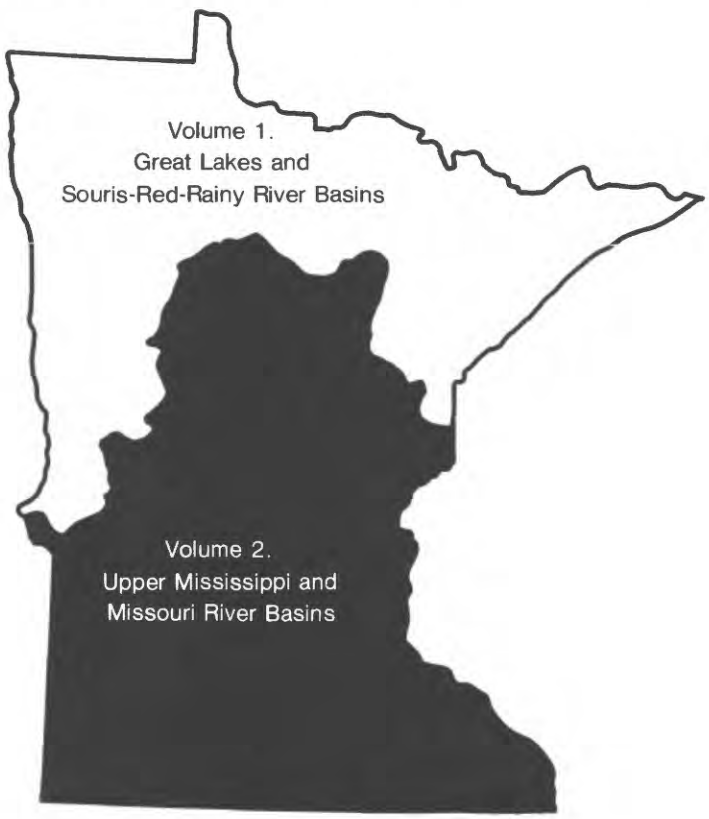
Water Resources Data Minnesota Water Year 1991

Volume 2. Upper Mississippi and Missouri River Basins



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN–91–2
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 1991

1990

OCTOBER

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1991

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SEPTEMBER

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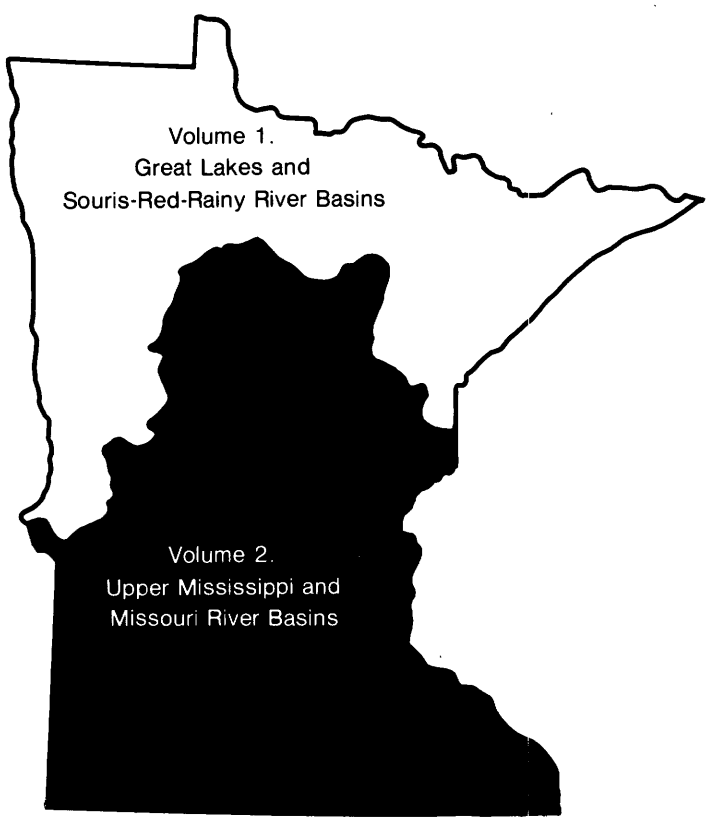
Water Resources Data Minnesota Water Year 1991

Volume 2. Upper Mississippi and Missouri River Basins

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



U.S. GEOLOGICAL SURVEY WATER-DATA REPORT MN-91-2
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

MANUEL LUJAN, JR, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information write to:

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

1992

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:

Lan H. Tornes, Water-Quality Specialist, Minnesota District
Alex Brietkrietz, Ground-Water Network Project Chief, Minnesota District

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

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Montevideo Field Headquarters

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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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7. Author(s) Kurt T. Gunard, Joseph H. Hess and James L. Zirbel			8. Performing Organization Rept. No. USGS-WDR-MN-91-2
9. Performing Organization Name and Address U.S. Geological Survey, Water Resources Division 2280 Woodale Drive Mounds View, MN 55112			10. Project/Task/Work Unit No. 11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address U.S. Geological Survey, Water Resources Division 2280 Woodale Drive Mounds View, MN 55112			13. Type of Report & Period Covered Annual Oct. 1, 1990 Sept. 30, 1991 14.

15. Supplementary Notes

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

16. Abstract (Limit: 200 words)

Water-resources data for the 1991 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 60 gaging stations; stage and contents for 9 lakes and reservoirs; water quality for 18 stream stations, 1 lake station, 22 partial-record sites, 1 precipitation station, 108 wells; and water levels for 119 observation wells. Also included are 59 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 or low-flow investigations. These data, together with the data in Volume 1, represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal Agencies in Minnesota

17. Document Analysis a. Descriptors

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

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement:	19. Security Class (This Report)	21. No. of Pages
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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--Continued

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

GROUND-WATER LEVELS

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

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

COUNTIES WITH QUALITY OF GROUND WATER RECORDS

PRECIPITATION SITES, FOR WHICH CHEMICAL QUALITY RECORDS ARE PUBLISHED

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 reccord 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 the data collected:
(d) discharge, (e) elevation (stage only)]

Station name	Station number	Drainage area (mi^2)	Period of record
UPPER MISSISSIPPI RIVER BASIN			
Mississippi River near Deer River, MN (d)	05210000	a3,190	1945-50
Prairie River near Taconite, MN (d)	05212700	a360	1967-83
Prairie River near Grand Rapids, MN (d)	05213000*	485	1909†, 1925-49
O'Brien Creek near Pengilly, MN (d)	05216800	-	1963-68
Initial tailings basin outflow near Keewatin, MN (d)	05216820	2.5	1982-85
Swan River near Calumet, MN (d)	05216850	114	1964-90
Swan River near Warba, MN (d)	05217000	254	1954-69
Swan River near Swan River, MN (d)	05217500	a290	1929
Mississippi River above Sandy River near Libby (above Sandy River), MN (d)	05218000	4,560	1895-1915, 1925-29
Mississippi River below Sandy River near Libby, MN (d)	05220500	a5,060	1930-90
Willow River near Palisade, MN (d)	05221000	442	1929
Ripple (Mud) River near Wealthwood, MN (d)	05226200	-	1937-39
Pelican Brook (Long Lake) near Pequot Lakes, MN (d)	05232000	-	1938-42, 1943-47
Rabbit River near Crosby, MN (d)	05241500	8.38	1945-63
Little Sand Lake outlet (Sand Lake outlet) near Dorset, MN (d)	05242700	a74	1930-41
Crow Wing River at Nimrod, MN (d)	05244000*	a1,010	1910-14, 1930-81
Crow Wing River at Motley, MN (d)	05244500	a2,140	1909† 1913-17, 1930-31
Diversion from Long Prairie River near Osakis, MN (d)	05244980	-	1939-47
Long Prairie River near Osakis, MN (d)	05245000	-	1949-54
Long Prairie River near Motley, MN (d)	05245500	973	1909-17, 1930-31
Crow Wing River at Pillager, MN (d)	05246000	a3,230	1903†, 1909-13, 1925-50
Mississippi River near Fort Ripley, MN (d)	05261000*	a11,010	1906, 1909-10, 1929
Nokasippi River near Fort Ripley, MN (d)	05261500	210	1929
Platte (Platt) River at Royalton, MN (d)	05268000*	338	1929-36
Mississippi River near Sauk Rapids, MN (d)	05269000	a12,400	1903-06
Mississippi River at Sartell, MN (d)	05270000	a12,450	1929, 1943-47†

"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
UPPER MISSISSIPPI RIVER BASIN--Continued			
Clearwater River at Clearwater, MN (d)	05273500	-	1937, 1940-42
Elk River above St. Francis River near Big Lake, MN (d)	05274500	384	1929
St. Francis River at Santiago, MN (d)	05274700	-	1965-70, 1980-81
St. Francis River above Zimmerman, MN (d)	05274750	-	1980-84
St. Francis River near Big Lake, MN (d)	05274900	-	1965-70
Mississippi River at Elk River, MN (d)	05275500	a14,500	1915-56
North Fork Crow River near Regal, MN (d)	05276000	215	1943-54
Middle Fork Crow River at New London, MN (d)	05277000	-	1939-42, 1943-47
Middle Fork Crow River (Calhoun Lake Diversion) near Spicer, MN (d)	05277500	-	1939, 1940-46
Middle Fork Crow River near Spicer, MN (d)	05278000	179	1949-87
North Fork Crow River near Rockford, MN (d)	05278400	-	1909-10
South Fork Crow River at Cosmos, MN (d)	05278500	221	1945-64
Buffalo Creek near Glencoe, MN (d)	05278930	374	1972-80
South Fork Crow River near Mayer, MN (d)	05279000*	a1,170	1934-79
South Fork Crow River near Rockford, MN (d)	05279500	a1,250	1909-12
Mississippi River at Anoka, MN (d)	05283500	a17,100	1897, 1905-13
Rum River at Onamia, MN (d)	05284500	414	1910-12
Rum River at Spencer Brook MN (d)	05284750	-	1960-64
Rum River at Cambridge, MN (d)	05285000	a1,160	1909-14
Rum River at St. Francis, MN (d)	05285500	-	1903
Rum River near Anoka, MN (d)	05286500	1,430	1905-06, 1909
Minnetonka Lake (head of Minnehaha Creek) near Wayzata (at Excelsior), MN (d)	05289000	-	1938-64
Minnehaha Creek at Minnetonka Mills, MN (d)	05289500	130	1953-64
MINNESOTA RIVER BASIN			
Minnesota River near Odessa, MN (d)	05292500	a1,340	1909-12, 1944-63
Pomme de Terre River near Morris, MN (d)	05293500	-	1937-39, 1940-47
Canby Creek at Canby, MN (d)	05299500	-	1938-39, 1940-46
Ten Mile Creek near Boyd, MN (d)	05300500	82.8	1949-51
Little Chippewa River near Lowry, MN (d)	05302000	a54	1941
Little Chippewa River near Starbuck, MN (d)	05302500*	111	1938-39
Chippewa River at diversion dam near Hancock, MN (d)	05303000	-	1930-39, 1940-46
Chippewa River at Benson, MN (d)	05303500	a1,270	1949-51
Shakopee Creek near Benson, MN (d)	05304000	352	1949-54

"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
MINNESOTA RIVER BASIN--Continued			
Chippewa River near Watson, MN (d)	05305000	a2,050	1910-17, 1931-36
South Branch Yellow Medicine River at Minneota, MN (d)	05311400	111	1960-81, 1983-87
Yellow Medicine River near Cottonwood, MN (d)	05311500	465	1945-46
Spring Creek near Clarkfield, MN (d)	05312000	a89	1945-46
Spring Creek near Hazel Run, MN (d)	05312500	101	1945-48
Yellow Medicine River near Hanley Falls, MN (d)	05313000	606	1945-47
Hawk Creek at outlet of Eagle Lake near Willmar, MN (d)	05313521	-	1972-73
Eagle Lake tributary No. 7 near Willmar, MN (d)	05313560	-	1972-73
Eagle Lake tributary No. 8 near Willmar, MN (d)	05313570	-	1972-73
Chetomba Creek near Maynard, MN (d)	05314000	a200	1949-51
Hawk Creek near Maynard, MN (d)	05314500*	474	1949-54
Prairie Ravine near Marshall, MN (d)	05315200*	5.63	1959-64
Redwood River near Green Valley, MN (d)	05315500	436	1945-57
Redwood River near Seaforth, MN (d)	05316000	573	1945-46
Minnesota River at New Ulm, MN (d)	05316770	9,536	1968-76
Dry Creek near Jeffers, MN (d)	05316900	3.13	1982-85
Minnesota River at Judson, MN (d)	05317500	a11,200	1938-50
East Branch (East Fork) Blue Earth River near Bricelyn, MN (d)	05318000*	132	1951-70
South Fork Watonwan River at diversion dam near St. James, MN (d)	05319000	-	1939, 1940-46
Blue Earth River at Mankato, MN (d)	05321000	a3,550	1938-39, 1940-42
Sand Creek at diversion dam near Jordan, MN (d)	05330400	-	1938-39, 1940-46
Purgatory Creek at Eden Prairie, MN (d)	05330800	-	1975-80
Nine Mile Creek at Bloomington, MN (d)	05330900	-	1963-73
ST. CROIX RIVER BASIN			
Glaisby Brook near Kettle River, MN (d)	05336200*	24.2	1959-70
Kettle River near Sandstone, MN (d)	05336500	825	1908-16
Grindstone River at Hinckley, MN (d)	05337000	-	1940-47
Snake River at Mora, MN (d)	05337500	422	1909-13
Snake River at Sanatorium Bridge near Pine City, MN (d)	05338000	-	1937-38
St. Croix River near Rush City, MN (d)	05339500	a5,120	1923-61
Sunrise River near Stacy, MN (d)	05340000	167	1949-65
Sunrise River near Lindstrom, MN (d)	05340050	231	1965-85

"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
LOWER MISSISSIPPI RIVER BASIN			
Vermillion River at Empire (Empire City), MN (d)	05345500	124	1942-44
Vermillion River at Hastings, MN (d)	05346000	195	1942-47 1990
Mississippi River at Wabasha, MN (d)	05371500	a56,600	1934
South Fork Zumbro River on Belt Line at Rochester, MN (d)	05372800*	155	1981
Bear Creek at Rochester, MN (d)	05372930*	80.0	1981
Silver Creek at Rochester, MN (d)	05372950*	17.3	1981
Cascade Creek at Rochester, MN (d)	05372990*	35.8	1981
South Fork Zumbro River near Rochester, MN (d)	05373000	304	1952-81
Zumbro River (South Branch) near Zumbro Falls, MN (d)	05373500	821	1911-17
Zumbro River at Zumbro Falls, MN (d)	05374000	-	1909-17, 1929-80
Zumbro River at Theilman, MN (d)	05374500	a1,320	1938-56
Zumbro River at Kellogg, MN (d)	05374900	1,400	1975-90
South Fork Whitewater River near Altura, MN (d)	05376500*	76.8	1939-71
Beaver Creek at Beaver, MN (d)	05377000	15.4	1939-40
Whitewater River at Beaver, MN (d)	05377500	288	1936-38 1939-56
Stockton Valley Creek at Stockton, MN (d)	05378230	-	1982-85
Straight Valley Creek near Rollingstone, MN (d)	05378300	5.16	1970-85
Gilmore Creek at Winona, MN (d)	05379000	8.95	1939-63
Mississippi River at Lamoile, MN (d)	05380500	a60,000	1930-31
Mississippi River at LaCrosse, WI (d)	05383500	-	1929-55
North Branch Root River tributary near Stewartville, MN (d)	05383600	0.73	1959-64
Rush Creek near Rushford, MN (d)	05384500*	129	1942-79
Root River near Lanesboro, MN (d)	05384000	615	1910 1911-17, 1940-85, 1987-90
South Fork Root River near Houston, MN (d)	b05385500	275	1953-83
Root River below South Fork near Houston, MN (d)	05386000	a1,560	1938-61
Turtle Creek near Austin, MN (d)	05456500	144	1947-51
Heron Lake outlet near Heron Lake, MN (d)	05475000	-	1930-43
BIG SIOUX RIVER BASIN			
Rock River at Luverne, MN (d)	06483000*	440	1911-14
Little Sioux River near Lakefield, MN (d)	06603000	17.1	1948-63
Jackson County ditch No. 11 near Lakefield, MN (d)	06603500	7.69	1948-61

* Presently operated as a high-flow partial-record station.
† Stage records only.
a Approximately.
b Discharge measurements made to maintain a current rating.

WATER RESOURCES DATA FOR MINNESOTA, 1990

INTRODUCTION

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

Water resources data for the 1991 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 60 gaging stations; stage and contents for 9 lakes and reservoirs; water quality for 18 stream stations, 1 lake station, 22 partial-record sites, 1 precipitation station, 108 wells; and water levels for 119 observation wells. Also included are 59 high-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data collection program, and are published as miscellaneous measurements or low-flow investigations. These data, together with the data in Volume 1, represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Minnesota.

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

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

Publications similar to this report are published annually by the Geological Survey for all States. These official Survey reports have an identification number consisting of the two-letter State abbreviation, the last two digits of the water year, and volume number. For example, this volume is identified as the "U.S. Geological Survey Water-Data Report MN-91-2. For archiving and general distribution, the reports for 1971-1974 water years also are identified as water-data reports. These water-data reports are for sale in paper copy or in microfiche by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Additional information, including current prices, for ordering specific reports may be obtained from the district chief at the address given on the back of the title page or by telephone (612) 783 3101.

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 about 19 in. (inches) in the northwest to more than 32 in. in the southeast. Precipitation during water year 1991 ranged from less than 20 in. in the northwest to 44 in. in several areas in southern, central, and east-central Minnesota. Precipitation ranged from more than 3 in. below normal (based on record period 1961-90) in small areas of northern, southwestern, and southeastern Minnesota to more than 12 in. above normal in other areas of southern, central, and east-central Minnesota; precipitation in one small area in central

Minnesota was more than 16 in. above normal during the water year (fig. 1).

The water year began with an 8- to 12-in. precipitation deficit in parts of northern Minnesota, and a 12- to 16-in. precipitation excess in parts of east-central and southeastern Minnesota. The following is a summary of precipitation during the 1991 water year:

October - above normal statewide except in the northwest and south where it was below normal.

November - below normal statewide.

December - near normal statewide except in parts of the south where it was considerably above normal.

January - below normal statewide.

February - below normal statewide except in the east-central, west-central, north-central, and northwest where it was above normal.

March - above normal statewide except in the northwest and northeast where it was below normal.

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

May - above normal statewide except in west-central region where it was below normal.

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

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

August - below normal statewide except in the south-central and southeast where it was above normal.

September - above normal statewide.

Two notable rainfalls occurred during the summer of 1991. The first was on Sunday, July 21, when approximately 6 in. of rain fell in a one-hour period in the Garvin Brook basin in southeastern Minnesota. This is about twice the 100-year one-hour rainfall for that area. The entire town of Stockton, which lies in the Garvin Brook valley, was flooded to depths as much as 5 feet. Four miles downstream from Stockton, the gage shelter for the gaging station, Garvin Brook near Minnesota City (05378235), was washed away. A survey showed that Garvin Brook had risen 17 feet at the gage site.

The second event was on September 7, when more than 6 in. of rain fell on Saturday evening between 2 pm and 10 pm from south of Breckenridge in west-central Minnesota near the North Dakota border to Paynesville in central Minnesota, and from Hector to Glencoe in central Minnesota. A Soil and Water Conservation District official reported 11 in. of rain just west of Glencoe. An additional 2 or more inches of rain fell over much of Minnesota on Sunday night, September 8. As a result, flood stages or near flood stages were reached in several tributaries to the Minnesota and Mississippi Rivers during September.

STREAMFLOW

Average annual runoff in Minnesota ranges from 1 in. in the west to 14 in. in the northeast. Annual runoff in water year 1991 ranged from 0.14 in. (6 percent of average) in a small part of northwestern Minnesota to 16.90 in. (129 percent of average) in east-central Minnesota (table 1, vol. 1). In contrast to the previous year, when runoff in the western one-third of the State was considerably less than one-half the long-term average, runoff in 1991 was less than one-half the long-term average only in the northwest. Runoff in west-central and southwestern Minnesota during 1991 generally exceeded the long-term average and for some streams was almost twice the long-term average. In the remaining eastern two-thirds of the State, runoff ranged from more than one-half the long-term average in the north to greater than twice the long-term average in some areas of the south (table 1, vol. 2).

In 1991, runoff to the Upper Mississippi and Missouri River Basins (Volume 2) ranged from below average in the north to considerably above average in parts of the south. Runoff ranged from as low as 47 percent of average in the Mississippi River at Grand Rapids (05211000) to as high as 222 percent of average in the Minnesota River at Mankato (05325000) in south-central Minnesota.

In east-central Minnesota, runoff in the Mississippi River at Aitkin (05227500) was 4.71 in. - 74 percent of the 46-year average (1946-91) of 6.40 in. and almost the same as in the previous year when runoff was 4.72 in. and 73 percent of average.

Runoff in the Crow River at Rockford (05280000), in the southern part of central Minnesota, was 8.54 in. or 216 percent of the station's 66-year average (1910-17, 1931, 1935-91) annual runoff of 3.96 in. reflecting the 8 to 20 in. of above normal precipitation in this basin during the 1991 water year (normal annual precipitation is 28 in.). In contrast, runoff in the previous year was 3.34 in. (86 percent of average).

In west-central Minnesota runoff in the Chippewa River near Milan (05304500) was 2.88 in., 127 percent of the station's 54-year average (1938-91) of 2.27 in. and more than twice the runoff that occurred in 1990 - 1.03 in. (46 percent of average).

In southwestern Minnesota, runoff in the Des Moines River at Jackson (05476000) was 4.84 in., 136 percent of the station's 56-year average (1936-91) of 3.56 in. This is 7 1/2 times the runoff that occurred in the previous year - 0.64 in. (18 percent of average), and is the result of 8 to 16 in. of above normal precipitation in this basin during 1991. Figure 2 shows the 1991 annual- and monthly-mean discharges for the above stations compared to the median of their mean discharge for a 30-year base period.

A new record peak discharge was recorded at Garvin Brook near Minnesota City (05378235) in southeastern Minnesota on July 21, 1991. The entire town of Stockton was inundated as a result of the intense rainfall. The stage rose to 17.79 feet at the gage on Garvin Brook, and a discharge of 10,800 ft^3/s was determined by indirect methods. The previous peak of record (1983, 1985-91), 1,580 ft^3/s, occurred on September 21, 1986 at a gage height of 6.63 ft. Also, record- and near-record-high monthly volumes occurred in the Minnesota and Mississippi Rivers as well as in several of their larger tributaries during late spring and summer of 1991.

The combined storage in the six Mississippi River Headwater Reservoirs (Winnibigoshish, Leech, Pokegama, Pine, Sandy, and Gull), in northern and central Minnesota, was 1,555,308 acre-feet at the close of the 1991 water year - an increase of 102,640 acre-feet from the close of last year.

WATER QUALITY

Boxplots for three U.S. Geological Survey National Stream-Quality Accounting Network (NASQAN) stations and one benchmark station are used to depict variability in concentrations of dissolved solids and nitrate as nitrogen in the Upper Mississippi River basin (figs. 3 and 4); there are no water-quality stations in the Missouri River basin in Minnesota.

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 of a centerline (the median) dividing a rectangle defined by the 75th and 25th percentiles. Whiskers 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.

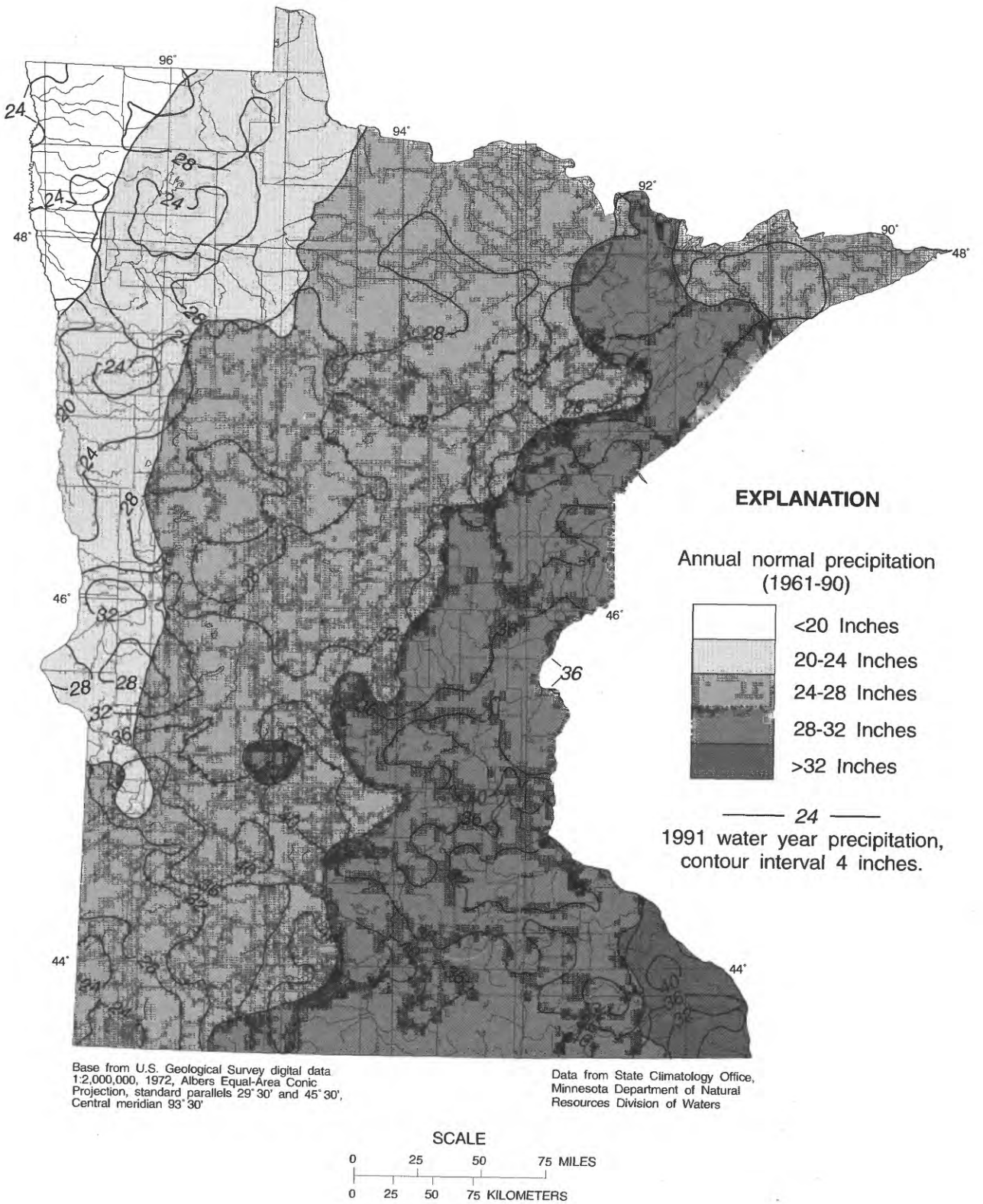


Figure 1.--Precipitation, in inches, during 1991 water year compared to normal annual precipitation in Minnesota.

Table 1.--Runoff at streamflow stations in 1991 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
			1991 Water year	Average	Inches	Water year	Inches	Water year	
05201500	Mississippi River at Winnibigoshish Dam near Deer River	1,442	2.65	4.88	11.61	1898*	0.85	1937*	107
05206500	Leech Lake River at Federal Dam	1,163	2.64	4.32	9.52	1899*	.40	1936*	107
05211000	Mississippi River at Grand Rapids	3,370	2.59	4.78	9.78	1906	.77	1934	108
05219000	Sandy River at Sandy Lake Dam at Libby	421	15.22	7.26	17.43	1986	.42	1931*	96
05227500	Mississippi River at Aitkin	6,140	4.71	6.40	11.03	1966	1.76	1977	46
05231000	Pine River at Cross Lake Dam at Cross Lake	562	4.28	5.32	13.48	1905*	.48	1931*	105
05245100	Long Prairie River at Long Prairie	432	3.93	4.81	11.51	1972	.79	1977	20
05247000	Gull River at Gull Lake Dam near Brainerd	287	3.72	5.16	10.79	1972	.76	1931*	80
05267000	Mississippi River near Royalton	11,600	4.32	5.36	10.44	1986	1.42	1934	67
05270500	Sauk River near St. Cloud	925	5.95	4.10	10.75	1972	0.75	1931	52
05275000	Elk River near Big Lake	615	9.23	6.12	14.77	1986	1.94	1935	60
05280000	Crow River at Rockford	2,520	8.54	3.96	14.84	1986	.35	1931	66§
05286000	Rum River near St. Francis	1,360	8.12	6.25	15.10	1986	.66	1934	59§
05287890	Elm Creek near Champlin	84.9	9.58	5.18	12.01	1986	.73	1988	13
05288500	Mississippi River near Anoka	19,100	6.16	5.62	12.62	1986	1.14	1934	60
05291000	Whetstone River near Big Stone City	389	2.97	1.74	6.32	1986	.05	1934	60
05292000	Minnesota River at Ortonville	1,160	1.67	1.24	4.26	1986	.03	1977, 1981	53
05293000	Yellow Bank River near Odessa	398	2.67	1.99	7.68	1986	.14	1981	52
05294000	Pomme de Terre River at Appleton	905	1.26	1.67	5.45	1986	.32	1977	56
05300000	Lac qui Parle River near Lac qui Parle	983	3.44	1.82	6.42	1986	.00	1934	60§
05301000	Minnesota River near Lac qui Parle	4,050	2.96	2.27	8.41	1986	.25	1959	49
05304500	Chippewa River near Milan	1,870	2.88	2.27	9.49	1986	.33	1940	54

Table 1.--Runoff at streamflow stations in 1991 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
			1991 Water year	Average	Inches	Water year	Inches	Water year	
05311000	Minnesota River at Montevideo	6,180	2.62	1.63	6.51	1986	.01	1934	70§
05313500	Yellow Medicine River near Granite Falls	653	4.35	2.56	9.98	1984	.17	1959	55§
05315000	Redwood River near Redwood Falls	629	4.60	2.70	9.21	1983	.23	1959	57§
05317000	Cottonwood River near New Ulm	1,280	5.42	3.36	12.63	1969	.44	1940	57§
05317200	Little Cottonwood River near Courtland	230	5.22	3.33	9.45	1983	.64	1977	18
05319500	Watonwan River near Garden City	812	9.58	5.32	13.83	1983	.86	1977	20§
05320000	Blue Earth River near Rapidan	2,430	10.95	5.12	16.08	1983	.59	1940, 1977	48§
05320500	Le Sueur River near Rapidan	1,100	10.73	5.73	16.53	1983	.63	1977	48§
05325000	Minnesota River at Mankato	14,900	6.09	2.75	8.44	1986	.12	1934	70§
05327000	High Island Creek near Henderson	237	6.99	4.83	13.54	1986	.53	1976	18
05330000	Minnesota River near Jordan	16,200	5.92	3.16	8.94	1986	.58	1940	57
05331000	Mississippi River at St. Paul	36,800	5.86	4.13	11.05	1986	.71	1934	93§
05336700	Kettle River below Sandstone	863	14.98	11.27	21.87	1972	4.00	1977	24
05337400	Knife River near Mora	102	10.78	8.28	17.97	1986	2.25	1988	17
05340500	St. Croix River at St. Croix Falls	6,240	12.06	9.38	18.65	1986	3.82	1934	89
05344500	Mississippi River at Prescott	44,800	6.94	5.21	11.68	1986	1.86	1931	63
05345000	Vermillion River near Empire	110	4.86	6.54	13.72	1986	2.91	1977	19§
05353800	Straight River near Fairbault	442	11.15	7.93	18.59	1983	1.35	1977	26
05372995	South Fork Zumbro River at Rochester	303	9.05	9.23	16.13	1983	3.91	1989	10
05376000	North Fork Whitewater River near Elba	101	4.85	6.29	12.54	1974	2.61	1968	26§
05378500	Mississippi River at Winona	59,200	8.32	6.38	13.04	1986	2.23	1934	63
05385000	Root River near Houston	1,270	9.35	7.50	16.48	1983	3.14	1931	61§
05457000	Cedar River near Austin	425	10.83	6.81	18.15	1983	1.98	1958	52§
05476000	Des Moines River at Jackson	1,220	4.84	3.56	13.35	1983	.17	1956	56

* Calendar year
§ Noncontinuous period

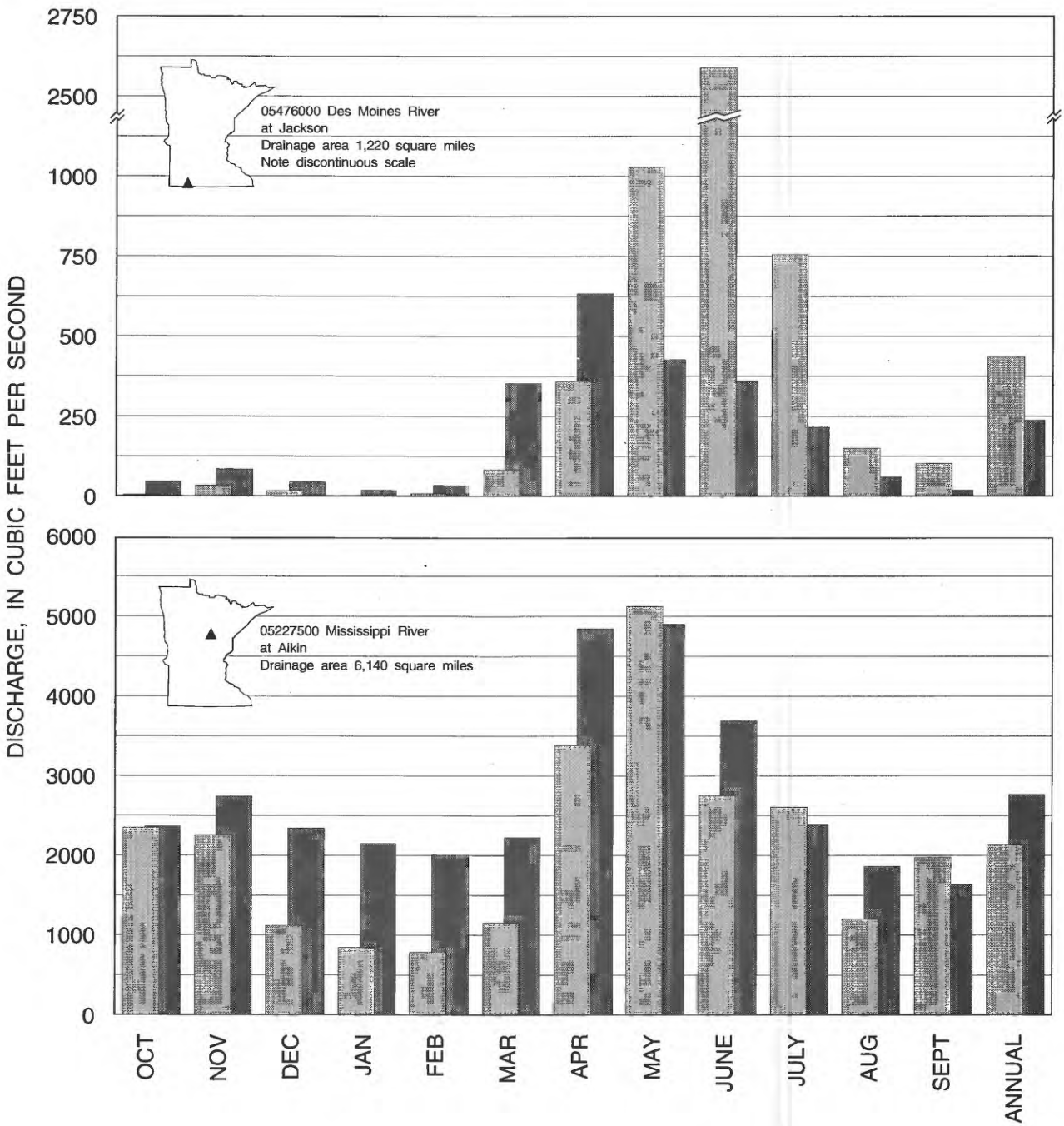
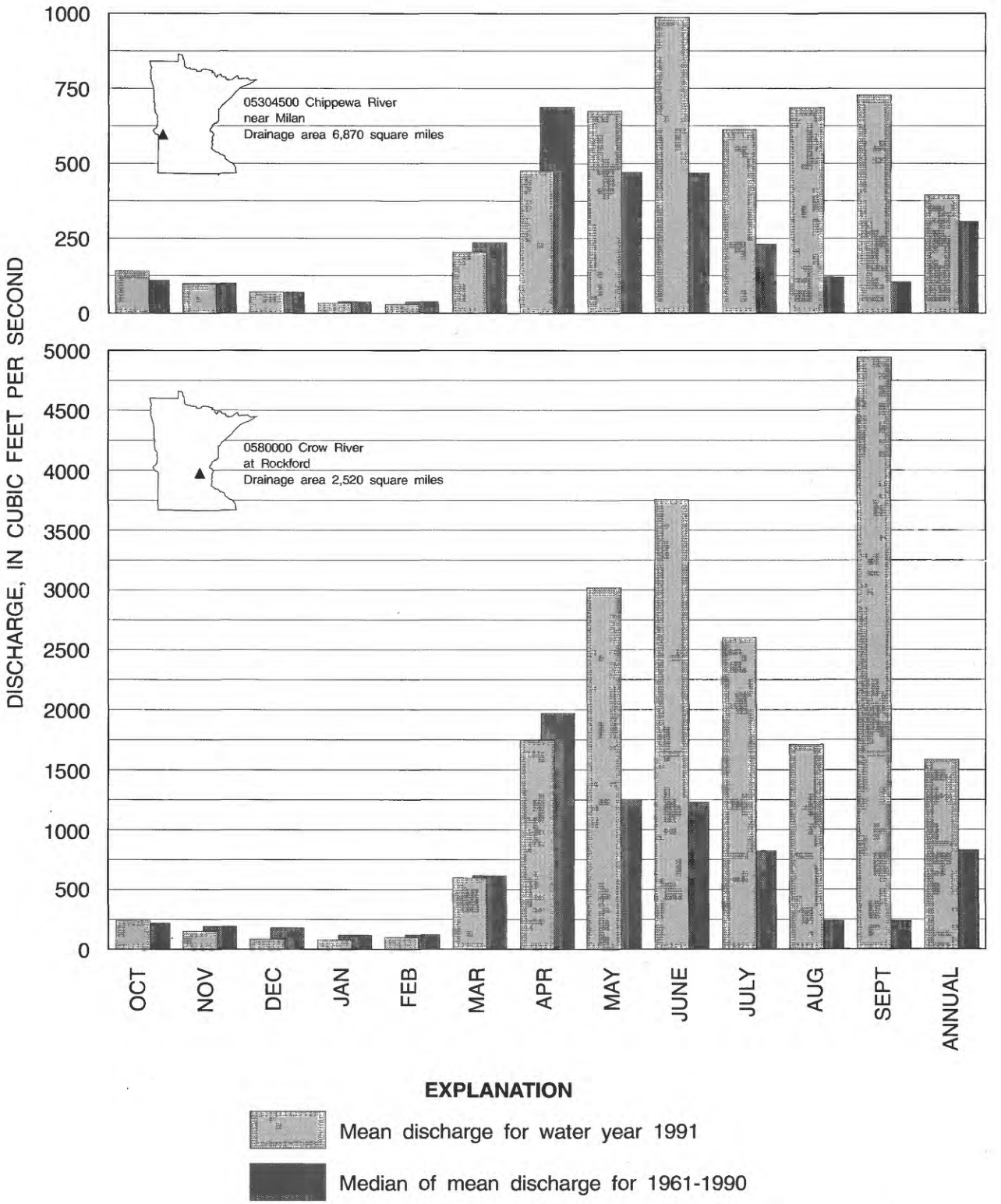


Figure 2.--Comparison of mean discharge for the 1991 water year with median



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

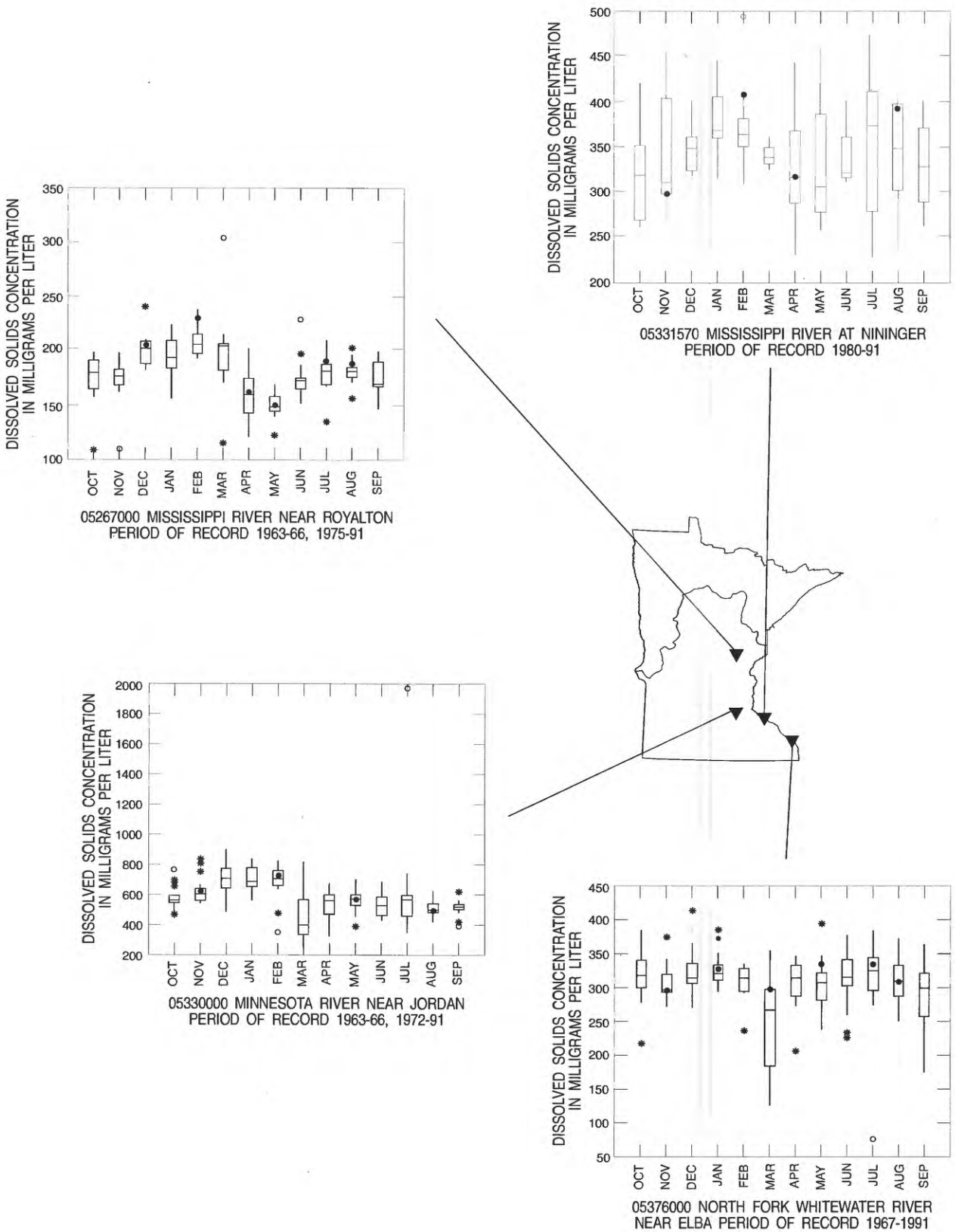


Figure 3--Comparison of dissolved-solids concentrations in water year 1991 with median for period of record at representative gaging stations.

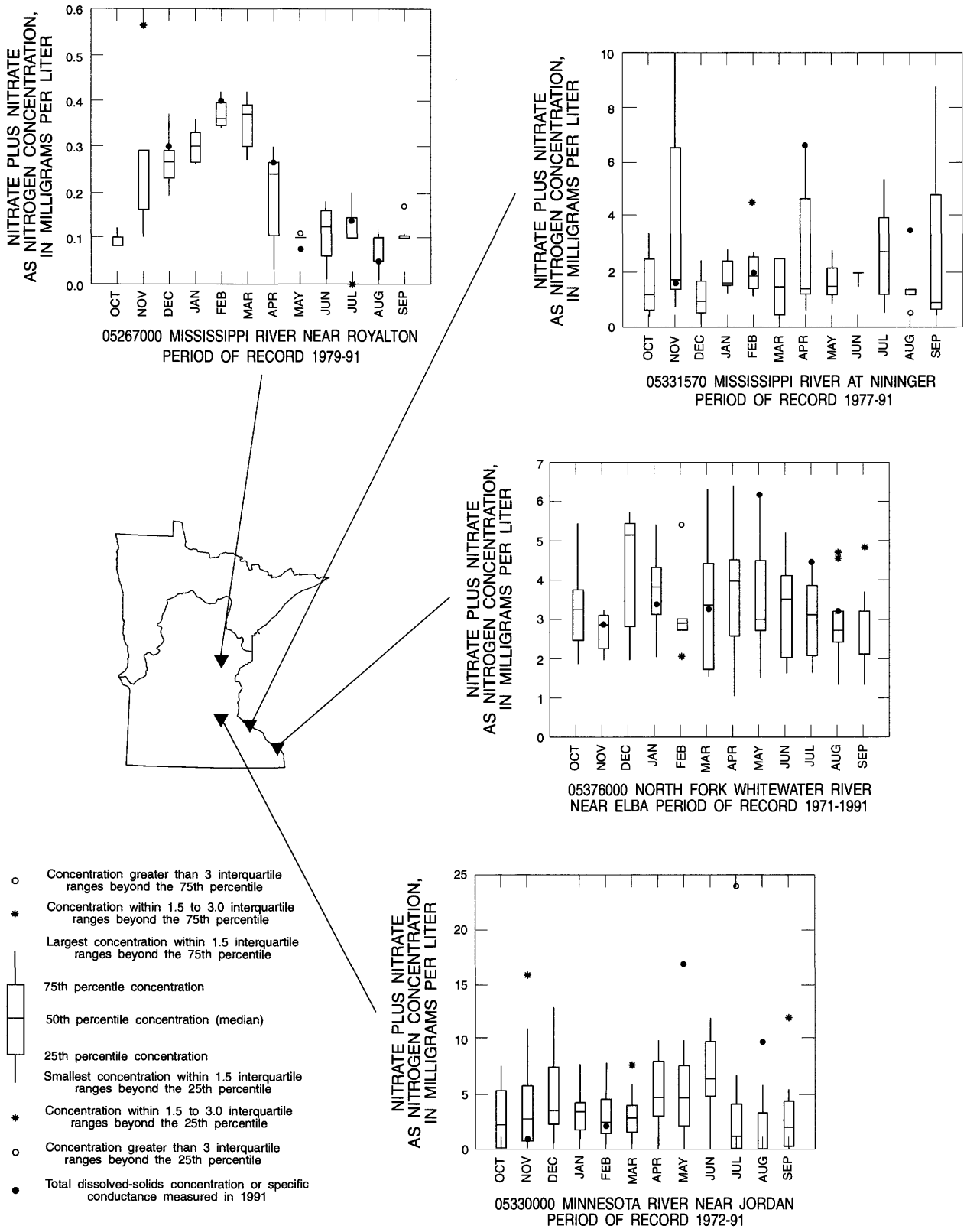


Figure 4--Comparison of nitrate plus nitrate concentrations in water year 1991 with median for period of record at representative gaging stations.

Observations greater than three interquartile ranges from the ends of the box are plotted with an open circle. Water year 1991 values are plotted with a closed circle to show where these data lie with respect to the historic distribution of data.

Dissolved-solids concentrations determined in 1991 generally were near the monthly medians in the Mississippi River near Royalton, the Minnesota River near Jordan, and the North Fork Whitewater River near Elba. Dissolved- solids concentrations in the Mississippi River at Nininger were near the monthly medians in all quarterly samples except the February sample, which was higher than the median.

Nitrate concentrations reported as nitrogen (analyzed for nitrate plus nitrite, with nitrite concentration assumed to be negligible) were near the median in samples collected in the Mississippi River near Royalton, but were higher in some samples collected at the other three stations. The samples with higher concentrations were collected in the spring and summer. A sample collected in August in the Minnesota River near Jordan had a nitrate concentration of 17 milligrams per liter.

One hundred twenty three water samples were collected from 88 wells. Nitrate concentrations were above the primary drinking-water standard of 10 mg/L (Minnesota Pollution Control Agency, 1988) in 13 samples. Fourteen samples were above the iron standard of 300 ug/L, and 7 samples were above the manganese standard of 50 ug/L.

GROUND-WATER LEVELS

Data for 18 wells completed in surficial sand aquifers, 17 in buried sand and gravel aquifers, 6 in the Upper Carbonate Aquifer, 6 in the St. Peter Aquifer, 35 in the Prairie du Chien-Jordan Aquifer, 12 in the Franconia-Ironton-Galesville Aquifer, 14 in the Mount Simon-Hinckley-Fond du Lac Aquifer, 4 in the Cretaceous Aquifer, and 2 in the Sioux Quartzite Aquifer are published in this volume.

Surficial Sand Aquifers

Water levels were higher in 13 of 18 shallow surficial-sand wells located in central and southern Minnesota at the end of the 1991 water year as compared to the previous year; water levels in 5 were lower. Water levels rose 4 feet in a well (440037094372601) in south-central Minnesota and were above the monthly average from June through September; this was the first time a monthly average had been exceeded in this well since July 1986 (see hydrograph page 242). Rainfall near this well was in excess of 10 inches above average during April-June. In well (46044094212501) in central Minnesota water levels rose 1.1 feet, but levels were below the monthly average during the entire year except for July (fig. 5a). During April and May, 4 inches of above average precipitation fell near this well. In the southern part of west-central Minnesota water levels in well (450631095562201) were almost at record highs the entire year in an area where precipitation was 11 inches above average. Water levels were below average during the entire water year in well (473023094570901) in north-central Minnesota with new monthly low levels from October to July, and an all-time low level in March for a 21-year period of record (see hydrograph page 196). In another well with 21 years of record (465142094433201) in the same part of the State an all-time record low level also occurred in March (fig. 5a and hydrograph page 217). The same well had new monthly low levels from October to May, near-record low levels in June, and new monthly low levels from July to September. In well (462415095003001) in the northern part of central Minnesota, water levels were below average all year. Less than average precipitation is the cause of the lower water levels in this part of the State.

Buried Sand and Gravel Aquifers

Water levels in 15 of 17 buried sand and gravel wells were higher at the end of the water year than they were at the end of the previous year. The two wells with lower water levels were in local areas of large groundwater withdrawals. One of these wells (444815093194901) with 12 years of record had new all-time monthly low levels for the entire water year (see hydrograph page 210). Ten feet of water level decline (about one foot per year) has been measured in this well. This well, located in Hennepin County, is in an area where pumping from the Prairie du Chien-Jordan aquifer has contributed to a decline in water levels in the overlying buried-drift aquifer. The other well (443801092571301) that had lower water levels is located in Dakota County and is in an area of large withdrawals for irrigation (see hydrograph page 205). This well had a new monthly low level in July, and was below average during August and September. As mentioned previously, most wells completed in the buried-drift aquifer had noticeable water level rises over the previous water year. Water level rises ranged from less than 1 foot to over 6 feet and averaged about 2 feet. For example, monthly water levels were about 3 feet above average from April to September in well 455236093172301 (fig. 5b and hydrograph page 219). Precipitation during this same period was in excess of 8 inches above average.

Upper Carbonate Aquifer

Two of 6 wells in the Upper Carbonate Aquifer, well (435742093164001) in south-central Minnesota and well (445538092232601) in southeastern Minnesota, about 45 miles apart, had above average levels from October through April, all-time high levels in May, and monthly high levels from June through September. Rainfall amounts during late spring and summer were 5 inches above average. Another well (440448092485501) in the southeast had record monthly high levels only in June, August, and September; the water level in this well was 4 feet higher at the end of September as compared to September 1990. Precipitation was at least 5 inches above average in the area of this well. Three wells (433846093220601, see hydrograph page 208, 434032093111801, and 434308093322001) in south-central Minnesota had record monthly high levels in November. These highs probably reflect the continuation of rising water levels from the wet fourth quarter of the previous water year.

St. Peter Aquifer

Two (450026093084201 and 450134092583101) of six wells completed in the St. Peter aquifer in the Twin Cities Metropolitan Area had record monthly low levels from October through July and both were below average during August and September (see hydrograph for former well page 229). Both wells have 20 years of record. Another well (445857093223101) had record monthly low levels from October through January, and levels were below average the rest of the year (see hydrograph page 215). Less than average precipitation in past years and increased demand for ground water have affected water levels in the St. Peter aquifer (fig. 5d). A well (434558093540001) in south-central Minnesota had an average monthly water-level rise of 0.3 foot during the water year. In this part of the State, precipitation was 6 inches above the yearly average and pumping of ground water for agricultural use from this well was reduced.

Prairie du Chien-Jordan Aquifer

Of 35 wells completed in the Prairie du Chien-Jordan aquifer, water levels were higher in 25 and lower in 10 wells compared to water levels in the previous water year. Water levels in 10 wells in the Minneapolis-St. Paul pumping center were, on the average, 3.4 feet higher than last year. This was in marked contrast to 7 wells in areas where irrigation is practiced where water levels were, on the average, about 2 feet lower than last year. In areas of large withdrawals, such as downtown St. Paul and Minneapolis, the monthly fluctuations in measured water levels was 51 feet in St. Paul and 54 feet in Minneapolis. In September, water levels rose 37 feet in St. Paul and 44 feet in Minneapolis. Water levels at the end of September were 11 feet above average in St. Paul and 14 feet above average in Minneapolis. A recorder well (445700093051001) in downtown St. Paul with 20 years of record had record-high levels in February, March, April, and May (fig. 5c). These record-high levels all occurred on the first Monday of each month between the hours of 2 a.m. and 6 a.m. It was determined that during the first weekend of each month, most if not all, nearby wells were not pumping, allowing the water level in this well to rise to its maximum natural level. A recorder well (43393509125180) in southeastern Minnesota had new monthly low levels for the entire year. Precipitation in this part of

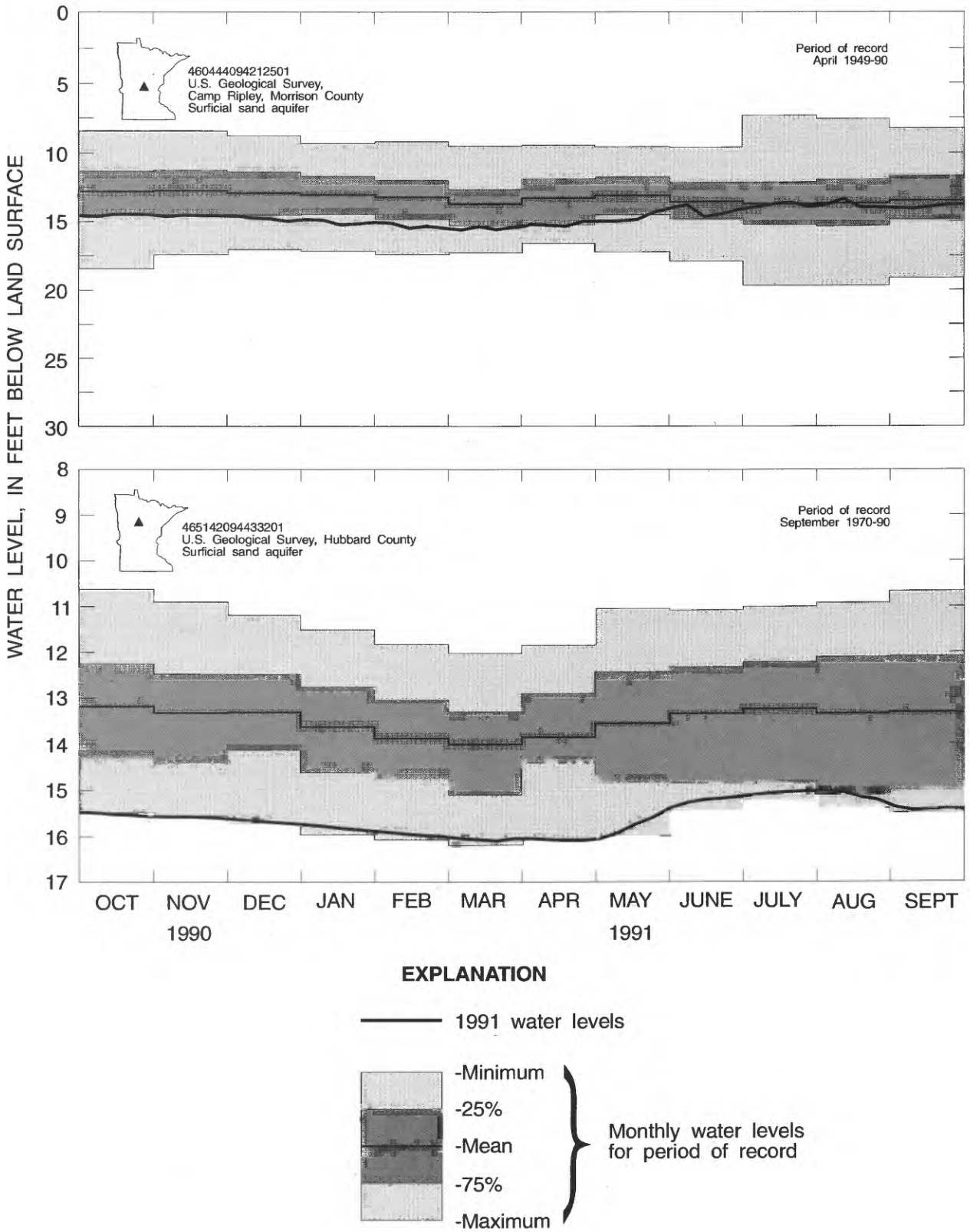


Figure 5a.--Relation of water levels during 1991 to long-term levels in two representative wells in surficial sand aquifers.

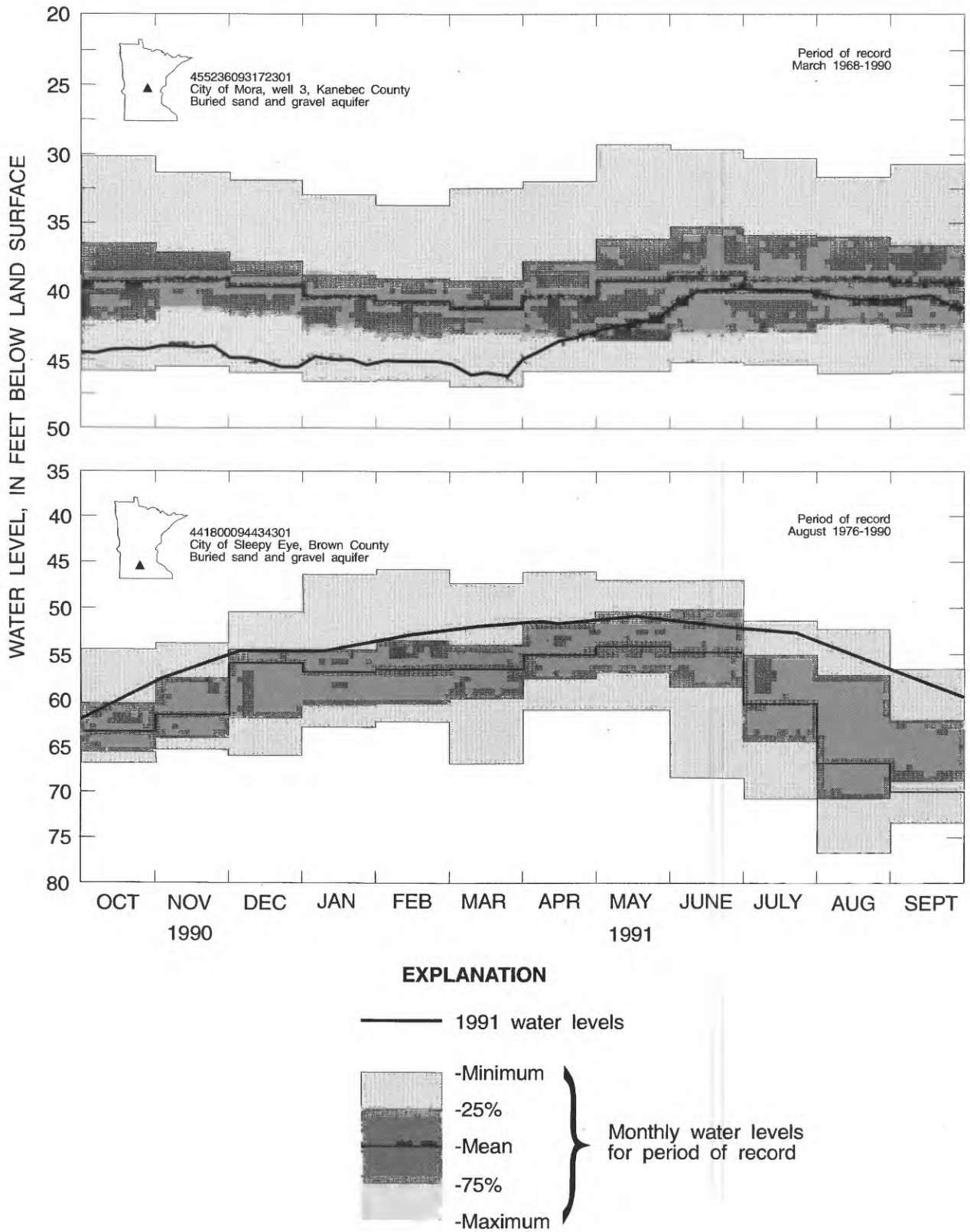


Figure 5b.--Relation of water levels during 1991 to long-term levels in two representative wells in buried sand and gravel aquifers.

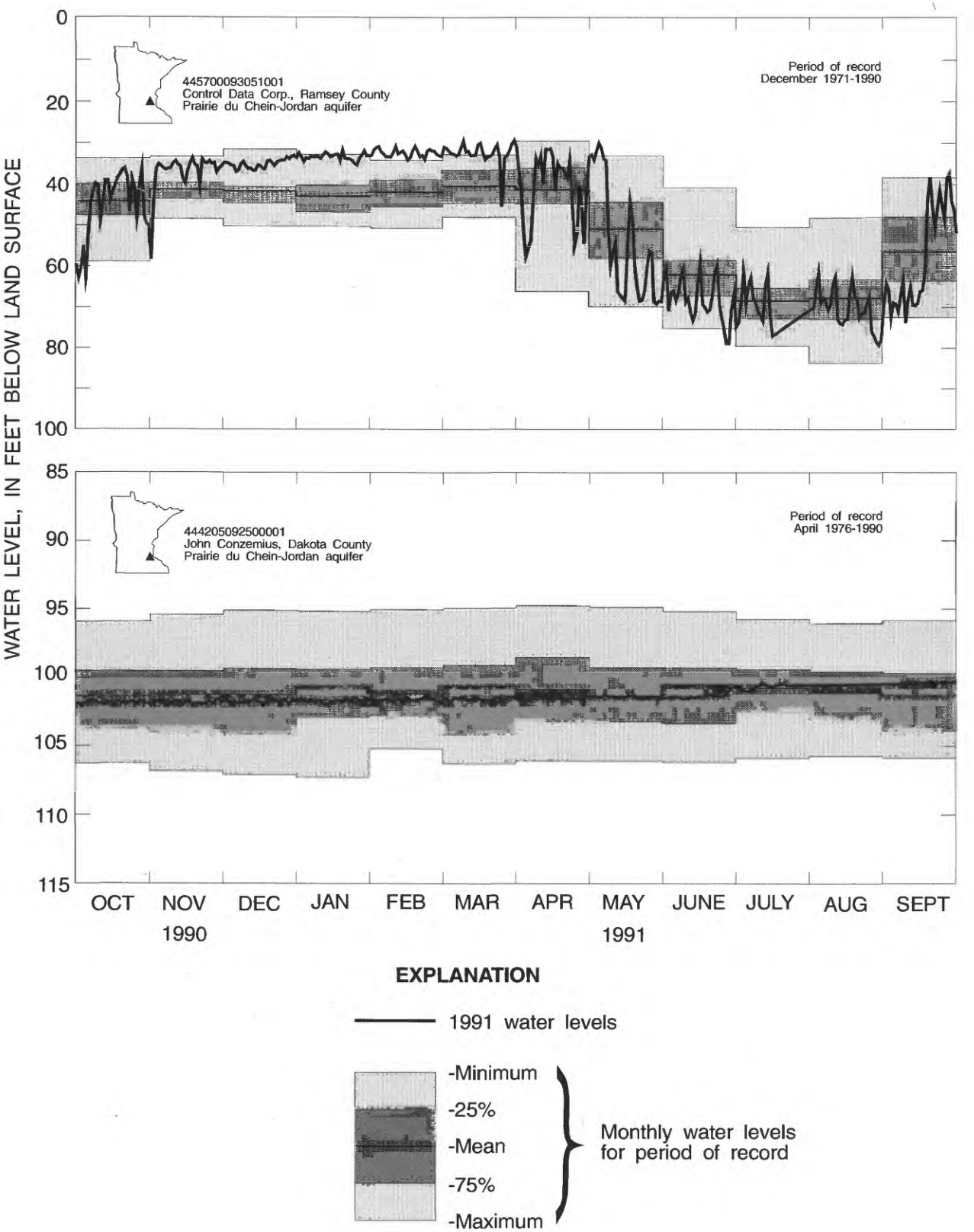


Figure 5c.--Relation of water levels during 1991 to long-term levels in two representative bedrock wells in the Prairie du Chein-Jordan aquifer.

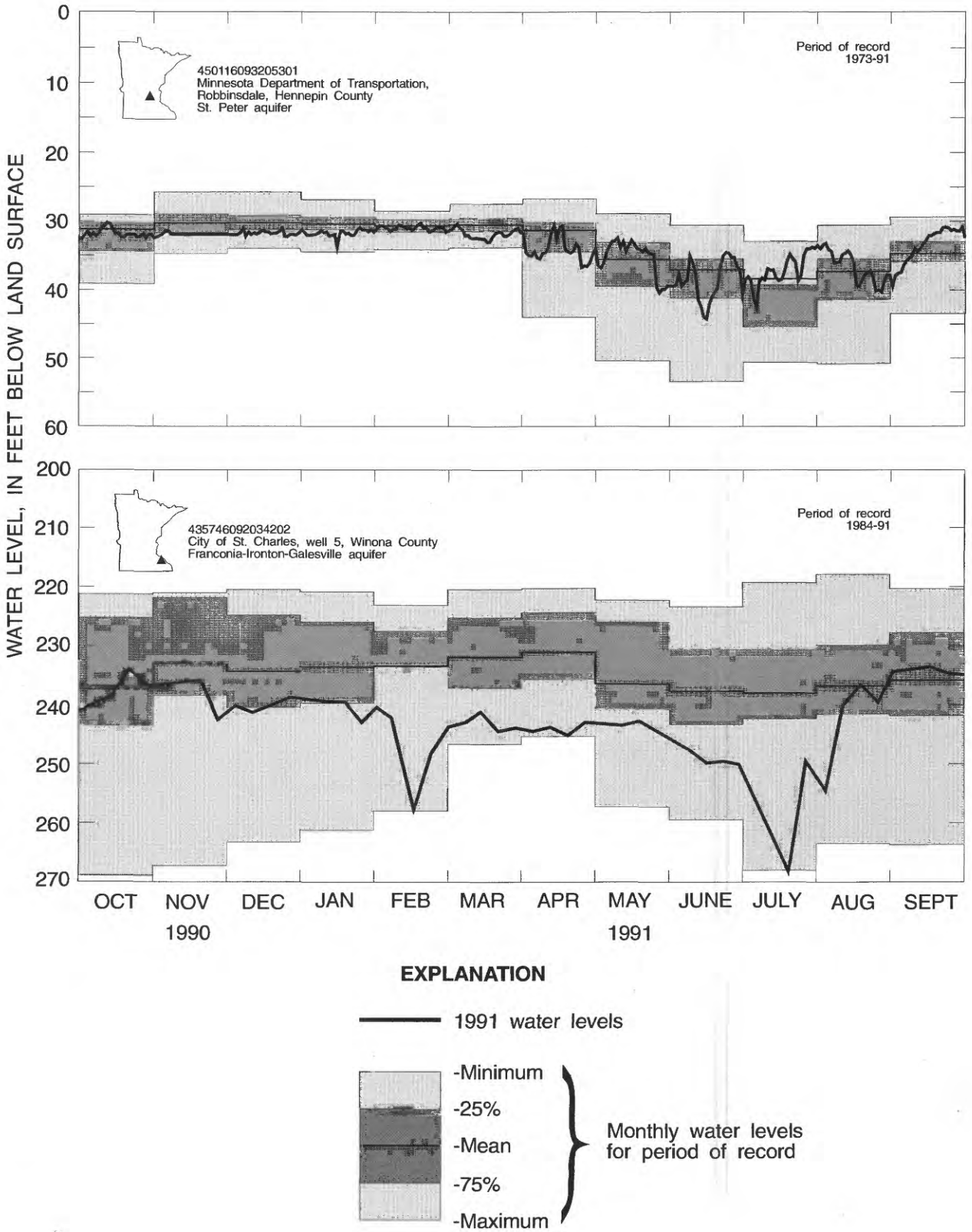


Figure 5d.--Relation of water levels during 1991 to long-term levels in two representative bedrock wells in the St. Peter and Franconia-Ironton-Galesville aquifer.

the State has not been adequate to reverse this downward trend in water level initiated by the drought in previous years. For example, from June to September, rainfall near this well was 4.6 inches below average. Another well (441134093505301), in a rural setting in south-central Minnesota had record monthly lows from October through June (see hydrograph page 198). These new lows are probably due to natural causes, such as less than average precipitation in previous years. Water levels rose in this well from July through September when precipitation was above average. A well (445044093102401) with 14 years of record, located in an urban setting, had record-low levels in November and July and water levels were below average during the entire year except for September. This well is less than 1 mile from several municipal supply wells.

Franconia-Ironton-Galesville Aquifer

Of 12 wells completed in the Franconia-Ironton-Galesville aquifer, 11 had higher water levels and 1 had lower water levels compared to the previous water year. The well with lower water levels is in a local pumping center; water levels were 3 feet lower than during comparable periods last year. A recorder well (440050094102801) in south-central Minnesota, had water levels below average from October through April and average from May through September. Rainfall was 8 inches above average from May to September in the area of this well. Two wells had record monthly low levels. One well (444427093353902), in central Minnesota, had a new low level in July; it is located near a sandstone quarry where pumping occurs. The other well (445536092462401), with 13 years of record, is located in east-central Minnesota. It had a new low level in March (see hydrograph page 240). In May the water level rose 4 feet as a result of 5 inches of above average rainfall during the month. Recharge to this well is very rapid as sand overlies the aquifer.

Mount Simon-Hinckley-Fond du Lac Aquifer

Of 14 wells completed in the Mount Simon-Hinckley-Fond du Lac aquifer, one well (444633093212901), with 20 years of record, had an all-time low water level in September. Another well (444427093353903), with 7 years of record, had a new monthly low level in September. Both wells are located in Scott county. Reversal of water level declines from 1989 within the Twin Cities Metropolitan Area has been observed in three wells. At the end of September 1991, water levels in two wells located in St. Paul and Minneapolis were 12 and 10 feet higher, respectively, than levels in September 1990 (fig. 5e). Water levels were, however, 13 feet below average in St. Paul and 25 feet below average in Minneapolis at the end of the water year. The third well, located at Lake Minnetonka, had a rise in water level of 6 feet from the lowest level of 1990. A well (443935091252901), in southeastern Minnesota, had a water level range of only 0.5 foot for the entire water year. Most of the wells in this part of the State are in the upper Prairie du Chien-Jordan aquifer and do not affect the Mount Simon-Hinckley Aquifer. Another well (450403093544501) in a rural setting of central Minnesota had a steady monthly water level rise of 1.1 feet over the previous water year.

Cretaceous Aquifer

Water levels in 4 wells completed in Cretaceous Sandstones were measured during the water year. Two of these wells in south-central Minnesota had gradual water level rises of 4 to 5 feet from their low levels of 1988 which was a drought year. In one well (440409094304901) the water rose 2 feet in response to 6 inches of above average rainfall during April and May of 1991. Water level in the other well (434359094422201) rose only 0.5 foot during this same period; 4 inches of above average rainfall fell in the area of this well. The latter well has a top screen setting of 372 feet, while the former well has a top screen setting of 100 feet. One well (441705096084501) in southwestern Minnesota, completed in the Dakota Sandstone (screened at 900 feet), had very little annual water level change - about 0.10 foot for the water year (see hydrograph page 221).

Sioux-Quartzite Aquifer

Two wells completed in the Sioux Quartzite in southwestern Minnesota were measured during the water year. One of these wells (434725094483001) with 10 years of record had new record low levels from October through March. This same well also had new monthly low levels for the entire previous water year and September of water year 1989 (19 consecutive months). These low water levels are probably related to deficient precipitation in previous years in this part of the State. The other well (434742095191501), located in southwestern Minnesota, had average water levels from October through March and above average April to September. Water levels in this well were also lower during water year 1990 but did not set any monthly records. It should be noted that the depth to the quartzite aquifer in the former well is 121 feet and in the latter well 225 feet.

SPECIAL NETWORKS AND PROGRAMS

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

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.

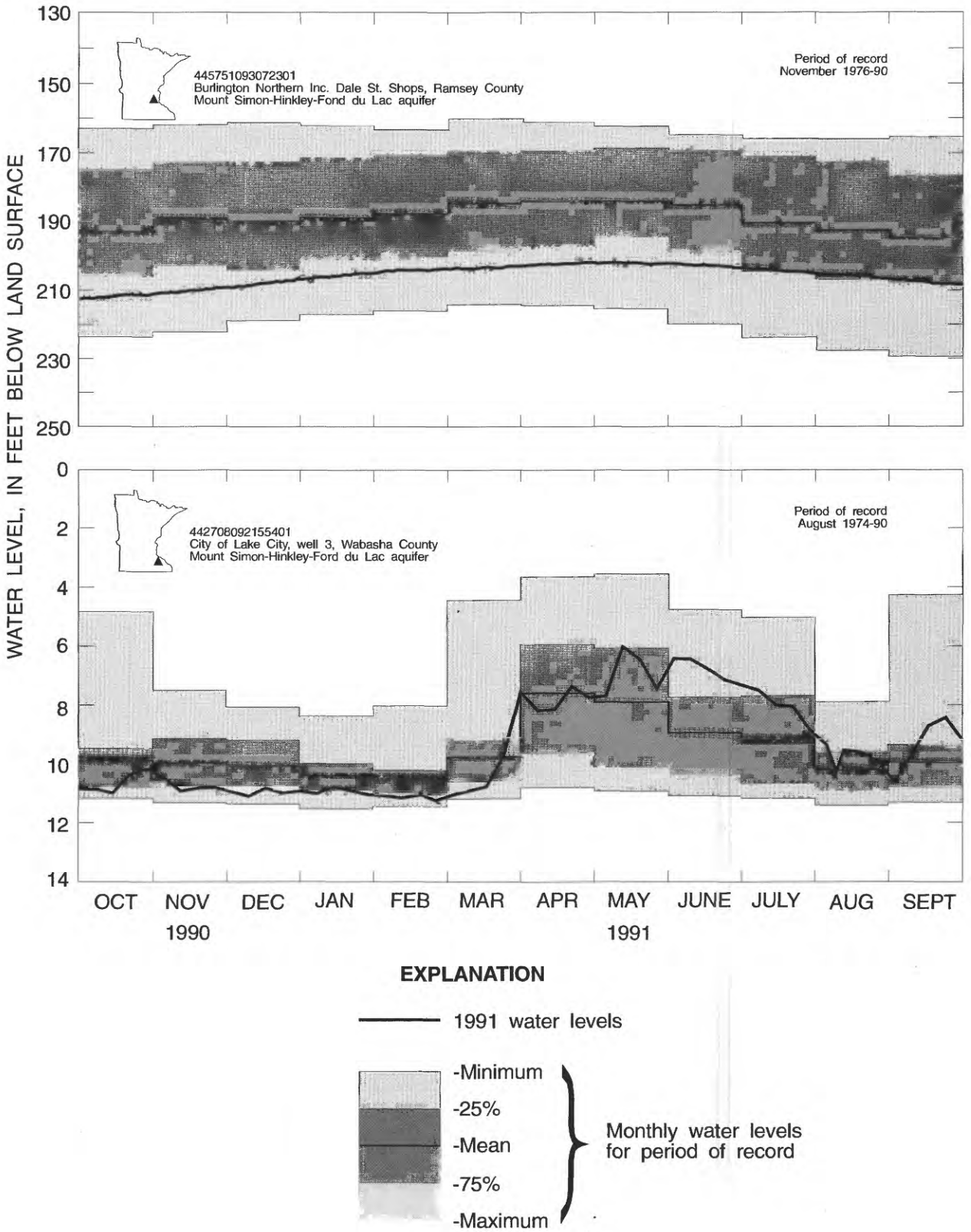


Figure 5e.--Relation of water levels during 1991 to long-term levels in two representative wells in the Mount Simon-Hinkley-Ford du Lac aquifer.

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 Order System and Station Number

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

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

Latitude-Longitude System for Wells and Miscellaneous Sites

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

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

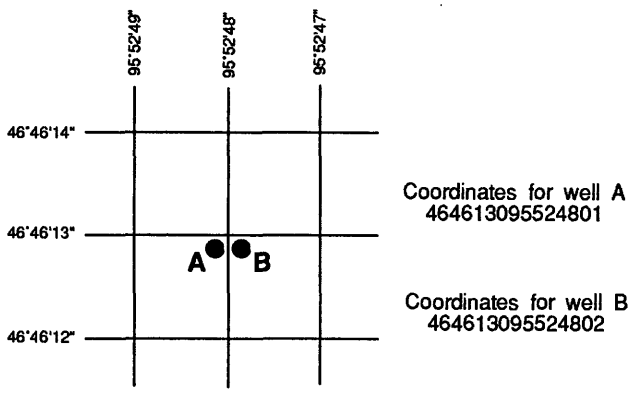


Figure 6.--Example of system for numbering wells and miscellaneous sites.

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 7 and 9.

Data Collection and Computation

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

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

In computing discharge records, results of individual measurements are plotted against the corresponding stages, and stage-discharge relation curves are then constructed. From these curves, rating tables indicating the approximate discharge for any stage within the range of the measurements are prepared. If it is

necessary to define extremes of discharge outside the range of current-meter measurements, the curves are extended using: (1) logarithmic-plotting; (2) velocity-area studies; (3) results of indirect measurements of peak discharge, such as slope-area or contracted-opening measurements, and computations of flow-over-dams or weirs; or (4) step-backwater techniques.

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

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

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

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

Data Presentation

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. At least 5 complete years of record must be available before this statistic is published for the designated period.

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 (AC-FT).--Indicates the depth, in acre-feet, to which the drainage area would be covered if all the runoff for the year were uniformly distributed on it.

ANNUAL RUNOFF (CFSM).--Indicates 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 for the year.

ANNUAL RUNOFF (INCHES).--Indicates the depth to which the drainage area would be covered if all the runoff for the year 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 8.

Arrangement of Records

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

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. 17 of this report. Also, detailed information on collecting, treating, and shipping samples may be obtained from the Geological Survey district office.

One sample can define adequately the water quality at a given time if the mixture of solutes throughout the stream cross section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary widely with different rates of water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled through several vertical sections to obtain a representative sample needed for an accurate mean concentration and for use in calculating load. All samples obtained for the National Stream Quality Accounting Network (see definitions) are obtained from at least several verticals. Whether samples are obtained from the centroid of flow or from several verticals, depends on flow conditions and other factors which must be evaluated by the collector.

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

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

Water Temperature

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

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

Sediment

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

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

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

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

Laboratory Measurements

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

Data Presentation

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

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

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

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

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

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

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

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

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

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

RECORDS OF GROUND-WATER LEVELS

Only water-level data from a national network of observation wells are given in this report. These data are intended to provide a sampling and historical record of water-level changes in the Nation's most important aquifers. Locations of the observation wells in this network in Minnesota are shown in figure 10.

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

Data Collection and Computation

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

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

Water-level records are obtained from direct measurements with a steel tape or from the graph or punched tape of a water-stage recorder. The water-level measurements in this report are given in feet with reference to land-surface datum (lsd). Land-surface datum is a datum plane that is approximately at land surface at each well. If nown, 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 28 representative wells; 7 in surficial-sand aquifers, 6 in buried-sand aquifers, and 15 in bedrock aquifers.

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) National Geodetic Vertical Datum of 1929 (NGVD of 1929); it is reported with a precision depending on the method of determination.

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

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

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

A table of water levels follows the station description for each well. Water levels are reported in feet below land-surface datum and all taped measurements of water level are listed. For wells equipped with recorders, abbreviated tables are published; generally, only water-level lows are listed for every fifth day and at the end of the month (eom). The highest and lowest water levels of the water year and their dates of occurrence are shown on a line below the abbreviated table. Because all values are not published for wells with recorders, the extremes may be values that are not listed in the table. Missing records are indicated by dashes in place of the water level. 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 35oC. In the laboratory these bacteria are defined as the organisms which produce colonies with a golden-green metallic sheet within 24 hours when incubated at 35°C ± 1.0°C on M-Endo medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample.

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

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

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

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

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

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

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

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

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

Bottom material: See Bed Material.

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

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

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

industrial wastes.

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

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

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

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

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

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

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

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

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

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 milliliters (mL) or liters (L). Numbers of planktonic organisms can be expressed in these terms.

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

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

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

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

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

The classification is as follows:

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

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

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

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

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

Picocurie (PC, pCi) is one trillionth (1×10^{-12}) of the amount of radioactivity represented by a curie (C1). A curie is the amount of radioactivity that yields 3.7×10^{10} radioactive disintegrations per second. A picocurie yields 2.22 dpm (disintegrations per minute).

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

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

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

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

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

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

Polychlorinated biphenyls (PCBs) are industrial chemicals that are mixtures of chlorinated biphenyl compounds having various percentages of chlorine. They are similar in structure to 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 per unit time [mg $O_2/(m^2 \cdot$ time) for periphyton and macrophytes and mg $O_2/(m^3 \cdot$ time) for phytoplankton] are the units for expressing primary productivity. They define production and respiration rates as estimated from changes in the measured dissolved oxygen concentration. The oxygen light and dark bottle method is preferred if the rate of primary production is sufficient for accurate measurements to be made within 24 hours. Unit time may be either the hour or day, depending on the incubation period.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Water year in Geological Survey reports dealing with surface-water supply is the 12-month period, October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 1991, is called the "1991 water year."

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

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

WRD is used as an abbreviation for "Water-Resources Data"

in the REVISED RECORDS paragraph to refer to State annual basic-data reports published before 1975.

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

PUBLICATIONS ON TECHNIQUES OF WATER-RESOURCES INVESTIGATIONS

The U.S. Geological Survey publishes a series of manuals describing procedures for planning and conducting specialized work in water-resources investigations. The material is grouped under major subject headings called books and is further divided into sections and chapters. For example, Section A of Book 3 (Applications of Hydraulics) pertains to surface water. The chapter, the unit of publication, is limited to a narrow field of subject matter. This format permits flexibility in revision and publication as the need arises.

The reports listed below are for sale by the U.S. Geological Survey, 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. Ficke, and G. F. Smoot: USGS--TWRI Book 1, Chapter D1. 1975. 65 pages.

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

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

2-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. S. 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 idirect 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.

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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-AI0. *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.

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 Antonius 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. Rathburn, N. Yotsukura, G. W. Parker, and L. L. DeLong: USGS--TWRI Book 3, Chapter A18. 1989. 52 pages.

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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.

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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-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.

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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.

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.

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.

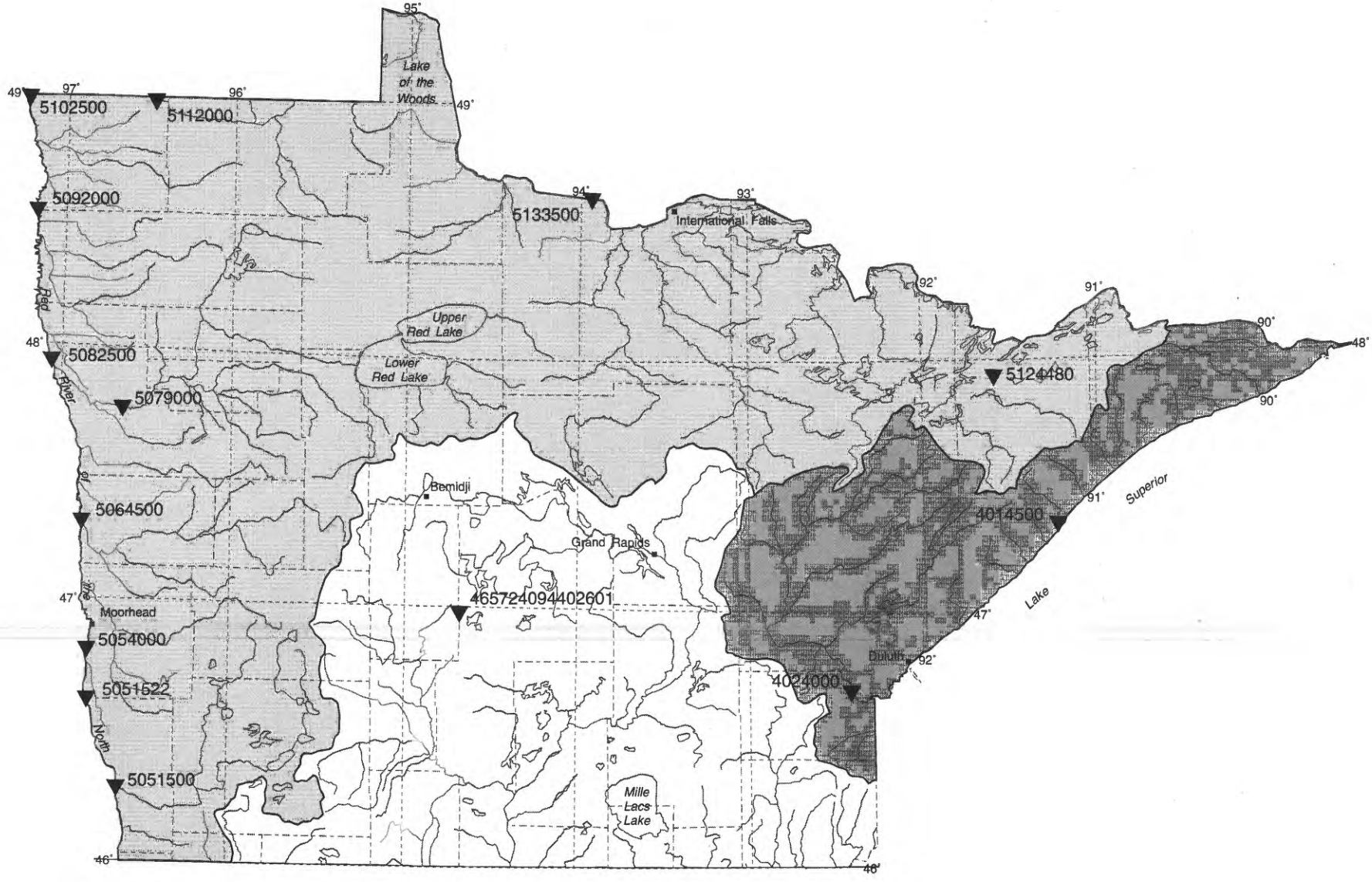
8-A1. *Methods of measuring water levels in deep wells,* by M. S. Garber and F. C. Koopman: USGS--TWRI Book 8, Chapter A1. 1968. 23 pages.

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

South Fork Zumbro River near Rochester
May 8, 1958


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
5079000
5124480
90°
48°
Bemidji
5064500
91°
Superior
4014500
Grand Rapids
47°
Red
465724094402601
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46°
46°

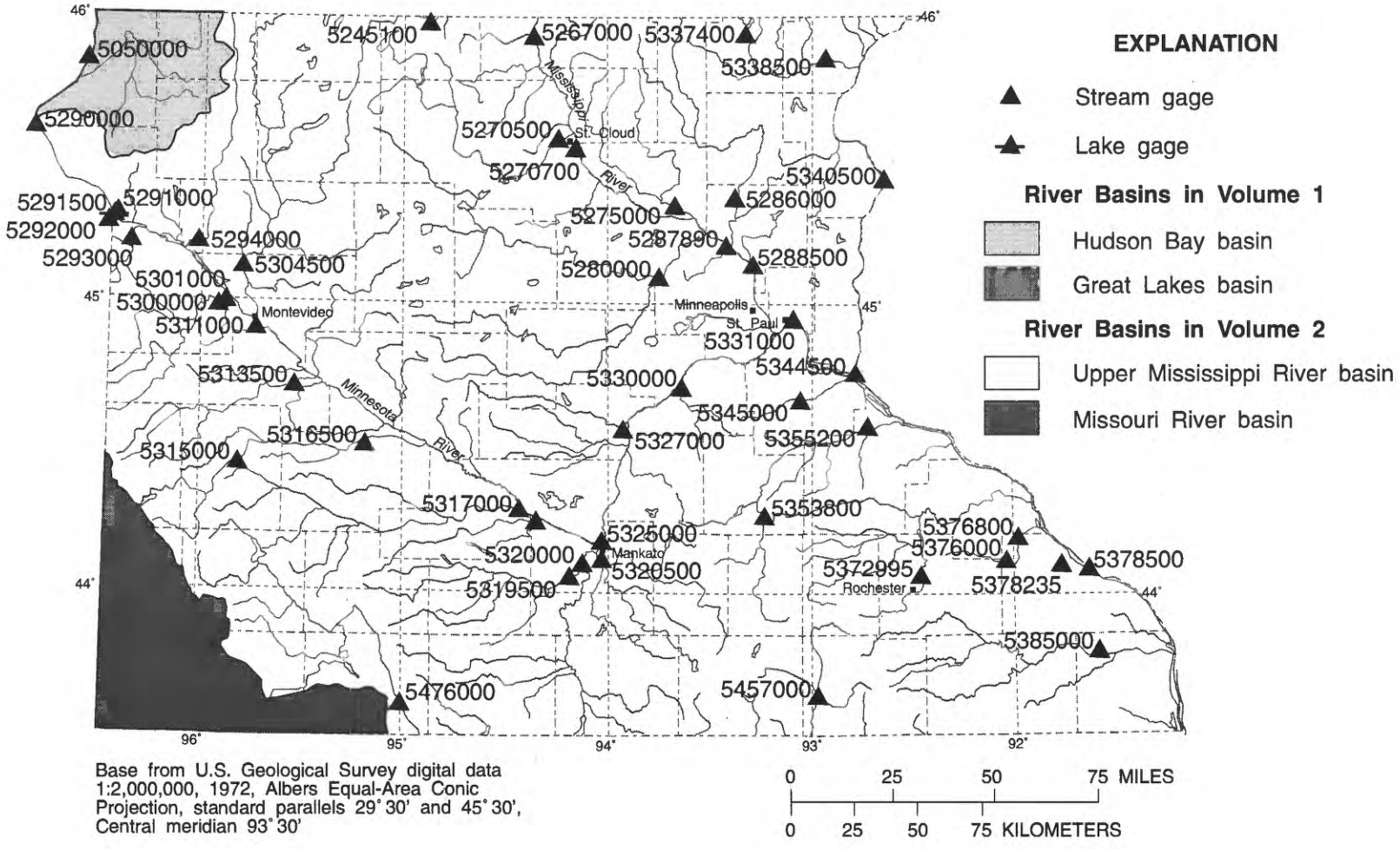
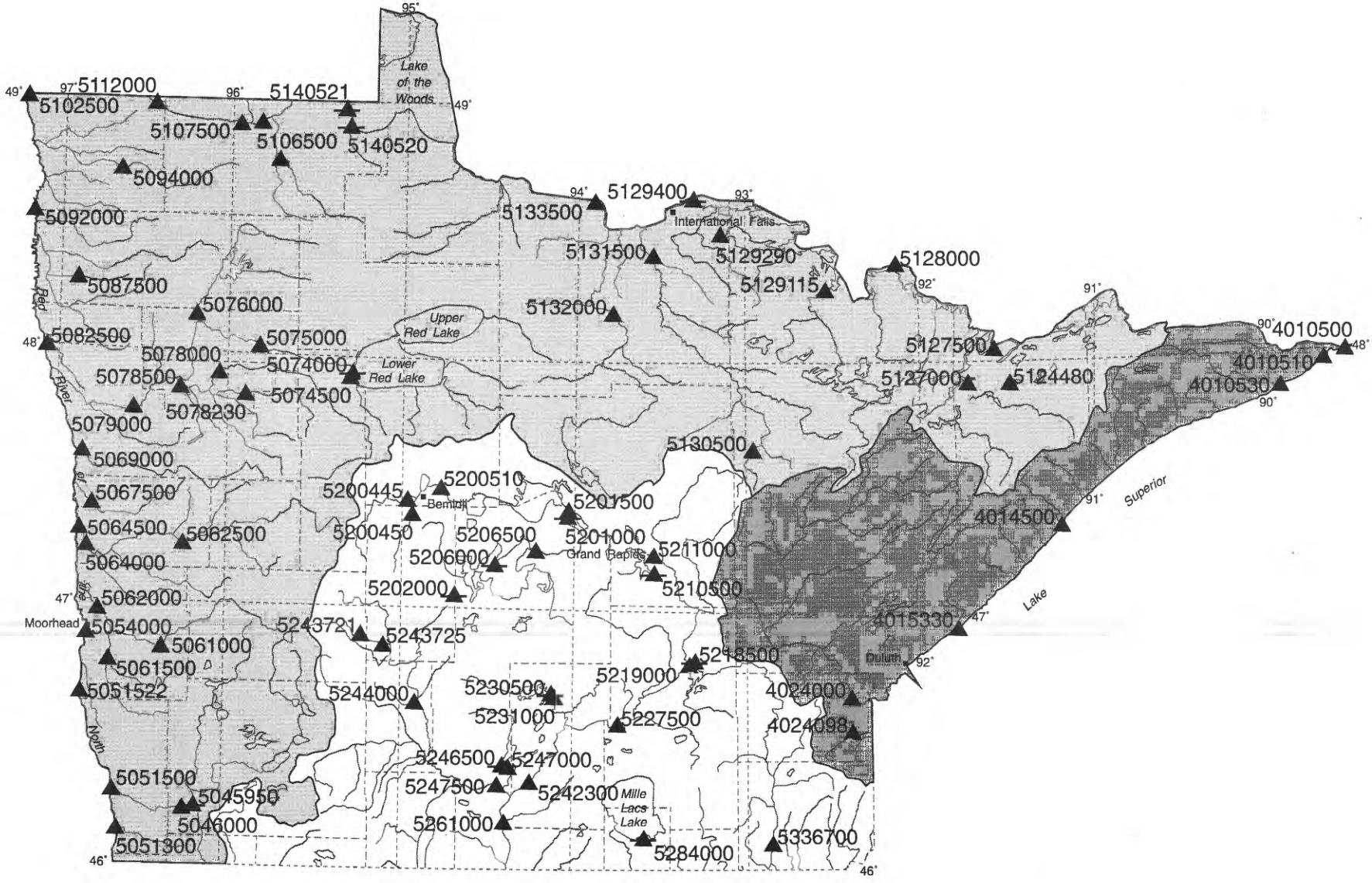


Figure 7.--Location of lake and stream-gaging stations


95°
49°
97°
96°
49°
Lake of the Woods
5112000
5102500
5140521
5107500
5106500
5140520
5094000
94°
5129400
93°
5092000
5133500
International Falls
5131500
5129290
5128000
5087500
5129115
92°
91°
Red River
5076000
5132000
Upper Red Lake
90°
4010500
48°
5082500
5075000
5127500
5078000
5074000
Lower Red Lake
4010510
5078500
5127000
5124480
4010530
5074500
90°
5078230
5079000
5130500
5069000
5200510
5067500
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Bemidt
5201500
91°
Superior
4014500
5064500
5062500
5200450
5206500
5201000
5211000
Grand Rapids
5064000
5206000
47°
5062000
5202000
5210500
Moorhead
5054000
5243721
5243725
4015330
47°
Lake
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5218500
Duluth
92°
5061500
5219000
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5051522
5244000
5231000
5227500
4024098
North
5246500
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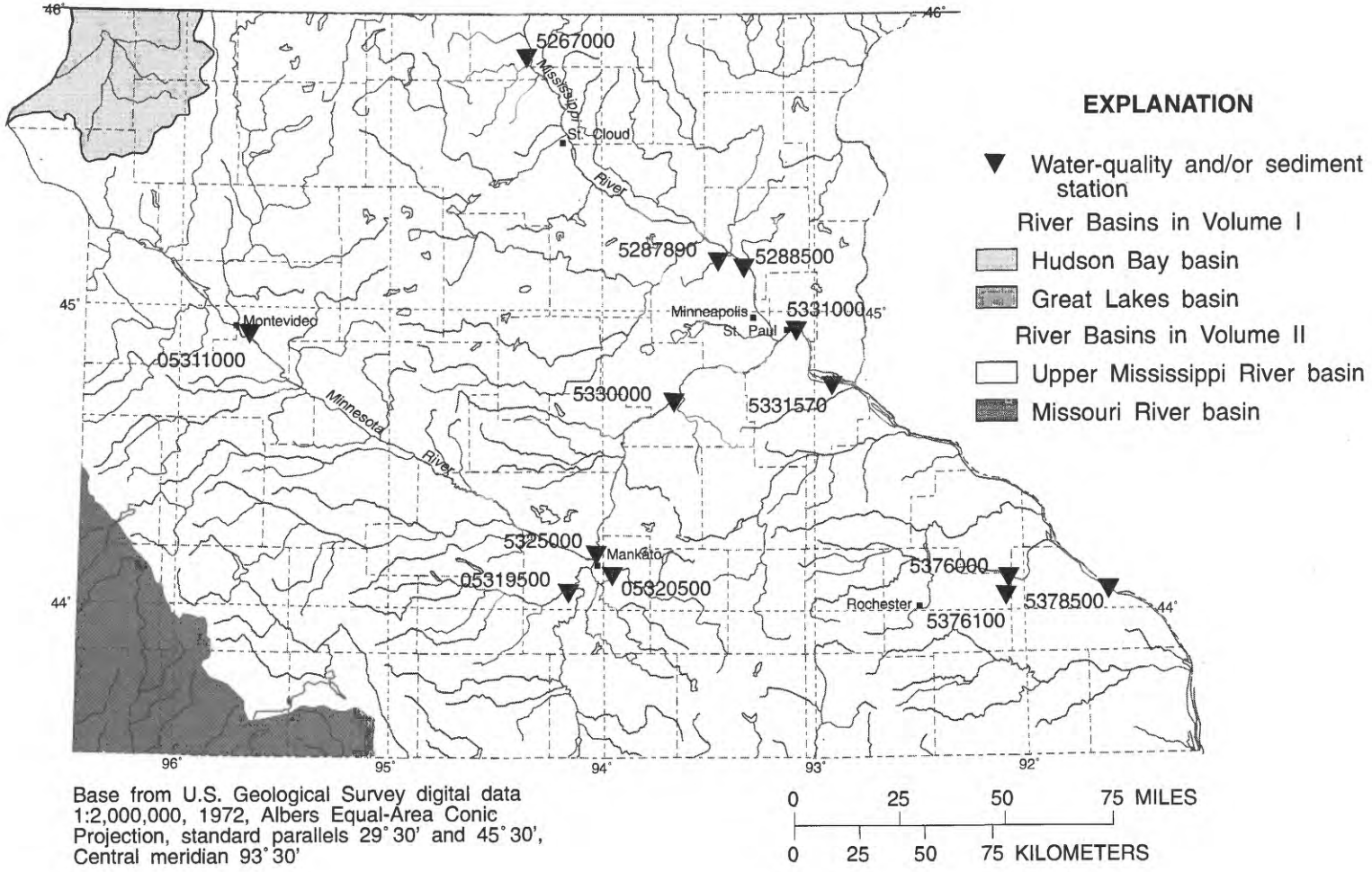


Figure 8.--Location of surface-water-quality stations

MISSISSIPPI RIVER MAIN STEM

05200510 MISSISSIPPI RIVER NEAR BEMIDJI, MN

LOCATION.--Lat 47°29'00", long 94°43'40", in SE¼SW¼ sec.3, T.146 N., R.32 W., Beltrami County, Hydrologic Unit 07010101, 3.5 mi east of Bemidji on right bank 100 ft upstream of County Highway 12 and 400 ft downstream from Stump Lake dam.

DRAINAGE AREA.--610 mi^2, approximately.

PERIOD OF RECORD.--September 1987 to current year (no winter records).

GAGE.--Water-stage recorder. Elevation of gage is 1,315 ft above National Geodetic Vertical Datum of 1929, from topographic map.

REMARKS.--Records good except those for estimated daily discharges, which are poor. Some regulation by Stump Lake dam upstream from station.

EXTREMES FOR CURRENT YEAR.--Maximum discharge during period October, March to September, 773 ft^3/s, May 17, gage height, 4.58 ft; minimum, 34 ft^3/s, Oct. 16, gage height, 2.27 ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	56	---	---	---	---	---	187	200	487	127	e85	100
2	51	---	---	---	---	---	185	197	473	125	e85	101
3	71	---	---	---	---	---	151	195	466	127	90	103
4	74	---	---	---	---	---	190	202	337	128	95	103
5	65	---	---	---	---	---	190	213	247	152	95	103
6	67	---	---	---	---	---	192	222	252	188	95	103
7	67	---	---	---	---	---	192	228	238	186	95	101
8	66	---	---	---	---	---	192	234	231	185	95	100
9	66	---	---	---	---	---	192	242	196	185	96	102
10	65	---	---	---	---	---	192	254	183	186	97	107
11	66	---	---	---	---	---	139	270	223	185	96	106
12	66	---	---	---	---	---	112	280	220	185	94	106
13	66	---	---	---	---	---	114	289	218	185	97	136
14	69	---	---	---	---	---	114	326	216	185	97	201
15	71	---	---	---	---	---	115	400	213	185	96	200
16	72	---	---	---	---	---	102	416	210	185	97	162
17	81	---	---	---	---	---	111	553	141	185	98	126
18	78	---	---	---	---	---	111	672	99	186	97	136
19	80	---	---	---	---	278	120	648	99	129	91	134
20	80	---	---	---	---	278	121	629	101	100	85	129
21	82	---	---	---	---	281	120	613	100	103	94	124
22	82	---	---	---	---	281	139	583	99	106	94	127
23	84	---	---	---	---	281	160	577	98	109	95	125
24	85	---	---	---	---	283	150	523	96	153	93	122
25	86	---	---	---	---	284	159	463	93	190	67	131
26	83	---	---	---	---	284	193	457	e86	190	83	135
27	82	---	---	---	---	231	193	452	82	190	96	138
28	83	---	---	---	---	184	193	444	94	190	99	139
29	99	---	---	---	---	185	193	344	125	190	99	138
30	99	---	---	---	---	185	199	259	128	190	101	142
31	99	---	---	---	---	186	---	306	---	149	100	---
TOTAL	2341	---	---	---	---	---	4721	11691	5851	5059	2897	3780
MEAN	75.5	---	---	---	---	---	157	377	195	163	93.5	126
MAX	99	---	---	---	---	---	199	672	487	190	101	201
MIN	51	---	---	---	---	---	102	195	82	100	67	100
AC-FT	4640	---	---	---	---	---	9360	23190	11610	10030	5750	7500
CFSM	.12	---	---	---	---	---	.26	.62	.32	.27	.15	.21
IN.	.14	---	---	---	---	---	.29	.71	.36	.31	.18	.23

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1991, BY WATER YEAR (WY)

MEAN	157	---	---	---	---	---	277	360	224	125	90.7	120
MAX	263	---	---	---	---	---	399	479	300	163	119	214
(WY)	1989	---	---	---	---	---	1989	1989	1989	1991	1988	1988
MIN	75.5	---	---	---	---	---	157	278	104	62.2	61.9	62.3
(WY)	1991	---	---	---	---	---	1991	1988	1988	1988	1989	1990

SUMMARY STATISTICS	FOR 1991 WATER YEAR		WATER YEARS 1987 - 1991	
HIGHEST DAILY MEAN			771	Apr 28 1989
LOWEST DAILY MEAN			22	Jul 12 1988
ANNUAL SEVEN-DAY MINIMUM			24	Jul 7 1988
INSTANTANEOUS PEAK FLOW	773	May 17	887	Apr 27 1989
INSTANTANEOUS PEAK STAGE	4.58	May 17	4.87	Apr 27 1989
INSTANTANEOUS LOW FLOW	34	Oct 16	16	Sep 26 1988
10 PERCENT EXCEEDS			382	
50 PERCENT EXCEEDS			163	
90 PERCENT EXCEEDS			68	

e Estimated

UPPER MISSISSIPPI RIVER BASIN

MISSISSIPPI RIVER MAIN STEM

05201000 WINNIBIGOSHISH LAKE NEAR DEER RIVER, MN

LOCATION.--Lat 47°25'42", long 94°03'00", in sec.25, T.146 N., R.27 W., Itasca County, Hydrologic Unit 07010101, on Leech Lake Indian Reservation, at dam on Mississippi River, 1 mi northwest of Little Winnibigoshish Lake, 14 mi northwest of city of Deer River, and at mile 1,248 upstream from Ohio River.

DRAINAGE AREA.--1,442 mi^2.

PERIOD OF RECORD.--April 1884 to current year. Prior to October 1941 monthend contents only, published in WSP 1308. Published as Winnibigoshish Reservoir near Deer River October 1941 to September 1956.

REVISED RECORDS.--WSP 1308: 1905(M).

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to July 8, 1949, nonrecording gage at same site, and July 9, 1949, to July 10, 1973, water-stage recorder at same site and at datum of 1,288.94 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Reservoir is formed by Winnibigoshish Lake and several other natural lakes controlled by a concrete and timber dam, completed in 1884; storage began in 1884. Capacity between elevations 1,294.94 ft and 1,303.14 ft (maximum allowable range) is 668,737 acre-ft of which 439,636 acre-ft is controlled storage between elevations 1,294.94 ft and 1,300.94 ft (normal operating range). Contents shown herein are contents above elevation 1,286.00 ft. Prior to September 1978, published contents as contents above elevation 1,288.94 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

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

EXTREMES FOR PERIOD OF RECORD.--Maximum contents observed, 996,500 acre-ft, capacity table then in use, July 30, 1905, elevation, 1,303.39 ft; minimum observed, 33,680 acre-ft, below zero of capacity table then in use, Oct. 20, 1931, elevation, 1,288.25 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 720,870 acre-ft, June 2, elevation, 1,298.51 ft; minimum, 616,510 acre-ft, Nov. 8, elevation, 1,296.92 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,297.42	649,300	
Oct. 31	1,297.16	632,250	-17,050
Nov. 30	1,297.02	623,050	-9,190
Dec. 31	1,297.21	635,520	+12,470
CAL YR 1990			-2,590
Jan. 31	1,297.32	642,730	+7,210
Feb. 28	1,297.43	649,960	+7,220
Mar. 31	1,297.53	656,520	+6,560
Apr. 30	1,298.03	689,360	+32,830
May 31	1,298.47	718,240	+28,880
June 30	1,298.14	696,580	-21,660
July 31	1,298.22	701,830	+5,250
Aug. 31	1,297.92	682,130	-19,690
Sept. 30	1,298.03	689,360	+7,220
WTR YR 1991			+40,060

MISSISSIPPI RIVER MAIN STEM

05201500 MISSISSIPPI RIVER AT WINNIBIGOSHISH DAM NEAR DEER RIVER, MN

LOCATION.--Lat 47°25'42", long 94°03'00", in SW¼ sec.25, T.146 N., R.27 W., Itasca County, Hydrologic Unit 07010101, on Leech Lake Indian Reservation, at dam 1 mi northwest of Little Winnibigoshish Lake, 14 mi northwest of city of Deer River, and at mile 1,248 upstream from Ohio River.

DRAINAGE AREA.--1,442 mi^2.

PERIOD OF RECORD.--May 1884 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder on headwater and nonrecording gage on tailwater. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U. S. Army Corps of Engineers). Prior to June 30, 1973, gages at same sites with datum at 1,289.47 ft, adjustment of 1912. Prior to July 8, 1949, nonrecording headwater gage at same site and datum in use.

REMARKS.--Daily discharge is computed on the basis of modified weir formula and corrected to conform with discharge measurements, the head being determined from readings of headwater and tailwater gages. Flow completely regulated by Winnibigoshish Lake (station 05201000).

COOPERATION.--Daily discharge computed by U. S. Army Corps of Engineers.

AVERAGE DISCHARGE (unadjusted).--107 years, 518 ft^3/s, 4.88 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 4,370 ft^3/s, Aug. 6, 1905; no flow at times in several years.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 700 ft^3/s, Oct. 23 to Nov. 7; minimum daily, 101 ft^3/s, Apr. 4 to 23, June 28 to July 1.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	500	700	148	197	249	249	250	101	501	101	402	151
2	500	700	148	197	249	249	200	101	499	102	398	151
3	500	700	148	197	249	249	149	101	499	102	395	151
4	500	700	148	197	249	249	101	101	499	102	395	151
5	500	700	148	197	249	249	101	101	497	102	395	151
6	500	700	148	197	249	249	101	101	497	153	397	151
7	500	700	148	197	249	249	101	101	497	204	397	151
8	500	625	148	197	249	249	101	101	497	204	398	151
9	500	575	148	248	249	249	101	101	491	204	346	151
10	550	475	148	248	249	249	101	101	493	204	350	151
11	550	475	148	248	249	249	101	101	500	204	350	151
12	550	475	148	248	249	249	101	101	500	302	350	151
13	550	475	148	248	249	249	101	101	500	398	350	151
14	550	300	196	248	249	249	101	101	450	498	349	152
15	550	200	196	248	249	249	101	101	450	498	349	152
16	550	200	196	248	249	249	101	101	450	396	349	152
17	550	148	196	248	249	249	101	101	450	304	350	202
18	600	148	196	248	249	249	101	101	401	202	350	253
19	600	148	198	248	249	249	101	101	351	203	350	302
20	650	148	196	248	249	249	101	101	351	202	349	351
21	650	148	196	248	249	249	101	101	252	203	349	400
22	650	148	197	248	249	249	101	101	252	203	349	400
23	700	149	197	248	249	250	101	101	252	203	300	400
24	700	149	197	249	249	250	101	150	252	203	251	446
25	700	148	197	249	249	250	101	253	202	303	201	495
26	700	148	197	249	249	250	101	349	152	303	201	495
27	700	148	197	249	249	250	101	445	102	303	201	494
28	700	148	197	249	249	250	101	445	101	303	201	494
29	700	148	197	249	---	250	101	501	101	303	201	494
30	700	148	197	249	---	250	101	501	101	351	201	494
31	700	---	197	249	---	250	---	501	---	400	201	---
TOTAL	18350	10774	5462	7288	6972	7728	3326	5468	11140	7763	10025	8139
MEAN	592	359	176	235	249	249	111	176	371	250	323	271
MAX	700	700	197	249	249	250	250	501	501	498	402	495
MIN	500	148	148	197	249	249	101	101	101	101	201	151
AC-FT	36400	21370	10830	14460	13830	15330	6600	10850	22100	15400	19880	16140
CFSM	.41	.25	.12	.16	.17	.17	.08	.12	.26	.17	.22	.19
IN.	.47	.28	.14	.19	.18	.20	.09	.14	.29	.20	.26	.21

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR	
ANNUAL TOTAL	113117		102435	
ANNUAL MEAN	310		281	
HIGHEST ANNUAL MEAN				
LOWEST ANNUAL MEAN				
HIGHEST DAILY MEAN	1260	Jul 1	700	Oct 23
LOWEST DAILY MEAN	100	Apr 7	101	Apr 4
ANNUAL SEVEN-DAY MINIMUM	100	Apr 7	101	Apr 4
ANNUAL RUNOFF (AC-FT)	224400		203200	
ANNUAL RUNOFF (CFSM)	.21		.19	
ANNUAL RUNOFF (INCHES)	2.92		2.64	
10 PERCENT EXCEEDS	700		500	
50 PERCENT EXCEEDS	205		249	
90 PERCENT EXCEEDS	100		101	

LEECH LAKE RIVER BASIN

05202000 WILLIAMS LAKE NEAR AKELEY, MN

LOCATION.--Lat 46°57'24", long 94°40'26", in SE¼NW¼ sec.12, T.140 N., R.32 W., Hubbard County, Hydrologic Unit 07010102, on northwest shore of Williams lake, 4 mi southeast of Akeley.

