112
12	1040	538	743	464	370	257	1910	1580	1780	737	333	106
13	1160	531	743	460	372	263	2070	1550	1800	763	318	106
14	1220	524	743	455	384	272	2080	1500	1840	799	317	102
15	1200	517	746	444	385	280	2010	1440	1800	787	300	95
16	1200	505	731	442	386	281	1910	1380	1730	754	279	90
17	1300	496	720	440	378	269	1780	1340	1660	731	273	86
18	1250	491	700	431	373	258	1650	1280	1590	697	260	84
19	1190	494	690	419	371	255	1550	1190	1480	670	250	79
20	1120	553	680	408	367	253	1460	1140	1430	636	248	73
21	1060	694	660	404	362	253	1370	1130	1380	612	260	68
22	1000	748	653	404	359	253	1300	1110	1420	598	250	70
23	954	775	642	404	355	255	1240	1080	1430	578	235	68
24	924	736	627	408	352	253	1190	1050	1320	551	225	71
25	902	766	616	414	348	250	1150	995	1240	529	215	71
26	876	826	614	408	345	256	1080	961	1240	506	205	70
27	854	845	611	404	343	264	1120	915	1310	484	195	68
28	823	848	606	398	338	273	1230	879	1360	468	190	66
29	790	851	588	394	330	286	1270	845	1310	448	185	64
30	772	851	580	390	---	291	1260	808	1240	429	180	63
31	760	---	575	390	---	305	---	775	---	416	175	---
TOTAL	28031	19720	22100	14260	10682	8646	38572	37058	39424	22487	8679	3082
MEAN	904	657	713	460	368	279	1286	1195	1314	725	280	103
MAX	1300	851	851	568	390	324	2080	1590	1840	1170	402	170
MIN	451	491	575	390	330	250	332	775	686	416	175	63
AC-FT	55600	39110	43840	28280	21190	17150	76510	73500	78200	44600	17210	6110

CAL YR 1983 TOTAL 227733 MEAN 624 MAX 1300 MIN 179 AC-FT 451700
WTR YR 1984 TOTAL 252741 MEAN 691 MAX 2080 MIN 63 AC-FT 501300

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 (15.8 km) northeast of Ray.

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

GAGE.--Water-stage recorder. Datum of gage is 1,100 ft (335 m), adjustment of 1912 (Corps of Engineers benchmark), water surface transfer.

REMARKS.--Records good. Flow completely regulated by outlet dam on Namakan Lake.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge,640 ft^3/s (18.1 m^3/s) July 21,1983,gage height,18.52 ft (5.645 m); no flow from approximately the middle of January to the middle of May each year; minimum gage height, 10.54 ft (3.213 m) Apr. 2, 8, 1984.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 620 ft^3/s (17.6 m^3/s) Aug 3, gage height, 18.44 ft (5.621 m); no flow Jan. 20 to May 6; minimum gage height, 10.54 ft (3.213 m) Apr. 2, 8.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	499	283	135	36	.00	.00	.00	.00	167	565	602	508
2	503	271	134	33	.00	.00	.00	.00	169	574	603	505
3	511	264	133	30	.00	.00	.00	.00	178	562	603	497
4	520	259	133	26	.00	.00	.00	.00	193	551	606	494
5	503	248	128	24	.00	.00	.00	.00	204	553	607	494
6	491	235	128	21	.00	.00	.00	.00	217	550	602	503
7	504	225	126	18	.00	.00	.00	.04	229	552	601	490
8	504	218	121	15	.00	.00	.00	.98	237	554	596	482
9	512	210	118	13	.00	.00	.00	6.2	286	548	580	470
10	513	204	118	10	.00	.00	.00	13	318	545	589	469
11	490	198	118	8.7	.00	.00	.00	16	345	541	596	467
12	490	196	116	7.0	.00	.00	.00	25	369	549	590	477
13	490	190	117	5.7	.00	.00	.00	33	381	581	591	443
14	490	180	114	4.0	.00	.00	.00	41	402	579	583	442
15	490	169	106	3.4	.00	.00	.00	53	418	554	562	436
16	490	166	102	1.9	.00	.00	.00	65	426	565	569	434
17	490	166	96	1.3	.00	.00	.00	70	435	559	558	432
18	487	157	91	.71	.00	.00	.00	71	428	574	545	416
19	477	150	87	.16	.00	.00	.00	83	445	571	541	411
20	460	149	83	.00	.00	.00	.00	96	464	573	537	399
21	438	135	80	.00	.00	.00	.00	104	476	584	535	419
22	422	140	73	.00	.00	.00	.00	107	497	579	519	398
23	406	141	68	.00	.00	.00	.00	112	485	561	533	367
24	385	130	64	.00	.00	.00	.00	121	482	567	540	379
25	367	136	61	.00	.00	.00	.00	128	503	562	537	364
26	351	140	58	.00	.00	.00	.00	132	506	558	540	358
27	343	143	53	.00	.00	.00	.00	142	525	563	536	353
28	312	143	48	.00	.00	.00	.00	147	546	572	532	344
29	312	140	45	.00	.00	.00	.00	153	557	580	519	341
30	304	135	43	.00	---	.00	.00	158	565	588	496	335
31	296	---	38	.00	---	.00	---	165	---	595	497	---
TOTAL	13850	5521	2935	258.87	.00	.00	.00	2042.22	11453	17509	17445	12927
MEAN	447	184	94.7	8.35	.000	.000	.000	65.9	382	565	563	431
MAX	520	283	135	36	.00	.00	.00	165	565	595	607	508
MIN	296	130	38	.00	.00	.00	.00	.00	167	541	496	335
AC-FT	27470	10950	5820	513	.00	.00	.00	4050	22720	34730	34600	25640

CAL YR 1983 TOTAL 81628.55 MEAN 224 MAX 630 MIN .00 AC-FT 161900
WTR YR 1984 TOTAL 83941.09 MEAN 229 MAX 607 MIN .00 AC-FT 166500

05129400 RAINY LAKE NEAR FORT FRANCES, ONTARIO
(International gaging station)

LOCATION.--Lat 48°38'30", long 93°20'00", at Five Mile dock, approximately 5 mi (8 km) northeast of town of Fort Frances.

PERIOD OF RECORD.--January 1910 to September 1917 and October 1934 to current year, in reports of Geological Survey. August 1911 to 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 at National Geodetic Vertical Datum of 1929 (United States and Canadian Boundary Survey). January 1910 to December 1949, nonrecording gage 3 mi (5 km) northeast at Ranier, Minn., at same datum. January 1950 to October 1964, water-stage recorder on Government dock at Pither's Point at Fort Frances and supplementary gage in town pumping station, 0.5 mi (0.8 km) south, used during winter months, at same datum.

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

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation observed, 1,112.97 ft (339.233 m) July 5, 1950; minimum observed, 1,101.26 ft (335.664 m) Apr. 17, 1923, Apr. 2, 1930.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,108.38 ft (337.835 m) July 2; maximum daily elevation, 1,108.31 ft (337.814 m) July 2; minimum, 1,104.77 ft (336.735 m) Apr. 2; minimum daily, 1,104.80 ft (336.742 m) Apr. 4, 5.

MONTHEND ELEVATION, IN FEET NGVD, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

Oct. 31 ..... 1107.86	Feb. 29 ..... 1105.72	June 30 ..... 1108.28
Nov. 30 ..... 1107.70	Mar. 31 ..... 1104.83	July 31 ..... 1107.88
Dec. 31 ..... 1107.00	Apr. 30 ..... 1105.39	Aug. 31 ..... 1107.28
Jan. 31 ..... 1106.37	May 31 ..... 1107.03	Sept.30 ..... 1107.09

NOTE.--Elevations other than those shown are available.

LAKE OF THE WOODS BASIN

05130500 STURGEON RIVER NEAR CHISHOLM, MN

LOCATION.--Lat 47°40'25", long 92°54'00", in NE¼NW¼ sec.20, T.60 N., R.20 W., St. Louis County, Hydrologic Unit 09030005, on left bank 1,000 ft (305 m) upstream from highway bridge, 0.6 mi (1.0 km) downstream from East Branch Sturgeon River, and 11.5 mi (18.5 km) north of Chisholm.

DRAINAGE AREA.--187 mi^2 (484 km^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 (397.977 m) National Geodetic Vertical Datum of 1929. Prior to Aug. 24, 1944, nonrecording gage at site 1,000 ft (305 m) downstream at different datum. Aug. 25, 1944, to Sept. 30, 1975, at present site at datum 1.00 ft (0.305 m) higher.

REMARKS.--Records good except those for winter period and those for period of no gage-height record, May 11 to June 10, which are fair.

AVERAGE DISCHARGE.--42 years, 125 ft^3/s (3.540 m^3/s), 9.08 in/yr (231 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,630 ft^3/s (103 m^3/s) May 7, 1950, gage height, 7.41 ft (2.259 m), present datum, from rating curve extended above 1,600 ft^3/s (45.3 m^3/s) on basis of slope-area measurement of peak flow; minimum daily, 3.8 ft^3/s (0.11 m^3/s) Jan. 31 to Feb. 3, 1977.

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

Date	Time	Discharge (ft^3/s)	Discharge (m^3/s)	Gage height (ft)	Gage height (m)
Apr. 9	unknown	576	16.3	3.98	1.213
June 12	1000	* 793	22.5	4.42	*1.347

Minimum discharge, 14 ft^3/s (0.40 m^3/s) Sept. 19, 20, gage height, 1.29 ft (0.393 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	104	159	157	64	40	55	150	215	100	131	39	17
2	121	152	155	65	40	54	200	206	98	125	36	16
3	163	147	150	65	40	54	238	198	100	148	34	17
4	186	143	145	66	40	52	297	187	100	136	33	17
5	211	139	142	67	40	53	348	177	100	123	35	16
6	225	136	137	66	40	50	457	169	110	111	35	16
7	218	134	133	65	40	50	518	199	140	102	35	15
8	220	130	129	65	40	50	562	254	250	93	37	16
9	212	127	125	63	40	50	571	290	400	97	39	17
10	215	125	120	60	40	51	557	295	700	97	36	16
11	268	121	120	60	40	51	532	280	757	94	34	16
12	296	117	114	58	40	51	518	270	777	90	32	16
13	327	113	108	57	41	50	502	260	719	95	30	17
14	324	113	103	53	43	50	478	245	608	94	29	16
15	288	112	100	52	43	48	444	230	508	87	28	16
16	273	113	98	53	44	43	401	215	414	83	27	16
17	263	112	95	51	48	41	357	200	333	79	26	18
18	252	110	95	51	50	41	318	190	284	76	25	16
19	242	112	90	51	54	39	283	180	248	71	24	14
20	226	153	89	51	56	38	253	170	221	66	23	15
21	210	194	89	50	57	37	230	160	196	61	26	16
22	200	210	89	49	58	38	213	155	180	59	24	16
23	191	209	85	46	60	38	197	150	164	56	23	16
24	184	164	82	45	60	43	184	145	149	53	22	17
25	179	190	80	43	60	50	172	140	138	51	21	17
26	173	220	76	41	59	53	166	135	140	48	20	17
27	170	210	74	41	58	57	182	125	163	47	20	17
28	165	192	70	40	57	70	204	120	165	45	19	17
29	160	176	68	40	56	85	216	115	162	44	20	18
30	156	165	65	40	---	100	220	110	148	42	18	18
31	153	---	64	40	---	120	---	105	---	42	17	---
TOTAL	6575	4498	3247	1658	1384	1662	9968	5890	8572	2546	867	492
MEAN	212	150	105	53.5	47.7	53.6	332	190	286	82.1	28.0	16.4
MAX	327	220	157	67	60	120	571	295	777	148	39	18
MIN	104	110	64	40	40	37	150	105	98	42	17	14
CFSM	1.13	.80	.56	.29	.26	.29	1.78	1.02	1.53	.44	.15	.09
IN.	1.31	.89	.65	.33	.28	.33	1.98	1.17	1.71	.51	.17	.10
AC-FT	13040	8920	6440	3290	2750	3300	19770	11680	17000	5050	1720	976

CAL YR 1983	TOTAL 45651	MEAN 125	MAX 327	MIN 35	CFSM .67	IN 9.08	AC-FT 90550		
WTR YR 1984	TOTAL 47359	MEAN 129	MAX 777	MIN 14	CFSM .69	IN 9.42	AC-FT 93940		

LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN

LOCATION.--Lat 48°23'45", long 93°32'57", in NE¼SE¼ sec.9, T.68 N., R.25 W., Koochiching County, Hydrologic Unit 09030005, on right bank at town of Littlefork, 0.9 mi (1.4 km) upstream from bridge on State Highway 217, 2.8 mi (4.5 km) upstream from Beaver Creek, and 19 mi (31 km) upstream from mouth.

DRAINAGE AREA.--1,730 mi^2 (4,481 km^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 (330.278 m) National Geodetic Vertical Datum of 1929. June 23, 1909, to Mar. 4, 1917, nonrecording gage and July 21, 1937, to Oct. 23, 1979, water-stage recorder at site 1.2 mi (1.9 km) downstream at datum 10.53 ft (3.210 m) lower; Mar. 5 to Sept. 30, 1917, and June 22, 1928, to July 20, 1937, nonrecording gage at site 1.18 mi (1.9 km) downstream at datum 10.53 ft (3.210 m) lower.

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

AVERAGE DISCHARGE.--61 years (water years 1912-16, 1929-84), 1,055 ft^3/s (29.88 m^3/s), 8.28 in/yr (210 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 25,000 ft^3/s (708 m^3/s) Apr. 18, 1916, May 11, 1950, gage height, 37.00 ft (11.278 m) site and datum then in use; minimum observed, 21 ft^3/s (0.59 m^3/s) Aug. 26, 27, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 9,590 ft^3/s (272 m^3/s) June 10, gage height, 12.84 ft (3.914 m); minimum, 77 ft^3/s (2.18 m^3/s) Sept. 22, gage height, 1.82 ft (0.555 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	801	1250	1580	345	235	215	300	2720	764	1160	255	108
2	1160	1190	1490	340	235	210	360	2480	734	1010	244	104
3	1360	1130	1420	335	235	210	500	2250	790	951	242	96
4	1730	1090	1340	330	235	210	800	2090	771	1020	237	91
5	2000	1060	1260	325	235	210	1300	1900	782	974	227	90
6	2080	1020	1190	320	235	210	1900	1760	910	976	214	86
7	2120	986	1130	315	230	205	2700	1860	1030	918	204	85
8	2410	962	1070	310	230	205	4500	3870	1840	830	197	99
9	2590	910	1010	300	230	205	6600	4720	6880	763	208	103
10	2490	867	950	295	230	205	6190	4680	9300	708	260	100
11	2590	846	900	290	230	205	6000	4390	8380	674	311	93
12	3340	806	860	285	225	205	5450	3930	7300	666	324	93
13	3790	766	810	280	225	200	5130	3500	6290	726	313	95
14	3960	773	770	275	225	200	5000	3340	6510	1040	348	93
15	3680	748	740	275	225	200	4740	3130	5950	987	333	94
16	3390	748	690	270	225	200	4460	2750	5030	890	300	91
17	3460	706	650	270	220	200	4120	2410	4220	816	265	88
18	3430	712	620	265	220	200	3620	2150	3470	750	224	87
19	3100	724	580	265	220	200	3130	1960	2840	681	189	85
20	2760	786	550	260	220	200	2740	1800	2320	609	173	84
21	2460	1170	520	260	220	195	2440	1680	1950	552	179	81
22	2200	2020	500	255	220	195	2230	1610	1700	510	173	78
23	2000	2100	480	255	220	195	2020	1550	1570	459	172	80
24	1860	2200	460	250	220	195	1850	1450	1410	406	172	85
25	1760	2150	440	250	215	200	1730	1330	1250	378	171	85
26	1670	2080	420	245	215	205	1590	1240	1130	353	174	80
27	1590	1980	400	245	215	208	1650	1150	1460	332	166	80
28	1510	1850	380	245	215	215	2350	1040	1630	313	152	83
29	1430	1760	370	245	215	220	2890	968	1490	292	140	95
30	1350	1680	360	240	---	235	2810	897	1330	278	129	116
31	1290	---	350	238	---	260	---	821	---	267	117	---
TOTAL	71361	37070	24290	8678	6520	6418	91100	71426	91031	21289	6813	2728
MEAN	2302	1236	784	280	225	207	3037	2304	3034	687	220	90.9
MAX	3960	2200	1580	345	235	260	6600	4720	9300	1160	348	116
MIN	801	706	350	238	215	195	300	821	734	267	117	78
CFSM	1.33	.71	.45	.16	.13	.12	1.76	1.33	1.75	.40	.13	.05
IN.	1.53	.80	.52	.19	.14	.14	1.96	1.54	1.96	.46	.15	.06
AC-FT	141500	73530	48180	17210	12930	12730	180700	141700	180600	42230	13510	5410

CAL YR 1983 TOTAL 378236 MEAN 1036 MAX 4820 MIN 157 CFSM .60 IN 8.13 AC-FT 750200
WTR YR 1984 TOTAL 438724 MEAN 1199 MAX 9300 MIN 78 CFSM .69 IN 9.43 AC-FT 870200

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

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967, 1969, 1971, 1973 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT , 1983												
12...	0915	3340	--	102	97	8.5	7.2	5.0	7.5	16	732	10.7
JAN , 1984												
31...	1215	--	238	195	221	6.8	6.9	-8.0	.0	7.5	725	10.3
MAY												
22...	1530	--	1610	102	101	6.8	7.4	20.0	16.0	15	722	8.6
JUL												
17...	1630	--	812	140	139	7.8	7.6	22.0	20.5	9.8	729	7.1

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)
OCT , 1983											
12...	93	41	360	17	5.6	2.6	1.4	56	17	3.3	.20
JAN , 1984											
31...	74	K2	<1	27	10	4.6	1.8	100	16	3.8	.10
MAY											
22...	92	2	43	14	4.6	1.8	.90	47	<.2	2.0	.10
JUL											
17...	83	21	400	20	6.3	2.4	.90	65	11	2.9	.20

LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOER 1983 TO SEPTEMBER 1984

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)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT , 1983											
12...	9.6	139	<.10	.050	2.2	.080	.030	.020	60	541	79
JAN , 1984											
31...	13	181	.22	.030	.70	.040	.030	<.010	7	4.5	94
MAY											
22...	3.2	95	.12	.130	.40	.050	.050	.040	26	113	92
JUL											
17...	5.8	128	<.10	.090	<.10	<.020	.020	.020	22	48	95

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)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)
OCT , 1983											
12...	0915	140	1	46	<.5	<1	<1	<3	<1	510	<1
JAN , 1984											
31...	1215	80	2	39	<.5	<1	3	<3	1	940	2
MAY											
22...	1530	10	2	24	<.5	<1	6	<3	1	330	<1
JUL											
17...	1630	10	2	28	<.5	<1	5	<3	2	380	1

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
OCT , 1983										
12...	5	20	<.1	<10	1	<1	<1	38	<6	7
JAN , 1984										
31...	4	47	<.1	<10	2	<1	<1	73	<6	33
MAY										
22...	9	16	<.1	<10	3	<1	<1	33	<6	39
JUL										
17...	12	16	.2	<10	1	<1	2	47	<6	17

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 (213 m) downstream from falls, 0.3 mi (0.5 km) downstream from bridge on U.S. Highway 71, and 4.8 mi (7.7 km) upstream from Sturgeon River.

DRAINAGE AREA.--1,460 mi^2 (3,780 km^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 (348.908 m) National Geodetic Vertical Datum of 1929. Prior to June 10, 1911, nonrecording gage at railroad bridge about 0.4 mi (0.6 km) 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 (61 m) upstream at same datum. October 1979 to September 1982, crest-stage gage at same site and datum.

REMARKS.--Records good except those for the winter period, which are fair. Prior to 1971, a powerplant, located 0.3 mi (0.5 km) upstream, caused some diurnal fluctuation at low flows.

AVERAGE DISCHARGE.--53 years (water years 1929-79, 1983-84), 719 ft^3/s (20.36 m^3/s), 6.69 in/yr (170 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 14,800 ft^3/s (419 m^3/s) May 8, 9, 1950; maximum gage height, 17.08 ft (5.206 m) May 8, 1950; minimum discharge recorded, 7 ft $^3/s$ (0.20 m^3/s) Aug. 7, 1939.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 6,510 ft^3/s (184 m^3/s) June 10, gage height, 9.98 ft (3.042 m); minimum, 180 ft^3/s (5.10 m^3/s) Sept. 22, 23, gage height, 3.10 ft (0.945 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	687	906	1100	310	230	230	400	2060	972	1630	419	218
2	800	894	1000	310	230	230	500	1870	972	1370	407	217
3	1010	882	950	300	230	230	700	1690	987	2100	403	213
4	1100	873	900	300	230	230	900	1540	979	2870	380	210
5	1200	849	860	290	230	230	1200	1440	1040	2840	359	212
6	1330	837	800	290	230	230	1500	1370	1190	2650	339	204
7	1400	840	750	280	230	230	2000	1500	1530	2000	327	202
8	1400	842	700	280	230	230	2500	2360	2670	1490	329	206
9	1400	823	650	270	230	230	2800	2830	5480	1210	320	209
10	1450	805	600	270	230	230	3170	2680	6460	1210	313	206
11	1590	776	570	270	230	230	3220	2500	6130	1490	314	216
12	1650	735	540	260	230	230	2950	2260	5330	1580	317	227
13	1680	710	520	260	230	230	2690	2100	4650	1670	315	223
14	1670	698	500	260	230	230	2540	1950	4140	1570	304	219
15	1610	693	480	250	230	230	2430	1780	3510	1480	289	217
16	1660	695	470	250	230	230	2270	1640	3080	1470	275	213
17	1720	650	450	250	230	230	2120	1570	2720	1380	262	212
18	1710	698	440	240	230	230	1930	1690	2430	1210	253	207
19	1640	696	420	240	230	230	1760	2080	2160	1040	243	199
20	1540	756	410	240	230	230	1640	2300	1900	938	239	194
21	1430	900	400	240	230	230	1550	2080	1680	845	259	189
22	1310	972	390	230	230	230	1460	1890	1530	761	249	185
23	1240	981	380	230	230	230	1390	1750	1430	688	246	184
24	1170	676	370	230	230	230	1310	1660	1340	618	246	188
25	1150	768	360	230	230	230	1240	1550	1250	566	239	197
26	1110	800	350	230	230	235	1180	1450	1260	540	236	208
27	1080	900	340	230	230	240	1310	1340	1890	522	231	215
28	1050	1100	330	230	230	250	1700	1240	2380	496	227	221
29	1010	1200	330	230	230	270	2050	1160	2290	473	221	219
30	970	1200	320	230	---	300	2150	1090	2000	447	217	216
31	938	---	320	230	---	350	---	1020	---	431	215	---
TOTAL	40705	25155	17000	7960	6670	7395	54560	55440	75380	39585	8993	6246
MEAN	1313	839	548	257	230	239	1819	1788	2513	1277	290	208
MAX	1720	1200	1100	310	230	350	3220	2830	6460	2870	419	227
MIN	687	650	320	230	230	230	400	1020	972	431	215	184
CFSM	.90	.58	.38	.18	.16	.16	1.25	1.23	1.72	.88	.20	.14
IN.	1.04	.64	.43	.20	.17	.19	1.39	1.41	1.92	1.01	.23	.16
AC-FT	80740	49890	33720	15790	13230	14670	108200	110000	149500	78520	17840	12390

CAL YR 1983 TOTAL 282777 MEAN 775 MAX 6540 MIN 203 CFSM .53 IN 7.20 AC-FT 560900
WTR YR 1984 TOTAL 345089 MEAN 943 MAX 6460 MIN 184 CFSM .65 IN 8.79 AC-FT 684500

LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN

(International gaging station)

LOCATION.--Lat 48°38'04", long 93°54'47", in NW¼SE¼ sec.36, T.160 N., R.26 W., Koochiching County, Hydrologic Unit 09030004, on left bank at Manitou Rapids, 4 mi (6 km) west of Indus.

DRAINAGE AREA.--19,400 mi^2 (50,200 km^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 Corps of Engineers. Published as "near Birchdale" 1932-34.

