J. D. CALVERT

1962

Surface Water Records of Minnesota

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY

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

United States Department of the Interior
Geological Survey - Water Resources Division

SURFACE WATER RECORDS OF MINNESOTA

1962

Prepared in cooperation with

Minnesota Department of Conservation, Division of Waters
Minnesota Department of Highways
Minnesota Department of Iron Range Resources and Rehabilitation
Hennepin County Board of Commissioners
City of Austin, through the Minnesota Division of Waters
City of Rochester, through the Minnesota Division of Waters
Erie Mining Company, through the Minnesota Division of Waters
Youngstown Mines Corp., through the Minnesota Division of Waters
Corps of Engineers, U. S. Army
U. S. Department of State

Copies of this report may be obtained from
District Engineer, Surface Water Branch
U. S. Geological Survey
1610 Post Office Building
St. Paul 1, Minnesota

CALENDAR FOR WATER YEAR 1962

OCTOBER 1961

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

NOVEMBER 1961

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

DECEMBER 1961

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

JANUARY 1962

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

FEBRUARY 1962

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

MARCH 1962

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

APRIL 1962

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

MAY 1962

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

JUNE 1962

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

JULY 1962

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

AUGUST 1962

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

SEPTEMBER 1962

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

CONTENTS

	Page
Introduction	1
Cooperation	2
Definition of terms and abbreviations	2
Downstream order and station numbers	4
Explanation of data	5
Accuracy of field data and computed results	9
Supplemental data	10
Gaging-station records	11
Streams tributary to Lake Superior	
Pigeon River at Middle Falls, below International Bridge	11
Baptism River near Beaver Bay	12
St. Louis River:	
Partridge River:	
Second Creek near Aurora	13
Partridge River near Aurora	14
St. Louis River near Aurora	15
Embarrass River at Embarrass	16
Embarrass River near McKinley	17
West Two River near Iron Junction	18
West Swan River (head of Swan River):	
East Swan River near Toivola	19
St. Louis River at Scanlon	20
Hudson Bay basin	
Lake Winnipeg (head of Nelson River):	
Red River of the North basin	
Otter Tail River (head of Red River of the North) near Detroit Lakes	21
Pelican River near Fergus Falls	22
Orwell Reservoir near Fergus Falls	23
Otter Tail River below Orwell Dam, near Fergus Falls	24
Bois de Sioux River near White Rock, S. Dak	25
Red River of the North at Wahpeton, N. Dak	26
Red River of the North at Fargo, N. Dak	27
Buffalo River near Hawley	28
South Branch Buffalo River at Sabin	29
Buffalo River near Dilworth	30
Wild Rice River at Twin Valley	31
Wild Rice River at Hendrum	32
Red River of the North at Halstad	33
Marsh River near Shelly	34
Sandhill River at Climax	35

Gaging-station records--Continued
Hudson Bay basin--Continued
Lake Winnipeg (head of Nelson River)--Continued
Red River of the North basin--Continued
Red Lake River: Page
Lower Red Lake near Red Lake..... 36
Red Lake River near Red Lake..... 37
Red Lake River at Highlanding, near Goodridge..... 38
Thief River near Thief River Falls..... 39
Clearwater River:
Ruffy Brook near Gonvick..... 40
Clearwater River at Plummer..... 41
Lost River at Oklee..... 42
Clearwater River at Red Lake Falls..... 43
Red Lake River at Crookston..... 44
Red River of the North at Grand Forks, N. Dak..... 45
Snake River:
Middle River at Argyle..... 46
Red River of the North at Drayton, N. Dak..... 47
Two Rivers:
South Branch Two Rivers at Lake Bronson..... 48
Red River of the North at Emerson, Manitoba..... 49
Roseau River below South Fork, near Malung..... 50
Sprague Creek near Sprague, Manitoba..... 51
Roseau River at Roseau Lake..... 52
Roseau River at Ross..... 53
Roseau River near Badger..... 54
Roseau River near Haug..... 55
Roseau River below State ditch 51, near Caribou... 56
Roseau River at international boundary, near Caribou..... 57
Lake of the Woods basin (head of Winnipeg River):
Namakan River (head of Rainy River):
Basswood River:
Kawishiwi River:
South Kawishiwi River:
Stony River near Isabella..... 58
Dunka River near Babbitt..... 59
Bear Island River near Ely..... 60
Kawishiwi River near Winton..... 61
Basswood River near Winton..... 62
Namakan River at outlet of Lac la Croix, Ontario.. 63
Vermilion Lake near Soudan..... 64
Pike River near Embarrass..... 65
Vermilion River below Vermilion Lake near Tower. 66
Rainy Lake at Fort Frances, Ontario..... 67

Gaging-station records--Continued
Hudson Bay basin--Continued
Lake Winnipeg (head of Nelson River)--Continued
Red River of the North basin--Continued
Little Fork River: Page
Sturgeon River near Chisholm..... 68
Little Fork River at Little Fork..... 69
Big Fork River at Big Falls..... 70
Rainy River at Manitou Rapids..... 71
Rapid River near Baudette..... 72
Warroad River near Warroad..... 73
Upper Mississippi River basin
Mississippi River:
Winnibigoshish Lake near Deer River..... 74
Mississippi River at Winnibigoshish Dam, near Deer River.. 75
Leech Lake River basin
Leech Lake at Federal Dam..... 76
Leech Lake River at Federal Dam..... 77
Pokegama Lake near Grand Rapids..... 78
Mississippi River at Grand Rapids..... 79
Swan River basin
Swan River near Warba..... 80
Sandy River basin
Sandy Lake at Libby..... 81
Sandy River at Sandy Lake Dam, at Libby..... 82
Mississippi River below Sandy River, near Libby..... 83
Mississippi River at Aitkin..... 84
Pine River basin
Pine River Reservoir at Cross Lake..... 85
Pine River at Cross Lake Dam, at Cross Lake..... 86
Pelican Brook:
Pelican Lake near Pequot Lakes..... 87
Rabbit River basin
Rabbit River near Crosby..... 88
Crow Wing River at Nimrod..... 89
Gull River:
Gull Lake near Brainerd..... 90
Gull River at Gull Lake Dam, near Brainerd..... 91
Mississippi River near Royalton..... 92
Sauk River basin
Sauk River near St. Cloud..... 93
Elk River basin
Elk River near Big Lake..... 94

Gaging-station records--Continued
Upper Mississippi River basin--Continued
Crow River basin — Page
North Fork Crow River:
Middle Fork Crow River near Spicer..... 95
South Fork Crow River at Cosmos..... 96
South Fork Crow River near Mayer..... 97
Crow River at Rockford..... 98
Rum River basin
Mille Lacs Lake (head of Rum River) at Garrison..... 99
Rum River at Spencer Brook..... 100
Rum River near St. Francis..... 101
Mississippi River near Anoka..... 102
Minnehaha Creek basin
Minnetonka Lake (head of Minnehaha Creek) near Wayzata.. 103
Minnehaha Creek at Minnetonka Mills..... 104
Minnesota River basin
Little Minnesota River (head of Minnesota River) near Peever, S. Dak..... 105
Whetstone River near Big Stone City, S. Dak..... 106
Big Stone Lake at Ortonville..... 107
Minnesota River at Ortonville..... 108
Minnesota River near Odessa..... 109
Yellow Bank River near Odessa..... 110
Pomme de Terre River at Appleton..... 111
Lac qui Parle River near Lac qui Parle..... 112
Minnesota River near Lac qui Parle..... 113
Chippewa River near Milan..... 114
Minnesota River at Montevideo..... 115
Yellow Medicine River:
South Branch Yellow Medicine River at Minneota..... 116
Yellow Medicine River near Granite Falls..... 117
Redwood River at Marshall..... 118
Redwood River near Redwood Falls..... 119
Cottonwood River near New Ulm..... 120
Blue Earth River:
East Branch Blue Earth River near Bricelyn..... 121
Blue Earth River near Rapidan..... 122
Le Sueur River near Rapidan..... 123
Minnesota River at Mankato..... 124
Minnesota River near Carver..... 125
Mississippi River at St. Paul..... 126

Gaging-station records--Continued
Upper Mississippi River basin--Continued
St. Croix River basin
St. Croix River: Page
Snake River near Pine City..... 127
Sunrise River near Stacy..... 128
St. Croix River at St. Croix Falls, Wis..... 129
Mississippi River at Prescott, Wis..... 130
Cannon River basin
Cannon River at Welch..... 131
Zumbro River basin
South Zumbro River near Rochester..... 132
Zumbro River at Zumbro Falls..... 133
Whitewater River basin
Whitewater River:
South Fork Whitewater River near Altura..... 134
Mississippi River at Winona..... 135
Gilmore Creek basin
Gilmore Creek at Winona..... 136
Root River basin
Root River:
North Branch Root River tributary near Stewartville... 137
Root River near Lanesboro..... 138
Rush Creek near Rushford..... 139
Root River near Houston..... 140
South Fork Root River near Houston..... 141
Iowa River basin
Iowa River:
Cedar River near Austin..... 142
Des Moines River basin
West Fork Des Moines River at Jackson..... 143
Mississippi River basin
Little Sioux River:
Little Sioux River near Lakefield..... 144
Discharge at partial-record stations and miscellaneous sites:
Low-flow partial-record stations..... 145
Crest-stage partial-record stations..... 146
Measurements at miscellaneous sites..... 153
Index..... 157

SURFACE WATER RECORDS OF MINNESOTA, 1962

INTRODUCTION

The surface-water records for the 1962 water year for gaging stations, partial-record stations, and miscellaneous sites within the State of Minnesota are given in this report. For convenience there are also included records for a few pertinent gaging stations in bordering states. The records were collected and computed by the Water Resources Division of the U.S. Geological Survey under the direction of L. R. Sawyer, district engineer, Surface Water Branch.

Through September 30, 1960, the records of discharge and stage of streams and contents and stage of lakes or reservoirs were published in an annual series of U.S. Geological Survey water-supply papers entitled "Surface Water Supply of the United States." Since 1951 there have been 20 volumes in the series; each volume covered an area whose boundaries coincided with those of certain natural drainage areas. The records in Minnesota were contained in Parts 4, 5 and 6 of that series.

Beginning with the 1962 water year, streamflow records and related data will be released by the Geological Survey in annual reports on a State-boundary basis. Distribution of these basic-data reports will be limited and primarily for local needs. The records later will be published in Geological Survey water-supply papers at 5-year intervals. These 5-year water-supply papers will show daily discharge and will be compiled on the same geographical areas previously used for the annual series; however, some of the 14 parts of conterminous United States will be further subdivided.

COOPERATION

Cooperative agreements between the U.S. Geological Survey and organizations of the State of Minnesota for the systematic collection of streamflow records began in 1909. Organizations that supplied data are acknowledged in station descriptions. Organizations that assisted in collecting data through cooperative agreements with the Survey are:

Minnesota Department of Conservation, Division of Waters, Sidney A. Frellsen, director.

Minnesota Department of Highways, L. P. Zimmerman, Commissioner, succeeded by James C. Marshall.

Minnesota State Iron Range Resources and Rehabilitation Commission, Kaarlo J. Otava, Commissioner, succeeded by A. M. De Yoannes.

Hennepin County Board of Commissioners, G. W. Matthews, chairman.

Assistance in the form of funds or services was given by Corps of Engineers, U.S. Army, in collecting records for 30 gaging stations published in this report.

Several gaging stations in the Hudson Bay and St. Lawrence River basins were maintained by funds appropriated to the United States Department of State.

On waters adjacent to the international boundary, certain gaging stations 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."

DEFINITION OF TERMS AND ABBREVIATIONS

The terms of streamflow and other hydrologic data, as used in this report, are defined as follows:

Gaging station is a particular site on a stream, canal, lake or reservoir where systematic observations of gage height or discharge are obtained. When used

in connection with a discharge record, the term is applied only to those gaging stations where a continuous record of discharge is obtained.

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

Cubic foot per second (cfs) is the rate of discharge of a stream whose channel is 1 square foot in cross-sectional area and whose average velocity is 1 foot per second.

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.

Runoff in inches (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.

Acre-foot (ac-ft) is the quantity of water required to cover an acre to the depth of 1 foot and is equivalent to 43,560 cubic feet.

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, 1.983471 acre-feet, or 646,317 gallons, and represents a runoff of 0.0372 inch from 1 square mile.

Stage-discharge relation is the relation between gage height and the amount of water flowing in a channel, expressed as volume per unit of time.

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, a long reach of the channel, or an artificial structure.

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.

The drainage area of a stream at a specified location is that area, measured in a horizontal plane, which is so enclosed by a topographic divide that direct surface runoff from precipitation normally would drain 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.

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

DOWNSTREAM ORDER AND STATION NUMBERS

Stations are listed in the same downstream order used in the water-supply papers. Records are listed in a downstream direction along the main stem with all stations on a tributary entering above a main-stem station listed before that station. If a tributary enters between two main-stem stations, it is listed between them. A similar order is followed listing stations on first rank, second rank, and other ranks of tributaries. To indicate the rank of any tributary on which a gaging station is situated and the stream to which it is immediately tributary, each indention in the listing of gaging stations in the table of contents of this report represents one rank. This downstream order and system of indention shows which gaging stations are on tributaries between any two stations on a main stem and the rank of the tributary on which each gaging station is situated.

As an added means of identification, each gaging station and partial-record station has been assigned a station number. The numbers have been assigned in the same downstream order used in the annual series of water-supply papers. In assigning station numbers, no distinction is made between partial-record stations and continuous-record gaging stations, so that 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 numbers to allow for new stations that may be established; hence the numbers are not consecutive.

The complete number for each station, such as 5-3310.00, includes the part number "5" and a six digit station number. In this report, the part number and only the essential digits of the station number are shown. For example, the complete number 5-3310.00 would appear as 5-3310, just to the left of the station name. In this report, the records are listed in downstream order by parts. All records for a drainage basin encompassing more than one State could be arranged in downstream order by assembling pages from the various State reports by station number to include all records in the basin.

EXPLANATION OF DATA

The base data collected at gaging stations consist of records of stage and measurements of discharge. In addition, observations of factors affecting the stage-discharge relation, weather records, and other information are used to supplement base data in determining the daily flow. The records of stage are obtained from a water-stage recorder that gives a continuous record of fluctuations or from direct readings on a nonrecording gage. Measurements of discharge are made with a current meter by the general methods adopted by the Geological Survey on the basis of experience in stream gaging since 1888. These methods are described in Water-Supply Paper 888 and are also outlined in standard textbooks on the measurement of stream discharge.

Rating tables giving the discharge for any stage are prepared from stage-discharge relation curves defined by discharge measurements. If extensions to the rating curves are necessary to define the extremes of discharge, they are made on the basis of indirect measurements of peak discharge (such as slope-area or contracted-opening measurements, or computation of flow over dams or weirs), velocity-area studies, and logarithmic plotting. The application of the daily mean gage height to those rating tables gives the daily mean discharge, from which the monthly and the yearly mean discharge are computed. 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 individual discharge measurements and notes by engineers and observers are used in applying the gage heights to the rating tables. If the stage-discharge

relation for a station is temporarily changed by the presence of aquatic growth or debris on the control, the daily mean discharge is computed by what is in effect the shifting-control method.

At some gaging stations the stage-discharge relation is affected by 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 determining discharge. Information required for determining 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. For such stations, the rate of change in stage is used as a factor in determining discharge.

At some gaging stations the stage-discharge relation is affected by ice during the winter, and it becomes impossible to compute the discharge in the usual manner. Discharge for periods of ice effect is computed on the basis of the gage-height record and occasional winter discharge measurements, consideration being given to the available information on temperature and precipitation, notes by gage observers and engineers, and comparable records of discharge for other stations in the same or nearby basins.

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 the daily discharge. This happens when the recorder stops or otherwise fails to operate properly, intakes are plugged, float is frozen in the well, or for various other reasons. For such periods the daily discharges are estimated on the basis of recorded range in stage, adjoining good record, discharge measurements, weather records, and comparison with other station records from the same or nearby basins.

The data in this report generally comprise a description of the station, a skeleton rating table, and a table showing the daily discharge and monthly and yearly discharge of the stream. Tables of mean daily gage height are included for some stations. Records are published for the water year which begins on October 1 and ends on September 30. A calendar for the 1961 water year is shown on page II to facilitate finding the day of the week for any date.

The description of the station gives the location, drainage area, records available, type and history of gages, average discharge, extremes of discharge, and general remarks. The location of the gaging station and the drainage area are obtained from the most accurate maps available. River mileage given under "Location" for some stations, is that determined and used by the Corps of Engineers unless otherwise noted. Under "Records available" are given periods for which there are published records for the present station or for stations generally equivalent to the present one. Under "Gage" are given the type of gage currently in use and the datum of the gage above mean sea level, and a condensed history of the types, locations, and datums of previous gages used during the period of records available. The references to "datum of 1929" and adjustments of other years are to the datum and adjustments of the U.S. Coast and Geodetic Survey. Under "Average discharge" is given the average discharge for the number of years indicated. It is not given for stations having fewer than five complete years of record or for stations where changes in water development during the period of record cause the figure to have little significance. Under "Extremes" are given the maximum discharge and gage height; the minimum discharge if there is little or no regulation; the minimum daily discharge if there is extensive regulation (also the minimum discharge if useful); and the minimum gage height if it is significant. In the first paragraph, the data given are for the complete current water year unless otherwise specified. In the second paragraph, the data given are for the periods of record within the calendar year dates in the heading (not necessarily those for the complete years indicated by the heading dates). Reliable information concerning major floods that have occurred outside the period of record are given in the third or last paragraph under "Extremes." Unless otherwise qualified, the maximum discharge corresponds to the crest stage obtained by use of a water-stage recorder, a crest-stage indicator, or a nonrecording gage read at the time of the crest. If the maximum gage height did not occur at the same time as the maximum discharge, it is given separately. Information pertaining to the accuracy of the records and to conditions which affect the natural flow at the gaging station is given under "Remarks."

Skeleton rating tables are published for all stations except those for which the daily discharge for the greater part of the open-water period was determined by the shifting-control method, the slope method, or other special methods involving an equivalent adjustment to the gage height of more than one-tenth foot. Skeleton rating tables generally are not published for canals, ditches, or springs.

The daily table gives the discharge corresponding to the daily mean gage height unless there are large or rapid changes in discharge during a day. For days having large or rapid changes, discharge for the day is computed by averaging the mean discharges for several parts of a day. For digital recorders, the daily mean discharge is always the average of the discharges at each punched reading. For stations equipped with nonrecording gages, the daily discharge corresponds to once-daily readings of the gage or to the mean of twice-daily readings; but for periods of rapidly changing stage the discharge is determined from a gage-height graph based on gage readings.

In the table of daily discharge, the figures for the maximum day and the minimum day for each month are underlined only on the first day of its occurrence.

In the monthly summary below the daily table, the line headed "Total" gives the sum of the daily figures; it is the total cfs-days for the month. The line headed "Mean" gives the average flow in cubic feet per second during the month. Discharge for the month may be expressed in cubic feet per second per square mile (line headed "Cfsm"), or in inches (line headed "In."), or in acre-feet (line headed "Ac-ft"). Figures for cubic feet per second per square mile and runoff in inches are omitted if the drainage area includes large noncontributing areas, or if the average annual rainfall on the drainage basin is usually less than 20 inches.

In the yearly summary below the monthly summary, the figures of maximum are the maximum daily discharges, not the momentary discharges when the water was at crest stage. Likewise, the minimums in this summary are the minimum daily discharges.

GPO 802-479-2

Peak discharges and the times of their occurrence and corresponding gage heights for most stations are listed below the table of daily and monthly discharge. All independent peaks above the selected base are given. The base discharge, which is given in parentheses, is selected so that an average of about three peaks a year can be presented. Peak discharges are not published for any stream for which the peaks are subject to substantial control by man. Time of day is expressed in 24-hour time, for example, 12:30 a.m. is 0030, 1:30 p.m. is 1330.

Footnotes to the table of daily discharge indicate periods for which discharge was computed or estimated by unusual or special methods because of no gage-height record, ice effect, or other conditions that reduce the degree of accuracy of the records. The footnotes are either reference footnotes, with corresponding symbols used in the table of daily discharge to indicate the days included, or general footnotes, introduced by the word "Note," in which the days included are stated. The methods used in computing data for such footnoted periods have been explained in preceding paragraphs.

For most gaging stations on lakes and reservoirs the data presented comprise a description of the station and a monthly summary table of stage and contents. For some reservoirs a table showing daily contents or stage is given. A skeleton table of capacity at given stages is published each year for all reservoirs for which records are published on a daily basis, but it is not published for reservoirs for which only monthly data are given.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS

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

The station description states the degree of accuracy of the records. "Excellent" indicates that, in general, the error in the daily records is believed to be less than 5 percent; "good," less than 10 percent; "fair," less than 15 percent; and "poor," probably more than 15 percent. The records of monthly and yearly mean discharge and runoff are, in general, more nearly accurate than the daily records.

Discharge at some stations, as indicated by the monthly mean, may vary widely from natural runoff, owing to 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 when relatively large negative adjustments are made or when evaporation is large in comparison with the observed discharge.

SUPPLEMENTAL DATA

Data collected at partial-record stations and at miscellaneous sites are given at the end of this report. Data for partial-record stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations, and the second is a table of annual maximum stage and discharge at crest-stage stations. Discharge measurements at miscellaneous sites are given in a third table.

Information of a more detailed nature than that published for most of the gaging stations is on file in the district office, such as discharge measurements and recorder charts or nonrecording-gage readings. At many gaging stations water samples are collected from the streams for the purpose of making chemical analyses; computing dissolved solids, suspended sediment loads, and particle-size distribution; or measuring water temperatures. For most of these samples the results are published in an annual series of U.S. Geological Survey water-supply papers entitled "Quality of Surface Waters of the United States." Information on the availability of unpublished data, or quality of water records may generally be obtained from the district office.

4-0105. Pigeon River at Middle Falls, below International Bridge, Minn.

(International gaging station)

Location.--Lat 48°00'44", long 89°36'58", in NE¼ sec.24, T.64 N., R.6 E., on right bank 400 ft upstream from Middle Falls, 3½ miles upstream from mouth, and 5¾ miles downstream from International Bridge.

Drainage area.--600 sq mi.

Records available.--June to October 1921, April to November 1922, March 1923 to September 1962. Published as "at International Bridge" April 1924 to September 1940. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Water-stage recorder. Datum of gage is 789.58 ft above mean sea level, datum of 1929. Prior to Sept. 2, 1936, staff gage and Sept. 2, 1936, to Sept. 30, 1940, wire-weight gage at International Bridge, 5¾ miles upstream at datum 100.24 ft higher.

Average discharge.--39 years (1923-62), 481 cfs.

Extremes.--Maximum discharge during year, 1,580 cfs Apr. 29 (gage height, 4.43 ft); minimum daily, 104 cfs Feb. 8, 9; minimum gage height, 0.84 ft Jan. 22.
1923-62: Maximum discharge, 11,000 cfs May 5, 1934 (gage height, 7.6 ft, site and datum then in use), from rating curve extended above 7,000 cfs; minimum, 27 cfs Nov. 4, 1945 (gage height, -0.08 ft).

Remarks.--Records good except those for periods of ice effect, which are fair.

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

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Spr. 22		Apr. 23 to Sept. 30			
1.0	137	1.0	172	3.0	817
2.0	414	1.5	302	4.0	1,320
3.0	775	2.0	452	5.0	2,010

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	217	181	139	126	116	112	160	1,200	788	363	285	285
2	215	320	142	128	116	112	166	1,220	744	346	274	288
3	207	762	146	130	115	111	172	1,210	697	337	271	280
4	196	749	150	132	113	111	177	1,160	655	331	280	277
5	186	582	152	132	110	112	180	1,110	644	325	282	280
6	181	480	152	130	108	113	185	1,040	652	322	406	271
7	173	426	150	128	105	115	188	914	629	331	744	263
8	168	340	150	125	104	116	192	847	597	375	847	258
9	168	330	145	122	104	118	198	805	582	424	714	269
10	*170	320	140	120	105	119	202	809	572	449	579	305
11	202	315	135	118	107	120	205	843	551	465	478	381
12	317	308	132	118	109	121	209	805	520	443	443	421
13	398	306	131	118	110	122	211	776	494	406	452	381
14	436	292	130	116	112	124	213	1,040	474	372	433	331
15	383	286	128	115	114	126	220	1,340	458	348	399	302
16	335	272	128	113	115	127	230	1,530	443	337	375	280
17	303	253	127	112	117	129	250	1,300	436	334	354	269
18	283	222	127	111	119	130	280	1,110	443	331	334	263
19	261	205	127	110	120	130	340	1,210	465	322	331	258
20	244	190	128	108	120	132	440	1,450	481	319	325	244
21	228	180	129	108	120	135	540	1,260	446	325	316	234
22	217	170	130	108	119	138	690	1,080	433	331	302	242
23	217	158	130	109	117	140	826	986	418	331	294	250
24	215	152	130	110	116	140	892	1,120	406	*325	288	263
25	212	148	130	112	116	142	1,060	1,170	399	331	280	*277
26	202	143	128	114	114	144	1,060	1,040	387	334	274	277
27	194	140	127	117	*113	146	*1,060	947	*375	316	269	266
28	191	*138	*125	118	113	*149	1,340	856	363	308	266	255
29	196	137	125	117	-	151	1,490	801	369	322	*263	242
30	194	137	124	117	---------	154	1,250	*796	372	322	263	231
31	*189	----------	124	*117	---------	158	----------	809	----------	302	271	----------
Total	7,298	8,642	4,161	3,659	3,167	3,997	14,625	32,584	15,293	10,827	11,692	8,443
Mean	235	288	134	118	113	129	488	1,050	510	349	377	281
Cfsm	0.392	0.480	0.223	0.197	0.188	0.215	0.813	1.75	0.850	0.582	0.628	0.468
In.	0.45	0.54	0.26	0.23	0.20	0.25	0.91	2.02	0.95	0.67	0.72	0.52

Calendar year 1961: Max 3,260 Min 76 Mean 383 Cfsm 0.638 In. 8.67
Water year 1961-62: Max 1,530 Min 104 Mean 341 Cfsm 0.568 In. 7.72

Peak discharge (base, 3,000 cfs). No peak above base

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 8-11, 14, Nov. 17 to Apr. 22.

4-0145. Baptism River near Beaver Bay, Minn.

Location.--Lat 47°20'15", long 91°12'00", in SE¼NE¼ sec.15, T.56 N., R.7 W., on right bank 260 ft upstream from bridge on U. S. Highway 61, 0.2 mile upstream from mouth, 4 miles northeast of Silver Bay, and 7 miles northeast of village of Beaver Bay.

Drainage area.--140 sq mi.

Records available.--October 1927 to September 1962. Monthly discharge only for some periods, published in WSP 1307.

Gage.--Water-stage recorder. Datum of gage is 609.97 ft above mean sea level (Corps of Engineers bench mark). Prior to Oct. 5, 1934, staff gage at same site and datum.

Average discharge.--35 years, 158 cfs.

Extremes.--Maximum discharge during year, 1,440 cfs Apr. 28 (gage height, 4.47 ft); minimum, 13 cfs Aug. 30 (gage height, 1.96 ft).
1927-62: Maximum discharge recorded, 9,350 cfs Aug. 9, 1939 (gage height, 8.11 ft), from rating curve extended above 4,000 cfs; minimum daily, 0.4 cfs Jan. 5, 6, 1940.

Remarks.--Records good except those for periods of ice effect or no gage-height record, which are fair.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Apr. 9		Apr. 10 to Sept. 30			
2.0	15	2.0	14	3.3	248
2.3	32	2.3	32	3.5	385
2.6	58	2.6	59	4.0	840
2.9	98	2.9	106	4.5	1,490
3.1	155	3.1	161		
3.5	374				

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	32	78	29	34	16	20	52	641	348	66	44	39
2	31	163	30	34	16	20	52	587	285	56	36	37
3	32	283	30	34	16	20	52	524	233	59	31	34
4	35	223	31	34	16	20	56	479	204	59	32	34
5	32	179	31	34	17	20	68	406	233	55	36	42
6	30	145	30	32	17	19	120	378	180	47	62	37
7	27	115	30	34	17	18	125	310	176	131	80	31
8	24	91	29	32	16	18	110	291	158	332	74	28
9	*23	80	29	30	16	18	95	285	140	224	67	157
10	23	76	28	27	15	18	85	348	124	224	56	325
11	148	71	28	26	15	18	87	362	131	228	63	370
12	191	74	28	26	16	19	100	722	146	165	149	254
13	159	81	27	25	17	18	106	731	128	126	143	176
14	132	74	27	25	17	18	114	686	111	91	102	126
15	105	71	27	25	18	18	114	731	91	70	82	93
16	91	66	27	24	19	18	137	659	76	59	66	72
17	78	62	28	24	19	19	158	551	78	53	54	59
18	67	49	29	23	19	19	370	444	116	49	44	48
19	61	45	30	22	19	19	470	686	121	44	37	41
20	53	44	31	22	19	20	479	713	102	44	32	35
21	53	42	32	21	19	20	533	614	87	54	25	32
22	50	41	32	20	19	20	623	596	104	58	21	30
23	50	40	33	20	19	22	650	860	100	69	22	29
24	48	38	33	20	19	23	740	1,230	100	*72	21	100
25	49	35	33	19	19	25	890	910	116	91	20	*158
26	49	31	33	19	19	27	*810	650	*106	84	18	137
27	47	*28	33	19	*19	*32	952	497	87	69	14	111
28	79	27	*33	18	20	37	1,300	370	72	64	*14	96
29	108	27	34	17	-	44	1,010	*318	80	69	14	80
30	*98	28	34	*16	---	54	731	318	76	65	14	69
31	91	---	34	16	---	54	---	340	---	54	26	---
Total	2096	2407	943	772	493	735	11,189	17,237	4,109	2,931	1,499	2,880
Mean	67.6	80.2	30.4	24.9	17.6	23.7	373	556	137	94.5	48.4	96.0
Cfsm	0.483	0.573	0.217	0.178	0.126	0.169	2.66	3.97	0.979	0.675	0.346	0.686
In.	0.56	0.64	0.25	0.20	0.13	0.20	2.97	4.58	1.09	0.78	0.40	0.76

Calendar year 1961: Max 2,740 Min 2.8 Mean 110 Cfsm 0.786 In. 10.63
Water year 1961-62: Max 1,300 Min 14 Mean 130 Cfsm 0.929 In. 12.56

Peak discharge (base, 1,300 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
4-28	0230	4.47	1,440	5-24	0600	4.41	1,350

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 19 to Dec. 29, Jan. 13 to Feb. 27, Mar. 15 to Apr. 9 (no gage-height record Jan. 17-29; discharge estimated on basis of recorded range in stage and weather records).

4-0155. Second Creek near Aurora, Minn.

Location.--Lat 47°31'25", long 92°11'35", in SW¼ sec.12, T.58 N., R.15 W., on left bank 0.1 mile downstream from First Creek, 0.4 mile upstream from mouth, and 2.1 miles east of Aurora.

Drainage area.--26.3 sq mi.

Records available.--March 1955 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,410.36 ft above mean sea level, datum of 1929 (levels by Erie Mining Company).

Average discharge.--7 years, 17.0 cfs.

Extremes.--Maximum discharge during year, 99 cfs May 24 (gage height, 4.67 ft); minimum daily, 2.2 cfs Feb. 7-10; minimum gage height, 3.16 ft Jan. 19, 20, Feb. 8.
1955-62: Maximum discharge, 213 cfs Apr. 22, 1961; maximum gage height, 5.75 ft Mar. 28, 1957 (backwater from ice); minimum discharge, 1.9 cfs Aug. 3, 1956; minimum gage height, 3.12 ft Dec. 24, 1961.

Remarks.--Records good except those for periods of ice effect, which are fair.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

3.4	8.0	4.0	39
3.6	15	4.5	82
3.8	25	5.0	136

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	17	15	9.2	4.6	2.3	2.7	15	68	* 37	19	25	*13
2	17	18	9.6	4.7	2.3	2.8	*13	* 57	33	17	21	12
3	19	*24	9.2	* 5.1	* 2.3	3.0	*12	49	30	17	22	10
4	17	24	10	4.6	2.3	3.2	10	44	30	17	20	11
5	16	23	10	4.3	2.3	3.5	10	37	35	17	20	10
6	16	21	10	4.0	2.3	* 4.1	11	34	33	16	30	8.9
7	15	20	9.6	3.8	2.2	4.6	12	32	30	34	30	8.0
8	14	18	8.9	3.6	2.2	5.1	12	32	28	66	31	8.0
9	13	16	8.2	3.5	2.2	5.5	12	33	26	73	30	9.6
10	13	14	7.8	3.4	2.2	5.9	12	33	24	76	25	12
11	17	14	7.3	3.3	2.3	6.2	12	33	37	66	26	16
12	18	15	7.0	3.3	2.3	6.6	16	52	34	55	29	17
13	22	14	6.7	3.3	2.4	7.2	14	58	30	45	28	17
14	22	14	6.4	3.2	2.4	7.5	11	60	30	34	27	16
15	22	17	6.0	3.0	2.4	8.0	9.9	71	27	27	24	13
16	22	18	5.8	2.9	2.4	8.6	9.9	69	29	24	21	10
17	*22	18	5.3	2.8	2.4	9.6	10	64	29	24	21	9.2
18	20	17	5.1	2.6	2.4	11	14	56	26	21	19	8.6
19	17	15	4.9	2.5	2.4	15	16	61	26	19	17	9.6
20	16	10	4.7	2.5	2.5	16	17	66	24	25	16	10
21	15	9.6	4.6	2.5	2.5	17	20	60	21	23	15	11
22	13	9.6	4.5	2.5	2.5	16	19	64	24	22	14	10
23	14	9.9	4.5	2.5	2.5	16	21	90	23	28	14	8.9
24	16	9.9	4.5	2.5	2.5	15	22	98	21	34	15	10
25	17	10	4.4	2.5	2.5	14	22	90	20	37	15	9.6
26	15	9.6	4.4	2.5	2.5	14	22	75	22	* 37	13	10
27	14	9.2	4.4	2.5	2.5	15	42	60	20	33	13	*13
28	14	8.8	4.5	2.5	2.6	18	68	49	20	28	13	12
29	12	8.3	4.5	2.5	-	20	75	41	25	24	13	13
30	13	*8.0	4.5	2.4	---	19	73	38	*21	27	12	9.6
31	16	---	4.5	2.4	---	17	---	40	---	25	12	---
Total	514	437.9	201.0	98.3	66.6	317.1	632.8	1,714	815	1,010	631	336.0
Mean	16.6	14.6	6.48	3.17	2.38	10.2	21.1	55.3	27.2	32.6	20.4	11.2
Cfsm	0.631	0.555	0.246	0.121	0.090	0.388	0.802	2.10	1.03	1.24	0.776	0.426
In.	0.73	0.62	0.28	0.14	0.09	0.45	0.89	2.42	1.15	1.43	0.89	0.48

Calendar year 1961: Max 198 Min 2.3 Mean 18.1 Cfsm 0.688 In. 9.32
Water year 1961-62 Max 98 Min 2.2 Mean 18.6 Cfsm 0.707 In. 9.57

Peak discharge (base, 60 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
4-28	2100	4.42	74	5-24	0600	4.67	99
5-15	1100	4.42	75	7-10	0900	4.46	78

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 8, 18, 19, 24, 27, 28, Dec. 5, Dec. 9 to Mar. 14, Mar. 17-25, Mar. 30 to Apr. 3, Apr. 10.

4-0160. Partridge River near Aurora, Minn.

Location.--Lat 47°31'02", long 92°11'24", in SE¼SW¼ sec.12, T.58 N., R.15 W., on right bank at upstream side of highway bridge, 1,000 ft downstream from Second Creek, 2½ miles east of Aurora, and 2¾ miles upstream from mouth.

Drainage area.--156 sq mi.

Records available.--August 1942 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,402.30 ft above mean sea level, datum of 1929. Aug. 5, 1942, to Aug. 25, 1944, staff gage and Aug. 26, 1944, to July 1, 1956, water-stage recorder at site 45 ft downstream at same datum.

Average discharge.--20 years 124 cfs (adjusted for storage and diversion).

Extremes.--Maximum discharge during year, 680 cfs July 12 (gage height, 4.60 ft); minimum daily, 7.4 cfs Feb. 9, 10; minimum gage height, 1.33 ft during period Jan. 17 to Feb. 2, Feb. 7 to Mar. 5, from recorded range in stage.

1942-62: Maximum discharge, 3,230 cfs May 10, 1950 (gage height, 7.86 ft); minimum, 2.2 cfs Jan. 30, 31, 1961; minimum gage height, that during period Jan. 17 to Feb. 2, Feb. 7 to Mar. 5, 1962.

Remarks.--Records good except those for periods of ice effect, which are fair. Flow regulated at times by storage in off-channel Partridge Reservoir, formerly known as Whitewater Lake. Reservoir formed from lake by levees around marsh areas and natural outlet. Available capacity, 20,000 acre-ft between elevations 1,410 ft (natural lake level) and 1,440 ft. Storage began Apr. 9, 1955. Storage in reservoir obtained from Colby Lake during periods of high flow; release from storage returned to Colby Lake to maintain lake elevation during diversion for iron-ore processing. Diversion began Feb. 7, 1956. Some seepage losses from reservoir bypass station.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Mar. 24		Mar. 25 to Sept. 30			
1.2	7.5	1.9	26	3.0	128
1.5	13	2.1	33	3.5	230
2.0	29	2.4	52	4.0	382
2.5	54	2.7	85	5.0	930
3.0	120				

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	40	40	38	17	8.9	8.0	37	93	* 312	69	172	*52
2	40	45	38	16	9.1	8.3	* 34	*80	296	65	157	49
3	45	* 58	38	* 16	*9.0	8.5	34	*69	275	63	141	47
4	45	57	39	16	*8.3	8.9	35	60	261	58	120	45
5	40	43	38	15	7.8	9.2	35	56	247	55	111	43
6	43	50	37	15	7.7	* 9.6	37	58	228	50	130	41
7	42	56	36	14	7.6	9.7	39	69	212	84	146	39
8	36	39	35	14	7.5	10.0	41	84	194	185	183	40
9	39	41	34	14	7.4	10	38	98	175	283	210	45
10	40	47	33	14	7.4	10	37	111	159	369	205	50
11	46	50	32	13	7.5	10	41	123	170	605	201	55
12	43	39	30	13	7.6	11	44	174	159	665	192	52
13	44	40	29	13	7.6	11	38	203	153	595	177	55
14	48	45	28	12	7.6	11	37	280	144	440	177	59
15	52	53	27	12	7.6	12	37	396	125	302	177	50
16	44	56	25	11	7.6	13	39	465	117	244	150	44
17	*43	41	24	11	7.6	15	38	396	112	198	132	42
18	45	40	24	10	7.7	18	38	334	104	160	115	41
19	49	40	23	9.5	7.7	23	41	430	97	133	98	39
20	44	38	23	9.2	7.7	28	46	460	92	132	85	39
21	38	37	22	8.8	7.7	30	38	465	87	120	74	38
22	40	36	22	8.6	7.7	31	33	490	76	118	66	36
23	42	35	22	8.6	7.8	30	35	575	85	130	69	33
24	45	34	22	8.7	7.8	28	38	625	87	157	66	37
25	48	35	21	8.8	7.8	28	38	660	87	183	71	36
26	40	36	21	8.8	7.8	27	39	670	85	*225	76	40
27	36	36	20	8.8	7.8	29	60	635	79	255	77	*51
28	40	36	20	8.6	7.8	33	93	565	77	252	72	55
29	41	37	18	8.5	-	37	101	465	84	225	64	52
30	43	*37	18	8.5	--------	37	99	382	*73	205	57	47
31	45	--------	17	8.7	--------	37	--------	340	--------	185	55	--------
Total	1,326	1,277	854	360.1	219.1	591.2	1,340	9,911	4,452	6,810	3,826	1,352
Mean	42.8	42.6	27.5	11.6	7.82	19.1	44.7	320	148	220	123	45.1
(ƒ)	+13.0	+13.1	+1.1	-0.2	-0.18	-0.6	+61.5	+120	+26	+43	+22	+9.6
Mean≠	55.8	55.7	28.6	11.4	7.64	18.5	106	440	274	263	145	54.7
Cfsm≠	0.358	0.357	0.183	0.073	0.049	0.119	0.679	2.82	1.76	1.69	0.929	0.351
In.≠	0.41	0.40	0.21	0.08	0.05	0.14	0.76	3.25	1.96	1.95	1.07	0.39

Calendar year 1961: Max 682 Min 2.3 Mean 53.4 Mean≠ 83.0 Cfsm≠ 0.532 In.≠ 7.22
Water year 1961-62: Max 670 Min 7.4 Mean 88.5 Mean≠ 114 Cfsm≠ 0.731 In.≠ 10.67

* Discharge measurement made on this day.

ƒ Change in contents in Partridge Reservoir and diversion to iron-ore processing plant, equivalent in cubic feet per second; furnished by Erie Mining Co.

≠ Adjusted for change in contents and diversion.

Note.--Stage-discharge relation affected by ice Nov. 19-23, Dec. 6 to Mar. 15 (no gage-height record Jan. 18 to Feb. 2, Feb. 7 to Mar. 5.

4-0165. St. Louis River near Aurora, Minn.

Location.--Lat 47°29'30", long 92°14'20", in SW¼ sec.22, T.58 N., R.15 W., on left bank at upstream side of highway bridge, three-quarters of a mile downstream from Partridge River and 1½ miles south of Aurora.

Drainage area.--312 sq mi.

Records available.--August 1942 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,371.24 ft above mean sea level, datum of 1929. Prior to Aug. 26, 1944, chain gage at same site and datum.

Average discharge.--20 years, 237 cfs (adjusted for storage and diversion).

Extremes.--Maximum discharge during year, 1,270 cfs May 25 (gage height, 4.09 ft); minimum daily, 22 cfs Feb. 7-11; minimum gage height, 0.88 ft during period Feb. 8-15, from recorded range in stage.
1942-62: Maximum discharge, 5,380 cfs May 14, 1950 (gage height, 8.37 ft); minimum, 4.0 cfs Oct. 2, 3, 1948 (gage height, 0.30 ft).

Remarks.--Records good except those for period of ice effect, which are fair. Flow regulated at times by storage in off-channel Partridge Reservoir, formerly known as Whitewater Lake. Reservoir formed from lake by levees around marsh areas and natural outlet. Available capacity 20,000 acre-ft between elevations 1,410 ft (natural lake level) and 1,440 ft. Storage began Apr. 9, 1955. Storage in reservoir obtained from Colby Lake during periods of high flow; release from storage returned to Colby Lake to maintain lake elevation during diversion for iron-ore processing. Diversion began Feb. 7, 1956. Some seepage losses from reservoir enter above station.

Rating tables, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Apr. 29		Apr. 30 to Sept. 30			
1.0	48	1.3	89	3.0	615
1.5	110	1.6	140	4.0	1,200
2.0	228	2.0	237	5.0	1,990
3.0	643	2.5	394		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	71	65	60	40	23	23	69	412	732	248	295	140
2	66	77	59	40	23	24	* 64	*401	*672	215	273	132
3	77	94	59	*40	*23	25	63	*398	615	209	252	127
4	77	92	60	39	24	26	64	387	580	199	229	121
5	68	77	60	37	23	27	64	378	551	188	215	118
6	69	81	59	36	23	* 27	68	368	508	172	261	109
7	70	*93	58	36	22	28	71	361	467	234	279	104
8	61	88	57	35	22	28	74	374	430	345	317	101
9	63	80	56	35	22	29	75	381	394	434	342	114
10	65	86	54	35	22	30	72	391	371	508	342	129
11	81	89	54	35	22	30	72	391	384	694	351	132
12	77	80	53	35	23	30	75	480	378	770	355	132
13	78	77	52	35	24	31	71	570	368	716	348	134
14	80	82	51	35	24	31	65	641	342	595	345	136
15	86	89	49	34	25	32	64	775	310	459	329	129
16	80	93	48	33	25	33	65	836	289	398	304	118
17	74	82	47	32	25	34	68	808	276	361	279	106
18	*76	74	46	32	25	36	69	694	258	317	258	112
19	77	72	46	31	24	39	74	797	249	286	234	107
20	75	71	46	31	24	41	78	863	234	307	212	104
21	63	70	46	30	24	42	78	913	223	317	193	101
22	64	68	46	30	24	42	81	960	223	317	176	100
23	70	67	45	29	24	43	84	1,120	212	310	186	96
24	72	65	45	29	24	43	90	1,230	212	326	181	114
25	80	63	44	28	24	45	94	1,260	209	351	176	104
26	71	62	43	28	24	47	96	1,220	215	371	172	109
27	62	62	42	27	23	50	157	1,150	212	*387	167	118
28	65	61	42	26	23	56	308	1,050	209	378	160	*123
29	68	60	41	25	-	65	391	942	234	384	154	119
30	70	* 60	41	24	----------	71	412	858	*223	339	146	114
31	70	----------	40	24	----------	71	----------	802	----------	310	*144	----------
Total	2,226	2,280	1,549	1,006	658	1,179	3,176	22,211	10,580	11,445	7,675	3,503
Mean	71.8	76.0	50.0	32.5	23.5	38.0	106	716	353	369	248	117
(✓)	+13.0	+13.1	+1.1	-0.2	-0.2	-0.6	+62	+120	+26	+43	+22	+10
Mean≠	84.8	89.1	51.1	32.3	23.3	37.4	168	836	379	412	270	127
Cfsm≠	0.272	0.286	0.164	0.104	0.075	0.120	0.538	2.68	1.21	1.32	0.865	0.407
In.≠	0.31	0.32	0.19	0.12	0.08	0.14	0.60	3.09	1.35	1.52	0.99	0.45

Calendar year 1961:	Max	11,030	Min	10	Mean	125	Mean≠	155	Cfsm≠	0.497	In.≠	6.72
Water year 1961-62:	Max	1,260	Min	22	Mean	185	Mean≠	211	Cfsm≠	0.676	In.≠	9.16

* Discharge measurement made on this day.
✓ Change in contents in Partridge Reservoir and diversion to iron-ore processing plant, equivalent in cubic feet per second; furnished by Erie Mining Company.
≠ Adjusted for change in contents and diversion.
Note.--Stage-discharge relation affected by ice Nov. 18 to Mar. 29 (no gage-height record Feb. 8-15, Feb. 26 to Mar. 4).

4-0170. Embarrass River at Embarrass, Minn.

Location.--Lat 47°39'24", long 92°11'51", in NW¼ sec.25, T.60 N., R.15 W., on left bank at Embarrass, 30 ft upstream from highway bridge and 100 ft upstream from railroad bridge.

Drainage area.--93.8 sq mi.

Records available.--August 1942 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,410.36 ft above mean sea level, datum of 1929. Prior to Aug. 28, 1944, chain gage at same site and datum.

Average discharge.--20 years, 66.7 cfs.

Extremes.--Maximum discharge during year, 572 cfs July 11 (gage height, 8.15 ft); minimum daily, 3.8 cfs Feb. 8-10.
1942-62: Maximum discharge, 1,740 cfs May 8, 9, 1950; maximum gage height, 10.92 ft May 9, 1950; minimum discharge, 1.8 cfs Aug. 16, 17, 18, 1961; minimum gage height, 0.66 ft Aug. 17, 1961.

Remarks.--Records good except those for periods of ice effect or no gage-height record, which are fair.

Rating table, water year 1961-62, except periods of ice effect,
(gage height, in feet, and discharge, in cubic feet per second)

0.8	3.0	2.0	82
.9	5.2	3.0	142
1.0	8.3	4.0	201
1.2	18	5.0	266
1.4	32	7.0	428
1.6	49	9.0	722

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	35	33	18	6.0	4.2	4.2	*24	*262	176	69	91	20
2	32	*36	18	6.0	*4.2	4.3	20	272	167	56	76	20
3	31	61	18	6.0	4.2	4.4	19	262	154	51	68	18
4	32	66	18	*6.1	4.2	4.5	22	239	141	46	67	19
5	31	62	18	6.1	4.2	4.6	29	217	135	45	73	20
6	28	57	17	6.2	4.2	4.6	34	197	128	40	110	20
7	26	*54	17	6.0	4.0	*4.7	36	179	117	86	138	19
8	24	46	16	5.8	3.8	4.7	36	167	104	274	129	17
9	25	46	15	5.6	3.8	4.7	32	161	92	385	116	17
10	32	40	14	5.4	3.8	4.7	29	155	82	522	100	22
11	40	38	14	5.4	3.9	4.7	29	150	118	566	88	34
12	51	39	13	5.3	4.0	4.7	29	166	152	513	101	34
13	61	41	12	5.3	4.1	4.7	27	187	155	439	99	29
14	66	37	11	5.3	4.1	4.7	25	199	147	362	84	24
15	62	39	10	5.2	4.1	4.7	23	222	133	284	78	22
16	*58	35	10	5.2	4.1	4.7	23	239	116	209	70	19
17	54	33	9.5	4.8	4.1	4.7	27	253	103	159	62	17
18	49	32	9.2	4.5	4.1	4.8	36	255	92	120	54	16
19	45	28	8.8	4.3	4.1	4.9	44	255	82	88	49	15
20	40	26	8.5	4.2	4.0	5.0	55	256	74	72	43	14
21	36	24	8.4	4.1	4.0	5.2	65	249	66	70	37	14
22	34	24	8.3	4.1	4.0	5.5	78	247	74	73	33	14
23	33	24	8.0	4.1	4.0	6.0	84	265	80	99	32	14
24	33	24	7.6	4.1	4.0	6.6	88	286	83	123	33	16
25	37	24	7.2	4.1	4.1	7.4	94	314	82	150	33	20
26	41	24	6.8	4.2	4.1	8.5	101	324	78	*149	30	*18
27	39	20	6.4	4.2	4.1	10.0	117	301	64	132	26	18
28	37	20	6.1	4.2	4.1	14	163	265	54	112	24	17
29	38	*19	6.0	4.2	-	23	208	227	*75	94	22	17
30	37	18	6.0	4.2	---------	28	*236	199	83	106	20	15
31	35	----------	6.0	4.2	---------	30	----------	*185	----------	109	*19	----------
Total	1,222	1,070	351.8	154.4	113.6	237.2	1,833	7,155	3,207	5,603	2,005	579
Mean	39.4	35.7	11.3	4.98	4.06	7.65	61.1	231	107	181	64.7	19.3
Cfsm	0.420	0.381	0.120	0.053	0.043	0.082	0.651	2.46	1.14	1.93	0.690	0.206
In.	0.48	0.42	0.14	0.06	0.05	0.09	0.73	2.84	1.27	2.22	0.79	0.23

Calendar year 1961: Max 715 Min 1.8 Mean 46.6 Cfsm 0.497 In. 6.74
Water year 1961-62: Max 566 Min 3.8 Mean 64.5 Cfsm 0.689 In. 9.32

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 4 to Jan. 17, Mar. 11-31, Apr. 5-7, 10, 12-16. No gage-height record Jan. 18 to Feb. 1, Feb. 7 to Mar. 6.

4-0180. Embarrass River near McKinley, Minn.

Location.--Lat 47°27'10", long 92°23'00", in NW¼ sec.4, T.57 N., R.16 W., on left bank 40 ft upstream from highway bridge, 0.9 mile downstream from outlet of Esquagama Lake, and 4½ miles southeast of McKinley.

Drainage area.--171 sq mi.

Records available.--October 1953 to September 1962 (discontinued).

Gage.--Water-stage recorder. Datum of gage is 1,338.65 ft above mean sea level, datum of 1929.

Average discharge.--9 years, 111 cfs.

Extremes.--Maximum discharge during year, 562 cfs May 25 (gage height, 8.28 ft); minimum daily, 32 cfs Feb. 9-12; minimum gage height, 3.16 ft Dec. 26.
1953-62: Maximum discharge, 1,690 cfs Apr. 20, 1954 (gage height, 11.72 ft); minimum, 11 cfs Sept. 7, 1955; minimum gage height, 2.66 ft June 26, 1959.

Remarks.--Records good except those for periods of ice effect, which are fair.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Nov. 30 to Dec. 4, Dec. 6, 7; May 28 to June 17)

3.3	44	8.0	528
4.0	103	9.0	672
6.0	308		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	96	76	*66	36	37	33	*78	319	446	*128	200	*66
2	90	*81	66	*37	38	34	79	340	*396	125	189	62
3	90	85	66	37	40	35	80	*361	367	123	181	61
4	84	87	66	37	*42	36	83	*378	346	120	169	60
5	81	87	65	36	40	*37	84	392	337	117	164	58
6	76	87	64	35	38	37	85	399	317	111	185	56
7	75	90	62	35	35	38	87	400	290	126	180	55
8	76	93	61	35	33	39	89	400	266	130	171	55
9	76	96	61	35	32	40	92	390	250	128	170	59
10	175	95	59	35	32	42	95	378	244	169	174	63
11	260	94	57	35	32	43	96	364	278	233	193	63
12	186	98	54	34	32	44	96	372	257	315	219	62
13	142	96	51	34	33	45	93	377	223	394	205	60
14	117	92	49	34	33	45	92	383	212	455	190	57
15	104	91	48	34	34	45	90	311	211	497	182	57
16	98	90	47	34	34	46	89	334	219	518	171	57
17	97	87	47	34	34	46	90	407	227	518	159	57
18	*98	82	47	34	33	47	92	429	221	494	148	57
19	107	81	46	34	33	47	92	459	208	449	139	55
20	112	78	45	34	34	48	92	473	194	403	129	53
21	105	77	43	34	34	48	96	473	182	350	121	52
22	98	76	41	35	35	49	104	475	177	294	110	51
23	93	74	39	35	35	50	113	515	162	245	107	50
24	92	73	38	36	34	50	122	551	152	213	99	54
25	91	72	37	39	33	51	134	560	146	195	92	53
26	89	72	36	41	33	52	143	556	141	189	85	53
27	84	68	34	40	33	56	178	545	134	*192	81	51
28	82	66	33	38	33	66	235	529	131	204	76	*50
29	82	66	34	37	-	81	270	516	145	211	74	49
30	77	66	35	37	---------	81	295	497	134	223	72	49
31	76	---------	35	36	---------	79	----------	476	---------	212	70	----------
Total	3,209	2476	1,532	1,107	969	1,490	3,464	13,359	7,013	8,081	4,505	1,685
Mean	104	82.5	49.4	35.7	34.6	48.1	115	431	234	261	145	56.2
Cfsm	0.608	0.482	0.289	0.209	0.202	0.281	0.673	2.52	1.37	1.53	0.848	0.329
In.	0.70	0.54	0.33	0.24	0.21	0.32	0.75	2.91	1.53	1.76	0.98	0.37

Calendar year 1961: Max 839 Min 18 Mean 112 Cfsm 0.655 In. 8.86
Water year 1961-62: Max 560 Min 32 Mean 134 Cfsm 0.784 In. 10.64

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 5, 8, 10-19, Dec. 26 to Mar. 22.

4-0190. West Two River near Iron Junction, Minn.

Location.--Lat 47°24'05", long 92°42'10", in SW¼SW¼ sec.24, T.57 N., R.19 W., on right bank 40 ft upstream from bridge on State Highway 216, 5 miles southwest of Iron Junction, and 9¼ miles upstream from St. Louis River.

Drainage area.--68.4 sq mi.

Records available.--October 1953 to September 1962 (discontinued).

Gage.--Water-stage recorder. Datum of gage is 1,322.05 ft above mean sea level, datum of 1929 (Minnesota Highway Department bench mark).

Average discharge.--9 years, 43.9 cfs.

Extremes.--Maximum discharge during year, 397 cfs May 25 (gage height, 7.09 ft); minimum daily, 6.6 cfs Feb. 27, 28, Mar. 1; minimum gage height, 2.42 ft Oct. 7-9.
1953-62: Maximum discharge, 916 cfs Apr. 17, 1954 (gage height, 9.85 ft); minimum daily, 3.0 cfs Jan. 22 to Feb. 6, 1957; minimum gage height, 2.34 ft Aug. 15-17, 24-28, 1961.

Remarks.--Records good except those for periods of ice effect, which are fair.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used June 4-28)

2.4	7.2	4.0	111
2.5	13	6.0	277
3.0	42	8.0	530

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	12	16	11	7.2	6.8	6.6	103	316	83	39	27	15
2	12	16	11	* 7.2	7.1	6.8	92	228	72	29	23	14
3	*12	21	11	7.1	7.2	7.0	81	169	62	25	21	15
4	12	29	11	7.1	7.1	7.2	78	126	55	24	20	18
5	11	27	11	7.0	*7.0	7.2	79	100	50	25	21	19
6	9.9	24	11	7.0	7.0	7.4	81	83	48	25	33	18
7	9.4	21	11	6.9	7.0	7.4	*84	67	44	31	36	17
8	8.3	20	11	6.8	6.9	7.6	87	61	40	49	36	16
9	9.9	19	10	6.8	6.8	7.6	85	62	38	79	29	20
10	11	18	10	6.8	6.9	7.7	77	64	37	*76	25	30
11	21	17	9.3	6.9	7.0	7.8	67	62	*38	56	27	*42
12	34	16	8.7	7.0	7.1	7.8	58	118	37	48	39	48
13	51	16	8.4	7.0	7.2	*8.1	51	*199	34	36	46	45
14	52	17	8.3	7.0	7.2	8.3	48	236	30	29	41	40
15	47	17	8.3	6.9	7.2	8.5	44	226	27	24	34	35
16	39	18	8.4	6.8	7.2	8.6	45	219	25	22	30	32
17	33	17	8.4	6.8	7.2	8.8	* 60	221	26	21	*27	29
18	28	16	8.5	6.8	7.2	9.0	100	193	28	19	24	25
19	24	16	8.5	6.9	7.2	9.2	147	179	27	17	23	23
20	21	15	8.5	7.0	7.2	9.5	159	187	25	20	21	21
21	19	14	8.5	7.0	7.2	9.8	161	189	23	23	20	20
22	18	14	8.5	7.0	7.1	10	164	177	22	29	20	19
23	17	14	8.4	7.0	7.0	11	162	244	22	31	19	18
24	17	13	8.4	7.1	7.0	11	153	328	22	37	18	21
25	20	12	8.2	7.0	6.8	12	149	388	20	39	18	22
26	20	12	8.0	6.8	6.7	13	137	326	18	37	17	22
27	21	*12	7.6	6.7	6.6	16	163	221	18	32	16	20
28	20	12	7.4	6.7	6.6	22	265	151	18	27	17	18
29	20	11	7.3	6.7	-	74	353	107	23	24	17	17
30	18	11	7.2	6.8	----------	105	388	89	37	27	16	17
31	*18	----------	7.2	6.8	----------	108	----------	85	----------	30	16	----------
Total	665.5	501	280.0	214.6	196.5	549.9	3,721	5,421	1,049	1,030	777	716
Mean	21.5	16.7	9.03	6.92	7.02	17.7	124	175	35.0	33.2	25.1	23.9
Cfsm	0.314	0.244	0.132	0.101	0.103	0.259	1.81	2.56	0.512	0.485	0.367	0.349
In.	0.36	0.27	0.15	0.12	0.11	0.30	2.02	2.95	0.57	0.56	0.42	0.39

Calendar year 1961: Max 836 Min 4.4 Mean 39.6 Cfsm 0.579 In. 7.86
Water year 1961-62: Max 388 Min 6.6 Mean 41.4 Cfsm 0.605 In. 8.22

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 4-6, 8-11, Nov. 13 to Apr. 15.

4-0195. East Swan River near Toivola, Minn.

Location.--Lat 47°16'55", long 92°50'05", NE¼NE¼ sec.2, T.55 N., R.20 W., on left bank, 350 ft downstream from bridge on St. Louis County Road 442, 4.8 miles upstream from confluence with West Swan River, 8 miles northwest of Toivola, and 8¾ miles upstream from St. Louis River.

Drainage area.--112 sq mi.

Records available.--September 1953 to September 1962 (discontinued).

Gage.--Water-stage recorder. Datum of gage is 1,260.46 ft above mean sea level, datum of 1929.

Average discharge.--9 years, 85.5 cfs.

Extremes.--Maximum discharge during year, 807 cfs May 24 (gage height, 13.14 ft); minimum daily, 15 cfs Feb. 9-12, Feb. 24 to Mar. 3; minimum gage height, 3.32 ft June 28.
1953-62: Maximum discharge, 1,690 cfs Apr. 15, 1956 (gage height, 17.94 ft); maximum gage height, 18.45 ft Apr. 12, 1954 (backwater from ice); minimum daily discharge, 13 cfs Jan. 28 to Feb. 3, 1955; minimum gage height, 3.15 ft Aug. 24, 1961.
Flood in May 1950 reached a stage of about 20.0 ft, from information by local residents.

Remarks.--Records good except those for periods of ice effect, which are fair.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1 to Nov. 3, Apr. 21 to May 6)

3.3	17	4.5	64	8.0	304
3.5	23	5.0	89	12.0	680
4.0	42	6.0	146	14.0	914

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	31	35	18	21	16	15	170	305	175	37	38	23
2	29	34	18	*21	16	15	160	239	148	40	30	24
3	*26	44	18	21	16	15	150	187	133	43	28	28
4	26	42	18	20	16	16	140	154	116	39	29	38
5	28	42	18	20	16	16	152	135	105	52	34	31
6	28	40	18	19	*16	16	162	118	98	42	90	26
7	30	37	18	19	16	17	*167	102	92	96	138	24
8	28	33	18	19	16	17	175	96	84	285	84	25
9	32	32	17	19	15	17	170	98	78	255	62	48
10	47	32	17	18	15	17	160	105	74	*159	53	115
11	56	33	17	18	15	17	150	107	*77	112	51	205
12	80	36	17	17	15	18	146	167	72	82	138	*218
13	88	34	17	17	16	18	140	*315	60	60	123	156
14	81	26	17	16	16	*18	137	344	52	51	86	112
15	70	25	17	16	16	19	133	347	45	42	76	86
16	60	25	17	16	16	19	132	422	42	38	71	67
17	54	25	17	16	16	19	132	403	47	32	*58	58
18	50	24	18	16	16	20	135	341	47	29	50	50
19	43	24	18	17	16	20	138	326	43	25	46	46
20	38	23	18	17	16	21	140	392	38	27	36	40
21	35	22	18	16	16	22	142	373	33	30	34	40
22	34	21	19	16	16	22	140	322	38	46	30	40
23	33	20	19	16	16	24	141	538	34	70	29	40
24	34	20	20	16	15	25	135	781	33	55	29	53
25	40	19	20	16	15	27	128	631	29	48	27	62
26	45	19	21	16	15	34	121	442	25	42	29	54
27	42	*19	21	16	15	46	*138	334	20	38	30	49
28	41	18	21	16	15	70	351	255	20	32	25	45
29	40	18	21	16	-	125	447	201	52	38	23	43
30	38	18	21	16	----------	165	384	187	48	56	22	40
31	*37	----------	21	16	----------	170	----------	194	----------	51	22	----------
Total	1,344	840	573	539	439	1,080	5,116	8,961	1,958	2,052	1,621	1,886
Mean	43.4	28.0	18.5	17.4	15.7	34.8	171	289	65.3	66.2	52.3	62.9
Cfsm	0.388	0.250	0.165	0.155	0.140	0.311	1.53	2.58	0.583	0.591	0.467	0.562
In.	0.45	0.28	0.19	0.18	0.15	0.36	1.70	2.98	0.65	0.68	0.54	0.63

Calendar year 1961: Max 1,090 Min 14 Mean 67.9 Cfsm 0.606 In. 8.23
Water year 1961-62: Max 781 Min 15 Mean 72.4 Cfsm 0.646 In. 8.79

Peak discharge (base, 400 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
4-29	0930	9.57	461	5-24	1400	13.14	807
5-16	1830	9.47	436				

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 5-11, Nov. 15 to Apr. 20.

4-0240. St. Louis River at Scanlon, Minn.

Location.--Lat 46°42'12", long 92°25'07", in NW¼ sec.30, T.49 N., R.16 W., on right bank 25 ft downstream from lower bridge on U.S. Highway 61 at Scanlon, 0.6 mile downstream from Minnesota Power & Light Co. powerplant, 3 miles upstream from Thomson Reservoir and 3.2 miles upstream from Midway River.

Drainage area.--3,430 sq mi, approximately.

Records available.--January 1908 to September 1962. Monthly discharge only for some periods, published in WSP 1307. Published as "near Thomson" 1908-50.

Gage.--Water-stage recorder. Datum of gage is 1,101.23 ft above mean sea level, datum of 1929. Oct. 5, 1909, to Sept. 5, 1914, chain gage 3 miles downstream and 50 ft below powerplant at datum about 420 ft lower. Sept. 6, 1914, to Aug. 4, 1953, powerplant record at Thomson hydroelectric plant.

Average discharge.--54 years, 2,182 cfs (unadjusted).

Extremes.--Maximum discharge during year, 14,000 cfs May 24 (gage height, 8.67 ft); minimum, 438 cfs Feb. 26, 27, 28, Mar. 1, 4 (gage height, 2.38 ft).
1908-62: Maximum daily discharge, 37,900 cfs May 9, 1950; maximum gage height, 15.8 ft, May 9, 1950, from Minnesota Highway Department (discharge uncertain); minimum daily discharge, 109 cfs Feb. 7, 1924.

Remarks.--Records good. Diurnal fluctuation caused by powerplant upstream. Flow regulated by Whiteface Reservoir and Boulder, Island, Rice and Fish Lakes (combined capacity, 332,160 acre-ft).

Rating tables, water year 1961-62 except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Nov. 1		Nov. 2 to Sept. 30			
2.5	560	2.6	585	5.0	3,840
3.0	935	3.0	885	6.0	5,940
3.5	1,450	3.5	1,380	7.0	8,740
		4.0	2,080	9.0	15,100

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	850	980	1,120	768	745	585	1,600	5,040	5,190	1,280	1,480	1,080
2	646	1,110	1,130	798	722	560	1,210	4,700	4,680	1,260	1,420	1,020
3	748	1,190	1,150	782	730	599	1,220	4,260	4,220	1,110	1,320	1,010
4	732	1,070	1,180	805	752	613	1,190	3,880	3,820	1,230	1,290	970
5	770	1,180	918	861	730	620	1,170	3,520	3,460	1,260	1,150	1,030
6	858	* 1,200	1,180	805	730	620	1,280	3,230	3,190	1,210	1,310	988
7	818	1,210	988	821	750	599	1,230	2,980	2,990	1,210	1,420	1,010
8	935	1,150	585	722	730	641	1,230	2,760	2,820	1,620	2,060	962
9	901	1,040	700	730	720	620	1,520	2,570	2,450	3,160	1,730	1,090
10	850	1,030	953	690	710	627	1,220	2,620	2,360	2,980	1,430	1,190
11	980	1,030	845	690	700	627	1,140	2,800	2,040	2,620	1,400	1,180
12	1,070	1,110	688	650	690	685	1,160	2,730	2,130	2,360	1,860	1,460
13	1,020	1,230	1,340	700	730	692	1,230	3,520	2,190	2,090	2,620	1,520
14	1,150	1,170	936	760	720	678	1,170	4,930	1,850	2,040	2,660	1,310
15	1,200	1,090	790	770	760	692	1,020	5,420	1,700	2,300	2,230	1,220
16	1,170	1,110	1,010	760	710	715	1,040	5,860	1,490	2,130	1,880	1,160
17	1,070	1,100	1,660	700	690	730	1,090	5,920	1,330	1,890	1,660	988
18	1,070	1,020	1,290	640	700	738	1,300	5,540	1,380	1,790	1,460	1,020
19	1,090	1,100	1,330	640	670	730	1,660	5,640	1,330	1,730	1,330	1,170
20	* 1,020	1,080	1,240	650 680	660	738	1,710	6,290	1,260	1,640	1,150	1,190
21	971	1,090	1,150		680	775	1,680	6,440	1,240	1,440	1,140	1,150
22	1,020	1,120	1,130	720	700	782	1,710	6,390	1,160	1,440	1,040	1,130
23	1,010	1,230	1,210	630	640	782	1,910	10,800	1,120	* 1,460	1,110	1,170
24	998	1,150	1,130	640	640	798	1,850	13,800	1,120	1,740	1,090	* 1,170
25	1,010	1,170	928	708	600	805	1,830	13,200	997	1,700	1,020	1,120
26	1,010	1,180	869	745	*640	829	* 1,830	11,500	*869	1,560	1,020	1,150
27	982	* 1,190	* 798	768	590	*829	1,930	10,000	1,080	1,550	1,090	1,180
28	1,010	1,100	790	745	580	919	3,250	8,410	1,230	1,500	*1,130	1,290
29	1,070	1,030	715	* 715	.	1,230	4,790	* 6,990	1,310	1,400	1,140	1,160
30	1,060	1,050	782	708	---------	1,460	5,350	6,260	1,350	1,400	1,070	1,130
31	1,020	---------	768	738	---------	1,790	---------	5,520	---------	1,460	1,180	---------
Total	30,109	33,510	31,303	22,539	19,419	24,108	51,520	183,520	63,356	53,560	44,890	34,218
Mean	968	1,117	1,010	727	694	778	1,717	5,920	2,112	1,728	1,448	1,141
(ƒ)	-307	-376	-593	-445	-426	-297	+908	+2,176	+536	-6	-128	-389
Mean ≠	661	741	417	282	268	481	2,625	8,096	2,648	1,722	1,320	752
Cfsm ≠	0.193	0.216	0.122	0.082	0.078	0.140	0.765	2.36	0.772	0.502	0.385	0.219
In. ≠	0.22	0.24	0.14	0.09	0.08	0.16	0.85	2.72	0.86	0.58	0.44	0.24

Calendar year 1961: Max 17,500 Min 585 Mean 1,668 Mean ≠ 1,623 Cfsm ≠ 0.473 In. ≠ 6.42
Water year 1961-62: Max 13,800 Min 560 Mean 1,622 Mean ≠ 1,676 Cfsm ≠ 0.489 In. ≠ 6.62

* Discharge measurement made on this day.
ƒ Change in contents, equivalent in cubic feet per second, in Whiteface Reservoir and Boulder, Island, Rice and Fish Lakes; records furnished by Minnesota Power and Light Co.
≠ Adjusted for change in contents.
Note.--Stage-discharge relation affected by ice Jan. 9-24, Feb. 27 to Mar. 2. No gage-height record Feb. 7-26.

5-0300. Otter Tail River near Detroit Lakes, Minn.

Location.--Lat 46°50', long 95°42', in sec.23, T.139 N., R.40 W., on right bank 10 ft upstream from highway bridge, 5 miles downstream from Height of Land Lake, and 7½ miles east of city of Detroit Lakes.

Drainage area.--270 sq mi.

Records available.--March 1937 to September 1962.

Gage.--Water-stage recorder and concrete control. Datum of gage is 1,409.49 ft above mean sea level, datum of 1929.

Average discharge.--25 years, 52.7 cfs (38,150 acre-ft per year).

Extremes.--Maximum discharge during year, 316 cfs June 8 (gage height, 4.65 ft); minimum, 1.6 cfs Nov. 8 (gage height, 2.67 ft).
1937-62: Maximum discharge, 371 cfs June 26, 1943 (gage height, 4.78 ft, from graph based on partial record); maximum gage height, 6.96 ft Jan. 27, 1950 (backwater from ice); minimum daily discharge, 0.1 cfs Mar. 23, 1940.

Remarks.--Records good except those for periods of ice effect, which are fair. Flow partly regulated by dams of Minnesota Department of Conservation on several lakes above station.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)

2.8	4.5	3.5	50
2.9	7.5	3.7	78
3.0	12	4.0	133
3.1	17	4.5	267
3.3	30	5.0	446

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	8.2	6.8	7.8	10	14	18	29	67	258	176	86	22
2	7.2	6.8	7.8	10	14	18	30	68	258	179	84	20
3	6.8	7.2	7.8	10	14	18	30	68	258	176	81	22
4	6.5	7.2	7.2	* 10	15	19	35	70	258	179	78	21
5	5.9	7.2	7.0	11	15	19	* 36	68	261	169	76	18
6	5.6	7.2	7.0	11	15	20	36	71	261	166	74	17
7	5.6	6.5	7.2	11	15	20	38	76	261	166	71	* 15
8	5.6	6.5	7.2	11	15	21	48	76	296	159	68	17
9	5.6	7.2	7.3	11	* 15	22	50	79	302	151	* 67	26
10	5.9	7.2	7.5	11	15	23	50	81	286	*141	65	33
11	6.8	7.2	7.7	11	16	23	50	84	280	131	73	35
12	6.5	7.2	7.8	11	16	24	51	84	267	109	76	32
13	6.5	7.2	7.9	11	16	24	52	100	261	125	73	30
14	6.5	6.8	8.0	11	16	25	52	107	261	129	68	30
15	6.5	6.8	8.1	12	16	25	52	119	*252	129	62	29
16	6.8	7.2	8.2	12	16	26	54	141	258	137	60	30
17	6.8	7.2	8.4	12	16	26	56	147	267	151	51	30
18	6.8	6.8	8.4	12	16	* 27	57	* 141	267	137	48	29
19	6.8	7.2	8.5	12	16	27	57	143	252	135	47	25
20	6.8	6.8	8.7	12	16	27	*60	143	243	129	47	22
21	6.5	6.8	8.9	12	17	28	62	143	240	127	46	19
22	6.5	6.5	9.0	13	17	28	64	169	237	127	43	17
23	5.9	6.8	9.0	13	17	28	65	195	231	123	42	17
24	5.6	6.8	9.1	13	17	28	67	198	220	117	39	21
25	6.8	6.8	9.1	13	17	28	64	216	213	113	37	19
26	* 6.8	6.8	9.2	13	17	28	62	222	207	109	34	18
27	7.5	6.8	9.2	13	17	28	67	219	198	104	32	17
28	7.5	6.8	9.2	13	17	29	60	222	190	100	29	16
29	7.5	* 6.8	9.3	14	-	29	60	240	184	98	27	16
30	6.8	7.5	9.5	14	----------	29	65	249	179	93	26	16
31	6.8	----------	9.7	14	----------	29	----------	255	----------	86	24	----------
Total	203.9	208.6	256.7	367	443	764	1,559	4,261	7,406	4,171	1,734	679
Mean	6.58	6.95	8.28	11.8	15.8	24.6	52.0	137	247	135	55.9	22.6
Ac-ft	404	414	509	728	879	1,520	3,090	8,450	14,690	8,270	3,440	1,350

Calendar year 1961: Max 142 Min 3.5 Mean 35.7 Ac-ft 25,830
Water year 1961-62: Max 302 Min 5.6 Mean 60.4 Ac-ft 43,740

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 5 to Apr. 1.

5-0405. Pelican River near Fergus Falls, Minn.

Location.--Lat 46°20'10", long 96°07'00", in NE¼ sec.17, T.133 N., R.43 W., on right bank 90 ft downstream from bridge on U. S. Highway 52, 3 miles northwest of Fergus Falls and 7½ miles upstream from mouth.

Drainage area.--482 sq mi.

Records available.--June 1909 to December 1912, July 1942 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,179.98 ft above mean sea level, datum of 1929 (levels by Minnesota Highway Department). June 19, 1909, to Dec. 31, 1912, staff gage at site 1 mile downstream at different datum. July 1, 1942, to Nov. 6, 1955, staff gage at present site and datum.

Average discharge.--22 years (1910-12, 1942-62) 69.8 cfs (50,530 acre-ft per year).

Extremes.--Maximum discharge during year, 365 cfs May 24 (gage height, 3.45 ft); maximum gage height, 4.98 ft Mar. 21 (backwater from ice); minimum daily discharge, 0.9 cfs Feb. 7-14.
1909-12, 1942-62: Maximum discharge, 756 cfs Mar. 29, 1943 (gage height, 5.53 ft); maximum gage height observed, 5.60 ft Mar. 28, 1950 (backwater from ice); no flow on many days in 1946, 1949-50.

Remarks.--Records good except those for period of ice effect, which are fair. Flow affected by storage in lakes above station.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used July 3 to Sept. 25)

1.2	8.0	2.5	153
1.4	16	3.0	259
1.7	35	4.0	497
2.0	70		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	11	12	12	5.0	1.0	1.0	30	149	275	241	177	117
2	11	13	12	4.9	1.0	1.0	70	145	270	261	171	115
3	11	13	12	4.9	1.0	1.0	135	137	266	261	165	119
4	10	13	11	* 4.8	1.0	1.0	170	129	261	277	161	120
5	10	12	11	4.7	1.0	1.0	*190	128	257	275	153	119
6	10	12	10	4.7	1.0	1.1	210	124	250	289	153	*113
7	11	13	10	4.5	.9	1.2	190	122	248	294	155	112
8	11	14	9.9	4.1	.9	1.3	160	122	300	280	*155	117
9	13	14	10	3.8	*.9	1.4	150	122	322	270	153	135
10	14	15	10	3.5	.9	1.5	142	124	336	*266	151	161
11	14	19	9.6	3.3	.9	1.5	138	124	336	257	195	165
12	14	21	9.3	3.3	.9	1.6	136	126	322	248	195	165
13	14	22	8.8	3.2	.9	1.6	135	126	305	239	189	159
14	14	20	8.4	3.1	.9	1.6	139	126	*294	233	185	155
15	15	14	8.1	2.8	1.0	1.7	128	137	294	226	189	153
16	15	19	7.7	2.6	1.0	1.8	128	197	307	224	177	155
17	16	21	7.4	2.5	1.0	1.9	137	*211	348	217	175	149
18	16	12	7.2	2.4	1.0	*2.0	149	215	341	213	171	141
19	14	13	7	2.2	1.0	2.1	149	228	329	257	165	135
20	14	14	6.7	2.0	1.0	2.3	* 141	226	322	246	157	129
21	14	11	6.4	1.8	1.0	4.0	135	219	317	233	151	124
22	15	10	6.1	1.7	1.0	7.2	129	270	305	224	147	120
23	14	12	5.9	1.5	1.0	8.4	126	322	298	217	145	122
24	14	13	5.7	1.4	1.0	9.5	122	348	291	211	141	126
25	14	13	5.4	1.3	1.0	11.0	120	351	284	204	137	124
26	* 14	13	5.4	1.3	1.0	12	115	339	270	202	131	126
27	14	13	5.4	1.2	1.0	13	137	322	259	197	126	120
28	14	12	5.3	1.2	1.0	14	143	310	250	191	119	119
29	14	*12	5.2	1.1		16	147	294	241	189	120	117
30	13	12	5.1	1.1	----------	18	151	291	235	193	119	122
31	13	----------	5.0	1.0	----------	21	----------	282	----------	187	119	----------
Total	411	427	249.0	86.9	27.2	163.7	4,152	6,366	8,733	7,322	4,847	3,954
Mean	13.3	14.2	8.03	2.80	0.97	5.28	138	205	291	236	156	132
Ac-ft	815	847	494	172	54	325	8,240	12,620	17,320	14,520	9,610	7,840

Calendar year 1961: Max 129 Min 5.0 Mean 34.0 Ac-ft 24,630
Water year 1961-62: Max 351 Min 0.9 Mean 101 Ac-ft 72,860

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 23 to Apr. 12. Computed from once daily staff-gage readings Oct. 1 to Dec. 26, Jan. 16 to Mar. 20.

5-0459.5. Orwell Reservoir near Fergus Falls, Minn.

Location.--Lat 46°12'55", long 96°10'40", in SW¼ sec.26, T.132 N., R.44 W., at dam on Otter Tail River at outlet of Orwell Reservoir, 7 miles southwest of Fergus Falls, Minn.

Drainage area.--1,830 sq mi, approximately.

Records available.--March 1953 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,000.00 ft above mean sea level, adjustment of 1912. Gage readings reduced to elevations above mean sea level.

Extremes.--Maximum contents during year, 16,920 acre-ft June 17 (elevation, 1,072.38 ft); minimum, 1,060 acre-ft Mar. 25 (elevation, 1,048.28 ft).
1953-62: Maximum contents, that of June 17, 1962; minimum (after initial filling), 844 acre-ft Aug. 26, 27, 1953 (elevation, 1,046.96 ft).

Remarks.--Reservoir is formed by earth dam with concrete spillway with one taintor gate; storage began in March 1953. Capacity to elevation, 1,075 ft (maximum operating stage) is 20,400 acre-ft of which 19,400 acre-ft is controlled storage above elevation 1,048 ft (minimum operating stage). Dead storage, 210 acre-ft. Figures given herein represent total contents. Reservoir is used for flood control and to increase low flow for water supply and pollution abatement.

Cooperation.--Records furnished by Corps of Engineers.

Month-end elevation and contents, water year October 1961 to September 1962

Date	Elevation (feet)≠	Contents (acre-feet)	Change in contents (acre-feet)
Sept.30	1,065.90	10,120	-
Oct. 31	1,064.03	8,620	-1,500
Nov. 30	1,059.48	5,440	-3,180
Dec. 31	1,055.30	3,340	-2,100
Calendar year 1961	-	-	-7,760
Jan. 31	1,051.70	1,960	-1,380
Feb. 28	1,054.83	3,130	+1,170
Mar. 31	1,050.68	1,650	-1,480
Apr. 30	1,051.45	1,880	+ 230
May 31	1,069.50	13,550	+11,670
June 30	1,068.85	12,850	- 700
July 31	1,067.00	11,100	-1,750
Aug. 31	1,054.00	2,800	-8,300
Sept.30	1,064.22	8,780	+5,980
Water year 1961-62	-	-	-1,340

≠ Elevation at 2400.

5-0460. Otter Tail River below Orwell Dam, near Fergus Falls, Minn.

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

Drainage area.--1,830 sq mi, approximately.

Records available.--October 1930 to September 1962. Prior to October 1952, published as Otter Tail River below Pelican River, near Fergus Falls. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 1,029.65 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Oct. 11, 1930, to Nov. 17, 1933, at same site at datum 2.00 ft higher; Nov. 18, 1933, to Mar. 21, 1953, at site 6.1 miles upstream at datum 40.30 ft higher.

Average discharge.--32 years, 254 cfs (183,900 acre-ft per year).

Extremes.--Maximum discharge during year, 1,260 cfs June 26 (gage height, 4.40 ft); minimum, 50 cfs Jan. 4 (gage height, 1.96 ft).
1930-62: Maximum discharge, 1,710 cfs June 17, 1953 (gage height, 5.60 ft, backwater from aquatic vegetation); minimum, 1.0 cfs May 2, 1934, Sept. 30, 1935; minimum daily, 1.6 cfs Feb. 7, 1937.

Remarks.--Records good. Flow regulated by Orwell Reservoir beginning Mar. 21, 1953 (see preceding page) and powerplants upstream.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Feb. 4		Feb. 5 to Sept. 30			
2.0	35	2.1	75	3.5	712
2.2	69	2.3	132	4.0	997
2.5	169	2.6	247	4.5	1,330
		3.0	444		

Discharge, in cubic feet per second, water year October 1962 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	109	98	92	72	85	118	392	449	943	1,140	1,020	408
2	105	98	90	70	82	130	382	481	943	931	997	413
3	105	105	90	66	82	124	377	492	943	883	979	413
4	105	109	90	* 64	86	128	387	481	937	1,120	961	418
5	105	109	90	70	90	145	* 397	476	937	1,110	943	418
6	105	115	90	69	90	174	408	470	931	1,120	925	*387
7	105	122	90	69	90	170	428	465	937	1,100	943	372
8	105	119	90	70	90	170	449	460	590	1,110	*1,040	377
9	105	119	90	72	*93	187	449	413	532	1,100	1,040	382
10	102	115	90	76	88	214	449	377	850	*1,090	860	387
11	102	112	90	80	88	218	444	377	860	1,080	1,020	392
12	98	112	90	80	88	214	444	382	866	1,070	1,010	397
13	98	112	90	80	94	210	439	387	883	1,060	997	428
14	102	115	90	80	95	210	439	423	* 895	1,040	1,010	470
15	98	115	90	79	96	206	439	492	919	1,030	986	476
16	98	115	90	79	96	210	428	572	967	1,020	967	486
17	98	115	90	90	96	* 210	428	* 609	1,140	1,000	860	492
18	102	115	90	95	96	215	423	626	1,250	997	750	492
19	98	115	90	95	96	226	*423	412	1,240	826	669	497
20	95	115	90	92	96	274	418	231	*1,240	399	663	497
21	95	112	90	90	96	283	418	247	1,240	326	599	497
22	95	112	90	90	96	297	418	265	1,240	321	481	502
23	95	112	90	95	96	270	418	274	1,240	551	512	476
24	95	112	90	95	96	252	465	283	1,240	889	534	465
25	* 95	112	90	92	100	252	508	288	1,240	967	518	465
26	95	112	90	92	102	283	492	423	1,240	961	524	465
27	92	105	90	92	106	341	476	696	1,240	955	508	465
28	92	95	83	90	112	372	455	806	1,220	949	481	455
29	92	* 95	81	82	-	378	449	901	1,190	943	470	444
30	92	95	78	86	----------	382	449	949	1,170	991	428	444
31	92	----------	76	87	----------	392	----------	943	----------	1,040	397	----------
Total	3,070	3,312	2,750	2,539	2,621	7,255	12,991	15,150	31,063	29,119	24,092	13,280
Mean	99.0	110	88.7	81.9	93.6	234	433	489	1,035	939	777	443
Ac-ft	6,090	6,570	5,450	5,040	5,200	14,390	25,770	30,050	61,610	57,760	47,790	26,340

Calendar year 1961 Max 503 Min 46 Mean 186 Ac-ft 134,600
Water year 1961-62: Max 1,250 Min 64 Mean 403 Ac-ft 292,100

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Jan. 5, 8-14, 30, Feb. 4 to Mar. 8, Mar. 13, 16, 18.