DRAINAGE AREA--0.88 mi^2.

GAGE-HEIGHT RECORDS

PERIOD OF RECORD--October 1988 to current year. August 1977 to September 1988, in files of the U.S. Geological Survey's Hydrology of Lakes Section in Denver, Colorado.

GAGE--Water-stage recorder. Datum of gage is 1,379.09 ft above National Geodetic Vertical datum of 1929. Prior to Oct. 1, 1990, at datum 2.00 ft higher.

EXTREMES FOR PERIOD OF RECORD--Maximum gage height, 3.33 ft, present datum, June 25, 1989; minimum, 1.72 ft, Sept. 5, 1991.

EXTREMES FOR CURRENT YEAR--Maximum gage height, 2.53 ft, May 13, 24, 25; minimum, 1.72 ft, Sept. 5.

GAGE HEIGHT, FEET, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.08	2.18	2.04	2.09	2.12	2.24	2.23	2.42	2.48	2.34	2.06	1.83
2	2.07	2.16	2.04	2.09	2.13	2.26	2.24	2.42	2.48	2.32	2.05	1.81
3	2.18	2.16	2.05	2.10	2.14	2.25	2.24	2.41	2.47	2.33	2.05	1.84
4	2.20	2.15	2.06	2.09	2.14	2.26	2.25	2.45	2.45	2.35	2.07	1.77
5	2.18	2.15	2.05	2.09	2.13	2.27	2.24	2.46	2.43	2.33	2.05	1.73
6	2.16	2.14	2.04	2.09	2.13	2.26	2.24	2.48	2.42	2.33	2.04	1.75
7	2.15	2.13	2.04	2.09	2.12	2.24	2.25	2.49	2.41	2.32	2.02	1.74
8	2.14	2.11	2.03	2.10	2.11	2.21	2.25	2.50	2.39	2.31	2.01	1.76
9	2.13	2.12	2.03	2.10	2.11	2.20	2.24	2.49	2.38	2.29	1.99	1.91
10	2.12	2.12	2.04	2.10	2.11	2.19	2.24	2.49	2.39	2.29	1.98	1.91
11	2.10	2.11	2.05	2.11	2.10	2.19	2.24	2.49	2.37	2.28	1.98	1.88
12	2.10	2.10	2.04	2.11	2.13	2.19	2.22	2.49	2.37	2.29	1.96	1.88
13	2.10	2.10	2.03	2.11	2.18	2.19	2.22	2.51	2.37	2.30	1.95	1.92
14	2.09	2.10	2.06	2.11	2.17	2.20	2.27	2.51	2.36	2.28	1.95	1.98
15	2.08	2.09	2.06	2.11	2.15	2.19	2.31	2.51	2.34	2.27	1.92	1.99
16	2.08	2.09	2.04	2.11	2.15	2.19	2.32	2.51	2.34	2.25	1.91	1.98
17	2.18	2.08	2.03	2.11	2.17	2.20	2.33	2.49	2.32	2.24	1.95	1.96
18	2.24	2.08	2.04	2.10	2.18	2.20	2.33	2.46	2.30	2.24	1.94	1.95
19	2.24	2.08	2.08	2.10	2.23	2.20	2.33	2.46	2.28	2.23	1.92	1.87
20	2.24	2.08	2.13	2.10	2.24	2.15	2.32	2.43	2.29	2.22	1.91	1.86
21	2.24	2.08	2.09	2.10	2.22	2.14	2.32	2.43	2.33	2.22	1.90	1.85
22	2.23	2.08	2.09	2.11	2.21	2.14	2.32	2.43	2.33	2.23	1.91	1.82
23	2.22	2.07	2.09	2.11	2.19	2.18	2.32	2.46	2.31	2.21	1.93	1.84
24	2.21	2.07	2.09	2.10	2.22	2.21	2.31	2.52	2.29	2.18	1.92	1.83
25	2.21	2.06	2.09	2.10	2.24	2.23	2.31	2.53	2.29	2.16	1.96	1.85
26	2.20	2.06	2.09	2.11	2.24	2.25	2.30	2.50	2.27	2.14	1.95	1.83
27	2.20	2.06	2.09	2.12	2.24	2.25	2.30	2.50	2.27	2.13	1.92	1.80
28	2.18	2.05	2.09	2.11	2.24	2.23	2.32	2.50	2.26	2.13	1.90	1.79
29	2.19	2.04	2.09	2.10	---	2.22	2.34	2.50	2.28	2.11	1.86	1.79
30	2.18	2.04	2.09	2.10	---	2.23	2.42	2.51	2.26	2.09	1.86	1.78
31	2.18	---	2.09	2.10	---	2.23	---	2.49	---	2.08	1.82	---
MEAN	2.16	2.10	2.06	2.10	2.17	2.21	2.29	2.48	2.35	2.24	1.96	1.85
MAX	2.24	2.18	2.13	2.12	2.24	2.27	2.42	2.53	2.48	2.35	2.07	1.99
MIN	2.07	2.04	2.03	2.09	2.10	2.14	2.22	2.41	2.26	2.08	1.82	1.73

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN

LOCATION.--Lat°57'24", long 94°40'26", in SE¼NE¼ sec.12, T.140 N., R.32 W. Hubbard County, Hydrologic Unit 07010102. Samples are collected near the center of the lake at the deepest point.

DRAINAGE AREA.--0.875 mi^2.

PERIOD OF RECORD.--Water years 1977 to current year.

REMARKS.--Additional data are available by contacting the district office.

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)
OCT												
11...	--	--	--	--	--	--	--	--	--	--	--	--
11...	175	8.1	22	7.3	1.3	0.90	92	<1.0	0.70	0.20	1.3	--
11...	--	--	--	--	--	--	--	--	--	--	--	--
11...	--	--	--	--	--	--	--	--	--	--	--	--
11...	--	--	--	--	--	--	--	--	--	--	--	--
11...	175	8.1	22	7.3	1.3	0.90	92	<1.0	0.80	0.20	1.3	--
11...	--	--	--	--	--	--	--	--	--	--	--	<0.010
25...	--	--	--	--	--	--	--	--	--	--	--	--
25...	176	6.1	23	7.4	1.3	0.90	93	<1.0	<0.10	<0.10	0.80	--
25...	--	--	--	--	--	--	--	--	--	--	--	--
25...	--	--	--	--	--	--	--	--	--	--	--	--
25...	--	--	--	--	--	--	--	--	--	--	--	--
25...	176	8.1	23	7.4	1.3	0.90	93	<1.0	0.20	<0.10	0.80	--
25...	--	--	--	--	--	--	--	--	--	--	--	--
NOV												
09...	--	--	--	--	--	--	--	--	--	--	--	--
09...	178	8.0	24	7.5	1.4	0.90	94	<1.0	1.3	<0.10	0.70	--
09...	--	--	--	--	--	--	--	--	--	--	--	--
09...	--	--	--	--	--	--	--	--	--	--	--	--
09...	--	--	--	--	--	--	--	--	--	--	--	--
09...	179	8.1	23	7.3	1.3	0.90	94	<1.0	1.6	<0.10	0.60	--
09...	--	--	--	--	--	--	--	--	--	--	--	<0.010
DEC												
13...	--	--	--	--	--	--	--	--	--	--	--	--
13...	190	8.1	27	8.0	1.4	0.90	108	<1.0	0.20	<0.10	0.60	--
13...	--	--	--	--	--	--	--	--	--	--	--	--
13...	--	--	--	--	--	--	--	--	--	--	--	--
13...	--	--	--	--	--	--	--	--	--	--	--	--
13...	188	8.0	27	7.9	1.4	0.90	100	<1.0	0.30	<0.10	0.70	--
13...	--	--	--	--	--	--	--	--	--	--	--	<0.010
JAN												
24...	--	--	--	--	--	--	--	--	--	--	--	--
24...	197	8.3	28	8.6	1.5	1.0	104	<1.0	0.30	<0.10	0.70	--
24...	--	--	--	--	--	--	--	--	--	--	--	--
24...	--	--	--	--	--	--	--	--	--	--	--	--
24...	--	--	--	--	--	--	--	--	--	--	--	--
24...	202	7.9	28	8.4	1.4	1.0	106	<1.0	0.30	<0.10	0.90	--
24...	--	--	--	--	--	--	--	--	--	--	--	<0.010
FEB												
21...	--	--	--	--	--	--	--	--	--	--	--	--
21...	205	8.0	29	8.2	1.4	1.1	107	<1.0	0.80	0.20	0.60	--
21...	--	--	--	--	--	--	--	--	--	--	--	--
21...	--	--	--	--	--	--	--	--	--	--	--	--
21...	--	--	--	--	--	--	--	--	--	--	--	--
21...	219	7.5	31	8.5	1.5	1.3	113	<1.0	0.70	0.10	1.7	--
21...	--	--	--	--	--	--	--	--	--	--	--	0.030
MAR												
27...	--	--	--	--	--	--	--	--	--	--	--	--
27...	205	7.8	28	8.0	1.4	0.90	107	<1.0	1.6	--	0.80	--
27...	--	--	--	--	--	--	--	--	--	--	--	--
27...	--	--	--	--	--	--	--	--	--	--	--	--
27...	--	--	--	--	--	--	--	--	--	--	--	--
27...	214	8.2	30	8.2	1.5	1.1	112	<1.0	<0.10	--	1.1	--
27...	--	--	--	--	--	--	--	--	--	--	--	--
APR												
17...	--	--	--	--	--	--	--	--	--	--	--	--
17...	194	8.4	27	7.8	1.4	1.3	99	0.40	1.6	--	0.60	--
17...	--	--	--	--	--	--	--	--	--	--	--	--
17...	--	--	--	--	--	--	--	--	--	--	--	--
17...	--	--	--	--	--	--	--	--	--	--	--	--
17...	190	8.0	27	7.7	1.3	1.0	101	0.20	1.8	--	0.60	--
17...	--	--	--	--	--	--	--	--	--	--	--	--

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS ORTHO TOTAL (MG/L AS P) (70507)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
OCT												
11...	--	--	--	--	--	0.014	--	--	--	--	--	--
11...	--	--	--	--	--	--	--	--	9	3	--	--
11...	--	--	--	--	--	0.012	--	--	--	--	--	--
11...	--	--	--	--	--	0.012	--	--	--	--	--	--
11...	--	--	--	--	--	0.012	--	--	--	--	--	--
11...	--	--	--	--	--	0.012	--	--	10	3	--	--
11...	<0.100	--	<0.010	--	1.2	--	<0.010	--	--	--	7.60	<0.200
25...	--	--	--	--	--	0.010	--	--	--	--	--	--
25...	--	--	--	--	--	--	--	--	17	4	--	--
25...	--	--	--	--	--	0.011	--	--	--	--	--	--
25...	--	--	--	--	--	0.009	--	--	--	--	--	--
25...	--	--	--	--	--	0.005	--	--	--	--	--	--
25...	--	--	--	--	--	0.004	--	--	13	3	--	--
25...	--	0.025	--	0.036	--	0.004	--	0.004	--	--	14.0	<0.200
NOV												
09...	--	--	--	--	--	0.011	--	--	--	--	--	--
09...	--	--	--	--	--	--	--	--	5	4	--	--
09...	--	--	--	--	--	0.035	--	--	--	--	--	--
09...	--	--	--	--	--	0.007	--	--	--	--	--	--
09...	--	--	--	--	--	0.008	--	--	--	--	--	--
09...	--	--	--	--	--	0.007	--	--	4	2	--	--
09...	<0.100	0.037	0.010	0.055	0.60	0.016	0.010	0.001	--	--	7.60	<0.100
DEC												
13...	--	--	--	--	--	<0.001	--	--	--	--	--	--
13...	--	--	--	--	--	--	--	--	16	1	--	--
13...	--	--	--	--	--	0.001	--	--	--	--	--	--
13...	--	--	--	--	--	0.020	--	--	--	--	--	--
13...	--	--	--	--	--	0.004	--	--	--	--	--	--
13...	--	--	--	--	--	0.011	--	--	5	3	--	--
13...	<0.100	0.040	0.080	0.042	0.80	<0.001	<0.010	<0.001	--	--	--	--
JAN												
24...	--	--	--	--	--	0.013	--	--	--	--	--	--
24...	--	--	--	--	--	--	--	--	5	<1	--	--
24...	--	--	--	--	--	0.006	--	--	--	--	--	--
24...	--	--	--	--	--	0.003	--	--	--	--	--	--
24...	--	--	--	--	--	0.008	--	--	--	--	--	--
24...	--	--	--	--	--	0.005	--	--	32	13	--	--
24...	<0.100	0.041	0.110	0.103	0.60	0.009	0.010	<0.001	--	--	0.500	<0.100
FEB												
21...	--	--	--	--	--	0.015	--	--	--	--	--	--
21...	--	--	--	--	--	--	--	--	28	21	--	--
21...	--	--	--	--	--	0.011	--	--	--	--	--	--
21...	--	--	--	--	--	0.006	--	--	--	--	--	--
21...	--	--	--	--	--	0.008	--	--	--	--	--	--
21...	--	--	--	--	--	0.029	--	--	82	160	--	--
21...	<0.100	0.044	0.220	0.216	0.80	0.007	<0.010	<0.001	--	--	0.500	<0.100
MAR												
27...	--	--	--	--	--	0.001	--	--	--	--	--	--
27...	--	--	--	--	--	--	--	--	7	5	--	--
27...	--	--	--	--	--	0.004	--	--	--	--	--	--
27...	--	--	--	--	--	<0.001	--	--	--	--	--	--
27...	--	--	--	--	--	0.004	--	--	--	--	--	--
27...	--	--	--	--	--	0.005	--	--	13	5	--	--
27...	--	0.142	--	0.157	0.80	0.005	--	<0.001	--	--	0.700	<0.100
APR												
17...	--	--	--	--	--	0.007	--	--	--	--	--	--
17...	--	--	--	--	--	--	--	--	5	3	--	--
17...	--	--	--	--	--	0.008	--	--	--	--	--	--
17...	--	--	--	--	--	0.006	--	--	--	--	--	--
17...	--	--	--	--	--	0.006	--	--	--	--	--	--
17...	--	--	--	--	--	0.011	--	--	4	4	--	--
17...	--	0.050	--	0.090	0.60	0.008	--	<0.001	--	--	1.80	<0.100

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)
MAY										
02...	--	--	--	--	--	--	--	--	--	--
02...	188	8.0	27	7.3	1.3	0.90	100	0.40	0.70	0.30
02...	--	--	--	--	--	--	--	--	--	--
02...	--	--	--	--	--	--	--	--	--	--
02...	--	--	--	--	--	--	--	--	--	--
02...	189	8.1	28	7.4	1.3	1.0	100	0.50	0.60	0.30
02...	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--
16...	187	8.4	27	7.5	1.3	0.90	100	0.40	0.20	0.20
16...	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--
16...	--	--	--	--	--	--	--	--	--	--
16...	140	7.6	16	4.5	0.90	1.0	59	0.50	0.20	0.30
16...	--	--	--	--	--	--	--	--	--	--
30...	--	--	--	--	--	--	--	--	--	--
30...	183	8.6	26	7.2	1.3	0.90	98	0.20	0.60	0.30
30...	--	--	--	--	--	--	--	--	--	--
30...	--	--	--	--	--	--	--	--	--	--
30...	--	--	--	--	--	--	--	--	--	--
30...	191	7.7	27	7.3	1.4	1.0	101	0.40	0.60	0.40
30...	--	--	--	--	--	--	--	--	--	--
JUN										
19...	--	--	--	--	--	--	--	--	--	--
19...	177	8.7	25	7.6	1.4	1.0	94	0.50	<0.10	1.7
19...	--	--	--	--	--	--	--	--	--	--
19...	--	--	--	--	--	--	--	--	--	--
19...	--	--	--	--	--	--	--	--	--	--
19...	195	7.6	29	7.8	1.4	1.0	103	0.70	<0.10	0.80
19...	--	--	--	--	--	--	--	--	--	--
JUL										
03...	--	--	--	--	--	--	--	--	--	--
03...	174	8.6	24	7.4	1.3	0.90	92	0.60	0.70	0.70
03...	--	--	--	--	--	--	--	--	--	--
03...	--	--	--	--	--	--	--	--	--	--
03...	--	--	--	--	--	--	--	--	--	--
03...	198	7.5	28	7.7	1.3	1.0	103	0.70	0.70	0.90
03...	--	--	--	--	--	--	--	--	--	--
18...	--	--	--	--	--	--	--	--	--	--
18...	166	8.6	23	7.5	1.5	0.80	90	0.40	<0.10	1.8
18...	--	--	--	--	--	--	--	--	--	--
18...	--	--	--	--	--	--	--	--	--	--
18...	--	--	--	--	--	--	--	--	--	--
18...	201	7.3	28	7.6	1.4	0.90	107	0.70	<0.10	1.5
18...	--	--	--	--	--	--	--	--	--	--

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
MAY									
02...	--	--	--	0.008	--	--	--	--	--
02...	--	--	--	--	--	<3	1	--	--
02...	--	--	--	0.010	--	--	--	--	--
02...	--	--	--	0.011	--	--	--	--	--
02...	--	--	--	0.010	--	--	--	--	--
02...	--	--	--	0.011	--	5	2	--	--
02...	0.032	0.086	0.50	0.008	<0.001	--	--	1.10	<0.200
16...	--	--	--	0.006	--	--	--	--	--
16...	--	--	--	--	--	5	2	--	--
16...	--	--	--	0.012	--	--	--	--	--
16...	--	--	--	0.010	--	--	--	--	--
16...	--	--	--	0.021	--	--	--	--	--
16...	--	--	--	0.016	--	7	8	--	--
16...	0.018	0.086	0.60	0.010	<0.001	--	--	--	--
30...	--	--	--	0.012	--	--	--	--	--
30...	--	--	--	--	--	11	1	--	--
30...	--	--	--	0.008	--	--	--	--	--
30...	--	--	--	0.008	--	--	--	--	--
30...	--	--	--	0.010	--	--	--	--	--
30...	--	--	--	0.010	--	33	35	--	--
30...	0.027	0.026	0.60	0.010	<0.001	--	--	2.10	<0.200
JUN									
19...	--	--	--	0.013	--	--	--	--	--
19...	--	--	--	--	--	7	9	--	--
19...	--	--	--	0.007	--	--	--	--	--
19...	--	--	--	0.010	--	--	--	--	--
19...	--	--	--	0.008	--	--	--	--	--
19...	--	--	--	0.011	--	29	98	--	--
19...	0.006	0.024	0.70	0.020	0.005	--	--	1.30	<0.200
JUL									
03...	--	--	--	0.003	--	--	--	--	--
03...	--	--	--	--	--	5	9	--	--
03...	--	--	--	0.004	--	--	--	--	--
03...	--	--	--	0.013	--	--	--	--	--
03...	--	--	--	0.067	--	--	--	--	--
03...	--	--	--	0.019	--	34	180	--	--
03...	0.007	0.020	0.90	0.016	<0.001	--	--	2.30	0.100
18...	--	--	--	0.001	--	--	--	--	--
18...	--	--	--	--	--	17	54	--	--
18...	--	--	--	0.007	--	--	--	--	--
18...	--	--	--	0.003	--	--	--	--	--
18...	--	--	--	0.005	--	--	--	--	--
18...	--	--	--	0.014	--	33	280	--	--
18...	0.009	0.025	1.0	0.029	<0.001	--	--	1.80	<0.200

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH WATER WHOLE LAB (STAND-ARD UNITS) (00403)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	ALKA-LINITY LAB (MG/L AS CACO3) (90410)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)
AUG										
01...	--	--	--	--	--	--	--	--	--	--
01...	166	8.5	22	7.7	1.3	0.80	90	0.50	0.40	1.0
01...	--	--	--	--	--	--	--	--	--	--
01...	--	--	--	--	--	--	--	--	--	--
01...	--	--	--	--	--	--	--	--	--	--
01...	203	7.4	30	7.9	1.4	1.0	107	0.90	0.50	2.1
01...	--	--	--	--	--	--	--	--	--	--
07...	165	8.5	22	7.8	1.5	0.90	89	0.40	0.20	0.80
07...	166	8.5	22	7.6	1.5	0.80	91	0.30	0.20	0.70
07...	165	8.6	22	7.6	1.5	0.80	89	0.60	0.20	0.70
07...	165	8.5	22	7.6	1.5	0.80	89	0.40	0.40	0.70
07...	165	8.5	22	7.6	1.5	0.90	89	0.40	0.40	0.80
07...	165	8.5	22	7.6	2.6	0.80	89	0.50	0.40	0.80
15...	--	--	--	--	--	--	--	--	--	--
15...	163	8.9	20	6.9	1.7	1.0	87	0.20	0.10	1.2
15...	--	--	--	--	--	--	--	--	--	--
15...	--	--	--	--	--	--	--	--	--	--
15...	--	--	--	--	--	--	--	--	--	--
15...	204	8.2	29	7.6	1.7	1.1	107	0.80	0.30	2.4
15...	--	--	--	--	--	--	--	--	--	--
29...	--	--	--	--	--	--	--	--	--	--
29...	163	8.7	20	7.5	1.3	0.90	87	0.50	<0.10	0.90
29...	--	--	--	--	--	--	--	--	--	--
29...	--	--	--	--	--	--	--	--	--	--
29...	201	7.3	29	7.8	1.4	1.1	107	0.90	0.30	2.4
29...	--	--	--	--	--	--	--	--	--	--
SEP										
12...	--	--	--	--	--	--	--	--	--	--
12...	167	8.1	22	7.7	1.6	0.90	90	0.50	0.50	0.80
12...	--	--	--	--	--	--	--	--	--	--
12...	--	--	--	--	--	--	--	--	--	--
12...	--	--	--	--	--	--	--	--	--	--
12...	208	7.2	30	8.2	1.6	1.1	109	0.60	0.60	3.3
12...	--	--	--	--	--	--	--	--	--	--
26...	--	--	--	--	--	--	--	--	--	--
26...	176	7.9	23	7.8	1.4	0.90	94	0.80	1.8	2.1
26...	--	--	--	--	--	--	--	--	--	--
26...	--	--	--	--	--	--	--	--	--	--
26...	--	--	--	--	--	--	--	--	--	--
26...	175	8.0	23	7.7	1.3	0.80	94	0.60	<0.10	1.1
26...	--	--	--	--	--	--	--	--	--	--

LEECH LAKE RIVER BASIN

465724094402601 WILLIAMS LAKE NEAR AKELEY, MN--Continued

WATER-QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
AUG									
01...	--	--	--	<0.001	--	--	--	--	--
01...	--	--	--	--	--	10	20	--	--
01...	--	--	--	<0.001	--	--	--	--	--
01...	--	--	--	<0.001	--	--	--	--	--
01...	--	--	--	0.001	--	--	--	--	--
01...	--	--	--	<0.001	--	20	270	--	--
01...	0.009	0.015	2.7	0.036	<0.001	--	--	2.60	<0.200
07...	<0.005	0.005	0.60	0.011	<0.001	<3	1	--	--
07...	<0.005	0.004	0.80	0.001	<0.001	<3	1	--	--
07...	<0.005	0.002	0.70	<0.001	<0.001	<3	<1	--	--
07...	<0.005	0.004	0.60	0.013	<0.001	<3	1	--	--
07...	<0.005	0.002	0.70	<0.001	<0.001	<3	<1	--	--
07...	0.007	0.002	0.70	<0.001	<0.001	<3	1	--	--
15...	--	--	--	0.004	--	--	--	--	--
15...	--	--	--	--	--	<3	13	--	--
15...	--	--	--	0.001	--	--	--	--	--
15...	--	--	--	0.005	--	--	--	--	--
15...	--	--	--	0.007	--	--	--	--	--
15...	--	--	--	0.008	--	11	190	--	--
15...	0.051	0.042	0.70	0.034	<0.001	--	--	--	--
29...	--	--	--	0.013	--	--	--	--	--
29...	--	--	--	--	--	<3	8	--	--
29...	--	--	--	0.005	--	--	--	--	--
29...	--	--	--	0.010	--	--	--	--	--
29...	--	--	--	0.012	--	5	150	--	--
29...	0.059	0.010	0.60	0.021	<0.001	--	--	--	--
SEP									
12...	--	--	--	0.011	--	--	--	--	--
12...	--	--	--	--	--	13	4	--	--
12...	--	--	--	0.010	--	--	--	--	--
12...	--	--	--	0.013	--	--	--	--	--
12...	--	--	--	0.011	--	--	--	--	--
12...	--	--	--	0.033	--	14	950	--	--
12...	0.028	0.027	0.60	0.011	<0.001	--	--	--	--
26...	--	--	--	0.011	--	--	--	--	--
26...	--	--	--	--	--	21	42	--	--
26...	--	--	--	0.012	--	--	--	--	--
26...	--	--	--	0.010	--	--	--	--	--
26...	--	--	--	0.009	--	--	--	--	--
26...	--	--	--	0.010	--	17	20	--	--
26...	0.010	0.061	0.80	0.011	<0.001	--	--	--	--

LEECH LAKE RIVER BASIN

05206000 LEECH LAKE AT FEDERAL DAM, MN

LOCATION.--Lat 47°12'23", long 94°18'31", in lot 2, sec.14, T.143 N., R.29 W., Cass County, Hydrologic Unit 07010102, on Leech Lake Indian Reservation, at head of Leech Lake River on Waboose Bay, 5 mi southwest of town of Federal Dam.

DRAINAGE AREA.--1,163 mi^2.

PERIOD OF RECORD.--April 1884 to current year. Monthend contents only for some periods, published in WSP 1308. Prior to October 1956, published as "Leech Lake Reservoir."

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Dec. 31, 1884, nonrecording gage 0.5 mi north of outlet to Leech Lake River at datum 98.47 ft higher. Dec. 31, 1884, to May 24, 1931, nonrecording gage 0.5 mi north of outlet to Leech Lake River and May 25, 1931, to July 10, 1973, water-stage recorder at same site and at datum 92.70 ft higher.

REMARKS .--Reservoir is formed by Leech Lake and several other natural lakes controlled by concrete and timber dam; storage began in 1884; original timber structure completed in 1884, replaced by present dam in 1902. Capacity between elevation 1,292.70 ft and 1,297.94 ft (maximum allowable range) is 688,985 acre-ft of which 352,637 acre-ft is controlled storage between elevations 1,292.70 ft and 1,295.70 ft (normal operating range). Contents shown herein are contents above elevation 1,290.00 ft. Prior to September 1978, published contents as contents above elevation 1,292.20 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

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

EXTREMES FOR PERIOD OF RECORD.--Maximum contents observed, 734,300 acre-ft, capacity table then in use, June 30, 1916, elevation, 1,297.88 ft; minimum, 51,380 acre-ft, capacity table then in use, Dec. 8, 24, 1976, elevation, 1,292.69 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 633,100 acre-ft, May 29, elevation, 1,295.09 ft; minimum, 464,810 acre-ft, Nov. 26, elevation, 1,293.73 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1990 to SEPTEMBER 1991

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,293.98	492,880	
Oct. 31	1,293.97	491,680	-1,200
Nov. 30	1,293.75	466,990	-24,690
Dec. 31	1,293.81	473,520	+6,530
CAL YR 1990			-15,720
Jan. 31	1,293.91	484,520	+11,000
Feb. 28	1,294.01	496,540	+12,010
Mar. 31	1,294.24	525,620	+29,090
Apr. 30	1,294.55	564,830	+39,210
May 31	1,295.05	628,050	+63,220
June 30	1,294.72	586,310	-41,740
July 31	1,294.75	590,110	+3,800
Aug. 31	1,294.36	540,790	-49,320
Sept. 30	1,294.54	563,560	+22,780
WTR YR 1991			+70,690

LEECH LAKE RIVER BASIN

05206500 LEECH LAKE RIVER AT FEDERAL DAM, MN

LOCATION.--Lat 47°14'45", long 94°13'12", in sec.34, T.144 N., R.28 W., Cass County, Hydrologic Unit 07010102, on Leech Lake Indian Reservation, on right bank at dam on Leech Lake River at city of Federal Dam, 2 mi downstream from natural outlet of Leech Lake.

DRAINAGE AREA.--1,163 mi^2.

PERIOD OF RECORD.--May 1884 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder, headwater gage, and nonrecording tailwater gage. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U. S. Army Corps of Engineers). Prior to June 30, 1973, gages (nonrecording headwater gage prior to July 3, 1948) at same sites with datum at 1,293.23 ft, adjustment of 1912. May 27 to Nov. 30, 1929, nonrecording gage at site 600 ft downstream at different datum.

REMARKS.--Discharge computed on basis of modified weir formula, the head being obtained from readings on tailwater gage and mean gage height from recording headwater gage. Flow completely regulated by Leech Lake (station 05206000).

COOPERATION.--Computations of daily discharge were provided by U.S. Army Corps of Engineers.

AVERAGE DISCHARGE (unadjusted).--107 years, 370 ft^3/s, 4.32 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 2,520 ft^3/s, June 7, 1957 (result of dam failure); no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 607 ft^3/s, Oct. 27; minimum daily, 96 ft^3/s, April 27.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	306	594	192	146	102	104	113	118	414	192	207	144
2	294	594	192	146	102	104	113	115	414	178	198	144
3	312	594	192	146	102	104	113	104	397	170	229	144
4	318	594	143	146	102	104	113	116	380	173	229	144
5	306	594	143	146	102	104	113	118	397	173	229	132
6	392	594	143	146	102	104	113	119	397	170	221	138
7	392	594	143	146	102	104	113	119	397	170	221	144
8	392	594	143	146	102	104	113	119	397	170	221	144
9	392	594	143	146	102	104	113	231	397	216	252	155
10	392	594	143	146	102	104	113	310	397	216	247	148
11	392	594	143	146	102	104	113	345	397	216	247	148
12	392	594	146	100	102	104	113	345	380	216	247	148
13	392	581	146	100	102	104	113	360	380	216	252	149
14	392	483	143	100	104	104	113	360	345	216	221	149
15	392	472	143	100	104	104	122	397	327	216	243	149
16	392	472	143	100	104	104	122	397	327	216	220	162
17	376	473	146	100	104	104	122	380	327	216	224	155
18	394	473	140	102	104	104	122	380	314	216	224	162
19	494	473	140	102	104	104	122	380	276	216	224	155
20	494	376	143	102	104	104	122	397	276	216	224	198
21	494	294	143	102	104	104	122	397	216	216	224	198
22	494	300	143	102	104	104	128	380	216	216	224	216
23	594	300	143	102	104	113	128	397	216	216	224	198
24	594	294	143	102	104	113	128	414	216	207	206	192
25	594	294	143	102	104	113	128	414	216	207	206	198
26	594	294	143	102	104	113	122	414	216	207	206	192
27	607	245	143	102	104	113	96	414	192	207	176	192
28	594	250	143	102	104	113	103	414	180	207	176	192
29	594	250	146	102	---	113	103	397	180	207	144	183
30	594	250	146	102	---	113	118	414	180	207	144	192
31	594	---	146	102	---	113	---	397	---	180	144	---
TOTAL	13953	13702	4592	3634	2886	3305	3490	9662	9364	6265	6654	4965
MEAN	450	457	148	117	103	107	116	312	312	202	215	165
MAX	607	594	192	146	104	113	128	414	414	216	252	216
MIN	294	245	140	100	102	104	96	104	180	170	144	132
AC-FT	27680	27180	9110	7210	5720	6560	6920	19160	18570	12430	13200	9850
CFSM	.39	.39	.13	.10	.09	.09	.10	.27	.27	.17	.18	.14
IN.	.45	.44	.15	.12	.09	.11	.11	.31	.30	.20	.21	.16

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR	
ANNUAL TOTAL	104438.0		82472	
ANNUAL MEAN	286		226	
HIGHEST ANNUAL MEAN				
LOWEST ANNUAL MEAN				
HIGHEST DAILY MEAN	840	Jun 26	607	Oct 27
LOWEST DAILY MEAN	92	Aug 11	96	Apr 27
ANNUAL SEVEN-DAY MINIMUM	93	Aug 10	100	Jan 12
ANNUAL RUNOFF (AC-FT)	207200		163600	
ANNUAL RUNOFF (CFSM)	.25		.19	
ANNUAL RUNOFF (INCHES)	3.34		2.64	
10 PERCENT EXCEEDS	594		414	
50 PERCENT EXCEEDS	192		173	
90 PERCENT EXCEEDS	104		104	

MISSISSIPPI RIVER MAIN STEM

05210500 POKEGAMA LAKE NEAR GRAND RAPIDS, MN

LOCATION.--Lat 47°10'00", long 93°33'20", in NW¼ sec.17, T.54 N., R.25 W., Itasca County, Hydrologic Unit 07010101, at narrows on U.S. Highway 169, 4 mi south of Grand Rapids and at mile 1,184 upstream from Ohio River.

DRAINAGE AREA.--3,265 mi^2.

PERIOD OF RECORD.--April 1884 to current year. Prior to October 1941 monthend contents only, published in WSP 1308. Published as Pokegama Reservoir near Grand Rapids, October 1941 to September 1956.

REVISED RECORDS.--WSP 1914: 1897(M).

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to May 30, 1949, nonrecording gage at Pooles Arm of Pokegama Lake 5 mi northwest, and May 31, 1949, to July 12, 1973, water-stage recorder at same site and at datum 64.42 ft higher.

REMARKS.--Reservoir is formed by Pokegama Lake and several other natural lakes controlled by concrete dam; storage began in 1884; original timber dam completed in 1884, replaced by present structure in 1888-89. Capacity between elevation 1,270.42 ft and 1,276.42 ft (maximum allowable range) is 80,126 acre-ft of which 52,483 acre-ft is controlled storage between elevations 1,270.42 ft and 1,274.42 ft (normal operating range). Contents shown herein are contents above elevation 1,267.00 ft. Prior to September 1978, published contents as contents above elevation 1,268.92 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

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

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 132,160 acre-ft, May 23, 1986, elevation, 1,275.28 ft; maximum elevation, 1,277.92 ft, May 8, 1897; minimum contents observed, 4,520 acre-ft, below zero of capacity table then in use, Sept. 30, 1934, elevation, 1,268.54 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 103,050 acre-ft, May 7, elevation, 1,273.73 ft; minimum, 72,810 acre-ft, Dec. 28, elevation, 1,271.71 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,273.14	93,670	
Oct. 31	1,272.32	81,500	-12,170
Nov. 30	1,271.80	74,090	-7,410
Dec. 31	1,271.71	72,810	-1,280
CAL YR 1990			-1,000
Jan. 31	1,271.75	73,380	+570
Feb. 28	1,271.80	74,090	+710
Mar. 31	1,272.56	85,010	+10,920
Apr. 30	1,273.53	99,700	+14,690
May 31	1,273.53	99,700	0
June 30	1,273.32	96,360	-3,340
July 31	1,273.28	95,770	-590
Aug. 31	1,273.35	96,810	+1,040
Sept. 30	1,273.36	96,960	+150
WTR YR 1991			+3,290

MISSISSIPPI RIVER MAIN STEM

05211000 MISSISSIPPI RIVER AT GRAND RAPIDS, MN

LOCATION.--Lat 47°13'56", long 93°31'48", in SW¼NW¼ sec.21, T.55 N., R.25 W., Itasca County, Hydrologic Unit 07010103, on left bank, in super-calendar room of Blandin Paper Mill in Grand Rapids, 400 ft downstream from Blandin Dam, 400 ft upstream from bridge on U.S. Highway 169, 2.5 mi upstream from Prairie River, and at mile 1,182 upstream from Ohio River.
DRAINAGE AREA.--3,370 mi^2, approximately.
PERIOD OF RECORD.--October 1883 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "at Pokegama Dam near Grand Rapids" 1942-44.
GAGE.--Water-stage recorder. Datum of gage is 1,242.03 ft above National Geodetic Vertical Datum of 1929. See WSP 1914 for history of changes prior to Jan. 17, 1951.
REMARKS.--Records fair. Flow regulated by Winnibigoshish Lake (station 05201000), Leech Lake (station 05206000), Pokegama Lake (station 05210500) and occasionally at low flow by powerplant at Blandin Dam. Backwater from Prairie River occurs at times in most years.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	553	1120	474	438	395	403	449	923	838	526	363	584
2	530	1220	512	430	410	435	467	1110	853	441	371	575
3	788	1340	492	413	428	417	464	881	888	510	361	499
4	859	1320	575	416	398	427	462	728	813	483	399	361
5	935	1320	495	438	426	419	468	726	826	441	416	365
6	983	1290	515	409	426	421	452	726	852	478	509	392
7	954	1290	522	420	404	428	483	1180	848	485	480	416
8	971	1250	506	405	415	413	479	1430	867	459	477	409
9	959	1210	520	407	439	424	458	1510	874	472	499	391
10	959	1200	517	414	400	417	475	1500	893	453	474	387
11	953	1250	506	440	423	428	467	1390	914	479	490	389
12	983	1210	524	420	424	434	460	1480	910	447	423	375
13	1040	1230	499	403	419	402	474	1360	981	439	409	408
14	1020	1200	517	417	419	424	493	1060	1010	454	400	341
15	1050	1250	509	419	432	426	592	1070	1050	458	514	394
16	1140	1210	504	402	415	409	622	1030	989	449	565	484
17	1290	1210	484	415	414	437	655	1050	976	448	732	525
18	1340	1210	489	423	419	414	612	1040	997	466	714	585
19	1470	1080	453	408	433	414	660	1050	1010	467	594	546
20	1650	1020	493	415	415	439	643	902	1000	472	532	569
21	1540	1030	467	418	422	421	628	717	1040	442	553	557
22	1530	991	478	414	419	435	579	718	935	488	481	570
23	1380	923	453	428	421	470	512	705	945	448	471	498
24	1330	832	474	403	418	428	504	702	711	474	492	492
25	1390	812	475	418	431	439	497	678	542	427	464	510
26	1240	672	471	419	416	462	403	722	543	502	513	478
27	1240	597	450	417	416	448	453	693	523	424	605	503
28	1310	589	400	416	435	456	406	655	530	504	610	507
29	1190	599	454	408	---	455	465	717	476	362	570	512
30	1070	614	417	409	---	452	599	711	489	401	580	548
31	1120	---	417	434	---	461	---	773	---	355	639	---
TOTAL	34767	32089	15062	12936	11732	13358	15381	29937	25123	14154	15700	14170
MEAN	1122	1070	486	417	419	431	513	966	837	457	506	472
MAX	1650	1340	575	440	439	470	660	1510	1050	526	732	585
MIN	530	589	400	402	395	402	403	655	476	355	361	341
AC-FT	68960	63650	29880	25660	23270	26500	30510	59380	49830	28070	31140	28110
CFSM	.33	.32	.14	.12	.12	.13	.15	.29	.25	.14	.15	.14
IN.	.38	.35	.17	.14	.13	.15	.17	.33	.28	.16	.17	.16
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1942 - 1991, BY WATER YEAR (WY)												
MEAN	1406	1550	1445	1463	1482	1393	1205	1289	1328	1360	1236	1228
MAX	2865	2496	2375	2410	2729	2762	3442	3026	3271	3363	3711	3542
(WY)	1986	1954	1954	1952	1945	1945	1945	1979	1962	1962	1950	1950
MIN	187	174	186	168	177	198	247	32.5	206	125	98.3	195
(WY)	1977	1977	1977	1977	1977	1977	1959	1949	1988	1961	1961	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1942 - 1991	
ANNUAL TOTAL	292864		234409			
ANNUAL MEAN	802		642		1373a	
HIGHEST ANNUAL MEAN					2265	1950
LOWEST ANNUAL MEAN					277	1977
HIGHEST DAILY MEAN	1760	Jun 25	1650	Oct 20	5250	Sep 5,8,1905
LOWEST DAILY MEAN	188	Apr 21	341	Sep 14	.00	Oct 2 1948
ANNUAL SEVEN-DAY MINIMUM	226	Apr 20	373	Jul 29	24	May 9 1949
INSTANTANEOUS PEAK FLOW	2040	Jul 5	1900	May 10	12500b	Sep 3 1948
INSTANTANEOUS PEAK STAGE	6.37	Jul 5	6.90	May 10	15.20c	Sep 3 1948
INSTANTANEOUS LOW FLOW	53	Aug 13	57	Jan 8		
ANNUAL RUNOFF (AC-FT)	580900		465000		994600	
ANNUAL RUNOFF (CFSM)	.24		.19		.41	
ANNUAL RUNOFF (INCHES)	3.23		2.59		5.54	
10 PERCENT EXCEEDS	1340		1180		2320	
50 PERCENT EXCEEDS	750		492		1380	
90 PERCENT EXCEEDS	358		409		335	

a Average based on 108 years of record is 1,185 ft^3/s; median is 1,060 ft^3/s.
b From rating curve extended above 4,500 ft^3/s.
c From floodmark, caused by dam failure.

SANDY RIVER BASIN

05218500 SANDY LAKE AT LIBBY, MN

LOCATION.--Lat 46°47'20", long 93°19'10", in sec.25, T.50 N., R.24 W., Aitkin County, Hydrologic Unit 07010103, on dam on Sandy River at Libby, 1.2 mi upstream from mouth, and 14 mi north of McGregor.

DRAINAGE AREA.--421 mi^2.

PERIOD OF RECORD.--July to December 1893, October to December 1894, July 1895 to current year. Monthend contents only for some periods, published in WSP 1308. Published as Sandy Lake Reservoir at Libby, October 1941 to September 1956.

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Sept. 23, 1949, nonrecording gage and Sept. 24, 1949, to Nov. 28, 1962, water-stage recorder at site 1 mi upstream at datum 1,207.71 ft, adjustment of 1912. Nov. 29, 1962, to June 30, 1973, water-stage recorder at present site at datum 1,207.71 ft, adjustment of 1912.

REMARKS.--Lake is formed by concrete dam which controls Sandy, Flowage, Snake, and Aitkin Lakes. Storage began in 1893; original timber crib dam completed in 1895, replaced by present structure in 1911. Capacity between elevation 1,214.31 ft and 1,221.31 ft (top of structure) is 73,037 acre-ft, of which 37,539 acre-ft is controlled storage between elevations 1,214.31 ft and 1,218.31 ft (normal operating range). Contents shown herein are contents above elevation 1,207.00 ft. Prior to September 1978, published contents as contents above elevation 1,209.03 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

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

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 167,200 acre-ft, capacity table then in use, May 19, 1950, elevation, 1,224.82 ft; minimum observed, 5,950 acre-ft, below zero of capacity table then in use, Jan. 20, 1921, elevation, 1,207.96 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 68,940 acre-ft, May 12, elevation, 1,217.04 ft; minimum, 45,600 acre-ft, Feb. 4, elevation, 1,214.46 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,216.44	63,150	
Oct. 31	1,216.55	64,200	+1,050
Nov. 30	1,215.46	54,160	-10,040
Dec. 31	1,214.01	49,390	-4,770
CAL YR 1990			-850
Jan. 31	1,214.50	45,940	-3,450
Feb. 28	1,214.57	46,520	+580
Mar. 31	1,215.68	56,130	+9,610
Apr. 30	1,216.32	62,010	+5,880
May 31	1,216.52	63,910	+1,910
June 30	1,216.69	65,530	+1,610
July 31	1,216.43	63,060	-2,470
Aug. 31	1,216.41	62,870	-190
Sept. 30	1,216.31	61,910	-960
WTR YR 1991			-1,240

SANDY RIVER BASIN

05219000 SANDY RIVER AT SANDY LAKE DAM, AT LIBBY, MN

LOCATION.--Lat 46°47'20", long 93°19'10", in sec.25, T.50 N., R.24 W., Aitkin County, Hydrologic Unit 07010103, at dam at outlet of Sandy Lake, at Libby, 1.2 mi above mouth, and 14 mi north of McGregor.

DRAINAGE AREA.--421 mi^2.

PERIOD OF RECORD.--July 1893 to March 1894, July 1894, November 1894 to March 1895, August 1895 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "below Sandy Lake Reservoir" 1893-1916.

GAGE.--Water-stage recorders on headwater and tailwater. Datum of gages is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to June 30, 1973, gages (nonrecording gages prior to June 20, 1949) at same site with datum at 1,207.71 ft, adjustment of 1912.

REMARKS.--Discharge computed on basis of head over dam, using modified weir formula, head being obtained from headwater and tailwater recorder records. Flow completely regulated by Sandy Lake (station 05218500).

COOPERATION.--Computations of daily discharge were provided by U.S. Army Corps of Engineers; discharge measurements made and records reviewed by Geological Survey.

AVERAGE DISCHARGE (unadjusted).--96 years (water years 1896-1991), 225 ft^3/s, 7.26 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 3,740 ft^3/s, July 12, 1897; no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 1,820 ft^3/s, Sept 14; minimum daily, 44 ft^3/s, Mar. 28.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	170	984	250	209	85	47	112	704	1500	930	1100	264
2	170	972	245	209	84	47	214	680	1480	1330	1090	264
3	170	804	243	209	84	47	219	664	1460	1270	760	264
4	165	804	248	209	84	47	223	640	1460	1270	784	264
5	258	784	250	209	84	47	320	624	1460	1260	784	264
6	242	514	248	209	47	47	512	600	1460	1580	566	264
7	240	516	248	207	47	48	506	1420	1110	1400	515	264
8	242	522	248	207	47	48	512	1180	1160	1160	420	256
9	245	522	248	207	47	49	512	1150	1160	880	371	250
10	248	522	248	204	47	49	651	1150	1160	744	209	873
11	248	522	248	124	47	48	801	1150	712	582	114	1420
12	152	522	248	124	47	48	792	1100	558	588	115	1800
13	155	522	248	124	48	47	792	1150	570	582	116	1800
14	155	522	245	122	47	47	801	1180	297	582	93	1820
15	153	522	248	122	47	47	801	1220	303	588	94	1780
16	102	312	250	122	47	48	783	1250	303	930	59	1750
17	102	319	245	122	48	48	984	928	303	910	59	1150
18	100	319	245	122	48	48	912	992	255	713	59	1190
19	188	322	245	122	47	48	1040	1020	260	728	59	1190
20	180	322	248	122	47	48	747	1040	159	728	157	744
21	174	322	248	122	47	48	738	592	161	855	145	768
22	170	326	245	122	47	48	747	336	510	855	148	768
23	410	326	243	122	47	47	747	360	500	940	148	768
24	560	326	240	122	47	47	747	372	500	990	115	408
25	574	329	238	121	48	47	756	376	505	1110	226	420
26	809	336	235	121	47	45	609	744	510	594	224	420
27	800	250	235	121	47	45	623	736	520	812	269	420
28	809	250	233	121	47	44	637	1190	701	612	269	424
29	819	250	233	83	---	103	644	1160	721	1130	266	424
30	984	250	235	85	---	106	644	1600	960	837	266	424
31	972	---	235	85	---	112	---	1520	---	1120	266	---
TOTAL	10766	14113	7566	4530	1506	1645	19126	28828	22718	28410	9866	23115
MEAN	347	470	244	146	53.8	53.1	638	930	757	916	318	770
MAX	984	984	250	209	85	112	1040	1600	1500	1580	1100	1820
MIN	100	250	233	83	47	44	112	336	159	582	59	250
AC-FT	21350	27990	15010	8990	2990	3260	37940	57180	45060	56350	19570	45850
CFSM	.82	1.12	.58	.35	.13	.13	1.51	2.21	1.80	2.18	.76	1.83
IN.	.95	1.25	.67	.40	.13	.15	1.69	2.55	2.01	2.51	.87	2.04

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR	
ANNUAL TOTAL	106838.0		172189	
ANNUAL MEAN	293		472	
HIGHEST ANNUAL MEAN				
LOWEST ANNUAL MEAN				
HIGHEST DAILY MEAN	1900	Jun 3	1820	Sep 14
LOWEST DAILY MEAN	15	Sep 8	44	Mar 28
ANNUAL SEVEN-DAY MINIMUM	18	Sep 5	46	Mar 22
ANNUAL RUNOFF (AC-FT)	211900		341500	
ANNUAL RUNOFF (CFSM)	.70		1.12	
ANNUAL RUNOFF (INCHES)	9.44		15.21	
10 PERCENT EXCEEDS	827		1150	
50 PERCENT EXCEEDS	170		266	
90 PERCENT EXCEEDS	20		48	

MISSISSIPPI RIVER MAIN STEM

05227500 MISSISSIPPI RIVER AT AITKIN, MN

LOCATION.--Lat 46°32'26", long 93°42'26", in SW¼NW¼ sec.24, T.47 N., R.27 W., Aitkin County, Hydrologic Unit 07010104, on right bank upstream side of highway bridge at north edge of Aitkin, 1 mi downstream from Ripple River and at mile 1,055.9 upstream from Ohio River.
DRAINAGE AREA.--6,140 mi^2, approximately.
PERIOD OF RECORD.--March 1945 to current year.
GAGE.--Water-stage recorder. Datum of gage is 1,182.41 ft above National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Mar. 1, 1945, to Mar. 14, 1961, nonrecording gage, and Mar. 15, 1961, to Sept. 30, 1967, water-stage recorder at same site at datum 3.0 ft higher. Diversion channel: Non-recording gage and crest-stage gage. Datum of gage is 1,182.02 ft above National Geodetic Vertical Datum of 1929. Apr. 9, 1955, to Apr. 10, 1956, nonrecording gage at site 4 mi downstream at different datum. Apr. 11, 1956, to Sept. 30, 1967, non-recording gage at same site at datum 3.0 ft higher.
REMARKS.--Records good except those for estimated daily discharges, which are fair. Flow regulated by Winnibigoshish Lake (sta 05201000), Leech Lake (sta 05206000), Pokegama Lake (sta 05210500), and Sandy Lake (sta 05218500). Water diverted at medium and high stages into Aitkin diversion channel 6.5 mi above station, bypasses station and returns to river 15.5 mi below station. Diversion began Apr. 2, 1955. These records include flow in diversion channel. Gage height telemeter and U.S. Army Corps of Engineers satellite telemeter at station.
EXTREMES FOR CURRENT YEAR.--River gage: Maximum discharge, 4,620 ft^3/s, May 11, 12, gage height, 11.95 ft. Diversion channel: Maximum discharge, 2,890 ft^3/s, May 11, 12, gage height, 11.45 ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1060	3280	e1300	e910	e790	e780	e2900	3470	4050	2720	2050	1130
2	1040	3170	e1250	e910	e790	e780	e2900	3680	4180	3160	1950	1120
3	1140	3100	e1250	e900	e790	e780	e2900	3830	4300	3440	1830	1160
4	1230	3030	e1200	e900	e790	e780	e2900	4170	4300	3550	1650	1140
5	1480	3020	e1200	e890	e790	e780	e2900	4550	4210	3610	1560	1100
6	1850	2970	e1200	e880	e780	e780	2850	5270	4020	3690	1480	1050
7	2050	2790	e1150	e870	e780	e780	2870	6360	3750	3710	1360	1020
8	2090	2600	e1150	e860	e780	e780	2930	7090	3420	3510	1290	1260
9	2050	2500	e1150	e860	e780	e780	2970	7300	3220	3190	1240	1900
10	1950	2440	e1150	e850	e780	e780	3020	7370	3090	2880	1190	2450
11	1890	2420	e1150	e850	e780	e780	3130	7420	2860	2570	1100	2780
12	1860	2380	e1100	e840	e780	e780	3210	7430	2600	2430	1030	3030
13	1790	2340	e1100	e840	e780	e780	3210	7380	2460	2490	975	3200
14	1750	2330	e1100	e830	e780	e780	3240	7200	2370	2570	939	3170
15	1710	2340	e1100	e820	e780	e780	3400	6960	2250	2520	893	3110
16	1700	2300	e1100	e810	e780	e800	3630	6630	2190	2440	849	3100
17	1730	2210	e1100	e800	e780	e800	3930	6180	2140	2440	807	2860
18	1870	2170	e1050	e800	e780	e850	4230	5700	2060	2390	825	2490
19	2160	2130	e1050	e800	e780	e900	4360	5330	1970	2300	928	2390
20	2580	2100	e1050	e800	e780	e950	4250	4970	1890	2260	1060	2320
21	2970	2090	e1050	e800	e780	e1000	4060	4540	1860	2310	1140	2170
22	3260	2040	e1000	e800	e780	e1100	3940	3960	1930	2300	1130	2090
23	3510	1980	e1000	e800	e780	e1200	3870	3490	2140	2250	1050	2010
24	3650	1910	e1000	e800	e780	e1500	3760	3500	2220	2160	1010	1860
25	3670	1800	e1000	e800	e780	e1800	3640	3460	2170	2090	1030	1690
26	e3600	1500	e980	e800	e780	e2100	3490	3360	2100	1950	1060	1570
27	e3550	1380	e960	e800	e780	e2400	3310	3370	2180	1760	1070	1500
28	e3500	e1350	e950	e790	e780	e2600	3170	3560	2220	1720	1050	1490
29	e3450	e1350	e940	e790	---	e2700	3080	3730	2210	1850	1050	1470
30	3380	e1300	e920	e790	---	e2800	3240	3740	2290	2050	1120	1470
31	3370	---	e920	e790	---	e2900	---	3840	---	2080	1150	---
TOTAL	72890	68320	33620	25780	21890	38100	101290	158840	82650	80390	36866	59100
MEAN	2351	2277	1085	832	782	1229	3376	5124	2755	2593	1189	1970
MAX	3670	3280	1300	910	790	2900	4360	7430	4300	3710	2050	3200
MIN	1040	1300	920	790	780	780	2850	3360	1860	1720	807	1020
AC-FT	144600	135500	66690	51130	43420	75570	200900	315100	163900	159500	73120	117200
CFSM	.38	.37	.18	.14	.13	.20	.55	.83	.45	.42	.19	.32
IN.	.44	.41	.20	.16	.13	.23	.61	.96	.50	.49	.22	.36

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1945 - 1991, BY WATER YEAR (WY)

MEAN	2598	2646	2167	1899	1825	2191	5157	5312	3735	2845	2279	2212
MAX	6534	6756	3762	3525	3196	5415	10830	15510	8072	7134	8270	6689
(WY)	1966	1972	1972	1966	1966	1945	1966	1950	1965	1975	1953	1986
MIN	313	328	324	345	398	638	1074	669	539	346	273	321
(WY)	1977	1977	1977	1977	1977	1977	1977	1958	1988	1961	1961	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1945 - 1991	
ANNUAL TOTAL	790547		779736			
ANNUAL MEAN	2165		2131		2895	
HIGHEST ANNUAL MEAN					4985	1966
LOWEST ANNUAL MEAN					796	1977
HIGHEST DAILY MEAN	6660	May 5	7430	May 12	19900	May 20 1950
LOWEST DAILY MEAN	462	Aug 22	780	Feb 6	153	Sep 1 1961
ANNUAL SEVEN-DAY MINIMUM	499	Aug 20	780	Feb 6	195	Aug 26 1961
INSTANTANEOUS PEAK FLOW	6680	May 5	7430	May 11,12	20000	May 20 1959
INSTANTANEOUS PEAK STAGE	11.20a	May 5	11.95	May 11,12	22.49b	May 20 1959
INSTANTANEOUS LOW FLOW	459	Aug 22			151	Sep 1 1961
ANNUAL RUNOFF (AC-FT)	1568000		1543000		2097000	
ANNUAL RUNOFF (CFSM)	.35		.35		.47	
ANNUAL RUNOFF (INCHES)	4.79		4.72		6.41	
10 PERCENT EXCEEDS	4090		3740		5850	
50 PERCENT EXCEEDS	1710		1890		2280	
90 PERCENT EXCEEDS	900		780		922	

a From observer reading.
b Present datum.
e Estimated.

PINE RIVER BASIN

05230500 PINE RIVER RESERVOIR AT CROSS LAKE, MN

LOCATION.--Lat 46°40'09", long 94°06'44", in SW¼NW¼ sec.21, T.137 N., R.27 W., Crow Wing County, Hydrologic Unit 07010105, at dam on Pine River, at outlet of Cross Lake at city of Cross Lake.

DRAINAGE AREA.--562 mi^2.

PERIOD OF RECORD.--March 1886 to current year. Monthend contents only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to May 3, 1949, nonrecording gage at same site and datum.

REMARKS.--Reservoir is formed by Trout, Whitefish, Rush, and Cross Lakes and several other natural lakes controlled by timber crib dams; storage began in 1886; dam completed in 1886. Capacity between elevations 1,226.32 ft and 1,234.82 ft (maximum allowable range) is 118,703 acre-ft of which 53,272 acre-ft is controlled storage between elevations 1,226.32 ft and 1,230.32 ft (normal operating range). Contents shown herein are contents above an elevation 1,216.00 ft. Prior to September 1978, published contents as contents above elevation 1,218.67 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

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

EXTREMES FOR PERIOD OF RECORD.--Maximum contents observed, 173,600 acre-ft, capacity table then in use, July 10, 1916, elevation, 1,234.56 ft; minimum observed, 1,310 acre-ft, below zero of capacity table then in use, Aug. 20, 1918, elevation, 1,217.67 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 105,850 acre-ft, May 7, elevation, 1,229.65 ft; minimum, 93,100 acre-ft, Feb. 8, elevation, 1,228.71 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,229.13	98,760	
Oct. 31	1,229.11	98,500	-260
Nov. 30	1,228.72	93,240	-5,260
Dec. 31	1,228.79	94,170	930
CAL YR 1990			+4,500
Jan. 31	1,228.73	93,370	-800
Feb. 28	1,228.83	94,710	1,340
Mar. 31	1,229.20	99,710	5,000
Apr. 30	1,229.57	104,760	5,050
May 31	1,229.33	101,490	-3,270
June 30	1,229.45	103,120	1,630
July 31	1,229.38	102,170	-950
Aug. 31	1,229.27	100,670	-1,500
Sept. 30	1,229.25	100,390	-280
WTR YR 1991			+1,630

PINE RIVER BASIN

05231000 PINE RIVER AT CROSS LAKE DAM, AT CROSS LAKE, MN

LOCATION.--Lat 46°40'09", long 94°06'44", in SW¼NW¼ sec.21, T.137 N., R.27 W., Crow Wing County, Hydrologic Unit 07010105, at dam at outlet of Cross Lake at city of Cross Lake.

DRAINAGE AREA.--562 mi^2.

PERIOD OF RECORD.--April 1886 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "below Pine River Reservoir" 1895-1916, 1929, and as "at Pine River Dam, at Cross Lake" 1941-56.

GAGE.--Water-stage recorder, headwater gage, and nonrecording tailwater gage. Datum of gages is 1,216.32 ft above National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Mar. 26, 1886, to May 31, 1929, nonrecording gages on headwater and tail water at same sites and datum. June 1 to Nov. 30, 1929, nonrecording gage in tailwater at datum 1.60 ft (0.49 m) lower. Dec. 1, 1929, to May 2, 1949, nonrecording gage on headwater and Dec. 1, 1929, to August 1949, nonrecording gage on tailwater at present sites and datum.

REMARKS.--Discharge computed principally on basis of modified weir formula, the head being obtained from twice-daily readings on tailwater gage and from headwater recorder. Flow completely regulated by Pine River Reservoir (station 05230500).

COOPERATION.--Computations of daily discharge were provided by U. S. Army Corps of Engineers.

AVERAGE DISCHARGE (unadjusted).--105 years, 220 ft^3/s, 5.32 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 2,250 ft^3/s, in June 1896 (does not include flow bypassing dam through crevasse); no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 900 ft^3/s, May 8-15; minimum daily, 30 ft^3/s, June 23-27, Aug. 7 to Sept. 19.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	100	200	150	120	120	90	225	650	300	190	60	30
2	100	200	100	120	120	104	225	650	300	250	51	30
3	100	200	100	120	120	120	225	650	300	250	45	30
4	100	200	100	120	120	120	225	550	281	350	45	30
5	100	200	100	120	120	120	225	650	267	350	45	30
6	100	200	100	120	120	120	225	650	250	350	37	30
7	100	200	100	120	120	120	225	800	225	350	30	30
8	100	200	100	120	120	120	225	900	225	350	30	30
9	100	200	100	120	120	120	225	900	225	320	30	30
10	100	200	100	120	120	120	225	900	225	290	30	30
11	100	200	100	120	120	120	225	900	194	290	30	30
12	100	200	100	120	104	120	225	900	175	275	30	30
13	100	200	100	120	90	120	180	900	134	290	30	30
14	100	200	100	120	90	120	180	900	100	290	30	30
15	100	200	100	120	90	120	180	900	100	290	30	30
16	100	200	100	120	90	120	225	700	90	200	30	30
17	100	200	100	120	90	120	225	700	90	200	30	30
18	100	200	100	120	90	120	225	700	50	200	30	30
19	125	200	100	120	90	120	276	700	50	170	30	30
20	150	200	100	120	90	120	311	700	50	250	30	50
21	150	200	112	120	90	120	300	553	50	250	30	50
22	150	200	120	120	90	120	300	480	42	250	30	50
23	150	200	120	120	90	120	300	427	30	203	30	50
24	173	200	120	120	90	120	300	400	30	170	30	50
25	200	200	120	120	90	120	300	400	30	170	30	50
26	200	200	120	120	90	175	225	400	30	77	30	50
27	200	200	120	120	90	180	225	400	30	60	30	50
28	200	200	120	120	90	180	225	400	51	60	30	50
29	200	200	120	120	---	219	225	369	190	60	30	50
30	200	200	120	120	---	225	225	350	190	60	30	50
31	200	---	120	120	---	225	---	321	---	60	30	---
TOTAL	4098	6000	3362	3720	2864	4158	7127	19800	4304	6925	1033	1120
MEAN	132	200	108	120	102	134	238	639	143	223	33.3	37.3
MAX	200	200	150	120	120	225	311	900	300	350	60	50
MIN	100	200	100	120	90	90	180	321	30	60	30	30
AC-FT	8130	11900	6670	7380	5680	8250	14140	39270	8540	13740	2050	2220
CFSM	.24	.36	.19	.21	.18	.24	.42	1.14	.26	.40	.06	.07
IN.	.27	.40	.22	.25	.19	.28	.47	1.31	.28	.46	.07	.07

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR	
ANNUAL TOTAL	71329.0		64511	
ANNUAL MEAN	195		177	
HIGHEST ANNUAL MEAN				
LOWEST ANNUAL MEAN				
HIGHEST DAILY MEAN	800	Apr 29	900	May 8
LOWEST DAILY MEAN	30	Jun 30	30	Jun 23
ANNUAL SEVEN-DAY MINIMUM	30	Jun 30	30	Aug 7
ANNUAL RUNOFF (AC-FT)	141500		128000	
ANNUAL RUNOFF (CFSM)	.35		.31	
ANNUAL RUNOFF (INCHES)	4.72		4.27	
10 PERCENT EXCEEDS	425		320	
50 PERCENT EXCEEDS	140		120	
90 PERCENT EXCEEDS	30		30	

MISSISSIPPI RIVER MAIN STEM

05242300 MISSISSIPPI RIVER AT BRAINERD, MN

LOCATION.--Lat 46°22'40", long 94°10'59", in SE¼SW¼ sec. 18, T.45 N., R.30 W., Crow Wing County, Hydrologic Unit 07010104, on left bank in hydro-plant of Potlach Corporation, Northwest Paper Division in Brainerd, 12.7 mi upstream from Crow Wing River, and at mile 1003.7 upstream from Ohio River.

DRAINAGE AREA.--7,320 mi^2, approximately.

PERIOD OF RECORD.--October 1987 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,146.96 ft above National Geodetic Vertical Datum of 1929.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Flow regulated by Winnibigoshish Lake (sta. 05201000), Leech Lake (sta. 05206000), Pokegama Lake (sta. 05210500), Sandy Lake (sta. 05218500), and Pine River Reservoir at Cross Lake (sta 05230500).

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1160	3700	e1550	1330	1090	1020	2960	4540	4860	3690	2640	1320
2	1100	3900	e1600	1260	1090	1070	3120	4960	5010	4090	2470	1180
3	1460	3660	1540	1150	1080	1020	3420	5230	5220	4500	2370	1550
4	1130	3710	1510	1240	1030	1010	3860	5460	5150	4630	2320	1280
5	1710	3720	1600	1230	1010	1090	3800	6170	5060	4640	2040	1540
6	1610	3540	1580	1220	1030	1090	3570	7020	4760	4680	2030	1210
7	2090	3710	1500	1210	1090	1010	3400	8050	4630	4700	1780	1390
8	2260	3460	1550	1060	1080	988	3420	8750	4200	4700	1490	1550
9	2310	3200	1650	1110	1050	1010	3480	9120	3830	4580	1530	1830
10	2190	3130	1500	1180	1030	995	3590	9360	3730	4170	1460	2360
11	2180	2740	1400	1190	1040	980	3590	9470	3450	3560	1260	3050
12	2110	2830	1410	1130	1040	917	3710	9430	3330	3590	1320	3290
13	1940	2840	1480	1140	1040	919	3880	9390	2880	3650	1320	3560
14	1930	2780	1310	1110	1060	1060	3830	9450	2890	3640	1150	3520
15	1950	2800	1390	1060	1090	1040	4090	9290	2830	3640	1070	3570
16	2040	2820	e1300	1100	993	1010	4360	8950	2400	3340	1100	3490
17	2260	2720	e1230	1110	995	1060	4550	8180	2570	3190	1150	3520
18	2200	2540	e1100	1140	976	1100	4760	7520	2480	3100	929	3150
19	2160	2610	e990	1050	981	1100	5030	7110	2370	3270	977	2800
20	2800	2520	e1000	1060	975	1230	5080	6740	2410	2850	1240	2700
21	3270	2460	e1100	1090	1020	1470	4910	6140	2340	2790	1370	2490
22	3520	2420	e1150	1100	1090	1410	4770	5490	2290	2780	1340	2410
23	3820	2400	e1200	1130	1080	1340	4600	4880	2390	2840	1330	2530
24	4120	2300	1240	1200	1110	1610	4550	4630	2580	2740	1270	2220
25	4150	2090	1260	1130	983	1620	4440	4450	2430	2580	1350	1950
26	4210	2010	1290	1050	991	2080	4420	4420	2390	2440	1300	1910
27	4040	1570	1390	1040	1080	2490	4030	4240	3030	2350	1430	1570
28	4110	1310	1380	1180	997	2830	3890	4480	2850	2220	1200	1570
29	3910	1300	1340	1130	---	2880	4200	4460	3050	2210	1230	1670
30	4010	1330	1340	1130	---	2930	3950	4800	3070	2260	1200	1570
31	3930	---	1350	1080	---	3100	---	4870	---	2480	1350	---
TOTAL	81680	82120	42230	35340	29121	44479	121260	207050	100480	105900	46016	67750
MEAN	2635	2737	1362	1140	1040	1435	4042	6679	3349	3416	1484	2258
MAX	4210	3900	1650	1330	1110	3100	5080	9470	5220	4700	2640	3570
MIN	1100	1300	990	1040	975	917	2960	4240	2290	2210	929	1180
AC-FT	162000	162900	83760	70100	57760	88220	240500	410700	199300	210100	91270	134400
CFSM	.36	.37	.19	.16	.14	.20	.55	.91	.46	.47	.20	.31
IN.	.42	.42	.21	.18	.15	.23	.62	1.05	.51	.54	.23	.34

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1991, BY WATER YEAR (WY)

MEAN	2528	2310	1826	1699	1683	2124	5045	4773	3532	2361	1510	2065
MAX	2635	2737	2148	2092	2250	2732	8601	6923	6193	3416	2260	2952
(WY)	1991	1991	1989	1989	1989	1990	1989	1989	1990	1991	1987	1989
MIN	2442	1970	1362	1140	1040	1435	3400	1928	662	442	935	1166
(WY)	1988	1989	1991	1991	1991	1991	1990	1988	1988	1988	1990	1990

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1987 - 1991	
ANNUAL TOTAL	977536		963426			
ANNUAL MEAN	2678		2640		2658	
HIGHEST ANNUAL MEAN					3384	1989
LOWEST ANNUAL MEAN					1950	1988
HIGHEST DAILY MEAN	8890	Jun 14	9470	May 11	10700	Apr 23 1989
LOWEST DAILY MEAN	551	Aug 24	917	Mar 12	348	Jul 30 1988
ANNUAL SEVEN-DAY MINIMUM	588	Aug 19	974	Mar 7	357	Jul 29 1988
INSTANTANEOUS PEAK FLOW	9250	Jun 14	9710	May 11	10800	Apr 23 1989
INSTANTANEOUS PEAK STAGE	11.31	Jun 14	11.64	May 11	12.40	Apr 23 1989
INSTANTANEOUS LOW FLOW	510	Aug 24	596a	Sep 30	273	Jul 12 1988
ANNUAL RUNOFF (AC-FT)	1939000		1911000		1925000	
ANNUAL RUNOFF (CFSM)	.37		.36		.36	
ANNUAL RUNOFF (INCHES)	4.97		4.90		4.93	
10 PERCENT EXCEEDS	5050		4700		4790	
50 PERCENT EXCEEDS	1990		2220		2150	
90 PERCENT EXCEEDS	1040		1060		1030	

a Due to regulation.
e Estimated

CROW WING RIVER BASIN

05243721 STRAIGHT RIVER AT COUNTY HIGHWAY 125 NEAR OSAGE, MN

LOCATION.--Lat 46°54'15", long 95°12'15", in NW¼NW¼ sec.35, T.140 N., R.36 W., Becker County, Hydrologic Unit 07010106, on downstream side of culverts on County Highway 125, 2.7 mi southest of Osage.

PERIOD OF RECORD.--October 1986 to current year (no winter records in 1987, 1990-91). Records of hourly water temperature, available in files of the Geological Survey.

GAGE.--Water-stage recorder. Elevation of gage is 1,435 ft above National Geodetic Vertical Datum of 1929, from topographic map.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	---	---	---	---	---	36	53	40	42	27	30
2	28	---	---	---	---	---	36	49	40	40	27	29
3	45	---	---	---	---	---	36	48	39	40	31	34
4	45	---	---	---	---	---	37	55	36	39	35	31
5	43	---	---	---	---	---	38	53	35	38	35	29
6	41	---	---	---	---	---	38	50	34	37	33	29
7	37	---	---	---	---	---	37	48	33	36	32	28
8	35	---	---	---	---	---	36	44	33	34	31	32
9	33	---	---	---	---	---	35	41	32	34	31	36
10	32	---	---	---	---	---	34	39	34	33	30	35
11	31	---	---	---	---	---	34	39	34	33	30	33
12	31	---	---	---	---	---	33	38	34	34	29	32
13	30	---	---	---	---	---	33	38	32	35	28	32
14	30	---	---	---	---	---	40	38	33	33	28	40
15	30	---	---	---	---	---	46	36	35	32	28	43
16	30	---	---	---	---	---	49	36	34	31	28	45
17	45	---	---	---	---	---	49	35	32	31	28	43
18	47	---	---	---	---	---	47	32	32	31	28	41
19	44	---	---	---	---	33	44	30	34	31	28	39
20	42	---	---	---	---	34	41	29	37	30	27	36
21	40	---	---	---	---	36	39	30	40	30	27	33
22	38	---	---	---	---	37	39	31	40	31	28	32
23	37	---	---	---	---	44	38	39	37	31	27	32
24	36	---	---	---	---	44	36	52	35	30	28	32
25	34	---	---	---	---	43	35	48	34	29	32	33
26	34	---	---	---	---	43	34	46	34	29	32	33
27	35	---	---	---	---	42	37	43	35	28	31	31
28	33	---	---	---	---	40	39	40	34	28	32	32
29	32	---	---	---	---	39	51	39	35	27	33	30
30	32	---	---	---	---	37	61	39	35	28	34	31
31	32	---	---	---	---	36	---	40	---	27	33	---
TOTAL	1111	---	---	---	---	---	1188	1278	1052	1012	931	1016
MEAN	35.8	---	---	---	---	---	39.6	41.2	35.1	32.6	30.0	33.9
MAX	47	---	---	---	---	---	61	55	40	42	35	45
MIN	28	---	---	---	---	---	33	29	32	27	27	28
AC-FT	2200	---	---	---	---	---	2360	2530	2090	2010	1850	2020

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1991, BY WATER YEAR (WY)

MEAN	38.2	39.2	38.9	37.5	35.2	37.0	43.7	43.0	37.2	32.2	32.7	35.7
MAX	49.5	39.7	39.7	37.5	35.9	38.2	48.5	46.5	41.7	40.2	36.8	41.5
(WY)	1987	1988	1989	1988	1989	1988	1989	1989	1989	1987	1987	1989
MIN	31.9	38.7	38.2	37.5	34.6	35.7	39.6	39.7	33.0	26.2	26.8	27.3
(WY)	1989	1989	1988	1989	1988	1989	1991	1988	1988	1988	1990	1990

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1987 - 1991	
ANNUAL MEAN					37.5	
HIGHEST ANNUAL MEAN					38.4	1989
LOWEST ANNUAL MEAN					36.6	1988
HIGHEST DAILY MEAN					66	Sep 4 1989
LOWEST DAILY MEAN					22	Jan 30 1990
ANNUAL SEVEN-DAY MINIMUM					24	Jul 18 1988
INSTANTANEOUS PEAK FLOW	54	Jun 3	65	Apr 29,30	69	Sep 4 1989
INSTANTANEOUS PEAK STAGE	7.65	Oct 18	7.75	Apr 29,30	7.86	Sep 4 1989
INSTANTANEOUS LOW FLOW	22a		26	Aug 22	21b	
ANNUAL RUNOFF (AC-FT)					27150	
10 PERCENT EXCEEDS					48	
50 PERCENT EXCEEDS					37	
90 PERCENT EXCEEDS					28	

a Occurred Aug. 10, 16, Sept. 11, 15.
b Occurred July 19, 21, 22, 23, 26, 1988.

CROW WING RIVER BASIN

05243725 STRAIGHT RIVER NEAR PARK RAPIDS, MN

LOCATION.--Lat 46°52'30", long 95°03'56", in NW¼NE¼ sec.11, T.139 N., R.35 W., Hubbard County, Hydrologic Unit 07010106, upstream from culvert on U.S. Highway 71, 3.2 mi south of Park Rapids.
DRAINAGE AREA.--53.2 mi^2.
PERIOD OF RECORD.--Occasional low-flow measurements, water years 1970-71, 1973, 1975-76. October 1986 to current year (no winter records in 1987, 1990-91). Records of hourly water temperature, available in files of the Geological Survey.
GAGE.--Water-stage recorder. Elevation of gage is 1,400 ft above National Geodetic Vertical Datum of 1929, from topographic map.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
EXTREMES OUTSIDE PERIOD OF RECORD.--A discharge of 35 ft^3/s was measured Aug. 4, 1976.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	38	---	---	---	---	---	e54	77	e56	51	39	42
2	37	---	---	---	---	---	e54	72	e55	54	38	42
3	49	---	---	---	---	---	e55	69	54	52	42	47
4	53	---	---	---	---	---	e57	77	52	54	45	45
5	53	---	---	---	---	---	59	74	50	51	46	43
6	51	---	---	---	---	---	56	71	49	50	45	42
7	50	---	---	---	---	---	52	68	48	50	44	42
8	47	---	---	---	---	---	51	64	47	47	41	e42
9	45	---	---	---	---	---	51	61	47	47	40	e50
10	44	---	---	---	---	---	50	59	49	43	39	e48
11	43	---	---	---	---	---	48	58	49	45	40	e47
12	43	---	---	---	---	---	47	58	47	50	40	e46
13	42	---	---	---	---	---	48	62	46	48	38	e45
14	42	---	---	---	---	---	54	58	44	48	37	e55
15	44	---	---	---	---	---	59	56	46	45	36	e60
16	43	---	---	---	---	---	63	54	46	44	37	e60
17	57	---	---	---	---	---	66	53	45	45	38	e60
18	64	---	---	---	---	---	63	51	43	43	38	e58
19	60	---	---	---	---	---	61	49	44	45	37	e54
20	57	---	---	---	---	---	58	48	49	45	36	e50
21	56	---	---	---	---	---	56	e48	51	44	36	e48
22	53	---	---	---	---	---	55	48	50	45	36	e46
23	50	---	---	---	---	---	55	e51	50	45	37	e44
24	49	---	---	---	---	---	54	e70	48	44	37	e44
25	48	---	---	---	---	---	52	e67	47	41	43	e45
26	47	---	---	---	---	---	51	e64	45	41	42	e45
27	47	---	---	---	---	---	55	e60	44	42	42	e44
28	47	---	---	---	---	---	57	e56	47	41	41	e43
29	45	---	---	---	---	---	63	e55	48	40	41	e42
30	45	---	---	---	---	---	80	e54	50	38	41	e41
31	46	---	---	---	---	---	---	e56	---	40	43	---
TOTAL	1495	---	---	---	---	---	1684	1868	1446	1418	1235	1420
MEAN	48.2	---	---	---	---	---	56.1	60.3	48.2	45.7	39.8	47.3
MAX	64	---	---	---	---	---	80	77	56	54	46	60
MIN	37	---	---	---	---	---	47	48	43	38	36	41
AC-FT	2970	---	---	---	---	---	3340	3710	2870	2810	2450	2820
CFSM	.91	---	---	---	---	---	1.06	1.13	.91	.86	.75	.89
IN.	1.05	---	---	---	---	---	1.18	1.31	1.01	.99	.86	.99

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1991, BY WATER YEAR (WY)

MEAN	55.4	51.1	48.5	44.5	47.6	56.1	64.2	61.9	53.1	46.1	43.6	49.6
MAX	73.6	54.8	51.0	46.0	49.1	61.3	73.0	68.2	59.2	60.2	52.7	57.2
(WY)	1987	1988	1988	1989	1988	1988	1989	1987	1987	1987	1987	1989
MIN	47.0	47.4	46.0	43.1	46.0	50.9	56.1	55.5	46.3	39.5	35.9	38.7
(WY)	1989	1989	1989	1988	1989	1989	1991	1988	1988	1988	1990	1990

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1987 - 1991	
ANNUAL MEAN					51.2	
HIGHEST ANNUAL MEAN					51.3	1989
LOWEST ANNUAL MEAN					51.1	1988
HIGHEST DAILY MEAN					85	May 22 1987
LOWEST DAILY MEAN					32	Aug 15 1990
ANNUAL SEVEN-DAY MINIMUM					34	Aug 5 1990
INSTANTANEOUS PEAK FLOW	75	Jun 4	84	Apr 30	89	Aug 31 1989
INSTANTANEOUS PEAK STAGE	1.80	Oct 18	1.80	Oct 18	2.66a	Mar 11 1989
INSTANTANEOUS LOW FLOW	28	Aug 11	35	Many days	28b	
ANNUAL RUNOFF (AC-FT)					37080	
ANNUAL RUNOFF (CFSM)					.96	
ANNUAL RUNOFF (INCHES)					13.07	
10 PERCENT EXCEEDS					69	
50 PERCENT EXCEEDS					51	
90 PERCENT EXCEEDS					40	

a Backwater from ice.
b Occurred July 22, 23, 1988, Aug. 11, 1990.
e Estimated.

CROW WING RIVER BASIN

05245100 LONG PRAIRIE RIVER AT LONG PRAIRIE, MN

LOCATION.--Lat 45°58'30", long 94°51'56", in NE¼NW¼ sec.20, T.129 N., R.33 W., Todd County, Hydrologic Unit 07010108, on right bank 90 ft upstream from bridge on First Avenue at Long Prairie and 400 ft downstream from Venewitz Creek.

DRAINAGE AREA.--432 mi^2.

PERIOD OF RECORD.--October 1971 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,281.74 ft above National Geodetic Vertical Datum of 1929.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	55	e28	e13	e12	25	219	373	174	335	187	92
2	37	51	e28	e13	e12	25	171	383	183	325	187	92
3	101	49	e27	e12	e12	25	144	387	197	306	185	89
4	92	47	e26	e12	e14	25	139	405	203	299	180	85
5	97	45	e26	e12	16	26	139	410	203	297	170	82
6	103	45	e26	e12	17	28	140	400	192	311	166	77
7	92	42	e26	e12	19	28	141	377	169	324	162	77
8	80	36	e26	e12	22	28	136	357	151	322	162	117
9	70	42	e27	12	25	28	138	337	148	314	154	137
10	64	43	e28	12	e26	31	141	311	152	300	157	140
11	55	43	30	12	e27	37	135	285	139	291	147	140
12	49	41	30	12	28	39	130	264	181	331	145	143
13	47	41	37	12	28	37	154	249	191	308	147	148
14	44	41	28	12	28	37	217	235	182	282	142	158
15	41	39	28	12	28	41	266	221	182	262	145	162
16	41	39	28	12	28	30	300	214	173	243	146	163
17	62	38	28	12	26	29	345	203	163	233	147	162
18	77	38	26	12	26	29	400	193	161	236	145	159
19	74	38	23	e12	26	50	425	190	163	235	144	149
20	81	38	e21	e12	25	90	426	188	201	227	145	142
21	80	38	e19	e12	25	113	417	181	221	225	143	138
22	73	38	e18	e12	25	118	407	174	228	225	145	135
23	70	37	e17	e12	25	129	383	169	237	218	138	132
24	64	32	e16	e12	25	128	337	168	231	216	133	127
25	60	24	e16	e12	25	198	290	179	224	208	141	126
26	58	30	e15	e12	25	294	259	177	225	200	139	121
27	54	35	e15	e12	25	339	249	168	243	196	134	115
28	51	30	e14	e12	25	233	248	159	257	200	125	111
29	50	30	e14	e12	---	234	271	158	270	197	106	106
30	51	30	e14	e12	---	255	340	158	283	194	102	107
31	59	---	e13	e12	---	258	---	169	---	191	96	---
TOTAL	2012	1175	718	374	645	2987	7507	7842	5927	8051	4565	3732
MEAN	64.9	39.2	23.2	12.1	23.0	96.4	250	253	198	260	147	124
MAX	103	55	37	13	28	339	426	410	283	335	187	163
MIN	35	24	13	12	12	25	130	158	139	191	96	77
AC-FT	3990	2330	1420	742	1280	5920	14890	15550	11760	15970	9050	7400
CFSM	.15	.09	.05	.03	.05	.22	.58	.59	.46	.60	.34	.29
IN.	.17	.10	.06	.03	.06	.26	.65	.68	.51	.69	.39	.32

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1972 - 1991, BY WATER YEAR (WY)

MEAN	128	118	72.8	57.6	56.7	163	348	245	206	179	133	121
MAX	512	425	270	217	208	441	748	653	422	777	715	607
(WY)	1987	1972	1987	1987	1987	1985	1986	1986	1985	1972	1972	1986
MIN	13.4	8.69	3.19	1.05	1.62	19.8	71.8	45.5	27.5	4.73	10.0	5.32
(WY)	1977	1977	1977	1977	1977	1989	1977	1977	1988	1988	1989	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1972 - 1991	
ANNUAL TOTAL	27304.9		45535			
ANNUAL MEAN	74.8		125		153	
HIGHEST ANNUAL MEAN					366	1972
LOWEST ANNUAL MEAN					25.2	1977
HIGHEST DAILY MEAN	438	Mar 13	426	Apr 20	2900	Jul 22 1972
LOWEST DAILY MEAN	2.8	Jan 28	12	Jan 3	.84	Jan 12 1977
ANNUAL SEVEN-DAY MINIMUM	3.0	Jan 26	12	Jan 3	.84	Jan 12 1977
INSTANTANEOUS PEAK FLOW	460	Mar 13	432	Apr 19	3270	Jul 22 1972
INSTANTANEOUS PEAK STAGE	4.95	Mar 13	4.86	Mar 26	9.37	Jul 22 1972
ANNUAL RUNOFF (AC-FT)	54160		90320		110500	
ANNUAL RUNOFF (CFSM)	.17		.29		.35	
ANNUAL RUNOFF (INCHES)	2.35		3.92		4.80	
10 PERCENT EXCEEDS	190		287		364	
50 PERCENT EXCEEDS	52		107		90	
90 PERCENT EXCEEDS	3.2		14		18	

e Estimated

CROW WING RIVER BASIN

05246500 GULL LAKE NEAR BRAINERD, MN

LOCATION.--Lat 46°24'40", long 94°21'26", in NF sec.20, T.134 N., R.29 W., Cass County, Hydrologic Unit 07010106, in pool of dam on Gull River, 800 ft south of outlet of Gull Lake, 0.2 mi upstream from Gull Lake Dam, and 8 mi northwest of Brainerd.

DRAINAGE AREA.--287 mi^2.

PERIOD OF RECORD.--August 1911 to current year. Prior to October 1941 monthend contents only, published in WSP 1308. Published as Gull Lake Reservoir October 1941 to September 1956.

GAGE.--Water-stage recorder. Datum of gage is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Aug. 10, 1949, nonrecording gage 800 ft north of present site at same datum. Aug. 11, 1949, to June 30, 1973, water-stage recorder at present site and at datum 1,188.14 ft, adjustment of 1912.

REMARKS.--Reservoir is formed by Gull Lake and several other natural lakes controlled by concrete dam completed in 1913; storage began in 1912. Capacity between elevation 1,192.75 ft and 1,194.75 ft (maximum allowable range and normal operating range) is 26,008 acre-ft. Contents shown herein are contents above elevation 1,188.00 ft. Prior to September 1978, published contents as contents above elevation 1,188.75 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

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

EXTREMES FOR PERIOD OF RECORD.--Maximum contents, 74,800 acre-ft, capacity table then in use, June 30, 1914, elevation, 1,195.05 ft; minimum observed, 22,250 acre-ft, capacity table then in use, Mar. 20, 1924, elevation, 1,190.75 ft.

EXTREMES FOR CURRENT YEAR.--Maximum contents, 64,030 acre-ft, July 1, elevation, 1,194.23 ft; minimum, 54,260 acre-ft, Jan. 10, elevation, 1,193.48 ft.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1,193.54	55,040	
Oct. 31	1,193.74	57,630	-2,600
Nov. 30	1,193.59	55,680	-1,950
Dec. 31	1,193.55	55,160	-520
CAL YR 1990			+1,550
Jan. 31	1,193.55	55,160	0
Feb. 28	1,193.61	55,940	+780
Mar. 31	1,193.67	56,720	+780
Apr. 30	1,194.13	62,720	+6,000
May 31	1,194.02	61,280	-1,440
June 30	1,194.12	62,590	+1,310
July 31	1,194.01	61,150	-1,440
Aug. 31	1,193.91	59,850	-1,300
Sept. 30	1,193.80	58,420	-1,430
WTR YR 1991			+3,380

CROW WING RIVER BASIN

05247000 GULL RIVER AT GULL LAKE DAM, NEAR BRAINERD, MN

LOCATION.--Lat 46°24'40", long 94°21'12", in sec.20, T.134 N., R.29 W., Cass County, Hydrologic Unit 07010106, in headwater and tailwater of dam at outlet of Gull Lake, 8 mi northwest of Brainerd.

DRAINAGE AREA.--287 mi^2.

PERIOD OF RECORD.--August 1911 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "Gull Lake Reservoir" 1929.

GAGE.--Water-stage recorder on headwater and nonrecording gage on tailwater. Datum of gages is National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). August 1911 to May 23, 1929, and Dec. 1, 1929, to Aug 1, 1949, both gages were nonrecording gages at same site and datum in use. May 24 to Nov. 30, 1929, nonrecording gage 500 ft downstream at different datum. Aug. 2, 1949, to June 30, 1973, at present sites with datum of gage at 1,188.14 ft, adjustment of 1912.

REMARKS.--Discharge computed at dam on basis of modified weir formulas, the head being obtained from twice-daily readings on tailwater gage and from headwater recorder. Flow completely regulated by Gull Lake (station 05246500).

COOPERATION.--Computations of daily discharge were provided by U.S. Army Corps of Engineers.

AVERAGE DISCHARGE (unadjusted).--80 years, 109 ft^3/s, 5.16 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 1,120 ft^3/s, May 15, 1938; no flow at times.

EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 400 ft^3/s, May 8-10; minimum daily, 18 ft^3/s, Oct. 1-3; 13-16.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	47	43	92	44	110	190	330	95	150	31	20
2	18	63	43	92	44	120	140	340	100	150	31	20
3	18	73	43	92	43	140	110	340	100	150	32	20
4	19	73	51	92	44	140	110	320	100	170	32	20
5	19	73	57	94	44	130	87	300	100	190	32	20
6	19	73	57	94	44	120	74	310	100	190	32	20
7	19	73	57	94	44	120	74	360	90	190	32	20
8	19	73	57	94	44	100	75	400	73	180	31	20
9	19	73	57	70	44	91	75	400	63	170	31	20
10	19	73	57	57	44	91	75	400	54	150	32	20
11	19	73	57	47	44	90	75	370	51	150	32	20
12	19	73	57	41	44	81	75	300	32	150	31	20
13	18	73	57	42	44	76	76	300	21	150	35	20
14	18	58	57	43	44	76	77	240	22	150	21	19
15	18	51	57	43	44	63	77	200	33	140	21	19
16	18	51	57	43	44	45	120	200	41	140	21	19
17	19	51	57	43	45	39	150	200	41	140	20	19
18	19	51	57	43	45	39	150	210	36	140	20	20
19	19	51	57	43	45	39	150	220	25	110	20	19
20	19	45	57	42	52	34	150	210	21	92	20	38
21	19	43	81	44	58	30	150	140	39	92	20	50
22	19	43	94	44	69	30	150	99	62	92	20	50
23	25	43	94	44	75	56	130	87	69	97	20	50
24	29	43	94	44	74	150	110	80	69	110	20	50
25	29	43	94	44	75	190	99	80	52	110	20	40
26	38	43	94	44	75	190	99	80	28	72	20	38
27	46	43	94	44	98	190	99	80	21	38	20	38
28	46	43	94	44	110	190	100	80	34	32	20	49
29	46	43	94	44	---	190	100	80	47	32	20	49
30	46	43	94	44	---	190	250	80	120	32	20	49
31	46	---	94	44	---	190	---	80	---	32	20	---
TOTAL	762	1701	2113	1785	1524	3340	3397	6916	1739	3791	777	876
MEAN	24.6	56.7	68.2	57.6	54.4	108	113	223	58.0	122	25.1	29.2
MAX	46	73	94	94	110	190	250	400	120	190	35	50
MIN	18	43	43	41	43	30	74	80	21	32	20	19
AC-FT	1510	3370	4190	3540	3020	6620	6740	13720	3450	7520	1540	1740
CFSM	.09	.20	.24	.20	.19	.38	.39	.78	.20	.43	.09	.10
IN.	.10	.22	.27	.23	.20	.43	.44	.90	.23	.49	.10	.11

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR	
ANNUAL TOTAL	31844.0		28721	
ANNUAL MEAN	87.2		78.7	
HIGHEST ANNUAL MEAN				
LOWEST ANNUAL MEAN				
HIGHEST DAILY MEAN	504	Mar 18	400	May 8
LOWEST DAILY MEAN	18	Aug 28	18	Oct 1
ANNUAL SEVEN-DAY MINIMUM	18	Sep 27	18	Oct 10
ANNUAL RUNOFF (AC-FT)	63160		56970	
ANNUAL RUNOFF (CFSM)	.30		.27	
ANNUAL RUNOFF (INCHES)	4.13		3.72	
10 PERCENT EXCEEDS	206		150	
50 PERCENT EXCEEDS	54		54	
90 PERCENT EXCEEDS	19		20	

CROW WING RIVER BASIN

05247500 CROW WING RIVER NEAR PILLAGER, MN

LOCATION.--Lat 46°18'18", long 94°22'38", in SW¼NE¼ sec.30, T.133 N., R.29 W., Cass County, Hydrologic Unit 07010106, at Sylvan dam powerplant of Minnesota Power Co., 3.6 mi above mouth and 4.9 mi southeast of Pillager.

DRAINAGE AREA.--3,520 mi^2, approximately.

PERIOD OF RECORD.--October 1968 to September 1986, October 1987 to current year. Records for August 1924 to September 1968 available in files of the Minnesota District Office.

GAGE.--Water stage recorder. Datum of gage is 1,151.00 ft, adjustment of 1912. Prior to January 16, 1991, staff gage attached to retaining wall approximately 20 ft below the turbine outlet bays. Datum of staff gage is 1,150.00 ft, adjustment of 1912.

REMARKS.--Records for period October 1, 1990 to April 24, 1991 are poor. Records for the period of April 25, 1991 to September 30, 1991 are good except those for estimated daily discharge, which are fair.

Discharge computed on the basis of powerplant records prior to January 16, 1991. Records for Oct. 1, 1968 to Sept. 30, 1975, were adjusted for storage change in the Sylvan dam reservoir. Flow partly regulated by powerplants and Gull Lake (station 05246500).

COOPERATION.--Records collected by Minnesota Power Co. under general supervision of Geological Survey prior to February 1991, in connection with a Federal Power Commission project.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum daily discharge since 1924, 18,300 ft^3/s, Apr. 14, 1965.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	391	717	615	e610	e579	e682	e2210	2910	1600	2110	e1200	464
2	402	718	652	e600	e579	e682	e2310	3080	1540	2280	e1140	477
3	520	697	572	e600	e579	e682	e2410	3030	1490	2340	e1070	598
4	723	603	552	e600	e571	e709	e2100	3070	1320	2360	e1000	674
5	762	725	552	e600	e588	e755	e1560	3210	1280	2230	e960	666
6	750	758	552	e590	e588	e656	e1410	3290	1260	2070	e950	596
7	560	757	551	e580	e588	e555	e1410	3200	1240	2170	e900	551
8	514	586	552	e580	e588	e470	e1390	3200	1220	1960	e850	590
9	501	607	552	e580	e588	e539	e1390	3140	992	1890	e810	583
10	524	645	552	e580	e604	e539	e1410	3100	778	1910	773	811
11	551	646	860	e580	e774	e547	e1360	3110	940	1830	790	889
12	551	646	620	e580	e664	e531	e1210	3060	970	1750	801	788
13	551	618	526	e580	e664	e500	e1270	2630	954	1750	679	726
14	551	634	551	e580	e664	e500	e1480	2450	939	1750	600	725
15	570	644	552	e570	e682	e508	e2020	2460	913	1620	628	713
16	549	644	551	e570	e682	e508	e2160	2620	773	1460	678	738
17	648	644	552	e570	e682	e508	e2160	2550	851	1330	648	791
18	744	644	552	e579	e682	e579	e2480	2480	736	1330	612	767
19	696	584	550	e571	e656	e664	e2610	2080	838	1330	604	758
20	724	565	520	e579	e613	e727	e2580	1680	881	1350	608	790
21	820	645	408	e455	e613	e943	e2560	1620	936	1350	629	818
22	694	660	415	e492	e613	e1200	e2540	1640	951	1180	642	715
23	1010	704	462	e547	e621	e1220	e2420	1630	954	1090	640	679
24	813	551	463	e547	e630	e1380	e2330	1780	1030	1130	645	706
25	727	456	464	e547	e630	e1360	2160	1770	989	1070	640	571
26	647	368	590	e547	e664	e1590	2030	1760	952	1050	643	621
27	732	320	710	e426	e682	e2180	2000	1740	946	1030	623	735
28	757	321	689	e448	e682	e2420	2010	1460	929	1050	535	716
29	816	404	477	e547	---	e2380	2110	1320	1400	e1060	439	713
30	829	522	383	e555	---	e2160	2580	1450	1760	e1150	440	671
31	712	---	551	e579	---	e2230	---	1510	---	e1170	443	---
TOTAL	20539	18033	17148	17369	17750	30904	59670	74030	32362	49150	22620	20640
MEAN	663	601	553	560	634	997	1989	2388	1079	1585	730	688
MAX	1010	758	860	610	774	2420	2610	3290	1760	2360	1200	889
MIN	391	320	383	426	571	470	1210	1320	736	1030	439	464
AC-FT	40740	35770	34010	34450	35210	61300	118400	146800	64190	97490	44870	40940
CFSM	.20	.18	.17	.17	.19	.30	.60	.72	.33	.48	.22	.21
IN.	.23	.20	.19	.20	.20	.35	.67	.83	.36	.55	.25	.23

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1969 - 1991, BY WATER YEAR (WY)

MEAN	1178	1172	767	630	638	1253	3122	2261	1583	1270	861	859
MAX	3771	3674	1544	1188	1125	2996	7429	5671	3483	3295	3520	3309
(WY)	1974	1972	1972	1986	1986	1972	1969	1986	1985	1972	1972	1986
MIN	215	215	199	218	255	548	882	545	447	206	120	161
(WY)	1977	1977	1977	1977	1977	1981	1981	1977	1988	1988	1976	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1969 - 1991	
ANNUAL TOTAL	348426		380215			
ANNUAL MEAN	955		1042		1300	
HIGHEST ANNUAL MEAN					2564	1972
LOWEST ANNUAL MEAN					446	1977
HIGHEST DAILY MEAN	4270	Mar 18	3290	May 6	16600	Apr 12 1969
LOWEST DAILY MEAN	106	Aug 8	320	Nov 27	60	Aug 10 1976
ANNUAL SEVEN-DAY MINIMUM	271	Aug 14	420	Nov 24	68	Aug 9 1976
ANNUAL RUNOFF (AC-FT)	691100		754200		942000	
ANNUAL RUNOFF (CFSM)	.29		.32		.39	
ANNUAL RUNOFF (INCHES)	3.93		4.29		5.35	
10 PERCENT EXCEEDS	2120		2190		2750	
50 PERCENT EXCEEDS	572		713		846	
90 PERCENT EXCEEDS	363		529		398	

e Estimated.

MISSISSIPPI RIVER MAIN STEM

05261000 MISSISSIPPI RIVER NEAR FORT RIPLEY, MN

LOCATION.--Lat 46°10'50", long 94°21'56", in SE¼NW¼ sec.27, T.43 N., R.32 W., Crow Wing County, Hydrologic Unit 07010104, on left bank 600 ft upstsream from Nokasippi River, 1.0 mile north of Fort Ripley, and at mile 982.1 upstream from Ohio River.

DRAINAGE AREA.--11,010 mi^2, approximately.

PERIOD OF RECORD.--June 1987 to current year. Operated as high-flow partial-record station October 1971 to June 1987. Prior to Oct. 1971 stage records collected by U.S. Weather Service.

GAGE.--Water-stage recorder. Datum of gage is 1,133.84 ft above National Geodetic Vertical Datum of 1929. Aug. 1904 to June 1987 nonrecording gages at different datums.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Flow partly regulated by powerplants and Winnibigoshish, Leech, Pokegama, Sandy, and Gull Lakes and by Pine River Reservoir (see stations 05201000, 05206000, 05210500, 05218500, 05230500, 05246500).

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1720	4590	e2000	e1700	e1500	e1700	5670	7560	6660	5740	3320	2010
2	1760	4740	e2200	e1600	e1500	e1700	5720	8550	6680	6700	3430	1950
3	2070	4340	e2200	e1500	e1480	e1700	6020	8490	6910	7310	3210	2380
4	2080	4210	e2000	e1600	e1480	e1700	6400	8900	6760	7680	3130	2020
5	2410	4240	e1950	e1600	e1450	e1700	5900	9560	6550	7490	2870	2370
6	2570	4240	e2050	e1550	e1500	e1700	5490	10900	6330	7200	2700	2110
7	2590	4230	e2100	e1500	e1550	e1730	5250	11500	6050	7320	2660	1940
8	2880	4150	e2100	e1500	e1550	e1650	5260	12700	5780	7210	2330	2120
9	2990	3690	e2050	e1500	e1500	e1550	5200	13100	5300	6860	2190	2220
10	2930	3680	e2100	e1500	e1450	e1600	5360	13400	4660	6500	2320	2960
11	2840	3450	e1950	e1500	e1480	e1600	5370	13300	4550	6030	2140	3870
12	2720	3450	e1850	e1500	e1480	e1650	5210	13200	4560	5700	2100	4240
13	2640	3530	e1900	e1500	e1500	e1600	5470	12700	4150	5620	2060	4280
14	2560	3510	e1950	e1500	e1500	e1550	5650	12200	4050	5550	1940	4570
15	2530	3510	e1950	e1500	e1550	e1600	6190	11900	4040	5470	1790	4480
16	2560	3540	e1900	e1400	e1500	e1750	6840	11600	3620	5240	1780	4440
17	2740	3520	e1850	e1400	e1600	e1900	6920	11100	3370	4820	1890	4410
18	3160	3260	e1500	e1500	e1600	e2050	7540	10300	3510	4940	1740	4220
19	2840	3340	e1350	e1550	e1500	e2300	8010	9280	3380	4820	1680	3860
20	3150	3190	e1200	e1550	e1500	2610	8080	8520	3500	4720	1750	3710
21	3950	3160	e1300	e1500	e1500	2850	8050	7860	3610	4550	2050	3610
22	4100	3180	e1450	e1500	e1500	2960	7870	7370	3340	4460	2080	3340
23	4790	3170	e1600	e1500	e1500	3030	7520	6770	3410	4100	2090	3280
24	4730	3080	e1650	e1500	e1500	3370	7340	6600	3450	4120	2060	3240
25	4850	2720	e1700	e1600	e1400	3520	7030	6410	3650	3880	2110	2870
26	4810	2630	e1750	e1500	e1450	3840	6790	6460	3830	3740	2120	2720
27	4840	2230	e1800	e1500	e1550	5010	6630	6230	3780	3600	1980	2700
28	4780	1870	e1850	e1500	e1650	5690	6410	6150	3980	3420	2020	2490
29	4870	e1600	e1800	e1500	---	5800	6520	6000	4690	3410	1820	2590
30	4840	e1750	e1800	e1500	---	5670	7120	6270	4970	3230	1840	2530
31	4700	---	e1800	e1500	---	5710	---	6610	---	3470	1820	---
TOTAL	103000	101800	56650	47050	42220	82790	192830	291490	139120	164900	69020	93530
MEAN	3323	3393	1827	1518	1508	2671	6428	9403	4637	5319	2226	3118
MAX	4870	4740	2200	1700	1650	5800	8080	13400	6910	7680	3430	4570
MIN	1720	1600	1200	1400	1400	1550	5200	6000	3340	3230	1680	1940
AC-FT	204300	201900	112400	93320	83740	164200	382500	578200	275900	327100	136900	185500
CFSM	.30	.31	.17	.14	.14	.24	.58	.85	.42	.48	.20	.28
IN.	.35	.34	.19	.16	.14	.28	.65	.98	.47	.56	.23	.32
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1987 - 1991, BY WATER YEAR (WY)												
MEAN	3263	3075	2323	2060	2100	3755	7593	7154	4731	3192	2190	2832
MAX	3343	3393	2856	2527	2705	6042	12210	9403	8021	5319	3360	3897
(WY)	1989	1991	1988	1988	1989	1990	1989	1991	1990	1991	1987	1989
MIN	3143	2680	1827	1518	1508	2671	5510	3025	1196	729	1517	1769
(WY)	1990	1989	1991	1991	1991	1991	1990	1988	1988	1988	1989	1990

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1987 - 1991	
ANNUAL TOTAL	1378690		1384400			
ANNUAL MEAN	3777		3793		3682	
HIGHEST ANNUAL MEAN					4380	1989
LOWEST ANNUAL MEAN					2813	1988
HIGHEST DAILY MEAN	12700	Mar 19,20	13400	May 10	15000	Apr 15 1989
LOWEST DAILY MEAN	1100	Sep 3	1200	Dec 20	558	Jul 30 1988
ANNUAL SEVEN-DAY MINIMUM	1170	Aug 19	1440	Dec 18	626	Jul 24 1988
INSTANTANEOUS PEAK FLOW			13500	May 10	15300	Apr 15 1989
INSTANTANEOUS PEAK STAGE	10.30	Mar 18	8.78	May 10	9.54	Apr 15 1989
INSTANTANEOUS LOW FLOW	1080	Sep 3			528	Jul 30 1988
ANNUAL RUNOFF (AC-FT)	2735000		2746000		2667000	
ANNUAL RUNOFF (CFSM)	.34		.34		.33	
ANNUAL RUNOFF (INCHES)	4.66		4.68		4.54	
10 PERCENT EXCEEDS	8360		7070		6860	
50 PERCENT EXCEEDS	2690		3150		2810	
90 PERCENT EXCEEDS	1400		1500		1500	

e Estimated

MISSISSIPPI RIVER MAIN STEM

05267000 MISSISSIPPI RIVER NEAR ROYALTON, MN

LOCATION.--Lat 45°51'41", long 94°21'33", in lot 2, sec.20, T.39 N., R.32 W., Morrison County, Hydrologic Unit 07010104, at plant of Minnesota Power Co., 4 mi northwest of Royalton, 4.5 mi downstream from Swan River, and at mile 956 upstream from Ohio River.

DRAINAGE AREA.--11,600 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--March 1924 to current year.

REMARKS.--No estimated daily discharges. Records poor. Discharge computed based on powerplant records. Flow partly regulated by powerplants and Winnibigoshish, Leech, Pokegama, Sandy, and Gull Lakes and by Pine River Reservoir (see stations 05201000, 05206000, 05210500, 05218500, 05230500, 05246500).

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 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1620	4380	1860	1970	1600	1500	5550	8200	6220	5020	2790	1380
2	1420	4410	2120	1630	1260	1360	5920	9380	6480	6800	3330	1710
3	2000	4300	1970	1590	1460	1580	5860	9350	6910	7560	2720	1720
4	2110	3940	1830	1620	1340	1470	6780	10000	6990	7950	2810	1940
5	1830	4030	1750	1710	1420	1400	6320	10200	6240	7590	2490	1620
6	2510	4130	1920	1710	1390	1650	5800	12100	6470	7250	2320	1970
7	2140	3920	2330	1650	1390	1630	4980	12100	5680	7210	2300	1570
8	2480	3780	2010	1500	1420	1620	4890	13100	5880	6960	2150	2020
9	2570	3150	2090	1550	1580	1270	4980	13200	5130	6810	1900	2030
10	2680	3250	2080	1500	1400	1580	5120	13800	4480	6390	2080	2140
11	2290	3560	2120	1430	1480	1460	5310	13600	4290	5830	2150	3170
12	2500	3570	1940	1570	1710	1480	4960	13300	4020	5150	1750	3840
13	2380	3220	1860	1550	1610	1480	5580	13100	3630	4890	1890	3240
14	2200	3070	1620	1380	1420	1240	6320	12600	3780	4950	1970	3990
15	2150	3200	1980	1200	1480	1480	7110	12500	4070	5100	1430	3750
16	2250	3100	1810	1330	1520	1610	7910	12000	3360	4650	1680	3770
17	2600	3060	1820	1410	1520	1620	8010	11900	3240	4290	1420	3670
18	2900	3000	1340	1690	1430	1680	8570	10900	3520	4300	1770	3820
19	2580	2790	1420	1540	1390	1850	8920	9710	3090	3840	1190	3360
20	2710	2860	1280	1650	1470	2110	8980	8730	3570	4310	1430	3320
21	3660	2680	1220	1410	1330	2800	9530	7720	3700	3890	1460	3340
22	3990	2760	1350	1520	1320	3510	8830	7030	3580	3920	1960	2760
23	4640	2750	1520	1380	1600	3800	8300	6900	3480	3600	1900	2900
24	4520	2850	1520	1570	1380	3430	7680	6380	3400	3580	1590	3040
25	4610	2410	1510	1620	1460	4100	6970	6500	3640	3480	1770	2840
26	4550	2330	1550	1470	1340	4140	6840	6540	3570	3240	1930	2200
27	4570	2120	1700	1390	1430	4780	7200	6390	3320	3290	1690	2420
28	4390	1370	1960	1330	1530	5970	6810	6260	4060	3250	1490	2020
29	4670	1270	1960	1400	---	6150	6960	6340	4250	2890	1860	2190
30	4550	1750	1850	1520	---	5820	7930	5920	4880	2900	1310	2340
31	4370	---	1710	1420	---	5410	---	6690	---	2820	1410	---
TOTAL	94440	93010	55000	47210	40680	80980	204920	302440	134930	153710	59940	80080
MEAN	3046	3100	1774	1523	1453	2612	6831	9756	4498	4958	1934	2669
MAX	4670	4410	2330	1970	1710	6150	9530	13800	6990	7950	3330	3990
MIN	1420	1270	1220	1200	1260	1240	4890	5920	3090	2820	1190	1380
AC-FT	187300	184500	109100	93640	80690	160600	406500	599900	267600	304900	118900	158800
CFSM	.26	.27	.15	.13	.13	.23	.59	.84	.39	.43	.17	.23
IN.	.30	.30	.18	.15	.13	.26	.66	.97	.43	.49	.19	.26

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1924 - 1991, BY WATER YEAR (WY)

MEAN	3987	3737	2900	2577	2490	3612	8890	8469	6410	4508	3540	3477
MAX	12930	14640	6456	5713	5048	12290	22200	24600	18160	12420	15230	12940
(WY)	1966	1972	1952	1966	1984	1966	1966	1950	1965	1975	1953	1986
MIN	632	618	627	534	758	968	1924	1663	1071	648	449	535
(WY)	1937	1937	1935	1935	1937	1940	1931	1977	1988	1988	1934	1934

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1924 - 1991	
ANNUAL TOTAL	1328252		1347340			
ANNUAL MEAN	3639		3691		4577	
HIGHEST ANNUAL MEAN					9555	1966
LOWEST ANNUAL MEAN					1213	1934
HIGHEST DAILY MEAN	11600	May 4	13800	May 10	37700	Apr 16 1965
LOWEST DAILY MEAN	853	Aug 21	1190	Aug 19	254	Nov 25 1936
ANNUAL SEVEN-DAY MINIMUM	966	Aug 29	1380	Dec 18	358	Sep 3 1936
ANNUAL RUNOFF (AC-FT)	2635000		2672000		3316000	
ANNUAL RUNOFF (CFSM)	.31		.32		.39	
ANNUAL RUNOFF (INCHES)	4.26		4.32		5.36	
10 PERCENT EXCEEDS	7760		7200		9520	
50 PERCENT EXCEEDS	2490		2790		3290	
90 PERCENT EXCEEDS	1330		1420		1250	

MISSISSIPPI RIVER MAIN STEM

05267000 MISSISSIPPI RIVER NEAR ROYALTON, MN--Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1963-66, 1975 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

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 (STAND-ARD UNITS) (00400)	PH 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)
DEC												
19...	1100	1860	326	350	8.3	8.0	0.0	1.5	738	12.5	36	K8
FEB												
05...	1045	1400	360	376	7.4	7.7	0.5	2.1	740	6.0	95	K10
APR												
16...	1115	8170	222	260	8.4	8.2	5.0	4.1	740	12.6	92	270
MAY												
21...	0930	8400	260	238	8.1	7.8	18.0	3.0	732	8.5	--	220
JUL												
11...	1145	6150	260	266	8.0	8.0	23.0	4.0	730	7.8	K18	160
AUG												
15...	1100	1770	317	296	8.0	8.3	22.5	2.2	732	7.2	K10	160

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)
DEC											
19...	47	15	7.7	1.7	164	169	0	200	15	6.3	0.2
FEB											
05...	46	15	7.3	1.9	193	179	0	236	16	6.2	0.1
APR											
16...	35	10	4.9	2.7	--	116	--	--	9.9	6.1	0.1
MAY											
21...	33	9.7	4.8	1.5	123	113	0	150	6.9	4.7	<0.1
JUL											
11...	38	11	4.1	1.6	132	130	0	161	4.5	3.5	0.1
AUG											
15...	40	13	6.3	1.4	--	140	--	--	7.8	6.8	0.1

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, 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)
DEC											
19...	8.3	202	0.01	0.30	0.05	0.05	0.7	0.01	0.01	<0.01	<0.01
FEB											
05...	11	216	0.01	0.40	0.16	0.16	0.8	<0.01	<0.01	<0.01	<0.01
APR											
16...	7.4	166	<0.01	0.27	0.03	<0.01	0.5	0.07	0.07	0.02	<0.01
MAY											
21...	6.2	154	<0.01	0.07	0.02	0.01	0.9	0.05	0.01	<0.01	<0.01
JUL											
11...	12	194	<0.01	0.14	0.03	0.03	1.2	0.06	0.02	0.03	0.02
AUG											
15...	9.6	184	<0.01	0.05	0.02	0.01	0.8	0.06	0.02	0.01	<0.01

MISSISSIPPI RIVER MAIN STEM

05267000 MISSISSIPPI RIVER NEAR ROYALTON, MN--Continued
(National stream-quality accounting network station)

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	SEDIMENT, SUSPENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)
DEC 19...	2	86	<10	<1	51	<0.5	<1.0	<1	<3	5	79
FEB 05...	--	--	--	--	--	--	--	--	--	--	--
APR 16...	6	--	10	<1	42	<0.5	<1.0	1	<3	<1	210
MAY 21...	13	88	<10	1	40	<0.5	<1.0	<1	<3	3	140
JUL 11...	13	89	10	2	42	<0.5	2.0	<1	<3	8	280
AUG 15...	3	100	<10	2	41	<0.5	<1.0	<1	<3	<1	52

DATE	LEAD, DISSOLVED (UG/L AS PB) (01049)	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	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)
DEC 19...	<1	7	33	<0.1	<10	<1	<1	<1.0	95	<6	19
FEB 05...	--	--	--	--	--	--	--	--	--	--	--
APR 16...	<1	4	26	<0.1	<10	<1	<1	<1.0	69	<6	9
MAY 21...	<1	<4	22	<0.1	<10	1	<1	<1.0	68	<6	6
JUL 11...	1	<4	17	<0.1	<10	1	<1	<1.0	76	<6	13
AUG 15...	<1	<4	2	<0.1	<10	<1	<1	<1.0	90	<6	13

SAUK RIVER BASIN

05270500 SAUK RIVER NEAR ST. CLOUD, MN

LOCATION.--Lat 45°33'35", long 94°14'00", in SW¼SW¼ sec.8, T.124 N., R.28 W., Stearns County, Hydrologic Unit 07010203, on right bank 0.5 mi northwest of Waite Park, 3 mi west of St. Cloud, and 5 mi upstream from mouth.

