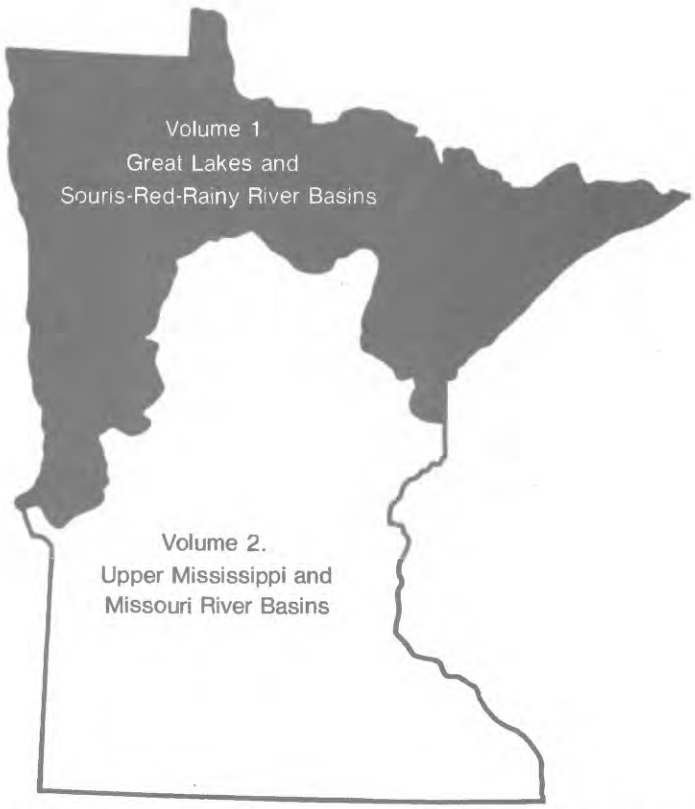
Water Resources Data Minnesota Water Year 1993

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



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-93-1
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 1993

1992

OCTOBER

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1993

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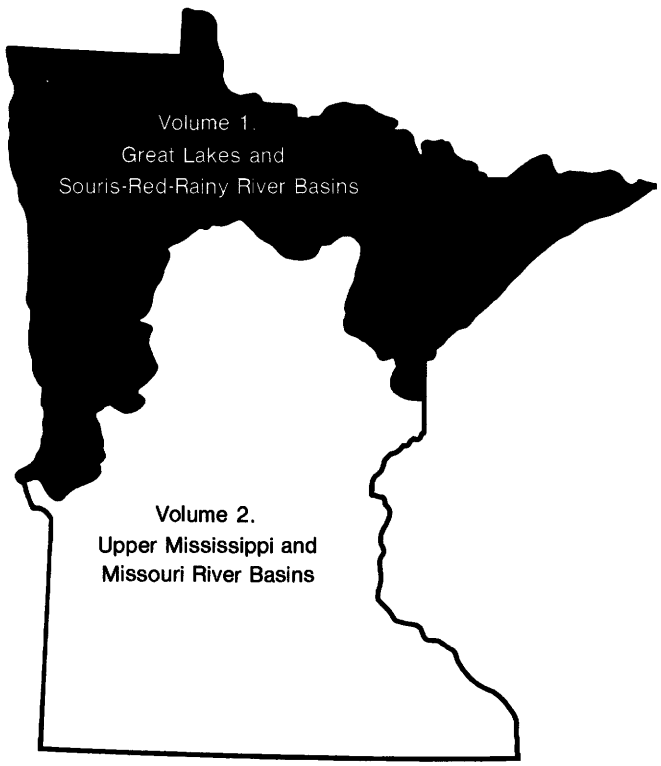
Water Resources Data Minnesota Water Year 1993

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

by Gregory B. Mitton, Joseph H. Hess, and Kevin G. Guttormson



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-93-1
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

DEPARTMENT OF THE INTERIOR

BRUCE BABBITT, Secretary

GEOLOGICAL SURVEY

Gordon P. Eaton, Director

For additional information write to:

District Chief, Water Resources Division
U.S. Geological Survey
2280 Woodale Drive
Mounds View, Minnesota 55112

1994

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. The authors had primary responsibility for assuring that the information contained herein is accurate, complete, and adheres to U.S. Geological Survey policy and established guidelines.

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 George Garklavs, District Chief, Minnesota.

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

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July 1994

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7. Author(s) Gregory B. Mitton, Joseph H. Hess and Kevin G. Guttormson

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16. Abstract (Limit: 200 words)

Water-resources data for the 1993 water year for Minnesota consist of records of stage, discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This volume contains discharge records for 46 gaging stations; stage and contents for 5 lakes and reservoirs; water quality for 15 stream stations; and water levels for 1 observation well. Also included are 26 high-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data together with the data in Volume 2, represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Minnesota.

17. Document Analysis a. Descriptors

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

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

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

GAGING STATIONS, IN DOWNSTREAM ORDER, FOR WHICH RECORDS ARE PUBLISHED--Continued

HUDSON BAY BASIN--Continued

* * * * * *

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

GROUND-WATER LEVELS

QUALITY OF GROUND WATER

WATER RESOURCES DATA - MINNESOTA, 1993

DISCONTINUED SURFACE-WATER DISCHARGE OR STAGE-ONLY STATIONS

The following continuous-record surface-water discharge or stage-only stations (gaging stations) in Minnesota have been discontinued. Daily streamflow or stage records were collected and published for the period of record, expressed in water years, shown for each station. Those stations with an asterisk (*)after the station number are currently operated as high-flow partial-record stations. Discontinued project stations with less than 3 years of record have not been included. Information regarding these stations may be obtained from the District Office at the address given on the back side of the title page of this report.

[Letters after station name designate type of data collected: (d) discharge, (e) elevation (stage only)]

Station name	Station number	Drainage area (mi^2)	Period of record
STREAMS TRIBUTARY TO LAKE SUPERIOR			
Pigeon River above mouth of Arrow River, MN (d)	04010000	256	1924-27
Grand Portage River at Grand Portage, MN (d)	04010510		1991-92
Reservation River near Hovland, MN (d)	04010530		1991-92
Brule River at mouth near Hoveland, MN (e)	04011000	248	1911
Devil Track River at mouth near Grand Marais, MN (e)	04011500	a77	1911
Cascade River at mouth near Grand Marais, MN (e)	04012000	111	1911
Poplar River at Lutsen, MN (d)	04012500*	114	1911†, 1912-17, 1928-47, 1952-61
Cross River at Schroeder, MN (d)	04013000	a91	1931-32
Beaver Creek (Beaver Bay Run) at Beaver Bay, MN (d)	04015000	126	1911-14, 1928-31
South Branch Partridge River near Babbitt, MN (d)	04015455	18.5	1977-80
Partridge River above Colby Lake, at Hoyt Lakes, MN (d)	04015475	106	1979-88
Second Creek near Aurora, MN (d)	04015500	29	1955-80
Partridge River near Aurora, MN (d)	04016000	161	1942-82
St. Louis River near Aurora, MN (d)	04016500	290	1942-87
Embarrass River at Embarrass, MN (d)	04017000	93.8	1942-64
Embarrass River near McKinley, MN (d)	04018000	171	1953-62
St. Louis River at Forbes, MN (d)	04018750	713	1965-90
East Two Rivers near Iron Junction, MN (d)	04018900	40.0	1966-79
West Two Rivers near Iron Junction, MN (d)	04019000	65.3	1953-62, 1965-79
West Swan River near Silica, MN (d)	04019300	16.3	1963-79

DISCONTINUED SURFACE-WATER DISCHARGE OR STAGE-ONLY STATIONS.--Continued

Station name	Station number	Drainage area (mi^2)	Period of record
STREAMS TRIBUTARY TO LAKE SUPERIOR--Continued			
East Swan River near Toivola, MN (d)	04019500	112	1953-62, 1964-71
Swan River near Toivola, MN (d)	04020000	254	1952-61
Whiteface River below (at) Meadowlands, MN (d)	04021000	453	1909-17
Stoney Brook at Brookston, MN (d)	04021530	97.3	1983-84
Cloquet River at Independence, MN (d)	04023000	a750	1909-17
Simian Creek near Brookston, MN (d)	04023150	-	1983-84
St. Louis River near Cloquet, MN (e)	04023500	a3,400	1903
Squaw Creek near Cloquet, MN (d)	04023600	-	1983-84
Otter Creek near Cloquet, MN (d)	04024015		1983-84
Elim Creek near Holyoke, MN (d)	04024090	1.06	1976-78
Skunk Creek below Elim Creek near Holyoke, MN (d)	04024093	8.83	1976-78
RED RIVER OF THE NORTH BASIN			
Otter Tail River near Detroit Lakes, MN (d)	05030000	270	1937-71
Otter Tail River at German Church, near Fergus Falls, MN (d)	05030500	a1,230	1904-17
Pelican River at Detroit Lakes, MN (d)	05033900	-	1968-71, 1974-75
Pelican River at Detroit Lake outlet near Detroit Lakes, MN (d)	05034100	-	1968-71, 1972-75
Long Lake outlet near Detroit Lakes, MN (d)	05035100	-	1968-71
West Branch County Ditch No. 14 near Detroit Lakes, MN (d)	05035200	-	1968-71
East Branch County Ditch No. 14 near Detroit Lakes, MN (d)	05035300	-	1968-71
St. Clair Lake outlet near Detroit Lakes, MN (d)	05035500	-	1968-75
Pelican River at Muskrat Lake outlet near Detroit Lakes, MN (d)	05035600	-	1968-75
Pelican River at Sallie Lake outlet near Detroit Lakes, MN (d)	05037100	-	1968-75
Pelican River at Lake Melissa outlet near Detroit Lakes, MN (d)	05039100	-	1968-75
Pelican River near Detroit Lakes, MN (d)	05040000	123	1942-53
Pelican River near Fergus Falls, MN (d)	05040500	482	1909-12, 1942-80
Otter Tail River (Red River) near Fergus Falls, MN (e)	05045500	a1,690	1909-10

DISCONTINUED SURFACE-WATER DISCHARGE OR STAGE-ONLY STATIONS.--Continued

Station name	Station number	Drainage area (mi^2)	Period of record
RED RIVER OF THE NORTH BASIN--Continued			
Otter Tail River near Breckenridge, MN (d)	05046500	a2,040	1931-32, 1939-46†
Mustinka River (head of Bois de Sioux River) near Norcross, MN(d	05047000	-	1940-47
Mustinka ditch above West Branch Mustinka River (Twelve Mile Creek) near Charlesville, MN (d)	05047500	-	1943-55
Mustinka Ditch ditch below West Branch Mustinka River (Twelve Mile Creek) near Charlesville, MN (d)	05048000	-	1943-55
West Branch Mustinka River (Twelve Mile Creek) below Mustinka ditch near Charlesville, MN (d)	05048500	-	1943-55
Mustinka River above (near) Wheaton, MN (d)	05049000	834	1915-24, 1930-58
Bois de Sioux River below Fairmont, ND (d)	05050500	a1,540	1919-44
Rabbit River at Cambell, MN (d)	05051000	266	1942-52
Red River of the North below Fargo, ND (d)	05054020	-	1969-78
Whiskey Creek at Barnesville, MN (d)	05061200*	25.3	1964-66
Wild Rice River near Ada, MN (d)	05063000	a1,100	1948-54
South Branch Wild Rice River near Borup, MN (d)	05063500*	254	1944-49
Marsh River below Ada, MN (d)	05067000	-	1948-52
Sand Hill River at Beltrami, MN (d)	05068000	a324	1943-58
Sand Hill ditch at Beltrami, MN (d)	05068500	-	1943-58
Thief River near Gatske, MN (d)	05075500	-	1953-56
Red Lake River at Thief River Falls, MN (d)	05076500	a3,450	1909-18, 1920-30
Clearwater River near Pinewood, MN (d)	05077000	132	1940-45
Clearwater River near Leonard, MN (d)	05077500	153	1934-47
Ruffy Brook near Gonvick, MN (d)	05077700*	45.2	1960-78
Red River of the North at Oslo, MN (d)	05083500	331,200	1936-37, 1941-43, 1945-60, 1973-78
Snake River at Warren, MN (d)	05085500	a175	1945, 1953-56
Snake River at Alvarado, MN (d)	05086000	309	1945,

"DISCONTINUED SURFACE-WATER DISCHARGE OR STAGE-ONLY STATIONS.--Continued

Station name	Station number	Drainage area (mi^2)	Period of record
RED RIVER OF THE NORTH BASIN--Continued			
Snake River at Alvarado, MN (d)	05086000	309	1945, 1953-56
Snake River near Argyle, MN (d)	05086500	481	1945
Middle River near Strandquist, MN (d)	05087000	-	1953-56
Tamarac River near Strandquist, MN (d)	05090500	-	1953-56
Tamarac River at Stephen, MN (d)	05091000	-	1945
Tamarac River near Stephen, MN (d)	05091500	a320	1945, 1953-55
Two Rivers (Middle Fork Two Rivers) near Hallock, MN (d)	05092500	131	1931-38
South Branch (South Fork) Two Rivers near Pelan, MN (d)	05093000	281	1928-38, 1953-56
South Branch Two Rivers (Two Rivers) at Hallock, MN (d)	05094500	-	1940-47
Two Rivers (South Branch Two Rivers) at Hallock, MN (d)	05095000		1911-14, 1929-30, 1938-39, 1941-43
Two Rivers below Hallock, MN (d)	05095500	644	1945-55
North Branch (North Fork) Two Rivers near Lancaster, MN (d)	05096000	a32	1929-38, 1941-55
State Ditch 85 near Lancaster, MN (d)	05096500	a95	1929-38, 1942-55
North Branch Two Rivers at Lancaster, MN (d)	05097000	209	1941-42, 1953-56
North Branch Two Rivers near Northcote, MN (d)	05097500	386	1941-42, 1945-51
Two Rivers below North Branch near Hallock, MN (d)	05098000	a1,060	1941-43
Roseau River (at) near Malung, MN (d)	05103000	252	1928-46
South Fork (West Branch) Roseau River near Malung, MN (d)	05104000	312	1911-14, 1928-46
Roseau River at Roseau, MN (d)	05105000	-	1940-47
Roseau River near Roseau, MN (d)	05105500	-	1930-60
Sprague Creek near Sprague, Manitoba (d)	05106000	176	1928-81
Pine Creek near Pine Creek, MN (d)	05107000	74.6	1928-53
Roseau River at Roseau Lake, MN (e)	05106500		1939-91
Roseau River at Ross, MN (d)	05107500	1,220	1928-91
Roseau River near Badger, MN (d)	05108000	-	1928-69

DISCONTINUED SURFACE-WATER DISCHARGE OR STAGE-ONLY STATIONS.--Continued

Station name	Station number	Drainage area (mi^2)	Period of record
RED RIVER OF THE NORTH BASIN--Continued			
Roseau River near Duxby, MN (d)	05108500	-	1929-51, 1952-56
Badger Creek near Badger, MN (d)	05109000	a2.2	1929-30, 1931-38
Roseau River near Haug, MN (d)	05109500	-	1932-66
Roseau River at outlet of State Ditch 69 near Oak Point, MN (d)	05110000	-	1939-42
Roseau River at head of State Ditch 51 near Oak Point, MN (d)	05110500	-	1933-42
Roseau River at Oak Point, MN (d)	05111000	-	1933-39, 1941-60
Roseau River at international boundary, near Caribou, MN (d)	05112500	a1,590	1933-69
LAKE OF THE WOODS BASIN			
Isabella River near Isabella, MN (d)	05124500	341	1953-61, 1976-77
Filson Creek near Ely, MN (d)	05124990	9.66	1974-85
South Kawishiwi River near Ely, MN (d)	05125000	-	1953-61, 1976-78
Stony River near Isabella, MN (d)	05125500	180	1953-64
Stony River near Babbitt, MN (d)	05125550	219	1975-80
Dunka River near Babbitt, MN (d)	05126000	53.4	1951-62, 1975-80
South Kawishiwi River above White Iron Lake near Ely, MN (d)	05126210		1975-78
Bear Island River near Ely, MN (d)	05126500	68.5	1953-62, 1975-77
Burntside River near Ely, MN (d)	05127205	-	1967-78
Bjorkman's Creek near Ely, MN (d)	05127207	1.36	1972-78
Armstrong Creek near Ely, MN (d)	05127210	5.29	1967-78
Longstorff Creek near Ely, MN (d)	05127215	8.84	1967-78
Shagawa Lake tributary at Ely, MN (d)	05127219	1.84	1971-78
Burgo Creek near Ely, MN (d)	05127220	3.04	1967-78
Shagawa River near Ely, MN (d)	05127230	99	1967-78

DISCONTINUED SURFACE-WATER DISCHARGE OR STAGE-ONLY STATIONS.--Continued

Station name	Station number	Drainage area (mi^2)	Period of record
LAKE OF THE WOODS BASIN--Continued			
Vermilion Lake near Soudan, MN (e)	05128200	-	1913-15, 1941-42, 1946-87
Pike River near Biwabik, MN (d)	05128340	-	1977-79
Pike River near Embarrass, MN (d)	05128500	115	1953-64, 1976-79
Vermilion River below Vermilion Lake near Tower, MN (d)	05129000	483	1911-17, 1928-81
Rainy River at International Falls, MN (d)	05129500	14,900	1905-60
Sturgeon River (Lake) at Side Lake, MN (d)	05130000	-	1938-47
Dark River near Chisholm, MN (d)	05131000	50.6	1942-61, 1965-79
Deer Lake outlet (Deer Lake) near Effie, MN (d)	05131800	-	1937-39, 1940-46
Big Fork River at Laurel, MN (d)	05132500	-	1909
Black River near Loman, MN (d)	05133000	-	1909
Rapid River near Baudette, MN (d)	05134200	543	1956-85
Warroad River near Warroad, MN (d)	05139500	162	1946-80
Bulldog Run near Warroad, MN (d)	05140000*	14.2	1946-51, 1966-77
East Branch Warroad River near Warroad, MN (d)	05140500*	102	1946-54, 1966-77

† Stage records only.
a Approximately.

DISCONTINUED SURFACE-WATER-QUALITY STATIONS

[The following stations were discontinued as continuous-record or periodic-record stations prior to the 1993 water year. Daily or periodic records of chemical, biological, sediment, temperature, dissolved oxygen, pH, or specific conductance were collected and published for the record shown for each station.]

Discontinued continuous-record and periodic-record surface-water-quality stations

Station name	Station number	Drainage area (sq mi)	Type of record	Period of record (water years)
Baptism River near Beaver Bay, MN	04014500	140	Temp, S.C.	1980-83
Partridge River abv Colby Lake at Hoyt Lakes, MN	04015475	106	Temp, S.C.	1976-85
St. Louis River at Forbes, MN	04018750	713	Sed.	1968-70
St. Louis River at Scanlon, MN	04024000	3430	Temp, S.C.	1980-83
Elim Creek near Holyoke, MN	04024090	1.06	Sed.	1976-79
Skunk Creek below Elim Creek near Holyoke, MN	04024093	8.83	C, Sed., Temp, D.O., pH, S.C.	1976-79
Deer Creek near Holyoke, MN	04024098	7.77	C, Bio., Temp, D.O., pH, S.C.	1977-79
			Sed.	1977-81
Buffalo River near Dilworth, MN	05062000	1040	Sed.	1971-81
Wild River River at Twin Valley, MN	05062500	888	C, Bio., Temp, D.O., pH, S.C.	1971, 73-79
			Sed.	1976-79
Roseau River below Roseau, MN	05105300		C, Bio., Sed., Temp, D.O., pH, S.C.	1973-83
Roseau River below State Ditch 51 nr Caribou, MN	05112000	1570	Temp, S.C.	1980-83
Kawishiwi River near Ely, MN	05124480	253	Temp	1966-81
Little Fork River at Littlefork, MN	05131500	1730	C, Bio., Sed., Temp, D.O., pH, S.C.	1967, 69, 71, 73-86
Big Fork River at Big Falls, MN	05132000	1460	C, Bio., Sed., Temp, D.O., pH, S.C.	1968, 71-77
Rainy River at Manitou Rapids, MN	05133500	19,400	Temp, S.C.	1980-83

Type of record: C (Chemical), Bio. (biological), Sed. (sediment), Temp. (temperature), D.O. (dissolved oxygen), pH (pH), S.C. (specific conductance).

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INTRODUCTION

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

Water resources data for the 1993 water year for Minnesota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This volume contains discharge records for 46 gaging stations; stage and contents for 5 lakes and reservoirs; water quality for 15 stream stations; and water levels for 1 observation well. Also included are 26 high-flow partial-record stations. 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 the books and Open-File Reports Section, Federal Center, Box 25425, Denver, Colorado 80225.

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-93-1. 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. Beginning with the 1990 water year, all water-data reports will also be available on Compact Disc-Read Only Memory (CD-ROM). All data reports published for the current water year for the entire Nation, including Puerto Rico and the Trust Territories, will be reproduced on a single CD-ROM disc.

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) 783-3101. A limited number of CD-ROM discs will be available for sale by the Books and Open-File Reports section, U.S. Geological Survey, Federal Center, Box 25425, Denver, Colorado 80225.

COOPERATION

The U.S. Geological Survey and agencies 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.

Minnesota Department of Transportation

Minnesota Pollution Control Agency.

Lower Red Lake Watershed Management Board.

Grand Portage Reservation Tribal Council.

Leech Lake Reservation Business Committee.

Mille Lacs Band of Chippewa - Tribal Government.

Beltrami Soil and Water Conservation District.

Elm Creek Conservation Commission.

Lower Red River Management Board.

Assistance in the form of funds or services was given by the U.S. Army Corps of Engineers and the Department of State. Other organizations that supplied data are acknowledged in station descriptions.

SUMMARY OF HYDROLOGIC CONDITIONS

Precipitation

With some exceptions in the north and northwest, all of Minnesota received greater than normal (based on data from 1961-90) (fig. 1) precipitation during the 1993 water year (fig. 2). Precipitation during the first quarter of the 1993 water year was generally above normal in the southern half of Minnesota and below normal in the northern half. The winter season began early when many parts of the State were covered with more than 6 inches of snow that fell November 1-3. The depth of the snow pack was maintained at or above median throughout the winter by numerous relatively small snowfalls. Notable events during the winter included a January ice storm in southern and eastern Minnesota and an unusually cold spell in the entire State in mid-March.

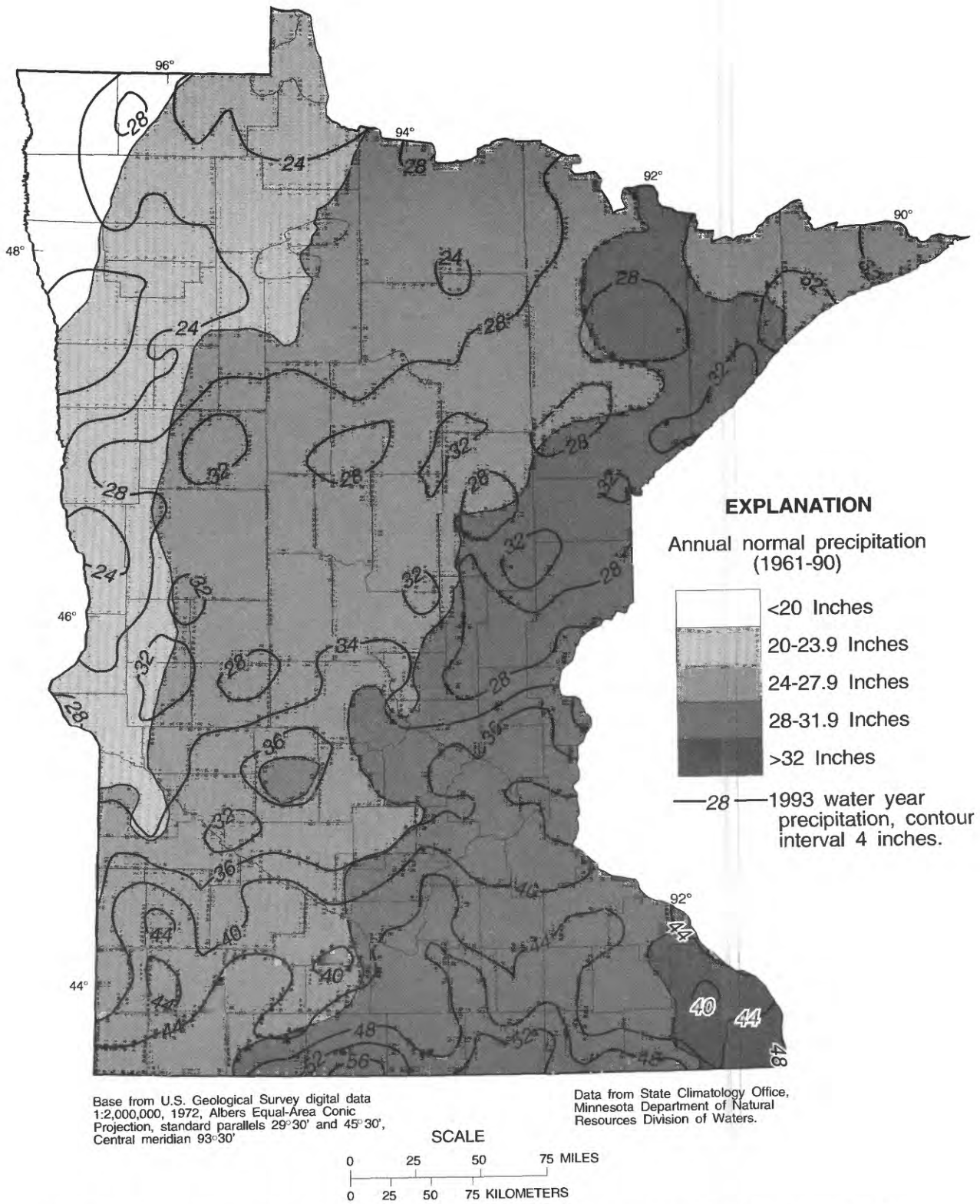

Figure 1.--Precipitation, in inches, during 1993 water year compared to normal annual precipitation in Minnesota.

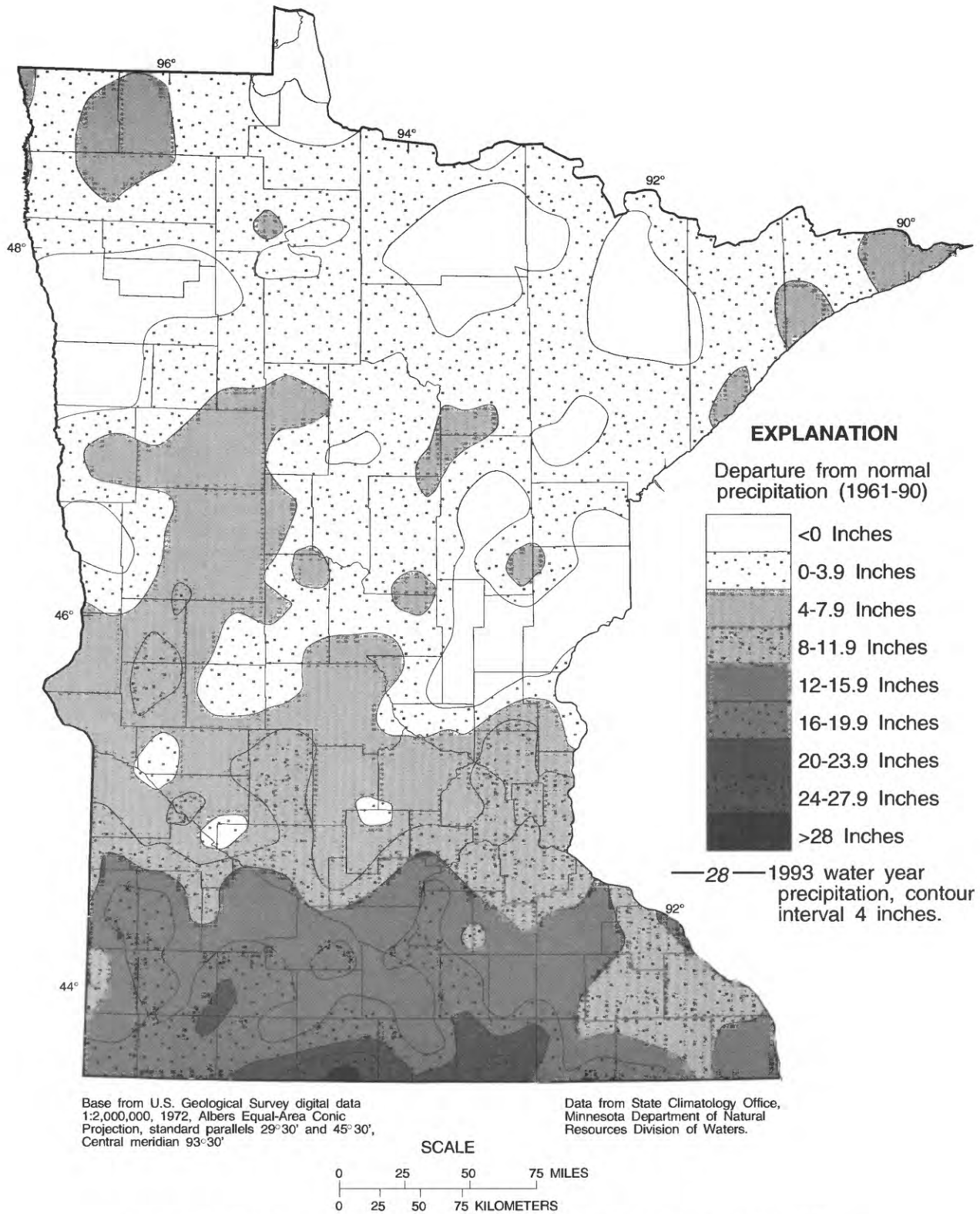

Figure 2.--Precipitation departure from normal, in inches, during 1993 water year in Minnesota.

Spring and early summer was one of the wettest periods in Minnesota's recorded climate history. Thunderstorms on May 7-8 in southern Minnesota left 4.28 inches in Marshall and 4.93 inches in Pipestone. Heavy rains continued during June in the southern one-third of Minnesota. Some locations reported June rainfalls totals exceeding 15 inches. In July and August, the wet weather persisted in southern Minnesota and began to extend into parts of the north and west. West central, northwestern, and northeastern Minnesota had downpours that often dropped many inches of rain in just a few hours. By the end of July, virtually the whole State had received from 125-200 percent of normal precipitation since April 1. In September, precipitation was below normal statewide except in the south-central region where it was above normal. Figure 3 shows total monthly precipitation compared to the normal monthly values.

Streamflow

Streamflow characteristics in the Great Lakes basin in northeast Minnesota and the Souris-Red-Rainy River basins, which extend from the northeast to the west and northwest parts of the state, are described in this volume. Figure 4 shows mean monthly and annual discharges for water year 1993 compared to the median of mean discharges for the period 1961-90 for 3 stations, Baptism River near Beaver Bay, Red Lake River at Crookston, and Little Fork River at Littlefork. The stations are located in 3 major basins - Lake Superior, Red River of the North, and Lake of the Woods River basins, respectively. The 1993 mean-annual discharges for each of the stations were close to the medians.

Monthly-mean discharges for the 3 stations were generally near or below the monthly medians until July. Because of the heavy rains beginning in July in many parts of northern Minnesota, there were notable increases in streamflow at the 3 stations. The July average of 519 ft^3/s at the Baptism River near Beaver Bay is a record for that station. The old record was 327 ft^3/s set in 1978. The instantaneous peak flow for the Baptism River in 1993 occurred July 4th with a discharge of 3930 ft^3/s. Discharge continued above the 75th percentile for August but receded to the normal range in September. Runoff for 1993 was 17.04 inches, 0.58 inches above the average for the period of record.

Monthly-mean discharges in the Red Lake River at Crookston in the Red River of the North basin were below normal through June. However, discharges for July, August, and September were 187, 340, and 247 percents respectively of the monthly medians. The annual runoff for 1993 was 3.49 inches, 0.63 inches above the average for the period of record.

Within the Red River of the North basin (Minnesota portion) the summer rainfall amounts were highest in the Buffalo River subbasin. Discharges in the Buffalo River near Dilworth were in the normal range through June, but in July, August, and September, discharges were 2800, 3600, and 535 percent of the monthly medians, respectively. The mean discharge of 910 ft^3/s for August was a record for that month. The instantaneous peak flow in the Buffalo River for 1993 occurred July 20th with a discharge of 3450 ft^3/s. The mean discharge for 1993 was 328 ft3/s compared to the 30-year median of 141 ft^3/s. The annual runoff for 1993 was 4.29 inches, which was 2.54 inches above the average for the period of record.

Monthly-mean discharges for the Little Fork River at Littlefork in the Lake of the Woods basin were below normal through June except for March, which was slightly above normal. However, discharges for July, August, and September were 414, 352, and 178 percents of the monthly medians, respectively. The instantaneous peak flow in the Little Fork River for 1993 occurred July 8th with a discharge of 6580 ft3/s. The mean discharge for 1993 in the Little Fork River was near the 30-year median, and the annual runoff for 1993 was 9.00 inches, 0.71 inches above the average for the period of record.

Water Quality

Boxplots for 5 U.S. Geological Survey National Stream-Quality Accounting Network (NASQAN) stations are used to depict variability in concentrations of dissolved solids and nitrate as nitrogen in the Lake Superior, Rainy River, and Red River of the North basins (figs. 5 and 6).

Boxplots display the central tendency, variation, and skewness of a data set as well as the presence or absence of extreme values. A boxplot consists of a centerline (the median) dividing a rectangle whose ends are defined by the 75th and 25th percentiles. Whiskers from the ends of the box to the most extreme observation within 1.5 times the interquartile range (the distance from the 25th to the 75th percentile values) beyond the ends of the box. Values more than 1.5 interquartile ranges from the box ends may indicate extreme hydrologic and chemical conditions or sampling and analytical errors. Observations from 1.5 to 3 interquartile ranges from the box in either direction are plotted individually with an open circle.

Dissolved-solids concentrations determined in 1993 were generally less than median for Baptism River near Beaver Bay and St. Louis River at Scanlon in the Lake Superior basin. Red Lake River at Crookston in the Red River of the North basin generally had concentrations of dissolved solids higher than the monthly medians in the fall and spring. Winter and summer concentrations were near the median. Rainy River at Manitou Rapids had concentrations of dissolved solids below the 25th percentile in the fall and winter, but the rest of the samples had concentrations near the median.

Nitrate concentrations reported as nitrogen (analyzed for nitrate plus nitrite, with nitrite concentration assumed to be negligible) were above the 75th percentile in the winter and below the 25th percentile in the spring and summer in the St. Louis River at Scanlon. In the Baptism River near Beaver Bay, nitrate concentrations were near the monthly medians in the fall and winter samples and below the medians in the spring and summer. Samples collected in the Rainy River at Manitou Rapids had concentrations near the median. At Red Lake River at Crookston, samples were collected for the National Water-Quality Assessment (NAWQA) Program as well as NASQAN. Nitrate concentrations fell above and below the monthly medians, but appear to average near the medians. Nitrate concentrations for all the stations shown in figure 5 were below 10 milligrams per liter.

Nine ground water wells were sampled in 6 counties. Nitrate concentrations were above the primary drinking-waters standard of 10 mg/L (Minnesota Pollution Control Agency, 1988) in a sample collected from a shallow well in Marshall County. Two samples were above the iron standard of 300 ug/L, and 1 sample was above the manganese standard of 50 ug/L.

Ground-Water Levels

Data from one well, located in a surficial sand aquifer, is presented in this volume. Five wells located in surficial sand aquifers, five in buried sand and gravel aquifers, and one located in the Biwabik Iron-Formation aquifer were phased out from the well network by August of 1992.

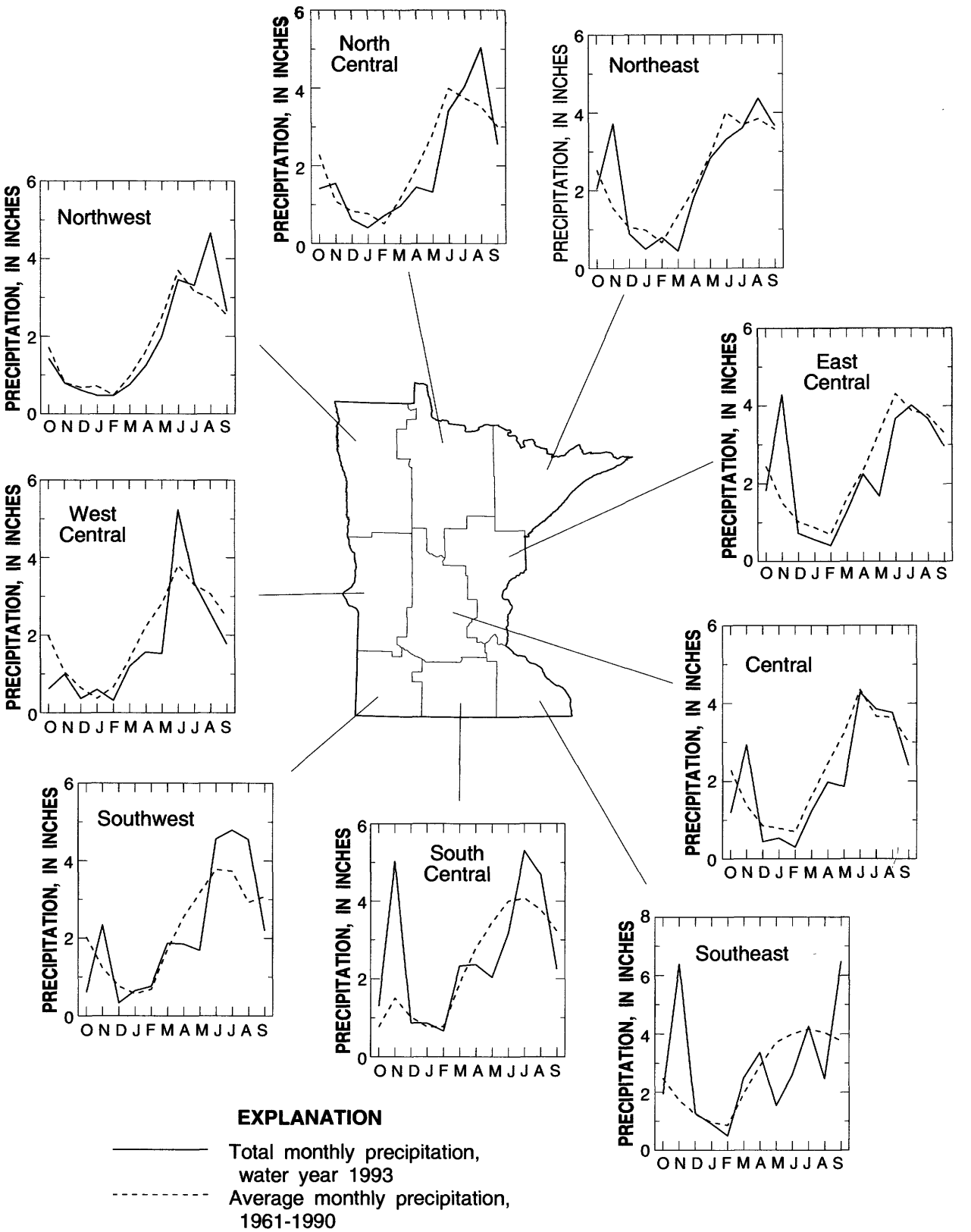

Figure 3.--Total monthly precipitation compared to average monthly precipitation by climatological division for a 30-year base period.

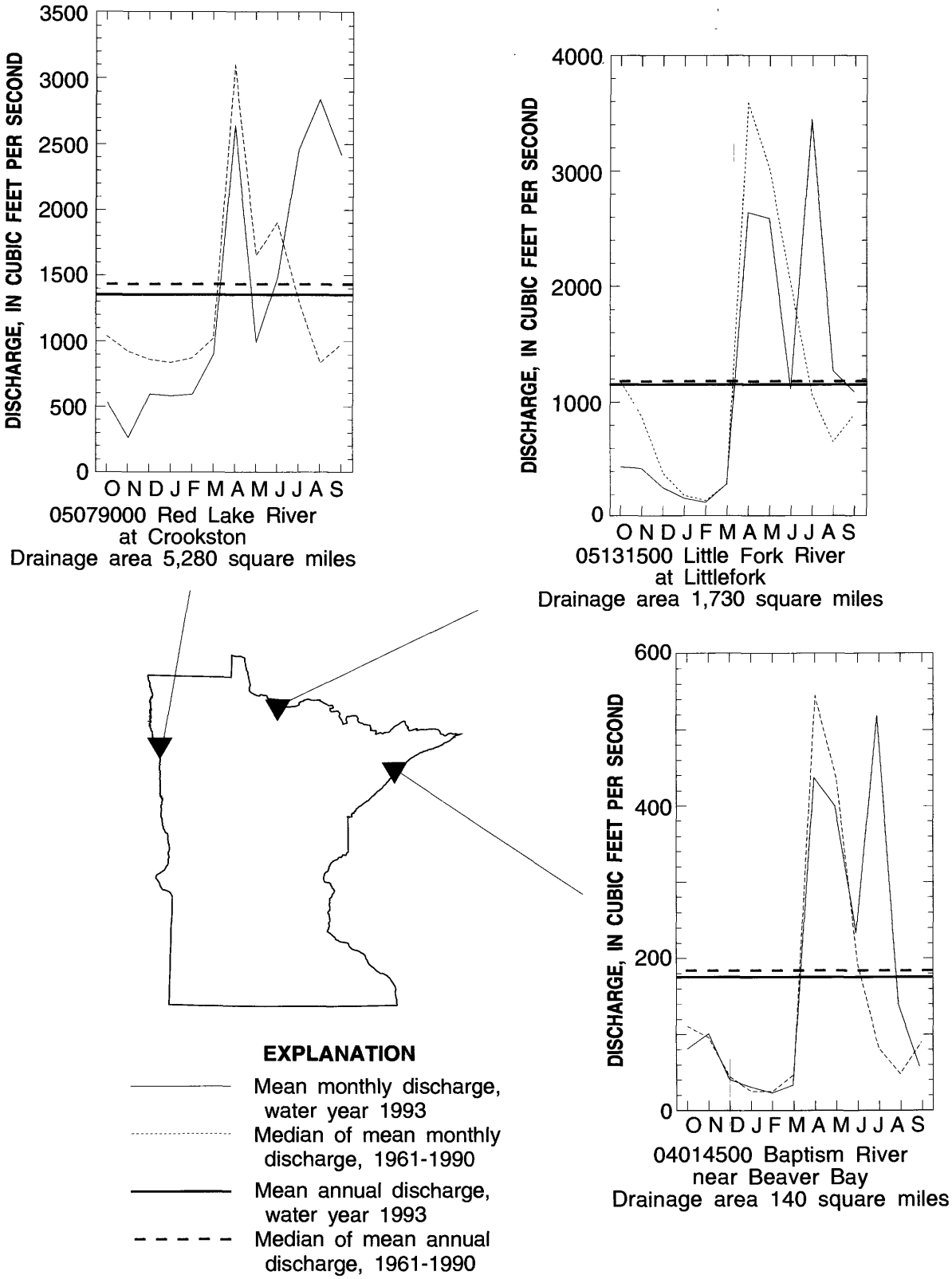

Figure 4.--Comparison of mean discharge for the 1993 water year with the median of mean discharges for 1961-90 at four long-term representative gaging stations.

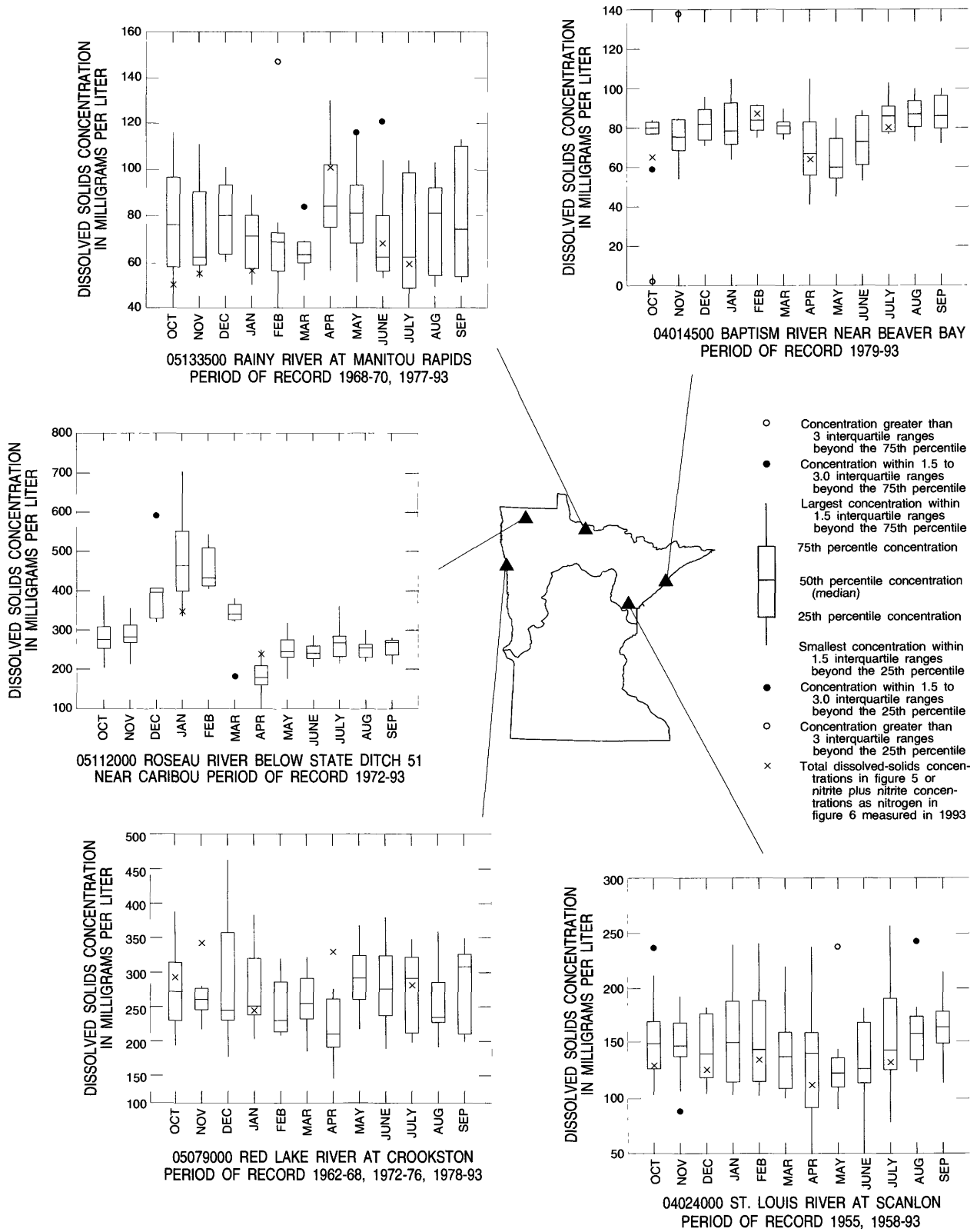

Figure 5--Dissolved-solids concentrations in samples collected during water year 1993 and selected statistics for period of record at five national network stations.

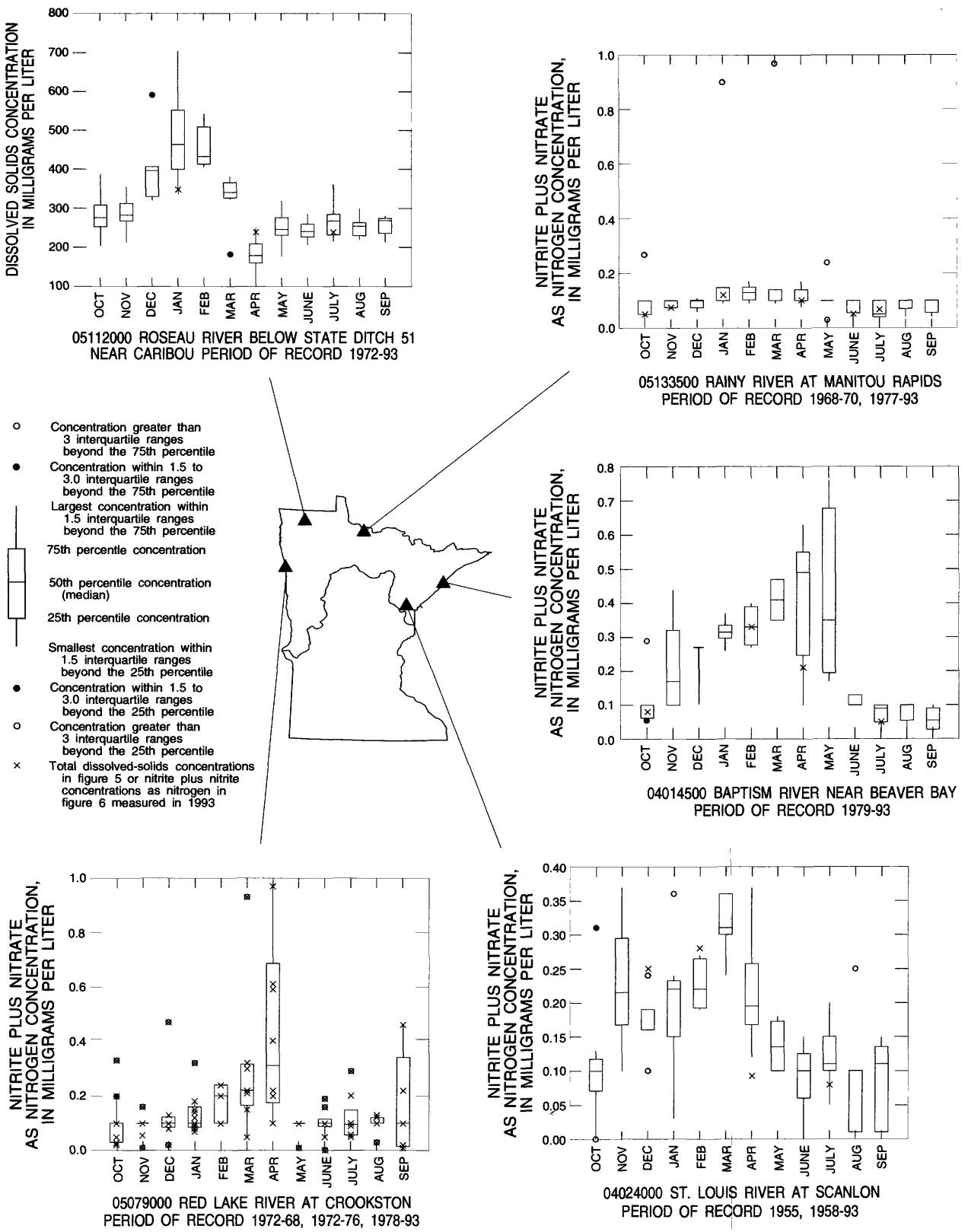

Figure 6--Nitrite plus nitrate concentrations in samples collected during water year 1993 and selected statistics for period of record at five national network stations.

Surficial Sand Aquifer

In late 1992 and continuing through the 1993 water year water levels increased by about 1.4 feet in one observation well located near Moorhead. This well is in an area of traditionally large ground water withdrawals for public supply and irrigation. Water levels at this well declined an average of 0.7 feet per year from 1949 to 1961 due to increased pumping in nearby wells for public supply. Increasingly, public supply water sources were obtained from the Red River. This change in water sources contributed to a water level rise of 5.5 feet during the period, 1962-70. Above normal rainfall and below normal temperatures during the water year along with increased diversion of water from the Red River of the North for public supply have added to these ground water level increases. The water level increases of the past two water years contrast with a long term decline from 1970 to 1991 of between seven and eight feet.

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 human activities.

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

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

The National Water-Quality Assessment (NAWQA) Program of the U.S. Geological Survey is a long-term program with goals to describe the status and trends of water-quality conditions for a large, diverse, and geographically distributed part of the Nation's ground- and surface-water resources, and to identify, describe, and explain the major natural and human factors that affect these observed conditions and trends.

Assessment activities have begun in more than one-third of the study units and ultimately will be conducted in 60 study units (major watersheds and aquifer systems) that represent a wide range of environmental settings nationwide and that account for a large percentage of the Nation's water use. A wide array of chemical constituents will be measured in ground water, surface water, streambed sediments, and fish tissues. The coordinated application of comparative hydrologic studies at a wide range of spatial and temporal scales will provide information for decision making by water-resources managers and a foundation for aggregation and comparison of findings to address water-quality issues of regional and national interest.

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 1993 water year that began October 1, 1992, and ended September 30, 1993. 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 8, 9, 10 and 11. The following sections of the introductory text are presented to provide users with a more detailed explanation of how the hydrologic data published in this report were collected, analyzed, computed, and arranged for presentation.

STATION IDENTIFICATION NUMBERS

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

Downstream Order System and Station Number

Since October 1, 1950, the order of listing hydrologic-station records in Survey reports is in a downstream direction along the main stream. All stations on a tributary entering upstream from a main-stream station are listed before that station. A station on a tributary that enters between two main-stream sections is listed between them. A similar order is followed by listing stations on first rank, second rank, and other ranks of tributaries. The rank of any tributary on which a station is situated with respect to the stream to which it is immediately tributary is indicated by an indentation in a list of stations in front of the report. Each indention represents one rank. This downstream order and system of indention show which stations are on tributaries between any two stations and the rank of the tributary on which each station is situated.

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

Numbering System for Wells and Miscellaneous Sites

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

The well and miscellaneous site numbering system of the U.S. Geological Survey is based on the grid system of latitude and longitude. The system provides the geographic location of the well or miscellaneous site and a unique number for each site. The number consists of 15 digits. The first 6 digits denote the degrees, minutes, and seconds of latitude, the next 7 digits denote degrees, minutes, and seconds of longitude, and the last 2 digits (assigned sequentially) identify the wells or other sites within a 1-second grid. See figure 7. 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.

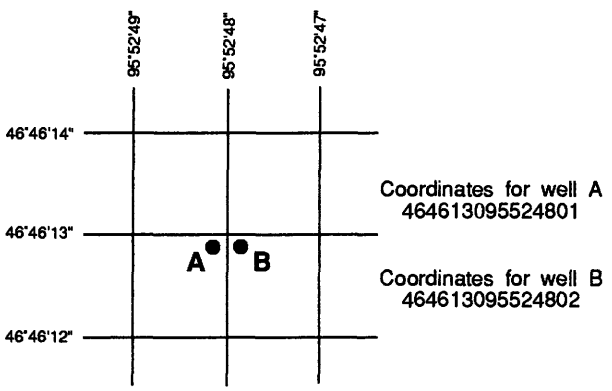

Figure 7. Example of system for numbering wells and miscellaneous sites.

RECORDS OF STAGE AND WATER DISCHARGE

Records of stage and water discharge may be complete or partial. Complete records of discharge are those obtained using a continuous stage-recording device through which either instantaneous or mean daily discharge may be computed for any time, or any period of time, during the period of record. Complete records of lake or reservoir content, similarly, 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 8 and 10.

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.

Records of stage are obtained with recorders that trace continuous graphs of stage; or encode stage values at selected time intervals and store on a variety of mediums. Measurements of discharge are made with current meters using methods adapted by the U.S. 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. 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

Streamflow data in this report are presented in a new format that is considerably different from the format in data reports prior to the 1991 water year. The major changes are that statistical characteristics of discharge now appear in tabular summaries following the water-year data table and less information is provided in the text or station manuscript above the table. These changes represent the results of a pilot program to reformat the annual water-data report to meet current user needs and data preferences.

The records published for each continuous-record surface-water discharge station (gaging station) now consist of four parts, the manuscript or station description; the data table of daily mean values of discharge for the current water year with summary data; a tabular statistical summary of monthly mean flow data for a designated period, by water year; and a summary statistics table that includes statistical data of annual, daily and instantaneous flows as well as data pertaining to annual runoff, 7-day low-flow minimums, and flow duration.

Station manuscript

The manuscript provides, under various headings, descriptive information, such as station location; period of record; historical extremes outside the period of record; 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 datum 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 U.S. Geological Survey by a cooperating organization are identified here.

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.

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 (address given on the back of title page of this report) 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.

Manuscript information for lake or reservoir stations differs from that for stream stations in the nature of the "Remarks" and to the inclusion of a skeleton stage-capacity table when daily contents are given.

Headings for AVERAGE DISCHARGE, EXTREMES FOR PERIOD OF RECORD, AND EXTREMES FOR CURRENT YEAR have been deleted and the information contained in these paragraphs, except for the listing of secondary instantaneous peak discharges in the EXTREMES FOR CURRENT YEAR paragraph, is now presented in the tabular summaries following the discharge table or in the REMARKS paragraph, as appropriate. No changes have been made to the data presentations of lake contents.

Data table of daily mean values

The daily table of discharge records for stream-gaging stations gives mean discharge for each day of the water year. In the monthly summary for the table, the line headed "TOTAL" gives the sum of the daily figures for each month; the line headed "MEAN" gives the average flow in cubic feet per second for the month; and the lines headed "MAX" and "MIN" give the maximum and minimum daily mean discharges, respectively, for each 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 or in acre-feet may be omitted if there is extensive regulation or diversion or if the drainage area includes large noncontributing areas. At some stations monthly and (or) yearly observed discharges are adjusted for reservoir storage or diversion, or diversion data or reservoir contents are given. These figure are identified by a symbol and corresponding footnote.

Statistics of monthly mean data

A tabular summary of the mean (line headed "MEAN"), maximum (line headed "MAX"), and minimum (line headed "MIN") of monthly mean flows for each month for a designated period is provided below the mean values table. The water years of the first occurrence of the maximum and minimum monthly flows are provided immediately below those figures. The designated period will be expressed as "FOR WATER YEARS 19__-19__, BY WATER YEAR (WY)," and will list the first and last water years of the range of years selected from the PERIOD OF RECORD paragraph in the station manuscript. It will consist of all of the station record within the specified water years, inclusive, including complete months of record for partial water years, if any, and may coincide with the period of record for the station. The water years for which the statistics are computed will be consecutive, unless a break in the station record is indicated in the manuscript.

Summary statistics

A table titled "SUMMARY STATISTICS" follows the statistics of monthly mean data tabulation. This table consists of four columns, with the first column containing the line headings of the statistics being reported. The table provides a statistical summary of yearly, daily, and instantaneous flows, not only for the current water year but also for the previous calendar year and for a designated period, as appropriate. The designated period selected, "WATER YEARS 19__-19__," will consist of all of the station record within the specified water years, inclusive, including complete months of record for partial water years, if any, and may coincide with the period of record for the station. The water years for which the statistics are computed will be consecutive, unless a break in the station record is indicated in the manuscript. All of the calculations for the statistical characteristics designated ANNUAL (see line headings below), except for the ANNUAL 7-DAY MINIMUM" statistic, are calculated for the designated period using complete water years. The other statistical characteristics may be calculated using partial water years.

The date or water year, as appropriate, of the first occurrence of each statistic reporting extreme values of discharge is provided adjacent to the statistic. Repeated occurrences may be noted in the REMARKS paragraph of the manuscript or in footnotes. Because the designated period may not be the same as the station period of record published in the manuscript, occasionally the dates of occurrence listed for the daily and instantaneous extremes in the designated-period column may not be within the selected water years listed in the heading. When this occurs, it will be noted in the REMARKS paragraph or in footnotes. Selected streamflow duration curve statistics and runoff data are also given. Runoff data may be omitted if there is extensive regulation or diversion of flow in the drainage basin.

The following summary statistics data, as appropriate, are provided with each continuous record of discharge. Comments to follow clarify information presented under the various line headings of the summary statistics table.

ANNUAL TOTAL.--The sum of the daily mean values of discharge for the year. At some stations the yearly mean discharge is adjusted for reservoir storage or diversion. The adjusted figures are identified by symbol and corresponding footnotes.

ANNUAL MEAN.--The arithmetic mean of the individual daily mean discharges for the year noted or for the designated period. At some stations the yearly mean discharge is adjusted for reservoir storage or diversion. The adjusted figures are identified by a symbol and corresponding footnotes.

HIGHEST ANNUAL MEAN.--The maximum annual mean discharge occurring for the designated period.

LOWEST ANNUAL MEAN.--The minimum annual mean discharge occurring for the designated period.

HIGHEST DAILY MEAN.--The maximum daily mean discharge for the year or for the designated period.

LOWEST DAILY MEAN.--The minimum daily mean discharge for the year or for the designated period.

ANNUAL 7-DAY MINIMUM.--The lowest mean discharge for 7 consecutive days for a calendar year or a water year. Note that most low-flow frequency analyses of annual 7-day minimum flows use a climatic year (April 1-March 31). The date shown in the summary statistics table is the initial date

of the 7-day period. (This value should not be confused with the 7-day 10-year low-flow statistic.)

INSTANTANEOUS PEAK FLOW.--The maximum instantaneous discharge occurring for the water year or for the designated period. Note that secondary instantaneous peak discharges above a selected base discharge are stored in District computer files for stations meeting certain criteria. Those discharge values may be obtained by writing to the District Office. (See address on back of title page of this report.)

INSTANTANEOUS PEAK STAGE.--The maximum instantaneous stage occurring for the water year or for the designated period. If the dates of occurrence for the instantaneous peak flow and instantaneous peak stage differ, the REMARKS paragraph in the manuscript or a footnote may be used to provide further information.

INSTANTANEOUS LOW FLOW.--The minimum instantaneous discharge occurring for the water year or for the designated period.

ANNUAL RUNOFF --Indicates the total quantity of water in runoff for a drainage area for the year. Data reports may use any of the following units of measurement in presenting annual runoff data.

Acre-foot (AC-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.

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 the runoff is distributed uniformly in time and area.

Inches (INCHES) indicates the depth to which the drainage area would be covered if all of the runoff for a given time period were uniformly distributed on it.

10 PERCENT EXCEEDS.--The discharge that is exceeded by 10 percent of the flow for the designated period.

50 PERCENT EXCEEDS.--The discharge that is exceeded by 50 percent of the flow for the designated period.

90 PERCENT EXCEEDS.--The discharge that is exceeded by 90 percent of the flow for the designated period.

Data collected at partial-record stations follow the information for continuous-record sites. Data for partial-record discharge stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. The tables of partial-record stations are followed by a listing of discharge measurements made at sites other than continuous-record or partial-record stations. These measurements are generally made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Identifying Estimated Daily Discharge

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

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 hundredth 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 U.S. 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 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 9.

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.

Onsite Measurement and Collection

Water quality data must be representative of 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. 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. Geological Survey 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 U.S. 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 U.S. 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. Environmental 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

Dissolved Trace-Element Concentrations

NOTE.--Traditionally, dissolved trace-element concentrations have been reported at the microgram per liter (µg/L) level. Recent evidence, mostly from large rivers, indicates that actual dissolved-phase concentrations for a number of trace elements are within the range of 10's and 100's of nanograms per liter (ng/L). Present data above the µg/L level should be used with caution. Such data may actually represent elevated environmental concentrations from natural or human causes. However, these data could reflect contamination introduced during sampling, processing, or analysis. To confidently produce dissolved trace-element data with insignificant contamination, the U.S. Geological Survey will begin using new trace-element protocols in water year 1994.

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 11.

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).

All water-level measurements are reported to the nearest hundredth of a foot. The error of water-level measurements is normally only a hundredth or a few hundredth of a foot.

Hydrographs showing water-level fluctuations are included for 3 representative wells; 1 in a surficial-sand aquifer, 1 in a buried sand aquifer, and 1 in a bedrock aquifer.

Data Presentation

Each well consists of two parts, the station description and the data table of water levels observed during the water year. In addition a graph of water levels for the current year or other selected period is included for several representative wells. The description of the well is presented first through use of descriptive headings preceding 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.

INSTRUMENTATION.--This paragraph provides information on both the frequency of measurement and the collection method used, allowing the user to better evaluate the reported water-level extremes by knowing whether they are based on weekly, monthly, or some other frequency of measurement.

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) sea level; 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-U.S. Geological 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 U.S. 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. A hydrograph for a selected period of record follows the water-level table for several representative wells.

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 U.S. Geological Survey is the principal Federal water-data agency and, as such, collects and disseminates about 70 percent of the water data currently being used by numerous State, local, private, and other Federal agencies to develop and manage our water resources. As part of the U.S. Geological Survey's program of releasing water data to the public, a large-scale computerized system has been developed for the storage and retrieval of water data collected through its activities. The National Water Data Storage and Retrieval System (WATSTORE) was established in 1972 to provide an effective and efficient means for the processing and maintenance of water data collected through the activities of the U.S. Geological Survey and to facilitate release of the data to the public. A variety of useful products, ranging from data tables to complex statistical analyses such as Log Pearson Type III, can be produced using WATSTORE. The system resides on the central computer facilities of the U.S. Geological Survey at its National Center in Reston, Virginia, and consists of related files and data bases.

- Station Header File - Contains descriptive information on more than 440,000 sites throughout the United States and its territories where the U.S. Geological Survey collects or has collected data.
- Daily Values File - Contains more than 220 million daily values of stream flows, stages, reservoir contents, water temperature, specific conductances, sediment concentrations, sediment discharges, and ground-water levels.
- Peak Flow File - Contains approximately 500,000 maximum (peak) streamflow and gage-height values at surface-water sites.
- Water Quality File - Contains approximately 2 million analyses of water samples that describe the chemical, physical, biological, and radio-chemical characteristics of both surface and ground water.
- Ground-Water Site Inventory Data Base - Contains inventory data for more than 900,000 wells, springs, and other sources of ground water. The data includes site location, geohydrologic characteristics, well-construction history, and one-time field measurements such as water temperature.

In 1976, the U.S. Geological Survey opened WATSTORE to the public for direct access. The signing of a Memorandum of Agreement with the Survey is required to obtain direct access to WATSTORE. The system can be accessed either synchronously or asynchronously. The requester will be expected to pay all computer costs he/she incurs. Direct access may be obtained by contacting:

U.S. Geological Survey
National Water Data Exchange
421 USGS National Center
Reston, Virginia 22092

In addition to providing direct access to WATSTORE, data can be provided in various machine-readable formats on magnetic tape or 5-1/4 inch floppy disk; and, as noted in the introduction, on CD-ROM discs. Beginning with the 1990 water year, all water-data reports will also be available on Compact disc - Read Only Memory (CD-ROM). All data reports published for the current water year for the entire Nation, including Puerto Rico and the Trust Territories, will be reproduced on a single CD-ROM disc. Information about the availability of specific types of data or products, and user charges, can be obtained locally from each of the Water Resources Division's District offices. (See address on the back of the title page.) A limited number of CD-ROM discs will be available for sale by the Books and Open-File Reports Section, U.S. Geological Survey, Federal Center, Box 25425, Denver, Colorado 80225.

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 sheen within 24 hours when incubated at 35°C ±1.0°C on M-Endo medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

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

Fecal streptococcal bacteria are bacteria also found in the intestine of warmblooded animals. Their presence in water is considered to verify fecal pollution. They are characterized as gram-positive, cocci bacteria which are capable of growth in brain-heart infusion broth. In the laboratory they are defined as all the organisms which produce red or pink colonies within 48 hours at 35° C ±1.0°C on M-FS 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.

Annual 7-day minimum is the lowest mean discharge

for 7 consecutive days for a calender year or a water year. Note that most low-flow frequency analyses of annual 7-day minimum flows use a climatic year (April 1-March 31). The date shown in the summary statistics table is the initial date of the 7-day period. (This value should not be confused with the 7-day 10-year low-flow statistic.)

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

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

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

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

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.

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

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

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

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

Organism count/volume refers to the number of organisms collected and enumerated in a sample and adjusted to the number per sample volume, usually 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	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 (C1). A curie is the amount of radioactivity that yields 3.7 x 1010 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 organo-chlorine 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 pet unit time

[mg O_2/(m^2 . time) for periphyton and macrophytes and mg O_2/(m^3 . time) for phytoplankton] are the units for expressing primary productivity. They define production and respiration rates as estimated from changes in the measured dissolved oxygen concentration. The oxygen light and dark bottle method is preferred if the rate of primary production is sufficient for accurate measurements to be made within 24 hours. Unit time may be either the hour or day, depending on the incubation period.

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

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

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

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

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

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 precipitation.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Streamflow is the discharge that occurs in a natural channel. Although the term "discharge" can be applied to the flow of a canal, the word "streamflow" uniquely describes the discharge in a surface stream course. The term "streamflow" is more general than "runoff" as a 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. 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 micrometer 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 lambata**

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

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

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

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

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

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

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

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

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

Water year in Geological Survey reports dealing with surface-water supply is the 12-month period, October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 1992 is called the "1992 water year."

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

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

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

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

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS

The U.S. Geological Survey publishes a series of manuals describing procedures for planning and conducting specialized work in water-resource 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 to Hydraulics) pertains to surface water. The chapter, the unit of publication, is limited to a narrow field of subject matter. This format permits flexibility in revision and publication as the need arises.

The reports listed below are for sale by the U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, Colorado 80225 (authorized agent of the Superintendent of Documents, Government Printing Office). Prepayment is required. Remittance should be sent by check or money order payable to the U.S. Geological Survey. Prices are not included because they are subject to change. Current prices can be obtained by writing to the above address. When ordering or inquiring about prices for any of these publications, please give the title, book number, chapter number, and "U.S. Geological Survey Techniques of Water-Resources Investigations".

1-D1. Water temperature--influential factors, field measurement, and data presentation, by H.H. Stevens, Jr., J.F. Ficken, 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-D2. Application of seismic-refraction techniques to hydrologic studies, by F.P. Haeni: USGS--TWRI Book 2, Chapter D2. 1988. 86 pages.

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

2-E2. Borehole geophysics applied to ground-water investigations, by W. Scott Keys: USGS--TWRI Book 2, Chapter E2. 1990. 150 pages.

2-F1. Application of drilling, coring, and sampling techniques to test holes and wells, by Eugene Shuter and Warren E. Teasdale: USGS--TWRI Book 2, Chapter F1. 1989. 97 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 in streams by dye tracing, by F.A. Kilpatrick and J.F. Wilson, Jr.: USGS--TWRI Book 3, Chapter A9. 1989. 27 pages.

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

3-A16. Measurement of discharge using tracers, by F.A. Kilpatrick and E.D. Cobb: USGS--TWRI Book 3, Chapter A16. 1985. 52 pages.

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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.

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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.

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

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

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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.

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5-C1. Laboratory theory and methods for sediment analysis, by H.P. Guy: USGS--TWRI Book 5, Chapter C1. 1969. 58 pages.

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

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

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

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Surface-Water Station Records

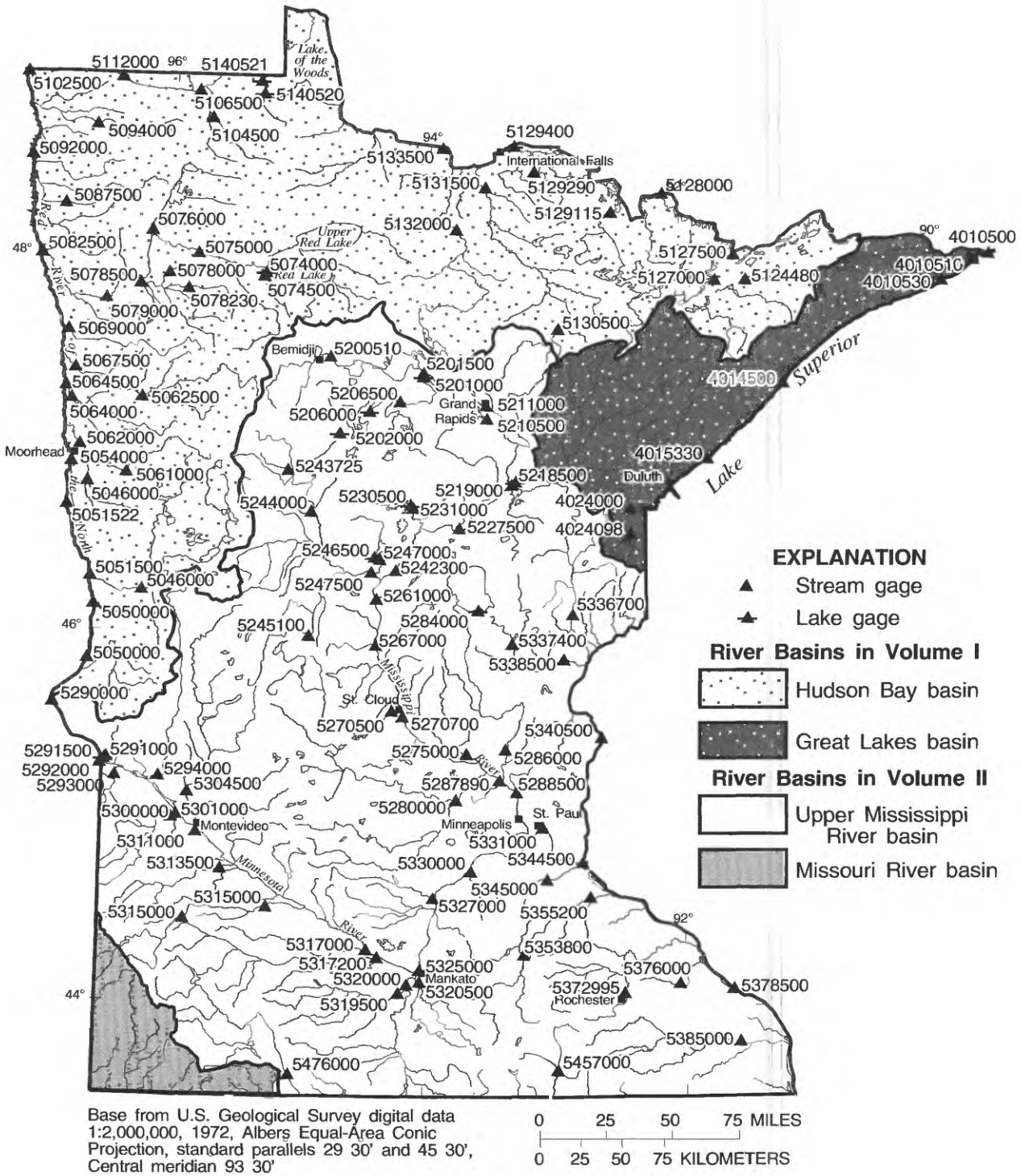


Figure 8.--Location of lake and stream-gaging stations

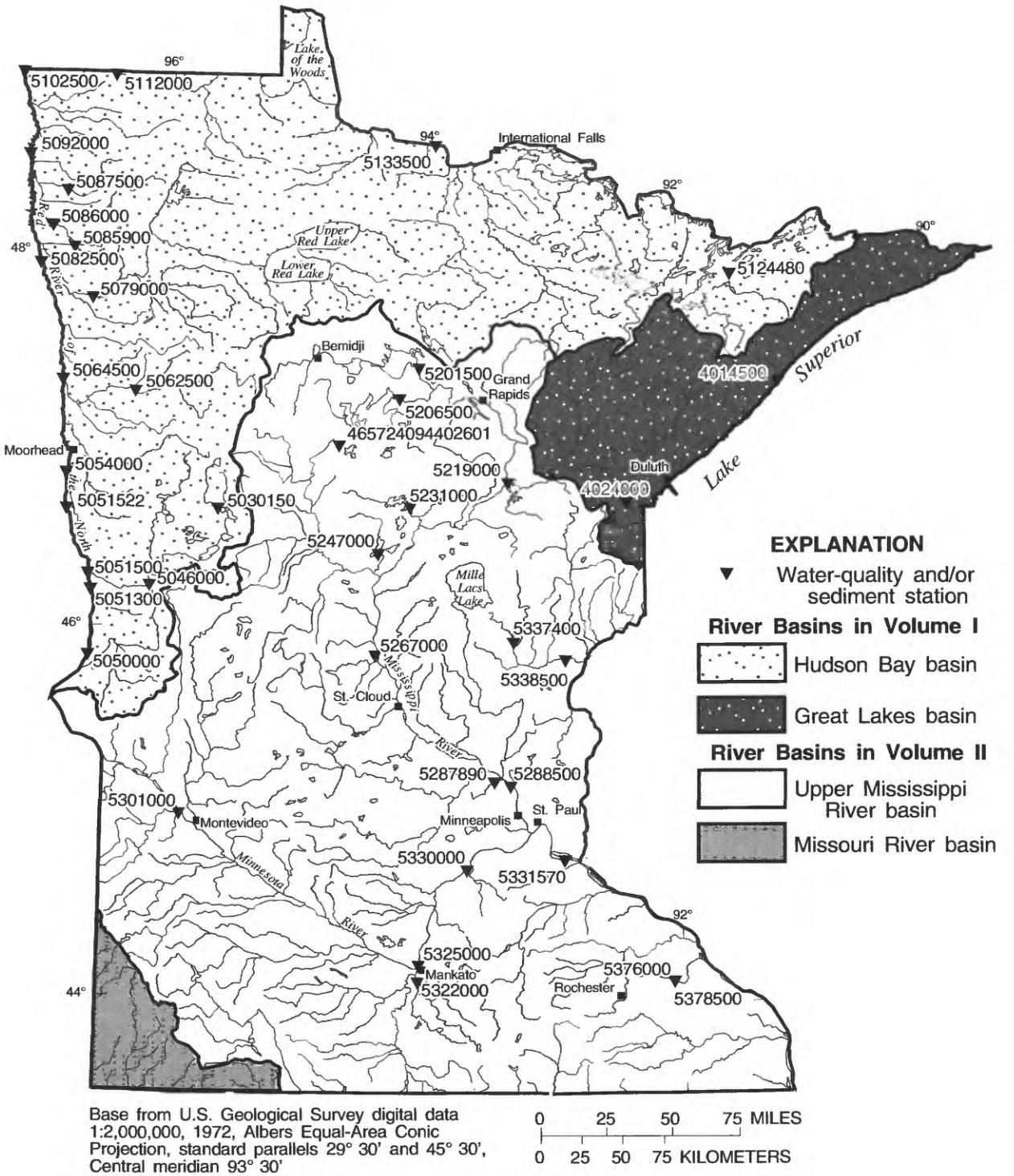


Figure 9.--Location of surface-water quality stations.

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

LOCATION.--Lat 48°44", long 89°36'58", in SW¼NE¼ sec. 24, T.64 N., R.6 E., Cook County, Hydrologic Unit 04010101, on the Grand Portage Indian Reservation, on right bank 400 ft upstream from Middle Falls, 2.5 mi upstream from Grand Portage Port of Entry, 3.5 mi upstream from mouth, and 4.7 mi northeast of city of Grand Portage.

DRAINAGE AREA.--600 mi².

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

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

GAGE.--Water-stage recorder. Datum of gage is 787.58 ft above sea level. Prior to Sept. 30, 1940, nonrecording gage at International Bridge, 5.8 mi upstream at datum 102.24 ft higher. Oct. 1, 1940, to Dec. 31, 1975, at present site at datum 2.00 ft higher.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Satellite telemeter at station.

