



In cooperation with the  
Red River Joint Watershed Management Board  
and the Red River Joint Water Resource Board

# High-Streamflow Statistics of Selected Streams in the Red River of the North Basin, North Dakota, Minnesota, South Dakota, and Manitoba

Open-File Report 00-344



U.S. Department of the Interior  
U.S. Geological Survey

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**By Tara Williams-Sether**

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**In cooperation with the  
Red River Joint Watershed Management Board  
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**Bismarck, North Dakota  
2000**



**U.S. DEPARTMENT OF THE INTERIOR**  
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**U.S. GEOLOGICAL SURVEY**  
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# HIGH-STREAMFLOW STATISTICS OF SELECTED STREAMS IN THE RED RIVER OF THE NORTH BASIN, NORTH DAKOTA, MINNESOTA, SOUTH DAKOTA, AND MANITOBA

By Tara Williams-Sether

## ABSTRACT

Statistical summaries of high-streamflow data through water year 1997 for selected active U.S. Geological Survey gaging stations for the Red River of the North Basin upstream of and including Emerson, Manitoba, but excluding the Devils Lake Basin, are presented in this report. The summaries for each streamflow-gaging station include (1) station description, (2) graph of the annual mean discharge for the period of record, (3) statistics of monthly and annual mean discharges, (4) graph of the annual flow duration, (5) monthly and annual flow duration, (6) probability of occurrence of annual high discharges, (7) annual peak discharge and corresponding gage height for the period of record, and (8) monthly and annual mean discharges for the period of record. Also included for stations located on the Red River of the North are hydrographs of daily mean discharges for the 3 years having the highest peak discharges and hydrographs of daily mean gage heights for the 3 years having the highest gage heights.

## INTRODUCTION

A part of the mission of the U.S Geological Survey is the collection of systematic data to determine the quantity, quality, and use of surface and ground water. A total of 6,959 streamflow-gaging stations (as of 1997) were operated by the U. S. Geological Survey in the United States, Puerto Rico, and the Trust Territories of the Pacific Islands (Lew, 1997). Of the 6,959 streamflow-gaging stations, 54 were operated in the Red River of the North Basin upstream of and including Emerson, Manitoba, but excluding the Devils Lake Basin.

At streamflow-gaging stations, the water level in the river is monitored continually. A relation between water level and discharge is developed by making periodic discharge measurements throughout the range in water level. This relation is referred to as a station rating. A continuous record of streamflow is computed for each gaging station by using the water-level record and the station rating.

Knowledge of the magnitude and temporal distribution of streamflow is essential for all aspects of water management and environmental planning. Federal, State, and local agencies responsible for the development and management of North Dakota's surface-water resources use this knowledge for making safe, economical, and environmentally sound water-resource planning decisions.

Streamflow statistics published in annual state water-data reports by the U. S. Geological Survey include records of daily mean discharge, annual high and low discharge, and annual mean discharge. Other statistics can be retrieved from U.S. Geological Survey computer files. Water-resource managers may use various sources to obtain the necessary statistics.

Recently completed reports (Wiche and Williams-Sether, 1997 and Williams-Sether and Wiche, 1998) list statistics for selected streamflow-gaging stations in the Red River of the North Basin through water year 1994. Above average precipitation during the last 3 subsequent years (1995-97) has resulted in record or near record peaks and volumes of streamflow within the Red River of the North Basin necessitating a need for current high-flow statistics.

The purpose of this report is to provide a comprehensive publication summarizing high-streamflow statistics through water year 1997 for selected active gaging stations for the Red River of the North Basin upstream of and including Emerson, Manitoba, but excluding the Devils Lake Basin. Active gaging stations listed in this report have at least 10 years of record. These stations are listed in table 1 and their locations are shown in figure 1. This report was prepared in cooperation with the Red River Joint Watershed Management Board and the Red River Joint Water Resource Board.

## **HISTORY OF STREAMFLOW-GAGING PROGRAM IN NORTH DAKOTA**

Much of the history of the streamflow-gaging program in North Dakota outlined in this report was written by Crosby (1970). However, the number of streamflow-gaging stations given in figure 2 may differ from the number given by Crosby (1970) because the type of gaging stations included may differ. The collection of systematic streamflow data began in 1882 when a gaging station was established on the Red River of the North at Grand Forks. This gaging station was a stage station; however, infrequent discharge measurements were made for navigational purposes. Stage data were obtained on the Missouri River at Bismarck in 1881-82 and in 1886-89 by the Missouri River Commission. As a result of the National Reclamation Act of 1902 and the disastrous flood in 1897 in the Red River of the North Basin, the U.S. Geological Survey, in cooperation with the State of North Dakota, established and operated streamflow-gaging stations from 1901-09 (fig. 2). Additional interest was created when problems with Canada concerning the division of waters along the international boundary resulted in the formation of the International Joint Commission in 1912. Eight streamflow-gaging stations were in operation in 1925 when State cooperation was discontinued (fig. 2). Only five federally operated gaging stations were continued. State cooperation resumed in 1931, but funds were limited from 1934-38. However, the Rivers and Harbors Act of 1927 and the Flood Control Acts of 1928 and 1936 resulted in the U.S. Army Corps of Engineers supporting a large expansion of the streamflow-gaging program. Forty-one gaging stations were in operation when the North Dakota-South Dakota U.S. Geological Survey Office was created on October 16, 1944. Plans for the coordinated development of the waters of the Missouri River Basin, with respect to flood control, navigation, power, and irrigation, were formulated in 1943-44 by the U.S. Army Corps of Engineers, the Bureau of Reclamation, and the States in the Basin. These plans resulted in a rapid increase in the streamflow-gaging program, and, by 1947, 64 gaging stations were in operation in North Dakota. The number of gaging stations grew steadily from the late 1940's until the late 1960's, and, by 1969, 109 gaging stations were in operation.

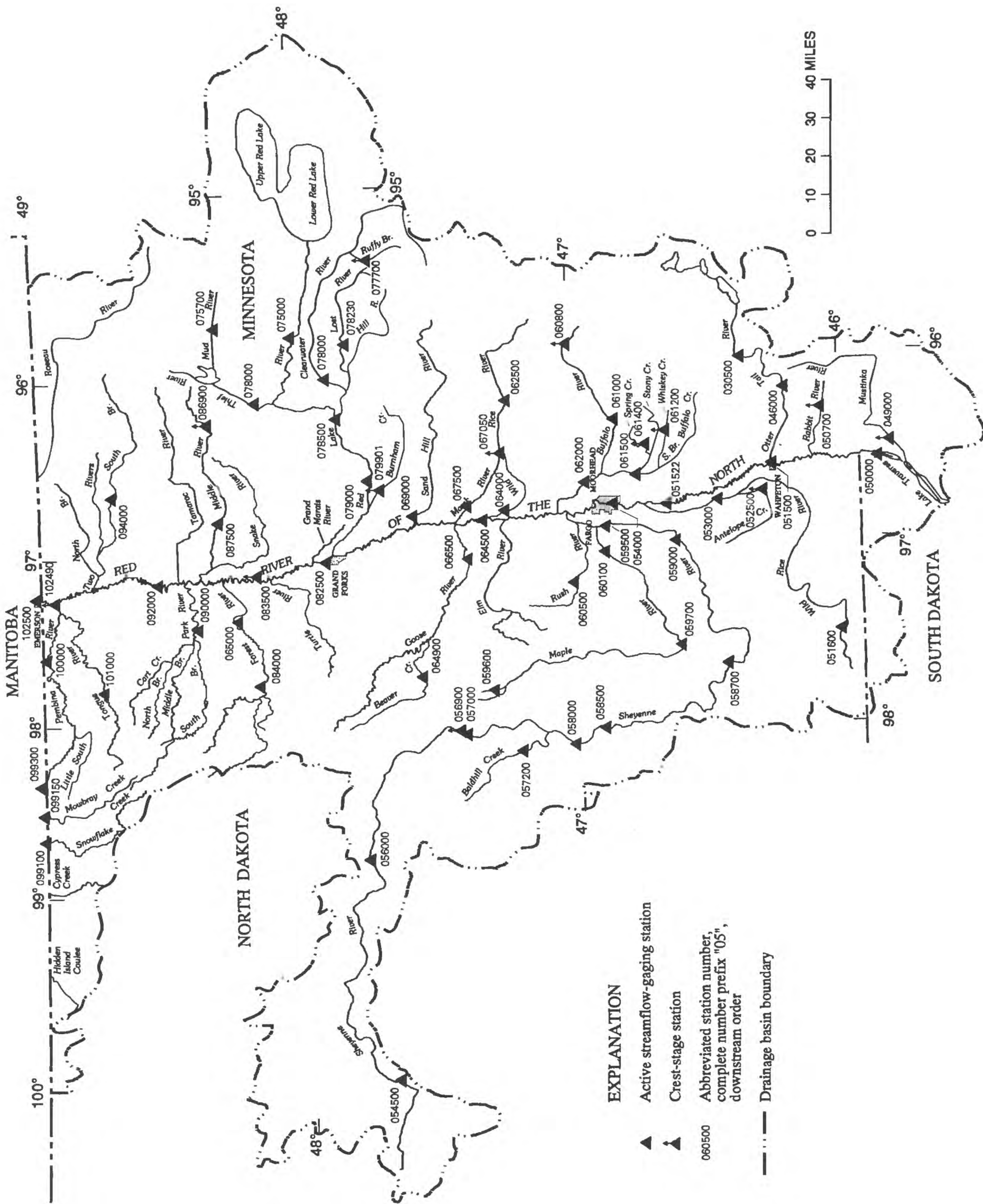
During 1969-76, the number of gaging stations in operation remained relatively stable. During the 1970's, the U.S. Geological Survey established 25 additional gaging stations to monitor the quantity and quality of streamflow in drainage basins underlain by strippable lignite deposits (Haffield, 1981). By 1979, about 145 gaging stations were in operation in North Dakota. During 1981-83, the number of gaging stations in operation declined rapidly, and, during 1984-87, the number declined slowly to about 110. During 1987-95, the number of gaging stations in operation has been relatively stable at about 105 to 110. Since 1996, the number of gaging stations has declined to about 98.



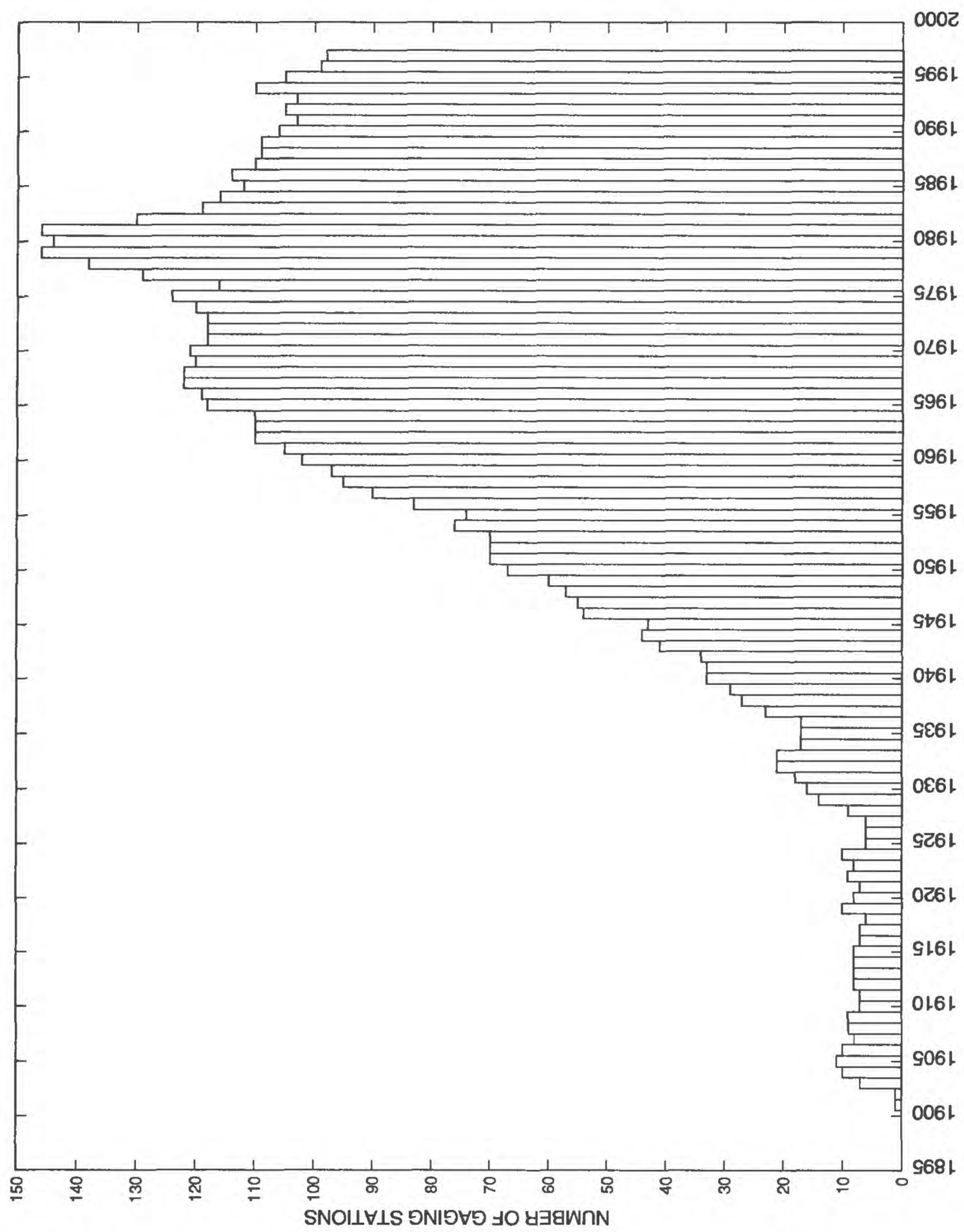
**Table 1.** Streamflow-gaging stations in the Red River of the North Basin for which streamflow statistics are published in this report

[ND, North Dakota; MN, Minnesota; MB, Manitoba; SD, South Dakota]

Station number	Station name	Station number	Station name
05030500	Otter Tail River near Elizabeth, MN	05066500	Goose River at Hillsboro, ND
05046000	Otter Tail River below Orwell Dam near Fergus Falls, MN	05067050	Marsh River Ditch near Ada, MN
05049000	Mustinka River above Wheaton, MN	05067500	Marsh River near Shelly, MN
05050000	Bois de Sioux River near White Rock, SD	05069000	Sand Hill River at Climax, MN
05050700	Rabbit River near Nashua, MN	05075000	Red Lake River at Highlanding near Goodridge, MN
05051500	Red River of the North at Wahpeton, ND	05075700	Mud River near Grygla, MN
05051522	Red River of the North at Hickson, ND	05076000	Thief River near Thief River Falls, MN
05051600	Wild Rice River near Rutland, ND	05077700	Ruffy Brook near Gonvick, MN
05052500	Antelope Creek at Dwight, ND	05078000	Clearwater River at Plummer, MN
05053000	Wild Rice River near Abercrombie, ND	05078230	Lost River at Oklee, MN
05054000	Red River of the North at Fargo, ND	05078500	Clearwater River at Red Lake Falls, MN
05054500	Sheyenne River above Harvey, ND	05079000	Red Lake River at Crookston, MN
05056000	Sheyenne River near Warwick, ND	05079901	Burnham Creek near Crookston, MN
05056900	Sheyenne River Tributary near Cooperstown, ND	05082500	Red River of the North at Grand Forks, ND
05057000	Sheyenne River near Cooperstown, ND	05083500	Red River of the North at Oslo, MN
05057200	Baldhill Creek near Dazey, ND	05084000	Forest River near Fordville, ND
05058000	Sheyenne River below Baldhill Dam, ND	05085000	Forest River at Minto, ND
05058500	Sheyenne River at Valley City, ND	05086900	Middle River near Newfolden, MN
05058700	Sheyenne River at Lisbon, ND	05087500	Middle River at Argyle, MN
05059000	Sheyenne River near Kindred, ND	05090000	Park River at Grafton, ND
05059500	Sheyenne River at West Fargo, ND	05092000	Red River of the North at Drayton, ND
05059600	Maple River near Hope, ND	05094000	South Branch Two Rivers at Lake Bronson, MN
05059700	Maple River near Enderlin, ND	05099100	Snowflake Creek near Snowflake, MB
05060100	Maple River below Mapleton, ND	05099150	Mowbray Creek near Mowbray, MB
05060500	Rush River at Amenia, ND	05099300	Pembina River near Windygates, MB
05060800	Buffalo River near Callaway, MN	05100000	Pembina River at Neche, ND
05061000	Buffalo River near Hawley, MN	05101000	Tongue River at Akra, ND
05061200	Whiskey Creek at Barnesville, MN	05102490	Red River of the North at Pembina, ND
05061400	Spring Creek above Downer, MN	05102500	Red River of the North at Emerson, MB
05061500	South Branch Buffalo River at Sabin, MN		
05062000	Buffalo River near Dilworth, MN		
05062500	Wild Rice River at Twin Valley, MN		
05064000	Wild Rice River at Hendrum, MN		
05064500	Red River of the North at Halstad, MN		
05064900	Beaver Creek near Finley, ND		







**Figure 2.** Number of streamflow-gaging stations in North Dakota, 1901-97.

## EXPLANATION OF STATION SUMMARIES

Station summaries are presented so that each station description and the tables of streamflow statistics and probabilities of occurrence are presented in the same order and format for each gaging station, including the same relative placement of the pages. Because the information and statistics in the tables were created by "data retrievals" or statistical program results, significant figures were not rounded to U.S. Geological Survey standards. The order of presentation is as follows:

1. station description,
2. graph of the annual mean discharge for the period of record,
3. table of statistics of monthly and annual mean discharges,
4. graph of the annual flow duration,
5. table of monthly and annual flow durations,
6. table of probability of occurrence of annual high discharges,
7. table of annual peak discharge and corresponding gage height for the period of record, and
8. table of monthly and annual mean discharges for the period of record.

In addition, for gaging stations located on the Red River of the North, hydrographs of daily mean discharges for the 3 years having the highest peak discharges and hydrographs of daily mean gage heights for the 3 years having the highest gage heights are shown. Statistics for gaging stations in this report are given only for post-regulation and period of record. Statistics for pre-regulation, as well as discontinued gaging stations, may be obtained from reports by Wiche and Williams-Sether (1997) and Williams-Sether and Wiche (1998).

### Station Description

The location, drainage area, period of record, and other information about each streamflow-gaging station are included in the station description. This information is compiled from records maintained by the U.S. Geological Survey and generally is presented in the same format as published in the annual State water-data report. The following comments clarify information presented under the various headings of the station description.

**LOCATION.**--Information on the gaging-station location is obtained from the most accurate maps available and is furnished with respect to cultural and physical features in the vicinity of the gaging station and the community or landmark included in the gaging-station name.

**DRAINAGE AREA.**--The drainage area is measured using U.S. Geological Survey 7.5-minute topographic quadrangle maps. However, 7.5-minute topographic maps were not available for drainage-area computations when some gaging stations were installed; therefore, the accuracy of drainage areas varies.

**PERIOD OF RECORD.**--The period of record is the period for which published records are available for the gaging station or for an equivalent gaging station. An equivalent gaging station is a gaging station that was in operation in a different location before the subject gaging station and whose location is such that records for it can be considered reasonably equivalent to records for the subject gaging station. This situation arises when a gaging station is relocated upstream or downstream and given a new gaging-station number and name, but the changes in drainage area and other basin characteristics are not significantly different. Period of record to current year indicates that the station was in operation as of September 30, 1997.

**GAGE.**--The type of gage or recorder that is or was used to collect data, the datum of the gage referred to sea level, and a condensed history of the types, locations, and datums of previous gages are given under this heading.

**EXTREMES FOR PERIOD OF RECORD.**--Extremes may include maximum and minimum discharges and maximum and minimum gage heights. Unless otherwise qualified, the maximum discharge is the instantaneous maximum discharge corresponding to the highest gage height that occurred. If the maximum gage height did not occur on the same day as the maximum discharge, the maximum gage height is listed separately. Similarly, the minimum discharge is the instantaneous minimum discharge corresponding to the lowest gage height that occurred, unless qualified and listed otherwise.

**EXTREMES OUTSIDE PERIOD OF RECORD.**--Included is any information available concerning major floods or unusually low flows that occurred outside the stated period of record. The information may not have been obtained by the U.S. Geological Survey.

### **Statistics of Monthly and Annual Mean Discharges**

Statistics of monthly and annual mean discharges presented for each gaging station include (1) the maximum, minimum, and mean monthly discharges and (2) the maximum, minimum, and mean annual discharges. The water years (October 1 through September 30) in which the maximum and minimum mean discharges occurred are listed with the respective values, and the standard deviation and coefficient of variation of the monthly and annual mean discharges are listed with the respective values. Also, the percentage of the annual mean discharge that is comprised by each monthly mean discharge is listed in the table.

Each of the statistics is explained in the following paragraphs. As an aid to the readers' understanding of how the monthly mean and annual mean discharges are determined, data for the gaging station Bois de Sioux River near White Rock, SD (05050000, p. 33 ) are used as an example. The monthly mean value is the average of the daily values for the month. The annual mean value is the average of the daily values for the year. Months or years for which all daily values are not available are not included in the compilation of statistics.

The maximum monthly mean discharge is the maximum value of all the monthly mean values. The maximum mean value for October is 535 cubic feet per second ( $\text{ft}^3/\text{s}$ ), which occurred during water year 1994. Similarly, the minimum monthly mean discharge is the minimum value of all the monthly mean values. The minimum mean value for October is 0  $\text{ft}^3/\text{s}$ , which occurred during several water years. The maximum and minimum monthly mean values are included in the statistics of monthly and annual mean discharges table and in the monthly and annual mean discharges table.

The mean monthly discharge is the mean of all the monthly mean discharges for a given month, and the standard deviation is a measure of the variability of the monthly mean values. The mean monthly discharge for October is 30.5  $\text{ft}^3/\text{s}$ , and the standard deviation is 92.2  $\text{ft}^3/\text{s}$ . The mean monthly discharge for October (mean of the monthly mean values) is the same as the mean of all October daily values for the period of record used. However, the standard deviation of monthly means is smaller than the standard deviation obtained using all daily values. The standard deviation is smaller because the monthly mean values have less variability than the daily values.

The coefficient of variation is the ratio of the standard deviation to the mean. The coefficient of variation is dimensionless. Because monthly mean discharges are generally much greater in spring than in winter, the standard deviations also are generally much greater in spring than in winter. However, dividing



the standard deviation by the mean monthly discharge tends to equalize the measures for all months so a more meaningful comparison among months can be made.

The percentage of the annual discharge that occurred during each month is calculated by dividing the mean discharge for the month by the total of the 12 monthly mean discharges and multiplying by 100. Because of rounding of the monthly percentage, the sum of the 12 percentages may not equal 100 percent.

The maximum, minimum, and mean annual discharges are selected or computed from the annual mean discharges for the period of record. The water years of occurrence of the maximum and minimum values are listed with the respective values, and the standard deviation of the mean of the annual mean values is listed with the mean value. The minimum annual mean discharge of  $0.377 \text{ ft}^3/\text{s}$  occurred in 1977, and the maximum annual mean discharge of  $536 \text{ ft}^3/\text{s}$  occurred in 1997. The mean annual discharge for the period of record is  $104 \text{ ft}^3/\text{s}$ .

### **Monthly and Annual Flow Duration**

The monthly and annual flow duration table is a magnitude and frequency analysis of daily discharge values. The duration table is computed by tabulating the number of daily discharge values that fall within preselected class limits, computing the percentage of values within each class, and interpolating discharge values for the percentages shown in the table. Monthly values are calculated from daily values in all complete months in the record, and annual values are calculated for all complete water years. For example, if the 75-percent flow duration value for October is  $0.03 \text{ ft}^3/\text{s}$ , then 75 percent of all October daily discharge values for the period of record were equal to or greater than  $0.03 \text{ ft}^3/\text{s}$ .

### **Probability of Occurrence of High Discharges**

The probabilities of occurrence of annual high discharges are presented in a table for each gaging station. The probability of occurrence is an estimate of the likelihood that a particular discharge in a stream will be equaled or exceeded in 1 year. The probability of occurrence of a high flow is called the exceedance probability. For example, if the maximum instantaneous discharge for the 0.20 exceedance probability is listed as  $1,280 \text{ ft}^3/\text{s}$ , then a 20 percent chance exists that a discharge equal to or greater than  $1,280 \text{ ft}^3/\text{s}$  will occur once during the year.

The recurrence interval, which is another way of expressing annual probability, is the reciprocal of the probability of occurrence. The recurrence interval for an exceedance probability of 0.20 is 5 years (1 divided by 0.20). For a long discharge record, the annual maximum discharge can be expected to equal or exceed  $1,280 \text{ ft}^3/\text{s}$ , on an average of once every 5 years.

The table of probability of occurrence of annual high discharges for each gaging station lists the maximum instantaneous discharge and the maximum mean discharge for 3-, 7-, 15-, and 30-consecutive-day periods for selected exceedance probabilities and recurrence intervals. Values for the maximum instantaneous discharge are computed from the streamflow record according to the guidelines established by the Hydrology Subcommittee of the Interagency Advisory Committee on Water Data (1982). According to the guidelines, adjustments are made for length of record and regional skew.

Values for the maximum mean discharges for 3-, 7-, 15-, and 30-consecutive-day periods are computed from the annual high mean values of the corresponding periods. The computations are based on the log-Pearson Type III distribution using values obtained for the water year.

## DATA CONSIDERATIONS

The reliability of statistical data is related to the length of record for a stream. The Hydrology Subcommittee of the Interagency Advisory Committee on Water Data (1982) recommends that at least 10 years of record be used for computing flood-frequency estimates. Therefore, the length of record criterion for inclusion of a gaging station in this report is at least 10 years. Even with this criterion, the lengths and continuity of record for the gaging stations vary substantially. Subsequently, extreme high flows may be included in the streamflow record of one gaging station and not in another, resulting in inconsistencies in the streamflow statistics when comparing gaging-station data. Also, longer record lengths for many of the gaging stations in this report may result in different streamflow statistics when comparing data in this report with data in previous publications.

## REFERENCES

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- Wiche, G.J., and Williams-Sether, Tara, 1997, Streamflow characteristics of streams in the upper Red River of the North Basin, North Dakota, Minnesota, and South Dakota: U.S. Geological Survey Open-File Report 97-416, 374 p.
- Williams-Sether, Tara, and Wiche, G.J., 1998, Streamflow statistics of selected streams in the lower Red River of the North Basin, North Dakota, Minnesota, and Manitoba: U.S. Geological Survey Open-File Report 98-21, 407 p.

# **STREAMFLOW STATISTICS**

## 05030500 OTTER TAIL RIVER NEAR ELIZABETH, MN

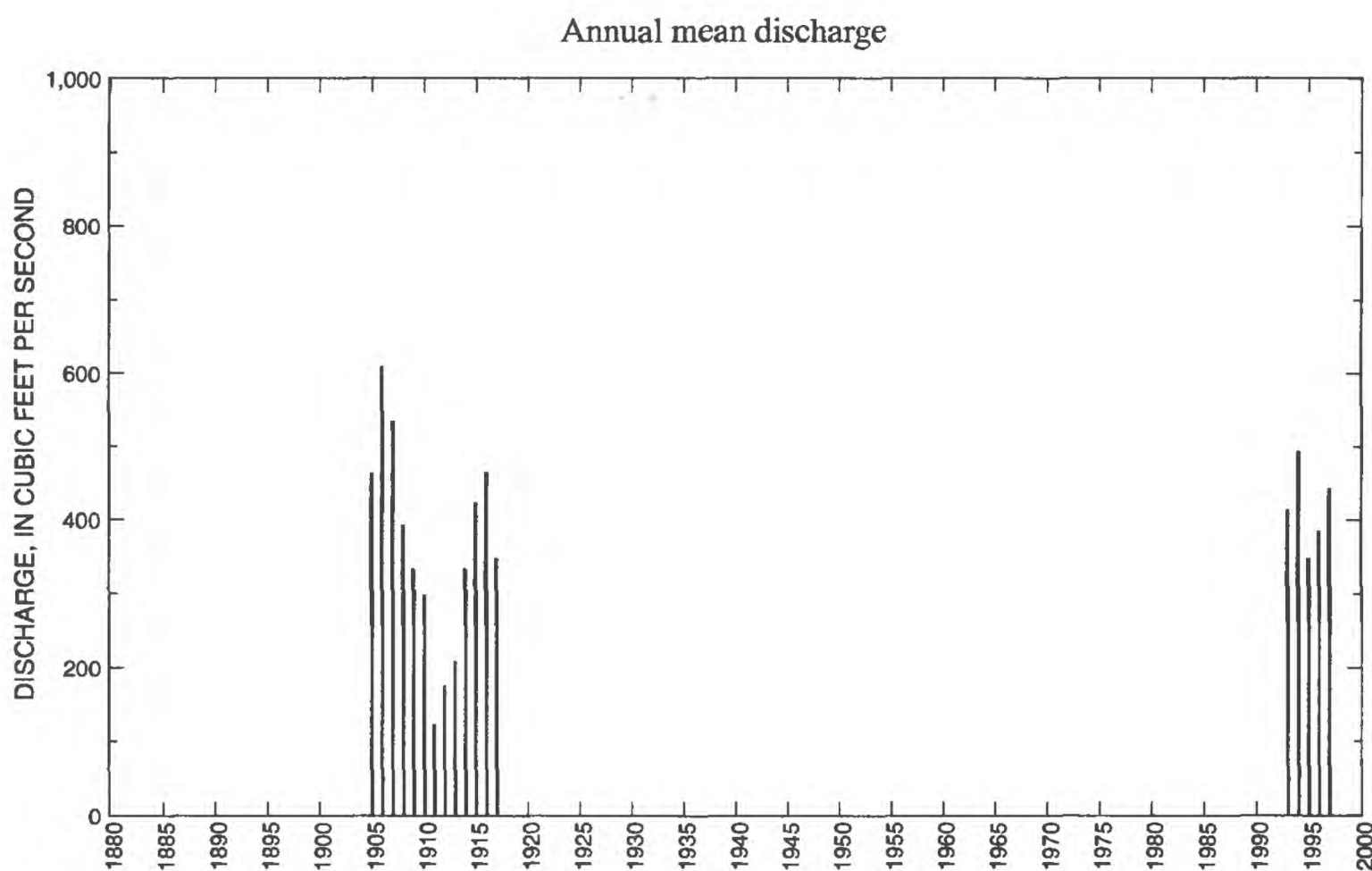
**LOCATION.**--Lat 46°22'10", long 96°01'02", in SW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.31, T.134 N., R.42 W., Ottertail County, Hydrologic Unit 09020103, on right bank, 2.5 mi below Taplin Gorge Dam, 5.0 mi above the Diversion Dam, 5.7 mi east of Elizabeth, and 6.6 mi northeast of Fergus Falls.

**DRAINAGE AREA.**--1,230 mi<sup>2</sup>, approximately.

**PERIOD OF RECORD.**--May 1904 to September 1917, monthly discharge only, published as at German Church near Fergus Falls in Water Supply Paper 1308. July 1992 to current year.

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

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 1,075 ft<sup>3</sup>/s, June 23, 1904, gage height, 4.2 ft; maximum gage height, 8.40 ft., May 11, 1997; minimum daily discharge, 16.0 ft<sup>3</sup>/s, Sept. 13, 1910, gage height, 1.9 ft.



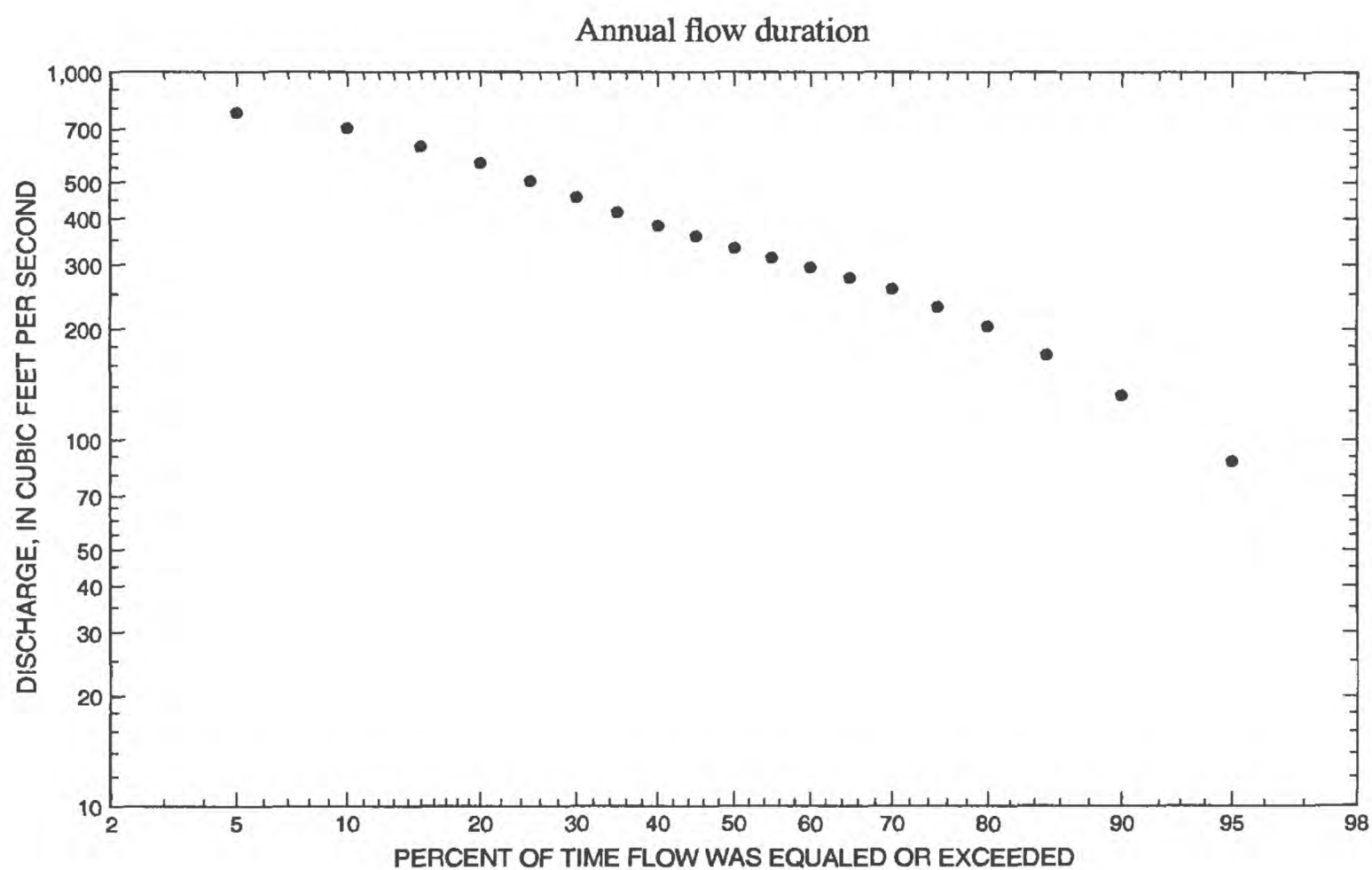


# 05030500 OTTER TAIL RIVER NEAR ELIZABETH, MN--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minlimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /a)			
October	740	1994	48.3	1911	353	204	0.58	7.81
November	688	1907	79.3	1911	341	169	0.49	7.56
December	489	1994	79.9	1911	300	120	0.40	6.64
January	400	1994	80.0	m	253	97.3	0.38	5.60
February	439	1994	70.0	1912	236	95.5	0.41	5.22
March	650	1907	70.0	1912	293	133	0.45	6.48
April	652	1907	180	1913	397	150	0.38	8.79
May	952	1997	221	1911	536	210	0.39	11.9
June	965	1906	169	1911	559	215	0.39	12.4
July	932	1906	108	1911	498	226	0.45	11.0
August	780	1905	64.8	1910	389	218	0.56	8.61
September	817	1993	32.6	1910	361	227	0.63	8.00
Annual	609	1906	123	1911	378	124	0.33	100



# 05030500 OTTER TAIL RIVER NEAR ELIZABETH, MN--Continued

Monthly and annual flow duration, in cubic feet per second

[ng, statistic not given]

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	81.8	72.7	74.5	169	236	211	121	88.8	56.5	90.2	91.0	81.4	87.7
90	83.6	82.4	111	207	275	257	195	130	112	114	136	111	133
85	114	87.4	135	239	293	310	240	164	133	143	149	148	171
80	185	157	187	254	320	331	274	194	153	164	166	170	204
75	192	186	195	268	356	353	309	214	192	184	202	218	231
70	197	204	217	283	392	409	344	236	208	207	236	258	258
65	240	230	250	317	425	465	384	271	219	239	278	273	277
60	249	235	257	334	445	504	424	295	264	288	313	285	296
55	257	241	266	354	470	558	462	319	303	314	324	295	314
50	273	249	276	373	524	588	501	356	328	325	333	305	333
45	281	258	303	400	544	611	538	382	346	337	342	321	357
40	288	264	315	427	585	638	568	420	366	359	363	335	384
35	295	269	330	445	640	668	599	461	404	423	384	347	416
30	304	277	348	480	674	700	650	497	452	455	406	364	457
25	318	299	368	505	706	722	702	541	508	507	433	378	508
20	328	313	381	541	731	744	724	595	569	564	490	389	567
15	369	323	399	587	761	778	747	688	657	599	559	452	626
10	ng	335	441	635	818	844	789	746	736	638	586	477	705
5	ng	415	ng	682	934	924	839	792	788	694	647	501	776

# 05030500 OTTER TAIL RIVER NEAR ELIZABETH, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	224	210	198	190	181
0.95	1.05	334	<sup>1</sup> 334	328	311	296
0.90	1.11	405	<sup>1</sup> 405	<sup>1</sup> 397	<sup>1</sup> 385	371
0.80	1.25	503	<sup>1</sup> 503	<sup>1</sup> 493	<sup>1</sup> 478	<sup>1</sup> 464
0.50	2	723	<sup>1</sup> 723	<sup>1</sup> 709	<sup>1</sup> 688	<sup>1</sup> 667
0.20	5	975	940	928	905	880
0.10	10	1,110	1,010	1,000	989	966
0.04	25	1,260	1,060	<sup>1</sup> 1,040	<sup>1</sup> 1,010	<sup>1</sup> 980
0.02	50	1,350	1,080	<sup>1</sup> 1,060	<sup>1</sup> 1,030	<sup>1</sup> 1,000
0.01	100	1,440	1,100	<sup>1</sup> 1,080	<sup>1</sup> 1,050	<sup>1</sup> 1,020
0.005	200	1,510	1,110	<sup>1</sup> 1,090	<sup>1</sup> 1,060	<sup>1</sup> 1,030
0.002	500	1,590	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

# 05030500 OTTER TAIL RIVER NEAR ELIZABETH, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1904	June 23	--	1,075	1915	July 19	2.80	837
1905	August 7	4.00	855	1916	June 29	3.00	982
1906	--	4.25	1,020	1917	October 1	2.45	613
1908	June 13	4.10	921	1992	August 13	5.68	335
1909	September 15	3.55	580	1993	September 20	8.10	842
1910	--	3.30	449	1994	October 3	8.09	840
1911	April 19	2.90	274	1995	April 18	7.18	714
1912	July 8	3.20	402	1996	May 19	8.17	961
1913	July 5	3.85	758	1997	May 11	8.40	994
1914	June 27	2.40	584				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1904	June 23	--	1,075	1913	July 5	3.85	758
1906	--	4.25	1,020	1995	April 18	7.18	714
1997	May 11	8.40	994	1917	October 1	2.45	613
1916	June 29	3.00	982	1914	June 27	2.40	584
1996	May 19	8.17	961	1909	September 15	3.55	580
1908	June 13	4.10	921	1910	--	3.30	449
1905	August 7	4.00	855	1912	July 8	3.20	402
1993	September 20	8.10	842	1992	August 13	5.68	335
1994	October 3	8.09	840	1911	April 19	2.90	274
1915	July 19	2.80	837				

# 05030500 OTTER TAIL RIVER NEAR ELIZABETH, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1904	--	--	--	--	--	--	--	574.1	695.7	512.6	365.4	329.0	--
1905	325.8	328.0	347.0	300.0	250.0	320.5	292.2	515.9	612.9	718.5	779.6	749.7	463.0
1906	613.5	557.5	450.0	382.0	260.0	382.0	498.9	772.2	965.0	931.6	742.1	726.6	608.8
1907	673.9	688.5	480.0	369.0	261.0	650.0	651.8	709.5	692.0	564.5	359.0	302.7	535.2
1908	337.4	336.0	301.1	260.0	230.0	200.0	312.3	420.6	813.2	685.6	453.5	361.6	392.8
1909	301.0	261.3	220.0	190.0	152.0	261.0	398.6	460.0	491.6	342.6	375.5	549.0	334.0
1910	510.7	425.8	389.6	325.0	240.0	284.8	434.3	416.8	293.9	162.6	64.8	32.6	298.9
1911	48.3	79.3	79.9	80.0	85.0	125.3	228.9	221.0	168.6	108.1	125.8	127.7	123.2
1912	163.8	128.2	110.0	80.0	70.0	70.0	181.4	284.3	324.8	278.2	216.2	203.5	176.1
1913	193.4	201.1	164.0	103.0	76.8	130.0	179.9	266.3	242.6	322.2	261.0	359.2	209.0
1914	320.4	362.8	348.7	280.0	190.0	185.0	248.6	306.3	409.3	522.4	443.3	379.7	334.0
1915	407.5	418.6	327.5	243.0	335.0	264.4	282.8	369.8	555.9	764.1	635.8	474.1	423.8
1916	432.4	369.1	321.5	211.2	256.4	293.8	392.1	671.2	774.3	729.4	549.0	584.6	465.9
1917	589.1	526.0	379.0	300.3	264.6	274.7	440.6	532.2	402.2	254.1	123.8	86.9	348.3
1992	--	--	--	--	--	--	--	--	--	--	232.7	207.8	--
1993	138.5	142.6	140.6	180.8	209.3	313.6	357.2	453.1	702.0	745.2	759.3	816.6	413.9
1994	740.1	571.4	489.2	400.0	439.3	443.1	549.1	740.8	568.5	452.0	308.8	226.7	494.7
1995	211.4	217.1	279.4	247.6	293.6	396.9	631.9	665.5	454.4	358.5	244.2	183.0	348.8
1996	233.9	332.2	279.5	281.3	315.3	336.2	459.3	855.2	754.2	435.6	218.3	134.0	386.3
1997	111.8	198.8	291.2	320.9	313.8	335.9	604.9	952.2	706.4	576.7	520.9	389.2	444.3



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

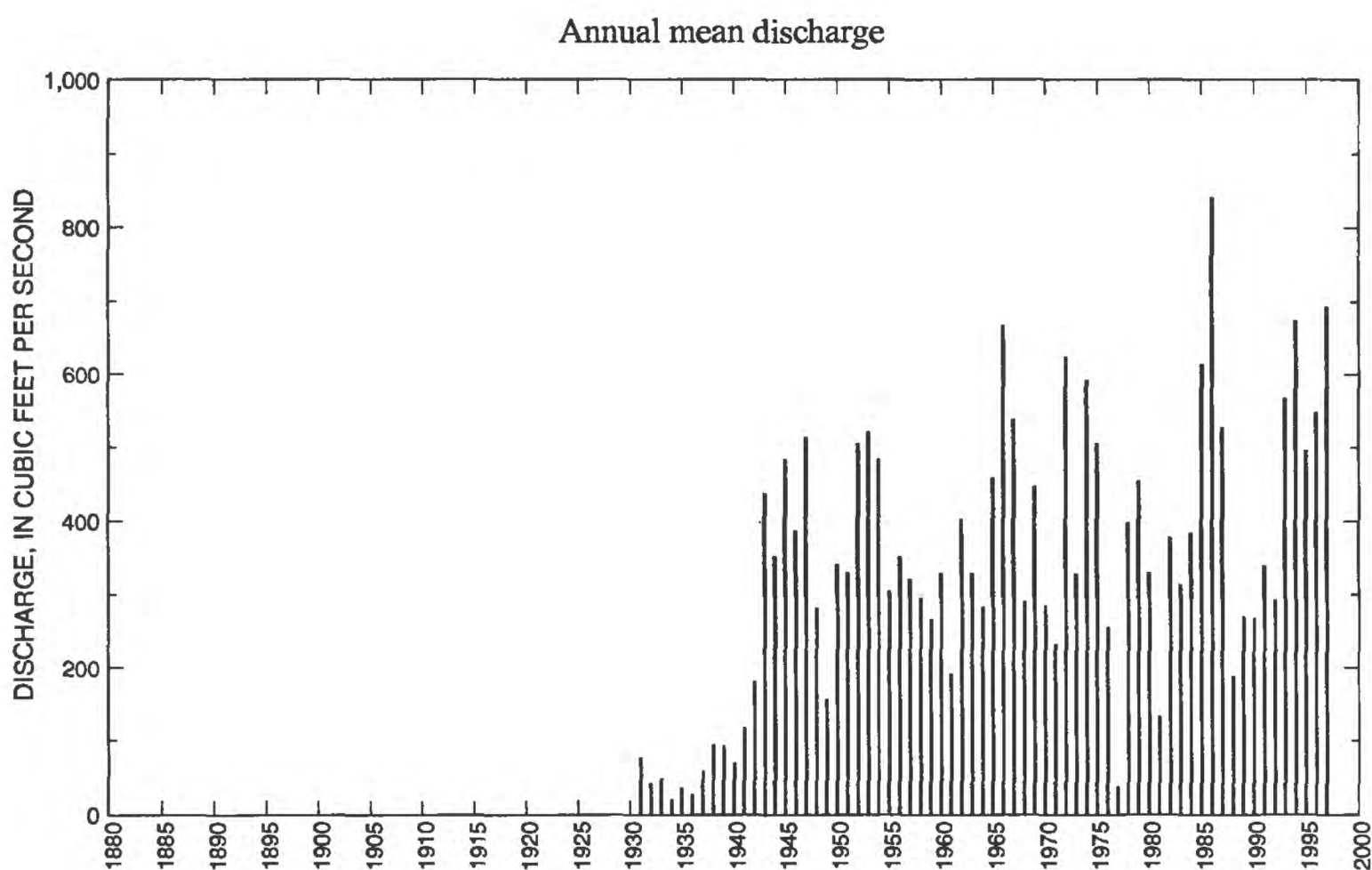
**LOCATION.**--Lat 46°12'35", long 96°11'05", in NE<sup>1</sup>/<sub>4</sub> sec.34, T.132 N., R.44 W., Otter Tail County, Hydrologic Unit 09020103, on left bank 0.7 mi downstream from Orwell Dam, 6.1 mi downstream from Dayton Hollow Dam, 8 mi southwest of Fergus Falls, and 11.1 mi downstream from Pelican River.

**DRAINAGE AREA.**--1,740 mi<sup>2</sup>.

**PERIOD OF RECORD.**--October 1930 to current year. Prior to October 1952, published as Otter Tail River below Pelican River near Fergus Falls. Monthly discharges only for some periods, published in Water-Supply Paper 1308.

**GAGE.**--Water-stage recorder. Datum of gage is 1,029.65 ft above sea level, adjustment of 1912. Oct. 11, 1930, to Nov. 17, 1933, at same site at datum 2.00 ft higher; Nov. 18, 1933, to Mar. 21, 1953, at site 6.1 mi upstream at datum 40.30 ft higher.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 1,710 ft<sup>3</sup>/s, June 17, 1953, gage height, 5.60 ft; minimum discharge, 0.70 ft<sup>3</sup>/s, Aug. 5, 1970, gage height 1.28 ft, caused by regulation.



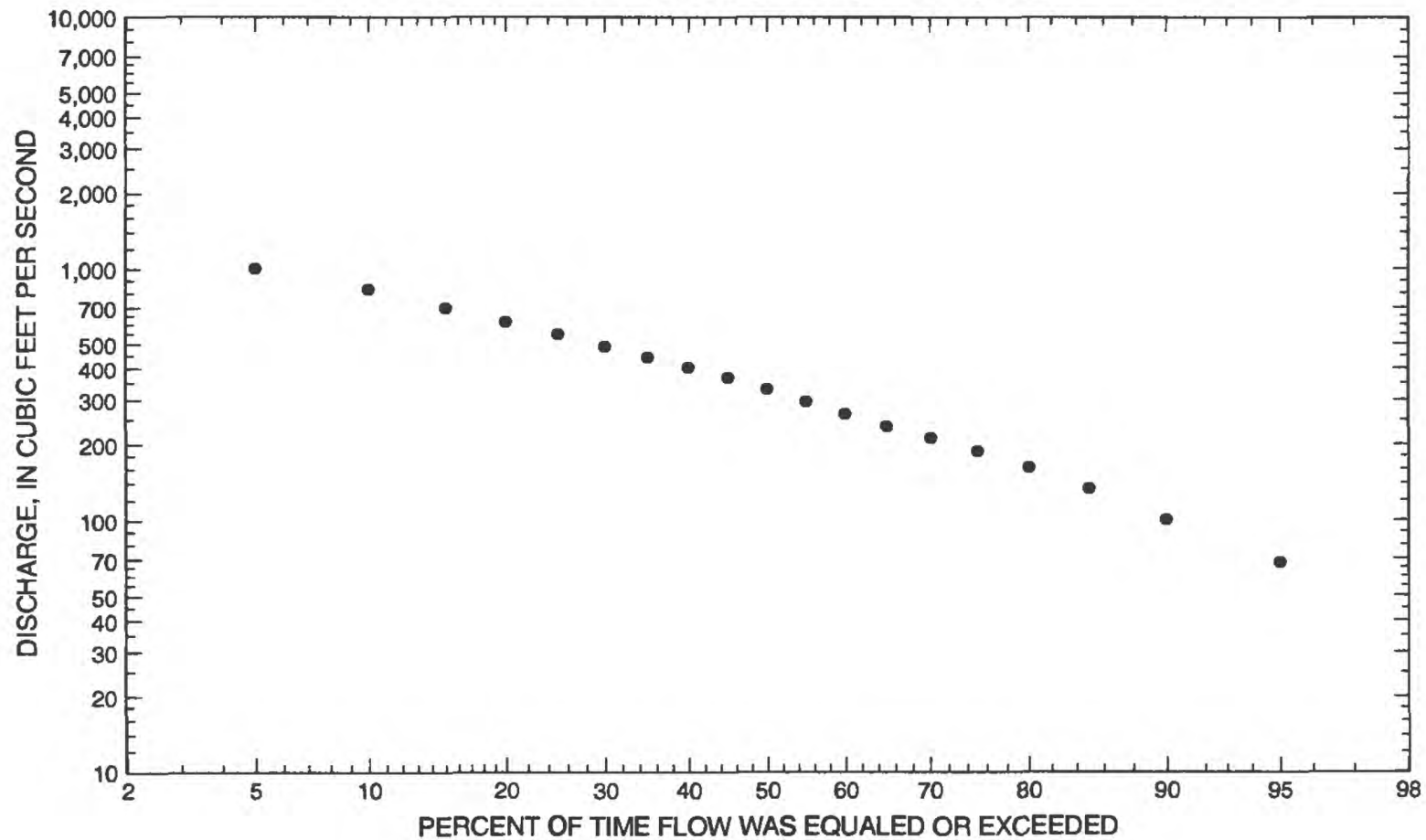
**05046000 OTTER TAIL RIVER BELOW ORWELL DAM NEAR  
FERGUS FALLS, MN--Continued**

Post-regulation period, 1953-97

Statistics of monthly and annual mean discharges, post-regulation period

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	973	1994	9.15	1977	276	200	0.73	5.73
November	831	1986	8.42	1977	290	194	0.67	6.01
December	706	1987	8.10	1977	280	177	0.63	5.82
January	603	1986	19.8	1977	273	152	0.55	5.67
February	647	1994	22.4	1977	282	140	0.50	5.85
March	724	1994	30.4	1977	375	146	0.39	7.78
April	1,200	1997	45.8	1977	566	227	0.40	11.7
May	1,430	1986	14.1	1977	687	328	0.48	14.3
June	1,420	1986	55.0	1977	678	350	0.52	14.1
July	1,250	1953	59.8	1977	501	277	0.55	10.4
August	1,080	1985	50.4	1977	338	255	0.75	7.01
September	1,030	1993	9.17	1976	273	223	0.82	5.67
Annual	842	1986	37.5	1977	402	165	0.41	100

Annual flow duration, post-regulation period





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

Monthly and annual flow duration, in cubic feet per second, post-regulation period

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	79.9	94.9	126	193	188	132	80.6	52.3	31.3	62.9	59.1	62.1	67.7
90	94.1	128	181	260	285	198	132	74.0	52.8	76.8	104	93.5	101
85	114	144	203	316	335	257	179	88.0	68.9	91.8	120	113	134
80	143	163	220	362	370	321	228	110	83.9	110	135	135	163
75	163	180	236	387	414	394	278	141	106	131	150	152	188
70	182	192	255	411	467	458	325	166	126	145	164	167	212
65	198	207	280	433	526	504	360	192	150	161	182	181	236
60	213	223	308	454	577	556	393	215	170	186	199	194	266
55	229	240	332	482	625	607	422	237	188	202	216	220	297
50	241	254	355	518	672	650	454	258	207	224	238	237	333
45	253	269	381	556	720	694	496	292	232	263	268	253	369
40	268	286	407	594	770	752	536	336	265	295	301	276	404
35	291	311	431	636	821	815	574	369	302	318	322	306	446
30	342	344	457	678	873	892	612	412	344	337	343	339	489
25	378	375	485	744	926	963	675	464	397	356	379	385	548
20	415	404	517	804	981	1,030	764	522	435	384	419	431	617
15	458	443	562	859	1,050	1,110	853	631	481	444	465	484	701
10	527	492	612	942	1,130	1,200	937	711	554	493	523	574	839
5	583	562	700	1,060	1,310	1,330	1,070	915	773	769	749	673	1,010

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

Probability of occurrence of annual high discharges, post-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	212	201	177	152
0.95	1.05	456	362	343	312	282
0.90	1.11	549	465	441	406	374
0.80	1.25	676	608	579	541	507
0.50	2	959	925	890	849	811
0.20	5	1,280	1,250	1,230	1,180	1,130
0.10	10	1,460	1,410	1,400	1,350	1,280
0.04	25	1,650	1,560	<sup>1</sup> 1,540	1,510	1,420
0.02	50	1,770	1,650	<sup>1</sup> 1,620	1,600	1,500
0.01	100	1,880	1,710	<sup>1</sup> 1,700	1,680	1,560
0.005	200	1,970	1,760	<sup>1</sup> 1,750	1,740	1,610
0.002	500	2,080	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
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Annual peak discharge, by year, and corresponding gage height

1931	May 18	2.03	686	1965	June 14	4.74	1,330
1932	June 14	--	551	1966	June 1	4.59	1,490
1933	June 18	--	577	1967	May 18	4.14	1,130
1934	May 29	2.92	448	1968	May 14	3.37	714
1935	June 26	--	472	1969	May 31	4.43	1,260
1936	April 14	2.97	468	1970	June 22	3.88	935
1937	July 30	3.27	518	1971	April 9	3.53	755
1938	June 16	--	544	1972	June 3	4.44	1,360
1939	--	3.20	603	1973	March 15	3.48	714
1940	September 2	3.28	600	1974	June 3	4.31	1,310
1941	July 2	--	611	1975	June 21	4.09	1,090
1942	June 6	3.52	747	1976	March 29	3.27	663
1943	April 2	4.31	1,150	1977	September 19	2.88	300
1944	June 4	4.31	1,200	1978	April 9	4.07	1,040
1945	November 14	4.13	1,120	1979	April 17	4.11	1,110
1946	July 19	--	777	1980	April 9	3.84	903
1947	June 10	4.81	1,370	1981	August 4	2.75	267
1948	May 18	--	900	1982	May 29	3.71	849
1949	July 8	3.61	564	1983	July 20	3.11	524
1950	May 23	--	1,100	1984	June 15	3.64	808
1951	April 5	--	1,160	1985	June 27	4.29	1,270
1952	April 10	3.91	1,040	1986	May 27	4.75	1,600
1953	June 17	5.60	1,710	1987	June 30	3.97	1,050
1954	June 20	4.26	1,210	1988	March 25	3.05	408
1955	August 6	3.53	730	1989	April 10	4.17	1,180
1956	May 29	4.05	1,080	1990	June 14	3.37	650
1957	May 23	3.70	794	1991	July 1	4.00	1,050
1958	March 4	3.19	534	1992	July 25	--	589
1959	June 8	3.32	612	1993	July 24	4.34	1,290
1960	May 26	3.66	810	1994	May 6	4.30	1,280
1961	May 23	3.44	664	1995	March 20	4.28	1,250
1962	June 26	4.40	1,260	1996	May 25	4.29	1,260
1963	June 17	3.65	745	1997	May 22	4.63	1,500
1964	May 11	3.73	861				

Annual peak discharge, from highest to lowest, and corresponding gage height

1953	June 17	5.60	1,710	1993	July 24	4.34	1,290
1986	May 27	4.75	1,600	1994	May 6	4.30	1,280
1997	May 22	4.63	1,500	1985	June 27	4.29	1,270
1966	June 1	4.59	1,490	1962	June 26	4.40	1,260
1947	June 10	4.81	1,370	1969	May 31	4.43	1,260
1972	June 3	4.44	1,360	1996	May 25	4.29	1,260
1965	June 14	4.74	1,330	1995	March 20	4.28	1,250
1974	June 3	4.31	1,310	1954	June 20	4.26	1,210

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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1944	June 4	4.31	1,200	1955	August 6	3.53	730
1989	April 10	4.17	1,180	1968	May 14	3.37	714
1951	April 5	--	1,160	1973	March 15	3.48	714
1943	April 2	4.31	1,150	1931	May 18	2.03	686
1967	May 18	4.14	1,130	1961	May 23	3.44	664
1945	November 14	4.13	1,120	1976	March 29	3.27	663
1979	April 17	4.11	1,110	1990	June 14	3.37	650
1950	May 23	--	1,100	1959	June 8	3.32	612
1975	June 21	4.09	1,090	1941	July 2	--	611
1956	May 29	4.05	1,080	1939	--	3.20	603
1987	June 30	3.97	1,050	1940	September 2	3.28	600
1991	July 1	4.00	1,050	1992	July 25	--	589
1952	April 10	3.91	1,040	1933	June 18	--	577
1978	April 9	4.07	1,040	1949	July 8	3.61	564
1970	June 22	3.88	935	1932	June 14	--	551
1980	April 9	3.84	903	1938	June 16	--	544
1948	May 18	--	900	1958	March 4	3.19	534
1964	May 11	3.73	861	1983	July 20	3.11	524
1982	May 29	3.71	849	1937	July 30	3.27	518
1960	May 26	3.66	810	1935	June 26	--	472
1984	June 15	3.64	808	1936	April 14	2.97	468
1957	May 23	3.70	794	1934	May 29	2.92	448
1946	July 19	--	777	1988	March 25	3.05	408
1971	April 9	3.53	755	1977	September 19	2.88	300
1942	June 6	3.52	747	1981	August 4	2.75	267
1963	June 17	3.65	745				



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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1931	49.4	42.8	64.3	30.0	65.0	131.8	140.8	159.5	104.4	62.6	32.3	44.4	77.3
1932	30.0	28.8	30.0	40.0	45.0	60.0	81.7	50.6	50.3	32.7	27.2	31.4	42.2
1933	24.5	35.0	95.0	23.0	25.0	170.0	51.3	37.8	61.8	19.1	14.7	25.8	48.8
1934	13.1	17.5	30.3	27.4	26.2	25.8	39.5	18.0	14.2	13.8	11.5	7.99	20.4
1935	11.9	13.7	14.1	16.0	10.8	58.8	51.5	51.8	63.5	102.6	22.8	13.9	36.2
1936	10.5	17.0	36.0	26.5	24.9	32.5	65.0	41.1	21.9	12.8	19.7	21.6	27.4
1937	25.3	23.1	19.5	15.1	15.7	23.5	60.9	58.0	178.2	96.9	72.7	125.0	59.4
1938	88.7	37.8	20.3	20.4	36.1	100.8	144.0	272.2	267.2	79.0	24.9	47.7	95.1
1939	29.4	26.4	46.4	117.4	118.9	228.2	207.0	180.7	83.3	46.4	18.5	16.9	93.2
1940	19.8	22.5	17.6	17.7	32.0	44.7	166.5	308.9	137.0	28.5	19.4	22.3	69.8
1941	22.8	51.4	36.1	58.6	105.2	163.5	277.1	302.7	210.5	99.0	39.0	51.5	117.9
1942	80.1	102.9	104.6	123.5	97.5	133.1	120.1	383.4	426.8	207.8	164.6	230.7	181.5
1943	336.7	362.5	306.2	306.2	240.9	310.1	595.3	656.1	776.3	534.1	432.5	396.7	438.4
1944	381.3	339.1	269.2	199.1	157.8	196.9	309.3	362.0	616.0	470.7	350.3	581.3	352.6
1945	695.2	667.4	502.9	411.6	369.3	527.8	649.7	735.3	640.9	312.3	158.6	142.9	485.0
1946	236.6	270.3	226.3	194.2	146.4	360.1	513.7	569.0	368.4	621.3	610.6	511.4	387.3
1947	559.8	547.9	479.1	415.3	341.8	343.2	703.6	900.3	871.8	560.4	238.1	207.3	514.7
1948	218.9	207.9	191.8	157.4	129.9	247.5	480.6	647.2	443.8	254.2	213.1	190.4	282.2
1949	137.9	115.3	68.1	90.3	107.6	200.6	220.6	224.0	213.9	225.1	178.3	93.5	156.6
1950	89.8	88.8	105.8	109.6	143.0	218.0	428.5	869.5	883.7	666.9	325.7	162.4	342.0
1951	131.3	98.2	111.1	143.6	199.9	260.5	607.6	635.0	661.5	463.5	332.1	321.7	330.6
1952	323.7	353.3	441.4	478.7	484.4	488.7	787.4	822.6	563.8	426.0	446.8	463.4	506.4
1953	349.4	242.2	203.1	169.3	212.0	334.0	421.0	558.3	1,262	1,246	746.9	507.0	522.5
1954	395.5	465.6	443.7	400.0	312.0	482.1	614.1	855.6	903.1	521.7	189.1	229.0	485.0
1955	117.4	146.0	211.5	230.1	190.2	240.0	410.4	355.1	319.3	466.5	465.7	501.8	305.0
1956	389.7	321.6	185.0	235.5	194.0	235.0	642.3	807.8	652.0	247.0	191.8	109.4	350.9
1957	68.9	44.0	69.2	111.0	112.7	274.8	426.7	634.3	592.4	578.4	498.2	436.0	321.7
1958	351.2	394.6	381.8	281.5	271.9	401.0	381.6	218.2	142.6	331.9	225.9	195.6	298.6
1959	153.0	163.1	154.5	238.9	233.5	288.8	321.1	318.5	515.7	430.9	208.4	172.1	266.5
1960	151.7	173.2	217.6	236.0	254.3	234.1	484.4	785.2	702.6	425.9	171.4	115.8	329.3
1961	102.8	130.9	136.2	161.5	168.3	235.2	281.3	346.2	378.8	187.4	95.0	80.6	191.9
1962	99.0	110.4	88.7	81.9	93.6	234.0	433.0	488.7	1,035	939.3	777.2	442.7	403.4
1963	399.7	366.0	317.2	286.3	197.2	284.8	450.5	443.2	555.4	359.6	140.6	155.7	330.2
1964	217.9	180.8	174.1	171.8	155.4	150.3	474.5	801.5	564.4	296.9	78.5	128.9	283.0
1965	228.1	215.5	231.1	216.9	176.5	213.6	565.5	961.1	1,156	730.6	419.6	398.3	460.4

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1966	520.4	487.5	518.6	489.0	432.6	605.4	1,033	1,273	1,149	564.4	521.4	411.6	667.9
1967	467.0	506.2	475.8	416.1	367.5	406.1	820.7	1,040	865.9	727.3	243.6	118.0	538.8
1968	201.5	184.1	156.3	136.5	147.9	264.8	397.4	598.1	575.0	431.4	233.6	167.3	291.5
1969	283.1	308.7	275.9	247.9	374.1	461.2	738.1	1,104	910.1	413.3	200.6	59.6	448.1
1970	112.6	150.8	149.7	193.9	214.8	229.0	385.1	679.7	716.5	440.5	122.1	28.8	285.5
1971	89.7	184.4	174.7	150.0	166.5	262.6	458.3	340.1	295.8	351.7	151.7	166.3	232.7
1972	247.6	487.6	592.5	563.8	473.2	510.4	865.5	969.9	1,181	692.3	491.9	425.0	624.6
1973	438.2	391.1	397.1	359.2	357.7	517.8	433.4	371.3	274.3	156.8	130.5	136.9	330.4
1974	380.6	634.3	641.1	506.5	461.2	483.5	608.4	984.0	1,156	666.1	337.2	252.6	592.9
1975	298.8	267.4	187.0	200.5	269.0	412.6	642.6	956.5	1,023	846.3	597.0	369.0	507.0
1976	334.1	320.9	240.9	247.5	305.8	432.9	518.5	317.8	171.0	110.4	57.3	9.17	255.3
1977	9.15	8.42	8.10	19.8	22.4	30.4	45.8	14.1	55.0	59.8	50.4	128.2	37.5
1978	200.8	298.7	363.1	402.5	356.6	384.9	814.4	812.0	519.2	402.3	137.3	96.0	399.0
1979	139.6	109.1	103.9	98.2	132.4	295.9	620.9	972.4	917.6	804.0	701.8	551.0	455.5
1980	343.5	355.7	325.1	357.8	392.7	488.8	548.5	505.2	346.5	166.7	102.8	40.9	330.9
1981	70.2	119.0	113.8	101.1	132.2	207.4	213.2	170.3	124.8	142.2	152.5	58.8	133.9
1982	139.5	220.7	246.9	239.7	256.0	406.6	612.3	748.4	719.8	503.4	276.7	171.9	378.9
1983	299.6	330.9	297.3	281.2	262.6	354.3	374.2	329.5	235.8	287.7	365.5	353.7	314.7
1984	329.8	292.4	257.8	275.4	345.8	369.1	656.2	621.5	637.8	468.2	247.4	125.8	385.4
1985	173.2	193.8	265.4	267.6	270.7	473.5	590.8	901.5	1,087	1,139	1,080	904.1	614.2
1986	817.0	830.6	681.8	603.0	538.6	545.4	1,051	1,427	1,425	883.5	611.0	684.2	842.3
1987	777.1	772.4	706.2	580.1	605.3	652.9	602.1	521.3	467.7	322.2	166.2	174.5	528.6
1988	134.6	130.9	147.9	169.8	231.0	320.0	347.4	356.9	201.9	75.1	78.3	74.0	188.8
1989	68.0	58.5	54.9	92.9	175.4	342.1	653.2	600.2	593.3	305.1	137.5	168.4	270.5
1990	117.1	136.3	120.5	111.1	145.7	294.6	428.1	517.9	551.6	385.3	236.8	163.2	267.8
1991	128.6	92.9	88.9	93.2	158.8	256.3	383.0	699.0	709.6	679.1	429.3	354.7	340.4
1992	200.3	175.6	167.5	205.8	248.8	369.2	443.9	431.9	381.2	351.1	291.4	265.5	294.4
1993	189.9	211.2	200.5	221.0	281.4	419.5	621.0	684.8	979.5	923.7	1,055	1,026	568.6
1994	972.6	798.4	619.1	556.3	646.9	724.3	816.9	1,009	706.7	565.5	408.4	279.4	675.8
1995	322.2	300.7	413.0	410.4	414.3	615.0	894.8	891.6	619.2	509.4	310.7	259.4	497.2
1996	363.0	435.5	414.3	366.1	401.9	546.0	738.8	1,100	1,069	573.9	348.0	223.3	548.4
1997	222.3	281.9	399.2	521.5	532.6	571.2	1,199	1,403	1,054	848.9	724.3	565.6	694.1

## 05049000 MUSTINKA RIVER ABOVE WHEATON, MN

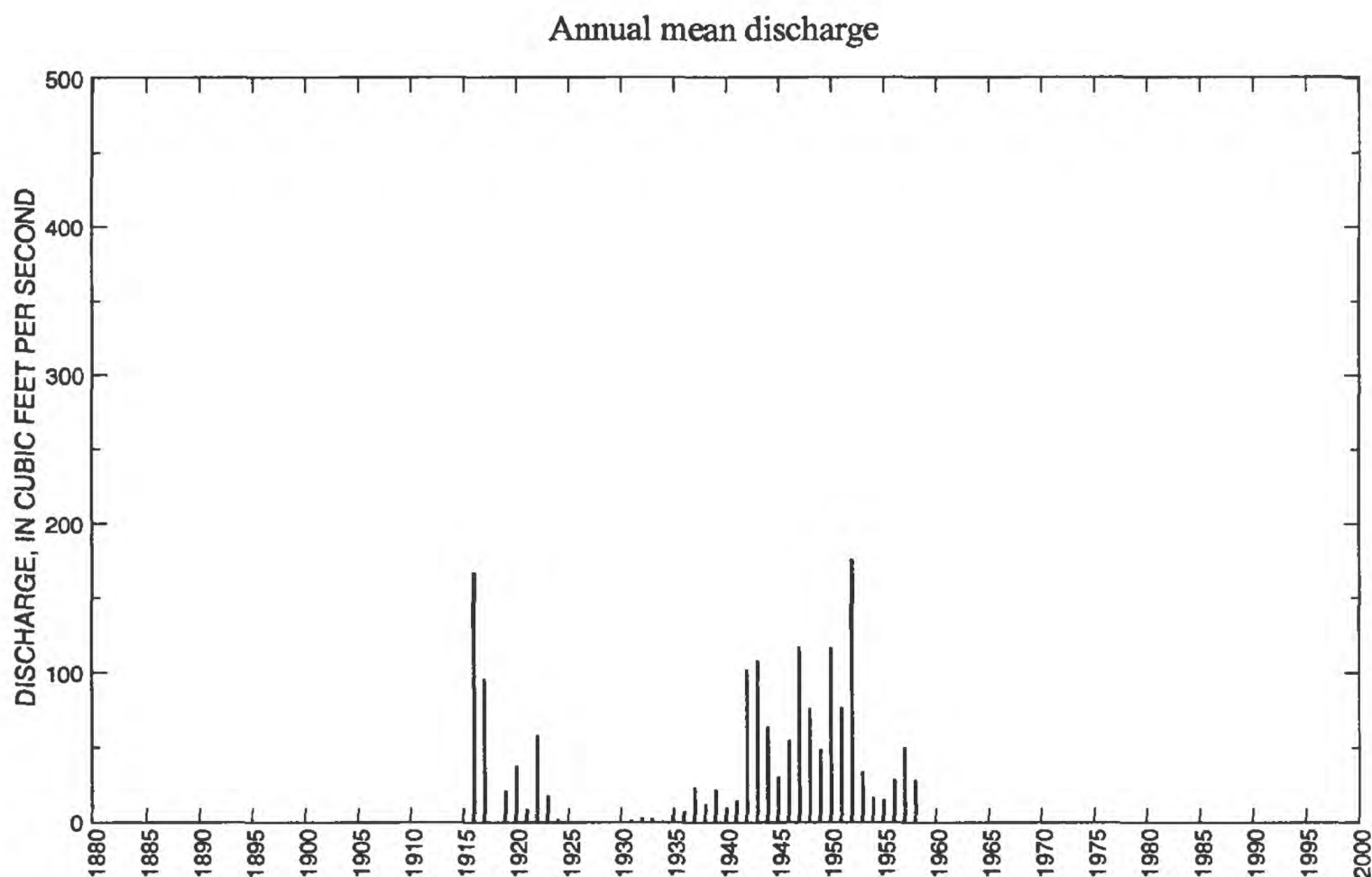
LOCATION.--Lat 45°49'15", long 96°29'25", in SW<sup>1</sup>/<sub>4</sub> sec.8, T.127 N., R.46 W., Traverse County, Hydrologic Unit 09020102, at bridge on U.S. Highway 75, 1 mi upstream from Chicago, Milwaukee, and St. Paul railroad bridge, 0.5 mi north of Wheaton, and about 8 mi above Lake Traverse.

DRAINAGE AREA.--810 mi<sup>2</sup>.

PERIOD OF RECORD.--October 1915 to September 1924, October 1930 to September 1958. Monthly discharge only for some periods, published in Water-Supply Paper 1308. Peaks only for 1985 to current year.

GAGE.--History of gage published in Water-Supply Paper 1728.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,800 ft<sup>3</sup>/s, Apr. 7, 1997, gage height, 23.63 ft; no flow at times in most years.





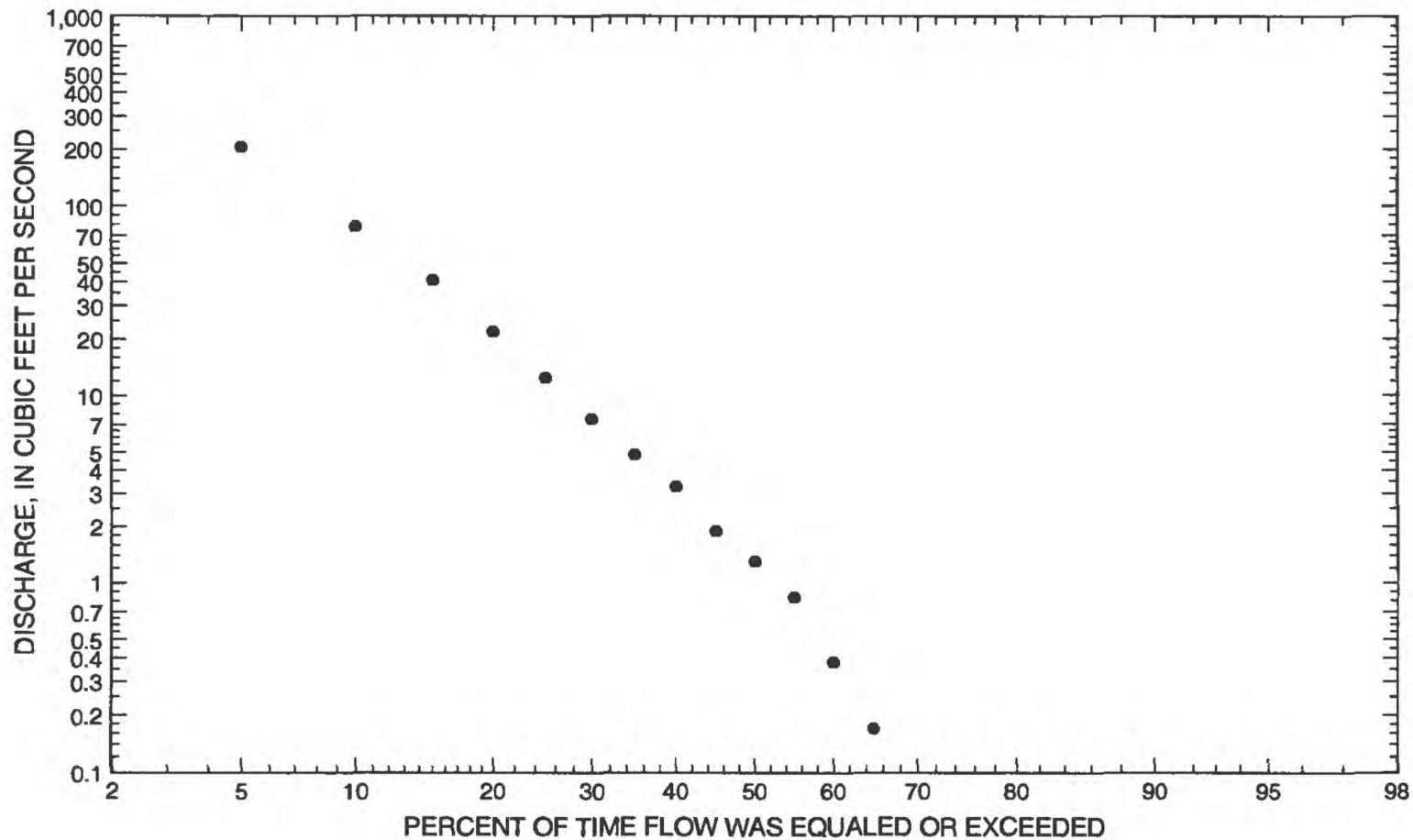
# 05049000 MUSTINKA RIVER ABOVE WHEATON, MN--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annuai discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	30.9	1917	0	m	3.29	6.58	2.00	0.60
November	41.3	1958	0	m	3.82	8.15	2.13	0.69
December	4.47	1958	0	m	0.94	1.26	1.34	0.17
January	3.80	1917	0	m	0.39	0.83	2.14	0.07
February	11.0	1958	0	m	0.63	1.87	2.94	0.12
March	435	1946	0.039	1934	76.6	110	1.43	13.9
April	1,770	1952	1.33	1931	237	369	1.56	43.0
May	571	1942	0.129	1934	74.6	124	1.67	13.5
June	524	1942	0.090	1934	74.7	127	1.69	13.6
July	821	1916	0	m	63.3	153	2.42	11.5
August	108	1916	0	m	10.1	22.2	2.19	1.84
September	44.1	1916	0	m	5.83	11.2	1.92	1.06
Annual	176	1952	0.192	1934	45.9	46.9	1.02	100

## Annual flow duration



# 05049000 MUSTINKA RIVER ABOVE WHEATON, MN--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	1.80	0.58	0.10	0	0	0	0	0	0	0
90	0	0	0	3.70	1.00	0.32	0	0	0	0	0	0	0
85	0	0	0	5.14	2.50	1.00	0.10	0	0	0	0	0	0
80	0	0	0	7.76	3.41	1.40	0.32	0	0	0	0	0	0
75	0	0	0	12.2	4.30	2.40	1.00	0.09	0	0	0	0	0
70	0	0	0	18.2	6.69	3.53	1.90	0.16	0	0	0	0	0
65	0	0	0.08	24.3	8.80	4.42	2.50	0.30	0.04	0	0	0	0.17
60	0	0	0.78	32.3	11.2	5.93	3.77	0.55	0.19	0	0.09	0	0.38
55	0	0	1.10	41.8	14.0	7.35	4.36	1.00	0.26	0.08	0.26	0	0.84
50	0	0	3.17	48.9	17.9	9.10	5.40	1.90	0.47	0.10	0.59	0.10	1.30
45	0	0	5.01	57.4	21.6	12.8	8.19	1.90	1.10	0.47	1.10	0.18	1.90
40	0	0	10.5	73.5	25.3	21.3	13.4	2.60	1.50	1.00	1.70	0.49	3.28
35	0	0.03	16.9	98.6	33.1	31.5	18.9	4.08	2.10	1.50	1.70	0.68	4.88
30	0.10	0.09	20.8	141	50.6	48.1	27.4	5.23	2.80	1.80	2.50	0.95	7.52
25	0.36	0.36	34.1	215	71.9	68.8	38.4	6.96	3.87	2.70	3.10	1.30	12.5
20	0.68	0.45	48.6	314	94.0	92.8	52.6	9.78	5.29	3.30	3.90	1.80	22.0
15	0.88	0.87	93.3	446	119	133	72.1	15.1	9.19	5.23	5.62	2.10	41.1
10	1.30	0.87	171	593	186	198	106	23.8	18.1	10.5	8.01	2.50	78.7
5	2.20	1.70	380	1,130	332	328	247	50.3	36.5	20.0	24.2	3.50	206

# 05049000 MUSTINKA RIVER ABOVE WHEATON, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedsnce probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s) <sup>1</sup>			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	7.17	4.43	2.62	1.70
0.95	1.05	81.0	35.8	23.6	14.5	9.19
0.90	1.11	144	76.2	52.0	32.4	20.4
0.80	1.25	281	174	123	78.2	49.1
0.50	2	913	649	493	320	202
0.20	5	2,620	1,760	1,420	935	606
0.10	10	4,340	2,640	2,200	1,450	957
0.04	25	7,170	3,780	3,230	2,140	1,440
0.02	50	9,730	4,570	3,980	2,640	1,800
0.01	100	12,700	5,310	4,690	3,100	2,140
0.005	200	16,000	5,970	5,340	3,530	2,470
0.002	500	20,800	ng	ng	ng	ng

<sup>1</sup>Statistics computed using period of daily value record 1916-58.

# 05049000 MUSTINKA RIVER ABOVE WHEATON, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water Year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1916	--	17.40	2,980	1947	April 13	14.68	2,710
1917	April 1	14.73	2,250	1948	April 1	--	2,080
1918	--	--	--	1949	July 12	12.98	1,770
1919	June 5	7.37	559	1950	May 11	--	1,690
1920	May 11	9.50	970	1951	April 8	--	3,180
1921	April 2	5.50	287	1952	April 10	16.56	7,320
1922	March 22	13.08	1,330	1953	March 26	--	572
1923	April 15	--	746	1954	June 9	6.61	393
1924	April 5	2.65	45.0	1955	July 13	5.58	484
1931	June 10	1.80	41.0	1956	May 29	--	655
1932	April 8	4.50	300	1957	April 21	10.68	1,610
1933	March 2	4.84	78.0	1958	April 8	6.84	690
1934	April 10	1.36	9.10	1985	May 31	9.37	1,190
1935	March 17	--	120	1986	March 29	18.91	5,500
1936	March 23	10.51	354	1987	June 1	4.78	275
1937	May 1	--	400	1988	May <sup>1</sup>	--	250
1938	July 4	6.42	267	1989	March 29	20.01	5,400
1939	March 25	13.62	1,420	1990	April 4	3.83	130
1940	April 2	8.08	349	1991	July 2	11.22	1,420
1941	June 23	--	240	1992	March 7	5.45	220
1942	May 17	14.08	1,480	1993	March 30	18.07	4,400
1943	April 4	--	1,940	1994	March 25	16.95	4,310
1944	June 6	13.29	1,520	1995	March 14	19.30	5,100
1945	March 16	--	892	1996	April 9	15.19	2,000
1946	March 21	14.56	2,460	1997	April 7	23.63	8,800
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 7	23.63	8,800	1944	June 6	13.29	1,520
1952	April 10	16.56	7,320	1942	May 17	14.08	1,480
1986	March 29	18.91	5,500	1939	March 25	13.62	1,420
1989	March 29	20.01	5,400	1991	July 2	11.22	1,420
1995	March 14	19.30	5,100	1922	March 22	13.08	1,330
1993	March 30	18.07	4,400	1985	May 31	9.37	1,190
1994	March 25	16.95	4,310	1920	May 11	9.50	970
1951	April 8	--	3,180	1945	March 16	--	892
1916	--	17.40	2,980	1923	April 15	--	746
1947	April 13	14.68	2,710	1958	April 8	6.84	690
1946	March 21	14.56	2,460	1956	May 29	--	655
1917	April 1	14.73	2,250	1953	March 26	--	572
1948	April 1	--	2,080	1919	June 5	7.37	559
1996	April 9	15.19	2,000	1955	July 13	5.58	484
1943	April 4	--	1,940	1937	May 1	--	400
1949	July 12	12.98	1,770	1954	June 9	6.61	393
1950	May 11	--	1,690	1936	March 23	10.51	354
1957	April 21	10.68	1,610	1940	April 2	8.08	349



# 05049000 MUSTINKA RIVER ABOVE WHEATON, MN--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water Year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1932	April 8	4.50	300	1990	April 4	3.83	130
1921	April 2	5.50	287	1935	March 17	--	120
1987	June 1	4.78	275	1933	March 2	4.84	78.0
1938	July 4	6.42	267	1924	April 5	2.65	45.0
1988	May <sup>1</sup>	--	250	1931	June 10	1.80	41.0
1941	June 23	--	240	1934	April 10	1.36	9.10
1992	March 7	5.45	220				

<sup>1</sup>Day of month unknown.

# 05049000 MUSTINKA RIVER ABOVE WHEATON, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1916	4.80	4.00	2.40	2.40	1.80	37.0	663.0	107.0	201.7	820.8	108.3	44.1	166.7
1917	30.9	26.1	2.90	3.80	2.50	261.0	642.6	159.2	17.7	3.13	1.84	2.00	96.1
1919	0.600	0.900	0.600	0.700	0.500	16.0	50.0	20.0	122.3	31.0	5.28	0.910	20.6
1920	1.89	1.80	0.900	1.40	1.00	118.3	33.2	83.2	110.7	92.9	6.29	2.12	38.0
1921	1.67	2.86	1.65	1.00	1.07	4.48	59.5	16.1	4.00	3.03	0.710	4.14	8.31
1922	1.87	1.40	1.00	0.700	0.500	380.6	273.5	26.3	3.85	0.639	0.065	0.097	57.9
1923	0.080	0.060	0.050	0.040	0.030	0.040	197.7	5.90	3.98	2.87	0.092	0.009	17.4
1924	0.126	0.380	0.200	0.100	0.100	1.00	12.9	2.85	1.96	1.24	0.226	1.51	1.87
1931	0	0	0	0	0	2.60	1.33	0.642	3.51	1.36	1.95	4.17	1.30
1932	0	0	0	0	0.259	4.10	25.7	2.68	0.890	.071	0	0	2.78
1933	0	0	0	0	0.675	14.3	5.54	4.28	2.30	0.032	0	0	2.28
1934	0	0	0	0	0	0.039	2.07	0.129	0.090	0	0	0	0.192
1935	0	0	0	0	0.100	42.6	5.47	10.5	13.9	16.0	0.439	0	7.50
1936	0	0	0	0	0	55.9	22.0	5.08	0.610	0	0	0	7.02
1937	0	0	0	0	0	13.0	172.4	66.3	6.48	15.5	2.46	0.100	23.0
1938	0	0	0	0	0.536	46.9	5.65	12.4	12.2	49.7	0.194	13.9	11.9
1939	0	0	0	0.029	0	213.9	28.1	3.82	4.61	3.73	0.445	0	21.5
1940	0	0	0	0	0	0.839	103.6	11.1	0.423	0	0	0	9.54
1941	0	0	0	0	0	35.6	55.7	4.65	28.0	1.94	11.8	32.2	14.1
1942	9.11	3.83	4.11	0	0	7.52	24.2	571.0	523.6	25.7	13.5	38.6	102.1
1943	14.5	13.9	1.28	0	0	43.0	742.7	81.3	266.3	88.5	44.3	12.3	108.3
1944	4.44	7.31	2.40	0	0	5.36	45.3	135.1	500.3	60.4	7.14	4.32	63.9
1945	2.85	5.84	2.08	0	0	192.8	76.8	24.0	52.6	3.98	0.632	0	30.3
1946	0.094	0.267	0	0	0	435.3	126.2	15.1	3.48	63.4	2.21	1.86	54.7
1947	10.8	7.11	1.73	0.097	0.275	107.1	977.5	185.7	106.1	17.4	0.558	0	117.1
1948	0	0.463	0.306	0	0	250.7	579.2	53.2	12.3	18.1	3.72	0.187	76.2
1949	0.110	0.370	0.045	0	0	72.7	44.3	2.85	6.82	429.7	16.0	1.50	48.6
1950	2.65	3.91	0.432	0	0	68.5	498.4	470.7	74.4	256.2	14.8	1.04	116.6
1951	2.42	1.47	0.181	0.010	0.393	0.065	673.3	117.0	82.7	43.7	5.25	1.96	76.8
1952	4.70	6.81	3.54	2.03	1.27	1.38	1,767	224.8	50.3	69.0	7.97	4.68	176.5
1953	0.261	0.433	1.09	0.739	0.821	153.8	73.1	42.1	92.8	35.7	1.34	0	33.7
1954	0.006	0.743	0.229	0	0	17.1	43.6	26.3	91.1	9.16	5.86	5.73	16.6
1955	2.84	3.54	0.806	0.039	0	16.7	61.0	3.49	18.3	68.7	3.72	0.570	15.0
1956	0.177	0.007	0	0	0	0.058	143.1	70.7	40.2	6.82	75.3	4.50	28.3
1957	0.481	2.89	1.49	0.100	0	33.7	169.0	98.8	221.4	34.5	20.4	25.0	50.5
1958	20.9	41.3	4.47	0.729	11.0	103.7	123.9	21.0	7.20	4.01	1.55	2.20	28.5

## 05050000 BOIS DE SIOUX RIVER NEAR WHITE ROCK, SD

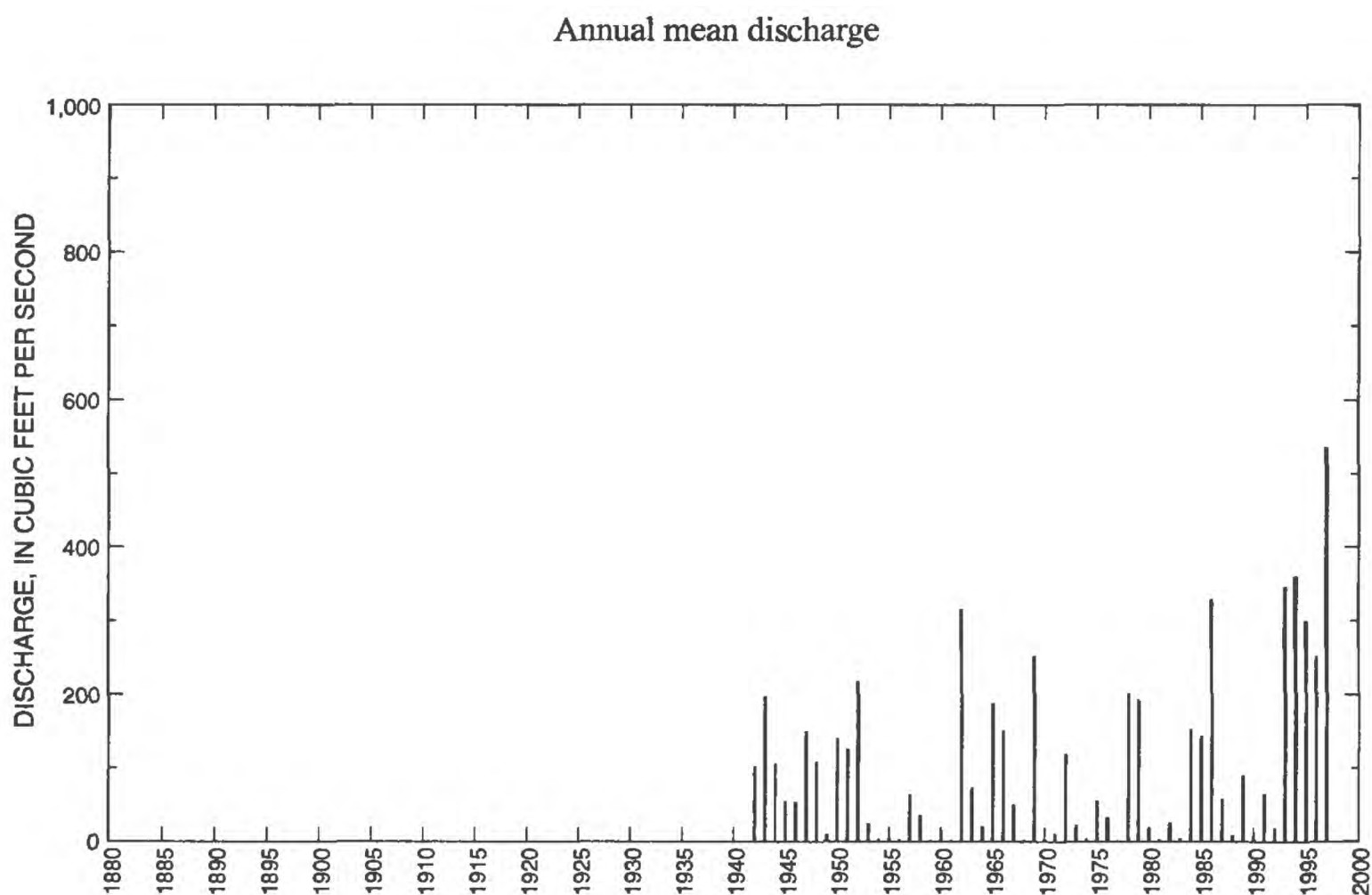
LOCATION.--Lat 45°51'45", long 96°34'25", in SW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.27, T.128 N., R.47 W., Roberts County, Hydrologic Unit 09020101, on Sisseton Indian Reservation, on left bank just downstream from Big Slough Outlet, 300 ft downstream from White Rock Dam, 4 mi south of White Rock, SD, and 5 mi northwest of Wheaton, MN.

DRAINAGE AREA.--1,160 mi<sup>2</sup>, approximately.

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

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

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,750 ft<sup>3</sup>/s, Apr. 20, 1997, gage height, 16.90 ft; no flow at times in most years.



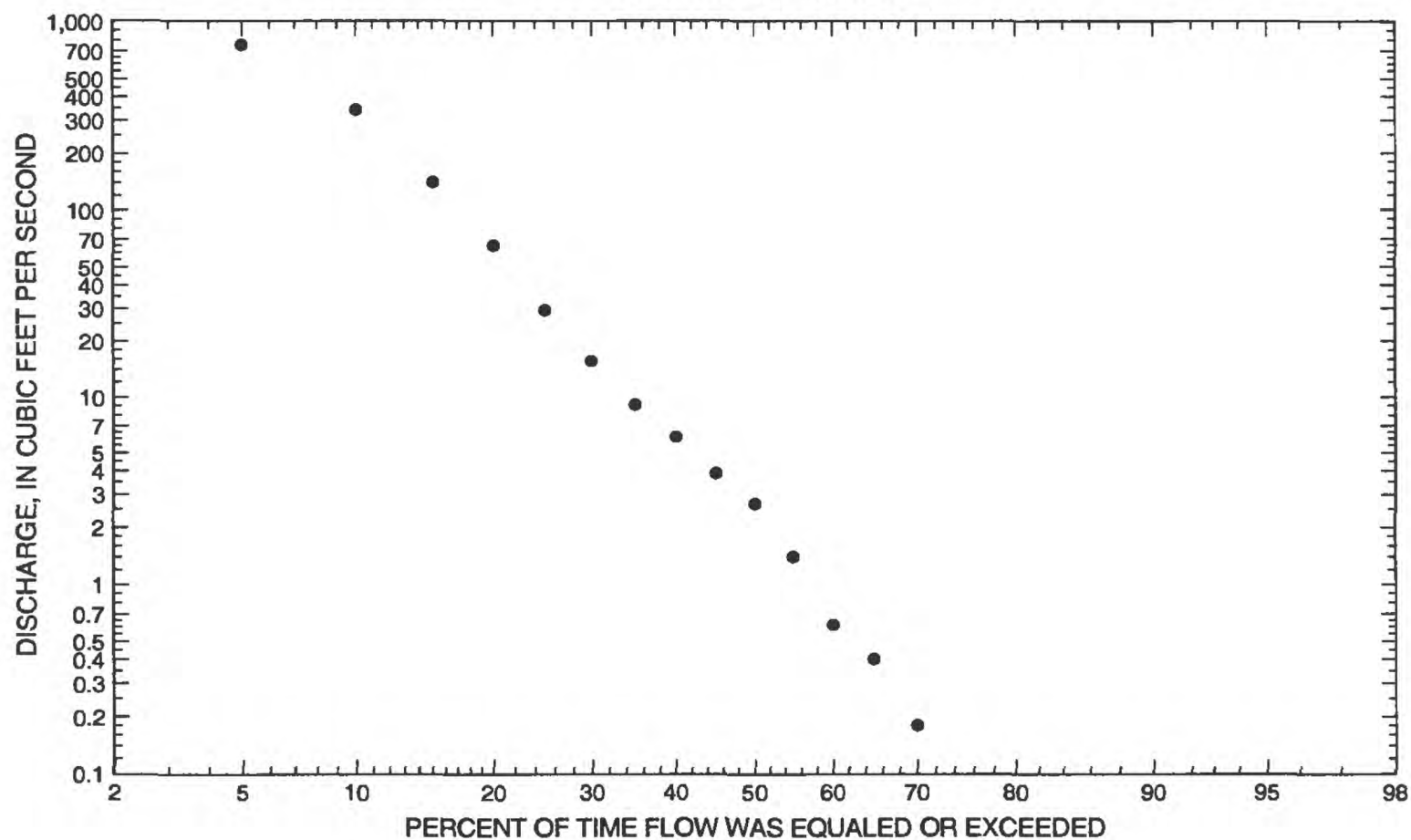
# 05050000 BOIS DE SIOUX RIVER NEAR WHITE ROCK, SD--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /a)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	535	1994	0	m	30.5	92.2	3.02	2.46
November	307	1996	0	m	16.9	54.4	3.23	1.36
December	57.5	1985	0	m	5.40	11.4	2.11	0.43
January	42.4	1997	0	m	3.45	8.30	2.41	0.28
February	148	1997	0	m	6.18	21.2	3.43	0.50
March	628	1996	0	m	48.0	105	2.19	3.86
April	3,810	1997	0	1942	310	577	1.86	25.0
May	1,440	1997	0.228	1977	307	414	1.35	24.7
June	1,100	1986	0.010	1977	249	305	1.23	20.0
July	1,040	1962	0	m	161	247	1.54	12.9
August	1,180	1993	0	m	71.2	219	3.08	5.73
September	1,060	1993	0	m	35.2	148	4.19	2.83
Annual	536	1997	0.377	1977	104	119	1.14	100

Annual flow duration





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

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	0.45	0.58	0	0	0	0	0	0	0	0
90	0	0	0	1.50	1.20	0.35	0	0	0	0	0	0	0
85	0	0	0	2.74	1.80	0.72	0.09	0	0	0	0	0	0
80	0	0	0	3.64	3.16	1.50	0.25	0	0	0	0	0	0
75	0	0	0	5.38	4.37	3.27	0.52	0.09	0.06	0.03	0	0	0
70	0	0	0.08	7.95	6.98	5.12	1.10	0.18	0.12	0.08	0.11	0	0.18
65	0	0	0.32	11.8	10.8	8.00	3.18	0.26	0.17	0.16	0.21	0	0.40
60	0	0	0.90	17.6	16.2	13.2	4.94	0.78	0.34	0.23	0.41	0	0.61
55	0	0	1.80	25.5	32.9	25.8	7.09	1.60	0.48	0.32	0.57	0.10	1.40
50	0	0	3.09	37.7	61.2	48.8	10.6	3.38	0.69	0.65	0.80	0.18	2.66
45	0	0	4.41	63.0	106	73.1	20.2	4.85	0.98	0.92	1.10	0.43	3.89
40	0.04	0	7.73	102	161	127	33.0	6.51	2.00	1.30	1.60	0.57	6.08
35	0.41	0.16	11.6	168	253	199	69.0	8.75	3.09	1.90	2.20	1.40	9.03
30	0.69	0.55	16.2	239	364	324	117	15.4	4.42	3.21	4.52	1.80	15.6
25	2.00	1.40	24.0	340	529	443	197	21.8	6.42	4.38	6.02	4.42	29.5
20	4.55	6.46	39.7	542	716	559	295	38.7	9.57	7.17	7.81	5.22	64.7
15	6.01	8.18	67.2	728	875	690	453	83.6	18.0	20.1	11.4	8.67	141
10	11.2	13.0	124	930	1,050	846	632	138	49.0	72.2	26.0	16.3	342
5	20.9	26.2	312	1,230	1,250	1,060	857	304	137	202	85.8	30.5	758

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

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	18.1	4.62	3.10	1.98	1.21
0.95	1.05	52.5	21.3	16.1	11.6	7.68
0.90	1.11	89.7	44.6	35.6	27.0	18.7
0.80	1.25	166	102	86.3	69.3	50.4
0.50	2	490	404	374	328	259
0.20	5	1,280	1,250	1,230	1,140	970
0.10	10	2,030	<sup>1</sup> 2,030	<sup>1</sup> 1,970	<sup>1</sup> 1,770	<sup>1</sup> 1,470
0.04	25	3,200	<sup>1</sup> 3,200	<sup>1</sup> 3,100	<sup>1</sup> 2,790	<sup>1</sup> 2,320
0.02	50	4,220	<sup>1</sup> 4,220	<sup>1</sup> 4,090	<sup>1</sup> 3,680	<sup>1</sup> 3,050
0.01	100	5,350	5,290	<sup>1</sup> 5,130	<sup>1</sup> 4,620	<sup>1</sup> 3,830
0.005	200	6,580	6,350	<sup>1</sup> 6,160	<sup>1</sup> 5,540	<sup>1</sup> 4,600
0.002	500	8,350	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1942	July 11	--	845	1970	October 14	4.68	102
1943	May 24	8.95	1,120	1971	June 26	5.93	188
1944	June 23	9.28	1,080	1972	April 10	9.39	776
1945	April 4	8.10	900	1973	March 27	7.00	381
1946	April 8	7.89	850	1974	May 1	4.22	54.0
1947	May 1	8.67	975	1975	July 16	8.95	552
1948	April 27	8.20	1,020	1976	March 21	8.60	522
1949	July 14	--	210	1977	March 13	5.52	27.0
1950	July 8	9.16	1,060	1978	April 19	11.59	929
1951	May 16	--	959	1979	May 4	10.15	1,030
1952	June 3	10.36	1,410	1980	June 14	6.19	169
1953	May 27	--	187	1981	July 19	4.16	27.0
1954	September 17	4.67	124	1982	April 16	8.25	414
1955	July 11	6.01	152	1983	November 29	6.63	150
1956	August 8	6.94	303	1984	April 14	11.00	978
1957	June 22	9.09	610	1985	March 31	9.19	860
1958	April 16	7.05	418	1986	May 7	12.12	1,820
1959	July 5	--	43.0	1987	October 9	7.71	530
1960	June 11	7.31	131	1988	April 12	5.84	180
1961	September 14	5.16	125	1989	April 14	10.72	693
1962	August 6	11.52	1,620	1990	March 13	4.85	89.0
1963	June 18	8.65	945	1991	July 7	11.14	685
1964	April 22	5.44	209	1992	August 1	7.17	139
1965	June 9	11.05	1,320	1993	August 4	11.52	1,300
1966	April 29	8.77	921	1994	April 8	11.88	1,550
1967	April 17	7.33	530	1995	April 5	11.85	1,690
1968	April 23	3.94	58.0	1996	May 18	10.07	1,230
1969	April <sup>1</sup>	15.07	3,770	1997	April 20	16.90	8,750
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 20	16.90	8,750	1984	April 14	11.00	978
1969	April <sup>1</sup>	15.07	3,770	1947	May 1	8.67	975
1986	May 7	12.12	1,820	1951	May 16	--	959
1995	April 5	11.85	1,690	1963	June 18	8.65	945
1962	August 6	11.52	1,620	1978	April 19	11.59	929
1994	April 8	11.88	1,550	1966	April 29	8.77	921
1952	June 3	10.36	1,410	1945	April 4	8.10	900
1965	June 9	11.05	1,320	1985	March 31	9.19	860
1993	August 4	11.52	1,300	1946	April 8	7.89	850
1996	May 18	10.07	1,230	1942	July 11	--	845
1943	May 24	8.95	1,120	1972	April 10	9.39	776
1944	June 23	9.28	1,080	1989	April 14	10.72	693
1950	July 8	9.16	1,060	1991	July 7	11.14	685
1979	May 4	10.15	1,030	1957	June 22	9.09	610
1948	April 27	8.20	1,020	1975	July 16	8.95	552

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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1967	April 17	7.33	530	1955	July 11	6.01	152
1986	October 9	7.71	530	1982	November 29	6.63	150
1976	March 21	8.60	522	1992	August 1	7.17	139
1958	April 16	7.05	418	1960	June 11	7.31	131
1982	April 16	8.25	414	1961	September 14	5.16	125
1973	March 27	7.00	381	1954	September 17	4.67	124
1956	August 8	6.94	303	1969	October 14	4.68	102
1949	July 14	--	210	1990	March 13	4.85	89.0
1964	April 22	5.44	209	1968	April 23	3.94	58.0
1971	June 26	5.93	188	1974	May 1	4.22	54.0
1953	May 27	--	187	1959	July 5	--	43.0
1988	April 12	5.84	180	1977	March 13	5.52	27.0
1980	June 14	6.19	169	1981	July 19	4.16	27.0

<sup>1</sup>Day of month unknown.