DRAINAGE AREA.--925 mi^2.

PERIOD OF RECORD.--July 1909 to December 1912, April to December 1913, May to November 1929, March 1930 to September 1931, April to November 1932, March to November 1933, March 1934 to September 1981, October 1990 to September 30, 1991. Monthly discharge only for some periods, published in WSP 1308.

REVISED RECORDS.--WSP 895: Drainage area. WSP 1308: 1912(M), 1932(M). WSP 1508: 1937(m).

GAGE.--Water-stage recorder. Datum of gage is 1,034.63 ft National Geodetic Vertical Datum of 1929. Prior to Nov. 22, 1934, nonrecording gage on highway bridge 1 mi downstream at datum 6.77 ft lower.

REMARKS.--Records good except those for estimated daily discharge, which are fair. Flow regulated by powerplants and reservoirs above station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	92	194	123	e86	e86	e86	819	967	612	635	473	141
2	86	216	106	e86	e87	e86	762	932	722	665	715	144
3	136	214	131	e85	e89	e86	714	918	752	679	743	149
4	169	215	122	e85	e92	e86	670	1060	731	674	774	144
5	158	205	132	e85	e97	e86	627	1130	743	648	809	139
6	143	198	125	e84	e100	e86	583	1260	748	620	781	127
7	139	191	122	e84	e104	e85	536	1270	741	607	708	134
8	142	174	118	e83	e103	e85	476	1230	714	592	663	843
9	147	161	115	e83	e102	e86	461	1200	703	569	628	936
10	154	147	114	e83	e100	e86	452	1180	690	555	578	1010
11	160	137	110	e83	e99	e90	411	1160	675	623	532	1120
12	166	128	112	e83	e98	e95	378	1130	707	790	486	1170
13	167	119	92	e83	e97	e98	465	1100	716	765	444	1150
14	169	119	100	e83	e95	e104	593	1040	725	756	406	1130
15	171	124	e99	e82	e94	e110	697	977	723	747	370	1110
16	155	120	e98	e83	e93	e120	739	928	692	708	344	1070
17	153	114	e96	e83	e93	e130	773	847	675	666	334	1020
18	183	113	93	e83	e92	e150	790	776	654	622	306	1010
19	168	111	e93	e83	e92	e170	808	756	604	e600	275	944
20	169	110	93	e83	e91	186	825	707	620	e580	258	907
21	199	116	e93	e83	e90	247	846	646	696	e560	243	890
22	193	140	e92	e83	e90	268	867	594	666	e540	230	870
23	188	143	e91	e83	e89	384	871	564	666	e520	228	823
24	187	134	e90	e83	e88	420	842	532	693	e505	227	754
25	177	131	e89	e83	e88	500	821	489	693	e485	241	730
26	174	109	e88	e83	e88	615	775	463	665	e471	245	684
27	180	129	e87	e83	e88	784	800	479	651	492	226	619
28	168	91	e86	e84	e87	902	826	490	623	552	203	580
29	152	122	e86	e84	---	926	830	531	593	533	187	550
30	157	139	e86	e84	---	903	984	541	577	518	177	530
31	171	---	e86	e85	---	875	---	567	---	489	159	---
TOTAL	4973	4364	3168	2591	2612	8935	21041	26464	20470	18766	12993	21428
MEAN	160	145	102	83.6	93.3	288	701	854	682	605	419	714
MAX	199	216	132	86	104	926	984	1270	752	790	809	1170
MIN	86	91	86	82	86	85	378	463	577	471	159	127
AC-FT	9860	8660	6280	5140	5180	17720	41730	52490	40600	37220	25770	42500
CFSM	.17	.16	.11	.09	.10	.31	.76	.92	.74	.65	.45	.77

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1991, BY WATER YEAR (WY)

MEAN	143	158	123	89.8	98.6	278	765	464	388	286	193	171
MAX	555	1091	528	336	568	1380	2810	1572	1333	1088	1250	1136
(WY)	1958	1972	1972	1980	1966	1966	1965	1975	1957	1957	1972	1957
MIN	6.22	6.18	5.15	3.25	7.61	28.7	16.5	7.84	15.9	10.6	10.5	10.7
(WY)	1934	1934	1935	1935	1935	1940	1934	1934	1934	1934	1933	1933

SUMMARY STATISTICS	FOR 1991 WATER YEAR		WATER YEARS 1909 - 1991	
ANNUAL TOTAL	147805			
ANNUAL MEAN	405		279a	
HIGHEST ANNUAL MEAN			732	1972
LOWEST ANNUAL MEAN			51.0	1931
HIGHEST DAILY MEAN	1270	May 7	7940	Apr 14 1965
LOWEST DAILY MEAN	82	Jan 15	1.3	Jan 6 1935
ANNUAL SEVEN-DAY MINIMUM	83	Jan 9	1.5	Jan 2 1935
INSTANTANEOUS PEAK FLOW	1300	May 6,7	9100	Apr 13 1965
INSTANTANEOUS PEAK STAGE	4.29	Sep 12,13	10.68	Apr 13 1965
INSTANTANEOUS LOW FLOW	77	Oct 2	.30	Nov 25 1936
ANNUAL RUNOFF (AC-FT)	293200		202000	
ANNUAL RUNOFF (CFSM)	.44		.30	

a Median of annual mean discharges is 240 ft^3/s.
e Estimated.

MISSISSIPPI RIVER MAIN STEM

05270700 MISSISSIPPI RIVER AT ST. CLOUD, MN

LOCATION.--Lat 45°32'50", long 94°08'44", in SE¼SW¼ sec.1, T.35 N., R.31 W., Sherburne County, Hydrologic Unit 07010203, on left bank about 250 ft below the left downstream end of the City of St. Cloud hydropower dam and at mile 926.3 upstream from Ohio River.
DRAINAGE AREA.--13,320 mi², approximately.
PERIOD OF RECORD.--October 1988 to current year.
GAGE.--Water-stage recorder. Datum of gage is 958.49 ft above National Geodatic Vertical Datum of 1929.
REMARKS.--Records fair. Flow partly regulated by powerplants and Winnibigoshish, Leech, Pokegama, Sandy, and Gull Lakes and by Pine River Reservoir (see stations 05201000, 05206000, 05210500, 05218500, 05230500, 05246500).

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2080	e5500	e2230	e2510	e1940	e2000	8570	10900	9640	8090	4630	2140
2	2020	e5500	e2470	e2110	e1910	e1880	8150	12100	10100	9210	5670	2350
3	3270	e5040	e2530	e1780	e1740	e1890	8140	11900	10200	10300	5320	2990
4	2890	e4580	e2310	e2110	e1930	e1890	8210	12900	10000	10300	5120	2720
5	2830	e4840	e2360	e2170	e1880	e1890	8320	13600	9270	10000	4810	2550
6	3290	e4900	e2610	e2170	e1880	e1870	7310	15600	9180	9690	4440	2940
7	2960	e4780	e2940	e2050	e1880	e1860	7170	16200	8420	9280	4440	2510
8	3600	e5040	e2890	e1880	e1880	e2060	6770	17000	8060	9230	4220	4470
9	3720	e4180	e2710	e1880	e1950	e1620	6690	17600	8090	8910	3870	3870
10	3880	e4010	e3250	e1880	e2060	e1990	6670	17600	7500	8510	3250	4210
11	3990	e4420	e2710	e1880	e1890	e1940	6780	17300	6950	7920	3810	4910
12	3650	e3700	e2460	e1870	e2350	e1880	6860	16900	6650	7570	3700	5910
13	3520	e4260	e2120	e1990	e2180	e1880	7020	16700	6400	7060	2870	5730
14	3580	e4160	e2410	e1870	e1940	e1620	8330	15500	5820	6920	3370	6250
15	3320	e4470	e2460	e1880	e1900	e1920	9770	14500	5910	6770	3020	6560
16	3370	e3700	e2290	e1880	e1900	e2230	10600	14100	5770	6730	2690	6270
17	3890	e4070	e2350	e1610	e2180	e2220	11100	14000	4950	6220	2910	6160
18	3870	e3880	e1940	e1760	e2070	2750	11500	13000	5100	6280	2570	6070
19	3990	e3700	e1630	e1910	e1880	2840	11900	12000	5170	6780	2540	5690
20	4030	e3870	e1500	e2050	e1880	3260	11900	10900	5730	6730	2330	4880
21	4160	e3510	e1490	e1880	e1890	3710	12200	10200	5360	6500	2520	4910
22	5400	e3880	e1880	e1880	e1890	4700	11400	9360	5170	6430	2570	5470
23	5730	e3780	e2020	e1880	e1890	6050	10800	8890	5210	6140	2980	4580
24	5890	e3880	e2060	e1750	e1890	6160	10300	8810	5170	5420	2650	4440
25	6110	e2920	e2060	e1990	e1820	7330	9440	8280	5340	5670	2710	5180
26	6130	e2950	e2060	e1990	e1600	8260	8710	8030	5470	5180	3010	3710
27	5570	e2760	e2170	e1740	e1900	9370	9620	8080	5480	5350	2960	3430
28	5680	e2010	e2730	e1880	e1950	e9830	8770	8210	5670	5350	2610	3760
29	e5870	e1950	e2520	e1740	---	e9570	9220	8380	5430	5190	2570	3050
30	e5680	e2170	e2410	e1880	---	9620	10700	8720	6390	4670	2510	4020
31	e5500	---	e2050	e1880	---	8930	---	9530	---	4990	1770	---
TOTAL	129470	118410	71620	59730	54050	125020	272920	386790	203600	223390	104440	131730
MEAN	4176	3947	2310	1927	1930	4033	9097	12480	6787	7206	3369	4391
MAX	6130	5500	3250	2510	2350	9830	12200	17600	10200	10300	5670	6560
MIN	2020	1950	1490	1610	1600	1620	6670	8030	4950	4670	1770	2140
AC-FT	256800	234900	142100	118500	107200	248000	541300	767200	403800	443100	207200	261300
CFSM	.31	.30	.17	.14	.14	.30	.68	.94	.51	.54	.25	.33
IN.	.36	.33	.20	.17	.15	.35	.76	1.08	.57	.62	.29	.37

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1988 - 1991, BY WATER YEAR (WY)

MEAN	3815	3348	2505	2235	2232	5150	10480	10660	7575	5302	2335	4595
MAX	4176	3947	2819	2788	2950	7557	15760	12480	10100	7206	3369	7360
(WY)	1991	1991	1989	1989	1989	1990	1989	1991	1990	1991	1991	1988
MIN	3592	2953	2310	1927	1815	3860	6576	8899	5841	3930	1535	2297
(WY)	1990	1989	1991	1991	1990	1989	1990	1990	1989	1989	1989	1990

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1988 - 1991	
ANNUAL TOTAL	1724300		1881170			
ANNUAL MEAN	4724		5154		4950	
HIGHEST ANNUAL MEAN					5154	1991
LOWEST ANNUAL MEAN					4615	1990
HIGHEST DAILY MEAN	14100	Mar 17	17600	May 9	18900	Apr 10 1989
LOWEST DAILY MEAN	1330	Aug 12	1490	Dec 21	1010	Aug 24 1989
ANNUAL SEVEN-DAY MINIMUM	1650	Feb 20	1790	Dec 18	1250	Aug 13 1989
INSTANTANEOUS PEAK FLOW	16700a	Mar 16,20	19700	May 9	19700	May 9 1991
INSTANTANEOUS PEAK STAGE	7.27a	Mar 16,20	7.71	May 9	7.71	May 9 1991
INSTANTANEOUS LOW FLOW					792	Aug 23 1989
ANNUAL RUNOFF (AC-FT)	3420000		3731000		3586000	
ANNUAL RUNOFF (CFSM)	.35		.39		.37	
ANNUAL RUNOFF (INCHES)	4.82		5.25		5.05	
10 PERCENT EXCEEDS	10400		10000		10400	
50 PERCENT EXCEEDS	3640		4030		3610	
90 PERCENT EXCEEDS	1810		1880		1880	

a Result of regulation.
e Estimated.

ELK RIVER BASIN

05275000 ELK RIVER NEAR BIG LAKE, MN

LOCATION.--Lat 45°20'02", long 93°40'00", in NE¼SW¼ sec.23, T.22 N., R.27 W., Sherburne County, Hydrologic Unit 07010203, on right bank at upstream side of highway bridge, 4 mi east of Big Lake and 4 mi downstream from St. Francis River.
DRAINAGE AREA.--615 mi^2.
PERIOD OF RECORD.--April 1911 to September 1917, April to September 1931, April to November 1932, March to November 1933, March 1934 to September 1987, October 1990 to current year.
REVISED RECORDS.--WSP 895: 1939. WSP 1308: 1912(M), 1915-17(M).
GAGE.--Water-stage recorder. Datum of gage is 899.60 ft above National Geodetic Vertical Datum of 1929. April 1911 to Sept. 30, 1917, April 1, 1931, to July 26, 1934, nonrecording gage at some site and datum.
REMARKS.--Records good except those for periods of estimated daily discharge, which are fair.
AVERAGE DISCHARGE.--60 years (water years 1912-17, 1935-87, 1991), 277 ft^3/s, 6.12 in/yr.
EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,360 ft^3/s, Apr. 16, 1965, gage height, 10.86 ft; minimum, 3.6 ft^3/s, July 31, 1934.
EXTREME FOR CURRENT YEAR.--Maximum discharge, 2,070 ft^3/s, May 10, gage height, 5.62 ft; minimum daily discharge, 128 ft^3/s, Jun. 22; minimum gage height, 1.06 ft, Nov. 28.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	192	302	e197	e136	e130	e150	1270	643	985	412	291	191
2	188	300	e192	e135	e132	e155	1170	660	1080	414	422	191
3	227	301	e190	e135	e135	e155	959	718	1140	406	478	191
4	268	300	e185	e135	e137	e157	776	914	1100	431	464	191
5	280	299	e180	e135	e140	e158	649	1120	1050	494	464	191
6	278	300	e180	e135	e145	e160	557	1360	1080	564	474	188
7	265	296	e178	e134	e150	e160	480	1470	1120	553	499	188
8	253	279	e175	e134	e153	e160	463	1580	1040	498	481	467
9	239	253	e175	e133	e155	e161	428	1880	911	452	443	583
10	228	240	e175	e133	e157	e162	396	2040	861	416	408	546
11	228	233	e175	e132	e157	e163	366	2030	898	404	374	513
12	236	224	e174	e132	e156	e165	352	1840	916	533	346	481
13	237	218	e173	e132	e156	e168	441	1650	901	596	318	446
14	231	212	e168	e131	e155	e170	569	1440	861	592	298	425
15	221	211	e163	e131	e155	e175	666	1280	769	e560	281	412
16	211	213	e158	e130	e154	e185	741	1160	674	e510	311	391
17	213	211	e155	e130	e153	e205	837	1030	596	e470	371	381
18	234	210	e152	e130	e153	e230	968	868	556	e450	314	374
19	247	206	e150	e129	e152	e260	1150	727	523	e425	e308	356
20	260	207	e148	e129	e152	e305	1340	619	528	e405	e300	328
21	308	210	e147	e129	e151	e370	1360	534	569	e370	e285	308
22	354	208	e146	e128	e151	e460	1250	488	568	342	e280	288
23	391	208	e145	e129	e150	e560	1130	474	558	332	e270	271
24	398	208	e144	e129	e150	e646	1020	474	547	325	e260	268
25	386	210	e143	e129	e150	765	888	480	528	325	e250	258
26	376	e191	e142	e129	e150	831	756	510	492	321	e240	248
27	365	e181	e141	e130	e149	873	667	601	451	321	e230	245
28	352	e173	e140	e130	e149	942	589	795	418	360	e220	242
29	334	e191	e139	e130	---	996	565	1040	391	349	e215	229
30	316	e199	e138	e130	---	1090	608	997	368	325	e210	219
31	307	---	e137	e130	---	1290	---	962	---	301	202	---
TOTAL	8623	6994	5005	4074	4177	12427	23411	32384	22479	13256	10307	9610
MEAN	278	233	161	131	149	401	780	1045	749	428	332	320
MAX	398	302	197	136	157	1290	1360	2040	1140	596	499	583
MIN	188	173	137	128	130	150	352	474	368	301	202	188
AC-FT	17100	13870	9930	8080	8290	24650	46440	64230	44590	26290	20440	19060
CFSM	.45	.38	.26	.21	.24	.65	1.27	1.70	1.22	.70	.54	.52
IN.	.52	.42	.30	.25	.25	.75	1.42	1.96	1.36	.80	.62	.58

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1911 - 1991, BY WATER YEAR (WY)

MEAN	213	211	149	109	115	297	652	443	348	269	178	201
MAX	778	794	410	290	392	1125	1823	1620	1647	1026	926	1050
(WY)	1985	1972	1966	1979	1984	1966	1969	1986	1984	1978	1972	1986
MIN	32.7	56.3	44.1	38.4	29.8	58.8	75.5	37.5	20.5	8.94	8.74	23.4
(WY)	1934	1935	1935	1935	1936	1934	1934	1934	1934	1934	1934	1932

SUMMARY STATISTICS	FOR 1991 WATER YEAR		WATER YEARS 1911 - 1991	
ANNUAL TOTAL	152747			
ANNUAL MEAN	418		277	
HIGHEST ANNUAL MEAN			669	1986
LOWEST ANNUAL MEAN			88.0	1935
HIGHEST DAILY MEAN	2040	May 10	7170	Apr 16 1965
LOWEST DAILY MEAN	128	Jan 22	4.0	Aug 1 1934
ANNUAL SEVEN-DAY MINIMUM	129	Jan 19	4.5	Jul 27 1934
INSTANTANEOUS PEAK FLOW	2070	May 10	7360	Apr 16 1965
INSTANTANEOUS PEAK STAGE	5.62	May 10	10.86	Apr 16 1965
INSTANTANEOUS LOW FLOW			3.6	Jul 31 1934
ANNUAL RUNOFF (AC-FT)	303000		200800	
ANNUAL RUNOFF (CFSM)	.68		.45	
ANNUAL RUNOFF (INCHES)	9.24		6.12	
10 PERCENT EXCEEDS			560	
50 PERCENT EXCEEDS			162	
90 PERCENT EXCEEDS			65	

e Estimated.

CROW RIVER BASIN

05280000 CROW RIVER AT ROCKFORD, MN

LOCATION.--Lat 45°05'12", long 93°44'02", in sec.29, T.119 N., R.24 W., Hennepin County, Hydrologic Unit 07010204, on right bank at Rockford, 150 ft downstream from bridge on State Highway 55 and 1 mi downstream from confluence of North and South Forks.
DRAINAGE AREA.--2,520 mi^2, approximately.
PERIOD OF RECORD.--April to July 1906 (published as "near Dayton"), June 1909 to September 1917, April to November 1929, March 1930 to September 1931, April to November 1932, March to November 1933, March 1934 to current year. Monthly discharge only for some periods, published in WSP 1308.
REVISED RECORDS.--WSP 1115: 1932. WSP 1508: 1933. WDR MN-77-2: 1972 (M)(m).
GAGE.--Water-stage recorder. Datum of gage is 893.08 ft above National Geodetic Vertical Datum of 1929. Apr. 13 to July 21, 1906, nonrecording gage at Berning Mill 14 mi downstream at different datum. June 4, 1909, to Sept. 30, 1917, nonrecording gage at site 600 ft downstream at different datum. Apr. 23, 1929, to Aug. 21, 1934, nonrecording gage at site 600 ft downstream at present datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	184	195	e92	e72	e83	e128	1630	1920	e3800	3470	1340	952
2	179	187	e93	e72	e84	e129	1470	1920	e4100	3530	1570	869
3	196	184	e95	e72	e86	e130	1320	1930	e4330	3480	1660	811
4	202	183	e98	e72	e88	e130	1220	2080	4780	3440	1700	756
5	214	179	e99	e72	e88	e132	1140	2370	5270	3370	1730	696
6	231	179	e100	e72	e88	e133	1080	2830	5650	3310	1770	658
7	242	177	e100	e72	e88	e135	1040	3160	5820	3270	1840	642
8	249	171	e99	e72	e88	e139	990	3490	5770	3230	1970	1260
9	240	163	e99	e72	e89	e145	959	3820	5550	3130	2060	2350
10	228	165	e98	e72	e90	e152	932	4040	5240	2980	2110	3180
11	219	165	e98	e72	e92	e170	901	4130	4860	2840	2120	4100
12	213	162	e94	e72	e93	e200	890	4070	4470	3060	2110	5120
13	208	158	e92	e73	e94	e220	1110	3910	4070	3080	2100	6190
14	202	156	e92	e74	e92	e255	1380	3680	3700	3010	2060	7150
15	196	154	e92	e76	e90	e275	1720	3440	3410	2920	1980	7970
16	190	153	e92	e79	e90	e290	1980	3200	3130	2850	1910	8500
17	186	150	e90	e82	e93	e310	2180	3010	2810	2820	1870	8700
18	229	148	e86	e83	e96	e325	2320	2890	2560	2820	1830	8670
19	284	146	e83	e83	e99	e360	2440	2810	2400	2810	1800	8490
20	288	146	e80	e83	e100	e410	2580	e2800	2350	2740	1780	8250
21	352	149	e77	e83	e104	e570	2680	e2700	2510	2550	1760	7930
22	308	147	e74	e83	e109	e646	2730	e2600	2600	2320	1710	7560
23	281	143	e72	e83	e111	e814	2680	e2520	2670	2000	1670	7180
24	270	140	e72	e83	e114	e990	2540	e2500	2720	1780	1580	6810
25	266	135	e72	e83	e116	e1210	2370	e2600	2820	1610	1520	6440
26	258	e116	e72	e83	e124	1400	2200	e2700	2900	1470	1460	6060
27	242	e89	e72	e83	e126	1740	2080	e3000	2980	1380	1380	5720
28	233	e86	e72	e83	e128	1790	1970	e3100	3070	1380	1290	5390
29	223	e88	e72	e83	---	1750	1920	e3200	3130	1350	1210	5070
30	207	e90	e72	e83	---	1780	1940	e3300	3140	1330	1130	4770
31	199	---	e72	e83	---	1750	---	e3500	---	1330	1050	---
TOTAL	7219	4504	2671	2410	2743	18608	52392	93220	112610	80660	53070	148244
MEAN	233	150	86.2	77.7	98.0	600	1746	3007	3754	2602	1712	4941
MAX	352	195	100	83	128	1790	2730	4130	5820	3530	2120	8700
MIN	179	86	72	72	83	128	890	1920	2350	1330	1050	642
AC-FT	14320	8930	5300	4780	5440	36910	103900	184900	223400	160000	105300	294000
CFSM	.09	.06	.03	.03	.04	.24	.69	1.19	1.49	1.03	.68	1.96
IN.	.11	.07	.04	.04	.04	.27	.77	1.38	1.66	1.19	.78	2.19

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1906 - 1991, BY WATER YEAR (WY)

MEAN	394	372	257	147	146	774	2047	1340	1209	879	483	455
MAX	3809	1909	1477	815	1115	4085	9026	5992	6166	4359	2511	4941
(WY)	1986	1972	1983	1983	1966	1983	1965	1986	1906	1957	1957	1991
MIN	16.6	28.3	17.3	12.4	12.5	25.1	57.1	26.7	14.8	5.76	5.87	13.0
(WY)	1934	1937	1938	1938	1959	1934	1934	1934	1934	1934	1934	1933

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1906 - 1991	
ANNUAL TOTAL	236728		578351			
ANNUAL MEAN	649		1585		735a	
HIGHEST ANNUAL MEAN					2754	1986
LOWEST ANNUAL MEAN					64.5	1931
HIGHEST DAILY MEAN	5370	Jun 25	8700	Sep 17	22100	Apr 16 1965
LOWEST DAILY MEAN	19	Jan 1	72	Dec 23	3.8	Aug 4 1934
ANNUAL SEVEN-DAY MINIMUM	20	Jan 1	72	Dec 23	4.0	Jul 31 1934
INSTANTANEOUS PEAK FLOW	5390	Jun 25	8740	Sep 17	22400	Apr 16 1965
INSTANTANEOUS PEAK STAGE	12.26	Jun 25	12.26	Sep 17	19.27b	Apr 16 1965
INSTANTANEOUS LOW FLOW					1.8c	Nov 15 1936
ANNUAL RUNOFF (AC-FT)	469500		1147000		534100	
ANNUAL RUNOFF (CFSM)	.26		.63		.29	
ANNUAL RUNOFF (INCHES)	3.49		8.54		3.98	
10 PERCENT EXCEEDS	1900		3860		2020	
50 PERCENT EXCEEDS	242		932		228	
90 PERCENT EXCEEDS	38		83		36	

a Median of annual mean discharges is 552 ft^3/s.
b From floodmark.
c Caused by ice jam upstream.
e Estimated.

RUM RIVER BASIN

05284000 MILLE LACS LAKE AT COVE BAY NEAR ONAMIA, MN

LOCATION.--Lat 46°06'36", long 93°37'08", in NE¼NE¼ sec.21, T.42 N., R.26 W., Mille Lacs County, Hydrologic Unit 07010207, in Minnesota Department of Natural Resources boathouse at Cove Bay boatlanding, 3.6 mi northeast of Onamia.

PERIOD OF RECORD.--June 1931 to current year. Monthend records for the period October 1939 to September 1953 published in WSP 1278 (fragmentary 1940-41). Published as "at Wealthwood" prior to October 1939, and as "at Garrison" October 1939 to September 1987 (gage heights collected at Wealthwood October 1939 to September 1941, but converted to gage datum at Garrison for publication).

GAGE.--Water-stage recorder. Datum of gage is 1,240.40 ft above National Geodetic Vertical Datum of 1929 (levels by Minnesota Department of Natural Resources). Gage readings have been reduced to elevations NGVD. Prior to Oct. 1, 1941, nonrecording gage at Wealthwood, 17 mi north of present site, at various datums; gage readings have been reduced to elevations, adjustment of 1912. Oct. 1, 1941, to Sept. 30, 1958, water-stage recorder at Garrison, 16 mi northwest of present site at datum 1,240.50 ft, adjustment of 1912. To convert these readings to National Geodetic Vertical Datum of 1929, subtract 0.10 ft. Oct. 1, 1958, to Sept. 30, 1987, water stage recorder at Garrison at present datum.

REMARKS.--Water level affected by fixed-crest spillway constructed in 1953 at outlet of Ogechie Lake, 2.7 mi downstream from outlet of Mille Lacs Lake, with crest at elevation 1,250.50 ft. Water level subject to fluctuation caused by change in direction and velocity of wind and by seiches.

EXTREMES FOR PERIOD OF RECORD.--Maximum elevation, 1,253.87 ft, Aug. 14, 1972, affected by wind action and seiche action; maximum daily, 1,253.43 ft, Aug. 22, 1972; minimum observed, 1,245.74 ft, Oct. 16-19, 1936.

EXTREMES FOR CURRENT YEAR.--Maximum elevation, 1,253.19 ft, July 5, affected by wind and seiche action; maximum daily, 1,251.85 ft, July 7; minimum, 1,250.04 ft, Nov. 22, affected by wind and seiche action; minimum daily, 1,250.17 ft, Nov. 29.

MONTHEND ELEVATION, IN FEET NGVD, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

Oct. 31 ..... 1,250.43	Feb. 28 ..... 1,250.44	June 30 ..... 1,251.66
Nov. 30 ..... 1,250.21	Mar. 31 ..... 1,250.64	July 31 ..... 1,251.69
Dec. 31 ..... 1,250.30	Apr. 30 ..... 1,251.05	Aug. 31 ..... 1,251.32
Jan. 31 ..... 1,250.31	May 31 ..... 1,251.55	Sept. 30 ..... 1,251.00

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

RUM RIVER BASIN

05286000 RUM RIVER NEAR ST. FRANCIS, MN

LOCATION.--Lat 45°19'40", long 93°22'20", in SE¼ sec.19, T.33 N., R.24 W., Anoka County, Hydrologic Unit 07010207, on left bank at upstream side of highway bridge, 4 mi south of St. Francis and 15.8 mi upstream from mouth.
DRAINAGE AREA.--1,360 mi^2, approximately.
PERIOD OF RECORD.--May to November 1929, March 1930 to September 1931, April to November 1932, March 1933 to current year.
REVISED RECORDS.--WSP 1308: 1930(M), 1932(M).
GAGE.--Water-stage recorder. Datum of gage is 860.74 ft above National Geodetic Vertical Datum of 1929 (levels by Anoka County Highway Department). Prior to Nov. 9, 1933, nonrecording gage at site 50 ft downstream at same datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair. Occasional regulation by Ogechie (also controls Mille Lacs Lake) and Onamia Lakes.
AVERAGE DISCHARGE.--59 years (water years 1931, 1934-91), 626 ft^3/s, 6.25 in/yr.
EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,100 ft^3/s, Apr. 20, 1965, Apr. 13, 1969; maximum gage height, 11.63 ft, Apr. 13, 1969; minimum discharge, 29 ft^3/s, Aug. 18, 1934, gage height, 1.91 ft.
EXTREMES FOR CURRENT YEAR.--Maximum discharge, 4,430 ft^3/s, May 12, gage height, 7.28 ft; minimum daily discharge, 150 ft^3/s, Jan. 26; minimum gage height, 2.38 ft, Nov. 28.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	221	518	e298	e176	e158	e195	2850	1200	2000	774	670	335
2	219	496	e285	e175	e162	e197	2570	1260	2100	770	758	324
3	237	475	e278	e173	e180	e198	2090	1380	2250	806	825	327
4	273	459	e272	e173	e210	e199	1610	1650	2370	956	883	326
5	300	437	e270	e173	e225	e210	1290	2010	2400	1170	917	319
6	319	422	e268	e173	e235	e215	1130	2490	2350	1350	923	319
7	344	412	261	e172	e245	e215	1040	2800	2300	1470	895	337
8	363	395	262	e172	e252	e219	1020	2870	2230	1470	851	567
9	369	383	261	e172	e260	e222	1030	3000	2080	1310	792	844
10	352	378	262	e171	e270	e228	1040	3440	1830	1110	729	1000
11	342	365	267	e170	e268	e230	1060	4050	1510	988	675	1040
12	333	359	269	e170	e250	235	1070	4400	1300	1020	627	1040
13	327	353	e262	e165	e245	e235	1120	4290	1190	977	583	1010
14	314	342	e243	e163	e233	e235	1250	3840	1140	964	548	959
15	307	344	e232	e165	e227	e239	1480	3270	1110	919	516	891
16	304	341	e228	e162	e210	e242	1670	2740	1090	869	492	819
17	311	336	e224	e162	e210	243	1900	2290	1050	826	501	761
18	331	327	e224	e161	e208	256	2230	1850	1040	834	506	713
19	368	322	e224	e160	e203	e283	2690	1540	1050	800	505	671
20	430	318	e224	e160	e200	353	3110	1370	1020	779	494	632
21	545	306	e221	e160	e208	499	3390	1240	1010	803	474	605
22	661	306	e217	e155	e210	670	3380	1120	1030	801	453	576
23	729	302	e205	e155	e205	e967	3110	1030	1070	790	437	547
24	781	303	e193	e151	e199	1280	2660	977	1110	771	418	519
25	807	301	e190	e151	e194	1630	2130	934	1130	740	408	499
26	798	299	e185	e150	e190	2080	1680	1000	1070	700	408	479
27	760	e275	e180	e151	e190	2330	1390	1230	976	675	405	462
28	709	243	e178	e151	e195	2510	1220	1480	893	688	400	442
29	645	e262	e178	e155	---	2660	1140	1810	823	694	389	430
30	593	e280	e178	e155	---	2810	1150	1990	772	692	371	415
31	552	---	e178	e155	---	2900	---	2020	---	686	352	---
TOTAL	13944	10659	7217	5057	6042	24985	54500	66571	43294	28202	18205	18208
MEAN	450	355	233	163	216	806	1817	2147	1443	910	587	607
MAX	807	518	298	176	270	2900	3390	4400	2400	1470	923	1040
MIN	219	243	178	150	158	195	1020	934	772	675	352	319
AC-FT	27660	21140	14310	10030	11980	49560	108100	132000	85870	55940	36110	36120
CFSM	.33	.26	.17	.12	.16	.59	1.34	1.58	1.06	.67	.43	.45
IN.	.38	.29	.20	.14	.17	.68	1.49	1.82	1.18	.77	.50	.50
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1929 - 1991, BY WATER YEAR (WY)												
MEAN	465	428	318	240	241	592	1508	1110	900	635	398	427
MAX	2300	1715	1051	660	813	2699	4269	3899	3399	2532	2251	2362
(WY)	1969	1972	1983	1987	1966	1966	1969	1986	1984	1954	1972	1986
MIN	65.4	71.8	55.8	51.5	59.2	75.8	154	73.6	43.7	34.5	37.3	47.1
(WY)	1934	1934	1934	1934	1934	1934	1934	1934	1934	1934	1934	1933

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1929 - 1991	
ANNUAL TOTAL	195166		296884			
ANNUAL MEAN	535		813		626	
HIGHEST ANNUAL MEAN					1512	1986
LOWEST ANNUAL MEAN					66.1	1934
HIGHEST DAILY MEAN	2800	Jun 11	4400	May 12	10000	Apr 13 1969
LOWEST DAILY MEAN	70	Jan 1	150	Jan 26	30	Aug 3 1934
ANNUAL SEVEN-DAY MINIMUM	70	Jan 1	152	Jan 22	31	Aug 1 1934
INSTANTANEOUS PEAK FLOW	2840	Jun 11	4430	May 12	10100a	
INSTANTANEOUS PEAK STAGE	6.17	Jun 11	7.28	May 12	11.63	Apr 13 1969
INSTANTANEOUS LOW FLOW					29	Aug 18 1934
ANNUAL RUNOFF (AC-FT)	387100		588900		453300	
ANNUAL RUNOFF (CFSM)	.39		.60		.46	
ANNUAL RUNOFF (INCHES)	5.34		8.12		6.25	
10 PERCENT EXCEEDS	1190		2080		1360	
50 PERCENT EXCEEDS	357		494		350	
90 PERCENT EXCEEDS	75		178		108	

a Occurred on Apr. 20, 1965 and Apr. 13, 1969.
e Estimated.

ELM CREEK BASIN

05287890 ELM CREEK NEAR CHAMPLIN, MN

LOCATION.--Lat 45°09'48", long 93°26'11", in NE¼NW¼ sec.35, T.120 N., R.22 W., Hennepin County, Hydrologic Unit 07010206, on left bank, 33 ft downstream from bridge on Elm Creek Road, 2.5 mi southwest of Champlin.

DRAINAGE AREA.--84.9 mi^2.

WATER DISCHARGE RECORDS

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

GAGE.--Water-stage recorder. Datum of gage is 850.71 ft above National Geodetic Vertical Datum of 1929. Prior to March 15, 1979, 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 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.9	1.7	1.9	e.78	e.74	.65	81	65	366	88	36	47
2	2.8	2.0	1.9	e.77	e.74	.55	69	66	363	109	58	42
3	4.4	2.0	1.8	e.76	e.80	.43	60	68	347	134	73	40
4	4.9	1.8	1.6	e.75	e.90	.46	53	83	323	172	78	35
5	6.3	1.8	1.6	e.74	1.2	.52	46	111	293	198	87	31
6	5.5	1.8	1.5	e.74	1.2	.74	38	181	258	196	98	26
7	5.4	1.9	1.5	e.74	1.1	.45	35	232	222	176	105	24
8	4.9	1.9	1.3	e.74	1.2	.43	33	275	186	152	108	58
9	4.5	1.9	1.3	e.74	1.4	.53	30	294	155	129	103	137
10	4.1	1.9	1.2	e.74	1.3	.54	28	283	144	111	92	227
11	3.7	1.9	e1.3	e.74	1.2	1.2	26	258	126	98	82	281
12	3.5	1.7	e1.4	e.74	1.1	1.7	24	227	108	104	74	316
13	3.1	1.6	e1.5	e.74	e1.1	2.3	46	198	93	97	66	328
14	2.7	1.6	e1.6	e.74	e1.1	4.2	73	172	82	88	59	340
15	2.3	1.5	e1.6	e.74	1.1	5.5	92	149	74	78	53	350
16	1.8	1.7	e1.5	e.74	1.0	7.6	108	131	64	71	49	334
17	2.1	1.6	e1.5	e.74	.93	8.7	120	122	57	68	47	323
18	2.2	1.6	e1.5	e.74	.92	9.5	125	110	53	65	43	303
19	2.1	1.5	e1.2	e.74	.79	12	124	95	50	64	39	278
20	2.4	1.5	e1.1	e.74	.78	16	115	82	65	60	36	250
21	3.1	1.5	e.93	e.74	e.80	30	103	72	82	56	32	226
22	3.6	1.5	e.90	e.74	e.80	40	92	65	91	55	29	201
23	4.7	1.5	e.88	e.74	e.80	91	80	58	91	52	34	176
24	4.1	1.5	e.86	e.74	e.80	109	69	51	90	49	43	154
25	2.2	1.5	e.85	e.74	e.80	115	60	44	87	44	51	134
26	1.9	1.5	e.84	e.74	.80	119	52	62	80	40	56	116
27	2.1	1.5	e.83	e.74	.78	124	49	94	72	39	60	98
28	1.8	1.5	e.82	e.74	.69	123	48	112	64	43	60	84
29	1.8	1.8	e.81	e.74	---	113	52	197	57	42	59	74
30	1.9	1.9	e.80	e.74	---	103	62	260	50	40	56	65
31	1.8	---	e.79	e.74	---	93	---	321	---	37	51	---
TOTAL	100.6	50.6	39.11	23.04	26.87	1134.00	1993	4538	4193	2755	1917	5098
MEAN	3.25	1.69	1.26	.74	.96	36.6	66.4	146	140	88.9	61.8	170
MAX	6.3	2.0	1.9	.78	1.4	124	125	321	366	198	108	350
MIN	1.8	1.5	.79	.74	.69	.43	24	44	50	37	29	24
AC-FT	200	100	78	46	53	2250	3950	9000	8320	5460	3800	10110
CFSM	.04	.02	.01	.01	.01	.43	.78	1.72	1.65	1.05	.73	2.00
IN.	.04	.02	.02	.01	.01	.50	.87	1.99	1.84	1.21	.84	2.23
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1979 - 1991, BY WATER YEAR (WY)												
MEAN	30.5	12.2	8.66	4.61	11.2	61.9	84.6	54.5	40.0	26.4	21.7	31.2
MAX	229	35.9	35.5	17.2	99.1	179	221	146	140	88.9	69.0	170
(WY)	1986	1986	1984	1984	1984	1983	1986	1991	1991	1991	1990	1991
MIN	1.13	1.03	.92	.74	.91	5.51	5.31	4.95	1.34	.76	1.44	1.08
(WY)	1990	1990	1990	1991	1990	1981	1987	1987	1988	1988	1989	1988

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1979 - 1991	
ANNUAL TOTAL	9068.23		21868.22			
ANNUAL MEAN	24.8		59.9		32.4	
HIGHEST ANNUAL MEAN					75.1	1986
LOWEST ANNUAL MEAN					4.54	1988
HIGHEST DAILY MEAN	222	Aug 1	366	Jun 1	545	Mar 27 1986
LOWEST DAILY MEAN	.79	Dec 31	.43	Mar 3	.31	Jun 30 1988
ANNUAL SEVEN-DAY MINIMUM	.82	Dec 25	.51	Mar 3	.35	Jun 26 1988
INSTANTANEOUS PEAK FLOW	225	Aug 1	371	Jun 1	597	Mar 27 1986
INSTANTANEOUS PEAK STAGE	7.70	Aug 1	8.91	Jun 1	9.93	Mar 27 1986
INSTANTANEOUS LOW FLOW			.40	Mar 3,5,7,8	.29	Jul 9 1989
ANNUAL RUNOFF (AC-FT)	17990		43380		23430	
ANNUAL RUNOFF (CFSM)	.29		.71		.38	
ANNUAL RUNOFF (INCHES)	3.97		9.58		5.17	
10 PERCENT EXCEEDS	74		174		95	
50 PERCENT EXCEEDS	7.3		34		8.0	
90 PERCENT EXCEEDS	.93		.74		1.2	

e Estimated

ELM CREEK BASIN

05287890 ELM CREEK NEAR CHAMPLIN, MN--Continued

WATER QUALITY RECORDS

PERIOD OF RECORD.--February 1988 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	SOLIDS, RESIDUE AT 105 DEG. C, TOTAL (MG/L) (00500)
OCT									
30...	1245	2.0	581	8.4	8.0	744	7.6	36	431
FEB									
05...	1200	1.1	700	7.7	2.0	746	9.5	17	418
MAR									
26...	1045	119	451	7.5	3.5	740	9.2	58	305
MAY									
01...	1300	65	504	7.7	8.0	733	9.2	55	320
07...	1345	233	463	7.9	8.0	--	--	47	304
22...	1200	63	488	7.9	20.5	737	5.7	60	311
JUN									
14...	1230	82	417	7.4	24.0	728	4.5	63	284
JUL									
17...	1230	68	395	7.4	27.0	735	4.3	60	--
AUG									
27...	1200	62	405	7.7	28.5	740	5.5	64	--
SEP									
10...	0845	219	264	7.2	20.0	745	4.4	52	--

DATE	SOLIDS, VOLA-TILE ON IGNI-TION, TOTAL (MG/L) (00505)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)
OCT								
30...	311	--	--	<0.10	0.02	1.0	0.11	0.06
FEB								
05...	326	--	--	<0.10	0.17	0.6	0.05	0.03
MAR								
26...	83	--	--	1.2	0.43	2.7	0.33	0.20
MAY								
01...	107	6	6	0.20	0.04	0.9	0.11	0.10
07...	101	22	9	0.65	0.04	1.3	0.20	0.16
22...	122	22	9	0.13	0.13	1.7	0.39	0.39
JUN								
14...	129	26	5	0.15	0.08	1.2	0.59	0.39
JUL								
17...	--	<1	<1	<0.05	0.07	2.2	0.53	0.30
AUG								
27...	--	13	6	0.08	0.04	1.4	0.32	0.21

ELM CREEK BASIN

05287890 ELM CREEK NEAR CHAMPLIN, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

SAMPLES COLLECTED BY AUTOMATIC SAMPLER

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)
MAY				
01...	1255	65	5	0.11
05...	0552	86	3	0.10
06...	1150	177	27	0.19
07...	1748	246	11	0.14
08...	2345	290	10	0.13
09...	1444	298	12	0.14
10...	2042	272	7	0.11
13...	0837	200	8	0.15
15...	2032	139	19	0.26
18...	0827	106	11	0.38
JUN				
14...	1235	77	26	0.59
19...	0903	49	18	0.48
20...	0142	62	47	0.51
20...	1821	61	19	0.46
21...	1100	82	43	0.53
22...	2018	88	23	0.40
27...	1651	69	22	0.49
30...	1127	49	23	0.72
JUL				
01...	0406	80	81	0.91
02...	1324	108	26	0.59
03...	0603	125	45	0.54
SEP				
09...	1100	139	76	0.74
10...	0339	186	52	0.44
10...	2018	241	53	0.35
11...	1257	267	27	0.33
12...	0536	293	106	0.32
15...	0012	342	19	0.39
19...	2045	254	14	0.27
24...	0039	153	17	0.22
27...	1154	87	17	0.21

MISSISSIPPI RIVER MAIN STEM

05288500 MISSISSIPPI RIVER NEAR ANOKA, MN

LOCATION.--Lat 45°07'36", long 93°17'48", in SW¼ sec.12, T.119 N., R.21 W., Hennepin County, Hydrologic Unit 07010206, on right bank 0.4 mi downstream from Coon Creek, 1.3 mi downstream from Coon Rapids dam at Coon Rapids, 6.5 mi downstream from Anoka, and at mile 864.8 upstream from Ohio River.
DRAINAGE AREA.--19,100 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1931 to current year. Prior to October 1931 published as "at Coon Rapids, near Anoka."
GAGE.--Water-stage recorder. Datum of gage is 804.53 ft above National Geodetic Vertical Datum of 1929. Prior to June 14, 1932, at site 1.2 mi upstream at different datum.
REMARKS.--No estimated daily discharges. Records good. Discharge during period of backwater from ice, Dec. 22 to Feb. 5, computed from discharge furnished by Ford Plant Dam downstream from station adjusted for time of travel, leakage through dam, and diversions to St. Paul and Minneapolis water works. Flow slightly regulated by six reservoirs on headwaters; total usable capacity, 1,640,600 acre-ft. Diurnal regulation caused by dam above station.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2780	6850	3010	3170	3220	2620	15400	15600	17900	13000	7480	3770
2	2640	6620	3280	3100	3060	2610	14700	15700	18000	13900	8510	3960
3	3210	6770	3000	3150	3890	2600	13800	16900	19200	15100	9680	4120
4	4070	6540	3350	2940	2960	2570	12700	17700	19300	15800	9260	4460
5	3790	6080	3220	3180	3230	2640	12500	19900	19500	16100	9030	4280
6	3730	5830	3300	3070	2550	2610	11800	21800	19200	15700	8660	3980
7	4230	6290	3700	3000	2530	2590	10900	24700	19200	15600	8390	4360
8	3820	6010	3740	2990	2510	2810	10500	25800	18300	15200	8610	6240
9	4590	5930	3840	3000	2590	2770	10100	27200	17900	14900	8190	9980
10	4620	5820	3380	2960	2540	2740	10000	28100	18000	14200	7720	10400
11	4730	5260	3770	3050	2580	2580	9870	28800	16000	13400	7170	11400
12	4320	5370	3480	3050	3000	2960	9980	28900	15100	14300	7560	13000
13	4410	4910	3370	3060	2870	2930	10700	28100	14300	13300	7190	14500
14	4200	4970	2520	3210	2540	2970	11600	26800	13300	13200	6450	15400
15	4060	5240	3150	3030	2780	3050	13800	24800	12400	12500	6610	16800
16	4030	4930	3180	3120	4430	2920	15500	23600	12000	12200	6300	17400
17	4160	5210	3300	3010	4270	3330	16700	22300	11300	11800	6230	17400
18	4720	4840	2790	2870	3420	3390	17400	20600	10200	11300	6150	17300
19	4660	5110	2700	3200	3420	3600	18500	19000	10200	11500	5790	17000
20	5200	4700	2430	2640	3610	4100	19400	17300	10500	10800	5630	16100
21	5250	4860	1790	2840	2990	5180	20000	16400	11300	10800	5300	15200
22	6120	4550	1700	3000	2620	6560	20400	15300	10800	10300	5440	15000
23	7200	4660	3070	2840	2640	8430	19500	14300	10700	9790	5660	14700
24	7320	4840	3240	2800	2930	10300	18100	13800	10700	9240	5830	13500
25	7540	4490	3230	2920	3090	11300	16600	13200	10600	8440	5460	13100
26	7580	4580	3110	3170	2760	12900	15100	13200	10800	8290	5440	13100
27	7240	3770	2930	3170	2550	14200	14300	13300	10700	7920	5500	11300
28	7250	4000	3510	2830	2420	15200	14200	14000	10500	8430	5300	10900
29	6960	2970	3200	2680	---	15800	13500	15400	10900	8090	5020	10600
30	7050	2810	3180	2640	---	15800	14200	16100	10500	7550	4750	9670
31	7260	---	3220	2850	---	16000	---	16500	---	7200	4510	---
TOTAL	158740	154810	96690	92540	84000	190060	431750	615100	419300	369850	208820	338920
MEAN	5121	5160	3119	2985	3000	6131	14390	19840	13980	11930	6736	11300
MAX	7580	6850	3840	3210	4430	16000	20400	28900	19500	16100	9680	17400
MIN	2640	2810	1700	2640	2420	2570	9870	13200	10200	7200	4510	3770
AC-FT	314900	307100	191800	183600	166600	377000	856400	1220000	831700	733600	414200	672200
CFSM	.27	.27	.16	.16	.16	.32	.75	1.04	.73	.62	.35	.59
IN.	.31	.30	.19	.18	.16	.37	.84	1.20	.82	.72	.41	.66

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1991, BY WATER YEAR (WY)

MEAN	6203	5959	4567	4058	3977	6922	17050	14630	11450	8127	5797	5720
MAX	21250	22800	10800	8304	9947	23410	42970	39760	29910	21120	22490	23570
(WY)	1987	1972	1972	1986	1966	1966	1969	1986	1943	1952	1972	1986
MIN	1128	1152	1006	935	1079	1602	3575	2796	1646	1022	715	888
(WY)	1937	1937	1935	1935	1933	1940	1959	1934	1934	1934	1934	1934

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1931 - 1991	
ANNUAL TOTAL	2421040		3160580			
ANNUAL MEAN	6633		8659		7904	
HIGHEST ANNUAL MEAN					17750	1986
LOWEST ANNUAL MEAN					1603	1934
HIGHEST DAILY MEAN	19800	Jun 24	28900	May 12	90300	Apr 17 1965
LOWEST DAILY MEAN	1700	Dec 22	1700	Dec 22	602	Sep 10 1934
ANNUAL SEVEN-DAY MINIMUM	2270	Feb 27	2530	Dec 18	646	Aug 26 1934
INSTANTANEOUS PEAK FLOW	21000	Jun 24	29300	May 12	91000	Apr 17 1965
INSTANTANEOUS PEAK STAGE	9.17	Jun 24	9.17	May 12	19.53	Apr 17 1965
INSTANTANEOUS LOW FLOW	1480a	Dec 21	1480a	Dec 21	529a	Aug 29 1976
ANNUAL RUNOFF (AC-FT)	4802000		6269000		5726000	
ANNUAL RUNOFF (CFSM)	.35		.45		.41	
ANNUAL RUNOFF (INCHES)	4.72		6.16		5.62	
10 PERCENT EXCEEDS	14400		17300		17300	
50 PERCENT EXCEEDS	4980		6300		5370	
90 PERCENT EXCEEDS	2430		2810		1980	

a Result of regulation.

MISSISSIPPI RIVER MAIN STEM

05288500 MISSISSIPPI RIVER NEAR ANOKA, MN--Continued

WATER-QUALITY RECORDS

LOCATION.--Sediment samples collected at Camden Avenue bridge, in Minneapolis, 7.0 mi downstream from gage. Tritium samples collected at gage near right bank. Prior to October 1, 1978, sediment samples collected at Lowry Avenue bridge.

DRAINAGE AREA.--19,600 mi^2, approximately.

PERIOD OF RECORD.--Water years 1963-67, 1975 to current year.

PERIOD OF RECORD.--
WATER TEMPERATURES: October 1975 to current year.
SUSPENDED SEDIMENT DISCHARGE: August 1975 to current year.

REMARKS.--Sediment samples were collected approximately daily by an observer during the open-water period. In general, daily concentrations and loads for the open-water period are considered good. During the winter period, daily sediment concentrations and loads are based primarily on concentrations of sediment in samples that were collected monthly and on daily water-discharge records. Sediment records for the winter period are considered fair. Water temperatures were obtained by the observer approximately daily during the open-water period and monthly by U.S. Geological Survey personnel during the winter period. Many temperatures are not published because of questionable values.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES (water years 1976-77, 1979-80, 1982-91): Maximum daily, 31.0°C, Aug. 25, 26, 1976, July 19, 1977; minimum daily, 0.0°C several days during winter period, each year.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 210 mg/L Apr. 3, 1982; minimum daily mean, 1 mg/L on several days in 1978, 1980, 1981, 1982, and 1984.
SEDIMENT LOADS: Maximum daily, 17,400 tons Apr. 20, 1982; minimum daily, 3.9 tons Feb. 2, 1981.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURES: Maximum daily, 29.0°C, Aug. 29, 30; minimum daily, 0.0°C several days during winter period.
SEDIMENT CONCENTRATION: Maximum daily mean, 92 mg/L, Mar. 27; minimum daily mean, 2 mg/L, Feb. 4.
SEDIMENT LOADS: Maximum daily, 4,040 tons, May 9; minimum daily, 14 tons, Dec. 21, 22.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17.0	12.0	2.0	---	---	---	6.0	10.0	22.0	25.0	25.0	25.0
2	18.0	10.0	---	---	---	---	6.0	10.0	25.0	25.0	23.0	22.0
3	---	7.0	---	---	---	.0	9.0	10.0	25.0	23.0	22.0	23.0
4	16.0	7.0	---	---	---	---	10.0	10.0	23.0	24.0	23.0	24.0
5	18.0	6.0	---	---	---	---	12.0	---	23.0	23.0	23.0	23.0
6	15.0	5.0	---	---	---	---	14.0	8.0	23.0	25.0	21.0	24.0
7	---	5.0	---	---	---	1.0	15.0	9.0	22.0	25.0	---	21.0
8	13.0	4.0	---	---	---	3.0	10.0	9.0	23.0	25.0	21.0	22.0
9	14.0	5.0	---	---	4.0	3.0	7.0	12.0	24.0	24.0	21.0	23.0
10	13.0	5.0	3.0	---	2.0	4.0	9.0	14.0	24.0	25.0	21.0	20.0
11	13.0	5.0	3.0	---	---	5.0	8.0	17.0	25.0	25.0	25.0	19.0
12	13.0	4.0	2.0	---	---	3.0	5.0	19.0	26.0	23.0	25.0	20.0
13	11.0	5.0	1.0	---	---	3.0	5.0	20.0	25.0	22.0	24.0	21.0
14	14.0	8.0	---	---	---	4.0	6.0	22.0	26.0	25.0	27.0	21.0
15	13.0	8.0	---	---	---	---	6.0	22.0	24.0	25.0	25.0	22.0
16	12.0	6.0	---	---	---	4.0	6.0	22.0	24.0	28.0	24.0	20.0
17	11.0	5.0	---	---	---	3.0	8.0	18.0	25.0	27.0	23.0	19.0
18	8.0	6.0	---	---	---	4.0	9.0	17.0	25.0	28.0	23.0	15.0
19	9.0	7.0	---	---	---	7.0	10.0	18.0	25.0	---	25.0	13.0
20	---	6.0	---	---	---	5.0	7.0	19.0	24.0	---	23.0	14.0
21	8.0	9.0	---	---	---	4.0	10.0	21.0	21.0	---	25.0	14.0
22	9.0	7.0	---	---	---	3.0	10.0	22.0	20.0	27.0	24.0	13.0
23	10.0	4.0	---	---	---	1.0	11.0	22.0	22.0	27.0	21.0	13.0
24	9.0	---	---	---	---	4.0	12.0	22.0	23.0	25.0	23.0	13.0
25	8.0	---	---	---	---	5.0	13.0	21.0	25.0	24.0	26.0	13.0
26	10.0	2.0	---	---	---	7.0	14.0	20.0	26.0	24.0	28.0	12.0
27	8.0	---	---	---	---	3.0	13.0	23.0	27.0	23.0	28.0	12.0
28	8.0	---	---	---	---	2.0	15.0	22.0	25.0	20.0	28.0	12.0
29	9.0	---	---	---	---	1.0	15.0	23.0	26.0	22.0	29.0	14.0
30	10.0	2.0	---	---	---	1.0	11.0	23.0	26.0	24.0	29.0	13.0
31	10.0	---	---	---	---	4.0	---	23.0	---	25.0	26.0	---
MEAN	---	---	---	---	---	---	9.7	---	24.1	---	---	18.0
MAX	---	---	---	---	---	---	15.0	---	27.0	---	---	25.0
MIN	---	---	---	---	---	---	5.0	---	20.0	---	---	12.0

MISSISSIPPI RIVER MAIN STEM

05288500 MISSISSIPPI RIVER NEAR ANOKA, MN--Continued

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DAY	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	4	30	19	351	6	49	3	26	3	26	7	50
2	5	36	17	304	6	53	3	25	3	25	7	49
3	8	69	14	256	5	40	3	26	3	32	7	49
4	10	110	11	194	5	45	3	24	2	16	7	49
5	8	82	8	131	5	43	3	26	3	26	7	50
6	8	81	8	126	5	45	3	25	3	21	8	56
7	8	91	10	170	5	50	3	24	4	27	7	49
8	8	83	7	114	5	50	3	24	4	27	5	38
9	6	74	5	80	5	52	3	24	5	35	10	75
10	5	62	4	63	5	46	3	24	5	34	9	67
11	5	64	5	71	4	41	3	25	5	35	6	42
12	6	70	6	87	5	47	3	25	5	40	9	72
13	6	71	7	93	5	45	3	25	7	54	6	47
14	6	68	8	107	4	27	3	26	6	41	6	48
15	7	77	8	113	4	34	3	25	6	45	5	41
16	7	76	8	106	3	26	3	25	7	84	5	39
17	7	79	8	113	3	27	3	24	6	69	5	45
18	6	76	8	105	3	23	3	23	6	55	8	73
19	5	63	8	110	3	22	3	26	6	55	7	68
20	6	84	9	114	3	20	3	21	7	68	10	111
21	6	85	10	131	3	14	3	23	6	48	28	392
22	6	99	9	111	3	14	3	24	6	42	39	691
23	13	253	7	88	3	25	3	23	6	43	63	1430
24	23	455	6	78	3	26	3	23	7	55	67	1860
25	37	753	5	61	3	26	3	24	7	58	64	1950
26	57	1170	4	49	3	25	3	26	6	45	63	2190
27	41	801	4	41	3	24	3	26	6	41	92	3530
28	28	548	4	43	3	28	3	23	6	39	88	3610
29	17	319	5	40	3	26	3	22	---	---	56	2390
30	16	305	5	38	3	26	3	21	---	---	49	2090
31	19	372	---	---	3	26	3	23	---	---	43	1860
TOTAL	---	6606	---	3488	---	1045	---	751	---	1186	---	23111
	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	34	1410	25	1050	75	3620	76	2670	16	323	17	173
2	26	1030	19	805	47	2280	44	1650	31	712	18	192
3	25	931	26	1190	38	1970	38	1550	32	836	21	234
4	24	823	26	1240	33	1720	38	1620	26	650	22	265
5	24	810	36	1930	32	1680	35	1520	22	536	22	254
6	21	669	45	2650	34	1760	35	1480	21	491	19	204
7	23	677	51	3400	29	1500	30	1260	20	453	29	341
8	26	737	55	3830	26	1280	29	1190	21	488	87	1470
9	20	545	55	4040	27	1300	28	1130	18	398	68	1830
10	15	405	53	4020	30	1460	26	997	17	354	62	1740
11	15	400	49	3810	31	1340	26	941	16	310	64	1970
12	15	404	46	3590	33	1350	27	1040	15	306	74	2600
13	19	549	44	3340	30	1160	26	934	16	311	80	3130
14	19	595	35	2530	24	862	24	855	14	244	67	2790
15	26	969	29	1940	22	737	22	742	16	286	63	2860
16	29	1210	29	1850	26	842	21	692	19	323	61	2870
17	30	1350	29	1750	25	763	25	796	16	269	45	2110
18	32	1500	39	2170	26	716	22	671	15	249	37	1730
19	36	1800	34	1740	26	716	24	745	14	219	34	1560
20	40	2100	29	1350	29	822	25	729	13	198	26	1130
21	42	2270	23	1020	36	1100	25	729	15	215	23	944
22	42	2310	22	909	41	1200	22	612	16	235	22	891
23	37	1950	21	811	31	896	21	555	33	504	22	873
24	27	1320	21	782	30	867	21	524	20	315	18	656
25	26	1170	21	748	33	944	21	479	16	236	20	707
26	24	978	23	820	26	758	20	448	14	206	34	1200
27	22	849	27	970	29	838	19	406	16	238	21	641
28	23	882	43	1630	29	822	19	432	15	215	14	412
29	27	984	50	2080	31	912	14	306	16	217	14	401
30	26	997	46	2000	29	822	13	265	15	192	11	287
31	---	---	80	3560	---	---	15	292	19	231	---	---
TOTAL	---	32624	---	63555	---	37037	---	28260	---	10760	---	36465
YEAR		244888										

MINNESOTA RIVER BASIN

05290000 LITTLE MINNESOTA RIVER NEAR PEEVER, SD

LOCATION.--Lat 45°36'05", long 96°52'18", in SW¼ sec.13, T.125 N., R.50 W., Roberts County, Hydrologic Unit 07020001, on Sisseton Indian Reservation, on right bank 2 mi northwest of town of Browns Valley, MN, 5.3 mi northeast of Peever, 7.2 mi downstream from Jorgenson River, and 8 mi upstream from Big Stone Lake.
DRAINAGE AREA.--447 mi^2.
PERIOD OF RECORD.--October 1939 to September 1981, October 1989 to current year.
REVISED RECORDS.--WSP 1308: 1943(M).
GAGE.--Water-stage recorder. Datum of gage is 1,002.20 ft above National Geodetic Vertical Datum of 1929. Oct. 1, 1939, to Mar. 20. 1940, nonrecording gage at site 4.5 mi downstream at different datum. Mar. 21 to Apr. 12, 1940, nonrecording gage at site 100 ft downstream at present datum. April 13 to Aug. 27, 1940, nonrecording gage at present site and datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 450 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
June 22	0930	*891	*5.77	July 23	1130	548	4.87
July 4	1300	513	4.78	July 28	2400	639	5.09

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.19	.58	.62	.49	e.74	.59	12	35	56	431	247	17
2	.22	.58	.60	.42	.75	.55	11	50	56	486	222	16
3	.31	.57	.59	.42	1.0	.55	10	43	56	436	304	14
4	.28	.58	.63	e.45	.99	1.5	10	63	75	500	230	13
5	.23	.57	.67	.49	.84	1.8	10	128	204	485	175	12
6	.34	.68	.67	.51	.83	1.9	11	113	356	437	149	11
7	.37	.66	.72	e.50	.72	3.9	11	96	263	388	134	10
8	.35	.94	.71	.39	.72	4.0	10	87	235	332	127	11
9	.35	.82	.71	.43	.68	33	9.7	71	186	281	127	21
10	.35	.62	.77	e.60	.65	38	9.2	60	155	238	112	109
11	.38	.61	.74	e.60	.61	25	8.8	51	128	210	96	85
12	.38	.63	.74	.65	.63	18	11	45	101	196	83	52
13	.38	.56	.70	.67	.64	13	15	39	82	184	73	44
14	.39	.57	.68	.71	.69	15	23	34	69	167	66	43
15	.42	.56	.76	.76	.75	14	35	32	63	147	60	55
16	.44	.51	.69	.76	.58	16	41	27	58	126	56	57
17	.70	.48	.69	.77	.55	15	41	24	53	111	52	45
18	.62	.49	.67	.71	.59	14	33	22	46	135	49	39
19	.58	.51	.73	.83	.58	17	27	20	40	136	44	34
20	.54	.59	.78	.91	.60	46	22	16	49	121	42	30
21	.52	.59	.72	.84	.85	83	18	13	204	114	41	27
22	.55	.59	.66	.84	.74	99	16	11	712	207	39	25
23	.58	.59	.61	.83	.65	69	14	9.9	399	485	37	22
24	.55	.60	.86	.77	.67	42	13	8.4	295	230	34	20
25	.58	.54	.79	.76	.70	35	11	6.7	258	169	35	18
26	.75	.61	.60	.57	.60	36	10	5.7	231	145	31	17
27	.56	.62	.62	.46	.58	36	10	5.3	233	206	27	17
28	.49	.59	.78	.56	.60	27	9.7	5.1	259	536	23	16
29	.51	.59	.63	.58	---	22	12	8.8	299	532	21	15
30	.53	.59	.41	.58	---	19	18	8.9	310	375	19	14
31	.53	---	.32	e.72	---	15	---	25	---	303	18	---
TOTAL	13.97	18.02	20.87	19.58	19.53	761.79	492.4	1163.8	5531	8849	2773	909
MEAN	.45	.60	.67	.63	.70	24.6	16.4	37.5	184	285	89.5	30.3
MAX	.75	.94	.86	.91	1.0	99	41	128	712	536	304	109
MIN	.19	.48	.32	.39	.55	.55	8.8	5.1	40	111	18	10
AC-FT	28	36	41	39	39	1510	977	2310	10970	17550	5500	1800
CFSM	.00	.00	.00	.00	.00	.05	.04	.08	.41	.64	.20	.07
IN.	.00	.00	.00	.00	.00	.06	.04	.10	.46	.74	.23	.08

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1940 - 1991, BY WATER YEAR (WY)

MEAN	76.9	25.6	32.7	12.7	62.6	201	263	92.4	90.7	38.1	15.3	10.0
MAX	333	98.3	135	52.3	268	573	1321	472	355	285	89.5	34.7
(WY)	1961	1961	1961	1961	1961	1943	1952	1942	1942	1991	1991	1961
MIN	.21	.25	.10	.000	.000	.51	2.89	2.20	.41	.041	.059	.074
(WY)	1940	1940	1940	1940	1940	1956	1981	1981	1976	1976	1976	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1940 - 1991	
ANNUAL TOTAL	2218.14		20571.96			
ANNUAL MEAN	6.08		56.4		43.0a	
HIGHEST ANNUAL MEAN					153	1962
LOWEST ANNUAL MEAN					1.37	1981
HIGHEST DAILY MEAN	173	Mar 13	712	Jun 22	4400	Apr 8 1952
LOWEST DAILY MEAN	.16	Sep 30	.19	Oct 1	.00	Jan 1 1940
ANNUAL SEVEN-DAY MINIMUM	.20	Sep 26	.28	Oct 1	.00	Jan 1 1940
INSTANTANEOUS PEAK FLOW	339	Mar 13	891	Jun 22	4730	Apr 8 1952
INSTANTANEOUS PEAK STAGE	5.12b	Mar 13	5.77	Jun 22	13.35c	Mar 25 1943
INSTANTANEOUS LOW FLOW	.12	Sep 30	.16	Oct 1		
ANNUAL RUNOFF (AC-FT)	4400		40800		31140	
ANNUAL RUNOFF (CFSM)	.014		.13		.096	
ANNUAL RUNOFF (INCHES)	.18		1.71		1.31	
10 PERCENT EXCEEDS	13		204		92	
50 PERCENT EXCEEDS	.63		11		2.5	
90 PERCENT EXCEEDS	.35		.53		.30	

a Median of annual mean discharges is 32 ft^3/s.
b Backwater from ice.
c From floodmark (backwater from ice).
e Estimated.

MINNESOTA RIVER BASIN

05291000 WHETSTONE RIVER NEAR BIG STONE CITY, SD

LOCATION.--Lat 45°17'32", long 96°29'14", in SE¼NW¼ sec.18, T.121 N., R.46 W., Grant County, Hydrologic Unit 07020001, on right bank 20 ft downstream from former highway bridge site, 1.5 mi west of Big Stone City, and 4.5 mi upstream from Big Stone Lake.
DRAINAGE AREA.--389 mi^2.
PERIOD OF RECORD.--March 1910 to November 1912 (no winter records), and March 1931 to current year. Monthly discharge only for some periods, published in WSP 1308.
REVISED RECORDS.--WSP 895: Drainage area. WSP 1308: 1932(M), 1935(M).
GAGE.--Water-stage recorder. Datum of gage is 996.96 ft adjustment of 1912. Mar. 8, 1910, to Nov. 30, 1912, nonrecording gage 2 mi downstream at different datum. Mar. 18, 1931, to May 3, 1939, nonrecording gage, at site 20 ft upstream at present datum. May 4, 1939, to Nov. 8, 1952, water-stage recorder at site 80 ft downstream at present datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known, about 26 ft in June 1919, present site and datum, from information by local resident, discharge 29,000 ft^3/s.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 200 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
June 5	2130	937	6.57	Aug. 3	1100	*3270	*10.40
June 22	1215	633	5.54	Aug. 9	0430	633	5.36
July 2	0215	2070	8.68	Sep. 11	0930	270	3.91
July 23	0600	777	5.84				

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.1	2.6	3.7	e3.8	e3.8	e5.8	15	24	95	810	307	47
2	2.3	2.4	3.8	e3.8	e3.8	e6.0	14	34	126	1510	927	39
3	3.3	2.5	3.8	e3.8	e3.8	e6.4	13	35	96	659	2720	34
4	3.4	2.4	3.8	e3.8	e3.8	e6.7	13	36	170	369	1420	31
5	5.5	2.5	3.9	e3.8	e3.8	e7.0	13	41	734	e250	627	26
6	3.3	2.5	4.2	e3.8	e3.9	e7.4	13	55	812	e200	365	24
7	4.5	2.5	4.5	e3.8	e3.9	e7.7	13	52	572	e160	307	25
8	3.5	2.5	4.6	e3.8	e3.9	e8.1	13	41	367	e125	440	35
9	2.5	3.2	4.4	e3.8	e3.9	e8.6	14	36	e233	e100	580	38
10	2.4	3.2	4.3	e3.8	e3.9	e9.3	13	31	e180	e80	371	146
11	2.4	3.3	4.3	e3.8	e4.0	e9.8	12	28	e140	e62	e290	256
12	2.4	3.3	4.2	e3.8	e4.0	e10	15	24	e115	e54	e220	148
13	2.4	3.9	e4.2	e3.8	e4.0	e11	20	21	e95	e47	e180	84
14	2.4	3.9	e4.2	e3.8	e4.1	e12	32	18	e84	e38	e150	69
15	2.5	5.2	e4.2	e3.8	e4.1	e13	49	17	e81	e34	e130	67
16	2.8	4.7	e4.2	e3.8	e4.2	e14	48	44	e75	e29	e110	70
17	4.0	4.8	e4.2	e3.8	e4.2	e15	48	38	e63	e25	e98	59
18	4.7	4.3	e4.2	e3.8	e4.3	e16	40	33	e53	e22	e80	50
19	3.9	3.9	e4.2	e3.8	e4.4	e22	33	33	e49	21	72	45
20	4.1	4.2	e4.2	e3.8	e4.5	e30	26	24	e56	19	70	40
21	4.4	4.1	4.2	e3.8	e4.6	e46	22	18	e260	27	67	36
22	3.6	3.9	e4.2	e3.8	e4.7	e55	19	15	569	539	65	32
23	3.0	3.4	e4.2	e3.8	e4.8	e64	17	13	486	734	60	30
24	2.7	3.5	e4.2	e3.8	e4.9	e51	16	11	314	662	57	30
25	2.5	3.2	e4.1	e3.8	e5.0	e34	14	9.2	275	400	55	27
26	2.5	3.1	e4.1	e3.8	e5.2	e29	13	7.7	277	300	54	25
27	2.6	3.4	e4.0	e3.8	e5.4	e24	15	7.3	279	307	47	24
28	2.5	3.2	e3.9	e3.8	e5.6	e21	14	9.9	281	429	40	23
29	2.7	3.2	e3.9	e3.8	---	e20	15	22	284	456	80	22
30	3.3	3.5	e3.9	e3.8	---	17	20	33	312	363	98	21
31	2.7	---	e3.9	e3.8	---	16	---	81	---	302	64	---
TOTAL	96.9	102.3	127.7	117.8	120.5	602.8	622	892.1	7533	9133	10151	1603
MEAN	3.13	3.41	4.12	3.80	4.30	19.4	20.7	28.8	251	295	327	53.4
MAX	5.5	5.2	4.6	3.8	5.6	64	49	81	812	1510	2720	256
MIN	2.1	2.4	3.7	3.8	3.8	5.8	12	7.3	49	19	40	21
AC-FT	192	203	253	234	239	1200	1230	1770	14940	18120	20130	3180
CFSM	.01	.01	.01	.01	.01	.05	.05	.07	.65	.76	.84	.14
IN.	.01	.01	.01	.01	.01	.06	.06	.09	.72	.87	.97	.15

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1910 - 1991, BY WATER YEAR (WY)

MEAN	8.81	10.3	7.02	4.49	10.0	145	180	79.9	73.5	34.9	16.0	8.10
MAX	70.5	78.3	43.3	20.5	118	612	1386	491	478	454	327	65.7
(WY)	1958	1972	1972	1987	1984	1978	1952	1972	1984	1962	1991	1942
MIN	.60	.40	.20	.000	.000	2.85	3.63	.77	1.42	.035	.000	.36
(WY)	1932	1935	1935	1934	1934	1969	1934	1934	1936	1934	1934	1935

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1910 - 1991	
ANNUAL TOTAL	3009.09		31102.1			
ANNUAL MEAN	8.24		85.2		49.7b	
HIGHEST ANNUAL MEAN					181	1986
LOWEST ANNUAL MEAN					1.52	1934
HIGHEST DAILY MEAN	217	Mar 14	2720	Aug 3	6090	Apr 8 1969
LOWEST DAILY MEAN	.29	Aug 13	2.1	Oct 1	.00c	
ANNUAL SEVEN-DAY MINIMUM	.42	Aug 10	2.4	Oct 9	.00	Jul 31 1933
INSTANTANEOUS PEAK FLOW	268	Mar 14	3270	Aug 3	6870	Apr 8 1969
INSTANTANEOUS PEAK STAGE	4.19a	Mar 14	10.40	Aug 3	14.32d	Apr 8 1969
INSTANTANEOUS LOW FLOW	.27	Aug 13,14	2.0	Oct 1		
ANNUAL RUNOFF (AC-FT)	5970		61690		35970	
ANNUAL RUNOFF (CFSM)	.021		.22		.13	
ANNUAL RUNOFF (INCHES)	.29		2.97		1.73	
10 PERCENT EXCEEDS	16		278		87	
50 PERCENT EXCEEDS	4.0		14		6.6	
90 PERCENT EXCEEDS	1.5		3.3		1.3	

a Backwater from ice.
b Median of annual mean discharges is 35 ft^3/s.
c No flow at times in most years.
d From floodmark.
e Estimated.

MINNESOTA RIVER BASIN

05291500 BIG STONE LAKE NEAR BIG STONE CITY, SD
(formerly published as Big Stone Lake at Ortonville)

LOCATION.--Lat 45°18'32", long 96°28'04", in NE¼NW¼ sec.8, T.121 N., R.46 W., Grant County, Hydrologic Unit 07020001, at new powerplant intake, 1.2 mi north of Big Stone City, SD, 1.2 mi northwest of concrete dam at outlet, and 1.0 mi west of Ortonville. Prior to January 1989, at old powerplant site at west edge of Ortonville.

PERIOD OF RECORD.--March 1937 to current year.

GAGE.--Nonrecording gage read once a day. Datum of gage is 957.69 ft above National Geodetic Vertical Datum of 1929. Prior to Sept. 17, 1947, nonrecording gage at site 1.2 mi southeast at same datum. Sept. 18, 1947, to June 30, 1963, water-stage recorder at site 1.2 mi southeast at same datum. Sept. 21, 1959, to June 30, 1963, supplementary nonrecording gage read once daily, at site 0.9 mi southeast at same datum. July 1, 1963 to Jan. 1989 nonrecording gage at site 0.9 mi southeast at same datum.

REMARKS.--Natural lake with concrete dam at outlet. Dam was rebuilt and completed in Nov. 1985, with the following changes: Eight 7 ft high by 10 ft wide electrically operated slide gates, one 48 in. by 48 in. gate; and one 18 in. sluice gate; sills of all gates are at 3.0 ft. Silt barrier dam 700 ft upstream in outlet channel of lake completed July 7, 1958; rebuilt and completed Dec. 1986 with the new crest at 7.0 ft (previous crest was at 5.9 ft). Supplementary nonrecording gage readings used for stages below crest of silt barrier to June 30, 1963. Water level subject to fluctuation caused by wind action.

EXTREMES FOR PERIOD OF RECORD.--Maximum gage height, 12.73 ft, Apr. 17, 1952; minimum observed, 3.53 ft, Mar. 2, 1957 (strong upstream wind in channel). Minimum observations of 3.10 ft, Mar. 2, 1940, and 2.20 ft, Nov. 20, 1940, at spillway site are the result of blockage of channel to spillway by ice and snow and do not represent lake elevations.

EXTREMES FOR CURRENT YEAR.--Maximum gage height observed, 8.28 ft, Aug. 4; minimum observed, 6.09 ft, Apr. 26.

GAGE HEIGHT, IN FEET, OCTOBER 1990 TO SEPTEMBER 1991

Oct. 31	6.48	Feb. 28	6.70	June 30	7.90
Nov. 30	6.48	Mar. 31	7.00	July 31	8.00
Dec. 31	6.54	Apr. 30	7.04	Aug. 31	7.84
Jan. 31	6.57	May 31	7.35	Sept. 30	7.70

NOTE.--Gage-height record other than that shown above is available in the District office.

MINNESOTA RIVER BASIN

05292000 MINNESOTA RIVER AT ORTONVILLE, MN

LOCATION.--Lat 45°17'44", long 96°26'38", in NE¼NW¼ sec.16, T.121 N., R.46 W., Big Stone County, Hydrologic Unit 07020001, on left bank 400 ft downstream from bridge on U.S. Highway 12 and 1,300 ft downstream from dam at outlet of Big Stone Lake, at Ortonville.

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

PERIOD OF RECORD.--February 1938 to current year.

REVISED RECORDS.--WSP 895: 1939. WSP 1508: 1942 (yearly mean).

GAGE.--Water-stage recorder. Datum of gage is 956.38 ft above National Geodetic Vertical Datum of 1929. Prior to Mar. 31, 1939, nonrecording gage on downstream side of dam 1,300 ft upstream at datum 1.31 ft higher.

REMARKS.--Records good except those for estimated daily discharges, which are fair. Some regulation by Big Stone Lake (station 05291500).

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.4	3.8	4.6	e2.5	2.2	2.2	16	49	104	1500	716	90
2	3.5	3.3	4.3	2.4	2.2	2.4	15	47	129	1790	1220	90
3	4.6	3.3	4.3	2.4	2.2	2.5	14	46	170	1410	1670	92
4	4.3	3.1	4.3	2.5	2.2	2.6	14	47	301	1050	1700	60
5	4.4	3.1	4.6	2.3	2.2	3.1	14	48	693	849	1120	29
6	6.0	2.8	4.6	2.3	2.2	2.2	14	57	926	741	838	28
7	5.2	3.0	4.3	e2.3	2.2	2.2	14	62	815	601	863	29
8	4.7	2.8	3.6	e2.3	2.2	2.2	11	56	792	572	948	29
9	4.6	2.6	3.1	e2.3	2.2	2.2	8.2	38	781	553	1030	57
10	4.4	2.5	2.8	e2.3	2.2	2.5	8.0	38	765	536	825	56
11	3.9	2.4	2.8	e2.3	2.2	2.7	8.3	40	504	382	657	47
12	4.0	2.5	2.5	e2.3	2.2	2.3	9.6	41	144	318	253	63
13	3.7	2.7	2.6	e2.3	2.2	2.2	9.7	42	96	386	185	56
14	3.6	2.5	2.7	e2.5	1.7	2.1	8.7	43	78	312	217	56
15	3.9	2.4	2.6	e2.6	1.8	2.2	8.8	42	72	78	215	56
16	3.9	2.8	2.7	2.7	1.9	2.4	8.2	42	68	64	160	57
17	4.4	3.2	2.7	2.7	1.9	2.4	8.1	38	65	65	92	57
18	4.4	3.1	3.0	2.5	1.9	2.5	8.1	37	64	65	93	57
19	4.7	3.2	2.8	2.2	1.9	2.6	8.1	36	61	65	90	53
20	4.1	3.4	2.7	1.9	1.9	4.7	17	35	130	65	89	51
21	4.0	3.1	2.4	2.5	2.3	7.9	20	37	365	66	90	51
22	4.0	2.8	e2.5	2.3	2.2	11	22	43	904	899	89	54
23	3.8	2.5	e2.5	2.2	1.9	17	21	45	901	1280	91	51
24	4.0	3.1	e2.5	2.5	2.0	33	15	43	784	991	88	51
25	3.7	3.6	e2.5	2.8	2.2	40	7.6	37	610	698	90	154
26	3.5	3.6	e2.5	2.6	2.2	31	7.9	37	374	290	88	372
27	3.6	4.0	e2.5	2.4	2.2	29	9.0	33	535	470	88	352
28	4.2	4.0	e2.5	2.4	2.2	29	7.7	33	721	839	87	299
29	3.9	4.3	e2.5	2.2	---	28	10	31	898	801	100	156
30	4.0	4.6	e2.5	2.2	---	19	29	32	900	715	95	98
31	4.2	---	e2.5	2.2	---	16	---	57	---	707	92	---
TOTAL	128.6	94.1	95.0	73.9	58.8	311.1	372.0	1312	13750	19158	13979	2751
MEAN	4.15	3.14	3.06	2.38	2.10	10.0	12.4	42.3	458	618	451	91.7
MAX	6.0	4.6	4.6	2.8	2.3	40	29	62	926	1790	1700	372
MIN	3.4	2.4	2.4	1.9	1.7	2.1	7.6	31	61	64	87	28
AC-FT	255	187	188	147	117	617	738	2600	27270	38000	27730	5460
CFSM	.00	.00	.00	.00	.00	.01	.01	.04	.40	.53	.39	.08
IN.	.00	.00	.00	.00	.00	.01	.01	.04	.44	.61	.45	.09

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1938 - 1991, BY WATER YEAR (WY)

MEAN	19.5	15.6	16.3	17.3	21.9	146	414	235	181	113	51.2	30.2
MAX	186	166	194	164	150	731	2195	887	1034	915	451	250
(WY)	1987	1943	1943	1943	1943	1986	1952	1986	1962	1962	1991	1942
MIN	.20	.20	.20	.17	.16	1.14	1.27	.91	1.30	1.11	.25	.18
(WY)	1939	1939	1939	1940	1940	1941	1941	1941	1977	1977	1959	1988

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1938 - 1991	
ANNUAL TOTAL	4493.27		52083.5			
ANNUAL MEAN	12.3		143		106a	
HIGHEST ANNUAL MEAN					364	1986
LOWEST ANNUAL MEAN					2.39	1977
HIGHEST DAILY MEAN	202	Mar 15	1790	Jul 2	3050	Apr 13 1952
LOWEST DAILY MEAN	.97	Aug 16	1.7	Feb 14	.00	Dec 13 1940
ANNUAL SEVEN-DAY MINIMUM	1.1	Aug 11	1.9	Feb 14	.08	Sep 12 1988
INSTANTANEOUS PEAK FLOW	257	Aug 19	1880	Jul 2	3060	Apr 13 1952
INSTANTANEOUS PEAK STAGE	4.02	Aug 19	8.95	Jul 2	12.92	Apr 13 1952
INSTANTANEOUS LOW FLOW	.84	Aug 17	1.5	Feb 24		
ANNUAL RUNOFF (AC-FT)	8910		103300		77020	
ANNUAL RUNOFF (CFSM)	.011		.12		.092	
ANNUAL RUNOFF (INCHES)	.14		1.67		1.25	
10 PERCENT EXCEEDS	22		671		280	
50 PERCENT EXCEEDS	5.7		8.7		14	
90 PERCENT EXCEEDS	2.7		2.2		1.0	

a Median of annual mean discharges is 80 ft^3/s.
e Estimated.

MINNESOTA RIVER BASIN

05293000 YELLOW BANK RIVER NEAR ODESSA, MN

LOCATION.--Lat 45°13'35", long 96°21'12", in SE¼SE¼ sec.1, T.120 N., R.46 W., Lac qui Parle County, Hydrologic Unit 07020001, on left bank 150 ft downstream from highway bridge, 2.5 mi southwest of Odessa, and 4.5 mi upstream from mouth.
DRAINAGE AREA.--398 mi^2.
PERIOD OF RECORD.--October 1939 to current year.
REVISED RECORDS.--WSP 1388: 1947(M), 1950.
GAGE.--Water-stage recorder. Datum of gage is 953.34 ft above National Geodetic Vertical Datum of 1929 (U.S. Army Corps of Engineers bench mark). Prior to Aug. 28, 1940, nonrecording gage at site 150 ft upstream at same datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
June 5	0200	1190	9.08	July 22	1430	495	6.07
June 23	0230	1630	*10.30	Aug 4	0330	*2010	10.20
July 2	1600	1070	8.28	Aug 9	1630	659	6.24

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.7	2.1	e1.0	e.34	e.16	e.75	25	20	295	482	89	30
2	1.8	2.0	e1.0	e.30	e.16	e.90	22	22	324	876	314	28
3	2.7	1.8	e1.0	e.28	e.17	e1.0	22	30	326	587	1010	26
4	2.4	1.8	e1.0	e.26	e.17	e1.1	21	36	817	263	1750	24
5	2.1	1.9	e1.0	e.25	e.17	e1.3	19	33	974	158	937	22
6	2.1	1.4	e1.0	e.23	e.17	e1.4	19	31	915	105	498	21
7	2.1	1.4	e1.0	e.22	e.17	e1.7	19	37	677	72	360	21
8	2.1	1.0	e1.0	e.21	e.18	e2.0	18	36	452	53	356	22
9	2.3	1.2	e1.0	e.20	e.18	e2.3	16	33	324	42	569	22
10	2.3	1.3	e.98	e.20	e.18	e2.8	14	30	208	34	523	21
11	2.4	1.0	e.98	e.19	e.18	e3.2	13	28	163	29	370	24
12	2.5	.98	e.97	e.18	e.19	e3.7	14	27	138	28	266	24
13	2.4	1.0	e.96	e.18	e.19	e4.4	18	24	112	23	204	23
14	2.5	1.0	e.95	e.17	e.20	e5.1	22	22	104	21	174	22
15	2.5	1.0	e.94	e.17	e.20	e5.8	29	21	90	17	149	22
16	2.5	1.0	e.93	e.17	e.21	e6.4	39	21	97	15	132	20
17	2.8	1.0	e.92	e.16	e.22	e8.0	40	43	92	13	120	19
18	2.9	1.0	e.91	e.16	e.23	e10	35	90	67	12	109	19
19	2.5	1.1	e.90	e.16	e.25	e16	30	72	56	11	102	18
20	2.4	.92	e.89	e.16	e.27	e25	26	49	70	9.1	93	17
21	2.5	1.1	e.88	e.16	e.29	e35	21	39	230	9.1	85	16
22	2.3	1.1	e.84	e.16	e.32	e88	19	32	1060	338	77	15
23	2.5	1.0	e.80	e.16	e.35	e126	16	27	1450	242	70	14
24	2.5	1.1	e.74	e.16	e.39	e110	15	24	e744	235	63	13
25	2.3	e1.0	e.68	e.15	e.44	e73	13	20	e328	145	57	13
26	2.2	e1.0	e.63	e.15	e.49	e52	12	17	e253	87	53	12
27	2.4	e1.0	e.58	e.16	e.55	e36	12	16	e266	104	47	11
28	2.2	e1.0	e.52	e.16	e.62	e36	13	18	e311	114	42	11
29	2.1	e1.0	e.46	e.16	---	e37	14	58	462	122	40	11
30	2.2	e1.0	e.41	e.16	---	e33	18	178	432	131	35	10
31	2.2	---	e.37	e.16	---	29	---	276	---	102	31	---
TOTAL	72.4	36.20	26.24	5.93	7.30	757.85	614	1410	11837	4479.2	8725	571
MEAN	2.34	1.21	.85	.19	.26	24.4	20.5	45.5	395	144	281	19.0
MAX	2.9	2.1	1.0	.34	.62	126	40	276	1450	876	1750	30
MIN	1.7	.92	.37	.15	.16	.75	12	16	56	9.1	31	10
AC-FT	144	72	52	12	14	1500	1220	2800	23480	8880	17310	1130
CFSM	.01	.00	.00	.00	.00	.06	.05	.11	.99	.36	.71	.05
IN.	.01	.00	.00	.00	.00	.07	.06	.13	1.11	.42	.82	.05

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1940 - 1991, BY WATER YEAR (WY)

MEAN	12.7	16.3	8.53	4.67	10.1	150	233	94.3	90.7	42.5	25.0	13.8
MAX	104	201	66.8	19.7	117	653	1341	652	496	375	281	273
(WY)	1985	1972	1972	1986	1984	1986	1952	1972	1984	1962	1991	1985
MIN	.31	.44	.32	.090	.001	1.59	9.13	2.94	1.83	.27	.088	.083
(WY)	1941	1977	1977	1977	1977	1965	1981	1981	1976	1976	1976	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1940 - 1991	
ANNUAL TOTAL	2792.05		28542.12			
ANNUAL MEAN	7.65		78.2		58.4a	
HIGHEST ANNUAL MEAN					225	1986
LOWEST ANNUAL MEAN					3.98	1981
HIGHEST DAILY MEAN	192	Mar 16	1750	Aug 4	6640	Apr 9 1969
LOWEST DAILY MEAN	.08	Aug 11	.15	Jan 25	.00b	
ANNUAL SEVEN-DAY MINIMUM	.19	Aug 6	.16	Jan 20	.00	Jan 26 1940
INSTANTANEOUS PEAK FLOW	220	Mar 16	2010	Aug 4	6970	Apr 9 1969
INSTANTANEOUS PEAK STAGE	4.96c	Mar 15,16	10.30	Jun 23	19.07d	Apr 9 1969
ANNUAL RUNOFF (AC-FT)	5540		56610		42340	
ANNUAL RUNOFF (CFSM)	.019		.20		.15	
ANNUAL RUNOFF (INCHES)	.26		2.67		2.00	
10 PERCENT EXCEEDS	19		238		120	
50 PERCENT EXCEEDS	1.8		13		8.3	
90 PERCENT EXCEEDS	.60		.20		.90	

a Median of annual mean discharges is 47 ft^3/s.
b Many days in several years.
c Backwater from ice.
d From floodmark.

MINNESOTA RIVER BASIN

05294000 POMME DE TERRE RIVER AT APPLETON, MN

LOCATION.--Lat 45°12'10", long 96°01'20", in SW¼NW¼ sec.14, T.120 N., R.43 W., Swift County, Hydrologic Unit 07020002, on left bank 60 ft upstream from bridge on U.S. Highway 59 and State Highway 119 at Appleton and 8 mi upstream from mouth.
DRAINAGE AREA.--905 mi^2, approximately.
PERIOD OF RECORD.--March 1931 to September 1935 (no winter records), October 1935 to current year. Prior to October 1953, published as "near Appleton."
REVISED RECORDS.--WSP 1308: 1931(M), 1937(M).
GAGE.--Water-stage recorder and concrete control. Datum of gage is 978.00 ft above National Geodetic Vertical Datum of 1929. Prior to Dec. 22, 1952, nonrecording gage at site 4 mi upstream at datum 25.17 ft higher.
REMARKS.--Records good. Flow affected by lakes above station. Occasional regulation at low flow by old milldam 500 ft upstream.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 200 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Jun 2	1500	244	5.50	Jul 15	Unknown	232	5.46
Jul 2	Unknown	226	5.44	Aug 3	0815	*320	*5.72

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.7	14	17	5.6	9.5	23	162	155	200	196	158	75
2	11	13	16	5.9	9.8	23	157	169	236	223	287	73
3	25	14	16	6.1	10	23	137	162	213	223	309	70
4	22	14	16	5.6	12	24	130	161	188	199	259	67
5	20	20	16	5.1	14	25	123	177	175	199	212	64
6	17	15	16	4.9	15	25	119	176	172	196	180	64
7	15	14	18	4.7	17	26	119	174	162	e198	164	80
8	13	14	20	4.5	18	27	118	173	153	199	158	89
9	13	15	20	4.6	19	29	116	162	150	202	153	105
10	13	15	20	4.6	21	30	114	162	166	202	143	117
11	9.8	17	21	4.8	22	32	111	160	178	202	135	120
12	11	18	22	5.1	22	35	114	153	165	223	130	116
13	11	19	17	5.5	22	33	124	149	153	e223	126	119
14	10	19	21	6.4	22	35	140	149	147	223	124	129
15	11	19	20	7.1	21	37	158	150	148	229	121	136
16	11	20	20	7.7	21	37	163	147	171	217	118	141
17	12	19	21	8.4	21	39	158	159	172	199	114	145
18	18	19	19	9.2	21	43	148	149	143	188	109	147
19	24	19	18	10	21	49	141	138	127	185	104	148
20	24	19	16	10	21	57	135	126	125	e185	101	145
21	21	20	15	9.7	22	64	131	118	165	e185	99	141
22	21	19	12	9.7	22	71	126	113	172	180	97	131
23	20	20	11	9.7	23	40	123	110	160	169	95	122
24	18	19	11	9.4	23	49	120	108	148	158	95	117
25	16	18	9.4	9.2	23	75	117	108	143	149	96	113
26	16	18	8.5	9.2	23	99	110	108	143	141	88	107
27	15	20	7.6	9.4	23	164	113	109	146	158	85	103
28	16	20	8.0	9.5	23	145	110	115	157	157	83	101
29	15	19	8.4	9.6	---	145	123	160	163	156	82	93
30	16	18	7.4	9.6	---	147	130	205	179	144	79	87
31	16	---	5.9	9.5	---	161	---	180	---	136	77	---
TOTAL	487.5	527	474.2	230.3	541.3	1812	3890	4585	4920	5844	4181	3265
MEAN	15.7	17.6	15.3	7.43	19.3	58.5	130	148	164	189	135	109
MAX	25	20	22	10	23	164	163	205	236	229	309	148
MIN	6.7	13	5.9	4.5	9.5	23	110	108	125	136	77	64
AC-FT	967	1050	941	457	1070	3590	7720	9090	9760	11590	8290	6480
CFSM	.02	.02	.02	.01	.02	.06	.14	.16	.18	.21	.15	.12
IN.	.02	.02	.02	.01	.02	.07	.16	.19	.20	.24	.17	.13
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1991, BY WATER YEAR (WY)												
MEAN	56.8	54.9	37.8	24.0	22.3	141	345	183	156	111	60.9	49.6
MAX	508	339	182	141	147	673	1587	846	516	726	338	331
(WY)	1985	1985	1987	1987	1987	1985	1969	1969	1965	1962	1986	1986
MIN	.000	3.52	1.00	.000	.000	2.04	20.9	8.09	2.17	.45	.095	.047
(WY)	1989	1989	1937	1937	1936	1969	1934	1934	1933	1988	1988	1988

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1931 - 1991	
ANNUAL TOTAL	16237.16		30757.3			
ANNUAL MEAN	44.5		84.3		111a	
HIGHEST ANNUAL MEAN					363	1986
LOWEST ANNUAL MEAN					21.1	1977
HIGHEST DAILY MEAN	155	Mar 30	309	Aug 3	5210	Apr 11 1969
LOWEST DAILY MEAN	.28	Aug 17	4.5	Jan 8	.00b	
ANNUAL SEVEN-DAY MINIMUM	4.7	Aug 11	4.7	Jan 5	.00	Feb 1 1936
INSTANTANEOUS PEAK FLOW	206	Mar 29	320	Aug 3	5520	Apr 11 1969
INSTANTANEOUS PEAK STAGE	5.42	Mar 29	5.72	Aug 3	14.58c	Apr 9 1969
INSTANTANEOUS LOW FLOW	0.00	Aug 17	4.4	Jan 8		
ANNUAL RUNOFF (AC-FT)	32210		61010		80070	
ANNUAL RUNOFF (CFSM)	.049		.093		.12	
ANNUAL RUNOFF (INCHES)	.67		1.26		1.66	
10 PERCENT EXCEEDS	98		176		252	
50 PERCENT EXCEEDS	24		77		43	
90 PERCENT EXCEEDS	10		9.7		5.8	

a Median of annual mean discharges is 91 ft^3/s.
b Occurred on many days in several years.
c Backwater from ice.
e Estimated.

MINNESOTA RIVER BASIN

05300000 LAC QUI PARLE RIVER NEAR LAC QUI PARLE, MN

LOCATION.--Lat 44°59'42, long 95°55'09" in SW¼SW¼ sec.27, T.118 N., R.42 W., Lac qui Parle County, Hydrologic Unit 07020003, on right bank 40 ft downstream from highway bridge and 0.5 mi southwest of city of Lac qui Parle.
DRAINAGE AREA.--983 mi^2.
PERIOD OF RECORD.--April 1910 to November 1914; March 1931 to current year (winter records incomplete prior to 1934). Published as "at Lac qui Parle," 1910-14.
REVISED RECORDS.--WSP 1308: 1912(M), 1935(M).
GAGE.--Water-stage recorder. Datum of gage is 951.98 ft above National Geodetic Vertical Datum of 1929 (Minnesota Department of Transportation benchmark). Apr. 27, 1910, to Nov. 15, 1914, nonrecording gage at site 2 mi downstream at different datum. Mar. 17, 1931, to Mar. 9, 1937, non recording gage at site 40 ft upstream at present datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.6	29	20	e5.7	e5.7	e9.1	140	208	407	1430	229	56
2	9.9	26	19	e5.7	e5.7	e9.6	128	269	1060	1380	800	52
3	19	23	18	e5.6	e5.7	e10	118	344	973	1250	1090	49
4	28	21	17	e5.6	e5.7	e11	111	362	2290	1090	931	44
5	23	20	17	e5.6	e5.8	e12	106	346	2480	924	825	41
6	18	21	17	e5.6	e5.8	e15	103	374	2500	789	626	38
7	65	19	17	e5.6	e5.8	e21	101	401	2510	676	525	43
8	58	19	19	e5.6	e5.8	e23	99	368	2430	583	534	56
9	54	18	20	e5.5	e5.9	e21	98	324	2200	507	525	57
10	46	13	21	e5.5	e5.9	e21	96	289	1960	443	516	52
11	37	12	24	e5.4	e6.0	e27	92	263	1680	401	467	54
12	35	16	27	e5.4	e6.0	e37	95	246	1400	366	396	56
13	32	19	22	e5.4	e6.0	e40	112	227	1150	338	335	58
14	28	21	e25	e5.4	e6.0	e74	128	209	954	313	289	62
15	29	19	29	e5.4	e6.1	e76	203	213	851	284	251	63
16	26	18	28	e5.5	e6.2	e76	276	220	882	254	222	65
17	30	20	25	e5.5	e6.3	e96	279	219	952	228	203	65
18	31	25	24	e5.5	e6.4	e90	251	192	895	205	187	63
19	30	28	23	e5.5	e6.5	e90	220	170	805	184	171	57
20	28	27	23	e5.5	e6.6	e106	195	161	800	167	157	54
21	35	27	17	e5.5	e6.7	e129	176	155	1860	158	150	51
22	35	27	12	e5.5	e6.8	e137	161	148	2080	445	139	47
23	37	37	9.0	e5.5	e7.0	e206	149	143	2200	380	129	44
24	47	29	7.3	e5.5	e7.3	e195	140	133	2180	271	119	49
25	46	23	e6.7	e5.6	e7.7	e149	133	130	2110	221	110	46
26	52	22	6.3	e5.6	e8.0	e159	126	141	1970	194	100	44
27	46	21	e6.2	e5.6	e7.4	e218	130	152	1720	214	90	45
28	44	23	e6.0	e5.6	e7.5	249	122	173	1400	293	81	46
29	34	27	e5.9	e5.6	---	222	130	227	1150	296	74	48
30	35	23	e5.8	e5.7	---	195	183	275	988	278	68	46
31	33	---	e5.7	e5.7	---	163	---	273	---	246	62	---
TOTAL	1077.5	673	522.9	171.9	178.3	2886.7	4401	7355	46837	14808	10401	1551
MEAN	34.8	22.4	16.9	5.55	6.37	93.1	147	237	1561	478	336	51.7
MAX	65	37	29	5.7	8.0	249	279	401	2510	1430	1090	65
MIN	6.6	12	5.7	5.4	5.7	9.1	92	130	407	158	62	38
AC-FT	2140	1330	1040	341	354	5730	8730	14590	92900	29370	20630	3080
CFSM	.04	.02	.02	.01	.01	.09	.15	.24	1.59	.49	.34	.05
IN.	.04	.03	.02	.01	.01	.11	.17	.28	1.77	.56	.39	.06

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1910 - 1991, BY WATER YEAR (WY)

MEAN	28.8	35.5	18.0	7.75	16.1	278	505	199	218	102	59.2	30.8
MAX	482	345	112	43.9	140	1634	3578	1028	1762	771	765	535
(WY)	1985	1971	1972	1987	1984	1985	1969	1944	1984	1962	1953	1985
MIN	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
(WY)	1932	1932	1932	1932	1934	1934	1934	1934	1934	1934	1931	1931

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1910 - 1991	
ANNUAL TOTAL	21139.0		90863.3			
ANNUAL MEAN	57.9		249		132a	
HIGHEST ANNUAL MEAN					465	1986
LOWEST ANNUAL MEAN					.000	1934
HIGHEST DAILY MEAN	988	Jun 19	2510	Jun 7	16000	Apr 10 1969
LOWEST DAILY MEAN	1.1	Sep 17	5.4	Jan 11	.00b	
ANNUAL SEVEN-DAY MINIMUM	1.4	Feb 17	5.4	Jan 9	.00	Jul 15 1931
INSTANTANEOUS PEAK FLOW	1050	Jun 19	2690	Jun 4	17100	Apr 10 1969
INSTANTANEOUS PEAK STAGE	5.14	Jun 19	9.02	Jun 4	19.37c	Apr 9 1965
INSTANTANEOUS LOW FLOW			5.4	Jan 11		
ANNUAL RUNOFF (AC-FT)	41930		180200		95620	
ANNUAL RUNOFF (CFSM)	.059		.25		.13	
ANNUAL RUNOFF (INCHES)	.80		3.44		1.82	
10 PERCENT EXCEEDS	134		802		273	
50 PERCENT EXCEEDS	24		56		16	
90 PERCENT EXCEEDS	2.6		5.8		.30	

a Median of annual mean discharges is 101 ft^3/s.
b Many days in several years.
c From floodmark (backwater from ice).

MINNESOTA RIVER BASIN

05301000 MINNESOTA RIVER NEAR LAC QUI PARLE, MN

LOCATION.--Lat 45°01'17", long 95°52'05", in NW¼NE¼ sec.24, T.118 N., R.42 W., Chippewa County, Hydrologic Unit 07020004, on left bank 200 ft downstream from dam at Lac qui Parle Outlet, 2.4 mi northeast of city of Lac qui Parle, and 3.5 mi west of Watson.

DRAINAGE AREA.--4,050 mi^2, approximately.

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

GAGE.--Water-stage recorder. Datum of gage is 900.00 ft above National Geodetic Vertican Datum of 1929 (levels by U.S. Army Corps of Engineers). Prior to Nov. 10, 1944, at datum 0.20 ft lower.

REMARKS.--Records good. Part of flow from 2,050 mi^2, of Chippewa River basin at times diverted into Minnesota River above station. Some regulation by Big Stone Lake since Apr. 17, 1937, Lac qui Parle since January 1938, Marsh Lake since Nov. 1, 1939, and Odessa Dam since May 1974.

REVISIONS.--Revised daily discharge, in cubic feet per second, for September 13, 1979 is 69. This figure supersedes that published in the report for 1979.

	TOTAL	MEAN	MAX	MIN	$(FT^3/3)/MI^2$	IN
September 1979	7967.8	266	672	1.8	.07	.07
Wtr Yr 1979	428438.8	1174	10500	1.8	.29	3.94
Cal Yr 1979	444901.8	1219	10500	1.8	.30	4.09

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	27	202	88	e86	24	81	1070	861	1000	3570	1700	485
2	28	200	88	e86	24	118	684	861	1070	3640	1890	482
3	72	200	88	e78	24	121	553	862	1160	3690	2190	525
4	100	202	91	e72	24	188	546	868	1590	3640	2700	599
5	100	135	88	e70	25	226	546	873	1630	3570	3160	590
6	102	95	88	e68	24	222	546	919	1610	3500	3290	472
7	101	95	88	e66	24	227	543	1120	1650	3430	3360	354
8	102	97	88	66	25	224	545	1220	1690	3330	3430	356
9	102	61	88	63	24	226	544	1220	1820	3200	3450	420
10	102	40	91	63	24	227	544	1210	1950	3080	3430	527
11	163	40	91	63	25	224	541	1200	2030	2960	3370	658
12	199	40	88	63	25	264	542	1190	2070	2870	3320	809
13	199	40	91	63	24	330	544	1070	2070	2730	3230	1050
14	199	40	91	61	23	393	547	833	2080	2580	3120	1460
15	198	63	91	63	29	424	654	826	2150	2380	3010	1450
16	199	91	91	61	25	424	768	876	2150	2060	2920	1420
17	214	91	88	61	25	422	771	964	2160	1960	2810	1320
18	201	91	91	61	25	418	839	911	2170	1940	2680	1320
19	201	91	91	61	25	418	938	908	2130	1890	2450	1250
20	201	91	91	61	26	441	932	904	2110	1820	2190	1000
21	200	93	e90	63	25	415	922	878	2400	1760	1960	455
22	202	91	e90	61	25	416	919	824	3590	1830	1850	437
23	201	91	e90	61	25	415	917	801	4960	1860	1770	432
24	201	100	e90	63	24	417	769	768	4720	1850	1670	469
25	202	88	e90	63	25	495	542	672	4140	1750	1600	534
26	200	91	e90	61	38	655	511	667	4060	1580	1570	526
27	205	91	e90	61	50	890	472	664	4000	1550	1570	521
28	202	93	e88	39	51	1060	470	667	3820	1580	1550	519
29	202	91	e86	24	---	1200	544	669	3600	1580	1440	515
30	202	88	e86	24	---	1280	727	743	3500	1590	1030	511
31	202	---	e86	24	---	1280	---	895	---	1690	505	---
TOTAL	5029	2922	2766	1880	757	14141	19990	27944	75080	76460	74215	21466
MEAN	162	97.4	89.2	60.6	27.0	456	666	901	2503	2466	2394	716
MAX	214	202	91	86	51	1280	1070	1220	4960	3690	3450	1460
MIN	27	40	86	24	23	81	470	664	1000	1550	505	354
AC-FT	9980	5800	5490	3730	1500	28050	39650	55430	148900	151700	147200	42580
CFSM	.04	.02	.02	.01	.01	.11	.16	.22	.62	.61	.59	.18
IN.	.05	.03	.03	.02	.01	.13	.18	.26	.69	.70	.68	.20

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1943 - 1991, BY WATER YEAR (WY)

MEAN	252	255	197	138	164	762	2556	1285	1058	807	403	240
MAX	2924	2327	1204	574	634	4108	10750	5771	4229	3309	2415	2402
(WY)	1987	1985	1985	1987	1987	1985	1986	1986	1984	1953	1986	1986
MIN	4.16	.46	.17	.19	.094	46.5	151	122	29.5	14.7	11.8	5.59
(WY)	1977	1977	1977	1977	1977	1956	1961	1959	1988	1988	1974	1967

MINNESOTA RIVER BASIN

05301000 MINNESOTA RIVER NEAR LAC QUI PARLE, MN--Continued

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1943 - 1991	
ANNUAL TOTAL	80523		322650			
ANNUAL MEAN	221		884		676	
HIGHEST ANNUAL MEAN					2507	1986
LOWEST ANNUAL MEAN					75.7	1959
HIGHEST DAILY MEAN	1210	Jun 22	4960	Jun 23	28700	Apr 12 1969
LOWEST DAILY MEAN	23	Feb 28	23	Feb 14	.00a	
ANNUAL SEVEN-DAY MINIMUM	24	Feb 23	24	Jan 29	.00	Oct 19 1951
INSTANTANEOUS PEAK FLOW	1230	Jun 22	5040	Jun 23,24	29400	Apr 12 1969
INSTANTANEOUS PEAK STAGE	25.51	Jun 22	33.39	Jun 23,24	39.75	Apr 12 1969
INSTANTANEOUS LOW FLOW	8.8	Aug 16	21	Feb 14		
ANNUAL RUNOFF (AC-FT)	159700		640000		490100	
ANNUAL RUNOFF (CFSM)	.054		.22		.17	
ANNUAL RUNOFF (INCHES)	.74		2.96		2.27	
10 PERCENT EXCEEDS	407		2690		1680	
50 PERCENT EXCEEDS	135		470		191	
90 PERCENT EXCEEDS	29		40		25	

a Many days in several years.
e Estimated.