GAGE.--Water-stage recorder. Datum of gage is 1,062.48 ft (323.844 m) National Geodetic Vertical Datum of 1929. Prior to Nov. 10, 1934, nonrecording gage at site near Birchdale 7 mi (11 km) downstream at different datum.

REMARKS.--Records good. Diurnal fluctuation caused by powerplant at International Falls. Some regulation at low and medium flows by Rainy and Namakan Lakes.

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

AVERAGE DISCHARGE.--56 years, 12,850 ft^3/s (363.9 m^3/s), 9.00 in/yr (229 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 71,600 ft^3/s (2,030 m^3/s) May 12, 1950, gage height, 21.04 ft (6.413 m); minimum daily, 928 ft^3/s (26.3 m^3/s) Dec. 26, 1929.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 43,100 ft^3/s (1,220 m^3/s) June 11, gage height, 15.10 ft (4.602 m); minimum, 4,270 ft^3/s (121 m^3/s) Sept. 22, gage height, 2.11 ft (0.643 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12000	17400	17000	14100	10300	10700	9900	16300	11800	23500	11800	6600
2	12600	17200	17000	14100	10300	10700	11200	15500	11800	23200	11800	5380
3	13200	17100	16900	14100	10300	10700	11700	15300	11800	26900	11700	4910
4	13700	16900	16500	14100	10300	10700	12500	14700	11900	29000	11500	4640
5	14200	15600	16300	14100	10300	10700	13600	14300	12000	29900	11200	4530
6	14500	15100	16100	14100	10300	10700	14200	14000	12400	30000	11000	4480
7	14200	14900	16000	14000	10300	10700	14900	14000	13200	29600	10500	4410
8	14800	14800	15800	13000	10300	10600	16000	15400	17000	28900	10300	4400
9	15200	14700	15500	13100	10300	10200	17600	18100	31200	28000	10200	4410
10	15200	13500	15500	12900	10300	10200	21100	19100	40300	24200	10100	4510
11	15100	12800	15400	12900	10300	10100	21500	18300	42900	19200	9610	4500
12	15200	12600	15300	12900	10800	10100	21600	17600	41500	15300	9780	4440
13	15800	12400	15100	13000	10800	10000	21300	16800	39200	14400	9660	4430
14	16300	12400	15000	12100	10800	9880	20800	16700	40200	16600	9240	4550
15	16600	12300	15000	11000	10800	9750	20500	16400	39800	18300	8680	4560
16	17200	12300	14900	11000	10700	9650	20000	15600	38100	18600	7530	4540
17	17400	12200	14800	11000	10700	9810	19300	14700	36300	18200	7130	4500
18	17900	12100	14700	11000	10800	10100	18600	14000	35400	18200	7060	4500
19	18100	12200	14600	11000	10800	10200	16700	14300	33600	20100	7090	4500
20	19900	12400	14600	10900	10700	9720	15100	14000	31200	20800	7200	4460
21	20300	12400	14600	10900	10800	9830	15000	14000	27300	20700	7280	4450
22	19900	12700	14500	10900	10800	9530	14600	14200	25700	20400	7400	4340
23	19500	13900	14500	10900	10800	9970	12800	14100	25000	19400	7460	4390
24	19100	13800	14400	10900	10800	10100	11700	13800	24600	14700	7500	4460
25	18800	13800	14300	10900	10800	10300	11000	13600	24100	12800	7330	4460
26	18600	15000	14200	10900	10800	10300	10700	13300	22900	12300	7230	4460
27	18400	15200	14200	10800	10800	9520	10800	13100	18100	12200	7070	4460
28	18200	15500	14200	10300	10800	9270	12700	12800	17600	12100	7020	4480
29	18100	15000	14100	10300	10800	8540	15000	12500	22600	12000	7120	4480
30	17800	16000	14100	10300	---	7740	15900	12300	23900	11900	7210	4460
31	17600	---	14100	10300	---	8150	---	12100	---	11900	7070	---
TOTAL	515400	424200	469200	371800	307400	308460	468300	460900	783400	613300	272770	137690
MEAN	16630	14140	15140	11990	10600	9950	15610	14870	26110	19780	8799	4590
MAX	20300	17400	17000	14100	10800	10700	21600	19100	42900	30000	11800	6600
MIN	12000	12100	14100	10300	10300	7740	9900	12100	11800	11900	7020	4340
CFSM	.86	.73	.78	.62	.55	.51	.81	.77	1.35	1.02	.45	.24
IN.	.99	.81	.90	.71	.59	.59	.90	.88	1.50	1.18	.52	.26
AC-FT	1022000	841400	930700	737500	609700	611800	928900	914200	1554000	1216000	541000	273100

CAL YR 1983	TOTAL	4755640	MEAN	13030	MAX	25300	MIN	6020	CFSM .67	IN 9.12	AC-FT	9433000
WTR YR 1984	TOTAL	5132820	MEAN	14020	MAX	42900	MIN	4340	CFSM .72	IN 9.84	AC-FT	10180000

LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1968-70, October 1977 to current year.

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

WATER QUALITY DATA WATER YEAR OTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	STREAM-FLOW, INSTAN-TANEOUS (CFS) (00061)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE, AIR (DEG C) (00020)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT , 1983												
12...	1500	--	15100	130	95	8.5	7.0	5.0	8.0	4.0	732	10.7
DEC												
06...	1015	16100	--	80	97	--	6.9	-15.0	.5	3.0	726	--
FEB , 1984												
01...	1000	10300	--	62	78	6.8	6.7	-8.0	1.0	1.9	722	12.5
MAR												
28...	1230	--	9300	113	85	7.5	7.1	7.0	1.0	2.0	730	11.6
MAY												
22...	1015	14200	--	97	90	7.7	7.2	20.0	14.0	4.2	722	9.4
JUL												
17...	1145	--	18100	90	77	7.1	7.3	20.5	19.0	4.7	726	7.6

DATE	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	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)
OCT , 1983											
12...	94	88	270	12	4.0	3.3	.80	40	12	3.5	<.10
DEC											
06...	--	--	87	13	4.1	3.7	.90	42	9.1	2.9	.10
FEB , 1984											
01...	93	K2600	160	8.4	2.7	3.7	.80	29	6.8	3.9	<.10
MAR											
28...	85	680	110	9.2	2.7	3.3	.90	30	5.6	3.9	<.10
MAY											
22...	96	1300	230	11	3.4	2.7	.80	36	6.7	4.1	<.10
JUL											
17...	86	170	1200	9.3	2.8	2.2	.70	31	9.8	2.6	<.10

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

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)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT , 1983											
12...	5.5	96	<.10	.060	.60	.040	.020	.010	14	571	76
DEC											
06...	5.3	94	.11	<.010	.60	.040	.020	.010	--	--	--
FEB , 1984											
01...	3.7	70	.15	.080	1.6	.030	.030	<.010	2	56	100
MAR											
28...	3.9	52	<.10	<.010	.80	.020	.010	<.010	6	151	72
MAY											
22...	2.6	82	<.10	.080	.30	.030	.020	<.010	13	498	93
JUL											
17...	2.9	56	<.10	.150	.30	.030	.030	.020	11	538	95

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)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)
FEB , 1984											
01...	1000	30	1	22	<.5	<1	4	<3	3	99	7
MAR											
28...	1230	30	1	21	<.5	<1	4	<3	1	120	3
MAY											
22...	1015	10	1	20	1.0	<1	5	<3	1	130	<1
JUL											
17...	1145	<10	2	20	<.5	<1	7	<3	12	150	2

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
FEB , 1984										
01...	<4	7	<.1	<10	1	<1	<1	26	<6	23
MAR										
28...	5	12	<.1	<10	1	<1	<1	28	<6	<3
MAY										
22...	9	6	<.1	<10	2	<1	<1	28	<6	13
JUL										
17...	8	5	.1	<10	<1	<1	3	26	<6	23

LAKE OF THE WOODS BASIN

05134200 RAPID RIVER NEAR BAUDETTE, MN

LOCATION.--Lat 48°32'10", long 94°33'45", in SE¼NE¼ sec.1, T.158 N., R.31 W., Lake of the Woods County, Hydrologic Unit 09030007, on left bank 20 ft (6 m) upstream from bridge on State Highway 72, 1.2 mi (1.9 km) downstream from North Branch Rapid River, and 12 mi (19 km) south of Baudette.

DRAINAGE AREA.--543 mi^2 (1,406 km^2).

PERIOD OF RECORD.--October 1956 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,093.92 ft (333.427 m) National Geodetic Vertical Datum of 1929 (Minnesota Department of Transportation bench mark).

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

AVERAGE DISCHARGE.--28 years, 316 ft^3/s (8.949 m^3/s), 7.90 in/yr (201 mm/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,550 ft^3/s (214 m^3/s) Apr. 26, 1979, gage height, 21.13 ft (6.440 m); no flow Dec. 20, 1976 to Mar. 9, 1977.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of May 11, 1950, reached a stage of 21.1 ft (6.431 m), from information by local residents and Minnesota Department of Transportation, discharge, about 7,500 ft^3/s (210 m^3/s).

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 1,810 ft^3/s (51.3 m^3/s) June 9, gage height, 8.61 ft (2.624 m); minimum, 4.4 ft^3/s (0.12 m^3/s) Sept. 22, 23, gage height, 1.84 ft (0.561 m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	709	526	390	74	27	48	800	570	131	678	64	8.6
2	1040	513	360	72	27	46	1000	542	117	605	58	8.3
3	1060	494	340	70	26	44	1100	507	107	570	53	8.8
4	1020	473	320	70	26	42	1200	488	103	528	46	12
5	962	465	300	70	26	41	1160	462	158	458	39	8.9
6	908	451	280	67	26	40	1100	448	332	415	34	8.0
7	898	440	260	64	26	39	1010	498	518	370	34	7.2
8	1070	436	240	62	26	38	908	578	1040	328	30	7.4
9	1060	423	230	60	26	37	834	568	1770	350	30	7.4
10	988	406	220	58	26	36	790	542	1650	368	28	7.3
11	969	386	205	56	26	35	898	518	1320	325	26	7.3
12	927	345	190	54	26	34	1200	492	1120	278	25	7.6
13	870	357	180	52	26	33	1270	472	972	562	22	7.3
14	844	345	170	50	27	32	1200	455	818	825	29	7.3
15	809	335	160	48	28	32	1110	430	686	698	25	6.8
16	1070	329	150	46	30	31	1030	400	615	555	23	6.6
17	1220	316	140	44	32	30	943	382	578	458	24	6.3
18	1130	333	130	42	34	30	860	365	558	385	18	6.0
19	1020	326	125	40	37	31	783	335	522	320	17	5.8
20	936	391	120	38	40	34	729	308	460	251	19	5.3
21	864	421	115	37	45	40	681	305	408	207	21	5.0
22	798	475	110	36	50	45	642	335	382	172	23	4.5
23	745	505	105	35	50	50	608	325	378	146	18	4.4
24	708	449	100	34	50	60	580	298	335	121	15	5.0
25	714	550	95	33	50	70	560	269	285	106	14	5.0
26	692	600	90	32	50	90	538	251	322	95	13	5.0
27	658	550	86	31	50	110	542	213	783	84	12	5.8
28	634	500	83	30	50	150	615	198	927	76	11	6.0
29	596	460	80	29	49	210	637	176	870	71	11	5.3
30	565	420	78	28	---	300	605	152	783	66	9.5	5.0
31	543	---	76	28	---	450	---	146	---	67	8.7	---
TOTAL	27027	13020	5528	1490	1012	2308	25933	12028	19048	10538	800.2	201.2
MEAN	872	434	178	48.1	34.9	74.5	864	388	635	340	25.8	6.71
MAX	1220	600	390	74	50	450	1270	578	1770	825	64	12
MIN	543	316	76	28	26	30	538	146	103	66	8.7	4.4
CFSM	1.61	.80	.33	.09	.06	.14	1.59	.72	1.17	.63	.05	.01
IN.	1.85	.89	.38	.10	.07	.16	1.78	.82	1.30	.72	.05	.01
AC-FT	53610	25830	10960	2960	2010	4580	51440	23860	37780	20900	1590	399

CAL YR 1983 TOTAL 137746.0 MEAN 377 MAX 1970 MIN 12 CFSM .69 IN 9.44 AC-FT 273200
WTR YR 1984 TOTAL 118933.4 MEAN 325 MAX 1770 MIN 4.4 CFSM .60 IN 8.15 AC-FT 235900

LAKE OF THE WOODS BASIN

05140520 LAKE OF THE WOODS AT WARROAD, MN

(International gaging station)

LOCATION.--Lat 48°54'15", long 95°18'57", in SW¼SE¼ sec.29, T.163 N., R.36 W., Roseau County, Hydrologic Unit 09030009, on left bank of Warroad River in Warroad, 300 ft (91 m) downstream from Canadian National railroad bridge, 1,000 ft (305 m) downstream from bridge on State Highway 11, and 4,000 ft (1,200 m) upstream from mouth of Warroad River.

DRAINAGE AREA.--27,200 mi^2 (70,400 km^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 (304.800 m) Lake of the Woods datum; gage readings have been reduced to elevations based on Lake of the Woods datum.

REMARKS.--Runoff conditions of the Warroad River can affect water levels obtained at this station. Water level subject to fluctuation caused by change in direction and velocity of wind and seiches.

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

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation, 1,062.36 ft (323.807 m) Sept. 12, 1978; maximum daily, 1,061.84 ft (323.649 m) Sept. 12, 1978; minimum elevation recorded, 1,055.94 ft (321.851 m) Sept. 4, 1980; minimum daily recorded, 1,056.52 ft (322.027 m) Apr. 15, 1981.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,061.89 ft (323.664 m) July 12; maximum daily, 1,060.75 ft (323.317 m) July 13; minimum, 1,057.85 ft (322.433 m) Apr. 28; minimum daily, 1058.34 ft (322.582 m) Apr. 28.

ELEVATION, IN FEET (LAKE OF THE WOODS DATUM), WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1059.75	1059.89	1059.85	1059.87	1059.44	1059.04	1058.47	1058.86	1059.06	1060.37	1060.57	1059.94
2	1059.83	1060.30	1059.84	1059.86	1059.42	1059.01	1058.47	1058.90	1058.79	1060.37	1060.52	1059.80
3	1059.89	1060.07	1059.86	1059.82	1059.39	1059.00	1058.48	1058.90	1058.97	1060.37	1060.50	1059.74
4	1059.76	1059.79	1059.84	1059.84	1059.37	1058.98	1058.48	1058.91	1059.22	1060.36	1060.48	1059.74
5	1059.66	1059.82	1059.85	1059.82	1059.36	1058.95	1058.50	1058.95	1059.10	1060.54	1060.47	1059.66
6	1059.70	1059.90	1059.86	1059.83	1059.35	1058.95	1058.52	1058.95	1059.28	1060.54	1060.39	1059.55
7	1059.87	1059.72	1059.85	1059.80	1059.33	1058.94	1058.54	1058.93	1059.10	1060.46	1060.41	1059.51
8	1059.73	1059.88	1059.84	1059.81	1059.31	1058.89	1058.54	1059.06	1059.18	1060.49	1060.34	1059.43
9	1059.69	1060.05	1059.85	1059.78	1059.29	1058.86	1058.56	1059.02	1059.52	1060.52	1060.31	1059.49
10	1059.64	1059.98	1059.90	1059.79	1059.27	1058.81	1058.58	1058.95	1059.75	1060.57	1060.47	1059.54
11	1059.57	1059.94	1059.88	1059.79	1059.25	1058.81	1058.64	1058.88	1059.44	1060.54	1060.32	1059.54
12	1059.93	1059.87	1059.88	1059.78	1059.26	1058.82	1058.69	1059.08	1059.68	1060.66	1060.32	1059.49
13	1059.94	1059.78	1059.90	1059.76	1059.22	1058.80	1058.69	1059.10	1059.72	1060.75	1060.28	1059.41
14	1059.85	1059.83	1059.89	1059.73	1059.19	1058.80	1058.70	1059.08	1059.81	1060.48	1060.15	1059.42
15	1060.03	1059.91	1059.90	1059.70	1059.22	1058.76	1058.72	1059.13	1059.82	1060.48	1060.29	1059.30
16	1059.73	1059.84	1059.89	1059.67	1059.22	1058.77	1058.76	1059.07	1059.88	1060.53	1060.26	1059.23
17	1059.72	1059.82	1059.88	1059.67	1059.22	1058.75	1058.77	1058.81	1059.98	1060.67	1060.20	1059.14
18	1060.02	1059.78	1059.88	1059.66	1059.21	1058.72	1058.79	1058.84	1060.02	1060.43	1060.22	1059.25
19	1059.93	1059.91	1059.88	1059.63	1059.19	1058.68	1058.81	1059.10	1060.13	1060.62	1060.11	1059.27
20	1059.88	1060.07	1059.87	1059.60	1059.17	1058.65	1058.82	1059.15	1060.18	1060.64	1059.95	1059.24
21	1059.83	1059.80	1059.86	1059.60	1059.18	1058.63	1058.85	1058.96	1060.19	1060.55	1060.00	1059.63
22	1059.91	1059.89	1059.85	1059.60	1059.15	1058.61	1058.84	1059.01	1060.19	1060.56	1060.18	1058.70
23	1059.88	1059.91	1059.84	1059.59	1059.13	1058.60	1058.83	1059.09	1060.00	1060.57	1060.02	1058.95
24	1059.83	1059.41	1059.82	1059.55	1059.13	1058.58	1058.80	1059.17	1060.23	1060.61	1059.93	1059.67
25	1059.82	1059.59	1059.82	1059.54	1059.12	1058.58	1058.75	1059.34	1060.11	1060.57	1059.92	1059.18
26	1059.89	1059.88	1059.82	1059.52	1059.09	1058.59	1059.10	1059.05	1060.24	1060.61	1059.89	1058.87
27	1059.87	1059.91	1059.82	1059.53	1059.08	1058.56	1059.02	1059.19	1060.41	1060.58	1059.89	1059.05
28	1059.93	1059.91	1059.85	1059.50	1059.06	1058.54	1058.34	1059.10	1060.43	1060.51	1059.89	1058.93
29	1059.90	1059.86	1059.86	1059.50	1059.05	1058.51	1058.83	1059.09	1060.39	1060.42	1059.75	1058.92
30	1059.84	1059.84	1059.87	1059.48	---	1058.49	1058.95	1058.91	1060.30	1060.39	1059.62	1059.00
31	1059.84	---	1059.88	1059.46	---	1058.48	---	1059.01	---	1060.56	1059.84	---
MEAN	1059.83	1059.87	1059.86	1059.68	1059.23	1058.75	1058.69	1059.02	1059.77	1060.53	1060.18	1059.35
MAX	1060.03	1060.30	1059.90	1059.87	1059.44	1059.04	1059.10	1059.34	1060.43	1060.75	1060.57	1059.94
MIN	1059.57	1059.41	1059.82	1059.46	1059.05	1058.48	1058.34	1058.81	1058.79	1060.36	1059.62	1058.70

CAL YR 1983 MEAN 1059.52 MAX 1060.54 MIN 1058.26
WTR YR 1984 MEAN 1059.57 MAX 1060.75 MIN 1058.34

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.

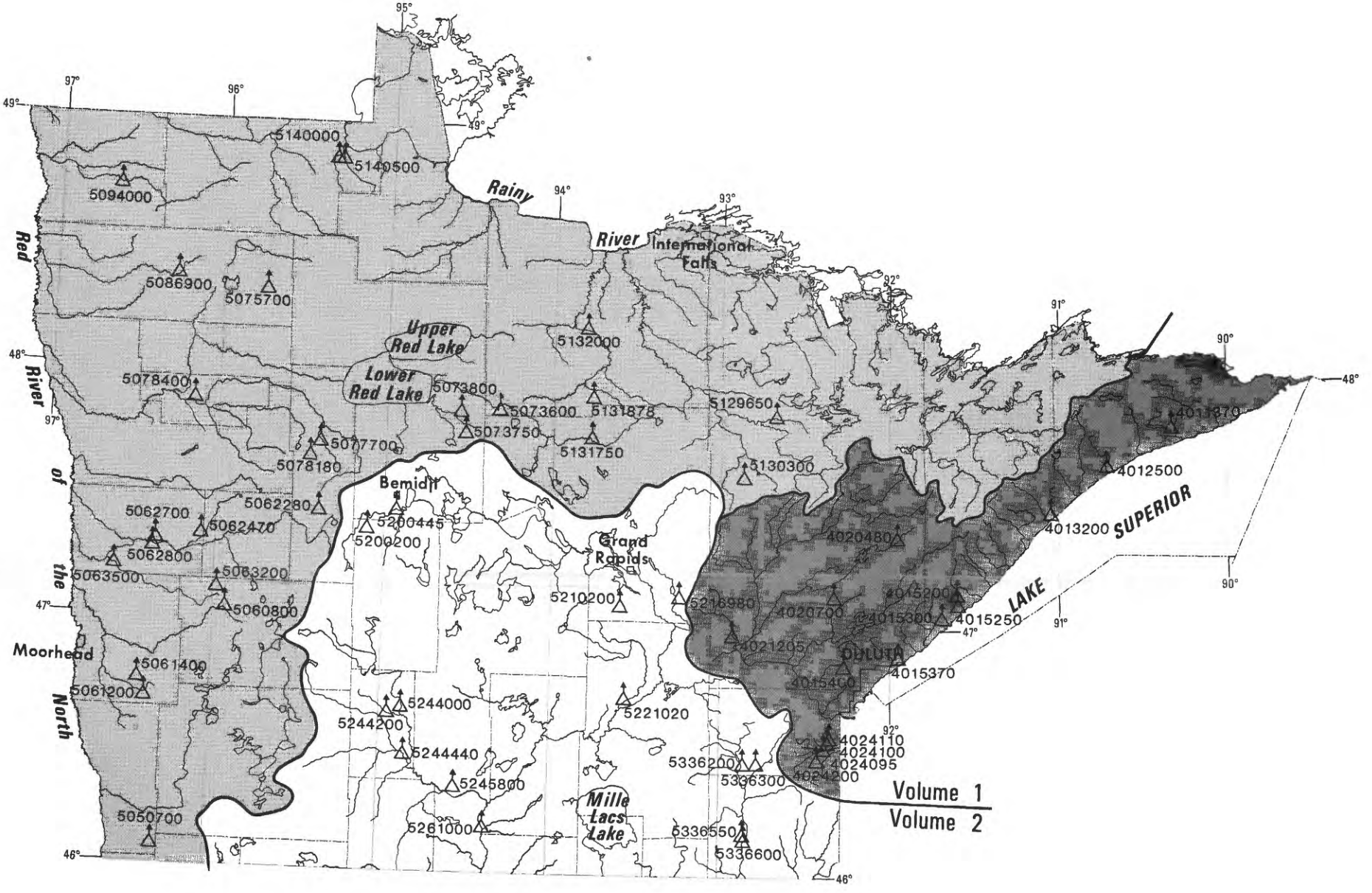
Low-flow partial-record stations

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 1984

Station No.	Station name	Location	Drainage area (mi^2)	Period of record	Measurements	
					Date	Discharge (ft^3/s)
		Streams tributary to Lake Superior				
04010530	Reservation River near Hovland, MN	Lat 47°52'38", long 89°51'45", in SW¼ sec.6, T.62 N., R.5 E., Cook County, Hydrologic Unit 04010101, at bridge on U.S. Highway 61, 0.2 Mile upstream from mouth, 4 miles northeast of Hovland.	-	1974, 1984	8-15-84	4.2
04013000	Cross River at Schroeder, MN	Lat 47°32'40", long 90°54'10", in NE¼NE¼ sec.1, T.58 N., R.5 W., Hydrologic Unit 04010101 Cook County, at bridge on U.S. Highway 61, at Schroeder.	a91	1911-12, 1930-32#, 1974	8-14-84	36
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	8-16-84	1.6
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 U.S. Highway 61, 0.2 mile upstream from mouth, 1.5 miles northeast of Two Harbors.	-	1974, 1984	8-16-84	8.80
		Stream tributary to the Red River of the North Basin				
05102600	Joe River near Noyes, MN	Lat 48°59'30", long 97°07'43", in NW¼NW¼ T.164 N., R.50 W., sec.34, Kittson County, Hydrologic Unit 09020311, 1.1 miles upstream of Minnesota-Candian Border, 3.5 miles east of junction of U.S. Highway 75 and County Road 16, on township road.	-	1984,	8-30-84	0