GPO 802-479-3

5-0500. Bois de Sioux River near White Rock, S. Dak.

Location.--Lat 45°51'45", long 96°34'25", in SW¼SW¼ sec.27, T.128 N., R.47 W., on left bank just downstream from Big Slough Outlet, 300 ft downstream from White Rock Dam, 4 miles south of White Rock, and 5 miles northwest of Wheaton, Minn.

Drainage area.--1,160 sq mi, approximately.

Records available.--October 1941 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 959.89 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Jan. 14, 1943, staff gage at same site and datum.

Average discharge.--21 years, 82.3 cfs (59,580 acre-ft per year).

Extremes.--Maximum discharge during year, 1,620 cfs Aug. 6 (gage height, 11.52 ft); no flow on many days.
1941-62: Maximum discharge, that of Aug. 6, 1962; no flow at times in most years.

Remarks.--Records good except those for period of ice effect, which are fair. Flow regulated by Lake Traverse-Bois de Sioux Flood Control and Water Conservation project (available capacity for flood control, 137,000 acre-ft).

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1						0	2.2	438	520	1,160	1,540	498
2						0	2.4	431	602	1,040	1,600	496
3						0	2.5	445	596	889	1,590	482
4						0	*2.7	452	770	1,040	1,570	459
5						0	12	455	1,100	1,170	1,550	444
6						0	50	450	1,220	757	1,550	*435
7						0	110	440	1,240	282	1,540	415
8						0	180	*442	935	216	*1,530	401
9						0	200	433	655	*120	1,510	393
10						0	165	433	699	249	1,470	397
11						0	125	433	581	617	1,450	381
12						0	87	429	388	1,080	1,440	360
13						0	97	431	164	1,290	1,430	292
14						0	140	474	*111	1,350	1,420	181
15						0	148	534	352	1,340	1,400	174
16						0	115	639	631	1,330	1,370	171
17						*0	106	*615	635	1,320	1,360	167
18						0	102	635	646	1,310	1,340	160
19						0	*70	566	642	1,410	1,290	152
20						0	48	220	*718	1,270	1,150	148
21						0	50	51	790	1,010	1,000	143
22						0	47	142	859	943	577	138
23						0	44	548	943	908	469	136
24						0	44	568	941	985	490	134
25	(*)					0	42	467	1,070	1,120	484	133
26						0	179	229	1,180	1,220	482	129
27						.1	334	83	1,170	1,300	478	126
28						.3	438	58	1,170	1,290	482	101
29		(*)			-	.6	438	272	1,160	1,290	488	78
30					---------	1.5	445	490	1,160	1,290	486	73
31		----------			---------	1.9	----------	486	----------	1,480	482	----------
Total	0	0	0	0	0	4.4	3,825.8	12,789	23,648	32,076	35,018	7,797
Mean	0	0	0	0	0	0.14	128	413	788	1,035	1,130	260
Ac-ft	0	0	0	0	0	8.7	7,590	25,370	46,910	63,620	69,460	15,470

Calendar year 1961: Max 18 Min 0 Mean 1.33 Ac-ft 960
Water year 1961-62: Max 1,600 Min 0 Mean 316 Ac-ft 228,400

* Discharge measurement or observation of no flow made on this day.
Note.--Stage-discharge relation affected by ice Mar. 27 to Apr. 16.

5-0515. Red River of the North at Wahpeton, N. Dak.

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

Drainage area.--4,010 sq mi, approximately.

Records available.--April 1942 to September 1962. Gage-height records collected in this vicinity since 1917 are contained in reports of U.S. Weather Bureau.

Gage.--Water-stage recorder and concrete and wooden dam. Datum of gage is 943 ft above mean sea level, datum of 1929. Prior to Aug. 6, 1943, Weather Bureau staff gage 800 ft upstream, converted to present datum. Aug. 6, 1943, to Oct. 27, 1950, chain gage at present site and datum.

Average discharge.--19 years (1943-62), 516 cfs (373,600 acre-ft per year).

Extremes.--Maximum discharge during year, 5,650 cfs June 11 (gage height, 13.98 ft); minimum, 43 cfs Nov. 3 (gage height, 2.89 ft).
1942-62: Maximum discharge, 7,130 cfs Apr. 12, 1952 (gage height, 14.99 ft); minimum, 8 cfs Aug. 25, 1961 (gage height, 2.26 ft).
Maximum stage known, 17.0 ft in spring of 1897.

Remarks.--Records good, except those for period of ice effect, which are fair. Flow regulated by Orwell Reservoir (capacity, 28,400 acre-ft), Lake Traverse (capacity, 137,000 acre-ft, available for flood control), numerous other controlled lakes and ponds, and several powerplants.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 9 to Dec. 6)

3.0	62	4.0	296	8.0	1,990
3.2	93	5.0	624	11.0	3,650
3.6	184	6.0	1,010	14.0	5,670

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	110	104	95	80	90	130	420	994	*1,800	2,200	2,470	870
2	110	101	104	80	*92	120	435	974	1,740	2,260	2,510	890
3	108	65	101	81	94	135	*450	*970	1,720	2,250	2,530	902
4	108	99	88	*83	95	145	470	990	1,700	2,360	2,550	890
5	* 106	127	73	75	90	150	530	986	1,790	3,020	2,520	878
6	106	116	60	60	80	150	*690	974	1,990	3,490	2,500	874
7	106	116	85	75	90	155	830	974	2,220	4,300	2,470	830
8	110	101	65	75	95	170	*930	954	3,720	4,650	2,450	799
9	112	* 110	85	70	100	175	860	962	5,030	4,170	*2,480	818
10	119	121	75	65	100	185	940	*914	5,390	3,290	2,500	846
11	116	125	70	80	100	195	1,010	846	5,610	* 2,550	2,480	838
12	112	119	80	90	100	210	*970	846	*5,140	2,310	2,500	814
13	110	101	75	95	100	230	1,140	858	3,990	2,390	2,540	799
14	112	90	70	95	105	240	1,450	858	*2,650	2,450	2,520	776
15	112	121	65	90	110	250	1,650	950	1,780	2,450	2,460	723
16	112	108	65	85	105	260	*1,860	1,310	1,640	2,420	2,400	734
17	108	88	65	80	100	270	1,970	2,070	2,170	2,390	2,360	707
18	110	88	65	85	100	275	1,940	2,170	2,670	2,360	2,280	696
19	110	86	65	90	100	270	1,760	2,670	2,840	2,720	2,160	685
20	110	97	55	95	100	260	*1,600	3,210	2,620	3,450	2,030	682
21	106	125	60	90	100	265	1,320	2,440	2,390	3,610	1,880	674
22	108	121	65	90	105	270	1,070	2,120	2,220	3,170	1,700	671
23	99	121	70	90	110	300	882	3,770	2,190	2,570	*1,210	678
24	104	110	70	90	115	340	745	* 4,980	2,180	2,210	1,030	667
25	106	110	75	95	120	360	682	5,140	2,140	2,250	1,050	635
26	108	91	80	95	125	360	682	4,410	2,160	*2,370	1,030	624
27	104	73	80	90	120	340	723	4,390	2,200	2,380	1,020	624
28	101	*79	80	90	*125	340	*866	2,210	2,200	2,360	998	620
29	102	85	80	90		*370	954	* 1,730	* 2,190	2,350	970	595
30	102	90	80	85	----------	420	998	1,650	2,160	2,340	966	554
31	104	----------	80	80	----------	*450	----------	1,480	----------	2,360	918	----------
Total	3,351	3,088	2,326	2,614	2,866	7,790	30,827	59,800	80,240	85,450	61,482	22,393
Mean	108	103	84.3	84.3	102	251	1,028	1,929	2,675	2,756	1,983	746
Ac-ft	6,650	6,120	4,610	5,180	5,680	15,450	61,140	118,600	159,200	169,500	121,900	44,420

Calendar year 1961: Max 537 Min 10 Mean 198 Ac-ft 143,200
Water year 1961-62: Max 5,610 Min 55 Mean 992 Ac-ft 718,400

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 7 to Apr. 15.

5-0540. Red River of the North at Fargo, N. Dak.

Location.--Lat 46°51'40", long 96°47'00", in NW¼NE¼ sec.18, T.139 N., R.48 W., at city water plant on 4th St. S. in Fargo, 25 miles upstream from mouth of Sheyenne River and at mile 453.

Drainage area.--6,800 sq mi, approximately.

Records available.--May 1901 to September 1962. Published as "at Moorhead, Minn." 1901.

Gage.--Water-stage recorder and concrete control. Datum of gage is 867.4 ft above mean sea level, datum of 1929. Prior to Sept. 1, 1914, staff gage at site 1½ miles downstream at datum 6.65 ft lower. Sept. 1, 1914 to July 31, 1928, staff gage at site 1 mile downstream at datum 3.70 higher. Aug. 1, 1928, to Apr. 12, 1959, staff gage at site 1 mile downstream at present datum. Aug. 13, 1959 to June 21, 1960, water-stage recorder at site 2 miles upstream at present datum.

Average discharge.--61 years, 504 cfs (364,900 acre-ft per year, unadjusted); median of yearly mean discharges, 410 cfs (297,000 acre-ft per year, unadjusted).

Extremes.--Maximum discharge during year, 9,580 cfs June 14; maximum gage height, 22.83 ft June 14; minimum discharge, 55 cfs Jan. 13 (gage height, 7.72 ft).
1901-62: Maximum discharge, 16,300 cfs Apr. 15, 16, 1952; maximum gage height, 28.79 ft Apr. 16, 1952; no flow for many days in each year for period 1932-41.
Maximum stage known, 40.1 ft Apr. 7, 1897, site and datum in use prior to 1914.

Remarks.--Records good except those for the period of ice effect, which are fair. Flow regulated by Orwell Reservoir (capacity, 28,400 acre-ft), Lake Traverse (capacity, 137,000 acre-ft, available for flood control), other controlled lakes and ponds and several power plants. Some small diversion for municipal supply. Figures of daily discharge do not include diversion by City of Fargo.

Discharge, in second feet, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	100	107	80	71	90	*107	377	1,300	*5,330	2,490	4,070	1,040
2	100	96	80	74	84	96	*419	1,330	*4,390	2,490	3,680	1,000
3	96	104	80	77	80	104	455	1,300	3,560	2,660	3,500	968
4	* 96	104	80	80	87	123	514	1,250	*2,790	3,620	3,400	960
5	96	90	87	* 80	84	134	697	1,200	*2,370	4,440	3,330	960
6	93	77	* 93	70	71	123	1,430	1,190	2,300	4,700	3,260	952
7	90	80	80	60	65	107	1,760	1,180	*2,350	5,590	3,160	936
8	90	* 90	71	60	77	119	*2,140	1,160	3,210	6,660	* 3,020	944
9	93	96	65	60	74	130	2,270	* 1,140	5,040	7,270	2,890	912
10	96	93	65	60	77	134	2,370	1,120	6,390	*7,870	2,790	896
11	123	104	65	60	77	143	*2,440	1,100	7,650	8,120	3,040	888
12	111	130	60	60	80	156	2,600	1,070	*8,700	8,160	3,520	*896
13	115	138	65	58	87	177	*3,000	1,000	*9,350	*7,940	3,770	896
14	115	126	65	65	90	177	3,500	968	*2,570	7,000	3,830	880
15	111	119	65	71	100	173	*3,850	976	*9,390	6,300	3,770	864
16	104	115	65	77	100	173	4,250	1,020	8,780	5,650	3,600	848
17	96	111	65	80	90	191	4,900	1,260	*8,250	5,230	3,330	808
18	104	104	62	80	77	220	6,000	1,990	7,210	4,840	3,000	800
19	104	87	68	77	77	236	*6,400	3,070	6,430	4,620	2,760	785
20	111	71	68	71	80	252	*5,970	3,810	5,770	4,770	2,600	770
21	104	74	68	74	80	262	5,300	4,250	5,280	5,650	2,430	755
22	104	96	68	77	87	230	*4,510	*4,830	*4,890	6,440	2,290	748
23	96	119	71	84	87	225	3,450	5,530	*4,460	7,060	2,110	755
24	100	130	71	87	96	215	2,330	6,540	3,940	7,310	* 1,890	755
25	100	130	74	90	100	225	*1,610	*7,240	3,360	*7,140	1,490	755
26	104	130	74	93	93	257	1,290	7,790	2,790	6,700	1,250	755
27	107	126	74	93	96	329	1,180	8,270	*2,610	6,030	1,180	718
28	100	107	77	93	104	359	1,150	*8,510	2,530	5,480	1,160	704
29	104	84	80	93	-	* 371	1,140	8,340	*2,500	5,080	1,130	690
30	107	80	74	93	----------	371	*1,220	7,640	2,460	4,760	1,100	697
31	104	----------	71	*90	----------	377	----------	*6,540	----------	4,380	1,070	----------
Total	3,174	3,118	2,231	2,358	2,390	6,296	78,522	103,914	153,650	176,450	83,420	25,335
Mean	102	104	72.0	76.1	85.4	203	2,617	3,352	5,122	5,692	2,691	844
Ac-ft	6,300	6,180	4,430	4,680	4,740	12,490	155,700	206,100	304,800	350,000	165,500	50,250
(ƒ)	409	379	404	400	345	396	392	442	471	450	580	418
Mean≠	109	110	78.5	82.6	91.6	210	2,624	3,359	5,130	5,699	2,700	852
Ac-ft≠	6,700	6,560	4,830	5,080	5,090	12,880	156,100	206,600	305,200	350,400	166,000	50,670

Calendar year 1961:	Max	928	Min	12	Mean	208	Ac-ft	150,800	Mean≠	216	Ac-ft≠	156,600
Water year 1961-62:	Max	9,570	Min	58	Mean	1,756	Ac-ft	1,271,000	Mean≠	1,763	Ac-ft≠	1,276,000

* Discharge measurement made on this day.
ƒ Diversion in acre-ft, by the City of Fargo.
≠ Adjusted for diversion.

5-0610. Buffalo River near Hawley, Minn.

Location.--Lat 46°51'00", long 96°19'45", near center of SE¼ sec.14, T.139 N., R.45 W., near left downstream end of bridge on farm lane, 2 miles southwest of Hawley.

Drainage area.--322 sq mi.

Records available.--March 1945 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,111.91 ft above mean sea level, datum of 1929. Prior to Jan. 29, 1953, chain gage at bridge 1,800 ft upstream at datum 3.17 ft lower.

Average discharge.--17 years, 72.1 cfs (52,200 acre-ft per year).

Extremes.--Maximum discharge during year, 1,430 cfs June 10 (gage height, 9.11 ft); minimum daily, 9.6 cfs Jan. 26 to Feb. 5.
1945-62: Maximum discharge, 1,590 cfs Aug. 5, 1955 (gage height, 9.31 ft); minimum observed, 6.8 cfs July 28, 1945; minimum gage height, 2.55 ft Sept. 5, 1961.
Maximum stage known, about 11.3 ft, present datum, in spring of 1921, from information by local resident.

Remarks.--Records good except those for period of ice effect, which are poor.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Apr. 25 to May 3, May 24-28)

2.6	9.1	6.0	348
2.8	14	7.0	522
3.0	22	8.0	810
3.5	54	9.0	1,340
4.0	99	9.1	1,420
5.0	212		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	16	18	15	11	9.6	12	70	153	486	132	78	28
2	15	18	15	11	9.6	12	85	138	425	143	73	28
3	15	17	14	11	9.6	12	100	123	380	160	69	34
4	14	16	14	10	9.6	12	*140	113	338	189	74	38
5	14	15	16	10	9.6	12	261	102	308	208	68	36
6	14	15	16	10	10	12	332	94	283	202	65	32
7	13	15	15	10	10	12	358	87	276	247	61	30
8	14	17	15	10	10	13	308	81	425	332	59	36
9	14	16	14	10	10	13	184	79	*1,120	398	55	44
10	16	15	14	10	10	13	129	76	1,390	372	52	57
11	18	15	14	10	10	14	141	75	1,340	322	75	66
12	18	16	13	10	11	14	133	73	1,170	294	120	64
13	19	16	13	10	12	14	190	70	985	251	136	56
14	19	18	13	10	12	14	205	68	821	204	104	48
15	18	19	13	10	13	14	176	77	687	172	83	44
16	18	17	13	9.8	13	14	171	92	781	155	71	44
17	17	15	12	9.8	13	14	175	184	660	140	63	44
18	17	17	12	9.8	13	14	177	334	588	126	57	42
19	17	18	12	9.8	*13	14	181	404	526	127	52	38
20	16	17	12	9.8	13	15	182	378	462	120	49	36
21	16	15	12	9.7	12	15	217	353	412	113	45	34
22	16	15	12	9.7	12	16	256	329	366	109	46	34
23	16	14	12	9.7	12	*17	269	370	319	118	46	36
24	18	15	12	*9.7	12	17	226	530	282	114	44	38
25	18	14	12	9.7	12	18	190	*639	243	104	41	*40
26	18	15	12	9.6	12	20	166	648	*211	94	36	40
27	20	16	12	9.6	12	25	*160	645	182	87	34	38
28	20	15	12	9.6	12	35	170	571	161	83	*32	38
29	19	*15	*12	9.6	-	45	168	522	145	83	31	36
30	*19	15	12	9.6	----------	*50	163	482	132	*85	31	37
31	19	----------	11	9.6	----------	60	----------	484	----------	85	29	----------
Total	521	479	406	308.1	317.0	582	5,683	8,374	15,904	5,369	1,879	1,216
Mean	16.8	16.0	13.1	9.94	11.3	18.8	18.9	270	530	173	60.6	40.5
Ac-ft	1,030	950	805	611	629	1,150	11,270	16,610	31,550	10,650	3,730	2,410

Calendar year 1961: Max 238 Min 8.3 Mean 35.8 Ac-ft 25,950
Water year 1961-62: Max 1,390 Min 9.6 Mean 112 Ac-ft 81,400

* Discharge measurement made on this day.

Note.--Stage-discharge relation affected by ice Nov. 3 to Apr. 3 (no gage-height record Feb. 7-18, Feb. 22 to Mar. 11, Mar. 15-22).

5-0615. South Branch Buffalo River at Sabin, Minn.

Location.--Lat 46°46'20", long 96°37'40", in SW¼SW¼ sec.9, T.138 N., R.47 W., near center of span on downstream side of highway bridge, a quarter of a mile downstream from Whiskey Creek and 1 mile east of Sabin.

Drainage area.--522 sq mi.

Records available.--March 1945 to September 1962.

Gage.--Chain gage read once or twice daily. Datum of gage is 902.39 ft above mean sea level, datum of 1929 (levels by Soil Conservation Service). Prior to Aug. 17, 1948, at site 1 mile downstream at different datum.

Average discharge.--17 years, 54.8 cfs (39,670 acre-ft per year).

Extremes.--Maximum discharge during year, 6,340 cfs June 9 (gage height, 17.04 ft); no flow Jan. 17 to Apr. 4. 1945-62: Maximum discharge, that of June 9, 1962; no flow for many days in most years.

Remarks.--Records fair except those for periods of ice effect or no gage-height record, which are poor.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	5.7	7.4	5.5	0.4			0	158	418	92	57	a 4.0
2	6.7	7.4	5.0	.3			0	175	376	92	67	a 4.0
3	6.4	7.0	5.2	.2			0	171	309	122	64	a 4.0
4	5.3	5.5	5.5	.2			*0	137	247	a220	a 60	4.0
5	5.8	4.8	5.5	.2			20	111	*206	371	53	6.0
			5.2									
6	6.0	4.2	5.0	.2			600	91	177	509	100	5.5
7	6.5	4.4	5.0	.2			1,000	77	159	a720	153	4.3
8	8.4	4.6		.2			*900	65	376	1,150	87	6.4
9	8.8	4.8	4.8	.2			600	59	*3,940	1,040	40	7.2
10	8.9	5.2	4.4	.2			550	56	5,750	716	33	15
11	9.1	5.4	4.2	.2			*510	52	4,240	512	a 100	33
12	10	6.0	4.0	.2			480	50	3,010	329	a 250	42
13	11	8.0	3.8	.1			500	48	1,770	218	370	42
14	12	7.5	3.2	.1			700	47	965	a180	326	38
15	13	7.5	2.6	.1			751	47	702	a150	220	32
16	13	7.5	2.4	.1			*689	56	778	a120	132	27
17	12	7.5	2.2	0			628	77	1,400	96	76	28
18	12	7.5	2.2	0			530	200	1,740	81	a55	30
19	12	7.0	2.0	0			428	572	1,380	88	a35	a25
20	11	6.8	1.8	0	(*)		328	1,140	950	103	29	23
21	11	6.8	1.6	0			*220	1,520	698	a115	23	19
22	10	6.8	1.2	0			176	1,190	550	125	20	a18
23	9.5	6.6	1.2	0		(*)	154	1,500	451	135	a18	a16
24	8.9	6.6	a1.0	0			138	2,530	a365	156	a16	15
25	8.6	6.4	a1.0	*0			122	*2,700	297	143	a14	*18
26	8.2	6.2	a.8	0			105	1,760	236	100	a12	a20
27	8.1	6.2	a.8	0			*102	1,050	*185	72	9.1	24
28	7.6	6.2	*.6	0			106	756	148	a60	5.8	24
29	7.4	*6.1	.7	0	-	(*)	128	625	120	49	*6.2	24
30	7.4	6.0	.6	0	----------		146	520	97	56	6.4	a24
31	*7.0	----------	.5	0	----------		----------	442	----------	*44	4.0	----------
Total	277.3	189.9	89.5	3.1	0	0	10,611	17,982	32,040	7,964	2,441.5	582.4
Mean	8.95	6.33	2.89	0.10	0	0	354	580	1,068	257	78.8	19.4
Ac-ft	550	377	178	6.1	0	0	21,050	35,670	63,550	15,800	4,840	1,160

Calendar year 1961: Max 229 Min 0 Mean 21.2 Ac-ft 15,360
Water year 1961-62: Max 5,750 Min 0 Mean 198 Ac-ft 143,200

* Discharge measurement or observation of no flow made on this day.
a No gage-height record.
Note.--Stage-discharge relation affected by ice Nov. 3 to Apr. 14.

5-0620. Buffalo River near Dilworth, Minn.

Location.--Lat 46°57'40", long 96°39'40", in SW¼SE¼ sec.6, T.140 N., R.47 W., on left bank 4½ miles southeast of Kragnes, 6½ miles northeast of Dilworth, and 9 miles downstream from South Branch.

Drainage area.--1,040 sq mi, approximately.

Records available.--March 1931 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Altitude of gage is 870 ft (from topographic map). Prior to Apr. 5, 1937, chain gage at same site and datum.

Average discharge.--31 years, 116 cfs, 83,980 acre-ft per year).

Extremes.--Maximum discharge during year, 6,140 cfs June 11, (gage height, 23.56 ft); minimum daily, 9.2 cfs Jan. 30 to Feb. 3.
1931-62: Maximum discharge, that of June 11, 1962; no flow at times in 1936.
Maximum stage known, that of June 11, 1962.

Remarks.--Records good except those for periods of ice effect or no gage-height record, which are fair.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1 to Nov. 3, May 23-29, June 13, 18, Sept. 10-30)

1.9	8.5	4.0	78	12.0	805	21.0	3,920
2.0	11	6.0	189	15.0	1,360	23.0	5,620
2.5	23	8.0	347	18.0	2,280	23.5	6,080
3.0	39						

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	24	26	22	11	9.2	11	22	347	1,330	288	153	40
2	23	26	20	11	9.2	11	*24	341	1,160	284	144	38
3	22	25	20	12	9.2	11	45	332	1,040	299	134	42
4	21	24	20	12	9.3	11	**70	314	944	381	123	46
5	20	20	19	12	11	11	100	279	*832	542	121	45
6	19	18	18	11	12	12	250	241	719	663	116	45
7	19	22	16	10	12	12	500	211	621	814	108	43
8	22	18	18	10	12	12	*960	189	716	1,030	136	45
9	24	20	19	10	12	13	1,320	174	1,100	1,300	152	46
10	24	18	18	10	12	13	1,450	162	3,300	1,630	127	77
11	28	22	18	9.8	12	13	*1,320	154	*5,990	1,620	133	92
12	30	22	17	9.6	13	14	1,150	148	5,830	1,410	232	106
13	32	26	15	9.6	13	15	1,050	144	5,220	1,140	365	115
14	31	24	14	9.6	13	15	1,000	139	a4,400	890	445	114
15	30	22	14	9.6	13	16	1,000	138	a3,600	676	444	104
16	30	23	13	9.6	12	16	*1,070	158	a2,800	512	365	90
17	30	24	13	9.4	12	16	1,100	216	a2,900	395	268	84
18	29	26	13	a 9.4	12	16	1,100	271	*3,080	325	200	78
19	28	22	13	a 9.4	11	16	1,090	421	a3,300	297	154	72
20	29	20	13	a 9.4	*11	16	987	734	a3,100	292	122	69
21	28	22	13	a 9.4	11	16	*817	970	a2,600	285	101	66
22	28	24	13	a 9.4	11	16	636	1,320	a2,200	284	89	61
23	27	24	13	a 9.3	11	16	519	1,800	a1,800	280	84	55
24	26	23	12	* 9.3	11	16	470	2,270	a1,500	277	78	52
25	26	22	12	9.3	11	16	446	2,860	a1,200	290	69	*54
26	27	22	12	9.3	11	17	412	*3,100	a900	292	62	54
27	27	21	12	9.3	11	18	*345	2,890	*690	251	55	54
28	27	19	*12	9.3	11	19	323	2,410	534	211	49	58
29	26	*18	12	9.3	-	20	307	2,050	412	181	44	60
30	27	20	12	9.2	----------	20	325	1,770	331	165	*42	61
31	*27	----------	11	9.2	----------	21	----------	1,540	----------	*160	40	----------
Total	811	663	467	306.7	317.9	465	20,208	28,093	64,149	17,464	4,755	1,966
Mean	26.2	22.1	15.1	9.89	11.4	15.0	674	906	2,138	563	153	65.5
Ac-ft	1,610	1,320	926	608	631	922	40,080	55,720	127,200	34,640	9,430	3,900

Calendar year 1961: Max 477 Min 5.8 Mean 62.6 Ac-ft 45,300
Water year 1961-62: Max 5,990 Min 9.2 Mean 383 Ac-ft 277,000

* Discharge measurement made on this day.
** Field estimate made on this day.
a No gage-height record.
Note.--Stage-discharge relation affected by ice Nov. 4 to Apr. 18.

5-0625. Wild Rice River at Twin Valley, Minn.

Location.--Lat 47°16'00", long 96°14'40", in NE¼ sec.27, T.144 N., R.44 W., on left bank 100 ft upstream from highway bridge, three-quarters of a mile northeast of village of Twin Valley, and 2 miles upstream from a small tributary.

Drainage area.--888 sq mi.

Records available.--June 1909 to September 1917, July 1930 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 1,008.16 ft above mean sea level, datum of 1929 (Corps of Engineers bench mark). June 1909 to September 1917 staff gage at site a quarter of a mile downstream at different datum. July 23, 1930, to Nov. 24, 1934, chain gage at highway bridge 100 ft downstream from present site at present datum. Nov. 25, 1934, to Aug. 2, 1950, water-stage recorder 80 ft upstream from present site at present datum.

Average discharge.--40 years, 158 cfs (114,400 acre-ft per year).

Extremes.--Maximum discharge during year, 2,760 cfs June 9 (gage height, 9.83 ft); minimum, 15 cfs Oct. 24 (gage height, 1.03 ft).
1909-17, 1930-62: Maximum discharge, 9,200 cfs July 22, 1909 (gage height, 20.0 ft, site and datum then in use), from rating curve extended above 3,300 cfs; minimum, 0.5 cfs Nov. 4, 1939.

Remarks.--Records good except those for period of ice effect, which are poor. Flow slightly regulated by Rice Lake and many other small lakes above station. Diurnal fluctuation caused by operation of mill at Faith, 17 miles above station.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)

1.1	19	4.0	514
1.3	34	6.0	1,060
1.5	54	9.0	2,270
2.0	114	9.7	2,680
3.0	294		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	41	46	34	24	26	20	110	444	1,290	404	202	81
2	42	47	36	25	26	21	150	449	1,260	398	190	76
3	42	42	36	25	26	21	190	435	1,210	411	181	80
4	41	48	36	26	27	21	270	422	1,150	504	175	81
5	35	39	36	26	27	22	480	415	1,090	524	163	75
6	39	56	40	27	26	23	490	400	1,020	509	158	72
7	33	49	38	28	26	24	*490	393	984	604	156	68
8	32	55	38	28	26	24	450	378	1,740	719	153	83
9	36	49	38	28	26	24	360	360	*2,550	737	147	129
10	37	46	36	27	26	24	324	350	2,640	719	144	150
11	39	47	34	27	25	25	339	337	2,440	693	161	142
12	37	51	34	26	25	25	*335	331	2,210	646	184	145
13	34	61	34	26	25	24	324	324	1,880	589	206	132
14	34	61	34	28	25	23	327	318	1,540	545	196	122
15	37	50	32	28	25	22	341	314	1,340	512	181	118
16	39	48	30	28	25	22	418	343	1,240	483	168	114
17	34	48	30	28	25	22	*481	409	1,220	458	160	111
18	34	58	30	28	25	22	567	507	1,190	435	150	104
19	33	48	30	27	*25	23	557	659	1,150	426	139	100
20	36	41	29	27	25	24	548	698	1,050	402	134	94
21	34	45	28	28	24	26	521	716	960	382	128	91
22	32	50	28	28	24	30	490	768	884	365	122	87
23	32	48	27	28	23	38	467	912	808	363	114	85
24	29	53	26	*29	22	60	449	*1,230	737	360	108	91
25	36	45	26	28	22	65	440	1,480	677	339	97	*86
26	36	43	25	27	21	70	*426	1,680	*607	312	88	85
27	36	42	24	26	21	75	415	1,620	550	286	* 96	81
28	34	42	23	26	20	80	415	1,470	497	266	90	76
29	30	*36	*23	26	-	90	444	1,370	453	250	86	74
30	*36	35	23	26	----------	*90	449	1,360	426	*230	85	68
31	33	----------	24	26	----------	95	----------	1,350	----------	214	83	----------
Total	1,103	1,429	962	835	689	1,175	12,067	22,242	36,793	14,085	4,445	2,901
Mean	35.6	47.6	31.0	26.9	24.6	37.9	402	717	1,226	454	143	96.7
Ac-ft	2,190	2,830	1,910	1,660	1,370	2,330	23,930	44,120	72,980	27,940	8,820	5,750

Calendar year 1961: Max 839 Min 10 Mean 107 Ac-ft 77,700
Water year 1961-62: Max 2,640 Min 20 Mean 270 Ac-ft 195,800

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 27 to Apr. 9.

5-0640. Wild Rice River at Hendrum, Minn.

Location.--Lat 47°16'05", long 96°47'50", in SE¼ sec.19, T.144 N., R.48 W., near center of span on downstream side of highway bridge, half a mile east of Hendrum and 4 miles upstream from mouth.

Drainage area.--1,600 sq mi, approximately.

Records available.--March 1944 to September 1962.

Gage.--Wire-weight gage read once or twice daily. Datum of gage is 836.75 ft above mean sea level, datum of 1929 (levels by Corps of Engineers). Prior to Aug. 2, 1949, chain gage at same site and datum.

Average discharge.--18 years, 209 cfs (151,300 acre-ft per year).

Extremes.--Maximum discharge during year, 3,680 cfs June 13 (gage height, 22.26 ft, backwater from Red River of the North); minimum daily, 19 cfs Feb. 26-28; minimum gage height observed, 140 ft Nov. 20.
1944-62: Maximum discharge, 4,660 cfs Apr. 14, 1956 (gage height, 24.26 ft); maximum gage height observed, 27.70 ft Apr. 15, 1947 (backwater from Red River of the North); no flow for some days in 1948-49.

Remarks.--Records fair. Large part of high flow diverted into Marsh River basin at overflow section 3½ miles east of Ada. Another diversion into Marsh River basin, formed 1½ miles southeast of Ada, diverted water at all stages 1947-51, after which it was closed except for small regulated flow diverted at same point. Amount of diversion not known.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	47	42	34	20	26	20	a150	533	2,040	a450	347	94
2	48	42	34	20	26	22	200	520	1,980	412	290	93
3	44	37	33	20	26	22	200	508	1,790	414	280	92
4	44	37	34	20	26	21	300	508	1,580	782	292	89
5	44	37	36	22	26	21	450	500	*1,400	997	313	95
6	44	36	30	22	25	23	700	477	1,280	*1,020	*258	90
7	44	32	32	22	25	22	*770	444	1,200	1,500	211	85
8	44	28	32	22	25	22	a750	440	1,270	1,880	190	89
9	50	50	32	24	24	22	700	425	1,960	1,940	176	a100
10	44	30	30	24	24	24	650	398	2,790	1,610	171	137
11	57	a40	30	26	23	26	600	380	3,300	1,160	174	166
12	66	52	30	26	23	26	*580	376	*3,620	986	182	179
13	60	48	30	26	23	25	600	374	3,630	**889	194	175
14	50	44	28	27	23	25	680	375	3,310	855	295	168
15	a44	50	28	28	22	24	750	370	2,640	812	314	160
16	38	55	28	28	22	24	*700	384	2,070	749	317	a150
17	38	50	26	28	22	24	700	424	1,930	737	304	128
18	42	35	26	28	21	24	850	482	*1,850	675	295	124
19	50	30	26	28	21	24	950	625	1,800	*508	a255	119
20	50	20	24	28	*20	24	889	a840	1,730	407	188	114
21	48	50	24	28	20	24	*846	1,020	1,640	443	168	109
22	46	50	24	28	20	24	806	1,110	1,520	445	148	106
23	40	50	24	28	20	26	752	1,140	1,390	466	138	101
24	38	50	22	28	20	28	688	1,760	1,380	494	124	96
25	38	a48	22	*30	20	30	626	2,080	*954	542	121	96
26	42	a46	22	30	19	32	*570	*2,230	849	591	108	*97
27	36	* 45	20	30	19	34	514	2,270	758	561	108	92
28	46	35	* 20	30	19	40	505	2,230	625	593	101	92
29	a44	20	20	28	-	*100	510	2,190	527	510	104	93
30	42	35	20	28	----------	110	519	2,100	475	463	97	98
31	* 41	----------	20	28	----------	120	----------	2,040	----------	427	*96	----------
Total	1,409	1,224	841	805	630	1,033	18,505	29,553	53,288	24,318	6,359	3,427
Mean	45.5	40.8	27.1	26.0	22.5	33.3	617	953	1,776	784	205	114
Ac-ft	2,790	2,430	1,670	1,600	1,250	2,050	36,700	58,620	105,700	48,230	12,610	6,800

Calendar year 1961: Max 1,080 Min 12 Mean 134 Ac-ft 96,990
Water year 1961-62: Max 3,630 Min 19 Mean 387 Ac-ft 280,400

* Discharge measurement made on this day.
a No gage-height record.
Note.--Stage-discharge relation affected by ice Nov. 7 to Apr. 19.

5-0645. Red River of the North at Halstad, Minn.

Location.--Lat 47°21'10", long 96°50'50", on line between secs. 24 and 25, T.145 N., R.49 W., on left bank on upstream side of highway bridge, half a mile west of Halstad, 2½ miles downstream from Wild Rice River, and at mile 375.2.

Drainage area.--21,800 sq mi, approximately, includes 3,800 sq mi in closed basins.

Records available.--April 1936 to June 1937 (no winter records), April 1942 to September 1960 (spring and summer months only), May 1961 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 826.65 ft above mean sea level, datum of 1929. Prior to July 17, 1961, wire-weight gage at same site and datum.

Extremes.--Maximum discharge during year, 15,900 cfs June 16 (gage height, 24.70 ft); minimum daily discharge, 131 cfs Dec. 27-31; minimum gage height, 2.30 ft Oct. 11.
1936-37, 1942-62: Maximum discharge, 24,500 cfs Apr. 16, 1947; maximum gage height, 34.00 ft Apr. 17, 1947; minimum discharge observed, 5.4 cfs Oct. 8, 9, 12-14, 1936.
Flood in 1897 reached a stage of about 38.5 ft.

Remarks.--Records excellent except those for period of ice effect, which are fair. Some regulation by many controlled lakes and reservoirs on tributaries.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Loop curves used May 23 to June 8, June 9-28, July 14-28)

1.8	122	3.0	344	16.0	7,950
2.0	144	5.0	1,020	23.0	13,800
2.5	225	8.0	2,460		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	217	229	190	132	155	170	550	2540	13200	4000	5940	1500
2	216	227	175	132	155	170	*650	2570	12600	3930	5310	1450
3	214	229	170	132	155	170	850	2590	11500	4040	4870	1420
4	219	240	170	132	155	175	1200	2560	*10000	5240	4710	1400
5	221	221	165	133	155	175	1900	2470	8020	6740	4460	1360
6	217	240	160	a133	160	175	3700	2340	6250	7780	*4190	1330
7	210	240	160	a133	160	175	5400	2220	*5240	10000	g4020	1310
8	203	235	160	a134	160	175	6700	2140	4920	11600	g3880	1300
9	196	225	155	a134	160	175	*7100	2060	5900	*12500	g3750	1320
10	192	235	155	g135	160	175	a7600	1990	8000	13000	g3650	1360
11	259	240	150	a135	160	175	8100	1940	*9900	13300	g3640	1380
12	444	250	145	135	160	175	*8300	1870	12000	13500	g3780	1420
13	690	250	145	135	160	175	8200	1830	13800	*13700	g4130	1520
14	519	260	140	135	160	180	8800	1800	*15000	13800	g4870	1660
15	390	255	a140	a135	165	185	9800	1740	15600	13400	g5480	1650
16	347	250	a140	a135	165	195	10500	1720	15800	12900	g5770	1570
17	361	250	a135	g135	170	210	*9800	1840	15400	11900	5730	1500
18	390	235	a135	135	170	220	10000	2180	15000	10500	5360	1410
19	390	240	a135	137	*170	240	10400	2720	*14600	*8980	4800	1350
20	366	240	g135	139	170	250	10400	3900	14000	7650	4270	1300
21	336	240	a135	141	170	265	*10100	5110	13300	6820	3860	1250
22	310	235	a134	143	170	285	9680	5970	12400	7300	3530	1210
23	290	210	a134	143	170	310	8960	7300	11200	7800	3240	1170
24	273	190	a133	143	170	325	7880	*9700	9900	*8540	2960	1140
25	*264	200	a133	*144	170	340	*6280	11500	*8500	9350	2690	1130
26	257	200	a132	145	170	345	4640	12600	7100	9900	2360	*1110
27	250	*205	131	147	170	350	*3560	13300	6000	10000	2000	1100
28	242	190	*131	149	170	360	2970	*13700	5120	9400	1760	1070
29	244	180	131	150	-	400	2670	13900	4660	8640	1680	1040
30	242	195	131	150	----------	490	2550	13900	4280	7740	1600	1010
31	233	----------	131	152	----------	520	----------	13500	----------	6780	*1550	----------
Total	9202	6836	4516	4293	4585	7730	189240	165500	309190	290730	119840	39740
Mean	297	228	146	138	164	249	6,308	5,339	10,310	9,378	3,866	1,325
Ac-ft	18,250	13,560	8,960	8,520	9,090	15,330	375,400	328,300	613,300	576,700	237,700	78,820

Calendar year 1961: Max Min Mean Ac-ft
Water year 1961-62: Max 15,800 Min 131 Mean 3,155 Ac-ft 2,284,000

* Discharge measurement made on this day.
a No gage-height record.
g Computed from once daily wire-weight gage readings
Note.--Stage-discharge relation affected by ice Nov. 6 to Apr. 18.

05-0675. Marsh River near Shelly, Minn.

Location.--Lat 47°24'45", long 96°45'50", in NE¼NW¼ sec.3, T.145 N., R.48 W., near center of span on downstream truss of bridge, 3¾ miles southeast of Shelly and 10 miles upstream from mouth.

Drainage area.--151 sq mi.

Records available.--March 1944 to September 1962. Monthly discharge only for March 1944, published in WSP 1308.

Gage.--Chain gage read once or twice daily. Datum of gage is 844.14 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Average discharge.--18 years, 98.0 cfs (70,950 acre-ft per year).

Extremes.--Maximum discharge during year, 1,240 cfs June 11 (gage height, 9.87 ft); no flow for many days.
1944-62: Maximum discharge, 4,660 cfs May 11, 1950 (gage height, 18.96 ft, from floodmark); no flow for many days most years.

Remarks.--Records good except those for period of ice effect, which are fair. Large part of high flow of Wild Rice River diverted into Marsh River basin at overflow section 3½ miles east of Ada. Another diversion from Wild Rice River formed 1 mile southeast of Ada supplemented flow at all stages 1947-51, after which it was closed except for small regulated flow diverted at same point for abatement of pollution from Ada sewage plant effluent.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Apr. 20-22, July 30 to Aug. 6)

-0.2	0	0.4	6.6	3.0	146
- .1	.4	.7	14	5.0	376
0.0	1.0	1.0	24	7.0	683
.1	1.8	1.5	46	9.0	1,070
.2	2.9	2.0	74	9.7	1,210

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0					0	5.0	18	397	15	13	.6
2	0					0	3.0	* 15	333	13	11	a .6
3	0					0	15	14	254	17	10	a .5
4	0					0	*30	13	210	a 78	10	.5
5	0					0	80	12	164	425	14	.7
6	0					0	*140	11	135	*482	* 16	.7
7	0					0	115	10	111	570	a 14	a 1.0
8	0					0	50	10	140	1,010	10	1.6
9	0					0	*40	9.3	482	1,130	a 8.0	1.1
10	0					0	45	8.1	952	974	6.8	2.1
11	0					0	65	8.1	*1,190	558	7.3	4.2
12	.9					0	95	7.5	1,200	457	7.7	a 4.0
13	1.4					0	105	8.1	1,020	384	12	a 3.6
14	1.8					0	*110	9.5	751	344	18	a 3.0
15	1.6					0	105	a15	511	315	17	2.6
16	1.4					0	175	35	359	291	23	a 2.4
17	1.2					0	260	69	342	259	18	2.3
18	1.0					0	*380	111	467	210	13	2.6
19	.9					0	280	151	*442	166	8.8	1.6
20	.6				(*)	0	228	191	316	119	7.0	a 1.5
21	.4					0	165	235	213	80	5.4	1.4
22	.4					0	113	268	137	58	4.6	1.2
23	a .2					0	78	461	64	49	3.3	1.1
24	.1					0	58	782	55	a 38	2.5	a 1.0
25	* .1					0	* 48	830	45	27	2.2	a .8
26	0					0	41	*730	a 35	26	a 2.0	* .6
27	0					0	37	596	28	a 25	1.6	.5
28	0					0	28	485	a 23	24	a 1.6	.5
29	0		(*)		-	* 0	23	391	a 20	a 20	a 1.4	.4
30	0				----------	0	19	330	16	16	1.4	a .4
31	a 0	----------			----------	8.0	----------	320	----------	14	* .6	----------
Total	12.0	0	0	0	0	8.0	2936.0	6153.6	10412	8194	271.2	45.1
Mean	0.39	0	0	0	0	0.26	97.9	199	347	264	8.75	1.50
Ac-ft	24	0	0	0	0	16	5,820	12,210	20,650	16,250	538	89

Calendar year 1961: Max 85 Min 0 Mean 6.49 Ac-ft 4,700
Water year 1961-62: Max 1,200 Min 0 Mean 76.8 Ac-ft 55,600

* Discharge measurement or observation of no flow made on this day.
a No gage-height record.
Note.--Stage-discharge relation affected by ice Mar. 28 to Apr. 19.

5-0690. Sandhill River at Climax, Minn.

Location.--Lat 47°36'10", long 96°47'40", in SE¼SE¼ sec.29, T.148 N., R.48 W., near center of span on upstream side of highway bridge, 1 mile southeast of Climax and 4 miles upstream from mouth.

Drainage area.--405 sq mi, approximately.

Records available.--March 1943 to September 1962 (winter records incomplete in some years). Monthly discharge only for some periods, published in WSP 1308.

Gage.--Chain gage read once daily. Datum of gage is 833.69 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers).

Average discharge.--14 years (1946-50, 1952-62), 60.3 cfs (43,660 acre-ft per year).

Extremes.--Maximum discharge during year, 1,570 cfs July 8 (gage height, 11.70, from floodmark); minimum daily, 1.0 cfs Jan. 17, 18.
1943-62: Maximum discharge, 3,040 cfs Apr. 22, 1950 (gage height, 16.31 ft, from floodmark); minimum not determined.

Remarks.--Records poor prior to Apr. 17, good thereafter.

Rating tables, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 4 to Nov. 3, May 24, 25)

Oct. 1 to Apr. 16				Apr. 17 to Sept. 30			
0.4	3.4	3.0	105	1.6	26	8.0	570
0.7	7.5	6.0	375	2.0	43	9.0	765
1.0	13	8.0	600	3.0	94	11.0	1,350
2.0	50			7.0	450		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	7.8	11	10	3.5	2.0	4.8	14	76	257	98	81	30
2	8.0	12	9.5	3.5	2.0	4.8	16	73	231	86	81	30
3	8.3	9.9	10	3.5	2.0	4.8	35	63	176	87	102	29
4	8.5	12	10	3.5	2.5	4.8	* 90	57	179	137	89	30
5	8.5	13	9.0	3	2.5	4.8	180	54	181	144	110	28
6	9.2	14	9.0	3.0	2.5	5.0	* 250	47	168	* 145	*90	27
7	9.2	12	8.5	2.5	2.5	5.0	220	*44	168	675	90	28
8	9.4	13	8.5	2.5	2.5	5.2	110	40	218	1,310	92	31
9	9.9	12	8.0	2.0	2.5	5.2	100	41	461	*751	72	57
10	10	13	8.0	1.5	2.5	5.2	180	38	490	647	61	68
11	38	14	7.5	1.5	2.5	5.2	220	39	526	582	57	64
12	47	16	7.5	* 1.1	2.5	5.4	* 260	51	576	540	61	57
13	48	15	7.0	1.1	2.5	5.4	210	53	615	522	59	51
14	40	14	6.5	1.1	2.5	5.4	* 230	67	523	514	60	47
15	38	14	* 6.4	1.1	2.5	5.4	300	74	455	430	56	*46
16	31	14	6.2	1.1	3.5	5.4	600	107	420	343	55	46
17	27	12	6.0	1.0	4.5	5.2	618	383	402	282	53	51
18	22	12	5.5	1.0	5.0	5.2	* 647	326	382	234	52	53
19	16	12	5.5	1.5	5.1	5.0	579	240	*328	205	50	55
20	15	* 12	5.5	1.5	*5.1	5.0	526	300	280	177	49	58
21	13	12	5.0	2.0	5.2	5.0	482	276	251	156	48	66
22	9.7	13	5.0	2.0	5.2	5.5	373	368	235	140	46	62
23	6.9	13	5.0	2.0	5.2	*7.3	352	541	220	135	45	60
24	16	12	5.0	2.0	5.0	7.5	301	* 845	201	127	42	57
25	*8.2	12	4.5	2.0	5.0	8.0	220	657	210	120	41	51
26	8.8	12	4.5	2.0	5.0	8.0	* 121	* 535	168	118	39	* 47
27	9.9	12	4.5	2.0	4.8	8.5	102	492	132	117	38	46
28	13	11	4.5	2.0	4.8	9.0	96	382	107	113	40	41
29	12	10	4.0	2.0	-	9.5	95	331	108	112	39	43
30	12	10	4.0	2.0	----------	10	84	314	110	100	34	45
31	12	----------	4.0	2.0	----------	12	----------	293	----------	90	30	----------
Total	532.3	373.9	204.1	62.5	99.4	192.5	7,611	7,207	8,778	9,237	1,862	1,404
Mean	17.2	12.5	6.58	2.02	3.55	6.21	254	232	293	298	60.1	46.8
Ac-ft	1,060	742	405	124	197	382	15,100	14,290	17,410	18,320	3,690	2,780

Calendar year 1961: Max 125 Min 4.0 Mean 20.8 Ac-ft 15,080
Water year 1961-62: Max 1,310 Min 1.0 Mean 103 Ac-ft 74,500

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 4 to Apr. 16.

5-0740. Lower Red Lake near Red Lake, Minn.

Location.--Lat 47°57', long 95°17', in NW¼ sec.28, T.152 N., R.36 W., on left bank just upstream from dam at outlet, 13 miles northwest of village of Red Lake.

Drainage area.--1,950 sq mi, approximately.

Records available.--June 1930 to November 1932 (published as Red Lake at Redby), May 1933 to September 1962 (published as Red Lake near Red Lake 1933-40); records on Upper Red Lake published as Red Lake at Waskish, April 1930 to September 1933, all in reports of Geological Survey. October 1921 to September 1929 gage heights at Redby and on Upper Red Lake at Waskish in files of Minnesota Department of Conservation (fragmentary).

Gage.--Water-stage recorder. Datum of gage is 1,169.00 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). May 1933 to Sept. 6, 1934, staff gage at same site and datum. Staff gages at Waskish and Redby at datum 69.00 ft lower.

Extremes.--Maximum gage height during year, 7.52 ft July 10 (affected by wind action); minimum, 3.46 ft Nov. 4 (affected by wind action).
1930-62: Maximum gage height, 9.53 ft June 25, 1950; minimum recorded, 0.80 ft Nov. 20, 1936.

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

Month-end gage height, in feet, October 1961 to September 1962

Oct. 31..... 4.29	Jan. 31..... 4.56	Apr. 30..... 5.04	July 31..... 6.81
Dec. 1..... 4.46	Feb. 28..... 4.67	May 31..... 6.49	Aug. 31..... 6.98
Dec. 31..... 4.47	Mar. 31..... 4.70	June 30..... 6.81	Sept.30..... 6.70

Note.--Mean daily gage heights are available.

5-0745. Red Lake River near Red Lake, Minn.

Location.--Lat 47°57', long 95°17', in NW¼ sec.28, T.152 N., R.36 W., on left bank 50 ft downstream from dam at outlet of Lower Red Lake and 13 miles northwest of village of Red Lake.

Drainage area.--1,950 sq mi, approximately.

Records available.--May 1933 to September 1962. Monthly discharge only for May 1933, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 1,167.00 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 7, 1934, staff gage at site 50 ft upstream at datum 2.00 ft higher. Sept. 7, 1934, to Nov. 26, 1951, water-stage recorder at present site at datum 2.00 ft higher.

Average discharge.--29 years, 386 cfs (279,500 acre-ft per year).

Extremes.--Maximum daily discharge during year, 1,260 cfs Aug. 23; maximum gage height, 7.11 ft Aug. 27 (backwater from aquatic vegetation); minimum daily discharge, 42 cfs June 1-3; minimum gage height, 1.10 ft May 13.
1933-62: Maximum discharge, 3,600 cfs June 25, 1950 (gage height, 11.19 ft, affected by seiches and backwater from aquatic vegetation, present datum), from rating curve extended above 1,400 cfs; no flow at times.

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

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	126	105	56	56	56	56	54	*52	42	1,210	1,120	1,200
2	126	105	56	56	56	56	54	52	42	1,210	1,120	1,200
3	125	105	56	56	56	56	52	50	42	*1,210	1,120	1,200
4	125	105	56	56	56	56	52	50	242	1,210	1,120	1,200
5	*125	105	56	56	56	56	50	50	*750	1,210	1,120	1,200
6	125	105	56	56	56	56	50	50	1,040	1,030	1,120	1,180
7	124	105	56	56	56	56	48	55	1,040	813	1,120	1,180
8	124	105	56	56	56	56	48	56	1,040	813	*1,120	1,180
9	122	105	56	56	56	56	48	54	1,040	824	1,120	1,180
10	120	105	56	56	56	56	*48	54	1,040	824	1,120	1,180
11	120	105	56	56	56	56	48	52	1,040	824	1,120	1,160
12	118	105	56	56	56	56	48	52	1,040	824	1,120	1,160
13	118	105	*56	56	56	56	48	52	587	993	1,120	1,160
14	116	105	56	56	*56	56	48	50	56	1,120	1,120	1,160
15	114	105	56	56	56	56	48	50	56	1,120	1,120	1,160
16	112	106	56	56	56	56	48	50	57	1,120	1,120	1,140
17	112	65	56	56	56	56	48	48	83	1,120	1,200	1,140
18	110	65	56	56	56	56	48	48	66	1,120	1,260	*1,190
19	*109	65	56	56	56	56	48	48	296	1,120	1,240	1,240
20	108	65	56	56	56	56	48	48	634	1,120	1,220	1,240
21	108	65	56	56	56	*56	48	46	684	1,120	1,120	1,240
22	108	65	56	*56	56	56	48	*46	752	1,120	1,200	1,240
23	108	65	56	56	56	56	48	46	752	1,120	1,260	1,240
24	108	65	56	56	56	56	48	46	752	1,120	1,240	1,240
25	108	65	56	56	56	56	48	46	874	1,120	1,220	1,240
26	105	65	56	56	56	56	48	46	1,080	1,120	1,220	1,240
27	105	65	56	56	56	56	50	44	1,080	1,120	1,220	1,240
28	105	65	56	56	56	56	50	44	1,120	1,120	1,220	1,240
29	105	65	56	56	-	56	50	44	1,210	1,120	1,220	1,240
30	105	60	56	56	----------	56	52	44	1,210	1,120	1,220	1,240
31	105	----------	56	56	----------	54	----------	44	----------	1,120	1,220	----------
Total	3,549	2,586	1,736	1,736	1,568	1,734	1,474	1,517	19,747	33,155	35,760	36,050
Mean	114	86.2	56.0	56.0	56.0	55.9	49.1	48.9	658	1,070	1,154	1,202
Ac-ft	7,040	5,130	3,440	3,440	3,110	3,440	2,920	3,010	39,170	65,760	70,930	71,500

Calendar year 1961: Max 240 Min 13 Mean 53.0 Ac-ft 38,340
Water year 1961-62: Max 1,260 Min 42 Mean 385 Ac-ft 278,900

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 3 to Apr. 23. Stage-discharge relation indefinite Oct. 1 to Nov. 2, Apr. 24 to Sept. 30.

5-0750. Red Lake River at High Landing, near Goodridge, Minn.

Location.--Lat 48°03', long 95°48', on line between secs. 28 and 29, T.153 N., R.40 W., on left bank at upstream side of highway bridge at High Landing, 7 miles south of Goodridge and 33 miles upstream from Thief River.

Drainage area.--2,300 sq mi, approximately.

Records available.--September 1929 to September 1962. Prior to October 1930, published as "at Kratka."

Gage.--Water-stage recorder. Datum of gage is 1,141.57 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Oct. 1, 1930, staff gage at site 10 miles downstream at different datum. Oct. 1, 1930, to Sept. 30, 1932, staff gage at datum 5.00 ft higher and Oct. 1, 1932, to Dec. 8, 1938, staff gage at datum 4.00 ft higher at site 50 ft downstream. Dec. 9, 1938, to Sept. 30, 1949, water-stage recorder at present site at datum 4.00 ft higher.

Average discharge.--33 years, 403 cfs (291,800 acre-ft per year).

Extremes.--Maximum discharge during year, 3,060 cfs June 11 (gage height, 12.10 ft); minimum daily, 40 cfs Dec. 6, 8.
1929-62: Maximum discharge, 3,720 cfs May 11, 1950 (gage height, 13.42 ft); no flow during infrequent periods in 1931-34, 1936-37.

Remarks.--Records good except those for periods of ice effect or backwater from aquatic vegetation, which are fair. Flow regulated by outlet dam on Lower Red Lake.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	128	103	50	46	48	48	50	76	802	1,160	1,000	1,100
2	129	114	48	46	48	48	50	75	709	*1,180	993	1,110
3	130	59	46	46	48	48	50	68	619	1,180	996	1,130
4	130	109	46	48	50	48	60	*63	*551	1,200	996	1,130
5	128	109	44	48	50	48	90	61	595	1,210	1,010	*1,130
6	126	110	40	48	48	48	250	51	850	1,210	1,000	1,130
7	127	140	42	48	48	46	260	59	1,090	1,290	*991	1,130
8	126	130	40	48	48	46	250	65	2,380	1,460	978	1,140
9	132	100	42	48	48	46	160	62	*2,950	1,350	978	1,230
10	137	85	44	48	48	46	*110	68	3,000	1,340	972	1,250
11	142	95	45	48	50	46	110	67	3,050	1,330	983	1,270
12	133	110	*46	48	50	46	120	70	3,010	1,210	1,010	1,270
13	134	100	46	48	*50	46	180	68	2,860	1,100	1,010	1,260
14	133	110	46	48	50	46	200	87	2,540	1,040	1,010	1,250
15	129	135	46	*48	50	46	200	97	1,840	1,040	1,010	1,250
16	128	*132	46	48	50	46	200	176	1,190	1,060	1,000	1,250
17	124	110	46	48	50	46	300	575	1,230	1,060	996	1,240
18	*116	100	46	48	50	46	580	519	1,310	1,070	1,000	1,230
19	123	75	46	48	50	46	*550	554	1,060	1,060	1,000	1,230
20	123	65	46	48	50	*46	420	553	957	1,060	1,000	1,240
21	120	60	46	48	50	46	382	438	1,080	1,050	1,010	1,260
22	119	55	48	48	48	48	321	499	1,150	1,060	1,020	1,270
23	113	50	48	48	48	48	*268	*1,620	1,190	1,080	1,020	1,290
24	103	45	48	48	48	48	250	1,920	1,220	1,090	1,020	1,310
25	112	45	48	48	48	48	194	1,640	1,170	1,080	1,040	1,310
26	108	55	48	48	48	48	159	1,310	1,120	1,060	1,050	1,310
27	113	55	46	48	48	50	122	1,080	1,130	1,050	1,070	1,320
28	112	50	46	48	48	55	102	892	1,130	1,050	1,090	1,330
29	104	50	46	48	-	55	93	737	1,140	1,050	1,090	1,330
30	105	50	46	48	----------	50	84	716	1,150	1,030	1,090	1,340
31	100	----------	46	48	----------	50	----------	845	----------	1,020	1,090	----------
Total	3,787	2,606	1,417	1,482	1,370	1,478	6,165	15,111	44,073	35,230	31,523	37,040
Mean	122	86.9	45.7	47.8	48.9	47.7	206	487	1,469	1,136	1,017	1,235
Ac-ft	7,510	5,170	2,810	2,940	2,720	2,930	12,230	29,970	87,420	69,880	62,520	73,470

Calendar year 1961: Max 264 Min 10 Mean 59.6 Ac-ft 43,170
Water year 1961-62: Max 3,050 Min 40 Mean 497 Ac-ft 359,600

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 6 to Apr. 20. Backwater from aquatic vegetation Oct. 1 to Nov. 5, June 1-6, June 19 to Sept. 30.

5-0760. Thief River near Thief River Falls, Minn.

Location.--Lat 48°11', long 96°10', in sec.3, T.154 N., R.43 W., on right bank a quarter of a mile upstream from highway bridge, 5 miles north of city of Thief River Falls, 7 miles upstream from mouth, and 9 miles downstream from Mud Lake National Wild Life Refuge.

Drainage area.--959 sq mi.

Records available.--July 1909 to September 1917, April 1920 to September 1921, October 1922 to September 1924, October 1928 to September 1962. Monthly discharge only for some periods, annual maximums for water years 1919, 1922, 1925, 1926, published in WSP 1308.

Gage.--Water-stage recorder and control of grouted boulders. Datum of gage is 1,112.33 ft above mean sea level, datum of 1929 (levels by Minnesota Highway Department). Prior to May 4, 1939, staff or chain gage at same site and datum.

Average discharge.--45 years, 121 cfs (87,600 acre-ft per year).

Extremes.--Maximum discharge during year, 2,800 cfs June 10 (gage height, 12.68 ft); no flow Dec. 26 to Mar. 26. 1909-17, 1919-26, 1928-62: Maximum discharge, 5,610 cfs May 13, 1950 (gage height, 17.38 ft); no flow at times in some years.

Remarks.--Records good except those for period of ice effect, which are poor. Some regulation by Thief and Mud Lakes.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Sept. 30)

3.7	0	4.4	2.9	5.0	59
3.8	.1	4.5	5.6	6.0	304
4.0	.2	4.6	9.5	10.0	1,580
4.2	.6	4.7	17	13.0	2,960
4.3	1.2	4.8	29		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	5.6	3.2	1.0			0	0.4	603	1,900	1,030	519	178
2	4.7	3.2	1.0			0	.4	579	1,740	*952	510	185
3	3.9	2.7	.8			0	.5	558	1,650	905	501	218
4	3.6	2.7	.8			0	** .6	*537	1,590	885	498	210
5	2.9	2.7	.8			0	1.4	522	1,550	862	501	*198
6	2.2	2.7	.8			0	30	504	1,510	829	504	190
7	1.6	2.4	.6			0	120	501	1,470	830	*498	182
8	1.1	1.9	.5			0	180	507	1,760	862	478	200
9	.9	1.6	.4			0	170	507	2,490	885	472	242
10	1.4	1.4	.4			0	*175	510	* 2,710	954	460	231
11	3.6	1.4	.3			0	200	510	2,660	928	426	229
12	17	1.6	** .2			0	220	507	2,580	846	418	221
13	25	1.9	.1		(*)	0	270	510	2,140	780	412	216
14	25	2.1	.2			0	350	561	1,970	729	406	208
15	23	2.4	.2	(*)		0	450	609	1,870	698	398	200
16	19	* 3.6	.1			0 0	600	673	1,840	676	335	193
17	16	3.9	.1			0	*900	954	1,900	657	312	188
18	*14	3.6	.1			0	1,500	1,050	1,890	648	312	185
19	12	3.2	.1			0	1,600	1,040	1,850	627	309	180
20	10	2.7	.1			0	* 1,660	1,230	1,780	606	304	178
21	11	2.2	.1			0	1,590	1,050	1,720	594	299	175
22	8.3	2.1	.1			0	1,400	1,040	1,680	588	299	172
23	6.0	1.9	.1			0	1,180	*1,920	1,640	588	296	170
24	9.1	1.9	.1			0	1,000	2,460	1,590	585	291	170
25	5.6	1.8	.1			0	*905	2,210	1,530	576	288	170
26	4.7	1.5	0			0	806	1,840	1,460	564	283	170
27	4.2	1.2	0			.2	716	1,580	1,370	555	283	168
28	4.2	1.2	0			.3	654	1,430	1,260	549	270	150
29	4.2	1.1	0		-	.3	630	1,390	1,190	543	195	44
30	4.2	1.0	0		----------	.3	624	1,640	1,140	519	180	21
31	3.6	----------	0		----------	.3	----------	2,010	----------	513	178	----------
Total	257.6	66.8	9.1	0	0	1.4	17,933.3	31,542	53,230	22,363	11,435	5,442
Mean	8.31	2.23	0.29	0	0	0.05	598	1,017	1,774	721	369	181
Ac-ft	511	132	18	0	0	2.8	35,570	62,560	105,600	44,360	22,680	10,790

Calendar year 1961: Max 400 Min 0 Mean 18.1 Ac-ft 13,090
Water year 1961-62 Max 2,710 Min 0 Mean 390 Ac-ft 282,200

* Discharge measurement or observation of no flow made on this day.
** Field estimate made on this day.
Note.--Stage-discharge relation affected by ice Nov. 27 to Apr. 19.

5-0777. Ruffy Brook near Gonvick, Minn.

Location.--Lat 47°44'50", long 95°24'45", on line between sec.5 and 8, T.149 N., R.37 W., on downstream side of bridge on County Highway 17, 4 miles upstream from mouth, and 4¾ miles east of Gonvick.

Drainage area.--45.2 sq mi.

Records available.--July 1960 to September 1962.

Gage.--Wire-weight gage read once daily. Datum of gage is 1,227.93 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 9, 1960, reference point at same site and datum.

Extremes.--Maximum discharge during year, 364 cfs July 7 (gage height, 6.70 ft, from floodmarks); minimum daily 1.1 cfs Jan. 14-20; minimum gage height, 1.18 ft Aug. 31.
1960-62: Maximum discharge, that of July 7, 1962; minimum discharge, 0.6 cfs Sept. 5, 1961; minimum gage height, that of Aug. 31, 1962.

Remarks.--Records good except those for period of ice effect, which are poor.

Rating tables, water year 1961-62, except period of ice effect
(gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Apr. 25				Apr. 26 to Sept. 30			
1.3	0.7	2.0	22	1.14	1.8	3.0	52
1.4	1.8	3.0	64	1.2	2.4	4.0	103
1.5	3.6	4.0	109	1.4	5.1	6.0	278
1.6	6.4	5.0	167	1.7	11	6.5	337
				2.0	18		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	3.4	2.8	2.8	1.2	1.2	1.8	5.0	*50	122	11	4.2	1.8
2	3.2	2.8	2.6	1.2	1.2	1.8	5.0	42	90	9.6	3.9	1.8
3	2.6	3.0	2.6	1.2	1.4	1.8	5.0	35	73	* 9.4	3.9	2.4
4	2.4	3.0	2.6	1.4	1.4	1.8	10	31	61	15	3.8	2.4
5	* 2.4	3.0	2.4	1.4	1.6	1.8	60	26	*54	13	3.8	2.1
6	2.4	4.5	2.4	1.2	1.6	1.8	100	23	47	15	3.8	* 2.0
7	2.4	4.5	2.2	1.2	1.6	1.8	*90	21	44	264	3.6	2.0
8	2.2	4.0	2.2	1.2	1.6	1.8	70	21	94	300	* 3.3	2.4
9	3.4	3.8	2.0	1.2	1.6	1.8	60	16	75	236	3.0	3.4
10	3.8	3.8	2.0	1.2	1.6	2.0	60	21	96	*212	2.9	2.9
11	4.6	3.6	1.8	1.2	1.6	2.0	50	17	150	166	6.1	2.1
12	5.2	3.8	1.8	1.2	1.8	2.0	40	28	150	104	5.6	1.5
13	4.9	3.8	* 1.8	1.2	1.8	2.0	30	80	102	72	4.6	1.2
14	4.0	4.8	1.8	1.1	* 1.9	2.0	25	111	73	63	4.4	1.0
15	3.8	5.0	1.6	1.1	1.9	2.0	20	116	50	46	4.2	1.0
16	3.6	4.8	1.6	* 1.1	1.9	2.0	*20	150	48	38	3.6	1.0
17	3.4	* 4.7	1.6	1.1	1.8	2.2	20	216	46	33	3.6	8.4
18	3.2	4.0	1.4	1.1	1.8	2.2	50	254	41	28	3.5	7.4
19	3.0	3.5	1.4	1.1	1.8	2.2	80	156	33	18	3.3	6.0
20	3.0	3.0	1.4	1.1	1.8	2.4	80	109	28	18	3.4	5.8
21	3.0	3.0	1.4	1.2	1.8	* 2.4	120	98	23	16	3.0	3.8
22	2.8	3.0	1.4	1.2	1.8	2.4	140	*102	26	16	3.1	3.5
23	2.8	3.0	1.4	1.2	1.8	2.4	*120	301	20	14	2.9	3.5
24	4.6	2.8	1.4	1.2	1.8	2.6	110	293	16	12	2.8	3.5
25	3.0	2.8	1.4	1.4	1.8	2.6	100	* 243	13	10	2.4	3.4
26	3.0	3.5	1.4	1.4	1.8	2.8	87	193	12	9.4	2.2	3.4
27	2.8	3.0	1.4	1.4	1.8	2.8	78	152	12	7.2	2.3	2.9
28	2.8	3.0	1.2	1.2	1.8	8.0	74	92	8.8	6.5	2.0	2.9
29	2.8	2.8	1.2	1.2	-	7.0	63	70	14	5.4	1.9	3.0
30	2.6	2.8	1.2	1.2	----------	6.0	56	74	11	5.4	1.9	3.0
31	2.8	----------	1.2	1.2	----------	5.0	----------	109	----------	4.8	1.8	----------
Total	99.9	105.9	54.6	37.5	47.3	83.2	1828.0	3250	1632.8	1777.7	104.8	218.4
Mean	3.22	3.53	1.76	1.21	1.69	2.68	60.9	105	54.4	57.3	3.38	7.28
Ac-ft	198	210	108	74	94	165	3,630	6,450	3,240	3,530	208	433

Calendar year 1961: Max 61 Min 0.6 Mean 6.65 Ac-ft 4,820
Water year 1961-62: Max 301 Min 1.1 Mean 25.3 Ac-ft 18,340

Peak discharge (base, 65 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
4-22	0600	4.90	145	6- 8	1600	4.10	110
5-18	1600	6.05	274	6-12	0200	4.82	166
5-23	0820	6.50	337	7- 7	1800	6.70	364
6- 1	0600	4.38	130				

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 3 to Apr. 25.

GPO 802-479-4

5-0780. Clearwater River at Plummer, Minn.

Location.--Lat 47°55', long 96°03', in SE¼SW¼ sec.4, T.151 N., R.42 W., on right bank 200 ft downstream from Soo Line Railroad bridge, 300 ft downstream from bridge on U. S. Highway 59, 0.9 mile northwest of railroad depot in Plummer, and 8 miles upstream from Hill River.

Drainage area.--512 sq mi.

Records available.--April 1939 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,099.12 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Nov. 10, 1939, staff gage at site 100 ft upstream at same datum.

Average discharge.--23 years, 170 cfs (123,100 acre-ft per year).

Extremes.--Maximum discharge during year, 3,640 cfs June 9 (gage height, 11.90 ft); minimum daily,26 cfs Feb. 28 to Mar. 7.
1939-62: Maximum discharge, that of June 9, 1962; minimum discharge, 7.9 ft July 8, 1940.

Remarks.--Records good except those for period of ice effect, which are poor. Slight regulation by Clearwater Lake.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)

2.4	26	6.0	732
2.7	53	8.0	1,390
3.0	89	10.0	2,360
4.0	257	12.0	3,710

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	76	53	48	34	28	26	50	568	1600	160	161	53
2	76	53	45	34	28	26	50	515	1410	*147	144	53
3	71	33	45	34	28	26	55	463	1230	145	139	52
4	70	42	44	34	30	26	60	*421	1070	155	150	51
5	70	50	42	34	30	26	140	377	942	219	212	* 55
6	69	56	40	32	30	26	400	340	847	228	234	52
7	66	62	38	32	30	26	*470	305	738	251	*212	49
8	63	55	38	32	30	28	580	283	1630	657	176	53
9	63	55	38	32	30	28	520	273	*3490	1050	155	70
10	65	50	38	32	30	28	430	275	3380	1390	144	197
11	76	60	38	30	30	30	*385	287	2540	1940	139	271
12	77	60	*38	30	30	30	380	291	2430	2000	169	287
13	82	60	38	30	*30	30	410	332	1880	1630	196	261
14	80	65	38	30	30	30	440	584	1550	1390	174	234
15	76	63	38	*30	30	30	430	622	1200	1220	163	215
16	72	*63	36	30	30	30	*395	749	982	1090	166	197
17	70	62	36	30	28	30	460	972	957	972	152	185
18	*66	70	36	30	28	30	700	1400	1140	879	137	173
19	66	60	36	28	28	32	720	1530	1090	795	126	164
20	63	50	36	28	28	*34	*770	1570	841	682	116	148
21	61	60	36	28	28	36	860	*1490	580	591	104	132
22	61	60	36	28	28	38	795	1390	474	528	99	120
23	58	58	34	28	28	38	789	1940	424	508	92	109
24	56	55	34	30	28	38	769	3040	385	435	86	100
25	55	50	34	30	28	38	*752	*3100	325	355	84	97
26	54	48	34	30	28	40	721	2920	271	293	79	95
27	56	50	34	30	28	42	679	2610	230	244	72	89
28	56	45	34	30	26	44	644	2090	197	227	71	85
29	56	40	34	28	-	46	625	1630	178	223	65	80
30	55	50	34	28	-------	48	*601	1560	176	212	58	76
31	53	-------	34	28	-------	50	-------	1740	-------	185	55	-------
Total	2038	1638	1164	944	808	1030	15080	35667	34187	20801	4130	3803
Mean	65.7	54.6	37.5	30.5	28.9	33.2	503	1,151	1,140	671	133	127
Ac-ft	4,040	3,250	2,310	1,870	1,600	2,040	29,910	70,740	67,810	41,260	8,190	7,540

Calendar year 1961: Max 450 Min 17 Mean 77.1 Ac-ft 55,780
Water year 1961-62: Max 3,490 Min 26 Mean 332 Ac-ft 240,600

Peak discharge (base, 500 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
4-21	0630	6.64	894	6- 9	1800	11,90	3,640
5-25	0100	11.24	3,170	7-12	0100	9.53	2,100

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 4 to Apr. 21 (no gage-height record Feb. 4-12, 14-20, 22-25, Apr. 10).

5-0782.3 Lost River at Oklee, Minn.

Location.--Lat 47°50'35", long 95°51'30", on west edge of sec.1, T.150 N., R.41 W., on upstream side of bridge on State Highway 222 at northwest edge of Oklee, 12 miles upstream from mouth.

Drainage area.--266 sq mi.

Records available.--July 1960 to September 1962.

Gage.--Wire-weight gage read once daily. Datum of gage is 1,134.94 ft above mean sea level, adjustment of 1912. (levels by Corps of Engineers). Prior to Sept. 9, 1960, reference points at same site and datum.

Extremes.--Maximum discharge during year, 1,490 cfs May 24 (gage height, 8.72 ft); minimum, 1.8 cfs Feb. 27 to Mar. 8.
1960-62: Maximum discharge, that of May 24, 1962; minimum, 0.1 cfs July 7-13, 15-17, Aug. 14-17, Aug. 29 to Sept. 9, 1961; minimum gage height, 1.29 ft Aug. 30 to Sept. 8, 1961.
Maximum stage known since at least 1897, 10.39 ft Apr. 21, 1950, from floodmarks (discharge, 2,790 cfs).

Remarks.--Records good except those for period of ice effect, which are poor.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Apr. 9-16, July 27 to Aug. 16)

1.6	2.2	5.0	313
1.7	7.5	6.0	513
2.0	29	8.0	1,180
2.5	71	8.7	1,480
3.0	119		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	14	9.5	7.5	3.2	2.2	1.8	35	255	926	93	55	12
2	14	10	7.5	3.2	2.4	1.8	40	239	597	* 86	48	14
3	13	10	7.5	3.2	2.4	1.8	60	252	513	84	46	12
4	12	10	6.3	3.2	2.2	1.8	120	213	455	152	49	12
5	11	9.5	6.3	3.2	2.2	1.8	200	177	430	179	67	* 12
6	8.9	9.5	6.0	3.2	2.2	1.8	350	159	406	187	92	12
7	7.5	9.5	5.5	3.2	2.0	1.8	*490	141	384	287	* 85	12
8	7.5	9.5	5.5	3.2	2.0	1.8	390	*127	858	483	63	24
9	7.5	10	5.0	3.0	2.0	2.0	311	129	1,360	657	49	64
10	16	10	5.0	3.0	2.0	2.0	276	133	1,460	738	37	123
11	17	7.5	4.8	2.8	2.0	2.2	* 253	138	1,460	890	39	141
12	23	14	*4.6	2.8	1.9	2.6	255	160	1,390	1,150	54	146
13	32	25	4.6	2.8	*1.9	2.6	266	201	1,200	1,240	62	136
14	31	24	4.4	2.6	1.9	2.6	269	261	958	1,140	57	101
15	28	20	4.2	*2.6	1.9	2.6	269	296	734	1,020	49	71
16	26	19	4.2	2.6	1.9	2.6	*224	328	672	834	44	60
17	24	*22	4.0	2.6	1.9	2.6	209	586	744	715	37	47
18	*19	19	4.0	2.6	1.9	2.8	227	919	744	577	36	40
19	16	19	4.0	2.6	1.9	2.8	257	1,000	651	478	32	36
20	12	19	3.8	2.6	1.9	*3.0	*280	977	577	412	29	34
21	11	17	3.8	2.4	1.9	8.0	314	*904	523	347	25	30
22	9.5	17	3.8	2.4	1.9	7.0	340	926	464	324	22	30
23	11	16	3.8	2.4	1.9	9.0	337	1,210	421	303	20	28
24	12	16	3.6	2.4	1.9	8.0	340	1,440	350	283	20	28
25	12	14	3.6	2.4	1.9	10.0	343	*1,400	323	244	19	27
26	11	10	3.6	2.4	1.9	12	332	1,390	297	217	18	26
27	10	8.9	3.4	2.4	1.8	20	317	1,320	262	186	12	24
28	9.5	7.5	3.4	2.2	1.8	30	300	1,130	232	143	14	22
29	9.5	6.3	3.4	2.2	-	35	284	940	186	114	14	18
30	9.5	6.3	3.4	2.2	---	35	*272	937	130	85	13	20
31	9.5	---	3.2	2.2	---	30	---	995	---	63	12	---
Total	453.9	405.0	143.7	83.8	55.7	248.8	7,960	19,283	19,707	13,711	1,219	1,362
Mean	14.6	13.5	4.64	2.70	1.99	8.03	265	622	657	442	39.3	45.4
Ac-ft	900	803	285	166	110	493	15,790	38,250	39,090	27,200	2,420	2,700

Calendar year 1961: Max 277 Min 0.1 Mean 23.0 Ac-ft 16,660
Water year 1961-62: Max 1,460 Min 1.8 Mean 177 Ac-ft 128,200

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 6 to Apr. 8.

5-0785. Clearwater River at Red Lake Falls, Minn.

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

Drainage area.--1,370 sq mi, approximately.

Records available.--June 1909 to September 1917, October 1934 to September 1962. Monthly discharge only for October, November 1934, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 949.49 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 12, 1911, staff gage at site half a mile upstream and Sept. 12, 1911, to Sept. 30, 1917, staff gage at site 40 ft upstream at different datum.

Average discharge.--36 years, 286 cfs (207,100 acre-ft per year).

Extremes.--Maximum discharge during year, 8,600 cfs June 10 (gage height, 10.96 ft); minimum daily, 40 cfs Feb. 26 to Mar. 10.
1909-17, 1934-62: Maximum discharge, 9,310 cfs May 6, 1950 (gage height, 11.28 ft); maximum gage height observed, 17.5 ft Apr. 5, 1913, site and datum then in use (backwater from ice); no flow Sept. 15, 1936, Sept. 14, 1939, Aug. 19-22, 1940.

Remarks.--Records good except those for period of ice effect, which are fair. Slight regulation by Clearwater Lake and several smaller lakes.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Apr. 16 to May 4, May 14-22, June 8-12, July 7-26)

1.7	30	3.0	368	7.0	3,580
2.0	80	4.0	902	11.0	8,890
2.5	200	5.0	1,580		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	116	80	50	46	42	40	80	1,010	3,940	503	403	118
2	114	78	60	46	42	40	90	952	3,180	436	364	114
3	114	62	55	44	42	40	100	860	2,580	426	426	111
4	107	50	50	44	42	40	160	783	*2,110	431	417	109
5	104	60	50	44	42	40	500	715	1,890	576	620	107
6	100	70	50	44	42	40	1,600	642	1,710	659	687	109
7	91	80	50	44	42	40	*1,640	576	1,540	1,100	610	104
8	87	85	48	44	42	40	1,890	518	4,090	2,040	479	123
9	89	80	48	44	42	40	1,640	493	7,670	*2,410	386	156
10	89	80	48	44	42	40	1,320	493	*8,300	3,000	344	291
11	116	70	48	44	42	42	*1,110	508	8,020	3,710	328	484
12	116	80	48	*44	42	42	1,040	550	6,470	4,030	352	555
13	118	80	46	44	42	42	1,120	593	5,260	3,860	386	529
14	130	85	46	44	42	42	1,180	927	4,260	3,470	*386	*484
15	152	90	*46	44	42	42	1,130	1,040	3,390	3,050	352	440
16	127	85	46	44	42	42	959	1,410	2,950	2,690	328	390
17	118	85	46	44	42	42	984	2,090	3,160	2,350	310	352
18	111	85	46	44	42	42	1,200	2,480	3,220	2,020	281	321
19	* 107	75	46	44	42	42	1,460	3,170	3,080	1,780	258	291
20	104	*85	46	44	42	42	*1,390	3,390	2,590	1,590	240	271
21	95	70	46	44	*42	44	1,460	*3,180	2,080	1,400	225	243
22	89	70	46	44	42	46	1,410	3,220	1,720	1,300	211	222
23	84	65	46	44	42	*46	1,380	4,960	1,520	1,230	192	208
24	80	65	46	44	42	48	1,350	*6,750	1,350	1,130	182	197
25	80	65	46	44	42	50	1,330	6,470	1,200	978	174	187
26	80	65	46	44	40	55	1,280	5,710	1,040	860	164	182
27	76	60	46	44	40	60	1,230	5,260	902	749	154	177
28	78	65	46	42	40	65	1,150	4,720	783	654	149	166
29	80	60	46	42		70	1,110	3,860	681	593	139	159
30	82	50	46	42	----------	70	1,070	3,990	576	529	135	154
31	78	----------	46	42	----------	75	----------	4,810	----------	464	125	----------
Total	3,112	2,180	1,479	1,360	1,170	1,449	33,363	76,230	91,262	50,018	9,807	7,354
Mean	100	72.7	47.7	43.9	41.8	46.7	1,112	2,459	3,042	1,613	316	245
Ac-ft	6,170	4,320	2,930	2,700	2,320	2,870	66,170	151,200	181,000	99,210	19,450	14,590

Calendar year 1961: Max 878 Min 17 Mean 122 Ac-ft 88,500
Water year 1961-62: Max 8,300 Min 40 Mean 764 Ac-ft 552,900

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 4 to Apr. 6.

5-0790. Red Lake River at Crookston, Minn.

Location.--Lat 47°46'32", long 96°36'33", in SW¼SW¼ sec.30, T.150 N., R.46 W., on right bank at downstream side of highway bridge in Crookston, 0.3 mile downstream from Interstate Power Co.'s dam and 0.6 mile downstream from bridge on State Highway 81.

Drainage area.--5,280 sq mi, approximately.

Records available.--May 1901 to September 1962. Monthly discharge only for some periods, published in WSP 1308. Figures of daily discharge for Apr. 3-30, 1904, published in WSP 130, have been found unreliable and should not be used.

Gage.--Water-stage recorder. Datum of gage is 832.72 ft above mean sea level, datum of 1929. May 18, 1901, to June 30, 1909, chain gage at bridge 300 ft upstream at same datum. July 1, 1909, to Sept. 25, 1911, chain gage, Sept. 26, 1911, to Sept. 30, 1919, water-stage recorder, and Oct. 1, 1919, to Sept. 30, 1930, chain gage, at present site and datum.

Average discharge.--61 years, 979 cfs (708,800 acre-ft per year).

