Water Resources Data Minnesota Water Year 1992

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

U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-92-1
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 1992

1991

OCTOBER

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1992

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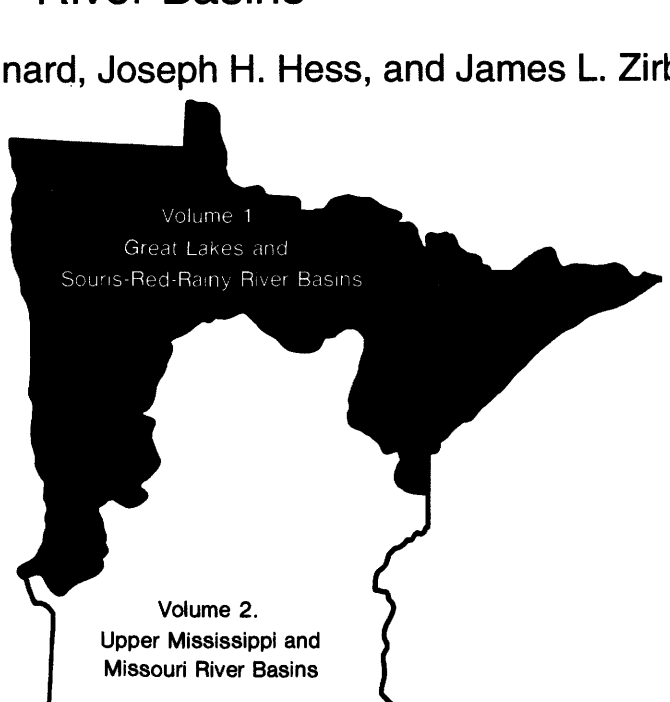
20	21	22	23	24	25	26
27	28	29	30			

Water Resources Data Minnesota Water Year 1992

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

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



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-92-1
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

Robert M. Hirsch, Acting Director

For additional information write to:

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

1993

PREFACE

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

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

Volume 2. Upper Mississippi and Missouri River Basins

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

Gregory W. Stratton, Water-Quality Technician, Minnesota District

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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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16. Abstract (Limit: 200 words)

Water-resources data for the 1992 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 13 stream stations; and water levels for 12 observation wells. Also included are 27 high-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data together with the data in Volume 2, represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Minnesota.

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

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

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

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

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

GROUND-WATER LEVELS

COUNTIES WITH QUALITY OF GROUND WATER

WATER RESOURCES DATA - MINNESOTA, 1992

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 crest-stage 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
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)	0401200	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)	040154	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
East Swan River near Toivola, MN (d)	04019500	112	1953-62, 1964-71

"See footnotes at end of table."

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			
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†
Otter Tail River near Breckenridge, MN (d)	05046500	a2,040	1931-32, 1939-46‡

"See footnotes at end of table."

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			
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)1	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, 1953-56
Snake River near Argyle, MN (d)	05086500	481	1945
Middle River near Strandquist, MN (d)	05087000	-	1953-56

"See footnotes at end of table."

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			
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
Roseau River near Duxby, MN (d)	05108500	-	1929-51, 1952-56

See footnotes at end of table."

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			
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
Vermilion Lake near Soudan, MN (e)	05128200	-	1913-15†, 1941-42†, 1946-87†
Pike River near Biwabik, MN (d)	05128340	-	1977-79

"See footnotes at end of table."

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			
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

* Presently operated as high-flow partial-record station.
† Stage record only.
a Approximately.

DISCONTINUED SURFACE-WATER-QUALITY STATIONS

[The following stations were discontinued as continuous-record or periodic-record stations prior to the 1992 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 1992 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 13 stream stations; and water levels for 12 observation wells. Also included are 27 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-92-1. 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 organizations of the State of Minnesota have had cooperative agreements for the systematic collection of streamflow records since 1909, for ground-water levels since 1948, and for water-quality records since 1952. Organizations that assisted in collecting data through cooperative agreement with the Survey are:

Minnesota Department of Natural Resources, Division of Waters, Kenneth Lokkesmoe, director.

Minnesota Department of Transportation, Leonard W. Levine, commissioner.

Metropolitan Waste Control Commission of the Twin Cities Area, Louis R. Clark, chairperson.

Beltrami Soil and Water Conservation District, Floyd W. Jorgensen, chairperson.

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

Leech Lake Reservation Business Committee, Daniel Brown, chairperson.

Lower Red River Watershed Management Board, Donald Ogaard, chairman.

Whitewater Joint Powers Board, Eugene Kalmes, chairman.

Assistance in the form of funds or services was given by the U.S. Army Corps of Engineers, in collecting records for 46 gaging stations and 12 water-quality stations published in this report of 2 volumes. Thirteen gaging stations in the Hudson Bay and St. Lawrence River basins were maintained by funds appropriated to the United States Department of State. Eight of these, on water adjacent to the international boundary, are maintained by the United-States (or Canada) under agreement with Canada (or the United States), and the records are obtained and compiled in a manner equally acceptable in both countries. These stations are designated herein as "International gaging stations."

SUMMARY OF HYDROLOGIC CONDITIONS

PRECIPITATION

Normal annual precipitation in Minnesota ranges from less than 19 in. (inches) in the northwest to more than 33 in. in the southeast. Precipitation duringwater year 1992 ranged from less than 20 in. in part of the northwest and west-central areas up to 40 in. in part of the northeast, central, south-central and southeast areas (fig. 1). Precipitation ranged from 12 in. below normal (based on record period 1961-90) in a small area in central Minnesota to more than 12 in. above normal in extreme tip of the "arrowhead" in northeastern Minnesota (fig 2).

The water year began with a 0- to 4-in. precipitation deficit in parts of northern and southwestern Minnesota, and a 12- to 20- in. precipitation excess in parts of central, south-central and southwestern Minnesota. The following is a summary of precipitation during the 1992 water year.

October - below normal statewide.

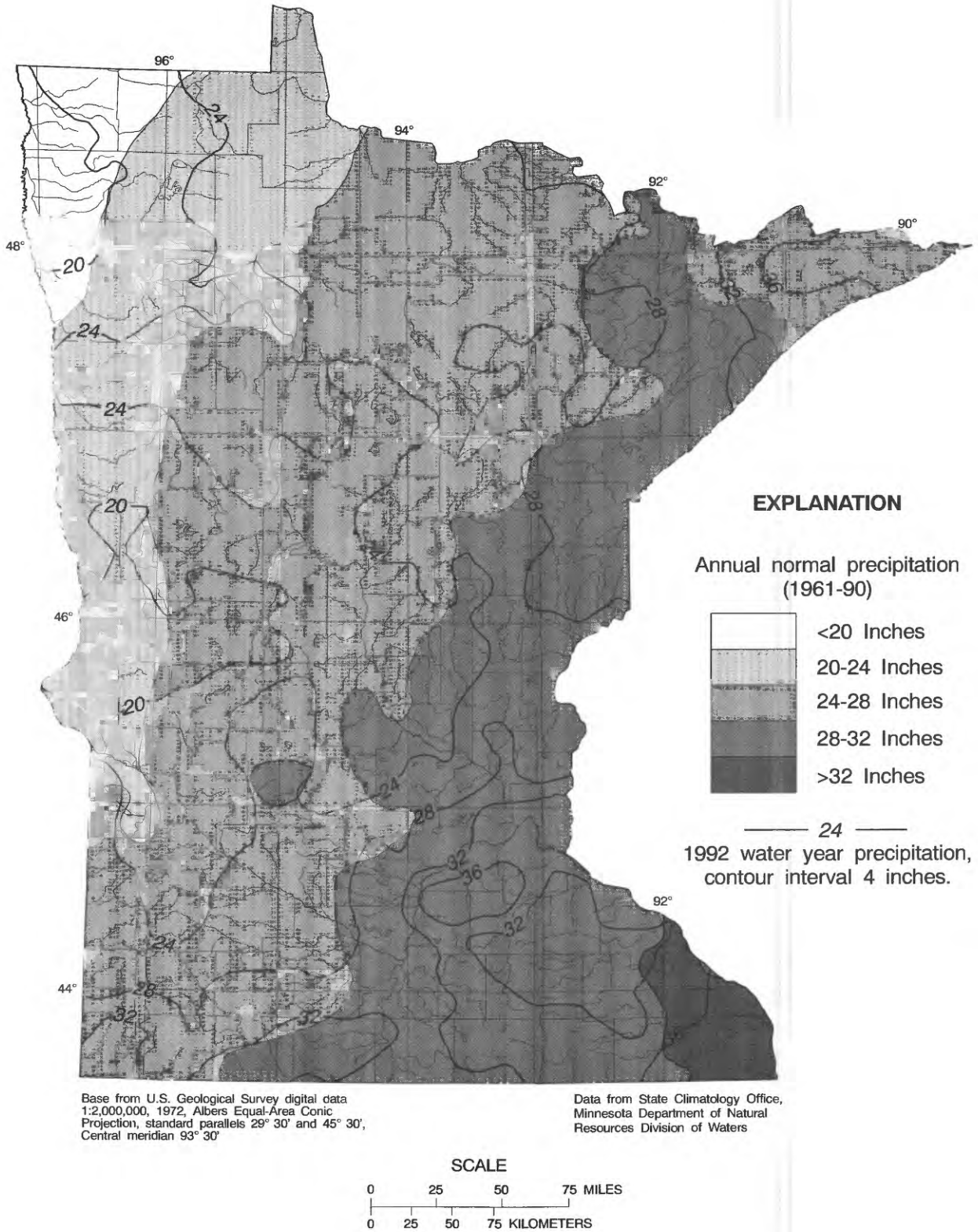


Figure 1.--Precipitation, in inches, during 1992 water year compared to normal annual precipitation in Minnesota.

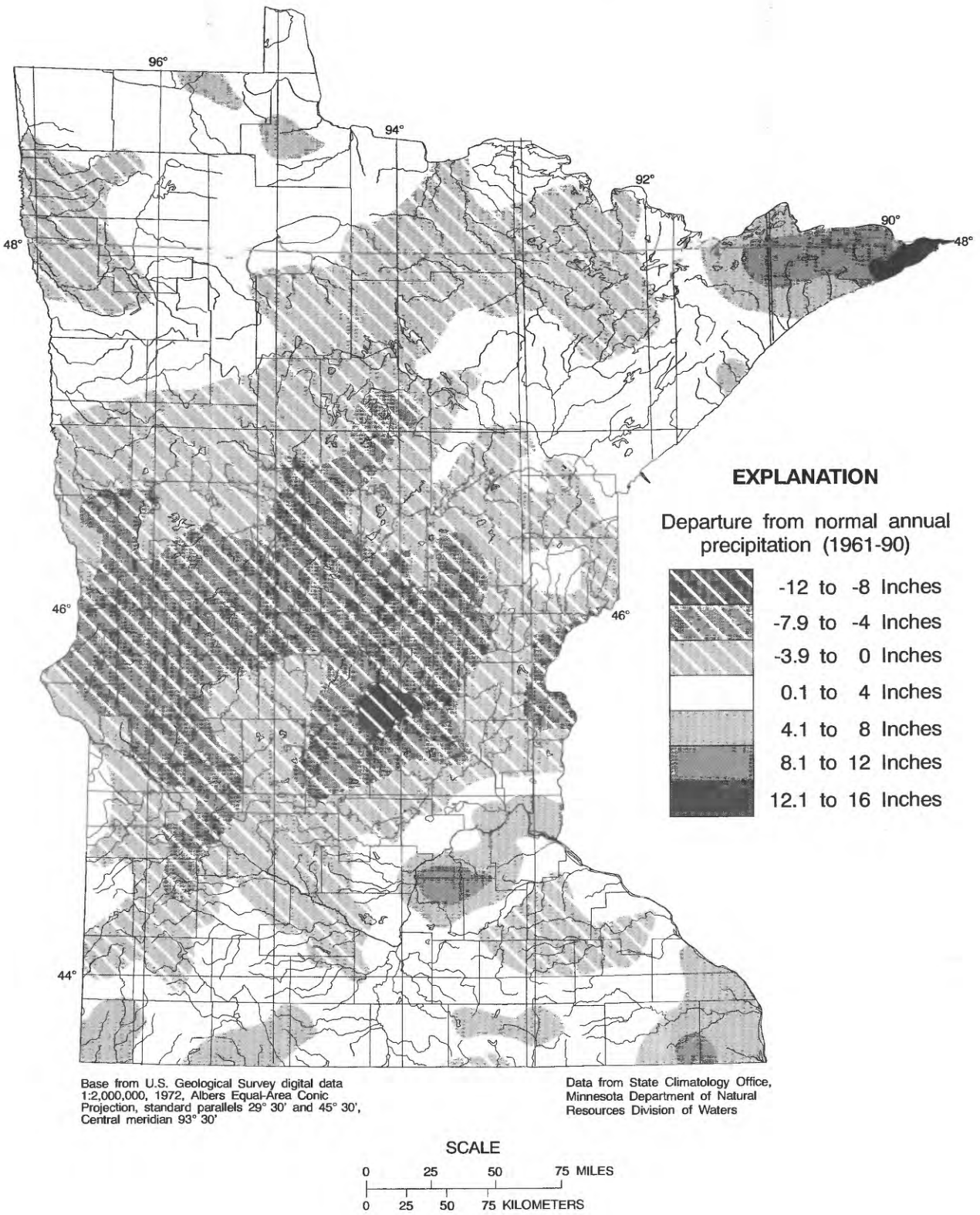


Figure 2.--Precipitation departure from normal, in inches, during 1992 water year in Minnesota.

November - above normal statewide except in the northwest and west-central regions where it was normal or below.

December - below normal statewide except for the southeast region where it was slightly above normal.

January - below normal statewide except for the southwest and south-central regions where it was above normal.

February - below normal statewide except for the north-central, northeast, and southwest regions where it was above normal.

March - below normal statewide except in the south where it was above normal.

April - below normal statewide except in the southeast where it was above normal.

May - below normal statewide.

June - below normal statewide except in the west-central and southwest regions where it was above normal.

July - above normal statewide except in the northeast where it was below normal.

August - above normal statewide except for the west-central, east-central, and southeast regions where it was below normal.

September - below normal statewide except for the northwest, northeast, and southeast regions were it was above normal.

Figure 3 shows total monthly precipitation compared to the normal 30-year (1961-90) monthly values. Two notable precipitation events occurred during the 1992 water year. The first was the "Great Halloween Snowstorm" of October 31 - November 2, 1991, when up to 28 in. of snow fell in the Twin Cities of Minneapolis and St. Paul, and up to 36 in. in the "arrowhead" region in northeastern Minnesota. This storm produced the greatest 24-hour snowfall ever recorded at the Twin City Airport - 20.4 in.. The previous record was 18.5 in. which fell on January 22-23, 1982 (James A. Zandlo, State Climatologist, oral commun., 1993). Only one other storm in historical weather records, the "Great Armistice Day Storm" in November 1940, compares with this event. Both of these storms produced record snowfalls, in a short time period, unusually early in the fall. As a result of the "Halloween storm", November, 1991 precipitation was about 2 1/2 times normal in the regions covered by the storm.

The second event occurred on the evening of September 15 and early morning of September 16, 1992 when 7 in. or more of rain fell in a band from the area around Belle Plain and New Prague to the Wisconsin border just south of Hastings in southeastern Minnesota. This caused September precipitation in this region to reach 1.7 times the normal 30-year (1961-90) value.

STREAMFLOW

Average annual runoff in Minnesota ranges from 1 in. in the west to 14 in. in the northeast. Annual runoff in water year 1992 ranged from 0.20 in. (22 percent of average) in part of west-central Minnesota to 11.83 in. (225 percent of average) in part of south-central Minnesota (table 1). Except for these extremes, runoff generally was greater than 50 percent of the long-term average in the northwest and west and near 100 percent of average in most of the remainder of the State except for parts of southern Minnesota where runoff was greater than 200 percent of average.

In 1992, runoff in the Great Lakes basin in northeast Minnesota and the Souris-Red-Rainy River basins, which extend from the north east to the west and northwest part of the state, (Volume 1) was similar to the pattern that occurred in 1991. Runoff in 1992 ranged from considerably below the long-term average in most of the west to near or somewhat above the long-term average in the east. Runoff as percent of average was lowest in the Red River of the North basin where it was 22 percent of the average in the Bois de Sioux River near White Rock, S.D. (05050000) and in the Red Lake River at High Landing near Goodrich (05075000). Runoff was highest in the Great Lakes basin where it was 127 percent of average in the Knife River near Two Harbors (04015330) and in the St. Louis River at Scanlon (04024000). An anomaly in this runoff pattern occurred in the Roseau River basin in northwestern Minnesota where runoff was 183 percent of average.

In northwestern Minnesota, runoff for the index station, Red Lake River at Crookston (05079000), was 1.43 in. - 50 percent of the station's 91-year average (1902-1992) of 2.85 in. and the 26th lowest runoff of record indicating a partial recovery from the drought which began in the 80's. In the four previous years (1988-91), runoff was the 11th, 23rd, 6th, and 11th lowest, respectively.

In north-central Minnesota, runoff for the index station, Little Fork River at Littlefork (05131500) was 7.32 in. - 88 percent of the 69-year average (1912-16, 1929-92) of 8.28 in. and 11 percent higher than each of the two previous years when it was 77 percent of average.

In northeastern Minnesota, runoff for the index station, Baptism River near Beaver Bay (04014500) was 17.31 in. - 105 percent of the 65-year average (1928-92) of 16.46 in.. reflecting the up to 8 in. of above normal precipitation in this area in 1992. Runoff in water years 1990 and 1991 was 9.00 in. and 14.26 in., respectively.

Annual snd monthly mean discharges for 1992 for the three index stations are compared to the median of mean discharges for the 30-year base period (1961-90) in figure 4. Although near-record high flows occurred at a few stations, no new records were established. For example, flows were in the excessive range throughout the entire year except for June, July, and August in the Roseau River below State Ditch 51 near Caribou (05112000), in contrast to the two previous water years of record low-flows.

WATER QUALITY

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

Boxplots are a useful graphical technique because they display the central tendency, variation, and skewness of a data set, as well as the presence or absence of extreme values. A boxplot consists pf a centerline (the median) dividing a rectangle defined by the 75th and 25th percentiles. Whsikers are drawn from the ends of the box (75th and 25th percentiles) 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 asterisk.

Observations greater than three interquartile ranges from the ends of the box are plotted ith an open circle. Water year 1992 values are plotted with a closed circle to show where these data lie with respect to the historic distribution of data.

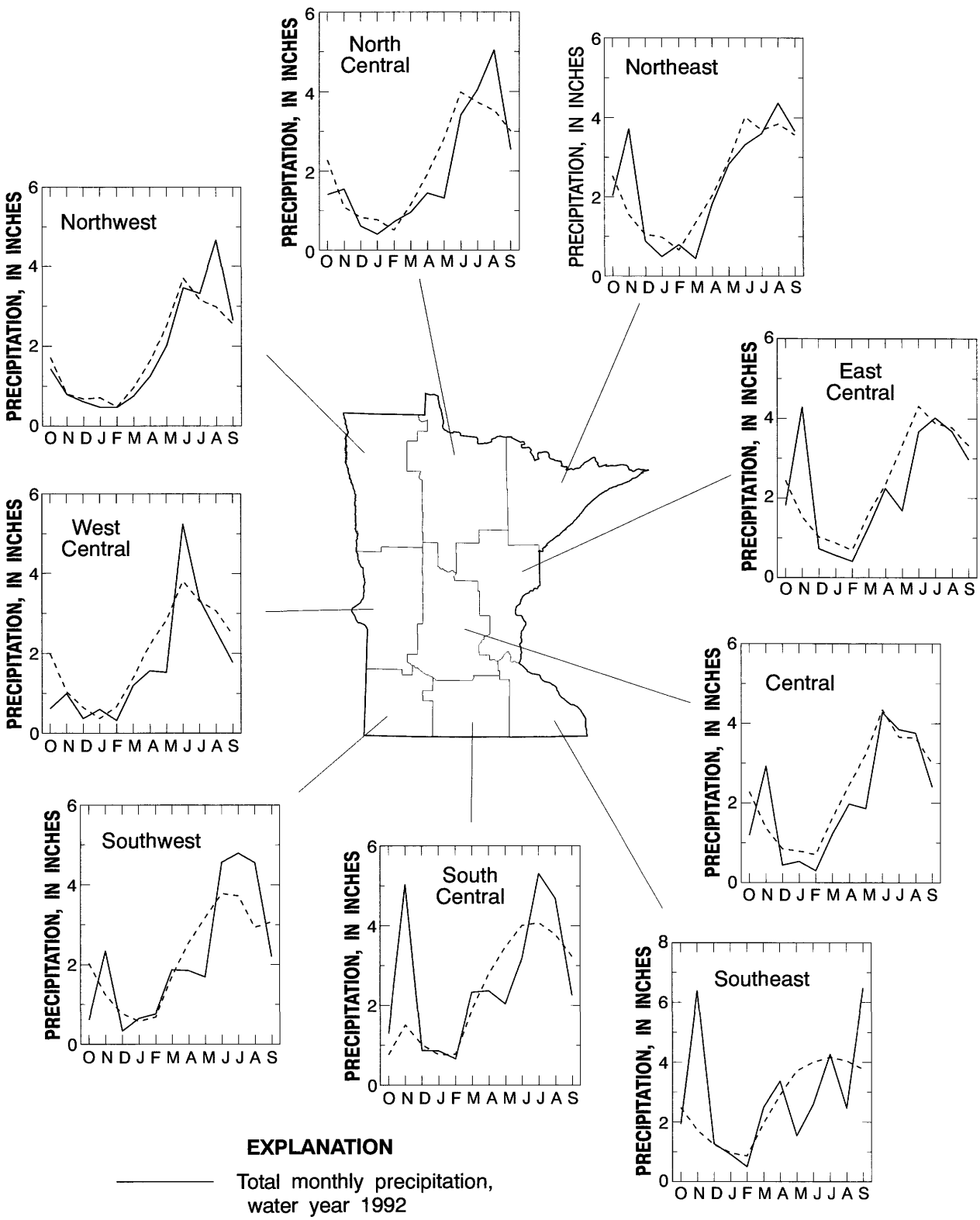


Figure 3.--Total monthly precipitation compared to average monthly precipitation by climatological division for a 30-year base period.

Table 1.--Runoff at streamflow stations in 1992 compared with long-term average for river basins in Minnesota

[Average runoff for station is based on period of record. Maximum and minimum runoff and year of occurrence are shown. mi^2, square miles.]

Station no.	Station name	Drainage area (mi^2)	Runoff (inches)		Maximum runoff		Minimum runoff		Years of record
			1992 Water year	Average	Inches	Water year	Inches	Water year	
04010500	Pigeon River at Middle Falls near Grand Portage	600	12.50	11.41	19.01	1971	3.58	1958	69
04014500	Baptism River near Beaver Bay	140	17.31	16.46	32.50	1972	7.92	1963	65
04015330	Knife River near Two Harbors	85.6	18.25	14.40	23.32	1986	7.01	1977	18
04024000	St. Louis River at Scanlon	3,430	11.81	9.29	16.93	1972	3.74	1924	84
04024098	Deer Creek near Holyoke	7.77	12.36	13.09	33.70	1986	6.38	1980	16
05046000	Otter Tail River below Orwell Dam near Fergus Falls	1,830	2.18	2.37	6.25	1966	.15	1934	62
05050000	Bois de Sioux River near White Rock	1,160	.20	.92	3.85	1986	.004	1977	51
05051500	Red River of the North at Wahpeton	4,010	1.15	1.82	5.00	1986	.18	1977	49
05061500	South Branch Buffalo River at Sabin	522	.72	1.43	5.15	1962	.32	1977	42δ
05062000	Buffalo River near Dilworth	1,040	1.02	1.71	5.76	1975	.33	1934	61
05064000	Wild Rice River at Hendrum	1,600	1.70	2.19	5.79	1975	.25	1977	47δ
05069000	Sand Hill River at Climax	426	1.11	2.23	6.50	1950	.59	1977	45δ
05074500	Red Lake River near Red Lake	1,950	.51	3.25	9.00	1951	.04	1936	59
05076000	Thief River near Thief River Falls	959	2.03	2.26	8.60	1966	.02	1939	74δ

Table 1.--Runoff at streamflow stations in 1992 compared with long-term average for river basins in Minnesota--Continued

Station no.	Station name	Drainage area (mi^2)	Runoff (inches)		Maximum runoff		Minimum runoff		Years of record
			1992 Water year	Average	Inches	Water year	Inches	Water year	
05078500	Clearwater River at Red Lake Falls	1,370	2.27	3.06	8.48	1950	.64	1939	65δ
05079000	Red Lake River at Crookston	5,280	1.43	2.85	8.05	1950	.22	1934	91
05082500	Red River of the North at Grand Forks	30,100	.75	1.15	3.42	1950	.11	1934	88
05087500	Middle River at Argyle	265	1.08	1.93	5.74	1966	.08	1977	41δ
05102500	Red River of the North at Emerson	40,200	.97	1.12	4.09	1950	.11	1934	80
05104500	Roseau River below South Fork near Malung	573	4.12	3.16	8.18	1950	.17	1990	46
05112000	Roseau River below State Ditch No. 51 near Caribou	1,570	4.43	2.42	5.91	1927	.31	1977	35δ
05124480	Kawishiwi River near Ely	253	10.42	11.18	16.80	1971	5.07	1977	26
05127000	Kawishiwi River near Winton	1,229	12.07	11.40	21.73	1950	2.65	1924	72δ
05127500	Basswood River near Winton	1,740	11.08	10.92	20.63	1950	4.35	1958	64δ
05128000	Namakan River at Outlet of Lac la Croix	5,170	10.43	10.08	19.10	1950	2.53	1924	70
05130500	Sturgeon River near Chisholm Falls	187	8.07	8.91	15.11	1950	4.58	1977	50
05131500	Little Fork River at Littlefork	1,730	7.32	8.28	15.01	1966	2.40	1931	69δ
05132000	Big Fork River at Big Falls	1,460	5.69	6.73	12.67	1950	.86	1931	61δ
05133500	Rainy River at Manitou Rapids	19,400	9.95	8.99	16.28	1950	4.10	1977	64

δ Noncontinuous period.

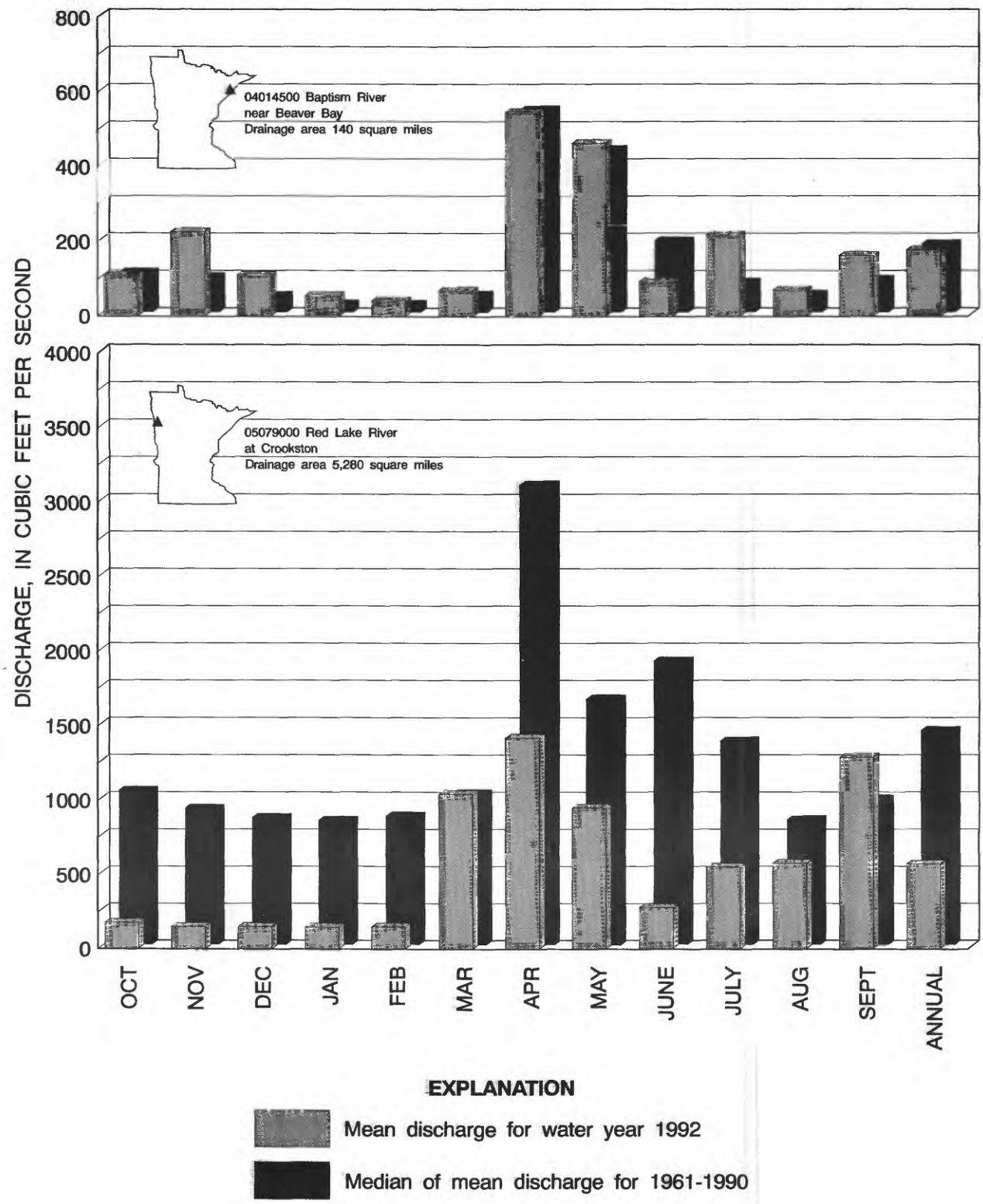
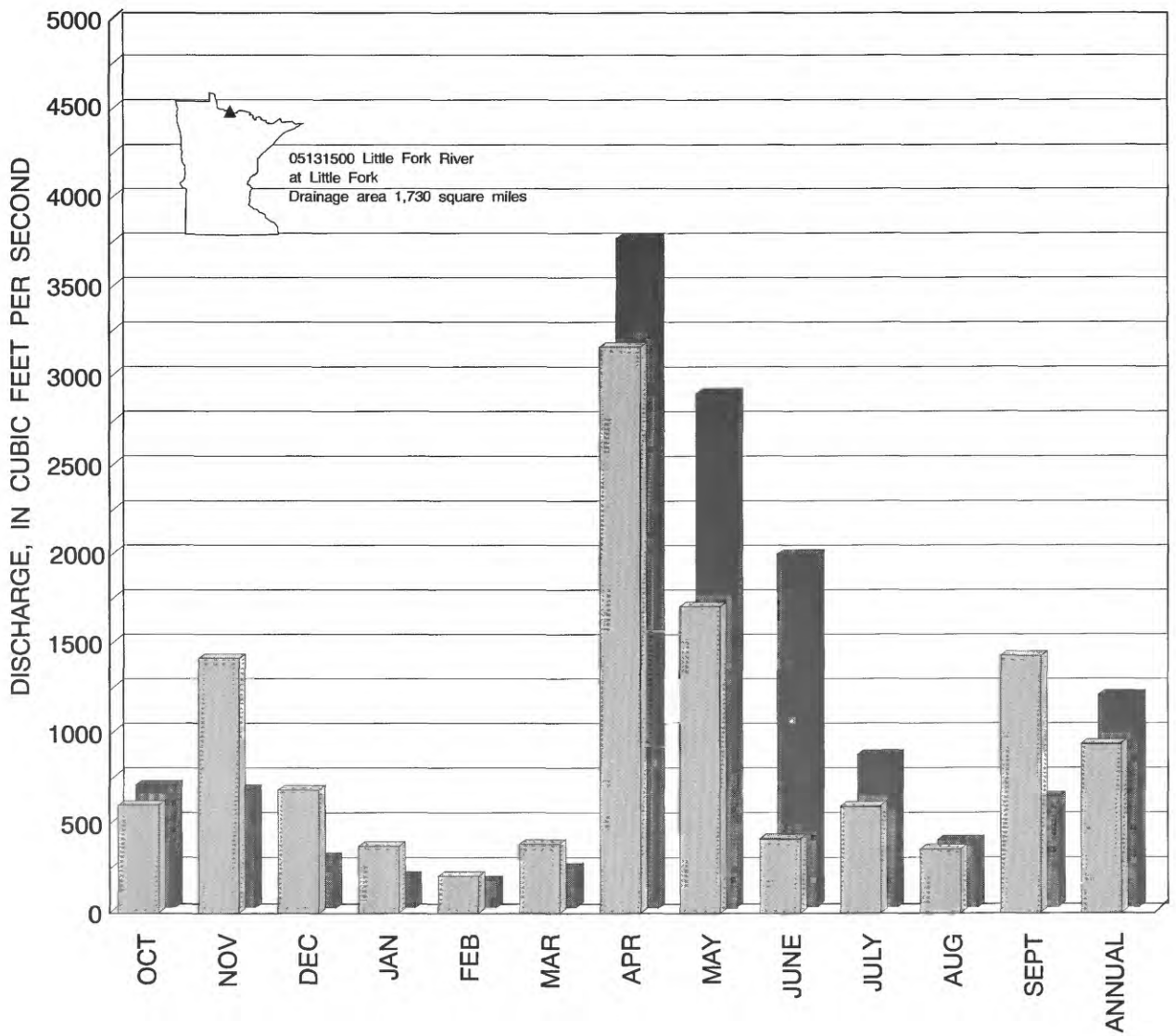


Figure 4.--Comparison of mean discharge for the 1992 water year with median



of mean discharge for 1961-90 at three long-term representative gaging stations.

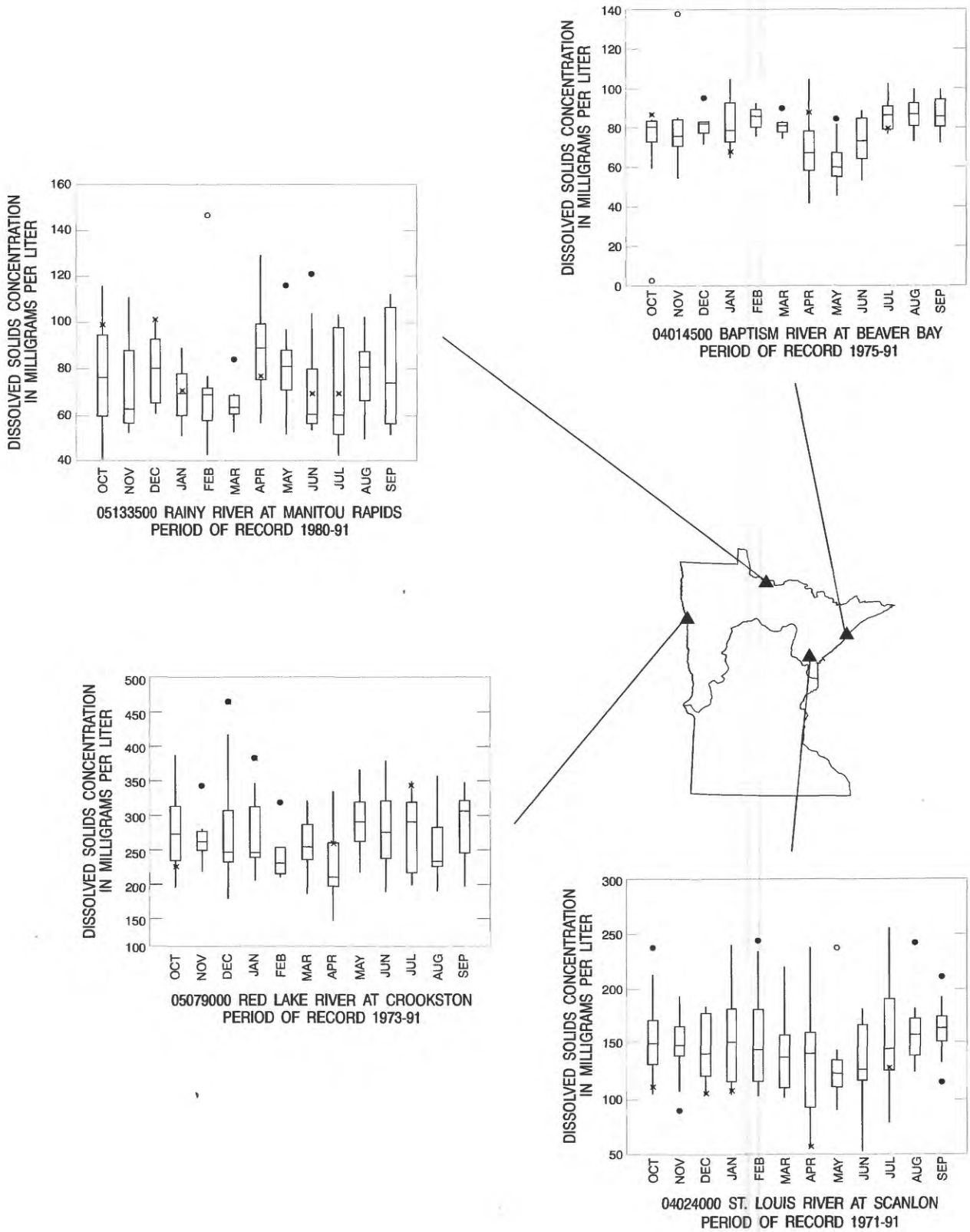


Figure 5--Comparison of dissolved-solids concentrations in samples collected during water year 1992 with median for period of record at four national network stations.

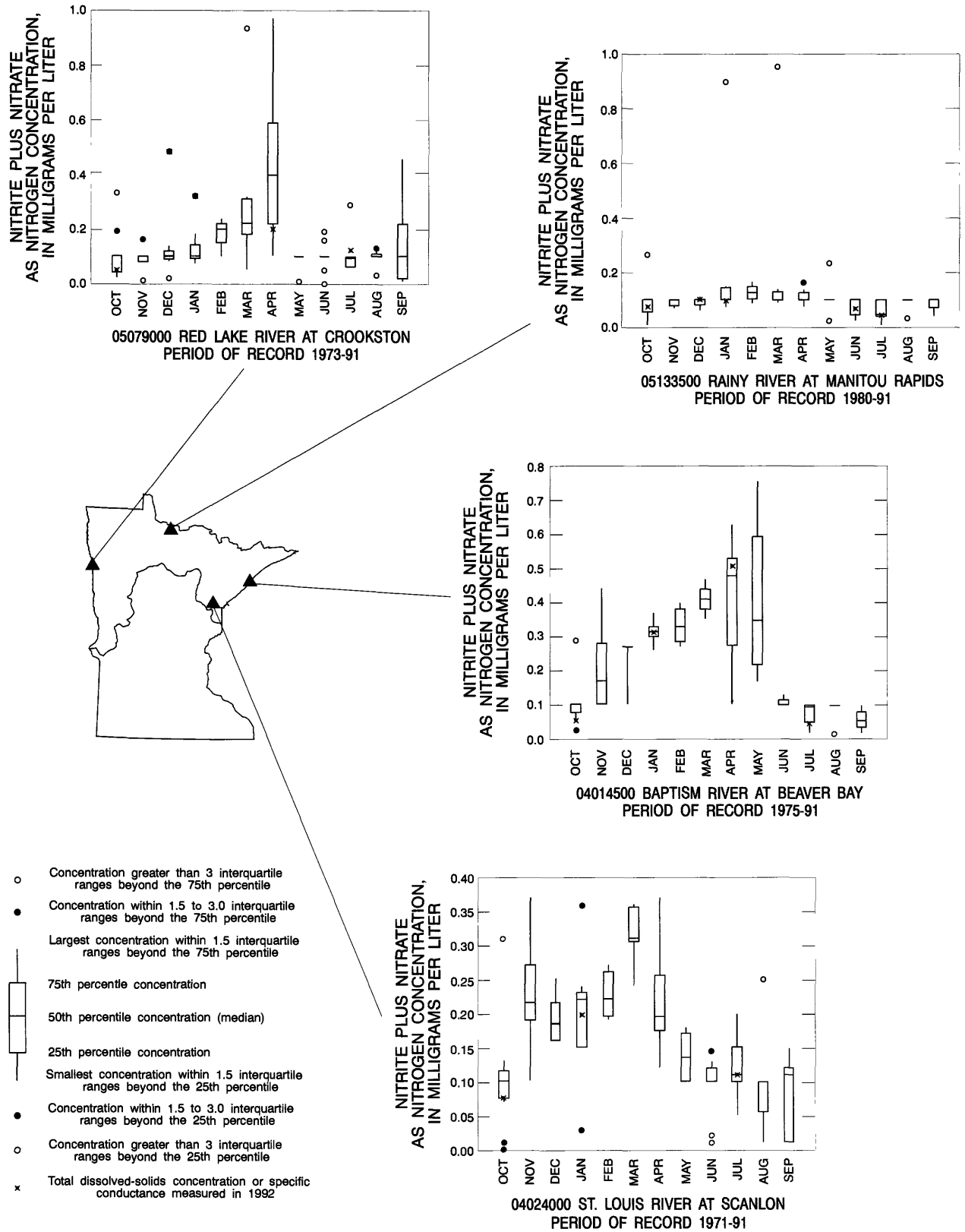


Figure 6--Comparison of nitrite plus nitrate concentrations in samples collected during water year 1992 with median for period of record at four national network stations.

Dissolved-solids concentrations determined in 1992 were generally less than median in the Lake Superior basin, as evidenced by data for Baptism River near Beaver Bay and St. Louis River at Scanlon. Red Lake River at Crookston in the Red River of the North basin generally had lower concentrations of dissolved solids in the fall and higher in the winter and summer. Rainy River at Manitou Rapids had greater concentrations of dissolved solids in all samples except the October sample.

Nitrate concentrations reported as nitrogen (analyzed for nitrate plus nitrite, with nitrite concentration assumed to be negligible) were generally close to the median throughout 1992 for the four NASQAN stations. Samples collected in December and January at Red Lake River at Crookston were exceptions; those samples had nitrate concentrations much higher than the monthly medians.

Sixty five wells were samples in 7 counties. Nitrate concentrations were above the primary drinking-waters standard of 10 mg/L (Minnesota Pollution Control Agency, 1988) in 2 samples, Iron concentrations in twenty five samples were above the iron standard of 300 ug/L, and manganese concentrations in 22 samples were above the manganese standard of 50 ug/L.

GROUND-WATER LEVELS

Data from six wells completed in surficial sand aquifers, five wells completed in buried sand and gravel aquifers, and one well completed in the Biwabik Iron-Formation aquifer are presented in this volume. A phaseout of these wells from the ground-water network began in March, and by the end of August, all of the wells were eliminated from the network. However, county soil and water conservation personnel will make water-level measurements in these wells starting in October 1992.

Surficial Sand Aquifers

Water level declines continued in well 465237096383901 near Moorhead, in northwestern Minnesota. From October through July, record monthly low levels were observed in this well, which has 45 years of record. The average monthly water level decline was 0.4 foot from the previous water year. This well is in an area of large ground water withdrawals for public supply and irrigation. In contrast, well 463854096250701 about 20 miles southeast of Moorhead had monthly water levels which were average during the year (fig. 7). This well has 37 years of record and shows no appreciable long-term water-level declines. Two wells, 455700096314001 and 463956095352601, in the west-central part of the state, had above-average monthly water levels for the year which probably reflects the above-normal rainfall from the previous year. Two wells in northeastern Minnesota, 474253091574101 and 475502091494601, also had above-average monthly water levels, although the precipitation amounts (October-April) were 3.2 inches below normal around these wells (fig. 7).

Buried Sand and Gravel Aquifers

Long-term water level declines continued in two wells in northwestern Minnesota. Record monthly low levels were measured in well 465328096391001 which has 31 years of record, and in December, the lowest level ever measured was recorded. The other well, 465231096415801 with 27 years of record, located 2.5 miles from the first well, had record monthly low levels from October through March. Both wells are in an area of large ground water withdrawals for public supply and irrigation.

Record water-level-highs for March and May were measured in well 455927095575505 in west-central Minnesota. Temperatures for these months were below normal, which may have caused less ground-water use from production wells allowing water levels to recover higher than normal. Water levels were above the monthly average in two wells, 473102092345001 and 473011092524301, in northeastern Minnesota, on the Mesabi Iron Range. These higher-than- normal water levels probably reflect the effect of the wet third and fourth quarters of the previous water year.

Bibwabik Iron-Formation Aquifer

Monthly high water levels were recorded for the entire water year as well as a record all time high in January in well 472638092533601 in northeastern Minnesota with 37 years of record (see hydrograph page). This well is located on the Mesabi Iron Range. Since 1983 a water-level rise of 12 feet,. or 1.3 feet per year has been recorded in this well. The steady rise in water level is due to a combination of above average precipitation and no dewatering of nearby mines. Many abandoned mine sites in this area are now filled with ground water.

SPECIAL NETWORKS AND PROGRAMS

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

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

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

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.

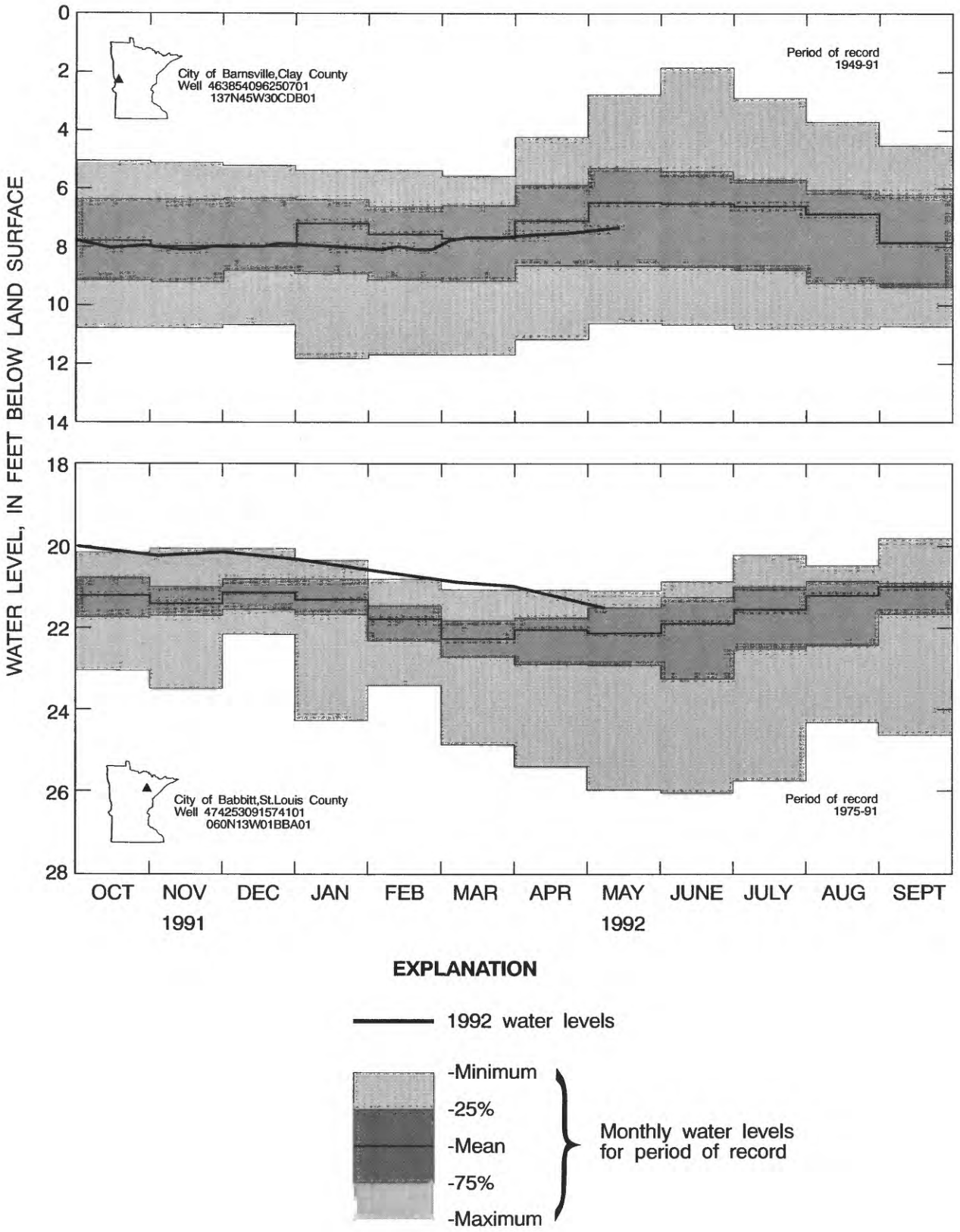


Figure 7.--Comparison of water levels during 1992 to long-term levels in two representative wells in surficial sand aquifers.

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 interst.

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 1991 water year that began October 1, 1990, and ended September 30, 1991. A calendar of the water year is provided on the inside of the front cover. The records contain streamflow data, stage and content data for lakes and reservoirs, water-quality data for the surface and ground water, and ground-water-level data. The locations of the stations and wells where the data were collected are shown in figures 7, 8, 9, and 10. 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 OrderSystem 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 i0 indicated by an indentation in a list of stations in front of the report. Each indention represents one rank. This downstream order and system of indention show which stations are on tributaries between any two stations and the rank of the tributary on which each station is situated.

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

Latitude-Longitude System for Wells and Miscellaneous Sites

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

The well and miscellaneous site numbering system of the U.S. Geological Survey is based on the grid system of latitude and longitude. The system provides the geographic location of the well or miscellaneous site and a unique number for each site. The number consists of 15 digits. The first 6 digits denote the degrees, minutes, and seconds of latitude, the next 7 digits denote degrees, minutes, and seconds of longitude, and the last 2 digits (assigned sequentially) identify the wells or other sites within a 1-second grid. See figure 8. Each well site is also identified by a local well number which consists of township, range, and section numbers, three letters designating 1/4, 1/4, 1/4 section location, and a two-digit sequential number.

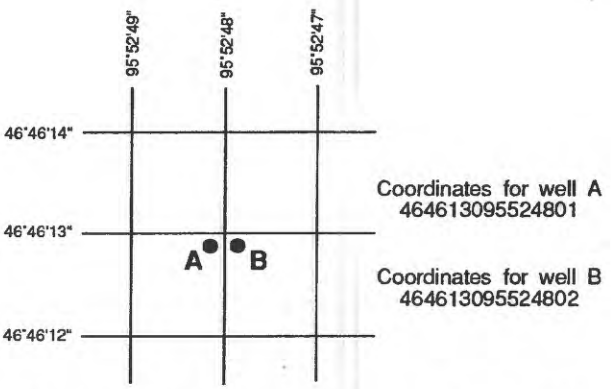


Figure 8. Example of system for numbering wells and miscellaneous sites.

RECORDS OF STAGE AND WATER DISCHARGE

Records of stage and water discharge may be complete or partial. Complete records of discharge are those obtained using a continuous stage-recording device through which either instantaneous or mean daily discharge may be computed for any-time, or any period of time, during the period of record. Complete records of lake or reservoir content, 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 9 and 11.

Data Collection and Computation

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

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

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

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

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

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

For some gaging stations there are periods when no gage-height record is obtained, or the recorded gage height is so faulty that it cannot be used to compute daily discharge or contents. This happens when the recorder stops or otherwise fails to operate properly, intakes are plugged, the float is frozen in the well, or for various other reasons. For such periods, the daily discharges are estimated from the recorded range in stage, previous or following record, discharge measurements, weather records, and comparison with other station records from the same or nearby basins. Likewise, daily contents may be estimated from operator's logs, previous or following record, inflow-outflow studies, and other information. Information explaining how estimated daily-discharge values are identified in station records is included in the next two sections, "Data Presentation" (REMARKS paragraph) and "Identifying Estimated Daily Discharge."

Data Presentation

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 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 quality 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 Geological Survey. Information on records available at specific sites can be obtained upon request.

RECORDS OF SURFACE-WATER QUALITY

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

Classification of Records

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

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

Arrangement of Records

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

Onsite Measurement and Collection

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

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

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

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

For chemical-quality stations equipped with digital monitors, the records consist of daily maximum, minimum, and mean values for each constituent measured and are based upon hourly punches beginning at 0100 hours and ending at 2400 hours for the day of record. More detailed records (hourly values) may be obtained from the U.S.G.S. district office whose address is given on the back of the title page of this report.

Water Temperature

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

At stations where recording instruments are used, either mean temperatures or maximum and minimum temperatures for each day are published. Water temperatures measured at the time of water-discharge measurements are on file in the district office.

Sediment

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

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

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

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

Laboratory Measurements

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

Data Presentation

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

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

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

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

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

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

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

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

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

REVISIONS.--If errors in published water-quality records are discovered after publication, appropriate updates are made to the Water-Quality File in the U.S. Geological Survey's computerized data system, WATSTORE, and subsequently by monthly transfer of update transactions to the U.S. 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 viewed 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 12.

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

Data Collection and Computation

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

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

Water-level records are obtained from direct measurements with a steel tape or from the graph or punched tape of a water-stage recorder. The water-level measurements in this report are given in feet with reference to land-surface datum (lsd). Land-surface datum is a datum plane that is approximately at land surface at each well. If known, the elevation of the land-surface datum is given in the well description. The height of the measuring point (MP) above or below land-surface datum is given in each well description. Water levels in wells equipped with recording gages are reported for every fifth day and the end of each month (eom).

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-Survey) observers.

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

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

A table of water levels follows the station description for each well. Water levels are reported in feet below land-surface datum and all taped measurements of water level are listed. For wells equipped with recorders, abbreviated tables are published; generally, only water-level lows are listed for every fifth day and at the end of the month (eom). The highest and lowest water levels of the water year and their dates of occurrence are shown on a line below the abbreviated table. Because all values are not published for wells with recorders, the extremes may be values that are not listed in the table. Missing records are indicated by dashes in place of the water level. 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-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

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

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

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

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

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

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

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

Bottom material: See Bed Material.

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

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

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

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

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

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

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

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

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

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

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

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

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 aspecific 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.

3-A10. Discharge ratings at gaging stations, by E.J. Kennedy: USGS--TWRI Book 3, Chapter A10. 1984. 59 pages.

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

3-A12. Fluorometric procedures for dye tracing, by J.F. Wilson, Jr., E.D. Cobb, and F.A. Kilpatrick: USGS--TWRI Book 3, Chapter A12. 1986. 41 pages.

3-A13. Computation of continuous records of streamflow, by E.J. Kennedy: USGS--TWRI Book 3, Chapter A13. 1983. 53 pages.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS

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

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

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

3-A17. Acoustic velocity meter systems, by Anonius Laenen: USGS--TWRI Book 3, Chapter A17. 1985. 38 pages.

3-A18. Determination of stream reaeration coefficients by use of tracers, by F.A. Kilpatrick, R.E. Rathbum, N. Yotsukura, G.W. Parker, and L.L. DeLong: USGS--TWRI Book 3, Chapter A18. 1989. 52 pages.

3-A19. Levels of streamflow gaging stations, by E.J. Kennedy: USGS--TWRI Book 3, Chapter A19. 1990. 27 pages.

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

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

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

3-B4. Regression modeling of ground-water flow, by Richard L. Cooley and Richard L. Naff: USGS--TWRI Book 3, Chapter B4. 1990. 232 pages.

3-B5. Definition of boundary and initial conditions in the analysis of saturated ground-water flow systems--An introduction, by O.L. Franke, T.E. Reilly, and G.D. Bennett: USGS--TWRI Book 3, Chapter B5. 1987. 15 pages.

3-B6. The principle of superposition and its application in ground-water hydraulics, by T.E. Reilly, O.L. Franke, and G.D. Bennett: USGS--TWRI Book 3, Chapter B6. 1987. 28 pages.

3-B7. Analytical solutions for one-, two-, and three-dimensional solute transport in ground-water systems with uniform flow, by Eliezer J. Wexler: USGS--TWRI Book 3, Chapter B7. 1992. 90 pages.

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

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

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

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

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

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

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

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

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

5-A1. Methods for determination of inorganic substances in water and fluvial sediments, by M.J. Fishman and L.C. Friedman: USGS--TWRI Book 5, Chapter A1. 1989. 545 pages.

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

5-A3. Methods for the determination of organic substances in water and fluvial sediments, edited by R.L. Wershaw, M.J. Fishman, R.R. Grabbe, and L.E. Lowe: USGS--TWRI Book 5, Chapter A3. 1987. 80 pages.

5-A4. Methods for collection and analysis of aquatic biological and microbiological samples, by L.J. Britton and P.E. Greeson, editors: USGS--TWRI Book 5, Chapter A4. 1989. 363 pages.

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS

5-A5. Methods for determination of radioactive substances in water and fluvial sediments, by L.L. Thatcher, V.J. Janzer, and K.W. Edwards: USGS--TWRI Book 5, Chapter A5. 1977. 95 pages.

5-A6. Quality assurance practices for the chemical and biological analyses of water and fluvial sediments, by L.C. Friedman and D.E. Erdmann: USGS--TWRI Book 5, Chapter A6. 1982. 181 pages.

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

6-A1. A modular three-dimensional finite-difference ground-water flow model, by M.G. McDonald and A.W. Harbaugh: USGS--TWRI Book 6, Chapter A1. 1988. 586 pages.

6-A2. Documentation of a computer program to simulate aquifer-system compaction using the modular finite-difference ground-water flow model, by S.A. Leake and D.E. Prudic: USGS--TWRI Book 6, Chapter A2. 1991. 68 pages.

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

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

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

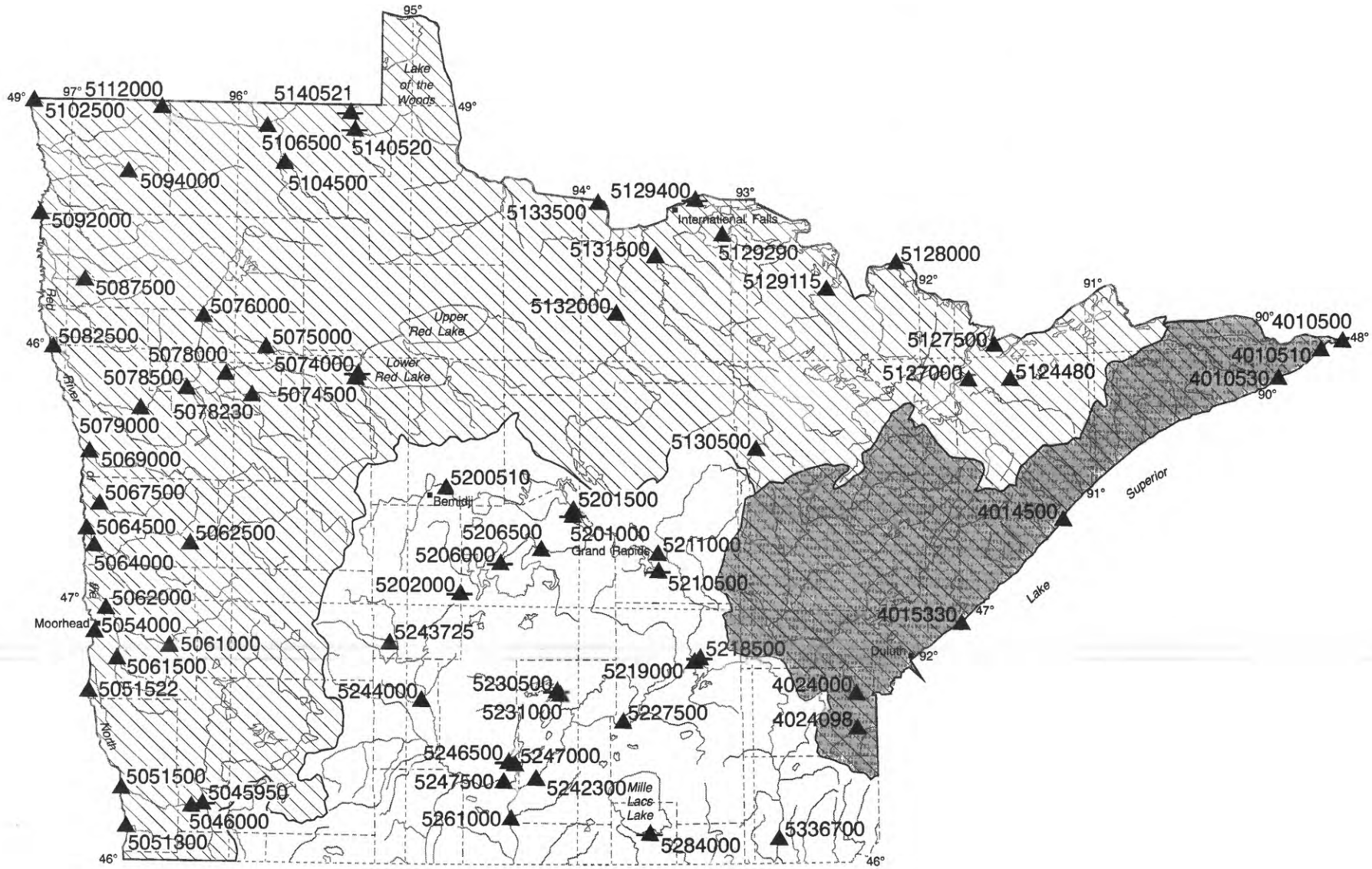
8-A1. Methods of measuring water levels in deep wells, by M.S. Garber and F.C. Koopman: USGS--TWRI Book 8, Chapter A1. 1968. 23 pages.

8-A2. Installation and service manual for U.S. Geological Survey manometers, by J.D. Craig: USGS--TWRI Book 8, Chapter A2. 1983. 57 pages.

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

Surface-Water Station Records

Big Fork River at Big Falls - Cableway
June 10, 1976


95°
Lake of the Woods
49°
97°
96°
49°
5112000
5102500
5140521
5106500
5140520
5104500
5094000
5092000
94°
5129400
93°
International Falls
5133500
5131500
5129290
5128000
5129115
92°
91°
5087500
5076000
5132000
Upper Red Lake
90°
4010500
48°
46°
5082500
5075000
5078000
5074000
Lower Red Lake
5127500
4010510
4010530
5127000
5124480
90°
5078500
5074500
5078230
5079000
5130500
5069000
5200510
Bemidji
5067500
5201500
91°
Superior
4014500
5064500
5062500
5206500
5201000
Grand Rapids
5211000
5206000
5064000
5202000
5210500
47°
5062000
47°
4015330
Lake
Moorhead
5054000
5243725
5061000
5218500
Duluth
92°
5061500
5219000
4024000
5051522
5244000
5230500
5231000
5227500
4024098
5246500
5247000
5051500
5247500
5242300
Mille Lacs Lake
5045950
5261000
5336700
5046000
5051300
5284000
46°
46°

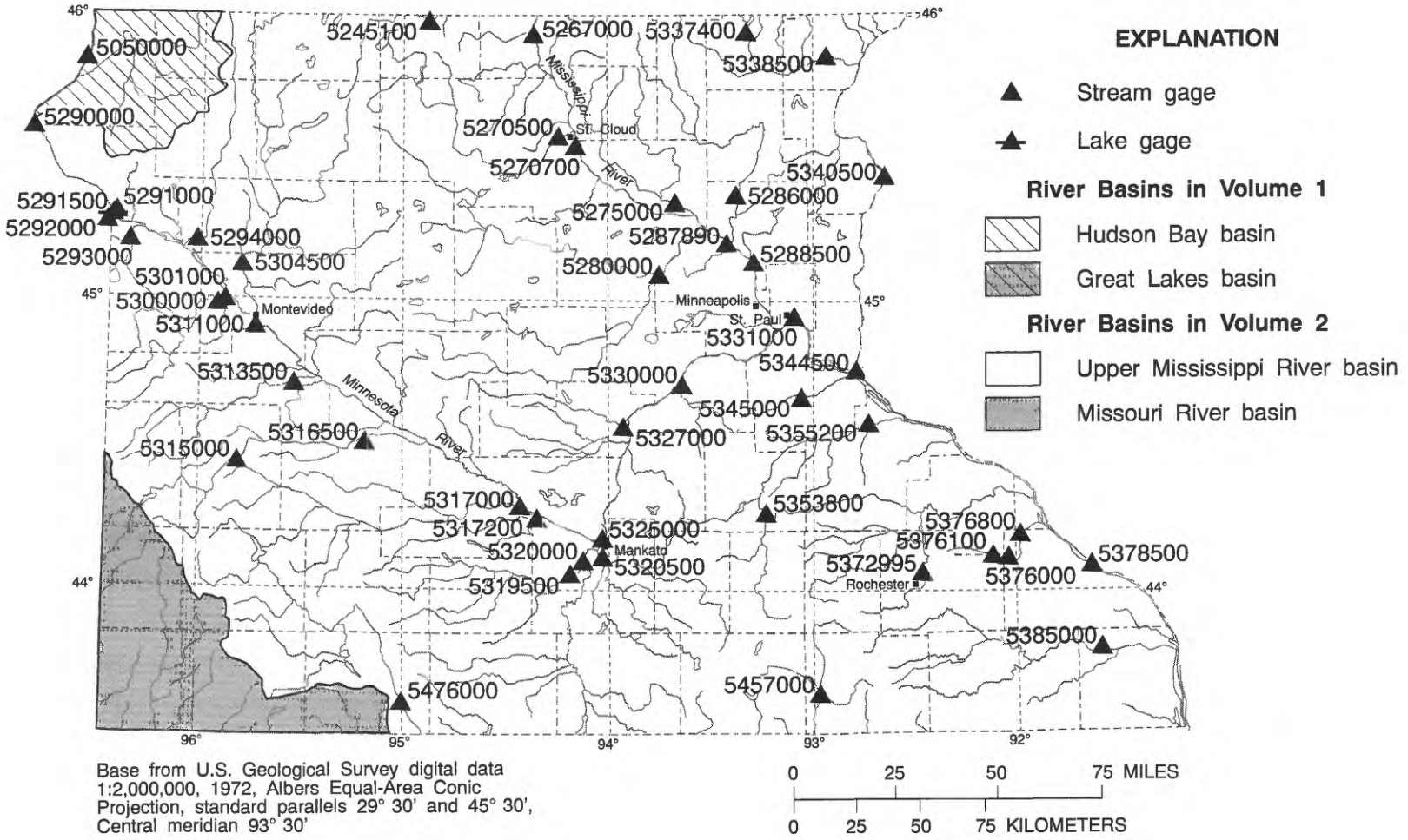
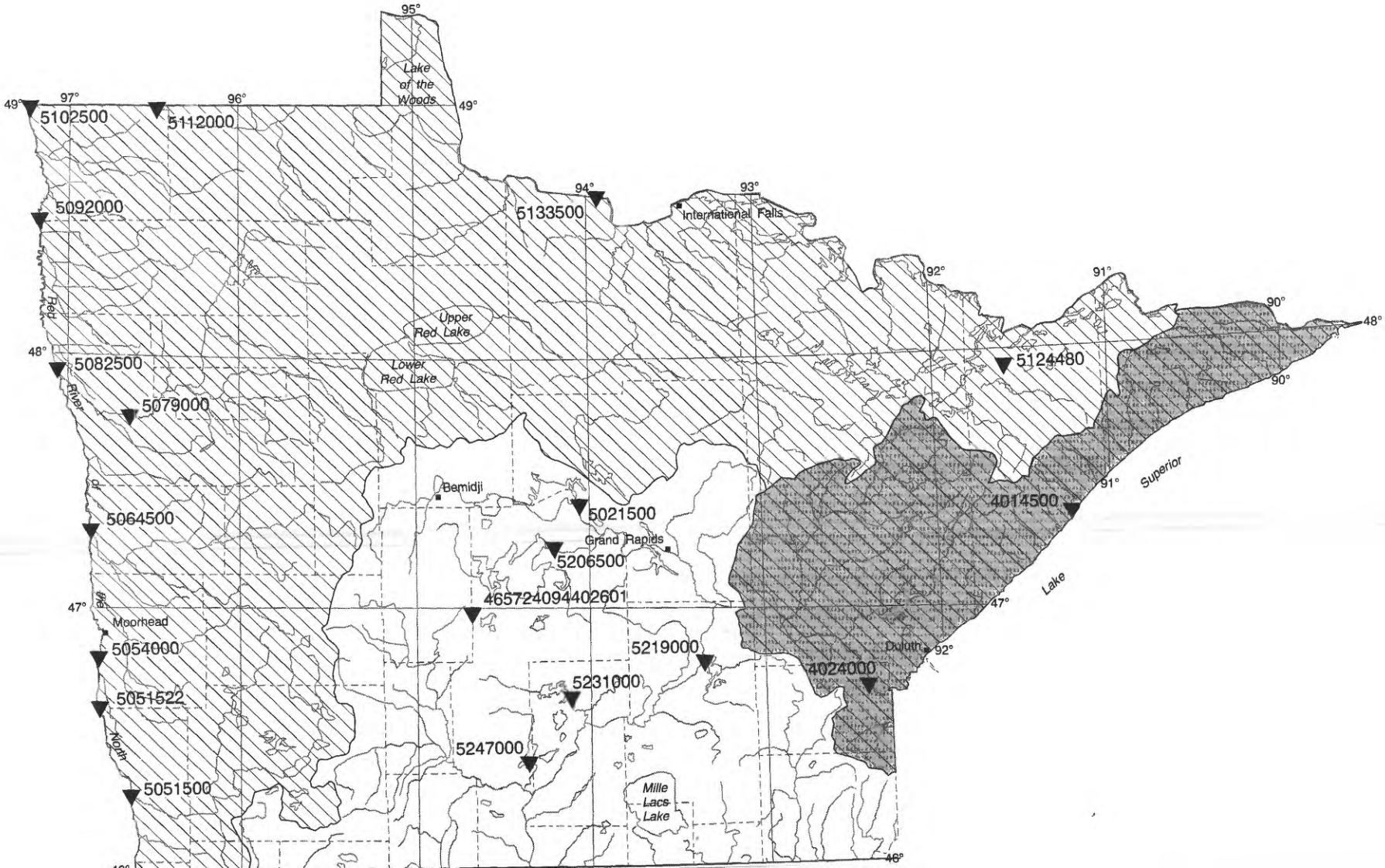


Figure 9.--Location of lake and stream-gaging stations.


95°
Lake of the Woods
49°
97°
96°
5102500
5112000
5092000
94°
93°
5133500
International Falls
92°
91°
90°
48°
Red River
Upper Red Lake
Lower Red Lake
5082500
5124480
5079000
Bemidji
5021500
4014500
Superior
Lake
5064500
Grand Rapids
5206500
465724094402601
47°
Moorhead
5054000
5219000
Duluth
4024000
5231000
5051522
5247000
North
5051500
Mille Lacs Lake
46°

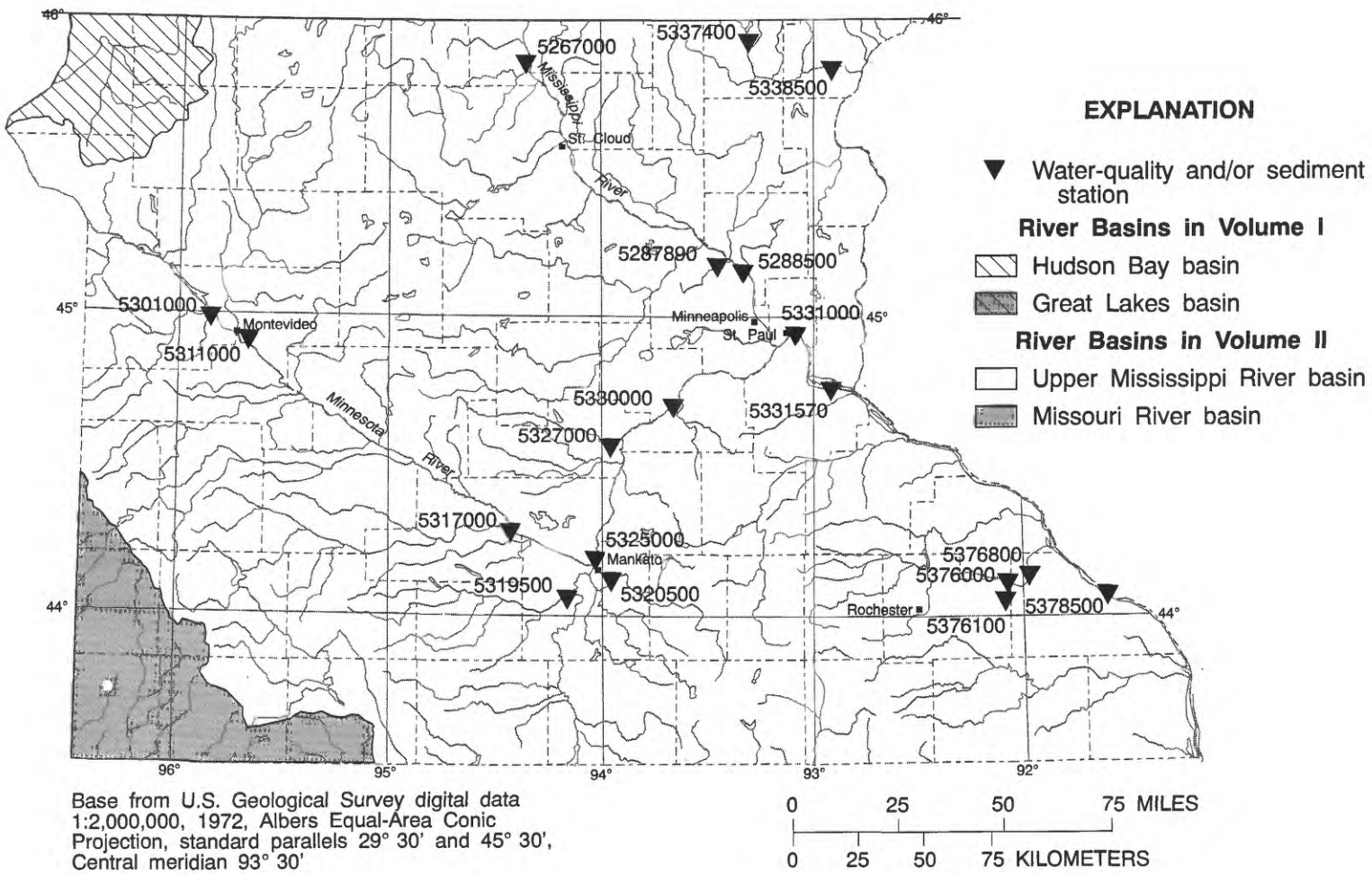


Figure 10.--Location of surface-water quality stations.

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

LOCATION.--Lat 48°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)	Date	Time	Discharge (ft³/s)	Gage height (ft)
May 3	1730	4,200	9.20	May 12	0130	*4,260	*9.53

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	59	e430	e315	e200	e170	e140	e130	2750	1230	503	233	202
2	60	e440	e300	e200	e165	e140	e130	3610	1170	670	225	571
3	58	e425	e290	e200	e165	e140	e130	4140	1110	1040	225	778
4	55	e410	e280	e200	e165	e140	e140	3970	1060	924	219	632
5	69	e395	e270	e200	e160	e140	e145	3480	1010	792	203	506
6	109	e380	e265	e200	e160	e150	e155	3110	968	686	189	500
7	112	e365	e260	e200	e160	e160	e170	3030	949	590	284	451
8	108	e350	e255	e200	e155	e170	e200	3320	915	543	669	518
9	97	e335	e250	e195	e155	e170	e230	3460	860	553	452	516
10	87	321	e245	e195	e155	e165	e250	3240	805	572	385	596
11	78	343	e240	e195	e150	e165	e235	3040	760	588	345	564
12	72	322	e235	e195	e150	e160	e220	4120	716	547	320	486
13	68	281	e230	e195	e150	e160	e210	4040	681	499	286	422
14	81	307	e225	e195	e150	e155	e205	3570	640	460	257	377
15	79	271	e220	e190	e150	e155	e200	3100	589	429	236	346
16	76	372	e216	e190	e145	e150	e220	2750	548	422	219	342
17	76	320	e213	e190	e145	e150	e300	2610	572	440	212	610
18	74	650	e210	e185	e145	e145	e500	2480	611	422	204	828
19	69	1070	e207	e185	e145	e145	e700	2300	618	403	193	680
20	66	1020	e204	e185	e140	e140	e1000	2120	572	434	185	576
21	87	815	e202	e180	e140	e140	e1500	1970	514	434	177	498
22	94	e650	e200	e180	e140	e135	e1400	1980	475	395	174	451
23	87	e550	e198	e180	e140	e135	e1300	2230	456	363	169	407
24	179	e490	e196	e175	e140	e135	e1200	2160	441	337	165	366
25	187	e440	e194	e175	e140	e135	e1200	1980	426	320	181	334
26	171	e420	e192	e175	e140	e135	e1200	1820	414	305	199	309
27	162	e390	e190	e170	e140	e135	e1300	1690	420	296	198	302
28	164	e365	e188	e170	e140	e135	1670	1580	444	298	184	306
29	342	e345	e188	e170	e140	e135	2260	1470	496	275	174	297
30	402	e325	e186	e170	---	e135	2650	1380	478	262	193	285
31	339	---	e186	e170	---	e135	---	1300	---	246	202	---
TOTAL	3767	13597	7050	5810	4340	4530	21150	83800	20948	15048	7557	14056
MEAN	122	453	227	187	150	146	705	2703	698	485	244	469
MAX	402	1070	315	200	170	170	2650	4140	1230	1040	669	828
MIN	55	271	186	170	140	135	130	1300	414	246	165	202
AC-FT	7470	26970	13980	11520	8610	8990	41950	166200	41550	29850	14990	27880
CFSM	.20	.76	.38	.31	.25	.24	1.17	4.51	1.16	.81	.41	.78
IN.	.23	.84	.44	.36	.27	.28	1.31	5.20	1.30	.93	.47	.87

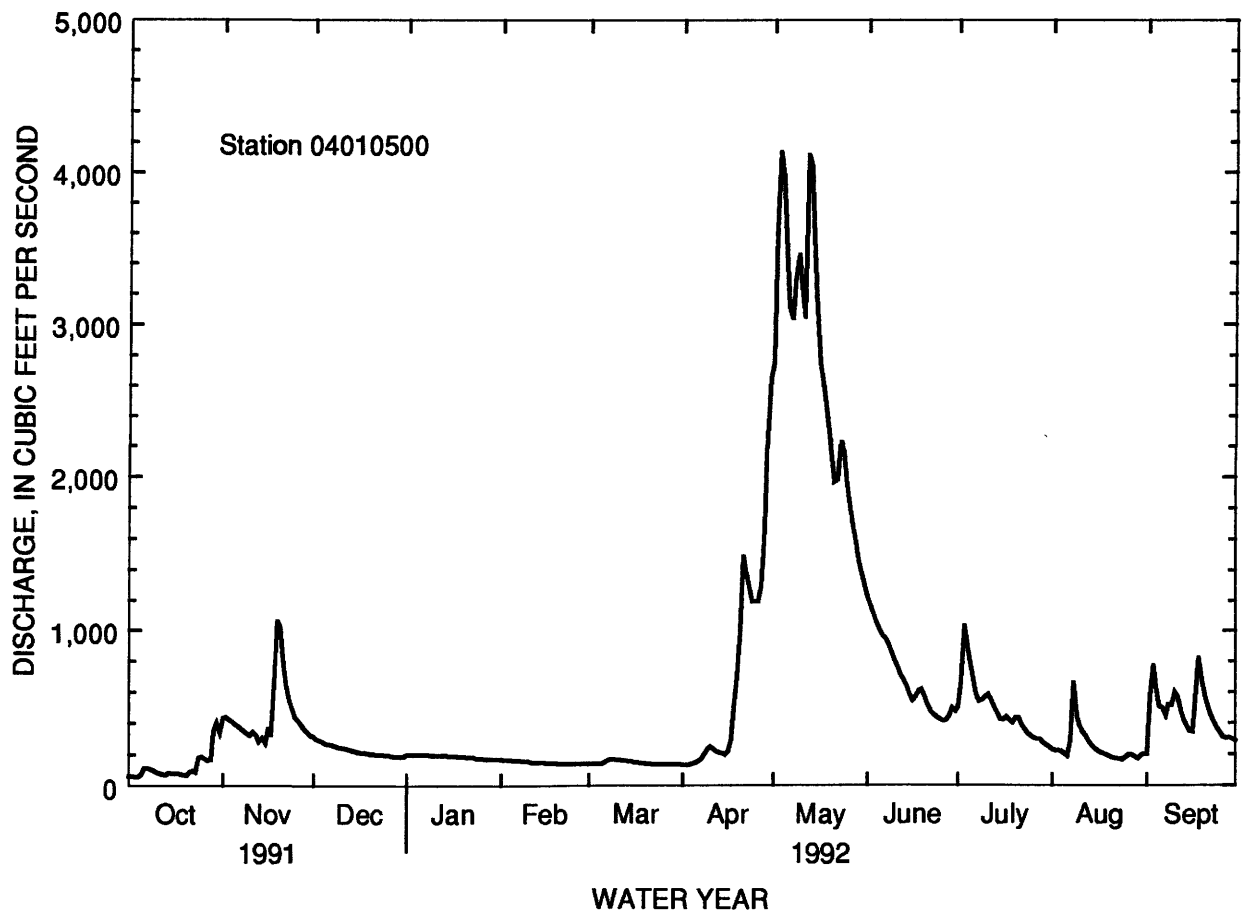
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1921 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	366	354	205	149	124	174	1205	1625	862	403	237	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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1921 - 1992	
ANNUAL TOTAL	161399		201653			
ANNUAL MEAN	442		551		504	
HIGHEST ANNUAL MEAN					840	1971
LOWEST ANNUAL MEAN					158	1958
HIGHEST DAILY MEAN	3710	Apr 30	4140	May 3	10700	May 5 1934
LOWEST DAILY MEAN	20	Sep 7	55	Oct 4	1.0	Jan 15 1977
ANNUAL SEVEN-DAY MINIMUM	24	Sep 5	74	Oct 14	1.0	Jan 15 1977
INSTANTANEOUS PEAK FLOW			4260	May 12	11000	May 5 1934
INSTANTANEOUS PEAK STAGE			9.53	May 12	7.60a	May 5 1934
INSTANTANEOUS LOW FLOW			55	Oct 4, 5		
ANNUAL RUNOFF (AC-FT)	320100		400000		365000	
ANNUAL RUNOFF (CFSM)	.74		.92		.84	
ANNUAL RUNOFF (INCHES)	10.01		12.50		11.41	
10 PERCENT EXCEEDS	1280		1300		1300	
50 PERCENT EXCEEDS	186		252		220	
90 PERCENT EXCEEDS	52		138		84	

a Site and datum then in use.

e Estimated.