Operated as a continuous-record gaging station.
a Approximate


Red River of the North
Rainy River
International Falls
Upper Red Lake
Lower Red Lake
Bemidji
Grand Rapids
Moorhead
Mille Lacs Lake
SUPERIOR LAKE
DULUTH
5140000
5140500
5094000
5086900
5075700
5132000
5078400
5073800
5073600
5131878
5073750
5131750
5129650
5077700
5078180
5130300
4015870
4012500
4013200
5062280
5062700
5062470
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5200200
4020480
5062800
5063500
5063200
5060800
5210200
5216980
4020700
4015200
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4015250
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Volume 1
Volume 2

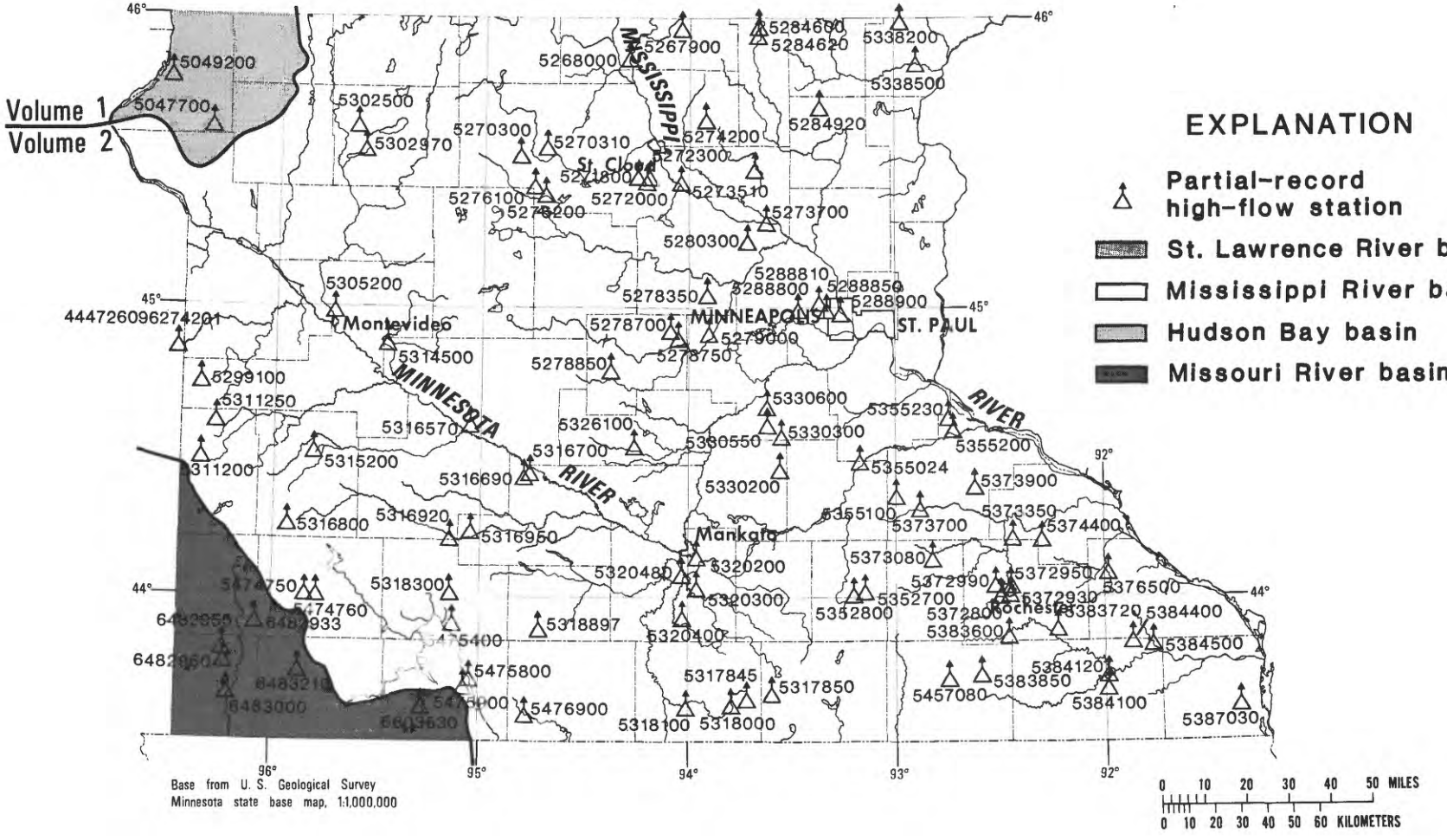

Figure 9.--Location of high-flow partial-record stations

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 1984

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, and 0.3 mile upstream from mouth.	112	1912-17#, 1928-47#, 1952-61#, 1972-84	4-28-84	5.25	1,080
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	1961-84	4-27-84	13.36	550
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, and 1.4 miles upstream from mouth.	.96	1960-84	6-10-84	7.12	†
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, and 4.5 miles northeast of Two Harbors.	3.72	1965-84	6-10-84	3.55	148
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 City, Hydrologic Unit 04010102, at culvert on county highway, 2.0 miles upstream from mouth, and 2.7 miles north of Two Harbors.	5.54	1960-84	6-10-84	9.64	†
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, and 0.5 mile northeast of Duluth city limits.	5.79	1964-84	6-10-84	14.31	200
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	1960-84	6-10-84	a15.41	120

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1984--Continued

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--Continued					
04020480	North Branch Whiteface River near Fairbanks, MN	Lat 47°22'20", long 91°56'28", at common corner of secs.35, 36, 1, and 2, along line between T.57 N., and T.56 N., R.13 W., St. Louis County, Hydrologic Unit 04010201, on right downstream wingwall of double box culvert on County Highway 16, 2 miles upstream from the mouth of Jenkins Creek, and 0.7 mile west of Fairbanks.	17.1	1979-84	6-12-84	b12.72	100
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	1979-84	4-13-84	a13.18	195
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	1972-84	6-10-84	15.11	1,000
04024095	Nemadji River near Holyoke, MN	Lat 46°31'04", long 92°23'22", in NE¼NE¼ sec.32, T.47 N., R.16 W., Carlton County, Hydrologic Unit 04010301, at bridge on State Highway 23, 3.5 miles north of Holyoke.	118	1972-84	6-11-84	12.91	2,150
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, and 4.4 mile east of Blackhoof.	4.94	1961-65, 1967-84	6-11-84	18.51	600
04024110	Rock Creek tributary near Blackhoof, MN	Lat 46°32'14", long 92°22'05", in NE¼SE¼ sec.21, T.47 N., R.16 W., Carlton County, Hydrologic Unit 04010301, at culvert on State Highway 23, 0.1 mile upstream from mouth, and 4.5 miles east of Blackhoof.	.20	1961-84	6-11-84	9.74	14
04024200	South Fork Nemadji River near Holyoke, MN	Lat 46°29'38", long 92°24'36", in SE¼SE¼ sec.6, T.46 N., R.16 W., Carlton County, Hydrologic Unit 04010301, at culvert on State Highway 23, 1.7 miles downstream from Clear Creek, and 2.0 miles northwest of Holyoke.	19.4	1961-84	6-11-84	12.60	710
		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	1964-84	6- 8-84	d7.29	25

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1984--Continued

Station No.	Station name	Location	Drainage area (mi2)	Period of Record	Annual maximum Date	Gage height (feet)	Discharge (ft3/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, Hydologic Unit 09020102, at culvert on County Highway 67, 1.4 miles upstream from mouth, 2.0 miles southwest of Wheaton.	68.5	1965-68, 1970-84	6-22-84	---	c40
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	1979-84	6- 8-84	c14.06	910
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	1960-84	6- 8-84	12.70	†
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#, 1967-84	6- 8-84	4.83	153
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	1961-84	6- 8-84	7.56	45
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	1961-84	3-27-84	d8.43	16
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	1961-84	6- 8-84	a12.08	165
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#, 1984	6-11-84	6.96	1,370
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	1961-84	6- 8-84	12.47	120

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1984--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					
05062800	Coon Creek near Twin Valley, MN	Lat 47°15'51", long 96°20'34", in NE¼NE¼ sec.26, T.144 N., R.45 W., Norman County, Hydrologic Unit 09020108, at bridge on County Highway 28, 1.3 miles upstream from mouth, 4.0 miles west of Twin Valley.	50.8	1962-84	6- 9-84	12.87	1,450
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	1963-84	6- 8-84	d7.98	78
05063500	South Branch Wild Rice River near Borup, MN	Lat 47°11'40", long 96°34'40", in NW¼NW¼w sec.24, T.143 N., R.47 W., Norman County, Hydrologic Unit 09020108, at bridge on County Highway 193, 3.5 miles upstream from Wild Rice River, 4.0 miles northwest of Borup.	254	1944-49#, 1972-84	6-11-84	17.58	2,700
05067500	Marsh River near Shelly, MN	Lat 47°24'45", long 96°45'50", in NE¼NW¼ sec.3, T.145 N., R.48 W., Norman County, Hydrologic Unit 09020107, at bridge 3.8 miles southeast of Shelly, 10 miles upstream from mouth.	151	1944-83#, 1984	6-11-84	a16.17	2,260
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	1960-84	6- 8-84	a14.81	42
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	1960-84	4- 5-84	13.03	41
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	1960-84	6- 8-84	a7.48	41
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	1979-84	6- 8-84	16.55	715
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#, 1979-84	3-26-84	4.03	195

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1984--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					
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	1960-84	4-17-75	e11.89	f 81
					3-29-76	e 8.46	c 42
					3-12-77	e 6.25	f 3.5
					4- 6-78	e11.00	f 72
					4-20-79	8.68	77
					4- 5-80	e ---	c 35
					9- 7-81	7.12	f 16
					7-21-82	8.60	f 72
					10-11-82	8.15	f 58
					6- 8-84	7.83	47
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	1961-84	6- 8-84	12.02	†
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	1979-84	6-10-84	b15.02	360
05094000	South Branch Two Rivers at Lake Bronson, MN	Lat 48°43'50", long 96°39'50", in SW¼SW¼ sec.30, T.161 N., R.46 W., Kittson, County, Hydrologic Unit 09020312, 70 ft upstream from culvert on U.S. Highway 59 at town of Lake Bronson, 3.4 miles downstream from dam at outlet of Bronson Lake.	444	1929-36#, 1937#, 1941-47#, 1954-81#, 1982-84	4- 3-84	6.45	623
		Lake of the Woods basin					
05129650	Little Fork River at Cook, MN	Lat 47°51'15", long 92°41'55", in SE¼NE¼ sec.13, T.62 N., R.19 W., St. Louis County, Hydrologic Unit 09030005, at bridge on U.S. Highway 53, 0.6 mile west of Cook.	61.5	1968-84	6-10-84	a15.53	398
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	1959-84	6-11-84	d12.16	135
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	1973-84	6- 9-84	a13.39	1,580
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	1979-84	6- 9-84	d13.59	288

\# Operated as a continuous-record gaging station.
† Discharge not determined.
a Affected by shifting control.
b Affected by beaver dam.
c Estimated.
d Backwater from aquatic growth and debris.
e Backwater from ice.
f Not previously published.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements at miscellaneous sites

Measurements of streamflow at points other than gaging stations are given in the following table. The measurements of base flow are designated by an asterisk (*); measurements of peak flow by a dagger (†).

Discharge measurements made at miscellaneous sites during water year 1984

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 miles south of County road 143.	-	-	5-22-84 6- 5-84 7-13-84 8-15-84 9- 8-84	46 54 20 0.87 0.42
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#	5-22-84 6- 5-84 8-15-84 9-13-84	94 74 3.9 0.7
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.	-	-	5-23-84 6- 6-84 7-12-84	1.8 20 19
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.	-		5-23-84 6- 6-84 7-12-84 8-15-84	33.2 20.0 18.5 0.2
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.	-	-	5-23-84 6- 7-84 7-11-84 8-16-84 9-19-84	158 93 95 10 4.8
Marsh Creek	Wild Rice River	Lat 47°19'03", long 93°05'15", in NW¼SW¼sec.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.	-	-	6- 7-84 7-11-84	17 0.5
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	5-23-84 6- 7-84 7-11-84 8-15-84 9-14-84	173 135 102 16 5.8
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.	-	-	5-23-84 6- 6-84 7-12-84	3.7 4.2 0.5

Operated as a continuous-record gaging station.

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

Water-quality partial-record stations are particular sites where chemical-quality, biological and (or) sediment data are collected systematically over a period of years for use in hydrological analyses.

465750096025701 - BUFFALO RIVER NEAR LAKE PARK

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	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)
MAY												
23...	1100	412	417	7.9	15.0	150	53	30	3.3	226	19	3.0

DATE	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, 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)	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)
MAY												
23...	292	31	<.10	.040	1.6	.50	.040	.010	2	100	60	1

DATE	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	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)	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)
MAY												
23...	10	1	20	<1	30	.6	<1	<1	<10	14	1.1	<.01

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

465955095364201 - OTTER TAIL RIVER NEAR PONSFORD

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE (DEG C) (00010)	TURBIDITY (NTU) (00076)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)
MAY										
22...	1400	333	329	7.6	8.1	17.0	2.5	35	19	1.7

DATE	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)	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)
MAY									
22...	174	2.0	1.5	197	2	<.10	.02	2.5	.30

DATE	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	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)	IRON, DISSOLVED (UG/L AS FE) (01046)
MAY									
22...	.02	.01	1	65	40	<1	<10	2	46

DATE	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)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	CYANIDE TOTAL (MG/L AS CN) (00720)
MAY									
22...	1	21	.4	<1	<1	14	9.4	.50	<.01

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

471710096055201 - WILD RICE RIVER NEAR FAITH

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE (DEG C) (00010)	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)
MAY												
23...	1800	419	415	8.2	18.0	180	58	20	2.4	225	45	50

DATE	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	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)	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)
MAY												
23...	298	10	<.10	.04	1.7	.30	.04	.03	2	100	70	1

DATE	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COPPER, DISSOLVED (UG/L AS CU) (01040)	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)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	CYANIDE TOTAL (MG/L AS CN) (00720)
MAY												
23...	10	<1	20	<1	20	.8	<1	<1	20	14	60	<.01

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482355092383601 - TOOTH LAKE NR CRANE LAKE MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	RESER-VOIR DEPTH (FEET) (72025)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE (DEG C) (00010)	COLOR (PLAT-INUM-COBALT UNITS) (00080)	TRANS-PAR-ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS-SOLVED (MG/L) (00300)
MAY										
03...	0930	38.4	33	35	6.4	6.6	6.5	35	3.3	10.4
AUG										
21...	1400	41.9	30	32	6.0	6.4	23.5	21	2.9	6.9

DATE	BARO-METRIC PRES-SURE (MM OF HG) (00025)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)
MAY									
03...	719	3.0	1.4	1.0	.60	13	10	.60	39
AUG									
21...	731	3.0	1.4	1.1	.70	13	16	.67	30

DATE	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
MAY									
03...	2	.06	.40	.010	<.001	75	8	1.1	<.10
AUG									
21...	4	<.01	.40	.004	<.001	71	33	1.9	<.10

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

482812092500801 - EK LAKE NR INTERNATIONAL FALLS MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	RESER-VOIR DEPTH (FEET) (72025)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE (DEG C) (00010)	COLOR (PLAT-INUM-COBALT UNITS) (00080)	TRANS-PAR-ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS-SOLVED (MG/L) (00300)
MAY										
03...	1020	18.1	31	33	5.7	7.0	8.0	55	1.5	10.9
AUG										
21...	1305	22.1	27	29	6.1	6.5	23.5	35	1.6	6.3

DATE	BARO-METRIC PRES-SURE (MM OF HG) (00025)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)
MAY									
03...	720	3.1	1.2	1.1	.70	13	2.6	.70	40
AUG									
21...	732	3.0	1.2	1.1	.60	10	5.2	<1.0	32

DATE	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
MAY									
03...	2	.05	.70	.020	.002	380	33	5.4	<.10
AUG									
21...	5	<.01	.90	.011	<.001	160	3	2.9	<.10

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483059092474501 - BROWN LAKE NR INTERNATIONAL FALLS MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	RESER-VOIR DEPTH (FEET) (72025)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE (DEG C) (00010)	COLOR (PLAT-INUM-COBALT UNITS) (00080)	TRANS-PAR-ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS-SOLVED (MG/L) (00300)
MAY										
02...	1315	26.0	24	25	5.9	6.2	7.0	40	2.1	10.5
AUG										
21...	1145	27.5	22	24	5.6	6.3	22.0	25	2.9	5.9

DATE	BARO-METRIC PRES-SURE (MM OF HG) (00025)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)
MAY									
02...	722	2.2	.87	1.0	.60	9.6	11	.80	32
AUG									
21...	731	2.2	.92	1.0	.60	9.0	4.7	.60	26

DATE	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
MAY									
02...	2	3.7	.30	.006	<.001	170	4	2.7	<.10
AUG									
21...	4	<.01	.50	<.001	<.001	130	160	2.6	<.10

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483109092422601 - RYAN LAKE NR INTERNATIONAL FALLS MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	RESER-VOIR DEPTH (FEET) (72025)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE (DEG C) (00010)	COLOR (PLAT-INUM-COBALT UNITS) (00080)	TRANS-PAR-ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS-SOLVED (MG/L) (00300)
MAY										
02...	1355	13.3	32	31	5.9	6.3	7.0	35	3.9	10.3
AUG										
21...	1215	13.2	28	30	6.4	6.7	23.0	22	3.2	6.1

DATE	BARO-METRIC PRES-SURE (MM OF HG) (00025)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)
MAY									
02...	723	3.1	1.1	1.0	.60	10	12	.60	46
AUG									
21...	732	2.9	1.1	1.1	.50	9.8	7.3	.70	32

DATE	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
MAY									
02...	2	1.1	.50	.003	.003	240	37	1.5	<.10
AUG									
21...	3	.01	.80	.040	<.001	53	4	2.1	<.10

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483139092553801 - LOITEN LAKE NR INTERNATIONAL FALLS MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE (DEG C) (00010)	COLOR (PLATINUM-COBALT UNITS) (00080)	TRANSPARENCY (SECCHI DISK) (M) (00078)	OXYGEN, DISSOLVED (MG/L) (00300)
MAY										
02...	1230	47.2	29	25	5.7	6.3	6.0	25	3.5	10.4
AUG										
21...	1045	42.0	26	28	5.7	6.4	21.0	10	4.5	5.8

DATE	BAROMETRIC PRESSURE (MM OF HG) (00025)	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)	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)
MAY									
02...	722	2.7	1.1	1.0	.70	12	4.9	.70	38
AUG									
21...	731	2.6	1.2	1.0	.70	10	6.5	.50	36

DATE	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
02...	1	4.6	.40	.003	<.001	140	5	.90	<.10
AUG									
21...	4	.03	.60	<.001	<.001	75	9	1.3	<.10

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483157092565701 - QUILL LAKE NR INTERNATIONAL FALLS MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	RESERVOIR DEPTH (FEET) (72025)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	TEMPERATURE (DEG C) (00010)	COLOR (PLATINUM-COBALT UNITS) (00080)	TRANSPARENCY (SECCHI DISK) (M) (00078)	OXYGEN, DISSOLVED (MG/L) (00300)
MAY										
02...	1150	38.2	28	22	5.6	6.2	6.0	38	3.0	10.3
AUG										
21...	1000	45.8	26	27	5.6	6.4	23.0	18	3.6	7.4

DATE	BAROMETRIC PRESSURE (MM OF HG) (00025)	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)	BICARBONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)
MAY									
02...	722	2.7	1.1	1.0	.70	10	5.0	.70	41
AUG									
21...	732	2.6	1.2	1.0	.70	8.4	6.7	<1.0	38

DATE	SOLIDS, RESIDUE AT 105 DEG. C, SUSPENDED (MG/L) (00530)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS, TOTAL (MG/L AS P) (00665)	PHOSPHORUS, DISSOLVED (MG/L AS P) (00666)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAY									
02...	1	.07	.40	.004	.002	230	9	.90	<.10
AUG									
21...	2	<.01	1.1	<.001	<.001	79	9	1.8	<.10

ANALYSES OF SAMPLES COLLECTED AT WATER-QUALITY PARTIAL-RECORD STATIONS

483215092585401 - WAR CLUB LAKE NR INTERNATIONAL FALLS MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	TIME	RESER-VOIR DEPTH (FEET) (72025)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE (DEG C) (00010)	COLOR (PLAT-INUM-COBALT UNITS) (00080)	TRANS-PAR-ENCY (SECCHI DISK) (M) (00078)	OXYGEN, DIS-SOLVED (MG/L) (00300)
MAY										
02...	1105	37.5	28	24	5.7	6.2	6.5	40	2.9	11.0
AUG										
21...	0920	36.8	27	27	5.8	6.5	23.5	23	2.1	6.3

DATE	BARO-METRIC PRES-SURE (MM OF HG) (00025)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE IT-FLD (MG/L AS HCO3) (99440)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)
MAY									
02...	724	2.7	1.1	1.0	.60	8.6	5.1	1.0	42
AUG									
21...	732	2.7	1.2	1.0	.60	7.8	7.2	.80	38

DATE	SOLIDS, RESIDUE AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, TOTAL (MG/L AS P) (00665)	PHOS-PHORUS, DIS-SOLVED (MG/L AS P) (00666)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
MAY									
02...	2	4.2	.40	.009	.004	130	6	2.1	<.10
AUG									
21...	2	.03	.80	<.001	<.001	89	5	2.0	<.10

WATER QUALITY DATA AT STREAMFLOW STATIONS

Field determinations of water temperature and specific conductance are made at many streamflow stations in addition to those that are also regular water-quality stations. These data are usually collected at regular intervals during routine visits to the station. Additional data for each station are published elsewhere in this report.