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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1942	0	0	0	0	0	0	0	2.52	147.9	623.3	197.7	243.8	102.1
1943	45.7	0.150	0	0	0	5.97	325.3	935.3	680.7	324.3	35.9	6.85	197.7
1944	7.56	11.0	1.38	0	0	3.66	157.0	252.8	598.1	225.0	15.8	4.80	106.1
1945	2.82	1.26	0.097	0	0	15.9	375.2	41.4	214.0	5.87	3.21	1.15	54.5
1946	3.11	1.13	0.274	0	0	28.1	530.5	24.7	13.1	38.7	4.17	2.32	53.4
1947	3.12	10.5	4.44	1.70	0.811	6.16	271.5	592.1	433.4	453.5	9.04	5.98	150.2
1948	6.76	8.36	1.84	0.006	0	36.9	358.7	750.2	84.5	15.4	18.2	15.0	108.5
1949	0.623	0.700	0.219	0	0	19.7	8.26	2.02	2.84	64.9	4.53	1.51	8.91
1950	1.15	1.41	0.016	0	0	4.60	23.1	17.8	575.1	713.0	327.8	19.4	141.3
1951	4.87	20.5	20.0	6.38	1.02	3.88	185.9	820.4	330.7	69.6	29.5	4.94	125.7
1952	4.49	13.0	22.9	20.5	12.7	55.0	259.9	1,002	944.3	260.3	7.52	0.357	217.1
1953	0.426	0.477	0.068	0	0	28.9	9.86	74.0	57.9	60.2	33.4	15.6	23.6
1954	1.85	1.19	0	0	0	2.89	5.56	4.66	6.75	2.00	1.33	2.36	2.38
1955	1.31	0.847	0.084	0	0	4.12	5.91	1.66	2.81	18.1	3.69	0.720	3.30
1956	0.406	0.040	0	0	0	0.013	13.1	3.29	1.35	0.310	5.85	0.283	2.05
1957	0.161	0.697	0.129	0	0	1.20	24.3	235.1	324.4	134.4	14.8	24.8	63.5
1958	33.8	39.0	4.32	13.6	10.8	41.9	223.0	41.5	7.74	6.51	0.206	0.790	35.1
1959	0.123	0	0	0	0	1.50	0.603	1.45	4.36	3.75	0.087	0.003	0.994
1960	0.016	0	0	0	0	1.87	19.1	72.8	68.5	19.6	0.132	0	15.2
1961	0.042	0	0	0	0	1.40	5.37	6.38	.837	0	0.045	1.86	1.33
1962	0	0	0	0	0	0.142	127.5	412.5	788.3	1,035	1,130	259.9	315.5
1963	45.7	7.69	5.48	3.52	8.16	17.6	104.5	42.3	558.4	75.3	8.38	3.73	72.9
1964	1.46	1.15	0.761	0.455	0.217	0.252	107.9	95.1	20.9	5.73	0.397	1.30	19.6
1965	1.17	0.977	0.468	0	0	0	427.2	433.3	1,088	308.6	9.30	5.26	188.9
1966	59.8	84.2	28.9	20.1	53.0	58.8	332.0	729.2	431.0	8.30	6.64	1.15	151.2
1967	23.8	4.02	0	0	0	13.7	223.8	104.8	26.2	199.9	0.765	0.447	50.0
1968	0.342	0.030	0	0	0	0.016	7.61	7.59	3.55	0.694	0.058	0.043	1.66
1969	0.452	0.760	0.403	0.058	0	0	1,322	1,310	374.2	20.6	0.232	0	252.6
1970	1.82	0.310	0	0	0	1.56	14.4	4.30	5.27	0.039	0	0	2.30
1971	0	0.147	0.087	0	0	2.40	4.80	4.80	69.3	23.6	4.40	5.42	9.55
1972	0.448	2.50	1.74	1.58	0.266	100.0	630.9	250.6	303.8	25.5	105.5	18.1	119.4
1973	0.064	0.597	0.678	4.02	8.15	139.2	77.8	17.7	9.37	0.039	0.279	0.047	21.6
1974	0.016	0.001	0	0	0	8.86	8.11	9.56	3.77	0.123	0.349	0.150	2.59
1975	0.015	0.001	0	0	0	0	26.5	183.7	87.1	315.6	12.0	23.4	54.7
1976	1.49	0.256	0.078	0	21.5	221.2	133.8	4.21	0.018	0	0	0.227	31.9

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1977	0	0	0	0	0	2.89	1.24	0.228	0.010	0.016	0.009	0.087	0.377
1978	0.212	1.02	0.011	0	0	3.88	623.4	718.8	520.0	415.6	108.2	18.4	201.5
1979	3.34	1.93	1.92	0.640	0.004	0.920	228.2	937.9	695.5	325.9	103.2	8.08	193.4
1980	7.20	7.28	9.09	9.35	11.9	40.7	23.3	25.5	62.2	12.8	1.83	1.47	17.7
1981	1.24	0.327	0.110	0	0.166	0.389	1.99	1.46	10.3	8.08	0.096	0.001	2.01
1982	0	0	0	0	0	3.89	200.5	99.5	3.57	5.43	0.188	0.024	26.0
1983	0.210	5.64	23.2	2.03	0	2.61	2.54	1.93	0.357	0.070	0	0	3.25
1984	0	0.002	0	0	1.94	6.19	716.9	311.8	426.2	281.2	103.8	0.718	153.5
1985	101.3	258.0	57.5	0.200	0.199	227.2	340.0	205.1	420.9	79.7	18.6	19.4	143.9
1986	8.43	5.17	3.66	4.54	6.84	55.3	720.6	1,092	1,103	722.8	151.1	61.9	329.0
1987	362.5	85.5	44.6	36.0	24.5	32.4	64.1	28.2	2.54	1.22	0.271	0.105	57.3
1988	22.4	8.57	4.57	0.310	0.009	9.70	41.7	4.82	0.452	0	0.005	0	7.70
1989	0.053	0.118	0	0	0	1.34	414.1	491.3	89.7	5.13	6.69	71.6	90.2
1990	10.1	11.5	6.57	0	0	21.9	6.98	11.0	8.24	2.12	0.075	1.06	6.68
1991	1.63	1.65	0.594	0.414	0.476	5.11	10.4	14.5	108.3	505.4	71.8	38.4	64.0
1992	58.5	0.830	0.781	0.650	1.38	8.93	10.4	2.93	6.64	22.4	92.4	0.239	17.4
1993	0.080	3.80	4.68	4.82	4.19	75.5	602.7	244.4	240.4	711.4	1,182	1,062	346.0
1994	534.6	20.9	6.57	6.61	7.25	199.0	1,088	1,105	489.7	689.0	139.5	7.22	360.2
1995	70.0	6.94	5.55	4.62	5.74	208.5	1,277	1,236	667.3	100.6	6.52	7.64	300.0
1996	271.8	307.3	25.3	8.67	16.3	628.4	841.6	723.2	187.4	5.81	4.17	0.475	252.1
1997	1.91	4.90	13.2	42.4	148.3	326.0	3,814	1,445	611.9	53.1	5.51	0.996	535.9

## 05050700 RABBIT RIVER NEAR NASHUA, MN

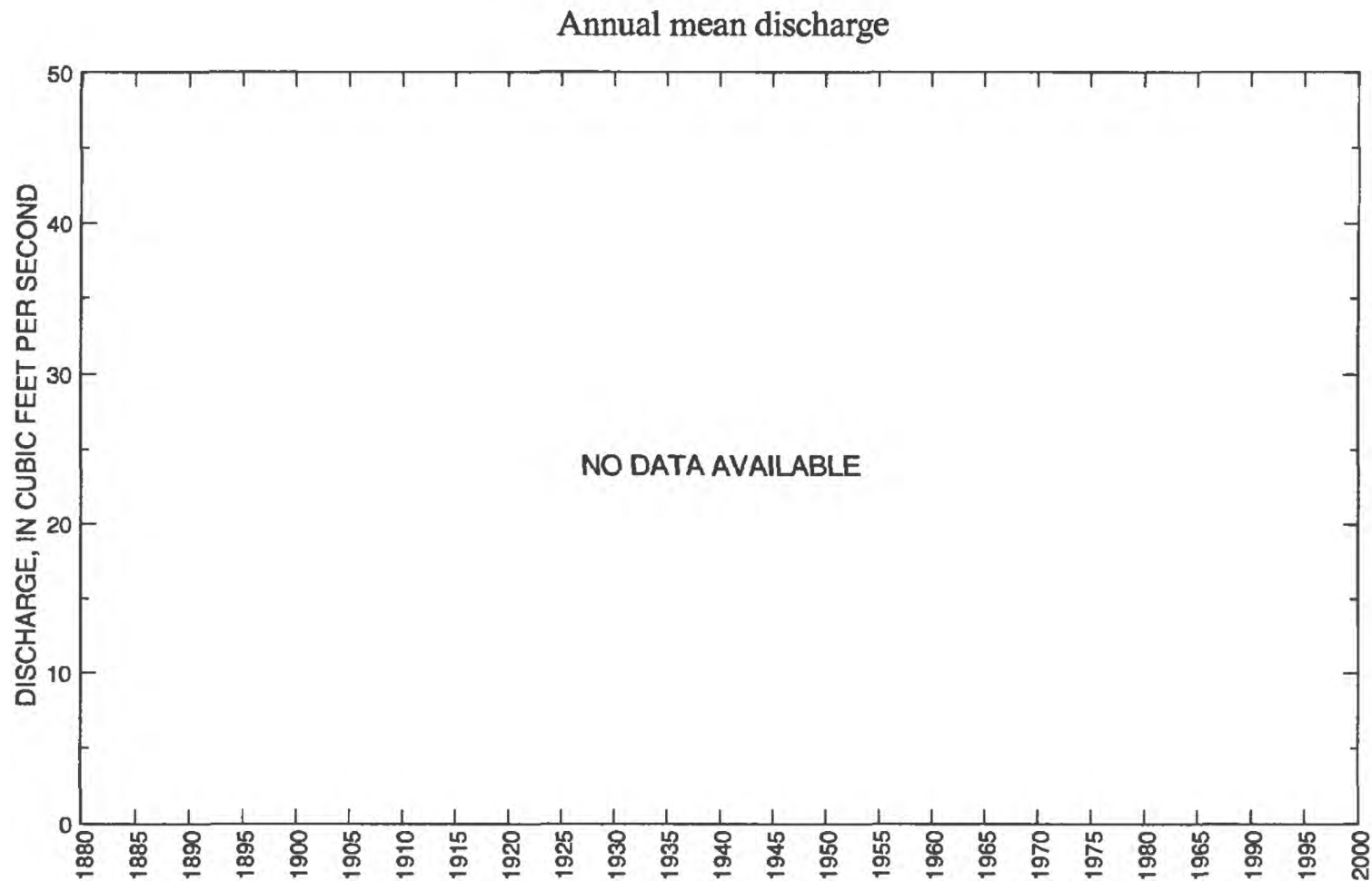
LOCATION.--Lat 46°04'30", long 96°18'24", in SE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec.15, T.130 N., R.45 W., Wilkin County, Hydrologic Unit 09020101, at bridge on County Road 19, 2.6 mi north of Nashua, and 4.8 mi upstream from mouth of South Fork Rabbit River.

DRAINAGE AREA.--99.2 mi<sup>2</sup>.

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

GAGE.--Crest-stage gage.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,640 ft<sup>3</sup>/s, Apr. 5, 1997, gage height, 15.76 ft, backwater from ice; maximum gage height, 19.56 ft, Apr. 10, 1997, backwater from ice.



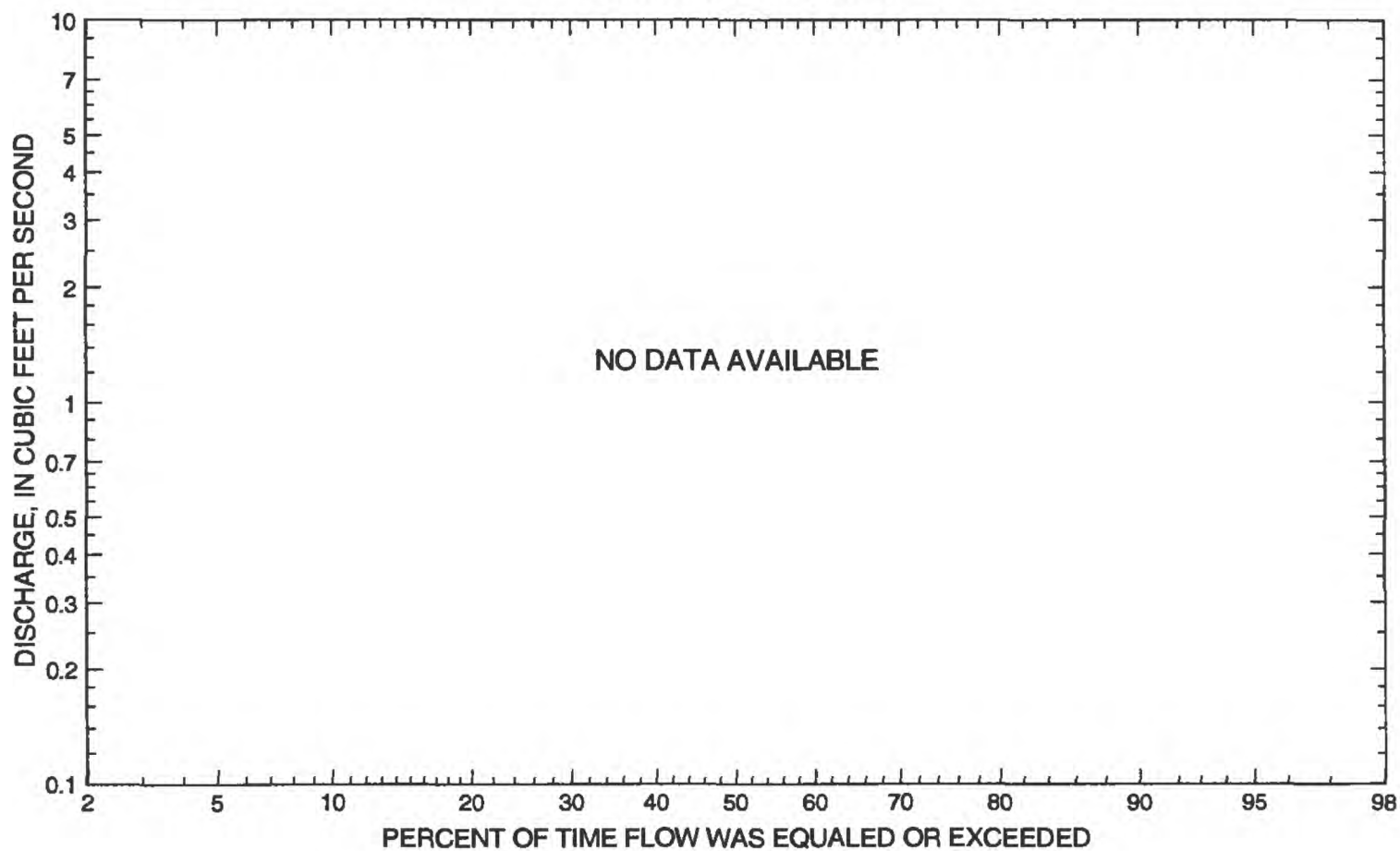
## 05050700 RABBIT RIVER NEAR NASHUA, MN--Continued

Statistics of monthly and annual mean discharges

[--, no data]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /e)			
October	--	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
August	--	--	--	--	--	--	--	--
September	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--

Annual flow duration





# 05050700 RABBIT RIVER NEAR NASHUA, MN--Continued

Monthly and annual flow duration, in cubic feet per second

[--, no data]

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	--	--	--	--	--	--	--	--	--	--	--	--	--
90	--	--	--	--	--	--	--	--	--	--	--	--	--
85	--	--	--	--	--	--	--	--	--	--	--	--	--
80	--	--	--	--	--	--	--	--	--	--	--	--	--
75	--	--	--	--	--	--	--	--	--	--	--	--	--
70	--	--	--	--	--	--	--	--	--	--	--	--	--
65	--	--	--	--	--	--	--	--	--	--	--	--	--
60	--	--	--	--	--	--	--	--	--	--	--	--	--
55	--	--	--	--	--	--	--	--	--	--	--	--	--
50	--	--	--	--	--	--	--	--	--	--	--	--	--
45	--	--	--	--	--	--	--	--	--	--	--	--	--
40	--	--	--	--	--	--	--	--	--	--	--	--	--
35	--	--	--	--	--	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--	--	--	--

# 05050700 RABBIT RIVER NEAR NASHUA, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given; --, no data]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	--	--	--	--
0.95	1.05	ng	--	--	--	--
0.90	1.11	153	--	--	--	--
0.80	1.25	244	--	--	--	--
0.50	2	536	--	--	--	--
0.20	5	1,030	--	--	--	--
0.10	10	1,370	--	--	--	--
0.04	25	1,800	--	--	--	--
0.02	50	2,110	--	--	--	--
0.01	100	2,400	--	--	--	--
0.005	200	2,680	--	--	--	--
0.002	500	3,030	--	--	--	--

## 05050700 RABBIT RIVER NEAR NASHUA, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1979	April 12	13.43	838	1989	March 27	15.08	760
1980	June 5	10.47	214	1990	March 13	--	5.00
1981	June 13	10.77	273	1991	September 8	14.86	765
1982	March 30	13.06	325	1992	June 17	10.10	79.0
1983	April 10	11.98	430	1993	March 30	14.06	720
1984	June 8	14.06	910	1994	March 23	15.37	1,020
1985	May 9	13.34	960	1995	March 14	13.70	765
1986	September 21	14.27	1,280	1996	April 11	14.01	560
1987	March 7	11.59	380	1997	April 5	15.76	1,640
1988	March <sup>1</sup>	11.23	120				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 5	15.76	1,640	1996	April 11	14.01	560
1986	September 21	14.27	1,280	1983	April 10	11.98	430
1994	March 23	15.37	1,020	1987	March 7	11.59	380
1985	May 9	13.34	960	1982	March 30	13.06	325
1984	June 8	14.06	910	1981	June 13	10.77	273
1979	April 12	13.43	838	1980	June 5	10.47	214
1995	March 14	13.70	765	1988	March <sup>1</sup>	11.23	120
1991	September 8	14.86	765	1992	June 17	10.10	79.0
1989	March 27	15.08	760	1990	March 13	--	5.00
1993	March 30	14.06	720				

<sup>1</sup>Day of month unknown.

05050700 RABBIT RIVER NEAR NASHUA, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[--, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
--	--	--	--	--	--	--	--	--	--	--	--	--	--



## 05051500 RED RIVER OF THE NORTH AT WAHPETON, ND

**LOCATION.**--Lat 46°15'55", long 96°35'40", in NE  $\frac{1}{4}$  sec.8, T.132 N., R.47 W., Richland County, Hydrologic Unit 09020104, on left bank in Wahpeton, 800 ft downstream from confluence of Bois de Sioux and Otter Tail Rivers, and at mile 548.6.

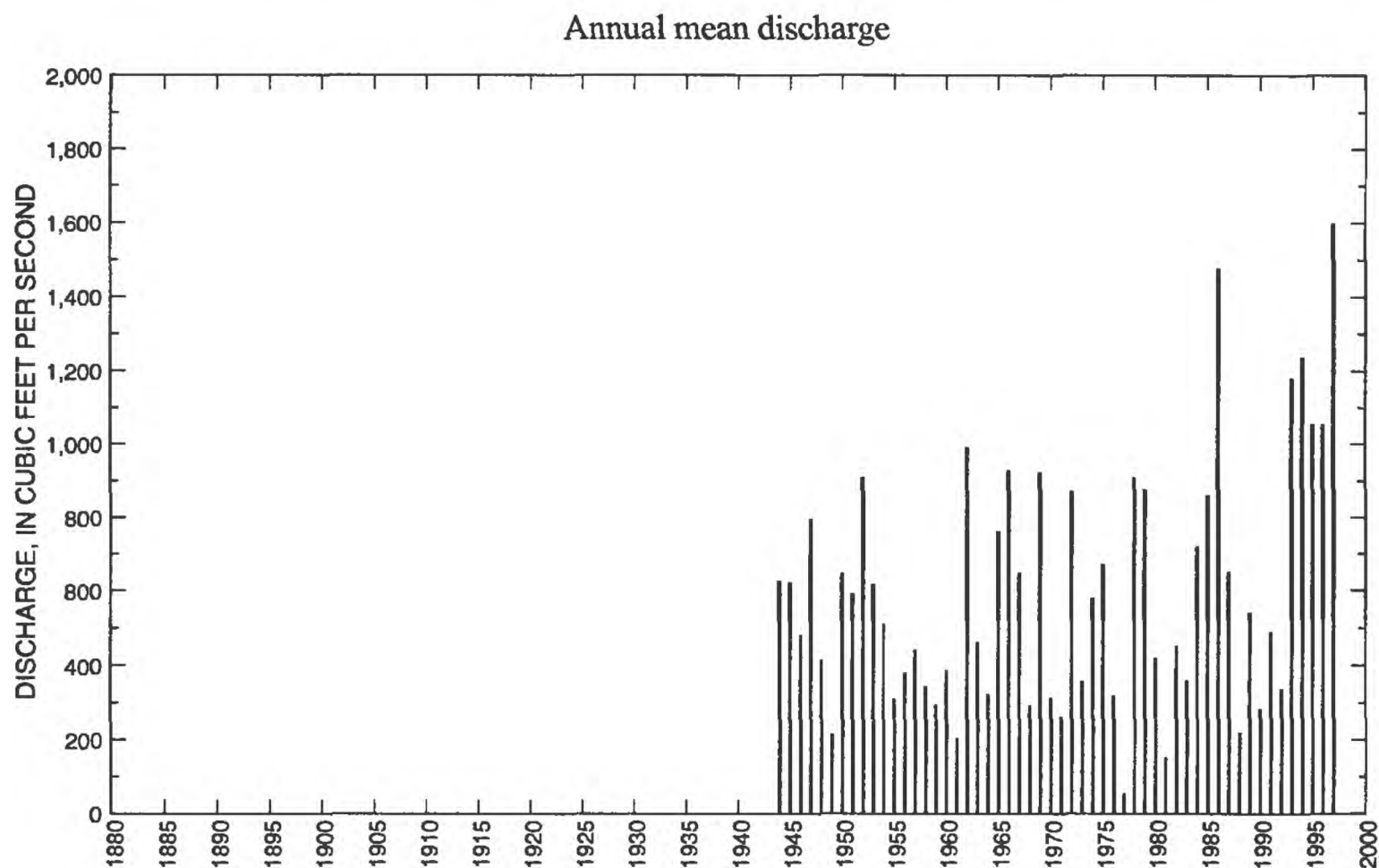
**DRAINAGE AREA.**--4,010 mi<sup>2</sup>, approximately.

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

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

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 12,800 ft<sup>3</sup>/s, Apr. 15, 1997, gage height, 16.34 ft; maximum gage height, 19.42 ft, Apr. 6, 1997, backwater from ice (from floodmark); minimum daily discharge, 1.7 ft<sup>3</sup>/s, Aug. 28 to Sept. 5, 1976, and Sept. 9-10, 1976, gage height 0.63 feet, Aug. 29, 1976.

**EXTREMES OUTSIDE PERIOD OF RECORD.**--A stage of 17.0 ft, discharge, 10,500 ft<sup>3</sup>/s, occurred in the spring of 1897.



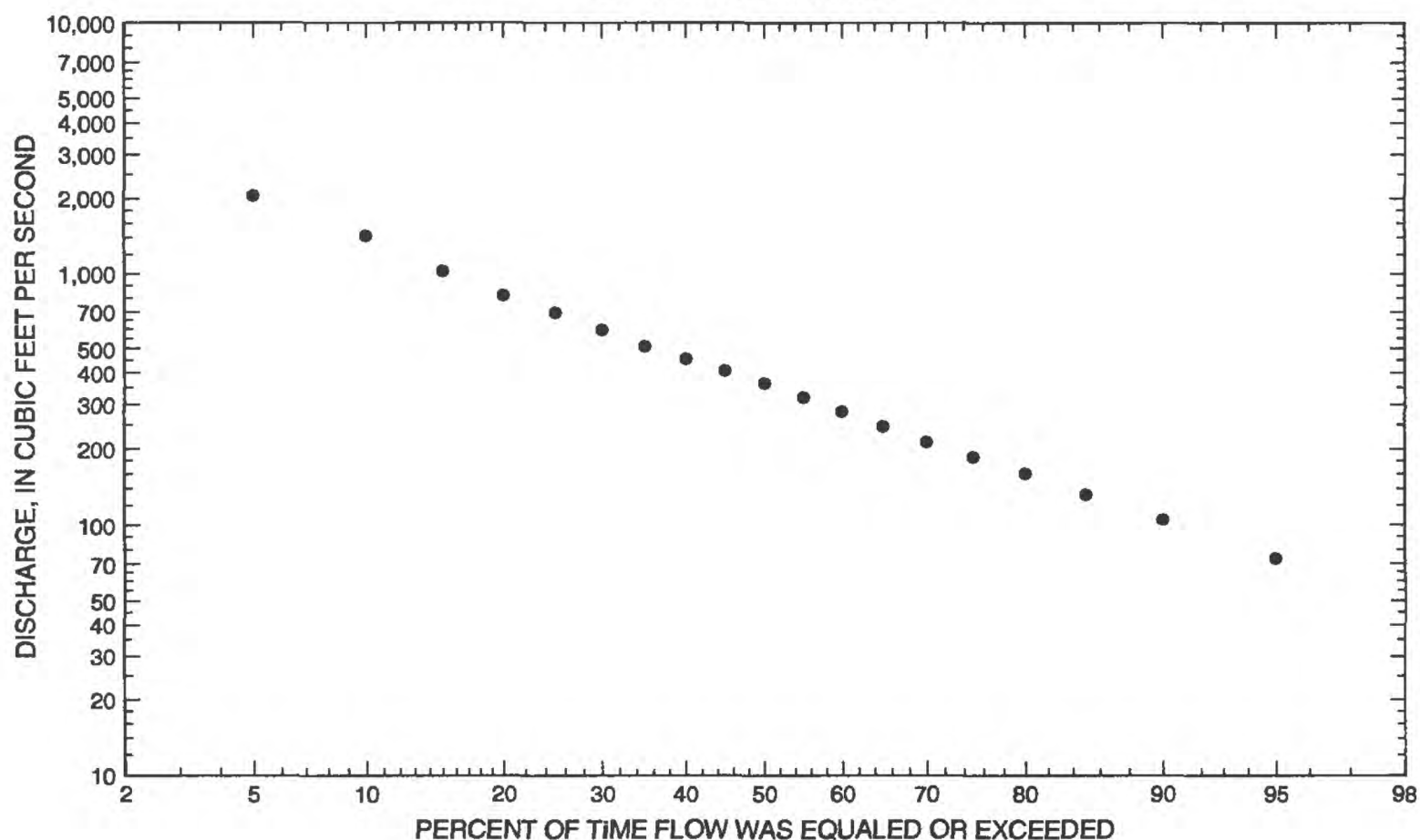
# 05051500 RED RIVER OF THE NORTH AT WAHPETON, ND--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentaga of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	1,600	1994	5.72	1977	329	286	0.87	4.52	
November	952	1987	7.40	1977	307	220	0.72	4.23	
December	820	1987	6.60	1977	276	180	0.65	3.80	
January	678	1986	8.81	1977	269	160	0.60	3.70	
February	721	1997	18.0	1977	284	164	0.58	3.91	
March	2,630	1995	84.3	1977	670	525	0.78	9.23	
April	8,720	1997	138	1977	1,420	1,400	0.98	19.6	
May	3,340	1997	22.5	1977	1,110	763	0.68	15.4	
June	2,680	1962	90.0	1977	1,060	659	0.62	14.5	
July	2,790	1993	65.6	1977	780	595	0.76	10.7	
August	2,500	1993	53.5	m	422	424	1.00	5.82	
September	2,150	1993	2.18	1976	334	357	1.07	4.59	
Annual	1,600	1997	54.0	1977	601	336	0.56	100	

## Annual flow duration



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

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	74.6	88.2	140	244	204	169	101	59.1	36.2	65.1	64.1	55.7	73.4
90	90.3	104	177	339	302	222	172	83.8	57.0	80.4	90.7	80.6	105
85	104	124	206	401	373	294	221	106	77.4	98.3	108	106	133
80	127	138	233	451	435	386	262	139	98.5	116	125	122	160
75	145	152	250	494	505	464	324	168	120	134	137	136	187
70	157	172	268	547	592	533	372	196	140	152	148	154	214
65	171	190	300	612	690	629	411	221	163	173	169	170	247
60	188	206	334	681	754	723	462	245	184	195	193	186	280
55	208	221	370	753	818	815	521	278	202	218	216	202	321
50	227	240	409	832	896	899	588	319	224	251	244	218	363
45	247	263	450	939	977	982	658	346	262	290	276	241	408
40	270	290	489	1,080	1,080	1,100	725	373	298	316	304	277	455
35	308	323	528	1,260	1,190	1,240	819	400	334	341	333	325	509
30	350	346	593	1,470	1,370	1,390	930	456	376	378	367	366	594
25	384	374	690	1,700	1,570	1,540	1,040	516	421	415	402	401	696
20	414	420	819	1,940	1,780	1,680	1,170	597	476	465	458	434	820
15	458	463	988	2,320	2,000	1,830	1,400	696	536	525	536	466	1,030
10	514	532	1,380	2,980	2,250	2,080	1,630	823	647	670	650	523	1,420
5	593	632	2,340	4,690	2,630	2,440	2,160	1,100	885	905	809	664	2,060

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

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s) <sup>1</sup>	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	230	<sup>2</sup> 225	<sup>2</sup> 220	<sup>2</sup> 205	192
0.95	1.05	460	<sup>2</sup> 450	<sup>2</sup> 440	426	364
0.90	1.11	670	<sup>2</sup> 650	<sup>2</sup> 630	584	503
0.80	1.25	1,030	<sup>2</sup> 990	<sup>2</sup> 940	848	734
0.50	2	2,250	<sup>2</sup> 2,210	2,090	1,690	1,440
0.20	5	4,450	<sup>2</sup> 4,350	4,110	3,260	2,680
0.10	10	6,200	<sup>2</sup> 6,100	5,760	4,530	3,620
0.04	25	8,050	<sup>2</sup> 7,900	<sup>2</sup> 7,510	6,380	4,910
0.02	50	9,900	<sup>2</sup> 9,750	<sup>2</sup> 9,250	7,930	5,930
0.01	100	11,900	<sup>2</sup> 11,700	<sup>2</sup> 11,200	9,600	6,980
0.005	200	14,200	<sup>2</sup> 14,000	<sup>2</sup> 13,400	11,400	8,060
0.002	500	18,000	ng	ng	ng	ng

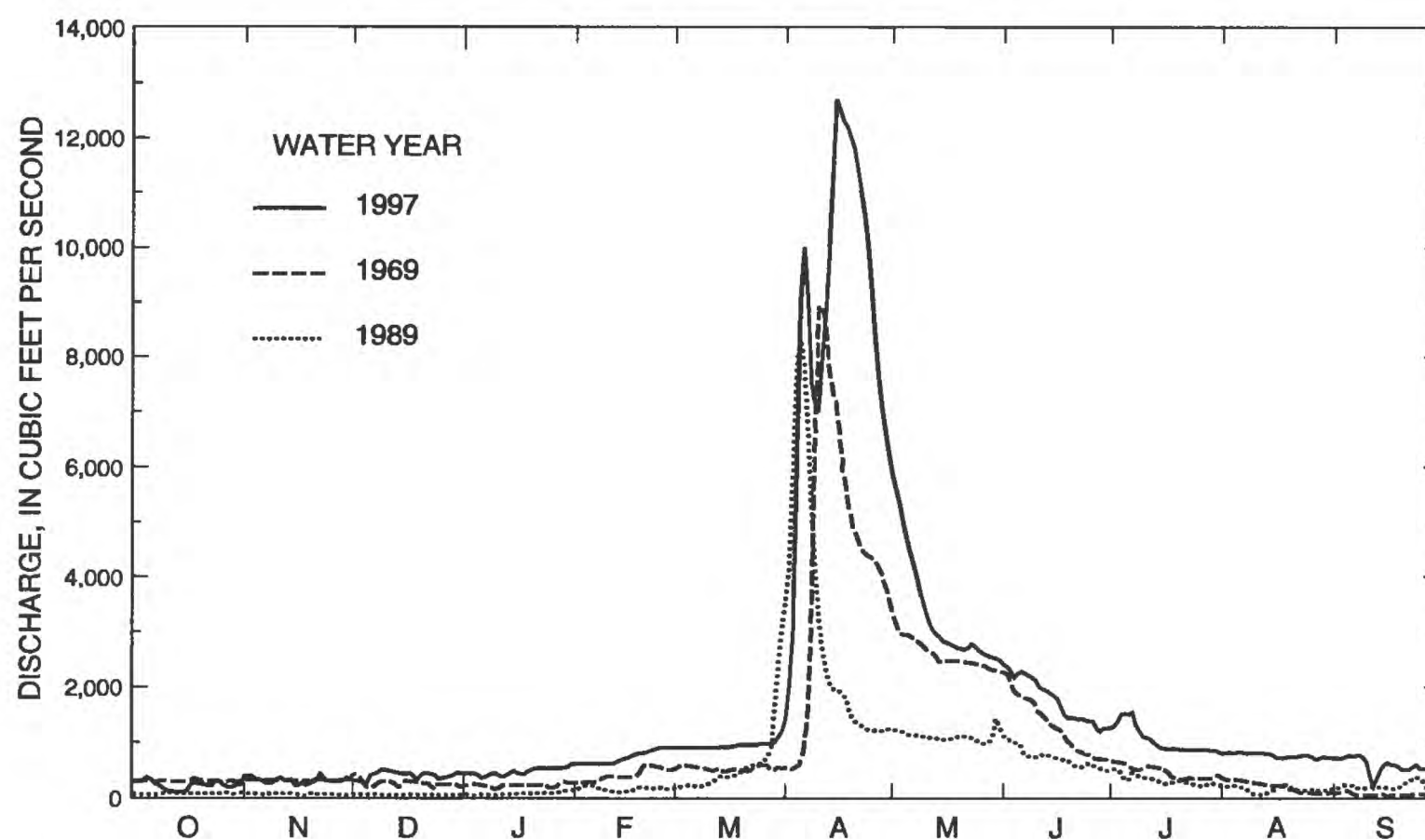
<sup>1</sup>From U.S. Army Corps of Engineers, May 2000.

<sup>2</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

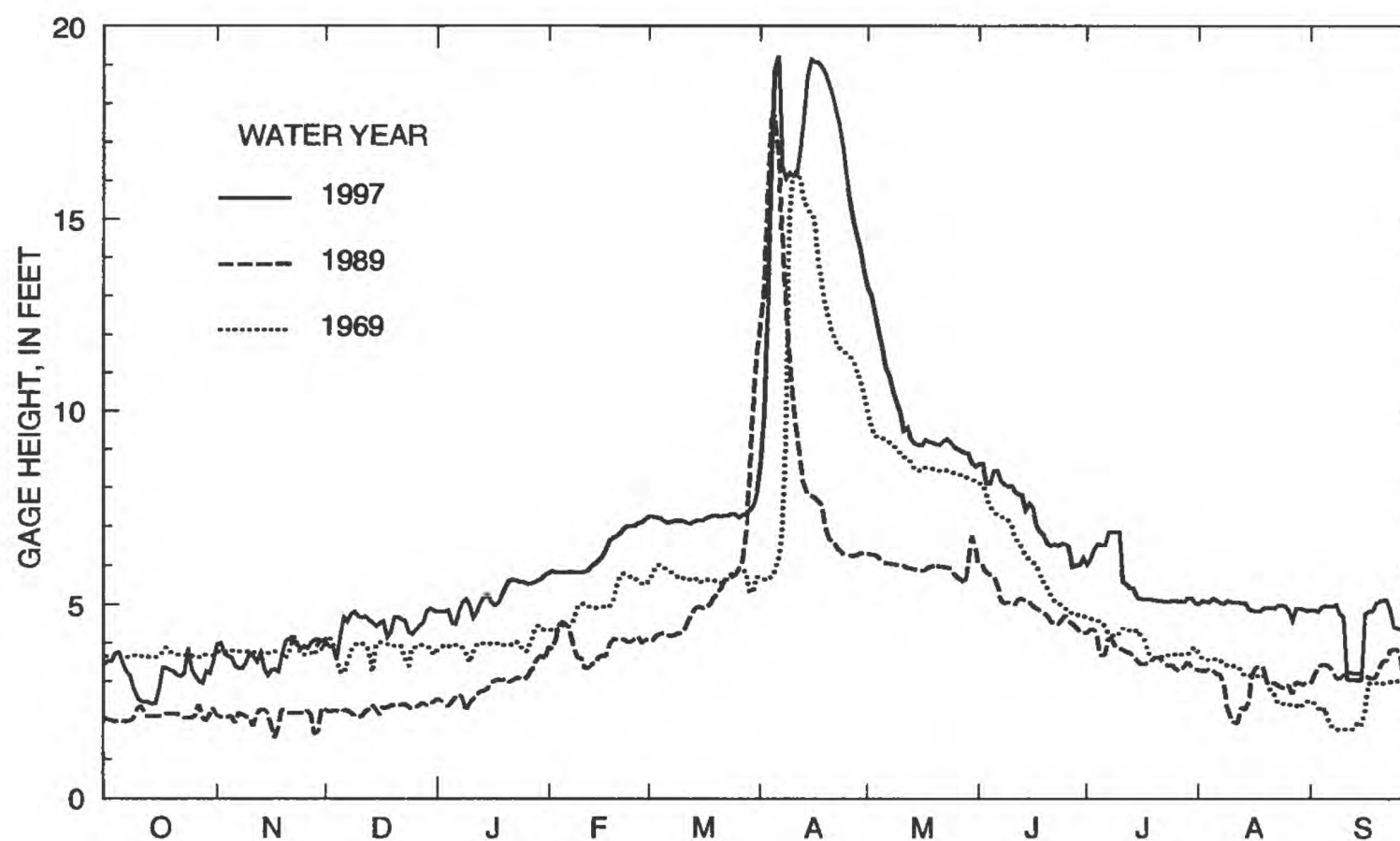


# 05051500 RED RIVER OF THE NORTH AT WAHPETON, ND--Continued

Highest daily mean discharge for period of record



Highest daily mean gage height for period of record



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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1942	June 7	10.49	3,280	1970	April 8	6.93	1,450
1943	April 2	14.75	5,000	1971	March 18	6.74	927
1944	June 6	12.11	4,360	1972	March 19	11.67	3,380
1945	March 17	11.44	3,910	1973	March 15	6.08	1,220
1946	March 22	9.74	3,110	1974	May 24	6.14	1,250
1947	April 12	11.90	4,610	1975	July 3	10.84	3,850
1948	April 6	8.58	2,300	1976	March 26	9.00	2,700
1949	July 10	9.24	2,290	1977	June 25	4.49	526
1950	April 2	11.62	4,190	1978	March 31	14.04	6,250
1951	April 7	14.01	6,090	1979	April 14	15.44	7,050
1952	April 12	14.99	7,130	1980	April 1	10.71	3,100
1953	June 21	9.87	3,150	1981	August 2	4.54	512
1954	June 9	7.59	1,860	1982	April 1	12.26	3,120
1955	April 2	6.99	1,150	1983	March 13	5.70	880
1956	April 14	7.88	1,980	1984	March 28	13.43	4,710
1957	April 22	8.82	2,290	1985	June 1	10.71	3,690
1958	April 15	5.59	866	1986	March 30	14.31	6,140
1959	May 27	6.17	1,050	1987	October 1	7.46	1,770
1960	April 7	8.89	2,370	1988	March 27	5.58	911
1961	June 8	4.72	548	1989	April 5	17.95	8,370
1962	June 11	13.98	5,650	1990	March 18	5.72	900
1963	June 11	11.38	3,830	1991	July 3	9.52	2,980
1964	May 6	7.39	1,700	1992	March 8	8.46	2,000
1965	April 11	14.34	5,690	1993	March 31	14.33	6,080
1966	March 18	12.91	4,760	1994	March 23	13.59	5,000
1967	June 15	8.81	2,500	1995	March 17	14.88	6,370
1968	May 18	4.95	708	1996	May 19	--	5,400
1969	April 10	16.34	9,200	1997	April 15	--	12,800
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 15	--	12,800	1966	March 18	12.91	4,760
1969	April 10	16.34	9,200	1984	March 28	13.43	4,710
1989	April 5	17.95	8,370	1947	April 12	11.90	4,610
1952	April 12	14.99	7,130	1944	June 6	12.11	4,360
1979	April 14	15.44	7,050	1950	April 2	11.62	4,190
1995	March 17	14.88	6,370	1945	March 17	11.44	3,910
1978	March 31	14.04	6,250	1975	July 3	10.84	3,850
1986	March 30	14.31	6,140	1963	June 11	11.38	3,830
1951	April 7	14.01	6,090	1985	June 1	10.71	3,690
1993	March 31	14.33	6,080	1972	March 19	11.67	3,380
1965	April 11	14.34	5,690	1942	June 7	10.49	3,280
1962	June 11	13.98	5,650	1953	June 21	9.87	3,150
1996	May 19	--	5,400	1982	April 1	12.26	3,120
1943	April 2	14.75	5,000	1946	March 22	9.74	3,110
1994	March 23	13.59	5,000	1980	April 1	10.71	3,100

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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1991	July 3	9.52	2,980	1974	May 24	6.14	1,250
1976	March 26	9.00	2,700	1973	March 15	6.08	1,220
1967	June 15	8.81	2,500	1955	April 2	6.99	1,150
1960	April 7	8.89	2,370	1959	May 27	6.17	1,050
1948	April 6	8.58	2,300	1971	March 18	6.74	927
1949	July 10	9.24	2,290	1988	March 27	5.58	911
1957	April 22	8.82	2,290	1990	March 18	5.72	900
1992	March 8	8.46	2,000	1983	March 13	5.70	880
1956	April 14	7.88	1,980	1958	April 15	5.59	866
1954	June 9	7.59	1,860	1968	May 18	4.95	708
1987	October 1	7.46	1,770	1961	June 8	4.72	548
1964	May 6	7.39	1,700	1977	June 25	4.49	526
1970	April 8	6.93	1,450	1981	August 2	4.54	512

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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1942	--	--	--	--	--	--	--	1,021	1,278	934.2	391.8	476.3	--
1943	391.9	--	--	--	--	412.3	2,152	1,669	1,818	1,069	562.4	402.8	--
1944	415.3	330.8	281.6	196.5	152.4	195.2	641.2	960.6	1,957	1,380	418.8	614.7	628.4
1945	753.6	698.3	510.2	405.3	375.7	1,250	1,133	837.5	916.3	305.0	146.2	140.7	623.6
1946	224.4	260.1	221.5	189.7	127.5	823.1	1,114	604.5	362.5	716.1	607.9	501.3	481.4
1947	597.2	583.3	482.6	413.2	345.0	486.5	2,021	1,627	1,487	1,083	231.7	207.0	797.7
1948	196.3	205.1	186.5	148.7	115.2	256.1	1,279	1,403	545.3	255.5	217.1	179.2	415.7
1949	130.8	117.7	54.8	69.8	85.7	242.3	406.4	217.9	224.7	727.7	198.2	92.1	215.1
1950	97.8	99.3	95.0	87.9	132.4	446.5	1,340	1,572	1,458	1,526	675.5	211.6	648.0
1951	146.2	124.3	126.1	155.2	147.9	241.6	2,208	1,615	1,063	592.8	370.9	331.6	593.5
1952	354.7	384.9	501.3	524.5	535.2	468.4	3,161	1,876	1,554	746.2	409.4	443.5	910.3
1953	351.6	235.8	189.2	166.5	192.7	549.6	542.9	756.0	1,669	1,347	856.3	564.9	620.5
1954	387.9	462.9	453.7	376.8	350.2	561.9	677.0	851.7	1,041	540.6	200.6	234.8	511.9
1955	124.3	137.5	198.7	245.5	186.4	266.5	543.1	330.2	305.9	509.7	445.4	448.1	312.3
1956	376.2	305.3	183.9	247.7	215.5	259.7	847.3	812.0	699.4	240.8	272.8	118.7	381.3
1957	70.8	49.7	65.7	106.0	113.9	448.2	672.1	930.9	1,067	790.5	521.6	461.6	442.9
1958	375.1	460.9	385.5	316.5	285.4	484.5	656.1	259.7	141.5	362.7	227.7	179.4	344.9
1959	142.7	160.0	172.6	259.7	245.0	315.5	370.1	425.8	564.0	514.3	213.8	162.2	295.7
1960	152.6	147.0	201.6	233.5	249.0	343.5	901.6	869.1	796.9	466.6	180.8	111.6	387.5
1961	98.8	124.8	150.3	155.6	180.5	300.0	290.8	389.0	425.7	190.1	78.9	79.0	205.2
1962	108.1	102.9	75.0	84.3	102.4	251.3	1,028	1,929	2,675	2,756	1,983	746.4	992.4
1963	434.0	360.7	326.5	312.3	232.9	397.6	607.5	509.4	1,591	480.9	157.1	159.2	463.6
1964	220.8	178.8	147.9	151.0	161.5	182.4	776.5	978.9	600.3	292.2	79.5	125.1	324.4
1965	224.4	213.7	236.0	197.9	184.3	226.0	1,789	1,490	2,526	1,230	415.0	422.3	762.4
1966	724.2	545.7	510.0	500.0	443.9	1,651	1,492	2,076	1,671	628.5	522.7	350.4	929.3
1967	448.9	457.4	403.9	391.1	363.4	659.5	1,388	1,239	1,182	882.5	227.2	114.6	647.3
1968	192.8	176.3	177.9	137.3	141.7	308.9	414.8	570.6	584.1	428.1	227.0	161.4	293.8
1969	295.4	311.5	257.9	219.5	402.1	526.1	4,436	2,606	1,317	470.7	204.8	64.4	923.6
1970	109.2	128.4	135.6	158.2	179.2	254.4	629.1	755.9	815.9	459.8	112.1	26.4	313.8
1971	89.6	170.2	147.5	130.6	132.8	424.4	547.2	368.5	342.3	465.9	165.8	167.9	263.3
1972	239.2	491.5	641.1	595.7	475.0	1,295	1,734	1,541	1,547	833.5	624.0	451.3	872.5
1973	436.2	361.8	390.7	351.7	359.5	791.4	547.8	370.4	301.4	151.2	121.9	114.3	358.5
1974	372.3	528.9	494.0	445.5	492.3	549.0	679.6	1,004	1,115	696.3	349.3	247.4	581.2
1975	282.4	275.0	177.8	187.8	249.8	341.8	1,258	1,231	1,283	1,787	585.3	363.0	670.6
1976	314.5	308.7	268.7	246.3	360.3	961.6	725.5	329.6	158.1	109.4	53.5	2.18	319.9



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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1977	5.72	7.40	6.60	8.81	18.0	84.3	138.0	22.5	90.0	65.6	53.5	149.1	54.0
1978	227.5	329.5	364.8	394.6	328.6	1,360	3,112	1,698	1,206	1,482	277.8	105.0	908.9
1979	141.7	117.9	114.2	104.1	102.7	324.5	3,245	1,977	1,763	1,223	825.1	600.9	878.5
1980	418.2	364.0	338.9	404.8	417.9	719.4	935.9	568.4	537.1	188.4	126.7	34.8	420.7
1981	65.0	112.4	108.9	103.6	153.0	227.0	211.3	183.9	208.2	186.8	225.6	52.0	153.2
1982	142.3	182.9	197.6	231.4	253.3	602.4	1,179	888.8	731.4	556.9	299.5	179.5	454.2
1983	410.6	362.6	353.3	327.1	325.1	541.4	434.2	324.2	212.8	335.0	351.4	345.8	360.8
1984	312.9	273.2	233.5	265.7	350.2	1,159	1,763	984.0	1,969	868.7	357.9	137.9	721.6
1985	440.6	501.3	367.1	268.4	311.2	1,193	954.5	1,299	1,762	1,157	1,104	938.9	860.7
1986	802.9	769.5	751.5	677.7	663.2	1,679	2,907	3,085	2,485	1,664	782.8	1,434	1,477
1987	1,247	952.2	820.3	613.6	687.1	958.5	725.1	584.5	492.6	364.9	188.2	187.1	652.1
1988	145.3	145.2	142.5	151.8	257.9	528.8	423.4	376.1	221.4	85.6	87.8	70.5	219.5
1989	68.1	61.8	51.6	71.8	159.1	578.1	3,003	1,110	728.3	317.9	152.0	219.3	541.5
1990	157.4	130.9	111.3	124.1	167.9	482.0	422.6	513.2	528.3	392.2	234.1	156.6	285.7
1991	114.4	82.8	86.6	81.9	97.2	330.9	459.8	752.0	1,025	1,497	532.1	802.2	490.6
1992	289.4	165.1	137.1	179.7	227.2	576.9	493.4	424.7	450.8	401.4	431.5	284.6	339.0
1993	183.1	197.4	198.7	186.2	239.0	922.1	2,086	1,095	1,586	2,787	2,496	2,148	1,181
1994	1,599	842.1	354.8	558.7	574.1	1,967	2,609	2,366	1,343	1,644	641.3	292.3	1,238
1995	441.5	307.3	425.2	383.1	444.1	2,629	2,619	2,419	1,523	855.2	318.3	270.0	1,056
1996	756.5	884.0	481.3	494.6	500.6	1,893	2,740	2,378	1,376	595.0	346.5	209.8	1,055
1997	219.5	303.1	398.1	462.6	721.3	941.9	8,717	3,344	1,777	1,044	765.3	581.9	1,600

## 05051522 RED RIVER OF THE NORTH AT HICKSON, ND

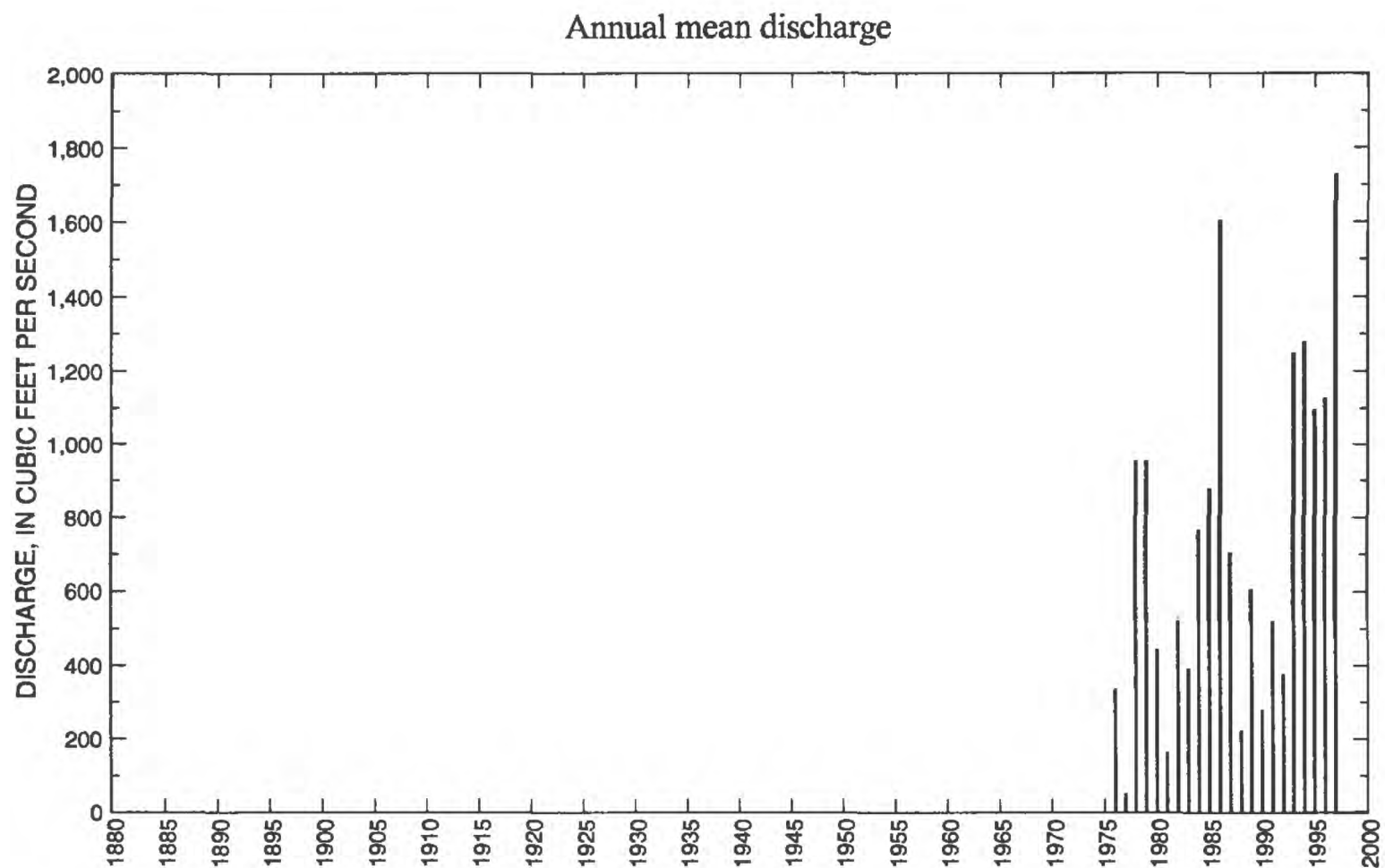
LOCATION.--Lat 46°39'35", long 96°47'44", in SW<sup>1</sup>/<sub>4</sub> sec.19, T.137 N., R.48 W., Clay County, MN, Hydrologic Unit 09020104, on right bank 60 ft downstream from bridge on township road and 1 mi southeast of Hickson.

DRAINAGE AREA.--4,300 mi<sup>2</sup>, approximately.

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

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

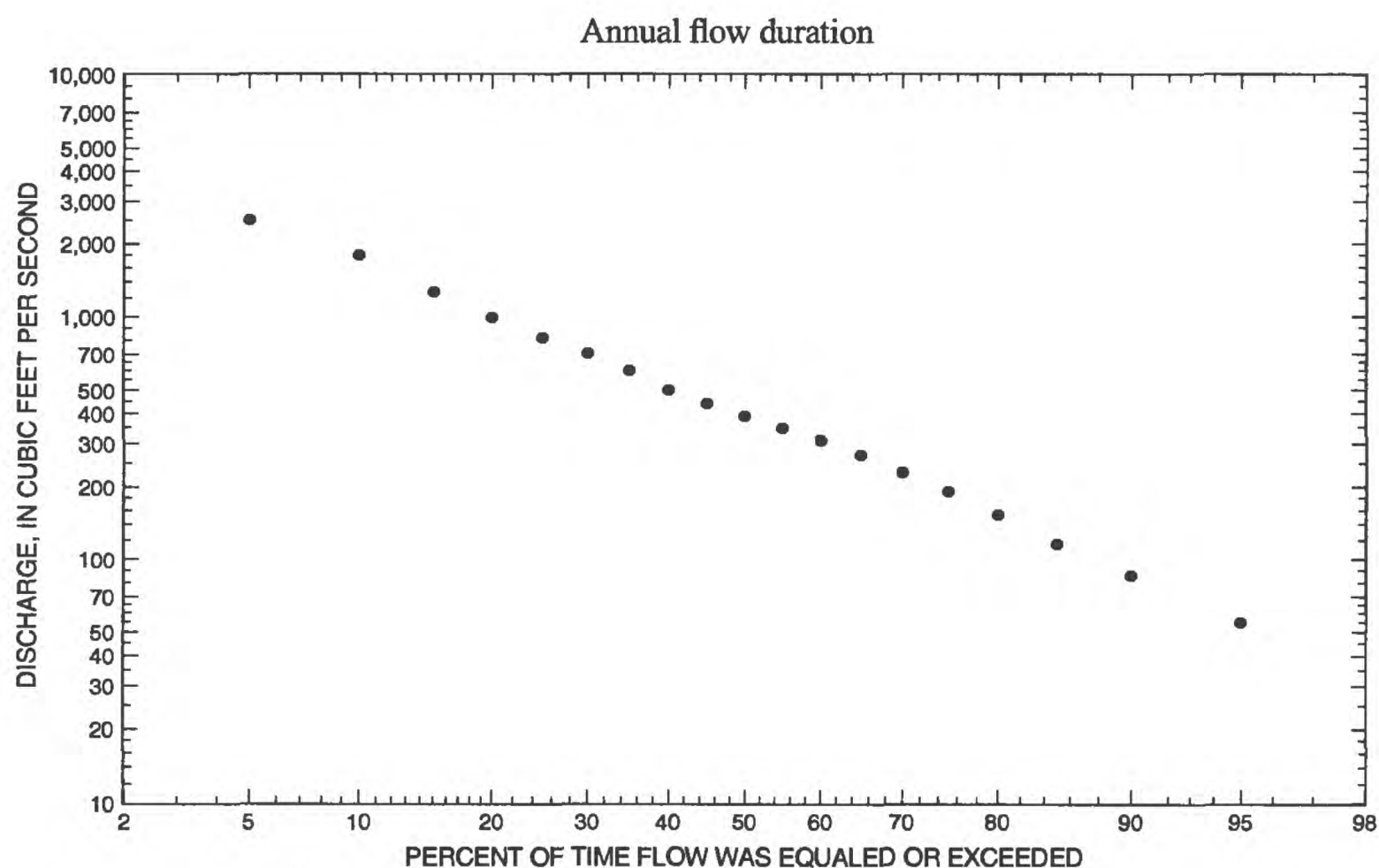
EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,300 ft<sup>3</sup>/s, Apr. 14, 1997, gage height, 35.81 ft; maximum gage height, 37.60 ft, Apr. 16, 1997; no flow Oct. 26, 1977, to Jan. 9, 1978.



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

## Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	1,560	1994	2.02	1977	397	394	0.99	4.48	
November	900	1987	0	1977	332	272	0.82	3.74	
December	817	1986	0	1977	291	217	0.75	3.28	
January	747	1986	4.95	1977	284	193	0.68	3.20	
February	745	1987	14.0	1977	336	207	0.61	3.79	
March	2,690	1995	75.9	1977	922	650	0.71	10.4	
April	9,860	1997	165	1977	2,200	2,210	1.00	24.8	
May	3,920	1997	22.0	1977	1,280	1,080	0.84	14.5	
June	2,480	1986	86.4	1977	1,040	696	0.67	11.7	
July	2,670	1993	73.4	1977	840	684	0.81	9.46	
August	2,670	1993	35.6	1977	511	560	1.10	5.75	
September	2,140	1993	12.6	1976	434	521	1.20	4.88	
Annual	1,730	1997	53.1	1977	740	466	0.63	100	



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

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	44.4	75.1	138	210	158	163	76.3	41.8	26.6	35.4	42.5	41.5	55.2
90	66.1	95.4	203	328	279	204	99.4	76.1	48.9	66.9	69.1	60.7	86.3
85	89.3	110	247	425	357	242	143	88.4	63.1	84.8	90.0	77.1	117
80	99.5	132	314	466	409	303	193	121	84.9	112	112	103	154
75	112	176	372	540	454	408	250	167	114	129	124	118	191
70	138	212	404	670	520	488	324	214	147	143	138	129	230
65	172	245	429	767	630	568	378	262	170	172	159	157	271
60	207	266	454	848	733	654	462	302	196	200	186	202	310
55	234	287	494	956	807	749	536	336	222	225	206	236	348
50	256	305	535	1,190	918	849	619	365	247	266	244	261	392
45	278	323	597	1,470	1,040	974	707	393	273	299	282	277	440
40	301	344	668	1,770	1,150	1,130	838	427	301	327	313	304	498
35	337	368	749	2,030	1,320	1,270	961	461	336	356	347	338	604
30	375	400	822	2,380	1,600	1,410	1,080	542	383	400	380	367	711
25	413	449	895	2,660	1,850	1,580	1,200	688	486	457	422	399	820
20	447	513	1,090	3,280	2,180	1,760	1,360	775	606	596	510	438	992
15	490	610	1,560	4,180	2,430	1,940	1,670	843	769	813	735	482	1,270
10	549	676	2,080	5,530	2,740	2,210	1,950	1,030	1,030	998	832	583	1,810
5	690	747	3,380	8,350	3,390	2,590	2,310	1,180	1,960	1,340	929	799	2,510



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

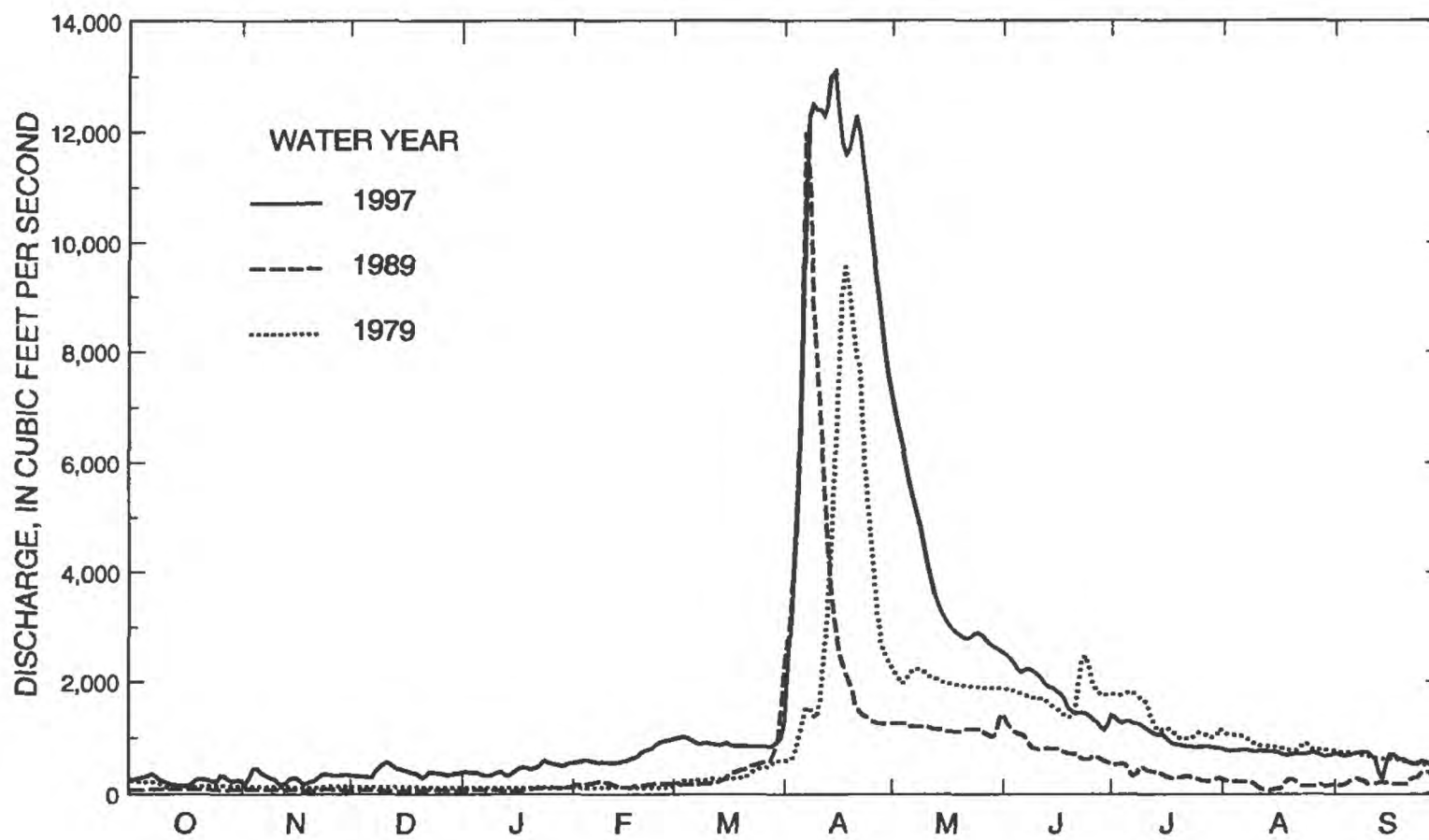
Probability of occurrence of annual high discharges

[ng, statistic not given]

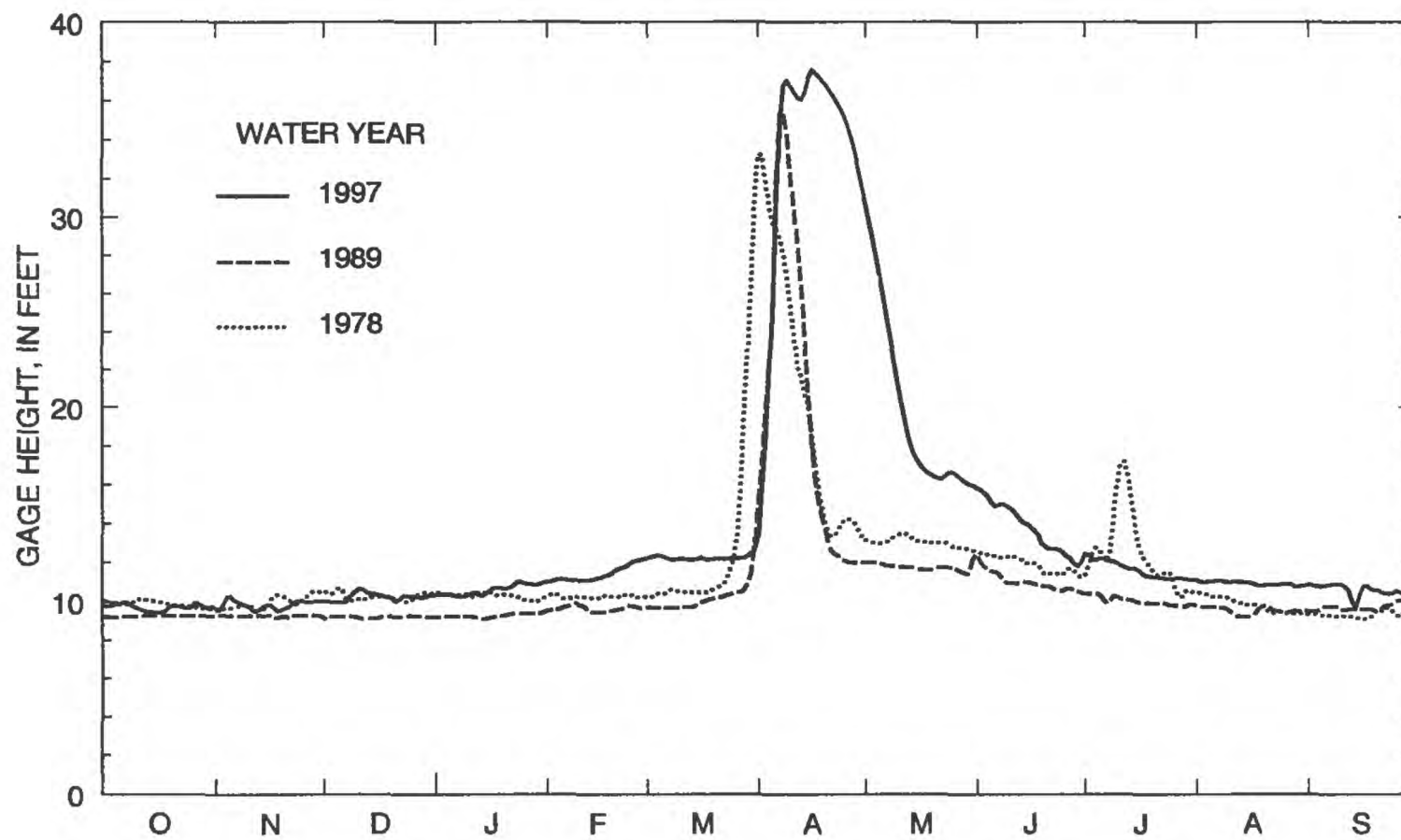
Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /a)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	169	154	120	109
0.95	1.05	ng	468	420	329	284
0.90	1.11	ng	769	685	538	454
0.80	1.25	ng	1,340	1,190	938	771
0.50	2	ng	3,440	3,050	2,420	1,900
0.20	5	ng	7,530	6,730	5,380	4,090
0.10	10	ng	10,700	9,620	7,720	5,780
0.04	25	ng	14,900	13,600	10,900	8,050
0.02	50	ng	18,100	16,600	13,400	9,780
0.01	100	ng	21,200	19,600	15,900	11,500
0.005	200	ng	24,300	22,600	18,300	13,200
0.002	500	ng	ng	ng	ng	ng

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

Highest daily mean discharge for period of record



Highest daily mean gage height for period of record



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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1976	March 31	16.94	2,500	1987	March 26	15.34	2,460
1977	June 27	10.30	408	1988	March 30	10.97	826
1978	April 2	33.54	9,200	1989	April 7	35.81	12,900
1979	April 18	33.03	9,600	1990	April 2	11.26	857
1980	April 4	19.13	3,250	1991	July 5	16.15	2,820
1981	August 4	10.41	544	1992	March 10	13.62	1,750
1982	April 4	23.07	4,200	1993	April 3	28.30	6,400
1983	March 19	11.08	824	1994	April 1	26.43	6,320
1984	March 31	25.58	5,100	1995	March 20	29.63	8,000
1985	June 3	18.71	3,680	1996	April 14	28.26	6,290
1986	April 1	27.27	6,720	1997	April 14	--	13,300
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 14	--	13,300	1985	June 3	18.71	3,680
1989	April 7	35.81	12,900	1980	April 4	19.13	3,250
1979	April 18	33.03	9,600	1991	July 5	16.15	2,820
1978	April 2	33.54	9,200	1976	March 31	16.94	2,500
1995	March 20	29.63	8,000	1987	March 26	15.34	2,460
1986	April 1	27.27	6,720	1992	March 10	13.62	1,750
1993	April 3	28.30	6,400	1990	April 2	11.26	857
1994	April 1	26.43	6,320	1988	March 30	10.97	826
1996	April 14	28.26	6,290	1983	March 19	11.08	824
1984	March 31	25.58	5,100	1981	August 4	10.41	544
1982	April 4	23.07	4,200	1977	June 27	10.30	408

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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1975	--	--	--	--	--	--	--	--	--	--	--	--	--
1976	368.5	327.7	261.6	228.9	319.3	870.3	880.3	367.8	231.2	120.1	68.4	12.6	337.9
1977	2.02	0	0	4.95	14.0	75.9	165.4	22.0	86.4	73.4	35.6	159.7	53.1
1978	255.6	304.1	378.4	403.5	333.7	1,002	4,165	1,610	1,165	1,404	320.5	120.6	955.0
1979	146.3	118.6	115.4	104.5	102.0	314.4	3,980	2,013	1,760	1,315	875.3	616.4	954.8
1980	415.6	372.1	328.7	375.9	402.6	641.2	1,301	599.8	537.1	193.8	135.6	36.0	443.9
1981	64.9	107.3	105.5	105.8	151.4	245.9	228.8	201.4	228.8	204.5	266.1	56.3	161.4
1982	148.4	195.8	200.5	233.2	251.8	679.3	1,721	933.2	822.7	608.0	339.9	221.0	529.5
1983	424.1	373.4	359.5	334.0	326.3	639.9	514.9	378.1	230.9	403.7	346.1	380.1	393.3
1984	329.9	272.5	261.5	278.2	367.5	1,113	2,132	985.2	1,918	972.1	414.0	186.4	767.5
1985	443.7	561.2	365.2	267.7	307.3	1,199	1,023	1,250	1,863	1,202	1,073	969.2	879.2
1986	851.0	790.4	816.6	746.8	681.0	1,543	3,791	3394	2,485	1,784	852.5	1,496	1,604
1987	1312	900.0	798.0	639.9	744.8	1,337	832.4	651.5	509.4	382.5	180.1	172.9	705.8
1988	147.4	151.7	142.8	148.4	237.0	519.4	470.5	385.4	244.9	85.4	87.2	72.6	224.2
1989	69.1	65.5	52.7	68.4	157.3	378.3	3,832	1,153	819.7	349.9	159.8	219.8	607.4
1990	170.7	126.6	95.1	103.7	118.5	356.5	453.5	520.7	561.6	432.4	243.4	171.7	280.3
1991	127.7	66.8	63.2	63.1	88.2	353.5	548.5	854.5	1,049	1,631	554.3	815.9	520.3
1992	321.1	139.8	147.6	180.9	237.4	734.8	555.6	459.0	537.6	395.5	495.9	309.5	376.9
1993	214	236	204	197	302	791	2,820	1,100	1,610	2,670	2,670	2,140	1,250
1994	1,560	776	432	469	655	2,080	3,010	2,340	1,410	1,610	671	294	1,280
1995	440.0	287.2	403.7	402.3	447.0	2,687	2,820	2,410	1,569	997.6	361.5	281.2	1,096
1996	695.1	854.1	496.8	478.6	493.1	1,838	3,397	2,708	1,415	610.8	348.9	209.5	1,128
1997	235.0	278.3	374.2	422.9	661.2	892.2	9,864	3,925	1,809	1,029	729.4	600.4	1,729

## 05051600 WILD RICE RIVER NEAR RUTLAND, ND

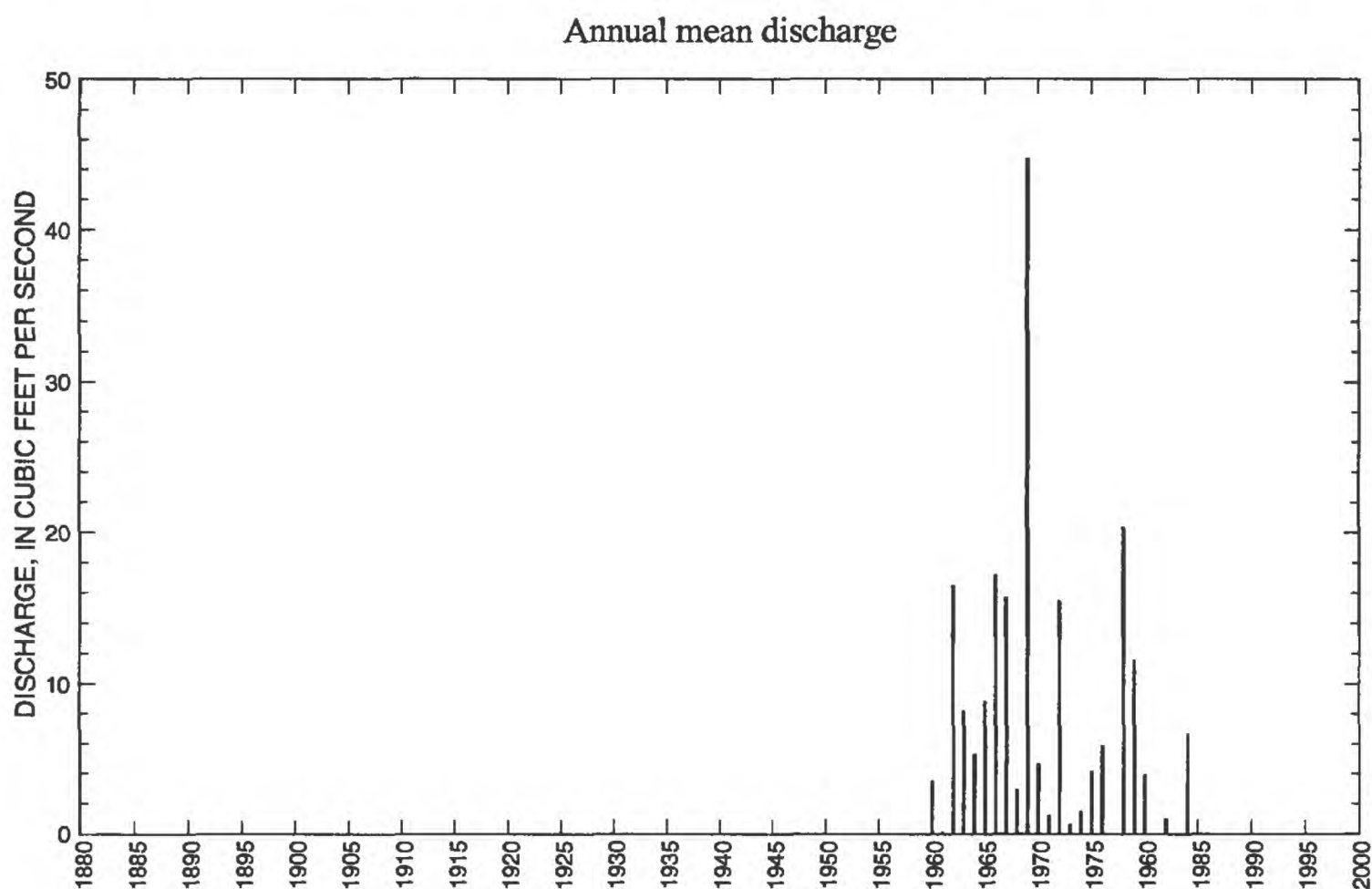
**LOCATION.**--Lat 46°01'20", long 97°30'40", in SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.36, T.130 N., R.55 W., Sargent County, Hydrologic Unit 09020105, on right bank 1,000 ft upstream from bridge on county highway, 2 mi south of Rutland, and 10 mi upstream from Lake Tewaukon.

**DRAINAGE AREA.**--546 mi<sup>2</sup>, of which about 250 mi<sup>2</sup> is probably noncontributing.

**PERIOD OF RECORD.**--October 1959 to current year (seasonal records only since 1982).

**GAGE.**--Water-stage recorder. Datum of gage is 1,197.73 ft above sea level. Prior to Dec. 11, 1960, nonrecording gage at same site and datum.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 2,700 ft<sup>3</sup>/s, Apr. 3, 1997, gage height, 10.11 ft; no flow at times each year.





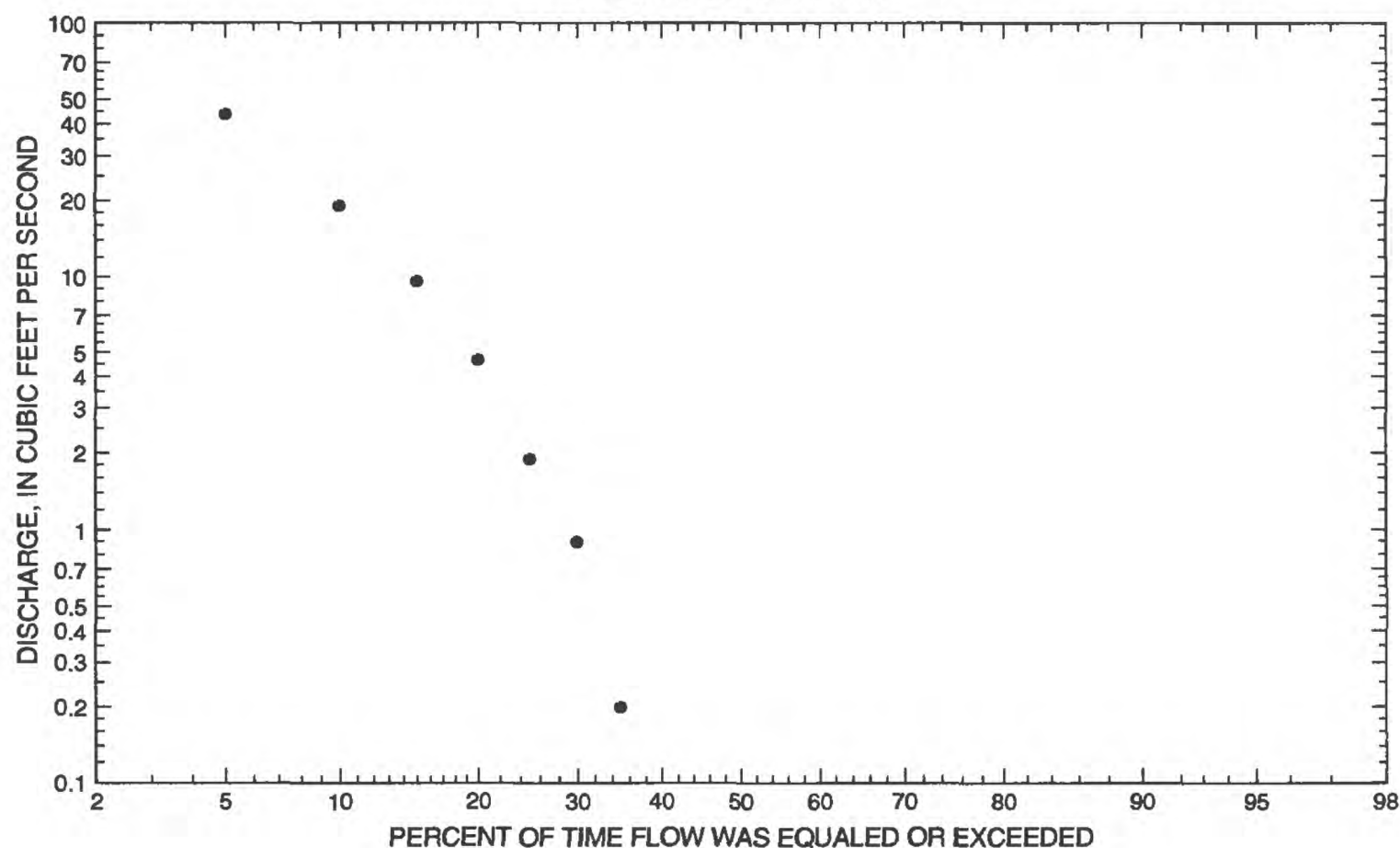
# 05051600 WILD RICE RIVER NEAR RUTLAND, ND--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Diacharge (ft <sup>3</sup> /s)			
October	4.81	1963	0	m	0.540	1.18	2.19	0.37
November	5.87	1963	0	m	0.360	1.23	3.44	0.25
December	2.90	1963	0	m	0.140	0.59	4.19	0.10
January	0.103	1963	0	m	0	0.02	4.90	0
February	1.00	1976	0	m	0.070	0.22	3.40	0.05
March	138	1966	0	m	22.4	36.9	1.65	15.6
April	756	1997	0	m	62.7	132	2.11	43.5
May	160	1997	0	m	23.0	38.9	1.69	15.9
June	82.4	1997	0	m	12.9	19.8	1.54	8.92
July	103	1993	0	m	15.5	25.2	1.63	10.7
August	47.0	1993	0	m	4.66	10.3	2.21	3.23
September	20.6	1997	0	m	2.06	4.16	2.02	1.42
Annual	44.8	1969	0	m	8.36	9.94	1.19	100

Annual flow duration



# 05051600 WILD RICE RIVER NEAR RUTLAND, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0.10	0	0	0	0	0	0	0	0	0
75	0	0	0	0.46	0.10	0	0	0	0	0	0	0	0
70	0	0	0	2.10	0.50	0	0	0	0	0	0	0	0
65	0	0	0	5.63	0.97	0.15	0	0	0	0	0	0	0
60	0	0	0	8.26	1.90	0.50	0	0	0	0	0	0	0
55	0	0	0	12.6	3.92	1.92	0.24	0	0	0	0	0	0
50	0	0	0	16.4	5.64	1.70	0.84	0	0	0	0	0	0
45	0	0	0	20.0	7.77	3.42	2.20	0	0	0	0	0	0
40	0	0	0.14	23.8	9.97	4.89	4.40	0.30	0	0	0	0	0
35	0	0	0.39	29.0	12.2	7.15	8.46	0.92	0.19	0	0	0	0.20
30	0	0	1.50	37.8	15.6	10.7	12.1	1.60	0.66	0	0	0	0.89
25	0	0	4.66	50.8	19.4	14.2	15.9	2.90	1.80	0	0	0	1.90
20	0	0	11.2	64.8	25.2	20.1	22.1	5.23	2.90	0.23	0	0	4.66
15	0	0	22.4	83.1	43.6	30.8	37.9	8.08	5.10	0.91	0.07	0	9.65
10	0	0	67.6	135	66.4	43.3	54.6	13.7	6.89	2.00	0.52	0	19.1
5	0	0	154	288	118	65.1	74.4	31.5	10.6	3.60	2.00	0.76	43.7

# 05051600 WILD RICE RIVER NEAR RUTLAND, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	0	0	0	0
0.95	1.05	ng	0	0	0	0
0.90	1.11	ng	2.34	1.91	1.62	1.19
0.80	1.25	24.5	14.1	12.0	9.93	7.48
0.50	2	110	76.0	65.7	51.9	37.1
0.20	5	411	249	214	160	104
0.10	10	762	419	357	257	156
0.04	25	1,400	677	569	395	223
0.02	50	2,010	898	748	506	272
0.01	100	2,730	1,140	940	621	317
0.005	200	3,570	1,390	1,130	734	359
0.002	500	4,860	ng	ng	ng	ng

# 05051600 WILD RICE RIVER NEAR RUTLAND, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)
Annual peak discharge, by year, and corresponding gage height							
1960	April 15	4.80	102	1979	April 21	5.39	365
1961	March 27	2.25	2.50	1980	March 23	4.50	130
1962	July 6	5.69	135	1981	--	--	0
1963	April 4	4.19	68.0	1982	April 17	2.88	20.0
1964	April 25	3.52	46.0	1983	October 9	2.45	7.60
1965	April 13	4.80	173	1984	March 28	4.62	150
1966	March 15	7.12	660	1985	March 18	3.20	38.0
1967	June 15	5.39	257	1986	April 20	5.51	361
1968	April 7	3.86	91.0	1987	March 30	4.06	138
1969	April 8	8.77	1,270	1988	February 27	--	1.00
1970	June 16	3.21	39.0	1989	March 31	8.47	700
1971	March 16	4.04	70.0	1990	--	--	0
1972	March 18	6.64	435	1991	July 3	3.29	25.0
1973	March 26	2.47	13.0	1992	June 22	3.50	25.0
1974	March 20	2.93	30.0	1993	March 28	6.12	300
1975	July 1	4.52	133	1994	March 21	7.08	400
1976	March 23	5.37	200	1995	March 14	7.98	500
1977	--	--	0	1996	May 19	6.02	573
1978	March 29	7.64	600	1997	April 3	10.11	2,700
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 3	10.11	2,700	1980	March 23	4.50	130
1969	April 8	8.77	1,270	1960	April 15	4.80	102
1989	March 31	8.47	700	1968	April 7	3.86	91.0
1966	March 15	7.12	660	1971	March 16	4.04	70.0
1978	March 29	7.64	600	1963	April 4	4.19	68.0
1996	May 19	6.02	573	1964	April 25	3.52	46.0
1995	March 14	7.98	500	1970	June 16	3.21	39.0
1972	March 18	6.64	435	1985	March 18	3.20	38.0
1994	March 21	7.08	400	1974	March 20	2.93	30.0
1979	April 21	5.39	365	1991	July 3	3.29	25.0
1986	April 20	5.51	361	1992	June 22	3.50	25.0
1993	March 28	6.12	300	1982	April 17	2.88	20.0
1967	June 15	5.39	257	1973	March 26	2.47	13.0
1976	March 23	5.37	200	1983	October 9	2.45	7.60
1965	April 13	4.80	173	1961	March 27	2.25	2.50
1984	March 28	4.62	150	1988	February 27	--	1.00
1987	March 30	4.06	138	1977	--	--	0
1962	July 6	5.69	135	1981	--	--	0
1975	July 1	4.52	133	1990	--	--	0

# 05051600 WILD RICE RIVER NEAR RUTLAND, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1960	0	0	0	0	0	0.184	41.8	1.51	0.207	0.058	0	0	3.59
1961	0	0	0	0	0	0.623	0.353	0.552	0.007	0	0	0	0.129
1962	0	0	0	0	0	3.10	40.5	23.2	52.0	64.2	11.2	3.26	16.5
1963	4.81	5.87	2.90	0.103	0	7.96	20.5	14.4	24.3	9.59	4.05	3.89	8.21
1964	2.79	1.68	0.410	0	0	1.01	25.6	11.7	10.1	9.20	1.22	0.790	5.36
1965	0	0	0	0	0	0	64.0	16.3	14.9	11.0	0.648	0	8.86
1966	0	0	0	0	0	138.0	25.2	20.0	8.12	6.80	4.90	0.406	17.2
1967	1.24	0.095	0.006	0	0	23.5	38.1	35.0	61.4	27.5	1.13	0	15.7
1968	0	0	0	0	0	0.111	8.46	11.7	7.29	6.88	0	1.15	2.97
1969	0.445	0.076	0.060	0	0	0	347.5	64.3	48.4	46.3	24.7	9.07	44.8
1970	2.15	0.872	0.023	0	0	1.70	16.9	16.6	16.1	1.86	0	0	4.68
1971	0	0	0	0	0	9.88	3.90	0.208	0.419	0.023	0	0	1.21
1972	0	0	0	0	0	83.9	20.9	58.3	16.0	1.98	2.55	0	15.5
1973	0	0	0	0	0	5.15	2.11	0.006	0	0	0	0	0.612
1974	0	0	0	0	0	7.81	6.93	2.32	0.793	0	0	0	1.50
1975	0	0	0	0	0	0	1.72	8.22	6.71	28.2	0.983	3.52	4.16
1976	0.224	0.001	0	0	1.00	48.9	18.6	1.81	0	0	0	0	5.91
1977	0	0	0	0	0	0	113.4	0	0	0	0	0	0
1978	0	0	0	0	0	36.9	113.4	9.47	6.13	78.0	0.595	0	20.4
1979	0	0	0	0	0	0	111.4	20.6	4.42	1.63	1.84	0.268	11.6
1980	0	0	0	0	0	28.0	19.0	0.354	0.201	0	0	0	3.98
1981	0	0	0	0	0	0	10.3	0	0	0	0	0	0
1982	0	0	0	0	0	0.133	10.3	1.14	0.056	0.105	0.73	0.776	1.04
1983	1.79	--	--	--	--	0.028	0	0	0	0	0	0	--
1984	0	0	0	0	0.555	18.3	43.3	8.96	5.06	3.54	0.834	0	6.69
1985	--	--	--	--	--	9.39	6.05	0.652	0.110	0	0	0	--
1986	--	--	--	--	--	0.955	92.3	69.3	11.6	44.7	12.6	7.07	--
1987	--	--	--	--	--	39.2	35.5	11.4	3.21	0	0	0	--
1988	--	--	--	--	0.093	0.046	0	0	0	0	0	0	--
1989	--	--	--	--	--	40.7	149.2	8.53	1.67	0.114	0	0	--
1990	--	--	--	--	--	0	0	0	0	0	0	0	--
1991	--	--	--	--	--	0	0	0	1.63	9.16	1.77	0	--
1992	--	--	--	--	--	0.343	0.191	0.237	6.80	8.36	0.514	0.723	--
1993	--	--	--	--	--	29.2	68.4	7.23	16.4	102.6	47.0	8.44	--



# 05051600 WILD RICE RIVER NEAR RUTLAND, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1994	--	--	--	--	--	83.2	89.7	45.6	4.41	14.0	2.69	2.62	--
1995	--	--	--	--	--	128.4	74.3	87.0	36.7	30.8	10.6	6.32	--
1996	--	--	--	--	--	101.4	131.2	156.6	41.7	16.6	10.4	9.22	--
1997	--	--	--	--	--	4.36	755.7	159.8	82.4	65.1	36.7	20.6	--

## 05052500 ANTELOPE CREEK AT DWIGHT, ND

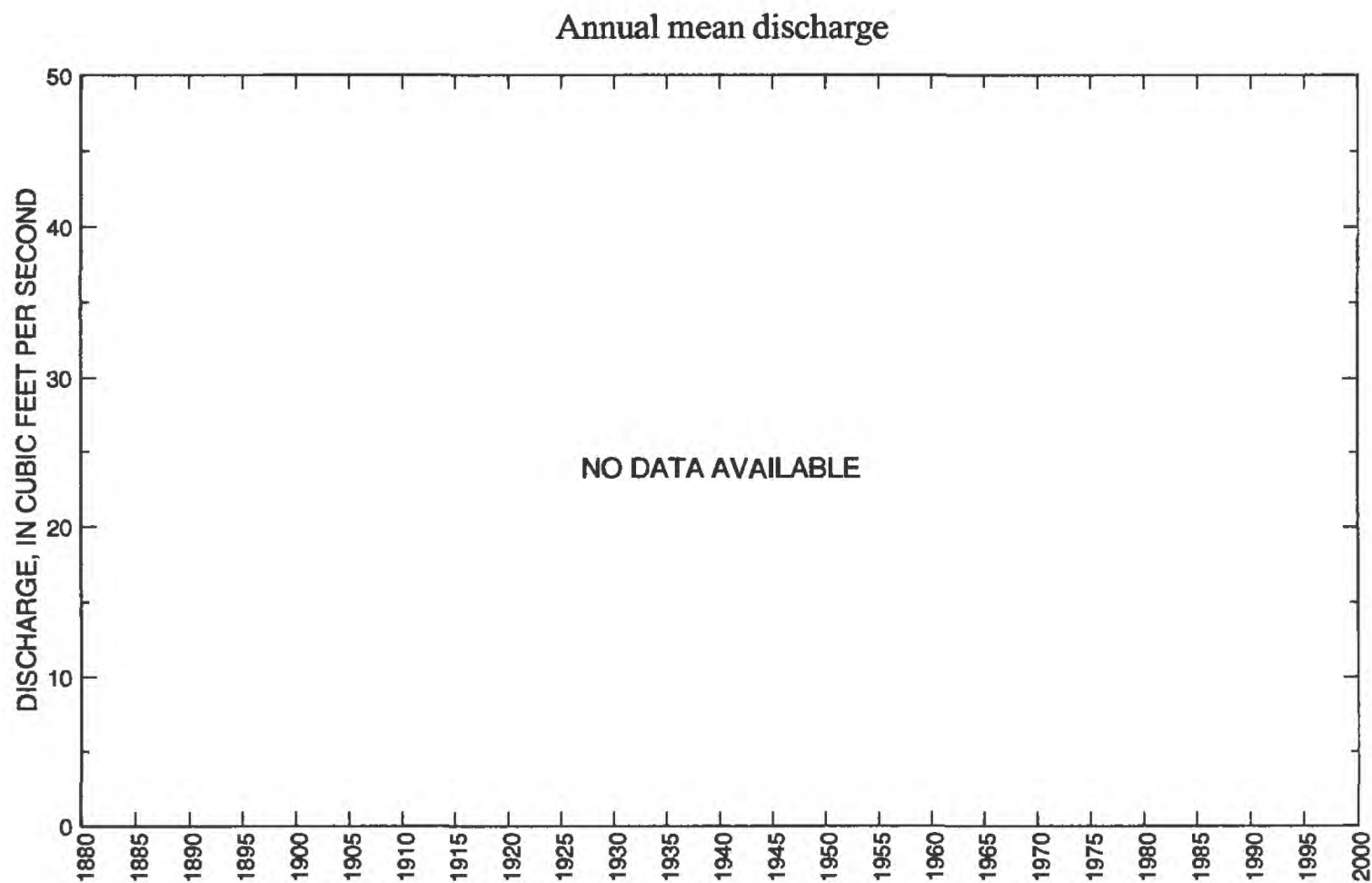
**LOCATION.**--Lat 46°18'52", long 97°03'10", in SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.20, T.133 N., R.48 W., Richland County, Hydrologic Unit 09020105, at bridge on former U.S. Highway 81 and about 0.5 mi north of Dwight.

**DRAINAGE AREA.**--293 mi<sup>2</sup>.

**PERIOD OF RECORD.**--October 1943-73, 1975, 1995 to current year. Operated as a continuous-record station water year 1944-49. Operated as a high-flow partial-record station water year 1950-73, 1975, 1995 to current year.

**GAGE.**--Crest-stage gage.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 9,000 ft<sup>3</sup>/s, Apr. 10, 1969, gage height, 17.82 ft; no flow at times.



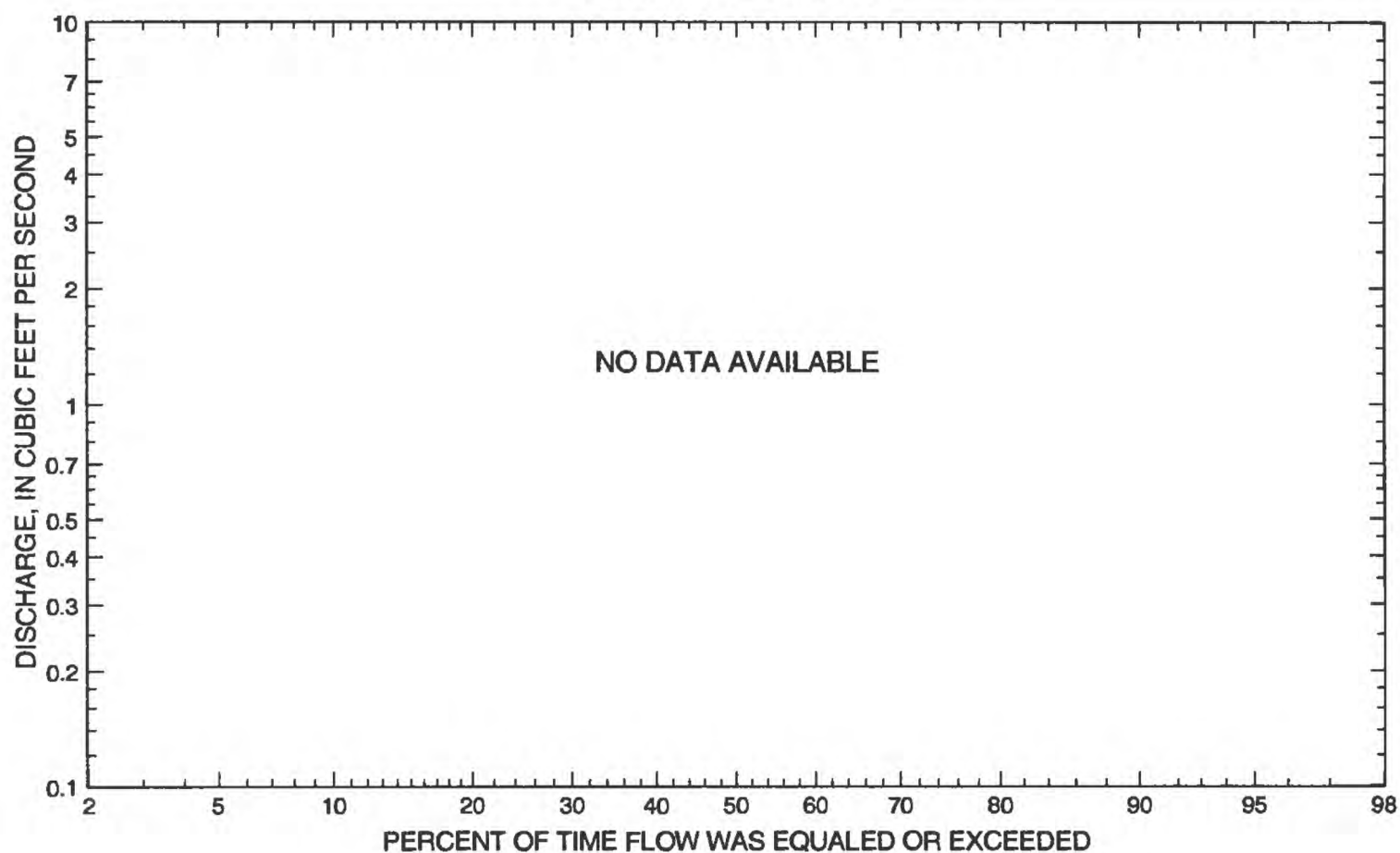
# 05052500 ANTELOPE CREEK AT DWIGHT, ND--Continued

Statistics of monthly and annual mean discharges

[--, no data]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	--	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
August	--	--	--	--	--	--	--	--
September	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--

Annual flow duration



# 05052500 ANTELOPE CREEK AT DWIGHT, ND--Continued

Monthly and annual flow duration, in cubic feet per second  
[--, no data]

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	--	--	--	--	--	--	--	--	--	--	--	--	--
90	--	--	--	--	--	--	--	--	--	--	--	--	--
85	--	--	--	--	--	--	--	--	--	--	--	--	--
80	--	--	--	--	--	--	--	--	--	--	--	--	--
75	--	--	--	--	--	--	--	--	--	--	--	--	--
70	--	--	--	--	--	--	--	--	--	--	--	--	--
65	--	--	--	--	--	--	--	--	--	--	--	--	--
60	--	--	--	--	--	--	--	--	--	--	--	--	--
55	--	--	--	--	--	--	--	--	--	--	--	--	--
50	--	--	--	--	--	--	--	--	--	--	--	--	--
45	--	--	--	--	--	--	--	--	--	--	--	--	--
40	--	--	--	--	--	--	--	--	--	--	--	--	--
35	--	--	--	--	--	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--	--	--	--

# 05052500 ANTELOPE CREEK AT DWIGHT, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given; --, no data]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	--	--	--	--
0.95	1.05	26.4	--	--	--	--
0.90	1.11	53.6	--	--	--	--
0.80	1.25	120	--	--	--	--
0.50	2	491	--	--	--	--
0.20	5	1,680	--	--	--	--
0.10	10	2,980	--	--	--	--
0.04	25	5,230	--	--	--	--
0.02	50	7,340	--	--	--	--
0.01	100	9,780	--	--	--	--
0.005	200	12,600	--	--	--	--
0.002	500	16,700	--	--	--	--



# 05052500 ANTELOPE CREEK AT DWIGHT, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1943	April <sup>1</sup>	16.00	--	1961	March 5	3.26	10.0
1944	July 5	6.98	460	1962	May 24	12.60	1,300
1945	March 19	9.50	868	1963	June 12	6.22	295
1946	March 21	12.33	1,360	1964	June 19	4.27	120
1947	April 12	11.34	1,160	1965	April 11	12.08	1,080
1948	April 6	5.00	120	1966	March 17	13.21	1,300
1949	March 31	5.80	270	1967	June 14	12.93	1,250
1950	May 9	9.90	893	1968	April 28	2.61	20.0
1951	April 4	13.26	1,700	1969	April 10	17.82	9,000
1952	April 8	16.31	3,670	1970	June 20	4.80	134
1953	May 30	8.53	578	1971	March 17	6.36	288
1954	June 11	4.39	111	1972	March 18	13.90	1,650
1955	March 31	6.58	341	1973	March 15	5.75	169
1956	April 11	5.88	237	1975	July 3	15.00	1,800
1957	April 20	4.70	134	1995	March 16	8.58	1,500
1958	April 7	3.22	50.0	1996	May 18	9.10	1,990
1959	March 18	2.62	2.00	1997	April 16	12.25	3,500
1960	April 7	4.08	78.0				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1969	April 10	17.82	9,000	1955	March 31	6.58	341
1952	April 8	16.31	3,670	1963	June 12	6.22	295
1997	April 16	12.25	3,500	1971	March 17	6.36	288
1996	May 18	9.10	1,990	1949	March 31	5.80	270
1975	July 3	15.00	1,800	1956	April 11	5.88	237
1951	April 4	13.26	1,700	1973	March 15	5.75	169
1972	March 18	13.90	1,650	1957	April 20	4.70	134
1995	March 16	8.58	1,500	1970	June 20	4.80	134
1946	March 21	12.33	1,360	1948	April 6	5.00	120
1962	May 24	12.60	1,300	1964	June 19	4.27	120
1966	March 17	13.21	1,300	1954	June 11	4.39	111
1967	June 14	12.93	1,250	1960	April 7	4.08	78.0
1947	April 12	11.34	1,160	1958	April 7	3.22	50.0
1965	April 11	12.08	1,080	1968	April 28	2.61	20.0
1950	May 9	9.90	893	1961	March 5	3.26	10.0
1945	March 19	9.50	868	1959	March 18	2.62	2.00
1953	May 30	8.53	578	1943	April <sup>1</sup>	16.00	--
1944	July 5	6.98	460				

<sup>1</sup>Day of month unknown.

# 05052500 ANTELOPE CREEK AT DWIGHT, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1944	0	0	0	0	0	4.25	19.3	7.44	33.2	83.8	29.4	13.0	15.9
1945	0.73	3.92	0.35	0	0	173	26.2	3.64	16.3	0	0	0	18.9
1946	0	0	0	0	0	217	10.4	0.05	0	6.79	0.04	0	19.9
1947	0	0	0	0	0	40.9	202	1.21	4.23	0.36	0	0	20.5
1948	0	0	0	0	0	0.10	32.0	0.47	0	0	0	0	2.67
1949	0	0	0	0	0	16.9	23.5	0.10	0.01	25.0	1.33	0	5.61

## 05053000 WILD RICE RIVER NEAR ABERCROMBIE, ND

**LOCATION.**--Lat 46°28'05", long 96°47'00", in NE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec.36, T.135 N., R.49 W., Richland County, Hydrologic Unit 09020105, on right bank 420 ft upstream from bridge on county highway, 0.75 mi upstream from rubble masonry dam which serves as control, 3.2 mi northwest of Abercrombie, and 7 mi downstream from Antelope Creek.

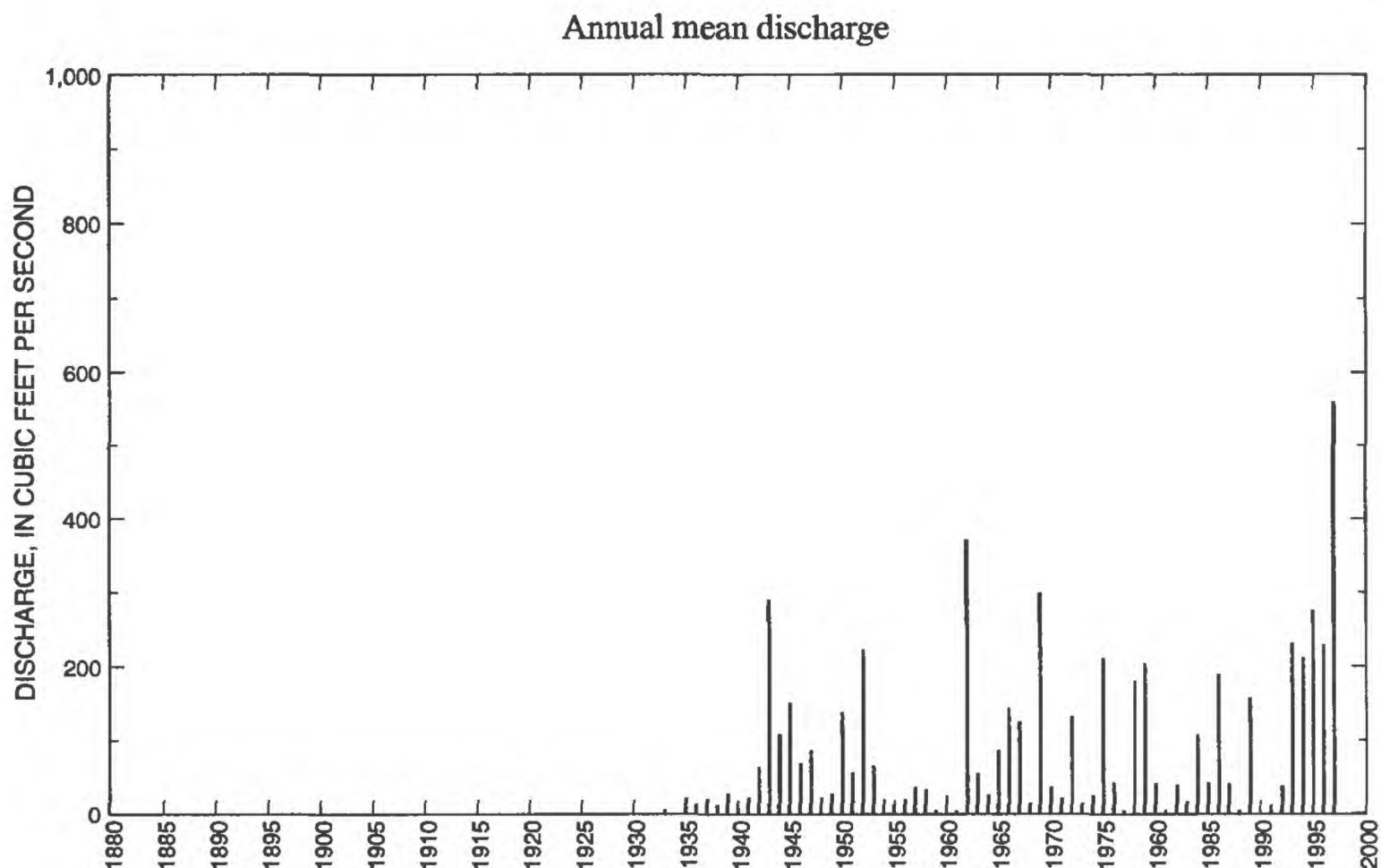
**DRAINAGE AREA.**--2,080 mi<sup>2</sup>, of which about 590 mi<sup>2</sup> is probably noncontributing.

**PERIOD OF RECORD.**--April 1932 to current year. Monthly discharge only for some periods, published in Water-Supply Paper 1308.

**GAGE.**--Water-stage recorder and masonry control. Datum of gage is 907.94 ft above sea level. Prior to Dec. 7, 1939, nonrecording gage at site 420 ft downstream at datum 5.0 ft lower. Dec. 7, 1939, to Nov. 24, 1952, nonrecording gage at site 0.75 mi downstream at present datum.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 9,540 ft<sup>3</sup>/s, Apr. 11, 1969, gage height, 24.58 ft; no flow at times.

**EXTREMES OUTSIDE PERIOD OF RECORD.**--Flood in spring of 1897 reached a stage of 27.5 ft, present site and datum, from floodmarks pointed out by local residents.