Extremes.--Maximum discharge during year, 16,700 cfs June 11 (gage height, 21.90 ft); minimum, 35 cfs Nov. 20 (gage height, 2.57 ft).
1901-62: Maximum discharge, 27,400 cfs May 7, 1950 (gage height, 25.70 ft); no flow for part of July 13, 1960 (caused by regulation of powerplant upstream).

Remarks.--Records good except those for periods of ice effect, which are fair. Diurnal fluctuation caused by powerplant upstream.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Mar. 23-30, Apr. 11-18, Apr. 24 to May 2, June 25 to July 9, July 15 to Aug. 14, Sept. 9-30)

Oct. 1 to Apr. 10

2.7	78
3.0	177
4.0	567
5.0	1,030

Apr. 11 to Sept. 30

Note.--Same as preceding table below 5.0 ft.

5.0	1,030
12.0	5,860
22.0	16,800

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	209	174	70	72	80	80	181	2,030	*9,030	2,840	2,150	1,440
2	195	166	65	72	80	80	230	1,940	7,500	2,620	2,100	1,430
3	191	142	65	72	80	80	280	1,840	6,220	2,520	2,230	1,470
4	213	78	70	76	80	80	500	1,730	5,280	2,540	2,250	1,610
5	184	166	70	80	84	80	1,000	1,610	4,870	2,510	2,680	1,540
6	177	103	70	80	84	80	*2,500	1,480	4,480	*2,620	2,710	1,500
7	184	130	70	80	84	80	4,100	*1,360	4,330	2,820	2,600	1,470
8	191	80	70	80	84	80	*3,700	1,290	4,970	4,030	2,380	1,610
9	149	190	70	80	84	80	3,900	1,240	10,500	5,320	2,110	1,800
10	163	180	70	80	84	80	2,900	1,240	*14,900	5,750	2,000	1,910
11	246	220	70	80	82	80	2,430	1,240	*16,300	7,420	1,990	2,040
12	394	190	68	*79	82	78	*2,240	1,300	16,100	7,520	2,000	2,140
13	371	140	68	79	82	81	2,170	1,340	13,700	6,950	*2,000	2,140
14	310	120	68	79	82	84	2,400	1,500	11,500	6,190	1,990	2,110
15	310	200	*67	79	82	87	2,590	2,100	9,830	5,020	1,950	*2,020
16	310	210	67	80	82	90	2,820	2,500	8,400	4,860	1,880	1,970
17	276	180	67	80	82	94	3,120	3,630	7,420	4,490	1,800	1,880
18	317	120	68	80	82	103	3,740	4,630	6,870	4,120	1,720	1,830
19	188	180	70	80	82	103	5,440	5,360	6,840	3,840	1,680	1,760
20	213	*160	70	80	82	100	6,020	6,110	6,460	3,560	1,650	1,730
21	206	180	70	80	*82	103	*5,440	6,190	5,420	3,290	1,630	1,720
22	174	160	70	80	82	106	4,750	5,580	4,930	3,140	1,610	1,690
23	199	150	70	80	82	*109	4,180	7,280	4,660	3,040	1,620	1,660
24	184	120	70	80	82	112	3,590	*12,300	4,440	2,980	1,590	1,660
25	*135	120	70	80	82	163	3,160	14,500	4,230	2,840	1,560	1,670
26	177	120	72	80	82	156	*2,840	12,900	3,960	2,690	1,550	1,670
27	191	90	72	80	80	135	2,580	10,600	3,680	2,580	1,550	1,660
28	160	70	72	80	80	142	2,360	8,890	3,280	2,510	1,580	1,640
29	170	70	72	80	-	146	2,200	7,490	3,120	2,410	1,580	1,640
30	170	70	72	80	----------	152	2,100	6,610	2,930	2,370	1,480	1,580
31	170	----------	72	80	----------	170	----------	8,500	----------	2,280	1,440	----------
Total	6,727	4,279	2,155	2,448	2,296	3,194	85,461	146,310	216,150	117,670	59,060	51,990
Mean	217	143	69.5	79.0	82.0	103	2,849	4,720	7,205	3,796	1,905	1,733
Ac-ft	13,340	8,490	4,270	4,860	4,550	6,340	169,500	290,200	428,700	233,400	117,100	103,100

Calendar year 1961: Max 1,310 Min 30 Mean 219 Ac-ft 158,400
Water year 1961-62: Max 16,300 Min 65 Mean 1,912 Ac-ft 1,384,000

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 7 to Mar. 11, Apr. 2-10.

5-0825. Red River of the North at Grand Forks, N. Dak.

Location.--Lat 47°56'26", long 97°02'47", in SE¼NE¼ sec.33, T.152 N., R.50 W., on left bank 500 ft downstream from dam at Riverside Park in Grand Forks, 2 miles downstream from Red Lake River, and at mile 296.0.

Drainage area.--30,100 sq mi, approximately, includes 3,800 sq mi, in closed basins.

Records available.--April 1882 to September 1962. Monthly discharge only prior to May 1901, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 778.35 ft above mean sea level, datum of 1929. 1882-92, gages near site of Northern Pacific Railway bridge, 1½ miles upstream (history not available, datum apparently the same as following gage). 1892 to Oct. 15, 1926, staff and chain gages on Northern Pacific Railway bridge, at datum about 5½ ft higher, but published referred to datum only half a foot higher than present datum. Oct. 16, 1926, to Nov. 2, 1933, staff gages near present site, at datum 5 ft higher than present datum but published at present datum.

Average discharge.--80 years, 2,306 cfs (1,669,000 acre-ft per year).

Extremes.--Maximum discharge during year, 26,600 cfs June 16 (gage height, 34.45 ft); minimum, 170 cfs Dec. 18 (gage height, 2.11 ft).
1882-1962: Maximum discharge, about 80,000 cfs Apr. 10, 1897 (gage height, 50.2 ft, site and datum then in use), from rating curve extended above 54,000 cfs; minimum, 2.4 cfs Feb. 3-5, 12, 14, 16-19, 1937 (caused by unusual regulation during repair of dam at Grand Forks.

Remarks.--Records good. Flow regulated by many lakes and reservoirs on tributaries.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	449	*446	255	200	205	240	600	4,920	*23,200	7,640	9,550	3,000
2	431	416	275	200	210	*240	670	4,730	23,300	7,100	8,500	2,920
3	422	425	300	200	210	245	780	*4,580	22,700	*6,850	*7,800	2,900
4	413	325	305	210	215	255	1,150	4,450	21,200	6,900	7,300	2,860
5	410	300	285	230	215	260	2,200	4,340	*19,200	8,080	6,890	2,910
6	413	350	270	220	205	265	*4,300	4,210	17,000	10,000	6,910	2,880
7	386	345	265	220	200	265	7,500	*4,080	14,300	11,800	6,760	2,810
8	380	310	255	225	195	265	10,300	3,920	*11,800	13,900	6,470	2,980
9	386	305	250	230	195	270	*11,100	3,750	12,200	16,400	6,140	3,230
10	383	335	260	220	200	270	11,900	3,610	15,500	*18,400	*5,800	3,410
11	491	392	245	210	210	270	12,600	3,480	*18,700	19,800	5,620	3,830
12	634	449	230	205	215	275	*12,800	3,410	22,200	21,000	5,500	4,050
13	855	455	215	205	220	265	13,100	3,360	24,800	*21,700	5,510	4,120
14	1,130	410	200	205	220	255	13,600	3,370	26,000	22,000	5,740	4,100
15	1,170	*404	185	200	230	250	13,800	3,440	*26,500	21,700	6,220	4,070
16	967	482	180	195	235	245	14,200	*3,770	26,400	20,600	6,700	3,970
17	792	500	175	190	220	240	16,000	4,400	25,500	19,300	7,000	3,810
18	718	425	*175	185	210	235	17,400	*6,100	*24,500	*18,100	7,050	3,620
19	694	350	195	180	210	245	17,600	7,900	23,600	17,000	6,830	3,420
20	698	335	190	175	210	260	17,800	9,350	22,900	15,400	6,430	3,250
21	645	383	190	175	215	275	17,900	*10,800	22,200	13,600	5,950	3,150
22	614	449	190	175	225	300	*17,400	12,000	*21,200	12,100	5,510	3,060
23	560	473	185	180	230	315	16,300	12,900	20,000	*11,300	5,150	2,970
24	527	434	180	185	235	335	15,000	*14,700	18,600	11,100	4,840	2,920
25	509	401	185	185	235	355	13,500	18,400	17,200	11,400	4,540	2,860
26	500	383	195	190	235	385	*11,500	21,800	15,500	11,800	4,280	2,830
27	476	342	200	190	235	420	9,450	23,800	13,600	*12,100	4,000	2,800
28	458	285	200	190	240	520	7,500	*24,600	*11,800	12,200	3,710	*2,760
29	455	290	*200	195	-	*570	6,050	24,700	10,000	12,000	*3,440	2,730
30	446	*290	200	200	----------	560	*5,200	24,300	8,600	11,300	3,250	2,700
31	437	----------	200	*200	----------	570	----------	23,200	----------	10,600	3,110	----------
Total	17,849	11,489	6,835	6,170	6,080	9,720	319,200	302,370	580,200	433,170	182,500	96,920
Mean	576	383	220	199	217	314	10,640	9,754	19,340	13,970	5,887	3,231
Ac-ft	35,400	22,790	13,560	12,240	12,060	19,280	633,100	599,700	1,151,000	859,200	362,000	192,200

Calendar year 1961 : Max 3,320 Min 119 Mean 767 Ac-ft 555,200
Water year 1961-62: Max 26,500 Min 175 Mean 5,404 Ac-ft 3,913,000

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 29 to Apr. 5.

5-0875. Middle River at Argyle, Minn.

Location.--Lat 48°20'27", long 96°49'02", in SE¼SW¼ sec.10, T.156 N., R.48 W., on left bank 20 ft upstream from bridge on U. S. Highway 75 in Argyle and 14 miles upstream from mouth.

Drainage area.--265 sq mi.

Records available.--March to September 1945, November 1950 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 828.53 ft above mean sea level, datum of 1929. Prior to Nov. 8, 1951, chain or wire-weight gage at bridge 20 ft upstream at datum 1.0 ft higher. Nov. 8, 1951, to Sept. 18, 1952, water-stage recorder at present site at datum 1.0 ft higher.

Average discharge.--12 years (1950-62), 31.3 cfs (22,660 acre-ft per year).

Extremes.--Maximum discharge during year, 1,620 cfs June 12 (gage height, 14.12 ft, backwater from vegetation); no flow Feb. 22 to Apr. 5.
1945, 1950-62: Maximum discharge, that of June 12, 1962; no flow at times most years.
Maximum stage known, 15.25 ft in April 1950, present datum, from floodmarks (discharge, 2,790 cfs).

Remarks.--Records good except those for period of ice effect, which are poor.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Apr. 26-30, May 5 to June 5, June 9-21)

0.8	0	1.5	6.0	6.0	238
.9	.1	1.7	9.5	9.0	504
1.0	.4	2.0	18	11.0	775
1.1	1.1	3.0	59	12.0	990
1.2	2.1	4.0	106	13.0	1,310
				14.0	1,870

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	5.5	*4.9	1.6	0.5	0.3		0	150	418	67	19	1.6
2	4.7	4.5	1.6	*.5	.3		0	*135	685	58	16	1.6
3	4.0	4.6	1.6	.5	.3		0	119	647	52	14	1.4
4	3.6	4.2	1.4	.5	.3		0	103	*471	49	14	1.6
5	3.3	4.2	1.4	.5	.3		*0	88	340	45	11	1.6
6	3.3	4.0	1.4	.5	.2		2	73	268	41	11	1.5
7	3.7	3.8	1.4	.5	.2		4	63	224	39	10	1.4
8	4.0	3.6	1.2	.5	.2		6	54	195	34	9.9	4.6
9	2.4	3.2	1.2	.4	.2		10	46	220	31	9.9	5.7
10	1.2	3.2	1.0	.4	.2		20	*42	742	28	9.9	5.5
11	4.2	3.2	1.0	.4	.1		100	41	1,240	39	10	6.4
12	5.8	3.2	1.0	.4	.1		150	41	*1,420	58	9.3	24
13	4.6	3.0	.8	.4	.1		180	43	1,440	94	9.3	31
14	4.1	2.8	.8	.4	.1		*190	43	1,100	82	7.7	29
15	5.7	2.8	.8	.4	.1		220	42	772	59	7.1	24
16	24	2.8	.8	.4	.1		240	90	548	48	6.3	22
17	22	2.4	.8	.3	.1		*270	168	409	35	5.5	12
18	21	2.4	.8	.3	.1		300	260	359	31	5.1	9.3
19	19	2.2	.8	.3	.1		400	305	445	27	5.1	7.1
20	15	2.2	.7	.3	.1		*640	288	484	22	4.7	5.8
21	13	2.2	.7	.3	.1		680	279	453	23	4.3	5.0
22	13	2.2	.7	.3	0		680	411	346	24	4.2	4.3
23	12	2.2	.7	.3	0		*670	506	268	18	4.5	3.0
24	10	2.2	.6	.3	0		620	419	210	23	3.8	2.9
25	8.3	2.2	.6	.3	0		520	872	*178	69	3.3	2.9
26	7.6	2.0	.6	.3	0		421	1,410	163	71	2.8	*2.8
27	6.6	2.2	.6	.3	*0	(*)	*354	1,120	137	59	2.3	2.6
28	6.4	*2.0	.5	.3	0		278	*786	109	46	2.0	2.3
29	6.0	1.8	.5	.3	-		215	550	91	37	*1.8	2.2
30	5.7	1.8	.5	*.3	----------		178	402	76	29	1.9	2.8
31	5.3	----------	.5	.3	----------		----------	318	----------	*23	1.7	----------
Total	255.0	88.0	28.6	11.7	3.6	0	7,348	9,267	14,458	1,361	227.4	227.9
Mean	8.23	2.93	0.92	0.38	0.13	0	245	299	482	43.9	7.34	7.60
Ac-ft	24	175	57	23	7.1	0	14,570	18,380	28,680	2,700	451	452

Calendar year 1961: Max 130 Min 0 Mean 6.36 Ac-ft 4,600
Water year 1961-62: Max 1,440 Min 0 Mean 91.2 Ac-ft 66,000

* Discharge measurement or observation of no flow made on this day.

Note.--Stage-discharge relation affected by ice Nov. 3 to Apr. 25 (no gage-height record Dec. 15-21, Jan. 10-29. Discharge computed from once-daily wire-weight gage readings Mar. 28 to Apr. 18.

5-0920. Red River of the North at Drayton, N. Dak.

Location.--Lat 48°34'20", long 97°08'50", on line between secs. 24 and 25, T.159 N., R.51 W., on downstream end of east pier of interstate highway bridge, 1½ miles northeast of Drayton and at mile 207.

Drainage area.--34,800 sq mi, approximately (includes 3,800 sq mi in closed basins).

Records available.--April 1936 to June 1937, April 1941 to September 1962 (fragmentary prior to April 1949).

Gage.--Water-stage recorder. Datum of gage is 755.00 ft above mean sea level, datum of 1929 (Minnesota highway bench mark). Prior to Nov. 30, 1954, wire-weight gage at site 1½ miles upstream at datum 1.59 ft higher.

Average discharge.--13 years (1949-62), 3,267 cfs (2,365,000 acre-ft per year); median of yearly mean discharges, 2,460 cfs (1,780,000 acre-ft per year).

Extremes.--Maximum discharge during year, 32,300 cfs Apr. 24 (gage height, 36.26 ft); minimum daily discharge, 190 cfs, Jan. 20-26; minimum gage height, 3.76 ft Nov. 4.
1936-37, 1941-62: Maximum discharge, 86,500 cfs May 12, 1950 (gage height, 41.58 ft, former site and datum); minimum observed, 7.7 cfs Oct. 16, 1936 (gage height, 1.75 ft, former site and datum).
Maximum discharge known since 1860, that of May 12, 1950. Flood of April 1897 reached a stage of about 41 ft, at site and datum in use prior to Nov. 30, 1954.

Remarks.--Records good except those for period of ice effect, which are fair. Some regulation by reservoirs on tributaries.

Correction.--The gage height for the maximum discharge for 1961 was in error. Correct statement should be "Maximum discharge during year, 3,600 cfs Mar. 31 (gage height, 12.98 ft)."

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	568	504	360	200	195	200	700	*14,400	23,500	14,800	11,600	3,460
2	*530	504	340	200	195	200	780	12,900	23,900	*12,800	10,900	3,280
3	510	510	320	200	195	200	800	11,000	24,300	11,200	10,100	3,170
4	497	447	300	210	200	210	820	*9,400	*24,700	9,700	9,300	3,050
5	478	510	*295	220	200	210	900	8,220	25,000	8,400	8,600	2,950
6	478	480	290	230	200	210	1,200	6,900	24,800	7,800	8,100	2,910
7	472	*390	290	230	195	210	2,000	6,000	23,800	8,900	7,750	2,920
8	472	380	280	220	*195	*215	4,300	*5,220	*22,300	10,900	7,500	2,930
9	472	330	260	210	195	215	6,900	4,700	20,800	*12,800	7,300	3,020
10	453	380	240	205	195	220	8,700	4,380	19,600	14,400	*6,940	3,120
11	542	380	230	*200	195	220	9,900	4,200	18,800	16,000	6,700	3,320
12	568	380	220	200	200	230	10,800	3,950	*20,100	17,500	6,350	3,610
13	568	420	220	200	200	230	11,800	3,850	21,300	18,600	6,150	3,970
14	653	400	220	200	210	240	12,600	3,840	22,800	19,600	6,000	4,230
15	750	440	225	195	210	245	13,400	3,860	*24,200	20,400	6,200	4,370
16	950	450	225	195	220	245	14,600	3,900	25,100	*21,000	6,800	4,390
17	1,230	430	220	195	220	250	15,800	*4,100	25,600	21,300	7,500	4,340
18	1,150	420	215	195	210	260	17,200	4,600	26,000	21,600	7,900	4,220
19	1,020	460	215	195	210	265	19,200	5,800	*26,300	21,700	8,100	4,010
20	904	480	210	190	210	265	22,600	7,400	26,500	*19,600	8,000	3,800
21	851	420	210	190	210	270	*25,600	*8,850	26,600	13,300	7,400	*3,570
22	825	400	210	190	210	270	28,900	10,100	26,600	17,200	6,800	3,400
23	779	350	215	190	205	275	*31,300	11,800	26,500	16,100	6,500	3,250
24	732	330	215	190	205	290	32,200	*13,600	25,900	15,000	6,000	3,150
25	699	380	205	190	205	310	28,500	14,700	*25,000	*13,900	5,600	3,050
26	640	450	215	190	200	330	*24,300	16,100	23,800	13,200	5,250	2,960
27	588	450	210	195	200	360	22,200	17,900	22,400	12,700	4,900	2,890
28	575	420	205	200	200	400	20,200	19,700	20,700	12,400	4,600	2,820
29	562	400	205	200	-	460	18,200	21,100	18,900	12,200	4,250	2,780
30	536	380	200	195	----------	540	16,300	22,200	16,800	12,100	3,850	2,750
31	510	----------	200	195	----------	620	----------	22,900	----------	*11,900	3,650	----------
Total	20,562	12,675	7,465	6,215	5,685	8,665	422,700	307,570	702,600	464,000	216,590	101,690
Mean	663	422	241	200	203	280	14,090	9,922	23,420	14,970	6,987	3,390
Ac-ft	40,780	25,140	14,830	12,330	11,280	17,190	838,400	610,100	1,394,000	920,300	429,600	201,700

Calendar year 1961: Max 3,550 Min 124 Mean 861 Ac-ft 623,500
Water year 1961-62: Max 32,200 Min 190 Mean 6,237 Ac-ft 4,516,000

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 5 to Apr. 21.

5-0940. South Branch Two Rivers at Lake Bronson, Minn.

Location.--Lat 48°43'50", long 96°39'50", in SW¼SW¼ sec.30, T.161 N., R.46 W., on left bank 100 ft upstream from bridge on U. S. Highway 59 at town of Lake Bronson and 2 miles downstream from dam at outlet of Bronson Lake.

Drainage area.--444 sq mi.

Records available.--September 1928 to November 1936, April to September 1937, April 1941 to October 1943, April to December 1944, April 1945 to September 1947, October 1953 to September 1962. Monthly discharge only for some periods, published in WSP 1308. Published as South Fork Two Rivers at Bronson prior to 1941.

Gage.--Water-stage recorder. Datum of gage is 930.46 ft above mean sea level, adjustment of 1928 (levels by Geodetic Survey of Canada). Prior to Nov. 23, 1953, chain gage at bridge 100 ft downstream at same datum.

Average discharge.--21 years (1928-36, 1941-43, 1945-47, 1953-62), 68.9 cfs (49,880 acre-ft per year).

Extremes.--Maximum discharge during year, 2,960 cfs June 13 (gage height, 10.82 ft); minimum, 0.8 cfs Nov. 16, 17 (gage height, 1.84 ft); minimum gage height, 1.81 ft Apr. 11, 12.
1928-37, 1941-47, 1953-62: Maximum discharge, that of June 13, 1962; no flow at times during 1937, 1941, 1960.

Remarks.--Records good except those for period of ice effect, which are fair. Flow partly regulated since 1937 by Bronson Lake (usable capacity, 3,700 acre-ft).

Rating tables, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1-10, Apr. 20-21, Sept. 21-30)

Oct. 1 to Apr. 20				Apr. 21 to Sept. 30			
1.8	0.8	2.6	39	1.9	3.1	3.0	108
1.9	1.7	3.0	93	2.0	4.8	4.0	350
2.0	3.6	3.5	188	2.2	13	7.0	1,360
2.1	6.4	4.0	307	2.4	28	11.0	3,040
2.3	16	7.0	1,260	2.7	60		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1.0	1.0	5.0	3.9	3.4	3.1	13	152	1,420	237	32	10
2	1.0	1.0	5.0	*3.9	3.3	5.0	13	*53	1,350	173	6.4	24
3	1.0	*1.0	5.0	3.9	3.3	60	13	16	1,010	118	6.4	139
4	1.0	1.0	5.0	3.8	3.3	65	13	103	662	122	7.2	66
5	1.0	1.0	4.8	3.8	3.3	60	14	99	437	122	7.2	4.8
6	1.0	1.0	4.8	3.8	3.3	55	14	94	342	124	38	4.8
7	1.0	.9	4.8	3.8	3.3	50	16	65	350	126	128	4.8
8	1.0	.9	4.6	3.8	3.3	40	14	9	356	132	128	5.4
9	1.1	.9	4.6	3.7	3.2	30	*3.4	5.1	921	309	126	5.4
10	4.4	1.0	4.6	3.7	3.2	20	1.4	24	1,650	272	126	4.8
11	4.9	1.0	4.6	3.7	3.2	10	1.3	169	2,380	42	124	4.6
12	1.3	1.0	4.6	3.7	3.2	8.0	1.4	146	2,680	97	126	4.6
13	1.1	1.0	4.6	3.7	3.2	30	17	143	*2,910	46	128	4.6
14	1.0	.9	4.6	3.7	3.2	35	105	143	2,740	122	150	4.6
15	1.1	.9	4.6	3.6	3.2	38	165	484	*2,160	171	208	4.4
16	1.1	.8	4.4	3.6	3.2	39	173	578	1,520	117	168	4.6
17	1.0	.8	4.4	3.6	3.2	42	235	670	1,750	141	99	4.8
18	1.0	.9	4.4	3.6	3.2	43	*728	766	1,150	109	104	3.7
19	1.0	.9	4.4	3.6	3.2	48	1,100	707	899	17	182	3.7
20	1.0	.9	4.2	3.6	3.2	49	1,080	673	801	119	162	3.9
21	1.0	1.0	4.2	3.6	3.2	50	1,130	738	593	164	5.8	3.9
22	1.0	1.1	4.2	3.6	3.2	32	1,190	804	515	41	45	3.7
23	1.0	1.1	4.2	3.5	3.2	15	1,190	1,300	563	39	118	3.7
24	1.0	1.1	4.0	3.5	3.1	14	*1,080	2,010	443	38	106	*3.5
25	1.0	1.1	4.0	3.5	3.1	16	928	2,120	301	37	11	3.5
26	1.0	1.0	4.0	3.4	3.1	*15	599	2,260	267	38	9.0	3.7
27	1.0	1.1	4.0	3.4	*3.1	14	413	1,980	262	96	9.0	3.7
28	1.0	*4.4	4.0	3.4	3.1	14	304	1,310	*184	91	8.5	4.6
29	1.0	5.0	4.0	3.4	-	13	291	*812	146	46	9.5	5.1
30	1.0	5.0	3.9	*3.4	----------	13	244	703	164	45	9.5	5.1
31	1.0	----------	3.9	3.4	----------	13	----------	1,180	----------	*43	*9.5	----------
Total	78.6	40.7	137.4	112.6	90.0	939.1	11,089.5	20,316.1	30,926	3,394	2,397.0	353.0
Mean	2.54	1.36	4.43	3.63	3.21	30.3	370	655	1,031	109	77.3	11.8
Ac-ft	156	81	273	223	179	1,860	22,000	40,300	61,340	6,730	4,750	700

Calendar year 1961: Max 300 Min 0.3 Mean 8.12 Ac-ft 5,880
Water year 1961-62: Max 2,910 Min 0.8 Mean 191 Ac-ft 138,600

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 29 to Mar. 12 (no gage-height record Feb. 7-18, Mar. 3,4).

5-1025. Red River of the North at Emerson, Manitoba

(International gaging station)

Location.--Lat 49°00'30", long 97°13'00", in sec.2, T.1, R.2 E., on right bank 1,500 ft downstream from Canadian National Railway bridge in Emerson, three-quarters of a mile downstream from International Boundary, 3.6 miles downstream from Pembina River, and at mile 154.3.

Drainage area.--40,200 sq mi, approximately (includes 3,800 sq mi in closed basins).

Records available.--March to November 1902 (gage heights only), May 1912 to September 1929 (monthly discharge only, published in WSP 1308), October 1929 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 700.00 ft above mean sea level, datum of 1929, by Geodetic Survey of Canada. Prior to 1912, staff gage at different datum. May 3, 1912, to Apr. 10, 1953, chain gage and/or staff gage on Canadian National Railway bridge, 1,500 ft upstream. May 3, 1912, to Sept. 30, 1923, at datum 2.55 ft lower than present datum; Oct. 1, 1923, to Sept. 30, 1925, at datum 1.14 ft lower than present datum; Oct. 1, 1925, to Sept. 30, 1947, at datum 0.57 ft higher than present datum; and Oct. 1, 1947, to Sept. 30, 1948, at datum 0.21 ft higher than present datum.

Average discharge.--50 years (1912-62), 2,755 cfs (1,995,000 acre-ft per year); median of yearly mean discharges, 2,320 cfs (1,680,000 acre-ft per year).

Extremes.--Maximum discharge during year, 33,400 cfs Apr. 25 (gage height, 81.93 ft); minimum daily, 158 cfs Jan. 28.
1912-62: Maximum discharge, 95,500 cfs May 13, 1950 (gage height, 90.89 ft); minimum observed, 0.9 cfs Feb. 6-8, 1937 (gage height, 44.00 ft).

Remarks.--Records good except those for periods of ice effect, which are fair.

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

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	508	471	387	201	190	217	430	23,400	24,200	22,000	12,100	3,830
2	504	427	371	201	194	217	504	21,400	24,800	20,100	11,600	3,620
3	475	388	339	194	198	220	588	19,100	25,200	18,000	11,000	3,450
4	451	422	314	190	201	228	673	16,500	25,600	15,700	10,100	3,310
5	430	310	302	182	209	228	754	13,900	25,700	13,400	9,260	3,200
6	414	359	291	190	205	228	833	11,400	25,800	11,500	8,640	3,140
7	391	438	276	201	209	224	974	9,340	25,700	10,500	8,060	3,060
8	391	475	279	209	205	220	1,410	7,680	25,400	10,600	7,730	3,010
9	395	414	287	217	205	217	3,210	6,560	25,000	11,100	7,530	3,010
10	403	339	287	224	209	213	5,800	5,770	24,400	12,200	7,310	3,040
11	418	318	283	220	213	224	7,760	5,230	23,800	13,700	7,100	3,120
12	438	351	279	220	205	232	9,290	4,870	23,200	15,100	6,790	3,240
13	463	347	272	220	194	232	10,500	4,640	23,000	16,100	6,490	3,460
14	475	318	264	224	190	228	11,200	4,630	23,400	17,100	6,250	3,710
15	496	318	260	228	182	228	12,200	4,620	24,200	17,900	6,140	3,920
16	620	367	256	232	178	224	13,200	4,770	25,000	18,600	6,170	4,030
17	842	430	252	228	178	217	14,100	5,060	25,700	19,200	6,420	4,060
18	1,040	451	248	228	182	201	15,800	5,440	26,300	19,600	6,810	4,030
19	1,080	463	248	219	178	194	17,800	6,080	26,700	19,800	7,150	3,930
20	1,000	467	244	209	186	194	22,400	7,310	27,000	19,900 19,800	7,360	3,780
21	885	483	240	200	190	186	27,400	8,650	27,200		7,390	3,610
22	815	487	236	190	205	186	29,900	9,970	27,300	19,600	7,260	3,460
23	746	471	232	181	217	182	31,500	11,600	27,300	19,100	6,920	3,310
24	729	442	224	171	217	174	32,700	14,100	27,200	18,200	6,480	3,180
25	676	391	217	162	217	166	33,300	15,900	27,000	17,000	6,070	3,090
26	651	351	213	162	213	174	31,000	17,300	26,700	15,700	5,720	3,010
27	621	418	209	162	213	228	28,400	18,900	26,200	14,500	5,400	2,940
28	551	483	209	158	213	279	27,500	20,400	25,600	13,600	5,070	2,880
29	520	487	209	162	-	314	26,400	21,700	24,800	13,000	4,730	2,820
30	504	438	205	170	----------	331	25,100	22,700	23,600	12,700	4,410	2,780
31	479	----------	205	178	----------	371	----------	23,500	----------	12,500	4,110	----------
Total	18,411	12,324	8,138	6,133	5,596	6,977	442,626	372,420	763,000	497,800	223,570	101,030
Mean	594	411	263	198	200	225	14,750	12,010	25,430	16,060	7,212	3,368
Ac-ft	36,520	24,440	16,140	12,160	11,100	13,840	877,900	738,700	1,513,000	987,800	443,400	200,400

Calendar year 1961: Max 4,290 Min 122 Mean 895 Ac-ft 648,100
Water year 1961-62: Max 33,300 Min 158 Mean 6,730 Ac-ft 4,875,000

Note.--Stage-discharge relation affected by ice Nov. 5 to Apr. 20.

5-1045. Roseau River below South Fork near Malung, Minn.

Location.--Lat 48°47'30", long 95°44'40", in SW¼ sec.6, T.161 N., R.39 W., on left bank a quarter of a mile downstream from South Fork and 1½ miles northwest of Malung.

Drainage area.--573 sq mi.

Records available.--October 1946 to September 1962.

Gage.--Water-stage recorder and concrete control. Datum of gage is 1,029.67 ft above mean sea level, adjustment of 1912.

Average discharge.--16 years, 128 cfs (92,670 acre-ft per year).

Extremes.--Maximum discharge during year, 2,500 cfs June 12 (gage height, 16.98 ft); minimum daily, 5.1 cfs Feb. 26-28.
1946-62: Maximum discharge, 3,650 cfs Apr. 24, 1950 (gage height, 22.51 ft); no flow for part of Jan. 15, 1952 (caused by construction of concrete control) and July 23 to Sept. 8, 1961.

Remarks.--Records good except those for periods of ice effect, which are fair.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

4.7	4.7	6.0	124
4.9	9.0	6.5	263
5.2	20	7.0	453
5.5	42	8.0	700
5.7	67	17.0	2,500

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	67	27	20	9.0	6.6	5.3	9.6	*418	1,100	113	*40	90
2	61	*27	20	9.0	6.8	5.3	10	380	1,120	96	38	83
3	53	23	19	*9.0	6.8	5.6	11	332	1,050	85	36	78
4	51	22	19	9.0	6.8	5.6	20	301	930	78	37	89
5	48	25	18	9.0	6.8	5.6	25	252	786	72	986	109
6	40	28	17	9.0	6.8	5.6	40	218	646	69	1,950	107
7	40	40	15	9.0	6.8	5.6	70	195	547	69	2,000	103
8	37	33	14	8.8	6.8	5.6	105	193	527	66	1,740	109
9	36	30	13	8.5	6.8	5.6	150	*224	760	59	1,410	120
10	36	32	12	8.5	6.8	5.6	200	282	1,280	58	1,130	201
11	38	29	11	8.5	6.8	5.8	250	340	2,180	52	896	271
12	39	29	11	8.5	6.6	6.0	300	372	2,460	48	730	301
13	58	30	11	8.5	6.6	6.2	280	360	2,170	41	596	324
14	74	31	11	8.5	6.6	6.2	250	388	1,380	36	530	305
15	78	32	11	8.5	6.6	6.2	300	614	1,090	33	439	267
16	74	32	10	8.5	6.6	6.2	400	758	914	31	356	218
17	72	31	9.9	8.3	6.4	6.2	600	820	830	28	305	187
18	72	26	9.6	8.0	6.2	6.2	1,400	924	750	26	263	164
19	72	30	9.3	8.0	6.0	6.6	*1,820	1,060	636	24	231	146
20	72	31	9.3	8.0	5.8	6.8	1,700	1,150	521	22	204	128
21	58	30	9.3	8.0	5.6	7.1	1,650	1,180	410	20	179	114
22	50	27	9.3	7.8	5.5	7.3	1,600	1,190	380	20	158	109
23	42	25	9.3	7.8	5.5	7.6	1,490	1,270	356	20	151	96
24	37	23	9.3	7.8	5.3	7.8	1,350	1,520	332	25	156	80
25	34	25	9.6	7.8	5.3	8.0	*1,190	1,820	301	37	158	*70
26	31	29	9.6	7.6	5.1	8.0	1,030	1,980	*286	38	146	70
27	28	28	9.6	7.6	5.1	*8.3	844	1,780	231	32	126	72
28	27	*24	9.6	7.4	*5.1	8.5	678	*1,510	184	39	114	56
29	27	23	9.6	7.2	-	8.8	555	1,250	151	49	*111	64
30	27	22	9.3	7.0	----------	9.0	463	1,060	133	45	107	45
31	27	----------	9.0	*6.8	----------	9.0	----------	1,060	----------	42	100	----------
Total	1,506	844	373.6	254.9	174.5	207.2	18,790.6	25,201	24,441	1,473	15,423	4,176
Mean	48.6	28.1	12.1	8.22	6.23	6.68	626	813	815	47.5	498	139
Ac-ft	2,990	1,670	741	506	346	411	37,270	49,990	48,480	2,920	30,590	8,280

Calendar year 1961: Max 580 Min 0 Mean 41.1 Ac-ft 29,760
Water year 1961-62: Max 2,460 Min 5.1 Mean 254 Ac-ft 184,200

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Feb. 7 to Mar. 23, Apr. 4-22.

5-1060. Sprague Creek near Sprague, Manitoba

(International gaging station)

Location.--Lat 48°59'33", long 95°39'43", in NE¼ sec.34, T.164 N., R.39 W., on left bank half a mile south of international boundary, 3½ miles south of Sprague, Manitoba, 8 miles upstream from mouth, and 14 miles northeast of Roseau, Minn.

Drainage area.--169 sq mi. Prior to October 1958, 151 sq mi; change due to construction of drainage ditch within basin.

Records available.--September 1928 to September 1962 (winter records incomplete prior to 1941). Prior to September 1951, published as Mud Creek near Sprague.

Gage.--Water-stage recorder and concrete control. Datum of gage is 1,038.4 ft above mean sea level, adjustment of 1928 by Geodetic Survey of Canada. Prior to Mar. 15, 1929, staff gage at same site and datum.

Average discharge.--23 years (1928-29, 1940-62), 56.9 cfs (41,190 acre-ft per year).

Extremes.--Maximum discharge during year, 862 cfs May 25 (gage height, 11.42 ft); no flow Jan. 30 to Feb. 3. 1928-62: Maximum discharge, 2,070 cfs Sept. 1, 1942 (gage height, 15.31 ft), from rating curve extended above 960 cfs; no flow at times in some years.

Remarks.--Records good except those for period of ice effect, which are poor.

Cooperation.--This station is maintained by the United States under agreement with Canada.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)

1.7	0	2.4	3.4	4.0	86
1.8	0.1	2.6	6.9	7.0	277
2.0	.3	2.9	16	9.0	472
2.1	.7	3.2	28	11.0	784
2.2	1.3	3.5	52	11.5	877

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.9	*3.1	0.9	0.6	0	0.7	4.0	*101	390	39	*30	68
2	.9	3.2	1.0	.8	0	.7	3.5	94	340	32	26	62
3	.9	3.3	1.0	*.9	0	.7	3.5	88	294	28	26	66
4	1.1	3.4	1.0	1.0	.1	.7	3.5	84	258	27	30	63
5	1.3	3.2	1.0	1.0	.1	.7	4.0	80	227	26	71	54
6	1.2	2.8	1.0	1.0	.1	.7	5.0	73	201	24	403	46
7	1.1	2.9	1.0	.9	.1	.7	5.5	67	183	24	369	42
8	1.3	2.6	.9	.9	.1	.7	6.0	66	201	56	257	43
9	1.6	2.6	.8	.8	.2	.7	6.0	*69	345	94	184	63
10	1.6	2.8	.8	.8	.2	.7	10	95	416	107	130	75
11	2.8	2.9	.6	.7	.2	.7	10	117	331	96	103	67
12	3.4	3.1	.5	.7	.2	.7	15	117	258	81	121	61
13	3.2	3.1	.7	.6	.3	.6	15	117	206	78	99	50
14	4.0	2.9	.8	.6	.3	.6	15	179	167	54	74	41
15	4.3	2.8	.9	.5	.4	.6	15	245	147	39	60	36
16	3.6	2.8	1.2	.5	.4	.6	20	287	201	31	50	34
17	3.6	2.5	1.5	.4	.5	.6	40	328	307	28	44	39
18	3.2	2.4	1.8	.4	.5	.6	180	332	283	25	39	35
19	3.1	2.4	1.8	.3	.5	.6	*220	345	227	23	77	31
20	2.9	2.3	1.6	.3	.5	.5	180	442	191	23	94	26
21	2.9	2.1	1.6	.2	.6	.5	*170	467	193	24	84	26
22	2.6	2.1	1.4	.2	.6	.5	150	444	336	28	173	25
23	2.6	2.2	1.4	.2	.6	.5	140	578	206	60	401	24
24	2.7	2.6	1.5	.2	.6	.5	136	791	172	62	428	23
25	2.7	2.5	1.5	.2	.7	.5	139	843	163	66	331	* 23
26	2.8	2.0	1.3	.1	.7	*.5	134	712	126	63	248	21
27	2.9	1.6	1.2	.1	*.7	.6	126	563	*94	53	184	22
28	2.9	1.5	1.0	.1	.7	.8	115	*448	72	48	147	21
29	2.9	*1.5	.6	.1	-	1.5	105	370	59	44	116	20
30	3.6	1.0	.5	0	----------	4.0	102	356	48	42	*88	20
31	3.4	----------	.5	* 0	----------	4.0	----------	416	----------	36	73	----------
Total	78.0	76.2	33.3	15.1	9.9	27.0	2,078	9,314	6,642	1,461	4,560	1,227
Mean	2.52	2.54	1.07	0.49	0.35	0.87	69.3	300	221	47.1	147	40.9
Ac-ft	155	151	66	30	20	54	4,120	18,470	13,170	2,900	9,040	2,430

Calendar year 1961: Max 100 Min 0 Mean 10.5 Ac-ft 7,620
Water year 1961-62: Max 843 Min 0 Mean 69.9 Ac-ft 50,610

* Discharge measurement or observation of no flow made on this day.
Note.--Stage-discharge relation affected by ice Nov. 10 to Apr. 23.

5-1065. Roseau River at Roseau Lake, Minn.

Location.--Lat 48°54'22", long 95°49'55", in SW¼SW¼ sec.28, T.163 N., R.40 W., on upstream bridge piling on left bank at Roseau Lake, 3½ miles upstream from Pine Creek, 3¾ miles downstream from Sprague Creek, and 7 miles northwest of Roseau.

Records available.--November 1939 to September 1962 (incomplete).

Gage.--Staff gage read once daily. Datum of gage is 1,018.59 ft above mean sea level, adjustment of 1928 by Geodetic Survey of Canada. Gage readings have been reduced to elevations above mean sea level.

Extremes.--Maximum elevation during year, 1,032.92 ft June 17; minimum observed, 1,021.29 ft Oct. 30.
1939-62: Maximum elevation observed, 1,036.86 ft May 13 1950; minimum observed, 1,019.75 ft Aug. 16, 1941.

Elevation, in feet, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	22.21	21.29					22.76	30.44	32.18	29.84	22.00	25.08
2	22.17	-					22.76	30.19	32.16	29.50	21.90	24.66
3	22.09	-					22.78	29.94	32.12	29.12	22.76	24.46
4	21.99	-					22.78	29.66	32.04	28.72	22.88	24.26
5	21.91	-					22.78	29.32	31.92	28.26	23.18	24.06
6	21.83	-					22.74	29.04	31.74	27.76	30.04	23.90
7	21.77	-					22.74	28.66	31.56	27.26	30.76	23.78
8	21.69	-					23.06	28.44	31.40	27.02	31.04	23.68
9	21.65	-					23.96	27.96	31.38	26.68	31.16	23.80
10	21.61	-					25.42	27.82	31.56	26.18	31.16	24.14
11	21.61	-					25.96	27.74	32.10	25.66	31.14	24.78
12	21.75	-					26.36	27.66	32.44	25.18	31.14	25.10
13	21.81	-					26.84	27.56	32.74	24.76	31.10	25.24
14	21.95	-					26.86	27.60	32.84	24.38	30.84	25.22
15	22.23	-					26.86	27.86	32.80	23.86	30.64	24.96
16	22.37	-					27.32	28.38	32.84	23.44	30.36	24.56
17	22.35	-					27.86	28.74	32.92	22.98	30.06	24.20
18	22.29	-					29.26	29.00	32.88	22.62	29.76	23.86
19	22.27	-					30.84	29.30	32.80	22.10	29.44	23.46
20	22.23	-					31.36	29.76	32.70	21.90	29.14	23.16
21	22.21	-					31.06	30.06	32.54	21.76	28.76	22.86
22	22.09	-					31.26	30.30	32.36	21.62	28.50	22.66
23	21.99	-					31.36	30.66	32.20	21.76	28.46	22.46
24	21.85	-					31.45	31.14	32.00	22.16	28.38	22.36
25	21.69	-					31.44	31.50	31.76	22.56	28.22	22.25
26	21.59	-					31.38	31.84	31.52	23.20	27.92	22.18
27	21.47	-					31.28	32.04	31.26	22.62	27.54	22.08
28	21.37	-					31.14	32.16	30.90	22.54	27.14	21.98
29	21.35	-			-		30.90	32.18	30.66	22.38	26.60	21.86
30	21.29	-			----------		30.66	32.16	30.22	22.26	25.96	21.74
31	21.29	----------			----------		----------	32.18	----------	22.16	25.50	----------

Note.--Add 1,000 ft to obtain elevation above mean sea level.

5-1075. Roseau River at Ross, Minn.

Location.--Lat 48°54'37", long 95°55'18", in SE¼ sec.27, T.163 N., R.41 W., on left bank 300 ft downstream from highway bridge, a quarter of a mile north of Ross, and 2.3 miles downstream from Pine Creek.

Drainage area.--1,220 sq mi, approximately.

Records available.--July 1928 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,018.44 ft above mean sea level, adjustment of 1928 by Geodetic Survey of Canada. Prior to Mar. 13, 1929, staff gage at same site and datum.

Average discharge.--34 years, 229 cfs (165,800 acre-ft per year).

Extremes.--Maximum discharge during year, 2,120 cfs June 17 (gage height, 13.86 ft); minimum daily, 5.4 cfs Feb. 26 to Mar. 3.
1928-62: Maximum discharge, 6,560 cfs May 12, 1950 (gage height, 18.25 ft); no flow Aug. 29, 30, 1961. Maximum stage known, about 19 ft in 1896. Other outstanding floods reached the following stages (from information by local residents); flood of July 1919, 17.5 ft; flood of 1927, about 16 ft.

Remarks.--Records fair prior to Apr. 26, good thereafter. High flow regulated by natural storage in Roseau Lake.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1 to Nov. 5, Aug. 26 to Sept. 30)

0.4	4.2	3.0	111
0.7	9.5	5.0	288
1.0	17	7.0	532
1.5	32	10.0	1,100
2.0	53	14.0	2,160

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	86	*37	26	9.2	7.0	5.4	20	1,390	1,860	1,250	110	375
2	80	39	26	*9.2	7.0	5.4	22	*1,320	1,850	1,160	102	332
3	75	37	26	9.2	7.0	5.4	22	1,240	1,840	1,070	160	306
4	74	36	26	9.2	7.0	5.6	22	1,170	1,830	978	180	286
5	63	39	24	9.2	7.0	5.6	24	1,080	1,790	884	322	272
6	58	34	22	9.2	6.8	5.6	32	1,020	1,750	790	1,020	260
7	54	34	20	9.2	6.8	5.6	40	947	1,700	710	1,140	244
8	50	40	18	9.2	6.8	5.6	50	874	1,660	667	1,230	232
9	47	48	16	9.2	6.8	5.6	100	811	1,640	607	1,350	248
10	45	48	14	9.0	6.8	5.8	200	*776	1,710	529	1,440	281
11	46	48	12	9.0	6.8	6.0	250	759	1,820	467	1,490	340
12	51	48	12	9.0	6.2	6.0	280	738	1,890	408	1,510	375
13	56	46	12	9.0	6.4	6.4	320	727	1,950	360	1,490	390
14	64	43	12	8.8	6.4	6.8	350	735	1,980	318	1,450	384
15	84	44	10	8.8	6.4	7.0	380	774	2,020	267	1,400	352
16	81	44	10	8.6	6.4	7.2	400	842	2,080	223	1,350	316
17	89	42	9.8	8.6	6.4	7.4	460	888	2,110	184	1,280	281
18	88	42	9.6	8.6	6.2	7.6	*620	949	2,090	150	1,210	248
19	87	38	9.6	8.4	6.2	7.8	850	1,040	2,070	114	1,130	220
20	86	36	9.4	8.4	6.2	8.0	1,000	1,120	2,030	98	1,060	188
21	84	34	9.2	8.2	6.0	8.2	*1,160	1,180	1,990	90	987	162
22	77	34	9.2	8.2	6.0	8.2	1,320	1,260	1,930	89	930	146
23	72	32	9.2	8.0	5.8	8.4	1,420	1,380	1,880	92	915	136
24	67	31	9.2	7.8	5.8	8.8	1,520	1,480	1,820	119	894	125
25	56	30	9.2	7.6	5.6	8.8	1,580	1,580	1,760	147	852	116
26	48	30	9.2	7.6	5.4	*9.1	1,620	1,680	1,690	153	792	*109
27	43	31	9.2	7.4	*5.4	9.6	*1,620	1,750	*1,600	153	721	98
28	38	32	9.2	7.4	5.4	10	1,580	1,810	1,510	145	645	94
29	36	*32	9.2	7.2	-	12	1,530	*1,850	1,430	137	*571	84
30	36	28	9.2	*7.1	---------	14	1,460	1,860	1,340	127	492	77
31	36	---------	9.2	7.0	---------	18	---------	1,860	---------	*121	425	---------
Total	1,957	1,137	425.6	262.5	178.0	240.9	20,252	36,890	54,620	12,607	28,648	7,077
Mean	63.1	37.9	13.7	8.47	6.36	7.77	675	1,190	1,821	407	924	236
Ac-ft	3,880	2,260	844	521	353	478	40,170	73,170	108,300	25,010	56,820	14,040

Calendar year 1961: Max 560 Min 0 Mean 65.4 Ac-ft 47,380
Water year 1961-62: Max 2,110 Min 5.4 Mean 450 Ac-ft 325,800

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 6 to Apr. 26.

5-1080. Roseau River near Badger, Minn.

Location.--Lat 48°54'42", long 96°00'24", in SW¼ sec.30, T.163 N., R.41 W., on right bank 100 ft upstream from highway bridge and 9 miles north of Badger.

Records available.--August 1928 to September 1962 (incomplete).

Gage.--Water-stage recorder. Datum of gage is 1,016.90 ft above mean sea level, adjustment of 1928 by Geodetic Survey of Canada. Gage readings have been reduced to elevations above mean sea level.

Extremes.--Maximum elevation during year, 1,029.89 ft June 17; minimum recorded, 1,018.76 ft Nov. 2.
1928-62: Maximum elevation, 1,032.65 ft May 13, 1950; minimum recorded, 1,017.42 ft Aug. 30, 1961.

Mean elevation, in feet, water year October 1961 to September 1962.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	19.87	18.80					-	27.59	29.09	27.33	20.35	23.43
2	19.78	18.78					-	27.36	29.05	27.02	20.23	23.05
3	19.70	18.85					-	27.13	29.01	26.73	20.72	22.76
4	19.60	-					-	26.89	29.98	26.41	21.28	22.53
5	19.51	-					20.32	26.60	28.91	26.05	22.13	22.36
6	19.42	-					20.44	26.33	28.80	25.69	26.23	22.25
7	19.35	-					20.76	26.08	28.65	25.41	26.92	22.09
8	19.25	-					21.33	25.80	28.56	25.24	27.17	21.96
9	19.19	-					22.22	25.52	28.48	24.91	27.53	22.07
10	19.13	-					23.43	25.36	28.79	24.47	27.83	22.33
11	19.17						24.20	25.25	29.14	24.29	28.01	22.81
12	19.19	-					-	25.17	29.28	23.68	28.08	23.12
13	19.24	-					24.60	25.11	29.40	23.30	28.06	23.26
14	19.33	-					-	25.15	29.47	22.89	27.95	23.27
15	19.63	-					-	25.28	29.56	22.44	27.82	23.06
16	19.86	-					-	25.56	29.76	21.88	27.63	22.77
17	19.91	-					-	25.76	29.87	21.39	27.42	22.45
18	19.88	-					-	25.98	29.82	21.47	27.18	22.14
19	19.82	-					-	26.32	29.74	20.46	26.93	21.78
20	19.79	-					-	29.65	29.66	20.14	26.72	21.47
21	19.77	-					-	26.83	29.55	19.97	26.45	21.16
22	19.68	-					-	27.11	29.39	19.92	26.23	20.92
23	19.57	-					-	27.64	29.24	19.98	26.15	20.77
24	19.44	-					28.23	27.93	29.09	20.35	26.08	20.61
25	19.29	-					28.36	28.18	28.91	20.72	25.95	20.45
26	29.16	-					28.34	28.44	28.69	20.89	25.72	20.32
27	19.04	-					28.29	28.66	28.44	20.89	25.43	20.22
28	18.96	-					28.19	28.84	28.16	20.82	25.10	20.14
29	18.90	-			-		28.02	28.98	28.11	20.70	24.72	19.98
30	18.86	-			---		27.79	29.08	27.63	20.60	24.26	19.81
31	18.84	---			---		---	29.12	---	20.49	23.83	---

Note.--Add 1,000 ft to obtain elevation above mean sea level

5-1095. Roseau River near Haug, Minn.

Location.--Lat 48°55'28", long 96°12'26", in SE¼ sec.21, T.163 N., R.43 W., on left bank 250 ft downstream from abandoned highway bridge, 5 miles south of international boundary, and 8¼ miles northwest of Haug.

Records available.--April 1932 to September 1962 (incomplete).

Gage.--Water-stage recorder. Datum of gage is 1,014.02 ft above mean sea level, adjustment of 1928 by Geodetic Survey of Canada. Gage readings have been reduced to elevations above mean sea level.

Extremes.--Maximum elevation during year, 1,023.54 ft about June 21, from recorded range in stage; minimum recorded, 1,015.86 ft Nov. 20.
1932-62: Maximum elevation, 1,024.64 ft May 15, 1950; minimum recorded, 1,014.74 ft Aug. 8, 1933.

Mean elevation, in feet water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	16.84	15.93					-	22.81	23.27	23.13	17.51	20.89
2	16.75	15.90					-	22.79	23.32	23.07	17.41	20.34
3	16.69	15.99					-	22.75	-	23.00	17.46	19.86
4	16.62	-					-	22.70	-	22.91	17.52	19.48
5	16.59	-					17.67	22.60	-	22.83	18.46	19.20
6	16.49	-					17.76	22.55	-	22.73	20.27	19.00
7	16.47	-					17.85	22.51	-	22.65	21.53	18.83
8	16.43	-					18.06	22.43	-	22.64	21.90	18.78
9	16.35	-					18.25	22.35	-	22.51	22.11	18.97
10	16.30	-					-	22.26	-	22.33	22.27	18.99
11	16.33	-					-	22.16	-	22.13	22.43	19.14
12	16.34	-					-	22.05	-	21.88	22.56	19.39
13	16.33	-					-	22.02	-	21.55	22.63	19.57
14	16.34	-					20.89	22.02	-	21.13	22.68	19.63
15	16.48	-					20.94	21.99	-	20.53	22.73	19.58
16	16.71	-					21.03	21.99	-	19.86	22.74	19.37
17	16.85	-					21.31	22.03	-	19.23	22.74	19.11
18	16.86	-					21.63	22.07	-	18.71	22.74	18.77
19	16.83	-					21.91	22.17	-	18.23	22.71	18.45
20	16.78	-					22.21	22.27	-	17.85	22.67	18.15
21	16.75	-					22.34	22.35	-	17.62	22.62	17.85
22	16.71	-					22.46	22.46	-	17.52	22.55	17.60
23	16.62	-					22.55	22.63	-	17.52	22.50	17.42
24	16.54	-					22.62	22.74	-	17.63	22.44	17.28
25	16.42	-					22.71	22.85	-	17.82	22.37	17.13
26	16.30	-					22.77	22.93	-	17.95	22.30	17.03
27	16.20	-					22.82	23.01	-	18.00	22.21	16.90
28	16.11	-					22.85	23.08	23.31	17.98	22.06	16.80
29	16.04	-			-		22.85	23.13	23.28	17.84	21.91	16.72
30	15.97	-			----------		22.82	23.18	23.21	17.74	21.70	16.58
31	15.95	----------			----------		----------	23.22	----------	17.64	21.36	----------

Note.--Add 1,000 ft to obtain elevation above mean sea level.

5-1120. Roseau River below State ditch 51, near Caribou, Minn.

(International gaging station)

Location.--Lat 48°58'54", long 96°27'46", in SE¼SW¼ sec.34, T.164 N., R.45 W., on left bank 400 ft downstream from State ditch 51 (known locally as Caribou cutoff ditch) and 0.6 mile west of Caribou.

Drainage area.--1,570 sq mi, approximately.

Records available.--April to October 1917, April 1920 to September 1962 (some winter records incomplete). Published as "at Caribou", prior to April 1929; as "below Cutoff ditch, near Caribou" April 1929 to September 1936. Records published for both sites April 1929 to September 1930. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 1,002.14 ft above mean sea level, adjustment of 1928, by Geodetic Survey of Canada. Prior to Apr. 1, 1929, chain gage at site at Caribou 0.6 mile upstream at datum 0.95 ft lower.

Average discharge.--15 years (1920-30, 1932-33, 1936-37, 1940-43), 298 cfs (215,700 acre-ft per year).

Extremes.--Maximum discharge during year, 2,070 cfs June 11 (gage height, 8.63 ft); minimum daily recorded, 20 cfs Nov. 3.
1917, 1920-62: Maximum discharge, 4,080 cfs May 19, 1950 (gage height, 11.81 ft); no flow Aug. 13, 1936. Flood of 1916 is reported to have reached a stage of about 15.5 ft at former site.

Remarks.--Records good except those for periods of shifting control, which are fair, or those for periods of ice effect, which are poor. Occasionally, at high stages, there is some natural diversion of flow above station to headwaters of Two Rivers.

Cooperation.--This station is maintained by the United States under agreement with Canada.

Rating table, water year 1961-62, except periods of ice effect or shifting control (gage height, in feet, and discharge, in cubic feet per second)

1.8	19	4.0	413
2.0	36	6.0	957
2.5	102	8.0	1,760
3.0	192	8.7	2,110

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	78	26				-	35	1,230	1,580	1,780	206	872
2	70	27				-	50	*1,260	1,610	1,750	*190	757
3	66	*20				-	70	1,260	1,640	1,710	202	648
4	62	-				-	80	1,260	1,660	1,680	239	559
5	56	-				-	100	1,240	1,680	1,630	328	494
6	53	-				-	120	1,230	1,700	1,590	528	443
7	50	-				-	140	1,230	1,720	1,570	807	416
8	50	-				-	170	1,230	1,760	1,590	904	401
9	46	-				-	200	1,210	1,770	1,520	957	443
10	42	-				-	220	*1,210	1,920	1,450	994	446
11	52	-				-	240	1,180	2,060	1,360	1,030	453
12	46	-				-	260	1,160	2,020	1,270	1,060	489
13	44	-				-	300	1,120	1,960	1,200	1,070	520
14	44	-				-	340	1,160	1,950	1,080	1,090	531
15	45	-				-	380	1,140	2,010	942	1,120	531
16	56	-				-	420	1,120	2,030	785	1,150	502
17	68	-				-	460	1,120	2,020	643	1,180	453
18	72	-				-	*520	1,100	2,020	518	1,210	403
19	72	-				-	600	1,120	2,010	418	1,230	344
20	70	-				-	900	1,140	2,010	351	1,230	295
21	68	-				-	800	1,140	2,000	308	1,240	252
22	68	-				-	800	1,140	2,000	277	1,250	212
23	63	-				-	900	1,330	1,990	271	1,250	188
24	57	-				-	*1,050	1,510	1,970	273	1,220	*171
25	54	-				-	1,080	1,450	1,960	288	1,200	152
26	46	-				-	1,100	1,410	1,930	295	1,170	140
27	41	-				*22	1,130	1,400	1,890	293	1,140	125
28	38	-				24	1,160	1,420	*1,880	286	1,110	115
29	34	-			-	30	1,180	*1,440	1,860	267	1,080	122
30	30	-			----------	35	1,210	1,520	1,830	246	1,030	97
31	27	----------			----------	35	----------	1,560	----------	227	*963	----------
Total	1,668	-				-	16,015	39,040	56,440	27,868	29,378	11,574
Mean	53.8	-				-	534	1,259	1,881	899	948	386
Ac-ft	3,310	-				-	31,770	77,430	111,900	55,280	58,270	22,960

Calendar year 1961: Max Min Mean Ac-ft
Water year 1961-62: Max Min Mean Ac-ft

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 3, Mar. 27 to Apr. 23 (no gage-height record Apr. 14-17, 19-23). Shifting-control method used Oct. 1 to Nov. 2, July 18 to Sept. 30.

GPO 802-479-5

5-1125. Roseau River at international boundary, near Caribou, Minn.

Location.--Lat 48°59'57", long 96°30'20", near center of sec.29, T.164 N., R.45 W., on left bank 400 ft upstream from last international boundary crossing and 3 miles northwest of Caribou.

Drainage area.--1,590 sq mi, approximately.

Records available.--May 1933 to September 1962 (incomplete).

Gage.--Water-stage recorder. Datum of gage is 1,002.59 ft above mean sea level, adjustment of 1928, by Geodetic Survey of Canada. Gage readings have been reduced to elevations above mean sea level.

Extremes.--Maximum elevation during year, 1,006.91 ft June 15;minimum recorded, 1,002.68 ft Apr. 5.
1933-62: Maximum elevation recorded, 1,007.43 ft Apr. 14, 1960; minimum recorded, 1,001.97 ft Aug. 14, 1933.

Mean elevation, in feet, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	3.41	3.09					-	6.16	6.61	6.77	3.91	5.74
2	3.39	3.09					-	6.19	6.63	6.74	3.86	5.41
3	3.37	3.17					-	6.23	6.66	6.72	3.88	5.11
4	3.33	-					-	6.23	6.69	6.70	3.99	4.88
5	3.30	-					2.69	6.21	6.69	6.67	4.21	4.68
6	3.27	-					2.71	6.19	6.70	6.62	4.65	4.58
7	3.24	-					2.72	6.19	6.72	6.60	5.41	4.49
8	3.25	-					2.72	6.19	6.74	6.61	5.75	4.47
9	3.23	-					2.72	6.16	6.76	6.58	5,88	4.56
10	3.20	-					2.73	6.17	6.79	6.50	5.95	4.58
11	3.25	-					2.73	6.11	6.86	6.42	6.02	4.58
12	3.23	-					2.71	6.05	6.89	6.31	6.09	4.66
13	3.21	-					2.82	5.99	6.90	6.19	6.12	4.70
14	3.20	-					2.87	6.06	6.89	5.98	6.17	4.75
15	3.22	-					-	6.02	6.88	5.69	6.20	4.75
16	3.28	-					-	5.98	-	5.27	6.25	4.67
17	3.36	-					-	5.96	-	4.88	6.29	4.55
18	3.38	-					3.54	5.93	-	4.59	6.32	4.44
19	3.39	-					4.22	5.96	-	4.36	6.36	4.30
20	3.38	-					6.11	6.01	-	4.21	6.37	4.17
21	3.37	-					5.72	6.01	-	4.09	6.38	4.06
22	3.37	-					5.69	6.01	-	4.02	6.39	3.96
23	3.33	-					5.73	6.32	-	4.00	6.39	4.89
24	3.31	-					5.78	6.56	-	4.03	6.36	3.83
25	3.30	-					5.83	6.47	-	4.06	6.32	3.77
26	3.27	-					5.91	6.42	-	4.08	6.29	3.74
27	3.22	-					5.96	6.40	-	4.10	6.25	3.69
28	3.19	-					6.01	6.42	6.81	4.08	6.19	3.66
29	3.16	-			-		6.07	6.45	6.80	4.03	6.14	3.62
30	3.11	-			---		6.12	6.50	6.79	3.99	6.06	3.59
31	3.09	---			---		---	6.58	---	3.95	5.93	---

Note.--Add 1,000 ft to obtain elevation above mean sea level.

5-1255. Stony River near Isabella, Minn.

Location.--Lat 47°41'10", long 91°38'20", in NW¼NW¼ sec.17, T.60 N., R.10 W., on left bank 275 ft downstream from Slate Lake and bridge on State Highway 1, 11 miles upstream from Birch Lake, and 12⅜ miles northwest of Isabella.

Drainage area.--180 sq mi.

Records available.--October 1952 to September 1962. Prior to October 1958, published as Stoney River near Isabella.

Gage.--Water-stage recorder. Datum of gage is 1,632.45 ft above mean sea level, datum of 1929.

Average discharge.--10 years, 130 cfs.

Extremes.--Maximum discharge during year, 800 cfs May 27 (gage height, 9.30 ft); minimum, 14 cfs Mar. 20-24 (gage height, 7.45 ft).
1952-62: Maximum discharge, 2,040 cfs Apr. 27, 1957 (gage height, 10.60 ft); minimum, 5.6 cfs Aug. 22, 1961 (gage height, 7.32 ft).

Remarks.--Records good.

Rating table, water year 1961-62 (gage height, in feet, and discharge, in cubic feet per second)

7.4	10	8.1	160
7.5	18	8.5	335
7.6	32	8.9	545
7.7	49	9.3	800
7.9	96		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	78	75	57	23	18	16	23	462	569	168	157	62
2	70	83	55	23	18	16	23	506	518	160	143	57
3	70	93	53	23	18	15	23	518	484	150	136	57
4	66	102	53	23	18	16	24	512	446	143	136	57
5	64	114	51	23	18	16	26	490	420	140	136	55
6	60	133	51	23	20	15	32	457	385	129	157	51
7	60	140	49	23	20	15	34	425	360	150	179	51
8	60	136	49	23	20	*15	35	400	325	202	219	51
9	57	133	47	23	18	15	37	375	300	240	249	53
10	55	126	46	23	16	15	35	350	276	290	262	57
11	*60	120	46	23	16	15	35	325	262	325	262	64
12	66	120	44	23	16	15	35	335	262	340	262	68
13	73	114	42	22	18	15	35	345	258	340	249	75
14	75	111	42	22	18	15	34	370	254	320	240	83
15	80	108	40	22	18	15	32	410	240	290	236	93
16	80	105	39	23	18	15	32	446	232	258	223	96
17	83	96	37	24	18	15	32	479	223	232	202	96
18	83	93	37	23	18	15	35	518	215	206	187	93
19	80	91	35	22	18	15	39	557	206	183	175	88
20	78	86	35	22	18	14	40	593	194	175	153	83
21	73	83	34	21	16	14	44	617	187	168	143	78
22	70	80	34	21	16	14	49	653	183	164	126	75
23	68	78	32	21	16	14	55	684	183	150	114	73
24	68	73	30	20	16	14	66	710	190	153	108	78
25	68	70	30	20	16	15	83	744	194	*160	99	80
26	68	68	30	18	16	15	99	772	194	164	88	*83
27	68	64	29	18	16	15	143	793	*187	168	80	86
28	70	60	27	18	16	16	*194	765	179	171	75	91
29	73	*60	*27	18	-	18	300	717	187	171	*70	93
30	70	57	26	18	---	22	395	665	175	179	66	96
31	*73	---	24	*18	---	*23	---	*623	---	168	64	---
Total	2167	2872	1231	667	488	483	2069	16616	8288	6257	4996	2223
Mean	69.9	95.7	39.7	21.5	17.4	15.6	69.0	536	276	202	161	74.1
Cfsm	0.388	0.532	0.221	0.119	0.097	0.087	0.383	2.98	1.53	1.12	0.894	0.412
In.	0.45	0.59	0.25	0.14	0.10	0.10	0.43	3.43	1.71	1.29	1.03	0.46

Calendar year 1961: Max 653 Min 6.4 Mean 80.0 Cfsm 0.444 In. 6.03
Water year 1961-62: Max 793 Min 14 Mean 132 Cfsm 0.733 In. 9.98

* Discharge measurement made on this day.

5-1260. Dunka River near Babbitt, Minn.

Location.--Lat 47°41'55", long 91°52'05", in NW¼NE¼ sec.9, T.60 N., R.12 W., on left bank 1.8 miles upstream from Birch Lake and 2½ miles northeast of Babbitt.

Drainage area.--53.0 sq mi.

Records available.--October 1951 to September 1962 (discontinued).

Gage.--Water-stage recorder. Datum of gage is 1,488.98 ft above mean sea level, datum of 1929.

Average discharge.--11 years, 37.4 cfs.

Extremes.--Maximum discharge during year, 371 cfs July 10 (gage height, 6.79 ft); minimum daily, 1.6 cfs Feb. 8-12; minimum gage height, 3.85 ft during period Feb. 2-27, from recorded range in stage.
1951-62: Maximum discharge, 691 cfs Apr. 16, 1954 (gage height, 7.84 ft); minimum, 0.6 cfs Aug. 20, 21, 22, 1961.

Remarks.--Records good except those for periods of ice effect or no gage-height record, which are fair.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

3.8	1.2	4.8	32
3.9	1.8	5.2	66
4.0	2.7	5.6	114
4.2	5.4	6.0	180
4.4	10	7.0	430

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	29	22	11	3.5	*1.8	1.9	13	247	116	54	84	20
2	27	24	11	3.5	1.8	1.9	11	213	114	46	70	20
3	25	42	11	3.5	1.8	1.9	9.1	173	103	40	58	19
4	25	50	11	3.5	1.8	2.0	11	152	94	33	53	19
5	25	49	11	3.3	1.8	2.0	12	137	96	31	54	18
6	25	46	11	3.2	1.7	1.9	20	124	96	28	74	17
7	24	41	10	3.1	1.7	1.9	21	110	90	50	103	19
8	22	37	10	3.0	1.6	1.9	21	97	79	159	120	18
9	18	34	9.4	2.9	1.6	1.9	19	92	68	302	102	18
10	18	29	8.8	2.8	1.6	1.9	20	92	66	360	98	23
11	22	29	8.3	2.8	1.6	1.9	17	91	103	352	76	41
12	*26	29	7.4	2.8	1.6	1.9	15	103	111	304	78	54
13	34	31	7.2	2.8	1.7	1.9	13	131	102	236	83	48
14	42	31	6.8	2.8	1.7	1.9	11	147	84	184	74	42
15	43	29	6.4	2.7	1.7	1.9	12	159	69	139	64	29
16	37	27	6.0	2.6	1.8	2.0	18	169	60	107	54	27
17	36	25	5.8	2.5	1.8	2.2	18	171	54	85	46	21
18	31	24	5.5	2.3	1.8	2.5	21	160	53	71	39	19
19	27	22	5.4	2.2	1.8	2.8	25	154	52	59	36	17
20	24	19	5.2	2.1	1.8	3.5	31	169	47	49	39	13
21	23	16	5.1	2.1	1.7	4.5	40	169	43	49	29	16
22	22	16	5.0	2.0	1.7	5.1	54	160	59	60	22	14
23	21	16	4.8	1.9	1.7	5.5	52	171	57	72	25	11
24	19	15	4.6	1.9	1.8	5.8	54	220	69	75	31	17
25	20	15	4.6	1.8	1.8	6.1	59	234	78	*103	34	24
26	22	15	4.4	1.8	1.8	6.4	66	209	76	132	34	*28
27	22	14	3.9	1.8	1.8	7.0	84	178	65	139	33	27
28	22	*14	3.7	1.8	*1.8	7.5	*148	145	55	120	26	25
29	26	12	*3.7	1.8	-	10.0	224	129	*61	92	20	26
30	27	11	3.7	1.8	---------	14	269	111	63	85	19	24
31	*25	----------	3.7	1.8	---------	*17	----------	*116	----------	90	*22	----------
Total	809	784	215.4	78.4	48.6	130.6	1,388.1	4,733	2,283	3,706	1,700	714
Mean	26.1	26.1	6.95	2.53	1.74	4.21	46.3	153	76.1	120	54.8	23.8
Cfsm	0.492	0.492	0.131	0.048	0.033	0.079	0.874	2.89	1.44	2.26	1.03	0.449
In.	0.57	0.55	0.15	0.06	0.03	0.09	0.97	3.32	1.60	2.60	1.19	0.50

Calendar year 1961: Max 454 Min 0.7 Mean 32.5 Cfsm 0.613 In. 8.32
Water year 1961-62: Max 360 Min 1.6 Mean 45.5 Cfsm 0.858 In. 11.63

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 5-9, 15-22, Jan. 2-5, Feb. 28 to Mar. 29. No gage-height record Jan. 6-31, Feb. 2-27.

5-1265. Bear Island River near Ely, Minn.

Location.--Lat 47°49'50", long 91°50'20", in SW¼ sec.23, T.62 N., R.12 W., on right bank 10 ft downstream from State Highway 1 and 6 miles southeast of Ely.

Drainage area.--68.5 sq mi.

Records available.--October 1952 to September 1962 (discontinued).

Gage.--Water-stage recorder. Datum of gage is 1,388.86 ft above mean sea level, datum of 1929.

Average discharge.--10 years, 41.6 cfs.

Extremes.--Maximum discharge during year, 256 cfs July 11 (gage height, 6.96 ft); minimum, 6.5 cfs Sept. 30 (gage height, 5.35 ft).
1952-62: Maximum discharge, 423 cfs May 3, 1954 (gage height, 7.03 ft); maximum gage height, 7.20 ft Apr. 24, 25, 1961; minimum discharge, 0.3 cfs Oct. 11, 12, 1961; minimum gage height, 4.33 ft Sept. 15, 16, 1955.

Remarks.--Records good except for those periods of ice effect, which are fair. Flow regulated by several lakes.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Sept. 23-30)

Oct. 1 to Mar. 11		Mar. 12 to Sept. 30			
5.8	20	5.2	6.2	6.0	44
6.0	32	5.3	7.3	6.3	80
6.2	56	5.4	9.4	6.6	137
		5.6	16	7.0	272
		5.8	28		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	52	*35	29	17	*9.0	9.2	*13	*137	156	55	79	35
2	50	38	29	17	9.0	9.2	12	145	150	53	76	34
3	49	44	28	17	9.0	9.3	12	148	145	50	76	32
4	49	36	27	17	9.2	9.4	14	150	137	43	76	31
5	48	42	27	17	9.2	9.5	18	153	135	43	75	30
6	46	42	27	16	9.0	10	20	150	130	42	84	29
7	45	43	26	16	8.8	11	20	150	123	71	83	27
8	41	42	25	15	8.7	*12	20	148	114	164	82	26
9	42	39	23	15	8.6	12	24	148	106	180	77	26
10	42	37	22	14	8.6	12	23	150	101	225	75	30
11	43	37	19	14	8.6	12	23	150	97	248	74	32
12	45	37	19	13	8.6	13	24	161	92	240	75	31
13	*49	37	19	13	8.6	13	24	167	88	221	71	30
14	48	37	19	13	8.7	13	24	177	83	203	70	28
15	46	37	19	12	8.8	13	24	183	79	183	67	26
16	46	36	19	12	9.0	13	25	183	75	167	65	24
17	45	35	19	11	9.1	13	28	186	70	153	61	22
18	43	34	19	11	9.2	13	32	177	67	137	57	20
19	42	33	19	11	9.3	13	36	186	66	130	55	18
20	41	32	18	10	9.4	12	40	196	61	119	52	15
21	39	32	18	10	9.4	12	44	193	59	112	48	13
22	39	32	18	10	9.4	12	52	193	59	106	46	11
23	39	32	18	9.8	9.5	11	56	210	57	103	53	10
24	38	31	18	9.8	9.4	11	61	218	59	101	52	12
25	39	31	18	9.7	9.4	10	66	214	63	*101	50	12
26	38	30	18	9.7	9.4	10	68	210	63	97	46	*10
27	37	30	17	9.6	9.3	10	79	203	*62	94	42	8.8
28	37	30	17	9.5	9.2	11	89	193	61	90	40	7.7
29	37	*30	*17	9.4	-	12	110	177	61	88	*39	7.2
30	37	29	17	9.2	---------	12	*130	174	59	88	37	6.8
31	36	---------	17	90	---------	12	---------	*167	---------	83	35	---------
Total	1,328	1,060	645	386.7	253.4	354.6	1,211	5,397	2,678	3,790	1,918	644.5
Mean	42.8	35.3	20.8	12.5	9.05	11.4	40.4	174	89.3	122	61.9	21.5
Cfsm	0.625	0.515	0.304	0.182	0.132	0.166	0.590	2.54	1.30	1.78	0.90	0.31
In.	0.72	0.58	0.35	0.21	0.14	0.19	0.66	2.93	1.45	2.06	1.04	0.35

Calendar year 1961: Max 240 Min 1.0 Mean 41.6 Cfsm 0.607 In. 8.26
Water year 1961-62: Max 248 Min 6.8 Mean 53.9 Cfsm 0.79 In. 10.68

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 3, 4, 8-10, 24, 26-28, 30, Dec. 4, 5, Dec. 9 to Mar. 11, Mar. 31, Apr. 1, 10.

5-1270. Kawishiwi River near Winton, Minn.

Location.--Lat 47°56'05", long 91°45'50", in NE¼NW¼ sec.20, T.63 N., R.11 W., at powerplant of Minnesota Power & Light Co., just upstream from Fall Lake, and 1.8 miles east of Winton.

Drainage area.--1,200 sq mi, approximately.

Records available.--June 1905 to June 1907, October 1912 to September 1919 (fragmentary), September 1923 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Average discharge.--43 years (1905-6, 1915-17, 1918-19, 1923-62), 963 cfs (unadjusted).

Extremes.--Maximum daily discharge during year, 4,620 cfs May 30; minimum daily, 32 cfs Jan. 7, Feb. 11. 1905-07, 1912-19, 1923-62: Maximum daily discharge, 16,000 cfs May 18, 1950; no flow at times.

Remarks.--Records good. Daily discharge computed from powerplant records. Flow regulated by powerplant and by Camp Six, Bald Eagle, Gabbro, Little Gabbro, Birch, White Iron, South Farm, Farm, and Garden Lakes.

Cooperation.--Records collected by Minnesota Power & Light Co., under general supervision of Geological Survey, in connection with a Federal Power Commission project.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	725	762	895	397	265	301	331	1,330	4,110	1,450	1,330	628
2	725	794	928	397	265	366	265	1,390	3,810	1,230	1,160	660
3	725	762	895	365	265	366	394	1,390	3,650	1,080	1,220	584
4	692	794	891	397	265	398	297	1,580	3,550	956	1,190	595
5	694	794	859	397	297	203	362	1,650	3,420	992	1,290	544
6	727	665	880	365	233	332	394	1,980	3,180	992	1,780	365
7	694	697	799	32	265	364	329	2,190	2,870	2,020	1,720	397
8	662	822	747	265	265	396	329	2,230	2,450	2,520	1,600	397
9	630	794	695	265	233	364	362	2,430	2,230	3,280	1,550	397
10	694	794	695	330	265	364	362	2,600	2,120	3,450	1,430	462
11	710	923	663	265	32	396	362	2,690	2,030	3,590	1,580	429
12	794	859	663	297	265	299	362	2,890	2,170	3,470	1,510	429
13	794	921	663	297	265	396	297	2,870	2,250	3,530	1,480	397
14	794	992	598	297	265	396	329	2,930	2,180	3,510	1,480	365
15	794	992	496	297	265	364	329	2,880	2,070	3,420	1,590	397
16	729	992	497	297	297	396	362	3,230	1,940	3,220	1,510	397
17	794	960	430	265	265	364	361	3,290	1,810	3,350	1,530	332
18	729	1,020	429	282	97	364	393	3,500	1,600	2,890	1,450	365
19	745	960	429	282	233	364	361	3,490	1,380	2,460	1,320	332
20	694	960	429	282	265	347	393	3,630	1,150	2,030	1,160	397
21	694	960	429	282	265	396	393	3,870	1,070	1,690	1,080	397
22	694	960	462	282	265	364	425	4,010	1,260	1,640	924	494
23	694	1,020	429	282	265	396	490	4,130	1,330	1,340	924	462
24	662	960	397	282	265	396	462	4,300	1,660	1,560	924	558
25	694	960	397	402	265	396	554	4,540	1,510	1,470	956	494
26	694	928	429	434	233	202	425	4,570	1,730	1,470	924	429
27	694	928	397	466	265	364	683	4,390	1,480	1,470	844	462
28	694	960	397	368	269	331	816	4,600	*1,350	1,510	725	462
29	694	928	365	400	-	396	820	4,360	1,390	1,550	660	429
30	678	895	397	233	----------	396	1,110	4,620	1,420	1,430	665	397
31	697	----------	397	233	----------	396	----------	4,180	----------	1,430	595	----------
Total	22,134	26,756	18,077	9,735	6,959	11,173	13,152	97,740	64,170	66,000	38,101	13,453
Mean	714	892	583	314	249	360	438	3,153	2,139	2,129	1,229	448
(✓)	- 84	-143	-85	-33	+ 5	-187	+136	+ 261	+ 179	- 9	-40	+36
Mean✓	630	749	498	281	254	173	574	3,414	2,318	2,120	1,189	484
Cfsm✓	0.525	0.624	0.415	0.234	0.212	0.144	0.478	2.84	1.93	1.77	0.991	0.403
In.✓	0.61	0.70	0.48	0.27	0.22	0.17	0.53	3.27	2.15	2.04	1.14	0.45

Calendar year 1961: Max 4,300 Min 0 Mean 758 Mean✓ 760 Cfsm✓ 0.633 In.✓ 8.61
Water year 1961-62: Max 4,620 Min 32 Mean 1,062 Mean✓ 1,065 Cfsm✓ 0.888 In.✓ 12.03

* Discharge measurement made on this day.
✓ Change in contents, equivalent in cubic feet per second, in Camp Six, Bald Eagle, Gabbro, Little Gabbro, Birch, White Iron, South Farm, Farm, and Garden Lakes.
✓ Adjusted for change in reservoir contents.

5-1275. Basswood River near Winton, Minn.

(International gaging station)

Location.--Lat 48°04'55", long 91°39'10", in sec.30, T.65 N., R.10 W., on Jackfish Bay of Basswood Lake, used to determine discharge at outlet (lat 48°06', long 91°39', in sec.19, T.65 N., R.10 W., on international boundary 14 miles northeast of Winton).

Drainage area.--1,740 sq mi, approximately (above outlet of Basswood Lake).

Records available.--March to June 1924, September 1925 to March 1928, January 1930 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 1,299.80 ft above mean sea level, adjustment of 1928, by Geodetic Survey of Canada. Prior to June 2, 1938, staff gages at several sites on Jackfish Bay, at same datum. June 2 to Oct. 27, 1938, staff gage at Williams Island half a mile northeast of present gage at same datum.

Average discharge.--34 years (1925-27, 1930-62), 1,318 cfs.

Extremes.--Maximum discharge during year, 4,490 cfs June 1 (gage height, 2.72 ft); minimum, 500 cfs Feb. 28 (gage height, -0.11 ft).
1924, 1925-27, 1930-62: Maximum discharge, 15,600 cfs May 24, 1950 (gage height, 6.94 ft); minimum, 73 cfs Dec. 5, 1948.

Remarks.--Records excellent except those for periods of no gage-height record, which are good. Flow affected by storage on Kawishiwi River.

Cooperation.--This station is maintained by the United States under agreement with Canada.

Rating table, water year 1961-62 (gage height, in feet, and discharge, in cubic feet per second)

-0.10	507	1.0	1,640
0	580	1.5	2,330
.2	760	2.0	3,160
.5	1,060	3.0	5,040

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,360	*1,120	1,180	790	580	507	544	970	4,470	2,080	2,260	1,320
2	1,340	1,130	1,180	790	580	*507	544	1,040	4,450	2,030	2,200	1,280
3	1,320	1,130	1,190	780	580	507	544	1,100	4,410	1,950	2,160	1,240
4	1,290	1,130	1,190	770	580	507	544	1,180	4,370	1,890	2,120	1,210
5	1,260	1,130	1,190	*760	589	514	544	1,270	4,320	1,850	2,080	1,180
6	1,240	1,130	1,190	750	580	514	544	1,360	4,220	1,790	2,140	1,140
7	1,200	1,090	1,190	741	573	522	551	1,460	4,090	1,840	2,160	1,110
8	1,180	1,090	1,190	722	565	522	551	1,570	3,960	1,920	2,200	1,080
9	1,260	1,090	1,190	712	558	529	573	1,680	3,810	2,120	2,200	1,060
10	1,270	1,090	1,180	694	551	529	580	*1,800	3,650	2,460	2,140	1,050
11	1,270	1,090	1,160	675	551	536	580	1,920	3,500	2,680	2,140	1,050
12	1,270	1,090	1,140	665	544	536	580	2,090	3,360	2,840	2,120	1,040
13	*1,280	1,100	1,140	656	551	536	580	2,220	3,270	2,960	2,090	1,020
14	1,290	1,130	1,100	648	558	536	573	2,380	3,160	3,060	2,060	970
15	1,300	1,130	1,090	631	558	536	573	2,520	3,060	3,130	2,020	910
16	1,290	1,130	1,080	622	565	544	573	2,650	3,010	3,200	1,970	880
17	1,270	1,130	1,060	614	558	544	573	2,820	2,990	3,250	1,930	860
18	1,240	1,140	1,030	597	551	536	573	2,920	2,890	3,250	1,920	840
19	1,200	1,140	1,020	589	544	536	580	3,110	2,770	3,210	1,890	830
20	1,150	1,140	990	580	544	536	589	3,340	2,670	3,140	1,850	820
21	1,110	1,150	980	580	529	536	597	3,470	2,550	3,080	1,820	810
22	1,080	1,160	950	580	529	536	622	3,610	2,460	3,040	1,770	800
23	1,060	1,170	940	580	522	529	622	3,770	2,410	2,890	1,720	860
24	1,050	1,180	920	573	514	529	640	3,880	2,360	2,840	1,690	930
25	1,020	1,190	900	565	514	529	656	3,990	2,330	2,750	1,640	990
26	1,010	1,180	880	558	507	529	665	4,110	2,300	2,630	1,590	1,040
27	1,000	1,180	850	558	507	529	722	4,200	2,270	2,550	1,560	1,070
28	1,020	1,190	840	573	507	536	810	4,280	*2,220	2,460	1,510	1,080
29	1,030	1,180	840	580	-	544	850	4,360	2,210	2,410	1,450	1,050
30	1,060	1,190	830	580	---------	544	910	4,410	2,140	2,390	*1,400	1,010
31	1,100	---------	800	589	---------	544	---------	4,450	---------	2,320	1,360	---------
Total	36,820	34,120	32,410	20,102	15,389	16,419	18,387	83,930	95,680	80,010	59,160	30,530
Mean	1,188	1,137	1,045	648	550	530	613	2,707	3,189	2,581	1,908	1,018
Cfsm	0.683	0.653	0.601	0.372	0.316	0.305	0.352	1.56	1.83	1.48	1.10	0.585
In.	0.79	0.73	0.69	0.43	0.33	0.35	0.39	1.79	2.04	1.71	1.26	0.65

Calendar year 1961: Max 4,010 Min 216 Mean 1,023 Cfsm 0.588 In. 7.99
Water year 1961-62 Max 4,470 Min 507 Mean 1,433 Cfsm 0.824 In. 11.16

* Discharge measurement made on this day.
Note.--No gage-height record Oct. 15-31, Sept. 5-7, 9-11, 14, 15, 18-23, 25, 27-30; discharge estimated on the basis of weather records, recorded change in stage and records for stations on nearby streams.