STREAMS TRIBUTARY TO LAKE SUPERIOR

04010510 GRAND PORTAGE RIVER AT GRAND PORTAGE, MN

LOCATION.--Lat 47°57'49", long 89°41'00", in SW¼SE¼ sec.4, T.63 N., R.6 E., Cook County, Hydrologic Unit 04010101, on Grand Portage Indian Reservation, on left bank at upstream side of bridge, 600 ft upstream of mouth, at city of Grand Portage.

PERIOD OF RECORD.--May 1991 to September 1992 (discontinued).

GAGE.--Nonrecording gage. Elevation of gage is 615 ft above mean sea level, from topographic map.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

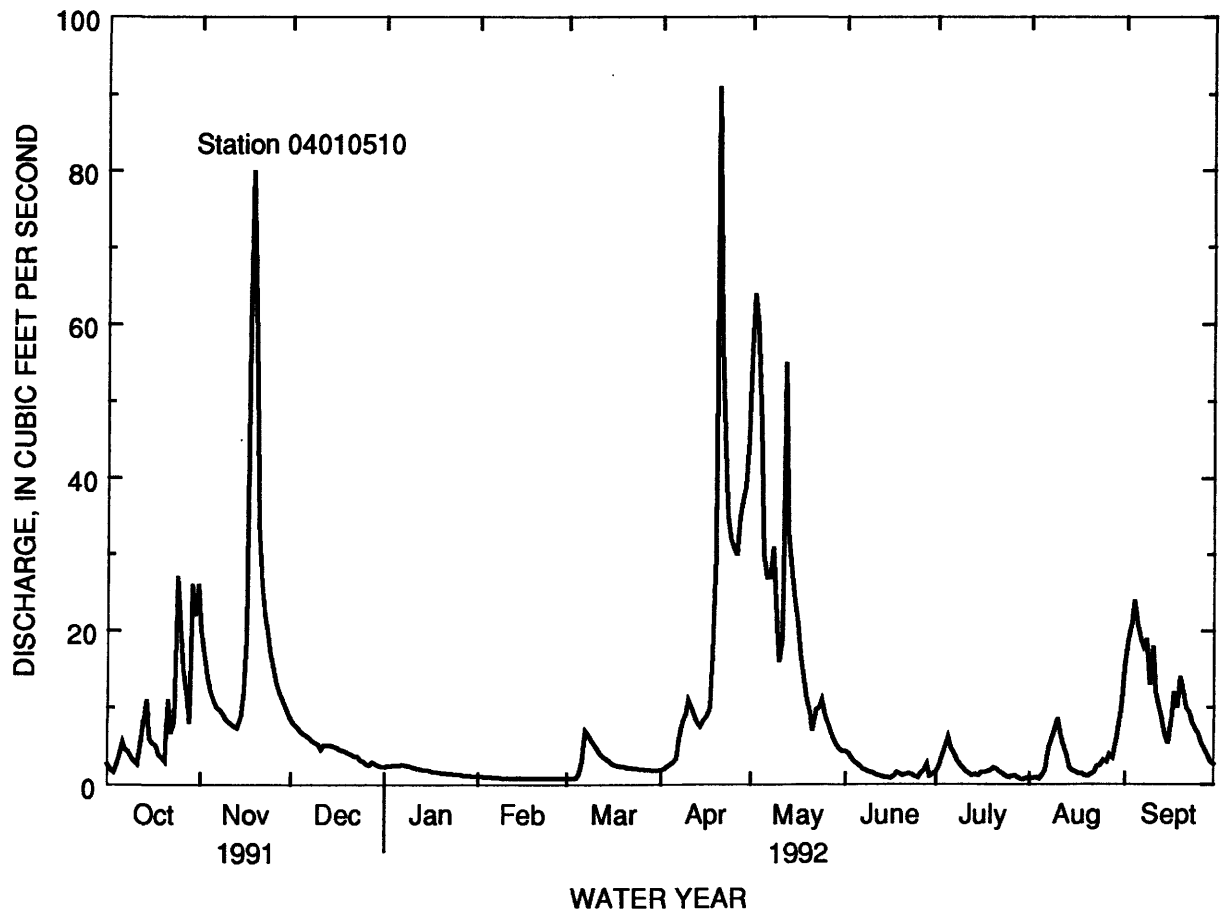
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.7	e20	e8.4	e2.3	e1.1	e.80	e1.9	55	4.3	1.7	.75	16
2	2.0	e17	e7.8	e2.4	e1.1	e.80	e2.0	e64	4.1	2.5	.85	19
3	1.7	e14	e7.4	e2.4	e1.0	e.80	e2.3	e60	3.5	3.7	.95	21
4	2.5	e12	e7.0	e2.5	e1.0	e.80	e2.6	47	3.0	4.8	.75	24
5	3.9	e11	e6.6	e2.5	e.98	e1.3	e2.9	e30	2.7	6.2	1.2	21
6	5.6	e10	e6.3	e2.5	e.94	e3.0	e3.4	27	2.3	4.8	1.8	19
7	4.6	e9.7	e6.0	e2.6	e.92	e7.0	e6.0	27	2.0	4.1	4.6	18
8	4.3	e9.2	e5.7	e2.5	e.90	e6.6	e8.0	31	1.8	3.2	5.9	19
9	3.5	e8.6	e5.4	e2.4	e.88	e5.8	e9.2	22	1.7	2.5	7.0	13
10	3.0	e8.2	e5.2	e2.3	e.86	e5.2	e11	16	1.6	2.2	8.6	18
11	2.7	e7.8	4.6	e2.2	e.84	e4.6	e10	19	1.3	1.7	6.4	12
12	5.3	e7.5	5.1	e2.1	e.84	e4.0	e8.8	55	1.2	1.4	5.1	10
13	8.6	7.3	5.1	e2.0	e.82	e3.6	e8.0	33	1.1	1.2	3.9	8.3
14	11	8.6	e5.1	e1.9	e.82	e3.3	7.6	28	.95	1.3	2.2	6.7
15	5.9	12	e4.9	e1.9	e.80	e3.0	8.3	24	.95	1.2	1.8	5.3
16	5.3	19	e4.8	e1.8	e.80	e2.7	e9.0	21	.85	1.6	1.7	8.3
17	5.1	59	e4.6	e1.7	e.80	e2.5	10	17	1.1	1.6	1.4	12
18	3.9	80	e4.4	e1.7	e.80	e2.4	e17	14	1.6	1.7	1.4	10
19	3.5	58	e4.3	e1.6	e.80	e2.3	e30	11	1.4	1.8	1.2	14
20	3.0	34	4.1	e1.5	e.80	e2.3	91	9.3	1.2	2.2	1.1	12
21	11	e26	3.9	e1.5	e.80	e2.2	e60	7.0	1.3	2.0	1.3	10
22	6.7	e22	3.7	e1.4	e.80	e2.2	e46	9.7	1.4	1.7	1.6	9.3
23	8.0	e20	3.7	e1.4	e.80	e2.1	e35	10	1.3	1.4	2.3	8.0
24	27	e17	3.2	e1.3	e.80	e2.1	32	11	1.1	1.1	2.5	7.3
25	22	e15	3.0	e1.3	e.80	e2.0	e31	9.0	.95	.95	3.2	6.7
26	15	e13	2.7	e1.3	e.80	e2.0	e30	8.0	1.4	1.1	2.9	5.3
27	12	e12	2.5	e1.2	e.80	e1.9	35	7.0	1.8	1.2	3.9	4.6
28	8.0	e11	2.9	e1.2	e.80	e1.9	37	5.9	2.7	.95	3.5	3.9
29	26	e10	2.7	e1.2	e.80	e1.8	e39	5.1	1.1	.66	5.6	3.0
30	22	e9.2	2.5	e1.1	---	e1.8	e45	4.6	1.3	.66	8.3	2.7
31	26	---	2.3	e1.1	---	e1.8	---	4.3	---	.85	11	---
TOTAL	271.8	568.1	145.9	56.8	25.00	84.60	639.0	691.9	53.00	63.97	104.70	347.4
MEAN	8.77	18.9	4.71	1.83	.86	2.73	21.3	22.3	1.77	2.06	3.38	11.6
MAX	27	80	8.4	2.6	1.1	7.0	91	64	4.3	6.2	11	24
MIN	1.7	7.3	2.3	1.1	.80	.80	1.9	4.3	.85	.66	.75	2.7
AC-FT	539	1130	289	113	50	168	1270	1370	105	127	208	689

e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1991 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	8.77	18.9	4.71	1.83	.86	2.73	21.3	22.3	3.16	3.32	1.78	6.84
MAX	8.77	18.9	4.71	1.83	.86	2.73	21.3	22.3	4.56	4.58	3.38	11.6
(WY)	1992	1992	1992	1992	1992	1992	1992	1992	1991	1991	1992	1992
MIN	8.77	18.9	4.71	1.83	.86	2.73	21.3	22.3	1.77	2.06	.18	2.10
(WY)	1992	1992	1992	1992	1992	1992	1992	1992	1992	1992	1991	1991

SUMMARY STATISTICS	FOR 1992 WATER YEAR		WATER YEARS 1991 - 1992	
ANNUAL TOTAL	3052.17			
ANNUAL MEAN	8.34		8.34	
HIGHEST ANNUAL MEAN			8.34	1992
LOWEST ANNUAL MEAN			8.34	1992
HIGHEST DAILY MEAN	91	Apr 20	91	Apr 20 1992
LOWEST DAILY MEAN	.66	Jul 29, 30	.10	Aug 12 1991
ANNUAL SEVEN-DAY MINIMUM	.78	Jul 29	.10	Aug 9 1991
INSTANTANEOUS PEAK FLOW	118	Nov 18	118	Nov 18 1991
INSTANTANEOUS PEAK STAGE	2.26	Nov 18	2.26	Nov 18 1991
ANNUAL RUNOFF (AC-FT)	6050		6040	
10 PERCENT EXCEEDS	22		19	
50 PERCENT EXCEEDS	3.5		2.7	
90 PERCENT EXCEEDS	.95		58	



STREAMS TRIBUTARY TO LAKE SUPERIOR

04010530 RESERVATION RIVER NEAR HOVLAND, MN

LOCATION.--Lat 46°52'38", long 89°51'45", in SE¼SW¼ sec.6, T.62 N., R.5. E., Cook County, Hydrologic Unit 04010101 on the Grand Portage Indian Reservation, on left bank at downstream side of bridge on U.S. Highway 61, 1,200 ft upstream from mouth and 5.5 miles northeast of Hovland.

PERIOD OF RECORD.--April 1991to September 1992 (discontinued).

GAGE.--Water stage recorder. Elevation of gage is 660 ft above mean sea level, from topographic map. Prior to May 14, 1991, nonrecording gage at same site and datum.

REMARKS.--Records fair.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

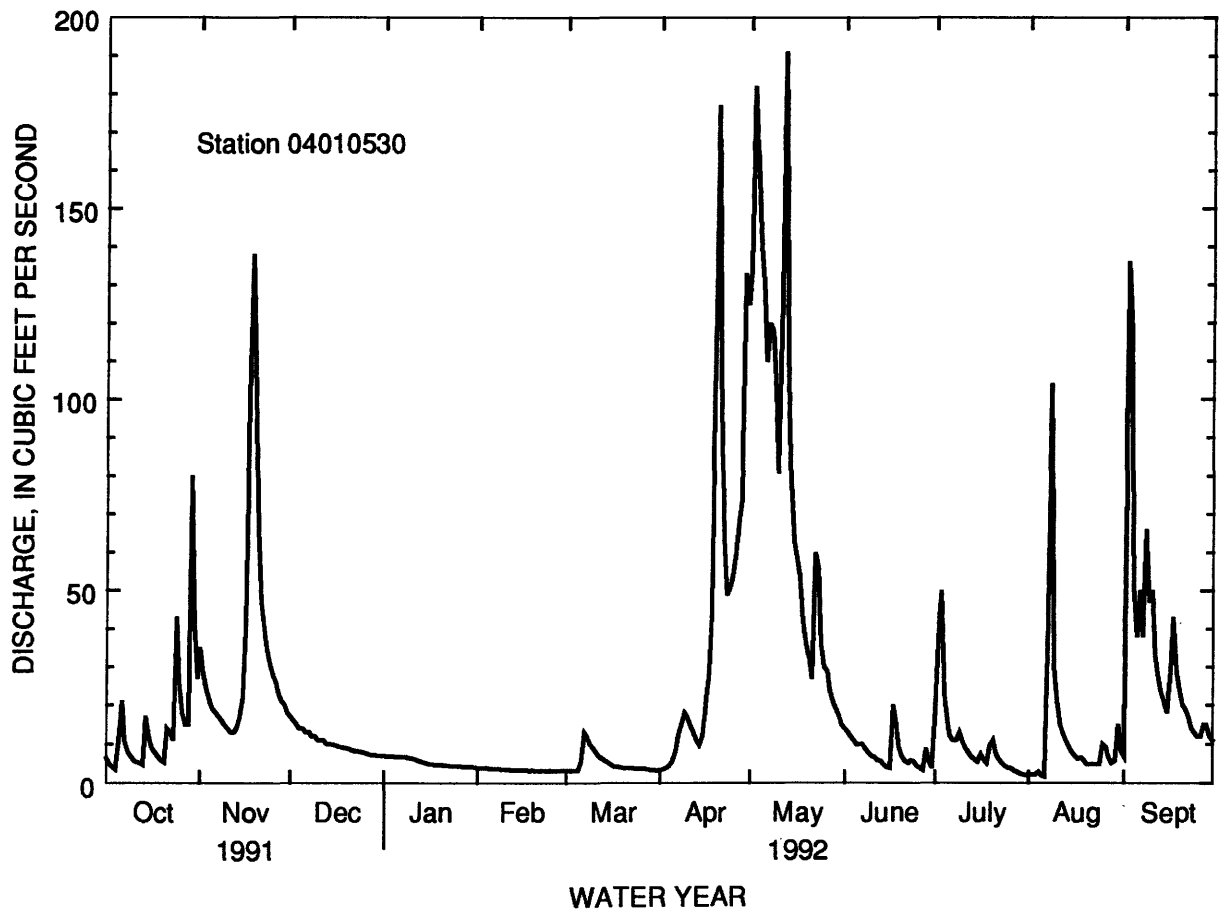
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.3	e35	e17	e7.0	e3.9	e3.2	e3.3	134	14	19	2.3	6.9
2	4.8	e28	e16	e6.8	e3.9	e3.2	e3.5	182	13	41	2.2	136
3	4.0	e24	e15	e6.8	e3.8	e3.2	3.9	162	12	50	2.1	118
4	3.5	e21	e14	e6.8	e3.8	e3.2	e4.3	140	11	23	2.8	51
5	11	e19	e14	e6.7	e3.7	e3.2	e5.6	131	9.9	16	2.0	38
6	21	e18	e13	e6.7	e3.6	e5.5	e8.0	110	10	12	1.6	50
7	11	e17	e13	6.7	e3.6	e13	12	120	10	11	43	38
8	8.2	e16	e12	e6.6	e3.6	e12	e15	118	8.6	11	104	66
9	6.8	e15	e12	e6.5	e3.5	e10	e18	102	7.7	13	30	47
10	5.8	e14	e11	e6.4	e3.5	e9.0	e17	81	6.9	11	21	50
11	5.3	e13	e11	e6.2	e3.5	e7.6	e15	127	6.6	9.0	15	33
12	5.2	e13	e11	e5.9	e3.4	e6.8	e13	191	5.8	7.9	13	27
13	4.7	e14	e10	e5.6	e3.4	e6.2	e11	112	5.7	6.9	11	23
14	17	e17	e10	e5.3	e3.3	e5.6	9.8	78	4.6	6.1	9.4	21
15	12	e22	e9.8	e5.1	e3.3	e5.1	12	63	4.0	5.5	8.0	18
16	8.9	e40	e9.6	e4.9	e3.3	e4.6	e20	58	3.9	7.4	7.0	29
17	7.9	e100	e9.4	e4.8	e3.3	4.2	29	54	20	6.1	6.2	43
18	6.9	138	e9.2	e4.7	e3.1	e4.1	44	42	15	5.2	6.5	29
19	5.8	102	e9.0	e4.6	3.3	e4.0	112	36	9.2	9.7	5.8	24
20	5.4	e66	e8.8	e4.6	e3.2	3.9	177	32	6.9	11	4.8	20
21	14	e47	e8.5	e4.5	e3.2	e3.9	107	27	5.7	7.4	4.8	19
22	13	e40	e8.2	e4.5	e3.2	e3.8	64	60	5.2	6.1	4.8	17
23	11	e35	e8.2	e4.4	e3.2	e3.8	49	56	5.8	5.1	4.8	14
24	43	e31	e8.0	e4.4	e3.2	3.7	51	36	5.5	4.4	4.8	13
25	26	e28	e7.8	e4.3	e3.2	e3.7	54	30	4.3	3.8	10	12
26	18	e26	e7.6	e4.3	e3.2	e3.6	60	29	4.0	3.9	9.2	12
27	15	e23	e7.4	e4.2	e3.2	3.6	69	24	3.4	3.1	6.6	15
28	15	e21	e7.2	e4.2	e3.2	e3.5	74	21	8.9	2.8	5.1	15
29	80	e20	e7.2	e4.1	e3.2	e3.4	133	19	5.9	2.5	5.6	12
30	41	e18	e7.0	e4.1	---	e3.3	125	17	3.8	2.2	15	11
31	27	---	e7.0	e4.0	---	3.2	---	15	---	2.0	8.4	---
TOTAL	464.5	1021	318.9	165.7	98.8	157.1	1319.4	2407	237.3	325.1	376.8	1007.9
MEAN	15.0	34.0	10.3	5.35	3.41	5.07	44.0	77.6	7.91	10.5	12.2	33.6
MAX	80	138	17	7.0	3.9	13	177	191	20	50	104	136
MIN	3.5	13	7.0	4.0	3.1	3.2	3.3	15	3.4	2.0	1.6	6.9

e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1991 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	15.0	34.0	10.3	5.35	3.41	5.07	63.9	59.8	10.3	12.5	6.51	19.0
MAX	15.0	34.0	10.3	5.35	3.41	5.07	83.7	77.6	12.7	14.4	12.2	33.6
(WY)	1992	1992	1992	1992	1992	1992	1991	1992	1991	1991	1992	1992
MIN	15.0	34.0	10.3	5.35	3.41	5.07	44.0	41.9	7.91	10.5	.87	4.41
(WY)	1992	1992	1992	1992	1992	1992	1992	1991	1992	1992	1991	1991

SUMMARY STATISTICS	FOR 1992 WATER YEAR		WATER YEARS 1991 - 1992	
ANNUAL TOTAL	7899.5			
ANNUAL MEAN	21.6		21.6	
HIGHEST ANNUAL MEAN			21.6	1992
LOWEST ANNUAL MEAN			21.6	1992
HIGHEST DAILY MEAN	191	May 12	191	May 12 1992
LOWEST DAILY MEAN	1.6	Aug 6	.29	Sep 1 1991
ANNUAL SEVEN-DAY MINIMUM	2.1	Jul 31	.44	Aug 29 1991
INSTANTANEOUS PEAK FLOW	386	May 11	386	May 11 1992
INSTANTANEOUS PEAK STAGE	3.04	May 11	3.04	May 11 1992
INSTANTANEOUS LOW FLOW	1.4	Aug 7	.22	Sep 1 1991
10 PERCENT EXCEEDS	55		67	
50 PERCENT EXCEEDS	9.2		9.0	
90 PERCENT EXCEEDS	3.4		2.5	



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 current year. Monthly discharge only for some periods, published in WSP 1307.

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

GAGE.--Water-stage recorder. Datum of gage is 613.65 ft above 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)
Apr. 21	0030	*2,420	*10.59	July 2	2130	1,370	9.52
May 12	Unknown	1,400	9.55				

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	91	262	119	e71	e47	e36	71	854	95	538	89	72
2	87	218	136	e70	e46	e36	73	907	84	1140	67	259
3	80	e200	e130	e69	e45	e36	e80	870	75	1160	46	367
4	73	e180	e125	e68	e45	e36	e90	688	71	783	36	254
5	68	e170	e125	e67	e44	e36	e110	534	65	545	30	212
6	67	e160	e120	e66	e43	e50	e150	435	78	376	25	177
7	67	e155	e120	e65	e43	e100	e200	384	91	261	171	135
8	67	e150	e115	e64	e42	e120	e250	336	80	196	383	168
9	64	e150	e115	e63	e42	e130	378	264	68	164	221	173
10	58	e145	e110	e63	e41	e130	353	238	58	131	147	294
11	55	e140	e110	e62	e41	e120	292	404	51	106	104	235
12	52	137	e105	e62	e40	e100	233	890	43	88	85	175
13	50	137	e105	e61	e40	e90	201	1070	36	75	69	136
14	63	146	e100	e61	e39	e80	199	703	31	73	55	114
15	80	159	e100	e60	e39	e75	217	563	28	70	44	91
16	86	153	e95	e59	e38	68	208	571	32	74	36	105
17	81	149	e95	e58	e38	67	272	732	81	63	32	243
18	72	512	e90	e58	e37	64	414	548	170	69	30	286
19	64	629	e90	e57	e37	60	777	435	152	73	26	258
20	60	536	e90	e56	e37	55	1730	357	114	98	24	196
21	68	447	e85	e55	e36	52	2050	285	89	90	26	155
22	79	375	e85	e54	e36	50	1510	336	72	74	25	122
23	80	277	e85	e53	e36	48	1070	420	65	63	23	97
24	108	216	e80	e52	e36	51	838	331	88	52	25	82
25	115	192	e80	e51	e36	60	714	270	124	46	51	71
26	103	174	e80	e51	e36	60	650	227	142	46	63	66
27	98	183	e78	e50	e36	61	663	195	120	39	54	63
28	108	156	e76	e49	e36	61	731	170	94	33	43	64
29	449	141	e74	e49	e36	57	873	148	72	30	40	64
30	427	148	e73	e48	---	69	974	127	57	35	80	60
31	319	---	e72	e48	---	74	---	110	---	45	79	---
TOTAL	3339	6797	3063	1820	1148	2132	16371	14402	2426	6636	2229	4794
MEAN	108	227	98.8	58.7	39.6	68.8	546	465	80.9	214	71.9	160
MAX	449	629	136	71	47	130	2050	1070	170	1160	383	367
MIN	50	137	72	48	36	36	71	110	28	30	23	60
AC-FT	6620	13480	6080	3610	2280	4230	32470	28570	4810	13160	4420	9510
CFSM	.77	1.62	.71	.42	.28	.49	3.90	3.32	.58	1.53	.51	1.14
IN.	.89	1.81	.81	.48	.31	.57	4.35	3.83	.64	1.76	.59	1.27

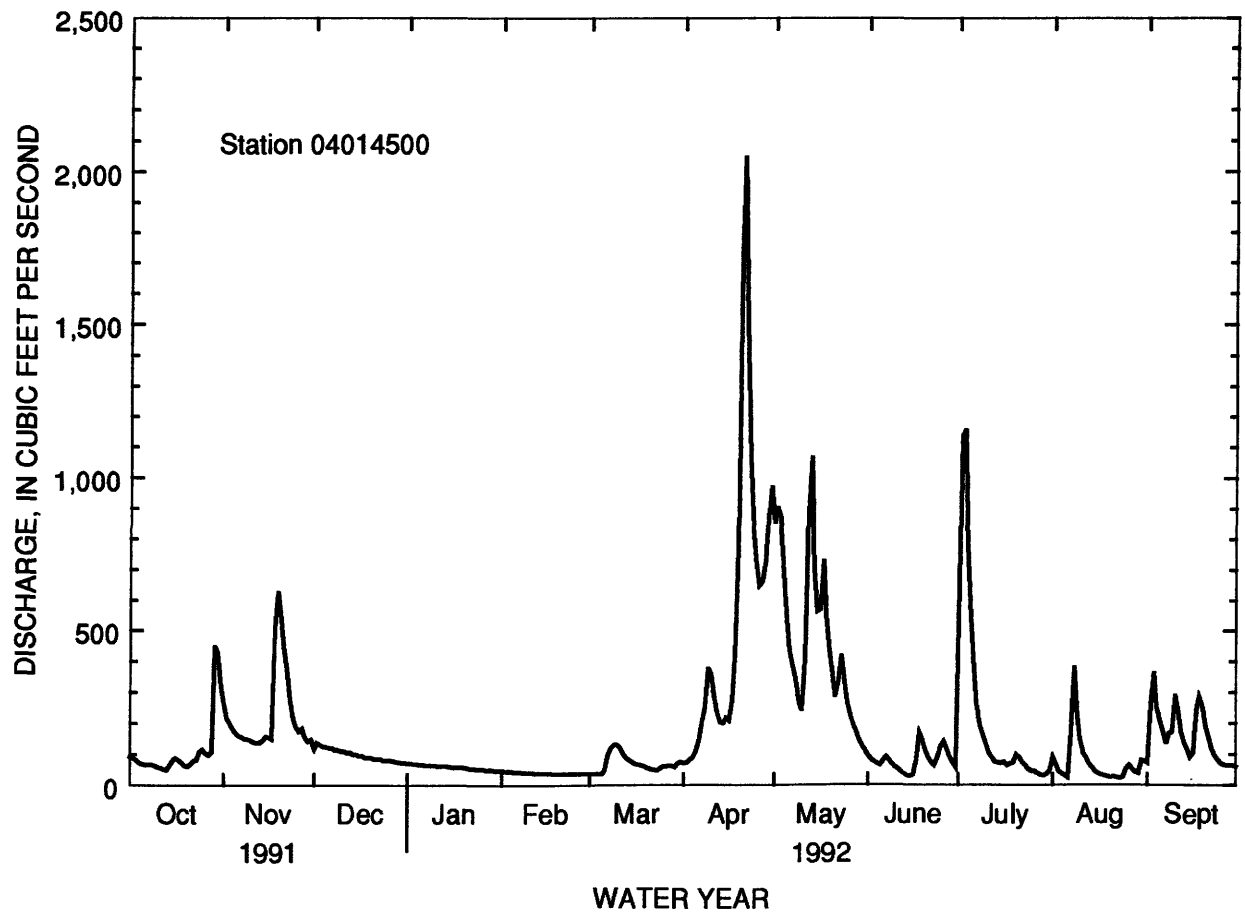
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1928 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	151	135	53.3	29.9	22.2	63.7	546	488	239	103	85.1	123
MAX	558	504	180	65.5	56.0	602	1083	1801	615	327	665	735
(WY)	1983	1933	1971	1969	1984	1945	1976	1950	1943	1978	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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1928 - 1992	
ANNUAL TOTAL	56761		65157			
ANNUAL MEAN	156		178		170	
HIGHEST ANNUAL MEAN					335	1972
LOWEST ANNUAL MEAN					81.6	1963
HIGHEST DAILY MEAN	1560	Apr 30	2050	Apr 21	6860	May 2 1972
LOWEST DAILY MEAN	12	Aug 15	23	Aug 23	.00	Jan 14 1977
ANNUAL SEVEN-DAY MINIMUM	13	Feb 26	26	Aug 18	.00	Jan 14 1977
INSTANTANEOUS PEAK FLOW			2420	Apr 21	10000a	Sep 24 1977
INSTANTANEOUS PEAK STAGE			10.59	Apr 21	11.06b	Apr 12 1965
INSTANTANEOUS LOW FLOW			23c			
ANNUAL RUNOFF (AC-FT)	112600		129200		122800	
ANNUAL RUNOFF (CFSM)	1.11		1.27		1.21	
ANNUAL RUNOFF (INCHES)	15.08		17.31		16.46	
10 PERCENT EXCEEDS	383		429		430	
50 PERCENT EXCEEDS	83		84		55	
90 PERCENT EXCEEDS	14		38		14	

a From rating curve extended above 4,200ft³/s on basis of slope-area measurement of peak flow.
b Site and datum in use from floodmark (backwater from ice).
c Occurred part or all of each day Aug. 6, 7, 20-24.



STREAMS TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

WATER QUALITY RECORDS

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
OCT												
02...	1400	99	82	78	7.8	7.5	11.0	1.2	738	10.3	K18	24
JAN												
14...	1215	60	--	83	8.1	7.6	0.0	1.6	738	13.5	K6	K19
APR												
14...	1300	188	93	103	7.4	7.5	2.0	6.1	751	12.1	K5	K5
JUL												
22...	0830	79	99	83	7.6	7.6	15.0	0.80	750	9.9	72	58

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)	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)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)
OCT												
02...	10	3.1	2.7	0.40	28	32	0	34	3.6	2.6	0.30	9.9
JAN												
14...	10	3.1	2.8	0.30	30	32	0	37	4.7	1.9	0.20	14
APR												
14...	11	5.0	3.6	1.1	--	36	0	23	7.1	4.1	<0.10	7.9
JUL												
22...	11	3.2	2.9	0.30	26	36	0	32	2.5	0.70	0.20	7.8

DATE	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 TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-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)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT												
02...	83	<0.010	<0.050	0.050	0.060	0.60	<0.010	<0.010	<0.010	<0.010	3	76
JAN												
14...	68	0.020	0.310	0.060	0.060	0.40	<0.010	<0.020	0.020	<0.010	3	81
APR												
14...	88	<0.010	0.520	0.050	0.040	0.30	<0.010	<0.010	<0.010	<0.010	3	91
JUL												
22...	80	<0.010	<0.050	0.050	0.040	0.50	<0.010	<0.010	<0.010	<0.010	--	--

STREAM TRIBUTARY TO LAKE SUPERIOR

04014500 BAPTISM RIVER NEAR BEAVER BAY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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)	VANADIUM, DISSOLVED (UG/L AS V) (01085)
OCT												
02...	90	5	<3	350	<4	5	<10	<1	<1	<1.0	29	<6
JAN												
14...	90	4	<3	330	<4	3	<10	1	<1	<1.0	26	<6
APR												
14...	100	10	<3	500	<4	35	<10	<1	<1	<1.0	30	<6
JUL												
22...	60	4	<3	400	<4	4	<10	<1	<1	<1.0	32	<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)
Nov. 2	---	Ice jam	*8.40	May 12	0300	1,300	5.79
Apr. 8	2315	1,180	5.64	July 1	1030	1,890	6.51
Apr. 21	0145	*3,140	7.84				

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	55	e300	e76	e34	e21	e16	e170	212	24	1070	13	24
2	63	e400	e73	e34	e21	e16	e150	175	22	1550	17	150
3	60	e200	e70	e33	e20	e16	e200	141	21	807	12	169
4	48	e130	e68	e33	e20	e16	e300	115	19	316	10	87
5	40	e120	e66	e32	e20	e16	e400	94	18	165	8.7	141
6	38	e110	e64	e32	e20	e16	e520	80	23	94	7.3	178
7	36	e105	e62	e31	e19	e40	e620	69	34	62	12	85
8	33	e100	e60	e31	e19	e100	690	62	26	46	67	124
9	30	e97	e58	e30	e19	e100	768	54	21	51	35	78
10	27	e95	e56	e30	e19	e80	580	49	18	102	21	78
11	25	e95	e54	e29	e18	e65	330	247	16	66	15	53
12	23	e95	e52	e29	e18	e55	226	1080	16	45	14	36
13	23	e96	e51	e28	e18	e45	172	480	11	34	11	28
14	27	e98	e50	e28	e18	e40	168	210	11	29	9.1	23
15	38	e100	e49	e28	e18	e35	253	186	11	24	7.9	19
16	36	e120	e48	e27	e17	e30	237	220	11	22	6.6	23
17	34	e200	e47	e27	e17	e28	323	341	52	22	5.8	84
18	29	e900	e46	e27	e17	e27	491	160	115	21	5.7	96
19	26	e700	e45	e26	e17	e26	1260	111	82	20	5.8	71
20	23	e500	e44	e26	e17	e25	1740	86	86	22	4.7	50
21	28	e300	e43	e25	e16	e24	2310	66	51	18	5.5	37
22	36	e220	e42	e25	e16	e24	1240	70	35	16	7.4	29
23	33	e160	e41	e24	e16	e24	812	155	30	15	6.4	23
24	53	e130	e40	e24	e16	e40	456	94	36	13	5.6	20
25	75	e110	e39	e24	e16	e80	315	67	52	12	15	18
26	63	e100	e38	e23	e16	e180	263	59	84	12	25	17
27	53	e95	e37	e23	e16	e150	248	47	53	13	22	16
28	50	e90	e36	e22	e16	e130	249	40	35	12	16	15
29	599	e85	e36	e22	e16	e120	276	35	25	10	13	15
30	405	e80	e35	e22	---	e124	267	31	19	9.3	21	14
31	226	---	e35	e21	---	e200	---	27	---	8.8	29	---
TOTAL	2335	5931	1561	850	517	1888	16034	4863	1057	4707.1	454.5	1801
MEAN	75.3	198	50.4	27.4	17.8	60.9	534	157	35.2	152	14.7	60.0
MAX	599	900	76	34	21	200	2310	1080	115	1550	67	178
MIN	23	80	35	21	16	16	150	27	11	8.8	4.7	14
AC-FT4	630	11760	3100	1690	1030	3740	31800	9650	2100	9340	902	3570
CFSM	.88	2.31	.59	.32	.21	.71	6.24	1.83	.41	1.77	.17	.70
IN.	1.01	2.58	.68	.37	.22	.82	6.97	2.11	.46	2.05	.20	.78

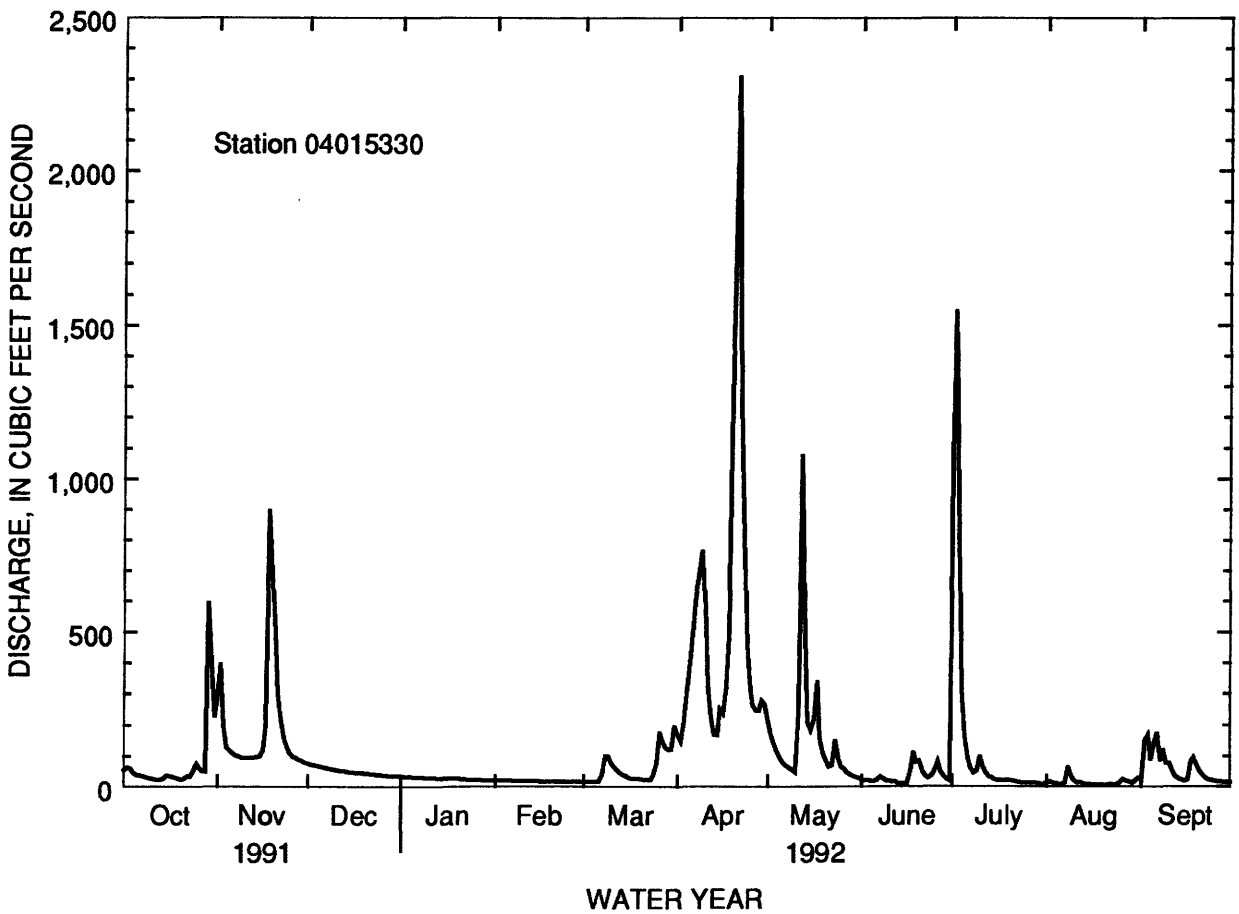
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1974 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	89.2	71.8	21.7	11.3	9.03	51.7	376	168	85.2	72.5	34.8	89.9
MAX	226	198	60.6	31.4	22.2	136	631	427	240	267	163	314
(WY)	1983	1992	1983	1975	1984	1976	1982	1979	1984	1978	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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1974 - 1992	
ANNUAL TOTAL	39781.4		41998.6			
ANNUAL MEAN	109		115		90.7	
HIGHEST ANNUAL MEAN					147	1986
LOWEST ANNUAL MEAN					44.2	1977
HIGHEST DAILY MEAN	2450	Jun 29	2310	Apr 21	4480	May 10 1979
LOWEST DAILY MEAN	2.8	Sep 2	4.7	Aug 20	.00a	
ANNUAL SEVEN-DAY MINIMUM	4.0	Aug 28	5.9	Aug 18	.00	Dec 2 1976
INSTANTANEOUS PEAK FLOW			3140	Apr 21	7440	May 10 1979
INSTANTANEOUS PEAK STAGE			8.40b	Nov 2	11.16	May 10 1979
INSTANTANEOUS LOW FLOW			4.6	Aug 20, 21		
ANNUAL RUNOFF (AC-FT)	78910		83300		65740	
ANNUAL RUNOFF (CFSM)	1.27		1.34		1.06	
ANNUAL RUNOFF (INCHES)	17.29		18.25		14.40	
10 PERCENT EXCEEDS	300		250		222	
50 PERCENT EXCEEDS	41		36		21	
90 PERCENT EXCEEDS	5.0		15		4.1	

a Many days in water year 1977.
b Backwater from ice.



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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1840	2520	e3500	e2200	e1700	1550	4070	5750	1730	4210	938	2370
2	1770	1580	e3500	e2200	e1700	1560	3940	5280	1570	11000	1010	2550
3	1700	1480	e3500	e2300	e1700	1540	3910	4720	1470	12100	960	3360
4	1570	2400	e2800	e2300	e1700	1550	4340	4460	1370	10900	851	3690
5	1570	3560	e2900	e2200	e1650	1550	5040	4220	1270	9440	824	3550
6	1570	3500	e3000	e2200	e1650	1610	5940	3830	1300	8370	757	3250
7	1550	3340	e3400	e2200	e1600	1660	7240	3750	1270	7320	859	3010
8	1540	3310	e3500	e2100	e1300	1850	7980	3860	1220	6520	962	2990
9	1440	3460	e3000	e2100	e800	2000	7780	3820	1140	5890	1090	3440
10	1340	3580	e3000	e1900	e1500	2580	7250	3690	1090	5360	1270	3590
11	1350	3520	e3000	e2000	e1300	2470	6640	4590	1000	4730	1200	3490
12	1200	3430	e2800	e2100	e1000	2250	5840	9460	948	4030	1130	3170
13	1230	3370	e2600	e1800	e1600	2120	5300	10700	939	3420	1080	2880
14	1340	3360	e2400	e1400	e1800	1950	4940	10100	836	3050	1030	2590
15	1350	3410	e1800	e1500	e1700	1800	4790	9330	759	2500	988	2550
16	1330	3400	e2000	e1000	e1600	1730	4650	9370	892	2180	916	2370
17	1410	3290	e2500	e1350	e1550	1630	4490	9900	1480	2130	946	2530
18	1380	3770	e2300	e1300	e1550	1630	4370	9730	2000	2060	873	3080
19	1320	5980	e2000	e2000	e1550	1570	4660	8970	2810	1950	822	3690
20	1300	7580	e2600	e1900	e1500	1510	5920	7750	3330	1760	823	3570
21	1270	8050	e2400	e1800	e1500	1470	8200	6540	3200	1740	870	3320
22	1270	7880	e2400	e1800	e1600	1420	10600	5680	2670	1580	841	2920
23	1320	7350	e2400	e1800	e1650	1390	11200	4930	2230	1450	993	2670
24	1350	e6500	e2300	e1600	e1700	1530	10600	4520	2280	1390	1110	2500
25	1350	e6000	e2300	e1400	e1650	2100	9600	4220	2830	1340	1280	2110
26	1320	e5000	e2300	e1700	e1700	2870	8720	3870	3140	1280	1530	2090
27	1270	e5000	e2300	e1800	e1700	3160	7910	3450	2990	1190	1510	1840
28	1320	e4500	e2200	e1700	e1700	3270	7260	2980	2570	1180	1380	1750
29	1860	e4000	e2200	e1800	1640	3280	6550	2390	2060	1090	1260	1630
30	2490	e4000	e2200	e1900	---	3340	6040	1990	1880	1010	1510	1540
31	2570	---	e2200	e1700	---	3830	---	1860	---	966	2200	---
TOTAL	46490	128120	81300	57050	45290	63770	195770	175710	54274	123136	33813	84090
MEAN	1500	4271	2623	1840	1562	2057	6526	5668	1809	3972	1091	2803
MAX	2570	8050	3500	2300	1800	3830	11200	10700	3330	12100	2200	3690
MIN	1200	1480	1800	1000	800	1390	3910	1860	759	966	757	1540
+	40	-101	-846	-815	-721.4	-98.9	1516.6	451.8	-27.9	-110.3	-125.9	183.9
MEAN ‡	1540	4170	1777	1025	840	1958	8042	6120	1781	3862	965	2987
CFSM ‡	.45	1.22	.52	.30	.24	.57	2.34	1.78	.52	1.13	.28	.87
IN ‡	.52	1.36	.60	.34	.26	.66	2.62	2.06	.58	1.30	.32	.97

CAL YR 1991 TOTAL 97423 MEAN 2671 MAX 11,100 MIN 494 MEAN‡2691 CFSM‡78 IN ‡ 10.65

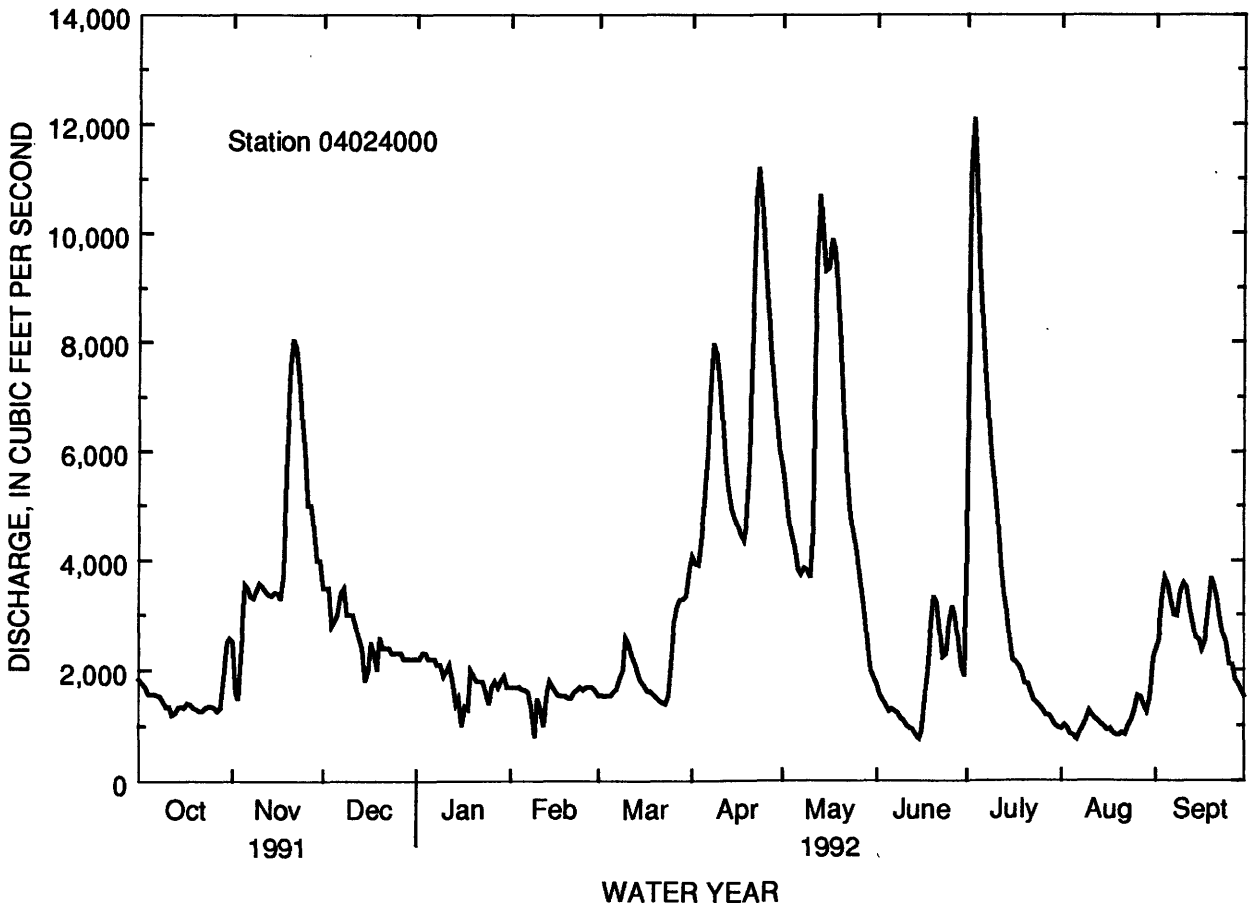
WTR YR 1992 TOTAL 108813 MEAN 2975 MAX 12,100 MIN 757 MEAN‡2919 CFSM‡.85 IN ‡11.59

+ 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.
‡ Adjusted for change in reservoir contents.
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1908 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	1977	1656	1248	1056	1039	1410	5555	5137	3559	2250	1659	1772
MAX	7508	8518	2993	2272	2200	6026	15230	22210	16480	6798	9197	7594
(WY)	1974	1972	1972	1966	1966	1945	1948	1950	1908	1953	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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1908 - 1992	
ANNUAL TOTAL	974823		1088813			
ANNUAL MEAN	2671		2975		2346	
HIGHEST ANNUAL MEAN					4276	1972
LOWEST ANNUAL MEAN					945	1924
HIGHEST DAILY MEAN	11100	May 7	12100	Jul 3	37900	May 9 1950
LOWEST DAILY MEAN	494	Sep 2	757	Aug 6	88	Aug 24 1977
ANNUAL SEVEN-DAY MINIMUM	539	Aug 30	870	Aug 16	134	Jul 26 1988
INSTANTANEOUS PEAK FLOW			12400	Jul 3	37900	May 9 1950
INSTANTANEOUS PEAK STAGE			8.31	Jul 3	15.80	May 9 1950
ANNUAL RUNOFF (AC-FT)	1934000		2160000		1699000	
ANNUAL RUNOFF (CFSM)	.78		.87		.68	
ANNUAL RUNOFF (INCHES)	10.57		11.81		9.29	
10 PERCENT EXCEEDS	5350		6180		5240	
50 PERCENT EXCEEDS	2160		2190		1360	
90 PERCENT EXCEEDS	850		1170		631	



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 1991 TO SEPTEMBER 1992

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)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
OCT												
03...	0830	1770	142	145	7.8	7.6	10.5	3.0	728	9.7	K6	20
DEC												
04...	1415	2320	142	137	7.4	7.6	0.5	3.3	734	11.4	K15	K9
JAN												
13...	1300	1750	190	150	7.9	7.4	0.0	3.4	727	13.5	K8	K17
APR												
13...	1230	5010	--	66	7.7	7.7	2.0	1.8	739	12.1	49	60
JUL												
22...	1330	1810	182	152	7.6	7.5	20.0	3.0	736	7.6	--	K12

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)	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)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)
OCT												
03...	15	7.1	4.4	1.0	55	59	0	67	9.6	4.4	0.20	7.9
DEC												
04...	13	6.9	4.8	1.0	40	51	0	49	7.0	3.5	0.40	9.3
JAN												
13...	15	7.2	4.3	1.1	59	59	0	72	9.3	3.2	0.20	10
APR												
13...	7.8	2.5	2.5	0.30	35	22	0	43	4.8	2.4	0.10	12
JUL												
22...	16	7.5	4.8	0.90	61	59	0	74	9.6	2.1	0.10	7.3

DATE	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 TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-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)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT												
03...	121	<0.010	0.068	0.040	0.030	0.70	0.030	0.010	0.030	0.010	6	100
DEC												
04...	104	<0.010	0.180	0.090	0.090	0.80	0.030	0.020	0.010	0.010	6	100
JAN												
13...	108	<0.010	0.210	0.080	0.080	0.60	0.020	0.020	0.020	<0.010	8	60
APR												
13...	57	<0.010	0.160	0.060	0.050	0.60	0.030	<0.010	0.020	<0.010	18	94
JUL												
22...	128	<0.010	0.110	0.040	0.030	1.0	0.030	0.010	0.020	0.020	--	--

STREAMS TRIBUTARY TO LAKE SUPERIOR

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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)	VANADIUM, DISSOLVED (UG/L AS V) (01085)
OCT												
03...	50	12	<3	670	<4	61	<10	<1	<1	<1.0	44	<6
DEC												
04...	--	--	--	--	--	--	--	--	--	--	--	--
JAN												
13...	70	10	<3	700	<4	33	<10	2	<1	<1.0	41	<6
APR												
13...	100	3	<3	240	<4	6	<10	<1	<1	<1.0	21	<6
JUL												
22...	60	13	3	1000	<4	85	<10	2	<1	<1.0	48	<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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.7	e5.5	e3.6	e2.4	e2.9	3.1	17	5.6	3.7	35	1.8	2.3
2	4.8	e5.2	e3.5	e2.3	e2.9	3.2	16	4.8	2.8	139	1.7	7.7
3	4.6	e5.0	e3.5	e2.3	e2.9	3.1	32	4.1	2.6	40	1.7	3.8
4	4.0	e4.8	e3.4	e2.2	e2.9	3.2	35	4.5	2.5	17	4.8	3.3
5	4.2	e4.6	e3.4	e2.2	e2.8	e3.5	40	4.0	2.3	7.3	4.6	6.5
6	5.0	e4.4	e3.3	e2.2	e2.8	e5.0	43	3.5	2.8	4.5	2.2	11
7	4.7	e4.2	e3.2	e2.2	e2.8	e8.0	29	3.3	2.7	3.6	3.3	3.7
8	4.4	e4.1	e3.1	e2.3	e2.8	e15	19	3.1	2.4	3.1	3.0	8.1
9	4.2	e4.0	e3.0	e2.4	e2.8	e13	17	2.8	2.2	3.0	2.0	5.3
10	4.0	e4.0	e3.0	e2.5	e2.7	e11	13	2.8	2.1	2.8	2.4	3.5
11	4.0	e4.0	e3.0	e2.9	e2.7	e9.0	9.4	28	1.9	3.0	2.7	2.2
12	3.7	e4.0	e3.1	e3.1	e2.7	e7.5	8.3	32	2.3	3.0	2.3	2.2
13	3.7	e4.0	e3.2	e3.4	e2.6	e6.0	7.8	11	2.8	2.7	1.6	2.3
14	3.8	e4.5	e3.3	e3.4	e2.6	e5.0	8.8	6.4	2.3	2.5	1.5	2.4
15	3.6	e4.5	e3.4	e3.4	e2.6	e4.7	20	5.4	2.5	2.3	1.4	1.7
16	3.2	e4.5	e3.5	e3.4	e2.5	e4.4	23	4.7	2.9	2.5	1.4	3.4
17	2.7	e6.0	e3.5	e3.4	e2.5	e4.2	16	4.5	12	2.3	1.5	7.6
18	2.6	e50	e3.5	e3.4	e2.5	e4.0	12	9.3	30	2.0	1.6	12
19	2.3	e40	e3.4	e3.4	2.5	e3.9	32	25	32	2.1	2.9	4.9
20	2.2	e25	e3.3	e3.4	2.7	e3.8	52	6.6	21	1.9	1.9	3.4
21	2.4	e15	e3.2	e3.3	2.9	e3.7	91	4.4	8.3	1.6	1.9	2.8
22	2.4	e10	e3.1	e3.3	3.0	e3.6	63	3.3	4.8	1.5	1.9	2.2
23	2.2	e7.0	e3.0	e3.2	2.8	e4.0	48	3.7	4.0	1.5	1.7	2.1
24	3.3	e5.5	e2.9	e3.2	2.9	e7.0	29	3.2	5.5	1.5	1.6	2.2
25	3.5	e4.5	e2.8	e3.1	2.9	e30	17	3.0	5.8	1.5	3.6	2.2
26	3.1	e4.1	e2.8	e3.1	2.9	e26	13	2.9	6.7	1.7	2.4	2.4
27	2.6	e4.0	e2.7	e3.0	3.1	24	9.2	2.9	3.9	1.6	1.6	2.4
28	3.5	e3.9	e2.6	e3.0	3.2	21	7.5	2.7	3.2	1.7	1.6	2.2
29	20	e3.8	e2.5	e3.0	3.1	18	6.6	2.8	2.6	1.4	1.6	2.3
30	7.3	e3.7	e2.5	e3.0	---	27	6.2	2.9	2.4	1.5	2.3	2.4
31	5.0	---	e2.4	e3.0	---	27	---	3.9	---	1.6	2.5	---
TOTAL	131.7	253.8	96.7	90.4	81.0	311.9	740.8	207.1	183.0	296.7	69.0	120.5
MEAN	4.25	8.46	3.12	2.92	2.79	10.1	24.7	6.68	6.10	9.57	2.23	4.02
MAX	20	50	3.6	3.4	3.2	30	91	32	32	139	4.8	12
MIN	2.2	3.7	2.4	2.2	2.5	3.1	6.2	2.7	1.9	1.4	1.4	1.7
AC-FT	261	503	192	179	161	619	1470	411	363	589	137	239
CFSM	.55	1.09	.40	.38	.36	1.29	3.18	.86	.79	1.23	.29	.52
IN.	.63	1.22	.46	.43	.39	1.49	3.55	.99	.88	1.42	.33	.58

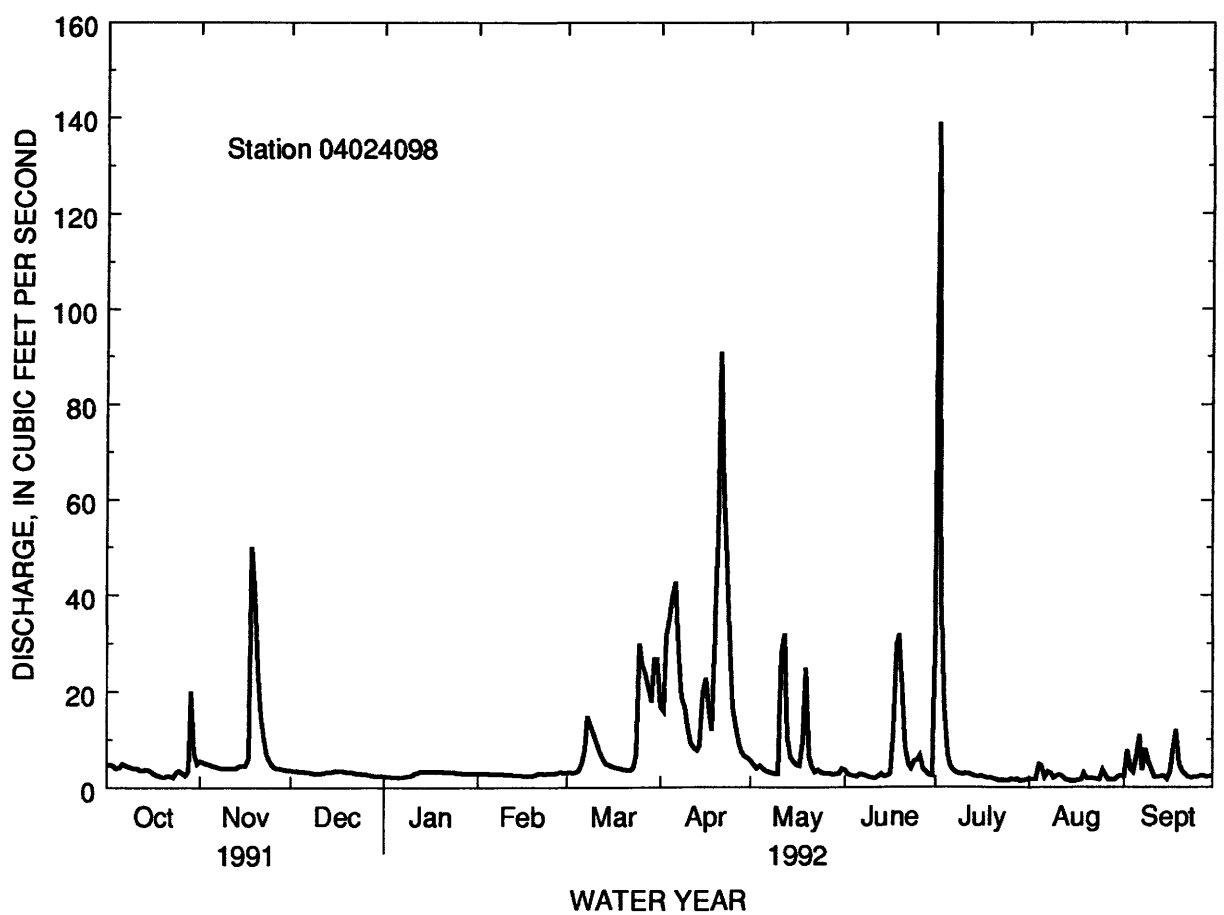
e Estimated.

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	7.02	4.54	2.45	1.86	2.36	8.53	23.7	10.8	7.17	6.65	5.28	9.23
MAX	21.8	12.2	3.86	2.92	5.87	19.2	90.8	24.3	19.8	22.3	36.9	30.4
(WY)	1983	1983	1983	1992	1981	1985	1986	1991	1984	1991	1986	1986
MIN	1.69	1.59	1.31	.97	1.06	2.34	4.11	2.15	1.65	1.50	.89	1.69
(WY)	1988	1977	1977	1979	1979	1986	1977	1980	1982	1988	1982	1981

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1976 - 1992	
ANNUAL TOTAL	3610.3		2582.6			
ANNUAL MEAN	9.89		7.06		7.49	
HIGHEST ANNUAL MEAN					19.3	1986
LOWEST ANNUAL MEAN					3.65	1980
HIGHEST DAILY MEAN	128	Jul 1	139	Jul 2	553	Sep 6 1990
LOWEST DAILY MEAN	1.2	Feb 28	1.4	Jul 29	.21	Jul 2 1976
ANNUAL SEVEN-DAY MINIMUM	1.3	Feb 27	1.6	Jul 21	.47	Aug 10 1982
INSTANTANEOUS PEAK FLOW			270	Jul 2	2000a	Sep 3 1985
INSTANTANEOUS PEAK STAGE			15.46	Jul 2	32.76b	Sep 3 1985
INSTANTANEOUS LOW FLOW			1.1	Aug 15	.20c	
ANNUAL RUNOFF (AC-FT)	7160		5120		5420	
ANNUAL RUNOFF (CFSM)	1.27		.91		.96	
ANNUAL RUNOFF (INCHES)	17.28		12.36		13.09	
10 PERCENT EXCEEDS	25		17		15	
50 PERCENT EXCEEDS	4.1		3.3		2.5	
90 PERCENT EXCEEDS	1.9		2.2		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 September 1992.

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. Flow regulated by power plants upstream.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	---	---	---	---	219	208
2	---	---	---	---	---	---	---	---	---	---	220	202
3	---	---	---	---	---	---	---	---	---	---	225	198
4	---	---	---	---	---	---	---	---	---	---	228	199
5	---	---	---	---	---	---	---	---	---	---	237	200
6	---	---	---	---	---	---	---	---	---	---	233	203
7	---	---	---	---	---	---	---	---	---	---	242	208
8	---	---	---	---	---	---	---	---	---	---	304	221
9	---	---	---	---	---	---	---	---	---	---	307	219
10	---	---	---	---	---	---	---	---	---	---	309	219
11	---	---	---	---	---	---	---	---	---	---	293	219
12	---	---	---	---	---	---	---	---	---	---	286	216
13	---	---	---	---	---	---	---	---	---	---	276	216
14	---	---	---	---	---	---	---	---	---	---	271	215
15	---	---	---	---	---	---	---	---	---	---	260	188
16	---	---	---	---	---	---	---	---	---	---	258	208
17	---	---	---	---	---	---	---	---	---	---	242	e250
18	---	---	---	---	---	---	---	---	---	---	220	e220
19	---	---	---	---	---	---	---	---	---	---	202	e220
20	---	---	---	---	---	---	---	---	---	---	199	e220
21	---	---	---	---	---	---	---	---	---	---	200	217
22	---	---	---	---	---	---	---	---	---	---	219	175
23	---	---	---	---	---	---	---	---	---	277	216	178
24	---	---	---	---	---	---	---	---	---	276	215	199
25	---	---	---	---	---	---	---	---	---	276	200	202
26	---	---	---	---	---	---	---	---	---	277	194	e202
27	---	---	---	---	---	---	---	---	---	279	186	e202
28	---	---	---	---	---	---	---	---	---	274	186	e202
29	---	---	---	---	---	---	---	---	---	253	184	202
30	---	---	---	---	---	---	---	---	---	260	191	205
31	---	---	---	---	---	---	---	---	---	260	193	---
TOTAL	---	---	---	---	---	---	---	---	---	---	7215	6233
MEAN	---	---	---	---	---	---	---	---	---	---	233	208
MAX	---	---	---	---	---	---	---	---	---	---	309	250
MIN	---	---	---	---	---	---	---	---	---	---	184	175
AC-FT	---	---	---	---	---	---	---	---	---	---	14310	12360
CFSM	---	---	---	---	---	---	---	---	---	---	.19	.17
IN.	---	---	---	---	---	---	---	---	---	---	.22	.19

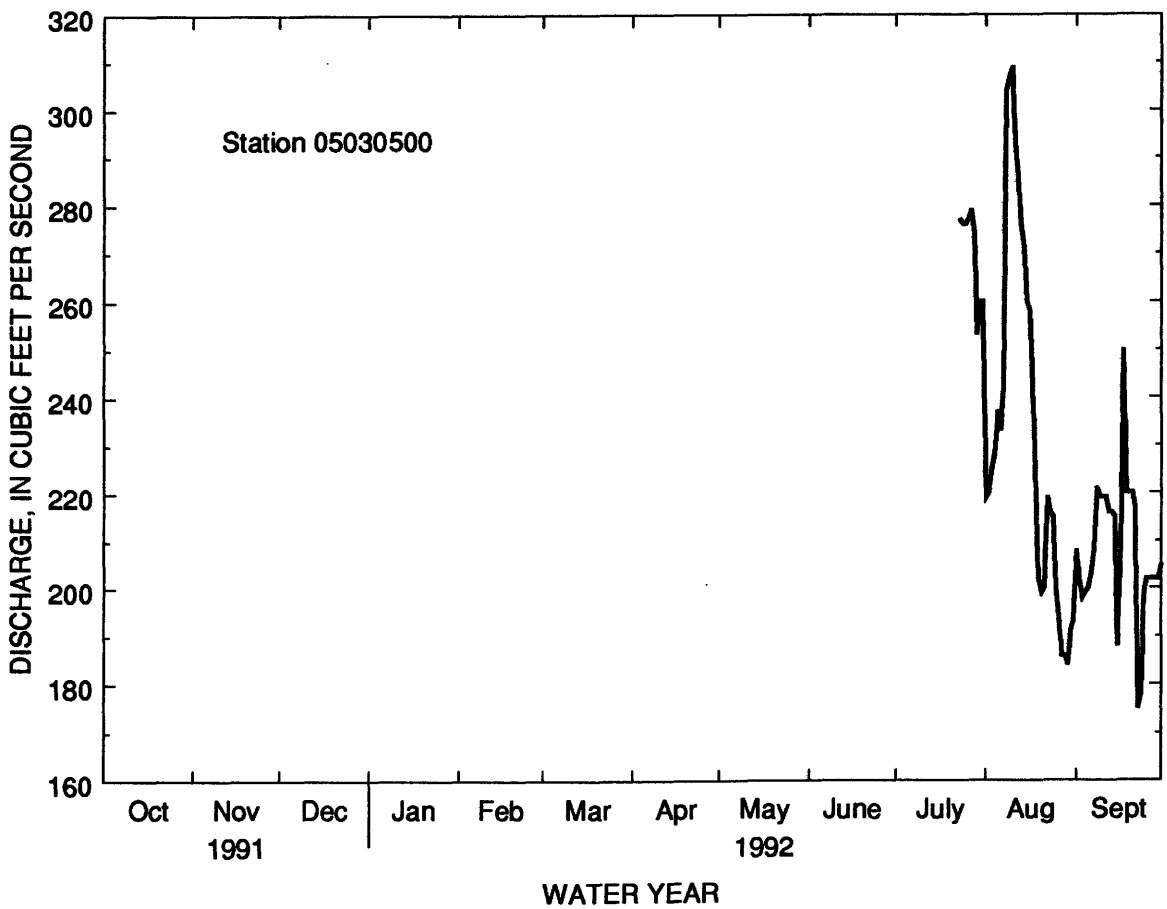
e Estimated.

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

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	---	---	---	---	---	---	---	---	---	---	233	208
MAX	---	---	---	---	---	---	---	---	---	---	233	208
(WY)	---	---	---	---	---	---	---	---	---	---	1992	1992
MIN	---	---	---	---	---	---	---	---	---	---	233	208
(WY)	---	---	---	---	---	---	---	---	---	---	1992	1992

SUMMARY STATISTICS FOR 1992 WATER YEAR

INSTANTANEOUS PEAK FLOW	335	Aug 13
INSTANTANEOUS PEAK STAGE	5.68	Aug 13



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.

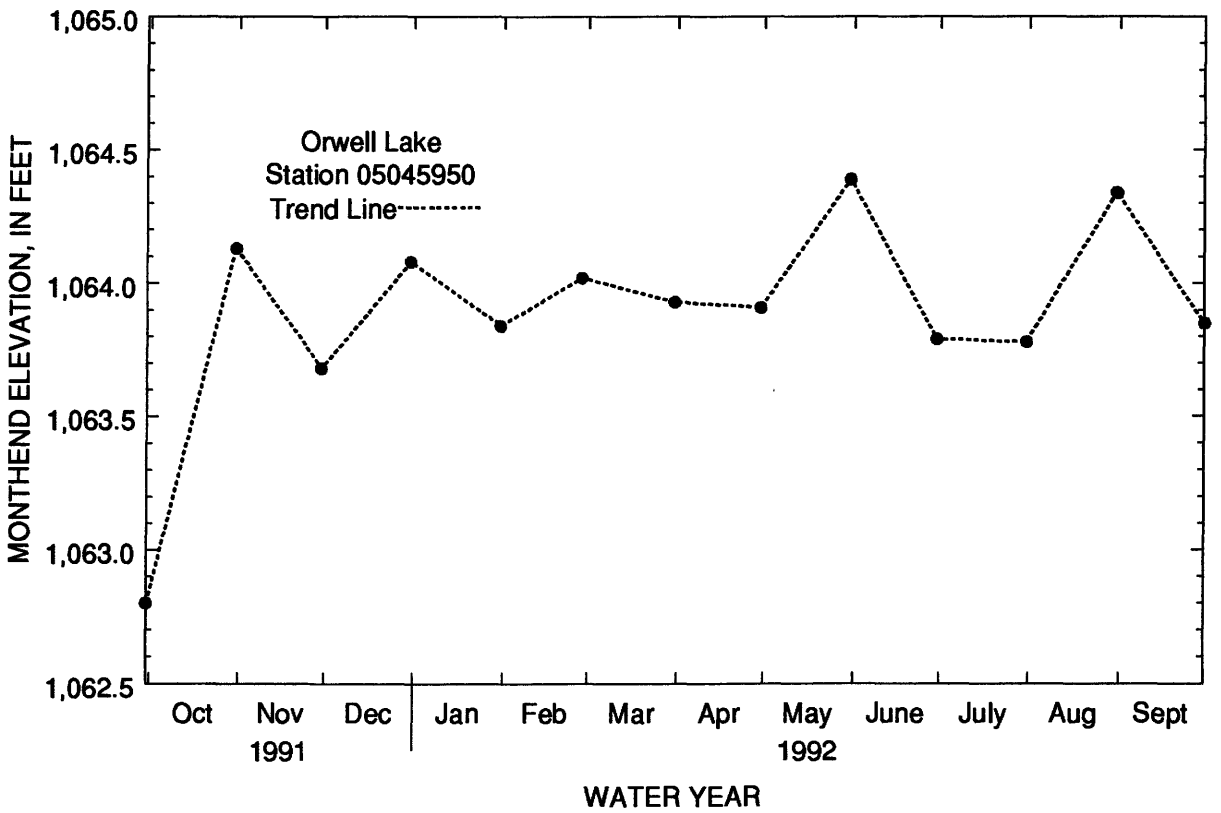
COOPERATION.--Records were provided by U.S. Army Corps of Engineers.

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, 9,180 acre-ft, Aug. 8, elevation, 1,065.03 ft; minimum, 7,580 acre-ft, Oct. 1, elevation, 1,063.04 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,062.80	7,400	
Oct. 31	1,064.13	8,410	+1010
Nov. 30	1,063.68	8,060	-350
Dec. 31	1,064.08	8,370	+310
CAL YR 1991			-40
Jan. 31	1,063.84	8,180	-190
Feb. 28	1,064.02	8,320	+140
Mar. 31	1,063.93	8,250	-70
Apr. 30	1,063.91	8,230	-20
May 31	1,064.39	8,630	+400
June 30	1,063.79	8,140	-490
July 31	1,063.78	8,140	0
Aug. 31	1,064.34	8,590	+450
Sept. 30	1,063.85	8,190	-400
WTR YR 1992			+790


1,065.0
1,064.5
1,064.0
1,063.5
1,063.0
1,062.5
MONTHEND ELEVATION, IN FEET
Orwell Lake
Station 05045950
Trend Line
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
1991
1992
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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	205	200	131	198	198	309	370	485	438	385	286	238
2	204	223	129	202	198	309	370	483	467	412	279	275
3	187	e225	126	211	198	309	370	483	369	412	266	294
4	185	e217	126	211	198	317	370	453	294	412	251	294
5	211	170	126	211	198	354	370	426	329	412	208	294
6	211	131	126	196	209	489	370	407	361	374	173	294
7	192	125	126	185	253	571	375	391	362	323	263	294
8	185	113	126	205	272	491	397	379	362	301	437	264
9	191	110	164	250	272	433	412	370	362	301	545	265
10	236	110	173	222	272	433	457	370	438	351	444	287
11	265	110	196	189	272	433	507	466	425	384	362	287
12	265	178	211	185	272	433	507	529	331	384	362	287
13	265	213	213	185	272	365	424	486	331	384	362	287
14	265	160	217	185	242	309	364	446	331	384	362	287
15	220	157	217	179	198	309	416	426	402	404	362	287
16	185	173	207	195	198	362	458	412	379	394	362	287
17	185	173	198	216	198	368	421	412	341	377	306	287
18	185	188	155	217	224	319	391	412	354	377	265	293
19	185	214	120	217	244	301	391	412	385	377	265	294
20	185	224	120	217	249	333	468	412	405	377	265	294
21	165	224	120	217	251	354	523	412	405	377	264	256
22	159	224	120	217	251	359	523	395	405	377	258	231
23	160	224	162	217	251	383	523	378	405	377	258	231
24	186	224	198	217	281	398	523	370	405	371	258	231
25	204	209	198	217	309	362	523	363	405	309	258	241
26	204	198	198	217	309	331	523	466	405	251	232	251
27	204	157	198	210	309	331	505	545	405	191	217	251
28	182	131	198	198	309	331	489	545	405	246	213	211
29	174	131	198	198	309	331	489	459	376	277	211	179
30	179	131	198	198	---	350	489	398	354	294	211	194
31	179	---	198	198	---	368	---	398	---	290	227	---
TOTAL	6208	5267	5193	6380	7216	11445	13318	13389	11436	10885	9032	7965
MEAN	200	176	168	206	249	369	444	432	381	351	291	265
MAX	265	225	217	250	309	571	523	545	467	412	545	294
MIN	159	110	120	179	198	301	364	363	294	191	173	179
AC-FT	12310	10450	10300	12650	14310	22700	26420	26560	22680	21590	17910	15800
CFSM	.11	.10	.09	.11	.14	.20	.24	.24	.21	.19	.16	.15

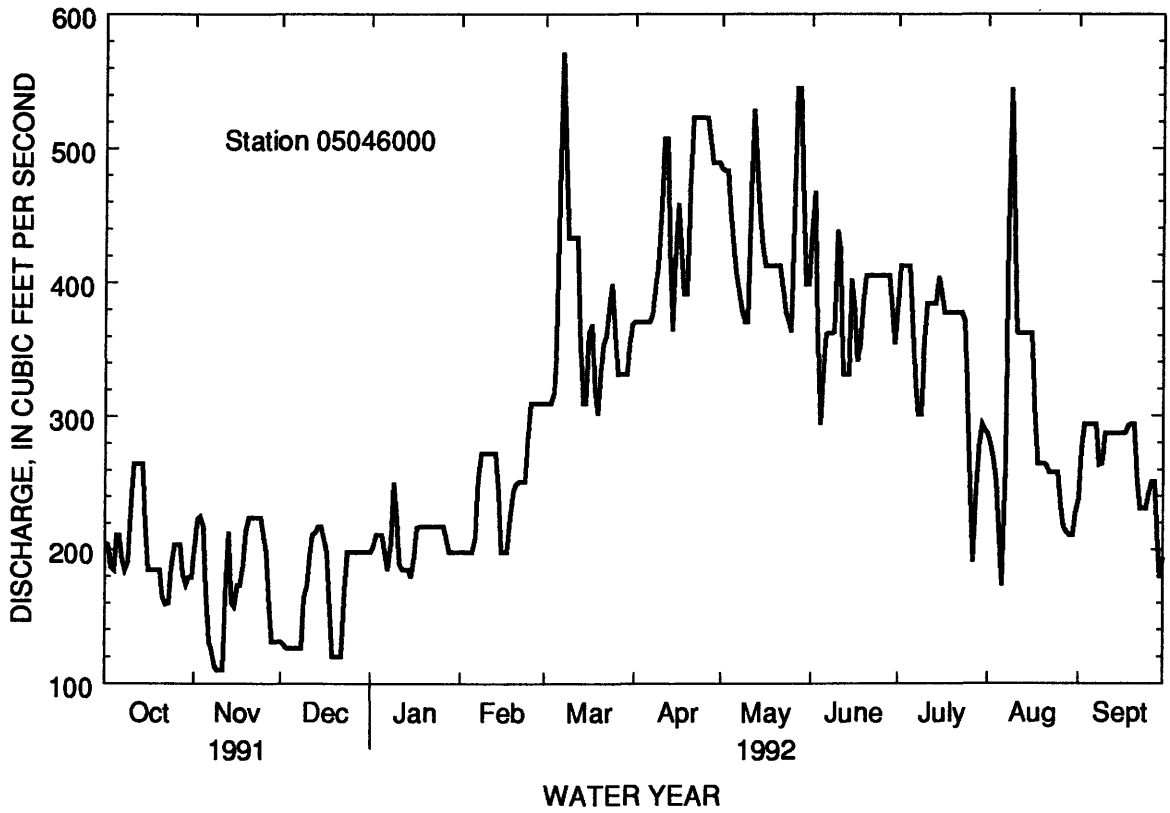
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1992, BY WATER YEAR (WY)

MEAN	224	233	222	214	215	295	450	550	544	395	260	220
MAX	817	831	706	603	605	653	1051	1427	1425	1246	1080	904
(WY)	1986	1986	1987	1986	1987	1987	1986	1986	1986	1953	1985	1985
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 1991 CALENDAR YEAR			FOR 1992 WATER YEAR		WATER YEARS 1931 1992	
ANNUAL TOTAL	131396		107734			
ANNUAL MEAN	360		294		319	
HIGHEST ANNUAL MEAN					842	1986
LOWEST ANNUAL MEAN					20.4	1934
HIGHEST DAILY MEAN	1010	Jul 2	571	Mar 7	1670	Jun 20 1953
LOWEST DAILY MEAN	82	Jan 19	110	Nov 9	1.6	Feb 7 1937
ANNUAL SEVEN-DAY MINIMUM	84	Jan 13	124	Nov 5	5.9	Sep 15 1934
INSTANTANEOUS PEAK FLOW			589	Jul 25, 26	1710	Jun 17 1953
INSTANTANEOUS PEAK STAGE			330a	Nov 4	5.60b	Jun 17 1953
INSTANTANEOUS LOW FLOW			7.0	Jul 26, 27	.70c	Aug 5 1970
ANNUAL RUNOFF (AC-FT)	260600		213700		231000	
ANNUAL RUNOFF (CFSM)	.20		.16		.17	
10 PERCENT EXCEEDS	713		434		693	
50 PERCENT EXCEEDS	291		278		246	
90 PERCENT EXCEEDS	120		177		30	

a Backwater from ice.
b Backwater from aquatic vegetation.
c Result of regulation.