# 05053000 WILD RICE RIVER NEAR ABERCROMBIE, ND--Continued

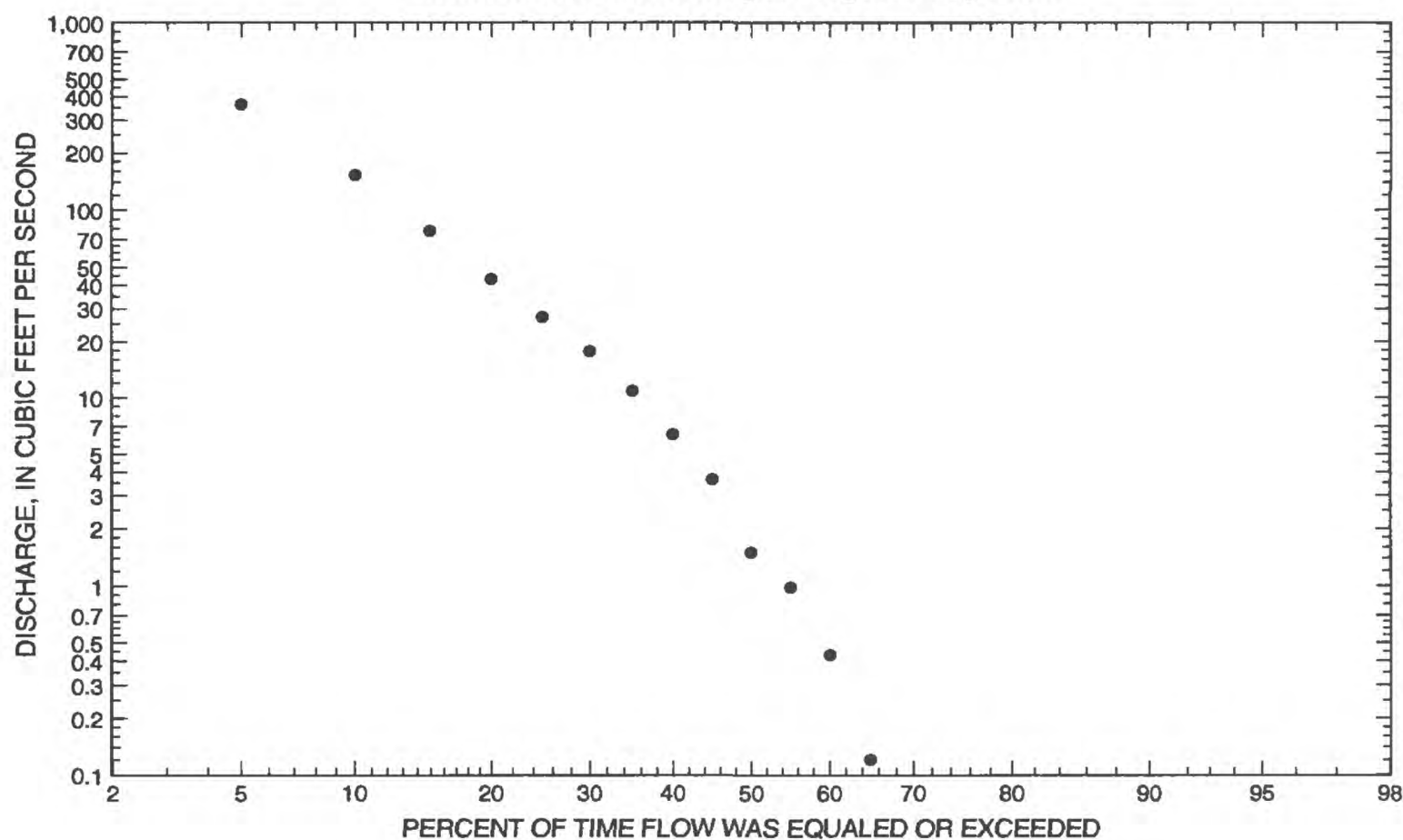
Post-regulation period, 1958-97

Statistics of monthly and annual mean discharges, post-regulation period

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /a)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	117	1996	0	m	9.70	22.1	2.28	0.76	
November	53.4	1996	0	m	7.47	11.9	1.59	0.58	
December	18.8	1987	0	m	3.88	5.37	1.39	0.30	
January	14.5	1994	0	m	1.61	2.82	1.75	0.13	
February	37.6	1984	0	m	2.70	7.08	2.62	0.21	
March	1,200	1995	0	m	177	275	1.55	13.9	
April	5,510	1997	2.81	1991	578	1,020	1.76	45.3	
May	951	1996	1.43	1988	165	241	1.46	12.9	
June	929	1962	0.085	1988	116	182	1.57	9.10	
July	1,790	1962	0	1961	168	370	2.21	13.1	
August	462	1993	0	m	36.3	90.9	2.50	2.85	
September	159	1986	0	m	11.4	29.6	2.59	0.89	
Annual	560	1997	2.70	1990	106	122	1.15	100	

Annual flow duration, post-regulation period



# 05053000 WILD RICE RIVER NEAR ABERCROMBIE, ND--Continued

Monthly and annual flow duration, in cubic feet per second, post-regulation period

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	1.40	0.67	0.05	0	0	0	0	0	0	0
90	0	0	0	6.93	3.19	0.30	0.05	0	0	0	0	0	0
85	0	0	0	12.7	5.30	0.94	0.15	0	0	0	0	0	0
80	0	0	0.07	19.3	8.18	2.00	0.48	0	0	0	0	0	0
75	0	0	0.35	25.9	12.2	4.74	1.00	0.03	0	0	0	0	0.02
70	0	0	0.53	36.3	18.6	7.70	2.99	0.06	0	0	0	0	0.12
65	0	0	0.78	56.7	25.7	11.2	5.06	0.12	0	0	0	0	0.28
60	0	0	1.70	77.3	33.3	15.8	7.24	0.24	0.02	0	0	0.19	0.64
55	0.18	0.06	4.23	107	41.6	20.2	11.7	0.50	0.10	0.02	0.09	0.86	1.50
50	0.36	0.16	9.73	137	51.7	27.0	17.1	1.00	0.18	0.06	0.34	1.40	2.99
45	0.45	0.30	16.5	168	62.9	34.9	22.9	2.00	0.25	0.15	2.30	1.80	5.38
40	0.70	0.40	22.8	210	78.5	43.6	30.6	4.26	0.49	0.28	4.41	2.30	8.59
35	1.10	0.55	28.9	258	95.7	55.5	43.4	7.43	0.93	0.94	5.57	3.00	13.8
30	1.40	0.55	36.8	317	121	72.2	60.8	14.6	1.80	2.30	7.45	4.36	21.5
25	1.70	0.74	53.9	411	154	96.6	88.7	23.0	4.82	6.28	9.61	5.38	32.7
20	2.10	1.00	91.0	566	211	137	144	37.7	10.2	11.4	13.9	6.66	52.0
15	2.70	2.51	170	894	302	195	226	54.4	17.2	20.3	19.1	8.71	91.4
10	4.84	4.38	426	1,480	417	282	339	85.5	32.0	31.1	24.6	11.6	186
5	7.18	8.13	1,200	3,000	746	544	1,020	180	58.0	48.3	35.0	18.1	444



# 05053000 WILD RICE RIVER NEAR ABERCROMBIE, ND--Continued

Probability of occurrence of annual high discharges, post-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-dsy period	7-dsy period	15-dsy period	30-dsy period
0.99	1.01	15.6	11.0	8.70	7.14	6.12
0.95	1.05	63.9	49.0	38.1	28.9	22.4
0.90	1.11	128	102	79.1	58.1	43.3
0.80	1.25	282	235	182	130	92.6
0.50	2	1,100	974	771	533	359
0.20	5	3,520	3,280	2,700	1,870	1,220
0.10	10	6,030	5,710	4,830	3,380	2,210
0.04	25	10,100	9,750	8,520	6,090	4,010
0.02	50	13,800	13,400	12,000	8,700	5,770
0.01	100	17,900	17,400	15,900	11,800	7,910
0.005	200	22,300	21,900	20,400	15,400	10,400
0.002	500	28,800	ng	ng	ng	ng

# 05053000 WILD RICE RIVER NEAR ABERCROMBIE, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1933	March 13	4.10	75.0	1966	March 19	18.43	2,850
1934	April 7	2.10	15.0	1967	June 17	14.17	2,050
1935	March 16	10.21	513	1968	April 28	2.53	127
1936	March 22	8.00	415	1969	April 11	24.58	9,540
1937	April 9	8.71	540	1970	June 17	4.18	556
1938	March 17	7.28	318	1971	July 4	4.18	508
1939	March 25	15.17	1,350	1972	March 18	14.69	2,100
1940	April 8	3.20	300	1973	March 17	3.67	426
1941	June 11	3.90	608	1974	April 12	4.73	630
1942	June 10	3.77	579	1975	July 4	19.16	3,500
1943	April 2	21.02	5,500	1976	March 24	6.90	870
1944	July 7	6.58	956	1977	September 27	2.41	91.0
1945	March 19	15.00	2,840	1978	March 30	20.03	4,900
1946	March 24	13.07	2,320	1979	April 15	22.39	6,000
1947	April 12	--	2,450	1980	April 1	12.22	1,800
1948	April 11	4.66	729	1981	April 2	1.69	25.8
1949	April 3	5.60	650	1982	April 1	11.62	1,550
1950	April 3	16.28	2,300	1983	March 19	2.79	265
1951	April 6	11.95	1,890	1984	March 29	16.74	2,970
1952	April 12	20.62	5,400	1985	June 3	9.01	1,210
1953	May 29	14.45	2,500	1986	March 28	14.07	2,210
1954	July 2	5.93	800	1987	March 27	5.34	701
1955	April 1	5.76	550	1988	March 10	2.33	105
1956	April 12	6.17	750	1989	April 7	23.27	7,150
1957	April 19	3.47	408	1990	April 2	2.12	74.0
1958	April 9	3.03	262	1991	July 5	3.72	410
1959	June 17	2.84	222	1992	June 18	8.32	1,000
1960	April 6	5.00	640	1993	April 1	17.52	3,630
1961	March 3	2.20	36.0	1994	July 23	12.83	2,430
1962	July 9	18.38	3,610	1995	March 30	18.18	3,730
1963	June 13	10.21	1,460	1996	May 20	16.18	3,260
1964	April 17	3.65	415	1997	April 16	--	9,470
1965	April 12	16.50	2,820				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1969	April 11	24.58	9,540	1962	July 9	18.38	3,610
1997	April 16	--	9,470	1975	July 4	19.16	3,500
1989	April 7	23.27	7,150	1996	May 20	16.18	3,260
1979	April 15	22.39	6,000	1984	March 29	16.74	2,970
1943	April 2	21.02	5,500	1966	March 19	18.43	2,850
1952	April 12	20.62	5,400	1945	March 19	15.00	2,840
1978	March 30	20.03	4,900	1965	April 12	16.50	2,820
1995	March 30	18.18	3,730	1953	May 29	14.45	2,500
1993	April 1	17.52	3,630	1947	April 12	--	2,450

# 05053000 WILD RICE RIVER NEAR ABERCROMBIE, ND--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1994	July 23	12.83	2,430	1970	June 17	4.18	556
1946	March 24	13.07	2,320	1955	April 1	5.76	550
1950	April 3	16.28	2,300	1937	April 9	8.71	540
1986	March 28	14.07	2,210	1935	March 16	10.21	513
1972	March 18	14.69	2,100	1971	July 4	4.18	508
1967	June 17	14.17	2,050	1973	March 17	3.67	426
1951	April 6	11.95	1,890	1936	March 22	8.00	415
1980	April 1	12.22	1,800	1964	April 17	3.65	415
1982	April 1	11.62	1,550	1991	July 5	3.72	410
1963	June 13	10.21	1,460	1957	April 19	3.47	408
1939	March 25	15.17	1,350	1938	March 17	7.28	318
1985	June 3	9.01	1,210	1940	April 8	3.20	300
1992	June 18	8.32	1,000	1983	March 19	2.79	265
1944	July 7	6.58	956	1958	April 9	3.03	262
1976	March 24	6.90	870	1959	June 17	2.84	222
1954	July 2	5.93	800	1968	April 28	2.53	127
1956	April 12	6.17	750	1988	March 10	2.33	105
1948	April 11	4.66	729	1977	September 27	2.41	91.0
1987	March 27	5.34	701	1933	March 13	4.10	75.0
1949	April 3	5.60	650	1990	April 2	2.12	74.0
1960	April 6	5.00	640	1961	March 3	2.20	36.0
1974	April 12	4.73	630	1981	April 2	1.69	25.8
1941	June 11	3.90	608	1934	April 7	2.10	15.0
1942	June 10	3.77	579				

# 05053000 WILD RICE RIVER NEAR ABERCROMBIE, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1932	--	--	--	--	--	--	--	5.80	3.26	0.706	0	0	--
1933	0	0	0	0	0.429	33.2	14.7	7.48	1.82	0	0	0	4.84
1934	0	0	0	0	0	0.316	3.71	0.110	1.35	0.355	0	0	.482
1935	0	0	0	0	0	152.7	20.0	12.7	42.2	20.0	5.00	1.00	21.4
1936	0	0	0	0	0	80.4	55.6	13.0	0.357	0	0	0	12.5
1937	0	0	0	0	0	0	117.5	85.1	20.9	18.0	3.89	2.00	20.6
1938	0	0	0	0	0	86.1	12.6	33.3	9.33	0.361	0	0	12.0
1939	0	0	0	0	0	223.0	45.8	3.21	23.4	23.4	1.85	0	27.0
1940	0	0	0	0	0	0	71.6	19.4	2.39	0.003	0	0	7.70
1941	0	0	0	0	0	79.1	63.5	18.9	78.0	12.2	4.50	9.96	22.2
1942	7.31	5.64	3.18	0.074	0	15.0	66.4	151.4	299.6	75.9	45.1	100.1	64.1
1943	110.9	60.4	19.2	6.69	1.83	232.6	1,767	174.2	706.9	353.5	51.5	22.6	290.8
1944	7.22	11.6	5.75	0.506	0.369	20.7	148.0	168.6	243.4	463.5	134.3	86.1	107.9
1945	19.6	32.4	12.8	0.890	1.25	1,006	412.5	130.4	157.4	15.8	4.19	2.19	150.8
1946	2.08	2.62	0.694	0	0	537.5	202.6	27.0	8.21	30.6	2.53	0.120	68.5
1947	5.27	6.89	2.09	0.961	0.243	52.8	716.9	158.4	74.5	22.1	0.606	0	86.2
1948	0	0	0	0	0	3.78	217.2	19.6	6.29	5.58	7.16	0.060	21.4
1949	0	0	0	0	0	32.6	150.3	25.0	7.13	95.0	13.3	0	27.0
1950	0	0	0	0	0	176.6	812.9	593.8	57.5	7.65	1.73	0	137.8
1951	0	0	0	0	0	14.6	583.5	41.0	27.1	19.8	0.458	0.957	56.7
1952	1.59	4.22	9.19	1.19	0.703	0.500	2,352	279.1	22.4	29.4	4.68	0.373	222.6
1953	0	0.483	1.20	0.726	0.993	95.4	39.7	272.5	321.7	47.5	6.25	0.197	65.8
1954	0	0	0.068	0.048	0.271	44.2	41.4	31.8	66.0	48.5	0.471	1.54	19.6
1955	0.268	0.257	0.977	0.194	0.029	23.1	106.4	3.33	1.29	1.93	16.9	0.020	12.8
1956	0	0	0	0	0	0	195.7	35.8	2.94	0	3.60	0	19.6
1957	0	0	0	0	0	46.0	95.7	58.0	80.8	47.5	21.6	79.8	35.8
1958	31.8	27.0	10.4	2.76	3.26	37.5	159.6	74.1	16.1	25.8	0.084	0.030	32.4
1959	0	0	0	0	0	11.9	6.70	2.93	23.2	4.05	0	0	4.06
1960	0	0	0	0	0	20.5	206.8	54.0	5.07	2.94	0.087	0	23.9
1961	0	0	0	0	0	21.1	8.58	10.4	1.03	0	0	0	3.46
1962	0	0	0	0	0	0	646.8	727.8	929.0	1,787	324.6	16.5	372.0
1963	6.35	7.64	2.88	0.171	0	43.0	87.0	40.0	453.4	20.3	2.12	0.120	54.8
1964	0	0	0	0	0	16.4	150.5	92.8	28.6	14.9	1.36	0.673	25.4
1965	0	0	0	0	0	0	732.3	95.8	109.5	79.0	22.8	3.67	86.3
1966	12.5	4.29	3.70	1.40	0.229	902.5	333.7	107.5	63.6	59.2	189.7	22.8	143.3



# 05053000 WILD RICE RIVER NEAR ABERCROMBIE, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1967	8.07	17.0	6.15	1.89	0.741	197.9	324.6	197.7	481.0	241.2	29.0	0.584	125.6
1968	0.011	1.02	1.22	0.405	0.049	19.3	57.8	51.8	26.0	5.35	1.98	2.95	14.0
1969	7.70	7.31	5.15	0.559	0.299	0.342	3,077	351.6	76.4	60.7	31.0	1.25	298.7
1970	0.061	0.049	2.07	1.71	1.03	18.1	139.4	51.6	177.7	41.9	0.074	0	36.0
1971	0	0	0	0	0	105.8	40.0	11.7	17.3	72.9	0.516	8.06	21.6
1972	2.96	19.5	10.1	2.87	0.687	543.3	281.1	499.4	146.2	50.6	16.1	0.388	132.0
1973	0	2.95	2.50	2.00	0.782	102.4	25.1	10.5	8.78	9.75	0.011	0.118	13.9
1974	5.94	3.98	2.38	0.354	0.232	65.3	151.1	61.6	17.7	0.103	0.046	0	25.8
1975	0	0	0	0	0	0.219	817.8	140.9	378.1	1,144	40.2	3.08	211.1
1976	9.31	14.1	4.65	2.96	24.6	255.3	176.2	25.9	0.726	0.034	0	0	42.9
1977	0	0	0	0	0	7.61	20.9	5.15	3.33	3.21	0.151	11.1	4.27
1978	24.6	9.16	6.08	3.52	2.30	614.4	1,018	146.2	39.8	222.7	45.7	26.7	180.4
1979	5.10	4.09	2.30	0.701	0.500	0.644	1,931	361.9	41.8	63.9	44.1	2.32	203.4
1980	0.138	7.69	4.11	1.75	0.741	118.2	282.6	24.7	55.5	0.935	3.46	0.271	41.4
1981	0.480	0.484	0.955	0.437	3.36	9.67	14.9	2.91	9.21	7.83	1.19	0.002	4.28
1982	0	0	0	0	0	48.8	359.4	25.2	2.39	26.9	1.07	0	38.4
1983	8.12	4.75	5.45	0.891	0.655	107.6	36.5	6.17	0.093	17.7	0.863	7.33	16.5
1984	0.390	0.126	0.025	0.052	37.6	588.0	472.0	64.0	126.0	3.79	1.09	0.001	107.7
1985	18.8	10.3	5.94	1.76	0.682	204.0	30.1	21.0	198.7	8.98	0.052	3.49	42.1
1986	0.225	0.033	2.34	1.98	1.16	433.0	884.0	682.3	67.6	22.0	15.6	159.4	189.7
1987	71.6	37.5	18.8	6.94	6.32	165.3	114.8	41.4	11.5	7.78	0.223	0.005	40.5
1988	0	0	0	0	0	28.9	11.9	1.43	0.085	4.10	1.14	0	3.99
1989	0	0	0	0	0	3.66	1808	69.7	37.4	2.09	1.07	0.305	158.2
1990	0.012	0	0	0	0	8.57	14.9	7.91	0.906	0.023	0	0	2.70
1991	0	0	0	0	0	7.69	2.81	27.1	12.7	69.2	4.39	9.57	11.3
1992	0.036	0.010	0.064	0.068	.582	31.0	44.7	23.0	228.2	105.1	25.7	2.20	38.3
1993	0.020	2.12	0.644	0	2.24	250.1	766.4	114.7	152.7	902.4	462.2	99.3	231.0
1994	29.5	18.7	18.6	14.5	9.82	621.1	741.7	241.8	34.3	741.6	40.1	12.2	212.1
1995	22.2	27.5	15.3	7.38	6.92	1,195	717.9	410.9	143.5	646.1	63.0	20.5	275.7
1996	117.3	53.4	16.9	6.06	2.55	283.5	924.6	950.6	337.0	49.7	10.7	0.412	229.5
1997	4.85	17.9	6.35	1.10	0.635	1.08	5,510	751.2	188.4	179.5	71.9	41.5	559.6



## 05054000 RED RIVER OF THE NORTH AT FARGO, ND

**LOCATION.**--Lat 46°51'40", long 96°47'00", in NW<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec.18, T.139 N., R.48 W., Cass County, Hydrologic Unit 09020104, at waterplant on Fourth Street South in Fargo, 25 mi upstream from mouth of Sheyenne River, and at mile 453.

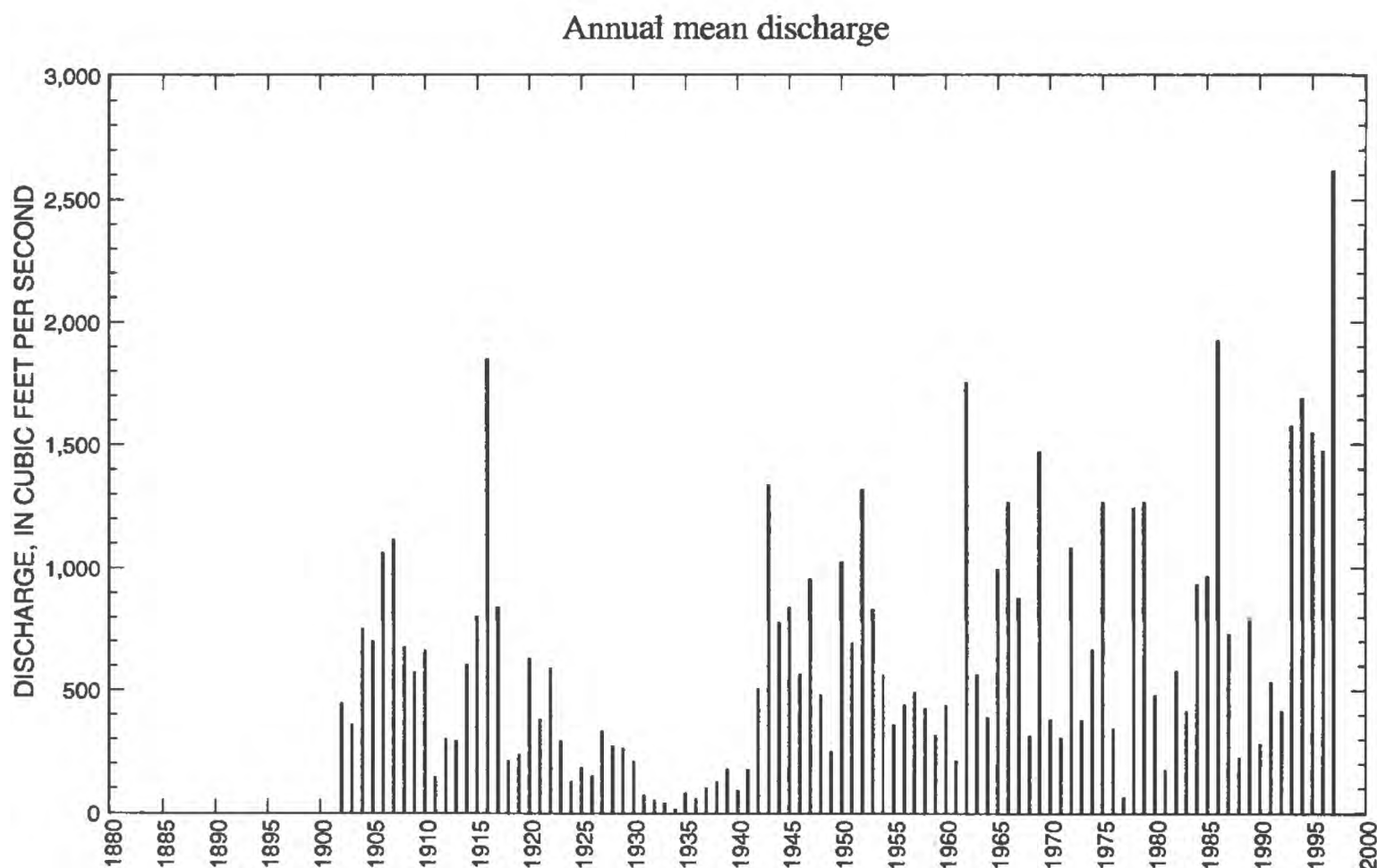
**DRAINAGE AREA.**--6,800 mi<sup>2</sup>, approximately.

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

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

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 28,000 ft<sup>3</sup>/s, Apr. 17, 1997, gage height, 37.34 ft; maximum gage height, 39.72 ft, Apr. 18, 1997; no flow for many days in each year during 1932-41, Sept. 30, 1970, Oct. 1-2, 1970, and Oct. 10-19, 1976.

**EXTREMES OUTSIDE PERIOD OF RECORD.**--Flood of Apr. 7, 1897, reached a stage of 40.1 ft present datum, discharge, 25,000 ft<sup>3</sup>/s at site 1.5 mi downstream.



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

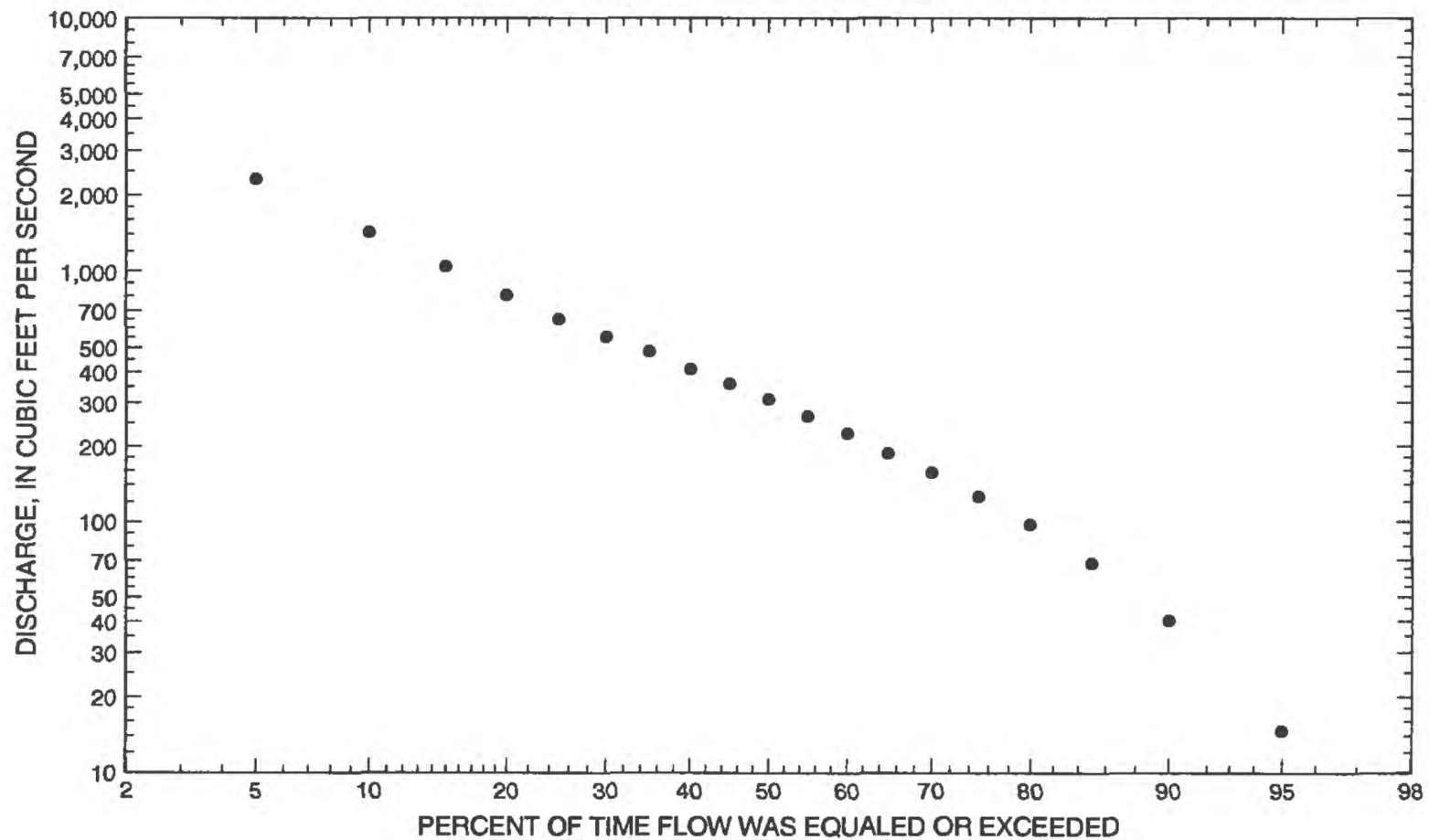
Period of record, 1902-97

Statistics of monthly and annual mean discharges, period of record

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /a)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	1,740	1994	0	m	314	308	0.98	4.13
November	942	1907	0	1937	273	227	0.83	3.59
December	800	1987	0	1938	226	186	0.82	2.97
January	740	1986	0	m	210	170	0.81	2.76
February	778	1987	0.179	1933	213	169	0.79	2.80
March	4,720	1995	26.8	1937	724	805	1.11	9.51
April	17,900	1997	102	1934	1,930	2,560	1.33	25.3
May	5,360	1997	8.12	1934	1,090	1,020	0.93	14.3
June	5,120	1962	2.87	1936	1,040	890	0.86	13.6
July	5,690	1962	0	m	861	1,060	1.24	11.3
August	3,290	1993	0	m	416	510	1.23	5.46
September	2,280	1993	0	m	318	367	1.15	4.18
Annual	2,620	1997	17.5	1934	636	506	0.80	100

Annual flow duration, period of record



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

Monthly and annual flow duration, in cubic feet per second, period of record

[ng, statistic not given]

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	8.68	14.1	49.8	156	91.0	58.1	22.1	3.07	ng	4.85	8.54	7.54	14.7
90	25.7	26.1	86.9	236	206	147	66.3	23.9	14.7	25.3	28.9	23.0	40.2
85	38.4	42.9	118	311	275	193	109	40.9	32.1	51.3	52.5	39.0	68.6
80	51.1	67.8	154	366	335	251	160	65.5	50.8	70.9	78.4	60.3	96.9
75	72.2	84.9	181	428	388	315	209	97.1	73.8	89.7	95.6	75.0	126
70	88.1	96.6	210	487	445	384	260	130	96.8	112	113	95.4	156
65	108	113	241	546	512	458	314	161	117	137	130	111	187
60	130	131	282	628	579	538	371	189	144	162	148	128	225
55	148	156	329	720	666	632	429	217	170	189	171	153	265
50	167	181	371	818	763	747	508	257	196	220	198	175	310
45	195	205	413	950	862	864	598	300	221	257	238	197	360
40	224	230	458	1,120	968	983	700	355	276	297	279	225	410
35	250	255	503	1,340	1,070	1,100	807	413	330	344	319	254	480
30	277	281	549	1,620	1,190	1,260	932	478	380	393	363	294	554
25	320	307	647	1,990	1,410	1,480	1,090	548	435	446	409	339	650
20	371	343	777	2,470	1,630	1,710	1,260	633	507	502	461	396	811
15	422	379	943	3,020	1,950	2,010	1,520	778	579	588	533	455	1,050
10	472	442	1,420	4,640	2,270	2,320	1,870	984	743	756	614	521	1,420
5	570	566	3,200	7,670	3,050	3,070	2,790	1,340	999	930	760	618	2,320

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

Probability of occurrence of annual high discharges, period of record

[ng, statistic not given]

Exceedsnce probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s) <sup>1</sup>	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-dsy period	7-dsy period	15-day period	30-day period
0.99	1.01	280	263	220	177	141
0.95	1.05	600	536	453	359	289
0.90	1.11	900	783	666	524	422
0.80	1.25	1,450	1,240	1,060	828	664
0.50	2	3,550	2,950	2,580	1,990	1,560
0.20	5	8,500	6,980	6,230	4,810	3,620
0.10	10	11,500	10,900	9,870	7,630	5,590
0.04	25	18,000	17,600	16,100	12,500	8,840
0.02	50	24,300	23,900	22,100	17,200	11,900
0.01	100	31,600	31,500	29,300	22,900	15,400
0.005	200	41,500	40,400	38,000	29,800	19,600
0.002	500	57,400	ng	ng	ng	ng

<sup>1</sup>From U.S. Army Corps of Engineers, May 2000.

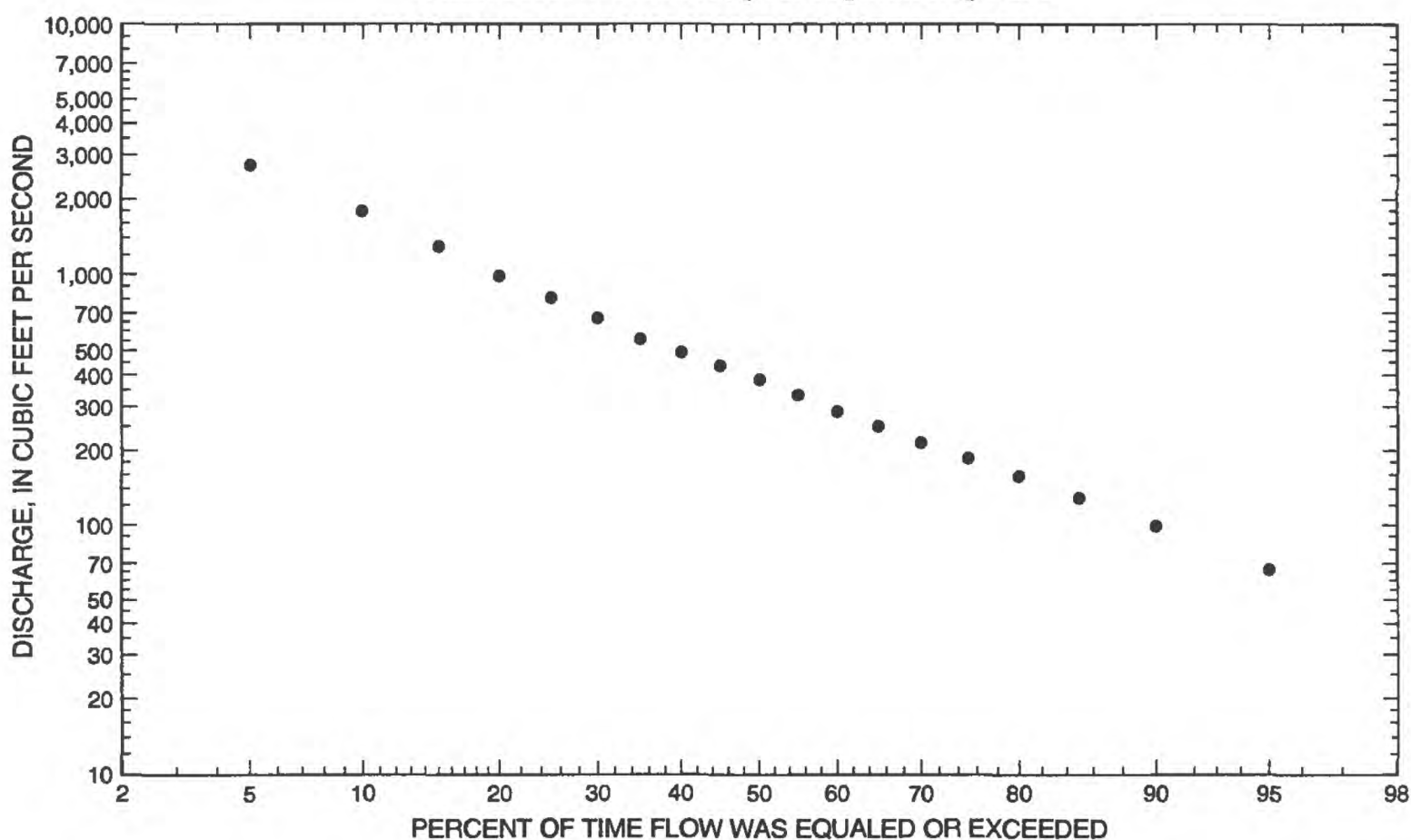
# 05054000 RED RIVER OF THE NORTH AT FARGO, ND--Continued

Post-regulation period, 1942-97

Statistics of monthly and annual mean discharges, post-regulation period

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /e)				
October	1,740	1994	3.77	1977	349	320	0.92	3.63	
November	926	1966	12.0	1977	304	218	0.72	3.16	
December	800	1987	11.7	1977	269	183	0.68	2.79	
January	740	1986	14.8	1977	265	170	0.64	2.76	
February	778	1987	19.0	1977	280	173	0.62	2.91	
March	4,720	1995	85.2	1977	869	933	1.07	9.03	
April	17,900	1997	194	1977	2,610	3,040	1.16	27.2	
May	5,360	1997	77.1	1977	1,410	1,150	0.82	14.7	
June	5,120	1962	91.1	1977	1,330	965	0.73	13.8	
July	5,690	1962	63.0	1988	1,080	1,120	1.04	11.2	
August	3,290	1993	18.5	1977	495	563	1.14	5.15	
September	2,280	1993	12.3	1976	360	397	1.10	3.74	
Annual	2,620	1997	64.7	1977	802	526	0.66	100	

Annual flow duration, post-regulation period





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

Monthly and annual flow duration, in cubic feet per second, post-regulation period

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	65.2	84.2	123	272	244	171	105	45.9	27.2	52.6	56.0	55.2	65.8
90	79.3	95.9	168	352	328	231	167	78.4	46.7	67.3	82.7	76.3	98.8
85	95.2	112	196	430	395	316	233	118	71.5	90.2	99.7	94.2	129
80	116	128	216	510	470	413	302	148	95.3	112	115	109	158
75	135	144	237	593	567	517	368	173	117	133	130	123	185
70	149	165	263	695	667	636	430	197	139	154	144	140	215
65	164	183	293	790	768	739	492	223	162	175	162	164	251
60	183	198	339	881	859	832	567	249	182	200	183	181	287
55	204	218	384	983	945	928	640	285	201	228	207	195	335
50	225	242	426	1,170	1,030	1,030	711	332	226	258	238	210	382
45	241	266	457	1,380	1,130	1,150	800	374	268	289	268	230	436
40	261	290	488	1,600	1,280	1,350	897	414	324	323	303	258	492
35	293	313	535	1,850	1,420	1,500	1,030	462	368	359	342	303	554
30	332	339	596	2,190	1,600	1,640	1,170	540	408	397	382	349	671
25	381	372	739	2,630	1,800	1,820	1,320	624	457	440	426	391	806
20	419	415	919	3,260	2,030	2,030	1,510	716	511	484	475	436	983
15	464	463	1,080	4,580	2,440	2,290	1,730	835	615	580	540	483	1,290
10	521	533	1,740	6,840	2,950	2,590	2,080	977	753	726	639	531	1,790
5	612	661	3,960	10,500	3,590	3,340	3,200	1,250	991	989	792	626	2,730

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

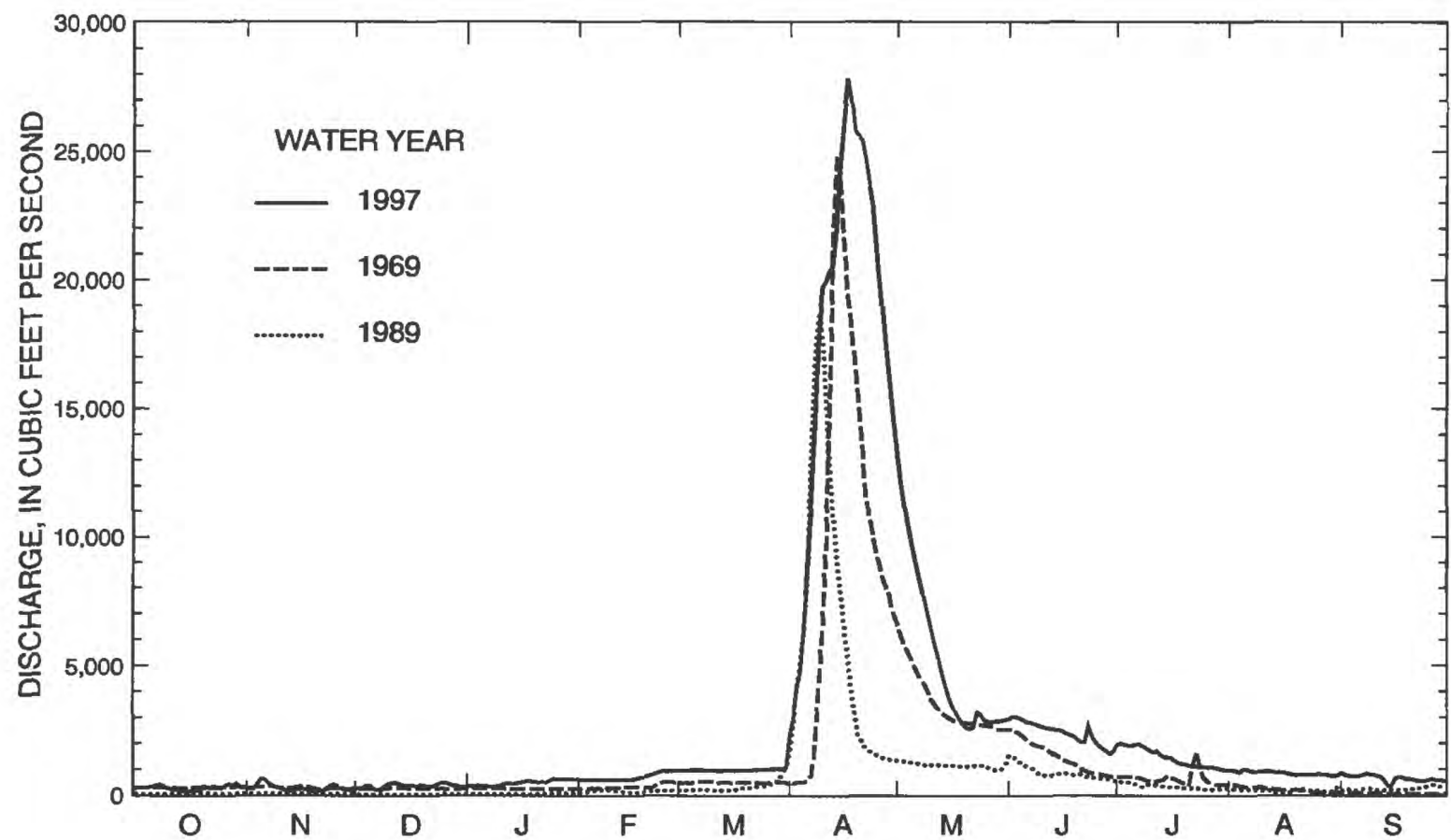
Probability of occurrence of annual high discharges, post-regulation period

[ng, statistic not given]

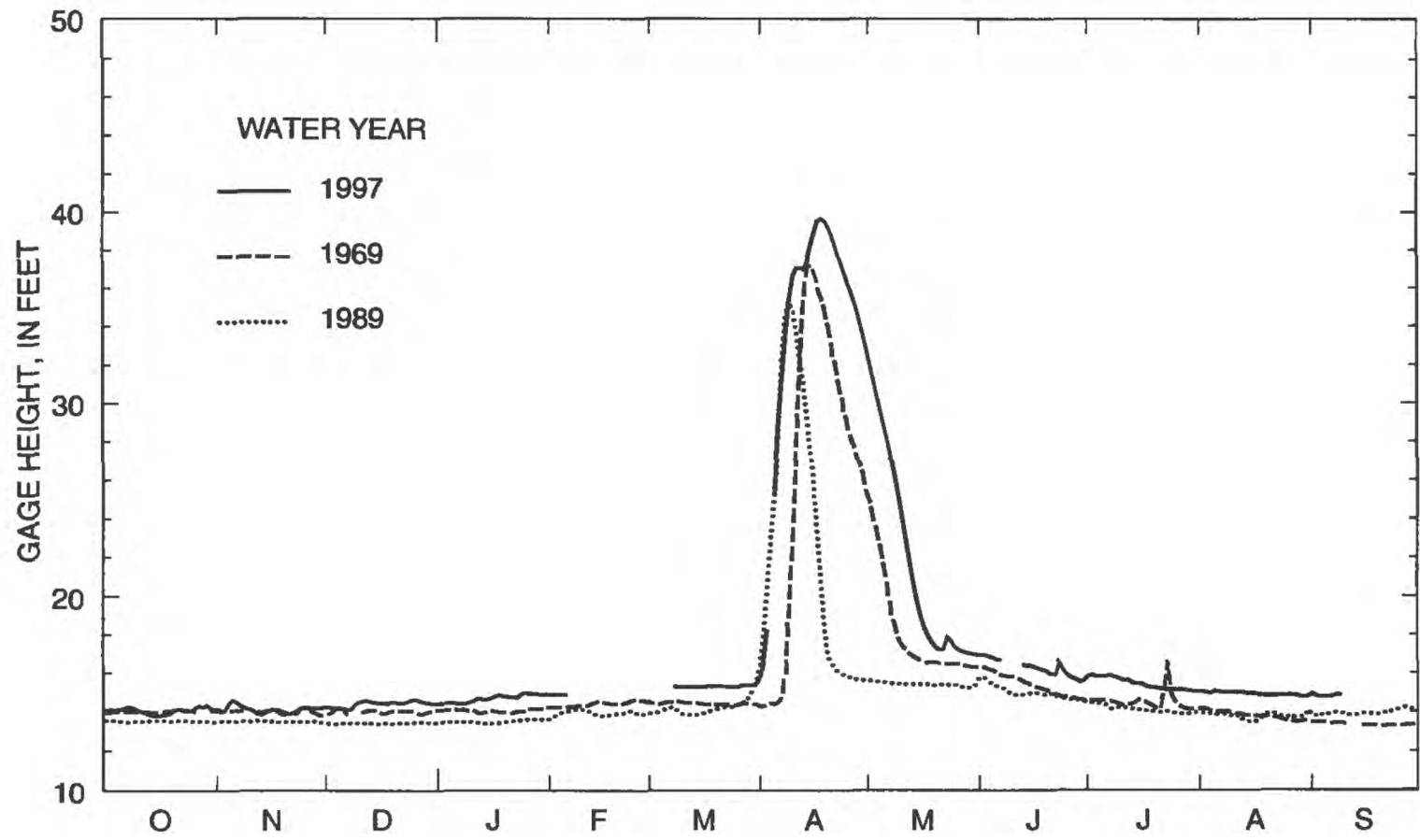
Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	391	319	254	229
0.95	1.05	ng	835	687	536	458
0.90	1.11	ng	1,230	1,020	790	658
0.80	1.25	ng	1,950	1,630	1,260	1,010
0.50	2	ng	4,520	3,890	2,970	2,270
0.20	5	ng	9,930	8,850	6,800	4,920
0.10	10	ng	14,700	13,400	10,400	7,310
0.04	25	ng	22,000	20,500	16,100	11,000
0.02	50	ng	28,300	26,900	21,300	14,400
0.01	100	ng	35,400	34,100	27,300	18,100
0.005	200	ng	43,200	42,300	34,100	22,400
0.002	500	ng	ng	ng	ng	ng

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

Highest daily mean discharge for period of record



Highest daily mean gage height for period of record



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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
<sup>1</sup> 1882	April 11	36.80	20,000	1945	March 22	20.70	7,700
<sup>1</sup> 1897	April 7	39.10	25,000	1946	March 27	17.13	5,970
1902	May 23	9.50	1,180	1947	April 15	22.93	9,300
1903	April 6	12.90	2,450	1948	April 10	12.45	3,390
1904	April 20	20.30	5,220	1949	July 12	11.27	2,660
1905	May 17	17.40	4,250	1950	April 7	20.88	7,800
1906	April 9	14.50	3,050	1951	April 11	20.73	8,010
1907	March 31	28.80	7,000	1952	April 16	28.79	16,300
1908	June 13	13.70	2,600	1953	June 1	18.05	6,720
1909	May 30	--	1,780	1954	July 4	10.53	1,920
1910	March 19	22.20	5,000	1955	April 4	11.12	2,760
1911	April 11	7.70	608	1956	April 16	12.54	3,870
1912	May 14	9.60	1,100	1957	April 24	11.10	2,540
1913	July 8	10.90	1,560	1958	July 6	10.90	2,280
1914	June 12	16.10	3,140	1959	July 8	10.42	1,250
1915	July 3	9.73	3,130	1960	April 8	12.48	3,900
1916	July 11	--	7,740	1961	June 9	9.24	1,020
1917	April 3	17.80	5,240	1962	June 14	22.83	9,580
1918	March 31	6.87	874	1963	June 14	19.97	4,930
1919	April 6	6.50	680	1964	April 18	16.22	2,400
1920	March 28	17.20	6,200	1965	April 15	30.50	11,400
1921	April 6	8.40	1,970	1966	March 22	30.16	10,700
1922	April 11	14.70	5,200	1967	June 19	22.34	5,900
1923	June 29	11.60	3,960	1968	April 30	14.71	788
1924	April 30	6.20	530	1969	April 15	37.34	25,300
1925	June 21	7.00	940	1970	June 18	16.27	2,480
1926	March 24	8.00	1,600	1971	July 7	15.87	1,910
1927	March 19	9.10	2,650	1972	March 24	25.36	7,250
1928	March 28	13.30	3,840	1973	March 15	16.41	1,950
1929	March 20	12.80	4,440	1974	April 14	20.25	4,150
1930	March 17	10.00	1,340	1975	July 4	33.26	13,200
1931	April 3	8.55	365	1976	March 30	18.70	3,200
1932	April 11	9.45	875	1977	July 4	14.99	878
1933	April 5	9.04	605	1978	April 2	34.41	17,500
1934	April 10	8.55	323	1979	April 19	34.93	17,300
1935	March 20	9.72	942	1980	April 5	20.74	5,470
1936	April 14	9.90	1,050	1981	May 24	15.84	1,710
1937	April 12	10.17	1,390	1982	April 4	25.07	5,920
1938	May 2	10.02	1,350	1983	July 4	15.99	1,750
1939	March 31	13.00	3,870	1984	April 1	28.27	9,550
1940	April 8	9.63	1,030	1985	June 5	20.08	4,690
1941	April 3	10.10	1,390	1986	April 2	27.19	8,640
1942	June 11	12.27	3,380	1987	March 27	17.75	3,300
1943	April 7	28.40	16,000	1988	March 11	15.10	981
1944	June 10	14.26	4,150	1989	April 9	35.39	18,900

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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height--Continued							
1990	June 2	15.40	1,220	1994	April 3	26.69	11,200
1991	July 6	16.99	2,630	1995	March 22	28.37	11,000
1992	June 19	16.93	2,590	1996	April 15	28.75	9,940
1993	April 5	28.27	10,100	1997	April 17	--	28,000
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 17	--	28,000	1905	May 17	17.40	4,250
1969	April 15	37.34	25,300	1944	June 10	14.26	4,150
<sup>1</sup> 1897	April 7	39.10	25,000	1974	April 14	20.25	4,150
<sup>1</sup> 1882	April 11	36.80	20,000	1923	June 29	11.60	3,960
1989	April 9	35.39	18,900	1960	April 8	12.48	3,900
1978	April 2	34.41	17,500	1939	March 31	13.00	3,870
1979	April 19	34.93	17,300	1956	April 16	12.54	3,870
1952	April 16	28.79	16,300	1928	March 28	13.30	3,840
1943	April 7	28.40	16,000	1948	April 10	12.45	3,390
1975	July 4	33.26	13,200	1942	June 11	12.27	3,380
1965	April 15	30.50	11,400	1987	March 27	17.75	3,300
1994	April 3	26.69	11,200	1976	March 30	18.70	3,200
1995	March 22	28.37	11,000	1914	June 12	16.10	3,140
1966	March 22	30.16	10,700	1915	July 3	9.73	3,130
1993	April 5	28.27	10,100	1906	April 9	14.50	3,050
1996	April 15	28.75	9,940	1955	April 4	11.12	2,760
1962	June 14	22.83	9,580	1949	July 12	11.27	2,660
1984	April 1	28.27	9,550	1927	March 19	9.10	2,650
1947	April 15	22.93	9,300	1991	July 6	16.99	2,630
1986	April 2	27.19	8,640	1908	June 13	13.70	2,600
1951	April 11	20.73	8,010	1992	June 19	16.93	2,590
1950	April 7	20.88	7,800	1957	April 24	11.10	2,540
1916	July 11	--	7,740	1970	June 18	16.27	2,480
1945	March 22	20.70	7,700	1903	April 6	12.90	2,450
1972	March 24	25.36	7,250	1964	April 18	16.22	2,400
1907	May 30	28.80	7,000	1958	July 6	10.90	2,280
1953	June 1	18.05	6,720	1921	April 6	8.40	1,970
1920	March 28	17.20	6,200	1973	March 15	16.41	1,950
1946	March 27	17.13	5,970	1954	July 4	10.53	1,920
1982	April 4	25.07	5,920	1971	July 7	15.87	1,910
1967	June 19	22.34	5,900	1909	May 30	--	1,780
1980	April 5	20.74	5,470	1983	July	15.99	1,750
1917	April 3	17.80	5,240	1981	May 24	15.84	1,710
1904	April 20	20.30	5,220	1926	March 24	8.00	1,600
1922	April 11	14.70	5,200	1913	July 8	10.90	1,560
1910	March 19	22.20	5,000	1937	April 12	10.17	1,390
1963	June 14	19.97	4,930	1941	April 3	10.10	1,390
1985	June 5	20.08	4,690	1938	May 2	10.02	1,350
1929	March 20	12.80	4,440	1930	March 17	10.00	1,340



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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1959	July 8	10.42	1,250	1977	July 4	14.99	878
1990	June 2	15.40	1,220	1932	April 11	9.45	875
1902	May 23	9.50	1,180	1918	March 31	6.87	874
1912	May 14	9.60	1,100	1968	April 30	14.71	788
1936	April 14	9.90	1,050	1919	April 6	6.50	680
1940	April 8	9.63	1,030	1911	April 11	7.70	608
1961	June 9	9.24	1,020	1933	April 5	9.04	605
1988	March 11	15.10	981	1924	April 30	6.20	530
1935	March 20	9.72	942	1931	April 3	8.55	365
1925	June 21	7.00	940	1934	April 10	8.55	323

<sup>1</sup>Historic data, not used in statistics.

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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1901	--	--	--	--	--	--	--	--	464.7	517.2	466.0	352.1	--
1902	380.1	305.0	257.0	228.0	198.0	432.0	469.0	732.3	904.0	676.2	462.6	327.7	449.1
1903	275.1	297.5	150.0	150.0	100.0	150.0	1,260	565.8	459.6	363.1	268.0	317.2	362.8
1904	471.2	438.0	293.0	260.0	243.0	374.0	2,590	1,043	1,269	1,123	501.8	452.5	752.9
1905	488.3	427.6	244.0	150.0	101.0	400.0	583.6	1,689	1,017	1,097	1,183	989.4	701.8
1906	846.9	739.0	584.0	394.0	301.0	600.0	2,053	1,628	1,678	1,547	1,288	1,074	1,064
1907	939.7	942.0	600.0	504.0	367.0	1,540	2,920	1,373	2,201	1,010	568.1	428.3	1,117
1908	456.0	399.8	315.0	290.0	250.0	500.0	1,100	691.3	1,725	1,264	695.9	461.8	678.7
1909	414.4	360.0	300.0	190.0	140.0	377.0	947.3	937.3	1,113	609.3	684.9	791.0	573.0
1910	761.6	574.0	488.0	407.0	324.0	2,126	1,425	966.5	491.2	220.0	85.3	47.9	662.8
1911	58.3	45.0	37.0	33.0	32.0	245.6	370.4	282.8	240.1	101.6	166.4	160.2	148.0
1912	244.8	135.0	120.0	89.0	80.0	89.0	564.1	727.5	528.3	482.7	330.3	223.8	301.8
1913	248.5	250.0	190.0	110.0	80.0	150.0	461.2	360.7	339.1	637.8	268.2	421.0	294.0
1914	493.6	436.3	351.7	290.0	200.0	327.1	666.0	876.5	1,550	1,013	510.5	541.5	605.9
1915	582.7	532.0	410.0	340.0	310.0	390.0	1,004	788.3	1,528	1,904	1,056	789.8	805.2
1916	793.7	571.4	400.0	265.0	254.0	646.0	6,075	2,542	2,118	5,455	1,848	1,248	1,853
1917	1,028	631.0	488.0	419.0	363.0	924.0	3,175	1,805	721.8	330.2	143.6	90.4	843.8
1918	107.5	132.0	86.3	42.0	32.6	342.3	376.4	444.8	440.3	251.5	186.2	116.0	214.1
1919	95.5	123.6	102.0	77.2	77.5	276.1	463.1	467.7	398.3	293.7	282.3	209.0	239.5
1920	188.8	252.3	153.7	155.0	150.0	1,678	888.1	928.6	1,218	960.2	497.8	458.0	629.2
1921	466.2	413.8	305.5	216.9	244.2	480.3	738.5	513.1	612.9	254.3	183.1	139.6	380.8
1922	144.9	95.2	70.0	25.0	23.1	1,856	2,643	1,073	694.8	308.7	88.5	37.0	589.8
1923	40.4	96.4	58.4	49.4	31.2	57.0	1,104	543.6	861.2	533.3	91.2	68.2	294.1
1924	87.8	93.4	72.7	52.0	50.0	72.0	266.9	302.5	204.9	165.4	85.1	91.5	128.7
1925	162.0	124.2	54.5	37.1	39.9	158.4	296.6	236.1	563.9	283.9	138.4	129.0	185.5
1926	147.0	117.0	64.2	48.3	62.7	474.2	352.0	203.8	172.3	57.6	47.9	55.3	150.7
1927	102.5	76.1	45.9	39.7	70.3	845.8	918.3	519.8	629.1	343.1	1,86.5	228.1	334.5
1928	208.5	174.3	95.2	96.0	86.9	949.0	499.4	370.8	295.4	293.8	78.2	113.3	272.8
1929	136.4	153.0	123.2	75.6	70.3	1,421	513.5	357.0	173.5	75.2	23.3	24.6	264.3
1930	53.7	62.2	33.7	36.5	148.8	710.9	398.3	590.1	290.2	145.2	38.3	16.2	211.0
1931	30.5	37.7	24.6	21.1	39.3	128.0	190.4	167.6	132.0	64.8	20.8	15.6	72.7
1932	26.6	28.0	21.6	36.1	47.3	134.9	231.8	55.6	33.2	7.73	0	8.78	52.4
1933	14.1	6.74	1.93	0	0.179	129.3	206.8	73.6	51.1	15.3	1.59	.077	41.8
1934	4.72	2.49	13.3	14.0	20.5	43.0	102.1	8.12	3.31	0	0	0	17.5
1935	0	,590	0.574	0	11.7	386.3	151.5	112.6	86.7	183.7	32.5	8.45	82.0

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1936	4.88	1.91	0.587	13.9	5.81	161.3	428.0	86.7	2.87	0	0	0	58.6
1937	0	0	4.23	4.40	.971	26.8	444.6	252.7	183.4	107.5	55.7	139.3	101.5
1938	89.0	59.0	0	5.34	104.9	236.4	163.6	425.7	330.1	98.9	18.5	57.7	125.5
1939	29.0	19.1	21.8	93.9	98.1	739.3	705.6	213.0	130.4	85.4	12.0	0	179.2
1940	9.85	17.4	14.0	1.08	8.57	40.1	446.6	384.4	185.5	15.1	3.20	0	93.5
1941	5.71	35.0	37.7	42.7	87.0	252.4	644.3	324.4	485.3	130.0	25.3	81.5	178.6
1942	93.1	125.1	98.2	112.1	109.7	190.0	325.6	1,299	1,665	988.8	469.9	608.2	508.4
1943	530.4	431.7	314.1	318.9	272.0	463.6	6,164	1,860	2,803	1,765	770.8	428.2	1,340
1944	400.9	371.2	290.5	202.2	163.2	255.3	868.2	1,196	2,128	2,013	689.3	769.8	779.6
1945	745.1	730.1	510.2	430.9	389.2	2,814	1,671	999.3	1,107	375.4	155.0	134.4	841.4
1946	218.3	248.2	219.4	186.8	112.8	1,550	1,347	639.8	420.4	705.6	598.9	503.8	565.6
1947	578.3	535.2	490.4	413.8	338.8	513.2	3,537	1,881	1,612	1,149	247.4	201.7	957.6
1948	217.1	204.6	183.0	140.2	103.3	215.7	1,806	1,619	625.4	273.7	217.8	172.1	481.1
1949	141.4	103.7	63.3	65.3	86.3	180.9	717.8	251.2	224.5	871.9	229.8	88.4	253.1
1950	78.7	80.5	95.6	88.3	133.6	527.2	3,669	3,320	1,768	1,521	768.4	213.7	1,025
1951	145.1	96.7	116.8	153.4	153.2	255.5	3,233	1,712	1,114	632.7	388.1	341.2	694.2
1952	349.0	338.2	511.5	528.9	535.0	533.4	7,256	2,149	1,609	1,270	426.4	445.3	1,322
1953	324.1	248.6	185.7	138.0	183.2	685.9	691.5	1,253	3,281	1,539	899.4	568.5	834.5
1954	373.8	477.2	412.3	357.2	344.0	631.4	863.0	943.9	1,190	721.1	233.5	240.5	566.1
1955	154.0	143.4	171.0	221.9	186.6	276.6	862.6	375.4	322.1	705.3	456.4	454.7	361.3
1956	402.4	299.0	174.3	238.4	219.6	250.8	1,410	834.3	830.9	287.9	265.9	113.9	442.7
1957	62.3	44.0	59.0	87.2	104.5	458.8	902.0	961.7	1,112	898.6	574.2	627.3	492.2
1958	450.7	468.0	418.9	323.1	306.6	574.1	849.5	379.1	164.1	794.1	227.3	173.5	428.6
1959	147.9	152.5	160.7	245.1	242.6	364.2	407.5	427.8	687.4	617.5	216.0	164.8	319.8
1960	144.3	124.4	206.5	208.0	228.1	308.9	1,493	955.1	834.8	528.7	179.1	108.0	442.3
1961	79.4	130.2	127.2	141.2	169.4	422.3	321.8	428.4	425.2	177.2	81.5	52.6	213.2
1962	102.4	103.9	72.0	76.1	85.4	203.1	2,617	3,352	5,122	5,692	2,691	844.5	1,756
1963	515.4	424.5	302.6	288.8	189.4	420.5	777.6	629.8	2,396	529.3	190.5	149.0	566.9
1964	210.6	173.3	150.1	138.8	169.8	193.8	1,182	1,142	734.8	385.1	93.9	118.1	390.4
1965	236.5	207.2	209.8	193.7	184.6	207.2	3,740	1,648	2,787	1,515	536.0	507.5	995.5
1966	825.0	566.8	512.1	491.3	490.0	3,756	2,269	2,312	1,810	794.3	899.9	410.0	1,268
1967	468.0	476.1	459.6	427.9	384.3	902.6	2,248	1,556	2,081	1,218	259.1	85.6	880.8
1968	171.6	161.1	165.5	134.6	135.4	373.7	502.5	674.6	639.8	435.1	222.8	156.8	314.9
1969	291.2	288.2	247.9	232.4	317.9	480.9	9,924	3,574	1,483	629.8	209.2	49.2	1,471
1970	86.0	120.1	111.6	154.3	174.0	250.0	1,027	838.5	1,207	510.5	109.5	14.1	383.0

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1971	61.3	162.3	124.0	137.7	125.2	565.8	663.1	377.5	368.7	706.4	141.0	246.2	307.5
1972	263.3	606.8	568.6	554.0	408.3	2,469	2,255	2,020	1,787	939.6	695.2	434.2	1,085
1973	438.5	359.7	393.8	383.8	440.6	978.1	541.2	338.0	283.2	155.0	115.5	120.2	379.0
1974	388.7	569.5	557.1	481.0	519.3	731.6	1,313	1,060	1,108	707.6	355.3	225.0	667.7
1975	296.2	259.5	184.9	188.1	267.7	388.8	3,201	1,463	2,430	5,378	708.0	433.9	1,271
1976	358.5	350.1	216.0	230.3	290.0	1,002	1,040	340.7	166.9	91.3	35.0	12.3	344.2
1977	3.77	12.0	11.7	14.8	19.0	85.2	193.9	77.1	91.1	74.8	18.5	177.7	64.7
1978	333.1	311.1	382.1	405.6	327.7	1,293	6,926	1,756	1,239	1,553	364.2	113.8	1,248
1979	154.6	108.9	100.5	97.9	93.0	266.0	6,768	2,576	1,938	1,461	1,012	634.9	1,265
1980	412.6	358.3	308.4	377.6	385.9	676.2	1,796	586.9	580.9	160.7	124.5	31.5	481.5
1981	55.4	99.8	98.2	85.8	139.7	245.1	253.9	346.3	231.5	222.0	272.3	44.5	175.0
1982	131.2	185.2	190.3	225.3	241.8	724.8	2,407	927.1	814.6	622.3	313.9	189.9	580.5
1983	479.5	362.2	332.6	294.6	300.8	702.2	632.3	394.9	227.5	578.4	304.0	362.4	415.4
1984	310.7	284.1	233.2	252.1	349.8	1,618	3,347	1,171	2,110	1,026	381.5	176.6	935.6
1985	521.0	502.2	334.7	252.8	331.3	1,468	1,102	1,341	2,175	1,348	1,148	1,049	967.0
1986	828.1	718.2	785.5	739.7	661.8	1,912	5,669	4,589	2,580	2,010	911.4	1,707	1,928
1987	1,435	893.3	800.2	706.9	778.1	1,415	926.6	668.1	507.3	365.0	153.1	152.7	734.3
1988	143.3	141.5	134.6	143.7	244.2	605.4	512.1	392.4	218.1	63.0	69.1	65.5	227.6
1989	56.3	48.6	30.9	46.9	139.2	291.5	6,367	1,145	866.1	319.8	156.1	227.2	801.7
1990	186.5	126.2	100.9	93.7	147.5	323.8	495.9	546.6	594.0	399.1	226.6	175.4	285.1
1991	132.1	81.8	72.4	72.6	86.4	334.3	567.9	927.5	1,116	1,662	587.5	750.0	535.1
1992	338.7	165.6	147.1	193.5	268.9	735.7	499.5	458.2	895.1	493.3	499.5	335.7	419.5
1993	211.8	225.1	196.2	209.7	284.8	776.2	3,993	1,328	1,909	4,119	3,293	2,280	1573
1994	1,741	738.3	466.1	603.2	697.5	2,754	5,016	2,852	1,577	2,600	853.8	315.5	1,690
1995	513.1	270.7	398.5	400.7	440.7	4,722	4,390	3,002	1,888	1,731	462.2	280.4	1,549
1996	923.8	926.1	502.7	471.0	523.9	2,361	4,851	3,888	1,908	745.1	387.1	209.8	1,475
1997	275.1	265.3	345.8	461.9	680.7	957.7	17,920	5,365	2,408	1,432	842.1	640.4	2,619



## 05054500 SHEYENNE RIVER ABOVE HARVEY, ND

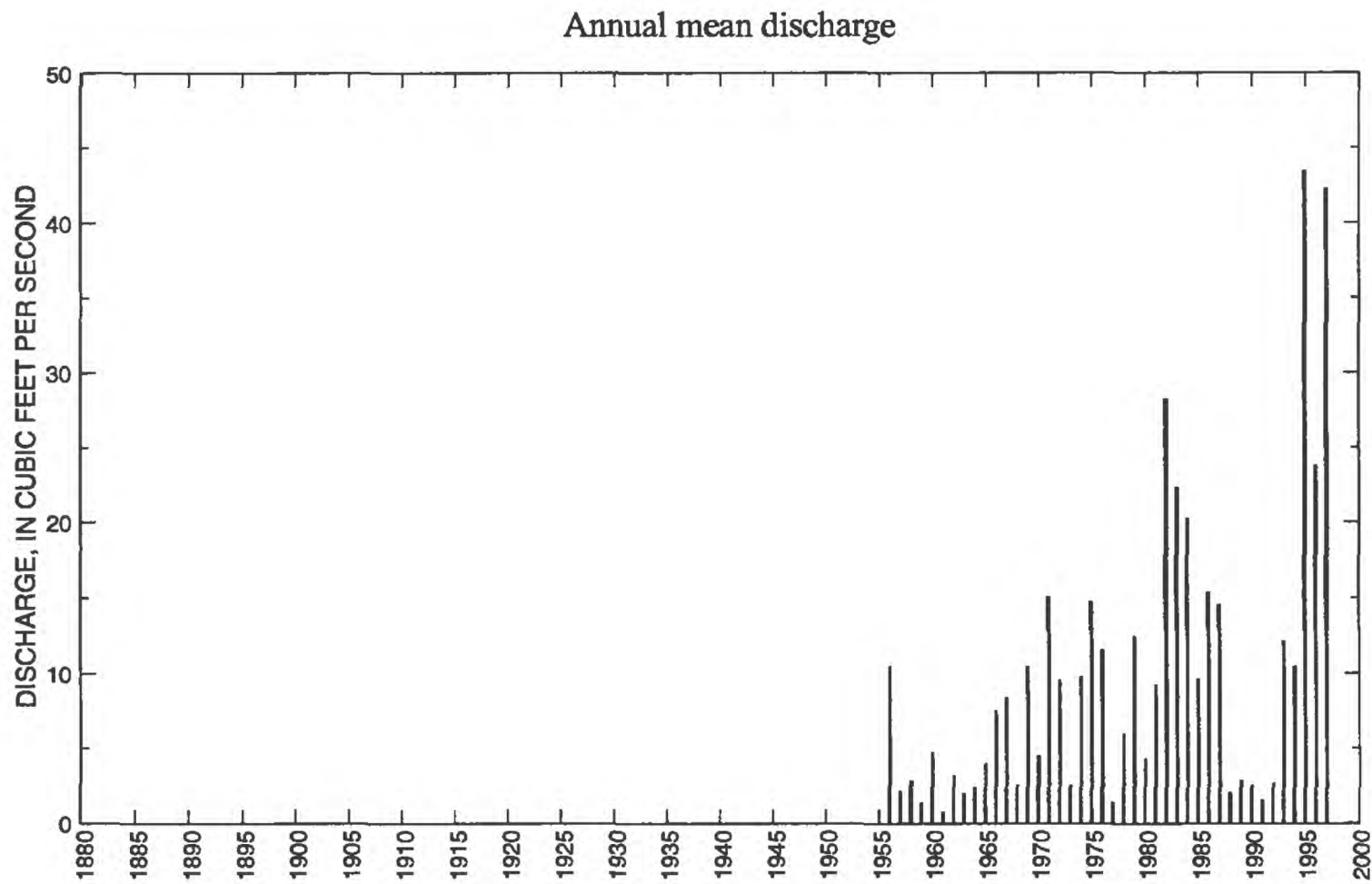
LOCATION.--Lat 47°42'10", long 99°56'55", in SW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.24, T.149 N., R.73 W., Wells County, Hydrologic Unit 09020202, on right bank just downstream from county road and 4.5 mi south of Harvey.

DRAINAGE AREA.--424 mi<sup>2</sup>, of which about 270 mi<sup>2</sup> is probably noncontributing.

PERIOD OF RECORD.--September 1955 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,547.30 ft above sea level.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,000 ft<sup>3</sup>/s, Apr. 20, 1979, gage height, 9.45 ft; maximum gage height, 10.30, Apr. 1, 1971, and Apr. 12, 1996, backwater from ice; no flow at times in most years.





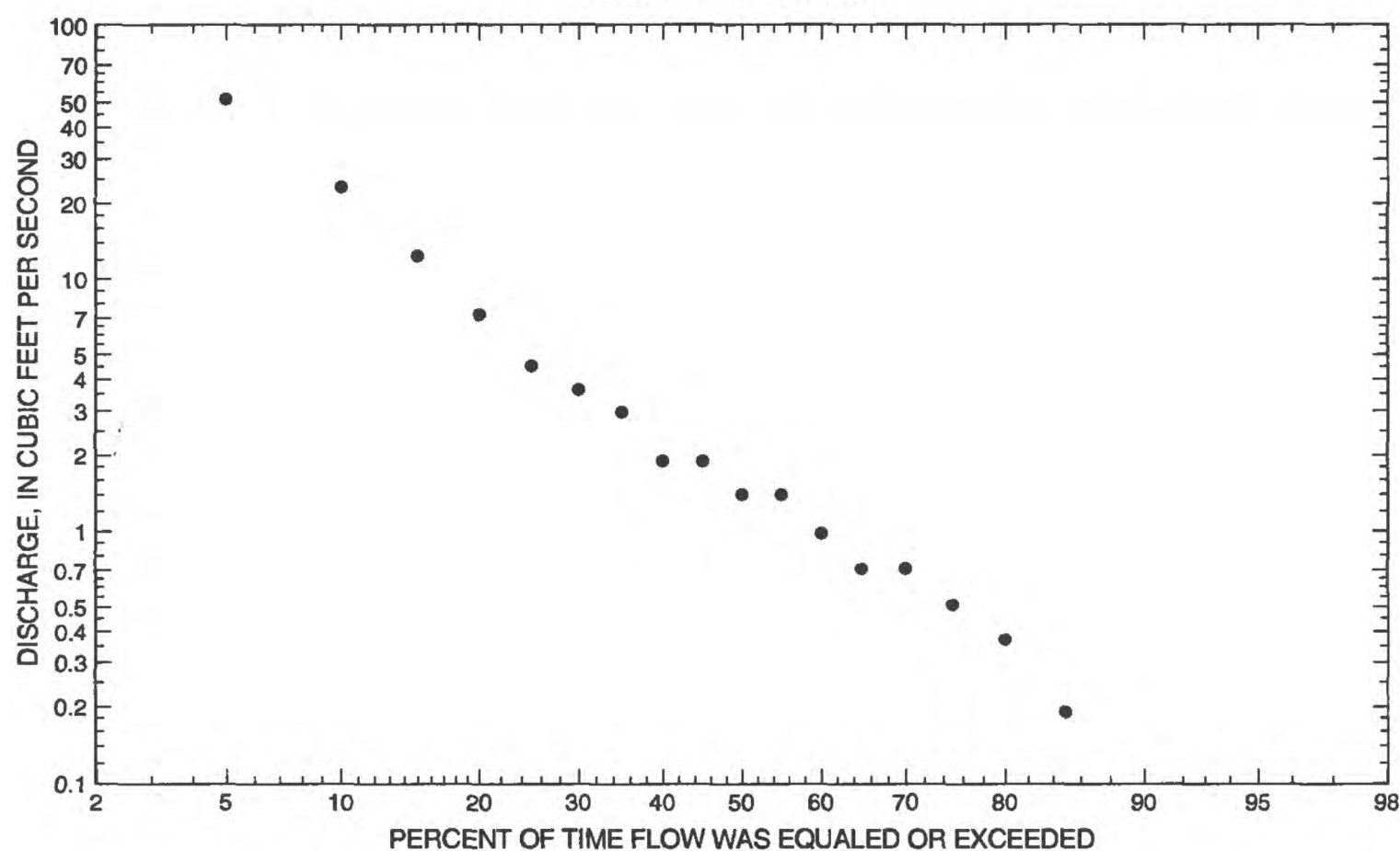
# 05054500 SHEYENNE RIVER ABOVE HARVEY, ND--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	34.5	1995	0.432	1991	3.25	5.49	1.69	2.71	
November	39.0	1995	0.265	1977	3.10	5.91	1.91	2.59	
December	21.2	1995	0.034	1996	1.43	3.30	2.30	1.20	
January	4.10	1983	0	m	0.59	1.03	1.74	0.49	
February	26.8	1983	0	m	2.51	5.38	2.14	2.10	
March	146	1995	0	1969	29.3	35.0	1.19	24.5	
April	324	1997	2.13	1991	40.6	59.1	1.45	34.0	
May	117	1995	1.59	1977	18.5	25.0	1.36	15.4	
June	54.0	1971	0.303	1961	8.45	9.87	1.17	7.06	
July	58.9	1993	0.071	1961	7.36	12.4	1.68	6.15	
August	25.6	1985	0	m	2.77	5.09	1.84	2.31	
September	4.79	1977	0.061	1976	1.71	1.27	0.74	1.43	
Annual	43.5	1995	0.763	1961	9.98	10.0	1.01	100	

Annual flow duration



# 05054500 SHEYENNE RIVER ABOVE HARVEY, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	1.80	1.20	0.53	0.08	0	0.07	0.33	0.46	0	0
90	0	0	0	2.30	1.50	0.80	0.29	0.06	0.25	0.50	0.65	0	0
85	0	0	0	2.30	1.80	0.99	0.39	0.19	0.36	0.74	0.77	0.10	0.19
80	0	0	0.24	2.80	2.20	1.20	0.53	0.25	0.43	0.90	0.91	0.13	0.37
75	0	0	0.40	3.50	2.20	1.50	0.72	0.45	0.52	1.10	1.10	0.17	0.51
70	0	0	0.85	3.50	2.70	1.90	0.72	0.60	0.62	1.10	1.30	0.28	0.71
65	0	0	1.40	4.98	3.30	2.30	0.97	0.60	0.74	1.10	1.30	0.36	0.71
60	0	0	2.30	6.35	4.00	2.30	1.30	0.60	0.89	1.40	1.50	0.47	0.98
55	0.04	0	3.00	9.58	5.64	2.80	1.80	0.80	1.10	1.40	1.50	0.60	1.40
50	0.09	0.12	4.78	14.9	6.96	3.50	2.40	0.80	1.10	1.60	1.80	0.60	1.40
45	0.17	0.20	5.69	19.5	8.15	4.30	2.40	1.10	1.30	1.60	1.80	0.78	1.90
40	0.21	0.26	7.23	24.7	10.5	5.56	3.41	1.10	1.50	1.60	1.80	0.78	1.90
35	0.39	0.45	15.0	31.8	13.7	6.78	3.97	1.40	1.50	2.00	2.10	1.00	2.98
30	0.48	0.45	21.7	39.4	17.6	8.16	4.83	1.40	1.80	2.00	2.10	1.00	3.64
25	0.48	1.00	32.6	47.6	22.3	10.5	6.30	1.90	1.80	2.50	2.50	1.00	4.53
20	0.73	1.40	49.0	58.8	27.9	13.8	7.81	2.60	2.20	3.00	2.90	1.30	7.24
15	1.10	2.30	71.5	74.6	36.7	16.7	11.6	3.88	2.60	3.70	3.50	1.30	12.4
10	1.60	3.86	101	103	51.5	21.8	17.2	5.06	3.10	5.22	4.10	2.20	23.2
5	3.00	12.2	148	170	73.2	30.7	27.5	9.53	4.50	10.8	8.29	3.81	51.6

# 05054500 SHEYENNE RIVER ABOVE HARVEY, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	5.50	3.47	2.77	2.04	1.67
0.95	1.05	14.9	10.2	8.05	5.72	4.28
0.90	1.11	24.7	17.4	13.6	9.59	6.96
0.80	1.25	44.0	31.9	24.9	17.4	12.3
0.50	2	123	90.5	70.4	50.1	35.1
0.20	5	308	223	173	129	93.7
0.10	10	477	338	263	203	153
0.04	25	738	506	395	320	253
0.02	50	963	643	503	421	346
0.01	100	1,210	788	618	534	457
0.005	200	1,480	939	737	658	585
0.002	500	1,870	ng	ng	ng	ng

# 05054500 SHEYENNE RIVER ABOVE HARVEY, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1956	April 11	8.92	224	1977	September 24	5.51	20.0
1957	March 23	8.14	26.0	1978	March 27	8.78	148
1958	June 30	7.26	58.0	1979	April 20	9.45	1,000
1959	March 28	5.70	15.0	1980	August 20	6.33	34.0
1960	March 27	8.94	209	1981	June 16	7.15	53.0
1961	April 5	5.19	14.0	1982	April 3	--	410
1962	March 24	8.51	110	1983	March 13	9.57	240
1963	June 8	7.32	65.0	1984	April 14	8.38	145
1964	April 1	8.18	54.0	1985	August 19	8.80	224
1965	April 9	8.43	95.0	1986	March 4	9.16	180
1966	March 15	9.21	410	1987	July 24	9.08	434
1967	March 26	9.94	300	1988	March 26	--	80.0
1968	March 7	7.59	62.0	1989	March 29	7.95	70.0
1969	April 11	9.45	370	1990	September 29	5.81	18.0
1970	April 6	7.74	58.0	1991	September 23	--	10.0
1971	April 2	10.25	300	1992	March 2	8.27	55.0
1972	March 15	9.09	177	1993	July 28	9.67	224
1973	February 27	9.41	18.0	1994	March 24	9.04	210
1974	May 20	8.36	160	1995	May 15	--	455
1975	April 29	--	160	1996	April 12	10.30	570
1976	March 20	--	220	1997	April 20	--	534
Annual peak discharge, from highest to lowest, and corresponding gage height							
1979	April 20	9.45	1,000	1978	March 27	8.78	148
1996	April 12	10.30	570	1984	April 14	8.38	145
1997	April 20	--	534	1962	March 24	8.51	110
1995	May 15	--	455	1965	April 9	8.43	95.0
1987	July 24	9.08	434	1988	March 26	--	80.0
1966	March 15	9.21	410	1989	March 29	7.95	70.0
1982	April 3	--	410	1963	June 8	7.32	65.0
1969	April 11	9.45	370	1968	March 7	7.59	62.0
1967	March 26	9.94	300	1958	June 30	7.26	58.0
1971	April 2	10.25	300	1970	April 6	7.74	58.0
1983	March 13	9.57	240	1992	March 2	8.27	55.0
1956	April 11	8.92	224	1964	April 1	8.18	54.0
1985	August 19	8.80	224	1981	June 16	7.15	53.0
1993	July 28	9.67	224	1980	August 20	6.33	34.0
1976	March 20	--	220	1957	March 23	8.14	26.0
1994	March 24	9.04	210	1977	September 24	5.51	20.0
1960	March 27	8.94	209	1973	February 27	9.41	18.0
1986	March 4	9.16	180	1990	September 29	5.81	18.0
1972	March 15	9.09	177	1959	March 28	5.70	15.0
1974	May 20	8.36	160	1961	April 5	5.19	14.0
1975	April 29	--	160	1991	September 23	--	10.0



# 05054500 SHEYENNE RIVER ABOVE HARVEY, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1956	1.41	1.05	0.265	0.113	0	11.0	69.3	19.1	19.2	3.49	0.910	1.58	10.5
1957	1.32	2.77	0.377	0.152	0	5.39	4.25	4.27	2.39	1.58	1.05	2.11	2.15
1958	2.56	2.46	1.10	0.635	3.57	7.15	4.97	2.38	2.07	6.94	0.100	0.443	2.86
1959	1.07	1.50	0.103	0	0	6.50	2.99	2.58	1.13	0.406	0	0.190	1.38
1960	5.95	0.980	0.897	0.316	0	30.6	5.76	6.69	3.40	0.181	0.923	0.743	4.75
1961	0.555	0.710	0.168	0.035	0.193	1.80	3.09	1.64	0.303	0.071	0.029	0.560	0.763
1962	0.474	0.810	0.090	0	0	14.2	3.21	6.54	5.56	5.78	0.761	0.680	3.21
1963	1.10	1.53	0.800	0.045	0	2.87	3.79	4.37	6.73	1.58	0.984	0.310	2.01
1964	0.852	0.983	0.219	0.013	0.031	0.081	10.0	3.42	8.30	2.55	0.952	1.76	2.42
1965	1.40	1.61	0.097	0	0	3.38	26.7	5.49	1.82	4.02	0.994	2.55	3.99
1966	2.25	1.52	1.69	0	0	61.4	4.89	3.43	3.01	9.32	1.07	0.456	7.53
1967	1.06	1.73	0.161	0	0	36.2	28.9	28.7	2.49	0.559	0	0.168	8.40
1968	1.31	1.58	0.523	0.008	0.046	10.3	4.07	5.75	1.65	1.11	2.01	2.02	2.55
1969	1.54	1.94	0.436	0	0	0	100.5	15.2	2.52	3.04	1.33	0.921	10.5
1970	1.25	1.32	1.24	0.343	0.202	0.628	19.8	14.8	7.41	3.81	1.64	1.39	4.49
1971	1.80	2.15	0.790	0.162	0.204	6.14	90.5	14.3	54.0	9.01	1.84	1.34	15.1
1972	4.18	2.49	0.908	0.001	0	61.2	25.8	13.9	3.09	1.09	0.813	0.710	9.59
1973	1.57	2.32	0.742	2.32	5.86	6.15	5.11	2.25	1.81	0.780	0.720	1.09	2.53
1974	2.53	1.39	0.166	0	0.896	15.6	22.4	54.4	17.5	0.759	0.368	0.940	9.82
1975	1.38	1.92	1.05	0.177	0.429	13.2	72.5	50.2	14.6	18.7	1.04	1.75	14.8
1976	2.10	1.92	0.739	0.423	2.04	71.1	49.8	8.64	1.78	0.418	0.074	0.061	11.6
1977	0.990	0.265	0.134	0	0	3.73	2.66	1.59	0.869	1.02	0.800	4.79	1.41
1978	2.89	1.32	0.310	0.250	0.341	34.8	15.9	7.76	3.71	2.94	0.333	0.600	5.98
1979	1.21	1.26	1.02	0.303	0.368	0.689	74.3	41.7	9.32	13.6	4.67	1.08	12.5
1980	1.31	1.83	1.43	0.939	0.500	9.27	19.1	3.55	2.15	1.29	6.64	3.90	4.32
1981	5.22	5.92	2.55	0.003	12.9	36.9	13.9	7.02	17.1	5.22	1.61	3.57	9.29
1982	2.06	1.86	1.43	0.153	19.1	123.1	98.7	25.8	17.6	43.4	5.35	0.727	28.3
1983	11.8	10.4	6.27	4.10	26.7	111.3	54.7	28.6	8.43	3.48	1.60	1.66	22.4
1984	1.45	2.48	0.879	3.19	6.68	44.8	93.4	62.1	18.1	3.34	3.24	4.29	20.3
1985	4.37	3.36	0.661	0	7.61	24.8	25.2	9.96	4.22	5.70	25.6	4.39	9.68
1986	11.2	2.89	0.682	0.561	3.45	81.4	45.9	24.9	6.07	2.81	1.73	2.53	15.4
1987	3.69	2.54	1.09	1.29	3.01	48.5	41.8	13.2	10.4	41.0	5.71	2.24	14.6
1988	1.83	1.46	0.667	0.005	0.766	9.09	3.79	2.35	1.63	0.925	1.32	0.731	2.06
1989	0.502	1.32	0.735	0	0	13.5	10.5	2.04	1.84	1.06	1.22	1.84	2.89
1990	2.05	3.18	1.34	1.13	1.08	2.25	2.90	2.83	5.06	6.29	0.924	1.48	2.55



# 05054500 SHEYENNE RIVER ABOVE HARVEY, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1991	0.432	0.633	1.03	1.05	1.61	3.33	2.13	2.65	1.12	1.03	1.08	2.46	1.54
1992	2.91	3.11	0.412	0.478	3.75	11.5	3.05	2.15	1.40	1.51	0.763	1.68	2.72
1993	1.52	2.36	1.40	0.127	0.452	27.2	7.69	4.84	12.7	58.9	22.5	4.68	12.2
1994	3.16	3.05	1.05	0.315	0.142	54.8	34.2	9.24	10.9	4.19	1.84	2.57	10.5
1995	34.5	39.0	21.2	3.11	0.638	145.8	108.9	116.7	27.3	14.8	4.34	1.99	43.5
1996	2.58	3.35	0.034	0	0	36.0	165.8	51.0	15.8	6.75	4.18	1.86	23.8
1997	2.98	3.79	3.35	3.10	2.82	43.7	324.4	88.3	18.4	14.7	3.25	1.16	42.3

## 05056000 SHEYENNE RIVER NEAR WARWICK, ND

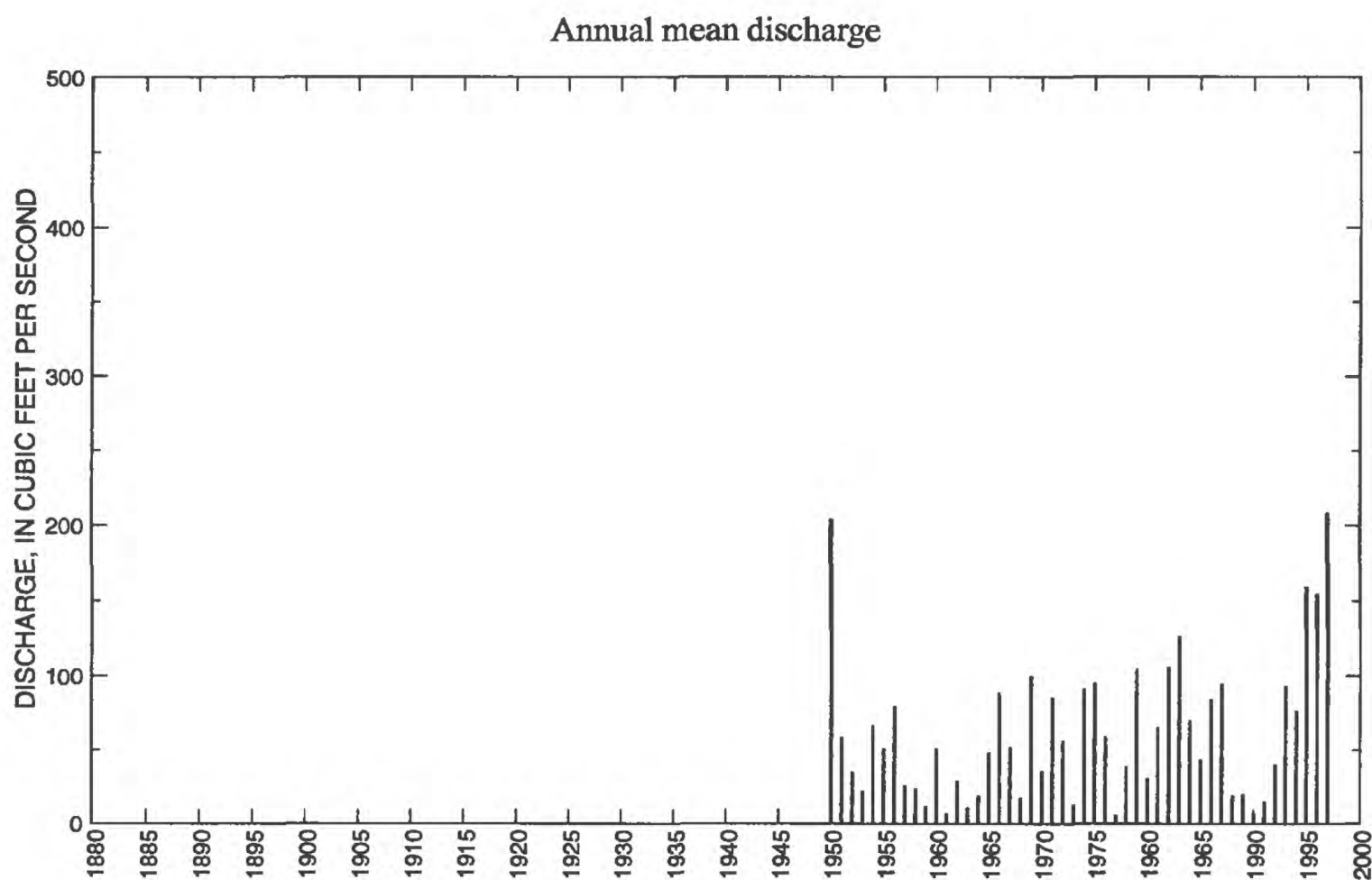
**LOCATION.**--Lat 47°48'20", long 98°42'57", on south quarter of line between secs.15 and 16, T.150 N., R.63 W., Eddy County, Hydrologic Unit 09020203, on left bank on downstream side of county highway bridge and 3.3 mi south of Warwick.

**DRAINAGE AREA.**--2,070 mi<sup>2</sup>, approximately, of which about 1,310 mi<sup>2</sup> is probably noncontributing (includes 227 mi<sup>2</sup> in closed basins).

**PERIOD OF RECORD.**--October 1949 to current year. Monthly discharge only for some periods, published in Water-Supply Paper 1308.

**GAGE.**--Water-stage recorder and rubble masonry control. Elevation of gage is 1,370 ft above sea level, by barometer.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 4,660 ft<sup>3</sup>/s, Apr. 14, 1969, gage height, 7.51 ft; maximum gage height, 8.08 ft, Apr. 21, 1997; no flow Aug. 7 to Sept. 1, 1961, and Sept. 3-9, 1961.

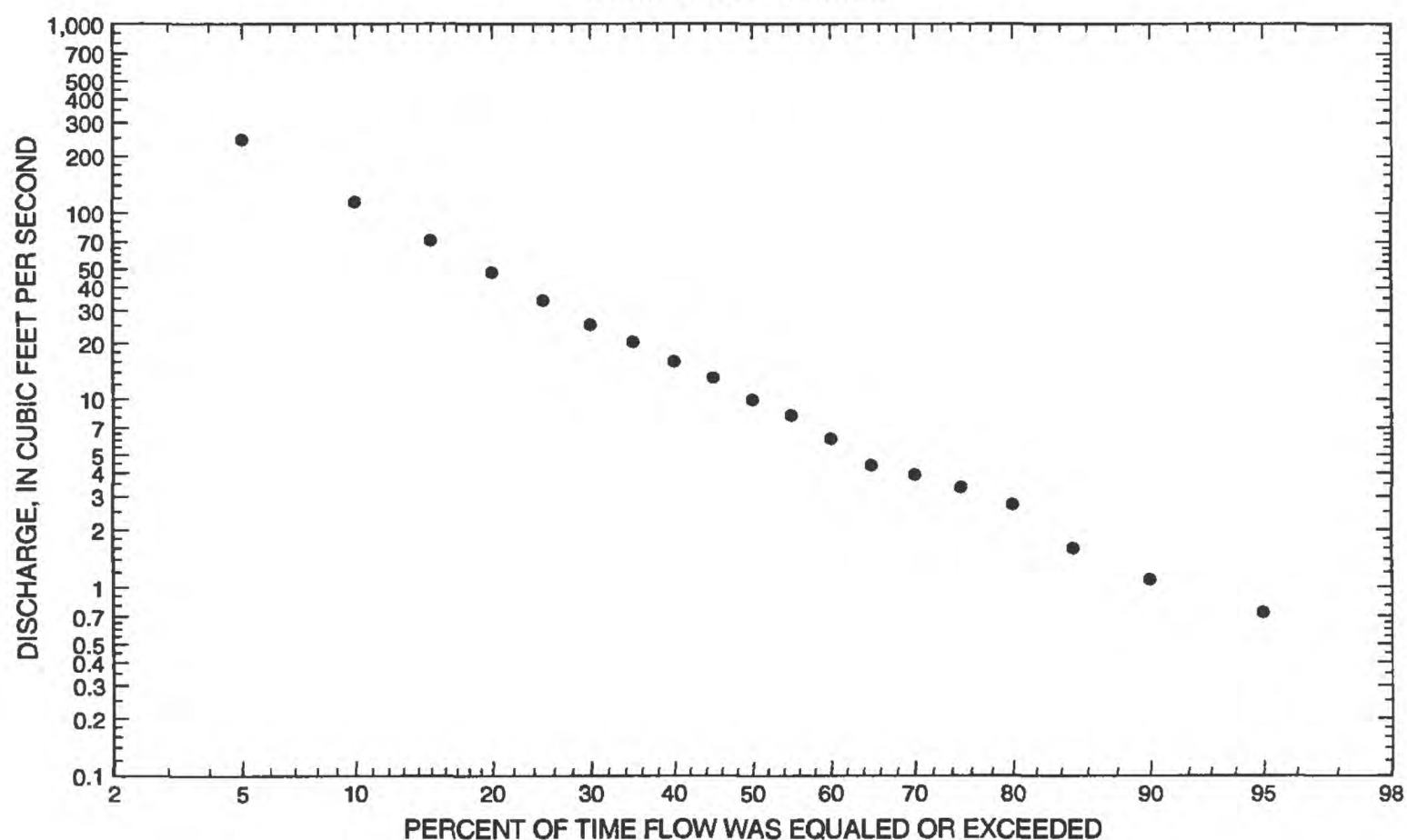


# 05056000 SHEYENNE RIVER NEAR WARWICK, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	73.2	1983	1.16	1953	13.6	15.7	1.16	1.81	
November	65.5	1995	1.28	1961	12.6	12.1	0.96	1.68	
December	42.8	1995	0.765	1961	7.81	7.56	0.97	1.04	
January	26.3	1983	0.474	1990	5.29	5.06	0.96	0.71	
February	154	1981	0.754	1990	9.81	23.3	2.38	1.31	
March	793	1983	1.46	1964	129	189	1.47	17.2	
April	1,790	1997	15.8	1977	323	379	1.17	43.1	
May	854	1950	10.4	1990	113	155	1.38	15.1	
June	326	1954	1.75	1961	55.4	60.2	1.09	7.40	
July	299	1993	0.356	1989	43.3	57.9	1.34	5.78	
August	423	1993	0.090	1961	24.9	61.9	2.49	3.32	
September	63.0	1957	0.707	1961	11.7	14.0	1.19	1.57	
Annual	208	1997	5.31	1977	62.4	48.9	0.78	100	

Annual flow duration



# 05056000 SHEYENNE RIVER NEAR WARWICK, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	1.00	0.94	1.10	15.5	11.6	2.70	0.55	0.25	0.66	0.95	1.60	1.30	0.73
90	1.20	1.20	1.90	21.2	16.0	4.75	0.94	0.74	0.84	1.10	2.20	1.80	1.10
85	1.70	1.40	2.40	25.7	18.9	7.00	1.60	0.74	0.84	1.50	2.90	2.10	1.60
80	1.90	1.40	3.10	30.7	21.7	10.4	2.70	1.10	1.30	1.80	3.90	2.90	2.70
75	1.90	1.80	4.17	36.0	24.4	12.9	4.82	1.50	1.30	2.50	3.90	2.90	3.37
70	2.30	2.20	4.67	42.0	27.2	15.4	6.21	1.50	1.70	2.90	4.50	3.40	3.93
65	2.70	2.20	5.49	49.9	31.7	17.8	7.10	2.20	1.70	3.50	5.90	4.00	4.38
60	3.10	2.70	6.70	62.5	36.1	21.0	10.4	3.39	2.20	4.10	7.09	4.00	6.12
55	3.10	2.70	7.42	82.3	40.5	24.4	13.6	4.08	3.50	4.80	8.00	4.70	8.14
50	3.10	2.70	13.1	102	47.7	29.6	16.2	5.19	4.78	6.38	8.68	4.70	9.98
45	3.60	3.40	19.9	132	57.2	35.6	19.0	7.40	6.02	8.09	10.1	5.78	13.0
40	4.20	3.40	27.8	161	70.0	42.5	22.3	10.2	7.55	9.75	11.7	6.49	16.0
35	4.20	4.20	40.9	193	83.3	50.6	27.7	13.6	9.90	12.8	13.0	7.30	20.3
30	4.90	5.27	61.2	232	97.2	59.5	33.6	17.1	12.3	14.8	14.5	8.31	25.4
25	6.83	6.53	84.1	300	118	69.3	40.5	21.3	14.8	17.0	16.7	9.74	34.0
20	8.00	7.22	117	418	140	80.6	54.3	26.5	17.4	22.1	18.7	11.2	47.9
15	8.74	8.37	182	588	181	92.5	75.9	35.9	21.3	28.5	20.9	13.8	71.2
10	11.2	11.4	388	888	247	122	103	50.4	28.4	35.8	24.5	16.2	114
5	14.6	17.7	828	1,510	394	196	153	80.0	42.6	52.5	42.2	21.7	245

# 05056000 SHEYENNE RIVER NEAR WARWICK, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	33.2	23.0	17.0	13.2	12.3
0.95	1.05	96.7	73.8	58.5	44.7	35.7
0.90	1.11	164	131	107	80.7	60.4
0.80	1.25	300	250	209	156	110
0.50	2	851	749	645	468	304
0.20	5	2,100	1,900	1,640	1,150	727
0.10	10	3,190	2,890	2,480	1,710	1,080
0.04	25	4,800	4,330	3,670	2,480	1,590
0.02	50	6,130	5,480	4,600	3,070	2,000
0.01	100	7,530	6,680	5,530	3,660	2,410
0.005	200	9,000	7,910	6,470	4,230	2,840
0.002	500	11,000	ng	ng	ng	ng



# 05056000 SHEYENNE RIVER NEAR WARWICK, ND--Continued

Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1950	April 17	7.45	3,800	1974	May 24	6.14	2,030
1951	April 11	5.01	1,240	1975	April 21	6.16	1,800
1952	April 8	4.17	737	1976	March 31	4.70	1,090
1953	July 3	3.08	204	1977	May 5	2.64	66.0
1954	June 19	4.38	878	1978	April 5	6.10	1,440
1955	April 3	5.04	1,330	1979	April 25	7.34	2,600
1956	April 18	7.83	4,250	1980	April 3	3.81	560
1957	September 5	3.17	249	1981	February 24	4.01	594
1958	March 3	4.04	666	1982	April 4	5.38	1,420
1959	March 21	2.83	153	1983	March 12	5.51	1,480
1960	April 7	5.57	1,450	1984	March 28	4.78	1,030
1961	March 26	2.55	81.0	1985	March 17	3.76	579
1962	April 1	3.50	436	1986	March 19	5.16	1,000
1963	June 25	2.68	116	1987	April 5	6.00	1,730
1964	April 9	3.13	247	1988	March 25	2.88	151
1965	April 12	4.64	1,000	1989	April 7	4.02	710
1966	March 19	7.63	3,100	1990	June 5	2.52	66.0
1967	March 31	5.24	1,340	1991	July 2	2.71	119
1968	March 12	3.10	211	1992	March 7	4.53	960
1969	April 14	7.51	4,660	1993	August 1	6.00	1,470
1970	April 10	3.52	445	1994	March 27	5.21	1,170
1971	April 12	6.55	2,360	1995	March 21	6.94	2,000
1972	March 21	5.08	1,360	1996	April 15	7.79	3,740
1973	March 13	3.10	170	1997	April 21	8.08	3,990
Annual peak discharge, from highest to lowest, and corresponding gage height							
1969	April 14	7.51	4,660	1951	April 11	5.01	1,240
1956	April 18	7.83	4,250	1994	March 27	5.21	1,170
1997	April 21	8.08	3,990	1976	March 31	4.70	1,090
1950	April 17	7.45	3,800	1984	March 28	4.78	1,030
1996	April 15	7.79	3,740	1965	April 12	4.64	1,000
1966	March 19	7.63	3,100	1986	March 19	5.16	1,000
1979	April 25	7.34	2,600	1992	March 7	4.53	960
1971	April 12	6.55	2,360	1954	June 19	4.38	878
1974	May 24	6.14	2,030	1952	April 8	4.17	737
1995	March 21	6.94	2,000	1989	April 7	4.02	710
1975	April 21	6.16	1,800	1958	March 3	4.04	666
1987	April 5	6.00	1,730	1981	February 24	4.01	594
1983	March 12	5.51	1,480	1985	March 17	3.76	579
1993	August 1	6.00	1,470	1980	April 3	3.81	560
1960	April 7	5.57	1,450	1970	April 10	3.52	445
1978	April 5	6.10	1,440	1962	April 1	3.50	436
1982	April 4	5.38	1,420	1957	September 5	3.17	249
1972	March 21	5.08	1,360	1964	April 9	3.13	247
1967	March 31	5.24	1,340	1968	March 12	3.10	211
1955	April 3	5.04	1,330	1953	July 3	3.08	204

# 05056000 SHEYENNE RIVER NEAR WARWICK, ND--Continued

Annual peak discharge and corresponding gage height--Continued

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1973	March 13	3.10	170	1963	June 25	2.68	116
1959	March 21	2.83	153	1961	March 26	2.55	81.0
1988	March 25	2.88	151	1977	May 5	2.64	66.0
1991	July 2	2.71	119	1990	June 5	2.52	66.0

# 05056000 SHEYENNE RIVER NEAR WARWICK, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1950	7.90	8.87	4.05	1.50	1.50	12.3	1,421	854.0	98.8	30.0	8.23	6.08	204.2
1951	12.0	11.1	8.23	10.6	6.68	21.7	440.3	90.5	70.1	21.5	2.68	11.6	58.5
1952	7.77	8.87	6.74	2.03	3.24	6.23	283.8	43.4	6.13	44.9	3.55	1.37	34.6
1953	1.16	7.97	2.61	2.35	2.57	13.3	38.5	60.3	61.2	64.4	3.06	2.07	21.7
1954	1.55	2.83	3.45	3.61	34.8	79.0	64.1	30.9	325.6	170.0	48.3	38.3	66.7
1955	33.5	18.5	9.06	3.14	2.43	40.4	332.5	65.4	77.5	23.6	4.48	2.11	50.8
1956	2.62	2.37	2.07	1.51	1.88	2.19	631.3	100.2	189.4	19.0	3.93	9.56	79.5
1957	6.05	23.8	6.84	2.62	1.30	43.3	51.3	36.4	21.1	24.5	25.8	63.0	25.5
1958	31.1	18.1	10.1	9.23	8.21	38.7	62.1	20.9	16.0	61.5	4.84	1.42	23.6
1959	3.05	5.23	4.63	3.20	2.49	48.6	35.2	23.9	8.92	2.57	1.11	0.803	11.7
1960	8.11	11.0	4.18	2.81	1.82	21.7	391.7	97.4	63.4	12.6	4.46	1.04	51.2
1961	1.53	1.28	0.765	0.723	0.961	23.2	31.5	13.7	1.75	1.45	0.090	0.707	6.49
1962	1.56	2.38	2.10	1.56	1.30	23.1	123.4	59.4	84.4	22.7	15.8	6.60	28.6
1963	6.10	6.30	4.62	2.14	1.52	17.1	32.0	22.4	23.0	6.95	3.57	1.71	10.6
1964	1.17	1.86	1.05	1.07	1.26	1.46	88.6	32.8	58.2	24.0	5.39	11.7	18.9
1965	16.3	8.65	5.90	2.04	3.06	12.3	270.8	38.7	17.0	123.1	57.2	24.2	48.3
1966	43.0	12.9	9.60	3.27	2.20	650.5	136.5	88.8	28.4	51.1	18.4	6.66	88.8
1967	9.65	6.52	4.13	3.64	4.74	197.2	211.5	139.8	29.5	10.4	1.43	1.57	51.9
1968	3.26	3.84	2.53	2.25	2.54	91.3	26.9	31.4	13.1	5.65	5.87	12.6	16.9
1969	6.81	4.83	3.83	2.58	2.17	2.37	1,022	85.0	26.7	24.2	24.0	5.85	99.9
1970	3.01	4.66	4.86	3.64	3.57	14.6	178.9	107.6	58.7	13.4	27.6	4.80	35.4
1971	3.84	8.10	4.27	3.18	2.10	4.61	674.7	66.6	163.6	79.6	6.85	18.3	85.6
1972	32.4	24.2	9.09	4.11	3.09	325.9	151.4	78.1	34.3	2.88	1.96	1.92	56.1
1973	3.77	8.83	3.42	2.39	1.88	72.9	25.5	20.1	6.66	1.56	1.88	3.25	12.8
1974	8.02	4.85	4.24	2.25	2.48	15.3	464.3	488.9	89.1	9.75	0.901	0.889	91.1
1975	3.73	11.8	5.70	5.95	5.75	51.6	561.2	369.5	67.5	45.4	6.38	8.07	95.2
1976	7.12	10.7	5.98	5.21	11.0	297.5	280.1	64.5	18.5	3.58	1.23	1.55	59.0
1977	1.97	2.19	2.68	3.32	3.42	15.4	15.8	12.5	2.24	1.07	1.18	1.70	5.31
1978	3.29	3.89	4.66	4.37	2.38	30.5	348.2	21.5	15.3	13.9	12.2	2.51	38.3
1979	2.74	8.97	4.39	7.09	4.76	5.79	701.3	288.9	56.2	117.4	52.0	8.30	104.7
1980	8.11	12.7	7.22	4.66	4.41	26.3	175.6	21.7	36.0	5.57	21.6	42.0	30.2
1981	41.7	50.3	19.6	12.3	153.6	165.3	71.6	53.7	135.2	40.5	19.7	28.0	65.2
1982	25.1	20.6	15.1	5.85	3.91	153.6	608.6	134.1	92.1	159.3	42.2	11.0	106.0
1983	73.2	33.9	29.6	26.3	55.9	793.0	309.2	105.1	45.2	21.4	5.46	8.40	126.4
1984	26.7	18.8	6.97	4.30	26.6	247.7	266.5	190.4	44.3	4.24	2.48	1.93	70.2

# 05056000 SHEYENNE RIVER NEAR WARWICK, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1985	8.53	8.64	5.91	3.65	4.09	249.9	39.8	29.4	29.0	7.01	80.3	44.6	43.0
1986	43.5	26.5	12.6	8.45	7.79	423.4	250.7	132.8	14.5	22.3	32.2	28.3	84.3
1987	18.5	18.7	19.3	13.1	16.1	215.7	545.1	52.8	18.7	142.0	60.2	16.9	94.8
1988	18.3	17.8	15.6	5.71	7.99	65.2	49.0	24.7	11.5	0.691	0.774	2.65	18.4
1989	2.50	4.02	3.62	3.88	3.50	4.44	186.5	23.1	4.74	0.356	0.398	0.763	19.6
1990	1.26	3.59	1.50	0.474	0.754	5.44	24.9	10.4	26.7	8.57	3.64	2.12	7.42
1991	2.38	11.1	3.77	1.64	2.64	10.5	17.0	34.5	23.8	31.9	14.6	22.1	14.7
1992	14.0	13.4	9.10	7.33	13.7	346.1	39.0	22.3	4.85	1.71	0.555	0.838	39.8
1993	1.32	3.08	4.08	3.00	2.96	82.5	182.1	49.6	20.7	299.2	423.4	37.8	93.6
1994	12.7	13.7	14.3	10.7	9.85	339.9	198.8	78.9	163.2	53.3	10.4	11.5	76.8
1995	49.9	65.5	42.8	22.5	15.7	696.4	479.6	282.9	91.4	88.8	53.5	12.1	159.6
1996	14.3	11.7	9.05	8.83	7.58	143.6	1,165	302.4	103.5	56.0	33.2	13.3	154.7
1997	16.4	13.5	9.06	7.72	6.86	35.0	1,794	414.0	61.7	104.2	34.7	18.4	208.4

## 05056900 SHEYENNE RIVER TRIBUTARY NEAR COOPERSTOWN, ND

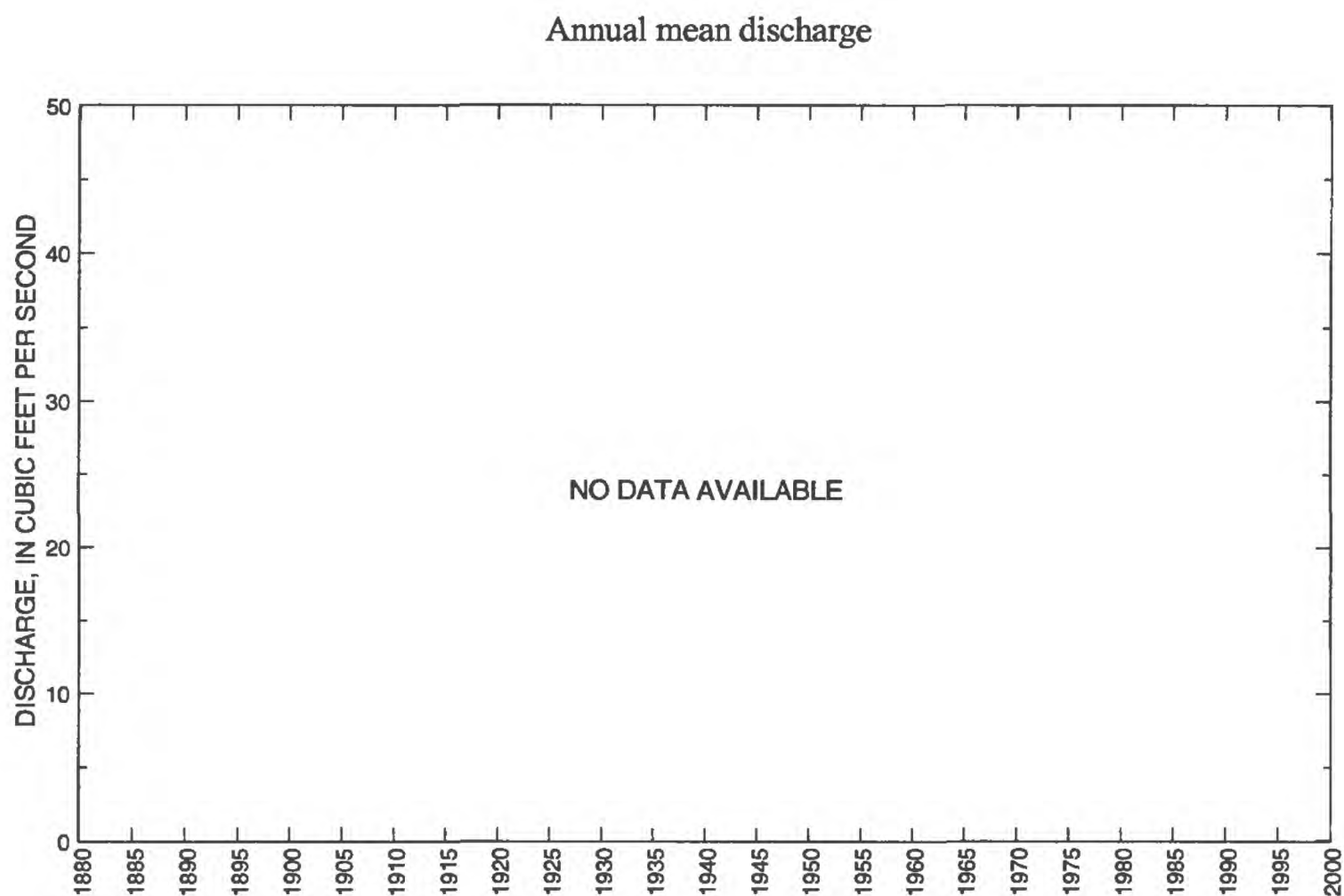
LOCATION.--Lat 47°27'25", long 98°00'25", in NW<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec.24, T.146 N., R.58 W., Griggs County, Hydrologic Unit 09020203, on county highway, 1.4 mi north of State Highway 200, and 5 mi east of Cooperstown.