MINNESOTA RIVER BASIN

05301000 MINNESOTA RIVER NEAR LAC QUI PARLE, MN--Continued

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water years 1963, 1967, 1989 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 20...	0845	2390	878	8.5	22.5	740	8.4	41	4.9	13

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
AUG 20...	13	0.02	0.02	0.32	0.32	0.02	0.02	1.2	1.0

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
AUG 20...	0.21	0.11	0.08	0.08	10	2.3	40	14.0	<0.10

MINNESOTA RIVER BASIN

05304500 CHIPPEWA RIVER NEAR MILAN, MN

LOCATION.--Lat 45°06'39", long 95°47'57", in SE¼SE¼ sec.16, T.119 N., R.41 W., Chippewa County, Hydrologic Unit 07020005, on right bank 800 ft upstream from bridge on State Highway 40, 2.0 mi upstream from small tributary, and 5.5 mi east of Milan.
DRAINAGE AREA.--1,870 mi^2, approximately.
PERIOD OF RECORD.--March 1937 to current year.
REVISED RECORDS.--WSP 1145: Drainage area.
GAGE.--Water-stage recorder. Datum of gage is 959.69 ft above National Geodetic Vertical Datum of 1929. Prior to June 15, 1942, nonrecording gage on bridge 800 ft downstream at same datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair. Flow regulated by several small lakes upstream from gage.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 400 ft^3/s, and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 27	0500	1,930	5.61	June 15	2030	1,300	4.48
Apr. 16	0130	807	3.56	June 22	0015	*2,710	*6.82
May 4	2215	828	3.60	July 1	1615	1,530	4.91
May 17	0245	988	3.90	July 22	1530	881	3.70
May 30	0115	1,200	4.29	July 28	2030	531	3.03
June 2	1145	1,330	4.54	Aug. 3	0200	2,590	6.65

a Backwater from ice.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	71	118	96	e44	e29	e29	413	762	885	1360	488	236
2	73	116	92	e44	e29	e29	386	742	1280	1370	1840	230
3	124	e106	90	e44	e29	e29	362	720	1160	1100	2430	222
4	205	e102	91	e42	e29	e29	344	780	1070	930	1750	211
5	216	e98	92	e40	e29	e29	341	820	1020	828	1350	204
6	208	e96	89	e39	e29	e33	330	790	928	742	1140	197
7	194	e96	91	e37	e29	e33	324	766	828	673	1010	212
8	188	e87	92	e35	e29	e35	315	732	733	625	963	625
9	183	e93	91	e35	e29	e37	312	709	668	580	892	1080
10	180	e98	90	e35	e29	e37	309	693	817	535	809	1440
11	168	e93	90	e35	e29	e40	301	663	773	502	726	1240
12	156	e95	92	e35	e29	e55	308	640	688	534	654	1090
13	148	98	95	e35	e29	e70	376	616	608	526	596	1050
14	142	98	79	e35	e29	e70	532	590	586	498	543	1120
15	133	102	e75	e35	e29	e70	762	579	967	470	500	1170
16	126	103	e68	e34	e29	e70	776	736	1220	441	478	1120
17	126	102	e63	e34	e29	e70	719	899	971	419	461	1060
18	124	98	e59	e33	e29	e70	676	726	798	420	434	1010
19	128	100	e55	e31	e29	e100	636	651	677	425	403	954
20	133	104	e52	e30	e29	e120	603	599	647	432	381	897
21	133	101	e50	e29	e29	e150	573	557	2020	446	360	847
22	133	102	e48	e28	e29	e185	542	523	2460	806	341	783
23	130	100	e48	e26	e29	e176	510	495	1650	705	330	729
24	126	97	e47	e29	e29	e210	482	468	1210	530	325	686
25	122	82	e47	e30	e29	e380	456	444	993	440	317	647
26	116	57	e47	e30	e29	e767	434	421	858	397	313	613
27	114	e100	e46	e29	e29	1310	435	415	774	424	301	586
28	114	e99	e46	e29	e29	658	476	517	730	514	283	560
29	114	e98	e45	e29	---	531	505	934	731	518	266	541
30	115	e97	e45	e29	---	452	634	1110	727	485	256	520
31	124	---	e45	e28	---	424	---	883	---	451	245	---
TOTAL	4367	2936	2156	1048	812	6298	14172	20980	29477	19126	21185	21880
MEAN	141	97.9	69.5	33.8	29.0	203	472	677	983	617	683	729
MAX	216	118	96	44	29	1310	776	1110	2460	1370	2430	1440
MIN	71	57	45	26	29	29	301	415	586	397	245	197
AC-FT	8660	5820	4280	2080	1610	12490	28110	41610	58470	37940	42020	43400
CFSM	.08	.05	.04	.02	.02	.11	.25	.36	.53	.33	.37	.39
IN.	.09	.06	.04	.02	.02	.13	.28	.42	.59	.38	.42	.44
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1938 - 1991, BY WATER YEAR (WY)												
MEAN	190	166	102	56.0	52.3	351	925	588	529	369	209	197
MAX	1996	1318	655	425	404	2141	3661	2462	2248	1822	1662	2273
(WY)	1985	1985	1985	1987	1987	1985	1952	1986	1984	1952	1986	1986
MIN	5.51	8.67	4.77	.094	.000	2.92	90.9	81.6	36.8	15.1	6.19	3.50
(WY)	1977	1977	1977	1940	1940	1965	1959	1939	1940	1940	1976	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1938 - 1991	
ANNUAL TOTAL	57997.4		144437			
ANNUAL MEAN	159		396		312a	
HIGHEST ANNUAL MEAN					1307	1986
LOWEST ANNUAL MEAN					45.4	1940
HIGHEST DAILY MEAN	1030	Jun 18	2460	Jun 22	10100	Apr 10 1969
LOWEST DAILY MEAN	5.8	Jan 8	26	Jan 23	.00b	
ANNUAL SEVEN-DAY MINIMUM	6.0	Jan 4	29	Jan 21	.00	Jan 4 1940
INSTANTANEOUS PEAK FLOW	1040	Jun 18	2710	Jun 22	11400	Apr 9 1969
INSTANTANEOUS PEAK STAGE	4.11	Jun 18	6.82	Jun 22	15.45	Apr 9 1969
ANNUAL RUNOFF (AC-FT)	115000		286500		225800	
ANNUAL RUNOFF (CFSM)	.085		.21		.17	
ANNUAL RUNOFF (INCHES)	1.15		2.87		2.26	
10 PERCENT EXCEEDS	320		932		841	
50 PERCENT EXCEEDS	116		245		106	
90 PERCENT EXCEEDS	14		29		13	

a Median of annual mean discharges is 229 ft^3/s.
b Many days during 1940.
e Estimated

MINNESOTA RIVER BASIN

05311000 MINNESOTA RIVER AT MONTEVIDEO, MN

LOCATION.--Lat 44°56'00", long 95°44'00", in NW¼NW¼ sec.19, T.117 N., R.40 W., Yellow Medicine County, Hydrologic Unit 07020004, on right bank 100 ft upstream from bridge on U.S. Highway 212, at Montevideo, and 400 ft downstream from Chippewa River.
DRAINAGE AREA.--6,180 mi^2, approximately.

WATER DISCHARGE RECORDS

PERIOD OF RECORD.--July 1909 to September 1917, October 1917 to September 1929 (no winter records), October 1929 to current year. Prior to October 1939, published as "near Montevideo." Monthly discharge only for some periods, published in WSP 1308.
REVISED RECORDS.--WSP 1035: 1919(M). WSP 1085: 1935-36. WSP 1508: 1912, 1925(M), 1929(M).
GAGE.--Water-stage recorder. Datum of gage is 909.12 ft above National Geodetic Vertical Datum of 1929. July 22, 1909, to Feb. 4, 1932, nonrecording gage at bridge 600 ft downstream at present datum. Feb. 5, 1932, to Nov. 26, 1934, nonrecording gage at bridge 100 ft downstream at present datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair. Flow regulated by Big Stone Lake since Apr. 17, 1937, Lac qui Parle since Jan. 1938, and Marsh Lake since Nov. 1, 1939.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	76	250	e110	e105	e42	e80	1150	1140	1560	5350	2230	671
2	76	229	e110	e105	e42	e120	892	1200	1910	5350	2670	650
3	88	221	e110	e105	e42	e180	743	1190	1930	5210	3120	637
4	109	221	e110	e100	e42	e200	692	1190	2370	5070	3210	707
5	122	217	e110	e90	e42	e260	673	1200	2270	4940	3550	721
6	130	140	e110	e85	e42	e295	663	1210	2400	4780	3930	697
7	133	119	e110	e80	e42	e295	654	1200	2350	4610	4270	559
8	133	120	e110	e80	e42	e295	645	1520	2330	4430	4510	610
9	133	118	e110	e79	e42	e295	642	1640	2430	4230	4630	671
10	134	86	e110	e79	e42	e295	642	1650	2570	4040	4710	871
11	139	71	e110	e78	e42	e295	643	1650	2690	3870	4680	951
12	223	70	e110	e78	e42	e295	649	1650	2740	3720	4600	1210
13	236	71	e110	e78	e42	e350	670	1550	2730	3570	e4450	1330
14	233	72	e91	e78	e42	e450	685	1200	2740	3410	e4270	1960
15	232	71	e110	e78	e42	e527	743	1160	2970	3250	e4100	2100
16	232	95	e110	e78	e42	e510	1100	1240	2920	2930	3970	2090
17	232	112	e110	e78	e42	e510	1130	1330	3030	2640	3820	1980
18	245	113	e110	e78	e42	506	1110	1280	2960	e2500	3620	1930
19	228	113	e115	e78	e42	496	1110	1250	2900	2370	3410	1860
20	227	114	e115	e78	e42	499	1120	1240	2920	2240	3140	1790
21	224	113	e118	e78	e42	500	1130	1230	2830	2170	2760	1240
22	222	113	e115	e78	e42	499	1090	1180	3340	2910	2490	1050
23	222	109	e115	e78	e42	499	1210	1140	4330	2780	2230	1020
24	218	110	e113	e78	e42	502	1180	1130	5870	2630	2070	1020
25	220	118	e110	e78	e42	543	918	1040	6290	2450	1950	1080
26	220	104	e108	e78	e45	673	712	1020	5880	2180	1880	1090
27	220	e110	e105	e78	e60	974	641	1030	5610	2130	1870	1080
28	221	e110	e105	e78	e74	1240	615	1050	5400	2280	1860	1060
29	217	e110	e105	e60	---	1320	653	1060	5110	2210	1780	1050
30	237	e110	e105	e42	---	1300	949	1080	4900	2140	1530	1040
31	250	---	e105	e42	---	1200	---	1310	---	2200	819	---
TOTAL	5832	3730	3395	2456	1229	16003	25454	38960	100280	104590	98129	34725
MEAN	188	124	110	79.2	43.9	516	848	1257	3343	3374	3165	1157
MAX	250	250	118	105	74	1320	1210	1650	6290	5350	4710	2100
MIN	76	70	91	42	42	80	615	1020	1560	2130	819	559
AC-FT	11570	7400	6730	4870	2440	31740	50490	77280	198900	207500	194600	68880
CFSM	.03	.02	.02	.01	.01	.08	.14	.20	.54	.55	.51	.19
IN.	.04	.02	.02	.01	.01	.10	.15	.23	.60	.63	.59	.21

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1991, BY WATER YEAR (WY)

MEAN	293	297	222	149	169	777	2387	1374	1169	931	452	303
MAX	3171	3164	1352	760	740	4893	12550	7315	5088	5718	3165	2613
(WY)	1987	1985	1985	1987	1987	1985	1952	1986	1984	1920	1991	1986
MIN	.76	1.61	2.35	1.57	1.06	5.06	7.82	3.13	1.40	1.89	.60	.57
(WY)	1934	1935	1935	1934	1937	1934	1934	1934	1934	1933	1933	1933

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1909 - 1991	
ANNUAL TOTAL	105442		434783			
ANNUAL MEAN	289		1191		743a	
HIGHEST ANNUAL MEAN					2961	1986
LOWEST ANNUAL MEAN					4.43	1934
HIGHEST DAILY MEAN	1640	Jun 24	6290	Jun 25	34400	Apr 13 1969
LOWEST DAILY MEAN	36	Feb 14	42	Jan 30	.00b	
ANNUAL SEVEN-DAY MINIMUM	39	Feb 12	42	Jan 30	.00	Jul 5 1934
INSTANTANEOUS PEAK FLOW	1690	Jun 22	6550	Jun 24	35100	Apr 12 1969
INSTANTANEOUS PEAK STAGE	7.72	Jun 22	14.33	Jun 24	21.68c	Apr 12 1969
ANNUAL RUNOFF (AC-FT)	209100		862400		538100	
ANNUAL RUNOFF (CFSM)	.047		.19		.12	
ANNUAL RUNOFF (INCHES)	.63		2.62		1.63	
10 PERCENT EXCEEDS	519		3410		1930	
50 PERCENT EXCEEDS	165		642		220	
90 PERCENT EXCEEDS	46		75		32	

a Median of annual mean discharges is 570 ft^3/s.
b Occurred several days in 1933, 1934, 1936.
c From highwater mark.
e Estimated.

MINNESOTA RIVER BASIN

05311000 MINNESOTA RIVER AT MONTEVIDEO, MN--Continued

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water years 1961-67, 1972-76, 1989 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
NOV										
01...	1345	258	898	8.7	10.5	729	10.5	49	4.6	2500
29...	1045	154	929	8.4	0.5	746	13.1	30	2.1	110
DEC										
27...	1500	106	980	8.1	0.0	733	10.0	30	1.4	K7300
JAN										
31...	1415	42	1130	7.8	0.5	740	7.6	26	1.6	2600
FEB										
28...	0930	74	990	8.4	0.5	732	13.9	32	2.3	K2900
MAR										
28...	1230	1200	458	7.9	2.0	732	13.8	51	5.5	--
APR										
24...	1320	1290	878	8.6	11.5	734	10.0	36	2.9	K120
MAY										
23...	1115	1140	842	8.4	24.5	732	7.9	43	3.6	42
JUN										
19...	1125	2910	828	8.3	25.0	739	7.1	45	1.3	500
22...	1445	3810	507	7.9	20.5	741	7.4	46	2.8	--
24...	1715	6310	628	8.2	22.5	738	6.4	36	2.1	--
JUL										
02...	0945	5360	712	8.4	23.5	734	6.7	43	2.1	--
30...	1330	2120	857	8.3	22.5	738	7.8	40	2.5	K4200
AUG										
20...	1245	3150	834	8.4	23.0	740	7.8	41	3.9	--
28...	0730	1860	844	8.7	25.5	739	7.4	46	4.6	K24
SEP										
25...	1230	1100	830	8.6	13.5	734	12.9	39	--	69

DATE	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)
NOV									
01...	160	--	--	--	--	--	--	<1	<1
29...	120	--	--	--	--	--	--	11	4
DEC									
27...	2100	--	--	--	--	--	--	<1	<1
JAN									
31...	950	--	--	--	--	--	--	6	6
FEB									
28...	440	--	--	--	--	--	--	7	6
MAR									
28...	--	87	47	25	9.2	240	0.2	47	11
APR									
24...	27	--	--	--	--	--	--	16	8
MAY									
23...	440	--	--	--	--	--	--	64	16
JUN									
19...	780	--	--	--	--	--	--	22	6
22...	--	--	--	--	--	--	--	137	26
24...	--	--	--	--	--	--	--	52	11
JUL									
02...	--	--	--	--	--	--	--	24	11
30...	780	--	--	--	--	--	--	50	11
AUG									
20...	--	--	--	--	--	--	--	31	15
28...	300	--	--	--	--	--	--	31	15
SEP									
25...	890	--	--	--	--	--	--	48	7

MINNESOTA RIVER BASIN

05311000 MINNESOTA RIVER AT MONTEVIDEO, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
NOV									
01...	--	0.03	0.02	0.20	0.10	0.26	0.26	1.7	1.3
29...	--	0.02	0.02	0.30	0.30	0.44	0.44	1.9	1.4
DEC									
27...	--	0.01	0.01	0.50	0.50	0.63	0.63	1.7	1.7
JAN									
31...	--	0.02	0.02	0.80	0.78	0.74	0.74	1.9	1.5
FEB									
28...	--	0.01	0.01	0.57	0.57	0.32	0.32	0.5	0.4
MAR									
28...	120	0.06	0.05	1.3	1.3	0.06	0.06	1.7	1.1
APR									
24...	--	0.02	<0.01	0.7	0.70	0.03	0.02	1.3	0.9
MAY									
23...	--	0.08	0.06	1.1	1.1	0.16	0.16	1.4	1.1
JUN									
19...	--	0.11	0.09	2.4	2.4	0.12	0.10	1.4	1.2
22...	--	0.12	0.09	2.4	2.3	0.15	0.14	1.1	1.0
24...	--	0.11	0.09	2.1	2.1	0.10	0.10	1.3	1.0
JUL									
02...	--	0.10	0.07	1.9	1.9	0.08	0.07	1.1	0.8
30...	--	0.04	0.04	1.6	1.7	0.09	0.09	1.6	1.2
AUG									
20...	--	0.02	0.02	0.44	0.44	0.01	0.01	1.5	0.8
28...	--	0.01	<0.01	0.06	<0.05	0.01	0.01	1.7	0.9
SEP									
25...	--	0.02	0.02	1.7	1.7	0.01	0.01	1.3	0.9

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
NOV									
01...	0.13	0.06	0.09	0.06	9.3	1.2	23	12.0	<0.50
29...	0.15	0.13	0.09	0.09	8.5	0.6	18	6.2	<0.30
DEC									
27...	0.13	0.11	0.13	0.08	11	0.3	69	2.7	<0.20
JAN									
31...	0.18	0.16	0.18	0.16	9.0	0.4	32	0.7	<0.10
FEB									
28...	0.26	0.17	0.17	0.16	9.4	1.1	165	9.0	0.40
MAR									
28...	0.22	0.09	0.10	0.04	10	1.5	120	12.0	0.90
APR									
24...	0.06	<0.01	0.02	<0.01	9.4	1.0	82	2.8	0.40
MAY									
23...	0.19	0.07	0.08	0.06	10	2.1	180	2.6	<1.00
JUN									
19...	0.26	0.17	0.15	0.14	9.4	>5.0	104	3.7	<0.60
22...	0.27	0.18	0.20	0.15	7.5	4.7	215	2.1	<0.60
24...	0.17	0.17	0.17	0.14	8.7	1.7	81	2.2	<0.70
JUL									
02...	0.30	0.17	0.19	0.15	9.0	2.1	89	3.3	<0.60
30...	0.29	0.15	0.11	0.10	10	3.1	96	14.0	0.80
AUG									
20...	0.20	0.11	0.09	0.06	10	2.4	62	16.0	<0.10
28...	0.25	0.10	0.04	0.03	9.8	2.6	86	18.0	<0.10
SEP									
25...	0.10	0.10	0.05	0.05	9.6	2.8	142	15.0	<0.10

MINNESOTA RIVER BASIN

05313500 YELLOW MEDICINE RIVER NEAR GRANITE FALLS, MN

LOCATION.--Lat 44°43'18", long 95°31'07", in SW¼ sec.35, T.115 N., R.39 W., Yellow Medicine County, Hydrologic Unit 07020004, on right bank 50 ft downstream from highway bridge, 6 mi upstream from mouth, and 8 mi south of town of Granite Falls.
DRAINAGE AREA.--653 mi^2.
PERIOD OF RECORD.--March 1931 to September 1935 (no winter records), October 1935 to September 1938, October 1939 to current year. Monthly discharge only for some periods, published in WSP 1308.
REVISED RECORDS.--WSP 1508: 1931, 1934(M), 1937(M), 1946(M), 1950(M).
GAGE.--Water-stage recorder. Datum of gage is 960.64 ft above National Geodetic Vertical Datum of 1929. Mar. 16, 1931, to June 13, 1938, nonrecording gage, on bridge 50 ft upstream at present datum. Oct. 12, 1939, to Nov. 30, 1952, nonrecording gage 500 ft downstream at present datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in June 1919 reached a stage of 17.5 ft, from information by local residents, discharge, 25,200 ft^3/s.
EXTREMES FOR CURRENT YEAR.--Peak discharge greater than base discharge of 300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
June 7	2130	*2,730	*6.93	June 23	1745	2,510	6.73
June 18	0315	2,550	6.77	July 11	1500	604	4.17

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.2	11	e8.0	e4.4	e4.4	e6.2	e184	164	428	1030	139	21
2	4.4	8.7	e8.0	e4.4	e4.5	e6.6	e145	199	469	847	143	19
3	7.4	16	e8.0	e4.4	e4.6	e7.0	120	197	555	709	147	17
4	8.8	16	e8.0	e4.4	e4.7	e7.5	109	201	1230	608	137	16
5	9.8	12	e7.9	e4.4	e4.9	e8.2	97	207	1450	528	126	15
6	9.3	16	e7.9	e4.4	e5.1	e9.0	91	229	2010	460	120	14
7	8.3	14	e7.8	e4.4	e5.2	e9.9	87	225	2610	403	118	16
8	7.8	11	e7.8	e4.4	e5.3	e11	83	206	2670	355	138	17
9	7.2	11	e7.7	e4.4	e5.4	e12	79	181	2410	327	208	18
10	7.0	12	e7.6	e4.4	e5.4	e13	75	164	1970	277	288	17
11	6.5	13	e7.6	e4.4	e5.4	e15	66	153	1510	341	271	17
12	7.3	12	e7.6	e4.4	e5.4	e16	66	149	1140	525	247	17
13	7.2	11	e7.6	e4.4	e5.4	e19	82	142	896	538	178	20
14	7.5	11	e7.5	e4.4	e5.4	e22	111	133	940	595	152	41
15	7.7	11	e7.5	e4.4	e5.4	e28	145	123	1640	535	140	44
16	7.5	9.4	e7.4	e4.4	e5.4	e29	154	118	2010	439	132	50
17	8.8	8.7	e7.3	e4.4	e5.4	e27	151	122	2330	362	122	43
18	9.0	9.4	e7.0	e4.4	e5.4	e29	144	129	2460	298	111	35
19	8.7	9.4	e6.7	e4.4	e5.4	e31	136	147	1850	244	102	28
20	9.4	9.8	e6.5	e4.4	e5.4	e39	124	155	1600	219	94	24
21	10	9.8	e6.2	e4.4	e5.4	e49	117	151	2250	190	86	21
22	9.5	9.4	e6.0	e4.4	e5.4	e56	110	143	2380	165	77	21
23	10	9.4	e5.8	e4.4	e5.4	e50	105	134	2460	149	70	21
24	28	9.4	e5.6	e4.4	e5.4	e32	96	122	2410	138	64	21
25	11	8.7	e5.4	e4.4	e5.4	e42	91	113	1980	124	57	21
26	5.6	e8.2	e5.2	e4.4	e5.5	e64	88	110	1560	115	51	21
27	5.4	e8.2	e5.0	e4.4	e5.6	e110	90	114	1290	117	45	21
28	8.7	e8.2	e4.9	e4.4	e5.8	e127	85	126	1060	141	37	26
29	8.0	e8.0	e4.8	e4.4	---	e116	97	238	1040	163	32	21
30	8.0	e8.0	e4.6	e4.4	---	e89	137	381	1100	158	28	19
31	8.7	---	e4.5	e4.4	---	e158	---	441	---	147	26	---
TOTAL	267.7	319.7	209.4	136.4	147.4	1238.4	3265	5417	49708	11247	3686	702
MEAN	8.64	10.7	6.75	4.40	5.26	39.9	109	175	1657	363	119	23.4
MAX	28	16	8.0	4.4	5.8	158	184	441	2670	1030	288	50
MIN	4.4	8.0	4.5	4.4	4.4	6.2	66	110	428	115	26	14
AC-FT	531	634	415	271	292	2460	6480	10740	98600	22310	7310	1390
CFSM	.01	.02	.01	.01	.01	.06	.17	.27	2.54	.56	.18	.04
IN.	.02	.02	.01	.01	.01	.07	.19	.31	2.83	.64	.21	.04
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1931 - 1991, BY WATER YEAR (WY)												
MEAN	32.0	35.6	21.2	11.0	14.9	202	445	170	238	107	54.9	38.5
MAX	409	274	135	75.5	97.1	933	3302	1087	2484	669	510	1005
(WY)	1987	1971	1987	1987	1966	1986	1969	1944	1984	1962	1953	1986
MIN	1.41	1.60	1.39	.90	.12	3.67	2.58	1.18	1.18	.34	.38	.47
(WY)	1937	1938	1936	1948	1959	1975	1934	1934	1934	1933	1934	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1931 - 1991	
ANNUAL TOTAL	27903.3		76344.0			
ANNUAL MEAN	76.4		209		123a	
HIGHEST ANNUAL MEAN					480	1984
LOWEST ANNUAL MEAN					8.32	1959
HIGHEST DAILY MEAN	1050	Jun 19	2670	Jun 8	16400	Apr 10 1969
LOWEST DAILY MEAN	2.3	Jan 28	4.4	Oct 2	.00c	
ANNUAL SEVEN-DAY MINIMUM	2.4	Jan 28	4.4	Jan 1	.00	Jan 21 1948
INSTANTANEOUS PEAK FLOW	1090	Jun 19	2730	Jun 7	17200	Apr 10 1969
INSTANTANEOUS PEAK STAGE	4.99	Jun 19	6.93	Jun 7	14.90	Apr 10 1969
INSTANTANEOUS LOW FLOW			4.2b			
ANNUAL RUNOFF (AC-FT)	55350		151400		88880	
ANNUAL RUNOFF (CFSM)	.12		.32		.19	
ANNUAL RUNOFF (INCHES)	1.59		4.35		2.55	
10 PERCENT EXCEEDS	238		526		254	
50 PERCENT EXCEEDS	16		21		15	
90 PERCENT EXCEEDS	2.8		4.6		2.1	

a Median of annual mean discharges is 79 ft^3/s.
b Occurred Oct. 1, 2, 3, 26, 27, but may have been less during period of ice effect.
c Many days in several years.
e Estimated.

MINNESOTA RIVER BASIN

05315000 REDWOOD RIVER NEAR MARSHALL, MN

LOCATION.--Lat 44°25'49", long 95°50'43", in SE¼SW¼ sec.12, T.111 N., R.42 W., Lyon County, Hydrologic Unit 07020006, on right bank 2.0 mi upstream from Redwood River diversion structure on southwest edge of town of Marshall, MN. Prior to Apr. 10, 1980, at site 5 mi downstream.
DRAINAGE AREA.--259 mi^2.
PERIOD OF RECORD.--March 1940 to current year. Monthly discharge only for some periods, published in WSP 1308.
REVISED RECORDS.--WDR MN-89-2: Drainage area.
GAGE.--Water-stage recorder. Datum of gage is 1,188.23 ft above National Geodetic Vertical Datum of 1929. March 1940 to April 9, 1980, nonrecording gage 5.0 mi downstream from present site at datum 43.35 ft lower (crest-stage gage added June 12, 1968). Since March 1964, nonrecording gage and crest-stage gage on diversion channel 1.5 mi downstream at datum 1,100.00 ft above National Geodetic Vertical Datum of 1929.
REMARKS.--Records fair. Water diverted at medium and high stages into diversion channel 2.0 mi below station. Diversion began Mar. 18, 1964. Unknown amount of natural diversion into Cottonwood River basin occurs at extremely high stages 0.8 mi below station.
EXTREMES FOR PERIOD OF RECORD.--River only, maximum discharge, 5,370 ft^3/s, June 17, 1957, gage height, 10.14 ft; maximum gage height, 11.05 ft, Apr. 6, 1951, from floodmark; no flow at times.
Diversion only, maximum discharge, 4,440 ft^3/s, Apr. 10, 1969, gage height, 78.45 ft; no flow on many days.
Combined flow, maximum discharge, 5,590 ft^3/s, Apr. 10, 1969; no flow at times.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.6	7.6	e8.0	e4.0	e4.0	e10	16	17	181	97	22	8.2
2	5.6	7.6	e8.0	e4.0	e4.1	e11	18	16	192	87	22	7.6
3	e6.6	7.6	e8.0	e4.0	e4.3	e11	18	16	158	81	21	6.9
4	e14	7.6	e8.0	e4.0	e4.6	e11	18	22	e300	72	20	5.6
5	e12	7.6	e8.0	e4.0	e4.8	e11	18	26	e450	67	19	6.0
6	e10	7.6	e8.0	e3.9	e5.1	e11	18	24	e430	64	18	6.9
7	e8.5	7.6	e8.1	e3.6	e5.4	e12	19	18	e410	e61	35	9.6
8	e6.9	7.6	e8.3	e3.9	e5.6	e12	20	15	e380	e59	95	22
9	e5.9	7.6	e8.5	e4.0	e5.8	e12	21	17	e370	e61	73	19
10	e5.5	7.6	e8.6	e4.0	e6.1	e13	21	18	e310	63	60	14
11	e5.4	7.6	e8.6	e4.0	e6.5	e13	21	18	e280	128	47	14
12	5.6	7.6	e8.6	e4.0	e6.9	e13	22	20	e240	100	37	15
13	5.4	7.9	e8.6	e4.0	e7.2	e13	22	21	220	85	30	16
14	6.3	7.9	e8.5	e4.0	e7.6	e14	31	21	204	71	26	31
15	6.0	8.2	e8.2	e4.0	e7.9	e14	33	20	247	64	22	28
16	6.3	8.6	e7.8	e4.0	e8.2	e14	26	18	263	56	21	20
17	6.9	8.2	e7.8	e4.0	e8.4	e14	21	21	209	52	20	16
18	6.9	8.2	e7.8	e4.0	e8.6	e14	17	18	176	46	19	14
19	6.3	8.2	e7.8	e4.0	e8.7	e15	16	17	161	46	18	12
20	6.9	8.2	e7.8	e4.0	e9.0	e15	16	17	158	42	18	12
21	6.9	8.2	e7.6	e4.0	e9.2	16	18	19	282	40	17	12
22	6.9	8.2	e7.2	e4.0	e9.3	20	18	20	347	38	16	11
23	6.9	8.2	e7.0	e4.0	e9.4	32	18	20	262	34	15	10
24	6.9	8.2	e6.5	e4.0	e9.5	27	20	20	192	32	14	14
25	7.2	8.2	e6.0	e4.0	e9.7	29	21	22	161	28	13	13
26	7.6	8.2	e5.5	e4.0	e9.9	52	20	21	144	28	12	13
27	7.6	e8.2	e5.1	e4.0	e10	63	21	20	131	27	12	12
28	7.6	e8.1	e4.7	e4.0	e10	21	20	64	123	29	10	12
29	7.6	e8.0	e4.4	e4.0	---	16	19	146	110	29	8.2	11
30	7.6	e8.0	e4.2	e4.0	---	16	16	107	104	27	8.2	10
31	7.6	---	e4.1	e4.0	---	17	---	147	---	25	8.2	---
TOTAL	223.0	238.1	225.3	123.4	205.8	562	603	986	7195	1739	776.6	401.8
MEAN	7.19	7.94	7.27	3.98	7.35	18.1	20.1	31.8	240	56.1	25.1	13.4
MAX	14	8.6	8.6	4.0	10	63	33	147	450	128	95	31
MIN	5.4	7.6	4.1	3.6	4.0	10	16	15	104	25	8.2	5.6
AC-FT	442	472	447	245	408	1110	1200	1960	14270	3450	1540	797
CFSM	.03	.03	.03	.02	.03	.07	.08	.12	.93	.22	.10	.05
IN.	.03	.03	.03	.02	.03	.08	.09	.14	1.03	.25	.11	.06

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1940 - 1991, BY WATER YEAR (WY)

MEAN	20.0	19.3	11.4	6.50	11.5	111	208	90.8	93.5	45.3	18.1	19.5
MAX	222	153	81.7	42.2	101	571	1152	596	752	306	184	292
(WY)	1969	1980	1983	1987	1983	1983	1969	1983	1957	1962	1963	1986
MIN	.029	.58	.87	.000	.090	2.70	7.36	3.90	.83	.058	.042	.007
(WY)	1977	1977	1977	1977	1979	1965	1990	1981	1976	1976	1941	1941

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1940 - 1991	
ANNUAL TOTAL	10006.0		13279.0			
ANNUAL MEAN	27.4		36.4		55.0a	
HIGHEST ANNUAL MEAN					219	1983
LOWEST ANNUAL MEAN					5.13	1981
HIGHEST DAILY MEAN	660	Jun 18	450	Jun 5	4760	Apr 9 1969
LOWEST DAILY MEAN	2.8	May 12	3.6	Jan 7	.00c	
ANNUAL SEVEN-DAY MINIMUM	3.2	May 7	3.9	Jan 2	.00	Jul 28 1940
INSTANTANEOUS PEAK FLOW	731	Jun 17	468b	Jun 5	5590	Apr 10 1969
INSTANTANEOUS PEAK STAGE	11.76	Jun 17	10.47b	Jun 5	11.05d	Apr 6 1951
ANNUAL RUNOFF (AC-FT)	19850		26340		39860	
ANNUAL RUNOFF (CFSM)	.11		.14		.21	
ANNUAL RUNOFF (INCHES)	1.44		1.91		2.89	
10 PERCENT EXCEEDS	57		96		124	
50 PERCENT EXCEEDS	8.5		13		9.3	
90 PERCENT EXCEEDS	3.9		4.4		1.7	

a Medium of annual mean discharges in 38 ft^3/s.
b Highest observed (no gage height record).
c Many days in several years.
d Site and datum then in use.

MINNESOTA RIVER BASIN

05316500 REDWOOD RIVER NEAR REDWOOD FALLS, MN

LOCATION.--Lat 44°31'25", long 95°10'20", in SE¼NE¼ sec.9, T.112 N., R.36 W., Redwood County, Hydrologic Unit 07020006, on right bank 4 ft upstream from highway bridge, 3 mi west of town of Redwood Falls, and 8.5 mi upstream from mouth.
DRAINAGE AREA.--629 mi^2.
PERIOD OF RECORD.--July 1909 to September 1914 (no winter records except 1911-12). August 1930 to September 1935 (no winter records), October 1935 to current year.
REVISED RECORDS.--WDR MN-89-2: Drainage area.
GAGE.--Water-stage recorder. Datum of gage is 972.33 ft above National Geodetic Vertical Datum of 1929. July 1909 to September 1914, nonrecording gage at bridge 20 ft downstream at datum 0.22 ft lower. August 1930 to Oct. 25, 1949, nonrecording gage, at bridge 20 ft downstream at present datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair. Natural discharge affected by unknown amount of interbasin flow between Yellow Medicine, Redwood, and Cottonwood River basins during extreme floods.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 400 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
June 2	0100	1,070	4.32	July 12	1100	1,340	4.97
June 4	1800	2,140	6.20	July 21	1315	431	3.21
June 18	2200	1,940	5.93	Aug. 8	1830	1,140	4.32
June 21	2200	*2,510	*6.68	Sep. 8	1430	751	3.74
June 28	0545	2,010	5.83	Sep. 15	0300	503	3.30

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.9	19	13	e7.1	e5.0	e12	121	203	924	592	141	35
2	7.4	20	15	e6.6	e5.1	e12	143	186	882	493	136	34
3	15	21	15	e6.3	e5.3	e12	140	183	726	435	139	32
4	25	22	14	e6.0	e5.4	e13	131	216	1710	386	131	30
5	40	21	13	e5.7	e5.7	e13	114	239	1960	344	117	29
6	30	20	13	e5.5	e6.0	e14	101	221	1680	308	106	28
7	22	20	14	e5.4	e6.3	e15	92	202	1620	285	158	125
8	18	18	16	e5.3	e6.7	e16	84	183	1760	264	938	618
9	17	17	16	e5.2	e6.9	e18	77	173	1770	243	587	471
10	12	20	17	e5.1	e7.2	e20	71	158	1440	226	356	250
11	12	25	17	e5.0	e7.5	e21	59	147	1060	285	324	187
12	14	21	17	e5.0	e7.8	e24	50	140	896	1150	285	198
13	14	19	15	e5.0	e8.0	e26	99	133	672	1060	243	200
14	15	19	15	e5.0	e8.3	e28	201	122	696	632	195	341
15	15	19	15	e5.0	e8.7	e32	253	119	1330	454	164	441
16	14	18	13	e5.0	e8.9	e35	227	138	1500	356	135	289
17	15	18	13	e5.0	e9.1	e40	195	213	1730	296	124	214
18	17	18	13	e5.0	e9.3	e45	173	302	1900	253	111	175
19	18	18	15	e5.0	e9.5	e52	154	306	1830	217	96	147
20	20	17	14	e5.0	e9.5	e62	136	265	1690	188	88	136
21	24	17	e14	e5.0	e9.9	e73	122	237	2260	308	88	127
22	30	17	e14	e5.0	e10	103	115	214	2290	289	84	118
23	28	20	e13	e5.0	e10	105	107	196	1870	214	74	107
24	25	18	e13	e5.0	e10	101	99	180	1670	165	68	114
25	24	16	e12	e5.0	e11	105	91	165	1500	140	62	149
26	25	e15	e11	e5.0	e11	158	85	152	1250	123	57	144
27	24	12	e10	e5.0	e11	293	92	146	875	119	52	130
28	22	12	e9.8	e5.0	e11	226	93	147	930	190	47	121
29	20	12	e9.1	e5.0	---	186	105	319	796	236	44	113
30	20	12	e8.2	e5.0	---	158	168	632	637	208	42	108
31	18	---	e7.6	e5.0	---	105	---	626	---	167	39	---
TOTAL	610.3	541	414.7	163.2	230.1	2123	3698	6863	41854	10626	5231	5211
MEAN	19.7	18.0	13.4	5.26	8.22	68.5	123	221	1395	343	169	174
MAX	40	25	17	7.1	11	293	253	632	2290	1150	938	618
MIN	7.4	12	7.6	5.0	5.0	12	50	119	637	119	39	28
AC-FT	1210	1070	823	324	456	4210	7330	13610	83020	21080	10380	10340
CFSM	.03	.03	.02	.01	.01	.11	.20	.35	2.22	.54	.27	.28
IN.	.04	.03	.02	.01	.01	.13	.22	.41	2.48	.63	.31	.31
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1991, BY WATER YEAR (WY)												
MEAN	42.2	47.6	25.9	11.7	15.7	218	384	179	207	114	55.6	41.7
MAX	395	541	245	75.9	167	1289	2880	1234	1898	621	640	673
(WY)	1987	1980	1983	1987	1983	1983	1969	1983	1957	1962	1979	1986
MIN	.84	.96	.46	.19	.20	1.54	14.6	2.75	1.01	.44	.51	.31
(WY)	1937	1936	1936	1940	1937	1965	1934	1934	1934	1934	1934	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1909 - 1991	
ANNUAL TOTAL	23192.2		77565.3			
ANNUAL MEAN	63.5		213		125c	
HIGHEST ANNUAL MEAN					473	1983
LOWEST ANNUAL MEAN					10.8	1959
HIGHEST DAILY MEAN	1220	Jun 18	2290	Jun 22	13200	Apr 9 1969
LOWEST DAILY MEAN	4.1a		5.0b		.00d	
ANNUAL SEVEN-DAY MINIMUM	4.1	Jan 2	5.0	Jan 11	.01	Jan 25 1940
INSTANTANEOUS PEAK FLOW	1450	Jun 17	2510	Jun 21	19700	Jun 18 1957
INSTANTANEOUS PEAK STAGE	5.08	Jun 17	6.68	Jun 21	15.92f	Jun 18 1957
ANNUAL RUNOFF (AC-FT)	46000		153900		90220	
ANNUAL RUNOFF (CFSM)	.10		.34		.20	
ANNUAL RUNOFF (INCHES)	1.37		4.59		2.69	
10 PERCENT EXCEEDS	137		621		258	
50 PERCENT EXCEEDS	23		57		21	
90 PERCENT EXCEEDS	6.0		6.5		2.0	

a Occurred Jan. 2-Feb. 2.
b Occurred Jan. 11-Feb. 1.
c Median of annual mean discharges is 80 ft^3/s.
d Several days in 1940 and 1959.
e Estimated.
f From floodmark.

MINNESOTA RIVER BASIN

05317000 COTTONWOOD RIVER NEAR NEW ULM, MN

LOCATION.--Lat 44°17'29", long 94°26'24", in SW¼NE¼ sec.33, T.110 N., R.30 W., Brown County, Hydrologic Unit 07020008, on left bank 600 ft upstream from highway bridge, 1.8 mi south of New Ulm, and 3.2 mi upstream from mouth.
DRAINAGE AREA.--1,280 mi^2, approximately.
PERIOD OF RECORD.--July 1909 to December 1913, March 1931 to March 1938, August 1938 to current year (winter records incomplete prior to 1936).
REVISED RECORDS.--WSP 355: 1912.
GAGE.--Water-stage recorder. Datum of gage is 796.83 ft above National Geodetic Vertical Datum of 1929. July 1, 1909, to Dec. 13, 1913, nonrecording gage at site 2.7 mi upstream at different datum. Mar. 15, 1931, to Mar. 31, 1938, nonrecording gage 2.2 mi upstream at datum 11.41 ft higher. Aug. 23, 1938, to June 25, 1948, nonrecording gage at present site and datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Apr 15	2130	1830	6.72	Jul 12	2300	1580	6.20
May 20	1800	1560	6.14	Aug 9	0330	1490	6.00
Jun 5	2100	4300	10.78	Sep 14	2400	1330	5.64
Jun 23	2030	*5440	*11.99				

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	39	50	55	e23	e16	e27	556	760	1470	1750	169	71
2	38	50	53	e22	e16	e28	524	863	2090	1440	161	66
3	55	53	51	e22	e16	e28	511	813	2480	1200	155	64
4	67	58	48	e21	e16	e29	504	896	3430	1020	148	61
5	71	57	49	e21	e16	e30	469	1020	4120	879	141	58
6	66	56	48	e21	e16	e30	423	1230	4100	767	132	55
7	59	54	49	e20	e16	e31	377	1090	3790	676	157	52
8	57	54	50	e20	e17	e33	341	960	3650	603	984	51
9	55	52	52	e20	e18	e37	308	860	3350	530	1410	65
10	53	53	54	e19	e19	e41	277	779	2680	475	1150	128
11	53	54	56	e19	e20	e45	256	717	2230	480	937	159
12	61	54	58	e18	e21	e50	248	660	2450	1210	743	249
13	58	54	52	e18	e21	e56	417	623	2400	1460	579	314
14	55	54	52	e18	e21	e64	874	575	2120	1110	458	1070
15	51	54	52	e17	e21	e72	1700	541	2150	901	376	1230
16	48	55	52	e17	e20	e84	1750	576	1960	805	325	1000
17	49	57	58	e17	e20	e98	1470	727	1950	689	293	803
18	51	58	53	e16	e20	e110	1200	1060	1820	572	258	636
19	57	57	53	e16	e20	e122	1000	1340	1560	470	229	520
20	57	56	46	e16	e20	e150	860	1520	1450	406	206	445
21	61	57	e41	e16	e23	e170	756	1450	2560	361	186	390
22	60	57	e35	e16	e25	e200	679	1260	4440	333	173	348
23	57	57	e32	e16	e25	e250	623	1080	5330	298	158	316
24	54	54	e30	e16	e25	e290	564	932	4810	268	146	332
25	56	53	e29	e16	e25	311	508	814	3870	245	134	347
26	55	49	e28	e16	e25	372	466	752	2980	226	123	356
27	54	54	e27	e16	e25	701	460	715	2280	209	112	349
28	51	32	e26	e16	e26	1030	438	735	1940	204	101	338
29	51	51	e25	e16	---	893	498	1100	2450	200	92	323
30	52	55	e25	e16	---	767	639	1390	2110	190	84	305
31	51	---	e24	e16	---	640	---	1370	---	179	77	---
TOTAL	1702	1609	1363	557	569	6789	19696	29208	84020	20156	10397	10501
MEAN	54.9	53.6	44.0	18.0	20.3	219	657	942	2801	650	335	350
MAX	71	58	58	23	26	1030	1750	1520	5330	1750	1410	1230
MIN	38	32	24	16	16	27	248	541	1450	179	77	51
AC-FT	3380	3190	2700	1100	1130	13470	39070	57930	166700	39980	20620	20830
CFSM	.04	.04	.03	.01	.02	.17	.51	.74	2.19	.51	.26	.27
IN.	.05	.05	.04	.02	.02	.20	.57	.85	2.44	.59	.30	.31

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1991, BY WATER YEAR (WY)

MEAN	152	126	79.3	43.8	83.1	589	916	487	490	268	142	134
MAX	3208	1099	572	236	628	2236	7075	2727	3355	1305	1003	2438
(WY)	1969	1980	1980	1980	1983	1983	1969	1983	1984	1947	1979	1986
MIN	4.57	7.97	5.77	1.61	1.47	13.9	40.0	7.57	8.58	4.37	1.05	3.28
(WY)	1934	1940	1936	1940	1940	1965	1959	1934	1911	1934	1934	1933

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1909 - 1991	
ANNUAL TOTAL	54373.0		186567			
ANNUAL MEAN	149		511		317b	
HIGHEST ANNUAL MEAN					1190	1969
LOWEST ANNUAL MEAN					41.1	1940
HIGHEST DAILY MEAN	1990	Jul 28	5330	Jun 23	27100	Apr 9 1969
LOWEST DAILY MEAN	6.2	Jan 1	16a		.60	Aug 1 1934
ANNUAL SEVEN-DAY MINIMUM	7.0	Jan 1	16	Jan 18	.64	Feb 1 1940
INSTANTANEOUS PEAK FLOW	2630	Jul 28	5440	Jun 23	28700	Apr 10 1969
INSTANTANEOUS PEAK STAGE	7.99	Jul 28	11.99	Jun 23	20.86c	Apr 8 1965
INSTANTANEOUS LOW FLOW					.50	Nov 27 1952
ANNUAL RUNOFF (AC-FT)	107800		370100		229400	
ANNUAL RUNOFF (CFSM)	.12		.40		.25	
ANNUAL RUNOFF (INCHES)	1.58		5.42		3.36	
10 PERCENT EXCEEDS	369		1450		695	
50 PERCENT EXCEEDS	57		112		66	
90 PERCENT EXCEEDS	9.9		20		11	

a Jan. 18-Feb. 7.
b Median of annual mean discharges is 224 ft^3/s.
c From floodmark (backwater from ice).

MINNESOTA RIVER BASIN

05317000 COTTONWOOD RIVER NEAR NEW ULM, MN--Continued

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water years 1960-68, 1970-76, 1989 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
MAY										
30...	1600	1420	874	8.2	22.0	730	8.1	85	2.2	258

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
MAY									
30...	58	0.15	0.10	15	15	0.06	0.06	4.4	1.6

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
MAY									
30...	0.32	0.12	0.17	0.11	6.7	9.6	566	8.50	<1.80

MINNESOTA RIVER BASIN

05317200 LITTLE COTTONWOOD RIVER NEAR COURTLAND, MN

LOCATION.--Lat 44°14'47", long 94°20'19", in SW¼NE¼ sec.17, T.109 N., R.29 W., Blue Earth County, Hydrologic Unit 07020007, on right bank 30 ft downstream from bridge on State Highway 68, 0.7 mi above mouth, 1.5 mi south of Courtland.
DRAINAGE AREA.--230 mi^2, approximately.
PERIOD OF RECORD.--October 1973 to current year. September 1969 to September 1973, operated as a low-flow station only.
GAGE.--Water-stage recorder. Datum of gage is 788.25 ft above National Geodetic Vertical Datum of 1929.
REMARKS.--Records fair.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 180 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 25	1500	185	4.05	Jun. 9	1830	(a)	*5.96
Apr. 14	2230	475	5.60	Jun. 14	0630	455	5.78
Apr. 30	1500	219	4.16	Jun. 27	1000	321	5.11
May 5	2200	368	5.05	Jul. 12	1400	463	5.89
May 22	2000	195	3.97	Aug. 8	1300	266	4.82
Jun. 5	0330	*526	5.90	Sep. 14	0430	451	5.75

a Increasing negative shift.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16	16	16	e3.9	3.2	14	159	193	216	159	30	18
2	14	16	14	e3.8	3.2	15	140	174	234	132	29	17
3	16	16	15	e3.6	3.2	17	126	174	238	115	28	19
4	24	17	13	e3.5	3.5	17	116	225	385	103	26	19
5	21	17	14	e3.4	3.7	19	109	301	505	91	25	19
6	21	17	14	e3.3	4.1	21	101	341	438	81	25	18
7	19	17	14	e3.2	5.4	20	92	282	403	71	67	18
8	18	15	14	e3.2	12	20	83	251	439	63	249	18
9	16	18	15	e3.2	17	20	76	243	491	55	183	18
10	15	19	16	e3.2	13	20	68	215	482	53	138	18
11	14	18	17	e3.2	11	22	64	194	415	138	109	23
12	15	17	17	e3.2	15	23	65	179	342	423	86	64
13	15	17	13	e3.3	16	22	228	168	269	324	70	84
14	15	18	12	e3.4	13	20	400	154	349	220	59	371
15	15	18	15	e3.5	12	20	441	145	297	159	51	338
16	13	18	12	e3.5	9.8	23	375	146	229	121	46	268
17	14	17	16	e3.6	9.4	27	356	148	219	100	42	226
18	16	18	13	e3.6	9.8	33	345	148	236	83	38	206
19	15	19	13	e3.6	9.8	42	311	155	249	72	35	177
20	15	17	12	e3.6	9.8	52	264	168	241	64	32	140
21	18	17	9.4	e3.5	11	72	223	182	232	57	29	116
22	20	17	8.3	e3.4	12	86	191	190	232	62	28	101
23	20	16	6.7	e3.3	14	130	167	188	219	50	26	90
24	19	16	5.6	e3.2	15	154	149	181	240	44	25	97
25	20	15	5.4	e3.2	15	162	134	170	273	40	23	106
26	21	16	e5.1	e3.2	14	153	122	163	302	36	23	102
27	18	23	e4.8	e3.2	14	142	124	161	317	34	22	96
28	16	11	e4.6	e3.2	13	143	118	186	301	39	21	88
29	16	14	e4.4	e3.2	---	135	135	231	239	38	20	82
30	16	16	e4.2	e3.2	---	148	207	212	184	35	19	75
31	16	---	e4.1	3.2	---	165	---	210	---	33	19	---
TOTAL	527	506	347.6	104.6	291.9	1957	5489	6078	9216	3095	1623	3032
MEAN	17.0	16.9	11.2	3.37	10.4	63.1	183	196	307	99.8	52.4	101
MAX	24	23	17	3.9	17	165	441	341	505	423	249	371
MIN	13	11	4.1	3.2	3.2	14	64	145	184	33	19	17
AC-FT	1050	1000	689	207	579	3880	10890	12060	18280	6140	3220	6010
CFSM	.07	.07	.05	.01	.05	.27	.80	.85	1.34	.43	.23	.44
IN.	.09	.08	.06	.02	.05	.32	.89	.98	1.49	.50	.26	.49
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1974 - 1991, BY WATER YEAR (WY)												
MEAN	30.4	32.3	17.8	8.98	14.5	102	143	96.3	101	55.7	37.7	37.0
MAX	163	134	82.0	33.6	105	324	463	285	350	287	217	262
(WY)	1987	1983	1980	1980	1983	1983	1983	1986	1984	1983	1979	1986
MIN	.75	.70	.21	.15	.38	5.79	9.64	4.17	2.39	.63	.81	.54
(WY)	1976	1977	1977	1977	1977	1975	1990	1981	1976	1988	1976	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1974 - 1991	
ANNUAL TOTAL	21510.86		32267.1			
ANNUAL MEAN	58.9		88.4		56.4	
HIGHEST ANNUAL MEAN					160	1983
LOWEST ANNUAL MEAN					9.18	1989
HIGHEST DAILY MEAN	766	Jul 29	505	Jun 5	1110	Mar 16 1985
LOWEST DAILY MEAN	.62	Jan 1	3.2a		.02	Sep 12 1977
ANNUAL SEVEN-DAY MINIMUM	.65	Jan 1	3.2	Jan 24	.08	Sep 11 1977
INSTANTANEOUS PEAK FLOW	931	Jul 29	526	Jun 5	951	Jul 7 1983
INSTANTANEOUS PEAK STAGE	7.57	Jul 29	5.96	Jun 9	8.29b	Mar 26 1979
INSTANTANEOUS LOW FLOW					.01	Sep 17 1977
ANNUAL RUNOFF (AC-FT)	42670		64000		40850	
ANNUAL RUNOFF (CFSM)	.26		.38		.25	
ANNUAL RUNOFF (INCHES)	3.48		5.22		3.33	
10 PERCENT EXCEEDS	168		240		160	
50 PERCENT EXCEEDS	16		23		16	
90 PERCENT EXCEEDS	.75		4.0		.96	

a Jan. 7-12, Jan. 24-Feb. 3.
b Backwater from ice.
e Estimated.

MINNESOTA RIVER BASIN

05319500 WATONWAN RIVER NEAR GARDEN CITY, MN

LOCATION.--Lat 44°02'47", long 94°11'43", in SW¼NE¼ sec.28, T.107 N., R.28 W., Blue Earth County, Hydrologic Unit 07020010, on left bank 25 ft downstream from bridge on County Highway 13, 1.5 miles west of Garden City, 7.3 mi upstream from mouth, and 9.2 mi downstream from Perch Creek.
DRAINAGE AREA.-- 812 mi^2.
PERIOD OF RECORD.--March 1940 to September 1945, September 1976 to current year. 1953, 1960, 1961, and 1969 (one or more discharge measurements each year).
REVISED RECORDS.--WDR MN-78-2: 1977.
GAGE.--Water-stage recorder. Datum of gage is 905.05 ft above National Geodetic Vertical Datum of 1929. Prior to September 30, 1945, nonrecording gage at site 200 ft upstream and at datum 0.17 ft higher.
REMARKS.--Records good except those for the periods of estimated daily discharge, which are fair.
EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of Apr. 7, 1965, reached a stage of 18.89 ft at datum 0.17 ft higher, from floodmarks, discharge, 19,000 ft^3/s.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 900 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 28	0730	1,400 cfs	4.77	Jun. 7	1000	*3,410	*8.21
Apr. 17	1230	2,970	7.55	Jun. 24	1830	1,930	5.81
May 7	1230	2,820	7.31	Jul. 1	0130	2,680	7.09
May 21	0800	2,530	6.84	Jul. 13	0830	1,290	4.55
May 29	0330	1,650	5.27	Sep. 16	1130	1,490	4.96

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	27	32	32	e16	e14	e24	962	1290	1270	2620	267	79
2	27	33	22	e16	e14	e24	921	1270	1310	2450	245	72
3	31	33	30	e15	e14	e25	849	1120	1690	2170	231	72
4	34	34	27	e15	e14	e25	780	1200	2280	1750	211	75
5	35	35	28	e15	e14	e26	702	1730	2890	1390	192	69
6	36	35	28	e15	e14	e28	623	2490	3210	1150	177	63
7	31	36	29	e14	e19	e29	555	2760	3350	961	211	60
8	30	36	29	e14	e21	e32	496	2630	3140	822	467	59
9	28	32	30	e14	e24	e36	442	2370	2760	732	705	59
10	27	35	32	e14	e25	e40	395	2090	2460	652	675	60
11	28	35	34	e14	e26	e45	391	1790	2370	642	579	81
12	29	35	36	e14	e25	e50	408	1510	2160	1090	489	242
13	29	34	29	e14	e24	e56	721	1270	1800	1280	418	270
14	29	34	e28	e14	e22	e65	1560	1100	1510	1190	360	577
15	30	35	e28	e14	e21	e74	2310	981	1570	1040	311	1280
16	28	35	e28	e14	e21	e87	2720	956	1640	890	275	1450
17	28	33	e28	e14	e21	e100	2890	1150	1520	753	265	1260
18	28	33	e28	e14	e21	e115	2690	1590	1250	638	276	1000
19	30	32	e26	e14	e21	e120	2350	2180	1070	545	252	799
20	34	31	e25	e14	e22	e189	1960	2460	965	482	220	630
21	36	33	e24	e14	e22	e393	1620	2500	991	447	201	527
22	35	32	e23	e14	e23	e538	1360	2260	1270	481	182	452
23	36	31	22	e14	e23	879	1160	1900	1650	503	166	390
24	37	31	e21	e14	e23	988	996	1560	1890	573	150	388
25	36	33	e20	e14	e23	1120	864	1300	1870	551	155	434
26	34	30	e19	e14	e23	1220	770	1130	1670	506	144	444
27	33	29	e18	e14	e23	1290	731	1270	1400	450	131	429
28	31	22	e18	e14	e23	1380	725	1590	1440	400	119	390
29	35	31	e17	e14	---	1350	744	1620	2220	361	110	354
30	35	34	e17	e14	---	1170	1000	1470	2530	334	97	338
31	32	---	e16	e14	---	1010	---	1380	---	304	87	---
TOTAL	979	984	792	442	580	12528	34695	51917	57146	28157	8368	12403
MEAN	31.6	32.8	25.5	14.3	20.7	404	1156	1675	1905	908	270	413
MAX	37	36	36	16	26	1380	2890	2760	3350	2620	705	1450
MIN	27	22	16	14	14	24	391	956	965	304	87	59
AC-FT	1940	1950	1570	877	1150	24850	68820	103000	113300	55850	16600	24600
CFSM	.04	.04	.03	.02	.03	.50	1.42	2.06	2.35	1.12	.33	.51
IN.	.04	.05	.04	.02	.03	.57	1.59	2.38	2.62	1.29	.38	.57
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1940 - 1991, BY WATER YEAR (WY)												
MEAN	157	173	105	49.3	74.9	485	730	514	700	310	174	188
MAX	614	813	453	228	626	1747	2570	2023	1905	1098	1095	799
(WY)	1986	1980	1980	1983	1983	1983	1983	1944	1991	1983	1979	1942
MIN	5.37	7.69	3.76	2.70	2.39	19.3	33.7	16.1	17.3	8.27	6.56	3.63
(WY)	1990	1977	1990	1977	1977	1940	1990	1940	1989	1940	1989	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1940 - 1991	
ANNUAL TOTAL	48020.8		208991			
ANNUAL MEAN	132		573		318	
HIGHEST ANNUAL MEAN					827	1983
LOWEST ANNUAL MEAN					43.7	1989
HIGHEST DAILY MEAN	1610	Jul 28	3350	Jun 7	5620	May 21 1944
LOWEST DAILY MEAN	3.1	Jan 1	14a		1.8	Dec 24,25 1989
ANNUAL SEVEN-DAY MINIMUM	3.8	Jan 1	14	Jan 7	1.9	Jan 20 1977
INSTANTANEOUS PEAK FLOW	1910	Jul 28	3410	Jun 7	5620	May 21 1944
INSTANTANEOUS PEAK STAGE	5.74	Jul 28	8.21	Jun 7	9.84b	May 21 1944
ANNUAL RUNOFF (AC-FT)	95250		414500		230600	
ANNUAL RUNOFF (CFSM)	.16		.71		.39	
ANNUAL RUNOFF (INCHES)	2.20		9.57		5.33	
10 PERCENT EXCEEDS	371		1710		850	
50 PERCENT EXCEEDS	35		115		92	
90 PERCENT EXCEEDS	6.4		16		8.7	

a Jan. 7 - Feb. 6.
b Datum then in use.
e Estimated.

MINNESOTA RIVER BASIN

05319500 WATONWAN RIVER NEAR GARDEN CITY, MN--Continued

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water years 1960-61, 1969, 1977-78, 1980-81, 1989 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
MAR												
16...	1330	87	845	8.7	0.5	744	13.0	20	2.0	100	35	32
19...	1145	120	725	7.6	1.0	738	14.0	49	4.5	91	32	30
20...	1145	182	694	8.3	0.5	733	13.0	29	5.1	87	29	23
22...	1145	538	547	8.3	1.0	728	12.9	56	5.3	69	22	16
23...	1000	819	475	8.8	1.0	723	12.2	70	7.1	63	19	12
26...	0930	1230	612	8.1	3.5	726	12.2	53	5.1	80	25	9.6
27...	0830	1260	604	7.7	4.0	728	12.4	45	4.4	80	25	10
28...	0945	1400	547	8.4	2.0	732	12.6	44	3.5	78	24	8.9
APR												
03...	1315	852	790	8.2	9.5	742	11.4	32	1.6	--	--	--
10...	1345	393	913	8.4	9.0	748	11.7	32	2.3	--	--	--
MAY												
05...	1900	2040	659	8.3	7.0	735	11.2	43	2.4	--	--	--
06...	1615	2630	612	8.2	7.5	736	10.6	43	2.6	--	--	--
07...	0930	2780	693	8.1	7.0	745	12.5	39	1.5	--	--	--
14...	1500	1090	757	8.2	20.5	735	9.5	37	2.0	--	--	--
JUN												
05...	1445	2950	565	8.3	19.0	743	7.8	37	1.7	--	--	--

DATE	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)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)
MAR												
16...	4.2	170	--	0.3	3	3	70	0.04	0.04	1.7	1.1	0.27
19...	5.8	130	41	0.3	9	9	80	0.06	0.06	2.1	2.1	0.24
20...	4.9	130	40	0.3	27	5	50	0.06	0.06	3.5	3.5	0.23
22...	5.4	86	30	0.3	83	15	40	0.11	0.10	5.0	5.0	0.33
23...	5.7	63	29	0.3	183	30	40	0.13	0.12	8.7	8.6	0.34
26...	5.1	82	31	0.4	146	24	40	0.17	0.13	13	13	0.32
27...	4.6	95	32	0.3	97	14	40	0.15	0.13	13	13	0.26
28...	4.4	88	28	0.3	95	26	40	0.17	0.14	13	13	0.26
APR												
03...	--	--	--	--	36	8	--	0.10	0.09	16	15	0.10
10...	--	--	--	--	32	16	--	0.05	0.05	13	13	0.02
MAY												
05...	--	--	--	--	246	36	--	0.09	0.06	19	19	0.07
06...	--	--	--	--	5	2	--	0.12	0.08	19	19	0.10
07...	--	--	--	--	99	18	--	0.11	0.08	20	20	0.06
14...	--	--	--	--	63	15	--	0.07	0.07	20	20	0.04
JUN												
05...	--	--	--	--	114	20	--	0.15	0.10	13	13	0.09

MINNESOTA RIVER BASIN

05319500 WATONWAN RIVER NEAR GARDEN CITY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO TOTAL (MG/L AS P) (70507)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	SEDIMENT, SUSPENDED (MG/L) (80154)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAR												
16...	0.27	1.1	1.1	0.27	0.20	0.23	0.20	4.9	0.6	23	3.3	0.30
19...	0.24	1.3	1.3	0.33	0.28	0.27	0.25	7.0	0.7	17	3.5	0.30
20...	0.23	1.4	1.1	0.31	0.20	0.23	0.20	7.7	0.5	35	5.2	0.50
22...	0.33	2.7	1.5	0.55	0.23	0.24	0.22	9.0	5.0	450	12.0	0.70
23...	0.34	3.0	1.8	0.50	0.20	0.24	0.20	8.0	4.9	313	8.9	0.70
26...	0.32	2.8	2.1	0.44	0.16	0.21	0.11	8.3	4.3	431	7.2	0.40
27...	0.25	1.9	1.7	0.37	0.15	0.18	0.11	7.6	3.3	404	5.3	0.40
28...	0.24	2.5	1.8	0.39	0.15	0.17	0.10	9.3	3.3	306	4.2	0.40
APR												
03...	0.10	1.8	1.8	0.15	0.10	0.12	0.10	6.8	1.7	242	2.8	<0.30
10...	0.02	1.7	1.5	0.14	0.10	0.09	0.07	6.8	2.3	58	6.5	<0.50
MAY												
05...	0.07	1.9	1.0	0.32	0.13	0.18	0.13	6.2	--	486	4.0	<1.20
06...	0.10	2.6	1.3	0.37	0.17	0.20	0.16	6.9	4.5	351	4.0	<2.50
07...	0.06	1.0	0.90	0.32	0.14	0.17	0.14	6.7	2.8	192	2.0	<1.20
14...	0.04	1.9	1.3	0.18	0.07	0.06	0.06	6.4	1.8	83	6.3	<1.10
JUN												
05...	0.05	1.8	1.1	0.32	0.20	0.27	0.20	7.4	2.2	407	2.6	<1.80

MINNESOTA RIVER BASIN

05320000 BLUE EARTH RIVER NEAR RAPIDAN, MN

LOCATION.--Lat 44°05'44", long 94°06'33", in SE¼SE¼ sec.6, T.107 N., R.27 W., Blue Earth County, Hydrologic Unit 07020009, on left bank 0.2 mi downstream from powerplant (reactivated in 1984) operated by Rapidan Redevelopment Limited Partnership, 2 mi west of Rapidan, 3.5 mi downstream from Watonwan River, and 7.8 mi upstream from Le Sueur River.
DRAINAGE AREA.--2,430 mi², approximately.
PERIOD OF RECORD.--July 1909 to November 1910 (published as "at Rapidan Mills," no winter records), October 1939 to September 1945, July 1949 to current year.
REVISED RECORDS.--WSP 895: Drainage area. WSP 1508: 1910.
GAGE.--Water-stage recorder. Datum of gage is 807.83 ft above National Geodetic Vertical Datum of 1929. July 20, 1909, to Apr. 28, 1910, nonrecording gage at site 0.2 mi upstream at different datum. Apr. 29 to Nov. 12, 1910, nonrecording gage at site 800 ft upstream at different datum. Oct. 4 to Nov. 14, 1939, 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 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	159	114	92	45	53	119	3180	3710	5360	5420	1850	447
2	156	117	92	54	52	126	3100	3720	5040	4950	1670	418
3	157	144	92	54	52	129	2920	3530	6270	4650	1400	417
4	157	144	86	39	52	146	2660	3510	8720	4060	1370	419
5	161	119	84	52	52	161	2430	4720	10200	3410	1220	373
6	163	101	86	42	53	183	2250	6840	10600	3000	1020	348
7	163	121	86	49	52	175	2080	7730	11500	2740	1130	348
8	157	138	86	46	68	207	1920	8070	12300	2280	1670	289
9	151	138	87	47	85	279	1750	8580	11800	2210	2460	290
10	149	123	86	51	84	367	1600	8750	10700	2210	3170	259
11	125	113	87	58	87	433	1540	8130	9780	2240	3440	320
12	112	116	87	44	100	382	1530	7270	8960	2740	3240	473
13	126	117	87	61	102	319	1750	6480	8210	3180	2750	628
14	142	131	87	58	94	289	2980	5670	7780	3590	2170	620
15	157	134	87	48	101	356	4530	4960	7620	3220	1970	2210
16	117	103	87	61	84	320	5660	4510	7090	2570	1670	2580
17	146	87	125	63	84	320	6160	4490	7120	2390	1560	2490
18	163	96	145	55	84	318	5930	4970	7120	2060	1460	1950
19	152	107	143	61	84	331	5320	5830	6990	1560	1600	1690
20	107	134	102	67	82	364	4820	6200	6560	1680	1480	1460
21	89	137	83	66	98	856	4570	6410	5890	1480	1340	1150
22	188	138	84	56	98	1880	4300	6260	5530	2470	1080	946
23	292	127	83	58	98	2280	3870	5830	5800	3550	1050	985
24	101	84	e64	61	99	2720	3500	5270	6000	3350	950	984
25	97	84	50	47	98	3200	3150	4860	5850	2810	966	818
26	102	87	58	53	111	3400	2870	4490	5370	2380	874	1020
27	139	113	66	52	111	3520	2730	4680	4880	2120	834	860
28	139	87	56	52	113	3570	2660	5600	4740	2050	735	733
29	138	92	70	52	---	3540	2850	5930	5670	1800	672	722
30	133	92	50	53	---	3700	3280	6140	5660	1950	618	699
31	128	---	64	53	---	3470	---	5890	---	2110	507	---
TOTAL	4466	3438	2642	1658	2331	37460	97890	179030	225110	86230	47926	26946
MEAN	144	115	85.2	53.5	83.2	1208	3263	5775	7504	2782	1546	898
MAX	292	144	145	67	113	3700	6160	8750	12300	5420	3440	2580
MIN	89	84	50	39	52	119	1530	3510	4740	1480	507	259
AC-FT	8860	6820	5240	3290	4620	74300	194200	355100	446500	171000	95060	53450
CFSM	.06	.05	.04	.02	.03	.50	1.34	2.38	3.09	1.14	.64	.37
IN.	.07	.05	.04	.03	.04	.57	1.50	2.74	3.45	1.32	.73	.41

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1991, BY WATER YEAR (WY)

MEAN	487	449	277	165	207	1257	2460	1578	1847	1068	552	460
MAX	5121	2643	1521	967	1793	6277	13230	5775	7504	3725	5541	3547
(WY)	1969	1983	1983	1983	1983	1983	1965	1991	1991	1963	1979	1979
MIN	22.5	26.7	16.0	14.8	14.2	92.4	142	53.4	110	30.9	37.7	22.1
(WY)	1940	1940	1956	1977	1959	1968	1977	1940	1976	1940	1976	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1909 - 1991	
ANNUAL TOTAL	199883		715127			
ANNUAL MEAN	548		1959		917	
HIGHEST ANNUAL MEAN					2877	1983
LOWEST ANNUAL MEAN					105	1940
HIGHEST DAILY MEAN	4720	Jul 29	12300	Jun 8	42500	Apr 9 1965
LOWEST DAILY MEAN	14	Jan 1	39	Jan 4	7.4	Oct 28 1955
ANNUAL SEVEN-DAY MINIMUM	17	Jan 1	47	Jan 4	8.1	Oct 24 1955
INSTANTANEOUS PEAK FLOW	6170	Jun 28	12800	Jun 8	43100	Apr 9 1965
INSTANTANEOUS PEAK STAGE	10.09	Jun 28	10.09	Jun 8	21.36a	Apr 9 1965
INSTANTANEOUS LOW FLOW			15	Jan 6,7,8,9	6.9	Oct 12 1955
ANNUAL RUNOFF (AC-FT)	396500		1418000		664600	
ANNUAL RUNOFF (CFSM)	.23		.81		.38	
ANNUAL RUNOFF (INCHES)	3.06		10.95		5.13	
10 PERCENT EXCEEDS	1590		5870		2380	
50 PERCENT EXCEEDS	156		473		292	
90 PERCENT EXCEEDS	28		61		35	

a From floodmark.
e Estimated.

MINNESOTA RIVER BASIN

05320500 LE SUEUR RIVER NEAR RAPIDAN, MN

LOCATION.--Lat 44°06'40", long 94°02'28", in SW¼ sec.35, T.108 N., R.27 W., Blue Earth County, Hydrologic Unit 07020011, on right bank 600 ft downstream from highway bridge, 1.8 mi northeast of Rapidan, and 2.3 mi upstream from mouth.
DRAINAGE AREA.--1,100 mi^2, approximately.
PERIOD OF RECORD.--October 1939 to September 1945, July 1949 to current year.
GAGE.--Water-stage recorder. Datum of gage is 775.76 ft above National Geodetic Vertical Datum of 1929. Prior to Nov. 15, 1939, nonrecording gage at same site and datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar 24	1700	1,870	4.54	June 6	1730	5,900	8.42
Apr 16	1300	2,760	5.56	June 15	0700	3,520	6.34
May 8	2330	*6,780	*9.10	July 12	1630	1,800	4.45
May 19	1600	3,390	6.22	July 24	0330	3,250	6.07
May 29	0100	3,020	5.84	Aug 10	1430	3,970	6.77

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	55	60	e45	e23	e20	e45	1400	1650	2080	721	637	190
2	50	53	e45	e22	e20	e45	1310	1720	1930	658	558	175
3	53	50	e42	e22	e20	e47	1200	1670	2290	609	492	167
4	53	48	e41	e22	e20	e48	1090	1980	4370	554	438	153
5	53	49	e40	e22	e20	e53	994	3290	5320	505	394	141
6	52	50	39	e21	e20	e58	915	5380	5670	468	357	130
7	52	53	41	e21	e22	e58	841	6150	5100	429	545	122
8	52	48	39	e21	e25	e66	780	6640	4130	391	2990	115
9	59	46	37	e21	e28	e71	726	6260	3340	363	3620	107
10	64	52	37	e21	e28	e91	670	5230	2850	346	3870	101
11	71	57	38	e21	e28	e110	646	4240	2490	423	3860	126
12	69	56	39	e20	e28	e107	657	3560	2460	1570	3420	149
13	62	52	e40	e21	e29	e109	871	3060	2400	1680	2490	147
14	57	51	e41	e21	e30	e130	1580	2740	2300	1490	1970	784
15	52	49	e41	e21	e29	e150	2580	2610	2950	1140	1570	923
16	52	45	e50	e22	e27	e167	2730	2340	2930	896	1280	809
17	48	43	56	e22	e27	e190	2640	2200	2980	759	1090	576
18	45	43	e51	e23	e27	e210	2440	2650	2930	638	933	434
19	49	43	e45	e23	e27	e235	2270	3260	2650	515	835	349
20	50	45	e39	e23	e28	346	2140	3150	2620	445	734	303
21	57	45	e34	e22	e31	516	2080	2920	2250	427	618	273
22	58	45	e30	e22	e38	717	1890	2650	1970	1540	552	249
23	56	44	e28	e21	e38	1150	1690	2400	1690	2930	511	222
24	60	42	e26	e20	e38	1510	1520	2260	1470	3090	436	236
25	56	41	e25	e20	e38	1660	1370	2160	1300	2390	391	249
26	54	42	e25	e20	e40	1500	1210	2080	1130	1840	350	237
27	55	43	e24	e20	e42	1380	1190	2500	994	1560	318	241
28	51	e43	e24	e20	e44	1350	1200	2900	894	1280	287	242
29	48	e43	e23	e20	---	1460	1340	2840	792	1060	262	228
30	49	44	e23	e20	---	1480	1540	2520	716	896	238	219
31	59	---	e23	e20	---	1410	---	2270	---	755	212	---
TOTAL	1701	1425	1131	658	812	16469	43510	97280	76996	32368	36258	8397
MEAN	54.9	47.5	36.5	21.2	29.0	531	1450	3138	2567	1044	1170	280
MAX	71	60	56	23	44	1660	2730	6640	5670	3090	3870	923
MIN	45	41	23	20	20	45	646	1650	716	346	212	101
AC-FT	3370	2830	2240	1310	1610	32670	86300	193000	152700	64200	71920	16660
CFSM	.05	.04	.03	.02	.03	.48	1.31	2.83	2.31	.94	1.05	.25
IN.	.06	.05	.04	.02	.03	.55	1.46	3.26	2.58	1.08	1.22	.28
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1940 - 1991, BY WATER YEAR (WY)												
MEAN	270	219	121	65.6	107	760	1244	869	861	523	299	216
MAX	3300	1430	502	440	1299	3465	6563	3706	2742	2355	2602	1436
(WY)	1969	1971	1983	1983	1984	1983	1965	1960	1975	1968	1968	1968
MIN	7.41	11.1	5.04	2.96	1.68	33.0	48.3	18.8	40.4	20.6	8.20	7.55
(WY)	1990	1956	1959	1957	1959	1964	1957	1940	1950	1988	1989	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1940 - 1991	
ANNUAL TOTAL	145628.5		317005			
ANNUAL MEAN	399		869		464	
HIGHEST ANNUAL MEAN					1339	1983
LOWEST ANNUAL MEAN					51.4	1977
HIGHEST DAILY MEAN	4210	Jul 31	6640	May 8	23400	Apr 8 1965
LOWEST DAILY MEAN	6.6	Jan 1	20	Jan 12	1.6a	
ANNUAL SEVEN-DAY MINIMUM	7.2	Jan 1	20	Jan 24	1.6	Feb 9 1959
INSTANTANEOUS PEAK FLOW	4360	Jul 31	6780	May 8	24700	Apr 8 1965
INSTANTANEOUS PEAK STAGE	7.51	Jul 31	9.10	May 8	22.72b	May 22 1960
INSTANTANEOUS LOW FLOW			29	Dec 13		
ANNUAL RUNOFF (AC-FT)	288900		628800		336500	
ANNUAL RUNOFF (CFSM)	.36		.78		.42	
ANNUAL RUNOFF (INCHES)	4.88		10.62		5.69	
10 PERCENT EXCEEDS	1260		2650		1280	
50 PERCENT EXCEEDS	59		212		120	
90 PERCENT EXCEEDS	9.8		23		15	

a Occurred Feb. 9-25, 1959.
b From floodmark.
e Estimated.

MINNESOTA RIVER BASIN

05320500 LE SUEUR RIVER NEAR RAPIDAN, MN--Continued

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967-69, 1989 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
MAR												
16...	1715	167	671	8.7	0.5	746	14.2	23	3.4	83	25	22
19...	1200	227	658	8.8	2.5	742	13.9	21	3.1	86	25	23
20...	1015	321	596	9.2	1.0	733	19.8	31	4.2	79	24	21
21...	0930	467	499	9.5	2.0	728	15.7	43	4.7	75	22	18
23...	1515	1200	503	8.5	0.5	729	13.2	75	6.9	72	21	12
26...	1515	1510	696	7.5	6.5	726	12.6	64	4.3	95	27	11
27...	1330	1370	723	--	5.0	728	11.5	53	6.8	96	28	11
APR												
03...	1545	1200	781	8.4	11.5	745	12.0	32	2.4	--	--	--
09...	1200	710	798	8.6	10.0	741	9.8	34	2.6	--	--	--
MAY												
06...	0945	5340	517	8.1	6.5	739	11.1	92	4.1	--	--	--
07...	1515	6330	577	8.6	8.5	748	12.4	82	2.9	--	--	--
08...	1000	6620	573	8.2	9.0	748	12.0	60	2.7	--	--	--
14...	0915	2760	704	8.5	19.5	736	9.0	41	1.7	--	--	--
JUN												
05...	0930	5260	417	8.3	18.5	747	8.5	83	2.3	--	--	--
JUL												
22...	1430	1810	465	8.2	26.0	743	7.1	60	15.2	--	--	--
23...	1100	2920	449	8.2	23.0	749	7.6	99	3.1	--	--	--
24...	1510	3090	487	8.2	23.0	745	7.6	58	2.9	--	--	--
26...	0830	1880	600	8.2	19.5	749	10.7	48	3.2	--	--	--

DATE	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)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)
MAR												
16...	3.9	68	34	0.3	15	10	60	0.03	0.03	5.9	5.5	0.11
19...	3.9	69	38	0.3	41	10	60	0.02	0.02	5.4	5.4	0.09
20...	3.9	60	36	0.2	31	7	50	0.03	0.03	5.1	5.1	0.11
21...	4.1	61	32	0.3	110	26	50	0.05	0.04	5.9	5.9	0.19
23...	4.4	47	28	0.3	669	70	30	0.07	0.06	10	10	0.26
26...	4.1	63	32	0.3	355	43	40	0.11	0.07	19	19	0.17
27...	3.7	70	34	0.4	221	26	40	0.10	0.07	19	19	0.15
APR												
03...	--	--	--	--	100	19	--	0.07	0.05	20	18	0.04
09...	--	--	--	--	77	15	--	0.05	0.05	17	16	0.02
MAY												
06...	--	--	--	--	664	61	--	0.18	0.10	19	19	0.16
07...	--	--	--	--	602	100	--	0.20	0.10	22	22	0.15
08...	--	--	--	--	438	68	--	0.19	0.10	22	21	0.12
14...	--	--	--	--	118	23	--	0.10	0.10	21	20	0.04
JUN												
05...	--	--	--	--	500	82	--	0.27	0.13	12	12	0.21
JUL												
22...	--	--	--	--	1120	148	--	0.03	0.03	8.9	8.8	<0.01
23...	--	--	--	--	676	108	--	0.05	0.04	10	10	0.03
24...	--	--	--	--	225	30	--	0.06	0.04	12	12	<0.01
26...	--	--	--	--	182	29	--	0.04	0.03	13	13	<0.01

MINNESOTA RIVER BASIN

05320500 LE SUEUR RIVER NEAR RAPIDAN, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO TOTAL (MG/L AS P) (70507)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	SEDIMENT, SUSPENDED (MG/L) (80154)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAR												
16...	0.09	1.4	1.4	0.14	0.09	0.10	0.08	5.5	1.1	40	4.8	<0.50
19...	0.09	1.5	1.5	0.19	0.10	0.10	0.10	7.0	1.1	140	5.3	0.40
20...	0.02	1.6	1.2	0.16	0.11	0.11	0.10	7.2	1.6	238	9.7	0.60
21...	0.16	2.3	1.3	0.26	0.11	0.14	0.11	7.9	1.9	365	12.0	0.60
23...	0.26	1.9	1.5	0.46	0.19	0.20	0.18	9.5	8.1	843	16.0	0.90
26...	0.17	3.1	2.1	0.51	0.16	0.19	0.10	8.9	>5.0	862	--	--
27...	0.15	2.6	1.7	0.39	0.14	0.17	0.10	8.3	3.5	715	14.0	<1.30
APR												
03...	0.04	1.5	1.5	0.21	0.07	0.12	0.07	7.6	2.4	303	8.2	0.60
09...	<0.01	2.0	0.8	0.15	0.06	0.06	0.03	7.8	2.5	156	13.0	0.70
MAY												
06...	0.15	2.9	1.4	0.49	0.21	0.32	0.21	10	>10	1770	3.0	<1.20
07...	0.11	3.3	1.2	0.58	0.20	0.31	0.20	10	>10	1110	1.8	<1.10
08...	0.11	2.8	0.8	0.49	0.18	0.29	0.18	9.2	5.6	1040	3.0	<1.20
14...	0.04	2.4	1.8	0.14	0.10	0.11	0.08	8.9	2.4	468	3.6	<1.10
JUN												
05...	0.12	2.7	1.9	0.61	0.35	0.45	0.33	8.6	>7.0	1040	<2.6	<1.60
JUL												
22...	0.03	4.0	1.7	0.66	0.21	0.19	0.19	7.3	>5.0	2440	3.8	<1.40
23...	0.03	2.4	1.4	0.57	0.26	0.25	0.25	3.7	>5.0	1280	2.8	<1.40
24...	<0.01	2.0	1.4	0.56	0.28	0.30	0.25	9.0	>5.0	712	3.2	<1.20
26...	<0.01	2.4	1.2	0.43	0.24	0.25	0.22	9.1	4.3	460	3.8	<0.80

MINNESOTA RIVER BASIN

05325000 MINNESOTA RIVER AT MANKATO, MN

LOCATION.--Lat 44°09'58", long 94°00'57", in NW¼NE¼ sec.13, T.108 N., R.27 W., Nicollet County, Hydrologic Unit 07020007, on left bank 12 ft downstream from bridge on U.S. Highway 169 in North Mankato, 1.1 mi downstream from Blue Earth River and at mile 107.1 upstream from Mississippi River.
DRAINAGE AREA.--14,900 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1903 to current year (no winter records 1904, 1906-10, 1918-29). Monthly discharge only for some periods, published in WSP 1308. Published as "near Mankato": 1903-21.
REVISED RECORDS.--WSP 875: 1917. WSP 955: Drainage area. WSP 1085: 1929. WSP 1238: 1903, 1908, 1919. WSP 1508: 1916(M), 1918(M), 1926(M), 1928, 1930, 1932(M), 1938(M). WDR-MN-76-1: 1881(M).
GAGE.--Water-stage recorder. Datum of gage is 747.92 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 19, 1921, nonrecording gage, at site 1.1 mi upstream at datum 6.4 ft higher. Mar. 15, 1922, to Nov. 30, 1924, nonrecording gage, and Dec. 1, 1924 to May 24, 1971, recorder at site 0.5 mi downstream at present datum. May 25, 1971 to Aug. 14, 1977, recorder at site 0.2 mi downstream at present datum. Aug. 14, 1977 to July 27, 1978, nonrecording gage at present site and datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known, 29.9 ft, Apr. 26, 1881, present site and datum, from floodmark (discharge, 110,000 ft^3/s).

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	580	603	437	e315	e270	e400	7970	8640	14200	23900	8160	3810
2	551	590	391	e305	e270	e410	7610	8950	14000	22700	7950	3520
3	562	610	389	e300	e270	e425	7340	9030	16100	20800	7530	3210
4	579	643	409	e295	e275	e440	6960	9760	21200	18600	7290	2820
5	576	654	436	e290	e280	e460	6400	12800	25700	16700	7140	2580
6	595	613	488	e285	e280	e485	5900	18200	28300	15200	6990	2430
7	604	603	488	e280	e285	e520	5370	20300	30300	14100	8010	2370
8	592	621	461	e280	e300	e550	4970	20900	31900	12800	12400	2310
9	576	624	459	e280	e310	e600	4570	21100	32800	12000	14800	3080
10	576	628	459	e280	e320	e660	4210	20200	32000	11200	16300	4500
11	563	596	465	e275	e335	e780	4040	18500	30100	10900	16600	5260
12	534	574	472	e275	e345	e820	3980	16600	28100	12800	16100	5660
13	533	552	443	e275	e350	e870	4950	14800	26200	14100	14500	5930
14	539	538	382	e275	e355	e980	7650	13200	25000	14500	12900	8040
15	540	545	462	e280	e350	e1080	11800	12100	25000	14500	11700	10300
16	532	526	469	e280	e325	e1140	14300	11000	24000	14500	10700	11000
17	491	465	511	e280	e315	e1220	15000	10600	22900	14400	10000	10500
18	587	454	596	e280	e325	e1360	14400	11500	22200	13400	9330	9700
19	601	463	e534	e280	e335	e1620	13200	13700	21900	e11800	9140	9140
20	610	472	e336	e280	e350	2030	12000	14600	22100	e10600	8680	8560
21	617	479	e262	e275	e360	2650	11200	14900	22300	e9830	8320	7990
22	614	489	e300	e270	e360	4210	10400	14400	23500	e10400	7730	7170
23	834	494	e350	e270	e370	5510	9560	13400	25500	e12300	7430	6690
24	712	468	e430	e270	e370	6450	8710	12400	26500	e12200	7060	6110
25	627	451	e425	e267	e375	7160	7980	11500	26800	e11000	6550	5630
26	607	460	e410	e267	e380	7350	7340	10700	26500	e10100	6000	5340
27	652	491	e385	e267	e385	7440	7070	10800	25300	e9350	5460	5010
28	652	416	e370	e267	e395	8300	6760	12000	23900	e8730	4970	4670
29	620	392	e350	e267	---	8900	6870	12900	23900	e8350	4590	4440
30	623	449	e335	e270	---	8990	7800	14000	24600	e8200	4320	4270
31	613	---	e325	e270	---	8500	---	14600	---	8440	4090	---
TOTAL	18492	15963	13029	8650	9240	92310	246310	428080	742800	408400	282740	172040
MEAN	597	532	420	279	330	2978	8210	13810	24760	13170	9121	5735
MAX	834	654	596	315	395	8990	15000	21100	32800	23900	16600	11000
MIN	491	392	262	267	270	400	3980	8640	14000	8200	4090	2310
AC-FT	36680	31660	25840	17160	18330	183100	488600	849100	1473000	810100	560800	341200
CFSM	.04	.04	.03	.02	.02	.20	.55	.93	1.66	.88	.61	.38
IN.	.05	.04	.03	.02	.02	.23	.61	1.07	1.85	1.02	.71	.43
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1903 - 1991, BY WATER YEAR (WY)												
MEAN	1418	1311	826	515	664	4094	8426	5162	5490	3890	1935	1492
MAX	14600	6675	4770	2672	4505	18230	44780	19570	24760	16510	13040	10170
(WY)	1969	1971	1983	1983	1983	1983	1969	1986	1991	1908	1979	1903
MIN	66.1	83.5	80.9	61.5	58.4	132	609	101	194	58.3	37.4	56.6
(WY)	1934	1934	1934	1940	1940	1934	1931	1934	1934	1934	1934	1934

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1903 - 1991	
ANNUAL TOTAL	814834		2438054			
ANNUAL MEAN	2232		6680		3013a	
HIGHEST ANNUAL MEAN					9260	1986
LOWEST ANNUAL MEAN					136	1934
HIGHEST DAILY MEAN	16900	Jul 30	32800	Jun 9	92700	Apr 10 1965
LOWEST DAILY MEAN	101	Jan 1	262	Dec 21	31	Aug 3 1934
ANNUAL SEVEN-DAY MINIMUM	106	Jan 1	268	Jan 23	33	Jul 29 1934
INSTANTANEOUS PEAK FLOW	17100	Jul 30	33100	Jun 9	94100	Apr 10 1965
INSTANTANEOUS PEAK STAGE	15.05	Jul 30	21.37	Jun 9	29.09	Apr 10 1965
INSTANTANEOUS LOW FLOW					26b	Aug 4 1934
ANNUAL RUNOFF (AC-FT)	1616000		4836000		2183000	
ANNUAL RUNOFF (CFSM)	.15		.45		.20	
ANNUAL RUNOFF (INCHES)	2.03		6.09		2.75	
10 PERCENT EXCEEDS	5150		18300		7910	
50 PERCENT EXCEEDS	775		4040		1080	
90 PERCENT EXCEEDS	178		298		180	

a Median of annual mean discharges is 2,550 ft^3/s.
b Minimum observed.
e Estimated.

MINNESOTA RIVER BASIN

05325000 MINNESOTA RIVER AT MANKATO, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1963-66, 1968 to current year.

PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: October 1967 to September 30, 1981, October 1982 to current year (fragmentary records).
SUSPENDED-SEDIMENT DISCHARGE: October 1967 to current year.

REMARKS.--Sediment samples were collected approximately daily by an observer during the open-water period. In general, daily concentrations and loads for the open-water period are considered good. During the winter period, daily sediment concentrations and loads are based primarily on concentrations of sediment in samples that were collected monthly and on daily water-discharge records. Sediment records for the winter period are considered fair. Water temperatures were obtained by the observer approximately daily during the open-water period and monthly by U.S. Geological Survey personnel during the winter period. Some temperatures are not published because of questionable values.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: Maximum daily, 31.0°C, July 4-9, 1989; minimum daily, 0.0°C on many days each year.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 2,850 mg/L, Aug. 7, 1968; minimum daily mean, 9 mg/L, Jan. 15-19, 1991.
SEDIMENT LOADS: Maximum daily, 247,000 tons, Apr. 9, 1969; minimum daily, 5.2 tons, Nov. 6, 1976.

EXTREMES FOR CURRENT YEAR.--
WATER TEMPERATURES: Maximum daily observed, 29.0°C, July 21; minimum daily observed, 1.0°C, Dec. 1, 3, 4.
SEDIMENT CONCENTRATIONS: Maximum daily mean, 1,200 mg/L, May 6; minimum daily mean, 9 mg/L, Jan. 15-19.
SEDIMENT LOADS: Maximum daily, 59,600 tons, May 6; minimum daily, 6.8 tons, Jan. 15-19.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
ONCE-DAILY

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18.0	13.0	1.0	---	---	2.0	---	10.5	22.0	25.5	24.0	25.0
2	17.5	10.0	---	---	---	---	10.0	10.0	23.0	26.0	24.0	24.5
3	17.0	9.0	1.0	---	---	1.5	10.3	---	23.0	23.0	24.0	23.5
4	16.5	7.0	1.0	---	---	1.5	---	---	20.5	23.5	23.0	24.0
5	18.0	5.0	1.5	---	---	---	10.5	---	20.0	24.5	23.5	---
6	14.5	---	1.5	---	2.0	2.0	11.0	7.5	20.5	24.0	21.5	24.0
7	13.5	---	2.0	---	---	1.5	10.5	7.0	19.5	24.0	---	---
8	13.0	4.0	2.5	---	2.0	2.0	10.0	9.5	21.0	24.0	19.5	23.0
9	12.5	3.0	2.0	---	1.5	2.0	10.0	12.0	22.0	24.0	19.5	23.0
10	13.0	4.0	1.5	---	---	1.5	10.0	16.0	23.0	24.5	20.0	20.5
11	13.5	4.0	2.0	---	---	2.0	9.0	12.0	23.5	---	22.0	20.0
12	13.5	4.5	2.0	---	---	2.0	---	19.0	---	24.0	23.0	20.0
13	13.0	7.0	---	---	---	1.5	8.0	20.0	24.0	24.0	24.0	20.5
14	13.0	10.5	---	---	---	2.0	7.0	---	24.5	24.0	---	---
15	12.0	10.0	---	---	---	2.0	7.5	20.0	22.5	24.0	24.0	20.0
16	---	---	---	---	---	2.0	8.0	20.0	23.0	26.5	---	20.0
17	11.5	---	---	---	---	2.0	9.5	14.0	23.0	26.5	21.0	17.5
18	10.0	7.0	---	---	---	2.0	9.0	13.0	24.0	28.0	23.0	14.0
19	10.0	7.0	---	---	---	3.0	9.0	14.0	23.5	---	23.5	12.5
20	10.5	9.0	---	---	---	---	9.0	15.0	23.0	27.5	22.0	13.0
21	10.5	9.0	---	---	2.0	---	9.5	17.0	20.5	29.0	23.5	13.5
22	11.0	5.0	---	---	---	3.0	10.0	19.0	---	26.5	24.5	13.0
23	10.0	5.0	---	---	---	2.0	23.0	20.5	22.0	24.5	24.0	12.5
24	10.0	5.0	---	---	---	2.0	12.0	19.0	23.0	24.0	24.5	12.0
25	10.0	3.0	---	---	1.5	2.5	12.5	18.5	23.5	23.5	24.5	12.0
26	10.0	3.0	---	---	---	3.0	---	---	25.0	22.0	26.0	12.5
27	10.0	---	---	---	2.0	3.0	---	---	26.0	---	26.5	12.0
28	10.0	---	---	---	---	---	15.0	21.5	26.5	21.0	27.0	13.5
29	10.5	2.0	---	---	---	---	15.0	22.0	25.5	21.5	28.0	13.5
30	10.5	2.0	---	---	---	---	12.0	22.0	27.0	23.0	28.0	14.0
31	12.0	---	---	---	---	---	---	21.0	---	23.5	---	---
MEAN	---	---	---	---	---	---	---	---	---	---	---	---
MAX	---	---	---	---	---	---	---	---	---	---	---	---
MIN	---	---	---	---	---	---	---	---	---	---	---	---

MINNESOTA RIVER BASIN

05325000 MINNESOTA RIVER AT MANKATO, MN--Continued

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DAY	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/ DAY)
	OCTOBER		NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
1	39	61	50	81	32	38	10	8.5	45	33	21	23
2	45	67	42	67	40	42	10	8.2	45	33	20	22
3	65	99	43	71	40	42	10	8.1	46	34	24	28
4	57	89	39	68	35	39	10	8.0	53	39	22	26
5	45	70	33	58	35	41	10	7.8	65	49	20	25
6	46	74	28	46	38	50	10	7.7	77	58	27	35
7	47	77	28	46	40	53	10	7.6	78	60	51	72
8	38	61	27	45	35	44	10	7.6	69	56	57	85
9	34	53	24	40	45	56	10	7.6	83	69	57	92
10	35	54	45	76	44	55	10	7.6	93	80	42	75
11	40	61	59	95	36	45	10	7.4	86	78	40	84
12	49	71	37	57	45	57	10	7.4	84	78	37	82
13	48	69	30	45	50	60	10	7.4	84	79	38	89
14	56	81	55	80	50	52	10	7.4	85	81	49	130
15	56	82	46	68	45	56	9	6.8	86	81	39	114
16	52	75	46	65	30	38	9	6.8	87	76	41	126
17	58	77	46	58	17	23	9	6.8	87	74	55	181
18	42	67	45	55	11	18	9	6.8	90	79	70	257
19	33	54	38	48	10	14	9	6.8	96	87	77	337
20	37	61	46	59	10	9.1	20	15	97	92	110	603
21	67	112	64	83	10	7.1	27	20	99	96	324	2320
22	47	78	64	84	10	8.1	34	25	83	81	698	7990
23	77	173	36	48	10	9.4	35	26	75	75	596	8870
24	50	96	33	42	10	12	38	28	57	57	470	8190
25	45	76	44	54	10	11	41	30	44	45	534	10300
26	48	79	29	36	10	11	43	31	38	39	556	11000
27	43	76	24	32	10	10	44	32	34	35	467	9380
28	37	65	37	42	10	10	45	32	25	27	400	8960
29	43	72	48	51	10	9.4	45	32	---	---	368	8840
30	49	82	33	40	10	9.0	45	33	---	---	377	9150
31	52	86	---	---	10	8.8	45	33	---	---	405	9290
TOTAL	---	2398	---	1740	---	937.9	---	479.3	---	1771	---	96776

	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
1	411	8840	227	5300	387	14800	144	9290	167	3680	105	1080
2	382	7850	152	3670	353	13300	154	9440	164	3520	119	1130
3	334	6620	120	2930	907	40200	170	9550	158	3210	134	1160
4	260	4890	186	4900	926	53000	165	8290	155	3050	122	929
5	190	3280	460	16600	719	49900	173	7800	159	3060	113	787
6	169	2690	1200	59600	538	41100	189	7760	186	3510	108	709
7	162	2350	910	49900	506	41400	194	7390	280	6050	103	659
8	170	2280	636	35900	438	37700	200	6910	659	22100	105	655
9	180	2220	581	33100	389	34400	195	6320	451	18000	308	2620
10	143	1630	501	27300	358	30900	186	5620	274	12100	280	3400
11	128	1400	427	21300	333	27100	226	6650	332	14900	371	5270
12	136	1460	364	16300	312	23700	430	15000	266	11600	255	3900
13	391	5540	334	13300	289	20400	311	11800	206	8060	190	3040
14	776	16100	330	11800	203	13700	253	9900	210	7310	416	9400
15	693	22100	327	10700	213	14400	212	8300	189	5970	521	14500
16	664	25600	232	6890	228	14800	167	6540	182	5210	260	7720
17	609	24700	198	5670	220	13600	154	5990	177	4760	169	4790
18	528	20500	450	14300	208	12500	145	5250	180	4520	142	3720
19	465	16600	430	15900	251	14800	144	4590	158	3890	151	3730
20	334	10800	244	9620	587	35000	154	4410	153	3570	180	4160
21	199	6020	191	7680	230	13800	158	4190	172	3860	158	3410
22	185	5190	180	7000	210	13300	592	16900	177	3690	152	2940
23	180	4650	190	6870	208	14300	761	25300	155	3110	148	2670
24	176	4140	225	7530	187	13400	568	18700	150	2860	145	2390
25	173	3730	192	5960	162	11700	361	10700	155	2740	122	1850
26	145	2870	180	5200	154	11000	228	6220	174	2820	128	1850
27	149	2840	201	5860	148	10100	186	4700	172	2540	131	1770
28	150	2740	360	11700	189	12200	160	3770	137	1840	125	1580
29	163	3020	362	12600	205	13200	158	3560	127	1570	121	1450
30	271	5710	390	14700	158	10500	205	4540	147	1710	115	1330
31	---	---	428	16900	---	---	183	4170	120	1330	---	---
TOTAL	---	228360	---	466980	---	670200	---	259550	---	176140	---	94599
YEAR		1999931.2										

MINNESOTA RIVER BASIN

05325000 MINNESOTA RIVER AT MANKATO, MN--Continued

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water years 1960-67, 1970-79, 1981-87, 1989 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)
MAY						
15...	2000	0.07	17	0.11	0.05	6.9
17...	2035	0.06	16	0.06	0.05	7.5
19...	1820	0.08	16	0.04	0.08	17
21...	2025	0.08	16	0.06	0.05	34
23...	1925	0.08	17	0.31	0.04	6.6
25...	2025	0.07	17	<0.01	0.04	6.7
28...	2030	0.06	17	<0.01	0.07	6.8
30...	2100	0.08	18	0.03	0.11	7.2
JUN						
01...	2155	0.10	17	0.04	0.11	7.6
03...	1930	0.12	13	0.04	0.15	6.7
05...	2030	0.13	13	0.08	0.20	7.5
07...	2250	0.16	13	0.06	0.15	7.4
09...	2150	0.15	11	0.06	0.14	7.2
11...	2003	0.15	12	0.04	0.14	7.3
13...	2035	0.12	11	0.04	0.13	7.2
15...	2155	0.09	12	0.04	0.14	7.3
17...	2130	0.08	12	0.05	0.16	13
20...	1727	0.24	12	0.22	0.01	7.0
23...	1803	0.08	11	0.04	0.12	16
25...	2110	0.15	11	0.17	0.03	18
27...	1950	0.06	10	0.03	0.15	>50
29...	2025	0.06	8.9	0.03	0.15	6.7
JUL						
01...	2210	0.06	8.4	0.04	0.15	7.2
09...	1920	0.03	7.1	0.03	0.12	>50
24...	2055	0.03	3.1	0.05	0.14	7.2
30...	2135	0.03	7.7	0.02	0.12	7.0
AUG						
05...	2145	0.03	6.9	<0.01	0.10	6.8
13...	2120	0.02	9.9	0.03	0.11	>50
21...	2140	<0.01	2.1	0.02	0.05	7.6
26...	2050	<0.01	1.3	0.02	<0.01	7.6
SEP						
03...	2030	0.01	1.3	0.02	<0.01	7.4
10...	2030	0.05	2.5	0.06	0.09	8.7
17...	2145	0.04	9.2	0.02	0.16	11
24...	0851	0.02	7.1	0.02	0.09	7.7

MINNESOTA RIVER BASIN

05327000 HIGH ISLAND CREEK NEAR HENDERSON, MN

LOCATION.--Lat 44°34'19", long 93°55'18", in NE¼NW¼ sec.26, T.113 N., R.26 W., Sibley County, Hydrologic Unit 07020012, on left bank 20 ft downstream from bridge on County Road 6, 1.6 mi upstream from mouth, and 3.1 mi north of Henderson.
DRAINAGE AREA.--237 mi^2.
PERIOD OF RECORD.--October 1973 to current year. May 1970 to September 1973, operated as a low-flow station only.
REVISED RECORDS.--WDR-MN-80-2: 1974-75, 1977-79.
GAGE.--Water-stage recorder. Datum of gage is 728.56 ft above National Geodetic Vertical Datum of 1929.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 23	1230	322	2.99	May 29	0100	539	4.10
Apr. 20	1430	636	3.43	May 31	1100	1,030	6.24
May 5	2000	710	4.90	June 1	2230	586	4.50
				Sep. 14	1430	*1,300	*7.31

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.7	3.4	3.2	1.8	1.6	e4.9	121	124	427	93	35	45
2	3.2	2.9	2.9	1.9	1.7	e5.2	102	128	471	100	42	42
3	4.0	3.3	2.9	1.9	1.7	e5.4	89	147	383	110	45	44
4	4.7	3.7	2.7	1.8	1.9	5.6	79	234	370	112	47	40
5	4.0	3.7	2.7	1.7	2.1	20	74	473	385	103	46	37
6	2.9	4.7	2.5	1.7	2.4	21	59	e670	397	91	47	35
7	2.3	3.5	2.7	1.7	2.8	18	54	e580	394	78	53	34
8	2.3	4.7	2.8	1.8	3.3	16	49	e470	394	69	71	61
9	2.2	5.3	2.9	1.9	3.9	16	46	e400	383	60	65	102
10	2.2	4.2	2.9	1.9	4.0	20	45	e365	349	54	64	188
11	2.2	3.6	3.0	1.9	4.0	31	42	e340	305	53	67	279
12	2.5	3.6	3.2	2.0	4.9	33	37	e330	256	51	75	361
13	2.5	3.4	3.2	1.9	4.8	24	75	e315	197	45	79	484
14	2.5	2.8	2.8	2.0	4.1	19	194	e275	162	43	78	1110
15	1.9	2.8	3.1	2.2	3.6	18	e220	e230	165	58	74	1220
16	2.1	2.3	3.0	2.1	3.4	19	e250	201	e140	86	74	1190
17	2.0	2.4	3.1	2.2	3.4	26	e280	193	e120	103	70	1180
18	2.3	2.5	3.0	2.0	3.4	83	311	185	104	102	67	e1160
19	2.5	2.9	e2.9	2.2	3.4	115	339	165	90	88	72	1110
20	3.3	3.4	e2.9	2.2	3.5	126	355	147	119	70	86	1060
21	4.9	3.1	2.5	2.0	4.0	157	336	129	162	60	95	1020
22	4.2	3.0	2.5	1.9	4.4	163	297	117	171	51	95	962
23	3.7	2.9	2.5	1.9	4.3	290	243	107	148	42	89	913
24	2.8	2.9	2.5	1.8	3.9	246	186	100	142	36	80	878
25	2.5	3.3	2.5	1.7	3.9	211	140	94	140	32	72	829
26	2.9	3.3	2.2	1.6	4.0	201	116	99	137	29	65	779
27	2.8	3.4	2.3	1.8	4.3	222	123	89	128	30	59	729
28	2.8	3.2	2.3	1.9	4.7	215	113	177	116	37	55	678
29	3.0	2.8	2.1	1.6	---	191	112	420	101	33	53	626
30	2.9	3.1	2.0	1.6	---	175	124	296	91	31	63	575
31	2.9	---	1.9	1.7	---	147	---	497	---	31	49	---
TOTAL	89.7	100.1	83.7	58.3	97.4	2844.1	4611	8097	6947	1981	2032	17771
MEAN	2.89	3.34	2.70	1.88	3.48	91.7	154	261	232	63.9	65.5	592
MAX	4.9	5.3	3.2	2.2	4.9	290	355	670	471	112	95	1220
MIN	1.9	2.3	1.9	1.6	1.6	4.9	37	89	90	29	35	34
AC-FT	178	199	166	116	193	5640	9150	16060	13780	3930	4030	35250
CFSM	.01	.01	.01	.01	.01	.39	.65	1.10	.98	.27	.28	2.50
IN.	.01	.02	.01	.01	.02	.45	.72	1.27	1.09	.31	.32	2.79

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1974 - 1991, BY WATER YEAR (WY)

MEAN	61.1	48.8	30.3	11.3	17.2	137	228	130	126	73.5	59.1	88.4
MAX	298	199	111	49.7	121	470	593	381	370	333	342	592
(WY)	1986	1980	1983	1983	1984	1983	1983	1986	1986	1986	1979	1991
MIN	1.51	2.11	1.37	.98	1.28	6.27	6.69	3.32	1.58	.80	1.16	1.18
(WY)	1990	1990	1976	1977	1989	1975	1990	1976	1976	1976	1976	1974

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1974 - 1991	
ANNUAL TOTAL	16596.4		44712.3			
ANNUAL MEAN	45.5		122		84.3	
HIGHEST ANNUAL MEAN					236	1986
LOWEST ANNUAL MEAN					9.23	1976
HIGHEST DAILY MEAN	633	Jun 17	1220	Sep 15	1800	Apr 28 1975
LOWEST DAILY MEAN	1.1	Mar 4	1.6	Jan 26	.46	Oct 3 1976
ANNUAL SEVEN-DAY MINIMUM	1.3	Feb 17	1.7	Jan 26	.59	Jul 10 1976
INSTANTANEOUS PEAK FLOW	892	Jun 17	1300	Sep 14	1760	Aug 25 1981
INSTANTANEOUS PEAK STAGE	6.00	Jun 17	7.31	Sep 14	9.09	Aug 25 1981
INSTANTANEOUS LOW FLOW	.90a		1.6b		.20c	Jan 4 1981
ANNUAL RUNOFF (AC-FT)	32920		88690		61080	
ANNUAL RUNOFF (CFSM)	.19		.52		.36	
ANNUAL RUNOFF (INCHES)	2.61		7.02		4.83	
10 PERCENT EXCEEDS	170		357		249	
50 PERCENT EXCEEDS	4.7		42		17	
90 PERCENT EXCEEDS	1.5		2.1		1.6	

a Occurred Oct. 24 and Nov.15.
b Occurred all or part of each day Jan. 25, 26, 29-31, Feb. 1.
c Result of freezeup.
e Estimated.

MINNESOTA RIVER BASIN

05327000 HIGH ISLAND CREEK NEAR HENDERSON, MN--Continued

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water years 1969, 1989 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
SEP 09...	1100	102	636	8.3	24.0	742	7.9	64	4.8	192

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
SEP 09...	59	0.13	0.12	2.6	2.6	0.18	0.17	2.2	1.4

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
SEP 09...	0.49	0.31	0.29	0.26	12	5.0	581	24.0	<0.10

MINNESOTA RIVER BASIN

05330000 MINNESOTA RIVER NEAR JORDAN, MN

LOCATION.--Lat 44°41'35", long 93°38'30", in NW¼SW¼ sec.7, T.114 N., R.23 W., Carver County, Hydrologic Unit 07020012, on pier at center downstream side of bridge, 1.5 mi northwest of Jordan, and at mile 39.4 upstream from Mississippi River.

DRAINAGE AREA.--16,200 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--September 1934 to current year. Prior to Oct. 1, 1966, published as "near Carver, Minn".

REVISED RECORDS.--WSP 955: Drainage area. WSP 1508: 1935. WDR MN-87-2: 1976 (cal. yr. summary).

GAGE.--Water-stage recorder. Datum of gage is 690.00 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1966, water-stage recorder 2.8 mi downstream with auxiliary nonrecording gage at present site and present datum.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	763	788	605	e425	e390	e530	8910	8540	15100	22400	8440	4490
2	730	792	555	e415	e395	e540	8570	9240	15400	22100	8350	4230
3	743	778	512	e405	e400	e550	8190	9590	15500	22000	8150	4030
4	733	771	513	e395	e405	e560	7880	9990	15300	21500	7830	3770
5	722	789	464	e390	e410	e570	7490	11100	15500	20500	7510	3400
6	731	803	572	e385	e420	e600	7040	13000	17100	19000	7310	3120
7	719	809	672	e380	e430	e650	6540	14400	20900	17800	7210	2890
8	718	779	672	e380	e440	e690	6100	15900	25500	16700	8080	2870
9	735	785	667	e380	e450	e750	5710	18600	29500	15600	10200	2890
10	727	788	634	e380	e465	e800	5380	20800	31700	14400	12100	3200
11	723	792	603	e385	e475	e850	5030	21900	33000	13000	13400	4710
12	738	791	599	e390	e490	e900	4830	22100	33000	12000	14300	5920
13	734	761	588	e400	e500	e980	5050	21400	32000	11900	15000	6610
14	720	737	582	e405	e510	e1070	6530	20200	30500	12600	15300	8550
15	703	718	481	e400	e510	e1160	9190	18500	29100	13200	15100	11900
16	702	709	e540	e405	e470	e1300	11400	16500	27800	13600	14100	13600
17	716	695	e570	e405	e455	e1440	12900	15000	26500	13800	12600	14300
18	701	675	e560	e400	e485	e1600	13900	13900	25000	13900	11300	14500
19	671	633	e550	e400	e495	1940	14500	13100	23400	13900	10200	13900
20	751	611	e440	e390	e500	2330	14800	13000	22500	13300	9580	12700
21	797	627	e325	e395	e490	2780	14600	13300	22000	12000	9100	11400
22	797	627	e280	e380	e495	3280	13700	13700	21900	10600	8670	10300
23	799	636	e330	e375	e520	4960	12600	14000	22000	10100	8150	9260
24	819	634	e370	e380	e530	6780	11300	14100	22200	10900	7720	8570
25	945	635	e410	e390	e515	7490	10100	13900	22700	11600	7340	8070
26	875	612	e460	e385	e515	7840	9150	13500	23700	11500	6860	7570
27	824	608	e490	e385	e515	8050	8550	13000	24600	10600	6360	7120
28	784	607	e480	e380	e520	8130	8100	12500	24700	9840	5820	6730
29	818	577	e465	e380	---	8490	7800	13100	23900	9450	5370	6340
30	815	575	e455	e385	---	8900	7870	13900	22900	8900	5060	6000
31	789	---	e440	e385	---	9060	---	14600	---	8450	4730	---
TOTAL	23542	21142	15884	12135	13195	95570	273710	456360	714900	437140	291240	222940
MEAN	759	705	512	391	471	3083	9124	14720	23830	14100	9395	7431
MAX	945	809	672	425	530	9060	14800	22100	33000	22400	15300	14500
MIN	671	575	280	375	390	530	4830	8540	15100	8450	4730	2870
AC-FT	46700	41940	31510	24070	26170	189600	542900	905200	1418000	867100	577700	442200
CFSM	.05	.04	.03	.02	.03	.19	.56	.91	1.47	.87	.58	.46
IN.	.05	.05	.04	.03	.03	.22	.63	1.05	1.64	1.00	.67	.51
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1935 - 1991, BY WATER YEAR (WY)												
MEAN	1882	1752	1227	747	840	4632	11040	7026	6627	4784	2616	1970
MAX	16030	7643	5216	3118	3992	21170	48210	23030	23830	15250	13910	11020
(WY)	1969	1969	1983	1983	1983	1983	1969	1986	1991	1984	1979	1979
MIN	167	178	158	111	130	322	926	923	633	279	178	183
(WY)	1935	1935	1977	1940	1940	1940	1959	1959	1976	1936	1936	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1935 - 1991	
ANNUAL TOTAL	945890		2577758			
ANNUAL MEAN	2591		7062		3767a	
HIGHEST ANNUAL MEAN					10670	1986
LOWEST ANNUAL MEAN					687	1940
HIGHEST DAILY MEAN	16800	Aug 3	33000	Jun 11	112000	Apr 11 1965
LOWEST DAILY MEAN	175	Jan 1	280	Dec 22	85	Jan 21 1940
ANNUAL SEVEN-DAY MINIMUM	190	Jan 1	374	Dec 20	89	Jan 20 1940
INSTANTANEOUS PEAK FLOW	17000	Aug 2	33300	Jun 11	117000	Apr 11 1965
INSTANTANEOUS PEAK STAGE	20.23	Aug 2	25.63	Jun 11	35.07	Apr 12 1965
INSTANTANEOUS LOW FLOW					79	Nov 17 1955
ANNUAL RUNOFF (AC-FT)	1876000		5113000		2729000	
ANNUAL RUNOFF (CFSM)	.16		.44		.23	
ANNUAL RUNOFF (INCHES)	2.17		5.92		3.16	
10 PERCENT EXCEEDS	6320		18500		9790	
50 PERCENT EXCEEDS	915		4490		1480	
90 PERCENT EXCEEDS	278		405		287	

a Median of annual mean discharges is 3,230 ft^3/s.
e Estimated.