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

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,000 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)
Jul 29	0500	*3010	*8.15

No other peak greater than base discharge.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	260	217	e200	e185	e148	e114	e420	1630	1080	323	1330	479
2	244	232	e190	e185	e144	e112	e390	2590	1000	321	1120	464
3	233	336	e180	e185	e140	e112	e360	2710	938	323	999	452
4	223	343	e170	e180	e136	e114	e340	2270	871	370	921	436
5	212	318	e160	e180	e132	e114	e340	2000	808	706	859	418
6	206	272	e160	e180	e132	e116	e350	1800	759	827	821	398
7	200	277	e160	e180	e130	e116	e380	1640	755	690	797	372
8	209	273	e160	e180	e130	e116	e450	1530	769	610	751	350
9	254	272	e170	e180	e128	e118	e600	1440	792	717	733	143
10	333	323	e190	e180	e128	e118	e900	1370	787	962	735	494
11	346	422	e190	e180	e126	e118	e1000	1400	757	1120	708	474
12	329	433	e190	e180	e126	e118	e900	1310	708	1210	665	429
13	302	422	e190	e180	e124	e118	e845	1200	661	1040	632	389
14	298	352	e190	e175	e124	e120	839	1100	651	861	594	382
15	277	337	e190	e175	e124	e120	812	1040	656	746	557	369
16	256	318	e190	e175	e122	e120	761	999	641	669	530	349
17	237	284	e190	e175	e122	e120	708	940	587	623	511	325
18	232	266	e190	e175	e122	e120	700	875	550	591	487	302
19	226	253	e190	e175	e120	e120	673	830	521	569	466	285
20	242	387	e190	e175	e120	e120	691	797	493	549	458	269
21	261	446	e190	e175	e120	e120	729	778	472	527	441	256
22	273	390	e190	e175	e118	e120	795	752	451	491	419	250
23	288	354	e185	e172	e118	e120	905	716	430	455	412	246
24	301	318	e185	e170	e118	e125	1450	934	406	425	401	242
25	291	282	e185	e168	e116	e135	2160	1400	414	477	397	238
26	275	245	e185	e166	e116	e160	1790	1300	420	988	391	229
27	263	e230	e185	e164	e116	e200	1390	1180	414	1000	419	227
28	254	e220	e185	e162	e114	e250	1710	1450	403	1970	425	220
29	239	e215	e185	e160	---	e330	1920	1360	374	2930	408	216
30	225	e210	e185	e156	---	e440	1690	1210	346	2370	445	210
31	218	---	e185	e152	---	e470	---	1160	---	1690	493	---
TOTAL	8007	9247	5685	5400	3514	4814	26998	41711	18914	27150	19325	9913
MEAN	258	308	183	174	125	155	900	1346	630	876	623	330
MAX	346	446	200	185	148	470	2160	2710	1080	2930	1330	494
MIN	200	210	160	152	114	112	340	716	346	321	391	143
AC-FT	15880	18340	11280	10710	6970	9550	53550	82730	37520	53850	38330	19660
CFSM.	43	.51	.31	.29	.21	.26	1.50	2.24	1.05	1.46	1.04	.55
IN.	.50	.57	.35	.33	.22	.30	1.67	2.59	1.17	1.68	1.20	.61

STREAMS TRIBUTARY TO LAKE SUPERIOR

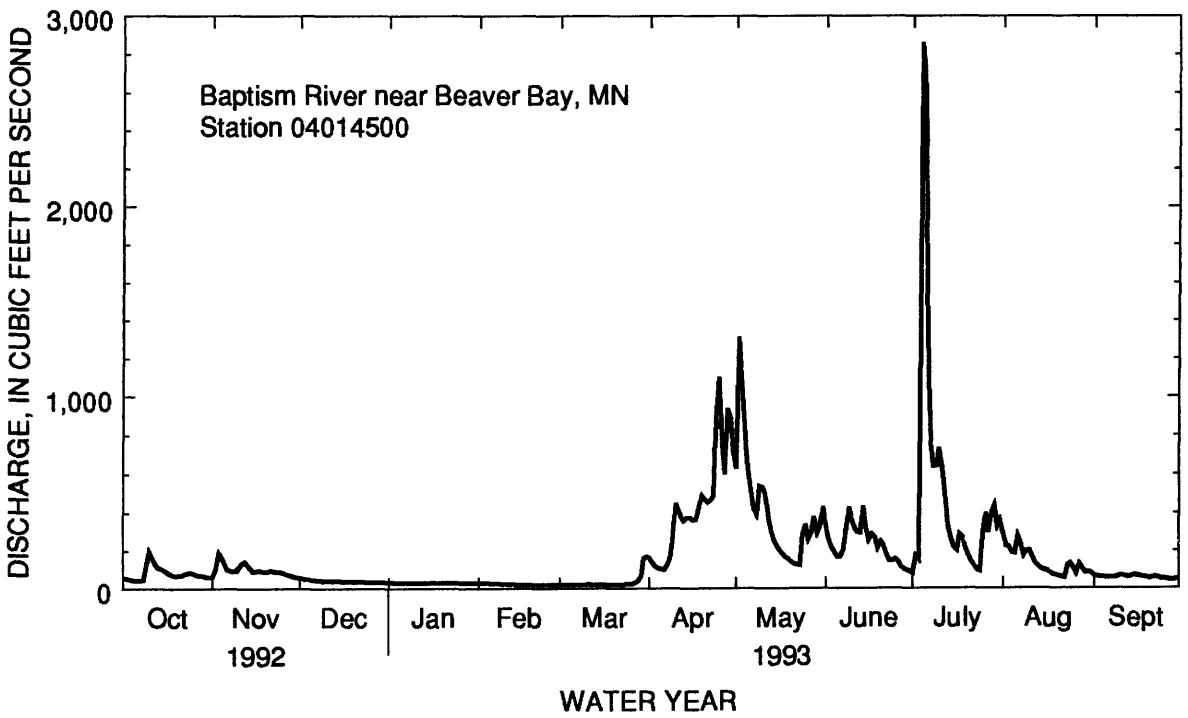
04010500 PIGEON RIVER AT MIDDLE FALLS, NEAR GRAND PORTAGE, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1921 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	365	353	204	149	124	174	1201	1621	859	410	242	305
MAX	2095	1461	720	431	300	1169	2701	4016	2801	1127	1029	2985
(WY)	1978	1971	1978	1975	1969	1945	1976	1950	1947	1968	1950	1977
MIN	17.4	11.4	2.85	2.18	8.02	60.0	290	138	125	78.0	57.7	40.2
(WY)	1977	1977	1977	1977	1977	1941	1977	1977	1977	1958	1991	1976

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1921 - 1993	
ANNUAL TOTAL	200178		180678			
ANNUAL MEAN	547		495		504	
HIGHEST ANNUAL MEAN					840	1971
LOWEST ANNUAL MEAN					158	1958
HIGHEST DAILY MEAN	4140	May 3	2930	Jul 29	10700	May 5 1934
LOWEST DAILY MEAN	130	Apr 1	112	Mar 2,3	1.0a	Jan 15 1977
ANNUAL SEVEN-DAY MINIMUM	133	Mar 28	114	Feb 27	1.0	Jan 15 1977
INSTANTANEOUS PEAK FLOW			3010	Jul 29	11000	May 5 1934
INSTANTANEOUS PEAK STAGE			8.15	Jul 29	7.60b	May 5 1934
ANNUAL RUNOFF (AC-FT)	396300		358600		365100	
ANNUAL RUNOFF (CFSM)	.91		.82		.84	
ANNUAL RUNOFF (INCHES)	12.38		11.20		11.41	
10 PERCENT EXCEEDS	1300		1090		1300	
50 PERCENT EXCEEDS	248		325		221	
90 PERCENT EXCEEDS	145		123		84	

a Also occurred Jan. 16-21, 1977.
b Site and datum then in use.



STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN

LOCATION.--Lat 47°20'07", long 91°12'06", in SE¼NE¼ sec.15, T. 56 N., R. 7 W., Lake County, Hydrologic Unit 04010101, on right bank 400 ft upstream from bridge on U.S. Highway 61, 0.3 mi upstream from mouth, 4 mi northeast of Silver Bay, and 7 mi northeast of city of Beaver Bay.
DRAINAGE AREA.--140 mi².

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1927 to September 1993 (discontinued). Monthly discharge only for some periods, published in WSP 1307.
REVISED RECORDS.--WSP 894: 1939. WSP 1337: 1933-34(M), 1935.
GAGE.--Water-stage recorder. Datum of gage is 613.65 ft above sea level (U.S. Army Corps of Engineers bench mark). Prior to Oct. 5, 1934, nonrecording gage, and Oct. 5, 1934 to Nov. 22, 1978, water-stage recorder site 370 ft downstream and at datum 3.68 ft lower.
REMARKS.--Records fair except those for estimated daily discharges, which are poor.
EXTREMES FOR CURRENT YEAR--Peak discharges greater than base discharge of 1,300 ft³/s and maximum (*).

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
May 2	1100	1470	9.28	July 4	1730	*3930	*11.38

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	56	60	e57	e33	e29	e19	e165	629	333	79	298	68
2	53	103	e54	e33	e29	e19	e140	1310	264	173	228	63
3	50	190	e52	e32	e29	e20	e120	1060	219	155	223	e61
4	47	169	e50	e32	e29	e20	e110	795	196	2860	191	e59
5	44	133	e48	e32	e28	e20	e105	633	167	2630	187	e58
6	44	105	e46	e32	e28	e21	e100	516	166	1310	280	e57
7	44	98	e44	e32	e27	e21	e120	425	204	760	244	e56
8	48	94	e43	e31	e26	e22	e160	394	299	642	178	e56
9	117	94	e42	e31	e25	e22	e250	540	430	645	201	e61
10	196	111	e42	e31	e25	e22	e450	535	367	734	204	e68
11	168	135	e41	e31	e24	e23	e420	501	325	631	164	e67
12	135	143	e40	e31	e23	e22	e380	394	301	495	133	e65
13	113	128	e40	e31	e23	e22	e360	312	296	338	122	e62
14	107	108	e39	e30	e22	e22	376	262	433	275	105	e66
15	100	92	e39	e30	e22	e22	378	227	324	221	97	e72
16	91	93	e38	e30	e21	e22	365	203	262	203	94	e68
17	82	96	e38	e30	e21	e22	368	184	291	292	83	e64
18	74	95	e38	e30	e21	e22	429	168	270	275	75	e60
19	68	91	e37	e30	e20	e22	490	156	217	217	71	e56
20	71	91	e37	e30	e20	e22	473	144	252	173	65	e54
21	72	97	e36	e30	e20	e22	458	135	232	144	59	e56
22	77	94	e36	e30	e20	e22	467	126	180	120	56	e60
23	84	92	e36	e30	e20	e22	487	123	147	102	125	e56
24	86	90	e35	e30	e19	e23	888	290	146	94	133	e52
25	84	87	e35	e30	e19	e24	1100	340	156	280	106	e50
26	77	e80	e35	e30	e19	e25	794	265	144	399	81	e47
27	72	e75	e34	e30	e19	e32	603	300	118	300	130	44
28	70	e70	e34	e30	e19	e41	938	379	104	407	110	45
29	66	e65	e33	e30	---	e65	891	298	96	441	84	47
30	61	e60	e33	e30	---	e160	725	328	89	334	87	47
31	60	---	e33	e30	---	e170	---	432	---	363	85	---
TOTAL	2517	3039	1245	952	647	1033	13110	12404	7028	16092	4299	1745
MEAN	81.2	101	40.2	30.7	23.1	33.3	437	400	234	519	139	58.2
MAX	196	190	57	33	29	170	1100	1310	433	2860	298	72
MIN	44	60	33	30	19	19	100	123	89	79	56	44
AC-FT	4990	6030	2470	1890	1280	2050	26000	24600	13940	31920	8530	3460
CFSM	.58	.72	.29	.22	.17	.24	3.12	2.86	1.67	3.71	.99	.42
IN.	.67	.81	.33	.25	.17	.27	3.48	3.30	1.87	4.28	1.14	.46

e Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1928 - 1993, BY WATER YEAR (WY)

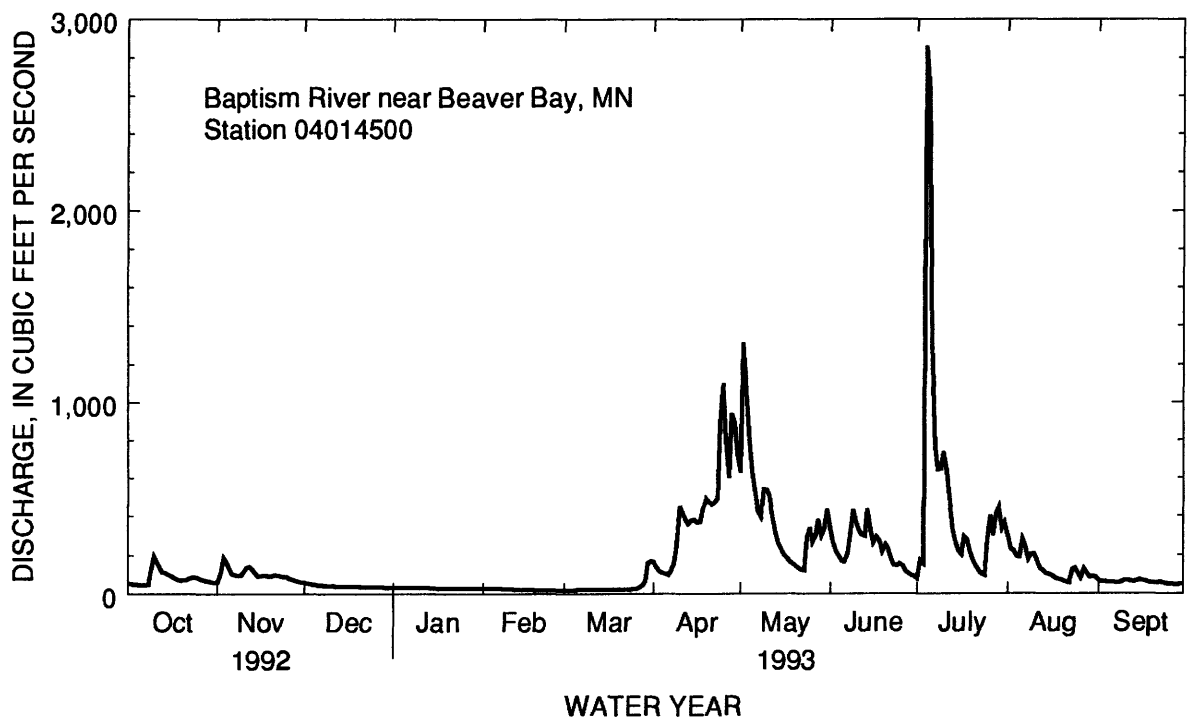
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	150	135	53.1	29.9	22.2	63.2	544	486	239	110	86.0	122
MAX	558	504	180	65.5	56.0	602	1083	1801	615	519	665	735
(WY)	1983	1933	1971	1969	1984	1945	1976	1950	1943	1993	1972	1977
MIN	7.01	5.20	.51	.036	.000	5.73	138	77.6	31.0	7.52	2.71	3.35
(WY)	1977	1977	1977	1977	1977	1940	1977	1977	1988	1934	1934	1976

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1928 - 1993	
ANNUAL TOTAL	58759		64111			
ANNUAL MEAN	161		176		170	
HIGHEST ANNUAL MEAN					335	1972
LOWEST ANNUAL MEAN					81.6	1963
HIGHEST DAILY MEAN	2050	Apr 21	2860	Jul 4	6860	May 2 1972
LOWEST DAILY MEAN	23	Aug 23	19	Feb 24 to Mar 2	.00[a]	Jan 14 1977
ANNUAL SEVEN-DAY MINIMUM	26	Aug 18	19	Feb 24	.00	Jan 14 1977
INSTANTANEOUS PEAK FLOW			3930	Jul 4	10000[b]	Sep 24 1977
INSTANTANEOUS PEAK STAGE			11.38	Jul 4	11.06[c]	Apr 12 1965
ANNUAL RUNOFF (AC-FT)	116500		127200		122900	
ANNUAL RUNOFF (CFSM)	1.15		1.25		1.21	
ANNUAL RUNOFF (INCHES)	15.61		17.04		16.46	
10 PERCENT EXCEEDS	379		427		430	
50 PERCENT EXCEEDS	71		83		55	
90 PERCENT EXCEEDS	36		22		15	

a Occurred Jan 14 to Mar 2, 1977.

b From rating curve extended above 4200 ft^3/s on basis of slope-area measurement of peak flow.

c From floodmark, site and datum in use (backwater from ice).



STREAMS TRIBUTARY TO LAKE SUPERIOR

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

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water years 1968 to current year (discontinued).
REMARKS.--Letter K indicates non-ideal colony count.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT										
27...	1115	72	80	78	7.8	7.7	3.0	1.6	742	12.8
FEB										
02...	0900	26	120	105	7.7	7.6	2.0	2.1	748	13.5
APR										
27...	1445	559	45	47	7.2	7.0	5.0	2.0	742	12.4
JUL										
20...	1745	166	70	69	7.6	7.5	21.0	0.50	745	7.1

DATE	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)
OCT										
27...	K2	42	9.7	3.2	2.4	0.30	31	32	0	38
FEB										
02...	K61	K31	12	3.8	3.6	0.30	41	43	0	51
APR										
27...	K4	K21	5.4	1.8	1.7	0.40	12	16	0	15
JUL										
20...	K11	330	9.5	2.8	2.3	0.20	28	31	0	34

DATE	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	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)
OCT										
27...	2.5	2.4	0.20	9.6	65	<0.010	0.080	0.040	0.50	0.020
FEB										
02...	4.4	3.0	0.20	14	87	0.010	0.330	0.080	0.40	0.010
APR										
27...	3.2	1.4	0.10	8.2	64	<0.010	0.210	0.050	0.60	0.040
JUL										
20...	2.0	1.5	0.20	9.4	80	<0.010	<0.050	0.060	0.60	<0.010

STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	IRON, DIS-SOLVED (UG/L AS FE) (01046)
OCT								
27...	<0.010	<0.010	1	100	70	4	<3	370
FEB								
02...	0.010	<0.010	3	73	60	4	<3	450
APR								
27...	<0.010	<0.010	3	87	120	3	<3	200
JUL								
20...	<0.010	<0.010	3	92	100	4	<3	400

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	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)
OCT								
27...	<4	4	<10	2	<1	<1.0	29	<6
FEB								
02...	<4	5	<10	<1	<1	<1.0	33	<6
APR								
27...	<4	4	<10	<1	<1	<1.0	16	<6
JUL								
20...	<4	4	<10	1	<1	<1.0	28	<6

STREAMS TRIBUTARY TO LAKE SUPERIOR

04015330 KNIFE RIVER NEAR TWO HARBORS, MN

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

DRAINAGE AREA.--85.6 mi².

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

GAGE.--Water-stage recorder and crest-stage gage. Elevation of gage is 640 ft above sea level from topographic map.

REMARKS.--Records fair except those for estimated daily discharges, which are poor.

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 800 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Apr. 24	1330	890	5.59	June 8	0630	911	5.62
May 2	0700	820	5.49	June 13	2100	946	5.67
May 24	1245	869	5.56	July 4	0415	*4580	*9.53
May 30	2000	834	5.51	July 8	0900	1170	5.99

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	23	e20	e11	e9.4	e8.0	e240	168	232	54	32	42
2	15	120	e19	e11	e9.4	e8.2	e130	664	145	337	26	29
3	15	513	e17	e10	e9.4	e8.6	e100	390	105	169	24	25
4	14	288	e16	e10	e9.4	e9.2	e120	233	87	3760	22	22
5	14	142	e15	e10	e9.2	e9.6	e150	171	68	1600	22	19
6	14	91	e15	e10	e9.2	e10	e200	134	73	562	22	17
7	15	69	e14	e10	e9.0	e12	e300	109	138	314	20	17
8	21	60	e14	e10	e8.8	e13	e400	106	615	873	18	17
9	95	54	e13	e10	e8.6	e14	e700	115	459	621	19	22
10	160	80	e13	e10	e8.6	e14	e400	161	281	506	23	25
11	99	105	e13	e10	e8.4	e14	e270	168	159	496	18	21
12	67	90	e13	e10	e8.4	e14	e200	111	105	310	16	19
13	50	71	e12	e10	e8.4	e14	229	83	315	172	16	18
14	46	52	e12	e10	e8.4	e13	293	70	526	131	16	23
15	42	61	e12	e9.8	e8.4	e12	259	60	231	99	16	27
16	38	74	e12	e9.8	e8.2	e11	230	49	142	79	15	24
17	38	82	e12	e9.8	e8.2	e11	221	43	207	86	13	22
18	35	70	e12	e9.8	e8.2	e10	236	40	270	75	12	21
19	31	54	e12	e9.8	e8.0	e10	261	44	152	58	12	19
20	32	50	e12	e9.8	e8.0	e10	204	40	324	45	12	18
21	39	e47	e12	e9.8	e8.0	e10	172	39	238	38	10	20
22	41	e42	e11	e9.6	e8.0	e10	158	36	125	31	11	23
23	39	e39	e11	e9.6	e8.0	e10	152	35	88	25	46	24
24	36	e36	e11	e9.6	e8.0	e11	573	553	246	24	86	23
25	33	e33	e11	e9.6	e8.0	e13	493	412	282	24	41	21
26	31	e30	e11	e9.6	e8.0	e16	264	199	157	31	26	19
27	31	e27	e11	e9.6	e8.0	e30	178	312	101	36	27	18
28	28	e25	e11	e9.4	e8.0	e600	206	392	76	34	46	19
29	25	e24	e11	e9.4	---	e550	186	205	62	37	31	26
30	22	e22	e11	e9.4	---	e450	175	385	54	32	34	27
31	23	---	e11	e9.4	---	e400	---	482	---	26	67	---
TOTAL	1204	2474	400	305.8	237.6	2325.6	7700	6009	6063	10685	799	667
MEAN	38.8	82.5	12.9	9.86	8.49	75.0	257	194	202	345	25.8	22.2
MAX	160	513	20	11	9.4	600	700	664	615	3760	86	42
MIN	14	22	11	9.4	8.0	8.0	100	35	54	24	10	17
AC-FT	2390	4910	793	607	471	4610	15270	11920	12030	21190	1580	1320
CFSM.	45	.96	.15	.12	.10	.88	3.00	2.26	2.36	4.03	.30	.26
IN.	.52	1.08	.17	.13	.10	1.01	3.35	2.61	2.63	4.64	.35	.29

e Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

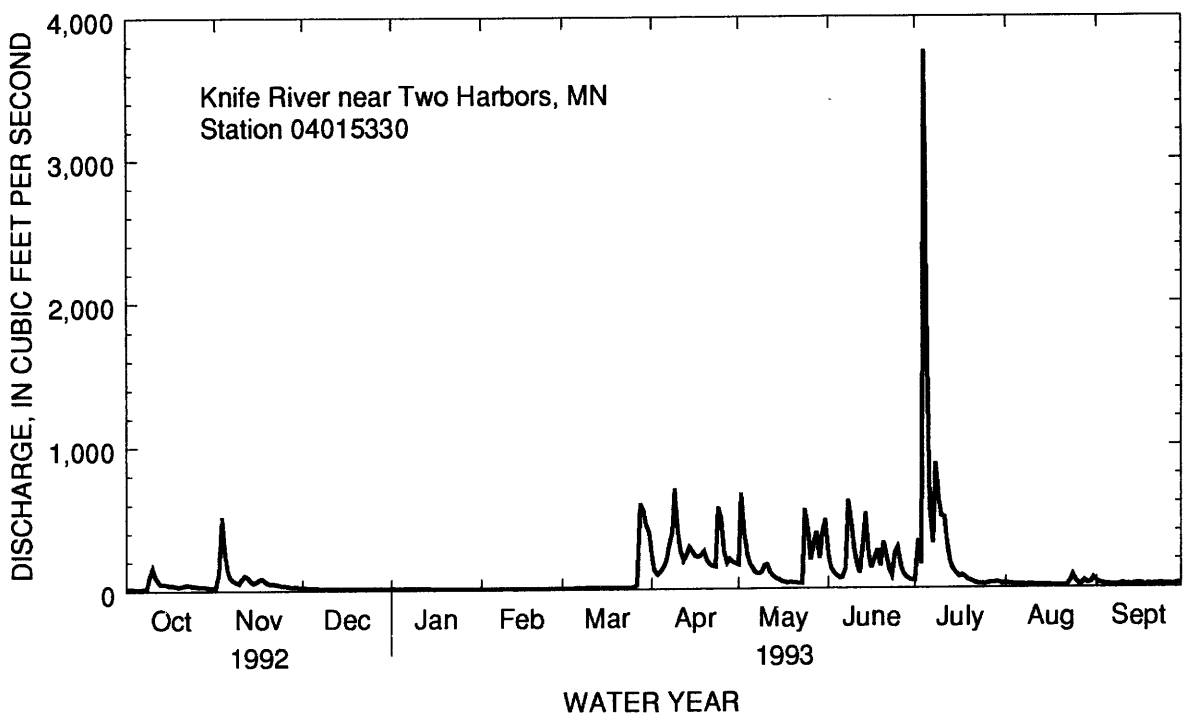
04015330 KNIFE RIVER NEAR TWO HARBORS, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1974 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	86.6	72.3	21.2	11.2	9.00	53.0	370	170	91.3	86.1	34.4	86.5
MAX	226	198	60.6	31.4	22.2	136	631	427	240	345	163	314
(WY)	1983	1992	1983	1975	1984	1976	1982	1979	1984	1993	1988	1977
MIN	3.06	1.58	.000	.000	.000	8.65	73.6	16.0	15.5	4.87	2.95	1.43
(WY)	1977	1977	1977	1977	1977	1980	1977	1976	1988	1988	1976	1976

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1974 - 1993	
ANNUAL TOTAL	36249.6		38870.0			
ANNUAL MEAN	99.0		106		91.6	
HIGHEST ANNUAL MEAN					147	1986
LOWEST ANNUAL MEAN					44.2	1977
HIGHEST DAILY MEAN	2310	Apr 21	3760	Jul 4	4480	May 10 1979
LOWEST DAILY MEAN	4.7	Aug 20	8.0[a]		.00[b]	
ANNUAL SEVEN-DAY MINIMUM	5.9	Aug 18	8.0	Feb 19	.00	Dec 2 1976
INSTANTANEOUS PEAK FLOW			4580	Jul 4	7440	May 10 1979
INSTANTANEOUS PEAK STAGE			9.53	Jul 4	11.16	May 10 1979
ANNUAL RUNOFF (AC-FT)	71900		77100		66340	
ANNUAL RUNOFF (CFSM)	1.16		1.24		1.07	
ANNUAL RUNOFF (INCHES)	15.75		16.89		14.53	
10 PERCENT EXCEEDS	214		284		229	
50 PERCENT EXCEEDS	28		26		22	
90 PERCENT EXCEEDS	12		9.5		4.2	

a Feb. 19 to Mar. 1.
b Many days in water year 1977.



STREAMS TRIBUTARY TO LAKE SUPERIOR

04015410 MILLER CREEK NEAR MOUTH AT DULUTH, MN

LOCATION.--Lat 46°45'41", long 92°07'45", in NW¼NW¼ sec. 4, T. 49 N., R. 14 W., St. Louis County, Hydrologic Unit 04010201, on right bank 150 ft south of intersection of West Michigan St. and 26th Ave., 0.5 mi upstream from mouth at Duluth.

DRAINAGE AREA.--

PERIOD OF RECORD.--October 1992 to September 1993.

GAGE.--Water-stage recorder. Datum of gage not determined.

REMARKS.--Records good except those for estimated periods, which are poor.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

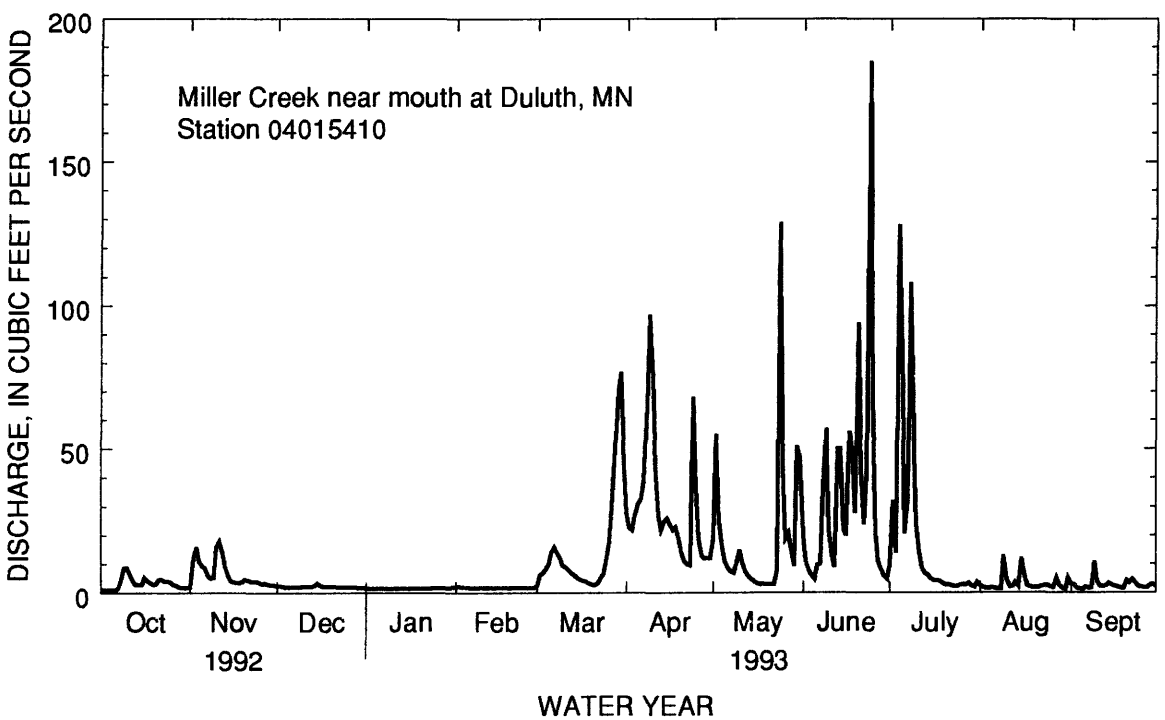
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.4	2.0	2.5	1.6	e2.0	e2.4	28	19	20	9.3	2.5	2.9
2	1.2	12	2.4	1.6	e2.2	e6.0	23	55	11	32	1.8	3.0
3	1.2	16	2.2	e1.6	e2.1	e7.0	22	25	7.6	14	1.6	1.6
4	1.1	11	2.1	e1.6	e2.0	e8.0	27	16	6.0	128	1.5	1.3
5	1.1	9.5	e2.1	e1.6	e1.9	e10	31	11	4.7	84	1.7	1.2
6	1.0	e8.8	e2.1	1.6	e1.8	e14	33	8.7	9.6	21	1.6	2.0
7	1.7	5.9	e2.1	e1.6	e1.8	e16	39	7.4	10	32	1.4	1.5
8	5.1	5.2	e2.1	e1.6	e1.8	e14	65	7.0	37	108	1.3	1.7
9	8.8	5.5	e2.1	e1.6	e1.8	e12	97	10	57	57	13	11
10	8.6	16	e2.2	e1.6	e1.8	e9.7	75	15	22	24	4.4	3.7
11	6.5	18	e2.2	e1.6	e1.8	e9.0	44	11	13	14	2.1	2.3
12	4.3	14	e2.2	e1.6	e1.8	e8.0	27	7.5	8.9	8.7	1.9	2.2
13	3.0	9.4	2.2	e1.6	e1.8	e7.0	22	5.8	50	6.8	3.6	2.5
14	3.0	6.0	2.4	e1.6	e1.8	e6.2	25	4.9	50	6.3	2.2	3.4
15	3.0	4.2	3.4	e1.6	e1.8	e5.4	26	4.0	22	4.9	12	2.7
16	5.5	3.8	2.7	e1.6	e1.8	e4.8	24	3.3	20	4.3	6.8	2.3
17	4.2	3.6	e2.3	e1.6	e1.8	e4.3	22	2.9	56	4.2	2.5	1.9
18	3.5	3.5	e2.3	e1.6	e1.8	e3.9	23	3.1	49	4.0	1.9	1.5
19	2.9	3.7	e2.2	1.6	e1.8	e3.4	19	3.0	28	3.4	1.7	1.5
20	3.2	4.7	e2.2	1.6	e1.8	e3.0	14	2.9	94	2.7	1.7	4.3
21	4.6	4.4	e2.2	e1.6	e1.8	e2.6	11	3.0	43	3.0	1.8	3.6
22	4.6	4.0	e2.1	e1.6	e1.8	e3.3	10	2.9	24	2.5	2.3	4.6
23	4.0	3.9	e2.1	e1.6	e1.8	e5.0	9.7	7.8	41	2.2	2.5	3.6
24	3.9	4.1	e2.0	e1.7	e1.8	e6.6	68	129	185	2.2	2.8	2.3
25	3.7	3.6	e2.0	e1.7	e1.8	e11	37	43	68	2.7	2.0	1.9
26	2.9	3.1	2.0	e1.7	e1.8	e18	19	19	21	2.9	1.7	1.7
27	2.6	3.3	2.0	e1.7	e1.8	e30	13	21	11	2.6	5.2	1.8
28	2.1	3.0	1.9	e1.7	e1.8	e50	12	15	8.0	3.3	2.7	2.6
29	1.8	2.8	1.8	1.7	---	e70	12	9.4	5.9	2.5	1.6	2.9
30	1.7	2.6	1.8	e1.7	---	77	12	51	5.0	2.0	1.2	2.3
31	1.7	---	1.8	e1.9	---	45	---	47	---	3.6	5.1	---
TOTAL	103.9	197.6	67.7	50.6	51.6	472.6	889.7	570.6	987.7	598.1	96.1	81.8
MEAN	3.35	6.59	2.18	1.63	1.84	15.2	29.7	18.4	32.9	19.3	3.10	2.73
MAX	8.8	18	3.4	1.9	2.2	77	97	129	185	128	13	11
MIN	1.0	2.0	1.8	1.6	1.8	2.4	9.7	2.9	4.7	2.0	1.2	1.2
AC-FT	206	392	134	100	102	937	1760	1130	1960	1190	191	162

e Estimated.

04015410 MILLER CREEK NEAR MOUTH AT DULUTH, MN--Continued

SUMMARY STATISTICS	FOR 1993 WATER YEAR		WATER YEARS 1992 - 1993	
ANNUAL TOTAL	4168.0			
ANNUAL MEAN	11.4			
HIGHEST DAILY MEAN	185	Jun 24		
LOWEST DAILY MEAN	1.0	Oct 6		
ANNUAL SEVEN-DAY MINIMUM	1.2	Oct 1		
INSTANTANEOUS PEAK FLOW	239	Jun 24	239	Jun 24 1993
INSTANTANEOUS PEAK STAGE	3.06	Jun 24	3.06	Jun 24 1993
INSTANTANEOUS LOW FLOW	.96	Oct 5	.96	Oct 5 1992
ANNUAL RUNOFF (AC-FT)	8270			
10 PERCENT EXCEEDS	29			
50 PERCENT EXCEEDS	3.4			
90 PERCENT EXCEEDS1.6				



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 downstream from lower bridge on U.S. Highway 61 at Scanlon, 0.6 mi downstream from Minnesota Power Co. powerplant, 3 mi upstream from Thomson Reservoir, and 3.2 mi upstream from Midway River.

DRAINAGE AREA.--3,430 mi², approximately.

WATER-DISCHARGE RECORDS

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

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

GAGE.--Water-stage recorder. Datum of gage is 1,101.23 ft above sea level. Oct. 5, 1909, to Sept. 5, 1914, nonrecording gage 3 mi downstream and 50 ft below powerplant at datum about 420 ft lower. Sept. 6, 1914, to Aug. 4, 1953, powerplant record at Thomson hydroelectric plant.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Diurnal fluctuation caused by powerplant upstream. Flow regulated by Whiteface Reservoir and Boulder, Island, Rice and Fish Lakes, combined capacity, 332,160 acre-ft; the water-discharge table shows the monthly change in contents (+).

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1490	1070	1340	e1170	1230	1170	5010	5970	6440	5080	4110	e2050
2	1420	1210	1490	e1130	1220	1160	4710	6710	5700	5460	3860	2050
3	1340	1280	1420	e1200	1240	1190	4400	7760	4990	5690	3570	1750
4	1290	1670	1340	e1250	1240	1230	4110	7370	4430	7090	3380	1880
5	1220	1740	1090	e1200	1240	1230	3860	6880	4080	15300	3070	1780
6	1150	1800	883	e1170	1230	1300	3720	6210	3820	18400	2940	1670
7	1160	1540	1210	e1120	1230	1270	3630	5550	3700	19300	2980	1560
8	1140	1440	1090	e1070	1230	1310	3700	5210	4530	20400	2780	1500
9	1210	1470	1290	e1090	1240	1370	4290	5030	8010	20600	2910	1770
10	1180	1650	1390	e1100	1220	1360	5620	4940	8170	20800	2910	1840
11	1220	1680	1320	e1080	1290	1340	5990	4770	7150	18800	2980	2200
12	1270	1880	1310	e1050	1270	1400	5480	4270	6070	16600	2750	2240
13	1220	1830	1290	e1130	1280	1350	5130	3830	5310	14000	2730	2130
14	1170	1660	1310	e1080	1280	1280	4920	3500	5090	10900	2500	2000
15	1170	1500	1310	e1140	1250	1390	4600	3080	4990	8540	2340	1860
16	1200	1450	1300	e1220	1230	1470	4270	2780	4520	7250	2180	1750
17	1220	1510	1160	e1200	1240	1300	3860	2480	4370	7330	2260	1780
18	1160	1590	963	e1220	1210	1250	3680	2270	4300	8060	2170	1770
19	1150	1660	1030	e1200	1180	1500	3510	2130	4140	7930	1930	1790
20	1190	1730	964	e1180	1190	1410	3470	2000	3970	7110	1760	1690
21	1160	1710	594	e1220	1190	1390	3170	1880	3840	6200	1670	1800
22	1180	1700	1350	1270	1220	1300	2950	1750	3400	5420	1650	1760
23	1180	1650	1260	1270	1200	1350	2880	1670	3230	4750	1750	1720
24	1160	1630	e1100	1230	1190	1210	3280	2690	5890	4240	1790	1690
25	1190	1600	e920	1220	1160	1410	5490	3830	9170	3920	1840	1610
26	1110	1440	e1120	1230	1190	1690	6630	3970	8600	3750	1690	1520
27	1110	1360	e1050	1230	1180	2330	5740	3620	7300	4150	1800	1630
28	1080	1340	e1200	1230	1170	3550	5580	3780	6240	4490	1830	1400
29	1080	1270	e1250	1220	---	4520	5870	4140	5720	4200	e1760	1210
30	1090	1320	e1180	1140	---	5360	6070	4200	5270	4220	e1820	1450
31	1090	---	e1100	1240	---	5420	---	5890	---	4270	e1800	---
TOTAL	37000	46380	36624	36500	34240	55810	135620	130160	162440	294250	75510	52850
MEAN	1194	1546	1181	1177	1223	1800	4521	4199	5415	9492	2436	1762
MAX	1490	1880	1490	1270	1290	5420	6630	7760	9170	20800	4110	2240
MIN	1080	1070	594	1050	1160	1160	2880	1670	3230	3750	1650	1210
+	-48.9	-228	-420	-461	-634	-609	1260	469	411	-91.6	-29.1	-416
MEAN‡	1145	1318	761	716	589	1191	5781	5168	5826	9400	2407	1346
CFSM‡	.33	.38	.22	.21	.17	.35	1.69	1.51	1.70	2.74	.70	.39
IN‡	.38	.42	.25	.24	.18	.40	1.89	1.74	1.90	3.16	.81	.44

CAL YR '92 TOTAL 952907 MEAN 2604 MAX 12100 MIN 594 MEAN‡ 2566 CFSM‡ .75 IN‡ 10.16
WTR YR '93 TOTAL 1097384 MEAN 3007 MAX 20800 MIN 594 MEAN‡ 2984 CFSM‡ .87 IN‡ 11.81

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

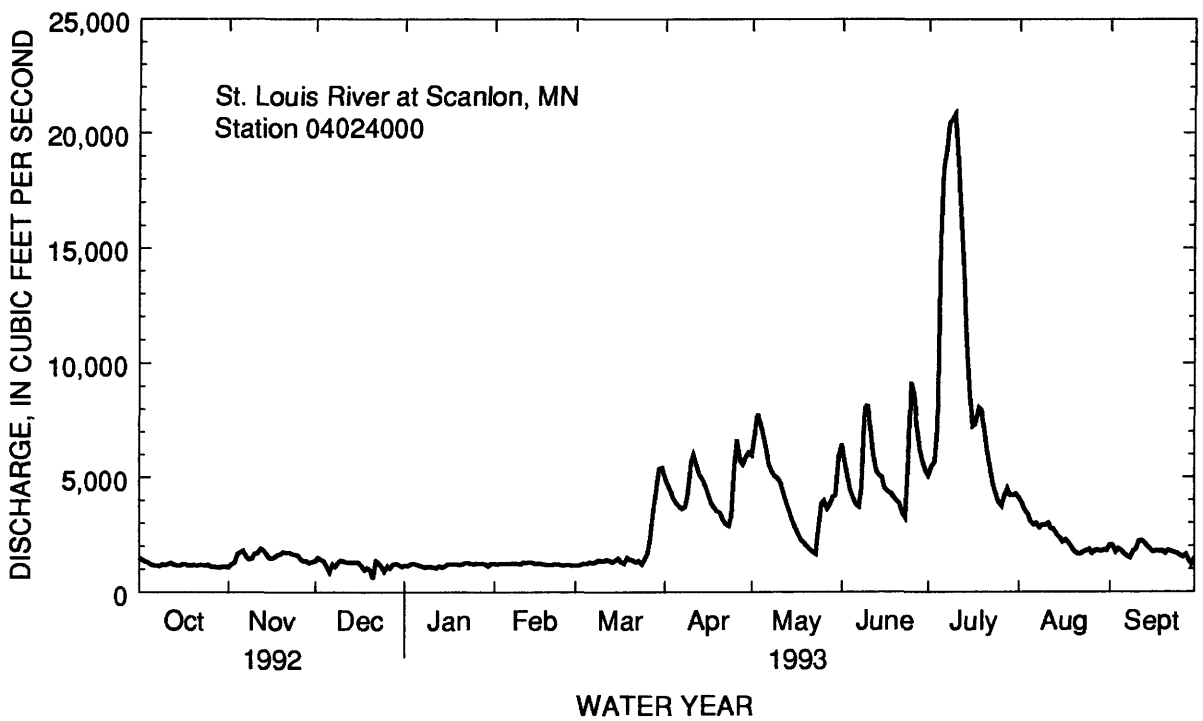
STREAMS TRIBUTARY TO LAKE SUPERIOR

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

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1908 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	1967	1655	1247	1057	1041	1414	5543	5126	3580	2334	1668	1772
MAX	7508	8518	2993	2272	2200	6026	15230	22210	16480	9492	9197	7594
(WY)	1974	1972	1972	1966	1966	1945	1948	1950	1908	1993	1953	1928
MIN	407	473	282	265	249	301	667	593	458	199	377	402
(WY)	1935	1935	1911	1911	1924	1924	1977	1977	1988	1988	1977	1934

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1908 - 1993	
ANNUAL TOTAL	952907		1097384			
ANNUAL MEAN	2604		3007		2353	
HIGHEST ANNUAL MEAN					4276	1972
LOWEST ANNUAL MEAN					945	1924
HIGHEST DAILY MEAN	12100	Jul 3	20800	Jul 10	37900	May 9 1950
LOWEST DAILY MEAN	594	Dec 21	594	Dec 21	88	Aug 24 1977
ANNUAL SEVEN-DAY MINIMUM	870	Aug 16	1030	Dec 19	134	Jul 26 1988
INSTANTANEOUS PEAK FLOW			21900	Jul 8	37900	May 9 1950
INSTANTANEOUS PEAK STAGE			10.93	Jul 8	15.80	May 9 1950
ANNUAL RUNOFF (AC-FT)	1890000		2177000		1705000	
ANNUAL RUNOFF (CFSM)	.76		.88		.69	
ANNUAL RUNOFF (INCHES)	10.33		11.90		9.32	
10 PERCENT EXCEEDS	5780		5920		5250	
50 PERCENT EXCEEDS	1670		1690		1370	
90 PERCENT EXCEEDS	1060		1160		635	



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 downstream from gage.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT										
26...	1100	1270	192	190	8.2	7.9	8.0	3.7	732	11.3
DEC										
16...	1315	1190	185	190	7.6	7.7	0.0	3.0	728	13.1
FEB										
01...	1200	1260	--	196	7.2	7.4	0.5	3.4	743	13.5
APR										
26...	1245	7420	135	137	7.7	7.4	8.0	10	738	8.8
JUL										
22...	1445	5400	135	127	7.5	7.4	20.5	2.6	734	6.6

DATE	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)
OCT										
26...	K2	68	18	10	5.3	1.2	69	74	0	84
DEC										
16...	K7	K8	19	10	6.0	1.2	69	73	0	84
FEB										
01...	K6	K6	18	9.1	7.3	1.2	71	75	0	87
APR										
26...	49	K520	15	6.8	4.1	1.2	47	51	0	57
JUL										
22...	K5	68	15	6.5	4.0	0.20	46	51	0	55

DATE	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)
OCT								
26...	14	5.4	0.20	8.4	130	<0.010	--	0.040
DEC								
16...	13	5.6	0.20	10	126	0.020	0.250	0.060
FEB								
01...	12	7.3	0.20	10	135	0.020	0.280	0.090
APR								
26...	9.5	4.9	<0.10	7.1	112	<0.010	0.092	0.030
JUL								
22...	7.7	3.9	0.20	8.1	133	<0.010	0.079	0.040

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	SEDIMENT, SUSPENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	COBALT, DISSOLVED (UG/L AS CO) (01035)
OCT 26...	0.60	0.040	0.020	<0.010	4	97	50	12	<3
DEC 16...	0.60	0.030	0.020	0.010	3	100	--	--	--
FEB 01...	0.50	0.030	<0.010	<0.010	5	92	40	11	<3
APR 26...	0.80	0.060	0.010	<0.010	30	96	70	12	<3
JUL 22...	1.1	0.040	0.030	<0.010	15	99	70	16	<3

DATE	IRON, DISSOLVED (UG/L AS FE) (01046)	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)
OCT 26...	830	<4	62	<10	2	<1	<1.0	57	<6
DEC 16...	--	--	--	--	--	--	--	--	--
FEB 01...	710	<4	45	<10	1	<1	<1.0	54	<6
APR 26...	460	<4	26	<10	<1	<1	<1.0	40	<6
JUL 22...	1100	<4	34	<10	2	<1	<1.0	45	<6

STREAMS TRIBUTARY TO LAKE SUPERIOR

04024098 DEER CREEK NEAR HOLYOKE, MN

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

DRAINAGE AREA.--7.77 mi².

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

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 786.14 ft above mean sea level.

REMARKS.--Records fair except those for estimated daily discharges, which are poor.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.9	3.0	e3.2	e2.8	e2.4	e2.2	11	13	13	9.1	2.7	1.1
2	2.9	7.9	e3.2	e2.8	e2.4	e2.3	8.0	30	8.2	12	2.2	.87
3	2.9	26	e3.2	e2.8	e2.4	e2.5	7.4	15	6.0	9.5	2.6	.95
4	2.9	12	e3.2	e2.8	e2.4	e2.9	8.3	13	5.1	74	2.4	.86
5	2.9	7.7	e3.2	e2.8	e2.3	e3.5	9.5	12	4.9	61	2.7	1.2
6	2.9	5.7	e3.2	e2.8	e2.3	e5.0	10	9.9	5.2	24	2.8	1.4
7	2.9	4.8	e3.2	e2.8	e2.3	e7.0	11	8.9	8.0	28	2.6	1.4
8	4.3	4.4	e3.2	e2.7	e2.3	e5.8	39	9.7	50	155	2.6	1.3
9	5.0	4.5	e3.2	e2.7	e2.3	e4.8	57	16	78	67	4.2	1.5
10	4.8	9.4	e3.2	e2.7	e2.3	4.4	19	16	24	24	2.9	1.4
11	4.0	8.4	e3.2	e2.7	e2.3	3.8	13	14	14	14	2.4	1.2
12	4.1	6.5	e3.2	e2.7	e2.3	3.0	11	10	19	11	2.1	1.4
13	3.9	5.1	e3.2	e2.7	e2.2	3.0	12	8.4	48	8.9	2.2	1.4
14	3.7	4.4	3.2	e2.6	e2.2	2.7	20	7.0	37	8.5	1.9	1.5
15	3.5	e3.9	3.2	e2.6	e2.2	2.9	19	6.2	14	6.4	2.2	1.2
16	3.4	e3.4	3.2	e2.6	e2.2	3.0	14	6.4	13	5.8	1.8	.85
17	3.4	e3.3	3.1	e2.6	e2.2	2.6	13	6.0	40	5.4	1.7	.78
18	3.3	e3.3	e3.1	e2.6	e2.2	2.5	12	5.9	37	4.5	1.8	.72
19	3.1	e3.2	e3.1	e2.6	e2.2	2.9	11	5.7	26	3.7	1.8	.94
20	3.0	e3.2	e3.0	e2.6	e2.2	2.9	9.6	5.6	152	3.2	1.4	1.5
21	3.2	e3.2	e3.0	e2.6	e2.2	2.9	8.4	5.3	49	3.0	1.5	2.0
22	3.2	e3.2	e3.0	e2.5	e2.2	3.1	8.1	5.0	19	2.7	1.9	1.4
23	3.1	e3.2	e3.0	e2.5	e2.2	3.9	8.4	5.8	37	2.3	5.2	1.2
24	3.2	e3.2	e3.0	e2.5	e2.2	e8.0	66	79	141	2.1	2.2	1.1
25	3.1	e3.2	e3.0	e2.5	e2.2	e17	32	24	34	2.4	1.5	1.0
26	2.9	e3.2	e2.9	e2.5	e2.2	e30	14	11	15	2.3	1.2	1.2
27	2.9	e3.2	e2.9	e2.5	e2.2	e24	13	14	13	2.3	1.3	1.3
28	3.0	e3.2	e2.9	e2.4	e2.2	e20	14	14	12	2.4	.98	1.6
29	2.9	e3.2	e2.9	e2.4	---	17	14	8.6	11	2.3	.77	1.5
30	2.9	e3.2	e2.9	e2.4	---	15	13	54	9.6	2.2	1.8	1.5
31	3.0	---	e2.9	e2.4	---	12	---	38	---	2.4	1.7	---
TOTAL	103.2	162.1	95.9	81.2	63.2	222.6	505.7	477.4	943.0	561.4	67.05	37.27
MEAN	3.33	5.40	3.09	2.62	2.26	7.18	16.9	15.4	31.4	18.1	2.16	1.24
MAX	5.0	26	3.2	2.8	2.4	30	66	79	152	155	5.2	2.0
MIN	2.9	3.0	2.9	2.4	2.2	2.2	7.4	5.0	4.9	2.1	.77	.72
AC-FT	205	322	190	161	125	442	1000	947	1870	1110	133	74
CFSM	.43	.70	.40	.34	.29	.92	2.17	1.98	4.05	2.33	.28	.16
IN.	.49	.78	.46	.39	.30	1.07	2.42	2.29	4.51	2.69	.32	.18

e Estimated.

STREAMS TRIBUTARY TO LAKE SUPERIOR

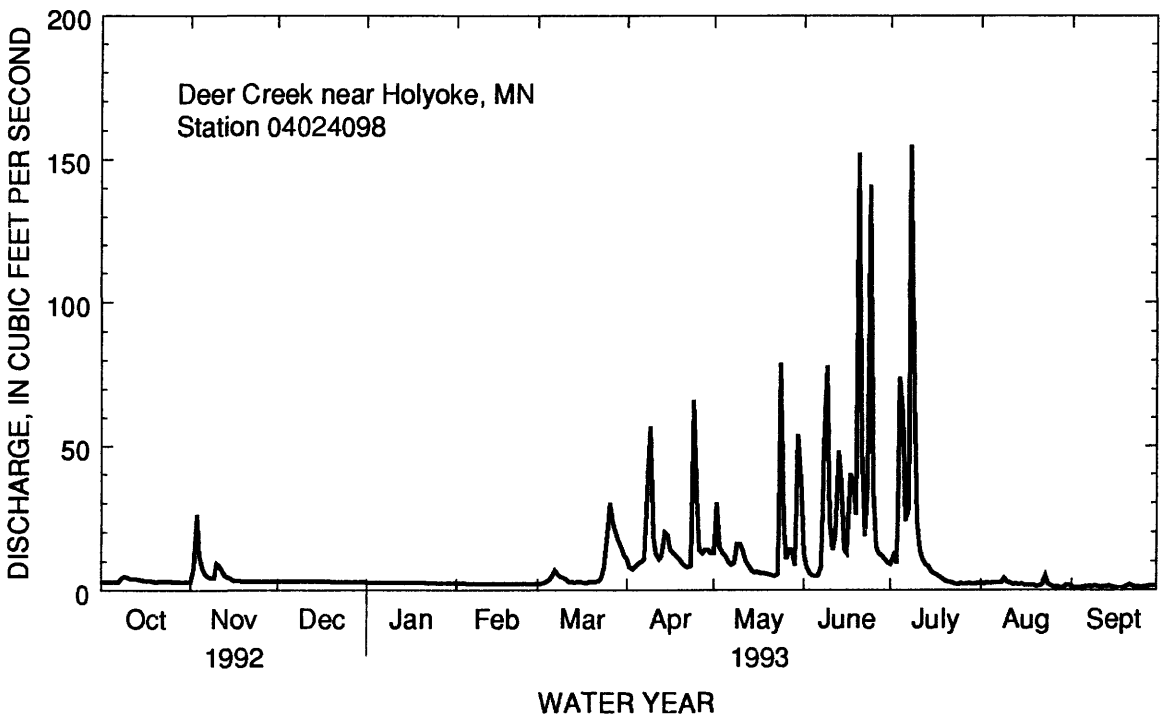
04024098 DEER CREEK NEAR HOLYOKE, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1976 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	6.80	4.60	2.49	1.90	2.35	8.46	23.3	11.1	8.52	7.33	5.10	8.76
MAX	21.8	12.2	3.86	2.92	5.87	19.2	90.8	24.3	31.4	22.3	36.9	30.4
(WY)	1983	1983	1983	1992	1981	1985	1986	1991	1993	1991	1986	1986
MIN	1.69	1.59	1.31	.97	1.06	2.34	4.11	2.15	1.65	1.50	.89	1.24
(WY	1988	1977	1977	1979	1979	1986	1977	1980	1982	1988	1982	1993

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1976 - 1993	
ANNUAL TOTAL	2461.6		3320.02			
ANNUAL MEAN	6.73		9.10		7.58	
HIGHEST ANNUAL MEAN					19.3	1986
LOWEST ANNUAL MEAN					3.65	1980
HIGHEST DAILY MEAN	139	Jul 2	155	Jul 8	553	Sep 6 1990
LOWEST DAILY MEAN	1.4	Jul 29	.72	Sep 18	.21	Jul 2 1976
ANNUAL SEVEN-DAY MINIMUM	1.6	Jul 21	1.1	Sep 13	.47	Aug 10 1982
INSTANTANEOUS PEAK FLOW			350	Jul 8	2000[a]	Sep 3 1985
INSTANTANEOUS PEAK STAGE			16.29	Jul 8	32.76[b]	Sep 3 1985
INSTANTANEOUS LOW FLOW			.72	Sep 18	.20[c]	Aug 13 1982
ANNUAL RUNOFF (AC-FT)	4880		6590		5490	
ANNUAL RUNOFF (CFSM)	.87		1.17		.98	
ANNUAL RUNOFF (INCHES)	11.79		15.90		13.26	
10 PERCENT EXCEEDS	16		19		15	
50 PERCENT EXCEEDS	3.2		3.2		2.6	
90 PERCENT EXCEEDS	2.2		1.7		1.4	

a From rating curve extended above 1,000 ft^3/s on basis of flow through culvert computations.
b From floodmark.
c Occurred Aug. 13, 16, 1982, July 12, 1989.



RED RIVER OF THE NORTH BASIN

05030500 OTTER TAIL RIVER NEAR ELIZABETH, MN

LOCATION.--Lat 46°22'10", long 96°01'02", in SW¼SE¼ sec.31, T.134 N., R.42 W., Ottertail County, Hydrologic Unit 09020103, on right bank, 2.5 miles below Taplin Gorge Dam, 5.0 miles above the Diversion Dam, 5.7 miles east of Elizabeth and 6.6 miles northeast of Fergus Falls.

DRAINAGE AREA.--1,230 mi², approximately.

PERIOD OF RECORD.--Nov. 1913 to September 1917, monthly discharge only, published as at German Church near Fergus Falls in WSP 1308. July 1992 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,250 ft above mean sea level, from topographic map. Nonrecording gage at same site Nov. 1913 to September 1917 at datum 1,265 ft from topographic map.

REMARKS.--Records good except those for estimated daily discharge, which are fair. Flow regulated by power plants upstream.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

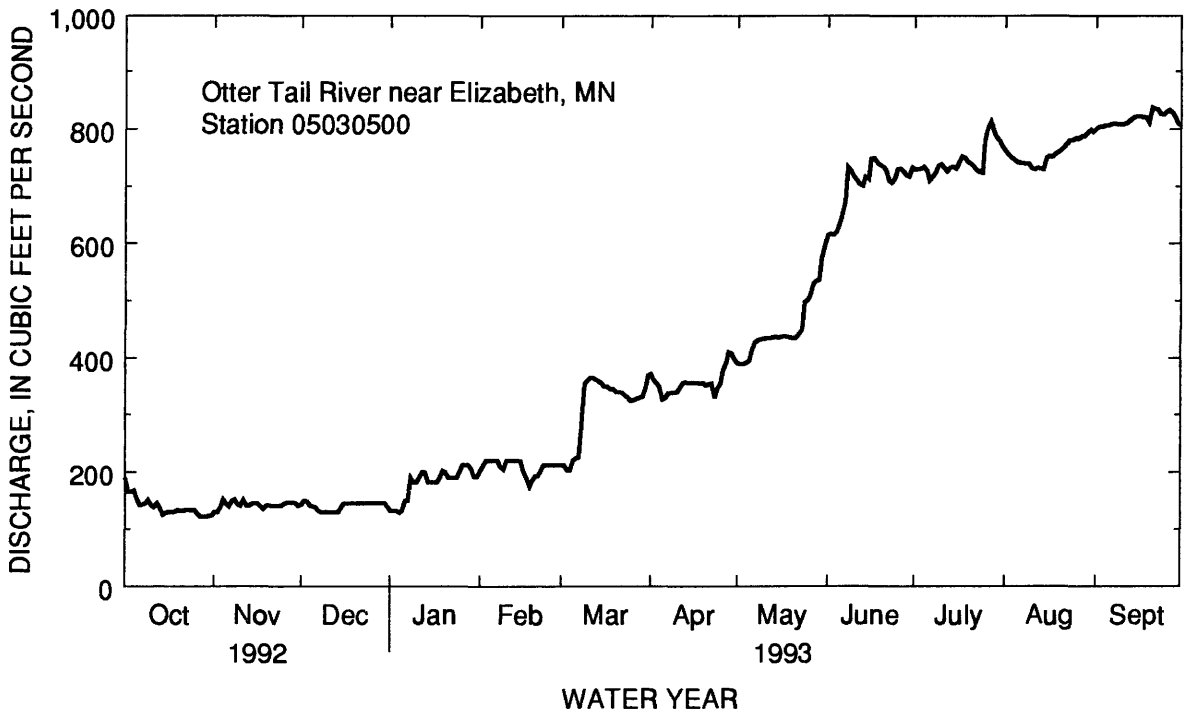
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	190	129	e143	e132	e203	e212	372	391	614	730	762	801
2	165	130	e150	e132	e211	e212	362	389	616	730	755	804
3	165	140	e150	e132	e220	e203	355	390	615	731	751	804
4	167	152	e142	e128	e220	e203	349	392	620	734	746	806
5	154	144	e140	e132	e220	e220	326	395	632	727	743	806
6	142	139	e138	e150	e220	e223	330	416	648	711	741	808
7	143	150	e132	e150	e220	e225	337	426	672	717	741	809
8	145	152	e130	e190	e210	e280	338	431	733	724	740	808
9	151	143	e130	e182	e205	e354	338	432	726	736	740	808
10	142	141	e130	e182	e220	e360	340	433	717	738	732	808
11	138	151	e130	e190	e220	e365	347	434	711	732	730	810
12	145	141	e130	e200	e220	e365	356	434	704	726	733	813
13	138	141	e130	e200	e220	e362	357	435	701	733	731	817
14	125	145	e130	e182	e220	e360	356	436	716	734	730	821
15	128	145	e140	e182	e218	e355	356	435	713	731	749	822
16	129	145	e145	e182	e202	e350	356	436	748	743	753	822
17	129	139	e145	e182	e190	e350	356	437	749	752	752	821
18	130	135	e145	e188	e175	e345	355	436	741	749	756	819
19	133	141	e145	e202	e185	e345	356	435	737	743	760	812
20	132	142	e145	e200	e193	e340	352	434	734	740	763	837
21	132	141	e145	e190	e193	e340	354	434	728	735	768	835
22	133	141	e145	e190	e203	e338	355	439	710	728	774	834
23	133	141	e145	e190	e212	334	330	448	706	725	781	826
24	133	141	e145	e190	e212	330	345	497	714	724	781	825
25	133	144	e145	e202	e212	324	355	501	730	779	784	829
26	127	146	e145	e212	e212	325	378	510	731	804	783	833
27	122	146	e145	e212	e212	327	391	530	726	813	787	827
28	122	146	e145	e212	e212	330	410	534	719	796	787	819
29	122	146	e145	e205	---	332	407	536	717	786	793	810
30	123	141	e145	e192	---	345	397	574	733	780	798	805
31	124	---	e138	e192	---	369	---	596	---	771	795	---
TOTAL	4295	4278	4358	5605	5860	9723	10716	14046	21061	23102	23539	24499
MEAN	139	143	141	181	209	314	357	453	702	745	759	817
MAX	190	152	150	212	220	369	410	596	749	813	798	837
MIN	122	129	130	128	175	203	326	389	614	711	730	801
AC-FT	8520	8490	8640	11120	11620	19290	21260	27860	41770	45820	46690	48590
CFSM	.11	.12	.11	.15	.17	.25	.29	.37	.57	.61	.62	.66
IN.	.13	.13	.13	.17	.18	.29	.32	.42	.64	.70	.71	.74

e Estimated.

RED RIVER OF THE NORTH BASIN

05030500 OTTER TAIL RIVER NEAR ELIZABETH, MN--Continued

SUMMARY STATISTIC	FOR 1993 WATER YEAR		WATER YEARS 1992 - 1993	
ANNUAL TOTAL	151082			
ANNUAL MEAN	414			
HIGHEST ANNUAL MEAN				
LOWEST ANNUAL MEAN				
HIGHEST DAILY MEAN	837	Sep 20	837	Sep 20 1993
LOWEST DAILY MEAN	122	Oct 27-29	122	Oct 27-29 1992
ANNUAL SEVEN-DAY MINIMUM	124	Oct 26		
INSTANTANEOUS PEAK FLOW	842	Sep 20	842	Sep 20 1993
INSTANTANEOUS PEAK STAGE	8.10	Sep 20	8.10	Sep 20 1993
ANNUAL RUNOFF (AC-FT)	299700			
ANNUAL RUNOFF (CFSM)	.34			
ANNUAL RUNOFF (INCHES)	4.57			
10 PERCENT EXCEEDS	789			
50 PERCENT EXCEEDS	350			
90 PERCENT EXCEEDS	138			



RED RIVER OF THE NORTH BASIN

05045950 ORWELL LAKE NEAR FERGUS FALLS, MN

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

DRAINAGE AREA.--1,830 mi², 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 in mean sea level, adjustment of 1912.

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

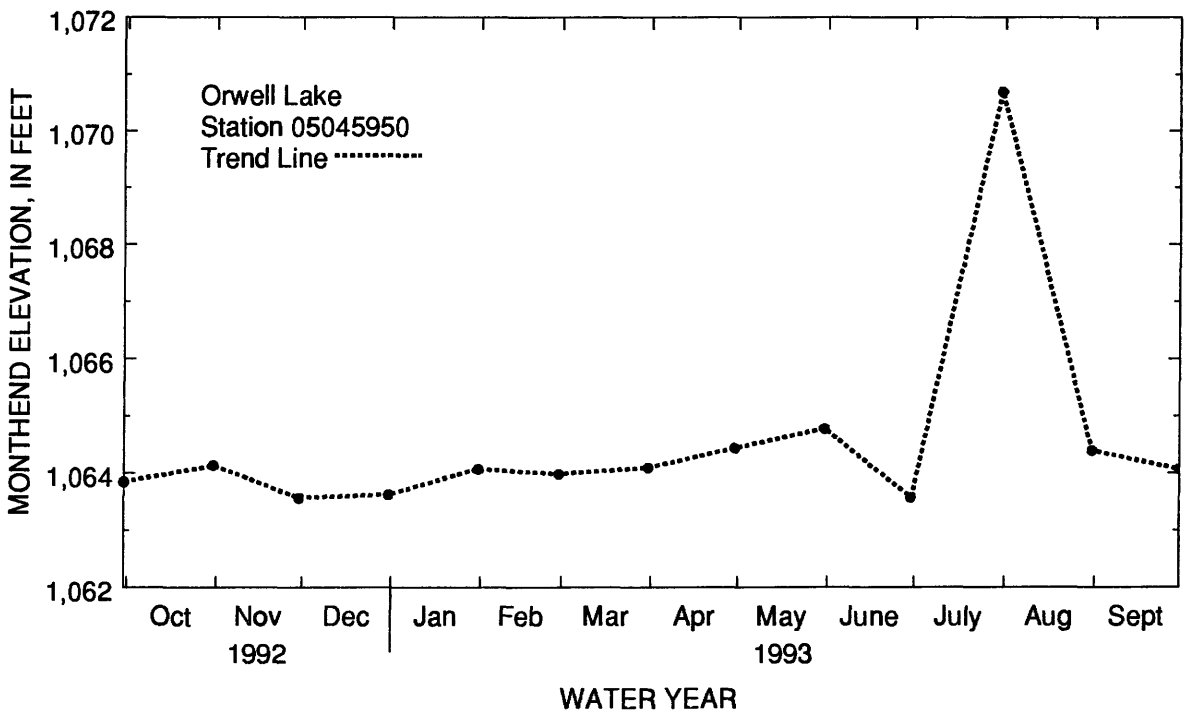
COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

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

EXTREMES FOR CURRENT YEAR.--Maximum contents, 14, 910 acre-ft, Aug. 1 elevation, 1,070.73 ft; minimum, 7,540 acre-ft, July 13, elevation, 1,062.98 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1063.85	8190	
Oct. 31	1064.14	8420	+ 230
Nov. 30	1063.57	7980	-440
Dec. 31	1063.63	8020	+40
CAL YR 1992			-350
Jan. 31	1064.08	8370	+350
Feb. 28	1063.99	8290	-80
Mar. 31	1064.10	8380	+90
Apr. 30	1064.44	8670	+290
May 31	1064.78	8960	+290
June 30	1063.58	7980	-980
July 31	1070.70	14880	+6900
Aug. 31	1064.40	8640	-6240
Sept. 30	1064.07	8360	-280
WTR YR 1993			+170


1,072
1,070
1,068
1,066
1,064
1,062
MONTHEND ELEVATION, IN FEET
Orwell Lake
Station 05045950
Trend Line
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
1992
1993
WATER YEAR

RED RIVER OF THE NORTH BASIN

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

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

DRAINAGE AREA.--1,830 mi², 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 above sea level, adjustment of 1912 (levels by U.S. Army Corps of Engineers). Oct. 11, 1930, to Nov. 17, 1933, at same site at datum 2.00 ft higher; Nov. 18, 1933, to Mar. 21, 1953, at site 6.1 mi upstream at datum 40.30 ft higher.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	204	173	179	137	271	265	702	699	884	1010	1050	999
2	221	173	179	137	258	259	747	699	964	1000	1160	1030
3	231	173	179	137	258	258	747	661	1010	1000	1240	1030
4	231	173	179	164	258	269	747	629	937	1000	1220	1030
5	231	196	179	186	258	329	747	629	884	1000	1220	1030
6	231	228	179	191	258	373	687	629	884	955	1220	1020
7	215	242	189	191	258	377	609	629	884	890	1220	1020
8	198	237	198	191	266	323	564	629	884	890	1210	1000
9	198	224	198	191	277	287	551	633	952	948	1220	989
10	198	217	195	191	302	287	551	659	1000	1080	1220	988
11	198	217	191	191	316	310	551	675	1010	1150	1200	988
12	196	229	191	185	316	351	578	675	1000	1040	1180	988
13	172	237	191	185	316	370	601	680	1000	957	1160	993
14	160	237	191	233	316	370	601	664	956	942	1150	925
15	154	237	191	258	316	374	605	652	891	942	1130	712
16	154	225	197	258	319	383	606	652	871	949	987	1050
17	149	217	204	258	309	390	606	649	871	777	916	1100
18	149	191	204	258	285	391	604	646	909	453	902	1100
19	149	173	204	238	283	391	576	646	942	523	890	1100
20	149	188	204	224	287	391	562	617	942	702	890	1100
21	166	215	204	224	287	391	562	595	980	988	890	1100
22	179	217	204	256	274	416	562	595	1010	1210	890	1100
23	179	217	220	276	265	465	562	596	1020	1230	890	1090
24	185	217	237	272	265	545	572	638	1120	1260	932	1060
25	185	217	237	264	265	607	573	731	1200	924	955	1040
26	222	217	237	245	265	551	592	769	1190	344	958	1040
27	231	217	237	237	265	603	606	765	1130	473	960	1040
28	217	217	237	234	265	731	662	833	1040	903	955	1040
29	190	217	216	264	---	693	699	888	1010	994	955	1040
30	173	197	198	287	---	625	699	884	1010	1050	960	1050
31	173	---	165	287	---	630	---	884	---	1050	962	---
TOTAL	5888	6335	6214	6850	7878	13005	18631	21230	29385	28634	32692	30792
MEAN	190	211	200	221	281	420	621	685	979	924	1055	1026
MAX	231	242	237	287	319	731	747	888	1200	1260	1240	1100
MIN	149	173	165	137	258	258	551	595	871	344	890	712
AC-FT	11680	12570	12330	13590	15630	25800	36950	42110	58290	56800	64840	61080
CFSM	.10	.12	.11	.12	.15	.23	.34	.37	.54	.50	.58	.56

e Estimated.

RED RIVER OF THE NORTH BASIN

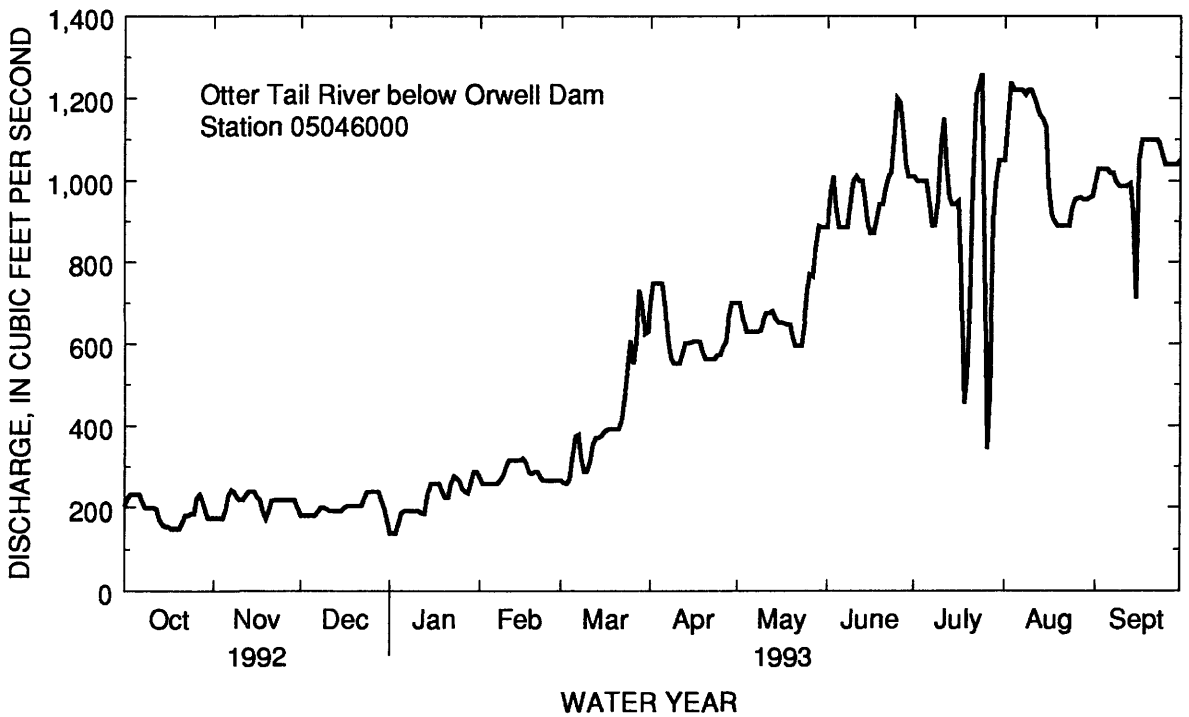
05046000 OTTER TAIL RIVER BELOW ORWELL DAM, NEAR FERGUS FALLS, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	223	233	222	214	216	297	453	553	551	403	273	233
MAX	817	831	706	603	605	653	1051	1427	1425	1246	1080	1026
(WY)	1986	1986	1987	1986	1987	1987	1986	1986	1986	1953	1985	1993
MIN	9.15	8.42	8.10	15.1	10.8	23.5	39.5	14.1	14.2	12.8	11.5	7.99
(WY)	1977	1977	1977	1937	1935	1937	1934	1977	1934	1936	1934	1934

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1931 - 1993	
ANNUAL TOTAL	109503		207534			
ANNUAL MEAN	299		569		323	
HIGHEST ANNUAL MEAN					842	1986
LOWEST ANNUAL MEAN					20.4	1934
HIGHEST DAILY MEAN	571	Mar 7	1260	Jul 24	1670	Jun 20 1953
LOWEST DAILY MEAN	149	Oct 17	137	Jan 1-3	1.6	Feb 7 1937
ANNUAL SEVEN-DAY MINIMUM	152	Oct 14	152	Oct 14	5.9	Sep 15 1934
INSTANTANEOUS PEAK FLOW			1290	Jul 24,25	1710	Jun 17 1953
INSTANTANEOUS PEAK STAGE			4.34	Jul 25	5.60[a]	Jun 17 1953
INSTANTANEOUS LOW FLOW			137[b]	Dec 31	.70[c]	Aug 5 1970
ANNUAL RUNOFF (AC-FT)	217200		411600		233900	
ANNUAL RUNOFF (CFSM)	.16		.31		.18	
10 PERCENT EXCEEDS	434		1040		701	
50 PERCENT EXCEEDS	278		551		250	
90 PERCENT EXCEEDS	189		190		30	

a Backwater from aquatic vegetation.
b Occurred part or all of each day Dec 31 - Jan 4.
c Result of regulation.



RED RIVER OF THE NORTH BASIN

05046000 OTTER TAIL RIVER BL ORWELL DAM NR FERGUS FALLS, MN--Continued
(National Water Quality Assessment Station)

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
FEB										
08...	1420	272	490	489	7.8	8.0	-5.0	2.0	740	14.2
APR										
01...	1330	747	439	452	8.2	7.9	3.0	4.0	739	13.8
26...	1500	606	432	444	8.6	8.1	15.5	10.0	736	11.5
MAY										
11...	1245	675	420	436	8.5	8.1	22.0	13.0	742	11.2
JUN										
07...	1430	884	435	437	8.4	8.1	12.5	16.0	725	9.2
29...	1500	1010	420	--	8.4	--	18.5	19.5	724	6.0
JUL										
19...	1300	711	395	415	--	7.9	17.5	20.5	739	8.7
AUG										
05...	0745	1210	406	422	8.1	8.0	15.0	21.0	736	3.5
19...	1300	890	402	422	8.3	8.0	19.5	21.5	735	3.8

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)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
FEB									
08...	41	32	11	5.1	271	0	222	--	17
APR									
01...	38	28	10	5.3	244	0	200	202	21
26...	41	28	8.7	4.5	207	6	180	199	24
MAY									
11...	39	28	8.7	4.8	229	3	192	201	20
JUN									
07...	39	29	8.6	4.5	227	5	190	195	23
29...	--	--	--	--	237	2	198	--	--
JUL									
19...	--	--	--	--	--	--	--	194	18
AUG									
05...	38	27	7.8	3.8	230	0	188	202	16
19...	41	28	8.0	3.3	227	0	186	200	16

RED RIVER OF THE NORTH BASIN

05046000 OTTER TAIL RIVER BL ORWELL DAM NR FERGUS FALLS, MN--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	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)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)
FEB									
08...	12	0.10	18	263	0.030	0.450	0.180	0.70	1.2
APR									
01...	11	0.10	15	265	0.020	0.440	0.080	0.60	0.80
26...	9.9	0.20	11	260	<0.010	<0.050	0.020	0.60	0.50
MAY									
11...	9.8	0.20	9.3	258	<0.010	<0.050	0.030	0.50	0.50
JUN									
07...	9.2	0.20	11	258	<0.010	0.140	0.030	0.50	0.50
29...	--	--	--	--	<0.010	<0.050	0.020	0.60	0.60
JUL									
19...	8.2	<0.10	--	239	<0.010	0.080	0.050	0.80	0.50
AUG									
05...	6.9	0.10	18	254	<0.010	<0.050	0.060	0.70	0.60
19...	8.2	0.20	18	246	<0.010	<0.050	0.050	0.80	0.50

DATE	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	SEDIMENT, SUSPENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
FEB									
08...	0.020	0.040	0.040	8	24	--	--	--	--
APR									
01...	0.020	0.020	0.030	19	32	--	--	16	86
26...	0.020	0.020	<0.010	9	8	--	--	20	92
MAY									
11...	0.030	<0.010	0.010	8	6	--	--	--	--
JUN									
07...	0.020	0.020	<0.010	17	4	--	--	40	95
29...	0.020	0.020	<0.010	--	--	--	--	20	100
JUL									
19...	0.060	0.030	0.030	--	--	7.9	0.1	16	92
AUG									
05...	0.030	0.020	0.030	9	2	--	--	21	91
19...	0.060	0.020	0.020	5	3	8.0	0.5	14	100

RED RIVER OF THE NORTH BASIN

05050000 BOIS DE SIOUX RIVER NEAR WHITE ROCK, SD

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

DRAINAGE AREA.--1,160 mi², approximately.

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

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

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.04	.12	e4.5	e5.2	e4.4	e4.1	e90	619	175	717	e1000	1150
2	.06	.50	e4.5	e5.2	e4.4	e4.1	e80	603	202	697	1220	1140
3	.06	2.0	e4.5	e5.1	e4.4	e4.1	e66	528	199	640	1250	1140
4	.05	3.0	e4.5	e5.1	e4.4	e4.1	57	417	176	632	1290	1130
5	.07	1.3	e4.4	e5.1	e4.3	e4.1	159	314	150	617	1280	1120
6	.11	3.6	e4.4	e5.0	e4.3	e4.1	406	264	152	653	1260	1120
7	.14	3.9	e4.4	e5.0	e4.3	e4.2	410	267	152	759	1250	1110
8	.11	3.6	e4.4	e5.0	e4.3	e4.7	410	279	153	823	1240	1110
9	.21	2.8	e4.4	e5.0	e4.2	e4.8	530	286	204	879	1150	1100
10	.29	3.7	e4.4	e4.9	e4.2	e5.0	696	293	273	958	1180	1090
11	.21	4.3	e4.4	e4.9	e4.2	e5.0	700	297	233	997	1180	1090
12	.17	5.4	e4.4	e4.9	e4.2	e5.0	696	302	194	1020	1170	1080
13	.19	5.6	e4.4	e4.9	e4.2	e5.0	689	295	193	1040	1160	1070
14	.05	4.6	e4.4	e4.9	e4.1	e5.0	682	293	190	1050	1170	1070
15	e.04	4.8	e4.5	e4.9	e4.1	e5.0	774	287	182	1060	1170	1070
16	e.03	4.3	e4.5	e4.9	e4.1	e5.0	873	283	144	1070	1160	1060
17	e.03	3.7	e4.6	e4.8	e4.1	e5.0	865	221	89	999	1150	1050
18	e.03	3.7	e4.6	e4.8	e4.1	e7.0	861	154	115	572	1180	1040
19	e.03	3.7	e4.7	e4.8	e4.1	e12	865	130	145	e75	1180	1040
20	e.03	4.3	e4.8	e4.7	e4.1	e23	885	95	142	e200	1180	1040
21	e.03	4.5	e4.8	e4.7	e4.1	e40	872	83	127	e700	1180	1040
22	.24	4.3	e4.9	e4.7	e4.1	e80	858	65	113	e950	1190	1030
23	e.03	4.3	e4.9	e4.6	e4.1	e150	809	67	143	e950	1180	1020
24	e.03	4.4	e5.0	e4.6	e4.1	e220	728	102	304	e1030	1180	1020
25	e.03	4.3	e5.0	e4.6	e4.1	e250	709	146	431	e1050	1170	1010
26	e.03	e4.8	e5.0	e4.6	e4.1	e290	684	147	445	e600	1160	1000
27	e.03	e4.7	e5.1	e4.5	e4.1	e320	675	148	459	e90	1150	997
28	e.03	e4.6	e5.1	e4.5	e4.1	e340	663	147	513	e88	1160	984
29	e.03	e4.6	e5.2	e4.5	---	e250	651	145	576	e86	1160	979
30	e.03	e4.6	e5.2	e4.5	---	e170	637	150	639	e150	1150	970
31	e.03	---	e5.2	e4.5	---	e110	---	150	---	e900	1140	---
TOTAL	2.49	114.02	145.1	149.4	117.3	2340.3	18080	7577	7213	22052	36640	31870
MEAN	.080	3.80	4.68	4.82	4.19	75.5	603	244	240	711	1182	1062
MAX.	29	5.6	5.2	5.2	4.4	340	885	619	639	1070	1290	1150
MIN.	03	.12	4.4	4.5	4.1	4.1	57	65	89	75	1000	970
AC-FT	4.9	226	288	296	233	4640	35860	15030	14310	43740	72680	63210
CFSM	.00	.00	.00	.00	.00	.07	.52	.21	.21	.61	1.02	.92
IN.	.00	.00	.00	.00	.00	.08	.58	.24	.23	.71	1.18	1.02

e Estimated.