DRAINAGE AREA.--15.2 mi<sup>2</sup>.

PERIOD OF RECORD.--Water year 1959-73, 1995 to current year.

GAGE.--Crest-stage gage.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,000 ft<sup>3</sup>/s, April 1969, gage height, 9.80 ft, backwater from ice; maximum gage height, 9.81 ft, March 1966, backwater from ice.



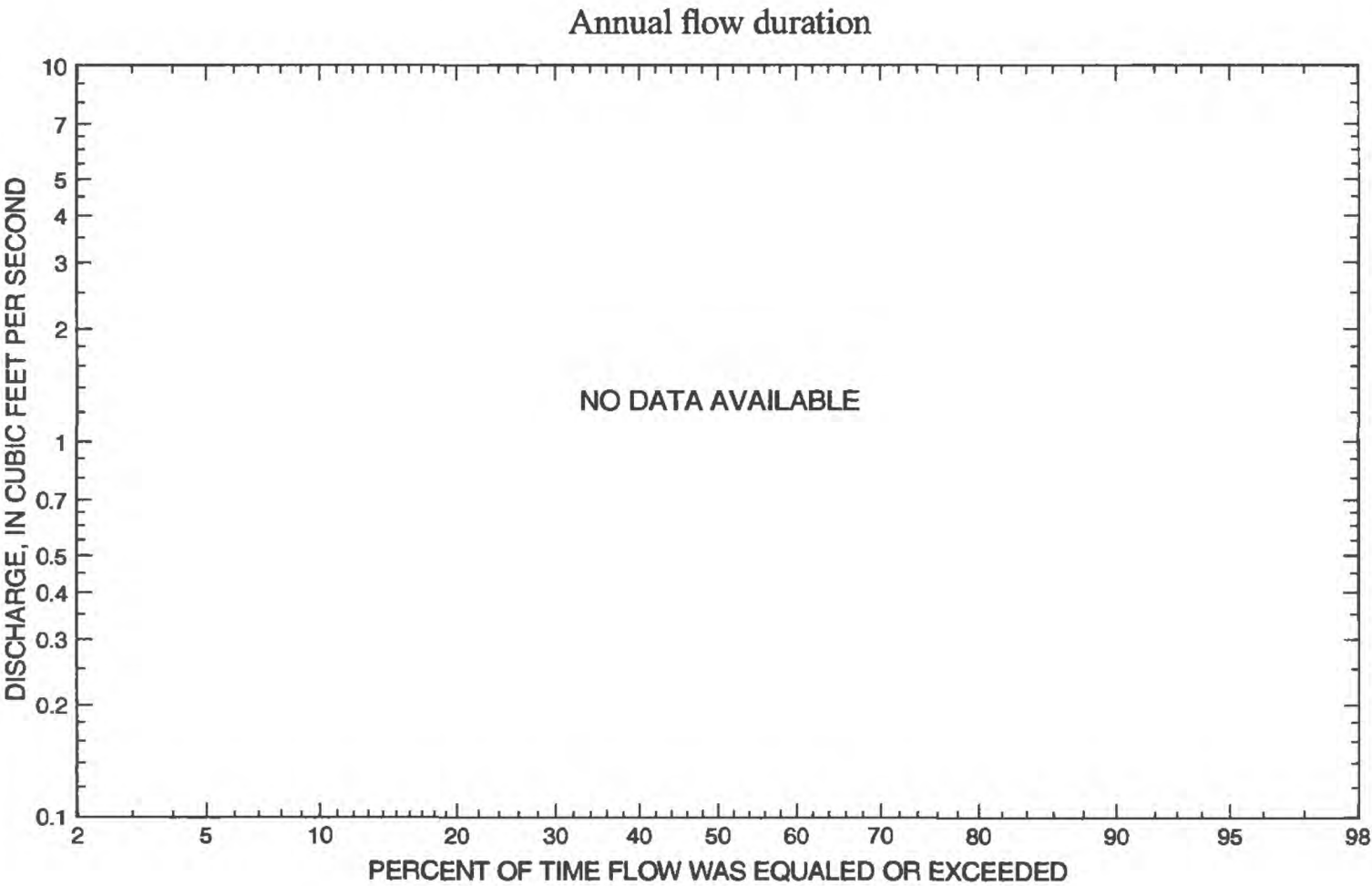


05056900 SHEYENNE RIVER TRIBUTARY NEAR COOPERSTOWN, ND--Continued

Statistics of monthly and annual mean discharges

[--, no data]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	--	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
August	--	--	--	--	--	--	--	--
September	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--



05056900 SHEYENNE RIVER TRIBUTARY NEAR COOPERSTOWN, ND--Continued

Monthly and annual flow duration, in cubic feet per second  
 [--, no data]

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	--	--	--	--	--	--	--	--	--	--	--	--	--
90	--	--	--	--	--	--	--	--	--	--	--	--	--
85	--	--	--	--	--	--	--	--	--	--	--	--	--
80	--	--	--	--	--	--	--	--	--	--	--	--	--
75	--	--	--	--	--	--	--	--	--	--	--	--	--
70	--	--	--	--	--	--	--	--	--	--	--	--	--
65	--	--	--	--	--	--	--	--	--	--	--	--	--
60	--	--	--	--	--	--	--	--	--	--	--	--	--
55	--	--	--	--	--	--	--	--	--	--	--	--	--
50	--	--	--	--	--	--	--	--	--	--	--	--	--
45	--	--	--	--	--	--	--	--	--	--	--	--	--
40	--	--	--	--	--	--	--	--	--	--	--	--	--
35	--	--	--	--	--	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--	--	--	--

# 05056900 SHEYENNE RIVER TRIBUTARY NEAR COOPERSTOWN, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given; --, no data]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	--	--	--	--
0.95	1.05	ng	--	--	--	--
0.90	1.11	69.4	--	--	--	--
0.80	1.25	117	--	--	--	--
0.50	2	283	--	--	--	--
0.20	5	587	--	--	--	--
0.10	10	813	--	--	--	--
0.04	25	1,100	--	--	--	--
0.02	50	1,320	--	--	--	--
0.01	100	1,530	--	--	--	--
0.005	200	1,730	--	--	--	--
0.002	500	1,980	--	--	--	--

# 05056900 SHEYENNE RIVER TRIBUTARY NEAR COOPERSTOWN, ND--Continued

## Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)
Annual peak discharge, by year, and corresponding gage height							
1959	April <sup>1</sup>	2.49	49.0	1968	June <sup>1</sup>	3.68	190
1960	May 25	7.14	445	1969	April <sup>1</sup>	9.80	1,000
1961	March 3	3.66	35.0	1970	April 7	7.10	700
1962	April <sup>1</sup>	5.94	350	1971	March 29	5.72	250
1963	July 11	3.95	140	1972	May 27	5.35	360
1964	June <sup>1</sup>	6.35	354	1973	March 5	3.50	5.00
1965	April 11	7.90	700	1995	March 13	5.80	385
1966	July <sup>1</sup>	4.77	375	1996	April 10	3.50	120
1967	May <sup>1</sup>	7.20	650	1997	April 2	4.88	250
Annual peak discharge, from highest to lowest, and corresponding gage height							
1969	April <sup>1</sup>	9.80	1,000	1962	April <sup>1</sup>	5.94	350
1965	April 11	7.90	700	1971	March 29	5.72	250
1970	April 7	7.10	700	1997	April 2	4.88	250
1967	May <sup>1</sup>	7.20	650	1968	June <sup>1</sup>	3.68	190
1960	May 25	7.14	445	1963	July 11	3.95	140
1995	March 13	5.80	385	1996	April 10	3.50	120
1966	July <sup>1</sup>	4.77	375	1959	April <sup>1</sup>	2.49	49.0
1972	May 27	5.35	360	1961	March 3	3.66	35.0
1964	June <sup>1</sup>	6.35	354	1973	March 5	3.50	5.00

<sup>1</sup>Day of month unknown.

05056900 SHEYENNE RIVER TRIBUTARY NEAR COOPERSTOWN, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[--, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
--	--	--	--	--	--	--	--	--	--	--	--	--	--



## 05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND

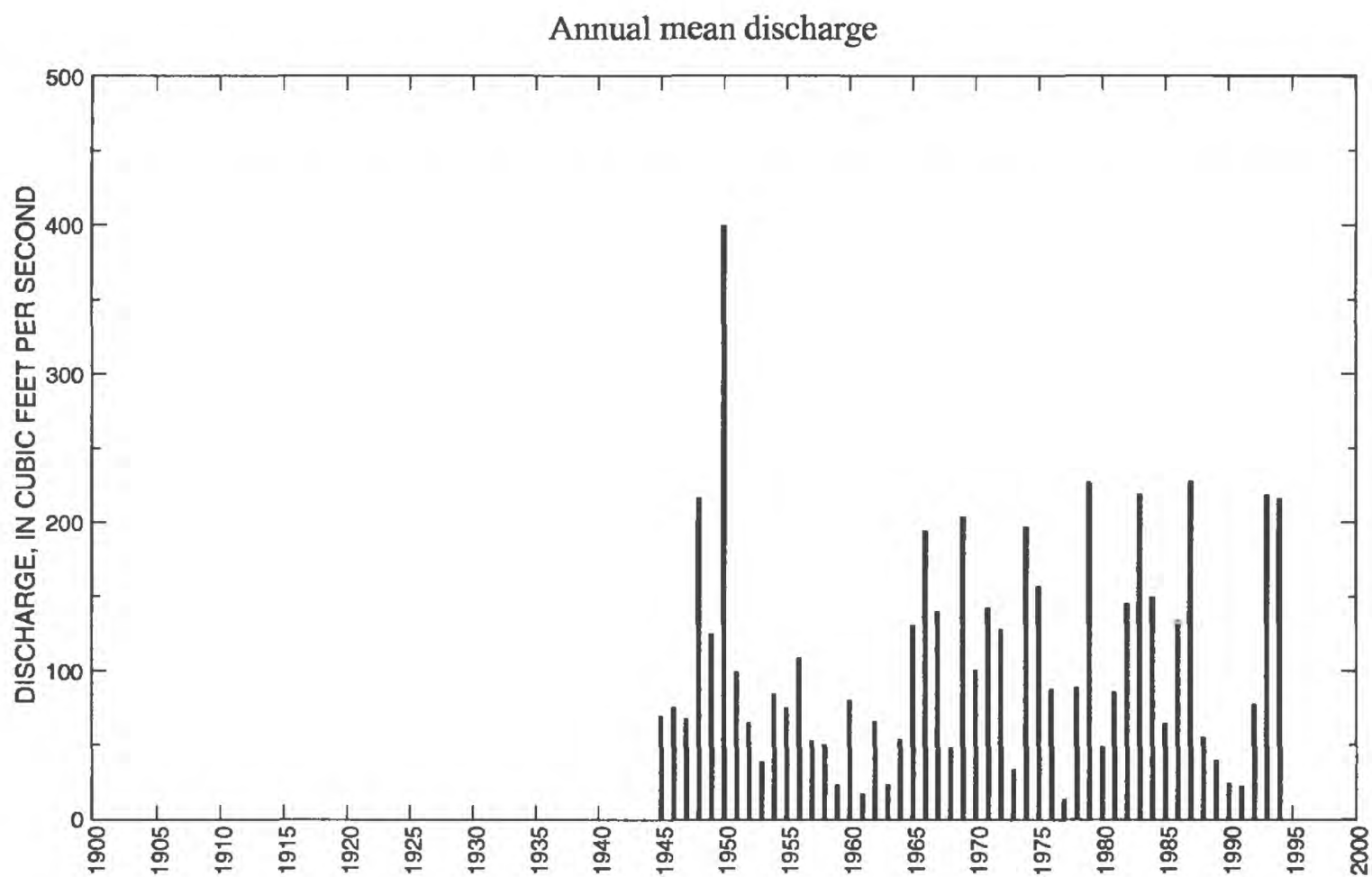
**LOCATION.**--Lat 47°25'58", long 98°01'38", in NW<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.26, T.146 N., R.58 W., Griggs County, Hydrologic Unit 09020203, on right bank at Ueland Dam, 0.7 mi downstream from State Highway 200, and 5 mi east of Cooperstown.

**DRAINAGE AREA.**--6,470 mi<sup>2</sup>, approximately, of which about 5,200 mi<sup>2</sup> is probably noncontributing (includes 3,800 mi<sup>2</sup> in closed basins).

**PERIOD OF RECORD.**--October 1944 to current year. Monthly discharge only for some periods, published in Water-Supply Paper 1308.

**GAGE.**--Water-stage recorder and artificial control. Datum of gage is 1,271.76 ft above sea level (Coast and Geodetic Survey benchmark). Aug. 31, 1950, to Oct. 22, 1985, gage located on right bank 300 ft downstream of present site and datum. Prior to Aug. 3, 1950, nonrecording gage at site 150 ft downstream of present site at same datum.

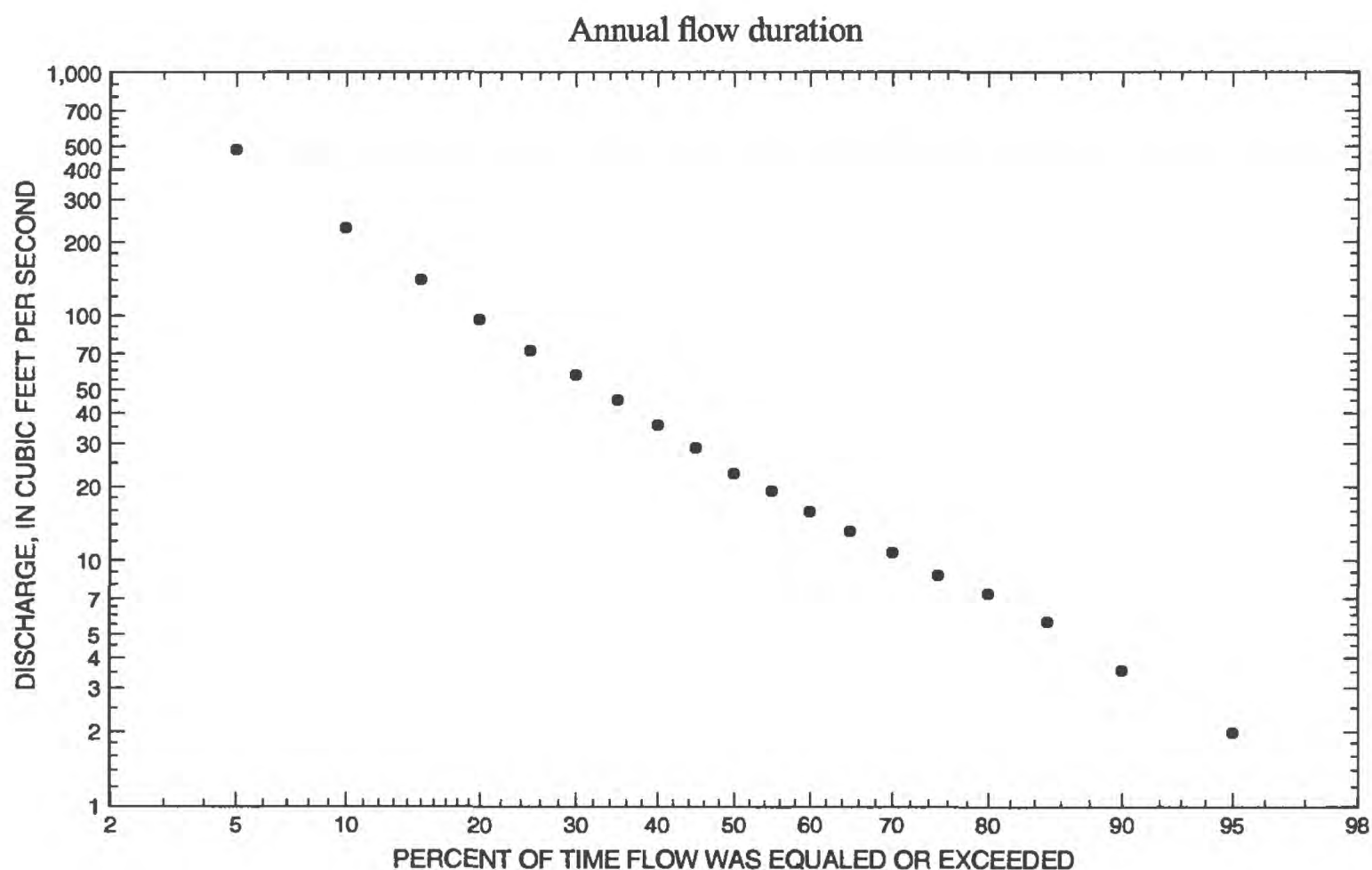
**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 7,830 ft<sup>3</sup>/s, Apr. 17, 1950, gage height, 18.69 ft; maximum gage height, 19.13 ft, Apr. 18, 1996; minimum discharge, 0 ft<sup>3</sup>/s, Aug. 29 to Oct. 8, 1959, Aug. 12 to Sept. 12, 1961, Jan. 25 to Mar. 6, 1963, and Aug. 24-25, 1963.



# 05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /a)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	392	1995	0.829	1964	34.3	56.6	1.65	2.34
November	255	1995	2.83	1977	30.8	36.3	1.18	2.09
December	119	1995	3.14	1977	19.1	18.2	0.95	1.30
January	68.2	1995	1.94	1964	12.6	11.0	0.87	0.85
February	74.7	1981	0	1963	13.1	14.6	1.12	0.89
March	1,380	1995	2.14	1964	186	284	1.53	12.7
April	2,620	1996	42.4	1991	636	636	1.00	43.2
May	1,950	1950	37.3	1961	240	337	1.40	16.3
June	435	1974	6.66	1961	120	93.4	0.78	8.15
July	640	1993	3.84	1961	90.9	106	1.16	6.19
August	1,030	1993	0.681	1961	55.0	144	2.62	3.74
September	321	1994	0	1959	32.4	55.7	1.72	2.21
Annual	399	1950	13.2	1977	122	96.0	0.78	100



# 05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	2.40	1.10	2.30	40.8	37.1	15.4	6.06	0.55	0.28	0.66	4.30	3.80	2.16
90	3.20	2.30	4.37	60.3	43.5	23.7	11.5	1.60	0.75	1.50	7.20	5.36	3.82
85	4.40	3.40	6.21	73.3	49.8	30.7	15.1	3.56	1.40	3.31	9.79	6.39	5.92
80	5.10	3.40	7.16	85.7	55.2	35.3	18.3	5.30	2.00	4.42	11.5	7.66	7.78
75	6.56	5.23	8.31	100	60.6	40.7	21.6	6.88	3.09	5.82	13.0	8.13	9.26
70	7.16	5.95	9.74	118	66.2	46.8	25.0	8.26	4.16	7.71	14.6	9.59	11.8
65	7.53	6.61	11.3	144	73.1	53.6	29.3	10.6	5.92	10.5	16.3	10.5	14.3
60	7.90	7.33	13.8	183	80.6	61.8	33.8	12.6	7.33	13.7	17.6	12.1	17.5
55	8.47	7.68	17.7	233	89.3	70.8	39.4	14.7	10.2	16.3	19.0	13.4	21.1
50	8.85	8.03	24.0	285	101	79.9	45.3	17.3	14.0	18.9	20.8	14.7	25.9
45	9.68	9.07	33.2	343	118	89.6	51.9	20.1	17.1	21.4	22.6	16.1	32.1
40	11.0	9.76	45.9	417	142	100	58.9	24.2	20.4	25.3	25.1	17.6	40.3
35	12.2	10.4	66.2	520	169	114	69.8	29.0	25.0	30.0	28.4	19.1	49.3
30	13.5	11.6	105	640	204	131	84.2	35.8	30.4	35.6	32.8	21.3	62.8
25	14.9	13.5	157	771	244	150	106	43.9	37.2	42.6	38.8	23.7	78.8
20	17.7	15.7	216	929	300	176	134	58.6	44.4	50.8	46.3	26.5	107
15	20.9	18.1	344	1,200	391	212	167	76.5	51.7	61.4	52.4	29.8	159
10	26.2	25.0	571	1,690	496	267	217	102	66.3	74.7	58.0	37.7	254
5	32.5	36.6	1,000	2,570	930	361	304	167	113	101	75.2	48.4	540

# 05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /a)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	66.8	52.8	47.3	43.7	39.0
0.95	1.05	170	144	130	114	92.9
0.90	1.11	271	238	215	184	144
0.80	1.25	465	418	378	317	238
0.50	2	1,200	1,110	998	813	581
0.20	5	2,810	2,570	2,290	1,840	1,290
0.10	10	4,200	3,780	3,350	2,700	1,900
0.04	25	6,280	5,520	4,840	3,920	2,780
0.02	50	8,010	6,900	6,010	4,910	3,510
0.01	100	9,880	8,340	7,220	5,930	4,290
0.005	200	11,900	9,810	8,440	6,980	5,120
0.002	500	14,700	ng	ng	ng	ng

# 05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND--Continued

Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1945	March 20	10.50	1,000	1972	March 27	12.26	1,120
1946	April 2	10.68	964	1973	March 15	7.52	260
1947	April 8	13.89	1,150	1974	April 15	16.40	2,460
1948	April 23	18.10	5,600	1975	April 25	15.35	1,490
1949	April 17	15.95	2,290	1976	April 2	13.45	1,450
1950	April 17	18.69	7,830	1977	April 5	5.49	136
1951	April 19	11.05	989	1978	April 12	14.13	1,460
1952	April 14	13.02	1,240	1979	April 20	17.87	4,680
1953	July 3	6.22	271	1980	April 9	10.57	750
1954	June 26	9.32	682	1981	March 23	8.61	500
1955	April 11	11.41	1,060	1982	April 12	15.83	1,900
1956	April 24	16.32	2,600	1983	April 12	16.24	1,610
1957	September 4	6.68	280	1984	April 3	15.13	1,850
1958	April 7	7.04	340	1985	March 23	11.74	930
1959	April 1	7.95	360	1986	March 23	15.56	1,760
1960	April 14	13.38	1,340	1987	April 5	18.21	4,840
1961	April 3	5.13	120	1988	April 5	10.96	389
1962	April 11	12.69	900	1989	April 16	11.95	796
1963	April 6	7.25	300	1990	June 30	10.30	159
1964	June 23	10.34	795	1991	May 6	7.09	84.0
1965	April 15	16.03	2,320	1992	March 16	13.72	1,100
1966	March 23	17.62	3,040	1993	July 25	18.33	2,780
1967	March 31	15.75	2,160	1994	April 1	15.31	1,750
1968	March 29	8.31	415	1995	March 26	17.78	3,380
1969	April 17	18.07	5,050	1996	April 18	19.13	6,760
1970	April 8	12.80	1,220	1997	April 24	18.52	5,280
1971	April 17	16.31	2,310				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1950	April 17	18.69	7,830	1984	April 3	15.13	1,850
1996	April 18	19.13	6,760	1986	March 23	15.56	1,760
1948	April 23	18.10	5,600	1994	April 1	15.31	1,750
1997	April 24	18.52	5,280	1983	April 12	16.24	1,610
1969	April 17	18.07	5,050	1975	April 25	15.35	1,490
1987	April 5	18.21	4,840	1978	April 12	14.13	1,460
1979	April 20	17.87	4,680	1976	April 2	13.45	1,450
1995	March 26	17.78	3,380	1960	April 14	13.38	1,340
1966	March 23	17.62	3,040	1952	April 14	13.02	1,240
1993	July 25	18.33	2,780	1947	April 8	13.89	1,150
1956	April 24	16.32	2,600	1970	April 8	12.80	1,220
1974	April 15	16.40	2,460	1972	March 27	12.26	1,120
1965	April 15	16.03	2,320	1992	March 16	13.72	1,100
1971	April 17	16.31	2,310	1955	April 11	11.41	1,060
1949	April 17	15.95	2,290	1945	March 20	10.50	1,000
1967	March 31	15.75	2,160	1951	April 19	11.05	989
1982	April 12	15.83	1,900	1946	April 2	10.68	964



# 05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND--Continued

Annual peak discharge and corresponding gage height--Continued

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1970	April 8	11.25	964	1959	April 1	7.95	360
1985	March 23	11.74	930	1958	April 7	7.04	340
1962	April 11	12.69	900	1963	April 6	7.25	300
1989	April 16	11.95	796	1957	September 4	6.68	280
1964	June 23	10.34	795	1953	July 3	6.22	271
1980	April 9	10.57	750	1973	March 15	7.52	260
1954	June 26	9.32	682	1990	June 30	10.30	159
1981	March 23	8.61	500	1977	April 5	5.49	136
1968	March 29	8.31	415	1961	April 3	5.13	120
1988	April 5	10.96	389	1991	May 6	7.09	84.0

# 05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1945	20.0	50.0	25.0	8.00	10.0	403.8	128.2	78.2	65.6	19.8	8.57	10.2	69.5
1946	9.35	12.8	8.46	9.44	3.71	370.5	297.4	52.9	24.1	61.9	34.0	13.0	75.2
1947	23.3	18.2	9.61	7.74	4.46	151.7	415.5	66.7	64.4	29.3	14.5	5.38	67.4
1948	18.7	15.6	12.1	10.6	5.41	6.77	1,780	618.6	69.3	46.8	26.6	2.76	216.2
1949	6.26	15.6	11.4	5.61	4.64	22.2	1,142	140.4	74.1	55.7	24.6	2.85	124.5
1950	23.8	23.7	16.8	12.9	8.61	53.7	2,293	1,953	272.6	80.4	24.6	25.4	399.4
1951	29.0	23.9	23.2	20.8	17.9	83.6	650.4	173.4	91.4	35.0	11.2	31.8	98.9
1952	18.1	16.4	15.7	11.6	10.6	44.3	446.6	80.0	32.0	85.6	12.1	6.26	64.6
1953	3.64	11.3	7.47	6.23	7.71	18.3	62.8	73.3	123.2	132.4	8.74	2.38	38.2
1954	4.19	9.25	8.77	7.68	48.2	121.9	116.6	51.3	313.0	213.1	65.5	47.3	83.8
1955	46.0	34.5	17.8	8.58	7.84	27.6	438.8	96.5	171.4	45.9	6.45	0.860	74.8
1956	3.49	6.60	5.53	4.66	4.00	4.81	677.9	243.0	280.3	51.3	12.9	18.3	108.5
1957	13.2	37.8	15.0	9.87	7.43	75.4	108.8	75.1	45.3	47.3	36.7	155.2	52.3
1958	86.7	61.8	31.5	17.8	15.8	48.1	126.6	45.9	38.0	107.6	12.8	2.35	49.8
1959	3.48	9.91	6.41	3.30	1.48	36.9	129.5	42.1	24.3	10.4	0.855	0	22.4
1960	8.50	8.35	6.57	5.08	3.74	52.8	616.1	101.4	121.4	31.8	8.20	4.24	79.9
1961	2.85	8.96	5.89	3.63	0.607	51.3	79.0	37.3	6.66	3.84	0.681	0.703	16.8
1962	3.77	3.35	4.70	4.09	2.36	24.7	360.5	108.2	189.2	49.1	26.4	11.9	65.4
1963	9.02	19.5	11.5	4.00	0	32.8	94.6	39.0	30.0	28.1	2.67	2.67	22.8
1964	0.829	3.64	3.43	1.94	1.22	2.14	161.8	62.4	236.7	101.3	27.7	40.9	53.3
1965	43.9	25.3	10.7	9.12	7.49	10.0	925.5	146.5	99.6	91.1	153.4	55.0	130.9
1966	95.8	41.8	21.9	14.0	7.65	1,022	385.3	236.2	154.5	188.4	107.9	27.8	193.9
1967	28.4	18.1	16.6	11.2	11.8	236.9	891.1	313.6	95.3	39.0	8.02	5.21	139.4
1968	13.0	14.7	9.82	8.75	7.53	169.2	125.9	78.9	81.3	23.9	14.6	24.6	47.8
1969	15.5	17.7	14.7	8.77	8.43	7.84	1,867	263.7	97.6	88.2	38.9	32.2	203.4
1970	27.4	26.7	22.5	15.6	11.7	32.3	520.7	265.4	184.7	39.0	39.3	19.2	100.1
1971	16.3	22.7	15.0	9.53	8.86	43.8	992.3	170.0	219.2	159.2	25.9	32.5	142.1
1972	51.5	52.4	23.9	10.1	7.06	462.0	478.5	266.6	130.7	21.4	15.5	7.79	127.5
1973	14.6	21.2	17.6	11.8	8.80	142.8	73.5	48.1	31.1	6.37	1.85	17.3	33.1
1974	42.1	17.8	13.3	7.75	5.84	10.3	1,111	659.9	435.2	41.9	16.7	5.29	196.7
1975	14.8	35.0	15.5	12.3	14.0	104.4	715.0	670.0	168.3	95.3	17.9	11.0	156.5
1976	21.6	21.3	15.7	11.7	12.1	196.3	596.4	115.9	39.0	16.7	3.05	0.869	87.1
1977	1.38	2.83	3.14	3.10	3.47	21.9	59.2	39.1	11.2	9.30	0.778	3.32	13.2
1978	11.3	12.2	9.15	8.52	5.03	91.3	707.9	93.8	50.6	21.5	21.5	30.8	88.1
1979	4.58	9.15	8.18	6.81	6.50	6.06	1,322	949.1	127.5	187.0	69.2	21.5	226.7

# 05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1980	11.7	23.7	15.5	11.2	10.5	43.3	283.5	57.4	53.4	15.1	8.06	50.6	48.3
1981	48.1	61.1	23.8	15.5	74.7	303.5	127.8	73.7	149.4	87.3	29.7	26.1	85.1
1982	40.6	32.6	21.1	8.84	4.61	104.5	875.5	214.5	165.9	195.4	61.5	17.0	144.9
1983	114.2	65.0	61.0	28.9	26.9	1,094	542.2	176.5	161.5	120.9	115.0	97.5	218.5
1984	49.3	46.4	37.1	25.5	16.6	354.5	770.9	328.3	115.0	40.9	8.95	0.966	149.3
1985	17.2	18.5	12.1	5.05	5.51	299.5	128.7	105.1	80.2	18.3	17.4	56.9	64.1
1986	54.2	71.0	24.1	20.2	10.7	500.9	421.1	298.7	49.0	71.6	42.1	24.3	133.2
1987	39.7	29.2	30.2	22.9	28.0	247.9	1,603	141.4	93.9	229.4	213.6	53.2	227.0
1988	52.3	52.8	43.0	16.5	17.6	154.6	183.0	72.3	29.3	24.3	8.41	1.82	54.7
1989	3.57	12.7	7.26	2.63	7.59	11.2	305.4	68.2	37.8	8.06	1.87	7.11	39.2
1990	4.38	11.1	4.05	6.16	5.79	7.83	69.5	38.4	76.8	40.7	13.5	6.44	23.7
1991	2.56	11.5	6.92	3.21	8.66	22.5	42.4	61.8	30.0	45.4	10.4	15.0	21.8
1992	25.5	22.9	16.9	12.9	19.6	516.9	96.5	64.0	39.1	80.8	15.3	8.56	77.3
1993	8.95	19.4	11.9	8.86	9.36	43.3	397.5	125.6	73.6	640.2	1,033	220.4	218.1
1994	79.2	50.1	41.2	31.4	31.2	426.1	686.1	179.3	318.7	314.8	108.1	321.0	215.7
1995	391.6	254.7	118.9	68.2	64.4	1,381	1,244	533.5	222.8	205.3	118.1	51.3	389.8
1996	69.7	70.7	32.9	34.0	33.0	116.3	2,623	578.6	252.6	203.5	107.8	35.6	343.9
1997	69.8	46.3	37.5	31.3	26.4	41.1	2,390	1,153	202.2	213.2	101.6	47.1	362.7

## 05057200 BALDHILL CREEK NEAR DAZEY, ND

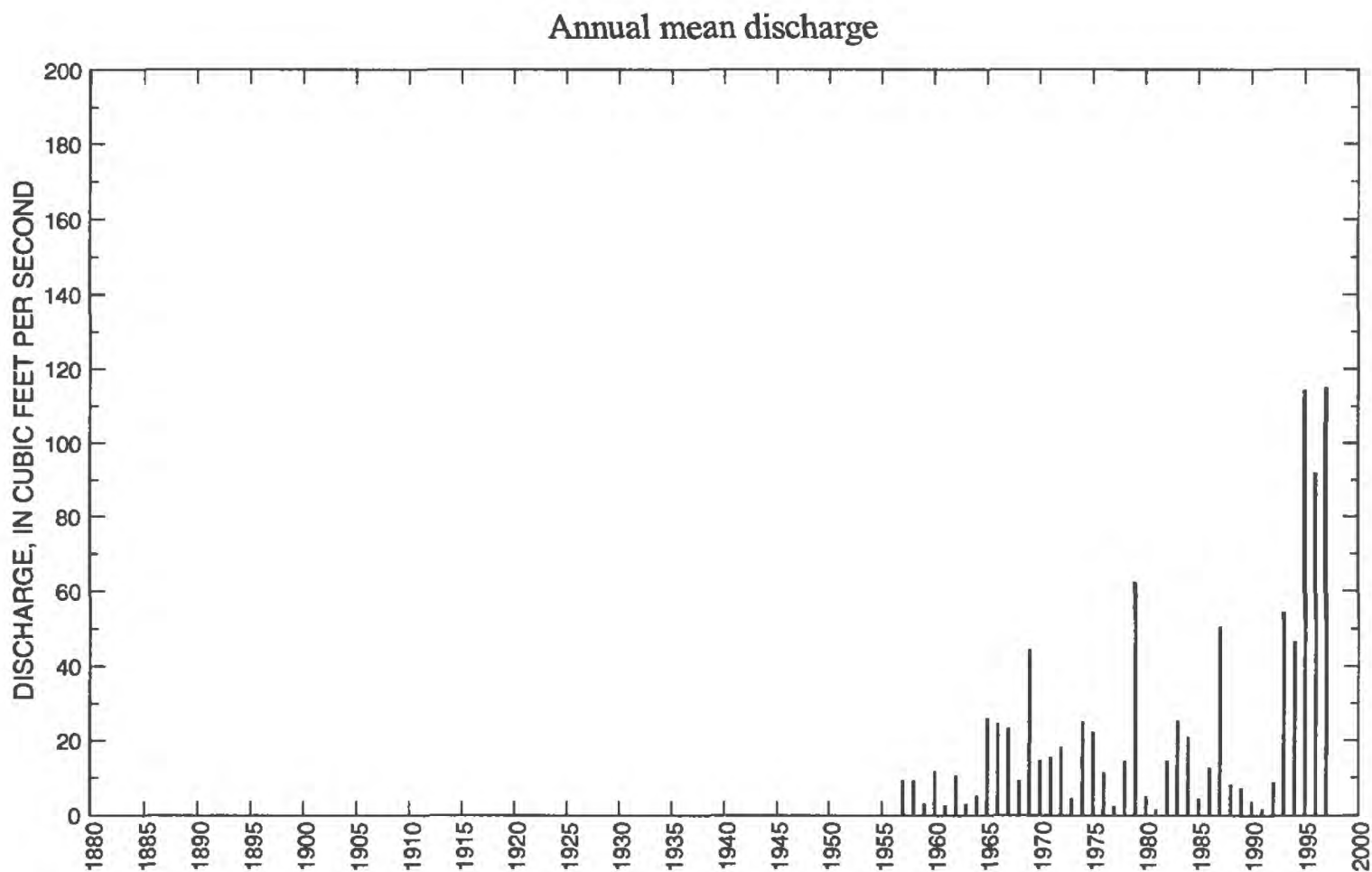
LOCATION.--Lat 47°13'45", long 98°07'28", in NW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.2, T.143 N., R.59 W., Barnes County, Hydrologic Unit 09020203, on left bank 500 ft upstream from bridge on county highway, 4.5 mi northeast of Dazey, and 14 mi upstream from mouth.

DRAINAGE AREA.--691 mi<sup>2</sup>, of which about 340 mi<sup>2</sup> is probably noncontributing.

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

GAGE.--Water-stage recorder. Prior to Nov. 9, 1956, nonrecording gage 500 ft downstream at same datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,000 ft<sup>3</sup>/s, Apr. 19, 1979, gage height, 17.78 ft; no flow at times.



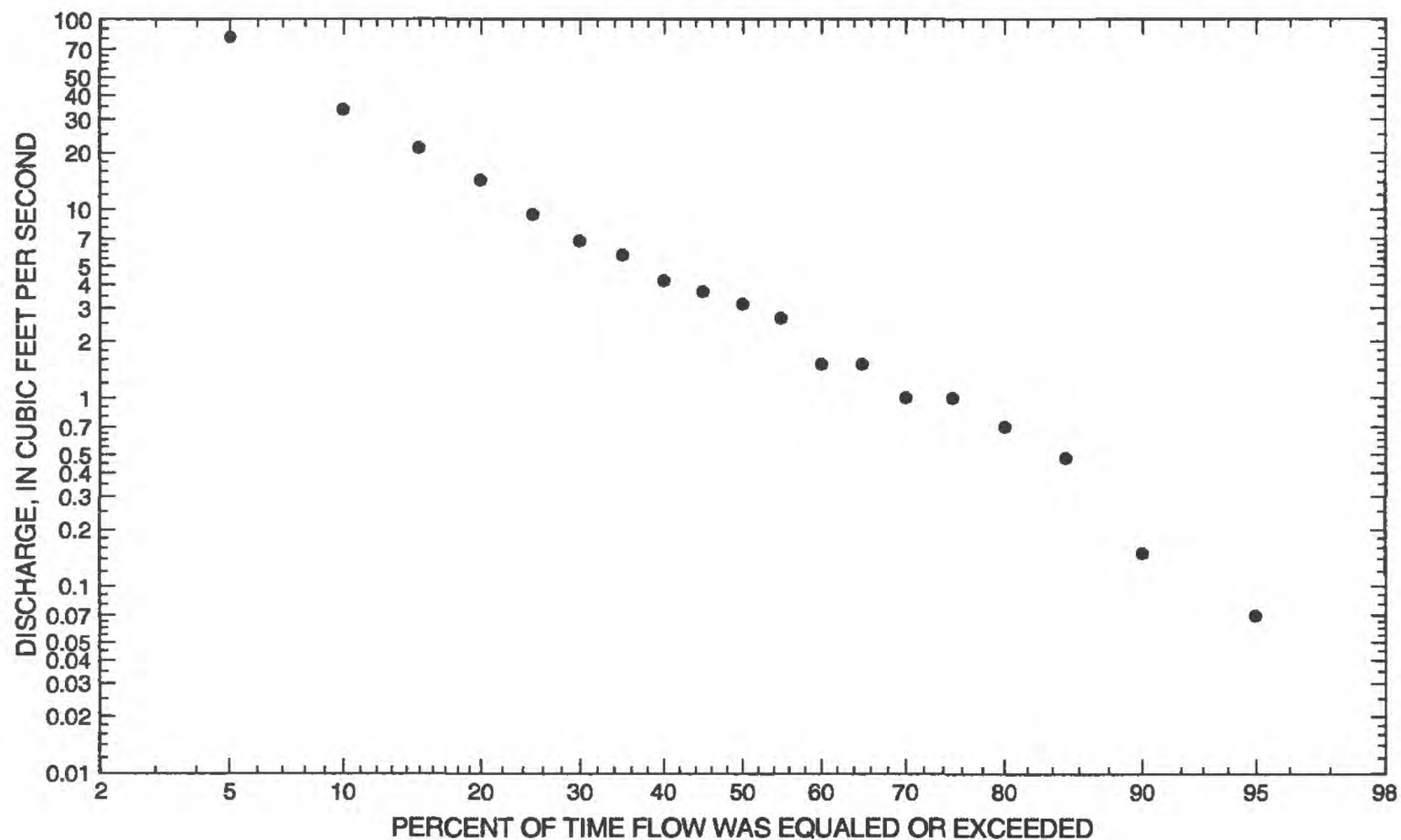
# 05057200 BALDHILL CREEK NEAR DAZEY, ND--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual dischrge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	106	1995	0.473	1992	7.37	16.9	2.29	2.64
November	48.7	1995	0.380	1960	5.39	8.02	1.49	1.93
December	16.1	1995	0.155	1959	2.74	2.94	1.07	0.98
January	7.31	1995	0	m	1.31	1.75	1.33	0.47
February	6.42	1995	0	m	1.66	1.94	1.16	0.60
March	476	1995	0.587	1964	59.0	91.3	1.55	21.1
April	1,040	1997	2.44	1981	128	215	1.67	46.0
May	220	1997	1.71	1981	27.5	43.0	1.56	9.86
June	53.0	1996	0.907	1961	14.3	14.5	1.02	5.12
July	273	1993	0.021	1989	17.2	43.6	2.54	6.16
August	133	1993	0.076	1984	7.67	21.9	2.86	2.75
September	58.5	1957	0.094	1984	6.82	13.5	1.98	2.44
Annual	115	1997	1.52	1981	23.4	28.4	1.21	100

Annual flow duration





# 05057200 BALDHILL CREEK NEAR DAZEY, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0.09	2.10	1.50	0.94	0.11	0.03	0.10	0.38	0.94	0.14	0.07
90	0	0	0.18	4.43	2.30	1.20	0.22	0.17	0.25	0.70	1.10	0.29	0.15
85	0	0	0.53	5.97	3.30	1.80	0.44	0.31	0.45	0.95	1.40	0.59	0.48
80	0.10	0.10	0.76	6.63	4.10	2.30	0.86	0.58	0.61	1.30	1.70	0.74	0.70
75	0.15	0.10	1.10	8.40	5.80	2.90	1.20	0.80	0.82	1.30	1.70	0.95	1.00
70	0.17	0.16	1.60	10.3	6.45	3.60	1.20	0.80	1.10	1.80	2.10	0.95	1.00
65	0.25	0.20	2.30	13.8	7.37	4.63	1.70	0.80	1.10	1.80	2.10	1.20	1.50
60	0.35	0.26	3.38	16.9	8.27	5.28	2.71	1.10	1.50	2.40	2.10	1.20	1.50
55	0.50	0.34	4.03	20.1	10.8	6.26	3.24	1.10	1.50	2.40	2.60	1.50	2.64
50	0.59	0.43	5.49	23.9	12.6	7.45	3.81	1.50	2.00	2.40	2.60	1.50	3.16
45	0.71	0.56	6.76	29.5	14.6	9.06	4.82	1.50	2.00	3.40	3.20	1.90	3.68
40	0.84	0.92	8.38	38.5	17.0	10.8	6.06	2.00	2.60	3.71	3.90	1.90	4.19
35	1.00	1.20	14.3	49.3	20.2	12.7	7.55	2.00	2.60	4.03	3.90	2.50	5.74
30	1.40	1.50	20.3	64.2	22.9	14.7	10.3	3.45	3.63	4.55	3.90	2.50	6.81
25	1.70	1.50	31.5	85.0	26.1	17.0	13.4	4.14	4.23	5.08	5.29	3.10	9.46
20	2.00	2.00	49.4	124	30.3	21.4	17.9	5.21	5.32	6.82	6.10	4.16	14.3
15	2.40	4.22	79.0	183	38.9	26.7	23.7	6.14	7.92	9.24	6.76	4.75	21.1
10	3.40	5.13	159	308	60.8	33.8	34.7	11.7	13.3	14.2	8.20	6.02	33.8
5	4.90	6.18	362	666	126	50.6	60.7	30.9	32.8	24.6	19.2	8.30	81.4

# 05057200 BALDHILL CREEK NEAR DAZEY, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	7.90	3.43	2.95	2.51	2.45
0.95	1.05	25.1	12.7	10.8	8.84	7.32
0.90	1.11	45.4	24.8	20.9	16.7	12.9
0.80	1.25	91.4	54.0	45.0	34.9	25.1
0.50	2	330	219	177	130	85.0
0.20	5	1,110	789	618	430	269
0.10	10	2,030	1,480	1,130	766	479
0.04	25	3,780	2,790	2,090	1,370	869
0.02	50	5,600	4,130	3,050	1,960	1,260
0.01	100	7,910	5,810	4,240	2,670	1,750
0.005	200	10,800	7,870	5,660	3,510	2,350
0.002	500	15,600	ng	ng	ng	ng

# 05057200 BALDHILL CREEK NEAR DAZEY, ND--Continued

## Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1956	April 12	6.75	767	1977	March 15	3.18	25.0
1957	September 3	5.07	248	1978	March 30	6.93	560
1958	October 25	3.31	56.0	1979	April 19	17.78	9,000
1959	March 14	4.42	30.0	1980	March 30	8.15	100
1960	April 5	6.00	370	1981	February 17	4.65	28.0
1961	March 2	3.60	40.0	1982	March 30	8.70	580
1962	March 28	6.84	390	1983	March 7	9.95	650
1963	April 6	3.47	24.0	1984	March 27	9.16	755
1964	June 19	3.65	60.0	1985	March 10	5.50	88.0
1965	April 12	9.23	1,780	1986	March 20	6.51	210
1966	March 13	8.69	880	1987	April 3	8.99	960
1967	March 27	6.90	650	1988	March 28	5.80	115
1968	June 8	4.46	210	1989	April 3	6.64	303
1969	April 11	10.90	2,510	1990	June 13	6.67	32.0
1970	June 17	5.96	472	1991	May 23	6.74	50.0
1971	March 31	6.20	305	1992	March 6	8.14	239
1972	April 14	5.03	305	1993	July 24	14.50	1,450
1973	March 14	3.84	100	1994	March 22	9.91	1,020
1974	April 11	8.39	1,130	1995	March 17	11.88	1,900
1975	April 17	7.51	680	1996	April 12	11.13	1,900
1976	March 24	6.39	400	1997	April 3	11.56	2,780
Annual peak discharge, from highest to lowest, and corresponding gage height							
1979	April 19	17.78	9,000	1960	April 5	6.00	370
1997	April 3	11.56	2,780	1971	March 31	6.20	305
1969	April 11	10.90	2,510	1972	April 14	5.03	305
1995	March 17	11.88	1,900	1989	April 3	6.64	303
1996	April 12	11.13	1,900	1957	September 3	5.07	248
1965	April 12	9.23	1,780	1992	March 6	8.14	239
1993	July 24	14.50	1,450	1968	June 8	4.46	210
1974	April 11	8.39	1,130	1986	March 20	6.51	210
1994	March 22	9.91	1,020	1988	March 28	5.80	115
1987	April 3	8.99	960	1973	March 14	3.84	100
1966	March 13	8.69	880	1980	March 30	8.15	100
1956	April 12	6.75	767	1985	March 10	5.50	88.0
1984	March 27	9.16	755	1964	June 19	3.65	60.0
1975	April 17	7.51	680	1958	October 25	3.31	56.0
1967	March 27	6.90	650	1991	May 23	6.74	50.0
1983	March 7	9.95	650	1961	March 2	3.60	40.0
1982	March 30	8.70	580	1990	June 13	6.67	32.0
1978	March 30	6.93	560	1959	March 14	4.42	30.0
1970	June 17	5.96	472	1981	February 17	4.65	28.0
1976	March 24	6.39	400	1977	March 15	3.18	25.0
1962	March 28	6.84	390	1963	April 6	3.47	24.0

# 05057200 BALDHILL CREEK NEAR DAZEY, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1956	--	--	--	--	--	--	118.0	12.1	10.6	3.25	1.75	1.84	--
1957	1.47	4.56	1.75	0.681	0	7.85	9.60	8.93	5.32	8.64	5.78	58.5	9.39
1958	29.8	20.5	7.42	1.90	2.18	4.64	12.6	7.14	8.60	11.8	2.15	1.28	9.22
1959	1.76	2.18	0.155	0	0	7.87	6.97	6.84	5.81	3.32	1.50	1.25	3.15
1960	2.60	0.380	0.610	0.019	0	32.2	84.9	7.32	7.17	1.85	2.31	2.11	11.7
1961	1.75	1.67	0.197	0.135	0.036	9.81	7.47	5.39	0.907	0.871	0.900	1.94	2.61
1962	1.66	1.41	0.574	0.103	0.100	25.6	46.8	14.3	18.0	14.2	2.53	2.86	10.7
1963	2.77	4.31	2.10	0.090	0	2.42	9.97	5.65	3.92	1.77	1.00	1.00	2.92
1964	0.971	1.25	0.726	0.223	0.197	0.587	13.6	6.00	17.6	11.8	4.58	4.53	5.16
1965	4.42	2.86	0.971	0.432	0.411	2.22	248.3	19.5	8.85	11.8	6.80	7.94	26.0
1966	9.66	5.63	3.06	0.239	0.086	163.8	28.7	26.3	22.8	19.7	5.97	2.87	24.4
1967	3.59	3.34	1.94	1.22	0.825	96.6	99.8	40.8	17.7	7.30	3.56	1.45	23.3
1968	3.21	2.18	1.48	0.558	0.549	20.0	14.2	17.3	31.6	11.1	4.88	4.04	9.27
1969	4.11	4.90	3.27	0.269	0.613	2.13	455.9	28.5	20.6	11.7	1.75	3.50	44.3
1970	4.89	5.51	4.19	1.79	2.00	12.7	43.7	26.4	50.6	10.9	6.13	6.86	14.6
1971	5.67	6.82	2.62	0.319	0.897	32.0	87.6	13.5	22.1	9.07	1.71	2.76	15.4
1972	5.04	7.06	2.99	1.38	0.192	66.2	79.8	33.7	13.6	2.57	2.76	1.94	18.1
1973	2.75	2.81	1.90	0.806	1.70	23.4	7.22	5.93	2.85	0.617	0.947	2.97	4.52
1974	3.65	2.95	1.71	0.393	0.731	2.40	232.9	37.4	16.5	2.23	1.91	1.44	25.1
1975	2.54	3.84	3.03	1.55	0.674	9.50	148.2	38.5	20.9	35.7	2.71	2.82	22.4
1976	3.23	3.44	1.89	1.02	3.66	76.8	33.7	7.59	2.41	1.17	0.087	0.128	11.3
1977	1.25	2.00	0.723	0.083	0.412	5.74	6.81	3.11	1.56	1.63	0.852	3.29	2.29
1978	3.52	4.92	3.33	0.733	0.180	59.8	83.7	12.0	3.35	0.824	0.811	0.737	14.5
1979	1.77	1.70	0.761	0.140	0.100	1.30	653.7	82.0	9.55	2.78	1.95	0.915	62.4
1980	1.32	1.98	1.88	0.931	0.445	15.4	29.5	2.69	1.84	0.238	1.98	1.12	4.93
1981	1.75	1.67	1.03	0.803	2.32	2.91	2.44	1.71	2.23	0.438	0.565	0.499	1.52
1982	2.14	2.33	1.11	0.481	1.61	67.5	75.0	10.4	6.48	4.56	0.952	0.607	14.5
1983	13.1	4.62	5.40	2.42	5.37	175.0	38.0	12.6	17.5	17.4	3.56	3.89	25.2
1984	3.58	4.08	1.82	1.91	4.28	143.3	60.4	23.7	5.39	0.639	0.076	0.094	20.9
1985	1.69	2.54	1.76	0.555	1.87	23.5	3.24	3.54	8.72	2.36	1.20	2.41	4.48
1986	4.86	3.05	1.79	2.33	1.73	48.6	31.1	37.4	4.73	5.66	4.62	5.19	12.7
1987	7.03	4.54	4.35	3.05	5.03	269.5	264.4	19.3	9.21	12.5	3.00	3.83	50.6
1988	6.19	5.62	3.40	1.05	1.68	41.4	25.5	9.73	1.94	0.353	0.673	0.549	8.20
1989	0.942	2.18	1.62	0.805	0.445	7.53	58.5	6.15	1.73	0.021	1.97	4.41	7.14
1990	1.27	2.66	0.582	0	0.061	2.86	12.3	2.08	12.3	7.31	0.266	0.499	3.51

# 05057200 BALDHILL CREEK NEAR DAZEY, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1991	0.956	1.11	0.793	0	0.074	2.36	3.16	7.29	2.54	0.802	0.130	0.327	1.64
1992	0.473	1.01	1.02	1.50	4.61	78.7	7.10	2.58	2.14	2.67	0.652	1.80	8.77
1993	1.78	2.09	0.877	0.056	1.19	76.1	73.2	18.6	12.2	273.3	133.3	52.5	54.4
1994	15.3	10.9	7.23	5.38	4.84	195.9	125.4	35.4	49.4	51.5	14.6	40.1	46.6
1995	106.4	48.7	16.1	7.31	6.42	475.5	337.4	143.3	47.5	82.8	55.0	34.8	114.3
1996	22.4	18.1	8.62	6.34	5.40	106.6	672.8	134.1	53.0	45.5	28.8	8.69	92.0
1997	8.82	7.41	5.72	4.91	5.32	20.1	1,040	219.8	38.9	28.0	5.51	6.32	115.1



## 05058000 SHEYENNE RIVER BELOW BALDHILL DAM, ND

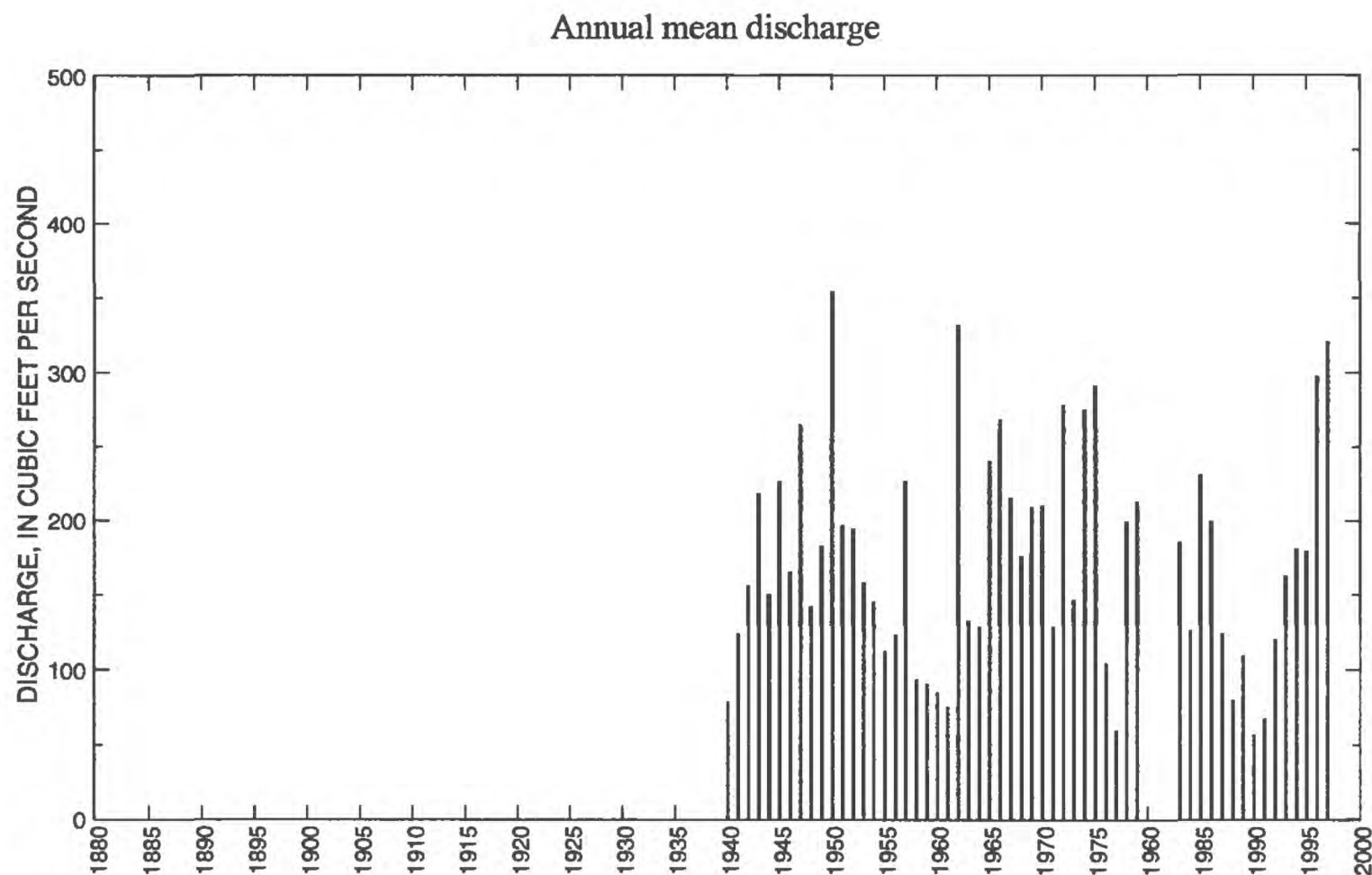
**LOCATION.**--Lat 47°01'50", long 98°05'50", in NW<sup>1</sup>/<sub>4</sub> sec.18, T.141 N., R.58 W., Barnes County, Hydrologic Unit 09020204, on right bank 600 ft downstream from Baldhill Dam, 8 mi northwest of Valley City, and at mile 270.5.

**DRAINAGE AREA.**--7,470 mi<sup>2</sup>, approximately, of which about 5,560 mi<sup>2</sup> is probably noncontributing, including 3,800 mi<sup>2</sup> in closed basin.

**PERIOD OF RECORD.**--October 1949 to current year. Monthly discharge only for some periods, published in Water Supply Paper 1308.

**GAGE.**--Water-stage recorder and concrete control. Datum of gage is 1,200.00 ft above sea level.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 4,740 ft<sup>3</sup>/s, Apr. 24, 1979, gage height, 36.26 ft; maximum gage height, 36.46 ft, Apr. 20, 1996; no flow at times in 1950 and 1952-53.

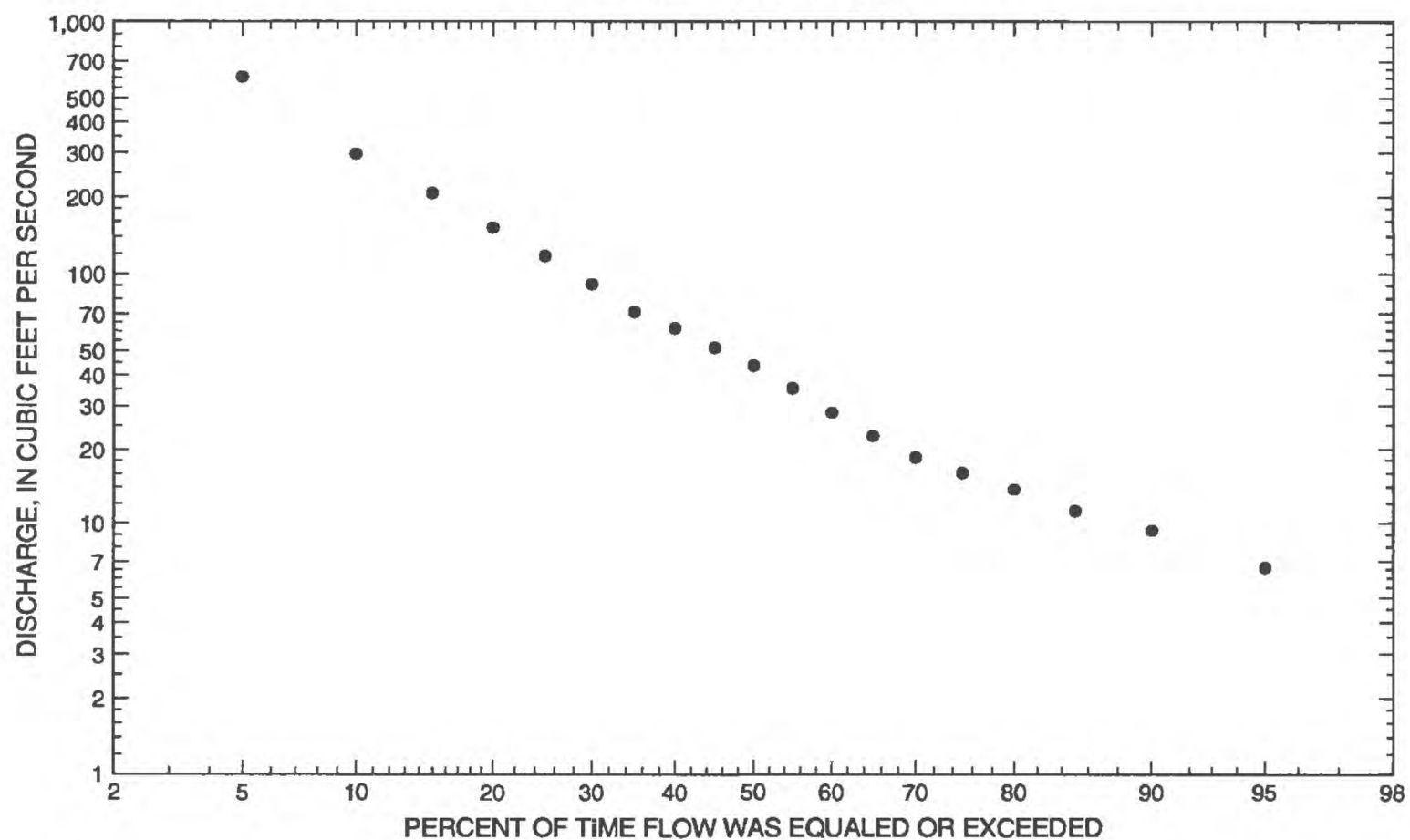


# 05058000 SHEYENNE RIVER BELOW BALDHILL DAM, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	622	1995	1.92	1956	53.4	93.5	1.75	2.88
November	291	1995	5.27	1956	65.4	60.5	0.93	3.53
December	231	1995	4.32	1980	63.8	52.9	0.83	3.44
January	182	1995	3.64	1956	60.4	43.8	0.73	3.26
February	300	1996	7.66	1956	70.6	64.6	0.91	3.81
March	1,570	1995	7.81	1955	206	329	1.60	11.1
April	3,330	1997	2.07	1953	618	761	1.23	33.4
May	2,910	1950	6.86	1959	304	512	1.68	16.4
June	1,150	1950	5.88	1958	155	187	1.21	8.34
July	1,270	1993	7.28	1959	123	199	1.62	6.62
August	1,560	1993	6.72	1977	79.6	226	2.84	4.30
September	577	1994	0.807	1955	55.3	102	1.84	2.98
Annual	574	1995	12.8	1991	154	144	0.94	100

Annual flow duration



# 05058000 SHEYENNE RIVER BELOW BALDHILL DAM, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	8.01	8.30	6.99	2.70	7.57	7.81	7.42	3.90	2.20	2.20	8.74	8.32	6.64
90	10.1	9.62	10.6	8.16	9.19	11.1	9.93	7.91	8.04	7.97	11.2	9.30	9.34
85	15.3	11.9	13.6	9.66	12.1	12.5	11.6	9.39	9.72	9.38	13.6	15.5	11.2
80	20.6	15.6	17.5	12.6	13.6	13.8	13.8	11.4	11.3	11.0	15.6	20.0	13.7
75	24.5	22.3	22.6	16.3	15.5	16.3	15.4	12.9	12.9	12.2	17.8	26.1	16.0
70	26.6	25.0	29.1	34.3	22.1	20.7	17.0	14.5	14.5	13.4	21.0	33.4	18.5
65	38.4	29.8	40.8	55.3	37.1	29.3	20.0	16.0	15.8	14.7	25.4	39.3	22.7
60	44.1	42.4	56.2	84.3	55.1	36.4	22.9	17.8	16.9	16.0	30.8	43.1	28.2
55	48.1	49.2	63.1	128	71.8	48.3	27.2	19.6	18.1	17.4	37.4	46.2	35.3
50	51.8	54.5	70.8	189	104	62.0	32.3	21.4	19.3	18.8	43.4	48.6	43.2
45	55.3	58.4	80.5	270	131	77.5	41.5	24.1	21.1	22.1	48.2	51.0	51.3
40	59.8	62.3	95.1	349	170	95.5	57.0	27.1	24.3	25.8	52.2	53.9	61.5
35	65.0	68.4	120	429	196	116	75.1	30.4	28.5	33.0	56.8	59.9	71.6
30	71.8	74.9	150	563	275	148	95.7	37.3	34.2	40.6	70.9	68.8	91.5
25	81.2	91.3	186	777	325	184	130	46.5	42.6	48.6	91.6	87.4	117
20	95.3	104	223	1,010	386	234	181	61.8	54.8	69.2	103	109	152
15	112	135	270	1,340	507	299	234	98.7	72.4	87.1	120	122	208
10	135	185	378	1,850	734	391	302	159	102	120	143	148	298
5	158	220	979	2,970	1,220	547	447	302	260	192	244	178	606

# 05058000 SHEYENNE RIVER BELOW BALDHILL DAM, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	29.9	15.8	15.0	14.6	14.3
0.95	1.05	105	67.8	60.7	52.4	44.2
0.90	1.11	193	135	119	98.2	77.9
0.80	1.25	378	288	251	200	150
0.50	2	1,150	980	863	676	479
0.20	5	2,790	2,530	2,340	1,910	1,360
0.10	10	4,100	3,770	3,600	3,060	2,250
0.04	25	5,850	5,380	<sup>1</sup> 5,060	<sup>1</sup> 4,250	<sup>1</sup> 3,140
0.02	50	7,140	6,540	<sup>1</sup> 6,150	<sup>1</sup> 5,170	<sup>1</sup> 3,830
0.01	100	8,390	7,630	<sup>1</sup> 7,170	<sup>1</sup> 6,020	<sup>1</sup> 4,450
0.005	200	9,590	8,640	<sup>1</sup> 8,120	<sup>1</sup> 6,820	<sup>1</sup> 5,050
0.002	500	11,100	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

# 05058000 SHEYENNE RIVER BELOW BALDHILL DAM, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1948	April 27	--	4,600	1974	April 21	30.02	1,940
1950	May 23	32.62	3,150	1975	April 29	29.20	1,640
1951	April 19	28.00	1,270	1976	April 10	27.99	982
1952	August 29	--	400	1977	October 1	26.16	37.0
1953	July 16	29.40	1,980	1978	April 7	28.55	1,370
1954	March 11	28.28	1,270	1979	April 24	36.26	4,740
1955	April 13	28.86	1,640	1980	April 3	27.38	516
1956	April 26	30.25	2,070	1981	April 3	27.37	493
1957	September 4	27.50	598	1982	April 12	30.01	1,930
1958	July 17	--	240	1983	March 9	29.91	1,910
1959	November 18	26.83	190	1984	April 3	29.50	1,790
1960	April 17	29.24	1,570	1985	May 16	27.73	680
1961	November 27	27.88	697	1986	April 19	30.22	2,050
1962	April 10	27.67	778	1987	April 14	30.51	2,200
1963	November 15	26.30	56.0	1988	January 19	26.84	146
1964	June 28	27.51	679	1989	April 4	27.60	642
1965	April 14	32.69	2,980	1990	September 13	26.75	123
1966	March 28	32.72	3,250	1991	July 25	26.60	82.0
1967	April 9	29.00	1,560	1992	March 7	28.57	1,260
1968	June 11	27.92	974	1993	July 28	34.98	3,720
1969	April 19	35.47	4,580	1994	April 2	29.28	1,630
1970	April 19	28.23	1,230	1995	March 28	34.15	3,980
1971	April 20	29.75	1,830	1996	April 20	36.46	5,460
1972	April 26	27.82	991	1997	April 27	35.12	4,510
1973	March 29	26.50	90.0				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1996	April 20	36.46	5,460	1994	April 2	29.28	1,630
1979	April 24	36.26	4,740	1960	April 17	29.24	1,570
1948	April 27	--	4,600	1967	April 9	29.00	1,560
1969	April 19	35.47	4,580	1978	April 7	28.55	1,370
1997	April 27	35.12	4,510	1951	April 19	28.00	1,270
1995	March 28	34.15	3,980	1954	March 11	28.28	1,270
1993	July 28	34.98	3,720	1992	March 7	28.57	1,260
1966	March 28	32.72	3,250	1970	April 19	28.23	1,230
1950	May 23	32.62	3,150	1972	April 26	27.82	991
1965	April 14	32.69	2,980	1976	April 10	27.99	982
1987	April 14	30.51	2,200	1968	June 11	27.92	974
1956	April 26	30.25	2,070	1962	April 10	27.67	778
1986	April 19	30.22	2,050	1961	November 27	27.88	697
1953	July 16	29.40	1,980	1985	May 16	27.73	680
1974	April 21	30.02	1,940	1964	June 28	27.51	679
1982	April 12	30.01	1,930	1989	April 4	27.60	642
1983	March 9	29.91	1,910	1957	September 4	27.50	598
1971	April 20	29.75	1,830	1980	April 3	27.38	516
1984	April 3	29.50	1,790	1981	April 3	27.37	493
1955	April 13	28.86	1,640	1952	August 29	--	400
1975	April 29	29.20	1,640	1958	July 17	--	240



# 05058000 SHEYENNE RIVER BELOW BALDHILL DAM, ND--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1958	November 18	26.83	190	1991	July 25	26.60	82.0
1988	January 19	26.84	146	1963	November 15	26.30	56.0
1990	September 13	26.75	123	1976	October 1	26.16	37.0
1973	March 29	26.50	90.0				

# 05058000 SHEYENNE RIVER BELOW BALDHILL DAM, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1950	2.50	25.0	18.3	10.6	10.2	50.0	1,730	2,906	1,154	245.5	68.2	3.46	520.6
1951	13.1	26.5	27.3	25.7	23.6	39.6	547.1	319.8	89.8	46.9	23.7	28.9	100.9
1952	50.0	15.0	14.9	24.6	29.0	14.7	2.63	13.6	14.3	13.0	21.6	16.6	19.2
1953	13.6	10.8	14.8	24.1	23.7	8.26	2.07	12.7	77.4	123.6	8.68	13.4	27.8
1954	19.3	19.9	41.3	60.3	56.3	80.7	132.2	36.4	165.6	215.5	30.9	49.5	75.6
1955	39.4	102.0	103.2	84.3	32.0	7.81	247.7	64.0	238.0	223.7	12.6	0.807	96.3
1956	1.92	5.27	7.64	3.64	7.66	63.3	374.4	354.9	275.2	51.9	12.9	3.89	96.6
1957	7.75	33.9	53.6	57.4	68.4	44.8	17.9	36.9	63.3	39.7	34.1	271.9	60.3
1958	98.8	120.0	82.3	80.1	68.1	67.6	41.3	17.9	5.88	75.8	14.3	15.9	57.4
1959	18.0	33.4	43.1	42.1	34.9	26.5	8.95	6.86	7.90	7.28	8.53	9.40	20.5
1960	10.1	17.3	28.0	24.2	22.3	16.8	668.9	77.2	152.6	26.3	14.3	14.4	88.4
1961	13.4	36.4	46.9	45.2	38.7	18.9	10.9	13.5	13.6	14.1	13.7	12.4	23.1
1962	14.3	14.5	15.0	15.0	14.7	67.9	300.4	137.2	219.4	89.0	26.1	14.7	77.2
1963	16.3	40.8	50.9	48.8	46.0	30.9	10.1	12.3	12.0	7.93	8.35	8.66	24.3
1964	8.94	25.3	36.5	25.4	17.8	11.4	10.0	9.50	212.5	135.6	13.5	30.2	44.6
1965	26.7	51.3	50.3	55.7	50.6	147.5	1,224	215.9	94.1	187.9	125.7	67.5	190.7
1966	109.9	104.8	110.6	104.4	65.6	1,067	623.1	277.6	183.5	172.0	208.8	63.8	259.3
1967	17.5	49.8	77.8	72.1	150.9	164.7	972.0	474.0	49.1	31.6	18.9	17.1	173.8
1968	14.5	27.1	42.7	43.5	46.8	42.2	142.7	130.5	225.1	28.3	17.1	18.3	64.6
1969	23.1	54.2	51.9	69.1	200.2	165.9	1,936	313.5	91.3	127.2	13.7	14.1	252.5
1970	18.3	37.4	48.6	53.2	87.6	146.4	420.3	329.7	333.0	32.5	15.2	13.2	127.5
1971	11.3	21.5	40.4	40.5	104.5	215.1	686.3	158.2	222.6	182.5	25.2	24.5	143.7
1972	46.4	127.6	156.5	125.0	48.1	192.8	794.6	335.2	218.6	18.2	16.8	18.6	174.3
1973	13.4	44.1	49.0	55.2	62.7	61.5	31.5	15.5	15.2	9.83	17.8	14.7	32.4
1974	20.0	43.4	37.5	70.4	180.1	219.1	920.8	684.4	507.5	17.0	16.3	13.4	226.3
1975	10.9	32.2	52.1	55.5	56.4	68.3	668.4	830.5	227.4	119.5	56.3	18.6	183.5
1976	29.2	52.0	69.5	78.1	68.3	64.3	493.3	106.7	18.0	17.7	24.1	36.1	87.5
1977	32.2	23.3	16.7	14.6	9.20	9.94	9.27	9.07	8.53	8.63	6.72	8.09	13.1
1978	11.0	32.7	45.2	63.0	104.1	143.7	703.4	128.7	41.8	19.2	20.3	39.1	111.7
1979	66.6	51.3	36.2	30.8	56.4	172.9	1,796	1,346	156.7	146.2	52.7	27.8	328.5
1980	93.8	156.4	4.32	10.4	10.9	83.1	153.2	9.32	19.4	17.4	10.1	152.0	59.6
1981	127.2	94.9	23.5	9.10	9.61	98.2	136.5	70.2	136.2	84.6	25.7	43.0	71.7
1982	152.7	134.6	8.61	7.93	32.3	173.8	892.4	233.3	176.7	226.9	56.9	14.2	175.6
1983	144.7	237.9	113.5	119.6	76.4	1,236	659.0	202.8	219.1	117.1	41.3	77.0	271.7
1984	106.2	140.4	133.7	78.3	64.0	256.8	911.6	351.0	113.9	33.4	37.1	41.0	188.4

# 05058000 SHEYENNE RIVER BELOW BALDHILL DAM, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1985	102.9	48.5	51.1	28.1	11.7	96.4	142.2	117.5	77.6	23.3	44.9	23.8	64.2
1986	31.6	98.6	142.9	140.4	197.9	166.5	391.2	307.2	51.1	66.5	60.9	28.2	139.8
1987	15.2	111.4	190.9	124.1	78.2	969.6	1,268	155.8	109.5	215.4	215.6	66.8	294.1
1988	89.7	96.4	110.0	117.9	112.4	58.2	17.7	52.0	30.6	18.4	25.4	12.0	61.7
1989	13.3	23.8	35.5	45.8	56.2	107.4	198.3	19.8	25.4	21.7	24.9	20.0	49.1
1990	33.0	23.1	22.1	13.3	12.2	14.8	10.0	7.35	10.1	13.3	44.9	57.2	21.8
1991	5.72	9.21	8.24	7.78	8.54	7.96	7.93	11.7	14.9	26.7	29.0	15.8	12.8
1992	12.2	26.0	55.8	45.7	18.4	448.5	86.2	40.0	32.3	60.5	30.9	29.7	74.5
1993	15.2	9.36	44.5	76.3	93.9	214.9	263.7	193.3	131.4	1,272	1,555	353.1	355.8
1994	118.6	152.9	127.6	98.0	181.6	427.7	718.7	163.0	404.9	538.5	192.1	576.8	307.7
1995	621.9	290.8	230.8	181.6	167.3	1,567	1,998	797.9	285.9	246.8	292.5	188.3	574.4
1996	70.5	75.9	104.7	124.8	300.1	336.9	2,969	953.2	294.5	248.1	107.9	19.6	464.0
1997	32.1	131.8	187.5	168.1	172.7	187.1	3,329	1,540	192.2	224.6	82.1	45.6	522.9

## 05058500 SHEYENNE RIVER AT VALLEY CITY, ND

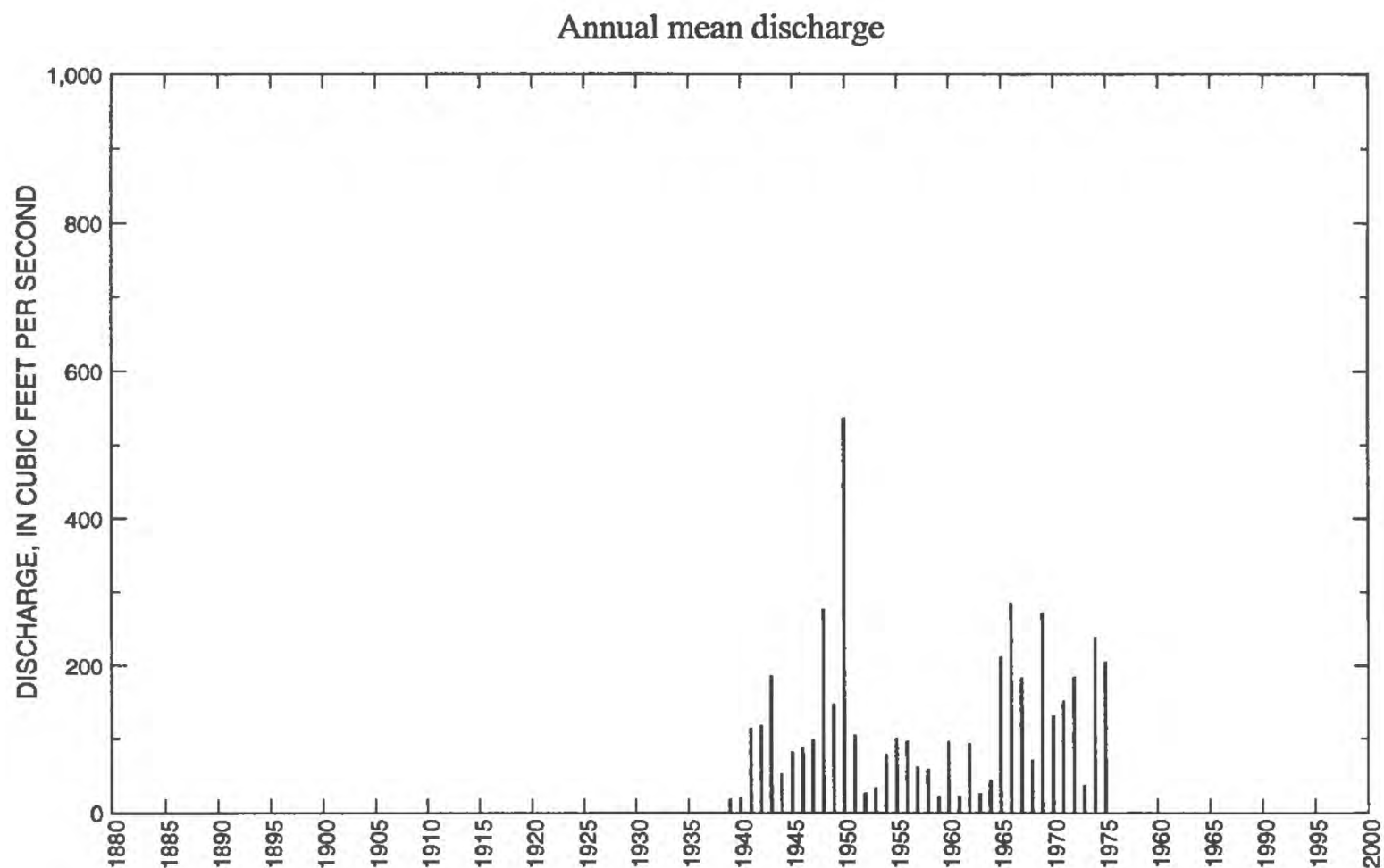
**LOCATION.**--Lat 46°54'50", long 98°00'30", in SE<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec.28, T.140 N., R.58 W., Barnes County, Hydrologic Unit 09020204, on left bank 100 ft downstream from College Dam in Valley City and at mile 253.0.

**DRAINAGE AREA.**--7,810 mi<sup>2</sup>, approximately, of which about 5,700 mi<sup>2</sup> is probably noncontributing, includes 3,800 mi<sup>2</sup> in closed basins.

**PERIOD OF RECORD.**--March to August 1919, March to June 1938, August to September 1975; October 1979 to current year (gage heights and annual maximum discharge since 1979). Records for July 1938, published in Water Supply Paper 855, have been found to be unreliable and should not be used.

**GAGE.**--Water-stage recorder and concrete control. Datum of gage is 1,199.27 ft above sea level. March to August 1919, nonrecording gage at site 0.5 mi upstream at different datum. March to Oct. 13, 1938, nonrecording gage at present site and datum.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 5,250 ft<sup>3</sup>/s, Apr. 21, 1996, gage height, 18.78 ft; no flow for several periods during 1938-41.



# 05058500 SHEYENNE RIVER AT VALLEY CITY, ND--Continued

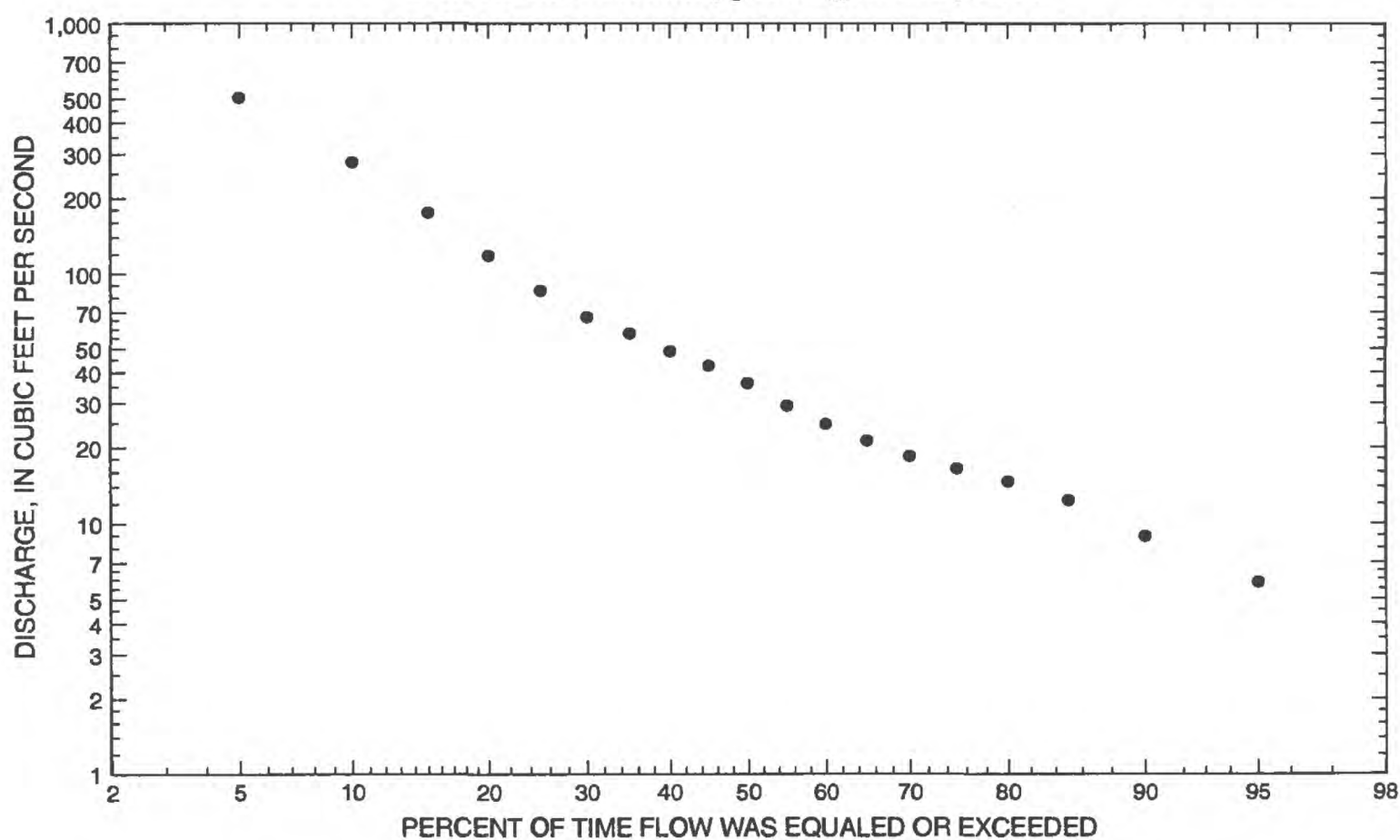
Post-regulation period, 1950-97

Statistics of monthly and annual mean discharges, post-regulation period

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	116	1983	1.29	1956	30.2	32.5	1.08	1.49
November	192	1983	2.19	1956	48.9	45.0	0.92	2.41
December	324	1997	6.27	1956	58.0	58.2	1.00	2.86
January	431	1997	2.66	1956	63.1	74.0	1.17	3.11
February	416	1997	7.17	1956	81.3	91.3	1.12	4.01
March	1,770	1995	10.0	1964	230	362	1.57	11.3
April	2,980	1996	3.19	1953	680	758	1.12	33.5
May	2,980	1950	9.77	1959	396	628	1.59	19.5
June	1,230	1950	8.49	1958	208	225	1.08	10.2
July	501	1994	10.2	1963	124	112	0.90	6.14
August	291	1995	7.94	1963	50.3	64.6	1.28	2.48
September	507	1994	2.29	m	59.2	108	1.83	2.92
Annual	537	1950	22.5	1959	130	115	0.88	100

Annual flow duration, post-regulation period





# 05058500 SHEYENNE RIVER AT VALLEY CITY, ND--Continued

Monthly and annual flow duration, in cubic feet per second, post-regulation period

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	11.3	8.98	8.64	4.58	10.1	10.0	8.38	2.50	1.60	1.30	7.86	10.1	5.82
90	15.9	14.8	14.2	9.98	13.1	14.4	11.1	6.84	4.70	4.42	11.7	14.6	8.90
85	21.3	18.1	17.8	14.9	15.4	17.4	14.2	9.43	8.65	6.71	13.4	19.5	12.4
80	23.4	21.1	22.2	19.6	17.7	21.0	16.8	11.6	11.3	10.2	14.9	24.7	14.7
75	26.0	23.6	27.1	31.8	24.0	26.5	19.2	13.1	12.9	11.8	16.3	27.3	16.5
70	32.9	27.4	35.1	47.5	35.7	34.8	23.0	14.5	14.6	13.3	17.8	32.5	18.4
65	38.4	31.5	45.4	66.7	54.2	49.9	27.5	15.9	15.8	14.1	20.9	37.2	21.3
60	41.4	38.9	58.3	98.9	74.1	64.7	32.5	17.3	16.9	15.0	24.1	40.1	24.7
55	44.6	44.3	64.7	176	101	81.2	40.9	18.9	17.9	15.8	27.2	43.0	29.3
50	47.8	48.3	71.2	244	135	102	48.9	20.5	19.0	16.7	31.6	46.0	36.2
45	51.0	53.4	86.6	300	178	120	62.0	22.0	20.2	17.8	36.6	49.0	42.6
40	54.3	60.0	106	378	215	139	82.2	23.6	22.6	19.1	42.0	51.3	49.0
35	57.7	64.4	133	506	270	171	108	27.7	25.1	20.5	47.1	53.6	57.3
30	61.1	70.8	173	738	335	213	135	32.9	29.4	21.8	52.0	55.9	67.3
25	67.0	85.4	229	1,000	408	281	180	43.0	35.5	26.3	60.5	58.8	86.3
20	77.4	107	268	1,240	529	333	230	71.6	44.8	37.2	82.1	68.4	119
15	93.2	152	317	1,550	746	395	281	102	83.8	44.9	98.8	88.0	176
10	105	224	480	2,070	949	484	344	152	127	67.5	117	108	279
5	147	322	960	3,070	1,830	634	446	237	299	112	151	151	506

## 05058500 SHEYENNE RIVER AT VALLEY CITY, ND--Continued

Probability of occurrence of annual high discharges, post-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s) <sup>1</sup>			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	65.1	35.5	24.3	17.7	16.7
0.95	1.05	182	111	80.6	58.4	48.4
0.90	1.11	299	192	144	105	82.4
0.80	1.25	520	353	276	203	152
0.50	2	1,300	964	824	629	444
0.20	5	2,720	2,160	2,030	1,640	1,150
0.10	10	3,750	3,070	3,030	2,540	1,800
0.04	25	5,050	4,240	<sup>2</sup> 3,940	<sup>2</sup> 3,230	<sup>2</sup> 2,330
0.02	50	5,980	5,080	<sup>2</sup> 4,720	<sup>2</sup> 3,870	<sup>2</sup> 2,790
0.01	100	6,860	5,890	<sup>2</sup> 5,480	<sup>2</sup> 4,490	<sup>2</sup> 3,230
0.005	200	7,690	6,650	<sup>2</sup> 6,180	<sup>2</sup> 5,070	<sup>2</sup> 3,650
0.002	500	8,710	ng	ng	ng	ng

<sup>1</sup>Statistics computed using period of daily value record 1950-75.

<sup>2</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

# 05058500 SHEYENNE RIVER AT VALLEY CITY, ND--Continued

## Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1919	April 18	14.90	2,750	1966	March 28	14.27	3,350
1938	March 29	3.90	244	1967	April 10	9.03	1,570
1939	April 6	4.34	342	1968	June 13	8.48	1,220
1940	April 8	5.14	525	1969	April 19	17.62	4,520
1941	April 19	9.10	1,590	1970	April 20	8.47	1,370
1942	April 17	7.72	1,190	1971	April 21	10.27	1,820
1943	March 27	10.78	1,900	1972	April 16	7.23	1,070
1944	June 3	4.50	399	1973	March 14	6.32	761
1945	March 24	7.06	1,020	1974	April 22	10.74	2,160
1946	March 26	7.56	1,160	1975	June 30	10.27	1,960
1947	April 11	10.19	1,910	1980	August 29	7.00	765
1948	April 28	17.51	4,580	1981	April 2	5.91	542
1949	April 21	10.90	2,120	1982	April 14	10.95	1,990
1950	May 5	14.60	3,050	1983	March 13	11.26	2,030
1951	April 19	8.08	1,270	1984	April 6	10.43	1,950
1952	March 31	6.02	650	1985	May 17	6.37	680
1953	July 17	8.11	1,230	1986	April 19	11.04	2,100
1954	July 13	6.29	726	1987	April 13	11.43	2,300
1955	April 14	9.04	1,490	1988	February 28	4.80	150
1956	April 28	10.58	1,870	1989	March 30	8.38	850
1957	September 4	6.48	627	1990	July 11	4.59	278
1958	July 17	4.21	248	1991	August 24	3.37	77.0
1959	June 27	7.02	988	1992	March 8	8.59	1,260
1960	April 17	9.52	1,570	1993	July 28	17.30	3,830
1961	March 2	4.01	251	1994	April 9	9.00	1,530
1962	July 7	9.71	1,270	1995	March 29	16.57	4,120
1963	July 26	3.39	78.0	1996	April 21	18.78	5,250
1964	June 28	6.56	643	1997	April 19	18.01	4,810
1965	April 16	14.93	3,080				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1996	April 21	18.78	5,250	1983	March 13	11.26	2,030
1997	April 19	18.01	4,810	1982	April 14	10.95	1,990
1948	April 28	17.51	4,580	1975	June 30	10.27	1,960
1969	April 19	17.62	4,520	1984	April 6	10.43	1,950
1995	March 29	16.57	4,120	1947	April 11	10.19	1,910
1993	July 28	17.30	3,830	1943	March 27	10.78	1,900
1966	March 28	14.27	3,350	1956	April 28	10.58	1,870
1965	April 16	14.93	3,080	1971	April 21	10.27	1,820
1950	May 5	14.60	3,050	1941	April 19	9.10	1,590
1919	April 18	14.90	2,750	1960	April 17	9.52	1,570
1987	April 13	11.43	2,300	1967	April 10	9.03	1,570
1974	April 22	10.74	2,160	1994	April 9	9.00	1,530
1949	April 21	10.90	2,120	1955	April 14	9.04	1,490
1986	April 19	11.04	2,100	1970	April 20	8.47	1,370

# 05058500 SHEYENNE RIVER AT VALLEY CITY, ND--Continued

Annual peak discharge and corresponding gage height--Continued

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1951	April 19	8.08	1,270	1952	March 31	6.02	650
1962	July 7	9.71	1,270	1964	June 28	6.56	643
1992	March 8	8.59	1,260	1957	September 4	6.48	627
1953	July 17	8.11	1,230	1981	April 2	5.91	542
1968	June 13	8.48	1,220	1940	April 8	5.14	525
1942	April 17	7.72	1,190	1944	June 3	4.50	399
1946	March 26	7.56	1,160	1939	April 6	4.34	342
1972	April 16	7.23	1,070	1990	July 11	4.59	278
1945	March 24	7.06	1,020	1961	March 2	4.01	251
1959	June 27	7.02	988	1958	July 17	4.21	248
1989	March 30	8.38	850	1938	March 29	3.90	244
1980	August 29	7.00	765	1988	February 28	4.80	150
1973	March 14	6.32	761	1963	July 26	3.39	78.0
1954	July 13	6.29	726	1991	August 24	3.37	77.0
1985	May 17	6.37	680				

# 05058500 SHEYENNE RIVER AT VALLEY CITY, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1919	--	--	--	--	--	--	1,580	--	--	--	--	--	--
1938	--	--	--	--	--	--	45.3	26.6	8.43	--	8.64	0.130	--
1939	0.223	0.213	0.158	0.252	0.332	67.7	114.5	21.1	14.6	--	0.026	0.010	18.4
1940	0.048	0	0	0	0	0	172.1	62.0	8.50	1.65	1.72	0.063	20.2
1941	0.048	0	0.016	0	0	68.0	953.3	116.8	131.7	0.316	18.0	44.4	115.1
1942	51.9	38.9	21.6	4.03	5.22	26.7	736.6	239.5	162.9	55.7	49.5	45.6	119.4
1943	25.0	23.9	10.8	9.56	20.0	470.0	904.2	186.6	406.8	130.7	39.7	8.00	186.0
1944	3.64	18.8	12.0	3.86	4.53	15.6	109.1	74.1	161.4	62.6	74.5	100.0	53.1
1945	21.3	54.7	31.0	10.4	12.4	447.6	168.0	91.2	79.4	26.5	25.8	12.1	82.3
1946	8.51	14.6	9.75	10.1	5.06	411.7	380.8	70.1	36.9	46.2	46.6	20.3	88.8
1947	35.5	24.7	11.5	15.3	8.61	230.9	629.5	87.1	95.2	35.5	12.8	1.59	98.8
1948	23.9	15.4	14.9	8.19	4.98	32.0	2,077	959.8	98.2	54.5	40.5	10.5	276.8
1949	0.790	26.1	10.8	6.25	7.20	80.7	1,254	188.3	103.4	100.5	3.03	1.23	147.5
1950	3.02	27.5	21.9	11.0	9.16	77.1	1,746	2,975	1,231	253.7	66.4	2.29	537.4
1951	13.2	30.7	26.6	25.9	24.0	73.2	555.9	325.5	95.3	47.2	22.3	27.5	105.5
1952	51.3	14.5	14.7	23.4	28.8	49.2	32.4	19.3	22.0	21.1	24.2	21.1	26.9
1953	15.1	11.9	13.7	23.1	36.2	18.2	3.19	22.2	112.0	133.1	9.22	12.3	34.2
1954	19.3	20.1	38.8	58.6	62.6	78.1	138.1	40.6	175.1	233.6	33.6	50.8	79.1
1955	41.7	99.9	98.5	84.3	33.4	23.3	253.5	69.3	255.8	229.5	17.1	2.29	100.7
1956	1.29	2.19	6.27	2.66	7.17	67.0	357.4	366.5	286.8	54.1	14.5	2.61	97.2
1957	7.19	38.0	52.5	54.7	63.4	45.4	17.0	33.9	64.8	46.5	43.5	289.2	62.6
1958	102.8	125.4	83.8	77.8	73.1	66.1	50.1	20.9	8.49	76.3	13.2	14.5	59.4
1959	17.0	28.4	39.8	38.9	33.7	29.0	9.97	9.77	29.9	14.1	9.84	9.93	22.5
1960	12.4	16.1	26.4	21.4	20.1	75.3	695.6	82.0	160.0	26.0	20.7	15.8	96.7
1961	12.6	27.8	45.1	43.3	36.5	31.1	13.7	13.1	14.3	15.2	11.7	15.9	23.3
1962	15.9	13.7	13.5	13.8	13.8	122.6	316.4	148.5	245.2	171.7	36.3	20.6	94.4
1963	18.7	40.2	50.7	50.2	48.7	37.2	13.4	13.2	18.8	10.2	7.94	10.9	26.6
1964	6.65	22.7	34.0	23.5	15.8	10.0	25.5	11.9	200.2	138.4	16.4	28.1	44.3
1965	29.4	50.7	50.5	53.9	48.1	149.5	1,411	225.6	108.8	208.3	1,45.2	78.3	212.5
1966	115.7	104.3	104.0	101.9	76.2	1,229	707.8	307.4	204.8	167.8	2,15.5	67.3	285.3
1967	16.8	43.9	75.9	68.1	154.1	206.6	1,012	512.1	56.8	27.7	17.5	17.8	183.3
1968	16.4	24.3	41.9	40.5	42.1	65.5	157.8	145.2	265.7	31.7	17.4	19.0	72.0
1969	20.7	59.9	51.6	63.1	208.2	186.1	2,091	333.8	97.5	156.1	16.9	18.1	272.6
1970	13.6	38.5	47.5	53.5	85.0	143.2	473.2	319.2	359.5	33.3	14.2	11.3	132.1
1971	13.9	24.0	39.4	37.3	119.7	263.3	691.3	167.5	234.1	192.1	25.9	25.2	152.1



# 05058500 SHEYENNE RIVER AT VALLEY CITY, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1972	49.3	132.2	154.7	119.3	45.2	269.3	876.3	319.7	191.0	25.1	20.5	22.6	184.9
1973	19.2	45.7	50.2	55.3	64.0	103.3	36.9	16.9	14.7	10.5	18.9	19.1	37.8
1974	18.0	31.0	34.5	63.4	198.9	245.4	1,008	727.1	508.0	18.3	18.1	13.0	239.0
1975	12.7	36.5	54.2	54.5	58.6	72.6	759.5	915.1	254.8	167.5	57.9	20.3	205.9
1982	--	--	--	--	--	--	--	--	--	168.5	44.9	15.0	--
1983	116.0	191.9	84.5	87.0	--	--	--	--	--	--	--	--	--
1985	--	--	--	--	--	--	--	--	--	--	--	--	--
1987	--	--	--	--	--	--	1,429	--	--	--	--	--	--
1990	--	--	24.7	18.4	16.5	15.8	--	--	--	--	--	--	--
1991	--	--	--	--	--	--	--	--	--	--	--	--	--
1992	17.7	26.8	60.5	50.3	41.3	437.9	--	--	--	64.0	31.7	39.0	--
1993	20.9	14.1	35.2	106.1	138.5	278.4	283.4	130.2	115.2	--	--	274.7	--
1994	96.8	125.1	--	--	300.2	447.9	710.4	177.0	307.8	500.7	137.5	507.0	--
1995	--	--	--	--	--	1,771	2,214	866.4	280.1	246.1	290.8	196.0	--
1996	--	--	--	--	--	520.0	2,982	1,116	299.0	249.5	110.6	27.7	--
1997	21.2	--	323.7	430.6	415.7	374.9	--	1,839	231.8	245.9	78.6	--	--

## 05058700 SHEYENNE RIVER AT LISBON, ND

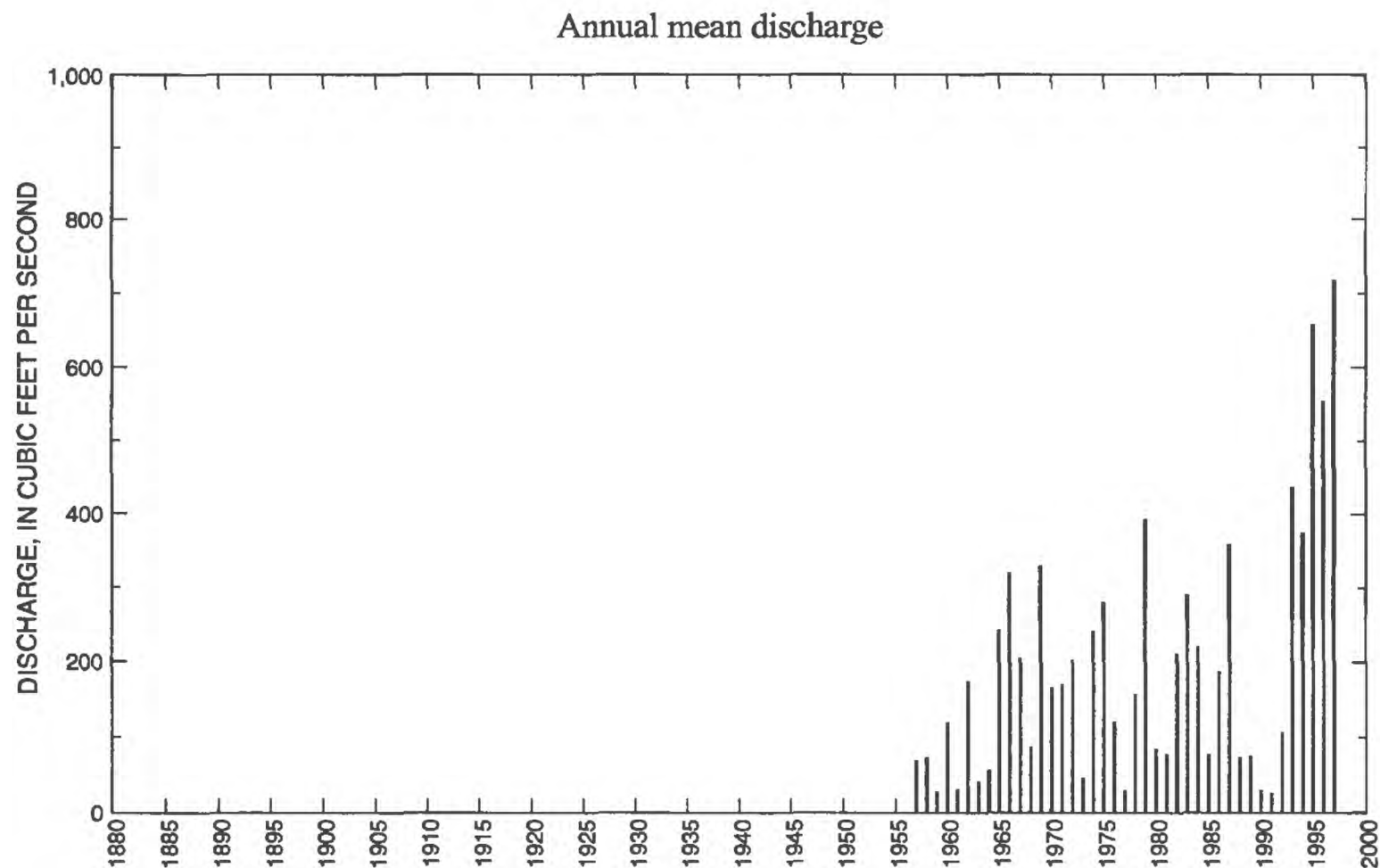
**LOCATION.**--Lat 46°26'49", long 97°40'44", on line between secs.1 and 2, T.134 N., R.56 W., Ransom County, Hydrologic Unit 09020204, on left bank 150 ft downstream from dam at State Fish Hatchery at north edge of city of Lisbon, 3 mi upstream from Timber Coulee, and at mile 162.1.

**DRAINAGE AREA.**--8,190 mi<sup>2</sup>, approximately, of which about 5,700 mi<sup>2</sup> is probably noncontributing, including 3,800 mi<sup>2</sup> in closed basins.

**PERIOD OF RECORD.**--September 1956 to current year.

**GAGE.**--Water-stage recorder. Datum of gage is 1,066.46 ft above sea level.

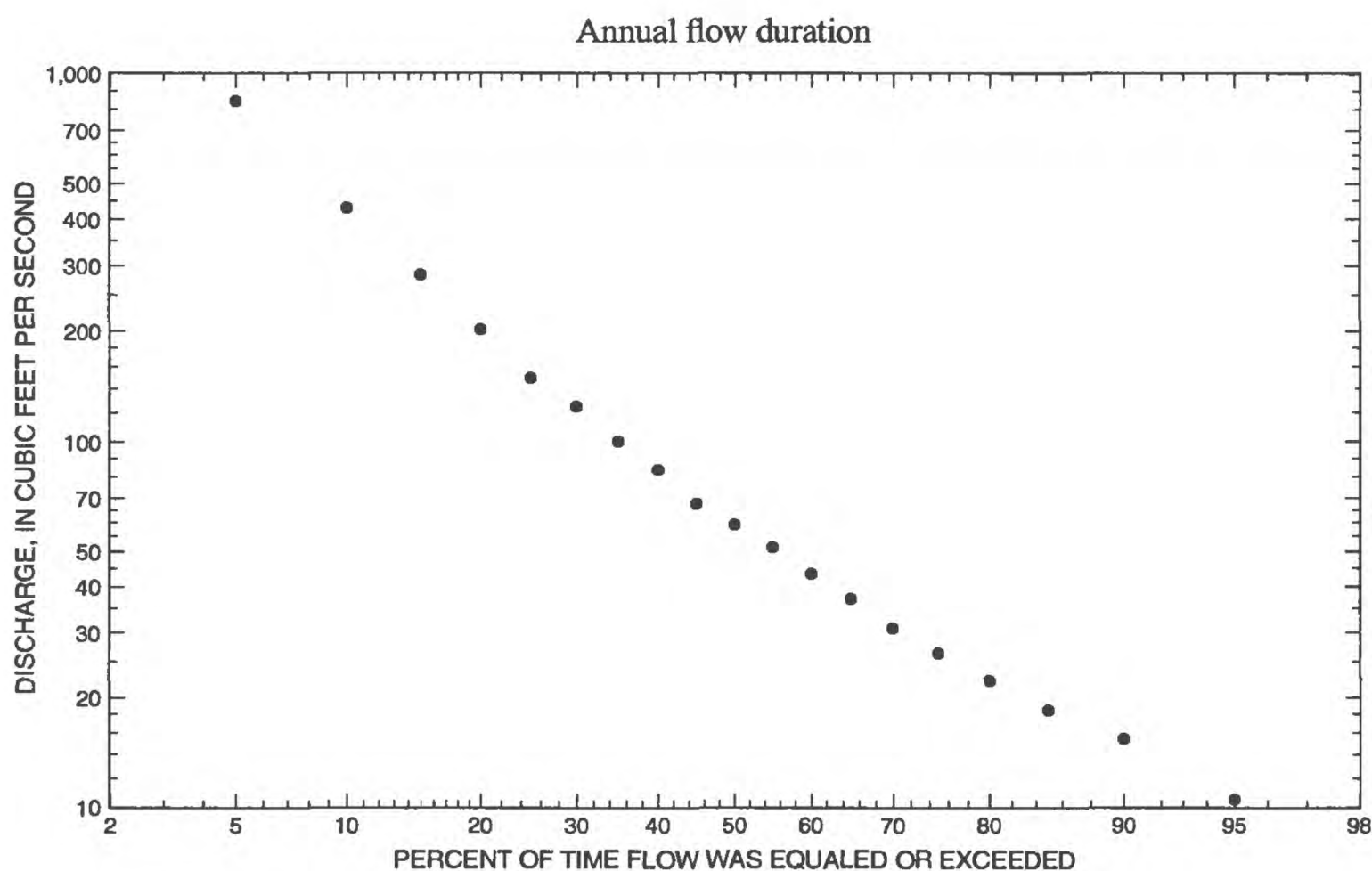
**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 5,670 ft<sup>3</sup>/s, Apr. 23, 1997, gage height, 18.24 ft; maximum gage height, 19.29 ft, Apr. 5, 1997, backwater from ice; no flow Sept. 19-21, 1956, Oct. 23-24, 1956, and Aug. 16, 1961, gage height, 1.53 ft.