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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	97	.86	e.80	e.72	e.59	e8.4	5.8	8.8	.95	6.5	138	e.18
2	97	e.82	e.80	e.72	e.59	e7.6	6.3	7.8	.87	6.7	134	e.17
3	97	e.78	e.80	e.71	e.59	e7.0	5.7	6.0	.81	6.8	131	e.18
4	99	e.76	e.80	e.71	e.59	e6.6	6.0	5.5	.78	6.4	129	e.19
5	102	e.72	e.80	e.70	e.59	e6.8	11	4.6	.80	5.9	128	e.20
6	104	e.70	e.80	e.70	e.64	e7.4	7.4	3.6	.84	5.4	127	e.25
7	104	e.70	e.80	e.69	e.80	e10	7.1	3.5	.84	4.9	129	e.30
8	107	e.70	e.80	e.68	e.90	e13	7.8	3.1	.90	4.9	126	.45
9	108	e.70	e.80	e.68	e.90	e14	7.1	2.4	.93	4.6	124	.51
10	109	e.70	e.80	e.68	e.90	e14	7.9	2.2	.92	5.1	123	.45
11	110	e.70	e.80	e.67	e.90	e13	9.0	2.1	.88	5.5	121	.39
12	109	e.70	e.80	e.67	e.90	e13	10	2.0	.81	6.2	121	.38
13	105	e.72	e.80	e.66	e.90	e12	11	1.7	.76	6.6	119	.36
14	102	e.76	e.80	e.66	e.90	e12	9.1	1.9	e.72	6.7	119	e.33
15	99	e.78	e.79	e.65	e.90	11	10	2.0	e.69	6.5	122	e.31
16	98	e.80	e.79	e.65	e.90	11	10	2.1	9.1	6.1	121	e.28
17	99	e.84	e.79	e.64	e.90	10	9.4	2.9	25	5.6	116	e.26
18	56	e.88	e.79	e.64	e.90	7.8	10	3.2	27	4.9	114	e.24
19	1.1	e.92	e.79	e.63	e.90	8.5	15	2.8	26	4.5	112	e.22
20	.74	e.98	e.78	e.63	e.90	6.7	16	2.4	22	4.1	110	e.20
21	.74	e1.0	e.78	e.63	e.90	6.1	15	2.1	16	3.7	110	e.19
22	.74	e1.1	e.78	e.62	e.90	5.8	14	2.0	11	3.3	105	e.17
23	.74	e1.1	e.77	e.62	e.90	6.2	14	2.3	9.1	3.1	104	e.16
24	.73	e1.0	e.76	e.62	e.90	6.2	15	2.3	7.8	2.8	77	e.15
25	.71	e.94	e.76	e.61	e.90	6.8	15	2.2	7.0	2.5	2.1	e.14
26	.71	e.90	e.75	e.60	e1.4	6.4	14	2.1	6.3	2.3	.18	e.13
27	.71	e.88	e.75	e.60	e4.0	7.6	12	1.9	5.7	50	e.15	e.12
28	.74	e.84	e.74	e.60	e5.0	9.8	11	1.7	5.2	120	e.11	e.11
29	.86	e.82	e.74	e.59	e9.0	7.1	10	1.4	4.6	130	e.13	.10
30	.88	e.80	e.73	e.59	---	8.0	9.2	1.2	4.8	132	e.15	.05
31	.88	---	e.73	e.59	---	6.9	---	1.0	---	131	e.19	---
TOTAL	1812.28	24.90	24.22	20.16	39.99	276.7	310.8	90.8	199.10	694.6	2863.01	7.17
MEAN	58.5	.83	.78	.65	1.38	8.93	10.4	2.93	6.64	22.4	92.4	.24
MAX	110	1.1	.80	.72	9.0	14	16	8.8	27	132	138	.51
MIN	.71	.70	.73	.59	.59	5.8	5.7	1.0	.69	2.3	.11	.05
AC-FT	3590	49	48	40	79	549	616	180	395	1380	5680	14
CFSM	.05	.00	.00	.00	.00	.01	.01	.00	.01	.02	.08	.00
IN .	.06	.00	.00	.00	.00	.01	.01	.00	.01	.02	.09	.00

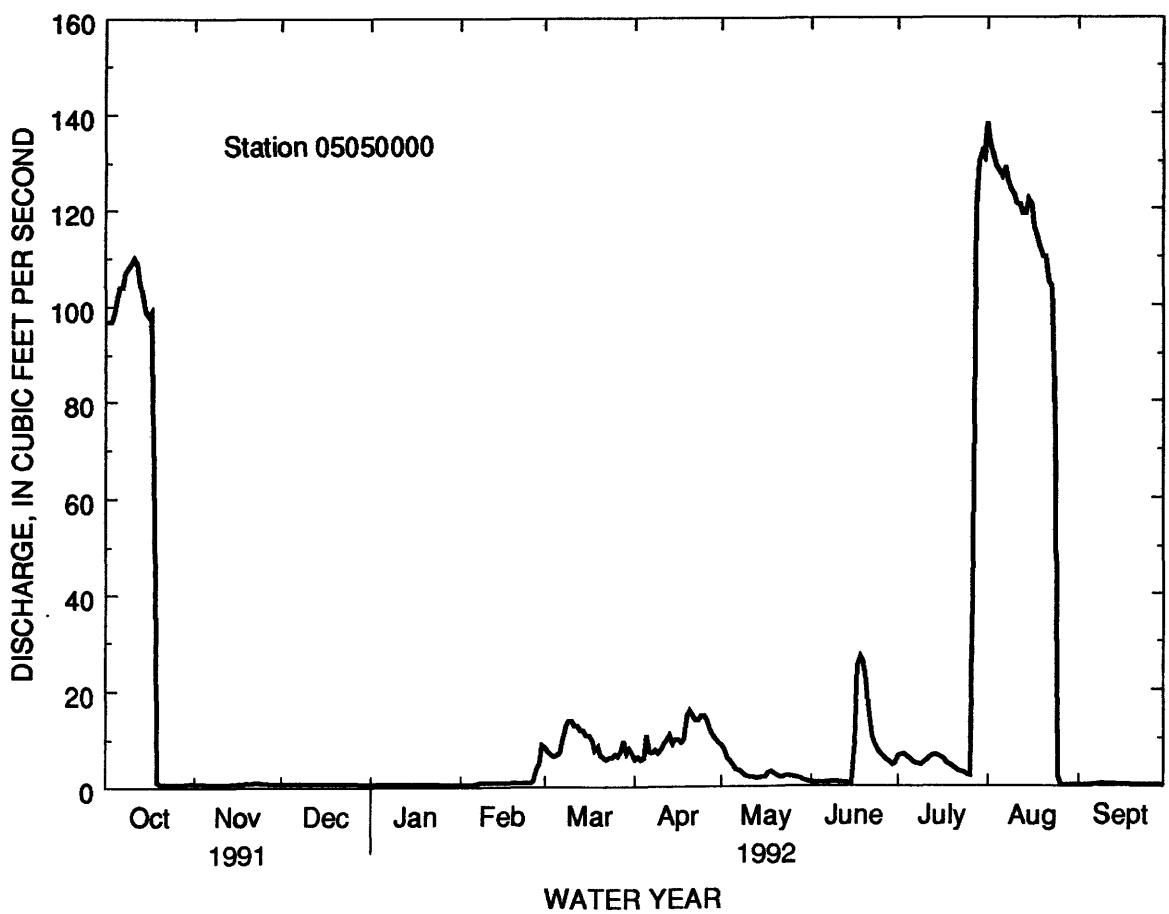
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	16.3	11.8	4.84	2.47	3.22	24.5	191	244	230	146	51.9	17.5
MAX	363	258	57.5	36.0	53.0	227	1322	1310	1103	1035	1130	260
(WY	1987	1985	1985	1987	1966	1985	1969	1969	1986	1962	1962	1962
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1942 - 1992	
ANNUAL TOTAL	25098.53		6363.73			
ANNUAL MEAN	68.8		17.4		78.8a	
HIGHEST ANNUAL MEAN					329	1986
LOWEST ANNUAL MEAN					.38	1977
HIGHEST DAILY MEAN	679	Jul 7	138	Aug 1	3380	Apr 20 1969
LOWEST DAILY MEAN	.40	Jan 16-31	.05	Sep 30	.00	Many days
ANNUAL SEVEN-DAY MINIMUM	.40	Jan 16	.11	Sep 24	.00	Oct 1 1941
INSTANTANEOUS PEAK FLOW			139	Aug 1	3770b	
INSTANTANEOUS PEAK STAGE			7.17	Aug 1	15.07bc	
ANNUAL RUNOFF (AC-FT)	49780		12620		57110	
ANNUAL RUNOFF (CFSM)	.059		.015		.068	
ANNUAL RUNOFF (INCHES)	.80		.20		.92	
10 PERCENT EXCEEDS	227		102		228	
50 PERCENT EXCEEDS	6.1		1.3		1.7	
90 PERCENT EXCEEDS	.48		.57		.00	

a Median of annual mean discharges is 53 ft³/s.
b Occurred during period Apr. 19-21, 1969.
c 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 poor. 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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

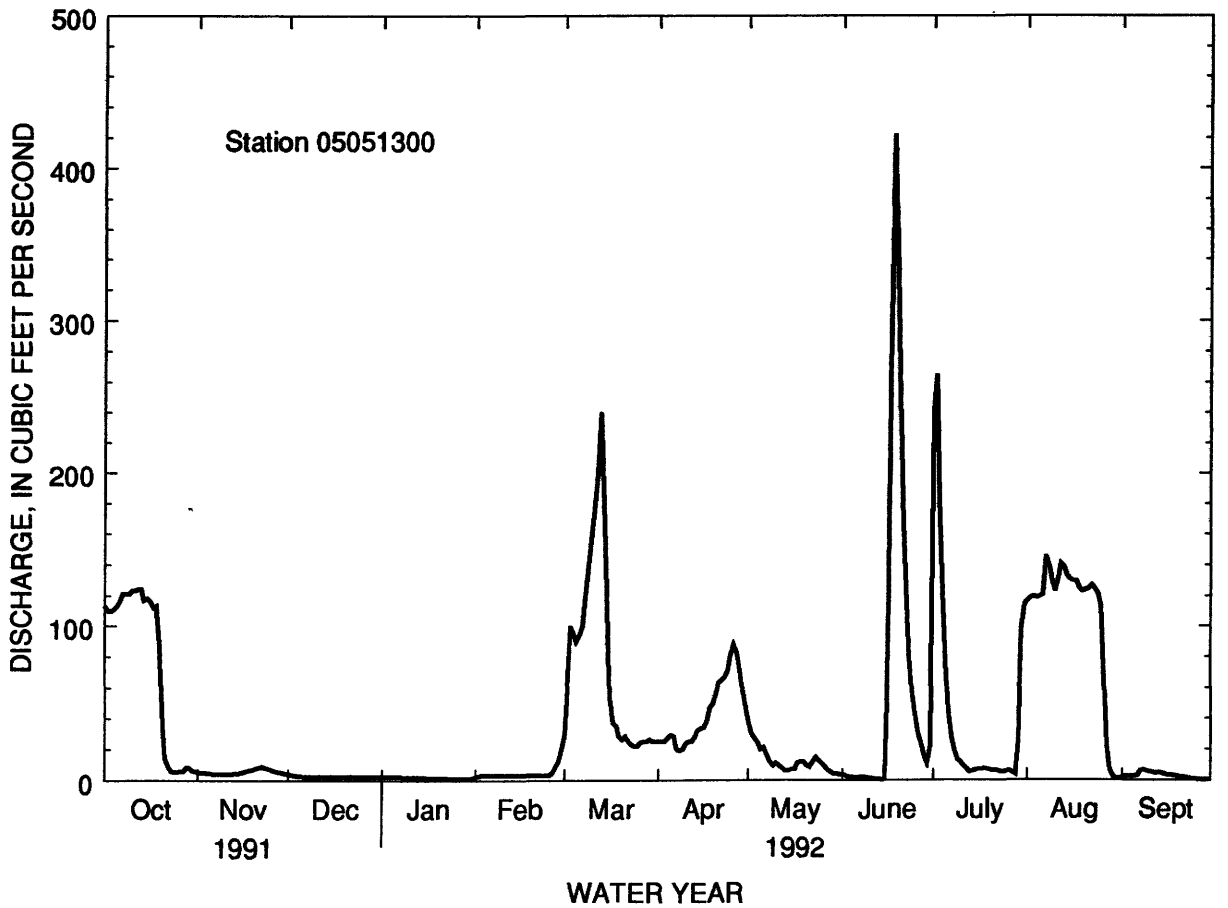
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	113	e5.3	e4.1	e2.2	e2.2	e30	25	38	3.7	241	117	1.5
2	110	e5.0	e3.7	e2.2	e2.7	e60	25	30	2.7	265	119	2.4
3	110	e4.7	e3.3	e2.2	e3.0	e100	25	27	2.0	183	120	2.4
4	111	e4.5	e2.9	e2.2	e3.0	e95	27	24	2.1	122	119	2.3
5	113	e4.3	e2.6	e2.2	e3.0	e90	29	20	1.5	76	120	2.5
6	117	e4.0	e2.4	e2.2	e3.0	e94	28	21	1.4	45	121	3.1
7	121	e4.0	e2.3	e2.2	e3.0	e100	20	16	1.9	28	146	6.2
8	121	e4.0	e2.3	e2.1	e3.0	e120	19	12	1.7	19	140	6.4
9	121	e4.0	e2.2	e2.1	e3.0	e140	20	9.5	1.4	13	131	5.9
10	123	e4.0	e2.2	e2.0	e3.0	e160	23	11	1.2	12	123	5.2
11	123	e4.0	e2.2	e1.9	e3.0	e180	25	9.3	1.0	9.5	132	4.7
12	124	e4.0	e2.2	e1.9	e3.0	e200	25	7.7	.78	7.2	141	4.6
13	124	e4.2	e2.2	e1.8	e3.0	e240	28	6.0	.67	5.3	139	4.8
14	117	e4.6	e2.2	e1.8	e3.0	e180	32	6.2	.42	5.9	133	4.5
15	118	e4.9	e2.2	e1.7	e3.0	e110	33	6.7	.71	6.6	131	3.7
16	116	e5.4	e2.2	e1.6	e3.0	53	34	7.1	86	7.0	130	3.2
17	112	e6.0	e2.2	e1.6	e3.0	37	39	11	299	6.9	130	3.0
18	113	e6.5	e2.2	e1.5	e3.0	35	47	12	422	7.2	125	2.8
19	88	e7.1	e2.2	e1.5	e3.0	28	50	12	351	7.1	123	2.5
20	35	e7.7	e2.2	e1.5	e3.0	26	57	9.4	250	6.3	124	2.1
21	14	e8.4	e2.2	e1.4	e3.0	28	63	8.5	167	6.0	125	1.8
22	9.2	e9.0	e2.2	e1.4	e3.0	25	65	12	115	6.0	127	1.5
23	5.7	e8.4	e2.2	e1.3	e3.0	23	67	15	79	5.4	125	1.3
24	5.4	e7.6	e2.2	e1.3	e3.0	22	71	13	55	5.2	122	.87
25	5.2	e7.0	e2.2	e1.2	e3.0	22	81	11	40	5.7	113	.50
26	5.6	e6.2	e2.2	e1.2	e5.0	24	88	8.9	30	6.1	63	.43
27	5.9	e5.6	e2.2	e1.1	e8.0	25	83	7.1	23	5.0	22	.42
28	8.2	e5.2	e2.2	e1.1	e12	25	74	5.2	15	3.8	6.5	.32
29	8.0	e4.8	e2.2	e1.1	e20	26	59	4.1	11	25	2.4	.26
30	e6.0	e4.6	e2.2	e1.2	---	25	47	3.9	22	100	1.1	.23
31	e5.7	---	e2.2	e1.6	---	25	---	3.7	---	115	1.2	---
TOTAL	2308.9	165.0	74.2	52.3	118.9	2348	1309	388.3	1988.18	1356.2	3272.2	81.43
MEAN	74.5	5.50	2.39	1.69	4.10	75.7	43.6	12.5	66.3	43.7	106	2.71
MAX	124	9.0	4.1	2.2	20	240	88	38	422	265	146	6.4
MIN	5.2	4.0	2.2	1.1	2.2	22	19	3.7	.42	3.8	1.1	.23
AC-FT	4580	327	147	104	236	4660	2600	770	3940	2690	6490	162
CFSM	.04	.00	.00	.00	.00	.04	.02	.01	.04	.02	.06	.00
IN.	.05	.00	.00	.00	.00	.05	.03	.01	.04	.03	.06	.00

e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1990 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	31.6	5.33	3.84	.65	1.45	56.4	36.7	35.1	148	333	67.8	141
MAX	74.5	8.54	8.48	1.69	4.10	75.7	53.9	81.0	364	951	106	422
(WY)	1992	1990	1990	1992	1992	1992	1991	1991	1991	1991	1992	1991
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1990 - 1992	
ANNUAL TOTAL	64873.16		13462.61			
ANNUAL MEAN	178		36.8		72.2	
HIGHEST ANNUAL MEAN					171	1991
LOWEST ANNUAL MEAN					8.77	1990
HIGHEST DAILY MEAN	2860	Jul 2	422	Jun 18	2860	July 2 1991
LOWEST DAILY MEAN	.00	Jan 20-31	.23	Sep 30	.00	Many days
ANNUAL SEVEN-DAY MINIMUM	.00	Jan 20	.43	Sep 24	.00	Jan 7 1990
INSTANTANEOUS PEAK FLOW			436	Jun 18	2980	July 2 1991
INSTANTANEOUS PEAK STAGE			10.58	Jun 18	17.89	July 2 1991
ANNUAL RUNOFF (AC-FT)	128700		26700		52260	
ANNUAL RUNOFF (CFSM)	.095		.020		.038	
ANNUAL RUNOFF (INCHES	1.28		.27		.52	
10 PERCENT EXCEEDS	541		122		130	
50 PERCENT EXCEEDS	25		6.5		6.1	
90 PERCENT EXCEEDS	.15		1.6		.00	



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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	505	e90	e96	e220	e210	e280	392	526	379	582	403	223
2	361	e70	e93	e220	e210	e300	400	509	402	672	394	262
3	340	e90	e90	e220	e210	e350	397	514	454	632	394	280
4	329	e130	e95	e225	e220	e400	397	512	422	564	386	309
5	316	e160	e105	e230	e220	e500	400	484	300	513	369	313
6	342	e200	e115	e230	e230	e700	395	430	290	475	353	321
7	353	185	e120	e215	e235	e1100	401	398	333	426	501	369
8	347	152	e120	e200	e220	e1900	373	345	345	357	689	350
9	333	122	e125	e190	e215	e1600	408	309	345	315	682	314
10	333	111	e140	e180	e210	985	448	315	341	306	710	288
11	371	106	e125	e170	e210	909	481	328	387	331	661	309
12	406	106	e120	e160	e210	998	536	400	427	380	552	312
13	410	120	e110	e150	e210	755	544	511	318	386	522	308
14	409	230	e100	e140	e210	547	493	477	297	382	506	308
15	409	244	e95	e130	e210	408	403	431	346	376	496	309
16	381	178	e105	e125	e210	392	405	409	580	388	490	309
17	320	206	e110	e120	e210	409	498	407	731	399	489	311
18	309	222	e115	e120	e230	434	498	395	784	376	458	307
19	306	232	e120	e125	e240	381	465	384	744	365	400	309
20	257	254	e125	e130	e250	339	457	382	656	366	385	302
21	201	e230	e130	e135	e250	356	532	378	589	364	389	303
22	170	e210	e135	e140	e250	396	613	428	532	361	389	286
23	149	e190	e140	e150	e245	400	619	421	495	359	387	245
24	146	e170	e160	e170	e240	407	621	371	467	350	387	226
25	151	e160	e170	e185	e235	428	634	363	448	350	391	216
26	178	e220	e190	e205	e240	410	642	357	438	335	360	222
27	183	e190	e210	e215	e245	368	638	410	427	353	300	244
28	190	e150	e220	e230	e255	360	607	534	416	337	248	250
29	192	e120	e230	e220	e260	353	564	546	413	316	240	238
30	145	e105	e220	e210	---	357	541	491	419	333	224	194
31	e130	---	e220	e210	---	363	---	400	---	395	221	---
TOTAL	8972	4953	4249	5570	6590	17885	14802	13165	13525	12444	13376	8537
MEAN	289	165	137	180	227	577	493	425	451	401	431	285
MAX	505	254	230	230	260	1900	642	546	784	672	710	369
MIN	130	70	90	120	210	280	373	309	290	306	221	194
AC-FT	17800	9820	8430	11050	13070	35470	29360	26110	26830	24680	26530	16930

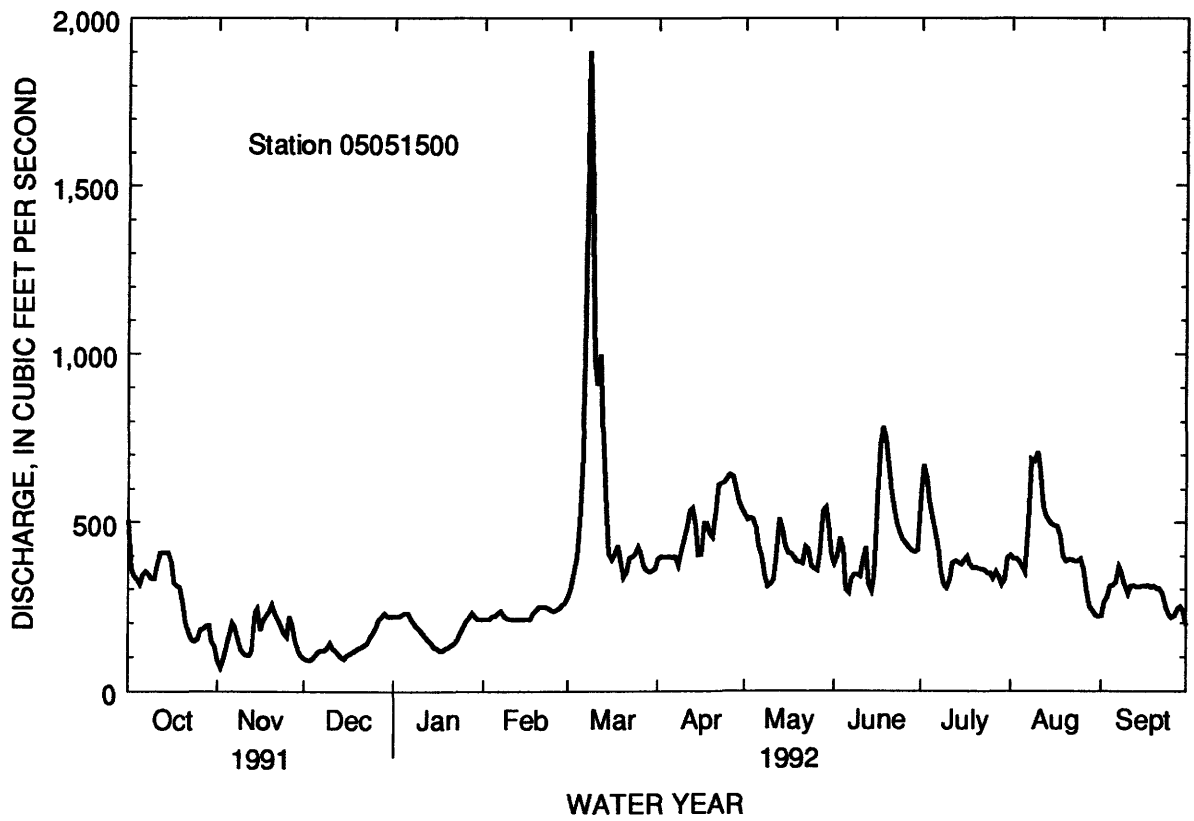
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	297	287	266	253	262	570	1188	996	1010	721	374	298
MAX	1247	952	820	678	687	1679	4436	3085	2675	2756	1983	1434
(WY)	1987	1987	1987	1986	1987	1986	1969	1986	1962	1962	1962	1986
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	1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1942-1992	
ANNUAL TOTAL	188518		124068			
ANNUAL MEAN	516		339		538	
HIGHEST ANNUAL MEAN					1477	1986
LOWEST ANNUAL MEAN					54.0	1977
HIGHEST DAILY MEAN	2960	Jul 3	1900	Mar 8	8940	Apr 10 1969
LOWEST DAILY MEAN	66	Jan 1	70	Nov 2	1.7	Aug 28 1976
ANNUAL SEVEN-DAY MINIMUM	75	Jan 22	100	Nov 30	1.7	Aug 28 1976
INSTANTANEOUS PEAK FLOW			2000a	Mar 8	9200	Apr 10 1969
INSTANTANEOUS PEAK STAGE			8.46b	Mar 8	17.95	Apr 5 1989
ANNUAL RUNOFF (AC-FT)	373900		246100		389600	
10 PERCENT EXCEEDS	1120		535		1220	
50 PERCENT EXCEEDS	393		330		350	
90 PERCENT EXCEEDS	90		130		100	

a About.
b Backwater from ice.



RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY RECORDS

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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											
10...	0850	334	783	--	8.5	9.0	--	--	--	--	--
NOV											
21...	0945	232	664	--	2.5	1.0	--	--	--	--	--
JAN											
08...	1445	200	684	--	-8.0	0.0	--	--	--	--	--
MAR											
19...	0915	416	612	7.6	-1.5	0.5	280	220	54	35	16
APR											
07...	0920	399	487	--	1.5	2.5	--	--	--	--	--
MAY											
14...	1315	501	477	--	16.0	16.5	--	--	--	--	--
AUG											
a06...	1100	360	863	8.4	16.5	21.5	390	--	70	51	33
SEP											
30...	1500	184	627	--	22.5	16.5	--	--	--	--	--

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, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)
MAR											
19...	11	0.4	7.7	85	16	0.20	15	379	363	0.52	426
AUG											
a06...	15	0.7	8.1	230	19	0.20	13	601	563	0.82	584

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)
MAR										
19...	3	50	30	<1	20	50	<0.1	5	1	360
AUG										
a06...	3	90	20	1	50	50	0.1	<1	<1	400

a Replicate sample also collected for quality-assurance purposes.

Bois de Sioux River at Wahpeton - Breckenridge

May 1992

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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	591	151	e110	224	229	414	418	651	466	425	336	258
2	561	73	e115	224	229	438	432	602	392	474	393	259
3	430	45	e115	222	229	487	460	565	374	640	393	261
4	360	65	e115	224	229	549	467	549	415	684	382	282
5	340	96	e115	231	229	632	462	549	439	627	383	309
6	322	128	e120	231	229	e750	462	546	360	556	384	330
7	325	209	e125	238	229	e1000	461	510	284	505	411	354
8	348	231	e130	e225	229	e1200	460	466	286	467	487	377
9	356	192	e135	e220	e220	e1400	447	429	317	408	652	394
10	350	158	e140	e210	e210	e1700	446	360	326	348	761	381
11	345	133	e140	e190	e200	e1600	502	342	327	309	788	342
12	348	117	e140	e180	e190	1190	532	341	323	300	819	325
13	374	107	e135	e170	e185	941	594	356	380	332	756	334
14	397	106	e130	e160	e180	930	630	467	375	368	677	333
15	404	111	e130	e150	e185	806	593	533	315	373	631	330
16	406	172	e130	e140	e190	683	507	491	540	369	602	324
17	404	205	e130	e140	e195	571	435	444	972	364	578	324
18	366	191	e130	e135	e200	544	488	417	1140	376	563	320
19	328	e185	e135	e130	e210	567	558	409	1100	374	546	326
20	319	e175	e135	e130	e220	591	543	404	1020	357	489	326
21	310	e170	e140	e125	238	566	523	395	896	349	444	321
22	263	e160	e150	e130	275	527	537	390	810	350	433	314
23	214	e150	e155	e135	282	557	632	401	723	346	445	310
24	182	e140	e155	e140	287	626	700	431	642	341	447	304
25	165	e135	e160	e150	295	634	711	421	582	348	429	282
26	159	e125	164	e160	297	586	726	392	532	345	425	264
27	170	e120	203	e175	304	525	742	387	490	338	424	244
28	199	e120	222	e190	324	466	755	390	461	334	389	240
29	212	e115	224	e200	365	446	747	477	431	331	339	256
30	212	e110	224	e210	---	434	699	556	411	274	297	262
31	194	---	224	e220	---	418	---	557	---	250	270	---
TOTAL	9954	4195	4576	5609	6884	22778	16669	14228	16129	12262	15373	9286
MEAN	321	140	148	181	237	735	556	459	538	396	496	310
MAX	591	231	224	238	365	1700	755	651	1140	684	819	394
MIN	159	45	110	125	180	414	418	341	284	250	270	240
AC-FT	19740	8320	9080	11130	13650	45180	33060	28220	31990	24320	30490	18420

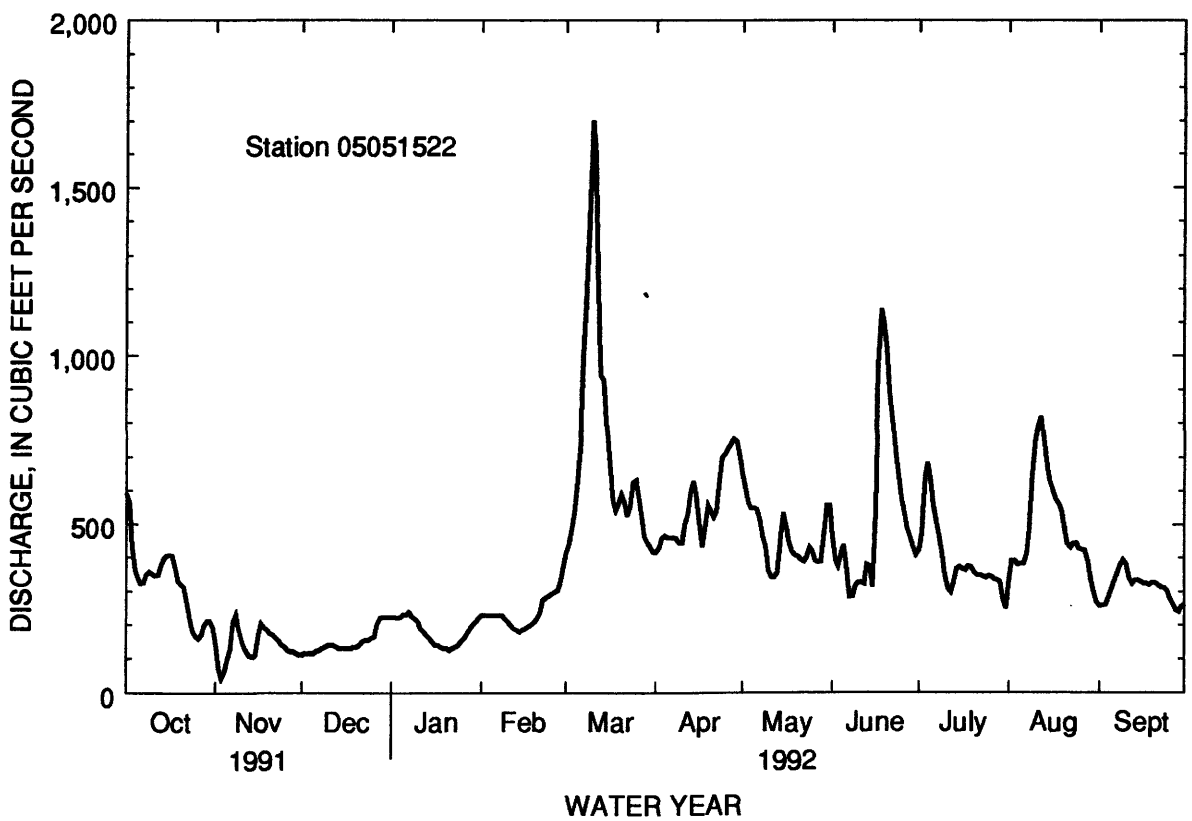
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1975 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	329	287	264	252	285	706	1564	928	885	680	379	354
MAX	1312	900	817	747	745	1543	4165	3394	2485	1784	1073	1496
(WY)	1987	1987	1986	1986	1987	1986	1978	1986	1986	1986	1985	1986
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	1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1975 - 1992	
ANNUAL TOTAL	200729		137943			
ANNUAL MEAN	550		377		576	
HIGHEST ANNUAL MEAN					1604	1986
LOWEST ANNUAL MEAN					53.1	1977
HIGHEST DAILY MEAN	2800	Jul 5	1700	Mar 10	12000	Apr 7 1989
LOWEST DAILY MEAN	45	Nov 3	45	Nov 3	.00	Oct 26 1976
ANNUAL SEVEN-DAY MINIMUM	59	Jan 20	107	Oct 31	.00	Oct 26 1976
INSTANTANEOUS PEAK FLOW			1750a	Mar 10	12900	Apr 7 1989
INSTANTANEOUS PEAK STAGE			13.62b	Mar 10	35.81	Apr 7 1989
ANNUAL RUNOFF (AC-FT)	398100		273600		417400	
10 PERCENT EXCEEDS	1200		633		1220	
50 PERCENT EXCEEDS	404		342		337	
90 PERCENT EXCEEDS	75		135		72	

a About.
b Backwater.



RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY RECORDS

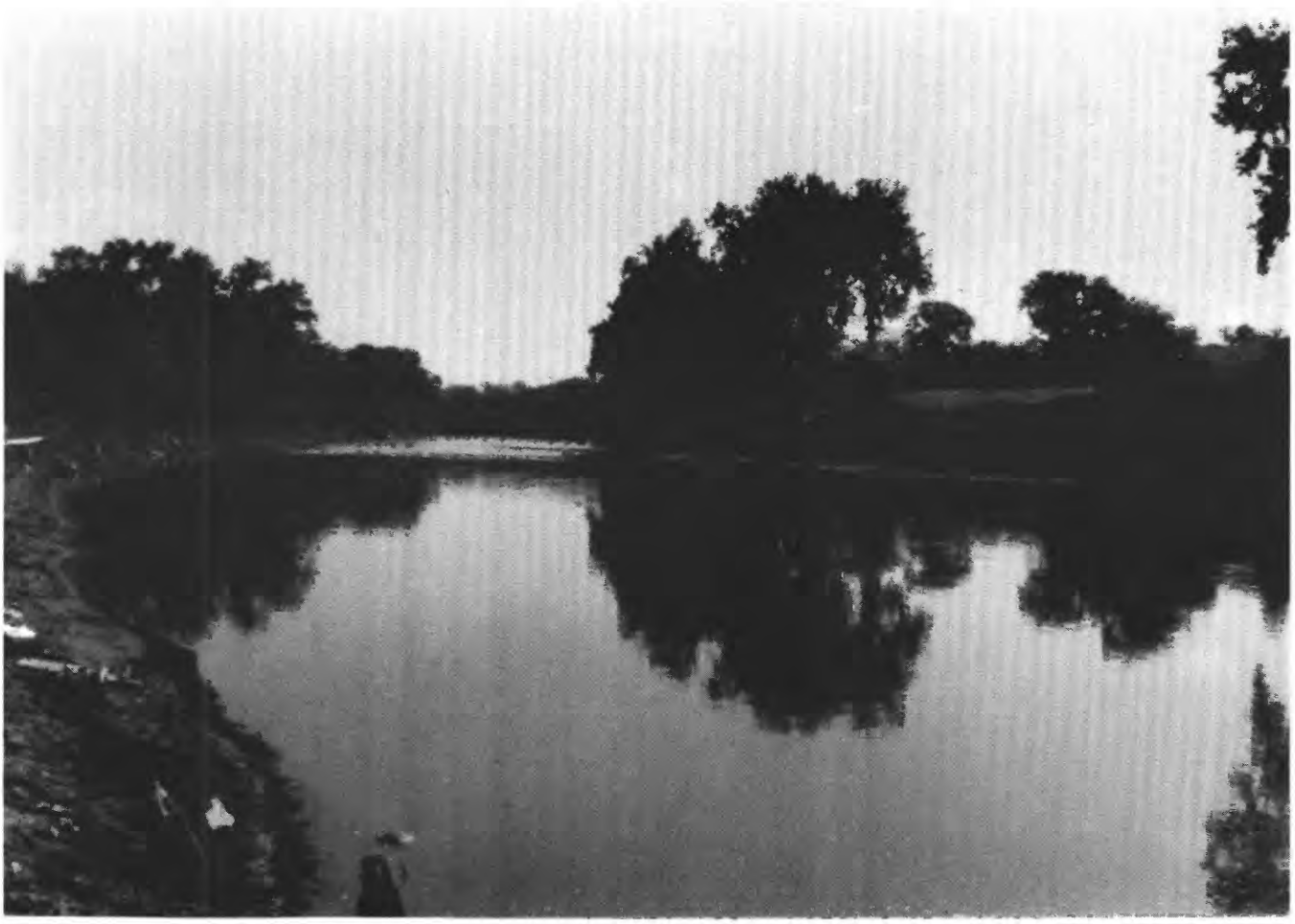
PERIOD OF RECORD.--Water years 1976 to current year.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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											
10...	1250	348	726	--	9.5	9.5	--	--	--	--	--
JAN											
08...	0845	223	701	--	-6.5	0.0	--	--	--	--	--
MAR											
25...	0930	605	542	8.0	-4.0	1.0	260	210	50	32	15
APR											
07...	1230	460	512	--	3.5	2.5	--	--	--	--	--
MAY											
15...	0740	537	529	--	12.5	13.0	--	--	--	--	--
JUN											
22...	1315	840	438	--	19.5	17.5	--	--	--	--	--
AUG											
05...	0845	383	890	8.5	21.0	21.0	390	290	71	52	39

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, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L) (70301)	SOLIDS, DIS-SOLVED (TONS PER AC-FT) (70303)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70302)
MAR											
25...	11	0.4	6.7	65	15	0.20	14	306	324	0.42	500
AUG											
05...	17	0.9	21	200	28	0.20	12	614	598	0.84	635

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)
MAR										
25...	3	80	30	1	20	30	<0.1	1	<1	240
AUG										
05...	4	80	20	<1	50	<10	0.1	<1	<1	370



Red River of the North at Grand Forks

June 1992

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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

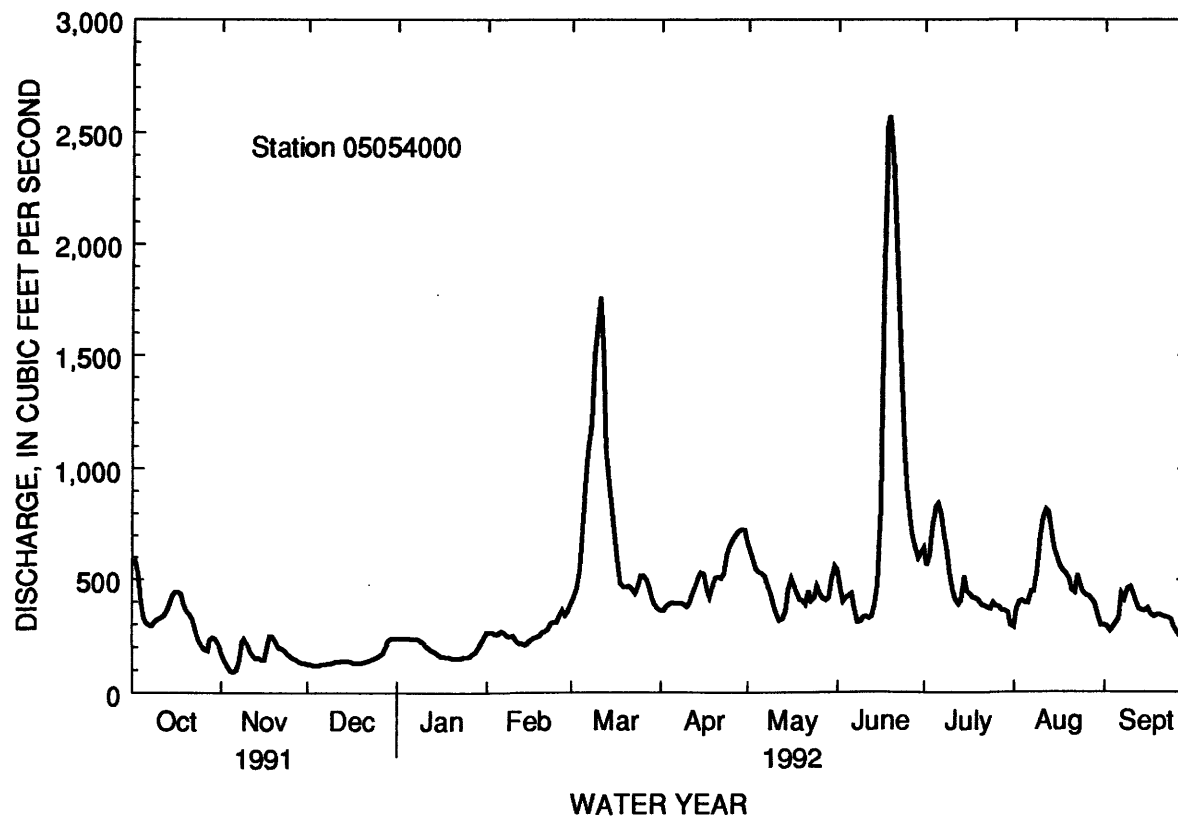
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	577	e170	e125	239	265	394	363	670	542	645	290	295
2	583	e140	e125	239	266	420	363	625	455	565	367	292
3	528	e120	e120	239	266	460	382	589	403	615	402	273
4	395	e95	e120	239	256	553	393	547	420	738	409	289
5	328	e90	e120	239	258	733	398	532	425	828	396	309
6	306	e100	e125	237	272	966	397	529	436	844	397	326
7	295	e130	124	e235	265	e1100	396	514	368	794	447	435
8	293	219	127	e235	250	e1200	396	474	310	706	448	414
9	311	235	128	e230	248	e1500	393	435	311	628	539	459
10	322	213	134	e220	e250	e1650	382	390	330	530	700	468
11	328	185	135	e205	e230	1760	397	345	337	453	780	438
12	337	161	135	e195	e215	1500	441	319	328	413	818	395
13	356	151	140	e185	e215	1090	467	326	335	394	807	371
14	388	154	e140	e180	e210	940	509	359	393	411	712	364
15	426	145	e140	e170	e220	836	533	453	474	515	640	362
16	442	144	e135	e160	e230	699	529	505	828	451	597	375
17	442	196	e130	e160	e240	568	455	474	1760	436	560	346
18	433	247	e130	e155	e245	483	426	435	2520	422	539	337
19	387	249	e130	e155	e250	466	477	411	2570	418	527	342
20	355	225	e130	e150	e265	466	510	404	2390	408	503	344
21	345	200	e135	e150	272	471	514	390	2120	392	454	339
22	320	e195	e140	e150	279	460	507	448	1810	384	441	334
23	268	e185	e145	e150	304	440	531	405	1500	379	522	332
24	233	e170	e150	e155	311	464	613	420	1170	374	467	322
25	206	e160	e155	e155	311	519	657	470	943	400	442	290
26	190	e150	e165	e160	339	518	680	434	805	385	429	264
27	184	e145	173	e170	363	502	705	415	707	381	425	247
28	231	e135	201	e180	342	470	720	406	647	365	408	231
29	243	e130	226	e200	360	416	728	419	598	366	391	238
30	237	e130	239	e220	---	392	723	503	619	355	333	241
31	e210	---	239	e240	---	372	---	558	---	298	295	---
TOTAL	10499	4969	4561	5997	7797	22808	14985	14204	26854	15293	15485	10072
MEAN	339	166	147	193	269	736	499	458	895	493	500	336
MAX	583	249	239	240	363	1760	728	670	2570	844	818	468
MIN	184	90	120	150	210	372	363	319	310	298	290	231
AC-FT	20820	9860	9050	11900	15470	45240	29720	28170	53260	30330	30710	19980
(+)	1257	1120	1152	1175	1100	1160	1114	1482	1458	1402	754	270
AC-FT*	22080	10980	10200	13080	16570	46400	30830	29650	54780	31730	31460	20250

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1901 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	291	261	217	198	196	637	1637	971	990	792	375	295
MAX	1435	942	800	740	778	3756	9924	4589	5122	5692	2691	1707
(WY)	1987	1907	1987	1986	1987	1966	1969	1986	1962	1962	1962	1986
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	1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1901 - 1992	
ANNUAL TOTAL	206563		153524			
ANNUAL MEAN	566	(*579)	419	(*438)	573	
HIGHEST ANNUAL MEAN					1928	1986
LOWEST ANNUAL MEAN					17.5	1934
HIGHEST DAILY MEAN	2600	Jul 6	2570	Jun 19	24800	Apr 14 1969
LOWEST DAILY MEAN	65	Jan 1	90	Nov 5	.00	Jul 25 1932
ANNUAL SEVEN-DAY MINIMUM	66	Jan 1	121	Nov 1	.00	Jul 25 1932
INSTANTANEOUS PEAK FLOW			2590	Jun 19	25300	Apr 15 1969
INSTANTANEOUS PEAK STAGE			16.93	Jun 19	37.34	Apr 15 1969
INSTANTANEOUS LOW FLOW					.00	Jul 25 1932
ANNUAL RUNOFF (AC-FT)	409700(*418,780)		304500	(*318,020)	414900	
10 PERCENT EXCEEDS	1330		701		1240	
50 PERCENT EXCEEDS	385		366		290	
90 PERCENT EXCEEDS	83		150		37	

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



RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY RECORDS

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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											
11...	1050	317	823	--	11.5	9.0	--	--	--	--	--
NOV											
20...	1340	227	658	--	8.5	1.5	--	--	--	--	--
JAN											
06...	1310	237	640	--	-5.0	0.0	--	--	--	--	--
MAR											
a18...	0815	481	608	7.4	-4.5	0.5	270	200	55	33	19
APR											
09...	0900	398	517	--	-5.0	2.5	--	--	--	--	--
JUN											
22...	1145	1820	421	--	20.0	18.5	--	--	--	--	--
AUG											
05...	1105	414	487	8.4	26.0	24.0	240	220	44	31	14

DATE	SODIUM PERCENT (00932)	SODIUM AD-SORP-TION RATIO AS K) (00931)	POTAS-SIUM, DIS-SOLVED (MG/L AS SO4) (00935)	SULFATE DIS-SOLVED (MG/L AS CL) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS F) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L SIO2) (00950)	SILICA, DIS-SOLVED (MG/L AS (MG/L) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED AC-FT) (70301)	SOLIDS, DIS-SOLVED (TONS PER DAY) (70303)	SOLIDS, DIS-SOLVED (TONS PER (70302)
MAR											
a18...	13	0.5	8.4	96	18	0.20	15	391	364	0.53	508
AUG											
05...	11	0.4	4.5	36	13	0.20	13	311	289	0.42	348

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)
MAR										
a18...	5	50	180	<1	20	50	<0.1	1	<1	380
AUG										
05...	3	30	10	<1	20	10	0.1	<1	<1	230

a Replicate sample also collected for quality-assurance purposes.

Red River of the North at Fargo

Time of Travel and Reaeration Study

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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

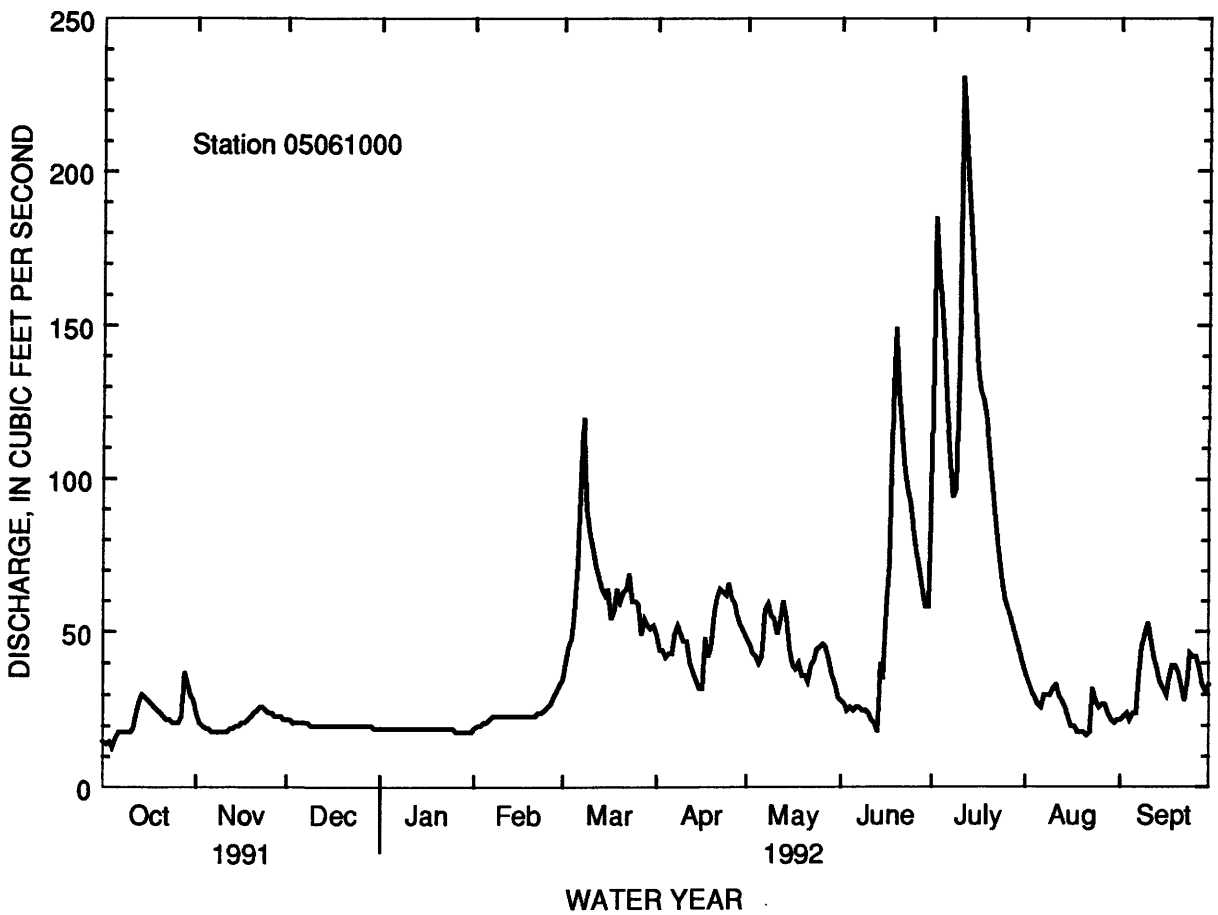
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15	24	e22	e19	e19	e35	49	48	28	107	37	22
2	14	e21	e22	e19	e20	e40	44	46	27	185	34	23
3	15	e20	e21	e19	e20	45	44	43	25	169	31	24
4	13	e19	e21	e19	e21	48	42	42	26	157	29	22
5	16	e19	e21	e19	e21	e56	43	40	25	141	27	24
6	18	e18	e21	e19	e22	e72	43	42	26	123	26	24
7	18	e18	e21	e19	e23	e100	49	57	26	107	30	35
8	18	e18	e21	e19	e23	e120	52	59	25	94	30	45
9	18	e18	e20	e19	e23	e90	49	55	25	97	30	49
10	18	e18	e20	e19	e23	e82	47	54	24	137	32	53
11	19	e18	e20	e19	e23	e77	47	49	22	231	33	48
12	24	e19	e20	e19	e23	e72	40	54	21	210	30	42
13	28	e19	e20	e19	e23	e68	37	60	18	195	28	38
14	30	e20	e20	e19	e23	e64	35	54	40	177	26	34
15	29	e20	e20	e19	e23	62	32	44	35	156	23	32
16	28	e21	e20	e19	e23	64	32	39	57	136	20	30
17	27	e21	e20	e19	e23	54	48	38	72	129	20	35
18	26	e22	e20	e19	e23	57	42	40	123	126	18	39
19	25	e23	e20	e19	e23	64	45	36	149	119	18	39
20	24	e24	e20	e19	e23	60	56	36	128	108	18	37
21	23	e25	e20	e19	e23	63	61	34	115	97	17	33
22	22	e26	e20	e19	e24	64	64	39	103	87	18	28
23	22	e26	e20	e19	e24	69	63	41	97	77	32	34
24	21	e25	e20	e19	e25	60	62	44	92	68	28	43
25	21	e24	e20	e19	e26	60	66	45	82	61	26	42
26	21	e24	e20	e18	e27	59	61	46	76	58	27	42
27	23	e23	e20	e18	e29	49	59	45	70	55	27	38
28	37	e23	e20	e18	e31	54	55	41	63	51	24	33
29	34	e23	e20	e18	e33	52	52	36	58	48	22	31
30	30	e22	e19	e18	---	51	50	33	58	44	21	33
31	28	---	e19	e18	---	52	---	29	---	40	22	---
TOTAL	705	641	628	583	687	1963	1469	1369	1736	3590	804	1052
MEAN	22.7	21.4	20.3	18.8	23.7	63.3	49.0	44.2	57.9	116	25.9	35.1
MAX	37	26	22	19	33	120	66	60	149	231	37	53
MIN	13	18	19	18	19	35	32	29	18	40	17	22
AC-FT	1400	1270	1250	1160	1360	3890	2910	2720	3440	7120	1590	2090
CFSM	.07	.07	.06	.06	.07	.20	.15	.14	.18	.36	.08	.11
IN.	.08	.07	.07	.07	.08	.23	.17	.16	.20	.41	.09	.12

e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	36.5	33.9	23.6	19.9	20.7	80.4	251	124	97.3	84.4	43.9	35.8
MAX	151	176	63.8	54.7	99.6	434	792	372	530	625	472	182
(WY)	1974	1972	1972	1981	1981	1966	1978	1985	1962	1975	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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1945 - 1992	
ANNUAL TOTAL	15433		15227			
ANNUAL MEAN	42.3		41.6		70.4	
HIGHEST ANNUAL MEAN					157	1975
LOWEST ANNUAL MEAN					16.7	1977
HIGHEST DAILY MEAN	246	May 6	231	Jul 11	1970	Jul 1 1975
LOWEST DAILY MEAN	10	Aug 22	13	Oct 4	3.2	Aug 25 1976
ANNUAL SEVEN-DAY MINIMUM	11	Aug 17	16	Oct 1	4.3	Aug 22 1976
INSTANTANEOUS PEAK FLOW			237	Jul 11	2050	Jul 1 1975
INSTANTANEOUS PEAK STAGE			5.66	Jul 11	9.76	Jul 1 1975
INSTANTANEOUS LOW FLOW			12	Oct 4	2.8	Aug 26 1977
ANNUAL RUNOFF (AC-FT)	30610		30200		51000	
ANNUAL RUNOFF (CFSM)	.13		.13		.22	
ANNUAL RUNOFF (INCHES)	1.78		1.76		2.97	
10 PERCENT EXCEEDS	102		76		166	
50 PERCENT EXCEEDS	21		28		30	
90 PERCENT EXCEEDS	13		19		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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.8	19	e9.4	e4.9	e4.9	e15	34	51	e27	e20	e10	e5.4
2	5.6	e18	e9.1	e4.9	e5.0	e20	32	46	e24	e32	e9.7	e5.4
3	5.4	e16	e8.8	e4.9	e5.1	e25	31	41	e21	e60	e9.4	e5.4
4	5.6	e15	e8.5	e4.9	e5.2	e38	32	38	e18	e80	e9.0	e5.4
5	6.0	e14	e8.2	e4.9	e5.2	e58	33	31	e15	e76	e8.4	e5.6
6	6.2	e12	e7.9	e4.9	e5.2	e80	32	23	e13	e60	e8.0	e5.8
7	6.7	e11	e7.7	e4.9	e5.2	e120	29	e20	e11	e45	e8.0	e6.0
8	7.4	e9.8	e7.4	e4.9	e5.2	e170	30	e19	e9.2	e30	e8.1	e6.6
9	7.9	e9.0	e7.1	e4.9	e5.2	e230	35	e20	e8.1	e20	e8.2	e7.4
10	8.7	e8.4	e6.8	e4.9	e5.2	e250	42	e20	e7.6	e12	e8.3	e9.0
11	9.2	e8.0	e6.6	e4.8	e5.2	e220	41	e18	e7.4	e10	e8.5	e11
12	9.8	e7.7	e6.4	e4.8	e5.2	e180	43	e15	e7.2	e11	e8.7	e15
13	11	e7.6	e6.2	e4.8	e5.2	e130	42	e13	e7.0	e12	e8.9	e19
14	11	e7.7	e6.0	e4.8	e5.2	e100	39	e14	e7.0	e13	e9.0	e20
15	12	e7.8	e5.9	e4.8	e5.2	e90	37	e15	e7.0	e17	e9.0	e20
16	12	e8.0	e5.7	e4.8	e5.2	e84	34	e14	e12	e30	e8.6	e18
17	12	e8.2	e5.6	e4.8	e5.2	e78	33	e13	e150	e27	e8.2	e16
18	12	e8.6	e5.6	e4.8	e5.2	e72	38	e15	e240	e25	e7.7	e14
19	13	e9.0	e5.4	e4.8	e5.2	e66	40	e17	e330	e23	e7.2	e12
20	13	e9.5	e5.4	e4.8	e5.2	e62	43	e16	e410	e23	e6.8	e11
21	13	e10	e5.2	e4.7	e5.2	e58	59	e16	e400	e23	e6.3	e10
22	15	e10	e5.2	e4.7	e5.3	e55	70	e16	e350	e22	e6.1	e9.2
23	15	e10	e5.2	e4.7	e5.3	e52	76	e16	e260	e21	e6.4	e8.2
24	16	e11	e5.0	e4.7	e5.3	e49	70	e17	e200	e19	e7.2	e7.2
25	16	e11	e5.0	e4.7	e5.4	e47	70	e17	e140	e17	e11	e6.0
26	18	e11	e5.0	e4.6	e5.5	e45	71	e18	e80	e16	e10	e5.0
27	18	e11	e5.0	e4.6	e6.0	e43	70	e21	e55	e15	e9.0	e4.5
28	16	e10	e5.0	e4.6	e8.0	e42	67	e25	e35	e13	e8.0	e3.2
29	21	e10	e5.0	e4.6	e10	e41	62	e30	e25	e12	e7.0	e2.6
30	20	e9.7	e5.0	e4.6	---	41	56	e34	e15	e11	e6.2	e2.3
31	19	---	e5.0	e4.7	---	34	---	e32	---	e11	e5.6	---
TOTAL	367.3	318.0	195.3	148.2	159.4	2595	1391	701	2891.5	806	252.5	276.2
MEAN	11.8	10.6	6.30	4.78	5.50	83.7	46.4	22.6	96.4	26.0	8.15	9.21
MAX	21	19	9.4	4.9	10	250	76	51	410	80	11	20
MIN	5.4	7.6	5.0	4.6	4.9	15	29	13	7.0	10	5.6	2.3
AC-FT	729	631	387	294	316	5150	2760	1390	5740	1600	501	548
CFSM	.02	.02	.01	.01	.01	.16	.09	.04	.18	.05	.02	.02
IN.	.03	.02	.01	.01	.01	.18	.10	.05	.21	.06	.02	.02

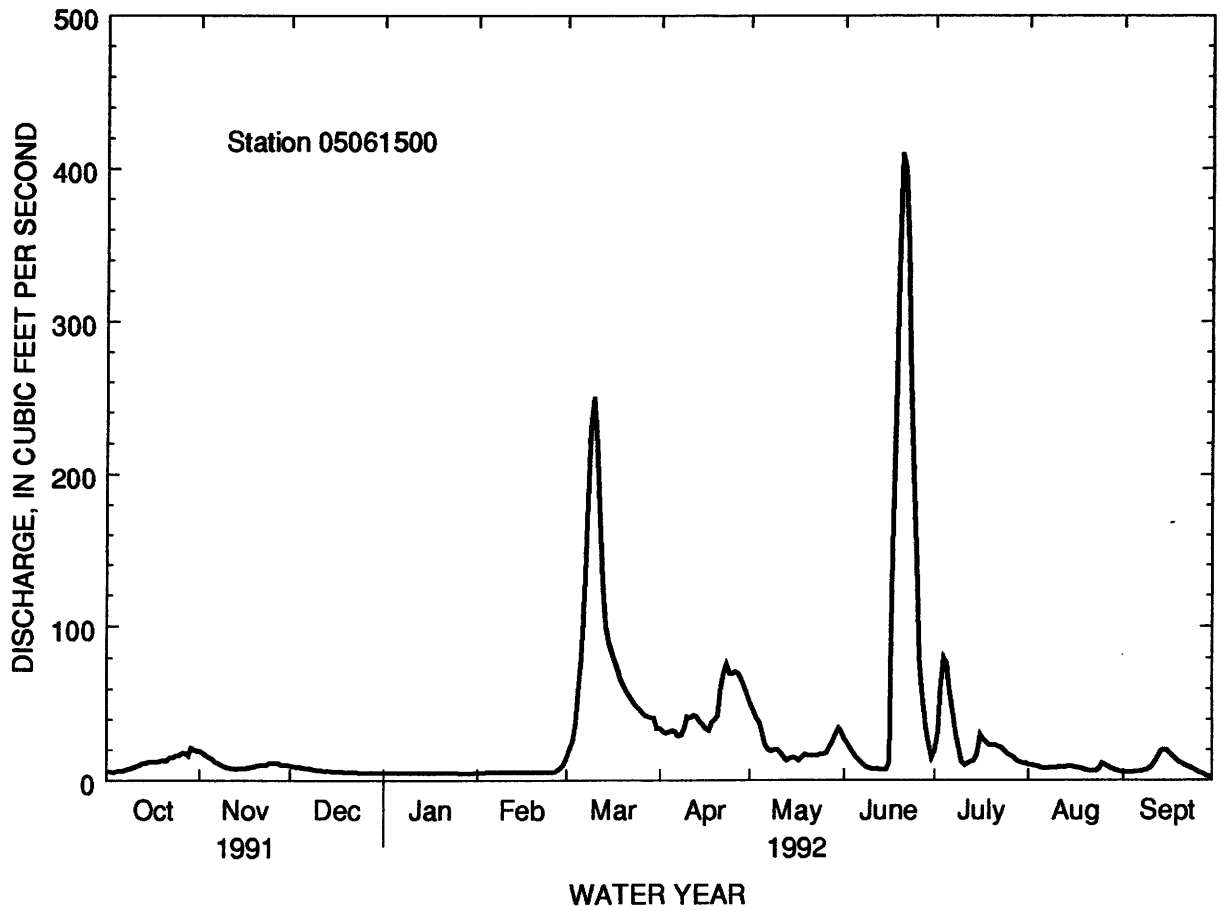
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	14.3	14.2	4.84	1.54	1.50	100	256	77.4	95.1	71.0	9.24	14.1
MAX	51.1	76.7	23.5	13.1	14.0	581	928	580	1068	1112	78.8	173
(WY)	1978	1972	1978	1978	1987	1966	1969	1962	1962	1975	1962	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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1945 - 1992	
ANNUAL TOTAL	9364.1		10101.4			
ANNUAL MEAN	25.7		27.6		55.1a	
HIGHEST ANNUAL MEAN					198	1962
LOWEST ANNUAL MEAN					12.2	1977
HIGHEST DAILY MEAN	278	May 4	410	Jun 20	8200	Jul 1 1975
LOWEST DAILY MEAN	1.1	Jan 27	2.3	Sep 30	.00	Dec 13 1945
ANNUAL SEVEN-DAY MINIMUM	1.1	Jan 24	4.4	Sep 24	.00	Dec 13 1945
INSTANTANEOUS PEAK FLOW			414	Jun 20	8500	Jul 2 1975
INSTANTANEOUS PEAK STAGE			10.94	Jun 20	19.90	Jul 2 1975
INSTANTANEOUS LOW FLOW			2.3	Sep 30		
ANNUAL RUNOFF (AC-FT)	18570		20040		39920	
ANNUAL RUNOFF (CFSM)	.049		.053		.11	
ANNUAL RUNOFF (INCHES)	.67		.72		1.43	
10 PERCENT EXCEEDS	76		60		100	
50 PERCENT EXCEEDS	8.5		11		7.0	
90 PERCENT EXCEEDS	2.1		5.0		.00	

a Median of annual mean discharges is 41 ft³/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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	41	e37	e31	e31	e54	99	125	61	141	49	28
2	16	e36	e37	e31	e32	e66	97	115	56	202	46	30
3	15	e33	e36	e31	e33	e93	93	106	52	252	43	31
4	14	e31	e36	e31	e34	e108	89	100	49	264	39	31
5	14	e30	e35	e31	e35	e125	88	94	46	244	35	29
6	15	e29	e35	e31	e36	e160	88	90	43	220	32	33
7	15	e28	e35	e31	e37	e300	88	85	40	195	31	42
8	16	e28	e34	e31	e37	e335	88	80	40	169	32	59
9	19	e27	e34	e31	e37	e340	89	86	40	148	32	60
10	20	e27	e34	e31	e37	e340	92	86	36	140	31	71
11	21	e27	e33	e31	e38	e330	93	80	35	136	29	80
12	21	e28	e33	e31	e38	e310	94	80	32	158	30	86
13	21	e28	e33	e31	e38	e270	94	74	30	206	33	83
14	24	e29	e33	e31	e38	e240	90	72	28	210	35	77
15	29	e31	e33	e31	e38	e210	86	76	28	203	33	76
16	33	e32	e32	e31	e38	e190	83	71	70	195	32	68
17	35	e34	e32	e31	e38	e165	79	62	232	181	29	59
18	33	e36	e32	e31	e38	e150	80	56	326	166	24	58
19	30	e38	e32	e31	e38	e135	91	52	385	154	21	55
20	29	e40	e32	e31	e38	e130	96	54	443	147	20	59
21	29	e42	e32	e31	e39	e128	100	55	478	139	16	58
22	29	e43	e32	e31	e39	e124	115	55	491	129	17	53
23	28	e44	e32	e31	e39	e118	130	56	479	116	23	46
24	26	e44	e32	e31	e39	e116	143	58	446	102	34	40
25	25	e44	e32	e31	e40	e114	149	62	392	92	55	37
26	28	e43	e32	e30	e41	e112	149	66	318	83	51	43
27	29	e41	e32	e30	e44	e110	152	67	247	75	41	45
28	29	e40	e32	e30	e48	e109	148	68	194	68	36	46
29	33	e39	e31	e30	e50	108	140	70	156	64	34	45
30	47	e38	e31	e30	---	109	133	69	130	62	31	41
31	48	---	e31	e31	---	105	---	65	---	53	30	---
TOTAL	789	1051	1027	956	1108	5304	3156	2335	5403	4714	1024	1569
MEAN	25.5	35.0	33.1	30.8	38.2	171	105	75.3	180	152	33.0	52.3
MAX	48	44	37	31	50	340	152	125	491	264	55	86
MIN	14	27	31	30	31	54	79	52	28	53	16	28
AC-FT	1560	2080	2040	1900	2200	10520	6260	4630	10720	9350	2030	3110
CFSM	.02	.03	.03	.03	.04	.16	.10	.07	.17	.15	.03	.05
IN.	.03	.04	.04	.03	.04	.19	.11	.08	.19	.17	.04	.06

e Estimated.

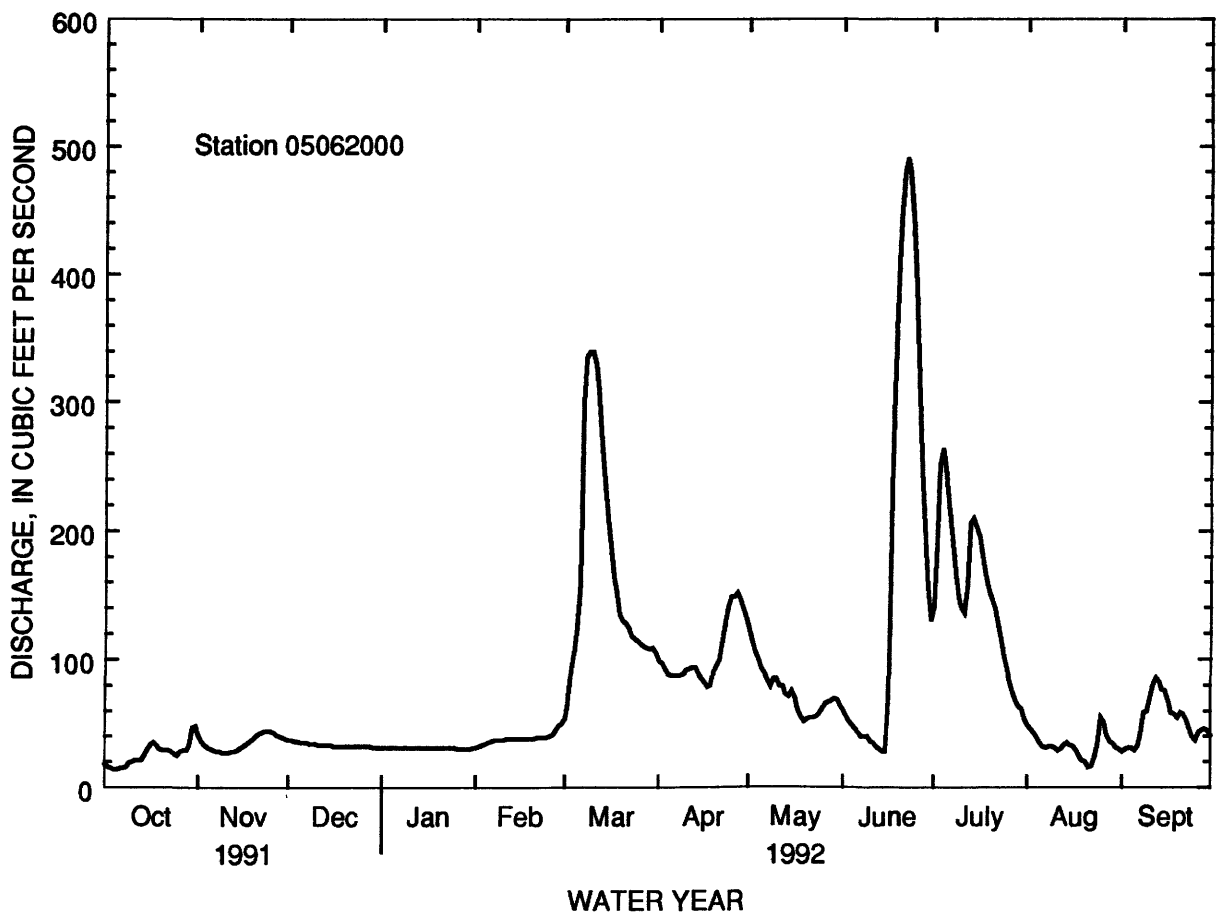
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	50.2	47.5	28.4	18.7	18.8	170	533	215	197	164	59.5	52.4
MAX	186	305	97.0	53.5	61.1	1308	1984	909	2138	2814	710	517
(WY)	1958	1972	1972	1987	1984	1966	1978	1986	1962	1975	1944	1944
MIN5	.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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1931 - 199	
ANNUAL TOTAL	27745		28436			
ANNUAL MEAN	76.0		77.7		131	
HIGHEST ANNUAL MEAN					441	1975
LOWEST ANNUAL MEAN					25.6	1934
HIGHEST DAILY MEAN	573	May 7	491	Jun 22	13500	Jul 2 1975
LOWEST DAILY MEAN	11	Aug 23	14	Oct 4, 5	.00a	
ANNUAL SEVEN-DAY MINIMUM	13	Aug 18	15	Oct 2	.00	Jul 28 1936
INSTANTANEOUS PEAK FLOW			492	Jun 22	13600	Jul 2 1975
INSTANTANEOUS PEAK STAGE			10.82b	Mar 8	27.10	Jul 2 1975
INSTANTANEOUS LOW FLOW			14.	Oct 4, 5, 6		
ANNUAL RUNOFF (AC-FT)	55030		56400		94950	
ANNUAL RUNOFF (CFSM)	.073		.075		.13	
ANNUAL RUNOFF (INCHES)	.99		1.02		1.71	
10 PERCENT EXCEEDS	180		161		276	
50 PERCENT EXCEEDS	32		41		34	
90 PERCENT EXCEEDS	14		29		9.2	

a At times in 1936.

b Backwater from ice.



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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	21	20	41	38	80	171	192	83	440	121	273
2	20	12	21	41	38	129	165	180	76	428	110	245
3	20	23	22	41	38	121	155	172	68	477	99	220
4	22	23	21	41	36	141	149	176	66	461	89	207
5	29	24	23	40	36	215	141	162	61	457	79	194
6	28	25	25	39	37	e600	142	149	52	448	71	175
7	25	24	28	37	36	e750	140	147	45	423	82	179
8	26	24	29	40	34	e700	141	154	40	404	95	218
9	24	29	30	38	36	632	132	217	37	411	80	270
10	24	36	31	41	37	e520	124	242	38	426	54	290
11	23	37	32	40	35	435	121	248	39	393	57	283
12	25	38	33	38	35	320	119	244	40	391	54	272
13	22	40	33	37	36	263	121	241	42	367	47	256
14	25	42	33	37	37	226	121	230	42	339	47	233
15	21	43	33	36	38	221	111	216	47	349	49	210
16	16	43	33	38	39	222	118	210	63	324	50	201
17	15	44	34	38	40	225	124	204	70	300	51	215
18	10	35	34	36	41	237	134	202	78	282	52	247
19	12	26	34	37	43	225	139	194	75	268	53	245
20	14	22	36	38	44	235	158	182	70	250	56	227
21	21	20	37	38	43	241	196	170	78	240	55	215
22	22	18	38	39	44	233	192	169	85	227	132	199
23	15	18	38	38	45	230	190	162	76	213	235	183
24	10	16	38	37	46	221	193	166	76	207	434	169
25	15	16	39	38	47	207	203	163	75	203	695	155
26	20	15	39	39	48	199	203	140	71	190	712	143
27	19	15	40	38	50	193	200	137	75	185	606	134
28	23	15	41	38	51	196	197	135	96	176	498	128
29	26	17	41	38	61	234	201	117	97	161	418	137
30	25	20	41	40	---	226	202	101	99	146	351	138
31	23	---	41	39	---	210	---	91	---	133	301	---
TOTAL	640	781	1018	1196	1189	8887	4703	5513	1960	9719	5833	6261
MEAN	20.6	26.0	32.8	38.6	41.0	287	157	178	65.3	314	188	209
MAX	29	44	41	41	61	750	203	248	99	477	712	290
MIN	10	12	20	36	34	80	111	91	37	133	47	128
AC-FT	1270	1550	2020	2370	2360	17630	9330	10940	3890	19280	11570	12420
CFSM	.02	.03	.04	.04	.05	.32	.18	.20	.07	.35	.21	.24
IN.	.03	.03	.04	.05	.05	.37	.20	.23	.08	.41	.24	.26

e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	84.1	73.1	48.8	37.1	34.2	125	562	415	302	218	91.4	81.5
MAX	614	488	123	100	80.0	747	1543	2259	1560	1923	960	788
(WY	1974	1972	1972	1910	1910	1945	1979	1950	1943	1909	1909	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

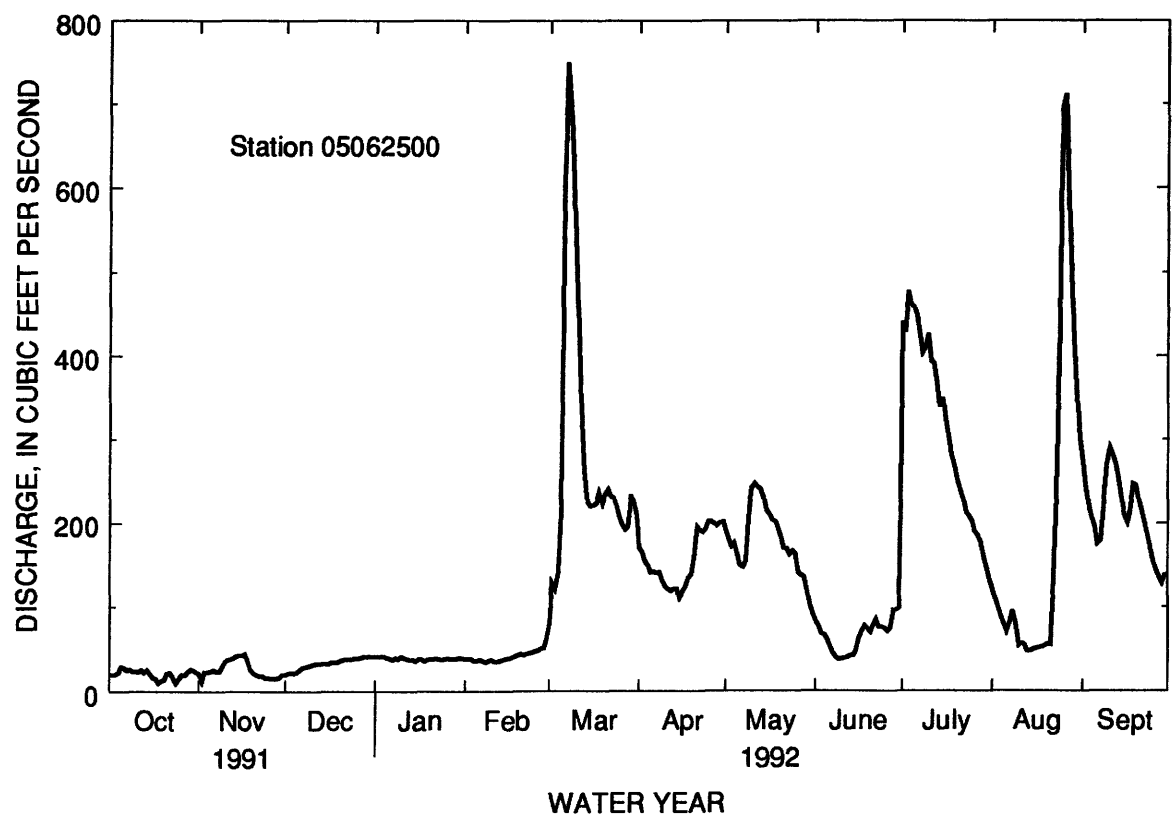
SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1909 - 1992	
ANNUAL TOTAL	31891.8		47700			
ANNUAL MEAN	87.4		130		169a	
HIGHEST ANNUAL MEAN					500	1950
LOWEST ANNUAL MEAN					22.7	1977
HIGHEST DAILY MEAN	677	May 6	750	Mar 7	9100	Jul 22 1909
LOWEST DAILY MEAN	4.9	Sep 1	10	Oct 18	1.1	Aug 13 1932
ANNUAL SEVEN-DAY MINIMUM	6.5	Aug 28	15	Oct 18	1.3	Aug 11 1932
INSTANTANEOUS PEAK FLOW			791	Aug 25	9200b	Jul 22 1909
INSTANTANEOUS PEAK STAGE			7.18c	Mar 8	20.00d	Jul 22 1909
INSTANTANEOUS LOW FLOW			6.2	Oct 18	.50	Nov 4 1939
ANNUAL RUNOFF (AC-FT)	63260		94610		122700	
ANNUAL RUNOFF (CFSM)	.098		.15		.19	
ANNUAL RUNOFF (INCHES)	1.34		2.00		2.59	
10 PERCENT EXCEEDS	210		272		440	
50 PERCENT EXCEEDS	28		75		62	
90 PERCENT EXCEEDS	16		23		15	

a Median of annual mean discharges is 150 ft³/s.

b From rating curve extended above 3,300 ft³/s.

c Backwater from ice.

d Site and datum then in use.