MINNESOTA RIVER BASIN

05330000 MINNESOTA RIVER NEAR JORDAN, MN--Continued
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1952, 1963-69, 1972 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

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 (STAND-ARD UNITS) (00400)	PH 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)
NOV												
27...	1120	608	931	968	8.4	8.0	3.5	6.5	732	14.6	170	88
FEB												
25...	1420	515	1070	1130	7.8	8.0	0.0	3.6	752	10.7	K2	K8
MAY												
15...	1145	17900	810	839	8.2	8.2	20.0	22	738	7.5	58	91
AUG												
13...	1300	15100	741	749	8.2	8.2	22.5	37	749	7.4	510	570

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)
NOV											
27...	97	46	48	5.7	--	297	--	--	180	58	0.3
FEB											
25...	120	45	53	6.5	344	339	0	420	200	66	0.3
MAY											
15...	100	37	15	3.8	215	220	0	262	130	36	0.4
AUG											
13...	94	36	14	4.8	282	225	0	344	120	23	0.4

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA 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)
NOV											
27...	5.7	623	0.02	0.9	0.04	0.04	0.8	0.12	<0.01	0.02	<0.01
FEB											
25...	19	735	0.03	2.2	0.64	0.64	1.5	0.20	0.12	0.14	0.12
MAY											
15...	16	563	0.08	17.0	0.03	0.03	1.8	0.10	0.07	0.06	0.05
AUG											
13...	25	497	0.05	9.6	0.03	<0.01	1.6	0.36	0.27	0.20	0.18

DATE	SEDIMENT, SUSPENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)
NOV											
27...	--	--	150	1	75	<0.5	<1.0	<1	<3	2	240
FEB											
25...	95	21	<10	1	81	<0.5	3.0	<1	<3	2	10
MAY											
15...	116	--	<10	2	87	<0.5	<1.0	<1	<3	2	5
AUG											
13...	340	55	<10	3	83	<0.5	<1.0	<1	<3	6	5

DATE	LEAD, DISSOLVED (UG/L AS PB) (01049)	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	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)
NOV											
27...	2	38	190	0.1	<10	3	<1	<1.0	410	<6	<3
FEB											
25...	<1	35	160	<0.1	<10	2	<1	<1.0	450	<6	4
MAY											
15...	<1	29	3	<0.1	<10	2	4	<1.0	330	<6	8
AUG											
13...	<1	31	4	<0.1	<10	3	3	<1.0	300	<6	15

MISSISSIPPI RIVER MAIN STEM

05331000 MISSISSIPPI RIVER AT ST. PAUL, MN

LOCATION.--Lat 44°56'40", long 93°05'20", in SE¼NE¼ sec.6, T.28 N., R.22 W., Ramsey County, Hydrologic Unit 07010206, on left bank in St. Paul, 300 ft upstream from Robert Street Bridge, 6 mi downstream from Minnesota River, and at mile 839.3 upstream from Ohio River.

DRAINAGE AREA.--36,800 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--Water year 1867-69, 1872-92 (annual maximums), March 1892 to current year (prior to 1901, fragmentary during some winters). Records prior to March 1892, published in the 19th Annual Report, Part 4, have been found to be unreliable and should not be used. Monthly discharge only for some periods, published in WSP 1308. Gage-height records (winter records incomplete) collected at same site since 1866 are contained in reports of U.S. Weather Bureau, War Department and Mississippi River Commission.

REVISED RECORDS.--WSP 285: 1892-96. WSP 715: Drainage area. WSP 875: 1938. WSP 895: 1939. WSP 1308: 1867(M). WSP 1508: 1897, 1898(M), 1903(M), 1917-18(M), 1928(M), 1929. WRD MN-74: 1973.

GAGE.--Water-stage recorder. Datum of gage is 683.62 ft above National Geodetic Vertical Datum of 1929. Prior to Mar. 18, 1925, nonrecording gage at several sites within 300 ft of present site at present datum. Mar. 18, 1925, to Mar. 10, 1933, water-stage recorder and Mar. 11, 1933, to Sept. 14, 1939, nonrecording gage, at present site and datum. Since September 1938, auxiliary water-stage recorder 5.6 mi downstream.

REMARKS.--Records good. Slight regulation except during extreme floods by reservoirs on headwaters and by power plants. Beginning July 20, 1938, sewage from Minneapolis and St. Paul, which formerly entered above station, was diverted to a sewage-disposal plant, thence to river below station. Figures of daily discharge do not include this diversion.

COOPERATION.--Records of Mississippi River at Twin City lock and dam computed and furnished by Ford Motor Co. Diversion through sewage disposal plant furnished by Metropolitan Waste Control Commission.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4170	7980	3350	3540	3130	2880	25400	22300	31700	34400	15900	9260
2	3600	7570	3560	3480	3490	3100	24600	24400	33700	36300	16100	8280
3	3500	7320	3800	3380	3350	3120	23600	25200	34100	36900	17100	8200
4	3960	7500	3570	3470	4180	3120	22300	26800	35400	38000	18100	8140
5	4850	7270	3930	3340	3240	3060	20900	28000	35300	38200	17300	8350
6	4490	6770	3770	3590	3520	3130	20300	31400	35700	37400	16700	8050
7	4390	6530	3790	3470	2860	3110	19100	35300	37000	35400	16100	7350
8	4880	6990	4210	3380	2830	3090	17700	39700	41000	34100	15800	7440
9	4460	6690	4240	3360	2820	3320	16800	42400	45000	32500	16900	9110
10	5210	6610	4310	3360	2910	3290	16000	46600	48800	31000	18700	12800
11	5240	6520	3790	3310	2900	3280	15600	49800	51100	29100	20200	13300
12	5360	5970	4190	3390	2950	3140	15100	51700	50500	26800	21100	15400
13	4940	6090	3870	3390	3360	3540	14900	52000	49500	26700	22400	19000
14	5030	5590	3920	3390	3200	3490	15900	50500	47700	25600	22700	21300
15	4840	5660	3170	3430	2890	3640	18300	47900	45100	26200	22300	24200
16	4690	5940	3780	3340	3160	3770	23300	44100	42800	26100	22300	29100
17	4650	5620	3810	3420	4810	3730	27300	40700	41000	26200	20900	31500
18	4810	5910	3810	3320	4670	4270	30100	37900	38900	26100	19300	32200
19	5370	5500	3350	3180	3820	4460	31800	35000	36200	25700	17800	32400
20	5280	5750	3260	3520	3890	4890	33600	32600	34500	25900	16400	31500
21	5820	5320	2950	2970	4090	5590	34800	30800	33900	24500	15500	29300
22	5870	5480	2260	3160	3480	7290	35200	30200	34200	23200	14600	27000
23	6730	5160	2130	3340	3110	9350	34600	29500	33600	21300	14300	25700
24	7790	5260	3570	3170	3120	12600	32600	28800	33600	20200	14100	24300
25	7890	5410	3730	3130	3390	17300	29800	28400	33800	20500	13800	22400
26	8190	5040	3730	3260	3540	19000	27000	27600	34200	20400	13100	21500
27	8280	5090	3600	3470	3240	21000	24500	27200	35500	20100	12500	20900
28	7950	4310	3360	3480	3030	22500	23100	26900	36300	18900	12000	18700
29	7970	4540	3880	3120	---	23600	22500	27000	36200	18600	11200	17800
30	7800	3580	3530	2960	---	24600	21500	29100	35700	17800	10500	17100
31	7820	---	3510	2940	---	25000	---	30600	---	16700	9840	---
TOTAL	175830	178970	111730	103060	94980	257260	718200	1080400	1162000	840800	515540	561580
MEAN	5672	5966	3604	3325	3392	8299	23940	34850	38730	27120	16630	18720
MAX	8280	7980	4310	3590	4810	25000	35200	52000	51100	38200	22700	32400
MIN	3500	3580	2130	2940	2820	2880	14900	22300	31700	16700	9840	7350
AC-FT	348800	355000	221600	204400	188400	510300	1425000	2143000	2305000	1668000	1023000	1114000
CFSM	.15	.16	.10	.09	.09	.23	.65	.95	1.05	.74	.45	.51
IN.	.18	.18	.11	.10	.10	.26	.73	1.09	1.17	.85	.52	.57
†	341	321	307	308	319	344	363	457	408	397	392	453
MEAN‡	6013	6287	3911	3633	3711	8643	24303	35307	39138	27517	17022	19173
CFSM‡	0.16	0.17	0.11	0.10	0.10	0.23	0.66	0.96	1.06	0.75	0.46	0.52
IN‡	0.19	0.19	0.12	0.11	0.11	0.27	0.74	1.11	1.19	0.86	0.53	0.58

CAL YR 1990 MEAN‡ 9,568 CFSM‡ 0.26 IN‡ 3.53
WTR YR 1991 MEAN‡ 16,259 CFSM‡ 0.44 IN‡ 6.00

MISSISSIPPI RIVER MAIN STEM

05331000 MISSISSIPPI RIVER AT ST. PAUL, MN--Continued

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1892 - 1991, BY WATER YEAR (WY)

MEAN	8215	7351	5234	4299	4291	10470	24580	19880	17490	13260	8259	7808
MAX	38210	27660	16080	11500	14700	43240	91610	66470	56530	43290	33380	34380
(WY)	1987	1972	1983	1983	1966	1983	1969	1986	1908	1905	1953	1986
MIN	1289	1348	1277	1097	1300	1757	3421	3085	1980	1272	864	1143
(WY)	1937	1937	1935	1935	1895	1940	1895	1934	1934	1934	1934	1934

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1892 - 1991	
ANNUAL TOTAL	3362830		5800350			
ANNUAL MEAN	9213a		15890a		10960ab	
HIGHEST ANNUAL MEAN					29580	1986
LOWEST ANNUAL MEAN					1935	1934
HIGHEST DAILY MEAN	35500	Jun 26	52000	May 13	171000	Apr 16 1965
LOWEST DAILY MEAN	2130	Dec 23	2130	Dec 23	632	Aug 26 1934
ANNUAL SEVEN-DAY MINIMUM	2490	Feb 28	2950	Feb 7	741	Aug 26 1934
INSTANTANEOUS PEAK FLOW					171000	Apr 16 1965
INSTANTANEOUS PEAK STAGE					26.01	Apr 16 1965
ANNUAL RUNOFF (AC-FT)	6670000		11500000		7937000	
ANNUAL RUNOFF (CFSM)	.25		.43		.30	
ANNUAL RUNOFF (INCHES)	3.40		5.86		4.05	
10 PERCENT EXCEEDS	20100		35300		25800	
50 PERCENT EXCEEDS	6690		9350		6690	
90 PERCENT EXCEEDS	2630		3250		2610	

† Diversion equivalent in cubic feet per second through sewage disposal plant.
‡ Adjusted for diversion.
a Unadjusted.
b Adjusted mean is 11,188 ft^3/s. Unadjusted median is 9,956 ft^3/s.

MISSISSIPPI RIVER BASIN

05331000 MISSISSIPPI RIVER AT ST. PAUL, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1956 to December 1990 (discontinued).

PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: October 1956 to December 1990 (discontinued).

INSTRUMENTATION.--Temperature recorder since October 1956.

EXTREMES FOR PERIOD OF DAILY RECORD.--
WATER TEMPERATURES: Maximum, 31.0°C, July 24-28, 1964, July 31, 1975, July 19, 21, 1977, Aug. 17, 1988; minimum, 0.0°C many days during winter periods.

EXTREMES FOR CURRENT PERIOD--October to December 1990:
WATER TEMPERATURES: Maximum during period, 15.0°C, Oct. 15; minimum, 0.0°C, Dec. 5.

WATER TEMPERATURE, DEGREES CELSIUS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
		OCTOBER			NOVEMBER			DECEMBER			JANUARY	
1	---	---	---	10.0	9.0	9.5	2.5	1.5	2.0	---	---	---
2	---	---	---	10.5	10.0	10.0	2.0	1.5	1.5	---	---	---
3	---	---	---	10.5	9.5	10.0	2.5	1.5	1.5	---	---	---
4	---	---	---	9.5	8.5	9.0	1.5	.5	1.0	---	---	---
5	---	---	---	8.5	7.5	8.0	1.5	.0	1.0	---	---	---
6	---	---	---	8.0	7.0	7.5	1.5	.5	1.0	---	---	---
7	---	---	---	7.5	6.5	7.0	2.0	.5	1.5	---	---	---
8	---	---	---	6.5	5.5	6.0	2.5	1.0	1.5	---	---	---
9	---	---	---	5.5	5.0	5.5	3.0	2.0	2.5	---	---	---
10	---	---	---	5.0	4.5	4.5	3.5	2.5	3.0	---	---	---
11	---	---	---	5.0	4.5	5.0	4.0	3.0	3.5	---	---	---
12	14.5	14.0	14.0	6.0	5.0	5.5	4.5	3.0	4.0	---	---	---
13	---	---	---	6.5	5.5	6.0	3.5	2.5	3.0	---	---	---
14	14.5	14.0	14.5	7.0	5.5	6.0	3.5	2.0	2.5	---	---	---
15	15.0	14.0	14.5	7.0	5.5	6.5	2.0	1.5	1.5	---	---	---
16	14.5	14.0	14.5	7.5	6.5	7.0	2.0	1.5	1.5	---	---	---
17	14.5	13.0	14.0	7.5	6.5	7.0	2.5	1.0	2.0	---	---	---
18	13.0	12.0	12.5	7.0	6.5	6.5	3.0	1.5	2.0	---	---	---
19	12.5	11.0	11.5	6.5	6.0	6.5	2.5	1.5	1.5	---	---	---
20	11.5	10.0	10.5	7.0	6.0	6.5	---	---	---	---	---	---
21	10.0	9.5	10.0	8.5	7.0	7.5	---	---	---	---	---	---
22	10.0	9.5	9.5	8.0	7.0	7.5	---	---	---	---	---	---
23	10.5	9.5	10.0	8.0	6.0	7.5	---	---	---	---	---	---
24	10.5	10.0	10.0	6.0	5.0	5.5	---	---	---	---	---	---
25	10.5	9.5	10.0	4.5	3.0	4.0	---	---	---	---	---	---
26	10.0	9.5	9.5	4.5	3.0	4.0	---	---	---	---	---	---
27	10.0	9.0	9.5	4.5	3.5	4.0	---	---	---	---	---	---
28	9.5	9.0	9.5	4.0	2.5	3.5	---	---	---	---	---	---
29	9.5	8.5	9.0	3.0	2.0	2.5	---	---	---	---	---	---
30	9.5	8.5	9.0	3.5	1.5	2.5	---	---	---	---	---	---
31	10.0	9.5	9.5	---	---	---	---	---	---	---	---	---
MONTH	---	---	---	10.5	1.5	6.3	---	---	---	---	---	---

MISSISSIPPI RIVER MAIN STEM

05331570 MISSISSIPPI RIVER AT NININGER, MN
(National stream-quality accounting network station)

WATER-QUALITY RECORDS

LOCATION.--Lat 44°46'22", long 92°54'07", NE¼NE¼ sec.18, T.115 N., R.17 W., Dakota County, Hydrologic Unit 07010206, on right bank at the end of Jason Avenue, and at mile 817.8 upstream from Ohio River.

DRAINAGE AREA.--37,000 mi^2 (95,000 km^2), approximately.

PERIOD OF RECORD.--January 1977 to current year.

REMARKS.--Water-discharge computed on the basis of discharge for Mississippi River at St. Paul (station 05331000) adjusted for inflow and travel time. Letter K indicates non-ideal colony count. Letter E indicates estimated value.

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, IN CUBIC FEET PER SECOND (00060)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH 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)
NOV												
28...	1215	5610	449	508	8.5	8.2	2.5	15	738	15.2	E380	100
FEB												
27...	0830	3980	683	721	7.9	7.8	1.0	2.0	743	12.6	51	K9
APR												
17...	1245	24500	545	556	8.2	8.1	7.5	35	747	12.0	K320	620
AUG												
01...	1215	17700	607	620	7.8	8.1	24.0	25	745	7.2	220	180

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)
NOV											
28...	53	20	23	3.2	174	188	5	202	40	29	0.3
FEB											
27...	66	23	48	4.3	218	219	0	266	47	68	0.2
APR											
17...	68	24	14	4.3	166	169	0	203	70	25	0.1
AUG											
01...	73	27	16	4.0	--	203	--	--	90	22	0.3

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L) (70300)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA 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)
NOV											
28...	4.8	297	0.02	1.4	0.10	0.10	1.2	0.50	0.13	0.14	0.13
FEB											
27...	12	408	0.06	2.0	0.65	0.65	1.5	0.32	0.25	0.23	0.23
APR											
17...	11	316	0.03	6.6	0.10	0.09	0.9	0.24	0.09	0.11	0.07
AUG											
01...	18	390	0.06	3.7	0.07	0.07	1.4	0.30	0.16	0.16	0.14

MISSISSIPPI RIVER MAIN STEM

05331570 MISSISSIPPI RIVER AT NININGER, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	SEDIMENT, SUSPENDED (MG/L) (80154)	SED. SUSP. SIEVE DIAM. % FINER THAN .062 MM (70331)	ALUMINUM, DISSOLVED (UG/L AS AL) (01106)	ARSENIC DISSOLVED (UG/L AS AS) (01000)	BARIUM, DISSOLVED (UG/L AS BA) (01005)	BERYLLIUM, DISSOLVED (UG/L AS BE) (01010)	CADMIUM DISSOLVED (UG/L AS CD) (01025)	CHROMIUM, DISSOLVED (UG/L AS CR) (01030)	COBALT, DISSOLVED (UG/L AS CO) (01035)	COPPER, DISSOLVED (UG/L AS CU) (01040)	IRON, DISSOLVED (UG/L AS FE) (01046)
NOV											
28...	--	--	10	<1	44	<0.5	<1.0	<1	<3	2	24
FEB											
27...	5	100	30	<1	62	<0.5	2.0	<1	<3	3	16
APR											
17...	76	--	<10	1	62	<0.5	<1.0	<1	<3	1	46
AUG											
01...	76	99	<10	3	68	<0.5	<1.0	<2	<3	4	18

DATE	LEAD, DISSOLVED (UG/L AS PB) (01049)	LITHIUM DISSOLVED (UG/L AS LI) (01130)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	MERCURY DISSOLVED (UG/L AS HG) (71890)	MOLYBDENUM, DISSOLVED (UG/L AS MO) (01060)	NICKEL, DISSOLVED (UG/L AS NI) (01065)	SELENIUM, DISSOLVED (UG/L AS SE) (01145)	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)
NOV											
28...	1	12	14	<0.1	<10	3	<1	<1.0	130	<6	5
FEB											
27...	<1	12	110	<0.1	<10	4	<1	<1.0	160	<6	16
APR											
17...	1	15	15	<0.1	<10	1	<1	<1.0	180	<6	16
AUG											
01...	<1	21	38	<0.1	<10	2	1	<1.0	210	<6	8

ST. CROIX RIVER BASIN

05336700 KETTLE RIVER BELOW SANDSTONE, MN

LOCATION.--Lat 46°06'20", long 92°51'50", in NW¼SW¼ sec.22, T.42 N., R.20 W., Pine County, Hydrologic Unit 07030003, on Sandstone Federal Correctional Institution property, on left bank about 900 ft downstream from abandoned powerplant dam, 1.8 mi south of Sandstone.
DRAINAGE AREA.--863 mi^2.
PERIOD OF RECORD.--October 1967 to current year.
GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 931.50 ft above National Geodetic Vertical Datum of 1929. (Minnesota Department of Transportation bench mark).
REMARKS.--Records good except those for estimated daily discharge, which are fair.
AVERAGE DISCHARGE.--24 years, 716 ft^3/s, 11.27 in/yr.
EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 17,200 ft^3/s, July 23, 1972, gage height, 15.38 ft; minimum, 25 ft^3/s, Nov. 11, 12, 1977, gage height, 3.37 ft, result of freezeup.
EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in April 1965 reached a stage of 12.96 ft, from flood marks, discharge, 13,400 ft^3/s.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 3,600 ft^3/s and maximum (*)

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 27	Unknown	4,440	6.11 from floodmarks	July 2	1030	3,610	7.59
May 7	1400	*6,480	*9.38	Sep. 10	0930	4,640	8.24

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	326	759	e220	e161	e152	e145	e2070	1620	2760	2260	1070	181
2	299	706	e210	e161	e152	e143	e1960	1660	2950	3510	961	175
3	379	651	e205	e161	e152	e145	e2070	1550	2550	3040	815	212
4	1190	603	e200	e161	e153	151	e2430	1670	2040	2630	710	255
5	1170	559	e195	e160	e158	146	e2810	2450	1660	2510	637	286
6	973	520	e190	e160	161	143	e2850	4450	1360	2210	563	280
7	834	490	e193	e160	161	e150	e2490	6260	1160	1860	500	718
8	753	452	e200	e159	162	146	e2240	5670	986	1580	457	2360
9	673	432	e200	e159	166	143	e2010	4790	843	1360	422	3570
10	592	413	e200	e158	170	142	e1900	3960	806	1180	389	4490
11	535	396	e193	e158	e180	143	e1840	3210	798	1150	360	3680
12	499	379	e180	e158	168	146	e1700	2580	711	1560	331	2670
13	469	354	e178	e157	e160	148	e1680	2140	668	1650	308	2120
14	444	356	e175	e154	e152	150	e1760	1800	818	1800	295	1760
15	442	351	e172	e152	e152	157	e2110	1490	1060	1670	284	1530
16	415	346	e170	e152	e152	158	e2340	1260	1080	1480	269	1570
17	494	340	e170	e152	e152	158	2300	1230	1010	1340	283	1690
18	1860	329	e168	e152	e152	163	2080	1180	931	1200	324	1590
19	2770	318	e168	e152	e152	188	1870	1030	854	1090	320	1520
20	2380	313	e168	e152	152	276	1670	930	763	973	294	1330
21	2510	321	e168	e152	152	636	1470	846	1310	883	260	1160
22	2670	340	e168	e152	153	831	1310	764	2750	800	241	1020
23	2360	346	e168	e152	e152	951	1270	725	2460	712	229	889
24	2040	342	e168	e152	e149	e1420	1240	871	1950	636	222	778
25	1750	302	e168	e152	e149	e2210	1160	1070	1620	574	224	702
26	1530	300	e168	e152	e146	e3300	1080	966	1360	520	233	665
27	1320	e278	e168	e152	e146	e4160	1020	1020	1150	478	241	620
28	1160	250	e165	e152	e146	e3450	980	1120	1040	570	238	573
29	1040	e235	e163	e152	---	e3100	963	1430	1180	1170	225	534
30	929	e228	e161	e152	---	e2800	1190	2340	1270	1320	211	509
31	832	---	e161	e152	---	e2400	---	2300	---	1180	192	---
TOTAL	35638	12009	5581	4811	4352	28399	53863	64382	41898	44696	12108	39437
MEAN	1150	400	180	155	155	916	1795	2077	1397	1448	391	1315
MAX	2770	759	220	161	180	4160	2850	6260	2950	3510	1070	4490
MIN	299	228	161	152	146	142	963	725	668	478	192	175
AC-FT	70690	23820	11070	9540	8630	56330	106800	127700	83100	89050	24020	78220
CFSM	1.33	.46	.21	.18	.18	1.06	2.08	2.41	1.62	1.68	.45	1.52
IN.	1.54	.52	.24	.21	.19	1.22	2.32	2.78	1.81	1.94	.52	1.70

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1968 - 1991, BY WATER YEAR (WY)

MEAN	806	575	270	170	166	483	2343	1311	863	618	384	606
MAX	2652	2414	652	411	417	1742	4653	3166	2297	2869	2094	3065
(WY)	1969	1972	1984	1984	1984	1973	1969	1986	1968	1972	1972	1986
MIN	80.6	85.8	98.3	77.3	98.5	141	435	222	131	110	86.4	71.3
(WY)	1977	1977	1977	1971	1977	1980	1977	1980	1988	1988	1976	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1968 - 1991	
ANNUAL TOTAL	230707		347374			
ANNUAL MEAN	632		952		716	
HIGHEST ANNUAL MEAN					1390	1972
LOWEST ANNUAL MEAN					254	1977
HIGHEST DAILY MEAN	5200	May 1	6260	May 7	16400	Jul 23 1972
LOWEST DAILY MEAN	105	Mar 7	142	Mar 10	43	Nov 12 1976
ANNUAL SEVEN-DAY MINIMUM	108	Mar 2	145	Mar 5	62	Jan 14 1971
INSTANTANEOUS PEAK FLOW	5390	May 1	6480	May 7	17200	Jul 23 1972
INSTANTANEOUS PEAK STAGE	8.71	May 1	9.38	May 7	15.38	Jul 23 1972
INSTANTANEOUS LOW FLOW	104a		142b		25c	
ANNUAL RUNOFF (AC-FT)	457600		689000		518900	
ANNUAL RUNOFF (CFSM)	.73		1.10		.83	
ANNUAL RUNOFF (INCHES)	9.94		14.97		11.28	
10 PERCENT EXCEEDS	1200		2360		1760	
50 PERCENT EXCEEDS	417		570		271	
90 PERCENT EXCEEDS	115		152		122	

a Occurred Mar. 6, 7, 8.
b Occurred Mar. 6, 7, 9, 10, 11.
c Occurred Nov. 11, 12, 1977, result of freeze up.
e Estimated.

ST. CROIX RIVER BASIN

05337400 KNIFE RIVER NEAR MORA, MN

LOCATION.--Lat 45°55'12", long 93°18'26", in SW¼SW¼S sec.26, T.40 N., R.24 W., Kanabec County, Hydrologic Unit 07030004, on left bank 400 ft upstream from bridge on County Highway 77, 1.1 mi upstream from mouth and 2.5 mi north of Mora.
DRAINAGE AREA.--102 mi^2.
PERIOD OF RECORD.--Occasional low-flow measurements, water years 1969-74; July 1974 to current year.
GAGE.--Water-stage recorder. Datum of gage is 991.20 ft above National Geodetic Vertical Datum of 1929. (Kanabec County bench mark).
REMARKS.--Records good except those for periods of estimated daily discharges, which are fair.
EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of July 26, 1972, reached a stage of 14.0 ft, from information by local resident (discharge not determined). Result of dam failure and backwater from collapsed bridge.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Apr. 15	2100	658	4.54	July 2	1100	606	4.43
May 6	2200	*1,020	*5.20				

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.7	38	e12	e5.5	e5.0	e6.3	169	250	293	268	23	5.1
2	5.1	40	e11	e5.4	e5.0	e6.4	143	263	263	585	31	3.9
3	23	35	e10	e5.4	e5.4	e6.5	128	244	232	530	32	22
4	32	31	e10	e5.4	e6.0	e6.5	119	259	180	420	28	17
5	35	29	e10	e5.4	e6.6	e6.4	117	363	146	311	24	16
6	35	26	e10	e5.3	e6.9	e6.4	118	820	120	237	21	13
7	28	24	e10	e5.3	e6.9	e6.4	128	948	100	178	19	11
8	24	31	e10	e5.2	e8.0	e6.4	148	700	85	142	19	35
9	22	27	e9.8	e5.2	e7.7	e6.5	141	515	78	114	15	53
10	20	20	9.8	e5.2	e7.3	e6.6	131	391	97	97	13	56
11	18	19	9.6	e5.2	e7.0	e6.9	127	315	82	85	13	50
12	17	19	9.4	e5.2	e6.8	e7.2	131	264	75	97	12	45
13	15	17	e9.2	e5.2	e6.7	e7.4	181	221	68	118	11	36
14	16	16	e9.0	e5.2	e6.6	e7.5	392	196	74	110	10	30
15	14	17	e9.0	e5.2	e6.6	e8.7	602	166	78	94	9.2	27
16	14	15	e8.8	e5.2	e6.5	e10	607	150	80	77	8.2	21
17	43	14	e8.6	e5.2	e6.4	e13	514	145	68	68	10	22
18	51	14	e8.4	e5.2	e6.4	19	420	116	87	61	10	20
19	45	14	e8.1	e5.2	e6.4	28	347	97	92	65	8.8	19
20	57	18	e7.7	e5.2	e6.5	41	281	88	126	63	6.7	18
21	72	15	e7.4	e5.2	e6.9	168	230	81	148	60	5.5	16
22	76	14	e7.1	e5.2	e7.1	247	201	77	136	54	5.5	14
23	90	13	e6.9	e5.2	e7.0	298	183	80	122	45	5.5	14
24	86	14	e6.5	e5.2	e6.7	286	155	131	108	38	5.2	14
25	68	13	e6.5	e5.1	e6.5	325	140	162	94	31	7.0	16
26	62	e13	e6.2	e5.1	e6.4	401	136	173	79	27	8.7	18
27	61	e13	e6.0	e5.1	e6.4	435	118	183	73	25	19	15
28	52	e12	e5.8	e5.1	e6.4	397	108	195	71	29	9.6	12
29	47	e12	e5.7	e5.0	---	317	130	237	69	34	6.2	11
30	44	e12	e5.6	e5.0	---	250	178	333	83	29	5.9	10
31	41	---	e5.5	e5.0	---	202	---	329	---	26	5.8	---
TOTAL	1217.8	595	259.6	161.5	184.1	3539.1	6523	8492	3407	4118	407.8	660.0
MEAN	39.3	19.8	8.37	5.21	6.57	114	217	274	114	133	13.2	22.0
MAX	90	40	12	5.5	8.0	435	607	948	293	585	32	56
MIN	4.7	12	5.5	5.0	5.0	6.3	108	77	68	25	5.2	3.9
AC-FT	2420	1180	515	320	365	7020	12940	16840	6760	8170	809	1310
CFSM	.39	.19	.08	.05	.06	1.12	2.13	2.69	1.11	1.30	.13	.22
IN.	.44	.22	.09	.06	.07	1.29	2.38	3.10	1.24	1.50	.15	.24
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1974 - 1991, BY WATER YEAR (WY)												
MEAN	58.0	41.1	25.3	12.3	13.5	63.7	223	111	65.3	60.7	25.5	43.6
MAX	242	206	109	28.8	48.9	238	472	338	233	171	120	257
(WY)	1985	1978	1978	1984	1984	1983	1986	1986	1984	1975	1986	1986
MIN	1.84	1.38	1.17	1.14	1.16	14.3	30.5	12.5	3.06	.98	1.86	2.15
(WY)	1977	1990	1990	1977	1990	1975	1977	1980	1988	1988	1976	1987

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1974 - 1991	
ANNUAL TOTAL	15027.0		29564.9			
ANNUAL MEAN	41.2		81.0		62.2	
HIGHEST ANNUAL MEAN					135	1986
LOWEST ANNUAL MEAN					16.8	1988
HIGHEST DAILY MEAN	516	Jun 4	948	May 7	1610	Apr 1 1986
LOWEST DAILY MEAN	1.0	Jan 1	3.9	Sep 2	.76	Jul 7 1988
ANNUAL SEVEN-DAY MINIMUM	1.0	Feb 15	5.0	Jan 27	.86	Jul 23 1988
INSTANTANEOUS PEAK FLOW	569	Jun 4	1020	May 6	1840	May 10 1979
INSTANTANEOUS PEAK STAGE	4.42	Jun 4	5.20	May 6	6.69	Nov 24 1977
INSTANTANEOUS LOW FLOW			3.6	Sep 2,3	.74a	
ANNUAL RUNOFF (AC-FT)	29810		58640		45040	
ANNUAL RUNOFF (CFSM)	.40		.79		.61	
ANNUAL RUNOFF (INCHES)	5.48		10.78		8.28	
10 PERCENT EXCEEDS	112		245		146	
50 PERCENT EXCEEDS	16		21		21	
90 PERCENT EXCEEDS	1.2		5.4		3.6	

a Occurred July 6, 7, 28, 29, 1988.
e Estimated.

ST. CROIX RIVER BASIN

05340500 ST. CROIX RIVER AT ST. CROIX FALLS, WI

LOCATION.--Lat 45°24'25", long 92°38'49", in SW¼NW¼ sec.30, T.34 N., R.18 W., Polk County, Hydrologic Unit 07030005, St. Croix National Scenic Riverway, on left bank, 1,500 ft downstream from powerplant of Northern States Power Co., in St. Croix Falls, and at mile 52.2.

DRAINAGE AREA.--6,240 mi^2.

PERIOD OF RECORD.--January 1902 to current year. Prior to January 1910, monthly discharge only, published in WSP 1308. Prior to October 1939, published as "near St. Croix Falls."

REVISED RECORDS.--WSP 1115: 1929. WDR WI-82-1: Drainage area.

GAGE.--Water-stage recorder and crest-stage gage. Datum of gage is 689.94 ft above National Geodetic Vertical Datum of 1929. Prior to July 1905, gage heights and discharge measurements were used by Loweth and Wolff, consulting engineers of St. Paul, Minn., to determine the flow. July 1905 to February 1940, records were computed from power generation at the St. Croix Falls Powerplant. February 1940 to Sept. 30, 1979, water-stage recorder at site 300 ft downstream at same datum.

REMARKS.--Estimated daily discharges: June 13-24, based on powerplant data provided by Northern States Power Company. Records good. Diurnal fluctuation caused by St. Croix Falls Powerplant 1,500 ft upstream. Data-collection platform at station.

AVERAGE DISCHARGE.--89 years, 4,312 ft^3/s, 9.38 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 54,900 ft^3/s, May 8, 1950, gage height, 25.19 ft; minimum daily, 75 ft^3/s, July 17, 1910.

EXTREMES FOR CURRENT YEAR.--Maximum discharge, 25,300 ft^3/s, May 9, gage height, 11.97 ft; minimum daily, 1,420 ft^3/s, Dec. 4.

RATING TABLE (gage height, in feet, and discharge, in cubic feet per second).

2.5	1,400	6.0	10,700
3.0	2,350	8.0	15,700
4.0	4,950	12.0	25,400

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2590	4520	2640	1800	2120	1820	11900	7950	12800	7030	6220	2040
2	2310	4090	2060	2380	1610	2040	10400	9920	14000	9130	5950	1710
3	2830	4130	2070	1820	1670	2000	9210	10700	16200	10500	5980	3460
4	2710	3950	1420	2010	1930	2030	8690	10600	15700	10900	5480	2880
5	3560	3640	1820	1810	1810	1870	8400	11000	12600	10600	4610	2480
6	4000	4050	2340	1790	1570	2000	8430	15800	11000	10600	4130	2700
7	3780	3190	2710	1870	2180	1880	8460	19900	9680	10100	4390	2570
8	3560	3310	2730	1660	1790	2080	8650	24000	8380	9220	3660	4180
9	3130	2960	2760	1970	2130	1720	9090	24800	7480	8270	3600	9100
10	3460	3300	2230	1790	1870	1780	9240	23400	7040	7620	3340	11700
11	2940	3130	2840	2080	2090	2220	9230	20900	6740	7070	3200	13600
12	3200	2790	2450	1850	2070	1910	9110	18000	6360	6790	3010	13600
13	2500	2820	2570	1630	1910	2210	9220	15600	5450	7710	3160	11500
14	3010	3390	2160	1990	1650	2080	10100	13700	5980	8220	2710	10500
15	2810	3080	2340	1860	2050	2200	11000	11600	5860	7800	2710	9280
16	2840	2900	1920	1960	2010	2580	11700	10400	7050	7370	2740	7570
17	3480	2830	2250	2250	1800	2290	12500	9210	7050	6710	2720	7620
18	3550	2900	2240	1910	1880	2330	12400	8780	7090	6410	2360	7650
19	5240	2890	2110	2020	1800	2900	11900	9630	6940	5610	2770	7360
20	7410	2910	1890	2340	1850	3190	11300	7720	6540	5820	2630	7480
21	7460	2890	1940	1770	1810	4230	10500	6530	6470	5620	2870	6870
22	7920	2600	1510	2210	2010	6200	9730	5240	7830	5460	2500	6590
23	8460	2840	1680	2080	1890	7870	8850	5340	10500	5320	2100	6300
24	8240	2960	1540	2050	1940	12100	8260	5780	11500	5000	2310	5580
25	7520	2700	1440	1980	1950	13900	7770	6530	9920	4400	2110	5540
26	7150	2230	2030	1740	1830	14800	7360	7590	8210	3970	2680	4940
27	6550	2820	1810	1710	1850	16200	6820	9250	7300	3780	2410	5090
28	5840	2270	2030	1940	2010	18000	6640	11200	6960	3800	2270	4560
29	5470	1760	2350	1700	---	17800	6330	11600	5610	3870	2210	4120
30	4860	1820	2070	1900	---	15800	6320	11800	6020	5250	2080	3820
31	4710	---	1820	1950	---	13600	---	12600	---	6010	2040	---
TOTAL	143090	91670	65770	59820	53080	183630	279510	377070	260260	215960	100950	192390
MEAN	4616	3056	2122	1930	1896	5924	9317	12160	8675	6966	3256	6413
MAX	8460	4520	2840	2380	2180	18000	12500	24800	16200	10900	6220	13600
MIN	2310	1760	1420	1630	1570	1720	6320	5240	5450	3780	2040	1710
CFSM	.74	.49	.34	.31	.30	.95	1.49	1.95	1.39	1.12	.52	1.03
IN.	.85	.55	.39	.36	.32	1.09	1.67	2.25	1.55	1.29	.60	1.15

CAL YR 1990 TOTAL 1368710 MEAN 3750 MAX 15700 MIN 1200 CFSM .60 IN. 8.16
WTR YR 1991 TOTAL 2023200 MEAN 5543 MAX 24800 MIN 1420 CFSM .89 IN. 12.06

MISSISSIPPI RIVER MAIN STEM

05344500 MISSISSIPPI RIVER AT PRESCOTT, WI

LOCATION.--Lat 44°44'45", long 92°48'00", in sec.9, T.26 N., R.20 W., Pierce County, Hydrologic Unit 07040001, on left bank at Prescott, 200 ft downstream from St. Croix River, 300 ft south of Chicago, Burlington & Quincy Railroad bridge, 800 ft south of bridge on U.S. Highway 10, and at mile 811.4 upstream from Ohio River.
DRAINAGE AREA.--44,800 mi^2, approximately.
PERIOD OF RECORD.--June 1928 to current year.
REVISED RECORDS.--WSP 1508: 1941. WRD MN-74: 1973.
GAGE.--Water-stage recorder. Datum of gage is 649.50 ft above National Geodetic Vertical Datum of 1929. Prior to Aug. 2, 1932, nonrecording gage at railroad bridge 300 ft upstream at following datums: June 3, 1928, to Sept. 30, 1929, 19.27 ft higher; Oct. 1, 1929, to Sept. 30, 1930, 17.68 ft higher; Oct. 1, 1930, to Aug. 1, 1932, 19.28 ft higher. Aug. 2, 1932, to Oct. 30, 1938, water-stage recorder at present site at datum 19.28 ft higher; Nov. 1, 1938, to Sept. 7, 1971, water-stage recorder at present site at datum 50.00 ft lower.
REMARKS.--Records good. Some regulation by reservoirs, navigation dams, and powerplants at low and medium stages. Flood flow not materially affected by artificial storage.
AVERAGE DISCHARGE.--63 years, 17,182 ft^3/s, 5.21 in/yr; median of yearly mean discharges, 16,000 ft^3/s, 4.85 in/yr.
EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 228,000 ft^3/s, Apr. 18, 1965, gage height, 43.11 ft; minimum daily, 1,380 ft^3/s, July 13, 1940; minimum gage height, 15.08 ft, Aug. 29, 1934, present datum.
EXTREMES FOR CURRENT YEAR.--Maximum daily discharge, 74,300 ft^3/s, May 12; maximum gage height, 33.27 ft, May 11; minimum daily discharge, 4,320 ft^3/s, Dec. 23; minimum gage height, 24.53 ft, Dec. 25, result of freeze up.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6740	13700	6170	6030	5570	5800	41000	29700	46300	44200	24100	12800
2	7500	13600	6880	6030	5940	5490	39500	32200	47400	43800	23700	12200
3	6650	12700	6420	6600	5800	5910	37100	36300	50700	47800	23700	10900
4	7190	12500	6710	5900	5740	5890	34800	38100	53200	49800	24700	12700
5	7430	12500	5790	6190	6920	5930	32800	39700	54200	51300	25100	12000
6	9220	11900	6510	5840	5800	5760	31200	41800	51000	51200	23400	11800
7	9310	11900	7000	6080	5830	5920	30600	50000	49900	50400	22300	11900
8	8970	10700	7420	6060	5790	5740	29300	58400	49600	47800	22100	11300
9	9280	11300	7830	5720	5360	5990	28200	67300	52300	45500	20900	12900
10	8380	10600	7880	6060	5720	5790	27600	70900	55200	42900	21900	19900
11	9500	10900	7400	5850	5460	5850	27000	73700	58700	40700	23500	26600
12	9070	10600	7490	5690	5680	6380	26500	74300	60800	38300	24900	29500
13	9350	9750	7480	5920	5700	5800	26100	73200	59800	35500	25700	31700
14	8330	9850	7250	5730	6070	6510	25900	71000	57800	36300	27200	33500
15	8940	9940	6780	6090	5540	6420	27900	67400	56800	35700	27000	34800
16	8560	9720	6210	6090	5620	6700	31300	62500	53800	35900	26600	36300
17	8410	9860	6460	6000	5820	7200	37100	57300	52700	35400	26600	39600
18	9040	9360	6870	6400	7420	6840	42100	52500	50800	34700	25100	42100
19	9260	9730	6830	5930	7390	7490	44900	49200	48700	34200	23000	42700
20	11700	9310	6180	5890	6370	8250	46100	47100	45700	33200	21900	42600
21	13900	9590	5840	6560	6500	9140	47300	42600	43500	33600	20300	41700
22	14400	9130	5500	5410	6720	11000	47700	39500	42800	32000	19700	38700
23	15000	8960	4320	6040	6240	15200	47400	37400	44500	30500	18400	35900
24	16300	8890	4350	6130	5690	19000	45700	36900	46600	28300	17800	34200
25	17200	9110	5710	5860	5690	26900	43100	36500	47600	26800	17700	32000
26	16600	9020	5800	5760	6060	33800	39700	37000	46200	26400	17200	29900
27	16600	8180	6480	5670	6150	36200	36300	37400	44700	25800	17100	28400
28	16000	8820	6140	5860	5880	39800	33100	38500	45000	25400	16100	27800
29	14900	7450	6100	6130	---	43100	31900	40500	45500	24100	15400	25000
30	14600	7100	7010	5490	---	43900	30900	41100	44000	23900	14500	23600
31	13800	---	6310	5520	---	42800	---	43500	---	24500	13600	---
TOTAL	342130	306670	201120	184530	168470	446500	1070100	1523500	1505800	1135900	671200	805000
MEAN	11040	10220	6488	5953	6017	14400	35670	49150	50190	36640	21650	26830
MAX	17200	13700	7880	6600	7420	43900	47700	74300	60800	51300	27200	42700
MIN	6650	7100	4320	5410	5360	5490	25900	29700	42800	23900	13600	10900
AC-FT	678600	608300	398900	366000	334200	885600	2123000	3022000	2987000	2253000	1331000	1597000
CFSM	.25	.23	.14	.13	.13	.32	.80	1.10	1.12	.82	.48	.60
IN.	.28	.25	.17	.15	.14	.37	.89	1.27	1.25	.94	.56	.67
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1928 - 1991, BY WATER YEAR (WY)												
MEAN	12990	12450	9309	7839	7803	16270	39540	31060	25040	18700	12340	12400
MAX	49740	40360	21460	16060	21390	55010	117600	90100	69720	48970	43840	45950
(WY)	1987	1972	1983	1983	1966	1983	1965	1986	1944	1952	1953	1986
MIN	3526	3874	3379	3153	3519	4369	7215	6304	4185	3197	2366	3002
(WY)	1933	1977	1934	1935	1934	1934	1931	1931	1934	1934	1934	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1928 - 1991	
ANNUAL TOTAL	5152370		8360920			
ANNUAL MEAN	14120		22910		17180	
HIGHEST ANNUAL MEAN					38540	1986
LOWEST ANNUAL MEAN					4367	1934
HIGHEST DAILY MEAN	42900	Jun 26	74300	May 12	226000	Apr 18 1965
LOWEST DAILY MEAN	4320	Dec 23	4320	Dec 23	1380	Jul 13 1940
ANNUAL SEVEN-DAY MINIMUM	4750	Jan 21	5390	Dec 20	2190	Aug 11 1936
INSTANTANEOUS PEAK FLOW					228000	Apr 18 1965
INSTANTANEOUS PEAK STAGE			33.27	May 11	43.11	Apr 18 1965
ANNUAL RUNOFF (AC-FT)	10220000		16580000		12450000	
ANNUAL RUNOFF (CFSM)	.32		.51		.38	
ANNUAL RUNOFF (INCHES)	4.28		6.94		5.21	
10 PERCENT EXCEEDS	29700		47700		37700	
50 PERCENT EXCEEDS	11300		16100		11000	
90 PERCENT EXCEEDS	4950		5840		4880	

VERMILLION RIVER BASIN

05345000 VERMILLION RIVER NEAR EMPIRE, MN

LOCATION.--Lat 44°40'00", long 93°03'17", in SW¼NW¼ sec.24, T.114 N., R.19 W., Dakota County, Hydrologic Unit 07040001, on right bank and just downstream from County Road 79, 2 mi west of Empire and 4 mi northeast of Farmington.
DRAINAGE AREA.--110 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1942 to June 1945 (no record during July, August, and September 1944), September 1969 to September 1973 (discharge measurements only), October 1973 to current year. Prior to October 1975 published as "near Empire City".
GAGE.--Water-stage recorder. Datum of gage is 851.99 ft above National Geodetic Vertical Datum of 1929 (levels by U.S. Army Corps of Engineers). April 12, 1942, to June 30, 1944, and October 1, 1944, to July 7, 1945, nonrecording gage at same site and present datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair. Some regulation at low-flow by sewage plant upstream.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 200 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
May 6	2000	*256	*5.49	May 30	1330	204	5.09

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	32	25	22	20	22	51	64	130	41	22	19
2	29	31	25	21	20	22	48	57	113	38	27	20
3	32	31	26	e21	21	21	46	51	102	37	29	24
4	32	31	25	e21	22	22	45	67	88	36	26	24
5	31	32	25	20	22	25	44	117	79	35	25	21
6	29	31	25	20	22	28	43	237	72	33	24	21
7	29	29	24	20	23	25	41	244	67	31	25	20
8	30	29	24	20	23	26	41	196	63	31	40	27
9	30	30	25	20	24	26	39	154	59	30	36	49
10	30	29	25	21	24	25	38	125	58	31	31	47
11	31	29	24	21	24	28	36	107	55	32	28	38
12	30	29	24	21	23	30	36	94	52	34	27	43
13	30	29	23	22	23	27	47	87	53	31	26	38
14	31	28	22	22	23	27	61	78	55	29	26	62
15	32	28	23	21	e23	27	69	72	54	28	26	74
16	30	28	23	21	e22	27	62	68	50	27	26	68
17	33	27	23	21	22	27	54	70	48	26	26	49
18	34	27	23	21	22	29	49	70	45	26	24	44
19	32	27	23	21	22	31	48	70	43	25	23	40
20	32	27	e23	21	22	34	45	68	46	24	23	38
21	35	27	e23	e21	22	44	43	64	48	24	23	37
22	35	27	e23	e21	24	50	42	61	47	27	22	35
23	34	26	e23	e21	23	128	41	61	44	25	22	33
24	33	26	e23	e21	22	112	39	62	42	24	22	35
25	32	25	e22	e21	26	79	37	60	40	23	22	36
26	32	26	e22	21	22	62	37	93	40	23	22	33
27	32	27	e22	21	22	68	41	145	38	23	21	34
28	31	26	e22	21	22	72	38	178	36	25	21	32
29	32	25	e22	20	---	61	47	187	34	26	21	32
30	31	25	e22	e20	---	55	66	199	33	25	21	32
31	31	---	e22	e20	---	53	---	171	---	23	19	---
TOTAL	974	844	726	646	630	1313	1374	3377	1734	893	776	1105
MEAN	31.4	28.1	23.4	20.8	22.5	42.4	45.8	109	57.8	28.8	25.0	36.8
MAX	35	32	26	22	26	128	69	244	130	41	40	74
MIN	29	25	22	20	20	21	36	51	33	23	19	19
AC-FT	1930	1670	1440	1280	1250	2600	2730	6700	3440	1770	1540	2190
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1943 - 1991, BY WATER YEAR (WY)												
MEAN	44.2	38.4	33.0	26.6	31.1	91.4	94.1	78.4	63.7	46.2	41.1	47.2
MAX	135	70.3	71.5	47.4	85.2	199	244	223	140	104	105	210
(WY)	1987	1987	1983	1983	1984	1983	1983	1986	1975	1986	1984	1986
MIN	14.9	15.6	12.4	11.0	13.1	25.4	35.2	29.3	23.0	16.0	14.3	14.6
(WY)	1977	1977	1977	1977	1977	1975	1977	1977	1988	1988	1976	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1943 - 1991	
ANNUAL TOTAL	15791		14392			
ANNUAL MEAN	43.3		39.4		53.0	
HIGHEST ANNUAL MEAN					111	1986
LOWEST ANNUAL MEAN					23.6	1977
HIGHEST DAILY MEAN	336	Mar 12	244	May 7	1300	Mar 27 1989
LOWEST DAILY MEAN	17	Feb 3	19	Aug 31	8.4	Jan 15 1975
ANNUAL SEVEN-DAY MINIMUM	18	Jan 31	20	Jan 3	9.0	Jan 13 1975
INSTANTANEOUS PEAK FLOW	401	Mar 12	256	May 6	2030a	Sep 18 1942
INSTANTANEOUS PEAK STAGE	6.04	Mar 12	5.49	May 6	8.30	Sep 22 1986
INSTANTANEOUS LOW FLOW	14	Feb 24	17	Sep 1,2,7		
ANNUAL RUNOFF (AC-FT)	31320		28550		38410	
10 PERCENT EXCEEDS	73		67		97	
50 PERCENT EXCEEDS	31		29		35	
90 PERCENT EXCEEDS	19		21		19	

a Instantaneous peak flow outside period of record is 6,200 ft^3/s in Apr. 1965, from rating extended above 2,100 ft^3/s.
e Estimated.

VERMILLION RIVER BASIN

05345000 VERMILLION RIVER NEAR EMPIRE, MN--Continued

WATER QUALITY RECORDS

PERIOD OF RECORD.--1972-76, 1980-81, 1990 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)
FEB												
05...	1300	20	1050	8.0	6.5	9.9	60	130	73	24	97	5.9
APR												
10...	1000	36	838	7.9	6.0	10.5	70	69	83	27	61	3.7
MAY												
16...	1100	66	726	7.8	15.5	7.6	320	390	82	24	36	3.1

DATE	SULFATE DIS-SOLVED (MG/L AS SO4) (00945)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL) (00940)	FLUO-RIDE, DIS-SOLVED (MG/L AS F) (00950)	SILICA, DIS-SOLVED (MG/L AS SIO2) (00955)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
FEB												
05...	31	150	0.30	18	0.04	10	0.06	1.4	1.4	2.1	1.7	1.6
APR												
10...	47	95	0.20	17	0.02	4.9	0.01	1.1	1.0	0.90	0.90	0.90
MAY												
16...	40	63	0.30	14	0.04	5.0	0.08	1.2	0.9	0.52	0.46	0.42

DATE	1,2,4-TRI-CHLORO-BENZENE TOTAL (UG/L) (34551)	1,2,5,6-DIBENZ-ANTHRA-CENE TOTAL (UG/L) (34556)	1,2-DI-CHLORO-BENZENE TOTAL (UG/L) (34536)	1,3-DI-CHLORO-BENZENE TOTAL (UG/L) (34566)	1,4-DI-CHLORO-BENZENE TOTAL (UG/L) (34571)	2,4,6-TRI-CHLORO-PHENOL TOTAL (UG/L) (34621)	2,4-DI-METHYL-PHENOL TOTAL (UG/L) (34606)	2,4-DI-CHLORO-PHENOL TOTAL (UG/L) (34601)	2,4,-DI-NITRO-PHENOL TOTAL (UG/L) (34616)	2,4-DI-NITRO-TOLUENE TOTAL (UG/L) (34611)	2,6-DI-NITRO-TOLUENE TOTAL (UG/L) (34626)
APR											
10...	<5.0	<10.0	<5.0	<5.0	<5.0	<20.0	<5.0	<5.0	<20.0	<5.0	<5.0

DATE	2-CHLORO-NAPH-THALENE TOTAL (UG/L) (34581)	2-CHLORO-PHENOL TOTAL (UG/L) (34586)	2-NITRO-PHENOL TOTAL (UG/L) (34591)	4,6-DINITRO-ORTHO-CRESOL TOTAL (UG/L) (34657)	4-BROMO-PHENYL PHENYL ETHER TOTAL (UG/L) (34636)	4-CHLORO-PHENYL PHENYL ETHER TOTAL (UG/L) (34641)	4-NITRO-PHENOL TOTAL (UG/L) (34646)	ACE-NAPHTH-ENE TOTAL (UG/L) (34205)	ACE-NAPHTH-YLENE TOTAL (UG/L) (34200)	ANTHRA-CENE TOTAL (UG/L) (34220)	BENZO-A-PYRENE TOTAL (UG/L) (34247)
APR											
10...	<5.0	<5.0	<5.0	<30.0	<5.0	<5.0	<30.0	<5.0	<5.0	<5.0	<10.0

VERMILLION RIVER BASIN

05345000 VERMILLION RIVER NEAR EMPIRE, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	BENZO B FLUOR-AN-THENE TOTAL (UG/L) (34230)	BENZO K FLUOR-AN-THENE TOTAL (UG/L) (34242)	BENZO A ANTHRAC ENE1,2-BENZANT HRACENE TOTAL (UG/L) (34526)	BENZOGH I PERYL ENE1,12 -BENZOP ERYLENE TOTAL (UG/L) (34521)	BIS (2-CHLORO-ETHOXY) METHANE TOTAL (UG/L) (34278)	BIS (2-CHLORO-ISO-PROPYL) ETHER TOTAL (UG/L) (34283)	BIS(2-ETHYL HEXYL) PHTHAL-ATE TOTAL (UG/L) (39100)	BIS 2-CHLORO-ETHYL ETHER TOTAL (UG/L) (34273)	CHRY-SENE TOTAL (UG/L) (34320)	DIETHYL PHTHAL-ATE TOTAL (UG/L) (34336)	DI-METHYL PHTHAL-ATE TOTAL (UG/L) (34341)
APR 10...	<10.0	<10.0	<10.0	<10.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0

DATE	DI-N-BUTYL PHTHAL-ATE TOTAL (UG/L) (39110)	DI-N-OCTYL PHTHAL-ATE TOTAL (UG/L) (34596)	FLUOR-ANTHENE TOTAL (UG/L) (34376)	FLUOR-ENE TOTAL (UG/L) (34381)	HEXA-CHLORO-BENZENE TOTAL (UG/L) (39700)	HEXA-CHLORO-BUT-ADIENE TOTAL (UG/L) (39702)	HEXA-CHLORO-CYCLO-PENT-ADIENE TOTAL (UG/L) (34386)	HEXA-CHLORO-ETHANE TOTAL (UG/L) (34396)	INDENO (1,2,3-CD) PYRENE TOTAL (UG/L) (34403)	ISO-PHORONE TOTAL (UG/L) (34408)	N-BUTYL BENZYL PHTHAL-ATE TOTAL (UG/L) (34292)
APR 10...	<5.0	<10.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0

DATE	N-NITRO-SODI-N-PROPYL-AMINE TOTAL (UG/L) (34428)	N-NITRO-SODI-METHY-LAMINE TOTAL (UG/L) (34438)	N-NITRO-SODI-PHENY-LAMINE TOTAL (UG/L) (34433)	NAPHTH-ALENE TOTAL (UG/L) (34696)	NITRO-BENZENE TOTAL (UG/L) (34447)	PARA-CHLORO-META CRESOL TOTAL (UG/L) (34452)	PENTA-CHLORO-PHENOL TOTAL (UG/L) (39032)	PHENAN-THRENE TOTAL (UG/L) (34461)	PHENOL (C6H-5OH) TOTAL (UG/L) (34694)	PYRENE TOTAL (UG/L) (34469)
APR 10...	<5.0	<5.0	<5.0	<5.0	<5.0	<30.0	<30.0	<5.0	<5.0	<5.0

CANNON RIVER BASIN

05353800 STRAIGHT RIVER NEAR FARIBAULT, MN

LOCATION.--Lat 44°15'29", long 93°13'51", in W½SE¼ sec.9, T.109 N., R.20 W., Rice County, Hydrologic Unit 07040002, on right bank 15 ft downstream from highway bridge, 2.8 mi upstream from Falls Creek and 3.2 mi southeast of Faribault.
DRAINAGE AREA.--442 mi^2.
PERIOD OF RECORD.--October 1965 to current year.
GAGE.--Water-stage recorder. Datum of gage is 1,034.58 ft above National Geodetic Vertical Datum of 1929.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
EXTREMES FOR CURRENT YEAR.--Peak discharge greater than base discharge of 1,500 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
May 6	2100	2,760	8.60	Jul. 12	0900	2,780	8.62
May 18	2200	1,500	6.96	Jul. 22	1700	*3,720	*9.58
May 28	1200	1,520	6.98	Aug. 8	1400	3,280	9.17

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	63	60	53	e37	e31	e65	493	780	653	179	434	132
2	63	61	37	e37	e32	e72	456	675	588	181	374	125
3	77	59	29	e37	e34	e76	415	565	614	169	339	122
4	79	63	48	e37	e36	e85	378	587	508	161	312	114
5	73	59	54	e37	e38	e100	351	1470	446	152	285	109
6	69	61	50	e37	e40	e138	328	2720	391	140	259	101
7	65	59	50	e37	e42	e167	303	2640	349	128	337	93
8	69	57	52	e37	e42	e150	296	2130	322	116	2700	95
9	70	58	52	e37	e42	e143	310	1790	296	109	2910	103
10	66	60	55	e37	e42	e145	329	1490	327	102	2670	93
11	65	58	59	e37	e43	e150	305	1230	437	151	2080	99
12	65	55	62	e38	e45	e157	293	1010	516	2110	1600	134
13	64	56	50	e39	e45	e150	439	892	417	1640	1270	113
14	64	55	48	e39	e43	e150	735	778	403	1790	939	255
15	61	57	e48	e40	e42	e152	855	668	847	1490	695	286
16	60	58	e47	e41	e45	e157	778	708	949	1130	597	229
17	60	55	e48	e41	e46	e160	624	833	717	830	564	187
18	67	52	e46	e42	e46	e165	543	1240	552	675	497	163
19	64	53	e45	e45	e46	e190	661	1460	439	562	432	145
20	66	55	e43	e44	e48	234	744	1360	367	585	385	133
21	74	54	41	e43	e50	317	677	1160	333	791	342	126
22	71	54	e40	e49	e48	352	569	929	311	2510	303	121
23	70	50	e39	e40	e49	882	504	766	281	2460	272	113
24	69	49	e38	e37	e52	1100	438	669	259	1800	250	131
25	66	47	e38	e34	e55	1010	385	612	243	1140	230	132
26	65	46	e38	e33	e57	781	354	916	224	783	212	129
27	64	48	e38	e32	e59	709	404	1310	207	610	194	123
28	63	49	e38	e31	e60	849	415	1420	188	700	177	115
29	61	42	e37	e31	---	724	526	1170	174	837	161	107
30	61	51	e37	e31	---	561	729	936	161	681	172	102
31	62	---	e37	e31	---	509	---	755	---	543	147	---
TOTAL	2056	1641	1397	1168	1258	10600	14637	35669	12519	25255	22139	4030
MEAN	66.3	54.7	45.1	37.7	44.9	342	488	1151	417	815	714	134
MAX	79	63	62	49	60	1100	855	2720	949	2510	2910	286
MIN	60	42	29	31	31	65	293	565	161	102	147	93
AC-FT	4080	3250	2770	2320	2500	21030	29030	70750	24830	50090	43910	7990
CFSM	.15	.12	.10	.09	.10	.77	1.10	2.60	.94	1.84	1.62	.30
IN.	.17	.14	.12	.10	.11	.89	1.23	3.00	1.05	2.13	1.86	.34

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1966 - 1991, BY WATER YEAR (WY)

MEAN	210	170	103	62.8	106	515	568	416	332	272	185	152
MAX	831	595	336	167	837	1270	1623	1224	1062	1005	1136	488
(WY)	1969	1971	1983	1974	1984	1973	1983	1973	1967	1983	1979	1986
MIN	17.0	15.1	11.0	11.0	12.9	26.4	70.2	58.1	45.8	26.2	16.2	16.0
(WY)	1977	1977	1977	1977	1968	1968	1977	1976	1976	1988	1976	1976

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1966 - 1991	
ANNUAL TOTAL	89787		132369			
ANNUAL MEAN	246		363		258	
HIGHEST ANNUAL MEAN					605	1983
LOWEST ANNUAL MEAN					43.9	1977
HIGHEST DAILY MEAN	3180	Jul 7	2910	Aug 9	5410	May 2 1973
LOWEST DAILY MEAN	17	Jan 1	29	Dec 3	11	Feb 18 1968
ANNUAL SEVEN-DAY MINIMUM	18	Jan 1	31	Jan 27	11	Feb 18 1968
INSTANTANEOUS PEAK FLOW	6030	Jul 7	3720	Jul 22	6030	Jul 7 1990
INSTANTANEOUS PEAK STAGE	11.31	Jul 7	9.58	Jul 22	12.74b	Mar 5 1974
INSTANTANEOUS LOW FLOW	16a	Dec 3	16a	Dec 3	10	Oct 27 1976
ANNUAL RUNOFF (AC-FT)	178100		262600		187200	
ANNUAL RUNOFF (CFSM)	.56		.82		.58	
ANNUAL RUNOFF (INCHES)	7.56		11.14		7.94	
10 PERCENT EXCEEDS	636		921		646	
50 PERCENT EXCEEDS	79		133		102	
90 PERCENT EXCEEDS	19		39		27	

a Result of temporary storage from freeze up.
b Backwater from ice.
e Estimated.

ZUMBRO RIVER BASIN

05372995 SOUTH FORK ZUMBRO RIVER AT ROCHESTER, MN

LOCATION.--Lat 44°03'42", long 92°27'58", in NW¼NE¼ sec.23, T.107 N., R.14 W., Olmsted County, Hydrologic Unit 07040004, on left bank 50 ft downstream from 37th Street bridge, 0.2 mi upstream from sewer plant, and 2.0 mi downstream from Silver Lake Dam.
DRAINAGE AREA.--303 mi^2.
PERIOD OF RECORD.--March 1981 to current year.
GAGE.--Water-stage recorder. Datum of gage is 950.00 ft above National Geodetic Vertical Datum of 1929.
REMARKS.--Records good except those for estimated daily discharges, which are poor. Slight regulation at times from Silver Lake.
EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of July 6, 1978, reached a stage of about 28.0 ft, on upstream side of bridge, discharge 30,500 ft^3/s. This is the highest known stage since at least 1908.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,300 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 23	1730	1,440	6.49	July 22	0230	2,310	8.00
May 6	0700	*2,640	*8.49	Aug. 9	0430	1,750	7.05

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	e85	68	64	e43	34	96	298	883	339	140	139	80
2	e85	67	60	e42	36	92	268	675	340	112	134	81
3	e90	73	60	e41	44	78	257	574	314	103	126	80
4	e93	73	59	e41	47	89	246	534	294	104	119	76
5	e88	72	64	41	46	109	247	974	280	101	110	73
6	e82	72	66	40	47	190	234	2330	245	95	103	73
7	e75	72	65	40	50	187	216	1230	226	95	237	73
8	e78	72	65	40	53	187	343	913	212	94	1160	105
9	e78	70	64	41	53	168	673	864	191	88	1460	86
10	e76	72	65	40	53	148	487	711	222	94	632	78
11	e73	70	65	41	51	156	378	609	217	186	424	90
12	e74	68	67	42	53	180	360	548	195	284	347	84
13	e72	67	62	42	59	170	427	516	182	229	290	82
14	e72	67	57	43	57	152	620	462	205	160	251	154
15	e70	67	66	45	50	150	722	435	369	132	221	111
16	e69	66	64	45	57	162	549	522	360	117	212	103
17	e70	66	65	45	56	155	455	522	284	185	209	90
18	e79	66	65	43	56	159	438	524	242	151	190	87
19	e74	67	63	47	57	180	636	581	216	131	171	82
20	e75	68	62	44	56	225	658	514	198	139	156	78
21	e84	66	48	42	65	289	506	452	186	126	148	76
22	e82	64	e48	50	60	410	450	412	175	805	137	76
23	e80	65	e48	43	58	1000	417	382	164	419	126	75
24	e78	66	e47	e41	63	815	377	350	155	259	118	95
25	e76	65	e46	40	61	485	339	307	146	218	112	82
26	e76	64	e46	37	68	411	381	299	136	123	108	78
27	e74	65	e46	36	66	447	839	409	128	93	100	76
28	e73	69	45	37	65	471	863	467	118	195	95	76
29	e72	60	e45	37	---	443	815	412	111	199	89	74
30	e71	64	e45	36	---	343	1230	362	107	178	86	69
31	e70	---	e44	35	---	300	---	353	---	156	82	---
TOTAL	2394	2031	1776	1280	1521	8447	14729	19126	6557	5511	7892	2543
MEAN	77.2	67.7	57.3	41.3	54.3	272	491	617	219	178	255	84.8
MAX	93	73	67	50	68	1000	1230	2330	369	805	1460	154
MIN	69	60	44	35	34	78	216	299	107	88	82	69
AC-FT	4750	4030	3520	2540	3020	16750	29210	37940	13010	10930	15650	5040
CFSM	.25	.22	.19	.14	.18	.90	1.62	2.04	.72	.59	.84	.28
IN.	.29	.25	.22	.16	.19	1.04	1.81	2.35	.81	.68	.97	.31

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1981 - 1991, BY WATER YEAR (WY)

MEAN	197	140	114	74.8	125	399	343	317	178	213	151	208
MAX	824	337	300	167	454	760	795	617	384	546	501	1075
(WY)	1987	1983	1983	1983	1984	1983	1983	1991	1990	1981	1990	1986
MIN	20.0	24.5	21.0	22.5	23.8	165	106	88.3	49.0	23.2	24.6	31.5
(WY)	1990	1990	1990	1990	1990	1987	1981	1989	1989	1988	1988	1988

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1981 - 1991	
ANNUAL TOTAL	75844		73807			
ANNUAL MEAN	208		202		206	
HIGHEST ANNUAL MEAN					360	1983
LOWEST ANNUAL MEAN					87.3	1989
HIGHEST DAILY MEAN	1840	Apr 24	2330	May 6	7710	Sep 21 1986
LOWEST DAILY MEAN	21	Jan 6	34	Feb 1	12	Sep 12 1988
ANNUAL SEVEN-DAY MINIMUM	22	Jan 2	36	Jan 27	14	Sep 8 1988
INSTANTANEOUS PEAK FLOW	2260	Apr 24	2640	May 6	10000	Sep 21 1986
INSTANTANEOUS PEAK STAGE	8.02	Apr 24	8.49	May 6	20.77	Sep 21 1986
INSTANTANEOUS LOW FLOW			33	Feb 1,2	10a	Oct 23 1981
ANNUAL RUNOFF (AC-FT)	150400		146400		149300	
ANNUAL RUNOFF (CFSM)	.69		.67		.68	
ANNUAL RUNOFF (INCHES)	9.31		9.06		9.24	
10 PERCENT EXCEEDS	538		486		467	
50 PERCENT EXCEEDS	85		93		112	
90 PERCENT EXCEEDS	23		46		29	

a Result of regulation.
e Estimated.

WHITEWATER RIVER BASIN

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MN
(Hydrologic bench-mark station)

LOCATION.--Lat 44°05'30", long 92°03'57", in sec.7, T.107 N., R.10 W., Winona County, Hydrologic Unit 07040003, on left bank 2.3 mi upstream from Middle Fork, 2.4 mi west of Elba, and 3.5 mi upstream from confluence with South Fork.
DRAINAGE AREA.--101 mi^2.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--May 1939 to September 1941, July 1967 to current year.
REVISED RECORDS.--WRD MN-74: 1967(M), 1969(M), 1971(M), 1972(M), 1973(M). WRD MN-80-2: 1978.
GAGE.--Water-stage recorder. Datum of gage is 769.60 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 12, 1939, nonrecording gage at site 2 mi downstream at different datum. Oct. 12, 1939, to Sept. 30, 1941, water-stage recorder at site 600 ft downstream at present datum. Prior to July 6, 1978, water-stage recorder at same site and present datum (gage destroyed by flood of July 1978), July 6 to Oct. 30, 1978, nonrecording gage at same site and present datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	23	22	23	e22	e18	37	105	63	30	36	31
2	21	23	23	23	e22	e18	33	87	59	30	35	30
3	25	23	24	23	e22	e18	32	75	55	31	35	30
4	25	23	24	22	e22	e17	31	69	53	32	35	30
5	25	23	24	22	e22	18	31	90	52	35	34	29
6	25	23	23	22	e21	24	30	180	47	34	33	29
7	23	23	22	22	e21	27	28	113	45	31	39	29
8	22	23	23	23	e21	29	31	95	43	31	140	34
9	22	23	23	22	e21	25	35	94	42	31	131	35
10	22	23	23	22	e21	23	39	78	41	31	73	34
11	22	23	23	24	e21	24	35	68	40	32	59	31
12	22	23	23	24	e21	25	32	60	40	68	52	33
13	22	23	23	23	e20	27	31	64	38	56	49	33
14	22	23	22	24	e20	28	33	64	38	38	48	37
15	22	23	24	24	e20	27	34	55	59	33	46	39
16	22	24	24	24	e20	27	33	69	85	33	45	37
17	22	24	24	24	e20	27	33	67	50	44	45	34
18	23	23	24	24	e20	27	35	59	42	50	45	33
19	23	23	25	24	e20	29	39	59	39	39	42	31
20	23	23	25	24	e20	36	49	55	38	38	41	31
21	26	25	22	23	e20	53	42	51	37	39	40	31
22	25	24	23	23	e20	61	40	48	37	109	40	31
23	25	23	14	23	e20	98	38	48	36	95	38	31
24	24	23	9.6	26	e19	88	36	49	35	55	37	31
25	24	23	17	24	e19	62	34	51	34	45	36	32
26	23	23	17	23	e19	53	34	55	33	41	35	32
27	23	23	22	23	e19	49	56	71	34	39	35	30
28	22	23	23	23	e19	48	78	89	32	39	33	29
29	22	22	23	e23	---	45	96	110	31	40	33	30
30	22	22	23	e23	---	39	175	74	30	40	33	30
31	22	---	24	e23	---	38	---	66	---	38	32	---
TOTAL	713	693	685.6	720	572	1128	1310	2318	1308	1327	1455	957
MEAN	23.0	23.1	22.1	23.2	20.4	36.4	43.7	74.8	43.6	42.8	46.9	31.9
MAX	26	25	25	26	22	98	175	180	85	109	140	39
MIN	21	22	9.6	22	19	17	28	48	30	30	32	29
AC-FT	1410	1370	1360	1430	1130	2240	2600	4600	2590	2630	2890	1900
CFSM	.23	.23	.22	.23	.20	.36	.43	.74	.43	.42	.46	.32
IN.	.26	.26	.25	.27	.21	.42	.48	.85	.48	.49	.54	.35

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1939 - 1991, BY WATER YEAR (WY)

MEAN	36.1	34.5	31.1	29.6	33.6	91.0	59.1	48.4	57.0	59.2	37.3	40.5
MAX	143	71.6	58.3	74.6	97.2	244	177	120	364	317	71.2	184
(WY)	1987	1987	1987	1973	1985	1973	1974	1973	1974	1978	1979	1986
MIN	14.4	14.1	12.9	13.1	14.2	14.5	14.8	15.6	25.8	15.8	15.0	13.5
(WY)	1968	1968	1940	1940	1968	1968	1968	1968	1972	1967	1967	1940

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1939 - 1991	
ANNUAL TOTAL	15348.6		13186.6			
ANNUAL MEAN	42.1		36.1		46.8	
HIGHEST ANNUAL MEAN					93.3	1974
LOWEST ANNUAL MEAN					19.4	1968
HIGHEST DAILY MEAN	887	Jul 7	180	May 6	6440	Jun 21 1974
LOWEST DAILY MEAN	9.6	Dec 24	9.6	Dec 24	9.6	Dec 24 1990
ANNUAL SEVEN-DAY MINIMUM	18	Dec 21	18	Dec 21	12	Dec 30 1939
INSTANTANEOUS PEAK FLOW	3420	Jul 7	220	Apr 30	16100	Jun 21 1974
INSTANTANEOUS PEAK STAGE	8.49	Jul 7	5.35	Apr 30	16.32b	Jun 21 1974
INSTANTANEOUS LOW FLOW			7.0a	Dec 26	7.0a	Dec 26 1990
ANNUAL RUNOFF (AC-FT)	30440		26160		33920	
ANNUAL RUNOFF (CFSM)	.42		.36		.46	
ANNUAL RUNOFF (INCHES)	5.65		4.86		6.30	
10 PERCENT EXCEEDS	55		59		68	
50 PERCENT EXCEEDS	24		30		32	
90 PERCENT EXCEEDS	21		22		17	

a Result of freezeup.
b From floodmark.
e Estimated.

WHITEWATER RIVER BASIN

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MN--Continued
(Hydrologic bench-mark station)

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1967 to current year.

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

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

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 (STAND-ARD UNITS) (00400)	PH 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)
NOV												
19...	1300	23	524	533	8.3	8.2	6.5	0.3	746	12.7	K4	K12
JAN												
30...	1045	23	546	572	8.7	8.0	0.5	1.8	724	13.9	2	80
MAR												
20...	1030	34	548	531	8.2	8.2	6.0	1.4	750	--	K2	20
APR												
29...	1200	77	--	--	--	--	13.0	--	--	--	--	--
29...	1750	115	--	--	--	--	13.5	--	--	--	--	--
30...	0700	216	--	--	--	--	--	--	--	--	--	--
MAY												
09...	0945	97	640	587	8.3	8.1	10.0	10	744	11.3	400	480
JUL												
25...	1132	45	--	--	--	--	16.0	--	--	--	--	--
30...	1100	40	589	532	8.1	8.2	16.0	4.8	744	11.1	--	62
30...	1130	40	378	--	--	--	16.0	--	--	--	--	--
AUG												
29...	0930	35	562	568	8.1	8.1	18.0	2.4	745	9.6	110	K1000

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)
NOV												
19...	73	27	5.0	1.1	251	244	0	306	13	9.6	0.1	13
JAN												
30...	75	26	4.6	1.0	276	280	0	336	15	11	<0.1	16
MAR												
20...	69	25	5.9	1.3	221	254	0	270	15	10	0.1	12
APR												
29...	--	--	--	--	--	--	--	--	--	--	--	--
29...	--	--	--	--	--	--	--	--	--	--	--	--
30...	--	--	--	--	--	--	--	--	--	--	--	--
MAY												
09...	84	22	7.1	2.4	256	257	0	312	18	18	0.1	14
JUL												
25...	--	--	--	--	--	--	--	--	--	--	--	--
30...	81	26	6.6	2.0	262	272	0	320	18	16	0.1	16
30...	--	--	--	--	--	--	--	--	--	--	--	--
AUG												
29...	78	27	6.2	1.7	276	249	0	337	17	16	0.2	13

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MN--Continued

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)
NOV												
19...	296	<0.01	2.9	0.04	0.04	0.4	0.02	0.02	0.02	0.02	30	32
JAN												
30...	326	<0.01	3.3	0.01	0.01	<0.2	0.05	0.04	0.04	0.04	<1	--
MAR												
20...	299	0.01	3.2	0.04	<0.01	0.3	0.05	0.05	0.04	0.04	32	20
APR												
29...	--	--	--	--	--	--	--	--	--	--	63	--
29...	--	--	--	--	--	--	--	--	--	--	91	--
30...	--	--	--	--	--	--	--	--	--	--	629	--
MAY												
09...	332	0.03	6.2	0.03	0.03	1.0	0.20	0.13	0.15	0.13	61	72
JUL												
25...	--	--	--	--	--	--	--	--	--	--	42	--
30...	332	0.01	4.5	0.02	0.01	0.5	0.14	0.11	0.09	0.09	83	26
30...	--	--	--	--	--	--	--	--	--	--	50	--
AUG												
29...	311	0.01	3.2	0.02	0.02	0.6	0.08	0.07	0.05	0.05	47	54

DATE	TIME	ALUM-INUM, DIS-SOLVED (UG/L AS AL) (01106)	ARSENIC DIS-SOLVED (UG/L AS AS) (01000)	BARIUM, DIS-SOLVED (UG/L AS BA) (01005)	BERYL-LIUM, DIS-SOLVED (UG/L AS BE) (01010)	CADMIUM DIS-SOLVED (UG/L AS CD) (01025)	CHRO-MIUM, DIS-SOLVED (UG/L AS CR) (01030)	COBALT, DIS-SOLVED (UG/L AS CO) (01035)	COPPER, DIS-SOLVED (UG/L AS CU) (01040)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	LEAD, DIS-SOLVED (UG/L AS PB) (01049)
NOV											
19...	1300	<10	<1	51	<0.5	<1.0	<1	<3	1	4	<1
MAY											
09...	0945	<10	<1	70	<0.5	<1.0	<1	<3	1	6	6
JUL											
30...	1100	<10	<1	75	<0.5	<1.0	2	<3	2	4	<1
AUG											
29...	0930	<10	<1	65	<0.5	<1.0	<1	<3	<1	4	<1

DATE	LITHIUM DIS-SOLVED (UG/L AS LI) (01130)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	MERCURY DIS-SOLVED (UG/L AS HG) (71890)	MOLYB-DENUM, DIS-SOLVED (UG/L AS MO) (01060)	NICKEL, DIS-SOLVED (UG/L AS NI) (01065)	SELE-NIUM, DIS-SOLVED (UG/L AS SE) (01145)	SILVER, DIS-SOLVED (UG/L AS AG) (01075)	STRON-TIUM, DIS-SOLVED (UG/L AS SR) (01080)	VANA-DIUM, DIS-SOLVED (UG/L AS V) (01085)	ZINC, DIS-SOLVED (UG/L AS ZN) (01090)
NOV										
19...	8	7	0.1	<10	2	<1	<1.0	72	<6	4
MAY										
09...	5	21	<0.1	<10	2	1	<1.0	97	<6	<3
JUL										
30...	6	14	<0.1	<10	<1	<1	<1.0	85	<6	<3
AUG										
29...	8	12	<0.1	<10	<1	<1	<1.0	81	<6	9

WHITEWATER RIVER BASIN

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MN--Continued

RADIOCHEMICAL ANALYSIS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	GROSS ALPHA, DIS-SOLVED (UG/L AS U-NAT) (80030)	GROSS ALPHA, SUSP. TOTAL (UG/L AS U-NAT) (80040)	GROSS BETA, DIS-SOLVED (PCI/L AS CS-137) (03515)	GROSS BETA, SUSP. TOTAL (PCI/L AS CS-137) (03516)	GROSS BETA, DIS-SOLVED (PCI/L AS SR/YT-90) (80050)	GROSS BETA, SUSP. TOTAL (PCI/L AS SR/YT-90) (80060)	RADIUM 226, DIS-SOLVED, RADON METHOD (PCI/L) (09511)	URANIUM NATURAL DIS-SOLVED (UG/L AS U) (22703)
JAN									
30...	1045	0.6	<0.6	2.3	<0.6	1.7	<0.6	0.05	0.56
MAR									
20...	1030	0.6	<0.6	2.8	<0.6	2.1	<0.6	0.05	0.62

SUSPENDED-SEDIMENT, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DAY	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/DAY)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS/DAY)
	APRIL		JUNE		JULY	
15	---	---	61	15	---	---
16	---	---	97	22	---	---
23	---	---	---	---	195	73
29	146	55	---	---	---	---
30	500	236	---	---	---	---

WHITEWATER RIVER BASIN

05376100 MIDDLE FORK WHITEWATER RIVER NEAR ST. CHARLES, MN

LOCATION.--Lat 44°02'20", long 92°07'00", in SE¼ sec.26, T.107 N., R.11 W., Olmsted County, Hydrologic Unit 07040003, on left downstream side of bridge on County Road 107, 8.5 mi upstream from confluence with North Fork.

DRAINAGE AREA.--Undetermined.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--September 1987 to June 1988 (discharge measurements only). July 1988 to current year during open-water periods only.

GAGE.--Water-stage recorder. Datum of gage is undetermined.

REMARKS.--Records good. Gage operated during open-water period only. Data for years previous to the 1991 water year are questionable and were not published.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge observed 637 ft^3/s, Mar. 11, 1989, gage height, 13.42 ft; minimum discharge observed, 4.9 ft^3/s, June 29, 1989.

EXTREMES FOR CURRENT PERIOD.--March to September 1991: Maximum discharge 542 ft^3/s, July 21, gage height, 12.87 ft; minimum 6.7 ft^3/s, Mar. 15-18, gage height, 10.62 ft.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	14	26	22	12	18	13
2	---	---	---	---	---	---	14	24	21	12	18	13
3	---	---	---	---	---	---	13	22	19	11	17	13
4	---	---	---	---	---	---	13	22	18	14	17	13
5	---	---	---	---	---	---	13	52	17	12	16	13
6	---	---	---	---	---	---	13	35	16	11	16	13
7	---	---	---	---	---	---	13	27	16	11	18	12
8	---	---	---	---	---	---	16	29	16	11	46	14
9	---	---	---	---	---	---	18	28	15	11	24	14
10	---	---	---	---	---	---	15	25	16	11	21	12
11	---	---	---	---	---	---	14	24	16	12	19	13
12	---	---	---	---	---	---	15	23	15	31	19	13
13	---	---	---	---	---	---	17	28	16	13	18	13
14	---	---	---	---	---	---	21	25	16	13	17	15
15	---	---	---	---	---	6.7	20	23	44	13	17	14
16	---	---	---	---	---	6.7	17	36	20	13	17	13
17	---	---	---	---	---	6.7	17	27	17	25	18	12
18	---	---	---	---	---	6.9	16	25	16	16	17	12
19	---	---	---	---	---	8.5	23	24	15	16	16	11
20	---	---	---	---	---	12	19	23	15	18	16	11
21	---	---	---	---	---	19	18	22	14	63	16	11
22	---	---	---	---	---	18	18	21	14	61	15	11
23	---	---	---	---	---	36	18	21	14	26	15	11
24	---	---	---	---	---	20	17	21	14	22	15	12
25	---	---	---	---	---	18	16	20	14	20	14	12
26	---	---	---	---	---	17	17	21	13	19	14	11
27	---	---	---	---	---	18	32	22	13	19	14	11
28	---	---	---	---	---	17	21	26	12	21	13	10
29	---	---	---	---	---	16	53	21	12	20	13	11
30	---	---	---	---	---	15	35	19	12	18	13	11
31	---	---	---	---	---	15	---	31	---	18	13	---
TOTAL	---	---	---	---	---	---	566	793	498	593	540	368
MEAN	---	---	---	---	---	---	18.9	25.6	16.6	19.1	17.4	12.3
MAX	---	---	---	---	---	---	53	52	44	63	46	15
MIN	---	---	---	---	---	---	13	19	12	11	13	10
AC-FT	---	---	---	---	---	---	1120	1570	988	1180	1070	730
CFSM	---	---	---	---	---	---	.75	1.02	.66	.76	.69	.49
IN.	---	---	---	---	---	---	.84	1.17	.74	.88	.80	.54

WHITEWATER RIVER BASIN

05376100 MIDDLE FORK WHITEWATER RIVER NEAR ST. CHARLES, MN--Continued

WATER-QUALITY RECORDS

PERIOD OF RECORD.--September 1987 to current year during open-water periods only.

INSTRUMENTATION.--Automatic sampler since September 1987 for storm-event sampling during open-water periods.

REMARKS.--Data for years previous to the 1991 water year are questionable and were not published.

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	TEMPER-ATURE WATER (DEG C) (00010)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)
MAR					
19...	1025	9.0	4.0	46	1.1
23...	1224	32	3.0	351	30
APR					
29...	1330	81	13.5	539	118
29...	1720	57	14.0	558	86
30...	0915	35	--	271	26
MAY					
22...	1245	21	18.0	48	2.7
JUN					
15...	1324	33	19.0	782	70
JUL					
11...	1145	11	--	44	1.3
21...	2300	110	20.0	1080	321
22...	1330	57	--	495	76
30...	1301	18	16.0	66	3.2

WHITEWATER RIVER BASIN

05376800 WHITEWATER RIVER NEAR BEAVER, MN

LOCATION.--Lat 44°00'19", long 92°00'19", in SW¼SE¼ sec.15, T.108 N., R.10 W., Winona County, Hydrologic Unit 07040003, on left bank at downstream side of bridge on County Road No. 30, 0.5 mi above mouth of Beaver Creek, and 4.7 mi north of Elba.
DRAINAGE.--271 mi^2.

WATER-DISHARGE RECORDS

PERIOD OF RECORD.--May 1975 to September 1985, May 1991 to current year.
GAGE.--Water-stage recorder. Datum of gage is 692.01 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1976, at datum 2.00 ft higher.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge since at least 1939, 19,200 ft^3/s, June 21, 1974, gage height, 13.00 ft, present datum, determined by contracted-opening measurement.
EXTREMES FOR CURRENT PERIOD.--May to September 1991: Peak discharges greater than base discharge of 2,000 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Jul 22	0100	*2,040	*6.95	No other peak greater than base discharge.			

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	---	---	---	---	---	---	---	---	e210	e120	139	123
2	---	---	---	---	---	---	---	---	e192	e123	138	123
3	---	---	---	---	---	---	---	---	e164	e130	140	122
4	---	---	---	---	---	---	---	---	e155	e132	139	121
5	---	---	---	---	---	---	---	---	e150	e138	138	121
6	---	---	---	---	---	---	---	---	e137	e129	138	119
7	---	---	---	---	---	---	---	---	e131	e119	152	118
8	---	---	---	---	---	---	---	---	e128	e115	340	126
9	---	---	---	---	---	---	---	---	e126	e107	336	130
10	---	---	---	---	---	---	---	---	e124	e117	247	122
11	---	---	---	---	---	---	---	---	e120	e114	212	114
12	---	---	---	---	---	---	---	---	e117	e182	195	119
13	---	---	---	---	---	---	---	---	e130	e170	185	112
14	---	---	---	---	---	---	---	---	e180	e130	180	126
15	---	---	---	---	---	---	---	220	e312	e124	175	127
16	---	---	---	---	---	---	---	311	e231	e107	172	116
17	---	---	---	---	---	---	---	285	e171	e141	177	112
18	---	---	---	---	---	---	---	e236	e160	e169	167	109
19	---	---	---	---	---	---	---	e228	e148	e130	160	109
20	---	---	---	---	---	---	---	e204	e139	e124	158	109
21	---	---	---	---	---	---	---	e188	147	e188	156	117
22	---	---	---	---	---	---	---	e175	144	703	152	116
23	---	---	---	---	---	---	---	e162	141	280	151	110
24	---	---	---	---	---	---	---	e160	e130	191	148	121
25	---	---	---	---	---	---	---	e161	e130	162	145	123
26	---	---	---	---	---	---	---	e169	e130	148	142	114
27	---	---	---	---	---	---	---	e180	e124	142	138	109
28	---	---	---	---	---	---	---	e200	e118	153	132	116
29	---	---	---	---	---	---	---	224	e117	155	130	115
30	---	---	---	---	---	---	---	198	e118	147	129	109
31	---	---	---	---	---	---	---	209	---	144	127	---
TOTAL	---	---	---	---	---	---	---	---	4524	5034	5238	3528
MEAN	---	---	---	---	---	---	---	---	151	162	169	118
MAX	---	---	---	---	---	---	---	---	312	703	340	130
MIN	---	---	---	---	---	---	---	---	117	107	127	109
AC-FT	---	---	---	---	---	---	---	---	8970	9980	10390	7000
CFSM	---	---	---	---	---	---	---	---	.56	.60	.62	.43
IN.	---	---	---	---	---	---	---	---	.62	.69	.72	.48

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1975 - 1991, BY WATER YEAR (WY)

MEAN	131	138	128	120	141	264	180	174	174	237	147	143
MAX	187	203	180	188	236	512	264	255	240	973	205	230
(WY)	1984	1984	1984	1980	1985	1985	1983	1984	1980	1978	1979	1978
MIN	88.0	84.8	77.0	80.6	59.7	84.2	92.9	89.6	112	92.1	87.1	85.5
(WY)	1978	1978	1977	1978	1978	1978	1977	1977	1976	1977	1977	1977

SUMMARY STATISTICS	FOR 1991 PERIOD		WATER YEARS 1975 - 1991	
ANNUAL MEAN			164	
HIGHEST ANNUAL MEAN			203	1984
LOWEST ANNUAL MEAN			103	1977
HIGHEST DAILY MEAN	703	Jul 22	8760	Jul 6 1978
LOWEST DAILY MEAN	107	Jul 9,16	53	Feb 20 1978
ANNUAL SEVEN-DAY MINIMUM			53	Feb 20 1978
INSTANTANEOUS PEAK FLOW	2040	Jul 22	15400	Jul 6 1978
INSTANTANEOUS PEAK STAGE	6.95	Jul 22	12.88	Jul 6 1978
INSTANTANEOUS LOW FLOW	93	Sep 30		
ANNUAL RUNOFF (AC-FT)			119100	
ANNUAL RUNOFF (CFSM)			.61	
ANNUAL RUNOFF (INCHES)			8.24	

e Estimated.

WATER QUALITY RECORDS

PERIOD OF RECORD.--Water years, 1975-1981, 1991.

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	TEMPER-ATURE WATER (DEG C) (00010)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	SEDI-MENT, DIS-CHARGE, SUS-PENDED (T/DAY) (80155)
MAR					
19...	1305	120	7.0	40	13
23...	1610	313	3.0	347	293
APR					
29...	1345	E460	14.0	1420	--
29...	1730	E435	14.0	5900	--
30...	0930	E460	8.0	992	--
MAY					
09...	1315	304	12.0	227	186
16...	2025	502	17.0	8640	11700
JUN					
15...	1357	319	19.0	2840	2450
JUL					
10...	1145	123	18.0	54	18
21...	2318	980	21.0	8710	23000
22...	1405	600	22.0	975	1580
30...	1206	145	16.0	109	43
AUG					
08...	1125	369	16.0	515	513

GARVIN BROOK BASIN

05378235 GARVIN BROOK NEAR MINNESOTA CITY, MN

LOCATION.--Lat 44°04'16", long 91°45'51", in SE¼NE¼ sec. 15, T.107 N., R.8 W., Winona County, Hydrologic Unit 07040003, on left bank, 20 ft downstream from County 23 bridge, 1.8 mi south of Minnesota City, and 2.3 mi upstream from Rollingstone Creek.

PERIOD OF RECORD.--March 1982 to November 1983, January 1984 to current year (partial winter records in 1984), (discontinued).

GAGE.--Water stage recorder and broad-crested weir.

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

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	27	27	e30	e27	24	e27	39	40	e31	44	e36
2	29	28	27	e30	e27	27	25	37	40	e30	45	e35
3	29	28	28	e30	e27	24	26	36	34	e28	41	e34
4	29	29	37	e30	e27	21	26	36	34	e28	42	e33
5	29	29	34	e30	e27	22	27	44	32	e29	41	e33
6	29	28	30	e30	e26	28	27	41	31	e28	40	e33
7	29	27	29	e30	e26	26	28	37	37	e27	43	e33
8	29	27	29	e30	e26	24	28	39	37	e28	70	e33
9	29	27	29	e30	26	23	29	39	e37	e29	45	e36
10	29	27	28	e30	26	23	29	39	e38	e30	41	e33
11	29	27	28	e30	26	24	30	40	e39	e28	38	e33
12	29	27	29	e30	e26	25	31	39	e38	e37	37	e34
13	29	27	29	e38	e25	e26	31	38	e38	e35	37	e33
14	29	28	e33	41	25	e26	32	37	e38	e35	37	e34
15	29	28	33	35	24	e26	32	38	e40	e35	38	e35
16	30	28	32	32	e24	e26	32	98	e38	e35	37	e33
17	30	28	33	31	e24	e26	30	56	e37	e35	38	e33
18	30	27	32	31	e24	e27	29	46	e37	e39	37	e33
19	30	27	32	30	24	e28	33	44	e36	e39	37	e33
20	30	28	32	30	24	e31	31	41	e35	e39	37	e33
21	30	28	e31	e30	24	e38	29	38	e34	e1990	37	e33
22	30	27	e29	e29	24	e58	26	37	e34	e500	37	e33
23	30	28	e28	e29	23	e51	26	37	e33	e105	37	e33
24	29	28	e27	e29	23	e47	26	37	e32	e58	37	e34
25	28	28	e29	e29	28	e43	25	37	e31	e41	37	e34
26	28	28	e30	e28	e25	e39	28	37	e30	e41	37	e33
27	27	27	e32	e28	23	e36	36	36	e30	e41	37	e33
28	27	25	e32	e28	23	e33	31	36	e30	e43	36	e33
29	27	24	e31	e28	---	e31	83	36	e30	e46	36	e33
30	27	27	e31	e28	---	e30	46	35	e30	47	36	e33
31	27	---	e31	e27	---	e28	---	39	---	46	36	---
TOTAL	895	822	942	941	704	941	939	1269	1050	3603	1228	1005
MEAN	28.9	27.4	30.4	30.4	25.1	30.4	31.3	40.9	35.0	116	39.6	33.5
MAX	30	29	37	41	28	58	83	98	40	1990	70	36
MIN	27	24	27	27	23	21	25	35	30	27	36	33
AC-FT	1780	1630	1870	1870	1400	1870	1860	2520	2080	7150	2440	1990

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1982 - 1991, BY WATER YEAR (WY)

MEAN	33.5	31.5	31.1	28.9	34.3	47.3	40.5	35.4	33.4	40.6	32.1	35.1
MAX	51.1	38.6	37.5	34.1	62.3	80.0	85.0	40.9	44.7	116	39.6	67.1
(WY)	1987	1985	1985	1985	1985	1989	1990	1991	1984	1991	1991	1986
MIN	21.4	26.1	25.6	21.1	25.1	30.4	31.3	25.6	22.5	23.4	21.9	20.6
(WY)	1989	1990	1990	1989	1991	1991	1989	1989	1989	1988	1988	1988

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1982 - 1991	
ANNUAL TOTAL	13685		14339			
ANNUAL MEAN	37.5		39.3		35.6	
HIGHEST ANNUAL MEAN					41.2	1985
LOWEST ANNUAL MEAN					28.9	1988
HIGHEST DAILY MEAN	381	Apr 24	1990	Jul 21	1990	Jul 21 1991
LOWEST DAILY MEAN	15	May 15	21	Mar 4	15	May 15 1990
ANNUAL SEVEN-DAY MINIMUM	20	May 9	23	Feb 27	18	Jan 22 1989
INSTANTANEOUS PEAK FLOW	1290	Apr. 24	11200	Jul 21	11200	Jul 21 1991
INSTANTANEOUS PEAK STAGE	5.96	Apr. 24	17.79	Jul 21	17.79	Jul 21 1991
INSTANTANEOUS LOW FLOW			16	Feb 16	12	Jan 4 1989
ANNUAL RUNOFF (AC-FT)	27140		28440		25820	
10 PERCENT EXCEEDS	58		40		41	
50 PERCENT EXCEEDS	29		30		33	
90 PERCENT EXCEEDS	25		26		25	

e Estimated.

MISSISSIPPI RIVER MAIN STEM

05378500 MISSISSIPPI RIVER AT WINONA, MN

LOCATION.--Lat 44°03'21", long 91°38'16", in sec.23, T.107 N., R.7 W., Winona County, Hydrologic Unit 07040003, on right bank at Winona pumping station in Winona, 9.5 mi upstream from Trempealeau River, and at mile 725.7 upstream from the Ohio River.
DRAINAGE AREA.--59,200 mi^2, approximately.

WATER-DISCHARGE RECORDS

PERIOD OF RECORD.--June 1928 to current year. Gage-height records collected in this vicinity since 1878 are contained in reports of Mississippi River Commission.
GAGE.--Water-stage recorder. Datum of gage is 639.64 ft above National Geodetic Vertical Datum of 1929. June 10, 1928, to Apr. 15, 1931, nonrecording gage at site 800 ft upstream. Prior to Oct. 1, 1929, at datum 0.20 ft higher and Oct. 1, 1929, to Apr. 15, 1931, at datum 0.12 ft lower. Apr. 16, 1931, to Nov. 12, 1934, nonrecording gage at present site and datum. Since Mar. 31, 1937, auxiliary water-stage recorder 2.7 mi upstream at tailwater of navigation dam 5A.
REMARKS.--No estimated daily discharges. Records good. Some regulation by reservoirs, navigation dams, and powerplants at low and medium stages. Flood flow not materially affected by artificial storage.
EXTREMES FOR PERIOD OF RECORD.--Minimum gage height, -3.38 ft, Aug. 31, 1934 (prior to dam construction in 1936); minimum gage height since 1938, after completion of dam, 1.95 ft, Jan. 27, 1944.
EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of June 18, 1880, reached an elevation of 657.14 ft, discharge, 172,000 ft^3/s, from information by U.S. Army Corps of Engineers.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18300	26800	15700	12400	10500	12300	80100	55500	71400	56600	35800	20800
2	17900	26000	14400	12300	10700	12600	78500	54200	75100	55800	35800	17900
3	15600	25200	14300	12300	10800	13800	73400	53300	79500	56400	35800	15600
4	15900	24200	14700	12700	10900	12600	67500	53300	83600	57500	36000	13800
5	18400	23100	14100	12600	10900	12600	64500	56100	87400	58500	36500	14100
6	19500	21200	13800	12500	11000	12400	59500	61500	89800	59300	36100	16000
7	22200	20500	13700	12400	10700	12400	54800	64600	88400	60400	36100	19300
8	23900	19100	12900	12400	10800	12800	51400	68500	83500	61700	39300	21200
9	23600	18400	12800	12400	11200	14800	50300	73100	78400	61800	38900	22800
10	22500	19100	12900	12300	11700	15500	49500	78900	74600	60400	38200	25800
11	22400	20300	12700	12300	12400	14900	49400	84800	71400	58100	39100	31100
12	21800	22100	13200	12200	12200	14100	50700	89200	70500	56700	36800	39000
13	21800	21600	15000	12200	11900	14600	51700	92000	68400	55500	35300	45100
14	21000	19800	15500	12100	12100	16700	55000	92800	66400	54900	35500	49900
15	20800	17700	14400	12100	12900	19200	56300	92000	69600	52700	36400	51900
16	20000	18400	14300	12100	13200	19700	54900	91300	70300	50100	38200	53400
17	18400	18100	14200	12000	13100	20100	55400	89100	69600	50200	38200	54600
18	17100	16200	14300	12000	13000	19600	60100	85100	67900	52500	36500	56000
19	19100	15100	14000	12000	12900	19000	64100	80500	67000	51600	34500	57700
20	20500	15800	13900	12100	12800	19300	65500	77900	66500	50700	32200	57400
21	24600	15500	12100	12100	12700	20700	65600	76000	65100	50700	30500	56500
22	26700	16500	11400	12000	12700	25700	66300	72800	63200	55700	30300	55900
23	29600	20000	9000	11900	13000	34100	66200	68900	60200	54100	29800	54500
24	35000	21000	8400	11000	13100	39000	65200	65000	59500	50600	28100	51800
25	36900	20400	8800	10800	12900	43800	63300	61000	63300	47600	26900	48900
26	35100	17600	8900	10200	12700	52900	60800	58500	64200	44600	26000	47500
27	33200	15100	9000	10400	12500	63100	59600	56400	63000	42600	25200	45600
28	31200	14400	9400	10500	12200	69600	58400	57100	62300	41800	24500	42200
29	29300	15200	10300	10500	---	74500	59100	60400	60400	40300	23500	40600
30	26500	14400	10600	10500	---	77600	57400	63700	58800	37900	22400	37100
31	27300	---	12200	10500	---	79400	---	66700	---	36200	20700	---
TOTAL	736100	578800	390900	365800	337500	889400	1814500	2200200	2119300	1623500	1019100	1164000
MEAN	23750	19290	12610	11800	12050	28690	60480	70970	70640	52370	32870	38800
MAX	36900	26800	15700	12700	13200	79400	80100	92800	89800	61800	39300	57700
MIN	15600	14400	8400	10200	10500	12300	49400	53300	58800	36200	20700	13800
AC-FT	1460000	1148000	775400	725600	669400	1764000	3599000	4364000	4204000	3220000	2021000	2309000
CFSM	.40	.33	.21	.20	.20	.48	1.02	1.20	1.19	.88	.56	.66
IN.	.46	.36	.25	.23	.21	.56	1.14	1.38	1.33	1.02	.64	.73

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1928 - 1991, BY WATER YEAR (WY)

MEAN	21750	21460	16630	14500	14710	29250	59040	47010	38240	29340	19890	21570
MAX	85950	50040	38540	30480	35900	86420	152600	111500	95980	64490	58410	69490
(WY)	1987	1972	1983	1983	1984	1983	1965	1986	1943	1957	1972	1986
MIN	6774	7367	6282	6742	7874	9023	12810	11930	8450	7063	5391	6790
(WY)	1934	1934	1934	1940	1977	1934	1931	1931	1934	1934	1934	1933

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1928 - 1991	
ANNUAL TOTAL	9827800		13239100			
ANNUAL MEAN	26930		36270		27810	
HIGHEST ANNUAL MEAN					56850	1986
LOWEST ANNUAL MEAN					9741	1934
HIGHEST DAILY MEAN	74300	Mar 19	92800	May 14	264000	Apr 20 1965
LOWEST DAILY MEAN	8400	Dec 24	8400	Dec 24	2250	Dec 29 1933
ANNUAL SEVEN-DAY MINIMUM	9030	Feb 10	9110	Dec 23	3210	Dec 27 1933
INSTANTANEOUS PEAK FLOW	74700	Mar 19	92900	May 14	268000	Apr 19 1965
INSTANTANEOUS PEAK STAGE	9.43	Mar 19	10.99	May 14	20.77a	Apr 19 1965
INSTANTANEOUS LOW FLOW					1940b	Dec 12 1980
ANNUAL RUNOFF (AC-FT)	19490000		26260000		20140000	
ANNUAL RUNOFF (CFSM)	.45		.61		.47	
ANNUAL RUNOFF (INCHES)	6.18		8.32		6.38	
10 PERCENT EXCEEDS	47300		69200		57600	
50 PERCENT EXCEEDS	22500		27300		19500	
90 PERCENT EXCEEDS	9900		12100		9700	

a From floodmark.
b Result of ice jam.

WATER-QUALITY RECORDS

PERIOD OF RECORD.--Water years 1963 to current year.

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	TEMPERATURE WATER (DEG C) (00010)	SEDIMENT, SUSPENDED (MG/L) (80154)
MAY 08...	1603	10.0	56

ROOT RIVER BASIN

05385000 ROOT RIVER NEAR HOUSTON, MN

LOCATION.--43°46'07", long 91°34'11", in SW¼NW¼ sec.33, T.104 N., R.6 W., Houston County, Hydrologic Unit 07040008, on right bank 0.2 mi north of Houston and 1.6 mi upstream from South Fork and 18.2 mi upstream from mouth.
DRAINAGE AREA.--1,270 mi^2, approximately.
PERIOD OF RECORD.--May 1909 to September 1917, May to November 1929, March 1930 to 1983, 1991. Operated as high-flow partial-record station October 1983 to September 1990. Monthly discharge only for some periods, published in WSP 1308.
REVISED RECORDS.--WSP 895: Drainage area. WSP 1508: 1911-12. WSP 1628: 1948(P).
GAGE.--Water-stage recorder. Datum of gage is 667.00 ft National Geodetic Vertical Datum of 1929. May 28, 1909, to Sept. 30, 1917, nonrecording gage at site 1.3 mi downstream at different datum. May 4, 1929, to Sept. 27, 1933, nonrecording gage and Sept. 28, 1933 to June 26, 1980, recording gage at site 0.9 mi upstream at datum 671.86 ft.
REMARKS.--Records good except those for estimated daily discharges, which are fair. Slight diurnal fluctuation at low flows caused by powerplants above station.
EXTREME FOR CURRENT YEAR.--Peak discharges above base of 5,000 ft^3/s and maximum (*).

Date	Time	Discharge (ft^3/s)	Gage height (ft)
May 7	0130	*4,940	*10.04

Minimum daily discharge, 355 ft^3/s Dec. 25, 26.

Date	Time	Discharge (ft^3/s)	Gage height (ft)

No peak greater than base discharge.

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	578	522	493	e361	e395	e508	e990	3940	1430	667	722	622
2	578	522	497	e362	e405	e503	e980	2790	1410	668	696	607
3	596	522	e490	e365	e415	e497	e960	2300	1320	654	695	618
4	636	522	474	e369	e430	e496	945	2020	1240	644	692	607
5	623	522	e470	e370	e440	e500	912	1890	1160	642	696	594
6	605	522	e465	e375	e455	e500	904	3010	1100	642	670	588
7	582	522	e460	e380	e465	e502	879	4250	1060	651	714	585
8	574	522	e452	e385	e470	e515	874	2760	1030	690	1000	581
9	569	524	e451	e390	e470	e530	891	2460	997	692	2280	606
10	561	521	e450	e395	e470	e553	947	2380	968	669	2620	636
11	561	518	e450	e400	e470	e556	989	2080	941	653	1650	611
12	561	515	e450	e405	e455	e591	948	1880	985	752	1290	640
13	556	514	e449	e405	e445	e608	951	1750	961	847	1130	863
14	556	512	e448	e405	e435	e614	1030	1630	1110	782	1040	974
15	552	513	e440	e405	e430	e619	1320	1510	1050	716	977	1070
16	548	519	e440	e405	e430	e623	1750	2150	1050	674	956	1040
17	543	509	e439	e405	e430	e634	1540	2780	1070	652	950	895
18	543	512	e435	e410	e440	e639	1380	3020	1060	650	945	811
19	543	511	e435	e405	e445	e700	1360	3170	976	889	852	714
20	539	513	e435	e400	e450	e1250	1680	3090	927	1050	749	654
21	539	515	e431	e390	e450	e1800	1840	2520	879	881	838	656
22	539	516	e430	e380	e450	e2150	1590	2230	852	2650	834	669
23	535	512	e395	e380	e455	e2700	1470	2010	828	1320	829	664
24	530	509	e380	e380	e460	e3050	1390	1860	811	1160	824	643
25	526	509	e355	e380	e470	e2000	1310	1750	794	998	818	641
26	522	503	e355	e380	e480	e1700	1220	1620	776	904	821	638
27	522	501	e358	e380	e500	e1450	1250	1650	751	834	812	574
28	518	507	e360	e380	e510	e1320	2070	1720	729	811	740	584
29	519	495	e358	e382	---	e1220	2710	1580	706	802	641	581
30	520	498	e360	e385	---	e1120	3240	1460	689	789	638	578
31	522	---	e360	e390	---	e1020	---	1390	---	739	622	---
TOTAL	17196	15422	13265	12004	12620	31468	40320	70650	29660	26172	29741	20544
MEAN	555	514	428	387	451	1015	1344	2279	989	844	959	685
MAX	636	524	497	410	510	3050	3240	4250	1430	2650	2620	1070
MIN	518	495	355	361	395	496	874	1390	689	642	622	574
AC-FT	34110	30590	26310	23810	25030	62420	79970	140100	58830	51910	58990	40750
CFSM	.44	.40	.34	.30	.35	.80	1.06	1.79	.78	.66	.76	.54
IN.	.50	.45	.39	.35	.37	.92	1.18	2.07	.87	.77	.87	.60

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1910 - 1991, BY WATER YEAR (WY)

MEAN	499	470	394	398	472	1393	1117	790	855	756	606	546
MAX	1465	1494	1347	1152	1427	3512	4963	2440	2803	3252	1998	2105
(WY)	1974	1983	1983	1973	1966	1961	1965	1973	1974	1978	1953	1938
MIN	193	218	189	172	168	251	274	234	261	236	231	243
(WY)	1934	1934	1934	1959	1959	1931	1931	1934	1934	1964	1958	1933

SUMMARY STATISTICS	FOR 1991 WATER YEAR		WATER YEARS 1910 - 1991	
ANNUAL TOTAL	319062			
ANNUAL MEAN	874		701	
HIGHEST ANNUAL MEAN			1541	1983
LOWEST ANNUAL MEAN			294	1931
HIGHEST DAILY MEAN	4250	May 7	31100	Apr 1 1952
LOWEST DAILY MEAN	355	Dec 25,26	82	Nov 28 1937
ANNUAL SEVEN-DAY MINIMUM	358	Dec 25	113	Dec 25 1933
INSTANTANEOUS PEAK FLOW	4940	May 7	37000	Apr 1 1952
INSTANTANEOUS PEAK STAGE	10.04	May 7	18.32a	Mar 2 1965
INSTANTANEOUS LOW FLOW			65b	
ANNUAL RUNOFF (AC-FT)	632900		507500	
ANNUAL RUNOFF (CFSM)	.69		.55	
ANNUAL RUNOFF (INCHES)	9.35		7.50	
10 PERCENT EXCEEDS	1730		1210	
50 PERCENT EXCEEDS	636		439	
90 PERCENT EXCEEDS	405		260	

a Backwater from ice.
b Occurred Dec. 26, 1933 and Feb. 25, 1935.
e Estimated.