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
04010500 PIGEON RIVER AT MIDDLE FALLS NEAR GRAND PORTAGE, MN							
NOV. 02, 1983...	393	6.5	73	APR 18.....	1890	3.0	55
JAN. 10, 1984...	240	.0	---	MAY 04.....	1920	5.0	---
JAN. 11.....	264	.0	90	JUNE 21.....	901	17.0	60
FEB. 21.....	210	.5	---	AUG. 15.....	317	23.0	75
MAR. 08.....	175	.0	127	SEPT. 05.....	115	13.0	---
04014500 BAPTISM RIVER NEAR BEAVER BAY, MN							
NOV. 01, 1983...	95	6.5	62	APR. 19.....	961	3.5	<50
JAN. 10, 1984...	68	.0	64	APR. 25.....	514	7.5	48
MAR. 07.....	46	.0	103	JUNE 20.....	215	14.0	55
APR. 11.....	484	1.0	55	AUG. 21.....	23	22.0	103
APR. 17.....	1170	3.0	<50				
04015330 KNIFE RIVER NEAR TWO HARBORS, MN							
NOV. 01, 1983...	37	6.0	127	APR. 24.....	81	10.0	80
JAN. 10, 1984...	23	0.5	154	MAY 09.....	160	6.0	85
MAR. 09.....	18	.0	171	JUNE 19.....	60	19.0	70
APR. 03.....	452	.0	65	AUG. 21.....	11	27.0	165
APR. 10.....	516	1.5	65				
04015475 PARTRIDGE RIVER ABOVE COLBY LAKE NEAR HOYT LAKES, MN							
OCT. 26, 1983...	116	5.5	71	APR. 17.....	581	7.0	41
DEC. 21.....	29	.0	92	JUNE 12.....	303	16.0	58
JAN. 04, 1984...	22	.0	92	JUNE 14.....	364	16.5	55
FEB. 17.....	24	.5	120	AUG. 06.....	11	27.0	132
APR. 12.....	392	2.0	<50				
04016500 ST. LOUIS RIVER NEAR AURORA, MN							
OCT. 26, 1983...	448	6.5	76	APR. 12.....	772	2.0	75
DEC. 21.....	164	.0	80	JUNE 14.....	1070	18.0	58
FEB. 16, 1984...	78	.5	100	AUG. 06.....	67	28.0	163
04018750 ST. LOUIS RIVER AT FORBES, MN							
OCT. 27, 1983...	906	6.0	170	APR. 09.....	1370	2.5	105
DEC. 20.....	414	.0	---	APR. 18.....	1770	5.5	136
FEB. 13, 1984...	194	0.5	255	JUNE 15.....	2250	16.5	108
MAR. 01.....	222	.5	200	AUG. 07.....	267	25.0	332
MAR. 23.....	43	.5	272				

MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

WATER QUALTIY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
04021530 STONEY BROOK AT BROOKSTON, MN							
NOV. 03, 1983...	54	6.0	143	APR. 09.....	370	2.5	70
JAN. 13, 1984...	39	.5	194	APR. 23.....	156	8.0	70
MAR. 05.....	30	.0	241	MAY 08.....	229	7.0	85
APR. 02.....	78	2.5	160	JUNE 18.....	211	17.0	85
APR. 05.....	219	3.0	100	AUG. 17.....	12	21.5	190
04023150 SIMIAN CREEK NEAR BROOKSTON, MN							
OCT. 31, 1983...	7.9	7.0	96	APR. 23.....	16	8.5	60
NOV. 08.....	7.1	7.0	---	MAY 08.....	37	7.5	65
APR. 02, 1984...	18	3.0	125	JUNE 18.....	33	19.0	70
APR. 05.....	41	3.0	95	AUG. 16.....	.52	21.0	235
APR. 09.....	78	3.5	65				
04023600 SQUAW CREEK NEAR CLOQUET, MN							
OCT. 31, 1983...	3.3	5.5	86	APR. 12.....	44	3.0	60
NOV. 08.....	5.1	9.0	---	APR. 23.....	9.9	8.0	55
APR. 02, 1984...	12	1.0	85	MAY 08.....	26	6.5	65
APR. 05.....	27	.0	72	JUNE 18.....	15	18.0	80
APR. 09.....	49	2.5	60	AUG. 17.....	.29	18.0	190
04024000 ST. LOUIS RIVER AT SCANLON, MN							
OCT. 31, 1983...	2130	6.0	137	APR. 16.....	7040	6.0	100
JAN. 09, 1984...	2260	0.5	110	JUNE 19.....	7450	17.5	100
MAR. 06.....	2240	.0	154	AUG. 22.....	1240	22.0	155
04024015 OTTER CREEK NEAR CLOQUET, MN							
OCT. 31, 1983...	3.4	5.5	64	APR. 16.....	32	---	---
NOV. 08.....	4.5	---	---	APR. 23.....	8.47	10.5	47
APR. 03, 1984...	13	.0	70	MAY 08.....	14.3	---	---
APR. 09.....	32	1.0	50	JUNE 18.....	12.8	21.0	75
APR. 12.....	35	1.5	50	AUG. 17.....	.29	18.0	105
04024098 DEER CREEK NEAR HOLYOKE, MN							
DEC. 07, 1983...	4.2	.0	280	JUNE 13.....	23	15.5	160
FEB. 08, 1984...	2.4	.0	295	JULY 19.....	1.9	17.0	260
FEB. 15.....	5.2	.0	300	SEPT. 11.....	1.2	13.5	260
APR. 04.....	41	2.0	---	SEPT. 25.....	18	9.0	170
MAY 08.....	12	5.0	205				

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
05046000 OTTER TAIL RIVER BELOW ORWELL DAM NEAR FERGUS FALLS, MN							
OCT. 04, 1983...	309	14.0	400	MAY 03.....	714	10.0	---
DEC. 02.....	279	2.0	380	JUNE 25.....	770	20.0	480
FEB. 01, 1984...	312	0.5	510	AUG. 14.....	51	---	---
APR. 14.....	727	7.0	450				
05050000 BOIS DE SIOUX RIVER NEAR WHITE ROCK, SOUTH DAKOTA							
OCT. 04, 1983...	0	---	---	APR. 20.....	931	---	---
DEC. 02.....	0	---	---	MAY. 03.....	340	11.0	990
FEB. 01, 1984...	0	---	---	JUNE 25.....	549	20.0	725
FEB. 28.....	13	1.0	490	JUNE 26.....	632	---	---
MAR. 28.....	34	2.0	500	AUG. 24.....	18	23.0	965
APR. 04.....	794	11.0	630				
05061000 BUFFALO RIVER NEAR HAWLEY							
OCT. 26, 1983...	75	9.0	850	APR. 26.....	111	11.0	695
NOV. 29.....	71	---	---	MAY 24.....	62	16.0	680
FEB. 23, 1984...	61	2.0	690	JUNE 21.....	207	20.0	750
MAR. 01.....	141	1.0	710	JULY 23.....	26	23.0	640
MAR. 27.....	776	2.5	530	AUG. 28.....	10	---	---
APR. 05.....	340	8.0	670	SEPT. 24.....	12	7.0	750
05061500 SOUTH BRANCH BUFFALO RIVER AT SABIN, MN							
OCT. 26, 1983...	13	---	900	MAY 24.....	9.7	15.0	1030
NOV. 29.....	16	---	---	JUNE 08.....	217	17.0	440
FEB. 24, 1984...	5.0	2.0	750	JUNE 21.....	60	20.0	820
MAR. 01.....	310	0.5	360	JULY 23.....	0	---	---
MAR. 29.....	1150	2.0	510	AUG. 02.....	0	---	---
APR. 05.....	194	8.5	750	AUG. 28.....	0	---	---
APR. 12.....	145	7.0	810	SEPT. 24.....	.11	7.0	1210
APR. 26.....	50	11.0	900				

WATER QUALITY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
05062000 BUFFALO RIVER NEAR DILWORTH, MN							
OCT. 26, 1983...	101	9.0	900	MAY 24.....	84	15.0	730
NOV. 29.....	82	1.5	1000	JUNE 08.....	862	18.0	340
JAN. 11, 1984...	29	0.0	840	JUNE 21.....	410	---	---
FEB. 23.....	64	1.0	800	JULY 05.....	90	22.0	---
MAR. 27.....	1280	0.5	420	JULY 23.....	36	24.0	675
MAR. 30.....	2740	0.5	480	AUG. 28.....	10	23.0	700
APR. 05.....	930	9.0	670	SEPT. 14.....	13	---	---
APR. 12.....	387	8.0	740	SEPT. 24.....	4.7	8.5	760
APR. 26.....	189	11.0	815				
05064000 WILD RICE RIVER AT HENDRUM, MN							
NOV. 16, 1983...	178	3.0	520	APR. 09.....	984	---	---
JAN. 11, 1984...	66	.0	---	MAY 02.....	391	8.0	550
MAR. 07.....	290	.5	555	JUNE 28.....	362	24.0	535
MAR. 27.....	2820	---	---	AUG. 14.....	23	24.0	600
APR. 03.....	1550	4.0	455				
05069000 SANDHILL RIVER AT CLIMAX, MN							
NOV. 15, 1983...	47	3.0	660	APR. 09.....	215	---	---
JAN. 11, 1984...	29	.0	1020	MAY 02.....	85	7.0	650
MAR. 06.....	60	.5	575	JUNE 28.....	176	22.0	640
MAR. 28.....	501	---	---	AUG. 14.....	18	24.0	600
APR. 02.....	1380	---	---				
05074500 RED LAKE RIVER NEAR RED LAKE, MN							
OCT. 07, 1983...	244	8.0	305	MAY 18.....	467	13.5	265
DEC. 05.....	807	.0	330	JULY 13.....	1100	22.0	270
JAN. 20, 1984...	805	.0	---	SEPT. 04.....	643	18.0	295
MAR. 23.....	776	2.0	300				
05075000 RED LAKE RIVER AT HIGH LANDING NEAR GOODRIDGE, MN							
OCT. 06, 1983...	531	7.0	335	MAR. 29.....	883	2.0	295
DEC. 02.....	838	.0	250	MAY. 17.....	622	16.0	270
JAN. 19, 1984...	752	.0	---	JULY 11.....	1010	23.0	270
MAR. 22.....	859	.5	300	SEPT. 05.....	631	16.0	300

MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

WATER QUALTIY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
05076000 THIEF RIVER NEAR THIEF RIVER FALLS, MN							
OCT. 06, 1983...	140	8.0	610	APR. 03.....	870	2.5	430
DEC. 01.....	120	.0	720	MAY 17.....	196	19.0	545
JAN. 18, 1984...	17	.0	900	JULY 11.....	260	25.0	465
MAR. 21.....	30	1.0	---	SEPT. 05.....	2.9	18.0	520
MAR. 30.....	500	.0	385				
05078000 CLEARWATER RIVER AT PLUMMER, MN							
OCT. 27, 1983...	139	6.0	---	APR. 10.....	99	7.0	535
NOV. 14.....	65	4.0	550	APR. 30.....	146	6.5	550
JAN. 09, 1984...	54	.0	595	MAY 09.....	131	8.0	660
MAR. 05.....	18	.0	540	JUNE 27.....	198	20.0	515
MAR. 22.....	115	.5	390	AUG. 13.....	70	25.5	790
APR. 02.....	336	1.5	480				
05078230 LOST RIVER AT OKLEE, MN							
OCT. 06, 1983...	44	7.0	760	APR. 10.....	104	7.0	330
OCT. 28.....	61	4.5	---	APR. 30.....	35	4.5	670
NOV. 14.....	30	3.0	590	MAY 17.....	16	20.0	780
JAN. 09, 1984...	14	.0	---	JUNE 25.....	59	21.5	540
MAR. 05.....	33	.5	520	AUG. 13.....	4.1	26.5	760
MAR. 29.....	271	1.5	350	SEPT. 05.....	.34	18.0	780
APR. 02.....	280	2.0	480				
05078500 CLEARWATER RIVER AT RED LAKE FALLS, MN							
NOV. 15, 1983...	161	5.0	560	APR. 30.....	347	7.0	600
JAN. 10, 1984...	92	.0	650	JUNE 27.....	390	22.5	520
MAR. 06.....	147	.5	600	AUG. 13.....	100	27.0	705
MAR. 29,.....	1190	1.0	350				
05079000 RED LAKE RIVER AT CROOKSTON, MN							
NOV. 15, 1983...	1340	2.0	385	MAY 01.....	1650	6.5	440
JAN. 10, 1984...	970	.0	422	JUNE 26.....	1840	23.0	475
MAR. 06.....	1050	.5	385	AUG. 14.....	867	25.5	366
APR. 03.....	4170	---	---				
05087500 MIDDLE RIVER AT ARGYLE, MN							
OCT. 05, 1983...	.27	9.0	---	MAR. 29.....	400	.0	275
OCT. 27.....	11	5.0	---	APR. 03.....	243	3.5	382
DEC. 01.....	6.7	.0	830	MAY 16.....	22	15.0	660
JAN. 18, 1984...	1.5	.0	1100	JULY 12.....	3.4	24.0	645
MAR. 21.....	.57	.5	---	SEPT. 06.....	.01	19.0	770

MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

WATER QUALTIY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
05104500 ROSEAU RIVER BELOW SOUTH FORK NEAR MALUNG, MN							
OCT. 05, 1983...	53	9.5	370	APR. 04.....	331	3.0	328
NOV. 30.....	55	.0	---	MAY 15.....	140	14.0	340
JAN. 16, 1984...	6.5	.0	680	JULY 10.....	76	23.0	365
MAR. 20.....	5.0	.0	---	AUG. 29.....	.34	14.5	---
05107500 ROSEAU RIVER AT ROSS, MN							
OCT. 04, 1983...	44	10.0	380	MAR 19.....	9.0	.5	630
OCT. 24.....	129	6.0	---	APR. 04.....	1190	5.0	270
OCT. 26.....	122	5.0	---	MAY 14.....	239	14.0	375
NOV. 29.....	100	.0	330	JULY 10.....	241	---	---
JAN. 17, 1984...	9.0	.0	620	AUG. 29.....	3.8	19.5	405
05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN							
OCT. 04, 1983...	42	9.5	355	APR. 04.....	1220	5.0	275
OCT. 26.....	132	4.0	---	MAY 15.....	298	13.0	380
NOV. 30.....	146	.0	390	JULY 10.....	241	23.0	405
JAN. 17, 1984...	13	.0	680	AUG. 22.....	15	18.0	---
FEB. 28.....	24	---	---	AUG. 28.....	10	21.5	400
MAR. 20.....	14	.5	710				
05124480 KAWISHIWI RIVER NEAR ELY, MN							
OCT. 25, 1983...	514	7.0	30	JUNE 13.....	420	17.0	26
FEB. 15, 1984...	94	.5	30	AUG. 07.....	89	25.0	34
APR 26.....	461	6.0	31				
05124990 FILSON CREEK NEAR ELY, MN							
OCT. 26, 1983...	12	4.0	28	APR. 25.....	16	9.0	30
DEC. 21.....	5.6	.0	---	MAY 09.....	59	5.0	22
FEB. 16, 1984...	1.3	.5	<50	JUNE 12.....	13	15.0	28
APR. 11.....	33	1.0	<50	AUG. 09.....	2.1	19.5	37
APR. 17.....	54	3.5	30	SEPT. 17.....	.26	12.0	<50
APR. 19.....	43	6.0	27				
05127000 KAWISHIWI RIVER NEAR WINTON, MN							
OCT. 25, 1983...	2580	8.0	59	JUNE 14, 1984....	3470	17.0	38
05127500 BASSWOOD RIVER NEAR WINTON, MN							
OCT. 12, 1983...	2240	11.0	---	AUG. 08.....	893	25.0	---
JUNE 20, 1984...	3490	19.0	51				

MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

WATER QUALTIY DATA AT STREAMFLOW STATIONS, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)	DATE	MEASURED DISCHARGE (ft^3/s)	TEMPERATURE (^oC)	SPECIFIC CONDUCTANCE (MICROMHOS)
05128000 NAMAKAN RIVER AT OUTLET OF LAC LA CROIX, ONTARIO							
AUG. 09, 1984...	3880	23.0	---	AUG. 31.....	2370	---	---
05129115 VERMILLION RIVER NEAR CRANE LAKE, MN							
OCT. 24, 1983...	920	7.0	57	APR. 11.....	1750	1.0	47
DEC. 22.....	653	.0	69	APR. 16.....	1870	7.0	44
FEB. 14, 1984...	382	.5	100	JUNE 11.....	1170	17.0	63
MAR. 20.....	253	.0	113	AUG. 06.....	329	25.0	85
05129290 GOLD PORTAGE OUTLET FROM KABETOGAMA LAKE NEAR RAY, MN							
OCT. 25, 1983...	375	3.5	90	JAN. 17.....	1.2	---	---
NOV. 02.....	293	7.0	90	MAY 23.....	111	13.0	80
NOV. 04.....	264	2.0	90	JUNE 06.....	226	---	---
NOV. 10.....	208	5.0	---	JULY 18.....	582	21.0	89
NOV. 17.....	167	---	---	SEPT. 11.....	489	18.0	90
JAN. 05, 1984...	25	.0	---				
05130500 STURGEON RIVER NEAR CHISHOLM, MN							
OCT. 27, 1983...	170	6.0	129	APR. 10.....	528	3.0	---
DEC. 15.....	95	4.0	45	JUNE 11.....	750	15.0	93
FEB. 13, 1984...	41	.5	175	AUG. 06.....	34	23.0	245
05131500 LITTLE FORK RIVER AT LITTLEFORK, MN							
OCT. 11, 1983...	2500	9.0	---	APR. 11.....	5890	.5	101
DEC. 07.....	1130	.5	130	MAY 22.....	1610	16.0	102
JAN. 31, 1984...	238	.0	195	JULY 17.....	819	20.5	140
MAR. 27.....	208	.5	284	SEPT. 10.....	100	16.0	250
05132000 BIG FORK RIVER AT BIG FALLS, MN							
OCT. 11, 1983...	1590	9.0	158	APR. 10.	3170	.5	150
DEC. 05.....	860	1.0	---	MAY 21.....	2180	17.0	152
JAN. 30, 1984...	226	.0	210	JULY 16.....	1510	14.0	200
MAR. 26.....	235	.0	345	SEPT. 10.....	205	14.0	265
05133500 RAINY RIVER AT MANITOU RAPIDS, MN							
OCT. 12, 1983...	15100	8.0	130	AUG. 10.....	10300	22.0	---
MAR. 28, 1984...	9420	1.0	113	SEPT. 12.....	4530	14.0	110
JULY 17.....	18100	19.0	90				

MISCELLANEOUS ANALYSES OF STREAMS IN MINNESOTA

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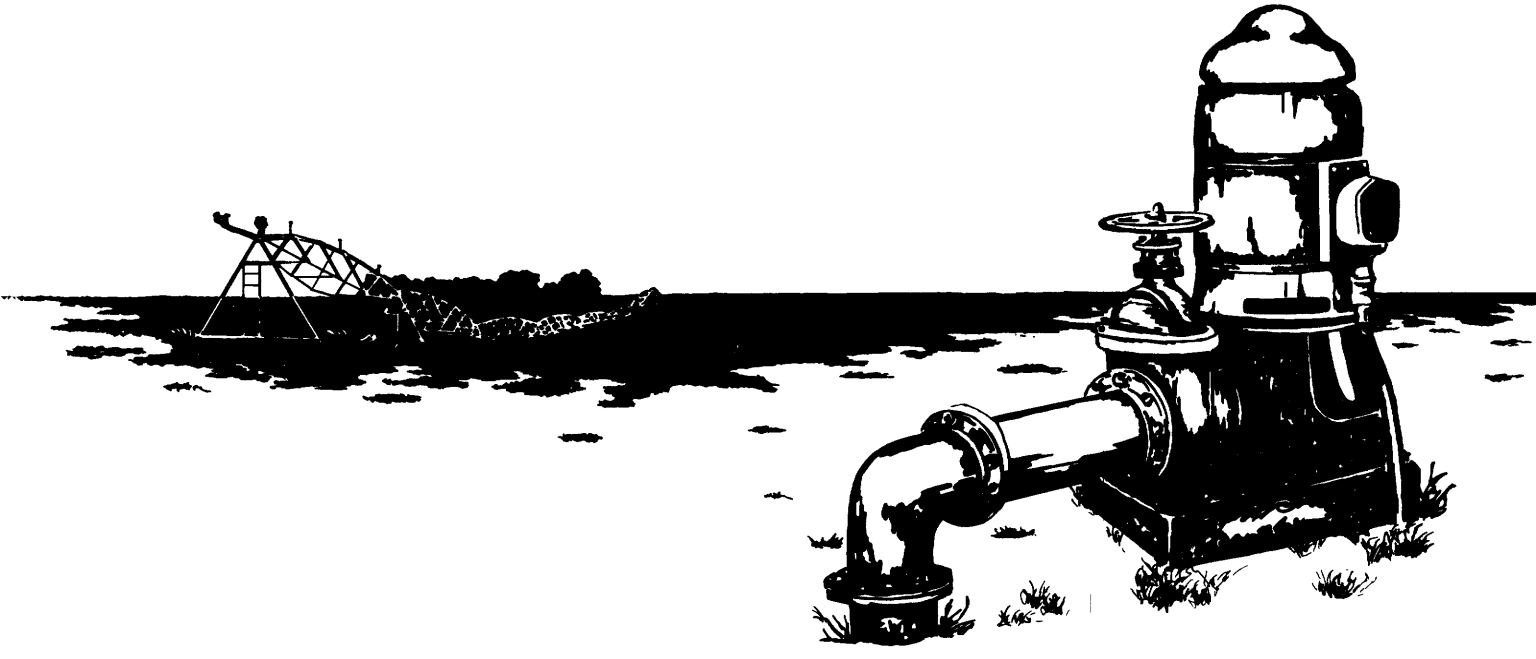
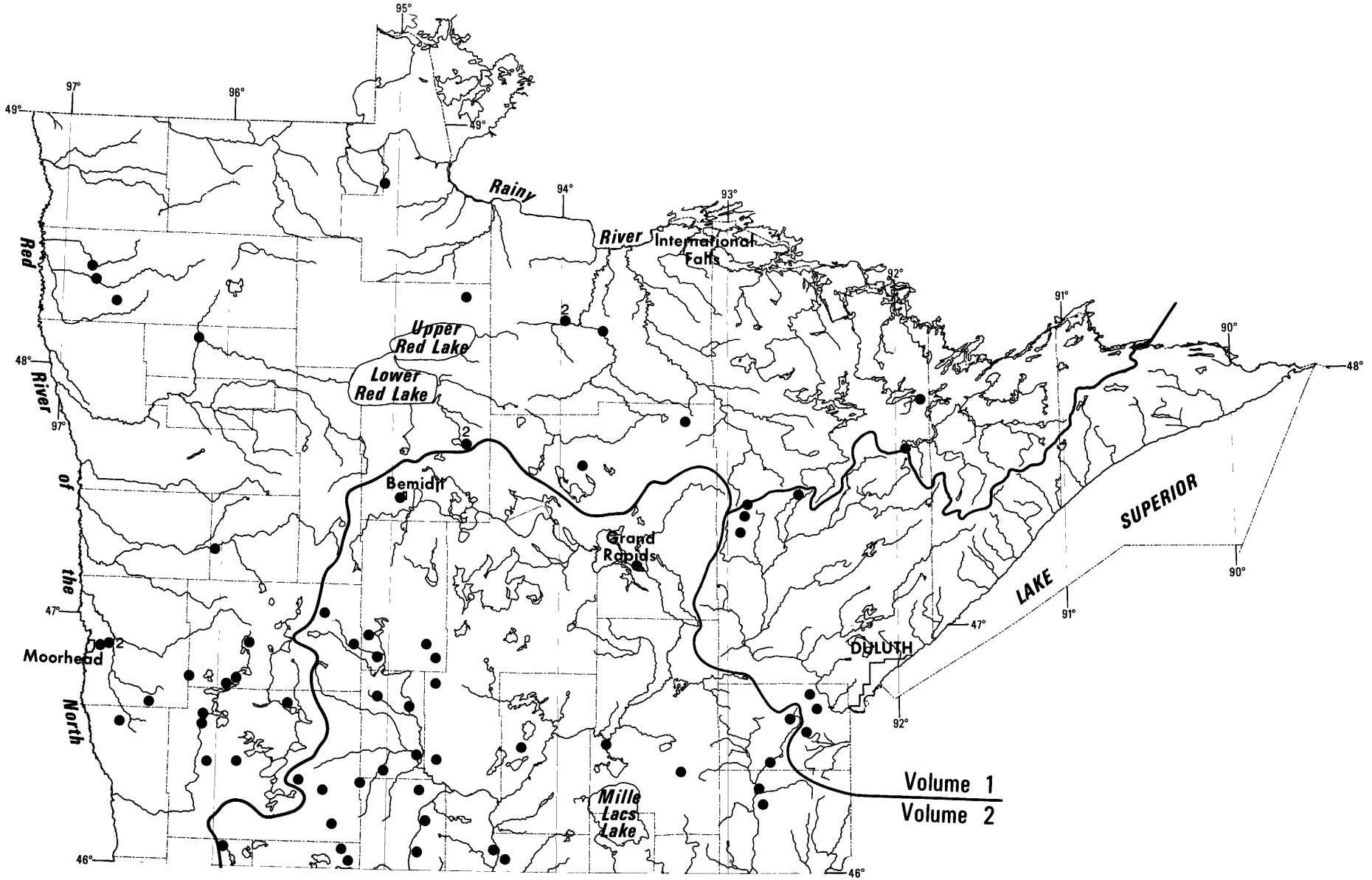
05134200 RAPID RIVER NEAR BAUDETTE, MN							
OCT 13, 1983...	890	6.0	130	APR. 09.....	832	4.5	162
DEC. 08.....	241	.0	105	MAY 24.....	300	17.0	157
FEB. 01, 1984...	27	.0	306	JULY 24.....	121	19.5	194
MAR. 29.....	213	.5	186	SEPT. 12.....	7.4	14.0	377
APR. 05.....	1160	.5	144				



GROUND-WATER RECORDS


95°
97°
96°
49°
Rainy
River
94°
93°
International Falls
92°
91°
90°
Red
River
of the
North
48°
97°
Upper Red Lake
Lower Red Lake
2
Bemidji
Grand Rapids
SUPERIOR
LAKE
47°
91°
90°
Moorhead
DULUTH
92°
Mille Lacs Lake
46°
Volume 1
Volume 2