5-1280. Namakan River at outlet of Lac la Croix, Ontario

(International gaging station)

Location.--Lat 48°21'20", long 92°12'50", at Campbell's Camp, 2½ miles west of outlet of Lac la Croix.

Drainage area.--5,165 sq mi.

Records available.--September 1921 to January 1922, April 1922 to September 1962, in reports of Geological Survey. Monthly discharge only for some periods, published in WSP 1308. August 1921 to September 1962 in reports of Water Resources Branch, Department of Northern Affairs and National Resources, Canada.

Gage.--Staff gage read twice daily. Gage readings have been reduced to elevations above mean sea level, United States and Canada Boundary Survey datum. Prior to October 1933, staff gages at various sites on Lac la Croix.

Average discharge.--40 years (1922-62), 3,558 cfs.

Extremes.--Maximum discharge during year, 11,000 cfs June 2, 3 (elevation, 1,187.65 ft); minimum, 1,760 cfs Apr. 8 (elevation, 1,182.95 ft).
1921-62: Maximum discharge, 28,200 cfs May 31 to June 2, 1950 (elevation, 1,193.50 ft); minimum, 535 cfs at times in February, March and April 1924 (elevation, 1,181.50 ft).

Remarks.--Records good.

Cooperation.--This station is maintained by Canada under agreement with the United States.

Rating table, water year 1961-62 (gage height, in feet, and discharge, in cubic feet per second)

1,182.5	1,280	1,186.0	6,980
1,183.0	1,820	1,188.0	11,900
1,184.0	3,130		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	4,020	3,360	3,090	2,860	2,220	1,990	1,920	2,890	10,900	7,370	7,230	6,040
2	4,100	3,360	3,050	2,860	2,210	1,990	1,890	3,030	11,000	7,300	7,190	5,950
3	4,080	3,360	3,050	2,850	2,190	1,990	1,860	3,140	11,000	7,230	7,120	5,840
4	4,070	3,360	3,050	2,840	2,180	1,990	1,830	3,220	10,800	7,190	7,050	5,730
5	*4,070	3,280	3,050	2,820	2,170	1,990	1,810	3,300	10,800	7,100	6,980	5,610
6	4,080	3,280	3,050	2,810	2,160	1,990	1,790	3,390	10,800	7,000	6,930	5,520
7	4,100	3,180	3,030	2,790	2,140	1,980	1,780	3,460	10,700	6,930	6,960	5,400
8	4,120	3,190	3,020	2,780	2,130	1,980	1,760	3,550	10,700	6,840	7,070	5,310
9	4,140	3,190	3,000	2,770	2,120	1,980	1,780	3,620	10,600	6,800	7,140	5,130
10	4,150	3,200	2,990	2,750	2,110	1,980	1,790	3,710	10,500	6,910	*7,100	5,130
11	4,080	3,200	2,980	2,740	2,100	1,980	1,810	3,780	10,400	7,000	7,100	5,030
12	4,050	3,200	2,980	2,720	2,070	1,980	1,830	3,880	10,300	7,100	7,100	4,910
13	4,020	3,220	2,960	2,710	2,060	1,980	1,860	4,050	10,000	7,070	7,100	4,790
14	3,980	3,200	2,960	2,700	2,060	1,980	1,880	4,280	9,840	7,050	7,100	4,720
15	3,910	3,200	2,950	2,670	2,050	1,980	1,900	4,590	9,480	7,030	7,070	4,600
16	3,880	3,190	2,950	2,650	2,050	1,980	1,930	4,930	9,380	7,000	7,070	4,530
17	3,840	3,190	2,950	2,640	2,040	1,980	1,950	5,760	9,240	6,980	7,070	4,420
18	3,810	3,180	2,950	2,610	2,040	1,980	1,980	6,520	9,000	6,960	7,070	4,350
19	3,780	3,180	2,960	2,580	2,040	1,980	2,000	6,980	8,760	7,000	7,070	4,240
20	3,740	3,140	2,960	2,560	2,040	1,980	2,020	7,440	8,520	7,050	7,070	4,070
21	3,710	3,140	2,960	2,530	2,040	1,980	2,050	7,950	8,450	7,120	7,050	4,000
22	3,680	3,130	2,960	2,490	2,020	1,980	2,070	8,360	8,340	7,190	7,030	3,900
23	3,680	3,130	2,950	2,450	2,020	1,980	2,100	8,760	8,240	7,230	7,000	3,830
24	3,650	3,130	2,950	2,430	2,020	1,980	2,120	9,000	8,110	7,230	6,980	3,730
25	3,580	3,130	2,930	2,400	2,010	1,980	2,160	9,240	7,990	7,230	6,980	3,660
26	3,540	3,130	2,930	2,380	2,010	1,980	2,210	9,480	7,830	7,260	6,960	3,570
27	3,500	3,120	2,920	2,350	2,000	1,980	2,280	9,740	7,740	7,260	6,930	3,500
28	3,490	3,120	2,920	2,320	2,000	1,950	2,410	9,980	7,650	7,280	6,610	3,420
29	3,390	3,120	2,910	2,300	-	1,950	2,570	10,200	7,560	7,280	6,480	3,340
30	3,360	3,100	2,890	2,270	---	1,950	2,750	10,500	7,460	7,300	6,390	3,280
31	3,360	---	2,890	2,240	---	1,930	---	10,800	---	7,300	6,260	---
Total	118,960	95,910	92,190	80,870	58,300	61,300	60,090	189,530	282,090	220,590	216,260	137,550
Mean	3,837	3,197	2,974	2,609	2,082	1,977	2,003	6,114	9,403	7,116	6,976	4,585
Cfsm	0.743	0.619	0.576	0.505	0.403	0.383	0.388	1.18	1.82	1.38	1.35	0.888
In.	0.86	0.69	0.66	0.58	0.42	0.44	0.43	1.36	2.03	1.59	1.56	0.99

Calendar year 1961: Max 10,400 Min 918 Mean 3,397 Cfsm 0.658 In. 8.91
Water year 1961-62: Max 11,000 Min 1,760 Mean 4,421 Cfsm 0.856 In. 11.61

* Discharge measurement made on this day.

5-1282. Vermilion Lake near Soudan, Minn.

Location.--Lat 47°49'52", long 92°16'20", in SW¼SE¼ sec.20, T.62 N., R.15 W., on south shore of Vermilion Lake, at McKinley Park, 2 miles northwest of Soudan.

Records available.--October 1913 to July 1915, July 1941 to November 1942, June 1946 to September 1962 (fragmentary during 1947).

Gage.--Water-stage recorder. Datum of gage is 1,355.10 ft above mean sea level, datum of 1929. October 1913 to July 1915, staff gage 2 miles southwest of present gage at Tower, at datum about 0.5 ft lower. July 1941 to November 1942 and June 1946 to June 1951, staff gage approximately 13 miles northwest at Vermilion Dam near Tower, at same datum. All gage readings have been reduced to elevations above mean sea level, datum of 1929.

Extremes.--Maximum elevation during year, 1,358.84 ft May 31; minimum, 1,356.96 ft Mar. 27.
1913-15, 1941-42, 1946-62: Maximum elevation observed, 1,359.52 ft May 16, 1950; minimum observed, 1,356.02 ft Jan. 29, 1942.
Elevation on June 6, 1913, was 1,359.94 ft (determined from reference point set by local observers).

Mean daily elevation, in feet, October 1961 to September 1962

Oct. 31.....1,357.29	Feb. 28.....1,357.07	June 30.....1,358.17
Nov. 30.....1,357.16	Mar. 31.....1,357.99	July 31.....1,358.03
Dec. 31.....1,357.13	Apr. 30.....1,357.68	Aug. 31.....1,357.52
Jan. 31.....1,357.06	May 31.....1,358.80	Sept.30.....1,357.22

Note.--Elevations other than those shown above are available.

5-1285. Pike River near Embarrass, Minn.

Location.--Lat 47°39'36", long 92°18'54", in NE¼NW¼ sec.25, T.60 N., R.16 W., on left bank 75 ft below bridge on County Road 373, 5.4 miles west of Embarrass, and 8.5 miles downstream from Sandy River.

Drainage area.--115 sq mi.

Records available.--October 1953 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,410.27 ft above mean sea level, datum of 1929.

Average discharge.--9 years, 77.7 cfs.

Extremes.--Maximum discharge during year, 590 cfs May 26 (gage height, 7.92 ft); minimum daily, 4.1 cfs Feb. 10-14; minimum gage height, 3.39 ft Feb. 1, 2, 12, 13.
1953-62: Maximum discharge, 1,750 cfs Apr. 17, 1954 (gage height, 10.28 ft); minimum daily, 3.2 cfs Feb. 24-26, 1955; minimum gage height, 3.08 ft Aug. 25-28, 1961.
Flood in May 1950 reached a stage of approximately 11.3 ft, from information by local residents (discharge, 2,400 cfs).

Remarks.--Records good except those for periods of ice effect, which are fair.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Nov. 1-7, July 16 to Aug. 24, Sept. 10-16)

3.4	8.7	5.0	112
3.5	12	6.0	215
4.0	38	7.0	360
4.5	72	8.0	615

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	46	66	24	10	4.7	4.5	*35	*497	*315	77	60	16
2	44	*69	24	10	*4.7	4.6	31	486	287	66	57	15
3	43	93	24	9.9	4.6	4.7	30	449	259	62	54	14
4	43	90	25	*9.8	4.5	4.8	32	407	234	58	56	14
5	45	112	25	9.7	4.4	4.9	36	371	219	55	57	14
6	42	105	25	9.5	4.4	5.0	46	337	211	51	74	13
7	39	94	25	9.2	4.3	*5.2	52	306	198	73	84	12
8	37	88	24	8.9	4.3	5.5	60	281	195	181	77	11
9	40	80	24	8.6	4.2	5.8	70	260	163	210	70	23
10	51	76	23	8.4	4.1	6.0	60	250	145	216	64	34
11	71	69	21	8.2	4.1	6.4	54	244	141	211	63	48
12	95	66	20	8.1	4.1	6.6	52	250	139	186	80	50
13	112	65	19	8.0	4.1	7.1	50	284	130	152	85	51
14	*120	65	18	7.9	4.1	7.6	48	320	116	118	80	48
15	120	60	17	7.8	4.2	8.8	47	356	102	93	78	44
16	115	55	17	7.6	4.2	9.2	49	392	93	75	70	41
17	108	52	16	7.4	4.3	10.0	61	420	89	63	63	37
18	102	48	15	7.1	4.4	12	92	427	85	51	58	32
19	92	45	15	6.7	4.4	13	127	427	83	42	52	29
20	83	41	15	6.4	4.4	14	153	432	74	40	46	25
21	77	39	14	6.3	4.4	15	176	425	68	46	42	24
22	70	38	14	6.2	4.3	16	205	412	66	52	38	23
23	66	37	14	6.1	4.3	17	232	437	62	58	34	21
24	64	36	14	6.1	4.3	18	244	500	62	70	30	24
25	73	35	14	6.0	4.3	19	249	540	58	86	27	25
26	82	32	13	6.0	4.3	21	251	578	51	*74	24	25
27	82	30	12	5.8	4.4	25	255	540	46	63	22	*23
28	81	27	12	5.6	4.5	30	298	481	42	56	19	22
29	79	*25	11	5.4	-	38	364	425	*64	51	18	21
30	74	24	11	5.1	---	50	449	376	81	63	16	20
31	70	---	10	4.9	---	41	---	344	---	65	*16	---
Total	2,266	1,762	555	232.7	121.3	435.7	3,908	12,254	3,878	2,764	1,614	799
Mean	73.1	58.7	17.9	7.51	4.33	14.1	130	395	129	89.2	52.1	26.6
Cfsm	0.636	0.510	0.156	0.065	0.038	0.123	1.13	3.43	1.12	0.776	0.453	0.231
In.	0.73	0.57	0.18	0.08	0.04	0.14	1.27	3.96	1.25	0.89	0.52	0.26

Calendar year 1961: Max 1,110 Min 3.3 Mean 75.8 Cfsm 0.659 In. 8.94
Water year 1961-62: Max 578 Min 4.1 Mean 83.8 Cfsm 0.729 In. 9.89

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 8, 9, 17-19, Nov. 26 to Apr. 15.

5-1290. Vermilion River below Vermilion Lake, near Tower, Minn.

Location.--Lat 47°57'41", long 92°28'33", in SE¼SW¼ sec.2, T.63 N., R.17 W., on left bank 200 ft downstream from dam at outlet of Vermilion Lake, 4.4 miles upstream from Twomile Creek, and 14.2 miles northwest of Tower.

Drainage area.--483 sq mi.

Records available.--May 1911 to September 1917, June 1928 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,350.36 ft above mean sea level, datum of 1929. May 17, 1911, to Sept. 30, 1917, and July 9, 1931, to Apr. 11, 1939, staff gage at same site and datum. June 26, 1928, to July 8, 1931, staff gage at datum 0.05 ft higher.

Average discharge.--40 years, 302 cfs.

Extremes.--Maximum discharge during year, 1,420 cfs May 30 (gage height, 3.40 ft); minimum, 76 cfs Mar. 27, 28 (gage height, 0.41 ft).
1911-17, 1928-62: Maximum discharge, 2,710 cfs May 23, 1950 (gage height, 4.68 ft); no flow Oct. 25-29, 1955, caused by temporary storage behind new concrete dam at outlet of Vermilion Lake.

Remarks.--Records good.

Rating table, water year 1961-62 (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1-9)

0.5	88	2.0	534
1.0	176	3.0	1,100
1.5	312	4.0	2,000

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	138	*192	157	131	108	118	90	462	1,310	750	624	312
2	142	180	157	131	108	117	91	489	1,310	729	614	312
3	151	186	159	*127	105	112	92	509	1,290	704	609	294
4	149	182	155	127	108	108	91	539	1,280	694	624	277
5	*142	170	157	129	115	106	94	539	1,260	679	644	277
6	148	188	155	129	113	105	97	554	1,230	669	669	271
7	138	148	155	127	*112	105	100	599	1,200	734	654	258
8	125	168	153	125	110	105	106	609	1,180	784	649	262
9	148	172	155	122	108	105	131	639	1,120	850	639	291
10	170	180	161	124	106	105	136	649	1,100	868	624	305
11	170	176	161	124	108	102	134	659	1,070	892	619	328
12	168	170	157	120	106	98	134	684	1,040	* 874	594	312
13	168	172	157	118	113	98	136	694	*998	862	589	* 294
14	182	188	155	120	120	98	134	*709	972	844	589	284
15	182	174	157	120	122	* 100	136	767	960	844	569	288
16	194	166	153	118	127	100	138	828	947	828	* 529	268
17	186	168	151	117	127	97	*138	979	954	806	519	235
18	176	174	148	115	125	97	136	998	923	789	519	235
19	186	174	148	113	124	94	142	1,080	886	772	489	222
20	190	170	148	112	122	91	153	1,120	880	750	466	224
21	190	172	144	115	120	91	163	1,170	868	724	475	214
22	201	170	142	117	120	91	178	1,210	862	740	466	212
23	182	172	142	117	120	88	194	1,250	844	724	448	217
24	182	172	140	113	120	88	208	1,240	862	729	416	208
25	176	172	144	110	120	88	227	1,280	862	704	412	208
26	182	166	138	108	118	87	241	1,330	850	704	394	194
27	208	166	136	105	118	87	277	1,330	828	694	394	201
28	182	*165	136	108	117	85	343	1,340	816	679	390	201
29	174	161	134	108	-	88	385	1,340	767	679	368	190
30	176	161	133	108	---------	91	426	1,350	750	659	335	182
31	157	----------	131	108	---------	91	----------	1,330	---------	639	324	----------
Total	5,263	5,175	4,619	3,666	3,240	3,036	5,051	28,276	30,219	23,397	16,254	7,576
Mean	170	172	149	188	116	97.9	168	912	1,007	755	524	253
Cfsm	0.352	0.356	0.308	0.244	0.240	0.203	0.348	1.89	2.08	1.56	1.08	0.524
In.	0.41	0.40	0.36	0.28	0.25	0.23	0.39	2.18	2.33	1.80	1.25	0.58

Calendar year 1961: Max 1,120 Min 16 Mean 237 Cfsm 0.491 In. 6.66
Water year 1961-62: Max 1,350 Min 85 Mean 372 Cfsm 0.770 In. 10.46

* Discharge measurement made on this day.

5-1294. Rainy Lake at Fort Frances, Ontario

(International gaging station)

Location.--Lat 48°37'15", long 93°21'20", on Government dock at Pither's Point in town of Fort Frances.

Records available.--January 1910 to September 1917 and October 1934 to September 1962 in reports of Geological Survey; August 1911 to September 1962 in reports of Water Resources Branch, Department of Northern Affairs and National Resources, Canada. Prior to October 1949, published as "at Ranier, Minn."

Gage.--Water-stage recorder. Auxiliary staff gages read once daily. Datum of gage is at mean sea level (United States and Canadian Boundary Survey). Prior to Jan. 1, 1950, staff gage 3 miles northeast of Ranier, Minn., at same datum. Supplementary gage in town pumping station, half a mile south, used during winter months.

Extremes.--1910-17, 1934-62: Maximum elevation observed, 1,112.97 ft July 5, 1950; minimum observed, 1,101.26 ft Apr. 17, 1923, Apr. 2, 1930.

Cooperation.--This station is maintained by Canada under agreement with the United States.

Month-end elevation, in feet, water year October 1961 to September 1962

Oct. 31	8.12	Apr. 30	5.90
Nov. 30	8.35	May 31	8.09
Dec. 31	7.93	June 30	8.23
Jan. 31	7.49	July 31	8.32
Feb. 28	6.96	Aug. 31	8.17
Mar. 31	5.65	Sept.30	8.00

Note.--Add 1,100 ft to obtain elevation above mean sea level.

5-1305. Sturgeon River near Chisholm, Minn.

Location.--Lat 47°40'25", long 92°54'00", in NE¼NW¼ sec.20, T.60 N., R.20 W., on left bank 1,000 ft upstream from highway bridge, 0.6 mile downstream from East Branch Sturgeon River, and 11½ miles north of Chisholm.

Drainage area.--187 sq mi.

Records available.--August 1942 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,306.7 ft above mean sea level, datum of 1929. Prior to Aug. 24, 1944, staff gage at site 1,000 ft downstream at different datum.

Average discharge.--20 years, 118 cfs.

Extremes.--Maximum discharge during year, 809 cfs May 17 (gage height, 3.45 ft); minimum daily, 14 cfs Mar. 11-14; minimum gage height, 0.34 ft Feb. 3, 4, 6.
1942-62: Maximum discharge, 3,630 cfs May 7, 1950 (gage height, 6.41 ft) from rating curve extended above 1,600 cfs on basis of slope-area measurement of peak flow; minimum daily, 6.0 cfs Feb. 18-27, 1944; minimum gage height, 0.12 ft Aug. 28, 1961.

Remarks.--Records good except those for periods of ice effect, which are fair.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

0.3	14	2.0	225
.6	26	2.5	383
.9	44	3.0	585
1.2	72	4.0	1,120
1.6	134		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	57	67	33	19	16	15	33	595	366	123	119	51
2	55	66	34	19	16	15	34	535	345	113	104	49
3	* 56	76	34	*19	16	15	37	465	314	107	100	55
4	57	67	36	19	16	15	42	401	280	104	103	58
5	56	79	30	19	16	15	56	352	263	103	117	58
6	55	71	30	19	16	15	84	304	251	100	186	58
7	52	69	29	18	*16	15	*113	271	238	174	190	55
8	50	58	29	18	16	15	140	257	220	212	188	55
9	60	56	28	18	16	15	134	248	208	212	167	75
10	67	52	28	18	16	15	130	243	202	*241	142	140
11	84	54	27	18	15	14	123	238	300	220	138	195
12	100	57	26	18	16	14	103	*355	*294	176	167	*212
13	110	58	26	17	16	14	98	430	246	142	169	246
14	112	54	25	17	16	*14	91	469	215	119	163	233
15	109	57	25	17	16	15	91	580	193	103	148	200
16	104	52	25	17	16	15	* 91	668	183	92	134	161
17	100	50	25	17	16	15	104	793	181	85	*123	130
18	94	49	25	16	16	15	156	768	188	76	110	110
19	86	46	24	16	16	15	210	723	188	70	104	100
20	80	43	24	16	16	15	248	683	176	88	95	92
21	75	41	24	15	16	16	277	628	163	97	88	81
22	72	40	24	16	16	16	311	604	154	95	80	76
23	72	41	23	16	16	16	324	693	144	95	76	74
24	70	37	23	16	16	17	328	768	142	94	74	75
25	76	41	22	16	16	17	328	788	134	97	69	74
26	81	40	21	16	15	18	314	728	124	95	64	74
27	81	33	21	16	15	19	334	628	113	85	61	72
28	79	* 36	20	16	15	22	423	526	106	79	59	69
29	78	34	20	16	-	26	535	461	113	78	55	66
30	*75	32	19	16	--------	30	595	415	126	121	53	62
31	71		19	16	--------	32		390		126	51	
Total	2374	1556	799	530	444	525	5887	16007	6170	3722	3497	3056
Mean	76.6	51.9	25.8	17.1	15.9	16.9	196	516	206	120	113	102
Cfsm	0.410	0.278	0.138	0.091	0.085	0.090	0.05	2.76	1.10	0.642	0.604	0.545
In.	0.47	0.31	0.16	0.11	0.09	0.10	1.17	3.18	1.23	0.74	0.70	0.61

Calendar year 1961: Max 1,280 Min 7.8 Mean 85.1 Cfsm 0.455 In. 6.18
Water year 1961-62: Max 793 Min 14 Mean 122 Cfsm 0.652 In. 8.87

Peak discharge (base, 500 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
4-30	2300	3.06	614	5-25	0800	3.42	793
5-17	1800	3.45	809				

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 6 to Jan. 28, Feb. 8-13, Feb. 20 to Apr. 8.

5-1315. Little Fork River at Little Fork, Minn.

Location.--Lat 48°24', long 93°34', in NW¼ sec.9, T.68 N., R.25 W., on left bank 100 ft downstream from bridge on State Highway 65 at town of Little Fork and 1½ miles upstream from Beaver Creek.

Drainage area.--1,730 sq mi, approximately.

Records available.--June to November 1909, April to November 1910, April 1911 to June 1917, September 1917, October 1917 to March 1919 (gage heights only), June 1928 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,073.06 ft above mean sea level, datum of 1929. June 23, 1909, to Mar. 4, 1917, staff gage at same site and datum. Mar. 5 to Sept. 30, 1917, June 22, 1928, to June 21, 1936, chain gage and June 22, 1936, to July 20, 1937, wire-weight gage, at site 100 ft upstream at same datum.

Average discharge.--39 years (1911-16, 1928-62), 969 cfs.

Extremes.--Maximum discharge during year, 13,500 cfs July 10 (gage height, 27.05 ft); minimum daily, 57 cfs Feb. 9-11; minimum gage height, 5.81 ft Jan. 24, 25, 26.
1909-17, 1928-62: Maximum discharge, 25,000 cfs Apr. 18, 1916, May 11, 1950 (gage height, 37.00 ft); minimum observed, 21 cfs Aug. 26, 27, 1936.

Remarks.--Records good except those for periods of ice effect, which are fair.

Rating table, water year 1961-62, except periods of ice effect or backwater from Rainy River (gage height, in feet, and discharge, in cubic feet per second)

6.0	265	16.0	4,820
7.0	528	22.0	9,120
9.0	1,200	27.0	13,500
12.0	2,600		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	588	454	225	102	62	59	140	6730	3700	1780	1450	499
2	576	*428	227	102	62	59	160	6070	3510	1510	1390	477
3	567	460	230	103	62	59	200	5310	3080	1260	1380	461
4	555	460	232	*104	61	60	275	4670	2730	1140	1840	461
5	540	454	228	105	60	61	350	4110	2630	1200	2230	456
6	* 519	484	220	105	59	63	550	3610	2380	2130	3540	441
7	495	513	210	102	58	65	900	3150	2050	2990	5230	431
8	469	450	202	98	* 58	68	1450	2920	2040	8110	5300	493
9	446	460	195	94	57	72	1600	2860	1930	12600	4370	727
10	443	549	182	91	57	77	1850	2950	1780	13200	3520	1080
11	454	516	170	88	57	82	1700	3030	1640	10300	2790	1330
12	501	466	153	86	58	86	1450	3010	1540	7400	2610	1900
13	594	426	145	86	59	88	1300	3130	1470	5580	2860	2320
14	731	390	140	85	60	90	1150	3790	*1420	4020	2820	* 2190
15	841	365	135	84	62	* 91	1080	*4730	1290	2880	2510	1940
16	874	350	132	81	62	93	1020	5720	1230	2390	*2180	1640
17	841	340	130	79	61	94	1050	6840	1310	2050	1860	1390
18	793	318	130	75	61	96	*1300	12600	1990	1690	1620	1180
19	731	298	130	72	61	96	2280	13400	3780	*1460	1350	993
20	669	275	128	71	60	98	3400	12500	3600	1380	1220	884
21	610	260	124	70	60	99	3450	10000	3040	1640	1100	796
22	564	252	122	70	60	100	3430	8110	2660	1950	1010	737
23	522	248	120	70	61	100	3400	8280	2420	1150	951	690
24	484	246	120	68	61	100	3490	10200	2240	1380	871	669
25	469	246	118	67	62	102	3500	10100	2030	2480	812	672
26	449	240	116	66	62	105	*3500	9020	1790	2660	765	653
27	446	235	114	65	62	107	3750	7690	1590	2470	700	628
28	451	230	110	64	60	109	5680	6400	1380	2120	668	604
29	484	*227	107	63	-	112	6930	5490	1360	1800	629	573
30	486	225	105	62	---------	118	7060	4410	1740	1550	573	555
31	478	----------	103	62	---------	125	----------	4070	----------	1430	521	----------
Total	17.670	10865	4803	2540	1685	2734	67395	194900	65350	105700	60670	27870
Mean	570	362	155	81.9	60.2	88.2	2,246	6,287	2,178	3,410	1,957	929
Cfsm	0.329	0.209	0.090	0.047	0.035	0.051	1.30	3.63	1.26	1.97	1.13	0.537
In.	0.38	0.23	0.10	0.05	0.04	0.06	1.45	4.19	1.40	2.27	1.30	0.60

Calendar year 1961: Max 9,080 Min 65 Mean 764 Cfsm 0.442 In. 5.99
Water year 1961-62: Max 13,400 Min 57 Mean 1,540 Cfsm 0.890 In. 12.07

* Discharge measurement made on this day
Note.--Stage-discharge relation affected by ice Nov. 8, 9, Nov. 15 to Apr. 22. Backwater from Rainy River May 26 to July 6, July 14-24, Aug. 13-20, Aug. 27 to Sept. 14.

5-1320. Big Fork River at Big Falls, Minn.

Location.--Lat 48°12', long 93°48', in sec.35, T.155 N., R.25 W., on left bank at village of Big Falls, 700 ft downstream from falls, 0.3 mile downstream from bridge on U.S. Highway 71, and 4¾ miles upstream from Sturgeon River.

Drainage area.--1,460 sq mi, approximately.

Records available.--August to November 1909, April to November 1910, April 1911 to September 1912 (gage heights and discharge measurements only), June 1928 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,144.71 ft above mean sea level, datum of 1929. Prior to June 10, 1911, staff gage at railroad bridge about 0.4 mile upstream at different datum. June 10, 1911, to Dec. 17, 1937, staff gage or chain gage at site 200 ft upstream at same datum.

Average discharge.--34 years (1928-1962), 640 cfs.

Extremes.--Maximum discharge during year, 9,560 cfs May 25 (gage height, 12.63 ft); minimum daily, 60 cfs Feb. 17-20; minimum gage height, 2.94 ft Nov. 7.
1909-12, 1928-62: Maximum discharge, 14,800 cfs May 8, 9, 1950; maximum gage height, 17.08 ft May 8, 1950; minimum discharge recorded, 7 cfs Aug. 7, 1939.

Remarks.--Records good except those for periods of ice effect, which are fair. Some diurnal fluctuation at low flow caused by powerplant a quarter of a mile upstream.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

3.0	134	6.0	2,190
3.5	349	8.0	4,270
4.0	635	10.0	6,540
5.0	1,340	13.0	9,980

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	284	*252	180	114	65	61	125	5,650	3,340	1,160	991	596
2	284	256	180	114	65	61	130	4,720	3,150	1,090	900	576
3	284	279	201	115	65	61	135	3,980	2,930	1,040	886	552
4	279	227	214	*116	64	61	137	3,390	2,730	998	1,230	558
5	274	274	220	117	64	62	150	2,940	2,560	1,060	1,680	558
6	*274	279	218	116	63	62	170	2,610	2,460	1,040	2,680	552
7	261	252	215	112	62	63	240	2,330	2,260	1,530	3,190	540
8	252	220	208	108	*62	64	370	2,240	2,140	4,070	2,820	583
9	252	193	200	105	61	65	460	2,140	2,020	5,440	2,420	752
10	256	210	192	100	61	66	505	2,090	1,890	4,570	2,060	872
11	270	279	185	97	61	66	452	2,070	1,780	3,700	1,770	1,220
12	297	297	176	95	61	67	430	2,090	1,680	3,040	2,320	1,290
13	307	270	170	93	62	68	430	2,250	1,580	2,500	2,700	1,220
14	321	230	165	92	62	70	420	2,520	*1,480	2,010	2,590	*1,120
15	326	205	160	92	62	70	420	*2,860	1,360	1,680	*2,340	1,030
16	330	192	157	90	61	*71	423	3,370	1,340	1,460	1,960	949
17	326	182	154	87	60	73	426	5,060	1,370	1,330	1,700	872
18	316	174	151	85	60	76	*498	6,180	1,960	1,200	1,510	810
19	307	166	150	83	60	78	750	6,540	2,450	*1,100	1,330	758
20	297	164	150	82	60	80	1,250	6,120	2,440	1,130	1,200	720
21	288	197	148	80	61	83	1,700	5,260	2,340	1,570	1,090	687
22	284	237	147	78	61	85	2,000	4,590	2,340	1,570	991	654
23	274	232	145	76	62	86	2,050	5,750	2,210	1,680	928	635
24	265	220	143	76	62	88	2,110	7,850	2,090	1,600	858	642
25	261	214	140	75	63	91	2,110	9,410	1,910	1,760	804	674
26	261	210	134	75	63	95	*2,070	8,660	1,670	1,650	765	654
27	265	203	129	74	62	100	2,390	7,030	1,480	1,410	732	654
28	270	193	125	72	62	106	4,140	5,400	1,300	1,270	694	642
29	261	*185	120	70	-	110	5,530	4,400	1,330	1,220	654	622
30	261	180	118	68	---------	117	6,140	3,850	1,290	1,100	628	602
31	252	---------	116	66	---------	122	---------	3,580	---------	1,050	609	---------
Total	8,739	6,672	5,111	2,823	1,737	2,428	38,161	136,930	60,880	57,028	47,030	22,594
Mean	282	222	165	91.1	62.0	78.3	1,272	4,417	2,029	1,840	1,517	753
Cfsm	0.193	0.152	0.113	0.062	0.042	0.054	0.871	3.03	1.39	1.26	1.04	0.516
In.	0.22	0.17	0.13	0.07	0.04	0.06	0.97	3.49	1.45	1.45	1.20	0.58

Calendar year 1961: Max 4,240 Min 69 Mean 385 Cfsm 0.264 In. 3.58
Water year 1961-62: Max 9,410 Min 60 Mean 1,069 Cfsm 0.732 In. 9.93

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 8, 14-19, 23, 24, 26, 27, 30, Dec. 5 to Apr. 16, Apr. 19-22.

5-1335. Rainy River at Manitou Rapids, Minn.

(International gaging station)

Location.--Lat 48°38'04", long 93°54'47", in sec.36, T.160 N., R.26 W., on left bank at Manitou Rapids, 3½ miles east of Manitou Post Office and 4 miles west of Indus.

Drainage area.--19,400 sq mi, approximately.

Records available.--July 1928 to September 1962. Monthly discharge only for some periods, published in WSP 1308. October 1911 to October 1924 (gage heights only) at site near Birchdale in files of Corps of Engineers. Published as "near Birchdale" 1932-34.

Gage.--Water-stage recorder. Datum of gage is 1,062.48 ft above mean sea level, datum of 1929. Prior to Nov. 10, 1934, chain gage at site near Birchdale 7 miles downstream at different datum.

Average discharge.--34 years, 11,800 cfs.

Extremes.--Maximum discharge during year, 55,000 cfs May 26 (gage height, 17.67 ft); minimum, 5,880 cfs Nov. 12 (gage height, 3.15 ft).
1928-62: Maximum discharge, 71,600 cfs May 12, 1950 (gage height, 21.04 ft); minimum daily, 928 cfs Dec. 26, 1929.

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

Cooperation.--This station is maintained by the United States under agreement with Canada.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)

3.0	5,620	10.0	23,300
4.0	7,500	14.0	38,300
5.0	9,660	18.0	56,600
7.0	14,700		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	10,700	10,000	9,000	11,300	8,800	11,300	10,600	25,800	39,900	26,200	16,800	19,600
2	11,000	*8,860	9,900	11,000	8,600	12,300	9,430	25,300	39,700	24,300	16,700	20,100
3	11,100	8,790	9,850	11,000	8,700	12,400	9,870	23,900	38,800	23,900	16,500	19,400
4	11,400	8,880	8,900	10,000	8,800	12,400	10,600	22,400	37,700	24,400	16,600	19,100
5	11,600	7,420	8,000	*8,800	8,300	11,400	11,100	20,800	36,700	24,800	17,200	17,500
6	11,600	7,560	9,200	10,200	7,900	12,000	11,900	19,800	35,800	25,200	19,100	15,400
7	11,400	9,080	10,000	9,700	8,300	12,400	12,000	18,200	35,100	28,300	26,500	13,400
8	10,500	9,320	9,800	9,400	9,000	12,400	12,200	17,700	34,700	35,700	30,600	12,900
9	9,020	9,180	9,800	9,300	9,300	12,400	11,300	17,500	34,100	42,000	30,900	13,400
10	8,380	8,970	9,400	10,200	9,200	12,300	12,200	17,500	33,600	49,900	31,100	13,200
11	10,100	8,490	8,600	10,000	9,100	12,500	12,300	17,600	33,200	51,600	30,900	20,100
12	10,900	6,400	9,000	10,200	8,200	11,000	12,100	17,900	32,800	48,100	30,100	25,100
13	11,100	7,000	9,500	10,500	9,000	11,800	12,000	17,700	32,000	43,600	30,400	27,100
14	11,300	7,600	9,800	8,900	9,800	12,200	11,800	17,700	30,400	40,200	30,800	26,900
15	10,800	7,160	10,200	9,000	9,800	12,300	11,500	20,100	*29,400	36,700	*30,400	23,600
16	11,600	7,500	10,400	8,600	10,200	12,400	11,500	22,000	27,000	34,500	29,600	21,400
17	12,000	7,800	10,500	8,800	10,200	12,400	11,100	26,300	26,200	32,900	28,800	20,200
18	12,400	7,900	10,000	8,600	10,000	12,500	12,800	37,300	26,400	31,600	28,000	19,600
19	12,200	7,760	9,500	8,400	9,200	11,000	14,300	46,500	31,900	*28,400	27,300	17,000
20	11,200	7,880	10,300	8,400	9,600	11,100	15,500	51,000	34,600	26,900	26,200	* 15,600
21	10,200	9,020	10,600	7,600	10,400	11,000	17,700	50,100	35,800	25,000	22,300	14,100
22	8,820	8,880	10,700	7,500	10,700	11,000	18,900	46,900	35,200	25,200	20,400	13,100
23	8,990	9,290	10,800	8,100	10,400	10,700	19,000	47,500	34,600	25,400	20,000	12,600
24	10,700	9,250	10,800	8,700	10,600	10,600	19,200	50,700	33,800	24,000	19,900	11,700
25	10,900	9,500	11,000	8,400	10,700	10,600	19,100	54,100	33,200	23,300	19,700	12,200
26	10,400	9,710	11,200	8,500	10,300	9,360	* 18,700	54,800	32,600	23,100	19,100	12,600
27	10,300	9,270	11,400	8,600	10,700	9,870	18,700	52,700	31,800	22,600	17,600	12,800
28	10,200	8,820	10,500	7,900	11,000	10,500	19,800	48,900	31,300	20,000	18,200	12,800
29	9,060	9,540	9,600	7,500	-	10,600	22,700	45,400	28,500	18,200	18,700	12,700
30	8,930	9,250	10,300	8,000	---------	10,700	24,500	43,600	27,000	17,000	18,700	12,500
31	9,540	----------	10,900	8,400	---------	10,700	----------	40,600	----------	16,900	18,700	----------
Total	328,340	256,080	309,450	281,500	266,800	356,130	434,400	1,018,300	993,800	919,900	727,800	507,700
Mean	10,590	8,536	9,982	9,081	9,529	11,490	14,480	32,850	33,130	29,670	23,480	16,920
Cfsm	0.546	0.440	0.515	0.468	0.491	0.592	0.746	1.69	1.71	1.53	1.21	0.872
In.	0.63	0.49	0.59	0.54	0.51	0.68	0.83	1.95	1.91	1.76	1.40	0.97

Calendar year 1961: Max 25,300 Min 2,830 Mean 9,836 Cfsm 0.507 In. 6.88
Water year 1961-62: Max 54,800 Min 7,160 Mean 17,530 Cfsm 0.904 In. 12.26

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 30 to Mar. 21.

5-1342. Rapid River near Baudette, Minn.

Location.--Lat 48°32'10", long 94°33'45", in NE¼ sec.1, T.158 N., R.31 W., on left bank 75 ft upstream from bridge on State Highway 72, 1.2 miles downstream from North Branch Rapid River, and 12 miles south of Baudette.

Drainage area.--543 sq mi.

Records available.--October 1956 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,093.92 ft above mean sea level, datum of 1929 (Minnesota Highway Department bench mark).

Average discharge.--6 years, 244 cfs.

Extremes.--Maximum discharge during year, 5,750 cfs May 24 (gage height, 17.13 ft); minimum daily, 6.0 cfs Feb. 10-24; minimum gage height, 1.87 ft Jan. 28.
1956-62: Maximum discharge, that of May 24, 1962; minimum, 0.1 cfs Aug. 13, 1961 (gage height, 1.18 ft).

Remarks.--Records good except those for period of ice effect, which are fair.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used May 4-21)

2.1	30	6.0	944
2.5	68	8.0	1,580
2.8	106	11.0	2,630
3.5	240	14.0	3,830
4.0	368	17.0	5,650
5.0	648		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	88	54	21	9.0	6.5	6.1	11	794	2,380	513	715	536
2	83	50	21	9.1	6.4	6.1	11	747	2,220	474	645	485
3	77	*46	21	9.1	6.4	6.1	12	706	2,090	471	878	477
4	74	45	22	9.2	6.4	6.1	13	668	1,820	541	776	499
5	74	43	22	9.0	6.2	6.1	14	616	1,610	893	1,080	474
6	*72	41	21	*8.8	6.1	6.1	16	578	1,460	836	2,570	433
7	67	40	20	8.6	6.1	6.1	30	547	1,340	965	2,720	484
8	65	40	20	8.4	6.1	6.1	120	578	1,290	1,500	2,630	590
9	63	39	18	8.2	*6.1	6.1	230	671	1,470	1,550	2,550	1,810
10	58	39	17	8.1	6.0	6.2	280	764	1,810	1,330	2,470	2,020
11	65	38	17	7.8	6.0	6.2	290	812	1,990	1,190	2,280	2,070
12	73	39	16	7.7	6.0	6.2	245	827	1,900	1,000	2,130	1,830
13	83	38	15	7.6	6.0	6.2	205	830	1,700	812	1,960	1,734
14	98	38	14	7.4	6.0	6.2	178	1,050	1,460	665	*1,710	1,280
15	102	37	14	7.3	6.0	6.3	160	1,300	*1,240	576	1,490	1,070
16	95	37	13	7.2	6.0	*6.4	150	*1,460	1,280	519	1,340	914
17	91	36	13	7.1	6.0	6.6	200	2,170	1,670	477	1,190	809
18	87	33	12	7.1	6.0	6.7	330	2,600	1,710	457	1,040	723
19	80	32	12	7.0	6.0	6.9	*573	2,780	1,510	425	941	* 648
20	74	31	11	7.0	6.0	7.1	990	2,980	1,300	*457	857	584
21	70	29	11	7.0	6.0	7.2	1,240	2,950	1,150	812	773	536
22	68	28	11	6.9	6.0	7.4	1,230	2,800	1,210	1,160	800	497
23	63	27	11	6.8	6.0	7.6	1,140	4,270	1,150	1,470	1,020	466
24	60	25	10	6.8	6.0	7.8	1,100	5,630	1,010	1,710	1,240	444
25	60	24	10	6.7	6.1	8.2	*1,050	5,400	908	1,760	1,150	430
26	61	24	10	6.7	6.1	8.5	996	4,670	806	1,530	962	408
27	60	23	9.6	6.6	6.1	8.8	938	3,860	712	1,180	842	384
28	60	22	9.2	6.5	6.1	9.0	890	3,220	616	1,050	752	357
29	57	22	9.1	6.5	-	9.3	854	2,720	587	1,010	686	336
30	57	*21	9.0	6.5	---------	10	827	2,370	576	896	616	318
31	55	----------	9.0	6.5	---------	10	----------	2,290	----------	806	567	----------
Total	2,240	1,041	448.9	234.2	170.7	219.7	14,323	63,658	41,975	29,035	41,380	23,646
Mean	72.3	34.7	14.5	7.55	6.10	7.09	477	2,053	1,399	937	1,335	788
Cfsm	0.133	0.064	0.027	0.014	0.011	0.013	0.878	3.78	2.58	1.73	2.46	1.45
In.	0.15	0.07	0.03	0.02	0.01	0.02	0.98	4.36	2.87	1.99	2.83	1.62

Calendar year 1961: Max 1,310 Min 0.2 Mean 111 Cfsm 0.204 In. 2.75
Water year 1961-62: Max 5,630 Min 6.0 Mean 598 Cfsm 1.10 In. 14.95

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 2 to Apr. 21.

GPO 802-479-6

5-1395. Warroad River near Warroad, Minn.

Location.--Lat 48°52'00", long 95°21'20", in SE¼NE¼ sec.12, T.162 N., R.37 W., on upstream handrail of bridge near center of span, half a mile upstream from Bulldog Run and 2½ miles south of Warroad.

Drainage area.--110 sq mi, approximately.

Records available.--March 1946 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Chain gage read once daily. Datum of gage is 1,070.74 ft above mean sea level, datum of 1929 (levels by Stanley Johnson, consulting engineer and instructor at University of North Dakota).

Average discharge.--16 years, 34.7 cfs.

Extremes.--Maximum discharge during year, 1,460 cfs Aug. 7 (gage height, 9.61 ft, from floodmarks); minimum daily, 1.8 cfs Mar. 15-24.
1946-62: Maximum discharge, that of Aug. 7, 1962; no flow Mar. 28, 1947, Aug. 20-29, 1953, Sept. 11-16, 19-22, 1960, June 25 to Sept. 2, 1961.

Remarks.--Records good except those for periods of shifting control which are fair, and those for periods of ice effect, which are poor.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Apr. 20				April 21 to Sept. 30			
1.9	1.3	3.0	26	2.5	7.3	5.0	132
2.0	2.1	3.5	47	2.7	12	6.0	211
2.1	3.2	4.0	76	3.0	21	7.0	348
2.3	6.4	6.0	207	3.5	43	8.0	670
2.6	13	7.0	338	4.0	72	9.0	1,160
						9.5	1,440

Discharge, in cubic feet per second, water year October to September

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	5.2	4.5	3.3	2.2	2.1	2.0	4.0	115	238	45	*15	24
2	5.0	*5.0	3.2	*2.0	2.1	2.0	5.0	*108	231	42	39	22
3	4.2	5.3	3.1	2.0	2.1	2.0	5.5	91	224	37	27	21
4	4.6	6.2	3.4	2.0	2.1	2.0	7.0	79	176	36	23	20
5	4.8	7.0	3.4	2.0	2.1	2.0	7.5	71	146	35	58	46
6	5.2	7.4	3.4	2.0	2.1	1.9	12	59	128	32	375	35
7	5.0	8.2	3.2	2.0	2.1	1.9	50	53	115	34	1,270	27
8	4.8	7.8	3.2	2.0	2.1	1.9	80	43	166	35	885	29
9	5.2	7.4	3.2	2.0	2.1	1.9	95	55	270	36	604	51
10	5.9	6.2	3.2	2.0	2.1	1.9	70	*79	550	34	437	101
11	7.6	7.0	3.0	2.0	2.1	1.9	60	91	855	29	325	138
12	8.4	7.4	3.0	2.0	2.1	1.9	50	96	840	23	246	152
13	9.7	7.8	3.0	2.0	2.1	1.9	45	90	*684	19	209	144
14	9.0	9.2	3.0	2.0	2.1	1.9	*45	95	514	15	164	122
15	8.4	8.6	3.0	2.0	2.1	1.8	50	120	410	14	124	97
16	7.6	7.0	2.8	2.0	2.1	1.8	50	134	*328	12	110	76
17	8.0	8.0	2.8	2.0	2.1	1.8	60	178	389	11	69	68
18	7.6	8.0	2.8	2.0	2.1	1.8	160	225	397	11	59	70
19	7.8	7.5	2.8	2.0	2.1	1.8	200	265	332	8.4	52	63
20	7.0	7.0	2.8	2.0	2.1	1.8	220	293	228	8.6	41	47
21	6.2	6.0	2.6	2.0	2.1	1.8	328	340	170	13	36	37
22	5.5	5.5	2.6	2.0	2.1	1.8	357	328	141	24	29	32
23	5.3	5.5	2.6	2.0	2.1	1.8	352	357	141	24	28	28
24	5.5	5.0	2.6	2.0	2.1	1.8	297	536	160	36	41	26
25	5.7	5.0	2.4	2.0	2.1	1.9	257	592	143	55	70	*25
26	5.3	5.0	2.4	2.0	2.1	1.9	228	480	117	40	56	22
27	4.8	4.0	2.4	2.1	2.1	*1.9	193	397	*91	32	38	22
28	4.3	3.5	2.4	2.1	*2.1	2.0	165	*344	72	27	30	22
29	4.2	*3.3	2.2	2.1	-	3.0	156	281	59	26	24	21
30	4.3	3.4	2.2	*2.1	---	4.0	130	245	53	22	*39	18
31	4.5	---	2.2	2.1	---	4.0	---	237	---	15	30	---
Total	186.6	188.7	88.2	62.7	58.8	63.8	3,739.0	6,477	8,368	831.0	5,553	1,606
Mean	6.02	6.29	2.85	2.02	2.10	2.06	125	209	279	26.8	179	53.5
Cfsm	0.055	0.057	0.026	0.018	0.019	0.019	1.14	1.90	2.54	0.244	1.63	0.486
In.	0.06	0.06	0.03	0.02	0.02	0.02	1.26	2.19	2.83	0.28	1.88	0.54

Calendar year 1961: Max 90 Min 0 Mean 7.55 Cfsm 0.069 In. 0.92
Water year 1961-62: Max 1,270 Min 1.8 Mean 74.6 Cfsm 0.678 In. 9.19

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 16 to Apr. 20. Shifting-control method used Oct. 1 to to Nov. 15, June 20 to Sept. 30.

MISSISSIPPI RIVER MAIN STEM

5-2010. Winnibigoshish Lake near Deer River, Minn.

Location.--Lat 47°25'42", long 94°03'00", in sec.25, T.146 N., R.27 W., at dam on Mississippi River, 1 mile northwest of Little Winnibigoshish Lake and 14 miles northwest of town of Deer River.

Drainage area.--1,442 sq mi.

Records available.--April 1884 to September 1962. Prior to October 1941 month-end contents only, published in WSP 1308. Published as Winnibigoshish Reservoir near Deer River October 1941 to September 1956.

Gage.--Water-stage recorder. Datum of gage is 1,289.47 ft above mean sea level, adjustment of 1912. Prior to July 8, 1949, staff gage at same site and datum.

Extremes.--Maximum contents during year, 695,640 acre-ft July 8 (gage height, 11.64 ft); minimum, 498,090 acre-ft Mar. 21, 22 (gage height, 8.98 ft).
1884-1962: Maximum contents observed, 996,500 acre-ft July 30, 1905 (gage height, 14.45 ft); minimum observed, 33,680 acre-ft below zero of capacity table Oct. 20, 1931 (gage height, -0.69 ft).

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 (revised) between gage heights 6.00 ft and 14.2 ft (maximum allowable range) is 653,570 acre-ft, of which 416,270 acre-ft is controlled storage between gage heights 6.00 ft and 120 ft (normal operating range). Contents shown herein are contents above gage height 0.00 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

Cooperation.--Records furnished by Corps of Engineers in terms of cfs-days and converted to acre-feet by Geological Survey.

Month-end gage height and contents, water year October 1961 to September 1962

	Gage height (feet)✓	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	9.14	508,580	-
Oct. 31	9.21	513,180	+4,600
Nov. 30	9.21	513,180	0
Dec. 31	9.15	509,240	-3,940
Calendar year 1961	-	-	+29,540
Jan. 31	9.07	504,000	-5,240
Feb. 28	9.05	502,690	-1,310
Mar. 31	9.02	500,710	-1,980
Apr. 30	9.47	530,260	+29,550
May 31	11.15	650,900	+120,640
June 30	11.29	663,690	+12,790
July 31	10.93	630,800	-32,890
Aug. 31	10.11	573,100	-57,700
Sept. 30	10.04	568,200	-4,900
Water year 1961-62	-	-	+59,620

Maximum contents during year, 695,640 acre-ft July 8 (gage height, 11.64 ft)
Minimum contents during year, 498,090 acre-ft Mar. 21, 22 (gage height, 8.98 ft)
✓ Gage height at 2400

5-2015. Mississippi River at Winnibigoshish Dam near Deer River, Minn.

Location.--Lat 47°25'42", long 94°03'00", in SW¼ sec.25, T.146 N., R.27 W., at dam 1 mile northwest of Little Winnibigoshish Lake and 14 miles northwest of town of Deer River.

Drainage area.--1,442 sq mi.

Records available.--May 1884 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder on headwater and staff gage on tailwater, read twice daily. Datum of gage is 1,289.47 ft above mean sea level, adjustment of 1912. Prior to July 8, 1949, staff headwater gage at same site and datum.

Average discharge.--78 years, 502 cfs, unadjusted.

Extremes.--Maximum daily discharge during year, 2,250 cfs July 8; minimum daily, 44 cfs Oct. 28.
1884-62: Maximum daily discharge, 4,370 cfs Aug. 6, 1905; no flow at times in several years.

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 (see preceding page).

Cooperation.--Computations of daily discharge furnished by Corps of Engineers; two discharge measurements made and records reviewed by Geological Survey.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	60	54	414	402	384	404	400	118	1,500	2040	1,700	1,800
2	56	134	412	402	382	404	400	105	1,720	2060	1,770	1,760
3	55	228	409	400	384	402	400	106	1,720	2090	1,770	1,770
4	56	337	414	398	384	404	400	107	1,730	2070	1,750	1,760
5	56	328	412	402	400	404	401	109	1,850	2090	1,740	1,680
6	56	336	412	400	384	404	404	113	1,990	2070	1,770	1,380
7	57	379	414	402	384	402	404	107	1,980	2110	1,850	1,000
8	58	359	414	402	382	400	408	110	1,980	2250	1,830	591
9	58	339	414	400	380	402	431	108	1,980	2150	1,770	511
10	57	386	422	395	377	400	427	111	1,980	2160	1,810	523
11	60	410	418	393	377	400	427	113	2,000	2160	1,800	527
12	62	414	418	392	377	402	427	101	2,000	2140	1,850	531
13	65	419	418	393	385	402	429	106	2,000	2110	1,840	534
14	52	410	415	398	* 407	400	429	106	1,990	1,740	1,820	511
15	52	408	414	395	408	399	429	108	1,970	1,730	1,820	505
16	51	408	414	395	414	399	427	114	1,990	1,730	1,830	527
17	53	414	414	393	412	399	393	223	2,000	1,760	1,790	523
18	58	403	412	392	412	395	353	339	2,060	1,740	1,740	510
19	53	403	409	390	412	395	300	413	2,090	1,760	1,740	505
20	51	400	412	387	410	393	247	530	2,050	1,810	1,720	499
21	51	405	409	392	408	393	202	527	2,060	1,800	1,740	497
22	49	435	409	390	409	392	140	529	*2,160	1,780	1,760	495
23	51	451	408	387	408	393	129	548	2,110	1,770	1,750	488
24	50	451	408	387	409	393	102	979	2,100	1,780	1,830	500
25	50	447	407	387	409	393	103	989	2,100	1,790	1,790	499
26	50	447	408	387	409	393	104	1,020	2,050	1,740	1,760	500
27	46	445	407	385	408	393	106	1,040	2,030	1,710	1,730	494
28	44	437	407	385	408	395	114	1,040	2,010	1,780	1,840	490
29	46	415	407	387	-	398	114	1,060	2,150	1,760	1,800	485
30	47	414	404	385	----------	400	117	1,080	2,120	1,770	1,760	485
31	49	----------	404	384	----------	398	----------	1,180	----------	1,750	1,780	----------
Total	1,659	11,316	12,759	12,187	11,123	12,351	9,167	13,239	59,470	59,200	55,250	22,880
Mean	53.5	377	412	393	397	398	306	427	1,982	1,910	1,782	763
(≠)	+74.8	0	-64.2	-85.2	-23.6	-32.3	+497	+1,962	+215	-535	-938	-82.3
Mean≠	128	377	348	308	373	366	803	2,389	2,197	1,375	844	681
Cfsm≠	0.089	0.261	0.241	0.214	0.259	0.254	0.557	1.66	1.52	0.954	0.585	0.472
Ins.≠	0.10	0.29	0.28	0.25	0.27	0.29	0.62	1.91	1.70	1.10	0.67	0.53

Calendar year 1961: Max 451 Min 42 Mean 170 Mean≠ 211 Cfsm≠ 0.146 In.≠ 1.96
Water year 1961-62: Max 2,250 Min 44 Mean 769 Mean≠ 851 Cfsm≠ 0.590 In.≠ 8.01

* Discharge measurement made on this day.
≠ Change in contents, equivalent in cubic feet per second, in Winnibigoshish Lake.
≠ Adjusted for change in contents.

5-2060. Leech Lake at Federal Dam, Minn.

Location.--Lat 47°12'23", long 94°18'31", in lot 2, sec.14, T.143 N., R.29 W., at head of Leech Lake River on Waboose Bay, 5 miles southwest of town of Federal Dam.

Drainage area.--1,163 sq mi.

Records available.--April 1884 to September 1962. Month-end 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 1,293.23 ft above mean sea level, adjustment of 1912. Prior to Dec. 31, 1884, staff gage half a mile north of outlet to Leech Lake River at datum 5.76 ft lower. Dec. 31, 1884, to May 24, 1931, staff gage half a mile north of outlet to Leech Lake River at present datum.

Extremes.--Maximum contents during year, 470,760 acre-ft July 8 (gage height, 3.44 ft); minimum, 146,280 acre-ft Apr. 7 (gage height, 0.86 ft).
1884-1962: Maximum contents observed, 734,300 acre-ft June 30, 1916 (gage height, 5.18 ft); minimum observed, 72,830 acre-ft below zero of capacity table Sept. 30, Nov. 19, 1934, Jan. 9, 1935 (gage height, -1.18 ft).

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 (revised) between gage heights 0.00 ft and 5.24 ft (maximum allowable range) is 689,780 acre-ft, of which 356,570 acre-ft is controlled storage between gage heights 0.00 ft and 3.00 ft (normal operating range). Contents shown herein are contents above gage height -0.50 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

Cooperation.--Records furnished by Corps of Engineers in terms of cfs-days and converted to acre-feet by Geological Survey.

Month-end gage height and contents, water year October 1961 to September 1962

	Gage height (feet)/	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	1.52	223,020	-
Oct. 31	1.33	199,000	-24,020
Nov. 30	1.13	175,660	-23,340
Dec. 31	1.05	166,950	-8,710
Calendar year 1961	-	-	-9,800
Jan. 31	0.92	152,810	-14,140
Feb. 28	0.95	156,060	+3,250
Mar. 31	0.93	153,900	-2,160
Apr. 30	1.53	224,290	+70,390
May 31	2.99	408,850	+184,560
June 30	3.03	413,910	+5,060
July 31	3.06	417,720	+3,810
Aug. 31	2.76	379,800	-37,920
Sept. 30	2.62	362,080	-17,720
Water year 1961-62	-	-	+139,060

Maximum contents during year, 470,670 acre-ft July 8 (gage height, 3.44 ft)
Minimum contents during year, 146,280 acre-ft Apr. 7 (gage height, 0.86 ft)
/ Gage height at 2400

5-2065. Leech Lake River at Federal Dam, Minn.

Location.--Lat 47°14'45", long 94°13'12", in sec.29, T.144 N., R.28 W., on right bank at dam on Leech Lake River at town of Federal Dam, 2 miles downstream from natural outlet of Leech Lake.

Drainage area.--1,163 sq mi.

Records available.--May 1884 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder, headwater gage, and staff tailwater gage, read twice daily. Datum of gage is 1,293.23 ft above mean sea level, adjustment of 1912. Prior to July 3, 1948, staff headwater gage at same datum. May 27 to Nov. 30, 1929, staff gage at site 600 ft downstream at different datum.

Average discharge.--78 years (1884-1962) 337 cfs, unadjusted.

Extremes.--Maximum daily discharge during year, 760 cfs July 8; minimum daily, 44 cfs Oct. 27.
1884-1962: Maximum daily discharge, 2,520 cfs June 7, 1957 (result of dam failure); no flow at times.

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 (see preceding page).

Cooperation.--Computations of daily discharge furnished by Corps of Engineers; five discharge measurements made and records reviewed by Geological Survey.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	59	149	392	386	382	392	389	115	610	619	693	712
2	49	319	392	382	385	389	389	97	602	615	693	703
3	48	344	389	386	389	386	382	99	599	635	670	712
4	51	324	415	382	392	389	386	100	591	643	711	712
5	51	297	378	378	382	392	386	104	602	655	729	707
6	50	299	392	378	378	392	396	106	610	655	746	732
7	50	319	396	382	382	392	382	96	602	688	753	692
8	47	*292	386	382	374	396	389	99	606	760	692	673
9	49	284	381	378	374	399	466	100	619	694	684	695
10	49	312	392	374	374	399	439	102	623	698	684	718
11	52	392	389	367	378	399	432	106	615	698	696	732
12	54	396	386	373	382	407	415	106	610	698	715	736
13	52	396	386	396	385	411	419	106	619	679	715	732
14	53	411	381	399	*397	407	422	111	619	646	724	736
15	53	389	378	392	392	403	419	116	615	642	730	721
16	52	382	392	396	411	403	399	121	631	675	721	736
17	54	389	392	389	403	396	412	141	602	707	692	747
18	52	396	392	385	399	392	344	156	631	700	675	716
19	49	386	399	396	399	396	276	165	655	695	672	699
20	49	389	399	378	403	399	218	175	639	707	*655	688
21	47	371	396	378	399	389	178	165	639	700	643	699
22	45	407	392	382	399	382	132	175	651	700	683	678
23	58	411	399	382	399	389	92	220	647	703	700	683
24	50	403	399	385	403	389	91	515	651	723	696	697
25	51	399	396	385	403	386	*92	494	*643	691	691	702
26	51	399	403	389	407	389	94	523	623	684	681	692
27	44	396	392	382	399	382	100	534	615	721	658	678
28	47	396	389	385	396	386	107	534	610	721	712	673
29	44	399	389	385	-	403	106	534	647	717	682	669
30	52	396	386	385	----------	399	115	560	643	722	716	665
31	64	----------	389	382	----------	382	----------	636	----------	716	712	----------
Total	1,576	10,842	12,137	11,899	10,966	12,215	8,867	7,211	18,669	21,307	21,624	21,135
Mean	50.8	361	392	384	392	394	296	233	622	687	698	704
(≠)	-391	-392	-142	-230	+58.6	-35.2	+1,183	+3,002	+85.0	+61.9	-617	-298
Mean≠	-340	-31	250	154	451	359	1,479	3,235	707	749	81.0	406
Cfsm≠	-0.292	-0.027	0.215	0.132	0.388	0.309	1.27	2.78	0.608	0.644	0.070	0.349
In.≠	-0.34	-0.03	0.25	0.15	0.40	0.36	1.42	3.21	0.68	0.74	0.08	0.39

Calendar year 1961: Max 406 Min 36 Mean 202 Mean≠ 188 Cfsm≠ 0.162 In.≠ 2.10
Water year 1961-62: Max 760 Min 44 Mean 434 Mean≠ 626 Cfsm≠ 0.538 In.≠ 7.31

* Discharge measurement made on this day.
≠ Change in contents, equivalent in cubic feet per second, in Leech Lake.
≠ Adjusted for change in contents.
Note.--Negative figures of adjusted discharge and runoff indicate that evaporation and seepage from lake exceeded inflow.

5-2105. Pokegama Lake near Grand Rapids, Minn.

Location.--Lat 47°10'00", long 93°33'20", in NW¼ sec.17, T.54 N., R.25 W., at narrows on State Highway 169, 4 miles south of Grand Rapids.

Drainage area.--3,265 sq mi.

Records available.--April 1884 to September 1962. Prior to October 1941 month-end contents only, published in WSP 1308. Published as Pokegama Reservoir near Grand Rapids October 1941 to September 1956.

Gage.--Water-stage recorder. Datum of gage is 1,264.89 ft above mean sea level, adjustment of 1912. Prior to May 30, 1949, staff gage at Pooles Arm of Pokegama Lake, 5 miles northwest at same datum.

Extremes.--Maximum contents during year, 93,120 acre-ft May 31 (gage height, 10.76 ft); minimum, 30,880 acre-ft Apr. 2 (gage height, 6.94 ft).
1884-1962: Maximum contents, 155,000 acre-ft May 8, 1897 (gage height, 13.50 ft); minimum observed, 4,520 acre-ft below zero of capacity table Sept. 30, 1934 (gage height, 4.12 ft).

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 (revised) between gage heights 6.00 ft and 12.0 ft (maximum allowable range) is 81,720 acre-ft, of which 53,150 acre-ft is controlled storage between gage heights 6.00 ft and 10.00 ft (normal operating range). Contents shown herein are contents above gage height 4.50 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

Cooperation.--Records furnished by Corps of Engineers in terms of cfs-days and converted to acre-feet by Geological Survey.

Month-end gage height and contents, water year October 1961 to September 1962

	Gage height (feet)/	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	8.89	59,190	-
Oct. 31	8.88	59,050	-140
Nov. 30	8.35	51,130	-7,920
Dec. 31	8.20	48,890	-2,240
Calendar year 1961	-	-	-4,350
Jan. 31	7.99	45,780	-3,110
Feb. 28	7.93	44,930	-850
Mar. 31	6.94	30,880	-14,050
Apr. 30	8.56	54,290	+23,410
May 31	10.73	92,510	+38,220
June 30	9.26	65,200	-27,310
July 31	8.85	58,590	-6,610
Aug. 31	8.80	57,860	-730
Sept. 30	9.00	60,830	+2,970
Water year 1961-62	-	-	+1,640

Maximum contents during year, 93,120 acre-ft May 31 (gage height, 10.76 ft)
Minimum contents during year, 30,880 acre-ft Apr. 2 (gage height, 6.94 ft)
/ Gage height at 2400.

5-2110. Mississippi River at Grand Rapids, Minn.

Location.--Lat 47°13'56", long 93°31'48", in SW¼NW¼ sec.21, T.55 N., R.25 W., in machine room of Blandin Paper Mill in Grand Rapids, 400 ft upstream from bridge on State Highway 169, 2.5 miles upstream from Prairie River, and at mile 1,182 upstream from Ohio River.

Drainage area.--3,370 sq mi, approximately.

Records available.--October 1883 to September 1962. 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 1,242.00 ft above mean sea level, adjustment of 1912. Prior to Feb. 17, 1945, staff gages operated by Corps of Engineers at Pokegama Dam 3½ miles upstream at datum 22.89 ft higher. Feb. 17, 1945, to Sept. 3, 1948, water-stage recorder at site 300 ft upstream, within 0.10 ft of present datum. Sept. 9, 1948, to Jan. 6, 1949, staff gage at site 400 ft downstream at present datum. Jan. 7, 1949, to Jan. 16, 1951, tape float and inside staff gages at present site and datum.

Average discharge.--79 years, 1,107 cfs.

Extremes.--Maximum discharge during year, 3,620 cfs July 7, computation of peak flow through Pokegama Dam (furnished by Corps of Engineers); minimum daily, 177 cfs Oct. 1.
1941-62: Maximum discharge, 12,500 cfs Sept. 3, 1948 (gage height, 15.2 ft, from floodmark), caused by dam failure at gage, from rating curve extended above 4,500 cfs by logarithmic plotting; maximum daily, 5,250 cfs Sept. 5, 8, 1905; no flow at times in several years.

Remarks.--Daily discharge is computed flow through Pokegama Dam and corrected to conform with discharge measurements. Flow completely regulated by Pokegama Lake (see preceding page). Backwater from Prairie River occurs at times in most years.

Cooperation.--Records furnished by Corps of Engineers, 1883-1944, 1959-62.

Discharge, in cubic feet per second, water year October to September

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	177	220	*739	837	809	816	1,040	628	2,980	3,280	3,080	2,650
2	179	407	809	837	809	816	1,040	928	3,090	3,280	3,060	2,660
3	179	507	865	837	816	809	1,070	953	3,220	3,360	3,030	2,680
4	182	586	893	823	816	809	1,100	982	3,120	3,330	2,920	2,690
5	179	575	858	837	823	823	1,170	1,010	3,050	3,340	2,920	2,760
6	*192	575	851	830	809	830	1,280	998	3,250	3,580	2,990	2,750
7	184	653	837	830	802	898	1,330	1,010	3,180	3,600	3,040	2,740
8	181	* 630	823	830	795	890	1,390	998	3,550	3,590	2,960	2,730
9	186	630	823	802	803	882	1,460	998	3,390	3,570	2,910	2,720
10	186	802	830	795	837	874	1,430	1,010	3,340	3,570	2,860	2,830
11	195	879	809	795	830	858	1,430	1,010	3,320	3,560	2,770	2,850
12	200	865	802	807	830	858	1,420	* 1,020	3,420	3,520	2,830	2,650
13	199	844	802	844	830	924	1,420	1,010	3,470	3,510	2,840	2,160
14	200	830	802	837	837	993	1,380	1,030	3,440	3,480	2,860	2,180
15	200	816	795	837	*837	1,090	1,250	1,080	3,340	3,460	2,870	2,190
16	203	802	851	837	858	1,090	1,260	1,180	3,280	3,440	2,850	2,190
17	205	828	851	816	844	1,130	1,020	1,450	3,200	3,420	2,840	2,160
18	200	900	851	802	837	1,080	967	1,660	3,190	*3,400	2,860	*2,150
19	199	865	858	802	844	1,080	1,010	2,060	3,180	3,390	2,860	2,030
20	199	851	858	795	837	1,100	1,030	2,050	3,160	3,360	2,850	2,030
21	198	844	851	795	830	* 1,190	1,060	2,050	3,280	3,330	*2,850	1,900
22	195	844	844	795	837	1,100	1,020	2,290	3,280	3,300	2,850	1,880
23	199	851	858	837	830	1,150	1,050	2,630	3,270	3,290	2,850	1,880
24	195	844	858	851	830	1,080	*655	2,930	3,240	3,270	2,820	1,900
25	198	837	851	865	837	1,040	671	1,180	3,200	3,200	2,810	1,900
26	195	837	858	*879	844	1,040	694	1,360	*3,380	3,180	2,810	1,750
27	192	823	837	851	830	1,010	590	1,540	3,330	3,160	2,800	1,740
28	195	816	844	837	823	1,010	680	1,660	3,310	3,130	2,800	1,630
29	191	816	837	823	-	1,040	715	1,820	3,360	3,110	2,630	1,630
30	195	802	837	809	----------	1,040	772	2,520	3,310	3,130	2,640	1,620
31	194	----------	844	809	----------	1,040	----------	3,010	----------	3,110	2,650	----------
Total	5,972	22,379	25,926	25,581	23,164	30,390	32,404	46,055	98,130	104,250	88,710	67,630
Mean	193	746	836	825	827	980	108	149	3,271	3,363	2,862	2,254
Ac-ft	-	-	-	-	-	-	-	-	-	-	-	-

Calendar year 1961: Max 1,320 Min 83 Mean 477 Ac-ft
Water year 1961-62: Max 3,600 Min 177 Mean 1,563 Ac-ft

* Discharge measurement made on this day.

5-2170. Swan River near Warba, Minn.

Location.--Lat 47°06'40", long 93°15'50", in SE¼ sec.33, T.54 N., R.23 W., on left bank 75 ft upstream from highway bridge, 1¼ miles south of Warba, 3¾ miles northwest of Swan River, and 22 miles upstream from mouth.

Drainage area.--254 sq mi.

Records available.--October 1953 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,259.80 ft above mean sea level (Minnesota State Highway Department bench mark).

Average discharge.--9 years, 123 cfs.

Extremes.--Maximum discharge during year, 714 cfs May 26 (gage height, 8.07 ft); minimum, 26 cfs Oct. 3; minimum gage height, 1.97 ft Oct. 1.
1953-62: Maximum discharge, 1,000 cfs Apr. 13, 1954 (gage height, 9.00 ft); maximum gage height, 9.02 ft Apr. 13, 1954 (backwater from ice); minimum discharge, 15 cfs Sept. 4, 5, 1961 (gage height, 1.65 ft).
Flood of May 1950 reached a stage of about 11.5 ft from information by local residents.

Remarks.--Records good except those for period of ice effect, which are fair.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 4 to Nov. 17, July 8 to Sept. 30)

1.9	26	4.0	175
2.4	54	6.0	378
3.0	95	8.0	698

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	28	35	46	40	37	36	150	306	495	87	72	47
2	28	37	46	40	37	36	140	288	467	91	55	46
3	27	49	46	40	37	37	132	274	429	98	49	49
4	31	53	47	40	37	38	140	260	387	97	45	50
5	34	61	47	40	37	39	155	249	343	99	44	50
6	34	59	46	39	36	40	165	234	309	92	70	48
7	32	*57	46	38	36	41	170	215	274	94	112	44
8	31	49	45	37	36	42	160	203	243	113	108	42
9	34	55	44	*37	37	43	145	196	218	116	89	75
10	40	61	44	36	37	44	142	* 195	201	105	77	157
11	*50	58	43	36	38	44	148	195	187	104	77	* 246
12	61	58	42	36	39	45	150	193	172	100	132	242
13	63	58	41	36	39	45	140	221	155	93	152	205
14	58	52	40	36	39	46	130	239	134	75	131	166
15	57	64	40	36	* 39	47	120	267	126	67	104	149
16	55	59	40	36	39	48	120	320	109	72	92	139
17	53	52	40	36	38	50	123	345	102	*67	80	130
18	52	51	39	36	38	52	121	349	106	57	76	124
19	49	50	39	35	38	53	128	350	107	53	82	113
20	44	48	39	35	38	54	126	367	92	57	81	104
21	37	48	40	35	38	*56	131	378	*82	61	76	94
22	34	48	40	34	38	59	141	391	81	58	*75	82
23	34	48	40	34	38	61	145	489	78	67	65	85
24	36	48	40	35	38	63	* 144	585	71	74	55	100
25	38	48	40	36	37	67	145	668	71	75	51	110
26	40	47	39	36	37	74	148	707	70	70	54	108
27	40	46	39	36	36	85	171	685	64	64	56	101
28	40	46	39	35	36	98	275	631	61	60	53	95
29	40	46	39	35	-	125	330	583	102	61	55	91
30	37	* 45	39	36	---------	150	325	547	103	73	53	88
31	35	----------	39	36	---------	153	----------	523	----------	79	48	----------
Total	1,272	1,536	1,294	1,133	1,050	1,871	4,760	11,453	5,439	2,479	2,369	3,180
Mean	41.0	51.2	41.7	36.5	37.5	60.4	159	369	181	80.0	76.4	106
Cfsm	0.161	0.202	0.164	0.144	0.148	0.238	0.626	1.45	0.713	0.315	0.301	0.417
In.	0.19	0.22	0.19	0.17	0.15	0.27	0.70	1.68	0.80	0.36	0.35	0.47

Calendar year 1961: Max 568 Min 15 Mean 78.9 Cfsm 0.311 In. 4.22
Water year 1961-62: Max 707 Min 27 Mean 104 Cfsm 0.409 In. 5.55

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 18 to Apr. 16.

5-2185. Sandy Lake at Libby, Minn.

Location.--Lat 46°46'40", long 93°19'20", in sec.36, T.50 N., R.24 W., at Libby, 1 mile upstream from dam on Sandy River, 2.2 (revised) miles upstream from mouth, and 14 miles north of McGregor.

Drainage area.--421 sq mi.

Records available.--July to December 1893, October to December 1894, July 1895 to September 1962. Month-end 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 1,207.71 ft above mean sea level, adjustment of 1912. Prior to Sept. 23, 1949, float gage at same site and datum.

Extremes.--Maximum contents during year, 67,360 acre-ft June 2 (gage height, 10.51 ft); minimum, 34,790 acre-ft Mar. 24, 25, 26 (gage height, 6.98 ft).
1895-1962: Maximum contents, 167,200 acre-ft May 19, 1950 (gage height, 17.51 ft); minimum observed, 5,950 acre-ft below zero of capacity table Jan. 20, 1921 (gage height, 0.65 ft).

Remarks.--Reservoir is formed by Sandy, Flowage, Snake, and Aitkin Lakes controlled by concrete dam. Storage began in 1893; original timber crib dam completed in 1895, replaced by present structure in 1911. Capacity (revised) between gage heights 7.00 ft and 14.00 ft (minimum allowable limit to top of structure) is 73,330 acre-ft, of which 37,550 acre-ft is controlled storage between gage heights 7.00 ft and 11.00 ft (normal operating range). Contents shown herein are contents above gage height 1.72 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

Cooperation.--Records furnished by Corps of Engineers in terms of cfs-days and converted to acre-feet by Geological Survey.

Month-end gage height and contents, water year October 1961 to September 1962

	Gage height (feet)✓	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	8.66	49,370	-
Oct. 31	8.74	50,100	+830
Nov. 30	8.61	48,900	-1,200
Dec. 31	8.51	47,970	-930
Calendar year 1961	-	-	+1,600
Jan. 31	8.30	46,100	-1,870
Feb. 28	8.13	44,580	-1,520
Mar. 31	7.04	35,280	-9,300
Apr. 30	8.83	50,930	+15,650
May 31	10.41	66,350	+15,420
June 30	9.05	52,980	-13,370
July 31	8.97	52,220	-760
Aug. 31	8.95	52,040	-180
Sept. 30	8.95	52,040	0
Water year 1961-62	-	-	+2,670

Maximum contents during year, 67,360 acre-ft June 2 (gage height, 10.51 ft)
Minimum contents during year, 34,790 acre-ft Mar. 24, 25, 26 (gage height, 6.98 ft)
✓ Gage height at 2400.

5-2190. Sandy River at Sandy Lake Dam at Libby, Minn.

Location.--Lat 46°47'18", long 93°19'06", in sec.25, T.50 N., R.24 W., at dam at outlet of Sandy Lake, a quarter of a mile north of Libby and 1.2 (revised) miles above mouth.

Drainage area.--421 sq mi.

Records available.--July 1893 to March 1894, July 1894, November 1894 to March 1895, August 1895 to September 1962. 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 1,207.71 ft above mean sea level, adjustment of 1912. Prior to June 20, 1949, staff gages at same site and datum.

Average discharge.--67 years (1895-1962), 200 cfs, unadjusted.

Extremes.--Maximum daily discharge during year, 936 cfs June 12; minimum daily, 3 cfs many days in October, June, July, August and September.
1893-1962: Maximum daily discharge, 3,738 cfs July 12, 1897; no flow at times.

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 (see preceding page).

Cooperation.--Four discharge measurements made and records reviewed by Geological Survey. Computations of daily discharge furnished by Corps of Engineers.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	3	52	49	46	45	208	80	24	676	110	3	3
2	3	52	48	46	45	206	80	200	743	200	3	3
3	3	52	48	46	44	206	85	200	805	320	3	3
4	3	51	48	46	44	206	120	295	739	320	3	3
5	3	51	48	46	44	210	115	355	880	315	3	3
6	* 3	51	49	46	44	212	115	350	827	315	52	3
7	3	52	50	47	45	214	110	345	863	320	232	3
8	3	52	51	46	45	212	110	345	883	315	225	3
9	3	51	50	46	45	212	110	270	920	120	225	3
10	3	51	49	47	45	210	105	275	932	120	225	69
11	3	51	48	47	44	210	105	180	913	56	3	155
12	3	50	47	47	45	210	110	190	936	56	275	140
13	3	50	47	47	44	210	110	190	* 888	58	260	135
14	3	50	46	47	44	210	110	341	884	58	260	135
15	3	50	46	47	44	208	110	422	866	60	345	145
16	3	49	46	47	44	204	115	475	822	3	130	155
17	3	49	46	47	43	202	115	585	575	3	135	160
18	3	49	46	47	43	204	115	570	265	3	140	165
19	3	49	46	47	44	208	120	550	206	3	87	3
20	3	48	46	47	44	210	120	525	51	3	3	3
21	3	48	46	47	44	210	125	580	*54	3	3	3
22	3	48	46	47	44	* 210	125	675	55	3	3	3
23	3	48	46	47	43	40	125	894	56	3	3	3
24	3	47	46	47	42	40	22	877	57	3	3	3
25	3	47	46	47	42	40	23	654	58	3	3	3
26	3	48	47	46	42	40	24	435	59	3	3	3
27	3	49	47	45	125	45	24	485	32	3	3	3
28	3	49	47	45	210	45	24	610	3	3	3	3
29	3	50	47	45	-	45	24	755	24	3	3	3
30	3	50	47	45	----------	45	24	816	114	3	3	3
31	3	----------	47	45	----------	40	----------	680	----------	3	3	----------
Total	93	1,494	1,466	1,438	1,477	4,972	2,700	14,148	15,186	2,791	2,645	1,322
Mean	3.0	49.8	47.3	46.4	52.7	160	90	456	506	90.0	85.3	44.1
(≠)	+11.9	-20.1	-15.1	-30.5	-27.3	-151	+263	+251	-225	-12.3	-3.0	0
Mean≠	14.9	29.7	32.2	15.9	25.4	9	353	707	281	77.7	82.3	44.1
Cfsm≠	0.035	0.071	0.076	0.038	0.060	0.021	0.838	1.68	0.667	0.185	0.195	0.105
In.≠	0.04	0.08	0.10	0.04	0.06	0.02	0.94	1.94	0.74	0.21	0.22	0.12

Calendar year 1961: Max 1,390 Min 3 Mean 74.9 Mean≠ 77.1 Cfsm≠ 0.183 In.≠ 2.52
Water year 1961-62: Max 936 Min 3 Mean 136 Mean≠ 140 Cfsm≠ 0.333 In.≠ 4.51

* Discharge measurement made on this day.
≠ Change in contents, equivalent in cubic feet per second, in Sandy Lake.
≠ Adjusted for change in contents.

5-2205. Mississippi River below Sandy River, near Libby, Minn.

Location.--Lat 46°47', long 93°20', in sec.25, T.50 N., R.24 W., on right bank 600 ft downstream from Sandy River and three-quarters of a mile northwest of Libby.

Drainage area.--5,060 sq mi, approximately.

Records available.--April 1930 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,204.55 ft above mean sea level, adjustment of 1912. Prior to July 28, 1931, staff gage at site 600 ft upstream at datum 3.16 ft higher.

Average discharge.--32 years, 1,839 cfs.

Extremes.--Maximum discharge during year, 6,220 cfs June 5 (gage height, 12.76 ft); minimum, 334 cfs Oct. 8 (gage height, 2.17 ft).
1930-62: Maximum discharge, 16,000 cfs May 17, 1950 (gage height, 20.02 ft); minimum, 83 cfs Nov. 16, 1936 (gage height, 1.44 ft).

Remarks.--Records good except those for period of ice effect, which are fair. Flow regulated by powerplants and Winnibigoshish, Leech, Pokegama, and Sandy Lakes (see p. 74, 76, 78, 81).

Rating tables, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Sept. 11-30)

Oct. 1 to Mar. 23		Mar. 24 to Sept. 30	
2.0	278	4.5	1,540
2.5	458	5.0	1,810
3.0	690	6.0	2,360
3.5	950	8.0	3,480
4.0	1,210	13.0	6,360
4.5	1,480		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	590	431	*1,270	1,070	1,030	1,370	1,840	2,040	5,730	4,070	3,420	2,970
2	500	518	1,250	1,090	1,050	1,400	1,760	2,170	5,900	4,210	3,390	2,930
3	454	605	1,280	1,100	1,060	1,410	1,550	2,190	6,050	4,310	3,380	2,930
4	392	799	1,310	1,110	1,060	1,390	1,580	2,370	6,160	4,310	3,370	2,910
5	458	929	1,300	1,120	1,060	1,370	1,680	2,530	6,210	4,310	3,360	2,880
6	496	929	1,050	1,120	1,050	1,350	1,780	2,610	6,180	4,280	3,500	2,910
7	403	*841	950	1,120	1,020	1,320	1,880	2,650	6,100	4,270	3,700	2,960
8	342	877	920	1,120	1,010	1,350	2,000	2,640	6,000	4,310	3,700	3,010
9	345	986	910	1,110	1,010	1,390	2,100	2,570	5,880	4,270	3,720	3,020
10	435	981	900	1,100	1,020	1,400	2,180	2,560	5,800	4,310	3,660	3,240
11	*442	1,030	870	1,080	1,030	1,410	2,200	2,500	5,700	4,240	3,550	3,580
12	544	1,160	840	1,060	1,050	1,410	2,170	2,480	5,580	4,190	3,820	3,740
13	680	1,150	820	1,070	1,060	1,400	2,180	2,500	*5,490	4,140	3,920	3,800
14	763	1,100	820	1,080	1,100	1,400	2,190	2,700	5,420	4,080	3,860	3,740
15	711	1,100	840	1,070	1,130	1,440	2,180	2,900	5,350	4,020	3,790	3,480
16	504	1,170	870	1,050	*1,160	1,500	2,100	3,040	5,270	3,940	3,630	3,260
17	384	1,160	900	1,030	1,180	1,560	2,020	3,200	5,050	*3,870	3,570	3,100
18	380	1,180	920	1,040	1,170	1,610	1,980	3,350	4,710	3,760	* 3,540	*2,970
19	496	1,260	950	1,060	1,140	1,660	1,890	*3,540	4,500	3,750	3,460	2,770
20	531	1,410	960	1,060	1,140	1,700	1,820	3,770	4,260	3,760	3,330	2,740
21	549	1,420	970	1,070	1,160	1,740	1,820	4,040	*4,180	3,760	3,260	2,710
22	549	1,370	970	1,060	1,190	*1,760	1,880	4,330	4,150	3,770	3,210	2,700
23	531	1,280	980	1,030	1,230	1,800	1,940	5,020	4,110	3,760	3,250	2,650
24	442	1,440	980	1,010	1,250	1,940	*1,890	5,610	4,070	3,710	3,290	2,590
25	435	1,390	980	*1,010	1,280	1,920	1,800	5,860	4,030	3,610	3,260	2,540
26	518	1,250	980	1,020	1,290	1,810	1,590	5,980	3,970	3,580	3,210	2,520
27	567	1,210	990	1,030	1,290	1,680	1,560	5,990	3,880	3,570	3,120	2,500
28	567	981	1,000	1,050	1,330	1,620	1,760	5,890	3,820	3,540	3,010	2,430
29	572	1,000	1,010	1,060	-	1,680	1,880	5,820	3,920	3,510	2,970	2,300
30	509	1,060	1,030	1,050	---------	1,720	1,950	5,760	4,020	3,510	2,970	2,180
31	427	----------	1,050	1,040	---------	1,820	----------	5,690	----------	3,470	2,980	----------
Total	15,516	32,017	30,870	33,090	31,550	48,330	57,150	114,300	151,490	122,190	106,200	88,060
Mean	501	1,067	996	1,067	1,127	1,559	1,905	3,687	5,050	3,942	3,426	2,935
Cfsm	0.099	0.211	0.197	0.211	0.223	0.308	0.376	0.729	0.998	0.779	0.677	0.580
In.	0.11	0.24	0.23	0.24	0.23	0.36	0.42	0.84	1.11	0.90	0.78	0.65

Calendar year 1961: Max 4,430 Min 157 Mean 969 Cfsm 0.192 In. 2.60
Water year 1961-62: Max 6,210 Min 342 Mean 2,276 Cfsm 0.450 In. 6.11

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 8 to Mar. 23 (no gage-height record Dec. 16-21).