RED RIVER OF THE NORTH BASIN

05050000 BOIS DE SIOUX RIVER NEAR WHITE ROCK, SD--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	16.0	11.6	4.84	2.52	3.24	25.5	199	244	230	157	73.7	37.6
MAX	363	258	57.5	36.0	53.0	227	1322	1310	1103	1035	1182	1062
(WY)	1987	1985	1985	1987	1966	1985	1969	1969	1986	1962	1993	1993
MIN.	000	.000	.000	.000	.000	.000	.000	.23	.010	.000	.000	.000
(WY)	1942	1942	1942	1942	1942	1942	1942	1977	1977	1961	1970	1960

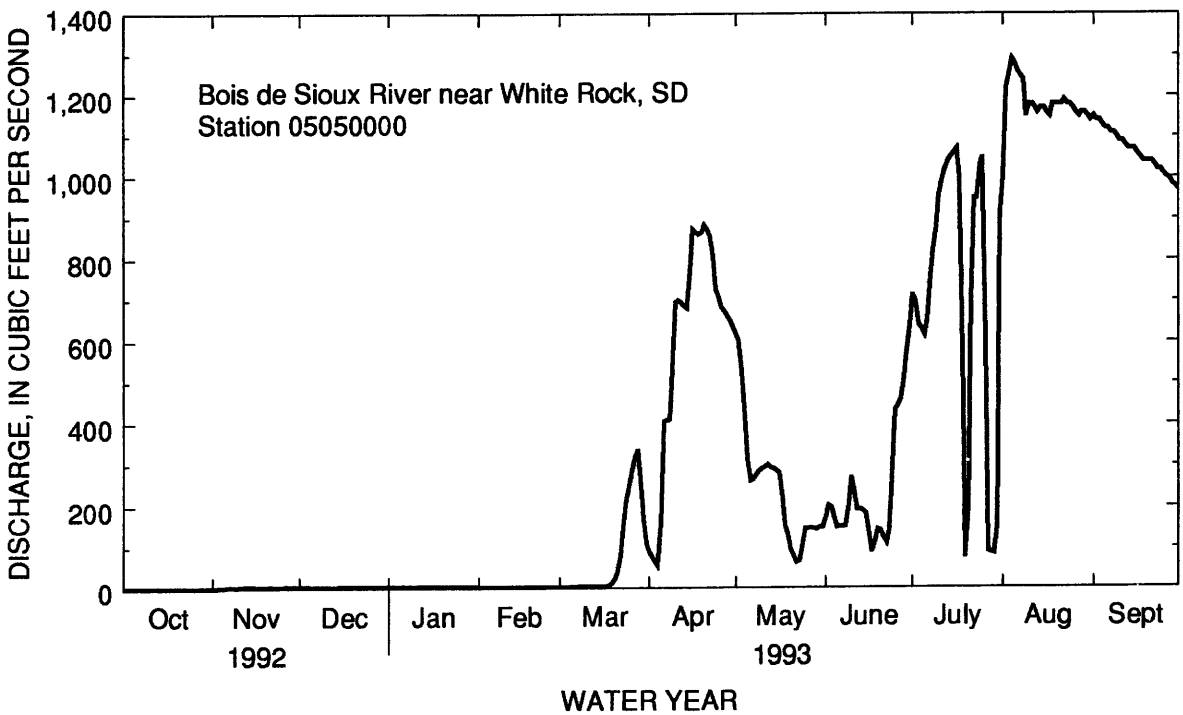
SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1942 - 1993	
ANNUAL TOTAL	4763.94		126300.61			
ANNUAL MEAN	13.0		346		84.0[a]	
HIGHEST ANNUAL MEAN					346	1993
LOWEST ANNUAL MEAN					.38	1977
HIGHEST DAILY MEAN	138	Aug 1	1290	Aug 4	3380	Apr 20 1969
LOWEST DAILY MEAN	.03	Oct 16	.03[b]	Oct 16	.00	Many days
ANNUAL SEVEN-DAY MINIMUM	.03	Oct 23	.03	Oct 23	.00	Oct 1 1941
INSTANTANEOUS PEAK FLOW			1300	Aug . 4	3770[c]	Apr 19 1969
INSTANTANEOUS PEAK STAGE			11.52	Aug 4	15.07[c,d]	Apr 19 1969
ANNUAL RUNOFF (AC-FT)	9450		250500		60830	
ANNUAL RUNOFF (CFSM)	.011		.30		.072	
ANNUAL RUNOFF (INCHES)	.15		4.05		.98	
10 PERCENT EXCEEDS	15		1110		249	
50 PERCENT EXCEEDS	3.7		89		1.8	
90 PERCENT EXCEEDS	.15		2.9		.00	

a Median of annual mean discharges is 54 ft^3/s.

b Occurred Oct 16-21, 23-31.

c Occurred during period Apr 19-21, 1969.

d From floodmark.



RED RIVER OF THE NORTH BASIN

05051300 BOIS DE SIOUX RIVER NEAR DORAN, MN

LOCATION.--Lat 46°09'08", long 96°34'44", in NE¼NE¼ sec.21, T.131 N., R.47 W., Wilkin County, Hydrologic Unit 09020101, on right bank, 10 ft downstream from bridge on County Highway 6, 3 miles downstream from Rabbit River, 4.3 mi southwest of Doran.

DRAINAGE AREA.--1,880 mi², approximately.

PERIOD OF RECORD.--October 1989 to current year.

GAGE.--Water-stage recorder. Datum of gage is 943.90 ft above mean sea level (elevation data obtained from Wilkin County Highway Engineer).

REMARKS.--Records good except for estimated daily discharges which are fair. Flow regulated by Lake Traverse-Boise de Sioux Flood Control and Water Conservation project near White Rock, SD.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.21	.36	e4.9	e2.1	e2.8	e4.0	e3600	708	583	778	1920	1340
2	.20	1.9	e4.9	e2.1	e2.8	e4.2	e3300	696	498	793	1760	1330
3	.17	4.0	e4.7	e2.1	e2.9	e4.4	3030	681	420	754	1660	1320
4	.15	e4.3	e4.5	e2.1	e3.0	e4.6	2450	599	367	773	1610	1310
5	.13	e4.5	e4.3	e2.1	e3.0	e4.8	1690	500	304	828	1590	1310
6	.12	e4.8	e4.2	e2.1	e3.1	e5.1	1140	406	257	868	1570	1300
7	.11	e5.1	e4.1	e2.1	e3.2	e5.3	932	379	249	861	1550	1290
8	.09	e5.1	e4.0	e2.1	e3.2	e5.5	770	377	298	852	1530	1290
9	.08	e4.7	e3.9	e2.1	e3.3	e5.8	688	379	331	905	1510	1280
10	.06	e5.0	e3.8	e2.1	e3.4	e6.0	771	375	406	1080	1480	1270
11	.04	e6.0	e3.7	e2.1	e3.4	e6.2	896	374	445	1180	1470	1270
12	.02	e7.0	e3.6	e2.1	e3.5	e6.5	950	365	390	1160	1460	1260
13	.03	e6.8	e3.5	e2.1	e3.5	e6.8	913	363	329	1130	1450	1240
14	.00	e6.6	e3.4	e2.1	e3.6	e7.1	856	351	304	1110	1470	1240
15	.01	e6.4	e3.3	e2.1	e3.7	e7.5	818	349	298	1120	1480	1240
16	.03	e6.2	e3.2	e2.1	e3.7	e8.0	897	341	301	1290	1470	1230
17	.03	e6.1	e3.1	e2.1	e3.8	e8.8	944	333	254	1890	1450	1220
18	.05	e6.1	e3.0	e2.1	e3.9	e9.5	932	246	205	2230	1450	1220
19	.06	e6.0	e2.9	e2.2	e3.9	e11	907	201	231	2000	1440	1230
20	.07	e5.8	e2.8	e2.2	e3.9	e15	910	172	272	1470	1430	1240
21	.06	e5.6	e2.7	e2.3	e3.9	e20	922	142	272	1140	1430	1240
22	.07	e5.4	e2.6	e2.3	e3.9	e60	914	135	263	1090	1430	1230
23	.09	e5.3	e2.6	e2.3	e3.9	e247	902	120	261	1070	1430	1220
24	.09	e5.2	e2.5	e2.4	e3.9	e400	865	135	671	1080	1420	1210
25	.09	e5.1	e2.5	e2.4	e3.9	e390	815	301	1420	2130	1410	1200
26	.09	e5.0	e2.4	e2.4	e3.9	e380	799	474	1510	2930	1400	1180
27	.08	e4.9	e2.3	e2.5	e3.9	e450	776	407	1230	3100	1380	1170
28	.08	e4.9	e2.2	e2.5	e3.9	e700	755	372	929	2980	1370	1160
29	.09	e4.9	e2.2	e2.6	---	e1400	737	342	784	2720	1360	1150
30	.09	e4.9	e2.1	e2.7	---	e2600	722	360	754	2390	1350	1140
31	.14	---	e2.1	e2.7	---	e3500	---	507	---	2090	1350	---
TOTAL	2.63	153.96	102.0	69.3	98.8	10283.1	35601	11490	14836	45792	46080	37330
MEAN	.085	5.13	3.29	2.24	3.53	332	1187	371	495	1477	1486	1244
MAX	.21	7.0	4.9	2.7	3.9	3500	3600	708	1510	3100	1920	1340
MIN	.00	.36	2.1	2.1	2.8	4.0	688	120	205	754	1350	1140
AC-FT	5.2	305	202	137	196	20400	70610	22790	29430	90830	91400	74040
CFSM	.00	.00	.00	.00	.00	.18	.63	.20	.26	.79	.79	.66
IN.	.00	.00	.00	.00	.00	.20	.70	.23	.29	.91	.91	.74

e Estimated.

RED RIVER OF THE NORTH BASIN

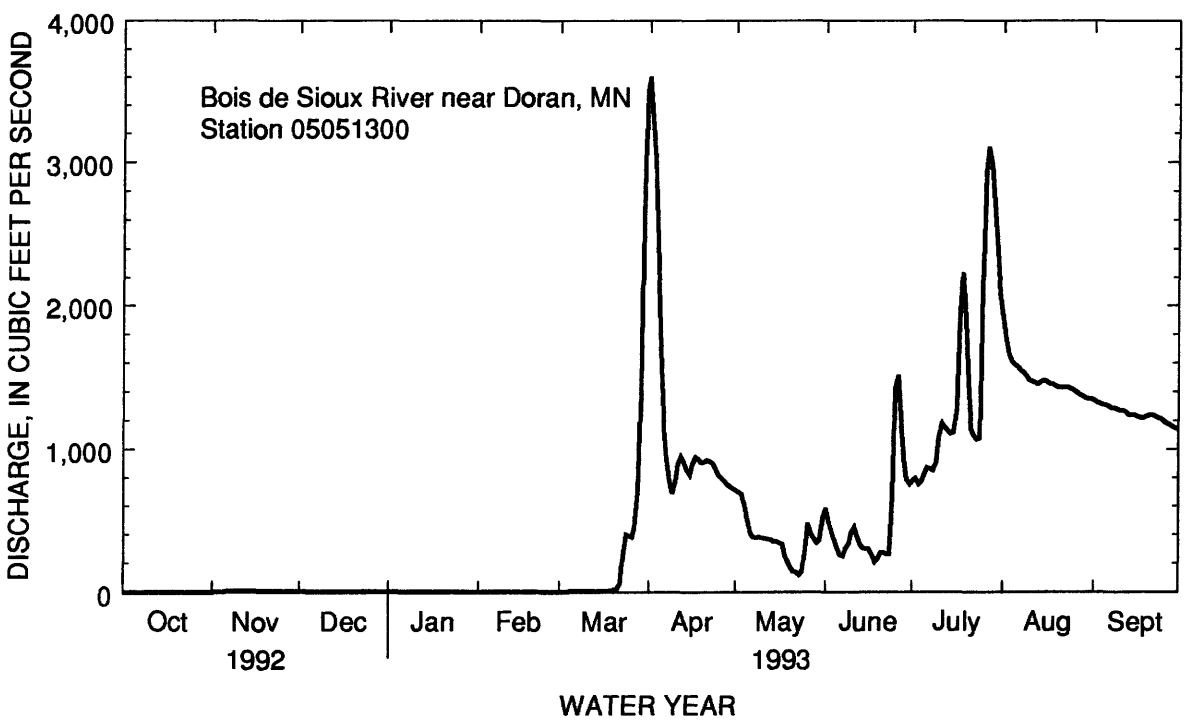
05051300 BOIS DE SIOUX RIVER NEAR DORAN, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	23.7	5.28	3.70	1.05	1.96	125	324	119	234	619	422	417
MAX	74.5	8.54	8.48	2.24	4.10	332	1187	371	495	1477	1486	1244
(WY)	1992	1990	1990	1993	1992	1993	1993	1993	1993	1993	1993	1993
MIN	.026	1.97	.65	.077	.000	25.5	12.6	11.8	12.6	4.37	.000	.000
(WY)	1991	1991	1991	1991	1990	1990	1990	1990	1990	1990	1990	1990

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1990 - 1993	
ANNUAL TOTAL	11173.10		201838.79			
ANNUAL MEAN	30.5		553		192	
HIGHEST ANNUAL MEAN					553	1993
LOWEST ANNUAL MEAN					8.77	1990
HIGHEST DAILY MEAN	422	Jun 18	3600	Apr 1	3600	Apr 1 1993
LOWEST DAILY MEAN	.00	Oct 14	.00	Oct 14	.00	Many days
ANNUAL SEVEN-DAY MINIMUM	.02	Oct 11	.02	Oct 11	.00	Jan 7 1990
INSTANTANEOUS PEAK FLOW			3660	Apr 1	3660	Apr 1 1993
INSTANTANEOUS PEAK STAGE			21.39[a]	Apr 1	21.39[a]	Apr 1 1993
INSTANTANEOUS LOW FLOW			.00	Oct 11-15		
ANNUAL RUNOFF (AC-FT)	22160		400300		139300	
ANNUAL RUNOFF (CFSM)	.016		.29		.10	
ANNUAL RUNOFF (INCHES)	.22		3.99		1.39	
10 PERCENT EXCEEDS	120		1450		783	
50 PERCENT EXCEEDS	5.1		247		7.1	
90 PERCENT EXCEEDS	.42		2.1		.00	

a Backwater from ice.



RED RIVER OF THE NORTH BASIN

05051300 BOIS DE SIOUX RIVER NEAR DORAN, MN--Continued
(National Water Quality Assessment Station)

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
MAR										
27...	0930	--	E450	1870	1890	7.8	7.6	1.0	0.5	736
APR										
02...	0830	--	E3300	496	500	7.9	7.3	1.0	3.0	740
26...	1700	797	--	892	910	8.9	7.7	12.5	10.0	737
MAY										
11...	1400	373	--	1080	1090	8.0	7.6	24.5	16.0	741
JUN										
02...	1150	502	--	1130	1050	7.7	8.0	14.0	15.5	737
14...	1600	298	--	1340	1340	8.2	7.9	13.0	19.0	734
25...	1330	1510	--	575	579	6.8	7.2	20.5	20.0	734
JUL										
20...	0630	1600	--	536	575	7.8	7.7	17.5	20.5	--
AUG										
20...	0630	1440	--	737	742	7.7	7.5	14.5	20.0	741

DATE	OXYGEN, DIS-SOLVED (MG/L) (00300)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
MAR										
27...	11.8	140	120	100	19	317	0	260	268	740
APR										
02...	11.8	46	21	16	8.1	91	0	75	86	130
26...	13.4	76	43	28	9.1	161	14	154	161	310
MAY										
11...	12.8	95	63	46	13	228	0	187	198	380
JUN										
02...	7.4	100	64	47	12	232	0	190	196	400
14...	7.4	120	82	60	25	295	0	242	233	510
25...	5.4	53	27	20	7.0	133	0	109	115	170
JUL										
20...	--	--	--	--	--	185	0	152	160	140
AUG										
20...	2.8	80	39	20	7.8	222	0	182	185	190

RED RIVER OF THE NORTH BASIN

05051300 BOIS DE SIOUX RIVER NEAR DORAN, MN--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	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)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)
MAR									
27...	47	0.20	8.8	1500	0.010	0.140	0.250	1.9	1.5
APR									
02...	8.9	<0.10	16	343	0.280	5.10	0.270	1.4	1.4
26...	17	0.20	12	661	<0.010	<0.050	0.020	1.2	1.0
MAY									
11...	18	0.30	7.6	810	<0.010	0.052	0.080	1.3	1.2
JUN									
02...	18	0.30	11	852	0.030	1.40	0.040	1.3	1.0
14...	26	0.20	6.8	1040	<0.010	<0.050	0.030	1.2	1.1
25...	7.4	0.20	15	408	0.030	0.860	0.090	0.90	0.90
JUL									
20...	7.8	0.10	--	393	0.010	0.076	0.070	1.1	0.90
AUG									
20...	13	0.20	25	510	0.060	0.120	0.130	1.4	1.2

DATE	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	SEDIMENT, SUSPENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
MAR									
27...	0.130	0.100	0.070	7	470	--	--	--	--
APR									
02...	0.490	0.490	0.450	44	29	--	--	36	99
26...	0.070	0.050	0.010	22	31	--	--	13	93
MAY									
11...	0.160	0.130	0.110	40	150	--	--	--	--
JUN									
02...	0.350	0.280	0.260	19	60	--	--	--	--
14...	0.200	0.180	0.150	9	71	--	--	80	76
25...	0.400	0.310	0.300	31	11	--	--	159	97
JUL									
20...	0.450	0.410	0.380	--	--	12	0.4	30	99
AUG									
20...	0.580	0.550	0.480	30	140	12	0.3	15	100

RED RIVER OF THE NORTH BASIN

05051500 RED RIVER OF THE NORTH AT WAHPETON, ND

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

DRAINAGE AREA.--4,010 mi², approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1942 to October 1942, March 1943 to current year. Gage-height records collected in this vicinity since 1917 are contained in reports of the U.S. Weather Bureau.

GAGE.--Water-stage recorder and concrete and wooden dam. Datum of gage is 942.97 ft above sea level. Prior to Aug. 6, 1943, U.S. Weather Bureau nonrecording gage 800 ft upstream, converted to present datum. Aug. 6, 1943, to Oct. 27, 1950, nonrecording gage at present site and datum.

REMARKS.--Records good except those for periods of estimated daily discharges, which are poor. Flow regulated by Orwell Reservoir, capacity, 14,100 acre-ft at elevation 1,070 ft above National Geodetic Vertical Datum of 1929, adjustment of 1912; Lake Traverse, capacity, 137,000 acre-ft, available for flood control; numerous other controlled lakes and ponds, and several powerplants.

EXTREMES OUTSIDE PERIOD OF RECORD.--A stage of 17.0 ft, discharge, 10,500 ft³/s, occurred in the spring of 1897 and has not been exceeded since.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	184	161	e251	e120	e300	e250	5610	1480	1970	1930	3380	2190
2	195	174	e213	e105	e290	e270	5010	1470	1720	1950	3120	2190
3	208	176	e189	e110	e260	e290	4430	1450	1540	1920	2960	2220
4	227	143	e176	e110	e250	e300	3750	1360	1480	2120	2940	2220
5	229	161	e130	e120	e248	e325	3110	1220	1400	2150	2890	2220
6	228	216	e135	e140	e245	e350	2400	1100	1260	2090	2820	2210
7	233	292	e130	e200	e244	e385	1990	1030	1220	2050	2760	2200
8	226	304	e150	e190	e243	e420	1690	1030	1300	1980	2710	2190
9	196	257	e200	e160	e242	e480	1500	1030	1350	1970	2660	2170
10	182	225	e220	e130	e240	e410	1460	1020	1390	2140	2570	2150
11	178	204	e230	e145	e239	e340	1610	989	1500	2340	2550	2150
12	174	201	e230	e150	e238	e325	1690	993	1470	e2490	2520	2140
13	174	165	e226	e160	e237	e320	1680	1020	1380	e2460	2500	2130
14	169	148	e231	e160	e235	e315	1640	1020	1320	2350	2500	2130
15	148	159	e230	e150	e225	e325	1580	996	1290	2300	2500	2120
16	181	244	e226	e150	e215	e340	1590	966	1270	2580	2480	1950
17	216	318	e228	e150	e215	e340	1660	958	1210	3320	2420	2010
18	146	289	e235	e160	e215	e335	1660	910	1140	3780	2320	2130
19	132	230	e235	e170	e210	e330	1630	838	1140	3510	2250	2180
20	125	165	e160	e160	e210	e410	1600	814	1200	2810	2220	2210
21	127	201	e180	e180	e220	e410	1590	755	1210	2350	2200	2210
22	142	e198	e180	e215	e230	e410	1580	746	1220	2260	2200	2190
23	165	e185	e180	e250	e240	e500	1560	743	1260	2420	2210	2180
24	171	e170	e205	e250	e240	e675	1640	833	1530	2520	2200	2170
25	173	e160	e215	e245	e240	e820	1560	1010	2550	2990	2200	2150
26	177	e140	e220	e300	e240	e1100	1490	1200	2940	4680	2230	2110
27	194	e125	e220	e290	e240	e1450	1470	1300	2810	4840	2230	2100
28	218	e140	e215	e280	e240	2170	1460	1240	2430	4310	2220	2080
29	209	e170	e205	e278	---	3370	1460	1210	2120	4160	2210	2070
30	189	e200	e175	e275	---	4890	1480	1380	1960	3980	2210	2070
31	159	---	e140	e270	---	5930	---	1840	---	3660	2200	---
TOTAL	5675	5921	6160	5773	6691	28585	62580	33951	47580	86410	77380	64440
MEAN	183	197	199	186	239	922	2086	1095	1586	2787	2496	2148
MAX	233	318	251	300	300	5930	5610	1840	2940	4840	3380	2220
MIN	125	125	130	105	210	250	1460	743	1140	1920	2200	1950
AC-FT	11260	11740	12220	11450	13270	56700	124100	67340	94370	171400	153500	127800

e Estimated.

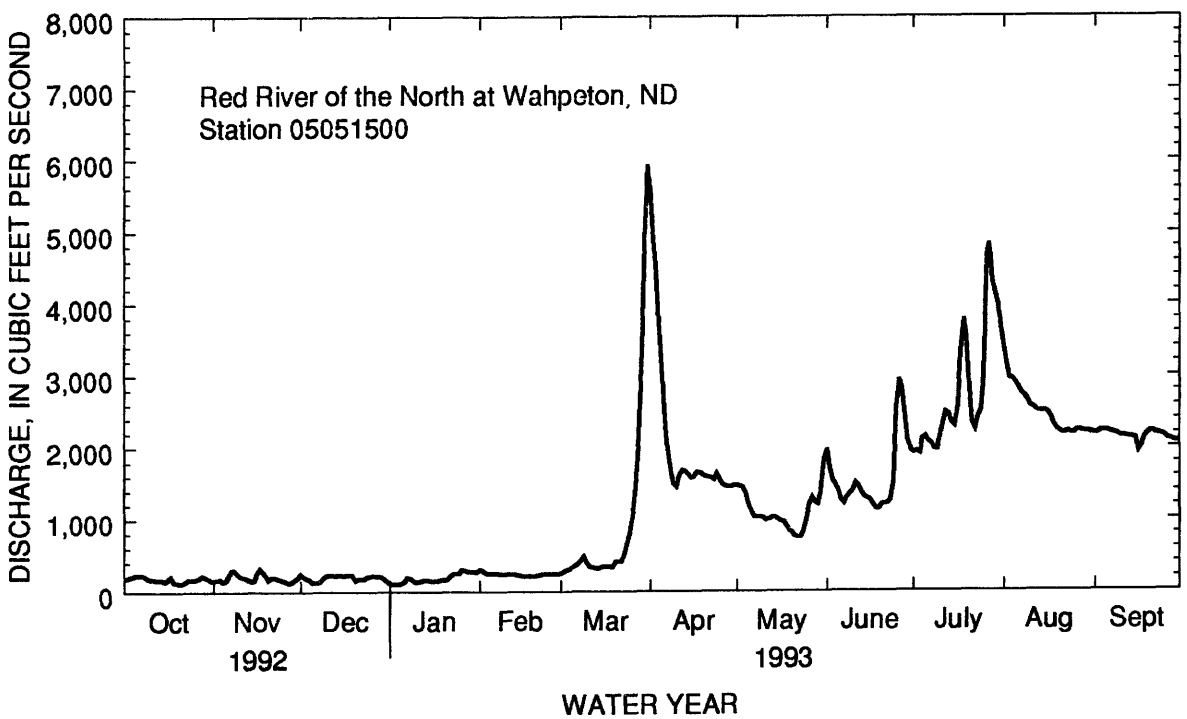
RED RIVER OF THE NORTH BASIN

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

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	295	285	265	252	262	577	1206	998	1021	760	415	333
MAX	1247	952	820	678	687	1679	4436	3085	2675	2787	2496	2148
(WY)	1987	1987	1987	1986	1987	1986	1969	1986	1962	1993	1993	1993
MIN	5.72	7.40	6.60	8.81	18.0	84.3	138	22.5	90.0	65.6	53.5	2.18
(WY)	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1976

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1942 - 1993	
ANNUAL TOTAL	123650		431146			
ANNUAL MEAN	338		1181		551	
HIGHEST ANNUAL MEAN					1477	1986
LOWEST ANNUAL MEAN					54.0	1977
HIGHEST DAILY MEAN	1900	Mar 8	5930	Mar 31	8940	Apr 10 1969
LOWEST DAILY MEAN	120	Jan 17	105	Jan 2	1.7	Aug 28 1976
ANNUAL SEVEN-DAY MINIMUM	126	Jan 15	121	Dec 31	1.7	Aug 28 1976
INSTANTANEOUS PEAK FLOW			6080	Mar 31	9200	Apr 10 1969
INSTANTANEOUS PEAK STAGE			14.33	Mar 31	17.95	Apr 5 1989
INSTANTANEOUS LOW FLOW					1.7	Aug 28 1976
ANNUAL RUNOFF (AC-FT)	245300		855200		398900	
10 PERCENT EXCEEDS	535		2510		1290	
50 PERCENT EXCEEDS	309		910		350	
90 PERCENT EXCEEDS	165		160		101	



RIVER OF THE NORTH BASIN

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

WATER-QUALITY RECORDS

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
NOV											
19...	0940	232	512	--	1.0	0.5	--	--	--	--	--
JAN											
07...	0905	201	507	--	1.0	1.0	--	--	--	--	--
FEB											
16...	1600	221	555	--	-2.0	0.0	--	--	--	--	--
23...	1200	242	667	--	-15.0	0.5	--	--	--	--	--
APR											
03...	1610	4190	499	--	6.0	4.5	--	--	--	--	--
06...	1300	2420	570	7.6	3.0	5.5	260	151	56	28	14
13...	0800	1650	780	--	3.0	4.5	--	--	--	--	--
MAY											
26...	1230	1220	908	--	16.5	15.0	--	--	--	--	--
JUL											
08...	0715	1980	732	-	17.5	19.0	--	--	--	--	--
27...	1225	4850	364	--	27.0	22.0	--	--	--	--	--
AUG											
04...	0830	2970	558	--	21.0	20.5	--	--	--	--	--
11...	1445	2520	607	--	31.0	25.0	--	--	--	--	--
SEP											
15...	0925	2120	705	7.6	12.0	12.0	340	218	64	44	20

DATE	SODIUM PERCENT (00932)	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)
APR											
06...	10	0.4	7.8	120	11	0.10	17	345	344	0.47	2250
SEP											
15...	11	0.5	8.8	150	15	0.20	18	451	481	0.65	2750

DATE	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
APR										
06...	5	50	40	<1	20	40	<0.1	1	<1	260
SEP										
15...	4	60	20	<1	40	20	0.1	1	<1	320

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RED RIVER OF THE NORTH BASIN

05051522 RED RIVER OF THE NORTH AT HICKSON, ND

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

DRAINAGE AREA.--4,300 mi², approximately.

WATER-DISCHARGE RECORDS

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

GAGE.--Water-stage recorder and concrete control. Datum of gage is 877.06 ft above sea level.

REMARKS.--Records good except those for periods of estimated daily discharges, which are fair. Flow regulated by Orwell Reservoir, capacity, 14,100 acre-ft at 1,070 ft above sea level, adjustment of 1912; Lake Traverse, capacity, 137,000 acre-ft, available for flood control, numerous other controlled lakes and ponds, and several powerplants.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	259	225	e245	e135	e300	276	e5000	1480	1820	2230	4290	2150
2	227	210	e280	e140	e305	254	e6200	1480	2090	2010	4090	2140
3	215	215	e260	e140	e310	255	e6300	1460	2020	1920	3790	2140
4	220	215	e220	e140	e315	260	e6300	1450	1770	2110	3550	2150
5	230	207	e195	e140	e320	261	e6000	1400	1560	2180	3350	2160
6	244	155	e175	e140	e325	282	e5500	1270	1460	2270	3180	2170
7	247	133	e165	e140	e330	328	e5000	1170	1320	2220	3040	2180
8	245	154	e140	e145	e335	368	4540	1080	1230	2080	2930	2170
9	247	256	e155	e150	e340	408	3320	1050	1270	1980	2850	2170
10	244	372	e180	e170	e340	429	2250	1050	1330	1900	2770	2160
11	225	339	e200	e200	e340	403	1690	1040	1370	1920	2710	2140
12	209	297	e235	e210	e338	337	1620	1040	1440	2080	2650	2130
13	204	282	e250	e195	e335	318	1740	1020	1490	2240	2580	2120
14	201	223	e250	e185	e330	312	1820	1030	1400	2340	2540	2110
15	203	182	e250	e175	e325	372	1810	1030	1310	2410	2510	2100
16	201	192	e250	e165	e320	402	1740	1010	1300	2500	2500	2100
17	187	257	e250	e165	e315	418	1680	981	1290	2610	2470	2030
18	210	351	e248	e165	e306	442	1720	954	1240	2930	2480	1950
19	229	e380	e245	e160	e295	451	1750	929	1180	3240	2400	2040
20	190	e320	e220	e180	e290	453	1730	866	1130	3440	2290	2130
21	177	e285	e180	e210	e280	476	1710	825	1150	3390	2220	2170
22	172	e260	e160	e235	e270	490	1690	792	1180	3030	2170	2200
23	174	e220	e160	e245	e260	504	1680	757	1200	2600	2160	2200
24	184	e230	e195	e250	e255	556	1710	772	1320	2280	2150	2190
25	198	e230	e210	e250	e250	756	1810	812	1450	2250	2160	2180
26	204	e210	e195	e265	242	e1000	1890	982	2080	2580	2160	2170
27	204	e185	e190	e275	235	e1500	1750	1180	2660	3410	2170	2150
28	204	e165	e185	e275	257	e2400	1600	1310	2910	3820	2190	2130
29	219	e140	e170	e280	---	e2800	1520	1290	2850	4190	2190	2120
30	236	e190	e150	e285	---	e3300	1480	1260	2580	4350	2180	2110
31	235	---	e130	e295	---	e3700	---	1360	---	4370	2170	---
TOTAL	6644	7080	6338	6105	8463	24511	84550	34130	48400	82880	82890	64060
MEAN	214	236	204	197	302	791	2818	1101	1613	2674	2674	2135
MAX	259	380	280	295	340	3700	6300	1480	2910	4370	4290	2200
MIN	172	133	130	135	235	254	1480	757	1130	1900	2150	1950
AC-FT	13180	14040	12570	12110	16790	48620	167700	67700	96000	164400	164400	127100

e Estimated.

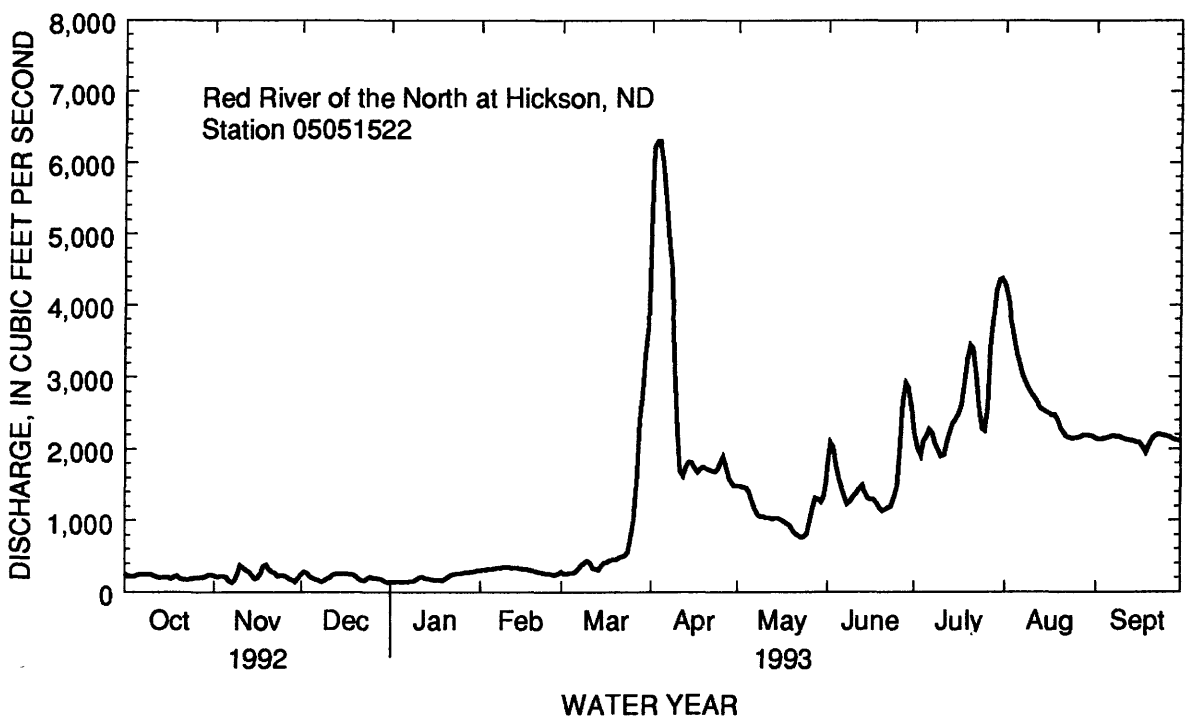
RED RIVER OF THE NORTH BASIN

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

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1975 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	323	284	261	249	286	711	1634	938	926	791	507	453
MAX	1312	900	817	747	745	1543	4165	3394	2485	2674	2674	2135
(WY)	1987	1987	1986	1986	1987	1986	1978	1986	1986	1993	1993	1993
MIN	2.02	.000	.000	4.95	14.0	75.9	165	22.0	86.4	73.4	35.6	12.6
(WY)	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1977	1976

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1975 - 1993	
ANNUAL TOTAL	139280		456051			
ANNUAL MEAN	381		1249		614	
HIGHEST ANNUAL MEAN					1604	1986
LOWEST ANNUAL MEAN					53.1	1977
HIGHEST DAILY MEAN	1700	Mar 10	6300	Apr 3	12000	Apr 7 1989
LOWEST DAILY MEAN	125	Jan 21	130	Dec 31	.00	Oct 26 1976
ANNUAL SEVEN-DAY MINIMUM	132	Jan 17	138	Dec 31	.00	Oct 26 1976
INSTANTANEOUS PEAK FLOW			6400	Apr 3	12900	Apr 7 1989
INSTANTANEOUS PEAK STAGE			28.30	Apr 3	35.81	Apr 7 1989
ANNUAL RUNOFF (AC-FT)	276300		904600		444500	
10 PERCENT EXCEEDS	633		2650		1430	
50 PERCENT EXCEEDS	330		929		340	
90 PERCENT EXCEEDS	181		183		74	



RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY RECORDS

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)
OCT											
01...	0845	258	--	627	--	15.5	8.0	--	--	--	--
NOV											
12...	1110	294	--	658	--	3.0	2.0	--	--	--	--
JAN											
13...	1320	195	--	563	--	-8.0	0.5	--	--	--	--
FEB											
18...	1000	307	--	575	--	-3.0	0.0	--	--	--	--
APR											
03...	1150	6370	--	486	--	11.0	1.0	--	--	--	--
05...	1000	--	6000	492	--	8.0	5.0	--	--	--	--
MAY											
27...	1030	1160	--	801	--	12.5	15.0	--	--	--	--
JUL											
08...	1325	2080	--	751	--	22.5	20.0	--	--	--	--
17...	0905	2560	--	606	--	27.0	22.0	--	--	--	--
18...	1300	2970	--	592	--	29.0	23.5	--	--	--	--
23...	1600	2510	--	616	--	22.5	22.0	--	--	--	--
27...	0650	3440	--	500	--	27.0	22.5	--	--	--	--
AUG											
03...	1455	3710	--	530	--	24.0	22.0	--	--	--	--
12...	0910	2640	--	608	--	22.0	24.0	--	--	--	--
SEP											
15...	1600	2110	--	688	8.0	16.0	15.5	340	218	64	43

DATE	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	SODIUM PERCENT (00932)	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)
SEP											
15...	19	11	0.5	8.8	150	15	0.20	18	449	478	0.65

SOLIDS, DIS-SOLVED (TONS DATE DAY) (70302)	ARSENIC DIS-SOLVED PER AS AS) (01000)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
SEP										
15...	2720	4	60	10	<1	40	10	<0.1	1	280

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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 waterplant on 4th St. S. in Fargo, 25 mi upstream from mouth of Sheyenne River, and at mi 453.

DRAINAGE AREA.--6,800 mi², approximately.

WATER-DISCHARGE RECORDS

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

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

GAGE.--Water-stage recorder and concrete control. Datum of gage is 861.8 ft above sea level. Oct. 1, 1960, to Sept. 30, 1962, water-stage recorder at present site at datum 5.6 ft higher. See WSP 1728 or 1913 for history of changes prior to Oct. 1, 1960.

REMARKS.--Records good except those for periods of estimated daily discharges, which are fair. Flow regulated by Orwell Reservoir, capacity, 14,100 acre-ft at 1,070 ft above sea level, adjustment of 1912; Lake Traverse, capacity 137,000 acre-ft, available for flood control, other controlled lakes and ponds, and several power-plants. Some small diversions for municipal supply. Figures of daily discharge do not include diversions to cities of Fargo and Moorhead and from Sheyenne River.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 7, 1897, reached a stage of 39.1 ft present datum, discharge, 25,000 ft³/s at site 1.5 mi downstream.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	243	247	191	e160	e300	e250	5530	1870	1870	2810	6430	2160
2	235	243	228	e160	e300	e245	6790	1850	2310	2680	6310	2160
3	215	228	252	e155	e300	e240	7790	1810	2460	2570	5910	2160
4	208	226	251	e155	e305	e240	9070	1780	2330	2640	5250	2180
5	208	222	229	e157	e310	e240	9900	1750	2100	2850	4810	2210
6	219	207	206	e160	e315	e250	9940	1650	1900	2930	4540	2220
7	230	166	184	e160	e320	e270	9250	1520	1700	2890	4280	2310
8	233	150	165	e165	e320	e300	7900	1380	1540	2760	4030	2400
9	235	169	160	e165	e320	e320	5920	1300	1460	2670	3790	2370
10	239	257	177	e170	e320	e340	4350	1260	1490	2490	3560	2380
11	239	295	194	e175	e320	e370	3090	1250	1560	2380	3350	2360
12	217	278	211	e180	e315	e410	2260	1230	1600	2390	3150	2340
13	207	230	217	e185	e315	e390	2250	1230	1710	2510	3000	2330
14	201	199	225	e190	e315	e370	2300	1220	1680	2590	2910	2330
15	195	174	221	e195	e310	e340	2310	1220	1580	2700	2750	2320
16	198	155	218	e200	e305	e360	2240	1210	1620	4460	2640	2320
17	194	153	218	e210	e300	e380	2130	1190	1550	5510	2570	2310
18	185	201	217	e215	e295	e430	2100	1150	1530	6090	2620	2220
19	216	289	211	e220	e285	e450	2080	1120	1490	6180	2600	2210
20	211	334	202	e225	e275	e470	2090	1070	1410	6160	2500	2280
21	197	310	e195	e230	e265	494	2060	1000	1350	6140	2410	2320
22	190	278	e190	e240	e250	508	2010	984	1430	5890	2340	2330
23	180	266	e185	e245	e235	525	1990	969	1520	5380	2320	2330
24	181	260	e180	e250	e225	598	2000	987	1970	4930	2300	2320
25	187	258	e175	e255	e215	633	2010	954	2170	4780	2290	2300
26	202	243	e170	e260	e210	e620	2160	994	2460	4770	2280	2280
27	213	225	e165	e270	e210	e800	2200	1230	2700	4790	2280	2250
28	208	184	e165	e280	e220	e2000	2110	1390	2880	5030	2250	2250
29	210	150	e160	e285	---	e3000	2020	1480	2960	5470	2210	2230
30	227	156	e160	e290	---	e3500	1930	1560	2940	5960	2200	2210
31	242	---	e160	e295	---	4720	---	1550	---	6300	2190	---
TOTAL	6565	6753	6082	6502	7975	24063	119780	41158	57270	127700	102070	68390
MEAN	212	225	196	210	285	776	3993	1328	1909	4119	3293	2280
MAX	243	334	252	295	320	4720	9940	1870	2960	6300	6430	2400
MIN	180	150	160	155	210	240	1930	954	1350	2380	2190	2160
AC-FT	13020	13390	12060	12900	15820	47730	237600	81640	113600	253300	202500	135700
(+)	1467	1291	1030	1323	1233	1122	341	375	333	775	1099	1321
AC-FT	14490	14680	13360	14220	17050	48850	237900	82020	113900	254100	203600	137000

\+ Diversion in acre-feet to cities of Fargo and Moorhead.
e Estimated.

RED RIVER OF THE NORTH BASIN

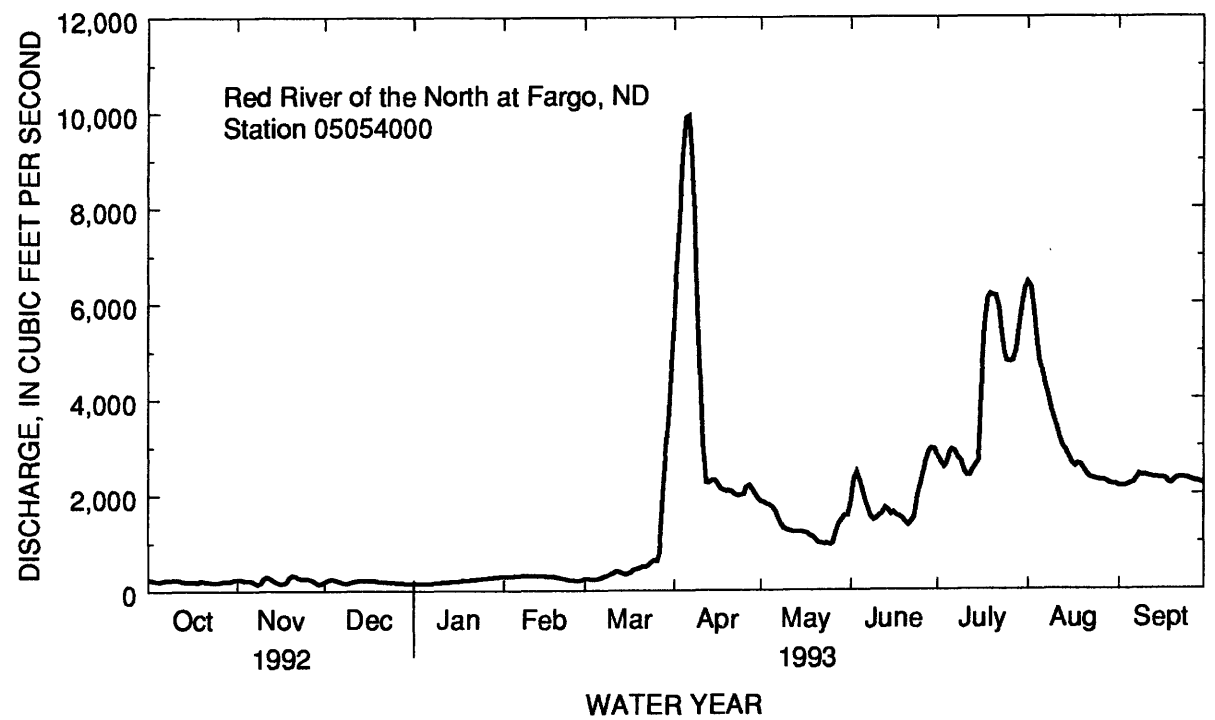
05054000 RED RIVER OF THE NORTH AT FARGO, ND--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1901 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	290	261	217	198	197	638	1663	975	999	828	407	316
MAX	1435	942	800	740	778	3756	9924	4589	5122	5692	3293	2280
(WY)	1987	1907	1987	1986	1987	1966	1969	1986	1962	1962	1993	1993
MIN	.000	.000	.000	.000	.18	26.8	102	8.12	2.87	.000	.000	.000
(WY)	1935	1937	1938	1933	1933	1937	1934	1934	1936	1934	1932	1934

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1901 - 1993	
ANNUAL TOTAL	152895		574308			
ANNUAL MEAN	418(a428)		1573(a1586)	584		
HIGHEST ANNUAL MEAN					1928	1986
LOWEST ANNUAL MEAN					17.5	1934
HIGHEST DAILY MEAN	2570	Jun 19	9940	Apr 6	24800	Apr 14 1969
LOWEST DAILY MEAN	150	Jan 20	150	Nov 8	.00	Jul 25 1932
ANNUAL SEVEN-DAY MINIMUM	152	Jan 18	158	Dec 30	.00	Jul 25 1932
INSTANTANEOUS PEAK FLOW			10100	Apr 5	25300	Apr 15 1969
INSTANTANEOUS PEAK STAGE			28.27	Apr 5	37.34	Apr 15 1969
INSTANTANEOUS LOW FLOW					.00	Jul 25 1932
ANNUAL RUNOFF (AC-FT)	303300	1	139000(a1151000)		422800	
10 PERCENT EXCEEDS	701		3650		1280	
50 PERCENT EXCEEDS	350		994		293	
90 PERCENT EXCEEDS	183		185		38	

a Adjusted for diversions to cities of Fargo and Moorhead.



RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY RECORDS

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
OCT											
01...	1130	250	588	--	23.0	8.5	--	--	--	--	--
NOV											
10...	0920	246	524	--	2.0	1.5	--	--	--	--	--
JAN											
05...	1320	157	640	--	-14.0	1.0	--	--	--	--	--
FEB											
18...	1620	295	650	--	11.0	0.0	--	--	--	--	--
APR											
04...	1025	8780	--	--	2.0	1.5	--	--	--	--	--
05...	1450	9820	436	--	12.0	3.0	--	--	--	--	--
13...	1510	2250	735	--	6.5	6.0	--	--	--	--	--
MAY											
27...	0820	1250	665	--	10.0	15.0	--	--	--	--	--
JUL											
09...	0825	2700	724	--	25.0	19.5	--	--	--	--	--
17...	1430	5610	355	--	28.5	22.0	--	--	--	--	--
20...	1005	6100	522	--	22.5	22.0	--	--	--	--	--
22...	1810	5760	505	--	18.5	21.0	--	--	--	--	--
29...	1805	5620	394	--	30.0	24.0	--	--	--	--	--
AUG											
03...	0825	5960	518	--	15.5	21.5	--	--	--	--	--
04...	1340	5150	556	--	26.0	22.5	--	--	--	--	--
12...	1515	3120	673	--	24.0	24.0	--	--	--	--	--
SEP											
17...	0840	2300	728	7.7	10.0	9.0	360	224	68	45	22

DATE	SODIUM PERCENT (00932)	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)
SEP											
17...	12	0.5	9.1	160	16	0.20	18	473	490	0.67	3040

DATE	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)
SEP										
17...	5	60	20	<1	40	10	<0.1	1	<1	340

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RED RIVER OF THE NORTH BASIN

05061000 BUFFALO RIVER NEAR HAWLEY, MN

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

DRAINAGE AREA.--322 mi².

PERIOD OF RECORD.--March 1945 to current year, WY 1981 (annual maximum only), March 1982 to September 1985 (no winter records).

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

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

REMARKS.--Records good except those for estimated daily discharges, which are fair.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	34	25	e24	e12	e15	e21	589	101	132	120	989	224
2	32	25	e23	e12	e15	e21	486	90	120	114	900	212
3	29	26	e23	e12	e16	e21	415	91	112	108	819	201
4	31	25	e22	e12	e17	e22	393	99	100	117	783	188
5	34	23	e21	e12	e18	e22	341	88	91	153	698	178
6	32	22	e21	e12	e18	e23	283	71	86	158	634	169
7	30	e21	e20	e12	e19	e23	256	68	84	159	577	162
8	29	e21	e19	e12	e19	e23	239	81	92	164	527	155
9	27	e22	e19	e12	e20	e23	210	79	109	152	545	147
10	26	e23	e18	e12	e20	e23	187	73	124	138	552	142
11	26	e24	e18	e12	e20	e24	173	68	125	128	507	136
12	26	e26	e17	e12	e20	e24	162	59	120	117	450	131
13	24	e27	e17	e12	e20	e24	144	51	152	108	393	125
14	22	e28	e17	e12	e20	e24	128	50	204	103	385	126
15	21	e29	e16	e12	e20	e24	119	58	165	101	383	124
16	23	e30	e16	e12	e20	e24	149	53	173	843	389	125
17	21	30	e16	e12	e20	e24	137	46	234	1630	374	121
18	21	30	e15	e12	e20	e24	128	41	247	1860	382	117
19	21	31	e15	e12	e20	e24	122	43	234	1800	347	115
20	21	32	e14	e12	e20	e24	121	42	225	1560	328	113
21	21	32	e14	e12	e20	e24	146	47	202	1390	315	112
22	22	33	e14	e13	e20	e24	156	49	175	1240	325	115
23	22	33	e13	e13	e20	e25	151	48	155	1120	322	120
24	22	33	e13	e13	e20	e30	156	60	151	1110	310	119
25	23	30	e13	e13	e20	e37	167	96	138	1300	290	109
26	22	28	e13	e13	e20	e50	165	95	133	1520	267	101
27	24	e27	e12	e13	e20	e70	154	96	126	1640	262	96
28	26	e26	e12	e13	e20	e180	140	104	120	1580	250	91
29	25	e26	e12	e13	---	e440	130	104	114	1400	237	85
30	26	e25	e12	e13	---	1020	116	105	117	1250	234	82
31	27	---	e12	e14	---	697	---	127	---	1120	231	---
TOTAL	790	813	511	383	537	3059	6263	2283	4360	24303	14005	4041
MEAN	25.5	27.1	16.5	12.4	19.2	98.7	209	73.6	145	784	452	135
MAX	34	33	24	14	20	1020	589	127	247	1860	989	224
MIN	21	21	12	12	15	21	116	41	84	101	231	82
AC-FT	1570	1610	1010	760	1070	6070	12420	4530	8650	48200	27780	8020
CFSM	.08	.08	.05	.04	.06	.31	.65	.23	.45	2.43	1.40	.42
IN.	.09	.09	.06	.04	.06	.35	.72	.26	.50	2.81	1.62	.47

e Estimated.

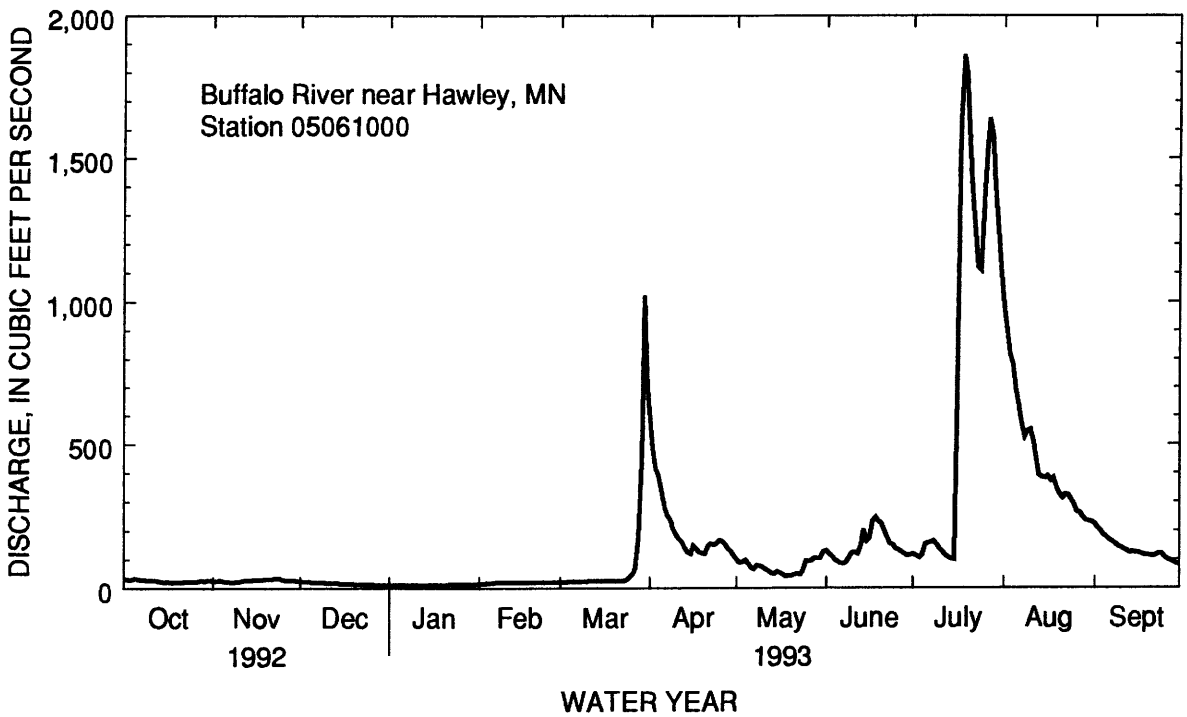
RED RIVER OF THE NORTH BASIN

05061000 BUFFALO RIVER NEAR HAWLEY, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	36.3	33.8	23.4	19.8	20.7	80.7	251	123	98.3	99.0	52.4	37.9
MAX	151	176	63.8	54.7	99.6	434	792	372	530	784	472	182
(WY)	1974	1972	1972	1981	1981	1966	1978	1985	1962	1993	1955	1957
MIN	11.6	12.2	10.6	9.94	9.87	15.0	33.3	21.5	12.7	10.1	5.87	8.52
(WY)	1979	1977	1977	1962	1949	1969	1981	1977	1977	1976	1976	1976

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1945 - 1993	
ANNUAL TOTAL	15367		61348			
ANNUAL MEAN	42.0		168		72.7	
HIGHEST ANNUAL MEAN					168	1993
LOWEST ANNUAL MEAN					16.7	1977
HIGHEST DAILY MEAN	231	Jul 11	1860	Jul 18	1970	Jul 1 1975
LOWEST DAILY MEAN	12	Dec 27	12	Dec 27	3.2	Aug 25 1976
ANNUAL SEVEN-DAY MINIMUM	12	Dec 25	12	Dec 27	4.3	Aug 22 1976
INSTANTANEOUS PEAK FLOW			2010	Jul 18	2050	Jul1 1975
INSTANTANEOUS PEAK STAGE			10.40	Jul 18	10.40	Jul 18 1993
INSTANTANEOUS LOW FLOW					2.8	Aug 26 1977
ANNUAL RUNOFF (AC-FT)	30480		121700		52640	
ANNUAL RUNOFF (CFSM)	.13		.52		.23	
ANNUAL RUNOFF (INCHES)	1.78		7.09		3.07	
10 PERCENT EXCEEDS	76		391		170	
50 PERCENT EXCEEDS	30		49		30	
90 PERCENT EXCEEDS	19		13		13	



RED RIVER OF THE NORTH BASIN

05061500 SOUTH BRANCH BUFFALO RIVER AT SABIN, MN

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

DRAINAGE AREA.--522 mi².

PERIOD OF RECORD.--March 1945 to current year, WY 1981 (annual maximum only), March 1982 to September 1985 (no winter records).

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

GAGE.--Water-stage recorder. Datum of gage is 902.39 ft above mean sea level (levels by Soil Conservation Service).

Prior to Aug. 17, 1948, nonrecording gage at site 1 mi downstream at different datum. Aug. 17, 1948, to Oct. 4, 1989, nonrecording gage at present site and datum

REMARKS.--Records poor.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e2.0	e7.2	e16	e4.0	e2.3	e2.2	1230	92	131	68	595	28
2	e2.0	e8.0	e15	e3.9	e2.3	e2.2	883	82	149	75	493	22
3	e2.0	e9.1	e14	e3.8	e2.3	e2.2	671	72	149	81	388	18
4	e2.0	e10	e14	e3.7	e2.3	e2.2	482	62	132	94	291	16
5	e2.0	e11	e13	e3.6	e2.3	e2.2	290	54	104	102	223	13
6	e2.0	e13	e12	e3.5	e2.2	e2.2	193	47	80	102	168	10
7	e2.0	e14	e12	e3.4	e2.2	e2.2	154	43	65	94	125	10
8	e1.9	e16	e11	e3.4	e2.2	e2.2	134	41	58	84	94	12
9	e1.9	e18	e11	e3.3	e2.2	e2.3	129	40	53	73	76	12
10	e1.9	e20	e10	e3.2	e2.2	e2.3	130	39	51	59	65	12
11	e1.9	e22	e9.5	e3.2	e2.2	e2.3	131	40	51	50	58	11
12	e1.9	e24	e9.1	e3.1	e2.2	e2.3	128	41	51	42	51	9.8
13	e1.9	e26	e8.7	e3.0	e2.2	e2.3	129	38	50	37	42	8.5
14	e1.9	e28	e8.3	e3.0	e2.2	e2.3	125	34	51	33	39	8.8
15	e1.9	e28	e7.9	e3.0	e2.2	e2.3	113	30	65	35	34	8.1
16	e1.8	e29	e7.6	e2.9	e2.2	e2.3	103	27	77	314	32	7.8
17	e1.8	e29	e7.2	e2.9	e2.2	e2.3	117	25	79	539	30	7.9
18	e1.8	e28	e6.9	e2.8	e2.2	e2.3	121	25	95	880	96	7.3
19	e1.8	e28	e6.5	e2.8	e2.2	e2.3	112	23	107	854	173	6.9
20	e1.9	e27	e6.2	e2.7	e2.2	e2.3	102	21	101	696	296	6.9
21	e2.0	e26	e6.0	e2.7	e2.2	e2.3	95	18	92	604	295	6.7
22	e2.2	e25	e5.8	e2.7	e2.2	e2.5	88	17	83	558	261	6.7
23	e2.4	e24	e5.6	e2.6	e2.2	e3.5	79	18	78	478	208	7.4
24	e2.6	e23	e5.3	e2.6	e2.2	e6.0	78	26	78	380	155	8.5
25	e2.9	e22	e5.1	e2.5	e2.2	e20	79	42	74	511	116	9.5
26	e3.3	e21	e4.9	e2.5	e2.2	e50	102	68	72	1200	86	12
27	e3.8	e20	e4.7	e2.5	e2.2	e100	125	91	71	1440	66	13
28	e4.3	e19	e4.6	e2.4	e2.2	e200	123	98	68	1250	53	13
29	e4.9	e18	e4.5	e2.4	---	e1000	121	104	65	972	42	12
30	e5.7	e17	e4.3	e2.4	---	1850	107	106	67	796	36	13
31	e6.4	---	e4.2	e2.4	---	1530	---	108	---	686	32	---
TOTAL	78.8	610.3	260.9	92.9	62.1	4809.5	6474	1572	2447	13187	4719	337.8
MEAN	2.54	20.3	8.42	3.00	2.22	155	216	50.7	81.6	425	152	11.3
MAX	6.4	29	16	4.0	2.3	1850	1230	108	149	1440	595	28
MIN	1.8	7.2	4.2	2.4	2.2	2.2	78	17	50	33	30	6.7
AC-FT	156	1210	517	184	123	9540	12840	3120	4850	26160	9360	670
CFSM	.00	.04	.02	.01	.00	.30	.41	.10	.16	.81	.29	.02
IN.	.01	.04	.02	.01	.00	.34	.46	.11	.17	.94	.34	.02

e Estimated.

RED RIVER OF THE NORTH BASIN

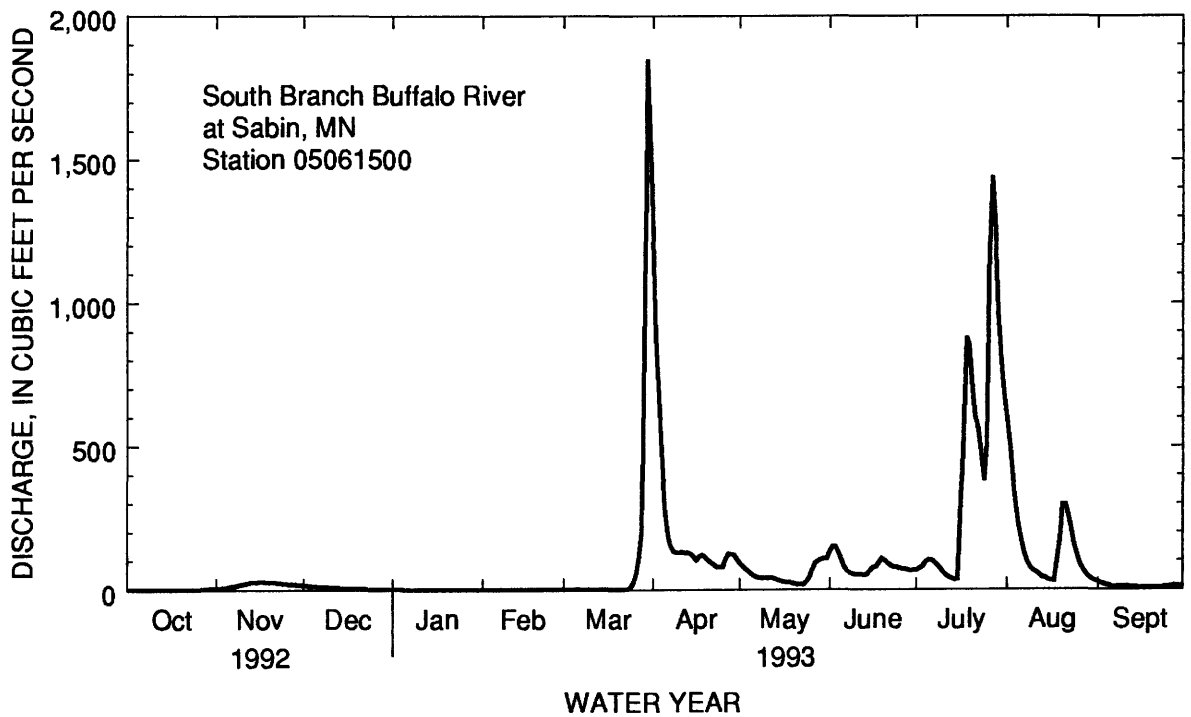
05061500 SOUTH BRANCH BUFFALO RIVER AT SABIN, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	14.0	14.3	4.92	1.57	1.52	102	255	76.8	94.8	78.4	12.2	14.0
MAX	51.1	76.7	23.5	13.1	14.0	581	928	580	1068	1112	152	173
(WY)	1978	1972	1978	1978	1987	1966	1969	1962	1962	1975	1993	1986
MIN	.023	2.05	.006	.000	.000	.000	27.9	8.28	1.30	.000	.000	.000
(WY)	1977	1977	1961	1946	1946	1951	1973	1980	1976	1988	1976	1976

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1945 - 1993	
ANNUAL TOTAL	10170.8		34651.3			
ANNUAL MEAN	27.8		94.9		56.0[a]	
HIGHEST ANNUAL MEAN					198	1962
LOWEST ANNUAL MEAN					12.2	1977
HIGHEST DAILY MEAN	410	Jun 20	1850	Mar 30	8200	Jul 1 1975
LOWEST DAILY MEAN	1.8	Oct 16-19	1.8	Oct 16-19	.00	Dec 13 1945
ANNUAL SEVEN-DAY MINIMUM	1.8	Oct 13	1.8	Oct 13	.00	Dec 13 1945
INSTANTANEOUS PEAK FLOW	414	Jun 20	1910	Mar 30	8500	Jul 2 1975
INSTANTANEOUS PEAK STAGE	10.94	Jun 20	14.57	Mar 30	19.90	Jul 2 1975
ANNUAL RUNOFF (AC-FT)	20170		68730		40570	
ANNUAL RUNOFF (CFSM)	.053		.18		.11	
ANNUAL RUNOFF (INCHES)	.72		2.47		1.46	
10 PERCENT EXCEEDS	60		170		101	
50 PERCENT EXCEEDS	11		18		7.0	
90 PERCENT EXCEEDS	4.6		2.2		.00	

a Median of annual mean discharges is 41 ft^3/s.



RED RIVER OF THE NORTH BASIN

05062000 BUFFALO RIVER NEAR DILWORTH, MN

LOCATION--Lat 46° 57'40", long 96° 39'40", in SW¼ SE¼ sec. 6, T.140 N., R.47 W., Clay County, Hydrologic Unit 09020106, on left bank 4.5 mi southeast of Kragnes, 6.5 mi northeast of Dilworth, and 9 mi downstream from South Branch.

DRAINAGE AREA.--1,040 mi², approximately.

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

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

GAGE.--Water-stage recorder. Datum of gage is 878.31 ft above sea level (levels by U.S. Army Corps of Engineers). Prior to April 5, 1937, nonrecording gage at same site and datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	38	40	e53	e25	e27	e28	2190	284	263	228	2470	280
2	35	e37	e52	e25	e27	e28	2060	257	282	237	2200	269
3	35	e36	e51	e25	e27	e28	1800	229	298	235	1950	257
4	36	e36	e49	e25	e27	e29	1620	209	299	236	1750	240
5	34	e37	e47	e25	e27	e29	1310	202	284	273	1560	223
6	32	e38	e46	e25	e27	e30	1090	192	253	316	1390	208
7	33	e39	e45	e25	e27	e30	875	170	217	333	1240	196
8	35	e40	e44	e25	e27	e30	686	156	188	332	1080	184
9	35	e42	e43	e25	e27	e31	570	156	174	318	929	172
10	33	e44	e42	e25	e27	e31	492	153	172	296	802	163
11	36	e46	e40	e25	e27	e31	442	149	179	266	723	156
12	37	e49	e39	e25	e27	e31	418	138	186	234	682	151
13	35	e52	e38	e25	e27	e31	394	127	188	210	638	146
14	32	60	e36	e25	e27	e31	367	117	188	192	592	141
15	31	74	e35	e25	e27	e31	342	104	225	179	539	139
16	29	75	e34	e25	e27	e31	317	97	263	826	494	138
17	27	81	e33	e25	e27	e31	303	98	287	1460	462	136
18	26	e76	e32	e25	e27	e32	304	90	312	2090	447	136
19	27	e73	e31	e25	e27	e32	302	80	338	2770	490	129
20	26	e71	e30	e26	e27	e32	289	74	354	3260	650	124
21	27	e69	e30	e26	e27	e32	271	71	353	3380	1000	122
22	29	e68	e29	e26	e27	e32	265	68	337	3100	1160	120
23	29	e67	e28	e26	e27	e32	271	72	318	2730	1090	119
24	30	e66	e28	e26	e27	e33	271	77	299	2440	885	120
25	32	e65	e27	e26	e27	e34	269	85	283	2460	756	124
26	33	e63	e26	e26	e27	e45	271	110	265	2680	492	124
27	35	e61	e26	e26	e27	e70	280	159	245	2970	427	117
28	37	e59	e25	e26	e27	e150	301	194	232	3240	377	112
29	35	e57	e25	e26	---	e300	308	222	220	3230	340	108
30	37	e55	e25	e27	---	e1050	300	241	220	3060	314	106
31	38	---	e25	e27	---	e1500	---	252	---	2770	295	---
TOTAL	1014	1676	1114	789	756	3885	18978	4633	7722	46351	28224	4760
MEAN	32.7	55.9	35.9	25.5	27.0	125	633	149	257	1495	910	159
MAX	38	81	53	27	27	1500	2190	284	354	3380	2470	280
MIN	26	36	25	25	27	28	265	68	172	179	295	106
AC-FT	2010	3320	2210	1560	1500	7710	37640	9190	15320	91940	55980	9440
CFSM	.03	.05	.03	.02	.03	.12	.61	.14	.25	1.44	.88	.15
IN.	.04	.06	.04	.03	.03	.14	.68	.17	.28	1.66	1.01	.17

e Estimated.

RED RIVER OF THE NORTH BASIN

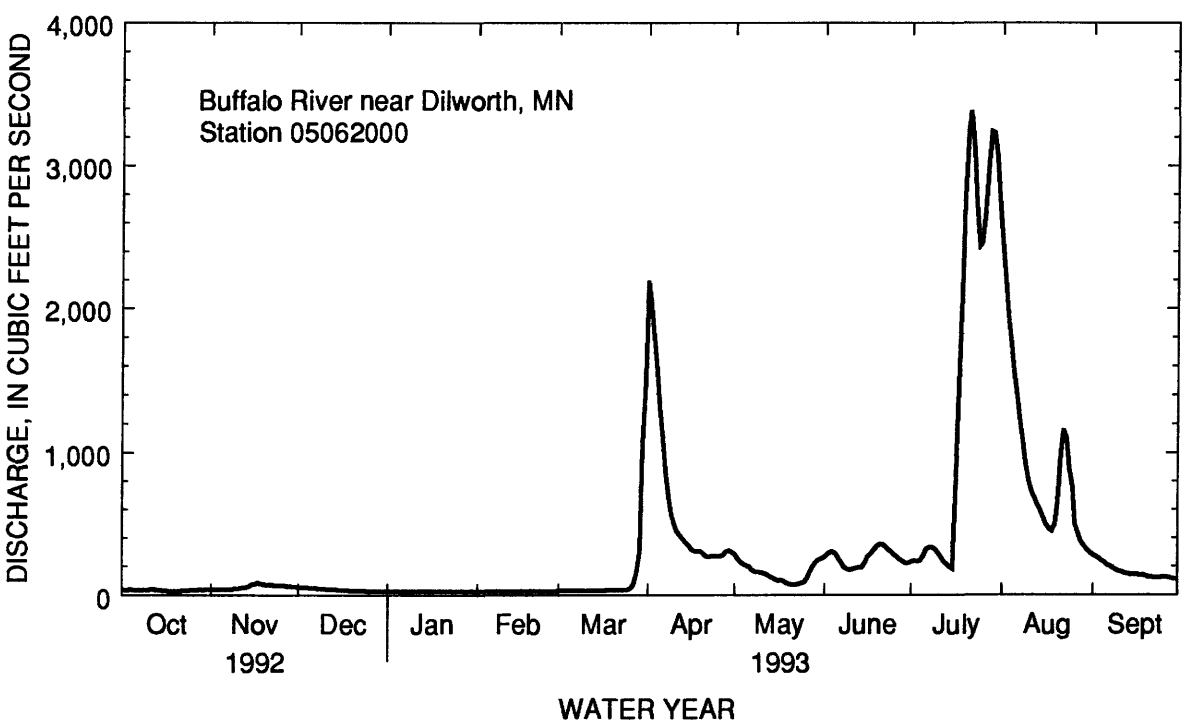
05062000 BUFFALO RIVER NEAR DILWORTH, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	49.9	47.6	28.6	18.8	19.0	169	535	214	198	185	73.0	54.1
MAX	186	305	97.0	53.5	61.1	1308	1984	909	2138	2814	910	517
(WY)	1958	1972	1972	1987	1984	1966	1978	1986	1962	1975	1993	1944
MIN	5.48	8.74	4.75	.87	.76	2.26	33.5	27.2	15.1	2.23	.000	.79
(WY	1940	1937	1938	1940	1940	1940	1931	1931	1934	1936	1936	1936

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1931 - 1993	
ANNUAL TOTAL	29373		119902			
ANNUAL MEAN	80.3		328		134	
HIGHEST ANNUAL MEAN					441	1975
LOWEST ANNUAL MEAN					25.6	1934
HIGHEST DAILY MEAN	491	Jun 22	3380	Jul 21	13500	Jul 2 1975
LOWEST DAILY MEAN	16	Aug 21	25	Dec 28 to Jan 20	.00[a]	Jul 22 1936
ANNUAL SEVEN-DAY MINIMUM	21	Aug 17	25	Dec 28	.00	Jul 28 1936
INSTANTANEOUS PEAK FLOW			3450	Jul 20	13600	Jul 2 1975
INSTANTANEOUS PEAK STAGE			22.88	Jul 20	27.10	Jul 2 1975
INSTANTANEOUS LOW FLOW						
ANNUAL RUNOFF (AC-FT)	58260		237800		97260	
ANNUAL RUNOFF (CFSM)	.077		.32		.13	
ANNUAL RUNOFF (INCHES)	1.05		4.29		1.75	
10 PERCENT EXCEEDS	161		879		283	
50 PERCENT EXCEEDS	49		80		34	
90 PERCENT EXCEEDS	30		26		9.3	

a At times in 1936.



RED RIVER OF THE NORTH BASIN

05062500 WILD RICE RIVER AT TWIN VALLEY, MN

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

DRAINAGE AREA.--88 mi².

PERIOD OF RECORD.--June 1909 to September 1917, July 1930 to September 1983, October 1989 to current year. Monthly discharge only for some periods, published in WSP 1308. October 1983 to September 1989, annual maximums only.

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

GAGE.--Water-stage recorder. Datum of gage is 1,008.16 ft above mean sea level (U.S. Army Corps of Engineers bench mark). June 1909 to September 1917, nonrecording gage at site 0.2 mi downstream at different datum. July 23, 1930, to Nov. 24, 1934, nonrecording gage at highway bridge 100 ft downstream from present site at present datum. Nov. 25, 1934, to Aug. 2, 1950, water-stage recorder 80 ft upstream from present site at present datum.

REMARKS.--Records fair. Flow slightly regulated by Rice Lake and many other small lakes above station. Satellite telemeter at station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	124	43	e76	e68	e64	e64	e1200	407	226	302	1760	550
2	112	49	e76	e68	e64	e65	e1100	422	223	289	1540	524
3	102	52	e75	e68	e64	e66	1020	410	215	277	1400	504
4	95	56	e75	e68	e64	e68	913	399	199	272	1280	473
5	89	e54	e74	e68	e64	e69	789	381	184	269	1190	440
6	82	e52	e74	e68	e64	e69	716	360	175	285	1110	409
7	77	e50	e73	e67	e64	e70	651	343	168	292	1030	379
8	73	e52	e73	e67	e64	e70	614	329	175	299	941	356
9	72	e58	e72	e67	e64	e70	604	319	248	306	1190	332
10	67	e66	e72	e67	e64	e70	607	317	394	331	1870	308
11	64	e74	e72	e67	e64	e70	580	314	355	295	2120	291
12	59	e80	e72	e67	e64	e70	545	304	329	259	1760	279
13	52	e87	e72	e66	e64	e70	528	288	349	239	1340	270
14	46	e93	e72	e66	e64	e70	490	272	351	225	1200	263
15	43	e95	e71	e66	e64	e70	461	254	384	218	1190	257
16	49	e95	e71	e66	e63	e70	448	238	458	671	1140	248
17	50	e94	e71	e66	e63	e70	435	219	498	968	1030	244
18	49	e92	e71	e66	e63	e70	416	204	594	1230	907	233
19	46	e91	e71	e66	e63	e70	378	194	590	1340	815	218
20	47	e89	e71	e66	e63	e70	359	194	532	1300	759	202
21	47	e88	e70	e65	e63	e70	335	182	483	1130	711	193
22	51	e86	e70	e65	e63	e71	308	172	432	976	658	185
23	49	e85	e70	e65	e63	e73	294	164	392	835	612	180
24	50	e84	e70	e65	e63	e78	307	180	365	736	567	177
25	51	e82	e70	e65	e63	e92	340	189	334	1220	534	171
26	54	e81	e69	e65	e63	e120	383	244	335	3180	497	164
27	57	e80	e69	e65	e63	e200	389	239	323	3920	483	155
28	52	e79	e69	e65	e63	e600	382	228	324	3850	493	151
29	46	e78	e69	e65	---	e1200	388	233	327	3240	485	149
30	44	e77	e69	e65	---	e1700	395	238	318	2600	527	146
31	44	---	e69	e65	---	e1500	---	230	---	2100	591	---
TOTAL	1943	2242	2218	2053	1779	7085	16375	8467	10280	33454	31730	8451
MEAN	62.7	74.7	71.5	66.2	63.5	229	546	273	343	1079	1024	282
MAX	124	95	76	68	64	1700	1200	422	594	3920	2120	550
MIN	43	43	69	65	63	64	294	164	168	218	483	146
AC-FT	3850	4450	4400	4070	3530	14050	32480	16790	20390	66360	62940	16760
CFSM	.07	.08	.08	.07	.07	.26	.61	.31	.39	1.22	1.15	.32
IN.	.08	.09	.09	.09	.07	.30	.69	.35	.43	1.40	1.33	.35

e Estimated.

RED RIVER OF THE NORTH BASIN

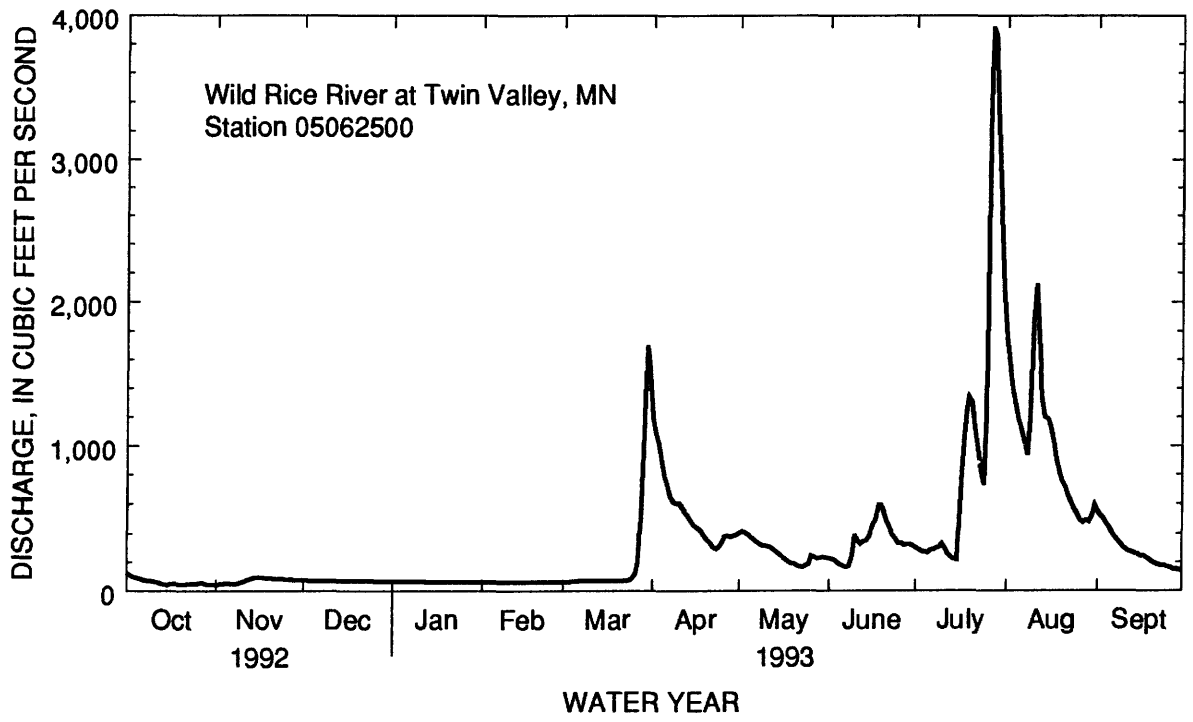
05062500 WILD RICE RIVER AT TWIN VALLEY, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	83.8	73.1	49.1	37.5	34.7	126	561	413	303	231	105	84.4
MAX	614	488	123	100	80.0	747	1543	2259	1560	1923	1024	788
(WY)	1974	1972	1972	1910	1910	1945	1979	1950	1943	1909	1993	1973
MIN	6.10	9.31	6.00	4.00	4.00	12.8	73.8	30.9	26.4	8.04	3.02	2.96
(WY)	1933	1933	1933	1933	1933	1940	1931	1977	1977	1934	1932	1936

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1909 - 1993	
ANNUAL TOTAL	51664		126077			
ANNUAL MEAN	141		345		172[a]	
HIGHEST ANNUAL MEAN					500	1950
LOWEST ANNUAL MEAN					22.7	1977
HIGHEST DAILY MEAN	750	Mar 7	3920	Jul 27	9100	Jul 22 1909
LOWEST DAILY MEAN	34	Feb 8	43	Oct 15	1.1	Aug 13 1932
ANNUAL SEVEN-DAY MINIMUM	36	Feb 7	47	Oct 14	1.3	Aug 11 1932
INSTANTANEOUS PEAK FLOW			3980	Jul 28	9200[b]	Jul 22 1909
INSTANTANEOUS PEAK STAGE			11.74	Jul 28	20.00[c]	Jul 22 1909
INSTANTANEOUS LOW FLOW			39	Oct 16	.50	Nov 4 1939
ANNUAL RUNOFF (AC-FT)	102500		50100		124600	
ANNUAL RUNOFF (CFSM)	.16		.39		.19	
ANNUAL RUNOFF (INCHES)	2.16		5.28		2.63	
10 PERCENT EXCEEDS	272		924		445	
50 PERCENT EXCEEDS	87		164		64	
90 PERCENT EXCEEDS	39		63		15	

a Median of annual mean discharges is 150 ft^3/s.
b From rating curve extended above 3,300 ft^3/s.
c Site and datum then in use.