IOWA RIVER BASIN

05457000 CEDAR RIVER NEAR AUSTIN, MN

LOCATION.--Lat 43°38'11", long 92°58'26", in NE¼SE¼ sec.15, T.102 N., R.18 W., Mower County, Hydrologic Unit 07080201, on left bank 200 ft upstream from abandoned powerhouse, 500 ft downstream from highway bridge, 1.1 mi downstream from Turtle Creek, and 1.1 mi south of Austin.
DRAINAGE AREA.--425 mi^2.
PERIOD OF RECORD.--May 1909 to September 1914, October 1944 to current year.
REVISED RECORDS.--WSP 1145: 1945, 1948.
GAGE.--Water-stage recorder. Datum of gage is 1,162.10 ft above National Geodetic Vertical Datum of 1929. May 1909 to April 1912, nonrecording gage in tailwater of powerplant 200 ft downstream at datum 3.1 ft lower. May 1912 to September 1914, nonrecording gage on highway bridge 500 ft downstream at datum 1.1 ft lower.
REMARKS.--Records good except those for estimated daily discharges, which are fair.
EXTREMES FOR CURRENT YEAR.--Peak discharges greater than base discharge of 1,400 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
Mar. 23	2230	3,000	8.87	Apr. 30	0830	1,600	6.28
Apr. 15	0100	1,560	6.19	May 6	0630	*4,640	*11.52
Apr. 19	2000	1,480	6.04	May 18	2000	3,000	8.87
Apr. 27	1630	1,790	6.65	Aug. 8	2400	4,460	11.24

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	98	96	87	e63	e56	91	403	1160	628	160	122	121
2	98	99	76	e62	e58	104	371	836	524	160	120	118
3	138	102	e75	e62	65	104	354	650	457	144	116	118
4	123	99	69	e62	69	109	333	572	404	134	110	113
5	117	97	70	e61	71	127	313	2040	368	128	108	114
6	112	99	76	e60	71	222	293	4410	331	123	107	110
7	103	97	78	e60	73	215	269	2560	302	143	166	105
8	102	91	81	e60	76	218	435	1710	280	124	2980	110
9	103	99	82	e60	79	187	1080	1550	261	114	3740	113
10	100	97	86	e60	80	174	898	1220	385	110	1900	108
11	98	92	92	e60	85	185	630	951	583	133	999	120
12	99	90	93	e61	85	225	549	783	428	257	634	140
13	98	89	86	e62	83	187	860	692	343	301	458	120
14	98	92	85	e63	73	175	1370	596	312	213	364	160
15	95	93	88	e65	e73	196	1450	530	367	169	305	159
16	94	94	83	e65	e72	241	1080	856	436	148	318	151
17	98	88	88	e65	e72	233	780	1210	382	139	511	135
18	112	87	85	e65	73	249	664	2330	330	402	430	126
19	100	89	85	e65	74	281	1250	2500	290	321	328	119
20	116	88	81	e65	75	338	1270	1560	272	230	281	115
21	122	93	e65	e64	78	527	910	1110	248	283	254	109
22	111	90	e67	e63	e76	623	702	867	228	352	229	105
23	114	89	e67	e63	e77	2490	609	714	208	433	209	103
24	108	85	e66	e61	e79	2220	509	634	195	298	193	117
25	103	85	e66	e60	e80	1110	435	575	183	221	178	115
26	100	80	e66	e58	e81	784	453	765	172	185	168	109
27	103	92	e66	e57	86	726	1430	1060	159	162	158	104
28	93	80	e65	e56	83	806	1280	1030	150	164	151	101
29	97	82	e65	e56	---	639	1130	984	142	159	144	96
30	99	86	e65	e55	---	491	1510	746	133	146	137	96
31	96	---	e64	e55	---	441	---	690	---	134	129	---
TOTAL	3248	2740	2368	1894	2103	14718	23620	37891	9501	6190	16047	3530
MEAN	105	91.3	76.4	61.1	75.1	475	787	1222	317	200	518	118
MAX	138	102	93	65	86	2490	1510	4410	628	433	3740	160
MIN	93	80	64	55	56	91	269	530	133	110	107	96
AC-FT	6440	5430	4700	3760	4170	29190	46850	75160	18850	12280	31830	7000
CFSM	.25	.21	.18	.14	.18	1.12	1.85	2.88	.75	.47	1.22	.28
IN.	.28	.24	.21	.17	.18	1.29	2.07	3.32	.83	.54	1.40	.31
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1909 - 1991, BY WATER YEAR (WY)												
MEAN	159	143	95.8	69.6	96.6	463	477	287	253	221	152	138
MAX	884	997	423	261	701	1428	2009	1222	861	1456	646	506
(WY)	1974	1910	1983	1973	1984	1973	1965	1991	1967	1978	1953	1946
MIN	37.3	35.7	26.6	26.5	25.0	53.3	52.9	67.9	48.9	22.6	32.3	30.9
(WY)	1959	1959	1913	1913	1913	1968	1911	1910	1950	1911	1948	1911

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1909 - 1991	
ANNUAL TOTAL	142460		123850			
ANNUAL MEAN	390		339		213a	
HIGHEST ANNUAL MEAN					568	1983
LOWEST ANNUAL MEAN					58.1	1977
HIGHEST DAILY MEAN	5460	Apr 24	4410	May 6	8720	Mar 29 1962
LOWEST DAILY MEAN	42	Jan 7	55	Jan 30,31	.00b	
ANNUAL SEVEN-DAY MINIMUM	45	Jan 2	56	Jan 26	13	Sep 1 1912
INSTANTANEOUS PEAK FLOW	7580	Apr 24	4640	May 6	12400	Jul 17 1978
INSTANTANEOUS PEAK STAGE	15.65	Apr 24	11.52	Jul 6	20.35a	Jul 17 1978
INSTANTANEOUS LOW FLOW	31	Feb 2,27	45	Jan 20		
ANNUAL RUNOFF (AC-FT)	282600		245700		154500	
ANNUAL RUNOFF (CFSM)	.92		.80		.50	
ANNUAL RUNOFF (INCHES)	12.47		10.84		6.82	
10 PERCENT EXCEEDS	960		863		427	
50 PERCENT EXCEEDS	126		121		85	
90 PERCENT EXCEEDS	49		65		43	

a Median of annual mean discharges is 195 ft^3/s.
b Occurred for several days in 1911.
c From floodmark in well.
e Estimated

DES MOINES RIVER BASIN

05476000 DES MOINES RIVER AT JACKSON, MN

LOCATION.--Lat 43°37'10", long 94°59'10", in SE¼SW¼ sec.24, T.102 N., R.35 W., Jackson County, Hydrologic Unit 07100001, on right bank in storage room of city powerplant in Jackson.
DRAINAGE AREA.--1,220 mi^2, approximately.
PERIOD OF RECORD.--May 1909 to December 1913, August 1930 to current year (winter record incomplete prior to 1936). Published as Des Moines River near Jackson, 1930-35, as West Fork Des Moines River near Jackson, 1936-44, and as West Fork Des Moines River at Jackson, 1945-69.
REVISED RECORDS.--WSP 1115: 1942. WSP 1175: Drainage area. WSP 1238: 1950. WSP 1308: 1938(M).
GAGE.--Water-stage recorder. Datum of gage is 1,287.75 ft above National Geodetic Vertical Datum of 1929. May 31, 1909, to Dec. 20, 1913, nonrecording gage at site 0.6 mi downstream at datum 0.99 ft lower. Aug. 22, 1930, to Sept. 30, 1944, nonrecording gage at site 7 mi upstream at datum 17.10 ft higher. Oct. 1, 1944, to Oct. 26, 1949, nonrecording gage at site 600 ft upstream at datum 10.64 ft higher. Oct. 27, 1949, to Dec. 15, 1965, water-stage recorder 200 ft downstream at present datum.
REMARKS.--Records good except those for estimated daily discharges, which are fair. Regulation at times by Yankton, Long, Shetek, and Heron Lakes.
EXTREMES FOR CURRENT YEAR.--Peak discharge greater than base discharge of 900 ft^3/s and maximum (*):

Date	Time	Discharge (ft^3/s)	Gage height (ft)	Date	Time	Discharge (ft^3/s)	Gage height (ft)
May 21	2100	1,810	8.97	June 23	0400	*3,470	*12.32
June 10	0615	3,400	12.20				

DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991
DAILY MEAN VALUES

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.82	7.8	23	1.0	1.1	12	271	604	e1200	1930	309	32
2	.50	9.8	25	1.0	1.1	20	190	538	e1300	1750	308	29
3	10	8.5	23	.86	1.8	11	161	503	1460	1590	295	45
4	23	7.8	21	.93	8.1	11	144	640	1930	1450	281	43
5	19	8.9	23	.76	10	18	133	752	2050	1290	262	39
6	11	9.4	21	e1.0	11	22	124	693	2200	1180	245	42
7	7.0	7.9	19	e2.2	16	22	135	621	2410	1090	260	42
8	8.7	8.8	18	3.7	23	21	135	612	2880	1000	251	41
9	7.5	40	20	1.4	27	20	170	596	3080	921	195	43
10	5.4	67	23	1.4	21	21	149	579	3260	873	149	46
11	4.6	62	26	e1.4	16	24	121	565	3160	833	136	57
12	3.7	42	29	e1.4	11	32	166	547	3020	887	128	89
13	17	34	28	e1.5	11	20	503	535	2880	814	130	104
14	19	36	30	1.6	15	19	760	553	2830	714	120	278
15	12	40	26	1.8	6.1	23	838	800	2810	647	112	272
16	10	65	21	2.3	5.6	25	753	1070	2770	588	104	262
17	10	54	22	2.4	5.3	23	652	1430	e2600	537	117	231
18	4.8	46	19	3.7	7.1	34	590	1690	e2400	490	286	191
19	11	46	16	3.5	7.0	60	544	1720	2170	450	272	160
20	13	47	17	3.4	8.0	107	511	1760	2280	431	229	144
21	7.9	48	11	2.8	11	170	473	1780	3300	402	213	130
22	6.6	62	9.3	4.4	14	198	446	1760	3280	544	138	130
23	7.9	51	8.0	3.1	13	179	423	1630	3310	520	89	123
24	6.6	42	4.7	3.1	13	155	321	1450	3050	460	79	128
25	8.4	33	4.5	3.1	12	179	247	e1220	2980	404	68	118
26	8.4	30	3.6	e2.8	10	354	386	e1260	2890	362	63	122
27	8.9	25	3.2	e2.3	9.6	411	453	e1350	2730	351	58	125
28	11	15	3.3	e2.0	10	287	476	e1350	2700	399	46	107
29	17	20	3.6	e1.8	---	219	529	e1250	2560	383	41	108
30	10	21	2.6	e1.4	---	210	606	e1150	2170	360	39	108
31	7.4	---	1.2	e1.2	---	248	---	e1100	---	335	36	---
TOTAL	298.12	994.9	505.0	65.25	304.8	3155	11410	32108	77660	23985	5059	3389
MEAN	9.62	33.2	16.3	2.10	10.9	102	380	1036	2589	774	163	113
MAX	23	67	30	4.4	27	411	838	1780	3310	1930	309	278
MIN	.50	7.8	1.2	.76	1.1	11	121	503	1200	335	36	29
AC-FT	591	1970	1000	129	605	6260	22630	63690	154000	47570	10030	6720
CFSM	.01	.03	.01	.00	.01	.08	.31	.85	2.12	.63	.13	.09
IN.	.01	.03	.02	.00	.01	.10	.35	.98	2.37	.73	.15	.10

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1930 - 1991, BY WATER YEAR (WY)

MEAN	140	143	81.6	38.6	57.2	414	965	544	506	403	162	152
MAX	1724	1833	792	298	504	2250	6045	2374	2843	2453	1408	2244
(WY)	1987	1980	1980	1980	1983	1983	1969	1984	1984	1983	1979	1942
MIN	.000	.000	.000	.000	.000	11.8	9.37	2.59	3.76	1.04	.13	.000
(WY)	1956	1956	1956	1956	1936	1959	1959	1934	1931	1931	1955	1931

SUMMARY STATISTICS	FOR 1990 CALENDAR YEAR		FOR 1991 WATER YEAR		WATER YEARS 1930 - 1991	
ANNUAL TOTAL	22247.51		158934.07			
ANNUAL MEAN	61.0		435		320a	
HIGHEST ANNUAL MEAN					1199	1983
LOWEST ANNUAL MEAN					15.1	1956
HIGHEST DAILY MEAN	514	May 27	3310	Jun 23	15500	Apr 11 1969
LOWEST DAILY MEAN	.00	Sep 15	.50	Oct 2	.00	Jul 19 1931
ANNUAL SEVEN-DAY MINIMUM	.00	Sep 15	.96	Dec 31	.00	Jul 19 1931
INSTANTANEOUS PEAK FLOW	999	Jun 16	3470	Jun 23	15700	Apr 11 1969
INSTANTANEOUS PEAK STAGE	7.08	Jun 16	12.32	Jun 23	19.45	Apr 11 1969
INSTANTANEOUS LOW FLOW	.40	Oct 2	.40	Oct 2	.00	Many years
ANNUAL RUNOFF (AC-FT)	44130		315200		231800	
ANNUAL RUNOFF (CFSM)	.050		.36		.26	
ANNUAL RUNOFF (INCHES)	.68		4.85		3.56	
10 PERCENT EXCEEDS	150		1510		863	
50 PERCENT EXCEEDS	33		62		66	
90 PERCENT EXCEEDS	1.5		3.5		2.4	

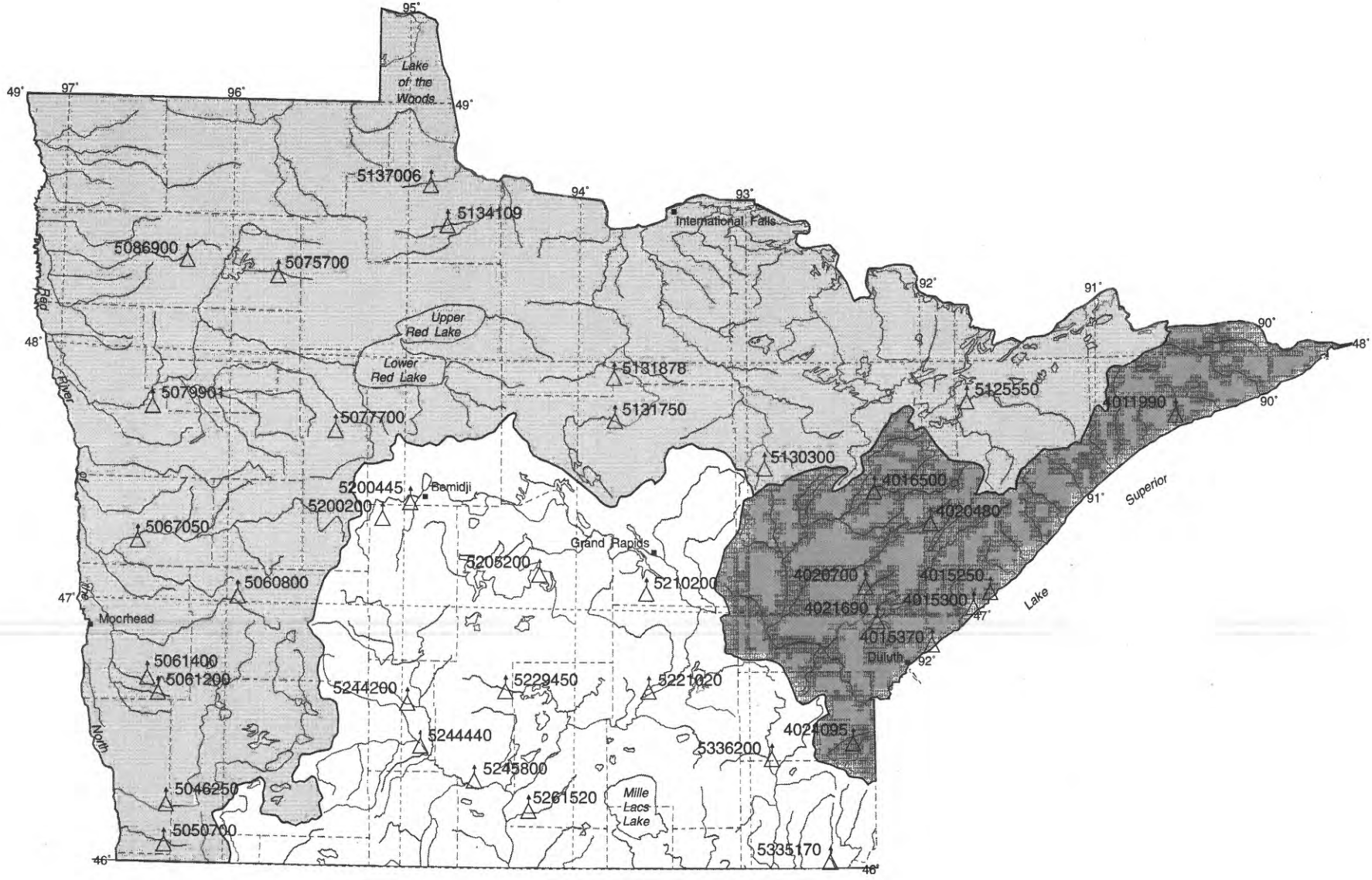
a Median of annual mean discharges is 240 ft^3/s.
e Estimated.

Partial-Record Stations and Miscellaneous Sites

Roseau River
November, 1928

High-Flow Partial-Record Stations

Hawk Creek near Maynard
June 17, 1992


95°
Lake of the Woods
49°
97°
96°
49°
5137006
5134109
94°
93°
International Falls
5086900
5075700
92°
91°
Upper Red Lake
90°
48°
Lower Red Lake
5131878
5125550
48°
5079901
5131750
5011990
90°
5077700
5130300
5200445
Bemidji
5200200
4016500
91°
Superior
4020480
5067050
Grand Rapids
5205200
5210200
4020700
4015250
5060800
47°
4015300
Lake
4021690
47°
Moorhead
4015370
Duluth
92°
5061400
5061200
5244200
5229450
5221020
4021095
5244440
5336200
5245800
5046250
5261520
Mille Lacs Lake
5050700
5335170
46°
46°

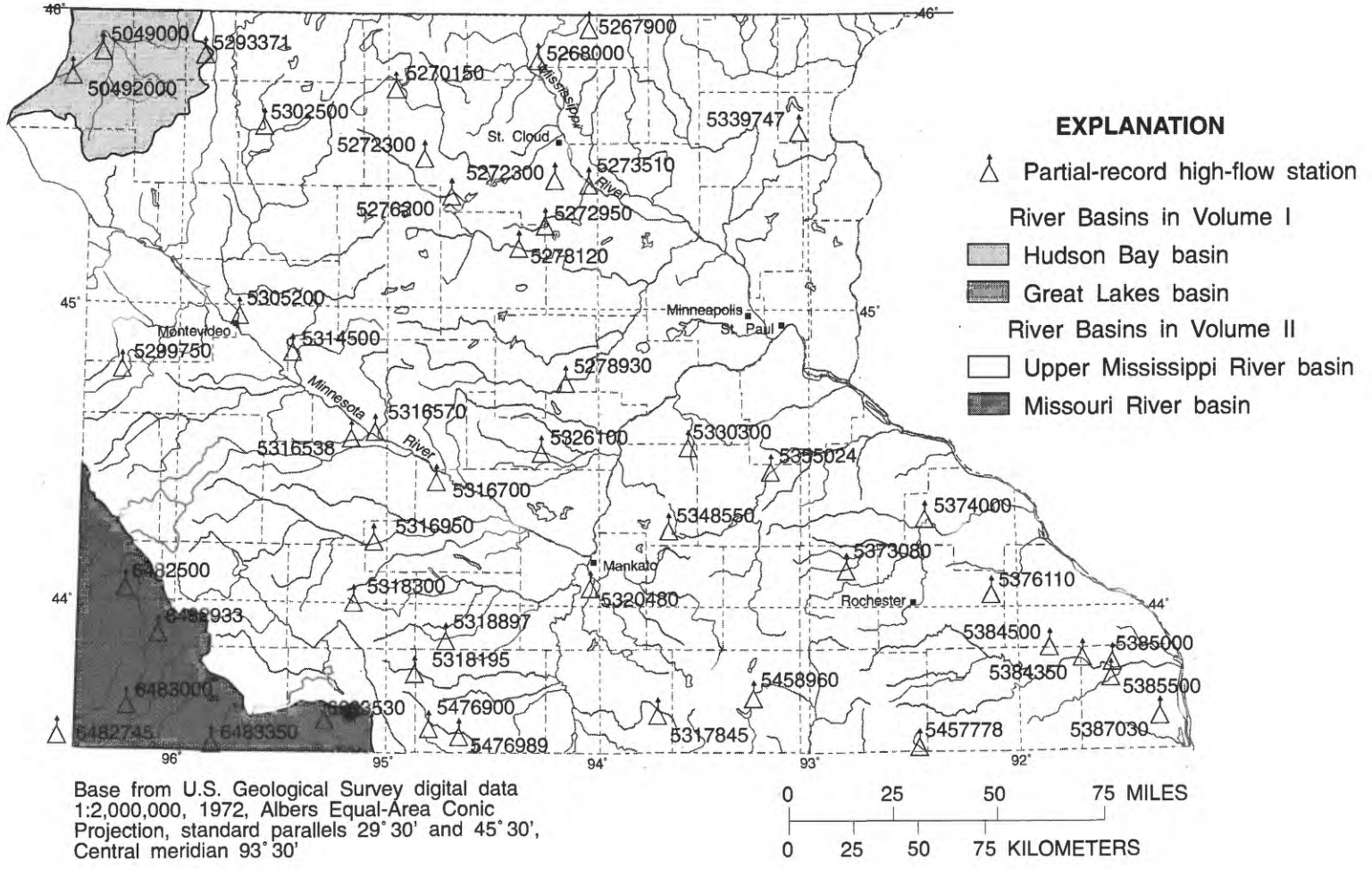


Figure 9.--Location of high-flow partial-record stations

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 for both low flow and high flow.

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 1991

Station name and number	Location and drainage area	Period of record	Water year 1991 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
Mississippi River main stem								
Hennepin Creek near Becida, MN 05200200	Lat 47°23'52", long 95°05'12", in NW¼NE¼ sec. 11, T.145 N., R.35 W., Hubbard County, Hydrologic Unit 07010101, at culvert on Stumphges Rapids Trail approximately 0.5 mile west of Hubbard County Road 3, 3 miles north of Becida, 1.5 miles upstream from mouth. Drainage area 41.4 mi^2.	1979-91	5-3-91	a11.78	41	5-11-85	15.25	375
Mississippi River at Bemidji, MN 05200445	Lat 46°27'04", long 94°54'23", in NW¼NW¼ sec.20, T.146 N., R.33 W., Beltrami County, Hydrologic Unit 07010101, at bridge on County Highway 11, 1.4 miles southwest of intersection of U.S. Highway 2 and County Highway 7 in Bemidji. Drainage area 400 mi^2.	1973-87, 1988-89#, 1990-91	5-9-91	b11.24	330	4-23-79	13.04	1,690
Leech Lake River basin								
Boy River near Remer, MN 05205200	Lat 47°04'51", long 94°05'54", in SE¼SE¼ sec.28 T.142 N., R.27 W., Cass County, Hydrologic Unit 07010102, at bridge on County Highway 53, 1.9 miles upstream from Boy Lake and 9 miles northwest of Remer. Drainage area 310 mi^2.	1986-91	7-12-91	b10.4	340	7-23-87	11.64	660
Smith Creek basin								
Smith Creek near Hill City, MN 05210200	Lat 47°04'58", long 93°34'59", in SE¼NW¼ sec.13, T.53 N., R.26 W., Itasca County, Hydrologic Unit 07010101, at culvert on U.S. Highway 169, 6.2 miles north of Hill City. Drainage area 8.00 mi^2.	1961-91	10-3-90	4.59	51	8-5-81	7.95	445

"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 1991--Continued

Station name and number	Location and drainage area	Period of record	Water year 1991 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
Willow River basin								
Willow River below Palisade, MN 05221020	Lat 46°42'36", long 93°33'21", in NW¼NE¼ sec.30, T.49 N., R.25 W., Aitkin County, Hydrologic Unit 07010103, at bridge on County Highway 3, 3.2 miles west of Palisade. Drainage area 445 mi^2.	1972-91	5-7-91	11.80	1,180	4-25-79	17.25	3,730
Pine River basin								
Pine River near Pine River, MN 05229450	Lat 46°41'39", long 94°22'11", in NE¼SE¼ sec.8., T.137 N., R.29 W., Cass County, Hydrologic Unit 07010105, at bridge 2.3 miles southeast of Pine River, on U.S. Highway 371, 4.9 miles upstream of upper Whitefish Lake. Drainage area 285 mi^2.	1986-91	5-8-91	C3.11	431	3-28-86	4.35	1,150
Crow Wing River basin								
Cat River near Nimrod, MN 05244200	Lat 46°37'49", long 94°55'51", in SW¼SW¼ sec.36, T.137 N., R.34 W., Wadena County, Hydrologic Unit 07010106, at bridge on State Highway 227, 2.5 miles west of Nimrod, 3.0 miles upstream from mouth. Drainage area 49.2 mi^2.	1961-91	7-1-91	ab5.52	92	10-12-73	9.43	560
Leaf River near Aldrich, MN 05244440	Lat 46°27'25", long 94°50'29", in SW¼SW¼ sec.34, T.135 N., R.33 W., Wadena County, Hydrologic Unit 07010107, at bridge on County Highway 29, 3.3 miles upstream from mouth, 7.0 miles northeast of Aldrich. Drainage area 860 mi^2.	1972-91	4-16-91	11.45	1030	4-22-79	16.15	5,170
Sevenmile Creek near Pillager, MN 05245800	Lat 46°20'32", long 94°32'56", in SW¼SE¼ sec.11, T.133 N., R.31 W., Cass County, Hydrologic Unit 07010106, at bridge on township road, 3.5 miles northwest of Pillager, 3.2 miles upstream from mouth. Drainage area 18.3 mi^2.	1979-91	6-30-91	11.81	80	6-14-83	13.08	285
Nokasippi River basin								
Nokasippi River near Fort Ripley, MN 05261520	Lat 46°12'02", long 94°19'03" on line between secs.13 and 24, T.43 N., R.32 W., Crow Wing County, Hydrologic Unit 07010104, at bridge on County Highway 2, 3 miles northeast of Fort Ripley. Drainage area 178 mi^2.	1967-70+, 1974+, 1976+, 1986-91	6-30-91	10.54	357	4-4-86	13.90	828
Platte River basin								
Hillman Creek near Pierz, 05267900	Lat 45°58'27", long 94°04'21", in NE¼SE¼ sec.9, T.40 N., R.30 W., Morrison County, Hydrologic Unit 07010201, at bridge on county highway, 1.1 miles upstream from mouth, 1.5 miles east of Pierz. Drainage area 46.7 mi^2.	1964-91	5-1-91	13.70	490	4-9-69	15.48	2,960

"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 1991--Continued

Station name and number	Location and drainage area	Period of record	Water year 1991 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
			Platte River basin--Continued					
Platte River above Royalton, MN 05266000	Lat 45°50'43", long 94°17'40", in SE¼NW¼ sec.26, T.39 N., R.32 W., Morrison County, Hydrologic Unit 07010201, at bridge on County Highway 27, 0.6 mile north of Royalton, 6.6 miles upstream from mouth. Drainage area 335 mi^2.	1929-36, 1972-91	4-16-91	12.47	2,150	7-26-72	7.84	6,850
			Sauk River basin					
Ashley Creek near Sauk Centre, MN 05270150	Lat 45°46'46", long 94°58'52", in NW¼SE¼ sec.29, T.127 N., R.34 W., Todd County, Hydrologic Unit 07010202, at bridge on County Highway 11, 3 miles north of Sauk Centre. Drainage area 113 mi^2.	1963-70+, 1974+, 1976+, 1986-88, 1989#, 1990-91	9-9-91	14.88	342	9-25-86	16.52	600
Sauk River tributary at Spring Hill, MN 05270300	Lat 45°31'22", long 94°48'31", in SW¼NE¼ sec.27, T.124 N., R.33 W., Stearns County, Hydrologic Unit 07010202, at culvert on State Highway 4, 1.0 mile east of Spring Hill, 2.7 miles upstream from mouth. Drainage area 7.06 mi^2.	1960-91	9-9-91	b10.67	152	7-6-78	22.76	1,440
			Johnson Creek basin					
Johnson Creek near St. Augusta, MN 05272300	Lat 45°27'49", long 94°09'19", in NW¼SW¼ sec.13, T.123 N., R.28 W., Stearns County, Hydrologic Unit 07010203, at bridge on County Highway 7, 1.0 mile south of St. Augusta, 3.3 miles upstream from mouth. Drainage area 46.7 mi^2.	1964-91	9-8-91	12.80	255	9-9-85	16.37	2,350
			Clearwater River basin					
Clearwater River near South Haven, MN 05272950	Lat 45°16'45", long 94°15'04", in NE¼NW¼ sec.19, T.121 N., R.28 W., Wright County, Hydrologic Unit 07010203, at culvert 3.4 miles southeast of Kimball, 0.25 mile downstream of Scott Lake Outlet, 2.0 miles southeast of South Haven. Drainage area -.	1985-91	9-16-91	14.76	236	9-9-85	17.11	1,040
			Mississippi River main stem					
Mississippi River at Clearwater, MN 05273510	Lat 45°25'15", long 94°02'37", in NW¼SW¼ sec.23, T.34 N., R.30 W., Sherburne County, Hydrologic Unit 07010203, on left bank 700 ft upstream from bridge, on State Highway 24 at Clearwater. Drainage area -.	1972-91	5-10-91	bc12.85	18,300	4-24-79	18.75	33,900
			Crow River basin					
North Fork Crow River at Paynesville, MN 05276200	Lat 45°23'09", long 94°42'41", in SW¼SE¼ sec.9, T.122 N., R.32 W., Stearns County, Hydrologic Unit 07010204, at bridge on county road at northeast edge of Paynesville city limits. Drainage area 236 mi^2.	1973-91	5-29-91	a4.43	c620	6-21-83	9.29	2,300

"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 1991--Continued

Station name and number	Location and drainage area	Period of record	Water year 1991 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
			Crow River basin--Continued					
North Fork Crow River near Kingston, MN 05278120	Lat 45°12'13", long 94°23'16", in SW¼SE¼ sec 13, T.120 N., R.30 W., Meeker County, Hydrologic Unit 07010204, at bridge on State Highway 24, 3.7 miles west of Kingston, 3.9 miles east of Forest City. Drainage area -.	1986-91	9-16-91	15.70	2,750	5-1-86	17.82	4,850
Buffalo Creek near Glencoe, MN 05278930	Lat 44°45'50", long 94°05'27", in SW¼SW¼ sec. 16, T.115 N., R.27 W., McLeod County, Hydrologic Unit 07010205, on right bank, 20 ft (6 m) downstream from bridge on County Highway 1, 2.6 mi (4.2 km) east of Glencoe. Drainage area 374 mi^2.	1972 1973-80#	9-12-91	11.78	4,300	9-12-91	11.78	4,300
			Minnesota River basin					
Pomme de terre River near Elbow Lake, MN 05293371	Lat 46°57'47", long 95°53'07", in SE¼SW¼ sec.19, T.129 N., R.41 W., Grant County, Hydrologic Unit 07020002, at bridge on County Road 47, 4 miles southeast of Elbow Lake, 2.5 miles south of the outlet of Pomme de Terre Lake. Drainage area 340 mi^2.	1986-91	7-2-91	4.54	195	4-6-69	d	e200
Florida Creek near Burr, MN 05299750	Lat 44°49'00", long 96°25'10", in SE¼SE¼ sec. 29, T.115 N., R.46 W., Yellow Medicine County, Hydrologic Unit 07020003, at culvert on County Road 15, 2.2 miles west of Burr, 6 miles northwest of Canby. Drainage area 50 mi^2.	1982 1983-84#	6-6-91	14.47	81	3-29-84	18.38	471
Little Chippewa River near Starbuck, MN 05302500	Lat 45°36'52", long 95°37'12", in NW¼NE¼ sec.30, T.125 N., R.39 W., Pope County, Hydrologic Unit 07020005, at culvert on State Highway 28, 4.4 miles west of Starbuck. Drainage area 69.6 mi^2.	1979-91	6-30-91	c12.54	178	6-30-91	c12.54	178
Spring Creek near Montevideo, MN 05305200	Lat 44°58'41", long 95°42'57", in NW¼NW¼ sec.5, T.117 N., R.40 W., Chippewa County, Hydrologic Unit 07020005, at culvert on State Highway 29, 1.2 miles upstream from mouth, 2.0 miles north of Montevideo. Drainage area 16.0 mi^2.	1959-91	7-21-91	18.00	470	7-19-62	18.22	492
Hawk Creek near Maynard, MN 05314500	Lat 44°52'10", long 95°26'58", in SW¼NW¼ sec.7, T.116 N., R.38 W., at Renville and Chippewa County line, Hydrologic Unit 07020004, at bridge on State Highway 23, 3.0 miles southwest of Maynard. Drainage area 474 mi^2.	1949-54#, 1981-91	9-9-91	15.96	1,540	6-18-57	16.10	6,970
Ramsey Creek near Redwood Falls, MN 05316538	Lat 44°33'08", long 95°10'38" in SE¼NE¼ sec. 33, T.113 N., R.36 W., Redwood County, Hydrologic Unit 07020006 at bridge on township road 2.3 miles northwest of KLGR radio towers, on west side of Redwood Falls. Drainage area	1991	6-4-91	24.69	755	6-4-91	24.69	755

"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 1991--Continued

Station name and number	Location and drainage area	Period of record	Water year 1991 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
	Minnesota River basin--Continued							
Beaver Creek at Beaver Falls, MN 05316570	Lat 44°35'03", long 95°02'49", in NE¼NW¼ sec.22, T.113 N., R.35 W., Renville County, Hydrologic Unit 07020004, at bridge on County Highway 2 in Beaver Falls, 2.2 miles upstream from mouth, 3.8 miles northwest of Morton. Drainage area 194 mi^2.	1972-91	9-8-91	a11.80	965	4-23-85	a11.33	1,070
Spring Creek near Sleepy Eye, MN 05316700	Lat 44°24'12", long 94°44'41", in NE¼SE¼ sec.24, T.111 N., R.33 W., Brown County, Hydrologic Unit 07020007, at culvert on county highway, 4.3 miles upstream from mouth, 7.5 miles north of Sleepy Eye. Drainage area 31.3 mi^2.	1959-91	6-22-91	14.54	510	4-10-65	17.79	930
Cottonwood River near Springfield, MN 05316950	Lat 44°12'12", long 95°02'53", on line between secs.33 and 34, T.109 N., R.35 W., Brown County, Hydrologic Unit 07020008, at bridge on County Highway 2, 1.3 miles downstream from Mound Creek, 1.0 mile upstream from Coal Mine Creek, 3.5 miles southwest of Springfield. Drainage area 773 mi^2.	1973-91	6-21-91	a23.72	3,400	6-25-84	29.12	8,500
East Branch Blue Earth River near Walters, MN 05317845	Lat 43°37'58", long 93°42'28", in SE¼SE¼ sec.16, T.102 N., R.24 W., Faribault County, Hydrologic Unit 07020009, at culvert on State Highway 22, 2.5 miles northwest of Walters. Drainage area 29.6 mi^2.	1979-91	6-1-91	17.87	500	4-28-81 6-1-91	18.17 17.87	500 500
Elm Creek near Trimont, MN 05318195	Lat 43°45'27", long 94°50'30", in NW¼NW¼ sec. 5, T. 103 N., R. 33 W., Martin County, Hydrologic Unit 07020009, at bridge on County Road 103, 12.5 miles northeast of Jackson, 5 miles west Trimont. Drainage area	1991	6-4-91	21.92	2,000	6-4-91	21.92	2,000
+Watonwan River near Delft, MN 05318300	Lat 43°59'55", long 95°07'11", in NE¼SE¼ sec.11, T.106 N., R.36 W., Cottonwood County, Hydrologic Unit 07020010, at culvert on U.S. Highway 71, 1.7 miles northwest of Delft. Drainage area 13.0 mi^2.	1960-91	6-21-91	17.10	665	5-30-80	17.82	900
South Fork Watonwan River near Ormsby, MN 05318897	Lat 43°53'08", long 94°41'27", in SE¼NW¼ sec.21, T.105 N., R.32 W., Watonwan County, Hydrologic Unit 07020010, at bridge on township road, 2.6 miles north of Ormsby, 5.0 miles upstream from Willow Creek. Drainage area 109 mi^2.	1979-91	6-15-91	14.42	638	5-31-80	18.40	1,410
Maple River near Rapidan, MN 05320480	Lat 44°03'54", long 94°01'32", in SW¼ sec.13, T.107 N., R.27 W., Blue Earth County, Hydrologic Unit 07020011, at bridge on County Highway 35, 3.0 miles southeast of Rapidan, 3.3 miles upstream from mouth. Drainage area 343 mi^2.	1972-91	6-5-91	12.05	3,520	3-1-83	12.73	4,550

"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 1991--Continued

Station name and number	Location and drainage area	Period of record	Water year 1991 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
			Minnesota River basin--Continued					
Middle Branch Rush River near Gaylord, MN 05326100	Lat 44°30'27", long 94°15'00", in SW¼NW¼ sec.18, T.112 N., on line between R.28 W. and R.29 W., Sibley County, Hydrologic Unit 07020012, at bridge on township road, 3.0 miles southwest of Gaylord, 10.5 miles upstream from the main branch of Rush River. Drainage area 68.5 mi^2.	1979-91	9-14-91	15.19	565	6-30-83	9.78	920
Sand Creek near New Prague, MN 05330300	Lat 44°32'37", long 93°32'16", in NE¼NW¼ sec.1, T.112 N., R.23 W., Le Sueur County, Hydrologic Unit 07020012, at culvert on State Highway 13 and 19, 1.9 miles east of New Prague. Drainage area 62.4 mi^2.	1960-91	5-6-91	10.94	310	5-21-60	14.84	1,100
			St. Croix River basin					
Crooked Creek near Hinckley, MN 05335170	Lat 46°00'42", long 92°31'45", in NE¼NE¼ sec.30, T.41 N., R.17 W., Pine County, Hydrologic Unit 07030001, at culvert on State Highway 48, 2.7 miles upstream from mouth, 8 miles south of Duxbury, 19 miles east of Hinckley. Drainage area 93 mi^2.	1966-70+, 1974-76+, 1979-80+, 1986-91	5-5-91	13.60	890	5-28-89	15.52	1,630
Glaisby Brook near Kettle River, MN 05336200	Lat 46°27'19", long 92°51'34", in SE¼NW¼ sec.22, T.46 N., R.20 W., Carlton County, Hydrologic Unit 07030003, at bridge on State Highways 27 and 73, 1.0 mile upstream from mouth, 2.4 miles south of Kettle River. Drainage area 27.5 mi^2.	1960-70#, 1971-91	5-6-91	a5.49	330	7-22-72	10.18	1,370
Goose Creek at Harris, MN 05339747	Lat 45°35'11", long 92°58'39", in SW¼SW¼ sec.21, T.36 N., R.21 W., Chisago County, Hydrologic Unit 07030005, at culverts on County Highway 9, 0.15 mile east of County Highway 30 in Harris, 8 miles above mouth. Drainage area f60 mi^2.	1986-91	5-5-91	7.40	286	5-5-91	7.40	235
			Cannon River basin					
Cannon River below Sabre Lake near Kilkenny, MN 05348550	Lat 44°17'50", long 93°37'44", in NE¼NE¼ sec. 31, T.110 N., R.23 W., LeSueur County, Hydrologic Unit 07040002, at bridge on township road, 0.25 mile downstream of Sabre Lake, 3 miles southeast of Kilkenny. Drainage area -.	1985-91	8-8-91	13.73	480	8-8-91	13.73	480
Cannon River at Northfield, MN 05355024	Lat 44°27'19", long 93°09'46", in NE¼NE¼ sec.1, T.111 N., R.20 W., Rice County, Hydrologic Unit 07040002, at Fifth Street bridge in Northfield. Drainage area 934 mi^2.	1980-91	8-10-91	904.23	5,500	7-28-90	904.87	7,150

"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 1991--Continued

Station name and number	Location and drainage area	Period of record	Water year 1991 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
			Zumbro River basin					
Milliken Creek near Concord, MN 05373080	Lat 44°07'13", long 92°49'08", in NW¼NW¼ sec.36, T.108 N., R.17 W., Dodge County, Hydrologic Unit 07040004, at bridge on County Road 9, 8.0 miles upstream from mouth, 2.1 miles southeast of Concord. Drainage area 22.2 mi^2.	1979-91	8-8-91	13.57	425	5-31-82	14.50	580
Zumbro River at Zumbro Falls, MN 05374000	Lat 44°17'12", long 92°25'56", in sec.36, T.110 N., R.14 W., Wabasha County, Hydrologic Unit 07040004, on left bank in Zumbro Falls, 1,000 ft downstsream from Cold Creek, 0.7 mi upstream from bridge on U.S. Highway 63, and 6.3 mi downstream from North Fork. Drainage area f1,130 mi^2.	1909-17#, 1929-80#, 1990-91	5-6-91	13.66	7,000	7-21-51	30.80	35,900
			Whitewater River basin					
Middle Fork Whitewater River neaer State Park Group Camp near St. Charles, MN 05376110	Lat 03'21", long 92 03'13", in SW¼ sec. 20, T.107 N., R.10 W., Olmsted County, Hydrologic Unit 07040003, at wooden bridge near Group Camp in Whitewater State Park. Drainage area -.	1986-91	7-22-91	65.50	†	4-24-90	67.39	†
			Root River basin					
Root River near Lanesboro, MN 05384000	Lat 43°44'58", long 91°58'43", in sec. 1, T. 103 N., R. 10 W, Fillmore County, Hydrologic Unit 07040008, on left bank 0.5 mi upstream from highway bridge, 1.2 mi upstream from South Branch, and 2.5 mi northeast of Lanesboro. Drainage area --615 mi^2.	1910-17# 1940-85# 1986 1987-90# 1991	5-6-91	6.07	3,230	3-29-62	16.11	22,100
Root River at Rushford, MN 05384350	Lat 43°48'11", long 91°45'10", in NE¼NE¼ sec.23, T.104 N., R.8 W., Fillmore County, Hydrologic Unit 07040008, at U.S. Highway 16 bridge on south side of Rushford. Drainage area -.	1985-91	5-6-91	g<23.93	e4,500	4-25-90	-	9,000
Rush Creek near Rushford, MN 05384500	Lat 43°50'00", long 91°46'40", on line between secs.3 and 10, T. 104 N., R.8 W., Fillmore County, Hydrologic Unit 07040008, at bridge, 1.5 miles northwest of Rushford, 3.0 miles upstream from mouth. Drainage area 129 mi^2.	1942-79#, 1980-91	7-21-91	7.81	3,480	3-26-50	13.54	11,600
South Fork Root River near Houston, MN 05385500	Lat 43°44'19", long 91°33'50", in NE¼SW¼ sec.9, T.103 N., R.6 W., Houston County, Hydrologic Unit 07040008, on left bank, 50 feet downstream from State Highway 76 bridge, 0.5 mile upstream from Badger Creek, 1.5 mile south of Houston. Drainage area 275 mi^2.	1953-83#, 1985-91	4-29-91	6.72	815	6-21-74	13.81	11,000

"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 1991--Continued

Station name and number	Location and drainage area	Period of record	Water year 1991 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
			Crooked Creek basin					
Crooked Creek at Freeburg, MN 05387030	Lat 43°36'37", long 91°21'39", in SW¼NE¼ sec.30, T.102 N., R.4 W., Houston County, Hydrologic Unit 07060001, at bridge on State Highway 249 at Freeburg, 6.5 miles upstream from mouth. Drainage area 44.2 mi^2.	1979-91	8-7-91	g	e100	6-17-84	15.66	1,430
			Iowa River basin					
Little Cedar River near Johnsburg, MN 05457778	Lat 43°30'52", long 92°45'19", in NW¼NE¼ sec.33, T.101 N., R.16 W., Mower County, Hydrologic Unit 07080201, at bridge on County Road 6, 1 mile northeast of Johnsburg, 1 mile north Minnesota-Iowa border. Drainage area 46 mi^2.	1986-91	8-8-91	14.11	†	9-9-86	14.66	†
Bancroft Creek at Bancroft, MN 05458960	Lat 43°42'09", long 93°21'23", in SW¼SE¼ sec.21, T.103 N., R.21 W., Freeborn County, Hydrologic Unit 07080202, at bridge on County Road 14, 1.6 miles northeast of Fountain Lake, 1 mile north of Interstate 90. Drainage area 29.1 mi^2.	1985+, 1986-91	5-6-91	5.76	250	3-23-89	6.96	475
			Des Moines River basin					
Fourmile Creek near Dunnell, MN 05476900	Lat 43°34'57", long 94°46'26", in SW¼NW¼ sec.2, T.101 N., R.33 W., Martin County, Hydrologic Unit 07100003, at bridge on State Highway 4, 0.6 mile upstream from mouth, 1.6 miles north of Dunnell. Drainage area 14.0 mi^2.	1960-91	6-4-91	a14.54	400	7-4-62	16.15	2,200
East Fork Des Moines River near Ceylon, MN 05476989	Lat 43°33'53", long 94°39'15", in NW¼SW¼ sec.11, T.101 N., R.32 W., Martin County, Hydrologic Unit 07010003, at bridge on County Road 23, 2.4 miles northwest of Ceylon. Drainage area 154 mi^2.	1986-91	6-5-91	21.18	1,100	6-5-91	21.18	1,100
			Big Sioux River basin					
Pipestone Creek near Pipestone, MN 06482500	Lat 44°04'54", long 96°18'27", in SE¼SE¼ sec. 12, T. 107 N., R. 46 W., Pipestone County, Hydrologic Unit 10170203, at bridge on Trunk Highway 75, 5.5 miles north of Pipestone. Drainage area -.	1991	6-22-91	17.50	†	6-22-91	17.50	†
Beaver Creek at Valley Springs, S.D. 06482745	Lat 43°35'10", long 96°28'20", in NW¼NW¼ sec.3, T.101 N., R.47 W., Minnehaha County, South Dakota Hydrologic Unit 10170203, at bridge on County Road 103 (Valley Drive), 1 mile west of South Dakota-Minnesota border, 2.5 miles south of Interstate 90. Drainage area 104 mi^2.	1986-91	6-4-91	a16.47	220	9-24-86	22.07	1,060

"See footnotes at end of the table."

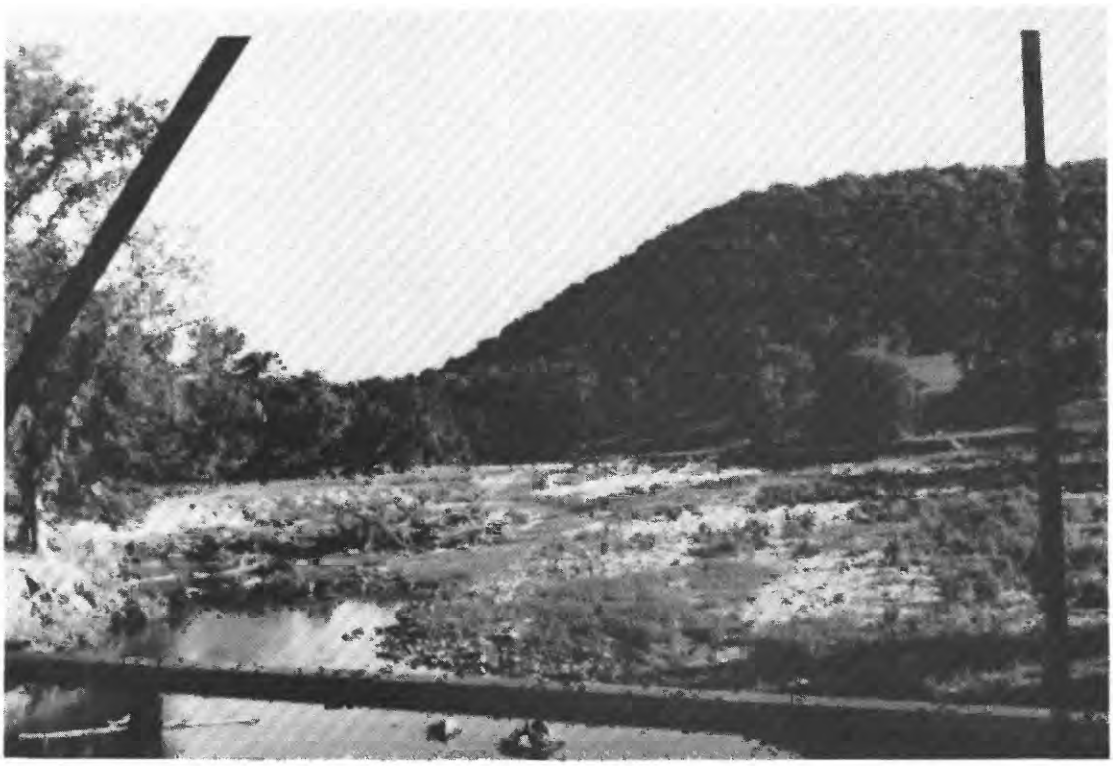
DISCHARGE AT PARTIAL-RECORD STATIONS AND MISCELLANEOUS SITES

Annual maximum discharge at high-flow partial-record stations during water year 1991--Continued

Station name and number	Location and drainage area	Period of record	Water year 1991 maximum			Period of record maximum		
			date	gage height (ft)	discharge (ft^3/s)	date	gage height (ft)	discharge (ft^3/s)
Big Sioux River basin--Continued								
Chanarambi Creek near Edgerton, MN 06482933	Lat 43°53'59", long 96°03'39", in NW¼SW¼ sec.18, T.105 N., R.43 W., near Murray and Pipestone County line, Hydrologic Unit 10170204, at bridge on township road, 3.8 miles northeast of Edgerton, 7.4 miles upstream from mouth. Drainage area 56.1 mi^2.	1979-91	3-19-91	10.62	62	9-19-86	18.09	580
Rock River at Luverne, MN 06483000	Lat 43°39'15", long 96°12'03", in SW¼NE¼ sec.11, T.102 N., R.45 W., Rock County, Hydrologic Unit 10170204, at bridge on Main Street (County Highway 4) in Luverne. Drainage area 425 mi^2.	1911-14#, 1972-91	6-6-91•	g	e300	6-13-14	13.20	11,600
Little Rock River near Rushmore, MN 06483350	Lat 43°32'36", long 95°48'58" in NE¼NE¼ sec. 24, T. 101 N, R. 42 W., Nobles County, Hydrologic Unit 10170204, at bridge #4967, on County Road 6, 1.5 miles west of Ransom, 5.1 miles south of Rushmore. Drainage area	1991	6-6-91	24.67	380	6-6-91	24.67	380
Little Sioux River basin								
Little Sioux River near Spafford, MN 06603530	Lat 43°36'08", long 95°15'27", in NE¼NE¼ sec.34, T.102 N., R.37 W., Jackson County, Hydrologic Unit 10230003, at bridge on county highway, 1.6 miles downstream from Jackson County ditch No. 11, 5.8 miles east of Spafford. Drainage area 41.1 mi^2.	1962-91	6-22-91	a9.82	600	6-29-69	12.06	4.500

< Less than, peak stage unknown, discharge estimated.
+ Operated as low flow site.
# Operated as a continuous-record gaging station.
† Discharge not determined.
a Backwater from acquatic growth or debris.
b Not annual maximum gage height.
c Affected by shifting control.
d Peak stage unknown.
e Discharge estimated.
f Approximately.
g Peak stage did not reach bottom of pipe.
h At datum then in use, 5.84 ft higher.

Miscellaneous Sites



Rush Creek near Rushford
August 14, 1962

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 1991

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Mississippi River main stem				
Mississippi River	Gulf of Mexico	Lat 47°27'01", long 94°28'40", in SW¼NW¼ sec.22, T.146 N. R.30 W., Beltrami County, Hydrologic Unit 07010101, 1000 feet below Knutson Dam at outlet to Cass Lake, 2.2 miles South of Pennington.	-	1991	2-26-91	230
Mississippi River	Gulf of Mexico	Lat 47°25'29", long 94°21'13", in NE¼NE¼ sec.33, T.146 N., R.29 W., on Itasca/Cass County line, Hydrologic Unit 07010101, at Becker Resort boat landing, 1 mile above Lake Winnibigoshish.	-	1991	2-26-91	294
Mississippi River	Gulf of Mexico	Lat 47°25'42", long 94°03'00", in SW¼ sec.25, T.146 N., R.27 W., Itasca County, Hydrologic Unit 07010101, on Leech Lake Indian Reservation, at dam 1 mile northwest of Little Winnibigoshish Lake, 14 miles northwest of city of Deer River, at mile 1,248 upstream from Ohio River (05201500).	1,442	#1884-91	2-26-91	233
Mississippi River	Gulf of Mexico	Lat 47°19'29", long 93°57'33", in NE¼NW¼ sec.3, T.144 N., R.26 W., Cass County, Hydrologic Unit 07010101 at bridge on Trunk Highway 2, 1 mile west of Ball Club.	-	1990-91	2-27-91	269
		Leech Lake River basin				
Boy River	Leech Lake River	Lat 47°04'51", long 94°05'54", in SE¼SE¼ sec.28 T.142 N., R.27 W., Cass County, Hydrologic Unit 07010102, at bridge on County Highway 53, 1.9 miles upstream from Boy Lake and 9 miles northwest of Remer (05205200).	310	+1986-91	2-25-91	58
Boy River	Leech Lake River	Lat 47°09'56", long 94°10'41", in NW¼NW¼ sec.36, T.143 N., R.28 W., Cass County, Hydrologic Unit 07010102, at bridge on County Road 8, 2.3 miles upstream of Leech Lake (Boy Bay), 6 miles south of Federal Dam.	-	1990-91	1-17-90	69
Leech Lake River	Mississippi River	Lat 47°14'45", long 94°13'12", in sec.34, T.144 N., R.28 W., Cass County, Hydrologic Unit 07010102, on Leech Lake Indian Reservation, on right bank at dam on Leech Lake River at city of Federal Dam, 2 miles downstream from natural outlet of Leech Lake (05206500).	1,163	#1984-91	2-28-91	99
Leech Lake River	Mississippi River	Lat 47°49'22", long 93°54'50", in SE¼NW¼ sec.13, T.144 N., R.26 W., Cass County, Hydrologic Unit 07010101, in river 2.5 miles downstream of Mud Lake Dam, 2.5 miles southeast of Ball Club.	-	1991	2-28-91	106

"See footnotes at end of the table."

Discharge measurements made at miscellaneous sites during water year 1991--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Mississippi River main stem				
Mississippi River	Gulf of Mexico	Lat 47°18'08", long 93°54'04", in NW¼SW¼ sec.7, T.144 N., R.25 W., Cass County, Hydrologic Unit 07010102, at bridge on County Road 3, 2 miles southeast of Ball Club (05207600).	-	1945-48, 1957, 1990-91	2-27-91	401
Mississippi River	Gulf of Mexico	Lat 47 °15'10", long 93°48'00", in NE¼NW¼ sec.35, T.144 N., R.25 W., Itasca County, Hydrologic Unit 07010101, at bridge on County Road 18, at Days High Landing, 5.6 miles south of Deer River. (05210000).	a3,190	1945-50, #b1979-91	2-28-91	373
		Crow River basin				
Fountain Creek	North Fork Crow River	Lat 45°01'20", long 93°56'29", in NE¼NW¼ sec.22, T.118 N., R. 26 W., Wright County, Hydrologic Unit 07010204, at culvert on County Highway 30, 3.3 miles southwest of Montrose (05278350).	6.73	1962-85, 1991	9-7-91	202
Otter Creek tributary	South Fork Crow River	Lat 44°53'34", long 94°04'24", in SE¼SE¼ sec. 33, T. 117 N., R. 27 W., McLeod County, Hydrologic Unit 07010205, at culvert on County Highway 63, 1.7 miles northwest of Lester Prairie, 3.3 miles upstream from mouth (05278750).	1.54	+1962-86, 1991	9-8-91	†58
Buffalo Creek tributary	South Fork Crow River	Lat 44°45'55", long 94°22'33", in NE¼SE¼ sec. 13, T. 115 N., R. 30 W., McLeod County, Hydrologic Unit 07010205, at culvert on State Highway 15, 0.6 mile above mouth, and 2.6 miles northwest of Brownton (05278850).	9.45	+1961-87, 1991	9-8-91	†175
South Fork Crow River	Crow River	Lat 44°54'20", long 93°53'05", in SW¼SW¼ sec. 30, T. 117 N., R. 25 W., Carver County, Hydrologic Unit 07010205, near center of span on downstream side of bridge on State Highway 7, 1.3 miles north of Mayer, 4.3 miles southwest of Watertown, 16 miles upstream from confluence with North Fork (05279000).	1,170	#1934-79, +1980-84, +1986, 1991	9-13-91	†6760
Mississippi River	Gulf of Mexico	Lat 44°58'46", long 93°14'50 ", in SE¼SE¼ sec.23, T.29 N., R.24 W., Hennepin County, Hydrologic Unit 07010206, at lower St. Anthony Falls lock and dam in Minneapolis at River Mile 853.3 upstream from Ohio River. (Discharge measurements made between Hennepin Avenue and Franklin Avenue bridges over the Mississippi River are included). (05288920).	a19,700	1912, 1938-39, 1941, 1943, 1953-54, 1957, 1963-85, 1990-91	4-26-91 8-8-91	†15,700 9,040
		Minnesota River basin				
Chippewa River	Minnesota River	Lat 44°56'53", long 95°43'50", in NE¼SE¼ sec.18, T.117 N., R.40 W., Chippewa County, Hydrologic Unit 07020005, at bridge on State Highway 7, at Montevideo (05305400).	-	1990-91	6-22-91	857
Chippewa River below diversion	Minnesota River	Lat 45°01'10", long 95°47'30", in NW¼ sec.22, T.118 N., R.41 W., Chippewa County, Hydrologic Unit 07020005, 1.4 miles northeast of Watson.	-	1945-91	11-7-90	*19

"See footnotes at end of the table."

Discharge measurements made at miscellaneous sites during water year 1991--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Minnesota River basin--Continued				
Hawk Creek	Minnesota River	Lat 44°44'11", long 95°25'21", in NE¼SE¼ sec.28, T.115 N., R.38 W., Renville County, Hydrologic Unit 07020004, at mouth of Hawk Creek, 0.25 mile northwest of County Highway 10 bridge on Minnesota River near Sacred Heart (05314550).	-	1990-91	7-1-91	1,180
Minnesota River	Mississippi River	Lat 44°43'54", long 95°25'14", in SE¼SE¼ sec.27, T.115 N., R.38 W., Renville County, Hydrologic Unit 07020004, at bridge on County Highway 10, 4.5 miles southwest Sacred Heart (05314560).	-	1990-91	8-20-91	3,890
Minnesota River	Mississippi River	Lat 44°37'11", long 95°10'39", in NW¼SW¼ sec.3, T.113 N., R.36 W., Renville County, Hydrologic Unit 07020004, at bridge on County Highway 21, 3 miles north of Delhi (05314740).	-	1990-91	8-20-91	4,060
Minnesota River	Mississippi River	Lat 44°32'46", long 94°59'45", in NE¼SE¼ sec.36, T.113 N., R.35 W., Renville County, Hydrologic Unit 07020007, at bridge on State Highway 19 and Trunk Highway 71 at Morton (05316580).	-	1990-91	8-21-91	4,460
Minnesota River	Mississippi River	Lat 44°26'01", long 94°43'01", in NE¼SW¼ sec.8, T.111 N., R.32 W., Nicollet County, Hydrologic Unit 07020007, at bridge on State Highway 4, 4 miles south of Fairfax (05316685).	-	1990-91	8-21-91	4,590
Minnesota River	Mississippi River	Lat 44°21'43", long 94°29'50", in SW¼NE¼ sec.1, T.110 N., R.31 W., Nicollet County, Hydrologic Unit 07020007, at bridge on County Highway 35, 1 mile northwest of New Ulm (053106760).	-	1990-91	8-21-91	5,240
Minnesota River	Mississippi River	Lat 44°15'28", long 94°20'29", in NE¼SW¼ sec.8, T.109 N., R.29 W., Nicollet County, Hydrologic Unit 07020007, at bridge on County Highway 24 at Courtland (05317250).	a11,200	1938-50, 1990-91	8-22-91 9-6-91	5,500 1,170
Minnesota River	Mississippi River	Lat 44°12'00", long 94°11'36", in NE¼SE¼ sec.33, T.109 N., R.28 W., Blue Earth County, Hydrologic Unit 07020007, at bridge on County Highway 42, 0.25 mile north of Judson (05317500).	-	1990-91	8-22-91 9-6-91	5,540 1,230
Blue Earth River	Minnesota River	Lat 44°04'06", long 94°06'00" in SE¼SW¼ sec.17, T.107 N., R.27 N., Blue Earth County, Hydrologic Unit 07020009, bridge at County Road 34, Rapidan (05318290)	-		3-15-91 3-21-91 3-22-92 3-26-91 4-3-91 4-9-91 5-6-91 5-7-91 5-8-91 5-9-91 6-5-91	278 958 1,570 2,530 2,170 1,330 4,490 5,070 5,480 6,760 7,820

"See footnotes at end of the table."

Discharge measurements made at miscellaneous sites during water year 1991--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Minnesota River basin--Continued				
Blue Earth River	Minnesota River	Lat 44°09'48", long 94°02'12", in SW¼NE¼ sec.13, T.108 N., R.27 W., Blue Earth County, Hydrologic Unit 07020009, at confluence with Minnesota River in Sibley Park above dam in Mankato (05322000).	-	1990-91	10-24-90	257
					11-28-90	133
					12-18-90	219
					1-11-91	*76
					2-27-91	*192
					3-6-91	344
					3-14-91	557
					3-19-91	570
					3-20-91	873
					3-21-91	1,410
					3-25-91	5,160
					3-26-91	5,180
					4-2-91	4,550
					4-10-91	2,360
					4-17-91	9,360
					4-25-91	4,470
					4-30-91	4,850
					5-10-91	†14,400
					5-15-91	7,850
					5-24-91	7,980
					5-31-91	8,700
					6-6-91	16,400
					6-13-91	15,700
					6-20-91	9,480
					6-28-91	5,650
					7-3-91	5,480
					7-10-91	2,360
					7-16-91	3,660
					7-25-91	5,720
					7-31-91	2,980
					8-30-91	*655
					9-26-91	1,350
Minnesota River	Mississippi River	Lat 44°18'26", long 93°57'35", in SE¼NW¼ sec.28, T.110 N., R.26 W., Nicollet County, Hydrologic Unit 07020007, at bridge on State Highway 22 at St. Peter (05325200).	-	1990-91	8-22-91	7,950
Rush River	Minnesota River	Lat 44°29'57", long 93°54'18" in NW¼NW¼ sec.24, T.112 N., R.26 W., Sibley County, Hydrologic Unit 07020007, at bridge on State Highway 93, 2 miles south of Henderson (05326400).	-	1990-91	5-30-91	1,820
Minnesota River	Mississippi River	Lat 44°31'46", long 93°54'02", in SE¼SW¼ sec.1, T.112 N., R.26 W., Sibley County, Hydrologic Unit 07020012, at bridge on State Highway 19 at Henderson (05326450).	-	1990-91	8-23-91	7,940
		Garvin Brook basin				
Garvin Brook	Mississippi River	Lat 44°01'24", long 91°47'06", in SW¼SE¼ sec. 33, T.107 N., R. at 8 W., Winona County, Hydrologic Unit 07040003, on Chicago and North-western Railroad bridge, 1.0 mile west of Stockton, 0.9 mile upstream from Stockton Valley Creek (05378220).	-	#1982-83, 1991	7-21-91	11,000

"See footnotes at end of the table."

Discharge measurements made at miscellaneous sites during water year 1991--Continued

Stream	Tributary	Location	Drainage area (mi^2)	Period of record	Date	Discharge (ft^3/s)
		Garvin Brook basin--Continued				
Stockton Valley Creek	Garvin Brook	Lat 44°00'56", long 91°45'36", in SE¼NE¼ sec. 3, T. 106 N., R. 8 W., Winona County, Hydrologic Unit 07040003, 0.9 mile above mouth, and 1.0 mile south of Stockton (05378230).	-	#1982-83, #1984-85, 1991	7-21-91	†42,300
Garvin Brook	Mississippi River	Lat 44°04'16", long 91°45'51", in SE¼NE¼ sec. 15, T. 107 N., R. 8 W., Winona County, Hydrologic Unit 07040003, on left bank, 20 ft downstream from County 23 bridge, 1.8 mile south of Minnesota City, and 2.3 miles upstream from Rollingstone Creek (05378235).	-	#1982-83, #1984-91	7-21-91	†11,200
		Gilmore Creek basin				
Gilmore Creek	Mississippi River	Lat 44°02'40", long 91°41'25", in Sec. 29, T. 107 N., R. 7 W., on left bank about 1,500 ft upstream from bridge carrying U.S. Highway No. 14 at the west edge of Winona, Winona County, Minn., and about 2¼ miles above Lake Winona, into which the stream flows (05379000).	8.95	#1939-63, +1964-65, 1991	7-21-91	†e4,400

Operated as a continuous record station.
+ Operated as a high-flow partial record station.
a Approximately.
b Stage only.
e Estimated.

Water-quality Partial Record Stations

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

Water-quality partial-record stations are particular sites where chemical-quality, biological and (or) sediment data are collected systematically over a period of years for use in hydrologic analyses. Letter K indicates non-ideal colony count.

05305400 CHIPPEWA RIVER AT MONTEVIDEO

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
JUN 22...	1100	860	422	7.9	19.0	742	6.6	54	2.1	208

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
JUN 22...	40	0.10	0.07	3.0	2.9	0.15	0.13	1.3	0.8

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
JUN 22...	0.22	0.14	0.15	0.12	7.4	>7.1	270	1.20	<0.60

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

05313510 YELLOW MEDICINE RIVER ON HWY 67 NEAR GRANITE FALLS

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
JUN										
05...	1130	1480	681	7.9	19.5	748	6.9	79	3.6	384

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
JUN									
05...	60	0.19	0.10	4.9	4.9	0.18	0.14	1.2	1.0

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
JUN									
05...	0.26	0.09	0.21	0.08	7.1	>4.9	616	6.30	<1.10

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

05314550 HAWK CREEK AT MOUTH NEAR SACRED HEART

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
JUL 01...	1530	1180	870	8.2	23.5	733	7.7	120	4.2	552

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
JUL 01...	28	0.07	0.06	11	10	0.06	0.04	2.8	1.2

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
JUL 01...	0.49	0.30	0.25	0.25	7.0	>9.8	1160	9.90	1.20

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

05314560 MINNESOTA RIVER NEAR SACRED HEART

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 20...	0845	3890	890	8.3	22.5	739	7.9	51	5.6	6

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
AUG 20...	6	0.01	0.01	1.4	1.4	<0.01	0.01	1.6	0.9

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
AUG 20...	0.22	0.11	0.09	0.07	9.8	3.3	82	30.0	<0.10

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

05314740 MINNESOTA RIVER NEAR DELHI

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
JAN										
31...	1730	--	1200	8.0	0.5	740	8.5	--	--	--
AUG										
20...	1345	4080	874	8.3	23.0	739	8.2	43	4.6	58

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
AUG									
20...	19	0.01	0.01	1.4	1.4	<0.01	0.01	1.8	1.3

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
AUG									
20...	0.24	0.11	0.08	0.07	9.6	3.7	100	21.0	<0.10

DATE	2, 4-DP TOTAL (UG/L) (82183)	2,4,5-T TOTAL (UG/L) (39740)	2,4-D, TOTAL (UG/L) (39730)	DICAMBA (MED-IBEN) (BAN-VEL D) TOTAL (UG/L) (82052)	PICLO-RAM (TOR-DON) (AMDON) TOTAL (UG/L) (39720)	SILVEX, TOTAL (UG/L) (39760)
JAN						
31...	<0.01	<0.01	0.02	<0.01	0.01	<0.01

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

05316541 REDWOOD RIVER BELOW RAMSEY CREEK AT REDWOOD FALLS

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
JUN 05...	1600	2640	515	8.0	20.0	748	8.9	50	2.9	264

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
JUN 05...	46	0.21	0.10	6.5	6.5	0.22	0.15	1.8	1.7

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
JUN 05...	0.37	0.20	0.33	0.19	6.3	>4.9	296	2.70	<1.10

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

05316580 MINNESOTA RIVER AT MORTON

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 21...	0930	4460	905	8.5	22.0	739	7.9	15	5.8	14

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
AUG 21...	12	0.02	0.02	2.2	2.2	<0.01	0.01	1.3	1.1

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
AUG 21...	0.24	0.10	0.08	0.07	9.2	3.4	102	19.0	<0.10

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

05316685 MINNESOTA RIVER NEAR FAIRFAX

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 21...	1245	4590	911	8.5	23.0	739	7.5	46	4.0	11

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
AUG 21...	10	0.02	0.02	2.4	2.4	<0.01	<0.01	1.4	0.90

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
AUG 21...	0.22	0.11	0.08	0.07	8.3	2.8	100	20.0	<0.10

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

05316760 MINNESOTA RIVER NEAR NEW ULM

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 21...	1430	5240	912	8.7	25.0	739	8.2	43	5.1	<1

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
AUG 21...	<1	0.03	0.02	2.7	2.7	<0.01	0.03	1.5	0.90

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
AUG 21...	0.21	0.11	0.08	0.07	8.9	3.1	77	21.0	<0.10

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

05317250 MINNESOTA RIVER AT COURTLAND

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG										
22...	0900	5500	866	8.4	23.0	746	7.2	39	3.9	33
SEP										
06...	1140	1170	961	8.2	21.5	746	7.9	44	4.9	53

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
AUG									
22...	14	0.03	0.02	2.7	2.7	<0.01	<0.01	1.0	0.70
SEP									
06...	29	0.02	0.01	0.56	0.58	0.02	<0.01	1.6	0.80

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
AUG									
22...	0.21	0.10	0.08	0.06	8.6	2.5	111	11.0	<0.10
SEP									
06...	0.17	0.09	0.06	0.04	8.1	>1.2	122	4.90	<0.10

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

05317500 MINNESOTA RIVER AT JUDSON, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG										
22...	1115	5540	854	8.4	24.0	742	7.2	39	3.9	62
SEP										
06...	1530	1240	942	8.3	23.0	745	9.9	55	5.0	79

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
AUG									
22...	24	0.02	0.02	2.8	2.8	<0.01	<0.01	1.3	0.70
SEP									
06...	36	0.02	0.01	0.62	0.62	0.01	<0.01	1.2	0.40

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
AUG									
22...	0.22	0.10	0.07	0.06	8.5	2.2	130	11.0	<0.10
SEP									
06...	0.23	0.07	0.06	0.03	7.5	4.2	115	6.70	<0.10

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

05318290 BLUE EARTH RIVER NEAR GOOD THUNDER, MINNESOTA

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
MAR												
15...	1300	278	637	8.4	1.0	747	13.5	20	1.1	84	26	19
19...	1615	419	600	8.0	1.0	736	12.9	23	3.3	81	26	21
21...	1145	958	606	8.7	0.5	728	13.3	50	3.7	75	23	17
22...	1545	1570	526	8.3	1.5	724	13.0	66	5.2	68	20	12
26...	0845	2530	678	8.5	5.0	726	11.3	49	3.9	94	28	12
APR												
03...	0900	2170	722	6.5	8.0	744	13.5	34	2.4	--	--	--
09...	1600	1330	761	8.7	10.5	738	10.4	38	4.5	--	--	--
MAY												
06...	0915	4490	599	7.9	7.5	737	10.8	60	2.8	--	--	--
07...	0945	5070	609	8.3	8.0	745	12.6	45	2.5	--	--	--
08...	1420	5480	607	7.8	9.0	740	10.0	43	2.5	--	--	--
09...	1015	6760	565	7.8	10.0	740	10.1	47	2.9	--	--	--
16...	0945	3640	722	8.3	19.0	735	8.9	33	1.6	--	--	--
JUN												
06...	0915	7850	539	8.3	19.5	748	7.6	49	1.8	--	--	--
JUL												
22...	1830	2540	548	8.4	26.5	741	6.8	120	4.0	--	--	--
23...	1500	3050	496	8.2	24.5	745	6.9	89	3.3	--	--	--
24...	0900	2710	517	8.2	22.5	741	7.5	54	3.6	--	--	--
25...	1800	2000	669	8.5	22.5	744	9.2	40	2.3	--	--	--

DATE	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)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)
MAR												
15...	3.5	70	30	0.3	9	2	50	0.04	0.04	7.0	6.7	0.21
19...	3.2	69	30	0.3	128	24	60	0.03	0.03	5.2	5.2	0.16
21...	3.6	69	34	0.3	231	25	60	0.04	0.03	5.3	4.8	0.19
22...	3.4	43	27	0.3	391	89	40	0.09	0.07	9.3	7.5	0.21
26...	3.5	56	35	0.4	275	34	30	0.12	0.06	17	17	0.26
APR												
03...	--	--	--	--	119	20	--	0.05	0.05	16	15	0.02
09...	--	--	--	--	99	17	--	0.03	0.03	15	15	<0.01
MAY												
06...	--	--	--	--	488	46	--	0.15	0.07	18	18	0.08
07...	--	--	--	--	363	56	--	0.15	0.08	18	18	0.08
08...	--	--	--	--	241	34	--	0.16	0.11	22	22	0.09
09...	--	--	--	--	356	47	--	0.13	0.13	23	23	0.07
16...	--	--	--	--	105	20	--	0.08	0.08	21	20	0.02
JUN												
06...	--	--	--	--	59	8	--	0.21	0.11	14	14	0.14
JUL												
22...	--	--	--	--	800	148	--	0.04	0.04	10	11	0.02
23...	--	--	--	--	616	100	--	0.03	0.03	9.9	9.8	<0.01
24...	--	--	--	--	386	31	--	0.04	0.03	11	11	<0.01
25...	--	--	--	--	243	30	--	0.03	0.02	13	13	<0.01

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

05318290 BLUE EARTH RIVER NEAR GOOD THUNDER, MINNESOTA--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO TOTAL (MG/L AS P) (70507)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	CARBON, ORGANIC DISSOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUSPENDED TOTAL (MG/L AS C) (00689)	SEDIMENT, SUSPENDED (MG/L) (80154)	CHLOR-A PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTOPLANKTON CHROMO FLUOROM (UG/L) (70954)
MAR												
15...	0.21	1.5	1.5	0.12	0.09	0.10	0.09	5.1	0.8	37	--	--
19...	0.16	1.5	1.0	0.12	0.05	0.08	0.05	6.3	2.7	193	6.70	0.60
21...	0.19	1.1	0.90	0.30	0.09	0.12	0.09	6.5	>5.0	736	13.0	1.10
22...	0.21	2.7	1.5	0.17	0.12	0.13	0.12	7.4	6.1	785	13.0	0.70
26...	0.26	2.4	1.8	0.42	0.12	0.20	0.08	7.0	>5.0	707	6.00	0.40
APR												
03...	0.02	1.8	1.4	0.17	0.04	0.06	0.04	6.4	2.9	242	9.30	0.40
09...	<0.01	1.9	1.0	0.21	0.03	0.05	<0.01	6.1	4.8	270	17.0	0.90
MAY												
06...	0.07	2.8	1.1	0.50	0.12	0.21	0.11	5.8	8.8	993	5.90	<2.50
07...	0.07	2.9	0.70	0.44	0.14	0.23	0.14	7.2	--	856	2.70	<1.10
08...	0.08	2.8	0.70	0.38	0.13	0.19	0.13	7.0	5.3	631	3.00	<1.20
09...	0.07	1.9	1.7	0.14	0.14	0.12	0.12	9.4	3.4	753	2.70	<1.10
16...	0.02	1.8	1.2	0.19	0.06	0.06	0.05	6.5	2.2	365	6.30	<1.10
JUN												
06...	0.05	1.4	1.2	0.36	0.18	0.31	0.18	7.1	5.4	566	2.20	<1.60
JUL												
22...	0.03	4.6	1.9	0.26	0.15	0.14	0.13	6.1	>5.0	210	1 13.0	1.40
23...	0.04	2.8	1.4	0.43	0.16	0.17	0.16	5.8	>5.0	010	1 7.30	<1.40
24...	<0.01	1.2	0.90	0.31	0.17	0.16	0.13	5.4	>5.0	638	6.30	<1.20
25...	0.01	1.5	1.3	0.41	0.17	0.14	0.13	6.0	>5.0	361	13.0	1.30

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

05322000 BLUE EARTH RIVER AT MOUTH AT MANKATO

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)
OCT										
24...	1300	257	693	8.8	9.5	749	16.0	51	6.8	K6
NOV										
28...	1340	133	840	8.3	2.0	746	13.7	21	4.6	K8
DEC										
18...	1400	219	953	8.6	1.0	734	13.5	18	1.9	K5
JAN										
11...	1400	76	1090	7.9	2.5	745	10.2	14	2.0	>2
FEB										
27...	1145	192	504	8.5	1.5	742	17.4	24	1.5	18
MAR										
06...	1200	344	763	8.0	3.0	738	11.1	18	1.5	K10
14...	1115	557	676	8.3	1.5	749	13.4	25	2.6	--
19...	0930	570	662	--	1.5	742	13.3	17	1.3	--
20...	1500	873	633	8.9	2.0	727	--	26	3.5	--
21...	1630	1410	603	8.8	1.5	734	14.1	37	3.8	--
25...	1515	5160	571	8.2	3.5	735	12.5	64	4.2	--
26...	1430	5180	656	8.3	6.0	728	11.6	51	3.1	--
APR										
02...	1415	4550	690	8.5	6.5	748	12.9	45	2.7	--
10...	0945	2360	774	8.7	9.5	748	11.5	34	3.4	--
17...	1230	9360	726	8.3	9.5	745	12.4	52	1.8	--
25...	0845	4470	800	8.3	12.5	740	12.5	29	1.1	42
30...	0930	4850	776	8.7	12.5	734	10.5	32	0.9	--
MAY										
10...	1000	14400	601	8.1	13.0	744	11.1	49	2.4	--
15...	0845	7850	665	8.2	19.0	738	9.5	37	1.5	--
24...	0910	7980	729	8.4	19.5	740	9.7	34	1.7	K200
31...	0830	8700	730	8.2	21.0	735	9.2	37	1.2	--
JUN										
06...	1000	16400	534	8.1	20.5	748	8.4	55	2.3	--
13...	1045	15700	621	8.3	23.0	738	8.6	41	2.2	--
20...	0745	9480	714	8.4	21.5	742	9.1	51	2.0	K2500
28...	0650	5650	721	8.0	25.5	741	8.5	39	1.5	--
JUL										
03...	0800	5580	672	8.3	23.5	738	8.1	39	1.7	--
10...	0800	2360	746	8.3	22.5	742	7.0	25	2.5	--
16...	0900	3660	720	8.4	24.0	744	10.2	40	1.3	--
25...	0745	5720	607	8.4	21.0	746	10.4	44	3.0	--
31...	0830	2980	666	8.3	21.5	744	8.6	30	1.8	K420
AUG										
30...	1030	655	641	8.8	26.0	746	10.8	43	7.3	370
SEP										
26...	1245	1350	819	8.3	13.0	741	12.7	23	--	310

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

05322000 BLUE EARTH RIVER AT MOUTH AT MANKATO--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	RESIDUE TOTAL AT 105 DEG. C, SUSPENDED (MG/L) (00530)	RESIDUE VOLATILE, SUSPENDED (MG/L) (00535)
OCT										
24...	K23	--	--	--	--	--	--	--	29	15
NOV										
28...	K9	--	--	--	--	--	--	--	16	<1
DEC										
18...	20	--	--	--	--	--	--	--	12	11
JAN										
11...	>2	--	--	--	--	--	--	--	6	6
FEB										
27...	37	--	--	--	--	--	--	--	6	6
MAR										
06...	7200	--	--	--	--	--	--	--	3	1
14...	--	88	28	22	4.0	80	37	0.2	20	5
19...	--	87	27	22	3.8	81	13	0.3	16	9
20...	--	80	25	21	3.7	82	35	0.3	21	9
21...	--	76	24	19	4.8	79	33	0.3	31	9
25...	--	79	23	10	3.8	63	30	0.3	371	46
26...	--	87	26	10	3.9	65	32	0.3	174	22
APR										
02...	--	--	--	--	--	--	--	--	114	20
10...	--	--	--	--	--	--	--	--	69	11
17...	--	--	--	--	--	--	--	--	243	33
25...	K52	--	--	--	--	--	--	--	25	11
30...	--	--	--	--	--	--	--	--	72	16
MAY										
10...	--	--	--	--	--	--	--	--	221	32
15...	--	--	--	--	--	--	--	--	127	21
24...	230	--	--	--	--	--	--	--	110	17
31...	--	--	--	--	--	--	--	--	111	5
JUN										
06...	--	--	--	--	--	--	--	--	346	52
13...	--	--	--	--	--	--	--	--	149	26
20...	K4600	--	--	--	--	--	--	--	248	36
28...	--	--	--	--	--	--	--	--	129	22
JUL										
03...	--	--	--	--	--	--	--	--	73	19
10...	--	--	--	--	--	--	--	--	35	8
16...	--	--	--	--	--	--	--	--	117	21
25...	--	--	--	--	--	--	--	--	119	21
31...	K260	--	--	--	--	--	--	--	65	3
AUG										
30...	1600	--	--	--	--	--	--	--	9	<1
SEP										
26...	1400	--	--	--	--	--	--	--	3	<1

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

05322000 BLUE EARTH RIVER AT MOUTH AT MANKATO--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	BORON, DIS-SOLVED (UG/L AS B) (01020)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
OCT									
24...	--	0.02	0.02	0.70	0.70	0.06	0.06	1.8	1.7
NOV									
28...	--	0.02	0.02	2.5	2.5	0.07	0.07	1.2	0.50
DEC									
18...	--	0.02	0.02	3.5	3.5	0.16	0.16	0.70	0.60
JAN									
11...	--	0.04	0.04	3.1	3.1	0.67	0.62	1.4	0.90
FEB									
27...	--	0.03	0.03	4.2	4.2	0.55	0.55	1.0	0.90
MAR									
06...	--	0.04	0.04	5.1	5.1	0.43	0.43	1.3	1.2
14...	60	0.04	0.04	6.0	6.0	0.20	0.20	0.70	0.70
19...	60	0.04	0.04	5.0	5.0	0.14	0.14	1.2	1.2
20...	70	0.03	0.03	4.7	4.3	0.15	0.14	1.4	1.3
21...	60	0.04	0.03	4.9	4.7	0.15	0.15	1.9	0.90
25...	40	0.10	0.08	14	14	0.27	0.27	2.1	2.1
26...	40	0.11	0.08	17	17	0.24	0.24	1.9	1.8
APR									
02...	--	0.08	0.06	17	16	0.09	0.08	1.2	1.2
10...	--	0.04	0.04	15	15	0.01	<0.01	1.9	1.5
17...	--	0.08	0.06	21	21	0.12	0.12	1.8	1.4
25...	--	0.04	0.03	20	20	0.02	0.02	2.0	0.80
30...	--	0.05	0.04	18	18	0.02	<0.01	2.1	1.4
MAY									
10...	--	0.11	0.08	24	24	0.06	0.06	2.3	1.6
15...	--	0.10	0.08	20	20	0.03	0.03	3.0	1.6
24...	--	0.10	0.06	19	19	0.04	0.04	1.4	1.4
31...	--	0.09	0.07	19	19	0.02	0.02	1.6	1.6
JUN									
06...	--	0.22	0.11	14	14	0.14	0.10	1.9	1.1
13...	--	0.13	0.09	15	15	0.05	0.02	2.1	1.1
20...	--	0.09	0.05	17	17	0.05	0.02	1.9	1.9
28...	--	0.05	0.03	16	16	0.03	0.03	2.0	1.4
JUL									
03...	--	0.07	0.04	13	13	0.03	0.02	1.4	1.0
10...	--	0.02	0.01	13	13	0.01	0.01	1.5	1.1
16...	--	0.04	0.03	15	15	<0.01	0.02	1.4	1.5
25...	--	0.04	0.03	12	12	<0.01	0.01	1.2	1.2
31...	--	0.02	0.02	11	11	0.01	0.01	1.5	1.1
AUG									
30...	--	0.02	0.02	5.3	5.3	0.04	0.04	1.7	0.9
SEP									
26...	--	0.02	0.01	9.3	9.0	0.08	<0.01	1.2	0.6

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

05322000 BLUE EARTH RIVER AT MOUTH AT MANKATO--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
OCT									
24...	0.10	0.10	0.02	0.02	6.4	>5.0	65	41.0	<1.10
NOV									
28...	0.06	0.04	0.03	<0.01	4.4	1.5	62	17.0	<0.60
DEC									
18...	0.13	0.04	0.04	0.03	5.4	1.0	41	5.80	<0.70
JAN									
11...	0.13	0.05	0.06	0.01	4.9	0.3	73	1.10	<0.30
FEB									
27...	0.23	0.16	0.17	0.13	6.7	0.6	--	<0.20	<0.20
MAR									
06...	0.18	0.12	0.13	0.11	6.8	0.1	156	1.50	<0.20
14...	0.20	0.13	0.11	<0.06	6.2	0.7	98	4.10	<0.50
19...	0.13	0.08	0.10	0.08	5.6	0.1	36	2.40	<0.40
20...	0.19	0.13	0.11	0.10	6.3	0.7	112	5.10	0.40
21...	0.26	0.09	0.13	0.09	6.9	1.6	--	11.0	0.70
25...	0.31	0.14	0.16	0.10	8.2	>5.0	831	3.00	<0.40
26...	0.42	0.15	0.16	0.10	8.0	4.0	554	4.30	0.40
APR									
02...	0.28	0.10	0.14	0.09	6.9	2.1	305	7.70	0.60
10...	0.19	0.05	0.06	0.02	6.9	4.0	126	18.0	0.80
17...	0.29	0.07	0.12	0.07	7.4	>5.0	661	6.10	<0.50
25...	0.12	0.04	0.06	0.04	6.3	1.5	188	3.00	<0.30
30...	0.15	0.05	0.05	0.03	6.1	1.9	226	8.20	0.40
MAY									
10...	0.15	0.11	0.15	0.11	8.1	3.2	525	2.00	<1.20
15...	0.19	0.09	0.12	0.07	7.2	2.8	390	6.30	--
24...	0.20	0.08	0.11	0.07	7.3	1.8	253	<2.60	<1.50
31...	0.29	0.25	0.12	0.10	7.0	1.6	267	5.10	<1.20
JUN									
06...	0.35	0.20	0.34	0.20	7.6	>4.9	608	2.70	<1.10
13...	0.18	0.15	0.18	0.15	6.9	3.5	328	6.20	<1.30
20...	0.21	0.14	0.15	0.12	6.5	1.9	645	2.90	<0.60
28...	0.27	0.12	0.13	0.09	6.1	3.0	176	4.00	<0.70
JUL									
03...	0.31	0.14	0.18	0.12	6.5	2.7	149	7.70	0.90
10...	0.13	0.09	0.09	0.09	6.3	2.1	98	6.10	0.60
16...	0.23	0.13	0.14	0.12	7.1	2.9	169	6.90	1.30
25...	0.44	0.21	0.21	0.19	7.3	4.4	337	6.30	<0.80
31...	0.23	0.12	0.09	0.09	6.4	2.4	165	11.0	<0.80
AUG									
30...	0.40	0.01	<0.01	<0.01	7.0	>5.0	70	14.0	<0.10
SEP									
26...	0.14	0.13	0.09	0.09	7.4	2.5	154	7.80	<0.10

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

05325050 MINNESOTA RIVER AT US HWY 14 BRIDGE AT MANKATO

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DISCHARGE, INST. CUBIC FEET PER SECOND (00061)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	BAROMETRIC PRESSURE (MM OF HG) (00025)	OXYGEN, DISSOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEMICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIOCHEMICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUSPENDED (MG/L) (00530)
APR										
17...	1750	15100	776	8.3	10.0	743	11.0	50	2.2	236
25...	1500	7760	896	8.4	13.0	738	--	36	1.1	58
30...	1445	7940	844	8.5	12.5	734	10.7	38	0.9	98
MAY										
10...	1445	20000	690	8.3	14.0	743	10.8	39	1.6	332
15...	1425	11500	746	8.4	20.0	739	9.6	35	2.1	100
24...	1345	12100	766	8.4	20.0	740	9.3	34	1.8	102
31...	1245	14700	764	8.3	22.0	735	8.7	59	1.8	266
JUN										
06...	1515	27700	621	8.1	20.0	748	7.8	43	1.8	228
13...	1535	26000	738	8.4	23.5	735	7.7	41	2.2	103
20...	1300	22200	784	8.2	23.0	741	8.4	53	1.8	253
28...	1215	23900	743	8.1	25.5	739	7.4	33	1.8	57
JUL										
03...	1315	20700	754	8.3	24.0	738	6.9	37	2.5	52
10...	1415	10400	872	8.3	25.0	742	7.5	39	2.3	35
16...	1545	14400	720	8.3	26.0	744	9.2	34	2.2	88
25...	1345	11000	749	8.3	23.0	748	9.6	46	3.4	125
31...	1310	8530	743	8.2	23.5	745	7.6	36	2.5	80
AUG										
22...	1300	7410	811	8.4	24.0	746	8.9	120	4.0	40

DATE	RESIDUE VOLATILE, SUSPENDED (MG/L) (00535)	NITROGEN, NITRITE TOTAL (MG/L AS N) (00615)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)
APR									
17...	29	0.08	0.06	20	19	0.10	0.10	1.7	0.90
25...	12	0.04	0.03	15	14	0.02	<0.01	1.5	1.1
30...	20	0.05	0.04	14	13	0.14	0.04	1.6	1.2
MAY									
10...	28	0.08	0.07	20	20	0.04	0.04	2.8	2.0
15...	18	0.08	0.07	16	16	0.02	0.02	1.7	1.4
24...	19	0.10	0.07	16	16	0.03	0.03	1.5	1.5
31...	48	0.17	0.10	16	16	0.05	0.05	2.2	1.4
JUN									
06...	38	0.20	0.15	12	12	0.12	0.08	1.7	1.2
13...	19	0.16	0.14	10	10	0.03	0.03	1.7	1.2
20...	38	0.13	0.07	10	10	0.08	0.04	2.1	1.4
28...	9	0.09	0.06	8.9	9.1	0.03	0.03	1.5	1.1
JUL									
03...	28	0.09	0.06	7.6	7.6	0.04	0.04	1.1	1.1
10...	9	0.03	0.02	6.9	6.8	0.01	0.05	1.3	0.90
16...	18	0.07	0.04	7.0	6.9	0.06	0.05	1.2	1.3
25...	24	0.04	0.03	8.0	8.0	0.01	<0.02	1.8	1.3
31...	13	0.04	0.04	7.7	7.7	0.02	<0.01	1.7	1.2
AUG									
22...	21	0.03	0.02	4.6	4.6	0.01	<0.01	1.4	1.3

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

05325050 MINNESOTA RIVER AT US HWY 14 BRIDGE AT MANKATO--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
APR									
17...	0.23	0.07	0.12	0.06	7.3	4.5	594	4.50	<0.50
25...	0.12	0.03	0.04	0.03	6.6	1.8	172	6.70	0.50
30...	0.18	0.05	0.05	0.02	6.4	3.2	328	19.0	0.80
MAY									
10...	0.18	0.09	0.12	0.09	11	3.2	482	4.00	<1.20
15...	0.13	0.06	0.07	0.04	7.3	2.7	332	8.90	1.10
24...	0.18	0.07	0.10	0.07	6.9	1.9	232	2.60	<1.50
31...	0.36	0.12	0.18	0.11	7.1	4.5	473	6.00	<1.20
JUN									
06...	0.36	0.18	0.27	0.18	7.6	>4.9	512	1.70	<1.10
13...	0.17	0.15	0.17	0.14	7.2	2.8	297	7.20	1.30
20...	0.24	0.17	0.19	0.15	6.8	>5.0	415	3.30	<0.60
28...	0.31	0.18	0.19	0.15	7.2	2.0	126	1.80	0.80
JUL									
03...	0.33	0.18	0.21	0.16	8.1	1.5	152	3.10	<0.90
10...	0.18	0.10	0.14	0.14	8.0	2.5	188	0.80	0.10
16...	0.29	0.16	0.20	0.16	7.7	2.3	166	7.50	0.80
25...	0.42	0.17	0.17	0.14	8.1	4.4	244	17.0	2.10
31...	0.31	0.12	0.11	0.09	7.2	3.4	168	14.0	1.10
AUG									
22...	0.22	0.08	0.07	0.06	8.0	3.0	154	13.0	<0.10

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

05325200 MINNESOTA RIVER AT ST. PETER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 22...	1415	7950	827	8.4	24.0	742	7.5	37	4.2	78

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
AUG 22...	29	0.02	0.02	4.7	4.7	<0.01	<0.01	1.4	1.0

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
AUG 22...	0.22	0.10	0.08	0.07	7.9	2.7	162	16.0	<0.10

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

05326400 RUSH RIVER NEAR HENDERSON, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
MAY 30...	1030	1820	504	8.1	19.0	734	7.0	86	3.5	436

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
MAY 30...	58	0.30	0.19	20	19	0.27	0.21	2.1	2.1

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
MAY 30...	0.55	0.26	0.36	0.25	10	6.7	1070	5.10	<1.20

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

05326450 MINNESOTA RIVER AT HENDERSON

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	BARO-METRIC PRES-SURE (MM OF HG) (00025)	OXYGEN, DIS-SOLVED (MG/L) (00300)	OXYGEN DEMAND, CHEM-ICAL (HIGH LEVEL) (MG/L) (00340)	OXYGEN DEMAND, BIO-CHEM-ICAL, 5 DAY (MG/L) (00310)	RESIDUE TOTAL AT 105 DEG. C, SUS-PENDED (MG/L) (00530)
AUG 23...	1000	7940	874	8.4	23.5	747	7.8	140	4.1	59

DATE	RESIDUE VOLA-TILE, SUS-PENDED (MG/L) (00535)	NITRO-GEN, NITRITE TOTAL (MG/L AS N) (00615)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N) (00630)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA TOTAL (MG/L AS N) (00610)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN, AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)
AUG 23...	22	0.03	0.02	4.8	4.8	0.01	<0.01	1.1	1.0

DATE	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)	CARBON, ORGANIC DIS-SOLVED (MG/L AS C) (00681)	CARBON, ORGANIC SUS-PENDED TOTAL (MG/L AS C) (00689)	SEDI-MENT, SUS-PENDED (MG/L) (80154)	CHLOR-A PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70953)	CHLOR-B PHYTO-PLANK-TON CHROMO FLUOROM (UG/L) (70954)
AUG 23...	0.20	0.11	0.08	0.07	7.8	3.0	177	25.0	<0.10

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

05344995 VERMILLION RIVER TRIBUTARY NEAR FARMINGTON, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)
FEB												
05...	1415	1.2	594	8.1	6.0	10.5	1	320	81	27	6.5	1.7
APR												
08...	1200	--	620	7.6	9.5	9.1	19	150	86	29	9.5	2.2
MAY												
16...	0915	12	600	7.6	14.5	6.5	230	1100	83	26	9.7	1.3

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)	NITRO-GEN, NITRITE DIS SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
FEB												
05...	47	23	0.1	24	0.01	0.60	0.02	0.40	0.40	0.04	0.02	0.02
APR												
08...	63	25	0.2	18	0.02	1.1	0.05	0.50	0.40	0.05	0.02	<0.01
MAY												
16...	44	23	0.2	15	0.04	1.7	0.06	0.80	0.80	0.04	0.03	0.02

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

05345200 VERMILLION RIVER TRIBUTARY NEAR EMPIRE, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)
MAY 16...	1230	0.01	694	7.5	20.0	2.1	160	980	100	30	6.0	7.0

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)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
MAY 16...	73	15	0.1	20	0.02	<0.05	0.21	1.2	1.0	0.13	0.07	0.04

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

443933093002801 - SOUTH BRANCH VERMILLION RIVER AT EMPIRE, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DISCHARGE, INST. CUBIC FEET PER SECOND (00061)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML) (31625)	STREPTOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)
FEB 05...	1015	8.7	463	8.1	2.0	11.0	400	2400	57	22	4.6	4.0
APR 11...	0930	--	514	8.0	6.5	10.3	42	84	70	24	5.4	1.4
MAY 17...	1045	15	491	7.9	13.5	8.5	170	350	68	23	5.0	1.2

DATE	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS TOTAL (MG/L AS P) (00665)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
FEB 05...	27	14	0.2	13	0.02	5.4	0.27	1.2	1.1	0.21	0.14	0.14
APR 11...	48	16	0.2	11	0.02	4.7	<0.01	0.60	0.60	0.03	0.02	<0.01
MAY 17...	28	18	0.2	9.9	0.05	4.7	0.08	1.1	0.70	0.06	0.04	<0.01

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

05346000 VERMILLION RIVER AT HASTINGS, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	DIS-CHARGE, INST. CUBIC FEET PER SECOND (00061)	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	PH (STAND-ARD UNITS) (00400)	TEMPER-ATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML) (31625)	STREP-TOCOCCI FECAL, KF AGAR (COLS. PER 100 ML) (31673)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)	POTAS-SIUM, DIS-SOLVED (MG/L AS K) (00935)
FEB												
07...	1400	--	709	8.0	0.0	14.3	62	--	68	23	51	4.6
APR												
11...	1230	--	742	8.4	7.5	12.7	90	100	80	27	44	3.0
MAY												
17...	1315	93	650	8.1	14.0	9.2	1700	1500	77	25	30	3.2

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)	NITRO-GEN, NITRITE DIS-SOLVED (MG/L AS N) (00613)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N) (00631)	NITRO-GEN, AMMONIA DIS-SOLVED (MG/L AS N) (00608)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N) (00625)	NITRO-GEN,AM-MONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOS-PHORUS TOTAL (MG/L AS P) (00665)	PHOS-PHORUS DIS-SOLVED (MG/L AS P) (00666)	PHOS-PHORUS ORTHO, DIS-SOLVED (MG/L AS P) (00671)
FEB												
07...	34	83	0.3	15	0.03	6.5	0.10	1.1	0.70	0.93	0.89	0.83
APR												
11...	45	77	0.3	13	0.02	5.3	<0.01	0.90	0.90	0.59	0.54	0.54
MAY												
17...	34	51	0.3	14	0.07	5.6	0.07	1.3	1.0	0.44	0.37	0.36

ANALYSES OF SAMPLES COLLECTED AT WATER QUALITY PARTIAL RECORD STATIONS

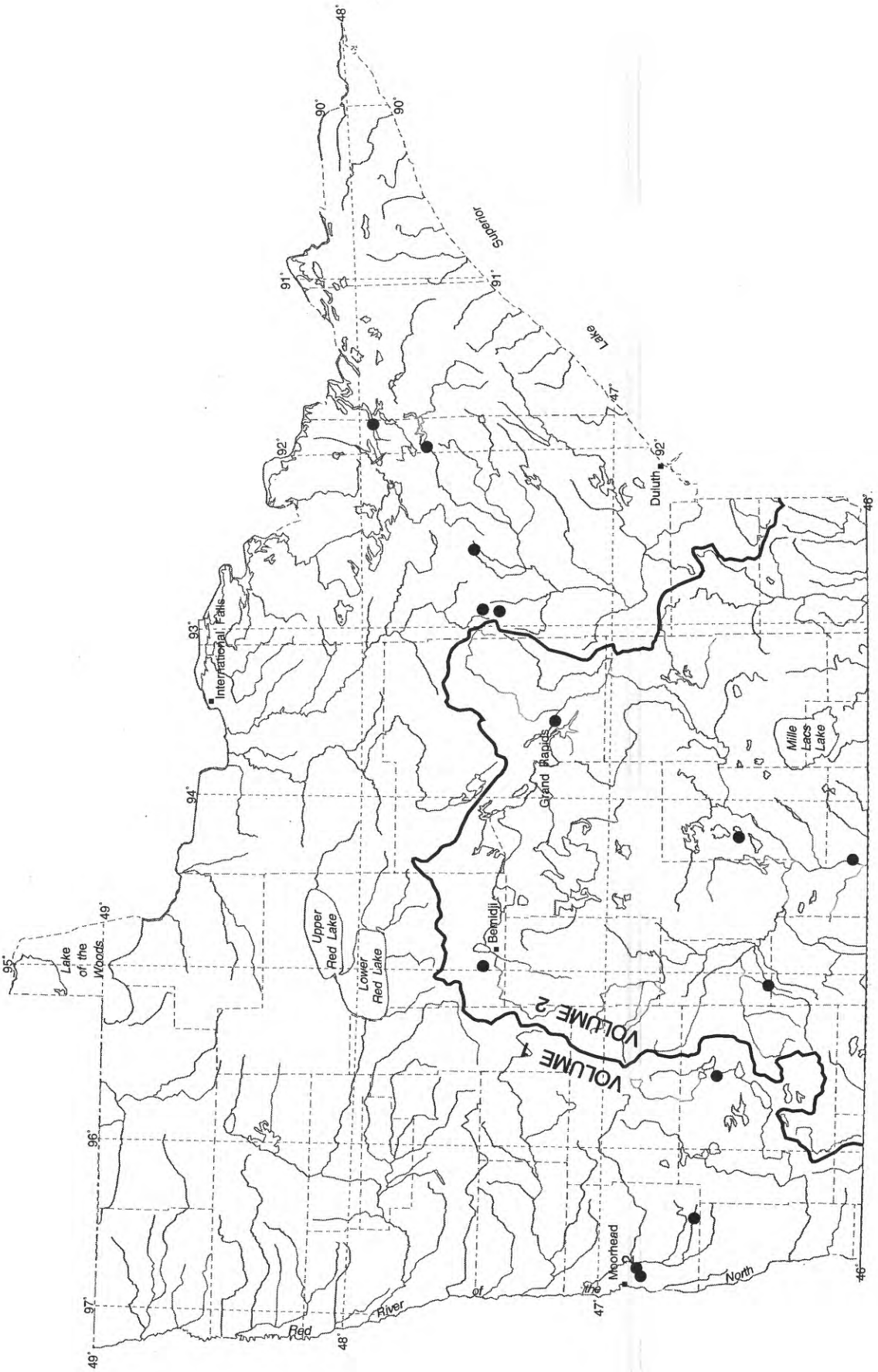
05376500 SOUTH FORK WHITEWATER RIVER NEAR ALTURA, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	TIME	TEMPERATURE WATER (DEG C) (00010)	SEDIMENT, SUSPENDED (MG/L) (80154)
MAR			
23...	1211	4.0	582
23...	1721	3.5	757
APR			
29...	1120	13.0	1880
29...	1710	15.0	1670
30...	0900	11.5	733
MAY			
16...	1815	17.0	4530
16...	1938	17.0	1250
JUN			
15...	1253	--	2080
JUL			
21...	2235	21.0	3870
30...	1331	18.0	89

Ground-water Levels

May, 1967


Lake Superior
Duluth
International Falls
Grand Rapids
Mille Lacs Lake
Bemidji
Upper Red Lake
Lower Red Lake
Lake of the Woods
Moorhead
Red River of the North
VOLUME 2
VOLUME 4
48°
90°
91°
92°
93°
94°
95°
96°
97°
47°
46°
49°

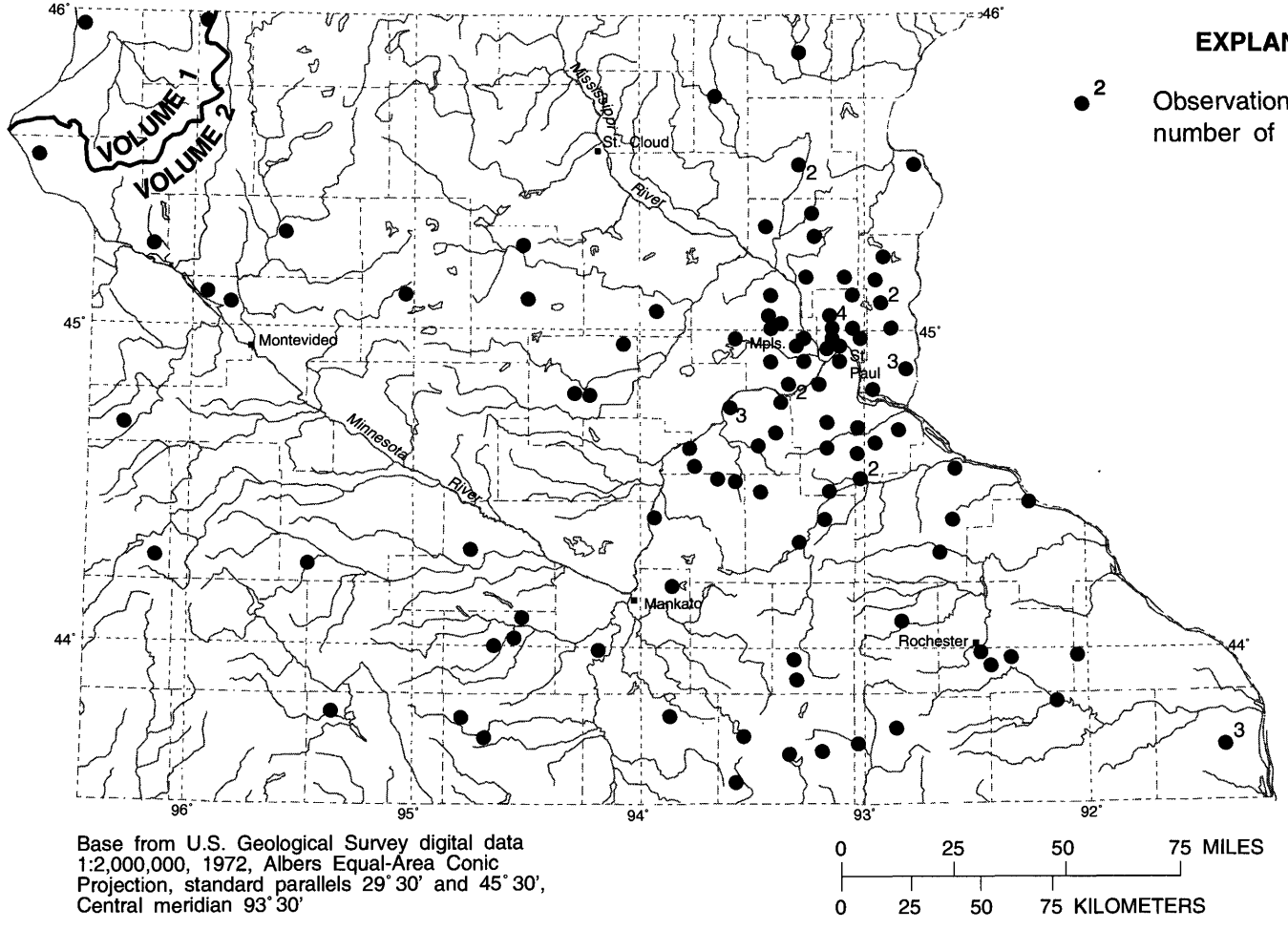


Figure 10.--Location of ground-water wells

ANOKA COUNTY

450927093033802. Local number, 031N22W23CBC02.
LOCATION.--Lat 45°09'27", long 93°03'38", in SW¼NW¼SW¼ sec.23, T.31 N., R.22 W., Hydrologic Unit 07010206, at city of Centerville.
Owner: U.S. Geological Survey.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in., depth 277 ft, screened 272 to 277 ft.
DATUM.--Land-surface datum is 901.6 ft National Geodetic Vertical Datum of 1929. Measuring point: Top of recorder platform, 2.20 ft above land-surface datum.
REMARKS.--Water level affected by nearby flowing wells.
PERIOD OF RECORD.--February 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 8.10 ft below land-surface datum, July 5, 1975; lowest, 18.57 ft below land-surface datum, Oct. 2, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATAUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 5	12.32	Dec 5	12.31	Feb 5	12.58	Apr 5	12.35	Jun 5	11.11	Aug 5	11.33
10	12.40	10	12.38	10	12.64	10	11.96	10	11.18	10	11.23
15	12.33	15	12.56	15	12.57	15	11.67	15	11.05	15	11.44
20	12.22	20	12.52	20	12.62	20	11.78	20	11.23	20	11.37
25	12.40	25	12.40	25	12.62	25	11.74	25	11.24	25	11.36
31	12.30	31	12.49	28	14.49	30	11.85	30	11.48	31	11.68
Nov 5	12.19	Jan 5	12.64	Mar 5	14.96	May 5	11.46	Jul 5	11.27	Sep 5	11.43
10	12.26	10	12.54	10	15.09	10	11.30	10	11.31	10	11.22
15	12.26	15	12.48	15	15.17	15	11.29	15	11.44	15	10.86
20	12.26	20	12.60	20	14.95	20	11.27	20	11.50	20	10.96
25	12.45	25	12.59	25	14.75	25	11.24	25	11.47	25	10.84
30	12.38	31	12.65	31	14.68	31	10.94	31	11.40	30	10.91

451210093170201. Local number, 031N24W01CBB01.
LOCATION.--Lat 45°12'10", long 93°17'02", in NW¼NW¼SW¼ sec.1, T.31 N., R.24 W., Hydrologic Unit 07010206, at Golf Course.
Owner: City of Coon Rapids.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in., depth 193 ft, screened 163 to 193 ft.
DATUM.--Altitude of land-surface datum is 897 ft. Measuring point: Top of breather pipe, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--December 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.43 ft below land-surface datum, May 13, 1986; lowest, 41.10 ft below land-surface datum, Sept. 21, 1989.

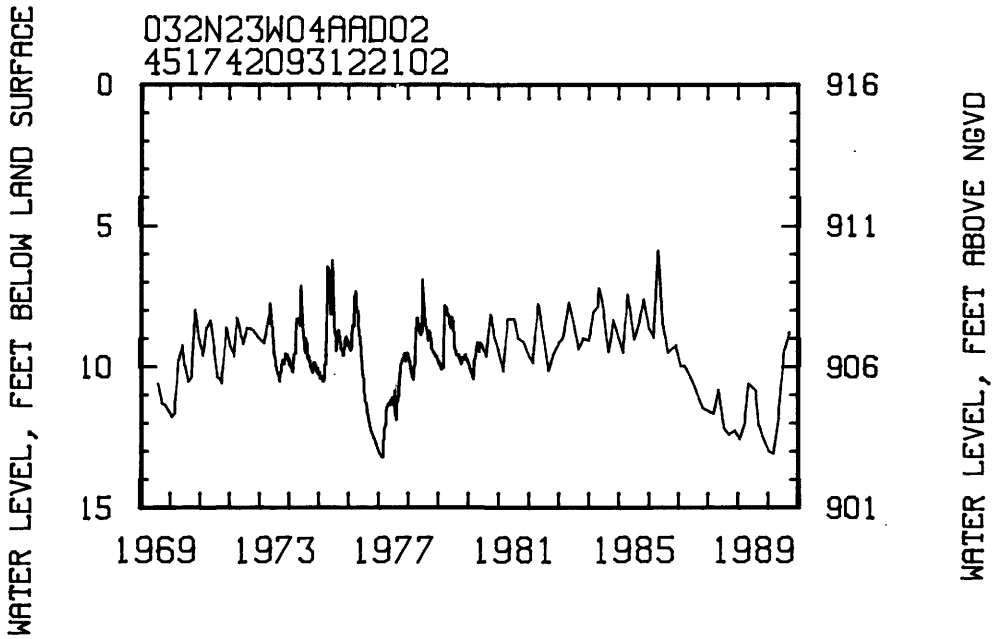
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec 04	25.17	Jan 16	25.10	Mar 11	25.43	Sep 17	24.45

451742093122102. Local number, 032N23W04AAD02.
LOCATION.--Lat 45°17'42", long 93°12'21", in SE¼NE¼NE¼ sec.4, T.32 N., R.23 W., Hydrologic Unit 07030005, 1.5 mi east of Soderville.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in., depth 21 ft, screened 19 to 21 ft.
DATUM.--Altitude of land-surface datum is 916 ft. Measuring point: Top of casing, 3.50 ft above land-surface datum.
PERIOD OF RECORD.--August 1969 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 5.82 ft below land-surface datum, May 13, 1986; lowest, 13.22 ft below land-surface datum, Mar. 5-9, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec 04	10.03	Mar 11	10.66	Jul 22	7.63
Jan 16	10.45	May 16	7.34	Sep 17	7.44



452305093141501. Local number, 033N23W05BAB01.
LOCATION.--Lat 45°23'05", long 93°14'15", in NW¼NE¼NW¼ sec.5, T.33 N., R.23 W., Hydrologic Unit 07010207, at 1300 229th Ave. NE, Bethel.
Owner: Friendship Baptist Church.
AQUIFER.--Franconian Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in., depth 141 ft, cased to 126 ft.
DATUM.--Altitude of land-surface datum is 923 ft. Measuring point: Top of well cap, 0.80 ft above land-surface datum.
PERIOD OF RECORD.--April 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 19.45 ft below land-surface datum, July 10, 1986; lowest, 23.11 ft below land-surface datum, Mar. 13, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec 04	21.87	Mar 11	22.39	Jul 22	20.22
Jan 16	22.10	May 16	21.58	Sep 17	19.62

451938093223101. Local number, 033N24W30ABB01.
LOCATION.--Lat 45°19'38", long 93°22'31", in NW¼NW¼NE¼ sec.30, T.33 N., R.24 W., Hydrologic Unit 07010207, at 4324 Viking Blvd.
Owner: Northwestern Bell Telephone Co.
AQUIFER.--Ironton-Galesville Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in., depth 280 ft, cased to 223 ft.
DATUM.--Altitude of land-surface datum is 900 ft. Measuring point: Top of casing, 1.50 ft above land-surface datum.
PERIOD OF RECORD.--April 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 26.64 ft below land-surface datum, May 13, 1986; lowest, 32.93 ft below land-surface datum, Oct. 31, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec 04	30.75	Mar 11	31.05	Jul 22	28.83
Jan 16	30.77	May 16	28.67	Sep 17	28.86

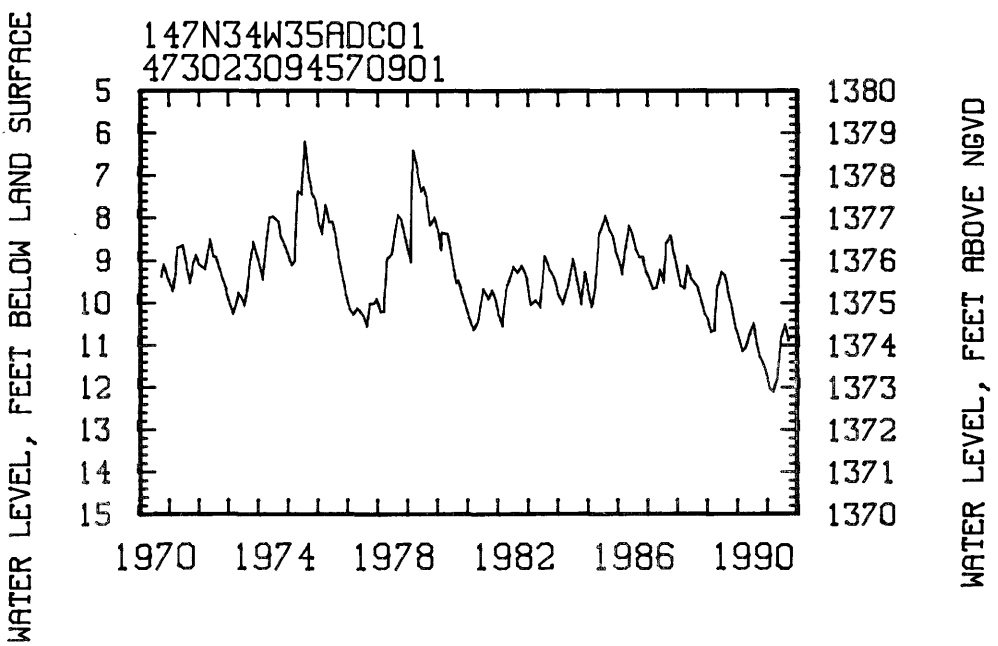
GROUND-WATER LEVELS

BELTRAMI COUNTY

473023094570901. Local number, 147N34W35ADC01.
LOCATION.--Lat 47°30'23", long 94°57'09", in SW¼SE¼NE¼ sec.35, T.147 N., R.34 W., Hydrologic Unit 07010101, on Clarence Hart farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in., depth 20 ft, screened 18 to 20 ft.
DATUM.--Altitude of land-surface datum is 1,383 ftm. Measuring point: Top of casing, 3.00 ft above land-surface datum.
PERIOD OF RECORD.--October 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.17 ft below land-surface datum, Aug. 1, 1975; lowest, 12.11 ft below land-surface datum, Mar. 11, 1991.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 01	11.28	Dec 11	11.59	Mar 11	12.11	Jun 27	10.79	Sep 17	10.87
29	11.39	Jan 28	12.02	May 10	11.69	Aug 07	10.50		



BIG STONE COUNTY

451517096104501. Local number, 121N44W27CCC01.
LOCATION.--Lat 45°15'17", long 96°10'45", in SW¼SW¼SW¼ sec.27, T.121 N., R.44 W., Hydrologic Unit 07010001, north of Correll.
Owner: U.S. Geological Survey
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in., depth 16 ft, screened 14 to 16 ft.
DATUM.--Altitude of land-surface datum is 1,018 ft. Measuring point: Top of casing, 3.10 ft above land-surface datum.
PERIOD OF RECORD.--September 1972 to February 1974, August 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.16 ft below land-surface datum, June 12, 1986; lowest, 8.99 ft below land-surface datum, Feb. 8, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

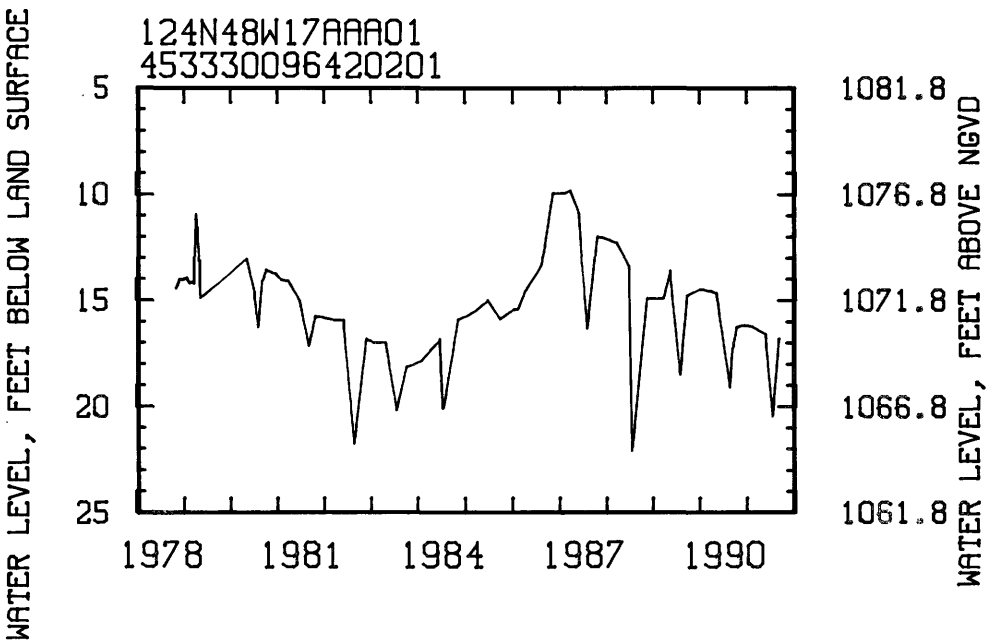
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 16	7.78	Jan 18	8.07	Apr 12	8.10	Jul 24	6.22

BIG STONE COUNTY--Continued

453330096420201. Local number, 124N48W17AAA01.
LOCATION.--Lat 45°33'30", long 96°42'02", in NE¼NE¼NE¼ sec.17, T.124 N., R.48 W., Hydrologic Unit 07020001, 0.5 mi east of Beardsley.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in., depth 282 ft, screened 242 to 282 ft.
DATUM.--Altitude of land-surface datum is 1,086.8 ft National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 3.60 ft above land-surface datum.
PERIOD OF RECORD.--November 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 9.77 ft below land-surface datum, Mar. 23, 1987; lowest, 22.10 ft below land-surface datum, July 21, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 15	16.23	Feb 12	16.23	Jul 24	20.45
Dec 11	16.13	May 29	16.61	Sep 10	16.80



BLUE EARTH COUNTY

440050094102801. Local number, 106N28W03DBA01.
LOCATION.--Lat 44°00'50", long 94°10'28", in NE¼NW¼SE¼ sec.3, T.106 N., R.28 W., Hydrologic Unit 07020010, at Farmland Industries Ammonia Plant, 3.2 mi north of Vernon Center.
Owner: Farmland Industries.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in., depth 390 ft, cased to 150 ft.
DATUM.--Altitude of land-surface datum is 1,005 ft. Measuring point: Top of recorder floor, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--October 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 71.81 ft below land-surface datum, Apr. 26, 1983; lowest, 76.73 ft below land-surface datum, Oct. 18, 1989.