5-2275. Mississippi River at Aitkin, Minn.

Location.--Lat 46°32'26", long 93°42'26", in W½ sec.24, T.47 N., R.27 W., on upstream side of highway bridge at north edge of Aitkin, 1 mile downstream from Mud River and at mile 1,055.9 upstream from Ohio River.

Drainage area.--6,140 sq mi, approximately.

Records available.--March 1945 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,185.41 ft above mean sea level, datum of 1929 (levels by Corps of Engineers). Mar. 1, 1945, to July 12, 1954, staff gage, July 13, 1954, to June 23, 1955, chain gage, June 24, 1955, to Mar. 14, 1961, wire-weight gage, at same site and datum.

Average discharge.--17 years, 2,782 cfs.

Extremes.--Maximum discharge during year, 9,300 cfs May 31 (gage height, 10.65 ft); minimum, 423 cfs Oct. 10 (gage height, -1.51 ft).
1945-62: Maximum discharge, 20,000 cfs May 20, 1950 (gage height, 19.49 ft); minimum, 151 cfs Sept. 1, 1961 (gage height, -2.40 ft).

Remarks.--Records good except those for period of ice effect, which are fair. Slight regulation by powerplants and by Winnibigoshish, Leech, Pokegama, and Sandy Lakes (see p. 74, 76, 78, 81). Water diverted at medium and high stages into Aitkin diversion channel 6½ miles above station, bypasses station and returns to river 15½ miles below station. Diversion began Apr. 2, 1955. These records include flow in diversion channel.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	677	604	1,050	1,190	1,090	1,200	2,970	3,100	9,200	4,430	3,500	2,980
2	666	565	*1,140	1,200	1,070	1,230	3,050	3,170	9,050	4,600	3,450	2,960
3	638	600	1,230	1,200	1,040	1,300	3,090	3,270	8,890	4,820	3,480	2,960
4	576	663	1,260	1,210	1,040	1,370	3,090	3,320	8,750	5,000	3,430	2,920
5	523	800	1,250	1,210	1,040	1,400	3,220	3,430	8,570	5,110	3,390	2,800
6	526	929	1,230	1,210	1,050	1,400	3,500	3,530	8,440	5,090	3,430	2,850
7	579	*1,010	1,200	1,220	1,060	1,380	3,590	3,550	8,260	5,030	3,610	2,890
8	562	960	1,050	1,220	1,050	1,330	3,710	3,540	8,040	5,020	3,790	2,940
9	478	915	1,000	*1,230	1,030	1,370	3,680	3,470	7,750	5,000	3,840	3,030
10	* 433	1,010	990	1,230	1,010	1,390	3,500	3,370	7,460	4,960	3,830	3,150
11	509	1,060	980	1,230	1,000	1,400	3,220	3,320	7,160	4,950	3,820	3,380
12	544	1,110	970	1,220	1,000	1,420	2,940	3,270	6,900	4,870	4,050	3,820
13	614	1,190	960	1,210	*1,000	1,500	2,880	3,240	6,660	4,770	4,310	4,090
14	747	1,220	950	1,200	1,000	1,560	2,890	3,200	6,460	4,640	4,390	4,170
15	852	1,200	970	1,180	1,010	1,600	2,830	3,500	6,240	4,490	4,350	4,100
16	866	1,190	1,000	1,180	1,020	1,620	2,770	3,710	6,060	* 4,370	4,230	3,890
17	761	1,220	1,050	1,180	1,030	1,700	2,720	3,900	5,900	4,280	4,030	* 3,660
18	604	1,180	1,080	1,190	1,060	1,750	2,700	*4,110	5,670	4,150	3,880	3,480
19	523	1,100	1,100	1,150	1,080	1,840	2,680	4,390	5,380	4,070	3,790	3,270
20	562	1,090	1,110	1,120	1,090	1,950	2,590	4,680	* 5,160	3,990	3,660	3,080
21	628	1,150	1,130	1,110	1,090	2,050	2,580	4,950	4,960	3,930	3,520	2,990
22	646	1,270	1,150	1,110	1,080	2,200	2,620	5,330	4,870	3,930	* 3,430	2,940
23	649	1,350	1,180	1,120	1,080	2,350	*2,710	6,890	4,780	3,920	3,340	2,890
24	646	1,340	1,200	1,130	1,100	2,550	2,810	8,200	4,700	3,900	3,340	2,850
25	610	1,250	1,190	1,100	1,120	2,750	2,820	8,730	4,590	3,860	3,340	2,780
26	551	1,370	1,180	1,080	1,150	2,850	2,790	8,970	4,450	3,770	3,320	2,740
27	558	1,350	1,170	1,050	1,190	2,950	2,660	9,100	4,330	3,700	3,250	2,720
28	642	1,250	1,150	1,040	1,200	2,890	2,670	9,180	4,170	3,660	3,170	2,700
29	694	1,210	1,140	1,070	-	2,890	2,820	9,230	4,230	3,610	3,080	2,650
30	712	1,130	1,150	1,090	---	2,890	2,980	9,260	4,330	3,590	3,020	2,680
31	684	---	1,160	1,090	---	2,910	---	9,300	---	3,590	2,990	---
Total	19,260	32,286	34,370	35,970	29,780	58,990	89,080	160,210	191,410	135,100	112,060	94,360
Mean	621	1,076	1,109	1,160	1,064	1,903	2,969	5,168	6,380	4,358	3,615	3,145
Cfsm	0.101	0.175	0.181	0.189	0.173	0.310	0.484	0.842	1.04	0.710	0.589	0.512
In.	0.12	0.20	0.21	0.22	0.18	0.36	0.54	0.97	1.16	0.82	0.68	0.57

Calendar year 1961: Max 5,970 Min 153 Mean 1,152 Cfsm 0.188 In. 2.54
Water year 1961-62: Max 9,300 Min 433 Mean 2,720 Cfsm 0.443 In. 6.03

* Discharge measurement made on this day.

Note.--Stage-discharge relation affected by ice Dec. 1 to Mar. 26. Computed from once-daily wire-weight gage readings by Corps of Engineers Feb. 28 to Mar. 23, May 6-18, Sept. 19-30.

5-2305. Pine River Reservoir at Cross Lake, Minn.

Location.--Lat 46°40'09", long 94°06'44", in SW¼NW¼ sec.21, T.137 N., R.27 W., at dam on Pine River, at outlet of Cross Lake at village of Cross Lake.

Drainage area.--562 sq mi.

Records available.--March 1886 to September 1962. Month-end contents only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 1,216.32 ft above mean sea level, datum of 1929 (levels by Corps of Engineers). Prior to May 3, 1949, staff gage at same site and datum.

Extremes.--Maximum contents during year, 101,740 acre-ft Aug. 12 (gage height, 13.25 ft); minimum, 71,570 acre-ft Apr. 7 (gage height, 10.99 ft).
1886-1962: Maximum contents observed, 173,600 acre-ft July 10, 1916 (gage height, 18.24 ft); minimum observed, 1,310 acre-ft below zero of capacity table Aug. 20, 1918 (gage height, 1.35 ft).

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 (revised) between gage heights 10.00 ft and 18.5 ft (maximum allowable range) is 118,710 acre-feet of which 53,280 acre-feet is controlled storage between gage heights 10.00 ft and 14.00 ft (normal operating range). Contents shown herein are contents above a gage height of 2.35 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

Cooperation.--Records furnished by Corps of Engineers in terms of cfs-days and converted to acre-feet by Geological Survey.

Month-end gage height and contents, water year October 1961 to September 1962

	Gage height (feet)/	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	12.57	92,510	-
Oct. 31	12.55	92,240	-270
Nov. 30	12.48	91,290	-950
Dec. 31	12.55	92,240	+950
Calendar year 1961	-	-	+3,760
Jan. 31	12.55	92,240	0
Feb. 28	12.63	93,330	+1,090
Mar. 31	11.20	74,320	-19,010
Apr. 30	11.75	81,560	+7,240
May 31	12.90	96,970	+15,410
June 30	12.79	95,480	-1,490
July 31	13.00	98,340	+2,860
Aug. 31	12.69	94,140	-4,200
Sept. 30	12.69	94,140	0
Water year 1961-62	-	-	+1,630

Maximum contents during year, 101,740 acre-ft Aug. 12 (gage height, 13.25 ft).
Minimum contents during year, 71,570 acre-ft Apr. 7 (gage height, 10.99 ft).
/ Gage height at 2400.

5-2310. Pine River at Cross Lake Dam, at Cross Lake, Minn.

Location.--Lat 46°40'09", long 94°06'44", in SW¼NW¼ sec.21, T.137 N., R.27 W., at dam at outlet of Cross Lake at village of Cross Lake.

Drainage area.--562 sq mi.

Records available.--April 1886 to September 1962. 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 tape float tailwater gage, read twice daily. Datum of gages is 1,216.32 ft above mean sea level, datum of 1929. Mar. 26, 1886, to May 31, 1929, staff gages on headwater and tailwater at same sites and datum. June 1 to Nov. 30, 1929, staff gage in tailwater at datum 1.60 ft lower. Dec. 1, 1929, to May 2, 1949, staff gage on headwater and Dec. 1, 1929, to August 1949, staff gage on tailwater at present sites and datum.

Average discharge.--76 years, 206 cfs, unadjusted.

Extremes.--Maximum daily discharge during year, 1,980 cfs May 26; minimum daily, 30 cfs Oct. 23-31.
1886-1962: Maximum daily discharge, 2,246 cfs in June 1896 (does not include flow bypassing dam through crevasse); no flow at times.

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 (see preceding page).

Cooperation.--Computations of daily discharge furnished by Corps of Engineers; five discharge measurements made and records reviewed by Geological Survey.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	35	40	70	70	77	290	470	45	1,300	100	120	65
2	35	70	70	70	77	415	457	45	1,010	100	120	65
3	35	70	70	70	77	415	425	45	1,010	100	120	65
4	35	70	70	77	77	405	425	45	*914	100	120	65
5	40	70	70	77	77	405	394	45	680	120	120	65
6	40	70	70	77	77	405	320	40	571	120	144	60
7	40	70	70	77	77	405	320	40	390	120	280	60
8	40	70	70	77	77	405	320	40	390	120	280	60
9	40	70	70	77	77	410	320	40	390	120	280	60
10	*40	70	70	77	77	425	320	40	390	120	280	91
11	40	70	70	77	77	435	315	40	394	120	275	165
12	40	70	70	77	* 77	435	315	40	405	120	275	165
13	35	70	70	77	80	420	315	40	405	120	314	165
14	35	70	70	77	80	420	315	40	418	120	445	165
15	35	70	70	77	80	428	315	40	555	120	445	160
16	35	70	70	77	80	445	315	40	555	120	445	175
17	35	70	70	77	80	445	282	40	555	120	430	210
18	35	70	70	77	80	445	169	* 40	555	120	420	210
19	35	70	70	77	80	458	75	40	555	120	415	210
20	35	70	70	77	80	490	65	40	555	*120	410	195
21	35	70	70	77	80	490	65	57	555	120	410	160
22	35	70	70	77	80	490	60	158	555	120	405	160
23	30	70	70	77	80	485	60	881	555	120	395	160
24	30	70	70	77	80	485	57	1,460	555	120	280	160
25	30	70	70	77	80	485	50	1,650	507	120	280	160
26	30	70	70	77	80	485	50	1,980	343	120	280	160
27	30	70	70	77	107	480	50	1,880	105	120	228	155
28	30	70	70	77	216	480	45	1,870	105	120	100	120
29	30	70	70	77	-	475	45	1,740	105	120	98	120
30	30	70	70	77	----------	475	45	1,620	100	120	70	120
31	30	----------	70	77	----------	475	----------	1,540	----------	120	70	----------
Total	1,080	2,070	2,170	2,366	2,367	13,706	6,779	15,661	15,482	3,640	8,354	3,951
Mean	34.8	69.0	70.0	76.3	84.5	442	226	505	516	117	269	132
(≠)	- 4.4	-16.0	+15.5	0	+19.6	-309	+122	+251	-25.0	+46.5	-68.4	0
Mean≠	30.4	53.0	85.5	76.3	104	133	348	756	491	164	201	132
Cfsm≠	0.054	0.094	0.152	0.136	0.185	0.237	0.619	1.35	0.874	0.292	0.358	0.235
In.≠	0.06	0.11	0.18	0.16	0.19	0.27	0.69	1.55	0.98	0.34	0.41	0.26

Calendar year 1961: Max 350 Min 30 Mean 80.7 Mean≠ 85.9 Cfsm≠ 0.153 In.≠ 2.09
Water year 1961-62: Max 1,980 Min 30 Mean 213 Mean≠ 215 Cfsm≠ 0.382 In.≠ 5.20

* Discharge measurement made on this day.
≠ Change in contents, equivalent in cubic feet per second, in Pine River Reservoir.
≠ Adjusted for change in contents.

5-2315. Pelican Lake near Pequot Lakes, Minn.

Location.--Lat 46°37', long 94°11', in NE¼NE¼ sec.10, T.136 N., R.28 W., on downstream side of right abutment of dam and bridge on channel between Ossawinnamakee and Pelican Lakes, 0.5 miles upstream from Pelican Lake and 6 miles east of town of Pequot Lakes.

Records available.--April 1938 to September 1962 (fragmentary). Prior to October 1956, published as Pelican Lake diversion near Pequot Lakes.

Gage.--Staff gage read about three times weekly during open-water period. Datum of gage is 1,203.69 ft above mean sea level, datum of 1929 (levels by Minnesota Department of Conservation).

Extremes.--Maximum gage height observed during year, 2.78 ft July 7; minimum observed, 1.60 ft Oct. 5, 7.
1938-62: Maximum gage height observed, 4.12 ft May 23, 25, 27, 1950; minimum observed, 1.36 ft May 2, 1938.

Remarks.--Crest of stoplogs on dam is normally fixed at 1,207.19 ft, but may be lowered to 1,203.69 ft (elevation of sill and apron) by removal of stoplogs.

Gage height, in feet, October 1961 to September 1962

Oct. 7	1.60	June 30	2.66	Sept. 29	2.34
Apr. 15	2.10	July 30	2.58		
May 31	2.64	Aug. 29	2.42		

Note.--Gage readings other than those shown are available.

5-2415. Rabbit River near Crosby, Minn.

Location.--Lat 46°30'55", long 93°57'35", in NE¼ sec.35, T.47 N., R.29 W., on right bank a third of a mile downstream from Clinker Lake control dam and 2 miles north of Crosby.

Drainage area.--8.38 sq mi.

Records available.--August 1945 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,190.00 ft above mean sea level, adjustment of 1912.

Average discharge.--17 years, 5.78 cfs.

Extremes.--Maximum discharge during year, 25 cfs May 23 (gage height, 6.26 ft); minimum daily, 0.7 cfs many days during October; minimum gage height, 5.09 ft Oct. 28.
1945-62: Maximum discharge, 94 cfs June 27, 1946 (gage height, 7.54 ft) from rating curve extended above 30 cfs (release from log jam); no flow at times.

Remarks.--Records fair. Some regulation by Clinker Lake. Flow affected by pumping from Rabbit Lake and underground mine.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.9	0.9	1.3	1.6	1.9	2.0	8.6	3.9	9.8	5.7	4.9	3.5
2	1.2	1.2	*1.4	1.7	1.9	2.0	5.7	4.2	9.8	6.6	4.4	3.5
3	1.2	1.6	1.6	1.7	2.0	2.0	4.4	4.2	9.2	6.4	4.0	4.5
4	1.1	1.4	1.8	1.7	2.0	2.0	3.9	4.2	9.1	6.4	4.4	5.0
5	.9	1.3	1.6	1.6	1.9	2.0	3.9	4.2	8.9	6.2	5.4	4.3
6	.8	*1.3	1.7	1.6	1.8	2.1	*4.1	4.2	8.4	6.0	6.5	3.6
7	.7	1.2	1.7	1.6	1.9	2.1	4.2	4.3	8.0	6.1	5.9	3.5
8	.7	1.2	1.7	*1.6	1.9	2.1	4.6	4.4	8.0	6.0	4.8	3.3
9	*.7	1.0	1.6	1.6	1.9	2.2	4.8	4.5	8.0	5.7	4.1	3.9
10	1.0	.9	1.6	1.6	1.9	2.1	4.5	5.6	8.2	5.5	3.6	5.6
11	2.4	.9	1.6	1.6	2.0	2.2	4.3	5.6	8.2	5.4	4.5	6.2
12	2.6	.9	1.6	1.7	*2.0	2.2	4.2	5.7	7.8	5.2	5.5	7.0
13	2.5	.9	1.6	1.7	2.0	2.3	4.0	7.2	6.6	5.2	6.0	7.4
14	2.4	1.0	1.6	1.6	2.0	2.3	3.9	7.0	6.4	5.0	6.4	5.4
15	2.4	1.0	1.6	1.6	2.1	2.4	3.7	6.9	6.2	4.8	6.9	4.0
16	2.5	1.2	1.6	1.6	2.2	2.5	3.5	7.5	6.1	4.7	7.0	3.1
17	2.5	1.2	1.6	1.6	2.2	2.6	3.2	7.4	6.4	4.6	5.9	3.1
18	2.4	1.3	1.6	1.6	2.1	2.7	3.3	*7.4	7.2	4.3	4.8	3.1
19	2.3	1.3	1.7	1.6	2.1	*2.8	4.0	8.2	*6.1	4.8	4.2	2.4
20	1.8	1.3	1.7	1.6	2.1	2.9	*3.7	8.2	5.5	*4.7	*3.9	2.0
21	1.3	1.3	1.7	1.7	2.1	3.0	3.3	8.2	5.4	4.7	3.6	*2.0
22	1.0	1.3	1.7	1.7	2.1	3.1	3.6	10	5.9	4.9	3.3	2.0
23	.9	1.3	1.8	1.8	2.1	3.2	3.8	22	5.9	4.9	3.3	2.4
24	.7	1.4	1.8	1.8	2.1	3.2	4.2	22	5.7	4.9	3.3	2.7
25	.8	1.3	1.6	1.9	2.1	3.7	4.7	20	5.6	5.0	3.2	3.0
26	.7	1.3	1.5	1.8	2.1	3.9	4.8	19	5.6	5.0	3.2	3.2
27	.7	1.4	1.5	1.8	2.0	4.3	4.4	14	5.3	5.6	3.2	3.4
28	.7	1.4	1.5	1.8	2.0	4.9	4.2	10	4.9	6.0	3.4	3.5
29	1.2	1.2	1.5	1.8	-	6.0	3.9	9.4	5.2	6.6	3.5	2.5
30	1.1	1.3	1.5	1.8	---------	7.2	3.7	10	5.3	7.0	3.7	1.8
31	1.0	---------	1.6	1.9	---------	8.2	---------	10	---------	5.7	3.5	---------
Total	43.1	36.2	49.9	52.3	56.5	96.2	127.1	269.4	208.7	169.6	140.3	110.9
Mean	1.39	1.21	1.61	1.69	2.02	3.10	4.24	8.69	6.96	5.47	4.53	3.70
Cfsm	0.166	0.144	0.192	0.202	0.241	0.370	0.506	1.04	0.831	0.653	0.541	0.442
In.	0.19	0.16	0.22	0.23	0.25	0.43	0.56	1.20	0.93	0.75	0.62	0.49

Calendar year 1961 : Max 16.0 Min 0.2 Mean 2.47 Cfsm 0.295 In. 4.00
Water year 1961-62: Max 22.0 Min 0.7 Mean 3.73 Cfsm 0.445 In. 6.03

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 5 to Mar. 22 (no gage-height record Jan. 15 to Feb. 11).

GPO 802-479-7

5-2440. Crow Wing River at Nimrod, Minn.

Location.--Lat 46°39', long 94°53', in sec.32, T.137 N., R.33 W., on right bank 200 ft upstream from highway bridge, 0.2 mile north of Nimrod, and 0.7 mile upstream from Cat River.

Drainage area.--1,010 sq mi, approximately.

Records available.--April 1910 to September 1914, July 1930 to September 1962 (winter records incomplete prior to 1940).

Gage.--Water-stage recorder. Datum of gage is 1,313.27 ft above mean sea level, datum of 1929 (levels by Wadena County Highway Department from Minnesota Highway Department bench mark). Apr. 15, 1910, to Sept. 30, 1914, chain gage at bridge 10 ft downstream at datum 2.2 ft lower. July 28, 1930, to Aug. 19, 1948, chain gage and Aug. 20, 1948, to Nov. 4, 1949, wire-weight gage, at bridge 10 ft downstream at same datum.

Average discharge.--23 years (1939-62), 452 cfs.

Extremes.--Maximum discharge during year, 2,750 cfs May 23 (gage height, 6.04 ft); minimum, 68 cfs Nov. 8.
1910-14, 1930-62: Maximum discharge, that of May 23, 1962; maximum gage height, 7.64 ft Apr. 20, 1950 (backwater from ice); minimum discharge observed, 45 cfs Aug. 7, 1936.

Remarks.--Records good except those for periods of ice effect, or no gage-height record, which are fair. Flow affected by natural storage in many lakes.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	316	156	148	240	228	230	410	700	1,520	683	404	360
2	294	156	147	245	230	230	430	666	1,420	705	394	344
3	289	164	142	245	230	230	450	672	1,330	711	399	338
4	289	155	135	242	228	235	470	666	1,280	728	421	344
5	284	150	112	*241	222	240	490	649	1,230	761	410	344
6	268	145	115	240	220	240	520	649	1,200	756	416	338
7	236	130	123	240	218	245	540	649	1,160	756	426	*338
8	221	100	135	235	220	252	560	649	1,120	666	416	355
9	226	130	155	235	220	260	590	649	1,080	632	*410	438
10	231	148	165	230	*226	268	620	649	1,020	621	404	548
11	262	152	170	230	228	275	620	644	996	*610	537	565
12	268	155	172	230	230	280	610	638	961	599	638	543
13	273	152	177	230	230	285	588	632	912	599	593	515
14	273	172	180	230	230	290	560	632	892	582	571	498
15	252	156	182	230	232	295	543	672	*919	576	554	492
16	226	156	185	225	235	300	509	790	975	576	532	498
17	208	150	190	220	235	303	504	872	989	565	532	492
18	185	148	195	220	235	308	532	*865	989	543	520	487
19	176	148	198	220	235	*315	554	865	961	543	520	482
20	176	148	200	220	235	320	582	905	933	520	515	465
21	176	150	202	220	232	325	599	898	912	509	504	443
22	176	150	205	220	232	330	627	1,160	898	515	498	432
23	176	155	208	220	230	335	632	2,470	898	515	492	470
24	176	160	210	220	230	340	*627	2,560	898	515	476	532
25	176	162	210	220	230	355	604	2,130	898	509	476	532
26	*176	162	212	220	230	355	582	1,850	879	492	448	520
27	172	160	215	220	230	360	660	1,750	852	476	421	487
28	172	158	220	220	230	370	739	1,690	802	470	394	470
29	172	152	225	220	-	380	716	1,610	778	454	388	448
30	164	*150	230	222	---------	390	722	1,570	733	438	382	443
31	156	---------	235	225	---------	400	---------	1,560	---------	421	377	---------
Total	6,845	4,530	5,598	7,075	6,411	9,341	17,190	33,361	30,435	18,046	14,468	13,561
Mean	221	151	181	228	229	301	573	1,076	1,014	582	467	452
Cfsm	0.219	0.150	0.179	0.226	0.227	0.298	0.567	1.07	1.00	0.576	0.462	0.448
In.	0.25	0.17	0.21	0.26	0.24	0.34	0.63	1.23	1.12	0.66	0.53	0.50

Calendar year 1961: Max 821 Min 100 Mean 298 Cfsm 0.295 In. 4.00
Water year 1961-62: Max 2,560 Min 100 Mean 457 Cfsm 0.452 In. 6.14

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 3-12, Nov. 17 to Apr. 12 (no gage-height record Feb. 25 to Mar. 18).

5-2465. Gull Lake near Brainerd, Minn.

Location.--Lat 46°24'40", long 94°21'26", in N½ sec.20, T.134 N., R.29 W., in pool of dam on Gull River, 800 ft south of outlet of Gull Lake, a quarter of a mile upstream from Gull Lake Dam, and 8 miles northwest of Brainerd.

Drainage area.--287 sq mi.

Records available.--August 1911 to September 1962. Prior to October 1941 month-end contents only, published in WSP 1308. Published as Gull Lake Reservoir October 1941 to September 1956.

Gage.--Water-stage recorder. Datum of gage is 1,188.14 ft above mean sea level, adjustment of 1912. Prior to Aug. 10, 1949, staff gage 800 ft north of present site at same datum.

Extremes.--Maximum contents during year, 66,110 acre-ft May 27 (gage height, 6.64 ft); minimum, 45,980 acre-ft Apr. 5 (gage height, 5.09 ft).
1911-62: Maximum contents, 74,800 acre-ft June 30, 1914 (gage height, 7.30 ft); minimum observed, 22,250 acre-ft Mar. 20, 1924 (gage height, 3.00 ft).

Remarks.--Reservoir is formed by Gull Lake and several other natural lakes controlled by concrete dam completed in 1913; storage began in 1912. Capacity (revised) between gage heights 5.00 ft and 7.00 ft (maximum allowable range and normal operating range) is 26,020 acre-ft. Contents shown herein are contents above gage height 1.00 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

Cooperation.--Records furnished by Corps of Engineers, in terms of cfs-days and converted to acre-feet by Geological Survey.

Month-end gage height and contents, water year October 1961 to September 1962

	Gage height (feet)/	Contents (acre-feet)	Change in contents (acre-feet)
Sept. 30	5.98	57,500	-
Oct. 31	5.92	56,710	-790
Nov. 30	5.80	55,160	-1,550
Dec. 31	5.82	55,420	+260
Calendar year 1961	-	-	+1,290
Jan. 31	5.81	55,290	-130
Feb. 28	5.86	55,930	+640
Mar. 31	5.15	46,760	-9,170
Apr. 30	5.98	57,500	+10,740
May 31	6.47	63,890	+6,390
June 30	6.10	59,070	-4,820
July 31	6.03	58,160	-910
Aug. 31	5.85	55,800	-2,360
Sept. 30	5.86	55,930	+130
Water year 1961-62	-	-	-1,570

Maximum contents during year, 66,110 acre-ft May 27 (gage height, 6.64 ft)
Minimum contents during year, 45,980 acre-ft Apr. 5 (gage height, 5.09 ft)
/ Gage height at 2400

5-2470. Gull River at Gull Lake Dam, near Brainerd, Minn.

Location.--Lat 46°24'40", long 94°21'12", in sec.20, T.134 N., R.29 W., in headwater and tailwater of dam at outlet of Gull Lake, 8 miles northwest of Brainerd.

Drainage area.--287 sq mi.

Records available.--August 1911 to September 1962. Monthly discharge only for some periods, published in WSP 1308. Published as "at Gull Lake Reservoir" 1929.

Gage.--Water-stage recorder on headwater and staff gage on tailwater. Datum of gages is 1,188.14 ft above mean sea level, adjustment of 1912. August 1911 to May 23, 1929, and Dec. 1, 1929, to Aug. 1, 1949, both gages were staff gages at same site and datum. May 24 to Nov. 30, 1929, staff gage 500 ft downstream at different datum.

Average discharge.--51 years, 100 cfs, unadjusted.

Extremes.--Maximum daily discharge during year, 660 cfs May 25-27; minimum daily, 15 cfs many days.
1911-62: Maximum daily discharge, 1,123 cfs May 15, 1938. No flow at times.

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 (see preceding page).

Cooperation.--Computations of daily discharge furnished by Corps of Engineers; two discharge measurements made and records reviewed by Geological Survey.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	15	20	44	44	44	182	179	15	630	74	25	15
2	15	47	44	44	44	196	177	15	610	159	23	15
3	15	49	44	44	44	196	176	15	600	193	42	15
4	15	47	46	44	44	193	164	15	600	195	69	15
5	15	47	43	44	45	188	162	99	590	274	68	15
6	15	45	44	44	45	198	150	99	585	267	89	15
7	15	47	44	44	45	195	153	96	580	268	146	15
8	15	45	43	44	45	193	160	96	575	342	172	15
9	15	43	44	44	45	190	169	96	397	303	197	15
10	15	43	45	44	45	185	169	98	266	122	134	15
11	15	43	45	43	44	184	169	98	243	123	104	21
12	15	43	47	43	44	182	171	98	166	70	145	20
13	15	43	47	44	45	191	171	106	108	70	201	20
14	15	41	45	44	46	185	171	114	59	41	191	49
15	15	48	45	44	48	180	169	153	20	25	132	48
16	15	48	45	44	52	177	168	179	15	25	135	48
17	15	48	45	44	52	174	66	176	15	25	86	47
18	15	46	45	43	52	184	37	140	15	25	78	45
19	15	45	45	43	52	177	39	185	15	43	41	18
20	15	45	45	43	52	172	41	267	25	72	29	15
21	15	45	45	43	52	196	45	261	91	71	15	15
22	15	45	45	43	52	190	51	265	92	71	15	15
23	15	45	45	43	53	*188	55	452	92	71	15	15
24	15	45	46	43	53	196	15	655	92	69	15	15
25	15	45	46	44	54	192	15	660	92	68	15	15
26	15	46	45	43	59	188	15	660	90	65	15	15
27	15	45	45	44	107	185	15	660	* 87	22	15	15
28	15	44	45	44	182	182	15	650	49	23	15	15
29	15	44	45	44	-	178	15	640	25	24	15	15
30	15	44	45	44	----------	177	15	645	76	25	15	15
31	15	----------	44	44	----------	177	----------	635	----------	25	15	----------
Total	465	1,331	1,391	1,354	1,545	5,771	3,117	8,343	6,900	3,250	2,272	631
Mean	15.0	44.4	44.9	43.7	55.2	186	104	269	230	105	73.3	21.0
(≠)	-12.9	-26.0	+4.2	-2.1	+11.6	-149	+180	+104	-81.0	-14.8	-38.2	+2.2
Mean≠	2.1	18.4	49.1	41.6	66.8	37.0	284	373	149	90.2	35.1	23.2
Cfsm≠	0.0073	0.064	0.171	0.145	0.233	0.129	0.990	1.30	0.519	0.314	0.122	0.081
In.≠	0.008	0.07	0.20	0.17	0.24	0.15	1.10	1.50	0.58	0.36	0.14	0.09

Calendar year 1961: Max 268 Min 15 Mean 38.3 Mean≠ 40.1 Cfsm≠ 0.140 In.≠ 1.90
Water year 1961-62: Max 660 Min 15 Mean 99.6 Mean≠ 97.4 Cfsm≠ 0.339 In.≠ 4.61

* Discharge measurement made on this day.
≠ Change in contents, equivalent in cubic feet per second, in Gull Lake.
≠ Adjusted for change in contents.

5-2670. Mississippi River near Royalton, Minn.

Location.--Lat 45°51'40", long 94°21'30", in lot 2, sec.20, T.39 N., R.32 W., at plant of Minnesota Power & Light Co., 4 miles northwest of Royalton, and 4.5 miles downstream from Swan River.

Drainage area.--11,600 sq mi, approximately.

Records available.--March 1924 to September 1962.

Average discharge.--38 years, 3,863 cfs.

Extremes.--Maximum daily discharge during year, 25,700 cfs May 27; minimum daily, 858 cfs Dec. 7.
1924-62: Maximum daily discharge, 29,400 cfs Apr. 13, 1952; minimum daily, 254 cfs Nov. 25, 1936.

Remarks.--Records good. Discharge computed on basis of powerplant records. Flow partly regulated by powerplants and Winnibigoshish, Leech, Pokegama, Sandy, and Gull Lakes and by Pine River Reservoir (see p. 74, 76, 78, 81, 90, 85).

Cooperation.--Records collected by Minnesota Power & Light Co. under general supervision of Geological Survey, in connection with a Federal Power Commission project.

Discharge, in cubic feet per second, water year October1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,290	1,270	1,690	1,570	1,520	1,470	3,780	6,160	19,300	6,180	5,680	4,180
2	1,310	1,730	1,620	1,580	1,550	1,490	3,720	6,190	18,200	5,910	5,680	4,120
3	1,360	1,710	1,820	1,620	1,560	1,620	4,000	6,560	17,400	7,120	5,500	4,220
4	1,330	1,450	1,970	1,660	1,500	1,810	4,270	5,370	16,500	7,770	4,790	4,080
5	1,430	1,490	1,550	1,690	1,440	1,870	4,690	5,430	15,000	8,190	5,180	4,020
6	1,260	1,430	1,740	1,630	1,480	2,020	5,040	5,230	15,300	8,760	5,860	3,990
7	1,180	1,640	858	1,620	1,520	2,130	5,400	5,200	14,600	9,260	5,970	3,730
8	1,030	1,760	1,160	1,650	1,550	2,050	6,300	5,200	14,200	9,750	6,030	4,050
9	1,190	1,930	1,330	1,600	1,520	2,060	7,570	5,680	13,700	9,870	6,160	4,270
10	1,310	1,680	1,280	1,550	1,500	2,020	7,610	5,380	12,900	9,870	6,160	4,700
11	1,420	1,840	1,240	1,480	1,500	2,090	7,800	5,420	12,100	9,770	6,300	5,200
12	1,320	2,060	1,400	1,560	1,420	2,120	8,960	5,090	11,800	9,440	6,660	5,010
13	1,070	2,080	1,340	1,570	1,490	2,200	9,320	5,310	12,400	9,320	7,120	5,680
14	1,120	2,040	1,290	1,560	1,560	2,220	8,960	5,980	9,970	8,840	*7,300	5,970
15	1,350	1,980	1,410	1,410	1,590	2,190	8,540	6,290	8,890	8,090	7,120	6,100
16	1,500	1,570	1,550	1,490	1,620	2,300	7,620	6,510	9,260	8,020	7,120	6,060
17	1,630	1,910	1,560	1,460	1,520	2,340	7,240	6,750	9,120	7,400	7,000	5,610
18	1,560	1,820	1,580	1,490	1,490	2,380	6,870	7,360	9,140	6,950	6,810	5,550
19	1,430	1,660	1,760	1,540	1,460	2,460	6,420	8,240	*9,440	7,030	6,660	5,080
20	1,250	1,650	1,680	1,460	1,460	*2,710	6,100	8,440	8,800	7,090	6,570	4,800
21	1,060	1,540	1,720	1,390	1,490	2,800	5,990	8,920	8,080	6,680	5,680	4,460
22	1,130	1,670	1,690	1,400	1,480	2,860	5,940	10,100	7,930	6,660	5,680	4,460
23	1,090	1,890	1,870	1,420	1,440	2,900	5,690	14,900	7,460	6,660	5,460	4,460
24	1,150	1,890	1,790	1,480	1,400	3,010	5,840	18,400	7,130	6,660	5,180	4,460
25	1,770	1,740	1,790	1,520	1,370	3,190	5,810	22,700	7,130	6,460	4,940	4,320
26	1,210	1,820	1,760	1,490	1,370	3,160	5,940	25,000	6,850	6,140	4,700	4,640
27	*1,120	1,760	1,810	1,480	1,380	3,530	5,690	25,700	6,660	5,690	4,700	4,200
28	1,260	1,760	1,780	1,410	1,450	3,780	5,540	23,200	6,370	5,680	4,700	4,280
29	1,400	1,600	1,780	1,420	-	3,950	5,680	22,300	6,510	6,180	4,700	4,040
30	1,270	1,780	1,570	1,460	---------	4,210	5,680	22,000	5,960	6,360	4,460	4,200
31	1,370	----------	1,630	1,490	---------	4,010	----------	20,200	----------	5,810	4,220	----------
Total	40,170	52,150	49,018	47,150	41,630	78,950	188,010	335,210	328,100	234,610	180,090	139,940
Mean	1,296	1,738	1,581	1,521	1,487	2,547	6,267	10,810	10,940	7,568	5,809	4,665
Cfsm	0.112	0.150	0.136	0.131	0.128	0.220	0.540	0.932	0.943	0.652	0.501	0.402
In.	0.13	0.17	0.16	0.15	0.13	0.25	0.60	1.07	1.05	0.75	0.58	0.45

Calendar year 1961: Max 9,140 Min 502 Mean 1,990 Cfsm 0.172 In. 3.06
Water year1961-62: Max 25,700 Min 858 Mean 4,699 Cfsm 0.405 In. 5.49

* Discharge measurement made on this day.

5-2705. Sauk River near St. Cloud, Minn.

Location.--Lat 45°33'35", long 94°14'00", in SE¼SW¼ sec.8, T.124 N., R.28 W., on right bank half a mile northwest of Waite Park, 3 miles west of St. Cloud, and 5 miles upstream from mouth.

Drainage area.--925 sq mi.

Records available.--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 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 1,034.95 ft above mean sea level, adjustment of 1912. Prior to Nov. 22, 1934, chain gage on highway bridge 1 mile downstream at datum 6.77 ft lower.

Average discharge.--32 years (1909-12, 1930-31, 1934-62), 245 cfs.

Extremes.--Maximum discharge during year, 1,990 cfs May 23 (gage height, 4.97 ft); minimum, 3.2 cfs Nov. 8, 27 (gage height, 0.24 ft) result of freeze-up.
1909-13: 1929-62: Maximum discharge, 5,580 cfs Apr. 13, 1951 (gage height, 7.89 ft); minimum, 0.3 cfs Nov. 25, 1936.

Remarks.--Records good except those for periods of ice effect, which are fair. Flow regulated by powerplants and reservoirs above station.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 6 to Nov. 6, July 20 to Sept. 30)

0.5	20	1.5	199
0.6	30	2.0	346
0.7	44	3.0	748
1.0	89	5.0	2,020

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	45	37	50	40	54	45	148	441	1,240	277	689	274
2	* 43	41	50	40	54	45	158	240	1,060	337	622	260
3	47	45	50	40	*54	46	175	216	455	346	472	257
4	47	41	46	40	53	46	220	208	483	393	469	260
5	44	40	43	40	52	46	280	196	527	444	466	248
6	41	36	42	39	49	46	450	186	543	466	503	234
7	40	37	42	39	48	46	* 650	172	774	519	507	219
8	40	24	42	*38	48	46	900	167	1,240	594	483	*214
9	38	31	42	38	49	46	1,100	167	1,180	662	458	237
10	44	38	42	38	50	46	1,300	162	1,090	1,050	*455	257
11	60	41	42	37	50	46	1,420	162	976	1,020	507	248
12	51	38	41	37	50	45	1,520	160	330	*653	551	234
13	44	36	41	37	50	44	1,480	183	298	653	511	234
14	43	36	41	37	50	43	1,440	196	312	1,120	491	228
15	40	41	40	38	50	42	1,390	216	318	1,230	469	228
16	36	43	40	38	50	41	1,330	237	330	1,240	448	399
17	36	37	40	38	49	41	1,270	254	337	1,240	416	379
18	36	33	40	37	49	41	1,210	269	393	1,210	399	372
19	36	36	40	37	48	42	1,050	292	*393	1,390	376	353
20		40	40	37	47	*43	448	303	372	1,550	356	340
21	36	43	40	37	46	44	476	300	359	1,580	343	337
22	36	45	39	38	46	45	531	*551	346	1,610	327	327
23	31	43	39	39	45	46	*555	1,780	337	1,570	324	309
24	30	43	39	40	45	48	738	1,650	324	1,490	318	309
25	36	46	39	42	45	50	698	1,600	312	1,430	300	303
26	36	40	39	43	45	53	622	1,610	309	1,330	289	292
27	*33	32	39	44	45	59	563	1,600	292	1,250	283	277
28	33	40	38	45	44	69	590	1,560	283	1,040	277	272
29	48	47	38	46	-	88	495	1,500	306	976	269	266
30	40	*48	39	48	---------	110	483	1,440	289	910	272	269
31	34	----------	39	51	---------	129	----------	1,360	----------	708	277	----------
Total	1,240	1,178	1,282	1,238	1,365	1,627	23,690	19,378	15,808	30,288	12,927	8,436
Mean	40.0	39.3	41.4	40.0	48.8	52.5	790	625	527	977	417	281
Cfsm	0.043	0.042	0.045	0.043	0.053	0.057	0.854	0.676	0.570	1.06	0.451	0.304
In.	0.05	0.05	0.05	0.05	0.05	0.07	0.95	0.78	0.64	1.22	0.52	0.34

Calendar year 1961: Max 272 Min 24 Mean 62.0 Cfsm 0.067 In. 0.91
Water year 1961-62: Max 1,780 Min 24 Mean 325 Cfsm 0.351 In. 4.77

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 9, Nov. 19 to Apr. 11.

5-2750. Elk River near Big Lake, Minn.

Location.--Lat 45°20', long 93°40', in sec.23, T.33 N., R.27 W., on right bank at upstream side of highway bridge, 4 miles east of Big Lake and 4 miles downstream from St. Francis River.

Drainage area.--615 sq mi.

Records available.--April 1911 to September 1917, April to September 1931, April to November 1932, March to November 1933, March 1934 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 899.60 ft above mean sea level, datum of 1929. April 1911 to Sept. 30, 1917, staff gage and Apr. 1, 1931, to July 26, 1934, chain gage, at same site and datum.

Average discharge.--34 years (1911-17, 1934-62), 243 cfs.

Extremes.--Maximum discharge during year, 2,040 cfs May 28 (gage height, 5.70 ft); minimum discharge, 51 cfs Dec. 7 (gage height, 0.72 ft, result of freezeup).
1911-17, 1931-62: Maximum discharge, 5,330 cfs Apr. 10, 1952 (gage height, 10.36 ft), from rating curve extended above 3,800 cfs; minimum, 3.6 cfs July 31, 1934.

Remarks.--Records good except those for periods of ice effect, which are fair.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

0.8	64	3.0	842
1.0	110	4.0	1,260
1.4	242	5.0	1,710
2.0	456	6.0	2,200

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	102	137	* 119	84	71	66	280	316	1,340	246	291	163
2	100	176	119	86	72	67	315	302	1,190	277	274	147
3	98	214	125	86	* 73	68	362	280	1,060	298	260	156
4	95	210	128	86	74	71	514	280	960	294	246	187
5	95	190	102	85	73	74	605	260	871	305	232	173
6	90	183	108	82	72	76	747	246	780	319	235	156
7	85	176	94	78	71	78	*775	232	702	330	242	166
8	83	152	100	* 75	69	80	850	221	658	341	221	170
9	85	140	105	72	68	82	1,010	210	620	330	214	190
10	92	160	100	70	70	84	1,140	207	630	330	204	* 224
11	131	163	94	69	72	85	1,470	200	631	330	200	221
12	150	160	91	68	73	87	1,970	210	582	* 319	214	207
13	140	150	90	68	74	88	1,960	232	514	305	* 224	204
14	156	147	88	69	75	89	1,790	249	467	291	221	207
15	160	143	88	69	76	90	1,580	263	413	294	228	204
16	156	140	87	68	76	90	1,390	266	373	302	228	270
17	147	140	87	67	75	91	1,220	280	355	291	218	308
18	134	108	88	67	74	92	1,080	288	352	280	207	305
19	134	94	88	67	74	93	951	316	337	330	197	294
20	143	125	88	67	73	96	829	337	330	388	187	288
21	137	130	87	67	73	*102	751	*330	359	391	176	288
22	119	110	86	67	72	105	690	449	* 377	398	170	284
23	113	115	86	67	72	115	* 616	755	362	434	180	274
24	113	123	86	68	71	130	553	960	323	449	176	274
25	113	128	86	70	70	155	499	1,040	294	430	166	277
26	110	128	84	71	69	170	452	1,230	277	420	156	280
27	* 113	110	81	72	67	185	413	1,700	274	398	156	270
28	110	110	80	72	66	200	388	2,000	242	366	150	249
29	131	115	80	71	-	220	362	1,900	266	344	147	242
30	143	122	81	70	---------	240	341	1,730	260	337	156	242
31	143	----------	83	70	---------	255	----------	1,520	----------	316	173	----------
Total	3,721	4,299	2,909	2,248	2,015	3,524	25,903	18,809	16,199	10,483	6,349	6,920
Mean	120	143	93.8	72.5	72.0	114	863	607	540	338	205	231
Cfsm	0.195	0.233	0.153	0.118	0.117	0.185	1.40	0.987	0.878	0.550	0.333	0.376
In.	0.23	0.26	0.18	0.14	0.12	0.21	1.57	1.14	0.98	0.63	0.38	0.42

Calendar year 1961: Max 478 Min 58 Mean 129 Cfsm 0.210 In. 2.85
Water year 1961-62: Max 2,000 Min 66 Mean 283 Cfsm 0.460 In. 6.26

* Discharge measuremenet made on this day.
Note.--Stage-discharge relation affected by ice Nov. 8, 9, 19-24, 27-29, Dec. 5 to Apr. 2.

5-2780. Middle Fork Crow River near Spicer, Minn.

Location.--Lat 45°15'45", long 94°48'10", in NE¼ sec.27, T.121 N., R.33 W., on right bank 75 ft upstream from highway bridge, 1½ miles downstream from Lake Calhoun, 3 miles downstream from Green Lake, and 6.8 miles northeast of Spicer.

Drainage area.--179 sq mi.

Records available.--March 1949 to September 1962.

Gage.--Water-stage recorder and concrete and steel V-notch sharp-crested weir. Datum of gage is 1,147.93 ft above mean sea level, datum of 1929 (Kandiyohi County Highway Department bench mark). Prior to July 20, 1950, chain gage at bridge 75 ft downstream at same datum.

Average discharge.--13 years, 49.5 cfs.

Extremes.--Maximum discharge during year, 178 cfs June 11 (gage height, 4.64 ft); maximum gage height, 5.17 ft Apr. 4 (backwater from ice); minimum daily, 0.3 cfs Jan. 29 to Mar. 9.
1949-62: Maximum discharge, 408 cfs June 29, 1953; maximum gage height, 6.67 ft June 25, 1957; no flow Mar. 15-24, 1949, Feb. 26 to Mar. 26, 1960.

Remarks.--Records good except those for periods of ice effect, which are fair. Flow affected by natural storage and some regulation from lakes above station.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to July 20				July 21 to Sept. 30	
1.7	0.8	2.5	27	2.2	13
1.8	1.3	3.0	50	2.5	30
1.9	2.8	3.5	79	3.0	60
2.0	5.6	4.0	120	4.0	125
2.2	13	4.5	165	5.0	210

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	2.1	1.3	1.2	1.1	0.3	0.3	2.5	59	68	56	60	40
2	* 1.8	1.6	1.2	* 1.1	.3	.3	*2.9	52	59	67	56	34
3	1.6	1.3	1.3	1.1	.3	.3	5.5	48	54	66	55	34
4	1.6	1.4	.9	1.1	.3	.3	10	46	53	69	58	33
5	1.5	1.4	.9	1.1	.3	.3	20	52	70	68	58	30
6	1.5	1.4	.9	1.0	* .3	.3	41	52	89	*77	61	29
7	1.4	1.4	.9	.9	.3	.3	50	48	109	79	57	29
8	1.5	1.3	.8	.9	.3	.3	56	52	118	87	51	29
9	1.6	1.3	.8	.8	.3	.3	53	53	130	77	55	33
10	1.8	1.4	.8	.8	.3	.4	52	54	156	66	58	38
11	1.9	1.4	.8	.8	.3	.4	50	55	176	63	61	33
12	1.8	1.4	.8	.7	.3	.4	49	57	171	61	62	* 33
13	1.6	1.3	.8	.7	.3	.4	*47	62	162	59	55	32
14	1.6	1.3	.8	.7	.3	* .5	46	63	151	58	*61	30
15	1.6	1.3	.9	.7	.3	.5	43	64	138	60	65	29
16	1.5	1.4	1.0	.7	.3	.5	45	59	125	58	65	37
17	1.5	1.4	1.1	.6	.3	.6	46	55	115	55	64	36
18	1.5	1.3	1.1	.6	.3	.6	42	53	119	51	63	33
19	1.4	1.3	1.0	.5	.3	.6	27	58	*111	96	62	30
20	1.5	1.3	1.0	.5	.3	.6	28	52	109	143	61	27
21	1.6	1.3	.9	.5	.3	.7	31	44	106	131	60	24
22	1.4	1.3	.9	.5	.3	.7	34	55	94	119	57	20
23	* 1.2	1.3	.9	.4	.3	.7	34	*82	85	116	55	18
24	1.3	1.2	.9	.4	.3	.8	41	88	79	109	54	20
25	1.3	1.2	.9	.4	.3	.9	46	78	77	101	52	19
26	1.2	1.2	.9	.4	.3	1.0	47	73	71	89	48	19
27	1.3	* 1.2	.9	.4	.3	1.1	48	72	64	81	45	16
28	1.4	1.2	.9	.4	.3	1.2	52	73	60	83	42	14
29	1.9	1.2	.9	.3		1.3	54	81	59	85	40	13
30	1.5	1.2	1.0	.3	---------	1.5	62	91	55	84	42	20
31	1.3	----------	1.0	.3	---------	1.9	----------	84	----------	71	44	----------
Total	47.7	39.5	29.1	20.7	8.4	20.0	1,164.9	1,915	3,033	2,485	1,727	832
Mean	1.54	1.32	0.94	0.67	0.30	0.65	38.8	61.8	101	80.2	55.7	27.7
Cfsm	0.0086	0.0074	0.0053	0.0037	0.0017	0.0036	0.217	0.345	0.564	0.448	0.311	0.155
In.	0.01	0.008	0.006	0.004	0.002	0.004	0.24	0.40	0.63	0.52	0.36	0.17

Calendar year 1961: Max 71 Min 0.8 Mean 10.6 Cfsm 0.059 In. 7.99
Water year 1961-62: Max 176 Min 0.3 Mean 31.0 Cfsm 0.173 In. 2.35

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 8, Dec. 5, Dec. 20 to Apr. 9.

5-2785. South Fork Crow River at Cosmos, Minn.

Location.--Lat 44°56'05", long 94°40'20", in SW¼ sec.14, T.117 N., R.32 W., on downstream side of bridge on State Highway 7, 1 mile east of Cosmos, 2¼ miles upstream from small tributary, and 3¼ miles west of Corvuso.

Drainage area.--221 sq. mi.

Records available.--March 1945 to September 1962.

Gage.--Wire-weight gage read once or twice daily. Datum of gage is 1,079.09 ft above mean sea level, datum of 1929 (levels by Corps of Engineers). Mar. 1 to Sept. 3, 1945, chain gage and Sept. 4, 1945, to June 12, 1959, wire-weight gage, at same site at datum 3.00 ft higher.

Average discharge.--17 years, 43.2 cfs.

Extremes.--Maximum discharge during year, 507 cfs July 19 (gage height, 9.06 ft, from graph based on gage readings); maximum gage-height, 9.83 ft Mar. 28, from graph based on gage readings (backwater from ice); no flow on many days.
1945-62: Maximum discharge, 1,890 cfs June 17, 1957 (gage height, 12.62 ft, present datum, from graph based on gage readings); no flow on many days.

Remarks.--Records good except those for periods of ice effect, which are fair.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used May 8 to July 20, Sept. 30)

2.3	0	4.0	36
2.4	.7	4.5	55
2.6	3.0	5.0	83
3.0	10	6.0	167
3.5	21	8.0	401

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.5	2.0	1.3	0.2	0	0	100	20	30	12	24	6.9
2	.4	1.2	1.2	*.2	0	0	*176	18	25	20	20	6.3
3	.3	.9	1.1	.2	0	0	250	16	24	23	19	7.5
4	.2	.8	1.0	.2	0	0	300	14	25	37	18	*8.1
5	.1	.7	.9	.2	.1	0	348	14	25	54	16	6.7
6	0	.7	.7	.2	*.1	0	294	13	25	*44	*16	6.1
7	0	.7	.5	.2	0	0	178	11	28	32	15	5.8
8	0	.7	.5	.2	0	0	189	11	29	51	14	5.8
9	0	.5	.5	.1	0	0	151	9.7	40	45	13	7.5
10	.9	.5	.5	.1	0	0	121	8.7	68	32	12	8.3
11	1.0	.5	.5	.1	0	0	93	8.9	60	26	12	7.5
12	.5	.5	.5	.1	0	0	100	9.1	*50	21	13	7.5
13	.5	.5	.5	.1	0	0	*87	14	42	18	12	6.9
14	.3	.5	.5	.1	0	*0	104	14	34	17	11	6.3
15	.3	.5	.5	.1	0	0	78	*13	27	17	11	6.7
16	.3	.5	.5	.1	0	0	61	13	25	16	11	8.1
17	.2	.4	.4	.1	0	0	52	11	26	16	9.9	6.9
18	.2	.5	.4		0	.1	49	13	26	16	9.5	6.3
19	.1	.5	.4	0	0	.1	48	14	25	268	9.1	6.1
20	0	.5	.4	0	0	.1	59	15	22	385	8.7	5.8
21	0	.5	.4	0	0	.1	69	15	20	245	8.3	5.8
22	0	1.2	.4	0	0	.1	49	19	18	187	7.9	6.0
23	*0	2.1	.4	0	0	.1	35	55	17	192	7.5	6.3
24	0	2.1	.4	0	0	.2	27	47	17	128	7.5	6.5
25	.1	1.8	.4	0	0	.2	24	41	15	91	7.1	6.5
26	.3	1.2	.3	0	0	.2	22	33	13	64	6.7	6.1
27	.4	*.8	.3	0	0	1.0	28	30	11	48	6.5	6.0
28	.6	1.0	.3	0	0	10	22	30	9.5	41	6.3	5.6
29	3.4	1.3	.3	0		30	22	32	10	35	6.3	5.1
30	2.6	1.4	.3	0	---	40	22	34	10	31	7.5	7.9
31	1.2	---	.3	0	---	50	---	34	---	27	8.1	---
Total	14.4	27.0	16.6	2.5	0.2	132.2	3,158	630.4	796.5	2,239	353.9	198.9
Mean	0.46	0.90	0.54	0.08	0.007	4.26	105	20.3	26.6	72.2	11.4	6.63
Cfsm	0.0021	0.0041	0.0024	0.00036	0.000032	0.019	0.475	0.092	0.120	0.327	0.052	0.030
In.	0.002	0.004	0.003	0.0004	0.00003	0.02	0.53	0.11	0.13	0.38	0.06	0.03

Calendar year 1961: Max 64 Min 0 Mean 3.35 Cfsm 0.0152 In. 0.19
Water year 1961-62: Max 385 Min 0 Mean 20.7 Cfsm 0.0937 In. 1.27

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 26-29, Dec. 11 to Apr. 4 (no gage-height record Dec. 11-16, 18-30)

5-2790. South Fork Crow River near Mayer, Minn.

Location.--Lat 44°54'20", long 93°53'05", in SW¼SW¼ sec.30, T.117 N., R.25 W., 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, and 16 miles upstream from confluence with North Fork.

Drainage area.--1,170 sq mi, approximately.

Records available.--April 1934 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Wire-weight gage read once or twice daily. Datum of gage is 926.00 ft above mean sea level (levels by Hennepin County Park Board Survey). Prior to June 14, 1940, chain gage at same site and datum.

Average discharge.--28 years, 217 cfs.

Extremes.--Maximum discharge during year, 3,000 cfs Apr. 7 (gage height, 10.17 ft); minimum daily, 1.0 cfs Feb. 28, Mar. 1

1934-62: Maximum discharge, 11,000 cfs Apr. 10, 1952 (gage height, 15.70 ft); no flow at times.

Remarks.--Records good except those for period of ice effect, which are fair.

Rating tables, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1-10, Apr. 5 to June 12)

Oct. 1 to Aug. 10				Aug. 11 to Sept. 30	
0.9	4.4	2.0	120	1.3	36
1.0	6.6	3.0	286	1.5	63
1.1	12	4.0	543	2.0	137
1.3	29	6.0	1,220	2.5	215
1.6	62	9.0	2,520		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	6.2	34	18	6.1	2.0	1.0	500	306	1,270	130	477	131
2	*6.2	177	19	*6.2	2.0	1.2	*1,170	276	1,110	149	389	122
3	7.7	195	19	6.3	2.0	1.5	2,160	240	963	249	323	107
4	8.2	192	21	6.1	2.0	2.1	2,500	221	840	267	296	* 119
5	7.1	130	6.4	5.9	1.9	3.2	2,730	195	763	* 376	254	132
6	6.4	102	5.8	5.4	*1.7	5.0	2,860	170	715	434	* 226	126
7	6.2	85	6.6	5.2	1.6	6.4	2,950	152	645	440	222	112
8	5.5	47	7.8	4.8	1.6	8.0	2,750	142	595	830	210	110
9	5.7	48	7.6	4.7	1.5	9.5	2,510	125	519	699	197	100
10	6.2	58	7.4	4.4	1.5	10.0	2,310	118	513	780	187	122
11	14	54	7.1	4.2	1.5	11	2,010	109	*477	741	178	144
12	9.8	49	6.9	4.1	1.5	12	*1,840	157	465	667	162	152
13	12	44	6.8	4.0	1.5	*12	1,710	381	440	604	155	125
14	9.8	39	6.6	3.9	1.5	13	1,580	*641	418	558	137	113
15	8.8	37	6.5	3.8	1.5	13	1,410	528	373	498	122	96
16	7.1	32	6.4	3.7	1.5	15	1,290	412	323	446	113	100
17	6.4	24	6.4	3.5	1.5	16	1,270	338	296	381	106	89
18	6.2	15	6.3	3.1	1.5	17	1,130	282	294	327	98	88
19	5.7	23	6.3	2.7	1.5	23	1,060	286	275	361	88	73
20	5.5	19	6.3	2.5	1.5	30	1,000	381	246	935	80	69
21	5.3	24	6.4	2.3	1.5	35	889	331	222	1,020	73	60
22	5.7	14	6.4	2.2	1.4	38	946	429	203	1,000	66	56
23	*5.5	14	6.4	2.2	1.4	43	963	1,500	184	1,080	92	53
24	5.1	12	6.4	2.1	1.3	48	858	2,210	165	1,150	152	50
25	4.8	24	6.2	2.0	1.2	52	715	2,410	147	1,270	125	43
26	5.3	25	6.2	2.0	1.1	56	610	2,270	114	1,290	102	49
27	5.1	* 8.2	6.0	2.0	1.1	63	510	2,180	110	1,200	88	42
28	5.1	11	5.9	2.0	1.0	74	412	1,900	92	1,030	74	* 42
29	12	22	5.8	2.0	-	100	373	1,750	133	890	66	37
30	24	19	5.8	2.0	---------	260	334	1,600	165	747	69	40
31	20	----------	6.0	2.0	---------	300	----------	1,430	----------	576	94	----------
Total	248.6	1,577.2	251.7	113.4	42.8	1,278.9	43,350	23,470	13,075	21,125	5,021	2,702
Mean	8.02	52.6	8.12	3.66	1.53	41.3	1,445	757	436	681	162	90.0
Cfsm	0.0069	0.045	0.0069	0.0031	0.0013	0.035	1.24	0.647	0.373	0.582	0.138	0.077
In.	0.008	0.05	0.008	0.004	0.001	0.04	1.38	0.75	0.42	0.67	0.16	0.09

Calendar year 1961: Max 457 Min 1.1 Mean 41.2 Cfsm 0.035 In. 0.48
Water year 1961-62: Max 2,950 Min 1.0 Mean 308 Cfsm 0.263 In. 3.58

* Discharge measurement made on this day.

Note.--Stage-discharge relation affected by ice Dec. 6 to Apr. 4.

5-2800. Crow River at Rockford, Minn.

Location.--Lat 45°05'15", long 93°44'00", in sec.29, T.119 N., R.24 W., on right bank at Rockford, 150 ft downstream from bridge on State Highway 55 and 1 mile downstream from confluence of North and South Forks.

Drainage area.--2,520 sq mi, approximately.

Records available.--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 September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 893.65 ft above mean sea level, adjustment of 1912. Apr. 13 to July 21, 1906, staff gage at Berning Mill 14 miles downstream at different datum. June 4, 1909, to Sept. 30, 1917, staff gage at site 600 ft downstream at different datum. Apr. 23, 1929, to Aug. 21, 1934, chain gage at site 600 ft downstream at present datum.

Average discharge.--37 years (1909-17, 1930-31, 1934-62) 559 cfs.

Extremes.--Maximum discharge during year, 5,020 cfs Apr. 8 (gage height, 9.04 ft); minimum, 7.5 cfs Dec. 7 (gage height, 1.15 ft).
1909-17, 1929-62: Maximum discharge, 13,900 cfs Apr. 13, 1952 (gage height, 16.24 ft); minimum, 1.8 cfs Nov. 15, 1936 (gage height, 1.05 ft), caused by ice jam upstream.

Remarks.--Records good.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)

1.6	38	2.5	220	4.0	1,010
1.8	57	3.0	401	6.0	2,540
2.0	89	3.5	662	9.0	4,980
2.2	136				

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	51	83	*100	50	*35	28	980	1,250	3,560	*650	1,460	367
2	50	188	98	*49	35	28	1,370	1,170	3,250	675	1,320	362
3	50	282	100	48	35	29	1,970	1,080	3,020	780	1,220	350
4	49	367	103	47	35	29	2,800	994	2,780	863	1,140	358
5	49	326	58	47	35	30	3,540	921	2,580	928	1,050	371
6	49	266	64	46	36	30	*4,100	821	2,420	1,030	994	358
7	46	241	49	45	36	31	4,630	733	2,280	1,160	950	330
8	45	196	59	44	36	31	4,920	681	2,130	1,260	906	307
9	45	179	63	44	37	31	4,960	650	2,000	1,350	863	318
10	48	182	61	43	37	31	4,770	614	1,920	1,450	800	350
11	64	173	59	43	38	32	*4,540	585	1,880	1,460	753	380
12	64	165	57	42	38	32	4,290	675	1,790	1,430	694	392
13	65	159	56	41	39	32	4,040	849	1,730	1,340	650	371
14	65	149	56	41	39	31	3,790	*1,260	1,660	1,260	614	338
15	65	136	55	*40	40	*31	3,560	1,330	1,580	1,190	568	307
16	76	131	55	39	*40	32	3,330	1,260	1,500	1,100	530	346
17	62	124	54	38	39	37	3,120	1,160	1,430	1,070	489	414
18	56	96	*54	38	39	42	2,940	1,140	1,350	1,000	460	414
19	56	83	54	37	38	50	2,780	1,040	1,280	1,160	432	397
20	55	94	54	37	38	56	2,610	1,070	1,200	1,480	406	358
										1,720		
21	53	105	54	37	37	60	2,460	1,070	1,130		380	334
22	52	110	54	36	36	64	2,400	1,170	1,090	1,860	354	311
23	52	103	54	36	35	68	2,350	1,960	1,050	1,980	392	300
24	50	100	54	36	34	72	2,270	2,760	987	2,030	414	286
25	51	112	53	35	31	75	2,100	3,500	906	2,100	419	276
26	51	114	53	35	28	81	1,920	4,120	800	2,150	380	263
27	52	96	53	35	* 26	88	1,740	4,380	707	2,140	350	250
28	51	83	52	35	27	100	1,600	4,360	620	2,060	322	* 238
29	64	96	52	35	-	200	1,480	4,210	675	1,940	296	229
30	* 72	105	51	35	---------	400	*1,350	4,050	713	1,780	*314	226
31	81	----------	51	35	---------	* 750	----------	*3,810	----------	*1,610	350	----------
Total	1,739	4,644	1,890	1,249	999	2,631	88,710	54,673	50,018	44,006	20,270	9,901
Mean	56.1	155	61.0	40.3	35.7	84.9	2,957	1,764	1,667	1,420	654	330
Cfsm	0.022	0.062	0.024	0.016	0.014	0.034	1.17	0.700	0.662	0.563	0.260	0.131
In.	0.03	0.07	0.03	0.02	0.01	0.04	1.31	0.81	0.74	0.65	0.30	0.15

Calendar year 1961: Max 1,190 Min 21 Mean 163 Cfsm 0.065 In. 0.87
Water year 1961-62: Max 4,960 Min 26 Mean 769 Cfsm 0.305 In. 4.16

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 8 to Apr. 1.

5-2840. Mille Lacs Lake at Garrison, Minn.

Location.--Lat 46°18'05", long 93°49'05", in SW¼SE¼ sec.12, T.44 N., R.28 W., at pumphouse of Minnesota Division of Game and Fish, a quarter of a mile southwest of Borden Lake Outlet and three-quarters mile northeast of Garrison.

Records available.--June 1931 to September 1962. Prior to October 1939, published as "at Wealthwood."

Gage.--Water-stage recorder. Datum of gage is 1,240.40 ft above mean sea level, datum of 1929. Prior to Oct. 1, 1941, staff gage at Wealthwood at various datums; gage readings have been reduced to elevations above mean sea level, adjustment of 1912. Oct. 1, 1941, to Sept. 30, 1958, water-stage recorder at datum 1,240.50 ft above mean sea level, adjustment of 1912. To convert these records to datum of 1929, subtract 0.10 ft.

Extremes.--Maximum elevation during year, 1,251.08 ft July 7 (affected by wind action); minimum, 1,248.82 ft Dec. 4 (affected by wind action).
1931-62: Maximum elevation, 1,253.51 ft July 25, 1952: minimum observed, 1,245.74 ft Oct. 16-19, 1936.

Remarks.--Water level affected by fixed-crest spillway at outlet of Ogechié 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.

Mean daily elevation, in feet, October 1961 to September 1962

Oct. 31.....	1,249.18	Jan. 31.....	1,249.22	Apr. 30.....	1,249.67	July 31.....	1,250.47
Nov. 30.....	1,249.15	Feb. 28.....	1,249.36	May 31.....	1,250.43	Aug. 31.....	1,250.37
Dec. 31.....	1,249.16	Mar. 31.....	1,249.42	June 30.....	1,250.53	Sept.30.....	1,250.19

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

5-2847.5 Rum River at Spencer Brook, Minn.

Location.--Lat 45°31'45", long 93°26'21", in NW¼NE¼ sec.15, T.35 N., R.25 W., near center of right span on downstream side of county highway bridge, 200 ft downstream from Spencer Brook, ½ mile north of Spencer Brook store, and 7½ miles southeast of Princeton.

Records available.--July 1960 to September 1962.

Gage.--Wire-weight gage read once daily. Datum of gage is 925.65 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers).

Extremes.--Maximum discharge during year, 7,350 cfs May 25 (gage height, 13.12 ft); minimum daily, 27 cfs Feb. 9; minimum gage height, 0.60 ft Oct. 9, 10.
1960-62: Maximum discharge, that of May 25, 1962; minimum daily, 14 cfs Jan. 27 to Feb. 3, 1961; minimum gage height, 0.50 ft Sept. 2, 3, 1961.

Remarks.--Records good except those for periods of ice effect or no gage-height record, which are fair. Occasional regulation by Ogechie (also controls Mille Lacs Lake) and Onamia Lakes.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used June 22 to July 29)

Oct. 1 to Mar. 30		Mar. 31 to Sept. 30			
0.9	54	0.6	35	9.0	2,100
1.0	62	1.0	70	10	2,860
1.5	115	2.0	195	11	4,010
2.0	185	3.0	362	12	5,480
		5.0	787	13.4	7,490
		7.0	1,300		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	39	52	58	41	28	29	322	399	1,280	128	194	72
2	*39	53	58	41	29	30	452	370	1,330	150	187	66
3	36	130	59	41	29	30	439	344	1,100	177	167	68
4	36	125	60	41	29	30	*556	313	1,000	233	150	66
5	35	120	58	41	30	31	578	288	639	243	136	66
6	36	116	56	40	29	31	731	262	727	243	136	66
7	36	110	54	39	28	*31	1,070	239	634	241	177	66
8	34	102	52	38	28	32	1,490	222	590	254	210	64
9	33	98	51	36	27	33	2,490	222	535	315	188	79
10	33	89	49	34	28	33	3,700	225	487	360	163	103
11	49	82	49	33	28	34	3,490	249	435	228	177	117
12	50	78	49	32	*29	35	2,940	282	397	269	204	128
13	52	76	48	31	29	36	2,360	298	391	201	247	132
14	54	73	48	30	29	37	1,930	321	337	177	264	134
15	56	71	48	30	29	39	1,520	544	306	154	228	*120
16	58	68	48	29	30	41	1,250	755	286	134	189	145
17	56	65	49	29	30	43	1,070	731	276	124	145	185
18	54	64	49	29	30	45	966	680	269	115	*136	187
19	54	65	50	29	30	48	955	614	385	132	122	164
20	53	65	50	29	29	52	946	1,040	525	133	111	151
21	51	65	49	29	29	57	891	1,560	470	148	100	141
22	49	63	49	29	29	62	803	2,000	431	236	99	120
23	47	66	48	30	29	70	*722	2,210	362	415	97	111
24	47	68	48	30	29	80	628	*3,230	296	727	94	105
25	46	66	47	31	29	90	561	*7,240	257	854	86	99
26	46	57	*46	31	29	100	502	6,090	228	634	81	91
27	46	60	45	31	29	114	449	4,390	185	*462	75	86
28	45	62	44	30	29	130	427	2,810	*156	337	72	83
29	53	60	43	30	-	160	399	*1,860	148	277	68	81
30	*53	59	42	29	----------	195	401	1,420	146	239	68	83
31	53	----------	42	29	----------	252	----------	1,260	----------	206	77	----------
Total	1,429	2,328	1,546	1,022	810	2,030	35,038	42,468	14,608	8,546	4,448	3,179
Mean	46.1	77.6	49.9	33.0	28.9	65.5	1,168	1,370	487	276	143	106
Ac-ft	-	-	-	-	-	-	-	-	-	-	-	-

Calendar year 1961: Max 715 Min 14 Mean 75.8 Ac-ft -
Water year 1961-62: Max 7,240 Min 27 Mean 322 Ac-ft -

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 18-30, Dec. 5 to Mar. 30. No gage-height record Nov. 3-6, Jan. 31 to Feb. 5.

5-2860. Rum River near St. Francis, Minn.

Location.--Lat 45°19'40", long 93°22'20", in SE¼ sec.19, T.33 N., R.24 W., on left bank at upstream side of highway bridge, 4 miles south of St. Francis and 15¾ miles upstream from mouth.

Drainage area.--1,360 sq mi, approximately.

Records available.--May to November 1929, March 1930 to September 1931, April to November 1932, March 1933 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 861.12 ft above mean sea level, adjustment of 1912. Prior to Nov. 9, 1933, chain gage at site 50 ft downstream at same datum.

Average discharge.--30 years (1930-31, 1933-62), 537 cfs.

Extremes.--Maximum discharge during year, 4,900 cfs May 29 (gage height, 7.65 ft); minimum, 120 cfs Oct. 7-10 (gage height, 2.27 ft Oct. 7-10).
1929-62: Maximum discharge, 9,260 cfs Apr. 13, 1952 (gage height, 11.03 ft); minimum, 29 cfs Aug. 18, 1934 (gage height, 1.91 ft).

Remarks.--Records good except those for periods of ice effect, which are fair. Occasional regulation by Ogechie (also controls Mille Lacs Lake) and Onamia Lakes.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

2.2	100	5.0	1,980
2.5	192	7.0	4,130
3.0	390	8.0	5,330
4.0	1,060		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	123	209	198	132	119	107	425	694	3,510	331	415	219
2	*123	256	199	134	116	109	482	668	2,930	344	372	216
3	123	331	199	135	114	110	574	642	2,450	381	358	212
4	123	400	*206	135	112	111	*701	610	2,120	395	340	237
5	126	395	206	135	111	*112	860	580	1,880	405	323	241
6	126	367	182	134	109	114	1,110	539	1,650	445	323	241
7	120	353	178	133	107	116	1,380	504	1,420	477	319	233
8	120	331	172	132	106	117	1,780	477	1,210	488	315	226
9	120	290	170	131	106	118	2,040	461	1,060	488	319	237
10	129	271	166	130	107	118	2,330	461	957	472	327	263
11	157	267	159	130	107	119	2,570	461	891	482	323	294
12	182	271	154	131	108	120	2,860	477	814	504	336	310
13	192	267	150	132	109	121	3,220	539	742	472	344	315
14	189	252	149	134	110	123	*3,480	586	674	415	349	315
15	186	241	150	133	112	125	3,510	616	616	367	400	*310
16	182	233	152	130	113	127	3,300	701	562	353	390	344
17	179	226	156	124	114	131	2,990	814	527	327	353	400
18	179	206	159	120	115	134	2,630	891	477	306	*327	440
19	176	176	160	118	114	138	2,260	940	477	336	294	445
20	173	181	154	117	114	143	1,880	948	466	362	271	430
21	166	185	155	117	112	149	1,630	932	539	390	256	395
22	160	190	156	120	110	155	1,490	1,090	642	425	252	372
23	157	190	158	*122	109	162	*1,380	1,630	642	472	244	349
24	163	190	159	128	107	172	1,280	2,200	586	562	237	327
25	166	185	159	129	106	186	1,170	*2,470	522	694	226	310
26	163	182	*158	128	105	202	1,040	2,640	466	822	223	294
27	163	175	149	127	104	226	940	3,100	425	*891	209	282
28	157	170	140	126	106	259	860	4,090	*376	852	202	271
29	179	178	136	124	-	290	792	4,820	372	708	199	263
30	*192	188	134	121	---------	325	728	*4,680	349	574	199	256
31	206	----------	132	120	---------	370	----------	4,130	----------	477	206	----------
Total	4,900	7,356	5,055	3,962	3,082	4,909	51,692	44,391	30,352	15,017	9,251	9,047
Mean	158	245	163	128	110	158	1,723	1,432	1,012	484	298	302
Cfsm	0.116	0.180	0.120	0.094	0.081	0.116	1.27	1.05	0.744	0.356	0.219	0.222
In.	0.13	0.20	0.14	0.11	0.08	0.13	1.41	1.21	0.83	0.41	0.25	0.25

Calendar year 1961: Max 1,250 Min 86 Mean 223 Cfsm 0.164 In. 2.22
Water year 1961-62: Max 4,820 Min 104 Mean 518 Cfsm 0.381 In. 5.15

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 20 to Dec. 1, Dec. 7 to Mar. 25, Mar. 29-31.

5-2885. Mississippi River near Anoka, Minn.

Location.--Lat 45°07'36", long 93°17'48", in SW¼ sec.12, T.119 N., R.21 W., on right bank half a mile downstream from Coon Creek, 1½ miles downstream from hydroelectric plant of Northern States Power Co. at Coon Rapids, 6½ miles downstream from Anoka, and at mile 864.8 upstream from Ohio River.

Drainage area.--19,100 sq mi, approximately.

Records available.--June 1931 to September 1962. Prior to October 1931 published as "at Coon Rapids, near Anoka." Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 805.02 ft above mean sea level, adjustment of 1912. Prior to June 14, 1932, at site 1⅛ miles upstream at different datum.

Average discharge.--31 years, 6,761 cfs.

Extremes.--Maximum discharge during year, 39,800 cfs May 29 (gage height, 11.55 ft); minimum, 1,110 cfs Dec. 10 (gage height, 0.76 ft).
1931-62: Maximum discharge, 75,900 cfs Apr. 14, 1952 (gage height, 17.51 ft); minimum, 586 cfs Sept. 13, 1934 (gage height, 0.37 ft).

Remarks.--Records good. Flow slightly regulated by six reservoirs on headwaters; total usable capacity, 1,640,600 acre-ft. Diurnal regulation caused by powerplant above station.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Nov. 27 to Dec. 7, Dec. 9, 10, June 12 to July 7)

0.9	1,300	2.0	3,300	6.0	15,100
1.2	1,800	3.0	5,600	8.0	23,300
1.5	2,320	4.0	8,250	12.0	42,000

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	a2150	2810	*2480	2700	2100	2000	6900	9760	32900	7900	10100	6310
2	a2150	3540	2540	2300	2100	2100	7300	9960	30500	8310	9280	6150
3	*1830	3890	2500	2500	2100	2150	8000	9570	28300	9570	8940	6410
4	1940	3100	2630	2450	2100	2200	9820	9600	26400	9630	8880	6100
5	1950	3560	2630	2500	2150	2200	12200	8880	24800	10400	8490	6540
6	2110	3390	2790	2400	2100	2600	14000	8250	22500	12100	8760	5900
7	2430	3150	2060	2200	2100	2650	16500	8250	21900	12500	9470	5480
8	a2350	2770	2150	2300	2000	2700	18500	7850	21000	12800	8850	5900
9	a1650	2500	1300	2100	2100	2800	20000	8050	20600	14000	9000	5920
10	a1950	2690	1320	2100	2250	2750	22600	8050	20500	14100	8730	6720
11	a2250	3090	1550	2350	2350	2800	22200	8100	19400	14600	8850	*6800
12	a2600	2730	1650	2200	2150	2700	22400	8130	17900	14200	9380	7010
13	a2900	2460	1600	2250	2100	2750	22800	8280	16500	*12400	*9760	7090
14	a2400	2300	2000	2300	2200	2900	22600	9250	16500	13100	9570	7850
15	1480	2390	2300	2450	2100	3300	21600	10100	13900	12800	9820	7820
16	a1900	2020	2300	2150	2300	3100	*20600	9790	13000	12100	9960	8490
17	a2600	1870	2000	2050	2500	3050	19000	10200	13400	11900	9600	8730
18	2710	1990	2100	2000	2300	3100	17700	11900	13500	11300	9040	8370
19	2830	3220	2150	2000	2150	3200	16100	11900	12800	11700	8790	8080
20	2670	3010	2200	2050	2050	3600	14500	12500	13000	12400	8730	7630
21	2560	3030	2950	2050	2200	3800	13500	*12700	12400	12700	8550	7110
22	2370	2480	2150	2050	2150	4000	13500	13500	*11700	12600	7710	7040
23	2190	2230	2400	2050	2100	3950	12700	18800	11600	12800	8130	6700
24	2540	2340	2450	1800	2050	3900	12200	27600	10900	13000	7710	7010
25	2650	2650	2600	2100	2100	3750	12300	30100	10100	13000	7280	6410
26	2650	2670	2500	2200	2050	4300	11800	33100	10500	12700	7060	6440
27	2500	3010	2600	2100	1950	4750	11500	36000	9530	12300	6720	7010
28	2520	2750	2300	2050	1900	4800	10800	38800	8850	11800	7220	6490
29	2690	2890	2300	2100	-	4500	10300	39400	9070	11500	6570	6050
30	*2770	2480	2550	2100	---	5700	10200	*37800	8790	11000	6520	6130
31	3130	---	2550	2100	---	6400	---	35700	---	10500	6280	---
Total	73420	83010	69600	68050	59800	104500	454120	511870	502740	371710	263750	205690
Mean	2,368	2,767	2,245	2,195	2,136	3,371	15,140	16,510	16,760	11,990	8,508	6,856
Cfsm	0.124	0.145	0.118	0.115	0.112	0.176	0.793	0.864	0.877	0.628	0.445	0.359
In.	0.14	0.16	0.14	0.13	0.12	0.20	0.88	1.00	0.98	0.72	0.51	0.40

Calendar year 1961: Max 15,100 Min 1,070 Mean 3,170 Cfsm 0.166 In. 2.25
Water year 1961-62: Max 39,400 Min 1,300 Mean 7,584 Cfsm 0.397 In. 5.38

* Discharge measurement made on this day.
a No gage-height record.
Note.--Stage-discharge relation affected by ice Dec. 8, Dec. 11 to Apr. 3.

05-2890. Minnetonka Lake near Wayzata, Minn.

Location.--Lat°44 57'00", long 93°29'55", in SW¼SW¼ sec.8, T.117 N., R.22 W., on east side of Wayzata Bay, 150 ft north of bridge over channel connecting Grays Bay and Wayzata Bay on State Highway 101.

Records available.--June 1938 to September 1962 (fragmentary prior to October 1941). Lake elevations collected in this vicinity since 1881 are contained in files of Hennepin County Highway Department. Published as "at Excelsior" prior to June 1947.

Gage.--Water-stage recorder. Datum of gage is 922.30 ft above mean sea level, datum of 1929. Prior to Sept. 10, 1939, staff gage and Sept. 10, 1939, to July 28, 1952, water-stage recorder, at Excelsior, at elevation 920.00 ft above mean sea level, 1903 adjustment, which is 0.96 ft higher than present datum. Gage readings have been reduced to elevations above mean sea level, datum of 1929, subsequent to June 30, 1947.

Extremes.--Maximum elevation during year, 929.90 ft May 23; minimum, 928.21 ft Oct. 28.
1939-62: Maximum elevation, 930.42 ft Sept. 17, 1951; minimum, 922.72 ft Dec. 21, 1938, to Jan. 3, 1939 (datum of 1929).

Remarks.--Water level subject to fluctuation caused by wind action.

Mean daily elevation, in feet, October 1961 to September 1962

Oct. 31.....928.37	Feb. 27.....928.61	June 30.....929.56
Nov. 30.....928.41	Mar. 31.....928.85	July 31.....929.63
Dec. 31.....928.42	Apr. 30.....929.54	Sept. 5.....929.32
Jan. 31.....928.44	May 31.....929.87	Sept.30.....929.18

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

5-2895. Minnehaha Creek at Minnetonka Mills, Minn.

Location.--Lat 44°56'30", long 93°26'45", near center of E½ sec.15, T.117 N., R.22 W., on left bank 40 ft upstream from bridge on county highway at Minnetonka Mills, 2.2 miles downstream from outlet of Minnetonka Lake, and 2.9 miles northwest of Hopkins.

Drainage area.--130 sq mi.

Records available.--August 1953 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 916.11 ft above mean sea level, datum of 1929.

Average discharge.--9 years, 13.3 cfs.

Extremes.--Maximum discharge during year, 235 cfs May 23 (gage height, 6.66 ft); maximum gage height, 6.91 ft Mar. 26 (backwater from ice); no flow on many days.
1953-62: Maximum discharge, that of May 23, 1962; maximum gage height, that of Mar. 26, 1962 (backwater from ice); no flow for many days each year.