RED RIVER OF THE NORTH BASIN

05062500 WILD RICE RIVER AT TWIN VALLEY, MN--Continued
(National Water Quality Assessment Station)

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
FEB										
10...	1100	--	E64	698	690	7.9	7.6	-11.5	0.0	748
MAR										
31...	1100	--	E1700	398	435	7.6	7.5	4.0	1.0	738
APR										
05...	1105	791	--	458	485	7.7	7.7	11.5	4.5	738
14...	1105	494	--	511	497	8.3	8.1	14.0	5.0	736
26...	1015	383	--	474	476	8.4	8.1	12.5	7.5	741
MAY										
06...	1050	360	--	467	464	8.1	8.2	24.0	3.5	735
18...	0930	206	--	507	496	8.3	8.2	10.5	13.0	738
25...	0930	180	--	502	493	8.1	8.3	16.0	13.5	736
26...	1045	248	--	544	556	8.3	8.0	13.0	13.0	738
JUN										
01...	1120	228	--	547	536	8.2	8.4	17.0	15.0	734
14...	1200	345	--	536	516	7.7	7.5	12.5	19.0	734
17...	1215	482	--	507	522	7.7	8.0	19.5	17.0	739
23...	1000	394	--	512	520	7.9	8.2	19.0	22.0	731
JUL										
08...	1110	299	--	499	--	7.8	--	20.5	18.0	732
17...	0800	948	--	420	--	8.2	--	17.5	19.5	--
28...	0830	4400	--	393	392	7.8	7.7	16.0	21.0	728
AUG										
06...	1040	1120	--	488	473	7.8	7.9	20.0	18.0	736
17...	1100	1050	--	510	479	7.7	7.9	22.0	21.0	734
30...	1120	533	--	474	477	8.3	8.2	16.5	19.0	734
SEP										
24...	1020	179	--	547	543	8.1	8.3	10.0	10.5	737

RED RIVER OF THE NORTH BASIN

05062500 WILD RICE RIVER AT TWIN VALLEY, MN--Continued
(National Water Quality Assessment Station)

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	OXYGEN, DIS-SOLVED (MG/L) (00300)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
FEB										
10...	7.2	78	34	11	3.3	558	0	458	--	23
MAR										
31...	12.0	47	18	5.0	7.8	147	0	120	134	56
APR										
05...	11.6	57	23	6.5	7.1	220	0	180	184	55
14...	11.3	63	25	7.7	5.1	--	--	--	220	51
26...	10.4	60	24	7.5	3.6	266	10	232	218	34
MAY										
06...	8.8	62	23	7.0	3.3	286	3	237	224	26
18...	9.2	61	24	8.0	2.9	266	17	246	249	22
25...	9.5	61	24	8.5	2.8	268	12	240	247	24
26...	9.5	67	29	11	3.1	286	10	252	268	38
JUN										
01...	10.7	64	27	11	2.7	284	8	245	257	37
14...	7.6	64	27	8.0	2.9	278	0	228	245	35
17...	8.3	62	27	9.4	5.6	283	0	232	234	40
23...	7.1	61	28	8.1	2.8	286	0	234	242	38
JUL										
08...	8.7	61	27	8.4	2.2	288	0	236	--	--
17...	--	--	--	--	--	--	--	--	--	--
28...	6.8	--	--	--	--	--	--	--	166	37
AUG										
06...	8.0	56	25	5.7	4.3	251	0	206	228	26
17...	7.4	64	25	6.0	4.9	--	--	--	229	27
30...	8.1	65	27	6.5	4.0	259	0	212	231	19
SEP										
24...	10.2	67	29	11	3.4	--	--	260	273	25

RED RIVER OF THE NORTH BASIN

05062500 WILD RICE RIVER AT TWIN VALLEY, MN--Continued
(National Water Quality Assessment Station)

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	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)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)
FEB									
10...	5.4	0.30	23	398	0.030	0.130	0.100	0.90	0.80
MAR									
31...	11	0.20	13	278	0.130	4.80	0.270	2.0	1.3
APR									
05...	8.6	0.20	14	299	0.080	1.90	0.100	1.3	1.0
14...	7.1	0.20	13	329	0.020	0.540	0.040	0.80	0.80
26...	5.3	0.20	6.4	293	<0.010	<0.050	0.020	0.70	0.60
MAY									
06...	4.4	0.20	6.0	290	<0.010	<0.050	0.020	0.80	0.60
18...	4.7	0.20	8.1	309	<0.010	<0.050	0.020	0.70	0.80
25...	4.2	0.20	7.9	306	<0.010	<0.050	0.020	0.60	0.70
26...	5.5	0.20	7.1	340	<0.010	<0.050	0.020	0.70	0.70
JUN									
01...	6.6	0.20	8.4	336	<0.010	<0.050	0.030	0.90	0.70
14...	4.7	0.20	13	339	<0.010	0.160	0.020	0.90	0.70
17...	6.6	0.20	15	346	0.010	0.230	0.040	1.0	0.80
23...	3.8	0.20	16	342	<0.010	0.085	0.040	0.90	0.80
JUL									
08...	--	--	--	--	<0.010	0.063	0.020	1.1	0.80
17...	--	--	--	--	--	--	--	--	--
28...	5.0	0.20	--	250	<0.010	0.081	0.090	1.4	1.0
AUG									
06...	4.2	0.20	22	310	<0.010	<0.050	0.010	1.2	0.90
17...	5.8	0.20	23	313	<0.010	0.074	0.050	1.0	0.90
30...	4.7	0.20	26	313	<0.010	0.110	0.030	0.80	0.80
SEP									
24...	6.1	0.20	18	326	<0.010	<0.050	0.020	0.70	0.70

RED RIVER OF THE NORTH BASIN

05062500 WILD RICE RIVER AT TWIN VALLEY, MN--Continued
(National Water Quality Assessment Station)

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	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)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
FEB									
10...	0.040	0.010	0.010	25	270	13	0.4	--	--
MAR									
31...	0.140	0.090	0.070	110	85	14	1.3	--	--
APR									
05...	0.120	<0.010	0.040	67	38	15	3.6	--	--
14...	0.030	0.030	0.020	41	43	--	--	--	--
26...	0.020	0.030	<0.010	38	30	11	1.1	--	--
MAY									
06...	0.030	0.010	<0.010	36	21	12	0.8	--	--
18...	0.030	0.010	0.010	38	42	14	0.7	--	--
25...	0.020	<0.010	<0.010	33	41	13	0.4	--	--
26...	0.030	0.030	0.010	43	28	14	0.6	--	--
JUN									
01...	0.040	0.020	0.010	43	31	15	0.3	--	--
14...	0.050	0.040	0.010	42	25	17	0.7	--	--
17...	0.080	0.050	0.040	58	26	16	1.2	--	--
23...	0.060	0.030	0.050	98	27	18	0.7	53	88
JUL									
08...	0.100	0.050	0.040	68	22	16	0.7	28	98
17...	--	--	--	--	--	--	--	57	90
28...	0.170	0.090	0.030	--	--	14	--	60	99
AUG									
06...	0.080	0.070	0.060	24	<1	16	0.6	74	83
17...	0.180	0.090	0.090	55	19	16	0.3	57	90
30...	0.090	0.070	0.060	57	25	14	0.3	63	95
SEP									
24...	0.020	0.030	0.010	51	40	14	0.3	5	82

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, on right bank 30 ft downstream from highway bridge, 0.5 mi east of Hendrum and 4 mi upstream from mouth.

DRAINAGE AREA.--1,600 mi², approximately.

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

REVISED RECORDS.--WSP 1728: 1958.

GAGE.--Water-stage recorder. Datum of gage is 836.75 ft above mean sea level (levels by U.S. Army Corps of Engineers). Prior to July 18, 1989, nonrecording gage at same site and datum.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	171	68	e86	e68	e72	e76	e2400	504	298	406	3670	643
2	134	69	e88	e68	e72	e77	e3000	504	289	380	3630	638
3	146	73	e90	e68	e72	e78	e3300	523	275	365	3600	605
4	132	75	e90	e68	e72	e78	e3000	510	259	352	3500	592
5	122	68	e88	e68	e72	e80	2350	500	236	334	3340	555
6	115	92	e88	e70	e73	e80	1820	481	207	334	3120	511
7	106	76	e86	e70	e73	e81	1400	455	202	385	2780	482
8	96	69	e84	e70	e73	e82	1050	438	175	414	2470	452
9	93	81	e82	e70	e73	e82	1020	424	180	423	2190	431
10	90	95	e80	e70	e73	e82	984	418	186	412	2040	434
11	88	112	e80	e72	e74	e83	934	410	327	393	2210	386
12	84	e115	e78	e72	e74	e83	864	401	376	389	2340	369
13	79	e118	e78	e72	e74	e83	771	390	347	323	2370	348
14	75	e115	e76	e72	e74	e83	726	367	365	286	2260	334
15	72	e105	e74	e72	e74	e84	663	344	492	260	1990	329
16	70	90	e74	e72	e75	e84	641	319	518	475	1830	312
17	70	93	e74	e72	e75	e84	614	298	599	1590	1700	303
18	71	144	e72	e72	e76	e84	590	275	834	2510	1480	284
19	73	151	e72	e72	e76	e84	573	252	819	2840	1260	272
20	73	144	e72	e72	e76	e85	531	238	752	2910	1110	270
21	72	130	e72	e72	e76	e85	498	231	670	2940	989	255
22	71	143	e70	e72	e76	e85	450	223	588	2900	920	232
23	72	138	e70	e72	e76	e86	437	207	533	2820	861	233
24	73	129	e70	e72	e76	e86	418	204	521	2670	789	226
25	72	128	e70	e72	e76	e88	429	213	484	2620	727	211
26	72	e130	e70	e72	e76	e99	466	218	463	2850	674	212
27	71	e95	e68	e72	e76	e240	482	269	448	3120	622	210
28	71	e75	e68	e72	e76	e650	520	306	429	3320	597	198
29	73	e80	67	e72	---	e1050	505	294	402	3490	581	194
30	71	e84	e68	e72	---	e1500	501	299	401	3600	576	186
31	69	---	e68	e72	---	e2000	---	308	---	3650	597	---
TOTAL	2747	3085	2373	2202	2081	7602	31937	10823	12675	49761	56823	10707
MEAN	88.6	103	76.5	71.0	74.3	245	1065	349	422	1605	1833	357
MAX	171	151	90	72	76	2000	3300	523	834	3650	3670	643
MIN	69	68	67	68	72	76	418	204	175	260	576	186
AC-FT	5450	6120	4710	4370	4130	15080	63350	21470	25140	98700	112700	21240
CFSM	.06	.06	.05	.04	.05	.15	.67	.22	.26	1.00	1.15	.22
IN.	.06	.07	.06	.05	.05	.18	.74	.25	.29	1.16	1.32	.25

e Estimated.

RED RIVER OF THE NORTH BASIN

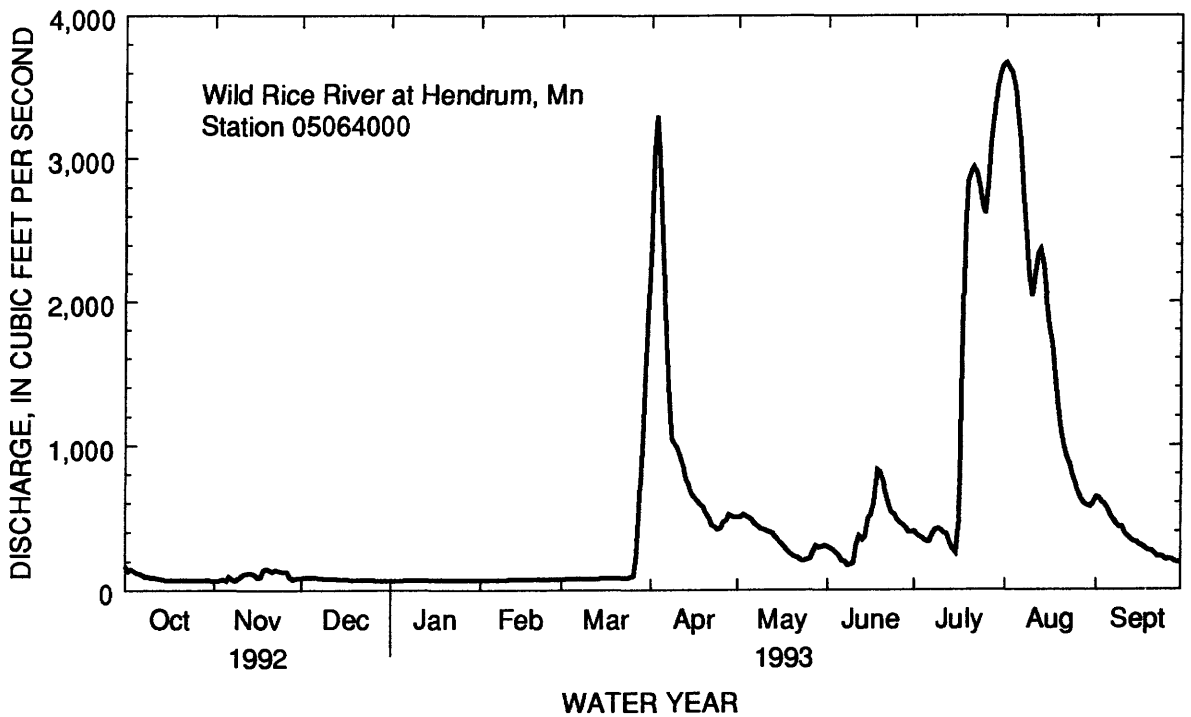
05064000 WILD RICE RIVER AT HENDRUM, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	114	104	62.1	45.1	43.7	270	1079	561	413	322	145	108
MAX	744	784	160	121	124	1485	3261	2074	1776	3136	1833	824
(WY)	1972	1972	1972	1986	1984	1966	1978	1985	1962	1975	1993	1973
MIN	.44	3.32	1.08	.092	.22	.46	106	56.1	9.15	8.82	1.07	.18
(WY)	1949	1949	1977	1977	1977	1949	1981	1977	1952	1951	1977	1948

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1944 - 1993	
ANNUAL TOTAL	78177		192816			
ANNUAL MEAN	214		528		264[a]	
HIGHEST ANNUAL MEAN					682	1975
LOWEST ANNUAL MEAN					28.9	1977
HIGHEST DAILY MEAN	1910	Jul 3	3670	Aug 1	9220	Apr 10 1978
LOWEST DAILY MEAN	33	Jun 15	67	Dec 29	.00	Sep 13 1948
ANNUAL SEVEN-DAY MINIMUM	34	Feb 7	68	Dec 27	.00	Sep 27 1948
INSTANTANEOUS PEAK FLOW			3680	Aug 1	9350	Apr 10 1978
INSTANTANEOUS PEAK STAGE			27.15[b]	Aug 2	32.30[b]	Apr 21 1979
INSTANTANEOUS LOW FLOW			61	Nov 5		
ANNUAL RUNOFF (AC-FT)	155100		382500		191000	
ANNUAL RUNOFF (CFSM)	.13		.33		.16	
ANNUAL RUNOFF (INCHES)	1.82		4.48		2.24	
10 PERCENT EXCEEDS	455		1820		663	
50 PERCENT EXCEEDS	123		198		80	
90 PERCENT EXCEEDS	37		72		15	

a Median of annual mean discharges is 219 ft³/s.
b Backwater from Red River of the North.



RED RIVER OF THE NORTH BASIN

05064500 RED RIVER OF THE NORTH AT HALSTAD, MN

(National stream quality accounting network station and radiochemical program station)

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 west of Halstad, 2.5 mi downstream from Wild Rice River, and at mile 375.2.

DRAINAGE AREA.--21,800 mi², approximately, including 3,800 mi² in closed basins.

WATER-DISCHARGE RECORDS

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

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

GAGE.--Water-stage recorder. Datum of gage is 826.65 ft above sea level. Prior to July 17, 1961, nonrecording gage at same site and datum.

REMARKS.--Records good except those for Nov. 2 to Apr. 3, which are fair.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	548	352	e430	e405	e490	e390	e12500	3200	e2200	4880	22000	4330
2	611	e320	e420	e405	e490	e380	e15000	3100	e2360	4820	22300	4210
3	581	e310	e410	e400	e480	e380	e16500	3060	e2800	4630	22200	4070
4	543	e295	e405	e380	e470	e380	17000	3000	e3290	4410	20700	3950
5	496	e285	e400	e370	e470	e380	16400	2920	3290	4330	20100	3850
6	463	e280	e400	e360	e480	e380	15600	2830	3170	4650	19100	3780
7	444	e285	e395	e350	e480	e390	14800	2730	2940	5220	17900	3760
8	440	e300	e385	e340	e480	e400	14200	2590	2720	5490	16700	3720
9	448	e340	e380	e320	e480	e410	13400	2380	2510	5350	15600	3650
10	439	e330	e375	e300	e480	e460	12600	2140	2360	5000	14600	3590
11	419	e310	e370	e320	e480	e500	11400	2140	2300	4620	13900	3560
12	402	e295	e370	e340	e480	e540	9570	2070	2350	4350	13400	3550
13	393	e285	e385	e360	e480	e550	7130	2030	2330	4170	12900	3520
14	369	e275	e400	e380	e490	e560	5310	1960	2430	4130	12400	3480
15	357	e270	e410	e400	e500	e560	4670	1900	2570	4130	11500	3450
16	358	e300	e415	e410	e510	e550	4410	1860	2610	5030	10800	3410
17	351	e350	e420	e420	e520	e540	4250	1810	2770	9000	10000	3350
18	351	e400	e425	e430	e530	e540	4080	1740	3070	12300	9100	3250
19	346	e470	e430	e440	e540	e530	3940	1670	3110	14900	8240	3110
20	330	e540	e440	e450	e540	e520	3850	1620	3060	16600	7640	3000
21	335	e500	e440	e450	e520	e540	3810	1600	3020	17700	7220	2980
22	344	e580	e440	e450	e500	e560	3720	e1620	2920	18300	6880	2960
23	334	e600	e435	e450	e470	e580	3570	e1660	3020	18100	6590	2960
24	323	e500	e435	e450	e430	e600	3420	e1720	3620	17800	e6200	2920
25	295	e500	e430	e450	e420	e640	3340	e1740	4180	18000	5910	2870
26	289	e420	e430	e450	e410	e700	3320	1680	4200	19000	5490	2810
27	293	e370	e420	e450	e400	e1500	3370	1610	4220	19600	5150	2750
28	302	e360	e420	e460	e400	e3500	3460	e1720	4410	20000	4830	2700
29	327	e410	e415	e470	---	e6000	3420	e1800	4620	20200	4560	2660
30	335	e440	e415	e480	---	e8000	3310	e1900	4770	21100	4370	2610
31	336	---	e410	e490	---	e10000	---	e2000	---	21900	4310	---
TOTAL	12202	11272	12755	12630	13420	41960	241350	65800	93220	339710	362590	100810
MEAN	394	376	411	407	479	1354	8045	2123	3107	10960	11700	3360
MAX	611	600	440	490	540	10000	17000	3200	4770	21900	22300	4330
MIN	289	270	370	300	400	380	3310	1600	2200	4130	4310	2610
AC-FT	24200	22360	25300	25050	26620	83230	478700	130500	184900	673800	719200	200000

e Estimated.

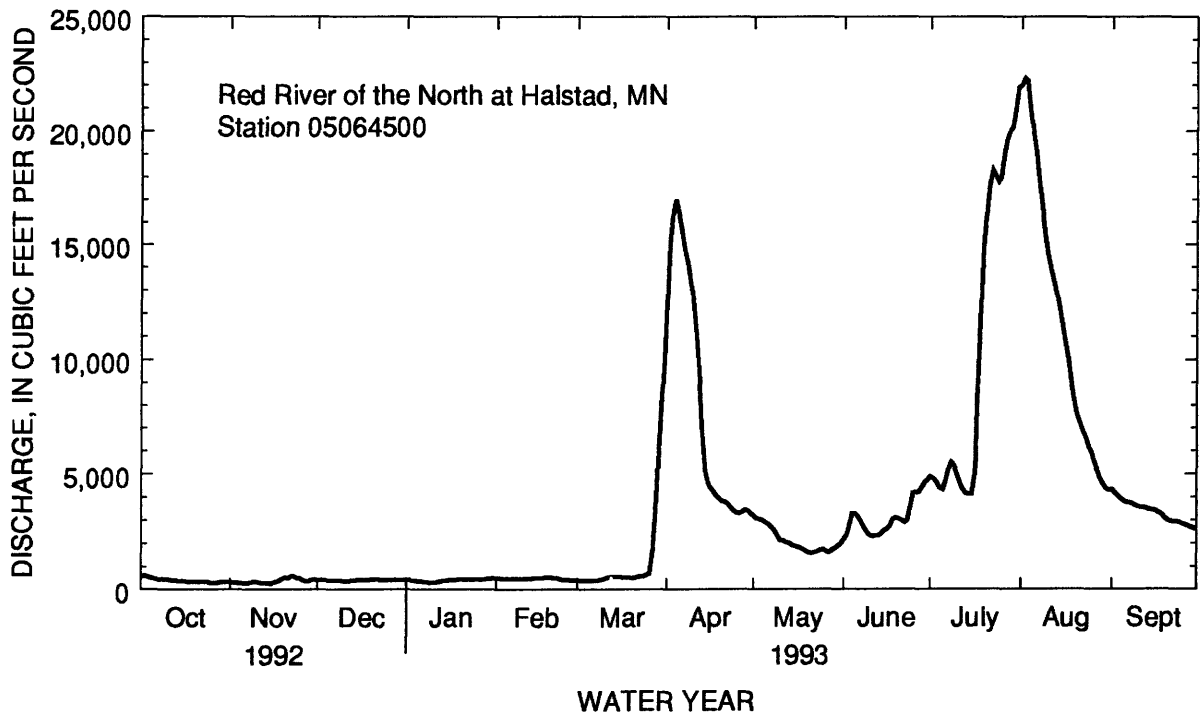
RED RIVER OF THE NORTH BASIN

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

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	665	626	493	418	431	1985	6556	3015	2516	2451	1089	668
MAX	2188	1771	1253	1023	1052	9429	20080	8994	10310	20060	11700	3360
(WY)	1987	1972	1987	1987	1987	1966	1969	1979	1962	1975	1993	1993
MIN	61.5	92.3	51.2	32.1	45.9	249	705	449	242	153	59.5	38.4
(WY)	1977	1977	1977	1977	1977	1962	1981	1977	1977	1988	1977	1976

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1961 - 1993	
ANNUAL TOTAL	353845		1307719			
ANNUAL MEAN	967		3583		1757	
HIGHEST ANNUAL MEAN					3968	1975
LOWEST ANNUAL MEAN					214	1977
HIGHEST DAILY MEAN	5000	Mar 10	22300	Aug 2	41500	Apr 22 1979
LOWEST DAILY MEAN	260	Jan 20	270	Nov 15	10	Sep 2 1976
ANNUAL SEVEN-DAY MINIMUM	270	Jan 16	295	Nov 10	17	Aug 28 1976
INSTANTANEOUS PEAK FLOW			22500	Aug 2	42000	Apr 22 1979
INSTANTANEOUS PEAK STAGE			30.56	Aug 2	39.00	Apr 22 1979
INSTANTANEOUS LOW FLOW					5.4	Oct 8 1936
ANNUAL RUNOFF (AC-FT)	701900		2594000		1273000	
10 PERCENT EXCEEDS	2230		12400		3790	
50 PERCENT EXCEEDS	699		1660		686	
90 PERCENT EXCEEDS	320		351		200	



RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY RECORDS

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
OCT												
14...	1045	378	685	--	8.2	2.0	5.0	19	11.8	95	280	254
NOV												
20...	1105	600	848	8.4	--	1.0	1.0	7.7	16.2	118	340	291
JAN												
04...	1315	382	825	--	--	-10.0	0.5	--	--	--	--	--
FEB												
10...	1420	478	771	7.6	--	-13.0	0.5	--	8.7	61	320	332
24...	1215	430	747	7.8	--	-11.5	0.5	6.7	--	--	320	280
APR												
04...	1100	17300	419	8.1	--	5.0	2.0	--	11.2	83	170	--
06...	1200	16600	434	--	--	9.0	4.0	--	--	--	--	--
16...	1145	4410	714	8.2	--	6.5	7.0	--	10.7	91	310	195
MAY												
14...	1215	2030	748	8.2	--	23.0	19.0	60	6.0	67	370	231
JUN												
02...	1410	2360	876	6.9	--	17.5	17.0	--	--	--	--	--
15...	1115	2580	790	7.8	--	20.0	19.5	--	6.5	73	350	222
JUL												
07...	1020	5200	678	7.9	--	--	--	--	--	--	--	--
18...	1000	12100	314	8.0	--	18.5	19.0	--	5.0	56	130	100
22...	1010	18400	378	7.8	--	20.0	20.0	--	3.2	36	160	--
26...	1200	19100	--	7.4	--	20.5	21.0	--	2.9	--	--	--
29...	1145	20000	453	--	--	27.0	24.0	--	--	--	--	--
31...	0900	22000	--	7.7	--	19.5	21.5	--	1.9	--	220	160
AUG												
04...	1730	19700	305	--	--	23.0	21.5	--	--	--	--	--
13...	1205	13000	638	--	--	21.0	22.0	--	--	--	--	--
18...	1305	9240	633	--	--	29.0	24.0	--	--	--	--	--
26...	1205	5400	680	--	--	21.5	23.0	--	--	--	--	--
SEP												
09...	1000	3630	1220	8.2	--	13.5	15.0	73	7.8	80	320	220

RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	SODIUM PERCENT (00932)	SODIUM ADSORPTION RATIO (00931)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CARBONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)
OCT												
14...	K13	K16	59	31	25	16	0.7	6.8	290	10	72	18
NOV												
20...	K5	89	72	39	48	23	1	7.4	323	16	120	37
FEB												
10...	--	--	65	38	31	17	0.8	7.0	405	0	83	19
24...	37	K28	65	38	33	18	0.8	6.4	341	0	78	18
APR												
04...	--	--	39	18	15	15	0.5	9.9	--	--	60	11
16...	--	--	68	35	29	16	0.7	9.8	238	0	160	16
MAY												
14...	29	95	78	42	36	17	0.8	11	282	0	180	22
JUN												
15...	--	--	71	42	33	17	0.8	9.9	271	0	170	18
JUL												
18...	--	--	30	13	10	14	0.4	6.2	122	0	44	6.8
22...	--	--	39	16	10	11	0.3	8.2	--	0	53	7.5
31...	--	--	50	22	15	13	0.4	10	196	0	64	9.4
SEP												
09...	110	180	67	37	27	15	0.7	8.1	--	--	130	14

DATE	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L) (70301)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)	SOLIDS, DISSOLVED (TONS PER AC-FT) (70303)	SOLIDS, DISSOLVED (TONS PER DAY) (70302)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NITRATE DISSOLVED (MG/L AS N) (00618)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)
OCT											
14...	0.20	12	378	421	0.57	430	0.010	<0.010	--	0.240	0.240
NOV											
20...	0.30	12	514	525	0.71	850	<0.010	<0.010	--	0.180	0.200
FEB											
10...	0.20	20	466	453	0.62	585	--	0.030	0.530	--	0.560
24...	0.20	21	430	437	0.59	507	--	0.020	0.550	--	0.570
APR											
04...	0.20	15	266	282	0.38	13200	--	0.190	3.41	--	3.60
16...	0.20	17	456	503	0.68	5990	--	0.020	0.900	--	0.920
MAY											
14...	0.30	10	523	546	0.74	2990	--	0.070	0.740	--	0.810
JUN											
15...	0.20	12	494	525	0.71	3660	--	0.060	0.880	--	0.940
JUL											
18...	0.10	16	189	198	0.27	6470	--	0.030	0.460	--	0.490
22...	0.20	20	238	251	0.34	12500	--	0.020	0.210	--	0.230
31...	0.10	27	295	324	0.44	19200	--	0.030	0.068	--	0.098
SEP											
09...	0.20	22	458	456	0.62	4470	--	0.010	0.330	--	0.340

RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, ORGANIC TOTAL (MG/L AS N) (00605)	NITROGEN, ORGANIC DISSOLVED (MG/L AS N) (00607)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	NITROGEN, TOTAL (MG/L AS N) (00600)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO TOTAL (MG/L AS P) (70507)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
OCT											
14...	0.020	0.020	0.88	--	0.90	--	1.1	0.220	0.100	0.110	0.100
NOV											
20...	1.10	1.20	1.4	--	2.5	--	2.7	0.470	0.370	0.400	0.360
FEB											
10...	--	0.310	--	0.59	1.0	0.90	--	0.100	0.080	--	0.080
24...	--	0.240	--	--	0.90	--	--	0.090	0.060	--	0.060
APR											
04...	--	0.250	--	1.0	1.4	1.3	--	0.280	0.260	--	0.240
16...	--	0.050	--	0.75	1.4	0.80	--	0.280	0.120	--	0.100
MAY											
14...	--	0.080	--	--	1.0	--	--	0.240	0.130	--	0.130
JUN											
15...	--	0.050	--	0.75	0.80	0.80	--	0.170	0.130	--	0.130
JUL											
18...	--	0.090	--	0.41	2.5	0.50	--	0.840	0.240	--	0.250
22...	--	0.070	--	0.63	1.1	0.70	--	0.350	0.250	--	0.220
26...	--	--	--	--	1.3	--	--	0.340	--	--	--
31...	--	0.090	--	0.81	1.1	0.90	--	0.380	0.330	--	0.290
SEP											
09...	--	0.060	--	--	0.80	--	--	0.350	0.220	--	0.210

DATE	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	COBALT, DISSOLVED (UG/L AS CO) (01035)	IRON, DISSOLVED (UG/L AS FE) (01046)	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)
OCT											
14...	20	51	<3	12	27	7	<10	3	<1	<1.0	210
FEB											
10...	--	--	--	5	--	39	--	--	--	--	--
APR											
04...	--	--	--	110	--	87	--	--	--	--	--
16...	--	--	--	25	--	6	--	--	--	--	--
MAY											
14...	20	79	<3	11	46	2	<10	4	<1	<1.0	320
JUN											
15...	--	--	--	5	--	<1	--	--	--	--	--
JUL											
18...	--	--	--	130	--	6	--	--	--	--	--
22...	--	--	--	70	--	11	--	--	--	--	--
31...	--	--	--	44	--	14	--	--	--	--	--
SEP											
09...	20	63	<3	20	37	4	<10	4	<1	<1.0	280

RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ALPHA COUNT, 2 SIGMA WAT DIS AS TH-230 (PCI/L) (75987)	ALPHA, 2 SIGMA SED SUS TOT DRY AS TH-230 (PCI/L) (76004)	ALPHA, COUNT, 2 SIGMA WAT DIS AS NAT U (UG/L) (75986)	GROSS ALPHA, DISSOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	BETA, 2 SIGMA WATER, DISS, AS CS-137 (PCI/L) (75989)	GROSS BETA, DISSOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	BETA, 2 SIGMA WATER, DISS, AS SR90/Y90 (PCI/L (75988)	GROSS BETA, DISSOLVED (PCI/L AS SR/YT-90) (80050)
OCT											
14...	<6	--	--	--	--	--	--	--	--	--	--
MAY											
14...	<6	--	--	--	--	--	--	--	--	--	--
JUL											
07...	--	2.5	6.7	3.6	5.3	13	2.5	13	11	1.8	9.9
SEP											
09...	<6	--	--	--	--	--	--	--	--	--	--

DATE	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/YT-90) (80060)	RA-226 2 SIGMA WATER, DISS, (PCI/L) (76001)	RADIUM 226, DISSOLVED, RADON METHOD (PCI/L) (09511)	BETA, 2 SIGMA SED, SUSP, TOT DRY SR90Y90 (PCI/L) (76005)	URANIUM NATURAL 2 SIGMA WATER, DISS, (UG/L) (75990)	URANIUM NATURAL DISSOLVED (UG/L AS U) (22703)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT											
14...	--	--	--	--	--	--	--	--	--	--	94
FEB											
24...	--	--	--	--	--	--	--	--	64	74	82
JUL											
07...	10	0.020	0.10	2.6	<1.0	2.2	--	--	--	--	--
22...	--	--	--	--	--	--	8.9	1.1	104	5170	97

RED RIVER OF THE NORTH BASIN

05067500 MARSH RIVER NEAR SHELLY, MN

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

DRAINAGE AREA.--151 mi².

PERIOD OF RECORD.--March 1944 to September 1983 and April 1985 to current year (no winter records since 1989). Monthly discharge only for March 1944, published in WSP 1308. Operated as a high-flow partial-record station October 1983 to March 1985.

GAGE.--Water-stage recorder. Datum of gage is 841.14 ft above mean sea level (levels by U.S. Army Corps of Engineers). Prior to Oct. 1, 1965, nonrecording gage at datum 3.0 ft higher. Oct. 1, 1965, to May 17, 1989, nonrecording gage at present site and datum.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.5	3.8	---	---	---	---	e460	8.7	3.0	14	e220	.91
2	3.1	4.8	---	---	---	---	e640	8.0	3.3	11	e160	.68
3	3.2	6.1	---	---	---	---	e610	7.4	3.5	7.4	e120	.72
4	2.8	5.4	---	---	---	---	e520	8.2	2.8	5.3	e85	.70
5	3.4	4.4	---	---	---	---	e430	7.9	2.0	4.2	e66	.77
6	4.2	3.5	---	---	---	---	357	7.3	1.6	4.6	e60	.87
7	4.0	3.0	---	---	---	---	198	6.6	1.4	4.4	e53	.88
8	3.6	2.6	---	---	---	---	104	5.8	1.5	3.8	e49	.73
9	4.8	8.0	---	---	---	---	93	5.6	2.5	3.5	e44	.90
10	4.6	5.1	---	---	---	---	93	5.4	1.9	3.8	e39	.77
11	5.0	4.2	---	---	---	---	78	5.1	7.0	4.9	e35	.71
12	5.8	4.4	---	---	---	---	59	4.5	8.4	7.3	e31	.66
13	2.5	5.3	---	---	---	---	47	4.3	7.0	7.6	29	.62
14	1.9	12	---	---	---	---	37	3.8	5.1	9.5	24	.55
15	1.9	11	---	---	---	---	32	13	3.6	10	20	.49
16	1.8	8.1	---	---	---	---	29	22	3.2	14	20	.38
17	2.0	6.2	---	---	---	---	27	11	3.5	18	17	.29
18	2.0	5.1	---	---	---	---	24	6.0	3.2	54	16	.26
19	2.1	4.9	---	---	---	---	23	4.1	3.1	98	14	.30
20	2.4	---	---	---	---	---	20	2.4	4.2	101	10	.23
21	2.2	---	---	---	---	---	16	1.4	3.8	85	7.3	.21
22	2.5	---	---	---	---	---	12	.95	3.0	70	5.8	.19
23	3.7	---	---	---	---	---	8.4	.91	3.2	59	5.0	.25
24	3.9	---	---	---	---	---	8.0	.79	14	50	4.4	.23
25	3.9	---	---	---	---	---	11	.75	11	57	3.0	.14
26	3.7	---	---	---	---	e4.1	13	.64	6.2	272	1.8	.15
27	3.7	---	---	---	---	e5.0	11	.60	4.4	473	1.5	.20
28	3.6	---	---	---	---	e7.8	8.6	.74	4.0	474	1.1	.22
29	4.0	---	---	---	---	e47	9.6	1.9	4.3	e480	.96	.20
30	4.2	---	---	---	---	e130	10	3.1	15	e400	1.2	.19
31	4.0	---	---	---	---	e290	---	3.4	---	e300	1.0	---
TOTAL	104.0	107.9	---	---	---	483.9	3988.6	162.28	140.7	3106.3	1145.06	14.40
MEAN	3.35	5.68	---	---	---	80.6	133	5.23	4.69	100	36.9	.48
MAX	5.8	12	---	---	---	290	640	22	15	480	220	.91
MIN	1.8	2.6	---	---	---	4.1	8.0	.60	1.4	3.5	.96	.14
AC-FT	206	214	---	---	---	960	7910	322	279	6160	2270	29
CFSM	.02	.04	---	---	---	.53	.88	.03	.03	.66	.24	.00
IN.	.03	.03	---	---	---	.12	.98	.04	.03	.77	.28	.00

e Estimated.

RED RIVER OF THE NORTH BASIN

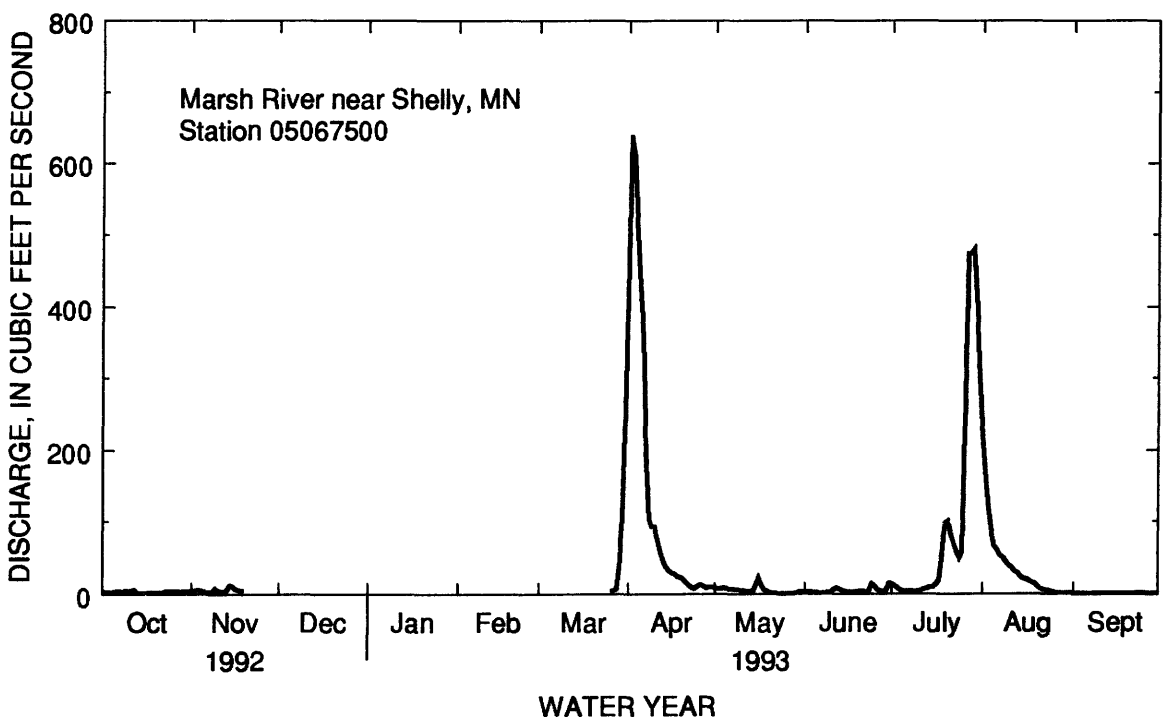
05067500 MARSH RIVER NEAR SHELLY, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	12.4	10.7	5.60	3.79	3.29	69.5	292	128	81.3	72.6	21.1	11.6
MAX	130	102	77.1	64.5	62.1	437	1537	2617	1030	820	363	144
(WY)	1952	1952	1951	1951	1951	1945	1950	1950	1950	1950	1949	1944
MIN	.000	.000	.000	.000	.000	.000	.078	.87	.000	.000	.000	.000
(WY)	1955	1956	1956	1946	1946	1964	1981	1980	1980	1961	1959	1954

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1944 - 1993	
ANNUAL MEAN					63.3[a]	
HIGHEST ANNUAL MEAN					543	1950
LOWEST ANNUAL MEAN					1.24	1977
HIGHEST DAILY MEAN	390	Mar 8	640	Apr 2	4740	Apr 19 1979
LOWEST DAILY MEAN			.14	Sep 25	.00	Many days
ANNUAL SEVEN-DAY MINIMUM					.00	Many times
INSTANTANEOUS PEAK FLOW			660	Apr 2	4880	Apr 19 1979
INSTANTANEOUS PEAK STAGE			13.78[b]	Apr 2	23.36[c]	Apr 19 1979
ANNUAL RUNOFF (AC-FT)					45850	
ANNUAL RUNOFF (CFSM)					.42	
ANNUAL RUNOFF (INCHES)					5.69	
10 PERCENT EXCEEDS					105	
50 PERCENT EXCEEDS					1.0	
90 PERCENT EXCEEDS					.00	

a Median of annual mean discharges is 46 ft³/s.
b Backwater from ice.
c From floodmark.



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, on left bank 25 ft upstream from bridge on U.S. Highway 75 in Climax and 3.7 mi upstream from mouth.

DRAINAGE AREA.--426 mi².

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

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

GAGE.--Water stage recorder. Datum of gage is 820.10 ft above mean sea level (levels by U.S. Army Corps of Engineers). Prior to Oct. 1, 1966, nonrecording gage at site 3.2 mi upstream at datum 12.78 ft higher. Oct. 1, 1966, to Sept 5, 1989, nonrecording gage at present site and datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	27	21	28	e17	e13	e12	e600	66	58	46	e1250	58
2	25	22	27	e17	e13	e12	e800	64	67	46	e1290	56
3	22	23	28	e16	e13	e12	e950	61	59	45	e1300	54
4	22	20	27	e16	e12	e12	e1200	59	61	44	e1280	52
5	21	19	e27	e16	e12	e12	e1150	60	53	48	e1240	53
6	20	24	27	e16	e12	e12	e1000	57	48	48	e1200	52
7	21	23	28	e15	e12	e12	e810	55	42	49	1100	49
8	21	25	28	e15	e12	e12	e600	53	43	50	e900	47
9	21	28	28	e15	e12	e12	e400	55	56	49	e700	45
10	22	30	e29	e15	e12	e12	e270	54	53	47	e500	43
11	23	34	e28	e14	e12	e12	e230	50	46	43	e350	41
12	20	35	e27	e14	e12	e12	205	48	45	39	227	41
13	20	30	e26	e14	e12	e12	184	46	42	39	150	44
14	20	32	e25	e14	e12	e12	169	44	40	36	127	41
15	20	31	e24	e14	e12	e12	153	41	41	35	128	40
16	21	25	e24	e14	e12	e12	141	39	42	39	126	40
17	22	34	e23	e14	e12	e12	129	37	49	47	127	39
18	19	32	e23	e14	e12	e12	121	35	50	51	123	39
19	21	29	e22	e14	e12	e12	114	35	57	46	116	41
20	24	27	e22	e13	e12	e12	106	33	59	45	110	38
21	21	29	e21	e13	e12	e12	98	32	50	61	105	36
22	23	29	e21	e13	e12	e12	90	32	43	171	99	34
23	26	28	e20	e13	e12	e12	85	34	40	307	93	32
24	23	28	e20	e13	e12	e13	84	38	46	e380	87	31
25	23	27	e19	e13	e12	e14	93	46	51	e420	82	38
26	23	e26	e19	e13	e12	e15	83	45	59	e440	75	35
27	23	22	e19	e13	e12	e17	76	42	63	e500	70	32
28	23	23	e18	e13	e12	e27	73	43	60	e700	67	30
29	22	29	e18	e13	---	e100	72	45	53	e900	63	28
30	21	30	e18	e13	---	e310	69	41	48	e1050	63	26
31	21	---	e17	e13	---	e450	---	42	---	e1150	62	---
TOTAL	681	815	731	440	339	1222	10155	1432	1524	6971	13210	1235
MEAN	22.0	27.2	23.6	14.2	12.1	39.4	338	46.2	50.8	225	426	41.2
MAX	27	35	29	17	13	450	1200	66	67	1150	1300	58
MIN	19	19	17	13	12	12	69	32	40	35	62	26
AC-FT	1350	1620	1450	873	672	2420	20140	2840	3020	13830	26200	2450
CFSM	.05	.06	.06	.03	.03	.09	.79	.11	.12	.53	1.00	.10
IN.	.06	.07	.06	.04	.03	.11	.89	.13	.13	.61	1.15	.11

e Estimated.

RED RIVER OF THE NORTH BASIN

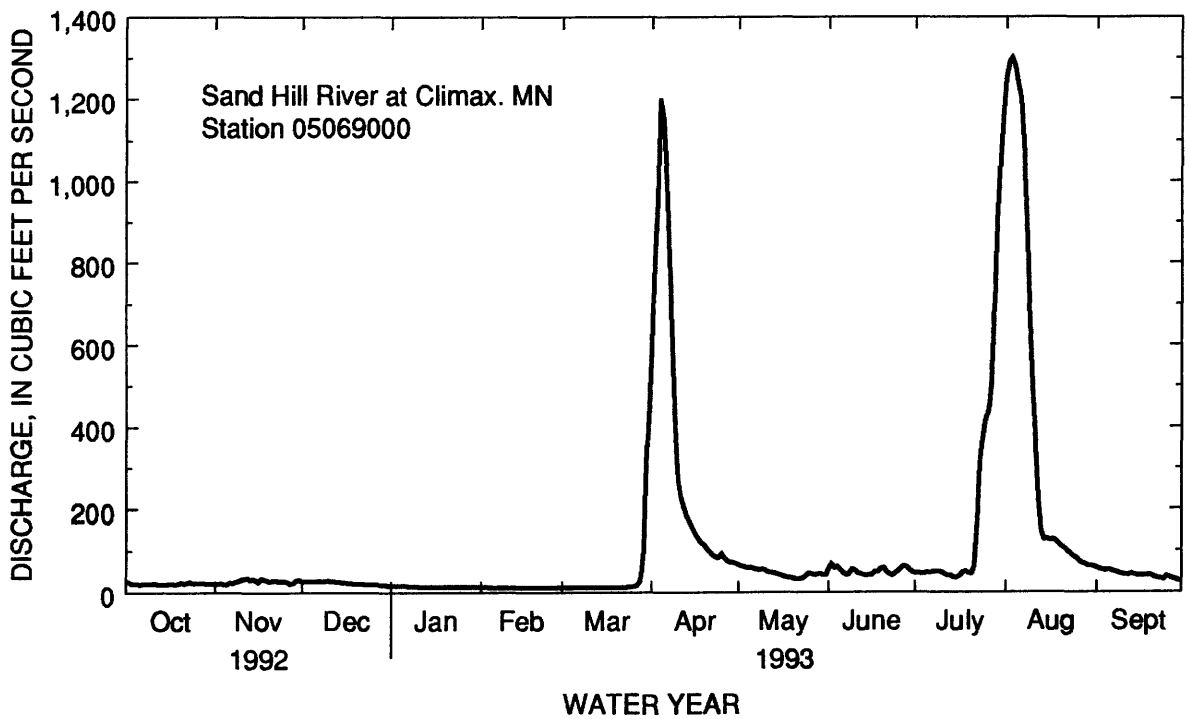
05069000 SAND HILL RIVER AT CLIMAX, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1943 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	31.8	27.2	16.7	12.3	12.2	74.7	345	118	94.0	61.4	37.7	25.2
MAX	223	209	48.7	30.1	46.8	385	946	1156	596	298	426	93.9
(WY)	1972	1972	1972	1986	1984	1966	1978	1950	1984	1962	1993	1985
MIN	9.43	8.64	5.11	2.02	3.55	5.81	25.3	23.7	11.5	8.95	6.30	6.49
(WY)	1977	1956	1964	1962	1962	1948	1981	1958	1980	1980	1961	1955

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1943 - 1993	
ANNUAL TOTAL	13877.9		38755			
ANNUAL MEAN	37.9		106		70.6[a]	
HIGHEST ANNUAL MEAN					204	1950
LOWEST ANNUAL MEAN					18.4	1977
HIGHEST DAILY MEAN	270	Aug 25	1300	Aug 3	4360	Apr 14 1965
LOWEST DAILY MEAN	5.8	Aug 6	12	Feb 4 - Mar 23	1.0	Jan 17 1962
ANNUAL SEVEN-DAY MINIMUM	6.8	Aug 15	12	Feb	41.1	Jan 12 1962
INSTANTANEOUS PEAK FLOW			1320	Aug 3	4560	Apr 14 1965
INSTANTANEOUS PEAK STAGE			16.13[b]	Aug 3	32.79[c]	Apr 23 1979
INSTANTANEOUS LOW FLOW			5.6	Oct 19		
ANNUAL RUNOFF (AC-FT)	27530		76870		51160	
ANNUAL RUNOFF (CFSM)	.089		.25		.17	
ANNUAL RUNOFF (INCHES)	1.21		3.38		2.25	
10 PERCENT EXCEEDS	78		176		139	
50 PERCENT EXCEEDS	27		32		22	
90 PERCENT EXCEEDS	10		12		8.6	

a Median of annual mean discharges is 51 ft^3/s.
b Backwater from ice.
c From floodmark (backwater from Red River of the North).



RED RIVER OF THE NORTH BASIN

05074000 LOWER RED LAKE NEAR RED LAKE, MN

LOCATION.--Lat 47°57'27", long 95°16'34", in $SW^1/_4NW^1/_4$ sec. 28, T. 152 N., R. 36 W., Clearwater County, Hydrologic Unit 09020302, on Red Lake Indian Reservation, on left bank just upstream from dam at outlet, 13 mi northwest of city of Red Lake.

DRAINAGE AREA.--1,950 mi^2, approximately.

PERIOD OF RECORD.--June 1930 to November 1932 and May 1933 to current year. Published as "Red lake at Redby" prior to May 1933 and as "Red Lake near Red Lake" May 1933 to September 1940. 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 Natural Resources (fragmentary).

GAGE.--Water-stage recorder. Datum of gage is 1,100.00 ft, adjustment of 1912 (levels by U.S. Army Corps of Engineers); gage readings have been reduced to elevations based on adjustment of 1912. May 1933 to Sept. 6, 1934, nonrecording gage and Sept. 7, 1934 to Sept. 30, 1986, recording gage at same site at datum 69.00 ft higher. Nonrecording gages at Waskish and Redby.

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

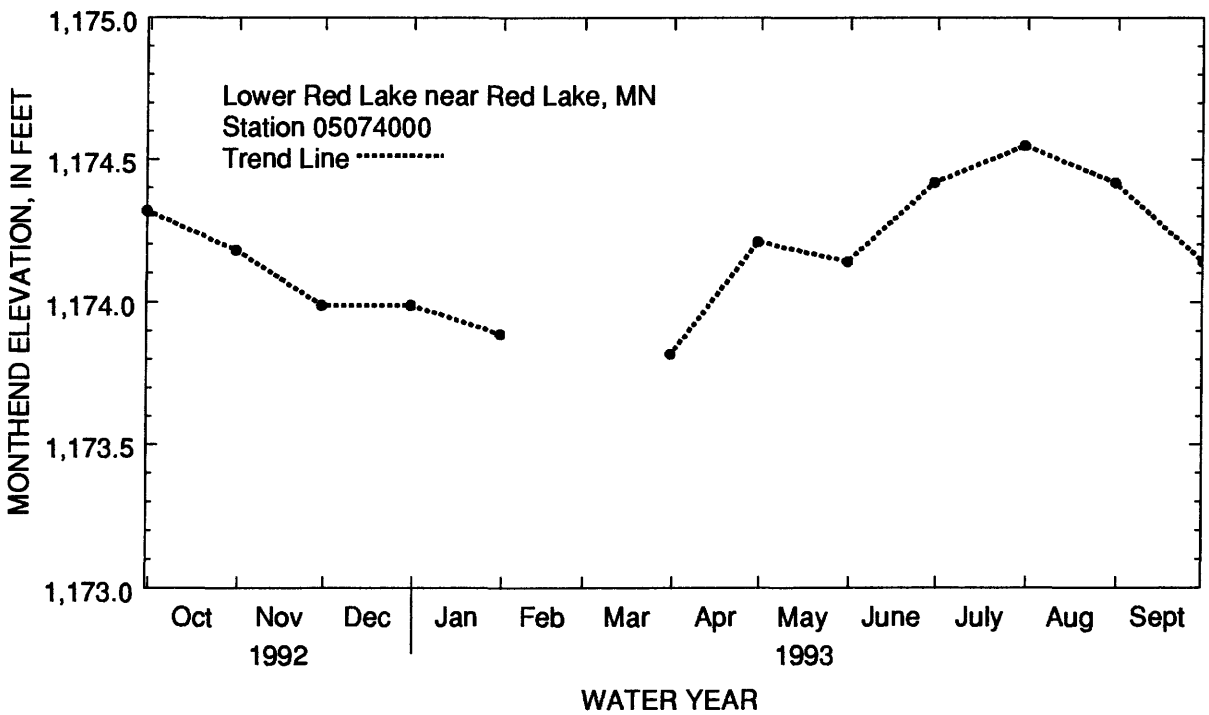
EXTREMES FOR PERIOD OF RECORD.--Maximum elevation, 1,178.53 ft, June 25, 1950; minimum recorded, 1,169.80 ft, Nov. 20, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum daily, 1,174.65 ft, July 27; minimum daily, 1,173.35 ft, Oct. 12.

MONTHEND ELEVATION, IN FEET, OCTOBER 1992 TO SEPTEMBER 1993

Oct. 31 ..... 1174.18	Feb. 28	June 30 ..... 1174.42
Nov. 30 ..... 1173.99	Mar. 31 ..... 1173.82	July 31 ..... 1174.55
Dec. 31 ..... 1173.99	Apr. 30 ..... 1174.21	Aug. 31 ..... 1174.42
Jan. 31 ..... 1173.89	May 31 ..... 1174.14	Sept. 30 ..... 1174.14

NOTE.--Mean daily gage heights are available.


Lower Red Lake near Red Lake, MN
Station 05074000
Trend Line
MONTHEND ELEVATION, IN FEET
1,175.0
1,174.5
1,174.0
1,173.5
1,173.0
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
1992
1993
WATER YEAR

RED RIVER OF THE NORTH BASIN

05074500 RED LAKE RIVER NEAR RED LAKE, MN

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

DRAINAGE AREA.--1,950 mi², 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 1,100.00 ft, adjustment of 1912 (levels by U.S. Army Corps of Engineers). Prior to Sept. 7, 1934, nonrecording gage at site 50 ft upstream at datum 69.00 ft higher. Sept. 7, 1934, to Nov. 26, 1951, water-stage recorder at present site at datum 69.00 ft higher. Nov. 27, 1951 to Sept. 30, 1986, water-stage recorder at present site at datum 67.00 ft higher.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e230	70	e545	e508	e499	e495	498	439	536	812	456	e360
2	e233	76	e542	e506	e499	e495	418	445	711	815	464	e80
3	e235	77	e540	e504	e499	e494	255	443	741	840	618	e80
4	e238	142	e540	e503	e499	e494	246	447	751	848	816	e300
5	e240	280	e540	e503	e499	e493	249	454	760	654	851	556
6	e245	110	e539	e503	e498	e492	258	453	774	443	868	571
7	e248	88	e539	e503	e498	e492	263	449	781	373	867	678
8	e250	85	e537	e503	e498	e491	280	449	811	337	878	827
9	255	79	e537	e503	e498	e490	296	453	820	303	854	846
10	253	76	e535	e503	e498	e490	281	454	816	283	e575	861
11	249	e74	e533	e502	e498	e489	277	460	821	281	e300	876
12	250	e71	e530	e502	e497	e488	275	613	825	440	e300	883
13	241	e68	e528	e502	e497	e488	277	907	825	700	e490	894
14	239	e69	e526	e502	e497	e487	281	937	784	723	680	900
15	235	e70	e525	e502	e497	e486	284	930	810	740	706	893
16	233	e71	e524	e502	e497	e486	285	923	819	762	775	877
17	230	e72	e523	e501	e497	e485	287	911	818	766	872	875
18	226	e74	e522	e501	e496	e485	293	901	793	766	883	876
19	220	e75	e521	e501	e496	e484	271	887	781	759	878	893
20	219	e76	e520	e501	e496	e484	272	870	765	806	900	903
21	187	e78	e520	e501	e496	e483	276	720	749	864	894	901
22	106	e78	e519	e501	e496	e482	271	436	799	871	901	886
23	93	e320	e518	e501	e496	e482	267	380	851	869	898	818
24	89	e547	e517	e500	e495	e481	273	e340	829	874	893	565
25	89	e547	e516	e500	e495	e480	262	e185	741	891	899	313
26	87	e547	e515	e500	e495	e479	249	e80	765	815	909	e80
27	85	e547	e514	e500	e495	478	252	e200	785	608	902	e80
28	83	e547	e513	e500	e495	490	255	435	797	366	900	e80
29	81	e547	e512	e500	---	503	316	459	829	e80	912	e80
30	79	e547	e510	e499	---	512	435	472	826	e260	848	e80
31	75	---	e509	e499	---	499	---	471	---	433	637	---
TOTAL	5823	6108	16309	15556	13916	15157	8702	17003	23513	19382	23624	17912
MEAN	188	204	526	502	497	489	290	548	784	625	762	597
MAX	255	547	545	508	499	512	498	937	851	891	912	903
MIN	75	68	509	499	495	478	246	80	536	80	300	80
AC-FT	11550	12120	32350	30860	27600	30060	17260	33730	46640	38440	46860	35530
CFSM	.10	.10	.27	.26	.25	.25	.15	.28	.40	.32	.39	.31
IN.	.11	.12	.31	.30	.27	.29	.17	.32	.45	.37	.45	.34

e Estimated.

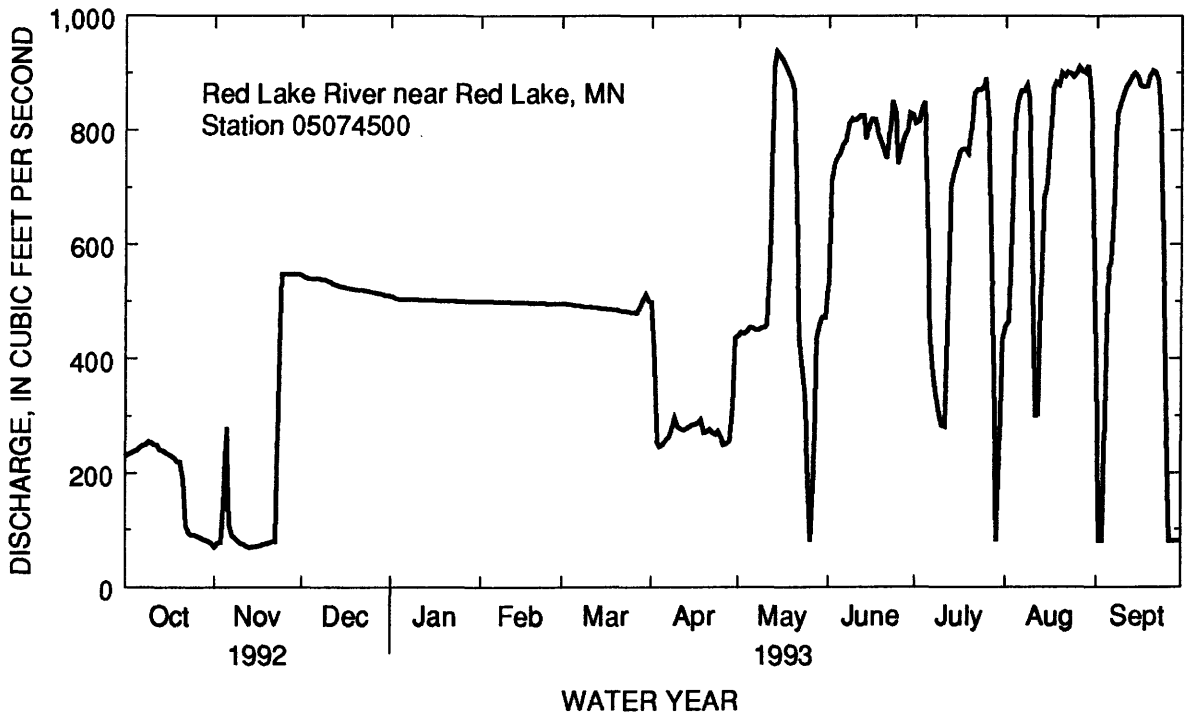
RED RIVER OF THE NORTH BASIN

05074500 RED LAKE RIVER NEAR RED LAKE, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1933 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	465	454	451	464	458	424	335	487	571	538	465	459
MAX	2071	1649	1498	1418	1342	1396	1199	1624	2025	1840	1464	1712
(WY)	1951	1951	1951	1951	1951	1951	1951	1950	1950	1950	1975	1950
MIN	5.10	3.57	.95	.35	.40	.60	4.00	.60	2.15	4.63	2.73	1.6
(WY)	1934	1934	1934	1934	1934	1936	1936	1933	1933	1934	1936	1934

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1933 - 1993	
ANNUAL TOTAL	48554		183005			
ANNUAL MEAN	133		501		468	
HIGHEST ANNUAL MEAN					1292	1951
LOWEST ANNUAL MEAN					5.55	1936
HIGHEST DAILY MEAN	547	Nov 24	937	May 14	2240	Oct 6 1950
LOWEST DAILY MEAN	54	Jul 9	68	Nov 13	.00	Sep 19 1933
ANNUAL SEVEN-DAY MINIMUM	54	Jul 9	71	Nov 11	.00	Sep 1 1934
INSTANTANEOUS PEAK FLOW			955	Aug 30	3600	Jun 25 1950
INSTANTANEOUS PEAK STAGE			73.81	Aug 30	78.19	Jun 25 1950
ANNUAL RUNOFF (AC-FT)	96310		363000		338900	
ANNUAL RUNOFF (CFSM)	.068		.26		.24	
ANNUAL RUNOFF (INCHES)	.93		3.49		3.26	
10 PERCENT EXCEEDS	511		870		1010	
50 PERCENT EXCEEDS	72		499		377	
90 PERCENT EXCEEDS	60		91		35	



RED RIVER OF THE NORTH BASIN

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

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

DRAINAGE AREA.--2,300 mi², 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 above sea level, adjustment of 1912 (levels by U.S. Army Corps of Engineers). See WSP 1308 or 1738 for history of changes prior to Oct. 1, 1949.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	285	52	e545	e540	e540	e535	e1050	594	643	846	728	1330
2	280	53	e545	e540	e540	e535	e950	624	659	904	666	1110
3	278	54	e545	e540	e540	e540	e860	627	746	912	637	877
4	277	52	e545	e540	e540	e540	795	619	815	1270	623	693
5	277	53	e545	e540	e540	e540	749	608	846	1320	667	626
6	272	213	e540	e540	e540	e540	709	598	866	1170	759	629
7	271	202	e540	e540	e540	e540	679	597	883	1010	823	642
8	272	101	e540	e540	e540	e540	659	592	939	834	860	654
9	270	86	e540	e540	e540	e540	694	585	963	694	1160	703
10	265	97	e540	e540	e540	e540	708	574	960	597	1310	772
11	259	77	e540	e540	e535	e540	684	568	945	524	1190	816
12	254	75	e540	e540	e535	e540	660	559	925	470	1050	848
13	244	51	e540	e540	e535	e540	649	605	920	444	912	870
14	246	e56	e540	e540	e535	e540	630	752	931	504	800	894
15	246	e68	e540	e540	e535	e540	602	845	906	600	771	918
16	245	e73	e540	e540	e535	e540	581	890	910	690	774	934
17	240	e75	e540	e540	e535	e540	561	911	953	756	778	934
18	233	e77	e540	e540	e535	e540	539	917	960	771	795	928
19	229	e80	e540	e540	e535	e540	528	919	942	773	825	921
20	229	e84	e540	e540	e535	e540	504	918	911	765	852	919
21	226	e88	e540	e540	e535	e540	480	917	880	763	876	925
22	220	e92	e540	e540	e535	e550	468	890	852	776	898	941
23	154	e98	e540	e540	e535	e560	458	728	839	801	913	942
24	88	e105	e540	e540	e535	e580	451	618	854	839	918	928
25	65	e140	e540	e540	e535	e600	447	499	871	1130	920	869
26	58	e300	e540	e540	e535	e650	442	224	843	1750	918	721
27	56	e450	e540	e540	e535	e750	427	124	811	1770	919	530
28	55	e520	e540	e540	e535	e900	432	195	804	1600	918	349
29	54	e545	e540	e540	---	e1050	441	519	811	1380	988	220
30	53	e545	e540	e540	---	e1150	489	611	830	1120	1470	156
31	52	---	e540	e540	---	e1230	---	638	---	877	1540	---
TOTAL	6253	4562	16765	16740	15030	19350	18326	19865	26018	28660	28258	23599
MEAN	202	152	541	540	537	624	611	641	867	925	912	787
MAX	285	545	545	540	540	1230	1050	919	963	1770	1540	1330
MIN	52	51	540	540	535	535	427	124	643	444	623	156
AC-FT	12400	9050	33250	33200	29810	38380	36350	39400	51610	56850	56050	46810
CFSM	.09	.07	.24	.23	.23	.27	.27	.28	.38	.40	.40	.34
IN.	.10	.07	.27	.27	.24	.31	.30	.32	.42	.46	.46	.38

e Estimated.

RED RIVER OF THE NORTH BASIN

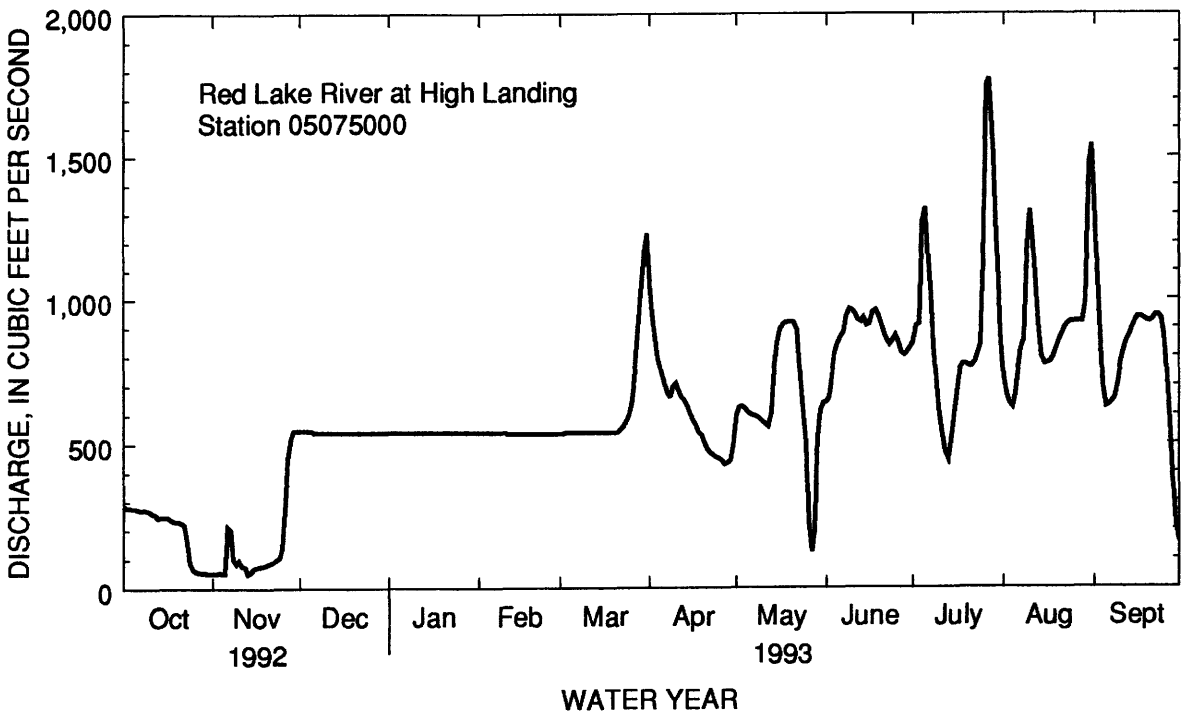
05075000 RED LAKE RIVER AT HIGH LANDING, NEAR GOODRIDGE, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1930 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	518	490	445	444	440	476	658	662	657	566	491	512
MAX	1955	1730	1539	1424	1366	1453	1980	3179	2161	2474	1478	1733
(WY)	1951	1951	1951	1951	1951	1951	1951	1950	1950	1975	1975	1950
MIN	2.11	1.61	.000	.000	.000	.000	24.7	5.58	1.04	5.92	.026	.000
(WY)	1934	1934	1934	1934	1934	1936	1933	1933	1936	1934	1934	1934

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1930 - 1993	
ANNUAL TOTAL	63428		223426			
ANNUAL MEAN	173		612		530	
HIGHEST ANNUAL MEAN					1407	1951
LOWEST ANNUAL MEAN					6.21	1934
HIGHEST DAILY MEAN	545	Nov 29	1770	Jul 27	4040	Jul 7 1975
LOWEST DAILY MEAN	51	Nov 13	51	Nov 13	.00	Many days
ANNUAL SEVEN-DAY MINIMUM	53	Oct 30	53	Oct 30	.00	Nov 16 1933
INSTANTANEOUS PEAK FLOW			1860	Jul 26	4060	Jul 7 1975
INSTANTANEOUS PEAK STAGE			10.74a	Mar 31	13.44	Jul 3 1975
ANNUAL RUNOFF (AC-FT)	125800		443200		383800	
ANNUAL RUNOFF (CFSM)	.075		.27		.23	
ANNUAL RUNOFF (INCHES)	1.03		3.61		3.13	
10 PERCENT EXCEEDS	374		929		1160	
50 PERCENT EXCEEDS	101		540		410	
90 PERCENT EXCEEDS	61		209		32	

a Backwater from ice.



RED RIVER OF THE NORTH BASIN

05076000 THIEF RIVER NEAR THIEF RIVER FALLS, MN

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

DRAINAGE AREA.--959 mi².

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

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

GAGE.--Water-stage recorder and control of grouted boulders. Datum of gage is 1,112.33 ft above mean sea level (levels by Minnesota Department of Transportation). Prior to May 4, 1939, nonrecording gages at same site and datum.

REMARKS.--Records good except those for estimated daily discharges, which are poor. Some regulation by Thief and Mud Lakes.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	278	86	9.5	1.7	e1.7	e.39	e1250	112	111	135	1330	2040
2	275	87	9.0	1.8	e1.8	e.37	e1300	111	110	132	1250	1870
3	273	42	7.9	1.9	e1.8	e.41	e1200	107	89	85	1180	1730
4	273	17	7.1	1.8	e1.7	e.48	e1100	109	81	311	1150	1630
5	272	16	6.6	1.7	e1.6	e.53	1030	153	53	550	1140	1520
6	269	9.9	7.4	1.7	e1.5	e.58	977	154	32	537	1100	1380
7	260	8.8	6.9	1.7	e1.4	e.63	970	150	31	654	1060	1250
8	188	8.3	6.8	1.6	e1.3	e.68	890	147	65	765	1030	1190
9	174	7.4	7.1	1.6	e1.2	e.78	962	143	176	802	1460	1140
10	172	8.6	6.8	1.6	e1.2	e.86	1040	137	230	789	1650	1110
11	172	8.9	5.2	1.6	e1.1	e.95	1020	105	416	728	1470	1070
12	172	11	4.7	1.6	e1.0	e1.0	955	103	293	636	1340	1060
13	173	11	4.9	1.6	e.98	e.98	903	98	245	466	1240	1040
14	172	16	5.1	1.6	e.94	e.96	860	56	222	419	1140	1060
15	172	16	5.1	1.6	e.89	e.94	823	42	182	397	1070	1110
16	172	16	5.1	1.6	e.83	e.92	761	39	181	379	1040	1040
17	172	15	4.9	1.6	e.78	e.90	540	39	194	741	1040	950
18	171	15	4.6	1.6	e.74	e.89	505	36	234	722	918	862
19	164	14	4.6	1.6	e.70	e.88	487	34	213	680	844	840
20	94	13	4.5	1.6	e.66	e.89	235	33	196	668	740	806
21	86	12	4.2	1.6	e.62	e.90	180	30	181	613	639	722
22	86	14	4.1	1.6	e.58	e.94	170	29	169	539	607	701
23	85	14	3.9	1.6	e.55	e.97	165	32	214	452	614	615
24	85	13	3.6	1.6	e.52	e1.2	161	42	266	336	546	601
25	84	14	3.4	1.6	e.49	e1.4	156	78	233	537	480	597
26	84	14	3.1	1.6	e.46	e2.1	147	95	159	1300	420	591
27	83	12	2.7	1.6	e.44	e5.0	95	100	146	1600	252	565
28	84	11	2.3	1.6	e.41	e50	96	116	140	1620	308	448
29	84	10	2.0	1.6	---	e250	102	121	134	1550	411	436
30	83	9.6	1.8	1.6	---	e800	111	118	135	1480	1730	394
31	82	---	1.8	e1.6	---	e1100	---	115	---	1410	2160	---
TOTAL	4994	550.5	156.7	50.7	27.89	2227.53	19191	2784	5131	22033	31359	30368
MEAN	161	18.3	5.05	1.64	1.00	71.9	640	89.8	171	711	1012	1012
MAX	278	87	9.5	1.9	1.8	1100	1300	154	416	1620	2160	2040
MIN	82	7.4	1.8	1.6	.41	.37	95	29	31	85	252	394
AC-FT	9910	1090	311	101	55	4420	38070	5520	10180	43700	62200	60230
CFSM	.17	.02	.01	.00	.00	.07	.67	.09	.18	.74	1.05	1.06
IN.	.19	.02	.01	.00	.00	.09	.74	.11	.20	.85	1.22	1.18

e Estimated.

RED RIVER OF THE NORTH BASIN

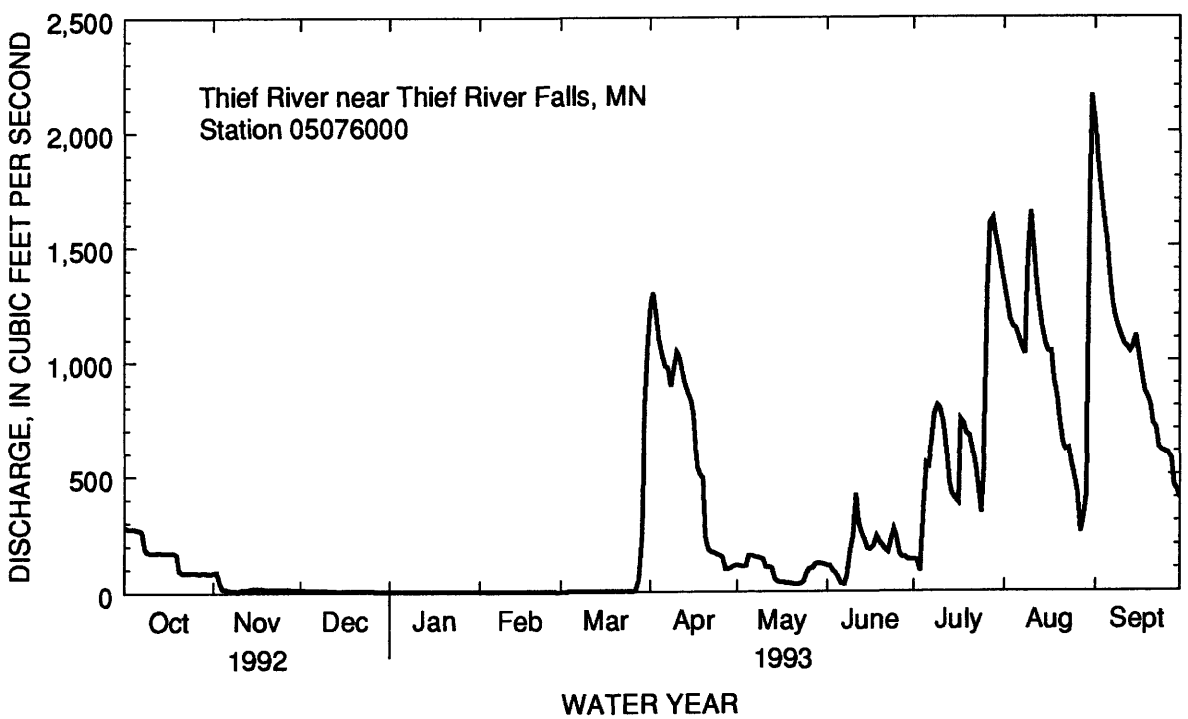
05076000 THIEF RIVER NEAR THIEF RIVER FALLS, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	84.6	61.9	19.2	5.57	3.53	66.5	579	458	285	199	93.9	97.5
MAX	637	844	206	100	45.0	609	2827	4274	1774	2103	1012	1012
(WY)	1986	1972	1945	1910	1910	1983	1966	1950	1962	1975	1993	1993
MIN	.000	.000	.000	.000	.000	.000	7.75	1.83	.032	.000	.000	.000
(WY)	1911	1911	1911	1911	1911	1930	1981	1990	1980	1932	1932	1929

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1909 - 1993	
ANNUAL TOTAL	57704.9		118873.32			
ANNUAL MEAN	158		326		162[a]	
HIGHEST ANNUAL MEAN					607	1966
LOWEST ANNUAL MEAN					1.28	1939
HIGHEST DAILY MEAN	1210	Apr 22	2160	Aug 31	5580	May 13 1950
LOWEST DAILY MEAN	1.8	Dec 30	.37	Mar 2	.00[b]	
ANNUAL SEVEN-DAY MINIMUM	2.4	Dec 25	.42	Feb 26	.00	Oct 1 1910
INSTANTANEOUS PEAK FLOW			2180	Aug 31	5610	May 13 1950
INSTANTANEOUS PEAK STAGE			11.90[c]	Apr 3	17.38	May 13 1950
ANNUAL RUNOFF (AC-FT)	114500		235800		117300	
ANNUAL RUNOFF (CFSM)	.16		.34		.17	
ANNUAL RUNOFF (INCHES)	2.24		4.61		2.29	
10 PERCENT EXCEEDS	464		1080		512	
50 PERCENT EXCEEDS	43		98		6.9	
90 PERCENT EXCEEDS	2.7		.98		.00	

a Median of annual mean discharges is 110 ft^3/s.
b Many days, several years.
c Backwater from ice.



RED RIVER OF THE NORTH BASIN

05078000 CLEARWATER RIVER AT PLUMMER, MN

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

DRAINAGE AREA.--512 mi².

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

GAGE.--Water-stage recorder. Datum of gage is 1,098.57 ft above sea level (levels by U.S. Army Corps of Engineers). Prior to Nov. 10, 1939, nonrecording gage at site 100 ft upstream at same datum.

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

EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 500 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
Mar. 31	--	800	*8.63a	Aug. 11	0100	724	6.42
July 28	2100	*954	7.20				

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	77	50	e58	e57	e53	e50	e760	239	191	199	617	372
2	72	59	e58	e57	e53	e50	e740	325	190	202	524	297
3	88	65	e58	e57	e53	e50	e700	294	163	228	461	261
4	102	e62	e58	e57	e53	e50	e620	244	139	277	430	235
5	89	e62	e58	e57	e53	e50	e550	209	124	451	402	214
6	71	e62	e58	e57	e53	e50	e470	184	120	471	394	193
7	62	e62	e58	e57	e52	e50	401	157	128	437	369	162
8	52	e61	e58	e57	e52	e50	310	179	163	405	327	143
9	49	e61	e58	e56	e52	e50	364	204	224	345	445	130
10	52	e61	e58	e56	e52	e50	430	208	233	300	675	123
11	52	e61	e58	e56	e52	e50	398	176	209	273	710	112
12	53	e61	e58	e56	e52	e50	348	132	180	250	594	104
13	48	e60	e58	e56	e52	e50	318	103	159	233	446	92
14	47	e60	e58	e56	e52	e50	288	80	175	285	374	82
15	42	e60	e58	e56	e52	e50	267	64	217	280	359	58
16	41	e60	e58	e56	e52	e50	256	59	215	262	341	53
17	40	e60	e58	e56	e51	e50	248	59	256	316	307	64
18	43	e60	e58	e55	e51	e50	253	65	295	365	276	65
19	47	e60	e57	e55	e51	e50	213	79	282	351	245	89
20	56	e60	e57	e55	e51	e50	219	64	251	329	222	73
21	58	e60	e57	e55	e51	e50	203	62	227	314	203	84
22	54	e60	e57	e55	e50	e50	178	67	209	278	187	109
23	52	e59	e57	e54	e50	e50	150	59	184	242	179	111
24	54	e59	e57	e54	e50	e54	140	70	183	222	170	114
25	60	e59	e57	e54	e50	e60	166	90	221	370	164	84
26	52	e59	e57	e54	e50	e70	160	118	279	696	154	69
27	55	e59	e57	e54	e50	e90	144	135	281	803	174	63
28	55	e58	e57	e54	e50	e200	170	152	245	923	202	62
29	62	e58	e57	e54	---	e340	212	149	206	923	210	53
30	52	e58	e57	e54	---	e600	228	149	169	839	324	57
31	49	---	e57	e54	---	e800	---	158	---	727	444	---
TOTAL	1786	1796	1785	1721	1443	3364	9904	4333	6118	12596	10929	3728
MEAN	57.6	59.9	57.6	55.5	51.5	109	330	140	204	406	353	124
MAX	102	65	58	57	53	800	760	325	295	923	710	372
MIN	40	50	57	54	50	50	140	59	120	199	154	53
AC-FT	3540	3560	3540	3410	2860	6670	19640	8590	12140	24980	21680	7390
CFSM	.11	.12	.11	.11	.10	.21	.64	.27	.40	.79	.69	.24

a Backwater from ice.
e Estimated.