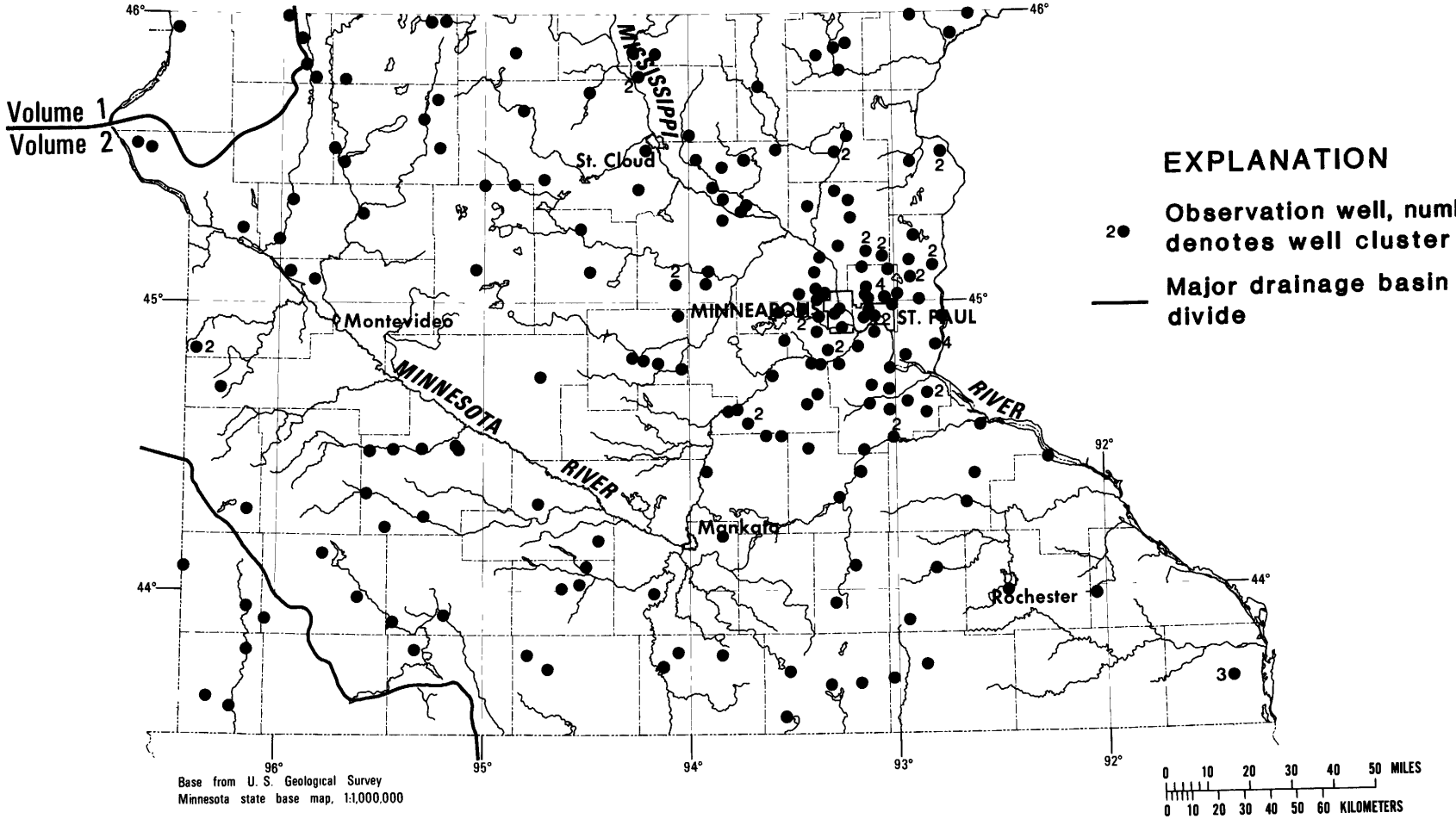


Figure 10.--Location of ground-water wells

GROUND-WATER LEVELS

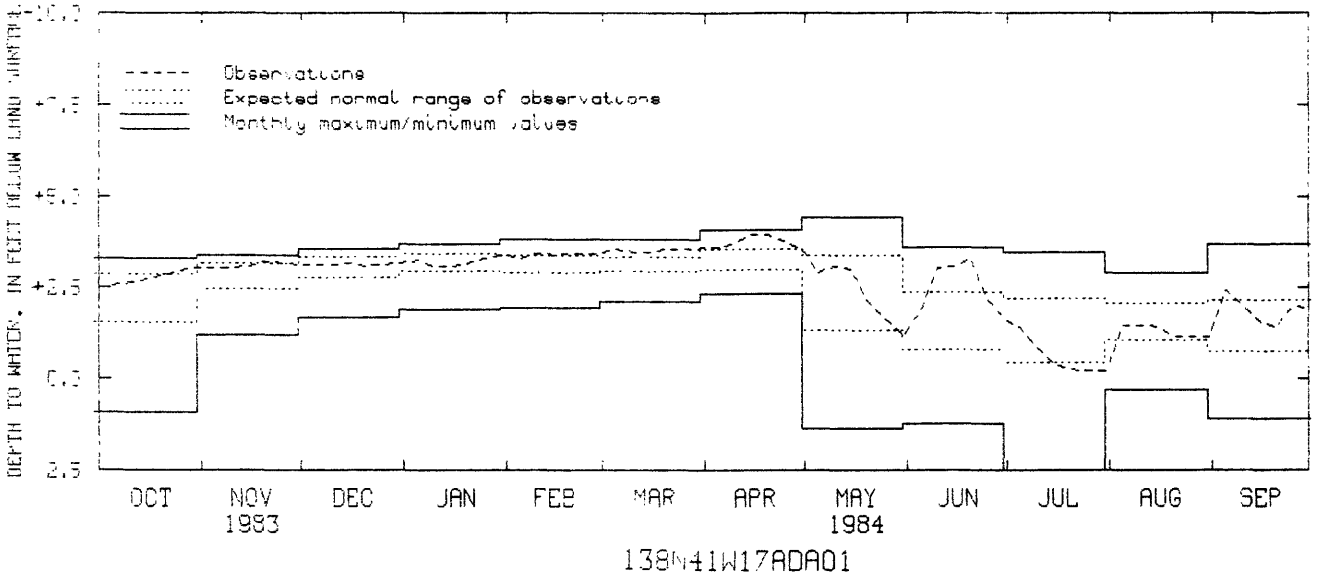
BECKER COUNTY

464613095524801. Local number, 138N41W17ADA01.
LOCATION.--Lat 46°46'13", long 95°52'48", in NE¼SE¼NE¼ sec.17, T.138 N., R.41 W., Hydrologic Unit 09020103, east shore of Lake Sallie.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in (0.15 m), depth 234 ft (71.3 m), screened 222 to 234 ft (67.7 to 71.3 m).
DATUM.--Land-surface datum is 1,333.2 ft (406.4 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 4.40 ft (1.34 m) above land-surface datum.
REMARKS.--Water level affected by pumping of nearby well.
PERIOD OF RECORD.--March 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.44 ft (1.35 m) above land-surface datum, May 23, 27, 1975; lowest, 2.47 ft (0.75 m) below land-surface datum, July 25, 1977.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984
LOWEST VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
5	2.57	3.06	3.15	3.24	3.31	3.56	3.60	2.90	1.90	1.40	1.45	2.44
10	2.63	3.05	3.13	3.08	3.45	3.50	3.73	3.10	3.05	0.87	1.48	2.00
15	2.60	3.09	3.17	3.07	3.40	3.49	3.95	3.00	3.10	0.40	1.43	1.59
20	....	3.22	3.09	3.15	3.45	3.57	3.94	2.10	3.28	0.26	1.18	1.40
25	3.06	3.19	3.14	3.30	3.45	3.58	....	1.65	2.20	0.22	1.15	2.00
EOM	3.05	3.12	3.18	3.39	3.44	3.59	3.58	1.19	1.67	0.23	1.14	1.92

WTR YEAR 1984 HIGHEST 3.63 MAR 27, 1984 LOWEST 0.21 Jul 14, 1984



464401095571301. Local number, 138N42W26CDA01.
LOCATION.--Lat 46°44'01", long 95°57'13", in NE¼SE¼SW¼ sec.26, T.138 N., R.42 W., Hydrologic Unit 09020103, on Don Bullock farm.
Owner: Don Bullock.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 90 ft (27.4 m), screened 88 to 90 ft (26.8 to 27.4 m).
DATUM.--Altitude of land-surface datum is 1,390 ft (424 m). Measuring point: Top of casing, 3.00 ft (0.91 m) above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 52.62 ft (16.04 m) below land-surface datum, June 13, 1980, Nov. 23, 1980; lowest, 53.99 ft (16.46 m) below land-surface datum, Jan. 22, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 2	52.94	DEC 10	52.70	FEB 19	52.95	APR 28	53.16	JUL 7	53.22	SEP 15	53.46
NOV 6	52.79	JAN 15	53.45	MAR 24	52.88	JUN 2	53.03	AUG 13	53.32		

464550096095901. Local number, 138N43W18CDA01.
LOCATION.--Lat 46°45'50", long 96°09'59", in NE¼SE¼SW¼ sec.18, T.138 N., R.43 W., Hydrologic Unit 09020103, on Fred Kraft farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 77 ft (23.5 m) screened 75 to 77 ft (22.9 to 23.5 m).
DATUM.--Altitude of land-surface datum is 1,420 ft (433 m). Measuring point: Top of casing, 3.75 ft (1.14 m) above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 58.47 ft (17.82 m) below land-surface datum, June 1, 1980; lowest, 60.84 ft (18.54 m) below land-surface datum, Aug. 25, 1983.

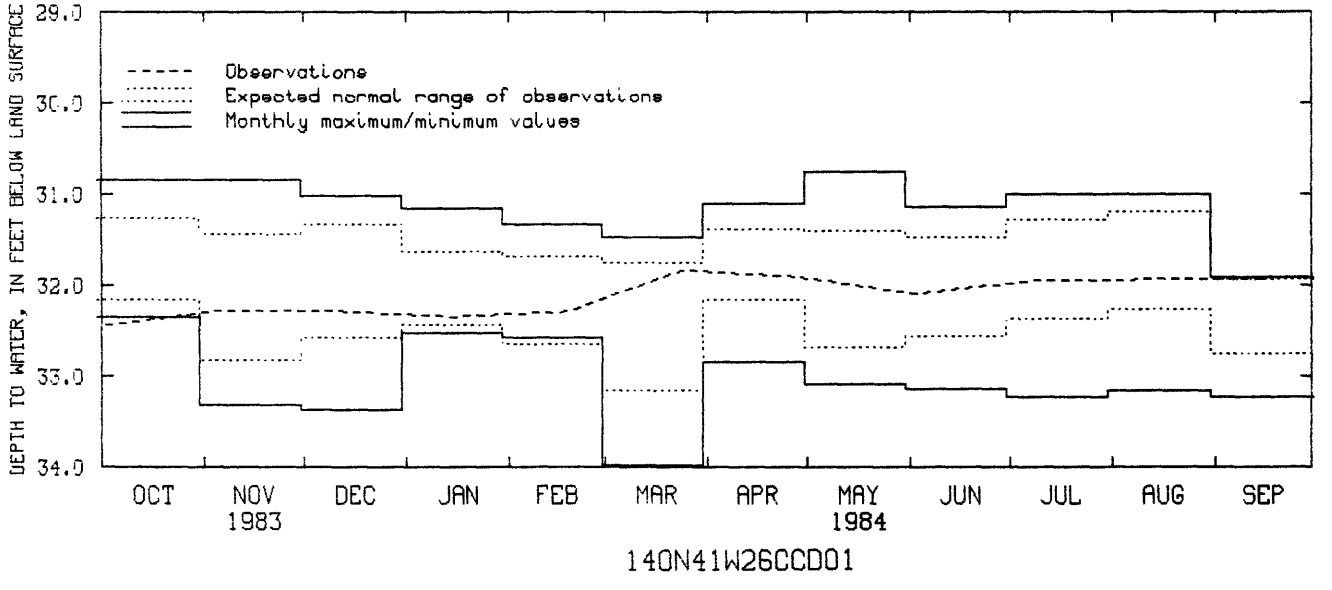
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 2	60.32	DEC 10	60.45	FEB 19	60.52	APR 28	60.15	JUL 7	60.07	SEP 15	60.30
NOV 6	60.39	JAN 15	60.54	MAR 24	60.43	JUN 2	60.10	AUG 13	60.12		

465422095495501. Local number, 140N41W26CCD01.
LOCATION.--Lat 46°54'22", long 95°49'55", in SE¼SW¼SW¼ sec.26, T.140 N., R.41 W., Hydrologic Unit 09020103, on Paul Scarie farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 53 ft (16.2 m), screened 51 to 53 ft (15.5 to 16.2 m).
DATUM.--Altitude of land-surface datum is 1,422 ft (433 m). Measuring point: Top of casing, 2.40 ft (0.73 m) above land-surface datum.
PERIOD OF RECORD.--December 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.75 ft (9.37 m) below land-surface datum, May 8, 1978; lowest, 33.98 ft (10.36 m) below land-surface datum, Mar. 21, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 2	32.44	DEC 10	32.28	FEB 19	32.28	APR 28	31.90	JUL 7	31.95	SEP 15	31.93
NOV 6	32.27	JAN 15	32.34	MAR 24	31.83	JUN 2	32.09	AUG 13	31.93		



4741110943314O1. 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 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 13	101.6	FEB 2	101.5	MAR 29	101.9	MAY 24	102.0	JUL 25	101.6	SEP 13	101.7
DEC 8	101.5										

4741110943314O2. 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, 22.80 ft (6.95 m) below land-surface datum, Sept. 1, 1984.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 13	22.41	FEB 2	22.62	MAR 29	23.33	MAY 24	22.01	JUL 25	21.57	SEP 13	22.80
DEC 8	22.54										

4817110943316O2. Local number, 156N31W36DAA02.
LOCATION.--Lat 48°17'11", long 94°33'16", in NE¼NE¼SE¼ sec.36, T.156 N., R.31 W., Hydrologic Unit 09020302, at Ludlow Lookout Tower.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in (0.05 m), depth 107 ft (32.6 m), screened 104 to 107 ft (31.7 to 32.6 m).
DATUM.--Land-surface datum is 1,195.8 ft (364.5 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 1.90 ft (0.58 m) above land-surface datum.
PERIOD OF RECORD.--July 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.05 ft (0.32 m) below land-surface datum, Oct. 13, 1983; lowest, 4.98 ft (1.52 m) below land-surface datum, Aug. 19, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

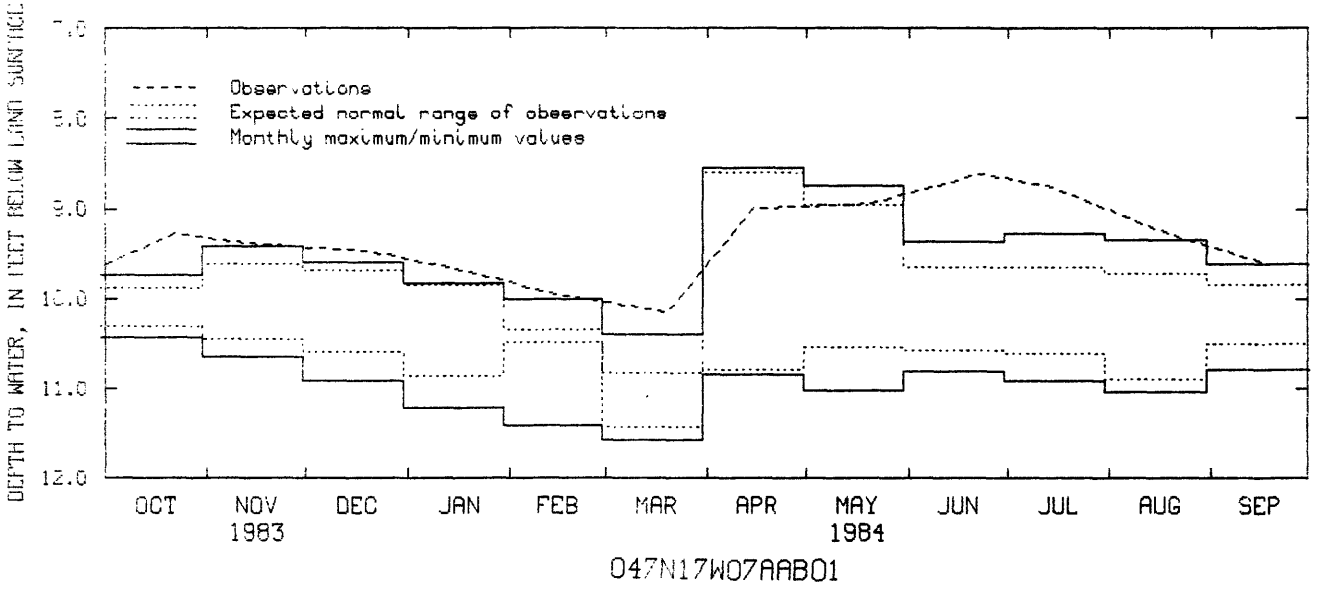
DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 13	1.05	DEC 8	1.90

CARLTON COUNTY

463437092313301. Local number, 047N17W07AAB01.
LOCATION.--Lat 46°34'37", long 92°31'33", in NW¼NE¼NE¼ sec.7, T.47 N., R.17 W., Hydrologic Unit 04010301, on Merle Olson farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in (0.04 m), depth 33 ft (10.1 m), screened 31 to 33 ft (9.4 to 10.1 m).
DATUM.--Altitude of land-surface datum is 1,110 ft (338 m). Measuring point: Top of casing, 4.00 ft (1.22 m) above land-surface datum.
PERIOD OF RECORD.--October 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 8.54 ft (2.60 m) below land-surface datum, Apr. 19, 1983; lowest, 11.58 ft (3.53 m) below land-surface datum, Mar. 29, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 22	9.28	DEC 20	9.47	FEB 15	9.95	APR 15	8.99	JUN 23	8.61	AUG 19	9.28
NOV 15	9.39	JAN 17	9.68	MAR 20	10.15	MAY 20	8.94	JUL 15	8.76	SEP 16	9.59



463948092280301. Local number, 048N17W02CCC01
LOCATION.--Lat 46°39'48", long 92°28'03", in SW¼SW¼SW¼ sec.2. T.48 N., R.17 W, Hydrologic Unit 04010201, 1.4 mi (2.2 km) west of Carlton.
Owner: U. S. Geological Survey.
AQUIFER.--Surficial Sand of Pleistocene Age.
WELL CHARACTERISTICS.--Board observation water-table well, diameter 1½ in (0.04 m), depth 28 ft (8.5 m), screened 26 to 28 ft (7.9 to 8.5 m).
DATUM.--Altitude of land-surface datum is 1,130 ft (344 m). Measuring point: Top of casing, 2.30 ft (0.70 m) above land-surface datum.
PERIOD OF RECORD.--August 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 20.92 ft (6.38 m) below land-surface datum, May 15, 1983; lowest, 25.60 ft (7.80 m) below land-surface datum, Mar. 29, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 22	21.85	DEC 20	22.18	FEB 15	23.11	APR 15	23.52	JUN 23	21.34	AUG 19	21.90
NOV 15	21.93	JAN 17	23.34	MAR 20	23.62	MAY 20	22.07	JUL 15	21.28	SEP 16	22.52

CARLTON COUNTY--Continued

464346092304901. Local number, 049N17W17ADD01.
LOCATION.--Lat 46°43'46", long 92°30'49", in SE¼SE¼NE¼ sec.17, T.49 N., R.17 W., Hydrologic Unit 04010201, 1.5 mi (2.4 km) west of Cloquet.
Owner: City of Cloquet, well 7.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 48 in (1.22 m), depth 49 ft (14.9 m), screened 39 to 49 ft (11.9 to 14.9 m).
DATUM.--Land-surface datum is 1,263.8 ft (385.2 m) National Geodetic Vertical Datum of 1929. Measuring point: Hole in steel cover, 2.30 ft (0.70 m) above land-surface datum.
PERIOD OF RECORD.--March 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.38 ft (1.94 m) below land-surface datum, May 5, 1982; lowest, 9.05 ft (2.76 m) below land-surface datum, Mar. 7, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

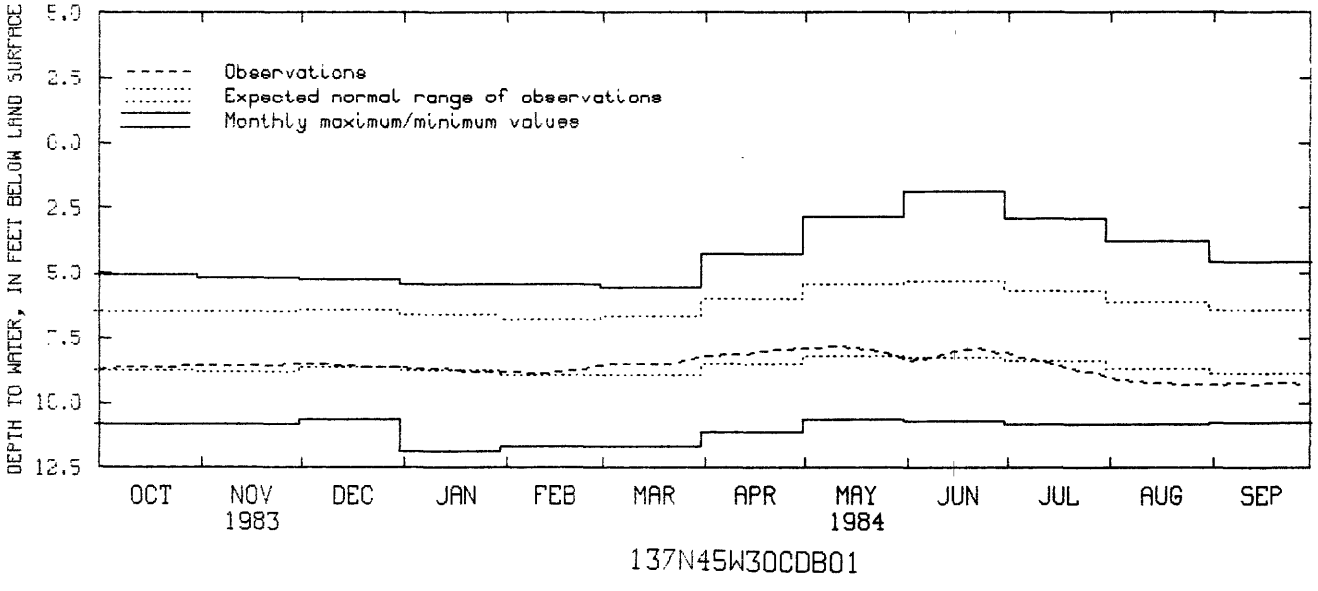
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 22	7.16	DEC 20	7.40	MAR 20	7.32	MAY 20	7.21	JUL 15	7.51	SEP 16	7.85
NOV 15	7.46	JAN 17	7.34	APR 15	6.88	JUN 23	6.90	AUG 19	8.14		

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 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 7	8.62	DEC 23	8.59	FEB 17	8.81	APR 13	8.12	JUN 8	8.27	AUG 3	9.08
14	8.59	30	8.63	24	8.66	20	7.97	15	7.99	10	9.18
21	8.60	JAN 6	8.67	MAR 2	8.51	27	7.91	22	7.89	21	9.27
NOV 4	8.52	13	8.69	9	8.50	MAY 4	7.86	29	8.05	31	9.29
14	8.57	20	8.80	16	8.51	11	7.82	JUL 6	8.27	SEP 7	9.25
18	8.53	27	8.77	23	8.47	18	7.91	13	8.45	14	9.26
25	8.52	FEB 3	8.80	30	8.21	25	8.06	20	8.68	21	9.21
DEC 9	8.51	10	8.85	APR 6	8.15	JUN 1	8.35	27	8.81	28	9.29
16	8.58										



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.