Remarks.--Records good except those for periods of ice effect, which are fair. Discharge affected by storage in Minnetonka Lake controlled by fixed-crest dam.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Apr. 14-May 3, May 28-31, July 13-Aug. 8)

4.35	0	4.7	1.7	5.2	20
4.4	.1	4.8	3.7	5.5	45
4.5	.3	4.9	6.4	6.0	114
4.6	.7	5.0	9.8	6.7	243

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0.2	0.5			0	*3.0	108	196	37	51	50
2	0	.9	.5			0	5.0	108	194	38	51	50
3	*0	.9	.5			0	8.0	108	181	39	50	48
4	0	.6	.4			0	20	98	179	38	48	51
5	0	.6	.4			0	25	92	177	40	51	*48
6	0	.7	.3			0	30	90	168	42	53	44
7	0	.7	.3			0	32	82	159	42	54	39
8	0	.7	.2			0	22	79	*154	46	*59	35
9	0	.7	.2			0	19	70	154	54	61	36
10	.1	.7	.2			0	21	66	152	51	60	44
11	0	.8	.1			0	19	65	141	47	64	43
12	0	.9	.1		(*)	0	23	109	130	42	72	37
13	0	*1.0	.1			0	35	161	121	37	69	34
14	0	.9	.1			0	50	194	111	37	66	32
15	0	.9	*0	(*)		0	56	199	*104	31	68	29
16	0	1.0	0			0	55	197	98	31	68	37
17	0	.9	0			0	59	196	100	31	64	44
18	0	.9	0			0	60	190	96	30	61	43
19	0	.8	0			0	61	199	89	38	59	40
20	0	.7	0			0	62	194	79	41	57	36
21	0	.6	0			0	65	175	72	41	54	34
22	0	.7	0			0	84	179	66	42	52	32
23	0	.7	0			*0	*95	*222	61	44	56	29
24	0	.7	0			0	96	224	55	47	59	29
25	0	.6	0			0	96	211	47	54	57	27
26	0	.6	0			.1	95	207	41	54	54	25
27	0	.6	0			.3	94	209	37	52	48	23
28	0	.6	0			.5	95	*211	35	50	45	*21
29	.6	.5	0		-	1.0	92	211	37	48	40	18
30	.3	.5	0		---	1.5	94	215	39	51	39	18
31	.2	---	0		---	2.0	---	213	---	51	46	---
Total	1.2	21.6	3.9	0	0	5.4	1,571.0	4,882	3,273	1,326	1,736	1,076
Mean	0.04	0.72	0.13	0	0	0.17	52.4	157	109	42.8	56.0	35.9
Cfsm	0.00031	0.0055	0.0010	0	0	0.0013	0.403	1.21	0.838	0.329	0.431	0.276
In.	0.0003	0.006	0.001	0	0	0.002	0.45	1.40	0.94	0.38	0.50	0.31

Calendar year 1961: Max 15 Min 0 Mean 1.48 Cfsm 0.011 In. 0.14
Water year 1961-62: Max 224 Min 0 Mean 38.1 Cfsm 0.293 In. 3.99

* Discharge measurement or observation of no flow made on this day.
Note.--Stage-discharge relation affected by ice Dec. 4 to Apr. 8.

GPO 802-479-8

5-2900. Little Minnesota River near Peever, S. Dak.

Location.--Lat 45°36'05", long 96°52'18", in SW¼ sec.13, T.125 N., R.50 W., on right bank, 2 miles northwest of town of Browns Valley, Minn., 3¾ miles upstream from proposed Lake Traverse diversion, 5.3 miles northeast of Peever, 7¼ miles downstream from Jorgenson River, and 8 miles upstream from Big Stone Lake.

Drainage area.--447 sq mi.

Records available.--October 1939 to September 1962.

Gage.--Water-stage recorder. Altitude of gage is 1,000 ft (from topographic map). Oct. 1, 1939, to Mar. 20, 1940, staff gage at site 4½ miles downstream at different datum. Mar. 21 to Apr. 12, 1940, staff gage at site 100 ft downstream at present datum. Apr. 13 to Aug. 27, 1940, staff gage at present site and datum.

Average discharge.--23 years, 50.1 cfs (36,270 acre-ft per year).

Extremes.--Maximum discharge during year, 3,140 cfs May 23 (gage height, 9.89 ft); minimum daily discharge, 0.2 cfs Oct. 4-5, 7, 24-27, Nov. 1
1939-62: Maximum discharge, 4,730 cfs Apr. 8, 1952 (gage height, 12.16 ft); maximum gage height, 13.35 ft Mar. 25, 1943, from floodmark (backwater from ice); no flow at times in 1940, 1942, 1950, 1954, 1957, 1959.

Remarks.--Records good except those for periods of ice effect, which are fair.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Apr. 5		Apr. 6 to Aug. 19				Aug. 20 to Sept. 30	
1.7	0.1	2.8	33	4.5	398	2.3	4.4
1.9	.4	3.0	54	5.0	525	2.4	7.0
2.0	.8	3.3	105	6.0	870	2.5	11
2.1	1.4	3.6	173	7.0	1,320	2.6	17
2.2	2.4	4.0	273	9.0	2,520	3.0	50

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	.3	.2	.3	.8	1.2	.9	530	166	418	73	132	7.6
2	.3	.3	.3	.9	1.2	.9	*410	139	336	91	119	7.6
3	.3	.4	.4	*1.0	1.2	.9	560	119	283	136	111	7.0
4	.2	.4	.4	1.1	1.2	.9	900	103	253	296	101	6.4
5	.2	.4	.3	1.1	1.1	.9	1,100	87	238	448	93	6.4
6	.3	.4	.4	1.0	1.1	1.0	1,520	75	208	797	89	*6.2
7	.2	.4	.4	1.0	1.1	1.0	1,150	65	193	1,340	85	5.9
8	.3	.4	.3	.9	* 1.1	1.1	838	60	618	1,420	*82	5.9
9	.3	.4	.3	.9	1.1	1.2	390	57	843	*932	73	6.7
10	.5	.4	.3	.9	1.1	1.3	456	54	710	565	65	8.7
11	1.4	.4	.3	.9	1.1	1.5	458	52	531	490	68	9.4
12	.9	.4	.3	.9	1.1	1.6	413	51	408	430	62	10
13	.6	.4	.3	.9	1.2	1.6	366	95	*313	360	58	9.0
14	.5	.4	.3	.9	1.2	1.6	340	121	248	313	52	7.3
15	.4	.3	.3	.9	1.2	1.6	306	125	203	293	47	7.0
16	.6	.4	.4	.8	1.2	1.5	286	542	198	313	43	10
17	.6	.3	.6	.8	1.1	* 1.5	288	*801	286	318	43	9.8
18	.4	.4	.6	.8	1.1	1.6	336	785	260	268	40	13
19	.3	.4	.6	.8	1.1	1.8	*360	897	298	374	38	9.0
20	.4	.4	.5	.8	1.1	1.8	343	714	210	1,200	32	7.6
21	.3	.4	.5	.8	1.0	1.9	293	520	186	559	30	7.0
22	.3	.4	.5	.8	1.0	1.9	278	1,150	260	458	26	6.4
23	.3	.4	.5	.8	1.0	2.0	236	2,440	141	343	22	6.7
24	.2	.4	.5	.9	1.0	2.2	203	2,410	127	273	20	7.6
25	* .2	.4	.5	.9	.9	2.5	186	1,390	115	228	18	7.6
26	.2	.4	.5	.9	.9	3.5	163	830	105	198	15	8.0
27	.2	.4	.6	1.0	.9	10	148	589	95	173	13	7.3
28	.3	* .3	.6	1.0	.9	100	146	480	82	153	11	7.0
29	.4	.4	.6	1.0	-	*540	138	420	76	146	9.8	6.2
30	.3	.3	.7	1.1	----------	900	158	607	76	166	7.6	7.0
31	.3	----------	.8	1.2	----------	730	----------	531	----------	183	8.7	----------
Total	12.0	11.3	13.9	28.5	30.4	2320.2	13299	16475	8318	13337	1614.1	231.3
Mean	0.39	0.38	0.45	0.92	1.09	74.8	443	531	277	430	52.1	7.71
Cfsm	0.00087	0.00085	0.0010	0.0021	0.0024	0.167	0.991	1.19	0.620	0.962	0.117	0.017
In.	0.001	0.0009	0.001	0.002	0.003	0.19	1.11	1.37	0.69	1.11	0.13	0.02
Ac-ft	24	22	28	57	60	4,600	26,380	32,680	16,500	26,450	3,200	459

Calendar year 1961: Max 59 Min 0.1 Mean 4.88 Cfsm 0.0109 In. 0.15 Ac-ft 3,540
Water year 1961-62: Max 2,440 Min 0.2 Mean 153 Cfsm 0.342 In. 4.63 Ac-ft 110,500

Peak discharge (base, 450 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-30	1300	7.30	930	5-30	1900	5.69	741
4- 6	1630	7.60	1,660	6- 9	0300	6.52	1,100
5-17	0200	6.50	1,100	7- 8	1900	7.72	1,730
5-19	1600	6.53	1,110	7-20	1100	7.65	1,680
5-23	2330	9.89	3,140				

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 9-15, Dec. 19 to Mar. 13, Mar. 24 to Apr. 5.

5-2910. Whetstone River near Big Stone City, S. Dak.

Location.--Lat 45°17'32", long 96°29'14", in SE¼NW¼ sec.18, T.121 N., R.46 W., on right bank 20 ft downstream from highway bridge, 1½ miles west of Big Stone City, and 4½ miles upstream from Big Stone Lake.

Drainage area.--389 sq mi.

Records available.--March 1910 to November 1912 (no winter records) and March 1931 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 996.96 ft above mean sea level, adjustment of 1912. Mar. 8, 1910, to Nov. 30, 1912, staff gage 2 miles downstream at different datum. Mar. 18, 1931, to Aug. 27, 1938, chain gage and Aug. 28, 1938, to May 3, 1939, wire-weight 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.

Average discharge.--31 years (1931-62), 46.6 cfs (33,740 acre-ft per year).

Extremes.--Maximum discharge during year, 2,900 cfs Mar. 29 (gage height, 10.38 ft); maximum gage height, 10.43 ft Mar. 29 (backwater from ice); minimum discharge, 0.6 cfs Oct. 7.
1910-12, 1931-62: Maximum discharge, 5,710 cfs Apr. 8, 1952 (gage height, 13.64 ft, from floodmark); maximum gage height, 13.95 ft Apr. 11, 1947; no flow at times in most years.
Maximum stage known, about 26 ft in June 1919, present site and datum, from information by local resident.

Remarks.--Records fair.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1.9	2.6	3.9	4.0	3.4	2.7	738	54	401	265	83	18
2	1.8	2.8	3.9	4.0	3.5	2.7	* 360	56	203	170	77	17
3	1.7	3.1	4.0	*4.0	3.5	2.7	500	48	145	328	71	15
4	1.7	3.4	4.6	4.0	3.4	2.7	910	39	125	268	67	16
5	1.4	3.6	4.7	4.0	3.4	2.7	1,230	32	116	499	63	*15
6	1.3	3.0	5.2	4.0	3.3	2.7	1,300	28	113	716	71	14
7	1.0	2.4	4.2	3.9	*3.3	2.7	1,010	25	107	1,990	*87	14
8	.9	2.6	4.1	3.8	3.3	2.8	653	24	788	*1,440	96	14
9	1.4	3.0	4.1	3.8	3.3	2.8	422	22	1,660	1,000	76	15
10	1.6	2.4	4.2	3.8	3.4	2.8	485	21	934	552	65	18
11	1.9	2.8	4.3	3.7	3.5	2.8	431	20	594	341	59	18
12	1.6	3.1	4.3	3.7	3.5	2.8	434	20	392	262	54	17
13	1.7	2.8	4.4	3.5	3.5	2.8	347	23	*235	199	50	16
14	1.7	3.1	4.5	3.4	3.5	2.9	272	26	157	160	48	14
15	1.7	2.0	4.5	3.3	3.5	*2.9	184	53	115	151	44	13
16	1.7	2.0	4.6	3.2	3.4	2.9	140	*155	166	172	40	14
17	1.7	1.8	4.6	3.1	3.3	2.9	*136	738	1,140	262	38	14
18	1.7	1.6	4.5	3.1	3.2	3.0	140	1,290	1,030	265	37	14
19	1.6	1.6	4.5	3.1	3.2	3.1	160	814	1,230	341	35	13
20	1.8	1.7	4.5	3.1	3.1	4.1	138	918	614	1,520	33	13
21	1.6	1.7	4.4	3.1	3.0	8.5	107	449	320	1,180	31	12
22	1.7	2.0	4.4	3.0	2.9	17	90	524	203	597	28	12
23	1.9	1.8	4.4	3.0	2.9	27	81	1,940	153	341	26	12
24	1.9	2.0	4.3	3.1	2.8	40	71	1,870	120	250	25	12
25	*1.9	3.4	4.3	3.1	2.8	59	65	858	100	190	24	12
26	1.9	3.1	4.3	3.2	2.7	130	58	437	85	158	22	12
27	1.2	3.1	4.2	3.2	2.7	333	54	272	77	134	21	11
28	1.5	*3.6	4.2	3.3	2.7	820	50	215	68	120	20	11
29	1.8	3.9	4.1	3.3		*2,750	47	199	63	108	18	11
30	1.9	3.9	4.1	3.3		1,400	52	228	255	100	18	11
31	1.9		4.1	3.4		1,260		636		91	18	
Total	51.0	79.9	134.4	107.5	90.0	6,902.0	10,665	12,034	11,709	14,070	1,445	418
Mean	1.65	2.66	4.34	3.47	3.21	223	356	388	390	454	46.6	13.9
Cfsm	0.0042	0.0068	0.011	0.0089	0.0083	0.573	0.915	0.997	1.00	1.17	0.120	0.036
In.	0.005	0.008	0.01	0.01	0.009	0.66	1.02	1.15	1.12	1.35	0.14	0.04
Ac-ft	101	158	267	213	179	13,690	21,150	23,870	23,220	27,910	2,870	829

Calendar year 1961: Max 218 Min 0.1 Mean 9.61 Cfsm 0.025 In. 0.33 Ac-ft 6,950
Water year 1961-62: Max 2,750 Min 0.9 Mean 158 Cfsm 0.406 In. 5.52 Ac-ft 114,500

Peak discharge (base, 200 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-29	0430	10.38	2,900	5-31	0700	5.81	688	7- 3	1330	4.85	380
4- 6	2200	7.57	1,400	6- 9	0300	8.74	1,980	7- 7	1500	9.66	2,530
5-18	0700	7.77	1,500	6-17	1900	7.75	1,480	7-20	1330	8.44	2,000
5-23	2100	9.63	2,510	6-30	2000	5.04	434				

* Discharge measurement made on this day.

Note.--Stage-discharge relation affected by ice Dec. 8 to Apr. 5.

5-2915. Big Stone Lake at Ortonville, Minn.

Location.--Lat 45°17'50", long 96°26'54", in NW¼NW¼ sec.16, T.121 N., R.46 W., in dike on left bank at end of concrete dam at outlet, half a mile southwest of Ortonville.

Records available.--March 1937 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 957.69 ft above mean sea level, datum of 1929. Prior to Sept. 17, 1947, staff gage at same site and datum. Since Sept. 21, 1959, supplementary wire-weight gage read once daily, at site ½ mile north at power plant intake.

Extremes.--Maximum gage height during year, 10.58 ft June 17; minimum, 5.98 ft Oct. 10.
1937-62: Maximum gage height, 12.73 ft Apr. 17, 1952; minimum observed, 2.20 ft Nov. 20, 1940.

Remarks.--Reservoir is formed by natural lake with concrete dam at outlet. Fixed crest of dam is at elevation 963.64 ft, with one 5-foot gate and two 2½-foot gates with lowest sill at elevation 958.40 ft (all elevations are referred to datum of 1929). Ordinarily changes in gate openings are not made.
Silt barrier dam 700 ft upstream in outlet channel of lake completed July 7, 1958; crest elevation, 963.6 ft. Supplementary wire-weight gage readings used for stages below crest of silt barrier. Water level subject to fluctuation caused by wind action.

Daily mean gage height, in feet, October 1961 to September 1962

Oct. 31.....6.22	Feb. 28..... 6.55	June 30.....9.02
Nov. 30.....6.17	Mar. 31..... 8.57	July 31.....9.42
Dec. 31.....6.27	Apr. 30..... 8.85	Aug. 31.....7.59
Jan. 31.....6.30	May 31.....10.31	Sept.30.....6.80

Note.--Gage-height record other than shown above is available.

5-2920. Minnesota River at Ortonville, Minn.

Location.--Lat 45°17'44", long 96°26'38", in NE¼NW¼ sec.16, T.121 N., R.46 W., 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 sq mi, approximately.

Records available.--February 1938 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 956.38 ft above mean sea level, datum of 1929. Prior to Mar. 31, 1939, staff gage on downstream side of dam 1,300 ft upstream at datum 1.31 ft higher.

Average discharge.--24 years, 119 cfs (86,150 acre-ft per year).

Extremes.--Maximum discharge during year, 1,400 cfs July 10 (gage height, 10.45 ft); maximum gage height, 10.50 ft Mar. 29, from floodmark (backwater from ice); minimum daily discharge, 0.6 cfs Nov. 19-21, Dec. 27 to Jan. 7.
1938-62: Maximum discharge, 3,060 cfs Apr. 13, 1952 (gage height, 12.92 ft); no flow Dec. 13, 1940.

Remarks.--Records good except those for periods of ice effect or no gage-height record, which are fair. Some regulation by Big Stone Lake (see preceding page).

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used May 9 to June 20, Aug. 22 to Sept. 30)

1.0	0.3	1.5	22	8.0	608
1.1	1.6	2.0	55	9.0	793
1.2	5.3	4.0	173	10	1,150
1.3	10	6.0	336	11	1,740

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	5.7	1.0	1.6	0.6	1.3	1.7	490	670	1,080	603	697	201
2	5.3	5.3	1.6	.6	1.4	1.7	385	622	1,040	637	691	184
3	5.3	2.9	1.6	*.6	1.4	1.7	410	600	1,000	605	654	226
4	4.5	2.9	2.9	.6	1.5	1.7	*578	565	997	656	618	189
5	4.5	3.7	1.6	.6	1.6	1.7	843	589	928	632	584	*165
6	4.5	2.5	1.6	.6	1.6	1.7	813	536	903	686	568	153
7	5.3	3.3	1.6	.6	*1.7	1.7	876	450	956	858	*528	154
8	5.7	1.2	1.5	.7	1.8	1.7	808	510	1,050	*1,130	509	159
9	4.9	1.2	1.5	.7	1.8	1.7	970	404	1,190	1,160	461	183
10	4.9	1.0	1.4	.7	1.8	1.7	945	454	1,290	1,240	451	187
11	6.2	1.0	1.3	.7	1.8	1.8	1,030	419	1,270	1,150	515	152
12	6.2	1.2	1.3	.7	1.8	1.8	1,200	430	1,230	1,120	522	159
13	6.2	1.0	1.2	.7	1.8	1.8	1,260	434	*1,200	1,080	514	160
14	5.7	.8	1.1	.7	1.8	1.8	948	459	1,130	1,050	416	150
15	5.3	.8	1.1	.7	1.8	*1.8	1,000	333	1,070	1,030	464	147
16	3.7	1.0	1.0	.7	1.8	1.8	1,060	*230	1,110	1,000	414	164
17	4.1	.8	1.0	.7	1.8	1.8	1,090	276	1,140	956	365	153
18	2.9	.8	1.0	.8	1.8	1.8	*1,130	418	1,260	894	331	147
19	2.5	.6	.9	.8	1.7	1.9	1,080	522	1,240	861	304	149
20	1.8	.6	.9	.8	1.7	1.9	1,020	573	1,280	1,020	327	133
21	2.2	.6	.9	0.8	1.7	2.0	1,000	545	1,190	1,090	297	133
22	2.2	.8	.9	.9	1.7	2.0	942	743	1,080	1,110	254	124
23	1.8	.8	.8	.9	1.7	2.1	849	1,100	1,020	1,020	301	117
24	*1.6	1.2	.8	1.0	1.7	2.2	833	1,190	931	1,020	282	134
25	3.7	2.2	.8	1.0	1.7	2.3	833	1,220	870	956	255	122
26	2.2	5.7	.7	1.1	1.7	2.7	840	1,200	796	879	229	126
27	1.2	3.3	.6	1.1	1.7	10	823	1,160	717	833	208	110
28	2.2	*1.8	.6	1.2	1.7	50	739	1,180	697	816	243	97
29	1.8	1.2	.6	1.2	-	250	721	1,260	700	789	231	97
30	1.2	1.2	.6	1.3	----------	*550	732	1,240	661	767	227	114
31	1.0	----------	.6	1.3	----------	590	----------	1,160	----------	732	217	----------
Total	116.3	52.4	35.6	25.4	47.3	1,498.5	26,248	21,492	31,026	28,380	12,677	4,489
Mean	3.75	1.75	1.15	0.82	1.69	48.3	875	693	1,034	915	409	150
Ac-ft	231	104	71	50	94	2,970	52,060	42,630	61,540	56,290	25,140	8,900

Calendar year 1961: Max 143 Min 0.6 Mean 12.4 Ac-ft 8,960
Water year 1961-62: Max 1,290 Min 0.6 Mean 345 Ac-ft 250,100

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 7 to Apr. 4. No gage-height record Dec. 16 to Jan. 2, Jan. 4 to Mar. 14, Mar. 16-27, May 22-24.

5-2925. Minnesota River near Odessa, Minn.

Location.--Lat 45°15'22", long 96°20'20", in SW¼SW¼ sec. 29, T.121 N., R.45 W., near center of span on upstream side of highway bridge, 0.6 mile southwest of Odessa and 5.0 miles upstream from Yellow Bank River.

Drainage area.--1,340 sq mi, approximately.

Records available.--July 1909 to December 1912 (no winter records), May 1944 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Wire-weight gage read once daily. Datum of gage is 940.76 ft above mean sea level, datum of 1929. July 4, 1909, to Dec. 31, 1912, chain gage at site 250 ft upstream at datum 0.45 ft lower. May 5, 1944, to July 18, 1948, chain gage at site 250 ft upstream at present datum.

Average discharge.--18 years (1944-62), 129 cfs (93,390 acre-ft per year).

Extremes.--Maximum discharge during year, 1,390 cfs June 21 (gage height, 12.68 ft); minimum daily, 0.7 cfs Mar. 5-24.
1909-12, 1944-62: Maximum discharge, 3,070 cfs Apr. 13, 1952 (gage height, 14.06 ft, from graph based on gage readings); no flow at times during 1950, 1951, 1954, 1959, 1960.

Remarks.--Records fair. Some regulation by Big Stone Lake (see p.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1 to Nov. 30, Sept. 12-30)

4.0	72	10.0	592
4.5	93	11.0	716
5.0	114	12.0	917
6.0	173	12.5	1,200
8.0	368	13.0	1,770

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	5.3	3.4	2.9	1.2	0.9	0.8	570	849	1,190	822	820	259
2	5.0	3.6	3.0	1.2	.9	.8	480	788	1,200	801	791	248
3	4.6	3.6	3.4	*1.2	.9	.8	440	767	1,160	777	753	242
4	5.1	4.1	3.6	1.1	.9	.8	*415	747	1,150	789	761	245
5	5.1	3.8	3.6	1.1	.9	.7	500	724	1,110	784	741	*222
6	5.0	4.0	3.6	1.1	.9	.7	807	713	1,050	789	716	210
7	5.0	3.6	3.5	1.1	.9	.7	777	684	1,010	*805	*677	195
8	5.3	3.8	3.5	1.1	*.9	.7	805	641	1,020	862	654	191
9	4.3	3.9	3.4	1.1	.9	.7	807	630	1,060	928	621	203
10	5.0	3.8	3.3	1.1	.9	.7	799	580	1,130	1,010	591	218
11	4.6	4.0	3.2	1.1	.9	.7	847	560	1,160	1,100	567	204
12	4.8	3.4	3.1	1.0	.9	.7	883	533	1,200	1,210	573	190
13	5.3	3.2	3.0	1.0	.9	.7	950	538	1,190	1,220	535	180
14	6.0	3.1	2.8	1.0	.9	.7	1,080	528	*1,190	1,240	504	180
15	6.0	3.2	2.7	1.0	.9	.7	1,160	*530	1,160	1,250	470	162
16	5.5	3.1	2.5	1.0	.9	*.7	1,210	491	1,230	1,290	471	166
17	5.0	3.0	2.3	1.0	.9	.7	1,270	432	1,180	1,240	446	158
18	5.8	3.0	2.1	1.0	.9	.7	*1,270	430	1,230	1,200	421	155
19	4.4	2.9	1.9	1.0	.9	.7	1,260	470	1,250	1,280	398	148
20	3.9	2.9	1.8	1.0	.8	.7	1,230	498	1,290	1,180	387	139
21	3.4	3.1	1.7	1.0	.8	.7	1,180	534	1,390	1,150	371	129
22	3.3	3.2	1.6	1.0	.8	.7	1,130	551	1,340	1,080	353	130
23	2.7	2.9	1.6	1.0	.8	.7	1,070	642	1,280	1,140	332	122
24	*2.7	3.1	1.5	1.0	.8	.7	1,020	786	1,240	1,110	329	124
25	2.6	3.3	1.4	1.0	.8	.8	980	822	1,160	1,060	320	126
26	2.9	3.6	1.4	1.0	.8	1.2	958	889	1,080	1,030	306	122
27	3.3	3.8	1.3	1.0	.8	5.0	944	892	999	985	298	121
28	2.9	*3.2	1.3	.9	.8	20	928	939	950	943	282	109
29	2.9	3.0	1.2	.9	-	100	872	921	875	905	275	105
30	3.3	2.7	1.2	.9	----------	350	881	1,100	847	878	274	106
31	3.4	----------	1.2	.9	----------	580	----------	1,160	----------	849	270	----------
Total	134.4	101.3	74.6	32.0	24.3	1,074.2	27,523	21,369	34,321	31,707	15,307	5,109
Mean	4.34	3.38	2.41	1.03	0.87	34.7	917	689	1,144	1,023	494	170
Ac-ft	267	201	148	63	48	2,130	54,590	42,380	68,070	62,890	30,360	10,130

Calendar year 1961: Max 119 Min 1.2 Mean 17.2 Ac-ft 12,460
Water year 1961-62: Max 1,390 Min 0.7 Mean 375 Ac-ft 271,300

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 1 to Apr. 5.

5-2930. Yellow Bank River near Odessa, Minn.

Location.--Lat 45°13'35", long 96°21'12", in SE¼SE¼ sec.1, T.120 N., R.46 W., on left bank 150 ft downstream from highway bridge, 2½ miles southwest of Odessa, and 4½ miles upstream from mouth.

Drainage area.--398 sq mi.

Records available.--October 1939 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 953.34 ft above mean sea level, datum of 1929 (Corps of Engineers bench mark). Prior to Aug. 28, 1940, wire-weight gage at site 150 ft upstream at same datum.

Average discharge.--23 years, 57.4 cfs (41,560 acre-ft per year).

Extremes.--Maximum discharge during year, 1,690 cfs July 21 (gage height, 9.32 ft); maximum gage height, 10.41 ft Mar. 29 (backwater from ice); minimum daily discharge, 0.5 cfs Feb. 6-10; minimum gage height, 1.80 ft Oct. 8, Nov. 2.
1939-62: Maximum discharge, 6,260 cfs Apr. 4, 1952 (gage height, 17.06 ft); maximum gage height, 17.98 ft Mar. 25, 1943, from floodmark (backwater from ice); no flow Jan. 26 to Feb. 8, 1940, Jan. 8, 9, 1942, Jan. 25 to Feb. 25, 1959.

Remarks.--Records good except those for period of ice effect and no gage-height record, which are fair.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1 to Nov. 24, Sept. 25-30)

1.6	0.3	2.2	14	4.0	250
1.7	1.3	2.3	19	6.0	705
1.8	2.5	2.5	35	8.0	1,300
2.0	7.3	3.0	94	10.0	1,900

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1.1	0.7	2.3	1.1	0.6	0.7	700	63	158	98	89	10
2	1.1	.7	2.1	1.1	.6	.7	*250	64	143	74	81	10
3	1.2	.8	2.3	*1.0	.6	.7	260	62	128	102	74	9.3
4	1.1	1.0	2.0	1.0	.6	.8	300	58	119	127	67	8.4
5	1.1	1.0	1.9	1.0	.6	.9	390	53	110	137	59	*7.3
6	.9	1.2	1.9	1.0	.5	1.0	660	45	100	274	55	6.2
7	1.0	1.3	1.8	1.0	.5	1.0	950	41	94	*339	*49	5.9
8	.7	1.6	1.8	1.0	* .5	1.1	662	39	116	745	45	5.9
9	1.1	1.6	1.9	.9	.5	1.2	339	37	212	*881	42	6.7
10	1.1	1.8	1.9	.9	.5	1.2	268	35	310	788	37	7.3
11	1.3	1.9	1.8	.9	.6	1.3	349	33	293	505	34	7.3
12	1.2	2.0	1.7	.9	.6	1.4	345	32	*227	371	32	6.7
13	1.2	2.0	1.7	.8	.6	1.5	335	47	177	278	31	5.9
14	1.1	2.0	1.7	.8	.6	1.5	308	44	136	225	29	5.9
15	1.5	1.9	1.7	.8	.6	1.6	255	*52	111	202	28	5.9
16	1.2	1.9	1.6	.8	.6	*1.7	209	110	114	190	26	5.9
17	.9	1.9	1.6	.8	.6	1.8	185	321	107	195	24	5.6
18	.9	1.9	1.6	.7	.6	1.9	*172	296	137	200	23	4.8
19	.8	1.9	1.5	.7	.6	2.0	166	252	143	390	21	4.8
20	.9	1.9	1.5	.7	.6	2.1	156	188	167	1,140	20	4.6
21	.9	1.9	1.5	.7	.6	2.3	137	172	134	1,590	19	4.6
22	.9	2.3	1.5	.7	.6	2.5	117	237	110	788	18	4.6
23	.9	2.5	1.5	.7	.6	2.8	107	650	91	505	17	4.8
24	* .9	2.5	1.5	.7	.6	3.2	98	658	77	351	16	3.7
25	.7	2.5	1.5	.7	.6	4.0	90	525	68	264	15	3.5
26	.7	2.5	1.4	.7	.6	10	81	568	58	212	14	3.7
27	.7	2.5	1.3	.6	.6	200	76	316	50	175	13	3.9
28	.7	*2.0	1.3	.6	.6	500	70	241	42	149	12	4.6
29	.8	2.3	1.2	.6	-	*1,620	64	199	37	130	11	4.8
30	.7	2.0	1.2	.6	----------	1,400	65	182	50	114	11	5.6
31	.7	----------	1.2	.6	----------	1,270	----------	167	----------	100	11	----------
Total	30.0	54.0	51.4	25.1	16.3	5,040.9	8,164	5,787	3,819	11,639	1,023	178.2
Mean	0.97	1.80	1.66	0.81	0.58	163	272	187	127	375	33.0	5.94
Cfsm	0.0024	0.0045	0.0042	0.0020	0.0015	0.410	0.683	0.470	0.319	0.942	0.083	0.015
In.	0.003	0.005	0.005	0.002	0.002	0.47	0.76	0.54	0.36	1.09	0.10	0.02
Ac-ft	60	107	102	50	32	10,000	16,190	11,480	7,570	23,080	2,030	353

Calendar year 1961: Max 200 Min 0.1 Mean 11.0 Cfsm 0.028 In. 0.37 Ac-ft 8,000
Water year 1961-62: Max 1,620 Min 0.5 Mean 98.2 Cfsm 0.247 In. 3.36 Ac-ft 71,050

Peak discharge (base, 300 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-29	1630	10.41	1,680	6- 9	1900	4.54	353
4- 7	1200	7.35	992	7- 9	1600-	7.05	1,010
5-17	1800	4.86	431		1800		
5-24	2000	7.22	1,060	7-21	0100	9.32	1,690

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 4 to Apr. 7. No gage-height record Aug. 13 to Sept. 4.

5-2940. Pomme de Terre River at Appleton, Minn.

Location.--Lat 45°12'10", long 96°01'20", in SW¼NW¼ sec.14, T.120 N., R.43 W., on left bank at Appleton, 60 ft upstream from bridge on U.S. Highway 59 and State Highway 119 and 8 miles upstream from mouth.

Drainage area.--905 sq mi, approximately.

Records available.--March 1931 to September 1935 (no winter records), October 1935 to September 1962. Prior to October 1953, published as "near Appleton".

Gage.--Water-stage recorder and concrete control. Datum of gage is 978.00 ft above mean sea level, datum of 1929. Prior to Dec. 22, 1952, staff gage at site 4 miles upstream at datum 25.17 ft higher.

Average discharge.--27 years (1935-62), 92.2 cfs (66,750 acre-ft per year).

Extremes.--Maximum discharge during year, 1,360 cfs July 22 (gage height, 7.68 ft); minimum daily, 2.6 cfs Jan. 22; minimum gage height, 3.71 ft Jan. 22.
1931-62: Maximum discharge, 5,050 cfs Apr. 8, 1952 (gage height, 10.13 ft, site and datum then in use); no flow for several periods.

Remarks.--Records good except those for period of ice effect, which are fair. Flow affected by lakes above station. Occasional regulation at low flow by old milldam 500 ft upstream.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 28 to Nov. 10)

Oct. 1 to Apr. 5				Apr. 6 to Sept. 30	
4.3	15	5.5	237	5.1	136
4.5	26	6.0	445	5.5	258
4.7	50	7.0	965	6.0	475
5.0	113			7.0	985

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	32	19	25	8.1	3.8	3.5	535	288	595	277	495	204
2	30	21	27	8.1	3.9	3.6	470	258	560	354	450	204
3	28	19	27	8.0	4.0	3.7	490	237	520	341	416	204
4	*25	19	20	8.0	4.1	3.8	570	223	490	394	407	197
5	24	21	*14	7.9	4.0	3.9	910	210	455	425	407	194
6	23	23	14	7.5	3.8	4.0	980	197	430	500	380	188
7	21	22	15	7.1	3.7	4.1	865	185	416	500	412	182
8	20	17	15	6.8	3.6	4.2	710	176	407	555	475	179
9	21	24	14	6.3	3.6	4.4	570	168	430	902	425	197
10	23	23	13	*5.9	3.6	4.5	490	162	416	1,190	384	223
11	22	25	13	5.7	3.7	4.6	590	162	402	963	358	240
12	23	25	12	5.7	3.8	4.6	715	159	394	825	341	237
13	24	24	11	5.7	*3.9	*4.6	755	182	376	790	333	223
14	24	20	11	5.6	4.0	4.6	760	234	367	780	321	207
15	23	24	10	5.2	4.1	4.6	700	210	358	780	308	201
16	24	24	10	4.7	4.2	4.6	650	262	350	760	288	207
17	22	18	10	4.3	4.2	4.7	630	244	371	725	277	217
18	23	17	10	3.9	4.1	4.7	*620	273	416	690	273	210
19	23	18	10	3.5	4.0	4.8	615	333	407	675	277	201
20	24	23	10	3.1	3.9	4.9	600	420	430	725	277	188
21	24	25	10	2.9	3.8	5.1	575	367	412	1,150	266	182
22	23	25	10	2.6	3.7	5.3	535	367	376	1,300	254	176
23	21	22	10	2.8	3.6	5.7	525	*565	346	1,100	240	171
24	20	20	9.8	3.0	3.6	6.0	490	897	341	*930	226	*168
25	18	25	9.6	3.2	3.5	6.5	445	1,010	325	860	220	174
26	20	27	9.4	3.4	3.4	7.0	407	855	304	800	213	171
27	20	19	9.2	3.5	3.4	8.2	376	795	285	750	*210	168
28	21	19	8.9	3.5	3.4	9.7	350	760	*269	695	207	162
29	22	24	8.6	3.6	-	35.0	329	725	246	640	207	154
30	20	22	8.3	3.6	--------	*162	308	680	234	590	207	162
31	*20	--------	8.1	3.7	--------	435	--------	635	--------	540	207	--------
Total	708	654	392.9	156.9	106.4	771.9	17,565	12,239	11,728	22,506	9,761	5,791
Mean	22.8	21.8	12.7	5.06	3.80	24.9	586	395	391	726	315	193
Cfsm	0.025	0.024	0.014	0.0056	0.0042	0.028	0.648	0.436	0.432	0.802	0.348	0.213
In.	0.03	0.03	0.02	0.006	0.004	0.03	0.72	0.50	0.48	0.92	0.40	0.24
Ac-ft	1,400	1,300	779	311	211	1,530	34,840	24,280	23,260	44,640	19,360	11,490

Calendar year 1961: Max 132 Min 5.3 Mean 35.3 Cfsm 0.0390 In. 0.53 Ac-ft 25,590
Water year 1961-62: Max 1,300 Min 2.6 Mean 226 Cfsm 0.250 In. 3.38 Ac-ft 163,400

Peak discharge (base, 200 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
4- 5	2030	7.56	1,270	7-22	0400-0700	7.68	1,360
4-14	0930	6.60	775				
5-25	0030	7.17	1,080	8- 8	0800	6.02	485
7-10	0500	7.46	1,240	9-11	0830	5.47	248

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 6 to Mar. 29.

5-3000. Lac qui Parle River near Lac qui Parle, Minn.

Location.--Lat 45°00', long 95°55', in SW¼SW¼ sec.27, T.118 N., R.42 W., on right bank 40 ft downstream from highway bridge and half a mile southwest of village of Lac qui Parle.

Drainage area.--983 sq mi.

Records available.--April 1910 to November 1914; March 1931 to September 1962 (winter records incomplete prior to 1934). Published as "at Lac qui Parle", 1910-14.

Gage.--Water-stage recorder. Datum of gage is 951.98 ft above mean sea level (Minnesota Highway Department bench mark). Apr. 27, 1910, to Nov. 15, 1914, staff gage at site 2 miles downstream at different datum. Mar. 17, 1931, to Mar. 9, 1937, staff gage at site 40 ft upstream at present datum.

Average discharge.--31 years (1912-13, 1931-32, 1933-62), 116 cfs (83,980 acre-ft per year).

Extremes.--Maximum discharge during year, 3,470 cfs Mar. 31 (gage height, 15.09 ft, backwater from ice); minimum daily, 0.2 cfs Jan. 10-17; minimum gage height, 0.45 ft Oct. 5, 6.
1910-14, 1931-62: Maximum discharge, 11,100 cfs Apr. 6, 1952 (gage height, 18.18 ft); maximum gage height, 18.52 ft Mar. 24, 1948 (backwater from ice). No flow at times in several years.

Remarks.--Records good except those for period of ice effect, which are fair.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1 to Nov. 16, Apr. 6-25, Sept. 12-30)

0.2	0.4	0.7	7.9	3.0	460
.3	1.1	.9	21	5.0	1,160
.4	1.9	1.2	50	7.0	2,110
.5	2.8	1.5	95	9.0	3,110
.6	4.5	2.0	189		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1.6	*1.2	4.4	0.6	0.6	1.7	3,250	217	340	59	424	18
2	1.8	1.6	4.5	.6	.6	1.7	3,000	212	314	80	361	15
3	1.6	1.9	4.8	.6	.7	1.8	*2,400	198	275	133	326	14
4	*1.5	1.6	5.1	.5	.7	1.9	2,500	182	250	393	294	12
5	1.6	2.0	*5.2	.4	.7	2.0	2,600	165	237	694	267	12
6	1.3	2.0	5.1	.4	.7	2.1	2,780	147	224	850	242	10
7	1.6	2.0	5.2	.3	.7	2.1	2,500	136	217	1,100	214	9.3
8	1.6	2.0	5.0	.3	.7	2.2	2,360	122	222	1,160	196	9.3
9	1.6	2.0	5.0	.3	.7	2.3	2,030	114	237	1,220	176	9.9
10	1.6	2.2	5.0	*.2	.8	2.3	1,620	109	261	1,130	157	9.9
11	1.6	2.2	5.0	.2	.8	2.4	1,510	107	272	968	142	8.3
12	1.6	2.4	4.7	.2	.8	2.5	1,430	104	232	804	131	7.1
13	1.6	2.6	4.2	.2	*.8	2.5	1,320	105	203	694	117	4.8
14	1.6	3.8	3.8	.2	.8	2.6	1,220	105	176	601	105	4.0
15	1.7	3.6	3.5	.2	.8	*2.7	1,110	109	157	559	92	3.8
16	1.7	3.8	3.2	.2	.9	2.7	991	119	149	556	81	5.7
17	1.8	4.0	3.0	.2	.9	2.8	854	114	143	633	70	4.2
18	1.9	4.2	2.6	.3	.9	3.0	646	119	153	684	63	3.6
19	2.0	4.2	2.3	.3	1.0	3.1	*492	140	147	908	56	3.3
20	2.0	4.2	2.0	.3	1.1	3.3	479	136	147	1,250	49	3.3
21	2.0	4.2	1.8	.3	1.1	3.5	436	159	133	1,410	43	4.0
22	1.8	4.2	1.6	.3	1.2	4.0	404	208	161	1,400	39	3.6
23	1.9	4.2	1.4	.3	1.3	4.6	361	410	157	1,180	36	4.5
24	1.8	4.2	1.2	.4	1.3	5.2	318	*530	133	*1,010	31	6.0
25	1.6	4.2	1.1	.4	1.4	6.0	310	694	112	880	29	*7.9
26	1.5	4.2	1.0	.3	1.5	7.2	278	626	98	770	26	7.9
27	1.5	4.1	.9	.5	1.5	9.0	253	527	86	674	23	8.8
28	1.5	4.2	.8	.5	1.6	11	237	445	*74	601	*22	9.9
29	1.1	4.4	.7	.5	-	60	227	401	64	546	19	12
30	.9	4.4	.7	.5	----------	700	224	384	56	498	17	19
31	1.1	---------	.6	.6	----------	*3,400	----------	364	----------	454	17	----------
Total	50.0	95.8	95.4	11.3	26.6	4,258.2	38,140	7,508	5,430	23,899	3,865	251.1
Mean	1.61	3.19	3.08	0.36	0.95	137	1,271	242	181	771	125	8.37
Cfsm	0.0016	0.0032	0.0031	0.00037	0.00097	0.139	1.29	0.246	0.184	0.784	0.127	0.0085
In.	0.002	0.004	0.004	0.0004	0.001	0.16	1.44	0.28	0.21	0.90	0.15	0.009
Ac-ft	99	190	189	22	53	8,450	75,650	14,890	10,770	47,400	7,670	498

Calendar year 1961: Max 389 Min 0 Mean 28.2 Cfsm 0.029 In. 0.39 Ac-ft 20,400
Water year 1961-62: Max 3,400 Min 0.2 Mean 229 Cfsm 0.233 In. 3.16 Ac-ft 165,900

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 27 to Apr. 5.

5-3010. Minnesota River near Lac qui Parle, Minn.

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

Drainage area.--4,050 sq mi, approximately.

Records available.--October 1942 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 900.00 ft above mean sea level, datum of 1929 (levels by Corps of Engineers). Prior to Nov. 10, 1944, at datum 0.20 ft lower.

Average discharge.--20 years, 661 cfs (478,500 acre-ft per year).

Extremes.--Maximum discharge during year, 4,330 cfs July 24 (gage height, 33.57 ft); minimum daily, 19 cfs Oct. 31, Nov. 2; minimum gage height, 20.50 ft Oct. 1, 4-7.
1942-62: Maximum discharge, 19,700 cfs Apr. 10, 1952 (gage height, 37.98 ft, from floodmark); no flow Nov. 17, 1942, Sept. 29, 1947, Oct. 19 to Nov. 18, 1951, Nov. 24, 1952.

Remarks.--Records good except those for period of ice effect, which are fair. Part of flow from 2,050 square miles of Chippewa River basin at times diverted into Minnesota River above station. Some regulation by Big Stone Lake since Apr. 17, 1927, Lac qui Parle Lake since January 1938, and Marsh Lake since Nov. 1, 1939

Rating tables, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 10 to Nov. 15, May 3-10, Sept. 7-30)

Oct. 1 to May 6				May 7 to Sept. 30	
20.4	19	26.0	1,060	26.0	980
20.6	32	28.0	1,610	28.0	1,480
20.8	54	30.0	2,310	30.0	2,050
21.3	131	32.0	3,450	32.0	3,000
22.0	243	34.0	5,270	34.0	4,780
24.0	612				

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	20	20	30	28	27	108	1,200	2,730	1,570	1,710	3,740	1,370
2	21	19	30	29	27	108	1,870	2,630	1,620	1,730	3,570	1,340
3	21	20	30	29	28	108	*2,800	2,530	1,670	1,720	3,430	1,320
4	*20	20	30	29	30	108	3,360	2,270	1,720	1,820	3,290	1,220
5	20	20	*30	29	29	108	3,700	1,920	1,770	1,880	3,140	1,060
6	20	20	30	29	27	108	4,120	1,850	1,800	1,960	3,070	1,030
7	20	20	30	28	26	108	4,270	1,800	1,830	2,110	2,980	1,010
8	20	20	30	27	26	108	4,540	1,770	1,880	2,290	2,870	994
9	20	20	30	26	27	107	4,570	1,690	1,900	2,390	2,740	1,000
10	21	20	30	26	28	107	4,460	1,640	1,960	2,520	2,630	997
11	23	21	30	26	29	106	4,400	1,590	1,990	2,620	2,580	966
12	23	21	29	*27	30	105	4,310	1,550	2,000	2,760	2,530	920
13	23	21	29	27	*31	*104	4,220	1,530	2,000	2,840	2,180	709
14	23	21	28	27	32	103	4,110	1,510	1,990	2,900	1,880	660
15	21	21	28	26	32	102	3,960	1,480	1,980	2,980	1,820	570
16	21	23	29	26	32	102	3,840	1,260	1,990	3,050	1,770	576
17	22	26	29	25	32	102	3,750	1,010	2,020	3,050	1,690	563
18	22	27	29	25	32	101	3,660	1,020	2,050	2,910	1,620	559
19	21	27	29	25	32	101	*3,570	1,040	2,010	3,240	1,580	508
20	21	28	28	25	32	100	3,490	1,040	2,010	3,730	1,530	465
21	23	29	29	25	31	99	3,440	1,050	1,990	4,120	1,560	460
22	23	29	29	25	31	98	3,310	1,160	1,990	4,220	1,560	453
23	23	29	29	26	31	97	3,170	1,300	1,980	*4,270	1,520	445
24	24	29	28	26	31	96	3,130	*1,280	1,950	4,280	1,480	*450
25	24	30	28	27	30	96	3,080	1,330	1,920	4,290	1,460	445
26	24	30	28	27	30	96	3,020	1,380	1,890	4,220	1,360	417
27	22	30	27	27	90	96	2,970	1,430	1,840	4,150	1,380	396
28	21	30	27	26	100	160	2,900	1,380	*1,810	4,120	*1,450	318
29	20	30	27	27	-	260	2,840	1,230	1,790	4,040	1,430	217
30	20	30	28	28	----------	450	2,800	1,340	1,750	4,020	1,410	221
31	*19	----------	28	27	----------	*891	----------	1,490	----------	3,890	1,390	----------
Total	666	731	896	830	963	4,543	104,860	48,230	56,670	95,830	66,640	21,659
Mean	21.5	24.4	28.9	26.8	34.4	147	3,495	1,556	1,889	3,091	2,150	722
Ac-ft	1,320	1,450	1,780	1,650	1,910	9,010	208,000	95,660	112,400	190,100	132,200	42,960

Calendar year 1961: Max 936 Min 19 Mean 101 Ac-ft 73,110
Water year 1961-62: Max 4,570 Min 19 Mean 1,100 Ac-ft 798,400

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 16 to Apr. 2.

5-3045. Chippewa River near Milan, Minn.

Location.--Lat 45°06'39", long 95°47'57", in SE¼SE¼ sec.16, T.119 N., R.41 W., on right bank 800 ft upstream from bridge on State Highway 40, 2.0 miles upstream from small tributary, and 5½ miles east of Milan.

Drainage area.--1,870 sq mi, approximately.

Records available.--March 1937 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 959.69 ft above mean sea level, datum of 1929. Prior to Mar. 23, 1940, chain gage and Mar. 23, 1940, to June 14, 1942, wire-weight gage, on bridge 800 ft downstream at same datum.

Average discharge.--25 years, 236 cfs (170,900 acre-ft per year).

Extremes.--Maximum discharge during year, 1,680 cfs Apr. 4 (gage height, 8.32 ft); maximum gage height, 8.36 ft Apr. 4 (backwater from ice); minimum daily, 5.0 cfs Feb. 26-28.
1937-62: Maximum discharge, 6,930 cfs Apr. 9, 1952 (gage height, 12.12 ft); maximum gage height, 12.29 ft Apr. 7, 1952 (backwater from ice); no flow at times during 1940.

Remarks.--Records good except those for periods of ice effect, which are fair. Flow regulated by several small lakes above gage.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
. (Shifting-control method used July 5 to Aug. 5)

Oct. 1 to Apr. 6		Apr. 7 to Sept. 30			
1.2	12	2.2	187	4.0	1,020
1.4	28	2.5	277	5.0	1,570
1.6	51	3.0	479	6.0	2,160
		3.5	744		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	32	27	35	11	5.3	5.1	*1,030	261	712	284	1,070	308
2	31	32	35	11	5.3	5.3	*990	255	684	361	1,010	297
3	*30	34	36	11	5.4	5.5	1,050	242	641	460	962	294
4	30	26	37	10	5.4	5.8	1,200	230	625	641	918	287
5	27	29	*37	10	5.3	6.2	1,400	221	599	1,430	874	280
6	27	37	33	9.0	5.2	6.5	1,200	207	572	1,300	847	271
7	25	36	32	8.2	5.1	7.0	1,100	207	551	1,250	836	261
8	25	34	32	7.6	5.1	7.3	1,000	201	588	1,290	809	267
9	25	33	31	7.1	5.1	7.7	701	201	663	1,340	776	297
10	25	35	30	6.8	5.1	7.8	787	198	712	1,340	749	337
11	28	40	29	*7.0	5.2	7.8	782	201	728	1,300	728	348
12	38	44	28	7.0	5.2	7.8	793	204	701	1,270	722	342
13	38	41	27	6.9	5.2	7.8	766	230	67[illegible]	1,240	701	330
14	34	35	26	6.8	*5.3	*7.8	701	287	[illegible]	1,190	674	311
15	35	33	24	6.6	5.3	7.8	668	297	652	1,150	647	301
16	34	35	24	6.2	5.4	7.9	647	318	610	1,120	615	308
17	34	34	23	6.0	5.4	8.0	610	326	583	1,070	588	318
18	32	36	22	5.8	5.4	8.2	*594	341	556	1,020	567	315
19	32	36	21	5.6	5.4	8.4	515	348	562	1,080	546	301
20	30	37	20	5.5	5.2	8.6	469	367	562	1,510	515	284
21	30	41	20	5.4	5.2	8.8	456	371	541	1,510	494	277
22	31	38	19	5.4	5.2	9.1	422	479	515	1,450	469	267
23	30	38	18	5.5	5.2	9.3	386	*766	484	1,550	445	261
24	29	37	17	5.5	5.2	9.6	363	1,060	441	*1,600	426	*261
25	30	37	17	5.5	5.2	10	337	1,040	404	1,580	408	255
26	31	41	16	5.5	5.0	11	318	968	371	1,510	395	255
27	30	39	15	5.4	5.0	110	297	940	337	1,410	*378	248
28	27	31	14	5.4	5.0	830	284	918	*315	1,330	348	242
29	30	30	13	5.3		1,050	277	862	294	1,260	333	239
30	28	36	13	5.2	----------	1,030	267	820	280	1,210	326	258
31	*25	----------	12	5.2	----------	1,100	----------	776	----------	1,130	318	----------
Total	933	1,062	756	214.4	146.3	4,322.1	20,410	14,142	16,641	37,186	19,494	8,620
Mean	30.1	35.4	24.4	6.92	5.22	139	680	456	555	1,200	629	287
Cfsm	0.0016	0.019	0.013	0.0037	0.0028	0.074	0.364	0.244	0.297	0.642	0.336	0.153
In.	0.002	0.02	0.02	0.004	0.003	0.09	0.41	0.28	0.33	0.74	0.39	0.17
Ac-ft	1,850	2,110	1,500	425	290	8,570	40,480	28,050	33,010	73,760	38,670	17,100

Calendar year 1961: Max 316 Min 4.7 Mean 53.4 Cfsm 0.029 In. 0.36 Ac-ft 38,680
Water year 1961-62: Max 1,600 Min 5.0 Mean 340 Cfsm 0.182 In. 2.46 Ac-ft 245,800

Peak discharge (base, 400 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
4- 4	2330	8.32	1,680	7- 5	1130-1400	5.00	1,520
5-24-25	2300-0100	4.13	1,090				
6-10	1900-2300	3.56	760	7-24	2000	5.28	1,610

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 5-11, 14-20, Nov. 23 to Apr. 6.

5-3110. Minnesota River at Montevideo, Minn.

Location.--Lat 44°56'00", long 95°44'00", in NW¼NW¼ sec.19, T.117 N., R.40 W., 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 sq mi, approximately.

Records available.--July 1909 to September 1917, October 1917 to September 1929 (no winter records), October 1929 to September 1962. Prior to October 1939 published as "near Montevideo." Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 910.87 ft above mean sea level, adjustment of 1912. July 22, 1909, to Feb. 4, 1932, chain gage at bridge 600 ft downstream at present datum. Feb. 5, 1932, to Nov. 26, 1934, chain gage at bridge 100 ft downstream at present datum.

Average discharge.--41 years (1909-17, 1929-62), 623 cfs (451,000 acre-ft per year).

Extremes.--Maximum discharge during year, 5,790 cfs July 26 (gage height, 14.57 ft); minimum daily, 37 cfs Feb. 18-21; minimum gage height, 1.77 ft Oct. 8.
1909-62: Maximum discharge, 24,500 cfs, Apr. 10, 1952 (gage height, 20.02 ft, from floodmark); no flow for several days in 1933-34, 1936.

Remarks.--Records good except those for period of ice effect, which are fair. Flow regulated by Big Stone Lake since Apr. 17, 1937, Lac qui Parle since January 1938 and Marsh Lake since Nov. 1, 1939.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)

1.7	39	6.0	874
2.0	70	8.0	1,560
2.5	135	10.0	2,410
3.0	208	12.0	3,500
4.0	379	14.0	5,050
5.0	596	15.0	6,480

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	50	*48	68	43	40	74	1,600	2,800	2,080	2,040	5,060	1,670
2	52	53	67	43	40	105	2,000	2,720	2,120	2,060	4,930	1,630
3	51	54	66	43	40	110	*2,500	2,660	2,160	2,100	4,790	1,600
4	51	52	64	43	40	110	3,500	2,570	2,210	2,200	4,630	1,570
5	*51	49	62	43	40	110	4,000	2,360	2,260	2,330	4,460	1,390
6	50	47	63	42	40	111	4,380	2,160	2,310	2,440	4,280	1,320
7	46	54	*63	41	39	112	4,880	2,050	2,340	2,520	4,100	1,290
8	45	50	62	41	39	112	5,100	1,990	2,400	2,590	3,940	1,290
9	45	47	60	41	39	111	5,100	1,950	2,440	2,660	3,780	1,320
10	53	44	60	42	39	112	5,240	1,870	2,520	2,730	3,660	1,330
11	54	60	59	42	39	112	5,140	1,830	2,560	2,810	3,530	1,330
12	51	60	58	*43	*39	112	5,100	1,800	2,580	2,890	3,420	1,320
13	54	60	56	43	38	111	4,980	1,800	2,580	3,010	3,300	1,150
14	60	55	55	43	38	*110	4,840	1,780	2,580	3,130	3,140	1,050
15	57	55	54	42	38	111	4,690	1,800	2,560	3,250	2,930	954
16	57	55	54	41	38	112	4,520	1,740	2,550	3,380	2,710	941
17	57	64	54	41	38	112	4,390	1,420	2,550	3,480	2,530	928
18	52	55	54	40	37	112	4,260	1,390	2,560	3,560	2,380	916
19	51	62	53	40	37	113	*4,140	1,420	2,550	3,750	2,260	887
20	50	70	52	39	37	113	3,980	1,420	2,540	4,090	2,170	823
21	49	71	51	39	37	113	3,830	1,420	2,520	4,370	2,090	793
22	48	72	50	40	38	114	3,790	1,540	2,520	4,730	2,060	778
23	47	66	50	41	39	115	3,550	*1,840	2,540	*5,310	2,020	760
24	46	63	49	41	39	116	3,380	1,980	2,480	5,620	1,960	751
25	45	70	48	40	40	118	3,270	2,040	2,420	5,730	1,900	*748
26	45	75	47	40	41	127	3,180	2,030	2,350	5,790	1,840	734
27	46	71	46	40	42	198	3,100	2,040	*2,280	5,720	1,780	698
28	47	63	45	40	48	420	3,020	2,070	2,190	5,620	*1,770	664
29	48	65	44	40	-	670	2,920	1,880	2,130	5,510	1,750	534
30	48	68	44	40	----------	890	2,870	1,900	2,080	5,390	1,740	525
31	47	----------	43	40	----------	1,200	----------	1,990	----------	5,220	1,710	----------
Total	1,553	1,778	1,701	1,277	1,099	6,266	117,250	60,260	71,960	116,030	92,620	31,694
Mean	50.1	59.3	54.9	41.2	39.2	202	3,908	1,944	2,399	3,743	2,988	1,056
Ac-ft	3,080	3,530	3,370	2,530	2,180	12,430	232,600	119,500	142,700	230,100	183,700	62,860

Calendar year 1961: Max 1,170 Min 28 Mean 170 Ac-ft 122,900
Water year 1961-62: Max 5,790 Min 37 Mean 1,379 Ac-ft 998,600

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 29 to Apr. 4.

5-3114. South Branch Yellow Medicine River at Minneota, Minn.

Location.--Lat 44°33'50", long 95°59'50", in SE¼ sec.26, T.113 N., R.43 W., on left upstream wingwall of bridge on State Highway 68, 0.5 mile northwest of Minneota, and 6 miles upstream from confluence with North Branch Yellow Medicine River.

Records available.--July 1960 to September 1962.

Gage.--Staff gage read once daily. Datum of gage is 1,150.00 ft above mean sea level, datum of 1929.

Extremes.--Maximum discharge during year, 1,350 cfs Mar. 29 (gage height, 10.75 ft, backwater from ice); no flow at times.
1959-62: Maximum discharge, that of Mar. 29, 1962; no flow at times.

Remarks.--Records fair above 100 cfs and poor below.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0.3	1.2	0.3	0.1	0	505	48	52	28	44	3.6
2	0	.8	1.2	.3	.1	0	361	45	44	474	33	2.5
3	0	*1.3	1.2	.4	.2	0	*352	43	39	261	30	2.8
4	0	1.4	1.2	.4	.3	0	443	40	39	456	27	3.8
5	0	1.2	1.1	.3	.3	0	448	37	39	369	25	3.1
6	*0	1	1.0	.3	.2	0	441	38	77	228	22	2.9
7	0	.9	*.9	.2	.2	0	322	38	67	151	20	2.6
8	0	.8	.8	.2	.2	0	246	34	54	119	18	2.4
9	0	.9	.7	.2	.2	0	205	33	46	112	17	4.5
10	.1	1	.6	.2	.2	0	172	32	43	88	16	4.5
11	.2	1.2	.6	.2	.2	0	131	32	41	70	15	3.8
12	.1	1.2	.5	.2	.3	0	117	35	39	58	13	3.0
13	0	1.0	.4	.1	.3	0	89	40	35	62	12	2.6
14	0	.9	.3	.1	.4	0	79	52	32	75	11	2.8
15	0	.9	.2	0	*.4	0	75	43	28	259	9.6	2.6
16	0	1.0	.2	0	.4	*0	75	39	24	236	8.4	3.1
17	0	1.0	.2	*0	.4	0	106	38	27	163	7.0	3.6
18	0	.9	.2	0	.3	0	171	42	28	121	6.5	3.1
19	.1	.9	.2	0	.3	0	142	75	25	299	6.3	3.2
20	.1	.8	.1	0	.3	0	99	62	22	267	5.4	2.9
21	.1	.8	.1	0	.3	0	88	46	*18	151	4.8	2.2
22	.1	.8	.1	0	.2	0	80	*212	16	106	4.2	2.1
23	0	.9	.1	0	.2	0	65	277	15	78	4.0	2.0
24	0	.9	.1	0	.1	0	60	196	12	62	3.8	1.8
25	0	1.0	.2	0	.1	0	*52	119	11	54	3.2	1.6
26	0	1.0	.2	0	.1	4	51	84	9.8	*46	3.0	1.4
27	.1	1.1	.2	0	0	650	49	75	9.3	41	2.8	*1.2
28	.1	1.1	.2	0	0	*1,100	50	64	8.7	39	2.3	1.0
29	.2	1.1	.2	0	-	1,240	49	64	10	34	2.2	1.1
30	.6	1.1	.3	.1	----------	1,030	51	80	13	48	*3.6	2.6
31	.6	----------	.3	.1	----------	713	----------	60	----------	38	6.3	----------
Total	2.4	29.2	14.8	3.6	6.3	4,737	5,174	2,123	923.8	4,593	386.4	80.4
Mean	0.08	0.97	0.48	0.12	0.22	153	172	68.5	30.8	148	12.5	2.68
Ac-ft	4.8	58	29	7.1	12	9,395	10,260	4,211	1,832	9,110	766	159

Calendar year 1961: Max 77 Min 0 Mean 4.55 Ac-ft 3,300
Water year 1961-62: Max 1,240 Min 0 Mean 49.5 Ac-ft 35,840

* Discharge measurement or observation of no flow made on this day.

Note.--Stage-discharge relation affected by ice Nov. 4 to Mar. 29, Apr. 9. Stage-discharge relation indefinite June 13-19, 22, July 10-14, Sept. 24, 25, 28-30; discharge estimated on basis of discharge measurements, observer's notes and weather records.

5-3135. Yellow Medicine River near Granite Falls, Minn.

Location.--Lat 44°43', long 95°31', in sec.35, T.115 N., R.39 W., on right bank 50 ft downstream from highway bridge, 6 miles upstream from mouth, and 8 miles south of town of Granite Falls.

Drainage area.--653 sq mi.

Records available.--March 1931 to September 1935 (no winter records), October 1935 to September 1938, October 1939 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 971.59 ft above mean sea level, datum of 1929. Mar. 16, 1931, to June 10, 1936, chain gage and June 11, 1936, to June 13, 1938, wire-weight gage, on bridge 50 ft upstream at same datum. Oct. 12, 1939, to Nov. 30, 1952, staff gage 500 ft downstream at same datum.

Average discharge.--26 years (1935-38, 1939-62), 101 cfs (73,120 acre-ft per year).

Extremes.--Maximum discharge during year, 3,150 cfs Mar. 31 (gage height, 7.38 ft); minimum, 1.8 cfs Oct. 7, 8. 1931-38, 1939-62: Maximum discharge, 11,800 cfs June 18, 1957 (gage height, 12.41 ft); no flow at times in 1931, 1933, 1948, 1959.
Flood in June 1919 reached a stage of 17.5 ft, from information by local residents.

Remarks.--Records good except those for period of ice effect, which are fair.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1 to Dec. 5)

2.0	1.9	2.6	46	5.0	1,180
2.1	3.1	2.8	87	6.0	1,880
2.2	6.2	3.0	145	7.0	2,750
2.3	11	3.3	247	8.0	3,950
2.4	19	4.0	560		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	2.0	4.0	5.8	4.5	5.0	3.7	*2,910	212	335	56	326	16
2	2.0	5.8	7.1	4.6	5.1	3.7	2,620	209	293	98	281	16
3	2.0	*5.8	6.6	4.6	5.2	3.7	2,350	195	255	195	255	18
4	2.0	4.6	*6.2	4.6	5.1	3.6	2,010	178	236	570	233	16
5	2.0	4.0	5.8	4.6	5.0	3.6	1,750	158	230	736	205	14
6	*2.0	3.7	5.6	4.6	4.9	3.6	1,730	139	216	863	185	14
7	2.0	3.5	5.4	4.5	4.9	3.7	1,750	130	247	1,070	165	12
8	2.0	3.3	5.3	4.5	4.8	3.7	1,770	120	322	1,080	145	19
9	2.2	3.3	5.2	4.4	4.8	3.7	1,610	111	365	922	126	23
10	2.9	3.5	5.2	4.4	4.8	3.7	1,410	106	335	778	111	20
11	3.5	5.4	5.2	4.4	4.9	3.7	1,230	106	314	682	100	17
12	3.7	5.8	5.2	4.4	5.1	3.7	1,120	106	266	595	92	17
13	3.7	5.4	5.2	4.4	5.1	3.7	1,040	111	233	646	85	14
14	3.7	5.0	5.2	4.4	*5.1	3.8	1,000	117	205	428	78	13
15	3.5	4.6	5.2	4.4	5.1	*3.8	889	152	181	400	69	12
16	3.3	4.6	5.2	4.4	5.0	3.7	802	158	162	490	61	12
17	3.3	4.6	5.1	*4.5	4.9	3.7	*700	133	152	736	56	12
18	3.5	4.6	5.0	4.5	4.8	3.8	664	123	136	778	52	11
19	3.5	4.6	5.0	4.5	4.7	3.8	658	123	133	814	46	9.6
20	3.7	4.6	5.0	4.5	4.6	3.8	676	145	130	838	42	9.6
21	3.5	4.6	4.9	4.5	4.4	3.9	605	255	126	1,010	38	10
22	3.5	5.4	4.8	4.5	4.2	4.0	525	326	*120	1,230	36	9.6
23	3.5	5.4	4.8	4.6	4.1	4.1	466	447	103	1,230	31	9.6
24	3.7	6.2	4.8	4.6	4.0	4.2	410	*616	109	993	29	9.1
25	3.5	6.2	4.8	4.7	3.9	4.5	356	736	126	*754	25	*9.1
26	3.7	7.1	4.7	4.7	3.8	4.9	310	652	87	610	24	9.1
27	3.7	6.2	4.7	4.8	3.7	5.7	285	535	78	525	23	11
28	4.0	5.8	4.6	4.8	3.7	19	255	456	63	461	19	8.1
29	5.0	5.4	4.6	4.8		160	236	410	56	405	*16	9.6
30	4.6	5.8	4.6	4.9		500	230	378	52	369	24	12
31	4.0		4.5	5.0		2,290		352		365	25	
Total	99.2	148.8	161.3	141.6	130.7	3,074.5	32,367	7,995	5,666	20,727	3,003	392.4
Mean	3.20	4.96	5.20	4.57	4.67	99.2	1,079	258	189	669	96.9	13.1
Cfsm	0.0049	0.0076	0.0080	0.0070	0.0072	0.152	1.65	0.395	0.289	1.02	0.148	0.020
In.	0.006	0.008	0.009	0.008	0.007	0.17	1.84	0.45	0.32	1.18	0.17	0.02
Ac-ft	197	295	320	281	259	6,100	6,420	1,590	1,120	4,110	5,960	778

Calendar year 1961: Max 365 Min 1.9 Mean 25.5 Cfsm 0.039 In. 0.52 Ac-ft 18,460
Water year 1961-62 Max 2,910 Min 2.0 Mean 202 Cfsm 0.309 In. 4.19 Ac-ft 2,910

Peak discharge (base, 100 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-31	2330	7.38	3,150	6-25	0330	3.00	145
5-15	2100	3.10	178	7- 7	1700	4.92	1,120
5-25	1200	4.33	748	7-22	2300	5.15	1,280
6- 9	0400	3.63	382				

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 6 to Mar. 31.

5-3150. Redwood River at Marshall, Minn.

Location.--Lat 44°27', long 95°47', in NW¼ sec.4, T.111 N., R.41 W., on upstream side of highway bridge on Fourth Street in Marshall and 10 miles upstream from Threemile Creek.

Drainage area.--307 sq mi.

Records available.--March 1940 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Chain gage read twice daily. Datum of gage is 1,144.88 ft above mean sea level, datum of 1929.

Average discharge.--22 years, 49.3 cfs (35,690 acre-ft per year).

Extremes.--Maximum discharge during year, 1,270 cfs Mar. 31 (gage height, 6.35 ft, backwater from ice); maximum gage height, 7.40 ft Mar. 28 (from floodmark, backwater from ice); minimum daily, 1.5 cfs Feb. 28, Mar. 1.
1940-62: Maximum discharge, 5,370 cfs June 17, 1957 (gage height, 10.14 ft); maximum gage height, 11.05 ft Apr. 6, 1951 (from floodmark); no flow at times.

Remarks.--Records fair except those for periods of ice effect or no gage-height record, which are poor. Unknown amount of natural diversion into Cottonwood River basin at extremely high stages.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1-26, May 22-31)

0.6	1.0	1.2	26	4.0	726
.7	2.2	1.3	38	5.0	1,050
.8	4.0	1.5	76	6.0	1,390
1.0	13	2.0	185		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1.8	9.0	4.0	2.4	2.1	1.5	1,180	139	260	95	117	6.0
2	2.0	12	5.2	2.4	3.5	1.6	790	123	222	302	86	a5.0
3	1.6	*9.0	a5.2	2.4	7.0	1.8	774	110	a205	368	82	4.3
4	1.6	6.5	6.0	2.5	9.0	a1.9	*786	108	192	524	72	4.3
5	1.8	6.0	3.6	2.6	8.0	1.8	866	97	197	518	60	4.3
6	*2.2	4.6	5.0	2.6	5.2	1.8	972	86	200	569	50	3.8
7	1.8	6.5	*3.4	2.5	a4.6	1.8	885	84	200	604	45	3.8
8	1.8	4.8	3.4	2.4	a4.2	2.0	812	82	207	507	30	3.6
9	1.9	4.6	3.6	2.3	a4.2	2.2	459	74	229	443	25	a4.4
10	3.8	4.6	a3.4	2.3	a4.9	2.6	496	74	205	392	21	4.8
11	3.0	5.2	3.4	2.3	a5.4	3.1	476	72	174	341	19	4.6
12	4.0	7.6	3.2	2.4	a6.0	a3.5	426	66	154	295	18	3.0
13	3.8	5.6	3.2	2.5	a6.4	a3.8	346	a72	143	262	15	3.8
14	3.8	5.2	3.0	2.5	a6.7	4.2	325	84	126	270	14	3.4
15	3.6	6.5	2.8	2.6	*7.2	4.5	310	89	117	290	12	3.8
16	3.2	6.5	2.7	a2.6	6.6	*4.8	290	80	84	300	10	3.4
17	2.8	6.0	2.7	*2.5	6.0	5.0	320	64	130	280	9.0	4.8
18	2.8	5.6	2.6	2.3	a5.4	5.0	578	70	148	250	8.5	4.8
19	2.6	6.0	2.6	a2.0	4.8	5.5	558	a100	a148	312	a7.5	3.8
20	2.5	7.0	2.5	1.8	4.2	7.0	549	a150	150	373	7.0	4.3
21	2.6	7.0	2.5	1.7	a3.7	8.0	454	a220	*130	349	6.5	4.8
22	3.2	7.0	2.5	1.6	a3.2	10	370	*401	101	323	5.2	4.0
23	3.2	a7.5	2.6	1.6	2.9	18	307	561	89	270	5.6	a4.2
24	3.4	8.0	2.6	1.6	a2.5	20	257	675	a82	227	5.2	4.8
25	3.4	8.0	2.7	1.7	a2.2	30	227	590	78	*187	a4.8	4.6
26	3.4	8.0	2.7	1.8	2.0	140	*187	454	68	165	4.6	*4.8
27	6.0	8.0	2.7	1.8	a1.7	300	174	a380	62	150	4.0	4.3
28	8.0	4.6	2.6	1.8	1.5	900	174	338	54	134	3.8	4.3
29	15	8.0	2.5	1.9	-	*950	152	338	58	132	3.6	6.0
30	10	3.6	2.4	1.9	----------	900	154	359	58	128	*9.0	4.6
31	9.0	----------	2.4	1.9	----------	1,250	----------	277	----------	126	6.5	----------
Total	119.6	198.5	99.7	67.2	131.1	4,591.4	14,654	6,417	4,271	9,486	766.8	130.4
Mean	3.86	6.62	3.22	2.17	4.68	148	488	207	142	306	24.7	4.35
Cfsm	0.013	0.022	0.010	0.0071	0.015	0.482	1.59	0.674	0.463	0.997	0.080	0.014
In.	0.01	0.02	0.01	0.008	0.02	0.56	1.78	0.78	0.52	1.15	0.09	0.02
Ac-ft	237	394	198	133	260	9,110	29,070	12,730	8,470	18,820	1,520	259

Calendar year 1961: Max 190 Min 0.6 Mean 18.0 Cfsm 0.059 In. 0.78 Ac-ft 13,020
Water year 1961-62: Max 1,250 Min 1.5 Mean 112 Cfsm 0.365 In. 4.97 Ac-ft 81,200

* Discharge measurement made on this day.
a No gage-height record.
Note.--Stage-discharge relation affected by ice Dec. 6 to Apr. 2.

5-3165. Redwood River near Redwood Falls, Minn.

Location.--Lat 44°31'25", long 95°10'20", in SE¼NE¼ sec.9, T.112 N., R.36 W., on right bank 20 ft upstream from highway bridge, 3 miles west of town of Redwood Falls, and 8.5 miles upstream from mouth.

Drainage area.--697 sq mi.

Records available.--July 1909 to September 1911 (no winter records), October 1911 to September 1912, October 1912 to September 1914 and August 1930 to September 1935 (no winter records), October 1935 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 972.33 ft above mean sea level, datum of 1929. July 1909 to September 1914, chain gage at bridge 20 ft downstream at datum 0.22 ft lower. August 1930 to Mar. 25. 1940, chain gage and Mar. 26, 1940, to Oct. 25, 1949, wire-weight gage, at bridge 20 ft downstream at present datum

Average discharge.--28 years (1911-12, 1935-62), 98.4 cfs (71,240 acre-feet per year).

Extremes.--Maximum discharge during year, 3,980 cfs Mar. 31 (gage height, 11.72 ft, backwater from ice); maximum gage height, 12.27 ft Mar. 31 (backwater from ice); minimum daily, 1.3 cfs Jan. 19-22, 1909-14, 1930-62: Maximum discharge, 19,700 cfs June 18, 1957 (gage height, 15.92 ft, from floodmark); no flow for several days in January 1940 and for part of each day Aug. 19, 20, 1959.

Remarks.--Records good except those for period of ice effect, which are poor. Natural discharge affected by unknown amount of interbasin flow between Yellow Medicine, Redwood and Cottonwood River basins during extreme floods.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)

1.3	1.6	1.8	35	4.0	975
1.4	4.6	2.0	70	5.0	1,630
1.5	9.7	2.5	201	6.0	2,360
1.6	16	3.0	390	7.0	3,260

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	6.1	25	16	5.1	2.1	2.6	*2.950	287	446	119	238	48
2	5.1	30	15	5.2	2.2	2.6	2.600	266	400	358	221	40
3	5.1	28	15	5.4	2.3	2.7	2.260	241	368	695	204	40
4	5.1	23	16	5.6	4.7	2.7	*2.000	218	341	803	189	38
5	3.3	24	17	5.8	5.2	2.8	1.760	201	325	962	173	34
6	4.1	24	12	5.6	5.0	2.9	1.700	186	321	988	170	31
7	4.1	*25	8.2	5.0	4.5	3.0	1.550	173	325	1.050	148	30
8	4.1	23	*11	4.0	5.2	3.1	1.480	170	468	1.120	129	30
9	5.6	21	12	3.5	7.6	3.2	1.290	159	478	1.120	116	31
10	5.6	20	13	3.4	7.5	3.3	1.290	156	405	1.050	108	35
11	6.6	25	12	3.2	6.9	3.5	1.100	156	390	910	101	37
12	*8.1	25	10	3.0	6.1	3.6	897	156	345	737	91	38
13	9.7	22	8.8	3.0	5.5	3.7	815	170	309	586	85	33
14	7.6	20	7.8	3.1	5.0	3.8	725	179	283	495	76	30
15	7.1	18	7.2	2.9	4.0	4.0	665	182	248	468	70	25
16	8.1	20	7.0	*2.6	*3.5	4.1	641	182	224	478	63	28
17	10	19	6.6	1.8	3.3	4.2	659	173	244	490	56	26
18	9.2	15	6.5	1.5	3.2	4.4	665	170	262	517	52	26
19	9.2	13	6.2	1.3	3.1	4.8	707	201	266	635	50	23
20	8.6	14	6.0	1.3	3.0	*5.8	*749	231	266	713	45	23
21	9.2	16	6.0	1.3	3.0	5.9	785	*269	262	677	40	23
22	9.7	18	5.8	1.3	2.9	6.4	779	495	*227	677	38	22
23	11	17	5.8	1.4	2.8	7.8	665	713	204	671	35	20
24	11	16	5.8	1.6	2.7	18	550	731	201	605	33	20
25	12	16	5.8	2.0	2.7	42	468	773	176	*473	31	18
26	11	18	5.8	1.9	2.6	100	405	827	156	386	28	*16
27	12	16	5.6	1.9	2.6	262	363	845	137	333	28	15
28	13	13	5.4	2.1	2.6	450	345	767	124	313	27	15
29	26	12	5.3	2.2	-	660	325	623	114	283	*26	15
30	24	13	5.2	2.2	----------	*968	305	556	114	280	42	19
31	26	--------	5.1	2.2	----------	3.410	----------	495	--------	258	52	----------
Total	297.3	589	274.9	92.4	111.8	6.000.9	31.493	10.951	8.429	19.250	2.765	829
Mean	9.59	19.6	8.87	2.98	3.99	194	1,050	353	281	621	89.2	27.6
Cfsm	0.014	0.028	0.013	0.0043	0.0057	0.278	1.51	0.506	0.403	0.891	0.128	0.040
In.	0.02	0.03	0.01	0.005	0.006	0.32	1.68	0.58	0.45	1.03	0.15	0.04
Ac-ft	590	1,170	545	183	221	11,900	62,470	21,720	16,720	38,180	5,480	1,640

Calendar year 1961: Max 390 Min 3.1 Mean 44.7 Cfsm 0.064 In. 0.86 Ac-ft 32,350
Water year 1961-62: Max 3,410 Min 1.3 Mean 222 Cfsm 0.32 In. 4.32 Ac-ft 160,800

Peak discharge (base, 75 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-31	0730	11.72	3,980	6- 8	1600	3.32	562
4-22	0100	3.75	815	7- 8	2300	4.24	1,130
5-27	1000	3.82	858	7-20	0200	3.61	731

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 5 to April 1.

5-3170. Cottonwood River near New Ulm, Minn.

Location.--Lat 44°17'40", long 94°26'40", in N½ sec.33, T.110 N., R.30 W., on left bank 600 ft upstream from highway bridge, 1.8 miles south of New Ulm, and 2 miles upstream from mouth.

Drainage area.--1,280 sq mi, approximately.

Records available.--July 1909 to December 1913, March 1931 to March 1938, August 1938 to September 1962 (winter records incomplete prior to 1936).

Gage.--Water-stage recorder. Datum of gage is 799.09 ft above mean sea level, adjustment of 1912; July 1, 1909, to Dec. 13, 1913, chain gage at site 2.7 miles upstream at different datum. Mar. 15, 1931, to Mar. 31, 1938, chain or wire-weight gage 2¼ miles upstream at datum 11.41 ft higher. Aug. 23, 1938, to June 25, 1948, staff gage at present site and datum.

Average discharge.--28 years (1911-13, 1935-37, 1938-62) 248 cfs (179,500 acre-ft per year).

Extremes.--Maximum discharge during year, 14,200 cfs Mar. 30 (gage height, 15.88 ft); minimum, 17 cfs Oct. 9, 10; minimum gage height, 1.13 ft Oct. 8, 9, 10.
1909-13, 1931-62: Maximum discharge, that of Mar. 30, 1962; maximum gage height, 16.94 ft July 9, 1947 (from floodmark); minimum observed, 0.5 cfs Nov. 27, 1952 (gage height, 0.77 ft).

Remarks.--Records good except those for periods of ice effect or no gage-height record, which are fair. Some regulation by dam at Cottonwood Lake and several other small lakes above station.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Mar. 3				Mar. 4 to Sept. 30			
1.2	18	1.3	29	2.5	247	9.0	3,100
1.4	34	1.5	49	3.0	397	11.0	4,760
1.8	86	1.7	77	4.0	745	13.0	8,200
2.2	151	2.0	132	6.0	1,520	16.0	14,500
2.5	216						

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	26	114	67	31	18	35	8410	752	686	365	*290	76
2	27	173	67	31	19	41	6320	675	608	414	308	71
3	27	151	67	30	19	41	4710	608	552	787	323	72
4	26	153	60	30	20	41	3930	542	518	1490	293	74
5	25	160	60	29	21	40	*3280	490	482	1580	269	71
6	*24	155	53	29	21	39	3030	434	482	2200	250	70
7	22	140	47	29	22	37	3010	394	1210	2420	214	65
8	20	124	46	28	22	36	2560	365	2220	2890	211	68
9	18	113	46	27	23	36	2200	344	1410	3230	186	72
10	24	108	44	26	24	36	1940	326	1580	3220	202	71
11	25	112	*43	25	26	34	1720	329	1580	2370	186	64
12	26	105	40	24	27	33	1660	320	1290	1700	167	64
13	24	96	39	23	47	32	1520	344	1080	1490	152	62
14	24	*89	38	22	44	32	1390	424	896	1140	142	58
15	24	90	34	21	40	32	1390	920	563	1080	132	56
16	22	84	32	*21	*39	32	1400	850	549	896	120	58
17	22	83	32	21	41	32	1410	*650	991	944	110	57
18	22	73	33	20	40	32	1630	542	1330	682	103	54
19	21	61	32	19	40	*33	2240	518	1720	1050	98	52
20	22	66	32	20	40	35	2460	619	1730	938	91	50
21	23	73	32	21	38	37	2070	707	1300	972	84	50
22	22	80	32	21	36	37	1780	1030	1130	1060	80	49
23	24	86	31	21	35	39	1550	1400	805	994	96	48
24	29	90	31	21	35	45	*1390	1700	804	857	86	233
25	26	75	31	21	33	54	1230	1930	658	734	*77	61
26	24	73	31	21	33	87	1060	1640	580	422	71	49
27	23	72	31	20	33	250	941	1330	521	482	68	45
28	25	74	31	20	33	1480	857	1110	455	455	65	44
29	39	71	31	20		6210	829	934	*414	441	64	44
30	50	67	32	19	----------	12500	801	829	356	414	68	50
31	62	---------	32	18	----------	*11200	----------	766	----------	353	84	----------
Total	818	3011	1257	729	869	32648	68718	23822	28500	38070	4690	1958
Mean	26.4	100	40.5	23.5	31.0	1,053	2,291	768	950	1,228	151	65.3
Cfsm	0.021	0.078	0.032	0.018	0.024	0.823	1.79	0.600	0.742	0.959	0.118	0.051
In.	0.02	0.09	0.04	0.02	0.03	0.95	2.00	0.69	0.83	1.11	0.14	0.06
Ac-ft	1,622	5,972	2,493	1,446	1,724	64,756	136,300	47,250	56,529	75,511	9,302	3,884

Calendar year 1961: Max 972 Min 11 Mean 125 Cfsm 0.098 In. 1.32 Ac-ft 90,300
Water year 1961-62: Max 12,500 Min 18 Mean 562 Cfsm 0.439 In. 5.98 Ac-ft 406,800

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 17-25, 27-29, Dec. 4-9, Dec. 25 to Jan. 18, Jan. 20, Feb. 3-8, 13-15, 17, Feb. 27 to Mar. 1. No gage-height record Nov. 5-14.

GPO 802-479-9

5-3180. East Branch Blue Earth River near Bricelyn, Minn.

Location.--Lat 43°37'50", long 93°47'25", in NE¼NE¼ sec.23, T.102 N., R.25 W., in center of span on downstream side of highway bridge, 2 miles upstream from Brush Creek, 3 miles downstream from south Walnut Lake, and 5 miles northeast of Bricelyn.

Drainage area.--132 sq mi.

Records available.--March 1951 to September 1962. Prior to October 1957, published as East Fork Blue Earth River near Bricelyn.