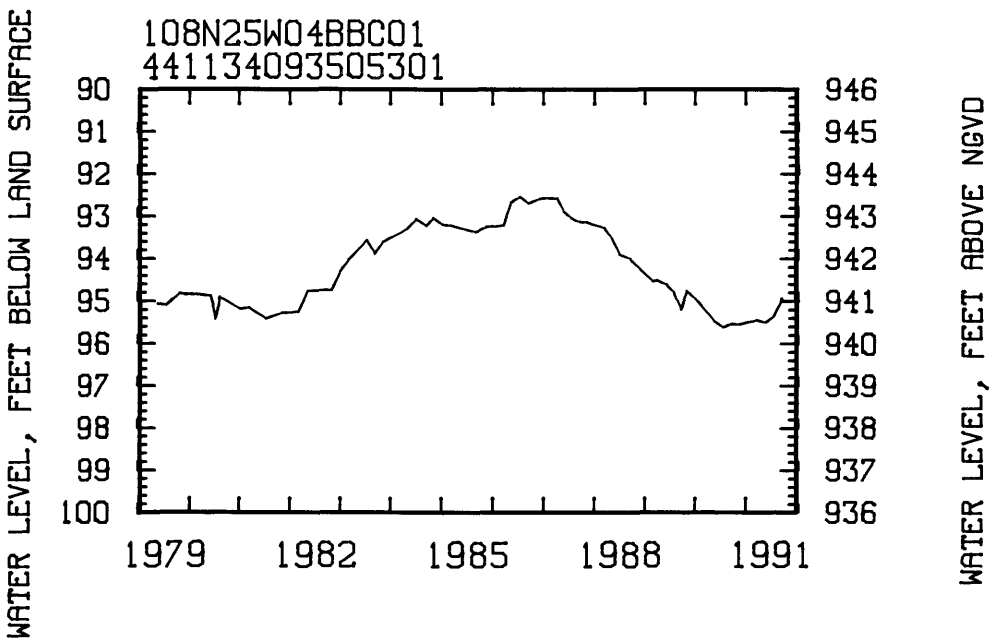
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATAUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 20	75.46	Mar 05	75.37	Aug 05	74.37	Sep 05	74.31
Jan 31	75.88	10	75.72	10	74.18	10	74.43
Feb 05	75.88	15	75.76	15	74.01	15	74.13
10	75.91	20	75.49	20	74.06	20	74.48
15	75.93	25	75.43	25	74.14	25	74.27
20	75.73	May 29	74.29	31	74.32	30	74.40
25	75.96	Jul 25	74.10				
28	75.65	31	74.04				

441134093505301. Local number, 108N25W04BBC01.
LOCATION.--Lat 44°11'34", long 93°50'53", in SW¼NW¼NW¼ sec.4, T.108 N., R.25 W., Hydrologic Unit 07020011, at 1.3 mi west of Madison Lake at waste treatment plant.
Owner: City of Madison Lake.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 6 in., depth 313 ft, cased to 296 ft.
DATUM.--Altitude of land-surface datum is 1,036 ft. Measuring point: Top of casing, 1.60 ft above land-surface datum.
PERIOD OF RECORD.--May 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 92.52 ft below land-surface datum, July 17, 1986; lowest, 95.62 ft below land-surface datum, July 25, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 20	95.55	May 29	95.51	Sep 25	94.94
Mar 26	95.43	Jul 24	95.34		



GROUND-WATER LEVELS

BROWN COUNTY

441800094434301. Local number, 110N32W30DDB01.
LOCATION.--Lat 44°18'00", long 94°43'43", in NW¼SE¼SE¼ sec.30, T.110 N., R.32 W., Hydrologic Unit 07020008, in Sleepy Eye at hospital.
Owner: City of Sleepy Eye.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 2 in., depth 176 ft.
DATUM.--Altitude of land-surface datum is 1,030 ft. Measuring point: Top of casing, 1.30 ft above land-surface datum.
REMARKS.--Water level affected by pumping from nearby wells.
PERIOD OF RECORD.--August 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 46.80 ft below land-surface datum, Apr. 1, 1987; lowest, 118.1 ft below land-surface datum, Sept. 15, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 01	62.20	Feb 04	52.90	May 01	50.90
Nov 01	57.70	Mar 01	52.00	Jun 06	52.10
Dec 01	54.70	26	51.46	Jul 01	52.70
Jan 02	54.70	Apr 01	51.70	Aug 01	56.10
				Sep 03	59.70

CHIPPEWA COUNTY

450447095490101. Local number, 119N41W29DDD01.
LOCATION.--Lat 45°04'47", long 95°40'01", in SE¼SE¼SE¼ sec.29, T.119 N., R.41 W., Hydrologic Unit 07020005, 5 mi north of Watson.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in., depth 19 ft, screened 17 to 19 ft.
DATUM.--Altitude of land-surface datum is 992 ft. Measuring point: Top of casing, 3.75 ft above land-surface datum.
PERIOD OF RECORD.--September 1972 to February 1974, January 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.43 ft below land-surface datum, Apr. 10, 1984; lowest, 9.06 ft below land-surface datum, Feb. 8, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 11	4.90	Apr 12	3.85	Jun 21	3.98	Sep 04	4.74

450631095562201. Local number, 119N42W17DDD01.
LOCATION.--Lat 45°06'31", long 95°56'22", in SE¼SE¼SE¼ sec.17, T.119 N., R.42 W., Hydrologic Unit 07020001, west of Milan.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial silt of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in., depth 19 ft, screened 17 to 19 ft.
DATUM.--Altitude of land-surface datum is 1,027 ft. Measuring point: Top of casing, 4.50 ft above land-surface datum.
PERIOD OF RECORD.--September 1972 to October 1973, April 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 1.50 ft below land-surface datum, May 7, 1973; lowest, 17.46 ft below land-surface datum, Apr. 1, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 11	5.80	Jan 18	8.72	Jun 28	2.58
Nov 07	9.70	Apr 12	4.97	Sep 04	4.45

CHISAGO COUNTY

453125092445401. Local number, 035N19W17BDB01.
LOCATION.--Lat 45°31'25", long 92°44'54", in NW¼SE¼NW¼ sec.17, T.35 N., R.19 W., Hydrologic Unit 07030005, at Wild River State Park.
Owner: State of Minnesota.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 6 in., depth 270 ft, cased 230 ft.
DATUM.--Altitude of land-surface datum is 820 ft. Measuring point: Top of casing, 0.70 ft above land-surface datum.
PERIOD OF RECORD.--October 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 40.06 ft below land-surface datum, Oct. 20, 1986; lowest, 44.19 ft below land-surface datum, June 8, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

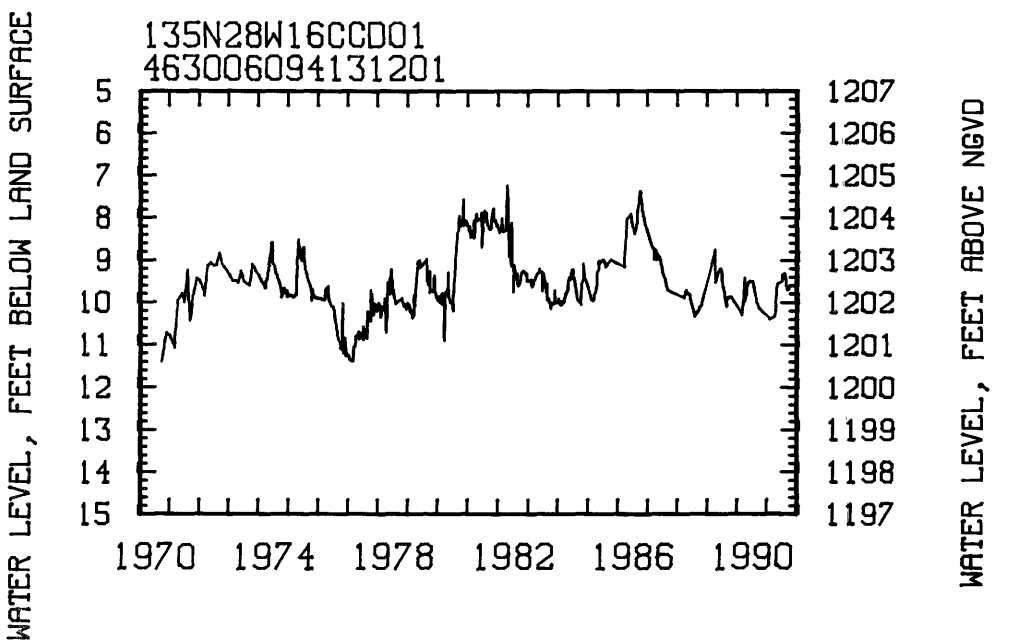
DATE	WATER LEVEL	DATE	WATER LEVEL
Aug 02	41.75	Sep 30	41.80

CROW WING COUNTY

463006094131201. Local number, 135N28W16CCD01.
LOCATION.--Lat 46°30'06", long 94°13'12", in SE¼SW¼SW¼ sec.16, T.135 N., R.28 W., Hydrologic Unit 07010106, northwest of Merrifield.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in., depth 18 ft, screened 16 to 18 ft.
DATUM.--Altitude of land-surface datum is 1,212 ft. Measuring point: Top of casing, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--October 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 7.20 ft below land-surface datum, May 1, 1982; lowest, 11.38 ft below land-surface datum, Oct. 16, 1970, Feb. 11, 1977, Mar. 11, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Jan 31	10.38	May 03	9.89	Aug 01	9.29
Feb 04	10.40	06	9.78	06	9.33
Apr 03	10.32	14	9.54	22	9.55
15	10.19	Jul 02	9.48	26	9.59
22	10.08	11	9.34	Sep 06	9.70
		17	9.32	12	9.68
		26	9.30	20	9.67
				25	9.68



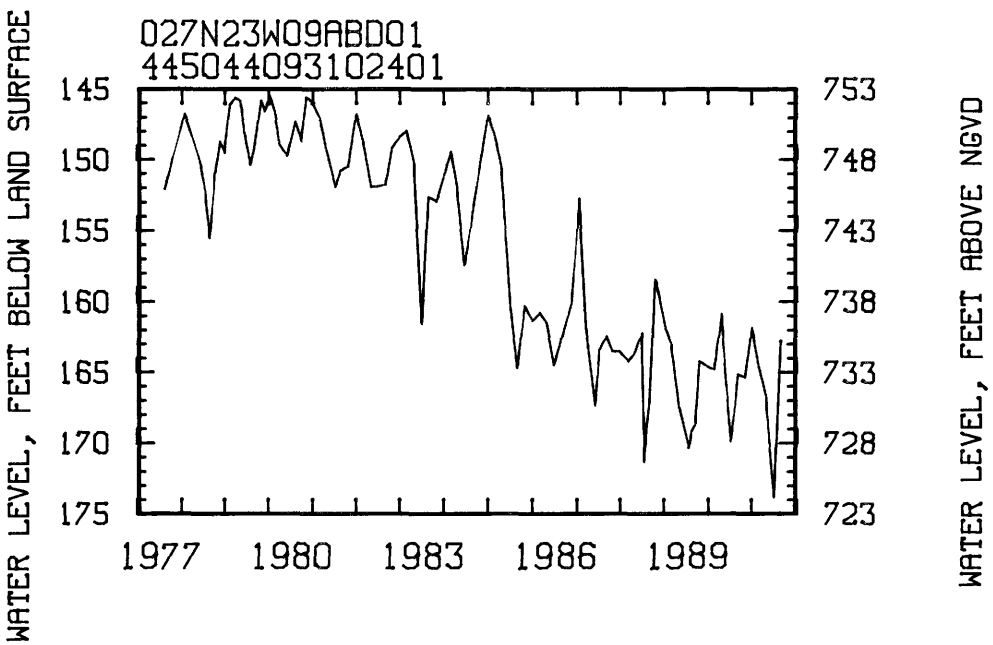
GROUND-WATER LEVELS

DAKOTA COUNTY

445044093102401. Local number, 027N23W09ABD01.
LOCATION.--Lat 44°50'44", long 93°10'24", in SE¼NW¼NE¼ sec.9, T.27 N., R.23 W., Hydrologic Unit 07020012, at Eagan.
Owner: City of Eagan, Timberline Addition.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 10 in., depth 503 ft, cased to 401 ft.
DATUM.--Altitude of land-surface datum is 900 ft. Measuring point: Hole in well cap, 2.60 ft above land-surface datum.
REMARKS.--Water-level affected by pumping.
PERIOD OF RECORD.--December 1965, April 1966, December 1966, March 1967, December 1970, August 1971, August 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 141.40 ft below land-surface datum, Apr. 5, 1966; lowest, 173.87 ft below land-surface datum, July 17, 1991.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 13	165.38	Mar 06	164.57	Jul 17	173.87
Jan 08	161.80	May 08	166.80	Sep 13	162.76



DAKOTA COUNTY--Continued

445330093054301. Local number, 028N22W19DCC02.
LOCATION.--Lat 44°53'30", long 93°05'43", in SW¼SW¼SE¼ sec.19, T.28 N., R.22 W., Hydrologic Unit 07010206, in West St. Paul.
Owner: U.S. Geological Survey, 2-N.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in., depth 539 ft, cased to 407 ft.
DATUM.--Land-surface datum is 1,036 ft National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.60 ft above land-surface datum.
REMARKS.--Water-level affected by regional pumping.
PERIOD OF RECORD.--January 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 309.13 ft below land-surface datum, Apr. 4, 1988; lowest, 328.0 ft below land-surface datum, July 31, 1975.

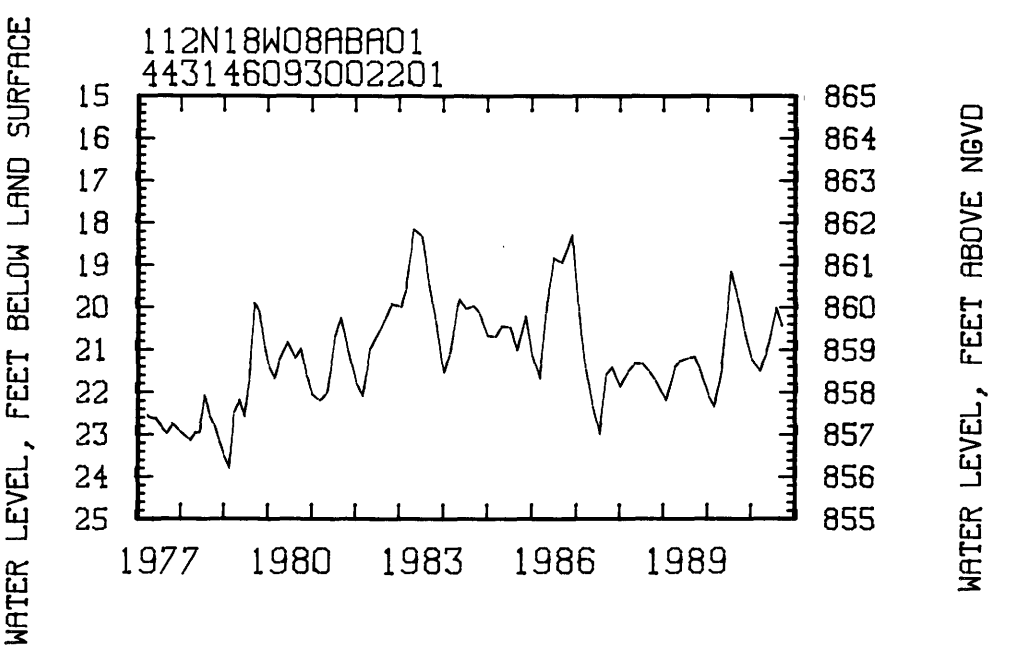
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 05	313.61	Dec 05	310.88	Mar 10	310.54	May 05	310.32	Jul 20	316.32	Sep 05	317.24
10	313.24	10	310.76	15	310.84	10	311.62	25	317.73	10	314.67
15	312.50	15	310.84	20	310.48	15	313.41	31	315.71	15	313.80
20	311.43	20	310.75	25	309.99	20	312.31	Aug 05	314.12	20	312.36
25	312.13	25	310.85	31	310.53	25	313.95	10	314.40	25	311.53
31	311.64	31	310.51	Apr 05	311.64	31	314.39	15	318.21	30	312.05
Nov 05	311.19	Jan 05	310.44	10	312.75	Jun 05	315.87	20	316.86		
10	310.99	10	311.10	15	310.65			25	315.25		
15	311.10	15	310.28	20	310.92			31	318.03		
20	310.94	20	310.19	25	312.46						
25	310.75			30	311.36						
30	310.92										

443146093002201. Local number, 112N18W08ABA01.
LOCATION.--Lat 44°31'46", long 93°00'22", in NE¼NW¼NE¼ sec.8, T.112 N., R.18 W., Hydrologic Unit 07040002, northeast of Randolph.
Owner: U.S. Geological Survey
AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in., depth 44 ft, screened 42 to 44 ft.
DATUM.--Altitude of land-surface datum is 880 ft. Measuring point: Top of casing, 3.40 ft above land-surface datum.
PERIOD OF RECORD.--April 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.13 ft below land-surface datum, May 3, 1983; lowest, 23.80 ft below land-surface datum, Feb. 21, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 09	20.59	Mar 12	21.51	Jul 26	20.00
Jan 09	21.24	May 09	21.08	Sep 12	20.43



443134093010601. Local number, 112N18W08BBC01.
LOCATION.--Lat 44°31'34", long 93°01'06", in SW¼NW¼NW¼ sec.8, T.112 N., R.18 W., Hydrologic Unit 07040002, at Randolph Fire Station.
Owner: City of Randolph.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled fire protection artesian well, diameter 10 in., depth 150 ft, cased to 64 ft.
DATUM.--Altitude of land-surface datum is 883 ft. Measuring point: Top of 3/4-inch breather pipe, 2.20 ft above land-surface datum.
PERIOD OF RECORD.--July 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.47 ft below land-surface datum, May 3, 1983; lowest, 19.70 ft below land-surface datum, Aug. 11, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 09	14.53	Mar 12	14.72	Jul 26	18.07
Jan 09	14.89	May 09	14.28	Sep 12	15.19

442830093085201. Local number, 112N19W30DBD01.
LOCATION.--Lat 44°28'30", long 93°08'52", in SE¼NW¼SE¼ sec.30, T.112 N., R.19 W., Hydrologic Unit 07040002, at Northfield waste treatment plant.
Owner: City of Northfield.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 6 in., depth 275 ft, cased to 212 ft.
DATUM.--Altitude of land-surface datum is 890 ft. Measuring point: Center of pressure guage, 2.05 ft above land-surface datum.
PERIOD OF RECORD.--May 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.54 ft above land-surface datum, July 12, 1983; lowest, 6.66 ft above land-surface datum, Mar. 12, 1991.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 09	+7.81	Mar 12	+6.66	Jul 26	+8.38
Jan 15	+7.12	May 09	+8.50	Sep 18	+8.04

443645093014701. Local number, 113N18W07BAC01.
LOCATION.--Lat 44°36'45", long 93°01'47", in SW¼NE¼NW¼ sec.7, T.113 N., R.18 W., Hydrologic Unit 07040001, west of Hampton.
Owner: Eugene Dohmen.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in., depth 325 ft, cased to 65 ft.
DATUM.--Altitude of land-surface datum is 915 ft. Measuring point: Hole in pump base, 1.60 ft above land-surface datum.
PERIOD OF RECORD.--April 1977 to August 1977, January 1978, June 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 23.15 ft below land-surface datum, Dec. 4, 1986; lowest, 33.19 ft below land-surface datum, Aug. 12, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 09	30.42	Mar 12	31.06	Sep 12	31.78
Jan 15	30.82	May 09	30.85		

444205092500001. Local number, 114N17W10AAA01.
LOCATION.--Lat 44°42'05", long 92°50'00", in NE¼NE¼NE¼ sec.10, T.114 N., R.17 W., Hydrologic Unit 07040001, southeast of Hastings.
Owner: John Conzemius.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in., depth 151 ft, depth of casing unknown.
DATUM.--Altitude of land-surface datum is 827 ft. Measuring point: Top of platform, 2.50 ft above land-surface datum.
PERIOD OF RECORD.--April 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 94.10 ft below land-surface datum, Mar. 31, 1987; lowest, 107.4 ft below land-surface datum, Mar. 12, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATAUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 05	101.87	Dec 05	101.90	Feb 05	102.18	Apr 05	102.15	Jun 05	102.41	Sep 15	103.28
10	101.94	10	102.03	10	102.17	10	102.36	10	102.28	20	103.47
15	102.00	15	101.99	15	102.31	15	102.19	15	102.41	25	103.29
20	101.88	20	102.09	20	102.17	20	102.34	20	102.52	30	103.39
25	102.03	25	102.17	25	102.30	25	102.26	25	102.38		
31	101.90	31	102.06	28	102.04	30	102.33	30	103.07		
Nov 05	101.86	Jan 05	102.07	Mar 05	101.95	May 05	102.33	Jul 05	102.76		
10	102.00	10	102.11	10	102.35	10	102.40	10	103.18		
15	101.89	15	102.05	15	102.33	15	102.32	15	103.06		
20	101.88	20	102.23	20	102.09	20	102.36	20	103.30		
25	102.05	25	102.27	25	102.32	25	102.28				
30	101.92	31	102.24	31	102.31	31	102.29				

444047092521901. Local number, 114N17W16CBB01.
LOCATION.--Lat 44°40'47", long 92°52'19", in NW¼NW¼SW¼ sec.16, T.114 N., R.17 W., Hyrologic Unit 07040001, Kirby Avenue, 0.5 mi (0.8 km) north of 190th Street.
Owner: Jim Huneke Construction Company.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled domestic water-table well, diameter 4 in., depth 170 ft, screened 164 to 170 ft.
DATUM.--Altitude of land-surface datum is 823 ft. Measuring point: Top of casing, 1.10 ft above land-surface datum.
PERIOD OF RECORD.--March 1976, March 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 73.32 ft below land-surface datum, Mar. 31, 1987; lowest, 87.75 ft below land-surface datum, June 27, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 07	82.75	Mar 05	82.10	Jul 26	84.05
Jan 09	82.25	May 07	82.45	Sep 12	84.82

443827092521801. Local number, 114N17W33BBC01.
LOCATION.--Lat 44°38'27", long 92°52'18", in SW¼NW¼NW¼ sec.33, T.114 N., R.17 W., Hydrologic Unit 07040001, 39 ft south of irrigation well.
Owner: Rainer Kimmes.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 16 in., depth 290 ft, cased to 25 ft.
DATUM.--Altitude of land-surface datum is 862 ft. Measuring point: Hole in plate over well, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--August 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 46.14 ft below land-surface datum, Dec. 1, 1986; lowest, 79.20 ft below land-surface datum, July 11, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 09	66.19	Mar 05	66.14	Jul 26	72.22
Jan 09	66.27	May 07	67.35	Sep 12	71.92

444117092595701. Local number, 114N18W17AAB01.
LOCATION.--Lat 44°41'17", long 92°59'57", in NW¼NE¼NE¼ sec.17, T.114 N., R.18 W., Hydrologic Unit 07040001, 180th Street, 0.25 mi west of Emery Avenue.
Owner: Joe Ries.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in., depth 280 ft, cased to 39 ft.
DATUM.--Altitude of land-surface datum is 905 ft. Measuring point: Edge of vent pipe, 1.40 ft above land-surface datum.
PERIOD OF RECORD.--June 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 57.30 ft below land-surface datum, Dec. 1, 1986; lowest, 74.15 ft below land-surface datum, Sept. 13, 1988.

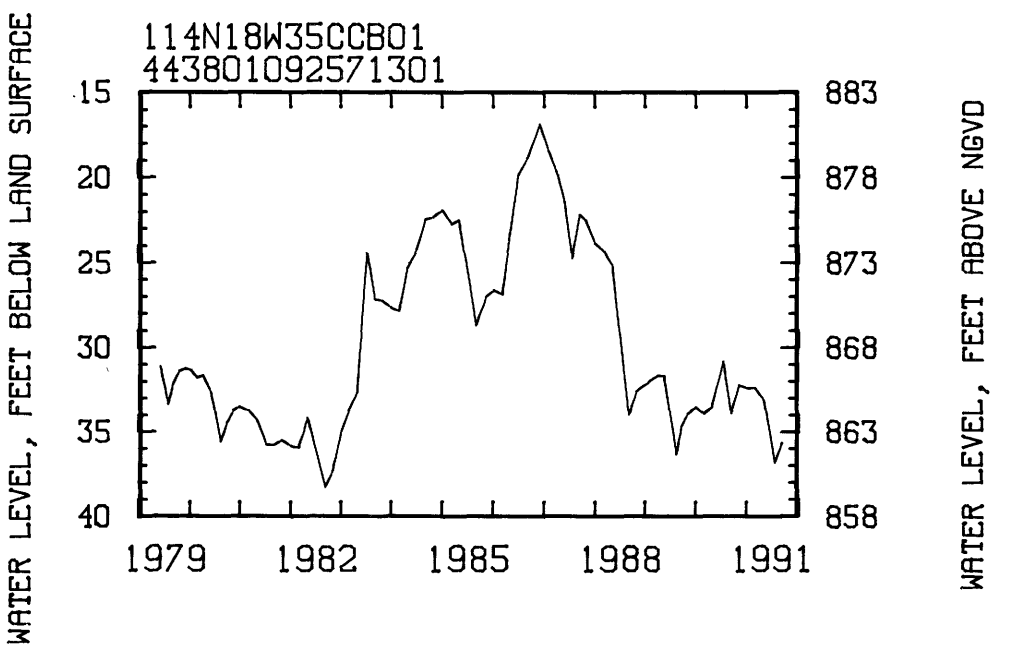
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 09	72.72	Mar 12	73.92	May 09	73.03	Sep 18	71.15

443801092571301. Local number, 114N18W35CCB01.
LOCATION.--Lat 44°38'01", long 92°57'13", in NW¼SW¼SW¼ sec.35, T.114 N., R.18 W., Hydrologic Unit 07040001, Goodwin Avenue, 1.1 mi (1.8 km) south of Northfield Boulevard.
Owner: Al Wagner, Jr.
AQUIFER.--Buried gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in., depth 203 ft, screened 173 to 203 ft.
DATUM.--Altitude of land-surface datum is 898 ft. Measuring point: Hole in pump base, 1.25 ft above land-surface datum.
PERIOD OF RECORD.--June 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 16.83 ft below land-surface datum, Dec. 1, 1986; lowest, 38.28 ft below land-surface datum, Sept. 13, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 09	32.18	Mar 05	32.34	Jul 26	36.81
Jan 09	32.41	May 09	33.12	Sep 12	35.67



DAKOTA COUNTY--Continued

444220093055001. Local number, 114N19W04DAC01.
LOCATION.--Lat 44°42'20", long 93°05'50", in SW¼NE¼SE¼ sec.4, T.114 N., R.19 W., Hydrologic Unit 07040001, 2.1 mi southeast of Rosemount.
Owner: University of Minnesota Agricultural Experiment Station (Plant Pathology).
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 6 in., depth 415 ft, cased to 355 ft.
DATUM.--Altitude of land-surface datum is 947 ft. Measuring point: Top of 1-inch breather pipe, 2.10 ft above land-surface datum.
PERIOD OF RECORD.--August 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 55.36 ft below land-surface datum, Dec. 1, 1986; lowest, 65.23 ft below land-surface datum, Nov. 27, 1970.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

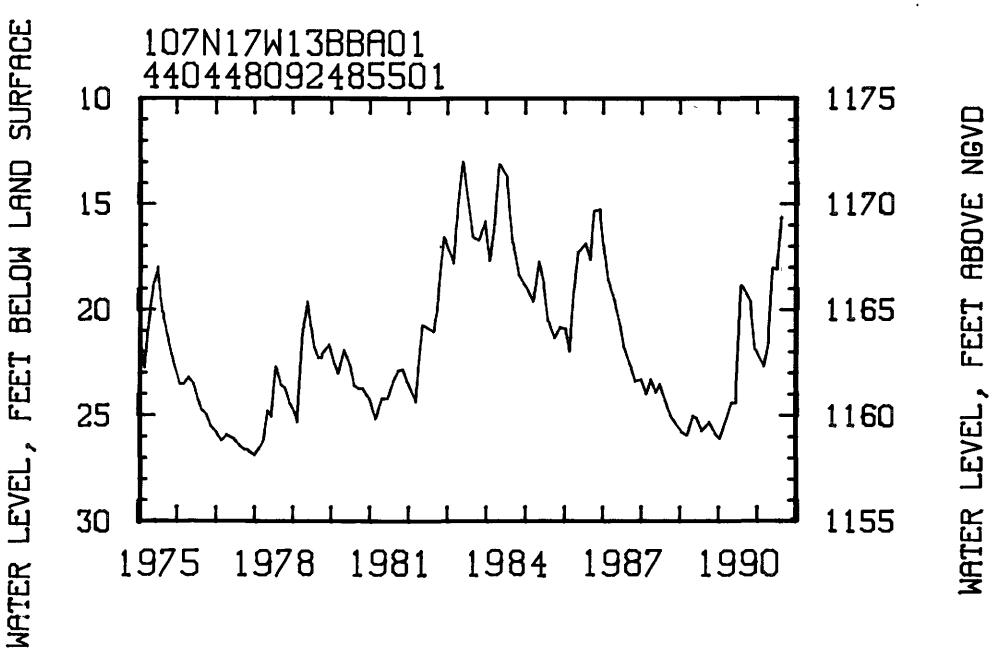
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 09	60.71	Mar 06	61.32	Jul 26	61.97
Jan 15	61.02	May 09	61.27	Sep 19	61.78

DODGE COUNTY

440448092485501. Local number, 107N17W13BBA01.
LOCATION.--Lat 44°04'48", long 92°48'55", in NE¼NW¼NW¼ sec.13, T.107 N., R.17 W., Hydrologic Unit 07040004, in city of Wasioja.
Owner: Wasioja Township Garage.
AQUIFER.--Galena Formation of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled maintenance artesian well, diameter 6 in., depth 100 ft, cased to 52 ft.
DATUM.--Altitude of land-surface datum is 1,185 ft. Measuring point: Top of casing, 1.60 ft above land-surface datum.
PERIOD OF RECORD.--January 1975 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 12.94 ft below land-surface datum, May 23, 1983; lowest, 26.88 ft below land-surface datum, Jan. 5, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 30	19.64	Mar 04	22.68	May 29	17.97	Aug 19	15.64
Dec 13	21.87	Apr 17	21.53	Jul 08	18.10		



GROUND-WATER LEVELS

FARIBAULT COUNTY

434558093540001. Local number, 104N26W36CAC01.
LOCATION.--Lat 43°45'58", long 93°54'00", in SW¼NE¼SW¼ sec.36, T.104 N., R.26 W., Hydrologic Unit 07020011, at Easton Creamery.
Owner: City of Easton.
AQUIFER.--Platteville Formation of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled public supply artesian well, diameter 6 in., depth 145 ft, cased to 120 ft.
DATUM.--Altitude of land-surface datum is 1,060 ft. Measuring point: Top of well cap, 1.20 ft above land-surface datum.
PERIOD OF RECORD.--August 1979, April 1980, May 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.97 ft below land-surface datum, May 10, 1983; lowest, 36.36 ft below land-surface datum, Aug. 2, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 19	34.65	Mar 25	34.00	Sep 24	31.30
Jan 30	32.22	Jul 23	32.08		

FILLMORE COUNTY

434936092102201. Local number, 104N11W08ADC01.
LOCATION.--Lat 43°49'36", long 92°10'22", in SW¼SE¼NE¼ sec.8, T.104 N., R.11 W., Hydrologic Unit 07040008, 0.8 mi southeast of Chatfield.
Owner: Fillmore County Highway Department.
AQUIFER.--Prairie du Chien group of early Ordovician age and Jordan sandstone of late Cambrian age.
WELL CHARACTERISTICS.--Drilled domestic water table well, diameter 4 in., depth 284 ft, cased to 128 ft.
DATUM.--Altitude of land-surface datum is 981 ft. Measuring point: Top of casing, 0.50 ft above land-surface datum.
PERIOD OF RECORD.--November 1989 to September 1990.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 28.73 ft below land-surface datum, May 7, 1991; lowest, 38.51 ft below land-surface date, Feb. 6, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec 05	33.64	Mar 05	35.40	Aug 01	31.14
Jan 09	34.81	May 07	28.73	Sep 12	32.44

FREEBORN COUNTY

433434093331201. Local number, 101N23W02DAC01.
LOCATION.--Lat 43°34'34", long 93°33'12", in SW¼NE¼SE¼ sec.2, T.101 N., R.23 W., Hydrologic Unit 07080203, 3 mi southwest of Conger.
Owner: Richard Steele.
AQUIFER.--Upper Carbonates of Devonian and Ordovician Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in., depth 373 ft (114 m), cased to 156 ft.
DATUM.--Altitude of land-surface datum is 1,280 ft. Measuring point: Vent pipe, 1.50 ft above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 65.58 ft below land-surface datum, Mar. 8, 1983; lowest, 75.45 ft below land-surface datum, Aug. 2, 1989.

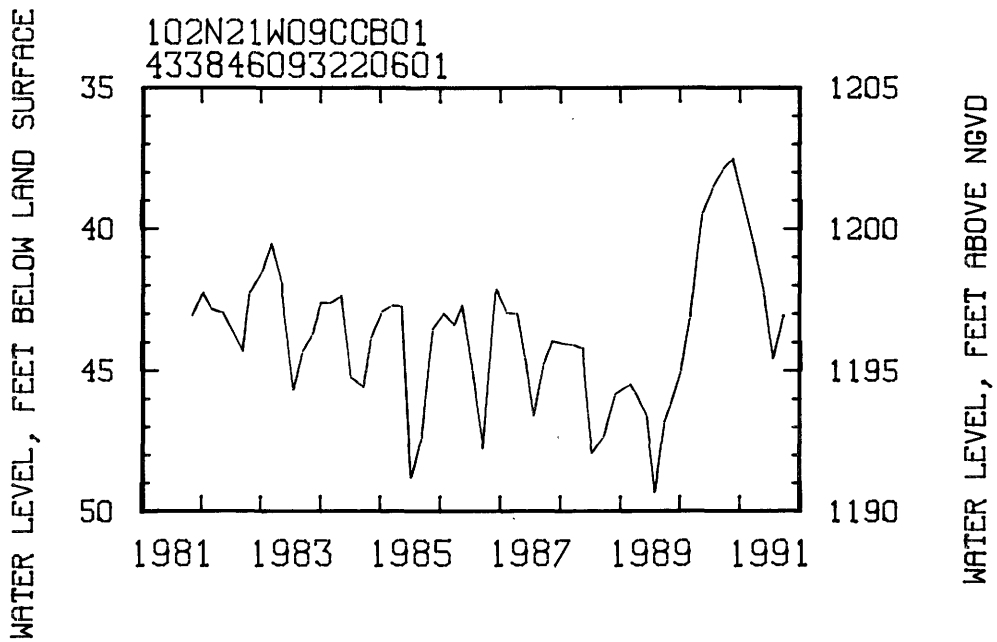
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 19	67.55	Mar 25	68.25	Jul 23	70.16
Jan 30	68.22	May 28	67.52	Sep 24	68.52

433846093220601. Local number, 102N21W09CCB01.
LOCATION.--Lat 43°38'46", long 93°22'06", in NW¼SW¼SW¼ sec.9, T.102 N., R.21 W., Hydrologic Unit 07080202, at Freeborn County Courthouse.
Owner: Freeborn County.
AQUIFER.--Cedar Valley Formation of Middle Devonian Age.
WELL CHARACTERISTICS.--Drilled public supply artesian well, diameter 5 in., depth 150 ft, cased to 138 ft.
DATUM.--Altitude of land-surface datum is 1,240 ft. Measuring point: Top of casing, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--November 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 37.50 ft below land-surface datum, Nov. 19, 1990; lowest, 49.32 ft below land-surface datum, Aug. 2, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 19	37.50	May 28	42.30	Sep 24	43.05
Mar 25	40.51	Jul 23	44.59		



434032093111801. Local number, 103N20W36CCB01.
LOCATION.--Lat 43°40'32", long 93°11'18", in NE¼SW¼SW¼ sec.36, T.103 N., R.20 W., Hydrologic Unit 07080201, at Pillsbury Grain Station.
Owner: Pillsbury Co.
AQUIFER.--Cedar Valley Formation of Middle Devonian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 5 in., depth 231 ft, cased to 136 ft.
DATUM.--Altitude of land-surface datum is 1,255 ft. Measuring point: Top of casing, 1.80 ft above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 48.40 ft below land-surface datum, May 10, 1984; lowest, 55.95 ft below land-surface datum, July 13, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 19	49.62	Mar 25	50.37	Jul 23	50.84
Jan 30	50.32	May 28	48.96	Sep 24	50.60

GROUND-WATER LEVELS

FREEBORN COUNTY--Continued

434308093322001. Local number, 103N23W13CDA01.
LOCATION.--Lat 43°43'08", long 93°32'20", in NE¼SE¼SW¼ sec.13, T.103 N., R.23 W., Hydrologic Unit 07020011, 3.3 mi northeast of Alden.
Owner: Oakview Golf Course.
AQUIFER.--Galena Formation of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 6 in., depth 270 ft, cased to 158 ft.
DATUM.--Altitude of land-surface datum is 1,250 ft. Measuring point: Hole in well cap, 1.90 ft above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 42.00 ft below land-surface datum, May 10, 1983; lowest, 48.77 ft below land-surface datum, Aug. 2, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 19	42.33	Mar 25	43.50	Jul 23	45.03
Jan 30	43.13	May 28	42.90	Sep 24	44.45

GOODHUE COUNTY

441737092400501. Local number, 110N15W31BBD01.
LOCATION.--Lat 44°17'37", long 92°40'05", in SE¼NW¼NW¼ sec.31, T.110 N., R.15 W., Hydrologic Unit 07040004, at Zumbrota Fire Station.
Owner: City of Zumbrota, well 3.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in., depth 210 ft, cased to 50 ft.
DATUM.--Altitude of land-surface datum is 1,000 ft. Measuring point: Hole in pump base, 2.20 ft above land-surface datum.
PERIOD OF RECORD.--June 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.38 ft below land-surface datum, Jan 7, 1987; lowest, 27.00 ft below land-surface datum, Jan. 5, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 22	23.35	Jan 14	22.90	Apr 15	23.52	Aug 12	21.39
Dec 04	23.04	Feb 25	23.89	May 20	22.06		

442401092372501. Local number, 111N15W21CDA01.
LOCATION.--Lat 44°24'01", long 92°37'25", in NE¼SE¼SW¼ sec.21, T.111 N., R.15 W., Hydrologic Unit 07040004, in Goodhue clerk's office.
Owner: City of Goodhue, creamery well.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 12 in., depth 310 ft, cased to 175 ft.
DATUM.--Altitude of land-surface datum is 1,125 ft. Measuring point: Top of 1¼ in elbow, 1.50 ft above land-surface datum.
PERIOD OF RECCORD.--June 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 119.00 ft below land-surface datum, Feb. 26, 1987; lowest, 156.5 ft below land-surface datum, May 26, 1983.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 22	131.02	Jan 14	134.63	Apr 15	135.52
Dec 04	130.47	Feb 25	135.82		

GOODHUE COUNTY--Continued

443012092362201. Local number, 113N15W27BAB01.
LOCATION.--Lat 44°30'12", long 92°26'22", in NW¼NE¼NW¼ sec.27, T.113 N., R.15 W., Hydrologic Unit 07040002, at Red Wing.
Owner: City of Red Wing, Anderson Park.
AQUIFER.--Eau Claire-Mount Simon Sandstones of Late Cambrian Age.
WELL CHARACTERISTISC.--Drilled unused artesian well, diameter 12 in., depth 560 ft, cased to 243 ft.
DATUM,--Altitude of land-surface datum is 800 ft. Measuring point: Edge of casing, 2.70 ft above land-surface datum.
PERIOD OF RECORD.--April 1976, June 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 100.50 ft below land-surface datum, Apr. 20, 1983; lowest, 109.62 ft below land-surface datum, Sept. 10, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

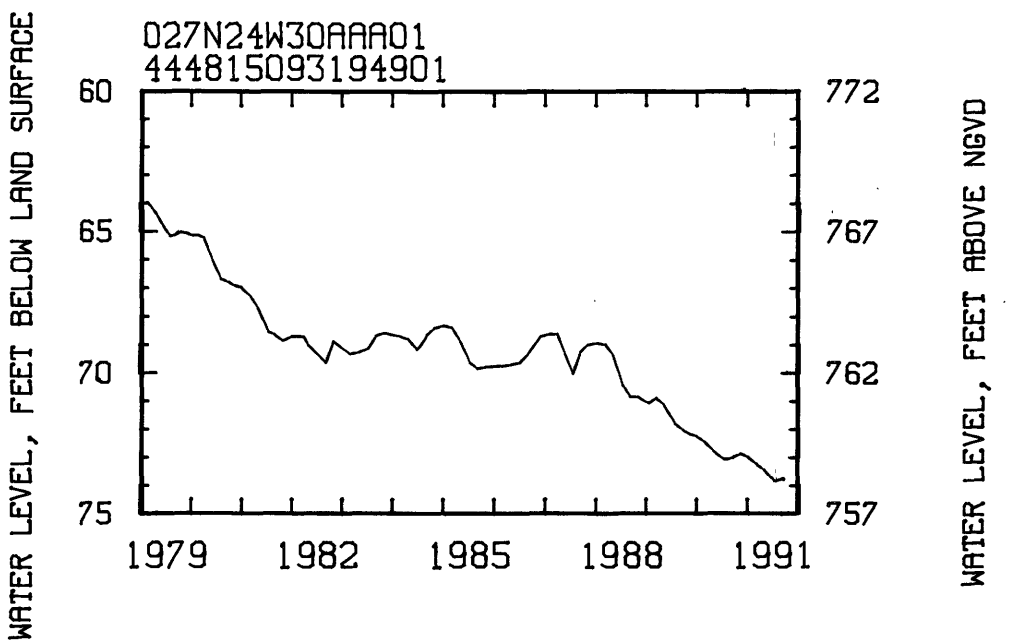
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 22	108.37	Jan 14	106.59	Apr 15	106.29	Aug 12	107.40	Sep 30	106.95
Dec 04	107.56	Feb 25	106.54	May 20	106.13	Sep 27	107.05		

HENNEPIN COUNTY

444815093194901. Local number, 027N24W30AAA01.
LOCATION.--Lat 44°48'15", long 93°19'49", in NE¼NE¼NE¼ sec.30, T.27 N., R.24 W., Hydrologic Unit 07020012, at 4001 West 110th Street, Bloomington.
Owner: Transfiguration Church.
AQUIFER.--Buried Sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in., depth 139 ft, screened 135 to 139 ft.
DATUM.--Altitude of land-surface datum is 832 ft. Measuring point: Top of casing, 0.50 ft above land-surface datum.
PERIOD OF RECORD.--March 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 63.97 ft below land-surface datum, Mar. 2, 1979; lowest, 73.84 ft below land-surface datum, July 19, 1991.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 14	72.85	Mar 07	73.23	Jul 19	73.84
Jan 08	73.00	May 08	73.46	Sep 19	73.74



444801093202801. Local number, 027N24W30BDA01.
LOCATION.--Lat 44°48'01", long 93°20'28", in NE¼SE¼NW¼ sec.30, T.27 N., R.24 W., Hydrologic Unit 07020012, in Bloomington.
Owner: City of Bloomington, at Southwood Terrace.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in., depth 330 ft, cased to 269 ft.
DATUM.--Altitude of land-surface datum is 815 ft. Measuring point: Top of recorder platform, 2.20 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--March 1969 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 63.05 ft below land-surface datum, Apr. 15, 1969; lowest, 84.86 ft below land-surface datum, July 1, 1988.

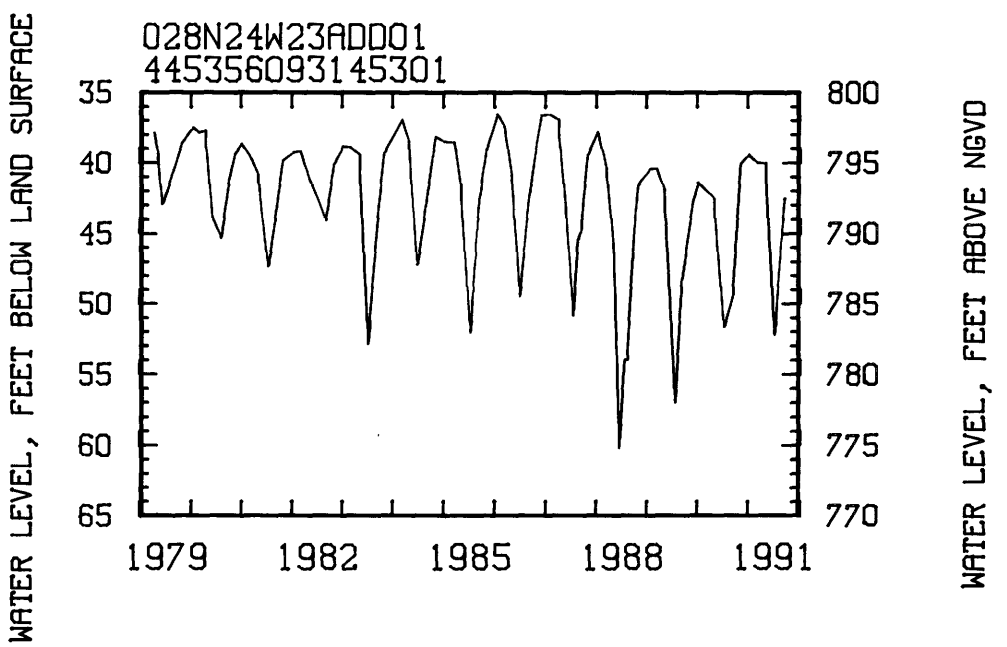
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATAUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 15	79.43	Jan 05	79.34	Mar 05	79.03	May 05	79.30	Jul 05	80.60	Sep 05	82.74
20	79.40	10	79.48	10	79.40	10	79.23	10	81.04	10	80.27
25	79.44	15	79.32	15	79.44	15	80.39	15	83.11	15	79.54
30	79.45	20	79.40	20	79.21	20	80.15	20	82.32	20	79.79
Dec 05	79.37	25	79.50	25	79.25	25	79.98	25	83.84	25	80.35
10	79.44	31	79.45	31	79.17	31	78.98	31	82.66	30	79.86
15	79.41	Feb 05	79.38	Apr 05	79.08	Jun 05	80.59	Aug 05	80.64		
20	79.45	10	79.29	10	80.18	10	81.70	10	80.79		
25	79.50	15	79.49	15	79.89	15	79.87	15	81.50		
31	79.44	20	79.27	20	79.11	20	83.45	20	82.90		
		25	79.39	25	79.87	25	81.98	25	80.44		
		28	79.17	30	79.82	30	83.81	31	84.17		

445356093145301. Local number, 028N24W23ADD01.
LOCATION.--Lat 44°53'56", long 93°14'53", in SE¼SE¼NE¼ sec.23, T.28 N., R.24 W., Hydrologic Unit 07010206, at 5728 Cedar Avenue, Minneapolis.
Owner: Hope Lutheran Church.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 6 in., depth 245 ft, cased to 172 ft.
DATUM.--Altitude of land-surface datum is 835 ft. Measuring point: Top of casing, 0.30 ft above land-surface datum.
PERIOD OF RECORD.--April 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 36.50 ft below land-surface datum, Jan. 22, 1986; lowest, 80.17 ft below land-surface datum, June 21, 1988.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 14	39.95	Mar 07	39.97	Jul 19	52.27
Jan 08	39.35	May 08	40.03	Sep 26	42.49



450116093205301. Local number, 029N24W06CCC01.
LOCATION.--Lat 45°61'16", long 93°20'53", in SW¼SW¼SW¼ sec.6, T.29 N., R.24 W., Hydrologic Unit 07010206, at 3610 Unity Avenue North, Robbinsdale.
Owner: Minnesota Department of Transportation.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 5 in., depth 200 ft, cased to 152 ft.
DATUM.--Altitude of land-surface datum is 870 ft. Measuring point: Top of casing, 3.50 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--March 1973 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 24.54 ft below land-surface datum, Dec. 28-29, 1975; lowest, 53.03 ft below land-surface datum, June 15, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATAUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 15	33.72	Jan 10	32.79	Mar 05	31.97	May 05	31.67	Jul 05	36.04	Sep 05	38.89
20	32.90	15	32.72	10	31.61	10	35.44	10	37.58	10	36.41
25	31.35	20	32.42	15	32.40	15	37.69	15	39.62	15	34.42
30	33.40	25	32.87	20	32.02	20	35.04	20	39.48	20	32.77
Dec 05	33.07	31	33.04	25	32.02	25	34.68	25	39.59	25	32.47
10	33.03	Feb 05	33.13	31	31.51	31	35.43	31	36.89	30	33.55
15	33.00	10	32.42	Apr 05	33.52	Jun 05	35.16	Aug 05	35.05		
20	33.45	15	32.96	10	33.64	10	35.79	10	34.51		
		20	32.82	15	32.65	15	40.32	15	36.98		
		25	32.40	20	32.49	20	40.33	20	35.93		
		28	32.30	25	35.59	25	38.44	25	38.71		
				30	36.44	30	42.95	31	41.22		

445833093154301. Local number, 029N24W26BAB01.
LOCATION.--Lat 44°58'33", long 93°15'43", in NW¼NE¼NW¼ sec.26, T.29 N., R.24 W., Hydrologic Unit 07010206, at 425 Portland Avenue.
Owner: Minneapolis Star and Tribune.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in., depth 445 ft, cased to 252 ft.
DATUM.--Altitude of land-surface datum is 835 ft. Measuring point: Top of steel cover, 7.60 ft below land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--June 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 56.45 ft below land-surface datum, Jan. 10, 1983; lowest, 149.36 ft below land-surface datum, Aug. 16, 1988.

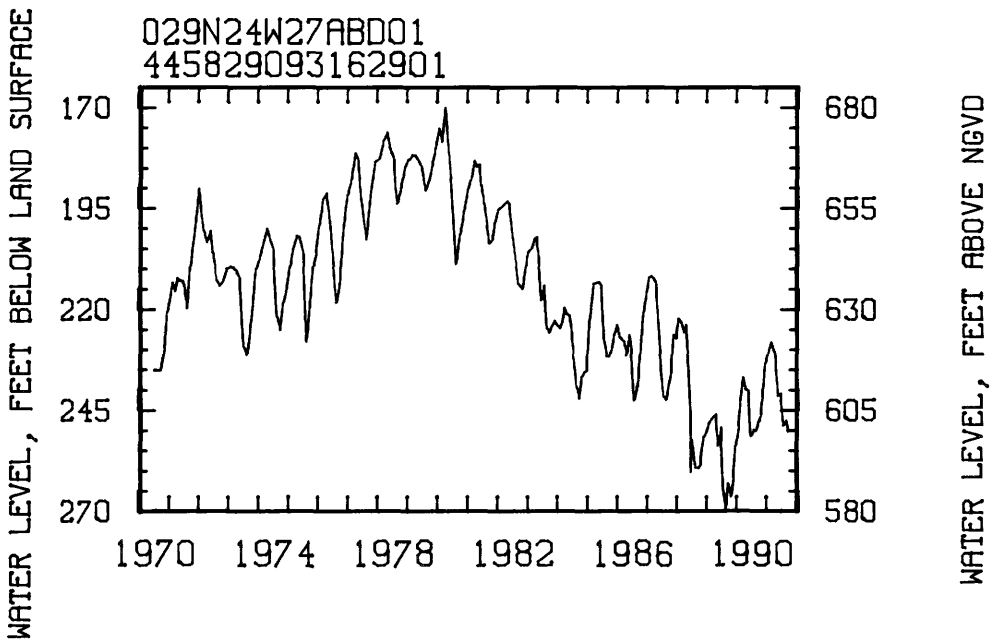
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 29	69.50	Dec 26	64.65	Feb 26	67.85	Apr 26	72.99	Jun 26	116.30	Aug 27	118.46
Nov 21	75.80	Jan 31	67.25	Mar 27	69.70	May 30	109.67	Jul 29	93.64	Sep 20	74.10

445829093162901. Local number, 029N24W27ABD01.
LOCATION.--Lat 44°58'29", long 93°16'29", in SE¼NW¼NE¼ sec.27, T.29 N., R.24 W., Hydrologic Unit 07010206, at 911 LaSalle Avenue, Minneapolis.
Owner: American Linen Supply Co.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age and Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in., depth 1,094 ft, cased to 812 ft.
DATUM.--Altitude of land-surface datum is 850 ft. Measuring point: Hole in pump base, 22.00 ft below land-surface datum.
REMARKS.--Water level affected by regional pumping.
PERIOD OF RECORD.--July 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 169.8 ft below land-surface datum, Apr. 15, 1980; lowest, 269.92 ft below land-surface datum, Aug. 28, 1989.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 29	245.76	Dec 26	233.19	Feb 26	227.95	Apr 26	231.54	Jun 26	240.73	Aug 27	247.37
Nov 21	241.28	Jan 31	229.92	Mar 27	230.00	May 30	241.35	Jul 29	248.85	Sep 20	250.08



445618093211801. Local number, 117N21W16CDB01.
LOCATION.--Lat 44°56'18", long 93°21'18", in NW¼SE¼SW¼ sec.16, T.117 N., R.21 W., Hydrologic Unit 07010206, at 2565 Wooddale Avenue South, St. Louis Park.
Owner: D-A Lubricant Co.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in., depth 691 ft, screened 651 to 661 ft.
DATUM.--Altitude of land-surface datum is 917.2 ft, National Geodetic Vertical Datum of 1929. Measuring point: Hole in well seal, 3.60 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--April 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 130.25 ft below land-surface datum, Feb. 6, 1987; lowest, 155.46 ft below land-surface datum, Sept. 20, 1988.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 14	144.34	Mar 07	137.01	Jul 19	141.30
Jan 10	140.32	May 13	134.72	Sep 19	145.70

445646093395301. Local number, 117N24W13BBC04.
LOCATION.--Lat 44°45'46", long 93°39'53", in SW¼NW¼NW¼ sec.13, T.117 N., R.24 W., Hydrologic Unit 07010206, at 3-Point Road.
Owner: City of Mound, well 4.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 10 in., depth 729 ft, cased to 600 ft.
DATUM.--Altitude of land-surface datum is 945 ft: Measuring point: Top of breather pipe, 2.35 ft above land-surface datum.
PERIOD OF RECORD.--November 1985 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 65.30 ft below land-surface datum, Mar. 4, 1980; lowest, 72.80 ft below-land surface datum, Nov. 2, 1989.

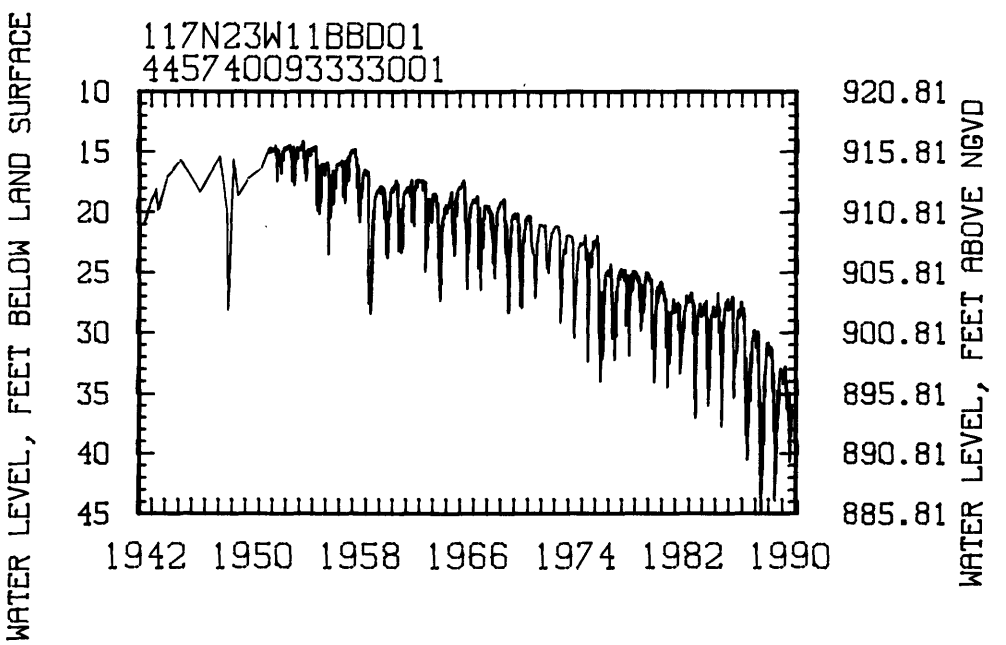
WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 11	66.45	Mar 07	66.32	Jul 19	66.57
Jan 10	66.59	May 13	66.01	Sep 19	66.95

445740093333001. Local number, 117N23W11BBD01.
LOCATION.--Lat 44°57'40", long 93°33'30", in SE¼NW¼NW¼ sec.11, T.117 N., R.23 W., Hydrologic Unit 07010206, 2 mi southwest of Wayzata, at Lake Minnetonka.
Owner: Minnetonka Boat Works, Inc., Orono.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in., depth 437 ft, cased to 270 ft.
DATUM.--Altitude of land-surface datum is 930.8 ft National Geodetic Vertical Datum of 1929. Measuring point: Wood floor of instrument shelter, 3.30 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--August 1942 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 14.05 ft below land-surface datum, Apr. 30, 1954; lowest, 44.77 ft below land-surface datum, June 28, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 05	35.20	Dec 05	32.47	Feb 05	33.07	Apr 05	33.28	Jun 05	34.32	Aug 05	34.36
10	35.14	10	32.53	10	32.69	10	33.62	10	32.96	10	33.13
15	34.48	15	33.04	15	32.48	15	33.33	15	35.94	15	34.34
20	33.88	20	33.00	20	32.10	20	33.01	20	35.55	20	34.22
25	34.10	25	33.01	25	32.28	25	33.14	25	37.44	25	35.05
31	34.67	31	32.79	28	32.16	30	33.00	30	38.23	31	37.30
Nov 05	33.40	Jan 05	32.52	Mar 05	32.40	May 05	33.21	Jul 05	35.42	Sep 05	37.37
10	32.93	10	32.62	10	32.88	10	33.51	10	35.60	10	36.67
15	33.00	15	32.04	15	32.89	15	34.33	15	34.26	15	35.45
20	32.88	20	32.44	20	32.38	20	33.95	20	36.46	20	35.10
25	32.35	25	32.91	25	32.32	25	34.49	25	37.51	25	34.42
30	32.48	31	33.26	31	32.72	31	32.80	31	35.48		



450223093231801. Local number, 118N21W07DCB01.
LOCATION.--Lat 45°02'23", long 93°23'18", in NW¼SW¼SE¼ sec.7, T.118 N., R.21 W., Hydrologic Unit 07010206, at 47th Avenue North and Aquila Avenue.
Owner: City of New Hope.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in., depth 422 ft, cased to 339 ft.
DATUM.--Altitude of land-surface datum is 933 ft. Measuring point: Top of wood platform, 3.00 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--October 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 60.46 ft below land-surface datum, Dec. 17, 1967; lowest, 77.56 ft below land-surface datum, July 11, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATAUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 05	71.41	Dec 05	69.43	Feb 05	69.86	Apr 05	69.88	Jun 05	70.65	Aug 05	71.18
10	70.84	10	69.26	10	69.42	10	70.50	10	71.82	10	70.71
15	70.00	15	69.62	15	70.06	15	68.81	15	72.17	15	71.50
20	69.74	20	69.81	20	69.56	20	69.68	20	72.17	20	71.37
25	68.75	25	68.78	25	69.34	25	70.48	25	71.70	25	71.40
31	69.79	31	68.90	28	69.31	30	70.25	30	74.25	31	73.97
Nov 05	69.19	Jan 05	69.32	Mar 05	69.09	May 05	70.05	Jul 05	70.78	Sep 05	72.65
10	69.07	10	69.65	10	69.58	10	70.37	10	71.97	10	71.62
15	69.53	15	69.12	15	69.79	15	71.95	15	72.41	15	70.13
20	69.10	20	69.23	20	69.43	20	71.35	20	72.77	20	69.97
25	69.04	25	69.89	25	69.46	25	70.79	25	73.51	25	69.61
30	69.31	31	69.87	31	69.43	31	70.42	31	71.99	30	69.53

445905093224401. Local number, 118N21W32CBB01.
LOCATION.--Lat 44°59'05", long 93°22'44", in NW¼NW¼SW¼ sec.32, T.118 N., R.21 W., Hydrologic Unit 07010206, at Winnetka Avenue and Highway 55, Golden Valley.
Owner: Red Owl Store.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 6 in., depth 95 ft, screened 87 to 95 ft.
DATUM.--Altitude of land-surface datum is 895 ft. Measuring point: Top of well cap, 0.80 ft above land-surface datum.
PERIOD OF RECORD.--May 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.72 ft below land-surface datum, May 12, 1986; lowest, 22.43 ft below land-surface datum, Jan. 18, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

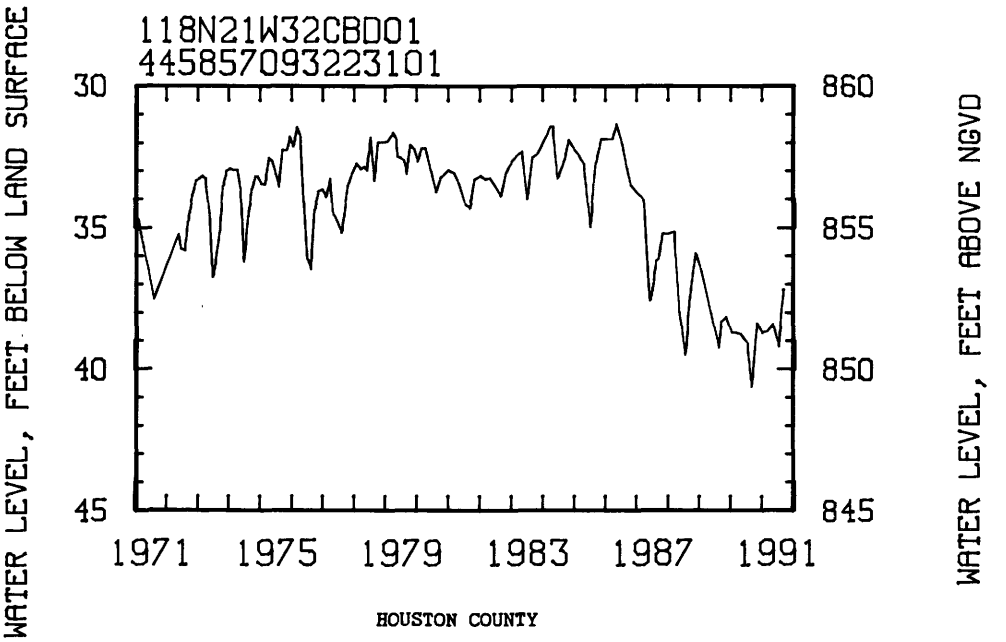
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 14	21.14	Mar 07	21.82	Jul 19	19.97
Jan 10	21.53	May 13	20.99	Sep 19	19.29

445857093223101. Local number, 118N21W32CBD01.
LOCATION.--Lat 44°58'57", long 93°22'31", in SE¼NW¼SW¼ sec.32, T.118 N., R.21 W., Hydrologic Unit 07010206, at 760 Harold Avenue, Golden Valley.
Owner: Golden Valley Methodist Church.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in., depth 265 ft, cased to 200 ft.
DATUM.--Altitude of land-surface datum is 890 ft. Measuring point: Top of well cap, 0.70 ft above land-surface datum.
PERIOD OF RECORD.--February 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 31.33 ft below land-surface datum, May 12, 1986; lowest, 40.62 ft below land-surface datum, Sept. 14, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

WATER DATE	LEVEL	WATER DATE	LEVEL	WATER DATE	LEVEL
Nov 14	38.35	Mar 07	38.63	Jul 19	39.20
Jan 10	38.71	May 13	38.40	Sep 19	37.17

HENNEPIN COUNTY



HOUSTON COUNTY

433935091251801. Local number, 102N05W03DCC01.
LOCATION.--Lat 43°39'35", long 91°25'18", in SW¼SW¼SE¼ sec.3, T.102 N., R.5 W., Hydrologic Unit 07060001, 3 mi east of Caledonia.
Owner: U.S Geological Survey.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation water-table well, diameter 4 in., depth 360 ft, cased to 309 ft.
DATUM.--Altitude of land-surface datum is 1,210 ft. Measuring point: Top of casing, 2.50 ft above land-surface datum.
PERIOD OF RECORD.--June 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 213.76 ft below land-surface datum, July 17, 1985; lowest, 246.64 ft below land-surface datum, Sept. 20, 1991.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 10	242.82	Mar 08	244.16	Sep 05	246.20
15	242.66	Aug 15	245.96	10	246.33
20	242.84	20	246.13	15	246.07
25	242.82	25	246.25	20	246.64
30	243.36	31	246.34	25	246.19
				30	246.35

433935091252001. Local number, 102N05W03DCC02.
LOCATION.--Lat 43°39'35", long 91°25'20", in SW¼SW¼SE¼ sec.3, T.102 N., R.5 W., Hydrologic Unit 07060001, 3 mi east of Caledonia.
Owner: U.S. Geological Survey.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in., depth 650 ft, cased to 614 ft.
DATUM.--Altitude of land-surface datum is 1,210 ft. Measuring point: Top of casing, 2.50 ft above land-surface datum.
PERIOD OF RECORD.--November 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 441.50 ft below land-surface datum, June 4, 1981; lowest, 452.21 ft below land-surface datum, July 31, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 08	451.40	Mar 08	451.76	Aug 14	451.40	Sep 27	451.43

GROUND-WATER LEVELS

HOUSTON COUNTY

443935091252901. Local number, 102N05W03DCC03.
LOCATION.--Lat 44°39'35", long 91°25'19", in SW¼SW¼SE¼ sec.3, T.102 N., R.5 W., Hydrologic Unit 07060001, 3 mi east of Caledonia.
Owner: U.S. Geological Survey
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in., depth 888 ft, cased to 858 ft.
DATUM.--Altitude of land-surface datum is 1,210 ft. Measuring point: Top of casing, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--July 1982 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 522.00 ft below land-surface datum, Nov. 10, 1983; lowest, 526.00 ft below land-surface datum, Sept. 29, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

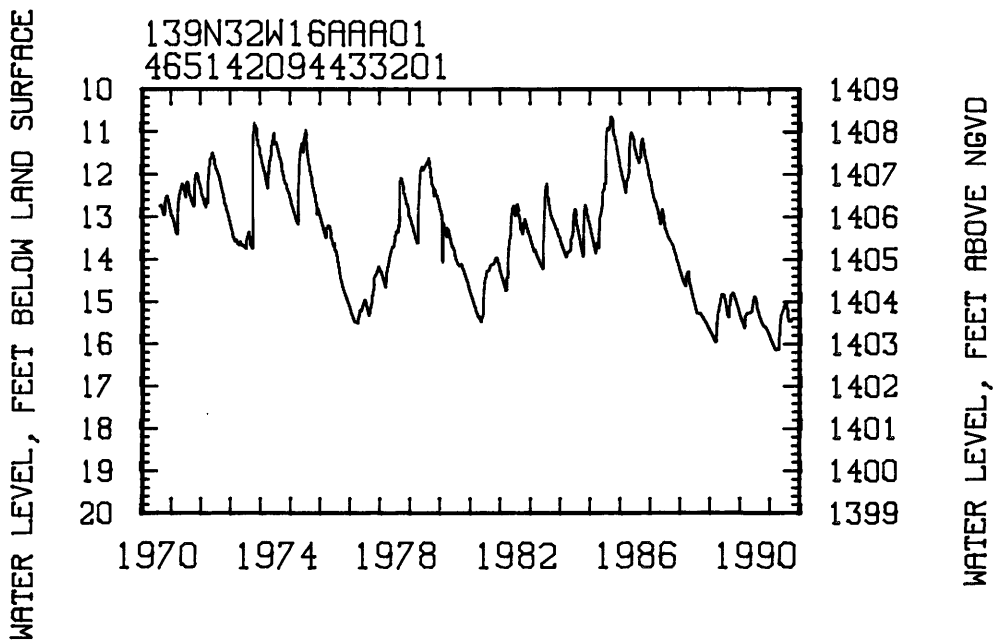
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 08	525.68	Mar 08	525.46	Sep 27	525.92

HUBBARD COUNTY

465142094433201. Local number, 139N32W16AAA01.
LOCATION.--Lat 46°51'42", long 94°43'32", in NE¼NE¼NE¼ sec.16, T.139 N., R.32 W., Hydrologic Unit 07010106, at Badoura Nursery.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in., depth 21 ft, screened 19 to 21 ft.
DATUM.--Altitude of land-surface datum is 1,419 ft. Measuring point: Top of casing, 2.00 ft above land-surface datum.
REMARKS.--Measured weekly by Archie Hakala.
PERIOD OF RECORD.--September 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.63 ft below land-surface datum, Sept. 24, 1985; lowest, 16.15 ft below land-surface datum, Mar. 19, 1991.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 02	15.50	Dec 18	15.72	Feb 05	15.96	Apr 02	16.10	Jun 04	15.29	Aug 06	15.05
09	15.51	25	15.75	12	16.00	09	16.12	11	15.22	13	15.16
16	15.55	Jan 01	15.78	19	16.03	16	16.14	18	15.20	20	15.23
22	15.56	08	15.81	26	16.05	23	16.14	25	15.15	27	15.39
30	15.59	15	15.86	Mar 05	16.10	30	16.10	Jul 02	15.11	Sep 03	15.46
Nov 07	15.60	22	15.89	12	16.12	May 07	15.97	09	15.07	10	15.44
13	15.60	29	15.93	19	16.15	14	15.78	16	15.05	17	15.43
20	15.61			26	16.10	21	15.63	23	15.03	24	15.44
27	15.63					28	15.42	30	15.02		



ISANTI COUNTY--Continued

453125093181101. Local number, 035N24W14BCD01.
LOCATION.--Lat 45°31'25", long 93°18'11", in SE¼SW¼NW¼ sec.14, T.35 N., R.24 W., Hydrologic Unit 07010207, northwest of Isanti.
Owner: Allen Kluck.
AQUIFER.--Eau Claire - Mount Simon Formations of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in., depth 300 ft, cased to 105 ft.
DATUM.--Altitude of land-surface datum is 940 ft. Measuring point: Hole in pump base, 0.10 ft above land-surface datum.
PERIOD OF RECORD.--February 1968 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 11.18 ft below land-surface datum, June 24, 1986; lowest, 16.16 ft below land-surface datum, Oct. 31, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL
Aug 02	12.43	Sep 30	12.38

453058093175901. Local number, 035N24W14CDC01.
LOCATION.--Lat 45°30'58", long 93°17'59", in SW¼SE¼SW¼ sec.14, T.35 N., R.24 W., Hydrologic Unit 07010207, northwest of Isanti.
Owner: Ernest Kluck.
AQUIFER.--Surficial outwash sand of Pleistocene Age.
WELL CHARACTERISTICS.--Driven unused water-table well, diameter 1¼ in., depth 17 ft, screen information not available.
DATUM.--Altitude of land-surface datum is 930 ft. Measuring point: Top of casing, 3.00 ft above land-surface datum.
PERIOD OF RECORD.--March 1968 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.50 ft below land-surface datum, June 24, 1986; lowest, 10.87 ft below land-surface datum, Oct. 31, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL
Aug 02	7.09	Sep 30	6.90

ITASCA COUNTY

471448093322001. Local number, 055N25W17ACD01.
LOCATION.--Lat 47°14'48", long 93°32'20", in SE¼SW¼NE¼ sec.17, T.55 N., R.25 W., Hydrologic Unit 07010103, at west end of 13th Street NW, Grand Rapids.
Owner: U.S. Geological Survey.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation water-table well, diameter 4 in., depth 147 ft, screened 143 to 147 ft.
DATUM.--Altitude of land-surface datum is 1,318 ft. Measuring point: Top of platform, 1.60 ft above land-surface datum.
PERIOD OF RECORD.--April 1962 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.04 ft below land-surface datum, June 1, 1966; lowest, 33.92 ft below land-surface datum, May 17, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 10	31.88	Nov 23	31.72	Feb 14	32.06	May 09	32.28	Jul 30	32.18
12	31.87	Jan 04	31.98	Mar 25	32.18	Jun 12	31.72	Sep 06	31.39

GROUND-WATER LEVELS

JACKSON COUNTY

434742095191501. Local number, 104N37W19DBD01.
LOCATION.--Lat 43°47'42", long 95°19'15", in SE¼NW¼SE¼ sec.19, T.104 N., R.37 W., Hydrologic Unit 07100001, at Heron Lake.
Owner: City of Heron Lake, old railroad well.
AQUIFER.--Sioux Quartzite of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 16 in., depth 323 ft, screened 205 to 225 ft.
DATUM.--Altitude of land-surface datum is 1,420 ft. Measuring point: Edge of breather pipe, 2.60 ft above land-surface datum.
PERIOD OF RECORD.--August 1972, July 1973, September 1976, July 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 59.16 ft below land-surface datum, Aug. 11, 1972; lowest, 66.10 ft below land-surface datum, July 14, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

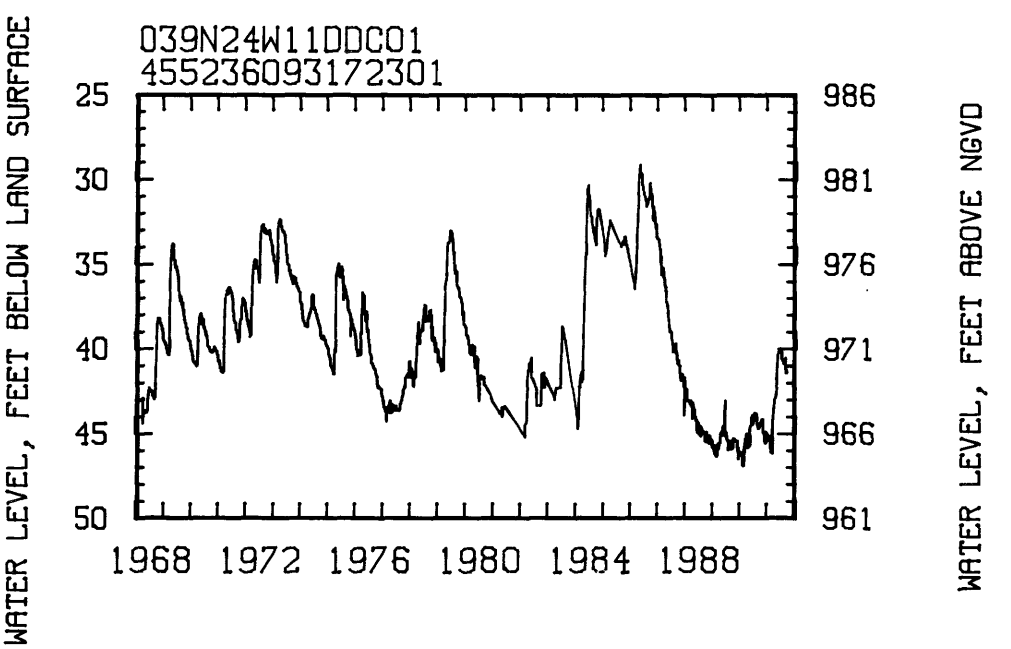
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 23	64.78	Feb 01	63.85	Jun 19	61.44
Nov 28	64.43	Apr 17	62.40	Aug 19	62.06

KANABEC COUNTY

455236093172301. Local number, 039N24W11DDC01.
LOCATION.--Lat 45°52'36", long 93°17'23", in SW¼SE¼SE¼ sec.11, T.39 N., R.24 W., Hydrologic Unit 07030004, intersection of Forest Avenue and U.S. Highway 65.
Owner: City of Mora, well 3.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, diameter 12 in., depth 170 ft, screened 150 to 170 ft.
DATUM.--Altitude of land-surface datum is 1,011 ft. Measuring point: Edge of vent pipe, 2.40 ft above land-surface datum.
PERIOD OF RECORD.--March 1968 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.10 ft below land-surface datum, May 27, 1986; lowest, 46.90 ft below land-surface datum, Mar. 5, 12, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 03	44.54	Dec 03	44.92	Feb 05	45.10	Apr 02	45.00	Jun 03	41.20	Aug 06	40.57
09	44.60	10	44.94	11	45.15	08	44.50	12	40.25	12	40.67
15	44.37	17	45.20	19	45.15	17	43.70	17	40.10	19	40.80
22	44.30	24	45.57	26	45.15	23	43.52	24	40.10	26	40.87
29	44.35	31	45.57	Mar 04	45.35	29	43.18	Jul 01	40.00	Sep 16	40.50
Nov 05	44.10	Jan 07	44.83	12	46.11	May 06	42.85	08	40.12	24	41.18
13	44.11	14	45.04	18	45.94	23	42.30	18	40.10	30	41.40
19	44.19	22	45.05	27	46.18	28	42.05	29	40.21		
26	44.10	28	45.40								



LE SUEUR COUNTY

442522093543901. Local number, 111N26W14ADA01.
LOCATION.--Lat 44°25'22", long 93°54'39", in NE¼SE¼NE¼ sec.14, T.111 N., R.26 W., Hydrologic Unit 07020012, 0.85 mi south of Le Sueur.
Owner: Merle Moser.
AQUIFER.--Buried gravel of Pleistocene Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in., depth 242 ft, screened 212 to 242 ft.
DATUM.--Altitude of land-surface datum is 855 ft. Measuring point: Edge of vent pipe, 1.20 ft above land-surface datum.
PERIOD OF RECORD.--January 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 71.82 ft below land-surface datum, Feb. 11, 1987; lowest, 84.55 ft below land-surface datum, Mar. 9, 1982.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 20	82.78	Mar 26	83.00	May 29	83.03	Sep 25	82.02

443234093333501 Local number, 112N23W02BAB01.
LOCATION.--Lat 44°32'34", long 93°33'35", in NW¼NE¼NW¼ sec.2, T.112 N., R.23 W., Hydrologic Unit 07020012, just east of New Prague.
Owner: Holy Trinity Lutheran Church.
AQUIFER.--St. Lawrence Formation of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in., depth 180 ft, cased to 155 ft.
DATUM.--Altitude of land-surface datum is 1,005 ft. Measuring point: Top of casing, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--April 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 93.56 ft below land-surface datum, Feb. 3, 1987; lowest, 99.42 ft below land-surface datum, July 26, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 20	96.73	May 10	96.15	Sep 18	97.00

443147093374501. Local number, 112N23W06DDD01.
LOCATION.--Lat 44°31'47",long 93°37'45", in SE¼SE¼SE¼ sec.6, T.112 N., R.23 W., Hydrologic Unit 07020012, 3 mi southwest of New Prague.
Owner: Friedens Lutheran Church.
AQUIFER.--St. Lawrence Formation of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 5 in., depth 265 ft, cased to 209 ft.
DATUM.--Altitude of land-surface datum is 1,019 ft. Measuring point: Top of casing, 1.70 ft above land-surface datum.
PERIOD OF RECORD.--April 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 150.85 ft below land-surface datum, Mar. 18, 1981; lowest, 153.58 ft below land-surface datum, July 19, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 20	151.70	Mar 14	151.82	May 10	151.78	Sep 18	152.52

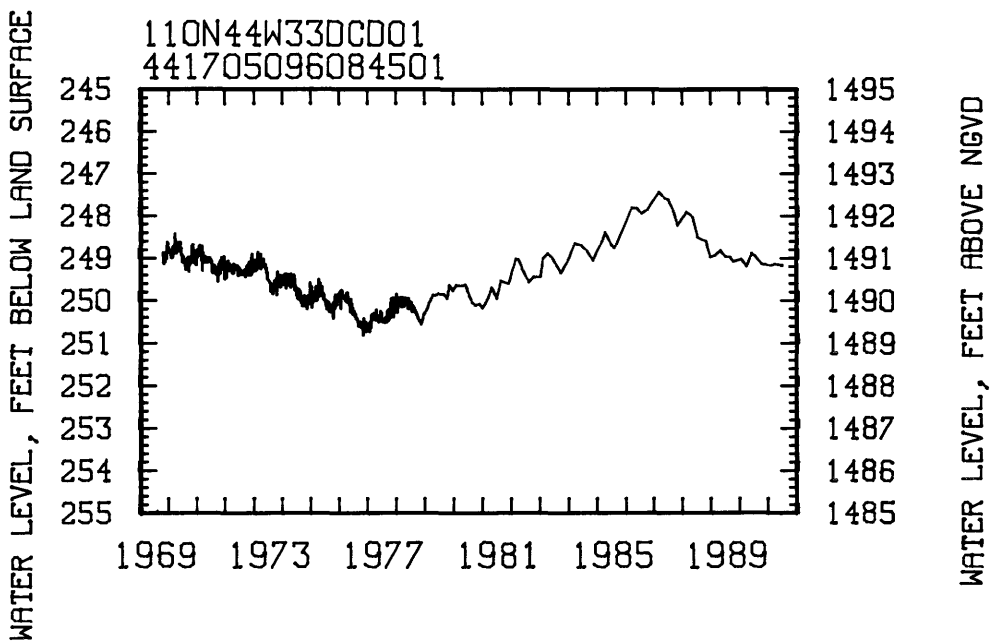
GROUND-WATER LEVELS

LINCOLN COUNTY

441705096084501. Local number, 110N44W33DCD01.
LOCATION.--Lat 44°17'05", long 96°08'45", in SE¼SW¼SE¼ sec.33, T.110 N., R.44 W., Hydrologic Unit 07020006, at Tyler.
Owner: U.S. Geological Survey.
AQUIFER.--Dakota Sandstone of Early Cretaceous Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 8 in., depth 967 ft, screened 890 to 900 ft.
DATUM.--Altitude of land-surface datum is 1,738 ft. Measuring point: Top of recorder platform, 3.50 ft above land-surface datum.
PERIOD OF RECORD.--November 1969 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 247.41 ft below land-surface datum, Mar. 23, 1987; lowest, 250.82 ft below land-surface datum, Nov. 12, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 23	249.14	Feb 21	249.17	Apr 08	249.12	Jul 10	249.17



MARTIN COUNTY

434359094422201. Local number, 103N32W08CCD01.
LOCATION.--Lat 43°43'59", long 94°42'22", in SE¼SW¼SW¼ sec.8, T.103 N., R.32 W., Hydrologic Unit 07020009, 1.5 mi south of Trimont.
Owner: Robert Olson.
AQUIFER.--Sandstone of Cretaceous Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 16 in., depth 412 ft, screened 372 to 412 ft.
DATUM.--Altitude of land-surface datum is 1,242 ft. Measuring point: Vent pipe, 0.50 ft above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 90.50 ft below land-surface datum, Apr. 14, 1987; lowest, 96.22 ft below land-surface datum, July 21, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 19	92.71	Mar 25	92.00	Jul 23	92.12
Jan 29	92.50	May 28	92.02	Sep 24	92.54

MARTIN COUNTY--Continued

434725094483001. Local number, 104N33W28BAB01.
LOCATION.--Lat 43°47'25", long 94°48'30", in NW¼NE¼NW¼ sec.28, T.104 N., R.33 W., Hydrologic Unit 07020009, 6.6 mi northwest of Trimont.
Owner: Kenneth Schafer.
AQUIFER.--Sioux Quartzite of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 5 in., depth 178 ft, cased to 121 ft.
DATUM.--Altitude of land-surface datum is 1,290 ft. Measuring point: Top of casing, 1.30 ft above land-surface datum.
PERIOD OF RECORD.--September 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 82.99 ft below land-surface datum, Apr. 14, 1987; lowest, 86.37 ft below land-surface datum, Mar. 25, 1991.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 19	85.78	Mar 25	86.37	Jul 23	85.56
Jan 29	86.02	May 28	85.50	Sep 24	85.25

MC LEOD COUNTY

444758094132101. Local number, 115N28W05ACC01.
LOCATION.--Lat 44°47'58", long 94°13'21", in SW¼SW¼NE¼ sec.5, T.115 N., R.28 W., Hydrologic Unit 07010205, northwest of Glencoe.
Owner: Graupmann Farms, Inc.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in., depth 472 ft, screened 432 to 472 ft.
DATUM.--Altitude of land-surface datum is 1,036 ft. Measuring point: Edge of vent pipe, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--September 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 80.50 ft below land-surface datum, Aug. 20, 1979; lowest, 109.65 ft below land-surface datum, Oct. 1, 1979.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 16	91.83	May 14	85.88	Sep 23	98.45
Mar 13	86.95	Jul 24	91.92		

444819094164701. Local number, 116N29W35DDC01.
LOCATION.--Lat 44°48'19", long 94°16'47", in SW¼SE¼SE¼ sec.35, T.116 N., R.29 W., Hydrologic Unit 07010205, 1.3 mi south of Biscay.
Owner: Charles Johnson.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in., depth 269 ft, screened 229 to 269 ft.
DATUM.--Altitude of land-surface datum is 1,050 ft. Measuring point: Edge of vent pipe, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--September 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 24.21 ft below land-surface datum, Jan. 23, 1986; lowest, 34.80 ft below land-surface datum, Aug. 26, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 16	30.18	May 14	28.73	Sep 23	28.55
Mar 13	29.45	Jul 25	28.60		

GROUND-WATER LEVELS

MC LEOD COUNTY--Continued

445721094031201. Local number 117N27W10DAA01.
LOCATION.--Lat 44°57'21", long 94°03'12", in NE¼NE¼SE¼ sec.10, T.117 N., R.27 W., Hydrologic Unit 07010205, 0.1 mi south of Winsted.
Owner: Winsted Farmers Coop.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled industrial artesian well, diameter 4 in., depth 129 ft, screened 125 to 129 ft.
DATUM.--Altitude of land-surface datum is 1,015 ft. Measuring point: Top of casing, 1.40 ft above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.63 ft below land-surface datum, Dec. 10, 1986; lowest, 45.50 ft below land-surface datum, Oct. 7, 1987.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

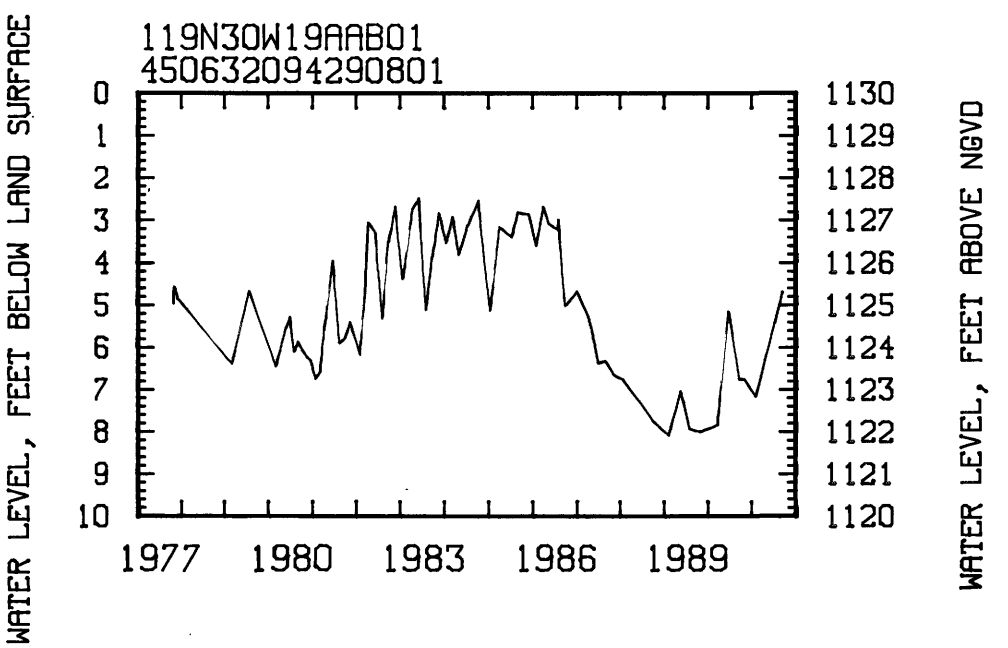
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 16	37.65	Mar 13	38.13	Jul 25	35.50
Jan 17	37.69	May 14	37.69	Sep 23	34.00

MEEKER COUNTY

450632094290801. Local number, 119N30W19AAB01.
LOCATION.--Lat 45°06'32", long 94°29'08", in NW¼NE¼NE¼ sec.19, T.119 N., R.30 W., Hydrologic Unit 07010204, on Ted Carlson farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1¼ in., depth 26 ft, screened 24 to 26 ft.
DATUM.--Altitude of land-surface datum is 1,130 ft. Measuring point: Top of casing, 3.30 ft above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.47 ft below land-surface datum, June 14, 1983; lowest 8.09 ft below land-surface datum, Feb. 13, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 08	6.75	Feb 08	7.17	Jul 18	5.40	Sep 18	4.70



MEEKER COUNTY--Continued

451542094322301. Local number, 121N31W26BDC01.
LOCATION.--Lat 45°15'42", long 94°32'23", in SW¼SE¼NW¼ sec.26, T.121 N., R.31 W., Hydrologic Unit 07010204, on Keith Langmo farm.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial sand of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 1½ in., depth 16 ft, screened 14 to 16 ft.
DATUM.--Altitude of land-surface datum is 1,112 ft. Measuring point: Top of casing, 3.00 ft above land-surface datum.
PERIOD OF RECORD.--November 1977 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 2.70 ft below land-surface datum, Aug. 18, 1986; lowest, 9.19 ft below land-surface datum, Mar. 30, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 08	6.15	Feb 08	6.98	Jul 18	4.08	Sep 18	3.46

MILLE LACS COUNTY

454450093395701. Local number, 038N27W35ABC01.
LOCATION.--Lat 45°44'50", long 93°39'57", in SW¼NW¼NE¼ sec.35, T.38 N., R.27 W., Hydrologic Unit 07010207, in Milaca.
Owner: City of Milaca, creamery well.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in., depth 82 ft, screened 67 to 82 ft.
DATUM.--Land-surface datum is 1,082.2 ft National Geodetic Vertical Datum of 1929. Measuring point: Top of breather pipe, 4.00 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--September 1967 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 35.72 ft below land-surface datum, July 20, 1984; lowest, 42.81 ft below land-surface datum, Aug. 27, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL
Aug 02	38.60	Sep 30	39.30

MORRISON COUNTY

460444094212501. Local number, 130N29W08DCC01.
LOCATION.--Lat 46°04'44", long 94°21'25", in SW¼SW¼SE¼ sec.8, T.130 N., R.29 W., Hydrologic Unit 07010104, at Camp Ripley.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation water-table well, diameter 2 in., depth 59 ft, screened 56 to 59 ft.
DATUM--Land-surface datum is 1,149.0 ft National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 2.10 ft above land-surface datum.
REMARKS.--Water levels used in monthly Water Resources Review.
PERIOD OF RECORD.--April 1949 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 7.35 ft below land-surface datum, July 28, 1972; lowest, 19.75 ft below land-surface datum, Aug. 4, 1961.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 05	14.67	Dec 07	14.70	Feb 01	15.21	Apr 03	15.49	Jun 01	14.08	Aug 02	13.85
12	14.74	14	14.85	08	15.29	05	15.36	07	13.85	09	13.36
19	14.58	21	14.93	15	15.68	19	15.52	14	14.78	16	14.02
26	14.58	28	15.12	22	15.53	26	15.14	22	14.52	23	14.05
Nov 02	14.61	Jan 04	14.98	Mar 01	15.68	May 03	15.13	28	14.22	Sep 06	14.14
09	14.74	11	15.03	08	15.81	10	15.12	Jul 05	14.02	13	14.00
16	14.64	18	15.41	15	15.55	18	14.99	12	13.78	20	13.84
23	14.67	25	15.33	22	15.79	24	14.47	19	13.66	27	13.81
30	14.68							26	14.00		

MOWER COUNTY

434010093010801. Local number, 102N18W05ACB01.
LOCATION.--Lat 43°40'10", long 93°01'08", in NW¼SW¼NE¼ sec.5, T.102 N., R.18 W., Hydrologic Unit 07080201, in Austin.
Owner: Church of Latter Day Saints.
AQUIFER.--Cedar Valley Formation of Middle Devonian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 5 in., depth 100 ft, cased to 77 ft.
DATUM.--Altitude of land-surface datum is 1,230 ft. Measuring point: Top of casing, 0.80 ft above land-surface datum.
PERIOD OF RECORD.--July 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 33.69 ft below land-surface datum, May 10, 1984; lowest, 38.44 ft below land-surface datum, July 10, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 19	36.09	May 28	33.98	Sep 24	35.89
Mar 25	35.87	Jul 23	35.82		

434417093521001. Local number, 103N17W09DAA01.
LOCATION.--Lat 43°44'17", long 93°52'10", in NE¼NE¼SE¼ sec.9, T.103 N., R.17 W., Hydrologic Unit 07080201, in Brownsdale.
Owner: Land O'Lakes, creamery well.
AQUIFER.--Cedar Valley Formation of Middle Devonian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in., depth 130 ft, casing information not available.
DATUM.--Altitude of land-surface datum is 1,280 ft. Measuring point: Top of well cap, 0.40 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--February 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 35.97 ft below land-surface datum, May 2, 1984; lowest, 45.20 ft below land-surface datum, Mar. 30, 1978.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 01	38.83	Mar 05	41.52	May 29	37.67
Dec 12	40.64	Apr 17	40.76	Jul 09	37.37

OLMSTED COUNTY

445538092232601. Local number, 105N13W04CAA01.
LOCATION.--Lat 44°55'38", long 92°23'26", in NW¼NW¼SW¼ sec.4, T.105 N., R.13 W., Hydrologic Unit 07040004, 1 mile east of Simpson.
Owner: Robert Sheehan.
AQUIFER.--Galena Formation of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in., depth 75 ft, cased to 23 ft.
DATUM.--Altitude of land-surface datum is 1,270 ft: Measuring point: Top of well cap, 1.20 ft above land-surface datum.
PERIOD OF RECORD.--March 1987 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 15.16 ft below land-surface datum, May 7, 1991; lowest, 33.30 ft below land-surface datum, Feb. 6, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec 05	29.60	Mar 05	28.50	Aug 01	24.54
Jan 09	30.53	May 07	15.16	Sep 12	25.89

435757092224201. Local number, 106N13W22CCB01.
LOCATION.--Lat 43°5'57", long 92°22'42", in NW¼SW¼SW¼ sec. 22, T.106 N., R.13 W., Hydrologic Unit 07040004, at Burr Oak School.
Owner: Independent School District 535.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 6 in. depth 510 ft, cased to 430 ft.
DATUM.--Altitude of land-surface datum is 1,090 ft: Measuring point: Top of well cap, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--February 1987 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 28.01 ft below land-surface datum, Feb. 25, 1987; lowest, 32.63 ft below land-surface datum, Feb. 6, 1990.

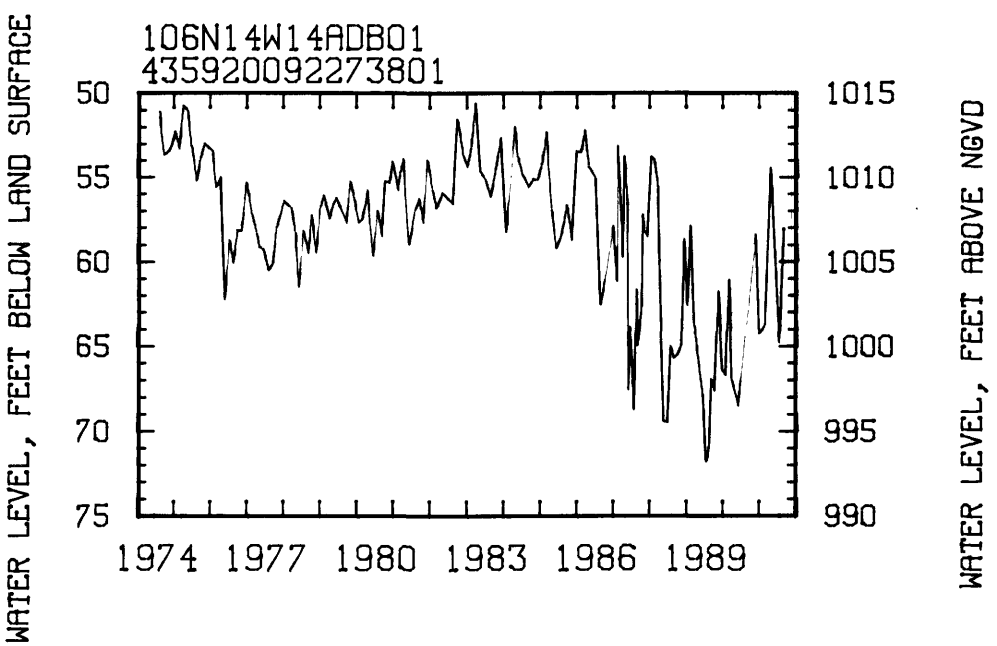
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec 05	29.60	Mar 04	30.18	Aug 01	28.88
Jan 09	30.53	May 07	29.68	Sep 12	29.15

435920092273801. Local number, 106N14W14ADB01.
LOCATION.--Lat 43°59'20", long 92°27'38", in NW¼SE¼NE¼ sec.14, T.106 N., R.14 W., Hydrologic Unit 07040004, in Rochester.
Owner: Golden Hill School Dist. #1371.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in., depth 478 ft, cased to 397 ft.
DATUM.--Altitude of land-surface datum is 1,065 ft. Measuring point: Edge of well cap, 1.80 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--August 1974 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 50.58 ft below land-surface datum, Apr. 12, 1983; lowest, 71.86 ft below land-surface datum, July 26, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec 05	58.30	Mar 05	63.65	Aug 01	64.82
Jan 09	64.29	May 07	54.35	Sep 12	58.04



GROUND-WATER LEVELS

RAMSEY COUNTY

445955093011001. Local number, 029N22W14CAB01.
LOCATION.--Lat 44°59'55", long 93°01'10", in NW¼NE¼SW¼ sec.14, T.29 N., R.22 W., Hydrologic Unit 07010206, at Goodrich Golf Course.
Owner: Ramsey County.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in., depth 523 ft, cased to 303 ft.
DATUM.--Altitude of land-surface datum is 970 ft. Measuring point: Edge of vent pipe, 2.50 ft above land-surface datum.
PERIOD OF RECORD.--Mey 1965, April 1966 to August 1966, August 1971, May 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 124.62 ft below land-surface datum, Feb. 6, 1987; lowest, 140.60 ft below land-surface datum, Apr. 6, 1966.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 06	131.50	May 16	134.23	Sep 17	130.84
Jan 07	132.00	Jul 16	138.67		

445955093011002. Local number, 029N22W14CAB02.
LOCATION.--Lat 44°59'55", long 93°01'10", in NW¼NE¼SW¼ sec.14, T.29 N., R.22 W., Hydrologic Unit 07010206, at Goodrich Golf Course.
Owner: U.S. Geological Survey.
AQUIFER.--Buried gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation artesian well, diameter 2 in., depth 81 ft, screened 78 to 81 ft.
DATUM.--Altitude of land-surface datum is 970 ft. Measuring point: Top of casing, 1.30 ft above land-surface datum.
PERIOD OF RECORD.--October 1966 to August 1971, August 1977, June 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 30.80 ft below land-surface datum, Oct. 28, 1986; lowest, 45.36 ft below land-surface datum, June 3, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 06	37.89	May 16	38.90	Sep 17	35.86
Jan 07	38.73	Jul 16	36.47		

445955093011003. Local number, 029N22W14CAB03.
LOCATION.--Lat 44°59'55", long 93°01'10", in NW¼NE¼SW¼ sec.14, T.29 N., R.22 W., Hydrologic Unit 07010206, at Goodrich Golf Course.
Owner: U.S. Geological Survey.
AQUIFER.--Buried gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in., depth 52 ft, screened 49 to 52 ft.
DATUM.--Altitude of land-surface datum is 970 ft. Measuring point: Top of casing, 1.80 ft above land-surface datum.
PERIOD OF RECORD.--October 1966 to August 1971, June 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 8.97 ft below land-surface datum, Oct. 28, 1986; lowest, 25.43 ft below land-surface datum, June 3, 1968.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 06	19.85	May 16	21.92	Sep 17	17.23
Jan 07	21.04	Jul 16	18.52		

450001093024701. Local number, 029N22W16ADD01.
LOCATION.--Lat 45°00'01", long 93°02'47", in SE¼SE¼NE¼ sec.16, T.29 N., R.22 W., Hydrologic Unit 07010206, at 1955 English St.
Owner: Maplewood Bowl.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 4 in., depth 163 ft, screened 158 to 163 ft.
DATUM.--Altitude of land-surface datum is 900 ft. Measuring point: Top of well cap, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--January 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 65.99 ft below land-surface datum, Feb. 6, 1987; lowest, 73.83 ft below land-surface datum, Apr. 30, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 06	73.22	Mar 04	73.11	Aug 02	72.85
Jan 07	73.08	May 16	73.16	Sep 17	72.84

445918092590901. Local number, 029N22W24ADA01.
LOCATION.--Lat 44°59'18", long 92°59'09", in NE¼SE¼NE¼ sec.24, T.29 N., R.22 W., Hydrologic Unit 07010206, at 1555 Century Avenue.
Owner: Northern States Power Co., Maplewood Gas Plant.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled fire protection artesian well, diameter 12 in., depth 523 ft, cased to 420 ft.
DATUM.--Land-surface datum is 996.5 ft National Geodetic Vertical Datum of 1929. Measuring point: Edge of 2 in. breather pipe, 2.40 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--August 1970 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 131.90 ft below land-surface datum, Mar. 9, 1987; lowest, 151.0 ft below land-surface datum, May 14, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 06	138.80	Jun 11	144.70

445700093051001. Local number, 029N22W31DDD01.
LOCATION.--Lat 44°57'00", long 93°05'10", in SE¼SE¼SE¼ sec.31, T.29 N., R.22 W., Hydrologic Unit 07010206, at 261 East 5th Street, St. Paul.
Owner: Control Data Corp.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in., depth 298 ft, cased to 151 ft.
DATUM.--Altitude of land-surface datum is 750 ft. Measuring point: Top of recorder platform, 9.00 ft below land-surface datum.
REMARKS.--Water level affected by pumping of nearby wells.
PERIOD OF RECORD.--December 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 27.85 ft below land-surface datum, Apr. 1, 1991; lowest, 83.28 ft below land-surface datum, Aug. 4, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 05	62.96	Dec 05	35.64	Feb 05	32.68	Apr 05	57.43	Jun 05	65.68	Aug 05	68.52
10	40.33	10	35.71	10	30.92	10	35.49	10	68.38	10	63.88
15	43.80	15	35.50	15	34.26	15	31.45	15	63.61	15	72.62
20	36.65	20	34.32	20	33.41	20	36.16	20	70.20	20	67.94
25	40.83	25	34.26	25	31.99	25	54.90	25	72.28	25	67.05
31	49.91	31	33.62	28	33.13	30	41.08	30	66.53	31	69.53
Nov 05	35.66	Jan 05	33.85	Mar 05	32.63	May 05	30.11	Jul 05	68.58	Sep 05	68.88
10	34.94	10	33.84	10	29.54	10	59.53	10	70.69	10	68.05
15	39.92	15	33.16	15	32.93	15	67.41	15	71.83	15	65.89
20	35.64	20	33.80	20	33.35	20	59.72	20	---	20	45.10
25	34.36	25	35.45	25	33.57	25	60.11	25	---	25	48.66
30	35.69	31	33.11	31	29.42	31	68.23	31	72.90	30	51.80

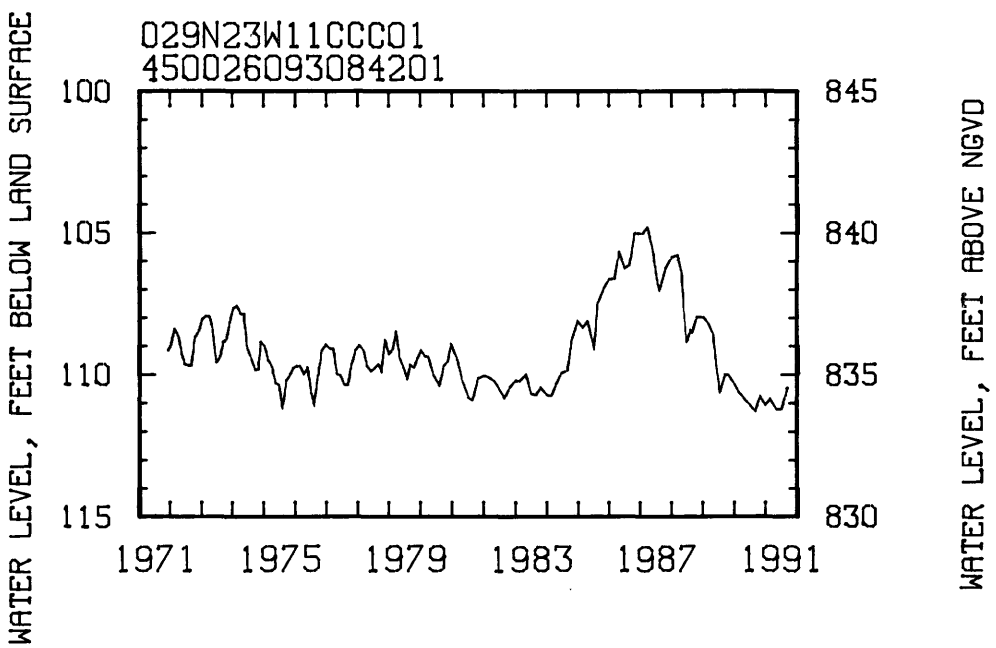
GROUND-WATER LEVELS

RAMSEY COUNTY--Continued

450026093084201. Local number, 029N23W11CCC01.
LOCATION.--Lat 45°00'26", long 93°08'42", in SW¼SW¼SW¼ sec.11, T.29 N., R.23 W., Hydrologic Unit 07010206, at 2204 North Lexington Avenue, Roseville.
Owner: Lexington Court Apartments.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in., depth 325 ft, cased to 192 ft.
DATUM.--Altitude of land-surface datum is 945 ft. Measuring point: Top of well cap, 1.40 ft above land-surface datum.
PERIOD OF RECORD.--January 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 104.77 ft below land-surface datum, Mar. 30, 1987; lowest, 111.30 ft below land-surface datum, Sept. 12, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 06	110.75	Mar 04	110.84	Jul 16	111.19
Jan 07	111.08	May 16	111.22	Sep 16	110.47



445751093072301. Local number, 029N23W25CCD01.
LOCATION.--Lat 44°57'51", long 93°07'23", SE¼SW¼SW¼ sec.25, T.29 N., R.23 W., Hydrologic Unit 07010206, at 760 North Dale Street, St. Paul.
Owner: Burlington Northern, Inc., Dale Street Shops.
AQUIFER.--Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 8 in., depth 999 ft, cased to 955 ft.
DATUM.--Land-surface datum is 859.5 ft National Geodetic Vertical Datum of 1929. Measuring point: Top of recorder floor, 4.60 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--December 1970, November 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 161.05 ft below land-surface datum, May 10, 1980; lowest, 226.05 ft below land-surface datum, Sept. 18, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 10	212.14	Jan 05	208.19	Mar 05	202.80	May 05	200.98	Jul 05	201.88	Sep 05	206.04
15	211.74	10	208.00	10	203.08	10	200.85	10	202.36	10	206.53
20	211.50	15	207.24	15	203.09	15	200.57	15	202.67	15	206.63
25	211.11	20	206.84	20	202.62	20	200.75	20	202.83	20	207.50
30	210.83	25	206.52	25	202.59	25	200.72	25	203.39	25	207.45
Dec 05	210.67	31	205.77	31	202.45	31	200.61	31	203.57	30	207.75
10	210.33	Feb 05	205.29	Apr 05	202.21	Jun 05	201.01	Aug 05	204.02		
15	209.92	10	204.96	10	202.27	10	200.95	10	204.32		
20	209.61	15	204.59	15	201.71	15	200.90	15	204.36		
25	209.20	20	203.98	20	201.76	20	201.27	20	204.84		
31	208.73	25	203.94	25	201.34	25	201.55	25	205.21		
		28	203.36	30	200.98	30	201.66	31	205.79		

445739093081201. Local number, 029N23W35BAD01.
LOCATION.--Lat 44°57'39", long 93°08'12", in SE¼NE¼NW¼ sec.35, T.29 N., R.23 W., Hydrologic Unit 07010206, Victoria Street, 0.35 mi north of University Avenue.
Owner: City of St. Paul.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 16 in., depth 234 ft, screened 174 to 234 ft.
DATUM.--Altitude of land-surface datum is 888 ft. Measuring point: Top of coupling, 0.50 ft above land-surface datum.
PERIOD OF RECORD.--May 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 118.83 ft below land-surface datum, Feb. 2, 1987; lowest, 133.03 ft below land-surface datum, May 5, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 06	120.42	Mar 04	118.95	Jul 16	120.54
Jan 07	120.08	May 15	119.46	Sep 16	120.46

450414093012701. Local number, 030N22W23CBB01.
LOCATION.--Lat 45°04'14", long 93°01'27", in NW¼NW¼SW¼ sec.23, T.30 N., R.22 W., Hydrologic Unit 07010206, Hoffman Road, 0.85 mi southwest of Highway 61.
Owner: White Bear Town Hall.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in., depth 96 ft, screened 91 to 96 ft.
DATUM.--Altitude of land-surface datum is 928 ft. Measuring point: Top of casing, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--April 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 17.54 ft below land-surface datum, Oct. 28, 1986; lowest, 28.08 ft below land-surface datum, May 15, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec 04	27.07	Mar 11	27.89	Jul 22	27.24
Jan 16	27.52	May 16	27.62	Sep 17	25.97

450238093082501. Local number, 030N23W35BDC01.
LOCATION.--Lat 45°02'38", long 93°08'25", in SW¼SE¼NW¼ sec.35, T.30 N., R.23 W., Hydrologic Unit 07010206, southeast corner of Arbogast Street and Richmond Avenue.
Owner: City of Shoreview.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 12 in., depth 510 ft, cased to 465 ft.
DATUM.--Altitude of land-surface datum is 960 ft. Measuring point: Hole in shelter floor, 1.50 ft above land-surface datum.
PERIOD OF RECORD.--April 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 129.26 ft below land-surface datum, Mar. 1, 1987; lowest, 146.01 ft below land-surface datum, July 28, 1989.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATAUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 05	140.81	Dec 05	141.72	Feb 05	142.08	Apr 05	139.30	Jun 05	139.61	Aug 05	140.17
10	140.29	10	141.74	10	142.07	10	140.18	10	141.15	10	140.05
15	139.99	15	141.79	15	142.36	15	139.18	15	142.43	15	140.28
20	140.01	20	142.00	20	142.06	20	139.52	20	142.40	20	139.91
25	140.07	25	141.66	25	142.25	25	139.45	25	141.84	25	140.40
31	139.82	31	141.57	28	141.98	30	139.80	30	143.31	31	141.50
Nov 05	141.02	Jan 05	141.62	Mar 05	141.67	May 05	138.46	Jul 05	142.21	Sep 05	139.97
10	141.50	10	141.65	10	142.42	10	137.96	10	142.12	10	139.80
15	141.67	15	141.35	15	142.50	15	139.05	15	142.12	15	139.21
20	141.45	20	141.94	20	142.09	20	138.62	20	143.17	20	138.84
25	141.53	25	142.30	25	140.18	25	139.64	25	143.16	25	137.79
30	141.91	31	142.15	31	139.29	31	139.43	31	142.39	30	137.46

GROUND-WATER LEVELS

REDWOOD COUNTY

441323095280701. Local number, 109N38W30BBD01.
LOCATION.--Lat 44°13'23", long 95°28'07", in SE¼NW¼NW¼ sec.30, T.109 N., R.38 W., Hydrologic Unit 07020008, at city of Walnut Grove.
Owner: Plum Creek Cheese Co.
AQUIFER.--Sandstone of Cretaceous Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 5 in., depth 240 ft, casing depth not available.
DATUM.--Altitude of land-surface datum is 1,218 ft. Measuring point: Top of well seal, 0.55 ft above land-surface datum.
PERIOD OF RECORD.--August 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 24.20 ft below land-surface datum, April 3, 1984; lowest, 26.80 ft below land-surface datum, Sept. 26, 1984.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

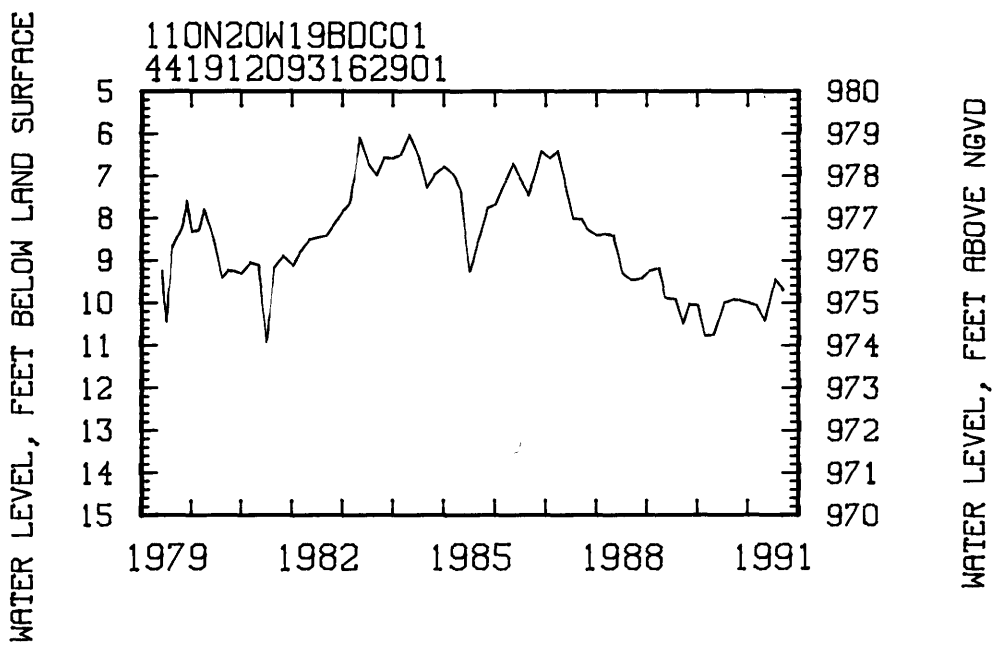
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 11	26.02	Feb 01	25.95	Aug 19	25.88
Nov 28	25.93	Jun 19	25.51		

RICE COUNTY

441912093162901. Local number, 110N20W19BDC01.
LOCATION.--Lat 44°19'12", long 93°16'29", in SW¼SE¼NW¼ sec.19, T.110 N., R.20 W., Hydrologic Unit 07040002, just north of Faribault.
Owner: St. Lawrence Cemetery Assn.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in., depth 400 ft, cased to 357 ft.
DATUM.--Altitude of land-surface datum is 985 ft. Measuring point: Top of casing, 1.60 ft above land-surface datum.
PERIOD OF RECORD.--June 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 6.02 ft below land-surface datum, May 2, 1984; lowest: 10.94 ft below land-surface datum, July 10, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 09	9.94	Mar 12	10.07	Jul 23	9.44
Jan 15	10.01	May 09	10.42	Sep 18	9.70



442543093113701. Local number, 111N20W11CDC01.
LOCATION.--Lat 44°25'43", long 93°11'37", in SW¼SE¼SW¼ sec.11, T.111 N., R.20 W., Hydrologic Unit 07040002, Highway 218 at Dundas.
Owner: Rollie Green.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled commercial artesian well, diameter 4 in., depth 158 ft, cased to 101 ft.
DATUM.--Altitude of land-surface datum is 950 ft. Measuring point: Top of casing, 2.00 ft above land-surface datum.
PERIOD OF RECORD.--October 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 21.72 ft below land-surface datum, May 14, 1986; lowest, 27.44 ft below land-surface datum, Nov. 9, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 09	27.44	Mar 12	26.56	Jul 23	25.13
Jan 15	26.89	May 09	24.93	Sep 18	25.56

442751093240701. Local number, 112N21W31CBB01.
LOCATION.--Lat 44°27'51", long 93°24'07", in NW¼NW¼SW¼ sec.31, T.112 N., R.21 W., Hydrologic Unit 07040002, 1.0 mi south of Highway 19.
Owner: Trondhiem Church.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in., depth 276 ft, cased to 232 ft.
DATUM.--Altitude of land-surface datum is 1,130 ft. Measuring point: Top of casing, 1.10 ft above land-surface datum.
PERIOD OF RECORD.--June 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 136.06 ft below land-surface datum, Sept. 21, 1987; lowest, 141.8 ft below land-surface datum, Oct. 30, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 09	140.53	May 09	140.82	Sep 18	140.76
Jan 15	140.65	Jul 26	140.93		

SCOTT COUNTY

443732093460301. Local number, 113N24W06BCB01.
LOCATION.--Lat 44°37'32", long 93°46'03", in NW¼SW¼NW¼ sec.6, T.113 N., R.24 W., Hydrologic Unit 07020012, in Belle Plaine.
Owner: Creative Tool and Engineering. Formerly Belle Plaine Coop Creamery.
AQUIFER.--Buried sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 12 in., depth 272 ft, screen information not available.
DATUM.--Altitude of land-surface datum is 840 ft. Measuring point: Top of well cap, 2.30 ft above land-surface datum.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 116.77 ft below land-surface datum, July 11, 1983; lowest, 143.96 ft below land-surface datum, July 9, 1981.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 20	120.50	Mar 26	119.87	Jul 25	119.68
Jan 15	120.87	May 10	118.68	Sep 25	118.20

443352093423001. Local number, 113N24W28DAA01.
LOCATION.--Lat 44°33'52", long 93°42'30", in NE¼NE¼SE¼ sec.28, T.113 N., R.24 W., Hydrologic Unit 07020012, at Michelle Wildlife Area.
Owner: U.S. Geological Survey.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in., depth 450 ft, cased to 219 ft.
DATUM.--Altitude of land-surface datum is 990 ft. Measuring point: Top of well seal, 2.30 ft above land-surface datum.
PERIOD OF RECORD.--August 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 131.70 ft below land-surface datum, May 2, 1984; lowest, 137.07 ft below land-surface datum, Aug. 15, 1989.