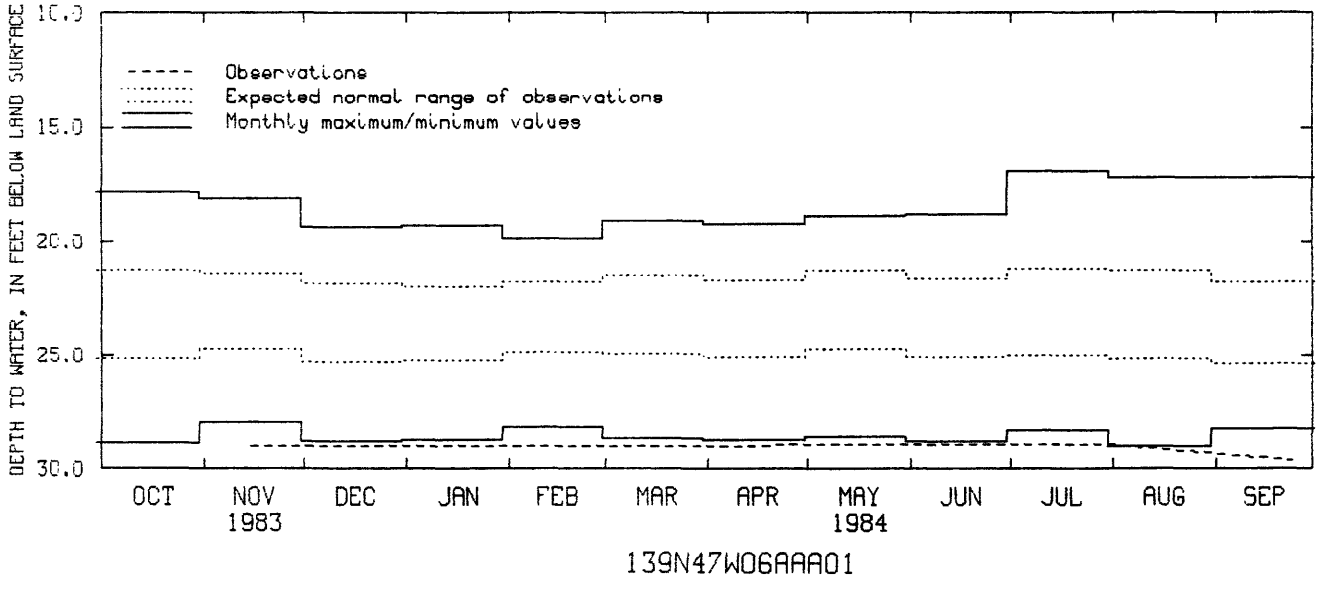
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 15	29.90	JAN 11	30.11	MAR 29	30.42	MAY 24	30.04	AUG 3	31.59	SEP 24	31.34

465328096391001. Local number, 139N47W06AAA01.
LOCATION.--Lat 46°53'27", long 96°39'08", in NE¼NE¼NE¼ sec.6, T.139 N., R.47 W., Hydrologic Unit 09020104, 2.7 mi (4.3 km) northeast of Dilworth.
Owner: U.S. Geological Survey, M-80.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 3 in (0.08 m), depth 103 ft (31.4 m), casing slotted near bottom.
DATUM.--Altitude of land-surface datum is 915 ft (279 m). Measuring point: Top of casing, 2.50 ft (0.76 m) above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--July 1949 to April 1966, November 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 16.94 ft (5.16 m) below land-surface datum, July 16, 1949; lowest, 29.62 ft (9.03 m) below land-surface datum, Sept. 24, 1984.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 15	28.97	MAR 29	28.98	MAY 24	28.93	AUG 3	28.96	SEP 24	29.62



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, 130.7 ft (39.84 m) below land-surface datum, Aug. 3, 1984.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

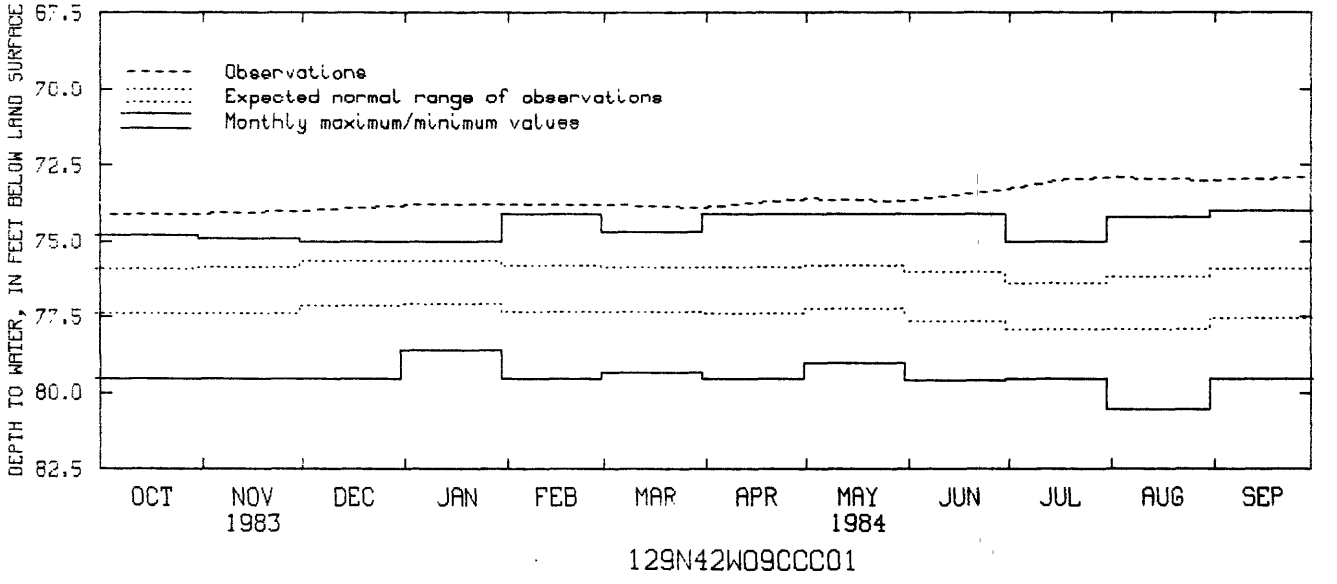
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 15	126.7	JAN 11	126.2	MAR 29	126.0	MAY 24	127.1	AUG 3	130.7

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, 72.90 ft (22.22 m) below land-surface datum, July 30, Sept. 28, 1984; 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 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 4	74.10	JAN 5	73.80	MAR 30	73.90	MAY 30	73.70	JUL 18	72.98	AUG 30	73.00
31	74.10	FEB 1	73.80	MAY 1	73.60	JUN 29	73.30	30	72.90	SEP 28	72.90
DEC 1	74.00	MAR 1	73.80								

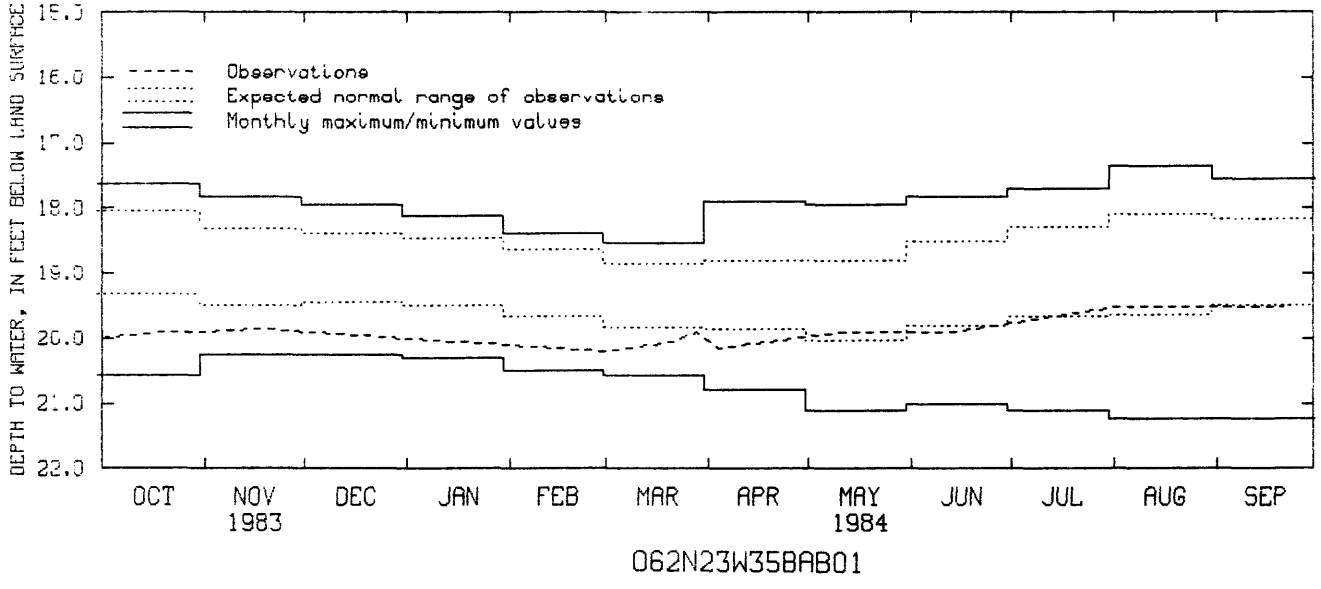


ITASCA COUNTY

474917093144601. Local number, 062N23W35BAB01.
LOCATION.--Lat 47°49'17", long 93°14'46", in NW¼NE¼NW¼ sec.35, T.62 N., R.23 W., Hydrologic Unit 09030005, at Thistledew Ranger Station.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 29 ft (8.8 m), screened 27 to 29 ft (8.2 to 8.8 m).
DATUM.--Altitude of land-surface datum is 1,393 ft (425 m). Measuring point: Top of casing, 3.30 ft (1.01 m) above land-surface datum.
PERIOD OF RECORD.--September 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.35 ft (5.29 m) below land-surface datum, Aug. 20, 1975; lowest, 21.22 ft (6.47 m) below land-surface datum, Aug. 24, Sept. 7, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

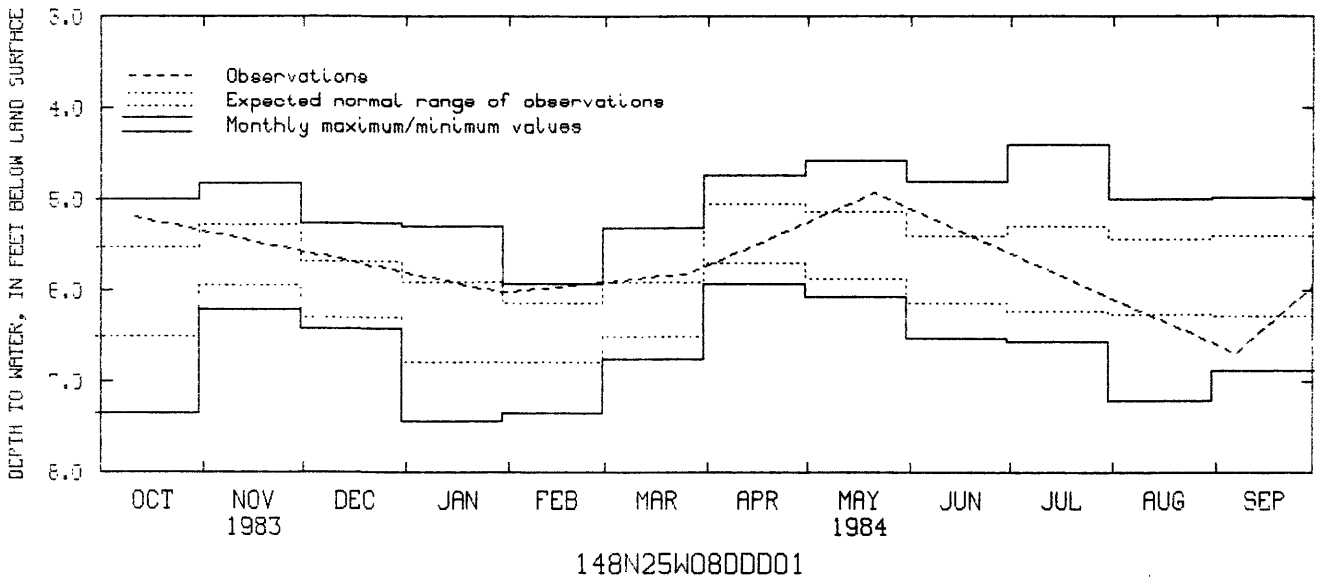
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 19	19.90	NOV 17	19.85	MAR 21	20.05	APR 4	20.15	JUN 14	19.90	SEP 21	19.50
NOV 2	19.90	MAR 1	20.20	28	19.90	MAY 11	19.90	AUG 3	19.50		



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, 7.44 ft (2.27 m) below land-surface datum, Jan. 3, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 11	5.19	JAN 30	6.02	MAY 21	4.93	JUL 16	5.83	SEP 7	6.68	SEP 10	6.58
DEC 5	5.60	MAR 26	5.81								

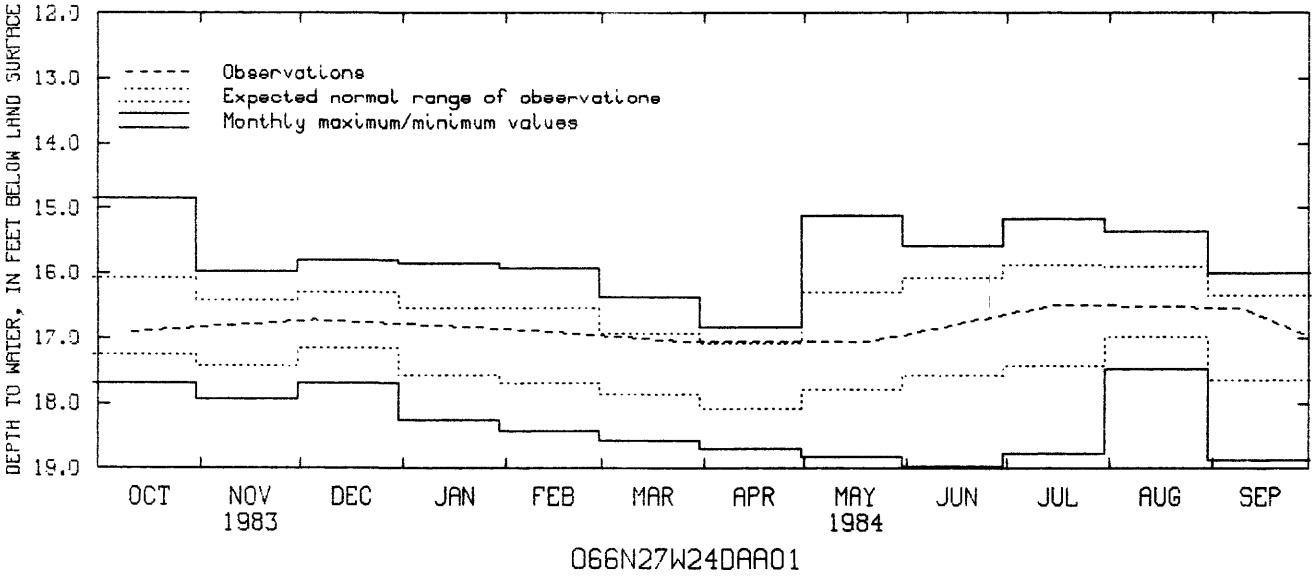


KOOCHICHING COUNTY

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 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 11	16.90	JAN 30	16.85	MAR 26	17.05	MAY 21	17.05	JUL 16	16.48	SEP 10	16.54
DEC 5	16.72										



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.

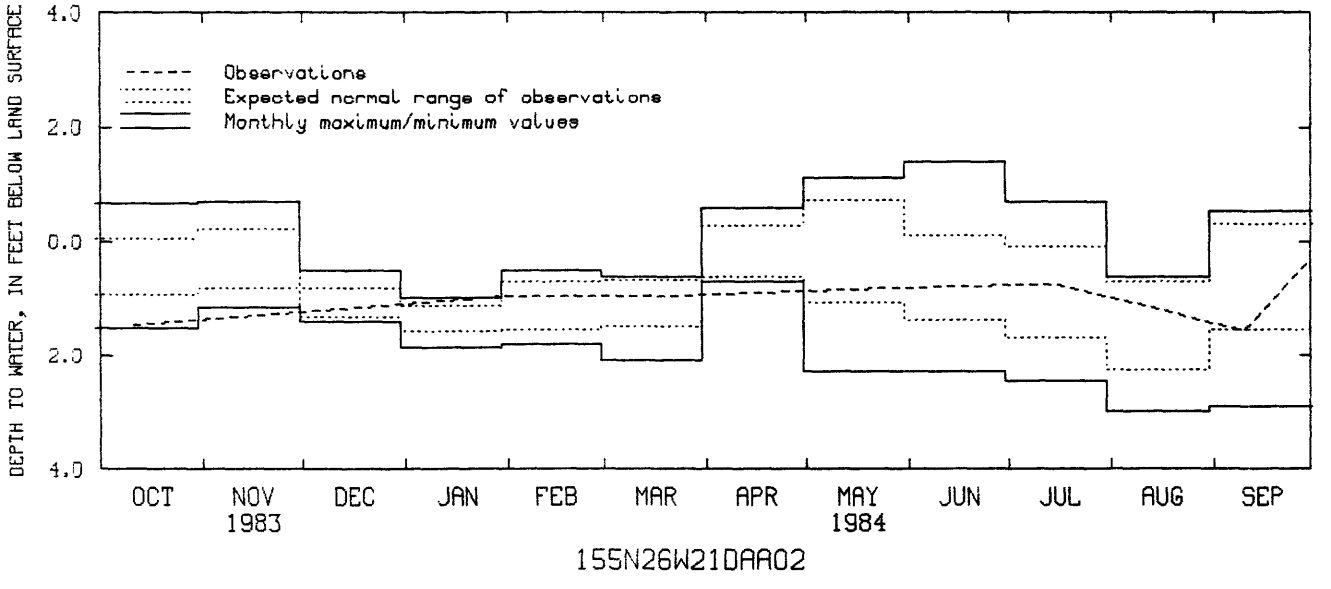
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 11	0.43	JAN 30	1.33	MAR 26	2.02	MAY 21	1.53	JUL 16	1.44	SEP 10	1.62

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 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 11	1.47	JAN 30	0.96	MAR 26	0.95	MAY 21	0.83	JUL 16	0.75	SEP 10	1.57

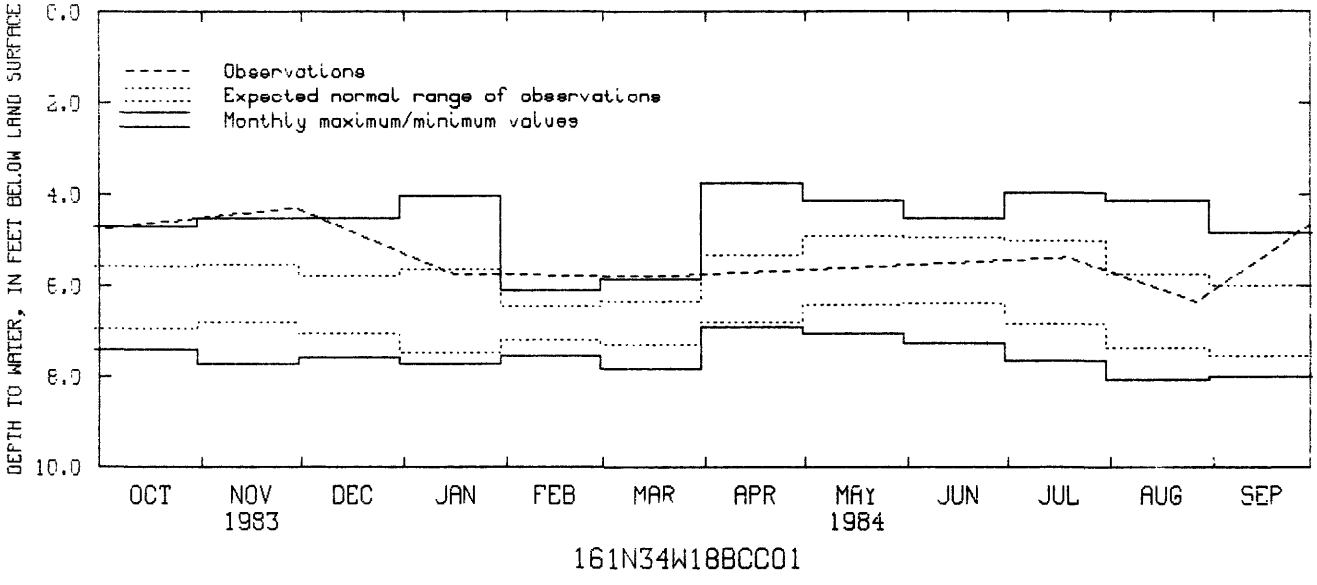


LAKE OF THE WOODS COUNTY

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 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 3	4.73	JAN 16	5.74	MAR 19	5.79	MAY 14	5.60	JUL 19	5.37	AUG 27	6.34
NOV 29	4.29										



MAHNOMEN COUNTY

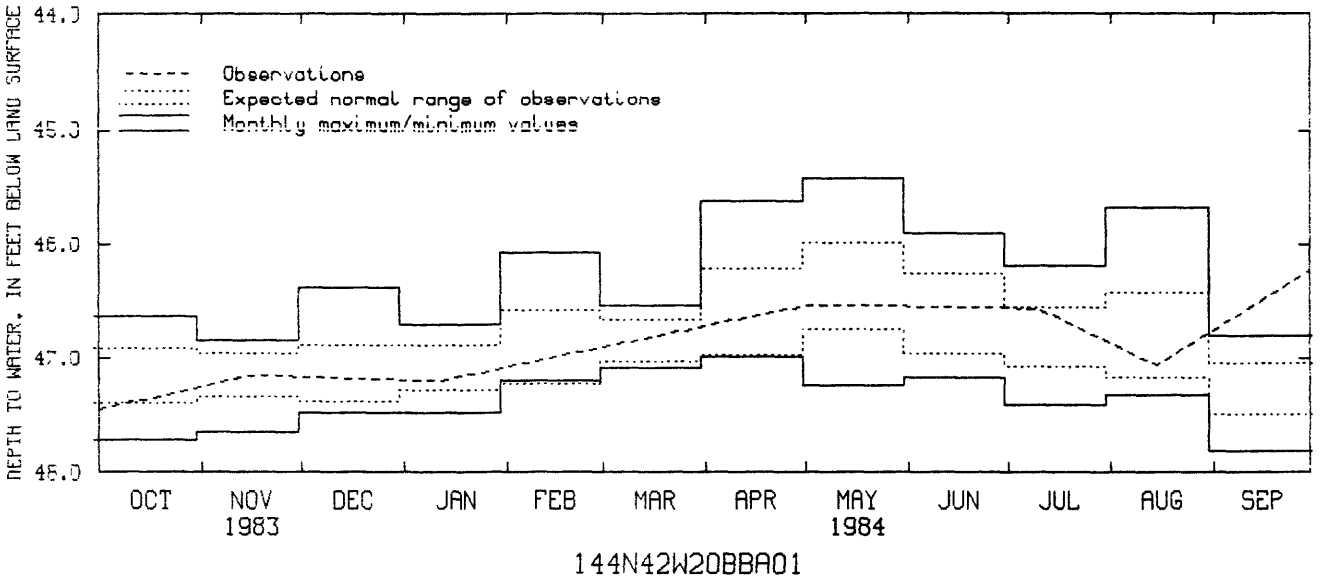
471653096020301. Local number, 144N42W20BBA01.
LOCATION.--Lat 47°16'53", long 96°02'03", in NE¼NW¼NW¼ sec.20, T.144 N., R.42 W., Hydrologic Unit 09020108, about 3 mi (4.8 km) southwest of Mahnomen.
Owner: Tom Wendt.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian 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, 45.43 ft (13.85 m) below land-surface datum, May 18, 1966; 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 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 16	47.15	JAN 11	47.20	MAY 2	46.53	JUL 10	46.56	AUG 15	47.06

GROUND-WATER LEVELS

MAHNOMEN COUNTY--Continued



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.