Gage.--Wire-weight gage read twice daily. Datum of gage is 1,131.86 ft above mean sea level, datum of 1929 (Minnesota State Highway Department bench mark).

Average discharge.--11 years, 33.2 cfs (24,040 acre-ft per year).

Extremes.--Maximum discharge during year, 1,150 cfs Mar. 30 (gage height, 10.65 ft); no flow Aug. 27-29.
1951-62: Maximum discharge, 1,320 cfs Apr. 7, 1951 (gage height, 10.68 ft, from graph based on gage readings); no flow on many days.

Remarks.--Records good except those for periods of ice effect or no gage-height record, which are poor.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	42	87	65	13	5.7	5.0	877	171	72	60	46	78
2	42	90	64	13	6.0	4.7	*716	165	71	69	39	125
3	41	95	64	13	6.2	4.6	647	154	67	*13	32	147
4	*41	96	62	13	6.3	4.4	*602	144	*64	24	26	159
5	41	94	58	12	6.2	4.3	593	135	67	34	20	156
6	39	92	55	11	6.0	4.3	605	127	64	38	15	147
7	38	90	57	10	5.9	4.4	599	115	63	39	15	139
8	35	87	58	8.5	5.8	4.4	578	104	62	47	13	135
9	34	86	60	6.8	5.8	4.5	537	98	61	71	11	131
10	34	88	62	5.0	5.8	4.5	507	[illegible]	61	101	8.1	127
11	38	91	63	4.3	5.9	4.6	* 467	83	51	114	6.3	124
12	45	91	*65	3.7	6.0	4.6	467	80	33	115	5.2	120
13	75	88	56	3.5	6.3	4.7	434	79	22	112	4.4	110
14	93	86	51	3.2	6.5	4.7	418	82	19	107	4.0	103
15	106	80	46	3.0	6.8	4.7	401	79	18	98	3.0	95
16	111	79	42	3.0	7.0	4.8	382	74	20	90	2.1	89
17	115	74	37	2.9	7.1	4.8	368	67	21	[illegible]	1.4	83
18	113	69	33	* 2.9	7.2	4.9	362	59	24	71	1.0	76
19	112	67	31	2.9	7.2	4.9	350	59	28	71	.6	69
20	110	63	28	2.9	7.2	5.0	333	57	32	86	.4	63
21	107	63	26	3.0	*7.1	5.0	314	55	33	103	.3	55
22	105	66	24	3.1	7.0	*5.1	303	62	32	117	.1	49
23	99	64	21	3.1	6.8	5.3	286	65	30	118	* .6	44
24	98	64	19	3.2	6.6	5.5	265	71	28	113	.5	39
25	93	66	17	3.3	6.4	6.0	246	87	22	107	.1	36
26	91	66	16	3.4	5.9	8.0	227	88	17	99	.1	34
27	87	65	15	3.6	5.6	27	209	83	12	90	0	30
28	82	64	14	3.9	5.3	118	196	79	8.1	82	0	26
29	87	65	14	4.3	-	*380	184	77	7.1	71	0	22
30	89	66	13	4.7	---------	1140	179	73	6.9	62	1.6	23
31	87	---------	13	5.1	---------	1020	---------	72	---------	*54	35	---------
Total	2330	2342	1249	178.3	177.6	2812.7	12652	2835	1116.1	2341.9	291.8	2634
Mean	75.2	78.1	40.3	5.75	6.34	90.7	422	91.5	37.2	75.5	9.41	87.8
Cfsm	0.570	0.592	0.305	0.044	0.048	0.687	3.20	0.693	0.282	0.572	0.071	0.665
In.	0.66	0.66	0.35	0.050	0.050	0.79	3.56	0.80	0.31	0.66	0.08	0.74

Calendar year 1961: Max 497 Min 0 Mean 57.6 Cfsm 0.436 In. 5.92
Water year 1961-62: Max 1,140 Min 0 Mean 84.8 Cfsm 0.642 In. 8.71

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 5-11, 17-20, 27-29, Dec. 7-9, 12, Jan. 18, Feb. 21, Mar. 22. No gage-height record Dec. 10, 11, Dec. 13 to Jan. 17, Jan. 19 to Feb. 20, Feb. 22 to Mar. 21, Mar. 23-28.

5-3200. Blue Earth River near Rapidan, Minn.

Location.--Lat 44°05'44", long 94°06'35", in SE¼SE¼ sec.6, T.107 N., R.27 W., on left bank 0.2 mile downstream from powerplant of Northern States Power Co., 2 miles west of Rapidan, 3½ miles downstream from Watonwan River, and 7¾ miles upstream from LeSueur River.

Drainage area.--2,430 sq mi, approximately.

Records available.--July 1909 to November 1910 (no winter records), October 1939 to September 1945, July 1949 to September 1962. Published as "at Rapidan Mills" 1909-10.

Gage.--Water-stage recorder. Datum of gage is 808.80 ft above mean sea level, adjustment of 1912. July 20, 1909, to Apr. 28, 1910, chain gage at site a quarter mile upstream at different datum. Apr. 29 to Nov. 12, 1910, staff gage at site 800 ft upstream at different datum. Oct. 4 to Nov. 14, 1939, staff gage at present site and datum.

Average discharge.--19 years (1939-45, 1949-62), 745 cfs (539,400 acre-ft per year).

Extremes.--Maximum discharge during year, 16,600 cfs Apr. 2 (gage height, 11.53 ft); minimum, 20 cfs Mar. 16, 17, 18 (gage height, 1.19 ft).
1909-10, 1939-45, 1949-62: Maximum discharge, 26,100 cfs Apr. 8, 1951 (gage height, 14.97 ft), from rating curve extended above 16,000 cfs by logarithmic plotting; minimum, 6.9 cfs Oct. 12, 1955 (gage height, 1.04 ft).

Remarks.--Records good. Flow regulated by Rapidan Reservoir (capacity, 2,980 acre-ft).

Rating table, water year 1961-62 (gage height, in feet, and discharge in cubic feet per second)

1.2	21	3.0	907
1.4	57	4.0	1,800
1.6	112	5.0	2,880
2.0	267	7.0	6,190
2.4	475	11.0	15,200

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	107	458	243	88	118	120	*13,400	2,020	1,580	640	735	2,000
2	273	463	300	238	118	122	15,400	2,050	1,400	*1,080	698	2,400
3	324	463	179	239	79	119	13,000	1,910	1,290	1,640	640	2,570
4	314	458	276	201	24	35	12,500	1,810	1,220	1,960	598	2,440
5	*324	463	275	204	118	131	11,700	1,750	1,200	3,500	506	2,040
6	327	458	314	200	122	131	10,400	1,660	1,300	3,750	513	1,790
7	331	463	234	26	118	131	9,350	1,530	1,560	3,800	494	1,880
8	220	463	166	138	79	129	8,800	1,370	1,640	4,460	513	1,650
9	331	463	168	144	78	186	8,040	1,240	1,610	4,200	572	1,480
10	328	463	60	152	77	204	*7,280	1,140	1,800	4,040	458	1,330
11	334	463	127	129	24	132	6,080	1,120	1,670	3,720	446	1,300
12	340	458	217	130	145	152	5,930	661	1,620	3,170	376	1,260
13	446	458	*237	133	228	111	5,280	467	1,410	2,640	373	1,190
14	353	*762	236	28	260	121	4,980	957	1,250	2,380	352	1,060
15	458	613	264	150	212	109	4,930	957	1,040	2,130	351	948
16	681	398	276	131	174	108	4,830	851	1,010	1,980	289	875
17	690	379	53	129	144	111	4,780	812	940	1,760	220	812
18	690	354	259	131	24	45	4,930	796	948	1,660	258	750
19	558	242	230	*129	123	140	4,960	812	1,030	1,750	158	720
20	513	300	237	124	123	140	4,980	907	1,030	2,280	160	661
21	506	366	234	28	128	122	4,940	1,060	957	2,050	223	640
22	513	386	233	128	*114	116	4,410	1,460	883	2,160	209	572
23	494	412	208	127	115	*137	3,820	2,390	781	2,170	230	538
24	481	396	48	116	107	142	3,400	3,030	720	1,940	276	506
25	469	349	50	69	23	177	3,050	3,200	654	1,660	*180	469
26	469	289	192	79	113	252	2,710	2,700	612	1,470	26	463
27	458	361	202	82	113	360	2,480	2,150	506	1,270	156	446
28	469	383	199	26	118	639	2,220	2,040	494	1,110	215	441
29	475	221	199	117	-	3,070	2,160	*1,870	481	1,040	218	441
30	469	223	197	124	---------	5,990	2,010	1,800	481	948	296	401
31	463	---------	87	119	---------	9,810	---------	1,690	---------	*859	653	---------
Total	13,208	12,428	6,200	3,859	3,219	23,292	192,750	48,210	33,117	69,217	11,392	34,073
Mean	426	414	200	124	115	751	6,425	1,555	1,104	2,233	367	1,136
Cfsm	0.175	0.170	0.082	0.051	0.047	0.309	2.64	0.640	0.454	0.919	0.151	0.467
In.	0.20	0.19	0.09	0.06	0.05	0.36	2.95	0.74	0.51	1.06	0.17	0.52
Ac-ft	26,200	24,650	12,300	7,650	6,380	46,200	382,300	95,620	65,690	137,300	22,600	67,580

Calendar year 1961: Max 10,400 Min 16 Mean 816 Cfsm 0.336 In. 4.54 Ac-ft 590,400
Water year 1961-62: Max 15,400 Min 23 Mean 1,236 Cfsm 0.509 In. 6.90 Ac-ft 894,470

* Discharge measurement made on this day.

5-3205. Le Sueur River near Rapidan, Minn.

Location.--Lat 44°06'40", long 94°02'28", in SW¼ sec.35, T.108 N., R.27 W., on right bank 600 ft downstream from highway bridge, 1.8 miles northeast of Rapidan, and 2.3 miles upstream from mouth.

Drainage area.--1,100 sq mi, approximately.

Records available.--October 1939 to September 1945, July 1949 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 775.76 ft above mean sea level, datum of 1929. Prior to Nov. 15, 1939, staff gage at same site and datum.

Average discharge.--19 years, 353 cfs (255,600 acre-ft per year).

Extremes.--Maximum discharge during year, 9,660 cfs Apr. 1 (gage height, 14.26 ft); minimum daily, 32 cfs Feb. 6-11; minimum gage height, 2.16 ft Aug. 29.
1939-45, 1949-62: Maximum discharge, 21,200 cfs May 22, 1960 (gage height, 22.72 ft, from floodmark); minimum daily, 1.6 cfs Feb. 9-25, 1959; minimum gage height, 1.85 ft Aug. 22, 23, 1955.

Remarks.--Records good except for periods of ice effect, which are fair.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Mar. 31		Apr. 1 to Sept. 30			
2.5	75	2.1	43	6.0	1,430
3.0	181	2.4	82	8.0	3,090
3.5	291	3.0	204	10.0	5,000
4.0	430	4.0	490	14.0	9,320
5.0	900	5.0	898		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	84	185	140	56	33	36	*8,960	1,070	945	252	* 350	3,350
2	84	194	148	55	33	36	*7,880	1,280	838	544	333	3,340
3	94	192	148	55	33	37	6,800	1,220	765	*1,180	296	3,340
4	104	194	135	54	33	37	5,570	1,130	730	1,720	281	3,080
5	*115	201	122	51	33	37	5,220	1,050	692	2,500	260	2,720
6	115	205	108	48	32	38	5,080	940	649	2,410	250	2,280
7	100	203	94	46	32	39	5,010	825	633	2,340	257	1,900
8	92	196	87	45	32	39	4,990	730	617	3,440	250	1,560
9	83	177	84	43	32	40	4,350	645	578	3,030	257	1,330
10	83	185	85	41	32	41	3,760	585	556	2,950	235	1,160
11	90	185	87	40	32	41	*3,270	548	530	2,870	206	1,040
12	126	183	90	39	33	41	2,980	548	508	2,530	189	931
13	338	174	* 91	38	33	42	2,730	585	476	2,150	169	833
14	486	*170	89	37	33	42	2,550	641	447	1,810	149	735
15	528	166 *159	86	36	34	43	2,390	645	391	1,500	130	649
16	532	140	84	35	34	44	2,320	621	359	1,280	116	593
17	486	96	82	35	34	46	2,450	574	353	1,080	103	533
18	438	94	81	34	34	47	2,630	515	359	926	92	497
19	395	102	79	*33	35	48	2,830	778	388	954	85	465
20	358		77	33	35	50	2,920	894	391	992	78	428
21	324	115	76	33	36	51	2,600	912	350	1,020	68	397
22	300	125	76	33	* 36	* 52	2,280	968	336	1,080	66	376
23	280	130	75	33	36	53	1,990	1,490	327	1,020	73	359
24	262	141	73	33	35	55	1,740	1,720	286	898	*72	342
25	247	150	71	33	35	58	1,510	1,810	257	782	82	330
26	227	152	70	33	35	65	1,310	1,690	230	654	74	313
27	214	150	66	33	35	76	1,170	1,460	204	559	64	296
28	201	135	63	33	36	200	1,060	1,310	182	494	57	278
29	203	136	61	33	-	700	973	*1,230	211	444	53	265
30	194	138	59	33	-------	2,600	926	1,150	257	412	140	286
31	190	-------	57	33	-------	7,000	-------	1,040	-------	382	1,880	-------
Total	7,373	4,773	2,744	1,217	946	11,734	100,249	30,604	13,845	44,203	6,715	34,006
Mean	238	159	88.5	39.3	33.8	379	3,342	987	462	1,426	217	1,134
Cfsm	0.216	0.145	0.080	0.036	0.031	0.345	3.04	0.897	0.420	1.30	0.197	1.03
In.	0.25	0.16	0.09	0.04	0.03	0.40	3.39	1.03	0.47	1.49	0.23	1.15
Ac-ft	14,620	9,470	5,440	2,410	1,880	23,270	198,800	60,700	27,460	87,680	13,320	67,450

Calendar year 1961: Max 6,200 Min 8.2 Mean 406 Cfsm 0.369 In. 5.01 Ac-ft 294,200
Water year 1961-62: Max 8,960 Min 32 Mean 708 Cfsm 0.644 In. 8.73 Ac-ft 512,500

Peak discharge (base, 1,300 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
4-1	0815	14.26	9,660	7-8	0500	8.53	3,570
4-20	0130	7.89	2,990	9-2	0100	8.33	3,390
5-25	1600	6.54	1,820				

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 17-22, Nov. 25 to Mar. 31.

5-3250. Minnesota River at Mankato, Minn.

Location.--Lat 44°10'10", long 94°00'15", in sec.7, T.108 N., R.26 W., on left bank at downstream side of Main Street Bridge in Mankato, 1.8 miles downstream from Blue Earth River and at mile 106.4.

Drainage area.--14,900 sq mi, approximately.

Records available.--May 1903 to September 1962 (no winter records 1904, 1906-10, 1918-29). Monthly dishcarge only for some periods, published in WSP 1308. Published as "near Mankato" 1903-21.

Gage.--Water-stage recorder. Datum of gage is 747.92 ft above mean sea level, datum of 1929. Prior to Aug. 6, 1910, staff gage amd Aug. 6, 1910, to Oct. 19, 1921, chain gage, at site 1.8 miles upstream at datum 6.4 ft higher. Mar. 15, 1922, to Nov. 30, 1924, chain gage at present site and datum.

Average discharge.--41 years (1905, 1910-17, 1929-62), 2,402 cfs (1,739,000 acre-ft per year).

Extremes.--Maximum discharge during year, 39,800 cfs Apr. 2 (gage height, 21.62 ft); minimum daily, 255 cfs Feb. 12; minimum gage height, 1.32 ft Feb. 19.
1903-62: Maximum discharge, 66,600 cfs Apr. 9, 1951 (gage height, 26.20 ft, from floodmark); minimum observed, 26 cfs Aug. 4, 1934.
Maximum stage known, 29.9 ft Apr. 26, 1881, from floodmark, present site and datum (discharge, 90,000 cfs).

Remarks.--Records good except those for period of ice effect, which are fair. Some diurnal fluctuation at low and medium stages caused by powerplants on Blue Earth River.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge in cubic feet per second)
(Shifting-control method used Mar. 15-28, Apr. 2-30, May 22 to July 13)

1.5	300	8.0	6,120
2.0	480	12.0	11,200
3.0	1,060	16.0	18,500
4.0	1,820	21.0	37,000
5.0	2,810		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	495	886	669	315	350	285	*37,000	10,100	8,160	4,020	*8,720	6,840
2	472	974	713	340	340	295	39,300	10,000	7,660	*4,880	8,380	7,870
3	555	1,110	647	465	330	315	36,700	9,600	7,150	5,880	8,140	8,060
4	565	1,170	674	460	310	330	34,600	9,050	6,830	7,190	7,960	7,780
5	570	1,230	630	460	270	278	33,200	8,530	*6,550	10,000	7,690	6,960
				465								
6	*575	1,230	674		335	322	*31,500	8,090	6,360	11,200	7,520	6,120
7	555	1,220	503	420	310	325	29,500	7,610	6,470	11,600	7,310	5,800
8	465	1,160	384	295	280	320	28,000	7,100	7,120	13,900	7,070	5,390
9	502	1,090	450	445	265	320	26,200	6,600	7,740	14,300	6,910	4,790
10	550	1,060	395	455	265	360	*24,100	6,160	7,840	14,600	6,610	4,430
11	580	1,050	370	450	360	378	22,300	5,950	7,900	14,900	6,350	4,160
12	585	1,040	420	385	255	320	21,500	5,630	7,900	14,400	6,110	3,990
13	866	1,020	525	365	290	334	20,500	4,850	7,640	13,500	5,750	3,820
14	1,020	1,090	*552	360	325	322	19,700	5,660	7,340	12,500	5,450	3,580
15	1,090	*1,240	540	300	360	317	19,000	5,840	6,890	11,700	5,200	3,380
16	1,200	918	550	340	350	328	18,500	5,920	6,370	10,900	5,010	3,120
17	1,320	866	480	355	340	338	18,300	5,650	6,160	10,100	4,600	2,960
18	1,300	777	375	340	300	350	18,300	5,380	6,470	9,500	4,310	2,720
19	1,160	590	475	*324	260	328	18,500	5,530	6,710	9,610	4,020	2,600
20	1,060	696	525	310	275	435	18,500	5,580	6,860	10,500	3,650	2,450
21	995	795	530	300	*285	462	18,400	5,690	6,850	10,400	3,440	2,340
22	981	880	510	310	280	*458	17,600	6,830	6,530	10,600	3,270	2,250
23	939	892	470	330	275	484	16,500	10,600	6,170	11,100	3,200	2,110
24	906	847	410	360	280	550	15,400	11,200	5,650	11,200	*3,140	2,060
25	899	866	310	365	265	605	14,300	11,400	5,360	10,900	2,930	2,190
26	873	777	315	355	260	691		11,100	5,020	10,900	2,720	2,000
27	821	783	405	335	270	886	13,300	10,200	4,700	10,300	2,550	1,860
28	808	873	465	310	275	1,900	12,500	9,760	4,430	9,940	2,580	1,800
29	866	636	460	295	-	6,360	11,700	*9,360	4,310	9,610	2,510	1,760
30	854	686	460	330	----------	13,800	11,000	8,990	4,160	9,380	2,630	1,780
31	873	---------	385	355	----------	25,200	10,500	8,620	----------	9,050	3,990	----------
Total	25,300	28,452	15,271	11,294	8,260	57,996	656,400	242,580	195,300	328,560	159,720	116,970
Mean	816	948	493	364	295	1,871	21,880	7,825	6,510	10,600	5,152	3,899
Cfsm	0.055	0.064	0.033	0.024	0.020	0.126	1.47	0.525	0.437	0.711	0.346	0.262
In.	0.06	0.07	0.04	0.03	0.02	0.14	1.64	0.60	0.49	0.82	0.40	0.29
Ac-ft	50,180	56,430	30,290	22,400	16,380	115,000	1,302,000	481,200	387,400	651,700	316,800	232,000

Calendar year 1961: Max 17,500 Min 179 Mean 1,813 Cfsm 0.122 In. 1.65 Ac-ft 1,312,000
Water year 1961-62: Max 39,300 Min 255 Mean 5,058 Cfsm 0.339 In. 4.60 Ac-ft 3,662,000

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 9 to Mar. 4.

5-3300. Minnesota River near Carver, Minn.

Location.--Lat 44°43'28", long 93°37'58", in NE¼SW¼ sec.31, T.115 N., R.23 W., on left bank 2½ miles south of Carver and at mile 36 upstream from Mississippi River.

Drainage area.--16,200 sq mi, approximately.

Records available.--September 1934 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 690.00 ft above mean sea level, datum of 1929. Prior to Dec. 5, 1934, staff gage at same site and datum. Auxiliary chain gage 2¾ miles upstream at same datum read twice daily.

Average discharge.--28 years, 3,051 cfs (2,209,000 acre-ft per year).

Extremes.--Maximum discharge during year, 39,700 cfs Apr. 4; maximum gage height, 25.12 ft Apr. 6 (backwater from Mississippi River); minimum daily discharge, 350 cfs Feb. 14; minimum gage height, 3.62 ft Dec. 12.
1934-62: Maximum discharge, 64,100 cfs Apr. 11, 1951 (gage height, 27.71 ft); maximum gage height, 28.31 ft Apr. 16, 1952; minimum discharge, 79 cfs Nov. 17, 1955; minimum gage height, 2.66 ft Nov. 22, 1935.

Remarks.--Records good except those for period of ice effect, which are fair.

Cooperation.--Auxiliary gage readings furnished by Corps of Engineers.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	733	909	829	605	430	405	*12,500	12,900	12,300	5,230	10,500	4,400
2	709	1,060	821	580	425	455	17,300	12,000	11,300	5,100	10,000	6,380
3	645	1,280	821	520	420	485	*29,900	11,600	10,200	5,850	9,430	7,500
4	629	1,450	845	510	415	510	38,800	10,500	9,500	6,570	9,140	8,020
5	661	1,580	773	550	410	520	*39,400	10,200	8,550	7,590	8,900	8,140
6	669	1,630	797	595	400	520	37,700	9,610	*8,080	8,940	8,540	*7,560
7	677	1,710	740	600	375	510	36,900	8,820	7,440	*10,300	8,320	6,840
8	685	1,680	620	600	370	495	35,300	8,340	7,300	11,500	8,030	6,460
9	*677	1,620	508	605	395	525	32,800	7,810	7,510	12,300	7,800	5,900
10	653	*1,560	512	505	400	560	30,600	7,130	8,540	13,300	7,470	5,500
11	685	1,480	535	480	380	600	28,500	6,760	8,840	14,400	7,320	5,180
12	725	1,440	505	510	365	630	26,900	6,620	8,800	15,300	7,040	4,880
13	701	1,370	545	520	360	660	25,900	7,660	8,760	16,000	6,620	4,640
14	725	1,320	600	520	350	665	24,900	7,750	8,470	16,300	6,370	4,560
15	885	1,280	720	515	360	660	24,100	7,530	8,210	16,500	6,100	4,300
16	959	1,510	790	505	395	655	*23,000	7,340	7,870	15,800	5,830	4,000
17	1,060	1,370	760	460	425	610	22,400	7,070	7,550	14,800	*5,600	3,500
18	1,190	1,170	*737	440	430	595	22,300	6,750	7,490	13,700	5,250	3,140
19	1,230	1,050	710	435	* 440	640	22,200	6,620	7,410	13,200	5,000	2,960
20	1,200	968	620	430	425	660	22,200	6,950	7,530	12,900	4,740	2,810
21	1,100	861	660	420	400	665	21,400	6,710	7,550	13,400	4,480	2,710
22	1,040	861	680	*400	400	700	22,200	7,620	7,640	13,800	4,200	2,620
23	993	933	685	400	430	750	21,800	11,700	7,430	14,300	4,000	2,540
24	968	976	670	390	450	795	21,200	14,900	7,170	14,100	3,700	2,460
25	942	976	655	390	455	805	20,200	16,800	6,730	13,800	3,350	2,380
26	917	950	625	435	460	830	19,000	17,100	6,400	13,400	3,220	2,380
27	901	925	530	440	460	* 895	17,500	16,800	5,870	13,200	3,040	2,350
28	909	861	520	430	450	1,020	16,500	16,000	5,710	12,800	2,860	2,200
29	968	877	540	420	-	2,000	15,300	15,300	5,600	12,100	2,820	2,110
30	942	909	575	410	----------	4,000	*14,100	13,900	5,350	11,700	2,810	2,090
31	925	---------	600	425	----------	9,920	----------	13,400	----------	11,100	2,870	----------
Total	26,703	36,566	20,528	15,045	11,475	33,740	742,800	320,190	237,100	379,280	185,350	130,510
Mean	861	1,219	662	485	410	1,088	24,760	10,330	7,903	12,230	5,979	4,350
Cfsm	0.053	0.075	0.041	0.030	0.025	0.067	1.53	0.64	0.49	0.75	0.37	0.27
In.	0.06	0.08	0.05	0.03	0.03	0.08	1.71	0.74	0.54	0.87	0.43	0.30
Ac-ft	52,960	72,530	40,720	29,840	22,760	66,920	1,473,000	635,100	470,300	752,300	367,600	258,900

Calendar year 1961: Max 15,600 Min 380 Mean 2,264 Cfsm 0.140 In. 1.89 Ac-ft 1,639,000
Water year 1961-62: Max 39,400 Min 350 Mean 5,861 Cfsm 0.362 In. 4.92 Ac-ft 4,243,000

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 7 to Mar. 30.

5-3310. Mississippi River at St. Paul, Minn.

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

Drainage area.--36,800 sq mi, approximately.

Records available.--March 1892 to September 1962 (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.

Gage.--Water-stage recorder. Datum of gage is 684.16 ft above mean sea level, adjustment of 1912. Prior to Mar. 18, 1925, staff or chain gage at several sites within 300 ft of present site at same datum. Mar. 18, 1925, to Mar. 10, 1933, water-stage recorder and Mar. 11, 1933, to Sept. 14, 1939, staff gage, at present site and datum. Since September 1938, auxiliary water-stage recorder 5.4 miles downstream.

Average discharge.--64 years (1894-95, 1896-97, 1900-1962), 9,836 cfs (adjusted for diversion).

Extremes.--Maximum discharge during year, 56,400 cfs Apr. 11 (gage height, 13.10 ft); minimum daily, 1,780 cfs Dec. 10.

1892-1962: Maximum discharge, 125,000 cfs Apr. 16, 1952 (gage height, 22.02 ft); minimum daily, 632 cfs Aug. 26, 1934.

Maximum stage known since at least 1870, that of Apr. 16, 1952. Flood of Apr. 29, 1881, reached a stage of 19.7 ft (discharge, 107,000 cfs), determined by Corps of Engineers.

Remarks.--Records good. Slight regulation except during extreme floods by reservoirs on headwaters and by powerplants. 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. Gage-height record at South St. Paul furnished by Corps of Engineers. Diversion through sewage-disposal plant furnished by Minneapolis-St. Paul Sanitary District.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	2720	3680	3500	3110	2490	2390	18500	26800	50800	14300	22700	9350
2	2780	4370	3430	2860	2470	2590	20700	25400	49000	14700	21600	10200
3	2630	4780	3390	3120	2550	2700	23700	24200	46200	15800	20600	12000
4	2500	4400	3600	2890	2530	2750	28000	22900	43400	17300	19700	12700
5	2420	5170	3480	3230	2560	2690	35400	22300	40300	18600	19300	13800
6	2550	4880	3730	2860	2590	3120	42700	20400	37100	20800	19000	13600
7	2740	4890	2490	2900	2530	3150	46100	19700	34800	22700	18600	12000
8	2910	4410	2650	2890	2280	3080	51600	18500	33100	23500	18400	11700
9	2110	4160	2060	2630	2460	3040	*54200	18400	31600	24900	18100	11600
10	2860	4180	1780	2680	2570	3030	55900	17600	32400	25600	17900	11700
11	2770	4640	2040	2720	2540	3210	56200	16400	31500	26900	17500	12000
12	2780	4190	2160	2690	2480	3160	55400	18400	30200	27300	17200	11400
13	3450	3610	1820	2820	2500	3190	54600	18000	28800	27300	17100	11300
14	3140	3640	2770	2840	2490	3250	52800	18300	28000	27400	16500	11600
15	2290	*3650	2830	2840	2360	3510	51100	19200	26400	27500	16300	11300
16	2430	3200	3150	2730	2510	3690	*49200	18800	24000	27400	15900	12900
17	3410	3220	2930	2470	2820	3560	46600	18900	23700	27100	15400	12500
18	3610	3140	2850	2450	2590	3710	44200	19200	23600	26300	14900	* 12100
19	3940	4040	2860	2410	2600	3800	42200	20300	22700	27200	14300	10800
20	3850	3920	2810	2460	2440	4360	40000	20400	22600	26500	* 13200	10600
21	3480	3790	3360	2410	2610	4600	38200	20800	22400	26600	12600	10200
22	3290	3370	3400	2380	2560	4750	37100	22000	21800	26800	12200	9690
23	*3150	3020	3060	2400	2610	4890	36200	26100	21400	* 27000	12300	9710
24	3450	3300	3260	2020	2590	4700	35300	35400	20400	27100	11000	9450
25	3520	3590	3240	2270	2550	4930	34500	40700	*18800	27000	10600	8790
26	3390	3650	2960	2460	2580	5310	33500	44100	19000	26900	10200	8280
27	3310	3970	3290	2580	2270	6090	32100	47000	17700	26400	9710	8650
28	3460	4010	2830	2440	2420	6480	30400	50000	16300	25800	9540	8830
29	3740	3830	2690	2450	-	6760	29100	52600	16300	25300	9680	8320
30	3570	3480	3010	2510	----------	8090	27900	53000	15400	24400	9410	8420
31	3960	----------	3180	2570	----------	10200	----------	*52200	----------	23500	10000	----------
Total	96210	118180	90610	82090	70550	130780	1203400	848000	849700	755900	471440	325490
Mean	3,104	3,939	2,923	2,648	2,520	4,219	40,110	27,350	28,320	24,380	15,210	10,850
(≠)	+261	+251	+225	+227	+239	+278	+176	+345	+344	+342	+353	+326
Mean≠	3,365	4,190	3,148	2,875	2,759	4,497	40,290	27,700	28,660	24,720	15,560	11,180
Cfsm≠	0.091	0.114	0.086	0.078	0.075	0.122	1.09	0.753	0.779	0.672	0.423	0.304
In.≠	0.10	0.13	0.10	0.09	0.08	0.14	1.22	0.87	0.87	0.77	0.49	0.34

Calendar year 1961:	Max	22,300	Min	1,540	Mean	5,529	Mean≠	5,793	Cfsm≠	0.157	In.≠	2.13
Water year 1961-62:	Max	56,200	Min	1,780	Mean	13,810	Mean≠	14,090	Cfsm≠	0.383	In.≠	5.20

* Discharge measurement made on this day.

≠ Diversion, equivalent in cubic feet per second, through sewage-disposal plant.

≠ Adjusted for diversion.

Note.--Stage-fall-discharge relation affected by ice or indefinite slope Oct. 1 to Apr. 1.

5-3385. Snake River near Pine City, Minn.

Location.--Lat 45°50'30", long 92°56'00", in SE¼NW¼ sec.26, T.39 N., R.21 W., on left bank at site of former powerplant and dam, half a mile downstream from Cross Lake and 1½ miles northeast of Pine City.

Drainage area.--958 sq mi.

Records available.--June 1913 to September 1917, July 1951 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 919.00 ft above mean sea level, datum of 1929. June 25, 1913, to Sept. 30, 1917, staff gage at site 500 ft downstream at different datum. July 1 to Oct. 28, 1951, staff gage at present site and datum.

Average discharge.--15 years, 543 cfs.

Extremes.--Maximum discharge during year, 7,730 cfs May 28 (gage height, 8.11 ft); minimum, 29 cfs Jan. 9 (gage height, 2.87 ft), result of freezeup.
1913-17, 1951-62: Maximum discharge, 7,710 cfs May 4, 1954; maximum gage height, 8.30 ft Apr. 12, 13, 1952; minimum discharge, 12 cfs Nov. 29, 30, 1960; minimum gage height, 2.65 ft Jan. 15, 1955.
A discharge measurement of 12,500 cfs was made May 9, 1950.

Remarks.--Records good except those for periods of ice effect, which are fair.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

3.0	56	5.0	1,870
3.2	133	6.0	3,290
3.5	301	8.0	7,440
4.0	729		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	94	*116	*120	83	59	58	211	1,260	3,970	282	148	183
2	87	168	120	85	60	*58	245	1,160	3,220	295	138	168
3	80	211	120	*87	61	58	289	1,060	2,660	301	178	168
4	76	205	138	83	61	58	369	929	2,250	308	183	183
5	73	222	116	82	60	58	482	845	1,900	315	183	168
6	70	228	120	80	59	58	*719	740	1,590	321	222	148
7	70	228	120	78	58	59	972	639	1,350	335	251	138
8	73	205	107	77	58	61	1,460	610	1,150	362	342	138
9	73	194	105	76	57	62	2,050	563	994	362	447	168
10	73	194	104	74	56	62	2,870	563	855	362	473	200
11	103	194	106	73	56	62	3,340	554	771	355	517	211
12	*103	194	103	71	56	62	3,510	563	669	342	554	228
13	103	194	100	71	56	62	*3,510	760	591	315	573	251
14	99	178	98	71	57	62	3,330	972	526	282	639	258
15	99	173	95	70	57	62	3,120	1,320	456	251	689	258
16	99	168	93	68	57	62	2,930	1,650	424	233	689	295
17	107	165	93	66	57	64	2,740	1,850	385	222	620	295
18	103	148	92	65	57	65	2,560	1,900	400	211	*563	282
19	99	133	91	63	57	67	2,360	2,000	400	211	500	264
20	94	133	91	62	57	70	2,290	1,980	416	217	447	251
21	90	138	91	62	57	74	2,290	2,050	424	211	400	*239
22	87	143	92	61	57	78	2,290	2,310	431	211	349	233
23	99	143	91	61	57	83	2,290	3,310	424	211	349	217
24	90	138	91	60	56	87	2,220	4,370	424	217	308	222
25	99	133	90	59	56	90	2,130	5,400	424	217	270	217
26	87	138	88	*59	56	94	2,000	6,610	392	205	239	200
27	80	124	86	59	56	94	1,830	7,540	369	*194	217	189
28	87	120	85	59	57	103	1,660	7,570	342	183	205	178
29	112	120	84	59	-	129	1,480	*6,700	*328	173	189	168
30	116	120	83	59	---	148	1,370	5,850	308	168	183	163
31	120	---	83	59	---	168	---	4,850	---	158	189	---
Total	2,845	4,968	3,096	2,142	1,608	2,378	58,917	78,478	28,843	8,030	11,254	6,281
Mean	91.8	166	99.9	69.1	57.4	76.7	1,964	2,532	961	259	363	209
Cfsm	0.096	0.173	0.104	0.072	0.060	0.080	2.05	2.64	1.00	0.270	0.379	0.218
In.	0.11	0.19	0.12	0.08	0.06	0.09	2.29	3.05	1.12	0.31	0.44	0.24

Calendar year 1961: Max 2,250 Min 32 Mean 203 Cfsm 0.212 In. 2.87
Water year 1961-62: Max 7,570 Min 56 Mean 572 Cfsm 0.597 In. 8.10

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 9 to Jan. 2, Jan. 5 to Mar. 22.

5-3400. Sunrise River near Stacy, Minn.

Location.--Lat 45°24'30", long 92°55'55", in NW¼NW¼ sec.26, T.34 N., R.21 W., on right bank on upstream side of highway bridge, 2½ miles northeast of Stacy, and 3 miles downstream from West Branch Sunrise River.

Drainage area.--167 sq mi.

Records available.--January 1949 to September 1962.

Gage.--Water-stage recorder. Altitude of gage is 855 ft (from topographic map). Prior to Nov. 10, 1949, chain gage at same site and datum.

Average discharge.--13 years, 66.7 cfs.

Extremes.--Maximum discharge during year, 314 cfs Apr. 9 (gage height, 6.70 ft); minimum, 18 cfs Oct. 7-9; minimum gage height, 2.59 ft Oct. 8.
1949-62: Maximum discharge, 806 cfs Apr. 12, 1952 (gage height, 7.88 ft); minimum observed, 3.6 cfs July 17, 1949 (gage height, 1.98 ft).

Remarks.--Records good except those for periods of ice effect, which are fair. At high stages a small part of flow discharges into the Rum River and Coon Creek basins from West Arm of Coon Lake and South Coon Lake, respectively.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1-10, June 12 to Aug. 16)

2.2	8.1	5.0	148
2.5	19	6.0	222
3.0	39	7.0	368
4.0	86		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	22	38	66	38	25	27	132	158	228	66	56	69
2	22	75	72	39	25	* 28	147	144	229	77	53	66
3	21	140	70	39	25	28	156	128	226	88	55	68
4	20	139	* 68	38	25	28	178	116	223	85	56	83
5	20	135	53	37	25	29	201	107	219	80	54	88
6	19	128	49	36	24	29	* 231	99	209	80	54	84
7	18	121	51	36	24	30	262	87	204	95	56	79
8	18	113	52	35	24	30	290	86	197	100	54	73
9	18	106	53	34	24	31	311	85	190	102	50	77
10	21	100	52	33	25	31	311	86	187	96	47	88
11	48	94	52	32	25	32	306	85	190	88	50	94
12	* 54	89	50	32	25	32	298	87	193	82	68	88
13	45	85	49	32	25	33	295	117	192	74	68	85
14	41	80	49	31	25	33	286	151	188	70	60	81
15	38	75	48	30	25	33	280	154	180	71	60	77
16	37	* 72	47	29	25	34	270	159	167	71	61	90
17	35	66	46	28	25	35	264	161	159	66	* 63	104
18	35	64	46	27	25	36	257	159	153	61	63	101
19	35	63	45	26	25	37	251	179	145	78	60	103
20	34	61	45	26	25	39	244	188	130	97	55	99
21	34	60	44	25	26	43	234	183	118	90	51	* 88
22	34	60	* 43	25	26	46	228	183	115	* 92	49	81
23	34	60	42	25	26	51	221	210	110	100	54	76
24	33	57	42	25	26	56	* 209	241	102	93	58	74
25	33	60	41	25	26	62	198	264	91	83	55	72
26	33	60	40	* 25	26	68	186	266	84	75	52	70
27	32	55	39	25	26	76	178	259	78	68	49	68
28	31	56	38	25	27	85	175	* 242	71	65	48	65
29	38	59	38	25	-	95	174	235	* 76	62	46	63
30	43	58	38	25	---------	110	168	229	71	62	47	63
31	40	----------	38	25	---------	120	----------	228	----------	60	60	----------
Total	986	2,429	1,506	933	705	1,447	6,941	5,076	4,725	2,477	1,712	2,417
Mean	31.8	81.0	48.6	30.1	25.2	46.7	231	164	158	79.9	55.2	80.6
Cfsm	0.190	0.485	0.291	0.180	0.151	0.280	1.38	0.982	0.946	0.478	0.331	0.483
In.	0.22	0.54	0.34	0.21	0.16	0.32	1.55	1.13	1.05	0.55	0.38	0.54

Calendar year 1961: Max 322 Min 11 Mean 64.2 Cfsm 0.384 In. 5.23
Water year 1961-62: Max 311 Min 18 Mean 85.9 Cfsm 0.514 In. 6.99

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 19-22, Dec. 6 to Apr. 1.

5-3405. St. Croix River at St. Croix Falls, Wis.

Location.--Lat 45°24'30", long 92°38'45", in NW¼ sec.30, T.34 N., R.18 W., on left bank 1,800 ft downstream from powerplant of Northern States Power Co., in St. Croix Falls, and at mile 52.2.

Drainage area.--5,930 sq mi, approximately.

Records available.--January 1902 to September 1962 in report of Geological Survey. Prior to January 1910, monthly discharge only, published in WSP 1308. Prior to October 1939, published as "near St. Croix Falls."

Gage.--Water-stage recorder. Datum of gage is 690.47 ft above mean sea level, adjustment of 1912. Prior to July 1905, gage heights and discharge measurements were used to determine flow. July 1905 to February 1940, records were computed from power generation at the St. Croix Falls powerplant 1,800 ft upstream.

Average discharge.--60 years (1902-62), 4,043 cfs.

Extremes.--Maximum discharge during year, 30,100 cfs May 26 (gage height, 14.12 ft); minimum, 142 cfs many days during November, December, January, February, March (gage height, 0.99 ft); minimum daily, 1,000 cfs Dec. 10. 1902-62: Maximum discharge, 54,900 cfs May 8, 1950 (gage height, 25.19 ft); minimum daily, 75 cfs July 17, 1910.

Remarks.--Records good. Flow regulated by powerplant upstream.

Rating table (gage height, in feet, and discharge, in cubic feet per second)

1.8	1,000	6.0	11,900
2.4	2,180	7.0	14,100
3.0	3,710	9.0	18,600
4.0	6,950	11.0	23,100
5.0	9,500	14.0	29,900

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	2060	2350	2640	1740	1680	1860	4720	7180	14400	2700	2040	2190
2	2490	3130	2920	1920	1980	2070	5290	6950	12500	3080	2210	2520
3	1950	4630	2380	2010	1860	1860	6040	5980	11700	3300	2160	2820
4	1710	4550	2490	2040	1820	1850	6810	6370	9400	4110	2090	3180
5	1990	4650	2270	2020	1890	1930	7970	5150	7410	4250	2070	3100
6	1920	4310	2330	2110	1740	1560	9790	5030	7660	3770	2080	3160
7	1970	4320	1490	1880	1830	1940	10200	4430	7360	3720	2060	3720
8	1800	3880	1490	1820	1630	1860	12300	4700	6350	3880	2340	3360
9	1710	3280	1310	1890	1850	1940	14400	4610	6120	4200	2250	2680
10	1660	3360	1000	1870	2110	1930	15600	4290	5490	3760	2200	3440
11	2290	3280	1630	1910	1550	2030	15800	4710	5370	3770	2740	3870
12	2390	3120	1590	1710	1830	2190	15900	4510	5300	3100	2580	4090
13	2140	3060	1860	1840	1670	1900	15100	5460	4900	3000	3020	4250
14	2270	2860	1900	1660	1860	2100	14100	7050	4480	2900	3030	4050
15	2230	2840	1920	1920	1780	1950	12900	10400	3940	2520	2810	3380
16	2110	2980	1890	1790	1890	2180	11600	12300	3870	2570	2870	4080
17	2180	2830	2090	1850	1690	2250	11100	12900	3300	2400	2540	4310
18	2220	2620	2060	1860	1880	2360	10700	12400	3450	1950	2350	4520
19	2200	2140	2120	1810	1740	2130	10900	13000	3640	2340	2620	4500
20	1970	1900	2230	1370	1760	2140	11300	14600	3650	2400	2160	3710
21	2240	2390	2380	1470	1840	2380	11200	15600	3870	2400	2120	3150
22	1760	2630	2410	1760	1880	2380	10900	16700	3750	2350	2220	2980
23	2050	2630	2210	1470	1810	2610	10400	20200	3530	2380	2750	3220
24	2100	2510	2190	1710	1930	2800	9910	25300	3510	2370	1890	3590
25	2160	2580	2010	1760	1800	2550	9480	28600	3790	2300	2410	2740
26	2070	2500	2150	1800	1940	2750	8830	30000	3420	2300	2320	2740
27	2020	2120	2010	1630	1730	3050	8320	28500	3380	2070	2120	2880
28	2200	1580	2090	1730	1900	3280	7870	25200	3410	2060	1940	3050
29	2260	2200	2050	1620	-	4400	7650	21900	2830	2280	2250	2810
30	2220	2240	1990	1660	---	4000	7570	18400	2660	2170	2160	2710
31	2620	---	1850	1750	---	4550	---	16500	---	2220	2420	---
Total	64960	89470	62950	55380	50870	74780	314650	389920	164440	88620	72820	100800
Mean	2,095	2,982	2,031	1,786	1,817	2,412	10,490	12,870	5,481	2,859	2,349	3,360
Cfsm	0.353	0.503	0.342	0.301	0.306	0.407	1.77	2.17	0.924	0.482	0.396	0.567
In.	0.41	0.56	0.39	0.35	0.32	0.47	1.97	2.50	1.03	0.56	0.46	0.63

Calendar year 1961: Max 27,300 Min 1,000 Mean 3,378 Cfsm 0.570 In. 7.73
Water year 1961-62 Max 30,000 Min 1,000 Mean 4,216 Cfsm 0.711 In. 9.65

5-3445. Mississippi River at Prescott, Wis.

Location.--Lat 44°44'45", long 92°48'00", in sec.9, T.26 N., R.20 W., 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 sq mi, approximately.

Records available.--June 1928 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 600.00 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Aug. 2, 1932, staff gage at railroad bridge 300 ft upstream at following datums: June 3, 1928, to Sept. 30, 1929, 69.27 ft higher; Oct. 1, 1929, to Sept. 30, 1930, 67.68 ft higher; Oct. 1, 1930, to Aug. 1, 1932, 69.28 ft higher. Aug. 2, 1932, to Oct. 30, 1938, water-stage recorder at present site at datum 69.28 ft higher. Auxiliary water-stage recorder 10.7 miles downstream from base gage.

Average discharge.--34 years, 14,790 cfs.

Extremes.--Maximum discharge during year, 76,300 cfs May 29 (gage height, 83.80 ft); minimum daily, 3,680 cfs Oct. 25; minimum gage height, 74.59 ft Mar. 26.
1928-62: Maximum discharge, 155,000 cfs Apr. 16-18, 1952 (gage height, 89.03 ft); minimum daily, 1,380 cfs July 13, 1940; minimum gage height, 65.08 ft Aug. 29, 1934, present datum.

Remarks.--Records good. Some regulation by reservoirs, navigation dams, and powerplants at low and medium stages. Flood flow not materially affected by artificial storage.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	5,940	9,270	7,130	5,850	5,080	4,950	21,300	36,900	*68,800	18,500	26,000	15,500
2	4,360	9,380	7,160	6,020	5,040	5,410	24,000	35,000	65,300	18,000	24,800	14,400
3	4,710	10,500	7,400	5,930	5,060	5,320	27,400	33,500	62,400	18,600	23,800	15,800
4	6,020	9,980	7,290	5,900	5,110	5,620	31,000	31,600	59,800	19,200	22,800	18,800
5	4,730	11,100	6,940	6,180	5,540	5,990	36,000	30,000	56,000	20,900	21,500	19,100
6	5,570	12,800	7,140	6,290	5,610	6,310	43,800	28,200	51,700	22,900	21,400	18,700
7	6,280	10,900	6,420	5,870	5,720	5,990	51,300	26,000	48,100	25,000	20,800	17,200
8	5,540	9,740	5,100	6,240	5,450	6,170	57,200	24,500	45,400	26,700	20,700	16,300
9	4,860	8,800	4,570	6,160	5,080	6,200	63,300	22,500	43,100	27,400	20,100	17,100
10	6,790	8,390	4,450	5,160	4,710	6,530	*67,200	21,700	41,200	28,800	19,900	17,500
11	5,360	8,120	4,460	5,540	4,750	6,480	70,000	21,700	40,300	29,700	19,900	17,300
12	7,190	8,540	5,080	5,010	4,740	7,000	71,500	22,800	38,800	30,700	20,400	17,200
13	5,670	8,150	5,480	5,070	4,870	6,870	71,100	24,200	37,200	30,700	20,000	17,600
14	5,800	7,570	5,740	5,080	5,240	6,670	69,700	24,600	35,600	30,800	19,700	17,500
15	5,160	7,190	5,970	5,260	5,760	7,010	66,800	24,900	34,000	30,800	19,700	17,400
16	5,150	7,730	6,490	5,230	5,630	7,350	64,000	27,300	32,200	30,600	19,900	17,300
17	5,150	7,100	6,460	5,180	5,710	7,600	61,600	29,200	30,300	30,500	19,600	18,100
18	5,980	6,680	6,600	5,110	5,590	7,660	58,300	30,400	29,400	29,700	18,600	18,600
19	6,320	6,380	6,680	5,030	5,350	7,310	51,900	32,100	28,000	29,900	17,500	*18,100
20	7,030	*6,510	6,080	5,110	5,430	7,960	53,800	33,000	26,900	30,700	17,200	16,800
21	7,430	6,820	6,350	5,100	5,440	7,940	52,800	33,400	26,600	29,800	*16,000	16,300
22	8,540	8,080	5,950	4,910	5,430	8,230	51,300	35,700	26,600	29,900	16,200	15,500
23	5,710	7,610	6,530	4,730	5,530	8,460	49,500	39,400	26,500	29,900	17,100	14,600
24	*6,100	6,930	6,830	4,870	5,440	8,270	48,200	46,700	26,000	*29,700	17,500	13,900
25	3,680	8,460	6,920	4,580	5,440	10,600	46,400	57,000	24,600	29,900	15,200	14,000
26	5,740	5,060	6,990	4,470	5,460	9,930	45,400	65,500	23,100	29,600	14,800	13,300
27	8,120	6,800	6,310	4,420	5,400	10,700	44,100	71,200	22,500	29,100	14,400	13,200
28	6,860	7,020	5,990	4,430	5,860	13,300	42,100	74,400	20,900	29,000	13,600	14,100
29	9,040	7,070	5,650	4,720	-	15,300	40,000	75,800	20,700	28,000	13,500	14,100
30	7,270	6,950	5,680	5,050	---------	15,700	39,000	74,600	20,200	27,800	14,300	14,000
31	6,460	----------	5,930	5,110	---------	19,200	----------	71,900	----------	26,800	16,300	----------
Total	188,560	245,630	191,770	163,610	149,470	258,030	1,520,000	1,205,700	1,112,200	849,600	583,200	489,300
Mean	6,083	8,188	6,186	5,278	5,338	8,324	50,670	38,890	37,070	27,410	18,810	16,310
Cfsm	0.136	0.183	0.138	0.118	0.119	0.186	1.13	0.868	0.827	0.612	0.420	0.364
In.	0.16	0.20	0.16	0.14	0.12	0.21	1.26	1.00	0.92	0.71	0.48	0.41

Calendar year 1961: Max 45,900 Min 3,470 Mean 9,899 Cfsm 0.221 In. 2.99
Water year 1961-62: Max 75,800 Min 3,680 Mean 19,060 Cfsm 0.425 In. 5.77

* Discharge measurement made on this day.
Note.--Stage-fall-discharge relation affected by ice Nov. 16 to Mar. 20.

5-3552. Cannon River at Welch, Minn.

Location.--Lat 44°33'50", long 92°43'55", in NW¼SW¼ sec.27, T.113 N., R.16 W., on right bank 0.3 mile downstream from highway bridge at Welch and 1.8 miles upstream from Belle Creek.

Drainage area.--1,320 sq mi, approximately.

Records available.--June 1909 to January 1914 (no winter records 1909-11), November 1930 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 699.16 ft above mean sea level, datum of 1929. Prior to Nov. 11, 1930, chain gage on highway bridge at site 0.3 mile upstream at datum 3.00 ft lower. Nov. 11, 1930, to Oct. 11, 1938, water-stage recorder at site 0.3 mile upstream at present datum.

Average discharge.--33 years (1911-13, 1931-62), 470 cfs.

Extremes.--Maximum discharge during year, 6,900 cfs Mar. 30 (gage height, 9.20 ft); minimum, 46 cfs Dec. 12 (gage height, 1.25 ft).
1909-14, 1930-62: Maximum discharge, 15,800 cfs Apr. 2, 1952 (gage height, 12.00 ft), from rating curve extended above 9,100 cfs by logarithmic plotting; maximum gage height, 12.04 ft Mar. 23, 1936 (site then in use); minimum discharge, 2.5 cfs Jan. 3, 1950 (gage height, 0.06 ft, backwater from ice).
Maximum stage known, 17.1 ft, present datum, in April 1888, from floodmark at mill about 2,400 ft upstream.

Remarks.--Records good except those for period of ice effect, which are fair Diurnal fluctuation caused by powerplants above station.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)

1.5	82	4.0	1,220
1.7	120	5.0	2,000
2.0	192	7.0	3,870
2.5	370	9.0	6,520
3.0	609		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	96	219	332	90	180	370	4,220	1,540	482	131	414	2,200
2	184	363	135	270	250	300	3,600	1,230	560	357	335	2,250
3	199	527	93	*315	280	170	3,460	1,050	555	466	325	1,690
4	196	251	286	360	200	100	3,790	596	584	506	231	745
5	196	205	220	350	335	225	3,970	517	613	611	114	906
6	197	365	170	170	360	*260	4,260	518	780	751	322	739
7	156	425	200	91	360	270	4,400	518	780	757	426	681
8	95	392	250	320	365	280	4,500	516	576	780	355	642
9	187	327	160	370	*375	280	4,270	513	568	768	297	592
10	297	166	100	400	250	230	3,800	507	485	751	263	622
11	433	189	230	280	100	110	3,410	511	424	745	246	564
12	404	201	150	230	360	220	3,190	1,040	468	745	214	557
13	443	182	150	145	400	260	2,980	810	463	503	233	625
14	531	289	150	90	420	220	2,760	780	493	462	279	563
15	511	292	150	230	410	120	2,580	774	484	325	286	*543
16	*501	260	118	255	360	98	2,400	774	434	349	286	518
17	492	*351	100	255	220	86	2,380	757	398	436	*284	392
18	492	194	235	185	100	82	2,370	757	506	417	193	423
19	387	98	280	160	280	185	2,420	609	556	632	102	402
20	231	219	285	150	395	207	2,450	531	512	924	196	379
21	243	254	290	98	400	215	2,280	526	557	745	210	263
22	135	265	350	230	420	326	2,130	399	586	*763	218	368
23	321	232	160	260	420	255	1,940	598	*485	816	243	214
24	410	290	90	100	380	263	1,780	699	311	870	315	280
25	290	242	180	430	100	100	*1,580	930	330	828	179	430
26	270	100	240	550	370	271	1,420	*876	370	757	98	379
27	259	268	270	200	400	373	1,290	792	319	734	195	267
28	213	307	278	100	400	1,960	1,180	792	298	532	224	329
29	175	312	282	240	-	4,620	1,020	828	386	402	189	245
30	238	316	230	270	---------	6,370	1,360	888	413	366	171	122
31	195	---------	98	210	---------	*5,370	---------	804	---------	467	1,220	---------
Total	8,977	8,101	6,262	7,404	8,890	24,196	83,190	22,980	14,776	18,696	8,563	18,930
Mean	290	270	202	239	318	781	2,773	741	493	603	276	631
Cfsm	0.220	0.205	0.153	0.181	0.241	0.592	2.10	0.561	0.373	0.457	0.209	0.478
In.	0.25	0.23	0.18	0.21	0.25	0.68	2.34	0.65	0.42	0.53	0.24	0.53

Calendar year 1961: Max 4,220 Min 81 Mean 493 Cfsm 0.373 In. 5.06
Water year 1961-62: Max 6,370 Min 82 Mean 633 Cfsm 0.480 In. 6.51

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 5 to Mar. 15.

5-3730. South Fork Zumbro River near Rochester, Minn.

Location.--Lat 44°04'00", long 92°27'55", in SE¼ sec.14, T.107 N., R.14 W., on left bank 30 ft upstream from ford, a quarter of a mile downstream from sewage plant, 1.6 miles north of Rochester, 2 miles downstream from Cascade Creek, and 2½ miles downstream from Silver Lake Dam.

Drainage area.--304 sq mi.

Records available.--January 1952 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 951.0 ft above mean sea level, datum of 1929 (levels by City of Rochester Sewage Department).

Average discharge.--10 years, 113 cfs.

Extremes.--Maximum discharge during year, 18,000 cfs Mar. 29 (gage height, 18.46 ft); minimum, 31 cfs Jan. 24, 25 (gage height, 1.73 ft).
1952-62: Maximum discharge, that of Mar. 29, 1962; minimum, 8.4 cfs Dec. 7, 1955.
Previous maximum stage known since at least 1908, about 17.5 ft July 21, 1951, from information by sewage plant superintendent.

Remarks.--Records good except those above 8,000 cfs, which are fair. Slight regulation at times from Silver Lake and at very low flows from sewage-plant effluent.

Rating tables, water year 1961-62 (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used June 16-29)

Oct. 1 to Mar. 27		Mar. 28 to Sept. 30			
1.6	19	1.9	37	6.0	1,230
1.8	38	2.1	63	9.0	2,800
2.0	73	2.5	130	11.0	4,250
3.0	314	3.0	242	14.0	8,810
5.0	913	4.0	517		
7.0	1,690				

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	69	65	94	46	37	*42	532	*338	120	71	70	850
2	61	*84	78	51	38	41	444	264	113	109	66	335
3	55	91	78	53	38	41	404	234	113	99	66	237
4	51	89	89	53	43	39	487	212	138	100	70	210
5	49	78	71	53	39	44	927	195	130	92	63	178
6	48	73	75	48	38	41	1,880	184	117	88	64	163
7	44	69	57	48	38	42	1,000	182	117	95	63	152
8	43	63	59	48	37	44	825	182	115	345	92	152
9	41	65	63	39	39	48	643	175	107	264	70	158
10	46	65	55	39	38	43	475	180	102	158	63	158
11	156	65	53	39	39	42	418	205	106	126	59	150
12	125	61	53	39	41	48	426	232	95	111	54	138
13	101	61	53	39	41	46	373	232	82	100	57	128
14	89	61	53	38	42	41	354	191	85	99	*53	*117
15	78	61	51	39	42	43	330	175	80	99	52	113
16	73	73	48	38	43	46	332	163	79	92	49	124
17	69	69	49	37	42	46	398	150	82	84	47	93
18	65	61	53	35	39	43	682	156	136	82	46	104
19	63	53	*59	34	42	48	441	182	107	114	42	99
20	61	59	57	35	41	55	357	148	88	*181	46	93
21	59	61	59	34	43	61	327	144	93	154	43	102
22	57	71	59	34	44	65	314	156	*93	115	48	102
23	57	71	59	*34	43	57	298	175	77	165	80	95
24	57	75	57	33	42	75	272	*186	71	146	100	93
25	55	80	57	34	43	98	252	165	71	115	80	90
26	51	89	59	34	42	202	237	142	68	95	61	88
27	53	*87	48	34	39	1,050	227	136	64	85	60	85
28	53	87	49	34	41	*5,990	215	136	63	80	53	82
29	73	53	48	36	-	8,370	210	142	107	77	49	77
30	69	73	48	37	----------	*1,010	493	156	80	76	149	95
31	67	----------	46	37	----------	670	----------	132	----------	70	1,260	----------
Total	2038	2113	1837	1232	1134	18531	14573	5650	2899	3687	3175	4661
Mean	65.7	70.4	59.3	39.7	40.5	598	486	182	96.6	119	102	155
Cfsm	0.216	0.232	0.195	0.131	0.133	1.97	1.60	0.599	0.318	0.391	0.336	0.510
In.	0.25	0.26	0.22	0.15	0.14	2.27	1.78	0.69	0.35	0.45	0.39	0.57

Calendar year 1961: Max 6,430 Min 27 Mean 135 Cfsm 0.444 In. 6.01
Water year 1961-62: Max 8,370 Min 33 Mean 169 Cfsm 0.556 In. 7.52

Peak discharge (base, 1,000 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-29	0200	18.46	18,000	8-31	1630	7.87	2,150
4- 6	0400	8.84	2,700				

* Discharge measurement made on this day.

5-3740. Zumbro River at Zumbro Falls, Minn.

Location.--Lat 44°17'12", long 92°25'56", in sec.36, T.110 N., R.14 W., on left bank in Zumbro Falls, 1,000 ft downstream from Spring Creek, 0.7 mile upstream from bridge on U. S. Highway 63, and 6.3 miles downstream from North Fork.

Drainage area.--1,130 sq mi, approximately.

Records available.--June 1909 to September 1917, April to November 1929, March 1930 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 811.26 ft above mean sea level, datum of 1929. Prior to Nov. 11, 1933, chain gage on bridge 800 ft downstream at same datum.

Average discharge.--40 years (1909-17, 1930-62), 478 cfs.

Extremes.--Maximum discharge during year, 29,100 cfs Mar. 29 (gage height, 28.20 ft); minimum, 53 cfs Feb. 5 (gage height, 6.25 ft).

1909-17, 1929-62: Maximum discharge, 35,900 cfs (revised) July 22, 1951 (gage height, 30.80 ft, from floodmark); minimum, 27 cfs Jan. 12, 1935 (gage height, 6.30 ft).

Flood of April 1888 reached stage of about 30.5 ft at present site or 29.7 ft original site. Flood in 1859 is known to have exceeded that of 1888 (gage height, not determined).

Remarks.--Records good except those for periods of ice effect or no gage-height record, which are fair.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Mar. 28

6.2	47
6.4	75
6.7	140
7.0	227
7.5	449
8.0	734
9.0	1,380
14.0	5,360

Mar. 29 to Sept. 30

Note.--Same as preceding table below 14.0 ft.

14.0	5,360
20.0	12,800
26.0	23,800

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	94	274	306	70	69	450	2800	*1,080	459	148	287	4,010
2	195	272	302	b72	67	450	1,740	1,010	232	362	214	2,210
3	253	279	290	75	69	250	1,990	914	163	390	263	1,090
4	219	543	262	75	72	110	1,940	882	358	368	201	959
5	225	532	262	72	59	80	2,500	626	522	440	130	901
6	212	504	252	72	65	165	4,420	609	391	555	382	875
7	138	471	234	72	67	170	3,940	607	367	276	329	629
8	92	444	230	67	70	180	3,310	598	430	180	145	336
9	174	386	230	59	96	310	3,110	597	230	817	128	266
10	228	334	221	62	79	190	2,110	572	186	825	192	580
11	236	311	b192	61	b192	90	1,670	378	478	578	221	587
12	294	302	b185	67	90	270	1,600	372	390	377	121	572
13	296	286	b215	69	81	230	1,480	230	345	418	298	576
14	241	298	b260	b70	83	170	1,260	485	348	217	289	*565
15	140	274	b248	69	84	170	1,090	582	414	140	254	306
16	282	270	241	65	84	170	1,040	574	221	433	*253	172
17	314	357	224	61	81	120	1,170	574	492	289	251	419
18	360	306	201	61	72	95	1,050	584	721	259	135	370
19	321	262	*201	60	77	200	2,070	304	734	484	112	333
20	283	241	169	60	79	189	1,520	368	875	1,020	218	337
21	178	234	b100	60	75	b200	1,210	571	813	*709	215	476
22	116	241	86	60	79	210	1,090	425	*618	650	136	283
23	246	244	83	*61	75	b312	1,040	554	354	551	241	150
24	308	248	b79	61	79	220	972	586	189	622	282	338
25	276	248	73	64	79	105	920	*609	454	583	212	433
26	257	255	73	b66	163	361	901	328	389	411	114	354
27	246	*248	62	67	*306	535	888	178	345	414	220	358
28	143	248	64	67	307	4,920	308	454	336	269	221	280
29	118	121	65	67	-	*23,600	428	589	348	158	213	218
30	230	153	67	65	---	9,420	888	434	211	339	338	143
31	*283	---	70	65	---	3,570	---	530	---	396	2,560	---
Total	6,998	9,186	5,547	2,042	2,799	47,512	50,455	17,204	12,413	13,678	9,175	19,126
Mean	226	306	179	65.9 (659)	100	1,530	1,682	555	414	441	296	638
Cfsm	0.200	0.270	0.158	0.058	0.088	1.35	1.49	0.491	0.366	0.390	0.262	0.565
In.	0.23	0.30	0.18	0.07	0.09	1.56	1.66	0.57	0.41	0.45	0.30	0.63

Calendar year 1961: Max 13,200 Min 47 Mean 489 Cfsm 0.433 In. 5.86
Water year 1961-62 Max 23,600 Min 59 Mean 537 Cfsm 0.475 In. 6.45

* Discharge measurement made on this day.
b Stage-discharge relation affected by ice.
Note.--No gage-height record Jan. 19-22, Mar. 1-19.

5-3765. South Fork Whitewater River near Altura, Minn.

Location.--Lat 44°04'10", long 91°58'49", in SE¼ sec.14, T.107 N., R.10 W., on left bank 500 ft upstream from highway bridge, 1.4 miles upstream from small tributary entering from the west, 2 miles west of Altura, and 2.4 miles upstream from Keefer Creek.

Drainage area.--76.8 sq mi.

Records available.--October 1939 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 761.80 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers).

Average discharge.--23 years, 27.8 cfs.

Extremes.--Maximum discharge during year, 4,870 cfs Mar. 28 (gage height, 10.01 ft); minimum daily, 9.2 cfs Feb. 6; minimum gage height, 0.96 ft Aug. 19.
1939-62: Maximum discharge, 5,460 cfs Aug. 31, 1947 (gage height, 10.61 ft); minimum, 3.8 cfs Mar. 24, 1940; minimum gage height, 0.74 ft Jan. 20, 1951.

Remarks.--Records good except those for periods of ice effect, which are fair.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1 to Nov. 18, Nov. 20-30, Mar. 28-29, Aug. 10-24)

Oct. 1 to Mar. 27		Mar. 28 to Sept. 30	
1.1	11	0.9	11
1.2	16	1.1	18
1.4	35	1.3	29
1.6	58	1.6	58
2.0	111	2.0	111
2.5	188		
3.0	302		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	13	13	14	12	11	11	41	25	16	14	13	29
2	13	14	14	12	11	12	35	* 22	15	14	13	20
3	13	14	14	12	11	12	34	21	15	14	13	17
4	12	13	14	12	11	13	52	19	18	14	12	17
5	12	13	14	12	10	12	111	17	17	14	12	16
6	12	13	14	12	9.2	12	98	17	16	14	12	16
7	13	14	14	11	9.5	13	64	16	15	14	12	16
8	13	13	13	11	10	13	57	17	14	14	12	16
9	13	13	13	11	10	12	52	16	15	14	12	17
10	14	13	12	11	11	12	41	15	14	14	12	18
11	15	14	11	11	11	13	36	16	14	15	11	17
12	15	14	11	11	12	13	34	18	14	16	11	17
13	15	14	11	12	12	12	34	21	13	14	11	*17
14	14	13	11	12	12	12	34	18	13	14	11	16
15	13	13	11	12	12	12	30	16	13	14	*11	16
16	13	15	11	11	12	13	29	14	13	14	11	17
17	13	13	12	11	12	12	31	14	13	14	11	16
18	12	13	13	10	13	12	38	15	14	14	11	17
19	12	13	13	10	13	12	34	18	15	14	11	16
20	12	14	*14	10	13	* 12	33	16	14	*15	11	16
21	12	14	14	11	13	13	30	15	*14	14	11	17
22	12	14	13	11	13	14	30	15	14	15	11	17
23	13	14	13	11	13	15	28	17	13	15	12	17
24	12	14	13	* 12	13	15	27	*18	13	14	13	17
25	12	14	13	12	12	16	25	16	13	14	12	17
26	*12	14	13	12	13	27	24	15	13	14	12	16
27	13	13	12	12	*13	192	23	15	13	14	12	16
28	13	*13	11	12	12	*2,310	23	23	13	13	12	16
29	14	13	11	11	-	709	23	18	14	13	12	17
30	13	14	11	11	---	74	29	18	14	13	15	18
31	13	---	11	10	---	52	---	18	---	13	18	---
Total	401	406	389	351	327.7	3,682	1,180	539	425	436	373	515
Mean	12.9	13.5	12.5	11.3	11.7	119	39.3	17.4	14.2	14.1	12.0	17.2
Cfsm	0.168	0.176	0.163	0.147	0.152	1.55	0.512	0.227	0.185	0.184	0.156	0.224
In.	0.19	0.20	0.19	0.17	0.16	1.78	0.57	0.26	0.21	0.21	0.18	0.25

Calendar year 1961: Max 2,130 Min 9.6 Mean 28.9 Cfsm 0.376 In. 5.11
Water year 1961-62: Max 2,310 Min 9.2 Mean 24.7 Cfsm 0.322 In. 4.37

Peak discharge (base, 200 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-28	1715	10.01	4,870				

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 19, Dec. 7-23, Dec. 26 to Jan. 4, Jan. 6 to Feb. 13, Feb. 19-23, Mar. 1-7.

5-3785. Mississippi River at Winona, Minn.

Location.--Lat 44°03'20", long 91°38'15", in sec.23, T.107 N., R.7 W., on right bank at Winona pumping station in Winona, 9½ miles upstream from Trempealeau River and at mile 725.7 upstream from the Ohio River.

Drainage area.--59,200 sq mi, approximately.

Records available.--June 1928 to September 1962. 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 mean sea level, datum of 1929. June 10, 1928, to Apr. 15, 1931, staff 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, staff gage at present site and datum. Since Mar. 31, 1937, auxiliary water-stage recorder 2.7 miles upstream at tailwater of navigation dam 5A.

Average discharge.--34 years, 24,380 cfs.

Extremes.--Maximum discharge during year, 92,200 cfs Apr. 15 (gage height, 11.63 ft); minimum daily, 3,700 cfs Dec. 11; minimum gage height, 4.65 ft, Dec. 14.
1928-62: Maximum discharge, 190,000 cfs Apr. 20, 1952 (gage height, 17.91 ft); minimum, 2,250 cfs Dec. 29, 1933 (gage height, -1.18 ft); minimum gage height, -3.38 ft Aug. 31, 1934.

Remarks.--Records good. Some regulation by reservoirs, navigation dams, and powerplants at low and medium stages. Flood flow not materially affected by artificial storage.

Cooperation.--Gage-height record at dam 5A furnished by Corps of Engineers.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	12,100	13,800	13,900	11,900	9,510	11,100	49,200	58,200	86,800	29,700	31,300	39,200
2	11,300	13,000	14,100	12,100	9,450	11,100	48,700	56,100	87,000	27,000	32,200	31,900
3	11,300	15,300	14,000	12,100	9,460	11,500	51,300	54,800	86,000	22,800	33,700	30,400
4	10,200	14,800	14,200	12,000	9,520	11,800	51,100	55,200	83,800	26,300	35,000	33,400
5	10,100	15,400	14,000	12,400	9,730	13,000	53,700	54,400	80,300	26,600	31,700	36,500
6	11,600	17,200	14,200	12,400	9,750	13,800	56,200	52,900	76,800	29,400	28,400	36,200
7	8,890	17,500	14,100	12,100	9,700	13,800	58,500	48,600	*73,300	32,600	26,100	31,700
8	7,860	18,500	11,300	12,100	9,620	13,800	62,200	46,400	69,600	32,800	28,000	31,100
9	10,900	18,200	6,550	12,300	9,690	13,700	66,900	40,500	67,100	32,200	28,200	31,400
10	13,600	19,000	5,280	12,100	9,690	13,800	70,100	38,800	63,800	34,500	24,300	32,900
11	*13,700	17,300	3,700	10,700	9,770	13,700	75,900	39,000	61,100	35,600	23,300	32,100
12	13,400	16,400	4,160	9,530	9,810	14,400	82,900	38,200	58,600	37,500	24,500	28,200
13	13,900	16,400	5,000	9,560	10,000	15,400	88,200	38,700	55,800	37,300	27,500	30,500
14	14,800	16,100	6,150	9,600	10,400	15,600	91,000	38,400	54,700	36,200	25,800	35,200
15	13,400	15,400	8,120	9,690	10,000	15,600	91,900	40,500	51,600	36,300	25,400	35,800
16	12,700	16,500	9,740	9,760	10,000	15,500	90,800	44,300	50,800	37,200	*26,300	34,000
17	9,290	16,200	12,600	9,740	10,000	15,600	88,300	45,800	49,600	37,900	26,400	*35,900
18	10,300	15,200	14,800	9,840	10,100	15,500	84,800	50,800	48,400	36,400	24,800	40,400
19	11,100	13,600	15,000	9,700	10,200	15,500	82,400	50,800	43,700	36,500	24,200	39,000
20	10,900	12,400	14,000	9,670	10,200	15,800	*78,200	53,100	43,300	40,200	24,000	37,800
21	9,060	11,200	13,500	9,660	10,200	16,200	75,000	53,000	40,900	41,200	20,800	37,900
22	5,730	13,000	13,500	9,670	10,200	16,800	72,200	52,800	40,700	39,500	19,800	37,500
23	5,890	16,000	13,200	9,700	10,100	17,200	69,300	55,500	39,700	38,900	23,600	32,400
24	5,870	15,500	13,200	9,620	10,100	17,600	67,400	57,900	39,600	38,300	28,400	28,900
25	5,750	13,900	13,200	9,540	10,200	19,100	64,400	60,700	35,100	*37,300	29,300	25,600
26	6,900	12,600	13,300	9,590	10,800	21,600	63,200	61,700	34,700	36,900	23,300	23,700
27	9,060	12,600	13,300	9,660	11,300	20,700	62,000	65,400	31,700	37,300	22,700	24,200
28	8,030	12,500	13,300	9,650	11,400	28,700	61,700	71,600	31,000	37,400	21,400	22,400
29	6,940	12,800	12,400	9,650	-	46,500	60,000	77,300	31,600	37,500	24,100	21,800
30	10,900	13,400	11,600	9,630	---------	52,900	58,400	81,200	30,500	35,800	25,800	19,900
31	12,700	----------	11,700	9,560	---------	53,100	----------	84,700	----------	33,100	34,000	----------
Total	318,170	451,700	357,100	325,220	280,900	590,400	2,075,900	1,667,300	1,647,600	1,078,200	824,300	957,900
Mean	10,260	15,060	11,520	10,490	10,030	19,050	69,200	53,780	54,920	34,780	26,590	31,930
Cfsm	0.173	0.254	0.195	0.177	0.169	0.320	1.17	0.908	0.928	0.588	0.449	0.539
In.	0.20	0.28	0.22	0.20	0.18	0.37	1.30	1.05	1.04	0.68	0.52	0.60

Calendar year 1961: Max 67,400 Min 3,700 Mean 18,260 Cfsm 0.308 In. 4.18
Water year 1961-62: Max 91,900 Min 3,700 Mean 28,970 Cfsm 0.489 In. 6.64

* Discharge measurement made on this day.
Note.--Fall-stage-discharge relation affected by ice Nov. 18 to Mar. 24.

5-3790. Gilmore Creek at Winona, Minn.

Location.--Lat 44°02'40", long 91°41'25", sec.29, T.107 N., R.7 W., on left bank at west edge of Winona, 1,500 ft upstream from bridge on U.S. Highway 14, 2¾ miles upstream from Lake Winona, and 6½ miles upstream from mouth.

Drainage area.--8.95 sq mi.

Records available.--October 1939 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 672.92 ft above mean sea level, adjustment of 1912. Prior to Nov. 4, 1939, staff gage at same site and datum.

Average discharge.--23 years, 3.67 cfs.

Extremes.--Maximum discharge during year, 436 cfs Aug. 30 (gage height, 1.65 ft); minimum, 1.5 cfs Aug. 13-15; minimum gage height, 0.09 ft June 30, July 1, 2, July 26-31, Aug. 2.
1939-62: Maximum discharge, 5,360 cfs July 21, 1951 (gage height, 9.47 ft), from rating curve extended above 260 cfs on basis of slope-area measurement at gage height 6.74 ft and logarithmic plotting; minimum, 0.4 cfs several days in July and August 1941.

Remarks.--Records poor. Some regulation at low flow by swimming pool three-quarters of a mile above station. Water diverted above station at times since May 1961 to maintain water level in pond. Records include diversion.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Mar. 9-22)

0.05	1.4	0.6	28
.1	2.1	.8	53
.2	4.2	1.0	94
.3	7.8	1.2	159
.4	13		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	2.7	3.3	3.1	2.9	2.9	*2.6	4.2	3.7	3.5	2.9	2.3	4.5
2	2.7	3.5	3.1	3.0	3.0	2.6	4.0	*3.5	3.7	3.1	2.3	3.7
3	2.7	3.5	3.1	3.0	3.0	2.7	4.0	3.5	3.3	3.1	2.1	3.7
4	2.7	3.3	3.1	3.0	2.8	2.8	4.5	3.5	3.7	3.1	2.3	3.7
5	2.9	3.3	3.1	3.0	2.7	2.9	*9.5	3.5	4.2	3.1	2.3	3.7
6	3.1	3.3	3.1	2.9	2.7	3.0	4.8	3.5	3.7	3.1	2.1	3.5
7	3.1	3.3	3.1	2.8	2.8	3.0	4.8	3.5	3.7	3.3	2.1	3.7
8	2.9	3.3	3.3	2.8	2.8	3.1	4.5	3.3	3.3	3.5	2.1	3.7
9	2.7	3.3	3.1	2.7	2.9	3.1	4.5	3.1	3.5	3.3	2	3.7
10	3.8	3.3	3.0	2.7	2.9	3.1	4.5	3.3	4.2	3.3	1.8	3.7
11	3.2	3.3	2.7	2.7	2.9	3.1	4.2	3.1	4.0	3.3	1.8	3.7
12	3.1	3.1	2.6	2.8	3.0	3.1	4.2	4.0	3.5	3.3	1.8	3.7
13	3.3	3.1	2.6	2.8	3.0	3.1	4.2	3.5	3.1	3.1	1.7	*3.5
14	3.1	3.1	2.6	2.8	3.0	3.1	4.2	3.5	3.3	3.1	1.5	3.5
15	3.0	3.1	2.8	2.8	2.9	3.1	4.2	3.3	3.3	3.1	*1.7	3.3
16	3.0	3.5	2.9	2.8	2.9	3.1	4.2	3.3	3.3	3.1	1.7	3.7
17	3.0	3.3	3.1	2.7	2.9	3.1	4.0	3.5	4.5	3.1	1.7	3.3
18	3.0	2.9	3.1	2.7	2.8	3.1	4.0	3.5	3.5	3.1	1.7	3.3
19	2.9	3.3	3.1	2.7	2.8	3.3	4.0	3.5	3.1	*3.3	1.7	3.3
20	2.9	3.1	*3.1	2.8	2.7	*3.3	4.0	3.5	2.9	3.8	1.7	3.1
21	2.9	2.9	3.3	2.8	2.7	4.0	4.0	3.5	* 2.9	3.3	1.7	3.1
22	3.2	3.1	3.3	2.9	2.7	4.8	4.0	3.7	3.3	3.1	1.7	3.1
23	3.0	3.1	3.3	*2.9	2.7	6.5	4.0	3.7	3.1	3.3	1.7	3.1
24	3.0	3.1	3.3	2.9	2.7	6.1	3.7	*3.5	3.1	3.3	7.2	2.9
25	2.9	3.1	3.3	*3.0	2.7	8.8	3.7	3.5	3.1	3.1	2.9	2.9
26	*2.9	3.1	3.2	3.0	2.7	9.3	3.7	3.5	3.1	2.9	2.7	2.9
27	3.1	3.1	3.0	3.0	2.7	15	4.0	3.5	3.1	2.7	2.7	3.1
28	3.1	*3.1	2.8	3.0	2.6	*105	4.0	3.7	2.9	2.7	2.7	2.9
29	3.3	3.1	2.7	3.0	-	6.5	3.7	3.5	2.9	2.7	2.9	2.9
30	3.3	3.1	2.8	2.9	--------	5.4	4.2	3.5	2.9	2.5	23	2.9
31	3.3	--------	2.9	2.9	--------	5.1	--------	3.5	--------	2.5	9.8	--------
Total	93.8	96.0	93.6	88.7	78.9	236.8	129.5	108.2	101.7	96.2	97.4	101.8
Mean	3.03	3.20	3.02	2.86	2.82	7.64	4.32	3.49	3.39	3.10	3.14	3.39
Cfsm	0.338	0.358	0.337	0.320	0.315	0.854	0.483	0.390	0.379	0.346	0.351	0.379
In.	0.39	0.40	0.39	0.37	0.33	0.98	0.54	0.45	0.42	0.40	0.40	0.42

Calendar year 1961: Max 138 Min 1.7 Mean 4.02 Cfsm 0.449 In. 6.10
Water year 1961-62 Max 105 Min 1.5 Mean 3.62 Cfsm 0.404 In. 5.49

Peak discharge (base, 60 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-28	1500	1.63	419	8-30	2130	1.65	436
8-24	1130	.98	78				

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 10-18, Dec. 25 to Mar. 8 (no gage-height record Jan. 17-22, 24, Jan. 26 to Feb. 28). No gage-height record Oct. 10-25.

GPO 802-479-10

5-3836. North Branch Root River tributary near Stewartville, Minn.

Location.--Lat 43°51'20", long 92°26'50", near center of sec. 36, T.105 N., R.14 W., on right bank just upstream from culvert on State Highway 30, 2 miles upstream from mouth and 2 miles east of Stewartville.

Drainage area.--0.73 sq mi.

Records available.--March 1959 to September 1962.

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

Extremes.--Maximum discharge during year, 98 cfs Mar. 28 (gage height, 8.63 ft, backwater from ice); no flow for many days.
1959-62: Maximum discharge, 328 cfs July 2, 1960 (gage height, 13.47 ft); no flow most of period.

Remarks.--Records fair except those for periods of ice effect, which are poor.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0				0	0	0.1	0.2	0	* 0	0.2
2	0	0				0	0	.1	.1	0	0	.2
3	0	**0				0	0	**.1	0	0	0	.2
4	0	0	(*)			0	.3	.1	.3	0	0	.2
5	0	0				0	*4.4	0	.2	0	0	.2
6	0	0				0	.2	0	.2	0	0	.2
7	0	0				0	.2	0	.2	.3	0	.2
8	0	0				0	.2	0	.1	.4	0	.2
9	0	0				0	.2	0	.1	0	0	.2
10	0	0				0	.2	.1	.1	0	0	.2
11	.1	0				0	.2	.2	0	0	0	.2
12	0	0				0	.2	.2	0	0	0	.2
13	0	0				0	.2	.2	0	0	*0	*.2
14	0	0				0	.3	.1	0	0	0	.1
15	0	0				0	.3	.1	0	0	0	0
16	0	0				0	.8	0	0	0	0	0
17	0	0				0	2.1	0	0	0	0	0
18	0	0				0	**1.1	.1	.1	0	0	0
19	0	0				0	.7	.1	0	.1	0	0
20	0	0				0	.8	0	0	*2.8	0	0
21	0	0				0	.9	0	0	.2	0	0
22	0	0				0	.9	.2	*0	.2	0	0
23	0	0				0	.7	.2	0	.2	0	0
24	0	0				0	.7	.1	0	.2	0	0
25	0	0				b.1	.6	**.1	0	.2	0	0
26	0	.1				b0	.6	.1	0	.1	0	0
27	0	0				*b4.6	.6	0	0	0	0	0
28	0	0				b36.0	.7	0	0	0	0	0
29	0	**0			-	.2	.5	.3	0	0	0	0
30	0	0			--------	.2	2.3	.4	0	0	2.7	.1
31	0	--------			--------	**.4	--------	.2	--------	0	20	--------
Total	0.1	0.1	0	0	0	41.4	20.9	3.1	1.6	7.7	22.7	2.8
Mean	0.003	0.003	0	0	0	1.34	0.70	0.10	0.05	0.25	0.73	0.09
Cfsm	0.0041	0.0041	0	0	0	1.84	0.958	0.137	0.068	0.034	1.00	0.123
In.	0.005	0.005	0	0	0	2.11	1.06	0.16	0.08	0.39	1.16	0.14

Calendar year 1961: Max 25 Min 0 Mean 0.169 Cfsm 0.232 In. 3.13
Water year 1961-62: Max 36 Min 0 Mean 0.275 Cfsm 0.377 In. 5.11

Peak discharge (base, 30 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-28	1230	8.63	98	8-31	0730	7.65	77

* Discharge measurement or observation of no flow made on this day.
** Field estimate made on this day.
b Stage-discharge relation affected by ice.

5-3840. Root River near Lanesboro, Minn.

Location.--Lat 43°44'58", long 91°58'43", in sec.1, T.103 N., R.10 W., on left bank half a mile upstream from highway bridge, 1¼ miles upstream from South Branch, and 2½ miles northeast of Lanesboro.

Drainage area.--615 sq mi.

Records available.--February to November 1910, February 1911 to September 1914, July 1915 to September 1917, August 1940 to September 1962. Published as North Branch Root River near Lanesboro, 1910-17."