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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	e18	e37	e36	e37	e70	290	258	127	343	158	425
2	24	e16	e37	e36	e37	e84	270	249	e118	1530	136	380
3	22	e12	e37	e36	e37	e100	232	233	e108	1910	127	337
4	20	e9.0	e37	e36	e36	e125	221	222	e95	1600	113	289
5	20	e6.9	e37	e36	e36	e200	208	216	87	1270	96	265
6	19	e10	e37	e37	e36	e330	195	210	e80	1030	86	247
7	22	e20	e37	e37	e35	e500	188	192	e74	866	80	226
8	28	e30	e37	e37	e35	e1000	184	182	67	754	82	270
9	28	e35	e37	e37	e35	e1400	181	181	e62	685	82	351
10	26	e40	e37	e37	e34	e1200	79	206	58	669	82	406
11	26	e42	e37	e37	e34	e1000	e170	267	51	e640	75	453
12	26	e44	e37	e37	e34	e800	e160	287	46	e620	74	424
13	27	e45	e37	e37	e34	e650	155	285	41	600	74	397
14	26	e46	e37	e37	e35	e560	e150	286	36	534	71	372
15	28	e47	e37	e37	e35	e510	e145	280	33	491	66	344
16	25	e48	e36	e37	e36	e480	e145	267	e80	477	62	300
17	26	e48	e36	e37	e36	e460	146	262	182	487	60	282
18	25	e48	e36	e37	e37	e440	e152	252	191	446	59	333
19	22	e47	e36	e37	e37	e420	e162	246	225	398	56	391
20	20	e46	e36	e37	e38	e410	175	238	278	378	54	395
21	20	e44	e36	e37	e38	e410	192	227	251	349	52	358
22	19	e43	e36	e37	e39	e420	238	219	207	328	56	326
23	21	e42	e36	e37	e40	e430	262	222	175	305	73	285
24	23	e41	e36	e37	e42	e450	255	211	153	282	223	253
25	24	e40	e36	e37	e44	e460	261	212	129	262	714	230
26	23	e39	e36	e37	e46	e470	275	223	106	252	1130	210
27	22	e38	e36	e37	e50	e450	277	206	91	234	1210	189
28	27	e38	e36	e37	e57	e430	275	186	78	221	1020	174
29	35	e37	e36	e37	e62	355	265	182	71	209	793	163
30	35	e37	e36	e37	---	325	260	e165	79	190	630	155
31	21	---	e36	e37	---	327	---	e145	---	174	510	---
TOTAL	753	1056.9	1131	1142	1132	15266	6168	7017	3379	18534	8104	9230
MEAN	24.3	35.2	36.5	36.8	39.0	492	206	226	113	598	261	308
MAX	35	48	37	37	62	1400	290	287	278	1910	1210	453
MIN	19	6.9	36	36	34	70	79	145	33	174	52	155
AC-FT	1490	2100	2240	2270	2250	30280	12230	13920	6700	36760	16070	18310
CFSM	.02	.02	.02	.02	.02	.31	.13	.14	.07	.37	.16	.19
IN.	.02	.02	.03	.03	.03	.35	.14	.16	.08	.43	.19	.21

e Estimated.

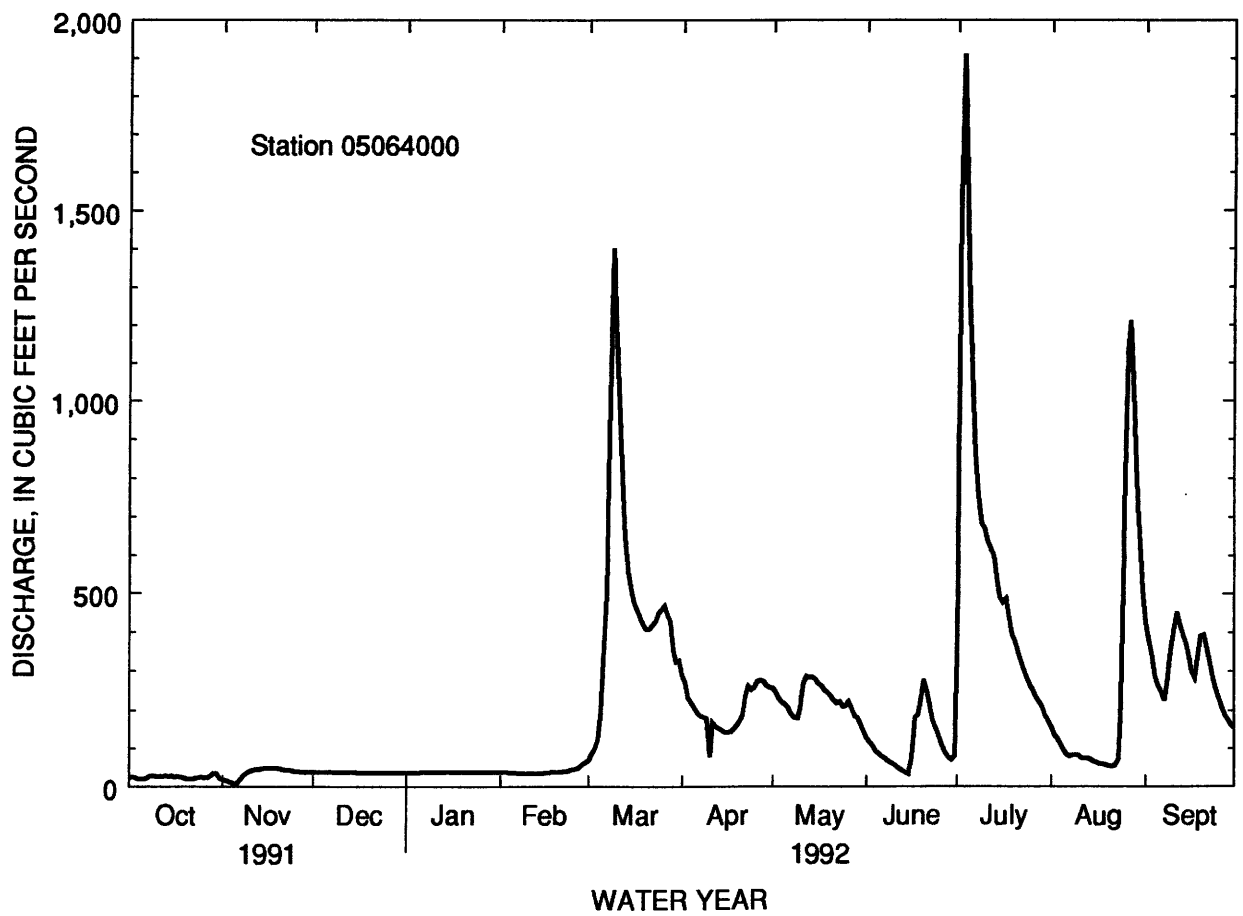
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1992, BY WATER YEAR (WY)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	115	104	61.8	44.5	43.0	270	1079	565	413	296	111	103
MAX	744	784	160	121	124	1485	3261	2074	1776	3136	960	824
(WY)	1972	1972	1972	1986	1984	1966	1978	1985	1962	1975	1944	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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1944 - 1992	
ANNUAL TOTAL	42706.5		72912.9			
ANNUAL MEAN	117		199		258a	
HIGHEST ANNUAL MEAN					682	1975
LOWEST ANNUAL MEAN					28.9	1977
HIGHEST DAILY MEAN	945	May 6	1910	Jul 3	9220	Apr 10 1978
LOWEST DAILY MEAN	6.6	Sep 7	6.9	Nov 5	.00	Sep 13 1948
ANNUAL SEVEN-DAY MINIMUM	7.7	Sep 1	13	Nov 1	.00	Sep 27 1948
INSTANTANEOUS PEAK FLOW			1950	Jul 3	9350	Apr 10 1978
INSTANTANEOUS PEAK STAGE			14.70	Jul 3	32.30b	Apr 21 1979
ANNUAL RUNOFF (AC-FT)	84710		144600		186900	
ANNUAL RUNOFF (CFSM)	.073		.12		16	
ANNUAL RUNOFF (INCHES)	.99		1.70		2.19	
10 PERCENT EXCEEDS	350		455		654	
50 PERCENT EXCEEDS	37		82		78	
90 PERCENT EXCEEDS	17		29		14	

a Median of annual mean discharges is 210 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. 3 to Mar. 29, which are poor.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	540	310	e380	e390	e360	e400	1290	1360	841	1820	840	962
2	607	294	e350	e390	e370	e430	1180	1340	889	3840	734	862
3	653	e270	e340	e380	e380	e460	1110	1290	867	4310	663	832
4	653	e250	e320	e370	e390	e480	1080	1230	793	3920	660	792
5	599	e200	e300	e360	e380	e500	1060	1170	739	3400	664	728
6	499	e170	e290	e355	e370	e1000	1040	1110	731	3060	644	703
7	427	e160	e280	e350	e360	e2000	1040	1070	704	2820	617	696
8	417	e150	e270	e335	e340	e3000	1030	1030	688	2490	615	761
9	417	e180	e260	e325	e320	e4500	1020	969	616	2110	647	885
10	417	e250	e260	e320	e310	e5000	1020	903	538	2190	649	973
11	418	e300	e260	e310	e310	e4800	1020	897	526	2290	746	1040
12	419	e350	e260	e310	e320	e4400	1000	898	537	2100	932	1060
13	419	e380	e260	e300	e330	e3600	985	859	530	1830	1030	1030
14	419	e400	e260	e300	e330	e3400	1010	808	517	1660	1060	964
15	417	e390	e260	e290	e330	e3200	1050	798	530	1660	1030	895
16	438	e380	e270	e280	e340	e3000	1080	822	605	1710	937	834
17	468	e360	e270	e280	e340	e2900	1080	888	1330	1710	850	810
18	483	e340	e280	e270	e350	e2800	1060	952	2550	1710	796	857
19	489	e330	e290	e270	e350	e2800	1020	912	3580	1540	776	900
20	492	e320	e300	e260	e350	e2700	1010	854	4110	1350	746	869
21	485	e330	e310	e260	e350	e2600	1060	812	4220	1260	703	825
22	454	e340	e320	e270	e345	e2600	1110	816	3930	1170	679	783
23	431	e390	e330	e280	e340	e2500	1150	851	3530	1120	667	748
24	401	e400	e340	e290	e335	e2500	1160	918	3050	1060	750	719
25	358	e400	e350	e300	e340	e2500	1200	866	2620	1010	1180	679
26	318	e420	e360	e300	e350	e2400	1280	879	2200	969	1550	644
27	292	e445	e370	e310	e360	e2300	1330	913	1870	942	1630	600
28	282	e440	e380	e320	e380	e2100	1350	864	1630	888	1550	560
29	298	e410	e390	e330	e390	e1900	1370	824	1430	901	1390	540
30	301	e400	e400	e340	---	1640	1370	801	1310	918	1220	526
31	335	---	e400	e350	---	1440	---	790	---	901	1090	---
TOTAL	13646	9759	9710	9795	10120	75850	33565	29494	48011	58659	28045	24077
MEAN	440	325	313	316	349	2447	1119	951	1600	1892	905	803
MAX	653	445	400	390	390	5000	1370	1360	4220	4310	1630	1060
MIN	282	150	260	260	310	400	985	790	517	888	615	526
AC-FT	27070	19360	19260	19430	20070	150400	66580	58500	95230	116400	55630	47760

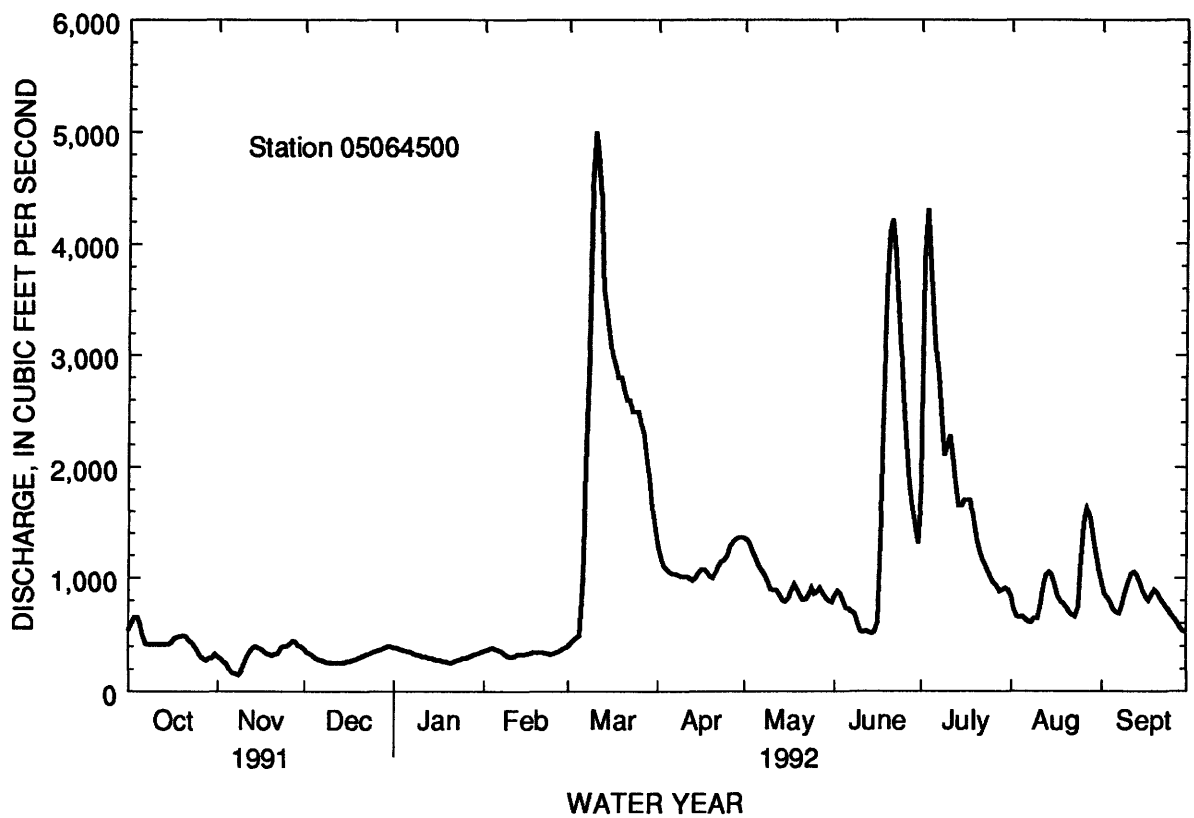
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1961-1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	674	634	496	418	429	2006	6508	3044	2498	2185	758	584
MAX	2188	1771	1253	1023	1052	9429	20080	8994	10310	20060	3866	2034
(WY)	1987	1972	1987	1987	1987	1966	1969	1979	1962	1975	1962	1986
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	1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1961-1992	
ANNUAL TOTAL	324139		350731			
ANNUAL MEAN	888		958		1698	
HIGHEST ANNUAL MEAN			3968		1975	
LOWEST ANNUAL MEAN			214		1977	
HIGHEST DAILY MEAN	3600	Jul 8	5000	Mar 10	41500	Apr 22 1979
LOWEST DAILY MEAN	70	Jan 2	150	Nov 8	10	Sep 2 1976
ANNUAL SEVEN-DAY MINIMUM	75	Jan 1	194	Nov 4	17	Aug 28 1976
INSTANTANEOUS PEAK FLOW			5200a	Mar 9	42000	Apr 22 1979
INSTANTANEOUS PEAK STAGE			15.64b	Mar 9	39.00	Apr 22 1979
INSTANTANEOUS LOW FLOW					5.4	Oct 8 1936
ANNUAL RUNOFF (AC-FT)	642900		695700		1230000	
10 PERCENT EXCEEDS	2090		2230		3640	
50 PERCENT EXCEEDS	524		699		685	
90 PERCENT EXCEEDS	150		299		196	

a About.
b Backwater from ice.



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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	PH SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	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											
03...	1050	656	--	631	8.5	11.0	11.0	40	7.4	67	290
NOV											
27...	1100	443	--	929	8.1	-8.0	0.0	8.1	8.4	57	380
JAN											
09...	1030	323	--	--	--	-13.5	0.0	--	--	--	--
FEB											
24...	1125	331	--	757	7.9	4.5	0.5	5.3	6.8	48	340
APR											
03...	1150	1110	--	641	--	--	2.0	--	--	--	--
14...	1110	1020	--	702	8.7	2.5	--	27	--	--	290
MAY											
21...	0845	812	--	429	--	18.0	17.5	--	--	--	--
JUN											
22...	0730	4030	--	504	--	15.0	18.0	--	--	--	--
JUL											
08...	0930	--	2490	573	8.0	21.5	19.0	56	6.8	77	250
09...	1050	2160	--	570	--	21.5	19.5	--	--	--	--

DATE	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	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)	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)
OCT											
03...	216	K39	K270	59	34	23	14	0.6	6.7	254	5
NOV											
27...	308	K25	K88	79	44	51	22	1	9.4	376	0
FEB											
24...	304	K4	K66	70	39	36	18	0.9	8.3	371	0
APR											
14...	236	K4	K33	60	33	33	20	0.8	7.1	273	7
JUL											
08...	187	140	160	57	27	20	14	0.5	7.2	228	0

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 DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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, 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 TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N) (00618)
OCT											
03...	100	17	0.20	15	386	394	0.54	698	0.020	<0.010	--
NOV											
27...	160	36	0.40	14	583	590	0.80	706	0.030	0.020	0.240
FEB											
24...	86	29	0.10	20	475	473	0.64	423	<0.010	<0.010	--
APR											
14...	110	21	0.20	8.1	415	431	0.59	1190	0.030	<0.010	--
JUL											
08...	84	13	0.20	20	343	354	0.48	2380	0.040	0.040	0.370

DATE	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N) (00605)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, TOTAL (MG/L AS N) (00600)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO TOTAL (MG/L AS P) (70507)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
OCT											
03...	<0.050	<0.050	0.030	0.020	0.87	0.90	--	0.270	0.130	0.130	0.120
NOV											
27...	0.260	0.260	1.50	1.60	1.1	2.6	2.9	0.630	0.540	0.530	0.510
FEB											
24...	0.720	0.700	0.220	0.220	0.68	0.90	1.6	0.170	0.120	0.110	0.090
APR											
14...	0.150	0.110	0.200	0.200	1.5	1.7	1.9	0.290	0.120	0.150	0.110
JUL											
08...	0.410	0.410	0.070	0.080	0.93	1.0	1.4	0.320	0.240	0.200	0.210

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 DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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 03...	<10	62	<3	16	30	2	<10	3	<1	<1.0	230
FEB 24...	<10	70	<3	21	34	22	<10	2	<1	<1.0	260
APR 14...	<10	54	<3	8	33	2	<10	3	<1	<1.0	230
JUL 08...	20	56	<3	4	27	2	<10	4	<1	<1.0	210

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, ASSR90 /Y90 (PCI/L (75988)
OCT 03...	<6	--	--	--	--	--	--	--	--	--
FEB 24...	<6	--	--	--	--	--	--	--	--	--
APR 14...	<6	3.2	1.3	2.9	4.4	1.6	2.3	12	1.5	1.7
JUL 08...	<6	1.4	5.5	1.9	2.4	11	1.9	11	7.4	1.5

DATE	GROSS BETA, DISSOLVED (PCI/L AS SR/YT-90) (80050)	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)	SEDIMENT, SUSPENDED (MG/L) (80154)	SEDIMENT, DISCHARGE, SUSPENDED (T/DAY) (80155)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT 03...	--	--	--	--	--	--	--	110	195	96
NOV 27...	--	--	--	--	--	--	--	16	19	96
FEB 24...	--	--	--	--	--	--	--	38	34	49
APR 14...	8.6	1.4	0.020	0.06	0.68	<1.0	2.8	460	1270	95
JUL 08...	8.2	6.7	0.020	0.09	2.0	<1.0	2.4	360	2420	99

Red River of the North at Halstad, Minnesota

June 1992

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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.00	.00	---	---	---	e6.0	15	6.9	1.3	11	.32	40
2	.00	.00	---	---	---	e7.0	11	4.7	1.2	41	.28	37
3	.00	.00	---	---	---	e8.0	9.1	2.7	.80	124	.21	32
4	.00	.00	---	---	---	e9.0	7.6	2.5	.47	133	.19	30
5	.00	.00	---	---	---	e15	7.7	2.7	.41	116	.19	28
6	.00	---	---	---	---	e35	7.6	2.3	.31	95	.19	25
7	.00	---	---	---	---	e130	7.6	2.0	.30	72	.18	26
8	.00	---	---	---	---	e390	5.5	.87	.32	52	.19	32
9	.00	---	---	---	---	e300	4.7	.65	.26	38	e.40	29
10	.00	---	---	---	---	e200	4.3	12	.27	30	e.65	30
11	.00	---	---	---	---	e122	2.9	15	.20	24	e.40	28
12	.00	---	---	---	---	e90	2.3	8.3	.17	19	e.30	25
13	.00	---	---	---	---	e55	1.6	3.9	.20	16	e.20	24
14	.00	---	---	---	---	e35	1.8	2.0	.16	13	e.30	27
15	.00	---	---	---	---	e20	1.8	1.2	.13	12	e.40	22
16	.00	---	---	---	---	e27	1.8	1.5	.19	12	e.35	18
17	.00	---	---	---	---	e42	1.2	1.4	.56	17	e.25	16
18	.00	---	---	---	---	e56	1.1	1.2	8.6	19	e.20	14
19	.00	---	---	---	---	e64	1.4	1.1	88	14	e.25	20
20	.00	---	---	---	---	e50	1.6	.74	114	9.9	e.35	24
21	.00	---	---	---	---	e42	3.9	.65	81	6.2	e.20	23
22	.00	---	---	---	---	e37	11	.59	58	4.8	e.60	20
23	.00	---	---	---	---	e33	10	.62	42	3.6	e3.0	21
24	.00	---	---	---	---	e33	9.5	.91	33	2.4	e15	18
25	.00	---	---	---	---	37	9.1	1.0	27	1.8	e100	14
26	.00	---	---	---	---	29	11	.96	21	1.2	e125	11
27	.00	---	---	---	---	24	11	1.2	16	.94	e114	8.1
28	.00	---	---	---	---	22	10	1.1	12	.77	102	5.9
29	.00	---	---	---	---	20	9.6	1.2	8.8	.66	70	4.7
30	.00	---	---	---	---	20	7.7	1.3	6.6	.57	58	3.9
31	.00	---	---	---	---	18	---	1.4	---	.38	46	---
TOTAL	0.00	---	---	---	---	1976.0	190.4	84.59	523.25	891.22	639.60	656.6
MEAN	.000	---	---	---	---	63.7	6.35	2.73	17.4	28.7	20.6	21.9
MAX	.00	---	---	---	---	390	15	15	114	133	125	40
MIN	.00	---	---	---	---	6.0	1.1	.59	.13	.38	.18	3.9
AC-FT	.00	---	---	---	---	3920	378	168	1040	1770	1270	1300
CFSM	.00	---	---	---	---	.42	.04	.02	.12	.19	.14	.14
IN.	.00	---	---	---	---	.49	.05	.02	.13	.22	.16	.16

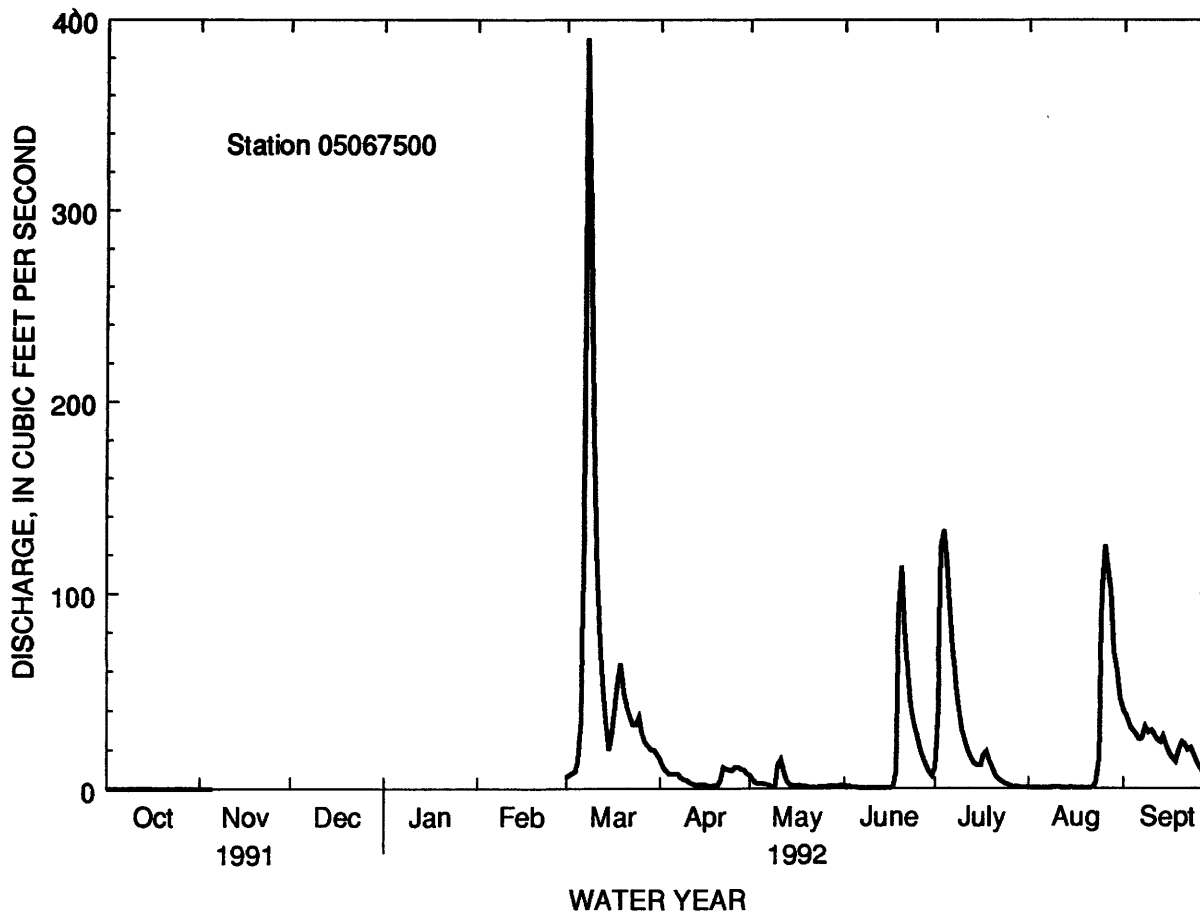
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1944 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	12.6	10.7	5.60	3.79	3.29	69.5	296	130	82.9	72.0	20.8	11.8
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 WATER YEAR		WATER YEARS 1944 - 1992	
ANNUAL MEAN			63.3a	(1944-89)
HIGHEST ANNUAL MEAN			543	1950
LOWEST ANNUAL MEAN			1.24	1977
HIGHEST DAILY MEAN			4740	Apr 19 1979
LOWEST DAILY MEAN			.00	Many days
ANNUAL SEVEN-DAY MINIMUM			.00	Sep 12 1945
INSTANTANEOUS PEAK FLOW	430	Mar. 8	4880	Apr 19 1979
INSTANTANEOUS PEAK STAGE	10.36b	Mar. 8	23.36c	Apr 19 1979
INSTANTANEOUS LOW FLOW				
ANNUAL RUNOFF (AC-FT)			45850	
ANNUAL RUNOFF (CFSM)			.42	
ANNUAL RUNOFF (INCHES)			5.69	
10 PERCENT EXCEEDS			106	
50 PERCENT EXCEEDS			.95	
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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.5	e11	e10	e10	e15	e21	e70	52	24	17	7.8	158
2	9.4	e9.0	e10	e10	e15	e25	e69	47	22	28	6.9	168
3	7.9	e7.0	e10	e10	e15	e30	e68	45	20	34	7.3	164
4	7.7	e4.5	e10	e10	e15	e34	e67	42	17	39	6.9	143
5	8.1	e16	e10	e10	e14	e45	e66	39	15	43	6.0	128
6	8.8	e15	e10	e10	e14	e80	e65	34	15	40	5.8	114
7	10	e14	e10	e10	e14	e170	e64	32	14	39	7.4	107
8	10	e13	e10	e10	e14	e150	63	31	14	40	14	124
9	10	e13	e10	e10	e14	e130	54	29	13	38	15	123
10	9.9	e12	e10	e10	e14	e120	49	28	12	37	9.6	113
11	11	e12	e10	e10	e13	e110	47	29	14	34	6.4	110
12	12	e11	e10	e10	e13	e100	44	32	12	32	7.8	102
13	11	e11	e10	e10	e13	e95	41	32	9.3	36	8.5	91
14	11	e11	e10	e10	e13	e90	40	32	7.0	33	8.7	82
15	13	e11	e10	e10	e13	e85	41	33	7.1	32	6.0	73
16	15	e11	e10	e10	e13	e80	41	35	12	31	6.3	65
17	17	e10	e10	e10	e13	e77	41	37	30	30	6.8	63
18	15	e10	e10	e10	e13	e73	40	42	43	30	7.0	61
19	15	e10	e10	e10	e13	e70	41	40	53	28	8.2	61
20	15	e10	e10	e10	e13	e70	45	38	44	28	7.1	59
21	15	e10	e10	e10	e13	e71	48	36	36	26	6.5	56
22	24	e10	e10	e10	e13	e73	51	34	33	24	15	53
23	17	e10	e10	e10	e13	e76	54	36	30	22	78	51
24	13	e10	e10	e9.0	e14	e80	55	41	26	27	177	49
25	13	e10	e10	e7.5	e14	e80	56	39	21	24	270	44
26	13	e10	e10	e10	e15	e79	58	40	17	20	200	41
27	13	e10	e10	e11	e16	e78	60	39	15	17	170	39
28	17	e10	e10	e13	e18	e76	62	37	13	14	146	36
29	19	e10	e10	e14	e19	e75	60	34	12	13	138	35
30	15	e10	e10	e15	---	e73	58	32	11	10	141	33
31	e14	---	e10	e15	---	e71	---	29	---	10	152	---
TOTAL	399.3	321.5	310	324.5	409	2487	1618	1126	611.4	876	1653.0	2546
MEAN	12.9	10.7	10.0	10.5	14.1	80.2	53.9	36.3	20.4	28.3	53.3	84.9
MAX	24	16	10	15	19	170	70	52	53	43	270	168
MIN	7.7	4.5	10	7.5	13	21	40	28	7.0	10	5.8	33
AC-FT	792	638	615	644	811	4930	3210	2230	1210	1740	3280	5050
CFSM	.03	.03	.02	.02	.03	.19	.13	.09	.05	.07	.13	.20
IN.	.03	.03	.03	.03	.04	.22	.14	.10	.05	.08	.14	.22

e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1943 - 1992, BY WATER YEAR (WY)

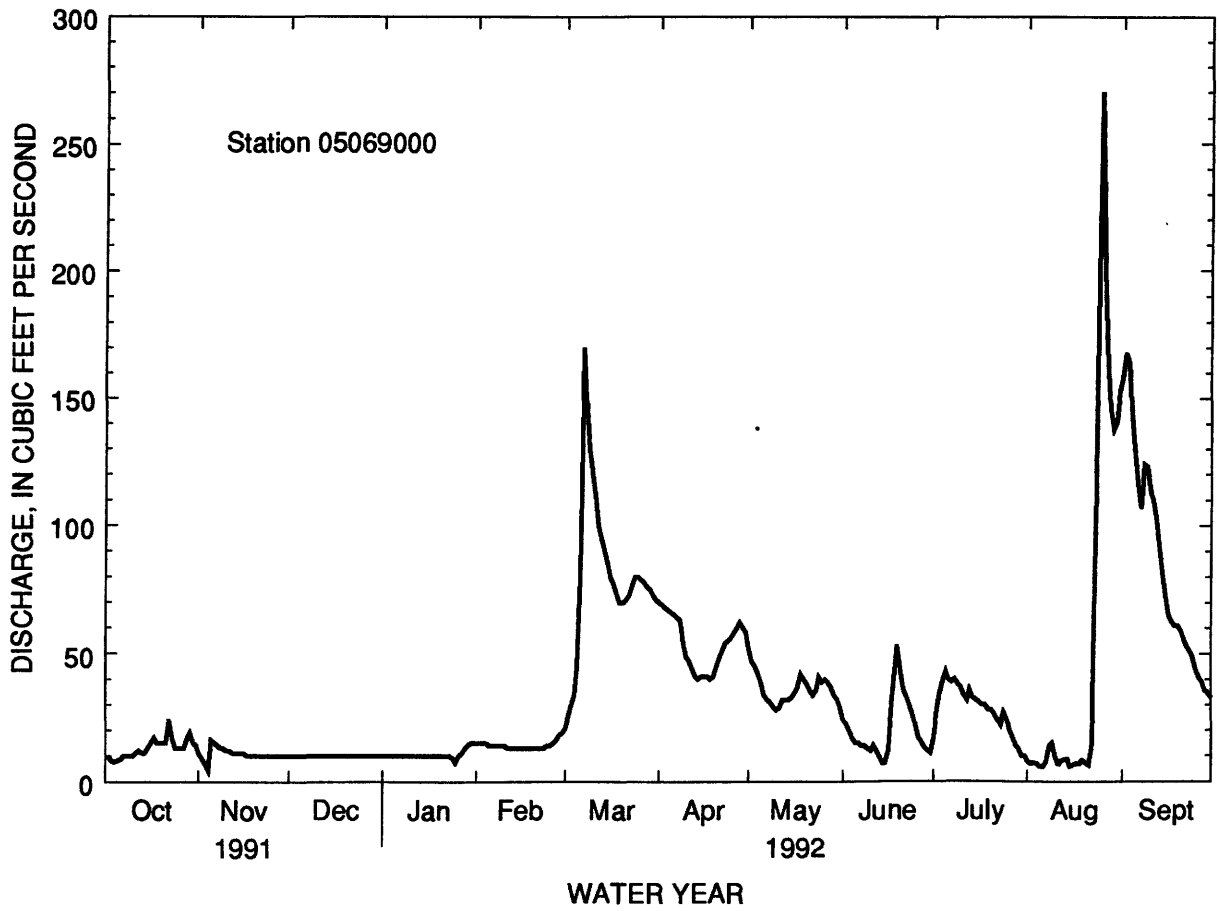
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	32.1	27.2	16.5	12.2	12.2	75.4	345	119	94.8	58.1	29.9	24.9
MAX	223	209	48.7	30.1	46.8	385	946	1156	596	298	256	93.9
(WY)	1972	1972	1972	1986	1984	1966	1978	1950	1984	1962	1985	1985
MIN	9.43	8.64	5.11	2.02	3.55	5.81	25.3	23.7	11.5	8.95	6.30	6.49
(WY)	1977	1956	1964	1962	1962	1948	1981	1958	1980	1980	1961	1955

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1943 - 1992	
ANNUAL TOTAL	10085.5		12681.7			
ANNUAL MEAN	27.6		34.6		69.8a	
HIGHEST ANNUAL MEAN					204	1950
LOWEST ANNUAL MEAN					18.4	1977
HIGHEST DAILY MEAN	454	May 23	270	Aug 25	4360	Apr 14 1965
LOWEST DAILY MEAN	4.5	Nov 4	4.5	Nov 4	1.0	Jan 17 1962
ANNUAL SEVEN-DAY MINIMUM	5.1	Jan 26	6.8	Aug 15	1.1	Jan 12 1962
INSTANTANEOUS PEAK FLOW			312	Aug 25	4560	Apr 14 1965
INSTANTANEOUS PEAK STAGE			7.06b	Mar 7	32.79c	Apr 23 1979
ANNUAL RUNOFF (AC-FT)	20000		25150		50590	
ANNUAL RUNOFF (CFSM)	.065		.081		.16	
ANNUAL RUNOFF (INCHES)	.88		1.11		2.23	
10 PERCENT EXCEEDS	67		78		139	
50 PERCENT EXCEEDS	12		15		21	
90 PERCENT EXCEEDS	7.0		10		8.5	

a Median of annual mean discharges is 51 ft³/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.

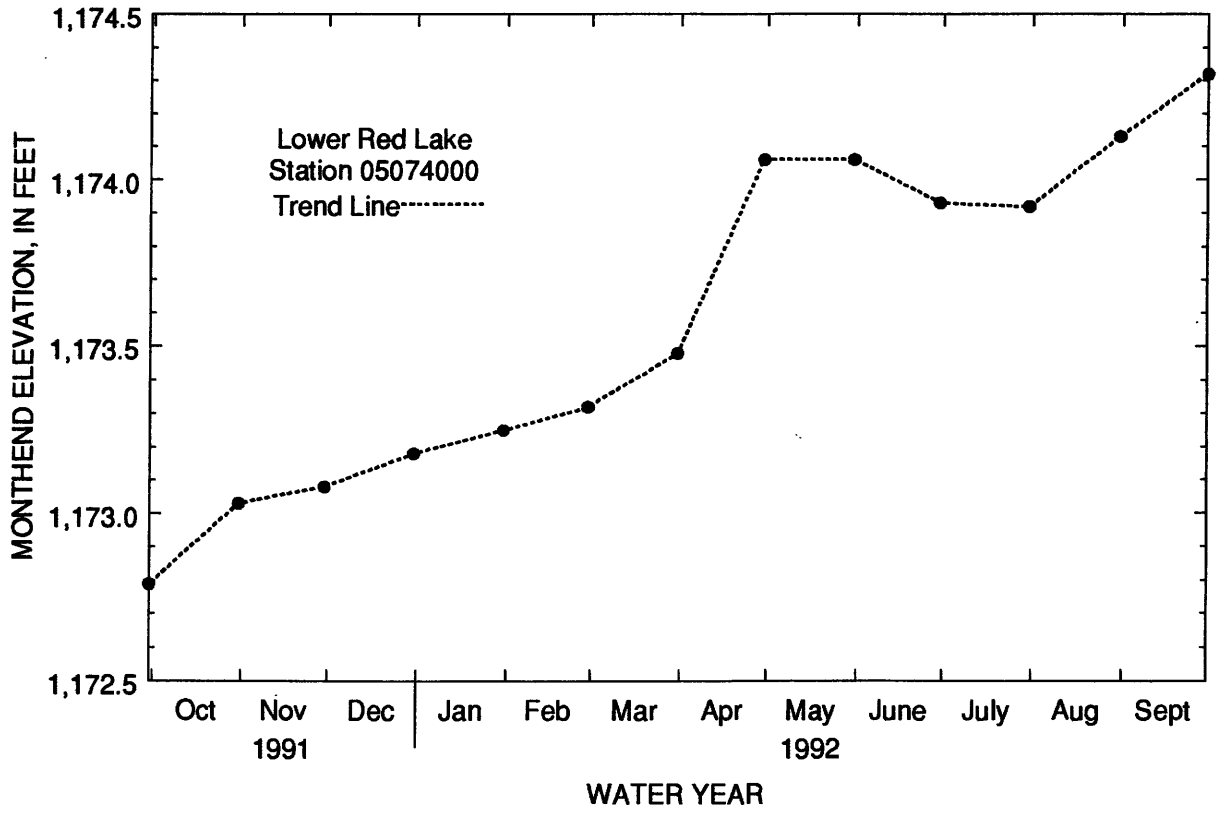
EXTREMES FOR PERIOD OF RECORD.--Maximum elevation, 1.178.53 ft, June 25, 1950; minimum recorded, 1,169.80 ft, Nov. 20, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum elevation 1,175.22 ft, Sept. 16; maximum daily, 1,174.53 ft, Sept. 20; minimum, 1,171.77 ft, Sept. 27; minimum daily, 1,172.70 ft, Nov. 2.

MONTHEND ELEVATION, IN FEET, OCTOBER 1991 TO SEPTEMBER 1992

Oct. 31 ..... 1,173.03	Feb. 29 ..... 1,173.32	June 30 ..... 1,173.93
Nov. 30 ..... 1,173.08	Mar. 31 ..... 1,173.48	July 31 ..... 1,173.92
Dec. 31 ..... 1,173.18	Apr. 30 ..... 1,174.06	Aug. 31 ..... 1,174.13
Jan. 31 ..... 1,173.25	May 31 ..... 1,174.06	Sept. 30 ..... 1,174.32

NOTE.--Mean daily gage heights are available.


1,174.5
1,174.0
1,173.5
1,173.0
1,172.5
MONTHEND ELEVATION, IN FEET
Lower Red Lake
Station 05074000
Trend Line
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
1991
1992
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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	75	77	72	70	68	67	74	72	72	58	58	62
2	74	73	72	70	68	68	74	72	72	57	58	61
3	74	72	70	70	68	68	74	74	72	56	60	61
4	74	72	70	70	68	68	74	74	70	56	60	62
5	74	72	70	70	68	69	74	74	70	56	60	62
6	74	72	70	70	68	70	74	74	70	56	60	62
7	75	72	70	70	68	68	74	74	70	56	60	62
8	74	72	70	70	68	68	74	76	70	55	60	62
9	74	72	70	70	68	70	74	76	69	54	60	62
10	75	72	70	70	67	71	75	76	68	54	60	62
11	75	72	70	70	66	72	75	77	67	54	62	62
12	76	72	70	70	66	72	76	76	66	55	62	63
13	76	72	70	70	66	72	76	76	66	54	62	63
14	74	72	70	70	66	72	76	76	66	54	62	64
15	76	72	70	70	66	73	75	76	66	54	62	64
16	76	72	70	70	66	74	74	76	66	54	62	64
17	75	72	70	68	66	73	74	76	65	54	62	e65
18	76	72	70	68	66	74	74	75	64	55	62	150
19	76	73	69	68	66	74	73	74	64	54	62	e225
20	76	74	68	68	66	74	72	74	63	54	62	e225
21	76	74	68	68	66	74	73	74	62	55	62	e225
22	76	74	68	68	66	74	74	74	62	56	62	e225
23	76	74	68	68	66	74	74	74	61	56	61	e225
24	76	74	68	68	66	74	75	74	60	56	60	e225
25	76	73	68	68	66	74	75	74	60	56	60	225
26	77	72	68	68	66	74	74	74	60	56	60	e225
27	78	72	68	68	66	76	74	74	60	57	62	e225
28	78	72	68	68	66	76	72	72	59	58	62	e225
29	76	72	69	68	66	74	72	72	58	58	62	e225
30	76	72	70	68	---	74	72	72	58	58	60	e225
31	78	---	70	68	---	74	---	72	---	58	61	---
TOTAL	2342	2178	2154	2140	1933	2235	2221	2304	1956	1724	1888	3913
MEAN	75.5	72.6	69.5	69.0	66.7	72.1	74.0	74.3	65.2	55.6	60.9	130
MAX	78	77	72	70	68	76	76	77	72	58	62	225
MIN	74	72	68	68	66	67	72	72	58	54	58	61
AC-FT	4650	4320	4270	4240	3830	4430	4410	4570	3880	3420	3740	7760
CFSM	.04	.04	.04	.04	.03	.04	.04	.04	.03	.03	.03	.07
IN.	.04	.04	.04	.04	.04	.04	.04	.04	.04	.03	.04	.07

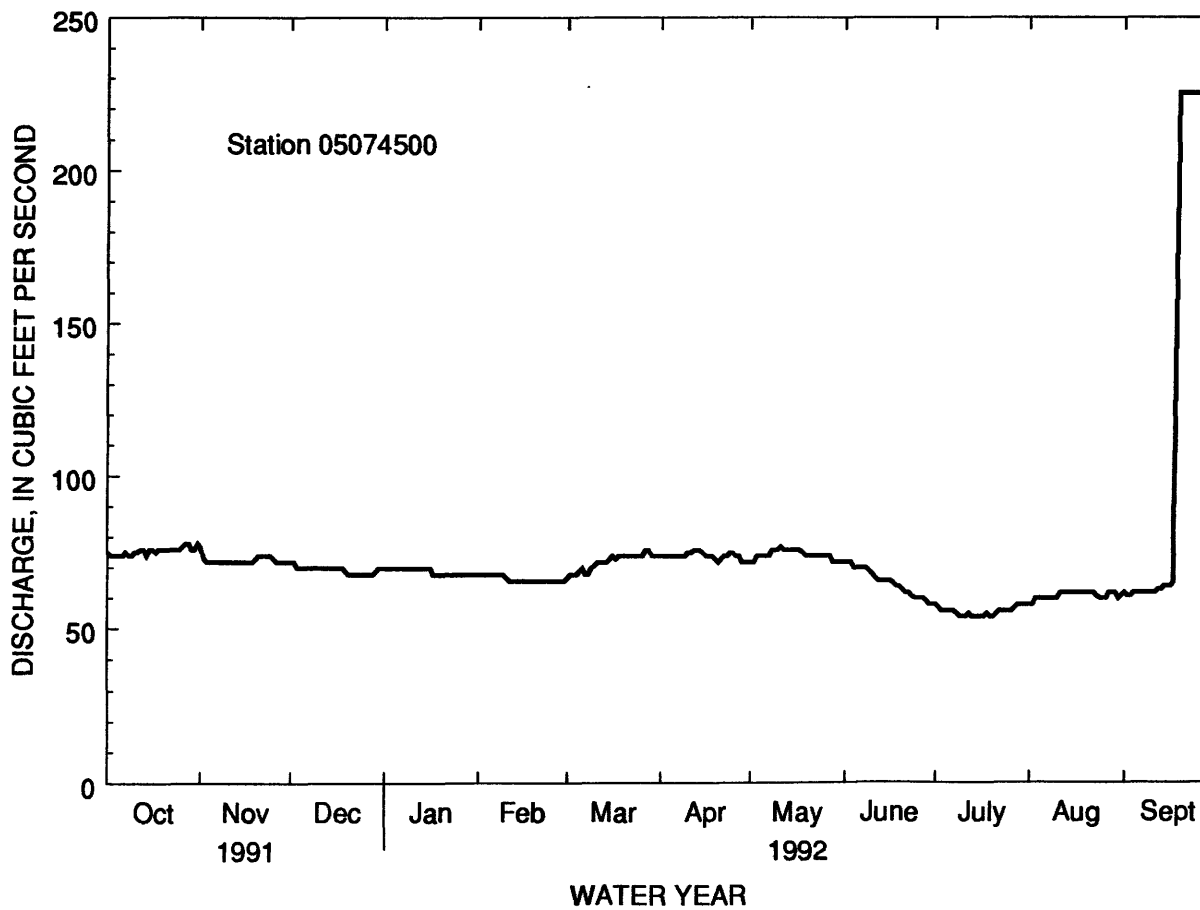
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1933 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	470	458	449	463	457	423	336	485	568	536	461	457
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	1.61
(WY)	1934	1934	1934	1934	1934	1936	1936	1933	1933	1934	1936	1934

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1933 - 1992	
ANNUAL TOTAL	24661		26988			
ANNUAL MEAN	67.6		73.7		467	
HIGHEST ANNUAL MEAN					1292	1951
LOWEST ANNUAL MEAN					5.55	1936
HIGHEST DAILY MEAN	78	Oct 27, 28, 31	225	Sep 19-30	2240	Oct 6 1950
LOWEST DAILY MEAN	62a		54b		.00	Sep 19 1933
ANNUAL SEVEN-DAY MINIMUM	62	Jan 1	54	Jul 9	.00	Sep 1 1934
INSTANTANEOUS PEAK FLOW			225	Sep 19-30	3600	Jun 25 1950
INSTANTANEOUS PEAK STAGE			71.01	Jul 12, 13, 15	78.19	Jun 25 1950
INSTANTANEOUS LOW FLOW			54	Jul 8-22		
ANNUAL RUNOFF (AC-FT)	48920		53530		338300	
ANNUAL RUNOFF (CFSM)	.035		.038		.24	
ANNUAL RUNOFF (INCHES)	.47		.51		3.23	
10 PERCENT EXCEEDS	74		76		1010	
50 PERCENT EXCEEDS	68		70		368	
90 PERCENT EXCEEDS	63		60		35	

a Jan. 1-28, Feb. 8-10.
b Jul. 9-11, 13-17, 19, 20.



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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	67	e44	e59	e61	e62	e65	e235	287	73	107	67	211
2	67	e47	e59	e61	e62	e65	e210	261	74	130	67	235
3	67	e50	e59	e61	e62	e66	e190	254	74	149	68	256
4	68	e60	e59	e61	e62	e69	e170	230	79	155	67	243
5	68	e60	e58	e61	e62	e78	e160	205	80	158	66	236
6	68	e60	e58	e61	e62	e100	e160	184	81	154	65	235
7	69	e60	e58	e61	e62	e190	e158	162	81	144	63	256
8	69	e60	e58	e61	e62	e250	e155	148	81	136	64	358
9	69	e60	e58	e61	e62	e210	133	136	79	127	65	359
10	69	e60	e58	e61	e62	e180	128	120	78	126	63	318
11	69	e60	e58	e61	e62	e160	130	112	78	138	60	286
12	69	e60	e58	e61	e62	e145	118	108	79	139	61	258
13	69	e60	e58	e61	e62	e130	123	98	80	129	61	240
14	70	e60	e58	e61	e62	e120	125	95	84	119	62	220
15	70	e60	e58	e61	e62	e110	141	89	88	110	60	199
16	70	e60	e58	e61	e63	e104	157	90	92	101	59	188
17	70	e60	e58	e61	e63	e99	163	97	101	95	69	189
18	71	e60	e58	e61	e64	e96	168	101	101	92	80	197
19	71	e60	e58	e61	e65	e96	244	92	99	91	73	196
20	71	e60	e58	e61	e65	e97	374	86	100	90	68	215
21	71	e60	e59	e62	e65	e98	375	83	101	91	69	258
22	71	e60	e60	e62	e65	e99	326	84	99	90	88	286
23	71	e60	e60	e62	e65	e103	300	90	97	86	129	307
24	71	e60	e60	e62	e65	e112	308	94	98	82	287	321
25	71	e60	e60	e62	e65	e135	330	90	96	78	310	316
26	71	e60	e60	e63	e65	e180	366	89	97	78	260	307
27	71	e60	e60	e63	e65	e175	372	85	102	76	221	301
28	71	e60	e60	e63	e65	e175	341	81	99	72	197	295
29	71	e60	e60	e63	e65	e180	315	76	93	70	185	292
30	71	e60	e60	e63	---	e200	307	76	93	70	193	290
31	e50	---	e60	e63	---	e230	---	74	---	69	205	---
TOTAL	2141	1761	1823	1908	1835	4117	6782	3877	2657	3352	3452	7868
MEAN	69.1	58.7	58.8	61.5	63.3	133	226	125	88.6	108	111	262
MAX	71	60	60	63	65	250	375	287	102	158	310	359
MIN	50	44	58	61	62	65	118	74	73	69	59	188
AC-FT	4250	3490	3620	3780	3640	8170	13450	7690	5270	6650	6850	15610
CFSM	.03	.03	.03	.03	.03	.06	.10	.05	.04	.05	.05	.11
IN.	.03	.03	.03	.03	.03	.07	.11	.06	.04	.05	.06	.13

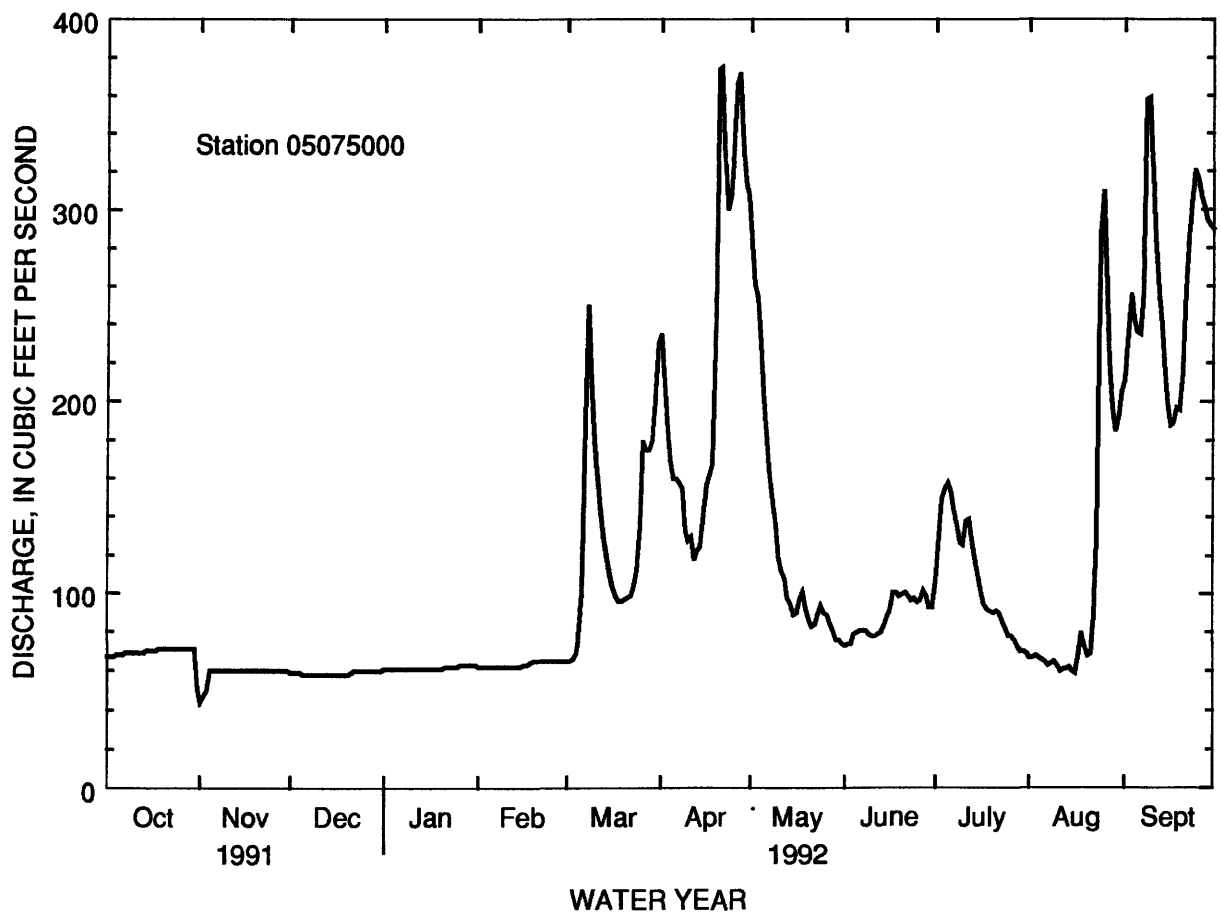
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1930 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	523	495	443	442	438	473	659	662	654	560	484	507
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1930 - 1992	
ANNUAL TOTAL	25346		41573			
ANNUAL MEAN	69.4		114		529	
HIGHEST ANNUAL MEAN					1407	1951
LOWEST ANNUAL MEAN					6.21	1934
HIGHEST DAILY MEAN	148	Jul 14	375	Apr 21	4040	Jul 7 1975
LOWEST DAILY MEAN	44	Nov 1	44	Nov 1	.00	Many days
ANNUAL SEVEN-DAY MINIMUM	53	Oct 31	53	Oct 31	.00	Nov 16 1933
INSTANTANEOUS PEAK FLOW			390	Apr 21	4060	Jul 7 1975
INSTANTANEOUS PEAK STAGE			7.15a	Mar 8	13.44	Jul 3 1975
ANNUAL RUNOFF (AC-FT)	50270		82460		382900	
ANNUAL RUNOFF (CFSM)	.030		.049		.23	
ANNUAL RUNOFF (INCHES)	.41		.67		3.12	
10 PERCENT EXCEEDS	88		243		1170	
50 PERCENT EXCEEDS	64		74		401	
90 PERCENT EXCEEDS	60		60		31	

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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.2	e6.0	e4.4	e2.5	e2.7	e3.5	e147	1050	112	31	32	69
2	5.0	e5.2	e4.1	e2.5	e2.7	e3.9	e160	975	91	57	32	73
3	4.5	e4.4	e3.8	e2.5	e2.7	e5.0	e180	953	88	102	32	87
4	4.2	e3.7	e3.6	e2.5	e2.7	e7.0	e200	905	47	104	32	117
5	3.8	e3.4	e3.4	e2.5	e2.8	e15	e220	804	37	103	30	133
6	4.2	e3.3	e3.2	e2.5	e2.8	e40	e238	686	36	101	27	135
7	4.2	e3.2	e3.1	e2.5	e2.8	e90	256	511	35	96	27	195
8	3.0	e3.3	e2.9	e2.5	e2.8	e200	256	445	37	91	24	393
9	2.7	e3.3	e2.8	e2.5	e2.8	e500	266	433	48	88	23	501
10	2.7	e3.4	e2.8	e2.5	e2.8	e460	346	424	33	90	23	515
11	2.5	e3.5	e2.7	e2.5	e2.8	e390	479	425	31	100	23	475
12	2.4	e3.6	e2.6	e2.5	e2.8	e300	476	429	31	101	23	407
13	2.4	e3.8	e2.6	e2.5	e2.8	e230	459	428	26	94	20	362
14	2.7	e4.0	e2.5	e2.5	e2.8	e180	452	403	16	72	19	363
15	2.5	e4.3	e2.5	e2.5	e2.8	e140	452	257	15	62	18	416
16	2.9	e4.8	e2.5	e2.5	e2.8	e90	455	249	16	59	16	497
17	2.9	e5.2	e2.5	e2.5	e2.8	e60	539	258	54	49	15	690
18	2.9	e5.7	e2.5	e2.5	e2.9	e42	545	271	140	41	14	666
19	2.8	e6.2	e2.5	e2.5	e2.9	e38	579	283	137	40	13	624
20	3.6	e6.7	e2.5	e2.5	e2.9	e36	783	277	115	39	10	583
21	4.6	e7.5	e2.5	e2.6	e2.9	e36	1100	270	104	37	9.4	546
22	4.4	e8.3	e2.5	e2.6	e3.0	e40	1210	268	104	36	11	517
23	4.3	e9.1	e2.5	e2.6	e3.0	e44	1180	265	70	35	17	501
24	4.4	e9.8	e2.5	e2.6	e3.0	e48	1160	264	45	35	24	477
25	4.1	e10	e2.5	e2.6	e3.1	e56	1160	264	28	34	47	456
26	3.9	e9.2	e2.5	e2.6	e3.1	e65	1190	243	43	33	88	443
27	4.8	e7.6	e2.5	e2.6	e3.2	e74	1210	175	53	33	91	433
28	5.5	e6.5	e2.5	e2.7	e3.3	e84	1180	172	53	33	84	419
29	7.5	e5.5	e2.5	e2.7	e3.4	e96	1130	162	51	32	81	314
30	6.3	e4.8	e2.5	e2.7	---	e110	1090	112	39	32	75	282
31	6.4	---	e2.5	e2.7	---	e125	---	112	---	32	65	---
TOTAL	123.3	165.3	87.0	79.0	83.9	3608.4	19098	12773	1735	1892	1045.4	11689
MEAN	3.98	5.51	2.81	2.55	2.89	116	637	412	57.8	61.0	33.7	390
MAX	7.5	10	4.4	2.7	3.4	500	1210	1050	140	104	91	690
MIN	2.4	3.2	2.5	2.5	2.7	3.5	147	112	15	31	9.4	69
AC-FT	245	328	173	157	166	7160	37880	25340	3440	3750	2070	23190
CFSM	.00	.01	.00	.00	.00	.12	.66	.43	.06	.06	.04	.41
IN.	.00	.01	.00	.00	.00	.14	.74	.50	.07	.07	.04	.45

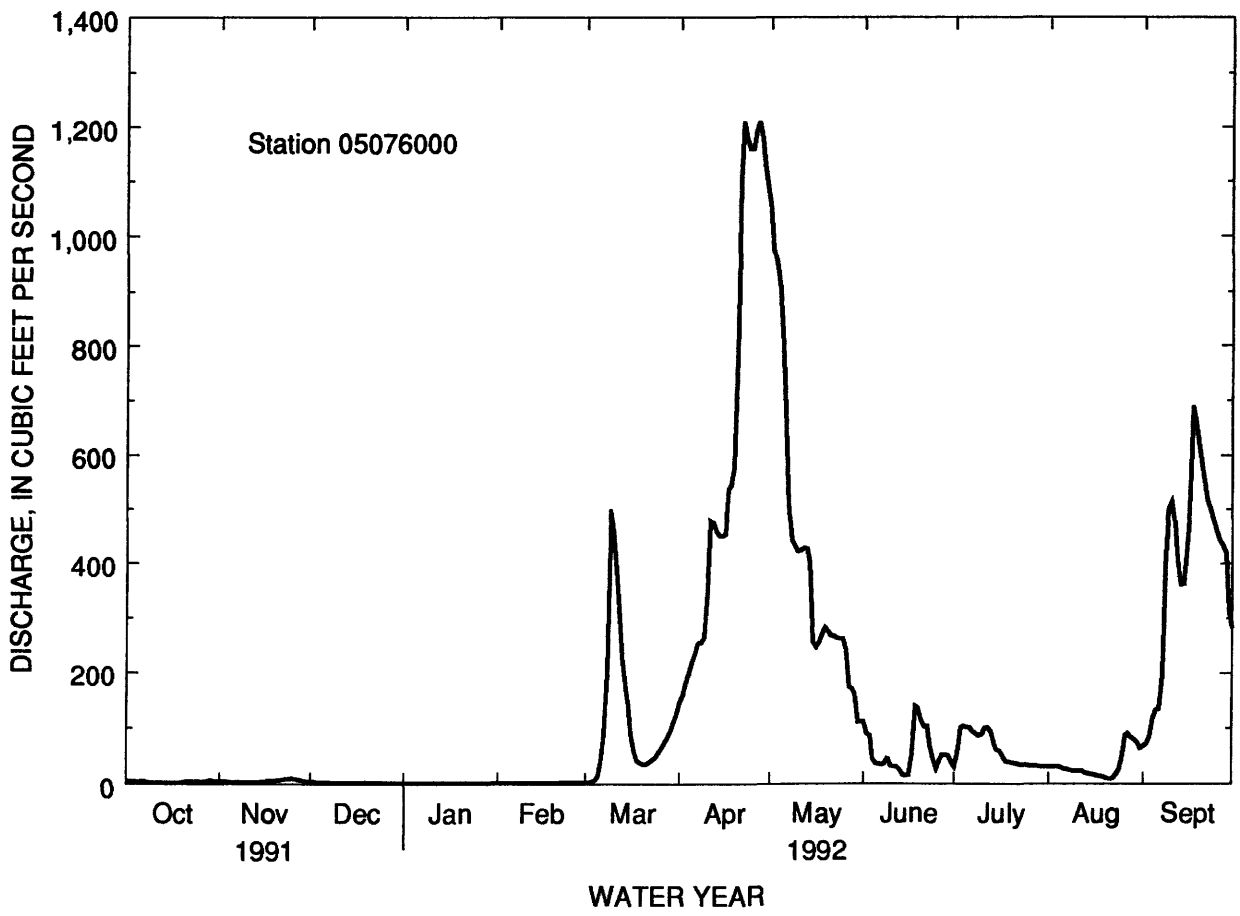
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	83.6	62.5	19.4	5.62	3.57	66.4	578	463	286	193	82.0	85.6
MAX	637	844	206	100	45.0	609	2827	4274	1774	2103	842	943
(WY)	1986	1972	1945	1910	1910	1983	1966	1950	1962	1975	1985	1985
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1909 - 1992	
ANNUAL TOTAL	2764.80		52379.3			
ANNUAL MEAN	7.57		143		160a	
HIGHEST ANNUAL MEAN					607	1966
LOWEST ANNUAL MEAN					1.28	1939
HIGHEST DAILY MEAN	202	May 24	1210	Apr 22	5580	May 13 1950
LOWEST DAILY MEAN	.00	Many days	2.4	Oct 12, 13	.00	Many days
ANNUAL SEVEN-DAY MINIMUM	.00	Jan 1	2.5	Dec 14	.00	Oct 1 1910
INSTANTANEOUS PEAK FLOW			1220	Apr 22	5610	May 13 1950
INSTANTANEOUS PEAK STAGE			9.18b	Mar 9	17.38	May 13 1950
INSTANTANEOUS LOW FLOW			2.2	Oct 13	.00	Many days
ANNUAL RUNOFF (AC-FT)	5480		103900		115700	
ANNUAL RUNOFF (CFSM)	.008		.15		.17	
ANNUAL RUNOFF (INCHES)	.11		2.03		2.26	
10 PERCENT EXCEEDS	22		464		504	
50 PERCENT EXCEEDS	2.5		31		6.7	
90 PERCENT EXCEEDS	.00		2.5		.00	

a Median of annual mean discharges is 110 ft³/s.
b 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. 7	-	Ice jam	*6.80	Sept. 9	0700	568	5.73
Aug. 26	0500	*776	6.60				

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	44	45	e50	e43	e32	e30	e55	271	53	120	130	386
2	40	28	e50	e42	e33	e51	e54	247	48	162	125	382
3	35	24	e50	e40	e34	e50	e60	227	44	225	112	418
4	32	14	e52	e38	e33	e55	e75	223	86	310	124	383
5	28	e35	e52	e38	e33	e50	83	188	85	339	127	341
6	40	e35	e53	e37	e30	e102	90	144	59	312	110	323
7	32	e35	e51	e35	e30	e161	82	133	56	331	112	321
8	27	e35	e40	e35	e33	e168	61	121	74	344	114	473
9	33	e35	e36	e33	e32	e157	59	102	74	345	101	561
10	27	e35	e47	e40	e30	e156	54	125	52	366	81	517
11	25	e35	e45	e38	e30	e66	98	139	44	368	88	453
12	27	e35	e48	e33	e36	e56	128	133	44	365	108	400
13	32	e36	e46	e37	e35	e50	115	112	48	341	112	365
14	28	e38	e45	e40	e36	e41	98	91	51	320	94	334
15	34	e40	e32	e38	e37	e38	108	110	50	344	84	290
16	35	e43	e36	e34	e35	e38	81	122	55	406	73	262
17	35	e46	e34	e30	e30	e38	71	178	75	408	72	277
18	36	e50	e43	e36	e37	e37	76	132	73	398	106	305
19	39	e60	e47	e36	e38	e27	85	131	80	385	111	293
20	65	e70	e48	e35	e33	e40	156	113	76	385	98	272
21	51	e70	e54	e35	e32	e50	244	101	85	360	89	245
22	38	e70	e48	e32	e35	e45	311	91	88	343	112	219
23	36	e60	e43	e30	e33	e40	315	92	95	310	292	199
24	45	e50	e41	e30	e30	e50	274	134	82	302	597	171
25	35	e42	e38	e30	e34	e60	271	126	88	298	720	152
26	42	e50	e38	e30	e35	e50	318	118	110	274	767	137
27	39	e50	e37	e31	e36	e45	341	79	108	224	668	133
28	36	e50	e37	e33	e36	e50	308	67	112	194	525	109
29	47	e50	e40	e32	e32	e60	300	45	109	173	423	93
30	47	e50	e44	e33	---	e65	281	52	109	146	375	76
31	40	---	e46	e33	---	e60	---	61	---	134	403	---
TOTAL	1150	1316	1371	1087	970	1986	4652	4008	2213	9332	7053	8890
MEAN	37.1	43.9	44.2	35.1	33.4	64.1	155	129	73.8	301	228	296
MAX	65	70	54	43	38	168	341	271	112	408	767	561
MIN	25	14	32	30	30	27	54	45	44	120	72	76
AC-FT	2280	2610	2720	2160	1920	3940	9230	7950	4390	18510	13990	17630
CFSM	.07	.09	.09	.07	.07	.13	.30	.25	.14	.59	.44	.58

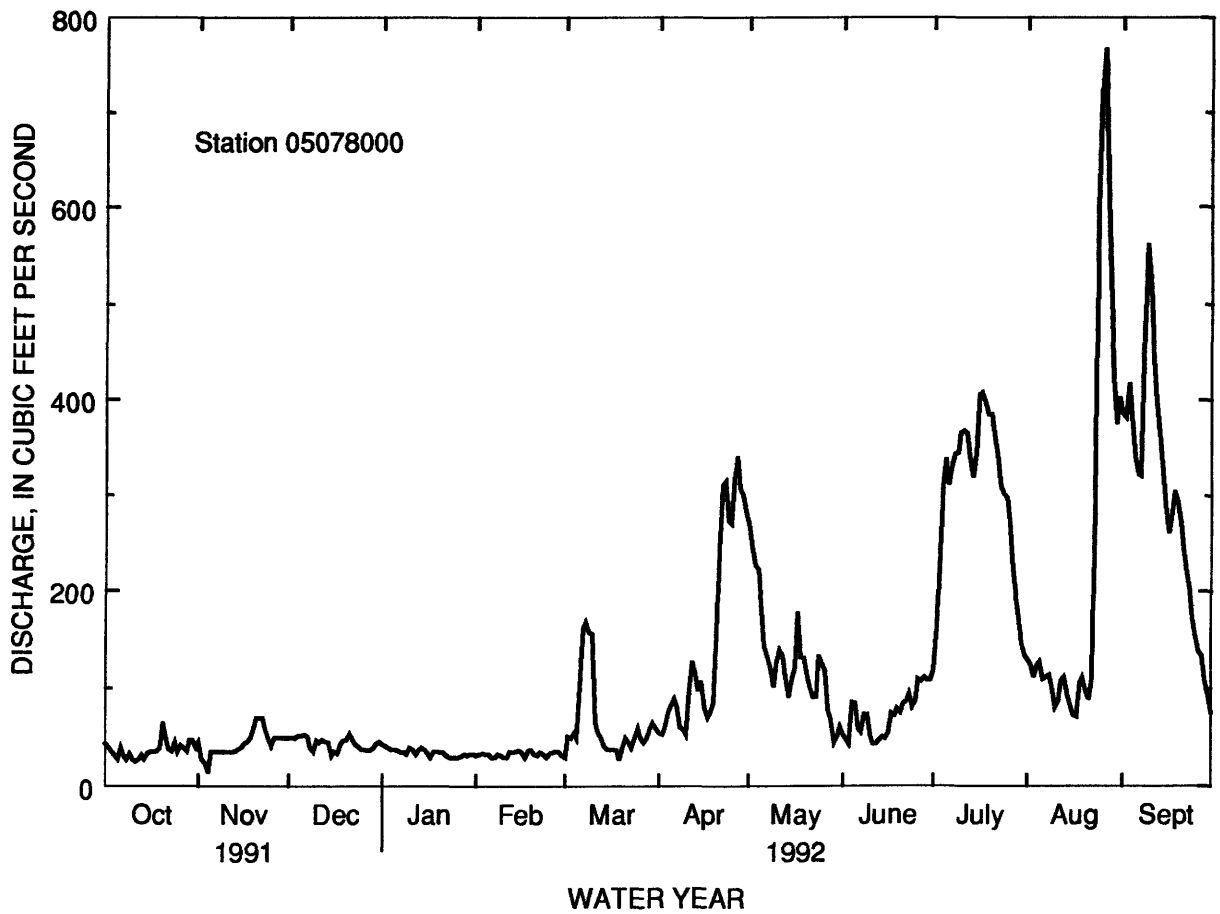
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1939 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	115	92.3	63.5	50.6	46.8	110	526	352	253	194	117	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	1.5	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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1939 - 1992	
ANNUAL TOTAL	26087		44028			
ANNUAL MEAN	71.5		120		170	
HIGHEST ANNUAL MEAN					354	1950
LOWEST ANNUAL MEAN					57.0	1990
HIGHEST DAILY MEAN	555	Jul 7	767	Aug 26	3840	Apr 25 1979
LOWEST DAILY MEAN	13	Feb 2	14	Nov 4	2.6	May 16 1977
ANNUAL SEVEN-DAY MINIMUM	22	Jan 30	28	Oct 8	2.9	May 10 1977
INSTANTANEOUS PEAK FLOW			776	Aug 26	3940	Apr 25 1979
INSTANTANEOUS PEAK STAGE			6.80a	Mar 7	12.37a	Apr 18 1979
INSTANTANEOUS LOW FLOW			9.6	Nov 5	2.5	May 16, 17, 1977
ANNUAL RUNOFF (AC-FT)	51740		87330		122900	
ANNUAL RUNOFF (CFSM)	.14		.23		.33	
10 PERCENT EXCEEDS	176		332		400	
50 PERCENT EXCEEDS	36		57		74	
90 PERCENT EXCEEDS	25		33		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 fair 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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	e24	e25	e20	e15	e20	90	94	16	16	13	112
2	18	e20	e26	e20	e15	e30	84	89	15	18	13	120
3	19	e17	e26	e19	e15	e40	82	82	13	26	12	133
4	20	e17	e26	e19	e15	e50	78	76	14	57	12	116
5	21	e17	e26	e19	e15	e70	76	65	15	76	13	100
6	21	e16	e26	e19	e15	e200	75	53	14	68	15	95
7	20	e16	e25	e19	e15	e400	75	48	13	58	18	97
8	21	e15	e25	e18	e15	e400	73	45	12	51	30	153
9	23	e15	e24	e18	e15	e250	71	43	12	48	33	179
10	22	e15	e24	e18	e15	e200	69	32	12	48	28	157
11	19	e16	e24	e18	e15	e150	57	35	12	43	25	132
12	17	e17	e23	e18	e15	e125	50	38	10	34	28	117
13	27	e18	e23	e18	e16	e106	49	36	9.7	28	27	101
14	35	e19	e23	e17	e16	e95	49	35	9.3	24	29	89
15	41	e21	e23	e17	e16	e85	50	28	10	22	e25	79
16	38	e24	e22	e17	e16	e77	50	25	10	22	e23	75
17	36	e27	e22	e17	e16	e70	50	32	11	22	e21	117
18	36	e30	e22	e17	e16	e65	50	34	12	22	19	124
19	35	e33	e22	e17	e16	e62	80	33	14	23	e25	107
20	32	e33	e22	e16	e16	e62	128	30	13	22	e30	92
21	28	e32	e21	e16	e17	e65	137	29	13	20	e29	82
22	24	e31	e21	e16	e17	e70	123	31	14	19	29	70
23	22	e29	e21	e16	e17	e75	113	32	15	20	e60	58
24	21	e26	e21	e16	e17	e80	110	33	16	18	277	48
25	18	e23	e21	e16	e17	e85	114	31	15	17	302	39
26	13	e19	e21	e16	e17	e90	118	28	14	17	232	32
27	14	e17	e20	e15	e17	93	112	25	13	17	180	30
28	22	e16	e20	e15	e17	93	104	21	13	16	142	27
29	26	e17	e20	e15	e18	104	101	18	14	14	112	23
30	31	e19	e20	e15	---	112	99	16	14	13	101	21
31	e28	---	e20	e15	---	105	---	16	---	13	112	---
TOTAL	767	639	705	532	462	3529	2517	1233	388.0	912	2015	2725
MEAN	24.7	21.3	22.7	17.2	15.9	114	83.9	39.8	12.9	29.4	65.0	90.8
MAX	41	33	26	20	18	400	137	94	16	76	302	179
MIN	13	15	20	15	15	20	49	16	9.3	13	12	21
AC-FT	1520	1270	1400	1060	916	7000	4990	2450	770	1810	4000	5410
CFSM.	09	.08	.09	.06	.06	.43	.32	.15	.05	.11	.24	.34
IN.	.11	.09	.10	.07	.06	.49	.35	.17	.05	.13	.28	.38

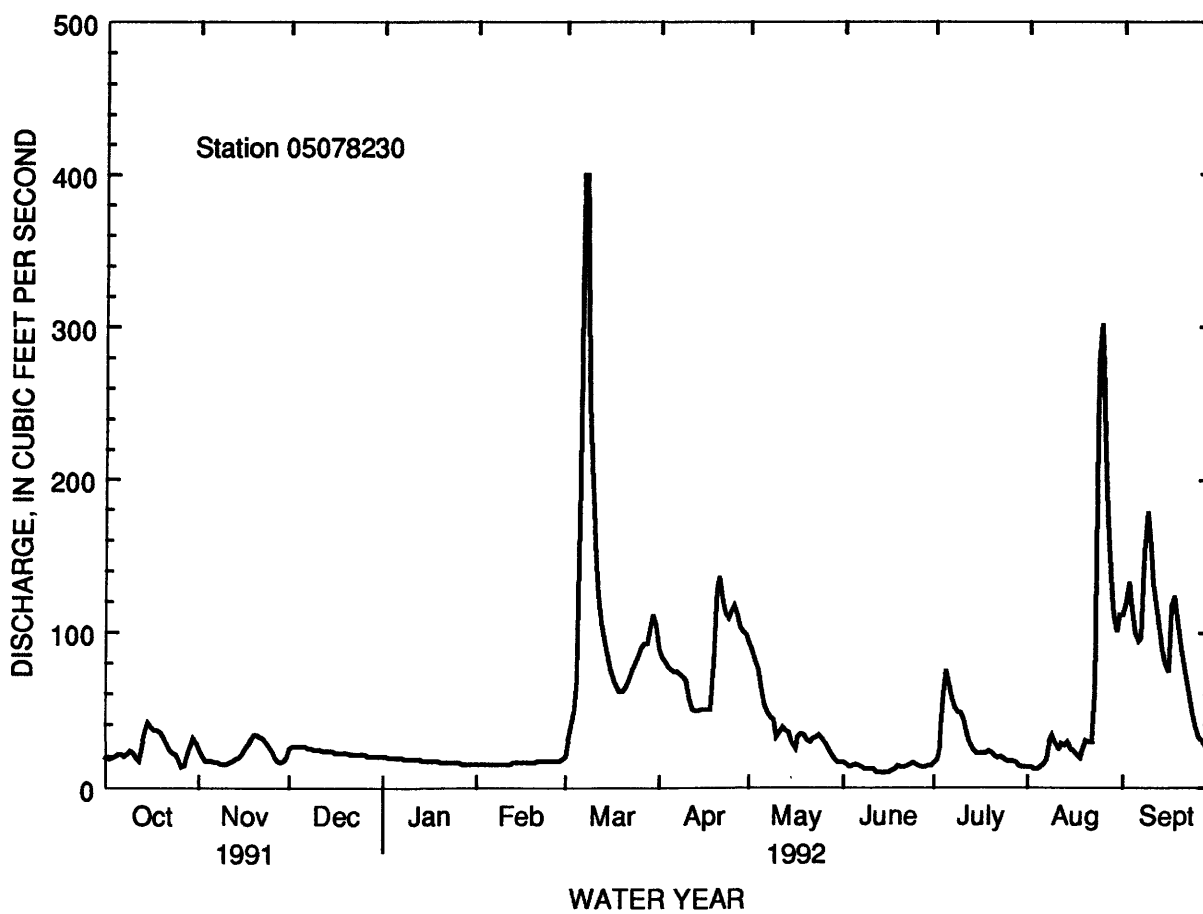
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1960 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	46.3	30.0	13.0	7.70	7.49	67.9	306	131	81.6	65.9	37.2	35.8
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1960 - 1992	
ANNUAL TOTAL	11964.14		16424.0			
ANNUAL MEAN	32.8		44.9		68.7	
HIGHEST ANNUAL MEAN					177	1962
LOWEST ANNUAL MEAN					18.2	1990
HIGHEST DAILY MEAN	215	Sep 10	400	Mar 7	3040	Apr 11 1969
LOWEST DAILY MEAN	.18	Jan 27	9.3	Jun 14	.00a	
ANNUAL SEVEN-DAY MINIMUM	.18	Jan 27	10	Jun 11	.00	Feb 16 1963
INSTANTANEOUS PEAK FLOW			500	Mar 8	3210	Apr 11 1969
INSTANTANEOUS PEAK STAGE			12.33b	Mar 8	16.72c	May 24 1962
INSTANTANEOUS LOW FLOW			9.2	Jun 14		
ANNUAL RUNOFF (AC-FT)	23730		32580		49740	
ANNUAL RUNOFF (CFSM)	.12		.17		.26	
ANNUAL RUNOFF (INCHES)	1.67		2.30		3.51	
10 PERCENT EXCEEDS	78		105		161	
50 PERCENT EXCEEDS	22		23		16	
90 PERCENT EXCEEDS	.62		15		2.0	

a Many days in 1963, 1964, 1977, and 1990.
b Backwater from ice.
c 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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	100	74	e100	e95	e65	e120	330	515	107	123	136	685
2	90	35	e100	e90	e65	e150	281	481	95	134	129	657
3	86	92	e100	e86	e65	e200	247	434	88	195	124	681
4	79	131	e100	e83	e65	e300	223	406	85	269	112	664
5	74	86	e100	e80	e65	e400	246	371	120	377	119	584
6	68	65	e100	e78	e65	e700	246	321	117	396	125	515
7	72	e70	e100	e76	e60	e1500	255	265	93	370	110	517
8	72	e70	e100	e74	e55	e1500	243	255	87	397	111	652
9	67	e70	e90	e72	e60	e1100	225	225	99	381	112	923
10	67	e70	e80	e70	e65	e900	213	207	94	396	107	902
11	67	e70	e85	e80	e60	e700	205	228	79	404	93	799
12	63	e70	e90	e80	e60	e600	230	238	64	400	93	687
13	62	e70	e90	e66	e75	e500	243	233	59	393	106	612
14	65	e73	e90	e75	e75	e400	224	219	60	351	121	557
15	70	e76	e90	e80	e75	311	218	189	63	338	104	504
16	84	e80	e70	e80	e75	307	226	198	67	374	95	455
17	98	e86	e69	e75	e70	245	201	227	72	425	92	460
18	90	e94	e68	e65	e65	245	197	258	85	415	87	581
19	86	e105	e80	e70	e70	237	229	252	90	408	99	570
20	90	e120	e90	e75	e75	215	365	216	96	397	119	509
21	108	e140	e100	e72	e70	230	578	191	90	395	116	451
22	102	e135	e110	e70	e70	243	637	178	96	369	112	393
23	86	e130	e100	e68	e70	243	626	172	95	347	207	340
24	77	e120	e95	e66	e70	261	590	182	102	313	1060	303
25	81	e115	e90	e65	e65	292	566	211	92	311	1610	259
26	77	e110	e85	e65	e70	307	610	199	94	301	1530	237
27	77	e105	e80	e65	e80	302	658	182	109	265	1280	218
28	81	e100	e77	e65	e90	290	614	145	106	220	996	189
29	92	e100	e75	e65	e90	298	568	132	107	195	798	169
30	118	e100	e80	e65	---	352	554	108	106	175	689	154
31	e95	---	e90	e65	---	374	---	102	---	152	675	---
TOTAL	2544	2762	2774	2281	2005	13822	10848	7540	2717	9986	11267	15227
MEAN	82.1	92.1	89.5	73.6	69.1	446	362	243	90.6	322	363	508
MAX	118	140	110	95	90	1500	658	515	120	425	1610	923
MIN	62	35	68	65	55	120	197	102	59	123	87	154
AC-FT	5050	5480	5500	4520	3980	27420	21520	14960	5390	19810	22350	30200
CFSM	.06	.07	.07	.05	.05	.33	.26	.18	.07	.24	.27	.37
IN.	.07	.07	.08	.06	.05	.38	.29	.20	.07	.27	.31	.41

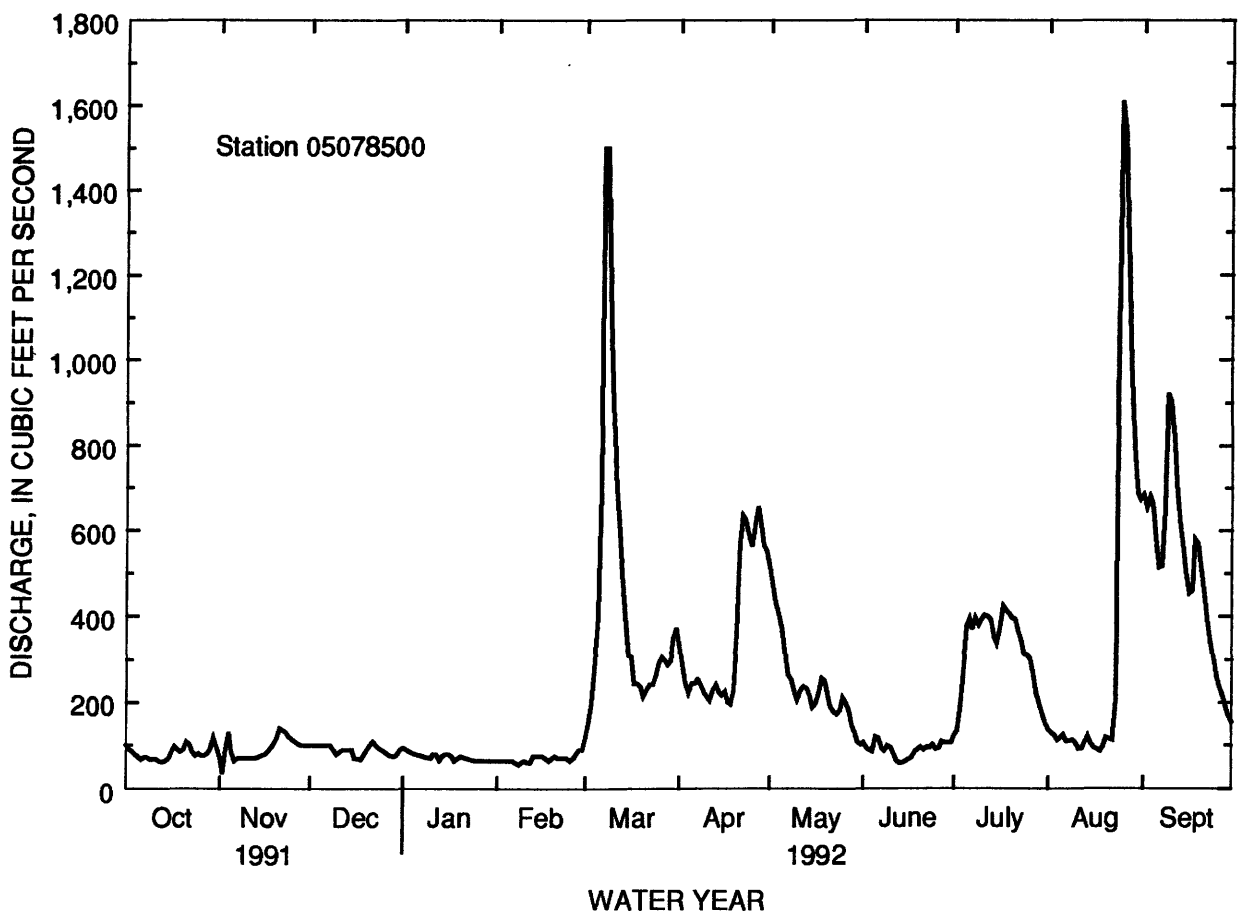
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	180	136	85.0	67.5	62.4	223	1136	670	479	340	194	175
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1909 - 1992	
ANNUAL TOTAL	51076		83773			
ANNUAL MEAN	140		229		309a	
HIGHEST ANNUAL MEAN					855	1950
LOWEST ANNUAL MEAN					64.4	1939
HIGHEST DAILY MEAN	831	Sep 17	1610	Aug 25	9930	Apr 25 1979
LOWEST DAILY MEAN	24	Feb 5	35	Nov 2	.10	Sep 15 1936
ANNUAL SEVEN-DAY MINIMUM	28	Feb 3	61	Feb 6	.24	Sep 12 1936
INSTANTANEOUS PEAK FLOW			1640	Aug 25	10300	Apr 25 1979
INSTANTANEOUS PEAK STAGE			10.10b	Mar 8	15.85c	Mar 6 1983
INSTANTANEOUS LOW FLOW			20d	Nov 2	.00f	
ANNUAL RUNOFF (AC-FT)	101300		166200		223700	
ANNUAL RUNOFF (CFSM)	.10		.17		.23	
ANNUAL RUNOFF (INCHES)	1.39		2.27		3.06	
10 PERCENT EXCEEDS	335		567		766	
50 PERCENT EXCEEDS	86		110		104	
90 PERCENT EXCEEDS	35		67		36	

a Median of annual mean discharges is 270 ft^3/s.
b Backwater from ice.
c From highwater mark, backwater from ice.
d Result of freezeup.
f Occurred Sept. 15, 1936, Sept. 14, 1939, and Aug. 19-22, 1940.