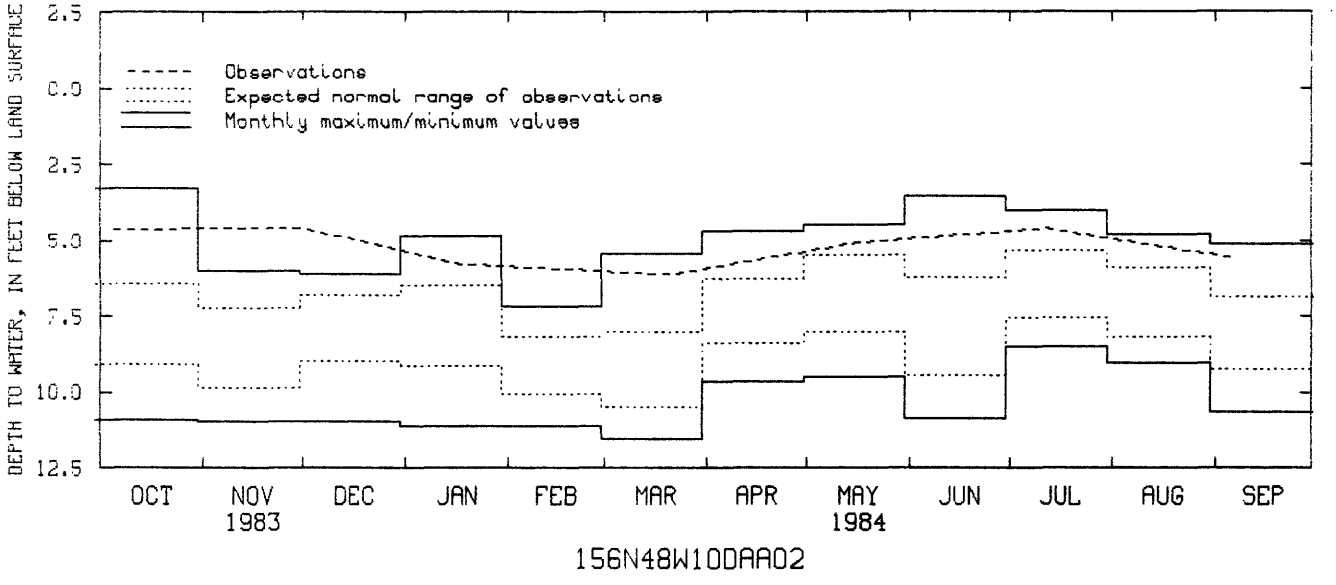
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 5	17.52	JAN 18	17.19	MAR 21	16.94	MAY 16	17.18	JUL 12	17.57	SEP 6	18.00
DEC 1	17.25										

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 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 5	4.63	JAN 18	5.79	MAR 21	6.13	MAY 16	5.08	JUL 12	4.60	SEP 6	5.55
DEC 1	4.59										



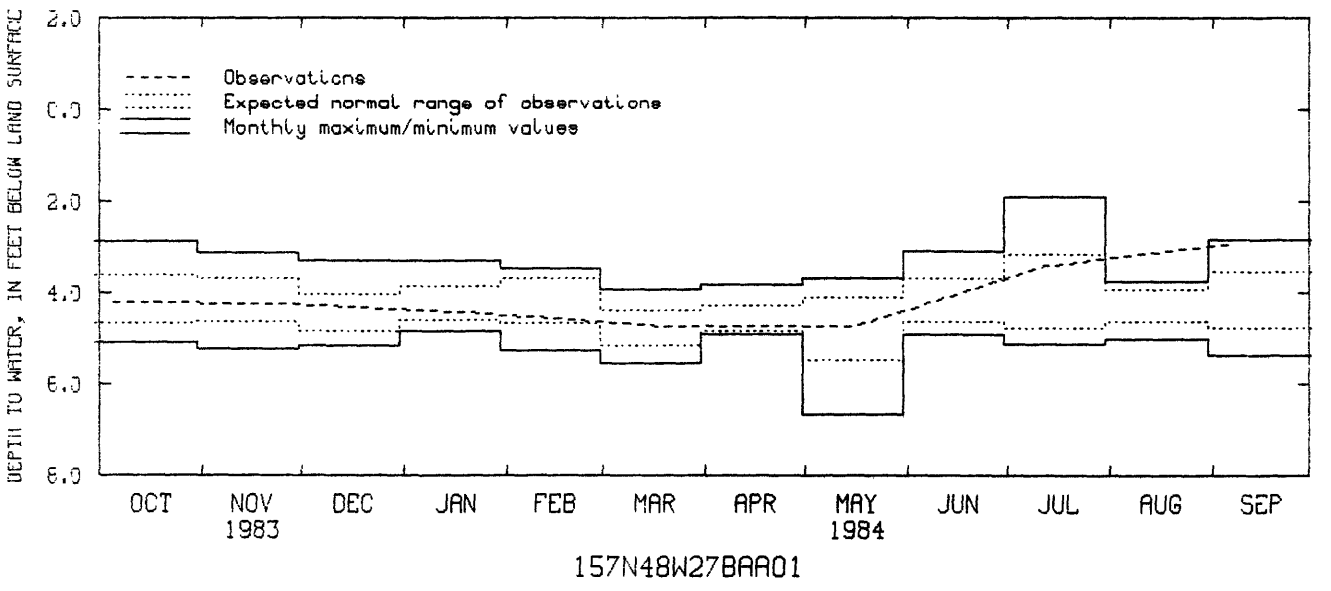
482354096501001. Local number, 157N48W27BAA01.
LOCATION.--Lat 48°23'54", long 96°50'10", in NE¼NE¼NW¼ sec.27, T.157 N., R.48 W., Hydrologic Unit 09020311, 4.3 mi (6.9 km) north of Argyle.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation 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, 1.88 ft (0.57 m) below land-surface datum, July 29, 1975; lowest, 6.65 ft (2.03 m) below land-surface datum, May 27, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 5	4.19	JAN 18	4.41	MAR 21	4.73	MAY 16	4.72	JUL 12	3.41	SEP 6	2.92
DEC 1	4.25										

GROUND-WATER LEVELS

MARSHALL COUNTY--Continued

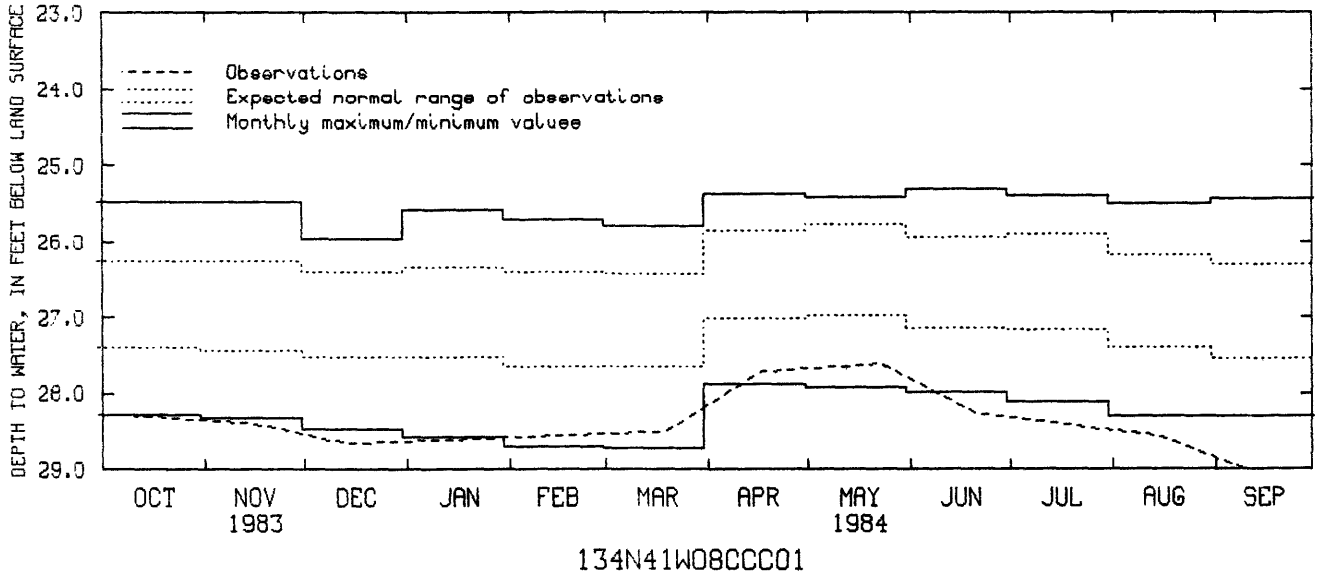


OTTER TAIL COUNTY

462538095530201. Local number, 134N41W08CCC01.
LOCATION.--46°25'38", long 95°53'02", in SW¼SW¼SW¼ sec.8, T.134 N., R.41 W., Hydrologic Unit 09020103, 0.9 mi (1.4 km) west of County Roads 35 and 22.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in (0.05 m), depth 43 ft (13.1 m), screened 40 to 43 ft (12.2 to 13.1 m).
DATUM.--Altitude of land-surface datum is 1,368 ft (417 m). Measuring point: Top of casing, 1.70 ft (0.52 m) above land-surface datum.
PERIOD OF RECORD.--November 1967 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 25.31 ft (7.71 m) below land-surface datum, June 1, 1974; lowest, 29.00 ft (8.84 m) below land-surface datum, Sept. 10, 1984.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 11	28.29	DEC 14	28.66	APR 17	27.71	JUN 21	28.26	AUG 15	28.56	SEP 10	29.00
NOV 15	28.39	MAR 19	28.50	MAY 23	27.61	JUL 17	28.40				



OTTER TAIL COUNTY--Continued

462522096031901. Local number, 134N43W14ADB01
LOCATION.--Lat 46°25'22", long 96°03'19", in NW¼SE¼NE¼ sec.14, T.134 N., R.43 W., Hydrologic Unit 09020103, on Ron Heikes farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 50 ft (15.2 m), screened 48 to 50 ft (14.6 to 15.2 m).
DATUM.--Altitude of land-surface datum is 1,280 ft (390 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 24.04 ft (7.33 m) below land-surface datum, May 2, 1980; lowest, 26.52 ft (8.08 m) below land-surface datum, Jan. 2, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 2	26.52	DEC 10	26.43	FEB 19	26.31	APR 28	25.33	JUL 7	25.25	SEP 15	26.17
NOV 6	26.39	JAN 15	26.50	MAR 24	25.90	JUN 2	25.59	AUG 13	25.83		

463650096042801. Local number, 136N43W10AAA01.
LOCATION.--Lat 46°36'50", long 96°04'28", in NE¼NE¼NE¼ sec.10, T.136 N., R.43 W., Hydrologic Unit 09020103, on Oliver Haugrud farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 22 ft (6.7 m), screened 20 to 22 ft (6.1 to 6.7 m).
DATUM.--Altitude of land-surface datum is 1,322 ft (403 m). Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--July 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.89 ft (2.10 m) below land-surface datum, Apr. 16, 1980; lowest, 8.67 ft (2.64 m) below land-surface datum, Dec. 1, 1980, Sept. 11, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 6	8.33	JAN 15	8.36	MAR 24	7.87	JUN 2	8.12	AUG 13	8.35	SEP 15	8.58
DEC 10	8.36	FEB 19	8.21	APR 28	7.87	JUL 7	8.11				

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 1983 TO SEPTEMBER 1984

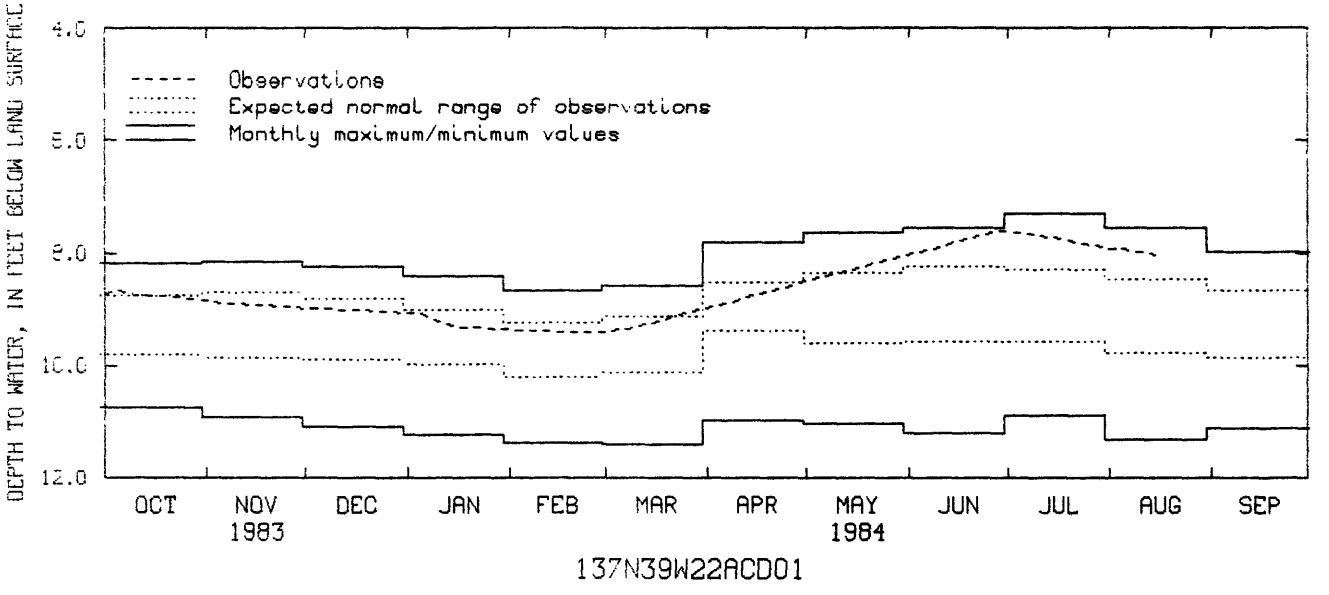
DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 15	48.90	FEB 24	48.86

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, 7.29 ft (2.22 m) below land-surface datum, July 15, 1975; 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 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 5	8.66	NOV 5	8.88	JAN 20	9.32	FEB 15	9.40	MAY 3	8.47	JUL 25	7.85
10	8.74	10	8.90	25	9.34	20	9.40	JUN 29	7.60	31	7.91
15	8.76	15	8.92	31	9.36	25	9.40	JUL 10	7.69	AUG 5	7.92
20	8.76	JAN 5	9.07	FEB 5	9.37	29	9.40	15	7.73	10	7.98
25	8.80	10	9.20	10	9.38	MAR 8	9.34	20	7.79	15	8.04
31	8.84	15	9.31								

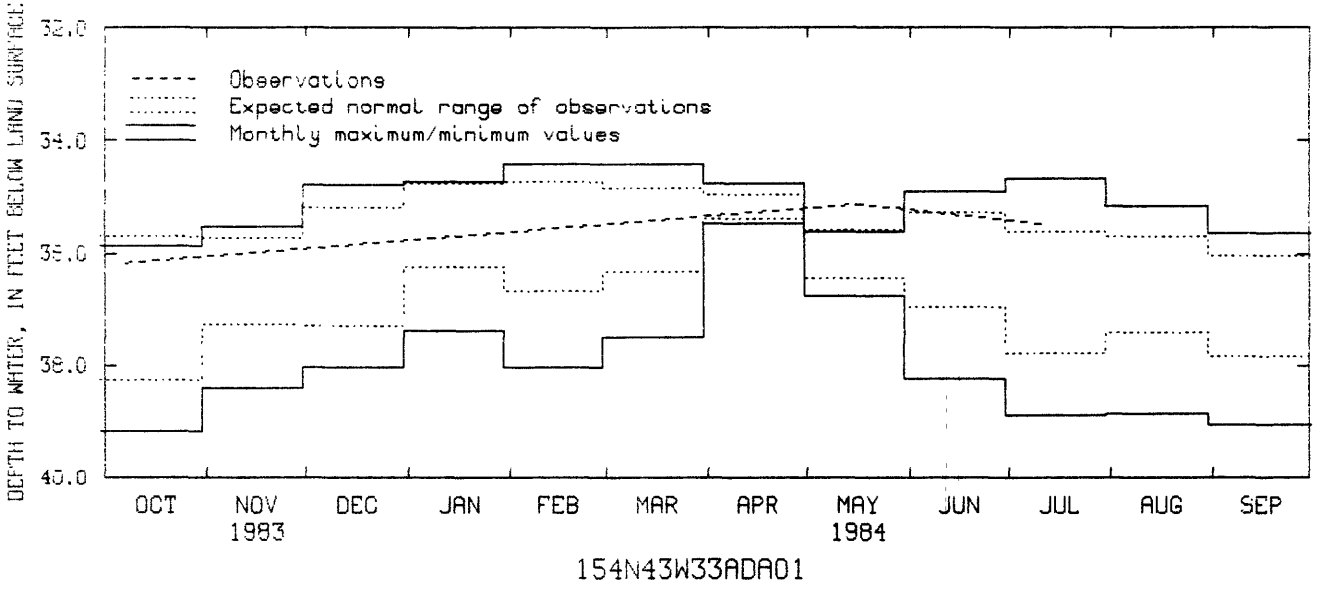


PENNINGTON COUNTY

480707096103501. Local number, 154N43W33ADA01.
LOCATION.--Lat 48°07'07", long 96°10'35", in NE¼SE¼NE¼ sec.33, T.154 N., R.43 W., Hydrologic Unit 09020303, in Thief River Falls.
Owner: Industrial Enterprises.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 3 in (0.08 m), depth 124 ft (37.8 m).
DATUM.--Altitude of land-surface datum is 1,127 ft (344 m). Measuring point: Top of casing, at land-surface datum.
PERIOD OF RECORD.--February 1965 to September 1969, August 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 34.40 ft (10.49 m) below land-surface datum, Feb. 21, 1967, Mar. 18, 1968; lowest, 39.16 ft (11.94 m) below land-surface datum, Oct. 7, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 7	36.17	MAY 16	35.12	JUL 11	35.47



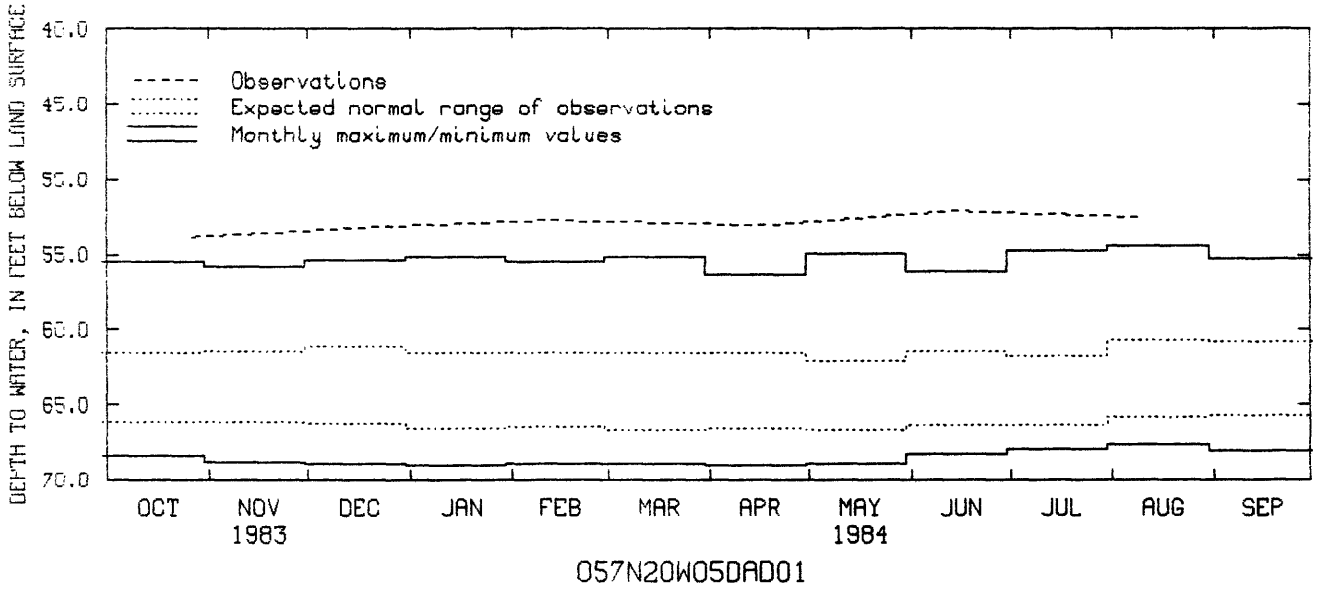
GROUND-WATER LEVELS

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, 52.07 ft (15.87 m) below land-surface datum, June 15, 1984; 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 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 27	53.82	DEC 20	53.16	FEB 13	52.70	APR 18	53.03	JUN 15	52.07	AUG 9	52.47



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, 2.98 ft (0.91 m) below land-surface datum, June 15, 1984; 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 1983 TO SEPTEMBER 19842

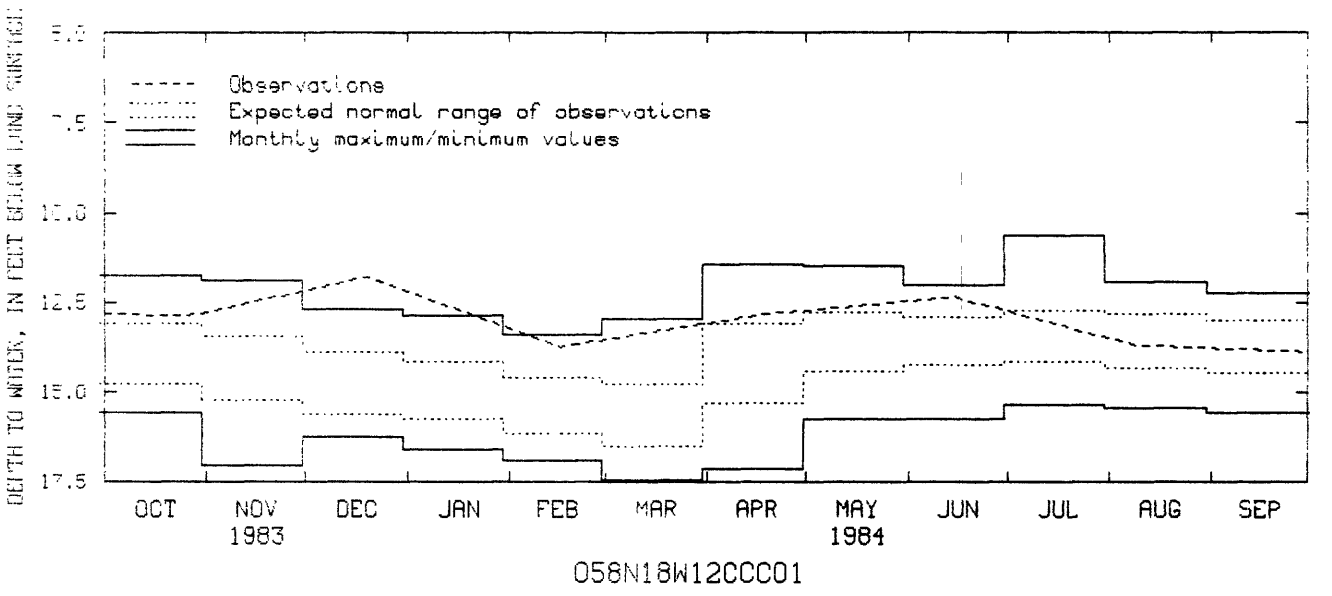
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 27	4.37	DEC 20	4.84	FEB 17	4.78	APR 18	4.01	JUN 15	2.98	AUG 9	5.32

ST. LOUIS COUNTY--Continued

473102092345001. Local number, 058N18W12CCC01.
LOCATION.--Lat 47°31'02", long 92°34'50", in SW¼SW¼SW¼ sec.12, T.58 N., R.18 W., Hydrologic Unit 04010201, 1 mi (1.6 km) west of Virginia.
Owner: U.S. Steel Corp.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in (0.15 m), depth 97 ft (29.6 m), slotted casing between 67 to 97 ft (20.4 to 29.6 m).
DATUM.--Land-surface datum is 1,427.5 ft (435.1 m) National Geodetic Vertical Datum of 1929. Measuring point: Edge of vent pipe, 1.90 ft (0.58 m) above land-surface datum.
PERIOD OF RECORD.--December 1954 to July 1964, July 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.64 ft (3.24 m) below land-surface datum, July 20, 1957; lowest, 17.47 ft (5.32 m) below land-surface datum, Apr. 2, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