# 05058700 SHEYENNE RIVER AT LISBON, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	716	1995	7.66	1957	66.5	112	1.69	2.79	
November	454	1995	12.2	1991	77.6	78.1	1.01	3.26	
December	290	1995	8.69	1991	74.2	62.4	0.84	3.12	
January	204	1995	8.15	1991	68.8	50.0	0.73	2.89	
February	413	1996	10.7	1991	86.2	77.2	0.90	3.62	
March	1,520	1995	19.8	1964	334	373	1.12	14.0	
April	4,180	1997	20.3	1991	795	912	1.15	33.4	
May	2,390	1997	17.5	1959	357	518	1.45	15.0	
June	555	1974	14.8	1961	174	147	0.85	7.31	
July	1,420	1993	6.07	1973	170	265	1.56	7.14	
August	1,940	1993	6.54	1961	109	304	2.78	4.59	
September	561	1994	5.25	1959	68.5	111	1.62	2.87	
Annual	719	1997	25.9	1991	198	171	0.86	100	



# 05058700 SHEYENNE RIVER AT LISBON, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	14.2	14.8	20.0	21.4	17.5	15.0	6.01	5.46	7.01	7.73	14.8	12.7	10.5
90	16.0	16.8	27.4	30.0	22.0	21.0	10.5	7.91	10.1	11.3	18.5	16.6	15.4
85	20.4	19.2	43.4	39.3	25.6	26.9	15.1	10.3	12.3	14.4	21.3	21.6	18.5
80	24.4	24.5	51.6	54.0	32.5	34.4	18.2	12.5	14.1	16.3	24.1	27.6	22.2
75	29.0	33.3	64.8	69.9	41.4	41.0	21.1	14.7	16.4	18.3	27.2	34.2	26.4
70	34.4	39.9	75.9	93.7	51.9	48.9	24.2	16.6	18.5	20.4	30.7	37.8	30.8
65	39.0	43.1	86.0	122	62.9	57.3	27.6	18.6	20.6	22.6	34.7	41.4	37.1
60	44.1	48.3	99.0	167	85.7	66.5	33.4	20.7	22.7	24.8	38.9	44.9	43.4
55	48.2	54.6	118	261	121	76.5	41.5	22.8	24.9	27.0	43.8	48.4	51.2
50	51.8	61.4	138	360	148	87.7	50.6	25.6	27.5	30.4	49.4	52.4	59.4
45	58.2	67.7	162	445	177	104	59.8	29.3	30.8	33.9	54.6	56.4	67.7
40	65.7	73.8	201	540	214	127	77.1	34.7	34.7	37.3	60.7	61.8	83.9
35	72.7	87.0	241	687	258	158	97.8	44.8	39.9	46.7	68.2	68.1	100
30	83.9	96.1	282	860	312	186	138	57.3	47.0	58.3	81.1	81.2	125
25	100	110	334	1,070	406	222	169	74.1	56.3	71.9	99.1	100	150
20	116	130	411	1,300	497	268	217	102	68.9	88.2	112	117	203
15	128	155	536	1,680	630	335	282	146	88.8	107	139	135	283
10	143	191	963	2,230	831	436	398	223	156	142	158	159	430
5	186	248	1,500	3,580	1,190	574	598	342	298	198	240	219	845

# 05058700 SHEYENNE RIVER AT LISBON, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	130	85.9	49.2	30.4	22.8
0.95	1.05	281	201	134	90.7	67.5
0.90	1.11	415	310	222	156	116
0.80	1.25	652	511	394	291	217
0.50	2	1,460	1,250	1,080	860	653
0.20	5	3,040	2,810	2,600	2,220	1,740
0.10	10	4,340	4,150	3,940	3,460	2,770
0.04	25	6,200	<sup>1</sup> 6,100	5,940	5,340	4,400
0.02	50	7,710	<sup>1</sup> 7,670	7,600	6,940	5,830
0.01	100	9,320	<sup>1</sup> 9,240	<sup>1</sup> 9,200	8,660	7,410
0.005	200	11,000	<sup>1</sup> 10,900	<sup>1</sup> 10,800	10,500	9,150
0.002	500	13,400	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.



# 05058700 SHEYENNE RIVER AT LISBON, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1957	September 7	5.20	612	1978	March 23	11.73	1,410
1958	April 7	--	490	1979	May 2	17.58	4,880
1959	June 29	4.28	451	1980	March 23	7.01	760
1960	April 11	9.81	1,980	1981	April 5	4.30	460
1961	March 6	4.61	482	1982	April 13	11.44	2,600
1962	July 7	10.55	2,210	1983	March 17	13.75	2,370
1963	June 8	3.02	207	1984	April 6	9.79	2,000
1964	June 30	4.96	634	1985	May 19	5.13	642
1965	April 14	16.02	3,630	1986	April 21	10.75	2,110
1966	March 30	16.23	4,260	1987	March 23	14.07	3,000
1967	April 15	8.52	1,580	1988	March 26	3.63	284
1968	June 16	7.63	1,300	1989	April 4	8.36	1,000
1969	April 24	16.54	4,380	1990	June 4	3.74	311
1970	May 29	8.70	1,500	1991	July 2	3.49	261
1971	April 28	9.67	1,850	1992	March 11	9.18	1,500
1972	March 16	10.33	1,450	1993	August 2	16.34	3,790
1973	March 17	5.29	677	1994	April 5	10.70	1,980
1974	April 25	10.25	2,020	1995	April 6	15.46	4,090
1975	July 1	19.04	5,270	1996	April 26	--	5,060
1976	April 13	6.29	984	1997	April 23	--	5,670
1977	May 5	7.35	1,230				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 23	--	5,670	1992	March 11	9.18	1,500
1975	July 1	19.04	5,270	1972	March 16	10.33	1,450
1996	April 26	--	5,060	1978	March 23	11.73	1,410
1979	May 2	17.58	4,880	1968	June 16	7.63	1,300
1969	April 24	16.54	4,380	1977	May 5	7.35	1,230
1966	March 30	16.23	4,260	1989	April 4	8.36	1,000
1995	April 6	15.46	4,090	1976	April 13	6.29	984
1993	August 2	16.34	3,790	1980	March 23	7.01	760
1965	April 14	16.02	3,630	1973	March 17	5.29	677
1987	March 23	14.07	3,000	1985	May 19	5.13	642
1982	April 13	11.44	2,600	1964	June 30	4.96	634
1983	March 17	13.75	2,370	1957	September 7	5.20	612
1962	July 7	10.55	2,210	1958	April 7	--	490
1986	April 21	10.75	2,110	1961	March 6	4.61	482
1974	April 25	10.25	2,020	1981	April 5	4.30	460
1984	April 6	9.79	2,000	1959	June 29	4.28	451
1960	April 11	9.81	1,980	1990	June 4	3.74	311
1994	April 5	10.70	1,980	1988	March 26	3.63	284
1971	April 28	9.67	1,850	1991	July 2	3.49	261
1967	April 15	8.52	1,580	1963	June 8	3.02	207
1970	May 29	8.70	1,500				

# 05058700 SHEYENNE RIVER AT LISBON, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1957	7.66	34.5	49.1	50.6	49.8	68.2	43.1	39.9	65.2	51.5	49.3	323.1	69.0
1958	109.4	133.9	80.9	70.7	95.6	116.0	98.8	38.4	27.6	72.3	17.2	12.9	72.7
1959	21.1	31.5	36.5	36.0	33.5	48.4	33.2	17.5	40.1	27.7	10.7	5.25	28.4
1960	16.0	12.7	26.0	19.5	21.9	175.3	838.4	100.0	171.8	35.7	21.0	13.9	120.1
1961	15.3	26.1	46.1	43.0	39.4	108.3	29.0	22.1	14.8	8.60	6.54	18.7	31.5
1962	21.1	18.5	13.0	13.2	14.8	246.6	469.4	210.6	277.4	657.0	91.6	39.9	173.8
1963	31.3	54.6	58.2	49.5	52.0	68.1	63.8	34.9	41.5	17.4	13.1	12.2	41.3
1964	11.7	25.9	36.6	25.8	26.2	19.8	78.9	30.4	159.2	203.4	22.9	33.7	56.2
1965	26.5	53.9	50.8	46.9	42.1	125.9	1,634	306.9	163.2	210.6	185.0	66.8	241.8
1966	120.5	97.9	105.8	103.7	76.8	1,304	991.4	358.9	217.9	149.0	219.6	71.9	319.8
1967	35.7	44.5	73.5	67.6	129.6	345.1	958.9	634.2	103.5	33.5	17.7	16.1	204.8
1968	18.3	29.1	42.6	37.4	41.3	128.1	168.3	163.5	329.2	47.7	17.5	21.8	86.8
1969	22.4	53.9	50.1	41.7	202.3	220.2	2,548	442.9	140.4	213.3	21.5	25.9	329.0
1970	22.1	47.5	58.5	65.5	100.9	231.1	523.1	401.7	446.5	68.2	17.7	17.2	166.2
1971	16.5	29.7	42.2	39.6	79.1	356.5	732.5	222.4	244.3	228.8	30.4	22.4	170.2
1972	56.6	106.6	158.6	138.2	78.6	363.5	927.8	289.4	235.5	39.8	24.9	19.2	202.6
1973	23.9	42.3	48.5	53.5	70.4	165.0	62.2	27.2	21.7	6.07	11.6	25.0	46.3
1974	22.4	32.8	34.7	63.7	177.9	283.8	1,006	685.7	555.4	20.1	16.6	10.1	241.2
1975	14.5	38.7	53.2	54.8	56.2	81.6	736.6	970.5	512.9	700.2	95.3	27.1	279.7
1976	38.1	62.7	92.7	93.7	107.0	169.3	601.5	172.3	51.6	21.3	10.7	29.9	120.3
1977	43.6	30.5	19.8	19.7	17.0	51.9	36.9	67.7	19.7	18.5	7.44	24.6	29.9
1978	23.9	40.6	48.3	55.3	98.8	426.8	806.5	180.5	79.2	42.2	22.2	61.5	156.7
1979	57.7	54.6	24.5	31.1	56.5	225.0	1,788	1,989	207.4	151.7	74.3	37.9	392.8
1980	73.7	180.4	22.7	15.9	15.9	209.4	246.9	18.9	34.8	28.4	15.8	158.9	84.7
1981	126.2	113.9	39.3	15.8	29.1	83.6	152.7	65.2	113.1	127.4	29.1	26.4	76.9
1982	140.6	167.6	18.2	14.0	15.6	189.9	1,244	297.5	171.3	184.6	72.7	13.7	210.4
1983	134.9	195.1	122.5	126.9	76.4	1,214	788.5	208.7	267.9	218.4	20.9	88.6	289.8
1984	106.9	137.3	136.3	109.4	76.0	415.7	1,092	382.0	109.8	35.0	16.4	32.5	220.2
1985	95.5	56.5	53.2	40.7	29.0	158.0	171.6	141.7	81.4	22.2	40.2	25.1	76.6
1986	36.2	100.2	143.0	139.9	193.7	354.3	509.8	490.0	81.8	72.4	90.2	34.0	187.1
1987	35.3	98.8	190.2	132.1	74.4	1,328	1,624	200.8	148.8	127.9	262.9	61.8	358.1
1988	89.8	102.4	112.7	118.3	139.4	145.6	38.0	54.1	34.6	6.52	18.2	13.5	72.7
1989	14.9	28.2	34.0	36.3	46.3	207.5	380.5	31.8	46.1	19.3	27.1	27.1	74.7
1990	32.5	27.4	17.5	21.5	16.8	30.9	28.7	18.6	60.3	20.8	23.9	55.8	29.5
1991	16.8	12.2	8.69	8.15	10.7	34.3	20.3	51.2	39.2	56.9	27.5	23.1	25.9

# 05058700 SHEYENNE RIVER AT LISBON, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1992	15.9	24.2	60.6	70.1	63.6	585.1	134.4	70.6	56.1	97.1	46.1	52.2	107.0
1993	25.4	23.1	31.0	80.0	102.5	325.1	444.2	158.3	249.4	1424	1945	377.9	436.6
1994	150.3	147.3	190.7	125.7	202.1	565.5	988.3	304.4	354.8	624.4	276.0	560.8	374.1
1995	715.9	453.9	289.8	203.9	166.8	1,525	2,540	907.6	326.6	273.8	275.6	205.1	658.6
1996	92.8	70.6	108.9	151.5	412.8	729.2	2,848	1,439	393.8	232.9	156.8	33.8	553.6
1997	45.8	140.4	211.8	190.3	195.7	250.6	4,181	2,394	439.1	378.2	129.1	79.4	718.6

## 05059000 SHEYENNE RIVER NEAR KINDRED, ND

**LOCATION.**--Lat 46°37'54", long 97°00'01", in SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.33, T.137 N., R.50 W., Cass County, Hydrologic Unit 09020204, on left bank 100 ft downstream from North Dakota State Highway 46 bridge crossing, 1.5 mi southeast of Kindred, and at mile 67.9.

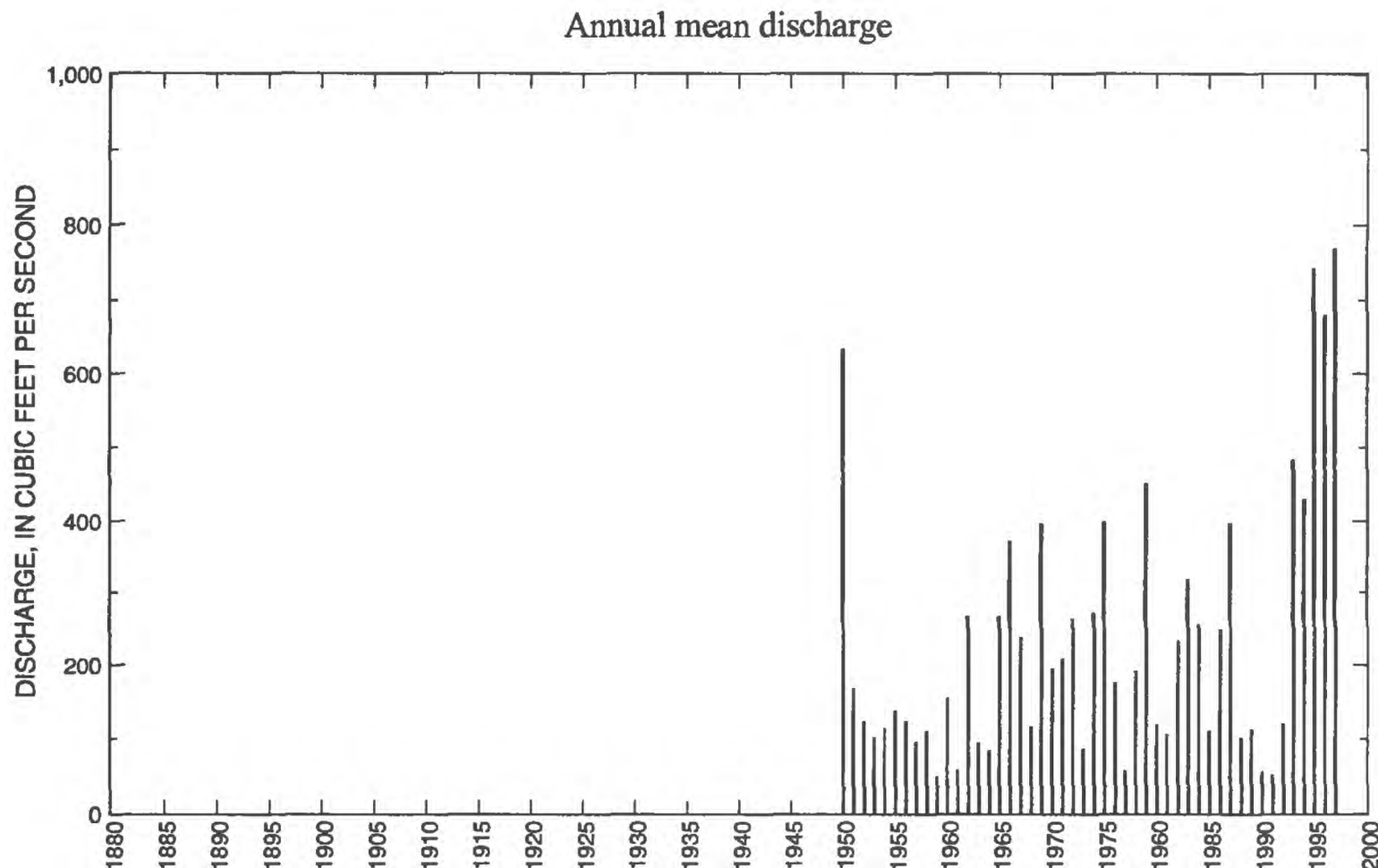
**DRAINAGE AREA.**--8,800 mi<sup>2</sup>, approximately, of which about 5,780 mi<sup>2</sup> is probably noncontributing, including 3,800 mi<sup>2</sup> in closed basins.

**PERIOD OF RECORD.**--July 1949 to current year.

**GAGE.**--Water-stage recorder. Datum of gage is 925.55 ft above sea level. From Oct. 1, 1962, to Sept. 30, 1989, gage was located at site 1,500 ft upstream. July 1949 to Sept. 30, 1962, nonrecording gage at same site and datum.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 5,970 ft<sup>3</sup>/s, Apr. 27, 1997, gage height, 21.38; maximum gage height, 22.33 ft<sup>3</sup>/s, Apr. 8, 1997; minimum daily discharge, 9.2 ft<sup>3</sup>/s, Aug. 16, 1990.

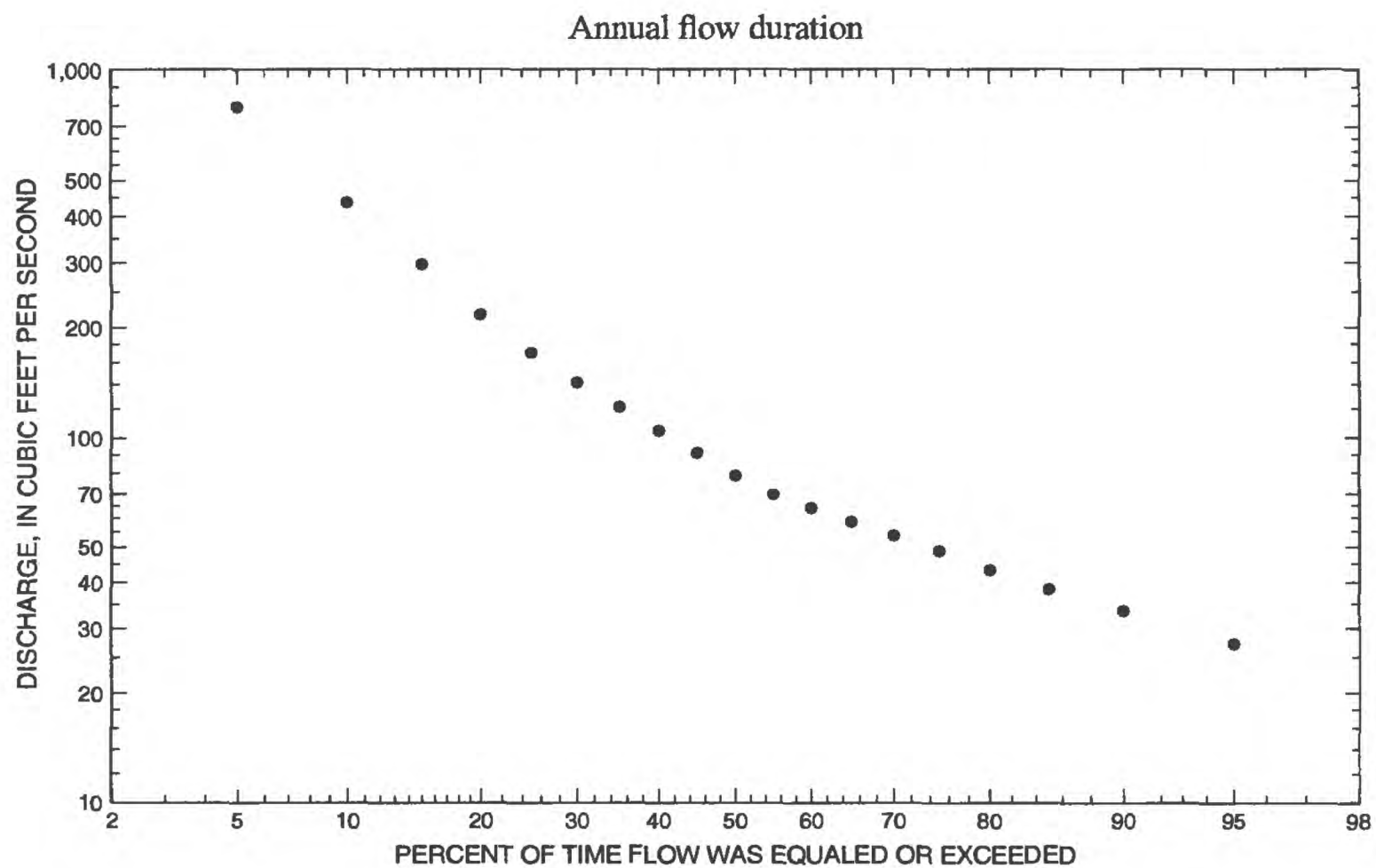
**EXTREMES OUTSIDE PERIOD OF RECORD.**--Spring flood in 1947 or 1948 reached a stage of 22.10 ft from floodmarks, discharge about 3,600 ft<sup>3</sup>/s.



# 05059000 SHEYENNE RIVER NEAR KINDRED, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	693	1995	24.6	1957	86.9	100	1.15	3.07
November	588	1995	22.7	1956	95.8	89.1	0.93	3.39
December	339	1995	17.6	1956	84.8	66.0	0.78	3.00
January	205	1995	17.5	1991	75.8	49.1	0.65	2.68
February	317	1996	21.7	1956	87.9	63.2	0.72	3.11
March	1,260	1987	35.1	1956	309	319	1.03	10.9
April	3,960	1997	71.7	1991	834	844	1.01	29.5
May	3,050	1950	53.6	1990	515	708	1.37	18.2
June	1,940	1950	48.4	1961	274	298	1.09	9.70
July	1,470	1975	26.7	1988	238	305	1.28	8.41
August	2,230	1993	17.5	1988	141	317	2.26	4.97
September	483	1993	25.1	1959	87.3	98.6	1.13	3.09
Annual	770	1997	48.0	1991	236	185	0.78	100





# 05059000 SHEYENNE RIVER NEAR KINDRED, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	22.7	28.2	34.0	73.0	57.6	52.0	29.3	21.1	23.7	26.4	28.2	21.5	27.3
90	27.6	31.5	45.7	93.2	65.2	60.4	37.5	25.6	28.5	31.3	33.6	31.4	33.7
85	34.3	35.5	53.9	112	72.9	67.1	45.9	29.5	30.7	36.0	38.7	36.0	39.4
80	36.5	39.8	62.6	133	82.5	75.1	53.8	33.0	32.9	39.5	42.0	41.1	44.7
75	39.6	44.0	72.8	156	94.3	84.8	61.3	36.3	35.3	42.1	45.2	44.2	49.5
70	45.7	47.8	87.3	182	107	97.1	68.7	39.7	37.8	44.7	48.2	46.7	54.6
65	49.1	50.7	101	220	123	113	76.5	43.3	40.8	47.4	51.4	49.3	60.3
60	51.4	54.9	116	277	144	131	85.7	47.0	44.5	50.3	56.7	51.9	66.8
55	54.4	59.8	132	354	192	146	97.0	50.9	48.6	53.4	61.7	55.1	74.9
50	58.5	63.8	147	431	230	167	113	54.8	52.8	56.7	66.6	58.8	85.9
45	62.4	69.6	160	530	269	192	130	60.5	57.4	61.0	72.4	62.8	99.7
40	67.5	79.9	193	661	312	217	151	66.7	62.4	66.0	78.6	67.0	116
35	73.3	89.3	227	787	367	248	176	78.6	71.5	73.2	88.7	76.1	134
30	88.5	98.9	273	928	446	288	216	96.3	79.7	81.0	107	97.4	158
25	102	111	324	1,100	534	334	273	120	89.6	93.8	119	114	193
20	119	122	392	1,330	624	379	345	156	101	109	134	126	247
15	141	144	487	1,640	889	448	406	208	114	128	153	143	339
10	165	185	712	2,070	1,240	548	500	283	158	162	180	162	496
5	181	220	1,410	3,320	2,270	827	669	378	311	218	229	216	962

## 05059000 SHEYENNE RIVER NEAR KINDRED, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /a)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	136	104	80.2	68.9	61.0
0.95	1.05	280	230	189	158	130
0.90	1.11	404	344	290	241	193
0.80	1.25	620	547	475	395	309
0.50	2	1,340	1,250	1,140	954	740
0.20	5	2,710	<sup>1</sup> 2,620	2,480	2,140	1,720
0.10	10	3,820	3,740	3,590	3,180	2,640
0.04	25	5,410	5,360	5,200	4,750	4,120
0.02	50	6,710	6,670	6,510	6,080	5,470
0.01	100	8,090	8,060	7,900	7,530	7,030
0.005	200	9,550	9,520	9,360	9,110	8,830
0.002	500	11,600	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

# 05059000 SHEYENNE RIVER NEAR KINDRED, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1947	--	22.10	3,600	1974	April 29	12.29	1,940
1950	May 13	20.50	3,210	1975	July 6	21.66	4,640
1951	May 5	7.70	1,010	1976	April 16	8.75	925
1952	April 8	17.80	2,240	1977	May 8	6.05	570
1953	July 3	6.44	679	1978	March 28	16.43	1,410
1954	July 6	6.17	631	1979	May 7	20.75	4,160
1955	April 19	8.80	1,120	1980	April 4	7.92	750
1956	May 4	10.82	1,460	1981	April 10	4.77	435
1957	September 12	5.70	547	1982	April 16	12.84	2,040
1958	March 5	6.95	480	1983	April 21	17.64	2,060
1959	July 3	4.13	204	1984	April 11	11.51	1,810
1960	April 13	11.76	1,820	1985	March 18	7.06	555
1961	March 11	5.10	350	1986	April 24	11.13	1,740
1962	July 11	15.14	2,310	1987	March 26	18.26	3,000
1963	April 6	4.99	430	1988	March 7	5.46	460
1964	July 3	--	600	1989	April 3	15.01	1,430
1965	April 18	17.30	2,760	1990	June 7	3.42	286
1966	April 3	19.15	3,380	1991	May 29	3.11	184
1967	April 18	10.48	1,460	1992	March 15	11.44	1,400
1968	June 18	7.67	1,010	1993	August 9	19.84	3,550
1969	April 15	21.03	4,690	1994	April 7	12.87	2,030
1970	April 27	9.59	1,230	1995	April 10	19.86	3,970
1971	April 30	11.46	1,750	1996	April 30	--	5,100
1972	March 19	13.54	1,530	1997	April 27	--	5,970
1973	March 22	6.19	710				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 27	--	5,970	1986	April 24	11.13	1,740
1996	April 30	--	5,100	1972	March 19	13.54	1,530
1969	April 15	21.03	4,690	1967	April 18	10.48	1,460
1975	July 6	21.66	4,640	1956	May 4	10.82	1,460
1979	May 7	20.75	4,160	1989	April 3	15.01	1,430
1995	April 10	19.86	3,970	1978	March 28	16.43	1,410
1947	--	22.10	3,600	1992	March 15	11.44	1,400
1993	August 9	19.84	3,550	1970	April 27	9.59	1,230
1966	April 3	19.15	3,380	1955	April 19	8.80	1,120
1950	May 13	20.50	3,210	1951	May 5	7.70	1,010
1987	March 26	18.26	3,000	1968	June 18	7.67	1,010
1965	April 18	17.30	2,760	1976	April 16	8.75	925
1962	July 11	15.14	2,310	1980	April 4	7.92	750
1952	April 8	17.80	2,240	1973	March 22	6.19	710
1983	April 21	17.64	2,060	1953	July 3	6.44	679
1982	April 16	12.84	2,040	1954	July 6	6.17	631
1994	April 7	12.87	2,030	1964	July 3	--	600
1974	April 29	12.29	1,940	1977	May 8	6.05	570
1960	April 13	11.76	1,820	1985	March 18	7.06	555
1984	April 11	11.51	1,810	1957	September 12	5.70	547
1971	April 30	11.46	1,750	1958	March 5	6.95	480

# 05059000 SHEYENNE RIVER NEAR KINDRED, ND--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1988	March 7	5.46	460	1990	June 7	3.42	286
1981	April 10	4.77	435	1959	July 3	4.13	204
1963	April 6	4.99	430	1991	May 29	3.11	184
1961	March 11	5.10	350				

# 05059000 SHEYENNE RIVER NEAR KINDRED, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1949	--	--	--	--	--	--	--	--	--	--	93.4	32.0	--
1950	34.8	39.7	44.2	29.7	28.9	200.6	1,575	3,053	1,938	401.4	174.4	57.4	633.3
1951	51.0	64.1	47.6	50.0	50.0	87.3	682.7	530.5	184.4	127.0	59.0	71.2	167.1
1952	61.5	86.7	47.4	45.5	59.0	62.1	787.4	116.8	73.4	75.9	38.9	41.2	123.7
1953	42.8	43.5	35.5	34.7	45.6	128.3	99.3	138.9	288.7	267.8	59.9	33.0	101.8
1954	40.6	47.7	52.9	67.1	111.4	132.7	222.7	100.8	112.9	336.6	73.4	69.4	114.0
1955	67.4	108.7	107.7	80.8	49.3	71.0	350.8	107.3	272.3	291.7	110.7	26.1	137.1
1956	29.9	22.7	17.6	19.7	21.7	35.1	255.4	611.9	298.8	98.3	49.3	26.0	124.1
1957	24.6	47.6	59.2	55.6	57.7	112.8	116.9	88.4	98.8	93.9	74.1	324.7	96.0
1958	129.1	170.7	115.7	96.5	89.0	209.1	176.8	84.7	73.7	104.6	43.7	30.5	110.5
1959	38.3	42.8	38.8	41.1	33.8	66.0	97.4	53.7	59.3	62.1	33.1	25.1	49.3
1960	36.0	30.6	41.9	38.0	36.1	69.0	1,060	181.7	212.6	84.7	36.5	41.3	154.4
1961	34.7	47.1	58.5	61.9	61.2	143.5	78.9	73.0	48.4	30.0	25.2	30.5	57.8
1962	41.9	33.1	24.9	25.2	31.0	145.8	728.5	306.4	394.5	1,065	274.1	111.8	266.5
1963	88.7	95.5	101.8	66.0	58.0	121.0	209.1	117.1	134.0	56.7	45.6	38.1	94.3
1964	37.1	46.2	45.7	30.5	43.2	51.2	165.5	86.8	124.8	276.5	49.5	55.5	84.4
1965	53.3	76.9	58.7	60.6	62.0	76.9	1,508	475.1	270.2	202.2	261.2	99.3	266.3
1966	186.3	126.8	138.0	113.1	100.9	1,121	1,327	463.7	301.1	192.2	274.1	103.6	371.8
1967	66.1	49.9	87.6	91.5	87.5	420.3	915.8	743.9	224.2	81.2	38.4	34.7	237.2
1968	38.3	38.1	48.0	53.9	50.0	161.4	247.4	236.0	340.3	99.9	43.4	41.5	116.3
1969	46.0	70.7	60.8	63.0	179.5	262.9	2464	965.1	232.6	306.4	75.4	57.0	397.1
1970	55.7	61.4	67.9	62.3	87.7	217.6	592.3	422.1	520.3	166.4	51.5	41.5	195.2
1971	41.3	55.9	48.3	57.4	62.5	393.5	662.7	424.7	304.9	316.1	64.3	66.9	208.7
1972	99.1	135.8	164.5	165.2	108.8	446.6	963.0	468.3	364.8	121.5	75.0	54.4	263.5
1973	62.6	69.6	55.9	58.9	94.3	308.6	156.0	72.5	58.0	32.3	30.7	44.6	87.0
1974	50.9	50.4	50.1	49.9	123.6	309.8	937.7	845.3	680.1	73.3	54.2	34.8	271.2
1975	42.4	58.1	57.5	71.9	67.2	97.4	762.1	1,191	634.2	1,466	190.8	113.7	398.8
1976	102.3	115.2	114.9	115.9	221.4	315.4	625.3	281.9	97.6	60.0	35.0	36.9	176.1
1977	38.4	45.2	41.2	38.0	41.6	109.7	103.7	102.2	56.9	39.9	22.5	40.9	56.8
1978	57.6	60.0	58.6	52.9	100.8	415.7	879.6	275.3	144.2	94.9	42.1	123.5	191.7
1979	81.5	86.8	49.4	44.6	51.2	148.6	1,817	2,306	355.8	218.0	153.4	81.3	451.3
1980	78.8	231.5	65.8	42.6	42.7	193.4	380.8	61.5	88.3	59.8	44.9	142.7	118.8
1981	132.3	140.7	69.0	36.9	49.4	120.3	210.7	105.4	133.1	178.2	57.7	35.7	106.0
1982	160.1	193.8	38.6	27.2	31.5	144.8	1,255	371.3	240.0	190.0	111.1	32.9	232.5
1983	134.7	182.1	164.5	138.6	86.0	1,165	931.4	287.0	266.6	311.9	45.2	103.7	319.4



# 05059000 SHEYENNE RIVER NEAR KINDRED, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1984	102.3	148.8	152.9	138.2	96.3	397.9	1,203	456.3	207.7	84.6	29.5	54.9	255.2
1985	115.0	85.8	64.8	58.5	38.2	212.7	224.6	206.8	143.6	62.7	51.5	59.7	110.7
1986	58.2	76.6	142.5	163.4	187.5	512.2	647.1	688.9	167.2	113.4	132.6	90.5	248.9
1987	86.5	105.7	205.5	170.1	115.9	1,256	1,796	303.6	226.1	93.6	313.7	85.7	397.2
1988	110.7	120.7	127.4	125.0	140.2	277.4	113.8	68.8	52.8	26.7	17.5	29.4	100.9
1989	34.4	37.1	33.6	37.6	54.7	174.7	711.9	86.0	74.7	38.0	35.5	42.7	112.8
1990	54.2	55.3	33.3	24.9	32.7	91.8	107.0	53.6	95.3	40.6	26.6	55.5	55.9
1991	47.2	31.7	18.5	17.5	26.6	65.5	71.7	85.8	69.1	65.1	30.1	45.7	48.0
1992	31.0	32.5	51.9	59.7	61.5	545.6	201.2	84.0	90.2	124.1	73.8	83.2	120.4
1993	54.6	48.8	31.9	73.7	106.8	253.4	681.9	221.3	316.6	1,250	2,231	483.2	483.6
1994	224.5	180.1	246.6	164.8	214.5	614.4	1203	460.3	374.3	759.8	252.7	467.3	430.6
1995	692.6	588.5	338.8	204.8	196.9	1,182	2,964	1,197	511.0	426.6	331.1	275.2	743.1
1996	181.6	143.9	119.0	126.4	316.9	965.0	2,799	2,171	684.4	296.4	268.8	89.4	679.4
1997	91.0	169.7	226.8	188.4	204.2	210.0	3,957	2,907	533.7	453.0	179.5	113.9	769.6

## 05059500 SHEYENNE RIVER AT WEST FARGO, ND

### Station Description

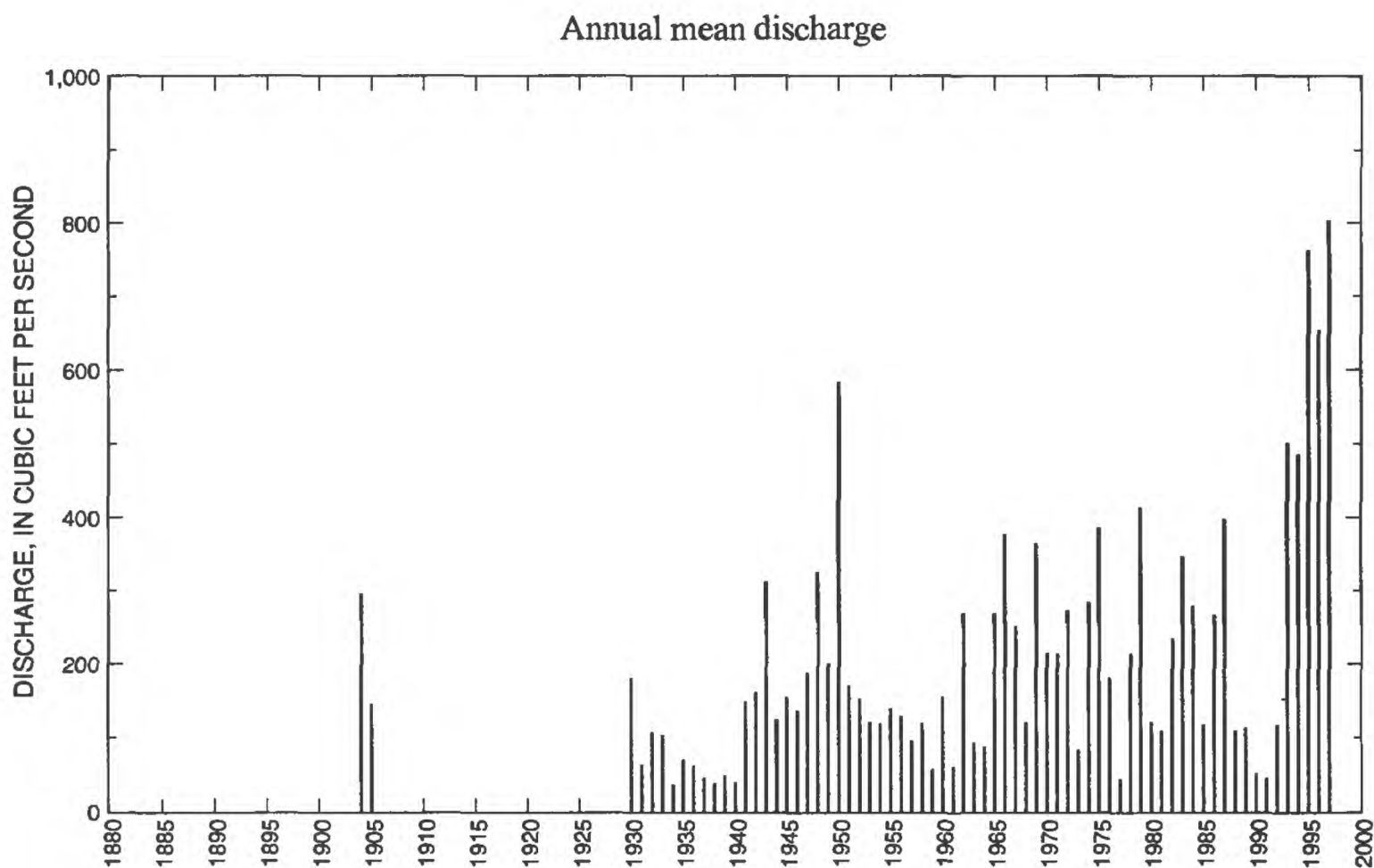
**LOCATION.**--Lat 46°53'28", long 96°54'24", in SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.31, T.140 N., R.49 W., Cass County, Hydrologic Unit 09020204, on right bank at downstream side of county highway bridge, 1 mi north of West Fargo, 3 mi upstream from Maple River, and at mile 24.5.

**DRAINAGE AREA.**--8,870 mi<sup>2</sup>, approximately, of which about 5,780 mi<sup>2</sup> is probably noncontributing, including 3,800 mi<sup>2</sup> in closed basins.

**PERIOD OF RECORD.**--March to November 1902 (gage heights only), April 1903 to October 1905, March to August 1919, September 1929 to current year. Published as "at or near Haggart" 1902-07, 1919. Records for March to November 1902 and November 1905 to June 1907, published in Water Supply Paper 100, 171, 207, and 245, have been found to be unreliable and should not be used. Monthly discharge only for some periods, published in Water Supply Paper 1308.

**GAGE.**--Water-stage recorder. Datum of gage is 877.19 ft above sea level. June 27, 1933, to September 1969 on left bank about 600 ft downstream on unimproved channel at same datum. See Water Supply Paper 1728 or 1913 for history of changes prior to June 27, 1933.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 4,810 ft<sup>3</sup>/s, 1997, maximum gage height, 22.25 ft, July 5, 1975; minimum daily discharge, 1.0 ft<sup>3</sup>/s, Sept. 23, 1976.



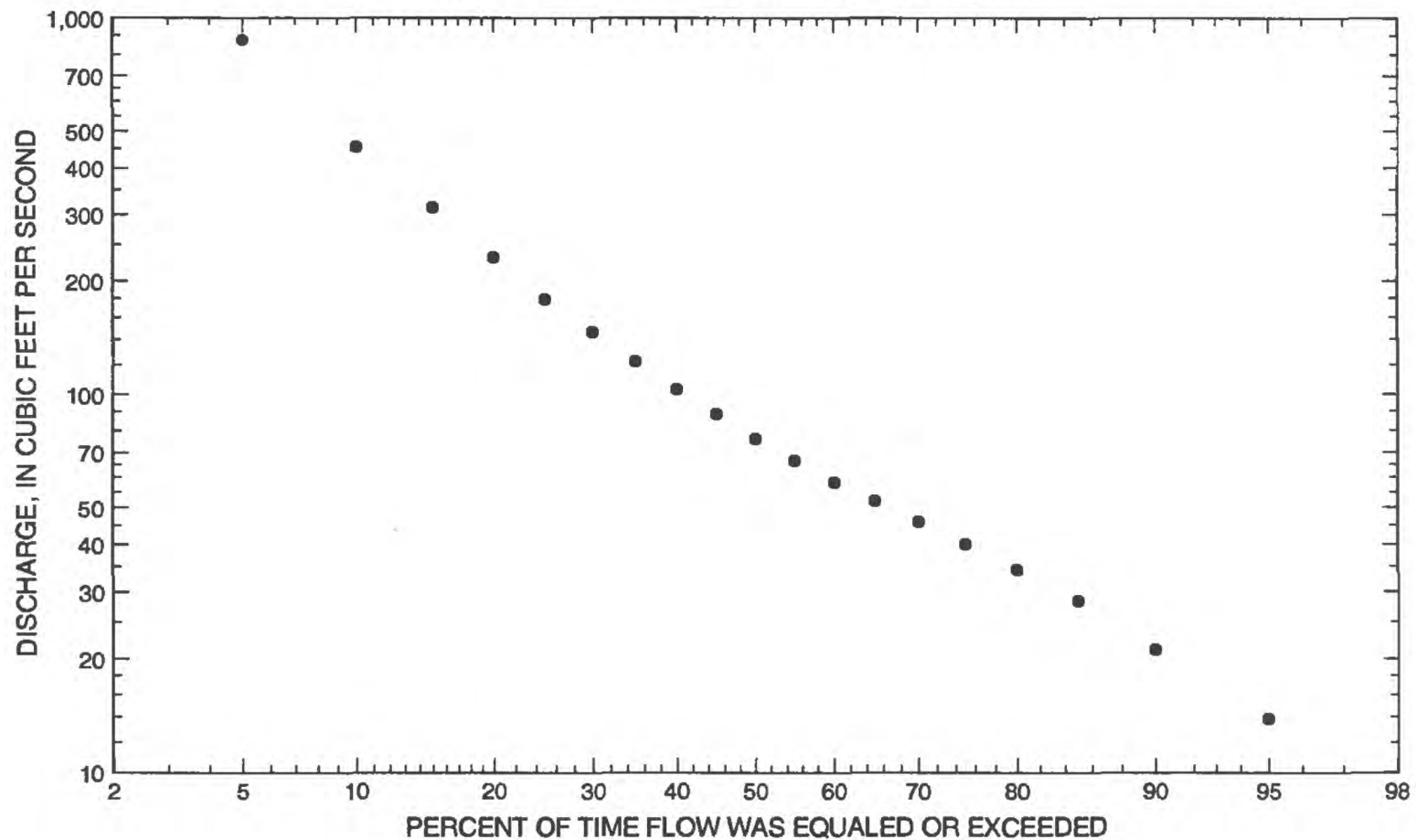
# 05059500 SHEYENNE RIVER AT WEST FARGO, ND--Continued

Post-regulation period, 1950-97

Statistics of monthly and annual mean discharges, post-regulation period

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	714	1995	18.5	1992	91.0	105	1.16	3.15
November	674	1995	18.9	1977	101	103	1.02	3.51
December	359	1995	9.15	1977	88.8	74.2	0.84	3.07
January	267	1997	8.40	1977	78.7	56.7	0.72	2.72
February	287	1996	16.4	1977	89.3	64.8	0.73	3.09
March	1,180	1995	34.0	1956	286	295	1.03	9.90
April	3,310	1997	65.2	1991	828	742	0.90	28.7
May	3,240	1997	54.0	1959	536	695	1.30	18.6
June	1,780	1950	40.2	1977	291	287	0.99	10.0
July	1,360	1975	26.8	1988	257	314	1.22	8.89
August	2,220	1993	21.1	1988	151	320	2.12	5.23
September	532	1993	7.43	1976	91.8	105	1.15	3.18
Annual	804	1997	44.5	1977	241	185	0.77	100

Annual flow duration, post-regulation period



# 05059500 SHEYENNE RIVER AT WEST FARGO, ND--Continued

Monthly and annual flow duration, in cubic feet per second, post-regulation period

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	21.2	22.5	37.0	75.5	56.8	49.2	30.9	21.2	22.0	25.1	25.0	20.6	25.9
90	24.8	31.9	46.2	101	69.1	61.4	39.3	26.0	27.7	30.4	30.9	27.5	33.6
85	31.4	37.1	52.0	124	81.2	71.3	50.9	30.7	31.3	34.6	37.1	34.7	39.8
80	35.8	41.8	58.6	144	93.6	82.0	59.5	35.3	34.8	38.3	41.8	39.6	45.4
75	38.8	46.5	67.9	173	106	95.2	67.3	39.3	37.5	41.1	45.7	45.3	50.8
70	42.1	49.8	77.9	198	118	110	76.3	43.2	40.2	44.2	49.4	49.5	56.1
65	45.9	52.4	91.5	246	132	124	88.2	46.8	43.4	48.0	53.3	52.5	61.7
60	49.5	55.8	104	313	159	137	102	50.3	47.3	51.7	58.2	55.1	69.9
55	54.4	60.5	118	386	208	155	115	54.6	51.2	55.4	62.9	57.3	78.0
50	63.0	66.0	138	464	248	180	128	59.7	55.2	59.2	67.5	59.5	90.8
45	67.2	72.8	158	578	292	207	144	65.8	59.2	63.6	72.7	63.1	105
40	70.6	81.4	182	710	356	236	161	73.7	63.6	68.8	80.1	69.6	122
35	75.9	92.2	218	845	424	274	187	87.8	74.6	76.7	90.0	81.1	141
30	90.8	101	267	991	507	320	238	110	86.6	85.0	105	96.3	166
25	105	109	298	1,160	582	360	298	136	98.4	97.7	121	116	210
20	120	121	339	1,360	690	408	363	185	109	120	139	133	271
15	144	146	416	1,690	946	480	435	236	124	138	166	143	360
10	162	174	605	2,050	1,310	616	523	309	175	172	200	166	524
5	194	256	1,230	2,880	2,460	881	826	415	350	237	258	245	1,010

## 05059500 SHEYENNE RIVER AT WEST FARGO, ND--Continued

Probability of occurrence of annual high discharges, post-regulation period

[ng, statistic not given]

Exceedsnce probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-dsy period
0.99	1.01	124	87.4	76.8	68.1	57.8
0.95	1.05	270	217	191	162	130
0.90	1.11	397	338	299	251	197
0.80	1.25	617	555	496	413	320
0.50	2	1,330	1,280	1,170	989	769
0.20	5	2,590	2,550	2,410	2,140	1,730
0.10	10	3,530	3,470	3,350	3,080	2,570
0.04	25	4,790	4,650	<sup>1</sup> 4,370	<sup>1</sup> 3,930	<sup>1</sup> 3,260
0.02	50	5,750	5,500	<sup>1</sup> 5,170	<sup>1</sup> 4,650	<sup>1</sup> 3,860
0.01	100	6,720	6,310	<sup>1</sup> 5,930	<sup>1</sup> 5,340	<sup>1</sup> 4,430
0.005	200	7,680	7,090	<sup>1</sup> 6,660	<sup>1</sup> 5,990	<sup>1</sup> 4,970
0.002	500	8,950	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.



# 05059500 SHEYENNE RIVER AT WEST FARGO, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1903	April 11	14.70	1,570	1962	July 13	18.77	2,420
1904	April 25	8.70	1,950	1963	April 8	8.63	490
1905	May 13	9.80	814	1964	July 6	8.99	542
1906	April 16	11.70	1,060	1965	April 24	--	2,530
1919	April 28	16.80	2,220	1966	April 4	--	3,110
1930	April 5	14.90	1,780	1967	April 21	14.92	1,830
1931	April 7	7.84	390	1968	June 20	11.46	1,020
1932	April 13	11.84	1,110	1969	April 22	21.20	3,060
1933	March 11	11.82	680	1970	June 2	14.83	1,120
1934	April 13	7.22	336	1971	May 1	14.63	1,800
1935	March 29	7.32	362	1972	March 20	18.28	1,560
1936	April 21	9.74	718	1973	March 17	13.14	500
1937	April 18	7.40	485	1974	April 29	16.36	2,060
1938	March 27	5.50	249	1975	July 3	21.75	2,850
1939	April 3	--	600	1976	April 17	11.46	963
1940	April 18	7.88	555	1977	May 9	8.54	475
1941	April 26	12.72	1,340	1978	March 29	21.04	1,660
1942	April 27	11.02	1,040	1979	April 21	22.12	3,480
1943	April 7	--	2,400	1980	April 8	11.55	825
1944	May 22	10.10	861	1981	April 11	7.99	460
1945	March 22	13.38	1,360	1982	April 17	17.12	2,040
1946	March 31	15.01	1,690	1983	March 22	19.82	2,100
1947	April 18	20.53	2,800	1984	April 12	15.60	2,070
1948	May 7	18.46	2,650	1985	May 23	8.84	608
1949	April 29	16.19	1,980	1986	April 25	14.97	1,720
1950	May 22	19.99	2,810	1987	March 29	20.35	2,940
1951	April 5	13.25	1,020	1988	March 10	9.28	450
1952	April 12	20.28	2,510	1989	April 4	20.53	1,420
1953	June 17	--	1,300	1990	June 9	6.16	155
1954	July 7	9.11	565	1991	July 1	11.67	270
1955	April 21	11.68	1,110	1992	March 17	14.39	1,070
1956	May 8	13.01	1,450	1993	August 11	--	3,250
1957	September 14	7.86	442	1994	March 30	--	2,840
1958	March 7	8.84	470	1995	--	--	3,830
1959	June 12	6.70	246	1996	May 2	--	4,240
1960	April 14	14.75	1,720	1997	--	--	4,810
1961	March 14	8.08	255				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	--	--	4,810	1969	April 22	21.20	3,060
1996	May 2	--	4,240	1987	March 29	20.35	2,940
1995	--	--	3,830	1975	July 3	21.75	2,850
1979	April 21	22.12	3,480	1994	March 30	--	2,840
1993	August 11	--	3,250	1950	May 22	19.99	2,810
1966	April 4	--	3,110	1947	April 18	20.53	2,800

# 05059500 SHEYENNE RIVER AT WEST FARGO, ND--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1948	May 7	18.46	2,650	1942	April 27	11.02	1,040
1965	April 24	--	2,530	1951	April 5	13.25	1,020
1952	April 12	20.28	2,510	1968	June 20	11.46	1,020
1962	July 13	18.77	2,420	1976	April 17	11.46	963
1943	April 7	--	2,400	1944	May 22	10.10	861
1919	April 28	16.80	2,220	1980	April 8	11.55	825
1983	March 22	19.82	2,100	1905	May 13	9.80	814
1984	April 12	15.60	2,070	1936	April 21	9.74	718
1974	April 29	16.36	2,060	1933	March 11	11.82	680
1982	April 17	17.12	2,040	1985	May 23	8.84	608
1949	April 29	16.19	1,980	1939	April 3	--	600
1904	April 25	8.70	1,950	1954	July 7	9.11	565
1967	April 21	14.92	1,830	1940	April 18	7.88	555
1971	May 1	14.63	1,800	1964	July 6	8.99	542
1930	April 5	14.90	1,780	1973	March 17	13.14	500
1960	April 14	14.75	1,720	1963	April 8	8.63	490
1986	April 25	14.97	1,720	1937	April 18	7.40	485
1946	March 31	15.01	1,690	1977	May 9	8.54	475
1978	March 29	21.04	1,660	1958	March 7	8.84	470
1903	April 11	14.70	1,570	1981	April 11	7.99	460
1972	March 20	18.28	1,560	1988	March 10	9.28	450
1956	May 8	13.01	1,450	1957	September 14	7.86	442
1989	April 4	20.53	1,420	1931	April 7	7.84	390
1945	March 22	13.38	1,360	1935	March 29	7.32	362
1941	April 26	12.72	1,340	1934	April 13	7.22	336
1953	June 17	--	1,300	1991	July 1	11.67	270
1970	June 2	14.83	1,120	1961	March 14	8.08	255
1932	April 13	11.84	1,110	1938	March 27	5.50	249
1955	April 21	11.68	1,110	1959	June 12	6.70	246
1992	March 17	14.39	1,070	1990	June 9	6.16	155
1906	April 16	11.70	1,060				

# 05059500 SHEYENNE RIVER AT WEST FARGO, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1903	--	--	--	--	--	--	--	369.0	163.2	79.9	46.4	82.3	--
1904	77.4	80.0	60.0	40.0	40.0	87.1	1,332	1,043	420.4	216.6	88.0	85.1	296.9
1905	93.2	91.3	60.0	40.0	30.0	100.0	194.3	326.4	205.6	177.1	303.4	120.0	146.0
1906	79.7	--	--	--	--	--	--	--	--	--	--	--	--
1919	--	--	--	--	--	--	1,573	784.2	305.0	175.4	67.6	--	--
1930	32.8	33.3	20.0	17.4	61.7	838.4	675.6	269.1	123.9	47.8	26.9	23.7	181.5
1931	23.0	32.8	22.9	12.8	51.2	122.5	228.2	84.6	117.4	31.2	21.7	18.3	63.6
1932	20.7	39.6	34.5	25.5	20.8	223.8	551.1	143.9	128.2	59.5	30.4	21.1	107.9
1933	21.2	34.5	21.0	16.0	15.7	415.6	401.5	176.8	68.2	39.4	17.7	12.0	103.7
1934	11.9	17.2	13.4	10.0	13.6	65.1	200.7	56.2	25.2	14.7	9.64	8.95	37.1
1935	17.1	16.2	9.81	9.10	15.3	118.9	178.5	106.3	93.1	108.3	136.5	34.2	70.6
1936	26.5	18.1	19.5	16.1	14.7	53.1	308.5	200.1	55.0	22.7	7.46	8.37	62.4
1937	9.88	12.4	7.48	7.77	5.47	36.6	195.3	101.8	103.2	36.7	22.2	21.3	46.6
1938	13.5	16.5	11.3	12.0	12.9	93.7	116.3	70.8	39.4	19.3	41.1	16.8	38.8
1939	11.9	15.2	12.0	11.4	10.1	105.0	258.8	61.7	55.6	26.7	11.3	9.06	49.0
1940	12.4	17.2	15.2	6.37	5.70	6.76	210.1	121.4	44.1	14.8	11.0	8.66	39.3
1941	10.8	15.8	12.9	12.6	12.6	32.3	1,038	230.4	218.7	113.1	48.2	53.0	149.0
1942	73.7	65.4	51.3	24.2	22.6	46.4	664.3	405.7	298.3	109.9	77.2	109.2	162.2
1943	64.3	56.7	36.5	33.2	36.5	269.2	1,656	371.1	768.9	271.8	132.0	62.9	312.0
1944	40.9	59.3	42.0	27.4	31.8	39.0	222.2	261.5	250.7	182.4	164.9	185.4	125.6
1945	78.8	92.5	60.7	44.5	47.0	552.9	456.3	188.4	160.1	78.9	63.2	37.7	155.6
1946	37.1	37.8	26.5	28.8	25.3	332.5	687.5	151.4	114.9	88.6	74.2	42.0	137.3
1947	76.5	58.2	41.7	38.0	40.4	71.5	1,276	238.5	231.2	114.1	57.8	32.2	188.7
1948	34.1	64.8	47.5	32.3	30.0	39.6	1,450	1,628	272.2	149.9	103.4	54.5	325.7
1949	34.5	52.5	38.9	27.9	22.3	118.7	1,157	519.1	194.0	138.5	85.6	27.3	201.1
1950	33.3	42.3	45.1	29.4	27.5	130.7	1,542	2,654	1,785	444.0	189.0	61.9	583.5
1951	52.6	65.1	54.4	50.0	50.0	67.7	708.9	553.5	191.8	132.5	61.8	68.8	171.5
1952	62.8	92.3	55.2	45.5	57.9	68.0	970.5	124.8	74.8	223.8	43.5	40.1	153.9
1953	43.6	47.0	35.2	33.5	43.0	129.3	108.1	157.5	474.8	285.9	65.6	34.2	121.6
1954	42.6	54.7	58.8	72.9	111.7	143.9	240.1	116.8	100.3	341.6	81.4	71.3	119.8
1955	64.3	98.8	92.9	81.0	50.6	58.1	376.3	110.4	281.5	294.9	134.4	31.7	139.7
1956	38.0	24.6	19.4	18.9	18.3	34.0	271.7	617.4	304.7	123.7	53.5	28.7	129.7
1957	27.1	43.4	55.8	40.0	42.1	120.0	143.4	96.7	114.9	103.8	80.5	290.3	96.4
1958	136.8	171.3	130.6	110.6	95.4	200.9	194.5	97.6	78.4	131.3	58.7	39.1	120.6
1959	38.4	44.7	41.2	41.9	36.0	73.8	121.2	54.0	92.9	77.8	33.3	33.5	57.4



# 05059500 SHEYENNE RIVER AT WEST FARGO, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1960	35.6	27.9	42.7	40.2	43.4	58.4	1,072	191.1	206.9	85.3	35.7	46.2	155.7
1961	32.8	46.5	59.8	69.1	63.4	148.2	95.0	83.3	47.6	32.5	23.7	30.2	61.1
1962	44.7	32.8	25.3	24.4	35.3	65.4	773.2	318.2	419.2	1,097	273.9	103.3	268.9
1963	80.2	90.6	97.0	68.4	60.9	108.0	232.0	124.3	126.3	60.4	46.8	37.9	94.4
1964	35.8	45.8	46.3	31.7	49.5	55.6	197.9	97.5	106.8	281.2	56.3	57.9	88.6
1965	51.5	78.6	59.3	64.8	66.6	75.3	1,409	583.5	282.0	180.6	276.6	100.7	268.5
1966	194.0	142.3	141.6	118.2	100.4	887.2	1,485	523.4	329.8	216.6	276.7	107.7	377.7
1967	76.6	51.4	90.4	95.6	94.7	343.9	992.3	797.4	272.5	101.0	53.3	45.1	251.5
1968	35.5	42.0	52.6	55.6	57.8	162.7	273.5	220.6	343.4	115.3	46.9	47.3	120.8
1969	49.8	71.0	65.2	67.2	174.8	284.5	1,789	1,124	282.1	324.1	90.5	60.7	364.8
1970	63.9	62.5	62.3	69.4	86.6	197.3	632.0	504.6	598.3	204.7	58.3	40.6	214.8
1971	39.5	56.3	49.8	55.6	62.6	358.4	630.8	520.8	313.4	330.0	68.2	68.7	213.5
1972	86.1	131.3	168.0	152.0	108.5	409.5	1,017	512.9	443.2	114.0	83.2	54.8	272.8
1973	57.3	60.6	55.9	59.1	93.9	267.7	154.9	74.6	61.4	34.4	32.3	48.1	83.3
1974	57.2	51.8	59.5	41.7	123.1	313.3	944.5	860.5	747.0	103.8	63.5	43.1	283.6
1975	40.1	57.6	55.6	69.3	75.4	114.5	734.7	1,175	589.5	1,358	214.1	107.9	385.3
1976	103.0	115.1	111.0	107.7	210.7	329.7	658.4	331.0	108.2	61.4	29.7	7.43	180.5
1977	27.6	18.9	9.15	8.40	16.4	83.7	110.7	117.6	40.2	41.4	22.1	36.7	44.5
1978	60.2	58.6	59.7	46.4	92.0	425.3	1,102	315.2	144.2	104.0	47.5	121.7	214.2
1979	79.5	81.9	46.7	43.3	50.3	120.1	1,591	2,066	403.3	208.9	164.5	83.3	413.2
1980	72.6	240.8	68.2	45.4	50.1	147.2	437.5	65.9	90.1	64.8	43.8	138.7	121.3
1981	135.1	146.4	74.1	38.0	46.0	111.7	230.5	112.3	140.8	186.5	61.8	35.5	110.1
1982	162.1	188.7	39.5	24.2	31.2	134.8	1,267	388.4	250.9	191.3	117.1	37.1	235.5
1983	157.6	233.9	186.4	147.4	91.2	1,067	1,085	299.7	312.1	420.0	60.1	96.5	347.6
1984	124.6	195.5	141.2	141.0	113.2	275.2	1,385	549.7	263.0	94.2	29.1	47.4	278.7
1985	105.8	93.8	77.2	72.4	51.0	191.6	274.8	226.7	142.0	62.3	51.2	68.2	118.3
1986	64.4	73.6	144.5	161.1	167.1	486.4	719.7	776.2	190.2	139.2	153.6	115.8	266.7
1987	103.5	106.7	227.2	175.9	117.0	1,123	1,757	361.8	251.6	82.8	355.0	97.3	397.2
1988	118.6	123.0	136.2	130.2	144.5	278.7	152.1	91.4	65.4	26.8	21.1	27.4	109.6
1989	34.5	39.3	31.5	42.5	49.9	112.4	744.4	98.9	86.7	41.0	37.7	53.0	113.6
1990	58.1	72.4	31.1	22.3	25.9	69.0	91.2	54.2	80.7	43.0	22.1	51.4	51.7
1991	56.4	31.5	22.4	24.1	32.5	68.5	65.2	64.3	53.1	63.8	27.3	34.2	45.4
1992	18.5	27.7	57.7	69.9	69.2	505.9	223.2	110.2	104.9	106.2	56.5	59.7	117.9
1993	56.0	53.9	34.6	69.9	101.9	247.5	781.9	258.5	342.9	1,272	2,218	532.3	501.5
1994	245.5	160.1	225.2	166.1	222.7	691.6	1,376	479.5	386.1	1,058	310.6	495.1	485.5

# 05059500 SHEYENNE RIVER AT WEST FARGO, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1995	713.5	673.7	359.2	237.6	200.1	1,184	2,922	1,216	561.5	439.4	347.1	291.5	762.8
1996	224.2	172.2	131.1	131.1	287.1	891.3	2,371	2,222	646.6	304.3	340.1	123.1	653.8
1997	125.3	227.0	327.6	266.9	285.0	312.7	3,312	3,235	617.1	523.1	244.8	152.2	803.7



## 05059600 MAPLE RIVER NEAR HOPE, ND

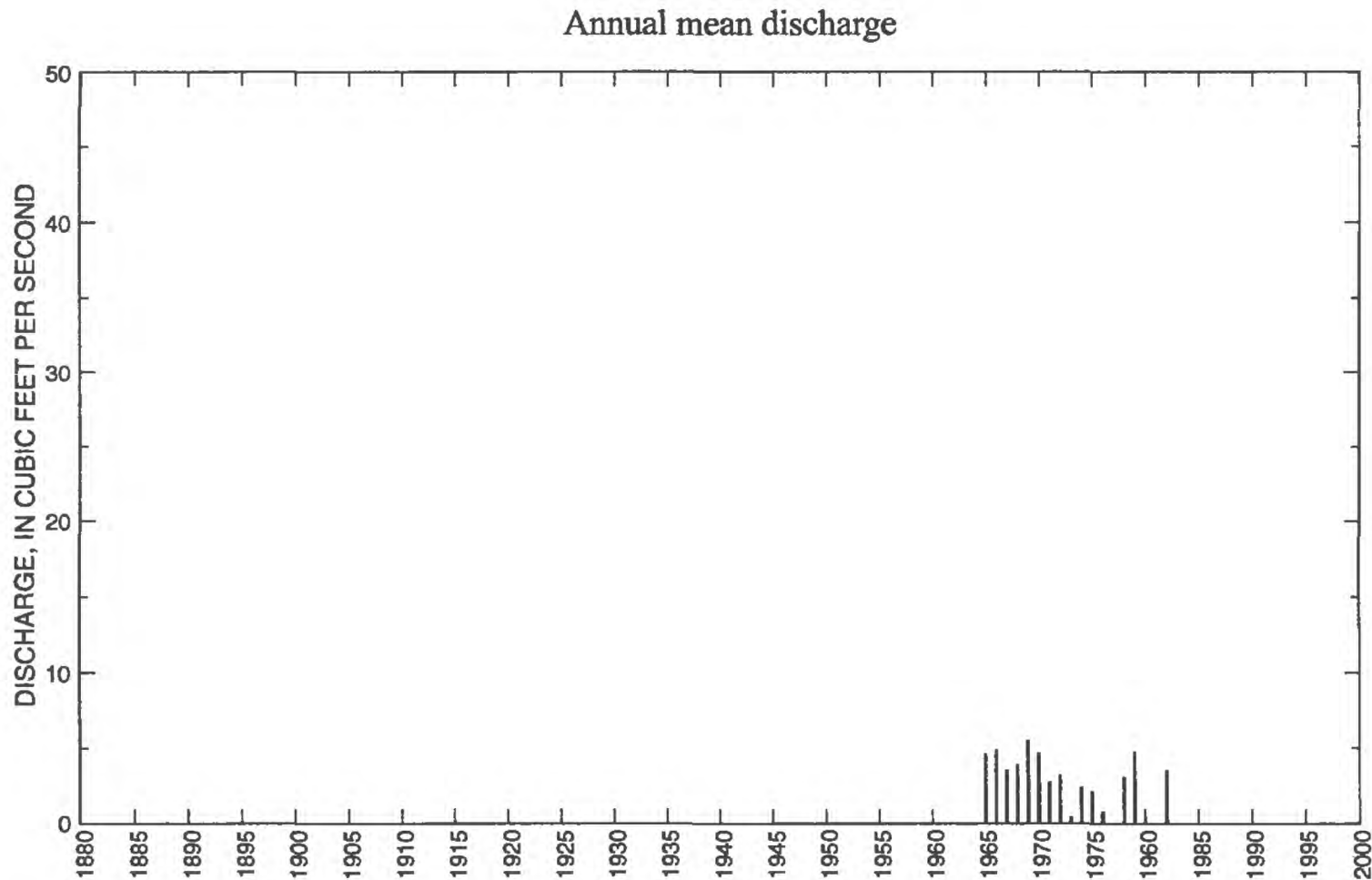
LOCATION.--Lat 47°19'30", long 97°47'25", in NW<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec.4, T.144 N., R.56 W., Steele County, Hydrologic Unit 09020205, 100 ft downstream from box culvert on State Highway 38, 500 ft east of the intersection of State Highway 32 and 38, and 3 mi west of Hope.

DRAINAGE AREA.--20.2 mi<sup>2</sup>, of which about 2.8 mi<sup>2</sup> is probably noncontributing.

PERIOD OF RECORD.--October 1964 to current year (seasonal records only since 1983).

GAGE.--Water-stage recorder. Datum of gage is 1,296.62 ft above sea level.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 900 ft<sup>3</sup>/s, Apr. 18, 1979, gage height, 5.86 ft, backwater from ice; maximum gage height, 8.83 ft, Mar. 31, 1997, backwater from ice; no flow for many days in most years.



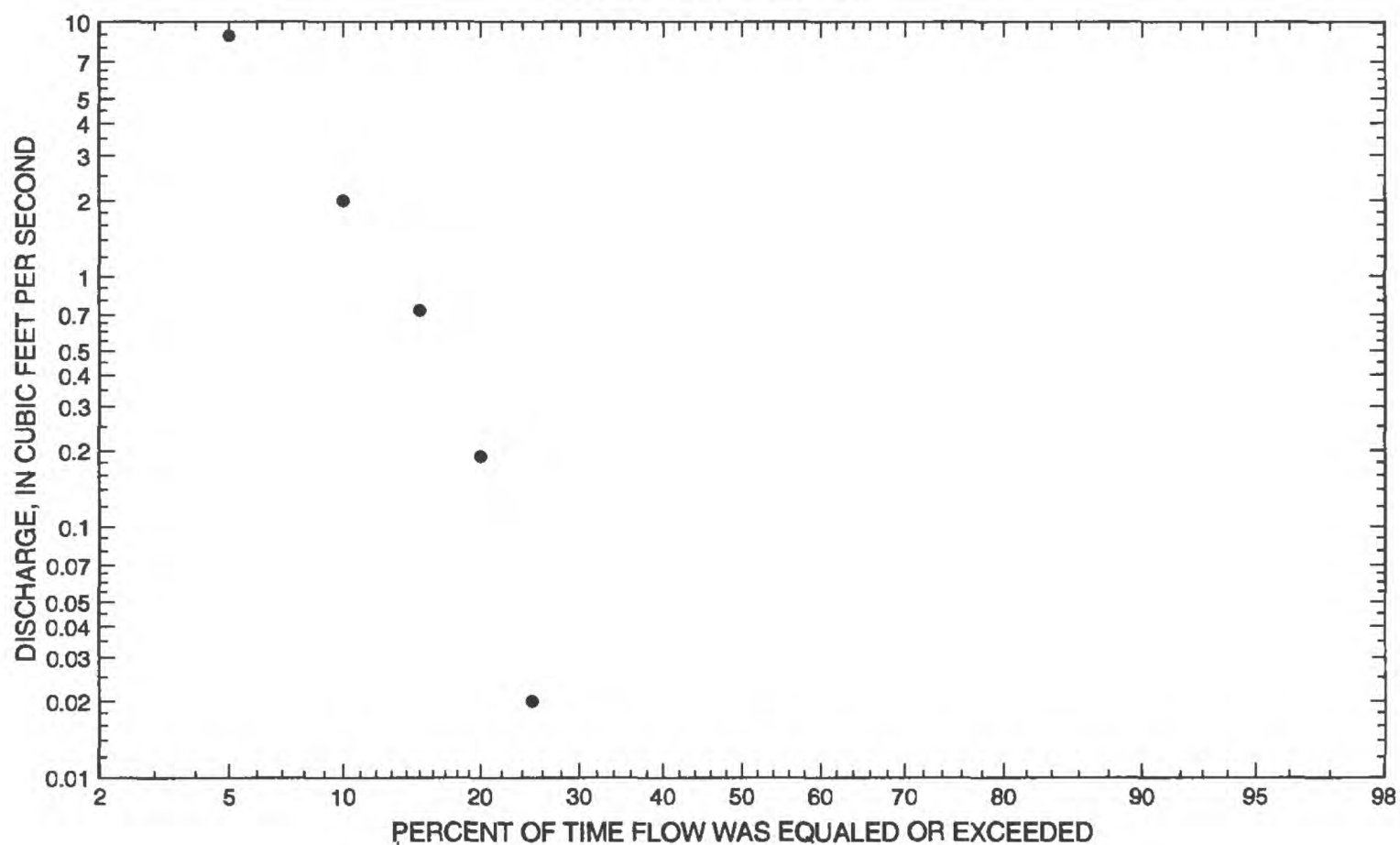
# 05059600 MAPLE RIVER NEAR HOPE, ND--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence; ng, statistic not given]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrenca	Discharge (ft <sup>3</sup> /a)			
October	1.07	1966	0	m	0.06	0.25	4.19	0.16
November	0.054	1966	0	m	0	0.01	3.76	0.01
December	0	m	0	m	0	0	ng	0
January	0	m	0	m	0	0	ng	0
February	0.006	1981	0	m	0	0	4.24	0
March	41.8	1987	0	m	10.6	12.4	1.17	27.9
April	63.8	1997	0.007	1991	16.2	18.6	1.15	42.6
May	11.9	1972	0	m	2.43	3.08	1.27	6.39
June	34.5	1968	0	m	2.76	6.47	2.35	7.25
July	65.3	1993	0	m	4.88	12.4	2.53	12.8
August	7.95	1993	0	m	0.57	1.82	3.20	1.49
September	15.3	1994	0	m	0.54	2.67	4.91	1.43
Annual	5.55	1969	0.002	1981	2.82	1.84	0.65	100

Annual flow duration



# 05059600 MAPLE RIVER NEAR HOPE, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0.02	0	0	0	0	0	0	0	0	0
75	0	0	0	0.10	0	0	0	0	0	0	0	0	0
70	0	0	0	0.27	0.04	0	0	0	0	0	0	0	0
65	0	0	0	0.51	0.10	0	0	0	0	0	0	0	0
60	0	0	0	0.71	0.18	0	0	0	0	0	0	0	0
55	0	0	0	1.40	0.32	0	0	0	0	0	0	0	0
50	0	0	0	1.90	0.56	0	0	0	0	0	0	0	0
45	0	0	0.04	3.25	0.75	0.03	0	0	0	0	0	0	0
40	0	0	0.13	4.25	0.75	0.06	0	0	0	0	0	0	0
35	0	0	0.67	5.49	1.00	0.16	0	0	0	0	0	0	0
30	0	0	1.80	7.74	1.30	0.30	0.07	0	0	0	0	0	0
25	0	0	4.15	11.5	1.80	0.76	0.47	0	0	0	0	0	0.02
20	0	0	6.84	16.6	2.40	1.00	1.20	0	0	0	0	0	0.19
15	0	0	16.5	24.7	3.20	1.90	3.37	0.06	0.02	0	0	0	0.73
10	0	0	34.7	39.7	4.88	3.61	8.63	0.52	0.07	0	0	0	2.00
5	0	0	60.1	82.8	9.18	9.54	22.6	2.30	0.74	0.35	0	0	8.89

# 05059600 MAPLE RIVER NEAR HOPE, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s) <sup>1</sup>			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	0.005	0.003	0.002	0.001
0.95	1.05	ng	0.377	0.238	0.140	0.084
0.90	1.11	29.2	2.29	1.44	0.838	0.498
0.80	1.25	59.7	13.4	8.28	4.81	2.83
0.50	2	192	122	73.6	42.5	24.6
0.20	5	486	327	194	111	64.0
0.10	10	722	401	236	135	77.5
0.04	25	1,040	439	257	148	84.3
0.02	50	1,270	449	263	151	86.1
0.01	100	1,490	453	265	152	86.8
0.005	200	1,700	455	266	152	87.1
0.002	500	1,960	ng	ng	ng	ng

<sup>1</sup>Statistics computed using period of daily value record 1965-82.

# 05059600 MAPLE RIVER NEAR HOPE, ND--Continued

Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1965	April 10	4.43	575	1982	April 1	5.56	850
1966	March 14	3.18	150	1983	March 13	4.29	160
1967	April 20	3.88	248	1984	March 24	4.81	300
1968	June 10	4.78	734	1985	March 12	3.29	73.0
1969	April 9	4.50	540	1986	March 17	3.69	100
1970	April 25	4.03	349	1987	March 21	6.47	360
1971	April 2	4.52	145	1988	March 24	3.78	75.0
1972	May 27	4.65	465	1989	April 5	4.11	217
1973	March 14	2.92	59.0	1990	June 13	3.08	4.10
1974	April 10	3.80	232	1991	May 24	3.33	19.0
1975	April 18	3.48	122	1992	March 4	4.11	100
1976	March 24	3.38	104	1993	July 24	7.53	585
1977	July 5	1.70	0.910	1994	July 8	5.30	234
1978	March 26	4.19	175	1995	March 13	4.94	215
1979	April 18	5.86	900	1996	April 9	6.37	300
1980	March 29	3.18	33.0	1997	March 31	6.36	623
1981	June 21	1.88	0.980				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1979	April 18	5.86	900	1978	March 26	4.19	175
1982	April 1	5.56	850	1983	March 13	4.29	160
1968	June 10	4.78	734	1966	March 14	3.18	150
1997	March 31	6.36	623	1971	April 2	4.52	145
1993	July 24	7.53	585	1975	April 18	3.48	122
1965	April 10	4.43	575	1976	March 24	3.38	104
1969	April 9	4.50	540	1986	March 17	3.69	100
1972	May 27	4.65	465	1992	March 4	4.11	100
1987	March 21	6.47	360	1988	March 24	3.78	75.0
1970	April 25	4.03	349	1985	March 12	3.29	73.0
1984	March 24	4.81	300	1973	March 14	2.92	59.0
1996	April 9	6.37	300	1980	March 29	3.18	33.0
1967	April 20	3.88	248	1991	May 24	3.33	19.0
1994	July 8	5.30	234	1990	June 13	3.08	4.10
1974	April 10	3.80	232	1981	June 21	1.88	0.980
1989	April 5	4.11	217	1977	July 5	1.70	0.910
1995	March 13	4.94	215				



# 05059600 MAPLE RIVER NEAR HOPE, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1965	0	0	0	0	0	2.46	41.9	0.601	1.11	9.13	0.063	0.714	4.64
1966	1.07	0.054	0	0	0	33.5	6.29	3.05	1.72	10.6	1.84	0.001	4.91
1967	0	0	0	0	0	16.2	17.7	7.20	1.75	0.002	0	0	3.58
1968	0	0	0	0	0	6.45	0.067	0.279	34.5	6.16	0.124	0.027	3.94
1969	0	0	0	0	0	0	56.5	3.08	6.37	1.45	0	0	5.55
1970	0	0	0	0	0	0.359	43.1	8.49	4.75	0.099	0	0	4.69
1971	0	0	0	0	0	3.28	11.2	0.969	15.2	2.75	0	0	2.76
1972	0	0	0	0	0	11.7	13.8	11.9	1.10	0.009	0.002	0.001	3.22
1973	0	0	0	0	0	4.86	0.021	0	0	0	0.013	0.001	0.415
1974	0.003	0	0	0	0	0	24.1	3.95	0.795	0	0	0	2.38
1975	0	0	0	0	0	0.019	17.2	3.81	2.73	1.70	0	0	2.11
1976	0	0	0	0	0	7.86	1.31	0.047	0	0	0	0	0.777
1977	0	0	0	0	0	0.034	0.013	0.007	0.003	0.013	0	0.006	0.006
1978	0.010	0.007	0	0	0	20.8	14.8	1.26	0.020	0	0	0	3.10
1979	0	0	0	0	0	0	55.2	2.81	0.105	0	0	0	4.78
1980	0	0	0	0	0	2.59	2.11	0	0	0	0.008	0	0.393
1981	0	0	0	0	0.006	0.005	0.008	0	0.001	0	0	0	0.002
1982	0	0	0	0	0	10.3	26.9	0.144	0.004	5.24	0	0	3.54
1983	--	--	--	--	--	20.2	9.55	1.13	7.15	0.754	0	0	--
1984	--	--	--	--	--	25.7	8.00	0.826	0	0	0	0	--
1985	--	--	--	--	--	9.38	0.044	0	0	0	0	0	--
1986	--	--	--	--	--	8.46	3.97	3.01	0.004	1.95	0.253	0.001	--
1987	--	--	--	--	--	41.8	22.6	3.95	0.225	14.5	0.099	0.020	--
1988	--	--	--	--	--	6.85	0.562	0.070	0	0	0	0	--
1989	--	--	--	--	--	0.887	29.3	0.573	0.133	0	0.001	0.023	--
1990	--	--	--	--	--	0.022	0.023	0	1.22	0.035	0	0	--
1991	--	--	--	--	--	0.015	0.007	3.54	0.383	0.020	0	0	--
1992	--	--	--	--	--	11.1	0.304	0.062	0.010	3.03	0.019	0.011	--
1993	--	--	--	--	--	16.8	4.08	1.87	2.46	65.3	7.95	1.61	--
1994	--	--	--	--	--	11.9	2.85	1.23	3.73	29.1	6.93	15.3	--
1995	--	--	--	--	--	38.3	21.3	3.81	0.618	8.19	1.14	0.198	--
1996	--	--	--	--	--	1.43	36.0	10.5	0.861	0.003	0	0	--
1997	--	--	--	--	--	37.0	63.8	2.14	4.12	1.10	0.255	0	--

## 05059700 MAPLE RIVER NEAR ENDERLIN, ND

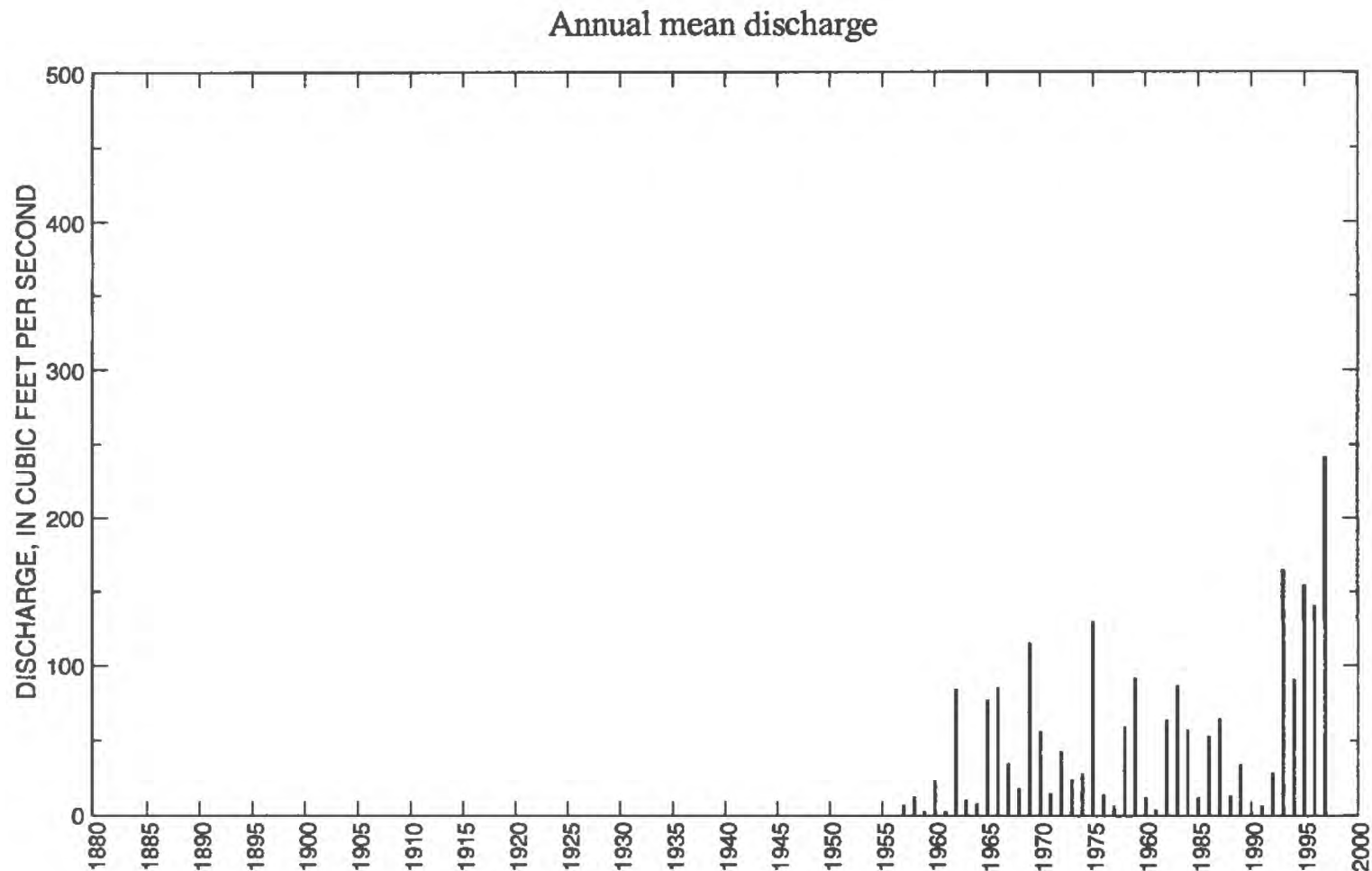
LOCATION.--Lat 46°37'18", long 97°34'25", on west line sec.2, T.136 N., R.55 W., Ransom County, Hydrologic Unit 09020205, on left bank 25 ft downstream from county highway bridge, 1 mi downstream from South Branch and 1.2 mi east of Enderlin.

DRAINAGE AREA.--843 mi<sup>2</sup>, of which about 47 mi<sup>2</sup> is probably noncontributing.

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

GAGE.--Water-stage recorder. Datum of gage is 1,056.72 ft above sea level. Sept. 21, 1956, to June 9, 1969, recording gage on right bank at same datum. Prior to Sept. 20, 1956, nonrecording gage at site 25 ft upstream at same datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,610 ft<sup>3</sup>/s, June 30, 1975, gage height, 15.41 ft; minimum daily discharge, 0.1 ft<sup>3</sup>/s, Dec. 7-9, 1963, gage height, 1.90 ft, Oct. 5, 1956.

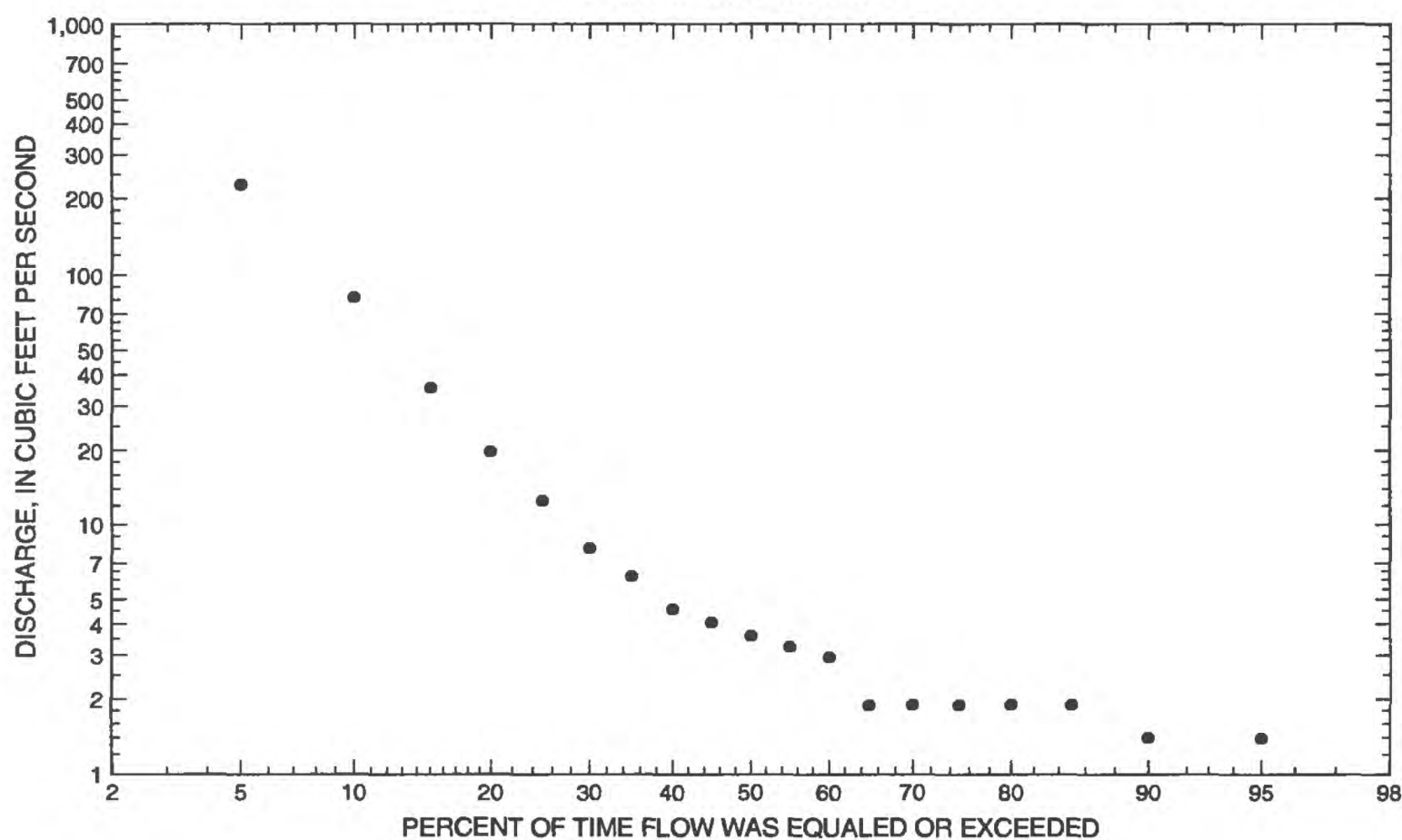


# 05059700 MAPLE RIVER NEAR ENDERLIN, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	211	1995	1.52	1993	9.66	32.5	3.37	1.53
November	63.6	1995	1.49	1961	5.81	9.68	1.67	0.92
December	16.0	1995	1.32	1961	3.38	2.38	0.70	0.53
January	4.05	1976	1.21	1969	2.45	0.74	0.30	0.39
February	11.9	1976	1.30	1969	2.98	1.98	0.66	0.47
March	622	1966	2.10	1969	131	171	1.31	20.6
April	2,160	1997	2.06	1991	279	418	1.50	44.0
May	259	1996	2.19	1992	56.0	73.0	1.30	8.84
June	424	1975	1.41	1961	43.2	88.7	2.05	6.82
July	874	1993	1.44	1961	66.5	163	2.45	10.5
August	506	1993	1.33	1961	22.8	80.4	3.53	3.60
September	111	1994	1.28	1984	10.8	19.7	1.82	1.71
Annual	242	1997	2.14	1990	53.0	54.4	1.03	100

Annual flow duration



# 05059700 MAPLE RIVER NEAR ENDERLIN, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	1.40	1.40	1.50	2.30	2.20	1.70	1.40	1.30	1.40	1.60	1.50	1.20	1.40
90	1.60	1.60	2.00	2.90	2.70	2.20	1.70	1.30	1.60	1.60	1.80	1.50	1.40
85	1.70	1.60	2.00	5.07	3.30	2.20	2.20	1.70	1.60	1.90	2.00	1.80	1.90
80	1.80	1.80	2.00	6.87	4.32	2.80	2.20	1.70	1.60	1.90	2.00	1.80	1.90
75	1.90	1.80	2.00	13.7	5.33	3.72	2.20	2.10	2.00	1.90	2.30	2.10	1.90
70	2.00	1.80	2.80	18.9	6.57	4.27	2.90	2.10	2.00	2.30	2.30	2.10	1.90
65	2.00	1.80	2.80	24.4	8.21	4.85	2.90	2.10	2.00	2.30	2.30	2.10	1.90
60	2.10	1.80	3.87	33.2	10.5	5.47	2.90	2.10	2.40	2.30	2.70	2.10	2.95
55	2.10	1.80	4.53	46.8	13.2	6.52	3.70	2.60	2.40	2.80	2.70	2.50	3.27
50	2.10	2.10	5.78	65.1	16.6	8.13	5.22	2.60	2.40	2.80	2.70	2.50	3.60
45	2.10	2.10	8.44	88.8	21.7	10.1	6.50	2.60	3.00	2.80	3.10	2.50	4.06
40	2.40	2.40	14.2	118	27.1	12.5	8.90	3.30	3.60	3.40	3.60	2.50	4.57
35	2.50	2.40	23.5	146	32.8	14.7	12.7	4.37	3.60	3.40	4.10	3.10	6.24
30	2.50	2.70	38.7	189	42.9	16.7	17.4	5.28	5.34	4.20	4.80	3.10	8.10
25	2.80	2.70	67.3	260	57.0	20.9	23.8	6.68	6.77	5.00	5.50	3.70	12.6
20	3.00	3.10	118	365	76.5	27.7	33.8	8.89	8.23	5.85	6.45	3.70	19.9
15	3.30	3.50	222	504	103	37.9	58.6	14.8	13.7	7.82	7.94	4.40	35.7
10	3.50	4.00	472	697	142	58.3	118	23.8	21.3	12.1	10.0	5.61	81.6
5	4.00	4.50	839	1,210	218	119	295	68.1	43.2	19.1	14.3	6.76	228

# 05059700 MAPLE RIVER NEAR ENDERLIN, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	12.2	4.00	2.77	2.05	1.65
0.95	1.05	48.2	22.8	16.9	12.4	9.12
0.90	1.11	95.0	52.4	39.9	29.0	20.6
0.80	1.25	207	132	103	74.0	51.0
0.50	2	797	597	478	339	224
0.20	5	2,590	1,990	1,590	1,110	724
0.10	10	4,480	3,330	2,630	1,830	1,200
0.04	25	7,680	5,330	4,150	2,860	1,890
0.02	50	10,600	6,940	5,330	3,660	2,430
0.01	100	14,000	8,580	6,500	4,450	2,990
0.005	200	17,700	10,200	7,650	5,210	3,530
0.002	500	23,200	ng	ng	ng	ng



# 05059700 MAPLE RIVER NEAR ENDERLIN, ND--Continued

Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1956	June 7	4.15	92.0	1977	July 5	5.32	208
1957	August 13	4.89	150	1978	March 24	10.19	2,350
1958	April 6	5.34	202	1979	April 20	11.50	3,200
1959	November 18	3.03	34.0	1980	March 19	6.07	250
1960	April 8	7.26	621	1981	July 14	5.84	172
1961	March 4	3.78	39.0	1982	April 2	11.72	3,400
1962	August 11	9.54	1,630	1983	June 23	12.23	2,930
1963	April 6	5.85	280	1984	March 28	10.95	2,590
1964	June 9	5.32	209	1985	May 12	6.39	357
1965	April 12	11.05	3,390	1986	March 24	8.48	1,090
1966	March 18	10.39	2,100	1987	March 22	10.41	2,220
1967	April 23	7.31	702	1988	March 9	7.84	302
1968	June 19	6.05	325	1989	March 31	8.42	981
1969	April 11	13.55	5,750	1990	June 2	3.37	15.0
1970	May 29	11.06	3,260	1991	May 27	5.25	178
1971	March 24	5.58	207	1992	March 10	7.32	710
1972	March 18	7.48	742	1993	July 17	12.72	3,770
1973	March 17	9.03	1,400	1994	March 22	11.50	3,040
1974	April 14	7.22	594	1995	March 17	10.07	1,830
1975	June 30	15.41	7,610	1996	April 11	12.28	3,860
1976	March 23	5.72	246	1997	April 16	12.58	4,060
Annual peak discharge, from highest to lowest, and corresponding gage height							
1975	June 30	15.41	7,610	1992	March 10	7.32	710
1969	April 11	13.55	5,750	1967	April 23	7.31	702
1997	April 16	12.58	4,060	1960	April 8	7.26	621
1996	April 11	12.28	3,860	1974	April 14	7.22	594
1993	July 17	12.72	3,770	1985	May 12	6.39	357
1982	April 2	11.72	3,400	1968	June 19	6.05	325
1965	April 12	11.05	3,390	1988	March 9	7.84	302
1970	May 29	11.06	3,260	1963	April 6	5.85	280
1979	April 20	11.50	3,200	1980	March 19	6.07	250
1994	March 22	11.50	3,040	1976	March 23	5.72	246
1983	June 23	12.23	2,930	1964	June 9	5.32	209
1984	March 28	10.95	2,590	1977	July 5	5.32	208
1978	March 24	10.19	2,350	1971	March 24	5.58	207
1987	March 22	10.41	2,220	1958	April 6	5.34	202
1966	March 18	10.39	2,100	1991	May 27	5.25	178
1995	March 17	10.07	1,830	1981	July 14	5.84	172
1962	August 11	9.54	1,630	1957	August 13	4.89	150
1973	March 17	9.03	1,400	1956	June 7	4.15	92.0
1986	March 24	8.48	1,090	1961	March 4	3.78	39.0
1989	March 31	8.42	981	1959	November 18	3.03	34.0
1972	March 18	7.48	742	1990	June 2	3.37	15.0

# 05059700 MAPLE RIVER NEAR ENDERLIN, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1956	--	--	--	--	--	--	--	--	11.2	1.79	4.37	6.35	--
1957	2.55	3.09	2.35	2.02	1.92	3.06	5.87	3.46	6.64	9.44	13.7	28.1	6.85
1958	7.94	13.3	5.87	2.74	9.18	25.7	45.8	5.22	10.4	15.8	2.73	2.31	12.2
1959	2.15	3.26	3.00	2.03	2.15	3.51	2.59	2.55	2.76	3.38	2.13	1.95	2.62
1960	3.05	2.42	2.02	1.72	1.97	47.6	200.6	7.58	4.04	2.66	1.75	1.76	22.9
1961	1.59	1.49	1.32	1.37	1.45	10.6	5.33	4.74	1.41	1.44	1.33	1.46	2.81
1962	2.08	1.73	1.72	1.75	1.60	59.6	257.3	49.0	45.5	404.0	152.0	23.1	84.0
1963	11.3	10.2	4.94	2.64	3.06	4.99	50.1	12.5	14.9	3.02	2.61	2.30	10.2
1964	2.15	2.31	1.88	2.17	2.06	3.44	24.7	14.3	15.4	14.8	4.24	3.62	7.58
1965	3.36	3.50	2.75	2.75	2.81	3.78	750.0	38.8	26.3	33.4	48.5	17.0	77.0
1966	16.6	11.2	5.84	2.46	2.20	622.2	238.6	70.5	15.4	10.3	8.65	6.58	85.1
1967	3.67	3.17	2.73	2.44	2.06	46.8	229.6	108.6	7.19	3.62	1.59	1.92	34.4
1968	2.47	2.26	2.12	1.97	2.74	36.3	20.0	12.2	102.6	17.3	7.64	2.82	17.5
1969	2.45	2.74	2.26	1.21	1.30	2.10	1,231	29.9	19.7	78.2	12.2	16.2	115.4
1970	5.34	4.00	2.82	2.15	1.85	16.9	258.1	191.1	160.8	22.1	3.26	6.00	56.1
1971	3.65	4.94	2.99	2.20	1.87	51.1	45.1	14.1	17.9	24.7	3.32	2.41	14.6
1972	7.42	8.65	4.97	3.60	4.54	183.3	156.0	59.6	43.6	6.95	21.8	11.1	42.7
1973	4.57	5.14	4.34	4.02	4.68	215.2	27.1	6.38	3.41	1.71	2.49	3.52	23.9
1974	3.98	2.77	2.44	3.61	2.80	4.30	200.6	82.1	21.4	3.29	2.85	3.16	27.7
1975	3.73	2.74	2.68	2.36	1.85	10.1	487.4	146.7	423.7	477.2	10.5	7.01	131.3
1976	5.95	6.51	4.25	4.05	11.9	63.0	50.2	7.66	3.48	3.19	3.33	3.98	13.9
1977	2.36	2.81	2.56	2.67	3.00	5.54	7.40	20.6	8.46	9.53	2.37	3.49	5.93
1978	4.38	6.92	4.44	3.06	3.20	348.5	272.1	22.7	16.5	18.0	3.31	2.74	59.1
1979	3.24	2.60	2.45	2.37	2.64	4.00	888.1	177.0	14.0	4.37	3.04	3.43	91.5
1980	3.05	3.67	2.95	2.64	2.56	37.3	72.0	5.90	4.42	3.78	2.97	2.80	12.0
1981	2.87	2.63	3.39	1.86	2.82	2.41	3.28	3.34	3.98	14.0	2.84	2.82	3.87
1982	3.36	2.43	2.46	2.09	1.71	35.1	674.2	32.6	10.8	3.88	2.56	2.00	63.8
1983	3.97	4.99	4.19	2.37	3.98	330.8	114.9	22.4	341.7	195.1	5.74	3.47	86.5
1984	2.86	3.76	2.61	2.15	2.82	319.8	314.0	27.0	4.04	2.95	1.89	1.28	57.1
1985	2.29	3.00	1.48	1.59	1.64	37.0	11.5	63.5	11.8	4.15	2.02	2.53	12.0
1986	2.59	3.28	2.40	1.89	1.91	229.6	256.6	102.7	7.55	7.94	8.09	5.85	52.8
1987	5.84	6.02	4.28	2.97	3.06	493.9	172.7	55.7	15.0	2.49	2.02	1.75	64.5
1988	2.02	2.62	2.19	1.88	3.98	97.6	36.9	4.16	2.26	1.92	2.31	2.07	13.4
1989	1.88	2.05	1.94	2.26	2.04	109.9	270.3	10.4	2.31	2.07	2.88	1.73	34.0
1990	2.27	2.38	1.53	1.67	1.39	2.58	2.74	2.39	2.72	1.63	1.92	2.51	2.14

# 05059700 MAPLE RIVER NEAR ENDERLIN, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1991	2.19	2.16	1.75	1.70	1.87	2.90	2.06	24.6	23.8	9.68	2.05	1.64	6.39
1992	1.56	1.69	1.61	1.96	4.74	238.7	13.5	2.19	4.31	56.5	3.77	2.49	28.1
1993	1.52	1.94	2.35	2.07	1.70	161.0	253.6	14.8	80.9	874.5	506.5	55.2	165.0
1994	13.7	6.07	4.98	3.55	2.78	419.5	202.4	78.3	18.9	170.2	49.2	111.1	90.8
1995	211.2	63.6	16.0	3.92	3.69	565.0	483.0	256.8	14.0	159.7	26.8	36.6	154.6
1996	21.6	9.16	4.74	3.11	3.61	370.9	934.6	258.8	43.9	5.42	2.62	35.3	140.6
1997	5.46	8.90	5.11	3.57	3.09	130.2	2,162	241.5	224.3	108.1	11.1	21.6	241.8

## 05060100 MAPLE RIVER BELOW MAPLETON, ND

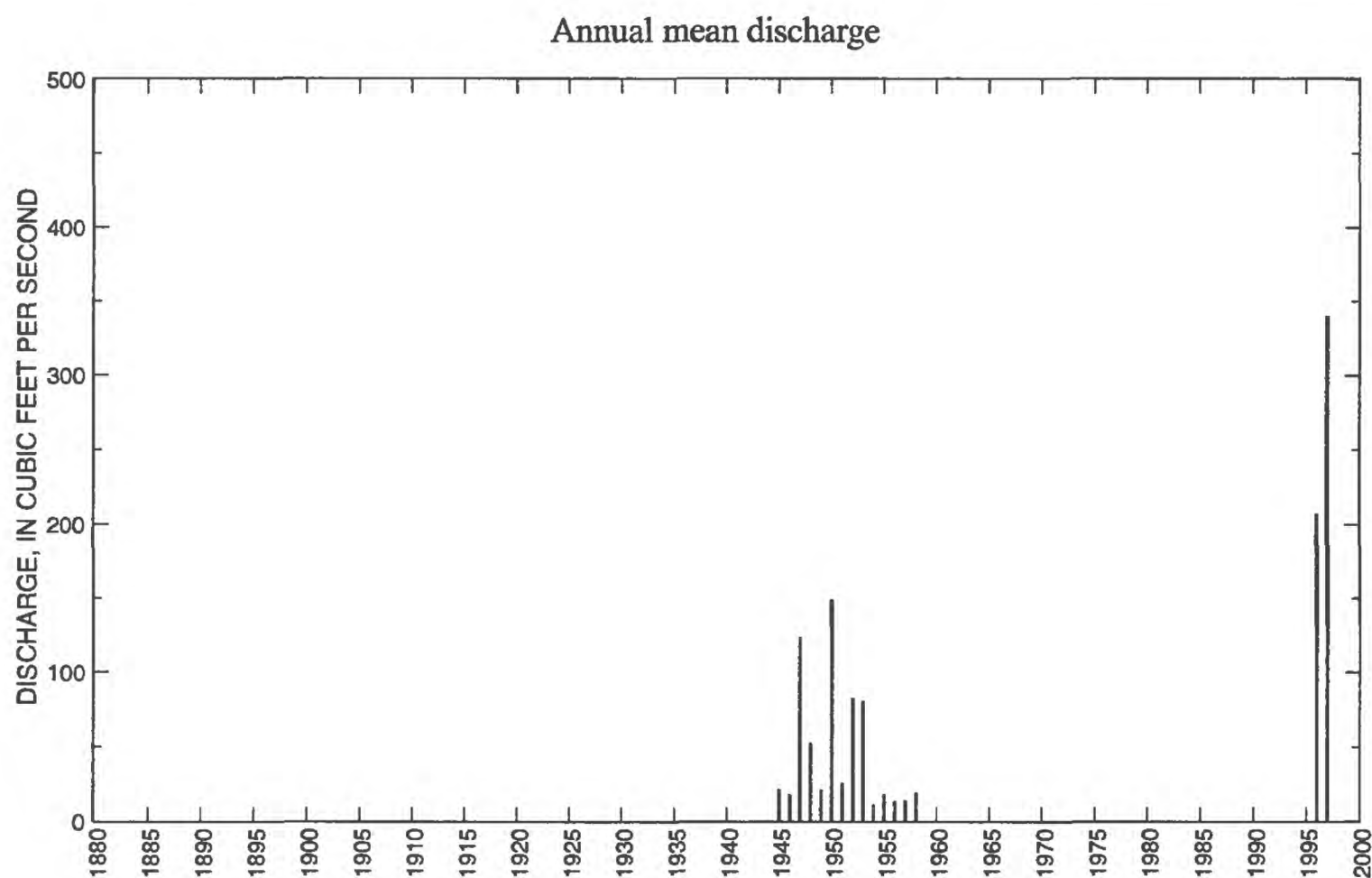
LOCATION.--Lat 46°54'19", long 97°03'08", in NW<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec.31, T.140 N., R.50 W., Cass County, Hydrologic Unit 09020204, on left bank just downstream from bridge on county highway and 1.0 mi north of Mapleton.

DRAINAGE AREA.--1,480 mi<sup>2</sup>, approximately, of which 70 mi<sup>2</sup> is probably noncontributing.

PERIOD OF RECORD.--April 1944 to September 1975, March 1995 to current year. April 1944 to September 1958 published as "at Mapleton". Record not equivalent at extreme high flows to station 05060000 (site 9 mi upstream), which was operated for water years 1959 to 1975.

GAGE.--Water-stage recorder. Datum of gage is 890.00 ft above sea level. Feb. 16, 1944, to Sept. 30, 1958, nonrecording gage at site 2 mi upstream at datum 3.33 ft lower.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,150 ft<sup>3</sup>/s, Apr. 16, 1997, gage height, 23.76 ft; maximum gage height, 24.96 ft, Apr. 8, 1997, backwater from ice; no flow at times.