RED RIVER OF THE NORTH BASIN

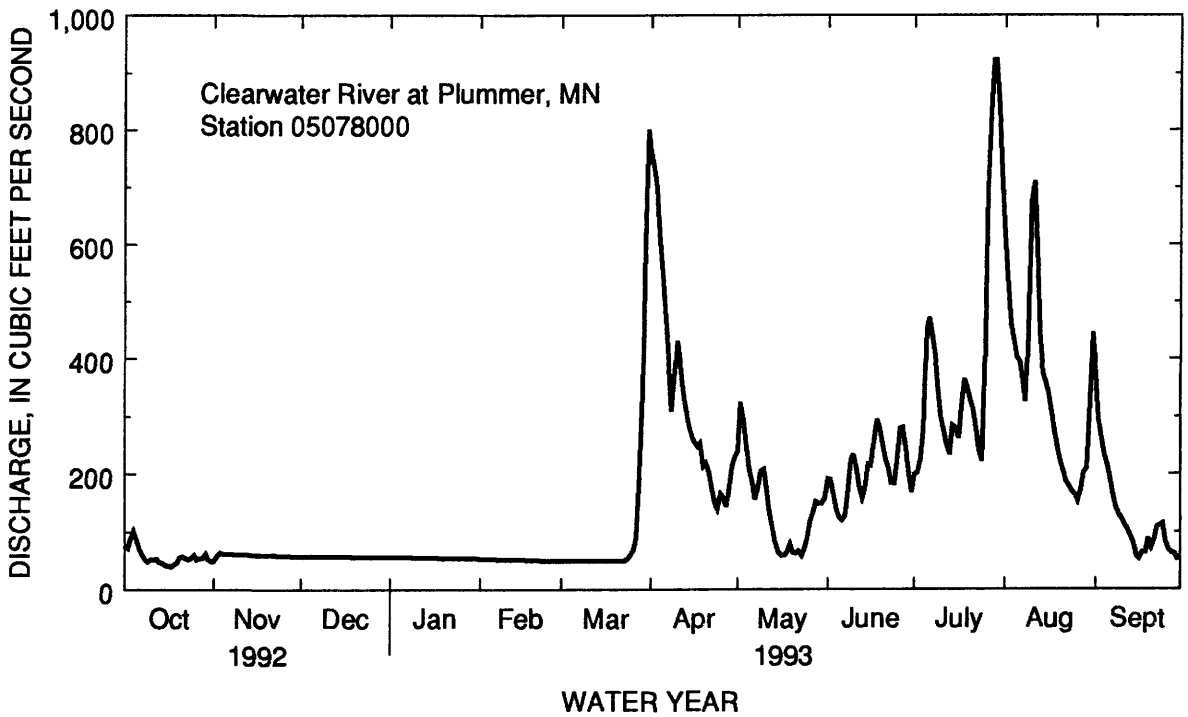
05078000 CLEARWATER RIVER AT PLUMMER, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1939 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	114	91.7	63.4	50.7	46.9	110	522	348	252	198	122	105
MAX	483	503	140	90.1	98.4	351	1391	1974	1140	844	507	666
(WY)	1972	1972	1978	1952	1974	1945	1966	1950	1962	1975	1985	1973
MIN	21.5	23.8	24.4	18.4	19.0	22.8	26.8	7.52	30.1	16.0	13.3	14.1
(WY)	1941	1991	1990	1940	1940	1940	1977	1977	1991	1940	1940	1940

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1939 - 1993	
ANNUAL TOTAL	45558		59503			
ANNUAL MEAN	124		163		169	
HIGHEST ANNUAL MEAN					354	1950
LOWEST ANNUAL MEAN					57.0	1990
HIGHEST DAILY MEAN	767	Aug 26	923	Jul 28	3840	Apr 25 1979
LOWEST DAILY MEAN	27	Mar 19	40	Oct 17	2.6	May 16 1977
ANNUAL SEVEN-DAY MINIMUM	31	Jan 22	44	Oct 13	2.9	May 10 1977
INSTANTANEOUS PEAK FLOW			954	Jul 28	3940	Apr 25 1979
INSTANTANEOUS PEAK STAGE			8.63	Mar 31	12.37[a]	Apr 18 1979
INSTANTANEOUS LOW FLOW			34	Oct 19	2.5	May 16 1977
ANNUAL RUNOFF (AC-FT)	90360		118000		122800	
ANNUAL RUNOFF (CFSM)	.24		.32		.33	
10 PERCENT EXCEEDS	332		369		400	
50 PERCENT EXCEEDS	61		65		74	
90 PERCENT EXCEEDS	35		50		32	

a Backwater from ice.



RED RIVER OF THE NORTH BASIN

05078230 LOST RIVER AT OKLEE, MN

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

DRAINAGE AREA.--266 mi².

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.--Water-stage recorder. Datum of gage is 1,126.94 ft above sea level, adjustment of 1912 (levels by U.S. Army Corps of Engineers). Prior to Sept. 9, 1960, reference points at same site at datum 8.00 ft higher. Sept. 9, 1960, to Sept. 30, 1964, nonrecording gage at same site at datum 8.00 ft higher. Oct. 1, 1964, to Sept. 30, 1981, and Feb. 24, 1982, to Sept. 6, 1989, nonrecording gage at same site and datum.

REMARKS.--Records good except those for estimated daily discharges, which are poor.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known since at least 1897, 18.39 ft, present datum, Apr. 21, 1950, from floodmarks, discharge, 2,790 ft³/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	21	19	21	e13	e10	e8.5	439	113	88	81	186	126
2	20	18	21	e13	e10	e8.4	310	105	84	106	158	118
3	19	20	21	e13	e10	e8.4	240	103	81	161	139	112
4	18	21	21	e12	e9.9	e8.4	215	99	71	297	130	102
5	19	25	21	e12	e9.9	e8.4	201	95	52	423	130	91
6	19	28	21	e12	e9.8	e8.4	190	85	41	299	136	79
7	18	40	21	e12	e9.8	e8.4	172	60	32	221	129	70
8	18	40	21	e12	e9.7	e8.4	173	51	67	183	121	61
9	19	38	21	e12	e9.7	e8.4	199	48	142	150	532	55
10	19	40	21	e12	e9.6	e8.4	189	46	137	125	556	51
11	19	43	21	e12	e9.5	e8.4	170	43	112	108	367	48
12	19	50	e21	e12	e9.5	e8.4	157	38	95	96	258	45
13	18	42	e21	e11	e9.4	e8.4	150	29	91	92	200	40
14	18	e43	e21	e11	e9.4	e8.4	146	20	94	85	167	38
15	18	43	e21	e11	e9.3	e8.4	140	18	107	79	160	37
16	19	43	e20	e11	e9.2	e8.4	133	18	114	86	150	36
17	20	43	e20	e11	e9.2	e8.4	127	17	140	120	133	35
18	20	42	e19	e11	e9.1	e8.4	123	16	145	148	114	34
19	20	41	e19	e11	e9.0	e8.4	121	16	130	137	100	32
20	21	41	e19	e11	e9.0	e8.4	118	13	112	126	91	35
21	23	43	e18	e11	e8.9	e8.4	115	16	100	114	85	36
22	24	43	e18	e11	e8.9	e8.4	110	18	88	102	78	46
23	27	41	e17	e11	e8.8	e10	106	15	87	93	73	73
24	28	20	e17	e11	e8.8	e20	105	16	109	90	69	71
25	26	21	e16	e11	e8.7	e30	108	41	133	191	65	52
26	24	20	e16	e11	e8.7	e80	105	74	135	524	60	43
27	22	21	e15	e10	e8.6	e200	103	77	134	646	59	38
28	20	21	e15	e10	e8.6	e400	107	87	128	538	64	38
29	19	21	e14	e10	---	e800	113	85	109	403	68	36
30	18	21	e14	e10	---	e1000	115	82	93	294	86	34
31	19	---	e14	e10	---	899	---	83	---	227	131	---
TOTAL	632	992	586	351	261.0	3623.9	4800	1627	3051	6345	4795	1712
MEAN	20.4	33.1	18.9	11.3	9.32	117	160	52.5	102	205	155	57.1
MAX	28	50	21	13	10	1000	439	113	145	646	556	126
MIN	18	18	14	10	8.6	8.4	103	13	32	79	59	32
AC-FT	1250	1970	1160	696	518	7190	9520	3230	6050	12590	9510	3400
CFSM	.08	.12	.07	.04	.04	.44	.60	.20	.38	.77	.58	.21
IN.	.09	.14	.08	.05	.04	.51	.67	.23	.43	.89	.67	.24

e Estimated.

RED RIVER OF THE NORTH BASIN

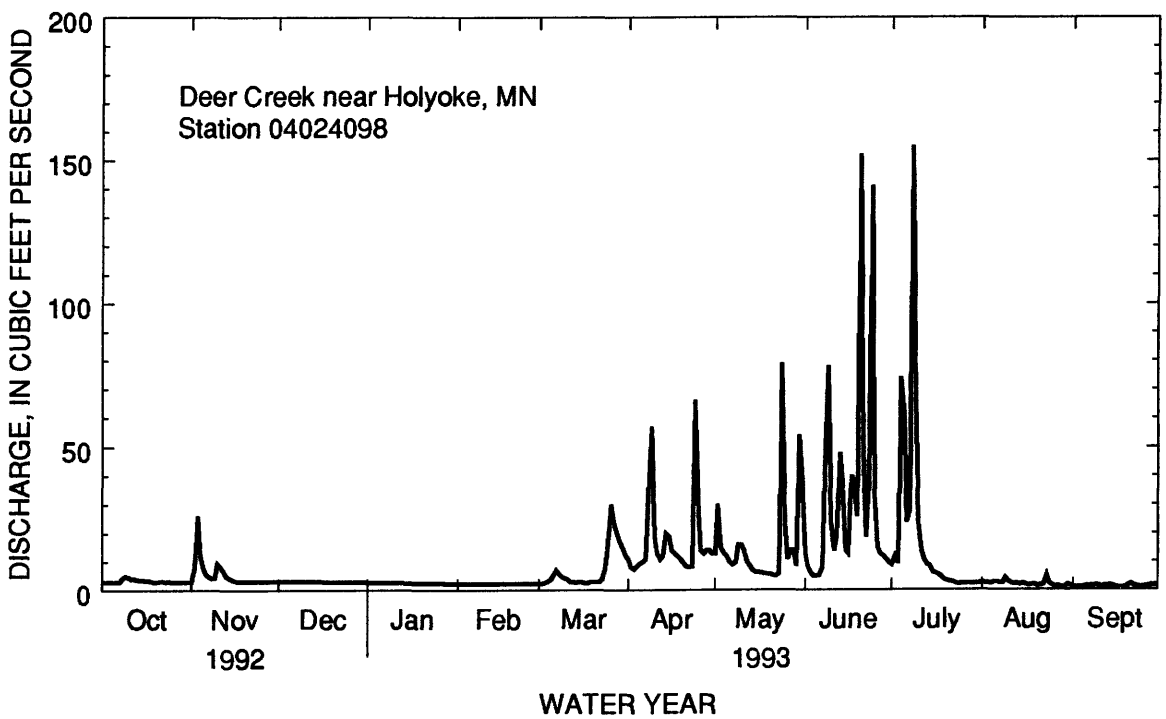
05078230 LOST RIVER AT OKLEE, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	45.4	30.1	13.2	7.81	7.55	69.4	302	129	82.2	70.0	40.6	36.5
MAX	470	232	56.6	19.8	25.8	242	745	622	657	442	351	330
(WY)	1972	1972	1978	1986	1984	1986	1966	1962	1962	1962	1985	1973
MIN	1.02	1.11	.050	.002	.000	.19	29.5	10.5	8.20	1.99	1.17	.000
(WY)	1991	1977	1977	1977	1977	1964	1991	1980	1980	1961	1961	1990

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1960 - 1993	
ANNUAL TOTAL	16523.0		28775.9			
ANNUAL MEAN	45.1		78.8		69.0	
HIGHEST ANNUAL MEAN					177	1962
LOWEST ANNUAL MEAN					18.2	1990
HIGHEST DAILY MEAN	400	Mar 7	1000	Mar 30	3040	Apr 11 1969
LOWEST DAILY MEAN	9.3	Jun 14	8.4a	Mar 2-22	.00b	Feb 16 1963
ANNUAL SEVEN-DAY MINIMUM	10	Jun 11	8.4	Mar 2	.00	Feb 16 1963
INSTANTANEOUS PEAK FLOW			1000	Mar 30	3210	Apr 11 1969
INSTANTANEOUS PEAK STAGE			12.47c	Mar 29,30	16.72d	May 24 1962
INSTANTANEOUS LOW FLOW			8.4a	Mar 2		
ANNUAL RUNOFF (AC-FT)	32770		57080		49970	
ANNUAL RUNOFF (CFSM)	.17		.30		.26	
ANNUAL RUNOFF (INCHES)	2.31		4.02		3.52	
10 PERCENT EXCEEDS	105		160		161	
50 PERCENT EXCEEDS	21		38		17	
90 PERCENT EXCEEDS	15		9.4		2.2	

a Minimum observed.
b Many days, several years.
c Backwater from ice.
d Present datum.



RED RIVER OF THE NORTH BASIN

05078500 CLEARWATER RIVER AT RED LAKE FALLS, MN

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

DRAINAGE AREA.--1,370 mi², approximately.

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

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

GAGE.--Water-stage recorder. Datum of gage is 948.94 ft above sea level (levels by U.S. Army Corps of Engineers). Prior to Sept. 12, 1911, nonrecording gage at site 0.5 mi upstream, and Sept. 12, 1911, to Sept. 30, 1917, nonrecording gage at site 40 ft upstream at different datum.

REMARKS.--Records good except those for estimated daily discharges, which are poor.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	132	86	e115	e82	e83	e83	2530	436	250	277	1350	714
2	129	89	e127	e83	e83	e83	1930	478	288	314	1130	603
3	124	97	e127	e83	e83	e83	1650	512	268	322	935	523
4	134	e82	e117	e83	e83	e83	1430	456	233	433	835	487
5	145	e74	e105	e83	e83	e83	1350	402	206	787	771	447
6	130	e74	e94	e83	e83	e83	1350	364	189	1080	732	418
7	115	e74	e85	e83	e83	e83	1130	323	191	929	713	391
8	107	e76	e80	e83	e83	e83	919	301	258	768	645	350
9	96	e79	e80	e83	e83	e83	974	328	431	653	1150	317
10	90	e81	e80	e83	e83	e83	1050	334	561	532	2520	287
11	91	e83	e81	e83	e83	e83	996	320	506	456	2290	269
12	85	e85	e81	e83	e83	e83	882	269	405	395	1740	244
13	87	e83	e81	e83	e83	e83	793	232	328	366	1290	235
14	83	e80	e81	e83	e83	e83	763	205	289	347	1020	211
15	81	e75	e81	e83	e83	e83	734	166	314	409	883	197
16	79	e100	e81	e83	e83	e83	675	138	383	385	845	165
17	77	e100	e81	e83	e83	e83	611	128	412	413	767	155
18	73	e100	e81	e83	e83	e83	596	122	528	539	660	159
19	81	e100	e81	e83	e83	e83	543	126	526	587	569	160
20	81	e100	e81	e83	e83	e83	494	132	461	518	503	174
21	92	e105	e81	e83	e83	e83	475	116	401	488	456	158
22	101	e110	e82	e83	e83	e83	437	108	363	445	416	177
23	117	e110	e82	e83	e83	e83	405	116	340	388	393	219
24	122	e110	e82	e83	e83	e83	363	126	312	353	370	256
25	121	e110	e82	e83	e83	e83	363	134	347	640	352	258
26	123	e110	e82	e83	e83	e100	377	157	431	2580	335	195
27	125	e110	e82	e83	e83	e200	350	199	469	2610	314	161
28	116	e110	e82	e83	e83	e1500	336	220	425	2420	347	148
29	106	e110	e82	e83	---	e2600	386	238	371	2190	386	140
30	103	e110	e82	e83	---	e3200	428	242	315	1870	460	126
31	93	---	e82	e83	---	e3000	---	235	---	1590	672	---
TOTAL	3239	2813	2721	2572	2324	12675	25320	7663	10801	26084	25849	8344
MEAN	104	93.8	87.8	83.0	83.0	409	844	247	360	841	834	278
MAX	145	110	127	83	83	3200	2530	512	561	2610	2520	714
MIN	73	74	80	82	83	83	336	108	189	277	314	126
AC-FT	6420	5580	5400	5100	4610	25140	50220	15200	21420	51740	51270	16550
CFSM	.08	.07	.06	.06	.06	.30	.62	.18	.26	.61	.61	.20
IN.	.09	.08	.07	.07	.06	.34	.69	.21	.29	.71	.70	.23

e Estimated.

RED RIVER OF THE NORTH BASIN

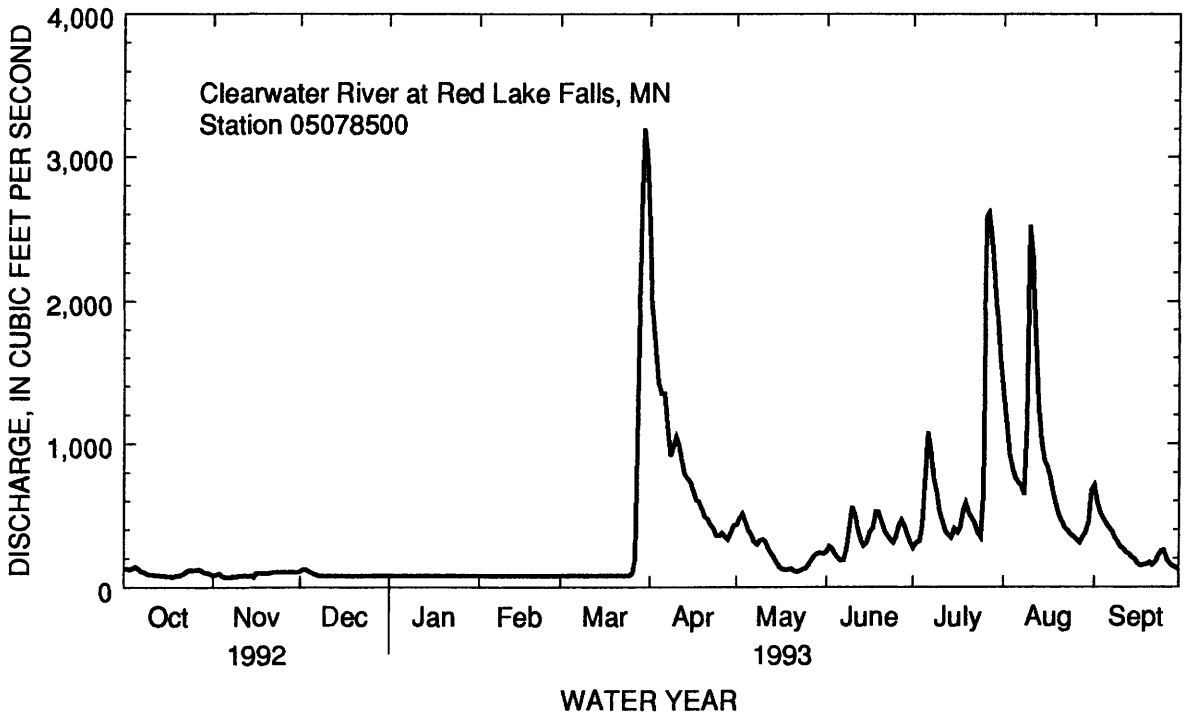
05078500 CLEARWATER RIVER AT RED LAKE FALLS, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	179	135	85.0	67.8	62.7	226	1131	664	478	348	203	177
MAX	1350	1233	260	220	150	993	3458	5059	3042	1613	1686	1267
(WY)	1972	1972	1910	1910	1984	1946	1966	1950	1962	1962	1985	1973
MIN	10.0	19.0	21.4	21.4	19.1	13.6	61.0	32.2	26.5	8.34	1.49	2.92
(WY)	1935	1935	1937	1940	1937	1937	1981	1977	1980	1936	1936	1936

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1909 - 1993	
ANNUAL TOTAL	84466		130405			
ANNUAL MEAN	231		357		310[a]	
HIGHEST ANNUAL MEAN					855	1950
LOWEST ANNUAL MEAN					64.4	1939
HIGHEST DAILY MEAN	1610	Aug 25	3200	Mar 30	9930	Apr 25 1979
LOWEST DAILY MEAN	55	Feb 8	73	Oct 18	.10	Sep 15 1936
ANNUAL SEVEN-DAY MINIMUM	61	Feb 6	77	Nov 4	.24	Sep 12 1936
INSTANTANEOUS PEAK FLOW					10300	Apr 25 1979
INSTANTANEOUS PEAK STAGE			9.88[b]	Mar 30	15.85[c]	Mar 6 1983
INSTANTANEOUS LOW FLOW					.00	Sep 15 1936
ANNUAL RUNOFF (AC-FT)	167500		258700		224300	
ANNUAL RUNOFF (CFSM)	.17		.26		.23	
ANNUAL RUNOFF (INCHES)	2.29		3.54		3.07	
10 PERCENT EXCEEDS	567		810		769	
50 PERCENT EXCEEDS	116		132		104	
90 PERCENT EXCEEDS	70		82		36	

a Median of annual mean discharges is 273 ft³/s.
b Backwater from ice.
c Highwater mark, backwater from ice.



RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN

LOCATION.--Lat 47°46'32", long 96°36'33", in SW¼SW¼ sec.30, T.150 N., R.46 W., Polk County, Hydrologic Unit 09020303, on right bank 100 ft upstream from Sargent Street bridge in Crookston, 0.3 mi downstream from Interstate Power Co.'s dam, 0.6 mi downstream from bridge on U.S. Highway 75, and 53 mi upstream from mouth.

DRAINAGE AREA.--5,280 mi², approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1901 to current year. Monthly discharge only for some periods, published in WSP 1308. Figures of daily discharge for Apr. 3-30, 1904, published in WSP 130, have been found unreliable and should not be used.

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

GAGE.--Water-stage recorder. Datum of gage is 832.72 ft above sea level. May 18, 1901, to June 30, 1909, nonrecording gage at bridge 300 ft upstream at same datum. July 1, 1909, to Sept. 25, 1911, nonrecording gage, Sept. 26, 1911, to Sept. 30, 1919, water-stage recorder, Oct. 1, 1919, to Sept. 30, 1930, nonrecording gage, at present site and datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Diurnal fluctuation prior to 1975 caused by powerplant 1,000 ft upstream. Runoff from 1,950 mi2 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).

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	773	303	e450	e575	e588	e604	e7080	987	1040	1100	3970	5310
2	725	304	e580	e575	e588	e604	e6900	1040	1140	1240	3440	4850
3	709	311	e640	e575	e588	e604	e6200	1180	1170	1230	3060	4090
4	698	323	e660	e575	e588	e604	e5400	1240	1170	1310	2740	3600
5	677	303	e650	e575	e588	e604	e4600	1180	1160	1900	2710	3200
6	720	196	e645	e575	e590	e606	e4100	1130	1240	2870	2470	2900
7	654	166	e640	e575	e590	e606	3640	1130	1240	2910	2540	2660
8	654	162	e630	e575	e590	e606	3030	1100	1310	2610	2530	2470
9	629	215	e625	e575	e590	e606	2760	1060	1420	2380	2530	2360
10	563	381	e620	e575	e590	e606	2820	1090	1770	2210	4660	2260
11	531	318	e615	e575	e590	e606	2900	1040	1930	1990	5430	2240
12	535	288	e610	e575	e592	e608	2760	1040	1990	1760	4920	2220
13	527	205	e605	e575	e592	e608	2470	940	1820	1630	4240	2240
14	523	190	e600	e577	e592	e608	2370	880	1600	1380	3580	2200
15	522	160	e595	e580	e592	e608	2300	840	1510	1280	3180	2190
16	517	218	e590	e582	e594	e608	2190	878	1540	1320	2870	2250
17	504	244	e590	e582	e594	e608	2080	963	1570	1360	2720	2210
18	519	283	e585	e582	e594	e608	1800	1030	1640	1680	2590	2120
19	510	326	e585	e582	e596	e608	1640	999	1760	1990	2400	2020
20	514	329	e580	e582	e596	e608	1560	1070	1750	1900	2360	2000
21	513	259	e580	e584	e596	e610	1430	1110	1590	1850	2020	2010
22	457	328	e575	e584	e598	e610	1170	1060	1500	1790	2030	1910
23	462	290	e575	e584	e598	e615	1150	1070	1430	1680	1970	1890
24	472	301	e575	e584	e598	e620	1050	1110	1500	1610	1950	1860
25	482	281	e575	e584	e600	e640	1000	973	1440	1760	1890	1870
26	442	242	e575	e586	e600	e680	998	879	1480	3500	1810	1840
27	382	218	e575	e586	e602	e800	970	882	1480	5890	1740	1720
28	360	199	e575	e586	e602	e1100	936	713	1410	6310	1600	1520
29	335	e220	e575	e586	---	e2000	882	625	1330	5860	1670	1270
30	301	e290	e575	e586	---	e3000	950	573	1430	5170	1970	1150
31	310	---	e575	e586	---	e5000	---	837	---	4560	4340	---
TOTAL	16520	7853	18425	17978	16616	27803	79136	30649	44360	76030	87930	72430
MEAN	533	262	594	580	593	897	2638	989	1479	2453	2836	2414
MAX	773	381	660	586	602	5000	7080	1240	1990	6310	5430	5310
MIN	301	160	450	575	588	604	882	573	1040	1100	1600	1150
AC-FT	32770	15580	36550	35660	32960	55150	157000	60790	87990	150800	174400	143700
CFSM	.10	.05	.11	.11	.11	.17	.50	.19	.28	.46	.54	.46
IN.	.12	.06	.13	.13	.12	.20	.56	.22	.31	.54	.62	.51

e Estimated.

RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

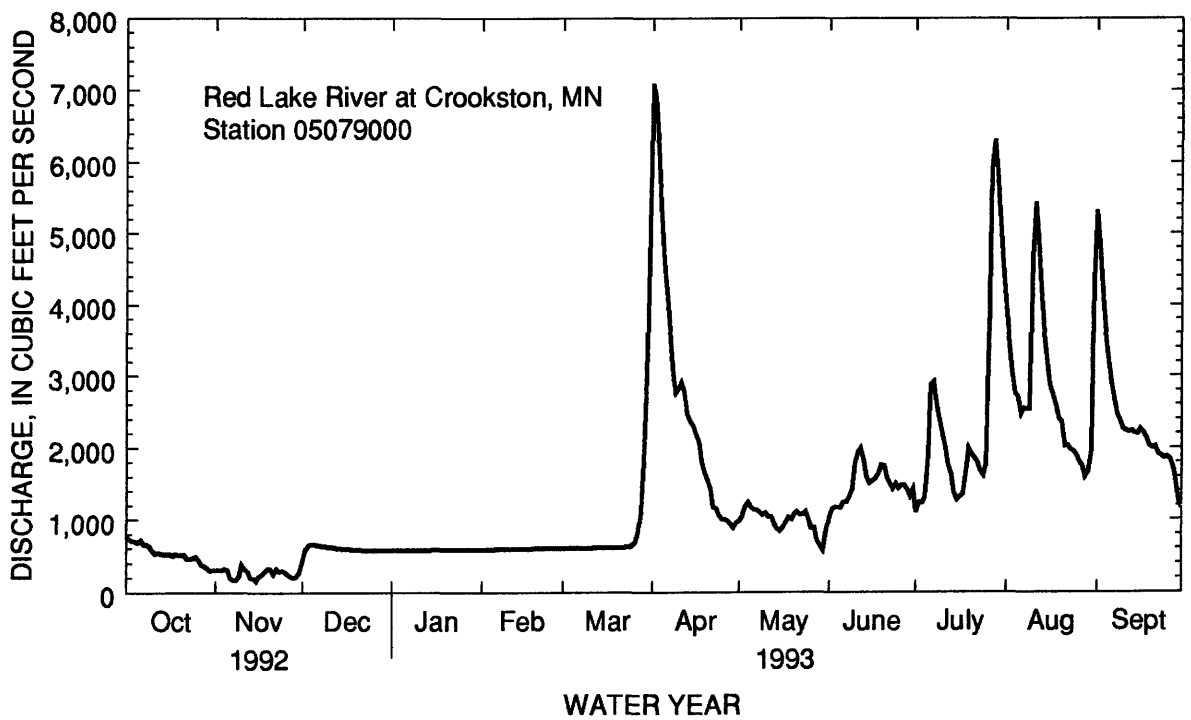
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1901 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	801	659	545	493	469	934	2944	2039	1641	1252	811	804
MAX	2836	3172	1900	1663	1464	3626	10260	15290	7205	6851	3868	3009
(WY)	1972	1972	1904	1951	1951	1910	1966	1950	1962	1975	1985	1905
MIN	8.02	10.1	5.34	15.6	17.8	24.9	232	154	80.4	26.2	12.3	8.87
(WY)	1937	1937	1937	1934	1937	1936	1981	1934	1934	1936	1934	1934

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1901 - 1993	
ANNUAL TOTAL	230915		495730			
ANNUAL MEAN	631		1358		1112	
HIGHEST ANNUAL MEAN					3129	1950
LOWEST ANNUAL MEAN					83.6	1934
HIGHEST DAILY MEAN	2370	Apr 23	7080	Apr 1	27100	Apr 12 1969
LOWEST DAILY MEAN	100	Feb 3	160	Nov 15	2.5	Sep 29 1936
ANNUAL SEVEN-DAY MINIMUM	139	Jan 28	227	Nov 12	3.9	Sep 28 1936
INSTANTANEOUS PEAK FLOW			7400	Apr 1	28400	Apr 12 1969
INSTANTANEOUS PEAK STAGE			18.24[a]	Apr 1	27.33	Apr 12 1969
INSTANTANEOUS LOW FLOW			98	Nov 13	.00[b]	Jul 13 1960
ANNUAL RUNOFF (AC-FT)	458000		983300		805400	
ANNUAL RUNOFF (CFSM)	.12		.26		.21	
ANNUAL RUNOFF (INCHES)	1.63		3.49		2.86	
10 PERCENT EXCEEDS	1350		2840		2490	
50 PERCENT EXCEEDS	523		840		650	
90 PERCENT EXCEEDS	145		447		109	

a Backwater from ice.

b Caused by regulation of powerplant upstream.



RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued
(National stream-quality accounting network station)
(National water-quality assessment 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 COLLECTED THROUGH THE NATIONAL STREAM-QUALITY ACCOUNTING NETWORK

WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT										
21...	1315	574	438	421	8.3	8.4	3.0	3.6	740	13.3
NOV										
24...	0845	303	540	547	8.2	8.2	0.0	2.4	742	14.1
JAN										
12...	1400	562	400	395	7.7	7.8	1.0	3.1	744	10.6
APR										
13...	1530	2160	465	--	8.1	7.6	6.5	11	741	11.8
JUL										
28...	1400	7030	420	399	7.8	7.8	22.0	60	735	6.2

DATE	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)
OCT										
21...	K14	31	56	21	5.0	2.7	183	186	0	223
NOV										
24...	24	K9	64	26	9.5	3.5	245	237	0	299
JAN										
12...	K7	20	46	17	5.2	<0.10	195	195	0	238
APR										
13...	K3	75	57	20	5.1	1.4	170	145	0	207
JUL										
28...	K170	K190	49	18	4.3	5.6	161	152	0	196

DATE	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	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)
OCT									
21...	40	3.3	0.10	6.5	293	<0.010	<0.050	0.020	0.90
NOV									
24...	55	7.2	0.10	7.9	342	<0.010	0.056	0.020	0.70
JAN									
12...	14	3.4	0.10	11	244	0.020	0.150	0.110	0.90
APR									
13...	61	7.3	0.10	11	329	0.040	0.610	0.080	1.1
JUL									
28...	49	6.0	0.20	16	281	0.010	0.200	0.080	1.3

RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

WATER QUALITY DATA COLLECTED THROUGH THE NATIONAL STREAM-QUALITY ACCOUNTING NETWORK

WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	ALUMI-NUM, DIS-SOLVED (UG/L AS AL) (01106)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	IRON, DIS-SOLVED (UG/L AS FE) (01046)
OCT									
21...	0.020	0.020	<0.010	5	100	<10	42	<3	18
NOV									
24...	0.010	0.010	<0.010	48	76	--	--	--	--
JAN									
12...	0.040	0.020	0.010	10	86	<10	52	<3	15
APR									
13...	0.080	0.020	0.020	45	93	20	48	<3	58
JUL									
28...	0.270	0.090	0.060	250	94	20	51	<3	70

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	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)
OCT								
21...	11	10	<10	1	<1	<1.0	120	<6
NOV								
24...	--	--	--	--	--	--	--	--
JAN								
12...	8	16	<10	<1	<1	<1.0	100	<6
APR								
13...	13	60	<10	1	<1	<1.0	120	<6
JUL								
28...	13	2	10	2	<1	<1.0	120	<6

RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

WATER QUALITY DATA COLLECTED THROUGH THE NATIONAL WATER-QUALITY ASSESSMENT PROGRAM

WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)
FEB										
10...	0900	--	E590	382	392	7.9	7.8	-14.5	0.0	750
APR										
03...	1000	--	E6200	345	357	7.6	7.5	3.0	3.5	748
MAY										
07...	1045	1150	--	443	454	8.3	8.1	12.5	10.5	731
19...	0915	989	--	354	366	8.3	8.1	9.5	11.5	743
JUN										
15...	1500	1500	--	439	445	8.0	7.8	23.5	18.5	744
JUL										
07...	1240	2810	--	444	450	--	7.8	17.0	16.5	738
AUG										
27...	1035	1740	--	453	435	7.8	8.0	17.5	21.5	743

DATE	OXYGEN, DIS-SOLVED (MG/L) (00300)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
FEB										
10...	11.9	38	16	4.5	2.7	220	0	181	--	12
APR										
03...	12.6	39	14	3.8	7.8	131	0	108	117	43
MAY										
07...	10.2	57	22	5.6	3.7	234	0	192	185	56
19...	10.3	44	17	4.5	2.9	199	0	163	170	21
JUN										
15...	8.8	53	22	5.6	3.8	217	0	178	183	48
JUL										
07...	7.9	58	21	5.1	4.4	191	0	157	160	68
AUG										
27...	8.0	63	21	4.5	3.6	214	0	175	185	39

RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

WATER QUALITY DATA COLLECTED THROUGH THE NATIONAL WATER-QUALITY ASSESSMENT PROGRAM

WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	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)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)
FEB									
10...	3.7	0.10	9.5	227	0.020	0.150	0.180	0.80	0.70
APR									
03...	8.7	0.20	10	237	0.090	2.40	0.300	1.6	1.3
MAY									
07...	4.6	0.20	3.1	289	<0.010	0.077	0.020	0.80	0.60
19...	4.0	0.20	5.9	217	<0.010	<0.050	0.020	0.70	0.70
JUN									
15...	4.8	0.20	7.9	289	<0.010	0.055	0.020	0.80	0.70
JUL									
07...	5.9	0.20	13	266	0.020	0.350	0.080	0.90	1.0
AUG									
27...	3.9	0.20	16	286	<0.010	0.096	0.030	0.90	0.90

DATE	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	SEDIMENT, SUSPENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
FEB									
10...	0.040	0.010	<0.010	14	18	--	--	--	--
APR									
03...	0.180	0.120	0.120	110	54	--	--	63	99
MAY									
07...	0.030	<0.010	<0.010	17	15	--	--	--	--
19...	0.020	<0.010	0.020	11	8	--	--	--	--
JUN									
15...	0.040	0.020	0.020	14	12	--	--	27	93
JUL									
07...	0.070	0.060	0.050	45	8	--	--	149	100
AUG									
27...	0.070	0.050	0.040	14	3	18	1.1	35	97

RED RIVER OF THE NORTH BASIN

05082500 RED RIVER OF THE NORTH AT GRAND FORKS, ND

LOCATION.--Lat 47°55'38", long 97°01'34", in sec.2, T.151 N., R.50 W., Grand Forks County, Hydrologic Unit 09020301, on the right bank 200 ft upstream from the DeMers Avenue bridge, 0.4 mi downstream from Red Lake River, and at mile 293.8.

DRAINAGE AREA.--30,100 mi², approximately, including 3,800 mi² in closed basins.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--April 1882 to current year. Prior to January 1904 monthly discharge only, published in WSP 1308.

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

GAGE.--Water-stage recorder. Datum of gage is 779.00 ft above sea level. Oct. 1, 1983, to Sept. 30, 1986, datum of gage was 780.00 ft at same site. Apr. 14, 1965, to Sept. 30, 1983, water-stage recorder 1.9 mi downstream at a datum of 778.35 ft. Nov. 3, 1933, to Apr. 13, 1965, water-stage recorder 0.3 mi upstream at 778.35 ft datum. See WSP 1728 or 1913 for history of changes prior to Nov. 3, 1933.

REMARKS.--Records good except those for period of estimated daily discharges, which are fair.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1540	681	754	e840	e1000	e1050	17700	4570	3130	6210	25900	8220
2	1480	689	1020	e830	e1000	e1080	20100	4490	3410	6090	26100	9400
3	1440	726	e1000	e800	e1000	e1100	22200	4420	3580	6070	26200	9680
4	1380	752	e990	e760	e1000	e1120	23000	4440	3910	5900	26200	9170
5	1330	765	e960	e750	e1000	1140	25200	4460	4260	5730	26100	8440
6	1280	752	e880	e750	1050	1140	25500	4350	4430	6100	25900	7660
7	1250	673	e810	e740	1050	1140	25200	4210	4360	7130	25500	7080
8	1220	609	e800	e730	1040	1140	24500	4110	4230	7780	25000	6830
9	1190	648	e830	e740	e1050	1130	23500	3960	4060	8030	24400	6630
10	1150	743	e860	e750	e1050	1160	22600	3750	3970	7810	23600	6420
11	1120	775	e890	e775	e1100	1190	21700	3610	4060	7320	22900	6230
12	1040	812	e900	e780	e1150	e1200	20700	3440	4200	6760	22200	6140
13	1010	668	e900	e780	e1150	e1250	19300	3370	4360	6270	20900	6070
14	989	619	e900	e780	e1150	e1300	17100	3240	4290	5880	19900	6050
15	973	596	e900	e780	e1150	e1300	14200	3120	4160	5590	18800	5970
16	954	554	e900	e790	e1150	e1300	11300	3030	4170	5510	17500	5860
17	941	659	e900	e790	e1150	e1300	8750	2970	4220	6340	16100	5850
18	916	757	e900	e790	e1200	e1300	7110	2970	4360	9580	14800	5790
19	921	897	e900	e790	e1200	e1300	6500	3000	4620	12900	13500	5620
20	915	948	e900	e790	e1200	e1300	6160	2900	4830	15100	12700	5420
21	932	990	e880	e800	e1190	e1300	5950	2860	4820	16600	11900	5290
22	903	985	e860	e800	e1170	e1320	5720	2880	4680	17600	11100	5240
23	908	977	e850	e800	e1150	e1340	5400	2880	4590	18300	10400	5120
24	901	1070	e850	e800	e1100	e1350	5180	2880	4590	18900	9360	5090
25	870	1060	e850	e820	e1050	e1400	4930	2860	4960	19700	9010	5050
26	901	906	e850	e840	e1030	1530	4740	2830	5480	20500	8340	4950
27	846	694	e860	e860	e1000	1880	4670	2760	5610	21600	7500	4860
28	808	556	e850	e900	e1000	2970	4670	2680	5680	22900	6850	4710
29	745	540	e840	e960	---	5520	4690	2660	5790	24100	6640	4470
30	730	600	e840	e980	---	10600	4640	2770	5980	24900	6550	4220
31	713	---	e840	e1000	---	14800	---	2880	---	25500	6800	---
TOTAL	32296	22701	27264	25095	30530	67950	412910	105350	134790	378700	528650	187530
MEAN	1042	757	879	810	1090	2192	13760	3398	4493	12220	17050	6251
MAX	1540	1070	1020	1000	1200	14800	25500	4570	5980	25500	26200	9680
MIN	713	540	754	730	1000	1050	4640	2660	3130	5510	6550	4220
AC-FT	64060	45030	54080	49780	60560	134800	819000	209000	267400	751200	1049000	372000

e Estimated.

RED RIVER OF THE NORTH BASIN

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

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1904 - 1993, BY WATER YEAR (WY)

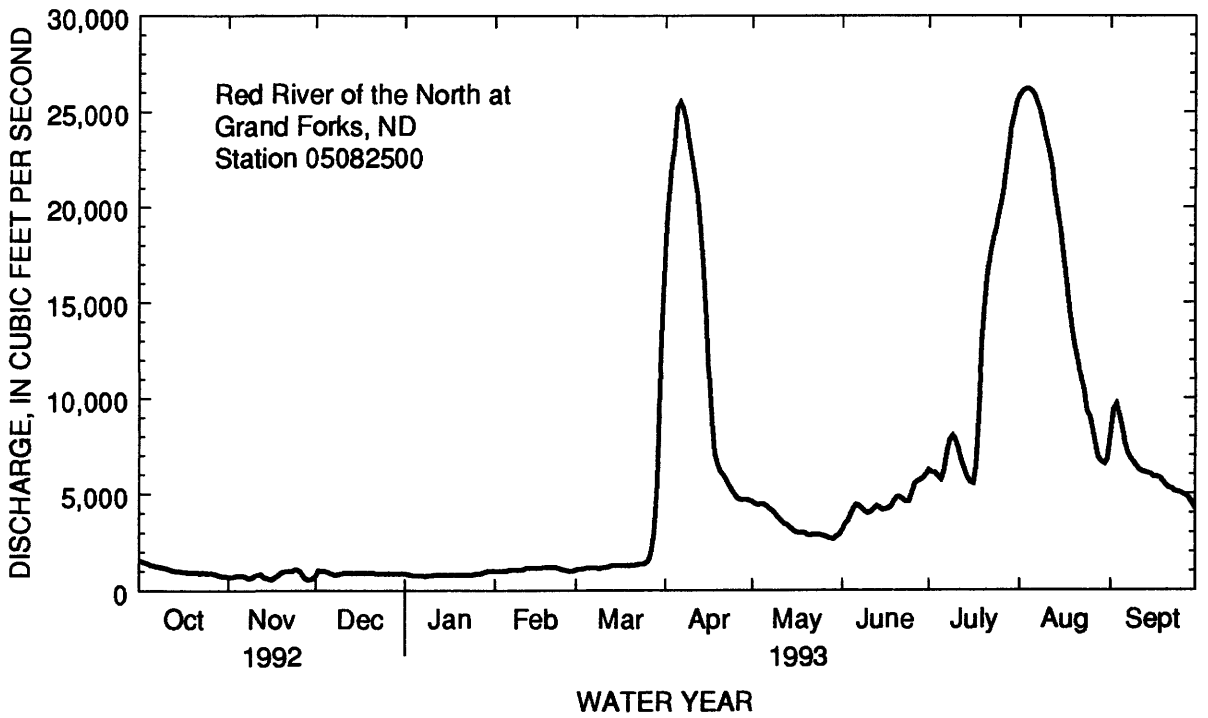
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	1312	1139	920	788	757	2310	9127	4871	3837	3123	1708	1392
MAX	4290	5218	3073	1929	1869	10250	31480	36510	19340	25270	17050	6251
(WY)	1972	1972	1972	1951	1952	1966	1979	1950	1962	1975	1993	1993
MIN	12.1	30.5	17.8	18.8	2.87	42.1	954	373	151	88.8	30.6	20.3
(WY)	1937	1937	1937	1937	1937	1937	1938	1934	1934	1936	1934	1936

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1904 - 1993	
ANNUAL TOTAL	637444		1953766			
ANNUAL MEAN	1742		5353		2586	
HIGHEST ANNUAL MEAN					7580	1950
LOWEST ANNUAL MEAN					244	1934
HIGHEST DAILY MEAN	7940	Mar 13	26200	Aug 3	80900	Apr 23 1979
LOWEST DAILY MEAN	442	Jan 1	540	Nov 29	1.8a	Sep 2 1977
ANNUAL SEVEN-DAY MINIMUM	469	Jan 1	666	Nov 12	2.5	Feb 12 1937
INSTANTANEOUS PEAK FLOW			26200	Aug 3	85000b	Apr 10 1897
INSTANTANEOUS PEAK STAGE			36.39	Aug 3	50.20c	Apr 10 1897
ANNUAL RUNOFF (AC-FT)	1264000		3875000		1873000	
10 PERCENT EXCEEDS	3690		17900		5770	
50 PERCENT EXCEEDS	1190		2830		1280	
90 PERCENT EXCEEDS	526		780		260	

a Caused by unusual regulating during repair of dam at Grand Forks

b Estimated, from rating curve extended above 58,000 ft3/s.

c Site and datum then in use.



RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY RECORDS

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)
NOV											
13...	1515	628	--	645	--	-3.0	1.0	--	--	--	--
DEC											
16...	1425	920	--	583	--	--	1.5	--	--	--	--
JAN											
11...	1430	773	--	561	--	-10.0	0.0	--	--	--	--
29...	1030	964	--	--	--	-10.0	0.0	--	--	--	--
FEB											
08...	1515	1050	--	577	7.7	-5.5	0.5	14.5	103	240	256
25...	1215	1050	--	585	--	--	--	--	--	--	--
MAR											
16...	1715	1300	--	760	--	-4.0	0.0	--	--	--	--
APR											
04...	1500	22400	--	371	7.8	9.5	5.0	11.8	94	160	114
06...	1600	26700	--	370	--	9.0	2.0	--	--	--	--
09...	1620	22700	--	498	--	9.0	4.0	--	--	--	--
19...	1215	6470	--	668	8.4	9.0	8.0	10.1	88	300	212
MAY											
03...	1110	4270	--	770	8.4	14.0	10.0	10.5	96	350	205
JUN											
02...	0945	3490	--	655	8.1	16.5	15.0	7.8	80	290	217
28...	1600	5920	--	--	--	27.0	19.0	--	--	--	--
JUL											
12...	1030	6720	--	611	8.0	18.5	19.0	7.4	82	290	186
28...	1445	23400	--	445	7.8	20.5	21.5	5.2	61	200	150
AUG											
03...	0900	25800	--	466	7.5	15.0	21.0	3.9	45	240	174
05...	1435	26100	--	266	--	--	21.0	--	--	--	--
13...	1545	20600	--	600	--	22.0	21.5	--	--	--	--
19...	0930	13600	--	659	--	23.5	22.5	--	--	--	--
24...	1200	9660	--	--	--	33.0	24.5	--	--	--	--
SEP											
03...	0910	--	9680	648	7.9	11.0	19.0	6.9	77	260	182
22...	1315	5400	--	652	--	10.0	12.0	--	--	--	--
23...	1300	--	5120	520	8.1	14.0	11.0	10.9	101	250	177

RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	SODIUM PERCENT (00932)	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	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)
FEB											
08...	53	27	17	13	0.5	4.6	312	0	44	10	0.10
APR											
04...	38	16	11	12	0.4	9.8	140	0	50	11	0.20
19...	67	31	23	14	0.6	8.6	258	0	140	12	0.20
MAY											
03...	77	38	27	14	0.6	7.8	247	2	170	15	0.20
JUN											
02...	63	33	25	15	0.6	6.5	264	0	110	15	0.20
JUL											
12...	65	31	22	14	0.6	7.2	227	0	120	11	0.20
28...	48	20	12	11	0.4	7.6	183	0	61	5.0	0.20
AUG											
03...	61	22	4.7	4	0.1	5.6	212	0	57	5.6	0.10
SEP											
03...	60	27	16	11	0.4	8.4	222	0	83	12	0.30
23...	58	26	12	9	0.3	5.9	216	0	73	7.8	0.20

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N) (00618)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N) (00607)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)
FEB											
08...	15	326	333	0.45	944	0.020	0.330	0.350	0.170	0.63	0.90
APR											
04...	13	235	248	0.34	15000	0.180	3.42	3.60	0.320	0.98	1.5
19...	15	427	447	0.61	7810	0.020	0.680	0.700	0.040	0.86	1.2
MAY											
03...	10	470	504	0.69	5810	0.010	0.220	0.230	0.060	0.84	1.0
JUN											
02...	9.2	394	426	0.58	4010	0.020	0.430	0.450	0.030	0.57	0.70
JUL											
12...	19	388	431	0.59	7820	<0.010	--	0.190	0.040	0.86	0.90
28...	19	264	293	0.40	18500	0.020	0.180	0.200	0.080	0.82	0.90
AUG											
03...	20	282	325	0.44	22600	0.030	0.150	0.180	0.080	1.4	1.4
SEP											
03...	20	338	366	0.50	9570	0.010	0.360	0.370	0.060	0.94	1.1
23...	13	303	336	0.46	4640	<0.010	--	0.130	0.060	0.74	0.80

RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
FEB											
08...	0.80	0.070	0.040	0.050	7	21	--	--	--	--	--
APR											
04...	1.3	0.260	0.200	0.170	69	130	--	--	--	--	--
19...	0.90	0.220	0.100	0.070	24	11	--	--	--	--	--
MAY											
03...	0.90	0.120	0.080	0.050	30	7	--	--	161	1860	98
JUN											
02...	0.60	0.140	0.110	0.100	150	22	--	--	181	1710	99
JUL											
12...	0.90	0.180	0.150	0.090	32	3	14	1.2	253	4590	100
28...	0.90	0.280	0.200	0.160	50	19	--	--	101	6380	98
AUG											
03...	1.5	0.140	0.120	0.100	70	20	--	--	--	--	--
SEP											
03...	1.0	0.180	0.170	0.170	70	11	12	3.2	--	--	--
23...	0.80	0.090	0.070	0.080	17	10	9.2	1.4	66	912	100

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RED RIVER OF THE NORTH BASIN

05085900 SNAKE RIVER ABOVE ALVARADO, MN
(National Water Quality Assessment Station)

LOCATION.--Lat 48°10'27", long 96°59'55", in SW¼SW¼NW¼ sec. 8,T.154 N.,R.49 W., Marshall County, Hydrologic Unit 09020309, on right bank 100 ft upstream from bridge on Minnesota State Highway 220, 1/2 south of Alvarado.
DRAINAGE AREA.--28 mi2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--October 1992 to September 1993.Annual maximum discharges, water years 1945, 1954-56 and 1978-81. Records of daily discharges for period March to September 1945, and October 1953 to July 1956, that were collected at a location 1/2 mi downstream (station 05086000, Snake River at Alvarado, MN) are not considered to be equivalent because of the controlled releases from the city's sewage treatment facility. This discharge enters the river between the two sites.Records for annual maximum discharges for these periods and thosefor the 1978-81 water years, when the station was operated as a high flow site can be considered to be equivalent.
EXTREMES FOR PERIOD OF RECORD.--Maximum observed discharge, 3,410 ft3/s, April 20, 1979.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e.00	e.00	e.00	e.00	e.10	e.00	e385	12	e.05	27	301	e1100
2	e.00	e.00	e.00	e.00	e.20	e.00	e300	14	e.00	21	246	e1270
3	e.00	e.00	e.00	e.00	e.30	e.00	e256	13	e.00	17	198	e1320
4	e.00	e.00	e.00	e.00	e.25	e.00	e192	9.4	e.00	16	152	e1200
5	e.00	e.00	e.00	e.00	e.20	e.00	e153	9.2	e.00	15	119	e850
6	e.00	e.00	e.00	e.00	e.20	e.00	e133	8.3	e.00	17	97	597
7	e.00	e.00	e.00	e.00	e.15	e.00	104	7.7	e.00	26	81	420
8	e.00	e.00	e.00	e.00	e.10	e.00	78	7.2	.20	26	70	254
9	e.00	e.00	e.00	e.00	e.10	e.00	66	6.8	1.4	27	67	167
10	e.00	e.00	e.00	e.00	e.10	e.00	58	6.0	1.2	26	125	121
11	e.00	e.00	e.00	e.00	e.05	e.00	49	5.0	.80	21	300	90
12	e.00	e.00	e.00	e.00	e.05	e.00	44	4.4	9.7	17	360	71
13	e.00	e.00	e.00	e.00	e.05	e.00	41	4.3	22	13	340	58
14	e.00	e.00	e.00	e.00	e.05	e.00	36	3.7	40	e8.5	350	50
15	e.00	e.00	e.00	e.00	e.00	e.00	31	2.6	34	e6.5	313	42
16	e.00	e.00	e.00	e.00	e.00	e.00	28	2.1	29	e4.0	270	37
17	e.00	e.00	e.00	e.00	e.00	e.00	25	1.7	25	e3.0	209	33
18	e.00	e.00	e.00	e.00	e.00	e.00	22	1.3	20	e2.2	155	30
19	e.00	e.00	e.00	e.00	e.00	e.00	21	1.3	18	e1.5	122	25
20	e.00	e.00	e.00	e.00	e.00	e.00	18	1.7	17	e1.0	94	22
21	e.00	e.00	e.00	e.00	e.00	e.00	15	1.0	15	e.70	75	19
22	e.00	e.00	e.00	e.00	e.00	e.00	13	1.4	12	e.55	62	15
23	e.00	e.00	e.00	e.00	e.00	e.10	12	1.0	14	e3.0	52	18
24	e.00	e.00	e.00	e.00	e.00	e.12	11	1.3	16	e20	43	17
25	e.00	e.00	e.00	e.00	e.00	e.14	8.4	e1.0	24	e50	36	17
26	e.00	e.00	e.00	e.00	e.00	e.17	7.8	e.70	34	e85	33	16
27	e.00	e.00	e.00	e.00	e.00	e.20	7.0	e.50	33	e190	34	14
28	e.00	e.00	e.00	e.00	e.00	e.25	6.4	e.35	36	e310	23	15
29	e.00	e.00	e.00	e.00	---	e1.5	7.0	e.25	35	e450	26	13
30	e.00	e.00	e.00	e.00	---	e15	6.9	e.15	32	390	170	12
31	e.00	---	e.00	e.05	---	e75	---	e.12	---	349	e700	---
TOTAL	0.00	0.00	0.00	0.05	1.90	92.48	2134.5	129.47	469.35	2143.95	5223	7913
MEAN	.000	.000	.000	.002	.068	2.98	71.1	4.18	15.6	69.2	168	264
MAX	.00	.00	.00	.05	.30	75	385	14	40	450	700	1320
MIN	.00	.00	.00	.00	.00	.00	6.4	.12	.00	.55	23	12
AC-FT	.00	.00	.00	.1	3.8	183	4230	257	931	4250	10360	15700

e Estimated.

RED RIVER OF THE NORTH BASIN

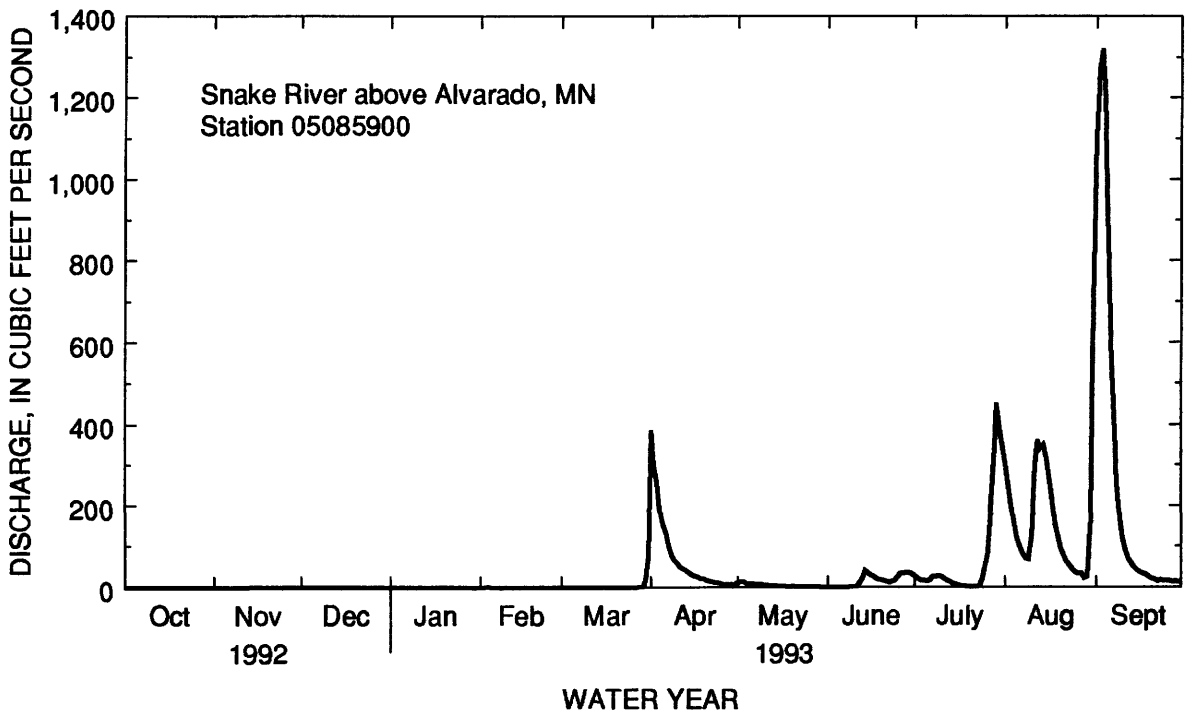
05085900 SNAKE RIVER ABOVE ALVARADO, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1993 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN.	000	.000	.000	.002	.068	2.98	71.1	4.18	15.6	69.2	168	264
MAX	.000	.000	.000	.002	.068	2.98	71.1	4.18	15.6	69.2	168	264
(WY)	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993
MIN	.000	.000	.000	.002	.068	2.98	71.1	4.18	15.6	69.2	168	264
(WY)	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993	1993

SUMMARY STATISTICS FOR 1993 WATER YEAR

ANNUAL TOTAL	18107.70	
ANNUAL MEAN	49.6	
HIGHEST DAILY MEAN	1320	Sep 3
LOWEST DAILY MEAN	.00	Oct 1
ANNUAL SEVEN-DAY MINIMUM	.00	Oct 1
INSTANTANEOUS PEAK FLOW	1320	Sep 3
INSTANTANEOUS PEAK STAGE	21.33	Sep 3
ANNUAL RUNOFF (AC-FT)	35920	
10 PERCENT EXCEEDS	121	
50 PERCENT EXCEEDS	.20	
90 PERCENT EXCEEDS	.00	



RED RIVER OF THE NORTH BASIN

05085900 SNAKE RIVER ABOVE ALVARADO, MN
(National Water Quality Assessment Station)

WATER-QUALITY RECORDS

PERIOD OF DAILY RECORD.--

WATER TEMPERATURE:June 1993 to September 1993.

SPECIFIC CONDUCTANCE:June 1993 to September 1993.

INSTRUMENTATION.--Water-quality sensors since June 1993.

REMARKS.--Records fair.Interruptions in record due to malfunction of recording instruments. Water quality data for period, Feb. 9 to Apr. 28 collected from site 2 miles downstream from present location and listed as 'Snake River at Alvarado, MN (05086000)' in this report.

EXTREMES FOR CURRENT PERIOD.--

WATER TEMPERATURE:Maximum recorded, 24.5C, June 21; minimum recorded, 7.0C, Sept. 30.

SPECIFIC CONDUCTANCE:Maximum recorded, 1,000 microsiemens, June 10; minimum recorded, 310 microsiemens, Aug. 11.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	17.5	15.5	16.5	22.0	21.0	21.5	15.5	15.0	15.0
2	---	---	---	20.5	16.0	18.5	21.0	20.0	20.5	15.5	15.5	15.5
3	---	---	---	21.0	18.5	19.5	20.0	19.0	19.5	16.0	15.0	15.5
4	---	---	---	21.5	19.5	20.5	20.0	18.5	19.0	16.0	15.5	16.0
5	---	---	---	20.5	18.5	19.0	19.5	18.5	19.0	16.0	15.0	15.5
6	---	---	---	19.0	18.0	18.0	19.5	18.0	19.0	15.5	14.0	15.0
7	---	---	---	18.0	17.5	17.5	20.5	18.0	19.5	15.0	14.0	14.5
8	---	---	---	19.0	16.5	18.0	22.0	19.0	20.5	15.0	14.5	15.0
9	19.0	16.0	17.0	21.5	17.5	19.5	23.5	20.5	22.0	15.5	14.5	15.0
10	21.5	16.5	18.5	21.5	19.5	20.5	23.5	21.5	22.5	15.0	13.0	14.0
11	23.0	18.0	20.0	20.5	18.5	19.5	22.0	20.5	21.0	15.5	13.0	14.0
12	23.0	20.0	22.0	20.0	17.0	18.5	20.5	19.5	20.0	15.5	14.5	15.0
13	22.0	20.5	22.0	---	---	---	19.5	18.0	18.5	15.0	12.0	13.0
14	20.5	17.5	19.0	---	---	---	19.0	17.5	18.0	12.0	10.5	11.5
15	18.5	16.0	17.5	---	---	---	19.5	18.5	18.5	12.0	10.0	11.0
16	17.5	16.0	16.5	---	---	---	20.0	18.0	19.0	12.0	10.5	11.0
17	18.5	15.0	17.0	---	---	---	19.5	18.5	19.0	12.0	10.0	11.0
18	20.0	16.5	18.5	---	---	---	20.0	18.0	19.0	12.5	10.5	11.5
19	21.0	17.5	19.5	---	---	---	19.5	18.0	19.0	12.5	11.0	12.0
20	22.5	18.0	20.5	---	---	---	19.5	17.5	18.5	12.5	11.5	12.0
21	24.5	20.0	22.5	---	---	---	20.0	18.0	19.0	12.5	11.5	12.0
22	24.0	22.0	23.0	---	---	---	19.5	18.5	19.0	12.5	11.0	12.0
23	23.5	20.5	22.5	---	---	---	21.0	18.5	19.5	11.0	9.0	10.5
24	23.0	20.5	21.5	---	---	---	22.0	19.0	20.5	12.0	10.0	11.0
25	20.5	17.0	18.0	---	---	---	22.0	20.0	21.0	12.5	11.0	12.0
26	17.5	16.5	16.5	---	---	---	22.0	19.5	20.0	12.5	10.0	11.0
27	16.5	15.5	16.0	---	---	---	20.0	18.0	19.0	10.0	8.5	9.0
28	16.5	15.0	15.5	---	---	---	19.0	17.0	18.0	9.5	8.5	9.5
29	16.0	15.0	15.5	---	---	---	18.5	16.5	17.5	8.5	7.0	8.0
30	15.5	15.0	15.5	---	---	---	16.5	15.5	16.0	10.0	7.0	8.5
31	---	---	---	22.5	21.5	22.0	16.0	14.5	15.0	---	---	---
MONTH	---	---	---	---	---	---	23.5	14.5	19.3	16.0	7.0	12.5

RED RIVER OF THE NORTH BASIN

05085900 SNAKE RIVER ABOVE ALVARADO, MN--Continued

SPECIFIC CONDUCTANCE, US/CM @ 25 DEGREES CENTIGRADE, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		JUNE			JULY			AUGUST			SEPTEMBER	
1	---	---	---	699	684	692	544	541	543	346	326	334
2	---	---	---	708	684	695	549	542	545	361	337	348
3	---	---	---	720	703	715	558	547	552	387	361	375
4	---	---	---	733	709	720	564	557	560	409	387	397
5	---	---	---	738	732	734	564	559	562	437	409	422
6	---	---	---	749	737	743	563	559	561	463	437	448
7	---	---	---	747	737	744	561	556	559	497	463	479
8	---	---	---	754	737	746	561	550	557	516	497	507
9	980	896	922	755	748	751	553	541	549	540	516	527
10	1000	835	926	750	725	736	554	471	541	560	540	548
11	882	796	852	765	745	759	491	310	366	580	560	568
12	882	830	865	768	761	765	412	391	401	600	580	591
13	830	745	798	---	---	---	413	409	411	611	599	603
14	964	734	800	---	---	---	422	409	414	628	611	617
15	906	858	889	---	---	---	438	422	431	646	628	635
16	887	783	808	---	---	---	453	433	443	651	642	646
17	811	774	799	---	---	---	473	453	463	665	649	655
18	774	690	732	---	---	---	496	473	483	678	663	669
19	690	660	670	---	---	---	506	494	500	690	677	681
20	681	658	664	---	---	---	522	506	512	702	690	696
21	735	681	711	---	---	---	537	520	528	708	698	701
22	748	722	740	---	---	---	549	536	543	717	708	713
23	734	700	722	---	---	---	567	549	558	721	712	716
24	727	693	716	---	---	---	586	566	575	730	720	724
25	723	689	712	---	---	---	599	584	591	741	729	734
26	734	662	703	---	---	---	605	593	597	747	741	744
27	757	679	734	---	---	---	610	596	601	748	739	742
28	710	674	692	---	---	---	607	563	581	751	743	748
29	709	683	700	---	---	---	619	579	605	749	738	742
30	700	690	694	---	---	---	595	419	533	766	749	758
31	---	---	---	543	527	535	452	342	390	---	---	---
MONTH	---	---	---	---	---	---	619	310	518	766	326	602

RED RIVER OF THE NORTH BASIN

05085900 SNAKE RIVER ABOVE ALVARADO, MN--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
MAY										
11...	1000	5.0	862	838	7.8	8.1	22.0	15.5	747	6.7
24...	0900	1.3	948	929	7.6	8.0	12.0	12.0	737	6.2
JUN										
08...	1000	0.0	899	--	7.6	--	--	16.0	723	4.9
09...	0930	0.70	884	903	8.1	7.9	15.0	15.5	729	3.5
11...	1045	0.76	920	878	7.8	8.1	25.0	18.5	738	4.4
16...	1145	30	788	798	7.6	7.9	12.5	16.5	737	9.7
24...	0930	17	739	706	7.5	7.9	14.0	21.0	733	5.0
JUL										
06...	1020	15	744	724	7.8	8.1	15.0	18.0	729	6.2
19...	0730	1.5	664	--	7.8	--	16.0	20.5	--	--
27...	1200	187	520	--	7.8	--	17.0	20.0	--	6.2
30...	1335	379	532	--	7.6	--	25.5	21.5	738	4.7
AUG										
03...	1200	198	580	565	7.6	7.7	18.5	19.0	744	5.2
10...	1015	103	638	545	8.0	7.7	21.0	21.5	739	5.2
13...	0830	349	415	422	7.9	7.7	12.0	18.0	746	5.2
31...	1115	658	328	355	7.9	7.1	12.5	15.0	744	5.6
SEP										
02...	0930	1300	339	353	7.8	7.1	16.0	15.5	736	5.0
08...	1125	249	528	--	7.6	--	17.5	14.5	732	7.7

RED RIVER OF THE NORTH BASIN

05085900 SNAKE RIVER ABOVE ALVARADO, MN--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

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)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
MAY									
11...	93	46	17	7.9	397	3	329	322	130
24...	98	51	23	8.4	--	0	--	312	140
JUN									
08...	--	--	--	--	--	--	--	--	--
09...	94	50	27	7.9	410	0	336	323	130
11...	93	50	21	7.9	384	3	320	333	120
16...	88	48	12	6.5	353	0	289	301	130
24...	84	41	11	6.7	305	0	250	254	120
JUL									
06...	88	43	12	6.9	315	0	258	272	110
19...	--	--	--	--	--	--	--	--	--
27...	--	--	--	--	238	0	195	--	--
30...	--	--	--	--	--	--	--	207	--
AUG									
03...	69	28	6.7	8.3	271	0	222	245	55
10...	55	21	21	11	--	0	--	186	75
13...	55	21	4.6	8.5	198	0	162	168	35
31...	34	14	5.7	11	131	0	107	148	27
SEP									
02...	37	15	3.4	5.3	144	0	118	129	30
08...	--	--	--	--	237	0	194	--	--

RED RIVER OF THE NORTH BASIN

05085900 SNAKE RIVER ABOVE ALVARADO, MN--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	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)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)
MAY									
11...	21	0.30	2.7	545	<0.010	<0.050	0.020	0.90	0.90
24...	34	0.30	4.0	608	0.020	0.150	0.050	1.5	1.2
JUN									
08...	--	--	--	--	--	--	--	--	--
09...	38	0.20	4.5	582	<0.010	0.140	0.050	1.1	0.90
11...	29	0.20	5.8	576	<0.010	<0.050	0.050	1.0	0.90
16...	14	0.20	14	434	0.010	0.058	0.040	1.2	1.1
24...	13	0.20	18	478	0.040	0.097	0.080	1.2	1.2
JUL									
06...	13	0.20	20	502	0.020	0.200	0.060	1.4	1.2
19...	--	--	--	--	--	--	--	--	--
27...	--	--	--	--	--	--	--	1.7	--
30...	--	--	--	--	--	--	--	1.3	--
AUG									
03...	8.9	0.20	38	396	0.020	0.100	0.090	1.7	1.4
10...	15	0.20	28	362	0.060	0.300	0.090	1.7	1.6
13...	7.1	0.20	27	283	0.030	0.170	0.090	1.4	1.2
31...	9.7	0.20	15	211	0.040	0.820	0.120	1.0	1.9
SEP									
02...	7.3	0.20	17	219	0.020	0.210	0.060	0.80	0.90
08...	--	--	--	--	0.020	0.180	0.080	1.1	1.2

RED RIVER OF THE NORTH BASIN

05085900 SNAKE RIVER ABOVE ALVARADO, MN--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	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)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
MAY									
11...	0.120	0.090	0.080	13	52	16	0.4	--	--
24...	0.170	0.110	0.070	32	220	17	1.1	--	--
JUN									
08...	--	--	--	--	--	--	--	--	--
09...	0.100	0.090	0.070	18	190	17	0.4	--	--
11...	0.120	0.110	0.080	9	110	16	0.5	--	--
16...	0.140	0.110	0.100	22	36	19	0.9	28	97
24...	0.200	0.180	0.180	33	79	19	1.1	--	--
JUL									
06...	0.180	0.140	0.130	44	60	20	0.7	31	100
19...	--	--	--	--	--	--	--	--	--
27...	0.260	--	--	--	--	--	--	171	99
30...	0.180	--	--	--	--	--	--	81	100
AUG									
03...	0.260	0.190	0.150	110	37	12	1.1	59	100
10...	0.230	0.200	0.180	39	38	22	0.9	76	100
13...	0.280	0.160	0.130	120	29	16	0.6	88	99
31...	0.240	0.150	0.130	120	66	11	>6.6	331	99
SEP									
02...	0.140	0.120	0.100	18	<1	13	1.1	140	99
08...	0.200	0.130	0.120	--	--	16	0.6	90	100

RED RIVER OF THE NORTH BASIN

05086000 SNAKE RIVER AT ALVARADO, MN

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)
FEB												
09...	0900	0.20	1620	1560	7.2	7.6	-6.0	0.5	736	0.6	130	70
APR												
01...	1100	368	325	353	7.6	7.7	4.5	0.5	736	11.5	36	14
03...	1050	256	359	383	7.7	6.9	4.0	0.5	748	13.4	38	16
06...	1105	119	382	405	7.5	7.6	12.5	0.5	743	11.1	42	18
15...	1430	31	566	588	8.0	7.9	17.0	8.0	740	11.0	67	30
28...	1520	6.4	748	758	8.1	8.1	17.5	13.0	732	10.5	89	41

DATE	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)
FEB												
09...	86	9.4	563	0	461	--	130	20	0.20	28	1010	0.020
APR												
01...	5.0	12	124	0	102	101	48	9.2	0.20	11	224	0.120
03...	5.3	11	137	0	112	124	53	10	0.20	12	249	0.130
06...	5.5	9.9	152	0	124	135	54	9.9	0.20	12	267	0.070
15...	9.2	8.8	256	0	210	214	84	14	0.20	16	380	0.010
28...	14	7.9	334	0	274	278	110	19	0.20	7.2	498	<0.010

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	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)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)
FEB											
09...	<0.050	1.40	2.6	2.7	0.570	0.380	0.380	870	1600	20	0.9
APR											
01...	2.60	0.300	1.7	1.5	0.320	0.260	0.240	130	72	16	1.5
03...	2.60	0.230	1.6	1.3	0.210	0.210	0.170	120	72	18	1.3
06...	1.50	0.170	1.4	1.1	0.160	0.040	0.070	97	100	15	2.3
15...	0.360	0.030	1.4	1.1	0.100	0.060	0.030	63	28	15	0.9
28...	<0.050	0.020	1.1	0.90	0.080	0.050	0.030	19	36	15	0.7

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RED RIVER OF THE NORTH BASIN

05087500 MIDDLE RIVER AT ARGYLE, MN

LOCATION.--Lat 48°20'25", long 96°48'58", in NE¼NW¼ sec.15, T.156 N., R.48 W., Marshall County, Hydrologic Unit 09020309, on left bank 30 ft upstream of bridge on County Highway 4 in Argyle and 14 mi upstream from mouth.

DRAINAGE AREA.--265 mi²

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

GAGE.--Water-stage recorder. Datum of gage is 828.53 ft above mean sea level. Prior to Nov. 8, 1951, nonrecording gage and Nov. 8, 1951, to Sept. 18, 1952, water-stage recorder at site 800 ft downstream at datum 1.0 ft higher. Sept. 19, 1952, to June 28, 1982, recording gage at site 800 feet downstream at present datum. June 29, 1982, to Sept. 20, 1983, nonrecording gage at present site and datum.

REMARKS.--Records fair except those for estimated daily discharges, which are poor.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1950 reached a stage of 15.25 ft present datum, site then in use, from floodmarks, discharge, 2,790 ft³/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.5	.26	e2.0	e.86	e.72	e.65	e280	15	11	73	497	511
2	3.8	.27	e1.8	e.84	e.72	e.65	e300	17	11	63	443	963
3	3.4	.31	e1.6	e.82	e.72	e.64	e290	24	14	53	376	1150
4	2.9	.32	e1.6	e.81	e.72	e.64	e280	33	17	46	326	1010
5	2.9	.32	e1.5	e.80	e.72	e.64	e260	35	14	42	276	835
6	2.4	.32	e1.5	e.78	e.72	e.64	248	36	15	50	231	686
7	2.1	.32	e1.5	e.76	e.71	e.64	236	35	15	55	191	560
8	1.9	.32	e1.4	e.76	e.71	e.64	213	33	18	70	160	435
9	1.6	.33	e1.4	e.76	e.71	e.64	186	29	16	102	167	345
10	1.0	.51	e1.4	e.76	e.70	e.64	164	26	17	106	308	287
11	.87	.46	e1.4	e.75	e.70	e.64	148	22	33	95	361	234
12	.50	.37	e1.3	e.75	e.70	e.64	133	19	63	84	472	192
13	.70	.33	e1.3	e.74	e.70	e.64	121	17	87	73	572	155
14	.78	.33	e1.3	e.74	e.69	e.64	106	15	90	61	572	130
15	.82	.33	e1.2	e.74	e.69	e.64	92	13	84	48	507	111
16	1.1	.33	e1.2	e.74	e.69	e.64	81	12	75	40	423	91
17	.88	.33	e1.2	e.74	e.69	e.64	72	10	63	38	353	75
18	.71	.33	e1.2	e.74	e.68	e.64	62	8.7	55	32	304	60
19	.69	.33	e1.1	e.74	e.68	e.64	52	8.0	47	28	251	50
20	.69	.39	e1.1	e.74	e.68	e.64	44	7.0	43	29	203	44
21	.85	.53	e1.1	e.74	e.67	e.68	38	6.3	40	34	166	39
22	.82	.62	e1.0	e.74	e.67	e.73	35	6.3	41	51	138	32
23	.27	.65	e1.0	e.73	e.67	e.80	31	5.8	52	58	116	29
24	.27	.67	e1.0	e.73	e.66	e.88	27	7.3	48	51	96	26
25	.26	.60	e1.0	e.73	e.66	e.95	23	6.0	52	56	81	24
26	.26	.38	e.98	e.73	e.66	e1.6	22	6.3	93	48	76	21
27	.26	.33	e.95	e.72	e.65	e4.0	19	7.9	115	118	72	19
28	.26	.37	e.93	e.72	e.65	e10	18	8.7	127	198	66	19
29	.26	e1.2	e.92	e.72	---	e23	16	7.7	106	319	65	21
30	.26	e1.8	e.90	e.72	---	e84	15	9.5	87	419	79	18
31	.26	---	e.88	e.72	---	e140	---	12	---	496	253	---
TOTAL	38.27	13.96	38.66	23.37	19.34	279.46	3612	498.5	1549	3036	8201	8172
MEAN	1.23	.47	1.25	.75	.69	9.01	120	16.1	51.6	97.9	265	272
MAX	4.5	1.8	2.0	.86	.72	140	300	36	127	496	572	1150
MIN	.26	.26	.88	.72	.65	.64	15	5.8	11	28	65	18
AC-FT	76	28	77	46	38	554	7160	989	3070	6020	16270	16210
CFSM	.00	.00	.00	.00	.00	.03	.45	.06	.19	.37	1.00	1.03
IN.	.01	.00	.01	.00	.00	.04	.51	.07	.22	.43	1.15	1.15

e Estimated.

RED RIVER OF THE NORTH BASIN

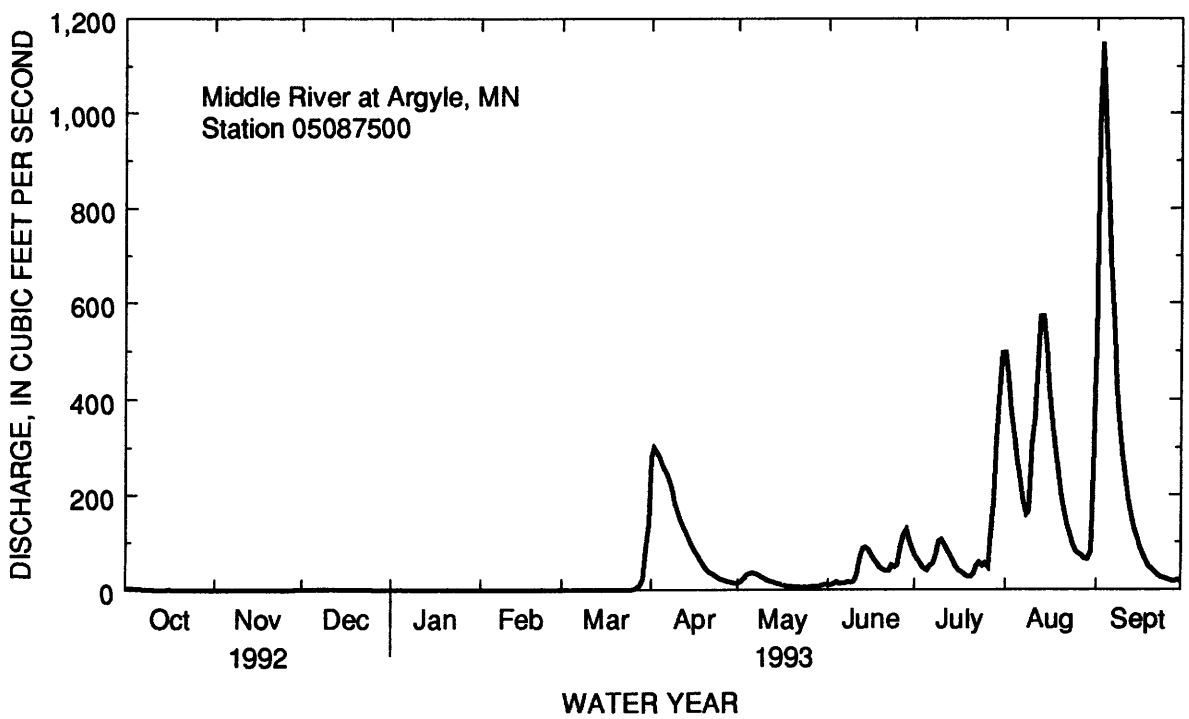
05087500 MIDDLE RIVER AT ARGYLE, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	8.83	5.05	2.25	.98	.74	24.6	203	70.9	71.3	52.0	10.7	13.5
MAX	94.1	33.4	15.8	4.65	3.32	217	747	330	660	688	265	272
(WY)	1983	1957	1983	1983	1983	1983	1966	1970	1970	1975	1993	1993
MIN	.000	.000	.000	.000	.000	.000	.20	2.12	.37	.000	.000	.000
(WY)	1954	1954	1954	1953	1953	1954	1991	1981	1973	1961	1961	1952

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1945 - 1993	
ANNUAL TOTAL	7627.49		25481.56			
ANNUAL MEAN	20.8		69.8		38.5[a]	
HIGHEST ANNUAL MEAN					112	1966
LOWEST ANNUAL MEAN					1.60	1977
HIGHEST DAILY MEAN	300	Mar 9	1150	Sep 3	3790	Jul 4 1975
LOWEST DAILY MEAN	.14	Sep 4	.26	Oct 25 - Nov 1	.00	Many days
ANNUAL SEVEN-DAY MINIMUM	.17	Aug 31	.26	Oct 25	.00	Aug 18 1952
INSTANTANEOUS PEAK FLOW			1180	Sep 3	4260	Jul 3 1975
INSTANTANEOUS PEAK STAGE			14.18	Sep 3	16.59[b]	Jul 3 1975
INSTANTANEOUS LOW FLOW			.25	Nov 1		
ANNUAL RUNOFF (AC-FT)	15130		50540		27870	
ANNUAL RUNOFF (CFSM)	.079		.26		.15	
ANNUAL RUNOFF (INCHES)	1.07		3.58		1.97	
10 PERCENT EXCEEDS	72		235		78	
50 PERCENT EXCEEDS	1.2		6.3		1.9	
90 PERCENT EXCEEDS	.26		.63		.00	

a Median at annual mean discharges is 25 ft ^{3}/s.
b Present datum.