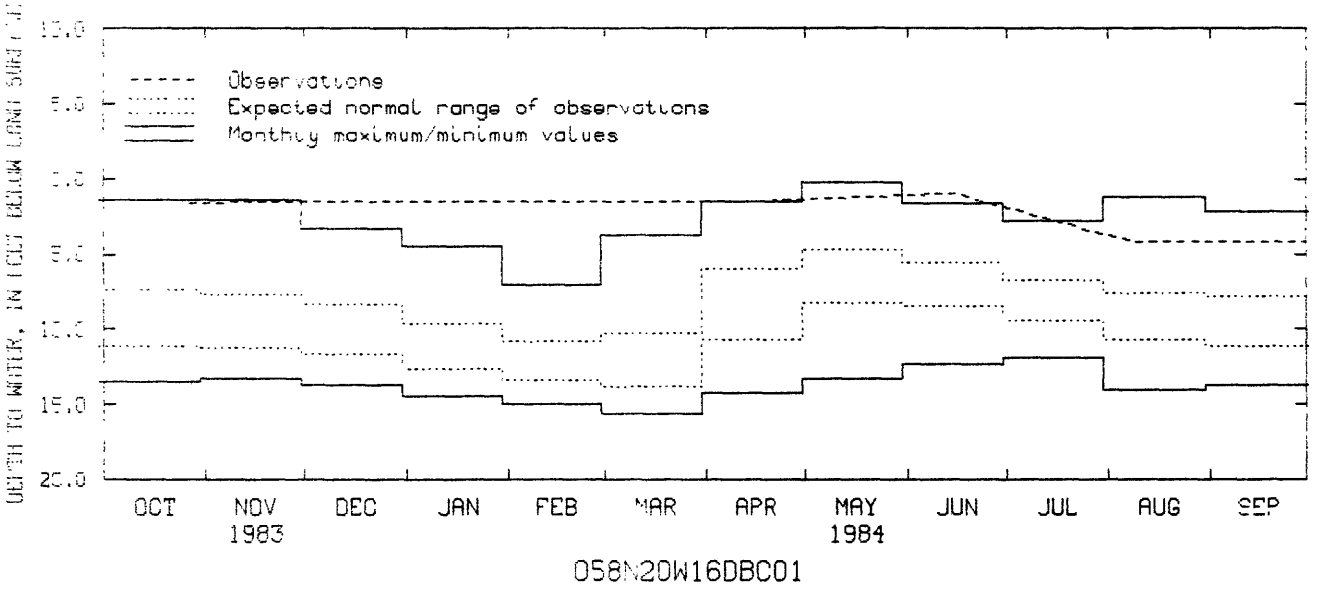
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 26	12.89	DEC 20	11.79	FEB 16	13.74	APR 17	12.84	JUN 15	12.35	AUG 9	13.70



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 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 27	1.58	APR 16	1.50	JUN 15	0.95	AUG 9	4.21



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 1983 TO SEPTEMBER 1984

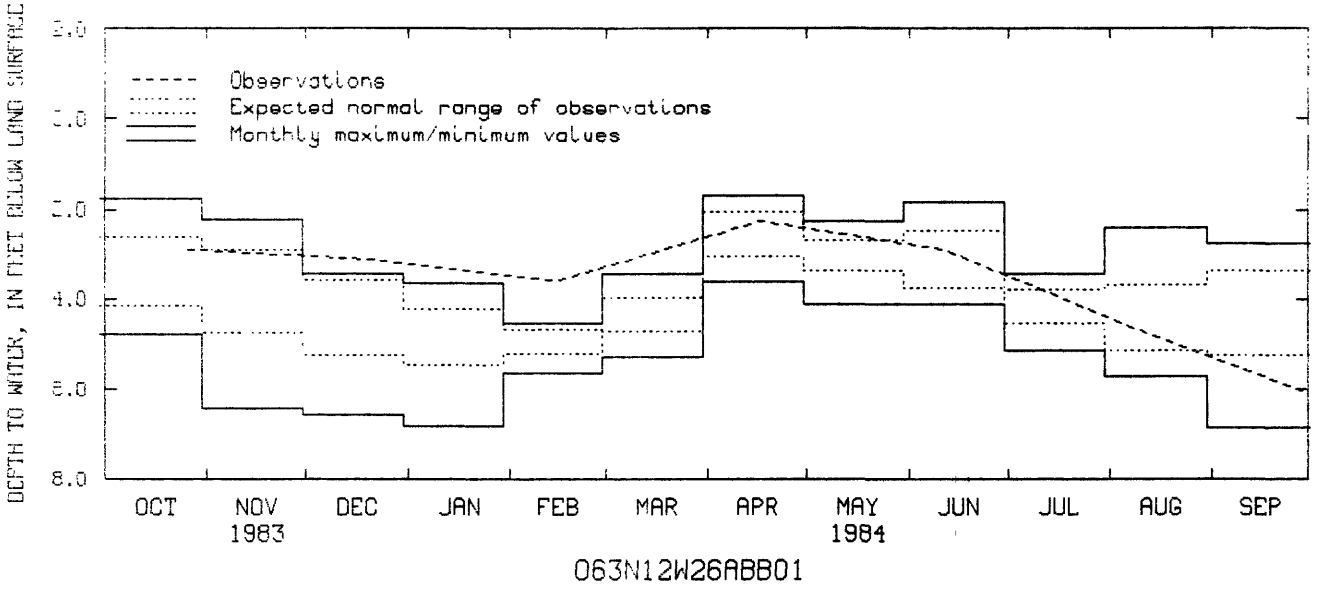
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 1	21.04	JAN 1	20.62	MAR 1	21.44	JUN 1	20.88	AUG 1	20.96	SEP 1	20.96
DEC 1	20.79	FEB 1	21.33	MAY 1	21.20	JUL 1	20.58				

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 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 26	2.89	DEC 20	3.12	FEB 15	3.60	APR 17	2.26	JUN 12	2.91	AUG 9	4.67

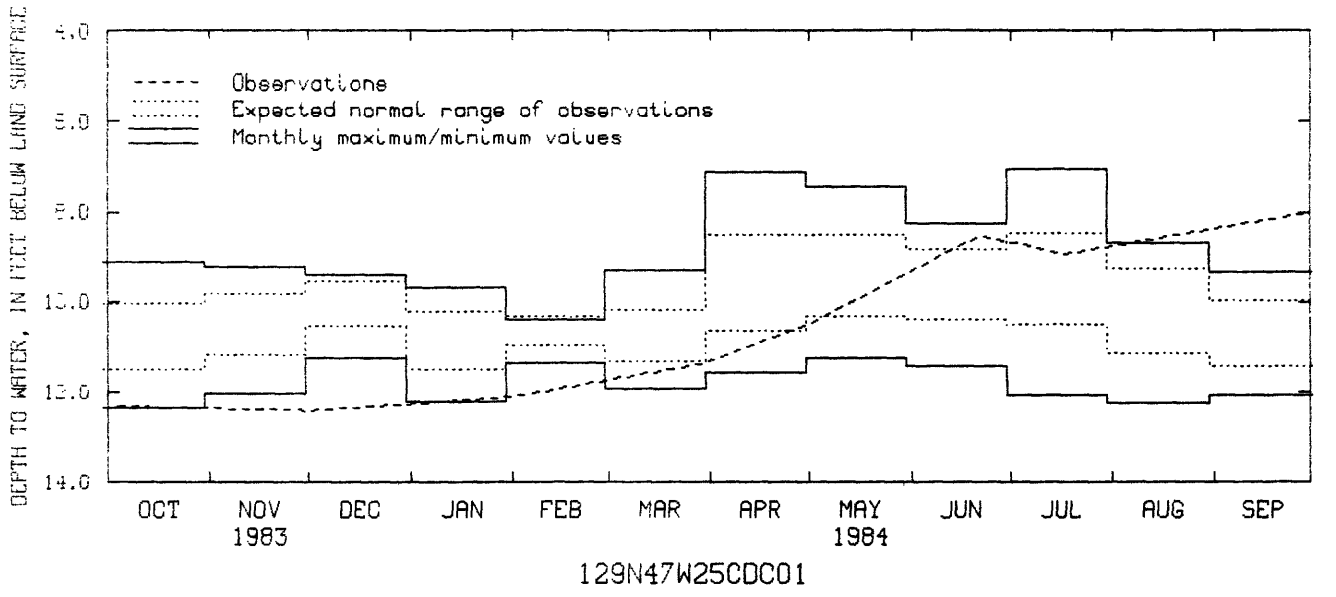


TRAVERSE COUNTY

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 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
OCT 4	12.33	FEB 1	12.11	MAR 29	11.39	MAY 3	10.44	JUN 22	8.53	JUL 18	8.94
DEC 2	12.42										



WILKIN COUNTY

463422096341701. Local number, 136N47W23CCC01.
LOCATION.--Lat 46°34'22", long 96°34'17", in SW¼SW¼SW¼ sec.23, T.136 N., R.47 W., Hydrologic Unit 09020106, 7.5 mi (12.1 km) east of Wolverton.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in (0.03 m), depth 62 ft (18.9 m), screened 58 to 62 ft (17.7 to 18.9 m).
DATUM.--Land-surface datum is 953.9 ft (290.8 m) National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.00 ft (0.61 m) above land-surface datum.
PERIOD OF RECORD.--October 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.61 ft (0.80 m) below land-surface datum, Mar. 21, 1966; lowest, 9.42 ft (2.87 m) below land-surface datum, Feb. 16, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV 15	5.78	JAN 11	6.60	APR 12	2.92	MAY 24	4.49	AUG 2	5.43
								Well destroyed	

BECKER COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE OF SAMPLE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)
470148095541801	CLARENCE ALDER T141NR41W08CDB	112BRDO	84-09-04	--	45.40	127

DATE OF SAMPLE	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	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)
84-09-04	1335.00	675	675	7.4	8.0	80	30	3.5	338	46	1.6	368

DATE OF SAMPLE	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)	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)
84-09-04	<.10	.58	1.7	.80	.01	<.01	19	66	80	<1	<10	1

DATE OF SAMPLE	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)	CYANIDE TOTAL (MG/L AS CN) (00720)
84-09-04	690	4	81	.2	<1	<1	45	<.01

CARLTON COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE OF SAMPLE	TIME	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)
464135092340701	BURIED DRIFT OBS WELL T49NR18W35AAA	112BRDO	84-05-16	--	280	301

DATE OF SAMPLE	PH (STANDARD UNITS) (00400)	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)	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)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)
84-05-16	8.7	33	10	13	1.5	152	4.4	2.4	.10	9.5	192	.06

DATE OF SAMPLE	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	ARSENIC TOTAL (UG/L AS AS) (01002)	BARIUM, TOTAL RECOVERABLE (UG/L AS BA) (01007)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD) (01027)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR) (01034)	COPPER, TOTAL RECOVERABLE (UG/L AS CU) (01042)	IRON, TOTAL RECOVERABLE (UG/L AS FE) (01045)	LEAD, TOTAL RECOVERABLE (UG/L AS PB) (01051)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN) (01055)	MERCURY TOTAL RECOVERABLE (UG/L AS HG) (71900)	SELENIUM, TOTAL (UG/L AS SE) (01147)	SILVER, TOTAL RECOVERABLE (UG/L AS AG) (01077)
84-05-16	.16	1	100	<1	10	3	70	5	100	.3	<1	<1

CARLTON COUNTY--Continued

DATE OF SAMPLE	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN) (01092)
84-05-16	100	1600

MAHNOMEN COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE OF SAMPLE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)
470842095435801	OBS WELL T143NR40W34CDA	112OTSH	84-09-05	1500	--	14.00
471055095512801	RON PAVEK T143NR41W22DCB	112BRDO	84-09-04	--	35.80	161
471115095403201	FLOWING WELL T143NR39W19BCD	112BRDO	84-09-05	1400	--	--
472415095575201	CISCO T146NR42W35CCD	112BRDO	84-09-04	--	1.00	114
472600095333001	OBS WELL T146NR39W25ACC	112OTSH	84-09-05	1200	8.20	14.00
472615095385501	ART RUDH T146NR39W20CBB	112BRDO	84-09-05	1000	--	107

DATE OF SAMPLE	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPECIFIC CONDUCTANCE (UMHOS) (00095)	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	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)
84-09-05	1475.00	455	534	7.2	--	85	21	1.2	298	3.5	1.5	327
84-09-04	1355.00	760	700	7.6	8.0	77	33	3.8	343	44	2.6	362
84-09-05	1482.00	529	585	7.4	7.0	79	28	2.4	339	2.3	1.6	365
84-09-04	1219.00	590	659	7.8	--	48	20	4.2	289	60	--	421
84-09-05	1455.00	405	475	7.3	11.5	69	18	3.0	262	<.2	1.7	--
84-09-05	1452.00	729	835	7.4	9.5	99	48	7.5	440	48	1.7	490

DATE OF SAMPLE	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)	PHORUS, DISSOLVED (MG/L AS P) (00666)	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)
84-09-05	1.8	.01	.40	.40	.03	.03	2	93	<20	<1	10	2
84-09-04	<.10	.60	1.1	.70	.03	.03	19	86	120	<1	<10	<1
84-09-05	<.10	.60	.70	.70	.02	.02	5	230	30	<1	<10	<1
84-09-04	<.10	.70	.70	.70	.04	.04	9	71	220	<1	10	<1
84-09-05	<.10	.13	.70	.70	<.01	<.01	2	97	30	<1	10	1
84-09-05	<.10	1.50	1.8	1.7	.11	.04	24	110	140	<1	10	<1

DATE OF SAMPLE	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)	CYANIDE TOTAL (MG/L AS CN) (00720)
84-09-05	9	4	120	<.1	<1	<1	1400	<.01
84-09-04	1700	5	180	.1	<1	<1	10	<.01
84-09-05	3900	3	84	<.1	<1	<1	27	<.01
84-09-04	620	4	54	.1	<1	<1	75	<.01
84-09-05	74	7	740	<.1	<1	<1	4400	<.01
84-09-05	4100	4	250	<.1	<1	<1	5	<.01

WATER QUALITY DATA, WATER YEAR OCTOBER 1983 TO SEPTEMBER 1984

OTTER TAIL COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE OF SAMPLE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	SPECIFIC CONDUCTANCE (UMHOS) (00095)
462100095414501	133N40W11BCC01	112OTSH	84-05-30	1030	20.00	365
462715095323001	134N39W01ACD02	112OTSH	84-05-30	1130	60.00	480
463245095331501	136N39W35DAD02	112OTSH	84-05-30	1230	68.00	720
463500095331501	136N39W14DDD01	112OTSH	84-05-18	--	40.00	510

DATE OF SAMPLE	SPECIFIC CONDUCTANCE LAB (UMHOS) (90095)	PH (STANDARD UNITS) (00400)	TEMPERATURE (DEG C) (00010)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)
84-05-30	421	7.3	11.0	22	3.1	5.2	.18
84-05-30	523	7.1	9.0	23	11	<.10	.48
84-05-30	583	7.3	8.5	12	3.7	4.6	.33
84-05-18	536	7.3	8.0	25	28	9.5	.09

ST. LOUIS COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE OF SAMPLE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)
464807092312501	BURIED DRIFT OBS WELL T50NR19W23DAD	112BRDO	84-05-16	--	--	--
465122092371201	051N18W33DDD	400MDMR	84-05-16	--	--	--
472217093033502	056N21W06BBA02 KTB-26	111HLCN	84-05-16	1115	--	25.00
472228093032203	057N21W31DCB03 KTB-31	112BRDO	84-05-17	1300	--	60.00
472228093032204	057N21W31DCB04 KTB-32	111HLCN	84-05-17	1330	--	17.00
472330093032103	057N21W30DBB03 KTB30	112PLSC	84-05-16	1000	--	20.80
480029093003301	064N21W22DCD01 ORR WELL 1	112WSCS	84-08-14	1330	28.00	35.60
480029093003302	064N21W22DCD02 ORR WELL 2DEEP	112WSCS	84-08-14	1800	18.00	28.00
480029093003303	064N21W22DCD03 ORR WELL 3DEEP	112WSCS	84-08-14	1500	18.00	48.80
480029093003309	064N21W22DCD09 ORR WELL 9	112WSCS	84-08-22	1600	26.00	34.20
480029093003310	064N21W22DCD10 ORR WELL10	112WSCS	84-08-22	1600	24.00	29.60
480029093003311	064N21W22DCD11 ORR WELL 11	112WSCS	84-08-22	1600	24.00	32.30
	064N21W22DCD11 ORR WELL 11	112WSCS	84-09-25	1100	25.00	32.30
480029093003312	064N21W22DCD12 ORR WELL 12	112WSCS	84-08-22	1600	24.00	29.80
480029093003313	064N21W22DCD13 ORR WELL 13	112WSCS	84-08-22	1600	17.00	24.30
480029093003314	064N21W22DCD14 ORR WELL 14	112WSCS	84-08-22	1600	18.00	24.30
480029093003352	064N21W22DCD52 ORR WELL 2SHALLOW	112WSCS	84-08-14	1800	18.00	22.00
	064N21W22DCD52 ORR WELL 2SHALLOW	112WSCS	84-08-22	1600	18.00	22.00
480029093003353	064N21W22DCD53 ORR WELL 3SHALLOW	112WSCS	84-08-14	1630	18.00	27.60
	064N21W22DCD53 ORR WELL 3SHALLOW	112WSCS	84-08-22	1600	18.00	27.60

ST. LOUIS COUNTY--Continued

DATE OF SAMPLE	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE (UMHOS) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (UMHOS) (90095)	PH (STAND-ARD UNITS) (00400)	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)	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)
84-05-16	--	295	319	9.0	--	27	17	15	1.6	170	2.0	2.5
84-05-16	1255.00	365	413	8.4	--	13	5.2	65	2.9	179	1.6	19
84-05-16	--	1200	1270	7.9	8.0	44	84	110	14	378	220	13
84-05-17	--	580	541	7.6	9.0	52	25	20	5.5	239	17	12
84-05-17	--	420	372	8.3	10.0	20	26	13	1.5	88	68	16
84-05-16	--	80	89	6.2	7.0	8.8	2.1	2.7	2.8	25	6.8	2.9
84-08-14	1392.00	165	--	6.3	14.0	--	--	--	--	--	--	--
84-08-14	1383.00	82	--	6.4	19.0	--	--	--	--	--	--	--
84-08-14	1383.00	289	--	6.8	21.5	--	--	--	--	--	--	--
84-08-22	1392.00	280	--	7.2	--	--	--	--	--	--	--	--
84-08-22	1388.00	82	--	6.6	--	--	--	--	--	--	--	--
84-08-22	1389.00	95	--	6.7	--	--	--	--	--	--	--	--
84-09-25	1389.00	83	82	6.7	--	8.1	2.4	3.4	2.8	27	6.0	1.1
84-08-22	1389.00	62	--	6.7	--	--	--	--	--	--	--	--
84-08-22	1381.00	50	--	6.7	--	--	--	--	--	--	--	--
84-08-22	1382.00	45	--	7.0	--	--	--	--	--	--	--	--
84-08-14	1383.00	531	--	6.8	19.0	--	--	--	--	--	--	--
84-08-22	1383.00	130	--	6.9	--	--	--	--	--	--	--	--
84-08-14	1383.00	487	--	6.8	13.0	--	--	--	--	--	--	--
84-08-22	1383.00	330	--	6.7	--	--	--	--	--	--	--	--

DATE OF SAMPLE	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, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS, ORTHO, TOTAL (MG/L AS P) (70507)	ARSENIC TOTAL (UG/L AS AS) (01002)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA) (01007)
84-05-16	.20	9.2	207	.06	--	<.10	--	--	--	1	--	<100
84-05-16	1.4	8.1	270	.06	--	<.10	--	--	--	1	--	<100
84-05-16	1.2	22	849	--	28	27	<.01	4.2	<.01	--	--	--
84-05-17	.40	31	342	--	<.10	<.10	.52	6.2	.02	--	--	--
84-05-17	1.4	19	256	--	<.10	<.10	.04	5.3	<.01	--	--	--
84-05-16	<.10	18	78	--	1.0	1.1	.38	5.3	<.01	--	--	--
84-08-14	--	--	--	--	--	--	--	--	--	--	1	--
84-08-14	--	--	--	--	--	--	--	--	--	--	<1	--
84-08-14	--	--	--	--	--	--	--	--	--	--	1	--
84-08-22	--	--	--	--	--	--	--	--	--	--	<1	--
84-08-22	--	--	--	--	--	--	--	--	--	--	<1	--
84-08-22	--	--	--	--	--	--	--	--	--	--	<1	--
84-09-25	<.10	16	--	--	--	2.7	--	--	--	--	<1	--
84-08-22	--	--	--	--	--	--	--	--	--	--	<1	--
84-08-22	--	--	--	--	--	--	--	--	--	--	<1	--
84-08-22	--	--	--	--	--	--	--	--	--	--	--	--
84-08-14	--	--	--	--	--	--	--	--	--	--	1	--
84-08-22	--	--	--	--	--	--	--	--	--	--	<1	--
84-08-14	--	--	--	--	--	--	--	--	--	--	<1	--
84-08-22	--	--	--	--	--	--	--	--	--	--	<1	--

ST. LOUIS COUNTY--Continued

DATE OF SAMPLE	BORON, DIS-SOLVED (UG/L AS B) (01020)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD) (01027)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR) (01034)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU) (01042)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE) (01045)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB) (01051)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN) (01055)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	SELE-NIUM, TOTAL (UG/L AS SE) (01147)
84-05-16	--	<1	10	--	3	120	--	12	--	70	--	<1
84-05-16	--	<1	10	--	7	110	--	3	--	<10	--	<1
84-05-16	--	--	--	10	--	--	--	--	--	--	320	--
84-05-17	--	--	--	--	--	--	--	--	--	--	1200	--
84-05-17	--	--	--	--	--	--	--	--	--	--	780	--
84-05-16	--	--	--	--	--	--	--	--	--	--	38	--
84-08-14	--	--	--	--	--	--	--	2	3	--	--	--
84-08-14	--	--	--	--	--	--	--	5	5	--	--	--
84-08-14	--	--	--	--	--	--	--	3	2	--	--	--
84-08-22	--	--	--	--	--	--	--	--	--	--	--	--
84-08-22	--	--	--	--	--	--	--	--	--	--	--	--
84-08-22	--	--	--	--	--	--	--	--	3	--	--	--
84-09-25	<20	--	--	--	--	--	110	--	1	--	--	--
84-08-22	--	--	--	--	--	--	--	--	7	--	--	--
84-08-22	--	--	--	--	--	--	--	--	6	--	--	--
84-08-22	--	--	--	--	--	--	--	1	--	--	--	--
84-08-14	--	--	--	--	--	--	--	21	14	--	--	--
84-08-22	--	--	--	--	--	--	--	--	4	--	--	--
84-08-14	--	--	--	--	--	--	--	2	1	--	--	--
84-08-22	--	--	--	--	--	--	--	--	3	--	--	--

DATE OF SAMPLE	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG) (01077)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN) (01092)
84-05-16	<1	110	510
84-05-16	<1	280	60
84-05-16	--	--	--
84-05-17	--	--	--
84-05-17	--	--	--
84-05-16	--	--	--
84-08-14	--	--	--
84-08-14	--	--	--
84-08-14	--	--	--
84-08-22	--	--	--
84-08-22	--	--	--
84-08-22	--	--	--
84-09-25	--	--	--
84-08-22	--	--	--
84-08-22	--	--	--
84-08-22	--	--	--
84-08-14	--	--	--
84-08-22	--	--	--
84-08-14	--	--	--
84-08-22	--	--	--

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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)
cfs-days	2.447×10^{3}	cubic meters (m^3)
	2.447×10^{-3}	cubic hectometers (hm^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

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