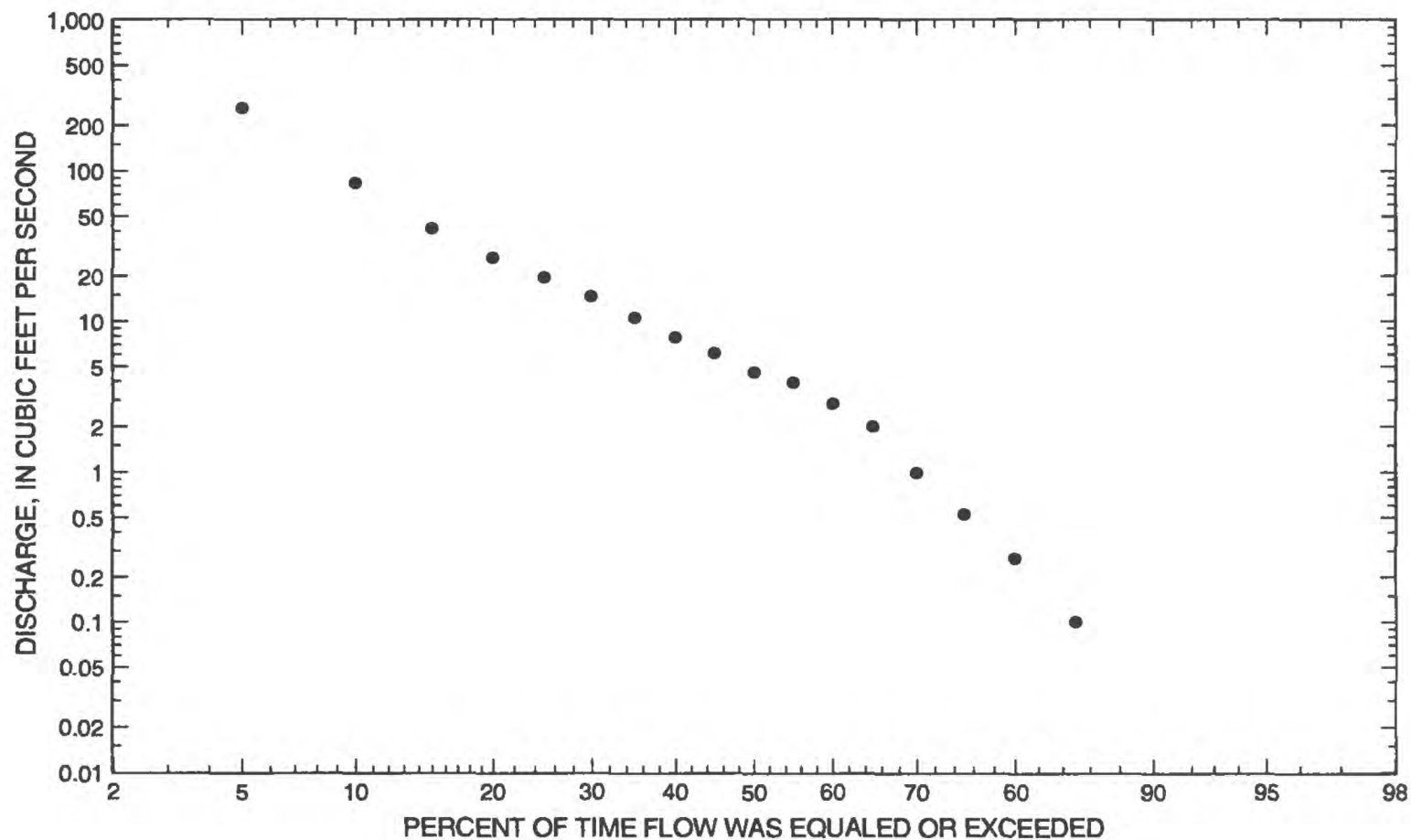
# 05060100 MAPLE RIVER BELOW MAPLETON, ND--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	51.1	1996	0	1953	6.34	12.5	1.98	0.67
November	19.4	1958	1.75	1953	7.44	5.71	0.77	0.78
December	7.33	1958	0.632	1956	3.57	2.53	0.71	0.38
January	3.21	1996	0.016	1956	1.18	1.09	0.92	0.12
February	3.57	1954	0	m	0.56	0.93	1.67	0.06
March	952	1995	0	1956	116	246	2.12	12.2
April	2,960	1997	21.0	1953	522	738	1.41	54.9
May	620	1950	6.30	1955	128	201	1.57	13.5
June	716	1953	6.52	1954	91.4	178	1.94	9.63
July	280	1997	2.90	1956	50.5	77.4	1.53	5.32
August	51.1	1953	0.042	1946	11.8	15.6	1.32	1.24
September	51.6	1995	0	1949	10.8	16.3	1.50	1.14
Annual	340	1997	11.1	1954	74.9	91.6	1.22	100

Annual flow duration





# 05060100 MAPLE RIVER BELOW MAPLETON, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	16.8	5.84	3.70	1.20	0	0	0	0.10	0.10	0
90	0	0	0	20.1	7.12	5.16	2.10	0.10	0	0	1.40	0.38	0
85	0	0	0	24.3	9.38	6.17	4.22	0.27	0	0	2.00	0.74	0.10
80	0.10	0	0	29.8	12.2	6.80	5.29	0.45	0.10	0.10	2.40	1.00	0.27
75	0.10	0	0	36.0	14.4	7.87	6.60	0.74	0.19	0.18	2.90	1.00	0.53
70	0.10	0	0.10	43.8	16.4	9.75	8.38	1.20	0.19	0.27	3.40	1.20	1.00
65	0.30	0	0.10	54.2	18.3	11.6	9.47	2.00	0.37	0.50	4.10	1.50	2.00
60	0.48	0.10	0.18	66.1	20.5	13.6	11.3	2.60	0.70	0.61	4.10	1.70	2.84
55	0.79	0.20	0.46	82.0	22.7	15.5	13.2	3.91	1.10	1.10	4.90	2.40	3.93
50	1.00	0.20	0.84	109	26.7	17.6	14.7	4.61	2.10	2.00	5.90	2.80	4.58
45	1.00	0.20	3.56	137	31.2	20.0	16.4	5.06	3.20	3.00	6.21	2.80	6.12
40	1.10	0.20	4.63	178	36.6	23.8	18.7	5.81	4.00	3.70	6.51	3.40	7.86
35	1.50	0.37	11.7	240	45.9	29.3	21.2	6.49	4.99	4.51	6.92	4.00	10.5
30	1.80	0.47	20.3	353	60.8	36.7	27.5	9.78	6.75	5.29	7.51	4.00	14.6
25	1.80	0.47	28.6	529	96.4	47.5	35.6	12.4	13.8	6.00	8.70	4.70	19.5
20	1.80	0.59	41.4	690	165	66.7	60.3	15.5	19.5	7.11	11.9	5.63	26.6
15	2.30	1.20	90.9	1,040	221	86.0	89.0	21.5	24.3	9.17	14.4	6.74	41.5
10	3.00	1.20	240	1,640	388	130	148	28.0	33.9	13.6	17.8	8.06	82.7
5	3.40	2.50	866	2,730	677	262	240	40.1	54.0	35.4	23.0	9.27	260

## 05060100 MAPLE RIVER BELOW MAPLETON, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	56.4	<sup>1</sup> 52.0	45.4	28.3	22.6
0.95	1.05	138	<sup>1</sup> 129	100	63.1	45.0
0.90	1.11	219	<sup>1</sup> 210	154	97.7	66.3
0.80	1.25	380	356	262	167	108
0.50	2	1,060	934	732	483	292
0.20	5	2,810	2,520	2,100	1,450	857
0.10	10	4,600	4,270	3,690	2,610	1,550
0.04	25	7,690	7,570	6,770	4,950	3,010
0.02	50	10,600	<sup>1</sup> 10,400	<sup>1</sup> 9,700	7,540	4,670
0.01	100	14,200	<sup>1</sup> 14,000	<sup>1</sup> 13,500	11,100	7,010
0.005	200	18,400	<sup>1</sup> 18,100	<sup>1</sup> 17,700	15,700	10,200
0.002	500	25,100	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

# 05060100 MAPLE RIVER BELOW MAPLETON, ND--Continued

Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1944	April 8	8.16	177	1953	June 17	18.62	4,840
1945	April 12	8.59	373	1954	March 21	8.62	200
1946	March 21	13.15	550	1955	April 2	12.40	500
1947	April 14	18.04	3,880	1956	April 14	11.51	630
1948	April 7	17.28	1,500	1957	June 23	8.52	430
1949	April 3	14.75	850	1958	April 10	7.57	195
1950	April 2	17.73	1,980	1995	March 30	20.33	2,360
1951	April 7	12.50	750	1996	April 16	21.68	3,460
1952	April 6	18.90	3,850	1997	April 16	23.76	7,150
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 16	23.76	7,150	1951	April 7	12.50	750
1953	June 17	18.62	4,840	1956	April 14	11.51	630
1947	April 14	18.04	3,880	1946	March 21	13.15	551
1952	April 6	18.90	3,850	1955	April 2	12.40	500
1996	April 16	21.68	3,460	1957	June 23	8.52	430
1995	March 30	20.33	2,360	1945	April 12	8.59	373
1950	April 2	17.73	1,980	1954	March 21	8.62	200
1948	April 7	17.28	1,500	1958	April 10	7.57	195
1949	April 3	14.75	850	1944	April 8	8.16	177

# 05060100 MAPLE RIVER BELOW MAPLETON, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1944	--	--	--	--	--	--	59.1	56.3	23.2	12.9	12.9	9.95	--
1945	5.06	14.5	4.84	0.329	0	93.2	86.4	25.2	16.5	3.60	3.37	0.467	21.2
1946	1.32	2.35	0.794	0.100	0.032	115.8	69.8	8.82	9.37	4.41	0.042	0.127	17.9
1947	5.96	5.48	1.28	0.129	0	100.7	945.6	59.3	353.2	17.9	1.02	4.04	123.4
1948	2.38	6.48	5.61	2.58	0.324	6.33	517.5	51.3	19.5	13.8	9.14	1.55	52.4
1949	0.694	6.20	1.75	0.042	0	8.96	209.1	15.4	8.07	7.26	0.229	0	21.3
1950	0.474	2.73	1.00	0.042	0	86.1	926.7	619.6	76.7	65.2	6.46	2.46	149.0
1951	4.29	3.55	1.36	0.710	0.200	7.37	234.1	16.1	11.6	11.4	6.02	10.8	25.4
1952	4.61	6.10	6.32	1.45	0.355	0.242	905.9	25.7	6.67	48.7	0.552	0.007	82.7
1953	0	1.75	1.99	1.42	1.47	25.0	21.0	88.5	716.5	63.4	51.1	1.78	80.7
1954	0.797	5.90	5.17	2.48	3.57	38.4	37.1	14.1	6.52	12.9	2.56	3.15	11.1
1955	0.787	3.37	3.05	1.48	0.250	0.184	117.9	6.30	13.4	63.2	9.47	0.280	18.3
1956	0.619	1.99	0.632	0.016	0	0	114.1	27.3	13.6	2.90	0.487	0.243	13.4
1957	0.019	7.42	1.89	0.497	0.150	7.10	27.1	13.5	54.3	13.8	15.2	25.5	13.8
1958	10.3	19.4	7.33	2.35	0.586	31.8	74.8	16.9	15.7	42.4	3.09	5.11	19.2
1995	--	--	--	--	--	951.5	692.9	300.5	46.2	226.1	47.7	51.6	--
1996	51.1	15.1	6.97	3.21	1.37	501.8	1,398	362.5	88.9	18.7	13.2	39.0	207.5
1997	13.1	16.7	7.11	2.09	0.579	3.07	2,956	597.6	166.2	280.2	29.7	38.6	340.4

## 05060500 RUSH RIVER AT AMENIA, ND

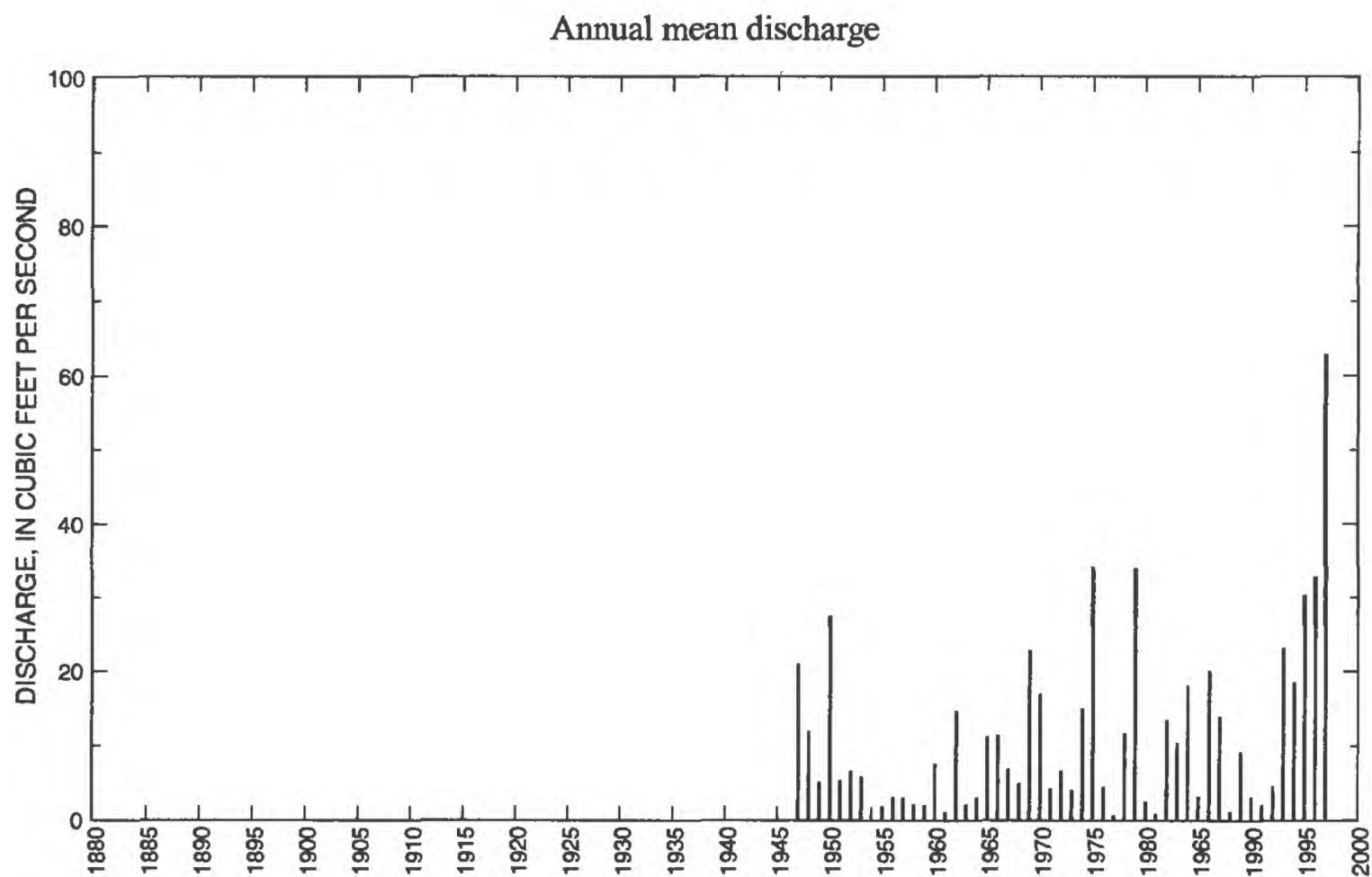
LOCATION.--Lat 47°01'00", long 97°12'50", in SE<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec.24, T.141 N., R.52 W., Cass County, Hydrologic Unit 09020204, on left bank downstream side of bridge on State Highway 18 and 0.6 mi north of Amenia.

DRAINAGE AREA.--116 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 943 ft above sea level, from topographic map. See Water Supply Paper 1913 for history of changes prior to June 10, 1961.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,490 ft<sup>3</sup>/s, Apr. 19, 1979, gage height, 10.37 ft; maximum gage height, 12.15, Mar. 23, 1966, backwater from ice; no flow at times in most years.





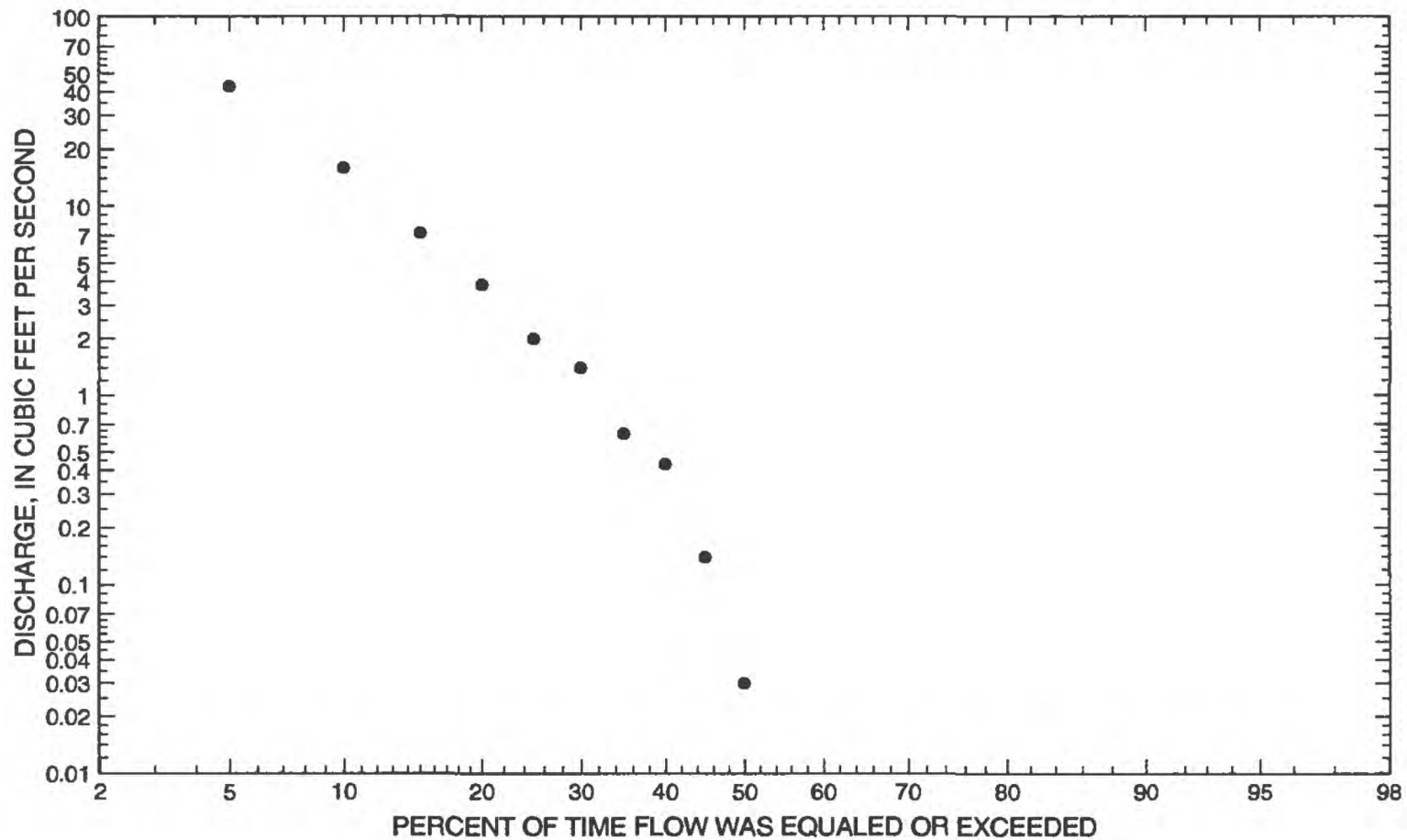
## 05060500 RUSH RIVER AT AMENIA, ND--Continued

### Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standards deviation (ft³/s)	Coeffi- cient of variation	Percentage of annusi discharge
	Dischsrge (ft³/s)	Water year of occurrence	Discharge (ft³/s)	Water year of occurrence	Dlschsrge (ft³/s)				
October	50.7	1995	0	m	1.91	7.39	3.86	1.39	
November	8.60	1995	0	m	1.00	1.94	1.94	0.72	
December	4.28	1995	0	m	0.31	0.82	2.61	0.23	
January	2.84	1997	0	m	0.12	0.47	3.95	0.09	
February	2.21	1976	0	m	0.20	0.53	2.71	0.14	
March	160	1995	0	m	24.5	33.7	1.37	17.8	
April	531	1997	1.12	1981	72.1	105	1.45	52.3	
May	81.3	1950	0.119	1955	12.8	17.5	1.37	9.29	
June	78.1	1997	0.009	1988	10.3	15.4	1.49	7.49	
July	168	1993	0	m	11.0	26.5	2.42	7.95	
August	22.3	1993	0	m	1.32	4.33	3.28	0.96	
September	47.3	1996	0	m	2.25	8.54	3.80	1.63	
Annual	62.9	1997	0.678	1977	11.5	12.0	1.05	100	

Annual flow duration



# 05060500 RUSH RIVER AT AMENIA, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jen.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	0.08	0.09	0	0	0	0	0	0	0	0
90	0	0	0	1.00	0.45	0	0	0	0	0	0	0	0
85	0	0	0	1.40	0.62	0.07	0	0	0	0	0	0	0
80	0	0	0	2.00	0.85	0.20	0	0	0	0	0	0	0
75	0	0	0	3.42	1.20	0.39	0	0	0	0	0	0	0
70	0	0	0	4.34	1.60	0.55	0	0	0	0	0	0	0
65	0	0	0	4.94	2.20	0.76	0.06	0	0	0	0	0	0
60	0	0	0	6.93	2.20	1.10	0.16	0	0	0	0	0	0
55	0	0	0	9.33	3.48	1.50	0.23	0	0	0	0	0	0
50	0	0	0.02	12.5	4.31	2.10	0.45	0	0	0	0.09	0	0.03
45	0	0	0.61	16.0	4.93	2.10	0.64	0	0	0	0.11	0	0.14
40	0	0	1.20	20.7	6.46	3.42	0.90	0	0	0	0.30	0	0.43
35	0	0	2.40	26.4	8.04	4.28	1.30	0	0	0	0.46	0	0.63
30	0	0	5.15	34.4	9.72	4.97	1.80	0.09	0	0.08	0.70	0.10	1.40
25	0	0	10.3	47.3	12.0	7.04	2.93	0.16	0.09	0.27	0.87	0.10	2.00
20	0	0	19.9	69.3	15.2	9.79	4.36	0.28	0.22	0.67	1.30	0.28	3.88
15	0	0	35.7	115	19.7	14.1	8.75	0.63	0.54	0.90	2.00	0.35	7.24
10	0.10	0.43	76.0	194	27.2	20.6	20.8	1.50	1.40	2.20	2.50	0.53	16.0
5	0.83	0.84	147	341	49.6	40.2	46.9	5.93	5.10	7.75	5.28	2.30	42.8

## 05060500 RUSH RIVER AT AMENIA, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /a)	Maximum mean discharge (ft <sup>3</sup> /a)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	13.1	8.21	5.33	3.54	2.91
0.95	1.05	35.7	22.0	14.7	9.92	7.27
0.90	1.11	59.5	36.5	24.8	16.7	11.7
0.80	1.25	108	66.4	45.6	30.8	20.3
0.50	2	320	198	138	91.9	56.5
0.20	5	869	554	387	250	148
0.10	10	1,420	925	644	407	240
0.04	25	2,340	1,570	1,080	668	394
0.02	50	3,190	2,180	1,500	905	538
0.01	100	4,180	2,920	1,990	1,180	707
0.005	200	5,320	3,790	2,570	1,490	905
0.002	500	7,070	ng	ng	ng	ng

# 05060500 RUSH RIVER AT AMENIA, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1947	April 14	8.90	1,230	1973	March 15	8.47	200
1948	April 11	--	590	1974	April 12	9.27	790
1949	March 31	--	400	1975	April 18	11.62	2,550
1950	April 7	--	620	1976	March 24	9.93	150
1951	March 28	8.60	368	1977	May 31	5.02	41.0
1952	April 1	9.70	600	1978	March 29	8.99	375
1953	June 16	8.63	1,050	1979	April 19	10.37	3,490
1954	April 6	4.90	120	1980	March 24	--	63.0
1955	March 31	9.00	200	1981	May 27	5.14	22.0
1956	April 13	--	250	1982	April 3	10.55	710
1957	June 24	5.58	115	1983	June 22	8.07	428
1958	July 5	5.40	77.0	1984	March 29	--	987
1959	June 10	6.25	100	1985	March 18	--	164
1960	April 6	8.09	437	1986	July 11	10.12	767
1961	March 6	6.06	25.0	1987	March 20	7.98	475
1962	April 5	10.30	450	1988	April 1	--	30.0
1963	April 7	5.30	68.0	1989	April 2	--	602
1964	April 5	6.70	100	1990	June 4	6.01	64.0
1965	April 11	11.60	900	1991	May 25	--	43.0
1966	March 31	9.16	300	1992	July 1	7.82	255
1967	April 17	7.82	384	1993	July 17	--	2,970
1968	June 8	7.07	190	1994	March 19	9.47	470
1969	April 10	11.41	1,690	1995	March 14	9.44	700
1970	April 6	9.41	380	1996	April 10	--	750
1971	April 2	6.20	97.0	1997	April 15	10.84	1,680
1972	April 14	7.05	252				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1979	April 19	10.37	3,490	1948	April 11	--	590
1993	July 17	--	2,970	1987	March 20	7.98	475
1975	April 18	11.62	2,550	1994	March 19	9.47	470
1969	April 10	11.41	1,690	1962	April 5	10.30	450
1997	April 15	10.84	1,680	1960	April 6	8.09	437
1947	April 14	8.90	1,230	1983	June 22	8.07	428
1953	June 16	8.63	1,050	1949	March 31	--	400
1984	March 29	--	987	1967	April 17	7.82	384
1965	April 11	11.60	900	1970	April 6	9.41	380
1974	April 12	9.27	790	1978	March 29	8.99	375
1986	July 11	10.12	767	1951	March 28	--	368
1996	April 10	--	750	1966	March 31	9.16	300
1982	April 3	10.55	710	1992	July 1	7.82	255
1995	March 14	9.44	700	1972	April 14	7.05	252
1950	April 7	--	620	1956	April 13	--	250
1989	April 2	--	602	1955	March 31	9.00	200
1952	April 1	9.70	600	1973	March 15	8.47	200

# 05060500 RUSH RIVER AT AMENIA, ND--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1968	June 8	7.07	190	1963	April 7	5.30	68.0
1985	March 18	--	164	1990	June 4	6.01	64.0
1976	March 24	9.93	150	1980	April 1	--	63.0
1954	April 6	--	120	1991	May 25	--	43.0
1957	June 24	5.58	115	1977	May 31	5.02	41.0
1959	June 10	6.25	100	1988	April 1	--	30.0
1964	April 5	6.70	100	1961	March 6	6.06	25.0
1971	April 2	6.20	97.0	1981	May 27	5.14	22.0
1958	July 5	5.40	77.0				



# 05060500 RUSH RIVER AT AMENIA, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1946	--	--	--	--	--	--	--	--	--	--	0	0	--
1947	0.303	0.847	0.168	0	0	30.7	174.4	7.83	38.7	1.53	0	0	21.0
1948	0.035	0.100	0.129	0.100	0	0	137.9	5.50	1.50	0.506	0.113	0	12.0
1949	0	0.183	0.032	0	0	15.2	40.6	2.58	1.09	1.98	0.100	0	5.13
1950	0	0.037	0	0	0	24.7	203.7	81.3	17.1	2.60	0.026	0	27.4
1951	0.148	0.150	0	0	0	29.8	28.2	2.20	3.06	0.629	0	0.263	5.39
1952	0.010	0.733	0.277	0	0	0	76.1	1.68	0.083	1.13	0.006	0	6.57
1953	0	0	0	0	0	5.30	2.23	5.66	48.9	8.10	0.913	0	5.90
1954	0	0	0	0	0.161	5.97	9.09	2.09	1.76	0.035	0	0	1.59
1955	0	0	0	0	0	6.13	11.5	0.119	1.38	0	1.73	0	1.74
1956	0	0	0	0	0	0	25.8	2.79	8.81	0.068	0	0	3.08
1957	0	0	0	0	0	3.77	1.72	2.17	16.6	6.65	2.64	1.73	2.94
1958	0.900	2.75	0.061	0	1.18	1.89	3.40	1.87	3.09	9.72	0	0	2.08
1959	0	0	0	0	0	16.3	1.44	1.23	4.50	0.190	0	0	1.99
1960	0	0	0	0	0	27.5	49.0	2.59	0.953	11.5	0.006	0	7.61
1961	0	0	0	0	0	7.54	2.94	2.15	0.153	0	0	0	1.08
1962	4.24	0.127	0	0	0	11.3	93.3	16.8	8.07	38.6	2.76	1.50	14.7
1963	0.510	2.63	1.24	0	0	2.40	10.2	3.42	3.87	0.023	0	0	2.02
1964	0	0	0	0	0	0	21.8	4.88	10.2	0.429	0.032	0.103	3.08
1965	0.119	0.660	0.097	0	0	0	108.9	15.2	4.49	5.98	0.103	0.590	11.2
1966	4.20	1.17	0.347	0	0	58.9	48.2	14.1	4.60	2.44	2.16	0.186	11.4
1967	0.015	0.010	0	0	0	19.0	50.3	9.83	2.74	1.17	0	0	6.91
1968	0	0	0	0	0	10.2	9.75	6.71	30.9	1.82	0	0	4.92
1969	0.094	0.473	0.175	0	0	0	238.2	8.42	5.44	22.7	0.682	0.339	22.8
1970	0.744	1.67	0.323	0.033	0.008	32.3	112.6	24.3	31.3	1.53	0.039	0.469	17.0
1971	0.244	1.09	0.119	0	0	20.5	18.4	6.96	2.63	0.478	0	0	4.22
1972	0.593	2.15	0.351	0.015	0	20.9	38.6	13.9	1.85	1.11	0.319	0.021	6.64
1973	0.244	0.979	0.043	0	0	33.8	3.02	1.39	0.198	0	0.043	7.88	4.01
1974	2.63	1.66	0.226	0	0	0	136.5	25.7	10.9	3.82	0.451	0.009	15.0
1975	0	1.45	0.082	0	0	0.106	286.3	43.8	40.2	39.5	0.084	0	34.1
1976	0.073	0.311	0.037	0	2.21	35.4	13.7	1.46	0.027	0	0	0	4.45
1977	0	0	0	0	0	2.35	3.00	2.35	0.388	0	0	0	0.678
1978	1.33	0.088	0	0	0	81.8	43.5	7.35	4.81	0.391	0.070	0.084	11.7
1979	0	0	0	0	0	0	381.9	20.0	8.94	1.17	0.066	0	33.9
1980	0.003	0.143	0.179	0	0	11.1	16.0	0.871	0.299	0	0.490	0.536	2.46

# 05060500 RUSH RIVER AT AMENIA, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1981	0	0.121	0.046	0	0.368	1.73	1.12	2.94	3.39	0.163	0	0	0.824
1982	0	0	0	0	0	3.55	141.2	17.7	1.66	0.001	0	0	13.5
1983	11.4	3.50	1.02	0	0.361	35.8	18.3	6.85	36.3	10.6	0.020	0	10.4
1984	0	0	0	0	0	135.5	52.5	4.79	21.6	1.16	0	0	18.1
1985	0	0	0	0	0	12.7	4.67	11.1	7.08	1.78	0	0	3.14
1986	0	0	0	0	0	40.2	91.8	61.4	0.987	40.7	2.77	1.35	20.1
1987	1.71	1.67	0.829	0.448	1.79	101.4	17.7	26.3	7.00	5.78	0.951	0.069	14.0
1988	0	0.546	0.561	0.060	0.059	4.39	6.91	1.02	0.009	0	0	0	1.13
1989	0	0	0	0	0	16.8	84.7	2.34	1.18	0	0	5.87	9.16
1990	0.076	0	0	0	0	0.935	4.43	3.24	21.1	6.93	0.007	0	3.04
1991	0	0	0	0	0	3.77	1.48	10.7	1.52	6.43	0.138	0	2.03
1992	0	0	0	0	0.001	23.0	4.08	1.34	5.57	20.1	0.012	0.001	4.56
1993	0	0	0	0	0	38.3	29.3	7.28	7.49	168.0	22.3	0.845	23.1
1994	1.95	2.09	0	0	0	67.4	16.6	7.86	3.72	58.5	22.1	40.1	18.5
1995	50.7	8.60	4.28	1.62	0.732	160.0	69.4	37.9	1.88	16.2	4.77	3.91	30.3
1996	12.3	7.68	1.74	0.978	0.910	50.5	198.7	64.4	8.03	1.93	1.45	47.3	32.8
1997	3.08	7.30	3.57	2.84	2.20	37.8	530.6	36.1	78.1	54.5	1.20	3.59	62.9

## 05060800 BUFFALO RIVER NEAR CALLAWAY, MN

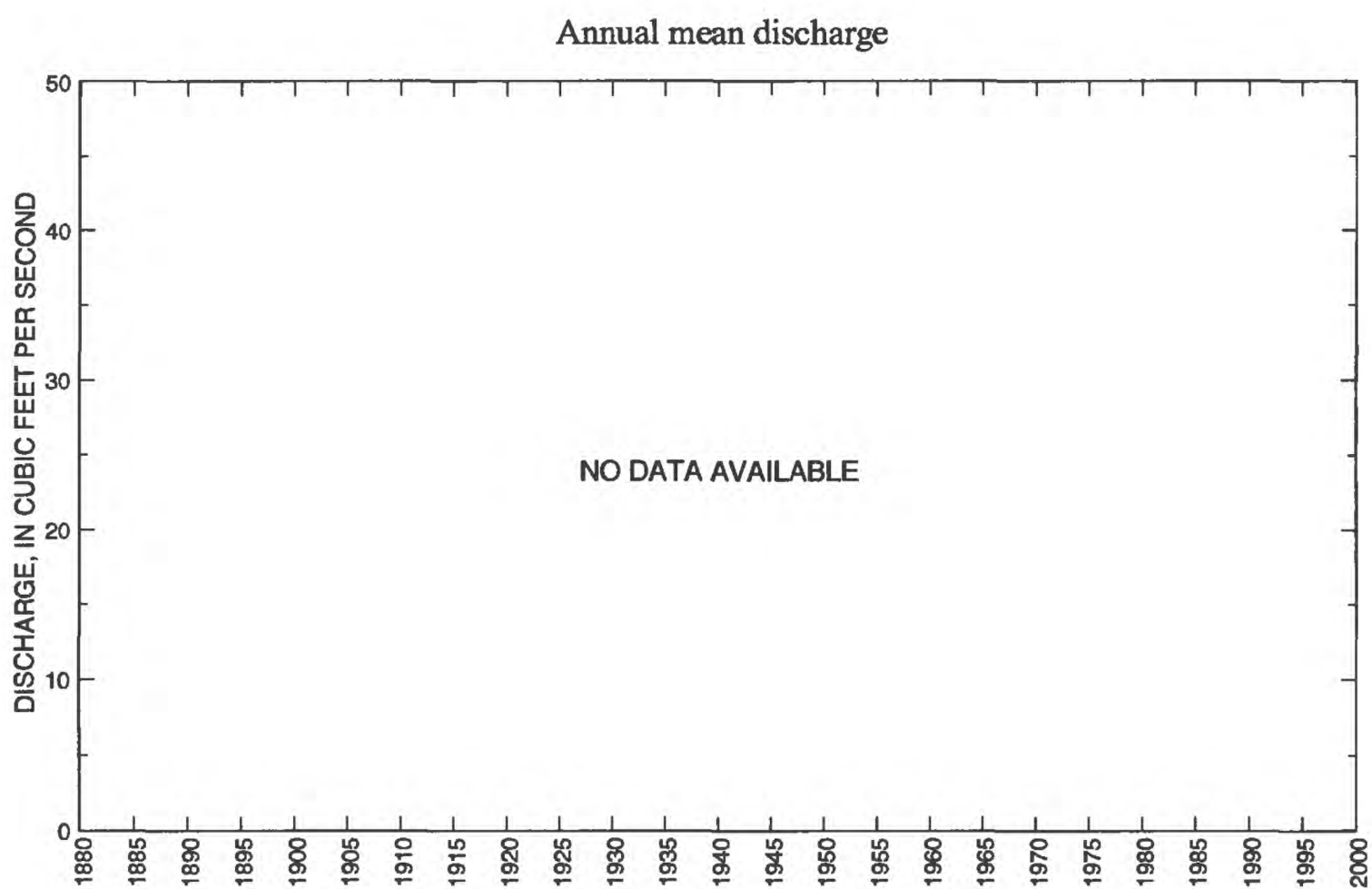
LOCATION.--Lat 47°01'17", long 95°54'43", in SW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.17, T.141 N., R.41 W., Becker County, Hydrologic Unit 09020106, at culvert on U.S. Highway 59 and 2.7 mi north on Callaway.

DRAINAGE AREA.--76.4 mi<sup>2</sup>.

PERIOD OF RECORD.--1960 to current year.

GAGE.--Crest-stage gage.

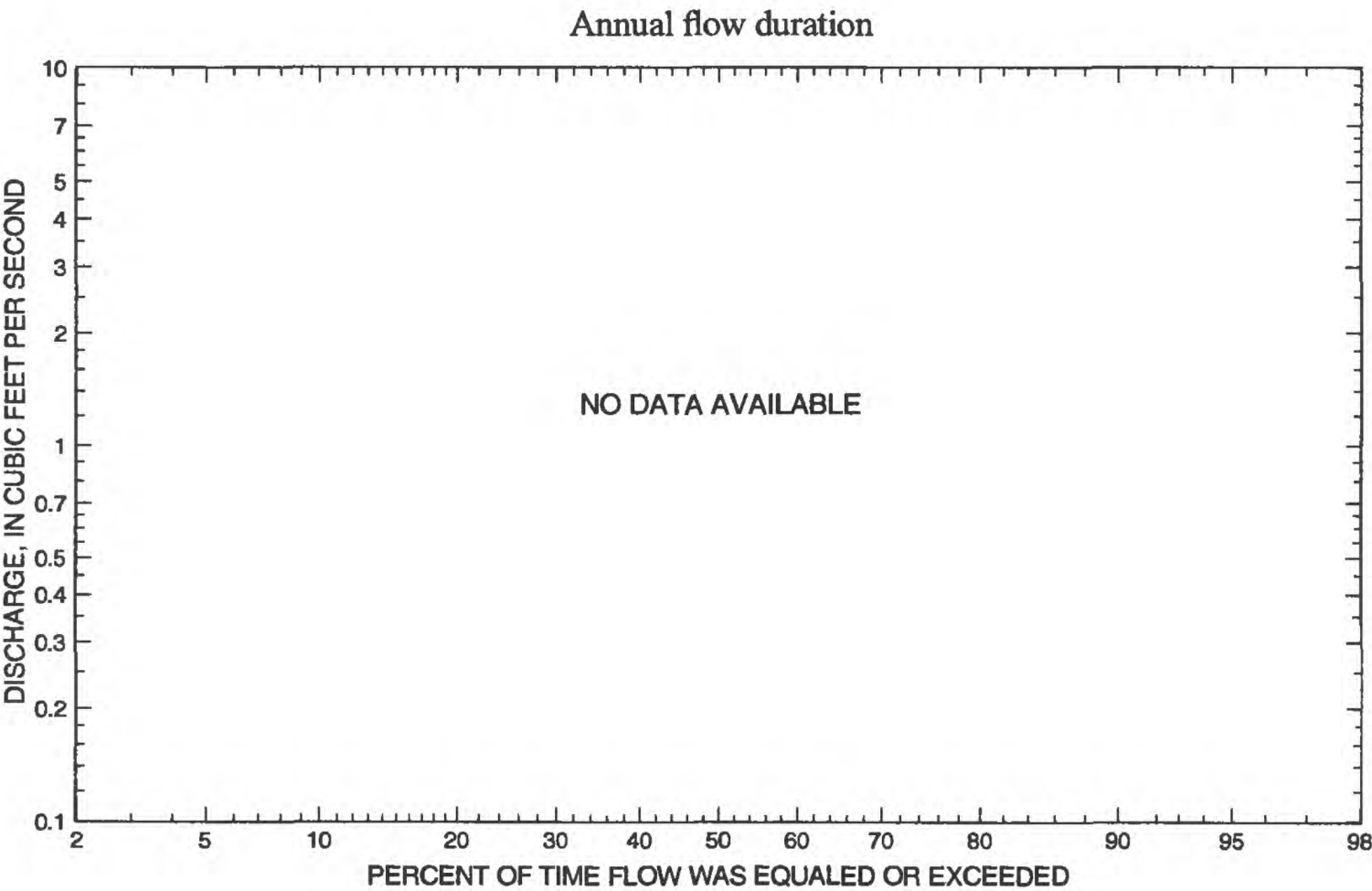
EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,630 ft<sup>3</sup>/s, July 16, 1993, gage height, 24.90 ft.



05060800 BUFFALO RIVER NEAR CALLAWAY, MN--Continued

Statistics of monthly and annual mean discharges  
[--, no data]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	--	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
August	--	--	--	--	--	--	--	--
September	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--



# 05060800 BUFFALO RIVER NEAR CALLAWAY, MN--Continued

Monthly and annual flow duration, in cubic feet per second  
[--, no data]

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	--	--	--	--	--	--	--	--	--	--	--	--	--
90	--	--	--	--	--	--	--	--	--	--	--	--	--
85	--	--	--	--	--	--	--	--	--	--	--	--	--
80	--	--	--	--	--	--	--	--	--	--	--	--	--
75	--	--	--	--	--	--	--	--	--	--	--	--	--
70	--	--	--	--	--	--	--	--	--	--	--	--	--
65	--	--	--	--	--	--	--	--	--	--	--	--	--
60	--	--	--	--	--	--	--	--	--	--	--	--	--
55	--	--	--	--	--	--	--	--	--	--	--	--	--
50	--	--	--	--	--	--	--	--	--	--	--	--	--
45	--	--	--	--	--	--	--	--	--	--	--	--	--
40	--	--	--	--	--	--	--	--	--	--	--	--	--
35	--	--	--	--	--	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--	--	--	--



# 05060800 BUFFALO RIVER NEAR CALLAWAY, MN--Continued

Probability of occurrence of annual high discharges

[--, no data]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	27.1	--	--	--	--
0.95	1.05	56.1	--	--	--	--
0.90	1.11	80.6	--	--	--	--
0.80	1.25	122	--	--	--	--
0.50	2	250	--	--	--	--
0.20	5	470	--	--	--	--
0.10	10	631	--	--	--	--
0.04	25	843	--	--	--	--
0.02	50	1,000	--	--	--	--
0.01	100	1,160	--	--	--	--
0.005	200	1,320	--	--	--	--
0.002	500	1,530	--	--	--	--

# 05060800 BUFFALO RIVER NEAR CALLAWAY, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1960	April 13	12.92	246	1979	April 18	15.57	340
1961	April 4	13.57	127	1980	April 3	14.23	305
1962	June 8	13.35	370	1981	March 30	13.18	38.0
1963	April 3	12.04	43.0	1982	July 10	13.05	204
1964	April 13	13.73	237	1983	July 4	16.85	600
1965	April 10	16.12	245	1984	June 8	12.70	176
1966	May 23	11.87	238	1985	May 12	17.13	635
1967	May 1	12.85	324	1986	April 14	13.21	220
1968	June 30	10.06	81.0	1987	March 8	13.03	71.0
1969	April 10	15.11	446	1988	April 2	14.01	124
1970	April 8	--	250	1989	April 3	14.99	290
1971	April 18	13.65	323	1990	April 1	14.11	255
1972	April 15	12.02	251	1991	May 6	11.30	69.0
1973	September 2	12.02	251	1992	July 10	13.17	215
1974	April 27	13.65	400	1993	July 16	24.90	1,630
1975	June 29	15.68	620	1994	March 21	13.78	270
1976	March 29	11.90	160	1995	March 18	15.87	382
1977	--	--	40.0	1996	May 18	16.61	570
1978	April 6	13.45	310	1997	April 5	18.06	560
Annual peak discharge, from highest to lowest, and corresponding gage height							
1993	July 16	24.90	1,630	1973	September 2	12.02	251
1985	May 12	17.13	635	1970	April 8	--	250
1975	June 29	15.68	620	1960	April 13	12.92	246
1983	July 4	16.85	600	1965	April 10	16.12	245
1996	May 18	16.61	570	1966	May 23	11.87	238
1997	April 5	18.06	560	1964	April 13	13.73	237
1969	April 10	15.11	446	1986	April 14	13.21	220
1974	April 27	13.65	400	1992	July 10	13.17	215
1995	March 18	15.87	382	1982	July 10	13.05	204
1962	June 8	13.35	370	1984	June 8	12.70	176
1979	April 18	15.57	340	1976	March 29	11.90	160
1967	May 1	12.85	324	1961	April 4	13.57	127
1971	April 18	13.65	323	1988	April 2	14.01	124
1978	April 6	13.45	310	1968	June 30	10.06	81.0
1980	April 3	14.23	305	1987	March 8	13.03	71.0
1989	April 3	14.99	290	1991	May 6	11.30	69.0
1994	March 21	13.78	270	1963	April 3	12.04	43.0
1990	April 1	14.11	255	1977	--	--	40.0
1972	April 15	12.02	251	1981	March 30	13.18	38.0

05060800 BUFFALO RIVER NEAR CALLAWAY, MN--Continued

Monthly and annual mean discharges, in cubic feet per second  
[--, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
--	--	--	--	--	--	--	--	--	--	--	--	--	--

## 05061000 BUFFALO RIVER NEAR HAWLEY, MN

**LOCATION.**--Lat 46°51'00", long 96°19'45", in NW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.14, T.139 N., R.45 W., Clay County, Hydrologic Unit 09020106, near left downstream end of bridge on farm lane and 2 mi southwest of Hawley.

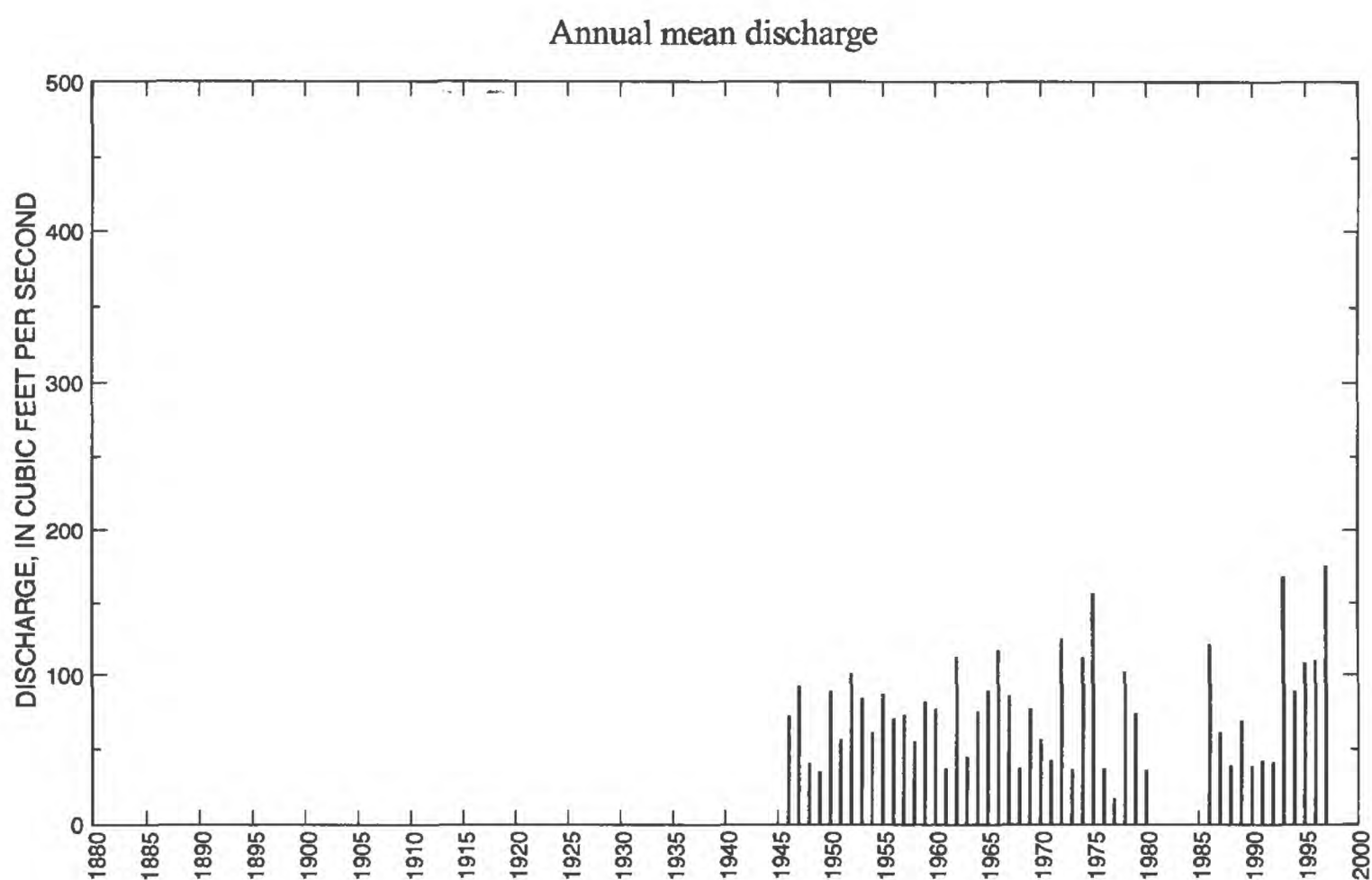
**DRAINAGE AREA.**--322 mi<sup>2</sup>.

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

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

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 2,360 ft<sup>3</sup>/s, Apr. 6, 1997, gage height, 10.77 ft, backwater from ice; minimum discharge, 2.8 ft<sup>3</sup>/s, Aug. 26, 1977, gage height, 3.15 ft, June 27 and July 26, 1977.

**EXTREMES OUTSIDE PERIOD OF RECORD.**--Maximum stage known, about 11.30 ft, present datum, spring of 1921, from information by local resident, discharge about 3,000 ft<sup>3</sup>/s.

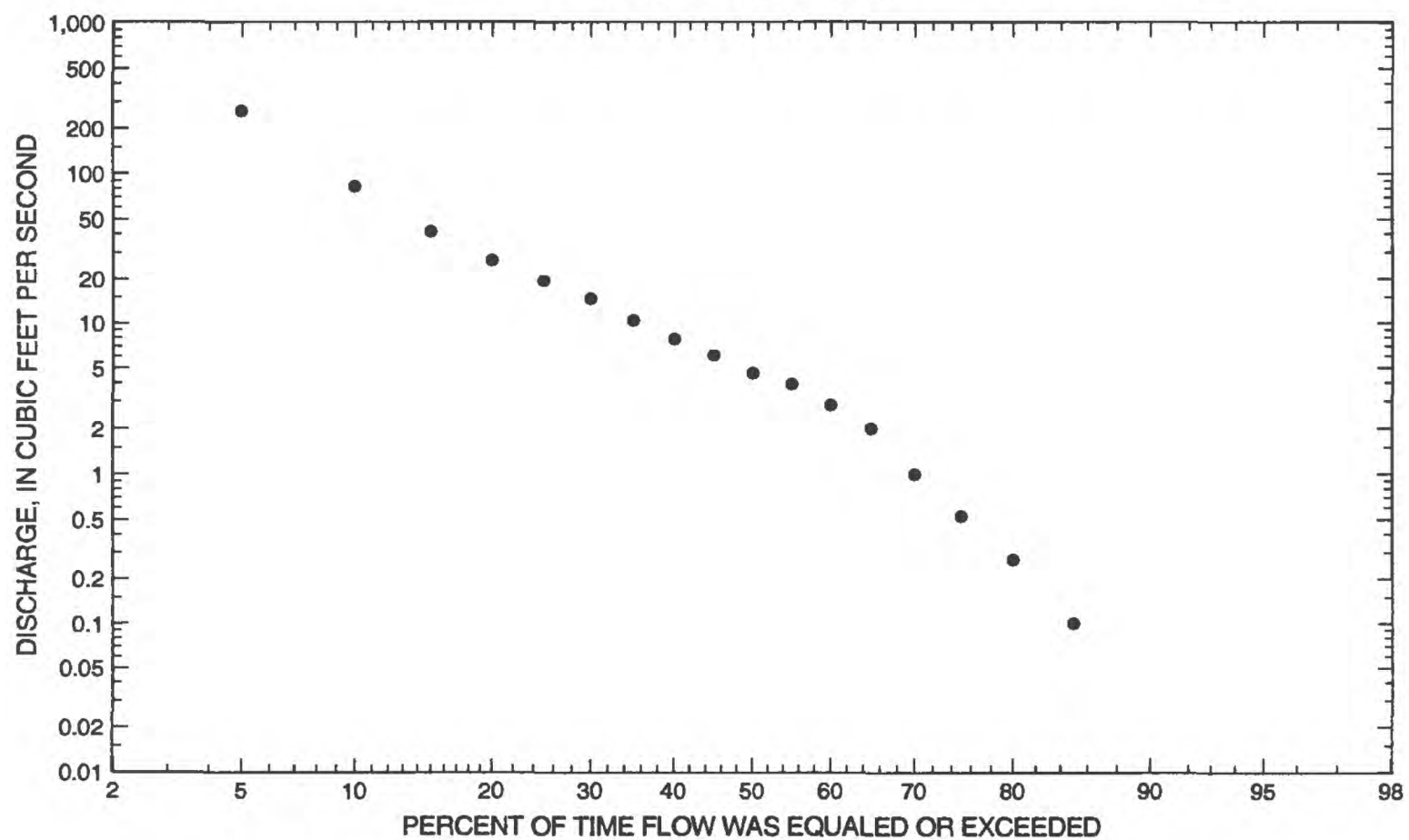


# 05061000 BUFFALO RIVER NEAR HAWLEY, MN--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minlimum		Mean	Standerd deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of snnuel discharge
	Dischsrge (ft <sup>3</sup> /s)	Water year of occurrence	Dischsrge (ft <sup>3</sup> /s)	Water year of occurrence	Dischsrge (ft <sup>3</sup> /s)			
October	151	1974	11.6	1979	39.1	30.9	0.79	4.26
November	176	1972	12.2	1977	36.9	27.8	0.75	4.01
December	63.8	1972	10.6	1977	25.2	12.3	0.49	2.74
January	54.7	1981	9.94	1962	21.1	9.83	0.47	2.30
February	99.6	1981	9.88	1949	21.9	13.9	0.63	2.38
March	434	1966	15.0	1969	85.9	85.9	1.00	9.34
April	1,040	1997	33.3	1981	268	203	0.76	29.2
May	372	1985	21.5	1977	130	88.7	0.68	14.1
June	530	1962	12.7	1977	99.3	92.7	0.93	10.8
July	784	1993	10.1	1976	101	150	1.48	11.0
August	472	1955	5.87	1976	52.1	88.9	1.70	5.67
September	182	1957	8.52	1976	38.3	33.9	0.89	4.17
Annual	175	1997	16.7	1977	76.7	36.4	0.47	100

Annual flow duration





# 05061000 BUFFALO RIVER NEAR HAWLEY, MN--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	11.2	11.3	14.3	35.4	30.4	18.9	11.4	8.21	9.21	12.5	14.8	12.5	11.6
90	12.3	12.4	16.0	47.0	37.7	24.0	15.6	10.2	11.4	14.2	16.6	13.4	13.9
85	12.9	13.1	17.6	55.5	43.0	28.6	18.5	12.4	13.1	16.1	18.3	14.1	15.5
80	13.5	13.9	19.3	64.8	48.0	32.9	21.1	14.4	14.8	17.6	19.9	14.9	17.4
75	14.0	14.4	21.1	77.2	54.2	37.4	23.8	16.5	16.3	19.2	21.7	16.0	19.3
70	14.7	14.9	22.7	91.0	61.2	42.3	26.8	18.2	17.8	21.3	22.9	17.3	21.2
65	15.5	15.6	24.5	108	69.0	47.5	30.3	19.8	19.6	23.0	23.9	18.6	23.2
60	16.4	16.6	27.1	127	77.3	52.9	34.1	21.5	21.5	24.4	24.9	19.6	25.5
55	17.3	17.6	29.8	151	86.2	58.8	38.4	23.3	23.5	25.9	25.9	20.7	28.1
50	18.4	18.7	32.5	179	95.0	64.9	43.0	25.6	26.5	27.7	26.9	21.6	31.4
45	19.3	19.8	35.8	206	106	70.9	48.1	28.0	29.4	29.6	29.0	22.8	35.1
40	20.2	20.9	41.4	233	118	77.5	54.9	30.9	31.8	31.8	30.7	24.2	39.2
35	21.7	22.4	52.0	263	133	85.5	63.5	34.1	34.6	34.7	32.9	25.6	46.0
30	24.9	24.3	65.1	302	151	96.5	46.8	38.9	38.3	38.1	36.3	27.8	55.4
25	27.9	27.1	83.3	345	171	111	94.9	45.0	43.0	44.9	41.5	32.6	69.6
20	30.6	28.5	104	402	192	129	118	53.2	50.0	54.0	50.2	37.5	90.1
15	33.4	31.8	137	480	222	156	146	66.4	60.4	67.2	57.5	40.0	122
10	36.4	35.3	215	610	255	198	210	89.6	81.8	83.6	67.9	43.8	177
5	38.9	38.1	350	866	328	267	356	172	124	109	92.3	49.2	288

# 05061000 BUFFALO RIVER NEAR HAWLEY, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	77.5	69.6	59.0	51.2	46.0
0.95	1.05	158	139	119	99.9	85.3
0.90	1.11	225	197	170	140	116
0.80	1.25	337	294	255	206	166
0.50	2	680	595	517	410	313
0.20	5	1,260	1,110	964	760	550
0.10	10	1,670	1,500	1,290	1,020	721
0.04	25	2,210	2,010	1,730	1,370	943
0.02	50	2,620	2,410	2,060	1,640	1,110
0.01	100	3,020	2,800	2,400	1,920	1,280
0.005	200	3,410	3,210	2,730	2,200	1,450
0.002	500	3,930	ng	ng	ng	ng

# 05061000 BUFFALO RIVER NEAR HAWLEY, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)
Annual peak discharge, by year, and corresponding gage height							
1945	March 16	9.52	894	1972	March 25	8.35	1,310
1946	March 19	8.49	452	1973	March 18	4.88	172
1947	April 13	9.42	878	1974	April 13	8.64	1,280
1948	April 13	--	297	1975	July 1	9.76	2,050
1949	April 7	6.67	256	1976	March 31	6.49	408
1950	April 7	9.32	841	1977	July 4	5.31	121
1951	April 7	9.00	792	1978	April 7	9.44	2,000
1952	April 8	9.10	880	1979	April 17	8.67	980
1953	June 17	7.47	598	1980	April 3	7.42	619
1954	April 12	7.36	630	1981	July 31	4.47	74.0
1955	August 5	9.31	1,590	1982	April 2	7.22	468
1956	April 11	8.50	1,020	1983	July 5	8.96	1,080
1957	March 26	6.61	456	1984	June 10	8.10	846
1958	July 5	4.86	195	1985	May 13	8.58	1,060
1959	July 11	7.04	551	1986	May 13	8.11	866
1960	April 27	7.54	660	1987	March 25	6.06	330
1961	May 16	5.28	246	1988	April 2	6.12	350
1962	June 10	9.11	1,430	1989	April 5	9.11	1,510
1963	August 12	5.48	253	1990	March 31	7.18	562
1964	April 19	8.46	1,000	1991	May 6	--	248
1965	April 11	8.87	1,250	1992	July 11	5.66	237
1966	March 18	10.42	1,520	1993	July 18	10.40	2,010
1967	March 30	7.57	669	1994	March 23	7.88	540
1968	March 28	4.97	202	1995	March 16	8.86	900
1969	April 9	9.07	1,880	1996	April 13	9.31	1,350
1970	April 10	6.98	498	1997	April 6	10.77	2,360
1971	April 2	6.45	382				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 6	10.77	2,360	1964	April 19	8.46	1,000
1975	July 1	9.76	2,050	1979	April 17	8.67	980
1993	July 18	10.40	2,010	1995	March 16	8.86	900
1978	April 7	9.44	2,000	1945	March 16	9.52	894
1969	April 9	9.07	1,880	1952	April 8	9.10	880
1955	August 5	9.31	1,590	1947	April 13	9.42	878
1966	March 18	10.42	1,520	1986	May 13	8.11	866
1989	April 5	9.11	1,510	1984	June 10	8.10	846
1962	June 10	9.11	1,430	1950	April 7	9.32	841
1996	April 13	9.31	1,350	1951	April 7	9.00	792
1972	March 25	8.35	1,310	1967	March 30	7.57	669
1974	April 13	8.64	1,280	1960	April 27	7.54	660
1965	April 11	8.87	1,250	1954	April 12	7.36	630
1983	July 5	8.96	1,080	1980	April 3	7.42	619
1985	May 13	8.58	1,060	1953	June 17	7.47	598
1956	April 11	8.50	1,020	1990	March 31	7.18	562

# 05061000 BUFFALO RIVER NEAR HAWLEY, MN--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1959	July 11	7.04	551	1949	April 7	6.67	256
1994	March 23	7.88	540	1963	August 12	5.48	253
1970	April 10	6.98	498	1991	May 6	--	248
1982	April 2	7.22	468	1961	May 16	5.28	246
1957	March 26	6.61	456	1992	July 11	5.66	237
1946	March 19	8.49	452	1968	March 28	4.97	202
1976	March 31	6.49	408	1958	July 5	4.86	195
1971	April 2	6.45	382	1973	March 18	4.88	172
1988	April 2	6.12	350	1977	July 4	5.31	121
1987	March 25	6.06	330	1981	July 31	4.47	74.0
1948	April 13	--	297				

# 05061000 BUFFALO RIVER NEAR HAWLEY, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1945	--	--	--	--	--	--	281.8	136.9	65.6	20.8	15.9	44.2	--
1946	37.5	25.2	21.6	16.8	12.3	178.0	147.1	81.1	80.8	194.9	39.9	28.4	72.5
1947	73.6	43.9	26.5	22.2	15.9	44.8	462.4	176.6	144.8	50.2	21.8	29.4	92.5
1948	25.0	23.4	21.3	17.4	13.4	34.0	179.5	58.3	51.5	26.1	22.2	14.6	40.4
1949	13.7	17.5	12.8	10.7	9.87	17.7	98.3	71.5	26.1	83.7	37.8	18.2	35.0
1950	21.9	23.0	22.3	13.8	14.8	67.4	447.0	280.5	117.0	34.9	13.6	11.8	89.0
1951	14.9	14.1	14.1	13.1	11.1	18.3	340.6	83.7	81.9	33.6	26.9	26.3	56.3
1952	31.0	29.2	38.0	27.0	27.0	24.9	425.3	73.8	28.5	290.7	168.3	45.6	100.8
1953	27.0	28.3	20.0	15.5	17.5	126.5	180.2	114.6	199.7	72.1	163.6	42.7	84.2
1954	27.0	24.3	25.7	25.9	27.9	60.1	247.2	160.8	69.5	28.5	15.5	20.8	61.1
1955	19.7	19.8	13.3	13.5	13.6	23.1	141.5	53.0	54.1	163.9	472.1	46.6	87.0
1956	33.6	29.2	22.6	17.6	20.2	22.6	468.4	123.5	55.3	22.2	22.3	16.0	70.6
1957	14.8	25.4	13.4	12.4	14.0	102.0	147.2	66.7	146.1	110.6	38.2	182.2	72.7
1958	111.5	83.8	40.8	30.8	22.6	37.1	61.9	40.2	68.9	75.1	32.1	53.2	55.0
1959	36.9	54.4	30.3	15.2	13.6	101.3	111.9	79.2	171.7	248.8	73.8	37.9	81.7
1960	40.9	34.1	27.8	23.7	21.9	43.5	355.9	173.5	82.4	52.3	40.8	30.7	77.1
1961	21.1	22.2	17.0	14.0	16.5	68.7	83.0	123.5	34.5	17.4	10.7	14.3	37.1
1962	16.8	16.0	13.1	9.94	11.3	18.8	189.4	270.1	530.1	173.2	60.6	40.5	112.4
1963	34.3	31.4	23.1	14.1	9.94	47.8	92.5	54.0	91.9	21.5	60.2	60.2	45.1
1964	26.4	20.0	15.4	15.7	17.7	23.9	434.2	209.5	72.7	31.1	16.9	25.3	75.4
1965	27.5	23.4	13.9	16.2	16.1	17.6	564.5	151.9	133.9	47.0	26.7	36.1	89.1
1966	45.4	28.8	24.4	22.5	19.3	434.3	373.3	222.2	74.2	43.0	74.4	32.0	116.8
1967	38.5	36.2	29.9	30.6	29.1	106.7	356.5	162.6	137.5	61.0	20.1	16.0	85.3
1968	17.3	18.4	18.6	13.6	12.2	53.7	86.5	83.5	59.2	39.7	19.5	23.1	37.1
1969	31.2	25.9	19.6	16.5	15.0	15.0	561.0	119.2	42.9	51.6	16.4	14.0	76.9
1970	29.3	28.2	18.6	13.1	15.4	19.6	222.1	159.5	112.0	38.6	10.8	10.1	56.4
1971	18.2	25.2	13.0	12.3	13.9	58.6	145.7	51.1	33.5	32.7	18.4	85.0	42.2
1972	109.6	176.4	63.8	30.6	29.2	316.4	373.1	213.5	89.6	37.7	32.8	24.5	124.8
1973	17.8	20.6	15.5	12.6	14.1	73.0	50.1	37.8	28.3	21.4	20.8	122.7	36.2
1974	150.6	58.8	35.4	29.2	27.5	32.2	451.3	294.7	143.5	56.2	36.9	23.1	111.7
1975	23.8	32.2	23.3	17.6	17.9	27.1	444.7	222.6	346.8	625.3	61.2	30.7	156.6
1976	33.6	35.2	22.8	20.3	26.3	95.5	121.9	41.7	18.6	10.1	5.87	8.52	36.7
1977	12.7	12.2	10.6	11.0	12.0	38.2	34.6	21.5	12.7	10.2	6.03	18.7	16.7
1978	31.8	39.7	42.5	33.2	24.9	47.7	792.2	118.4	43.7	31.6	14.1	11.9	102.0
1979	11.6	14.1	13.3	13.9	14.0	18.6	393.9	176.2	73.1	110.5	35.5	13.4	74.0



# 05061000 BUFFALO RIVER NEAR HAWLEY, MN--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1980	15.4	30.4	18.6	18.2	20.9	31.9	197.0	36.8	23.3	13.1	12.7	19.5	36.2
1981	--	24.5	27.2	54.7	99.6	33.1	33.3	24.6	--	--	--	--	--
1982	--	--	--	--	--	78.0	236.3	79.3	41.7	75.8	22.5	--	--
1983	--	--	--	--	--	89.9	70.3	50.7	60.2	481.4	69.0	49.1	--
1984	60.5	55.2	--	--	--	208.0	238.3	77.0	284.6	34.4	12.8	10.9	--
1985	45.8	--	--	--	--	170.6	78.1	371.5	279.6	91.7	55.2	72.0	--
1986	85.7	62.0	46.9	38.4	36.2	187.0	389.2	340.6	92.9	52.5	34.0	80.9	120.8
1987	75.9	61.9	46.5	38.4	35.7	180.3	103.7	79.8	40.3	25.7	24.3	19.6	61.3
1988	19.9	19.9	21.5	19.3	22.6	140.0	120.2	40.1	17.2	10.4	16.0	16.2	38.7
1989	15.4	16.2	17.8	19.2	19.6	37.9	506.9	82.1	36.4	13.6	12.5	58.0	69.1
1990	23.4	24.4	16.6	15.9	20.4	91.7	118.1	64.2	50.4	20.4	10.2	9.82	38.8
1991	15.5	37.3	13.6	12.4	13.9	50.6	61.9	136.7	66.5	65.1	16.5	16.5	42.4
1992	22.7	21.4	20.3	18.8	23.7	63.3	49.0	44.2	57.9	115.8	25.9	35.1	41.6
1993	25.5	26.4	16.5	12.4	19.2	98.7	208.8	73.6	145.3	784.0	451.8	134.7	168.0
1994	--	--	--	--	--	--	--	--	--	--	--	--	--
1995	115.7	101.1	47.8	35.5	36.0	318.3	230.2	152.5	53.7	136.6	36.0	22.5	107.8
1996	76.2	70.1	42.7	35.4	34.0	70.3	451.5	323.5	120.4	39.7	28.4	25.1	109.6
1997	34.3	60.8	38.8	33.8	31.8	26.3	1,036	272.1	182.3	236.5	80.8	72.8	174.9

## 05061200 WHISKEY CREEK AT BARNESVILLE, MN

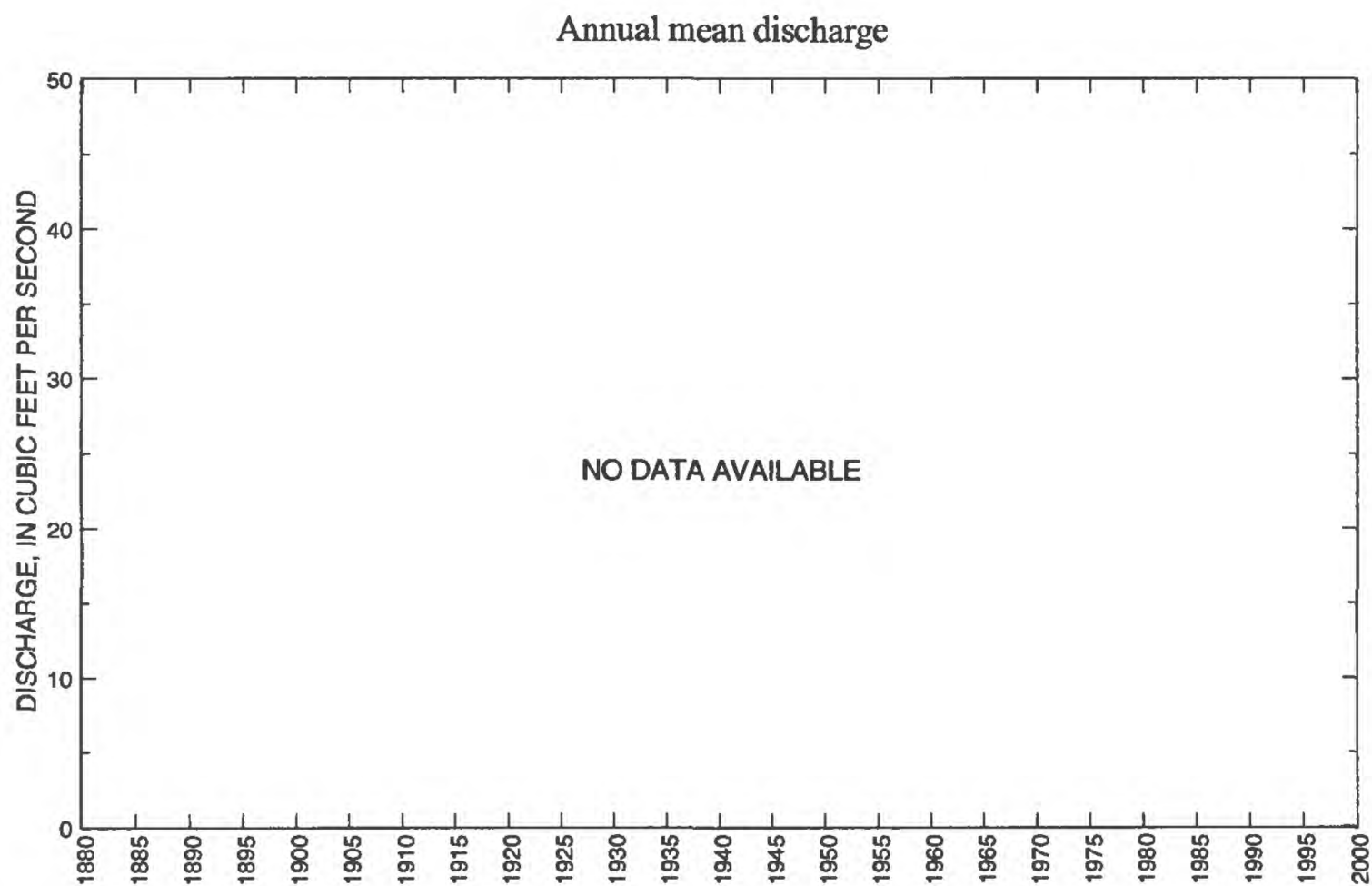
LOCATION.--Lat 46°39'35", long 96°25'54", in SE<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.20, T.137 N., R.45 W., Clay County, Hydrologic Unit 09020106, at culvert on State Highway 34, 0.7 mi upstream from Blue Eagle Lake, and 1.0 mi northeast of Barnesville.

DRAINAGE AREA.--76.3 mi<sup>2</sup>.

PERIOD OF RECORD.--Water year 1961 to current year. Operated as a high-flow partial-record station 1961-64 and 1967 to current year. Operated as a continuous-record station 1965-66.

GAGE.--Crest-stage gage.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 660 ft<sup>3</sup>/s, May 31, 1985, gage height, 7.12 ft; maximum gage height, 8.25 ft, Mar. 14, 1966, backwater from ice.



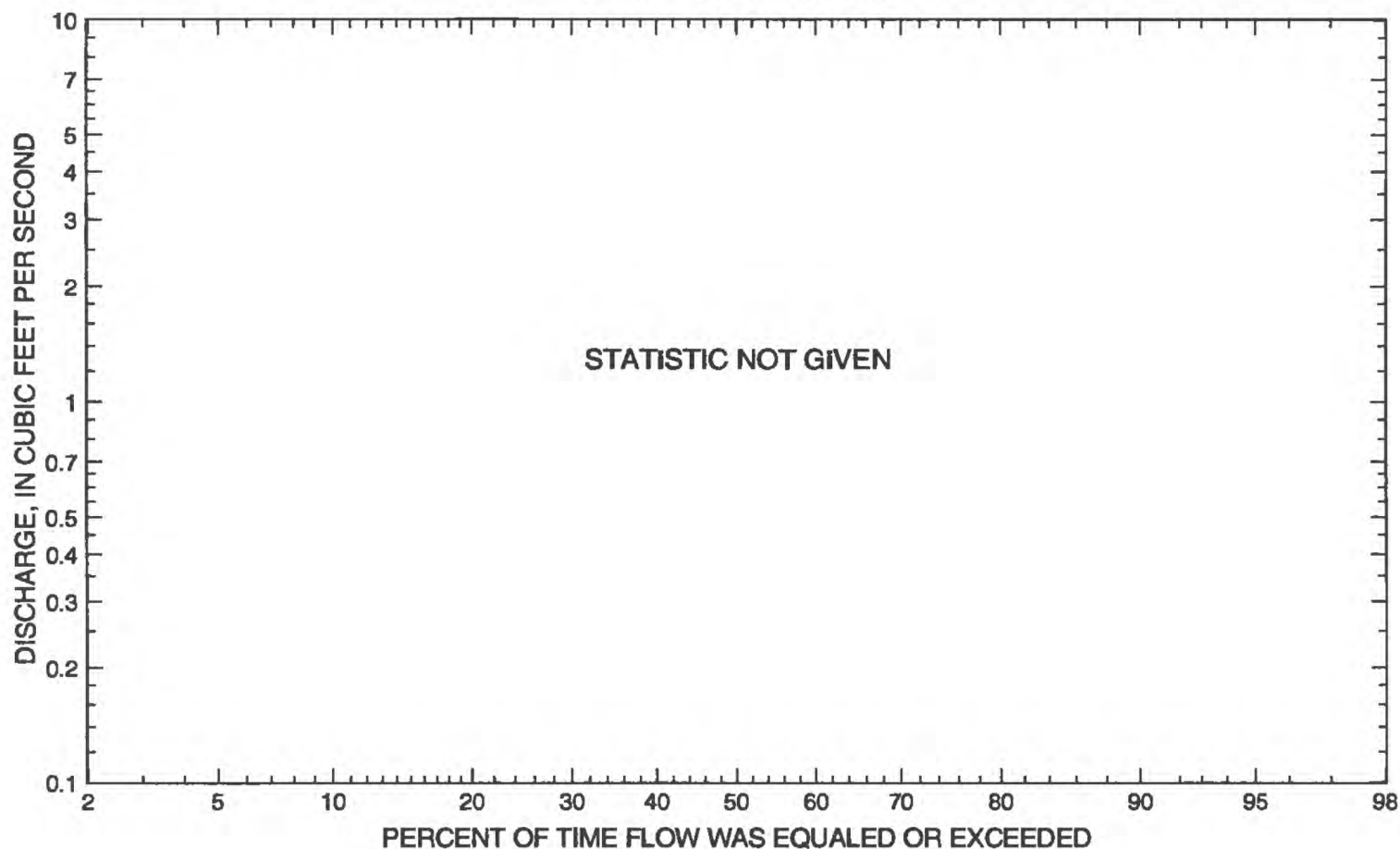
# 05061200 WHISKEY CREEK AT BARNESVILLE, MN--Continued

## Statistics of monthly and annual mean discharges

[ng, statistic not given]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	ng	ng	ng	ng	ng	ng	ng	ng
November	ng	ng	ng	ng	ng	ng	ng	ng
December	ng	ng	ng	ng	ng	ng	ng	ng
January	ng	ng	ng	ng	ng	ng	ng	ng
February	ng	ng	ng	ng	ng	ng	ng	ng
March	ng	ng	ng	ng	ng	ng	ng	ng
April	ng	ng	ng	ng	ng	ng	ng	ng
May	ng	ng	ng	ng	ng	ng	ng	ng
June	ng	ng	ng	ng	ng	ng	ng	ng
July	ng	ng	ng	ng	ng	ng	ng	ng
August	ng	ng	ng	ng	ng	ng	ng	ng
September	ng	ng	ng	ng	ng	ng	ng	ng
Annual	ng	ng	ng	ng	ng	ng	ng	ng

## Annual flow duration



# 05061200 WHISKEY CREEK AT BARNESVILLE, MN--Continued

Monthly and annual flow duration, in cubic feet per second

[ng, statistic not given]

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
90	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
85	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
80	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
75	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
70	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
65	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
60	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
55	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
50	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
45	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
40	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
35	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
30	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
25	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
20	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
15	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
10	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
5	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng

# 05061200 WHISKEY CREEK AT BARNESVILLE, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	25.0	ng	ng	ng	ng
0.95	1.05	43.0	ng	ng	ng	ng
0.90	1.11	57.1	ng	ng	ng	ng
0.80	1.25	80.2	ng	ng	ng	ng
0.50	2	152	ng	ng	ng	ng
0.20	5	281	ng	ng	ng	ng
0.10	10	385	ng	ng	ng	ng
0.04	25	537	ng	ng	ng	ng
0.02	50	663	ng	ng	ng	ng
0.01	100	800	ng	ng	ng	ng
0.005	200	948	ng	ng	ng	ng
0.002	500	1,160	ng	ng	ng	ng



# 05061200 WHISKEY CREEK AT BARNESVILLE, MN--Continued

Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1961	March 13	5.75	40.0	1980	April 4	4.94	118
1962	June 8	6.52	292	1981	July 30	4.09	67.0
1963	June 1	6.07	236	1982	May 17	3.63	38.0
1964	April 15	4.83	117	1983	July 2	5.16	175
1965	April 9	5.45	175	1984	June 8	4.83	153
1966	March 14	8.25	260	1985	May 31	7.12	660
1967	June 14	4.90	159	1986	June 18	5.79	232
1968	April 8	4.94	164	1987	March 6	4.85	79.0
1969	April 9	6.85	570	1988	May 7	3.81	74.0
1970	June 17	3.78	73.0	1989	April 3	6.44	142
1971	June 29	4.44	119	1990	March 30	4.43	118
1972	March 17	6.41	170	1991	May 1	4.36	112
1973	March 14	3.14	33.0	1992	June 16	3.76	56.0
1974	April 12	4.26	105	1993	March 29	6.88	410
1975	June 29	6.97	610	1994	March 22	5.50	120
1976	March 23	5.94	82.0	1995	March 15	5.65	260
1977	May 30	4.43	117	1996	May 18	5.55	245
1978	March 31	7.38	348	1997	April 5	8.04	340
1979	April 20	5.11	161				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1985	May 31	7.12	660	1989	April 3	6.44	142
1975	June 29	6.97	610	1994	March 22	5.50	120
1969	April 9	6.85	570	1971	June 29	4.44	119
1993	March 29	6.88	410	1980	April 4	4.94	118
1978	March 31	7.38	348	1990	March 30	4.43	118
1997	April 5	8.04	340	1964	April 15	4.83	117
1962	June 8	6.52	292	1977	May 30	4.43	117
1966	March 14	8.25	260	1991	May 1	4.36	112
1995	March 15	5.65	260	1974	April 12	4.26	105
1996	May 18	5.55	245	1976	March 23	5.94	82.0
1963	June 1	6.07	236	1987	March 6	4.85	79.0
1986	June 18	5.79	232	1988	May 7	3.81	74.0
1965	April 9	5.45	175	1970	June 17	3.78	73.0
1983	July 2	5.16	175	1981	July 30	4.09	67.0
1972	March 17	6.41	170	1992	June 16	3.76	56.0
1968	April 8	4.94	164	1961	March 13	5.75	40.0
1979	April 20	5.11	161	1982	May 17	3.63	38.0
1967	June 14	4.90	159	1973	March 14	3.14	33.0
1984	June 8	4.83	153				

05061200 WHISKEY CREEK AT BARNESVILLE, MN--Continued

Monthly and annual mean discharges, in cubic feet per second  
[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1965	2.69	4.02	0.85	1.05	1.43	2.04	53.9	8.12	14.1	3.76	0.76	7.04	8.24
1966	6.67	0.59	1.41	0.074	0.061	41.2	15.8	9.89	6.50	1.22	2.36	0.32	7.24

## 05061400 SPRING CREEK ABOVE DOWNER, MN

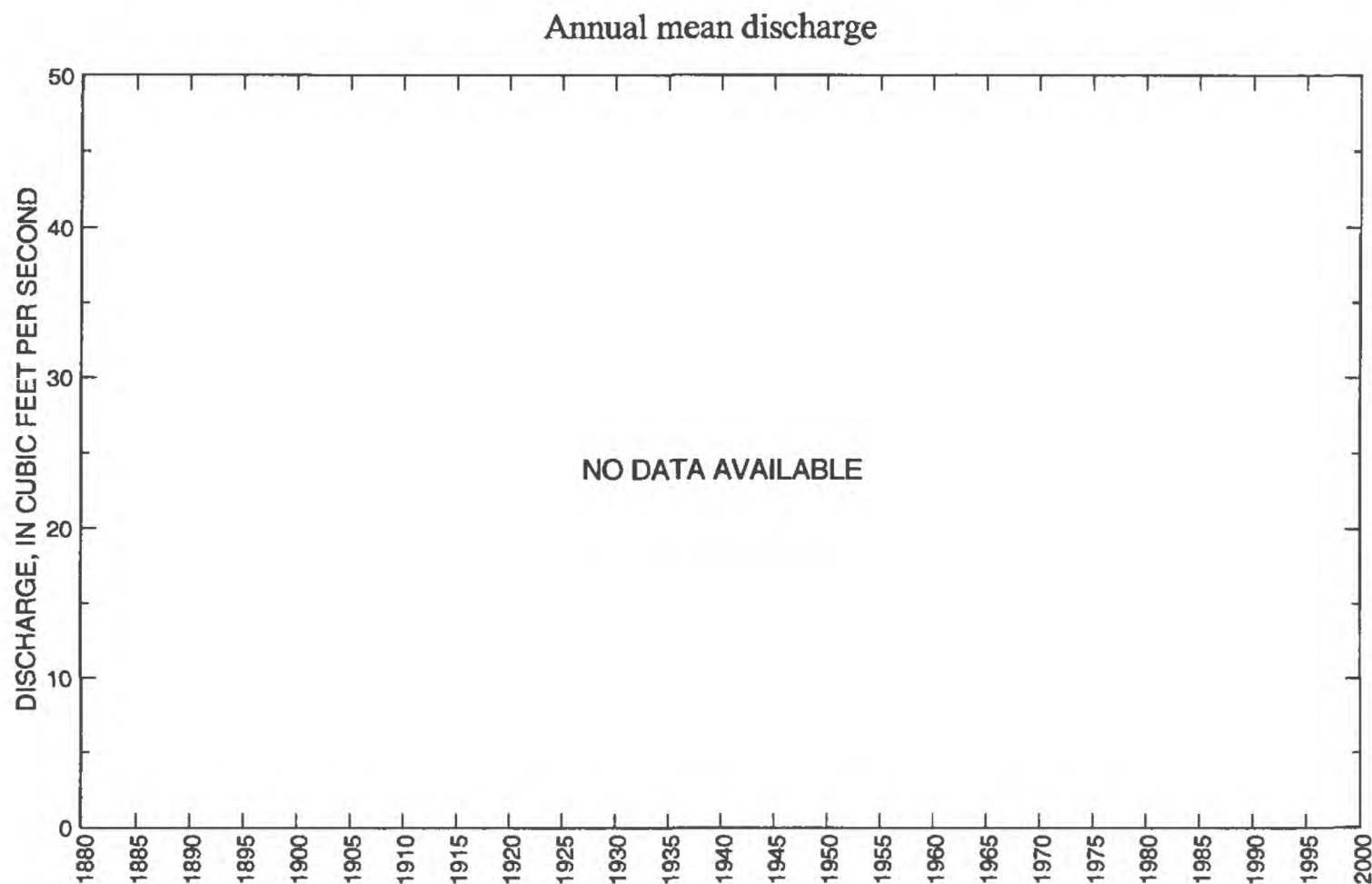
LOCATION.--Lat 46°44'37", long 96°25'12", in NW<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec.30, T.138 N., R.45 W., Clay County, Hydrologic Unit 09020106, at culvert on county road and 3.1 mi east of Downer.

DRAINAGE AREA.--7.93 mi<sup>2</sup>.

PERIOD OF RECORD.--Water year 1961 to current year.

GAGE.--Crest-stage gage.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,460 ft<sup>3</sup>/s, June 29, 1975, gage height, 13.52 ft; maximum gage height, 13.78 ft, June 17, 1986.



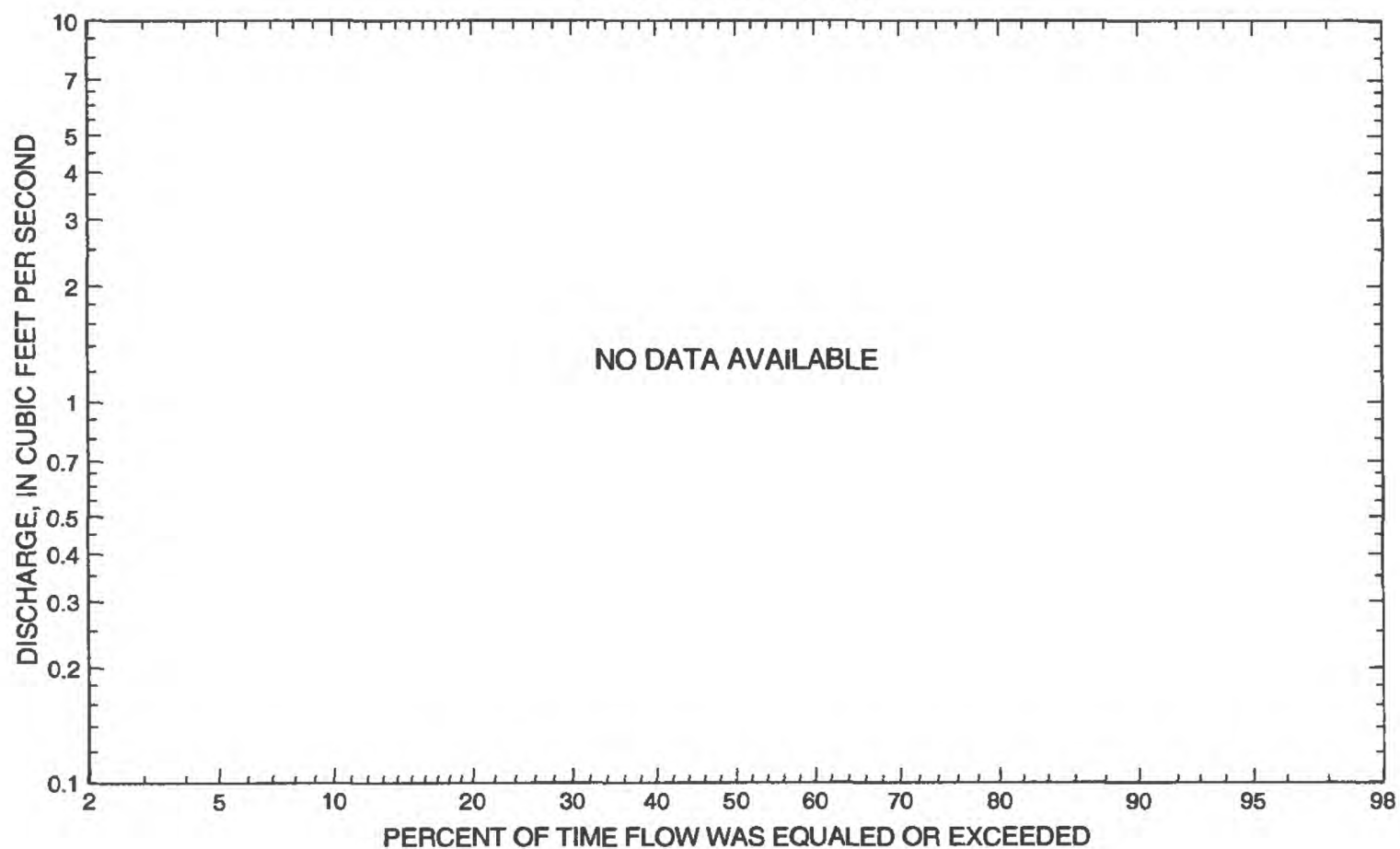
# 05061400 SPRING CREEK ABOVE DOWNER, MN--Continued

Statistics of monthly and annual mean discharges

[--, no data]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	--	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
August	--	--	--	--	--	--	--	--
September	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--

## Annual flow duration



05061400 SPRING CREEK ABOVE DOWNER, MN--Continued

Monthly and annual flow duration, in cubic feet per second  
[--, no data]

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	--	--	--	--	--	--	--	--	--	--	--	--	--
90	--	--	--	--	--	--	--	--	--	--	--	--	--
85	--	--	--	--	--	--	--	--	--	--	--	--	--
80	--	--	--	--	--	--	--	--	--	--	--	--	--
75	--	--	--	--	--	--	--	--	--	--	--	--	--
70	--	--	--	--	--	--	--	--	--	--	--	--	--
65	--	--	--	--	--	--	--	--	--	--	--	--	--
60	--	--	--	--	--	--	--	--	--	--	--	--	--
55	--	--	--	--	--	--	--	--	--	--	--	--	--
50	--	--	--	--	--	--	--	--	--	--	--	--	--
45	--	--	--	--	--	--	--	--	--	--	--	--	--
40	--	--	--	--	--	--	--	--	--	--	--	--	--
35	--	--	--	--	--	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--	--	--	--



# 05061400 SPRING CREEK ABOVE DOWNER, MN--Continued

Probability of occurrence of annual high discharges

[--, no data]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /a)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	3.50	--	--	--	--
0.95	1.05	7.20	--	--	--	--
0.90	1.11	10.7	--	--	--	--
0.80	1.25	17.9	--	--	--	--
0.50	2	50.4	--	--	--	--
0.20	5	155	--	--	--	--
0.10	10	290	--	--	--	--
0.04	25	581	--	--	--	--
0.02	50	923	--	--	--	--
0.01	100	1,420	--	--	--	--
0.005	200	2,110	--	--	--	--
0.002	500	3,460	--	--	--	--

# 05061400 SPRING CREEK ABOVE DOWNER, MN--Continued

Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1961	March 3	6.96	21.0	1980	March 28	7.42	22.0
1962	June 8	13.46	860	1981	July 30	6.26	11.0
1963	May 26	7.78	69.0	1982	May 17	7.14	10.0
1964	April 15	6.90	41.0	1983	July 2	9.96	184
1965	April 10	7.47	103	1984	June 8	7.56	45.0
1966	June 5	6.64	53.0	1985	May 31	7.45	53.0
1967	June 14	6.26	12.0	1986	June 17	13.78	839
1968	June 10	6.30	35.0	1987	March 6	6.82	28.0
1969	April 9	8.08	117	1988	July 13	6.15	15.0
1970	April 8	5.96	15.0	1989	March 27	8.33	51.0
1971	June 29	7.38	84.0	1990	March 30	6.05	13.0
1972	March 17	7.38	84.0	1991	May 31	6.68	30.0
1973	April 14	7.39	84.0	1992	June 16	7.38	54.0
1974	July 13	5.85	11.0	1993	July 24	11.56	265
1975	June 29	13.52	1,460	1994	March 20	6.97	31.0
1976	March 23	6.75	5.80	1995	March 13	7.12	47.0
1977	July 5	7.02	31.0	1996	May 18	10.71	225
1978	March 31	9.18	74.0	1997	April 5	10.82	234
1979	June 30	7.39	46.0				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1975	June 29	13.52	1,460	1979	June 30	7.39	46.0
1962	June 8	13.46	860	1984	June 8	7.56	45.0
1986	June 17	13.78	839	1964	April 15	6.90	41.0
1993	July 24	11.56	265	1968	June 10	6.30	35.0
1997	April 5	10.82	234	1977	July 5	7.02	31.0
1996	May 18	10.71	225	1994	March 20	6.97	31.0
1983	July 2	9.96	184	1991	May 31	6.68	30.0
1969	April 9	8.08	117	1987	March 6	6.82	28.0
1965	April 10	7.47	103	1980	March 28	7.42	22.0
1971	June 29	7.38	84.0	1961	March 3	6.96	21.0
1972	March 17	7.38	84.0	1970	April 8	5.96	15.0
1973	April 14	7.39	84.0	1988	July 13	6.15	15.0
1978	March 31	9.18	74.0	1990	March 30	6.05	13.0
1963	May 26	7.78	69.0	1967	June 14	6.26	12.0
1992	June 16	7.38	54.0	1974	July 13	5.85	11.0
1966	June 5	6.64	53.0	1981	July 30	6.26	11.0
1985	May 31	7.45	53.0	1982	May 17	7.14	10.0
1989	March 27	8.33	51.0	1976	March 23	6.75	5.80
1995	March 13	7.12	47.0				

05061400 SPRING CREEK ABOVE DOWNER, MN--Continued

Monthly and annual mean discharges, in cubic feet per second  
[--, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
--	--	--	--	--	--	--	--	--	--	--	--	--	--

## 05061500 SOUTH BRANCH BUFFALO RIVER AT SABIN, MN

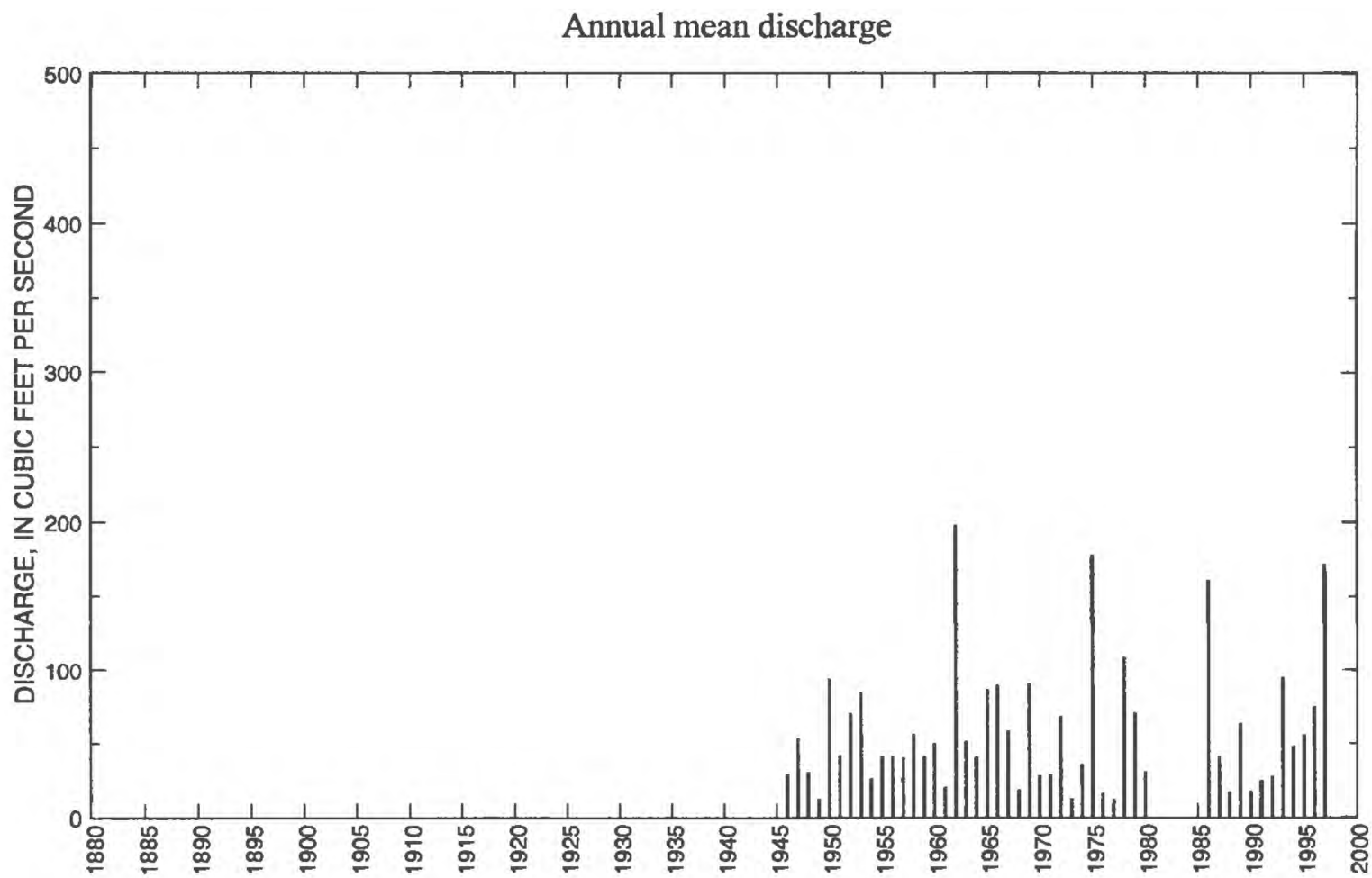
LOCATION.--Lat 46°46'20", long 96°37'40", in SW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.9, T.138 N., R.47 W., Clay County, Hydrologic Unit 09020106, near center of span on downstream side of highway bridge, 0.3 mi downstream from Stony Creek, and 1 mi east of Sabin.

DRAINAGE AREA.--522 mi<sup>2</sup>.

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

GAGE.--Water-stage recorder. Datum of gage is 902.39 ft above sea level (levels by Soil Conservation Service). Prior to Aug. 17, 1948, nonrecording gage at site 1 mi downstream at different datum. Aug. 17, 1948, to Oct. 4, 1989, nonrecording gage at present site and datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 8,500 ft<sup>3</sup>/s, July 2, 1975, gage height, 19.90 ft; no flow for many days in most years.



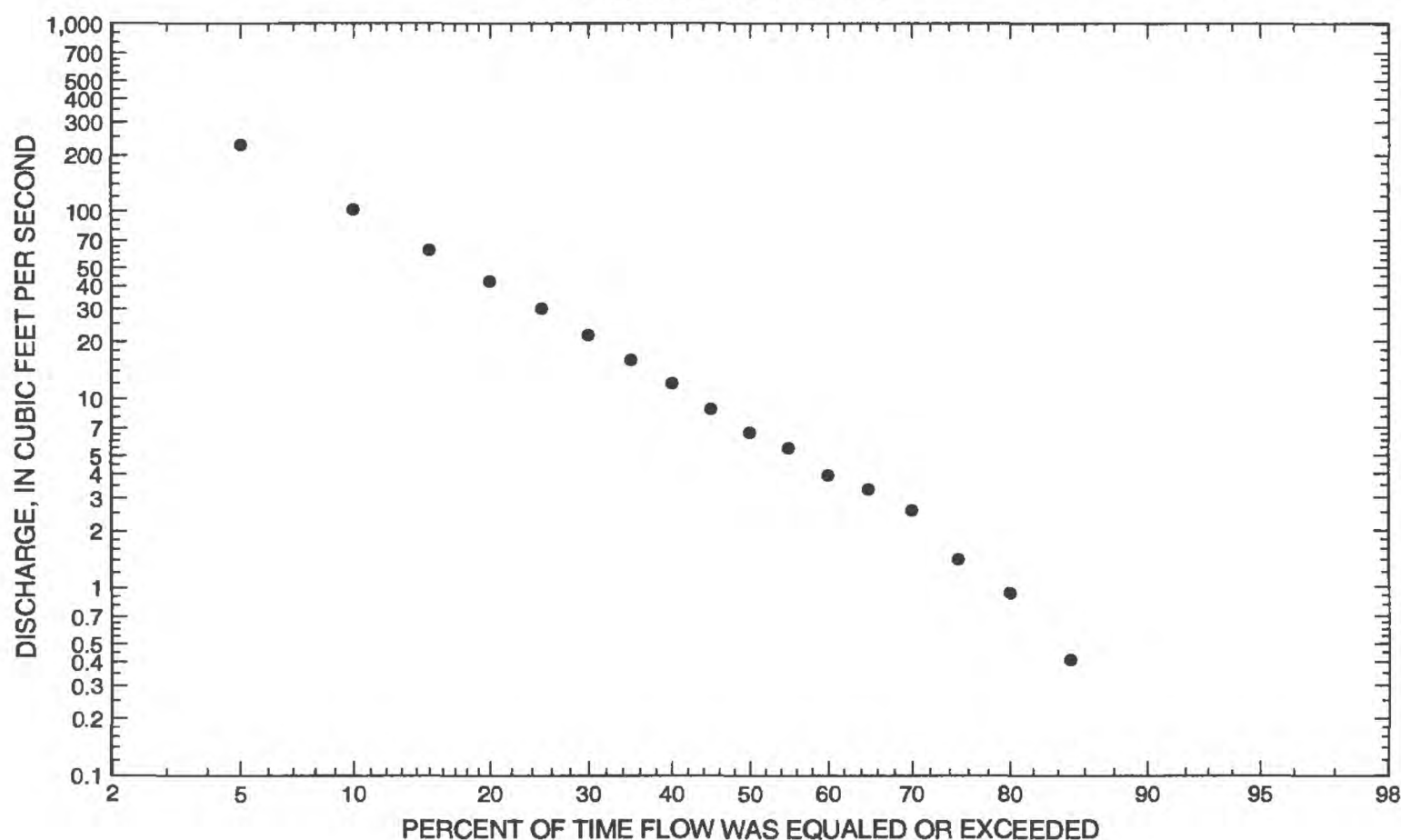
# 05061500 SOUTH BRANCH BUFFALO RIVER AT SABIN, MN--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	59.2	1996	0.023	1977	15.0	14.9	0.99	2.15	
November	76.7	1972	2.05	1977	14.9	13.3	0.89	2.13	
December	23.5	1978	0.006	1961	5.03	4.83	0.96	0.72	
January	13.1	1978	0	m	1.72	2.56	1.49	0.25	
February	14.0	1987	0	m	1.65	2.58	1.57	0.24	
March	581	1966	0	m	105	138	1.32	15.0	
April	1,680	1997	27.9	1973	281	302	1.07	40.2	
May	580	1962	8.28	1980	82.4	103	1.25	11.8	
June	1,070	1962	1.30	1976	90.4	179	1.98	12.9	
July	1,110	1975	0	1988	76.6	177	2.31	11.0	
August	152	1993	0	1976	11.8	24.6	2.08	1.69	
September	174	1986	0	1976	13.6	28.5	2.10	1.94	
Annual	198	1962	12.2	1977	58.7	44.5	0.76	100	

## Annual flow duration





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

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	23.4	6.31	1.40	0.14	0	0	0.57	2.10	0	0
90	0	0	0	30.6	12.2	2.85	1.50	0	0.17	1.30	3.10	0	0
85	0	0	0	36.9	16.1	4.25	2.34	0.37	0.58	2.40	3.80	0.45	0.41
80	0	0	0	43.8	19.3	6.17	2.86	0.71	0.78	2.40	5.13	0.69	0.93
75	0	0	0.18	51.5	22.6	7.84	3.43	0.98	1.40	3.73	5.99	1.10	1.40
70	0	0	0.52	59.5	26.0	9.15	4.07	1.40	2.00	4.52	6.99	1.40	2.56
65	0.10	0	1.10	68.0	29.8	11.6	5.65	1.90	2.00	5.15	7.46	2.10	3.33
60	0.22	0	2.49	76.9	34.2	13.8	6.72	2.67	2.70	6.06	8.45	2.10	3.92
55	0.38	0.08	3.52	88.4	38.7	16.3	8.34	3.19	2.70	6.53	9.00	2.60	5.47
50	0.55	0.17	4.99	99.9	43.0	19.1	11.3	3.69	4.01	8.21	10.7	3.30	6.60
45	0.80	0.55	7.56	117	47.2	23.2	14.4	4.12	4.54	9.14	12.1	3.30	8.77
40	1.10	0.88	15.5	135	51.5	27.9	18.5	4.55	5.39	11.0	13.2	4.52	12.0
35	1.40	1.10	29.8	164	58.7	34.4	23.9	6.03	6.78	12.9	14.4	5.20	15.9
30	1.70	1.80	47.8	201	66.3	42.4	31.4	7.22	8.00	16.5	16.2	5.73	21.7
25	2.00	2.30	73.6	254	76.9	53.8	42.9	8.55	10.0	20.2	18.7	6.59	30.2
20	2.90	2.90	104	349	92.8	73.6	60.8	11.9	12.9	24.2	21.6	7.27	42.5
15	4.20	4.10	159	496	116	103	87.6	16.9	17.8	30.3	27.3	8.58	62.1
10	5.17	5.04	259	690	151	169	134	24.0	26.3	38.1	32.6	12.2	102
5	5.96	6.20	504	1,100	236	377	310	44.4	58.0	54.3	44.3	17.1	226

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

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	85.2	66.7	56.0	39.3	31.1
0.95	1.05	192	150	122	85.2	63.8
0.90	1.11	292	229	183	127	92.5
0.80	1.25	477	377	296	203	143
0.50	2	1,170	944	715	480	318
0.20	5	2,700	2,270	1,650	1,080	675
0.10	10	4,080	3,520	2,510	1,610	983
0.04	25	6,240	5,560	3,890	2,450	1,450
0.02	50	8,150	7,420	5,120	3,180	1,840
0.01	100	10,300	9,570	6,520	4,000	2,280
0.005	200	12,700	12,000	8,110	4,920	2,760
0.002	500	16,200	ng	ng	ng	ng

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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1945	March 18	14.69	1,480	1972	March 17	14.39	2,140
1946	March 18	14.34	955	1973	March 16	7.33	132
1947	April 12	13.82	1,230	1974	April 13	12.76	1,330
1948	April 4	--	730	1975	July 2	19.90	8,500
1949	April 5	9.08	324	1976	March 26	11.10	369
1950	April 1	--	1,460	1977	June 3	9.05	234
1951	April 6	13.39	1,640	1978	March 31	15.70	3,440
1952	April 8	15.37	3,400	1979	April 14	15.33	2,800
1953	May 31	15.38	3,410	1980	April 2	12.99	1,260
1954	March 24	10.90	390	1981	May 23	11.33	500
1955	April 2	12.28	862	1982	April 1	13.12	1,350
1956	April 5	15.18	2,410	1983	July 5	14.03	1,500
1957	April 21	12.53	982	1984	March 26	13.94	2,090
1958	July 7	14.60	1,520	1985	June 2	13.69	1,660
1959	June 20	11.18	572	1986	March 25	14.86	2,550
1960	April 27	12.34	1,020	1987	March 26	11.34	689
1961	May 18	9.09	248	1988	March 9	10.64	175
1962	June 9	17.04	6,340	1989	April 4	16.30	3,800
1963	June 4	13.20	1,420	1990	April 1	9.22	178
1964	April 17	11.72	796	1991	May 4	10.30	285
1965	April 11	15.96	4,130	1992	June 20	10.94	414
1966	March 15	16.78	3,310	1993	March 30	14.57	1,910
1967	March 27	12.95	1,240	1994	March 24	12.79	730
1968	April 10	8.25	230	1995	March 15	14.41	1,770
1969	April 10	18.12	6,410	1996	May 20	14.46	2,000
1970	April 9	10.70	432	1997	April 5	18.92	5,850
1971	September 6	9.32	326				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1975	July 2	19.90	8,500	1993	March 30	14.57	1,910
1969	April 10	18.12	6,410	1995	March 15	14.41	1,770
1962	June 9	17.04	6,340	1985	June 2	13.69	1,660
1997	April 5	18.92	5,850	1951	April 6	13.39	1,640
1965	April 11	15.96	4,130	1958	July 7	14.60	1,520
1989	April 4	16.30	3,800	1983	July 5	14.03	1,500
1978	March 31	15.70	3,440	1945	March 18	14.69	1,480
1953	May 31	15.38	3,410	1950	April 1	--	1,460
1952	April 8	15.37	3,400	1963	June 4	13.20	1,420
1966	March 15	16.78	3,310	1982	April 1	13.12	1,350
1979	April 14	15.33	2,800	1974	April 13	12.76	1,330
1986	March 25	14.86	2,550	1980	April 2	12.99	1,260
1956	April 5	15.18	2,410	1967	March 27	12.95	1,240
1972	March 17	14.39	2,140	1947	April 12	13.82	1,230
1984	March 26	13.94	2,090	1960	April 27	12.34	1,020
1996	May 20	14.46	2,000	1957	April 21	12.53	982

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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1946	March 18	14.34	955	1976	March 26	11.10	369
1955	April 2	12.28	862	1971	September 6	9.32	326
1964	April 17	11.72	796	1949	April 5	9.08	324
1948	April 4	--	730	1991	May 4	10.30	285
1994	March 24	12.79	730	1961	May 18	9.09	248
1987	March 26	11.34	689	1977	June 3	9.05	234
1959	June 20	11.18	572	1968	April 10	8.25	230
1981	May 23	11.33	500	1990	April 1	9.22	178
1970	April 9	10.70	432	1988	March 9	10.64	175
1992	June 20	10.94	414	1973	March 16	7.33	132
1954	March 24	10.90	390				

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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1945	--	--	--	--	--	--	190.2	50.1	41.0	3.77	3.08	4.92	--
1946	7.84	5.29	0.265	0	0	201.9	51.1	18.9	15.8	37.6	3.88	2.72	29.1
1947	8.91	9.87	2.62	0.729	2.39	105.1	393.4	50.8	63.6	8.29	0.529	2.19	53.8
1948	6.13	2.93	0.016	0	0	56.6	263.8	22.2	8.89	4.38	1.88	0.490	30.4
1949	0.923	5.31	1.59	0	0	0.271	90.2	23.0	5.64	15.9	8.57	0.223	12.6
1950	3.32	4.53	1.99	0	0	188.4	618.5	286.2	17.5	4.81	1.71	0.927	94.0
1951	3.84	2.89	0.613	0	0	9	383.1	32.3	60.2	15.7	3.61	8.31	42.1
1952	20.5	10.9	6.66	1.79	1.00	1.51	595.3	14.3	3.38	179.8	11.1	8.15	70.7
1953	3.97	7.82	2.02	0.558	0	86.9	90.6	241.1	544.2	21.4	17.6	4.16	84.9
1954	1.24	3.90	1.75	0.568	0.889	86.6	91.1	50.7	54.5	10.0	4.42	6.01	26.0
1955	19.4	10.5	3.40	0.626	0	4.84	164.3	25.2	42.4	213.0	9.86	1.49	41.4
1956	2.67	2.64	0.135	0	0	0.177	411.5	54.3	21.1	3.12	2.84	1.56	41.2
1957	4.10	5.49	1.73	0.235	0	75.1	157.8	49.4	48.4	35.6	11.8	91.5	40.0
1958	34.1	40.1	6.93	2.21	3.65	19.6	41.7	27.4	45.6	419.4	12.0	15.4	56.3
1959	10.8	28.4	2.09	0	0	54.6	44.7	55.5	179.5	90.6	14.5	9.01	40.9
1960	13.7	7.53	4.18	3.24	2.86	27.4	386.6	68.5	38.6	39.0	7.75	8.73	50.3
1961	4.58	5.58	0.006	0	1.07	74.9	65.2	78.2	5.55	1.97	2.10	5.22	20.5
1962	8.95	6.33	2.89	0.100	0	0	353.7	580.1	1,068	256.9	78.8	19.4	197.8
1963	20.8	31.2	9.11	0.013	0	41.4	88.9	98.9	293.8	5.36	9.61	22.0	51.6
1964	6.29	7.49	2.55	0	0	3.94	347.1	79.0	30.0	5.13	5.09	7.10	40.8
1965	6.24	10.3	0.135	0	0	0.068	816.9	62.4	99.1	25.8	14.4	18.2	86.9
1966	50.9	17.3	5.04	0.729	0	581.2	163.1	100.0	31.1	33.3	71.6	8.41	89.7
1967	18.8	13.8	3.83	0.435	0.143	140.1	280.8	80.3	157.4	7.30	1.56	1.64	58.7
1968	11.7	16.0	3.81	0.132	0	25.7	66.1	47.7	29.8	12.4	4.27	11.1	19.1
1969	33.6	30.6	7.91	0.535	0	0	927.8	42.7	10.0	38.1	8.36	3.14	91.0
1970	9.16	12.9	5.34	1.83	1.86	8.76	162.7	61.6	62.3	8.23	1.23	2.12	28.0
1971	6.46	9.31	3.34	0.235	0	58.6	72.5	23.5	17.2	102.8	4.16	41.6	28.5
1972	36.3	76.7	14.4	2.99	1.19	314.1	158.5	175.5	21.4	5.13	7.43	4.31	68.5
1973	13.8	15.1	4.68	4.88	4.92	37.1	27.9	20.4	4.19	3.49	3.37	11.9	12.7
1974	26.0	13.2	9.74	0.733	0.050	5.46	255.1	84.0	22.8	4.32	6.79	1.35	35.7
1975	6.73	15.2	3.34	0.329	0.029	0.623	395.6	71.2	515.7	1,112	6.44	1.66	178.3
1976	8.82	14.8	5.35	0.835	0.372	73.1	80.3	10.2	1.30	1.22	0	0	16.4
1977	0.023	2.05	0.772	0.190	0.094	28.7	37.9	8.91	35.8	15.2	0.426	16.5	12.2
1978	51.1	32.8	23.5	13.1	5.29	450.8	679.0	29.9	8.69	7.67	1.06	2.89	108.9
1979	2.94	4.74	2.03	0.582	0.236	4.76	677.0	78.5	23.3	55.2	10.8	2.67	71.3



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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1980	4.10	18.2	5.04	1.64	2.11	38.9	275.5	8.28	7.73	0.217	2.17	5.60	30.4
1982	--	--	--	--	--	211.1	248.3	45.8	6.00	7.72	2.47	--	--
1983	--	--	--	--	--	114.4	43.7	32.0	8.03	312.4	12.3	--	--
1984	7.78	16.1	--	--	--	441.5	156.8	27.3	129.5	5.76	0.014	0.161	--
1985	33.6	--	--	--	--	148.3	75.1	146.2	267.4	32.8	26.7	72.8	--
1986	36.4	14.4	7.89	5.07	2.95	439.0	601.1	324.7	231.9	70.0	19.0	173.5	160.8
1987	45.1	27.8	20.8	7.84	14.0	213.4	86.3	44.3	8.11	5.45	6.92	8.62	41.0
1988	6.79	13.0	8.42	0	1.07	85.7	57.7	29.0	6.02	0	0.108	0.650	17.4
1989	3.00	7.40	3.64	2.18	2.88	10.9	694.8	25.5	9.98	1.64	0.032	12.6	63.8
1990	8.53	8.63	2.31	4.14	4.51	39.9	60.1	42.1	34.4	6.57	0.398	0.316	17.7
1991	5.71	9.50	5.03	1.38	4.00	31.2	47.4	85.1	34.7	65.7	3.59	3.78	24.9
1992	11.8	10.6	6.30	4.78	5.50	83.7	46.4	22.6	96.4	26.0	8.15	9.21	27.6
1993	2.54	20.3	8.42	3.00	2.22	155.1	215.8	50.7	81.6	425.4	152.2	11.3	94.9
1994	10.5	7.98	6.40	5.94	5.80	210.0	198.2	72.0	13.6	30.1	5.93	8.65	48.2
1995	27.1	40.9	10.6	5.00	4.69	341.2	115.7	76.6	9.19	26.3	3.46	5.42	56.1
1996	59.2	23.0	5.51	0.898	0.590	19.5	385.2	349.5	50.2	4.42	4.41	1.93	75.3
1997	9.81	14.1	2.12	1.14	0.995	1.11	1,683	100.8	75.8	158.2	12.8	17.7	171.5

## 05062000 BUFFALO RIVER NEAR DILWORTH, MN

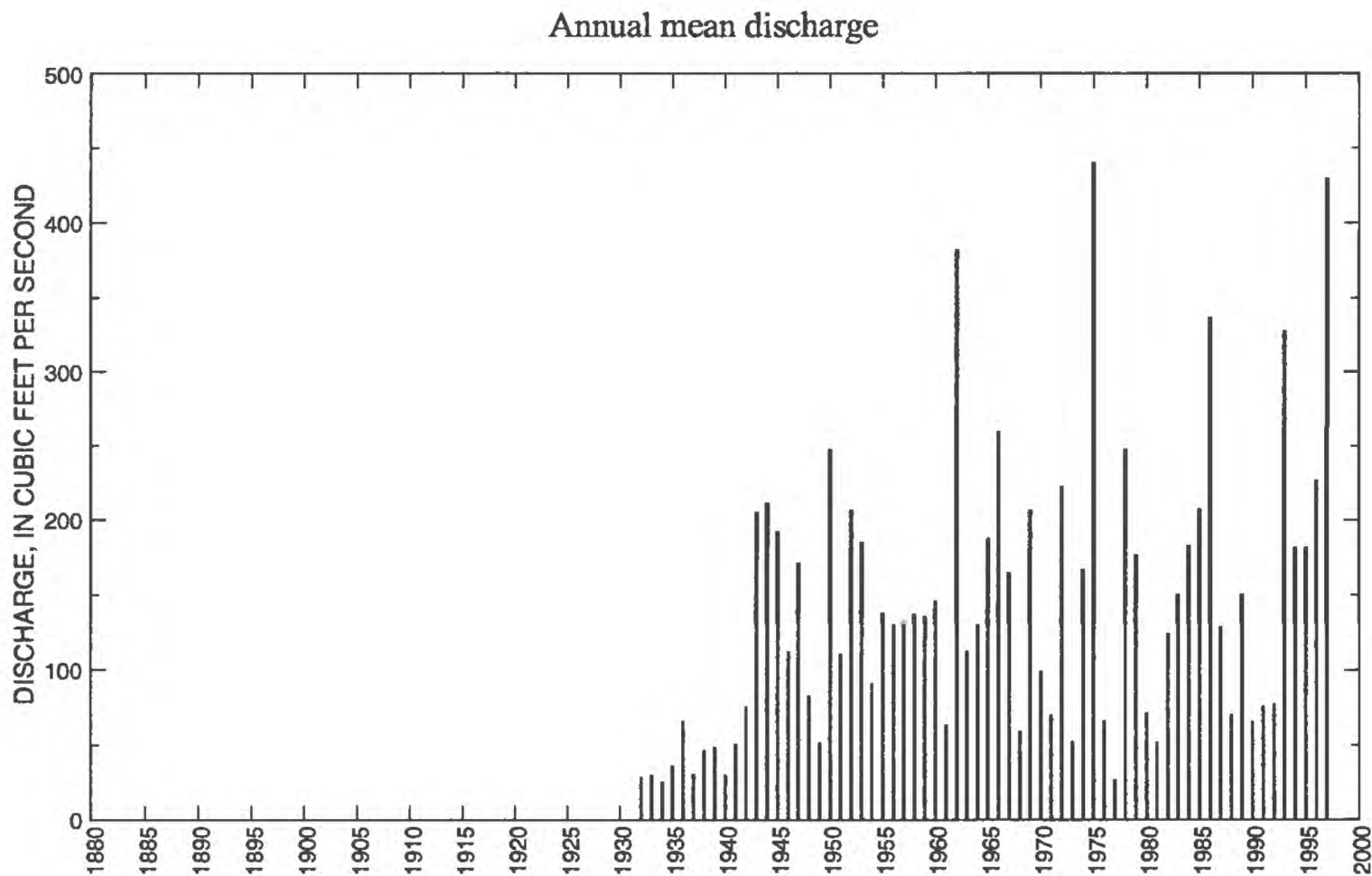
LOCATION.--Lat 46°57'40", long 96°39'40", in SW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.6, T.140 N., R.47 W., Clay County, Hydrologic Unit 09020106, on left bank 4.5 mi southeast of Kragnes, 6.5 mi northeast of Dilworth, and 9 mi downstream from South Branch.