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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	222	154	e168	e146	e145	e185	e1500	2000	312	248	301	1080
2	210	123	e167	e148	e145	e225	e1350	1930	299	273	275	1120
3	208	105	e166	e150	e100	e280	e1200	1780	306	324	274	1080
4	190	e110	e165	e150	e145	e330	1060	1660	263	398	277	1110
5	155	e125	e164	e148	e145	e400	963	1630	249	549	258	1110
6	169	e142	e163	e148	e145	e600	993	1460	278	663	251	1090
7	166	e120	e162	e148	e145	e1100	1000	1300	236	681	291	1120
8	173	e105	e161	e148	e145	e1800	937	1050	208	670	250	1210
9	140	e94	e160	e145	e145	e2350	834	978	196	705	239	1750
10	162	e110	e150	e145	e145	e1850	895	875	206	642	263	2100
11	128	e110	e140	e145	e145	e1600	836	856	193	659	238	2010
12	154	e110	e140	e145	e145	e1450	833	928	181	639	224	1760
13	113	e110	e145	e145	e145	e1300	913	796	176	623	226	1540
14	132	e112	e145	e145	e145	e1200	889	865	155	616	224	1360
15	129	e114	e143	e145	e145	e1100	882	792	178	600	234	1240
16	150	e118	e140	e145	e145	e980	857	785	191	570	229	1190
17	129	e125	e125	e145	e145	e930	877	653	254	579	257	1190
18	172	e135	e125	e145	e145	e890	888	670	271	616	267	1250
19	152	e150	e130	e145	e145	e820	1040	699	323	596	222	1460
20	176	e165	e134	e145	e145	e780	1150	714	320	585	219	1360
21	148	e185	e138	e145	e146	e760	1660	660	319	559	222	1300
22	187	e205	e140	e145	e147	e760	2190	631	282	564	297	1210
23	166	e218	e140	e145	e148	e770	2370	572	269	524	337	1120
24	185	e218	e140	e145	e149	e790	2150	559	275	460	511	1090
25	168	e200	e140	e145	e150	e820	2140	592	256	426	1560	1060
26	174	e190	e140	e145	e151	e920	2130	650	222	453	1920	1020
27	175	e180	e140	e145	e152	e1200	2220	597	213	472	1920	968
28	182	e176	e140	e145	e158	e1200	2360	550	203	432	1720	940
29	228	e174	e140	e145	e170	e1170	2220	457	215	369	1440	905
30	208	e170	e142	e145	---	e1100	2090	409	229	343	1240	860
31	237	---	e144	e145	---	e1400	---	396	---	334	1150	---
TOTAL	5288	4353	4537	4521	4226	31060	41427	28494	7278	16172	17336	37603
MEAN	171	145	146	146	146	1002	1381	919	243	522	559	1253
MAX	237	218	168	150	170	2350	2370	2000	323	705	1920	2100
MIN	113	94	125	145	100	185	833	396	155	248	219	860
AC-FT	10490	8630	9000	8970	8380	61610	82170	56520	14440	32080	34390	74590
CFSM.	03	.03	.03	.03	.03	.19	.26	.17	.05	.10	.11	.24
IN.	.04	.03	.03	.03	.03	.22	.29	.20	.05	.11	.12	.26

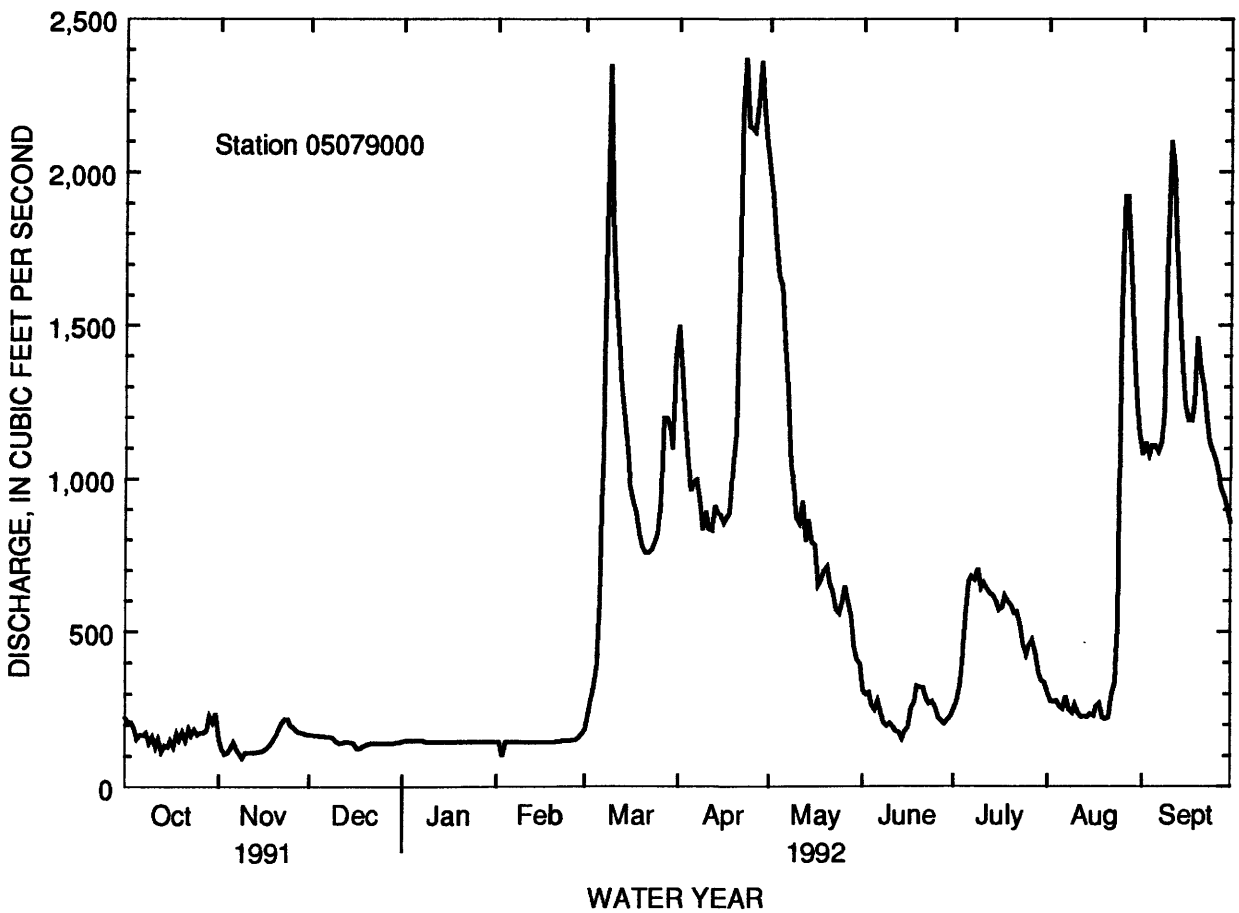
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1901 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	804	664	545	492	467	934	2947	2050	1643	1239	789	787
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1901 - 1992	
ANNUAL TOTAL	90865		202295			
ANNUAL MEAN	249		553		1109	
HIGHEST ANNUAL MEAN					3129	1950
LOWEST ANNUAL MEAN					83.6	1934
HIGHEST DAILY MEAN	1300	Jun 13	2370	Apr 23	27100	Apr 12 1969
LOWEST DAILY MEAN	80	Jan 27	94	Nov 9	2.5	Sep 29 1936
ANNUAL SEVEN-DAY MINIMUM	81	Jan 27	107	Nov 8	3.9	Sep 28 1936
INSTANTANEOUS PEAK FLOW			2460	Apr 28	28400	Apr 12 1969
INSTANTANEOUS PEAK STAGE			12.17a	Mar 9	27.33	Apr 12 1969
INSTANTANEOUS LOW FLOW			70	Nov 3	.00b	Jul 13 1960
ANNUAL RUNOFF (AC-FT)	180200		401300		803400	
ANNUAL RUNOFF (CFSM)	.047		.10		.21	
ANNUAL RUNOFF (INCHES)	.64		1.43		2.85	
10 PERCENT EXCEEDS	518		1350		2480	
50 PERCENT EXCEEDS	166		252		650	
90 PERCENT EXCEEDS	95		140		107	

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)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1962, 1974-76, 1979 to current year
REMARKS.--Letter K indicates non-ideal colony count.

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
OCT												
08...	1430	184	495	534	8.7	8.6	9.0	1.9	734	14.1	K6	K12
09...	0830	--	--	--	--	--	--	--	--	--	--	--
DEC												
04...	1530	105	730	743	8.0	7.9	0.0	2.5	742	13.1	K9	K12
JAN												
22...	1520	146	610	603	8.2	7.7	0.5	2.3	724	7.6	K10	K14
APR												
16...	0845	848	400	426	8.2	8.1	7.0	6.0	738	12.3	39	K19
JUL												
08...	1245	720	525	532	8.5	8.2	21.5	6.5	735	8.0	200	370

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)	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)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)
OCT												
08...	61	27	13	4.8	186	201	0	227	85	11	0.20	0.45
09...	--	--	--	--	--	--	--	--	--	--	--	--
DEC												
04...	94	38	13	4.9	294	307	0	359	120	12	0.20	13
JAN												
22...	77	29	11	4.5	270	284	0	329	45	11	0.20	18
APR												
16...	57	19	5.1	4.2	157	170	0	192	54	7.0	0.20	6.8
JUL												
08...	61	27	10	3.8	194	210	7	237	72	9.7	0.20	8.5

RED RIVER OF THE NORTH BASIN

05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	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 TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-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)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT												
08...	324	<0.010	<0.050	<0.010	<0.010	0.80	0.030	<0.010	0.010	<0.010	--	--
09...	--	--	--	--	--	--	--	--	--	--	6	60
DEC												
04...	463	<0.010	0.470	0.030	0.030	1.0	0.020	0.020	0.010	<0.010	--	--
JAN												
22...	383	<0.010	0.320	0.170	0.190	0.90	0.050	0.020	0.030	0.020	--	--
APR												
16...	268	<0.010	0.200	0.020	0.020	0.70	0.030	<0.010	0.020	<0.010	18	91
JUL												
08...	348	<0.010	0.058	0.050	0.040	1.1	0.070	0.050	0.050	0.040	16	95

DATE	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)	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												
08...	10	50	<3	32	19	9	<10	<1	<1	<1.0	160	<6
09...	--	--	--	--	--	--	--	--	--	--	--	--
DEC												
04...	--	--	--	--	--	--	--	--	--	--	--	--
JAN												
22...	20	71	<3	34	16	35	<10	<1	<1	<1.0	180	<6
APR												
16...	10	43	<3	38	13	34	<10	<1	<1	<1.0	120	<6
JUL												
08...	<10	60	<3	18	15	23	<10	<1	<1	<1.0	170	<6

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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	859	461	604	442	487	552	3620	3500	1200	1720	1250	2400
2	801	375	596	454	496	576	3270	3360	1180	1930	1190	2240
3	844	285	597	471	494	600	3150	3300	1180	4040	1090	2100
4	864	290	586	475	496	670	2910	3100	1200	5180	982	2010
5	886	331	557	476	496	908	2640	2920	1110	5170	934	1980
6	853	371	520	480	496	1460	2430	2810	1000	4660	924	1900
7	774	403	477	486	506	2670	2360	2610	985	4250	977	1880
8	668	419	445	495	514	5590	2320	2390	989	3880	961	1880
9	619	376	413	491	558	e6520	2220	2180	918	3520	925	1940
10	598	355	401	526	584	e7280	2130	1960	863	3200	890	2440
11	585	358	395	577	586	e7770	2090	1850	790	3060	888	2920
12	620	388	394	601	577	e7860	2100	1760	736	3190	928	3090
13	609	439	395	660	564	e7940	2010	1790	708	3040	1090	2970
14	636	489	398	644	550	e7360	2030	1730	708	2730	1290	2730
15	639	520	434	566	545	e6310	2050	1680	711	2490	1290	2460
16	608	525	443	600	545	e5440	2070	1680	766	2400	1200	2240
17	612	527	443	564	531	e4470	2120	1630	874	2390	1180	2090
18	662	527	442	543	529	e4030	2150	1580	1280	2470	1030	1980
19	675	528	461	536	529	e3920	2140	1630	2590	2700	955	2020
20	704	538	477	527	525	e3840	2180	1630	3940	2850	894	2220
21	715	559	472	516	539	e3770	2280	1610	4790	2480	866	2240
22	708	605	474	516	539	e3730	2720	1570	5140	2150	858	2170
23	691	625	477	508	520	e3690	3380	1460	4990	1950	967	2040
24	677	637	471	503	515	e3730	3550	1440	4490	1810	1170	1900
25	658	673	483	496	493	e3860	3320	1480	3880	1690	1390	1780
26	592	677	479	486	491	e3980	3310	1490	3330	1550	2240	1730
27	537	651	458	478	500	e4030	3380	1500	2830	1470	3370	1630
28	526	641	441	492	490	e4500	3510	1540	2410	1440	3680	1590
29	583	640	439	500	506	4850	3690	1460	2070	1400	3540	1520
30	542	623	430	494	---	4760	3640	1350	1810	1320	3070	1460
31	492	---	427	486	---	4130	---	1240	---	1280	2650	---
TOTAL	20837	14836	14529	16089	15201	130796	80770	61230	59468	83410	44669	63550
MEAN	672	495	469	519	524	4219	2692	1975	1982	2691	1441	2118
MAX	886	677	604	660	586	7940	3690	3500	5140	5180	3680	3090
MIN	492	285	394	442	487	552	2010	1240	708	1280	858	1460
AC-FT	41330	29430	28820	31910	30150	259400	160200	121400	118000	165400	88600	126100

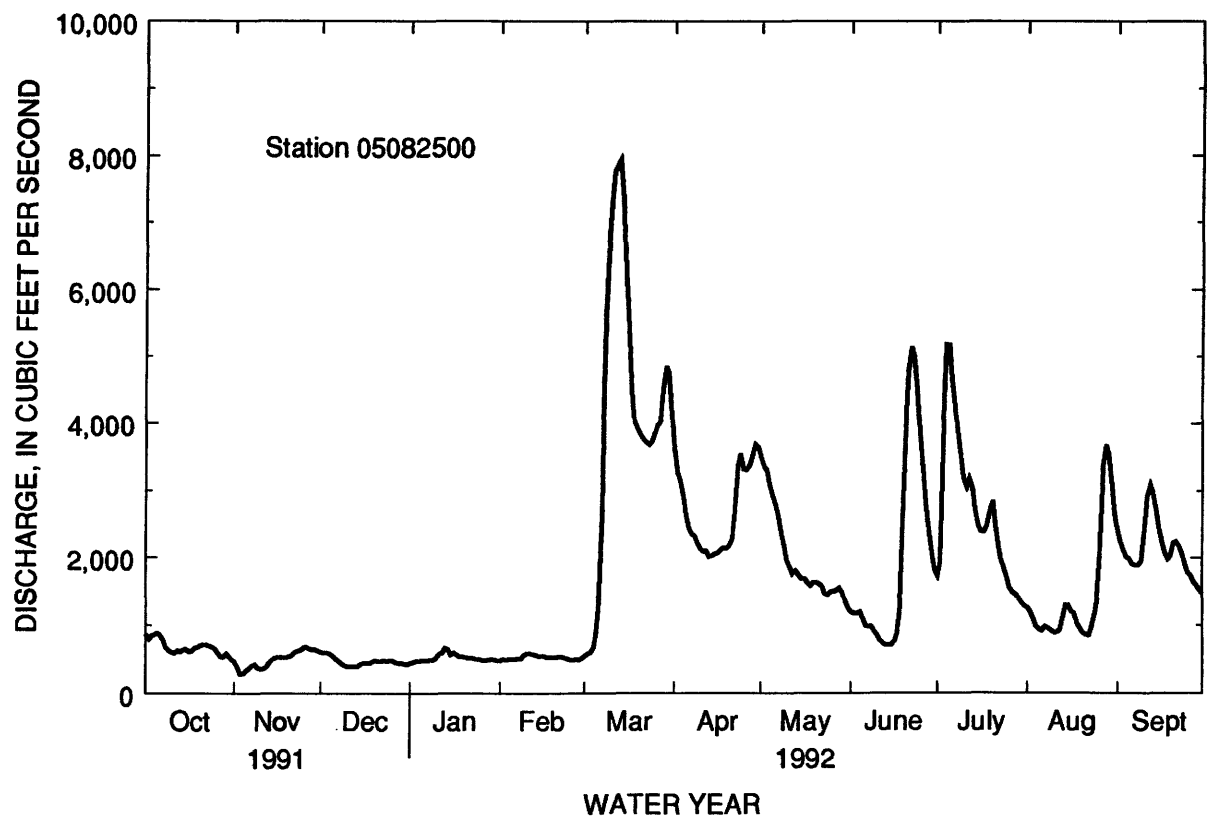
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1904 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	1315	1144	921	787	754	2311	9075	4888	3829	3021	1535	1338
MAX	4290	5218	3073	1929	1869	10250	31480	36510	19340	25270	6564	4702
(WY)	1972	1972	1972	1951	1952	1966	1979	1950	1962	1975	1905	1985
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	1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1904 - 1992	
ANNUAL TOTAL	450227		605385			
ANNUAL MEAN	1233		1654		2555	
HIGHEST ANNUAL MEAN					7580	1950
LOWEST ANNUAL MEAN					244	1934
HIGHEST DAILY MEAN	4850	Jul 8	7940	Mar 13	80900	Apr 23 1979
LOWEST DAILY MEAN	180	Jan 1	285	Nov 3	1.8c	Sep 2 1977
ANNUAL SEVEN-DAY MINIMUM	184	Jan 10	353	Nov 2	2.5	Feb 12 1937
INSTANTANEOUS PEAK FLOW			8000a	Mar 12	85000d	Apr 10 1897
INSTANTANEOUS PEAK STAGE			23.30b	Mar 12	50.20f	Apr 10 1897
ANNUAL RUNOFF (AC-FT)	893000		1201000		1851000	
10 PERCENT EXCEEDS	2790		3690		5660	
50 PERCENT EXCEEDS	774		1010		1280	
90 PERCENT EXCEEDS	239		475		260	

a About.
b Backwater from ice.
c Caused by unusual regulating during repair of dam at Grand Forks.
d About, from rating curve extended above 58,000 ft³/s.
f 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 1991 TO SEPTEMBER 1992

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)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN, DIS-SOLVED (PER-CENT SATUR-ATION) (00301)	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												
25...	1545	606	605	--	1.0	5.0	--	--	--	--	--	--
NOV												
27...	1450	650	925	8.2	-5.5	0.5	--	--	340	280	71	39
DEC												
11...	1245	405	840	8.0	-12.0	0.0	13.0	92	380	310	83	42
31...	1200	428	900	--	1.5	0.5	--	--	--	--	--	--
JAN												
27...	1645	473	900	--	-14.5	0.0	--	--	--	--	--	--
MAR												
13...	1100	8080	425	--	1.0	0.5	--	--	--	--	--	--
APR												
03...	1150	3170	539	7.8	8.0	3.0	--	--	220	180	50	23
MAY												
29...	1215	1600	655	--	20.0	17.0	--	--	--	--	--	--
JUL												
06...	1155	4680	458	--	15.0	17.5	--	--	--	--	--	--
AUG												
03...	1005	1120	572	--	19.5	18.0	--	--	--	--	--	--
SEP												
30...	0945	1630	590	8.1	10.0	12.5	--	--	300	230	68	31

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)
NOV											
27...	39	20	0.9	7.3	110	29	0.30	12	476	523	0.71
DEC											
11...	38	18	0.8	7.4	130	30	0.20	7.4	522	554	0.75
APR											
03...	20	16	0.6	5.8	76	11	0.20	14	310	351	0.48
SEP											
30...	15	10	0.4	4.4	84	12	0.20	9.3	362	401	0.55

RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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)
NOV											
27...	918	3	90	30	<1	30	20	<0.1	<1	<1	380
DEC											
11...	606	4	110	10	<1	30	20	<0.1	1	<1	420
APR											
03...	3000	2	40	20	<1	20	10	<0.1	2	1	290
SEP											
30...	1760	4	60	20	<1	20	10	<0.1	<1	<1	320

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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.10	.30	e3.0	e1.3	e.54	e.41	e110	98	14	3.3	2.0	.17
2	.10	e.28	e2.9	e1.2	e.53	e.43	e138	84	13	3.1	1.2	.17
3	.10	e.26	e2.9	e1.2	e.52	e.46	e170	73	12	3.3	.99	.15
4	.10	e.24	e2.8	e1.1	e.51	e.52	e160	63	12	3.0	.87	.14
5	.10	e.23	e2.8	e1.1	e.50	e.62	e150	53	10	2.9	1.5	.18
6	.11	e.22	e2.7	e1.1	e.49	e1.5	e142	44	8.9	2.8	1.2	.19
7	.13	e.21	e2.7	e1.0	e.48	e10	136	37	8.7	16	1.1	.30
8	.14	e.20	e2.6	e1.0	e.47	e170	124	34	8.0	43	.83	.24
9	.12	e.20	e2.6	e.97	e.46	e300	118	31	7.2	44	.48	.24
10	.10	e.21	e2.5	e.95	e.45	e290	118	28	7.1	34	.53	.28
11	.09	e.22	e2.5	e.92	e.45	e280	109	28	5.7	28	.31	.26
12	.09	e.24	e2.5	e.90	e.44	e250	98	25	5.3	22	.29	.24
13	.16	e.27	e2.4	e.87	e.43	e22	83	23	4.5	20	.25	.23
14	.20	e.40	e2.4	e.85	e.43	e180	70	21	3.8	17	.21	.20
15	.14	e.60	e2.4	e.83	e.42	e130	59	20	3.2	17	.20	.20
16	.20	e.90	e2.3	e.81	e.42	e90	51	21	3.7	16	.21	.21
17	.20	e1.3	e2.3	e.79	e.41	e70	46	20	3.6	15	.22	.89
18	.17	e1.8	e2.2	e.77	e.41	e57	45	20	3.2	14	.21	3.6
19	.16	e2.3	e2.2	e.75	e.40	e45	46	21	2.5	12	.21	3.3
20	.18	e2.7	e2.1	e.73	e.40	e38	47	35	2.2	10	.20	2.4
21	.26	e3.1	e2.0	e.72	e.40	e32	57	57	1.6	8.5	.19	1.2
22	.27	e3.4	e1.9	e.70	e.40	e29	80	72	1.5	7.7	.23	.49
23	.25	e3.5	e1.9	e.68	e.40	e29	107	54	1.3	6.8	.28	.38
24	.45	e3.5	e1.8	e.66	e.40	e31	113	45	1.5	5.8	.29	.43
25	.42	e3.5	e1.7	e.65	e.40	e34	112	38	1.9	5.3	.28	.45
26	.27	e3.4	e1.6	e.63	e.40	e40	109	34	1.7	4.7	.25	.49
27	.27	e3.3	e1.6	e.61	e.40	e47	117	29	1.3	3.9	.21	.74
28	1.1	e3.2	e1.5	e.60	e.40	e55	127	24	1.6	3.2	.21	.78
29	2.2	e3.1	e1.4	e.59	e.40	e63	127	21	2.6	2.5	.24	.89
30	1.3	e3.1	e1.4	e.57	---	e74	116	18	2.5	2.5	.26	1.0
31	.36	---	e1.3	e.55	---	e86	---	16	---	2.3	.21	---
TOTAL	9.84	46.18	68.9	26.10	12.76	2653.94	3085	1187	156.1	379.6	15.66	20.44
MEAN	.32	1.54	2.22	.84	.44	85.6	103	38.3	5.20	12.2	.51	.68
MAX	2.2	3.5	3.0	1.3	.54	300	170	98	14	44	2.0	3.6
MIN	.09	.20	1.3	.55	.40	.41	45	16	1.3	2.3	.19	.14
AC-FT	20	92	137	52	25	5260	6120	2350	310	753	31	41
CFSM	.00	.01	.01	.00	.00	.32	.39	.14	.02	.05	.00	.00
IN.	.00	.01	.01	.00	.00	.37	.43	.17	.02	.05	.00	.00

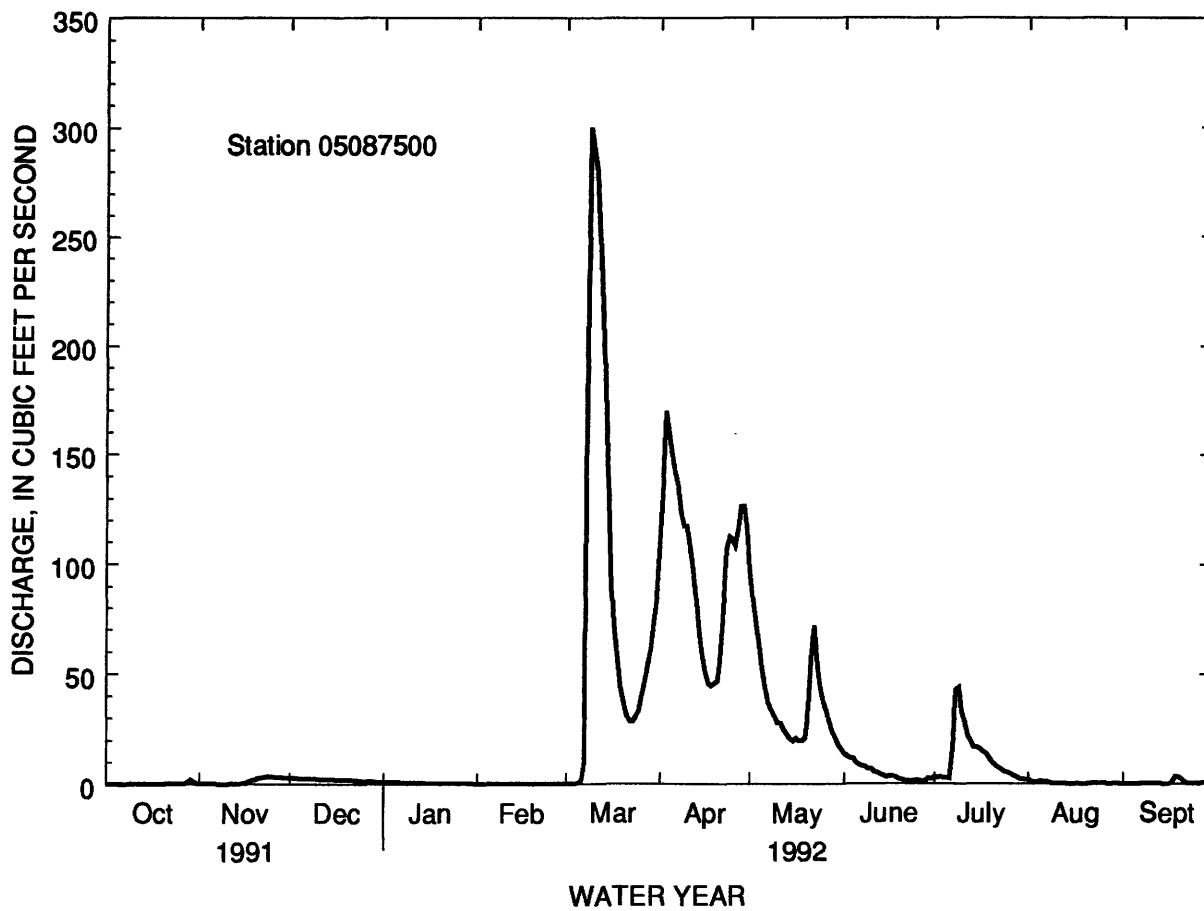
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	9.01	5.16	2.27	.98	.74	25.0	205	72.1	71.8	51.0	4.77	7.51
MAX	94.1	33.4	15.8	4.65	3.32	217	747	330	660	688	29.5	163
(WY)	1983	1957	1983	1983	1983	1983	1966	1970	1970	1975	1985	1957
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1945 - 1992	
ANNUAL TOTAL	1760.27		7661.52			
ANNUAL MEAN	4.82		20.9		37.8a	
HIGHEST ANNUAL MEAN					112	1966
LOWEST ANNUAL MEAN					1.60	1977
HIGHEST DAILY MEAN	84	Jul 8	300	Mar 9	3790	Jul 4 1975
LOWEST DAILY MEAN	.00	Many days	.09	Oct 11, 12	.00	Many days
ANNUAL SEVEN-DAY MINIMUM	.00	Jan 1	.11	Oct 1	.00	Aug 18 1952
INSTANTANEOUS PEAK FLOW			350	Mar 9	4260	Jul 3 1975
INSTANTANEOUS PEAK STAGE			9.87b	Mar 9	16.59c	Jul 3 1975
INSTANTANEOUS LOW FLOW			.08	Oct 11, 12		
ANNUAL RUNOFF (AC-FT)	3490		15200		27390	
ANNUAL RUNOFF (CFSM)	.018		.079		.14	
ANNUAL RUNOFF (INCHES)	.25		1.08		1.93	
10 PERCENT EXCEEDS	12		72		74	
50 PERCENT EXCEEDS	.27		1.7		1.8	
90 PERCENT EXCEEDS	.00		.21		.00	

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



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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1040	e650	651	490	456	480	e7600	4390	1810	2460	1560	3470
2	980	e600	634	485	449	530	e8000	4260	1680	2240	1510	3080
3	940	e500	625	480	456	574	e8500	4080	1570	2140	1460	2860
4	881	e500	583	480	456	651	e7400	3890	1540	2730	1390	2660
5	891	e450	550	475	456	e700	e6300	3690	1530	4300	1280	2490
6	940	542	559	470	472	e1000	e5200	3450	1510	5040	1180	2400
7	960	534	550	472	456	e1500	e4920	3280	1440	4920	1140	2350
8	940	526	534	503	464	e2000	e4570	3110	1350	4680	1130	2300
9	881	534	510	526	487	e2700	e4250	2980	1290	4410	1110	2250
10	795	550	487	550	495	e5600	e3930	2780	1260	4090	1080	2230
11	704	567	464	559	503	e7000	e3630	2590	1200	3760	1030	2360
12	695	551	449	550	518	e7500	e3340	2410	1080	3470	1010	2820
13	669	526	449	550	542	e7900	e3150	2290	1040	3490	997	3200
14	686	511	479	559	542	e8200	2870	2180	981	3470	1040	3340
15	713	526	534	534	567	e8400	2650	2140	948	3290	1130	3260
16	686	551	534	550	542	e8600	2550	2100	920	3030	1260	3060
17	669	592	526	559	518	e8500	2540	2080	960	2830	1360	2850
18	669	617	518	559	518	e7750	2540	2070	1050	2720	1390	2630
19	660	625	510	559	510	e7000	2550	1990	1210	2690	1390	2470
20	686	643	510	559	526	e6250	e2630	1950	1780	2750	1320	2370
21	722	651	487	542	550	e5500	e2680	1910	2940	2910	1250	2360
22	749	651	487	526	550	e4750	2690	1980	3960	2930	1190	2490
23	758	643	487	510	526	e4000	2850	2360	4570	2720	1150	2520
24	786	625	487	600	518	e4000	3330	2750	4770	2440	1150	2480
25	786	660	495	600	510	e4400	3910	2730	4780	2220	1240	2350
26	768	710	503	542	503	e4900	4260	2490	4520	2070	1440	2190
27	758	731	518	490	487	e5300	4270	2290	4080	1940	1820	2060
28	768	713	518	487	464	e5800	4310	2130	3590	1800	2770	2010
29	843	677	518	464	472	e6200	4330	2060	3160	1710	3660	1930
30	e800	660	526	456	---	e6700	4410	2020	2760	1640	3960	1860
31	e740	---	490	456	---	e7100	---	1930	---	1600	3840	---
TOTAL	24563	17816	16172	16142	14513	151485	126160	82360	65279	92490	48237	76700
MEAN	792	594	522	521	500	4887	4205	2657	2176	2984	1556	2557
MAX	1040	731	651	600	567	8600	8500	4390	4780	5040	3960	3470
MIN	660	450	449	456	449	480	2540	1910	920	1600	997	1860
AC-FT4	8720	35340	32080	32020	28790	300500	250200	163400	129500	183500	95680	152100

e Estimated.

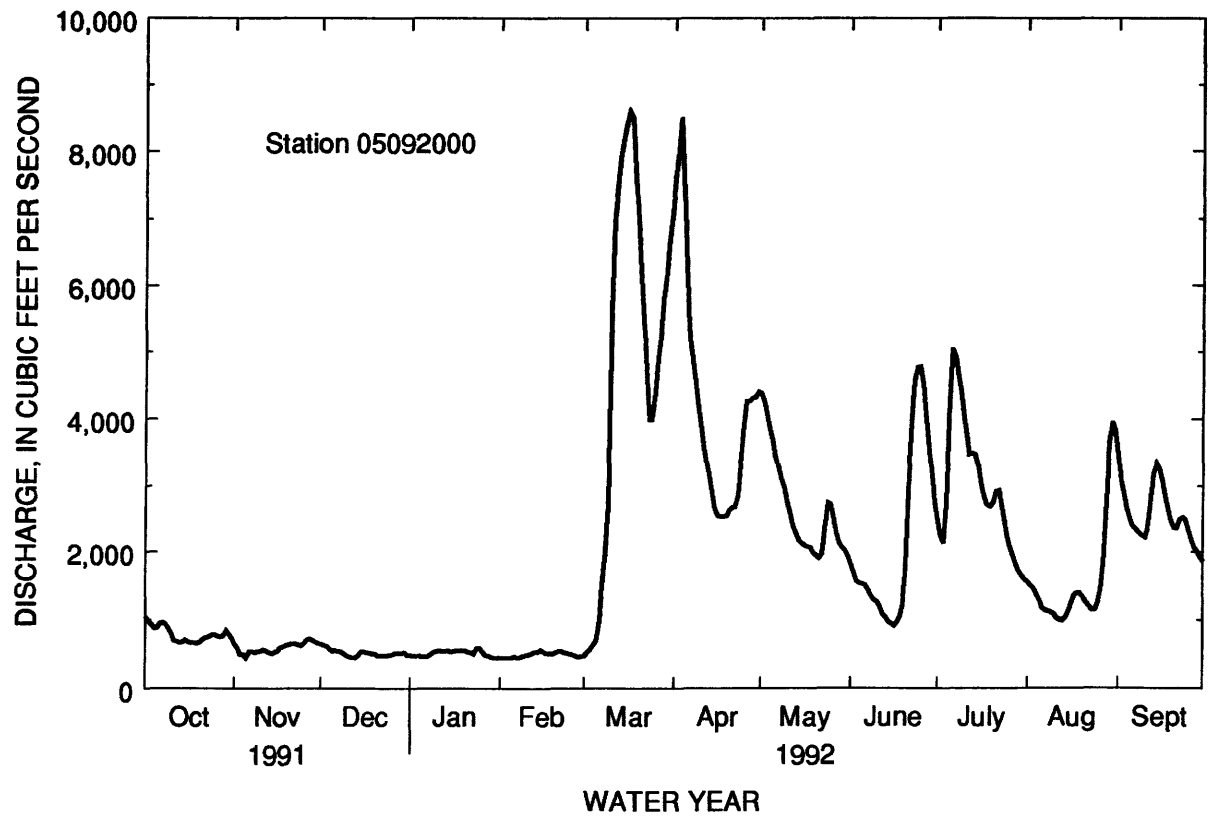
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1949-1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	1699	1468	1168	1028	1000	2536	13500	8249	5200	4177	1942	1638
MAX	4463	5653	3072	2065	1876	9329	38390	58890	23420	28240	7247	5392
(WY)	1972	1972	1972	1966	1952	1983	1966	1950	1962	1975	1985	1957
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	1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1949-1992	
ANNUAL TOTAL	472056	731917				
ANNUAL MEAN	1293		2000		3646	
HIGHEST ANNUAL MEAN					10510	1950
LOWEST ANNUAL MEAN					536	1977
HIGHEST DAILY MEAN	4940	Jul 11	8600	Mar 16	91000	Apr 28 1979
LOWEST DAILY MEAN	156	Jan 3	449	Dec 12	110	Dec 23 1989
ANNUAL SEVEN-DAY MINIMUM	162	Jan 1	455	Jan 30	118	Dec 28 1989
INSTANTANEOUS PEAK FLOW			8800a	Mar 16	92900	Apr 28 1979
INSTANTANEOUS PEAK STAGE			23.28b	Mar 16	43.66	Apr 28 1979
INSTANTANEOUS LOW FLOW					7.7	Oct 16 1936
ANNUAL RUNOFF (AC-FT)	936300		1452000		2641000	
10 PERCENT EXCEEDS	2910		4400		7700	
50 PERCENT EXCEEDS	795		1260		1650	
90 PERCENT EXCEEDS	228		493		448	

a About.

b Backwater from ice.



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 1991 TO SEPTEMBER 1992

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)	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										
29...	1140	678	1440	8.2	-2.0	0.5	--	--	480	--
DEC										
12...	1550	451	1190	8.1	0.0	0.0	10.5	75	400	303
JAN										
21...	1505	541	1010	--	0.0	-2.0	--	--	--	--
APR										
06...	1645	5170	588	--	10.0	4.0	--	--	--	--
13...	1600	3130	695	8.2	8.0	6.0	--	--	240	--
JUN										
01...	1155	1820	939	--	20.0	22.0	--	--	--	--
JUL										
08...	1200	4670	525	--	20.5	18.0	--	--	--	--
SEP										
29...	1145	1920	675	8.3	16.0	13.0	--	--	320	--

DATE	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)	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)
NOV									
29...	310	98	56	130	37	3	12	--	--
DEC									
12...	--	84	47	83	30	2	9.3	370	0
APR									
13...	190	56	25	44	28	1	5.6	--	--
SEP									
29...	235	73	33	23	13	0.6	5.3	--	--

RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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, 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)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)
NOV 29...	220	160	0.30	12	878	932	1.27	1710	4
DEC 12...	140	110	0.30	14	673	718	0.98	874	<1
APR 13...	80	51	0.20	8.7	383	389	0.53	3290	2
SEP 29...	98	25	0.20	13	412	455	0.62	2360	5

DATE	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)
NOV 29...	200	20	<1	70	20	0.1	1	<1	700
DEC 12...	150	10	<1	<1	20	<0.1	<1	<1	<1
APR 13...	70	10	<1	30	10	<0.1	<1	<1	350
SEP 29...	80	20	<1	20	10	<0.1	1	<1	370

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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	137	255	e49	e15	e9.0	e17	1520	435	53	11	5.8	8.0
2	131	177	e48	e14	e7.0	e17	1830	386	29	11	5.9	8.8
3	129	e130	e47	e13	e5.5	e18	1820	365	23	15	5.8	10
4	179	e100	e46	e12	e4.5	e19	1740	326	24	73	5.8	11
5	152	e84	e45	e12	e3.9	e20	1660	289	31	62	5.8	12
6	94	e70	e44	e12	e3.0	e21	1590	254	38	10	5.7	20
7	64	e62	e43	e12	e3.7	e33	1540	226	38	54	6.1	111
8	53	e55	e42	e12	e4.4	e90	1380	199	36	48	5.9	157
9	44	e49	e42	e12	e6.0	e180	1220	170	32	35	5.8	196
10	39	e43	e41	e12	e8.0	e300	1100	150	31	32	5.8	272
11	36	e40	e40	e12	e11	e500	991	143	7.2	22	6.0	148
12	33	e37	e39	e12	e13	e450	869	135	5.5	21	6.2	73
13	32	e36	e39	e12	e14	e380	688	122	5.6	15	6.2	60
14	33	e35	e38	e12	e15	e320	404	70	5.7	6.4	5.9	54
15	31	e40	e38	e12	e16	e270	597	8.1	5.9	6.4	5.8	44
16	28	e53	e37	e12	e17	e230	658	8.8	7.1	6.0	6.0	50
17	32	e61	e36	e12	e17	e190	611	10	55	6.2	6.0	41
18	28	e64	e35	e12	e17	e170	539	27	103	6.6	5.8	40
19	26	e65	e34	e12	e17	e140	566	261	7.3	7.1	5.7	37
20	25	e65	e32	e12	e17	e120	1110	255	6.4	7.1	5.5	34
21	28	e64	e31	e12	e17	e100	1130	242	6.7	6.9	5.4	68
22	27	e62	e29	e12	e17	e85	918	179	7.1	6.5	5.8	143
23	26	e60	e28	e12	e17	e70	809	163	7.2	6.3	7.0	136
24	29	e58	e26	e12	e17	e60	753	260	7.1	6.2	6.1	137
25	28	e56	e24	e12	e17	e70	824	198	7.6	6.2	6.2	134
26	30	e55	e23	e12	e17	e100	865	85	6.7	5.9	5.5	131
27	33	e54	e21	e12	e17	e150	803	50	6.4	5.9	5.2	130
28	46	e52	e20	e12	e17	e230	687	61	6.3	5.7	5.2	133
29	124	e51	e18	e12	e17	e340	573	73	6.8	5.8	5.6	127
30	327	e50	e17	e11	---	474	492	76	8.1	5.8	18	120
31	333	---	e16	e10	---	1060	---	71	---	6.0	7.3	---
TOTAL	2357	2083	1068	375	362.0	6224	30287	5297.9	613.7	522.0	194.8	2645.8
MEAN	76.0	69.4	34.5	12.1	12.5	201	1010	171	20.5	16.8	6.28	88.2
MAX	333	255	49	15	17	1060	1830	435	103	73	18	272
MIN	25	35	16	10	3.0	17	404	8.1	5.5	5.7	5.2	8.0
AC-FT	4680	4130	2120	744	718	12350	60070	10510	1220	1040	386	5250
CFSM	.17	.16	.08	.03	.03	.45	2.27	.38	.05	.04	.01	.20
IN.	.20	.17	.09	.03	.03	.52	2.54	.44	.05	.04	.02	.22

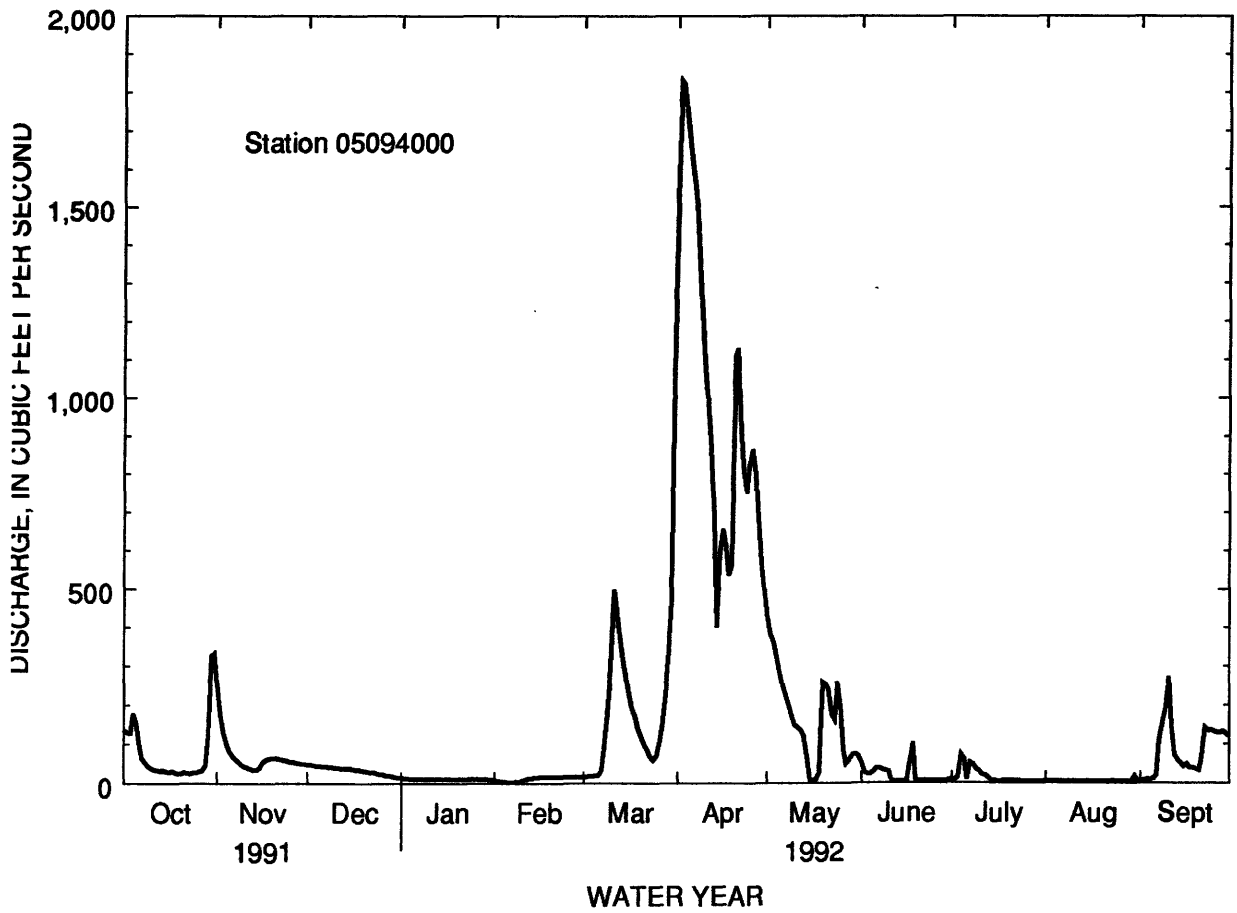
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1929 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	18.4	11.1	4.58	2.79	3.24	58.0	407	195	165	103	23.7	34.8
MAX	153	87.5	34.5	12.1	23.6	362	1977	1338	1336	1136	360	525
(WY)	1958	1957	1992	1992	1981	1986	1966	1970	1970	1956	1985	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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1929 - 1992	
ANNUAL TOTAL	30079.92		52030.2			
ANNUAL MEAN	82.4		142		85.5a	
HIGHEST ANNUAL MEAN					312	1966
LOWEST ANNUAL MEAN					2.89	1934
HIGHEST DAILY MEAN	1920	Jul 13	1830	Apr 2	5290	Apr 5 1966
LOWEST DAILY MEAN	.14	May 9	3.0	Feb 6	.00	Jul 25 1937
ANNUAL SEVEN-DAY MINIMUM	.16	May 6	4.4	Feb 3	.00	Many days
INSTANTANEOUS PEAK FLOW			1870	Apr 2	5410	Apr 5 1966
INSTANTANEOUS PEAK STAGE			10.82	Apr 2	18.23	Apr 5 1966
ANNUAL RUNOFF (AC-FT)	59660		103200		61940	
ANNUAL RUNOFF (CFSM)	.19		.32		.19	
ANNUAL RUNOFF (INCHES)	2.52		4.36		2.62	
10 PERCENT EXCEEDS	155		382		208	
50 PERCENT EXCEEDS	12		33		4.4	
90 PERCENT EXCEEDS	.34		6.0		.80	

a Median of annual mean discharges is 56 ft³/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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

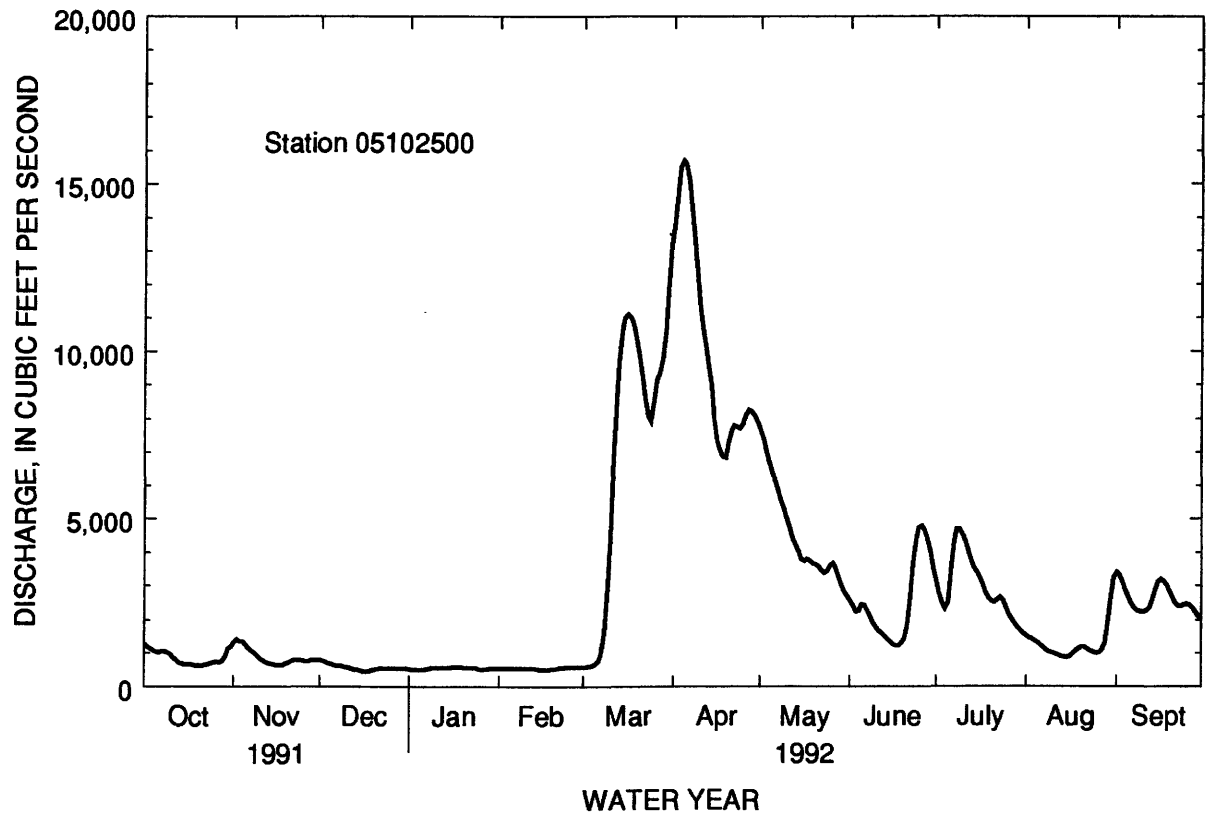
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1290	e1340	e794	e533	e554	e590	e13700	7700	2570	3100	1550	3410
2	1190	e1430	e773	e519	e554	e597	e14700	7420	2420	2760	1490	3330
3	1130	e1380	e745	e508	e554	e604	e15500	7100	2240	2490	1440	3110
4	1090	e1360	e710	e501	e554	e629	e15700	6780	2260	2340	1390	2870
5	1050	e1270	e678	e501	e551	e671	e15600	6460	2450	2530	1330	2660
6	1030	e1160	e650	e512	e547	e756	15100	6180	2440	3430	1260	2490
7	1060	e1090	e632	e530	e551	e982	14300	5860	2290	4340	1170	2360
8	1060	e1030	e621	e551	e551	e1620	13300	5580	2110	4700	1110	2290
9	1020	e943	e611	e561	e554	e2690	12400	5330	1930	4700	1050	2250
10	971	e858	e597	e568	e551	e4450	11300	5050	1790	4550	1020	2240
11	879	e805	e572	e568	e551	e6390	10700	4770	1690	4340	992	2270
12	787	e749	e540	e576	e551	e8230	10100	4480	1610	4060	957	2360
13	713	e710	e512	e579	e544	e9670	9530	4240	1530	3740	922	2570
14	685	e681	e501	e579	e530	e10600	8970	4030	1450	3530	893	2880
15	664	e664	e484	e576	e519	e11000	8020	3810	1360	3400	879	3120
16	671	e639	e459	e583	e508	e11100	7340	3740	1280	3250	911	3190
17	667	e639	e452	e583	e508	e11000	7060	3810	1240	3040	985	3140
18	643	e653	e463	e590	e516	e10800	6890	3740	1240	2820	1080	3020
19	629	e685	e484	e586	e523	e10300	6850	3670	1320	2640	1150	2850
20	618	e727	e508	e576	e537	e9850	7270	3640	1470	2550	1190	2670
21	621	e766	e530	e565	e547	e9220	7660	3570	1820	2540	1190	2510
22	643	e787	e544	e565	e558	e8620	7800	3470	2690	2610	1130	2420
23	671	e798	e544	e576	e568	e8090	7770	3390	3670	2660	1090	2420
24	706	e794	e540	e572	e586	e7940	7730	3450	4380	2560	1040	2460
25	727	e770	e540	e537	e593	e8550	7870	3600	4730	2380	1010	2480
26	734	e752	e544	e516	e597	e9150	8120	3670	4800	2190	1020	2430
27	727	e759	e540	e526	e597	e9360	8260	3520	4660	2030	1110	2330
28	766	e791	e540	e537	e593	e9750	8230	3260	4380	1900	1330	2220
29	918	e805	e544	e540	e590	e10500	8120	2990	3950	1780	1910	2120
30	1140	e805	e547	e547	---	e11800	7910	2810	3500	1690	2700	2030
31	e1200	---	e544	e551	---	e13200	---	2690	---	1610	3260	---
TOTAL	26700	26640	17743	17112	16037	218709	303800	139810	75270	92260	39559	78500
MEAN	861	888	572	552	553	7055	10130	4510	2509	2976	1276	2617
MAX	1290	1430	794	590	597	13200	15700	7700	4800	4700	3260	3410
MIN	618	639	452	501	508	590	6850	2690	1240	1610	879	2030
AC-FT	52960	52840	35190	33940	31810	433800	602600	277300	149300	183000	78470	155700

e Estimated.

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	1427	1274	936	776	737	2023	12460	8359	4894	3724	1701	1468
MAX	4533	5163	2760	2053	1914	9361	45820	72820	25430	28020	7342	6388
(WY)	1986	1972	1966	1951	1952	1983	1966	1950	1962	1975	1985	1957
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	1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1912-1992	
ANNUAL TOTAL	531992		1052140			
ANNUAL MEAN	1458		2875		3322	
HIGHEST ANNUAL MEAN					12100	1950
LOWEST ANNUAL MEAN					333	1934
HIGHEST DAILY MEAN	5690	Jul 12	15700	Apr 4	94400	May 13 1950
LOWEST DAILY MEAN	156	Jan 23	452	Dec 17	.90	Feb 6 1937
ANNUAL SEVEN-DAY MINIMUM	161	Jan 18	479	Dec 14	.97	Feb 4 1937
INSTANTANEOUS PEAK FLOW			15800	Apr 4	95500	May 13 1950
INSTANTANEOUS PEAK STAGE			774.19	Apr 4	791.19	May 1 1979
INSTANTANEOUS LOW FLOW					.90	Feb 6 1937
ANNUAL RUNOFF (AC-FT)	1055000		2087000		2407000	
10 PERCENT EXCEEDS	3310		8100		7270	
50 PERCENT EXCEEDS	971		1330		1360	
90 PERCENT EXCEEDS	190		544		250	



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. Letter K indicates non-ideal colony count.
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, 1,550 microsiemens, Nov. 17; minimum daily mean, 457 microsiemens, Mar. 15 and 16.
WATER TEMPERATURES: Maximum daily mean, 25.3C, Aug. 9; minimum daily mean, 0.0C, on many days during the winter months.

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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											
02...	1130	--	1190	898	8.1	10.5	11.0	60	10.4	95	270
NOV											
26...	1100	--	752	1620	8.1	-3.0	0.5	8.1	13.6	95	440
DEC											
12...	1115	542	--	1140	7.8	-3.0	0.0	--	12.2	87	400
FEB											
25...	1030	--	593	1140	7.5	-10.5	0.0	5.0	11.3	79	370
APR											
15...	1200	8040	--	424	8.3	10.0	5.5	140	10.8	88	190
JUL											
07...	1115	--	4340	737	7.9	19.0	18.0	--	8.2	91	--

DATE	ALKA-LINITY WAT DIS TOT IT FIELD MG/L AS CACO3 (39086)	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)	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)
OCT											
02...	172	K42	5	62	27	69	35	2	7.5	210	0
NOV											
26...	274	K24	330	94	50	130	38	3	17	334	0
DEC											
12...	308	--	--	89	44	79	29	2	9.0	376	0
FEB											
25...	304	K4	K9	82	41	80	31	2	7.9	371	0
APR											
15...	160	8	320	46	18	22	20	0.7	6.2	195	0
JUL											
07...	173	K53	K40	--	--	--	--	--	--	212	0

RED RIVER OF THE NORTH BASIN

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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, 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 TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N) (00618)
OCT											
02...	110	100	0.30	16	500	522	0.71	1680	0.030	0.040	0.810
NOV											
26...	230	190	0.30	11	890	914	1.24	1860	0.020	0.010	0.480
DEC											
12...	160	100	0.30	13	680	739	1.01	1080	--	--	--
FEB											
25...	100	110	0.20	20	629	631	0.86	1010	<0.010	<0.010	--
APR											
15...	65	22	<0.10	12	289	287	0.39	6230	0.020	0.010	0.230
JUL											
07...	130	38	0.20	--	--	447	--	--	<0.010	<0.010	--

DATE	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, ORGANIC TOTAL (MG/L AS N) (00605)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, TOTAL (MG/L AS N) (00600)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO TOTAL (MG/L AS P) (70507)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
OCT											
02...	0.840	0.850	0.030	0.050	0.87	0.90	1.7	0.270	0.180	0.160	0.150
NOV											
26...	0.400	0.490	0.140	0.160	1.1	1.2	1.6	0.340	0.250	0.270	0.230
FEB											
25...	0.780	0.920	0.140	0.160	0.66	0.80	1.6	0.140	0.160	0.100	0.080
APR											
15...	0.260	0.240	0.070	0.060	1.3	1.4	1.7	0.290	0.080	0.050	0.060
JUL											
07...	0.660	0.670	0.010	0.020	0.69	0.70	1.4	0.270	0.190	0.150	0.150

DATE	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE) (01010)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)
OCT											
02...	20	62	--	--	--	<3	--	28	--	40	8
DEC											
12...	--	68	<0.5	<1.0	<5	<3	<10	21	<10	48	14
FEB											
25...	<10	71	--	--	--	<3	--	7	--	49	25
APR											
15...	20	31	--	--	--	<3	--	21	--	22	43

RED RIVER OF THE NORTH BASIN

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	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)	SEDI-ZINC, DIS-SOLVED (UG/L AS ZN) (01090)	SED. SEDI-MENT, SUS-PENDED (MG/L) (80154)	MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)	SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT										
02...	<10	3	<1	<1.0	320	<6	--	148	476	98
DEC										
12...	<10	<10	<1	2.0	380	<6	13	--	--	--
FEB										
25...	<10	2	<1	<1.0	390	<6	--	64	102	86
APR										
15...	<10	5	<1	<1.0	170	<6	--	483	10500	98

SPECIFIC CONDUCTANCE, MICROSIEMENS/CM AT 25 DEGREES CENTIGRADE, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	802	751	1230	1210	1020	1020	396	650	768	597	774	636
2	832	732	1260	1210	1040	1000	402	685	766	611	770	633
3	844	729	1250	1140	1030	1010	410	696	797	624	767	640
4	843	773	1210	1160	1020	1030	410	700	788	644	746	599
5	851	770	1180	1120	1000	1030	416	657	766	705	715	573
6	903	788	1170	1090	999	967	430	660	758	720	728	588
7	906	834	1130	1070	984	986	445	656	813	731	776	628
8	918	912	1040	1110	985	969	451	654	809	739	779	638
9	927	1020	1040	1140	999	1000	460	663	811	594	790	662
10	928	1070	1040	1140	1030	892	472	662	846	561	855	682
11	932	1090	1050	1100	1020	755	497	667	877	563	867	675
12	932	1210	1040	1070	1030	652	524	671	873	578	807	711
13	930	1340	1040	1050	1040	536	538	670	880	601	803	728
14	904	1420	1030	1060	1050	477	572	680	902	610	818	737
15	909	1430	1000	1060	1050	457	578	672	911	631	845	738
16	905	1490	1010	1030	1060	457	665	712	915	644	846	737
17	911	1550	1010	1030	1060	464	627	724	915	661	799	748
18	897	1530	1040	999	1060	463	581	683	895	682	779	742
19	898	1500	1100	995	1040	507	612	693	880	700	752	747
20	889	1570	1140	990	1020	502	545	658	896	666	755	754
21	905	1500	1160	989	1010	509	578	664	900	697	732	745
22	901	1470	1150	973	988	529	579	670	928	704	717	745
23	898	1410	1120	976	984	547	589	679	873	745	702	746
24	1010	1340	1070	961	991	554	605	684	808	774	710	746
25	1010	1320	1020	951	995	512	610	686	608	789	781	729
26	957	1290	1000	939	1000	505	615	696	607	795	842	716
27	862	1280	1020	944	1020	498	620	655	580	798	887	708
28	845	1300	1040	947	1010	464	635	637	571	805	873	704
29	802	1310	1140	957	1000	442	659	665	574	818	744	721
30	774	1330	1190	964	---	430	697	706	613	786	768	758
31	770	---	1180	1010	---	402	---	714	---	779	735	---
MEAN	890	1200	1100	1040	1020	663	541	676	798	689	783	697

RED RIVER OF THE NORTH BASIN

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	12.3	1.0	.0	.0	.0	.8	.4	10.0	22.2	19.2	22.9	17.8
2	12.1	.2	.0	.0	.0	.8	1.3	10.0	22.0	19.2	22.8	18.1
3	12.1	.2	.0	.0	.0	.8	1.4	10.7	22.3	19.3	22.3	18.8
4	11.7	.5	.0	.0	.1	1.4	1.7	12.0	22.0	18.3	22.1	18.6
5	11.0	.2	.0	.0	.3	2.0	2.2	15.2	21.3	18.7	22.3	19.2
6	9.4	.1	.0	.0	.2	1.9	3.3	16.0	21.0	19.2	22.8	18.0
7	9.5	.1	.0	.0	.2	2.0	4.1	17.1	19.4	19.8	23.3	16.9
8	9.9	.0	.0	.0	.2	1.9	4.9	18.3	19.6	20.5	24.1	16.5
9	10.0	.0	.0	.0	.2	1.8	5.3	19.3	20.9	19.8	25.3	16.0
10	10.1	.0	.0	.0	.1	1.3	5.4	19.8	23.0	20.3	24.9	15.2
11	9.9	.0	.0	.0	.2	1.2	5.3	19.0	24.4	20.2	23.7	15.6
12	10.0	.4	.0	.0	.8	1.2	5.2	18.8	24.4	20.9	22.2	16.1
13	9.6	.0	.0	.0	.7	1.1	5.1	18.0	25.1	21.5	22.3	17.2
14	8.3	.1	.0	.0	.8	1.2	5.2	17.6	24.6	22.0	22.7	17.2
15	7.2	.0	.0	.0	.9	1.2	5.4	18.0	23.8	22.6	23.0	16.5
16	7.1	.0	.0	.0	.8	1.1	5.4	19.1	22.4	22.8	23.1	16.0
17	7.6	.0	.0	.0	.7	.8	7.2	18.9	21.3	21.5	23.2	15.3
18	5.8	.0	.0	.0	.7	.8	7.1	18.3	20.2	21.5	23.3	14.7
19	5.5	.0	.0	.0	.8	.8	7.0	19.7	19.1	21.9	23.0	14.2
20	5.2	.0	.0	.0	.8	.8	7.5	20.9	19.4	21.5	23.1	14.6
21	4.7	.0	.1	.0	.8	.8	6.9	22.5	19.8	21.7	22.7	15.2
22	5.0	.0	.0	.0	.8	.8	5.6	19.8	19.1	22.1	22.8	14.3
23	4.9	.0	.0	.0	1.0	.8	5.3	20.5	19.9	22.9	21.8	14.4
24	4.5	.0	.0	.0	.8	.7	5.6	18.2	20.4	22.7	19.7	14.9
25	4.3	.0	.0	.0	.8	.7	5.8	18.1	19.9	22.6	18.7	15.5
26	4.4	.0	.0	.0	.8	.8	6.4	18.3	19.7	22.7	18.7	14.4
27	4.5	.0	.0	.0	.8	.8	7.2	18.5	20.2	22.4	19.1	14.0
28	4.4	.0	.0	.0	.8	.8	8.1	19.0	20.8	22.4	18.9	13.1
29	1.8	.0	.0	.0	.8	1.1	9.1	19.7	20.6	22.4	18.5	12.7
30	2.6	.0	.0	.0	---	.9	10.0	20.6	20.3	22.6	19.0	12.9
31	2.3	---	.0	.0	---	1.2	---	21.5	---	23.0	18.4	---
MEAN	7.3	.1	.0	.0	.5	1.1	5.3	17.9	21.3	21.2	22.0	15.8

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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	120	176	e39	e13	13	10	e1450	650	71	28	6.3	35
2	116	93	e35	e13	14	10	e1350	618	62	32	5.7	39
3	110	e81	e32	e12	14	10	e1250	544	56	65	5.1	38
4	102	e74	e31	e12	e13	11	e1200	477	53	139	5.8	37
5	94	e69	e30	e12	e12	11	e1150	420	54	192	6.2	77
6	88	e66	e29	e12	e11	12	1130	366	57	204	4.1	134
7	83	e65	e28	e12	e9.6	20	1030	321	62	180	.96	175
8	77	e67	e28	e12	e8.6	115	1020	283	60	144	1.2	504
9	73	e68	e27	e12	e7.6	e300	1010	240	56	118	1.8	524
10	68	e70	e27	e12	e6.4	e470	975	212	52	108	1.9	501.
11	61	e72	e27	e12	e5.5	e500	901	208	47	97	1.3	439
12	56	e75	e27	e12	e5.0	e460	788	205	44	88	1.3	358
13	53	78	e26	e12	e5.5	e350	650	203	40	77	.45	283
14	52	81	e26	e12	e6.2	e200	578	194	36	66	.47	230
15	50	83	e26	e12	e7.0	e140	551	179	35	54	.64	194
16	49	87	e26	e12	e8.0	e110	543	179	31	44	.68	173
17	53	90	e25	e12	e9.0	e95	543	351	34	35	.97	157
18	51	92	e24	e12	e10	e85	540	510	38	29	1.3	158
19	49	101	e22	12	11	e73	949	489	46	23	1.6	165
20	47	121	e20	12	11	e66	1450	419	55	21	1.8	179
21	49	146	e18	12	11	e60	1490	336	55	17	2.1	185
22	54	151	e16	12	11	e54	1430	270	50	14	3.2	178
23	54	136	e15	12	10	e52	1320	250	45	14	25	168
24	54	116	e15	11	10	e60	1160	224	41	13	62	162
25	54	101	e14	12	10	e150	1080	205	39	12	62	154
26	57	91	e14	12	10	e300	1120	186	37	11	45	141
27	59	77	e14	13	9.9	e380	1070	160	34	11	33	126
28	62	63	e13	13	10	e450	964	138	31	10	24	113
29	88	56	e13	13	10	e700	846	118	29	8.6	19	102
30	147	e46	e13	14	---	e1300	739	102	28	8.0	26	94
31	177	---	e13	13	---	e1600	---	88	---	7.8	29	---
TOTAL	2307	2692	713	379	279.3	8154	30277	9145	1378	1870.4	379.87	5823
MEAN	74.4	89.7	23.0	12.2	9.63	263	1009	295	45.9	60.3	12.3	194
MAX	177	176	39	14	14	1600	1490	650	71	204	62	524
MIN	47	46	13	11	5.0	10	540	88	28	7.8	.45	35
AC-FT	4580	5340	1410	752	554	16170	60050	18140	2730	3710	753	11550
CFSM	.13	.16	.04	.02	.02	.46	1.76	.51	.08	.11	.02	.34
IN.	.15	.17	.05	.02	.02	.53	1.97	.59	.09	.12	.02	.38

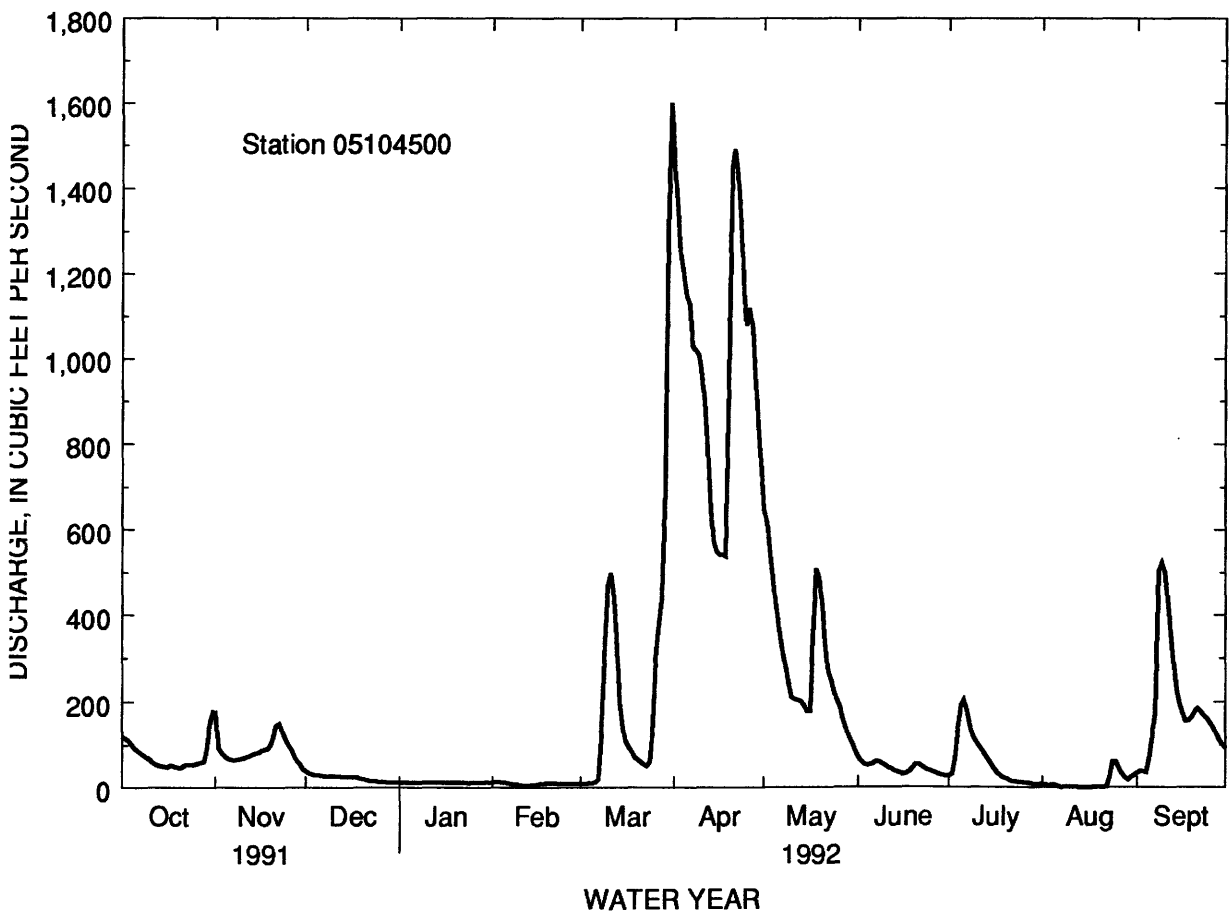
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1947 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	68.1	44.4	14.3	6.95	5.23	54.5	598	305	227	147	57.1	72.1
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1947 - 1992	
ANNUAL TOTAL	23982.86		63397.57			
ANNUAL MEAN	65.7		173a		133a	
HIGHEST ANNUAL MEAN					304	1950
LOWEST ANNUAL MEAN					7.28	1990
HIGHEST DAILY MEAN	860	Jul 9	1600	Mar 31	5670	Jul 18 1968
LOWEST DAILY MEAN	.04	Mar 13	.45	Aug 13	.00	Jul 23 1961
ANNUAL SEVEN-DAY MINIMUM	.04	Mar 11	.83	Aug 11	.00	Jul 23 1961
INSTANTANEOUS PEAK FLOW			1800	Mar 31	5750	Jul 18 1968
INSTANTANEOUS PEAK STAGE			14.41b	Mar 30	23.37b	Apr 3 1966
INSTANTANEOUS LOW FLOW			.38	Aug 14	.00	Many days
ANNUAL RUNOFF (AC-FT)	47570		125700		96440	
ANNUAL RUNOFF (CFSM)	.11		.30		.23	
ANNUAL RUNOFF (INCHES)	1.56		4.12		3.16	
10 PERCENT EXCEEDS	150		529		307	
50 PERCENT EXCEEDS	15		54		15	
90 PERCENT EXCEEDS	.11		9.8		1.3	

a Median of annual mean discharges 110 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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	631	e550	e190	e59	e37	e33	e800	2440	1240	102	58	99
2	600	e550	e170	e58	e37	e33	e1000	2440	1130	95	55	99
3	565	e470	e160	e57	e37	e34	e1200	2400	995	130	51	99
4	527	e420	e150	e56	e37	e34	e1300	2390	900	280	48	104
5	481	e390	e140	e55	e36	e34	1420	2380	848	482	44	118
6	427	e360	e130	e54	e36	e40	1560	2360	749	583	41	127
7	376	e340	e125	e53	e36	e45	1530	2320	643	613	39	242
8	328	e330	e120	e52	e36	e50	1600	2280	536	609	36	370
9	290	e320	e115	e51	e36	e60	1670	2240	444	591	38	543
10	267	e310	e110	e50	e36	e70	1730	2210	373	559	38	691
11	242	e305	e105	e49	e35	e90	1800	2190	359	507	40	756
12	219	e305	e100	e48	e35	e150	1840	2150	288	441	40	795
13	198	e300	e97	e47	e35	e300	1870	2090	236	369	38	819
14	180	e300	e94	e46	e35	e400	2010	2040	187	311	36	841
15	176	e305	e92	e45	e35	e400	2070	1990	149	266	34	855
16	172	e310	e90	e44	e34	e380	2110	2020	124	226	32	858
17	160	e315	e88	e43	e34	e350	2140	2040	127	192	31	832
18	159	e330	e86	e42	e34	e320	2160	1950	151	159	29	803
19	154	e350	e84	e42	e34	e290	2270	1890	164	135	26	788
20	143	e400	e82	e41	e34	e270	2310	1830	183	117	25	760
21	134	e450	e80	e41	e33	e250	2280	1770	187	103	23	668
22	129	e480	e78	e41	e33	e230	2290	1730	186	94	22	586
23	130	e470	e76	e40	e33	e210	2310	1680	176	87	27	526
24	144	e440	e74	e40	e33	e200	2360	1640	165	80	30	470
25	162	e400	e72	e39	e33	e190	2370	1600	167	76	142	461
26	175	e360	e70	e39	e33	e190	2390	1560	156	74	261	438
27	184	e320	e68	e38	e33	e190	2420	1510	148	72	282	345
28	203	e280	e66	e38	e33	e250	2460	1460	137	72	234	289
29	282	e240	e64	e38	e33	e400	2450	1400	123	68	185	258
30	412	e210	e62	e38	---	e500	2440	1350	108	64	142	232
31	538	---	e60	e37	---	e650	---	1290	---	61	112	---
TOTAL	8788	10910	3098	1421	1006	6643	58160	60640	11379	7618	2239	14872
MEAN	283	364	99.9	45.8	34.7	214	1939	1956	379	246	72.2	496
MAX	631	550	190	59	37	650	2460	2440	1240	613	282	858
MIN	129	210	60	37	33	33	800	1290	108	61	22	99
AC-FT	17430	21640	6140	2820	2000	13180	115400	120300	22570	15110	4440	29500
CFSM	.18	.23	.06	.03	.02	.14	1.23	1.25	.24	.16	.05	.32
IN.	.21	.26	.07	.03	.02	.16	1.38	1.44	.27	.18	.05	.35