(RED RIVER OF THE NORTH BASIN

05087500 MIDDLE RIVER AT ARGYLE, MN--Continued
(National water quality assessment station)

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
AUG												
18...	0950	312	493	7.8	18.0	21.0	738	5.6	1.7	0.250	49	53

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RED RIVER OF THE NORTH BASIN

05092000 RED RIVER OF THE NORTH AT DRAYTON, ND

LOCATION.--Lat 48°34'20", long 97°08'50", in SE¼SE¼SE¼ sec.24, T.159 N., R.51 W., Pembina County, Hydrologic Unit 09020311, on downstream side of bridge on North Dakota State Highway 11, at the North Dakota-Minnesota border, 1.5 mi northeast of Drayton, and at mile 206.7.

DRAINAGE AREA.--34,800 mi², approximately, includes 3,800 mi² in closed basins.

WATER-DISCHARGE RECORDS

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

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

GAGE.--Water-stage recorder and concrete control. Datum of gage is 755.00 ft above sea level (Minnesota highway bench mark). Prior to Nov. 30, 1954, nonrecording gage at site 1.5 mi upstream at datum 1.59 ft higher.

REMARKS.--Records good except those for period Oct. 30 to Mar. 4, which are fair and those for Mar. 5-13, which are poor.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1770	712	497	910	e900	e980	e10000	5020	3150	5940	24700	10200
2	1680	679	474	894	e880	e980	e12000	5000	3270	6100	25300	10500
3	1630	663	479	879	e860	e1000	e13500	4900	3490	6150	25900	11100
4	1560	685	579	818	e840	e1000	e15000	4930	3700	6170	26600	11700
5	1490	718	725	757	e820	e1010	18600	4790	3920	6140	27400	12400
6	1420	731	801	726	e830	e1020	20800	4820	4210	5970	26000	12700
7	1370	731	818	742	e840	e1020	23100	4760	4490	5990	25400	12500
8	1340	723	821	742	e850	e1020	24300	4670	4700	6530	25100	11700
9	1320	722	789	742	e900	e1020	25100	4550	4660	7260	25300	10700
10	1300	717	779	742	e950	e1020	25500	4430	4520	7790	25600	9640
11	1260	695	793	772	e1000	e1020	25500	4240	4350	7990	26300	8780
12	1210	695	868	833	e1050	e1040	25400	4130	4290	7900	27300	8040
13	1180	683	930	821	e1100	e1060	25100	4030	4380	7530	27500	7450
14	1130	601	949	771	e1100	e1100	24300	3890	4520	7070	27500	7000
15	1070	573	956	726	e1150	e1150	23200	3810	4660	6590	27400	6650
16	1020	576	954	709	e1150	e1200	21400	3680	4670	6170	26800	6380
17	1010	622	957	725	e1150	e1230	19100	3570	4650	5940	25800	6180
18	996	646	963	784	e1150	e1220	16200	3480	4650	6060	24300	6040
19	990	640	952	861	e1150	e1250	13000	3420	4670	7450	e22000	5930
20	971	659	932	910	e1150	e1300	9840	3400	4750	9500	e20000	5900
21	978	776	908	882	e1100	e1350	8180	3400	4890	11500	e18500	5880
22	963	911	911	835	e1050	e1390	7280	3360	4970	13100	e17500	5870
23	960	987	897	817	e1050	e1430	6480	3320	5030	14500	e16500	5950
24	941	1010	861	818	e1000	e1480	5940	3310	4990	15300	e16000	5830
25	889	1020	818	810	e990	e1570	5560	3320	4900	16300	15300	5690
26	881	989	805	840	e975	e1680	5320	3310	4940	17900	14200	5540
27	854	835	806	863	e980	e1840	5150	3280	5210	19300	13300	5470
28	839	691	819	864	e980	e2080	5030	3230	5460	20700	12900	5360
29	835	622	840	869	---	e2570	4990	3150	5640	21900	11400	5240
30	796	563	880	e860	---	e4120	5020	3080	5810	23000	10800	5030
31	743	---	891	e880	---	e7570	---	3080	---	23900	10300	---
TOTAL	35396	21875	25452	25202	27945	48720	449890	121360	137540	333640	668900	237350
MEAN	1142	729	821	813	998	1572	15000	3915	4585	10760	21580	7912
MAX	1770	1020	963	910	1150	7570	25500	5020	5810	23900	27500	12700
MIN	743	563	474	709	820	980	4990	3080	3150	5940	10300	5030
AC-FT	70210	43390	50480	49990	55430	96640	892400	240700	272800	661800	1327000	470800

e Estimated.

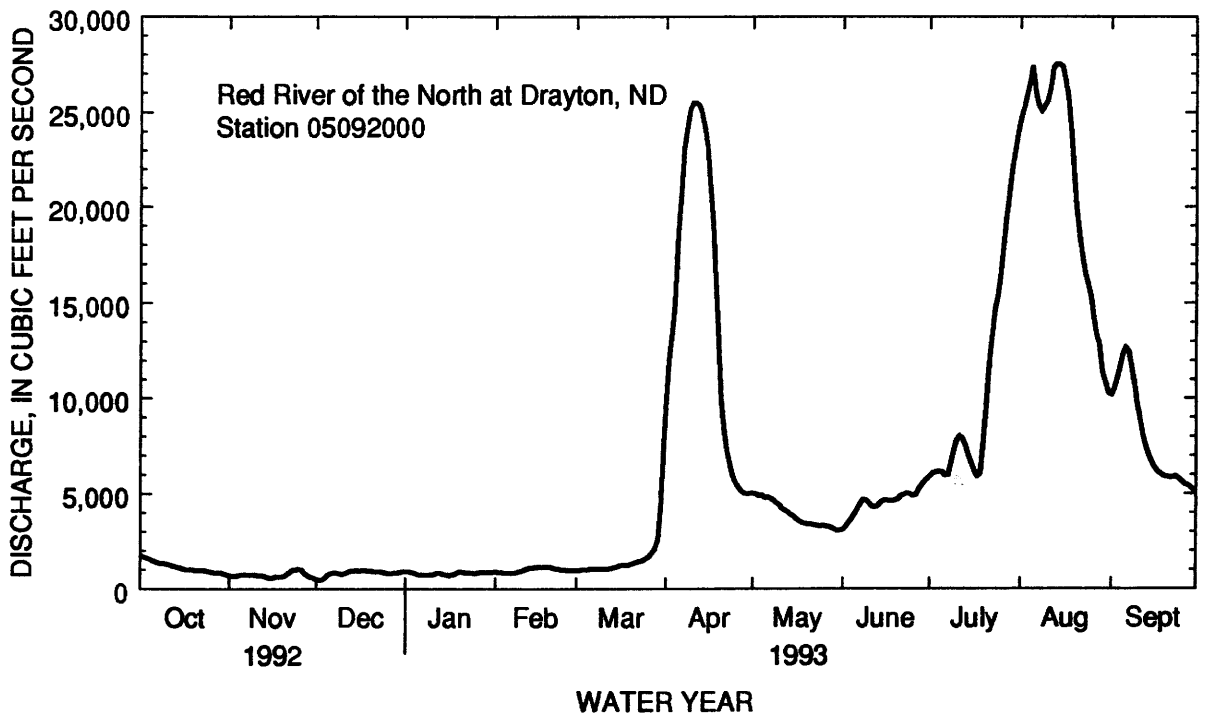
RED RIVER OF THE NORTH BASIN

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

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1949 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	1687	1451	1160	1024	1000	2514	13530	8153	5186	4323	2378	1778
MAX	4463	5653	3072	2065	1876	9329	38390	58890	23420	28240	21580	7912
(WY)	1972	1972	1972	1966	1952	1983	1966	1950	1962	1975	1993	1993
MIN	317	277	149	174	201	280	1275	938	676	348	243	329
(WY)	1991	1977	1977	1990	1977	1962	1981	1977	1977	1988	1977	1988

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1949 - 1993	
ANNUAL TOTAL	756089		2133270			
ANNUAL MEAN	2066		5845		3696	
HIGHEST ANNUAL MEAN					10510	1950
LOWEST ANNUAL MEAN					536	1977
HIGHEST DAILY MEAN	8600	Mar 16	27500	Aug 13	91000	Apr 28 1979
LOWEST DAILY MEAN	449	Feb 2	474	Dec 2	110	Dec 23 1989
ANNUAL SEVEN-DAY MINIMUM	455	Jan 30	558	Nov 28	118	Dec 28 1989
INSTANTANEOUS PEAK FLOW			27600	Aug 14	92900	Apr 28 1979
INSTANTANEOUS PEAK STAGE			36.48	Aug 14	43.66	Apr 28 1979
INSTANTANEOUS LOW FLOW					7.7	Oct 16 1936
ANNUAL RUNOFF (AC-FT)	1500000		4231000		2677000	
10 PERCENT EXCEEDS	4400		19200		7900	
50 PERCENT EXCEEDS	1380		3150		1650	
90 PERCENT EXCEEDS	518		743		450	



RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY RECORDS

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)
NOV											
12...	1505	726	928	--	--	0.0	1.0	--	--	--	--
DEC											
21...	1505	921	910	--	--	--	0.0	--	--	--	--
30...	1430	892	766	--	--	--	0.0	--	--	--	--
JAN											
12...	1600	833	610	--	--	-10.0	0.0	--	--	--	--
21...	1220	880	835	--	--	-3.5	0.5	--	--	--	--
FEB											
01...	1310	900	--	--	--	-4.0	0.0	--	--	--	--
12...	1105	1000	590	--	--	--	0.5	--	--	--	--
26...	1610	973	--	--	--	--	0.0	--	--	--	--
MAR											
05...	1120	1010	755	--	--	5.0	0.0	--	--	--	--
16...	1235	1210	650	--	--	-4.0	0.0	--	--	--	--
APR											
08...	1000	24000	410	--	--	6.5	2.0	--	--	--	--
09...	1230	25200	451	--	--	7.0	3.5	--	--	--	--
13...	1705	24900	458	--	8.0	12.0	6.0	200	135	47	21
20...	1420	9700	751	--	--	11.0	8.0	--	--	--	--
MAY											
06...	1435	4800	770	--	--	30.0	--	--	--	--	--
JUN											
09...	1600	4660	788	--	--	21.5	28.5	--	--	--	--
JUL											
14...	1250	7100	--	--	--	23.5	20.0	--	--	--	--
23...	1450	14500	338	--	--	20.0	18.5	--	--	--	--
28...	1100	20700	362	--	--	16.5	19.5	--	--	--	--
AUG											
05...	1050	27400	535	--	--	17.5	21.5	--	--	--	--
12...	0920	27400	450	--	--	25.0	22.0	--	--	--	--
20...	1230	19800	628	--	--	26.0	22.5	--	--	--	--
25...	1610	15100	690	--	--	29.0	23.0	--	--	--	--
SEP											
01...	1150	10300	687	--	--	20.0	19.5	--	--	--	--
10...	1320	9570	687	--	--	19.5	17.5	--	--	--	--
23...	1345	5960	748	7.8	--	18.0	14.0	320	233	69	36

RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	SODIUM PERCENT (00932)	SODIUM AD-SORP-TION RATIO (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L SOLVED SIO2) (00955)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER (AC-FT)() (70303)
APR											
13...	16	14	0.5	8.5	80	16	0.20	10	280	301	0.41
SEP											
23...	32	17	0.8	7.7	120	29	0.20	16	450	472	0.64

DATE	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BORON, DIS-SOLVED (UG/L AS B) (01020)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	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)
APR											
13...	20200	3	50	40	<1	20	30	0.1	1	<1	240
SEP											
23...	7600	4	80	10	<1	40	<10	<0.1	<1	<1	280

RED RIVER OF THE NORTH BASIN

05094000 SOUTH BRANCH TWO RIVERS AT LAKE BRONSON, MN

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

DRAINAGE AREA.--444 mi².

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

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

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

REMARKS.--Records good except those for estimated daily discharges, which are poor. Flow partly regulated since 1937 by Bronson Lake, usable capacity, 3,700 acre-ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	113	.45	.43	e.45	.52	e.60	e400	78	64	39	1550	1360
2	108	.45	e.43	e.45	.52	e1.5	826	83	58	130	1420	1270
3	104	.59	.44	e.45	.52	e2.8	599	134	33	115	1150	1240
4	97	.59	.44	e.45	.52	e4.8	477	122	9.3	65	1140	1160
5	89	.56	e.44	.45	e.52	e4.0	391	35	13	86	1110	1050
6	80	.52	e.44	.45	e.52	e3.0	508	10	30	341	874	822
7	67	.52	e.44	.45	e.52	e2.0	487	35	33	8.4	608	579
8	60	.52	e.44	.45	e.52	e1.4	317	37	36	131	587	563
9	52	.52	e.44	.45	e.52	e.90	204	36	76	171	1960	528
10	44	.70	e.44	e.45	e.52	e.70	379	34	422	95	2840	501
11	37	.63	e.44	e.45	e.52	e.65	273	32	492	139	2450	487
12	30	.58	e.44	e.46	e.52	e.55	57	30	288	164	2540	446
13	22	.53	e.44	e.46	e.52	e.50	47	24	225	2.0	2600	398
14	18	.52	e.44	e.46	e.52	e.45	67	3.5	140	.95	2600	356
15	18	.50	e.44	e.46	e.52	e.40	122	5.0	109	22	2440	317
16	16	.58	e.44	e.47	e.52	e.30	129	7.5	111	45	2080	150
17	14	.56	e.44	e.47	e.52	e.32	139	9.0	95	54	1650	72
18	13	.52	e.44	e.47	e.52	e.29	95	9.1	59	65	1400	241
19	12	.53	e.44	e.48	e.52	e.27	63	9.1	62	65	1030	194
20	12	.59	e.44	e.48	e.52	.24	43	9.4	62	64	863	166
21	12	.59	e.45	e.48	e.52	.21	23	9.6	62	63	686	119
22	11	.53	e.45	e.49	e.52	.23	40	9.5	62	59	588	117
23	11	.52	e.45	e.49	e.52	.25	43	14	52	50	533	119
24	11	.52	e.45	e.49	e.52	e.30	41	24	25	16	581	119
25	10	.52	e.45	e.49	e.52	.37	38	107	7.6	172	598	118
26	9.0	.47	e.45	e.50	e.52	.53	34	122	183	850	568	116
27	1.7	.45	e.45	e.50	e.52	e.80	32	115	161	1240	921	114
28	.61	.44	e.45	e.50	e.52	e1.2	34	84	138	1470	1020	88
29	.51	.41	e.45	e.50	---	e1.7	54	65	77	1610	967	67
30	.40	e.41	e.45	e.51	---	e2.5	71	70	50	1620	1140	71
31	.39	---	e.45	e.51	---	e150	---	70	---	1600	1320	---
TOTAL	1073.61	15.82	13.73	14.62	14.56	183.76	6033	1432.73	234.9	10552.35	41814	12948
MEAN	34.6	.53	.44	.47	.52	5.93	201	46.2	108	340	1349	432
MAX	113	.70	.45	.51	.52	150	826	134	492	1620	2840	1360
MIN	.39	.41	.43	.45	.52	.21	23	3.5	7.6	.95	533	67
AC-FT	2130	31	27	29	29	364	11970	2840	6420	20930	82940	25680
CFSM.	08	.00	.00	.00	.00	.01	.45	.10	.24	.77	3.04	.97
IN.	.09	.00	.00	.00	.00	.02	.51	.12	.27	.88	3.50	1.08

e Estimated.

RED RIVER OF THE NORTH BASIN

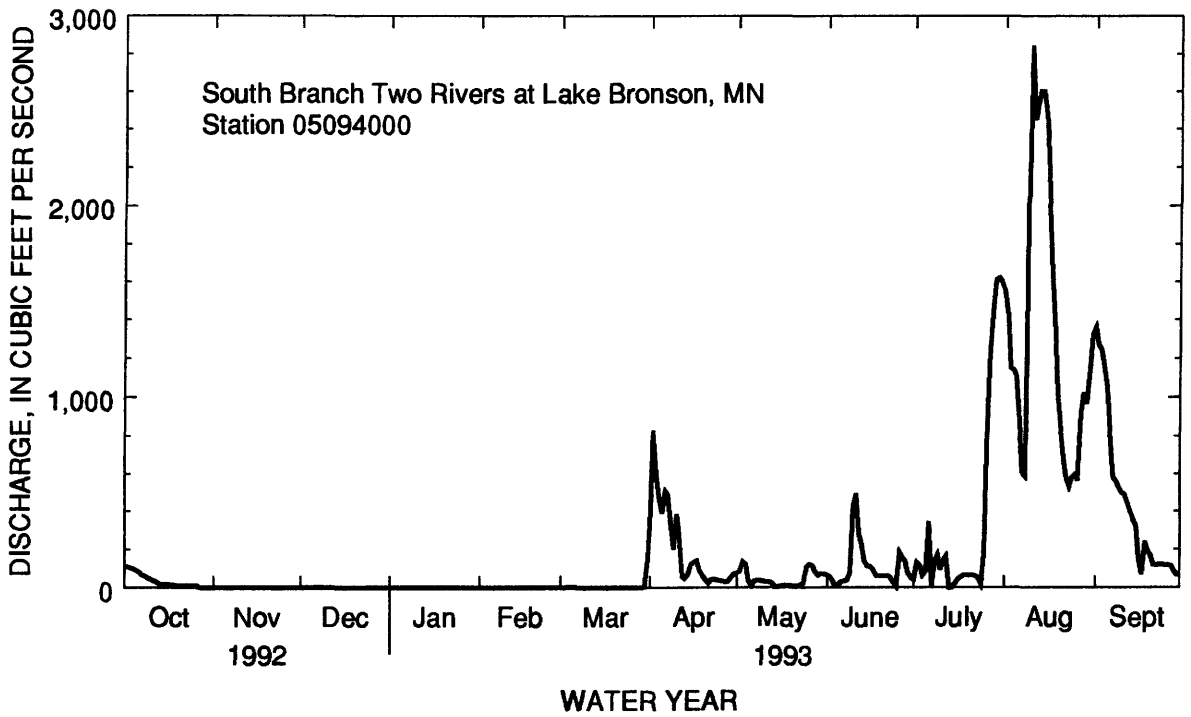
05094000 SOUTH BRANCH TWO RIVERS AT LAKE BRONSON, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1929 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	18.7	10.9	4.49	2.74	3.19	56.9	403	193	164	107	48.7	42.3
MAX	153	87.5	34.5	12.1	23.6	362	1977	1338	1336	1136	1349	525
(WY)	1958	1957	1992	1992	1981	1986	1966	1970	1970	1956	1993	1957
MIN	.40	.38	.13	.12	.12	.66	.54	.98	1.43	.44	.089	.000
(WY)	1991	1990	1987	1987	1987	1934	1991	1991	1980	1988	1988	1937

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1929 - 1993	
ANNUAL TOTAL	47625.36		77331.05			
ANNUAL MEAN	130		212		88.1[a]	
HIGHEST ANNUAL MEAN					312	1966
LOWEST ANNUAL MEAN					2.89	1934
HIGHEST DAILY MEAN	1830	Apr 2	2840	Aug 10	5290	Apr 5 1966
LOWEST DAILY MEAN	.39	Oct 31	.21	Mar 21	.00	Many days
ANNUAL SEVEN-DAY MINIMUM	.43	Nov 28	.26	Mar 18	.00	Aug 2 1937
INSTANTANEOUS PEAK FLOW			3050	Aug 10	5410	Apr 5 1966
INSTANTANEOUS PEAK STAGE			12.87	Aug 10	18.23	Apr 5 1966
ANNUAL RUNOFF (AC-FT)	94460		153400		63850	
ANNUAL RUNOFF (CFSM)	.29		.48		.20	
ANNUAL RUNOFF (INCHES)	3.99		6.48		2.70	
10 PERCENT EXCEEDS	382		740		215	
50 PERCENT EXCEEDS	12		16		4.4	
90 PERCENT EXCEEDS	.45		.45		.72	

a Median of annual mean discharges is 56 ft^3/s.



RED RIVER OF THE NORTH BASIN

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

LOCATION.--Lat 49°00'30", long 97°12'40", in sec.2, T.1, R.2 E., Hydrologic Unit 09020311, on right bank 1,500 ft downstream from Canadian National Railway bridge in Emerson, 0.8 mi downstream from international boundary, 3.6 mi downstream from Pembina River, and at mile 154.3.

DRAINAGE AREA.--40,200 mi², approximately, includes 3,800 mi² 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 Geodetic Survey of Canada Datum of 1929. See WSP 1728 or 1913 for history of changes prior to Apr. 10, 1953.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1950	840	e985	e893	e936	e999	e6320	5370	3000	6040	26500	13600
2	1870	816	e946	e879	e946	e1000	e8370	5330	3030	6140	27000	13500
3	1790	794	e886	e876	e953	e999	e10100	5260	3120	6250	27400	14100
4	1710	777	e855	e876	e964	e999	e11600	5230	3280	6360	27700	15000
5	1630	766	e837	e869	e975	e999	e13200	5190	3480	6390	28000	15500
6	1560	e759	e837	e862	e985	e999	e15300	5120	3710	6390	28300	15600
7	1490	e763	e851	e862	e992	e996	e18500	5090	3960	6290	28500	15300
8	1430	e777	e879	e855	e1010	e992	e22400	5050	4170	6460	28600	14700
9	1370	e787	e925	e848	e1010	e989	24500	4940	4380	6820	29100	13800
10	1320	e809	e946	e844	e1010	e985	24900	4840	4410	7420	29500	13000
11	1290	e823	e950	e840	e1010	e982	25000	4730	4480	7880	29900	12000
12	1250	e826	e950	e840	e1010	e982	25200	4730	4700	8050	30600	11100
13	1210	e823	e950	e837	e1020	e985	25400	4630	4870	7980	31000	10300
14	1190	e805	e957	e833	e1020	e992	25000	4450	4910	7700	31400	9680
15	1150	e816	e964	e830	e1030	e1010	24300	4270	5010	7200	31700	9150
16	1110	e826	e975	e830	e1040	e1030	23200	4100	5090	6750	31800	8690
17	1070	e830	e975	e830	e1060	e1080	21700	3880	5090	6430	31900	8330
18	1030	e830	e975	e833	e1070	e1140	19600	3710	5010	6250	31700	7980
19	1000	e833	e975	e837	e1070	e1190	17200	3570	4980	6710	31300	7700
20	989	e833	e967	e844	e1070	e1240	14600	3450	4980	7630	30700	7520
21	978	e833	e964	e844	e1060	e1260	12100	3380	5050	9750	29900	7310
22	967	e840	e957	e851	e1050	e1280	10100	3330	5120	11200	28900	7060
23	960	e862	e946	e855	e1040	e1290	8440	3260	5260	12300	27500	6820
24	957	e897	e946	e858	e1030	e1290	7420	3220	5300	13100	26000	6600
25	953	e946	e939	e865	e1030	e1310	6780	3210	5230	14200	24200	6430
26	943	e989	e936	e869	e1020	e1350	6290	3190	5120	16400	22400	6220
27	929	e1010	e932	e872	e1020	e1420	5900	3190	5160	18600	20500	6070
28	907	e1020	e922	e876	e1010	e1590	5650	3200	5400	21200	18500	5900
29	883	e1020	e915	e883	---	e1990	5470	3170	5690	22600	16800	5760
30	872	e1010	e907	e893	---	e2830	5370	3100	5900	24300	15400	5580
31	858	---	e907	e925	---	e4410	---	3020	---	25700	14300	---
TOTAL	37616	25560	28856	26609	28441	40608	449910	128210	138890	326490	837000	300300
MEAN	1213	852	931	858	1016	1310	15000	4136	4630	10530	27000	10010
MAX	1950	1020	985	925	1070	4410	25400	5370	5900	25700	31900	15600
MIN	858	759	837	830	936	982	5370	3020	3000	6040	14300	5580
AC-FT	74610	50700	57240	52780	56410	80550	892400	254300	275500	647600	1660000	595600

e Estimated.

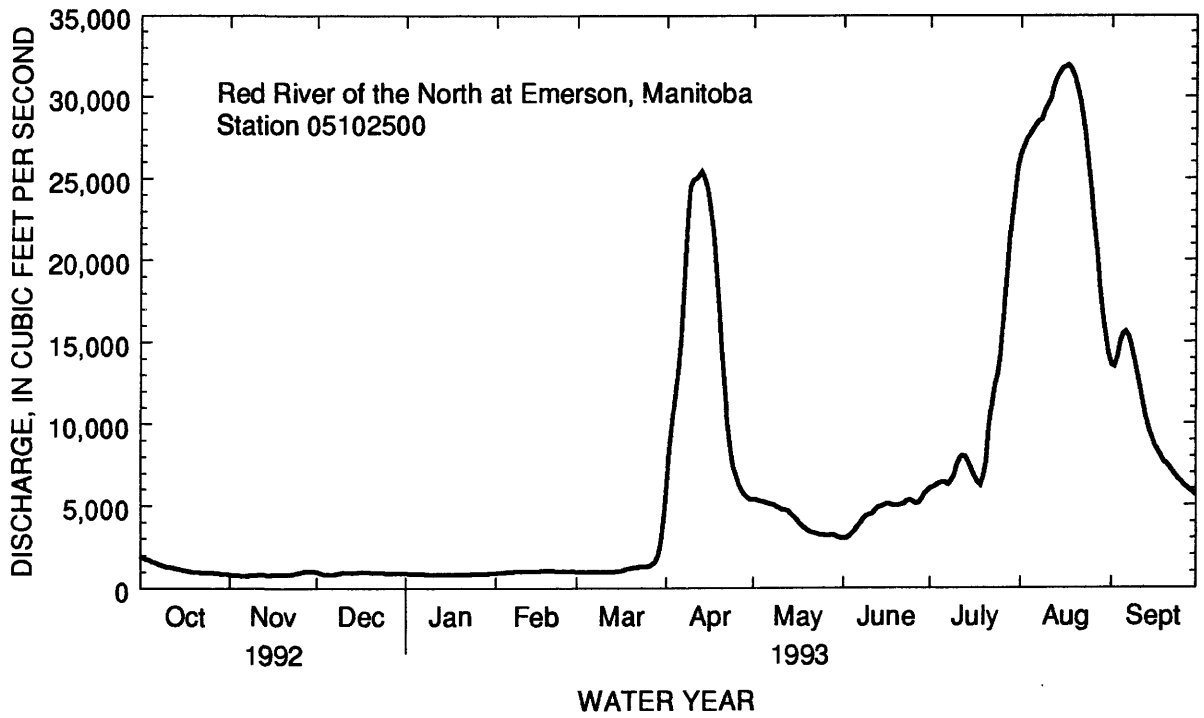
RED RIVER OF THE NORTH BASIN

05102500 RED RIVER OF THE NORTH AT EMERSON, MANITOBA--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1912-1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	1424	1268	936	777	740	2014	12490	8306	4891	3807	2010	1572
MAX	4533	5163	2760	2053	1914	9361	45820	72820	25430	28020	27000	10010
(WY)	1986	1972	1966	1951	1952	1983	1966	1950	1962	1975	1993	1993
MIN	28.6	23.7	33.3	7.05	1.21	2.25	1282	663	196	121	46.6	23.6
(WY)	1937	1937	1937	1937	1937	1937	1938	1934	1934	1936	1934	1934

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1912 - 1993	
ANNUAL TOTAL	1073089		2368490			
ANNUAL MEAN	2932		6489		3361	
HIGHEST ANNUAL MEAN					12100	1950
LOWEST ANNUAL MEAN					333	1934
HIGHEST DAILY MEAN	15700	Apr 4	31900	Aug 17	94400	May 13 1950
LOWEST DAILY MEAN	501	Jan 4	759	Nov 6	.90	Feb 6 1937
ANNUAL SEVEN-DAY MINIMUM	515	Jan 1	775	Nov 3	.97	Feb 4 1937
INSTANTANEOUS PEAK FLOW			31900	Aug 16	95500	May 13 1950
INSTANTANEOUS PEAK STAGE			779.02	Aug 16	791.19	May 1 1979
INSTANTANEOUS LOW FLOW					.90	Feb 6 1937
ANNUAL RUNOFF (AC-FT)	2128000		4698000		2435000	
10 PERCENT EXCEEDS	8100		22500		7400	
50 PERCENT EXCEEDS	1440		3020		1370	
90 PERCENT EXCEEDS	557		846		254	



RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1978 to current year.
PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: October 1977 to current year.
WATER TEMPERATURE: October 1977 to current year.
REMARKS.--Records of daily mean values of water temperature and specific conductance are furnished by Water Survey of Canada.
EXTREMES FOR PERIOD OF DAILY RECORD.--
SPECIFIC CONDUCTANCE: Maximum daily mean, 2,180 microsiemens, Dec. 8, 1989; minimum daily mean, 259 microsiemens, Apr. 14, 1989.
WATER TEMPERATURES: Maximum daily mean, 26.7C, Aug. 16, 1988; minimum daily mean, 0.0C, on many days during winter months.
EXTREMES FOR CURRENT YEAR.--
SPECIFIC CONDUCTANCE: Maximum daily mean, 1,100 microsiemens, Dec. 9; minimum daily mean, 351 microsiemens,July 23.
WATER TEMPERATURES: Maximum daily mean, 21.9 C, Aug. 28; minimum daily mean, 0.0C, on many days during the winter months.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	HARD-NESS TOTAL (MG/L AS CACO3) (00900)
OCT											
15...	1215	1150	--	710	8.8	7.0	6.0	33	7.9	65	290
NOV											
19...	1130	--	833	1020	8.6	-5.0	3.0	6.4	14.6	110	310
FEB											
09...	1340	1020	--	735	7.7	-6.0	0.5	--	14.4	103	280
23...	1130	--	1040	896	7.7	-14.0	0.0	3.5	12.6	88	290
APR											
07...	1115	--	E18500	383	8.0	--	0.5	--	11.8	84	160
13...	1035	25500	--	438	7.7	--	5.0	--	9.9	79	180
20...	1120	--	14600	699	8.0	5.0	9.5	--	10.3	92	270
27...	1115	--	5900	792	8.1	16.5	10.5	65	10.4	97	310
MAY											
04...	1105	--	5230	771	8.2	19.5	12.5	--	10.0	98	330
10...	1305	--	4840	789	7.9	23.5	17.0	--	8.4	89	330
20...	1030	--	3450	850	8.0	10.5	14.5	--	9.6	97	330
JUN											
03...	1115	--	3120	807	8.1	17.0	16.5	--	9.5	99	320
16...	1515	--	5090	736	7.9	15.5	19.0	--	7.7	86	300
JUL											
01...	1020	--	6040	753	7.8	19.5	18.5	--	7.7	85	310
15...	1110	7240	--	696	7.6	18.0	20.5	230	6.6	75	280
23...	0900	--	12300	321	7.8	19.0	18.5	--	3.2	35	--
29...	1050	--	22600	545	7.7	23.5	21.0	--	4.4	51	200
AUG											
04...	1030	--	27700	536	7.4	18.0	20.5	--	2.1	24	210
09...	1015	--	29100	--	7.8	18.0	19.5	--	2.8	--	310
16...	1140	--	31800	565	7.5	22.0	21.5	--	1.3	16	260
SEP											
07...	1130	--	15300	600	8.0	17.0	15.0	54	6.2	63	260
20...	1145	--	7520	693	8.1	15.5	14.5	--	5.4	55	300

RED RIVER OF THE NORTH BASIN

05102500 RED RIVER OF THE NORTH AT EMERSON, MANITOBA--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	ALKALINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKALINITY LAB (MG/L AS CACO3) (90410)	COLIFORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	SODIUM PERCENT (00932)	SODIUM ADSORPTION RATIO (00931)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)
OCT											
15...	--	232	K6	K2	68	29	34	20	0.9	5.5	--
NOV											
19...	227	--	<1	K13	68	35	80	35	2	9.6	233
FEB											
09...	255	--	--	--	62	30	37	22	1	5.5	311
23...	260	--	K7	K240	66	30	58	30	1	6.0	317
APR											
07...	112	--	--	--	36	16	12	13	0.4	9.8	136
13...	128	--	--	--	44	18	15	14	0.5	9.5	155
20...	187	--	--	--	62	27	36	22	1	9.9	228
27...	214	--	--	--	71	32	39	21	1	9.2	262
MAY											
04...	219	--	--	--	73	35	37	19	0.9	8.3	260
10...	208	--	--	--	74	36	35	18	0.8	8.5	252
20...	226	--	--	--	74	36	46	23	1	8.8	264
JUN											
03...	216	--	--	--	70	35	44	22	1	8.6	257
16...	200	--	--	--	66	34	37	20	0.9	7.2	244
JUL											
01...	212	--	--	--	69	34	39	21	1	8.8	258
15...	183	--	--	--	64	30	32	19	0.8	7.1	224
29...	129	--	--	--	48	20	30	23	0.9	8.9	157
AUG											
04...	--	164	--	--	51	20	21	17	0.6	10	--
09...	--	276	--	--	73	31	7.5	5	0.2	8.8	--
16...	--	207	--	--	64	24	22	15	0.6	10	--
SEP											
07...	175	--	K37	140	60	26	22	15	0.6	9.2	214
20...	215	--	--	--	68	32	29	17	0.7	8.3	262

RED RIVER OF THE NORTH BASIN

05102500 RED RIVER OF THE NORTH AT EMERSON, MANITOBA--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	CARBONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	CHLORIDE, SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	FLUORIDE, DIS-SOLVED (MG/L AS CL) (00940)	SILICA, DIS-SOLVED (MG/L AS F) (00950)	SOLIDS, SUM OF DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE CONSTITUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)
OCT											
15...	--	79	42	0.20	10	408	466	0.63	1450	0.030	<0.010
NOV											
19...	22	110	110	0.20	5.4	555	578	0.79	1300	<0.010	0.010
FEB											
09...	0	63	41	0.10	15	409	407	0.55	1120	--	0.020
23...	0	69	81	0.20	16	485	498	0.68	1400	--	0.020
APR											
07...	0	46	11	0.10	13	228	245	0.33	--	--	0.170
13...	0	73	13	0.20	14	276	291	0.40	20000	--	0.140
20...	0	120	40	0.20	16	429	448	0.61	17700	--	0.040
27...	0	150	38	0.20	13	483	478	0.65	7610	--	<0.010
MAY											
04...	4	150	31	0.20	9.4	477	503	0.68	7100	--	<0.010
10...	1	160	28	0.20	9.4	477	513	0.70	6700	--	<0.010
20...	6	170	44	0.30	9.9	526	547	0.74	5100	--	<0.010
JUN											
03...	7	140	38	0.20	9.2	480	504	0.69	4250	--	<0.010
16...	0	140	31	0.20	12	451	487	0.66	6690	--	<0.010
JUL											
01...	0	130	33	0.20	14	459	480	0.65	7830	--	<0.010
15...	0	120	25	0.20	18	409	451	0.61	8820	--	<0.010
29...	0	82	30	0.20	21	319	337	0.46	20600	--	0.030
AUG											
04...	--	70	17	0.20	26	315	342	0.47	25600	--	0.020
09...	--	44	11	0.20	38	380	423	0.58	33200	--	0.010
16...	--	73	15	0.20	28	362	375	0.51	32200	--	0.020
SEP											
07...	0	80	24	0.20	20	349	371	0.50	15300	--	0.010
20...	0	110	21	0.20	19	418	452	0.61	9180	--	<0.010

RED RIVER OF THE NORTH BASIN

05102500 RED RIVER OF THE NORTH AT EMERSON, MANITOBA--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N) (00618)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N) (00605)	NITRO-GEN, ORGANIC DIS-SOLVED (MG/L AS N) (00607)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	NITRO-GEN, TOTAL (MG/L AS N) (00600)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)
OCT											
15...	--	0.130	0.150	0.050	0.040	1.0	--	1.1	--	1.2	0.210
NOV											
19...	--	<0.050	<0.050	0.020	0.020	0.78	--	0.80	--	--	0.110
FEB											
09...	0.340	--	0.360	--	0.200	--	0.60	0.80	0.80	--	0.070
23...	0.440	--	0.460	--	0.190	--	--	0.90	--	--	0.070
APR											
07...	3.53	--	3.70	--	0.300	--	1.2	1.6	1.5	--	0.490
13...	2.56	--	2.70	--	0.200	--	1.1	1.3	1.3	--	0.350
20...	1.16	--	1.20	--	0.120	--	0.98	1.2	1.1	--	0.180
27...	--	--	0.370	--	0.020	--	--	0.80	--	--	0.120
MAY											
04...	--	--	0.190	--	0.030	--	0.67	1.0	0.70	--	0.140
10...	--	--	0.120	--	0.030	--	1.2	0.90	1.2	--	0.160
20...	--	--	0.290	--	0.030	--	0.57	0.80	0.60	--	0.090
JUN											
03...	--	--	0.400	--	0.040	--	0.56	1.0	0.60	--	0.240
16...	--	--	0.820	--	0.020	--	0.68	1.9	0.70	--	0.360
JUL											
01...	--	--	0.920	--	0.030	--	0.67	0.70	0.70	--	0.180
15...	--	--	0.360	--	0.030	--	0.77	1.1	0.80	--	0.390
29...	0.230	--	0.260	--	0.090	--	0.81	0.90	0.90	--	0.330
AUG											
04...	0.120	--	0.140	--	0.070	--	0.83	1.1	0.90	--	0.360
09...	0.057	--	0.067	--	0.070	--	0.73	1.1	0.80	--	0.330
16...	0.120	--	0.140	--	0.120	--	0.88	1.4	1.0	--	0.450
SEP											
07...	0.290	--	0.300	--	0.040	--	--	0.90	--	--	0.190
20...	--	--	0.260	--	0.050	--	1.4	1.4	1.4	--	0.250

RED RIVER OF THE NORTH BASIN

05102500 RED RIVER OF THE NORTH AT EMERSON, MANITOBA--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO TOTAL (MG/L AS P) (70507)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)
OCT										
15...	0.110	0.150	0.100	30	51	<3	17	27	4	<10
NOV										
19...	0.090	0.070	0.070	--	--	--	--	--	--	--
FEB										
09...	0.040	--	0.050	--	--	--	4	--	31	--
23...	0.050	--	0.050	<10	65	<3	9	28	35	<10
APR										
07...	0.200	--	0.180	--	--	--	260	--	47	--
13...	0.150	--	0.110	--	--	--	67	--	31	--
20...	0.120	--	0.140	--	--	--	25	--	5	--
27...	0.090	--	0.050	20	60	<3	5	38	1	<10
MAY										
04...	0.060	--	0.050	--	--	--	7	--	1	--
10...	0.050	--	0.050	--	--	--	4	--	1	--
20...	0.070	--	0.070	--	--	--	7	--	1	--
JUN										
03...	0.090	--	0.080	--	--	--	23	--	2	--
16...	0.100	--	0.100	--	--	--	8	--	<1	--
JUL										
01...	0.160	--	0.150	--	--	--	22	--	1	--
15...	0.170	--	0.150	--	--	--	--	--	--	--
29...	0.210	--	0.170	--	--	--	49	--	10	--
AUG										
04...	0.250	--	0.210	--	--	--	87	--	26	--
09...	0.280	--	0.270	--	--	--	110	--	36	--
16...	0.290	--	0.280	--	--	--	43	--	85	--
SEP										
07...	0.170	--	0.160	20	54	<3	54	26	9	<10
20...	0.150	--	0.140	--	--	--	16	--	4	--

RED RIVER OF THE NORTH BASIN

05102500 RED RIVER OF THE NORTH AT EMERSON, MANITOBA--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	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										
15...	3	<1	<1.0	240	<6	--	--	--	--	--
NOV										
19...	--	--	--	--	--	--	--	63	142	84
FEB										
09...	--	--	--	--	--	14	0.3	--	--	--
23...	2	<1	<1.0	280	<6	--	--	89	250	96
APR										
07...	--	--	--	--	--	12	8.6	--	--	--
13...	--	--	--	--	--	12	1.3	--	--	--
20...	--	--	--	--	--	12	1.4	--	--	--
27...	2	1	<1.0	280	<6	--	--	190	3030	99
MAY										
04...	--	--	--	--	--	11	3.9	--	--	--
10...	--	--	--	--	--	11	2.2	--	--	--
20...	--	--	--	--	--	11	1.7	--	--	--
JUN										
03...	--	--	--	--	--	10	1.4	--	--	--
16...	--	--	--	--	--	12	3.5	--	--	--
JUL										
01...	--	--	--	--	--	12	2.7	--	--	--
15...	--	--	--	--	--	--	--	334	6530	99
29...	--	--	--	--	--	8.7	3.2	--	--	--
AUG										
04...	--	--	--	--	--	22	--	--	--	--
09...	--	--	--	--	--	12	1.1	--	--	--
16...	--	--	--	--	--	13	0.5	--	--	--
SEP										
07...	4	<1	<1.0	210	<6	--	--	125	5160	100
20...	--	--	--	--	--	14	--	--	--	--

RED RIVER OF THE NORTH BASIN

05102500 RED RIVER OF THE NORTH AT EMERSON, MANITOBA--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

SPECIFIC CONDUCTANCE, US/CM @ 25 DEGREES CENTIGRADE, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	742	770	1030	753	743	734	709	751	684	620	526	564
2	731	752	1010	746	736	730	696	751	696	580	521	556
3	738	736	1020	745	721	733	680	750	691	562	496	575
4	722	727	1010	737	704	737	656	739	699	647	475	588
5	716	717	1020	718	698	743	614	729	693	639	481	510
6	725	721	1040	675	704	744	590	729	666	635	494	512
7	735	719	1070	657	707	747	566	737	631	610	506	499
8	741	736	1090	655	698	755	533	747	629	595	516	519
9	741	764	1100	671	689	765	509	732	726	595	516	550
10	740	809	1050	677	683	769	489	735	714	593	521	558
11	739	862	1020	658	677	763	452	724	668	600	531	582
12	734	949	994	644	677	760	428	709	681	588	540	552
13	728	1020	974	643	680	746	450	712	671	601	590	579
14	724	991	958	621	671	721	464	744	665	594	586	599
15	729	958	943	621	666	699	474	796	678	616	589	576
16	718	954	924	618	712	671	509	729	657	629	598	595
17	690	957	909	613	819	654	550	723	657	632	606	600
18	743	969	912	622	831	651	580	772	627	713	610	591
19	828	972	904	678	826	658	620	759	603	691	619	635
20	831	1010	884	756	860	722	662	785	619	681	626	627
21	831	991	871	744	887	737	700	814	645	671	642	609
22	801	965	848	732	865	793	747	815	646	536	645	591
23	787	936	834	730	821	840	778	815	629	351	652	648
24	784	983	829	734	773	845	788	813	618	356	665	632
25	806	1040	820	743	745	850	782	788	579	373	675	650
26	817	1010	813	752	720	722	771	761	538	389	632	635
27	809	1030	806	764	720	679	773	758	625	410	648	623
28	808	1020	804	755	719	674	772	725	641	447	667	633
29	823	1010	798	750	---	666	766	715	659	495	666	728
30	818	1010	793	757	---	646	759	711	647	488	668	725
31	816	---	797	758	---	641	---	706	---	501	585	---
MEAN	764	903	931	701	741	729	629	751	653	563	584	595

RED RIVER OF THE NORTH BASIN

05102500 RED RIVER OF THE NORTH AT EMERSON, MANITOBA--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	13.5	4.6	.0	.0	.0	.0	.1	8.9	12.6	15.3	21.2	17.8
2	13.9	3.8	.0	.0	.0	.0	.4	9.1	13.1	15.7	20.7	16.6
3	14.3	2.5	.0	.0	.0	.0	.5	9.5	13.5	14.8	19.9	15.9
4	14.5	1.4	.0	.0	.0	.0	.9	10.2	14.4	17.5	19.3	16.3
5	14.8	.8	.0	.0	.0	.0	1.3	11.7	15.4	18.6	19.2	16.0
6	14.4	.4	.0	.0	.0	.0	1.9	12.7	15.7	16.4	19.3	14.5
7	13.6	.2	.0	.0	.0	.0	2.3	13.4	15.4	16.1	19.6	13.0
8	12.8	.0	.0	.0	.0	.0	2.6	13.9	14.5	16.0	19.9	13.1
9	12.6	.0	.0	.0	.0	.0	2.8	14.2	15.3	16.0	20.3	12.8
10	12.6	.0	.0	.0	.0	.0	3.0	14.6	16.2	15.9	20.7	13.4
11	10.7	.0	.0	.0	.0	.0	3.3	15.4	17.2	17.6	21.2	13.1
12	10.3	.0	.0	.0	.0	.0	3.5	15.1	17.1	16.1	21.4	11.9
13	9.8	.0	.0	.0	.0	.0	4.1	15.5	18.4	16.6	20.5	11.7
14	8.3	.0	.0	.0	.0	.0	4.7	16.3	17.6	17.0	20.5	12.0
15	7.9	.0	.0	.0	.0	.0	5.1	15.5	17.5	17.9	20.6	12.1
16	7.5	.0	.0	.0	.0	.0	5.9	14.4	17.2	17.9	20.7	12.3
17	6.9	.0	.0	.0	.0	.0	6.0	13.0	16.9	17.9	20.9	12.2
18	6.4	.0	.0	.0	.0	.0	6.6	13.0	17.0	20.4	20.7	11.0
19	4.5	.0	.0	.0	.0	.0	6.8	12.0	18.3	19.1	20.7	10.9
20	3.9	.0	.0	.0	.0	.0	6.2	12.4	18.1	18.9	20.6	10.9
21	4.4	.0	.0	.0	.0	.0	6.2	12.7	18.4	18.9	20.8	11.8
22	5.4	.0	.0	.0	.0	.0	6.8	13.1	19.1	19.2	20.8	10.7
23	6.2	.0	.0	.0	.0	.0	7.5	13.2	18.7	19.3	20.8	10.5
24	6.6	.0	.0	.0	.0	.0	7.9	13.1	19.3	19.3	21.1	9.8
25	7.0	.0	.0	.0	.0	.0	7.7	12.5	16.8	19.6	21.2	10.0
26	6.7	.0	.0	.0	.0	.0	7.8	12.5	14.0	19.5	21.3	10.1
27	6.3	.0	.0	.0	.0	.0	8.5	12.7	15.8	19.8	21.4	9.8
28	6.3	.0	.0	.0	.0	.0	8.6	12.8	15.4	19.6	21.9	9.4
29	6.4	.1	.0	.0	---	.0	8.9	12.8	15.9	19.9	20.8	10.5
30	5.8	.0	.0	.0	---	.0	9.0	13.3	15.3	20.5	20.5	10.2
31	5.7	---	.0	.0	---	.0	---	13.3	---	21.0	19.2	---
MEAN	9.0	.5	.0	.0	.0	.0	4.9	13.0	16.3	18.0	20.6	12.3

RED RIVER OF THE NORTH BASIN

05104500 ROSEAU RIVER BELOW SOUTH FORK NEAR MALUNG, MN

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

DRAINAGE AREA.--573 mi².

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

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

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

REMARKS.--Records good except those for estimated daily discharges, which are poor. Some flow bypasses the gaging station through a natural overflow channel 0.8 mi upstream and returns to river 0.5 mi downstream. Overflow begins at stage of about 13.0 ft, discharge, 1,800 ft³/s. These records include any flow in the overflow channel.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	88	33	e31	e12	8.6	3.5	e1050	210	88	70	1030	2100
2	79	32	e30	e12	8.6	4.0	e900	207	83	68	770	1740
3	72	35	e28	e12	8.8	4.6	e750	202	72	71	743	1230
4	67	36	e26	e12	8.9	5.1	e610	199	64	196	484	812
5	63	38	e25	e12	e8.7	5.6	e510	189	52	324	354	632
6	58	38	e24	e11	e8.5	6.1	421	168	46	435	250	498
7	54	40	e23	e11	e8.2	6.5	384	151	41	498	214	369
8	45	39	e22	e11	e7.9	6.8	352	137	56	484	173	275
9	35	38	e21	e11	e7.5	7.4	352	136	109	414	208	226
10	35	40	e20	e11	e7.2	e7.4	352	128	189	343	298	187
11	36	38	e20	e11	e7.0	e7.4	354	121	329	268	290	176
12	38	43	e19	e11	e6.7	e7.3	345	115	372	214	313	173
13	34	43	e19	e10	e6.5	7.1	335	105	361	166	236	163
14	33	45	e18	e10	e6.2	6.4	304	91	316	137	257	137
15	31	45	e18	e10	e5.8	e6.2	267	79	250	116	230	124
16	33	49	e17	e10	e5.5	e6.2	244	72	216	96	196	116
17	41	53	e16	e10	e5.0	e6.2	235	68	195	87	171	112
18	50	49	e16	e9.9	4.6	e6.3	218	63	184	86	153	110
19	54	48	e16	e9.8	3.6	e6.4	203	59	179	81	130	106
20	54	47	e15	e9.7	e3.5	e6.5	190	56	172	78	105	97
21	51	47	e15	e9.6	e3.4	e6.6	178	52	155	78	87	91
22	48	47	e15	e9.5	e3.3	e6.6	161	48	131	75	84	80
23	44	46	e14	e9.4	e3.2	e6.7	152	45	126	71	75	77
24	50	46	e14	e9.0	e3.1	e6.8	145	48	118	67	87	78
25	46	45	e14	e8.8	e3.0	e7.0	138	58	114	106	97	75
26	40	39	e13	e8.7	e2.9	e8.5	135	67	105	637	135	70
27	38	e37	e13	8.7	2.8	e11	134	80	99	846	187	63
28	35	e35	e13	8.6	3.0	e100	135	85	91	1340	203	62
29	33	e34	e13	8.5	---	e1000	169	90	78	1850	223	58
30	32	e33	e13	8.6	---	e1400	203	95	75	1740	681	57
31	31	---	e13	8.6	---	e1240	---	92	---	1410	1350	---
TOTAL	1448	1238	574	314.4	162.0	3916.2	9926	3316	4466	12452	9814	10094
MEAN	46.7	41.3	18.5	10.1	5.79	126	331	107	149	402	317	336
MAX	88	53	31	12	8.9	1400	1050	210	372	1850	1350	2100
MIN	31	32	13	8.5	2.8	3.5	134	45	41	67	75	57
AC-FT	2870	2460	1140	624	321	7770	19690	6580	8860	24700	19470	20020
CFSM	.08	.07	.03	.02	.01	.22	.58	.19	.26	.70	.55	.59
IN.	.09	.08	.04	.02	.01	.25	.64	.22	.29	.81	.64	.66

e Estimated.

RED RIVER OF THE NORTH BASIN

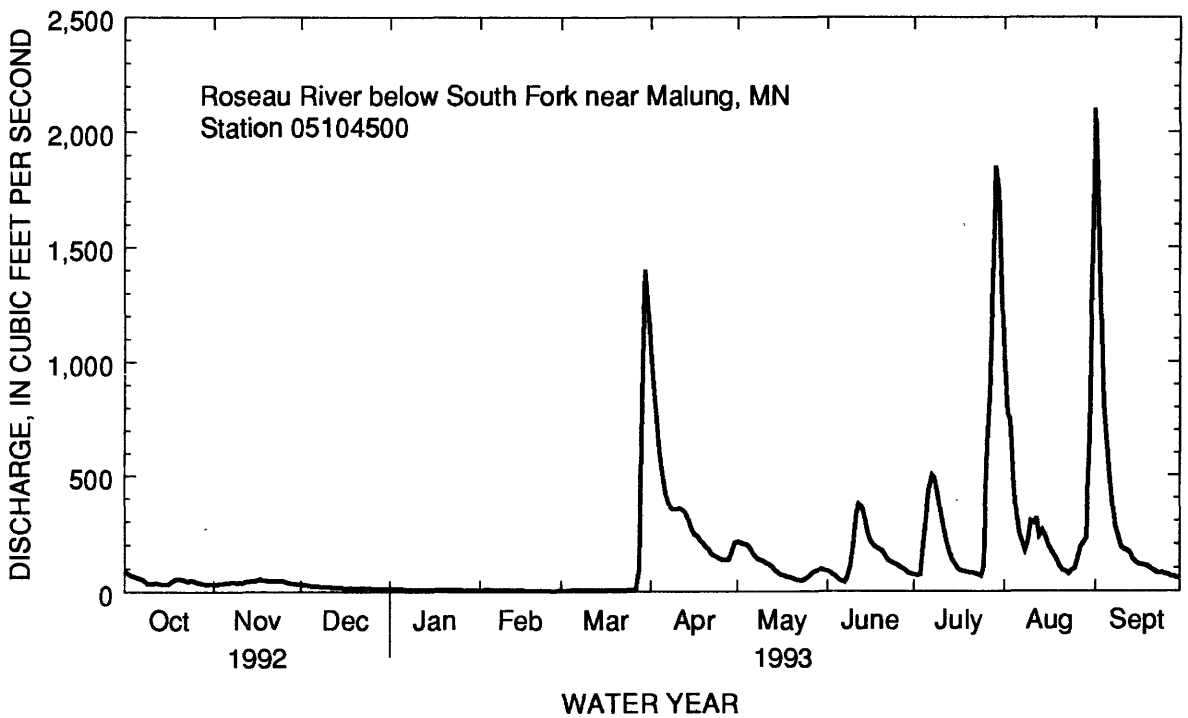
05104500 ROSEAU RIVER BELOW SOUTH FORK NEAR MALUNG, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	67.6	44.3	14.3	7.02	5.24	56.1	592	301	225	153	62.6	77.7
MAX	351	229	51.1	21.0	14.4	345	2035	1589	1140	1152	585	710
(WY)	1983	1957	1978	1966	1986	1986	1966	1950	1968	1968	1968	1957
MIN	.029	.16	.013	.000	.000	.83	5.60	8.77	4.16	.092	.000	.025
(WY)	1991	1991	1977	1977	1977	1977	1991	1990	1980	1980	1961	1988

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1947 - 1993	
ANNUAL TOTAL	60945.57		57720.6			
ANNUAL MEAN	167		158		134[a]	
HIGHEST ANNUAL MEAN					304	1950
LOWEST ANNUAL MEAN					7.28	1990
HIGHEST DAILY MEAN	1600	Mar 31	2100	Sep 1	5670	Jul 18 1968
LOWEST DAILY MEAN	.45	Aug 13	2.8	Feb 27	.00	Jul 23 1961
ANNUAL SEVEN-DAY MINIMUM	.83	Aug 11	3.0	Feb 22	.00	Jul 23 1961
INSTANTANEOUS PEAK FLOW			2220	Sep 1	5750	Jul 18 1968
INSTANTANEOUS PEAK STAGE			14.69	Sep 1	23.37[b]	Apr 3 1966
INSTANTANEOUS LOW FLOW			1.7	Feb 19	.00	Jan 15 1952
ANNUAL RUNOFF (AC-FT)	120900		114500		96820	
ANNUAL RUNOFF (CFSM)	.29		.28		.23	
ANNUAL RUNOFF (INCHES)	3.96		3.75		3.17	
10 PERCENT EXCEEDS	529		354		309	
50 PERCENT EXCEEDS	39		58		16	
90 PERCENT EXCEEDS	9.8		6.9		1.3	

a Median of annual mean discharges is 114 ft ^{3}/s.
b Backwater from ice.



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 SE¼SW ¼ sec.34, T.164 N., R.45 W., Kittson County, Hydrologic Unit 09020314, on left bank 400 ft downstream from State ditch 51 (known locally as Caribou cutoff ditch) and 0.6 mi west of Caribou.

DRAINAGE AREA.--1,570 mi², 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 1,002.31 ft above sea level (levels by Geodetic Survey of Canada). Prior to Apr. 1, 1929, nonrecording gage at site at Caribou 0.6 mi upstream at datum 0.95 ft lower.

REMARKS.--Records good except those for estimated daily discharges, which are poor. Satellite telemeter at station. Occasionally, at high stages, there is some natural diversion of flow above station to headwaters of Two Rivers.

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

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	210	68	e150	e39	e24	e19	e500	664	222	390	1290	1580
2	190	67	e135	e38	e24	e19	e650	702	214	388	1300	1560
3	172	66	e130	e37	e24	e18	e950	708	199	428	1330	1560
4	155	63	e125	e36	e23	e18	e1500	716	178	494	1350	1560
5	139	72	e125	e36	e23	e18	e1350	719	151	533	1370	1560
6	122	75	e120	e35	e23	e18	1320	710	138	668	1380	1570
7	114	78	e120	e34	e23	e18	1330	692	126	746	1390	1580
8	106	77	e130	e34	e22	e18	1360	660	149	775	1400	1590
9	104	81	e140	e33	e22	e18	1370	586	362	783	1700	1610
10	107	81	e140	e33	e22	e18	1380	525	800	776	1670	1610
11	101	80	e130	e32	e22	e19	1390	491	988	754	1630	1600
12	96	80	e100	e32	e21	e19	1400	459	1020	718	1630	1600
13	94	81	e90	e31	e21	e19	1410	431	1030	628	1630	1600
14	87	90	e85	e31	e21	e20	1400	398	1050	520	1640	1570
15	78	88	e80	e30	e21	e20	1390	351	1060	424	1660	1550
16	74	93	e75	e30	e21	e20	1370	313	1070	341	1670	1510
17	73	140	e70	e29	e20	e21	1350	281	1080	297	1690	1480
18	73	205	e66	e29	e20	e21	1320	235	1050	277	1700	1440
19	73	223	e62	e29	e20	e22	1290	202	1000	272	1700	1390
20	75	224	e60	e28	e20	e22	1250	184	935	336	1700	1330
21	80	226	e58	e28	e20	e23	1190	171	845	374	1690	1250
22	86	224	e56	e27	e20	e24	1120	158	729	364	1680	1150
23	88	221	e54	e27	e20	e24	1040	152	630	310	1710	1020
24	87	e220	e52	e27	e19	e25	947	151	590	254	1690	861
25	86	e215	e50	e26	e19	e26	840	147	575	288	1650	710
26	84	e210	e48	e26	e19	e29	725	159	543	620	1650	589
27	83	e205	e46	e26	e19	e40	632	174	513	965	1630	504
28	82	e200	e44	e26	e19	e70	602	185	467	1180	1590	445
29	78	e195	e42	e25	---	e130	590	202	433	1250	1600	406
30	75	e180	e41	e25	---	e220	608	221	401	1250	1680	373
31	72	---	e40	e24	---	e300	---	224	---	1270	1630	---
TOTAL	3144	4128	2664	943	592	1296	33574	11971	18548	18673	49030	38158
MEAN	101	138	85.9	30.4	21.1	41.8	1119	386	618	602	1582	1272
MAX	210	226	150	39	24	300	1500	719	1080	1270	1710	1610
MIN	72	63	40	24	19	18	500	147	126	254	1290	373
AC-FT	6240	8190	5280	1870	1170	2570	66590	23740	36790	37040	97250	75690
CFSM	.06	.09	.05	.02	.01	.03	.71	.25	.39	.38	1.01	.81
IN.	.07	.10	.06	.02	.01	.03	.80	.28	.44	.44	1.16	.90

e Estimated.

RED RIVER OF THE NORTH BASIN

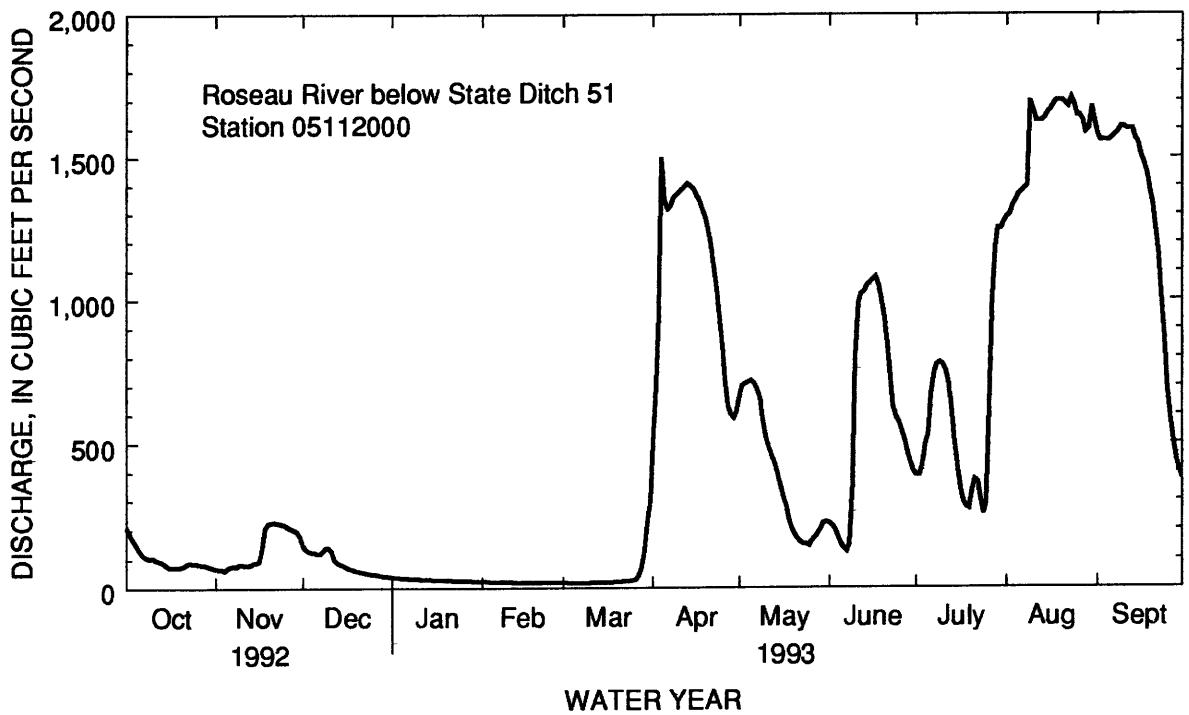
05112000 ROSEAU RIVER BELOW STATE DITCH 51, NEAR CARIBOU, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1917 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	163	109	44.5	23.9	19.2	100	800	915	570	391	159	175
MAX	1302	382	226	134	75.1	446	2167	3029	2588	1653	1582	1451
(WY)	1942	1927	1927	1927	1927	1946	1966	1950	1970	1968	1993	1968
MIN	.12	.26	.53	.090	.060	1.57	38.2	26.9	6.70	.65	2.09	.30
(WY)	1991	1991	1991	1991	1991	1989	1981	1988	1980	1980	1936	1990

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1917 - 1993	
ANNUAL TOTAL	173914		182721			
ANNUAL MEAN	475		501		286	
HIGHEST ANNUAL MEAN					683	1927
LOWEST ANNUAL MEAN					35.9	1977
HIGHEST DAILY MEAN	2460	Apr 28	1710	Aug 23	4020	May 19 1950
LOWEST DAILY MEAN	22	Aug 22	18	Mar 3-10	.00[a]	Aug 13 1936
ANNUAL SEVEN-DAY MINIMUM	26	Aug 18	18	Mar 3	.04	Sep 12 1990
INSTANTANEOUS PEAK FLOW			1730	Aug 9	4080	May 19 1950
INSTANTANEOUS PEAK STAGE			8.87[b]	Apr 4	11.81	May 19 1950
INSTANTANEOUS LOW FLOW					.00[c]	Aug 13 1936
ANNUAL RUNOFF (AC-FT)	344100		363000		207200	
ANNUAL RUNOFF (CFSM)	.30		.32		.18	
ANNUAL RUNOFF (INCHES)	4.11		4.33		2.47	
10 PERCENT EXCEEDS	1880		1560		1200	
50 PERCENT EXCEEDS	125		199		74	
90 PERCENT EXCEEDS	36		22		8.2	

a Also occurred Sep 15-17, 1990.
b Backwater from ice.
c Also occurred Sep 15-17, 1990 and part of each day Oct 12,13, and Nov 13, 1990.



RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1972 to current year.
REMARKS.--Letter K indicates non-ideal colony count.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT										
21...	0830	78	495	421	8.2	8.1	2.5	9.7	737	12.3
JAN										
12...	0900	30	580	551	7.5	7.3	1.0	4.4	741	3.3
APR										
13...	0930	1370	340	--	7.6	7.8	6.0	2.4	737	9.7
JUL										
28...	0830	1150	320	332	7.8	7.7	16.5	5.9	728	5.6

DATE	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)
OCT										
21...	23	180	57	21	8.4	1.4	210	211	0	256
JAN										
12...	K3	K5	67	24	10	<0.10	287	281	0	350
APR										
13...	K5	K12	43	16	4.0	5.9	137	172	0	167
JUL										
28...	K91	K310	40	16	4.3	3.4	147	155	0	179

DATE	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3, DIS-SOLVED (MG/L AS N) (00631)
OCT							
21...	16	5.9	0.10	9.9	302	<0.010	<0.050
JAN							
12...	17	5.2	0.20	18	348	0.030	0.160
APR							
13...	26	7.1	0.20	9.8	238	0.010	0.320
JUL							
28...	16	4.0	0.20	12	238	<0.010	0.140

RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51, NEAR CARIBOU, MN--Continued
(National Water Quality Assessment station)

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	SEDIMENT, SUSPENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	BARIUM, DISSOLVED (UG/L AS BA) (01005)
OCT									
21...	0.040	1.1	0.060	0.030	0.020	17	99	30	35
JAN									
12...	0.300	1.1	0.060	0.030	0.030	17	95	<10	41
APR									
13...	0.040	1.1	0.080	0.040	0.020	16	72	20	32
JUL									
28...	0.080	1.3	0.120	0.080	0.050	--	--	20	34

DATE	COBALT, DISSOLVED (UG/L AS CO) (01035)	IRON, DISSOLVED (UG/L AS FE) (01046)	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)
OCT										
21...	<3	130	9	17	<10	2	<1	<1.0	110	<6
JAN										
12...	<3	200	9	150	<10	1	<1	<1.0	140	<6
APR										
13...	<3	97	8	9	<10	1	<1	<1.0	83	<6
JUL										
28...	<3	91	13	3	10	1	<1	<1.0	94	<6

DATE	TIME	DISCHARGE, INST. CUBIC FEET PER SECOND (00061)	DISCHARGE, IN CUBIC FEET PER SECOND (00060)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH CIFIC CONDUCTANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	WATER WHOLE LAB (STANDARD UNITS) (00403)	TEMPERATURE AIR (DEG C) (00020)	BAROTEMPERATURE WATER (DEG C) (00010)	METRIC PRESSURE (MM OF HG) (00025)
FEB										
16...	1130	--	E21	672	657	7.5	7.3	-21.5	0.0	745
APR										
09...	0830	1370	--	330	336	7.7	7.5	-0.5	3.0	729
MAY										
05...	1130	719	--	384	386	7.8	7.9	--	12.5	740
21...	1300	172	--	409	417	8.1	8.0	14.5	13.0	736
JUN										
17...	1300	1080	--	370	377	7.8	7.8	19.0	16.5	728
JUL										
09...	1030	785	--	366	375	8.0	7.9	17.5	18.0	730

RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	OXYGEN, DIS-SOLVED (MG/L) (00300)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
FEB										
16...	0.4	78	32	11	2.6	404	0	331	--	16
APR										
09...	11.4	39	14	3.8	6.5	154	0	126	130	28
MAY										
05...	10.0	50	18	5.0	2.4	230	0	189	180	21
21...	9.8	54	20	5.4	1.7	238	0	195	203	22
JUN										
17...	5.5	50	18	5.3	2.3	222	0	182	183	13
JUL										
09...	7.5	51	19	4.5	2.4	233	0	191	184	12

RED RIVER OF THE NORTH BASIN

05112000 ROSEAU RIVER BELOW STATE DITCH 51 NEAR CARIBOU, MN--Continued
(National Water Quality Assessment station)

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	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)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)
FEB									
16...	38	0.10	23	369	0.060	0.180	0.300	1.3	1.2
APR									
09...	7.3	0.20	9.2	222	0.030	0.970	0.030	1.2	1.0
MAY									
05...	3.9	0.10	6.8	259	<0.010	<0.050	0.030	1.1	1.0
21...	2.9	0.20	6.4	279	<0.010	<0.050	0.010	1.1	0.80
JUN									
17...	3.3	0.20	12	267	<0.010	<0.050	0.030	1.1	0.90
JUL									
09...	3.3	0.20	11	259	<0.010	0.068	0.040	1.2	1.1

DATE	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	SEDIMENT, SUSPENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
FEB									
16...	0.150	<0.010	0.020	360	620	--	--	--	--
APR									
09...	0.140	0.090	0.060	150	13	--	--	22	88
MAY									
05...	0.030	0.020	<0.010	49	13	--	--	--	--
21...	0.060	0.010	0.010	49	29	--	--	29	95
JUN									
17...	0.080	0.060	0.040	87	22	--	--	--	--
JUL									
09...	0.080	0.060	0.050	82	9	24	0.6	22	98

LAKE OF THE WOODS BASIN

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

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

DRAINAGE AREA.--253 mi².

WATER-DISCHARGE RECORDS

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

GAGE.--Water-stage recorder. Elevation of gage is 1,450 ft above sea level, from topographic map.

REMARKS.--Records good, except for estimated period, which is fair.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	142	117	91	81	65	49	54	363	389	e270	e275	191
2	144	118	94	80	64	48	53	420	388	e260	e275	205
3	145	121	92	81	63	49	53	461	372	e260	e270	223
4	147	121	90	83	62	48	51	491	357	e270	e265	215
5	147	121	90	82	62	48	51	518	345	e290	e260	207
6	147	117	91	81	62	48	51	536	337	e320	e260	201
7	146	115	88	80	62	48	51	551	336	e340	e260	195
8	145	114	87	80	62	48	53	561	342	e360	e260	190
9	152	112	88	79	62	49	63	575	340	e370	e270	200
10	159	113	88	79	62	49	69	579	332	e370	e280	201
11	158	112	88	79	61	49	73	582	324	e360	e270	194
12	156	112	88	79	60	47	75	582	319	e350	e270	191
13	151	113	88	80	59	46	77	575	319	e345	e270	187
14	151	111	88	80	58	44	79	572	319	e340	e270	185
15	150	108	88	79	56	44	81	560	e305	e330	e270	182
16	146	106	88	78	56	44	83	545	e300	e320	e280	177
17	143	106	85	77	54	44	86	531	e295	e310	e275	174
18	139	106	82	77	54	43	90	518	e290	e300	267	172
19	137	105	83	76	54	43	93	503	e285	e280	263	169
20	143	106	82	73	53	43	96	482	e280	e270	257	165
21	140	104	82	68	52	43	99	467	e280	e265	247	163
22	140	103	82	68	52	42	104	449	e275	e260	240	166
23	139	101	86	68	52	42	109	433	e275	e255	240	166
24	137	100	83	68	51	42	129	442	e280	e255	237	161
25	134	99	89	66	51	42	154	444	e285	e255	228	158
26	131	98	85	67	50	43	168	435	e290	e265	228	160
27	129	96	83	69	50	44	188	424	e295	e270	232	158
28	126	95	82	70	49	46	243	423	e285	e275	214	160
29	124	94	82	67	---	48	285	413	e280	e280	203	162
30	122	93	82	67	---	51	327	413	e275	e280	206	156
31	120	---	82	66	---	54	---	399	---	e280	203	---
TOTAL	4390	3237	2677	2328	1598	1428	3188	15247	9394	9255	7845	5434
MEAN	142	108	86.4	75.1	57.1	46.1	106	492	313	299	253	181
MAX	159	121	94	83	65	54	327	582	389	370	280	223
MIN	120	93	82	66	49	42	51	363	275	255	203	156
AC-FT	8710	6420	5310	4620	3170	2830	6320	30240	18630	18360	15560	10780
CFSM	.56	.43	.34	.30	.23	.18	.42	1.94	1.24	1.18	1.00	.72
IN.	.65	.48	.39	.34	.23	.21	.47	2.24	1.38	1.36	1.15	.80

e Estimated.

LAKE OF THE WOODS BASIN

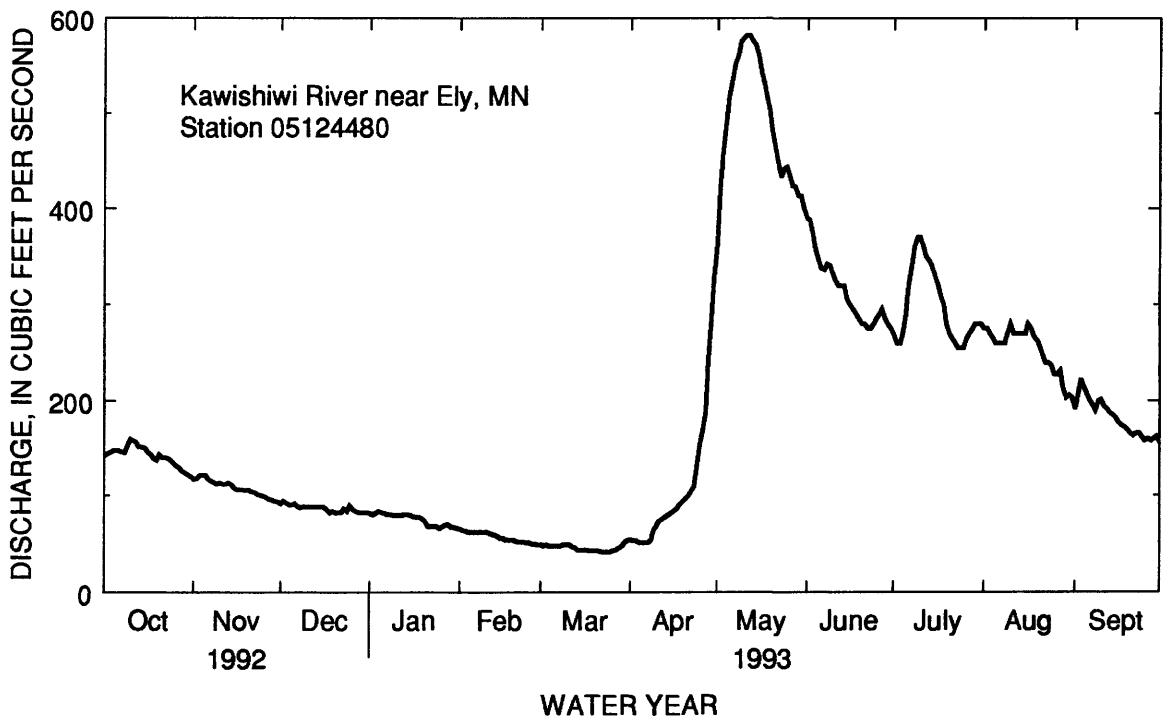
05124480 KAWISHIWI RIVER NEAR ELY, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	159	170	135	92.3	67.8	56.3	243	664	386	199	148	150
MAX	881	684	345	163	107	85.2	785	1133	1069	467	758	698
(WY)	1978	1971	1983	1984	1971	1969	1976	1979	1970	1968	1988	1988
MIN	12.1	9.43	7.25	5.32	4.77	5.87	8.95	13.3	115	74.5	46.7	18.5
(WY)	1977	1977	1977	1977	1977	1977	1977	1977	1977	1980	1976	1976

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1966 - 1993	
ANNUAL TOTAL	72771		66021			
ANNUAL MEAN	199		181		207	
HIGHEST ANNUAL MEAN					313	1971
LOWEST ANNUAL MEAN					94.5	1977
HIGHEST DAILY MEAN	1010	May 14-16	582	May 11,12	1710	Apr 24 1976
LOWEST DAILY MEAN	55	Apr 2,4	42	Mar 22-25	4.5	Jan 31 1977
ANNUAL SEVEN-DAY MINIMUM	56	Mar 30	42	Mar 19	4.6	Jan 29 1977
INSTANTANEOUS PEAK FLOW			585	May 11	1720	Apr 24 1976
INSTANTANEOUS PEAK STAGE			4.68	May 11,12	5.92	Apr 24 1976
INSTANTANEOUS LOW FLOW			41	Mar 24-26	4.5[a]	
ANNUAL RUNOFF (AC-FT)	144300		131000		150000	
ANNUAL RUNOFF (CFSM)	.79		.71		.82	
ANNUAL RUNOFF (INCHES)	10.70		9.71		11.12	
10 PERCENT EXCEEDS	496		361		525	
50 PERCENT EXCEEDS	117		137		108	
90 PERCENT EXCEEDS	68		51		37	

a Occurred Jan. 30 to Feb. 2, 1977.



LAKE OF THE WOODS BASIN

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

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water years 1966 to current year.
REMARKS.--Letter K indicates non-ideal colony count.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
OCT											
28...	0900	128	30	31	7.2	7.4	6.0	2.0	719	11.0	K4
JAN											
20...	1100	75	30	33	6.5	6.9	1.0	0.90	732	13.5	K10
MAY											
05...	1315	532	--	32	6.8	6.6	9.0	2.0	725	11.0	K1
JUL											
19...	1230	272	28	31	7.2	6.7	20.5	0.50	718	7.1	K10

DATE	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 WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)
OCT											
28...	52	3.0	1.4	1.1	0.30	10	10	0	12	2.6	0.50
JAN											
20...	K3	3.2	1.5	1.0	0.40	8	12	0	10	2.6	0.60
MAY											
05...	K2	2.9	1.3	1.0	0.40	--	12	0	--	2.6	0.40
JUL											
19...	550	3.0	1.3	1.1	0.30	9	13	0	11	2.4	0.40

DATE	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, N02+N03 DIS-SOLVED (MG/L ASN) (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)
OCT											
28...	<0.10	3.1	30	<0.010	<0.050	0.030	0.40	0.020	<0.010	<0.010	2
JAN											
20...	<0.10	3.3	41	0.010	0.067	0.050	0.40	0.010	<0.010	<0.010	2
MAY											
05...	0.20	3.7	39	<0.010	0.053	0.030	0.40	0.010	<0.010	<0.010	72
JUL											
19...	<0.10	3.3	40	<0.010	<0.050	0.040	0.40	<0.010	<0.010	<0.010	1

LAKE OF THE WOODS BASIN

05124480 KAWISHWI RIVER NEAR ELY, MN--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	SED. SUSP. SIEVE DIAM. % FINER THAN 062 MM (70331)	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MOLYB-DENUM, DIS-SOLVED (UG/L AS M0) (010600)	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)
OCT											
28...	94	20	3	<3	180	<4	3	<10	2	<1	<1.0
JAN											
20...	93	30	4	<3	160	<4	5	<10	1	<1	<1.0
MAY											
05...	20	40	<2	<3	180	<4	13	<10	2	<1	<1.0
JUL											
19...	100	70	4	<3	160	<4	2	<10	1	<1	<1.0

DATE	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	GROSS ALPHA, DIS-SOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	ALPHA, COUNT, 2 SIGMA WAT DIS AS NAT U (UG/L) (75986)	ALPHA COUNT, 2 SIGMA WAT DIS AS TH-230 (PCI/L) (75987)	ALPHA, 2 SIGMA SED SUS TOT DRY AS TH-230 (PCI/L) (76004)	GROSS BETA, DIS-SOLVED PCI/L AS CS-137) (03515)	GROSS BETA, SUSP. TOTAL PCI/L AS CS-137) (03516)	GROSS BETA, DIS-SOLVED PCI/L AS SR YT-90) (80050)	GROSS BETA, SUSP. TOTAL PCI/L AS SR YT-90 (80060)
OCT											
28...	13	<6	<0.6	<0.6	0.19	0.12	0.37	1.2	0.8	1.1	0.7
JAN											
20...	13	<6	--	--	--	--	--	--	--	--	--
MAY											
05...	11	<6	<0.6	<0.6	0.19	0.12	0.33	1.2	<0.6	1.2	<0.6
JUL											
19...	12	<6	--	--	--	--	--	--	--	--	--

DATE	BETA, 2 SIGMA WATER, DISS, AS SR90 /Y90 (PCI/L (75988)	BETA, 2 SIGMA WATER, DISS, AS CS-137 (PCI/L) (75989)	BETA, 2 SIGMA SED, SUSP, TOT DRY SR90Y90 (PCI/L) (76005)	RADIUM 226, DIS-SOLVED, RADON METHOD (PCI/L) (09511)	RA-226 2 SIGMA WATER, DISS, (PCI/L) (76001)	URANIUM NATURAL DIS-SOLVED (UG/L AS U) (22703)
OCT						
28...	0.52	0.58	0.54	<0.02	<0.00	0.01
JAN						
20...	--	--	--	--	--	--
MAY						
05...	0.49	0.51	0.46	0.03	0.010	<0.01
JUL						
19...	--	--	--	--	--	--

LAKE OF THE WOODS BASIN

05127000 KAWISHIWI RIVER NEAR WINTON, MN

LOCATION.--Lat 47°56'05", long 91°45'50", in NE¼NW¼ sec.20, T.63 N., R.11 W., Lake County, Hydrologic Unit 09030001, Superior National Forest, at powerplant of Minnesota Power Co., just upstream from Fall Lake, and 1.8 mi east of Winton.