DRAINAGE AREA.--1,040 mi<sup>2</sup>, approximately.

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

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

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,600 ft<sup>3</sup>/s, July 2, 1975, gage height, 27.10 ft; no flow at times in 1936.



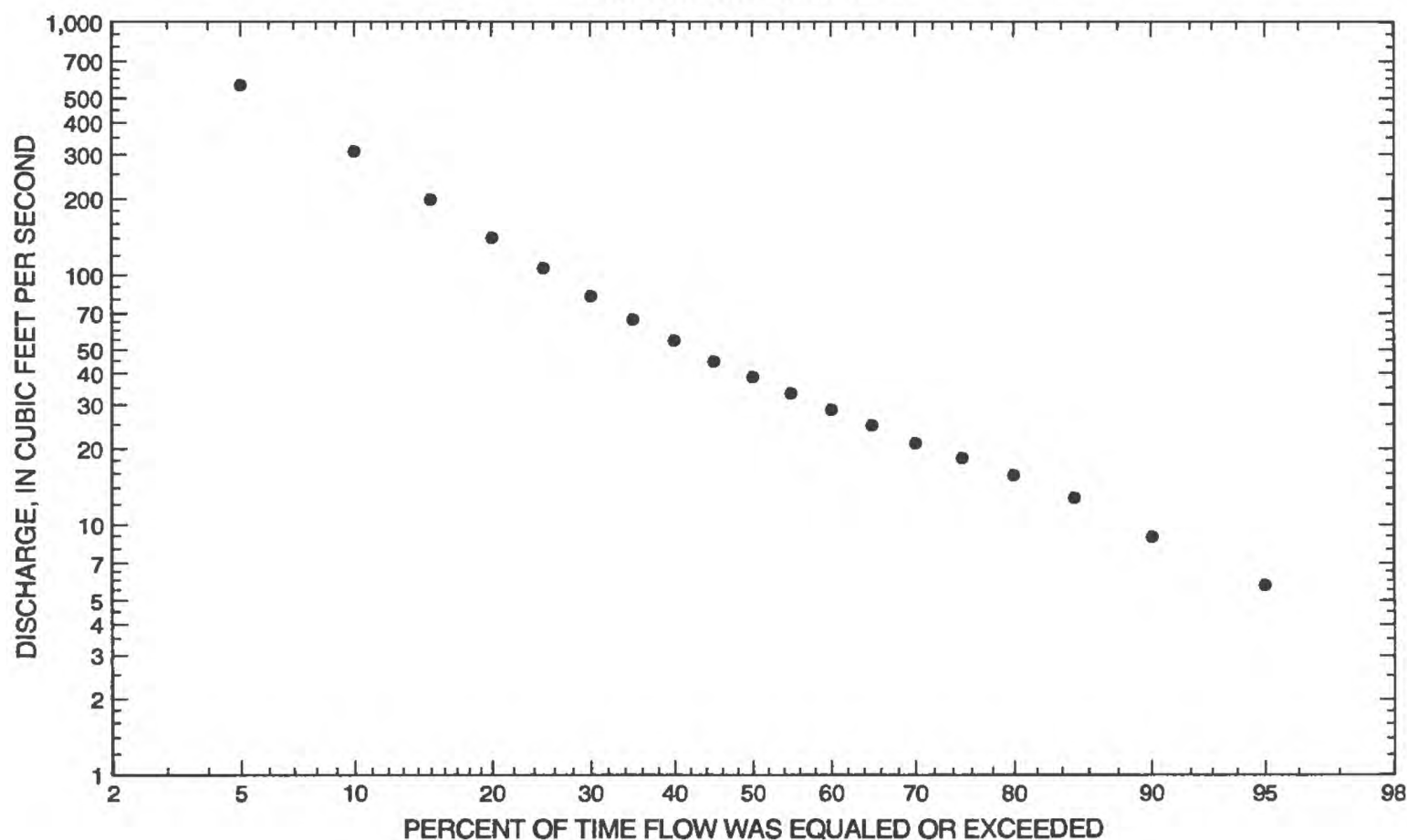
## 05062000 BUFFALO RIVER NEAR DILWORTH, MN--Continued

### Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /a)	Coeffl- cient of variation	Percentega of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Diacharge (ft <sup>3</sup> /s)				
October	200	1996	5.48	1940	53.8	49.6	0.92	3.20	
November	305	1972	8.74	1937	51.0	45.3	0.89	3.03	
December	97.0	1972	4.75	1938	30.5	20.0	0.65	1.82	
January	53.5	m	0.868	1940	20.3	12.7	0.62	1.21	
February	61.1	1984	0.759	1940	20.4	13.1	0.64	1.21	
March	1,310	1966	2.26	1940	181	243	1.34	10.8	
April	3,410	1997	33.5	1931	585	588	1.01	34.8	
May	909	1986	27.2	1931	228	201	0.88	13.6	
June	2,140	1962	15.1	1934	197	304	1.54	11.7	
July	2,810	1975	2.23	1936	187	404	2.16	11.1	
August	910	1993	0	1936	72.3	148	2.04	4.30	
September	518	1944	0.790	1936	54.1	80.1	1.48	3.22	
Annual	440	1975	25.6	1934	142	95.9	0.68	100	

Annual flow duration



# 05062000 BUFFALO RIVER NEAR DILWORTH, MN--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	3.60	3.50	4.42	45.1	30.5	17.2	5.24	1.40	3.10	7.68	10.2	5.90	5.73
90	5.97	5.17	10.7	69.8	44.7	22.3	8.57	5.04	5.39	10.4	13.0	8.59	8.97
85	8.33	8.43	14.1	89.3	56.0	28.6	13.2	6.86	8.13	14.0	17.1	11.5	12.8
80	8.98	9.58	16.4	104	66.5	34.0	17.5	9.71	10.7	17.2	19.5	14.3	15.7
75	11.6	11.7	18.9	120	76.9	41.6	22.0	12.6	12.9	19.7	22.9	16.1	18.4
70	13.0	13.5	21.4	138	88.8	49.7	26.3	15.2	15.1	22.6	25.7	17.8	21.1
65	14.1	14.4	25.0	165	100	58.6	30.8	17.8	17.7	26.0	29.1	19.5	24.8
60	15.2	15.4	28.8	198	113	67.2	36.5	20.2	20.8	28.2	31.5	21.2	28.6
55	16.4	16.4	33.1	235	128	76.3	42.3	22.6	23.7	30.5	34.1	22.7	33.3
50	17.5	17.7	37.5	275	148	87.5	51.2	25.7	26.6	33.7	37.0	24.2	38.6
45	19.0	19.0	44.0	328	166	100	60.7	30.1	29.9	36.8	41.4	26.6	44.8
40	20.7	20.6	51.8	389	188	114	74.5	35.5	33.4	39.8	47.1	29.2	54.7
35	22.6	22.9	62.0	458	214	131	89.8	41.8	39.3	45.5	53.0	31.6	66.3
30	25.0	25.3	91.3	535	241	155	113	49.7	46.6	54.4	59.5	34.9	82.6
25	27.5	28.0	128	659	278	186	144	58.8	55.5	66.2	67.2	39.7	107
20	30.3	30.6	177	843	321	234	184	72.2	68.2	82.6	73.9	48.0	141
15	34.1	34.4	263	1,060	374	291	255	94.0	89.3	100	81.8	54.9	200
10	39.1	39.2	424	1,420	447	401	380	146	128	129	97.1	64.0	309
5	47.5	48.5	898	2,150	644	674	689	288	206	175	131	70.7	564

# 05062000 BUFFALO RIVER NEAR DILWORTH, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	135	115	91.5	70.2
0.95	1.05	265	265	231	180	137
0.90	1.11	388	380	332	257	194
0.80	1.25	611	586	513	392	292
0.50	2	1,430	1,330	1,150	863	622
0.20	5	3,280	3,020	2,510	1,860	1,280
0.10	10	5,020	4,620	3,740	2,740	1,830
0.04	25	7,840	7,250	5,670	4,130	2,660
0.02	50	10,400	9,700	7,380	5,360	3,360
0.01	100	13,400	12,600	9,340	6,750	4,140
0.005	200	16,900	16,000	11,500	8,330	4,990
0.002	500	22,200	ng	ng	ng	ng



# 05062000 BUFFALO RIVER NEAR DILWORTH, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1931	April 10	--	46.0	1965	April 11	23.37	5,960
1932	April 12	8.83	311	1966	March 18	23.31	5,000
1933	April 3	9.02	269	1967	March 30	16.68	1,820
1934	April 10	9.02	374	1968	March 30	8.92	406
1935	March 21	9.09	311	1969	April 11	25.55	10,400
1936	April 16	14.59	1,460	1970	April 12	12.85	802
1937	April 14	9.00	390	1971	April 10	9.81	493
1938	May 5	8.78	550	1972	March 19	19.36	2,590
1939	March 29	15.77	1,350	1973	March 18	--	205
1940	April 7	10.29	510	1974	April 14	17.97	2,130
1941	April 4	12.71	800	1975	July 2	27.10	13,600
1942	May 6	10.94	762	1976	April 1	13.50	1,000
1943	April 2	22.60	4,530	1977	June 5	5.99	163
1944	August 20	12.81	998	1978	March 31	22.76	5,420
1945	March 20	19.38	2,660	1979	April 16	21.60	4,380
1946	March 22	17.05	1,670	1980	April 4	16.78	1,850
1947	April 13	20.26	3,380	1981	May 23	13.02	1,090
1948	April 8	14.44	1,310	1982	April 2	17.80	2,210
1949	April 8	11.17	602	1983	July 9	16.75	1,990
1950	April 7	--	2,600	1984	March 29	19.27	2,940
1951	April 7	17.47	2,230	1985	June 5	15.53	1,940
1952	April 10	21.24	4,310	1986	March 28	20.50	3,440
1953	June 20	18.43	2,430	1987	March 13	13.19	954
1954	April 12	11.54	686	1988	April 4	10.55	648
1955	April 4	14.85	1,260	1989	April 6	22.80	5,380
1956	April 12	18.37	2,410	1990	April 3	12.40	600
1957	April 24	13.70	1,080	1991	May 6	10.66	576
1958	July 11	15.70	1,540	1992	June 22	--	492
1959	June 23	11.81	699	1993	July 20	22.88	3,450
1960	April 30	15.12	1,390	1994	March 24	20.82	3,270
1961	May 19	9.90	480	1995	March 19	18.50	2,110
1962	June 11	23.56	6,140	1996	April 14	19.42	2,720
1963	June 7	14.76	1,300	1997	April 6	27.02	8,370
1964	April 22	16.40	1,740				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1975	July 2	27.10	13,600	1979	April 16	21.60	4,380
1969	April 11	25.55	10,400	1952	April 10	21.24	4,310
1997	April 6	27.02	8,370	1993	July 20	22.88	3,450
1962	June 11	23.56	6,140	1986	March 28	20.50	3,440
1965	April 11	23.37	5,960	1947	April 13	20.26	3,380
1978	March 31	22.76	5,420	1994	March 24	20.82	3,270
1989	April 6	22.80	5,380	1984	March 29	19.27	2,940
1966	March 18	23.31	5,000	1996	April 14	19.42	2,720
1943	April 2	22.60	4,530	1945	March 20	19.38	2,660

# 05062000 BUFFALO RIVER NEAR DILWORTH, MN--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1950	April 7	--	2,600	1987	March 13	13.19	954
1972	March 19	19.36	2,590	1970	April 12	12.85	802
1953	June 20	18.43	2,430	1941	April 4	12.71	800
1956	April 12	18.37	2,410	1942	May 6	10.94	762
1951	April 7	17.47	2,230	1959	June 23	11.81	699
1982	April 2	17.80	2,210	1954	April 12	11.54	686
1974	April 14	17.97	2,130	1988	April 4	10.55	648
1995	March 19	18.50	2,110	1949	April 8	11.17	602
1983	July 9	16.75	1,990	1990	April 3	12.40	600
1985	June 5	15.53	1,940	1991	May 6	10.66	576
1980	April 4	16.78	1,850	1938	May 5	8.78	550
1967	March 30	16.68	1,820	1940	April 7	10.29	510
1964	April 22	16.40	1,740	1971	April 10	9.81	493
1946	March 22	17.05	1,670	1992	June 22	--	492
1958	July 11	15.70	1,540	1961	May 19	9.90	480
1936	April 16	14.59	1,460	1968	March 30	8.92	406
1960	April 30	15.12	1,390	1937	April 14	9.00	390
1939	March 29	15.77	1,350	1934	April 10	9.02	374
1948	April 8	14.44	1,310	1932	April 12	8.83	311
1963	June 7	14.76	1,300	1935	March 21	9.09	311
1955	April 4	14.85	1,260	1933	April 3	9.02	269
1981	May 23	13.02	1,090	1973	March 18	--	205
1957	April 24	13.70	1,080	1977	June 5	5.99	163
1976	April 1	13.50	1,000	1931	April 10	--	46.0
1944	August 20	12.81	998				

# 05062000 BUFFALO RIVER NEAR DILWORTH, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1931	--	--	--	--	--	--	33.5	27.2	26.1	17.4	12.7	6.18	--
1932	13.3	18.0	14.0	10.8	11.5	54.2	123.0	51.4	31.6	6.66	2.85	5.73	28.5
1933	12.7	9.67	5.88	4.62	4.40	90.5	119.3	60.9	24.0	9.01	7.27	7.78	29.8
1934	15.3	17.6	15.0	11.0	15.0	38.0	141.3	28.5	15.1	4.09	1.45	5.73	25.6
1935	19.4	10.6	9.64	9.16	15.0	123.8	76.8	60.3	42.9	40.2	15.9	8.66	36.2
1936	16.8	9.99	6.29	2.97	1.00	65.0	579.1	98.3	17.6	2.23	0	0.790	66.1
1937	6.39	8.74	6.00	6.00	5.00	3.00	136.8	104.6	46.9	14.1	17.2	14.8	30.8
1938	11.4	10.7	4.75	4.34	5.46	105.7	51.2	247.1	85.4	17.1	7.00	7.23	46.9
1939	7.50	11.3	7.97	5.80	4.17	216.0	270.2	32.2	18.8	7.84	1.74	1.75	48.8
1940	5.48	10.5	8.16	0.868	0.759	2.26	228.8	64.1	18.0	6.26	11.1	5.78	29.9
1941	8.99	14.9	9.48	9.44	9.84	61.6	350.6	46.7	61.5	12.3	7.40	19.1	50.7
1942	25.5	23.9	11.2	2.24	1.56	29.1	87.1	295.8	208.7	35.8	31.4	152.7	75.6
1943	74.8	58.0	21.2	10.7	8.12	74.2	1,158	234.2	434.0	247.5	109.3	41.8	205.2
1944	28.5	36.7	15.5	8.65	9.76	23.4	214.3	230.1	263.4	473.3	710.0	517.5	211.5
1945	134.4	128.6	63.8	21.6	15.9	861.3	582.8	246.4	133.9	31.1	22.2	50.7	192.1
1946	49.1	31.0	20.6	13.1	9.52	441.4	229.8	101.0	86.9	269.4	53.1	32.2	112.4
1947	76.4	66.0	41.4	30.1	21.5	127.7	1,054	267.9	274.1	67.7	18.4	20.0	171.4
1948	27.1	25.7	22.6	17.0	16.2	44.4	618.1	98.7	62.1	34.7	23.6	14.6	83.0
1949	13.6	17.6	14.0	10.9	9.84	18.2	215.3	108.5	36.8	101.4	55.1	17.0	51.6
1950	24.9	28.9	21.5	9.55	6.18	202.5	1,577	852.2	167.5	53.1	16.1	12.7	247.5
1951	19.7	17.3	15.6	13.5	13.8	19.2	800.4	144.3	173.3	51.6	32.9	38.7	110.9
1952	57.2	44.5	38.6	27.3	26.7	28.8	1,284	120.1	32.7	507.9	231.9	91.7	206.9
1953	35.8	40.1	23.1	15.7	17.4	202.3	295.0	249.5	955.8	132.9	206.0	53.5	185.3
1954	29.7	31.1	26.1	22.1	31.9	98.9	358.0	263.3	142.7	45.5	20.3	25.8	91.2
1955	39.0	32.6	18.6	13.0	13.3	14.5	367.8	89.3	99.5	466.1	435.3	55.9	138.1
1956	44.9	30.6	20.9	16.8	20.1	25.0	1,034	221.4	98.2	26.0	23.7	14.1	130.2
1957	19.7	38.9	18.0	13.9	14.2	187.4	346.1	145.1	210.1	198.1	65.2	336.0	132.6
1958	186.2	159.7	51.4	31.6	26.6	60.7	115.9	77.8	139.5	653.1	53.8	79.8	137.4
1959	51.1	85.0	39.0	16.9	13.6	116.5	212.3	171.4	389.0	388.4	87.5	54.2	135.9
1960	52.0	40.5	35.0	34.3	26.9	62.3	837.1	356.5	126.0	103.0	42.0	44.2	146.0
1961	27.4	30.9	20.7	17.5	16.5	142.6	162.7	247.2	51.9	19.4	9.02	16.2	63.9
1962	26.2	22.1	15.1	9.89	11.4	15.0	673.6	906.2	2,138	563.4	153.4	65.5	382.6
1963	56.1	68.1	35.4	9.60	6.23	94.7	232.4	158.5	492.2	29.8	70.6	101.8	112.6
1964	38.2	34.1	20.6	16.8	18.1	44.5	854.1	349.1	119.2	43.5	18.4	29.0	131.4
1965	34.8	34.6	14.6	15.8	16.4	17.0	1,392	309.2	260.8	77.6	40.3	55.8	187.8

# 05062000 BUFFALO RIVER NEAR DILWORTH, MN--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1966	110.7	73.2	65.3	36.5	29.1	1,308	638.6	405.5	105.3	82.5	185.7	49.1	259.8
1967	57.9	43.3	33.9	36.3	39.9	195.1	851.3	280.7	328.1	84.1	20.5	16.0	165.0
1968	20.3	19.8	19.0	10.5	10.3	92.4	169.1	129.4	108.1	75.5	22.4	32.6	59.1
1969	57.1	53.3	27.4	17.3	15.0	17.9	1,903	195.6	63.8	98.4	31.7	17.2	206.4
1970	35.2	40.6	25.3	19.1	18.4	42.8	439.5	258.5	245.3	51.4	9.10	9.44	99.3
1971	20.3	34.5	18.5	12.5	13.7	83.6	255.3	84.4	59.3	116.1	21.2	122.0	70.0
1972	185.6	305.4	97.0	34.9	30.4	714.4	622.7	419.6	134.9	44.8	46.6	29.5	222.7
1973	28.2	42.6	25.0	15.7	15.7	122.2	97.6	66.8	36.2	22.9	23.5	131.7	52.4
1974	184.2	82.5	56.4	30.5	32.6	52.0	773.8	455.6	186.1	69.0	55.0	29.7	167.3
1975	33.0	46.6	27.4	20.2	19.0	27.0	951.1	394.4	805.1	2,814	78.9	31.4	440.5
1976	48.0	58.7	33.2	25.3	28.5	194.5	306.6	66.5	23.8	10.1	1.74	2.54	66.5
1977	8.42	12.5	8.46	8.82	9.37	41.4	89.3	35.2	37.0	28.7	5.48	36.7	26.7
1978	96.6	67.9	66.9	51.2	30.7	388.5	1,984	187.5	61.3	36.3	13.4	9.52	248.2
1979	12.8	19.3	18.1	14.3	13.0	17.9	1,335	323.0	121.9	187.9	53.7	16.8	177.0
1980	18.7	60.1	33.7	21.6	23.8	67.7	496.5	58.4	33.9	12.9	10.4	29.8	71.7
1981	34.4	37.0	24.3	17.5	29.0	61.6	83.4	152.1	46.8	40.4	61.5	37.5	52.3
1982	79.4	72.3	33.2	13.3	14.4	237.9	714.5	152.2	55.5	77.9	27.0	17.7	124.5
1983	131.8	58.8	44.9	25.4	26.6	202.7	145.7	103.8	75.8	806.9	106.4	59.8	150.8
1984	77.6	71.0	46.0	28.8	61.1	617.9	534.9	126.1	564.1	55.2	13.3	10.8	183.3
1985	150.9	70.4	41.5	26.0	20.7	343.2	174.8	644.0	624.0	146.9	97.0	140.7	207.7
1986	114.2	79.0	58.2	46.7	44.3	581.2	1,364	908.9	436.2	152.4	58.0	200.8	337.4
1987	135.3	116.1	80.1	53.5	55.7	554.0	228.6	154.4	65.7	35.2	35.9	27.0	129.3
1988	30.8	45.8	38.1	23.3	22.5	263.3	274.9	80.9	29.4	8.18	13.3	14.1	70.4
1989	17.2	23.9	22.0	21.0	19.7	49.9	1,359	134.7	56.0	17.2	17.6	93.8	151.2
1990	36.3	32.2	19.7	20.4	23.6	106.0	217.4	141.8	135.8	37.2	11.0	10.9	66.0
1991	22.9	46.4	25.9	14.7	19.1	82.8	138.3	260.5	110.7	150.1	19.6	17.1	76.1
1992	25.5	35.0	33.1	30.8	38.2	171.1	105.2	75.3	180.1	152.1	33.0	52.3	77.7
1993	32.7	55.9	35.9	25.5	27.0	125.3	632.6	149.5	257.4	1,495	910.5	158.7	328.5
1994	83.1	73.4	66.8	53.5	50.1	630.8	536.3	292.9	116.1	155.4	66.2	49.6	182.1
1995	119.6	109.7	61.2	46.0	48.3	682.2	459.8	279.6	76.7	206.6	45.3	33.4	181.9
1996	200.0	118.9	61.2	38.0	35.0	152.7	1,069	720.8	223.9	52.1	32.3	26.4	227.2
1997	54.3	110.3	56.2	36.6	34.1	33.5	3,412	451.4	331.2	461.5	103.1	107.4	429.8



## 05062500 WILD RICE RIVER AT TWIN VALLEY, MN

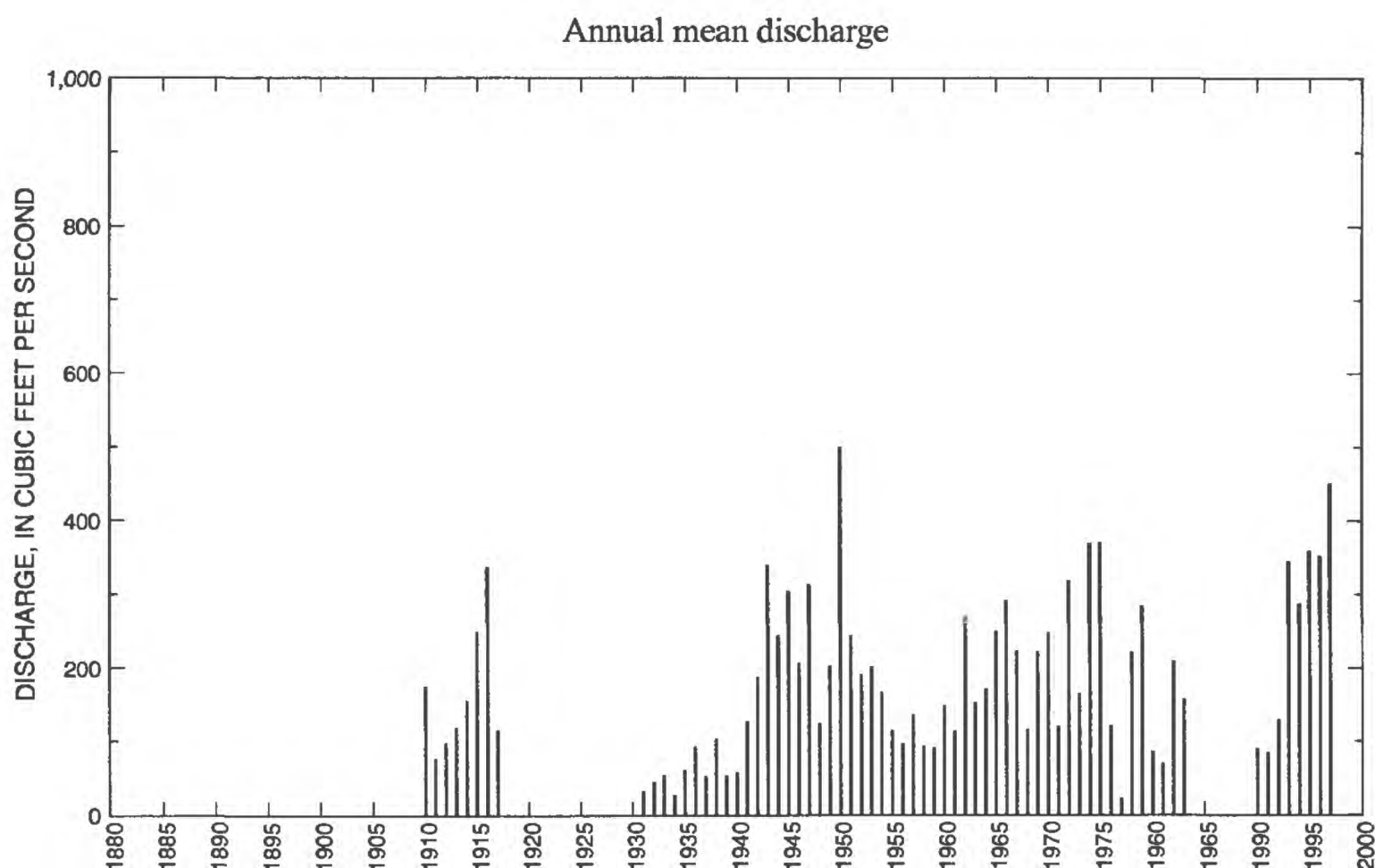
LOCATION.--Lat 47°16'00", long 96°14'40", in NW<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec.27, T.144 N., R.44 W., Norman County, Hydrologic Unit 09020108, on left bank 100 ft upstream from highway bridge, 0.8 mi northeast of Twin Valley, and 2 mi upstream from small tributary.

DRAINAGE AREA.--929 mi<sup>2</sup>.

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

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

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,000 ft<sup>3</sup>/s, Apr. 6, 1997, gage height, 15.91 ft; maximum gage height, 20.00 ft, July 22, 1909, from rating curve extended above 3,300 ft<sup>3</sup>/s; minimum discharge, 0.5 ft<sup>3</sup>/s, Nov. 4, 1939.



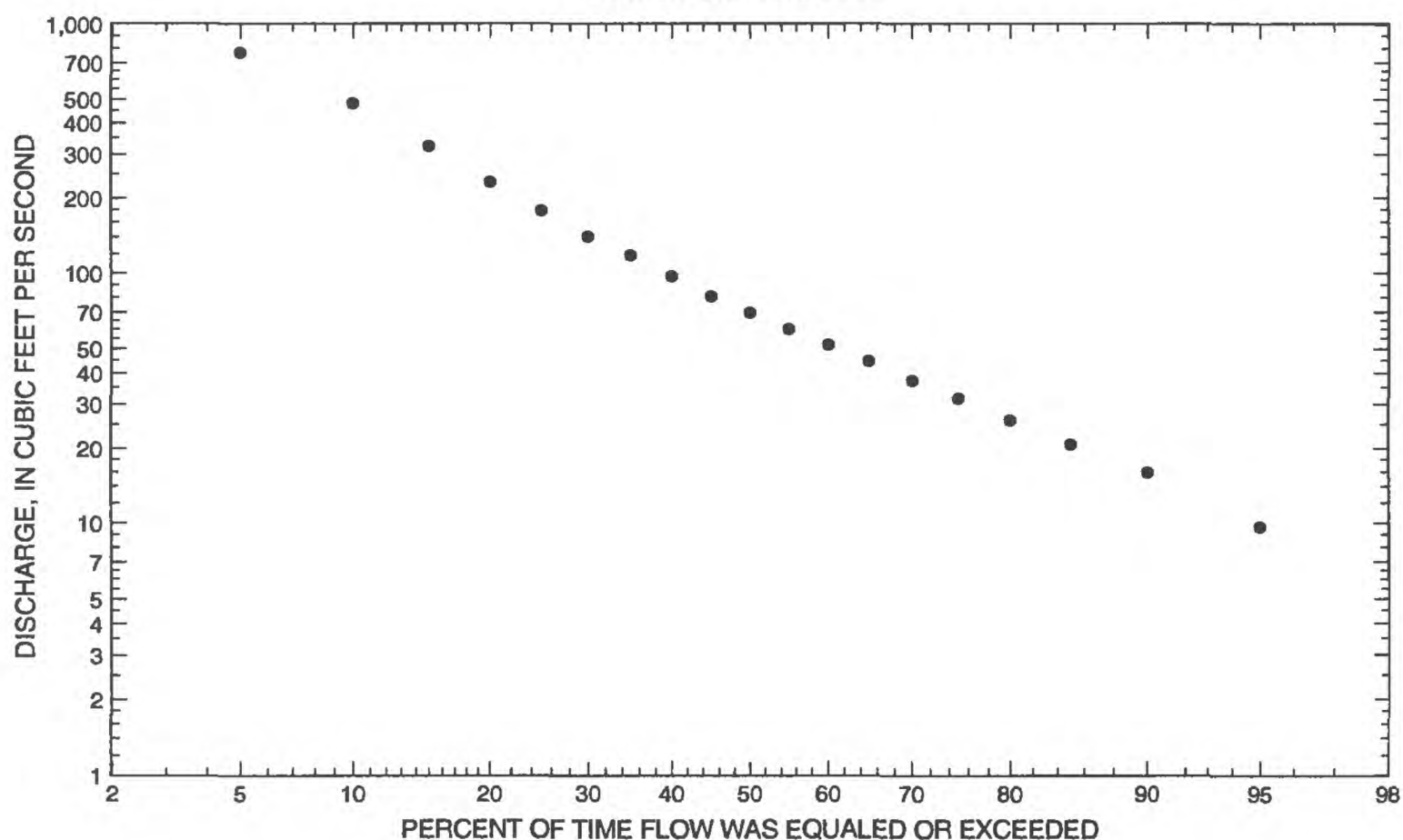


## 05062500 WILD RICE RIVER AT TWIN VALLEY, MN--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /a)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /a)	Water year of occurrence	Diacharge (ft <sup>3</sup> /s)				
October	614	1974	6.10	1933	90.6	103	1.13	4.06	
November	488	1972	9.31	1933	81.0	77.2	0.95	3.63	
December	202	1995	6.00	1933	54.0	37.9	0.70	2.42	
January	132	1996	4.00	1933	41.9	28.3	0.68	1.88	
February	137	1996	4.00	1933	39.2	26.5	0.68	1.76	
March	828	1995	12.8	1940	139	162	1.16	6.23	
April	2,470	1997	73.8	1931	607	487	0.80	27.2	
May	2,260	1950	30.9	1977	430	344	0.80	19.3	
June	1,560	1943	26.4	1977	306	288	0.94	13.7	
July	1,930	1909	8.04	1934	249	337	1.36	11.1	
August	1,030	1993	3.02	1932	109	178	1.63	4.88	
September	788	1973	2.96	1936	86.7	121	1.39	3.88	
Annual	500	1950	22.7	1977	183	109	0.60	100	

Annual flow duration



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

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	8.92	9.30	16.0	69.1	67.6	39.5	13.0	4.78	4.44	7.71	12.7	8.46	9.63
90	11.2	12.0	20.5	95.2	94.0	57.4	24.1	7.58	6.26	12.2	17.7	13.0	16.0
85	15.3	14.0	24.2	128	128	72.0	32.8	13.8	10.8	15.5	22.5	18.0	20.7
80	17.0	17.9	27.7	150	156	86.0	41.7	19.4	14.3	19.1	25.8	20.8	25.9
75	19.6	20.1	31.6	174	178	103	51.8	23.8	18.5	23.4	29.1	22.7	31.5
70	23.2	23.2	36.3	199	200	120	60.8	28.1	22.6	28.2	34.1	27.5	37.3
65	26.5	25.1	41.8	236	226	139	68.6	32.6	26.8	33.5	40.8	32.8	44.5
60	30.3	26.7	47.6	284	256	154	77.0	37.6	31.8	38.5	46.3	37.0	52.0
55	33.5	31.0	52.6	332	291	170	88.6	43.3	36.6	44.7	52.1	40.9	59.8
50	36.5	34.2	58.0	381	328	186	102	50.3	43.5	52.1	58.6	45.9	69.6
45	40.0	37.5	64.5	435	371	211	116	59.0	52.1	60.5	65.4	51.8	80.8
40	44.1	40.2	71.0	503	417	242	138	68.4	61.8	72.5	77.6	56.1	97.7
35	47.4	44.0	77.4	577	464	274	168	78.5	72.1	88.5	87.2	60.1	118
30	52.9	49.0	91.0	673	510	311	210	91.9	85.4	106	96.1	66.5	141
25	58.5	53.2	121	829	569	364	257	110	104	123	105	74.9	178
20	63.6	57.5	147	978	638	426	335	136	130	141	118	86.7	233
15	69.0	62.9	196	1,140	720	507	436	175	162	166	133	98.3	323
10	80.8	72.4	304	1,370	821	645	600	235	202	206	157	108	480
5	98.2	91.1	600	1,880	1,160	996	929	383	295	277	221	126	770

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

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedsnce probability	Recurrence Interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	128	103	90.4	82.3	71.2
0.95	1.05	270	223	201	178	151
0.90	1.11	394	329	299	260	219
0.80	1.25	615	514	467	400	333
0.50	2	1,370	1,120	1,010	833	680
0.20	5	2,880	2,240	1,940	1,560	1,250
0.10	10	4,140	3,110	2,610	2,080	1,640
0.04	25	5,990	4,300	3,490	2,740	2,140
0.02	50	7,530	5,230	4,150	3,220	2,510
0.01	100	9,200	6,180	4,790	3,690	2,860
0.005	200	11,000	7,160	5,420	4,150	3,190
0.002	500	13,500	ng	ng	ng	ng

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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1909	July 22	20.00	9,200	1960	April 15	4.80	716
1910	April 26	9.60	1,610	1961	May 17	5.29	847
1911	April 22	6.70	473	1962	June 9	9.83	2,760
1912	May 12	7.55	758	1963	May 30	8.00	1,680
1913	April 2	9.60	1,610	1964	April 17	7.68	1,640
1914	June 10	8.50	1,120	1965	April 12	10.48	3,160
1915	June 29	11.10	2,340	1966	April 2	8.90	2,120
1916	June 1	--	1,670	1967	April 1	9.09	1,710
1917	April 3	--	719	1968	March 30	4.33	594
1931	May 21	--	112	1969	April 10	11.83	4,850
1932	April 9	3.59	358	1970	April 30	7.97	1,740
1933	May 23	3.27	450	1971	April 10	6.01	1,060
1934	April 12	2.60	266	1972	March 21	9.66	2,220
1935	July 14	--	216	1973	September 4	7.75	1,670
1936	April 14	9.27	2,490	1974	April 12	11.03	3,890
1937	May 3	3.32	301	1975	July 1	11.29	3,660
1938	May 12	5.82	836	1976	March 29	7.10	1,250
1939	March 30	4.44	459	1977	April 21	2.29	146
1940	April 9	7.28	1,100	1978	April 7	13.64	6,470
1941	April 3	6.11	828	1979	April 18	12.93	6,010
1941	June 9	5.77	828	1980	April 3	6.08	1,080
1942	May 3	8.15	1,550	1981	September 6	3.45	295
1943	June 4	11.74	4,120	1982	April 19	6.51	1,200
1944	July 8	7.86	1,560	1983	March 7	6.44	635
1945	April 2	8.15	1,520	1984	June 11	6.96	1,370
1946	March 24	7.60	1,490	1985	May 13	11.42	4,100
1947	April 15	9.47	2,510	1986	May 13	8.38	1,960
1948	April 9	5.65	916	1987	July 24	6.91	1,280
1949	July 8	7.94	1,610	1988	April 5	6.28	711
1950	June 26	12.02	4,380	1989	April 5	13.65	5,260
1951	April 9	8.31	1,820	1990	April 3	6.31	1,090
1952	April 8	8.27	1,810	1991	May 6	4.96	682
1953	July 4	6.44	1,170	1992	August 25	--	791
1954	April 10	7.09	1,390	1993	July 28	11.74	3,980
1955	April 4	5.57	927	1994	June 21	8.37	1,810
1956	April 12	6.99	1,380	1995	March 15	10.94	2,500
1957	April 21	5.17	814	1996	April 14	12.35	3,700
1958	July 7	3.00	294	1997	April 6	15.91	10,000
1959	May 6	3.73	451				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 6	15.91	10,000	1989	April 5	13.65	5,260
1909	July 22	20.00	9,200	1969	April 10	11.83	4,850
1978	April 7	13.64	6,470	1950	June 26	12.02	4,380
1979	April 18	12.93	6,010	1943	June 4	11.74	4,120

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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1985	May 13	11.42	4,100	1982	April 19	6.51	1,200
1993	July 28	11.74	3,980	1953	July 4	6.44	1,170
1974	April 12	11.03	3,890	1940	April 9	7.28	1,100
1996	April 14	12.35	3,700	1990	April 3	6.31	1,090
1975	July 1	11.29	3,660	1980	April 3	6.08	1,080
1965	April 12	10.48	3,160	1971	April 10	6.01	1,060
1962	June 9	9.83	2,760	1955	April 4	5.57	927
1947	April 15	9.47	2,510	1948	April 9	5.65	916
1995	March 15	10.94	2,500	1961	May 17	5.29	847
1936	April 14	9.27	2,490	1938	May 12	5.82	836
1915	June 29	11.10	2,340	1941	April 3	6.11	828
1972	March 21	9.66	2,220	1941	June 9	5.77	828
1966	April 2	8.90	2,120	1957	April 21	5.17	814
1986	May 13	8.38	1,960	1992	August 25	--	791
1951	April 9	8.31	1,820	1912	May 12	7.55	758
1952	April 8	8.27	1,810	1917	April 3	--	719
1994	June 21	8.37	1,810	1960	April 15	4.80	716
1970	April 30	7.97	1,740	1988	April 5	6.28	711
1967	April 1	9.09	1,710	1991	May 6	4.96	682
1963	May 30	8.00	1,680	1983	March 7	6.44	635
1916	June 1	--	1,670	1968	March 30	4.33	594
1973	September 4	7.75	1,670	1911	April 22	6.70	473
1964	April 17	7.68	1,640	1939	March 30	4.44	459
1910	April 26	9.60	1,610	1959	May 6	3.73	451
1913	April 2	9.60	1,610	1933	May 23	3.27	450
1949	July 8	7.94	1,610	1932	April 9	3.59	358
1944	July 8	7.86	1,560	1937	May 3	3.32	301
1942	May 3	8.15	1,550	1981	September 6	3.45	295
1945	April 2	8.15	1,520	1958	July 7	3.00	294
1946	March 24	7.60	1,490	1934	April 12	2.60	266
1954	April 10	7.09	1,390	1935	July 14	--	216
1956	April 12	6.99	1,380	1977	April 21	2.29	146
1984	June 11	6.96	1,370	1914	June 10	8.50	112
1987	July 24	6.91	1,280	1931	May 21	--	112
1976	March 29	7.10	1,250				



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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1909	--	--	--	--	--	--	--	--	--	1,923	959.8	286.4	--
1910	105.4	136.4	120.0	100.0	80.0	80.0	552.0	562.9	274.0	53.8	21.0	21.6	175.6
1911	24.5	25.4	21.0	22.0	18.0	70.0	238.5	200.2	103.6	132.6	33.3	25.5	76.5
1912	133.6	32.4	35.0	31.0	13.0	25.0	179.2	416.4	117.1	49.5	33.0	105.8	97.9
1913	162.7	68.1	19.0	12.4	8.93	40.5	451.6	118.2	309.1	82.8	107.1	52.1	119.2
1914	57.2	75.6	54.0	21.1	14.1	36.8	251.9	210.6	542.8	336.5	118.8	138.9	154.9
1915	120.6	95.9	69.5	29.7	33.9	59.0	248.6	408.9	747.7	773.5	246.4	138.8	248.8
1916	109.6	81.4	53.9	36.8	27.6	76.8	989.3	654.0	844.3	717.1	257.8	205.0	337.4
1917	148.3	110.6	79.2	59.5	40.0	111.3	417.6	214.4	82.5	46.9	26.9	50.8	115.7
1930	--	--	--	--	--	--	--	--	--	--	10.1	11.0	--
1931	14.3	28.2	20.0	15.0	25.0	29.9	73.8	58.1	60.4	30.9	26.3	9.89	32.6
1932	16.7	24.2	20.0	35.0	25.0	70.5	137.8	127.8	63.6	13.3	3.02	4.65	45.1
1933	6.10	9.31	6.00	4.00	4.00	162.1	206.6	126.0	98.5	19.6	5.41	4.90	54.5
1934	12.0	15.9	12.0	9.00	12.0	15.0	141.0	70.1	26.8	8.04	4.79	4.56	27.5
1935	7.85	13.1	8.69	12.1	12.1	66.6	109.6	135.7	86.1	130.6	84.6	64.4	61.3
1936	41.4	34.0	25.7	14.2	10.0	19.8	607.1	252.4	85.9	16.7	3.37	2.96	92.3
1937	6.78	10.4	7.79	9.57	11.1	15.5	86.9	205.9	121.8	51.2	56.9	50.9	53.1
1938	33.1	32.3	10.4	16.5	18.5	80.3	89.6	539.1	237.8	116.4	40.0	16.0	103.3
1939	14.6	17.8	21.4	17.5	18.0	75.7	247.1	88.9	71.5	44.0	13.9	13.7	53.6
1940	16.2	16.1	15.9	9.24	9.34	12.8	295.4	191.5	83.1	19.5	17.6	5.22	57.5
1941	16.6	28.1	25.4	23.3	16.1	42.1	441.3	260.8	334.4	59.6	85.6	199.0	127.2
1942	218.2	102.3	53.7	18.9	20.6	134.3	326.3	650.9	241.4	102.8	96.8	275.8	187.7
1943	141.4	91.3	49.1	38.4	36.5	110.6	957.8	610.4	1,560	298.4	142.0	57.1	340.0
1944	44.0	41.5	22.5	21.5	23.3	31.9	169.7	384.6	456.4	736.1	502.5	487.5	244.2
1945	242.9	145.4	97.3	68.2	59.3	746.9	1,219	580.5	198.1	82.9	74.7	130.6	304.5
1946	183.4	100.9	73.9	47.7	39.6	507.4	713.3	400.6	215.5	131.0	28.0	33.3	206.9
1947	166.2	115.4	74.7	58.4	52.5	113.5	1,274	860.9	736.1	174.6	75.9	68.9	313.8
1948	82.6	64.1	56.5	50.4	27.3	60.8	606.2	313.7	115.0	79.5	34.7	10.7	124.9
1949	13.0	26.2	28.4	28.8	24.1	27.4	286.2	269.9	298.2	840.6	470.7	106.9	203.4
1950	83.5	110.5	105.6	38.7	45.5	157.2	1,302	2,259	1,069	646.1	110.5	48.9	500.3
1951	122.6	81.2	73.1	66.3	70.4	92.0	1,104	774.8	291.8	88.4	55.6	123.1	245.0
1952	132.2	102.4	116.8	93.4	77.3	79.9	907.9	349.5	87.5	185.6	118.8	53.7	191.7
1953	32.6	43.9	50.2	37.6	36.0	205.5	390.2	389.9	439.3	517.0	199.3	76.8	202.5
1954	46.3	51.7	68.1	65.9	72.9	111.2	654.5	536.4	257.6	97.7	27.0	27.1	167.9
1955	40.8	50.8	41.1	31.5	33.7	37.9	485.2	259.7	230.7	121.0	38.8	11.3	115.0

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1956	17.5	18.4	14.3	12.9	16.8	21.2	521.9	326.9	159.6	28.8	16.8	13.3	96.9
1957	14.3	33.4	19.1	16.1	18.9	112.6	350.7	269.4	248.8	308.8	81.0	152.9	135.8
1958	148.2	184.0	66.4	48.3	42.7	96.9	142.8	76.2	128.1	139.0	33.6	23.8	94.3
1959	29.1	57.6	37.9	24.6	22.0	79.1	203.1	222.6	172.0	154.6	65.7	24.1	91.4
1960	45.4	47.2	45.6	46.4	42.2	64.5	458.8	315.2	352.8	153.4	77.3	135.3	148.2
1961	81.4	62.3	56.4	36.3	34.7	134.7	229.3	494.0	138.4	46.1	22.2	31.7	114.6
1962	35.6	47.6	31.0	26.9	24.6	37.9	402.2	717.5	1,226	454.4	143.4	96.7	270.5
1963	68.1	71.6	42.5	9.65	6.50	66.0	325.2	390.6	641.6	112.2	49.1	48.2	152.5
1964	26.1	28.7	22.4	24.5	29.6	38.9	670.8	547.4	444.8	162.1	37.0	37.3	171.9
1965	62.6	51.7	32.1	33.1	34.4	33.1	1,241	639.1	607.4	177.6	45.7	55.9	250.3
1966	125.9	73.3	102.5	70.8	40.4	577.1	1,190	785.8	222.4	85.0	139.5	80.8	292.1
1967	75.5	61.3	51.8	60.8	64.2	205.3	977.3	491.3	405.7	231.1	38.2	16.6	223.0
1968	23.6	24.1	43.7	30.1	21.2	177.9	327.7	284.0	182.2	141.6	62.7	74.7	116.3
1969	118.4	95.4	59.6	55.5	59.1	64.4	1,357	458.8	250.9	80.9	44.4	32.0	222.1
1970	134.3	134.7	102.8	65.7	52.4	58.0	870.9	759.8	606.2	152.8	25.9	17.4	248.3
1971	27.5	66.4	40.4	33.8	36.2	101.9	599.4	278.8	126.4	53.8	31.9	52.4	120.5
1972	364.1	487.6	122.7	77.1	58.4	466.2	1,034	723.2	258.4	96.0	98.7	56.4	320.1
1973	72.5	65.6	35.7	37.3	39.9	276.5	207.5	179.8	132.6	74.5	81.8	788.4	165.6
1974	613.5	203.1	95.5	64.7	60.5	62.0	1,452	1,223	474.9	90.8	59.8	34.6	370.2
1975	48.3	107.1	65.5	51.3	52.2	74.6	1,173	825.3	662.2	1,175	154.7	49.2	371.1
1976	48.7	86.1	61.5	58.6	61.8	316.3	568.7	152.8	65.4	32.4	7.85	4.01	121.7
1977	10.7	12.2	7.65	8.39	12.6	29.4	91.1	30.9	26.4	12.7	5.72	25.2	22.7
1978	68.0	112.6	113.6	68.5	47.4	74.7	1,508	307.8	131.2	75.7	68.5	99.8	221.8
1979	48.8	42.6	37.1	34.8	41.8	82.5	1,543	832.6	301.0	357.6	55.9	36.7	284.4
1980	27.0	100.9	59.5	46.1	48.0	73.2	504.0	124.1	30.2	10.8	8.19	11.5	86.3
1981	19.2	25.7	18.6	15.6	21.0	54.5	85.9	74.3	132.0	160.0	92.5	143.3	70.3
1982	224.3	184.5	83.8	53.9	50.0	172.7	875.5	575.3	200.0	61.0	24.6	14.7	210.1
1983	138.9	122.0	49.7	44.0	44.6	389.5	237.4	152.4	184.9	344.5	108.5	61.5	157.4
1984	--	--	--	--	--	--	--	--	--	--	--	--	--
1989	--	--	--	--	--	--	--	--	--	--	--	--	--
1990	39.7	39.1	16.2	17.4	22.7	164.9	307.4	226.8	173.2	59.2	11.4	5.39	90.4
1991	10.3	19.7	16.0	17.0	26.9	93.0	163.1	419.8	103.0	99.0	20.0	20.1	84.5
1992	20.6	26.0	32.8	38.6	41.0	286.7	156.8	177.8	65.3	313.5	188.2	208.7	130.3
1993	62.7	74.7	71.5	66.2	63.5	228.5	545.8	273.1	342.7	1,079	1,024	281.7	345.4
1994	111.2	100.3	97.5	91.6	90.8	290.7	639.6	499.0	517.1	575.8	193.3	238.0	287.7

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1995	395.1	336.6	201.5	128.5	114.8	828.3	661.0	538.3	193.1	569.4	207.2	114.1	359.7
1996	236.7	190.4	133.2	131.6	136.9	134.5	1,645	1,159	306.8	90.6	51.0	31.5	353.1
1997	58.9	215.0	103.1	103.0	110.4	121.7	2,471	648.0	360.8	895.9	222.7	111.2	450.9

## 05064000 WILD RICE RIVER AT HENDRUM, MN

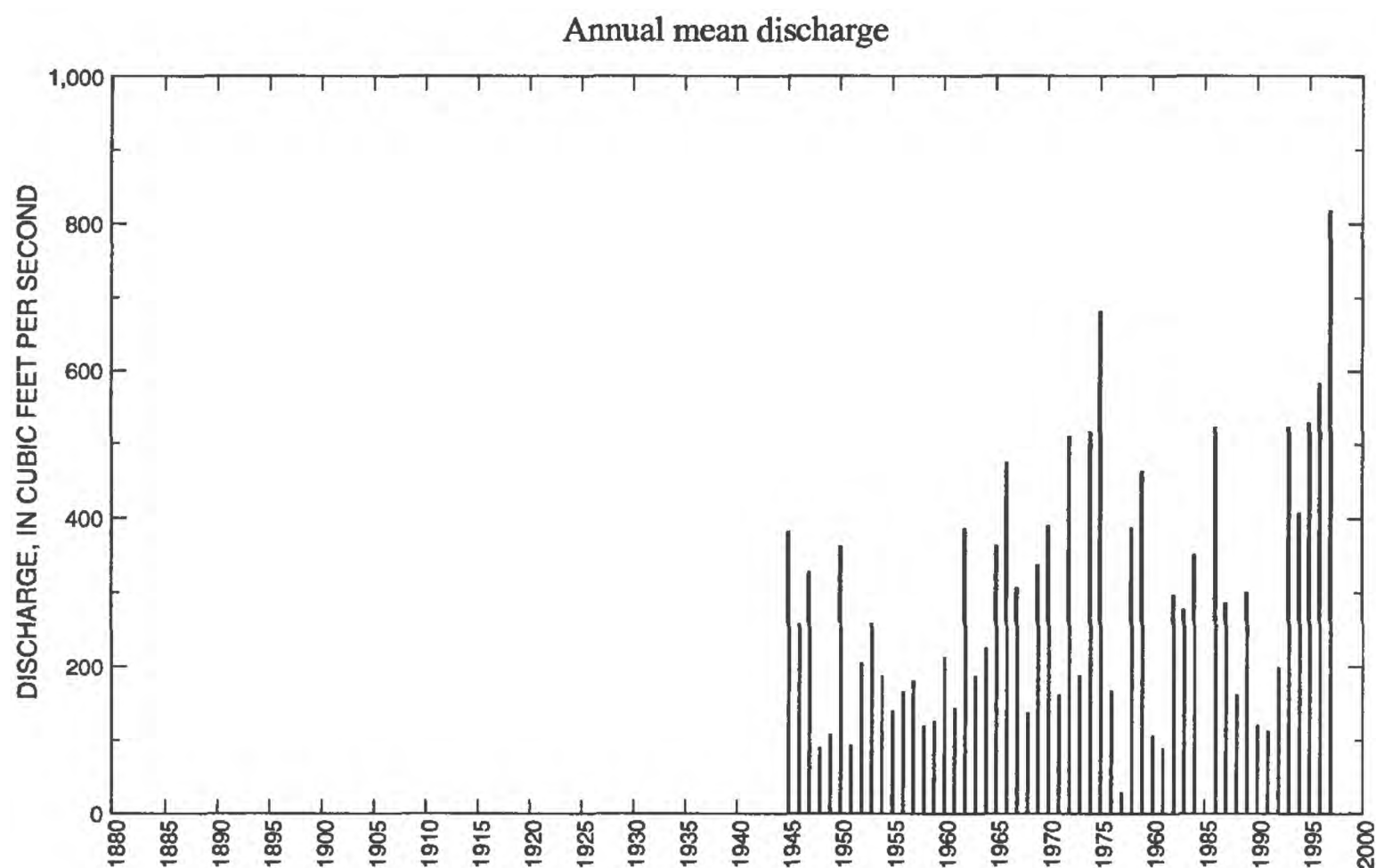
**LOCATION.**--Lat 47°16'05", long 96°47'50", in SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.19, T.144 N., R.48 W., Norman County, Hydrologic Unit 09020108, on right bank 30 ft downstream from highway bridge, 0.5 mi east of Hendrum, and 4 mi upstream from mouth.

**DRAINAGE AREA.**--1,600 mi<sup>2</sup>, approximately.

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

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

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 10,600 ft<sup>3</sup>/s, Apr. 18, 1997, gage height, 33.85 ft, backwater from Red River of the North; minimum discharge, 0 ft<sup>3</sup>/s at times in 1948-49.



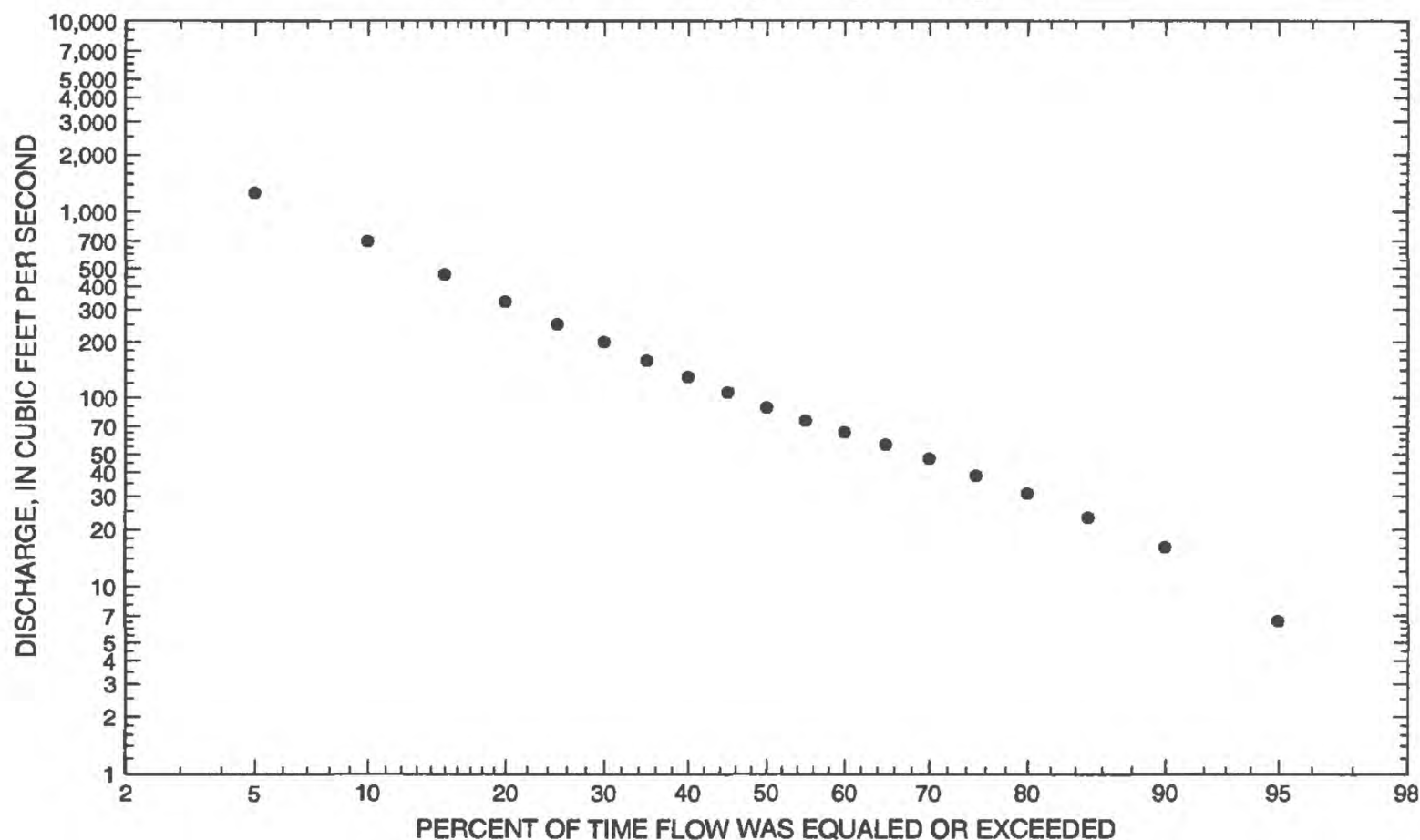
# 05064000 WILD RICE RIVER AT HENDRUM, MN--Continued

Post-regulation period, 1962-97

Statistics of monthly and annual mean discharges, post-regulation period

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	744	1972	7.68	1977	152	182	1.20	3.73
November	784	1972	10.3	1977	139	146	1.05	3.42
December	217	1995	1.08	1977	77.7	51.3	0.66	1.91
January	149	1996	0.092	1977	58.6	36.1	0.62	1.44
February	149	1996	0.219	1977	57.3	34.8	0.61	1.41
March	1,480	1966	23.4	1965	334	377	1.13	8.20
April	5,120	1997	106	1981	1,390	1,130	0.82	34.2
May	2,070	1985	56.1	1977	686	527	0.77	16.9
June	1,780	1962	36.7	1977	471	424	0.90	11.6
July	3,140	1975	11.9	1980	423	617	1.46	10.4
August	1,830	1993	1.07	1977	161	307	1.91	3.96
September	824	1973	0.722	1976	119	157	1.32	2.94
Annual	818	1997	28.9	1977	332	184	0.55	100

Annual flow duration, post-regulation period





# 05064000 WILD RICE RIVER AT HENDRUM, MN--Continued

Monthly and annual flow duration, in cubic feet per second, post-regulation period

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	8.53	5.74	19.7	114	89.7	48.1	15.7	3.65	4.62	14.0	18.9	13.0	13.2
90	15.8	18.7	25.9	164	145	77.0	30.4	10.9	11.8	21.5	29.2	18.7	22.4
85	20.7	22.7	29.8	207	190	101	54.0	16.2	15.4	27.1	34.4	24.8	30.7
80	26.9	26.9	41.8	252	219	122	66.7	24.0	19.4	33.1	42.3	30.9	38.7
75	31.9	31.4	52.9	313	251	148	75.9	30.5	25.8	39.1	49.8	36.1	48.3
70	35.2	36.2	58.8	388	278	172	88.1	37.0	32.7	45.0	59.4	41.8	57.8
65	39.2	41.5	64.7	464	316	194	102	43.4	39.8	51.5	69.1	48.1	66.5
60	45.9	46.3	71.4	547	363	215	118	51.1	46.6	61.9	79.8	54.8	75.2
55	52.3	50.5	78.7	638	413	243	136	60.5	54.1	72.0	90.9	60.8	85.7
50	58.5	54.7	85.9	744	466	271	155	70.4	62.8	80.6	102	66.4	102
45	62.6	58.7	104	876	536	300	177	81.0	72.2	89.3	112	72.0	119
40	66.0	62.5	125	998	629	337	200	91.5	85.6	99.7	122	82.5	144
35	69.4	66.4	143	1,170	691	384	241	110	99.1	124	135	93.1	169
30	72.8	70.3	192	1,400	774	455	303	128	113	149	149	104	216
25	76.6	75.8	275	1,730	876	546	392	161	127	175	168	115	278
20	85.2	82.4	412	2,170	988	646	493	201	156	216	190	126	365
15	93.8	89.1	616	2,720	1,140	781	647	248	198	276	212	136	521
10	120	106	903	3,670	1,440	995	1,070	320	272	353	285	146	804
5	139	135	1,790	5,150	2,070	1,690	1,770	515	454	535	392	173	1,460

# 05064000 WILD RICE RIVER AT HENDRUM, MN--Continued

Probability of occurrence of annual high discharges, post-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	260	211	172	139
0.95	1.05	905	592	490	391	314
0.90	1.11	1,210	883	740	584	467
0.80	1.25	1,700	1,380	1,180	918	725
0.50	2	3,170	2,940	2,570	1,980	1,510
0.20	5	5,640	5,510	4,930	3,790	2,750
0.10	10	7,490	7,290	6,610	5,080	3,590
0.04	25	10,000	9,500	8,720	6,730	4,590
0.02	50	12,000	11,100	10,300	7,930	5,280
0.01	100	14,100	12,600	11,700	9,100	5,930
0.005	200	16,200	14,000	13,100	10,200	6,530
0.002	500	19,200	ng	ng	ng	ng

# 05064000 WILD RICE RIVER AT HENDRUM, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1944	July 15	16.07	2,260	1971	April 10	13.20	1,500
1945	March 18	--	2,200	1972	April 15	23.24	4,550
1946	March 23	20.56	2,600	1973	September 6	13.03	1,630
1947	April 15	27.70	4,200	1974	April 16	26.21	5,590
1948	April 8	20.13	2,200	1975	July 5	30.91	7,660
1949	July 11	--	738	1976	March 30	20.22	2,120
1950	May 10	--	3,000	1977	April 11	5.55	245
1951	April 7	--	2,570	1978	April 10	31.42	9,350
1952	April 11	--	2,860	1979	April 21	32.30	8,800
1953	June 18	16.88	1,650	1980	April 5	17.36	1,800
1954	April 12	15.26	1,940	1981	May 24	14.50	1,840
1955	April 5	15.99	1,850	1982	April 3	22.51	3,280
1956	April 14	24.26	4,660	1983	July 5	15.12	2,290
1957	September 4	--	1,250	1984	June 11	25.00	5,400
1958	July 7	8.16	633	1985	May 16	25.14	5,230
1959	April 6	8.92	540	1986	March 31	23.10	3,850
1960	April 8	16.48	1,600	1987	July 25	14.26	1,500
1961	May 17	10.66	1,080	1988	April 8	11.30	1,190
1962	June 13	22.26	3,680	1989	April 7	29.60	5,480
1963	June 3	13.89	1,670	1990	April 1	14.26	1,100
1964	April 23	17.55	2,690	1991	May 6	10.27	952
1965	April 14	29.44	6,800	1992	July 3	14.70	1,950
1966	March 31	28.30	4,120	1993	August 1	--	3,680
1967	April 1	20.57	3,250	1994	April 3	20.30	2,600
1968	March 29	11.26	726	1995	March 17	22.32	3,200
1969	April 15	31.42	8,300	1996	April 14	28.83	5,750
1970	June 20	22.41	3,940	1997	April 18	33.85	10,600
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 18	33.85	10,600	1970	June 20	22.41	3,940
1978	April 10	31.42	9,350	1986	March 31	23.10	3,850
1979	April 21	32.30	8,800	1962	June 13	22.26	3,680
1969	April 15	31.42	8,300	1993	August 1	--	3,680
1975	July 5	30.91	7,660	1982	April 3	22.51	3,280
1965	April 14	29.44	6,800	1967	April 1	20.57	3,250
1996	April 14	28.83	5,750	1995	March 17	22.32	3,200
1974	April 16	26.21	5,590	1950	May 10	--	3,000
1989	April 7	29.60	5,480	1952	April 11	--	2,860
1984	June 11	25.00	5,400	1964	April 23	17.55	2,690
1985	May 16	25.14	5,230	1946	March 23	20.56	2,600
1956	April 14	24.26	4,660	1994	April 3	20.30	2,600
1972	April 15	23.24	4,550	1951	April 7	--	2,570
1947	April 15	27.70	4,200	1983	July 5	15.12	2,290
1966	March 31	28.30	4,120	1944	July 15	16.07	2,260

# 05064000 WILD RICE RIVER AT HENDRUM, MN--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1945	March 18	--	2,200	1971	April 10	13.20	1,500
1948	April 8	20.13	2,200	1987	July 25	14.26	1,500
1976	March 30	20.22	2,120	1957	September 4	--	1,250
1992	July 3	14.70	1,950	1988	April 8	11.30	1,190
1954	April 12	15.26	1,940	1990	April 1	14.26	1,100
1955	April 5	15.99	1,850	1961	May 17	10.66	1,080
1981	May 24	14.50	1,840	1991	May 6	10.27	952
1980	April 5	17.36	1,800	1949	July 11	--	738
1963	June 3	13.89	1,670	1968	March 29	11.26	726
1953	June 18	16.88	1,650	1958	July 7	8.16	633
1973	September 6	13.03	1,630	1959	April 6	8.92	540
1960	April 8	16.48	1,600	1977	April 11	5.55	245

# 05064000 WILD RICE RIVER AT HENDRUM, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1944	--	--	--	--	--	--	303.4	501.6	661.2	1,122	960.0	762.3	--
1945	299.0	227.6	138.5	76.0	63.4	1,077	1,451	670.8	243.5	99.6	93.9	148.8	383.6
1946	225.3	141.5	71.6	35.2	22.9	744.7	881.5	425.8	264.7	201.3	30.2	35.8	257.8
1947	191.5	112.7	70.3	54.5	46.7	176.6	1,789	662.8	735.1	98.0	13.6	5.99	328.5
1948	13.3	9.69	6.64	4.09	3.40	3.24	837.4	156.5	38.7	18.4	3.93	0.183	90.4
1949	0.435	3.32	1.73	0.800	0.400	0.461	226.9	99.0	203.7	428.3	274.5	55.4	108.6
1950	41.2	44.0	31.4	13.4	12.6	84.6	1,738	1,634	482.5	258.2	7.50	4.56	363.3
1951	6.19	4.75	3.56	3.03	2.81	8.16	798.9	196.7	71.8	8.82	7.76	16.6	93.4
1952	16.6	25.2	152.1	99.2	83.1	80.8	1,239	296.1	9.15	272.9	147.0	58.1	205.9
1953	31.7	42.7	48.5	36.9	36.6	197.6	500.4	439.8	887.8	559.5	236.3	89.3	259.4
1954	49.4	52.3	58.8	61.5	72.7	128.0	727.2	595.8	326.6	118.6	33.7	29.1	187.7
1955	42.4	50.4	29.9	21.9	31.0	33.0	608.9	283.0	261.3	140.3	171.1	14.7	140.5
1956	23.1	19.0	14.6	13.6	18.4	23.5	1,175	417.7	224.8	41.3	23.0	19.2	166.5
1957	16.9	43.7	18.5	14.4	14.4	161.2	427.4	322.4	331.3	365.1	108.6	346.5	181.1
1958	212.6	210.6	78.2	49.1	43.0	109.7	172.7	101.0	161.0	222.0	43.7	37.4	120.4
1959	35.8	70.9	43.9	22.3	19.4	118.7	301.6	301.1	268.3	212.2	88.4	37.9	127.1
1960	53.8	55.2	46.8	56.2	46.9	95.4	896.6	407.0	428.5	212.0	101.6	167.1	213.0
1961	97.3	81.6	57.0	40.0	36.2	208.1	304.2	600.4	183.0	54.4	24.8	34.8	144.3
1962	45.5	40.8	27.1	26.0	22.5	33.3	616.8	953.3	1,776	784.5	205.1	114.2	387.4
1963	84.2	95.1	52.3	10.4	5.72	112.1	474.3	369.0	802.7	129.6	55.0	62.5	187.4
1964	27.9	31.9	19.4	19.5	24.2	28.4	1,178	637.0	483.2	175.4	51.0	41.1	225.2
1965	90.7	65.2	28.8	29.7	31.4	23.4	2,259	750.6	731.5	242.8	68.7	75.9	364.6
1966	168.1	94.5	117.9	85.5	56.1	1,485	1,950	987.1	288.0	124.5	219.3	104.2	475.3
1967	79.5	67.7	55.0	61.4	68.9	308.7	1,570	643.3	521.8	252.7	43.8	17.2	306.9
1968	25.7	24.1	49.3	32.3	21.8	207.9	387.1	318.0	242.5	187.7	67.8	87.1	137.7
1969	135.7	106.1	62.1	55.9	61.7	71.1	2,478	544.6	304.6	167.6	51.1	37.5	337.7
1970	151.1	170.5	109.2	68.3	54.0	58.8	1,430	1,071	1,323	211.1	37.4	23.8	391.4
1971	35.4	78.6	45.6	34.8	37.6	195.4	794.6	332.1	161.6	75.5	36.1	121.1	162.0
1972	744.0	783.8	160.2	91.2	70.0	990.0	1,740	895.3	328.4	151.9	118.9	62.5	511.4
1973	76.0	79.0	37.8	39.6	43.2	407.1	244.8	204.6	142.4	82.0	83.0	823.7	188.3
1974	639.2	290.3	144.1	80.9	80.5	87.3	2,345	1,635	549.2	178.0	124.9	43.1	516.8
1975	66.5	157.6	69.3	61.6	65.6	99.4	2,155	1,156	880.5	3,136	213.9	82.1	682.1
1976	69.9	115.1	68.3	63.9	73.7	468.7	830.1	195.2	82.2	41.2	8.11	0.722	167.6
1977	7.68	10.3	1.08	0.092	0.219	28.8	167.4	56.1	36.7	12.7	1.07	25.5	28.9
1978	83.5	114.1	150.6	81.3	51.5	144.0	3,261	407.8	165.9	73.1	63.4	92.4	387.9



# 05064000 WILD RICE RIVER AT HENDRUM, MN--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1979	49.4	39.5	32.1	29.8	29.2	61.1	3,060	1,134	418.2	603.0	79.5	46.2	464.0
1980	40.8	120.2	60.6	46.6	48.2	71.0	673.2	153.8	46.8	11.9	6.04	12.3	106.8
1981	26.7	29.2	15.4	8.94	12.3	52.4	105.5	178.5	144.9	176.9	148.0	168.7	89.3
1982	287.7	212.0	98.4	62.4	60.0	219.2	1,637	612.5	219.6	112.8	39.0	19.1	297.8
1983	265.4	166.4	66.7	46.9	46.4	721.6	358.3	175.3	422.4	775.7	168.6	100.5	278.2
1984	174.2	158.8	92.3	64.4	123.9	791.1	884.6	246.5	1,554	118.8	23.0	14.5	351.8
1985	--	--	--	--	--	--	--	2,074	1,195	757.2	494.7	309.9	--
1986	257.1	186.4	127.8	120.9	102.0	600.5	2,366	1,611	494.1	207.1	87.9	124.2	524.3
1987	186.4	188.2	128.0	81.5	75.5	864.0	434.7	464.7	273.2	386.6	234.8	98.8	286.8
1988	117.9	101.5	92.3	66.0	59.5	467.3	717.3	206.7	54.8	16.2	22.4	30.8	162.6
1989	31.7	51.6	50.0	50.4	54.4	72.0	2,387	494.1	263.3	61.0	13.5	109.4	300.8
1990	41.8	56.2	17.3	16.1	19.6	139.9	488.4	304.4	280.2	71.9	12.3	3.89	120.9
1991	11.5	20.6	17.2	17.0	27.0	146.3	233.1	548.8	135.5	141.6	25.9	22.8	113.1
1992	24.3	35.2	36.5	36.8	39.0	492.5	205.6	226.4	112.6	597.9	261.4	307.7	199.2
1993	88.6	102.8	76.5	71.0	74.3	245.2	1,065	349.1	422.5	1,605	1,833	356.9	528.3
1994	133.5	114.5	104.1	84.5	77.3	343.5	1,116	696.8	721.7	836.9	239.5	419.9	408.0
1995	637.2	471.7	217.4	123.2	115.9	1,373	858.7	859.2	224.2	979.6	306.7	141.9	530.2
1996	337.9	207.0	141.9	148.7	149.3	144.5	3,087	2,059	506.6	142.0	63.8	41.9	584.1
1997	64.3	291.2	146.5	131.9	121.8	129.8	5,115	1,149	658.8	1,587	295.8	156.1	818.4

## 05064500 RED RIVER OF THE NORTH AT HALSTAD, MN

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

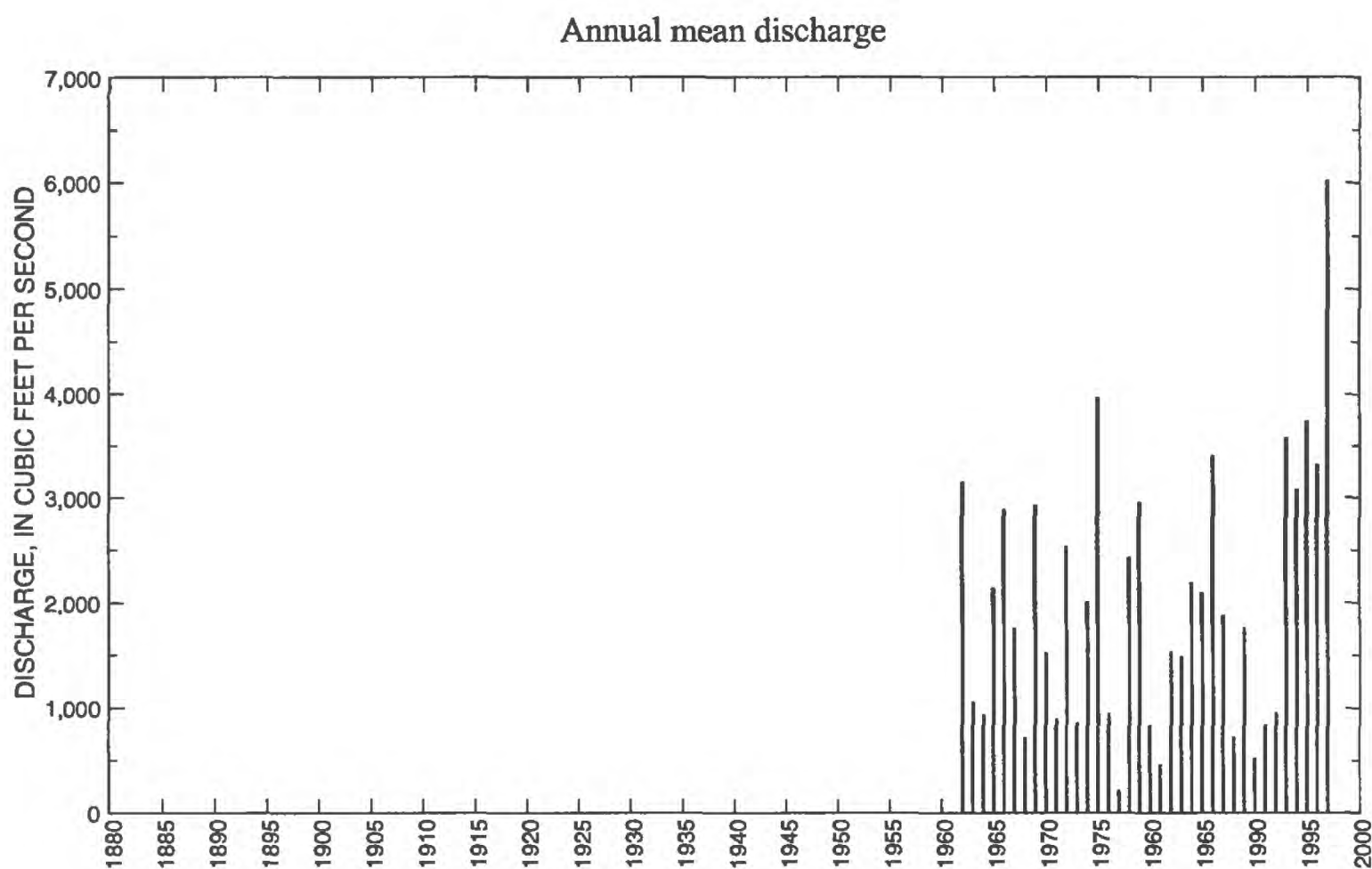
DRAINAGE AREA.--21,800 mi<sup>2</sup>, approximately, including 3,800 mi<sup>2</sup> in closed basins.

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

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

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 71,500 ft<sup>3</sup>/s, Apr. 19, 1997, gage height, 40.74 ft; minimum discharge, 5.4 ft<sup>3</sup>/s, Oct. 8, 9, 12, 13, and 14, 1936.

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

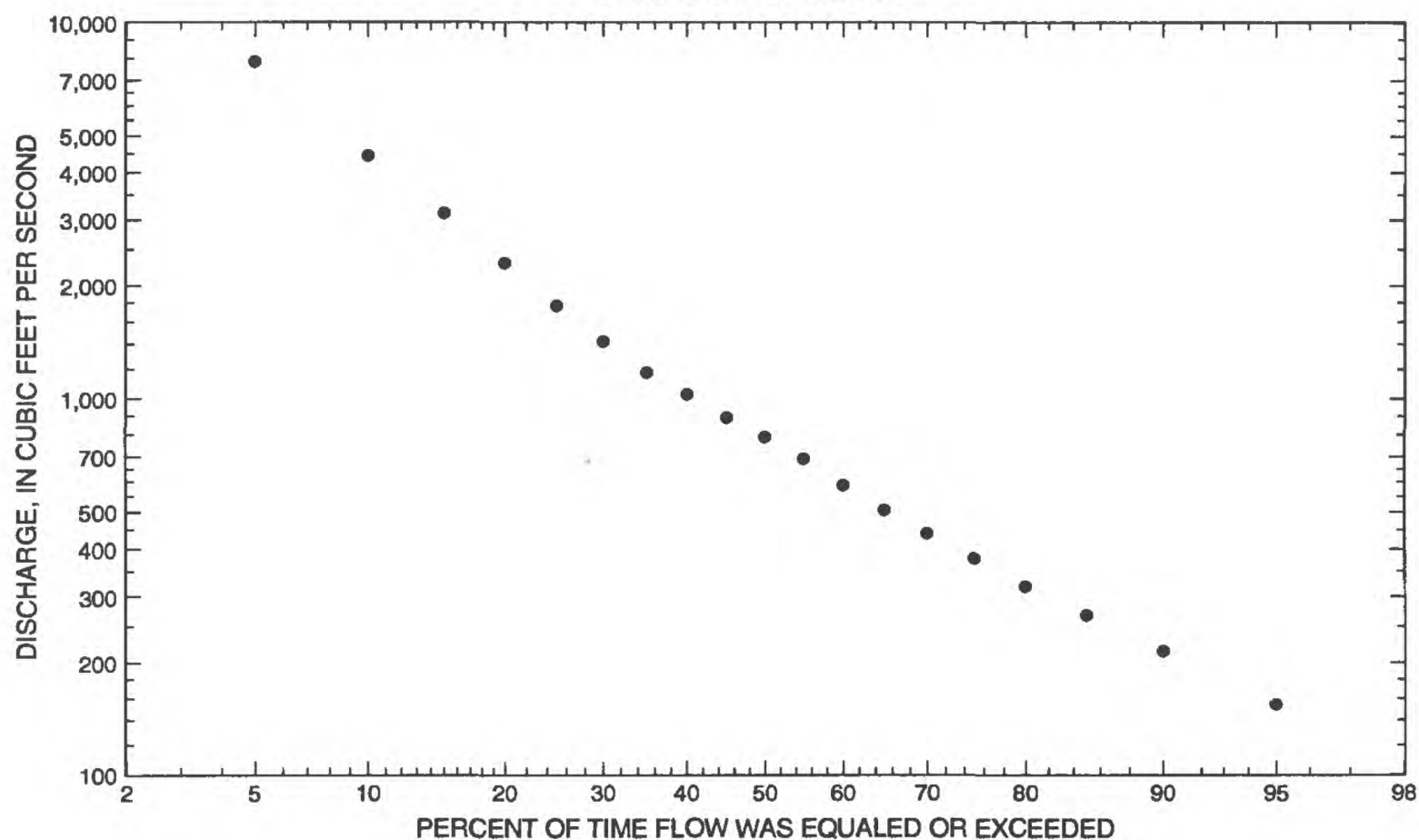


# 05064500 RED RIVER OF THE NORTH AT HALSTAD, MN--Continued

## Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /e)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	2,880	1995	61.5	1977	791	659	0.83	3.30	
November	1,840	1995	92.3	1977	714	459	0.64	2.98	
December	1,250	1987	51.2	1977	551	340	0.62	2.30	
January	1,020	1987	32.1	1977	465	285	0.61	1.94	
February	1,270	1997	45.9	1977	490	291	0.59	2.04	
March	9,440	1995	249	1962	2,300	2,340	1.02	9.58	
April	38,500	1997	705	1981	7,870	7,440	0.95	32.8	
May	15,600	1997	449	1977	3,680	3,210	0.87	15.4	
June	10,300	1962	242	1977	2,630	1,950	0.74	11.0	
July	20,100	1975	153	1988	2,630	3,770	1.43	11.0	
August	11,700	1993	59.5	1977	1,120	1,930	1.72	4.69	
September	3,360	1993	38.4	1976	721	678	0.94	3.01	
Annual	6,030	1997	214	1977	2,010	1,270	0.63	100	

Annual flow duration



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

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	104	149	224	782	634	424	199	113	122	150	194	123	154
90	135	168	276	956	831	521	276	179	162	194	236	161	215
85	152	192	328	1,110	940	666	396	218	193	235	276	215	268
80	201	229	401	1,340	1,070	833	538	256	218	278	307	243	318
75	234	246	462	1,620	1,220	1,020	688	301	248	310	338	268	378
70	278	278	514	1,910	1,410	1,200	837	343	278	344	379	301	440
65	306	318	578	2,350	1,680	1,410	982	383	308	379	432	342	507
60	328	347	671	3,000	1,950	1,610	1,090	461	348	416	482	385	589
55	351	402	798	3,670	2,230	1,870	1,210	545	405	458	536	432	691
50	379	441	894	4,200	2,540	2,090	1,370	617	462	521	614	466	793
45	440	470	1,000	4,860	2,810	2,320	1,550	708	528	584	695	502	894
40	474	499	1,130	5,650	3,100	2,570	1,720	813	604	643	757	559	1,030
35	537	529	1,330	6,900	3,420	2,850	1,960	960	699	697	802	642	1,180
30	636	581	1,690	8,470	3,850	3,140	2,230	1,090	788	790	856	716	1,430
25	714	704	2,100	10,100	4,420	3,440	2,580	1,220	898	974	930	799	1,770
20	775	759	2,770	12,600	5,190	3,820	3,010	1,390	1,060	1,260	1,040	895	2,300
15	836	842	4,220	15,400	6,190	4,300	3,760	1,590	1,290	1,510	1,210	993	3,130
10	898	922	5,610	21,200	7,790	5,030	5,260	1,870	1,520	1,860	1,400	1,090	4,450
5	966	1,040	10,200	26,300	11,400	7,030	9,060	2,890	2,260	2,360	1,620	1,180	7,870

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

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s) <sup>1</sup>	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	949	<sup>2</sup> 910	867	706	568
0.95	1.05	1,870	<sup>2</sup> 1,800	<sup>2</sup> 1,750	1,640	1,320
0.90	1.11	2,660	<sup>2</sup> 2,610	<sup>2</sup> 2,560	2,510	2,020
0.80	1.25	4,040	<sup>2</sup> 3,950	<sup>2</sup> 3,850	<sup>2</sup> 3,700	3,260
0.50	2	8,790	<sup>2</sup> 8,530	<sup>2</sup> 8,270	<sup>2</sup> 8,000	7,550
0.20	5	18,500	<sup>2</sup> 18,000	<sup>2</sup> 17,500	<sup>2</sup> 17,000	15,700
0.10	10	27,000	<sup>2</sup> 26,400	<sup>2</sup> 25,700	<sup>2</sup> 25,000	22,200
0.04	25	40,000	<sup>2</sup> 39,000	<sup>2</sup> 38,000	<sup>2</sup> 36,000	31,100
0.02	50	51,500	<sup>2</sup> 50,000	<sup>2</sup> 48,500	<sup>2</sup> 46,000	38,100
0.01	100	64,200	<sup>2</sup> 62,500	<sup>2</sup> 60,000	<sup>2</sup> 57,000	45,300
0.005	200	78,400	<sup>2</sup> 76,000	<sup>2</sup> 73,500	<sup>2</sup> 70,000	52,700
0.002	500	99,600	ng	ng	ng	ng

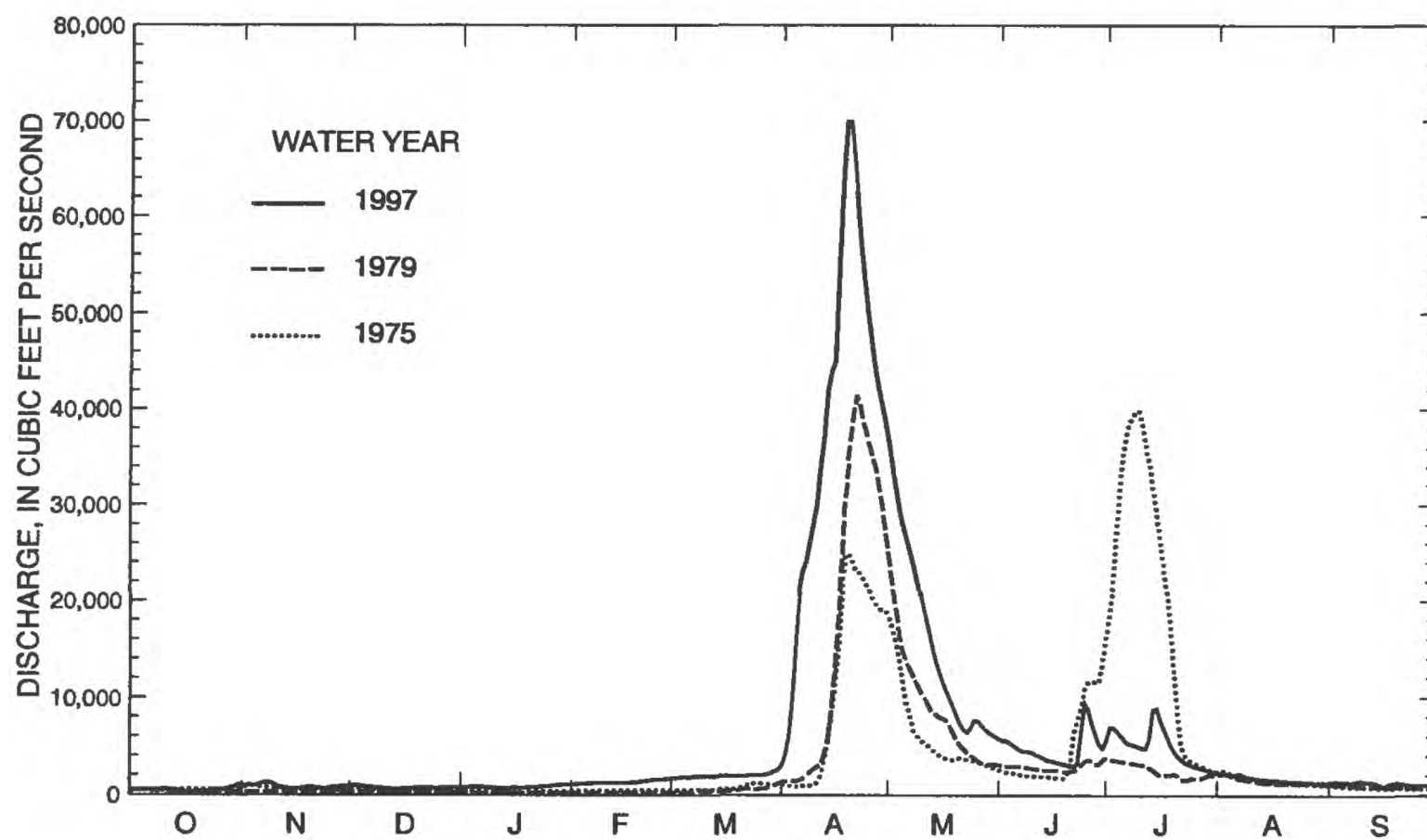
<sup>1</sup>From U.S. Army Corps of Engineers, May 2000.

<sup>2</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

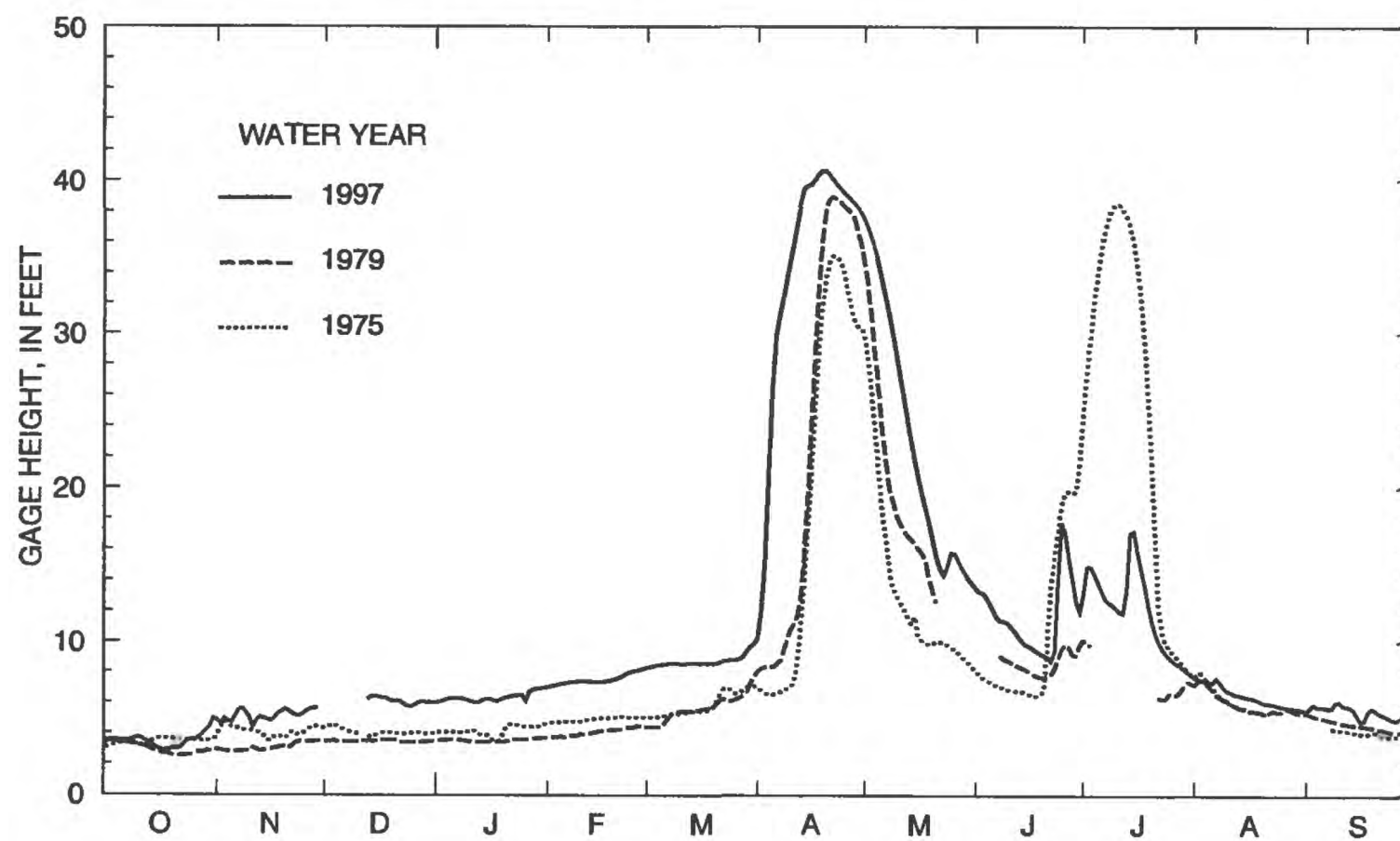


# 05064500 RED RIVER OF THE NORTH AT HALSTAD, MN--Continued

Highest daily mean discharge for period of record



Highest daily mean gage height for period of record



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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)
Annual peak discharge, by year, and corresponding gage height							
1936	April 15	16.33	7,670	1969	April 18	38.29	35,700
1937	April 15	9.39	2,660	1970	April 10	22.36	11,600
1942	May 5	12.86	5,060	1971	April 1	15.62	5,480
1943	April 11	31.31	21,800	1972	March 24	28.96	16,200
1944	July 13	15.79	7,200	1973	March 18	17.71	6,200
1945	March 23	23.60	13,300	1974	April 16	26.72	17,800
1946	March 29	19.50	10,000	1975	July 10	38.55	39,900
1947	April 16	33.50	24,500	1976	March 31	23.30	9,950
1948	April 10	--	16,000	1977	May 7	7.50	2,050
1949	April 7	16.53	7,710	1978	April 9	37.61	28,800
1950	May 11	--	18,700	1979	April 22	39.00	42,000
1951	April 10	22.43	12,900	1980	April 5	21.98	12,900
1952	April 18	29.78	20,700	1981	May 25	10.57	3,920
1953	June 22	22.78	13,600	1982	April 9	27.13	13,200
1954	April 13	11.44	4,660	1983	July 6	14.98	7,800
1955	April 6	19.28	7,200	1984	April 1	29.99	21,900
1956	April 15	23.67	12,900	1985	May 13	19.07	10,400
1957	June 24	12.20	4,980	1986	March 31	25.89	17,400
1958	July 8	11.31	4,420	1987	March 30	21.43	9,860
1959	June 13	10.13	3,780	1988	March 28	12.42	5,010
1960	April 10	21.66	8,600	1989	April 9	35.65	26,000
1961	May 22	6.96	1,900	1990	April 10	8.55	2,880
1962	June 16	24.70	15,900	1991	July 8	9.99	3,700
1963	June 16	13.14	5,850	1992	March 9	15.64	5,200
1964	April 23	15.27	7,820	1993	August 2	30.56	22,500
1965	April 17	35.27	25,600	1994	April 3	--	16,600
1966	March 27	35.35	26,800	1995	March 31	30.51	23,300
1967	April 23	22.71	13,800	1996	April 18	35.11	25,200
1968	June 19	7.80	2,350	1997	April 19	40.74	71,500
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 19	40.74	71,500	1952	April 18	29.78	20,700
1979	April 22	39.00	42,000	1950	May 11	--	18,700
1975	July 10	38.55	39,900	1974	April 16	26.72	17,800
1969	April 18	38.29	35,700	1986	March 31	25.89	17,400
1978	April 9	37.61	28,800	1994	April 3	--	16,600
1966	March 27	35.35	26,800	1972	March 24	28.96	16,200
1989	April 9	35.65	26,000	1948	April 10	--	16,000
1965	April 17	35.27	25,600	1962	June 16	24.70	15,900
1996	April 18	35.11	25,200	1967	April 23	22.71	13,800
1947	April 16	33.50	24,500	1953	June 22	22.78	13,600
1995	March 31	30.51	23,300	1945	March 23	23.60	13,300
1993	August 2	30.56	22,500	1982	April 9	27.13	13,200
1984	April 1	29.99	21,900	1951	April 10	22.43	12,900
1943	April 11	31.31	21,800	1956	April 15	23.67	12,900

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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1980	April 5	21.98	12,900	1971	April 1	15.62	5,480
1970	April 10	22.36	11,600	1992	March 9	15.64	5,200
1985	May 13	19.07	10,400	1942	May 5	12.86	5,060
1946	March 29	19.50	10,000	1988	March 28	12.42	5,010
1976	March 31	23.30	9,950	1957	June 24	12.20	4,980
1987	March 30	21.43	9,860	1954	April 13	11.44	4,660
1960	April 10	21.66	8,600	1958	July 8	11.31	4,420
1964	April 23	15.27	7,820	1981	May 25	10.57	3,920
1983	July 6	14.98	7,800	1959	June 13	10.13	3,780
1949	April 7	16.53	7,710	1991	July 8	9.99	3,700
1936	April 15	16.33	7,670	1990	April 10	8.55	2,880
1944	July 13	15.79	7,200	1937	April 15	9.39	2,660
1955	April 6	19.28	7,200	1968	June 19	7.80	2,350
1973	March 18	17.71	6,200	1977	May 7	7.50	2,050
1963	June 16	13.14	5,850	1961	May 22	6.96	1,900

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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1961	--	--	--	--	--	--	--	--	753.3	313.4	196.8	185.5	--
1962	296.8	227.9	145.7	138.5	163.7	249.4	6,308	5,339	10,310	9,378	3,866	1,325	3,155
1963	822.9	773.1	553.1	395.8	302.7	688.1	2,189	1,323	3,918	929.7	444.0	392.3	1,059
1964	327.6	319.2	247.4	225.0	226.0	303.4	3,930	2,449	1,734	973.0	258.6	239.4	933.2
1965	378.5	383.6	261.8	285.3	266.8	298.5	12,200	3,581	4,137	2,195	1,035	750.7	2,139
1966	1,359	877.5	831.0	745.2	737.3	9,429	9,535	4,607	2,656	1,377	1,643	767.1	2,892
1967	686.0	713.2	643.5	611.9	519.3	1,519	7,193	3,674	3,241	1,731	441.3	169.9	1,760
1968	278.1	292.0	290.6	254.0	235.3	938.1	1,492	1,448	1,671	977.0	401.5	322.8	716.8
1969	511.2	545.4	466.1	331.6	528.9	919.4	20,080	6,715	2,364	2,080	558.3	219.4	2,932
1970	379.5	472.9	335.0	336.6	362.8	575.2	5,844	3,365	5,016	1,183	267.1	179.6	1,521
1971	188.5	409.4	253.4	210.6	226.1	1,556	3,085	1,481	936.8	1,327	345.5	679.5	892.8
1972	1,602	1,771	1,164	963.0	828.1	5,949	7,169	4,400	3,332	1,476	1,109	671.2	2,538
1973	632.1	612.8	445.8	435.5	578.9	2,919	1,382	803.5	608.3	313.7	265.0	1,285	857.7
1974	1,386	999.6	947.7	771.5	731.3	1,305	7,270	5,017	3,013	1,438	821.5	372.6	2,007
1975	486.5	606.2	386.5	329.4	445.3	724.2	11,250	6,195	4,583	20,060	1,494	757.7	3,968
1976	682.4	761.5	484.2	500.2	616.4	2,582	3,786	1,181	430.2	241.5	87.8	38.4	947.8
1977	61.5	92.3	51.2	32.1	45.9	330.8	733.3	449.0	241.6	250.7	59.5	221.4	214.3
1978	646.5	592.7	730.8	706.0	480.2	1,629	16,740	2,950	1,964	2,019	598.7	320.0	2,437
1979	301.6	283.6	258.4	178.1	173.9	461.5	17,350	8,994	2,812	2,487	1,400	847.1	2,959
1980	635.4	813.7	517.9	498.7	453.3	774.0	3,881	979.6	776.3	289.4	229.7	259.6	838.1
1981	266.4	367.0	223.7	140.3	203.2	618.1	704.7	923.3	567.7	678.2	540.9	291.3	462.3
1982	617.5	756.1	483.1	310.6	356.4	1,174	9,299	2,322	1,366	1,050	506.3	281.5	1,538
1983	1,209	915.4	681.9	411.0	314.6	3,674	2,924	1,057	1,607	3,442	776.9	743.2	1,488
1984	737.3	776.6	600.6	506.1	594.1	4,192	9,233	2,173	5,361	1,501	571.4	285.8	2,201
1985	1,350	1,228	818.3	680.2	502.1	3,164	2,198	5,095	4,250	2,395	1,813	1,604	2,102
1986	1,341	1,144	1,056	950.6	940.1	4,642	11,720	8,639	4,218	2,855	1,324	2,034	3,411
1987	2,188	1,420	1,253	1,023	1,052	4,975	4,333	2,044	1,420	1,444	899.0	465.9	1,883
1988	414.8	477.2	461.6	319.9	484.6	2,615	2,146	801.2	449.0	153.3	154.2	171.6	721.0
1989	163.7	216.4	201.6	150.4	249.2	560.4	14,270	2,259	1,535	544.9	281.3	885.8	1,762
1990	304.9	284.8	129.9	118.4	160.1	324.7	1,249	1,112	1,462	635.5	268.6	256.0	525.4
1991	204.8	204.9	140.2	94.4	168.0	638.1	1,142	2,042	1,604	2,283	688.4	861.6	843.5
1992	440.2	325.3	313.2	316.0	349.0	2,447	1,119	951.4	1,600	1,892	904.7	802.6	958.3
1993	393.6	375.7	411.5	407.4	479.3	1,354	8,045	2,123	3,107	10,960	11,700	3,360	3,583
1994	1,950	1,404	1,129	894.1	911.3	4,221	8,797	4,675	2,950	5,993	1,819	2,146	3,084
1995	2,875	1,843	1,004	881.0	885.0	9,444	12,200	6,045	2,957	4,364	1,348	842.0	3,739

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1996	1,866	1,586	1,179	796.8	792.2	3,524	14,080	9,748	3,761	1,268	854.8	477.5	3,323
1997	478.4	831.1	726.1	794.8	1,270	1,923	38,460	15,570	4,747	4,953	1,622	1,180	6,028



## 05064900 BEAVER CREEK NEAR FINLEY, ND

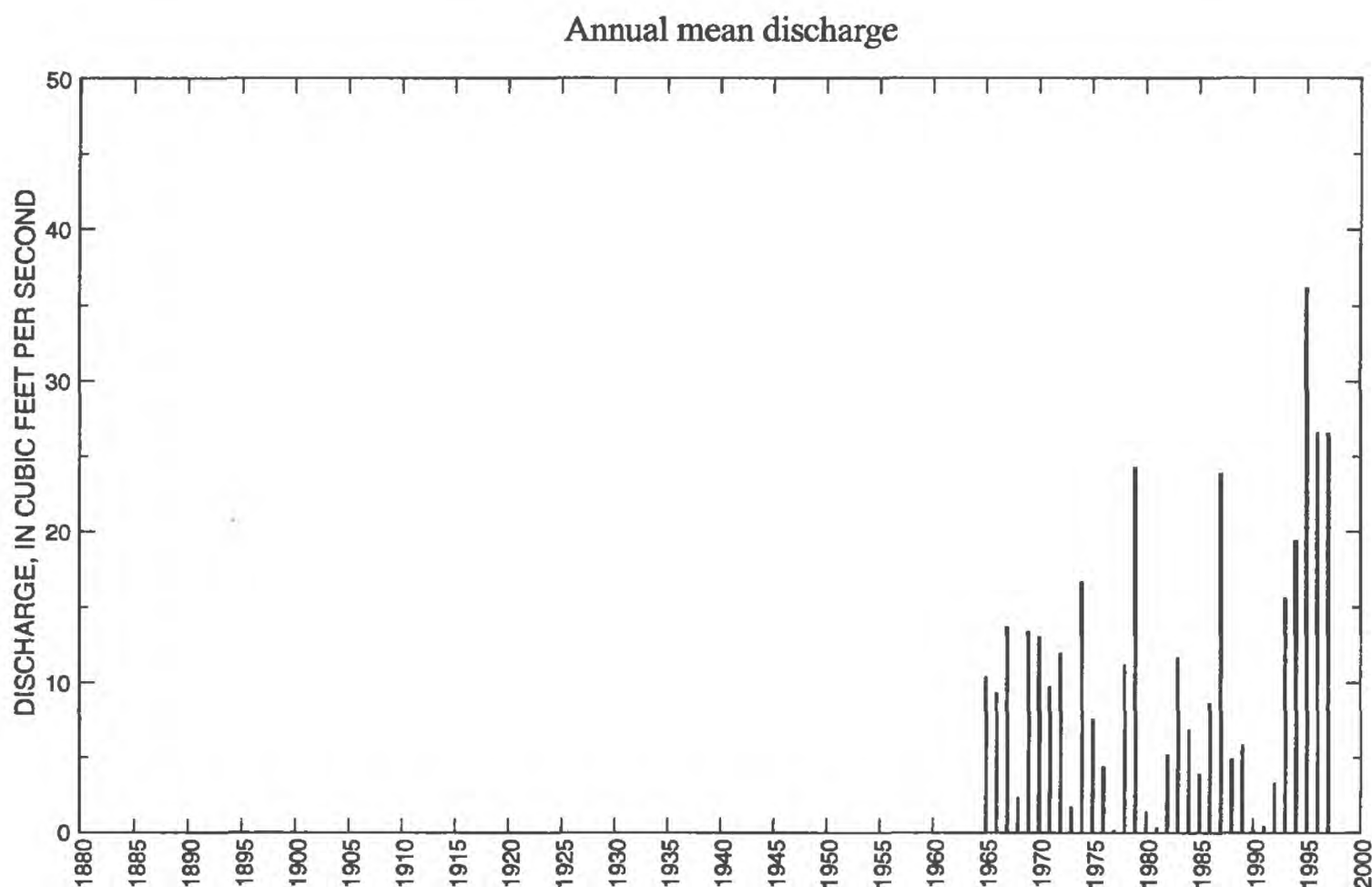
LOCATION.--Lat 47°35'40", long 97°42'18", in NE<sup>1</sup>/<sub>4</sub> sec.31, T.148 N., R.55 W., Steele County, Hydrologic Unit 09020109, on right bank 500 ft upstream from bridge on county highway and 7 mi northeast of Finley.