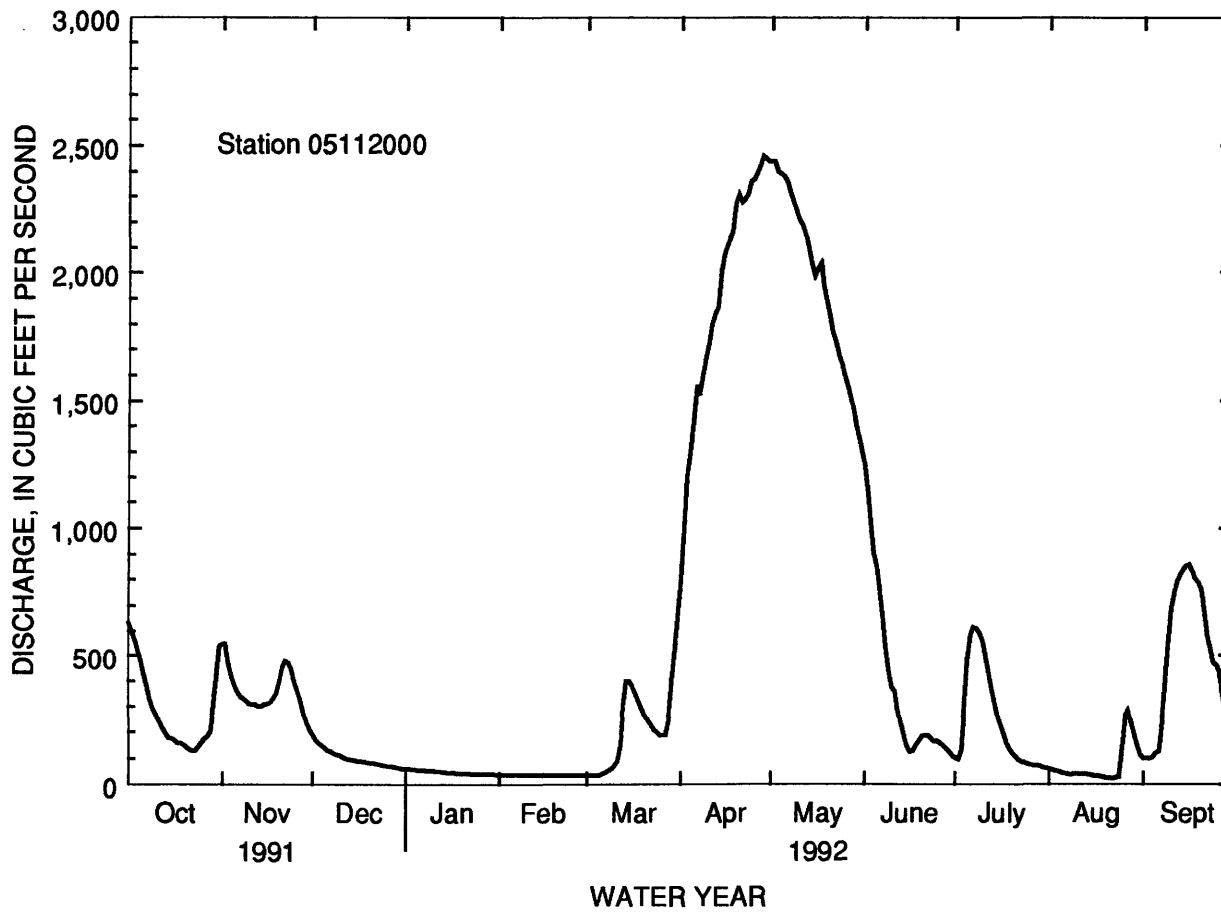
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1917 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	164	108	43.4	23.8	19.1	102	796	922	569	388	139	160
MAX	1302	382	226	134	75.1	446	2167	3029	2588	1653	1577	1451
(WY)	1942	1927	1927	1927	1927	1946	1966	1950	1970	1968	1968	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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1917 - 1992	
ANNUAL TOTAL	84940.05		186774			
ANNUAL MEAN	233		510		279	
HIGHEST ANNUAL MEAN					683	1927
LOWEST ANNUAL MEAN					35.9	1977
HIGHEST DAILY MEAN	1330	Jul 17	2460	Apr 28	4020	May 19 1950
LOWEST DAILY MEAN	.06	Jan 14	22	Aug 22	.00	Sep 15 1990
ANNUAL SEVEN-DAY MINIMUM	.06	Jan 14	26	Aug 18	.04	Sep 12 1990
INSTANTANEOUS PEAK FLOW			2470	Apr 28	4080	May 19 1950
INSTANTANEOUS PEAK STAGE			9.33	Apr 28	11.81	May 19 1950
INSTANTANEOUS LOW FLOW			20	Aug 22	.00a	Aug 13 1936
ANNUAL RUNOFF (AC-FT)	168500		370500		202500	
ANNUAL RUNOFF (CFSM)	.15		.33		.18	
ANNUAL RUNOFF (INCHES)	2.01		4.43		2.42	
10 PERCENT EXCEEDS	772		1880		1190	
50 PERCENT EXCEEDS	81		187		72	
90 PERCENT EXCEEDS	.06		36		8.0	

a Occurred Aug. 13, 1936, Sept. 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 1991 TO SEPTEMBER 1992

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)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
OCT												
08...	1100	323	360	385	8.0	7.9	6.0	5.6	724	10.6	56	69
JAN												
22...	1030	146	550	591	7.9	7.3	0.5	2.1	719	7.6	K5	K3
APR												
15...	1240	2020	241	277	7.6	7.6	5.0	3.6	736	8.7	K3	22
JUL												
08...	0930	608	345	389	8.1	8.0	18.0	9.4	729	7.7	77	200

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)	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)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)
OCT												
08...	50	18	8.5	2.5	170	174	0	207	27	9.5	0.10	13
JAN												
22...	81	29	9.3	2.8	--	305	0	372	23	9.3	0.20	21
APR												
15...	37	12	2.4	4.0	125	126	0	152	14	1.6	0.20	8.3
JUL												
08...	48	19	5.6	1.8	176	184	0	215	20	4.1	<0.10	9.6

DATE	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 TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-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)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT												
08...	268	<0.010	<0.050	0.020	<0.010	1.2	0.060	0.020	0.030	0.020	25	81
JAN												
22...	339	<0.010	0.160	0.100	0.140	1.1	0.030	<0.010	0.020	<0.010	50	90
APR												
15...	181	<0.010	0.073	0.020	0.020	0.70	0.040	0.040	0.020	0.010	60	43
JUL												
08...	277	0.010	0.580	0.040	0.030	1.4	0.080	0.030	0.040	0.030	30	94

RED RIVER OF THE NORTH BASIN

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

WATER-QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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)	VANADIUM, DISSOLVED (UG/L AS V) (01085)
OCT												
08...	20	33	<3	190	11	16	<10	1	<1	<1.0	92	<6
JAN												
22...	20	48	<3	400	16	630	<10	1	<1	<1.0	160	<6
APR												
15...	<10	25	<3	64	8	16	<10	1	<1	<1.0	68	<6
JUL												
08...	10	34	<3	89	8	10	<10	<1	<1	<1.0	100	<6

LAKE OF THE WOODS BASIN

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

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

DRAINAGE AREA.--253 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.--No estimated daily discharges. Records good.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

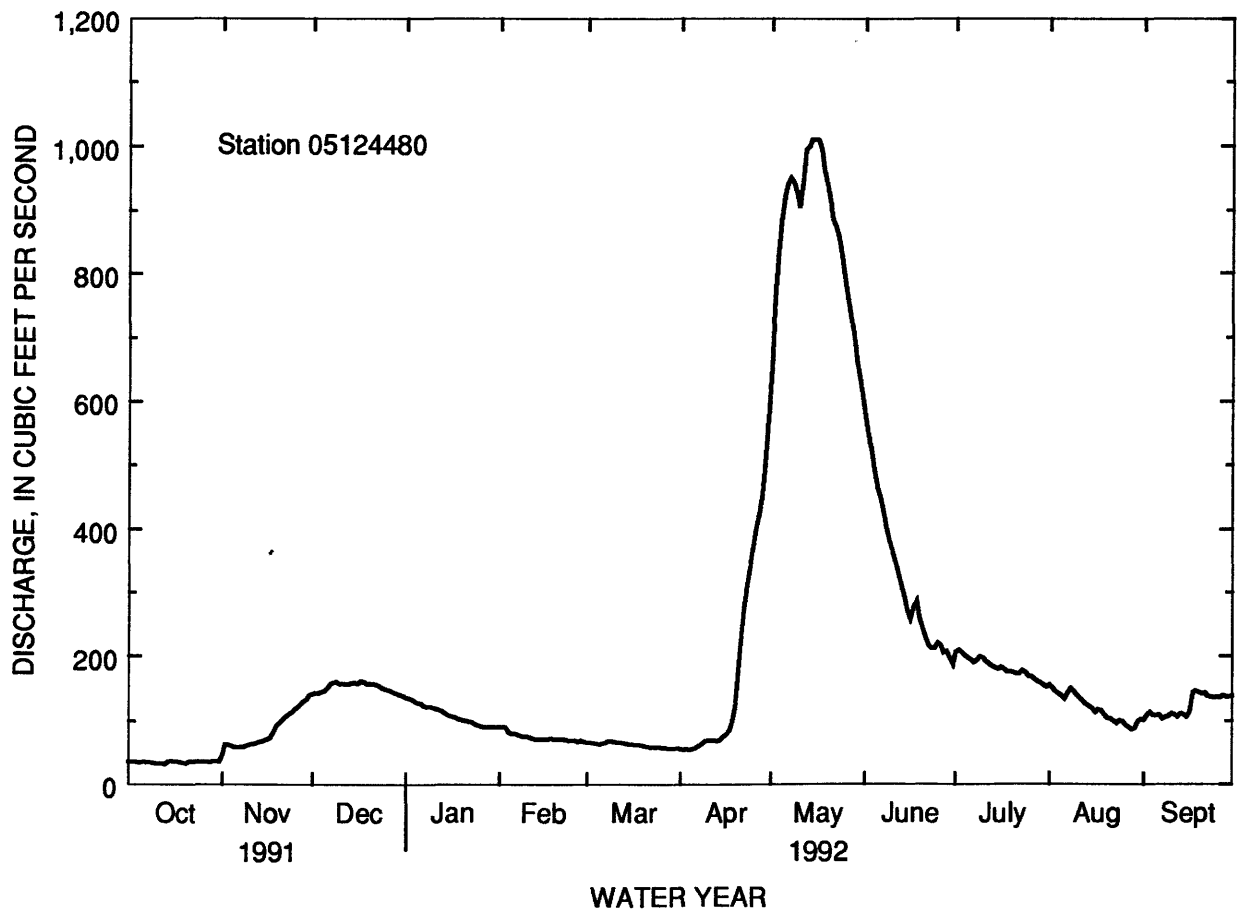
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	36	47	143	137	91	67	56	653	577	206	156	102
2	36	63	144	136	91	67	55	743	547	209	151	110
3	36	63	144	134	91	66	56	823	521	205	146	114
4	35	61	146	131	83	65	55	883	493	201	143	110
5	35	59	147	129	80	64	56	922	465	197	139	109
6	36	59	152	128	81	65	58	941	448	194	135	110
7	35	59	158	124	79	66	61	951	426	190	144	104
8	35	59	160	123	77	69	64	944	403	193	151	106
9	34	61	161	123	76	69	69	927	383	199	146	108
10	33	63	158	122	76	68	70	905	366	197	141	112
11	33	64	158	120	75	67	70	944	348	192	136	110
12	33	65	158	118	73	67	70	995	330	188	131	107
13	32	67	158	116	72	66	69	1000	311	184	127	112
14	36	68	159	113	72	65	71	1010	292	182	124	110
15	37	70	160	110	72	64	75	1010	273	180	120	107
16	36	72	158	108	72	64	79	1010	259	183	114	114
17	36	74	162	107	72	63	85	996	278	180	118	144
18	35	83	161	105	73	63	96	965	287	176	117	147
19	34	93	158	103	72	62	120	942	262	176	110	145
20	33	98	158	102	72	61	178	916	244	175	105	143
21	36	102	158	101	72	60	233	886	229	173	104	144
22	36	107	157	100	72	59	274	875	216	173	101	139
23	36	111	155	99	71	59	312	856	212	178	97	138
24	36	114	152	95	70	59	344	826	212	175	101	137
25	36	118	150	94	70	59	373	796	220	169	100	138
26	36	122	149	92	70	58	401	763	216	169	94	137
27	36	127	147	91	68	58	423	733	205	165	91	140
28	35	131	145	91	70	57	455	701	207	161	87	138
29	37	134	143	91	68	57	503	666	197	159	89	138
30	37	141	141	91	---	57	572	637	187	156	100	139
31	36	---	140	91	---	57	---	606	---	153	103	---
TOTAL	1093	2555	4740	3425	2181	1948	5403	26825	9614	5638	3721	3712
MEAN	35.3	85.2	153	110	75.2	62.8	180	865	320	182	120	124
MAX	37	141	162	137	91	69	572	1010	577	209	156	147
MIN	32	47	140	91	68	57	55	606	187	153	87	102
AC-FT	2170	5070	9400	6790	4330	3860	10720	53210	19070	11180	7380	7360
CFSM	.14	.34	.60	.44	.30	.25	.71	3.42	1.27	.72	.47	.49
IN.	.16	.38	.70	.50	.32	.29	.79	3.94	1.41	.83	.55	.55

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	160	173	137	93.0	68.2	56.7	249	671	389	195	144	149
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1966 - 1992	
ANNUAL TOTAL	47512		70855			
ANNUAL MEAN	130		194		208	
HIGHEST ANNUAL MEAN					313	1971
LOWEST ANNUAL MEAN					94.5	1977
HIGHEST DAILY MEAN	512	May 9	1010	May 14	1710	Apr 24 1976
LOWEST DAILY MEAN	32	Sep 7	32	Oct 13	4.5	Jan 31 1977
ANNUAL SEVEN-DAY MINIMUM	34	Oct 7	34	Oct 7	4.6	Jan 29 1977
INSTANTANEOUS PEAK FLOW			1020	May 14	1720	Apr 24 1976
INSTANTANEOUS PEAK STAGE			5.29	May 14	5.92	Apr 24 1976
INSTANTANEOUS LOW FLOW			32	Oct 13	4.5a	
ANNUAL RUNOFF (AC-FT)	94240		140500		150800	
ANNUAL RUNOFF (CFSM)	.51		.77		.82	
ANNUAL RUNOFF (INCHES)	6.99		10.42		11.18	
10 PERCENT EXCEEDS	354		496		530	
50 PERCENT EXCEEDS	64		117		107	
90 PERCENT EXCEEDS	36		56		37	

a Occurred all or part of each day 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 1991 TO SEPTEMBER 1992

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)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
OCT												
01...	1330	36	30	32	7.6	7.2	11.0	1.3	714	9.0	<1	220
FEB												
05...	1400	76	32	34	7.1	7.0	0.0	0.70	713	11.6	<1	K10
MAY												
05...	1415	976	23	33	6.6	7.2	6.0	1.5	728	11.9	K1	57
JUL												
21...	1200	165	31	31	6.4	7.0	19.0	0.60	727	10.2	K12	K18

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)	ALKA-LINITY WAT DIS TOT ID FIELD MG/L AS CAC03 (39086)	ALKA-LINITY LAB (MG/L AS CAC03) (90410)	CAR-BONATE WATER DIS IT FIELD MG/L AS C03 (00452)	BICAR-BONATE WATER DIS IT FIELD (MG/L HC03 (00453)	SULFATE DIS-SOLVED (MG/L AS S04) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)
OCT											
01...	3.2	1.4	1.0	0.50	12	12	0	13	2.8	0.60	0.10
FEB											
05...	3.4	1.5	1.2	0.40	11	13	0	13	2.7	0.60	0.20
MAY											
05...	3.0	1.4	1.0	0.30	12	11	0	14	2.5	0.60	<0.10
JUL											
21...	3.1	1.3	1.3	0.30	9	10	0	11	2.6	0.20	<0.10

DATE	SILICA, DIS-SOLVED (MG/L AS SI02) (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 AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N0) (00610)	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) (00655)	PHOS-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)
OCT											
01...	2.8	22	<0.010	<0.050	0.040	0.030	0.30	0.020	<0.010	0.020	<0.010
FEB											
05...	3.2	38	0.020	0.060	0.020	0.020	0.40	<0.010	<0.010	<0.010	<0.010
MAY											
05...	4.2	28	<0.010	0.081	0.030	0.020	0.50	<0.010	<0.010	<0.010	<0.010
JUL											
21...	3.4	35	<0.010	<0.050	0.020	0.030	0.30	<0.010	<0.010	<0.010	<0.010

LAKE OF THE WOODS BASIN

05124480 KAWISHWI RIVER NEAR ELY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	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)	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)
OCT											
01...	6	84	20	4	<3	130	<4	4	<10	<1	<1
FEB											
05...	2	61	30	2	<3	200	<4	6	<10	<1	<1
MAY											
05...	5	81	70	4	<3	270	<4	27	<10	2	<1
JUL											
21...	100	11	40	4	<3	240	<4	6	<10	2	<1

DATE	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	GROSS ALPHA, DISSOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DISSOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DISSOLVED (PCI/L AS SR/YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/YT-90) (80060)	RADIUM 226, DISSOLVED, RADON METHOD (PCI/L) (09511)	URANIUM NATURAL DISSOLVED (UG/L AS U) (22703)
OCT											
01...	<1.0	11	<6	<0.6	<0.6	1.3	<0.6	1.2	<0.6	0.04	<0.01
FEB											
05...	<1.0	13	<6	--	--	--	--	--	--	--	--
MAY											
05...	<1.0	12	<6	<0.6	<0.6	1.1	<0.6	1.0	<0.6	<0.02	0.01
JUL											
21...	<1.0	12	<6	--	--	--	--	--	--	--	--

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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	399	483	1040	959	396	398	395	3970	2280	959	398	482
2	399	649	1020	926	397	409	407	3970	2240	959	398	694
3	399	798	1040	882	397	429	417	3980	2070	959	538	798
4	382	894	1040	882	397	442	417	4220	1540	960	594	797
5	399	960	1040	882	397	442	646	4400	1040	960	580	795
6	399	960	1050	824	397	567	707	4490	1330	960	596	795
7	399	960	1120	794	397	793	590	4450	1480	960	595	795
8	399	960	1100	794	397	791	674	4450	1230	962	398	795
9	399	960	1040	794	397	791	787	4490	959	1260	399	891
10	399	959	1040	794	397	675	788	4330	961	1480	589	959
11	399	959	962	794	397	512	786	4260	961	1480	681	959
12	331	959	1040	794	397	790	786	4590	960	1480	613	960
13	216	959	1040	794	397	789	822	4450	961	1480	601	1140
14	300	922	1040	794	397	789	874	4490	960	1440	600	1400
15	444	884	1040	793	397	789	874	4490	961	1350	398	1410
16	444	884	1020	793	397	788	837	4540	961	1350	365	1240
17	444	884	1000	776	397	788	787	4490	960	1130	283	1280
18	444	933	1000	397	397	788	787	4550	962	958	399	1280
19	444	959	1000	397	397	788	787	4880	962	960	399	1230
20	444	960	975	677	397	787	873	4790	962	960	399	1230
21	421	960	961	795	397	394	954	4340	960	959	399	1310
22	399	960	961	794	397	394	955	4050	960	959	399	1590
23	399	960	961	794	397	673	1660	4040	960	959	399	1040
24	399	960	960	695	397	706	2400	3730	960	959	399	853
25	399	960	960	397	397	600	2720	3500	960	959	399	869
26	399	961	960	397	424	598	2720	2740	960	959	399	960
27	399	962	960	681	397	394	2740	2460	960	909	399	960
28	399	962	959	794	398	395	3540	2520	960	830	399	960
29	447	962	958	792	398	395	4100	2410	960	794	399	960
30	482	993	958	792	---	395	4020	2240	959	794	399	960
31	482	---	959	694	---	395	---	2270	---	743	456	---
TOTAL	12508	27526	31204	23165	11541	18684	39850	122580	34339	32831	14269	30392
MEAN	403	918	1007	747	398	603	1328	3954	1145	1059	460	1013
MAX	482	993	1120	959	424	793	4100	4880	2280	1480	681	1590
MIN	216	483	958	397	396	394	395	2240	959	743	283	482
+	30	105	-167	-264	-60	-185	497	146	-77	-25	63	86
MEAN ‡	433	1023	840	483	338	418	1825	4100	1068	1034	523	1099
CFSM ‡	.35	.83	.68	.39	.28	.34	1.48	3.34	.87	.84	.43	.89
IN ‡.	.41	.93	.79	.45	.30	.39	1.66	3.85	.97	.97	.49	1.00

CAL YR.	1991	TOTAL 280,254	MEAN 768	MAX. 2880	MIN. 0	MEAN ‡773	CFSM ‡.63	IN ‡8.54
WTR YR	1992	TOTAL 398,889	MEAN 1090	MAX. 4480	MIN. 216	MEAN ‡1101	CFSM ‡.90	IN ‡12.20

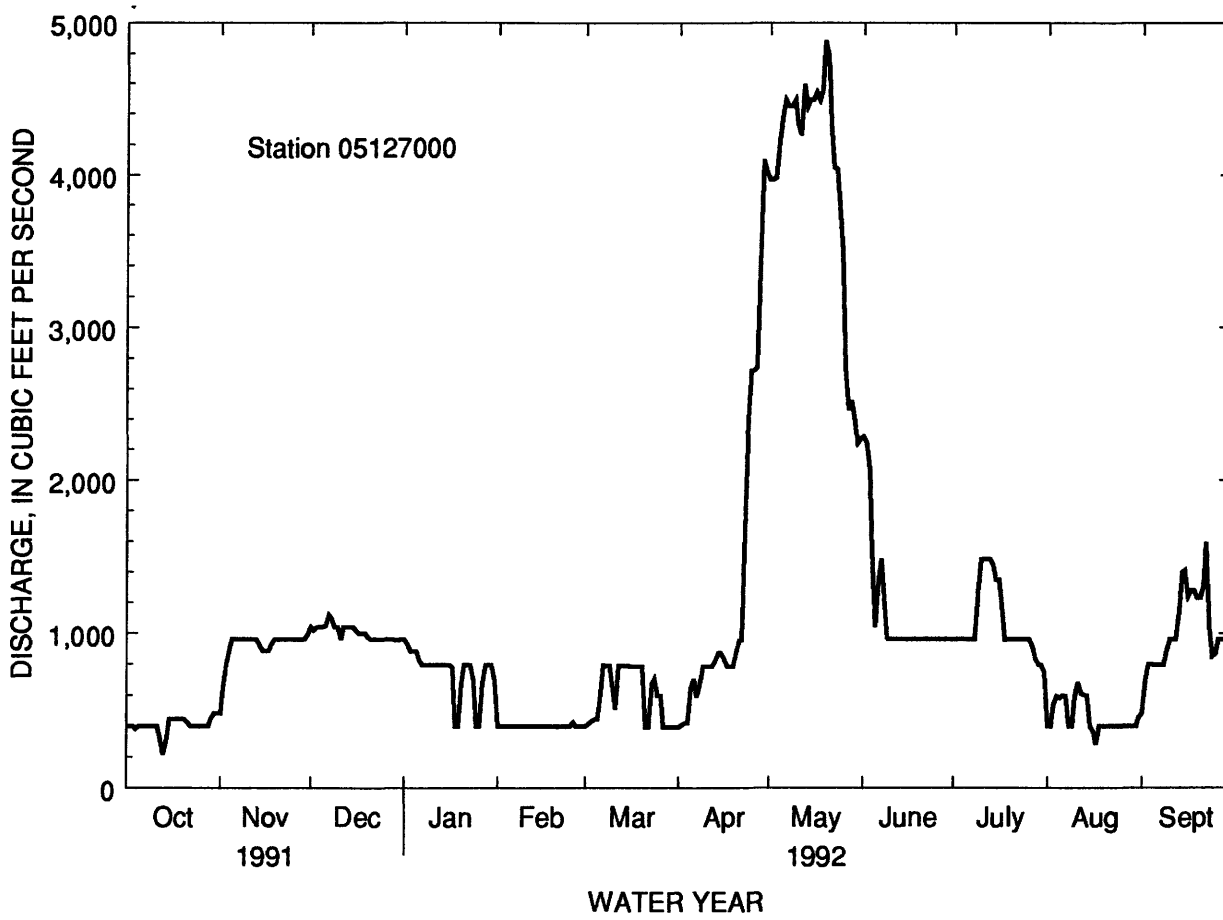
+ Change in contents, equivalent in cubic feet per second, in Camp Six, Bald Eagle, Gabbro, Little Gabbro, Birch, White Iron, Farm, South Farm and Garden Lakes.

‡ Adjusted for change in reservoir content.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1905 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	900	752	587	450	343	369	1187	3133	1952	1125	689	757
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1905 - 1992	
ANNUAL TOTAL	280254.00		398889			
ANNUAL MEAN	768		1090		1031	
HIGHEST ANNUAL MEAN					1967	1950
LOWEST ANNUAL MEAN					240	1924
HIGHEST DAILY MEAN	2880	May 9	4880	May 19	16000	May 18 1950
LOWEST DAILY MEAN	.00	At times	216	Oct 13	.00	At times
ANNUAL SEVEN-DAY MINIMUM	140	Sep 1	349	Oct 8	.00	Oct 13 1923
ANNUAL RUNOFF (AC-FT)	555900		791200		747200	
ANNUAL RUNOFF (CFSM)	.62		.89		.84	
ANNUAL RUNOFF (INCHES)	8.48		12.07		11.40	
10 PERCENT EXCEEDS	1470		2320		2450	
50 PERCENT EXCEEDS	582		873		590	
90 PERCENT EXCEEDS	294		397		190	



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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

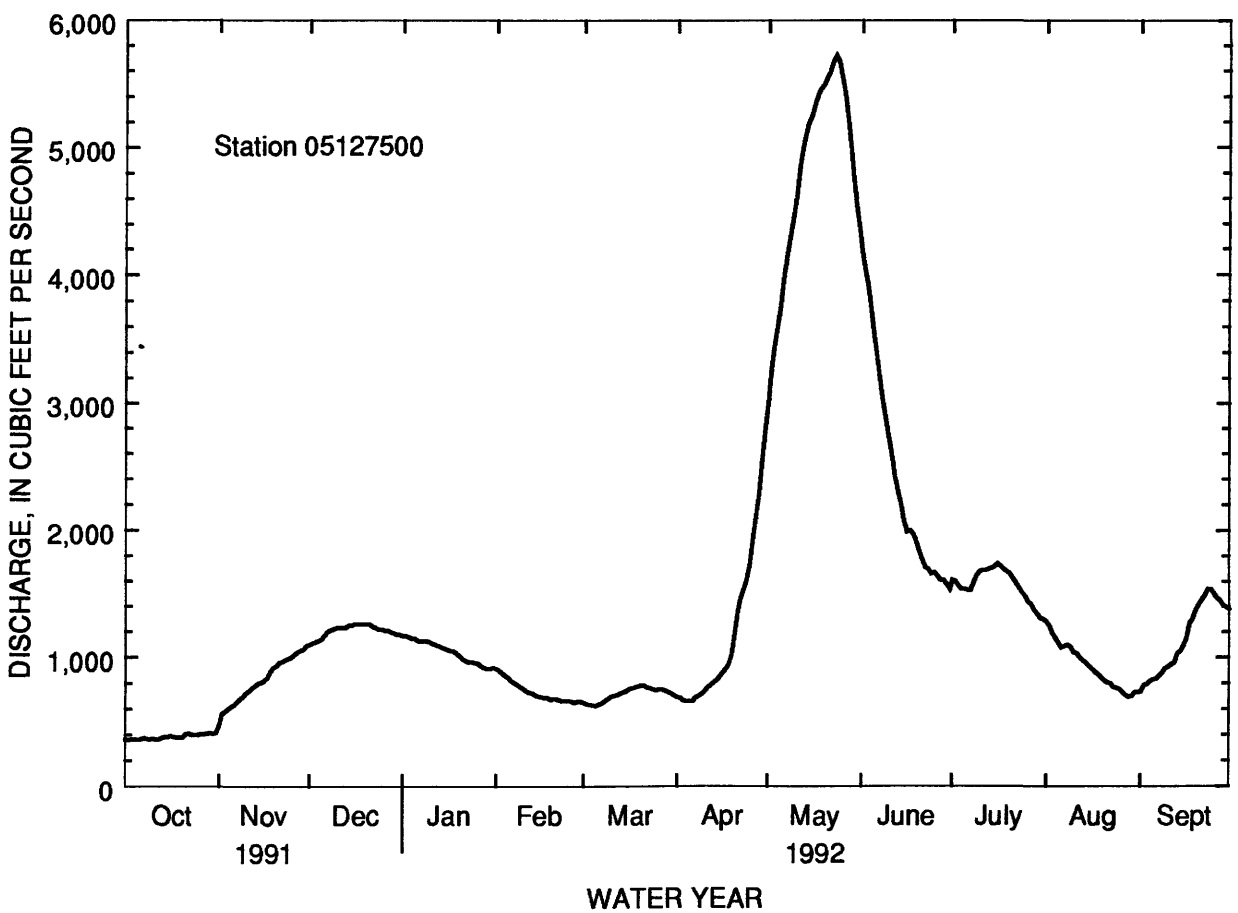
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	364	477	1100	1170	917	649	697	3000	4180	1610	1280	736
2	362	560	1110	1170	900	639	689	3230	4030	1600	1240	787
3	366	580	1120	1160	881	633	672	3440	3900	1560	1190	795
4	365	598	1130	1150	860	629	668	3600	3730	1540	1150	813
5	367	617	1140	1150	843	625	667	3770	3530	1540	1110	833
6	368	628	1170	1130	822	634	668	3960	3360	1530	1080	835
7	374	655	1200	1130	806	645	688	4130	3160	1530	1090	860
8	371	682	1210	1130	790	666	704	4290	3010	1590	1100	881
9	367	698	1220	1130	775	679	718	4440	2860	1650	1080	914
10	369	727	1230	1120	760	696	745	4570	2710	1680	1040	928
11	366	741	1230	1110	743	705	768	4820	2560	1690	1030	952
12	367	764	1230	1100	732	711	790	4990	2420	1690	1000	960
13	374	778	1230	1090	725	720	809	5110	2300	1700	978	1030
14	385	799	1250	1080	710	730	832	5190	2190	1710	958	1050
15	387	805	1250	1070	700	740	854	5250	2080	1720	935	1090
16	391	824	1260	1060	694	754	883	5340	1990	1740	911	1150
17	386	841	1260	1050	690	764	915	5420	2000	1720	890	1270
18	379	893	1260	1050	688	773	950	5460	1970	1700	871	1300
19	379	918	1260	1030	677	782	1020	5490	1920	1680	847	1370
20	381	938	1260	1010	683	787	1190	5550	1840	1660	824	1420
21	405	959	1260	989	683	783	1370	5590	1770	1620	805	1460
22	410	966	1240	977	672	771	1470	5670	1710	1590	799	1490
23	401	980	1230	966	668	763	1540	5720	1700	1550	769	1540
24	401	988	1220	968	668	754	1620	5670	1660	1510	764	1540
25	400	1000	1220	962	663	751	1750	5560	1670	1480	756	1500
26	404	1020	1210	956	658	758	1920	5430	1640	1440	732	1470
27	406	1040	1210	938	653	758	2110	5220	1610	1420	713	1450
28	410	1050	1200	923	659	747	2290	4980	1610	1370	695	1410
29	415	1060	1190	917	658	735	2510	4750	1580	1340	699	1400
30	411	1090	1180	916	---	727	2770	4550	1540	1310	729	1380
31	416	---	1180	918	---	709	---	4360	---	1300	732	---
TOTAL	11947	24676	37460	32520	21378	22217	35277	148550	72230	48770	28797	34614
MEAN	385	823	1208	1049	737	717	1176	4792	2408	1573	929	1154
MAX	416	1090	1260	1170	917	787	2770	5720	4180	1740	1280	1540
MIN	362	477	1100	916	653	625	667	3000	1540	1300	695	736
AC-FT	23700	48940	74300	64500	42400	44070	69970	294600	143300	96740	57120	68660
CFSM	.22	.47	.69	.60	.42	.41	.68	2.75	1.38	.90	.53	.66
IN.	.26	.53	.80	.70	.46	.47	.75	3.18	1.54	1.04	.62	.74

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	1094	1009	864	718	592	566	1205	3770	2907	1793	1097	1007
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1931 - 1992	
ANNUAL TOTAL	374196		518436			
ANNUAL MEAN	1025		1416		1399	
HIGHEST ANNUAL MEAN					2643	1950
LOWEST ANNUAL MEAN					557	1958
HIGHEST DAILY MEAN	3130	May 17	5720	May 23	15200	May 24 1950
LOWEST DAILY MEAN	341	Sep 24	362	Oct 2	58	Nov 3 1976
ANNUAL SEVEN-DAY MINIMUM	350	Sep 22	367	Oct 1	58	Nov 7 1976
INSTANTANEOUS PEAK FLOW			5740	May 22, 23	15600	May 24 1950
INSTANTANEOUS PEAK STAGE			6.33	May 22, 23	9.94a	May 24 1950
INSTANTANEOUS LOW FLOW			360b		55	Nov 18 1976
ANNUAL RUNOFF (AC-FT)	742200		1028000		1013000	
ANNUAL RUNOFF (CFSM)	.59		.81		.80	
ANNUAL RUNOFF (INCHES)	8.00		11.08		10.92	
10 PERCENT EXCEEDS	1850		3180		3270	
50 PERCENT EXCEEDS	788		1030		854	
90 PERCENT EXCEEDS	375		623		375	

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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1250	1140	e2000	2660	2320	1970	1740	4660	11700	6990	5190	3640
2	1230	1170	e2040	2660	2290	1950	1740	e4940	11600	6920	5120	3740
3	1220	1200	e2080	2640	2270	1940	1730	e5300	11500	6750	5050	3850
4	1210	1240	e2120	2640	2260	1910	1730	e5650	11300	6670	4980	3960
5	1190	1250	e2160	2630	2250	1910	1740	e6000	11200	6670	4840	3990
6	1170	1240	e2190	2620	2220	1900	1740	e6360	11000	6640	4770	4060
7	1170	1250	e2230	2610	2210	1910	1760	e6710	10800	6600	4800	4170
8	1160	1270	e2270	2620	2190	1910	1770	e7100	10600	6500	4840	4240
9	1130	1290	e2310	2620	2180	1910	1780	e7490	10500	e6430	4800	4380
10	1140	1300	2340	2610	2170	1900	1800	e7840	10200	e6390	4660	4480
11	1110	1310	2380	2600	2160	1890	1820	e8230	9990	e6360	4660	4590
12	1110	1330	2400	2590	2140	1880	1840	e8620	9750	e6320	4590	4660
13	1120	1340	2440	2570	2140	1860	1860	8970	9500	e6290	4480	4730
14	1100	1350	2490	2560	2120	1850	1880	9290	9250	e6290	4410	4770
15	1110	1360	2520	2550	2110	1850	1900	9640	9010	6250	4340	4840
16	1120	1370	2550	2530	2090	1840	1930	9920	8760	6220	4240	4940
17	1060	1390	2570	2510	2080	1820	1970	10200	8720	6220	4170	5120
18	1060	1450	2610	2510	2070	1810	2020	10400	8510	6180	4100	5120
19	1080	1500	2620	2500	2060	1800	2130	10600	8330	6140	4060	5230
20	1080	1540	2640	2480	2060	1790	2290	10800	8160	6110	3990	5300
21	1110	1590	2650	2470	2060	1790	2500	10900	7950	6070	3920	5230
22	1120	1620	2660	2450	2050	1780	2690	11000	7770	6040	3920	5260
23	1080	1650	2660	2430	2030	1770	2890	11200	7660	5970	3880	5330
24	1080	1680	2670	2420	2030	1750	3060	11400	7520	5900	3920	5330
25	1070	1740	2680	2400	2020	1740	3250	11400	7450	5790	3880	5370
26	1080	1790	2680	2390	2000	1740	3440	11500	7350	5690	3780	5370
27	1080	1840	2680	2390	1980	1750	3640	11600	7200	5650	3740	5330
28	1090	1880	2680	2370	1990	1740	3880	11700	7130	5510	3710	5330
29	1080	1910	2680	2360	1980	1740	4100	11700	7030	5440	3640	5400
30	1080	1960	2680	2340	---	1740	4410	11700	6920	5370	3640	5370
31	1100	---	2670	2330	---	1740	---	11700	---	5260	3600	---
TOTAL	34790	43950	76350	78060	61530	56880	71030	284520	274360	191630	133720	143130
MEAN	1122	1465	2463	2518	2122	1835	2368	9178	9145	6182	4314	4771
MAX	1250	1960	2680	2660	2320	1970	4410	11700	11700	6990	5190	5400
MIN	1060	1140	2000	2330	1980	1740	1730	4660	6920	5260	3600	3640
AC-FT	69010	87170	151400	154800	122000	112800	140900	564300	544200	380100	265200	283900
CFSM.	22	.28	.48	.49	.41	.35	.46	1.78	1.77	1.20	.83	.92
IN.	.25	.32	.55	.56	.44	.41	.51	2.05	1.97	1.38	.96	1.03

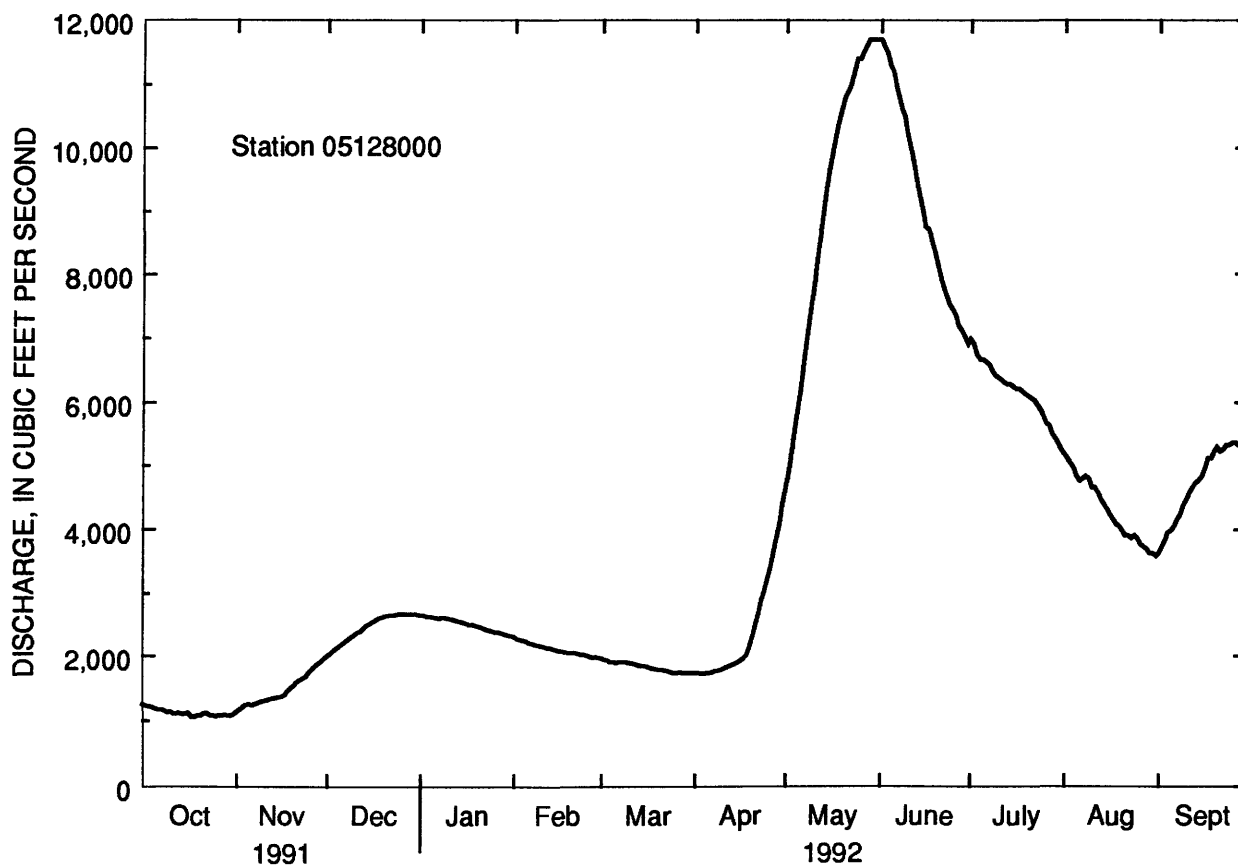
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1921 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	3064	2887	2569	2169	1872	1662	2548	7691	8058	6105	3983	3177
MAX	4200	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)1	977	1977	1977	1977	1924	1924	1977	1977	1924	1924	1980	1933

SUMMARY STATISTICS	FOR 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1921 - 1992	
ANNUAL TOTAL	1035590		1449950			
ANNUAL MEAN	2837		3962		3834	
HIGHEST ANNUAL MEAN					7270	1950
LOWEST ANNUAL MEAN					964	1924
HIGHEST DAILY MEAN	7170	May 25	11700	May 28	28200	May 31 1950
LOWEST DAILY MEAN	1060	Oct 17	1060	Oct 17	535	Feb 4 1924
ANNUAL SEVEN-DAY MINIMUM	1080	Oct 23	1080	Oct 23	535	Feb 4 1924
INSTANTANEOUS PEAK FLOW			11800	May 31	28200a	
INSTANTANEOUS PEAK STAGE			1187.94	May 31	1193.30a	
INSTANTANEOUS LOW FLOW			939	Oct 17	535b	
ANNUAL RUNOFF (AC-FT)	2054000		2876000		2778000	
ANNUAL RUNOFF (CFSM)	.55		.77		.74	
ANNUAL RUNOFF (INCHES)	7.45		10.43		10.08	
10 PERCENT EXCEEDS	5910		8650		8340	
50 PERCENT EXCEEDS	1910		2610		2640	
90 PERCENT EXCEEDS	1250		1250		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. No estimated daily discharges.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of April 1979 reached a stage of 15.15 ft, from high-water mark, discharge, about 4,600 ft³/s.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

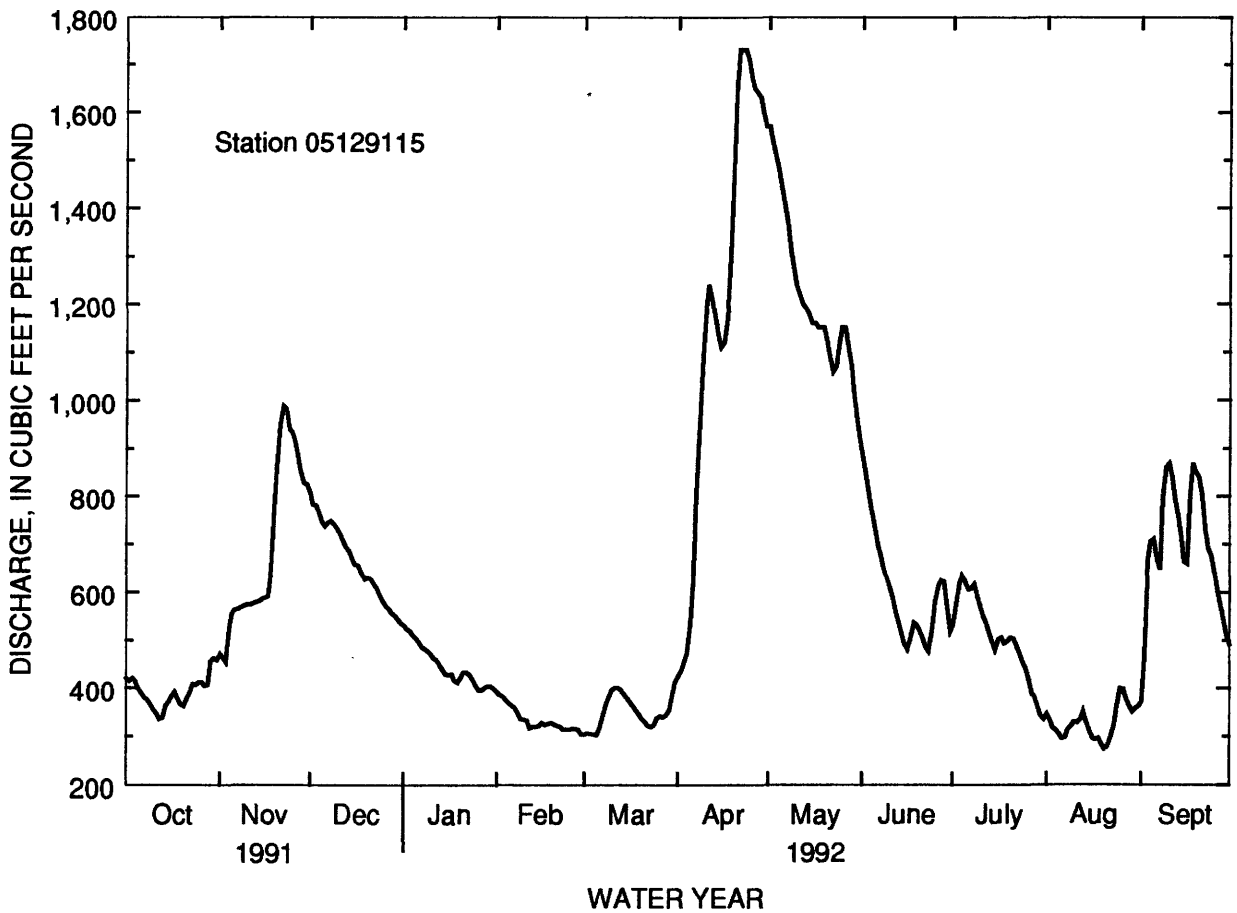
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	420	471	806	531	392	304	425	1570	885	532	346	371
2	414	465	783	523	387	307	437	1540	848	576	333	465
3	420	454	780	519	382	305	453	1510	806	620	318	669
4	415	522	764	512	375	304	476	1480	773	634	313	705
5	399	556	746	505	368	302	536	1440	738	623	305	710
6	389	564	737	497	364	316	648	1410	700	607	295	670
7	380	565	745	488	358	340	803	1370	674	608	297	648
8	376	569	748	483	346	365	956	1310	650	617	316	796
9	366	572	741	479	335	383	1090	1270	630	592	322	861
10	355	574	731	471	334	395	1190	1240	610	569	330	869
11	346	574	720	464	333	401	1240	1220	588	551	329	839
12	336	577	708	460	317	401	1210	1200	562	535	335	797
13	338	580	693	447	320	397	1170	1190	538	514	352	759
14	364	581	685	439	320	389	1130	1180	515	496	329	712
15	372	586	667	429	322	379	1110	1160	495	481	312	663
16	383	589	657	427	327	373	1120	1160	483	502	296	659
17	392	592	655	429	324	363	1170	1150	507	507	293	806
18	377	647	639	416	326	355	1270	1150	537	495	295	869
19	366	773	628	411	327	346	1430	1150	533	498	282	850
20	362	878	630	422	325	337	1640	1120	521	507	275	838
21	378	949	628	433	322	330	1730	1090	505	504	280	799
22	392	988	619	433	320	323	1730	1060	486	491	300	733
23	408	981	608	428	315	319	1730	1070	478	475	325	691
24	406	938	596	417	315	324	1710	1120	518	455	363	675
25	412	933	582	406	314	339	1670	1150	581	440	400	637
26	411	913	572	395	316	342	1650	1150	614	420	398	603
27	403	878	565	395	316	340	1640	1110	625	391	379	571
28	406	850	557	401	314	344	1630	1070	622	380	363	539
29	455	827	551	404	304	355	1600	1010	569	358	352	511
30	462	825	544	404	---	381	1570	958	520	343	358	492
31	458	---	537	399	---	411	---	915	---	335	362	---
TOTAL	12161	20771	20622	13867	9718	10870	36164	37523	18111	15656	10153	20807
MEAN	392	692	665	447	335	351	1205	1210	604	505	328	694
MAX	462	988	806	531	392	411	1730	1570	885	634	400	869
MIN	336	454	537	395	304	302	425	915	478	335	275	371
AC-FT	24120	41200	40900	27510	19280	21560	71730	74430	35920	31050	20140	41270

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1979 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	569	512	409	282	233	275	1127	1390	1016	747	447	485
MAX1	175	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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1979 - 1992	
ANNUAL TOTAL	218934		226423			
ANNUAL MEAN	600		619		627	
HIGHEST ANNUAL MEAN					806	1986
LOWEST ANNUAL MEAN					326	1980
HIGHEST DAILY MEAN	1750	May 13	1730	Apr 21	4300	Apr 25 1985
LOWEST DAILY MEAN	141	Feb 18	275	Aug 20	38	Aug 13 1980
ANNUAL SEVEN-DAY MINIMUM	146	Feb 13	289	Aug 16	40	Aug 10 1980
INSTANTANEOUS PEAK FLOW			1870	Apr 23	4360	Apr 25 1985
INSTANTANEOUS PEAK STAGE			10.93	Apr 23	15.20	Apr 25 1985
INSTANTANEOUS LOW FLOW			271	Aug 20, 22	38	Aug 13, 14, 1980
ANNUAL RUNOFF (AC-FT)	434300		449100		454400	
10 PERCENT EXCEEDS	1250		1150		1410	
50 PERCENT EXCEEDS	488		509		414	
90 PERCENT EXCEEDS	160		324		158	



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. No estimated daily discharges. Flow completely regulated by outlet dam on Namakan Lake.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

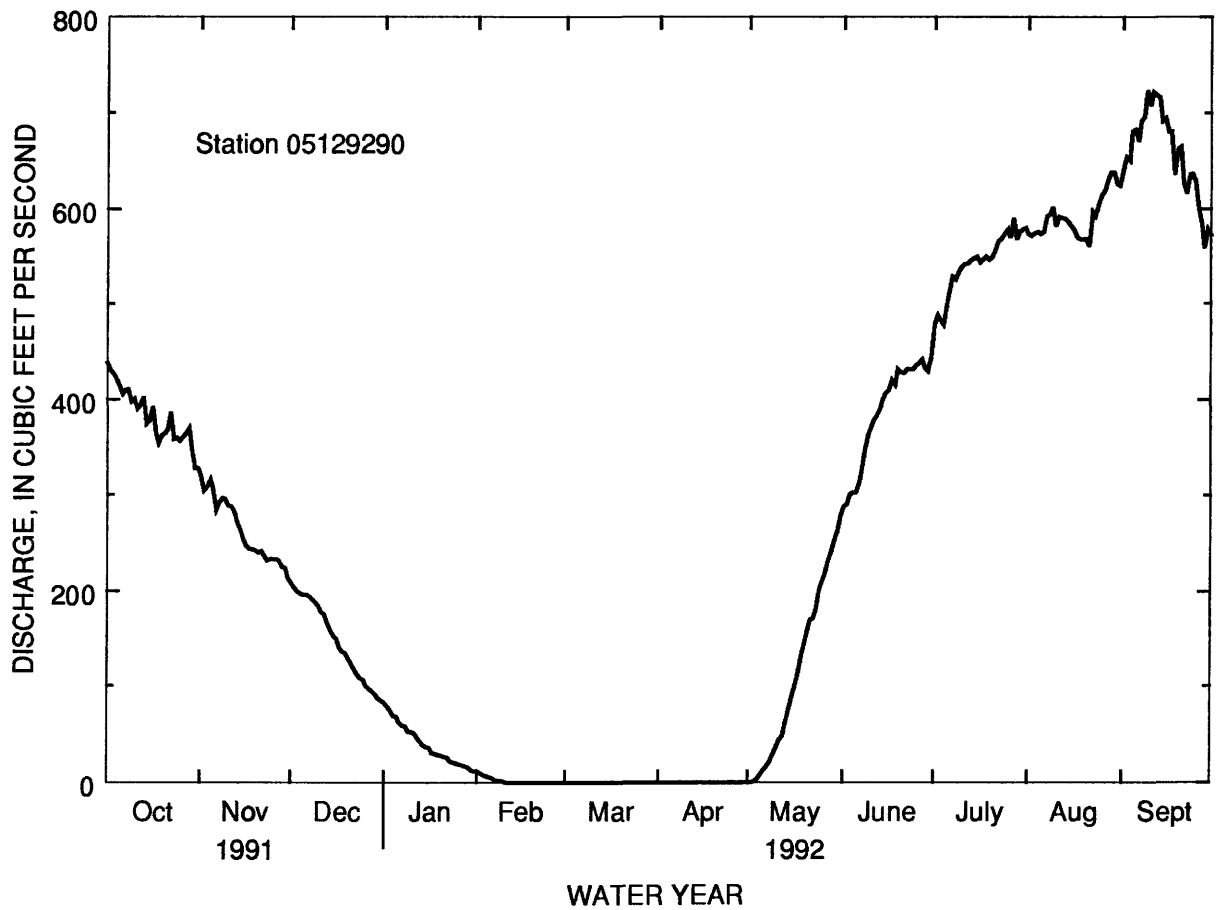
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	438	321	209	82	12	.00	.00	.12	288	479	574	641
2	431	305	204	79	10	.00	.00	.18	291	488	572	654
3	427	309	200	75	8.0	.00	.00	1.2	300	483	575	651
4	422	316	198	69	6.9	.00	.00	4.0	303	478	576	681
5	415	307	197	68	6.4	.00	.00	8.4	303	499	574	683
6	406	285	197	62	4.6	.00	.00	13	312	513	576	671
7	410	293	195	59	2.9	.00	.00	17	325	529	593	692
8	411	297	192	58	2.0	.00	.00	22	347	526	595	696
9	398	296	189	53	1.8	.00	.00	30	362	534	602	724
10	401	289	185	52	.81	.00	.00	36	372	539	582	708
11	391	288	179	51	.22	.00	.00	44	379	542	592	722
12	395	282	176	46	.21	.00	.00	48	384	543	591	719
13	403	272	167	43	.19	.00	.00	61	391	546	590	717
14	375	264	159	39	.17	.00	.00	75	401	548	587	692
15	378	254	153	37	.17	.00	.00	88	407	550	583	695
16	393	248	150	36	.14	.00	.00	101	410	544	579	681
17	365	245	141	31	.13	.00	.00	112	421	547	571	681
18	355	244	136	30	.12	.00	.00	130	416	550	568	636
19	363	243	135	29	.10	.00	.00	145	432	547	568	662
20	365	241	129	28	.10	.00	.00	159	429	550	569	665
21	369	242	123	27	.08	.00	.00	170	428	558	561	627
22	387	237	117	26	.04	.00	.00	172	432	566	597	617
23	359	233	112	22	.00	.00	.00	183	432	569	593	636
24	360	234	108	21	.00	.00	.00	201	432	575	605	637
25	357	234	106	20	.00	.00	.00	211	436	579	615	629
26	361	234	100	19	.00	.00	.00	221	438	570	620	600
27	365	232	97	18	.00	.00	.00	232	442	591	630	584
28	370	226	94	17	.00	.00	.00	242	433	568	638	559
29	349	225	91	16	.00	.00	.00	254	430	576	638	579
30	328	215	87	13	---	.00	.06	265	444	579	626	573
31	328	---	85	12	---	.00	---	279	---	580	625	---
TOTAL	11875	7911	4611	1238	57.08	0.00	0.06	3524.90	11620	16846	18365	19712
MEAN	383	264	149	39.9	1.97	.000	.002	114	387	543	592	657
MAX	438	321	209	82	12	.00	.06	279	444	591	638	724
MIN	328	215	85	12	.00	.00	.00	.12	288	478	561	559
AC-FT	23550	15690	9150	2460	113	.00	.1	6990	23050	33410	36430	39100

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1983 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	397	199	78.6	15.3	1.05	.000	.35	126	377	576	590	559
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1983 - 1992	
ANNUAL TOTAL	92291.22		95760.04			
ANNUAL MEAN	253		262		245	
HIGHEST ANNUAL MEAN					280	1986
LOWEST ANNUAL MEAN					192	1987
HIGHEST DAILY MEAN	698	Jul 10	724	Sep 9	876	Sep 22 1988
LOWEST DAILY MEAN	.00	Many days	.00	Many days	.00	Many days in each yr
ANNUAL SEVEN-DAY MINIMUM	.00	Feb 21	.00	Feb 23	.00	Jan 21 1983
INSTANTANEOUS PEAK FLOW			742	Sep 11	897	Sep 21 1988
INSTANTANEOUS PEAK STAGE			18.67	Sep 11	19.23	Sep 21 1988
ANNUAL RUNOFF (AC-FT)	183100		189900		177200	
10 PERCENT EXCEEDS	570		596		591	
50 PERCENT EXCEEDS	226		232		161	
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.

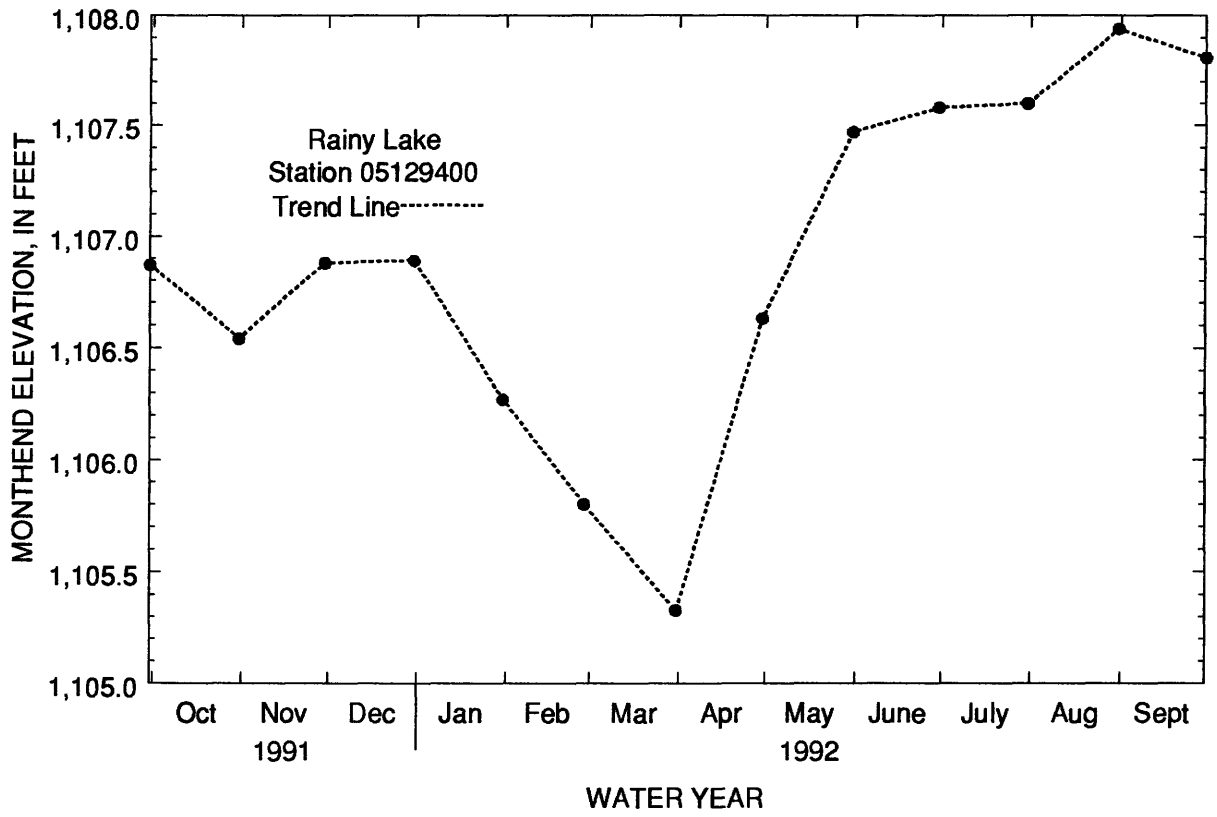
EXTREMES FOR PERIOD OF RECORD.--Maximum elevation observed, 1,112.97 ft, July 5, 1950; minimum observed, 1,101.26 ft, Apr. 17, 1923, Apr. 2, 1930.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,108.44 ft, Sept. 10; maximum daily elevation, 1,108.33 ft, Sept. 9; minimum, 1,105.31 ft, Mar. 25; minimum daily, 1,105.32 ft, Mar. 26.

MONTHEND ELEVATION, IN SEA LEVEL, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

Oct. 31 ..... 1,106.54	Feb. 28 ..... 1,105.80	June 30 ..... 1,107.58
Nov. 30 ..... 1,106.88	Mar. 31 ..... 1,105.33	July 31 ..... 1,107.60
Dec. 31 ..... 1,106.89	Apr. 30 ..... 1,106.63	Aug. 31 ..... 1,107.94
Jan. 31 ..... 1,106.27	May 31 ..... 1,107.47	Sept. 30 ..... 1,107.81

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


1,108.0
1,107.5
1,107.0
1,106.5
1,106.0
1,105.5
1,105.0
MONTHEND ELEVATION, IN FEET
Rainy Lake
Station 05129400
Trend Line
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
1991
1992
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)
Apr. 21, 22	--	*432	*3.66	No peak greater than base discharge.			

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	36	120	e125	e64	e45	42	144	270	67	133	42	132
2	34	115	e120	e63	e45	43	154	250	61	228	41	185
3	32	131	e115	e62	e44	43	170	237	64	299	39	203
4	30	135	e110	e62	e44	44	185	219	74	346	37	216
5	28	140	e110	e62	e43	45	227	201	56	317	34	212
6	30	149	e105	e62	e43	54	296	187	52	248	32	185
7	31	148	e105	e62	e42	70	364	174	49	191	36	167
8	31	145	e100	e61	e42	91	384	163	46	181	46	182
9	31	138	e100	e61	e41	103	411	157	43	167	42	172
10	31	131	98	e60	e41	107	391	146	39	136	48	173
11	34	125	96	e58	e40	104	344	163	36	109	45	159
12	31	120	94	e54	e40	95	289	244	33	90	42	147
13	31	117	92	e50	e40	88	262	307	31	75	39	138
14	42	118	90	e48	e39	83	223	321	27	67	36	119
15	48	123	88	e46	e39	76	216	289	25	61	34	104
16	51	126	86	e46	e39	72	215	249	25	68	32	110
17	51	127	85	e47	e39	69	215	219	40	71	32	179
18	48	172	83	e48	e39	66	224	193	57	77	33	209
19	45	238	82	e50	e39	63	266	168	58	84	31	224
20	43	276	80	e51	e39	59	340	148	58	81	32	218
21	46	309	80	e52	e38	57	411	130	53	78	39	202
22	47	319	79	e52	e38	55	430	135	48	69	40	181
23	47	296	75	e52	e38	55	406	148	49	64	41	164
24	49	255	73	e51	e38	64	376	134	76	58	75	153
25	57	e220	71	e50	39	84	348	119	82	55	79	144
26	47	e180	70	e49	40	89	334	108	83	63	79	132
27	43	e160	69	e48	40	94	328	101	74	57	76	127
28	47	e150	68	e48	41	100	320	94	66	53	69	127
29	89	e140	68	e47	42	108	307	88	56	50	69	126
30	113	e130	67	e47	---	126	289	80	48	46	99	125
31	127	---	66	e46	---	140	---	73	---	43	122	---
TOTAL	1450	5053	2750	1659	1177	2389	8869	5515	1576	3665	1541	4915
MEAN	46.8	168	88.7	53.5	40.6	77.1	296	178	52.5	118	49.7	164
MAX	127	319	125	64	45	140	430	321	83	346	122	224
MIN	28	115	66	46	38	42	144	73	25	43	31	104
AC-FT	2880	10020	5450	3290	2330	4740	17590	10940	3130	7270	3060	9750
CFSM.	.25	.90	.47	.29	.22	.41	1.58	.95	.28	.63	.27	.88
IN.	.29	1.01	.55	.33	.23	.48	1.76	1.10	.31	.73	.31	.98

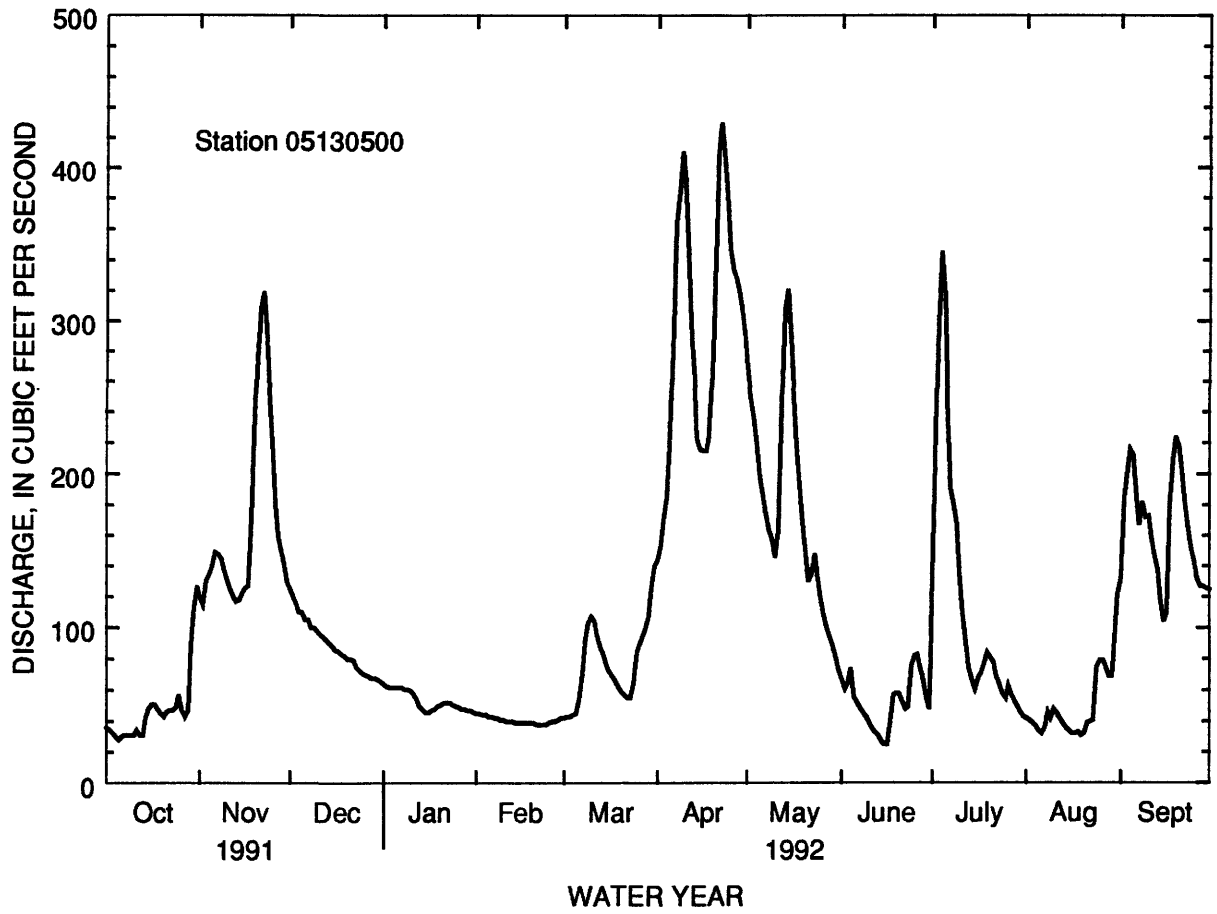
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	112	89.1	45.7	27.7	22.2	48.4	370	307	185	105	68.0	90.6
MAX	369	264	115	66.0	47.7	337	868	1451	528	483	268	424
(WY)	1974	1978	1978	1966	1984	1945	1948	1950	1944	1944	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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1942 - 1992	
ANNUAL TOTAL	35463		40559			
ANNUAL MEAN	97.2		111		123	
HIGHEST ANNUAL MEAN					208	1950
LOWEST ANNUAL MEAN					63.1	1977
HIGHEST DAILY MEAN	519	May 8	430	Apr 22	3530	May 8 1950
LOWEST DAILY MEAN	21	Mar 4	25	Jun 15	2.5	Jul 30 1988
ANNUAL SEVEN-DAY MINIMUM	21	Mar 4	30	Oct 4	3.0	Jul 24 1988
INSTANTANEOUS PEAK FLOW			432	Apr 21, 22	3630a	May 7 1950
INSTANTANEOUS PEAK STAGE			3.66	Apr 21, 22	7.41b	May 7 1950
INSTANTANEOUS LOW FLOW			24	Jun 15		
ANNUAL RUNOFF (AC-FT)	70340		80450		88870	
ANNUAL RUNOFF (CFSM)	.52		.59		.66	
ANNUAL RUNOFF (INCHES)	7.05		8.07		8.91	
10 PERCENT EXCEEDS	239		240		294	
50 PERCENT EXCEEDS	60		76		55	
90 PERCENT EXCEEDS	22		39		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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	583	996	e1040	e460	e265	e180	e1300	3220	747	407	249	693
2	552	907	e990	e450	e260	e180	e1400	3090	679	403	246	910
3	532	771	e940	e440	e255	e180	e1450	2870	618	549	232	1310
4	529	831	e890	e430	e250	e180	e1500	2630	547	1050	212	1890
5	521	e1030	e860	e425	e250	e180	e1800	2440	500	1280	198	1990
6	503	e1230	e830	e420	e245	e190	e2300	2240	454	1320	186	1900
7	500	e1250	e810	e410	e240	e200	e3000	2050	416	1220	187	1660
8	491	e1220	e790	e400	e235	e250	e3900	1850	398	1060	191	1800
9	487	e1170	e760	e395	e230	e350	e4200	1720	359	879	198	2490
10	485	e1120	e740	e390	e225	e400	e4300	1590	326	737	218	2590
11	472	e1070	e710	e380	e220	e450	e4100	1560	259	764	240	2350
12	459	e1050	e690	e370	e215	e450	e3600	1540	233	813	258	1990
13	443	e1040	e680	e365	e210	e450	e3200	1450	219	751	250	1640
14	437	e1020	e660	e360	e205	e420	e2800	1480	195	638	243	1370
15	489	e1000	e650	e350	e205	e390	e2600	1710	174	535	227	1160
16	549	e1020	e630	e345	e200	e360	e2400	1810	161	454	210	1010
17	662	e1100	e620	e340	e200	e330	e2300	1850	162	416	200	986
18	727	e1200	e610	e335	e195	e310	e2300	1720	183	384	195	1230
19	723	e1600	e590	e330	e190	e290	e2500	1530	197	365	202	1650
20	667	e2600	e580	e325	e190	e280	e3500	1360	224	366	213	1820
21	653	e2950	e570	e320	e190	e270	4520	1200	279	379	203	1740
22	661	e2950	e560	e315	e185	e260	4680	1070	352	379	241	1530
23	707	e2600	e550	e310	e185	e255	4540	1080	365	388	298	1310
24	754	e2200	e540	e300	e185	e250	4290	1440	344	383	378	1130
25	771	e1900	e530	e295	e180	e260	4120	1840	312	352	462	956
26	773	e1600	e520	e290	e180	e300	4020	1700	341	332	605	837
27	748	e1400	e510	e285	e180	e400	3940	1440	419	324	706	759
28	720	e1300	e500	e280	e180	e500	3760	1230	467	299	670	699
29	763	e1200	e490	e275	e180	e600	3520	1070	476	278	598	639
30	844	e1100	e480	e270	---	e800	3350	949	437	277	555	583
31	887	---	e470	e270	---	e1000	---	832	---	262	593	---
TOTAL	19092	42425	20790	10930	6130	10915	95190	53561	10843	18044	9664	42622
MEAN	616	1414	671	353	211	352	3173	1728	361	582	312	1421
MAX	887	2950	1040	460	265	1000	4680	3220	747	1320	706	2590
MIN	437	771	470	270	180	180	1300	832	161	262	186	583
AC-FT	37870	84150	41240	21680	12160	21650	188800	106200	21510	35790	19170	84540
CFSM	.36	.82	.39	.20	.12	.20	1.83	1.00	.21	.34	.18	.82
IN.	.41	.91	.45	.24	.13	.23	2.05	1.15	.23	.39	.21	.92

e Estimated.

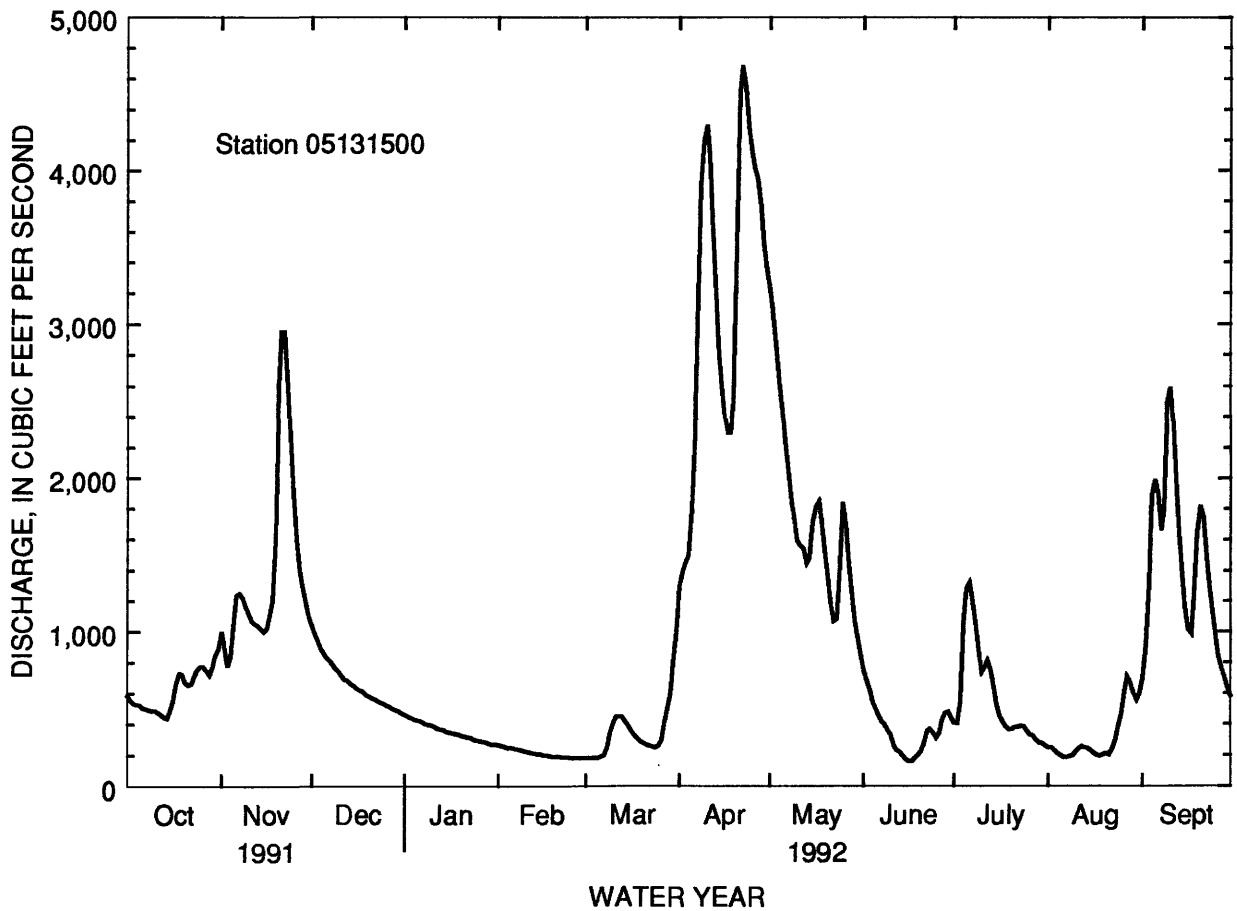
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	863	681	301	142	108	269	3186	2889	1807	922	544	744
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1909 - 1992	
ANNUAL TOTAL	359017		340206			
ANNUAL MEAN	984		930		1054	
HIGHEST ANNUAL MEAN					1912	1966
LOWEST ANNUAL MEAN					306	1931
HIGHEST DAILY MEAN	5460	Jul 6	4680	Apr 22	25000	Apr 18 1916
LOWEST DAILY MEAN	85	Feb 26	161	Jun 16	21	Aug 26 1936
ANNUAL SEVEN-DAY MINIMUM	85	Feb 26	180	Feb 25	22	Aug 21 1936
INSTANTANEOUS PEAK FLOW			4690	Apr 22	25000a	
INSTANTANEOUS PEAK STAGE			10.70b	Apr 9	37.00a	
INSTANTANEOUS LOW FLOW			157	Jun 16, 17		
ANNUAL RUNOFF (AC-FT)	712100		674800		763500	
ANNUAL RUNOFF (CFSM)	.57		.54		.61	
ANNUAL RUNOFF (INCHES)	7.72		7.32		8.28	
10 PERCENT EXCEEDS	2800		2300		2800	
50 PERCENT EXCEEDS	597		551		349	
90 PERCENT EXCEEDS	95		204		85	

a Occurred Apr. 18, 1916, May 11, 1950, site and datum then in use.

b Backwater from ice.