DRAINAGE AREA.--1,229 mi².

PERIOD OF RECORD.--June 1905 to June 1907, October 1912 to September 1919 (fragmentary), September 1923 to current year. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WDR MN-77-1: Drainage area.

REMARKS.--No estimated daily discharges. Records fair. Daily discharge computed from powerplant records. Flow regulated by powerplant and by Camp Six, Bald Eagle, Gabbro, Little Gabbro, Birch, White Iron, South Farm, and Garden Lakes.

COOPERATION.--Records collected by Minnesota Power Co., under general supervision of Geological Survey, in connection with a Federal Power Commission project.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	960	.00	698	398	398	428	480	1670	1720	1220	1470	915
2	960	278	712	398	398	443	480	2520	1720	1340	1600	916
3	960	399	599	398	398	443	480	2740	1650	1470	1930	959
4	960	399	599	398	398	421	480	2740	1520	2320	2100	958
5	960	399	597	398	398	399	742	2750	1470	2740	2090	958
6	960	399	399	398	398	399	960	2760	1470	2530	2020	958
7	959	399	598	398	398	399	674	2790	1470	2250	1890	910
8	852	399	605	398	398	399	960	3180	1470	2080	1890	822
9	800	399	569	398	399	415	955	3340	1780	2290	1810	888
10	795	426	574	398	399	422	954	3430	2040	2860	1690	914
11	794	445	599	398	399	422	954	3260	1910	2980	1530	883
12	794	452	398	398	399	422	954	2950	1810	2960	1470	882
13	794	457	399	398	399	421	954	2470	1810	2960	1330	823
14	794	457	599	398	399	421	954	2370	1810	2960	1220	794
15	794	458	599	398	399	421	954	2220	1750	2750	1220	794
16	714	458	594	398	399	421	954	2230	1700	2520	1220	794
17	398	458	597	398	399	421	955	2230	1700	2520	1220	794
18	398	600	590	398	399	544	955	1930	1700	2570	1230	793
19	661	606	398	398	399	749	955	1690	1700	2570	1230	793
20	795	563	398	398	399	749	911	1690	1700	2580	1070	792
21	794	585	597	398	398	749	879	1620	1710	2400	959	793
22	794	400	599	398	398	378	861	1580	1630	2170	960	694
23	716	686	398	398	398	374	809	1580	1420	1860	960	660
24	397	800	398	398	398	374	791	1700	1350	1690	960	662
25	398	717	398	398	398	389	791	1790	1600	1690	960	397
26	665	399	398	398	399	397	791	1800	1910	1690	961	398
27	795	682	398	398	399	397	791	1810	1890	1690	960	680
28	793	715	398	398	399	427	873	1770	1680	1690	960	795
29	793	399	398	398	---	467	957	1730	1360	1690	960	795
30	594	684	398	398	---	480	1120	1730	1220	1550	959	789
31	395	---	398	398	---	480	---	1730	---	1470	959	---
TOTAL	23236	14518.00	15899	12338	11159	14071	25328	69800	49670	68060	41788	24003
MEAN	750	484	513	398	399	454	844	2252	1656	2195	1348	800
MAX	960	800	712	398	399	749	1120	3430	2040	2980	2100	959
MIN	395	.00	398	398	398	374	480	1580	1220	1220	959	397
+	-93.7	23.7	-77	-64.5	-161	-170	355	131	7.5	9.4	-23.9	-18.3
MEAN ‡	656	508	436	334	238	284	1199	2383	1663	2205	1324	782
CFSM ‡	.53	.41	.35	.27	.19	.23	.98	1.94	1.35	1.79	1.08	.64
IN ‡.	.61	.46	.40	.31	.20	.27	1.09	2.24	1.51	2.06	1.25	.71

CAL YR.	1991	TOTAL 381304	MEAN 1042	MAX. 4880	MIN. 0.0	MEAN ‡1044	CFSM ‡.85 IN ‡11.54
WTR YR	1992	TOTAL 369870	MEAN 1013	MAX. 3430	MIN. 0.0	MEAN ‡1007	CFSM ‡.82 IN ‡11.13

+ 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

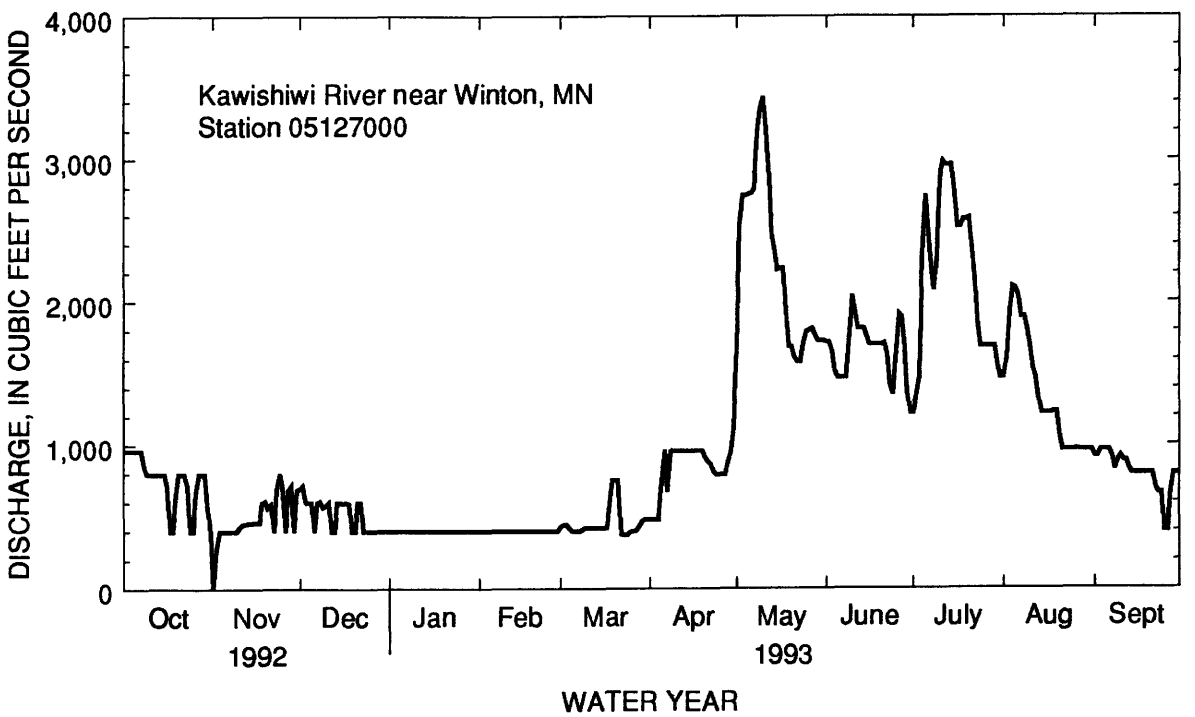
05127000 KAWISHIWI RIVER NEAR WINTON, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1905 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	898	749	586	449	344	370	1183	3121	1949	1139	697	758
MAX	4277	3572	1422	862	770	844	5020	9278	5661	2748	3775	3149
(WY)	1947	1971	1983	1978	1927	1945	1945	1950	1968	1944	1988	1928
MIN	66.5	8.97	76.1	80.3	74.5	103	19.3	111	519	217	51.7	38.1
(WY)	1924	1924	1977	1977	1977	1924	1924	1924	1980	1961	1919	1919

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1905 - 1993	
ANNUAL TOTAL	381304.00		369870.00			
ANNUAL MEAN	1042		1013		1031	
HIGHEST ANNUAL MEAN					1967	1950
LOWEST ANNUAL MEAN					240	1924
HIGHEST DAILY MEAN	4880	May 19	3430	May 10	16000	May 18 1950
LOWEST DAILY MEAN	.00	Nov 1	.00	Nov 1	.00[a]	
ANNUAL SEVEN-DAY MINIMUM	324	Oct 31	324	Oct 31	.00	Oct 13 1923
ANNUAL RUNOFF (AC-FT)	756300		733600		747000	
ANNUAL RUNOFF (CFSM)	.85		.82		.84	
ANNUAL RUNOFF (INCHES)	11.54		11.20		11.40	
10 PERCENT EXCEEDS	2320		2080		2440	
50 PERCENT EXCEEDS	789		793		593	
90 PERCENT EXCEEDS	397		398		190	

a Many times, several years.



LAKE OF THE WOODS BASIN

05127500 BASSWOOD RIVER NEAR WINTON, MN
(International gaging station)

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

DRAINAGE AREA.--1,740 mi², 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 above sea level, 1928 datum, (levels by Geodetic Survey of Canada). Prior to Oct. 27, 1938, nonrecording gages at several sites in vicinity of gage, at datum 3.0 ft higher. Oct. 28, 1938, to Sept. 30, 1966, water-stage recorder at datum 3.0 ft higher.

REMARKS.--No estimated daily discharges. Records good. Satellite telemeter at station. Some regulation by powerplant on Kawishiwi River at Winton, and by many lakes located upstream from station.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1360	882	706	711	592	520	552	1520	2500	1950	2660	1720
2	1340	866	704	704	587	520	552	1670	2490	1910	2580	1760
3	1320	838	710	700	584	519	552	1820	2470	1880	2560	1790
4	1310	811	708	695	580	514	560	1990	2440	2050	2530	1780
5	1300	796	717	693	578	514	563	2150	2400	2130	2580	1760
6	1260	773	713	686	583	512	574	2300	2380	2190	2590	1720
7	1250	758	709	677	578	514	594	2420	2370	2280	2580	1690
8	1230	739	708	668	576	519	628	2540	2360	2380	2560	1670
9	1220	729	708	662	571	517	701	2680	2340	2510	2600	1670
10	1230	713	705	659	566	513	764	2820	2330	2600	2580	1650
11	1210	703	706	655	560	513	806	2940	2330	2780	2540	1640
12	1170	689	705	651	558	509	850	3040	2310	2890	2480	1610
13	1150	680	704	658	553	508	888	3100	2310	3010	2420	1590
14	1140	676	713	651	552	506	919	3090	2300	3090	2350	1570
15	1120	672	718	651	552	507	951	3070	2290	3160	2350	1540
16	1090	675	716	651	548	509	976	3030	2280	3200	2380	1510
17	1070	671	720	650	544	513	998	2990	2240	3240	2340	1470
18	1040	668	724	642	544	515	1020	2940	2200	3250	2280	1440
19	1010	670	729	640	544	516	1040	2870	2170	3260	2230	1420
20	1000	682	729	625	542	520	1060	2790	2130	3270	2190	1390
21	996	684	720	624	534	520	1070	2710	2100	3290	2130	1360
22	985	694	725	625	528	520	1080	2640	2080	3270	2070	1350
23	976	692	730	618	528	520	1090	2580	2060	3210	2040	1330
24	975	692	738	609	528	520	1140	2590	2110	3110	2010	1300
25	957	694	733	608	528	520	1200	2560	2080	3080	1960	1280
26	928	698	730	618	528	517	1210	2520	2030	3030	1920	1250
27	918	702	725	608	528	520	1220	2520	2030	2970	1900	1230
28	903	702	717	608	524	520	1310	2500	2040	2930	1850	1210
29	894	703	719	607	---	522	1380	2510	2040	2900	1800	1200
30	891	704	719	598	---	530	1460	2520	2010	2840	1790	1190
31	888	---	721	592	---	551	---	2510	---	2770	1750	---
TOTAL	34131	21656	22229	20044	15518	16038	27708	79930	67220	86430	70600	45090
MEAN	1101	722	717	647	554	517	924	2578	2241	2788	2277	1503
MAX	1360	882	738	711	592	551	1460	3100	2500	3290	2660	1790
MIN	888	668	704	592	524	506	552	1520	2010	1880	1750	1190
AC-FT	67700	42950	44090	39760	30780	31810	54960	158500	133300	171400	140000	89440
CFSM	.63	.41	.41	.37	.32	.30	.53	1.48	1.29	1.60	1.31	.86
IN.	.73	.46	.48	.43	.33	.34	.59	1.71	1.44	1.85	1.51	.96

e Estimated.

LAKE OF THE WOODS BASIN

05127500 BASSWOOD RIVER NEAR WINTON, MN--Continued

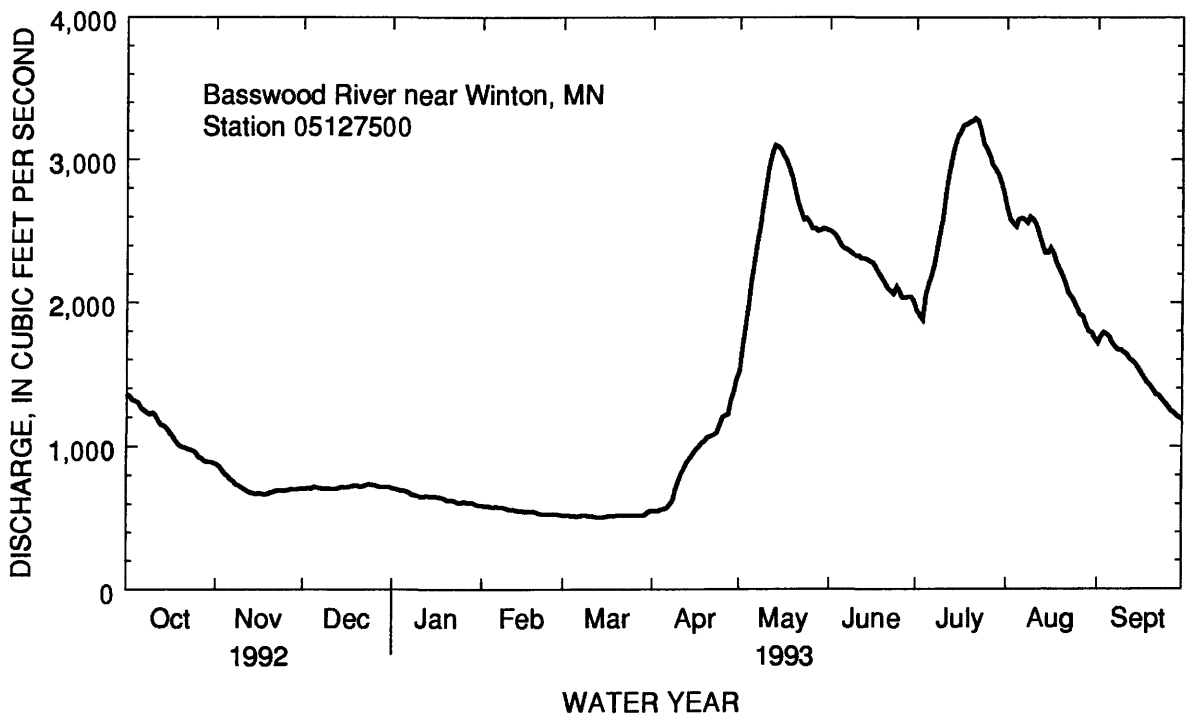
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1993, BY WATER YEAR (WY)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	1094	1004	862	717	591	566	1201	3751	2897	1809	1115	1015
MAX	5320	3879	2510	1475	1229	1143	5069	9114	7332	4453	3487	5034
(WY)	1978	1971	1983	1966	1966	1966	1945	1950	1950	1944	1944	1988
MIN	65.1	60.2	76.2	86.2	95.0	135	269	225	696	512	323	120
(WY)	1977	1977	1977	1977	1977	1977	1977	1977	1980	1980	1980	1976

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1931 - 1993	
ANNUAL TOTAL	522369		506594			
ANNUAL MEAN	1427		1388		1394	
HIGHEST ANNUAL MEAN					2643	1950
LOWEST ANNUAL MEAN					557	1958
HIGHEST DAILY MEAN	5720	May 23	3290	Jul 21	15200	May 24 1950
LOWEST DAILY MEAN	625	Mar 5	506	Mar 14	58	Nov 3 1976
ANNUAL SEVEN-DAY MINIMUM	636	Mar 1	509	Mar 10	58	Nov 7 1976
INSTANTANEOUS PEAK FLOW			3300	Jul 19,21,22	15600	May 24 1950
INSTANTANEOUS PEAK STAGE			5.08	Jul 19,21,22	9.94[a]	May 24 1950
INSTANTANEOUS LOW FLOW			505[b]		55	Nov 18 1976
ANNUAL RUNOFF (AC-FT)	1034000		1006000		1010000	
ANNUAL RUNOFF (CFSM)	.82		.80		.80	
ANNUAL RUNOFF (INCHES)	11.14		10.83		10.88	
10 PERCENT EXCEEDS	3180		2620		3250	
50 PERCENT EXCEEDS	964		1040		855	
90 PERCENT EXCEEDS	689		529		377	

a Present datum.

b Occurred Oct. 1, 2, 3, 5, 9, 11.



LAKE OF THE WOODS BASIN

05128000 NAMAKAN RIVER AT OUTLET OF LAC LA CROIX, ONTARIO
(International gaging station)

LOCATION.--Lat 48°21'14", long 92°13'01", at Campbell's Camp, on Lac La Croix Lake, used to determine discharge at outlet [Lat 48°23'00", long 92°10'40", 2.5 mi east of Campbell's Camp].

DRAINAGE AREA.--5,170 mi².

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 good. Satellite telemeter at station.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5370	3370	2440	2300	2090	1780	1610	3670	6780	e5540	8510	6430
2	5330	3310	2430	2310	2090	1780	1610	3920	6750	e5510	8510	6430
3	5300	3280	2420	2310	2070	1760	1610	4130	6710	e5470	8580	6360
4	5230	3230	2390	2300	2040	1740	1610	4380	6640	e5540	8580	6250
5	5160	3200	2390	2300	2030	1740	1620	4590	6570	e5650	8650	6220
6	5050	3160	2370	2300	2040	1730	1640	4840	6530	e5720	8720	6110
7	4980	3120	2340	2290	2030	1720	1660	5090	6570	e5790	8690	6070
8	4910	3080	2330	2280	2020	1710	1700	5330	6570	5860	8690	6000
9	4800	3050	2320	2260	2010	1720	1780	5580	6500	5930	8690	5930
10	4770	2950	2310	2250	1990	1710	1850	5760	6500	6070	8690	5900
11	4700	2970	2290	2250	1980	1710	1910	5930	6460	6140	8650	5860
12	4520	2900	2270	2250	1970	1700	1970	6140	6430	6220	8550	5830
13	4480	2860	2260	2250	1960	1700	2030	6320	6360	6360	8480	5760
14	4450	2860	2280	2240	1950	1680	2100	6430	6250	6430	8370	5760
15	4380	2830	2270	2240	1940	1670	2180	6530	6250	6530	8330	5720
16	4270	2810	2260	2240	1930	1650	2240	6670	6290	6820	8260	5650
17	4170	2790	2250	2230	1920	1650	2310	6820	6250	7030	8160	5540
18	4100	2770	2250	2220	1910	1630	2380	6890	6180	7170	8020	5470
19	4060	2740	2240	2210	1900	1610	2450	6920	6140	7270	7840	5400
20	3990	2720	2240	2200	1890	1600	2510	6960	6070	7420	7730	5370
21	3960	2680	2240	2190	1860	1590	2560	6990	6040	7520	7590	5330
22	3880	2680	2240	2190	1850	1590	2620	7030	6000	7630	7450	5190
23	3810	2650	2240	2180	1850	1580	2680	7030	5900	7660	7380	5120
24	3780	2620	2250	2160	1840	1570	2770	7030	5860	7700	7270	5050
25	3710	2590	2230	2140	1830	1560	2840	7030	5860	7800	7170	5010
26	3640	2560	2250	2150	1820	1570	2920	6990	5690	7980	7060	4910
27	3600	2540	2240	2140	1810	1570	3010	7030	5620	8160	6990	4840
28	3530	2520	2240	2130	1790	1570	3160	6990	e5620	8330	6890	4800
29	3490	2490	2250	2120	---	1580	3320	6960	e5580	8440	6750	4730
30	3420	2470	2270	2120	---	1590	3480	6960	e5540	8510	6670	4660
31	3390	---	2300	2100	---	1610	---	6850	---	8580	6530	---
TOTAL	134230	85800	71100	68850	54410	51370	68130	189790	186510	212780	246450	167700
MEAN	4330	2860	2294	2221	1943	1657	2271	6122	6217	6864	7950	5590
MAX	5370	3370	2440	2310	2090	1780	3480	7030	6780	8580	8720	6430
MIN	3390	2470	2230	2100	1790	1560	1610	3670	5540	5470	6530	4660
AC-FT	266200	170200	141000	136600	107900	101900	135100	376400	369900	422000	488800	332600
CFSM	.84	.55	.44	.43	.38	.32	.44	1.18	1.20	1.33	1.54	1.08
IN.	.97	.62	.51	.50	.39	.37	.49	1.37	1.34	1.53	1.77	1.21

e Estimated.

LAKE OF THE WOODS BASIN

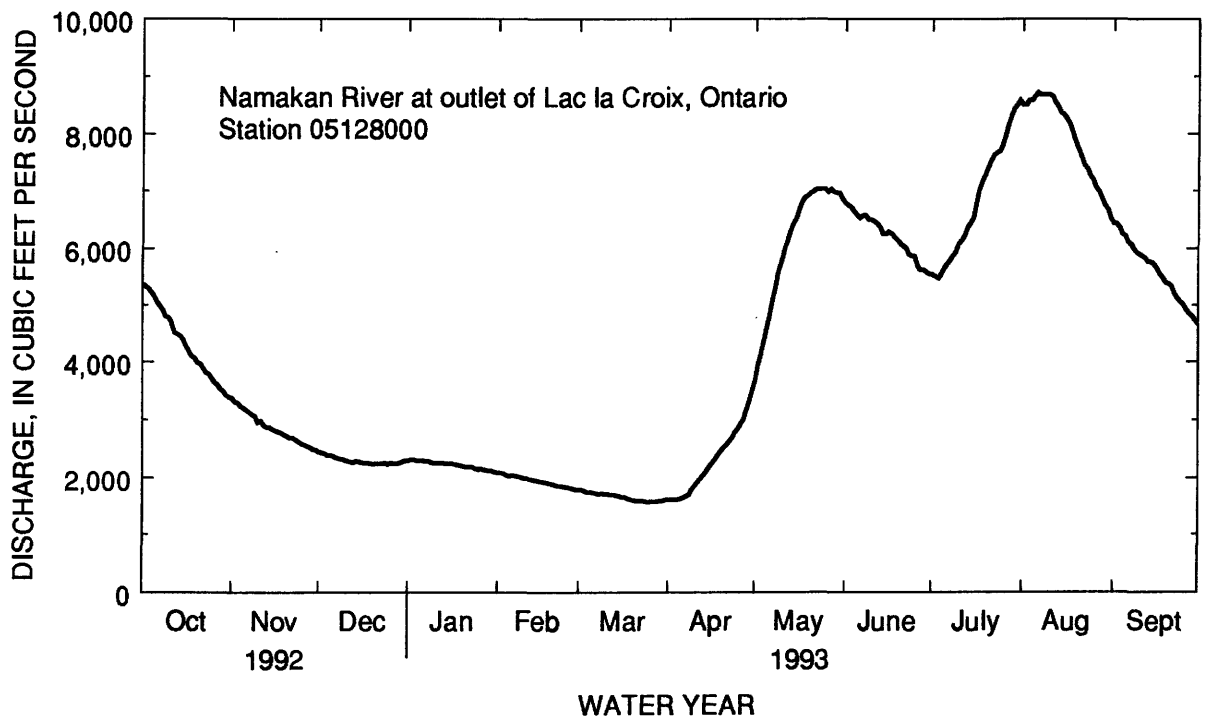
05128000 NAMAKAN RIVER AT OUTLET OF LAC LA CROIX, ONTARIO--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1921 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	3082	2886	2565	2169	1873	1662	2544	7669	8032	6116	4039	3210
MAX	14200	10610	7189	4568	3432	2996	9071	16900	22120	15930	11200	13140
(WY)	1978	1978	1972	1978	1966	1966	1945	1938	1950	1968	1944	1988
MIN	835	624	567	547	540	535	614	899	1475	1263	1141	1223
(WY)	1977	1977	1977	1977	1924	1924	1977	1977	1924	1924	1980	1933

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1921 - 1993	
ANNUAL TOTAL	1585990		1537120			
ANNUAL MEAN	4333		4211		3839	
HIGHEST ANNUAL MEAN					7270	1950
LOWEST ANNUAL MEAN					964	1924
HIGHEST DAILY MEAN	11700	May 28	8720	Aug 6	28200	May 31 1950
LOWEST DAILY MEAN	1730	Apr 3	1560	Mar 25	535	Feb 4 1924
ANNUAL SEVEN-DAY MINIMUM	1740	Mar 29	1570	Mar 23	535	Feb 4 1924
INSTANTANEOUS PEAK FLOW			8790	Aug 9	28200[a]	May 31 1950
INSTANTANEOUS PEAK STAGE			1186.79	Aug 9	1193.30[a]	May 31 1950
INSTANTANEOUS LOW FLOW			1560	Mar 25	535[b]	Feb 1 1924
ANNUAL RUNOFF (AC-FT)	3146000		3049000		2782000	
ANNUAL RUNOFF (CFSM)	.84		.81		.74	
ANNUAL RUNOFF (INCHES)	11.41		11.06		10.09	
10 PERCENT EXCEEDS	8650		7270		8330	
50 PERCENT EXCEEDS	3600		3480		2650	
90 PERCENT EXCEEDS	1900		1750		1180	

a Occurred May 31 to June 2, 1950.
b Occurred at times in Feb., Mar., and Apr. 1924.



LAKE OF THE WOODS BASIN

05129115 VERMILION RIVER NEAR CRANE LAKE, MN

LOCATION.--Lat 48°15'53", long 92°33'57", in NE¼NE¼ sec. 30, T.67 N., R.17 W., St. Louis County, Hydrologic Unit 09030002, in Superior National Forest, on left bank 350 ft downstream from bridge on Forest Route 491, 3.5 mi upstream from mouth, and 3.5 mi west of city of Crane Lake.

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

GAGE.--Water-stage recorder. Elevation of gage is 1,180 ft above sea level, from topographic map.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	477	239	270	258	246	e167	810	1570	914	639	1780	1290
2	458	243	268	256	245	e165	847	1690	878	623	1700	1250
3	438	262	265	262	242	e163	842	1750	846	598	1640	1260
4	422	269	262	262	237	e162	820	1810	819	802	1660	1310
5	411	269	256	260	234	e162	801	1770	791	1400	1650	1320
6	399	269	254	256	230	e161	806	1710	764	1600	1650	1290
7	377	269	247	250	230	e160	831	1630	753	1590	1620	1210
8	367	269	240	243	222	e159	889	1580	772	1520	1560	1140
9	363	273	238	235	218	e158	1010	1560	788	1440	1530	1110
10	362	298	237	234	217	e157	1180	1520	794	1390	1510	1090
11	356	309	233	239	207	e157	1270	1490	779	1400	1470	1070
12	346	318	230	253	206	e156	1300	1430	762	1410	1410	1060
13	324	322	230	264	211	e155	1290	1390	752	1410	1360	1030
14	318	322	236	264	209	e154	1220	1340	749	1410	1300	1090
15	312	319	240	267	196	e153	1150	1270	723	1390	1300	1160
16	306	315	241	265	189	e152	1100	1230	710	1390	1310	1150
17	298	315	239	263	183	e151	1060	1190	704	1440	1340	1110
18	288	314	234	257	e180	158	1010	1150	687	1510	1350	1040
19	281	312	241	254	e178	160	968	1110	664	1570	1320	985
20	284	311	237	253	e177	165	930	1070	642	1580	1270	935
21	285	311	234	251	e176	170	890	1030	613	1560	1200	908
22	291	307	239	251	e175	170	851	1000	584	1530	1140	896
23	293	306	242	248	e173	168	819	982	578	1500	1150	887
24	291	303	236	244	e172	171	822	967	644	1490	1250	868
25	283	299	241	232	e171	191	893	968	752	1480	1240	843
26	276	297	236	231	e170	219	943	952	774	1510	1200	830
27	267	292	241	237	e169	251	940	938	753	1520	1220	809
28	262	286	247	239	e168	331	990	953	725	1700	1180	818
29	255	278	249	237	---	445	1140	953	690	1880	1100	838
30	250	272	252	239	---	609	1420	949	660	1940	1150	846
31	243	---	257	244	---	738	---	937	---	1860	1290	---
TOTAL	10183	8768	7572	7748	5631	6638	29842	39889	22064	44082	42850	31443
MEAN	328	292	244	250	201	214	995	1287	735	1422	1382	1048
MAX	477	322	270	267	246	738	1420	1810	914	1940	1780	1320
MIN	243	239	230	231	168	151	801	937	578	598	1100	809
AC-FT	20200	17390	15020	15370	11170	13170	59190	79120	43760	87440	84990	62370

e Estimated.

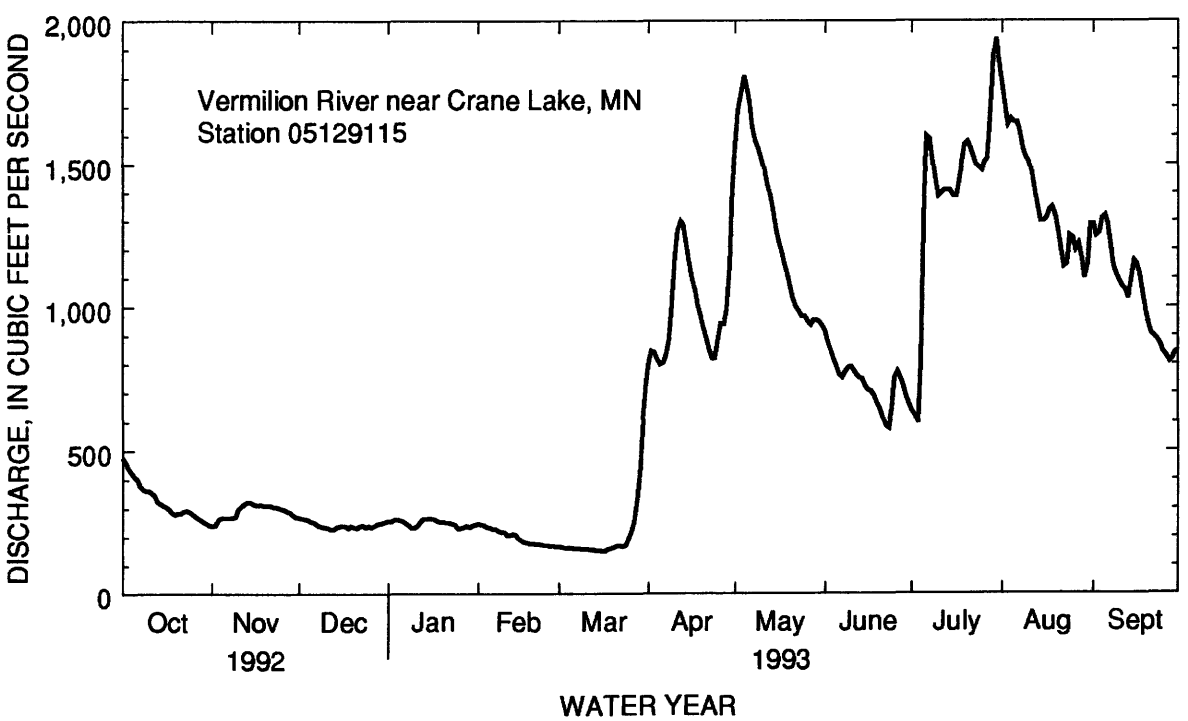
LAKE OF THE WOODS BASIN

05129115 VERMILION RIVER NEAR CRANE LAKE, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1979 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	552	496	398	279	231	270	1117	1383	996	795	510	523
MAX	1175	1138	872	460	368	465	1641	2249	1840	1609	1612	1880
(WY)	1986	1983	1983	1984	1984	1987	1986	1982	1985	1985	1988	1988
MIN	181	152	116	97.8	94.1	89.5	627	507	205	113	60.0	103
(WY)	1980	1988	1988	1988	1988	1988	1987	1980	1980	1980	1980	1984

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1979 - 1993	
ANNUAL TOTAL	199392		256710			
ANNUAL MEAN	545		703		633	
HIGHEST ANNUAL MEAN					806	1986
LOWEST ANNUAL MEAN					326	1980
HIGHEST DAILY MEAN	1730	Apr 21	1940	Jul 30	4300	Apr 25 1985
LOWEST DAILY MEAN	230	Dec 12	151	Mar 17	38	Aug 13 1980
ANNUAL SEVEN-DAY MINIMUM	235	Dec 8	154	Mar 11	40	Aug 10 1980
INSTANTANEOUS PEAK FLOW			1960	Jul 29	4360	Apr 25 1985
INSTANTANEOUS PEAK STAGE			11.13	Jul 29	15.20	Apr 25 1985
INSTANTANEOUS LOW FLOW					38	Aug 13 1980
ANNUAL RUNOFF (AC-FT)	395500		509200		458300	
10 PERCENT EXCEEDS	1150		1490		1420	
50 PERCENT EXCEEDS	399		598		416	
90 PERCENT EXCEEDS	266		187		160	



LAKE OF THE WOODS BASIN

05129290 GOLD PORTAGE OUTLET FROM KABETOGAMA LAKE NEAR RAY, MN

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

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

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

REMARKS.--Records good except those for estimated discharge, which are fair. Flow completely regulated by outlet dam on Nomaken Lake.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	571	307	128	50	10	.00	.00	.00	178	599	e673	589
2	557	296	122	51	9.2	.00	.00	.30	190	608	e647	582
3	549	286	119	49	7.3	.00	.00	.60	200	622	e635	582
4	548	268	112	46	6.4	.00	.00	.90	209	675	e634	564
5	544	263	112	46	4.9	.00	.00	4.2	e223	692	e634	566
6	512	258	107	44	4.7	.00	.00	8.3	e238	683	e633	567
7	512	253	103	43	3.0	.00	.00	15	e252	700	e633	567
8	503	251	102	41	2.4	.00	.00	19	e266	706	e632	576
9	492	244	100	39	1.8	.00	.00	24	e284	693	e632	551
10	478	228	94	38	.69	.00	.00	27	e301	678	e631	558
11	470	227	91	38	.31	.00	.00	31	322	e697	e630	581
12	427	212	88	38	.22	.00	.00	34	347	e681	e620	584
13	432	201	86	36	.19	.00	.00	39	365	e673	e610	575
14	430	203	85	35	.16	.00	.00	41	359	e670	e600	585
15	424	201	82	34	.14	.00	.00	43	382	e665	e602	594
16	403	202	78	34	.12	.00	.00	51	417	e663	e600	599
17	387	197	75	31	.10	.00	.00	58	432	e676	e597	583
18	372	190	74	32	.10	.00	.00	60	448	e678	e597	583
19	380	186	71	30	.08	.00	.00	64	464	e686	e592	588
20	367	182	68	29	.04	.00	.00	68	474	e684	584	591
21	356	170	67	28	.01	.00	.00	79	485	e686	585	586
22	345	172	64	25	.00	.00	.00	91	507	e694	588	562
23	332	166	61	22	.00	.00	.00	101	522	e697	588	555
24	334	160	61	20	.00	.00	.00	106	545	e702	588	552
25	329	153	57	19	.00	.00	.00	114	547	e715	591	551
26	318	147	57	18	.00	.00	.00	124	532	e713	603	538
27	323	143	55	17	.00	.00	.00	139	549	e715	602	532
28	313	141	52	15	.00	.00	.00	149	569	e718	602	535
29	316	135	52	14	---	.00	.00	160	592	e707	593	529
30	302	131	52	13	---	.00	.00	169	600	e697	585	530
31	304	---	51	11	---	.00	---	170	---	e689	578	---
TOTAL	12930	6173	2526	986	51.86	0.00	0.00	1990.30	11799	21162	18919	17035
MEAN	417	206	81.5	31.8	1.85	.000	.000	64.2	393	683	610	568
MAX	571	307	128	51	10	.00	.00	170	600	718	673	599
MIN	302	131	51	11	.00	.00	.00	.00	178	599	578	529
AC-FT	25650	12240	5010	1960	103	.00	.00	3950	23400	41970	37530	33790

e Estimated.

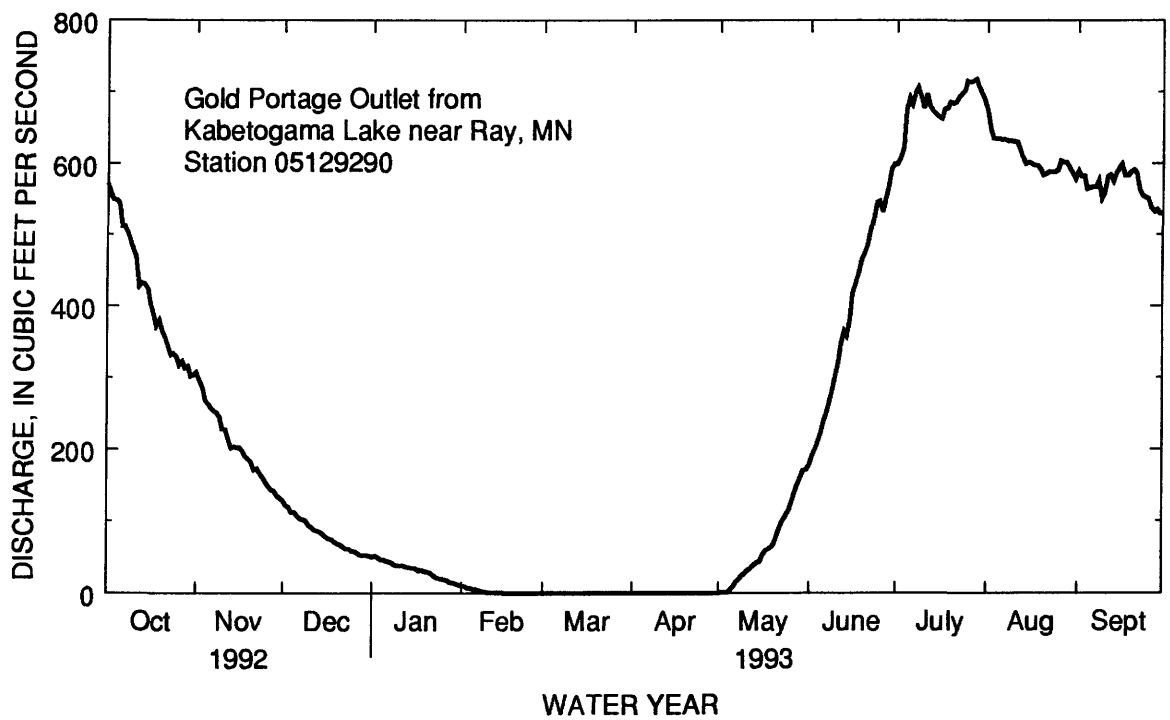
LAKE OF THE WOODS BASIN

05129290 GOLD PORTAGE OUTLET FROM KABETOGAMA LAKE NEAR RAY, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1983 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	399	199	78.8	16.8	1.12	.000	.32	120	378	586	592	560
MAX	530	267	149	45.1	7.34	.002	1.66	307	583	683	686	787
(WY)	1986	1990	1992	1990	1990	1990	1985	1986	1985	1985	1988	1988
MIN	285	115	16.5	1.10	.000	.000	.000	.000	96.0	432	519	431
(WY)	1985	1988	1988	1988	1983	1983	1983	1987	1987	1987	1986	1984

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1983 - 1993	
ANNUAL TOTAL	92992.04		93572.16			
ANNUAL MEAN	254		256		246	
HIGHEST ANNUAL MEAN					280	1986
LOWEST ANNUAL MEAN					192	1987
HIGHEST DAILY MEAN	724	Sep 9	718	Jul 28	876	Sep 22 1988
LOWEST DAILY MEAN	.00	Feb 23	.00	Feb 22 to May 1	.00	Many days in each yr
ANNUAL SEVEN-DAY MINIMUM	.00	Feb 23	.00	Feb 22 to May 1	.00	Jan 21 1983
INSTANTANEOUS PEAK FLOW			721	Jul 8	897	Sep 21 1988
INSTANTANEOUS PEAK STAGE			18.50	Jul 8	19.23	Sep 21 1988
ANNUAL RUNOFF (AC-FT)	184400		185600		178000	
10 PERCENT EXCEEDS	596		632		594	
50 PERCENT EXCEEDS	172		147		159	
90 PERCENT EXCEEDS	.00		.00		.00	



LAKE OF THE WOODS BASIN

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

LOCATION.--Lat 48°38'30", long 93°20'00", at Five Mile dock, approximately 5 mi northeast of city 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 sea level (United States and Canadian Boundary Survey). January 1910 to December 1949, nonrecording gage 3 mi northeast at Ranier, Minn., at same datum. January 1950 to October 1964, water-stage recorder on Government dock at Pither's Point at Fort Frances, and supplementary gage in town pumping station, 0.5 mi south, used during winter months, at same datum.

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

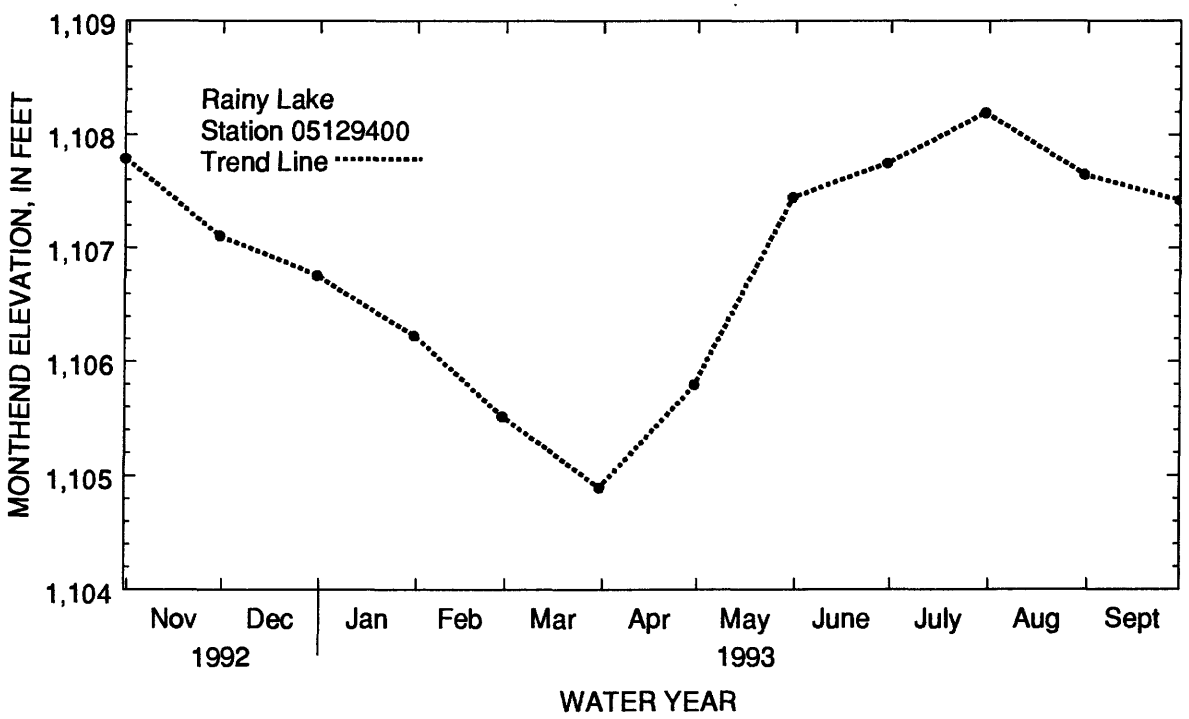
EXTREMES FOR PERIOD OF RECORD.--Maximum elevation observed, 1,112.97 ft, July 5, 1950; minimum observed, 1,101.26 ft, Apr. 17, 1923, Apr. 2, 1930.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,108.22 ft, July 31; maximum daily elevation, 1,108.20 ft, July 30; minimum, 1,104.85 ft, Mar. 27; minimum daily, 1,104.86 ft, Mar. 27.

MONTHEND ELEVATION, IN SEA LEVEL, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

Oct. 31 ..... 1,107.79	Feb. 28 ..... 1,105.52	June 30 ..... 1,107.75
Nov. 30 ..... 1,107.11	Mar. 31 ..... 1,104.90	July 31 ..... 1,108.20
Dec. 31 ..... 1,106.76	Apr. 30 ..... 1,105.80	Aug. 31 ..... 1,107.65
Jan. 31 ..... 1,106.23	May 31 ..... 1,107.45	Sept. 30 ..... 1,107.42

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


1,109
1,108
1,107
1,106
1,105
1,104
MONTHEND ELEVATION, IN FEET
Rainy Lake
Station 05129400
Trend Line
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
1992
1993
WATER YEAR

LAKE OF THE WOODS BASIN

05130500 STURGEON RIVER NEAR CHISHOLM, MN

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

DRAINAGE AREA.--187 mi².

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

REVISED RECORDS.--WSP 1438: 1946.

GAGE.--Water-stage recorder. Datum of gage is 1,305.7 ft above sea level. Prior to Aug. 24, 1944, nonrecording gage at site 1,000 ft downstream at different datum. Aug. 25, 1944, to Sept. 30, 1975, at present site at datum 1.00 ft higher.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

EXTREMES FOR CURRENT YEAR.--Peak discharge greater than base of 500 ft³/s and maximum (*):

Date	Time	Discharge (ft³/s)	Gage height (ft)	Date	Time	Discharge (ft³/s)	Gage height (ft)
*July 6	1200	*1800	*6.15	July 29	0100	538	3.99
July 18	1100	1200	5.29				

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	122	78	e61	e39	e34	e25	e290	339	177	127	411	158
2	119	79	e60	e39	e34	e26	e270	395	169	123	364	174
3	116	84	e59	e39	e34	e27	e250	424	155	112	326	183
4	115	87	e58	e39	e34	e28	230	411	135	538	297	178
5	113	86	e57	e39	e34	e28	205	362	116	1260	285	171
6	110	84	e56	e38	e34	e29	185	316	111	1750	280	156
7	107	86	e55	e38	e34	e29	172	275	128	1510	267	143
8	107	84	e54	e38	e33	e29	180	255	140	1070	255	134
9	109	82	e54	e38	e33	e29	210	267	155	757	251	147
10	118	87	e53	e38	e32	e29	247	260	166	583	245	153
11	119	87	e53	e38	e32	e29	270	246	167	492	239	149
12	119	88	e53	e38	e31	e29	262	224	161	414	232	142
13	115	81	e53	e38	e31	e29	242	202	150	356	223	137
14	110	87	e53	e37	e30	e29	223	180	145	316	214	146
15	107	86	e53	e37	e30	e29	204	163	142	284	206	144
16	106	75	e52	e37	e29	e29	188	150	133	622	198	141
17	105	74	e52	e37	e29	e29	175	138	125	1140	188	136
18	105	75	e51	e37	e28	e29	165	126	113	1190	182	129
19	100	75	e50	e37	e28	e29	159	117	103	1090	176	121
20	94	75	e50	e37	e27	e29	156	110	93	817	168	118
21	90	76	e49	e37	e27	e30	147	103	84	581	161	119
22	89	75	e48	e37	e26	e30	140	98	76	450	158	126
23	86	76	e47	e37	e26	e30	130	98	102	380	166	125
24	85	72	e46	e37	e26	e31	157	120	128	335	161	117
25	85	71	e45	e37	e25	e33	219	141	196	321	160	109
26	87	65	e44	e37	e25	e40	249	143	254	350	157	104
27	86	e63	e43	e36	e25	e50	250	150	259	384	154	100
28	83	e63	e43	e35	e25	e80	265	172	228	473	149	104
29	87	e62	e42	e34	---	e120	313	176	185	529	144	105
30	84	e62	e41	e34	---	e200	348	178	150	491	162	103
31	79	---	e40	e34	---	e300	---	181	---	455	163	---
TOTAL	3157	2325	1575	1153	836	1513	6501	6520	4446	19300	6742	4072
MEAN	102	77.5	50.8	37.2	29.9	48.8	217	210	148	623	217	136
MAX	122	88	61	39	34	300	348	424	259	1750	411	183
MIN	79	62	40	34	25	25	130	98	76	112	144	100
AC-FT	6260	4610	3120	2290	1660	3000	12890	12930	8820	38280	13370	8080
CFSM	.54	.41	.27	.20	.16	.26	1.16	1.12	.79	3.33	1.16	.73
IN.	.63	.46	.31	.23	.17	.30	1.29	1.30	.88	3.84	1.34	.81

e Estimated.

LAKE OF THE WOODS BASIN

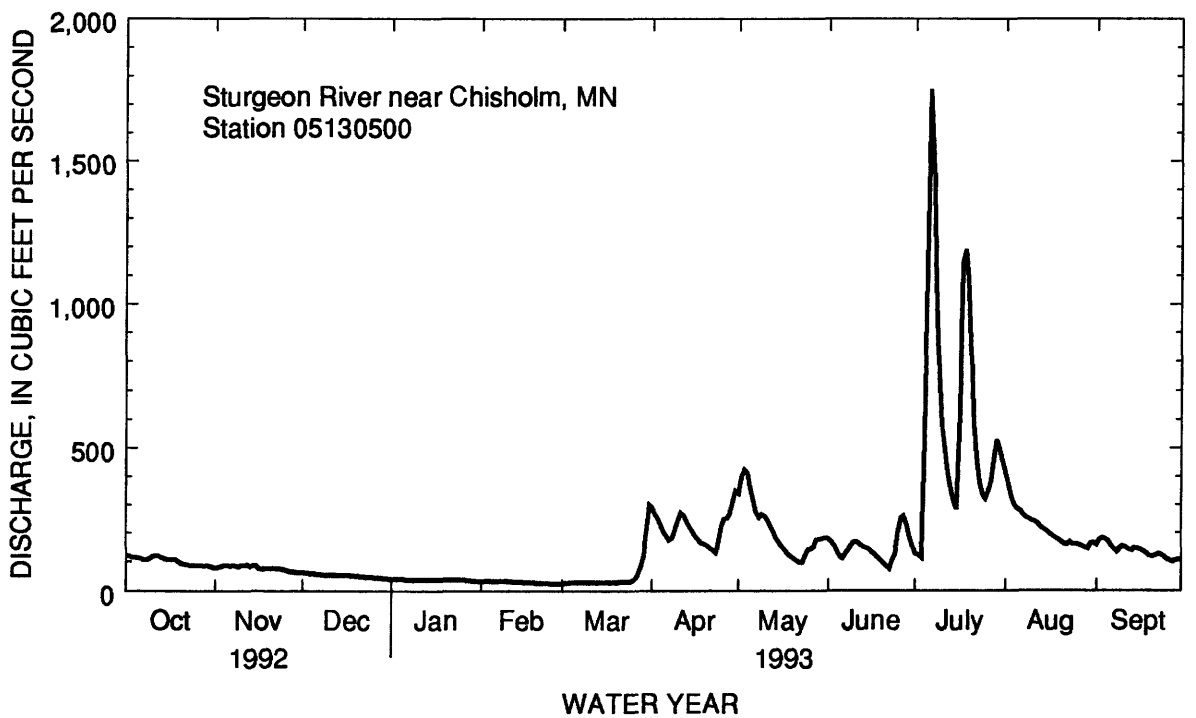
05130500 STURGEON RIVER NEAR CHISHOLM, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	111	88.9	45.8	27.9	22.4	48.4	367	305	184	115	70.9	91.5
MAX	369	264	115	66.0	47.7	337	868	1451	528	623	268	424
(WY)	1974	1978	1978	1966	1984	1945	1948	1950	1944	1993	1988	1977
MIN	7.85	8.90	4.82	3.98	4.54	10.0	41.0	22.9	14.7	5.99	12.6	4.60
(WY)	1977	1977	1977	1977	1977	1957	1977	1977	1988	1988	1961	1976

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1942 - 1993	
ANNUAL TOTAL	38363		58140			
ANNUAL MEAN	105		159		123	
HIGHEST ANNUAL MEAN					208	1950
LOWEST ANNUAL MEAN					63.1	1977
HIGHEST DAILY MEAN	430	Apr 22	1750	Jul 6	3530	May 8 1950
LOWEST DAILY MEAN	25	Jun 15	25	Feb 25-Mar 1	2.5	Jul 30 1988
ANNUAL SEVEN-DAY MINIMUM	31	Jun 10	25	Feb 23	3.0	Jul 24 1988
INSTANTANEOUS PEAK FLOW			1800	Jul 6	3630[a]	May 7 1950
INSTANTANEOUS PEAK STAGE			6.15	Jul 6	7.41[b]	May 7 1950
ANNUAL RUNOFF (AC-FT)	76070		115200		89110	
ANNUAL RUNOFF (CFSM)	.56		.85		.66	
ANNUAL RUNOFF (INCHES)	7.63		11.55		8.93	
10 PERCENT EXCEEDS	223		316		294	
50 PERCENT EXCEEDS	75		110		56	
90 PERCENT EXCEEDS	40		30		17	

a From rating curve extended above 1,600 ft³/s, on basis of slope-area measurement of peak flow.
b Present datum.



LAKE OF THE WOODS BASIN

05131500 LITTLE FORK RIVER AT LITTLEFORK, MN

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

DRAINAGE AREA.--1,730 mi², approximately.

PERIOD OF RECORD.--June to November 1909, April to November 1910, April 1911 to June 1917, September 1917, October 1917 to March 1919 (gage heights only), June 1928 to current year.

REVISED RECORDS.--WSP 955: Drainage area. WSP 1508: 1913, 1916, 1928-32, 1934. WRD MN-74: 1963.

GAGE.--Water-stage recorder. Datum of gage is 1,083.59 ft above sea level. June 23, 1909, to Mar. 4, 1917, nonrecording gage and July 21, 1937, to Oct. 23, 1979, water-stage recorder at site 1.2 mi downstream at datum 10.53 ft lower; Mar. 5 to Sept. 30, 1917, and June 22, 1928, to July 20, 1937, non-recording gage at site 1.18 mi downstream at datum 10.53 ft lower.

REMARKS.--Records good except those for estimated daily discharges, which are fair.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	546	398	e285	e192	e120	e118	e2800	5500	1340	1210	2890	1040
2	526	407	e280	e190	e120	e123	e2700	5730	1260	1050	2410	1120
3	498	422	e280	e186	e118	e128	e2600	6200	1150	943	2000	1210
4	482	431	e275	e182	e118	e132	e2550	5900	1070	1110	1760	1860
5	451	429	e270	e180	e118	e132	e2500	5340	967	3190	1650	2080
6	427	386	e265	e178	e115	e132	e2300	4730	876	5900	1820	1830
7	401	376	e262	e175	e115	e132	e2200	4210	824	6460	1810	1510
8	391	370	e260	e170	e115	e132	e2300	3780	817	6470	1640	1180
9	376	380	e258	e167	e115	e132	e2400	3480	886	5960	1540	992
10	364	427	e255	e163	e115	e132	e2600	3220	1070	5100	1750	922
11	362	445	e252	e160	e115	e132	e3100	3050	1170	4330	1750	918
12	362	466	e250	e157	e115	e132	e3600	2760	1190	3750	1580	918
13	367	470	e250	e154	e115	e132	e3100	2410	1110	3210	1390	911
14	385	426	e245	e150	e113	e132	3000	2110	1020	2700	1180	934
15	383	406	e245	e148	e112	e132	2740	1850	963	2280	1040	1250
16	382	407	e240	e145	e112	e132	2470	1640	925	1870	1040	1420
17	378	403	e238	e140	e112	e132	2250	1450	946	2010	1070	1340
18	380	416	e235	e140	e111	e132	2120	1330	940	4090	959	1180
19	378	493	e232	e135	e110	e132	2030	1200	884	4670	880	1040
20	378	508	e230	e135	e110	e132	1940	1120	817	4690	797	913
21	375	494	e230	e132	e110	e132	1850	1030	750	4250	731	835
22	411	473	e228	e130	e110	e132	1740	953	664	3630	677	784
23	482	446	e228	e128	e110	e132	1800	946	603	2900	648	781
24	481	e400	e222	e125	e110	e132	2000	1050	572	2250	652	798
25	477	e380	e220	e123	e110	e132	2420	1180	701	1810	681	785
26	466	e360	e215	e122	e110	e138	2950	1180	2010	1740	714	766
27	451	e330	e210	e120	e110	e150	3140	1180	2160	2040	727	758
28	434	e315	e208	e120	e115	e300	3210	1330	2020	3650	769	700
29	433	e300	e203	e120	---	e600	3690	1390	1740	5310	762	706
30	417	e290	e200	e120	---	e1700	4890	1370	1450	4450	757	748
31	399	---	e195	e120	---	e2300	---	1360	---	3480	896	---
TOTAL	13043	12254	7466	4607	3179	8461	78990	79979	32895	106503	38970	32229
MEAN	421	408	241	149	114	273	2633	2580	1096	3436	1257	1074
MAX	546	508	285	192	120	2300	4890	6200	2160	6470	2890	2080
MIN	362	290	195	120	110	118	1740	946	572	943	648	700
AC-FT	25870	24310	14810	9140	6310	16780	156700	158600	65250	211200	77300	63930
CFSM.	24	.24	.14	.09	.07	.16	1.52	1.49	.63	1.99	.73	.62
IN.	.28	.26	.16	.10	.07	.18	1.70	1.72	.71	2.29	.84	.69

e Estimated.

LAKE OF THE WOODS BASIN

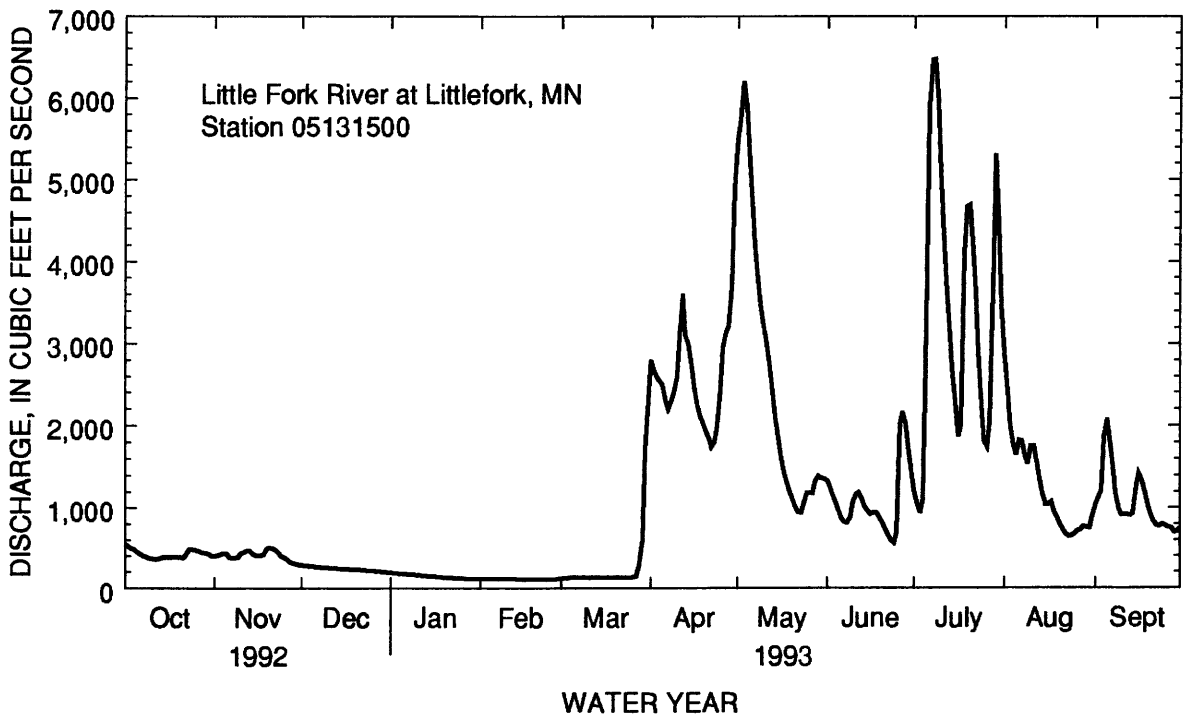
05131500 LITTLE FORK RIVER AT LITTLEFORK, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	857	677	301	142	108	269	3179	2885	1798	956	553	749
MAX	3320	3044	972	477	270	3022	8421	12190	5490	3643	2679	5189
(WY)	1947	1972	1983	1966	1969	1945	1966	1950	1944	1944	1988	1977
MIN	43.4	60.8	52.6	43.5	42.2	50.2	292	173	182	75.4	34.3	29.2
(WY)	1977	1977	1977	1931	1963	1940	1977	1977	1988	1988	1936	1976

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1909 - 1993	
ANNUAL TOTAL	290662		418576			
ANNUAL MEAN	794		1147		1055	
HIGHEST ANNUAL MEAN					1912	1966
LOWEST ANNUAL MEAN					306	1931
HIGHEST DAILY MEAN	4680	Apr 22	6470	Jul 8	25000	Apr 18 1916
LOWEST DAILY MEAN	161	Jun 16	110	Feb 19-27	21	Aug 26-27 1936
ANNUAL SEVEN-DAY MINIMUM	180	Feb 25	110	Feb 19	22	Aug 21 1936
INSTANTANEOUS PEAK FLOW			6580	Jul 8	25000a	Apr 18 1916
INSTANTANEOUS PEAK STAGE			9.15	Jul 8	37.00a	Apr 18 1916
ANNUAL RUNOFF (AC-FT)	576500		830200		764500	
ANNUAL RUNOFF (CFSM)	.46		.66		.61	
ANNUAL RUNOFF (INCHES)	6.25		9.00		8.29	
10 PERCENT EXCEEDS	1990		3020		2800	
50 PERCENT EXCEEDS	393		648		352	
90 PERCENT EXCEEDS	201		123		85	

a Occurred Apr. 18, 1916, May 11, 1950, site and datum then in use.



LAKE OF THE WOODS BASIN

05132000 BIG FORK RIVER AT BIG FALLS, MN

LOCATION.--Lat 48°11'45", long 93°48'25", in SW¼SE¼ sec.35, T.155 N., R.25 W., Koochiching County, Hydrologic Unit 09030006, on left bank at village of Big Falls, 700 ft downstream from falls, 0.3 mi downstream from bridge on U.S. Highway 71, and 4.8 mi upstream from Sturgeon River.

DRAINAGE AREA.--1,460 mi², approximately.

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

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

GAGE.--Water-stage recorder. Datum of gage is 1,144.71 ft above sea level. Prior to June 10, 1911, nonrecording gage at railroad bridge about 0.4 mi upstream at different datum. June 10, 1911, to Sept. 30, 1912, and June 22, 1928, to Dec. 17, 1937, nonrecording gage at site 200 ft upstream at same datum.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Prior to 1971, a powerplant, located 0.3 mi upstream, caused some diurnal fluctuation at low flows.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	521	e360	e370	e220	e195	e125	e2200	2560	786	411	1590	742
2	e508	e370	e360	e220	e195	e130	e2100	2890	738	406	1370	734
3	e490	e380	e350	e215	e195	e130	e2000	3170	680	395	1180	754
4	e485	e390	e345	e215	e195	e135	e1900	3120	613	663	1070	769
5	e470	384	e340	e215	e195	e140	e1700	2930	554	1190	1010	751
6	e460	375	e335	e215	e190	e140	e1600	2600	509	1970	1030	735
7	e450	336	e330	e210	e190	e145	e1500	2320	512	2700	992	727
8	e440	310	e320	e210	e185	e145	e1800	2120	513	2080	939	719
9	e430	361	e310	e210	e180	e150	e2400	2010	592	1580	937	748
10	e425	513	e300	e210	e175	e150	2940	1900	1070	1240	957	787
11	e420	538	e295	e210	e170	e150	2690	1780	2820	1010	982	792
12	e420	543	e295	e205	e165	e150	e2400	1640	2110	873	979	768
13	e420	483	e290	e205	e160	e150	e2200	1480	1670	772	904	760
14	e420	424	e285	e205	e155	e150	e2050	1340	1370	697	824	820
15	e420	475	e280	e205	e150	e150	1850	1190	1180	635	764	889
16	e425	402	e275	e200	e145	e150	1720	1090	1110	604	711	915
17	e425	390	e270	e200	e145	e150	1610	1020	1050	740	669	892
18	e425	407	e265	e200	e140	e150	1560	929	946	957	638	854
19	e425	503	e260	e195	e140	e150	1510	844	871	1060	607	826
20	425	514	e260	e195	e135	e150	1450	795	798	1030	581	799
21	e430	509	e255	e195	e135	e150	1400	758	716	949	557	781
22	e435	495	e250	e195	e135	e150	1300	720	634	859	543	789
23	e440	477	e245	e195	e130	e150	1250	710	558	771	547	812
24	e450	461	e240	e195	e130	e150	1310	755	507	690	556	811
25	e460	455	e235	e195	e125	e150	1610	793	479	647	550	807
26	e430	e420	e230	e195	e125	e160	1790	797	474	729	545	787
27	404	e410	e230	e195	e125	e170	1800	813	482	835	569	773
28	e390	e400	e225	e195	e125	e320	1850	861	461	1220	555	777
29	e370	e390	e225	e195	---	e740	2050	848	447	1640	569	787
30	364	e380	e220	e195	---	e1800	2400	821	433	1760	628	791
31	e355	---	e220	e195	---	e2000	---	826	---	1730	684	---
TOTAL	13432	12855	8710	6305	4430	8830	55940	46430	25683	32843	25037	23696
MEAN	433	428	281	203	158	285	1865	1498	856	1059	808	790
MAX	521	543	370	220	195	2000	2940	3170	2820	2700	1590	915
MIN	355	310	220	195	125	125	1250	710	433	395	543	719
AC-FT	26640	25500	17280	12510	8790	17510	111000	92090	50940	65140	49660	47000
CFSM	.30	.29	.19	.14	.11	.20	1.28	1.03	.59	.73	.55	.54
IN.	.34	.33	.22	.16	.11	.22	1.43	1.18	.65	.84	.64	.60

e Estimated.

LAKE OF THE WOODS BASIN

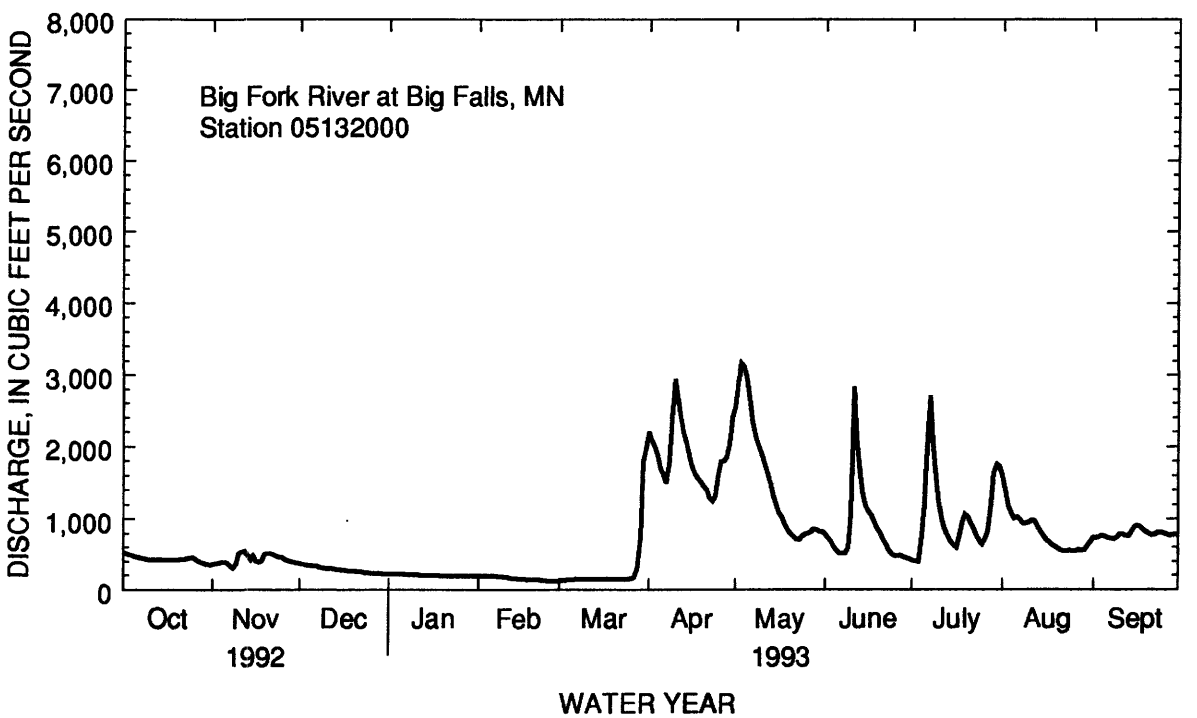
05132000 BIG FORK RIVER AT BIG FALLS, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	659	524	277	171	134	242	1899	2001	1173	640	401	560
MAX	2247	2034	685	399	335	1928	5186	7496	2890	2321	1799	2989
(WY)	1970	1972	1970	1969	1969	1945	1966	1950	1974	1944	1978	1937
MIN	38.3	44.5	31.6	22.2	22.9	32.9	175	138	180	46.0	26.7	22.4
(WY)	1932	1935	1935	1935	1935	1940	1931	1931	1934	1931	1934	1934

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1909 - 1993	
ANNUAL TOTAL	217058		264191			
ANNUAL MEAN	593		724		724	
HIGHEST ANNUAL MEAN					1362	1950
LOWEST ANNUAL MEAN					92.0	1931
HIGHEST DAILY MEAN	2990	Apr 21	3170	May 3	14800	May 9 1950
LOWEST DAILY MEAN	127	Jun 16	125	Feb 25 to Mar 1	14	Jan 10 1940
ANNUAL SEVEN-DAY MINIMUM	146	Feb 23	126	Feb 23	18	Jan 22 1935
INSTANTANEOUS PEAK FLOW			3190	May 3	14800	May 8 1950
INSTANTANEOUS PEAK STAGE			7.68a	Apr 1	17.08	May 8 1950
INSTANTANEOUS LOW FLOW					7.0	Aug 7 1939
ANNUAL RUNOFF (AC-FT)	430500		524000		524200	
ANNUAL RUNOFF (CFSM)	.41		.50		.50	
ANNUAL RUNOFF (INCHES)	5.53		6.73		6.73	
10 PERCENT EXCEEDS	1400		1740		1810	
50 PERCENT EXCEEDS	360		508		319	
90 PERCENT EXCEEDS	176		150		78	

a Backwater from ice.



LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN
(International gaging station)

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

DRAINAGE AREA.--19,400 mi², approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--July 1928 to current year. Monthly discharge only for some periods, published in WSP 1308. October 1911 to October 1924 (gage heights only) at site near Birchdale in files of U.S. Army Corps of Engineers. Published as "near Birchdale" 1932-34.

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

REMARKS.--Records good except those for estimated daily discharges, which are fair. Satellite telemeter at station. Diurnal fluctuation caused by powerplant at International Falls. Some regulation at low and medium flows by Rainy and Namakan Lakes.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25700	15000	12400	e9200	e7300	e6400	12700	14900	12800	14700	35600	24700
2	26100	15000	12200	e7300	e9200	e8900	13100	16100	13600	13500	34600	23700
3	24900	15000	e12000	e7400	e9300	e8800	12700	17200	13700	14100	33900	25200
4	24400	15100	e12000	e7400	e9200	e8600	11000	17600	13500	15700	33400	25900
5	24000	15100	e12000	e9400	e9200	e8500	10700	17100	12800	20500	33000	26400
6	21100	15100	e12000	e9300	e9100	e8500	12000	16200	11000	23900	33000	26100
7	19600	15000	e12000	e9200	e7200	e6200	12200	15100	10700	27500	32800	20400
8	18900	15000	e12000	e9200	e7100	e6200	12300	13700	12200	28700	32400	17100
9	16600	14900	e12000	e9300	e9200	e8600	12200	12200	12700	27800	32700	16700
10	15700	15100	e12000	e7200	e9200	e8400	11300	12000	13600	27300	32700	16800
11	15500	15300	e12000	e7400	e9100	e8600	11900	12000	14600	26100	32600	16800
12	15400	15300	e11000	e9300	e8800	e8900	13800	12800	15600	24800	31900	16600
13	15400	14900	e9000	e9300	e9000	e8200	15700	14300	13800	23700	31200	16400
14	13600	13900	e9000	e9500	e7300	e6000	15100	14400	13300	22900	29100	16700
15	11600	13500	e11000	e9100	e7100	e6100	14000	14100	14600	22200	27900	16900
16	10900	13400	e11000	e9000	e9000	e8700	13400	13500	14600	21600	27400	17300
17	10700	13300	e11000	e7200	e8900	e8000	12400	13300	16000	21800	26800	17500
18	10900	13300	e10500	e7200	e9000	e8100	10400	13400	16700	22500	26400	17200
19	10900	13400	e9000	e9400	e8900	e8300	10100	13100	16100	23900	25800	17000
20	10800	13500	e7000	e9300	e9200	e8100	11600	12800	14100	24600	25700	16600
21	11200	13600	e7000	e9200	e7000	e5800	11800	12600	13700	24300	23800	16400
22	13800	13700	e9000	e9200	e7100	e5800	11600	11600	14700	23600	22500	16300
23	14900	13600	e9000	e9000	e9000	e8200	11400	9850	14100	22700	22000	16500
24	15200	13500	e9000	e7200	e8800	e7800	10700	10500	13900	22000	18900	16400
25	15200	13500	e8500	e7300	e8500	e6900	9820	11900	14400	21700	16000	16400
26	15200	13500	e6500	e9200	e8700	e6900	10300	13600	14500	21600	15600	16300
27	15200	13300	e6500	e9200	e8800	e6800	11600	13700	13900	23700	16600	16300
28	15100	13200	e6500	e9200	e6400	e4500	12300	13800	14200	26700	16700	16200
29	15100	13300	e8500	e9100	---	e5100	12800	13400	15400	32100	16800	16200
30	15100	13500	e9000	e9100	---	e8600	14200	11600	15400	35900	19300	16200
31	15000	---	e9000	e7000	---	11800	---	11300	---	36400	24300	---
TOTAL	503700	424800	309600	266300	236600	236300	365120	419650	420200	738500	831400	555200
MEAN	16250	14160	9987	8590	8450	7623	12170	13540	14010	23820	26820	18510
MAX	26100	15300	12400	9500	9300	11800	15700	17600	16700	36400	35600	26400
MIN	10700	13200	6500	7000	6400	4500	9820	9850	10700	13500	15600	16200
AC-FT	999100	842600	614100	528200	469300	468700	724200	832400	833500	1465000	1649000	1101000
CFSM	.84	.73	.51	.44	.44	.39	.63	.70	.72	1.23	1.38	.95
IN.	.97	.81	.59	.51	.45	.45	.70	.80	.81	1.42	1.59	1.06

e Estimated.

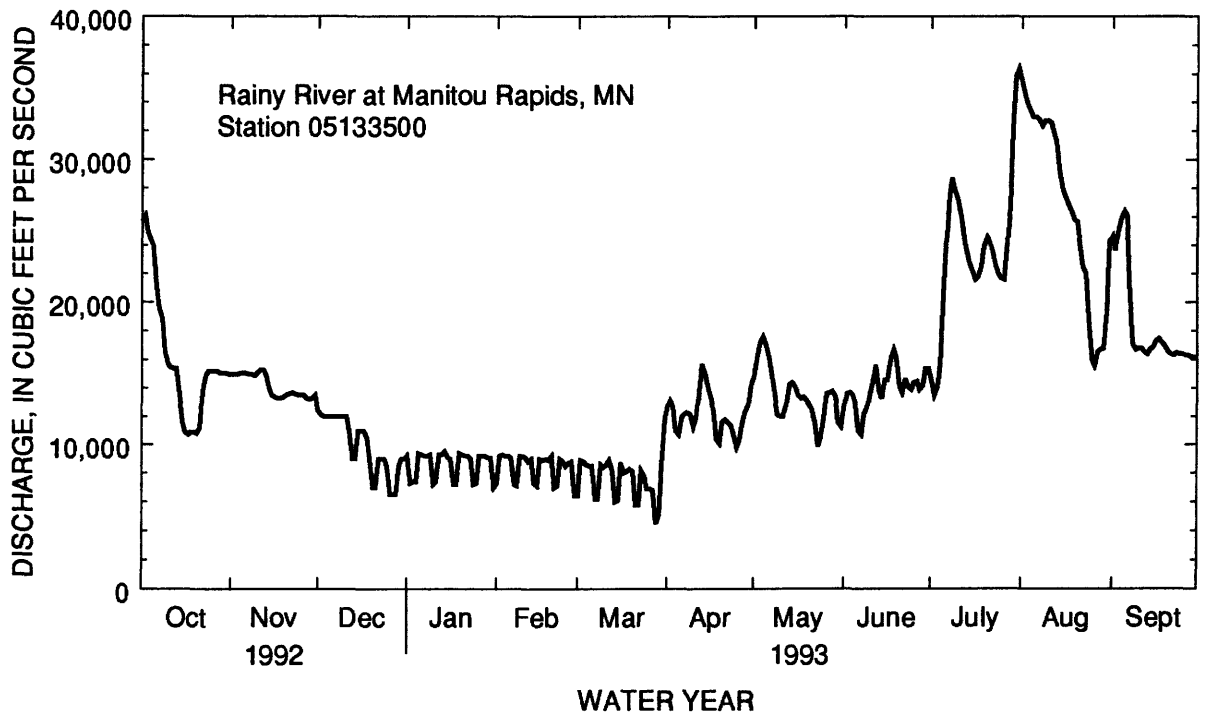
RED RIVER OF THE NORTH BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1929 - 1993, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	11870	11090	10030	9088	8749	8992	15430	19570	20150	16450	11430	11270
MAX	42410	37280	27790	18430	17240	16640	38100	52880	49480	47970	33700	30620
(WY)	1942	1972	1972	1972	1969	1945	1966	1950	1950	1950	1944	1988
MIN	4728	3796	3190	2900	3129	2926	4378	4106	3676	3483	3422	4168
(WY)	1981	1977	1930	1931	1931	1931	1977	1977	1980	1980	1980	1958

SUMMARY STATISTICS	FOR 1992 CALENDAR YEAR		FOR 1993 WATER YEAR		WATER YEARS 1929 - 1993	
ANNUAL TOTAL	5654220		5307370			
ANNUAL MEAN	15450		14540		12860	
HIGHEST ANNUAL MEAN					23260	1950
LOWEST ANNUAL MEAN					4470	1931
HIGHEST DAILY MEAN	36700	Sep 11	36400	Jul 31	71300	May 11 1950
LOWEST DAILY MEAN	6500	Dec 26	4500	Mar 28	928	Dec 26 1929
ANNUAL SEVEN-DAY MINIMUM	7790	Dec 23	6600	Mar 23	1500	Dec 24 1929
INSTANTANEOUS PEAK FLOW			36500	Jul 31	71600	May 12 1950
INSTANTANEOUS PEAK STAGE			13.57	Jul 31	21.04	May 12 1950
ANNUAL RUNOFF (AC-FT)	11220000		10530000		9315000	
ANNUAL RUNOFF (CFSM)	.80		.75		.66	
ANNUAL RUNOFF (INCHES)	10.84		10.18		9.00	
10 PERCENT EXCEEDS	25700		24800		25400	
50 PERCENT EXCEEDS	13300		13400		10300	
90 PERCENT EXCEEDS	9000		7920		5000	



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, 1978 to current year.
REMARKS.--Letter K indicates non-ideal colony count.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	TUR-BID-ITY (NTU) (00076)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
OCT										
20...	1245	10800	86	79	7.6	7.4	5.0	2.5	720	11.0
NOV										
23...	1400	13500	80	73	7.6	7.5	0.5	1.9	732	13.0
JAN										
11...	1230	14700	80	76	6.9	7.2	0.5	1.5	744	13.2
APR										
12...	1245	13400	115	116	7.8	7.4	1.0	23	737	7.0
JUN										
02...	1300	13400	--	83	7.7	7.2	14.0	3.8	730	9.0
JUL										
27...	1030	23600	87	73	7.3	7.4	19.0	1.6	727	6.0

DATE	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)
OCT										
20...	K56	53	8.8	2.5	3.6	0.80	26	28	0	32
NOV										
23...	31	K18	7.6	2.3	3.3	0.70	23	25	0	28
JAN										
11...	88	50	7.0	1.9	4.2	<0.10	25	26	0	31
APR										
12...	210	61	13	4.3	3.4	1.4	44	47	0	54
JUN										
02...	K16	300	9.1	3.1	3.2	0.70	28	32	0	34
JUL										
27...	24	61	7.9	2.4	2.7	0.80	27	27	0	33

LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	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
OCT									
20...	5.2	2.8	<0.10	2.9	50	<0.010	<0.050	0.050	0.50
NOV									
23...	4.6	2.5	<0.10	2.4	55	<0.010	0.074	0.030	0.50
JAN									
11...	5.4	3.2	<0.10	3.1	56	0.020	0.120	0.080	0.50
APR									
12...	6.3	3.2	<0.10	5.8	101	<0.010	0.100	0.070	0.70
JUN									
02...	4.6	2.8	<0.10	3.1	68	<0.010	<0.050	0.040	0.50
JUL									
27...	4.2	1.9	<0.10	2.9	59	<0.010	0.067	0.110	0.50

DATE	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)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	BARIUM, DIS SOLVED (UG/L AS BA)' (01005)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	IRON, DIS-- SOLVED (UG/L AS FE) (01046)
OCT									
20...	0.020	0.020	<0.010	3	100	50	10	<3	97
NOV									
23...	0.030	0.020	<0.010	9	95	--	--	--	--
JAN									
11...	0.020	0.020	0.020	1	100	30	8	<3	83
APR									
12...	0.090	0.020	<0.010	81	98	100	15	<3	250
JUN									
02...	0.070	<0.010	<0.010	5	100	--	-	--	---
JUL									
27...	0.040	0.050	<0.010	26	32	50	9	<3	110

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	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)
OCT								
20...	<4	7	<10	<1	<1	<1.0	25	<6
NOV								
23...	--	--	--	--	--	--	--	--
JAN								
11...	<4	5	<10	<1	<1	<1.0	22	<6
APR								
12...	<4	42	<10	<1	<1	<1.0	29	<6
JUN								
02...	--	--	--	--	--	--	--	--
JUL								
27...	<4	2	10	1	<1	<1.0	23	<6

LAKE OF THE WOODS BASIN

05140520 LAKE OF THE WOODS AT WARROAD, MN
(International gaging station)

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

DRAINAGE AREA.--27,200 mi².