Gage.--Water-stage recorder. Datum of gage is 791.84 ft above mean sea level, adjustment of 1912. Prior to Oct. 1, 1917, chain gage at site half a mile downstream at datum about 1.5 ft higher.

Average discharge.--27 years (1911-14, 1915-17, 1940-62), 325 cfs.

Extremes.--Maximum discharge during year, 22,100 cfs Mar. 29 (gage height, 16.11 ft); minimum daily, 75 cfs Feb. 6 ; minimum gage height, 1.83 ft Aug. 21-23.
1910-17, 1940-62: Maximum discharge, that of Mar. 29, 1962; minimum, 29 cfs Aug. 27, 1949 (gage height, 1.08 ft).

Remarks.--Records good except those for periods of ice effect, which are fair. Diurnal fluctuation at times during medium and low flow caused by power plant above station.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Mar. 28		Mar. 29 to Aug. 31				Sept. 1-30	
2.1	91	1.8	108	9.0	6,180	2.0	173
2.4	172	2.2	205	13.0	14,200	2.5	348
3.0	418	3.0	520	16.0	21,800	3.0	570
4.0	1,000	4.0	1,010			4.0	1,050
7.0	3,650	5.0	1,670			5.0	1,680
10.0	7,850	7.0	3,500			7.0	3,500
						9.0	6,180

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	130	128	163	107	80	82	1,140	682	270	153	160	5,930
2	128	*136	156	109	80	83	830	538	224	163	153	1,610
3	128	141	150	112	81	84	682	*414	211	178	153	810
4	125	141	150	115	82	86	668	342	220	350	153	611
5	119	141	144	113	79	90	1,320	307	243	296	153	538
6	117	141	144	110	75	95	4,110	281	250	236	151	533
7	114	141	140	108	76	98	2,630	256	233	205	146	441
8	112	141	132	105	78	*101	1,720	256	230	345	151	388
9	112	138	130	103	78	102	1,380	250	217	601	160	376
10	114	133	127	102	78	105	960	246	202	583	151	384
11	133	133	120	100	80	107	785	285	194	338	143	*397
12	144	130	112	100	81	109	750	326	186	256	141	388
13	160	130	108	100	82	110	725	334	176	220	136	352
14	147	128	105	98	82	108	624	334	170	202	*134	308
15	156	130	105	98	83	106	547	303	163	192	129	280
16	147	144	107	95	84	105	524	270	156	181	129	272
17	141	144	110	95	84	110	542	239	156	173	127	268
18	136	136	112	93	84	118	1,130	227	304	*163	123	247
19	133	127	112	92	84	125	1,160	233	292	166	121	230
20	128	133	110	90	85	130	770	263	*285	214	121	221
21	125	140	*109	87	85	132	624	233	224	552	118	215
22	125	141	108	85	86	133	556	*217	200	592	116	215
23	128	138	108	84	86	136	511	*236	189	476	125	212
24	125	138	109	84	86	142	467	285	178	397	182	203
25	125	138	110	*83	84	150	419	300	166	296	224	203
26	122	144	110	83	84	210	371	260	153	239	181	197
27	119	147	108	82	82	*874	342	230	146	208	168	194
28	119	145	105	82	82	7,580	323	220	148	197	143	188
29	133	*143	105	81	-	19,500	303	224	143	189	136	185
30	128	166	105	80	----------	*5,050	326	224	153	178	316	194
31	128	----------	105	80	----------	1,570	----------	285	----------	170	2,000	----------
Total	4,001	4,156	3,719	2,956	2,291	37,531	27,239	9,100	6,082	8,709	6,544	16,590
Mean	129	139	120	95.4	81.8	1,211	908	294	203	281	211	553
Cfsm	0.210	0.226	0.195	0.155	0.133	1.97	1.48	0.478	0.330	0.457	0.343	0.899
In.	0.24	0.25	0.22	0.18	0.14	2.27	1.65	0.55	0.37	0.53	0.40	1.00

Calendar year 1961: Max 17,800 Min 100 Mean 315 Cfsm 0.512 In. 6.96
Water year 1961-62: Max 19,500 Min 75 Mean 353 Cfsm 0.574 In. 7.80

Peak discharge (base, 3,500 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-29	1400	16.11	22,100	9-1	1800	10.48	8,700
4- 6	1400	8.66	5,660				

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Nov. 19-21, 28, 29, Dec. 7 to Mar. 26.

5-3845. Rush Creek near Rushford, Minn.

Location.--Lat 43°50'00", long 91°46'40", on line between sec. 3 and 10, T.104 N., R.8 W., on downstream side near center of span of highway bridge, 1½ miles northwest of Rushford and 3 miles upstream from mouth.

Drainage area.--129 sq mi.

Records available.--August 1942 to September 1962.

Gage.--Chain gage read twice daily. Datum of gage is 735.00 ft above mean sea level, adjustment of 1912. Prior to June 14, 1950, water-stage recorder at site 100 ft upstream, at datum 5 ft higher, Aug. 5, 1942, to Oct. 27, 1945, at datum 3 ft higher, Oct. 28, 1945, to Aug. 3, 1949; at present datum thereafter.

Average discharge.--20 years, 54.5 cfs.

Extremes.--Maximum discharge during year, 4,550 cfs Mar. 28 (gage height, 9.98 ft, from floodmarks); minimum daily, 32 cfs Jan. 30, 31, Feb. 1; minimum gage height, 1.84 ft Sept. 24, 29.
1942-62: Maximum discharge, 11,600 cfs Mar. 26, 1950 (gage height, 13.54 ft, from floodmark), from rating curve extended above 1,400 cfs on basis of contracted-opening measurements at gage heights 11.0 and 13.5 ft; minimum, 17 cfs May 22, 1959; minimum gage height, that of Sept. 24, 29, 1962.
Flood of June 28, 29, 1942, reached a discharge of 11,000 cfs (by slope-area measurement of peak flow).

Remarks.--Records fair.

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	39	41	41	38	32	36	114	43	40	36	37	64
2	38	43	40	38	33	36	104	*41	40	42	37	60
3	38	43	40	38	33	35	104	41	40	39	40	56
4	38	42	40	38	38	35	102	41	65	38	38	55
5	37	42	40	36	37	35	*99	41	43	38	37	54
6	37	41	40	35	35	35	82	41	41	38	36	52
7	37	41	40	35	34	35	72	42	42	38	36	54
8	38	41	38	35	33	35	71	41	41	45	38	53
9	38	41	38	34	33	35	72	41	55	40	36	56
10	40	41	37	34	34	35	70	41	42	39	36	56
11	41	41	37	34	34	35	70	42	44	39	35	*53
12	40	41	37	33	35	35	67	43	42	39	35	52
13	39	40	36	34	36	34	63	42	42	39	35	51
14	39	39	36	35	36	33	59	42	41	40	*35	50
15	39	40	37	35	36	33	58	41	42	41	35	51
16	40	41	37	34	35	33	57	40	41	40	36	53
17	40	41	38	34	35	34	58	40	42	38	35	50
18	40	39	38	34	35	34	56	41	42	*38	35	49
19	39	41	39	34	36	34	56	42	41	40	35	49
20	40	41	39	35	35	35	55	42	*40	38	35	49
21	40	41	*38	36	36	36	55	41	40	40	34	50
22	40	41	46	37	35	37	51	*41	40	38	34	50
23	40	42	45	38	36	38	48	42	40	38	36	49
24	40	42	46	*39	35	38	47	42	40	36	64	47
25	39	41	46	40	35	41	47	41	38	38	50	48
26	*40	42	38	39	35	44	46	41	38	38	40	48
27	40	41	36	37	36	128	46	41	38	39	35	47
28	40	41	35	35	*37	1420	45	41	38	38	35	47
29	46	*41	36	33	-	383	44	42	39	38	36	47
30	41	41	37	32	---	135	46	41	37	38	66	53
31	42	---	38	32	---	121	---	41	---	37	88	---
Total	1225	1233	1209	1101	980	3113	1964	1282	1254	1203	1240	1553
Mean	39.5	41.1	39.0	35.5	35.0	100	65.5	41.4	41.8	38.8	40.0	51.8
Cfsm	0.306	0.319	0.302	0.275	0.271	0.775	0.508	0.321	0.324	0.301	0.310	0.402
In.	0.35	0.36	0.35	0.32	0.28	0.90	0.57	0.37	0.36	0.35	0.36	0.45

Calendar year 1961: Max 3,530 Min 32 Mean 74.8 Cfsm 0.580 In. 7.87
Water year 1961-62: Max 1,420 Min 32 Mean 47.6 Cfsm 0.369 In. 5.02

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 8-20, Dec. 27 to Jan. 1, Jan. 6-27, Jan. 30 to Feb. 2, Feb. 6-11, Feb. 26 to Mar. 4, Mar. 11-20.

5-3850. Root River near Houston, Minn.

Location.--Lat 43°46'05", long 91°35'11", in sec.32, T.104 N., R.6 W., on right bank 1 mile west of Houston and 2½ miles upstream from South Fork.

Drainage area.--1,270 sq mi, approximately.

Records available.--May 1909 to September 1917, May to November 1929, March 1930 to September 1962. Monthly discharge only for some periods, published in WSP 1308.

Gage.--Water-stage recorder. Datum of gage is 671.86 ft above mean sea level, datum of 1929. May 28, 1909, to Sept. 30, 1917, staff gage at site 1½ miles downstream at different datum. May 4, 1929, to Sept. 27, 1933, chain gage at present site and datum.

Average discharge.--40 years (1909-17, 1930-62), 650 cfs.

Extremes.--Maximum discharge during year, 29,500 cfs Mar. 30 (gage height, 14.36 ft); minimum daily, 256 cfs Feb. 9.
1909-17, 1929-62: Maximum discharge, 37,000 cfs Apr. 1, 1952; maximum gage height, 15.10 ft Mar. 27, 1961; minimum discharge, 65 cfs Dec. 26, 1933, Feb. 25, 1935.

Remarks.--Records fair. Slight diurnal fluctuation at low flows caused by powerplants above station.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Mar. 27-31)

1.6	294	6.0	3,220
2.0	414	8.0	6,010
2.5	651	10.0	9,860
3.0	940	12.0	16,500
4.0	1,590	15.0	30,700

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	342	326	372	315	271	292	2570	749	551	406	432	5510
2	318	334	375	319	272	292	1900	*1040	546	449	414	4830
3	309	358	375	320	273	292	1520	874	504	641	418	2130
4	311	342	372	325	271	296	*1340	754	546	566	418	1630
5	307	342	362	322	269	298	1730	694	528	605	402	1400
6	307	345	358	318	264	302	3910	641	528	576	398	1260
7	302	342	350	312	260	306	4410	605	518	523	391	1150
8	304	342	341	307	258	309	3070	585	509	523	387	1030
9	300	345	336	301	256	312	2580	566	551	772	394	970
10	298	339	331	296	260	320	2030	556	615	934	394	934
11	320	334	329	294	263	324	1640	566	566	832	383	898
12	318	331	327	295	271	330	1480	683	509	673	375	*862
13	335	326	325	298	278	336	1420	689	481	566	372	814
14	350	315	329	299	281	342	1300	678	467	523	365	738
15	360	331	332	299	286	345	1160	667	449	495	*365	683
16	350	355	340	290	291	345	1050	631	440	472	358	662
17	335	349	345	282	298	342	1020	580	436	449	355	631
18	325	339	352	274	302	340	1160	566	481	436	352	595
19	318	326	355	268	304	340	1990	561	571	*436	352	571
20	313	318	*357	261	309	345	1550	546	*551	481	352	542
21	309	331	355	258	311	350	1290	556	537	542	352	532
22	309	349	354	257	310	358	1120	537	499	850	352	523
23	309	358	352	258	309	375	1010	*556	481	826	362	513
24	313	358	350	*259	307	400	940	546	472	790	418	504
25	311	352	348	260	305	445	880	580	454	678	532	490
26	320	352	340	261	303	550	802	576	436	580	472	476
27	*315	355	330	262	300	1220	754	542	418	532	436	467
28	309	*349	320	264	*295	6960	722	528	410	495	406	458
29	342	352	318	268	-	* 19100	678	537	423	481	391	454
30	337	362	314	269	---	20800	700	513	414	463	682	458
31	326	---	314	270	---	3950	---	509	---	440	2770	---
Total	9920	10257	10658	8881	7977	60916	47726	19211	14891	18035	14850	32715
Mean	320	342	344	286	285	1,965	1,591	620	496	582	479	1,090
Cfsm	0.252	0.269	0.271	0.225	0.224	1.55	1.25	0.488	0.391	0.458	0.377	0.858
In.	0.29	0.30	0.31	0.26	0.23	1.78	1.40	0.56	0.44	0.53	0.43	0.96

Calendar year 1961: Max 29,800 Min 275 Mean 664 Cfsm 0.523 In. 7.11
Water year 1961-62 Max 20,800 Min 256 Mean 701 Cfsm 0.552 In. 7.49

Peak discharge (base, 5,000 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-30	0400	14.36	29,500	9-2	0130	9.10	8,000
4- 7	0015	8.03	6,060				

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 7 to Mar. 26.

5-3855. South Fork Root River near Houston, Minn.

Location.--Lat 43°44', long 91°34', in NE¼SW¼ sec. 9, T. 103 N., R. 6 W., on left bank 50 ft downstream from bridge on State Highway 76, half a mile upstream from Badger Creek and 1½ miles south of Houston.

Drainage area.--275 sq mi.

Records available.--January 1953 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 680.41 ft above mean sea level, datum of 1929.

Average discharge.--9 years, 122 cfs.

Extremes.--Maximum discharge during year, 8,420 cfs Mar. 29 (gage height, 13.35 ft); minimum, 11 cfs Nov. 28 (gage height, 1.47 ft).
1953-1962: Maximum discharge, that of Mar. 29, 1962; maximum gage height, 13.74 ft Mar. 26, 1961 (backwater from ice); minimum discharge, that of Nov. 28, 1961.

Remarks.--Records good except those for period of ice effect, which are fair.

Rating table, water year 1961-62, except period of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1, 2, Nov. 20, 21, Nov. 24 to to Dec. 6, Mar. 29 to June 7, June 19 to July 3)

Oct. 1 to Mar. 27		Mar. 28 to Sept. 30			
2.6	62	2.0	73	9.0	1,250
2.8	70	2.5	134	10.0	1,640
3.1	85	3.0	196	11.0	2,570
3.5	111	5.0	467	12.0	4,500
4.0	166	7.0	796		
6.0	446				

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	104	82	76	80	82	80	269	120	71	93	90	562
2	91	86	76	82	82	80	222	*114	72	120	87	269
3	88	94	75	82	82	80	197	109	73	290	93	214
4	87	88	76	82	82	80	*195	107	87	121	93	191
5	72	87	73	82	82	79	277	111	86	109	90	184
6	78	85	60	82	80	78	287	115	81	104	87	164
7	78	84	68	80	78	77	249	108	78	102	86	152
8	79	83	79	78	77	77	232	108	80	103	86	147
9	80	82	78	77	77	76	219	107	87	119	90	148
10	82	83	76	77	76	75	196	105	104	102	86	150
11	98	82	76	77	76	73	183	115	150	97	89	145
12	92	82	76	78	76	72	181	122	101	96	89	*136
13	89	82	76	80	77	71	181	124	92	93	89	129
14	84	79	76	80	77	71	171	114	93	96	86	126
15	84	80	78	80	77	70	163	111	91	96	*89	124
16	82	99	82	79	77	70	156	110	92	95	90	130
17	81	97	84	78	77	72	154	107	93	92	92	131
18	80	92	85	78	78	74	152	107	107	91	90	125
19	82	86	86	78	78	77	146	113	98	*95	92	122
20	80	83	*86	78	79	82	148	107	97	98	91	120
21	80	82	86	78	80	83	147	107	*103	96	92	119
22	80	90	86	78	80	92	145	107	99	93	89	120
23	82	87	86	79	80	97	139	*111	98	101	98	119
24	80	84	85	*80	80	98	133	108	97	96	103	117
25	78	83	84	80	80	123	128	108	92	92	101	116
26	78	82	83	80	80	184	121	110	92	91	91	114
27	*78	81	81	80	80	461	124	115	91	90	92	111
28	79	*69	80	81	*80	2,920	130	90	99	92	91	110
29	87	84	79	81		*4,040	125	84	99	92	87	110
30	87	78	78	82		437	124	75	95	92	136	111
31	84		79	82		300		73		91	1,870	
Total	2,584	2,536	2,449	2,469	2,210	10,349	5,294	3,322	2,798	3,238	4,635	4,616
Mean	83.4	84.5	79.0	79.6	78.9	334	176	107	93.3	104	150	154
Cfsm	0.303	0.307	0.287	0.289	0.287	1.21	0.640	0.389	0.339	0.378	0.545	0.560
In.	0.35	0.34	0.33	0.33	0.30	1.40	0.72	0.45	0.38	0.44	0.63	0.62

Calendar year 1961: Max 6,200 Min 60 Mean 140 Cfsm 0.509 In. 6.90
Water year 1961-62: Max 4,040 Min 60 Mean 127 Cfsm 0.462 In. 6.29

Peak discharge (base, 900 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-29	0430	13.35	8,420	8-31	1900	11.18	2,830

* Discharge measurement made on this day.
Note.--Stage-discharge relation affected by ice Dec. 7 to Mar. 13.

5-4570. Cedar River near Austin, Minn.

Location.--Lat 43°38'10", long 92°58'20", in NE¼SE¼ sec.15, T.102 N., R.18 W., on left bank 200 ft upstream from abandoned powerhouse, 500 ft downstream from highway bridge, 1.1 miles downstream from Turtle Creek, and 1.1 miles south of Austin.

Drainage area.--425 sq mi.

Records available.--May 1909 to September 1962.

Gage.--Water-stage recorder. Datum of gage is 1,162.10 ft above mean sea level, datum of 1929. May 1909 to April 1912 staff gage in tailwater of powerplant 200 ft downstream at datum 3.1 ft lower. May 1912 to September 1914 chain gage on highway bridge 500 ft downstream at datum 1.1 ft lower.

Average discharge.--23 years, 171 cfs.

Extremes.--Maximum discharge during year, 9,530 cfs Mar. 29 (gage height, 17.18 ft); minimum, 52 cfs Feb. 10, 18 (gage height, 2.27 ft).
1909-14, 1944-62: Maximum discharge, 8,800 cfs Mar. 26, 1950 (gage height, 17.81 ft); no flow for several days in 1911.

Remarks.--Records good except those for periods of ice effect or shifting-control method, which are fair.

Rating table, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1 to Nov. 15, Nov. 18 to Dec. 5, May 26 to July 8)

2.2	44	4.0	598
2.5	91	7.0	2,060
2.8	172	11.0	4,620
3.1	265	17.0	9,370
3.5	399		

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	69	110	105	76	59	b59	1,520	291	146	76	105	2,120
2	74	129	105	78	59	58	1,100	259	126	1,930	96	763
3	72	*149	103	80	61	58	*951	221	110	2,440	101	440
4	70	160	110	83	66	58	831	*196	123	1,330	91	368
5	67	146	96	82	69	59	1,260	178	149	951	85	347
6	64	140	b 80	76	b64	58	3,330	166	146	662	87	265
7	58	129	b 76	74	58	59	3,430	152	135	511	91	218
8	55	123	b 74	b 73	56	61	3,010	155	126	2,040	87	199
9	56	113	b 74	b 72	56	*62	2,040	143	115	1,760	83	208
10	67	110	b 74	b 71	54	62	1,340	126	118	970	80	*230
11	166	108	b 74	b 70	54	62	1,160	169	135	519	78	221
12	233	103	b 74	b 70	55	64	1,140	211	132	357	76	190
13	*208	103	74	69	58	61	877	233	110	300	*78	172
14	208	98	76	69	58	59	754	205	96	259	76	158
15	166	96	72	70	59	64	701	169	87	230	76	146
16	143	b 96	72	67	59	64	745	143	76	211	74	152
17	129	b 92	72	b 65	58	64	1,030	126	80	*193	72	146
18	121	89	78	62	56	62	1,950	129	330	181	70	137
19	113	85	83	59	59	67	1,380	132	*418	262	70	129
20	103	91	83	58	59	69	812	121	214	794	72	121
21	98	91	*83	b 59	61	74	623	*123	135	817	72	132
22	91	101	82	b 59	59	74	527	205	105	374	74	129
23	93	101	80	59	59	72	456	515	89	307	89	123
24	89	105	78	59	61	76	382	436	82	233	93	123
25	89	121	b 76	* 59	59	83	333	252	76	187	80	123
26	82	123	b 75	61	61	103	275	178	70	152	72	118
27	80	126	b 74	59	61	* 149	255	149	66	137	74	115
28	76	123	74	58	b 60	2,760	259	137	62	132	72	113
29	91	115	72	61	-	*8,720	249	146	89	123	72	110
30	103	*108	74	61	---	3,200	262	143	80	121	304	152
31	110	---	74	62	---	2,170	---	143	---	115	2,670	---
Total	3,244	3,384	2,497	2,081	1,658	18,711	32,982	5,952	3,826	18,674	5,320	7,968
Mean	105	113	80.5	67.1	59.2	604	1,099	192	128	602	172	266
Cfsm	0.247	0.266	0.189	0.158	0.139	1.42	2.59	0.452	0.301	1.42	0.405	0.626
In.	0.28	0.30	0.22	0.18	0.15	1.64	2.89	0.52	0.33	1.63	0.47	0.70

Calendar year 1961: Max 7,230 Min 36 Mean 145 Cfsm 0.341 In. 4.62
Water year 1961-62: Max 8,720 Min 54 Mean 291 Cfsm 0.685 In. 9.31

Peak discharge (base, 1,400 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-29	0300	17.18	9,530	7- 3	0130	9.07	3,240
4- 7	0200	10.28	4,120	7- 8	1630	7.91	2,580
4-18	1500	7.29	2,230	8-31	2000	10.18	4,050

* Discharge measurement made on this day.
b Stage-discharge relation affected by ice.

5-4760. West Fork Des Moines River at Jackson, Minn.

Location.--Lat 43°37'10", long 94°59'10", in SE¼SW¼ sec.24, T.102 N., R.35 W., on right bank in Jackson, 200 ft downstream from dam at powerplant.

Drainage area.--1,220 sq mi, approximately.

Records available.--May 1909 to December 1913, August 1930 to September 1962 (winter records incomplete prior to 1936). Published as Des Moines River at Jackson, 1909-13, as Des Moines River near Jackson, 1930-35, and as West Fork Des Moines River near Jackson, 1936-44.

Gage.--Water-stage recorder. Datum of gage is 1,287.75 ft above mean sea level, datum of 1929. May 31, 1909, to Dec. 20, 1913, staff gage at site 0.6 mile downstream at datum 0.99 ft lower. Aug. 22, 1930, to Sept. 30, 1944, chain gage at site 7 miles upstream at datum 17.10 ft higher. Oct. 1, 1944, to Oct. 26, 1949 (revised) wire-weight gage at site 600 ft upstream at datum 10.64 ft higher.

Average discharge.--27 years (1935-62), 266 cfs.

Extremes.--Maximum discharge during year, 5,350 cfs Apr. 5 (gage height, 14.97 ft); minimum, 5.6 cfs Mar. 22 (gage height, 2.93 ft).
1909-13, 1930-62: Maximum discharge, 8,360 cfs June 8, 1953 (gage height, 17.43 ft, from floodmark), from rating curve extended above 3,500 cfs on basis of contracted-opening measurement of peak flow; no flow at times.

Remarks.--Records good except those for periods of ice effect, which are fair. Regulation at times by Yankton, Long, Shetek, and Heron Lakes.

Rating tables, water year 1961-62, except periods of ice effect (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Apr. 1				Apr. 2 to Sept. 30			
3.0	7.8	5.0	316	3.2	35	8.0	1,240
3.1	13	6.0	564	3.5	70	10.0	1,960
3.2	21	8.0	1,170	4.0	152	12.0	2,940
3.5	61	11.0	2,240	5.0	377	15.0	5,380
4.0	134						

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	26	45	82	31	12	16	g2130	1,660	1,150	620	580	*119
2	21	71	76	32	13	16	g3390	1,580	1,030	655	546	118
3	19	125	78	33	13	16	*4,000	1,480	965	711	520	111
4	21	145	81	33	35	16	*4,790	1,400	940	1,420	492	105
5	20	145	65	34	45	16	5,260	1,260	931	1,260	464	100
6	19	130	38	33	37	16	5,090	1,180	904	1,360	442	102
7	19	128	25	31	34	16	5,050	1,070	866	1,440	417	94
8	15	*113	38	28	28	16	4,930	984	922	1,650	382	89
9	15	108	38	23	25	16	4,800	998	1,090	1,800	352	89
10	29	112	40	20	22	16	4,440	822	1,100	1,940	330	88
11	*25	124	g37	19	21	16	4,260	770	1,050	1,920	311	88
12	31	118	*35	18	20	15	*4,060	720	1,000	1,820	297	85
13	23	106	34	18	19	15	3,820	674	943	1,690	279	81
14	21	97	32	17	21	15	3,550	633	872	1,530	258	79
15	26	97	32	17	21	15	3,410	593	796	1,360	238	72
16	26	108	31	16	20	15	3,220	580	725	1,230	221	70
17	22	78	31	16	20	15	3,010	606	782	1,100	206	79
18	20	50	32	*15	19	15	2,820	*630	978	1,080	191	82
19	21	64	33	14	19	15	2,850	687	1,010	1,080	178	70
20	15	86	33	13	18	15	2,750	706	*956	1,090	162	57
21	15	94	34	10	*18	*15	2,780	649	947	1,090	146	57
22	14	92	34	10	18	91	3,120	779	975	1,030	139	61
23	14	78	35	10	18	27	3,050	857	1,010	994	131	68
24	15	82	35	98	17	17	2,840	871	1,020	949	110	41
25	16	89	36	98	17	22	2,500	837	959	886	113	37
26	20	89	35	98	17	60	2,190	828	860	828	108	61
27	20	79	34	10	17	275	2,100	889	762	*767	102	59
28	13	56	32	10	17	g1,500	1,990	1,040	676	748	95	*52
29	17	82	31	10		g2,250	1,880	1,150	660	709	85	51
30	54	95	31	11	---------	*g2,290	1,760	1,210	649	663	124	48
31	53	----------	31	11	---------	g2,220	----------	1,210	----------	617	131	----------
Total	685	2,886	1,259	572.4	601	8,996.1	101,840	29,353	27,528	36,037	8,150	2,313
Mean	22.1	96.2	40.6	18.5	21.5	290	3,395	947	918	1,162	263	77.1
Cfsm	0.018	0.079	0.033	0.015	0.018	0.238	2.78	0.776	0.752	0.952	0.216	0.063
In.	0.02	0.09	0.04	0.02	0.02	0.27	0.31	0.89	0.84	1.10	0.25	0.07

Calendar year 1961: Max 1,580 Min 13 Mean 172 Cfsm 0.141 In. 1.90
Water year 1961-62 Max 5,260 Min 9.1 Mean 603 Cfsm 0.494 In. 6.71

Peak discharge (base, 500 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
4- 5	0630	14.97	5,350	6-18	2230	7.39	1,040
5-31	0400	7.96	1,230	7- 4	0700	10.09	2,000
6-9	2000	7.64	1,120	7-10	1800	9.98	1,950

* Discharge measurement made on this day.
g Computed from outside staff gage readings.
Note.--Stage-discharge relation affected by ice Dec. 6 to Mar. 20, Mar. 28-31.

6-6030. Little Sioux River near Lakefield, Minn.

Location.--Lat 43°37'10", long 95°16'30", in SE¼ sec.21, T.102 N., R.37 W., on left bank at upstream side of highway bridge, a quarter of a mile upstream from Jackson County ditch 11 and 6.7 miles southwest of Lakefield.

Drainage area.--17.1 sq mi.

Records available.--July 1948 to September 1962.

Gage.--Water-stage recorder and concrete control. Datum of gage is 1,405.28 ft above mean sea level, datum of 1929.

Average discharge.--14 years, 3.88 cfs (2,810 acre-ft per year).

Extremes.--Maximum discharge during year, 250 cfs Mar. 28 (gage height, 5.74 ft); no flow on many days.
1948-62: Maximum discharge, 2,550 cfs June 7, 1953 (gage height, 10.20 ft), from rating curve extended above 170 cfs on basis of contracted opening determination of combined flow of Little Sioux River and Jackson County ditch; no flow on many days each year.

Remarks.--Records good except those for periods of ice effect or backwater from aquatic vegetation, which are fair.

Rating table, water year 1961-62 (gage height, in feet, and discharge, in cubic feet per second)

2.5	0	3.4	8.6
2.9	.3	3.6	20
3.0	.5	4.0	44
3.1	1.0	4.5	92
3.2	2.0	5.0	154
3.3	4.6	6.0	287

Discharge, in cubic feet per second, water year October 1961 to September 1962

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1						0	128	4.2	8.2	5.6	1.1	*0.1
2						0	74	3.6	6.8	6.0	.9	0
3						0	*59	2.9	6.0	5.3	.7	0
4						0	67	2.4	5.6	4.0	.7	0
5						0	53	2.0	6.8	2.6	.6	0
6						0	43	1.9	6.0	24	.5	*0
7						0	33	1.6	6.8	23	.4	0
8		(*)				0	31	1.3	3.7	20	.3	0
9						0	36	1.2	4.2	18	.2	0
10						0	23	1.1	4.4	16	.2	0
11	(*)					0	21	1.0	4.0	14	.2	0
12			(*)			0	*25	1.1	3.6	12	.2	0
13						0	20	1.0	3.0	11	.2	0
14						0	18	.8	2.4	10	.1	0
15						0	20	.7	1.6	9.1	.1	0
16						0	18	.5	1.2	8.6	0	0
17						0	18	.4	1.6	7.7	0	0
18				(*)		0	18	*.5	2.0	6.4	0	0
19						0	17	1.6	2.0	8.2	0	0
20					(*)	0	16	1.3	*1.7	7.7	0	0
21						*0	13	1.4	1.5	6.8	0	0
22						0	15	4.1	1.3	5.6	0	0
23						0	13	2.2	1.1	5.3	0	0
24						.2	9.7	2.5	9.7	4.0	0	0
25						2.6	7.2	2.5	8.6	3.4	0	0
26						28	5.6	2.1	7.2	*2.4	0	0
27						97	6.4	1.6	5.6	2.2	0	*0
28						202	6.4	1.7	4.2	2.4	0	0
29					-	229	5.6	1.4	5.3	2.0	0	0
30					------	*211	5.3	1.1	5.0	1.7	0	0
31		------			------	190	------	9.7	------	1.3	.2	------
Total	0	0	0	0	0	959.8	825.2	234.2	484.8	315.7	6.6	0.1
Mean	0	0	0	0	0	31.0	27.5	7.55	16.2	10.2	0.21	0.003
Ac-ft	0	0	0	0	0	1,900	1,640	465	962	626	13	0.2

Calendar year 1961: Max 76 Min 0 Mean 2.80 Ac-ft 2,020
Water year 1961-62: Max 229 Min 0 Mean 7.74 Ac-ft 5,610

Peak discharge (base, 30 cfs)

Date	Time	Gage height	Discharge	Date	Time	Gage height	Discharge
3-28	0130	5.74	250	5-22	0530	4.16	56
4- 9	1000	4.29	68	6-10	0600	4.40	45
4-12	1145	4.06	48	7- 4	1400	4.62	53

* Discharge measurement or observation of no flow made on this day.
Note.--Stage-discharge relation affected by ice Apr. 9, 15. Backwater from aquatic vegetation June 8-25, July 4-12.

GPO 802-479-11

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 floodflow analyses, depending on the type of data collected. In addition, discharge measurements are made at other sites not included in the partial-record program. These measurements are generally made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Records collected at partial-record stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations and the second is a table of annual maximum stage and discharge at crest-stage stations. Discharge measurements made at miscellaneous sites for both low flow and high flow are given in a third table.

Low-flow partial-record stations

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

Discharge measurements made at low-flow partial-record stations during water year 1962

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Stream tributary to Lake Superior				
4-0189	East Two Rivers near Iron Junction, Minn.	At common corner of secs.19,20,29,30, T.57 N., R.18 W., at culvert on State Highway 37, 2.2 miles southwest of Iron Junction, Minn.	34.5	1957-61	10- 4-61 10-31-61	13.7 15.8
		Crow Wing River basin				
5-2427	Little Sand Lake Outlet near Dorset, Minn.	NE¼ sec.36, T.141 N., R.34 W., ½ mile below Little Sand Lake and 3 miles northeast of Dorset, Minn.	a74	1930-41≠, 1942, 1956-62	10-26-61 11-30-61 1- 5-62 2-10-62 4- 6-62 4-24-62 5-18-62 6-15-62 7-11-62 8- 9-62 9- 7-62	10.0 8.99 12.3 13.3 23.0 27.8 45.6 47.7 49.2 38.1 25.2

a Approximately
≠ Operated as a continuous-record gaging station.

Crest-stage partial-record stations

The following table contains annual maximum discharges for crest-stage stations. A crest-stage gage is 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 but is 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 crest-stage partial-record stations

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
Streams tributary to Lake Superior							
4-0113.7	South Branch Devils Track River near Grand Marais, Minn.	NW¼ sec.9, T.61 N., R.1 E. at culvert on County Highway 12, 1½ miles above mouth, and 2½ miles north of Grand Marais.	-	1961-62	5 -23-62	16.25	(≠)
4-0114	South Branch Devils Track River tributary near Grand Marais, Minn.	NE¼ sec.9, T.61 N., R.1 E., at culvert on County Highway 12, a quarter mile above mouth, and 2½ miles north of Grand Marais.	-	1961-62	10-11-62	9.45	(≠)
4-0132	Caribou River near Little Marais, Minn.	NW¼SE¼ sec.36, T.58 N., R.6 W., at culvert on U.S. Highway 61, 0.2 mile above mouth and 5.2 miles northeast of Little Marais.	-	1961-62	4 -27-62 5 -23-62	11.28	190
4-0151.5	Crow Creek near Silver Creek, Minn.	SW¼SW¼ sec.23, T.54 N., R.10 W., at culvert on County Highway 3, 2.3 miles northeast of Silver Creek, and 4.0 miles above mouth.	-	1960-62	5 -23-62	8.47	(≠)
4-0152	Encampment River tributary at Silver Creek, Minn.	NE¼SE¼ sec.33, T.54 N., R.10 W., at culvert on County Highway 3, 0.3 mile north of Silver Creek and 1.4 miles above mouth.	-	1960-62	5 -23-62	6.81	26
4-0153	Little Stewart River near Two Harbors, Minn.	SE¼NE¼ sec.24, T.53 N., R.11 W., at culvert on county highway, 2.0 miles above mouth, and 2.7 miles north of Two Harbors.	-	1960-62	5 -23-62	10.43	118
4-0154	Miller Creek at Duluth, Minn.	SE¼NE¼ sec.13, T.50 N., R.15 W., at culvert on U.S. Highway 53, 0.2 mile northwest of Duluth city limits.	-	1960-62	5 -23-62	16.22	193
4-0177	McKinley Lake tributary at McKinley, Minn.	SW¼NE¼ sec.18, T.58 N., R.16 W. at culvert on State Highway 135 at west edge of McKinley.	-	1960-62	4 -27-62	8.07	11
4-0187	Mud Hen Creek tributary near Central Lakes, Minn.	SW¼NW¼ sec.14, T.56 N., R.17 W., at culvert on U.S. Highway 53, 0.3 mile above mouth and 3.2 miles north of Central Lakes.	-	1960-62	4 -27-62	7.38	(≠)
4-0188	East Two River tributary at Virginia, Minn.	NE¼NE¼ sec.12, T.58 N., R.18 W., at culvert on U.S. Highway 169, 0.2 mile west of Virginia city limits, and 1.1 miles above mouth.	4.26	1959-62	6 -29-62	6.18	44
4-0241	Rock Creek near Blackhoof, Minn.	SW¼SE¼ sec.21, T.47 N., R.16 W., at culvert on State Highway 23, 4.0 miles above mouth, and 4.4 miles east of Blackhoof.	-	1961-62	4 -20-61 5 -23-62	15.13 16.53	282 404
4-0241.1	Rock Creek tributary near Blackhoof, Minn.	NE¼SE¼ sec.21, T.47 N., R.16 W., at culvert on State Highway 23, 0.1 mile above mouth, and 4.5 miles east of Blackhoof.	-	1961-62	5 -23-62	9.82	(≠)
4-0242	South Fork Nemadji River near Holyoke, Minn.	E½SE¼ sec.6, T.46 N., R.16 W., at culvert on State Highway 23, 2.0 miles northwest of Holyoke, and 4¼ miles above Net River.	-	1961-62	5 -14-61 5 -23-62	11.44 13.46	407 900
Red River of the North basin							
5-0608	Buffalo River near Callaway, Minn.	SW¼SW¼ sec.17, T.141 N., R.41 W., at culvert on U.S. Highway 59, 2.7 miles north of Callaway.	-	1960-62	6 -8 -62	13.35	370
5-0612	Whisky Creek at Barnesville, Minn.	NE¼NW¼ sec.29, T.137 N., R.45 W., at culvert on State Highway 34, 0.7 mile above Blue Eagle Lake, and 1.0 mile northeast of Barnesville.	-	1961-62	6 -8 -62	6.52	292
5-0613.9	Hay creek near Downer, Minn.	NW¼SW¼ sec.28, T.138 N., R.45 W., at culvert on county highway, 4.9 miles east of Downer.	-	1961-62	5 -14-61 6 -8 -62	8.22 11.64	5 50

≠ Discharge not determined.

Annual maximum discharge at crest-stage partial-record stations--continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
Red River of the North basin--continued							
5-0614	Hay creek above Downer, Minn.	NW¼NW¼ sec.30, T.138 N., R.45 W., at culvert on county road, 3.1 miles east of Downer.	-	1961-62	6- 8-62	13.46	382
5-0622.8	Wild Rice River tributary near Bagley, Minn.	SW¼NW¼ sec.21, T.146 N., R.37 W., at culvert on State Highway 92, 5.0 miles south of Bagley.	-	1961-62	5-23-62	7.94	29
5-0624.7	Marsh River tributary near Mahnomen, Minn.	SE¼SW¼ sec.36, T.145 N., R.43 W., at culvert on State Highway 31, a quarter mile above mouth, and 5½ miles west of Mahnomen.	-	1961-62	6- 8-62	10.27	116
5-0627	Wild Rice River tributary near Twin Valley, Minn.	SW¼SE¼ sec.12, T.144 N., R.45 W., at culvert on State Highway 31, 1¼ miles above mouth, and 4¼ miles northwest of Twin Valley	-	1961-62	5-14-61 6- 8-62	10.63 12.39	6.4 107
5-0628	Coon Creek near Twin Valley, Minn.	NE¼NE¼ sec.26, T.144 N., R.45 W., at bridge on County Highway 28, 1.1 mile above mouth, and 4.0 miles west of Twin Valley.	-	1962	6- 8-62	12.68	896
5-0736	South Branch Battle River at Northome, Minn.	NE¼ sec.25, T.151 N., R.29 W., at culvert on U.S. Highway 71, three-quarters of a mile west of Northome, and 3 miles above Battle Lake.	-	1960-62	5-29-60 5-14-61 5-23-62	12.88 14.83 14.45	5.7 99 68
5-0737.5	South Branch Cormorant River tributary near Blackduck, Minn.	NW¼NW¼ sec.32, T.150 N., R.30 W., at culvert on County Highway 304, 3 miles above mouth, and 3¾ miles north of Blackduck.	-	1960-62	5-23-62	16.54	346
5-0738	Perry Creek near Shooks, Minn.	NW¼SW¼ sec.30, T.151 N., R.30 W., at culvert on State Highway 72, 5 miles west of Shooks.	-	1960-62	5-14-61 5-23-62	6.54 7.38	30 61
5-0766	Red Lake River tributary near Thief River Falls, Minn.	SW¼SE¼ sec.8, T.153 N., R.43 W., at culvert on County Highway 7, 0.5 mile above mouth, and 3.1 miles south of Thief River Falls.	-	1962	6- 8-62	6.20	(✓)
5-0781	Lost River at Gonvick, Minn.	NE¼NE¼ sec.16, T.149 N., R.38 W., at culvert on county highway, a half mile south of Gonvick, and 3 miles below Pine Lake.	-	1960-62	4-26-60 5-15-61 6- 8-62	6.48 a7.42 9.06	50 25 255
5-0781.8	Lost River tributary near Clearbrook, Minn.	NW¼ sec.13, T.148 N., R.38 W., at culvert on county highway, 3½ miles south of Clearbrook.	-	1960-62	5-23-62	14.35	132
5-0782	Lost River tributary at Clearbrook, Minn.	SW¼NW¼ sec.29, T.149 N., R.37 W., at culvert on county highway at north edge of Clearbrook, and three-quarters of a mile above mouth,	-	1960-62	5-23-62	15.83	147
5-0784	Clearwater River tributary near Plummer, Minn.	SE¼SE¼ sec.22, T.151 N., R.43 W., at culvert on county highway, 1¼ miles above mouth, and 5½ miles southwest of Plummer.	-	1961-62	5-23-62	8.48	106
Lake of the Woods basin							
5-1287	Pike River tributary near Wahlsten, Minn.	SW¼SW¼ sec.32, T.61 N., R.15 W., at culvert on State Highway 135, 1.2 miles south of Wahlsten, and 2.7 miles above mouth.	-	1961-62	7- 8-62	6.37	23
5-1297.1	South Branch Little Fork River near Britt, Minn.	NW¼NE¼ sec.28, T.60 N., R.18 W., at culvert adjacent to U.S. Highway 53, 0.6 mile below Sand Lake, and 5.9 miles west of Britt.	-	1961-62	5-23-62	7.22	22
5-1303	Boriin Creek near Chisholm, Minn.	SE¼SE¼ sec.9, T.59 N., R.20 W., at culvert on State Highway 73, 1.2 miles above mouth, and 7.8 miles north of Chisholm.	13.7	1959-62	6-11-62	11.82	117
Split Hand Creek basin							
5-2150	Split Hand Creek tributary near Hill City, Minn.	SE¼NW¼ sec.13, T.53 N., R.26 W., at culvert on U.S. Highway 169, 6½ miles north of Hill City.	-	1961-62	5-23-62	6.02	(✓)
Swan River basin							
5-2166	O'Brien Creek tributary near Keewatin, Minn.	SW¼SW¼ sec.27, T.57 N., R.22 W., at culvert on U.S. Highway 169, 0.2 mile above mouth, and 2.6 miles southwest of Keewatin.	-	1959-62	-	b	<5
5-2167	O'Brien Creek near Nashwauk, Minn.	NE¼NE¼ sec.33, T.57 N., R.22 W., at culvert on U.S. Highway 169, 1.5 miles east of Nashwauk, and 3.0 miles above Welcome Creek,	-	1959-62	4- 8-62	c8.66	74

✓ Discharge not determined.
a Backwater from debris.
b Peak stage did not reach bottom of gage.
c Backwater from ice.

Annual maximum discharge at crest-stage partial-record stations--continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Swan River basin--continued					
5-2169.8	Swan River tributary at Warba, Minn.	NW¼ sec.34, T.54 N., R.23 W., at culvert on U.S. Highway 2, three-quarters of a mile above mouth, and 1 mile southeast of Warba.	-	1961-62	5-23-62	6.80	(✗)
		Mississippi River basin					
5-2177	Mississippi River tributary near Jacobson, Minn.	SW¼NW¼ sec.8, T.52 N., R.23 W., at culvert on State Highway 34, 1¼ miles west of Jacobson.	-	1961-62	9-11-62	a8.35	(✗)
		Crow Wing River basin					
5-2441	Kitten Creek near Sebeka, Minn.	SE¼SE¼ sec.15, T.137 N., R.35 W., at culvert on county highway, 3¼ miles above mouth, and 3¼ miles north of Sebeka.	-	1961-62	5-23-62	10.50	60
5-2442	Cat River near Nimrod, Minn.	SW¼SW¼ sec.36, T.137 N., R.34 W., at bridge on State Highway 227, 2½ miles west of Nimrod, and 3 miles above mouth.	-	1961-62	5-23-62	7.52	(✗)
		Platte River basin					
5-2678	Big Mink Creek tributary near Lastrup, Minn.	NW¼SW¼ sec.14, T.41 N., R.30 W., at culvert on State Highway 25, 1.4 miles above mouth, and 2.1 miles west of Lastrup.	-	1961-62	5-23-62	9.27	(✗)
		Sauk River basin					
5-2703	Sauk River tributary at Spring Hill, Minn.	NE¼ sec.27, T.124 N., R.33 W., at culvert on State Highway 4, 1 mile east of Spring Hill, and 1¼ miles above mouth.	-	1960-62	7-19-62	10.87	(✗)
5-2703.1	Sauk River tributary near St. Martin, Minn.	SE¼ sec.19, T.124 N., R.32 W., at culvert on county highway, 4½ miles northwest of St. Martin.	-	1960 1962	8-27-60 7-19-62	10.63 10.47	83 79
		Elk River basin					
5-2739	Mayhew Creek at Silver Corners, Minn.	SW¼SW¼ sec.28, T.38 N., R.30 W., at culvert on State Highway 25 at Silver Corners, 3.7 miles above Mayhew Lake.	-	1961-62	5-23-62	14.82	(✗)
5-2742	Stony Brook tributary near Foley, Minn.	NW¼ sec.2, T.36 N., R.29 W., at culvert on State Highway 25, a quarter mile above mouth, and 1½ miles south of Foley.	-	1960-62	5-23-62	11.35	132
		Crow River basin					
5-2761	North Fork Crow River tributary near Paynesville, Minn.	NW¼ sec.12, T.122 N., R.33 W., at culvert on county highway, 1 mile above mouth, and 3 miles west of Paynesville.	-	1960-61	4-14-61 5-23-62	c17.94 16.74	13 10
5-2783.5	Fountain Creek near Montrose, Minn.	NE¼NW¼ sec.22, T.118 N., R.26 W., at culvert on County Highway 30, 3.3 miles southwest of Montrose.	-	1962	5-23-62	7.42	(✗)
5-2787	Otter Creek near Lester Prairie, Minn.	SE¼SE¼ sec.28, T.117 N., R.27 W., at culvert on State Highway 7, 2.1 miles northwest of Lester Prairie, and 4.4 miles above mouth.	-	1961-62	5-18-61 5-22-62	6.08 8.66	52 121
5-2787.5	Otter Creek tributary near Lester Prairie, Minn.	SE¼SE¼ sec.33, T.117 N., R.27 W., at culvert on County Highway 63, 1.7 miles northwest of Lester Prairie, and 3.3 miles above mouth.	-	1962	5-23-62	10.83	79
5-2788.5	Buffalo Creek tributary near Brownton, Minn.	NE¼SE¼ sec.13, T.115 N., R.30 W., at culvert on State Highway 15, 0.6 mile above mouth, and 2.6 miles northwest of Brownton.	-	1961-62	3-28-62	c16.16	(✗)
5-2790.3	South Fork Crow River tributary near Mayer, Minn.	NW¼NE¼ sec.36, T.117 N., R.26 W., at culvert on State Highway 7, 0.7 mile above mouth, and 1.4 miles north of Mayer.	-	1962	5-22-62	5.91	(✗)

✗ Discharge not determined.
a Backwater from debris.
c Backwater from ice.

Annual maximum discharge at crest-stage partial-record stations--continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Rum River basin					
5-2841	Mille Lacs Lake tributary near Wealthwood, Minn.	NW¼NE¼ sec.25, T.45 N., R.27 W., at culvert on State Highway 18, 0.2 mile above mouth, and 2.0 miles west of Wealthwood.	-	1961-62	5-23-62	10.11	32
5-2846	Robinson Brook near Onamia, Minn.	NE¼SE¼ sec.11, T.40 N., R.27 W., at culvert on U.S. Highway 169, a quarter mile above mouth, and 6¾ miles south of Onamia.	-	1960-62	5-23-62	15.52	75
5-2846.2	Rum River tributary near Onamia, Minn.	E½ sec.14, T.40 N., R.27 W., at culvert on U.S. Highway 169, a quarter mile above mouth, and 7¾ miles south of Onamia.	-	1960-62	5-23-62	9.51	80
5-2849.2	Stanchfield Creek tributary near Day, Minn.	NW¼SE¼ sec.13, T.37 N., R.25 W., at culvert on County Highway 60, 0.5 mile above mouth, and 1.5 miles southwest of Day.	-	1961-62	5-23-62	8.50	(✓)
		Minnesota River basin					
5-2991	Lazarus Creek tributary near Canby, Minn.	N½ sec.6, T.114 N., R.45 W., at culvert on State Highway 68, 3 miles west of Canby, and 3¾ miles above mouth.	-	1960-62	7- 4-62	13.64	(✓)
5-3012	Minnesota River tributary near Montevideo, Minn.	NE¼NE¼ sec.21, T.117 N., R.41 W., at culvert on U.S. Highway 212, 1 mile above mouth, and 3¾ miles west of Montevideo.	-	1960-62	7-19-62	9.28	(✓)
5-3029.7	Lake Emily tributary near Starbuck, Minn.	NW¼ sec.27, T.124 N., R.39 W., at culvert on State Highway 29, 6½ miles south of Starbuck.	-	1962	7-19-62	10.30	(✓)
5-3034.5	Hassel Creek near Clontarf, Minn.	NW¼SE¼ sec.4, T.122 N., R.39 W. at culvert on State Highway 29, a quarter mile above Lake Hassel, and 5¾ miles east of Clontarf.	-	1962	7-19-62	11.92	(✓)
5-3052	Spring Creek near Montevideo, Minn.	SW¼SW¼ sec.32, T.118 N., R.40 W., at culvert on State Highway 29, 1¼ miles above mouth, and 2¼ miles north of Montevideo.	16.3	1959-62	7-19-62	18.22	492
5-3112	North Branch Yellow Medicine River near Ivanhoe, Minn.	NW¼ sec.2, T.111 N., R.46 W., at culvert on State Highway 19, 5¼ miles west of Ivanhoe.	-	1960-62	7- 1-62	13.66	202
5-3112.5	North Branch Yellow Medicine River tributary near Wilno, Minn.	SE¼NE¼ sec.33, T.113 N., R.45 W., at culvert on U.S. Highway 75, 1½ miles above mouth, and 4½ miles northwest of Wilno.	-	1960-62	7- 4-62	9.10	26
5-3113	North Branch Yellow Medicine River tributary near Porter, Minn.	E½ sec.16, T.113 N., R.45 W., at culvert on U.S. Highway 75, 6¾ miles southwest of Porter.	-	1960-62	4-10-62	c16.79	(✓)
5-3138	Chetomba Creek tributary near Blomkest, Minn.	SW¼SW¼ sec.35, T.118 N., R.35 W., at culvert on U.S. Highway 71, 2¾ miles northeast of Blomkest.	-	1959-62	4-17-62	c8.71	(✓)
5-3149	Redwood River at Ruthton, Minn.	NW¼NW¼ sec.11, T.108 N., R.44 W., at culvert on State Highway 23, 0.1 mile northeast of Ruthton.	-	1959-62	7- 4-62	16.09	(✓)
5-3165.5	West Fork Beaver Creek near Olivia, Minn.	SW¼SW¼ sec.14, T.116 N., R.35 W., at culvert on U.S. Highway 71, 5½ miles northwest of Olivia.	-	1959-62	4- 8-62	c7.53	130
5-3167	Spring Creek near Sleepy Eye, Minn.	NE¼SE¼ sec.24, T.111 N., R.33 W., at culvert on county highway, 3¾ miles above mouth, and 7½ miles north of Sleepy Eye.	30.0	1959-62	7- 7-62	15.89	680
5-3168	Cottonwood River tributary near Balaton, Minn.	NW¼NW¼ sec.19, T.109 N., R.42 W., at culvert on U.S. Highway 14, 4¾ miles west of Balaton.	-	1959-62	7- 4-62	5.73	(✓)
5-3168.5	Meadow Creek tributary near Marshall, Minn.	E½ sec.34, T.111 N., R.41 W., at culvert on U.S. Highway 59, 1¾ miles above mouth, and 4½ miles south of Marshall.	-	1961-62	5-22-62	13.49	(✓)
5-3169	Dry Creek near Jeffers, Minn.	NE¼NE¼ sec.31, T.108 N., R.36 W., at culvert on County Highway 10, 4½ miles north of Jeffers.	3.24	1961-62	3-14-61 7- 7-62	c5.12 6.50	26 (✓)
5-3178.2	Coon Creek near Frost, Minn.	E½NE¼ sec.22, T.101 N., R.26 W. at bridge on State Highway 254, 3.2 miles south of Frost.	-	1960-62	3-28-62	c14.36	(✓)
5-3178.5	Foster Creek near Alden, Minn.	NE¼NE¼ sec.9, T.102 N., R.23 W., at culvert on U.S. Highway 16, 1.2 miles southwest of Alden.	-	1959-62	7-19-62	6.27	(✓)
5-3181	East Branch Blue Earth River tributary near Blue Earth, Minn.	W½SE¼ sec.24, T.102 N., R.27 W., at culvert on County Highway 13, a quarter mile above mouth, and 4¾ miles east of Blue Earth.	-	1960-62	3-27-62	c6.87	119

✓ Discharge not determined.
c Backwater from ice.

Annual maximum discharge at crest-stage partial-record stations--continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Minnesota River basin--continued					
5-3183	North Fork Watonwan River near Delft, Minn.	E½ sec.11, T.106 N., R.36 W., at culvert on U.S. Highway 71, 1¾ miles northwest of Delft	13.1	1960-62	4- 9-62	c18.00	108
5-3202	LeSueur River tributary near Mankato, Minn.	SE¼SW¼ sec.28, T.108 N., R.26 W., at culvert on State Highway 22, 0.2 mile above mouth, and 1.5 miles southeast of Mankato Airport.	.073	1959-62	7-20-62	20.33	18
5-3203	Cobb River tributary near Mapleton, Minn.	SW¼NE¼ sec.4, T.106 N., R.26 W., at culvert on State Highway 22, 1.0 mile above mouth, and 6.3 miles north of Mapleton.	7.25	1959-62	7- 7-62	15.67	126
5-3204	Maple River tributary near Mapleton, Minn.	SW¼ sec. 1, T.105 N., R.27 W., at culvert on State Highway 30, 1 mile above mouth, and 3½ miles west of Mapleton.	5.75	1959-62	5-30-59 3-25-61 8-31-62	15.89 19.58 18.08	54 d257 175
5-3204.4	Maple River tributary near Amboy, Minn.	NW¼ sec.19, T.105 N., R.27 W., at culvert on State Highway 30, 1½ miles east of Amboy.	13.8	1959-62	8-31-62	e15.60	202
5-3251	Minnesota River tributary near North Mankato, Minn.	SW¼SW¼ sec.13, T.109 N., R.27 W., at culvert on county road, 200 ft above U.S. Highway 169, 0.4 mile above mouth, and 4.2 miles north of North Mankato.	-	1961-62	5-23-62	5.56	(✗)
5-3301.5	Sand Creek tributary near Montgomery, Minn.	NE¼ sec. 18, T.111 N., R.22 W., at culvert on State Highway 21, 3½ miles east of Montgomery.	0.29	1961-62	5-12-62	8.68	(✗)
5-3302	Rice Lake tributary near Montgomery, Minn.	N½ sec.13, T.111 N., R.23 W., at culvert on State Highway 21, 1¼ miles above Rice Lake, and 2½ miles east of Montgomery.	2.49	1960-62	5-18-61 5-12-62	6.67 7.88	33 76
5-3303	Sand Creek near New Prague, Minn.	NE¼NW¼ sec.1, T.112 N., R.23 W., at culvert on State Highways 13 and 19, 1.9 miles east of New Prague.	65	1960-62	10-11-62	9.32	84
5-3305.5	Raven Stream tributary near New Prague, Minn.	NW¼ sec.28, T.113 N., R.23 W., at culvert on county road, 1.6 miles above mouth, and 2.3 miles northwest of New Prague.	23	1960-62	5-23-62	10.57	126
5-3306	Sand Creek tributary near Jordan, Minn.	NW¼NE¼ sec.5, T.113 N., R.23 W., at culvert on State Highway 21, 0.8 mile above mouth, and 2.8 miles south of Jordan.	2.62	1960-62	5-23-62	13.02	(✗)
		St. Croix River basin					
5-3363	Moose River tributary at Moose Lake, Minn.	SE¼NE¼ sec.19, T.46 N., R.19 W., at culvert on State Highway 27, 0.9 mile above mouth, and 1.2 mile west of Moose Lake.	-	1960-62	4-24-60 5-15-61 5-23-62	7.81 8.60 9.68	18 46 112
5-3364.8	Kettle River tributary near Sandstone, Minn.	NE¼SE¼ sec.33, T.43 N., R.20 W., at culvert on U.S. Highway 61, 1.3 miles above mouth, and 2.2 miles north of Sandstone.	-	1960-62	3-29-60 5-14-61 5-23-62	c15.80 15.56 17.80	15 22 121
5-3366	Kettle River tributary at Sandstone, Minn.	SE¼SE¼ sec.4, T.42 N., R.20 W., at culvert on U.S. Highway 61 at Sandstone, and 0.2 mile above mouth.	-	1960-62	5-23-62	7.45	(✗)
5-3382	Mission Creek near Hinckley, Minn.	SW¼SW¼ sec.25, T.41 N., R.21 W., at culvert on U.S. Highway 61, 1.2 miles south of Hinckley.	-	1960-62	5-23-62	14.69	(✗)
		Vermillion River basin					
5-3459	Vermillion River tributary near Hastings, Minn.	NE¼SE¼ sec.35, T.115 N., R.18 W., at culvert on county highway, 2.0 miles above mouth, and 4.1 miles west of Hastings.	-	1960-62	3-30-62	c18.50	(✗)
		Cannon River basin					
5-3527	Turtle Creek tributary near Pratt, Minn.	NW¼ sec.8, T.106 N., R.19 W., at culvert on U.S. Highway 218, 1 mile above mouth, and 1½ miles southeast of Pratt.	-	1960-62	4-30-62	15.75	32
5-3528	Turtle Creek tributary near Steele Center, Minn.	NW¼NW¼ sec.11, T.106 N., R.20 W., at culvert on township road, 1½ miles above mouth and 1½ miles northeast of Steele Center.	-	1960-62	8-31-62	6.42	71
5-3551	Little Cannon River tributary near Kenyon, Minn.	SE¼ sec.9, T.110 N., R.18 W., at culvert on State Highway 56, a quarter mile above mouth, and 5 miles north of Kenyon.	-	1960-62	8-31-62	14.56	270
5-3551.5	Pine Creek near Cannon Falls, Minn.	NE¼NE¼ sec.6, T.112 N., R.17 W. at culvert on State Highway 20, 2.0 miles above mouth, and 2.1 miles north of Cannon Falls.	-	1960-62	5-12-62	2.78	(✗)

✗ Discharge not determined.
c Backwater from ice.
d Revised.
e Affected by shifting control.

Annual maximum discharge at crest-stage partial-record stations--continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Cannon River basin--continued					
5-3551.8	Cannon River tributary near Miesville, Minn.	SW¼SW¼ sec.9, T.113 N., R.17 W., at culvert on State Highway 50, 2.9 miles west of Miesville.	-	1960-61	5-12-62	15.26	103
5-3552.3	Cannon River tributary near Welch, Minn.	SW¼SW¼ sec.11, T.113 N., R.16 W., at culvert on U.S. Highway 61, 1.2 miles above mouth, and 2.7 miles northeast of Welch.	-	1960-62	7- 2-60 4-15-61 5-12-62	8.43 8.13 8.14	18 14 14
		Zumbro River basin					
5-3733.5	Zumbro River tributary near South Troy, Minn.	SE¼NE¼ sec.6, T.108 N., R.13 W., at culvert on county road, 0.8 mile above mouth, and 1.3 miles south of South Troy.	.16	1962	6-17-62	7.65	(✓)
5-3737	North Fork Zumbro River tributary near Wanamingo, Minn.	SE¼SE¼ sec.32, T.110 N., R.17 W., at culvert on County Highway 1, 3¼ miles above mouth, and 4⅛ miles southwest of Wanamingo.	-	1960-62	8-31-62	10.86	(✓)
5-3739	Trout Brook tributary near Goodhue, Minn.	SE¼ sec.4, T.110 N., R.15 W., at culvert on State Highway 58, three-quarter mile above mouth, and 3 miles south of Goodhue.	.41	1960-62	8-31-62	6.77	(✓)
		East Indian Creek basin					
5-3758	East Indian Creek tributary near Weaver, Minn.	NW¼SE¼ sec.23, T.109 N., R.10 W., at culvert on County Highway 14, 0.3 mile above mouth, and 2.5 miles northwest of Weaver.	.21	1962	5-29-62	9.25	(✓)
		Garvin Brook basin					
5-3783	Straight Valley Creek near Rollingstone, Minn.	SE¼NE¼ sec.12, T.107 N., R.9 W., at bridge on county highway, 0.2 mile above mouth, and 1.5 miles southwest of Rollingstone.	5.16	1959-62	3-28-62	15.23	(✓)
		Root River basin					
5-3837	Mill Creek tributary near Chatfield, Minn.	SW¼NW¼ sec.14, T.105 N., R.12 W., at culvert on county highway, 0.8 mile above mouth, and 4.5 miles northwest of Chatfield.	2.36	1959-62	3-28-62	13.39	(✓)
5-3837.2	Mill Creek near Chatfield, Minn.	SE¼NW¼ sec.23, T.105 N., R.12 W., at bridge on county highway, 3.4 miles northwest of Chatfield, and 4.8 miles above mouth.	22.4	1962	3-28-62	15.95	(✓)
5-3838.5	Bear Creek near Grand Meadow, Minn.	NE¼SE¼ sec.14, T.103 N., R.15 W., at bridge on county highway, 1½ miles northwest of Grand Meadow, and 4 miles above North Fork Bear Creek.	-	1962	3-28-62	21.18	3,730
5-3841	Trout Creek tributary near Lanesboro, Minn.	SW¼ sec.6, T.102 N., R.9 W., at culvert on county highway, three-quarter mile above mouth, and 4 miles south of Lanesboro.	4.08	1959-62	3-28-62	14.19	188
5-3841.5	Root River tributary near Whalan, Minn.	SW¼ sec.17, T.103 N., R.9 W., at culvert on private road, 1⅛ miles southwest of Whalan.	.30	1959-62	3-28-62	c5.85	6.1
5-3842	Whalan Creek near Whalan, Minn.	SE¼ sec.21, T.103 N., R.9 W., at bridge on county highway, 1⅛ miles southeast of Whalan, and 2¼ miles above mouth.	7.85	1959-62	3-28-62	16.95	825
5-3843	Big Springs Creek near Arendahl, Minn.	NE¼SE¼ sec.7, T.104 N., R.9 W., at culvert on State Highway 250, 2.0 miles west of Arendahl.	.14	1959-62	3-27-62	c9.19	19
5-3844	Pine Creek near Arendahl, Minn.	SE¼NE¼ sec.3, T.104 N., R.9 W., at bridge on County Highway 25, 1.3 miles northeast of Arendahl, and 4.9 miles above Hemingway Creek.	28.1	1959-62	3-27-62	c13.44	914
		Iowa River basin					
5-4570.8	Rose Creek tributary near Dexter, Minn.	SE¼SW¼ sec.22, T.103 N., R.16 W., at culvert on county highway, 1¼ miles above mouth, and 2⅛ miles southwest of Dexter.	-	1962	8-31-62	9.07	(✓)
5-4589.5	Shell Rock River tributary near Albert Lea, Minn.	SW¼SE¼ sec.25, T.103 N., R.22 W., at culvert on State Highway 13, 0.4 mile above mouth, and 2.4 miles northwest of Albert Lea city limits.	-	1960-62	5-11-62	18.58	(✓)

✓ Discharge not determined.
c Backwater from ice.

Annual maximum discharge at crest-stage partial-record stations--continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
Des Moines River basin							
5-4747.5	Beaver Creek tributary near Slayton, Minn.	NW¼NW¼ sec.17, T.106 N., R.41 W., at culvert on State Highway 47, 2¾ miles west of Slayton, and 2¾ miles above mouth.	-	1961-62	3-28-62	c21.22	(✓)
5-4747.6	Beaver Creek tributary above Slayton, Minn.	NE¼NE¼ sec.17, T.106 N., R.41 W., at culvert on State Highway 30, three-quarters of a mile above mouth, and 1½ miles west of Slayton.	-	1961-62	3-28-62	c21.56	(✓)
5-4754	Warren Lake tributary near Windom, Minn.	SE¼NE¼ sec.14, T.105 N., R.36 W., at culvert on U.S. Highway 71, a quarter mile above Warren Lake, and 2.4 miles north of Windom.	1.38	1960-62	3-25-61 3-28-62	4.63 5.40	23 46
5-4758	West Fork Des Moines River tributary near Jackson, Minn.	NW¼SE¼ sec.27, T.103 N., R.35 W. at culvert on county highway, three-quarters of a mile above mouth, and 5½ miles north of Jackson.	1.42	1960-62	3-28-62	c16.34	(✓)
5-4759	West Fork Des Moines River tributary near Lakefield, Minn.	SE¼SE¼ sec.32, T.103 N., R.35 W., at culvert on County Highway 19, 1½ miles above mouth, and 5¾ miles east of Lakefield.	4.52	1960-62	3-28-62	c8.86	(✓)
5-4761	Story Brook near Petersburg, Minn.	SW¼NW¼ sec.24, T.101 N., R.35 W., at bridge on U.S. Highway 71, 3 miles above mouth, and 4 miles west of Petersburg.	-	1960-62	3-29-60 3-25-61 7- 4-62	11.03 11.06 12.77	d1,030 d1,050 2,110
5-4769	East Fork Des Moines River tributary near Dunnell, Minn.	SW¼NW¼ sec.2, T.101 N., R.33 W., at bridge on State Highway 4, a half mile above mouth, and 1½ miles north of Dunnell.	7.88	1960-62	5-21-60 3-25-61 7- 4-62	14.58 14.69 16.15	d705 d760 2,200
Big Sioux River basin							
6-4829.2	Rock River tributary near Hatfield, Minn.	NE¼NE¼ sec.1, T.105 N., R.45 W., at culvert on County Highway 16, 1¾ miles south of Hatfield, and 3¼ miles above mouth.	-	1961-62	7- 2-62	16.08	(✓)
6-4829.5	Mound Creek near Hardwick, Minn.	SE¼SE¼ sec.15, T.104 N., R.45 W., at culvert on county highway, 2¼ miles northwest of Hardwick.	2.77	1959-62	4-13-62	9.92	88
6-4829.6	Mound Creek tributary at Hardwick, Minn.	SE¼ sec.34, T.104 N., R.45 W., at culvert on U.S. Highway 75, half a mile above mouth, and 1 mile southwest of Hardwick.	.23	1959-62	7- 2-62	7.25	(✓)
6-4830.5	Rock River tributary near Luverne, Minn.	NE¼ sec.10, T.101 N., R.45 W., at culvert on U.S. Highway 75, 5.8 miles south of Luverne.	-	1959-62	7- 2-62	14.82	(✓)
6-4831.5	Kanaranzi Creek tributary near Adrian, Minn.	E½ sec.16, T.102 N., R.42 W., at culvert on private road, a quarter mile above mouth, and 3 miles east of Adrian.	-	1959-62	5-19-62	9.47	56
6-4832	North Branch Kanaranzi Creek tributary near Lismore, Minn.	SW¼SW¼ sec.31, T.104 N., R.42 W., at culvert on county highway adjacent to State Highway 91, 60 ft above mouth and 1¼ miles northeast of Lismore.	-	1959-62	4-13-62	c18.52	(✓)
Little Sioux River basin							
6-6035.2	Little Sioux River tributary near Spafford, Minn.	NW¼NE¼ sec.27, T.102 N., R.38 W., at culvert on U.S. Highway 16, 0.4 mile west of Spafford, and a half mile above mouth.	4.06	1959-62	4- 5-62	c7.25	50
6-6035.3	Little Sioux River near Spafford, Minn.	NE¼NE¼ sec.34, T.102 N., R.37 W., at bridge on county highway, 1.6 miles below Jackson County ditch No. 11, and 5.8 miles east of Spafford.	-	1962	4- 6-62	c9.23	(✓)

✓ Discharge not determined.
c Backwater from ice.
d Revised.

Measurements at miscellaneous sites

Measurements of streamflow at points other than gaging stations or partial-record stations are given in the following table. Those that are 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 1962

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
Stream tributary to Lake Superior						
Poplar River	Lake Superior	SW¼NE¼ sec.33, T.60 N., R.3 W., at bridge on U.S. Highway 61 at Lutsen, Minn.	114	1911-17 1928-47 1952-61≠	9-26-62	100
Elbow Creek	St. Louis River	SW¼SE¼ sec.22, T.57 N., R.18 W., at culvert on State Highway 37, 1¼ miles south of Iron Junction, Minn.	-	1958-61	10- 4-61 10-31-61	*2.91 *3.62
Red River of the North basin						
South Branch Wild Rice River	Wild Rice River	On line between sec.8 and 9, T.142 N., R.45 W., at bridge on County Road 63, 5½ miles northeast of Felton, Minn.	-	1959-61	10-31-61 4- 8-62 4-17-62 4-27-62 5-25-62 6- 9-62 6-27-62 7-31-62 8-30-62 9-26-62	*6.80 178 118 39.8 398 1,390 *39.1 *11.2 *3.51 *6.01
State Ditch No. 45	....do.....	On line between sec.15 and 16, T.141 N., R.46 W., at culvert on State Highway 9, 3 miles south of Felton, Minn.	-	1959-61	10-31-61 4-17-62 4-27-62 5-25-62 6- 9-62 6-27-62 7-31-62 8-30-62 9-26-62	*1.13 11.7 18.3 40.4 75.8 *4.25 *2.70 *1.58 *2.54
Lake of the Woods basin						
Sand River	Pike River....	NW¼ sec.6, T.59 N., R.17 W., at bridge on U.S. Highway 53, 1.3 miles southwest of Britt, Minn.	-	1958-61	10-19-61 11- 2-61	*23.6 *15.0
Rice River	South Branch Little Fork River	SW¼ sec.4, T.60 N., R.18 W., at bridge on U.S. Highway 53, 5.1 miles south of Angora, Minn.	-	1958-61	10- 4-61 10-31-61	*27.0 *28.0
South Branch Little Fork River	Little Fork River	NE¼SE¼ sec.31, T.62 N., R.18 W., at bridge on U.S. Highway 53, 3.1 miles south of Cook, Minn.	-	1958-61	10- 4-61 11- 1-61 4-27-62 5-14-62 5-24-62 6-13-62 7-11-62 9-27-62	*51.2 *50.2 243 314 622 127 407 †38.7
Little Fork River	Rainy River...	SE¼NE¼ sec.13, T.62 N., R.19 W., at bridge on U.S. Highway 53, 0.6 mile west of Cook, Minn.	-	1950, 1958-61	10- 4-61 10-31-61 11- 1-61 4-17-62 5-13-62 5-24-62 6-12-62 7-11-62 9-27-62	*36.6 *25.5 *24.7 39.7 153 422 51.2 279 *23.2
Mississippi River main stem						
Mississippi River	Gulf of Mexico	Sec.21, T.146 N., R.30 W., at outlet of Cass Lake, 7½ miles northeast of Cass Lake, Minn.	1,090	1951-53 1955-56 1959	10-13-61 6- 5-62	367 1,430

* Base flow
≠ Operated as a continuous-record gaging station.

Discharge measurements made at miscellaneous sites during water year 1962

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
Swan River basin						
Welcome Creek	O'Brien Creek	NE¼ sec.25, T.57 N., R.22 W., at culvert on U.S. Highway 169, 0.2 mile east of Keewatin, Minn.	-	-	9-28-62	*2.79
Crow River basin						
South Fork Crow River	Crow River	SE¼ sec.11, T.118 N., R.25 W., at Delano, Minn.	-	-	4- 6-62 4-12-62	3,110 2,460
Rum River basin						
Rum River....	Mississippi River	SE¼SE¼ sec.36, T.36 N., R.24 W., at bridge on State Highway 47 at West Point, 8 miles west of Cambridge, Minn.	-	1958-61	5-25-62	5,930
....do.....	.....do.....	SW¼ sec.27, T.36 N., R.24 W., at bridge on State Highway 95 5 miles west of Cambridge, Minn.	-	-	5-24-62	1,920
....do.....	.....do.....	W½ sec.30, T.35 N., R.23 W., at bridge on County Road No. 5, 0.8 mile west of Isanti, Minn.	-	1958-60	5-25-62	2,320
Mississippi River main stem						
Mississippi River	Gulf of Mexico	Below lock and dam No. 1, between Minneapolis and St. Paul, Minn., 4 miles upstream from Minnesota River.	19,700	1935, 1938, 1939, 1941, 1945-50, 1954, 1959, 1961	9-20-62	7,450
Minnesota River basin						
Threemile Creek	Redwood River	NW¼ sec.2, T.112 N., R.41 W., at bridge on State Highway 23, 1 mile north of Green Valley, Minn.	-	1958-61	10- 6-61 11- 3-61 12- 7-61 1-17-62 2-15-62 4-26-62 5-22-62 6-21-61 7-26-62 8-30-62 9-26-62	a*.01 3.95 *.81 0 0 29.4 59.6 27.7 53.2 *1.15 *2.14
Clear Creek	.....do.....	SE¼ sec.29, T.112 N., R.37 W., at county highway bridge, ¾ mile southeast of Seaforth, Minn., and 1 mile above mouth.	-	1958-60	10-12-61 11- 7-61 12- 8-61 1-17-62 2-15-62 4-20-62 5-21-62 6-22-62 7-25-62 8-29-62 9-29-62	*2.10 *0.97 *1.14 0 0 56.1 30.6 21.7 21.1 *3.74 *2.81
Ramsey Creek	.....do.....	Near center of N½ sec.35, T.113 N., R.36 W., at bridge, 1¾ miles northwest of Redwood Falls, Minn., and 2¼ miles above mouth.	-	1958-61	10-12-61 11- 6-61 12- 8-61 1-16-62 2-15-62 4-20-62 5-21-62 6-22-62 7-25-62 8-29-62 9-26-62	*1.44 *1.68 *.50 0 0 38.6 15.9 *13.9 24.6 *3.74 *2.91
East Branch Blue Earth River	Blue Earth River	SW¼ sec.1, T.102 N., R.25 W. at bridge at outlet of South Walnut Lake, 7 miles north of Bricelyn, Minn.	-	-	11- 9-61	41.5

* Base flow
a Estimated

Discharge measurements made at miscellaneous sites during water year 1962

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
Mississippi River main stem						
Mississippi River	Gulf of Mexico	At Hastings, Minn.	37,100	1929, 1931-39, 1945-48, 1950, 1953-57, 1959-61	4-10-62 6- 1-62 7-24-62	59,000 52,800 27,600
St. Croix River basin						
St. Croix River	Mississippi River	At Prescott, Wis.	7,650	1939, 1946-48, 1950, 1953-57, 1959-61	4-10-62 6- 1-62 7-24-62	11,800 17,600 2,960
Zumbro River basin						
Zumbro River	Mississippi River	NW¼SW¼ sec.31, T.110 N., R.11 W., at highway bridge at Thielman, Minn.	b1,320	1938-56≠, 1957, 1958, 1960-61	10-31-61 5-25-62 6-23-62 7-21-62	384 533 929 886
.....do.....	.....do.....	S½ sec.22, T.110 N., R.10 W., at bridge on U.S. Highway 61 at Kellogg, Minn.	b1,400	1932, 1933, 1935, 1936, 1938, 1939	3-29-62 3-30-62	10,500 ✓23,200
Root River basin						
Root River....	Mississippi River	SE¼NW¼ sec.21, T.104 N., R.8 W., at bridge on U.S. Highway 16, 2.8 miles west of Rushford, Minn.	-	1959-61	4- 5-62 5-22-62 7-18-62 9-12-62	2,100 *386 *309 657

* Base flow
✓ Peak flow
b Approximately
≠ Operated as a continuous-record gaging station.

INDEX

	Page
Accuracy of field data and computed results	9
Acre-foot, definition of	3
Baptism River near Beaver Bay	12
Basswood River near Winton	62
Bear Island River near Ely	60
Big Fork River at Big Falls	70
Big Stone Lake at Ortonville	107
Blue Earth River, near Rapidan	122
East Branch, near Bricelyn	121
Bois de Sioux River near White Rock, S. Dak	25
Buffalo River, near Dilworth	30
near Hawley	28
South Branch, at Sabin	29
Cannon River at Welch	131
Cannon River basin, crest-stage partial-record stations in	150
Cedar River near Austin	142
Cfs-day, definition of	3
Chippewa River near Milan	114
Clearwater River, at Plummer	41
at Red Lake Falls	43
Contents, definition of	3
Control, definition of	3
Cooperation	2
Cottonwood River near New Ulm	120
Crow River, at Rockford	98
Middle Fork, near Spicer	95
South Fork, at Cosmos	96
near Mayer	97
Crow River basin, crest-stage partial-record stations in	148
gaging-station records in	95-98
Crow Wing River at Nimrod	89
Crow Wing River basin, crest-stage partial-record stations in	148
gaging-station records in	89-91
low-flow partial-record stations	145
Cubic feet per second per square mile, definition of	3
Cubic feet per second, definition of	3
Data, accuracy of	9
explanation of	5
Supplemental	10
Des Moines River, West Fork at Jackson	143
Des Moines River basin, crest-stage partial-record stations in	152
Drainage area, definition of	4
Dunka River near Babbitt	59
East Swan River near Toivola	19
Elk River near Big Lake	94
Elk River basin, crest-stage partial-record stations in	148
Embarrass River at Embarrass	16
near McKinley	17
Gaging-station, definition of	2
Garvin Brook basin, crest-stage partial-record station in	151
Gilmore Creek at Winona	136
Gull Lake near Brainerd	90
Gull River at Gull Lake Dam, near Brainerd	91
Introduction	1
Iowa River basin, crest-stage partial-record stations in	151
gaging-station records in	142
Kawishiwi River near Winton	61
Lac qui Parle River near Lac qui Parle	112
Lake of the Woods basin, crest-stage partial-record stations in	147
gaging-station records in	58-73
measurements at miscellaneous sites in	153
Lake Superior, streams tributary to, crest-stage partial-record stations	146
gaging-station records	11-20
low-flow partial record stations	145
measurements at miscellaneous sites	153
Lakes and reservoirs:	Page
Big Stone Lake at Ortonville	107
Gull Lake near Brainerd	90
Leech Lake at Federal Dam	76
Lower Red Lake near Red Lake	36
Mille Lacs Lake at Garrison	99
Minnetonka Lake near Wayzata	103
Orwell Reservoir near Fergus Falls	23
Pelican Lake near Pequot Lakes	87
Pine River Reservoir at Cross Lake	85
Pokegama Lake near Grand Rapids	78
Rainy Lake at Fort Francis	67
Sandy Lake at Libby	81
Vermilion Lake near Soudan	64
Winnibigoshish Lake near Deer River	74
Le Sueur River near Rapidan	123
Leech Lake at Federal Dam	76
Leech Lake River at Federal Dam	77
Little Fork River at Little Fork	69
Little Minnesota River near Peever, S. Dak	105
Little Sioux River near Lakefield	144
Lost River at Oklee	42
Lower Red Lake near Red Lake	36
Marsh River near Shelly	34
Middle River at Argyle	46
Mille Lacs Lake at Garrison	99
Minnehaha Creek at Minnetonka Mills	104
Minnesota River at Mankato	124
at Montevideo	115
at Ortonville	108
near Carver	125
near Lac qui Parle	113
near Odessa	109
Minnesota River basin, crest-stage partial-record station in	149-150
gaging-station records in	105-125
measurements at miscellaneous sites in	154
Minnetonka Lake near Wayzata	103
Mississippi River, at Aitkin	84
at Grand Rapids	79
at Prescott	130
at St. Paul	126
at Winnibigoshish Dam, near Deer River	75
at Winona	135
below Sandy River, near Libby	83
crest-stage partial-record stations	148
measurements at miscellaneous sites	154
near Anoka	102
near Royalton	92
Namakan River at outlet of Lac la Croix, Ontario	63
Order, downstream and station numbers	4
Orwell Reservoir near Fergus Falls	23
Otter Tail River, below Orwell Dam, near Fergus Falls	24
near Detroit Lakes	21
Partial-record station, definition of	3
Partridge River near Aurora	14
Pelican Lake near Pequot Lakes	87
Pelican River near Fergus Falls	22
Pigeon River, at Middle Falls, below International Bridge	11
Pike River near Embarrass	65
Pine River at Cross Lake Dam, at Cross Lake	86
Pine River Reservoir at Cross Lake	85
Platte River basin, crest-stage partial-record stations in	148
Pokegama Lake near Grand Rapids	78
Pomme de Terre River at Appleton	111
Rabbit River near Crosby	88
Rainy Lake at Fort Francis	67
Rainy River at Manitou Rapids	71
Rapid River near Baudette	72
Red Lake River, at Crookston	44
at High Landing, near Goodridge	38
near Red Lake	37
Red River of the North, at Drayton, N. Dak	47
at Emerson, Manitoba	49
at Fargo, N. Dak	27

	Page
Red River of the North, at Drayton, N. Dak.	47
at Grand Forks, N. Dak.	45
at Halstad	33
at Wahpeton, N. Dak.	26
Red River of the North basin, crest-stage partial-record stations in	146-147
gaging-station records in	21-57
measurements at miscellaneous sites in	153
Redwood River, at Marshall	118
near Redwood Falls	119
Reservoirs. See lakes and reservoirs.	
Root River, near Houston	140
near Lanesboro	138
North Branch Root River tributary near Stewartville	137
South Fork, near Houston	141
Root River basin, crest-stage partial-record stations in	151
gaging-station records in	137-141
measurements at miscellaneous sites in	155
Roseau River, at international boundary, near Caribou	57
at Roseau Lake	52
at Ross	53
below South Fork, near Malung	50
below State ditch 51, near Caribou	56
near Badger	54
near Haug	55
Ruffy Brook near Gonvick	40
Rum River, at Spencer Brook	100
near St. Francis	101
Rum River basin, crest-stage partial-record stations in	149
gaging-station records in	99-101
measurements at miscellaneous sites in	154
Rush Creek near Rushford	139
St. Croix River at St. Croix Falls, Wis.	129
St. Croix River basin, crest-stage partial-record stations in	150
gaging-station records in	127-129
measurements at miscellaneous sites in	155
St. Louis River, at Scanlon	20
near Aurora	15
Sandhill River at Climax	35
Sandy Lake at Libby	81
Sandy River at Sandy Lake Dam, at Libby	82
Second Creek near Aurora	13
Sauk River near St. Cloud	93
Sauk River basin, crest-stage partial-record stations in	148
Snake River near Pine City	127
Split Hand Creek basin, crest-stage partial-record stations in	147
Sprague Creek near Sprague, Manitoba	51
Stony River near Isabella	58
Sturgeon River near Chisholm	68
Sunrise River near Stacy	128
Swan River (tributary to Mississippi River) near Warba	80
Swan River basin (tributary to Mississippi River) crest-stage partial-record station in	147-148
Terms and abbreviations, definition of	2
Thief River near Thief River Falls	39
Two Rivers, South Branch, at Lake Bronson	48
Vermilion Lake near Soudan	64
Vermilion River (tributary to Mississippi River) basin, crest-stage partial-record station in	150
Vermilion River (tributary to Namakan River) below Vermilion Lake, near Tower	66
WSP, definition of	4
Warroad River near Warroad	73
West Two River near Iron Junction	18
Whetstone River near Big Stone City, S. Dak.	106
Whitewater River, South Fork, near Altura	134
Wild Rice River at Hendrum	32
at Twin Valley	31
Winnibigoshish Lake near Deer River	74
Yellow Bank River near Odessa	110
Yellow Medicine River, near Granite Falls	117
South Branch, at Minneota	116
Zumbro River, at Zumbro Falls	133
South Fork, near Rochester	132
Zumbro River basin, crest-stage partial-record stations in	151
gaging-station records in	132-133
measurements at miscellaneous sites in	155

GPO 002-479-