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 fair except those for estimated daily discharges, which are poor. 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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	386	529	e440	e260	e190	e150	e760	2270	364	259	249	1030
2	369	350	e420	e260	e185	e150	e900	2120	338	415	219	1120
3	358	335	e390	e255	e185	e155	e950	1990	307	774	203	1340
4	348	498	e375	e250	e180	e160	e950	1880	285	1170	195	1520
5	340	e600	e365	e250	e180	e165	e1000	1740	269	1270	191	1600
6	346	e700	e355	e245	e180	e170	e1200	1600	252	1150	175	1760
7	347	e740	e350	e245	e175	e180	e1500	1520	236	1000	177	1750
8	341	e700	e340	e240	e175	e195	e2000	1430	220	846	184	1990
9	339	e660	e330	e240	e170	e240	e2200	1370	209	742	237	2090
10	330	e640	e330	e235	e170	e300	e2150	1310	194	680	339	e2000
11	316	e620	e320	e235	e170	e350	e2000	1340	182	630	347	1710
12	311	e620	e320	e230	e165	e350	1870	1310	167	571	332	e1500
13	301	e610	e315	e230	e165	e330	1490	1230	153	494	318	e1200
14	328	e600	e310	e225	e165	e320	1340	1130	140	434	308	e1000
15	403	e590	e305	e225	e160	e300	1270	1070	129	388	308	e900
16	409	e590	e300	e220	e160	e280	1250	1020	127	367	297	e800
17	424	e610	e300	e220	e160	e270	1250	1030	143	355	287	e800
18	417	e640	e295	e215	e155	e260	1280	978	196	344	306	e1000
19	392	e700	e295	e215	e155	e250	1400	916	270	337	324	e1200
20	375	e780	e290	e210	e155	e240	2050	847	290	376	342	e1400
21	389	e980	e290	e210	e150	e230	2990	776	279	419	383	e1400
22	416	e1000	e285	e205	e150	e220	2990	727	262	430	463	e1200
23	438	e940	e285	e205	e150	e210	2780	748	248	382	592	e1000
24	435	e820	e280	e200	e145	e200	2630	724	243	335	731	810
25	440	e720	e280	e200	e145	e200	2500	687	264	299	852	e750
26	439	e640	e275	e200	e145	e250	2450	629	283	277	891	e700
27	429	e590	e275	e195	e145	e300	2480	564	283	261	857	e650
28	424	e550	e270	e195	e145	e350	2480	518	256	253	799	e600
29	476	e500	e270	e195	e145	e400	2420	478	247	267	748	e560
30	523	e470	e265	e190	---	e500	2380	440	243	282	786	e540
31	523	---	e265	e190	---	e600	---	400	---	270	958	---
TOTAL	12112	19322	9785	6890	4720	8275	54910	34792	7079	16077	13398	35920
MEAN	391	644	316	222	163	267	1830	1122	236	519	432	1197
MAX	523	1000	440	260	190	600	2990	2270	364	1270	958	2090
MIN	301	335	265	190	145	150	760	400	127	253	175	540
AC-FT	24020	38330	19410	13670	9360	16410	108900	69010	14040	31890	26570	71250
CFSM.	27	.44	.22	.15	.11	.18	1.25	.77	.16	.36	.30	.82
IN.	.31	.49	.25	.18	.12	.21	1.40	.89	.18	.41	.34	.92

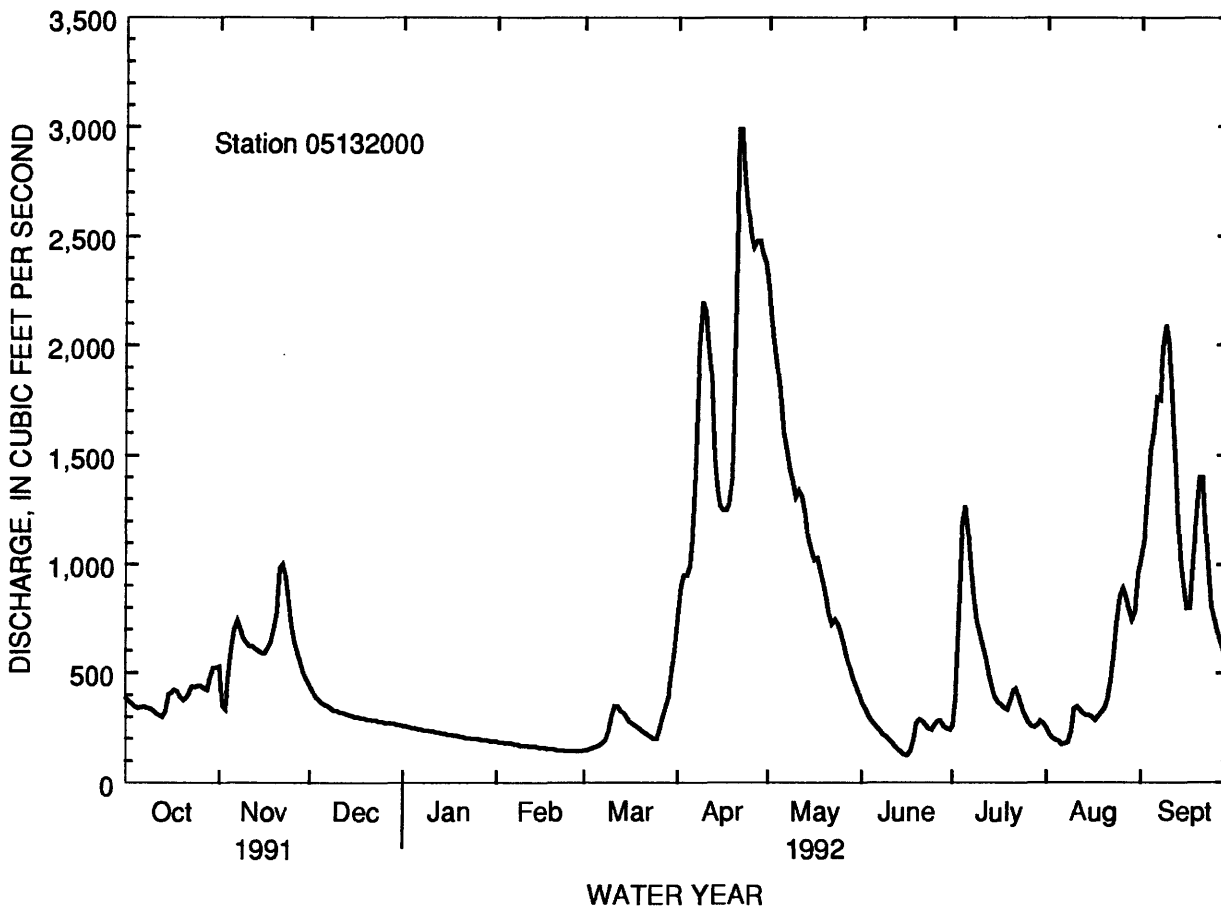
e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	662	525	277	170	134	242	1900	2009	1179	633	395	556
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1909 - 1992	
ANNUAL TOTAL	199597		223280			
ANNUAL MEAN	547		610		724	
HIGHEST ANNUAL MEAN					1362	1950
LOWEST ANNUAL MEAN					92.0	1931
HIGHEST DAILY MEAN	3410	May 8	2990	Apr 21	14800	May 9 1950
LOWEST DAILY MEAN	117	Mar 19	127	Jun 16	14	Jan 10 1940
ANNUAL SEVEN-DAY MINIMUM	118	Mar 15	146	Feb 23	18	Jan 22 1935
INSTANTANEOUS PEAK FLOW			3110	Apr 21	14800	May 8 1950
INSTANTANEOUS PEAK STAGE			7.05	Apr 9a	17.08	May 8 1950
INSTANTANEOUS LOW FLOW			124	Jun 15, 16	7.0	Aug 7 1939
ANNUAL RUNOFF (AC-FT)	395900		442900		524200	
ANNUAL RUNOFF (CFSM)	.37		.42		.50	
ANNUAL RUNOFF (INCHES)	5.09		5.69		6.73	
10 PERCENT EXCEEDS	1240		1400		1810	
50 PERCENT EXCEEDS	368		350		314	
90 PERCENT EXCEEDS	121		176		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 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

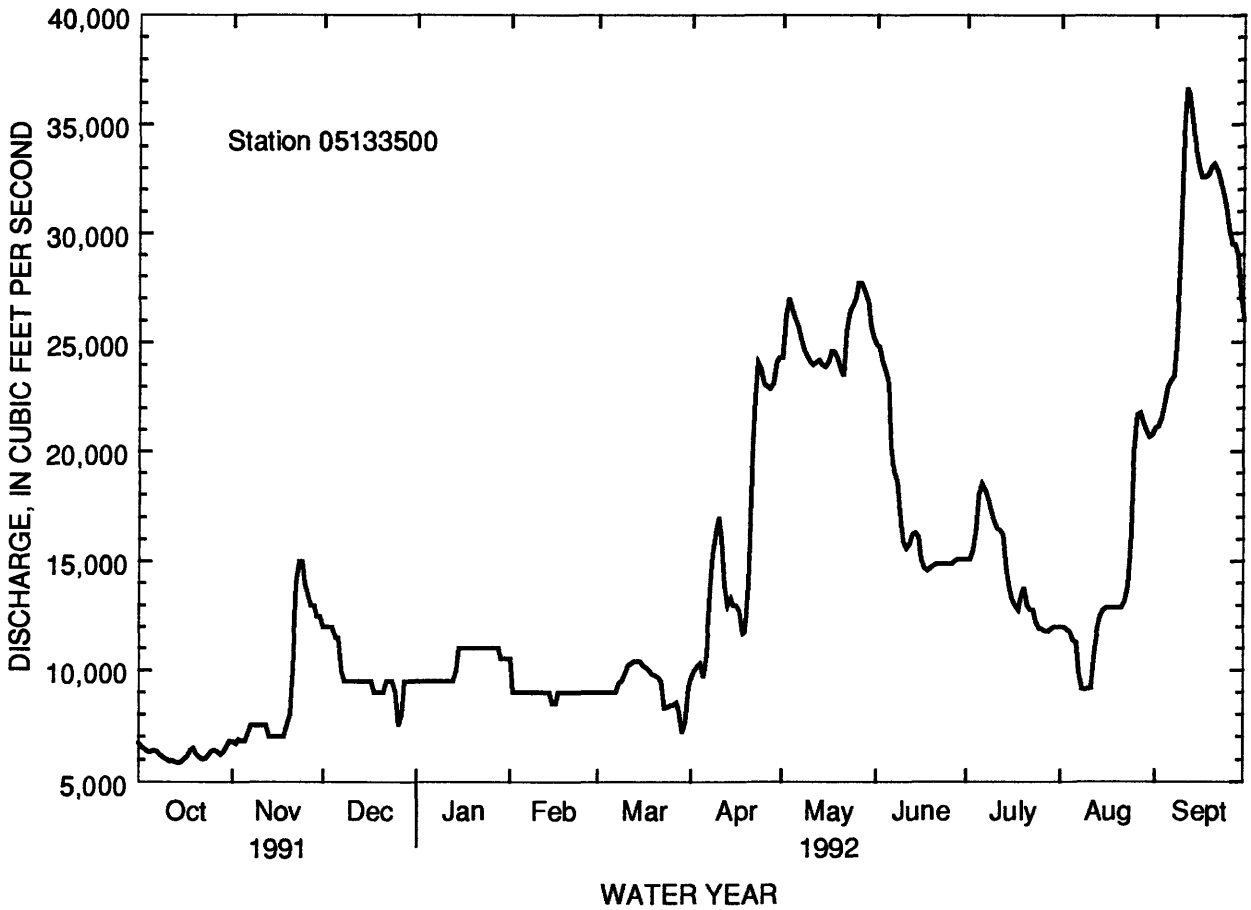
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6720	6770	e12000	e9500	e10500	e9000	9680	24300	24900	15100	12000	21100
2	6550	6680	e12000	e9500	e9000	e9000	10000	26300	24800	15100	12000	21200
3	6470	6860	e12000	e9500	e9000	e9000	10200	27000	24100	e15500	11900	21600
4	6350	e6800	e12000	e9500	e9000	e9000	10300	26500	23700	e16500	11800	22200
5	6340	e6800	e11500	e9500	e9000	e9000	9670	26100	23100	e18000	11400	23000
6	6410	e7200	e11500	e9500	e9000	e9000	10700	25700	20200	e18500	11300	23300
7	6340	e7500	e10000	e9500	e9000	e9000	13600	25200	19000	18200	9940	23500
8	6230	e7500	e9500	e9500	e9000	9390	15300	24700	18600	17800	9170	25300
9	6100	e7500	e9500	e9500	e9000	9520	16300	24400	17200	17300	9150	29000
10	6030	e7500	e9500	e9500	e9000	9800	17000	24100	15900	16800	9180	34500
11	5940	e7500	e9500	e9500	e9000	10200	16000	24000	15600	16500	9200	36700
12	5950	e7500	e9500	e9500	e9000	10300	13900	24100	15800	16400	10800	36400
13	5910	e7000	e9500	e9500	e9000	10400	13000	24200	16200	16200	11900	35200
14	5850	e7000	e9500	e10000	e9000	10400	13300	24000	16300	14700	12500	33800
15	5900	e7000	e9500	e11000	e8500	10400	13000	23900	16100	13800	12800	33000
16	6020	e7000	e9500	e11000	e8500	10200	13000	24100	15100	13300	12900	32600
17	6130	e7000	e9500	e11000	e9000	10100	12700	24600	14700	13000	12900	32600
18	6400	e7000	e9000	e11000	e9000	9980	11700	24600	14600	12800	12900	32700
19	6490	e7500	e9000	e11000	e9000	9810	11800	24300	14700	13400	12900	33100
20	6250	e8000	e9000	e11000	e9000	9760	13900	23800	14800	13800	12900	33200
21	6120	e10000	e9000	e11000	e9000	9670	18900	23500	14900	13000	12900	32900
22	6030	e14000	e9500	e11000	e9000	9510	22500	25500	14900	12800	13200	32400
23	6050	e15000	e9500	e11000	e9000	8290	24100	26400	14900	12800	13900	31900
24	6210	e15000	e9500	e11000	e9000	8330	23800	26700	14900	12200	16300	31200
25	6370	e14000	e9000	e11000	e9000	8420	23100	27000	14900	11900	20000	30100
26	6400	e13500	e7500	e11000	e9000	8400	23000	27700	14900	11900	21700	29500
27	6330	e13000	e8000	e11000	e9000	8520	22900	27700	15000	11800	21800	29500
28	6230	e13000	e9500	e11000	e9000	8160	23100	27300	15100	11800	21400	29000
29	6360	e12500	e9500	e10500	e9000	7190	24100	26900	15100	11900	21000	26900
30	6620	e12500	e9500	e10500	---	7660	24300	25800	15100	12000	20700	26000
31	6810	---	e9500	e10500	---	9220	---	25200	---	12000	20800	---
TOTAL	193910	276110	303000	319000	261500	286630	484850	785600	515100	446800	433240	883400
MEAN	6255	9204	9774	10290	9017	9246	16160	25340	17170	14410	13980	29450
MAX	6810	15000	12000	11000	10500	10400	24300	27700	24900	18500	21800	36700
MIN	5850	6680	7500	9500	8500	7190	9670	23500	14600	11800	9150	21100
AC-FT	384600	547700	601000	632700	518700	568500	961700	1558000	1022000	886200	859300	1752000
CFSM.	32	.47	.50	.53	.46	.48	.83	1.31	.89	.74	.72	1.52
IN. .	37	.53	.58	.61	.50	.55	.93	1.51	.99	.86	.83	1.69

e Estimated.

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1929 - 1992, BY WATER YEAR (WY)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
MEAN	11810	11040	10030	9096	8753	9014	15480	19670	20250	16330	11190	11160
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 1991 CALENDAR YEAR		FOR 1992 WATER YEAR		WATER YEARS 1929 - 1992	
ANNUAL TOTAL	3552360		5189140			
ANNUAL MEAN	9732		14180		12830	
HIGHEST ANNUAL MEAN					23260	1950
LOWEST ANNUAL MEAN					4470	1931
HIGHEST DAILY MEAN	23500	May 9	36700	Sep 11	71300	May 11 1950
LOWEST DAILY MEAN	4500	Mar 14	5850	Oct 14	928	Dec 26 1929
ANNUAL SEVEN-DAY MINIMUM	4710	Sep 1	5940	Oct 10	1500	Dec 24 1929
INSTANTANEOUS PEAK FLOW			36900	Sep 11	71600	May 12 1950
INSTANTANEOUS PEAK STAGE			13.66	Sep 11	21.04	May 12 1950
INSTANTANEOUS LOW FLOW			5770	Oct 11		
ANNUAL RUNOFF (AC-FT)	7046000		10290000		9295000	
ANNUAL RUNOFF (CFSM)	.50		.73		.66	
ANNUAL RUNOFF (INCHES)	6.81		9.95		8.99	
10 PERCENT EXCEEDS	17000		25400		25400	
50 PERCENT EXCEEDS	8000		11500		10200	
90 PERCENT EXCEEDS	5000		6960		5000	



LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued
(National stream-quality 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 1991 TO SEPTEMBER 1992

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)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)
OCT												
07...	1330	6050	100	109	7.4	7.2	8.0	3.5	728	9.6	190	22
DEC												
03...	1230	20400	107	116	7.7	7.6	0.0	4.0	732	11.6	67	92
JAN												
21...	1200	17600	102	82	7.2	7.4	0.5	1.6	730	12.1	K20	20
APR												
14...	0820	13300	106	97	7.4	7.6	1.0	7.9	738	12.5	K19	K14
JUN												
08...	1045	18700	80	65	7.3	7.4	13.5	1.6	737	9.8	41	K3
JUL												
07...	1330	18200	80	82	7.6	7.6	18.0	3.0	727	6.5	K720	68

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)	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)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)
OCT												
07...	14	4.5	4.1	0.90	--	44	0	54	4.5	4.3	0.10	4.1
DEC												
03...	14	5.1	3.5	0.90	42	49	0	51	5.7	2.7	0.20	5.6
JAN												
21...	9.1	2.7	3.6	0.90	33	31	0	40	4.8	2.7	0.20	3.0
APR												
14...	10	3.2	4.2	1.1	33	34	0	40	6.4	4.5	<0.10	4.2
JUN												
08...	6.8	2.1	2.6	0.70	22	23	0	26	4.3	2.3	<0.10	2.7
JUL												
07...	9.7	2.9	2.8	0.70	30	31	0	37	4.4	2.2	<0.10	3.4

LAKE OF THE WOODS BASIN

05133500 RAINY RIVER AT MANITOU RAPIDS, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	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 TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-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)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)
OCT												
07...	98	<0.010	<0.050	0.050	0.040	0.70	0.040	<0.010	0.020	<0.010	15	87
DEC												
03...	101	<0.010	0.100	0.060	0.050	0.70	0.030	0.020	0.010	<0.010	9	90
JAN												
21...	71	<0.010	0.090	0.050	0.050	0.40	0.020	<0.010	0.010	<0.010	12	85
APR												
14...	78	<0.010	0.077	0.020	0.020	0.50	0.030	0.010	0.020	<0.010	31	85
JUN												
08...	68	<0.010	0.068	0.030	0.040	0.30	0.020	0.020	<0.010	0.010	9	77
JUL												
07...	68	<0.010	<0.050	0.020	0.020	0.50	0.030	<0.010	0.010	<0.010	15	47

DATE	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)	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												
07...	10	13	<3	320	<4	29	<10	2	<1	<1.0	30	<6
DEC												
03...	--	--	--	--	--	--	--	--	--	--	--	--
JAN												
21...	30	9	<3	130	<4	8	<10	<1	<1	<1.0	26	<6
APR												
14...	60	10	<3	150	5	17	<10	1	<1	<1.0	25	<6
JUN												
08...	--	--	--	--	--	--	--	--	--	--	--	--
JUL												
07...	40	10	<3	140	<4	5	<10	<1	<1	<1.0	27	<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.

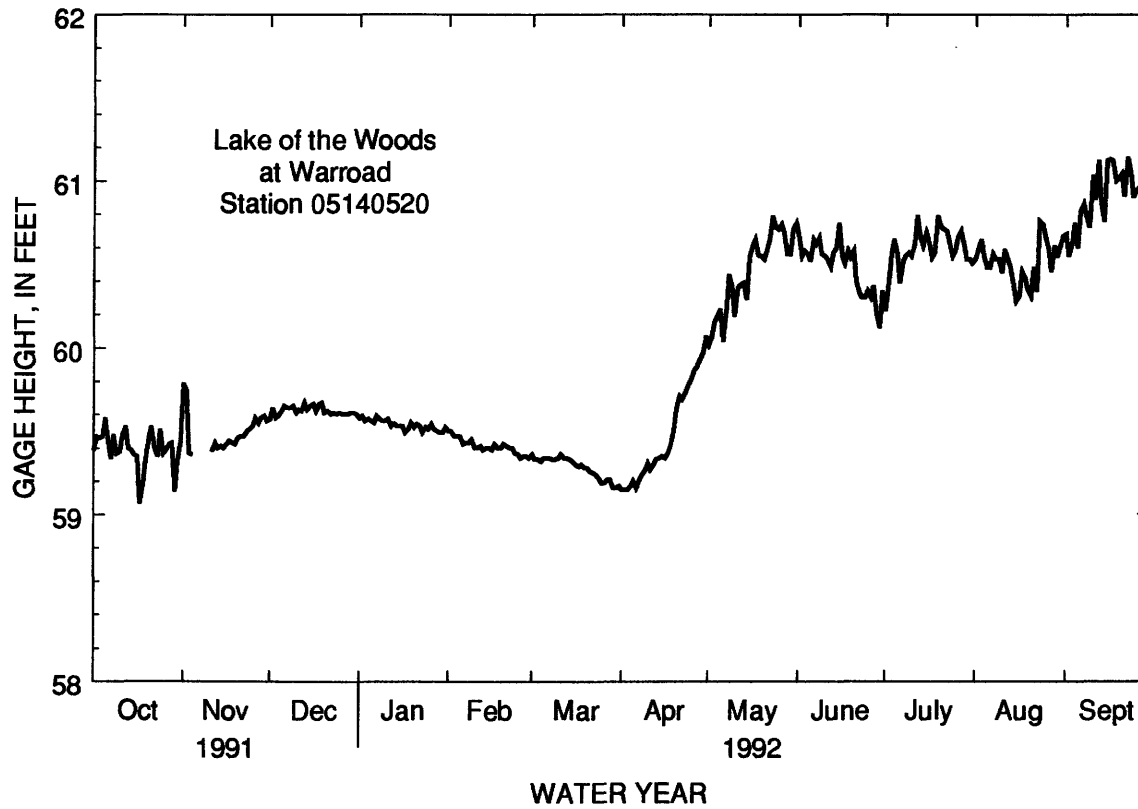
EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 62.38 ft, July 15, 1989; maximum daily, 61.84 ft, Sept. 12, 1978; minimum gage height recorded, 55.94 ft, Sept. 4, 1980; minimum daily recorded, 56.52 ft, Apr. 15, 1981.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 61.31 ft, Sept. 15; maximum daily, 61.13 ft, Sept. 12, 22; minimum, 58.18 ft, Oct. 17; minimum daily, 59.06 ft, Oct. 17.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	59.39	59.79	59.57	59.58	59.50	59.36	59.15	60.02	60.68	60.22	60.53	60.68
2	59.47	59.74	59.64	59.59	59.50	59.33	59.15	60.07	60.55	60.36	60.59	60.55
3	59.46	59.37	59.58	59.56	59.47	59.33	59.15	60.15	60.58	60.56	60.65	60.62
4	59.47	59.36	59.59	59.57	59.47	59.32	59.17	60.19	60.56	60.65	60.55	60.75
5	59.58	---	59.62	59.56	59.47	59.34	59.20	60.23	60.52	60.56	60.48	60.60
6	59.46	---	59.65	59.55	59.42	59.34	59.16	60.04	60.65	60.39	60.48	60.82
7	59.34	---	59.64	59.59	59.43	59.34	59.20	60.20	60.62	60.52	60.56	60.86
8	59.48	---	59.64	59.57	59.43	59.33	59.24	60.44	60.66	60.55	60.53	60.79
9	59.37	---	59.65	59.56	59.45	59.33	59.26	60.37	60.56	60.57	60.53	60.72
10	59.38	---	59.61	59.56	59.40	59.34	59.31	60.19	60.55	60.55	60.45	61.03
11	59.48	59.38	59.63	59.57	59.40	59.36	59.27	60.36	60.53	60.62	60.59	60.89
12	59.53	59.43	59.62	59.53	59.41	59.34	59.30	60.38	60.49	60.79	60.53	61.12
13	59.40	59.40	59.67	59.55	59.39	59.34	59.33	60.39	60.57	60.66	60.48	60.86
14	59.39	59.41	59.63	59.53	59.40	59.33	59.34	60.29	60.60	60.61	60.38	60.76
15	59.36	59.40	59.65	59.53	59.40	59.32	59.35	60.54	60.75	60.69	60.28	61.12
16	59.35	59.42	59.66	59.53	59.39	59.30	59.34	60.61	60.55	60.64	60.31	61.13
17	59.07	59.44	59.62	59.49	59.42	59.29	59.37	60.65	60.51	60.54	60.46	61.12
18	59.18	59.43	59.66	59.51	59.40	59.30	59.41	60.55	60.58	60.57	60.42	61.00
19	59.33	59.42	59.67	59.55	59.40	59.28	59.50	60.55	60.54	60.79	60.35	61.01
20	59.46	59.46	59.61	59.52	59.42	59.28	59.63	60.53	60.58	60.72	60.31	61.04
21	59.53	59.47	59.62	59.54	59.41	59.26	59.71	60.58	60.40	60.71	60.48	60.91
22	59.40	59.47	59.60	59.53	59.40	59.25	59.69	60.66	60.33	60.70	60.34	61.14
23	59.35	59.50	59.61	59.49	59.40	59.24	59.73	60.79	60.30	60.63	60.76	61.05
24	59.51	59.51	59.60	59.52	59.37	59.22	59.77	60.72	60.30	60.55	60.74	60.90
25	59.37	59.53	59.61	59.51	59.36	59.19	59.81	60.71	60.34	60.58	60.67	60.94
26	59.39	59.58	59.60	59.54	59.34	59.19	59.86	60.74	60.30	60.66	60.59	60.96
27	59.42	59.55	59.60	59.51	59.35	59.21	59.89	60.69	60.37	60.70	60.46	60.92
28	59.43	59.58	59.60	59.50	59.35	59.21	59.93	60.56	60.20	60.61	60.61	60.96
29	59.14	59.59	59.61	59.49	59.34	59.16	59.97	60.56	60.12	60.53	60.54	61.01
30	59.32	59.56	59.61	59.49	---	59.16	60.07	60.71	60.34	60.53	60.61	61.04
31	59.44	---	59.60	59.52	---	59.17	---	60.75	---	60.51	60.67	---
MEAN	59.40	---	59.62	59.54	59.41	59.28	59.48	60.46	60.49	60.59	60.51	60.91
MAX	59.58	---	59.67	59.59	59.50	59.36	60.07	60.79	60.75	60.79	60.76	61.14
MIN	59.07	---	59.57	59.49	59.34	59.16	59.15	60.02	60.12	60.22	60.28	60.55


Lake of the Woods
at Warroad
Station 05140520
GAGE HEIGHT, IN FEET
62
61
60
59
58
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
1991
1992
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.

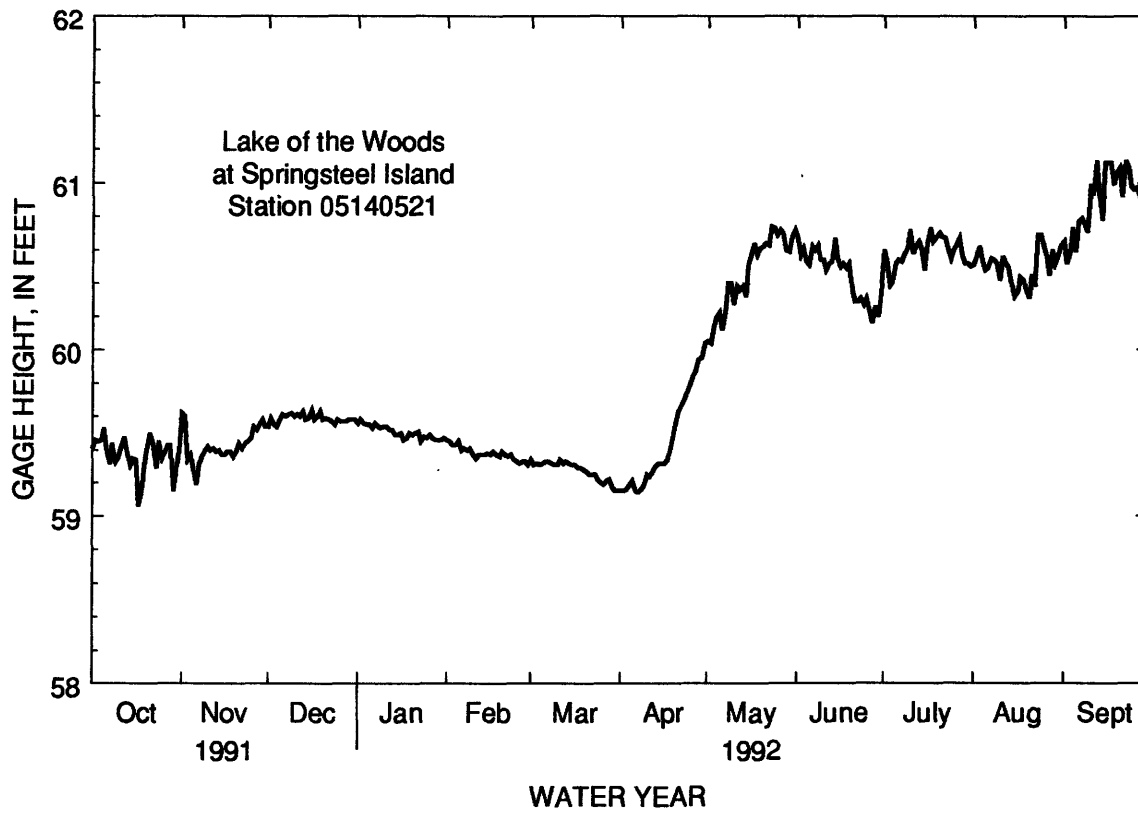
EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 62.24 ft, July 5, 1989; maximum daily, 61.81 ft, July 6, 7, 1985; minimum, 57.22 ft, Nov. 22, 1990; minimum daily, 57.43 ft, Mar. 18, 19, 20, 1988.

EXTREMES FOR CURRENT YEAR.--Maximum gage height, 61.31 ft, Sept. 15; maximum daily, 61.13 ft, Sept. 12, 22; minimum, 58.18 ft, Oct. 17; minimum daily, 59.06 ft, Oct. 17.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	59.41	59.62	59.54	59.56	59.46	59.34	59.15	60.05	60.68	60.60	60.51	60.65
2	59.46	59.60	59.59	59.58	59.45	59.31	59.15	60.04	60.57	60.54	60.56	60.52
3	59.45	59.34	59.55	59.56	59.43	59.32	59.16	60.13	60.61	60.39	60.62	60.58
4	59.46	59.37	59.54	59.55	59.43	59.31	59.19	60.19	60.53	60.41	60.54	60.73
5	59.53	59.28	59.58	59.55	59.45	59.32	59.21	60.22	60.51	60.52	60.48	60.59
6	59.41	59.19	59.61	59.53	59.40	59.33	59.15	60.12	60.62	60.54	60.49	60.77
7	59.32	59.32	59.60	59.56	59.41	59.33	59.14	60.22	60.60	60.53	60.55	60.79
8	59.44	59.36	59.61	59.54	59.40	59.32	59.16	60.40	60.63	60.57	60.54	60.76
9	59.33	59.39	59.62	59.53	59.41	59.31	59.18	60.40	60.54	60.61	60.52	60.71
10	59.36	59.42	59.60	59.54	59.37	59.31	59.25	60.27	60.54	60.72	60.42	60.99
11	59.42	59.40	59.61	59.54	59.35	59.34	59.24	60.38	60.48	60.58	60.56	60.93
12	59.48	59.41	59.60	59.52	59.37	59.32	59.27	60.36	60.52	60.62	60.52	61.13
13	59.40	59.39	59.63	59.52	59.37	59.33	59.30	60.38	60.53	60.65	60.49	60.93
14	59.31	59.40	59.58	59.49	59.37	59.32	59.32	60.32	60.67	60.61	60.39	60.78
15	59.35	59.37	59.59	59.49	59.38	59.31	59.32	60.51	60.55	60.48	60.32	61.12
16	59.34	59.37	59.64	59.50	59.37	59.31	59.32	60.58	60.50	60.64	60.35	61.12
17	59.06	59.39	59.58	59.46	59.39	59.29	59.34	60.64	60.52	60.73	60.44	61.12
18	59.15	59.39	59.60	59.47	59.37	59.29	59.38	60.57	60.49	60.65	60.42	60.99
19	59.31	59.36	59.63	59.50	59.36	59.28	59.47	60.61	60.52	60.68	60.36	61.06
20	59.42	59.39	59.58	59.49	59.39	59.27	59.55	60.62	60.36	60.70	60.31	61.09
21	59.50	59.44	59.59	59.50	59.37	59.25	59.63	60.64	60.29	60.68	60.45	60.92
22	59.44	59.41	59.58	59.51	59.36	59.25	59.66	60.63	60.29	60.67	60.38	61.13
23	59.29	59.44	59.57	59.45	59.37	59.25	59.70	60.74	60.31	60.61	60.69	61.09
24	59.45	59.45	59.55	59.48	59.34	59.22	59.74	60.73	60.27	60.55	60.69	60.98
25	59.35	59.47	59.58	59.47	59.33	59.20	59.79	60.69	60.31	60.60	60.63	60.96
26	59.38	59.54	59.57	59.49	59.32	59.19	59.84	60.72	60.23	60.63	60.56	60.97
27	59.43	59.52	59.57	59.47	59.33	59.21	59.88	60.70	60.16	60.67	60.45	60.90
28	59.43	59.55	59.57	59.46	59.33	59.22	59.94	60.60	60.26	60.56	60.60	60.95
29	59.15	59.58	59.58	59.46	59.31	59.17	59.95	60.59	60.20	60.52	60.52	61.01
30	59.29	59.54	59.58	59.46	---	59.15	60.04	60.68	60.34	60.52	60.57	61.03
31	59.39	---	59.58	59.47	---	59.15	---	60.72	---	60.50	60.63	---
MEAN	59.37	59.42	59.59	59.51	59.38	59.27	59.45	60.47	60.45	60.59	60.50	60.91
MAX	59.53	59.62	59.64	59.58	59.46	59.34	60.04	60.74	60.68	60.73	60.69	61.13
MIN	59.06	59.19	59.54	59.45	59.31	59.15	59.14	60.04	60.16	60.39	60.31	60.52


Lake of the Woods
at Springsteel Island
Station 05140521
GAGE HEIGHT, IN FEET
62
61
60
59
58
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
June
July
Aug
Sept
1991
1992
WATER YEAR

Partial-Record Stations and Miscellaneous Sites

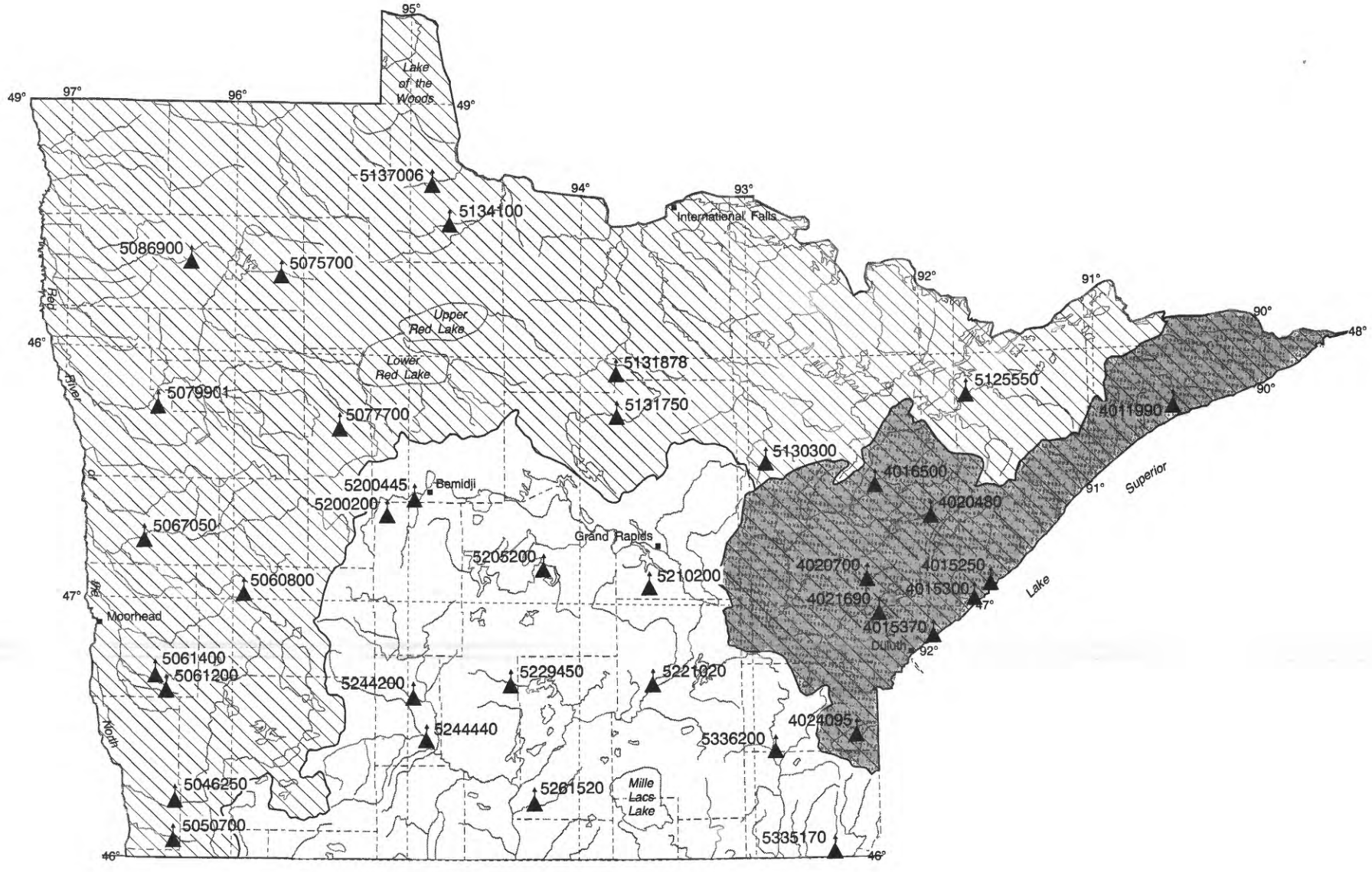
High-Flow Partial-Record Stations

Upstream Side of Bridge

Downstream Side of Bridge

Ruffy Brook near Gonvick

October 4, 1978


95°
49°
97°
96°
Lake of the Woods
49°
5137006
94°
93°
International Falls
5134100
5086900
5075700
92°
91°
90°
48°
Red River
Upper Red Lake
Lower Red Lake
46°
5131878
5125550
5079901
5131750
4011990
90°
5077700
5130300
4016500
5200445
Bemidji
91°
Superior
5200200
4020480
5067050
Grand Rapids
5205200
4020700
4015250
5210200
5060800
47°
Red
4015300
Lake
4021690
47°
Moorhead
4015370
Duluth
92°
5061400
5061200
5229450
5221020
5244200
4024095
5244440
5336200
North
5046250
5261520
Mille Lacs Lake
5050700
5335170
46°
46°

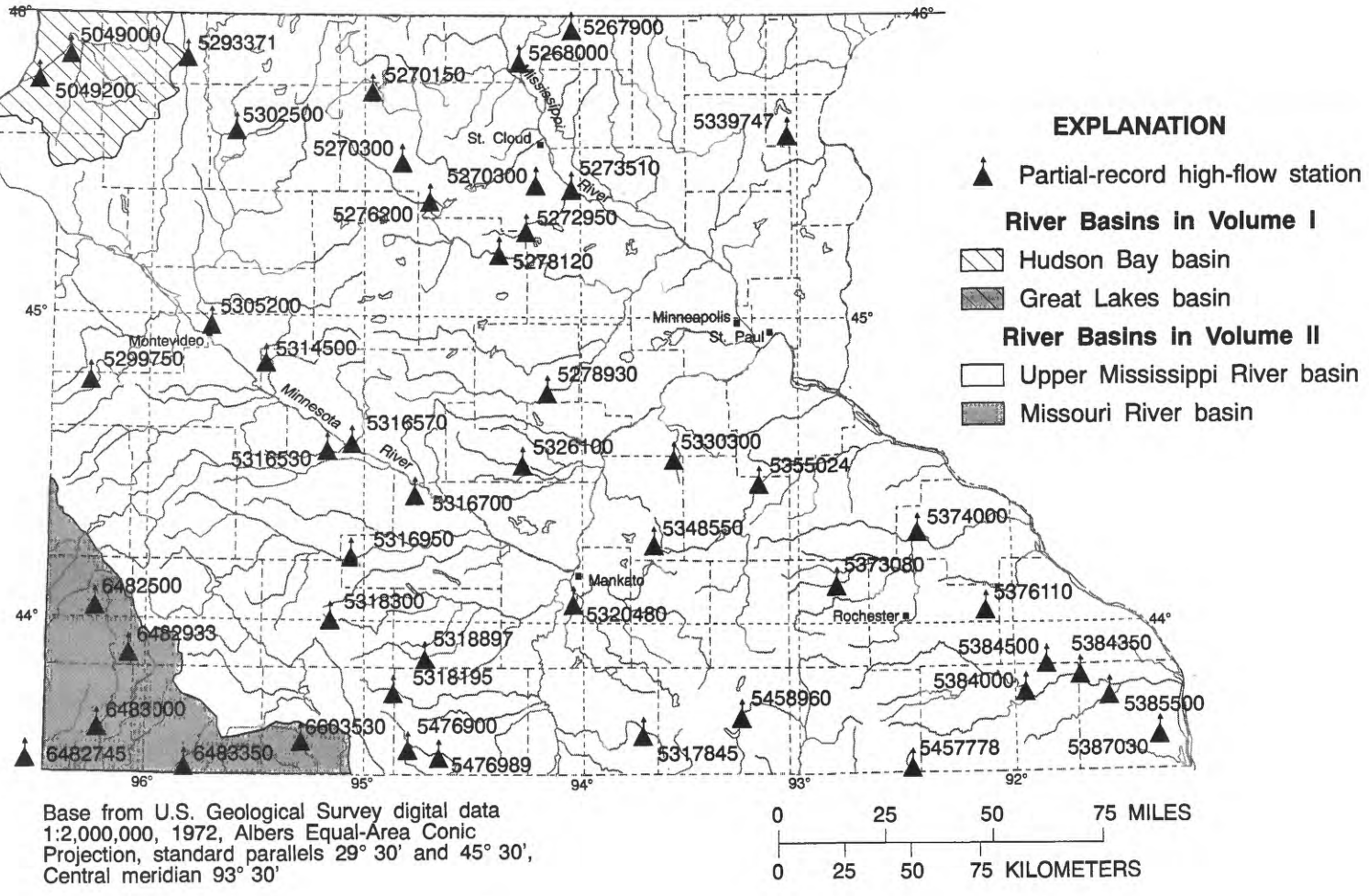


Figure 11.--Location of high-flow partial-record stations.

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 1992

Station name and number	Location and drainage area	Period of record	Water year 1992 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.	1985-92	5-12-92	12.57	a954	4-29-90	11.95	1,210
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.	1965-92	4-20-92	b5.68	320	9-20-72	17.08	1,880
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.	1960-92	4-21-92	b10.23	158	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 1992--Continued

Station name and number	Location and drainage area	Period of record	Water year 1992 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.	1964-92	4-20-92	14.28	200	5-9-79	21.76	1,180
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# 1988-92	4-23-92	3.97	1,270	5-14-50	8.37	5,380
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	1979-92	4-22-92	12.50	230	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.	1979-92	4-22-92	a13.70	255	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.	1986-92	5-12-92	7.39	550	4-30-90	7.51	570

"See footnotes at end of the table."

Annual maximum discharge at high-flow partial-record stations during water year 1992--Continued

Station name and number	Location and drainage area	Period of record	Water year 1992 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.	1972-92	7-2-92	10.52	1,180	9-3-85	17.38	4,420
		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.	1990-92	3-7-92	c15.08	640	6-23-90	15.63	1,730
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#, 1985-92	3-7-92	c5.45	220	4-10-52	16.56	7,320
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.	1965-92	3-8-92	5.28	42	4-9-69	---	d2,400
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.	1979-92	6-17-92	e10.10	79	9-21-86	14.27	1,280

"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 1992--Continued

Station name and number	Location and drainage area	Period of record	Water year 1992 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 SW¼SW¼ 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.	1960-92	7-10-92	13.17	215	5-12-85	17.13	635
Whiskey Creek at Barnesville, MN 05061200	Lat 46°39'35", long 96°23'54", in SE¼SW¼ sec.20, T.137 N., R.45 W., Clay County, Hydrologic Unit 09020106, at culvert on State Highway 34, 0.7 mile upstream from Blue Eagle Lake, 1.0 mile northeast of Barnesville. Drainage area is 25.3 mi^2.	1961-64, 1965-66#, 1967-92	6-16-92	a3.76	56	5-31-85	7.12	660
Spring Creek above Downer, MN 05061400	Lat 46°44'37", long 96°25'12", in NW¼NW¼ sec.30, T.138 N., R.45 W., Clay County, Hydrologic Unit 09020106, at culvert on county road, 3.1 miles east of Downer. Drainage area is 5.81 mi^2.	1961-92	6-16-92	7.38	54	6-29-75	13.52	1,460
Marsh River Ditch near Ada, MN 05067050	Lat 47°17'46", long 96°26'09", in NE¼NE¼ sec.13, T.144 N., R.46 W., Norman County, Hydrologic Unit 09020108, at bridge on County Highway 24, 3.5 miles southeast of Ada. Drainage area is ___ mi^2.	1985-92	-	-	0	4-6-89	16.74	1,070
Mud River near Grygla, MN 05075700	Lat 48°19'31", long 95°44'35", in NE¼NE¼ 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.	1979-92	4-21-92	a16.10	740	4-26-79	18.49	1,480
Ruffy Brook near Gonvick, MN 05077700	Lat 47°44'50", long 95°24'45", in SE¼SE¼ 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,# 1987-92	3-7-92	c3.25	98	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 1992--Continued

Station name and number	Location and drainage area	Period of record	Water year 1992 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 f111 mi^2.	1986-92	3-7-92	c15.80	205	4-4-89	20.44	1,900
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.	1979-92	4-1-92	c13.86	115	4-25-79	17.10	1,000
		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#, 1986-92	5-12-92	6.56	1,060	4-19-76	8.71	2,490
Boriin Creek near Chisholm, MN 05130300	Lat 47°36'14", long 92°51'58", in SE¼SE¼ sec.9, T.59 N., R.20 W., St. Louis County, Hydrologic Unit 09030005, at culvert on State Highway 73, 1.3 miles upstream from mouth, 7.8 miles north of Chisholm. Drainage area is 13.7 mi^2.	1959-92	4-8-92	d11.36	83	4-13-69	13.40	700
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.	1973-92	4-6-92	10.83	872	4-22-79	15.48	2,830

"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 1992--Continued

Station name and number	Location and drainage area	Period of record	Water year 1992 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.	1979-92	4-21-92	a12.66	141	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 f180 mi^2.	1986-92	4-23-92	10.88	920	3-31-86	11.16	1,000
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 f145 mi^2.	1986-92	4-7-92	c11.77	575	3-31-86	14.30	1,400

Operated as a continuous-record gaging station.
a Affected by shifting control.
b Not annual maximum gage height.
c Backwater from ice.
d Estimated.
e Backwater from aquatic growth or debris.
f Approximate.

Miscellaneous Sites

Whiteface River near Meadowland

September 9, 1965

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 1992

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Stream tributary to Lake Superior				
Section 5 Creek	Lake Superior	Lat 47°53'00", long 89°50'18", in $SE^1/_4NW^1/_4$ sec.5, T.62 N., R.5 E., Cook County, Hydrologic Unit 04010101, at bridge on U.S. Highway 61, 6.5 miles northeast of Hoveland.	-	1991-92	‡9-24-91 11-19-91	*.06 23
		Red River of the North basin				
Buffalo River	Red River of the	Lat 46°51'49", long 96°28'04", in $SE^1/_4$ sec.10, R.46 W., T.139 N., Clay County, Hydrologic Unit 09020106, at foot bridge downstream of dam in Buffalo River State Park, 5.5 miles east of Glyndon (465149096280401).	-	1992	8-5-92	27
Buffalo River	Red River of the North	Lat 47°04'43", long 96°47'50", in $NE^1/_4NE^1/_4$ sec.31, T.142 N., R.48 W., Clay County, Hydrologic Unit 09020106, at culvert crossing 0.7 mile downstream from U.S. Highway 75 bridge, 1.5 miles upstream from mouth (05062100).	-	1992	12-9-91	30
Wild Rice River	Red River of the North	Lat 47°17'35", long 96°48'23", in $NE^1/_4NE^1/_4$ sec.13, T.144 N., R.49 W., Norman County, Hydrologic Unit 09020108, at bridge on county road, 2 miles upstream from mouth, 2 miles north of Hendrum (05064100).	-	1992	12-9-91	36
Sand Hill River	Red River of the North	Lat 47°32'35", long 96°15'31", in $NE^1/_4NE^1/_4$ sec.21, T.147 N., R.44 W., Polk County, Hydrologic Unit 09020301, at bridge on County Road 12, 1 mile northeast of Fertile (05067900).	225	1950, 1964-67, 1970-73, 1976, 1980, 1992	8-5-92	5.6
Red Lake River	Red River of the North	Lat 47°53'31", long 96°14'24", in $SW^1/_4$ sec.13, R.44 W., T.151 N., Red Lake County, Hydrologic Unit 09020303 at bridge on State Highway 32, 2 miles east of Red Lake Falls (475331096144601).	-	1992	8-12-92	186

‡ Not previously published.

DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Discharge measurements made at miscellaneous sites during water year 1992--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Red River of the North basin--Continued				
Red Lake River	Red River of the North	Lat 47°51'40", long 96°54'48", in NE¼NE¼ sec.34, T.151 N., R.49 W., Polk County, Hydrologic Unit 09020303, at bridge on county road, about 12 miles upstream from mouth, and 5.7 miles southeast of East Grand Forks (05081000).	-	1992	12-11-91	*1.6
Snake River	Red River of the North	Lat 48°24'42", long 97°06'26", in SE¼SE¼ sec.16, T.157 N., R.50 W., Marshall County, Hydrologic Unit 09020309, at crossing on State Highway 220, 2.0 miles upstream from mouth, 7 miles north of Big Woods (05087600).	-	1992	12-11-91	*1.6
Tamarac River	Red River of the North	Lat 48°29'34", long 97°06'27", in NW¼SW¼ sec.22., T.158 N., R..50 W., Marshall County, Hydrologic Unit 09020311, at crossing on State Highway 220, 1.2 miles upstream from mouth, 6 miles southeast of Robbin (05091600)	-	1992	12-11-91	*3.1
Two Rivers	Red River of the North	Lat 48°48'32", long 97°07'40", in SE¼NE¼ sec.5, T.161 N., R.50 W., Kittson County, Hydrologic Unit 09020312, at County Road crossing, 3 miles upstream from mouth, 1.5 miles downstream from confluence with North Branch, 5.5 miles southwest of Northgate (05098100).	-	1992	12-12-91	64
Roseau River	Red River of the North	Lat 48°38'53", long 95°36'10", in SW¼ sec.30, T.160 N., R.38 W., Roseau County, Hydrologic Unit 09020314, upstream of bridge of County Road 4, 1 mile west of Hayes Lake State Park, 7.5 miles east of Wannaska.	-	1992	8-10-92	*.90

Miscellaneous Water-Quality

Buffalo River near Georgetown

Sampling for macro invertebrates in stream bottom and off woody debris.

Spring 1992

ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

LOCATION.--These miscellaneous analyses were collected and analyzed as part of the NAWQA (National Water Quality Assessment) study being conducted in the Red River of the North basin (<, less than; U, micrograms; UG/G, micrograms per gram; WS, wet-sieved.)

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	ALUMINUM BOT MAT <63U WS FIELD PERCENT (34790)	ANTIMONY BOT MAT <63U WS FIELD (UG/G) (34795)	ARSENIC BOT MAT <63U WS FIELD (UG/G) (34800)	BERYLLIUM BOT MAT <63U WS FIELD (UG/G) (34810)	BISMUTH BOT MAT <63U WS FIELD (UG/G) (34816)	CADMIUM BOT MAT <63U WS FIELD (UG/G) (34825)	CERIUM, BOT MAT <63U WS FIELD (UG/G) (34835)	CHROMIUM BOT MAT <63U WS FIELD (UG/G (34840)	COBALT BOT MAT <63U WS FIELD (UG/G) (34845)	COPPER BOT MAT <63U WS FIELD (UG/G) (34850)
	05046500	OTTER TAIL RIVER AT BRECKENRIDGE, MN (LAT 46 16 20N LONG 096 34 40W)									
AUG 1992 20...	1000	4.6	1	7	1	<10	0	50	50	9	17
	05062500	WILD RICE RIVER AT TWIN VALLEY, MN (LAT 47 16 00N LONG 096 14 40W)									
AUG 1992 05...	1330	4.4	1	8	1	<10	0	46	45	9	13
	05078500	CLEARWATER RIVER AT RED LAKE FALLS, MN (LAT 47 53 15N LONG 096 16 25W)									
AUG 1992 12...	1300	4.1	1	5	<1	<10	1	41	46	8	17
	05082200	RED LAKE RIVER AT EAST GRAND FORKS, MN (LAT 47 55 24N LONG 097 00 59W)									
SEP 1992 02...	1100	5.9	1	7	1	<10	1	50	70	14	20

DATE	EUROPIUM BOT MAT <63U WS FIELD (UG/G)	GALLIUM BOT MAT <63U WS FIELD (UG/G)	GOLD BOT MAT <63U WS FIELD (UG/G)	HOLMIUM BOT MAT <63U WS FIELD (UG/G)	IRON BOT MAT <63U WS FIELD PERCENT	LEAD BOT MAT <63U WS FIELD (UG/G)	LITHIUM BOT MAT <63U WS FIELD (UG/G)	MAGNESIUM BOT MAT <63U WS FIELD PERCENT	MANGANESE BOT MAT <63U WS FIELD ((UG/G)	MERCURY BOT MAT <63U WS FIELD (UG/G)
	05046500	OTTER TAIL RIVER AT BRECKENRIDGE, MN (LAT 46 16 20N LONG 096 34 40W)								
AUG 1992 20...	29	12	<8	<4	2.3	12	30	2.6	900	<0
	05062500	WILD RICE RIVER AT TWIN VALLEY, MN (LAT 47 16 00N LONG 096 14 40W)								
AUG 1992 05...	26	12	<8	<4	2.3	10	20	3.2	1100	0
	05078500	CLEARWATER RIVER AT RED LAKE FALLS, MN (LAT 47 53 15N LONG 096 16 25W)								
AUG 1992 12...	24	11	<8	<4	2.3	17	20	2.3	1100	0
	05082200	RED LAKE RIVER AT EAST GRAND FORKS, MN (LAT 47 55 24N LONG 097 00 59W)								
SEP 1992 02...	29	16	<8	<4	2.8	11	40	3.1	1100	0

ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	MOLYB-DENUM BOT MAT <63U WS FIELD (UG/G) (34915)	NEODYM-IUM BOT MAT <63U WS FIELD (UG/G) (34920)	NICKEL BOT MAT <63U WS FIELD (UG/G) (34925)	NIOBIUM BOT MAT <63U WS FIELD (UG/G) (34930)	PHOS-PHORUS BOT MAT <63U WS FIELD (UG/G) (34935)	POTAS-SIUM BOT MAT <63U WS FIELD (UG/G) (34940)	SCAN-DIUM BOT MAT <63U WS FIELD (UG/G) (34945)	SELE-NIUM BOT MAT <63U WS FIELD (UG/G) (34950)	SILVER BOT MAT <63U WS FIELD (UG/G) (34955)	SODIUM BOT MAT <63U WS FIELD (UG/G) (34960)
	05046500		OTTER TAIL RIVER AT BRECKENRIDGE, MN (LAT 46 16 20N LONG 096 34 40W)							
AUG 1992 20...	<2	27	20	7	0.09	1.3	7	1	0	0.71
	05062500		WILD RICE RIVER AT TWIN VALLEY, MN (LAT 47 16 00N LONG 096 14 40W)							
AUG 1992 05...	<2	23	19	6	0.10	1.3	7	1	0	0.88
	05078500		CLEARWATER RIVER AT RED LAKE FALLS, MN (LAT 47 53 15N LONG 096 16 25W)							
AUG 1992 12...	<2	22	20	6	0.12	1.2	7	1	0	0.70
	05082200		RED LAKE RIVER AT EAST GRAND FORKS, MN (LAT 47 55 24N LONG 097 00 59W)							
SEP 1992 02...	<2	26	30	9	0.09	1.6	10	1	0	0.66

DATE	STRON-TIUM BOT MAT <63U WS FIELD (UG/G) (34965)	SULFUR BOT MAT <63U WS FIELD (UG/G) (34970)	TANTA-LUM BOT MAT <63U WS FIELD (UG/G) (34975)	THORIUM BOT MAT <63U WS FIELD (UG/G) (34980)	TIN BOT MAT <63U WS FIELD (UG/G) (34985)	URANIUM BOT MAT <63U WS FIELD (UG/G) (35000)	VANA-DIUM BOT MAT <63U WS FIELD (UG/G) (35005)	YTRIUM BOT MAT <63U WS FIELD (UG/G) (35010)	YTTER-BIUM BOT MAT <63U WS FIELD (UG/G) (35015)	ZINC BOT MAT <63U WS FIELD (UG/G) (35020)
	05046500		OTTER TAIL RIVER AT BRECKENRIDGE, MN (LAT 46 16 20N LONG 096 34 40W)							
AUG 1992 20...	200	0	<40	9	<10	3	88	16	2	69
	05062500		WILD RICE RIVER AT TWIN VALLEY, MN (LAT 47 16 00N LONG 096 14 40W)							
AUG 1992 05...	190	0	<40	7	<10	3	71	14	2	52
	05078500		CLEARWATER RIVER AT RED LAKE FALLS, MN (LAT 47 53 15N LONG 096 16 25W)							
AUG 1992 12...	190	1	<40	6	<10	3	75	12	1	73
	05082200		RED LAKE RIVER AT EAST GRAND FORKS, MN (LAT 47 55 24N LONG 097 00 59W)							
SEP 1992 02...	150	0	<40	9	<10	3	130	15	2	79

ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	ALUM-INUM BOT MAT <63U WS FIELD PERCENT (34790)	ANTI-MONY BOT MAT <63U WS FIELD (UG/G) (34795)	ARSENIC BOT MAT <63U WS FIELD (UG/G) (34800)	BERYL-LIUM BOT MAT <63U WS FIELD (UG/G) (34810)	BISMUTH BOT MAT <63U WS FIELD (UG/G) (34816)	CADMIUM BOT MAT <63U WS FIELD (UG/G) (34825)	CERIUM BOT MAT <63U WS FIELD (UG/G) (34835)	CHRO-MIUM BOT MAT <63U WS FIELD (UG/G) (34840)	COBALT BOT MAT <63U WS FIELD (UG/G) (34845)	COPPER BOT MAT <63U WS FIELD (UG/G) (34850)
05082500		RED RIVER OF THE NORTH AT GRAND FORKS, ND (LAT 47 55 38N LONG 097 01 34W)									
SEP 1992 02...	1800	6.0	1	6	1	<10	2	51	71	13	22
05087600		SNAKE RIVER NEAR MOUTH NR. BIG WOOD, MN (LAT 48 24 42N LONG 097 06 26W)									
AUG 1992 11...	1530	6.7	1	6	2	<10	1	57	83	14	28
05094500		SOUTH BRANCH TWO RIVERS AT HALLOCK, MN (LAT 48 47 00N LONG 096 55 00W)									
AUG 1992 11...	0900	7.6	2	10	2	<10	0	54	95	17	28
05104500		ROSEAU RIVER BELOW SOUTH FORK NEAR MALUNG, MN (LAT 48 47 30N LONG 095 44 40W)									
AUG 1992 10...	1700	5.0	1	4	1	<10	0	55	55	10	13
465149096280401		BUFFALO RIVER AT BUFFALO R ST PARK NR GLYNDON, M(LAT 46 51 49N LONG 096 28 04W)									
AUG 1992 05...	0900	3.9	1	10	<1	<10	0	43	41	9	14

DATE	EURO-PIUM BOT MAT <63U WS FIELD (UG/G) (34855)	GALLIUM BOT MAT <63U WS FIELD (UG/G) (34860)	GOLD BOT MAT <63U WS FIELD (UG/G) (34870)	HOLMIUM BOT MAT <63U WS FIELD (UG/G) (34875)	IRON BOT MAT <63U WS FIELD (UG/G) (34880)	LEAD BOT MAT <63U WS FIELD (UG/G) (34890)	LITHIUM BOT MAT <63U WS FIELD (UG/G) (34895)	MAGNE-SIUM BOT MAT <63U WS FIELD PERCENT (34900)	MANGA-NESE BOT MAT <63U WS FIELD (UG/G) (34905)	MERCURY BOT MAT <63U WS FIELD (UG/G) (34910)
05082500			RED RIVER OF THE NORTH AT GRAND FORKS, ND (LAT 47 55 38N LONG 097 01 34W)							
SEP 1992 02...	30	15	<8	<4	2.8	11	40	2.4	1100	0
05087600			SNAKE RIVER NEAR MOUTH NR. BIG WOOD, MN (LAT 48 24 42N LONG 097 06 26W)							
AUG 1992 11...	33	17	<8	<4	3.2	16	50	2.4	610	0
05094500			SOUTH BRANCH TWO RIVERS AT HALLOCK, MN (LAT 48 47 00N LONG 096 55 00W)							
AUG 1992 11...	32	20	<8	<4	3.8	14	50	2.0	1100	0
05104500			ROSEAU RIVER BELOW SOUTH FORK NEAR MALUNG, MN (LAT 48 47 30N LONG 095 44 40W)							
AUG 1992 10...	31	13	<8	<4	2.5	9	30	4.1	1000	<0
465149096280401			BUFFALO RIVER AT BUFFALO R ST PARK NR GLYNDON, M(LAT 46 51 49N LONG 096 28 04W)							
AUG 1992 05...	25	11	<8	<4	2.5	12	20	2.5	1400	0

ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	MOLYB-DENUM BOT MAT <63U WS FIELD (UG/G) (34915)	NEODYM-IUM BOT MAT <63U WS FIELD (UG/G) (34920)	NICKEL BOT MAT <63U WS FIELD (UG/G) (34925)	NIOBIUM BOT MAT <63U WS FIELD (UG/G) (34930)	PHOS-PHORUS BOT MAT <63U WS FIELD PERCENT (34935)	POTAS-SIUM BOT MAT <63U WS FIELD PERCENT (34940)	SCAN-DIUM BOT MAT <63U WS FIELD (UG/G) (34945)	SELE-NIUM BOT MAT <63U WS FIELD (UG/G) (34950)	SILVER BOT MAT <63U WS FIELD (UG/G) (34955)	SODIUM BOT MAT <63U WS FIELD PERCENT (34960)
05082500	RED RIVER OF THE NORTH AT GRAND FORKS, ND (LAT 47 55 38N LONG 097 01 34W)									
SEP 1992 02...	<2	28	33	8	0.08	1.6	10	1	0	0.59
05087600	SNAKE RIVER NEAR MOUTH NR. BIG WOOD, MN (LAT 48 24 42N LONG 097 06 26W)									
AUG 1992 11...	<2	29	35	9	0.09	1.7	11	1	0	0.58
05094500	SOUTH BRANCH TWO RIVERS AT HALLOCK, MN (LAT 48 47 00N LONG 096 55 00W)									
AUG 1992 11...	<2	30	42	8	0.08	1.8	14	1	0	0.50
05104500	ROSEAU RIVER BELOW SOUTH FORK NEAR MALUNG, MN (LAT 48 47 30N LONG 095 44 40W)									
AUG 1992 10...	<2	29	21	7	0.09	1.4	8	0	0	0.85
465149096280401	BUFFALO RIVER AT BUFFALO R ST PARK NR GLYNDON, M(LAT 46 51 49N LONG 096 28 04W)									
AUG 1992 05...	<2	24	17	5	0.13	1.2	6	1	0	0.79

DATE	STRON-TIUM BOT MAT <63U WS FIELD (UG/G) (34965)	SULFUR BOT MAT <63U WS FIELD (UG/G) (34970)	TANTA-LUM BOT MAT <63U WS FIELD (UG/G) (34975)	THORIUM BOT MAT <63U WS FIELD (UG/G) (34980)	TIN BOT MAT <63U WS FIELD (UG/G) (34985)	URANIUM BOT MAT <63U WS FIELD (UG/G) (35000)	VANA-DIUM BOT MAT <63U WS FIELD (UG/G) (35005)	YTTRIUM BOT MAT <63U WS FIELD (UG/G) (35010)	YTTER-BIUM BOT MAT <63U WS FIELD (UG/G) (35015)	ZINC BOT MAT <63U WS FIELD (UG/G) (35020)
05082500	RED RIVER OF THE NORTH AT GRAND FORKS, ND (LAT 47 55 38N LONG 097 01 34W)									
SEP 1992 02...	150	0	<40	8	<10	3	140	17	2	87
5087600	SNAKE RIVER NEAR MOUTH NR. BIG WOOD, MN (LAT 48 24 42N LONG 097 06 26W)									
AUG 1992 11...	130	0	<40	11	<10	3	150	18	2	99
05094500	SOUTH BRANCH TWO RIVERS AT HALLOCK, MN (LAT 48 47 00N LONG 096 55 00W)									
AUG 1992 11...	130	0	<40	11	<10	10	170	18	2	100
05104500	ROSEAU RIVER BELOW SOUTH FORK NEAR MALUNG, MN (LAT 48 47 30N LONG 095 44 40W)									
AUG 1992 10...	170	0	<40	9	<10	2	78	14	1	58
465149096280401	BUFFALO RIVER AT BUFFALO R ST PARK NR GLYNDON, M(LAT 46 51 49N LONG 096 28 04W)									
AUG 1992 05...	210	0	<40	7	<10	2	60	13	1	58

ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	TIME	ALUMINUM BOT MAT <63U WS FIELD PERCENT (34790)	ANTIMONY BOT MAT <63U WS FIELD (UG/G) (34795)	ARSENIC BOT MAT <63U WS FIELD (UG/G) (34800)	BERYLLIUM BOT MAT <63U WS FIELD (UG/G) (34810)	BISMUTH BOT MAT <63U WS FIELD (UG/G) (34816)	CADMIUM BOT MAT <63U WS FIELD (UG/G) (34825)	CERIUM BOT MAT <63U WS FIELD (UG/G) (34835)	CHROMIUM BOT MAT <63U WS FIELD (UG/G) (34840)	COBALT BOT MAT <63U WS FIELD (UG/G) (34845)	COPPER BOT MAT <63U WS FIELD (UG/G) (34850)
471243095514301				WHITE EARTH RIVER NEAR WAUBUN, MN (LAT 47 12 43N LONG 095 51 43W)							
SEP 1992											
01...	1230	4.7	1	8	1	<10	0	47	50	10	16
471931095564601				WILD RICE RIVER NEAR MAHNOMEN, MN. (LAT 47 19 31N LONG 095 56 46W)							
AUG 1992											
12...	1700	4.4	1	8	1	<10	0	48	48	9	13
SEP											
01...	1500	4.6	1	7	1	<10	<0	46	50	10	14
475331096144601				RED LAKE RIVER AT RED LAKE FALLS, MN. (LAT 47 53 31N LONG 096 14 24W)							
AUG 1992											
12...	0930	4.6	1	4	1	<10	0	44	52	10	17

DATE	TIME	EUROPIUM BOT MAT <63U WS FIELD (UG/G) (34855)	GALLIUM BOT MAT <63U WS FIELD (UG/G) (34860)	GOLD BOT MAT <63U WS FIELD (UG/G) (34870)	HOLMIUM BOT MAT <63U WS FIELD (UG/G) (34875)	IRON BOT MAT <63U WS FIELD PERCENT (34880)	LEAD BOT MAT <63U WS FIELD (UG/G) (34890)	LITHIUM BOT MAT <63U WS FIELD (UG/G) (34895)	MAGNESIUM BOT MAT <63U WS FIELD PERCENT (34900)	MANGANESE BOT MAT <63U WS FIELD (UG/G) (34905)	MERCURY BOT MAT <63U WS FIELD (UG/G) (34910)
471243095514301				WHITE EARTH RIVER NEAR WAUBUN, MN (LAT 47 12 43N LONG 095 51 43W)							
SEP 1992											
01...	27	12	<8	<4	2.3	8	30	3.3	820	0	
471931095564601				WILD RICE RIVER NEAR MAHNOMEN, MN. (LAT 47 19 31N LONG 095 56 46W)							
AUG 1992											
12...	28	13	<8	<4	2.5	10	30	3.1	1600	0	
SEP											
01...	26	13	<8	<4	2.5	9	30	3.1	1500	0	
475331096144601				RED LAKE RIVER AT RED LAKE FALLS, MN. (LAT 47 53 31N LONG 096 14 24W)							
AUG 1992											
12...	26	13	<8	<4	2.3	18	30	2.6	920	<0	

ANALYSES OF SAMPLES COLLECTED AT MISCELLANEOUS SITES

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

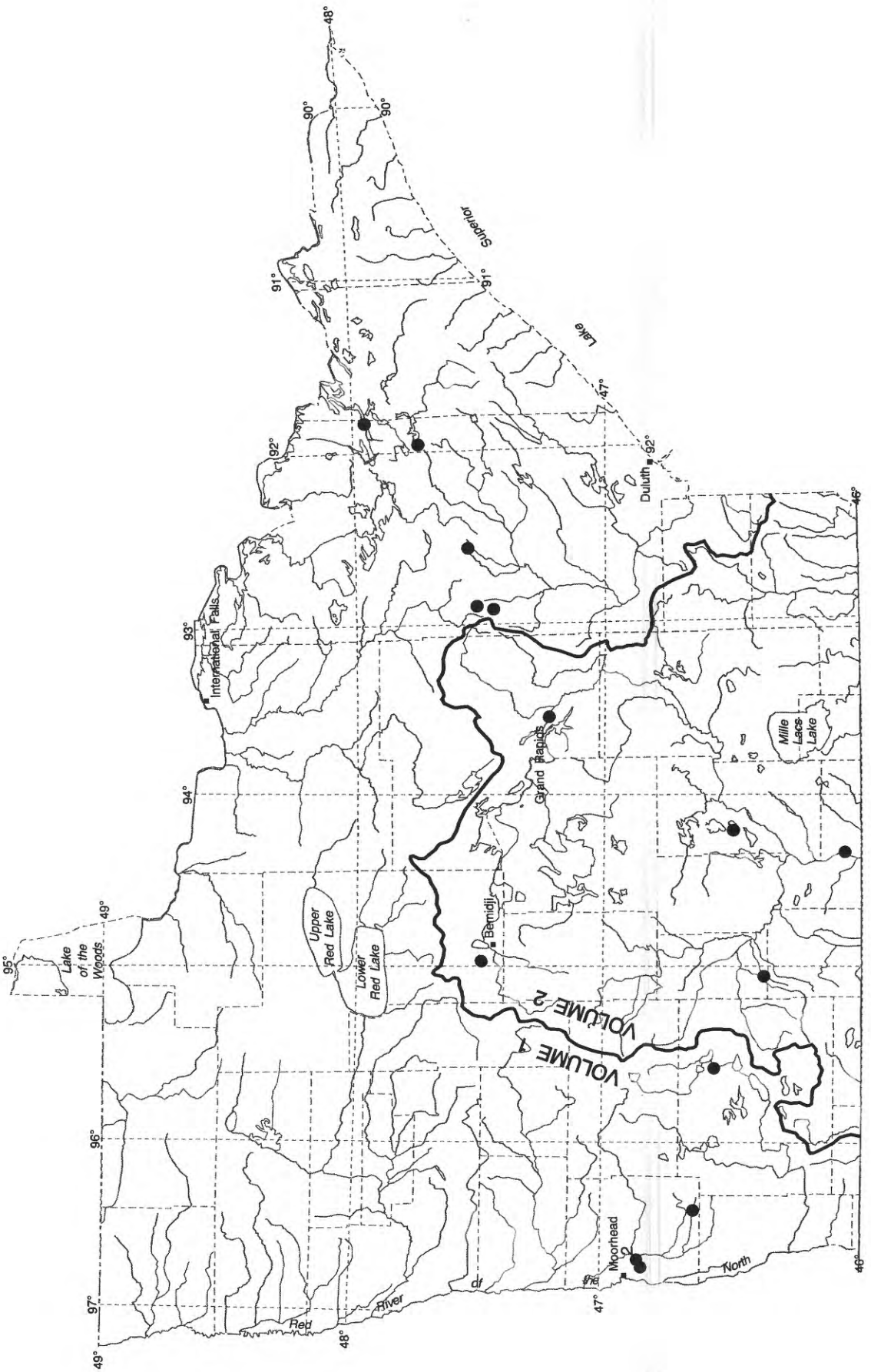
DATE	MOLYB-DENUM BOT MAT <63U WS FIELD (UG/G) (34915)	NEODYM-IUM BOT MAT <63U WS FIELD (UG/G) (34920)	NICKEL BOT MAT <63U WS FIELD (UG/G) (34925)	NIOBIUM BOT MAT <63U WS FIELD (UG/G) (34930)	PHOS-PHORUS BOT MAT <63U WS FIELD PERCENT (34935)	POTAS-SIUM BOT MAT <63U WS FIELD PERCENT (34940)	SCAN-DIUM BOT MAT <63U WS FIELD (UG/G) (34945)	SELE-NIUM BOT MAT <63U WS FIELD (UG/G) (34950)	SILVER BOT MAT <63U WS FIELD (UG/G) (34955)	SODIUM BOT MAT <63U WS FIELD PERCENT (34960)
471243095514301			WHITE EARTH RIVER NEAR WAUBUN, MN (LAT 47 12 43N LONG 095 51 43W)							
SEP 1992										
01...	<2	25	20	7	0.09	1.4	7	1	0	0.76
471931095564601			WILD RICE RIVER NEAR MAHNOMEN, MN. (LAT 47 19 31N LONG 095 56 46W)							
AUG 1992										
12...	<2	27	19	7	0.10	1.3	7	1	0	0.73
SEP										
01...	<2	25	20	6	0.10	1.3	7	1	0	0.73
475331096144601			RED LAKE RIVER AT RED LAKE FALLS, MN. (LAT 47 53 31N LONG 096 14 24W)							
AUG 1992										
12...	<2	25	23	6	0.12	1.3	7	1	0	0.69

DATE	STRON-TIUM BOT MAT <63U WS FIELD (UG/G) (34965)	SULFUR BOT MAT <63U WS FIELD (UG/G) (34970)	TANTA-LUM BOT MAT <63U WS FIELD (UG/G) (34975)	THORIUM BOT MAT <63U WS FIELD (UG/G) (34980)	TIN BOT MAT <63U WS FIELD (UG/G) (34985)	URANIUM BOT MAT <63U WS FIELD (UG/G) (35000)	VANA-DIUM BOT MAT <63U WS FIELD (UG/G) (35005)	YTTRIUM BOT MAT <63U WS FIELD (UG/G) (35010)	YTTER-BIUM BOT MAT <63U WS FIELD (UG/G) (35015)	ZINC BOT MAT <63U WS FIELD (UG/G) (35020)
471243095514301			WHITE EARTH RIVER NEAR WAUBUN, MN (LAT 47 12 43N LONG 095 51 43W)							
SEP 1992										
01...	170	0	<40	7	<10	3	82	14	2	58
471931095564601			WILD RICE RIVER NEAR MAHNOMEN, MN. (LAT 47 19 31N LONG 095 56 46W)							
AUG 1992										
12...	180	0	<40	9	<10	3	77	13	1	56
SEP										
01...	180	0	<40	8	<10	3	81	13	2	61
475331096144601			RED LAKE RIVER AT RED LAKE FALLS, MN. (LAT 47 53 31N LONG 096 14 24W)							
AUG 1992										
12...	180	1	<40	8	<10	3	93	12	1	71

Ground-Water Levels

Drilling Observation Well

Tim Cowdery and Don Boyce


Lake Superior
Duluth
International Falls
Grand Rapids
Mille Lacs Lake
Bemidji
Upper Red Lake
Lower Red Lake
Lake of the Woods
Moorhead
Red River
North
VOLUME 1
VOLUME 2
95°
96°
97°
94°
93°
92°
91°
90°
49°
48°
47°
46°

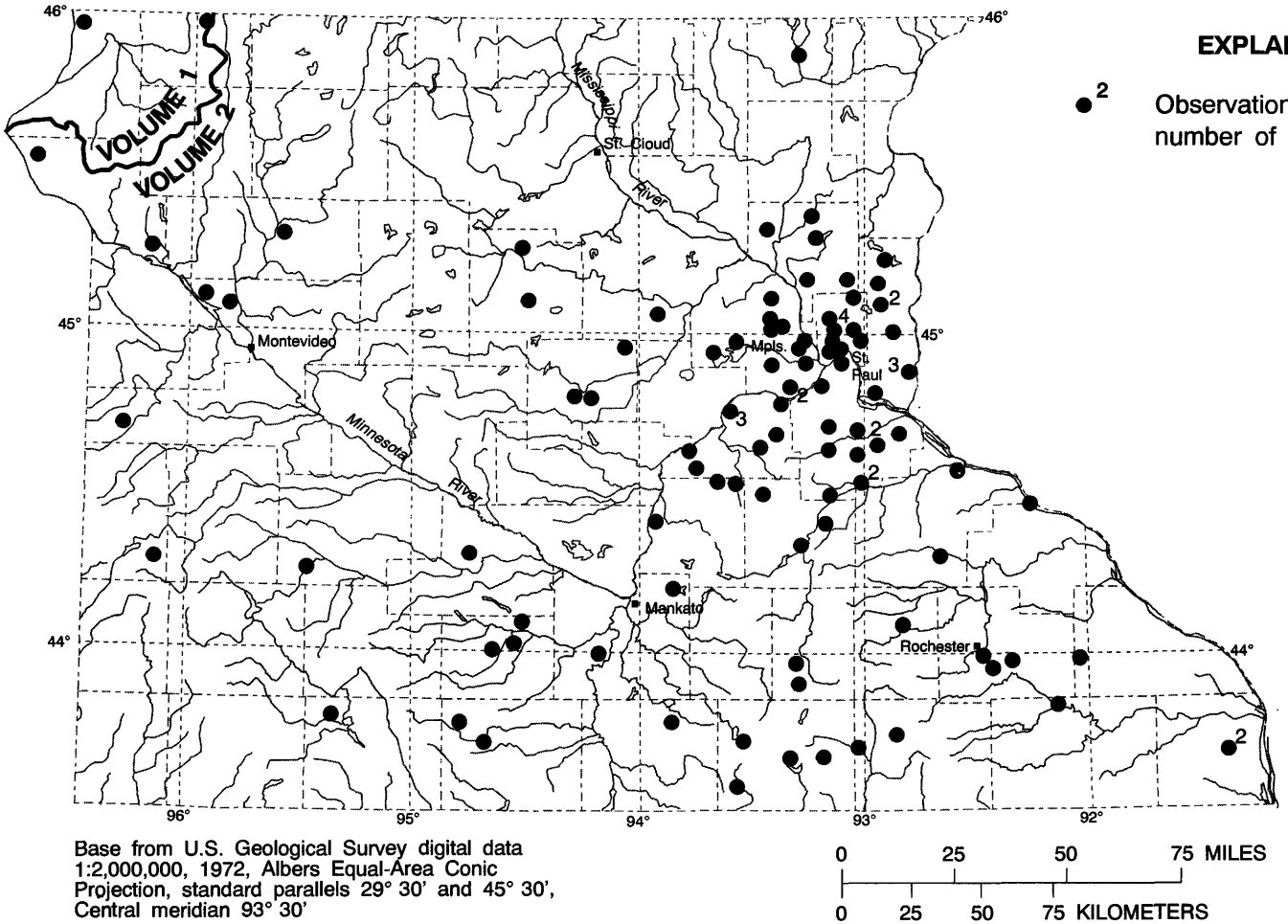


Figure 12.--Location of ground-water wells.