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 above sea level, 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.

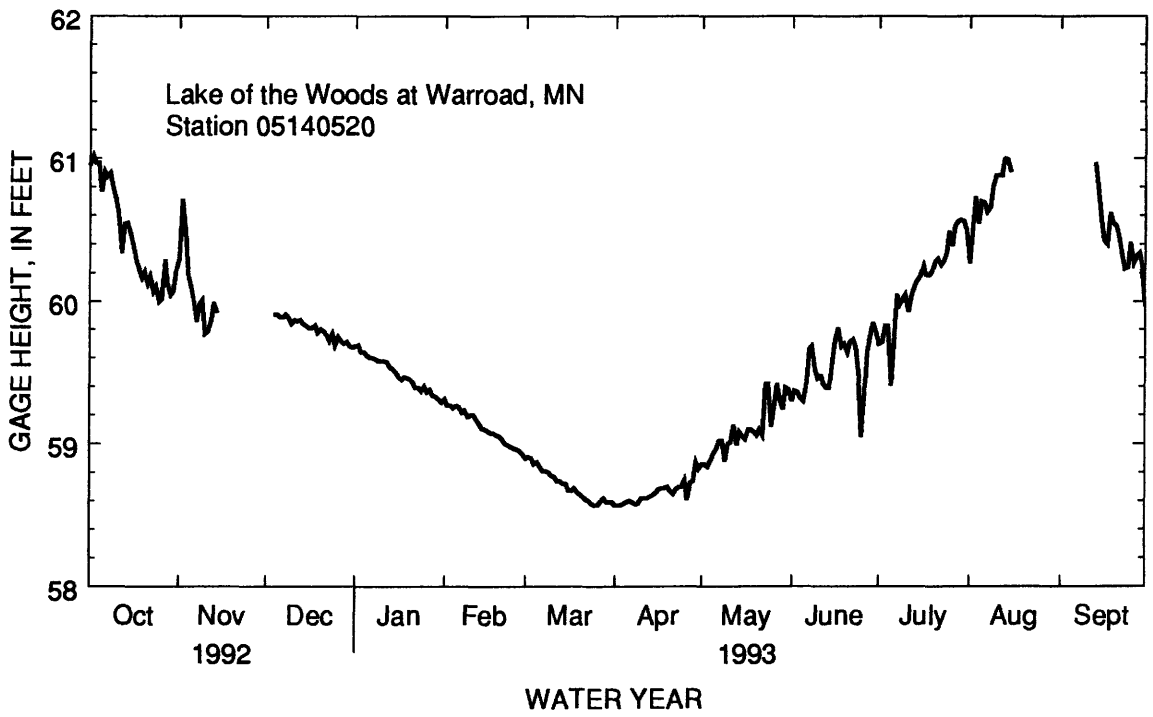
EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 62.38 ft, July 15, 1989; maximum daily, 61.84 ft, Sept. 12, 1978; minimum gage height recorded, 55.94 ft, Sept. 4, 1980; minimum daily recorded, 56.52 ft, Apr. 15, 1981.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 61.38 ft, Aug. 3; maximum daily, 61.02 ft, Oct. 2; minimum, 58.35 ft, May 9; minimum daily, 58.57 ft, Mar. 25, 26, Apr. 1-3.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	60.95	60.30	---	59.68	59.31	58.90	58.57	58.86	59.30	59.70	60.27	---
2	61.02	60.71	---	59.69	59.27	58.91	58.57	58.86	59.37	59.71	60.53	---
3	60.97	60.49	---	59.64	59.27	58.90	58.57	58.84	59.36	59.83	60.73	---
4	60.97	60.20	59.91	59.64	59.25	58.86	58.58	58.89	59.32	59.83	60.55	---
5	60.77	60.11	59.91	59.62	59.27	58.87	58.59	58.93	59.30	59.41	60.70	---
6	60.91	60.02	59.89	59.60	59.26	58.84	58.60	58.97	59.39	59.70	60.69	---
7	60.87	59.86	59.89	59.60	59.22	58.81	58.59	59.02	59.66	60.05	60.63	---
8	60.90	59.98	59.91	59.59	59.23	58.81	58.58	59.02	59.68	59.98	60.66	---
9	60.80	60.01	59.88	59.58	59.19	58.80	58.58	58.88	59.52	60.02	60.80	---
10	60.71	59.77	59.84	59.58	59.20	58.78	58.62	59.00	59.46	60.05	60.88	---
11	60.61	59.79	59.87	59.58	59.20	58.77	58.62	59.01	59.48	59.93	60.88	---
12	60.34	59.87	59.86	59.57	59.17	58.74	58.62	59.13	59.42	60.03	60.88	---
13	60.54	59.99	59.87	59.54	59.14	58.74	58.63	58.99	59.39	60.11	61.00	60.97
14	60.55	59.92	59.84	59.52	59.11	58.72	58.64	59.08	59.39	60.15	60.99	60.81
15	60.47	---	59.83	59.50	59.10	58.72	58.66	59.05	59.58	60.18	60.91	60.57
16	60.39	---	59.81	59.47	59.09	58.67	58.68	59.03	59.72	60.25	---	60.43
17	60.28	---	59.81	59.45	59.07	58.67	58.69	59.10	59.81	60.19	---	60.40
18	60.23	---	59.83	59.47	59.07	58.69	58.69	59.10	59.68	60.19	---	60.62
19	60.17	---	59.78	59.46	59.06	58.66	58.70	59.08	59.70	60.21	---	60.55
20	60.21	---	59.80	59.45	59.05	58.64	58.67	59.06	59.64	60.28	---	60.53
21	60.13	---	59.79	59.43	59.03	58.63	58.65	59.10	59.71	60.30	---	60.46
22	60.18	---	59.76	59.39	59.00	58.61	58.68	59.06	59.73	60.26	---	60.32
23	60.07	---	59.72	59.39	58.99	58.60	58.70	59.42	59.68	60.28	---	60.23
24	60.11	---	59.77	59.37	58.98	58.58	58.70	59.42	59.46	60.34	---	60.24
25	60.00	---	59.69	59.40	58.97	58.57	58.75	59.12	59.05	60.49	---	60.41
26	60.02	---	59.75	59.36	58.96	58.57	58.61	59.25	59.36	60.39	---	60.27
27	60.29	---	59.72	59.38	58.95	58.59	58.73	59.42	59.64	60.53	---	60.32
28	60.13	---	59.70	59.34	58.93	58.62	58.74	59.31	59.77	60.56	---	60.34
29	60.05	---	59.71	59.33	---	58.59	58.87	59.24	59.85	60.57	---	60.25
30	60.07	---	59.68	59.31	---	58.59	58.83	59.39	59.78	60.56	---	59.97
31	60.23	---	59.67	59.29	---	58.59	---	59.38	---	60.50	---	---
MEAN	60.45	---	---	59.49	59.12	58.71	58.66	59.10	59.54	60.15	---	---
MAX	61.02	---	---	59.69	59.31	58.91	58.87	59.42	59.85	60.57	---	---
MIN	60.00	---	---	59.29	58.93	58.57	58.57	58.84	59.05	59.41	---	---


Lake of the Woods at Warroad, MN
Station 05140520
GAGE HEIGHT, IN FEET
62
61
60
59
58
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
1992
1993
WATER YEAR

LAKE OF THE WOODS BASIN

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

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

DRAINAGE AREA.--27,200 mi².

PERIOD OF RECORD.--June 1985 to current year.

GAGE.--Water-stage recorder. Datum at gage is 1,000.00 ft above sea level, Lake of the Woods datum.

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

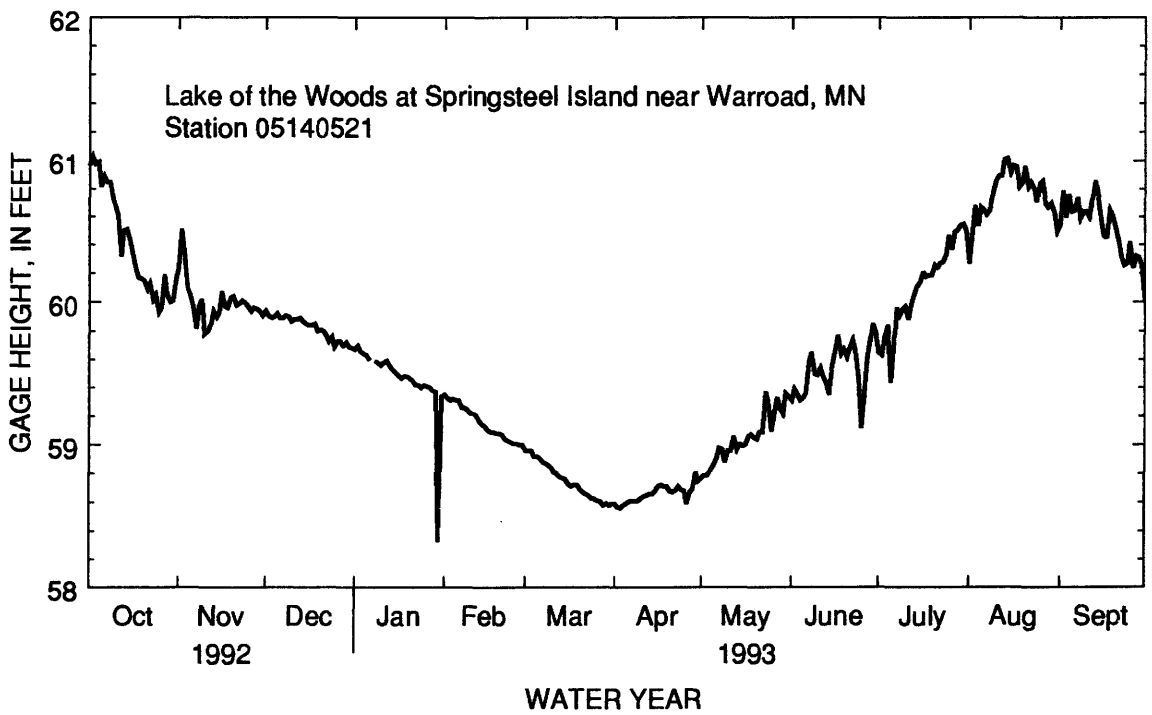
EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 62.24 ft, July 5, 1989; maximum daily, 61.81 ft, July 6, 7, 1985; minimum, 57.22 ft, Nov. 22, 1990; minimum daily, 57.43 ft, Mar. 18, 19, 20, 1988.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 61.37 ft, Aug. 9; maximum daily, 61.03 ft, Oct. 2; minimum, 58.47 ft, May 9; minimum daily, 58.56 ft, Apr. 3.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	60.97	60.24	59.94	59.67	59.35	58.96	58.59	58.77	59.31	59.65	60.27	60.55
2	61.03	60.51	59.91	59.70	59.33	58.96	58.57	58.79	59.39	59.63	60.50	60.79
3	60.98	60.31	59.89	59.66	59.31	58.96	58.56	58.79	59.35	59.77	60.68	60.60
4	60.99	60.10	59.90	59.64	59.32	58.92	58.58	58.83	59.31	59.84	60.54	60.76
5	60.82	60.04	59.92	59.63	59.31	58.92	58.59	58.86	59.33	59.44	60.67	60.64
6	60.89	59.97	59.89	59.60	59.31	58.91	58.61	58.91	59.36	59.67	60.65	60.65
7	60.85	59.82	59.89	---	59.26	58.88	58.61	58.98	59.58	59.96	60.62	60.74
8	60.85	59.97	59.91	59.59	59.26	58.87	58.61	58.97	59.65	59.91	60.65	60.59
9	60.75	60.02	59.90	59.58	59.24	58.86	58.61	58.88	59.50	59.95	60.77	60.64
10	60.68	59.78	59.87	59.56	59.22	58.84	58.63	58.96	59.49	59.97	60.86	60.64
11	60.61	59.80	59.88	59.58	59.22	58.81	58.64	58.96	59.54	59.88	60.90	60.60
12	60.32	59.85	59.88	59.59	59.21	58.80	58.65	59.06	59.48	59.98	60.90	60.71
13	60.50	59.94	59.89	59.56	59.17	58.78	58.66	58.97	59.43	60.06	61.01	60.86
14	60.51	59.90	59.87	59.53	59.15	58.77	58.66	59.01	59.35	60.11	61.02	60.78
15	60.43	59.93	59.85	59.51	59.13	58.76	58.68	58.99	59.56	60.14	60.92	60.59
16	60.34	60.07	59.84	59.49	59.11	58.73	58.71	59.00	59.65	60.21	60.97	60.47
17	60.23	59.97	59.84	59.47	59.09	58.71	58.72	59.06	59.77	60.18	60.96	60.45
18	60.17	59.96	59.85	59.48	59.09	58.72	58.71	59.07	59.64	60.19	60.82	60.65
19	60.16	60.03	59.80	59.48	59.08	58.72	58.71	59.05	59.67	60.19	60.85	60.61
20	60.15	60.04	59.81	59.47	59.08	58.69	58.68	59.04	59.62	60.26	60.96	60.52
21	60.09	59.98	59.80	59.45	59.07	58.67	58.67	59.09	59.68	60.24	60.82	60.44
22	60.13	59.99	59.77	59.42	59.04	58.66	58.68	59.09	59.74	60.27	60.85	60.31
23	60.02	60.01	59.73	59.42	59.03	58.65	58.71	59.37	59.66	60.28	60.80	60.26
24	60.05	59.99	59.76	59.40	59.02	58.63	58.69	59.30	59.47	60.33	60.71	60.27
25	59.93	59.97	59.69	59.42	59.01	58.63	58.68	59.10	59.12	60.47	60.84	60.42
26	59.96	59.94	59.73	59.41	59.01	58.61	58.59	59.21	59.35	60.37	60.86	60.24
27	60.19	59.96	59.73	59.40	59.00	58.61	58.67	59.33	59.60	60.49	60.70	60.32
28	60.05	59.95	59.70	59.38	59.00	58.58	58.69	59.26	59.74	60.51	60.67	60.31
29	60.00	59.94	59.72	59.37	---	58.59	58.81	59.22	59.85	60.54	60.70	60.26
30	60.01	59.91	59.69	58.33	---	58.58	58.75	59.36	59.78	60.55	60.63	60.01
31	60.16	---	59.68	59.34	---	58.59	---	59.34	---	60.51	60.50	---
MEAN	60.41	60.00	59.82	---	59.16	58.75	58.66	59.05	59.53	60.11	60.76	60.52
MAX	61.03	60.51	59.94	---	59.35	58.96	58.81	59.37	59.85	60.55	61.02	60.86
MIN	59.93	59.78	59.68	---	59.00	58.58	58.56	58.77	59.12	59.44	60.27	60.01


Lake of the Woods at Springsteel Island near Warroad, MN
Station 05140521
GAGE HEIGHT, IN FEET
62
61
60
59
58
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
1992
1993
WATER YEAR

LOW FLOW INVESTIGATIONS

LOW-FLOW INVESTIGATIONS

Low-flow investigations in the Buffalo River basin

A series of discharge measurements were made in the Buffalo River basin (Buffalo aquifer study) during February 8-10, 1993 to determine base flow variations. Conditions were excellent, and all measurements are considered base flow.

The measurements were made during constant base flow of the stream; the stream was completey ice covered.

Discharge measurements made in the Buffalo River basin, MN, Feb 8-10, 1993

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Buffalo River basin				
aBuffalo River	Red River of the North	Lat 46°53'59", long 96°36'34", in $SW^1/_4NW^1/_4$ sec. 34, T. 140 N., R. 47 W., Clay County, Hydrologic Unit 09020106, at bridge on County 68, 1.6 miles north of State Highway 10, about 2.1 miles northwest of Glyndon, MN (05061020).		1948, 1977-78, 1980, 1988, 1993	b2-9-93	24.2
aSouth Branch Buffalo River	Buffalo River	Lat 46°34'21", long 96°30'23", on section line between secs. 20 and 29, T. 136 N., R. 46 W., Wilkin County, Hydrologic Unit 09020106, at bridge on township road 186, 6.8 miles northwest of Lawndale, MN.		1977-78, 1993	b2-8-93	0
aDeerborn Creek	Buffalo River	Lat 46°34'45", long 96°29'17", on line between secs. 20 and 21, T. 136 N., R. 46 W., Wilkin County, Hydrologic Unit 09020106, at bridge on county road, 1.2 miles west of State Highway 9 about 6 miles southwest of Barnesville, and 6.4 miles northwest of Lawndale, MN (05061080).	48.4	1970-73, 1976, 1977-78, 1988, 1993	b2-8-93	1.48
aSouth Branch Buffalo River	Buffalo River	Lat 46°37'50", long 96°33'52", on section line between secs. 36 and and 1, T. 137 N., R. 47 W., on line between Clay County and Wilkin County, Hydrologic Unit 09020106, at bridge on county road, 5.9 miles south of Baker, MN.	-	1977-78, 1993	b2-8-93	0
aSouth Branch Buffalo River	Buffalo River	Lat 46°38'44", long 96°34'43", on line between secs. 26 and 35, T. 137 N., R. 47 W., Wilkin County, Hydrologic Unit 09020106, at bridge on County Road 51, 4.9 miles southwest of Baker, 7.7 miles west of Barnesville.		1978, 1993	b2-8-93	0.49

"See footnotes at end of the table."

LOW-FLOW INVESTIGATIONS

Discharge measurements made in the Buffalo River basin, MN Feb 8-10, 1993

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Buffalo River basin--Continued				
aSouth Branch Buffalo River	Buffalo River	Lat 46°39'35", long 96°34'57", on line between secs. 23 and 26, T. 137 N., R. 47 W., Clay County, at bridge on County Highway 2, 4 miles south of Baker, and 7.4 miles west of Barnesville (05061100).	c185	1964-66, 1970-73, 1976-77, 1988, 1993	b2-8-93	1.0
aSouth Branch Buffalo River	Buffalo River	Lat 46°41'28", long 96°36'37", in $SE^1/_4SE^1/_4$ sec. 9, T. 137 N., R. 47 W., Clay County, Hydrologic Unit 09020106, at bridge on County Highway 57, 3.4 miles southwest of Baker, MN.		1977-78, 1993	b2-9-93	0.79
aStony Creek	South Branch Buffalo River	Lat 46°44'48", long 96°36'26", on line between secs. 22 and 27, T. 138 N., R. 47 W., Clay County, Hydrologic Unit 09020106, at bridge on County Highway 65, 3 miles southeast of Sabin, MN, and 2.4 miles above mouth (05061490).	c145	1964-66#, 1970-73. 1976-78, 1988, 1993	b2-9-93	0.52
aSouth Branch Buffalo River	Buffalo River	Lat 46°46'20", long 96°37'40", in $SW^1/_4SW^1/_4$ 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 mile downstream from Stony Creek and 1 mile east of Sabin (05061500).	522	1945-93#	b2-9-93	2.23
aSouth Branch Buffalo River	Buffalo River	Lat 46°49'09", long 96°37'12", on section line between secs. 28 and 33, T. 139 N., R. 47 W., Clay County, Hydrologic Unit 09020106, at bridge on County Highway 12, 3.2 miles northeast of Sabin, MN.	-	1977-78, 1993	b2-9-93	1.82
aBuffalo River	Red River of the North	Lat 46°54'19", long 96°37'09", in $NW^1/_4NE^1/_4$ sec. 33, T. 140 N., R. 47 W., Clay County, Hydrologic Unit 09020106, at bridge on County Highway 18, 3.0 miles northwest of Glyndon, MN.	-	1978, 1993	b2-9-93	28.1
aBuffalo River	Red River of the North	Lat 46°56'03", long 96°38'39", on section line between secs. 17 and 20, T. 140 N., R. 47 W., Clay County, Hydrologic Unit 09020106, at bridge on County Highway 91, 5 miles southwest of Averill, MN.	-	1931, 1947, 1978, 1993	b2-9-93	24.8
aBuffalo River	Red River of the North	Lat 46°57'40", long 96°39'40", in $SW^1/_4SE^1/_4$ sec. 6, T. 140 N., R. 47 W., Clay County, Hydrologic Unit 09020106, on left bank 4.5 miles southeast of Kragnes, 6.5 miles northeast of Dilworth, and 9 miles downstream from South Branch.	1,040	1931-93#	b2-9-93	27.0

"See footnotes at end of the table."

LOW-FLOW NVESTIGATIONS

Discharge measurements made in the Buffalo River basin, MN, Feb 8-10, 1993

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Buffalo River basin--Continued				
aBuffalo River	Red River of the North	Lat 46°58'20", long 96°41'22", in $SW^1/_4NW^1/_4$, sec. 1, T.140 N., R.48 W., Clay County, Hydrologic Unit 09020106, at 1st county bridge below gaging station (05062000) near Dilworth, MN.	-	1978, 1993	b2-10-93	24.8
aBuffalo River	Red River of the North	Lat 47°00'18", long 96°43'53", in $NE^1/_4NE^1/_4$ sec. 27, T. 141 N., R. 48 W., Clay County, Hydrologic Unit 09020106, at County Highway 5, 1.5 miles northeast of Kragnes, MN.	-	1948, 1977-78, 1993	b2-10-93	25.3

operated as a continuous record gaging station.
a also published as a miscellaneous site.
b total ice cover.
c approximately.

Partial-Record Stations and Miscellaneous Sites

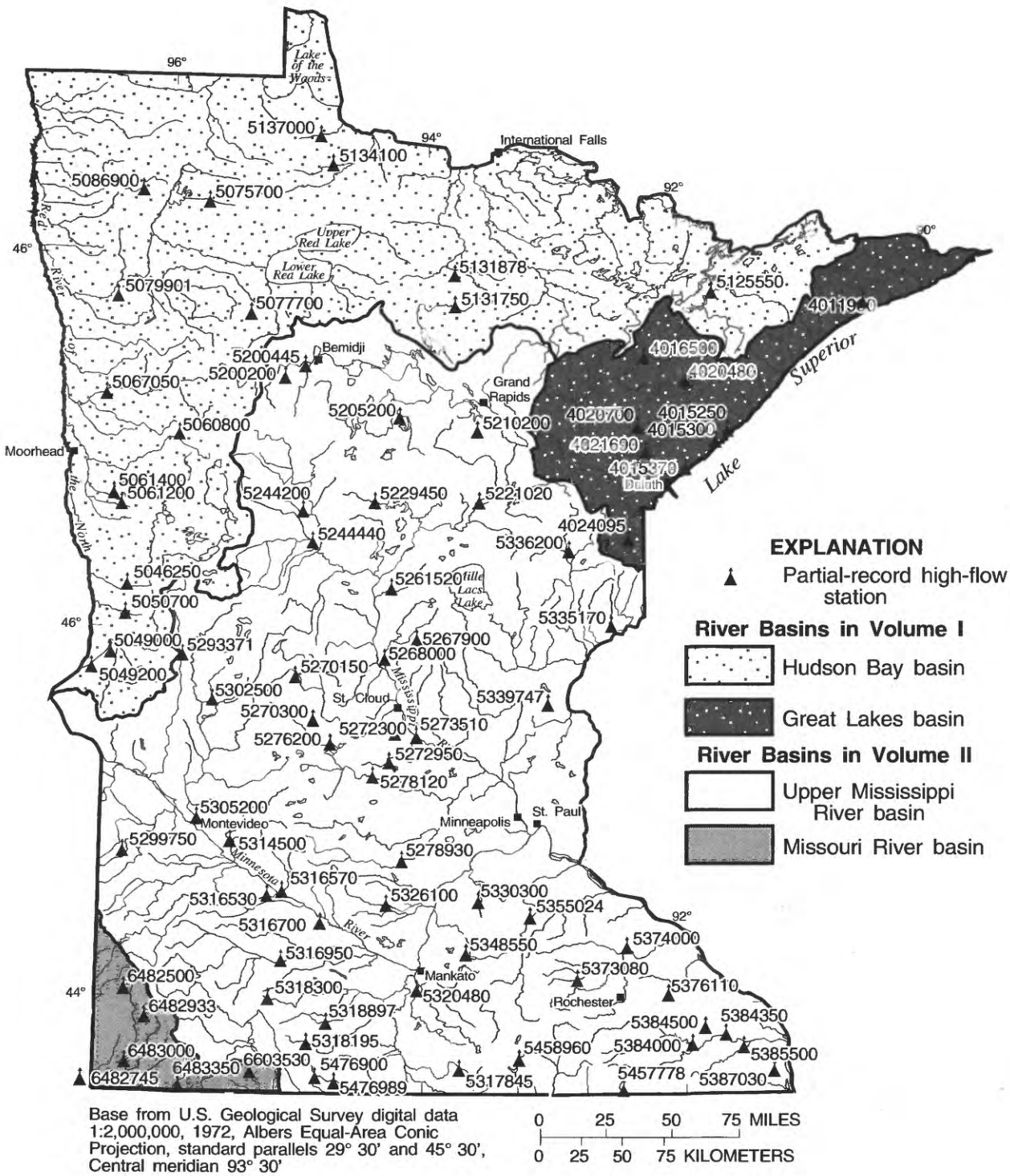


Figure 10.--Location of high-flow partial-record stations.

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 or miscellaneous sites are presented in two tables. The first is a table of discharge at high-flow partial-record stations and the second is a table of discharge measurements made at 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 1993

Station name and number	Location and drainage area	Period of record	Water year 1993 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
			Streams tributary to Lake Superior					
Cascade River near Grand Marais, MN 04011990	Lat 47°47'24", long 90°31'35", in SE¼sec.1, T.61 N., R.2 W., Cook County, Hydrologic Unit 04010101, at bridge on Forest Road 45, 6.6 miles upstream from mouth, 9.5 miles west of Grand Marais. Drainage area is ___ mi^2.	1985-93	7-4-93	a11.33	752	4-29-90	11.95	1210
Silver Creek tributary near Two Harbors, MN 04015250	Lat 47°04'40", long 91°36'49", in SW¼NE¼ sec.16, T.53 N., R.10 W., Lake County, Hydrologic Unit 04010102, at culvert on County Highway 3, 1.0 mile upstream from mouth, 4.5 miles northeast of Two Harbors. Drainage area is 3.72 mi^2.	1965-93	7-4-93	11.20	1090	9-20-72	17.08	1880
Little Stewart River near Two Harbors, MN 04015300	Lat 47°03'52", long 91°40'03", in SE¼NE¼ sec.24, T.53 N., R.11 W., Lake County, Hydrologic Unit 04010102, at culvert on County Highway 2, 2.0 miles upstream from mouth, 2.7 miles north of Two Harbors. Drainage area is 5.54 mi^2.	1960-93	7-4-93	11.31	255	9-20-72	15.18	598

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1993--Continued

Station name and number	Location and drainage area	Period of record	Water year 1993 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
		Streams tributary to Lake Superior--Continued						
Talmadge River at Duluth, MN 04015370	Lat 46°53'20", long 91°55'21", in SE¼NE¼ sec.24, T.51 N., R.13 W., St. Louis County, Hydrologic Unit 04010102, at culvert on U.S. Highway 61, 0.6 mile upstream from mouth, 0.5 mile northeast of Duluth city limits. Drainage area is 5.79 mi^2.	1964-93	7-4-93	15.99	420	5-9-79	21.76	1180
St. Louis River near Aurora, MN 04016500	Lat 47°29'30", long 92°14'20", in NW¼SW¼ sec.22, T.58 N., R.15 W., St. Louis County, Hydrologic Unit 04010201, at bridge on County Highway 100, 0.8 mile downstream from Partridge River and 1.5 mile south of Aurora. Drainage area is 290 mi^2.	1942-87# 1988-93	7-5-93	4.32	1510	5-14-50	8.37	5380
North Branch Whiteface River near Fairbanks, MN 04020480	Lat 47°22'20", long 91°56'28", in NW¼NW¼ sec.1, T.56 N., R.13 W., St. Louis County, Hydrologic Unit 04010201, at culvert on County Highway 16, 2 miles upstream from the mouth of Jenkins Creek, 0.7 mile west of Fairbanks. Drainage area is 17.1 mi^2	1979-93	7-4-93	12.44	215	4-23-79	13.67	660
Bug Creek at Shaw, MN 04020700	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 culverts on County Road 15 at Shaw, 7.5 miles upstream from mouth. Drainage area is 24.0 mi^2.	1979-93	7-5-93	14.91	535	4-23-79	15.12	590
Cloquet River near Toimi, MN 04021690	Lat 47°21'00", long 91°39'30", in NE¼SW ¼ sec.7, T.56 N., R.10 W., Lake County, Hydrologic Unit 04010202, at bridge on County Highway 2, 5.8 miles southeast of Toimi, 23 miles north of Two Harbors. Drainage area is ___ mi^2.	1986-93	7-4-93	9.06	1540	7-4-93	9.06	1540

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1993--Continued

Station name and number	Location and drainage area	Period of record	Water year 1993 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
		Streams tributary to Lake Superior--Continued						
Nemadji River near Holyoke, MN 04024095	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, 7 miles south of Wrenshall. Drainage area is 118 mi^2.	1972-93	6-24-93	10.57	1200	9-3-85	17.38	4420
		Red River of the North basin						
Ottertail River near Foxhome, MN 05046250	Lat 46°12'48", long 96°18'24", in SW¼SW¼ sec.26, T.132 N., R.45 W., Wilkin County, Hydrologic Unit 09020103, at bridge on County Road 19, 4 miles south of Foxhome, 10.8 miles below Orwell Dam. Drainage area is ___ mi^2.	1990-93	b7-2-91 7-25-93	15.63 16.38	b1140 1400	7-25-93	16.38	1400
Mustinka River above Wheaton, MN 05049000	Lat 45°49'15", long 96°29'25", in SW¼ sec.8, T.127 N., R.46 W., Traverse County, Hydrologic Unit 09020102, at bridge on U.S. Highway 75, 1 mile upstream from Chicago, Milwaukee and St. Paul railroad bridge, 0.5 mile north of Wheaton, about 8 miles above Lake Traverse. Drainage area is 834 mi^2.	1915-24#, 1930-58#, 1985-93	3-30-93	c18.07	4400	4-10-52	16.56	7320
Eighteenmile Creek near Wheaton, MN 05049200	Lat 45°47'18", long 96°31'52", in NW¼NW¼ sec.25, T.127 N., R.47 W., Traverse County, Hydrologic Unit 09020102, at culvert on County Highway 7, 1.4 miles upstream from mouth, 2.0 miles southwest of Wheaton. Drainage area 68.5 mi^2.	1965-93	7-25-93	d9.87	960	4-9-69	---	e2400
Rabbit River near Nashua, MN 05050700	Lat 46°04'30", long 96°18'24", in SE¼NE¼ sec. 15, T.130 N., R.45 W., Wilkin County, Hydrologic Unit 09020101, at bridge on County Road 19, 2.6 miles north of Nashua, 4.8 miles upstream from mouth of South Fork Rabbit River. Drainage area is 56.1 mi^2.	1979-93	3-30-93	c14.06	720	9-21-86	14.27	1280

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1993--Continued

Station name and number	Location and drainage area	Period of record	Water year 1993 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
		Red River of the North basin--Continued						
Buffalo River near Callaway, MN 05060800	Lat 47°01'17", long 95°54'43", in $SW^1/_4SW^1/_4$ sec. 17, T.141 N., R.41 W., Becker County, Hydrologic Unit 09020106, at culvert on U.S. Highway 59, 2.7 miles north of Callaway. Drainage area is 94.5 mi^2.	1960-93	7-16-93	24.90	1630	7-16-93	24.90	1630
Whiskey Creek at Barnesville, MN 05061200	Lat 46°39'35", long 96°23'54", in $SE^1/_4SW^1/_4$ 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. Drainage area is 25.3 mi^2.	1961-64, 1965-66#, 1967-93	3-29-93	c6.88	410	5-31-85	7.12	660
Spring Creek above Downer, MN 05061400	Lat 46°44'37", long 96°25'12", in $NW^1/_4NW^1/_4$ sec.30, T.138 N., R.45 W., Clay County, Hydrologic Unit 09020106, at culvert on county road, 3.1 miles east of Downer. Drainage area is 5.81 mi^2.	1961-93	7-24-93	11.56	265	6-29-75	13.52	1460
Marsh River Ditch near Ada, MN 05067050	Lat 47°17'46", long 96°26'09", in $NE^1/_4NE^1/_4$ sec.13, T.144 N., R.46 W., Norman County, Hydrologic Unit 09020108, at bridge on County Highway 24, 3.5 miles southeast of Ada. Drainage area is ___ mi^2.	1985-93	7-27-93	df14.44	140	4-6-89	16.74	1070
Mud River near Grygla, MN 05075700	Lat 48°19'31", long 95°44'35", in $NE^1/_4NE^1/_4$ sec.23, T.156 N., R.40 W., Hydrologic Unit 09020304, Marshall County, at bridge on State Highway 89, 6 miles west of Grygla. Drainage area is 170 mi^2.	1979-93	7-26-93	f17.95	1240	4-26-79	18.49	1480
Ruffy Brook near Gonvick, MN 05077700	Lat 47°44'50", long 95°24'45", in $SE^1/_4SE^1/_4$ sec.5, T.149 N., R.37 W., Clearwater County, Hydrologic Unit 09020305, at culvert on County Highway 67, 4.0 miles upstream from mouth, 4.8 miles east of Gonvick. Drainage area is 45.2 mi^2.	1960-78#, 1979-85, 1986,# 1987-93	3-29-93	3.74	169	3-30-67	6.35	453

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1993--Continued

Station name and number	Location and drainage area	Period of record	Water year 1993 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
		Red River of the North basin--Continued						
Burnham Creek near Crookston, MN 05079901	Lat 47°43'59", long 96°39'52", in SE¼SW¼ sec.10, T.149 N., R.47 W., Polk County, Hydrologic Unit 09020303, at triple box culvert on U.S. Highway 75, 0.75 mile northeast of Girard, 3 miles southwest of Crookston, 7 miles above mouth. Drainage area is g111 mi^2.	1986-93	3-29-93	c17.50	880	4-4-89	20.44	1900
Middle River near Newfolden, MN 05086900	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. Drainage area is 91.1 mi^2.	1979-93	8-31-93	f16.67	550	4-25-79	17.10	1000
		Lake of the Woods basin						
Stony River near Babbitt, MN 05125550	Lat 47°41'36", long 91°45'38", in SW¼SW¼ sec.8, T.60 N., R.11 W., Lake County, Hydrologic Unit 09030001, in Superior National Forest, at bridge on Forest Road 424, 4.7 miles upstream from mouth, 8.5 miles southeast of Babbitt. Drainage area is 219 mi^2.	1975-80#, 1986-93	7-5-93	6.28	945	4-19-76	8.71	2490
Big Fork River near Bigfork, MN 05131750	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. Drainage area is 602 mi^2.	1973-93	7-7-93	f12.38	995	4-22-79	15.48	2830

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1993--Continued

Station name and number	Location and drainage area	Period of record	Water year 1993 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
			Lake of the Woods basin--Continued					
Bowerman Brook near Craigville, MN 05131878	Lat 47°55'29", long 93°45'34", in NE¼NW¼ sec.26, T.63 N., R.27 W., Koochiching County, Hydrologic Unit 09030006, at culvert on State Highway 6, 2.4 miles upstream from mouth, 7.0 miles west of Craigville. Drainage area is 25.0 mi^2.	1979-93	3-30-93	c13.10	190	4-21-79	14.73	650
North Branch Rapid River near Baudette, MN 05134100	Lat 48°31'56", long 94°38'50", in NW¼SW¼ sec.4, T.158 N., R.31 W., Lake of the Woods County, Hydrologic Unit 09030007, at bridge on County Highway 1, 12.7 miles southwest of Baudette. Drainage area is g180 mi^2.	1986-93	8-30-93	6.61	270	3-31-86	11.16	1000
Winter Road River near Baudette, MN 05137000	Lat 48°42'39", long 94°41'52", in NW¼NE¼ sec.1, T.160 N., R.32 W., Lake of the Woods County, Hydrologic Unit 09030008, at bridge on State Highway 11, 4.5 miles west of Baudette, 1.8 miles east of Pitt, 5 miles upstream of mouth. Drainage area is g145 mi^2.	1986-93	7-4-93	9.72	390	3-31-86	14.30	1400

Operated as a continuous-record gaging station.
a Affected by shifting control.
b Revised.
c Backwater from ice.
d Not annual maximum gage height.
e Estimated.
f Backwater from aquatic growth or debris.
g Approximate.

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 1993

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Streams tributary to Lake Superior				
Whiteface River	St. Louis River	Lat 47°10'49", long 92°28'47", in SW¼NE¼ sec.10, T. 54 N., R.17 W., St. Louis County, Hydrologic Unit 04010201, at North bound bridge on Trunk Highway 53, 0.75 mile north of Cotton, 1 mile above mouth of Paleface River.		1974, 1993	11-2-92 11-3-92 11-4-92 7-13-93	105 66 254 818
Cloquet River	St. Louis River	Lat 46°57'09", long 92°19'48", in NW¼NE¼ sec.35, T.52 N., R. 16 W., St. Louis County, Hydrologic Unit 04010202, at railroad bridge, 4.2 miles northwest of Twig, MN, 0.6 mile downstream of mouth of Beaver River outlet from Fish Lake Reservoir, high measurements made from County Road 15 bridge 0.5 mile downstream.		1965, 1993	11-2-92 11-3-92 11-4-92 7-14-93	262 481 †866 †2160
Cloquet River	St. Louis River	Lat 46°57'29", long 92°27'34", in NW¼SE¼ sec. 26, T. 52 N., R. 17 W., St. Louis County, Hydrologic Unit 04010202, at bridge #3232, on U.S. Highway 53 at Independence, 12 miles north of Cloquet, 1.7 miles northeast of Brookston (04023000).	a750	1909-17#, 1993	11-2-92 11-3-92 11-4-92 7-14-93	281 509 †1040 †2880
		Red River of the North basin				
Bois de Sioux River	Red River of the North	Lat 46°03'04", long 96°33'58", in SE¼SW¼ sec. 22, T. 130 N., R.47 W., Wilkin County, Hydrologic Unit 09020101, at bridge on Trunk Highway 55, 1.5 miles east of Fairmount, N.D.		1993	5-12-93	313
Rabbit River	Bois de Sioux River	Lat 46°05'12", long 96°23'26", in NE¼SE¼ sec. 12, T. 130 N., R. 46 W., Wilkin County, at Trunk Highway 9, 0.3 mile above mouth of the South Fork Rabbit River, 1 mile south of Cambell, 4 miles downstream of site 05050700.		1993	7-9-93	143
		Red River of the North basin				
Otter Tail River	Red River of the North	Lat 46°17'06", long 96°02'58", in SW¼SW¼ sec. 36, T. 133 N., R. 43 W., Otter Tail County, Hydrologic Unit 09020103, at bridge on east Mount Faith Street, in Fergus Falls.		1993	6-22-93	759

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at miscellaneous sites during water year 1993

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Red River of the North basin--Continued				
bBuffalo River	Red River of the North	Lat 46°53'59", long 96°36'34", in SW¼NW¼ sec. 34, T. 140 N., R. 47 W., Clay County, Hydrologic Unit 09020106, at bridge on County 68, 1.6 miles north of State Highway 10, about 2.1 miles northwest of Glyndon, MN (05061020).		1948, 1977-78, 1980, 1988, 1993	c2-9-93	*24.2
bSouth Branch Buffalo River	Buffalo River	Lat 46°34'21", long 96°30'23", on section line between secs. 20 and 29, T. 136 N., R. 46 W., Wilkin County, Hydrologic Unit 09020106, at bridge on township road 186, 6.8 miles northwest of Lawndale, MN.		1977-78, 1993	c2-8-93	*0
bDeerborn Creek	Buffalo River	Lat 46°34'45", long 96°29'17", on line between secs. 20 and 21, T. 136 N., R. 46 W., Wilkin County, Hydrologic Unit 09020106, at bridge on county road, 1.2 miles west of State Highway 9 about 6 miles southwest of Barnesville, and 6.4 miles northwest of Lawndale, MN (05061080).	48.4	1970-73, 1976, 1977-78, 1988, 1993	c2-8-93	*1.48
bSouth Branch Buffalo River	Buffalo River	Lat 46°37'50", long 96°33'52", on section line between secs. 36 and and 1, T. 137 N., R. 47 W., on line between Clay County and Wilkin County, Hydrologic Unit 09020106, at bridge on county road, 5.9 miles south of Baker, MN.	-	1977-78, 1993	c2-8-93	*0
bSouth Branch Buffalo River	Buffalo River	Lat 46°38'44", long 96°34'43", on line between secs. 26 and 35, T. 137 N., R. 47 W., Wilkin County, Hydrologic Unit 09020106, at bridge on County Road 51, 4.9 miles southwest of Baker, 7.7 miles west of Barnesville.		1978, 1993	c2-8-93	*0.49
bSouth Branch Buffalo River	Buffalo River	Lat 46°39'35", long 96°34'57", on line between secs. 23 and 26, T. 137 N., R. 47 W., Clay County, at bridge on County Highway 2, 4 miles south of Baker, and 7.4 miles west of Barnesville (05061100).	a185	1964-66, 1970-73, 1976-77, 1988, 1993	c2-8-93	*1.0

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at miscellaneous sites during water year 1993

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Red River of the North basin--Continued				
bSouth Branch Buffalo River	Buffalo River	Lat 46°41'28", long 96°36'37", in SE¼SE¼ sec. 9, T. 137 N., R. 47 W., Clay County, Hydrologic Unit 09020106, at bridge on County Highway 57, 3.4 miles southwest of Baker, MN.		1977-78, 1993	c2-9-93	*0.79
bStony Creek	South Branch Buffalo River	Lat 46°44'48", long 96°36'26", on line between secs. 22 and 27, T. 138 N., R. 47 W., Clay County, Hydrologic Unit 09020106, at bridge on County Highway 65, 3 miles southeast of Sabin, MN, and 2.4 miles above mouth (05061490).	a145	1964-66,# 1970-73. 1976-78, 1988, 1993	c2-9-93	*0.52
bSouth Branch Buffalo River	Buffalo River	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 mile downstream from Stony Creek and 1 mile east of Sabin (05061500).	522	1945-93#	c2-9-93	*2.23
bSouth Branch Buffalo River	Buffalo River	Lat 46°49'09", long 96°37'12", on section line between secs. 28 and 33, T. 139 N., R. 47 W., Clay County, Hydrologic Unit 09020106, at bridge on County Highway 12, 3.2 miles northeast of Sabin, MN.	-	1977-78, 1993	c2-9-93	*1.82
bBuffalo River	Red River of the North	Lat 46°54'19", long 96°37'09", in NW¼NE¼ sec. 33, T. 140 N., R. 47 W., Clay County, Hydrologic Unit 09020106, at bridge on County Highway 18, 3.0 miles northwest of Glyndon, MN.	-	1978, 1993	c2-9-93	*28.1
bBuffalo River	Red River of the North	Lat 46°56'03", long 96°38'39", on section line between secs. 17 and 20, T. 140 N., R. 47 W., Clay County, Hydrologic Unit 09020106, at bridge on County Highway 91, 5 miles southwest of Averill, MN.	-	1931, 1947, 1978, 1993	c2-9-93	*24.8
bBuffalo River	Red River of the North	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 miles southeast of Kragnes, 6.5 miles northeast of Dilworth, and 9 miles downstream from South Branch.	1,040	1931-93#	c2-9-93	*27.0

"See footnotes at end of the table."

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at miscellaneous sites during water year 1993

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Red River of the North basin--Continued				
bBuffalo River	Red River of the North	Lat 46°58'20", long 96°41'22", in $SW^1/_4NW^1/_4$ sec. 1, T. 140 N., R. 48 W., Clay County, Hydrologic Unit 09020106, at lst county bridge below gaging station (05062000) near Dilworth, MN.	-	1978, 1993	c2-10-93	*24.8
bBuffalo River	Red River of the North	Lat 47°00'18", long 96°43'53", in $NE^1/_4NE^1/_4$ sec. 27, T. 141 N., R. 48 W., Clay County, Hydrologic Unit 09020106, at County Highway 5, 1.5 miles northeast of Kragnes, MN.	-	1948, 1977-78, 1993	c2-10-93	*25.3
South Branch Wild Rice River	Wild Rice River	Lat 47°05'10", long 96°15'28", in $SW^1/_4NW^1/_4$ sec. 27, T. 142 N., R. 44 W., Clay County, Hydrologic Unit 09020108, at bridge on north edge of Ulen, MN.	-	1993	7-17-93 7-26-93	†939 †1130
Tamarac River	Red River of the North	Lat 48°26'56", long 96°53'22", in $NE^1/_4SE^1/_4$ sec. 6, T. 157 N. R. 48 W., Marshall County, Hydrologic Unit 09020311, at County Highway bridge 5 at Steven (05091000), measurement made 1 mile upstream at Trunk Highway 75 bridge.	254	1945#, 1946-47, 1949-51, 1964, 1980, 1993	8-12-93	†1280
Two Rivers	Red River the North	Lat 48°46'30", long 96°55'52", in $SE^1/_4SE^1/_4$ sec. 12, T. 161 N., R. 49 W., Kittson County, Hydrologic Unit 09020312, at bridge on State Highway 175 at east edge of Hallock, MN, and 0.2 mile downstream from South Branch Two Rivers, measurement made 1 mile. downstream at Trunk Highway 75 bridge (05095000).	625	1911-14#, 1929-30#, 1941-43#. 1967-71#. 1974, 1976, 1978-80, 1987-88, 1993	8-18-93	†2260
North Branch Two Rivers	Two Rivers	Lat 48°50'58", long 97°00'19" in $SW^1/_4SE^1/_4$ sec. 16, T. 162 N., R. 49 W., Kittson County, Hydrologic Unit 09020312, at bridge on U.S. Highway 75, 0.5 mile northwest of Northcote.	-	1980, 1993	8-18-93	†467

operated as a continuous record gaging station.
a approximately.
b also published as low flow investigations.
c total ice cover.

WATER QUALITY

PARTIAL-RECORD STATIONS

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

Water-quality partial-record stations are particular sites where chemical-quality, biological and (or) sediment data are collected systematically over a period of years for use in hydrologic analyses. Letter E indicates estimated value. Letter K indicates non-ideal colony count.

05030150 OTTER TAIL RIVER NEAR PERHAM, MINN
(National Water Quality Assessment Station)

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCTANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)
FEB										
08...	1130	96	442	461	7.4	7.6	-8.0	0.0	732	11.2
APR										
01...	1010	133	333	352	8.0	7.8	-2.0	0.5	732	9.6
26...	1210	223	340	349	8.1	8.0	13.0	9.0	731	12.1
MAY										
11...	0930	275	380	392	8.1	7.7	16.5	12.0	735	11.8
JUN										
07...	1115	197	365	370	8.0	8.2	11.0	14.5	720	7.9
29...	0945	225	355	--	8.0	--	14.0	17.0	727	5.5
JUL										
19...	0900	--	354	360	7.9	7.8	15.5	18.0	729	6.1
AUG										
04...	1100	541	344	344	7.7	7.9	19.0	17.0	732	2.6
19...	0930	649	343	327	7.8	7.6	18.0	19.5	728	2.2

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)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER DIS IT FIELD MG/L AS HCO3 (00453)	CAR-BONATE WATER DIS IT FIELD MG/L AS CO3 (00452)	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
FEB									
08...	48	27	6.5	3.0	293	0	240	--	4.1
APR									
01...	38	19	4.5	2.6	210	0	172	179	3.8
26...	41	19	4.4	2.2	210	0	172	177	3.2
MAY									
11...	43	22	5.0	2.5	236	0	193	204	2.6
JUN									
07...	42	22	4.8	1.8	231	0	189	194	2.6
29...	--	--	--	--	232	0	190	--	--
JUL									
19...	41	21	4.2	1.4	227	0	186	194	1.7
AUG									
04...	40	19	3.6	2.0	206	0	168	184	1.2
19...	41	19	3.7	1.8	197	0	162	164	1.0

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

05030150 OTTER TAIL RIVER NEAR PERHAM, MINN

WATER-QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	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)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)
FEB									
08...	5.0	0.10	16	246	0.020	0.290	0.140	0.70	0.60
APR									
01...	4.1	<0.10	12	198	<0.010	0.220	0.070	0.80	0.50
26...	3.5	0.10	9.0	203	<0.010	0.058	0.040	0.60	0.50
MAY									
11...	3.7	0.10	10	237	<0.010	0.092	0.060	0.60	0.50
JUN									
07...	2.9	0.10	7.9	215	<0.010	<0.050	0.030	0.60	0.50
29...	--	--	--	--	<0.010	<0.050	0.030	0.60	0.50
JUL									
19...	2.4	0.20	16	218	<0.010	<0.050	0.030	0.90	0.50
AUG									
04...	3.2	0.20	19	214	<0.010	<0.050	0.040	0.80	0.60
19...	2.2	0.10	18	203	<0.010	<0.050	0.040	0.80	0.70

DATE	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	SEDIMENT, SUSPENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
FEB									
08...	0.030	<0.010	<0.010	53	71	--	--	--	--
APR									
01...	0.030	<0.010	<0.010	100	78	--	--	64	93
26...	0.030	0.020	<0.010	45	53	--	--	4	97
MAY									
11...	0.030	<0.010	0.010	29	100	--	--	--	--
JUN									
07...	0.020	0.020	<0.010	36	40	--	--	17	81
29...	0.010	0.010	<0.010	--	--	--	--	3	73
JUL									
19...	0.050	0.020	0.020	140	63	10	0.4	7	96
AUG									
04...	0.020	<0.010	0.020	160	32	12	0.2	15	79
19...	0.060	0.060	0.040	150	53	11	0.3	9	95

WATER QUALITY

MISCELLANEOUS SITES

ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

Samples are collected at sites other than gaging stations and partial-record stations to give better areal coverage in a river basin. Such sites are referred to as miscellaneous sites. Letter K indicates non-ideal colony count.

WATER QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE AIR (DEG C) (00020)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)
05091000 TAMARAC RIVER AT STEPHEN, MN (LAT 48 26 58N LONG 096 53 22W)												
AUG 1993												
12...	1130	1280	27	277	7.3	7.6	19.0	20.5	743	3.0	34	12
18...	1115	--	38	--	7.1	--	20.0	21.0	738	2.2	--	--
05095500 TWO RIVERS BELOW HALLOCK, MN (LAT 48 46 50N LONG 097 02 25W)												
AUG 1993												
18...	1115	2260	33	--	7.6	--	20.0	19.0	740	4.0	--	--
05096000 NORTH BRANCH TWO RIVERS NEAR LANCASTER, MN (LAT 48 53 21N LONG 096 40 01W)												
AUG 1993												
18...	0900	467	40	--	7.7	--	18.5	19.5	740	3.2	--	--
481606097041001 SNAKE RIVER NR ALVARADO, MN (5MI N. AND 3MI W.) (LAT 48 16 06N LONG 097 04 10W)												
AUG 1993												
31...	1140	--	50	--	7.8	--	13.0	14.0	744	6.7	--	--

DATE	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)
05091000 TAMARAC RIVER AT STEPHEN, MN (LAT 48 26 58N LONG 096 53 22W)											
AUG 1993											
12...	1.7	7.0	119	8.7	4.3	0.10	16	182	0.020	0.098	0.080
18...	--	--	--	--	--	--	--	--	--	--	--
05095500 TWO RIVERS BELOW HALLOCK, MN (LAT 48 46 50N LONG 097 02 25W)											
AUG 1993											
18...	--	--	--	--	--	--	--	--	--	--	--
05096000 NORTH BRANCH TWO RIVERS NEAR LANCASTER, MN (LAT 48 53 21N LONG 096 40 01W)											
AUG 1993											
18...	--	--	--	--	--	--	--	--	--	--	--
481606097041001 SNAKE RIVER NR ALVARADO, MN (5MI N. AND 3MI W.) (LAT 48 16 06N LONG 097 04 10W)											
AUG 1993											
31...	--	--	--	--	--	--	--	--	0.110	1.10	0.100

ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	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)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	SEDIMENT, SUSPENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
05091000 TAMARAC RIVER AT STEPHEN, MN (LAT 48 26 58N LONG 096 53 22W)											
AUG 1993											
12...	1.1	0.80	0.260	0.180	0.170	130	41	13	0.9	70	87
18...	1.3	--	0.210	--	--	--	--	--	--	28	83
05095500 TWO RIVERS BELOW HALLOCK, MN (LAT 48 46 50N LONG 097 02 25W)											
AUG 1993											
18...	1.3	--	0.230	--	--	--	--	--	--	30	94
05096000 NORTH BRANCH TWO RIVERS NEAR LANCASTER, MN (LAT 48 53 21N LONG 096 40 01W)											
AUG 1993											
18...	1.4	--	0.110	--	--	--	--	--	--	8	98
481606097041001 SNAKE RIVER NR ALVARADO, MN (5MI N. AND 3MI W.) (LAT 48 16 06N LONG 097 04 10W)											
AUG 1993											
31...	1.0	--	0.430	--	0.420	--	--	--	--	--	--

ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	SAMPLING DEPTH (FEET) (00003)	DEPTH AT SAMPLE LOCATION, TOTAL (FEET) (81903)	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	TURBIDITY (NTU) (00076)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	PH WATER WHOLE LAB (STANDARD UNITS) (00403)	OXYGEN DEMAND, CHEMICAL (HIGH LEVEL) (MG/L) (00340)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	CALCIUM DISSOLVED (MG/L AS CA) (00915)
475730089393001 GRAND PORTAGE BAY AT GRAND PORTAGE MN (SITE 1)												
AUG 1993												
16...	1700	--	23.3	--	99	0.20	--	8.2	--	--	--	14
16...	1701	22.0	--	91	--	--	8.8	--	--	15.5	10.7	--
16...	1702	18.0	--	91	--	--	8.7	--	--	16.0	9.4	--
16...	1703	14.0	--	90	--	--	8.5	--	--	16.5	9.4	--
16...	1704	10.0	--	90	--	--	8.5	--	--	16.5	9.4	--
16...	1705	6.00	--	90	--	--	8.5	--	--	17.0	9.2	--
16...	1706	2.00	--	91	--	--	8.4	--	--	17.0	9.8	--
475730089400001 GRAND PORTAGE BAY AT GRAND PORTAGE MN (SITE 2)												
AUG 1993												
16...	1200	--	13.8	--	98	0.20	--	8.0	--	--	--	15
16...	1201	11.0	--	92	--	--	8.8	--	--	15.0	10.1	--
16...	1202	9.00	--	92	--	--	8.6	--	--	15.5	9.8	--
16...	1203	7.00	--	92	--	--	8.5	--	--	15.5	10.0	--
16...	1204	5.00	--	92	--	--	8.4	--	--	16.0	9.8	--
16...	1205	3.00	--	92	--	--	8.4	--	--	16.0	9.6	--
16...	1206	1.00	--	91	--	--	8.4	--	--	16.0	9.8	--

DATE	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	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)	RESIDUE AT 105 DEG. C, DISSOLVED (MG/L) (00515)	RESIDUE TOTAL AT 105 DEG. C, SUSPENDED (MG/L) (00530)	ALUMINUM, TOTAL RECOVERABLE (UG/L AS AL) (01105)	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ANTIMONY, TOTAL (UG/L AS SB) (01097)
475730089393001 GRAND PORTAGE BAY AT GRAND PORTAGE MN (SITE 1)												
AUG 1993												
16...	2.7	1.4	42	3.4	1.5	<0.10	2.3	61	1	<10	<10	<1
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
475730089400001 GRAND PORTAGE BAY AT GRAND PORTAGE MN (SITE 2)												
AUG 1993												
16...	2.7	1.4	43	3.5	1.5	<0.10	2.2	66	1	<10	<10	<1
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--

ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	ANTIMONY, DISSOLVED (UG/L AS SB) (01095)	ARSENIC TOTAL (UG/L AS AS) (01002)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, TOTAL RECOVERABLE (UG/L AS BA) (01007)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, TOTAL RECOVERABLE (UG/L AS BE) (01012)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	BORON, DISSOLVED (UG/L AS B) (01020)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CADMIUM TOTAL RECOVERABLE (UG/L AS CD) (01027)	CHROMIUM, TOTAL RECOVERABLE (UG/L AS CR) (01034)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)
475730089393001 GRAND PORTAGE BAY AT GRAND PORTAGE MN (SITE 1)												
AUG 1993												
16...	<1	<1	<	<100	9	<10	<0.5	<10	<1.0	<1	<1	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
475730089400001 GRAND PORTAGE BAY AT GRAND PORTAGE MN (SITE 2)												
AUG 1993												
16...	<1	<1	<	<100	10	<10	<0.5	<10	<1.0	<1	<1	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--

DATE	COBALT, TOTAL RECOVERABLE (UG/L AS CO) (01037)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, TOTAL RECOVERABLE (UG/L AS CU) (01042)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, TOTAL RECOVERABLE (UG/L AS FE) (01045)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, TOTAL RECOVERABLE (UG/L AS PB) (01051)	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN) (01055)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY TOTAL RECOVERABLE (UG/L AS HG) (71900)	MERCURY DISSOLVED (UG/L AS HG) (71890)
475730089393001 GRAND PORTAGE BAY AT GRAND PORTAGE MN (SITE 1)												
AUG 1993												
16...	<1	<3	2	30	4	<1	<4	<10	<1	<0.10	<0.1	
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
475730089400001 GRAND PORTAGE BAY AT GRAND PORTAGE MN (SITE 2)												
AUG 1993												
16...	<1	<3	2	40	11	<1	<4	<10	<1	<0.10	--	
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--	--

ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	MOLYBDENUM, TOTAL RECOVERABLE (UG/L AS MO) (01062)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, TOTAL RECOVERABLE (UG/L AS NI) (01067)	SELENIUM, TOTAL (UG/L AS SE) (01147)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	SILVER, TOTAL RECOVERABLE (UG/L AS AG) (01077)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN) (01092)	ZINC, DISSOLVED (UG/L AS ZN) (01090)
475730089393001 GRAND PORTAGE BAY AT GRAND PORTAGE MN (SITE 1)											
AUG 1993											
16...	<1	<10	<	<1	<1	<1	<1.0	23	<6	<10	<3
16...	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--
475730089400001 GRAND PORTAGE BAY AT GRAND PORTAGE MN (SITE 2)											
AUG 1993											
16...	<1	<10	<	<1	<1	<1	<1.0	23	<6	10	17
16...	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--	--

ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

BED MATERIAL COLLECTED IN GRAND PORTAGE BAY AT GRAND PORTAGE, MN

WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	TIME	ALUMINUM, RECOV. FM BOTTOM MATERIAL (UG/G) (01108)	ARSENIC TOTAL IN BOTTOM MATERIAL (UG/G AS AS) (01003)	BARIUM, RECOV. FM BOTTOM MATERIAL (UG/G AS BA) (01008)	BERYLLIUM, RECOV. FM BOTTOM MATERIAL (UG/G) (01013)	COBALT, RECOV. FM BOTTOM MATERIAL (UG/G AS CO) (01038)	CADMIUM RECOV. FM BOTTOM MATERIAL (UG/G AS CD) (01028)
475710089412001 T63NR06E09BDB (LAT 47 57 10N LONG 089 41 20W)							
AUG 1993 16...	1930	6300	3	20	<1	<5	<1
475717089392001 T63NR06E03DDC (LAT 47 57 17N LONG 089 39 20W)							
AUG 1993 16...	1800	8600	6	20	<1	<5	<1
475740089410001 T63NR06E09ABB (LAT 47 57 40N LONG 089 41 00W)							
AUG 1993 16...	1900	8700	5	30	<1	10	<1
475757089394001 T63NR06E03DBC (LAT 47 57 57N LONG 089 39 40W)							
AUG 1993 16...	1830	7500	5	20	<1	<5	<1

DATE	CHROMIUM, RECOV. FM BOTTOM MATERIAL (UG/G) (01029)	COPPER, RECOV. FM BOTTOM MATERIAL (UG/G AS CU) (01043)	LEAD, RECOV. FM BOTTOM MATERIAL (UG/G AS PB) (01052)	MERCURY RECOV. FM BOTTOM MATERIAL (UG/G AS HG) (71921)	NICKEL, RECOV. FM BOTTOM MATERIAL (UG/G AS NI) (01068)	SELENIUM, TOTAL IN BOTTOM MATERIAL (UG/G) (01148)	ZINC, RECOV. FM BOTTOM MATERIAL (UG/G AS ZN) (01093)
475710089412001 T63NR06E09BDB (LAT 47 57 10N LONG 089 41 20W)							
AUG 1993 16...	10	10	<10	<0.01	10	<1	30
475717089392001 T63NR06E03DDC (LAT 47 57 17N LONG 089 39 20W)							
AUG 1993 16...	20	9	<10	<0.01	10	<1	50
475740089410001 T63NR06E09ABB (LAT 47 57 40N LONG 089 41 00W)							
AUG 1993 16...	20	10	<10	<0.01	20	<1	50
475757089394001 T63NR06E03DBC (LAT 47 57 57N LONG 089 39 40W)							
AUG 1993 16...	10	8	<10	<0.01	10	<1	40

GROUND-WATER LEVELS

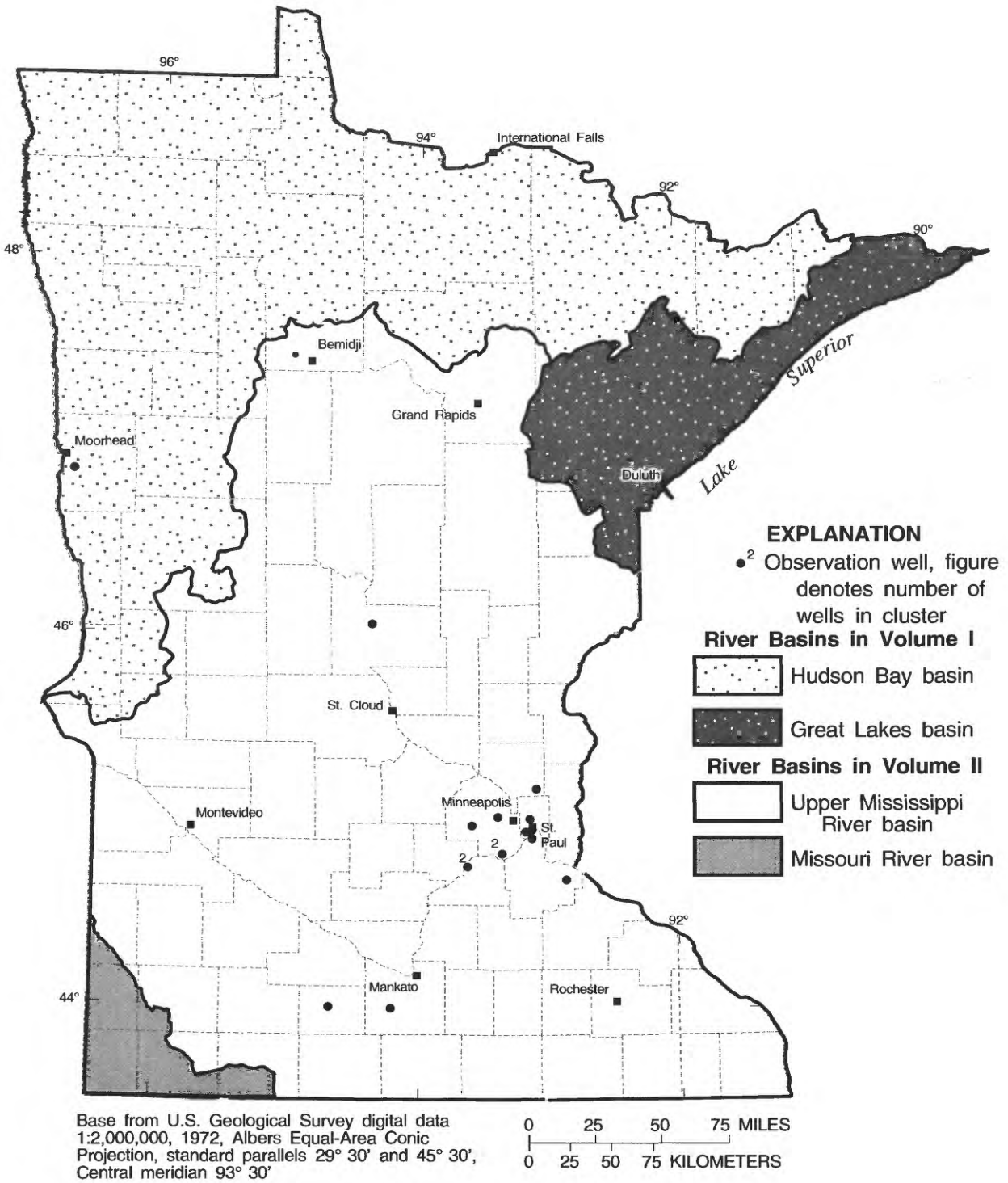


Figure 11.--Location of ground-water wells.

CLAY COUNTY

465237096383901. Local number, 139N47W05DCD0.
LOCATION.--Lat 46 52'37", long 96 38'39", in SW SE SW sec. 5, T.139 N., R.47 W., Hydrologic Unit 09020104, 2.4 mi 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., depth 131 ft, slotted 91 to 107 ft.
DATUM.--.Land-surface datum is 916.7 ft National Geodetic Vertical Datum of 1929. Measuring point: Top of recorder floor, 3.60 ft above land-surface datum.
REMARKS.--Water level affected by pumping from nearby wells.
PERIOD OF RECORD.--January 1974 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 12.19 ft below land-surface datum, July 15m 1947; lowest, 32.94 ft below land-surface datum, Aug. 24, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JUL 30	30.49	AUG 31	31.16	SEP 28	30.90

GROUND-WATER QUALITY

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

COOK COUNTY

STATION NUMBER	LOCAL IDENT-I-FIER	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)
475618089423801	T63NR6E17CAB	08-17-93	1300	350.00	322	7.9	33

STATION NUMBER	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)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)
475618089423801	3.1	33	0.10	115	4.9	30	0.20	204

WATER QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

MARSHALL COUNTY

STATION NUMBER	LOCAL IDENT-I-FIER	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)
481807096430801	156N47W29CAD EFT	11-13-92	1130	32.00	853	829	7.4	79	54
482634096324101	157-46-02DDCC	11-12-92	1254	16.00	1040	--	--	--	--

STATION NUMBER	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)
481807096430801	6.5	3.6	428	24	2.9	0.20	22	485	--	--
482634096324101	--	--	--	--	--	--	--	--	0.110	38.0

STATION NUMBER	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE) (01010)	BORON, DIS-SOLVED (UG/L AS B) (01020)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)
481807096430801	--	--	--	250	<0.5	30	1.0	<5	<3	<10
482634096324101	<0.010	0.020	0.010	--	--	--	--	--	--	--

STATION NUMBER	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)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	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)
481807096430801	23	<10	15	150	20	<10	<1.0	180	<6	16
482634096324101	--	--	--	--	--	--	--	--	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

PENNINGTON COUNTY

STATION NUMBER	LOCAL IDENT-I-FIER	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)
480540096263000	153-45-04DCDD	11-12-92	1009	95.00	1026	890	7.9

STATION NUMBER	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 WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	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)
480540096263000	43	33	84	6.8	246	220	20	0.50	20

STATION NUMBER	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE) (01010)	BORON, DIS-SOLVED (UG/L AS B) (01020)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	IRON, DIS-SOLVED (UG/L AS FE) (01046)
480540096263000	572	67	<0.5	230	<1.0	<5	<3	<10	570

STATION NUMBER	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)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	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)
480540096263000	<10	19	28	10	<10	<1.0	420	<6	6

WATER QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

POLK COUNTY

STATION NUMBER	LOCAL IDENT-I-FIER	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)
474537096195200	149N44W05BBBB	10-30-92	1300	32.60	1125	--	--	--	--
474629096180400	150N44W28CDD	11-12-92	1521	15.00	1050	426	7.8	51	18

STATION NUMBER	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	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)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE) (01010)	BORON, DIS-SOLVED (UG/L AS B) (01020)
474537096195200	--	--	205	--	--	--	--	--	--	--	--
474629096180400	.3	1.3	170	6.0	0.90	0.10	13	246	44	<0.5	20

STATION NUMBER	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)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)
474537096195200	--	--	--	--	--	--	--	--	--	--
474629096180400	<1.0	<5	<3	<10	15	<10	<4	18	<10	<10

STATION NUMBER	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)	2, 4-DP TOTAL (UG/L) (82183)	2,4,5-T TOTAL (UG/L) (39740)	2,4-D, TOTAL (UG/L) (39730)	DICAMBA (MED-IBEN) (BAN-VEL D) TOTAL (UG/L) (82052)	PICLO-RAM (TOR-DON) (AMDON) TOTAL (UG/L) (39720)	SILVEX, TOTAL (UG/L) (39760)
474537096195200	--	--	--	--	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
474629096180400	<1.0	61	<6	43	--	--	--	--	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

RED LAKE COUNTY

STATION NUMBER	LOCAL IDENT-I-FIER	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)
474537096134400	150-44-36DDDC	10-30-92	1450	165.00	1105	633	7.8
474537096160300	150-44-34DDDD	10-30-92	1434	172.00	1095	541	8.7

STATIONNUMBER	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 WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	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)
474537096134400	51	28	34	2.4	360	2.4	5.0	0.30	20
474537096160300	45	17	41	5.0	245	34	5.8	0.50	15

STATION NUMBER	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE) (01010)	BORON, DIS-SOLVED (UG/L AS B) (01020)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	IRON, DIS-SOLVED (UG/L AS FE) (01046)
474537096134400	343	110	<0.5	130	<1.0	<5	<3	<10	670
474537096160300	300	54	<0.5	90	<1.0	<5	<3	<10	11

STATION NUMBER	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)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	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)
474537096134400	<10	16	29	<10	<10	<1.0	360	<6	--
474537096160300	<10	15	48	<10	<10	1.0	110	<6	--

WATER QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

TRAVERSE COUNTY

STATION NUMBER	LOCAL IDENTIFIER	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)
455138096314701	128N-47W-36BAB	09-28-93	1440	58.00	1001	1070	7.3	11.0	0.2

STATION NUMBER	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	ETHANE, 1112-TETRACHLORO-WAT UNF REC (UG/L) (77562)	1,1,1-TRICHLORO-ETHANE TOTAL (UG/L) (34506)	ETHANE, 1,1,2,2 TETRACHLORO-WAT UNF REC (UG/L) (34516)	1,1,2-TRICHLORO-ETHANE TOTAL (UG/L) (34511)	1,1-DICHLORO-ETHANE TOTAL (UG/L) (34496)	1,1-DICHLOROETHYLENE TOTAL (UG/L) (34501)	1,2,3-TRICHLOROBENZENE WAT, WH REC (UG/L) (77613)
455138096314701	<0.010	<0.050	1.50	<0.010	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20

STATION NUMBER	BENZENE 1,2,4-TRICHLORO-WAT UNF REC (UG/L) (34551)	1,2-DIBROMO ETHANE WATER WHOLE TOTAL (UG/L) (77651)	BENZENE O-CHLORO-WATER UNFLTRD REC (UG/L) (34536)	1,2-DICHLOROETHANE TOTAL (UG/L) (32103)	1,2-DICHLOROPROPANE TOTAL (UG/L) (34541)	1,2-TRANSDICHLOROETHENE TOTAL (UG/L) (34546)	BENZENE 1,3-DICHLORO-WATER UNFLTRD REC (UG/L) (34566)	1,3-DICHLOROPROPANE TOTAL (UG/L) (77173)	BENZENE 1,4-DICHLORO-WHUNFLTRD WAT. WATER WHOLE TOTAL (UG/L) (34571)	123-TRICHLOROPROPANE WATER WHOLE TOTAL (UG/L) (77443)	2,2-DICHLOROPROPANE WAT, WH TOTAL (UG/L) (77170)
455138096314701	<0.20	<0.2	<0.20	<0.2	<0.2	<0.2	<0.20	<0.2	<0.20	<0.2	<0.2

STATION NUMBER	2-CHLOROETHYLVINYLETHER TOTAL (UG/L) (34576)	ACROLEIN TOTAL (UG/L) (34210)	ACRYLONITRILE TOTAL (UG/L) (34215)	BENZENE TOTAL (UG/L) (34030)	BROMOBENZENE WATER, WHOLE, TOTAL (UG/L) (81555)	BROMOFORM TOTAL (UG/L) (32104)	CARBONTETRACHLORIDE TOTAL (UG/L) (32102)	CHLORODIBROMOBENZENE TOTAL (UG/L) (34301)	CHLORODIBROMOMETHANE TOTAL (UG/L) (32105)	CHLOROETHANE TOTAL (UG/L) (34311)
455138096314701	<1.0	<20	<20	<0.2	<0.2	<0.2	<0.2	<0.20	<0.2	<0.2

STATION NUMBER	CHLOROFORM TOTAL (UG/L) (32106)	CIS-1,2 DICHLORO-PROPENE CIS 1,3-DICHLORO-PROPENE TOTAL (UG/L) (34704)	DIBROMO-DICHLORO-ETHENE WATER TOTAL (UG/L) (77093)	CHLORODIBROMOPROPANE WATER WHOLE TOT.REC (UG/L) (82625)	DICHLORODIBROMOMETHANE TOTAL (UG/L) (32101)	DICHLORODIFLUOROMETHANE TOTAL (UG/L) (34668)	ETHYLBENZENE TOTAL (UG/L) (34371)	FREON-113 WATER UNFLTRD REC (UG/L) (77652)	HEXACHLOROBUTADIENE TOTAL (UG/L) (39702)	MESITYLENE WATER UNFLTRD REC (UG/L) (77226)
455138096314701	<0.2	<0.2	<0.2	<1.0	<0.2	<0.2	<0.2	<0.5	<0.2	<0.20

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1992 TO SEPTEMBER 1993

TRAVERSE COUNTY--Continued

STATION NUMBER	METHYL-BROMIDE TOTAL (UG/L) (34413)	METHYL-CHLORIDE TOTAL (UG/L) (34418)	O-METHYL-ENE CHLORIDE TOTAL (UG/L) (34423)	P-ISO-BENZENE N-BUTYL WATER UNFLTRD REC (UG/L) (77342)	BENZENE N-PROPY WATER UNFLTRD REC (UG/L) (77224)	CHLORO-NAPHTHALENE TOTAL (UG/L) (34696)	TOLUENE TOLUENE WATER WHOLE TOTAL (UG/L) (77275)	PROPYL-P-CHLOR WATER UNFLTRD REC (UG/L) (77277)	PSEUDO-TOLUENE WATER WHOLE REC (UG/L) (77356)	CUMENE WATER UNFLTRD REC (UG/L) (77222)
455138096314701	<0.2	<0.2	<0.2	<0.20	<0.20	<0.2	<0.2	<0.20	<0.20	<0.20

STATION NUMBER	BENZENE SEC BUTYL-WATER UNFLTRD REC (UG/L) (77350)	STYRENE TOTAL (UG/L) (77128)	BENZENE TERT-BUTYL-WATER UNFLTRD REC (UG/L) (77353)	TETRA-CHLORO-ETHYL-ENE TOTAL (UG/L) (34475)	TOLUENE TOTAL (UG/L) (34010)	TRANS-1,3-DI-CHLORO-PROPENE TOTAL (UG/L) (34699)	TRI-CHLORO-ETHYL-ENE TOTAL (UG/L) (39180)	TRI-CHLORO-FLUORO-METHANE TOTAL (UG/L) (34488)	VINYL CHLO-RIDE TOTAL (UG/L) (39175)	XYLENE WATER UNFLTRD REC (UG/L) (81551)
455138096314701	<0.20	<0.2	<0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.20

U.S. GOVERNMENT PRINTING OFFICE: 1994—558–638

CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
	Length	
inch (in.)	2.54×10^{1}	millimeter
	2.54×10^{-2}	meter
foot (ft)	3.048×10^{-1}	meter
mile (mi)	1.609×10^{0}	kilometer
	Area	
acre	4.047×10^{3}	square meter
	4.047×10^{-1}	square hectometer
	4.047×10^{-3}	square kilometer
square mile (mi^2)	2.590×10^{0}	square kilometer
	Volume	
gallon (gal)	3.785×10^{0}	liter
	3.785×10^{0}	cubic decimeter
	3.785×10^{-3}	cubic meter
million gallons (Mgal)	3.785×10^{3}	cubic meter
	3.785×10^{-3}	cubic hectometer
cubic foot (ft^3)	2.832×10^{1}	cubic decimeter
	2.832×10^{-2}	cubic meter
cubic–foot–per–second day [(ft^3/s) d]	2.447×10^{3}	cubic meter
	2.447×10^{-3}	cubic hectometer
acre–foot (acre–ft)	1.233×10^{3}	cubic meter
	1.233×10^{-3}	cubic hectometer
	1.233×10^{-6}	cubic kilometer
	Flow	
cubic foot per second (ft^3/s)	2.832×10^{1}	liter per second
	2.832×10^{1}	cubic decimeter per second
	2.832×10^{-2}	cubic meter per second
gallon per minute (gal/min)	6.309×10^{-2}	liter per second
	6.309×10^{-2}	cubic decimeter per second
	6.309×10^{-5}	cubic meter per second
million gallons per day (Mgal/d)	4.381×10^{1}	cubic decimeter per second
	4.381×10^{-2}	cubic meter per second
	Mass	
ton (short)	9.072×10^{-1}	megagram or metric ton

Sea level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—a geodetic datum derived from a general adjustment for the first–order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

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