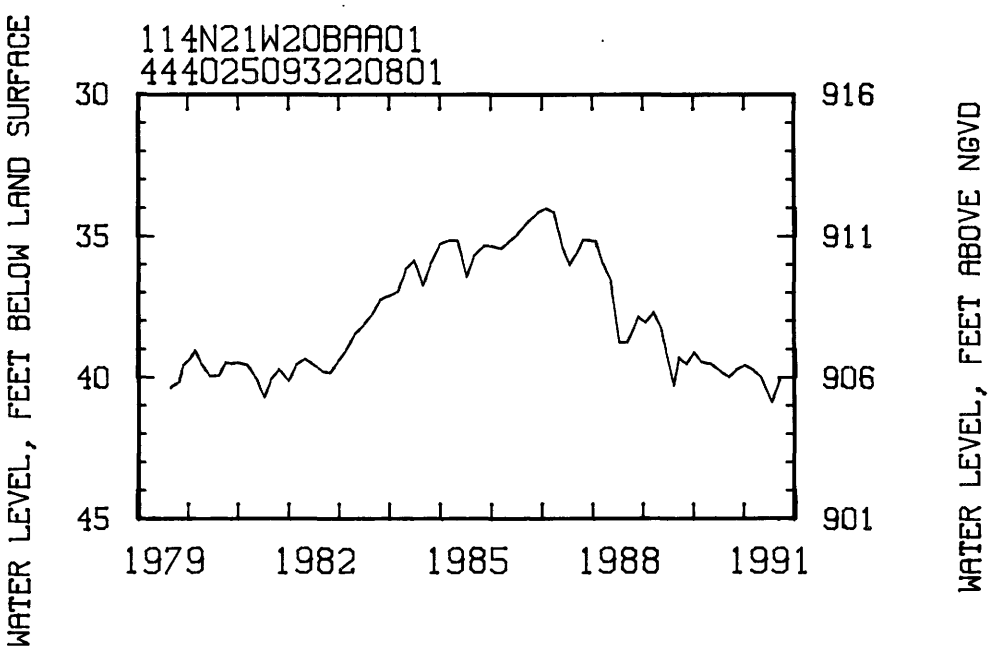
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 20	135.27	Jan 15	135.22	May 10	135.20	Sep 18	135.05

444025093220801. Local number, 114N21W20BAA01.
LOCATION.--Lat 44°40'25", long 93°22'08", in NE¼NE¼NW¼ sec.20, T.114 N., R.21 W., Hydrologic Unit 07020012, 0.5 mi east of Credit River.
Owner: Credit River Town Hall.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in., depth 98 ft, screened 93 to 98 ft.
DATUM.--Altitude of land-surface datum is 946 ft. Measuring point: Top of casing, 1.10 ft above land-surface datum.
PERIOD OF RECORD.--September 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 34.00 ft below land-surface datum, Feb. 3, 1987; lowest, 40.88 ft below land-surface datum, July 26, 1991.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 09	39.72	Mar 12	39.74	Jul 26	40.88
Jan 15	39.54	May 09	40.00	Sep 18	40.09



443752093254401. Local number, 114N22W35DCC01.
LOCATION.--Lat 44°37'52", long 93°25'44", in SW¼SW¼SE¼ sec.35, T.114 N., R.22 W., Hydrologic Unit 07020012, southwest of Credit River.
Owner: St. Catherine's Church.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in., depth 235 ft, cased to 194 ft.
DATUM.--Altitude of land-surface datum is 1,015 ft. Measuring point: Top of casing, 1.20 ft above land-surface datum.
PERIOD OF RECORD.--September 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 83.27 ft below land-surface datum, Dec. 4, 1986; lowest, 90.30 ft below land-surface datum, Sept. 6, 1979.

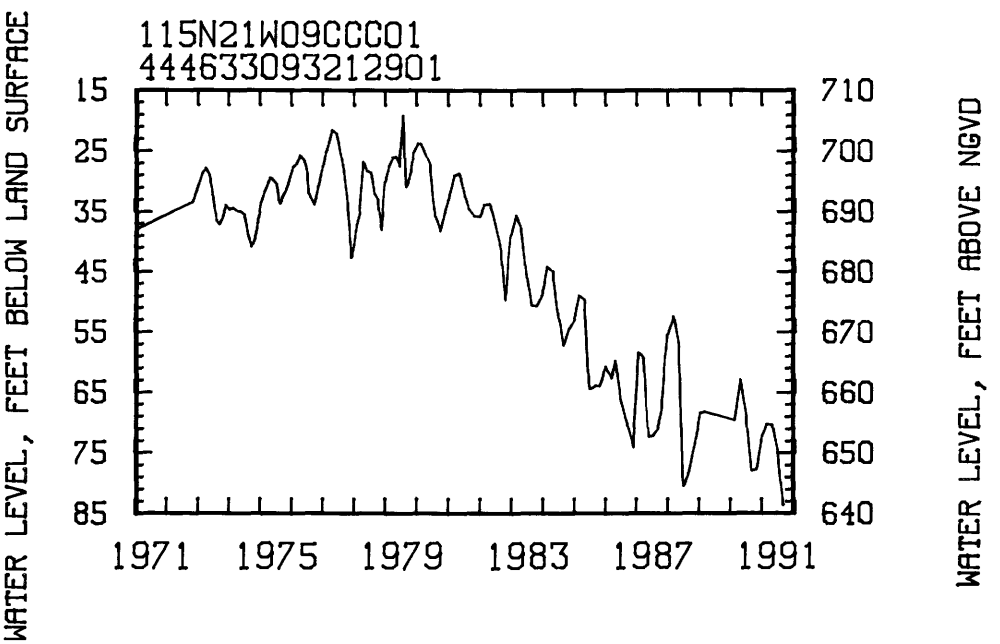
WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 09	87.85	May 09	88.17	Sep 18	87.83
Mar 12	88.10	Jul 26	87.96		

445633093212901. Local number, 115N21W09CCC01.
LOCATION.--Lat 44°46'33", long 93°21'29", in SW¼SW¼SW¼ sec.9, T.115 N., R.21 W., Hydrologic Unit 07020012, at Savage waste treatment plant.
Owner: City of Savage, well 2.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age and Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled public-supply artesian well, depth 846 ft, 16 in. casing 0 ft to 280 ft, 10 in. casing 250 ft to 660 ft.
DATUM.--Land-surface datum is 730 ft. Measuring point: Edge of vent pipe 0.75 ft above land-surface datum.
PERIOD OF RECORD.--February 1971 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 18.98 ft below land-surface datum, Aug. 9, 1979; lowest, 83.57 ft below land-surface datum, Sept. 19, 1991.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 13	77.55	Mar 06	70.21	Jul 17	75.11
Jan 08	72.20	May 10	70.19	Sep 19	83.57



444427093353901. Local number, 115N23W28BDD01.
LOCATION.--Lat 44°44'27", long 93°43'53", in SE¼SE¼NW¼ sec.28, T.115 N., R.23 W., Hydrologic Unit 07020012, Merriam Junction.
Owner: Chicago and Northwestern Transportation Company.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 16 in., depth 140 ft, cased to 75 ft.
DATUM.--Altitude of land-surface datum is 758 ft. Measuring point: Top of casing, 0.90 ft above land-surface datum.
PERIOD OF RECORD.--November 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 25.75 ft below land-surface datum, Mar. 8, 1985; lowest, 43.20 ft below land-surface datum, Feb. 28, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 13	41.43	Mar 06	42.39	Jul 17	40.50
Jan 08	41.50	May 10	41.92	Sep 13	40.25

444427093353902. Local number, 115N23W28BDD02.
LOCATION.--Lat 44°44'27", long 93°35'39", in SE¼SE¼NW¼ sec.28, T.115 N., R.23 W., Hydrologic Unit 07020012, Merriam Junction.
Owner: Chicago and Northwestern Transportation Company.
AQUIFER.--Ironton-Galesville Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in., depth 355 ft, screened 350 to 355 ft.
DATUM.--Altitude of land-surface datum is 758 ft. Measuring point: Top of casing, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--November 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 20.52 ft below land-surface datum, Mar. 21, 1986; lowest, 45.28 ft below land-surface datum, July 29, 1991.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATAUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 05	34.12	Dec 05	25.85	Feb 05	23.53	Apr 05	32.23	Jul 20	39.87
10	34.37	10	25.06	10	23.49	10	29.90	25	39.97
15	31.96	15	24.71	15	23.42	15	27.57	Sep 20	32.52
20	29.84	20	24.40	20	23.16	20	30.01	25	32.31
25	33.48	25	24.23	25	23.42	25	31.70	30	32.00
31	34.23	31	24.03	28	23.15	30	30.86		
Nov 15	33.53	Jan 05	23.92	Mar 05	22.85	May 05	29.04		
20	30.76	10	23.94	10	23.27	10	30.87		
25	27.44	15	23.62	15	23.26	15	31.00		
30	28.25	20	23.72	20	22.98	20	29.25		
		25	23.77	25	22.92	25	28.57		
		31	23.62	31	33.90	31	29.81		

444427093353903. Local number, 115N23W28BDD03.
LOCATION.--Lat 44°44'27", long 93°35'39", in SE¼SE¼NW¼ sec.28, T.115 N., R.23 W., Hydrologic Unit 07020012, Merriam Junction.
Owner: Chicago and Northwestern Transportation Company.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in., depth 525 ft, screened 520 to 525 ft.
DATUM.--Altitude of land-surface datum is 758 ft. Measuring point: Top of casing, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--November 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 33.85 ft below land-surface datum, Mar. 8, 1985; lowest, 55.12 ft below land-surface datum, Aug. 1, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATAUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

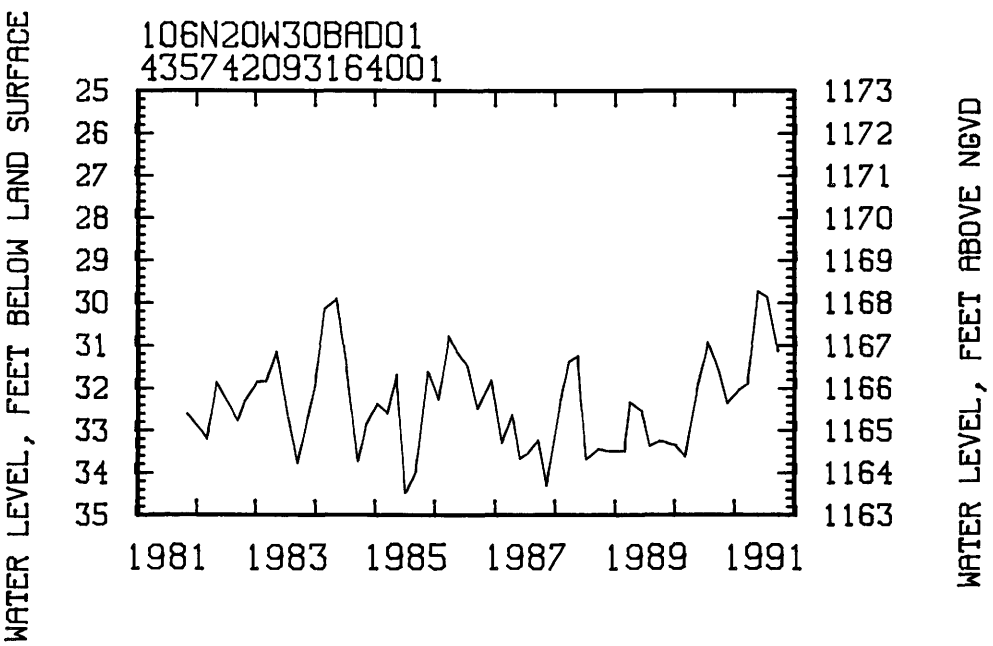
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 05	48.66	Dec 05	46.63	Feb 05	45.61	Apr 05	45.16	Jun 05	44.92
10	48.71	10	46.26	10	45.35	10	45.75	10	44.69
15	48.31	15	46.03	15	45.12	15	45.23	15	45.50
20	47.79	20	46.05	20	45.00	20	45.06	20	46.01
25	47.94	25	46.30	25	45.20	25	44.73	25	46.18
31	47.63	31	46.12	28	44.65	30	44.20	30	46.97
Nov 15	47.16	Jan 05	46.11	Mar 05	44.57	May 05	44.21	Jul 05	48.24
20	47.06	10	46.16	10	44.86	10	43.89	10	48.87
25	46.91	15	45.57	15	44.52	15	43.79	15	49.12
30	46.80	20	45.32	20	44.39	20	44.40	20	49.56
		25	45.26	25	44.34	25	44.38	Sep 15	52.26
		31	45.39	31	44.84	31	44.46	20	52.65
								25	52.17
								30	51.79

STEELE COUNTY

435742093164001. Local number, 106N20W30BAD01.
LOCATION.--Lat 43°57'42", long 93°16'40", in SE¼NE¼NW¼ sec.30, T.106 N., R.20 W., Hydrologic Unit 07040002, at Hope.
Owner: Hope Elevator.
AQUIFER.--Galena Formation of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled commerical artesian well, diameter 5 in., depth 215 ft, cased to 108 ft.
DATUM.--Altitude of land-surface datum is 1,198 ft. Measuring point: Top of casing, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--November 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.72 ft below land-surface datum, May 28, 1991; lowest, 34.48 ft below land-surface datum, July 10, 1985.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 19	32.36	Mar 25	31.87	Jul 23	29.88
Jan 30	32.02	May 28	29.72	Sep 24	31.12



435611093163001. Local number 106N20W31DCC01.
LOCATION.--Lat 43°56'11", long 93°16'30", in SW¼SW¼SE¼ sec.31, T.106 N., R.20 W., Hydrologic Unit 07040002, 1.75 mi south of city of Hope.
Owner: Owatonna Gun Club.
AQUIFER.--Galena formation of Middle Ordovician age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in., depth 168 ft, cased to 97 ft.
DATUM.--Altitude of land-surface datum is 1,180 ft. Measuring point: Top of casing, 1.40 ft above land-surface datum.
PERIOD OF RECORD.--November 1989 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 0.66 ft below land-surface datum, May 10, 1984; lowest, 4.97 ft below land-surface datum, Jan. 9, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATAUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 19	3.76	May 25	3.53	Jul 23	1.64
Jan 30	3.92	28	1.63	Sep 24	2.87

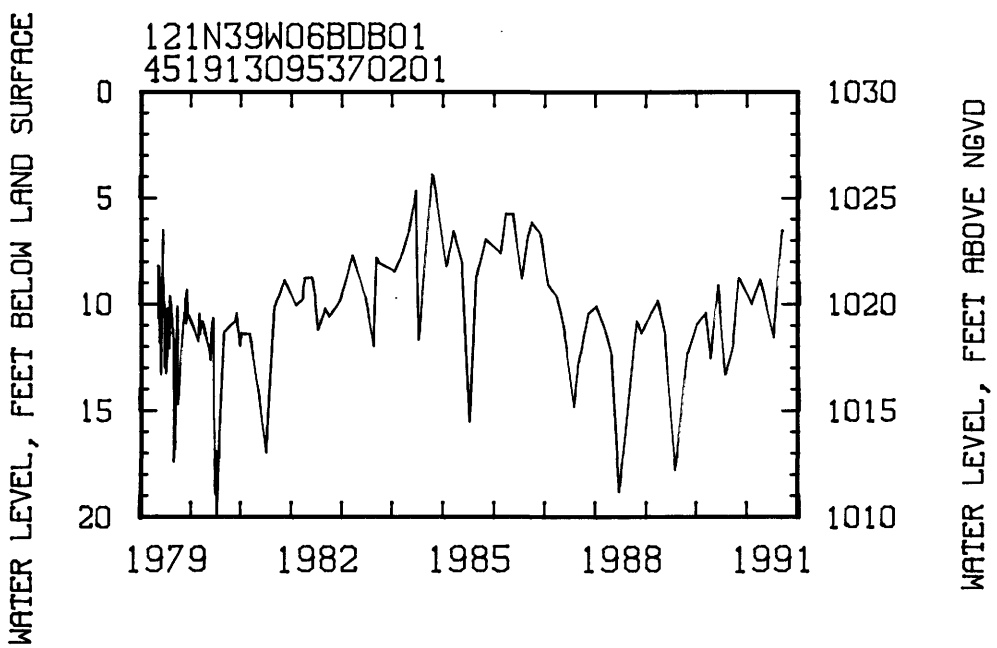
GROUND-WATER LEVELS

SWIFT COUNTY

451913095370201. Local number, 121N39W06BDB01.
LOCATION.--Lat 45°19'13", long 95°37'02", in NW¼SE¼NW¼ sec.6, T.121 N., R.39 W., Hydrologic Unit 07020005, in Ambush Park.
Owner: City of Benson.
AQUIFER.--Buried sand of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 3 in., depth 143 ft, screened 123 to 143 ft.
DATUM.--Altitude of land-surface datum is 1,030 ft. Measuring point: Top of casing 3.00 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--May 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.85 ft below land-surface datum, Oct. 25, 1984; lowest, 19.90 ft below land-surface datum, July 24, 1980.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 08	8.72	Apr 11	8.81	Sep 18	6.52
Feb 08	9.99	Jul 17	11.59		



WABASHA COUNTY

442708092155401. Local number, 111N12W04BBD01.
LOCATION.--Lat 44°27'08", long 92°15'54", in SE¼NW¼NW¼ sec.04, T.111 N., R.12 W., Hydrologic Unit 07040001, at Lake City.
Owner: City of Lake City, well 3.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 16 in., depth 430 ft, cased to 258 ft.
DATUM.--Altitude of land-surface datum is 685 ft. Measuring point: Top of casing, 1.00 ft above land-surface datum.
REMARKS.--Measured weekly by David Finley.
PERIOD OF RECORD.--August 1974 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 3.63 ft below land-surface datum, May 5, 1975; lowest, 11.50 ft below land-surface datum, Jan. 31, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 01	10.84	Dec 03	10.93	Feb 04	11.06	Apr 01	7.59	Jun 03	6.45	Aug 05	9.35
09	10.86	10	11.08	11	11.13	08	8.20	10	6.47	09	10.28
15	10.98	17	10.82	19	11.03	15	8.16	17	6.80	12	9.54
22	10.37	24	10.97	25	11.22	22	7.38	24	7.16	19	9.60
29	10.16	31	10.91	Mar 04	11.03	29	7.76	Jul 08	7.52	26	9.92
Nov 05	10.46	Jan 07	10.99	11	10.89	May 06	7.72	15	8.02	Sep 02	10.62
12	10.91	14	10.77	18	10.76	13	6.04	22	8.07	16	8.72
19	10.80	22	10.91	25	9.72	20	6.47	29	8.85	23	8.45
26	10.80	28	11.02			27	7.46			30	9.21

WADENA COUNTY

462415095003001. Local number, 134N34W19ADD01.
LOCATION.--Lat 46°24'21", long 95°00'36", in SE¼SE¼NE¼ sec.19, T.134 N., R.34 W., Hydrologic Unit 07010107, 0.05 mi north of Verndale.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in., depth 37 ft, screened 34 to 37 ft.
DATUM.--Altitude of land-surface datum is 1,342 ft. Measuring point: Top of casing, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--September 1966 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 9.18 ft below land-surface datum, May 23, 1986; lowest, 15.33 ft below land-surface datum, Mar. 10-11, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Jan 31	14.58	Apr 16	14.46	Jun 17	13.39	Aug 20	13.59
Mar 16	14.76	May 17	13.67	Jul 16	13.15	Sep 16	13.80

WASHINGTON COUNTY

445125092464001. Local number, 027N20W02BCC01.
LOCATION.--Lat 44°51'25", long 92°46'40", in SW¼SW¼NW¼ sec.2, T.27 N., R.20 W., Hydrologic Unit 07030005, in Afton State Park by Afton Alps.
Owner: U.S. Geological Survey.
AQUIFER.--St. Lawrence Formation and Franconian Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 6 in., depth 285 ft, cased to 105 ft.
DATUM.--Altitude of land-surface datum is 695 ft. Measuring point: Center of pressure guage, 3.80 ft above land-surface datum.
PERIOD OF RECORD.--March 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 33.94 ft above land-surface datum, May 2, 1980; lowest, 19.67 ft above land-surface datum, Jan.8, 1985.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Jun 19	+26.64	Jul 18	+25.26	Sep 11	+25.26

445125092464002. Local number, 027N20W02BCC02.
LOCATION.--Lat 44°51'25", long 92°46'40", in SW¼SW¼NW¼ sec.2, T.27 N., R.20 W., Hydrologic Unit 07030005, in Afton State Park by Afton Alps.
Owner: U.S. Geological Survey.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 4 in., depth 385 ft, cased to 365 ft.
DATUM.--Altitude of land-surface datum is 695 ft. Measuring point: Center of pressure guage, 3.80 ft above land-surface datum.
PERIOD OF RECORD.--March 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 42.35 ft above land-surface datum, May 2, 1980; lowest, 23.81 ft above land-surface datum, Jan. 8, 1985.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Jun 19	+32.00	Jul 18	+30.62	Sep 11	+30.62

445125092464003. Local number, 027N20W02BCC03.
LOCATION.--Lat 44°51'25", long 92°46'40", in SW¼SW¼NW¼ sec.2, T.27 N., R.20 W., Hydrologic Unit 07030005, in Afton State Park by Afton Alps.
Owner: U.S. Geological Survey.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled observation artesian well, diameter 1¼ in., depth 535 ft, screened 530 to 535 ft.
DATUM.--Altitude of land-surface datum is 695 ft. Measuring point: Center of pressure guage, 3.40 ft above land-surface datum.
PERIOD OF RECORD.--March 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 22.05 ft above land-surface datum, May 2, 1980; lowest, 3.40 ft above land-surface datum, Nov. 14, 1989.

WATER LEVEL, IN FEET ABOVE LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Jun 19	+6.10	Jul 19	+6.04	Sep 12	+5.26

444751092563101. Local number, 027N21W28BCC01.
LOCATION.--Lat 44°47'51", 92°56'31", in SW¼SW¼NW¼ sec.28, T.27 N., R.21 W., Hydrologic Unit 07010206, 0.1 mi east of Ideal Avenue South.
Owner: Eugene Smallidge.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation water-table well, diameter 16 in., depth 345 ft, cased to 60 ft.
DATUM.--Altitude of land-surface datum is 807 ft. Measuring point: Hole in pump base, 2.10 ft above land-surface datum.
PERIOD OF RECORD.--August 1977, January 1978, December 1979 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 60.32 ft below land-surface datum, Oct. 28, 1986; lowest, 81.87 ft below land-surface datum, Aug. 3, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

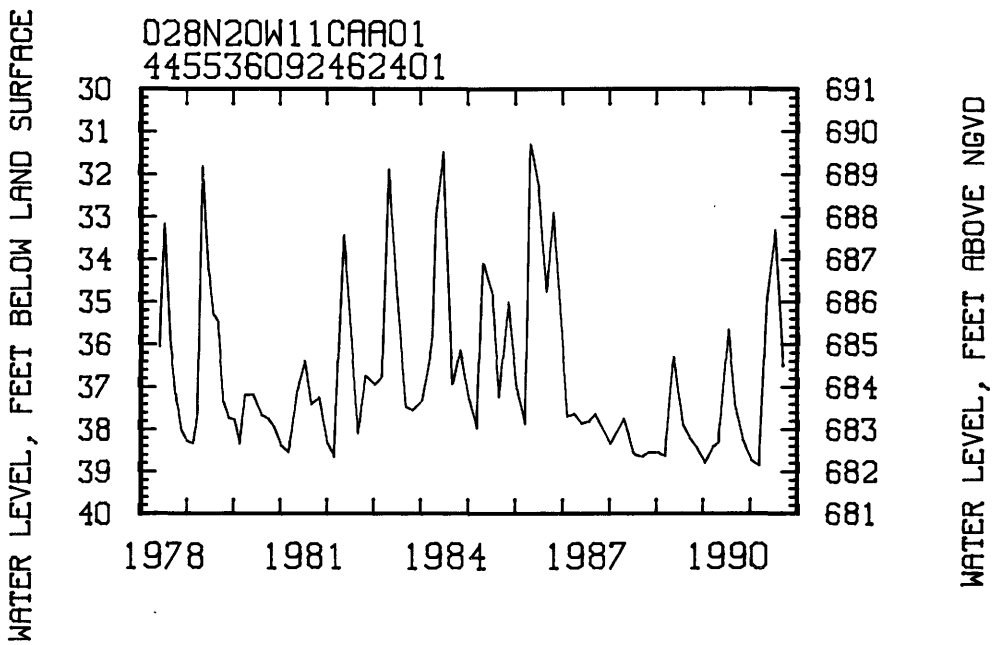
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 07	67.53	May 09	70.99	Sep 18	72.96
Mar 25	70.53	Jul 26	71.43		

WASHINGTON COUNTY--Continued

445536092462401. Local number, 028N20W11CAA01.
LOCATION.--Lat 44°55'36", long 92°46'24", in NE¼NE¼SW¼ sec.11, T.28 N., R.20 W., Hydrologic Unit 07030005, at Lake St. Croix Beach.
Owner: Lower St. Croix Valley Fire Department.
AQUIFER.--Franconian Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled domestic water-table well, diameter 4 in., depth 94 ft, cased to 78 ft.
DATUM.--Altitude of land-surface datum is 720 ft. Measuring point: Top of electrical housing, 1.70 ft above land-surface datum.
PERIOD OF RECORD.--June 1978 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 31.27 ft, 5 below land-surface datum, May 1, 1986; lowest, 38.86 ft below land-surface datum, Mar. 11, 1991.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 06	38.24	Mar 11	38.86	Jul 16	33.29
Jan 11	38.73	May 13	34.96	Sep 17	36.50



450134092583101. Local number, 029N21W06CAD01.
LOCATION.--Lat 45°01'34", long 92°58'31", in SE¼NE¼SW¼ sec.6, T.29 N., R.21 W., Hydrologic Unit 07010206, at 6488 North Highway 36 Boulevard.
Owner: Twenty Nine Pines Trailer Park.
AQUIFER.--St. Peter Sandstone of Middle Ordovician Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in., depth 210 ft, cased to 141 ft.
DATUM.--Altitude of land-surface datum is 980 ft. Measuring point: Hole in pump base, 2.20 ft above land-surface datum.
PERIOD OF RECORD.--April 1974 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 71.07 ft below land-surface datum, Feb. 6, 1987; lowest, 78.40 ft below land-surface datum, Sep. 12, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 06	78.36	Mar 04	77.47	Jul 16	78.33
Jan 11	78.12	May 13	77.67	Sep 17	78.12

450027092552101. Local number, 029N21W10CCC01.
LOCATION.--Lat 45°00'27", long 95°55'21", in SW¼SW¼SW¼ sec.10, T.29 N., R.21 W., Hydrologic Unit 07010206, Lake Jane Road, 0.7 mi (1.1 km) north of Highway 212.
Owner: City of Lake Elmo.
AQUIFER.--Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 6 in., depth 348 ft, cased to 280 ft.
DATUM.--Altitude of land-surface datum is 935 ft. Measuring point: Top of well cap, 1.20 ft above land-surface datum.
PERIOD OF RECORD.--September 1977, February 1978, February 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 31.92 ft below land-surface datum, Oct. 28, 1986; lowest, 45.65 ft below land-surface datum, Sept. 28, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 06	44.28	Mar 04	44.77	Jul 16	44.43
Jan 11	44.50	May 13	44.82	Sep 17	44.15

450858092575001. Local number, 031N21W28ABD01.
LOCATION.--Lat 45°08'58", long 92°57'50", in SE¼NW¼NE¼ sec.28, T.31 N., R.21 W., Hydrologic Unit 07010206, County Road 8A, 1.65 mi east of Highway 61.
Owner: White Bear Gun Club.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age.
WELL CHARACTERISTICS.--Drilled domestic artesian well, diameter 4 in., depth 142 ft, cased to 94 ft.
DATUM.--Altitude of land-surface datum is 939 ft. Measuring point: Top of well cap, 1.30 ft above land-surface datum.
PERIOD OF RECORD.--September 1977, February 1978, February 1980 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 7.57 ft below land-surface datum, Oct. 28, 1986; lowest, 14.17 ft below land-surface datum, Mar. 13, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec 04	13.18	Mar 11	13.47	Jul 22	11.59
Jan 16	13.32	May 16	12.07	Sep 17	10.66

451355092532601. Local number, 032N20W30BCD01.
LOCATION.--Lat 45°13'55", long 92°53'26", in SE¼SW¼NW¼ sec.30, T.32 N., R.20 W., Hydrologic Unit 07030005, 0.25 mi north of 192nd Street.
Owner: Arno Birr.
AQUIFER.--Prairie du Chien Group of Early Ordovician Age and Jordan Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in., depth 260 ft, cased to 141 ft.
DATUM.--Altitude of land-surface datum is 990 ft. Measuring point: Vent pipe, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--March 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 51.56 ft below land-surface datum, Oct. 28, 1986; lowest, 58.53 ft below land-surface datum, Sept. 15, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

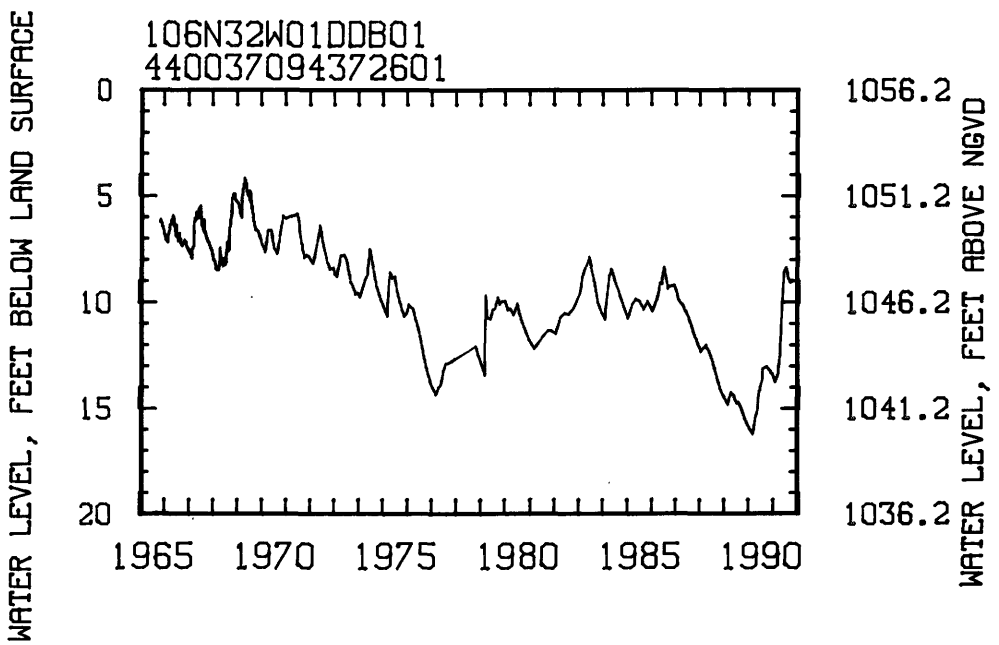
DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Dec 04	57.30	May 16	56.84	Jul 22	56.24	Sep 17	55.93

WATONWAN COUNTY

440037094372601. Local number, 106N32W01DDB01.
LOCATION.--Lat 44°00'37", long 94°37'26", in NW¼SE¼SE¼ sec.1, T.106 N., R.32 W., Hydrologic Unit 07020010, north of St. James.
Owner: U.S. Geological Survey.
AQUIFER.--Surficial outwash sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Bored observation water-table well, diameter 2 in., depth 22 ft, screened 19 to 22 ft.
DATUM.--Altitude of land-surface datum is 1,056.2 ft National Geodetic Vertical Datum of 1929. Measuring point: Top of casing, 4.80 ft above land-surface datum.
PERIOD OF RECORD.--November 1965 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.11 ft below land-surface datum, Apr. 27, 1969; lowest, 16.22 ft below land-surface datum, Mar. 7, 1990.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 24	13.14	Jan 29	13.76	Apr 16	12.52	Jul 09	8.34
Nov 20	13.23	Feb 22	13.50	May 29	9.90	24	6.43
28	13.32	Mar 20	13.28	Jun 26	8.48	Aug 19	8.86
Dec 19	13.35	26	13.14			Sep 25	9.05



440409094304901. Local number, 107N31W14DAC01.
LOCATION.--Lat 44°04'09", long 94°30'49", in SW¼NE¼SE¼ sec.14, T.107 N., R.31 W., Hydrologic Unit 07020010, 2.75 mi east of LaSalle.
Owner: William Lassas.
AQUIFER.--Sandstone of Cretaceous Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 12 in., depth 150 ft, screened 100 to 135 ft.
DATUM.--Altitude of land-surface datum is 1,008 ft. Measuring point: Vent pipe, 1.80 ft above land-surface datum.
PERIOD OF RECORD.--September 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 10.44 ft below land-surface datum, May 9, 1983; lowest, 16.29 ft below land-surface datum, July 12, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 20	13.56	May 29	11.02	Sep 25	11.88
Mar 26	13.07	Jul 24	11.71		

GROUND-WATER LEVELS

WATONWAN COUNTY--Continued

440133094312501. Local number, 107N31W35CAC01.
LOCATION.--Lat 44°01'33", long 94°31'25", in SW¼NE¼SW¼ sec.35, T.107 N., R.31 W., Hydrologic Unit 07020010, northeast of St. James.
Owner: Al Guyer.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled irrigation artesian well, diameter 10 in., depth 350 ft, screened 310 to 350 ft.
DATUM.--Altitude of land-surface datum is 1,055 ft. Measuring point: Vent pipe, 1.00 ft above land-surface datum.
PERIOD OF RECORD.--September 1981 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 29.83 ft below land-surface datum, May 9, 1983; lowest, 41.64 ft below land-surface datum, July 12, 1988.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 20	33.93	May 29	31.93	Sep 25	32.12
Mar 26	33.72	Jul 24	31.95		

WINONA COUNTY

435746092034202. Local number, 106N10W19DDA02.
LOCATION.--Lat 43°57'46", long 92°03'42", in NE¼SE¼SE¼ sec. 19, T.106N., R.10W., Hydrologic Unit 07040003, at St. Charles.
Owner: City of St. Charles, Well 5.
AQUIFER.--Ironton-Galesville Sandstones of Late Cambrian Age.
WELL CHARACTERISTICS.--Drilled public supply artesian well, diameter 12 in., depth 702 ft, cased to 645 ft.
DATUM.--Altitude of land-surface datum is 1,160 ft; Measuring point: Edge of vent pipe, 1.00 ft above land-surface datum.
REMARKS.--Water level affected by pumping.
PERIOD OF RECORD.--May 1984 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 218.80 ft below land-surface datum, Aug. 26, 1987; lowest, 269.10 ft below land-surface datum, Oct. 28, 1988.

WATER LEVEL, IN FEET BELOW LAND SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 02	241.40	Dec 04	240.60	Feb 05	242.53	Apr 03	244.80	Jun 05	247.88	Aug 06	240.52
15	238.88	11	241.70	14	257.80	10	244.10	12	250.06	13	237.06
22	234.52	18	240.60	21	248.42	17	245.50	19	249.80	20	240.00
31	237.22	26	239.20	28	244.05	24	243.30	25	250.30	26	234.90
Nov 06	236.90	Jan 02	239.52	Mar 07	243.30	May 09	243.80	Jul 15	268.14	Sep 10	234.12
20	236.35	10	239.86	13	241.55	16	243.10	22	249.82	17	235.17
27	242.88	17	239.90	20	244.80			31	254.62	24	235.40
		24	243.30	27	244.20						
		31	240.82								

WRIGHT COUNTY

450403093544501. Local number, 119N26W35DDA01.
LOCATION.--Lat 45°04'03", long 93°54'45", in NE¼SE¼SE¼ sec.35, T.119 N., R.26 W., Hydrologic Unit 07010204, at Montrose.
Owner: City of Montrose, well 1.
AQUIFER.--Mount Simon Sandstone of Late Cambrian Age and Hinckley Sandstone of Late Precambrian Age.
WELL CHARACTERISTICS.--Drilled unused artesian well, diameter 10 in., depth 693 ft, cased to 526 ft.
DATUM.--Altitude of land-surface datum is 1,000 ft. Measuring point: Edge of breather pipe, 1.50 ft above land-surface datum.
PERIOD OF RECORD.--September 1976 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 73.54 ft below land-surface datum, Sept. 28, 1981; lowest, 78.38 ft below land-surface datum, Nov. 3, 1977.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Nov 16	77.80	Mar 13	77.70	Jul 25	77.03
Jan 17	77.71	May 14	77.21	Sep 23	76.69

444219096165501. Local number, 114N45W04DCD01.
LOCATION.--Lat 44°42'19", long 96°16'55", in SE¼SW¼SE¼ sec.4, T.114 N., R.45 W., Hydrologic Unit 07020003, at Canby City Park.
Owner: City of Canby, well 6.
AQUIFER.--Surficial sand and gravel of Pleistocene Age.
WELL CHARACTERISTICS.--Drilled unused water-table well, diameter 12 in., depth 62 ft, screened 44 to 68 ft.
DATUM.--Altitude of land-surface datum is 1,255 ft. Measuring point: Top of casing, 2.90 ft above land-surface datum.
PERIOD OF RECORD.--January 1964 to current year.
EXTREMES FOR PERIOD OF RECORD.--Highest water level, 4.67 ft below land-surface datum, June 5, 1965; lowest, 11.32 ft below land-surface datum, Oct. 7, 1976.

WATER LEVEL, IN FEET BELOW LAND-SURFACE DATUM, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
Oct 23	8.52	Apr 04	7.20	Jul 12	7.80
Feb 21	8.46	Jun 06	4.87		

Quality of Ground Water

May, 1967

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

BLUE EARTH COUNTY

STATION NUMBER	LOCAL IDENTIFIER	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)
440907093514401	108N-25W-20 BBAAAD	03-25-91	1550	--	117
		07-22-91	1535	55.00	117

STATION NUMBER	PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MIN) (72004)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
440907093514401	--	--	--	--	--	<0.01	0.06	1.2	<0.01
	26	695	7.3	14.0	0.0	<0.01	<0.05	0.99	<0.01

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DAKOTA COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MIN) (72004)
443422093064701	113N19W21CCDCAC UN207502 S	367PRDC	08-01-91	1100	--	90	21
443422093064901	113N19W21CCCDAD 207503 OIS	367PRDC	08-01-91	1200	--	90	36
443449093060401	113N19W21ADCCCA 207699 BON	371JRDN	08-01-91	1400	--	420	24
443511092594201	113N18W20AAAAAB 426961 COO	371JRDN	08-09-91	1100	--	350	21
443528092590701	113N18W16CADDBA 179135 IST	367PRDC	08-09-91	1215	--	240	24
443603093020301	113N18W18BBBBCD 104113 POM	367PRDC	08-02-91	1530	--	190	24
443607092565601	113N18W11CCD1 PEINE WELL		05-02-91	1045	--	--	--
443748093035901	113N19W02BAAABB UN418684 B	371JRDN	08-02-91	1230	--	300	14
443748093085001	113N19W6BAA1 DAKOTA CO.		05-22-91	1020	--	--	--
443848093381501	114N-19W-30 DDDABC		03-08-91	1200	--	60	--
			07-16-91	1630	9.00	60	25
443856092572101	114N18W27DAD1 STEVEN REC		05-02-91	1130	--	--	--
443909093020401	114N18W30BCCCCB 196606 PIL	371JRDN	08-05-91	1400	--	257	25
443915093081102	114N019W - SHALLOW WELL AT	112PLSC	02-05-91	1445	--	9.7	--
		112PLSC	04-08-91	1330	--	9.7	--
		112PLSC	05-15-91	1110	--	9.7	--
443915093081103	114N019W - DEEP WELL AT F	112PLSC	02-05-91	1515	--	21	--
		112PLSC	04-08-91	1240	--	21	--
		112PLSC	05-16-91	1000	--	21	--
443924093010001	114N18W30AADBCB 101038 HAR	367PRDC	08-09-91	--	--	128	24
443926093010001	114N18W30AADBAA UN216439 G	367PRDC	08-02-91	1145	--	137	24
443927093010101	114N18W30AAACCC 236603 KAH	367PRDC	08-09-91	1345	--	147	24
443930093004801	114N18W29BBBADD 194283 NAP	371JRDN	08-14-91	1200	--	234	35
443932093031601	114N19W25BBBBBD 198342 HAW	367PRDC	08-05-91	1315	--	110	19
443933092533501	114N17W20CCCCBD UN435233 P	371JRDN	08-07-91	1230	--	340	21
443933093002802	114N018W - SITE 3 SHALLOW	112PLSC	02-05-91	1045	--	21	--
		112PLSC	04-11-91	0950	--	21	--
		112PLSC	05-17-91	1100	--	21	--
443933093002803	114N018W - SITE 3 DEEP WEL	112PLSC	02-05-91	1105	--	52	--
		112PLSC	04-11-91	1040	--	52	--
		112PLSC	05-17-91	1150	--	52	--
443936092533701	114N17W20CCCBCC 240142 BAU	367PRDC	08-07-91	1345	--	125	26
443939092533801	114N17W19DDADDD UN207656 B	367PRDC	08-05-91	1230	--	125	28
444000093031702	114N019W - SITE 2 SHALLOW	112PLSC	02-05-91	1250	--	10	--
		112PLSC	04-10-91	1030	--	10	--
		112PLSC	05-15-91	1215	--	10	--
444000093031703	114N019W - SITE 2 DEEP WEL	112PLSC	02-05-91	1320	--	42.4	--
		112PLSC	04-10-91	1130	--	42.4	--
		112PLSC	05-16-91	1150	--	42.4	--
444024092501901	114N17W15DCD1 PAUL MAHER		05-01-91	1410	--	--	--
444025092501201	114N17W15DDCDCB UN170898 M	110QRNR	07-30-91	1430	--	174	21
444026092511701	114N17W16DDDCDC 145881 LAT	371JRDN	07-30-91	1100	--	185	44
444038092511401	114N17W14DADDAB 104125 MOL	371JRDN	08-14-91	1000	--	318	21
444049093020402	114N018W - SITE 4 SHALLOW	112PLSC	02-07-91	1130	--	11	--
		112PLSC	04-10-91	1245	--	11	--
		112PLSC	05-15-91	1325	--	11	--
444049093020403	114N018W - SITE 4 DEEP WE	112PLSC	02-07-91	1215	--	23.7	--
		112PLSC	04-10-91	1310	--	23.7	--
		112PLSC	05-16-91	1315	--	23.7	--
444056092522101	114N17W18BCC1 CHARLES BA		05-01-91	1310	--	--	--
444058092461901	114N16W17BCB1 PAT SAGER		05-01-91	1145	--	--	--
444109092581701	114N18W15BBDBBB 121076 LAR	371JRDN	08-14-91	1315	--	235	14
444147092491601	114N-17W-11 ACCACB		03-11-91	1135	--	160	--
			07-16-91	1415	80.00	160	30
444147093182001	114N21W11ACC1 KROOK WELL		05-22-91	1355	--	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DAKOTA COUNTY--Continued

STATION NUMBER	SPE-CIFIC CON-DUCT-ANCE (US/CM) (00095)	SPE-CIFIC CON-DUCT-ANCE LAB (US/CM) (90095)	PH (STAND-ARD UNITS) (00400)	PH LAB (STAND-ARD UNITS) (00403)	OXID-ATION RED-UCTION POTEN-TIAL (MV) (00090)	TEMPER-ATURE WATER (DEG C) (00010)	OXYGEN, DIS-SOLVED (MG/L) (00300)	CALCIUM DIS-SOLVED (MG/L AS CA) (00915)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG) (00925)	SODIUM, DIS-SOLVED (MG/L AS NA) (00930)
443422093064701	436	551	7.5	7.7	0.2	14.5	6.6	71	24	4.8
443422093064901	408	505	7.6	8.1	0.1	14.0	6.5	68	24	4.1
443449093060401	209	298	7.6	8.0	-0.2	17.0	<0.1	59	21	2.8
443511092594201	420	428	7.9	8.0	0.1	12.0	7.0	50	21	4.5
443528092590701	433	449	7.8	8.0	0.1	11.5	1.7	55	22	4.1
443603093020301	484	545	7.4	7.6	0	10.5	0.1	66	36	2.3
443607092565601	311	316	7.8	7.8	--	10.5	--	47	12	4.0
443748093035901	520	542	7.5	7.8	-0.1	11.0	<0.1	76	26	5.3
443748093085001	501	512	7.3	7.4	--	10.0	--	76	20	3.4
443848093381501	--	--	--	--	--	--	--	--	--	--
	690	--	6.9	--	--	16.0	3.2	--	--	--
443856092572101	483	496	7.7	7.8	--	10.0	--	65	21	4.4
443909093020401	498	--	7.4	7.6	-0.1	11.0	<0.1	73	24	4.2
443915093081102	793	792	7.4	7.5	--	8.0	--	82	23	56
	875	905	7.2	7.4	--	6.5	--	99	29	53
	787	823	7.1	7.5	--	9.0	--	91	26	40
443915093081103	601	605	7.5	7.6	--	9.5	0	79	31	4.8
	575	592	7.4	7.6	--	9.0	0	78	30	4.7
	567	586	7.3	7.6	--	9.5	0.1	76	28	3.9
443924093010001	604	620	7.5	7.6	0.1	11.5	4.6	77	29	4.4
443926093010001	587	--	7.5	--	0.2	12.0	4.3	--	--	--
443927093010101	567	592	7.5	7.7	0.1	11.0	4.7	75	28	4.4
443930093004801	477	462	7.5	7.8	-0.1	11.5	<0.1	64	23	4.2
443932093031601	489	503	7.6	7.8	-0.1	10.5	<0.1	71	24	5.0
443933092533501	517	530	7.7	7.9	0.2	12.5	4.4	65	27	3.3
443933093002802	585	595	7.5	7.6	--	7.0	0	74	27	3.9
	568	593	7.4	7.6	--	5.5	<0.1	78	28	4.0
	543	586	7.3	7.7	--	6.5	0.3	75	29	4.2
443933093002803	504	514	7.7	7.7	--	9.0	0.3	68	24	4.6
	491	509	7.5	7.7	--	8.5	<0.1	69	24	4.6
	473	502	7.4	7.7	--	9.0	0.1	67	25	4.8
443936092533701	1400	1440	7.3	7.7	0.2	13.0	11.0	140	45	79
443939092533801	865	864	7.2	7.4	0.2	11.5	9.2	110	41	12
444000093031702	707	712	7.5	7.5	--	7.5	2.5	95	29	4.7
	705	733	7.2	7.5	--	6.0	0.8	100	32	5.2
	749	770	7.1	7.4	--	7.5	0.4	110	32	4.9
444000093031703	506	518	7.7	7.7	--	9.0	0	66	27	5.0
	490	515	7.6	7.7	--	8.5	0.6	68	26	5.0
	480	507	7.5	7.7	--	10.0	0.1	68	23	4.9
444024092501901	626	652	7.5	7.7	--	9.5	--	79	32	4.0
444025092501201	454	--	7.5	--	0.2	12.0	9.3	--	--	--
444026092511701	435	511	7.5	7.7	0.3	12.0	8.1	71	31	3.7
444038092511401	567	551	7.8	7.9	0.2	10.5	8.8	68	28	3.5
444049093020402	538	542	7.2	7.2	--	6.5	--	58	20	20
	617	648	7.0	7.2	--	7.0	--	66	23	28
	652	671	6.9	7.3	--	8.5	--	68	22	30
444049093020403	395	398	7.9	7.8	--	9.0	8.0	50	18	2.9
	367	386	7.7	7.9	--	9.0	--	49	18	3.0
	370	368	7.6	7.8	--	9.0	8.0	48	16	2.9
444056092522101	558	579	7.6	7.7	--	10.5	--	67	28	3.5
444058092461901	359	365	7.8	8.0	--	10.0	--	49	14	2.1
444109092581701	489	477	7.7	8.0	0.1	10.0	--	60	25	3.2
444147092491601	--	--	--	--	--	--	--	--	--	--
	373	--	7.5	--	--	16.0	7.6	--	--	--
444147093182001	570	597	7.5	7.7	--	11.0	--	75	31	5.7

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DAKOTA COUNTY--Continued

STATION NUMBER	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	CARBONATE WATER WH IT FIELD MG/L AS CO3 (00447)	ALKALINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)
443422093064701	1.0	246	--	204	202	197	33	19	0.2	15
443422093064901	1.0	222	--	183	182	195	32	14	0.2	14
443449093060401	0.9	232	--	191	190	120	44	0.9	0.2	12
443511092594201	2.5	184	--	152	151	155	23	13	0.1	11
443528092590701	0.9	165	--	135	135	142	61	15	0.2	11
443603093020301	1.3	322	--	268	264	264	36	0.6	0.2	11
443607092565601	0.5	--	--	--	--	153	18	2.4	0.2	15
443748093035901	1.5	346	7	283	284	249	26	1.1	0.2	13
443748093085001	2.3	--	--	--	--	247	11	18	0.1	15
443848093381501	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
443856092572101	0.7	--	--	--	--	165	24	14	0.1	16
443909093020401	1.4	310	--	255	254	--	21	0.1	0.2	13
443915093081102	5.6	--	--	--	--	291	70	45	0.2	18
	4.7	--	--	--	--	311	65	80	0.1	18
	3.9	--	--	--	--	294	67	63	0.2	18
443915093081103	1.7	--	--	--	--	265	58	12	0.2	26
	1.7	--	--	--	--	264	61	12	0.2	25
	1.4	--	--	--	--	265	53	10	0.1	24
443924093010001	1.1	285	--	235	234	241	27	15	0.2	14
443926093010001	--	--	--	--	--	--	--	12	--	--
443927093010101	1.1	292	--	239	239	241	28	13	0.1	14
443930093004801	1.3	278	--	225	228	209	17	0.9	0.1	13
443932093031601	1.4	327	--	272	268	264	15	1.4	0.2	21
443933092533501	0.9	235	--	196	193	201	24	11	<0.1	13
443933093002802	1.2	--	--	--	--	242	28	14	<0.1	14
	1.1	--	--	--	--	247	28	15	0.2	13
	1.2	--	--	--	--	241	23	17	0.2	13
443933093002803	1.4	--	--	--	--	269	22	3.0	0.1	20
	1.4	--	--	--	--	268	18	3.2	0.2	20
	1.4	--	--	--	--	268	17	0.4	0.2	18
443936092533701	16	376	--	308	308	316	34	160	0.1	18
443939092533801	2.6	303	--	250	248	257	37	50	0.1	15
444000093031702	1.0	--	--	--	--	213	33	14	<0.1	21
	0.9	--	--	--	--	231	85	17	0.1	20
	0.8	--	--	--	--	280	100	16	<0.1	20
444000093031703	2.0	--	--	--	--	281	16	3.0	0.1	25
	1.9	--	--	--	--	280	11	2.3	0.2	26
	1.6	--	--	--	--	280	9.7	1.9	0.2	24
444024092501901	0.7	--	--	--	--	230	29	19	0.1	17
444025092501201	--	--	--	--	--	--	--	16	--	--
444026092511701	0.9	252	--	203	206	210	23	13	0.1	15
444038092511401	1.2	242	--	198	198	191	57	14	0.1	11
444049093020402	3.0	--	--	--	--	183	24	24	<0.1	14
	3.2	--	--	--	--	190	24	67	0.1	14
	3.1	--	--	--	--	174	24	87	<0.1	13
444049093020403	0.9	--	--	--	--	167	24	4.9	0.1	17
	0.9	--	--	--	--	164	22	5.3	0.2	18
	0.7	--	--	--	--	160	19	3.8	0.1	17
444056092522101	0.8	--	--	--	--	199	22	20	0.2	14
444058092461901	0.7	--	--	--	--	132	14	8.9	0.1	17
444109092581701	3.7	270	--	221	221	227	11	6.0	0.2	14
444147092491601	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
444147093182001	1.9	--	--	--	--	307	14	14	0.2	24

DAKOTA COUNTY--Continued

STATION NUMBER	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)	IRON, DIS-SOLVED (UG/L AS FE) (01046)	MANGA-NESE, DIS-SOLVED (UG/L AS MN) (01056)	TRITIUM IN WATER MOLE-CULES (TU) (07012)
443422093064701	321	<0.01	8.5	<0.01	--	0.02	<0.01	10	<1	30.1
443422093064901	327	<0.01	7.2	<0.01	--	0.02	<0.01	10	<1	34.4
443449093060401	243	<0.01	<0.05	0.03	--	<0.01	<0.01	1700	23	1.9
443511092594201	255	<0.01	8.1	<0.01	--	<0.01	<0.01	7	3	53.4
443528092590701	298	<0.01	3.7	<0.01	--	<0.01	<0.01	11	<1	26.4
443603093020301	293	<0.01	0.12	0.01	--	<0.01	<0.01	120	18	9.9
443607092565601	--	0.01	0.05	0.10	<0.20	0.04	0.01	--	--	--
443748093035901	324	<0.01	<0.05	0.07	--	<0.01	<0.01	2700	63	--
443748093085001	--	<0.01	<0.05	0.05	0.40	0.02	0.02	--	--	--
443848093381501	--	<0.01	4.1	<0.01	--	--	0.02	--	--	--
	--	<0.01	4.4	<0.01	--	--	<0.01	--	--	--
443856092572101	--	<0.01	13	<0.01	0.40	0.03	0.02	--	--	--
443909093020401	280	<0.01	<0.05	0.08	--	0.01	<0.01	1300	52	<0.8
443915093081102	--	0.02	0.60	<0.01	0.30	<0.01	<0.01	--	--	--
	--	0.01	0.12	0.07	0.20	0.02	<0.01	--	--	--
	--	0.02	0.24	0.09	0.60	<0.01	<0.01	--	--	--
443915093081103	--	<0.01	<0.10	0.13	0.30	0.03	0.03	--	--	--
	--	<0.01	<0.05	0.14	0.40	0.02	0.01	--	--	--
	--	0.01	<0.05	0.14	0.30	0.02	0.02	--	--	--
443924093010001	346	<0.01	14	<0.01	--	0.01	<0.01	9	<1	18.4
443926093010001	--	--	2.0	--	--	--	--	--	--	--
443927093010101	327	<0.01	11	<0.01	--	0.01	0.01	3	<1	17.1
443930093004801	267	<0.01	<0.05	0.10	--	0.01	<0.01	1300	80	<0.8
443932093031601	309	<0.01	<0.05	0.18	--	0.01	<0.01	670	430	1.0
443933092533501	314	<0.01	10	<0.01	--	<0.01	<0.01	11	5	25.9
443933093002802	--	0.03	<7.8	<0.01	1.2	0.02	0.02	--	--	--
	--	0.02	7.3	<0.01	0.30	0.02	<0.01	--	--	--
	--	0.03	9.3	0.03	0.90	0.02	<0.01	--	--	--
443933093002803	--	<0.01	<0.10	0.07	0.90	0.03	0.02	--	--	--
	--	<0.01	<0.05	0.06	<0.20	0.01	<0.01	--	--	--
	--	<0.01	<0.05	0.09	0.50	<0.01	<0.01	--	--	--
443936092533701	908	<0.01	40	<0.01	--	0.60	0.57	11	<1	<30.7
443939092533801	496	<0.01	22	<0.01	--	<0.01	<0.01	35	<1	37.3
444000093031702	--	<0.01	25	<0.01	1.2	0.01	0.01	--	--	--
	--	<0.01	13	<0.01	0.50	0.02	<0.01	--	--	--
	--	0.01	5.5	0.02	0.40	0.02	<0.01	--	--	--
444000093031703	--	<0.01	<0.10	0.17	0.60	0.01	0.01	--	--	--
	--	<0.01	<0.05	0.16	<0.20	0.02	<0.01	--	--	--
	--	<0.01	<0.05	0.21	0.30	0.03	0.02	--	--	--
444024092501901	--	0.01	18.0	0.02	0.70	0.02	<0.01	--	--	--
444025092501201	--	--	18	--	--	--	--	--	--	--
444026092511701	324	<0.01	2.8	<0.01	--	<0.01	<0.01	5	<1	22.8
444038092511401	335	0.63	6.0	<0.01	--	<0.01	<0.01	7	73	17.5
444049093020402	--	0.35	11	<0.01	0.80	0.05	0.04	--	--	--
	--	0.18	4.2	<0.01	0.90	0.06	0.03	--	--	--
	--	0.22	5.1	0.03	0.70	0.04	0.04	--	--	--
444049093020403	--	<0.01	4.6	0.02	0.40	0.05	0.04	--	--	--
	--	<0.01	4.2	<0.01	0.30	0.04	0.02	--	--	--
	--	0.02	4.0	0.02	1.3	0.04	0.03	--	--	--
444056092522101	--	<0.01	16	0.01	0.60	0.01	<0.01	--	--	--
444058092461901	--	0.03	9.0	0.04	0.40	0.04	0.03	--	--	--
444109092581701	286	<0.01	5.2	0.01	--	0.02	0.01	14	<1	21.3
444147092491601	--	0.01	5.7	<0.01	--	--	0.01	--	--	--
	--	<0.01	5.4	0.01	--	--	<0.01	--	--	--
444147093182001	--	<0.01	0.27	0.13	<0.20	0.02	0.02	--	--	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DAKOTA COUNTY--Continued

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MIN) (72004)	SPECIFIC CONDUCTANCE (US/CM) (00095)
444156092490201	114N17W11AACCCC 425300 SCH	371JRDN	07-30-91	1330	330	21	362
444209092462101	114N16W6DDD1 MCNAMARA WE		05-01-91	1100	--	--	459
444230092571101	114N18W02CBBCCA 136495 RON	367PRDC	08-06-91	1315	234	51	496
444240092565701	114N18W02BCDAAC 170875 SIM	371JRDN	08-06-91	1200	320	18	504
444250093154901	114N20W06ABD1 UNITED CHU		05-22-91	1300	--	--	545
444252092465401	114N16W06ABCBBA UN194085 W	371JRDN	08-07-91	1100	240	21	400
444304093055401	115N19W33DDD1 U. OF M AG		05-22-91	1140	--	--	492

STATION NUMBER	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	OXIDATION REDUCTION POTENTIAL (MV) (00090)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)
444156092490201	433	7.6	7.8	-0.1	12.0	<0.1	58	23	2.8	1.2
444209092462101	478	7.6	7.9	--	10.0	--	59	21	4.0	0.6
444230092571101	506	7.6	7.8	0.2	11.5	6.6	68	23	3.2	1.0
444240092565701	516	7.7	7.9	-0.2	11.0	<0.1	64	31	3.0	1.3
444250093154901	564	7.3	7.5	--	14.0	--	79	26	2.7	2.1
444252092465401	411	7.6	8.0	-0.1	10.5	<0.1	54	21	3.1	1.0
444304093055401	515	7.4	7.6	--	8.5	--	71	23	3.4	1.5

STATION NUMBER	BICARBONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKALINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)
444156092490201	244	202	200	194	40	4.0	0.2	13	247
444209092462101	--	--	--	188	17	8.7	0.1	16	--
444230092571101	266	218	218	225	23	8.3	0.1	16	272
444240092565701	332	272	272	258	16	1.8	0.1	11	302
444250093154901	--	--	--	282	31	2.7	0.2	19	--
444252092465401	254	210	208	186	17	1.4	0.1	14	251
444304093055401	--	--	--	256	20	6.0	0.1	16	--

STATION NUMBER	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN, AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	TRITIUM IN WATER MOLECULES (TU) (07012)
444156092490201	<0.01	<0.05	0.01	--	<0.01	<0.01	900	32	1.4
444209092462101	<0.01	11	<0.01	0.50	0.02	0.01	--	--	--
444230092571101	<0.01	6.2	<0.01	--	0.02	0.02	4	<1	15.4
444240092565701	<0.01	<0.05	<0.01	--	0.01	<0.01	1800	42	<0.8
444250093154901	<0.01	<0.05	0.09	0.30	0.01	0.01	--	--	--
444252092465401	<0.01	<0.05	<0.01	--	<0.01	<0.01	620	47	0.8
444304093055401	<0.01	1.9	0.02	0.60	0.03	0.01	--	--	--

DAKOTA COUNTY--Continued

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	TIME	DEPTH OF WELL, TOTAL (FEET) (72008)	PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MIN) (72004)	SPECIFIC CONDUCTANCE (US/CM) (00095)
444312092515702	115N017W - SITE 5 SHALLOW	112PLSC	02-07-91	1445	59	--	907
		112PLSC	04-10-91	1425	59	--	722
		112PLSC	05-17-91	1400	59	--	654
444333092593401	115N18W33BCC1 SWOBODA WE		05-02-91	1230	--	--	751
444513093185401	115N21W23BCDCCD 206037 LHA	367PRDC	08-13-91	1300	193	36	589
444552093080001	115N19W18DCA1 DON GRUNTH		05-23-91	1020	--	--	477
444601093082901	115N19W18DAA1 MARVIN KA		05-23-91	1115	--	--	531
444634093041401	27N22W32DCC1 PHILLIP BRA		06-05-91	1100	--	--	556
444638093034401	27N22W33CCA1 BOB PLAN WE		05-02-91	1425	--	--	568
444843093045801	27N22W20CBB1 KOWSKI WELL		05-23-91	1245	--	--	613
445000093055701	27N22W7CDC1 RABUSE WELL		06-04-91	1015	--	--	483
445053093055001	27N22W6CDC1 MIKE TAURIN		06-05-91	1000	--	--	822
445134093082001	27N23W2BAC1 JIM HANSON W		06-04-91	1115	--	--	635

STATION NUMBER	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	OXIDATION REDUCTION POTENTIAL (MV) (00090)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)	POTASSIUM, DISSOLVED (MG/L AS K) (00935)
444312092515702	903	7.5	7.6	--	13.0	7.7	83	27	55	4.3
	752	7.4	7.7	--	8.5	8.3	69	23	53	3.0
	706	7.4	7.7	--	6.0	9.2	71	25	40	2.8
444333092593401	778	7.3	7.5	--	9.0	--	100	34	5.7	2.1
444513093185401	598	7.6	7.8	-0.1	11.5	<0.1	81	27	6.9	3.8
444552093080001	497	7.7	7.7	--	10.0	--	64	25	3.4	1.9
444601093082901	556	7.6	7.7	--	9.5	--	72	28	3.4	1.6
444634093041401	557	7.4	7.6	--	11.0	0.6	77	29	3.7	1.7
444638093034401	595	7.4	7.6	--	9.5	--	80	27	5.3	1.6
444843093045801	646	7.6	7.8	--	10.5	--	82	34	3.7	2.2
445000093055701	531	7.5	7.7	--	10.5	4.3	74	24	3.7	1.6
445053093055001	827	7.3	7.6	--	11.5	10.6	99	40	13	1.9
445134093082001	743	7.4	7.7	--	10.5	0	89	38	12	1.9

STATION NUMBER	BICARBONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKALINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)
444312092515702	--	--	--	238	35	110	0.2	13	--
	--	--	--	210	39	74	0.2	13	--
	--	--	--	222	38	57	0.3	15	--
444333092593401	--	--	--	246	33	28	0.2	15	--
444513093185401	333	273	273	278	39	11	0.1	27	340
444552093080001	--	--	--	244	31	5.6	<0.1	16	--
444601093082901	--	--	--	253	33	12	<0.1	17	--
444634093041401	--	--	--	256	29	9.2	<0.1	17	--
444638093034401	--	--	--	259	29	13	0.2	20	--
444843093045801	--	--	--	283	30	35	<0.1	23	--
445000093055701	--	--	--	244	43	5.1	<0.1	20	--
445053093055001	--	--	--	297	30	75	<0.1	21	--
445134093082001	--	--	--	299	44	48	<0.1	18	--

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DAKOTA COUNTY--Continued

STATION NUMBER	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	NITROGEN,AMMONIA + ORGANIC DIS. (MG/L AS N) (00623)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	TRITIUM IN WATER MOLECULES (TU) (07012)
444312092515702	<0.01	9.6	<0.01	1.2	0.54	0.50	--	--	--
	<0.01	6.9	<0.01	0.60	0.43	0.43	--	--	--
	0.01	4.8	0.03	0.80	0.48	0.48	--	--	--
444333092593401	0.01	26	0.02	0.60	0.02	<0.01	--	--	--
444513093185401	<0.01	<0.05	0.19	--	0.02	<0.01	910	120	22.5
444552093080001	<0.01	0.08	0.04	<0.20	0.02	<0.01	--	--	--
444601093082901	<0.01	3.3	0.02	0.50	0.01	<0.01	--	--	--
444634093041401	<0.01	3.3	0.01	0.30	<0.01	<0.01	--	--	--
444638093034401	0.01	5.4	0.02	0.40	0.01	<0.01	--	--	--
444843093045801	<0.01	0.06	0.13	0.30	0.03	<0.01	--	--	--
445000093055701	0.02	1.1	<0.01	<0.20	<0.01	<0.01	--	--	--
445053093055001	<0.01	3.7	0.02	2.3	0.03	0.02	--	--	--
445134093082001	<0.01	<0.05	0.04	<0.20	0.02	0.02	--	--	--

ANALYSIS FOR ORGANIC CHEMICALS

STATION NUMBER	DATE	TIME	1,2,4-TRICHLOROBENZENE TOTAL (UG/L) (34551)	1,2,5,6-DIBENZANTHRACENE TOTAL (UG/L) (34556)	1,2-DICHLOROBENZENE TOTAL (UG/L) (34536)	1,3-DICHLOROBENZENE TOTAL (UG/L) (34566)	1,4-DICHLOROBENZENE TOTAL (UG/L) (34571)	2,4,6-TRICHLOROPHENOL TOTAL (UG/L) (34621)	2,4-DIMETHYLPHENOL TOTAL (UG/L) (34606)	2,4-DICHLOROPHENOL TOTAL (UG/L) (34601)
444000093031702	02-05-91	1250								
	04-10-91	1030	<5.0	<10.0	<5.0	<5.0	<5.0	<20.0	<5.0	<5.0
	05-15-91	1215								
444000093031703	02-05-91	1320								
	04-10-91	1130	<5.0	<10.0	<5.0	<5.0	<5.0	<20.0	<5.0	<5.0
	05-16-91	1150								

STATION NUMBER	2,4,-DINITROPHENOL TOTAL (UG/L) (34616)	2,4-DINITROTOLUENE TOTAL (UG/L) (34611)	2,6-DINITROTOLUENE TOTAL (UG/L) (34626)	2-CHLORONAPHTHALENE TOTAL (UG/L) (34581)	2-CHLOROPHENOL TOTAL (UG/L) (34586)	2-NITROPHENOL TOTAL (UG/L) (34591)	4,6-DINITRO-ORTHO-CRESOL TOTAL (UG/L) (34657)	4-BROMOPHENYL PHENYL ETHER TOTAL (UG/L) (34636)	4-CHLOROPHENYL PHENYL ETHER TOTAL (UG/L) (34641)	4-NITROPHENOL TOTAL (UG/L) (34646)
444000093031702	<20.0	<5.0	<5.0	<5.0	<5.0	<5.0	<30.0	<5.0	<5.0	<30.0
444000093031703	<20.0	<5.0	<5.0	<5.0	<5.0	<5.0	<30.0	<5.0	<5.0	<30.0

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

DAKOTA COUNTY--Continued

STATION NUMBER	ACE-NAPHTH-ENE TOTAL (UG/L) (34205)	ACE-NAPHTH-YLENE TOTAL (UG/L) (34200)	ANTHRA-CENE TOTAL (UG/L) (34220)	BENZO-A-PYRENE TOTAL (UG/L) (34247)	BENZO B FLUOR-AN-THENE TOTAL (UG/L) (34230)	BENZO K FLUOR-AN-THENE TOTAL (UG/L) (34242)	BENZO A ANTHRAC ENE1,2-BENZANT HRACENE TOTAL (UG/L) (34526)	BENZOGH I PERYL ENE1,12 -BENZOP ERYLENE TOTAL (UG/L) (34521)	BIS (2-CHLORO-ETHOXY) METHANE TOTAL (UG/L) (34278)
444000093031702	<5.0	<5.0	<5.0	<10.0	<10.0	<10.0	<10.0	<10.0	<5.0
444000093031703	<5.0	<5.0	<5.0	<10.0	<10.0	<10.0	<10.0	<10.0	<5.0

STATION NUMBER	BIS (2-CHLORO-ISO-PROPYL) ETHER TOTAL (UG/L) (34283)	BIS(2-ETHYL HEXYL) PHTHAL-ATE TOTAL (UG/L) (39100)	BIS 2-CHLORO-ETHYL ETHER TOTAL (UG/L) (34273)	CHRY-SENE TOTAL (UG/L) (34320)	DIETHYL PHTHAL-ATE TOTAL (UG/L) (34336)	DI-METHYL PHTHAL-ATE TOTAL (UG/L) (34341)	DI-N-BUTYL PHTHAL-ATE TOTAL (UG/L) (39110)	DI-N-OCTYL PHTHAL-ATE TOTAL (UG/L) (34596)	FLUOR-ANTHENE TOTAL (UG/L) (34376)
444000093031702	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<10.0	<5.0
444000093031703	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0	<10.0	<5.0

STATION NUMBER	FLUOR-ENE TOTAL (UG/L) (34381)	HEXA-CHLORO-BENZENE TOTAL (UG/L) (39700)	HEXA-CHLORO-BUT-ADIENE TOTAL (UG/L) (39702)	HEXA-CHLORO-CYCLO-PENT-ADIENE TOTAL (UG/L) (34386)	HEXA-CHLORO-ETHANE TOTAL (UG/L) (34396)	INDENO (1,2,3-CD) PYRENE TOTAL (UG/L) (34403)	ISO-PHORONE TOTAL (UG/L) (34408)	N-BUTYL BENZYL PHTHAL-ATE TOTAL (UG/L) (34292)	N-NITRO-SODI-N-PROPYL-AMINE TOTAL (UG/L) (34428)
444000093031702	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0
444000093031703	<5.0	<5.0	<5.0	<5.0	<5.0	<10.0	<5.0	<5.0	<5.0

STATION NUMBER	N-NITRO-SODI-METHY-LAMINE TOTAL (UG/L) (34438)	N-NITRO-SODI-PHENY-LAMINE TOTAL (UG/L) (34433)	NAPHTH-ALENE TOTAL (UG/L) (34696)	NITRO-BENZENE TOTAL (UG/L) (34447)	PARA-CHLORO-META CRESOL TOTAL (UG/L) (34452)	PENTA-CHLORO-PHENOL TOTAL (UG/L) (39032)	PHENAN-THRENE TOTAL (UG/L) (34461)	PHENOL (C6H-5OH) TOTAL (UG/L) (34694)	PYRENE TOTAL (UG/L) (34469)
444000093031702	<5.0	<5.0	<5.0	<5.0	<30.0	<30.0	<5.0	<5.0	<5.0
444000093031703	<5.0	<5.0	<5.0	<5.0	<30.0	<30.0	<5.0	<5.0	<5.0

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

GOODHUE COUNTY

STATION NUMBER	LOCAL IDENTIFIER	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)
442003092423501	110N-16W-14 BCCDBA	03-13-91	1305	--	200
		07-17-91	1730	85.00	200
442503092434801	111N-16W-15 CCCDCC	03-13-91	1515	--	350
		07-17-91	1630	210.00	350

STATION NUMBER	PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MIN) (72004)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
442003092423501	--	--	--	--	--	<0.01	0.07	<0.01	<0.01
	27	356	7.2	13.0	0.1	<0.01	<0.05	0.02	<0.01
442503092434801	--	--	--	--	--	<0.01	0.18	<0.01	<0.01
	25	531	7.1	14.5	0.1	<0.01	0.05	0.01	<0.01

HOUSTON COUNTY

STATION NUMBER	LOCAL IDENTIFIER	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)
434613091350501	104N-06W-32 BCABC	03-12-91	1250	--	175
		07-18-91	1500	135.0	175

STATION NUMBER	PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MIN) (72004)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
434613091350501	--	--	--	--	--	0.01	3.5	<0.01	0.04
	27	530	7.1	14.0	13.7	<0.01	3.7	<0.01	<0.01

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

JACKSON COUNTY

STATION NUMBER	LOCAL IDENTIFIER	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)
433755095113201	102N-36W-17 CCAB	03-26-91	0930	--	26
		03-26-91	0935	--	26
		07-23-91	1317	9.32	26
434028094590801	103N-34W-30 CDDCAC	03-22-91	1805	--	80
		07-23-91	1015	45.00	80

STATION NUMBER	PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MIN) (72004)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
433755095113201	--	--	--	--	--	<0.01	2.4	<0.01	0.02
	--	--	--	--	--	--	--	--	--
	32	473	7.3	10.5	0.4	0.01	6.7	0.02	0.03
434028094590801	--	--	--	--	--	<0.01	<0.05	2.1	<0.01
	23	2080	6.7	11053.0	0.1	<0.01	<0.05	1.9	<0.01

MURRAY COUNTY

STATION NUMBER	LOCAL IDENTIFIER	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	ELEV. OF LAND SURFACE DATUM (FT. ABOVE NGVD) (72000)
435133095360801	105N-40W-36 BBCCDC	03-28-91	1320	--	37.00	1515
		07-23-91	1815	31.00	37.00	1515
435625095540301	106N-42W-33 CBCCAA	03-21-91	1235	--	42.00	1695
		07-23-91	1615	15.00	42.00	1695

STATION NUMBER	PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MIN) (72004)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
435133095360801	--	--	--	--	--	<0.01	0.94	0.09	<0.01
	15	1030	7.1	13.0	3.7	<0.01	1.4	0.01	<0.01
435625095540301	--	--	--	--	--	0.05	2.1	0.13	<0.01
	26	1120	6.9	10.5	0.8	<0.01	5.2	0.20	<0.01

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

OLMSTED COUNTY

STATION NUMBER	LOCAL IDENTIFIER	GEOLOGIC UNIT	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MIN) (72004)
440233092115101	107N-11W-31 AAAAAC		03-12-91	1535	--	262	--
			07-18-91	1050	165.00	262	25
440305092273901	107N14W23DDDCBB 120037 SIE	367PRDC	08-22-91	1430	--	250	24
440330092225201	107N13W21ADCAAD 105490 DON	367PRDC	08-21-91	1515	--	395	36
440335092243401	107N13W20BDAD XXXXXX LAURE		08-22-91	1130	--	220	27
440336092241801	107N13W20ACACAC UN105455 K	367PRDC	08-22-91	1245	--	292	21
440343092160001	107N12W21ABCADA 101409 VER	371JRDN	08-19-91	1730	--	500	30
440346092155501	107N12W21ABACAD 220756 RIG	367PRDC	08-20-91	1230	--	296	21
440347092181801	107N-12W-19ABAD UNW00254 R	364GLEN	08-20-91	1530	--	70	21
440350092155801	107N12W21ABABBB 227474 FER	367PRDC	08-19-91	1245	--	191	21
440352092155701	107N12W16DCDCCD UN220754 Y	367PRDC	08-19-91	1415	--	295	21
440353092152001	107N12W15CCDCAD UN119824 V	371JRDN	08-19-91	1545	--	600	21
440354092180301	107N12W18DDDCBD 105012 BRO	367PRDC	08-20-91	1400	--	350	24
440411092255801	107N13W18CABD W00359 DOBLA	367PRDC	08-23-91	1745	--	100	21
440412092273201	107N14W14DADAAB 228549 OLS	367PRDC	08-21-91	1045	--	156	21
440415092231901	107N13W16CAAADA 139145 OLN	371JRDN	08-21-91	1815	--	560	21
440417092255701	107N13W18CABBAA UN228616 L	367PRDC	08-20-91	1645	--	140	21
440433092252301	107N13W18AACC W01319 SEHL	367PRDC	08-23-91	1215	--	60	27
440455092120601	107N-12W-12 DDBDBB		03-11-91	1815	--	520	--
			07-18-91	1705	125.00	520	20
440534092261701	107N13W07BBBBCD 228650 KEI	367PRDC	08-21-91	1330	--	290	21
440535092233501	107N13W09BABB 421071 KIELY	371JRDN	08-20-91	1115	--	620	21
440545092264801	107N14W01DCCABC 228620 LAN	371JRDN	08-21-91	1200	--	384	21

STATION NUMBER	SPECIFIC CONDUCTANCE (US/CM) (00095)	SPECIFIC CONDUCTANCE LAB (US/CM) (90095)	PH (STANDARD UNITS) (00400)	PH LAB (STANDARD UNITS) (00403)	OXIDATION REDUCTION POTENTIAL (MV) (00090)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	CALCIUM DISSOLVED (MG/L AS CA) (00915)	MAGNESIUM, DISSOLVED (MG/L AS MG) (00925)	SODIUM, DISSOLVED (MG/L AS NA) (00930)
440233092115101	--	--	--	--	--	--	--	--	--	--
	627	--	7.1	--	--	13.0	9.5	--	--	--
440305092273901	704	711	7.2	7.6	0.4	12.5	7.9	110	24	5.2
440330092225201	494	502	7.2	7.7	-0.1	11.0	<0.1	73	21	2.7
440335092243401	755	791	7.2	7.6	0.2	12.0	10.3	120	14	8.1
440336092241801	603	600	7.2	8.0	0.7	12.0	<0.1	90	29	3.5
440343092160001	614	618	7.3	7.7	-0.1	10.0	3.1	95	21	4.6
440346092155501	602	585	7.3	7.7	-0.1	16.0	<0.1	92	21	3.7
440347092181801	611	597	7.2	8.0	0.2	9.5	7.6	90	21	5.9
440350092155801	767	780	7.3	7.6	0.2	11.5	8.4	120	25	15
440352092155701	679	678	7.3	7.9	0.2	10.0	10.6	110	22	6.6
440353092152001	482	480	7.4	8.1	0.0	10.5	6.2	75	19	2.2
440354092180301	490	487	7.4	7.9	0.1	11.5	7.8	70	22	2.3
440411092255801	572	--	7.4	--	0.3	11.0	9.5	--	--	--
440412092273201	525	531	7.4	8.0	0.2	11.5	7.2	70	26	2.4
440415092231901	479	462	7.5	7.9	-0.2	11.5	0.3	70	21	2.5
440417092255701	622	613	7.4	7.8	0.2	11.0	8.8	94	21	3.6
440433092252301	806	811	7.1	7.5	0.3	12.0	9.5	100	32	7.9
440455092120601	--	--	--	--	--	--	--	--	--	--
	480	--	7.4	--	--	15.5	0.2	--	--	--
440534092261701	568	575	7.3	8.0	0.2	12.5	10.7	79	27	2.7
440535092233501	525	502	7.5	7.8	-0.2	11.5	<0.1	70	23	2.5
440545092264801	502	508	7.3	7.8	0.1	12.0	7.3	74	22	2.4

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

OLMSTED COUNTY--Continued

STATION NUMBER	POTASSIUM, DISSOLVED (MG/L AS K) (00935)	BICARBONATE WATER WH IT FIELD MG/L AS HCO3 (00450)	ALKALINITY WAT WH TOT IT FIELD MG/L AS CACO3 (00419)	ALKALINITY WAT WH TOT FET FIELD MG/L AS CACO3 (00410)	ALKALINITY LAB (MG/L AS CACO3) (90410)	SULFATE DISSOLVED (MG/L AS SO4) (00945)	CHLORIDE, DISSOLVED (MG/L AS CL) (00940)	FLUORIDE, DISSOLVED (MG/L AS F) (00950)	SILICA, DISSOLVED (MG/L AS SIO2) (00955)	SOLIDS, RESIDUE AT 180 DEG. C DISSOLVED (MG/L) (70300)
440233092115101	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
440305092273901	1.6	373	306	306	276	54	14	0.1	13	450
440330092225201	1.6	321	264	263	--	22	0.60	0.2	9.7	270
440335092243401	12	370	297	303	306	38	31	0.2	14	462
440336092241801	1.7	354	286	290	--	48	4.4	0.2	11	341
440343092160001	0.6	339	278	278	--	64	8.9	0.1	14	344
440346092155501	0.6	337	276	276	253	44	6.2	0.2	14	351
440347092181801	1.3	--	--	--	275	19	15	0.2	20	349
440350092155801	1.8	374	311	307	317	35	41	0.1	17	459
440352092155701	1.5	352	293	289	--	27	23	0.1	16	393
440353092152001	0.5	316	261	259	--	17	0.80	0.2	15	271
440354092180301	0.7	316	257	259	249	16	1.0	0.1	13	259
440411092255801	--	--	--	--	--	--	13	--	--	--
440412092273201	1.1	295	237	242	--	20	8.4	0.1	12	305
440415092231901	1.1	332	273	272	--	13	0.70	0.2	10	267
440417092255701	1.4	322	266	264	--	20	13	0.1	13	359
440433092252301	24	411	339	337	345	32	30	0.2	20	491
440455092120601	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
440534092261701	1.2	344	284	282	--	24	7.5	0.1	13	327
440535092233501	1.1	340	283	279	--	14	1.3	0.2	11	277
440545092264801	1.2	328	271	269	--	19	0.80	0.2	11	276

STATION NUMBER	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS DISSOLVED (MG/L AS P) (00666)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)	IRON, DISSOLVED (UG/L AS FE) (01046)	MANGANESE, DISSOLVED (UG/L AS MN) (01056)	TRITIUM TOTAL (PCI/L) (07000)	TRITIUM IN WATER MOLECULES (TU) (07012)
440233092115101	0.01	4.4	<0.01	--	0.02	--	--	--	--
	<0.01	4.3	0.01	--	<0.01	--	--	--	--
440305092273901	<0.01	3.5	<0.01	0.02	0.02	14	<1	--	22.8
440330092225201	<0.01	<0.05	0.12	<0.01	<0.01	2000	33	--	0.8
440335092243401	<0.01	10.0	0.02	0.04	0.01	10	<1	--	15.3
440336092241801	<0.01	<0.05	<0.01	<0.01	<0.01	5	<1	--	<0.8
440343092160001	<0.01	<0.05	0.02	<0.01	<0.01	510	36	--	8.4
440346092155501	<0.01	<0.05	<0.01	<0.01	<0.01	2700	29	--	<0.8
440347092181801	<0.01	7.0	0.02	0.03	<0.01	<3	<1	--	--
440350092155801	--	--	--	--	--	9	<1	--	25.7
440352092155701	<0.01	6.70	<0.01	0.03	0.01	9	<1	67	22.9
440353092152001	<0.01	<0.05	<0.01	<0.01	<0.01	280	22	--	<0.8
440354092180301	<0.01	<0.05	<0.01	<0.01	<0.01	220	6	--	<0.8
440411092255801	--	6.5	--	--	--	--	--	--	--
440412092273201	<0.01	4.1	0.01	<0.01	<0.01	11	<1	--	15.8
440415092231901	<0.01	<0.05	0.06	<0.01	<0.01	4100	69	--	<0.8
440417092255701	<0.01	7.6	<0.01	0.02	<0.01	4	<1	74	25.2
440433092252301	<0.01	5.2	0.03	0.29	0.11	3	<1	--	20.1
440455092120601	0.01	<0.05	0.02	--	<0.01	--	--	--	--
	<0.01	<0.05	0.05	--	<0.01	--	--	--	--
440534092261701	<0.01	3.0	0.02	<0.01	<0.01	10	<1	--	13.2
440535092233501	<0.01	<0.05	0.05	<0.01	<0.01	5500	59	--	<0.8
440545092264801	0.01	<0.05	0.02	<0.01	<0.01	79	11	--	<0.8

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

REDWOOD COUNTY

STATION NUMBER	LOCAL IDENTIFIER	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)
441753095160801	110N-37W-27 DADDCD	03-22-91	1420	--	44
		08-08-91	1210	20.00	44

STATION NUMBER	PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MIN) (72004)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
441753095160801	--	--	--	--	--	<0.01	6.9	0.04	0.01
	30	1020	6.7	12.5	0.1	0.15	14	0.07	<0.01

WABASHA COUNTY

STATION NUMBER	LOCAL IDENTIFIER	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)	PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MIN) (72004)
441638092042401	109N-11W-01 AACBAD	03-11-91	1620	--	98	--
		07-18-91	1240	72.00	98	5

STATION NUMBER	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
441638092042401	--	--	--	--	0.01	2.4	<0.01	0.02
	558	7.3	15.0	7.6	<0.01	2.3	0.02	<0.01

QUALITY OF GROUND WATER

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

WATONWAN COUNTY

STATION NUMBER	LOCAL IDENTIFIER	DATE	TIME	DEPTH BELOW LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)
440037094372601	106N32W01DDB01	03-26-91	1225	--	22
		07-22-91	1800	12.86	22

STATION NUMBER	PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MIN) (72004)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
440037094372601	--	--	--	--	--	<0.01	<0.05	0.03	<0.01
	23	1930	6.6	12.0	3.0	<0.01	<0.05	0.04	<0.01

YELLOW MEDICINE COUNTY

STATION NUMBER	LOCAL IDENTIFIER	DATE	TIME	LAND SURFACE (WATER LEVEL) (FEET) (72019)	DEPTH OF WELL, TOTAL (FEET) (72008)
444307096245801	115N-46W-33CCDDAA	03-27-91	1650	--	25
		08-07-91	1725	10.00	25

STATION NUMBER	PUMP OR FLOW PERIOD PRIOR TO SAMPLING (MIN) (72004)	SPECIFIC CONDUCTANCE (US/CM) (00095)	PH (STANDARD UNITS) (00400)	TEMPERATURE WATER (DEG C) (00010)	OXYGEN, DISSOLVED (MG/L) (00300)	NITROGEN, NITRITE DISSOLVED (MG/L AS N) (00613)	NITROGEN, NO2+NO3 DISSOLVED (MG/L AS N) (00631)	NITROGEN, AMMONIA DISSOLVED (MG/L AS N) (00608)	PHOSPHORUS ORTHO, DISSOLVED (MG/L AS P) (00671)
444307096245801	--	--	--	--	--	<0.01	<0.05	0.14	<0.01
	26	570	6.9	12.5	0.1	<0.01	<0.05	0.16	<0.01

CHEMICAL QUALITY OF PRECIPITATION

461458094295000 PRECIPITATION STATION AT CAMP RIPLEY, MN

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

LOCATION.--Lat 46°14'58", long 94°29'50", in NE¼ sec.18, T.132 N., R.30 W., Morrison County, Hydrologic Unit 07010104, approximately 500 ft southwest of the abandoned Gilgal Church and approximately 5 miles south of the town of Pillager.

PERIOD OF RECORD.--October 1983 to current year (weekly composite).

INSTRUMENTATION.--Samples are collected in a polyethylene bucket by an electrically operated wet/dry collector. A recording rain gage and a standard U.S. Weather Service bulk rain gage measure rainfall quantity.

REMARKS.--An observer collects only the wetfall bucket and services the rain gages every Tuesday around 0900 hours. The observer weighs the bucket and if there is enough wetfall, determines specific conductance and pH. The bucket with its remaining contents is then sent to the Illinois State Water Survey Laboratory for analysis.

CHEMICAL ANALYSIS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

WEEKLY COMPOSITE

DATE	GREEN-WICH MEAN TIME	TOTAL PRECIP-ITATION FOR DEFINED PERIOD (IN) (00193)	SPEC. CONDUC-TANCE FIELD ATM DEP WET TOT (US/CM) (83154)	SPEC. CONDUC-TANCE LAB ATM DEP WET TOT (US/CM) (83156)	PH FIELD ATM DEP WET T (UNITS) (83106)	PH LAB ATM DEP WET T (UNITS) (83107)	CALCIUM ATM DEP WET DIS (MG/L) (82932)	MAG-NESIUM ATM DEP WET DIS (MG/L) (83002)
OCT 02-09	1000	1.95	8.7	9.7	5.25	6.53	0.620	0.100
OCT 09-16	1200	0.0	--	19.3	--	6.79	0.700	0.170
OCT 16-23	1000	1.58	14.7	11.0	4.70	5.07	0.310	0.033
OCT 23-30	1300	--	--	--	--	--	--	--
OCT 30-NOV 06	1430	0.01	--	19.6	--	6.43	0.830	0.172
NOV 06-13	1100	0.0	--	--	--	--	--	--
NOV 13-20	1100	0.03	--	16.6	--	5.09	0.300	0.067
NOV 20-27	1100	0.20	54.7	46.7	4.60	4.62	0.340	0.046
NOV 27-DEC 04	1100	0.30	7.1	5.8	4.70	5.63	0.110	0.026
DEC 04-11	1500	0.0	--	--	--	--	--	--
DEC 11-18	1100	0.01	--	8.3	--	5.71	0.100	0.023
DEC 18-25	1100	0.75	11.4	10.0	4.90	4.76	0.190	0.024
DEC 25 1990-JAN 01 1991	1600	0.0	--	--	--	--	--	--
JAN 01-08	1600	0.02	--	--	--	--	--	--
JAN 08-15	1300	0.24	10.9	9.5	4.70	4.75	0.050	0.008
JAN 15-22	1700	0.11	11.2	9.1	4.90	5.78	0.330	0.061
JAN 22-29	1600	0.15	4.4	3.3	5.10	5.80	0.090	0.015
JAN 29-FEB 05	1800	0.0	--	1.3	--	5.78	<0.010	<0.003
FEB 05-12	1300	0.0	--	1.7	--	5.80	<0.010	<0.003
FEB 12-19	1300	0.58	10.7	9.1	4.80	4.89	0.100	0.017

CHEMICAL QUALITY OF PRECIPITATION

461458094295000 - PRECIPITATION STATION AT CAMP RIPLEY, MN--Continued

CHEMICAL ANALYSIS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

WEEKLY COMPOSITE

DATE	GREEN-WICH MEAN TIME	TOTAL PRECIP-ITATION FOR DEFINED PERIOD (IN) (00193)	SPEC. CONDUC-TANCE FIELD ATM DEP WET TOT (US/CM) (83154)	SPEC. CONDUC-TANCE LAB ATM DEP WET TOT (US/CM) (83156)	PH FIELD ATM DEP WET T (UNITS) (83106)	PH LAB ATM DEP WET T (UNITS) (83107)	CALCIUM ATM DEP WET DIS (MG/L) (82932)	MAG-NESIUM ATM DEP WET DIS (MG/L) (83002)
FEB 19-26	1530	0.40	4.9	3.7	5.10	5.67	0.100	0.012
FEB 26-MAR 05	1430	0.07	--	--	--	--	--	--
MAR 05-12	1300	0.0	--	1.7	--	5.85	0.090	<0.003
MAR 12-19	1330	0.0	--	3.4	--	5.96	<0.010	0.003
MAR 19-26	1400	1.94	11.2	14.7	4.50	4.67	0.210	0.019
MAR 26-APR 02	1500	0.03	--	25.0	--	6.82	0.820	0.237
APR 02-09	2130	0.25	17.8	3.8	4.40	5.38	0.100	0.016
APR 09-16	1930	2.22	12.0	13.1	4.60	4.62	0.100	0.015
APR 16-23	2000	0.06	27.1	14.7	4.60	6.44	0.220	0.041
APR 23-30	1930	1.97	11.2	9.3	4.80	5.05	0.160	0.024
APR 30-MAY 07	1930	1.25	8.4	5.9	5.10	5.08	0.070	0.006
MAY 07-14	1930	0.46	17.1	10.6	5.40	6.42	0.400	0.056
MAY 14-21	1930	0.10	13.5	12.4	5.65	6.49	0.380	0.088
MAY 21-28	2030	0.95	6.5	5.9	5.40	6.13	0.150	0.030
MAY 28-JUN 04	2000	1.04	7.8	7.2	5.50	5.47	0.190	0.019
JUN 04-11	1930	0.05	--	35.6	--	6.14	1.17	0.164
JUN 11-18	2030	2.37	7.0	6.5	5.40	5.96	0.090	0.013
JUN 18-25	1930	1.65	9.6	8.8	5.00	5.95	0.400	0.043
JUN 25-JUL 02	1730	5.08	8.4	8.8	5.40	6.18	0.460	0.069
JUL 02-09	1930	0.14	8.8	7.6	5.10	5.80	0.280	0.047

CHEMICAL QUALITY OF PRECIPITATION

461458094295000 - PRECIPITATION STATION AT CAMP RIPLEY, MN--Continued

WATER QUALITY DATA, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

WEEKLY COMPOSITE

DATE	GREEN-WICH MEAN TIME	TOTAL PRECIP-ITATION FOR DEFINED PERIOD (IN) (00193)	SPEC. CONDUC-TANCE FIELD ATM DEP WET TOT (US/CM) (83154)	SPEC. CONDUC-TANCE LAB ATM DEP WET TOT (US/CM) (83156)	PH FIELD ATM DEP WET T (UNITS) (83106)	PH LAB ATM DEP WET T (UNITS) (83107)	CALCIUM ATM DEP WET DIS (MG/L) (82932)	MAG-NESIUM ATM DEP WET DIS (MG/L) (83002)
JUL 09-16	1930	0.60	7.7	7.1	5.10	5.17	0.120	0.041
JUL 16-23	1430	0.42	17.4	15.7	--	6.50	0.830	0.150
JUL 23-30	1930	0.45	10.0	8.3	--	5.19	0.120	0.017
JUL 30-AUG 06	1930	0.30	6.3	4.4	--	5.32	0.080	0.014
AUG 06-13	1600	0.01	--	99.1	--	3.81	--	--
AUG 13-20	1930	0.18	10.2	9.1	--	6.01	0.340	0.077
AUG 20-27	1930	0.99	12.3	11.7	4.80	5.58	0.280	0.029
AUG 27-SEP 03	1400	1.39	10.9	7.1	--	5.88	0.170	0.026
SEP 03-10	1930	1.05	8.7	7.8	--	4.99	0.040	0.003
SEP 10-17	2000	0.26	9.4	9.1	--	5.58	0.140	0.022
SEP 17-24	1930	0.08	6.0	4.8	--	5.97	0.080	0.017
SEP 24-OCT 01	2000	0.54	22.7	24.1	--	6.72	1.55	0.252

CHEMICAL QUALITY OF PRECIPITATION

461458094295000 - PRECIPITATION STATION AT CAMP RIPLEY, MN--Continued

CHEMICAL ANALYSIS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

WEEKLY COMPOSITE

DATE	SODIUM ATM DEP WET DIS (MG/L) (83138)	POTASSIUM ATM DEP WET DIS (MG/L) (83120)	SULFATE ATM DEP WET DIS AS SO4 (MG/L) (83160)	CHLORIDE ATM DEP WET DIS (MG/L) (82944)	NITROGEN NITRATE ATM DEP WET DIS AS NO3 (MG/L) (83071)	NITROGEN AMMON. ATM DEP WET DIS AS NH4 (MG/L) (83047)	PHOSPHORUS ORTHO ATM DEP WET DIS AS PO4 (MG/L) (83111)
OCT 02-09	0.048	0.057	1.01	0.05	0.78	0.500	<0.020
OCT 09-16	0.478	0.203	1.23	0.47	1.51	0.800	<0.090
OCT 16-23	0.021	0.023	1.50	0.07	1.32	0.590	<0.020
OCT 23-30	--	--	--	--	--	--	--
OCT 30-NOV 06	0.693	0.068	1.54	0.32	3.05	0.720	<0.070
NOV 06-13	--	--	--	--	--	--	--
NOV 13-20	0.239	0.035	2.35	0.15	3.46	0.750	<0.020
NOV 20-27	0.102	0.042	7.12	0.38	7.20	2.44	<0.020
NOV 27-DEC 04	0.067	0.044	0.49	0.07	1.10	0.510	<0.020
DEC 04-11	--	--	--	--	--	--	--
DEC 11-18	0.057	0.064	0.57	0.23	1.59	0.610	<0.080
DEC 18-25	0.031	0.018	0.29	0.05	1.78	0.100	<0.020
DEC 25 1990-JAN 01 1991	--	--	--	--	--	--	--
JAN 01-08	--	--	--	--	--	--	--
JAN 08-15	0.043	0.010	0.15	0.08	1.54	0.080	<0.020
JAN 15-22	0.146	0.031	0.25	0.18	2.64	0.560	<0.020
JAN 22-29	0.044	0.013	0.11	0.07	0.63	0.130	<0.020
JAN 29-FEB 05	0.022	0.006	<0.03	0.08	0.05	0.020	<0.020
FEB 05-12	0.051	0.005	<0.03	0.08	0.04	0.260	<0.020
FEB 12-19	0.027	0.007	0.32	0.06	1.68	0.200	<0.020

CHEMICAL QUALITY OF PRECIPITATION

461458094295000 - PRECIPITATION STATION AT CAMP RIPLEY, MN--Continued

CHEMICAL ANALYSIS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

WEEKLY COMPOSITE

DATE	SODIUM ATM DEP WET DIS (MG/L) (83138)	POTASSIUM ATM DEP WET DIS (MG/L) (83120)	SULFATE ATM DEP WET DIS AS SO4 (MG/L) (83160)	CHLORIDE ATM DEP WET DIS (MG/L) (82944)	NITROGEN NITRATE ATM DEP WET DIS AS NO3 (MG/L) (83071)	NITROGEN AMMON. ATM DEP WET DIS AS NH4 (MG/L) (83047)	PHOSPHORUS ORTHO ATM DEP WET DIS AS PO4 (MG/L) (83111)
FEB 19-26	0.060	0.014	0.18	0.10	0.64	0.170	<0.020
FEB 26-MAR 05	--	--	--	--	--	--	--
MAR 05-12	0.033	<0.003	0.04	0.05	0.08	<0.020	<0.020
MAR 12-19	0.014	0.005	0.03	<0.03	0.05	<0.020	<0.020
MAR 19-26	0.034	0.011	1.81	0.07	1.14	0.360	<0.020
MAR 26-APR 02	0.573	0.035	2.37	0.17	2.13	1.54	<0.020
APR 02-09	0.024	<0.003	0.26	0.05	0.51	0.030	<0.020
APR 09-16	0.038	0.015	1.08	0.05	0.86	0.090	<0.020
APR 16-23	0.038	0.034	1.58	0.08	2.39	1.43	<0.020
APR 23-30	0.035	0.028	1.22	0.05	0.93	0.360	<0.020
APR 30-MAY 07	0.015	0.007	0.53	0.03	0.59	0.120	<0.020
MAY 07-14	0.117	0.054	0.94	0.14	1.00	0.780	<0.020
MAY 14-21	0.066	0.025	0.65	0.11	1.67	1.08	<0.020
MAY 21-28	0.012	0.018	0.45	0.04	0.92	0.510	<0.020
MAY 28-JUN 04	0.030	0.015	0.83	0.07	1.15	0.400	<0.020
JUN 04-11	0.293	0.328	3.86	0.64	4.22	1.00	<0.120
JUN 11-18	0.013	0.013	0.66	0.06	1.03	0.590	<0.020
JUN 18-25	0.040	0.021	1.22	0.09	1.45	0.550	<0.020
JUN 25-JUL 02	0.066	0.037	0.82	0.09	1.01	0.520	<0.020
JUL 02-09	0.053	0.146	0.56	0.21	1.01	0.210	<0.020

CHEMICAL QUALITY OF PRECIPITATION

461458094295000 - PRECIPITATION STATION AT CAMP RIPLEY, MN--Continued

CHEMICAL ANALYSIS, WATER YEAR OCTOBER 1990 TO SEPTEMBER 1991

WEEKLY COMPOSITE

DATE	SODIUM ATM DEP WET DIS (MG/L) (83138)	POTASSIUM ATM DEP WET DIS (MG/L) (83120)	SULFATE ATM DEP WET DIS AS SO4 (MG/L) (83160)	CHLORIDE ATM DEP WET DIS (MG/L) (82944)	NITROGEN NITRATE ATM DEP WET DIS AS NO3 (MG/L) (83071)	NITROGEN AMMON. ATM DEP WET DIS AS NH4 (MG/L) (83047)	PHOSPHORUS ORTHO ATM DEP WET DIS AS PO4 (MG/L) (83111)
JUL 09-16	0.025	0.020	0.69	0.06	0.99	0.190	<0.020
JUL 16-23	0.070	0.091	1.53	0.16	2.39	1.09	<0.020
JUL 23-30	0.013	<0.003	1.13	0.04	0.93	0.490	<0.020
JUL 30-AUG 06	0.020	0.005	0.35	0.04	0.56	0.140	0.090
AUG 06-13	--	--	--	--	--	--	--
AUG 13-20	0.103	0.074	1.25	0.13	1.41	0.500	<0.020
AUG 20-27	0.022	0.048	1.64	0.08	1.99	1.00	<0.020
AUG 27-SEP 03	0.027	0.020	1.28	0.04	0.69	0.540	<0.020
SEP 03-10	0.016	0.003	0.94	0.04	0.63	0.310	<0.020
SEP 10-17	0.036	0.029	1.15	0.07	1.51	0.700	<0.020
SEP 17-24	0.078	0.040	0.51	0.13	0.37	0.200	0.080
SEP 24-OCT 01	0.134	0.198	2.28	0.11	2.31	1.46	<0.020

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October 1, 1978

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

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

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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