GROUND-WATER LEVELS

CLAY COUNTY

463854096250701. Local number, 137N45W30CDB01.
LOCATION.--Lat 46°38'54", long 96°25'07", in NW¼SE¼SW¼ sec.30, T.137 N., R.45 W., Hydrologic Unit 09020106, in Barnesville.
Owner: City of Barnesville, well 3.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 10 in., depth 73 ft.
DATUM.--Altitude of land-surface datum is 1,022 ft. Measuring point: Top of casing, 1.50 ft above land-surface datum.
PERIOD OF RECORD.--January 1949 to January 1975, May 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.86 ft below land-surface datum, June 9, 1962; lowest, 11.86 ft below land-surface datum, June 3, 1970.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 04	7.80	Nov 22	8.10	Dec 27	7.90	Feb 28	8.10	Apr 10	7.60
18	8.05	29	8.00	Feb 07	8.10	Mar 06	7.80	24	7.55
Nov 01	7.97	Dec 13	8.00	14	8.00	13	7.70	May 15	7.36
15	8.10	20	8.00	21	8.10	27	7.70		

465237096383901. Local number, 139N47W05CDC01.
LOCATION.--Lat 46°52'37", long 96°38'39", in SW¼SE¼SW¼ sec.5, T.139 N., R.47 W., Hydrologic Unit 09020104, 2.4 mi 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 1947 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 12.19 ft below land-surface datum, July 15, 1947; lowest, 32.94 ft below land-surface datum, Aug. 24, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 05	32.34	Dec 05	31.86	Feb 05	32.42	Apr 05	31.54	Jun 05	31.96	Aug 05	32.18
10	32.40	10	31.90	10	32.44	10	31.76	10	31.88	10	32.28
15	32.46	15	31.90	15	32.44	15	31.92	15	32.02	15	32.40
20	32.44	20	32.10	20	32.44	20	32.00	20	31.92		
25	32.44	25	32.08	25	32.44	25	31.92	25	31.86		
31	32.46	31	32.08	29	32.38	30	31.96	30	31.92		
Nov 05	32.20	Jan 05	32.14	Mar 05	32.18	May 05	32.02	Jul 05	31.88		
10	31.90	10	32.16	10	32.24	10	31.92	10	31.72		
15	32.02	15	32.16	15	32.18	15	31.98	15	31.78		
20	32.08	20	32.16	20	31.76	20	31.98	20	31.76		
25	32.14	25	32.16	25	31.56	25	31.98	25	31.82		
30	32.02	31	32.38	31	31.38	31	31.90	31	31.96		

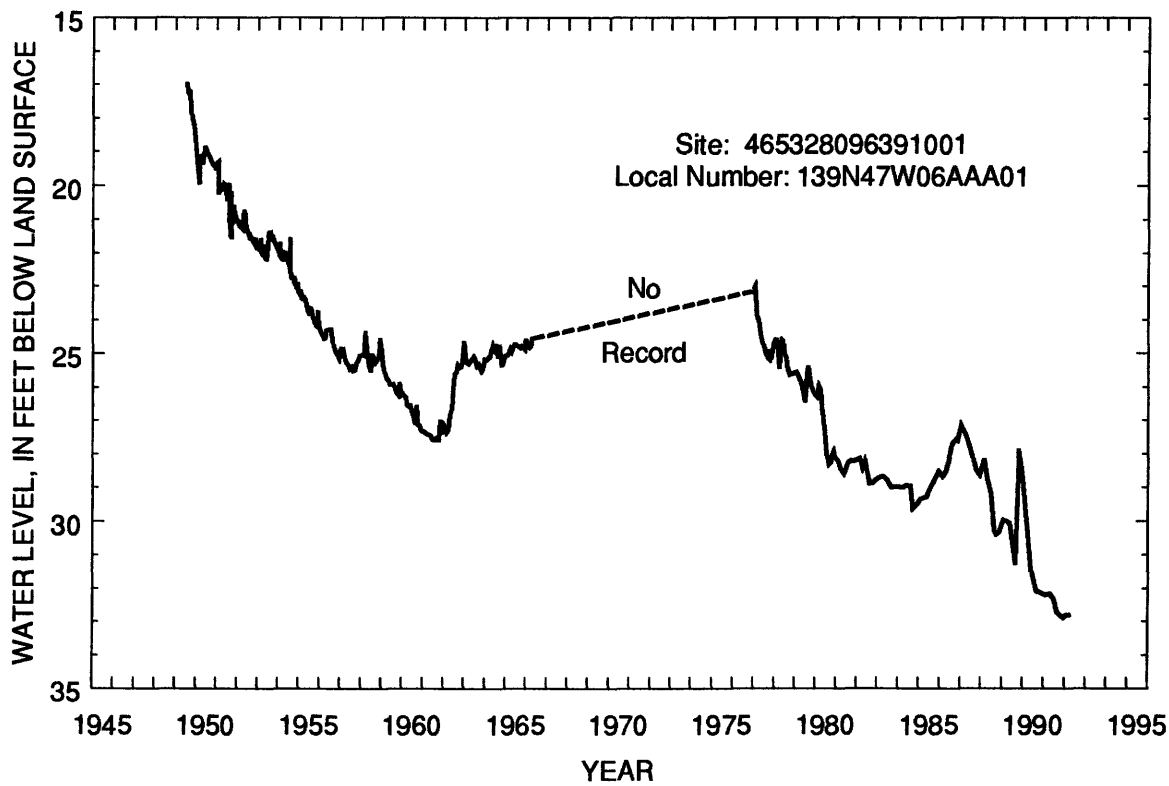
GROUND-WATER LEVELS

CLAY COUNTY--Continued

465328096391001. Local number, 139N47W06AAA01.
LOCATION.--Lat 46°53'27", long 96°39'08", in NE¼NE¼NE¼ sec.6, T.139 N., R.47 W., Hydrologic Unit 09020104, 2.7 mi northeast of Dilworth.
Owner: U.S. Geological Survey, M-80.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 3 in., depth 103 ft, casing slotted near bottom.
DATUM.--Altitude of land-surface datum is 915 ft. Measuring point: Top of casing, 2.50 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--July 1949 to April 1966, November 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 16.94 ft below land-surface datum, July 16, 1949; lowest, 34.20 ft below land-surface datum, Jul 28 and Sep 24, 1992.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 29	32.82	Jan 28	32.78	Apr 21	32.79	Aug 25	33.60
Dec 17	32.88	Mar 04	32.80	Jul 28	34.20	Sep 24	34.20



GROUND-WATER LEVELS

CLAY COUNTY--Continued

465231096415801. Local number, 139N48W11ABA01.
LOCATION.--Lat 46°52'31", long 96°41'58", in NE¼NW¼NE¼ sec.11, T.139 N., R.48 W., Hydrologic Unit 09020104, at Dilworth.
Owner: City of Dilworth.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 8 in., depth 152 ft.
DATUM.--Altitude of land-surface datum is 908 ft. Measuring point: Top of recorder platform, 2.40 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--May 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 101.33 ft below land-surface datum, Dec. 29, 1965; lowest, 131.24 ft below land-surface datum, July 18, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 29	127.82	Dec 17	125.83	Mar 04	126.35	Apr 21	124.13

GRANT COUNTY

455927095575505. Local number, 129N42W16ABB05.
LOCATION.--Lat 45°59'27", long 95°57'55", in NW¼NW¼NE¼ sec.16, T.129 N., R.42 W., Hydrologic Unit 09020102, in city of Elbow Lake.
Owner: City of Elbow Lake, well 5.
AQUIFER.--Buried sand of Pleistocene age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 12 in., depth 215 ft, screened 190 to 215 ft.
DATUM.--Altitude of land-surface datum is 1,220 ft. Measuring point: Top breather pipe, 1.80 above land-surface datum.
PERIOD OF RECORD.--October 1989 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 74.10 ft below land-surface datum, Apr. 30, 1990, Nov 27, 1991, Feb 28, 1992; lowest, 76.50 ft below land-surface datum, Nov. 1, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 01	74.20	Dec 30	74.20	Feb 28	74.10	Apr 29	74.80
27	74.10	Jan 29	74.80	Mar 31	73.90	May 28	73.90

OTTER TAIL COUNTY

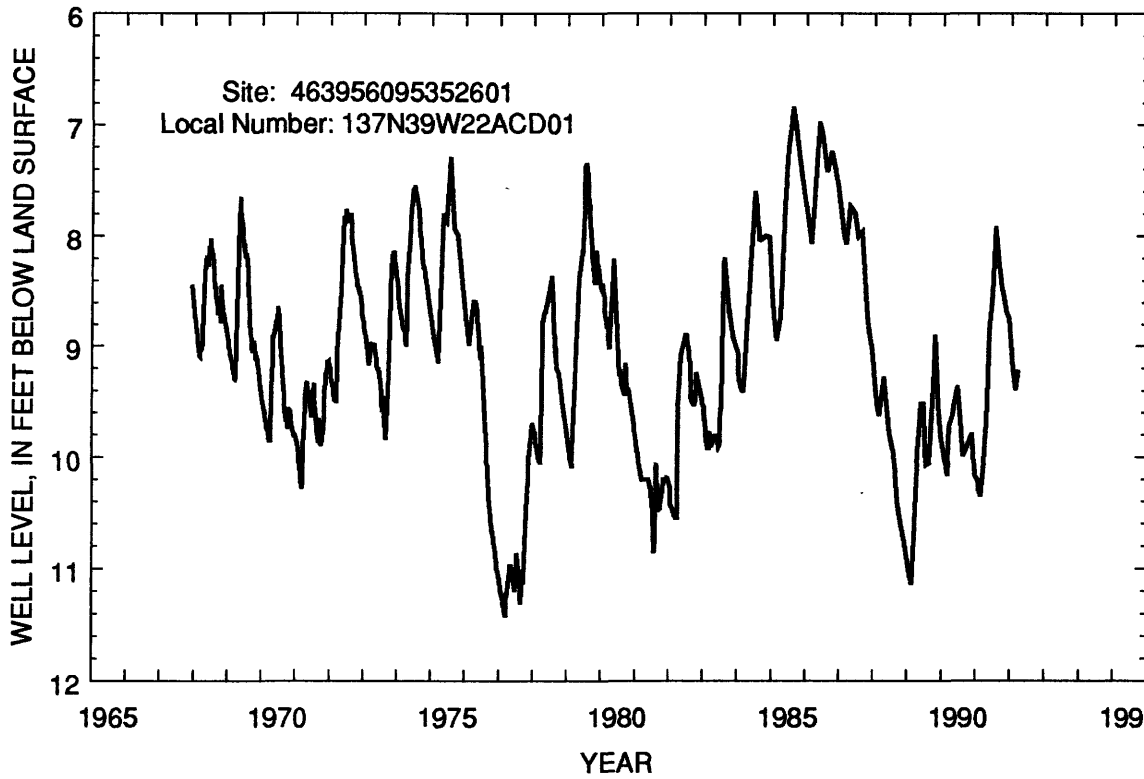
463956095352601. Local number, 137N39W22ACD01.
LOCATION.--Lat 46°39'56", long 95°35'26", in SE¼SW¼NE¼ sec.22, T.137 N., R.39 W., Hydrologic Unit 09020103, 4.5 mi north of Perham.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in., depth 24 ft, screened 21 to 24 ft.
DATUM.--Altitude of land-surface datum is 1,370 ft. Measuring point: Top of casing, 0.50 ft above land-surface datum.
PERIOD OF RECORD.--December 1967 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.84 ft below land-surface datum, Aug. 12, 1985; lowest, 11.41 ft below land-surface datum, Mar. 10, 15, 1977.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 23	8.56	Nov 22	8.70	Dec 20	8.75	Jan 25	9.21	Feb 23	9.39	Mar 24	9.22

GROUND-WATER LEVELS

OTTER TAIL COUNTY--Continued



ST. LOUIS COUNTY

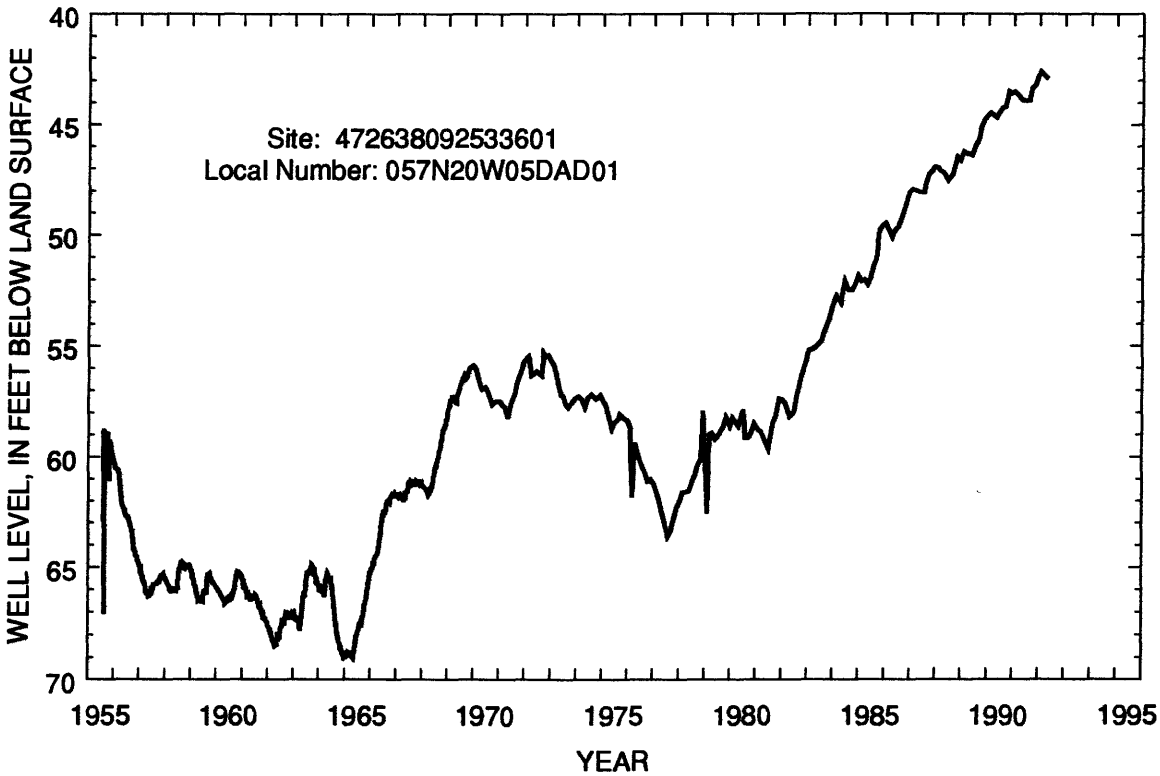
472638092533601. Local number, 057N20W05DAD01.
LOCATION.--Lat 47°26'38", long 92°53'36", in SE¼NE¼SE¼ sec.5, T.57 N., R.20 W., Hydrologic Unit 04010201, 2.5 mi east of Hibbing.
Owner: Burlington Northern, Inc.
AQUIFER.--Biwabik Iron Formation of Middle Precambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in., depth 430 ft, cased to 315 ft.
DATUM.--Altitude of land-surface datum is 1,470 ft. Measuring point: Top of platform, 1.20 ft above land-surface datum.
PERIOD OF RECORD.--August 1955 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 42.60 ft below land-surface datum, Jan 22, 1992; lowest, 69.07 ft below land-surface datum, Jan. 15, 1965.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 28	43.21	Dec 10	42.81	Jan 22	42.60	Mar 04	42.76	Apr 16	42.91

GROUND-WATER LEVELS

ST. LOUIS COUNTY--Continued



473102092345001. Local number, 058N18W12CCC01.
LOCATION.--Lat 47°31'02", long 92°34'50, in SW¼SW¼SW¼ sec.12, T.58 N., R.18 W., Hydrologic Unit 04010201, 1 mi west of Virginia. Owner: U.S. Steel Corp.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in., depth 97 ft, slotted casing between 67 to 97 ft.
DATUM.--Land-surface datum is 1,427.5 ft National Geodetic Vertical Datum of 1929. Measuring point: Edge of vent pipe, 1.90 ft above land-surface datum.
PERIOD OF RECORD.--December 1954 to July 1964 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.64 ft below land-surface datum, July 20, 1957; lowest, 17.47 ft below land-surface datum, Apr. 2, 1964.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 28	12.81	Dec 10	12.77	Jan 24	13.20	Mar 04	13.53

GROUND-WATER LEVELS

ST. LOUIS COUNTY--Continued

473011092524301. Local number, 058N20W16DBC01.
LOCATION.--Lat 47°30'11", long 92°52'43", in SW¼NW¼SE¼ sec.16, T.58 N., R.20 W., Hydrologic Unit 04010201, in Chisholm.
Owner: City of Chisholm.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in. depth 40 ft, screened 30 to 40 ft.
DATUM.--Altitude of land-surface datum is 1,500 ft. Measuring point: Top of wood platform, 1.70 ft above land-surface datum.
REMARKS.--Water level affected by pumping. Water-level subject to freezing during winter months.
PERIOD OF RECORD.--August 1953 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.23 ft below land-surface datum, May 10, 1954; lowest, 15.60 ft below land-surface datum, Mar. 23-24, 1957.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL
Oct 28	2.82

474253091574101. Local number, 060N13W01BBA01.
LOCATION.--Lat 47°42'53", long 91°57'41", in NE¼NW¼NW¼ sec.1, T.60 N., R.13 W., Hydrologic Unit 09030001, at Babbitt water tower.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in., depth 30 ft, screened 27 to 30 ft.
DATUM.--Altitude of land-surface datum is 1,485 ft. Measuring point: Top of 3 in pipe, 4.00 ft above land-surface datum.
PERIOD OF RECORD.--October 1975 to June 1978, July 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 19.79 ft below land-surface datum, Sept. 6, 1989; lowest, 26.03 ft below land-surface datum, June 14, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 04	20.80	Dec 03	20.92	Feb 04	21.33	Apr 01	21.67
Nov 06	21.00	Jan 03	21.08	Mar 09	21.58	May 08	21.42

475502091494601. Local number, 063N12W26ABB01.
LOCATION.--Lat 47°55'02", long 91°49'46", NW¼NW¼NE¼ sec.26, T.63 N., R.12 W., Hydrologic Unit 09030001, at Ely.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1 in., depth 9 ft, screened 7 to 9 ft.
DATUM.--Altitude of land-surface datum is 1,342 ft. Measuring point: Top of casing, 4.00 ft above land-surface datum.
PERIOD OF RECORD.--October 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.53 ft below land-surface datum, May 14, 1986; lowest, 6.87 ft below land-surface datum, Sept. 27, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 01	4.02	Nov 20	2.71	Jan 14	3.40	Feb 20	4.17	Apr 01	2.46

GROUND-WATER LEVELS

TRAVERSE COUNTY

455700096314001. Local number, 129N47W25CDC01.
LOCATION.--Lat 45°57'00", long 93°31'40", in SW¼SE¼SW¼ sec.25, T.129 N., R.47 W., Hydrologic Unit 09020101, 9 mi north of Wheaton.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1 in., depth 39 ft, open end.
DATUM.--Altitude of land-surface datum is 1,010 ft. Measuring point: Top of casing, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--October 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.39 ft below land-surface datum, Sept. 23, 1986; lowest, 12.42 ft below land-surface datum, Dec. 2, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 28	8.46	Dec 18	8.97	Jan 29	8.80	Apr 22	8.74

Ground-Water Quality Data

Radon Sampling of Ground Water

Red River of the North NAWQA Program

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

CLEARWATER COUNTY

STATION NUMBER	LOCAL IDENT-I-FIER	GEO-LOGIC UNIT	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)	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)
473131095160600	147.36.28BBC	112DMDF	09-02-92	1220	15.00	1445	545	473	7.1
473150095210500	147.37.22CDD	112DMDF	09-01-92	0920	29.00	1470	790	--	7.1
473832095253300	148N37W18 BBC	112DMDF	09-11-92	1750	155.00	1460	875	885	7.3

DATE	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	BICAR-BONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	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)
09-02-92	7.5	8.0	76	16	2.6	1.5	252	255	3.2	6.1	0.20	24
09-01-92	--	8.0	--	--	--	--	343	--	--	--	--	--
09-11-92	7.5	875.0	--	--	--	--	449	396	60	3.3	0.20	21

DATE	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 DIS. (MG/L AS N) (00623)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	CARBON, ORGANIC TOTAL (MG/L AS C) (00680)
09-02-92	279	<0.010	0.130	0.020	<0.20	0.029	0.027	1	9	<100	1.5
09-01-92	--	--	--	--	--	--	--	--	--	--	--
09-11-92	518	<0.010	<0.050	0.580	0.70	0.006	0.006	--	--	--	3.1

ANALYSIS FOR ORGANIC CHEMICALS

STATION NUMBER	DATE	TIME	ALA-CHLOR TOTAL RECOVER (UG/L) (77825)	AME-TRYNE TOTAL (82184)	ATRA-ZINE WATER UNFLTRD REC (UG/L) (39630)	CARBO-IN ATER HOLE RECOV-ERABLE (UG/L (30245)	CYAN-AZINE TOTAL (UG/L) (81757)	CYCLO-ATE ATER HOLE RECOV-ERABLE (UG/L (30254)
473131095160600	09-02-92	1220	<0.10	<0.10	2.0	<0.20	<0.20	<0.10
473832095253300	09-11-92	1750	--	--	--	--	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

CLEARWATER COUNTY--Continued

ANALYSIS FOR ORGANIC CHEMICALS

DATE	DEETHYL ATRA-ZINE, WATER, WHOLE, TOTAL (UG/L) (75981)	DE-ISO PROPYL ATRAZIN WATER, WHOLE, TOTAL (UG/L) (75980)	DIPHEN-AMID WATER WHOLE RECOV-ERABLE (UG/L) (30255)	HEXAZI-NONE WATER WHOLE RECOV-ERABLE (UG/L) (30264)	METOLA-CHLOR WATER WHOLE TOT.REC (UG/L) (82612)	METRI-BUZIN WATER WHOLE TOT.REC (UG/L) (82611)	PHENOLS TOTAL (UG/L) (32730)	PROME-TONE TOTAL (UG/L) (39056)
09-02-92	0.20	<0.20	<0.10	<0.20	<0.20	<0.10	2	<0.20
09-11-92	--	--	--	--	--	--	<1	--

DATE	PROME-TRYNE TOTAL (UG/L) (39057)	PROPA-CHLOR WATER WHOLE RECOV. (UG/L) (30295)	PRO-PAZINE TOTAL (UG/L) (39024)	SIMA-ZINE TOTAL (UG/L) (39055)	SIME-TRYNE TOTAL (UG/L) (39054)	TER-BACIL WATER WHOLE RECOV. (UG/L) (30311)	TRI-FLURA-LIN TOTAL RECOVER (UG/L) (39030)	VER-NOLATE WATER WHOLE RECOV. (UG/L) (30324)
09-02-92	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10
09-11-92	--	--	--	--	--	--	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

COOK COUNTY

STATION NUMBER	LOCAL IDENT-I-FIER	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	PUMP OR FLOW PERIOD PRIOR TO SAM-PLING (MIN) (72004)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)
475229089520701	T62NR5E06CCC	09-15-92	1000	230.00	--	5250	5210
475325089491001	T63NR5E33CCD	09-16-92	1700	404.00	20	1840	1480
475505089444501	T63NR5E25ABA	09-15-92	1200	104.00	--	825	716
475618089423801	T63NR6E17CAB	09-14-92	1600	350.00	--	4650	4540
475650089425501	T63NR6E07DDD	09-16-92	1400	285.00	--	620	183
475710089390001	T63NR6E10AAA	09-14-92	1800	115.00	--	315	317
475719089465201	T63NR5E03CCC	09-16-92	1600	275.00	--	300	94
475755089410501	T63NR6E04CDA	09-15-92	1500	155.00	--	860	709
		09-15-92	1530	155.00	--	860	764
475827089413501	T63NR6E04BBC	09-16-92	1100	84.00	--	895	974
480002089360501	T64NR7E30BCB	09-15-92	1400	--	--	660	458

DATE	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	TEMPER-ATURE WATER (DEG C) (00010)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)
09-15-92	8.9	7.5	7.0	490	1.6	460	1.9	17	9.2	43
09-16-92	8.8	8.7	8.0	52	0.32	240	1.8	48	49	61
09-15-92	7.4	7.7	9.0	35	3.4	95	0.60	52	53	34
09-14-92	8.2	8.2	9.0	440	0.60	400	0.70	19	14	19
09-16-92	10.0	10.0	7.0	2.0	0.29	36	0.20	78	78	5.4
09-14-92	8.8	8.8	6.5	8.0	1.8	57	1.5	104	103	22
09-16-92	6.8	7.4	6.5	12	3.3	1.6	0.30	44	44	5.1
09-15-92	7.6	7.9	6.5	66	33	38	3.5	205	207	91
09-15-92	7.6	7.8	6.5	65	33	37	3.4	205	207	91
09-16-92	7.9	8.1	6.5	56	19	91	4.7	66	67	17
09-15-92	8.5	8.6	11.0	14	4.8	66	4.2	85	87	41

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

COOK COUNTY--Continued

DATE	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	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)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)
09-15-92	1600	0.90	3110	--	--	<1	<100	10	2
09-16-92	410	1.7	800	--	--	1	54	<10	<1
09-15-92	170	0.50	394	--	--	<1	18	<10	<1
09-14-92	99	0.60	2760	--	--	<1	500	10	<1
09-16-92	3.6	0.60	107	--	--	<1	7	<10	<1
09-14-92	23	3.4	179	--	--	<1	25	<10	<1
09-16-92	1.1	<0.10	58	--	--	<1	7	<10	<1
09-15-92	73	0.80	450	--	--	3	33	<10	<1
09-15-92	77	0.80	445	--	--	3	33	<10	<1
09-16-92	240	1.0	531	<0.010	<0.050	3	110	<10	<1
09-15-92	64	1.8	255	--	--	<1	64	<10	<1

DATE	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)	LEAD, DISSOLVED (UG/L AS PB) (01049)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	SILVER, DISSOLVED (UG/L AS AG) (01075)	ZINC, DISSOLVED (UG/L AS ZN) (01090)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)
09-15-92	10	100	<100	20	<0.1	<1.0	260	<1	--
09-16-92	<10	<3	<100	<1	<0.1	<1.0	14	<1	--
09-15-92	<10	37	<100	16	<0.1	<1.0	52	<1	--
09-14-92	10	30	<100	20	<0.1	<1.0	20	<1	--
09-16-92	<10	30	<100	<1	<0.1	<1.0	3	<1	--
09-14-92	<10	19	<100	11	<0.1	<1.0	<3	<1	--
09-16-92	<10	1600	<100	19	<0.1	<1.0	13	<1	--
09-15-92	<10	1300	<100	59	<0.1	<1.0	23	<1	--
09-15-92	<10	1600	<100	58	<0.1	<1.0	12	<1	--
09-16-92	<10	170	<100	31	<0.1	<1.0	<3	<1	0.6
09-15-92	<10	36	<100	12	<0.1	<1.0	<3	<1	--

ANALYSIS FOR ORGANIC CHEMICALS

STATION NUMBER	DATE	TIME	1,1,1-TRICHLOROETHANE TOTAL (UG/L) 34506)	1,1-DICHLOROETHANE TOTAL (UG/L) (34496)	BENZENE 1,1-DICHLOROETHYLENE TOTAL (UG/L) (34501)	O-CHLOROWATER 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-DICHLOROWATER UNFLTRD REC (UG/L) (34566)
475827089413501	09-16-92	1100	<0.2	<0.2	<0.2	<0.20	<0.2	<0.2	<0.2	<0.20

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

COOK COUNTY--Continued

ANALYSIS FOR ORGANIC CHEMICALS

DATE	BENZENE 1,4-DI-CHLORO-WATER UNFLTRD REC (UG/L) (34571)	BENZENE TOTAL (UG/L) (34030)	BROMO-FORM TOTAL (UG/L) (32104)	CARBON-TETRA-CHLO-RIDE TOTAL (UG/L) (32102)	CHLORO-BENZENE TOTAL (UG/L) (34301)	CHLORO-DI-BROMO-METHANE TOTAL (UG/L) (32105)	CHLORO-FORM TOTAL (UG/L) (32106)	CIS-1,2 -DI-CHLORO-ETHENE WATER TOTAL (UG/L) (77093)	DI-CHLORO-BROMO-METHANE TOTAL (UG/L) (32101)	DI-CHLORO-DI-FLUORO-METHANE TOTAL (UG/L) (34668)
09-16-92	<0.20	<0.2	<0.2	<0.2	<0.20	<0.2	<0.2	<0.2	<0.2	<0.2

DATE	ETHYL-BENZENE TOTAL (UG/L) (34371)	FREON-113 WATER UNFLTRD REC (UG/L) (77652)	METHYL-ENE CHLO-RIDE TOTAL (UG/L) (34423)	STYRENE TOTAL (UG/L) (77128)	TETRA-CHLORO-ETHYL-ENE TOTAL (UG/L) (34475)	TOLUENE TOTAL (UG/L) (34010)	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)
09-16-92	<0.2	<0.5	<0.2	<0.2	<0.2	0.2	<0.2	<0.2	<0.2	<0.20

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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)
481200096133000	155-43-31DBCD	06-04-92	1655	180.00	1165	1770	7.5	180
481332096342900	155-46-22CDC	06-08-92	1045	86.00	946	883	7.3	57
481437096232700	155-45-13CCB	06-05-92	1100	207.00	1075	852	7.7	56
481452095512700	155-41-13ADB	06-04-92	1119	236.00	1153	658	7.9	41
481537095504800	155-40-07BDCB	06-05-92	1430	118.00	1155	917	7.6	70
481807096430801	156N47W29CAD	04-28-92	1600	32.00	853	827	7.2	80
481820096401700	156-48-26BBBD	08-19-92	1000	29.00	848	--	--	--
482447096094300	157-43-14BBA	06-04-92	1300	218.00	1145	697	7.8	36
482634096111000	157-43-03CCCD	08-20-92	1150	22.00	1160	--	--	--
482634096324101	157-46-02DDCC	08-20-92	1025	16.00	1040	--	--	--
482725096332201	158-46-35CDCC2	04-28-92	1740	23.00	1048	401	7.7	53
		08-26-92	1420	23.00	1048	--	--	--
482935096332101	158-46-23BDCC	04-28-92	1130	22.00	1052	488	7.5	60

DATE	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)	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)
06-04-92	120	71	8.7	292	750	4.0	0.30	23	1420	--	--
06-08-92	20	94	5.0	354	<0.10	88	0.40	34	504	--	--
06-05-92	38	73	3.3	290	150	14	0.40	22	539	--	--
06-04-92	24	74	2.4	281	55	12	0.30	26	384	--	--
06-05-92	40	78	3.4	305	210	9.7	0.20	26	594	--	--
04-28-92	54	6.8	3.5	--	25	7.9	0.20	23	481	--	--
08-19-92	--	--	--	--	--	--	--	--	--	<0.010	2.00
06-04-92	38	63	3.2	296	63	13	0.50	21	401	--	--
08-20-92	--	--	--	--	--	--	--	--	--	0.110	7.90
08-20-92	--	--	--	--	--	--	--	--	--	0.040	44.0
04-28-92	17	1.5	0.80	198	5.4	1.6	0.10	10	222	--	--
08-26-92	--	--	--	--	--	--	--	--	--	0.040	6.00
04-28-92	23	1.9	1.6	260	5.2	5.3	0.10	8.1	260	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

MARSHALL COUNTY--Continued

DATE	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	BORON, DISSOLVED (UG/L AS B) (01020)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)
06-04-92	--	--	--	20	<0.5	290	<1.0	<5	4	<10	1700
06-08-92	--	--	--	300	<0.5	170	<1.0	<5	9	<10	2600
06-05-92	--	--	--	83	<0.5	260	<1.0	<5	<3	<10	630
06-04-92	--	--	--	140	<0.5	180	<1.0	<5	<3	<10	310
06-05-92	--	--	--	89	<0.5	180	<1.0	<5	<3	<10	770
04-28-92	--	--	--	280	<0.5	30	<1.0	<5	<3	<10	2300
08-19-92	0.450	0.020	<0.010	--	--	--	--	--	--	--	--
06-04-92	--	--	--	130	<0.5	180	<1.0	<5	3	<10	610
08-20-92	0.050	<0.010	<0.010	--	--	--	--	--	--	--	--
08-20-92	0.020	<0.010	0.010	--	--	--	--	--	--	--	--
04-28-92	--	--	--	27	<0.5	10	<1.0	<5	<3	<10	20
08-26-92	0.040	<0.010	<0.010	--	--	--	--	--	--	--	--
04-28-92	--	--	--	30	<0.5	20	<1.0	<5	<3	<10	11

DATE	LEAD, DISSOLVED (UG/L AS PB) (01049)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)	LITHIUM DISSOLVED (UG/L AS LI) (01130)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)
06-04-92	<10	110	<10	<10	<1.0	1100	<6	8	110	3.5
06-08-92	<10	72	<10	<10	<1.0	220	<6	45	15	8.5
06-05-92	<10	50	<10	<10	<1.0	480	<6	68	28	3.5
06-04-92	<10	18	<10	<10	<1.0	290	<6	13	22	3.5
06-05-92	<10	45	<10	<10	<1.0	460	<6	3	18	3.4
04-28-92	<10	150	10	<10	<1.0	180	<6	52	15	5.9
08-19-92	--	--	--	--	--	--	--	--	--	--
06-04-92	<10	11	<10	<10	<1.0	530	<6	11	22	2.9
08-20-92	--	--	--	--	--	--	--	--	--	--
08-20-92	--	--	--	--	--	--	--	--	--	--
04-28-92	<10	7	<10	<10	<1.0	43	<6	80	<4	1.3
08-26-92	--	--	--	--	--	--	--	--	--	--
04-28-92	<10	20	<10	<10	<1.0	44	<6	11	<4	2.5

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

MARSHALL COUNTY--Continued

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)
475815096273500	152-45-17CCCD	06-09-92	1030	22.00	1010	606	7.7	83
475924096211300	152-45-13AAD	06-10-92	1550	74.00	1037	588	7.8	39
480211096265200	153-45-28CDD	06-09-92	1431	22.40	1035	579	7.8	73
		09-03-92	1140	22.40	1035	--	--	--
480354096261000	153-45-21AAAA	08-26-92	1650	22.00	1030	--	--	--
480440096034100	153-42-16BAB	06-08-92	1445	114.00	1130	749	7.6	61
480537096205800	153-44-06DDDD	06-17-92	1542	13.00	1103	1270	6.7	200
		08-20-92	1522	13.00	1103	--	--	--
480537096263000	153-45-09ABA	06-09-92	1655	17.80	1030	544	7.8	82
480550096220100	153-45-30AAAA	08-20-92	1710	--	--	--	--	--
480815096122500	154-43-20DCCC	08-20-92	1405	26.00	1130	--	--	--
480937096261300	154-45-16DADB	08-25-92	1145	85.00	1031	--	--	--

ANALYSIS FOR ORGANIC CHEMICALS

STATION NUMBER	DATE	TIME	2, 4-DP TOTAL (UG/L) (82183)	2,4,5-T TOTAL (UG/L) (39740)	2,4-D, TOTAL (UG/L) (39730)	2,6-DI-ETHYL ANALINE WAT FLT 0.7 U GF, REC (UG/L) (82660)	ALA-CHLOR, WATER, DISS, REC, (UG/L) (46342)	ALPHA BHC DIS-SOLVED (UG/L) (34253)	ATRA-ZINE, WATER, DISS, REC (UG/L) (39632)
481820096401700	08-19-92	1000	<0.01	<0.01	<0.01	<0.00	--	--	--
482634096111000	08-20-92	1150	<0.01	<0.01	<0.01	--	<0.00	<0.01	0.00
482634096324101	08-20-92	1025	<0.01	<0.01	<0.01	--	<0.00	<0.01	0.01
	08-26-92	1420	<0.01	<0.01	<0.01	--	<0.00	<0.01	0.01

DATE	BUTYL-ATE, WATER, DISS, REC (UG/L) (04028)	CHLOR-PYRIFOS DIS-SOLVED (UG/L) (38933)	CYANA-ZINE, WATER, DISS, REC (UG/L) (04041)	DEETHYL ATRA-ZINE, WATER, DISS, REC (UG/L) (04040)	DI-AZINON, DIS-SOLVED (UG/L) (39572)	DICAMBA (MED-IBEN) (BAN-VEL D) TOTAL (UG/L) (82052)	DI-ELDRIN DIS-SOLVED (UG/L) (39381)	FONOFOS WATER DISS REC (UG/L) (04095)	LINDANE DIS-SOLVED (UG/L) (39341)	MALA-THION, DIS-SOLVED (UG/L) (39532)
08-19-92	--	--	--	--	--	<0.01	--	--	--	--
08-26-92	<0.00	<0.00	<0.01	<0.02	<0.00	<0.01	<0.02	<0.00	<0.01	<0.01

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

MARSHALL COUNTY--Continued

ANALYSIS FOR ORGANIC CHEMICALS

DATE	METO-LACHLOR WATER DISSOLV (UG/L) (39415)	METRI-BUZIN SENCOR WATER DISSOLV (UG/L) (82630)	P,P' DDE DISSOLV (UG/L) (34653)	PARA-THION, DIS-SOLVED (UG/L) (39542)	PICLO-RAM (TOR-DON) (AMDON) TOTAL (UG/L) (39720)	PRO-METON, WATER, DISS, REC (UG/L) (04037)	PROP-CHLOR, WATER, DISS, REC (UG/L) (04024)	SILVEX, TOTAL (UG/L) (39760)	SI-MAZINE, WATER, DISS, REC (UG/L) (04035)
08-19-92	--	--	--	--	<0.01	--	--	<0.01	--
08-20-92	<0.00	0.00	0.01	<0.01	<0.01	<0.01	<0.00	<0.01	0.00
08-20-92	<0.00	<0.01	<0.00	<0.01	<0.01	<0.01	<0.00	<0.01	0.00
08-26-92	<0.00	<0.01	<0.00	<0.01	<0.01	<0.01	<0.00	<0.01	0.01

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

PENNINGTON COUNTY

STATION NUMBER	LOCAL IDENT-I-FIER	DATE	TIME	DEPTH OF WELL, TOTAL FEET	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD	SPE-CIFIC CON-DUCT-ANCE LAB (USCM)	PH WATER WHOLE LAB (STAND-ARD UNITS)	CALCIUM DIS-SOLVED (MG/L AS CA)
475815096273500	152-45-17CCCD	06-09-92	1030	22.00	1010	606	7.7	83
475924096211300	152-45-13ADD	06-10-92	1550	74.00	1037	588	7.8	39
480211096265200	153-45-28CDD	06-09-92	1431	22.40	1035	579	7.8	73
		09-03-92	1140	22.40	1035	--	--	--
480354096261000	153-45-21AAAA	08-26-92	1650	22.00	1030	--	--	--
480400996034100	153-42-16BAB	06-08-92	1445	114.00	1130	749	7.6	61
480537096205800	153-44-06DDDD	06-17-92	1542	13.00	1103	1270	6.7	200
		08-20-92	1522	13.00	1103	--	--	--
480537096263000	153-45-09ABA	06-09-92	1655	17.80	1030	544	7.8	8.2
4805500962220100	153-4530AAA	08-20-92	1710	--	--	--	--	--
480815096122500	154-43-20DCCC	08-20-92	1405	26.00	1130	--	--	--
480937096261300	154-45-16DADB	08-25-92	1145	85.00	1031	--	--	--

DATE	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)	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)
06-09-92	31	3.6	2.2	304	29	13	0.20	19	357	--	--
06-10-92	19	64	4.6	314	<0.10	14	0.40	25	338	--	--
06-09-92	28	3.7	2.8	204	13	12	0.20	17	329	--	--
09-03-92	--	--	--	--	--	--	--	--	--	<0.010	22.0
08-26-92	--	--	--	--	--	--	--	--	--	0.730	5.30
06-08-92	32	56	4.8	413	0.30	16	0.30	21	431	--	--
06-17-92	70	5.1	6.0	746	42	22	0.20	26	868	--	--
08-20-92	--	--	--	--	--	--	--	--	--	<0.010	<0.050
06-09-92	19	8.9	2.1	262	9.4	10	0.10	14	321	--	--
08-20-92	--	--	--	--	--	--	--	--	--	<0.010	0.052
08-20-92	--	--	--	--	--	--	--	--	--	<0.010	<0.050
08-25-92	--	--	--	--	--	--	--	--	--	<0.010	<0.050

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

PENNINGTON COUNTY--Continued

DATE	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	BORON, DISSOLVED (UG/L AS B) (01020)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)
06-09-92	--	--	--	56	<0.5	100	<1.0	<5	<3	<10	9
06-10-92	--	--	--	120	<0.5	320	<1.0	<5	<3	<10	62
06-09-92	--	--	--	50	<0.5	230	<1.0	<5	<3	<10	7
09-03-92	0.040	<0.010	<0.010	--	--	--	--	--	--	--	--
08-26-92	0.130	<0.010	<0.010	--	--	--	--	--	--	--	--
06-08-92	--	--	--	140	<0.5	170	<1.0	<5	10	<10	4000
06-17-92	--	--	--	330	<0.5	40	<1.0	8	<3	<10	8500
08-20-92	0.760	0.040	<0.010	--	--	--	--	--	--	--	--
06-09-92	--	--	--	55	<0.5	2600	<1.0	<5	<3	<10	20
08-20-92	0.040	<0.010	<0.010	--	--	--	--	--	--	--	--
08-20-92	0.200	0.120	<0.010	--	--	--	--	--	--	--	--
08-25-92	1.00	0.060	0.060	--	--	--	--	--	--	--	--

DATE	LEAD, DISSOLVED (UG/L AS PB) (01049)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SILVER, DISSOLVED (UG/L AS AG) (01075)	STRONTIUM, DISSOLVED (UG/L AS SR) (01080)	VANADIUM, DISSOLVED (UG/L AS V) (01085)	ZINC, DISSOLVED (UG/L AS ZN) (01090)	LITHIUM DISSOLVED (UG/L AS LI) (01130)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)
06-09-92	<10	440	<10	<10	<1.0	100	<6	11	7	4.3
06-10-92	<10	48	<10	<10	<1.0	280	<6	41	20	5.0
06-09-92	<10	51	<10	<10	<1.0	77	<6	8	5	2.0
09-03-92	--	--	--	--	--	--	--	--	--	--
08-26-92	--	--	--	--	--	--	--	--	--	--
06-08-92	<10	18	<10	<10	<1.0	350	<6	8	13	7.8
06-17-92	<10	690	<10	<10	<1.0	380	7	33	21	27
08-20-92	--	--	--	--	--	--	--	--	--	--
06-09-92	<10	12	<10	10	<1.0	68	<6	6	4	4.2
08-20-92	--	--	--	--	--	--	--	--	--	--
08-20-92	--	--	--	--	--	--	--	--	--	--
08-25-92	--	--	--	--	--	--	--	--	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

PENNINGTON COUNTY--Continued

ANALYSIS FOR ORGANIC CHEMICALS

STATION NUMBER	DATE	TIME	2, 4-DP TOTAL (UG/L) (82183)	2,4,5-T TOTAL (UG/L) (39740)	2,4-D, TOTAL (UG/L) (39730)	2,6-DIETHYL ANALINE WAT FLT 0.7 U GF, REC (UG/L) (82660)	ALACHLOR, WATER, DISS, REC, (UG/L) (46342)	ALPHA BHC DISSOLVED (UG/L) (34253)	HCH ALPHA D6 SRG WAT FLT 0.7 U GF, REC PERCENT (91065)	ATRAZINE, WATER, DISS, REC (UG/L) (39632)	BENFLURALIN WAT FLD 0.7 U GF, REC (UG/L) (82673)
480211096265200	09-03-92	1140	<0.01	<0.01	<0.01	<0.00	<0.00	<0.01	110	0.00	<0.00
480354096261000	08-26-92	1650	<0.01	<0.01	<0.01	--	<0.00	<0.01	--	0.01	--
480537096205800	08-20-92	1522	<0.01	<0.01	<0.01	<0.00	<0.00	<0.01	110	0.01	<0.00
480550096220100	08-20-92	1710	<0.01	<0.01	<0.01	--	<0.00	<0.01	--	0.01	--
480815096122500	08-20-92	1405	<0.01	<0.01	<0.01	--	<0.00	<0.01	--	0.00	--
480937096261300	08-25-92	1145	<0.01	<0.01	<0.01	--	<0.00	<0.01	--	0.01	--

DATE	BUTYLATE, WATER, DISS, REC (UG/L) (04028)	CARBARYL WATER FLTRD 0.7 U GF, REC (UG/L) (82680)	CARBOFURAN WATER FLTRD 0.7 U GF, REC (UG/L) (82674)	CHLORPYRIFOS DISSOLVED (UG/L) (38933)	CYANAZINE, WATER, DISS, REC (UG/L) (04041)	DCPA WATER FLTRD 0.7 U GF, REC (UG/L) (82682)	DEETHYL ATRAZINE, WATER, DISS, REC (UG/L) (04040)	DIAZINON, DISSOLVED (UG/L) (39572)	DIAZINON D10 SRG WAT FLT 0.7 U GF, REC PERCENT (91063)	DICAMBA (MEDIBEN) (BANVEL D) TOTAL (UG/L) (82052)	DIELDRIN DISSOLVED (UG/L) (39381)	DIMETHOATE WATER FLTRD 0.7 U GG, REC (UG/L) (82662)
09-03-92	<0.00	<0.01	<0.00	<0.00	<0.01	<0.00	<0.02	<0.00	100	<0.01	<0.02	<0.02
08-26-92	<0.00	--	--	<0.00	<0.01	--	<0.02	<0.00	--	<0.01	<0.02	--
08-20-92	<0.00	<0.01	<0.00	<0.00	<0.01	0.00	<0.02	<0.00	89	<0.01	<0.02	<0.02
08-20-92	<0.00	--	--	<0.00	<0.01	--	<0.02	<0.00	--	<0.01	<0.02	--
08-20-92	<0.00	--	--	<0.00	<0.01	--	<0.02	<0.00	--	<0.01	<0.02	--
08-25-92	<0.00	--	--	<0.00	<0.01	--	<0.02	<0.00	--	<0.01	<0.02	--

DATE	DISULFOTON WATER FLTRD 0.7 U GF, REC (UG/L) (82677)	ETHOPROP WATER FLTRD 0.7 U GF, REC (UG/L) (82672)	FONOFOS WATER DISS REC (UG/L) (04095)	LINDANE DISSOLVED (UG/L) (39341)	LINURON WATER FLTRD 0.7 U GF, REC (UG/L) (82666)	MALATHION, DISSOLVED (UG/L) (39532)	METHYL AZINPHOS WAT FLT 0.7 U GF, REC (UG/L) (82686)	METHYL PARATHION WAT FLT 0.7 U GF, REC (UG/L) (82667)	METOLACHLOR WATER DISSOLV (UG/L) (39415)	METRIBUZIN SENCOR WATER DISSOLV (UG/L) (82630)	MOLINATE WATER FLTRD 0.7 U GF, REC (UG/L) (82671)
09-03-92	<0.10	<0.00	<0.00	<0.01	<0.01	<0.01	<0.01	<0.00	<0.00	<0.01	<0.00
08-26-92	--	--	<0.00	<0.01	--	<0.01	--	--	<0.00	0.01	--
08-20-92	<0.10	<0.00	<0.00	<0.01	<0.01	<0.01	<0.01	<0.00	<0.00	0.01	<0.00
08-20-92	--	--	<0.00	<0.01	--	<0.01	--	--	<0.00	0.01	--
08-20-92	--	--	<0.00	<0.01	--	<0.01	--	--	<0.00	<0.01	--
08-25-92	--	--	<0.00	<0.01	--	<0.01	--	--	<0.00	0.00	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

PENNINGTON COUNTY--Continued

ANALYSIS FOR ORGANIC CHEMICALS

DATE	NAPROP-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82684)	P,P' DDE DISSOLV (UG/L) (34653)	PARA-THION, DIS-SOLVED (UG/L) (39542)	PEB-ULATE WATER FILTRD 0.7 U GF, REC (UG/L) (82669)	PENDI-METH-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82683)	PER-METHRIN CIS WAT FLT 0.7 U GF, REC (UG/L) (82687)	PHORATE WATER FLTRD 0.7 U GF, REC (UG/L) (82664)	PICLO-RAM (TOR-DON) (AMDON) TOTAL (UG/L) (39720)	PRON-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82676)	PRO-METON, WATER, DISS, REC (UG/L) (04037)	PROP-CHLOR, WATER, DISS, REC (UG/L) (04024)
09-03-92	<0.00	<0.00	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.00
08-26-92	--	0.00	<0.01	--	--	--	--	<0.01	--	<0.01	<0.00
08-20-92	0.01	<0.00	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.00
08-20-92	--	<0.00	<0.01	--	--	--	--	<0.01	--	<0.01	<0.00
08-20-92	--	<0.00	<0.01	--	--	--	--	<0.01	--	<0.01	<0.00
08-25-92	--	<0.00	<0.01	--	--	--	--	<0.01	--	<0.01	<0.00

DATE	PRO-PANIL WATER FLTRD 0.7 U GF, REC (UG/L) (82679)	PRO-PARGITE WATER FLTRD 0.7 U GF, REC (UG/L) (82685)	SILVEX, TOTAL (UG/L) (39760)	SI-MAZINE, WATER, DISS, REC (UG/L) (04035)	TEBU-THIURON WATER FLTRD 0.7 U GF, REC (UG/L) (82670)	TER-BACIL WATER FLTRD 0.7 U GF, REC (UG/L) (82665)	TER-BUFOS WATER FLTRD 0.7 U GF, REC (UG/L) (82675)	TERBUTH YLAZINE SURROGT WAT FLT 0.7 U GF, REC PERCENT (91064)	THIO-BENCARB WATER FLTRD 0.7 U GF, REC (UG/L) (82681)	TRIAL-LATE WATER FLTRD 0.7 U GF, REC (UG/L) (82678)	TRI-FLUR-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82661)
09-03-92	<0.00	<0.01	<0.01	0.00	<0.01	<0.01	<0.01	110	<0.01	<0.00	<0.00
08-26-92	--	--	<0.01	0.00	--	--	--	--	--	--	--
08-20-92	<0.00	<0.01	<0.01	0.00	<0.01	<0.01	<0.01	99	<0.01	<0.00	<0.00
08-20-92	--	--	<0.01	0.00	--	--	--	--	--	--	--
08-20-92	--	--	<0.01	0.00	--	--	--	--	--	--	--
08-25-92	--	--	<0.01	0.00	--	--	--	--	--	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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)
473048096124300	147-44-36BBAD	08-27-92	1030	63.00	1185	--	--	--
473119095500500	147-41-26ADCD	06-22-92	1500	237.00	1251	750	7.5	69
473214095484500	147-41-24ADDB	06-19-92	1000	78.00	1280	923	7.3	120
473229096083400	147-43-21BADA	07-13-92	1100	83.00	1190	711	7.6	86
473233096152100	147-44-22BBAB	06-11-92	1500	260.00	1125	841	7.5	82
473238096165300	147-44-17DDD	06-11-92	1615	59.00	1133	515	7.6	79
473412096263200	147-45-7BAA	06-11-92	1248	210.00	933	721	7.8	46
473752095521401	148N41W15CCDA	04-29-92	1305	60.00	1212	816	7.5	82
		08-25-92	1145	60.00	1212	--	--	--
474207096083000	149-43-22DDCC	07-13-92	1400	86.00	1161	639	7.7	72
474224095451400	149-40-22DDBA	06-30-92	1030	84.00	1280	882	7.3	120
474241095454900	149-40-22BDD	06-30-92	1630	170.00	1290	727	7.8	86
474252096160800	149N44W22AADA	08-19-92	1530	53.00	1135	--	--	--
474258096155400	149-44-1AAAA	08-19-92	1630	--	--	--	--	--
474258096222000	149-45-24BBB	06-29-92	1350	121.00	1040	779	7.8	54
474356095525100	149-41-10DDDD	06-30-92	1400	75.00	1200	486	7.5	67
474450096532300	149-49-2DDD 0	6-11-92	1055	158.00	852	2060	7.6	94
474537096195200	149N44W05BBBB	06-16-92	1430	32.60	1125	--	--	--
		08-24-92	1205	32.60	1125	--	--	--
474537096195202	149-44-05BBBB2	06-16-92	1500	33.00	1080	--	--	--
474629096180400	150N44W28CDD	04-29-92	1050	15.00	1050	428	7.7	56
474728095434501	150N40W24CCC	08-25-92	--	46.00	1220	--	--	--
480512096520700	153-48-07ADD	06-10-92	1730	101.00	840	2630	7.6	85

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

POLK COUNTY--Continued

DATE	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)	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)
08-27-92	--	--	--	--	--	--	--	--	--	<0.010	<0.050
06-22-92	29	50	4.6	327	70	15	0.30	21	454	--	--
06-19-92	46	22	5.8	385	140	0.90	0.20	29	603	--	--
07-13-92	32	27	7.7	372	35	0.30	0.30	28	417	--	--
06-11-92	42	41	4.8	406	87	7.4	0.70	25	523	--	--
06-11-92	22	2.2	1.3	236	53	4.4	0.20	27	314	--	--
06-11-92	25	79	4.3	362	34	14	0.40	26	427	--	--
04-29-92	36	28	4.7	--	91	1.0	0.20	26	493	--	--
08-25-92	--	--	--	--	--	--	--	--	--	<0.010	<0.050
07-13-92	31	27	5.7	336	23	0.50	0.40	30	358	--	--
06-30-92	50	12	6.2	491	28	0.60	0.20	30	521	--	--
06-30-92	33	33	5.1	347	69	1.2	0.20	27	437	--	--
08-19-92	--	--	--	--	--	--	--	--	--	<0.010	<0.050
08-19-92	--	--	--	--	--	--	--	--	--	<0.010	0.390
06-29-92	30	76	3.8	426	4.4	7.4	0.30	33	457	--	--
06-30-92	24	2.3	2.0	252	27	0.60	<0.10	28	294	--	--
06-11-92	29	290	8.9	302	130	390	0.40	28	1160	--	--
06-16-92	--	--	--	--	--	--	--	--	--	<0.010	0.210
08-24-92	--	--	--	--	--	--	--	--	--	<0.010	<0.050
06-16-92	--	--	--	--	--	--	--	--	--	--	--
04-29-92	17	0.60	0.90	--	7.9	0.80	0.10	13	260	--	--
08-25-92	--	--	--	--	--	--	--	--	--	<0.010	1.30
06-10-92	38	390	8.9	228	320	600	0.50	26	1470	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

POLK COUNTY--Continued

DATE	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	BORON, DISSOLVED (UG/L AS B) (01020)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)
08-27-92	0.160	0.040	0.050	--	--	--	--	--	--	--	--
06-22-92	--	--	--	65	<0.5	190	<1.0	<5	<3	<10	1100
06-19-92	--	--	--	33	<0.5	200	<1.0	<5	<3	<10	1100
07-13-92	--	--	--	94	<0.5	240	<1.0	<5	5	<10	810
06-11-92	--	--	--	32	<0.5	230	<1.0	<5	10	<10	3300
06-11-92	--	--	--	150	<0.5	20	<1.0	<5	4	<10	800
06-11-92	--	--	--	170	<0.5	360	<1.0	<5	<3	<10	180
04-29-92	--	--	--	35	<0.5	190	<1.0	<5	<3	<10	1100
08-25-92	0.760	<0.010	<0.010	--	--	--	--	--	--	--	--
07-13-92	--	--	--	96	<0.5	170	<1.0	<5	4	<10	780
06-30-92	--	--	--	170	<0.5	130	1.0	<5	10	<10	2200
06-30-92	--	--	--	44	<0.5	180	<1.0	<5	<3	<10	720
08-19-92	1.60	0.020	0.040	--	--	--	--	--	--	--	--
08-19-92	0.030	<0.010	0.010	--	--	--	--	--	--	--	--
06-29-92	--	--	--	180	<0.5	240	<1.0	<5	<3	<10	45
06-30-92	--	--	--	200	<0.5	20	1.0	<5	7	<10	1800
06-11-92	--	--	--	30	<1	910	<2.0	<10	<6	<20	730
06-16-92	0.050	0.010	<0.010	--	--	--	--	--	--	--	--
08-24-92	0.070	<0.010	0.010	--	--	--	--	--	--	--	--
06-16-92	--	--	--	--	--	--	--	--	--	--	--
04-29-92	--	--	--	34	<0.5	10	<1.0	20	<3	<10	160
08-25-92	0.040	<0.010	<0.010	--	--	--	--	--	--	--	--
06-10-92	--	--	--	21	<1	860	<2.0	<10	<6	<20	1000

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

POLK COUNTY--Continued

DATE	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	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)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)
08-27-92	--	--	--	--	--	--	--	--	--	--
06-22-92	<10	110	<10	<10	<1.0	360	<6	8	25	2.3
06-19-92	<10	110	<10	<10	<1.0	610	<6	20	74	2.1
07-13-92	<10	65	<10	<10	<1.0	640	<6	130	71	2.0
06-11-92	<10	54	<10	<10	<1.0	440	<6	16	43	--
06-11-92	<10	170	<10	<10	<1.0	86	<6	3	5	1.3
06-11-92	<10	14	<10	<10	<1.0	410	<6	29	29	3.3
04-29-92	<10	66	20	<10	<1.0	490	<6	58	43	1.9
08-25-92	--	--	--	--	--	--	--	--	--	--
07-13-92	<10	47	<10	<10	2.0	380	<6	9	38	2.0
06-30-92	<10	75	<10	<10	1.0	660	<6	<3	52	2.7
06-30-92	10	89	<10	<10	<1.0	380	<6	14	27	2.1
08-19-92	--	--	--	--	--	--	--	--	--	--
08-19-92	--	--	--	--	--	--	--	--	--	--
06-29-92	<10	28	<10	<10	<1.0	440	<6	8	25	5.3
06-30-92	<10	170	<10	<10	<1.0	110	<6	6	9	1.4
06-11-92	<20	130	<20	<20	<2.0	560	<12	660	95	2.0
06-16-92	--	--	--	--	--	--	--	--	--	--
08-24-92	--	--	--	--	--	--	--	--	--	--
06-16-92	--	--	--	--	--	--	--	--	--	--
04-29-92	<10	13	<10	<10	1.0	41	<6	8	<4	1.2
08-25-92	--	--	--	--	--	--	--	--	--	--
06-10-92	<20	110	<20	<20	<2.0	1000	<12	9	100	2.4

ANALYSIS OF ORGANIC CHEMICALS

STATION NUMBER	DATE	TIME	2, 4-DP TOTAL (UG/L) (82183)	2,4,5-T TOTAL (UG/L) (39740)	2,4-D, TOTAL (UG/L) (39730)	2,6-DI-ETHYL ANALINE WAT FLT 0.7 U GF, REC (UG/L) (82660)	ALA-CHLOR, WATER, DISS, REC, (UG/L) (46342)	ALPHA BHC DIS-SOLVED (UG/L) (34253)	HCH ALPHA D6 SRG WAT FLT 0.7 U GF, REC PERCENT (91065)	ATRA-ZINE, WATER, DISS, REC (UG/L) (39632)	BEN-FLUR-ALIN WAT FLD 0.7 U GF, REC (UG/L) (82673)
473048096124300	08-27-92	1030	<0.01	<0.01	<0.01	--	<0.00	<0.01	--	0.00	--
473752095521401	08-25-92	1145	<0.01	<0.01	<0.01	--	<0.00	<0.01	--	0.01	--
474252096160800	08-19-92	1530	<0.01	<0.01	<0.01	--	<0.00	<0.01	--	0.05	--
474258096155400	08-19-92	1630	<0.01	<0.01	<0.01	--	<0.00	<0.01	--	0.01	--
474537096195200	06-16-92	1430	<0.01	<0.01	<0.01	--	--	--	--	--	--
	08-24-92	1205	<0.01	<0.01	<0.01	<0.00	<0.00	<0.01	110	0.02	<0.00
474537096195202	06-16-92	1500	<0.01	<0.01	<0.01	--	<0.00	<0.01	--	0.00	--
474728095434501	08-25-92	--	<0.01	<0.01	<0.01	--	<0.00	<0.01	--	0.00	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

POLK COUNTY--Continued

ANALYSIS OF ORGANIC CHEMICALS

DATE	BUTYL-ATE, WATER, DISS, REC (UG/L) (04028)	CAR-BARYL WATER FLTRD 0.7 U GF, REC (UG/L) (82680)	CARBO-FURAN WATER FLTRD 0.7 U GF, REC (UG/L) (82674)	CHLOR-PYRIFOS DIS-SOLVED (UG/L) (38933)	CYANA-ZINE, WATER, DISS, REC (UG/L) (04041)	DCPA WATER FLTRD 0.7 U GF, REC (UG/L) (82682)	DEETHYL ATRA-ZINE, WATER, DISS, REC (UG/L) (04040)	DI-AZINON, DIS-SOLVED (UG/L) (39572)	DIAZ-INON D10 SRG WAT FLT 0.7 U GF, REC PERCENT (91063)	DICAMBA (MED-IBEN) (BAN-VEL D) TOTAL (UG/L) (82052)	DI-ELDRIN DIS-SOLVED (UG/L) (39381)	DIMETH-OATE WATER FLTRD 0.7 U GG, REC (UG/L) (82662)
08-27-92	<0.00	--	--	<0.00	<0.01	--	<0.02	<0.00	--	<0.01	<0.02	--
08-25-92	<0.00	--	--	<0.00	<0.01	--	<0.02	<0.00	--	<0.01	<0.02	--
08-19-92	<0.00	--	--	<0.00	<0.01	--	<0.02	<0.00	--	<0.01	<0.02	--
08-19-92	<0.00	--	--	<0.00	<0.01	--	<0.02	<0.00	--	<0.01	<0.02	--
06-16-92	--	--	--	--	--	--	--	--	--	<0.01	--	--
08-24-92	<0.00	<0.01	<0.00	<0.00	<0.01	0.00	<0.02	<0.00	88	<0.01	<0.02	<0.02
06-16-92	<0.00	--	--	<0.00	<0.01	--	<0.02	<0.00	--	<0.01	<0.02	--
08-25-92	<0.00	--	--	<0.00	<0.01	--	<0.02	0.03	--	<0.01	<0.02	--

DATE	DISUL-FOTON WATER FLTRD 0.7 U GF, REC (UG/L) (82677)	ETHO-PROP WATER FLTRD 0.7 U GF, REC (UG/L) (82672)	FONOFOS WATER DISS REC (UG/L) (04095)	LINDANE DIS-SOLVED (UG/L) (39341)	LIN-URON WATER FLTRD 0.7 U GF, REC (UG/L) (82666)	MALA-THION, DIS-SOLVED (UG/L) (39532)	METHYL AZIN-PHOS WAT FLT 0.7 U GF, REC (UG/L) (82686)	METHYL PARA-THION WAT FLT 0.7 U GF, REC (UG/L) (82667)	METO-LACHLOR WATER DISSOLV (UG/L) (39415)	METRI-BUZIN SENCOR WATER DISSOLV (UG/L) (82630)	MOL-INATE WATER FLTRD 0.7 U GF, REC (UG/L) (82671)
08-27-92	--	--	<0.00	<0.01	--	<0.01	--	--	<0.00	0.01	--
08-25-92	--	--	<0.00	<0.01	--	<0.01	--	--	<0.00	<0.01	--
08-19-92	--	--	<0.00	0.01	--	<0.01	--	--	<0.00	0.01	--
08-19-92	--	--	<0.00	<0.01	--	<0.01	--	--	<0.00	0.02	--
06-16-92	--	--	--	--	--	--	--	--	--	--	--
08-24-92	<0.10	<0.00	<0.00	0.01	<0.01	<0.01	<0.01	<0.00	<0.00	0.01	<0.00
06-16-92	--	--	<0.00	<0.00	--	<0.01	--	--	<0.00	0.00	--
08-25-92	--	--	<0.00	<0.01	--	<0.01	--	--	<0.00	0.01	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

POLK COUNTY--Continued

ANALYSIS OF ORGANIC CHEMICALS

DATE	NAPROP-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82684)	P,P' DDE DISSOLV (UG/L) (34653)	PARA-THION, DIS-SOLVED (UG/L) (39542)	PEB-ULATE WATER FILTRD 0.7 U GF, REC (UG/L) (82669)	PENDI-METH-ALIN WAT FLT 0.7 U GF, REC (82683)	PER-METHRIN CIS WAT FLT 0.7 U GF, REC (82687)	PHORATE WATER FLTRD 0.7 U GF, REC (82664)	PICLO-RAM (TOR-DON) (AMDON) TOTAL (UG/L) (39720)	PRON-AMIDE WATER FLTRD 0.7 U GF, REC (82676)	PRO-METON, WATER, DISS, REC (UG/L) (04037)	PROP-CHLOR, WATER, DISS, REC (UG/L) (04024)
08-27-92	--	<0.00	<0.01	--	--	--	--	<0.01	--	<0.01	<0.00
08-25-92	--	<0.00	<0.01	--	--	--	--	<0.01	--	<0.01	<0.00
08-19-92	--	<0.00	<0.01	--	--	--	--	<0.01	--	<0.01	<0.00
08-19-92	--	<0.00	<0.01	--	--	--	--	<0.01	--	<0.01	<0.00
06-16-92--	--	--	--	--	--	--	0.01	--	--	--	
08-24-92	0.01	0.00	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.00
06-16-92	--	<0.00	<0.00	--	--	--	--	0.02	--	<0.00	<0.00
08-25-92	--	0.01	<0.01	--	--	--	--	<0.01	--	<0.01	<0.00

DATE	PRO-PANIL WATER FLTRD 0.7 U GF, REC (UG/L) (82679)	PRO-PARGITE WATER FLTRD 0.7 U GF, REC (UG/L) (82685)	SILVEX, TOTAL (UG/L) (39760)	SI-MAZINE, WATER, DISS, REC (UG/L) (04035)	TEBU-THIURON WATER FLTRD 0.7 U GF, REC (82670)	TER-BACIL WATER FLTRD 0.7 U GF, REC (82665)	TER-BUFOS WATER FLTRD 0.7 U GF, REC (82675)	TERBUTH YLAZINE SURROGT WAT FLT 0.7 U GF, REC PERCENT (91064)	THIO-BENCARB WATER FLTRD 0.7 U GF, REC (82681)	TRIAL-LATE WATER FLTRD 0.7 U GF, REC (UG/L) (82678)	TRI-FLUR-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82661)
08-27-92	--	--	<0.01	0.00	--	--	--	--	--	--	--
08-25-92	--	--	<0.01	0.01	--	--	--	--	--	--	--
08-19-92	--	--	<0.01	0.00	--	--	--	--	--	--	--
08-19-92	--	--	<0.01	0.00	--	--	--	--	--	--	--
06-16-92	--	--	<0.01	--	--	--	--	--	--	--	--
08-24-92	<0.00	<0.01	<0.01	0.00	<0.01	<0.01	<0.01	110	<0.01	<0.00	<0.00
06-16-92	--	--	<0.01	<0.00	--	--	--	--	--	--	--
08-25-92	--	--	<0.01	0.00	--	--	--	--	--	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

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)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)
474628096195300	150-44-31AAAA	08-26-92	1851	29.00	1058	--	--	--
474638095532800	150-41-27CDA	08-21-92	1015	36.00	1182	--	--	--
474719096163100	150-44-27ABBA	08-19-92	1400	17.70	1083	--	--	--
474913095582600	150-42-12DCDB	06-18-92	0923	191.00	1131	662	7.5	80
475145096255000	151-45-28CDC	06-10-92	1328	200.00	905	972	8.2	13
475421096195600	151-44-07DDD	06-10-92	1122	220.00	1025	1600	7.3	190
475702095592300	152-42-26DDDD	06-29-92	1012	45.00	1130	821	7.6	83
475758095465700	152-40-28ABAA	08-21-92	1203	70.00	1155	--	--	--
		09-03-92	0950	70.00	1155	--	--	--

DATE	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)	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)
08-26-92	--	--	--	--	--	--	--	--	--	<0.010	0.055
08-21-92	--	--	--	--	--	--	--	--	--	0.090	0.960
08-19-92	--	--	--	--	--	--	--	--	--	<0.010	3.40
06-18-92	29	22	3.5	382	46	1.2	0.20	27	393	--	--
06-10-92	8.3	190	1.9	309	24	110	0.90	19	572	--	--
06-10-92	72	87	6.6	396	480	37	0.40	31	1240	--	--
06-29-92	40	54	4.6	310	190	6.6	0.30	27	577	--	--
08-21-92	--	--	--	--	--	--	--	--	--	<0.010	<0.050
09-03-92	--	--	--	--	--	--	--	--	--	--	--

DATE	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)	IRON, DIS-SOLVED (UG/L AS FE) (01046)
08-26-92	0.410	<0.010	<0.010	--	--	--	--	--	--	--	--
08-21-92	0.030	<0.010	0.030	--	--	--	--	--	--	--	--
08-19-92	0.040	0.010	<0.010	--	--	--	--	--	--	--	--
06-18-92	--	--	--	99	<0.5	100	1.0	<5	<3	<10	1400
06-10-92	--	--	--	44	<0.5	920	<1.0	<5	<3	<10	100
06-10-92	--	--	--	15	<0.5	390	<1.0	<5	10	<10	3700
06-29-92	--	--	--	38	<0.5	160	<1.0	<5	<3	<10	68
08-21-92	0.540	0.030	0.050	--	--	--	--	--	--	--	--
09-03-92	--	--	--	--	--	--	--	--	--	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

RED LAKE COUNTY--Continued

DATE	LEAD, DIS-SOLVED (UG/L AS PB) (01049)	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)	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)
08-26-92	--	--	--	--	--	--	--	--	--	--
08-21-92	--	--	--	--	--	--	--	--	--	--
08-19-92	--	--	--	--	--	--	--	--	--	--
06-18-92	<10	58	10	<10	2.0	270	<6	11	15	1.8
06-10-92	<10	5	<10	<10	<1.0	180	<6	<3	17	3.9
06-10-92	10	190	<10	<10	<1.0	770	<6	13	110	2.1
06-29-92	<10	220	<10	<10	<1.0	400	<6	7	24	2.3
08-21-92	--	--	--	--	--	--	--	--	--	--
09-03-92	--	--	--	--	--	--	--	--	--	--

ANALYSIS OF ORGANIC CHEMICALS

STATION NUMBER	DATE	TIME	2, 4-DP TOTAL (UG/L) (82183)	2,4,5-T TOTAL (UG/L) (39740)	2,4-D, TOTAL (UG/L) (39730)	ALA-CHLOR, WATER, DISS, REC, (UG/L) (46342)	ALPHA BHC DIS-SOLVED (UG/L) (34253)	ATRA-ZINE, WATER, DISS, REC (UG/L) (39632)	BUTYL-ATE, WATER, DISS, REC (UG/L) (04028)
474628096195300	08-26-92	1851	<0.01	<0.01	<0.01	<0.00	<0.01	0.01	<0.00
474638095532800	08-21-92	1015	<0.01	<0.01	<0.01	<0.00	<0.01	0.00	<0.00
474719096163100	08-19-92	1400	<0.01	<0.01	<0.01	<0.00	<0.01	0.01	<0.00
475758095465700	08-21-92	1203	--	--	--	<0.00	<0.01	0.00	<0.00
	09-03-92	0950	--	--	--	<0.00	<0.01	0.01	<0.00

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

RED LAKE COUNTY--Continued

ANALYSIS OF ORGANIC CHEMICALS

DATE	CHLORPYRIFOS DISSOLVED (UG/L) (38933)	CYANAZINE, WATER, DISS, REC (UG/L) (04041)	DEETHYL ATRAZINE, WATER, DISS, REC (UG/L) (04040)	DIAZINON, DISSOLVED (UG/L) (39572)	DICAMBA (MEDIBEN) (BANVEL D) TOTAL (UG/L) (82052)	DIELDRIN DISSOLVED (UG/L) (39381)	FONOFOS WATER DISS REC (UG/L) (04095)	LINDANE DISSOLVED (UG/L) (39341)	MALATHION, DISSOLVED (UG/L) (39532)
08-26-92	<0.00	<0.01	<0.02	<0.00	<0.01	<0.02	<0.00	<0.01	<0.01
08-21-92	<0.00	<0.01	<0.02	<0.00	<0.01	<0.02	<0.00	0.01	<0.01
08-19-92	<0.00	<0.01	<0.02	<0.00	<0.01	<0.02	<0.00	0.01	<0.01
08-21-92	<0.00	<0.01	<0.02	<0.00	--	<0.02	<0.00	<0.01	<0.01
09-03-92	<0.00	<0.01	<0.02	<0.00	--	<0.02	<0.00	<0.01	<0.01

DATE	METOLACHLOR WATER DISSOLV (UG/L) (39415)	METRIBUZIN SENCOR WATER DISSOLV (UG/L) (82630)	P,P' DDE DISSOLV (UG/L) (34653)	PARATHION, DISSOLVED (UG/L) (39542)	PICLORAM (TORDON) (AMDON) TOTAL (UG/L) (39720)	PROMETON, WATER, DISS, REC (UG/L) (04037)	PROPCHLOR, WATER, DISS, REC (UG/L) (04024)	SILVEX, TOTAL (UG/L) (39760)	SIMAZINE, WATER, DISS, REC (UG/L) (04035)
08-26-92	<0.00	<0.01	0.00	<0.01	<0.01	<0.01	<0.00	<0.01	0.00
08-21-92	<0.00	0.00	0.00	<0.01	<0.01	<0.01	<0.00	<0.01	0.00
08-19-92	<0.00	0.01	<0.00	<0.01	<0.01	<0.01	<0.00	<0.01	0.00
08-21-92	<0.00	0.00	<0.00	<0.01	--	<0.01	<0.00	--	0.00
09-03-92	<0.00	0.01	<0.00	<0.01	--	<0.01	<0.00	--	0.00

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

TRAVERSE COUNTY

STATION NUMBER	LOCAL IDENT-I-FIER	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	ELEV. OF LAND DEPTH OF WELL, TOTAL (FEET) (72008)	SURFACE DATUM (FT. ABOVE NGVD) (72000)
454717096331201	127N47W27AAABDD	08-18-92	2045	15.00	36.00	980

DATE	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH WATER WHOLE FIELD (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	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)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
08-18-92	2710	7.5	19.0	11.2	<0.010	0.083	1.80	0.020

ANALYSIS FOR ORGANIC CHEMICALS

STATION NUMBER	DATE	TIME	2,6-DI-ETHYL ANALINE WAT FLT 0.7 U GF, REC (UG/L) (82660)	ALA-CHLOR, WATER, DISS, REC, (UG/L) (46342)	ALPHA BHC DIS-SOLVED (UG/L) (34253)	HCH ALPHA D6 SRG WAT FLT 0.7 U GF, REC PERCENT (91065)	ATRA-ZINE, WATER, DISS, REC (UG/L) (39632)	BEN-FLUR-ALIN WAT FLD 0.7 U GF, REC (UG/L) (82673)	BUTYL-ATE, WATER, DISS, REC (UG/L) (04028)	CAR-BARYL WATER FLTRD 0.7 U GF, REC (UG/L) (82680)
4547170963312010	8-18-92	2045	<0.00	<0.00	<0.01	65	<0.01	<0.01	<0.00	<0.01

DATE	CARBO-FURAN WATER FLTRD 0.7 U GF, REC (UG/L) (82674)	CHLOR-PYRIFOS DIS-SOLVED (UG/L) (38933)	CYANA-ZINE, WATER, DISS, REC (UG/L) (04041)	DCPA WATER FLTRD 0.7 U GF, REC (UG/L) (82682)	DEETHYL ATRA-ZINE, WATER, DISS, REC (UG/L) (04040)	DI-AZINON, DIS-SOLVED (UG/L) (39572)	DIAZ-INON D10 SRG WAT FLT 0.7 U GF, REC PERCENT (91063)	DI-ELDRIN DIS-SOLVED (UG/L) (39381)	DIMETH-OATE WATER FLTRD 0.7 U GG, REC (UG/L) (82662)	DISUL-FOTON WATER FLTRD 0.7 U GF, REC (UG/L) (82677)
08-18-92	<0.00	<0.00	<0.01	<0.00	<0.02	<0.00	84	<0.02	<0.02	<0.10

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1991 TO SEPTEMBER 1992

TRAVERSE COUNTY--Continued

ANALYSIS FOR ORGANIC CHEMICALS

DATE	ETHO-PROP WATER FLTRD 0.7 U GF, REC (UG/L) (82672)	FONOFOS WATER DISS REC (UG/L) (04095)	LINDANE DIS-SOLVED (UG/L) (39341)	LIN-URON WATER FLTRD 0.7 U GF, REC (UG/L) (82666)	MALA-THION, DIS-SOLVED (UG/L) (39532)	METHYL AZIN-PHOS WAT FLT 0.7 U GF, REC (UG/L) (82686)	METHYL PARA-THION WAT FLT 0.7 U GF, REC (UG/L) (82667)	METO-LACHLOR WATER DISSOLV (UG/L) (39415)	METRI-BUZIN SENCOR WATER DISSOLV (UG/L) (82630)	MOL-INATE WATER FLTRD 0.7 U GF, REC (UG/L) (82671)
08-18-92	<0.00	<0.00	<0.01	<0.01	<0.01	<0.01	<0.00	<0.00	<0.01	<0.00

DATE	NAPROP-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82684)	P,P' DDE DISSOLV (UG/L) (34653)	PARA-THION, DIS-SOLVED (UG/L) (39542)	PEB-ULATE WATER FILTRD 0.7 U GF, REC (UG/L) (82669)	PENDI-METH-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82683)	PER-METHRIN CIS WAT FLT 0.7 U GF, REC (UG/L) (82687)	PHORATE WATER FLTRD 0.7 U GF, REC (UG/L) (82664)	PRON-AMIDE WATER FLTRD 0.7 U GF, REC (UG/L) (82676)	PRO-METON, WATER, DISS, REC (UG/L) (04037)	PROP-CHLOR, WATER, DISS, REC (UG/L) (04024)
08-18-92	<0.00	<0.02	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.00

DATE	PRO-PANIL WATER FLTRD 0.7 U GF, REC (UG/L) (82679)	PRO-PARGITE WATER FLTRD 0.7 U GF, REC (UG/L) (82685)	SI-MAZINE, WATER, DISS, REC (UG/L) (04035)	TEBU-THIURON WATER FLTRD 0.7 U GF, REC (UG/L) (82670)	TER-BACIL WATER FLTRD 0.7 U GF, REC (UG/L) (82665)	TER-BUFOS WATER FLTRD 0.7 U GF, REC (UG/L) (82675)	TERBUTH YLAZINE SURROGT WAT FLT 0.7 U GF, REC PERCENT (91064)	THIO-BENCARB WATER FLTRD 0.7 U GF, REC (UG/L) (82681)	TRIAL-LATE WATER FLTRD 0.7 U GF, REC (UG/L) (82678)	TRI-FLUR-ALIN WAT FLT 0.7 U GF, REC (UG/L) (82661)
08-18-92	<0.00	<0.01	<0.01	<0.01	<0.01	<0.01	75	<0.01	<0.00	<0.01

Baptism River near Beaver Bay

Looking Upstream (cable in background)

June 1938

☆U.S. GOVERNMENT PRINTING OFFICE: 1994 - 556-720

October 1, 1978

FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM UNITS (SI)

The following factors may be used to convert the inch-pound units published herein to the International System of Units (SI).

Multiply inch-pound units	By	To obtain SI units
	Length	
inches (in)	2.54×10^{1}	millimeters (mm)
	2.54×10^{-2}	meters (m)
feet (ft)	3.048×10^{-1}	meters (m)
miles (mi)	1.609×10^{0}	kilometers (km)
	Area	
acres	4.047×10^{3}	square meters (m^2)
	4.047×10^{-1}	square hectometers (hm^2)
	4.047×10^{-3}	square kilometers (km^2)
square miles (mi^2)	2.590×10^{0}	square kilometers (km^2)
	Volume	
gallons (gal)	3.785×10^{0}	liters (L)
	3.785×10^{0}	cubic decimeters (dm^3)
	3.785×10^{-3}	cubic meters (m^3)
million gallons	3.785×10^{3}	cubic meters (m^3)
	3.785×10^{-3}	cubic hectometers (hm^3)
cubic feet (ft^3)	2.832×10^{1}	cubic decimeters (dm^3)
	2.832×10^{-2}	cubic meters (m^3)
cfs-days	2.447×10^{3}	cubic meters (m^3)
	2.447×10^{-3}	cubic hectometers (hm^3)
acre-feet (acre-ft)	1.233×10^{3}	cubic meters (m^3)
	1.233×10^{-3}	cubic hectometers (hm^3)
	1.233×10^{-6}	cubic kilometers (km^3)
	Flow	
cubic feet per second (ft^3/s)	2.832×10^{1}	liters per second (L/s)
	2.832×10^{1}	cubic decimeters per second (dm^3/s)
	2.832×10^{-2}	cubic meters per second (m^3/s)
gallons per minute (gal/min)	6.309×10^{-2}	liters per second (L/s)
	6.309×10^{-2}	cubic decimeters per second (dm^3/s)
	6.309×10^{-5}	cubic meters per second (m^3/s)
million gallons per day	4.381×10^{1}	cubic decimeters per second (dm^3/s)
	4.381×10^{-2}	cubic meters per second (m^3/s)
	Mass	
tons (short)	9.072×10^{-1}	megagrams (Mg) or metric tons

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