DRAINAGE AREA.--160 mi<sup>2</sup>, approximately.

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

GAGE.--Water-stage recorder and concrete broad-crested weir. Datum of gage is 1,170.08 ft above sea level.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,900 ft<sup>3</sup>/s, Apr. 19, 1979, gage height, 8.35 ft, backwater from ice; maximum gage height, 10.79 ft, Apr. 11, 1996, backwater from ice; no flow at times.



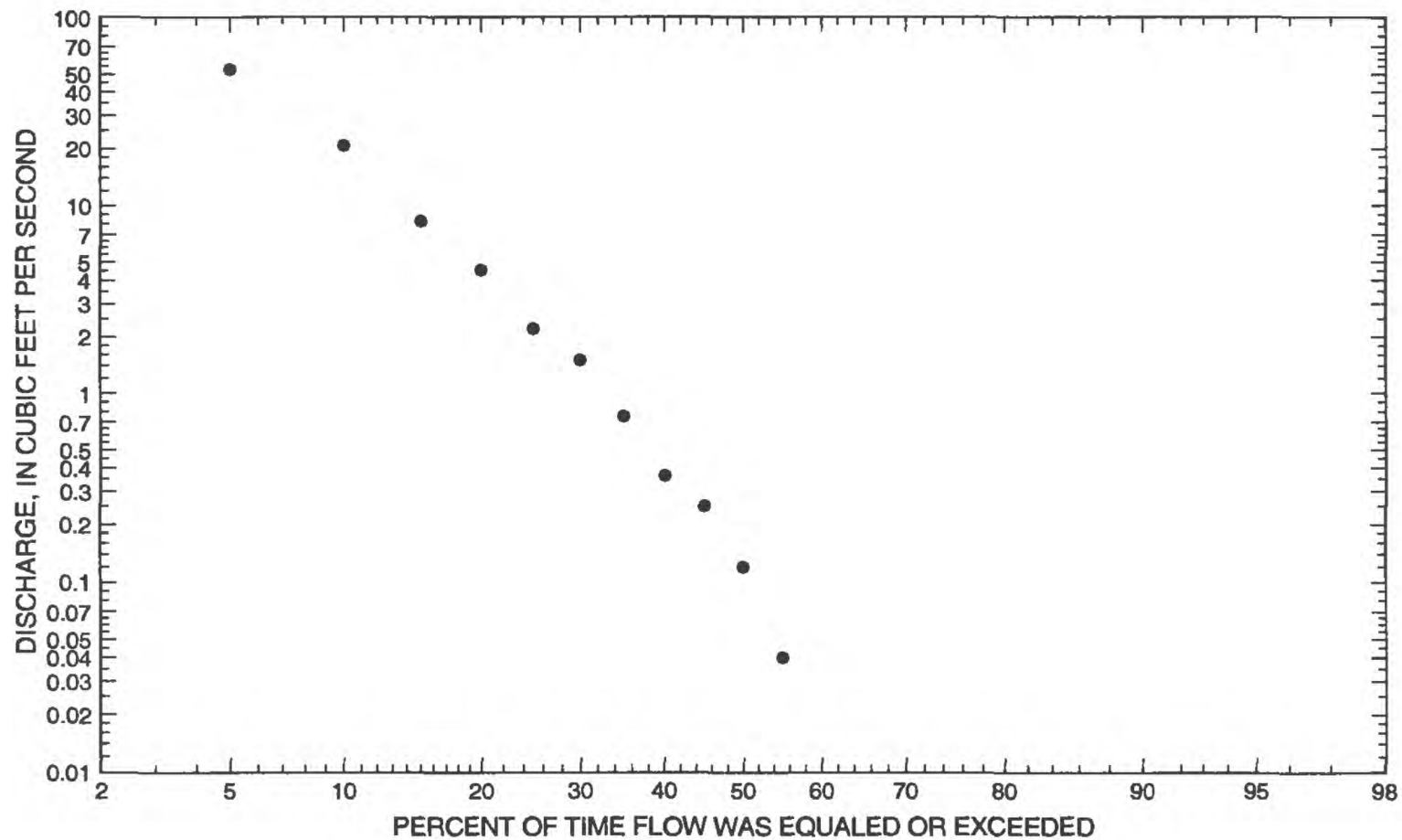
# 05064900 BEAVER CREEK NEAR FINLEY, ND--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	30.3	1995	0	m	1.99	5.48	2.75	1.56	
November	25.4	1995	0	m	1.28	4.44	3.48	1.00	
December	4.33	1995	0	m	0.29	0.85	2.95	0.23	
January	1.06	1995	0	m	0.07	0.23	3.44	0.05	
February	2.61	1984	0	m	0.25	0.54	2.16	0.19	
March	151	1995	0	m	26.5	30.6	1.15	20.7	
April	252	1996	0.192	1981	62.0	71.0	1.15	48.5	
May	81.2	1995	0.042	1977	13.8	19.8	1.44	10.8	
June	29.4	1994	0.001	m	5.70	7.09	1.24	4.46	
July	104	1993	0	m	9.57	21.0	2.20	7.49	
August	43.4	1994	0	m	4.03	9.53	2.36	3.16	
September	21.2	1993	0	m	2.31	5.25	2.28	1.81	
Annual	36.2	1995	0.121	1977	10.6	9.02	0.85	100	

## Annual flow duration



# 05064900 BEAVER CREEK NEAR FINLEY, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	0.09	0.02	0	0	0	0	0	0	0	0
90	0	0	0	0.36	0.14	0	0	0	0	0	0	0	0
85	0	0	0	0.52	0.34	0.03	0	0	0	0	0	0	0
80	0	0	0	1.10	0.46	0.14	0	0	0	0	0	0	0
75	0	0	0	1.50	0.61	0.25	0	0	0	0	0	0	0
70	0	0	0	2.20	1.10	0.34	0	0	0	0	0	0	0
65	0	0	0	4.99	1.50	0.45	0.07	0	0	0	0	0	0
60	0	0	0	7.61	2.00	0.60	0.18	0	0	0	0	0	0
55	0	0	0.13	10.8	2.00	1.10	0.34	0	0	0	0.07	0	0.04
50	0	0	0.34	15.3	2.70	1.10	0.47	0	0.02	0.08	0.12	0	0.12
45	0	0	0.88	20.6	3.90	1.50	0.90	0.03	0.08	0.19	0.20	0	0.25
40	0	0	2.30	27.9	4.54	1.90	1.20	0.10	0.19	0.24	0.25	0	0.36
35	0	0	5.22	36.5	5.58	2.60	2.46	0.19	0.24	0.32	0.25	0	0.75
30	0	0	9.89	46.8	7.92	3.71	3.27	0.33	0.41	0.71	0.42	0.05	1.50
25	0	0	18.3	59.5	13.1	4.43	4.21	0.60	0.71	1.20	0.54	0.10	2.20
20	0	0	37.5	80.0	22.5	7.14	6.31	1.40	1.20	1.60	0.69	0.18	4.55
15	0	0.17	62.6	111	33.3	11.4	9.59	3.93	2.70	2.70	1.10	0.34	8.21
10	0.09	0.50	93.2	169	46.1	17.1	16.4	11.3	6.20	4.30	1.50	0.52	20.7
5	0.59	0.85	156	291	65.7	25.8	40.3	22.8	14.0	6.89	4.35	1.80	53.1

# 05064900 BEAVER CREEK NEAR FINLEY, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	4.2	1.44	0.853	0.587	0.404
0.95	1.05	18.3	8.75	5.85	4.11	2.77
0.90	1.11	37.3	20.1	14.1	9.92	6.63
0.80	1.25	82.4	48.9	35.6	25.1	16.6
0.50	2	306	191	143	99.8	65.3
0.20	5	881	501	367	249	162
0.10	10	1,400	722	515	344	223
0.04	25	2,140	973	671	440	286
0.02	50	2,720	1,130	761	493	321
0.01	100	3,310	1,260	831	533	347
0.005	200	3,890	1,370	885	563	367
0.002	500	4,640	ng	ng	ng	ng

# 05064900 BEAVER CREEK NEAR FINLEY, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1965	April 11	6.88	1,250	1982	March 30	5.74	700
1966	March 20	7.33	400	1983	June 21	4.53	259
1967	April 20	5.52	652	1984	March 25	--	150
1968	June 7	3.55	47.0	1985	March 11	4.49	253
1969	April 9	6.55	1,320	1986	May 12	4.60	282
1970	June 16	6.49	1,270	1987	July 22	6.04	688
1971	April 5	4.77	392	1988	March 24	4.07	130
1972	May 26	5.65	736	1989	April 5	4.55	230
1973	March 14	4.35	170	1990	June 30	2.67	9.70
1974	April 11	--	550	1991	May 23	2.65	7.80
1975	June 22	5.07	472	1992	March 5	--	95.0
1976	March 24	5.26	290	1993	July 23	6.42	700
1977	March 31	3.00	29.0	1994	April 24	--	170
1978	March 28	7.28	950	1995	March 14	5.80	325
1979	April 19	8.35	1,900	1996	April 11	10.79	1,200
1980	March 31	3.72	100	1997	April 5	--	450
1981	July 17	2.89	10.0				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1979	April 19	8.35	1,900	1976	March 24	5.26	290
1969	April 9	6.55	1,320	1986	May 12	4.60	282
1970	June 16	6.49	1,270	1983	June 21	4.53	259
1965	April 11	6.88	1,250	1985	March 11	4.49	253
1996	April 11	10.79	1,200	1989	April 5	4.55	230
1978	March 28	7.28	950	1973	March 14	4.35	170
1972	May 26	5.65	736	1994	March 24	--	170
1982	March 30	5.74	700	1984	March 25	--	150
1993	July 23	6.42	700	1988	March 24	4.07	130
1987	July 22	6.04	688	1980	March 31	3.72	100
1967	April 20	5.52	652	1992	March 5	--	95.0
1974	April 11	--	550	1968	June 7	3.55	47.0
1975	June 22	5.07	472	1977	March 31	3.00	29.0
1997	April 5	--	450	1981	July 17	2.89	10.0
1966	March 20	7.33	400	1990	June 30	2.67	9.70
1971	April 5	4.77	392	1991	May 23	2.65	7.80
1995	March 14	5.80	325				



# 05064900 BEAVER CREEK NEAR FINLEY, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1965	1.15	0.140	0	0	0	0	108.6	6.01	6.21	2.24	0.381	1.86	10.4
1966	1.33	0.119	0.061	0	0	64.6	14.4	9.07	3.63	11.8	5.09	0.269	9.32
1967	0.139	0.019	0	0	0	62.7	65.8	30.5	3.38	0.434	0.025	0	13.7
1968	0	0	0	0	0	10.7	2.86	0.891	8.24	3.45	0.440	1.31	2.33
1969	0.089	0.124	0.046	0	0	0	145.8	3.54	3.76	1.76	0	7.87	13.4
1970	1.28	0.454	0.270	0	0	0.387	126.1	13.2	15.8	0.120	0.005	0.687	13.1
1971	0.018	0.391	0.008	0	0	35.5	68.1	2.30	4.13	5.97	0.115	0.721	9.76
1972	4.30	1.45	0.090	0	0	43.5	68.1	24.6	1.73	0	0.001	0	12.0
1973	0	0	0	0	0.111	13.6	1.43	0.754	3.68	0.172	0	0	1.67
1974	4.48	0.687	0.088	0	0	0	131.5	39.4	16.5	5.18	3.22	0.127	16.7
1975	0.010	0.473	0.007	0	0	3.90	57.5	17.1	11.1	1.87	0	0	7.62
1976	0	0	0	0	0.172	37.3	13.6	1.21	0.056	0.053	0	0	4.40
1977	0	0	0	0	0	0.812	0.537	0.042	0.003	0.037	0	0.014	0.121
1978	0.185	0.209	0.315	0	0	44.0	86.0	3.28	0.309	0	0	0.691	11.2
1979	0.008	0	0	0	0	0	244.1	47.0	2.49	0.681	0.276	0.002	24.3
1980	0	0	0	0	0	7.56	8.66	0.307	0.001	0	0	0	1.38
1981	0	0	0	0	1.05	0.812	0.192	0.118	0.293	1.02	0.224	0.057	0.310
1982	1.08	0.458	0.005	0	0	28.4	28.8	2.49	1.09	0.053	0.118	0.001	5.23
1983	9.30	1.41	0.214	0.031	0.573	55.5	26.0	2.93	8.31	6.41	18.3	10.6	11.7
1984	3.76	1.87	0.361	0	2.61	34.6	33.9	4.52	1.39	0.013	0	0	6.91
1985	0	0	0	0	0.714	34.1	3.55	4.46	1.47	0.064	0.329	2.07	3.94
1986	1.26	0.614	0.149	0.011	0	47.4	25.8	16.3	0.285	8.95	0.320	1.88	8.67
1987	0.297	1.79	0.151	0	0	36.2	137.1	15.8	19.8	54.3	18.2	2.74	23.9
1988	0.321	0.264	0.017	0	0.083	32.0	19.9	0.371	0.001	5.78	0.458	0	4.95
1989	0	0	0	0	0	1.27	65.8	3.92	0.466	0	0	0	5.89
1990	0	0	0	0	0	0.247	0.863	0.137	1.65	0.402	0	0	0.273
1991	0	0	0	0	0	0.039	0.521	1.88	0.368	1.97	0.155	0	0.417
1992	0	0.060	0	0	1.24	29.3	1.52	1.92	2.06	2.65	0.066	0.190	3.29
1993	0	0.024	0	0	0	24.0	4.12	0.874	2.43	103.6	27.7	21.2	15.6
1994	5.09	5.04	2.52	0.796	0.723	47.6	22.1	13.5	29.4	41.0	43.4	20.1	19.4
1995	30.3	25.4	4.33	1.06	0.510	151.1	79.4	81.2	14.8	31.9	7.06	3.00	36.2
1996	1.05	0.807	0.743	0.219	0.352	0.375	251.6	47.8	14.7	3.63	0.841	0.323	26.6
1997	0.336	0.314	0.169	0.073	0.044	26.1	200.7	56.8	8.52	20.3	6.30	0.478	26.6

## 05066500 GOOSE RIVER AT HILLSBORO, ND

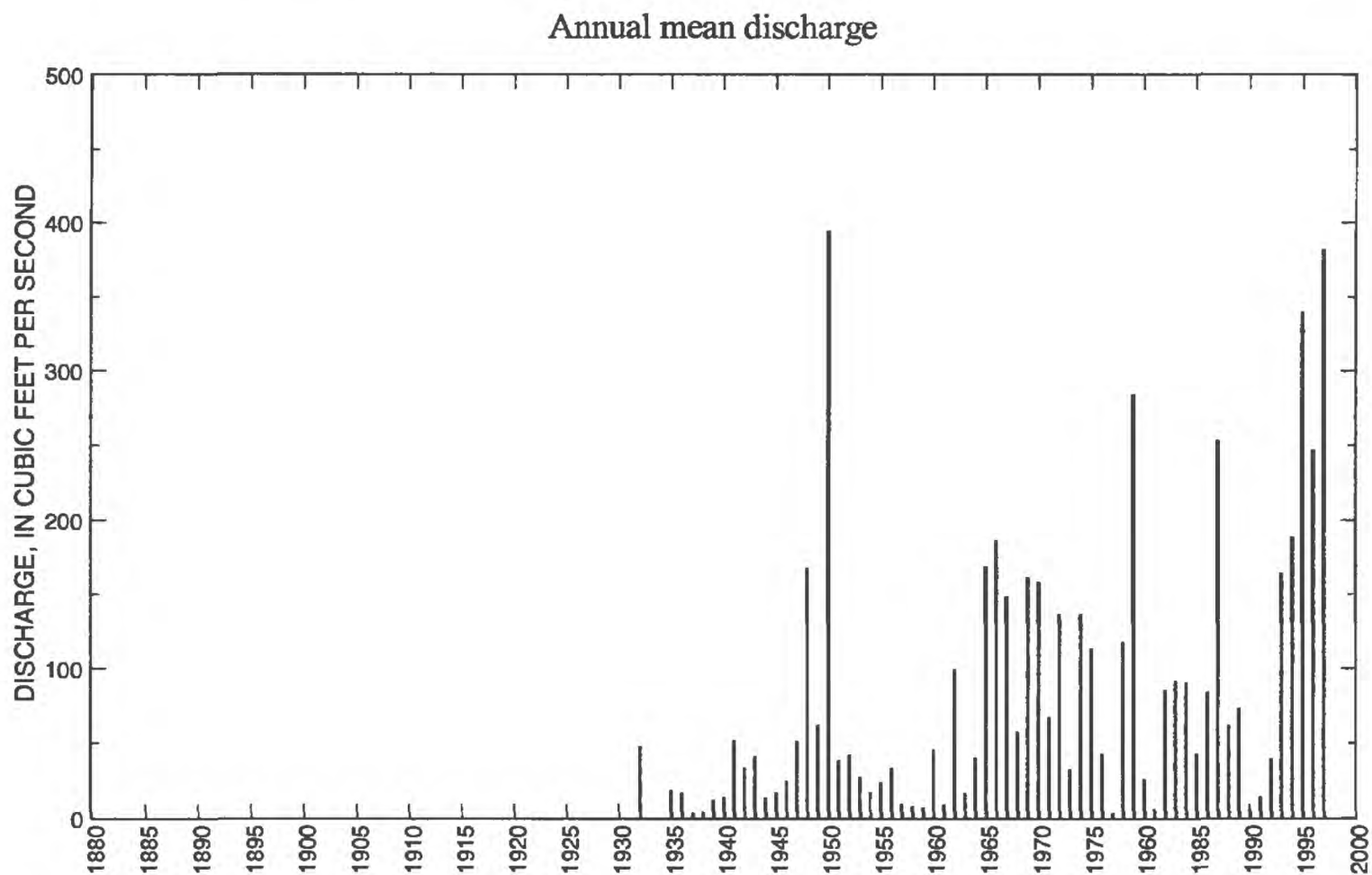
LOCATION.--Lat 47°24'34", long 97°03'39", NW<sup>1</sup>/<sub>4</sub> sec.5, T.145 N., R.50 W., Traill County, Hydrologic Unit 09020109, on right bank 600 ft upstream from Foogman Dam in Hillsboro and 27.5 mi upstream from mouth.

DRAINAGE AREA.--1,203 mi<sup>2</sup> of which about 110 mi<sup>2</sup> is probably noncontributing.

PERIOD OF RECORD.--March 1931 to current year. No winter records during 1932-34. Monthly discharge only for some periods, published in Water Supply Paper 1308.

GAGE.--Water-stage recorder and masonry dam. Datum of gage is 879.52 ft above sea level. Sept. 26, 1941, to Oct. 27, 1965, at site 600 ft downstream at same datum. See Water Supply Paper 1728 or 1913 for history of changes prior to Sept. 26, 1941.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 14,800 ft<sup>3</sup>/s, Apr. 21, 1979, gage height, 16.76 ft; no flow at times.



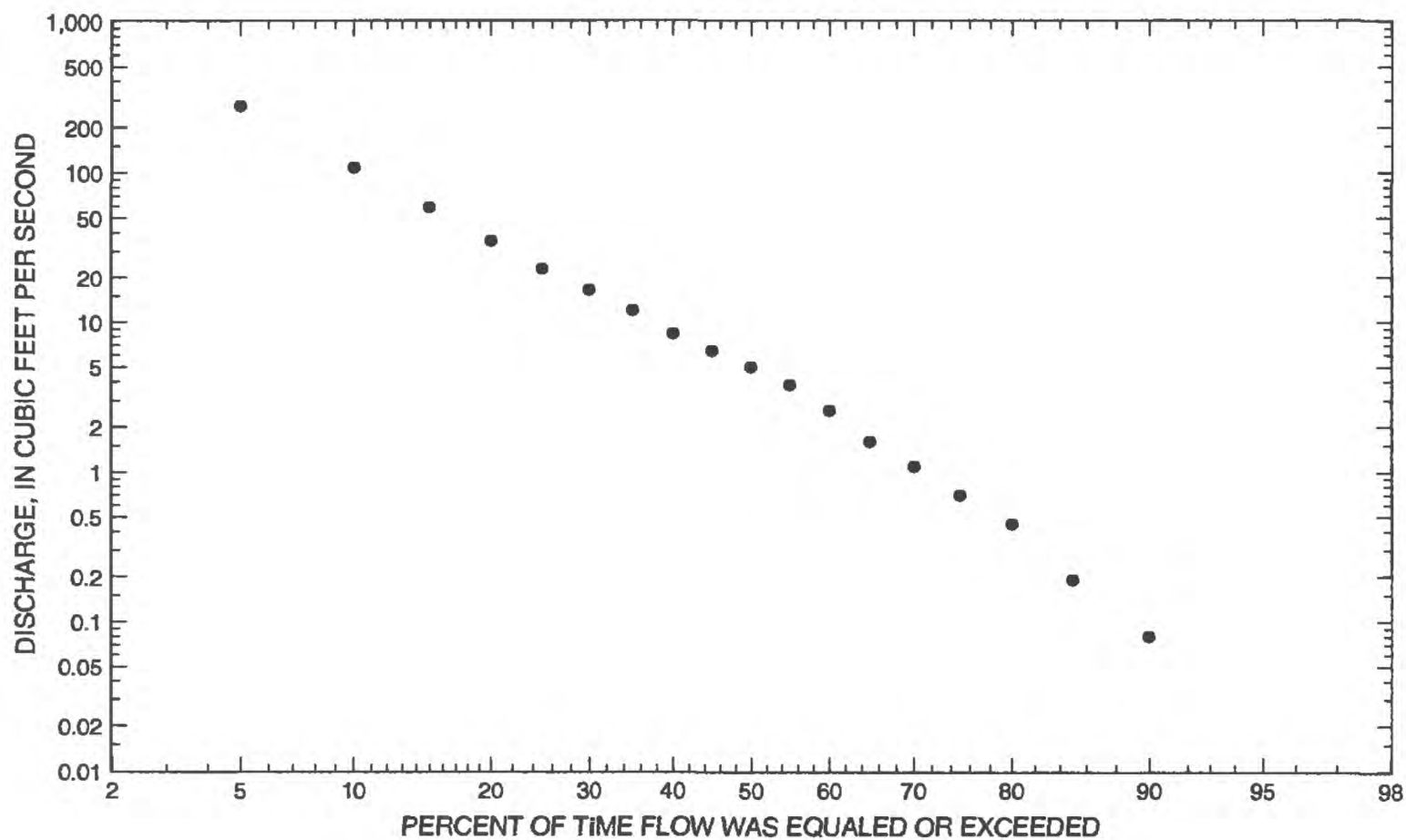
## 05066500 GOOSE RIVER AT HILLSBORO, ND--Continued

### Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	436	1995	0	m	16.0	55.4	3.47	1.61	
November	188	1995	0	m	11.7	25.7	2.20	1.18	
December	79.9	1995	0	m	7.59	12.8	1.69	0.77	
January	31.8	1995	0	m	4.55	7.57	1.66	0.46	
February	20.0	1932	0	m	8.15	34.1	4.18	0.82	
March	1,220	1995	0	1940	153	250	1.64	15.4	
April	3,410	1997	6.51	1938	504	699	1.39	50.8	
May	2,280	1950	1.12	1939	122	292	2.40	12.3	
June	385	1968	1.35	1938	63.0	73.5	1.17	6.36	
July	729	1993	0	1940	61.1	133	2.18	6.16	
August	515	1993	0	m	23.9	71.8	3.01	2.41	
September	326	1994	0	m	17.0	49.0	2.88	1.71	
Annual	395	1950	3.47	1937	84.6	93.4	1.10	100	

Annual flow duration



# 05066500 GOOSE RIVER AT HILLSBORO, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	5.89	2.30	0.97	0.06	0	0	0	0	0	0
90	0	0	0.19	10.1	4.76	1.70	0.27	0	0	0	0	0	0.08
85	0.10	0.10	0.49	17.0	6.56	3.79	0.56	0.09	0.08	0.09	0.17	0.19	0.30
80	0.17	0.18	0.67	23.8	8.02	4.97	1.20	0.29	0.16	0.16	0.31	0.19	0.45
75	0.28	0.27	0.92	29.6	12.0	7.36	1.70	0.60	0.23	0.30	0.42	0.37	0.70
70	0.36	0.40	1.30	35.7	14.4	9.60	2.98	0.87	0.33	0.40	0.57	0.58	1.10
65	0.47	0.59	2.40	47.3	17.3	12.0	4.01	0.87	0.47	0.53	1.10	0.90	1.60
60	0.60	0.72	3.60	60.4	21.2	15.0	5.79	1.30	0.66	0.53	1.50	1.40	2.93
55	0.78	1.30	4.60	75.3	25.6	17.8	7.72	1.80	0.94	0.72	2.00	1.70	4.34
50	1.30	1.90	5.27	97.9	30.3	21.6	10.1	1.80	1.30	0.97	3.78	2.70	5.59
45	2.20	2.30	7.73	132	37.3	28.4	12.9	3.07	1.90	1.80	4.46	3.40	7.47
40	2.80	2.90	12.1	180	46.0	38.4	15.3	4.12	1.90	2.30	5.52	3.40	10.2
35	3.72	3.50	19.4	243	56.7	49.6	20.3	5.93	2.97	4.05	7.07	4.84	14.0
30	4.46	4.77	33.5	321	76.8	60.4	28.0	7.26	4.22	5.76	8.43	6.15	19.0
25	5.14	5.45	64.7	444	102	72.2	38.2	9.95	6.78	8.27	11.5	7.16	27.2
20	5.69	6.04	109	652	137	88.4	50.6	14.5	11.8	12.8	15.2	10.2	42.3
15	8.26	7.16	189	958	189	113	70.0	21.9	19.9	20.1	19.1	14.1	69.4
10	10.9	12.0	390	1,410	279	155	108	51.7	35.7	30.3	25.6	17.8	132
5	16.1	17.0	968	2,520	466	240	245	119	69.5	55.5	39.8	24.5	340

# 05066500 GOOSE RIVER AT HILLSBORO, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-dsy period	7-day period	15-day period	30-day period
0.99	1.01	21.6	17.5	15.7	11.8	9.21
0.95	1.05	81.6	73.1	62.0	44.8	31.2
0.90	1.11	156	145	121	85.8	57.2
0.80	1.25	328	313	255	178	114
0.50	2	1,160	1,110	894	614	382
0.20	5	3,400	3,100	2,510	1,730	1,090
0.10	10	5,560	4,850	3,980	2,740	1,780
0.04	25	8,930	7,330	6,130	4,260	2,890
0.02	50	11,800	9,270	7,860	5,510	3,860
0.01	100	14,900	11,200	9,650	6,820	4,930
0.005	200	18,200	13,100	11,500	8,160	6,100
0.002	500	22,900	ng	ng	ng	ng



# 05066500 GOOSE RIVER AT HILLSBORO, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
<sup>1</sup> 1882	April <sup>2</sup>	--	6,700	1963	April 8	1.24	290
<sup>1</sup> 1897	April <sup>2</sup>	--	5,700	1964	June 14	3.61	1,110
<sup>1</sup> 1904	April <sup>2</sup>	--	5,300	1965	April 13	14.01	6,800
<sup>1</sup> 1916	April <sup>2</sup>	--	4,700	1966	March 23	12.17	3,290
1931	April 7	4.20	100	1967	April 24	7.81	2,650
1932	March 3	15.14	959	1968	June 12	4.48	1,420
1933	March <sup>2</sup>	10.40	300	1969	April 12	14.19	7,640
1934	April 2	4.95	107	1970	April 9	9.18	3,040
1935	June 14	8.45	697	1971	April 10	4.41	1,550
1936	April 16	13.06	1,660	1972	April 15	6.62	2,380
1937	April 15	3.57	46.0	1973	March 15	4.05	1,280
1938	March 15	4.44	104	1974	April 15	9.43	3,450
1939	March 26	11.00	564	1975	April 19	11.11	3,810
1940	April 17	1.66	710	1976	March 29	3.98	1,260
1941	April 11	2.26	1,320	1977	April 11	2.01	86.0
1942	April 6	2.27	1,140	1978	April 1	10.56	3,800
1943	March 29	8.84	3,480	1979	April 21	16.76	14,800
1944	April 10	1.11	304	1980	March 31	3.55	790
1945	March 17	1.09	293	1981	June 25	1.83	25.6
1946	March 22	3.22	1,300	1982	April 3	8.89	2,900
1947	April 13	5.30	1,700	1983	March 17	--	1,140
1948	April 16	10.63	4,180	1984	March 29	7.99	2,660
1949	April 8	3.38	1,640	1985	March 16	4.17	1,240
1950	April 19	14.94	9,420	1986	March 24	4.81	1,630
1951	March 31	3.48	1,130	1987	March 26	10.22	3,570
1952	April 4	3.33	1,300	1988	March 28	3.86	1,060
1953	July 6	1.36	408	1989	April 8	9.80	3,000
1954	June 15	0.99	231	1990	April 6	2.01	94.0
1955	April 3	2.44	1,220	1991	June 1	2.75	351
1956	April 19	2.58	1,390	1992	March 8	3.69	975
1957	September 7	1.17	200	1993	July 30	12.90	4,360
1958	July 3	0.69	88.0	1994	March 23	6.91	2,160
1959	April 5	0.84	143	1995	March 18	9.00	3,390
1960	April 9	3.37	1,360	1996	April 13	12.06	4,750
1961	March 7	0.66	82.0	1997	April 6	15.62	8,520
1962	April 9	8.64	2,350				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1979	April 21	16.76	14,800	<sup>1</sup> 1904	April <sup>2</sup>	--	5,300
1950	April 19	14.94	9,420	1996	April 13	12.06	4,750
1997	April 6	15.62	8,520	<sup>1</sup> 1916	April <sup>2</sup>	--	4,700
1969	April 12	14.19	7,640	1993	July 30	12.90	4,360
1965	April 13	14.01	6,800	1948	April 16	10.63	4,180
<sup>1</sup> 1882	April <sup>2</sup>	--	6,700	1975	April 19	11.11	3,810
<sup>1</sup> 1897	April <sup>2</sup>	--	5,700	1978	April 1	10.56	3,800

# 05066500 GOOSE RIVER AT HILLSBORO, ND--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1987	March 26	10.22	3,570	1983	March 17	--	1,140
1943	March 29	8.84	3,480	1951	March 31	3.48	1,130
1974	April 15	9.43	3,450	1964	June 14	3.61	1,110
1995	March 18	9.00	3,390	1988	March 28	3.86	1,060
1966	March 23	12.17	3,290	1992	March 8	3.69	975
1970	April 9	9.18	3,040	1932	March 3	15.14	959
1989	April 8	9.80	3,000	1980	March 31	3.55	790
1982	April 3	8.89	2,900	1940	April 17	1.66	710
1984	March 29	7.99	2,660	1935	June 14	8.45	697
1967	April 24	7.81	2,650	1939	March 26	11.00	564
1972	April 15	6.62	2,380	1953	July 6	1.36	408
1962	April 9	8.64	2,350	1991	June 1	2.75	351
1994	March 23	6.91	2,160	1944	April 10	1.11	304
1947	April 13	5.30	1,700	1933	March <sup>2</sup>	10.40	300
1936	April 16	13.06	1,660	1945	March 17	1.09	293
1949	April 8	3.38	1,640	1963	April 8	1.24	290
1986	March 24	4.81	1,630	1954	June 15	0.99	231
1971	April 10	4.41	1,550	1957	September 7	1.17	200
1968	June 12	4.48	1,420	1959	April 5	0.84	143
1956	April 19	2.58	1,390	1934	April 2	4.95	107
1960	April 9	3.37	1,360	1938	March 15	4.44	104
1941	April 11	2.26	1,320	1931	April 7	4.20	100
1946	March 22	3.22	1,300	1990	April 6	2.01	94.0
1952	April 4	3.33	1,300	1958	July 3	0.69	88.0
1973	March 15	4.05	1,280	1977	April 11	2.01	86.0
1976	March 29	3.98	1,260	1961	March 7	0.66	82.0
1985	March 16	4.17	1,240	1937	April 15	3.57	46.0
1955	April 3	2.44	1,220	1981	June 25	1.83	25.6
1942	April 6	2.27	1,140				

<sup>1</sup>Determined by U.S. Army Corps of Engineers; not used in statistics.

<sup>2</sup>Day of month unknown.

# 05066500 GOOSE RIVER AT HILLSBORO, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1931	--	--	--	--	--	--	26.8	3.56	4.24	1.27	1.33	0.330	--
1932	0.300	0.200	0.200	0.200	20.0	272.2	238.6	27.4	12.6	0.984	0.294	0.390	47.8
1933	0.526	--	--	--	--	--	105.7	16.5	6.01	--	--	--	--
1934	--	--	--	--	--	--	33.1	2.05	2.75	1.24	1.45	2.77	--
1935	0.700	0.200	0.200	0.200	0.300	70.0	32.0	19.9	86.0	12.0	1.00	0.400	18.6
1936	0.300	0.400	0.200	0.200	0.200	1.00	190.4	14.1	2.77	0.577	0.100	0.100	17.3
1937	0.100	0.100	0.100	0.100	0.200	0.500	15.4	7.49	9.65	2.43	3.73	2.00	3.47
1938	0.100	0.100	0.100	0.100	0.100	35.1	6.51	5.35	1.35	0.013	0	0	4.12
1939	0	0	0	0	0	99.0	37.5	1.12	9.02	0.119	0	0	12.3
1940	0	0	0	0	0	0	156.3	9.05	1.63	0	4.69	0.013	14.1
1941	0	0	0	0	0	24.5	517.2	14.0	61.4	6.93	1.26	2.53	51.7
1942	6.06	5.24	2.33	0.074	0	9.25	256.9	81.1	31.4	6.05	3.55	2.72	33.6
1943	0.916	0.820	0.742	0.445	0.321	215.0	122.0	33.3	91.4	21.5	2.12	0.457	40.9
1944	0.232	0.407	0.297	0.174	0.121	2.02	65.5	16.6	21.2	5.72	39.0	12.7	13.6
1945	2.87	13.5	5.60	0.661	0.643	98.5	40.5	18.2	17.1	5.98	1.30	1.09	17.3
1946	1.66	0.527	0.510	0.471	0.557	209.8	51.6	16.0	9.11	8.85	0.542	0.837	25.3
1947	1.36	1.46	0.671	0.216	0.139	121.5	394.7	38.3	52.0	9.17	1.94	0.887	51.6
1948	0.768	2.19	1.46	0.452	0.100	0.532	1,840	148.0	23.2	15.6	9.90	0.950	168.0
1949	0.445	3.78	1.61	0.458	0.257	1.14	516.2	37.9	158.9	18.6	12.5	1.11	62.1
1950	3.23	6.61	4.96	2.69	2.37	45.1	2,168	2,275	135.0	57.9	12.0	7.18	394.5
1951	6.08	7.88	7.35	6.27	5.81	92.1	289.3	27.4	14.4	3.61	1.58	4.29	38.7
1952	2.64	4.43	1.86	0	1.84	14.2	328.0	11.2	1.43	131.4	9.13	1.41	42.1
1953	1.08	2.05	2.73	1.88	1.92	28.4	21.8	28.6	135.7	101.6	2.17	2.86	27.6
1954	0.765	2.45	2.96	2.55	16.1	57.8	61.2	19.3	41.2	4.69	0.697	0.350	17.4
1955	0.200	0.260	0.297	0.568	0.700	0.981	214.6	6.35	61.7	5.66	2.58	0.163	24.2
1956	0.200	0.483	0.635	0.581	0.500	0.706	281.7	55.4	57.3	6.05	0.994	0.967	33.4
1957	0.384	1.82	1.43	0.994	0.739	18.3	17.8	7.88	10.5	5.30	0.106	53.0	9.81
1958	16.5	14.8	4.20	0.961	0.814	1.57	15.8	4.87	3.15	29.0	3.52	0.460	8.03
1959	0.319	0.050	0	0	0	33.6	37.2	6.70	6.81	0.484	1.33	0.293	7.24
1960	0.339	0.667	0.910	0.877	0.803	71.8	435.5	15.0	12.7	10.2	4.13	1.61	45.7
1961	0.258	1.05	0.984	0.768	0.818	54.4	26.9	19.6	3.47	0.158	0.081	0.403	9.15
1962	2.45	0.690	0.606	0.568	0.521	0.848	690.0	179.0	146.1	48.0	11.0	122.8	99.5
1963	16.5	14.4	9.10	2.32	0.296	29.3	89.0	18.4	10.5	11.8	2.08	0.350	17.0
1964	0.858	0.557	0.116	0	0	1.52	149.8	18.5	275.6	29.7	5.31	8.27	40.3
1965	26.6	7.42	3.72	3.00	1.84	1.38	1,632	171.5	69.8	67.9	23.4	36.2	168.9

# 05066500 GOOSE RIVER AT HILLSBORO, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1966	50.2	27.5	17.5	10.8	6.86	1,106	473.3	164.5	88.1	118.3	132.2	18.6	186.3
1967	9.56	10.5	4.47	4.76	3.90	282.9	946.0	403.1	97.7	17.1	2.18	1.04	148.5
1968	1.96	3.74	3.37	4.22	2.38	119.3	52.2	34.9	385.2	53.5	19.2	12.8	57.4
1969	7.52	11.8	7.88	3.97	3.56	5.79	1,585	133.3	80.1	73.6	14.9	31.8	161.7
1970	27.5	15.5	14.5	10.3	10.9	13.3	1,186	316.3	265.2	38.6	8.58	8.89	158.6
1971	3.56	13.4	7.54	3.57	4.96	78.9	489.7	65.5	69.4	62.0	6.63	4.07	67.1
1972	30.2	46.5	16.1	7.39	4.93	421.6	764.4	235.8	97.0	11.3	6.79	2.71	136.8
1973	1.09	6.75	3.96	3.67	5.97	275.4	50.5	18.5	12.2	3.62	1.78	4.41	32.7
1974	9.89	8.66	4.77	1.33	3.06	2.44	1,068	284.7	183.9	37.8	40.9	6.06	136.8
1975	1.63	5.89	7.45	6.91	6.18	26.7	919.9	243.0	89.4	58.6	2.84	2.22	113.6
1976	1.00	4.69	3.58	3.86	5.05	235.3	230.1	23.0	6.47	1.14	0.061	0	42.9
1977	0	0	0.232	0.300	0.296	2.26	17.6	9.72	5.06	4.18	0.145	1.96	3.48
1978	4.25	12.7	6.63	4.06	2.06	302.9	961.8	78.4	34.7	9.93	1.32	5.44	118.2
1979	1.04	1.02	1.62	1.70	2.05	3.14	2,878	421.1	71.7	44.3	15.1	3.22	284.4
1980	4.32	6.74	8.45	5.02	4.73	55.3	215.4	9.76	2.65	0.437	1.48	2.25	26.2
1981	0.782	2.43	2.40	2.16	4.85	9.88	6.61	7.48	14.4	7.64	8.15	2.76	5.79
1982	4.89	7.84	11.0	5.23	4.19	80.6	816.7	64.3	19.1	18.8	1.60	0.415	85.5
1983	62.9	20.7	22.0	8.96	8.00	418.6	230.9	57.1	129.6	62.7	29.0	44.3	91.8
1984	26.5	25.7	15.3	8.42	7.06	403.2	402.0	83.0	114.5	4.14	0.058	0	90.8
1985	5.90	4.50	0.672	0.828	2.40	344.5	75.6	40.7	13.7	0.581	19.0	0.814	43.0
1986	4.06	5.17	5.55	6.08	5.31	391.3	265.5	217.9	41.8	46.7	7.45	4.94	84.2
1987	14.4	15.1	18.0	12.7	6.81	922.9	1,043	147.8	102.5	532.5	160.1	50.0	253.6
1988	15.4	25.0	22.5	12.4	13.9	349.1	248.7	37.5	13.5	4.52	0.780	0.537	62.1
1989	0.735	2.50	3.76	4.58	4.16	6.46	789.4	51.7	20.8	3.15	1.32	1.44	73.3
1990	0.568	0.492	0.190	0.842	1.21	2.57	23.7	10.5	8.65	13.9	4.24	0	5.58
1991	0	0.006	0	0.275	2.94	7.20	23.6	80.2	47.8	8.91	0.547	0	14.3
1992	0.021	2.01	1.57	0.374	0.210	274.9	29.4	12.3	10.7	108.0	13.8	18.2	39.8
1993	6.43	16.5	9.15	3.95	5.31	157.8	223.4	42.7	48.4	729.1	515.0	200.0	164.9
1994	55.0	36.2	31.1	23.2	16.9	555.4	250.9	164.6	142.0	426.2	221.9	326.1	188.8
1995	436.4	188.0	79.9	31.8	17.4	1,220	994.3	516.1	105.4	307.4	86.8	65.5	340.0
1996	92.8	59.1	22.5	19.5	12.0	76.6	1,988	473.0	133.9	88.8	16.0	8.68	247.2
1997	25.5	21.3	14.1	12.5	16.3	34.2	3,412	375.9	144.6	464.6	73.2	23.4	382.1



## 05067050 MARSH RIVER DITCH NEAR ADA, MN

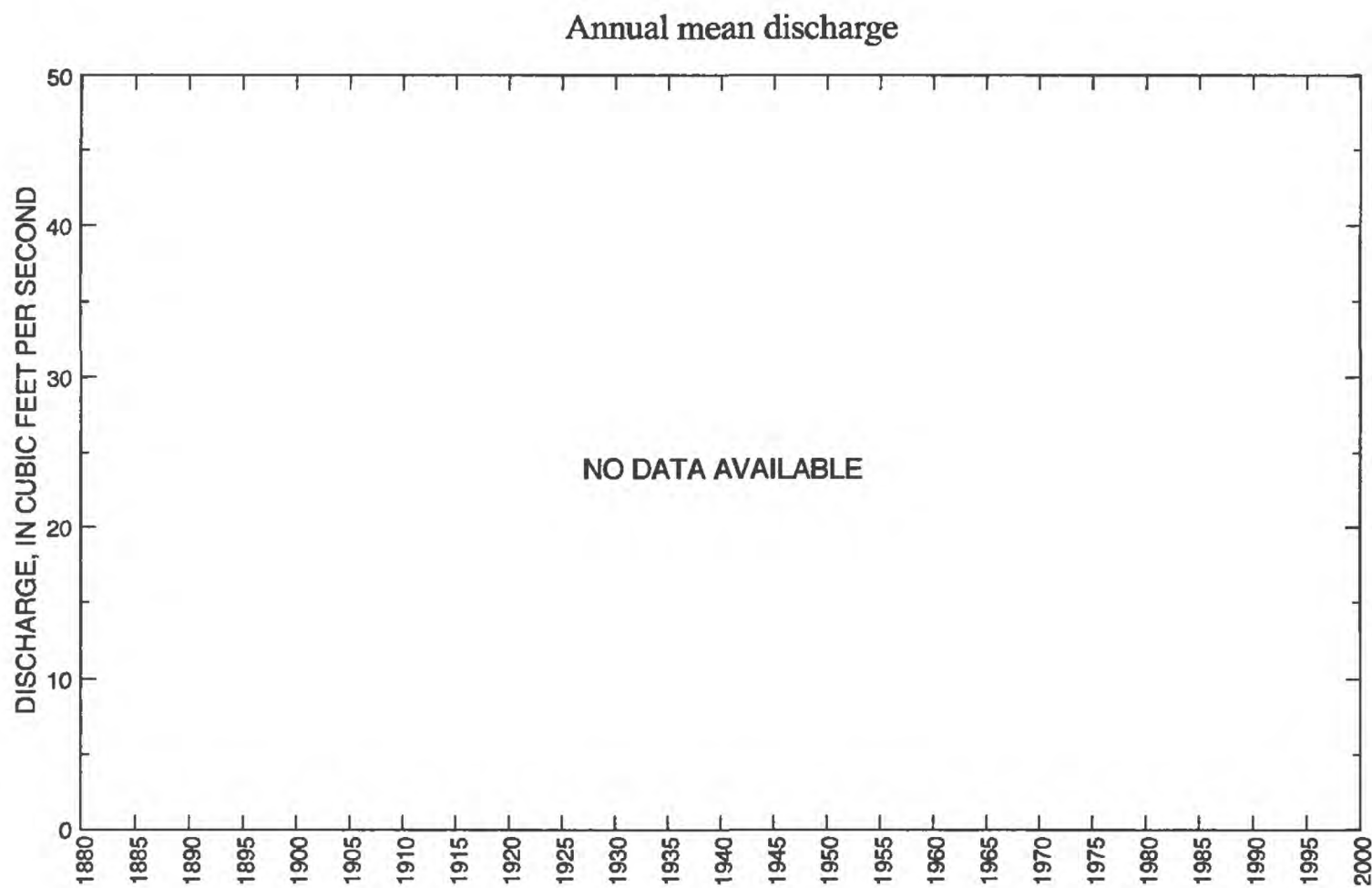
LOCATION.--Lat 47°17'46", long 96°26'09", in NE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec.13, T.144 N., R.46 W., Norman County, Hydrologic Unit 09020108, at bridge on County Highway 24 and 3.5 mi southeast of Ada.

DRAINAGE AREA.-- Unknown.

PERIOD OF RECORD.--Water year 1985 to current year.

GAGE.--Crest-stage gage.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,070 ft<sup>3</sup>/s, Apr. 6, 1989, gage height, 16.74 ft; maximum gage height, 19.38 ft, Apr. 3, 1997, backwater from ice.





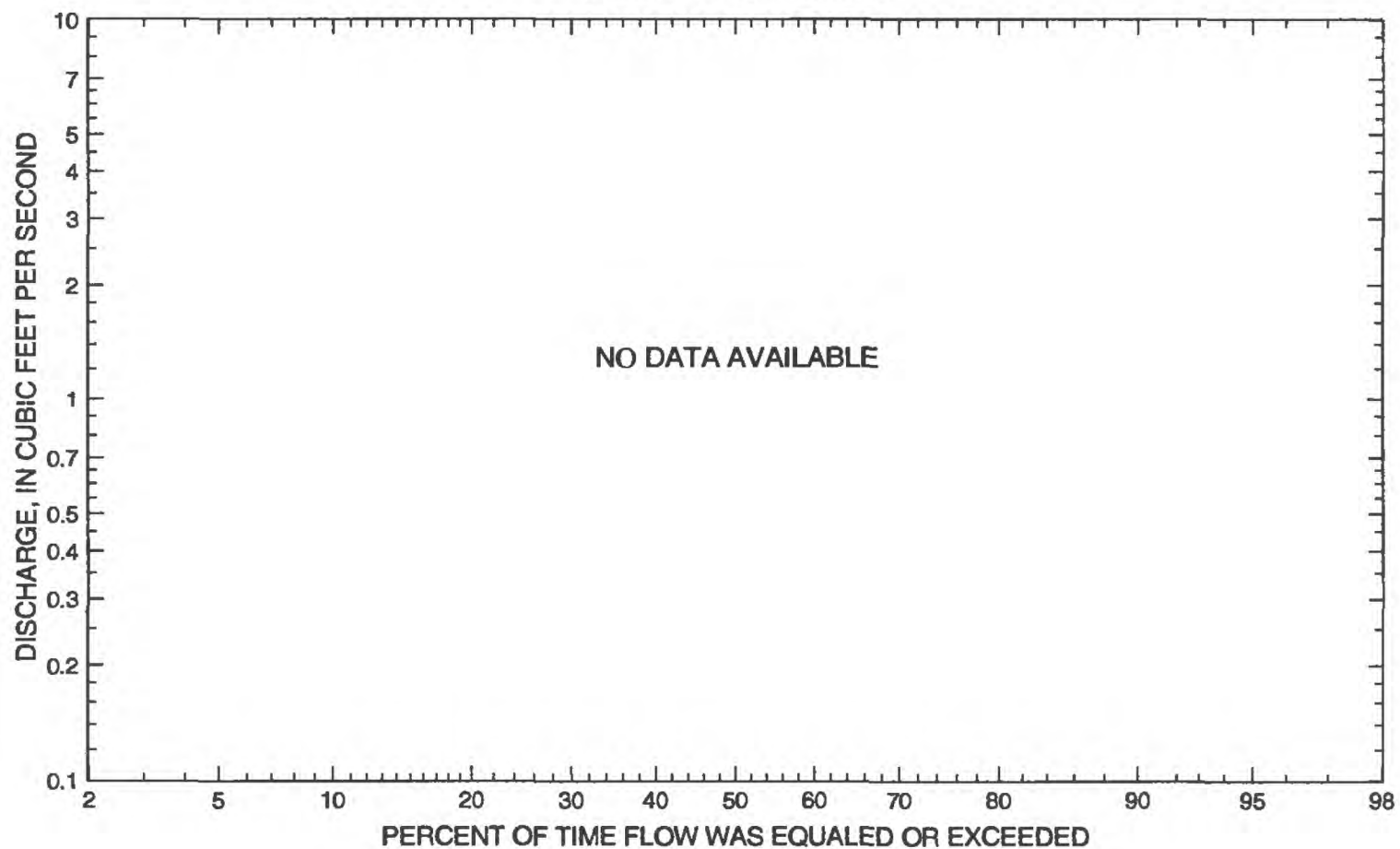
## 05067050 MARSH RIVER DITCH NEAR ADA, MN--Continued

Statistics of monthly and annual mean discharges

[--, no data]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	--	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
August	--	--	--	--	--	--	--	--
September	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--

Annual flow duration



05067050 MARSH RIVER DITCH NEAR ADA, MN--Continued

Monthly and annual flow duration, in cubic feet per second  
[--, no data]

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	--	--	--	--	--	--	--	--	--	--	--	--	--
90	--	--	--	--	--	--	--	--	--	--	--	--	--
85	--	--	--	--	--	--	--	--	--	--	--	--	--
80	--	--	--	--	--	--	--	--	--	--	--	--	--
75	--	--	--	--	--	--	--	--	--	--	--	--	--
70	--	--	--	--	--	--	--	--	--	--	--	--	--
65	--	--	--	--	--	--	--	--	--	--	--	--	--
60	--	--	--	--	--	--	--	--	--	--	--	--	--
55	--	--	--	--	--	--	--	--	--	--	--	--	--
50	--	--	--	--	--	--	--	--	--	--	--	--	--
45	--	--	--	--	--	--	--	--	--	--	--	--	--
40	--	--	--	--	--	--	--	--	--	--	--	--	--
35	--	--	--	--	--	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--	--	--	--

# 05067050 MARSH RIVER DITCH NEAR ADA, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given; --, no data]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	--	--	--	--
0.95	1.05	ng	--	--	--	--
0.90	1.11	ng	--	--	--	--
0.80	1.25	ng	--	--	--	--
0.50	2	ng <sup>1</sup>	--	--	--	--
0.20	5	ng <sup>1</sup>	--	--	--	--
0.10	10	ng <sup>1</sup>	--	--	--	--
0.04	25	ng <sup>1</sup>	--	--	--	--
0.02	50	ng <sup>1</sup>	--	--	--	--
0.01	100	ng <sup>1</sup>	--	--	--	--
0.005	200	ng <sup>1</sup>	--	--	--	--
0.002	500	ng <sup>1</sup>	--	--	--	--

<sup>1</sup>Statistic not given because of too many zero flow years in data base.

# 05067050 MARSH RIVER DITCH NEAR ADA, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)
Annual peak discharge, by year, and corresponding gage height							
1985	May 13	15.42	630	1992	--	--	0
1986	March 28	15.32	600	1993	July 27	14.44	140
1987	March 10	14.89	0	1994	--	--	0
1988	March 26	11.92	43.0	1995	March 15	13.39	78.0
1989	April 6	16.74	1,070	1996	April 14	17.39	950
1990	--	--	0	1997	April 3	19.38	--
1991	--	--	0				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1989	April 6	16.74	1,070	1987	March 10	14.89	0
1996	April 14	17.39	950	1990	--	--	0
1985	May 13	15.42	630	1991	--	--	0
1986	March 28	15.32	600	1992	--	--	0
1993	July 27	14.44	140	1994	--	--	0
1995	March 15	13.39	78.0	1997	April 3	19.38	--
1988	March 26	11.92	43.0				

05067050 MARSH RIVER DITCH NEAR ADA, MN--Continued

Monthly and annual mean discharges, in cubic feet per second  
[--, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
--	--	--	--	--	--	--	--	--	--	--	--	--	--



## 05067500 MARSH RIVER NEAR SHELLY, MN

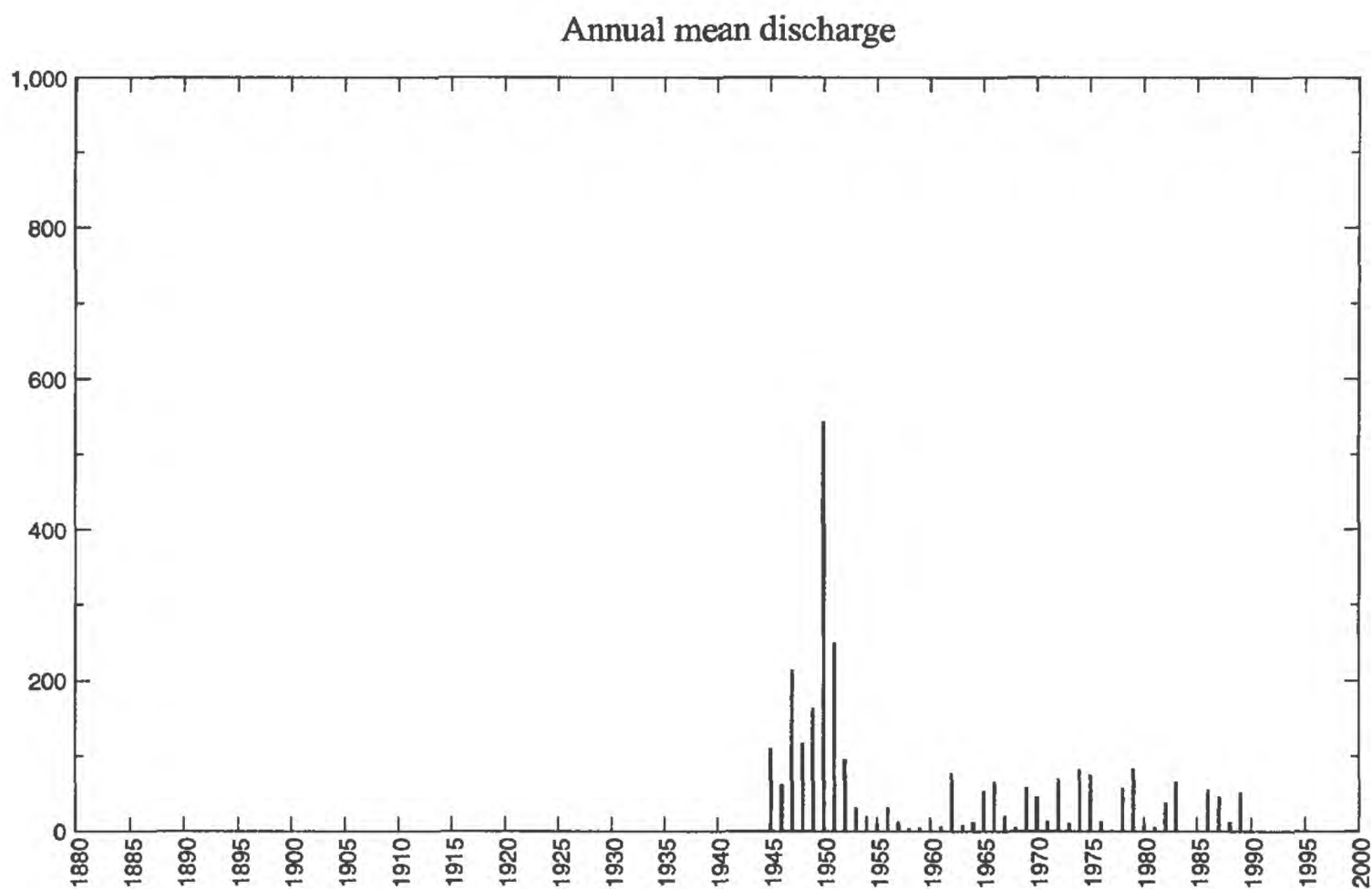
**LOCATION.**--Lat 47°24'45", long 96°45'50", NE<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec.3, T.145 N., R.48 W., Norman County, Hydrologic Unit 09020107, near center of span on downstream truss of bridge, 3.8 mi southeast of Shelly, and 10 mi upstream from mouth.

**DRAINAGE AREA.**--151 mi<sup>2</sup>.

**PERIOD OF RECORD.**--March 1944 to September 1983, April 1985 to current year. No winter records since 1989. Monthly discharge only for March 1944, published in Water Supply Paper 1308. Operated as a high-flow partial-record station October 1983 to March 1985.

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

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 4,880 ft<sup>3</sup>/s, Apr. 19, 1979, gage height, 23.36 ft, from floodmark; no flow at times.



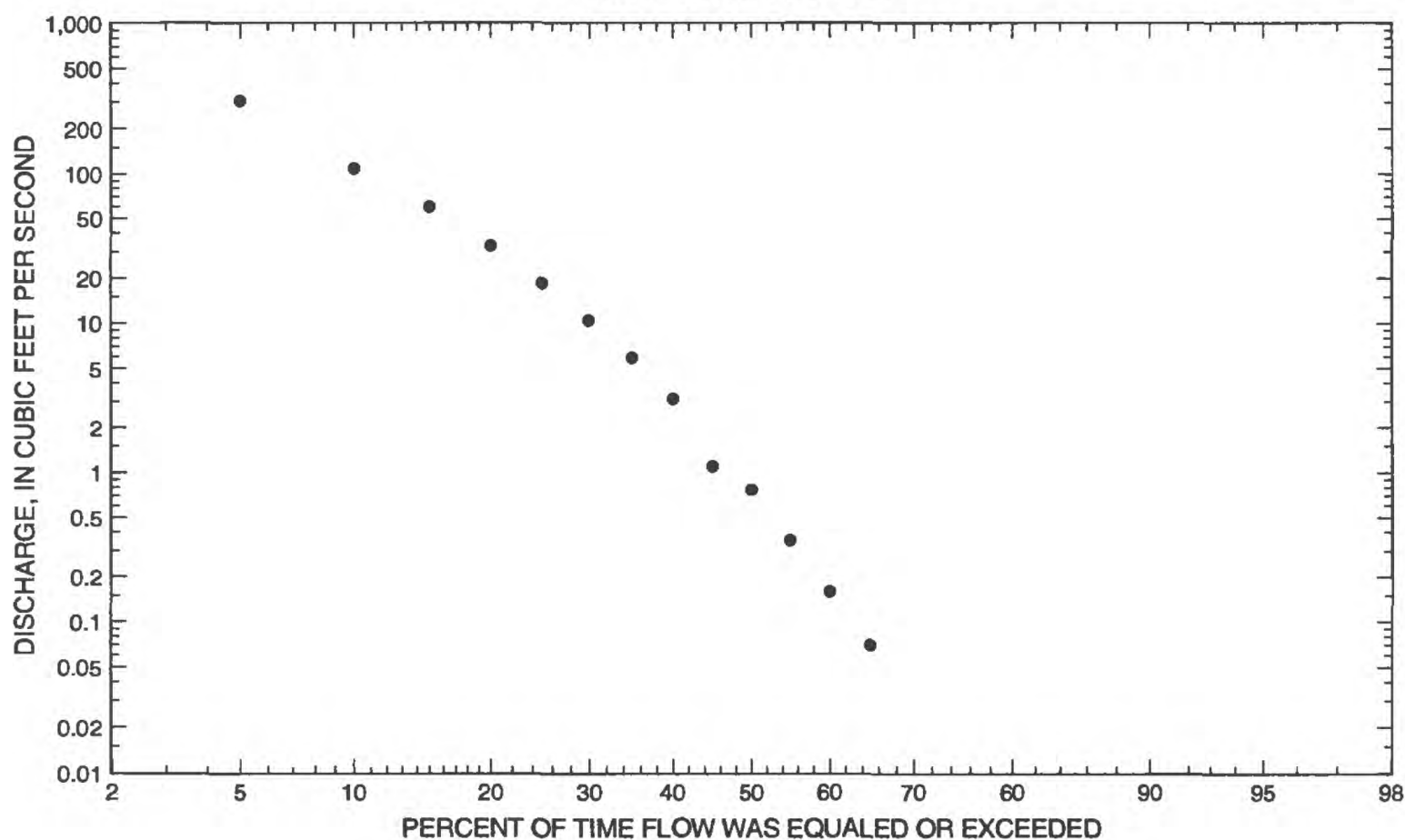
# 05067500 MARSH RIVER NEAR SHELLY, MN--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	130	1952	0	m	13.1	28.8	2.20	1.76	
November	102	1952	0	m	11.0	24.6	2.24	1.48	
December	77.1	1951	0	m	5.60	16.1	2.87	0.75	
January	64.5	1951	0	m	3.79	12.0	3.16	0.51	
February	62.1	1951	0	m	3.29	10.8	3.29	0.44	
March	437	1945	0	m	76.7	124	1.62	10.3	
April	1,540	1950	0.078	1981	311	381	1.22	41.8	
May	2,620	1950	0.866	1980	126	370	2.94	17.0	
June	1,030	1950	0	1980	82.9	179	2.16	11.2	
July	820	1950	0	m	77.4	153	1.97	10.4	
August	363	1949	0	m	19.7	57.4	2.91	2.65	
September	144	1944	0	m	12.5	30.6	2.45	1.68	
Annual	543	1950	1.24	1977	63.3	92.7	1.46	100	

Annual flow duration



# 05067500 MARSH RIVER NEAR SHELLY, MN--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	0.23	0.23	0	0	0	0	0	0	0	0
90	0	0	0	1.60	1.10	0.22	0	0	0	0	0	0	0
85	0	0	0	5.77	1.70	0.71	0	0	0	0	0	0	0
80	0	0	0	8.53	3.72	1.50	0.14	0	0	0	0	0	0
75	0	0	0	11.4	5.47	2.32	0.29	0	0	0	0	0	0
70	0	0	0	15.8	6.98	3.10	0.62	0	0	0	0	0	0
65	0	0	0.06	21.9	9.56	3.76	0.91	0	0	0	0	0	0.07
60	0	0	0.13	30.0	13.0	5.08	1.30	0.04	0	0	0.15	0	0.16
55	0	0	0.26	40.7	17.1	6.38	1.90	0.15	0.02	0.08	0.37	0.07	0.35
50	0	0	0.37	57.3	21.7	8.35	3.53	0.30	0.20	0.28	0.49	0.16	0.77
45	0.02	0	1.10	80.4	26.5	11.1	4.85	0.60	0.38	0.52	0.67	0.28	1.10
40	0.09	0.06	5.78	114	32.4	14.4	7.63	0.85	0.53	0.95	1.20	0.37	3.13
35	0.15	0.08	15.0	166	38.3	19.4	13.8	1.20	1.00	1.70	1.60	0.49	5.90
30	0.19	0.11	22.5	234	49.6	28.1	25.0	2.40	2.00	3.59	3.86	0.64	10.4
25	0.25	0.19	34.0	334	65.5	41.8	43.2	4.12	3.33	5.90	5.51	1.10	18.6
20	0.33	0.24	59.1	470	96.3	68.0	71.7	8.24	6.08	14.7	8.30	2.00	32.6
15	0.73	0.42	97.2	653	161	109	108	19.4	14.7	24.7	16.9	3.94	60.3
10	14.1	12.1	206	945	259	214	181	53.1	39.4	44.9	46.0	14.9	109
5	28.8	25.1	490	1,610	574	447	495	100	75.7	85.3	74.5	48.7	306

# 05067500 MARSH RIVER NEAR SHELLY, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	39.2	21.0	17.3	13.4	8.09
0.95	1.05	118	72.5	56.3	40.9	25.7
0.90	1.11	202	132	100	71.0	45.4
0.80	1.25	368	258	193	133	87.0
0.50	2	1,010	791	587	397	267
0.20	5	2,310	1,980	1,500	1,030	707
0.10	10	3,350	2,960	2,310	1,600	1,110
0.04	25	4,730	4,320	3,470	2,460	1,720
0.02	50	5,780	5,360	4,420	3,190	2,240
0.01	100	6,820	6,390	5,400	3,970	2,790
0.005	200	7,830	7,410	6,410	4,800	3,380
0.002	500	9,120	ng	ng	ng	ng

# 05067500 MARSH RIVER NEAR SHELLY, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1944	July 11	<sup>1</sup> 8.64	1,030	1971	April 1	10.11	619
1945	March 18	<sup>1</sup> 8.48	1,000	1972	April 15	16.26	2,070
1946	March 23	<sup>1</sup> 12.02	1,510	1973	March 16	9.30	366
1947	April 14	<sup>1</sup> 17.80	4,150	1974	April 15	18.87	2,460
1948	April 13	--	1,040	1975	April 19	17.81	2,330
1949	June 3	<sup>1</sup> 9.83	1,260	1976	March 31	11.32	785
1950	May 11	<sup>1</sup> 18.96	4,660	1977	April 10	4.13	42
1951	April 8	<sup>1</sup> 12.56	2,100	1978	April 9	19.22	2,240
1952	July 21	<sup>1</sup> 7.80	979	1979	April 19	23.36	4,880
1953	June 17	<sup>1</sup> 4.11	389	1980	April 3	9.99	615
1954	April 13	<sup>1</sup> 4.63	376	1981	May 23	11.03	896
1955	April 5	<sup>1</sup> 4.10	289	1982	April 2	13.06	1,070
1956	April 13	<sup>1</sup> 12.50	1,960	1983	March 8	13.84	1,240
1957	June 23	<sup>1</sup> 4.99	304	1984	June 11	16.17	2,260
1958	July 10	<sup>1</sup> 1.48	47	1985	May 13	13.23	1,380
1959	March 31	<sup>1</sup> 2.42	96	1986	March 30	14.59	1,720
1960	April 7	<sup>1</sup> 6.04	492	1987	July 24	15.80	1,730
1961	March 9	<sup>1</sup> 3.51	100	1988	March 26	7.86	250
1962	June 11	<sup>1</sup> 9.87	1,240	1989	April 7	21.18	3,490
1963	April 8	<sup>1</sup> 4.60	274	1990	June 2	6.65	254
1964	April 22	<sup>1</sup> 5.41	450	1991	May 23	11.88	1,120
1965	April 13	<sup>1</sup> 16.87	3,120	1992	March 8	10.36	430
1966	April 2	13.85	1,460	1993	April 2	13.78	660
1967	March 30	11.54	866	1994	September 19	11.50	995
1968	March 27	7.35	221	1995	March 29	15.21	1,500
1969	April 12	22.28	3,910	1996	April 15	19.01	2,100
1970	April 9	13.38	1,320	1997	April 18	25.45	4,300
Annual peak discharge, from highest to lowest, and corresponding gage height							
1979	April 19	23.36	4,880	1986	March 30	14.59	1,720
1950	May 11	<sup>1</sup> 18.96	4,660	1946	March 23	<sup>1</sup> 12.02	1,510
1997	April 18	25.45	4,300	1995	March 29	15.21	1,500
1947	April 14	<sup>1</sup> 17.80	4,150	1966	April 2	13.85	1,460
1969	April 12	22.28	3,910	1985	May 13	13.23	1,380
1989	April 7	21.18	3,490	1970	April 9	13.38	1,320
1965	April 13	<sup>1</sup> 16.87	3,120	1949	June 3	<sup>1</sup> 9.83	1,260
1974	April 15	18.87	2,460	1962	June 11	<sup>1</sup> 9.87	1,240
1975	April 19	17.81	2,330	1983	March 8	13.84	1,240
1984	June 11	16.17	2,260	1991	May 23	11.88	1,120
1978	April 9	19.22	2,240	1982	April 2	13.06	1,070
1951	April 8	<sup>1</sup> 12.56	2,100	1948	April 13	--	1,040
1996	April 15	19.01	2,100	1944	July 11	<sup>1</sup> 8.64	1,030
1972	April 15	16.26	2,070	1945	March 18	<sup>1</sup> 8.48	1,000
1956	April 13	<sup>1</sup> 12.50	1,960	1994	September 19	11.50	995
1987	July 24	15.80	1,730	1952	July 21	<sup>1</sup> 7.80	979



# 05067500 MARSH RIVER NEAR SHELLY, MN--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1981	May 23	11.03	896	1973	March 16	9.30	366
1967	March 30	11.54	866	1957	June 23	<sup>1</sup> 4.99	304
1976	March 31	11.32	785	1955	April 5	<sup>1</sup> 4.10	289
1993	April 2	13.78	660	1963	April 8	<sup>1</sup> 4.60	274
1971	April 1	10.11	619	1990	June 2	6.65	254
1980	April 3	9.99	615	1988	March 26	7.86	250
1960	April 7	<sup>1</sup> 6.04	492	1968	March 27	7.35	221
1964	April 22	<sup>1</sup> 5.41	450	1961	March 9	<sup>1</sup> 3.51	100
1992	March 8	10.36	430	1959	March 31	<sup>1</sup> 2.42	96
1953	June 17	<sup>1</sup> 4.11	389	1958	July 10	<sup>1</sup> 1.48	47
1954	April 13	<sup>1</sup> 4.63	376	1977	April 10	4.13	42

<sup>1</sup>Adjusted to current datum.

# 05067500 MARSH RIVER NEAR SHELLY, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1944	--	--	--	--	--	0.142	83.3	43.5	114.2	327.2	163.9	143.8	--
1945	19.0	11.8	3.56	0.823	0.350	437.2	629.4	184.5	22.4	7.24	2.61	1.83	110.3
1946	1.29	0.820	0.084	0	0	363.5	280.2	60.7	13.0	12.8	0.058	0.453	61.4
1947	3.99	1.68	0.510	0	0	22.0	1,273	424.3	607.5	129.9	65.9	56.0	214.2
1948	73.0	55.8	47.5	35.4	25.1	28.9	656.3	265.8	102.2	76.0	40.6	11.7	117.7
1949	10.8	19.8	17.8	18.2	14.9	18.1	216.7	198.3	411.5	585.2	362.7	74.2	163.4
1950	60.5	74.3	58.6	27.2	23.8	51.9	1,537	2,617	1,030	821.0	133.7	50.8	543.3
1951	118.4	85.7	77.1	64.5	62.1	107.0	1,190	714.6	301.7	102.5	60.7	122.5	250.2
1952	129.8	101.8	13.1	12.4	10.8	14.8	390.7	125.3	90.3	201.9	54.3	3.80	95.7
1953	1.30	0.877	0.681	0.174	0.132	52.1	46.5	38.5	100.7	119.6	6.61	1.64	30.9
1954	0.039	0.227	0.742	0.206	0.050	6.64	135.4	60.2	22.4	2.21	0.106	0	19.0
1955	0	0.053	0.106	0	0	0.484	69.5	9.39	14.9	17.6	11.2	0	10.2
1956	0	0	0	0	0	0.010	317.2	37.5	23.7	1.02	0.035	0.090	31.2
1957	0	0	0	0	0	40.5	35.5	10.3	41.6	17.2	0.906	5.17	12.6
1958	3.01	7.03	0.945	0	0.339	1.33	4.13	1.35	3.00	15.5	0.255	0	3.09
1959	0	0	0	0	0.007	18.3	19.9	6.75	4.96	1.27	0	0	4.28
1960	0	0	0	0	0	23.7	108.9	10.6	12.6	8.27	0.277	3.47	13.9
1961	0	0.117	0	0	0	35.6	12.9	25.0	3.03	0	0	0.013	6.46
1962	0.387	0	0	0	0	0.258	97.9	198.5	347.1	264.3	8.75	1.50	76.8
1963	0.687	1.60	0.713	0.155	0	20.6	33.7	11.6	32.7	0.445	0	0	8.49
1964	0	0	0	0	0	0	103.4	23.2	18.6	3.26	0.061	0.167	12.3
1965	0.077	0.123	0	0	0	0	573.3	25.9	29.7	21.0	3.63	3.76	54.2
1966	26.9	5.43	2.72	0.152	0.068	389.4	291.5	50.4	9.99	2.38	1.70	2.32	65.6
1967	0.210	0.030	0	0	0	60.1	143.6	30.1	9.92	1.17	0	0	20.4
1968	0	0	0	0	0	19.9	11.8	5.42	15.7	1.06	0	0	4.49
1969	0	0	0	0	0	0	608.5	31.4	24.7	42.8	3.19	2.34	58.8
1970	2.85	2.29	0.768	0.177	0.168	1.47	350.4	58.0	137.6	2.33	0.045	0.137	45.9
1971	0.255	0.563	0.023	0	0	46.7	100.7	5.39	2.76	0.458	0	0	13.0
1972	60.7	60.2	4.57	0.500	0	317.9	321.3	52.9	4.71	5.26	2.43	0.587	69.3
1973	0.837	0	0.278	0.098	0.078	84.1	10.3	4.21	0.741	0	0	25.6	10.6
1974	30.7	5.38	1.41	0.291	0.174	0.165	775.2	149.9	20.7	1.25	3.88	0.078	81.8
1975	0.232	6.35	0.593	0.235	0.121	0.128	552.8	86.0	17.0	230.1	0.889	0.009	74.4
1976	0.001	0.866	0.008	0	0.004	68.1	71.0	2.44	4.06	0.014	0	0	12.2
1977	0	0	0	0	0	2.79	10.2	1.36	0.565	0	0	0.004	1.24
1978	0.501	0.180	0.020	0.020	0.020	15.5	676.3	9.95	0.998	0.018	0.004	0	57.9

# 05067500 MARSH RIVER NEAR SHELLY, MN--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1979	0	0	0	0	0	0	894.8	43.7	13.4	53.4	1.43	0.087	83.0
1980	0	0.626	0.070	0.015	0	6.75	105.9	0.866	0	0	0.033	0	9.39
1981	0	0	0	0	1.36	1.30	0.078	47.7	3.92	1.18	0.199	4.64	5.09
1982	12.7	5.32	1.54	0.097	0.228	70.8	337.3	24.8	2.86	1.18	0.123	0	37.9
1983	12.0	7.46	5.04	1.33	0.790	342.4	68.8	4.34	247.1	55.7	20.5	18.5	65.6
1985	--	--	--	--	--	--	14.3	297.6	11.2	9.13	8.14	3.83	--
1986	4.61	1.82	0.568	0.445	0.400	164.2	321.9	135.5	19.3	18.4	4.19	0.547	56.1
1987	0.319	1.04	1.20	0.338	0.270	206.2	20.9	33.2	5.92	259.6	12.6	1.44	46.0
1988	0.745	0.706	0.626	0.197	0.164	81.9	49.7	1.56	0.100	0	2.92	5.68	12.1
1989	0.098	0.073	0	0	0	0.484	608.6	12.5	4.60	0.076	0	0	51.5
1990	4.43	--	--	--	--	--	28.1	3.57	30.7	5.15	0	0	--
1991	0	--	--	--	--	9.20	4.93	72.0	27.4	2.84	0.125	0	--
1992	0	--	--	--	--	63.7	6.35	2.73	17.4	28.7	20.6	21.9	--
1993	3.35	--	--	--	--	--	133.0	5.23	4.69	100.2	36.9	0.480	--
1994	--	--	--	--	--	--	109.8	32.3	92.9	124.6	1.83	91.9	--
1995	52.6	23.1	--	--	--	407.9	77.3	83.5	11.8	167.7	4.39	0.850	--
1996	17.8	--	--	--	--	--	644.2	223.5	11.4	2.83	0.182	0.023	--
1997	0.135	--	--	--	--	--	1,309	81.1	295.5	250.0	2.68	1.33	--

## 05069000 SAND HILL RIVER AT CLIMAX, MN

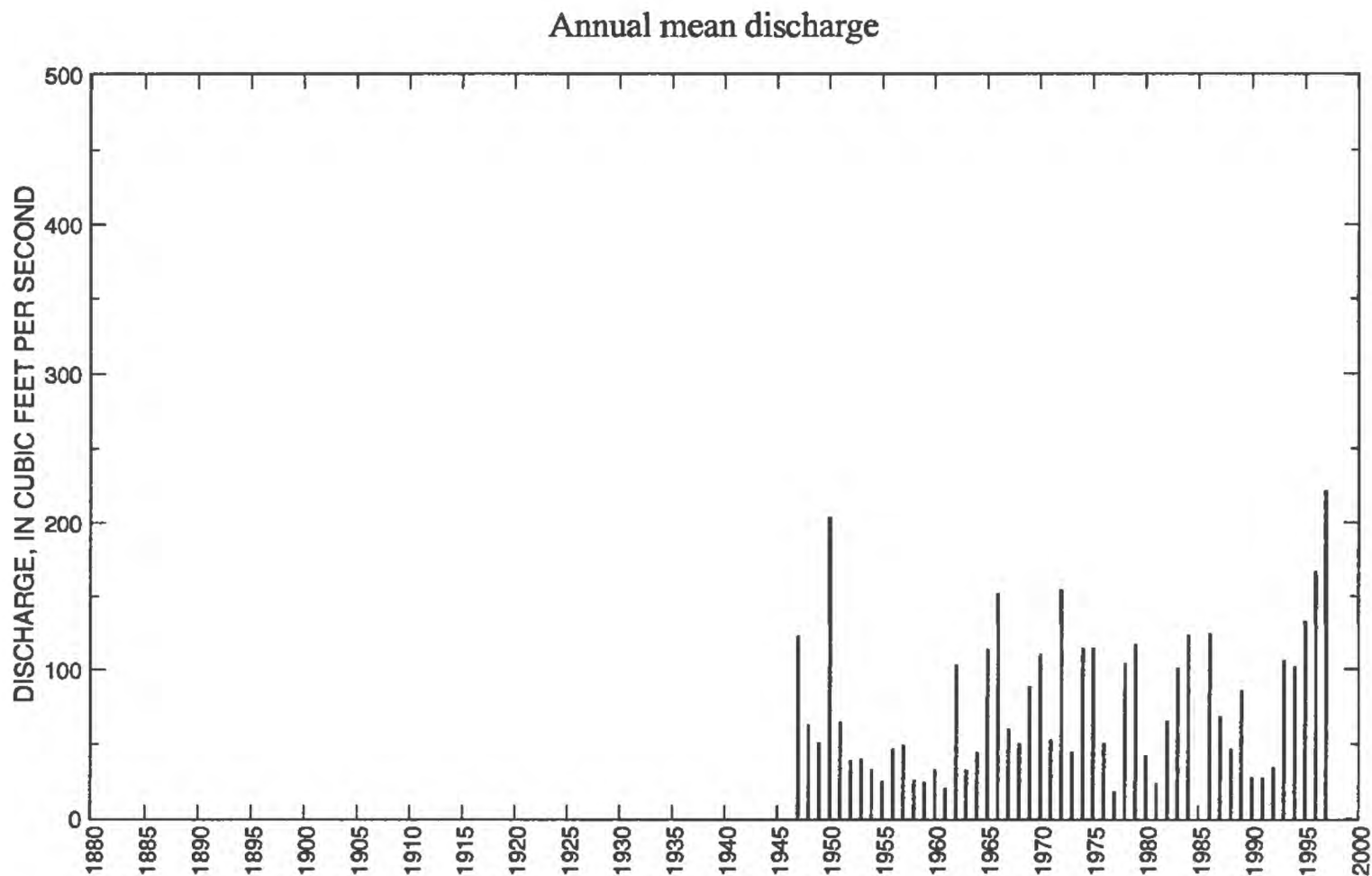
**LOCATION.**--Lat 47°36'43", long 96°48'52", in NE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec.30, T.148 N., R.48 W., Polk County, Hydrologic Unit 09020301, on left bank 25 ft upstream from bridge on U.S. Highway 75 in Climax and 3.7 mi upstream from mouth.

**DRAINAGE AREA.**--426 mi<sup>2</sup>.

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

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

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 4,560 ft<sup>3</sup>/s, Apr. 14, 1965, gage height, 17.81 ft; maximum gage height, 39.40 ft, Apr. 20, 1997, backwater from Red River of the North; minimum daily discharge, 1.0 ft<sup>3</sup>/s, Jan. 17-18, 1962.

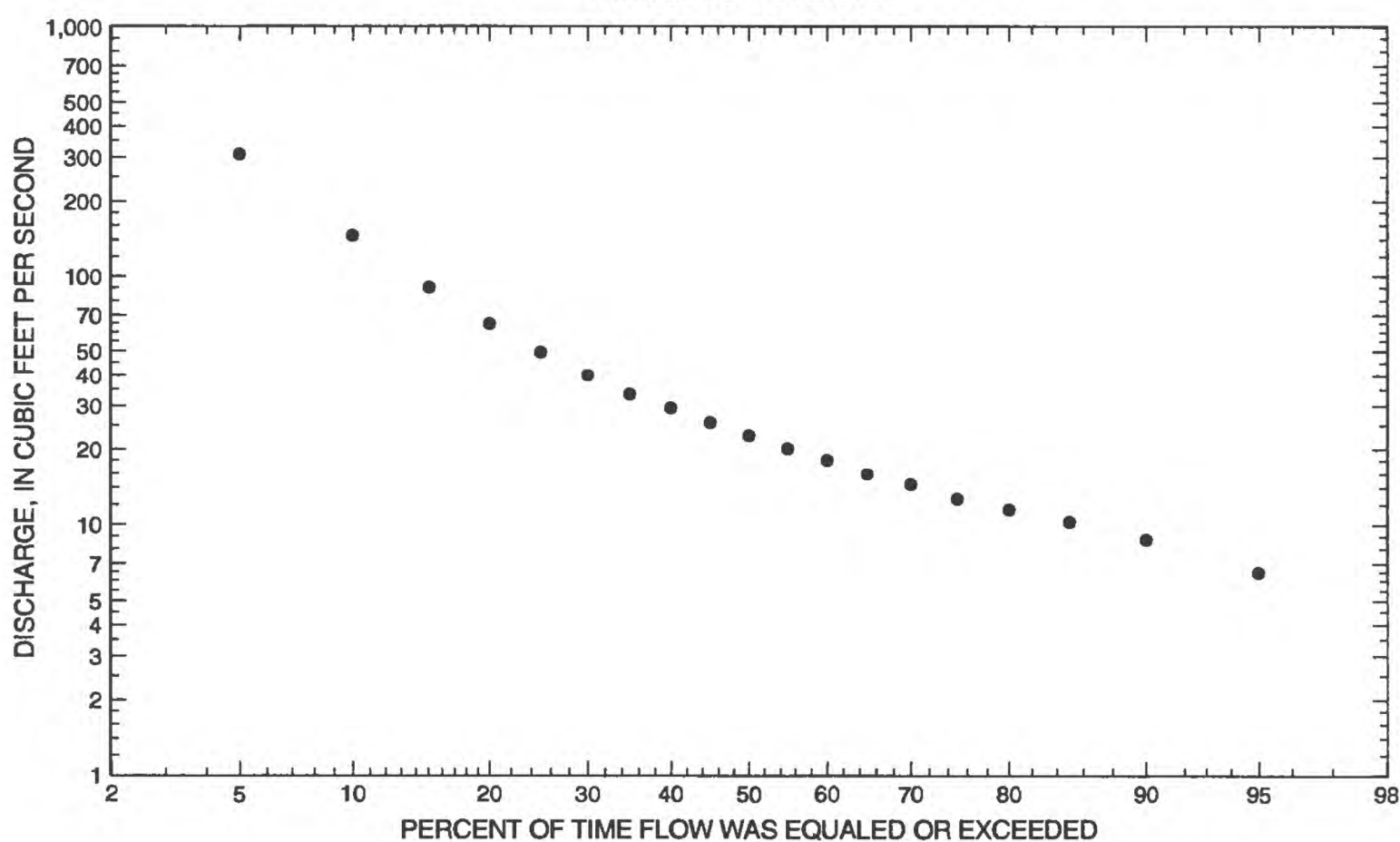


# 05069000 SAND HILL RIVER AT CLIMAX, MN--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	224	1972	9.43	1977	35.4	39.4	1.11	3.80	
November	209	1972	8.64	1956	29.0	29.1	1.00	3.11	
December	48.7	1972	5.11	1964	17.9	9.84	0.55	1.92	
January	31.5	1996	2.02	1962	13.2	6.73	0.51	1.42	
February	46.8	1984	3.55	1962	12.9	7.23	0.56	1.39	
March	455	1995	5.81	1948	79.7	104	1.31	8.56	
April	1,570	1997	25.3	1981	378	342	0.90	40.6	
May	1,160	1950	23.7	1958	124	163	1.31	13.3	
June	596	1984	11.5	1980	96.1	103	1.07	10.3	
July	478	1997	8.95	1980	79.0	98.3	1.24	8.49	
August	426	1993	6.30	1961	38.4	65.6	1.71	4.12	
September	124	1994	6.49	1955	27.2	24.6	0.91	2.92	
Annual	221	1997	18.4	1977	77.5	49.3	0.64	100	

Annual flow duration





# 05069000 SAND HILL RIVER AT CLIMAX, MN--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	4.50	4.90	6.62	24.7	24.7	15.7	10.2	6.69	6.50	9.35	10.2	5.80	6.48
90	5.00	5.40	8.10	33.9	30.0	20.1	13.5	8.12	8.45	11.1	11.6	7.80	8.70
85	6.20	6.80	8.74	43.8	33.3	23.4	15.4	8.91	9.70	12.0	12.7	8.60	10.3
80	6.80	6.80	10.5	54.2	36.3	26.1	17.1	10.6	10.5	12.9	13.9	10.3	11.5
75	7.60	7.60	11.8	63.5	39.8	29.3	18.7	11.6	11.8	13.9	15.0	10.9	12.7
70	8.50	8.73	13.0	76.3	43.6	33.1	20.9	13.0	12.8	14.9	16.1	11.6	14.4
65	9.90	9.84	14.0	90.7	48.1	37.2	23.7	14.2	13.9	16.6	17.4	12.3	15.9
60	11.2	11.1	15.1	106	53.8	40.5	27.0	15.7	15.0	18.7	19.1	13.3	18.0
55	11.8	11.8	17.8	127	60.9	43.8	30.5	17.2	16.1	20.2	20.8	14.4	20.1
50	12.4	12.3	19.9	154	70.2	48.3	34.4	19.0	17.5	21.6	22.6	15.4	22.7
45	13.0	12.8	22.0	187	78.3	52.9	38.9	21.1	18.9	23.1	24.8	16.3	25.6
40	13.8	13.4	25.5	229	88.2	60.0	43.9	23.6	20.3	24.6	26.6	17.5	29.3
35	14.7	14.1	29.6	281	99.9	67.6	49.5	26.7	22.3	27.4	28.4	19.4	33.5
30	15.7	14.7	36.2	344	114	75.9	59.0	30.1	24.8	30.4	30.3	22.0	40.0
25	17.4	15.9	49.4	409	132	88.5	69.7	34.1	29.7	34.3	32.4	24.5	49.5
20	19.1	17.5	71.9	520	160	111	87.6	40.4	36.5	42.6	35.7	26.5	64.6
15	21.3	18.8	106	678	191	145	118	49.4	45.4	59.1	41.8	28.9	90.1
10	24.1	21.9	208	961	240	211	184	64.2	59.9	78.5	48.0	32.7	145
5	28.1	25.2	401	1,570	346	337	332	113	82.7	107	62.0	36.9	309

# 05069000 SAND HILL RIVER AT CLIMAX, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	104	73.8	60.7	46.0	34.2
0.95	1.05	218	162	131	98.3	71.4
0.90	1.11	317	243	195	145	104
0.80	1.25	492	389	311	228	161
0.50	2	1,080	912	727	520	354
0.20	5	2,240	2,010	1,610	1,120	735
0.10	10	3,200	2,960	2,380	1,630	1,050
0.04	25	4,590	4,400	3,560	2,390	1,510
0.02	50	5,740	5,630	4,580	3,040	1,900
0.01	100	6,970	<sup>1</sup> 6,860	5,710	3,750	2,310
0.005	200	8,290	<sup>1</sup> 8,180	6,950	4,530	2,750
0.002	500	10,200	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

# 05069000 SAND HILL RIVER AT CLIMAX, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1943	April 7	10.48	941	1971	April 8	13.60	1,460
1944	August 18	--	226	1972	April 13	14.03	2,160
1945	April 11	9.18	767	1973	March 17	11.25	897
1946	March 27	--	675	1974	April 16	15.87	1,890
1947	April 19	13.28	1,840	1975	April 20	19.24	2,550
1948	April 14	--	1,640	1976	April 2	13.60	1,390
1949	June 1	10.40	990	1977	May 31	--	298
1950	April 22	16.31	3,040	1978	April 10	27.21	3,060
1951	April 11	11.90	1,250	1979	April 20	--	3,400
1952	April 12	9.52	544	1980	April 5	10.10	879
1953	March 29	--	219	1981	May 24	7.20	362
1954	June 15	--	489	1982	April 15	10.00	820
1955	April 8	10.35	842	1983	June 14	11.00	1,230
1956	April 20	10.72	1,370	1984	June 9	15.60	2,850
1957	June 29	7.06	481	1985	August 17	10.50	974
1958	July 5	--	168	1986	March 29	16.21	2,000
1959	April 2	7.64	310	1987	July 29	7.95	492
1960	April 6	8.80	460	1988	March 5	8.94	610
1961	March 25	4.86	140	1989	March 10	25.00	2,430
1962	July 8	11.70	1,570	1990	June 2	7.52	405
1963	April 7	6.34	300	1991	May 23	8.71	613
1964	April 17	9.40	730	1992	August 25	--	312
1965	April 14	17.81	4,560	1993	August 3	16.13	1,320
1966	April 2	17.33	4,220	1994	July 8	12.67	1,660
1967	March 30	14.46	2,060	1995	March 17	13.77	1,340
1968	June 7	12.71	1,400	1996	April 19	25.17	4,290
1969	April 14	24.57	4,180	1997	April 20	39.40	4,360
1970	April 16	13.64	1,980				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1965	April 14	17.81	4,560	1947	April 19	13.28	1,840
1997	April 20	39.40	4,360	1994	July 8	12.67	1,660
1996	April 19	25.17	4,290	1948	April 14	--	1,640
1966	April 2	17.33	4,220	1962	July 8	11.70	1,570
1969	April 14	24.57	4,180	1971	April 8	13.60	1,460
1979	April 20	--	3,400	1968	June 7	12.71	1,400
1978	April 10	27.21	3,060	1976	April 2	13.60	1,390
1950	April 22	16.31	3,040	1956	April 20	10.72	1,370
1984	June 9	15.60	2,850	1995	March 17	13.77	1,340
1975	April 20	19.24	2,550	1993	August 3	16.13	1,320
1989	March 10	25.00	2,430	1951	April 11	11.90	1,250
1972	April 13	14.03	2,160	1983	June 14	11.00	1,230
1967	March 30	14.46	2,060	1949	June 1	10.40	990
1986	March 29	16.27	2,000	1985	August 17	10.50	974
1970	April 16	13.64	1,980	1943	April 7	10.48	941
1974	April 16	15.87	1,890	1973	March 17	11.25	897

# 05069000 SAND HILL RIVER AT CLIMAX, MN--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1980	April 5	10.10	879	1960	April 6	8.80	460
1955	April 8	10.35	842	1990	June 2	7.52	405
1982	April 15	10.00	820	1981	May 24	7.20	362
1945	April 11	9.18	767	1992	August 25	--	312
1964	April 17	9.40	730	1959	April 2	7.64	310
1946	March 27	--	675	1963	April 7	6.34	300
1991	May 23	8.71	613	1977	May 31	--	298
1988	March 5	8.94	610	1944	August 18	--	226
1952	April 12	9.52	544	1953	March 29	--	219
1987	July 29	7.95	492	1958	July 5	--	168
1954	June 15	--	489	1961	March 25	4.86	140
1957	June 29	7.06	481				

# 05069000 SAND HILL RIVER AT CLIMAX, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1943	--	--	--	--	--	--	307.4	117.5	234.9	66.2	33.4	19.5	--
1944	18.4	17.1	--	--	--	--	63.8	58.7	58.3	98.0	125.3	72.6	--
1945	46.2	46.5	26.1	--	--	181.0	294.9	145.0	97.5	41.7	30.5	45.4	--
1946	57.6	34.4	--	--	--	145.3	225.2	74.6	42.4	32.3	12.9	18.7	--
1947	35.8	24.4	13.6	12.7	13.0	24.0	687.1	191.9	368.6	65.4	30.3	19.4	123.1
1948	19.3	18.6	11.3	8.74	6.45	5.81	511.0	75.9	34.7	33.8	22.3	12.7	62.8
1949	12.5	16.9	13.5	9.08	8.95	14.5	171.9	60.4	196.6	69.2	28.9	12.9	51.1
1950	24.0	27.5	18.0	11.0	7.00	9.90	818.5	1156	115.4	181.3	43.1	18.4	203.7
1951	32.5	21.8	16.0	14.0	12.0	10.8	428.7	131.5	44.6	20.3	18.4	25.6	64.4
1952	21.1	20.7	14.0	12.0	11.0	15.0	221.9	46.8	21.5	52.9	18.6	14.6	39.0
1953	18.8	20.7	13.3	7.90	10.8	68.4	99.2	65.9	80.3	49.7	28.6	16.3	40.1
1954	12.5	13.5	10.9	5.29	6.44	20.1	144.1	57.0	81.6	29.3	10.9	7.99	33.2
1955	10.8	12.9	8.32	6.81	7.36	7.42	150.2	31.5	34.4	15.6	12.4	6.49	25.2
1956	10.4	8.64	6.13	5.23	5.41	7.42	316.7	105.3	60.1	16.0	11.5	11.5	46.7
1957	13.6	20.4	10.4	8.52	7.54	48.6	120.3	41.1	118.6	130.5	23.6	52.0	49.6
1958	31.4	43.0	17.4	13.9	12.4	22.2	30.7	23.7	25.6	62.9	17.9	11.3	26.1
1959	12.9	17.5	7.24	4.81	3.84	36.9	78.6	68.2	27.5	16.5	14.3	7.89	24.8
1960	18.7	11.8	12.2	12.0	9.78	16.3	162.1	39.3	47.0	41.6	16.1	14.5	33.3
1961	11.8	16.2	8.38	6.71	7.28	64.3	52.8	41.7	13.3	10.2	6.30	9.83	20.8
1962	17.2	12.5	6.58	2.02	3.55	6.21	253.7	232.5	292.6	298.0	60.1	46.8	102.9
1963	36.0	32.4	17.4	9.25	4.94	37.4	94.4	47.2	57.5	33.4	12.1	10.6	32.8
1964	10.8	8.88	5.11	6.60	9.59	11.8	226.2	88.8	48.3	68.1	17.6	34.5	44.5
1965	24.8	19.6	11.5	10.8	8.34	10.6	916.7	135.5	126.0	54.9	25.4	30.7	113.7
1966	71.6	32.3	32.7	18.1	16.2	384.6	934.6	191.7	67.7	25.2	27.7	21.9	151.9
1967	18.9	12.3	10.5	12.5	14.3	90.0	340.9	102.4	73.0	26.5	12.7	12.1	60.3
1968	13.4	12.9	13.0	10.2	7.96	100.8	67.9	37.6	269.3	48.5	15.0	12.2	50.5
1969	21.0	19.4	12.6	4.70	5.64	7.50	669.0	129.7	103.2	50.0	20.4	24.8	88.4
1970	30.5	19.7	16.3	13.0	11.1	12.7	751.3	241.2	165.3	37.5	16.8	13.3	110.2
1971	25.0	30.4	11.3	11.6	12.5	43.3	345.1	61.3	36.5	17.3	10.5	33.2	52.8
1972	223.5	209.3	48.7	25.8	19.1	318.5	716.6	169.5	49.2	29.0	33.4	17.4	154.7
1973	22.5	32.7	12.7	11.0	12.2	228.1	51.1	37.5	22.5	12.2	12.6	80.3	44.9
1974	95.0	45.6	23.3	18.7	18.0	19.0	711.5	300.4	87.5	19.4	24.6	18.6	114.8
1975	18.5	33.9	17.0	11.9	13.7	23.5	756.1	220.8	48.9	182.3	35.3	18.6	114.8
1976	22.9	27.1	19.2	15.9	15.1	83.8	316.8	41.3	33.3	19.5	10.7	7.34	50.8
1977	9.43	10.2	8.91	7.86	8.18	18.9	51.6	32.6	40.6	10.9	6.96	15.4	18.4



# 05069000 SAND HILL RIVER AT CLIMAX, MN--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1978	21.1	26.3	27.9	18.3	13.2	37.2	946.0	63.4	53.5	21.6	15.3	17.2	104.1
1979	13.6	14.8	13.3	12.1	12.9	17.2	868.9	160.5	71.1	166.0	45.2	17.8	117.3
1980	18.0	28.1	24.0	19.2	21.3	42.9	280.0	33.5	11.5	8.95	10.2	11.1	42.1
1981	15.4	15.3	9.56	8.05	12.2	32.8	25.3	50.7	38.8	24.3	17.1	34.5	23.7
1982	59.5	35.4	22.3	12.1	10.3	49.9	347.5	144.4	35.7	42.4	12.7	10.2	65.2
1983	81.8	27.5	26.9	19.2	19.0	333.9	181.4	54.7	228.1	113.2	49.4	72.0	101.0
1984	70.2	49.9	35.9	26.8	46.8	201.5	336.8	55.5	595.8	44.6	17.0	11.8	123.5
1985	--	--	--	--	--	--	--	--	168.3	181.3	256.2	93.9	--
1986	88.1	47.0	38.1	30.1	22.9	217.4	579.4	269.1	69.5	82.9	26.8	21.2	124.6
1987	24.0	28.1	22.4	17.2	16.1	185.2	80.1	110.1	60.1	138.3	104.2	27.8	68.4
1988	26.5	27.2	24.5	20.3	16.4	126.4	209.1	37.1	36.4	13.8	9.88	14.0	46.7
1989	13.2	17.0	15.0	13.8	11.2	14.2	776.6	79.7	40.8	28.4	12.2	14.4	85.6
1990	14.9	14.5	7.08	8.58	11.3	59.7	88.6	39.3	58.9	16.8	8.05	7.73	27.9
1991	9.99	12.1	10.3	6.27	10.9	51.0	48.9	97.1	30.8	31.2	9.78	10.1	27.5
1992	12.9	10.7	10.0	10.5	14.1	80.2	53.9	36.3	20.4	28.3	53.3	84.9	34.6
1993	22.0	27.2	23.6	14.2	12.1	39.4	338.5	46.2	50.8	224.9	426.1	41.2	106.2
1994	22.7	21.6	25.2	17.4	14.0	52.5	221.7	105.3	175.0	375.5	63.7	123.6	101.9
1995	135.7	89.6	37.9	23.2	22.0	455.3	229.4	156.8	40.8	326.8	45.0	27.3	133.8
1996	135.5	55.3	36.3	31.5	28.7	31.1	1,167	370.8	90.6	33.3	20.0	17.7	167.1
1997	23.1	36.6	27.6	24.0	21.9	24.2	1,568	176.2	185.9	478.0	62.2	40.4	221.4

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

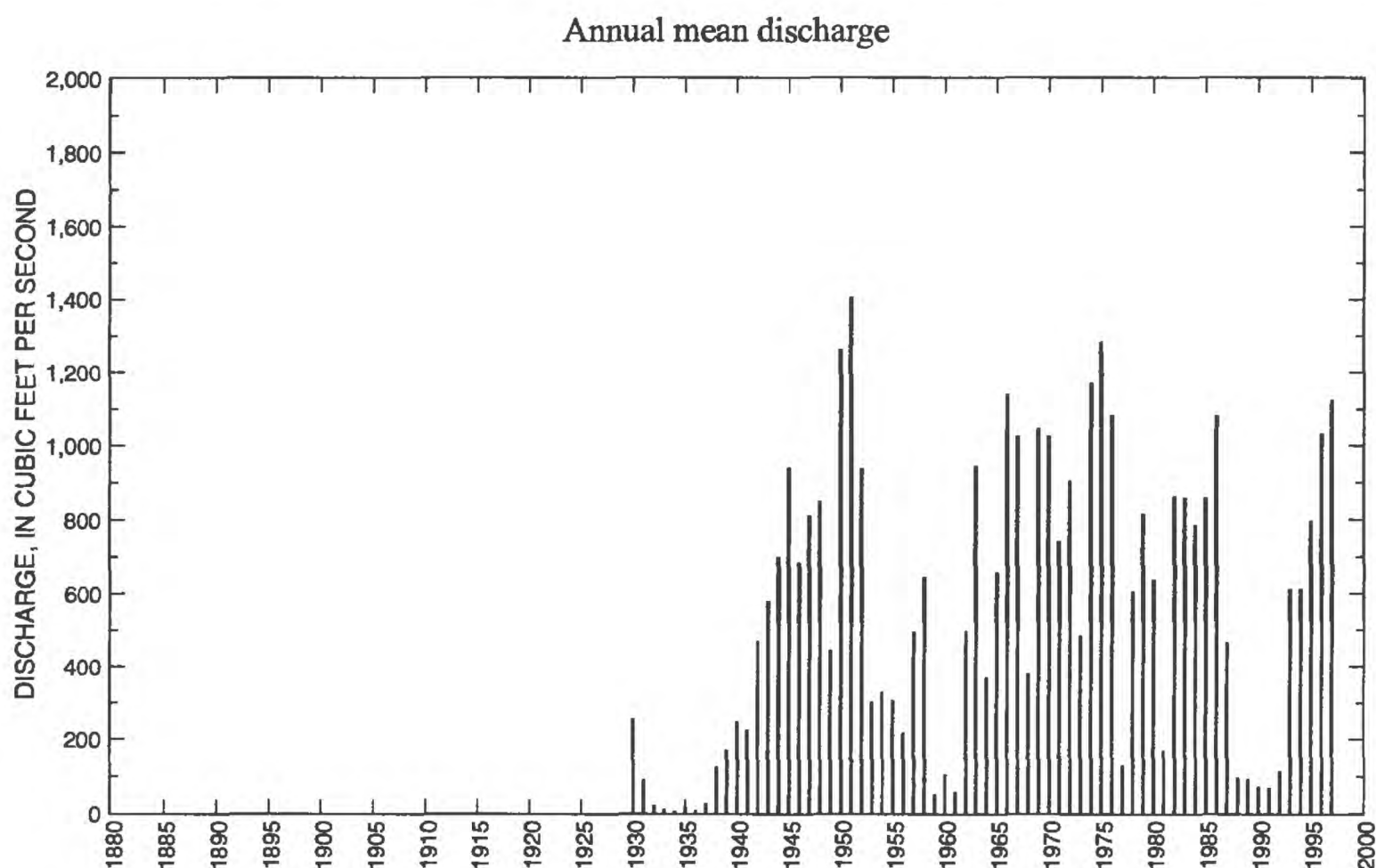
LOCATION.--Lat 48°02'34", long 95°48'28", in NW<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec.28, T.153 N., R.40 W., Pennington County, Hydrologic Unit 09020303, on left bank 50 ft upstream from highway bridge at High Landing, 7 mi south of Goodridge, and 33 mi upstream from Thief River.

DRAINAGE AREA.--2,300 mi<sup>2</sup>, approximately.

PERIOD OF RECORD.--September 1929 to current year. Prior to October 1930, published as "at Kratka".

GAGE.--Water-stage recorder. Datum of gage is 1,141.57 ft above sea level, adjustment of 1912 (levels by U.S. Army Corps of Engineers). See Water Supply Paper 1308 or 1738 for history of changes prior to Oct. 1, 1949.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 4,060 ft<sup>3</sup>/s, July 7, 1975, gage height, 13.39 ft; maximum gage height, 13.44 ft, July 3, 1975, backwater from ice; no flow at times.



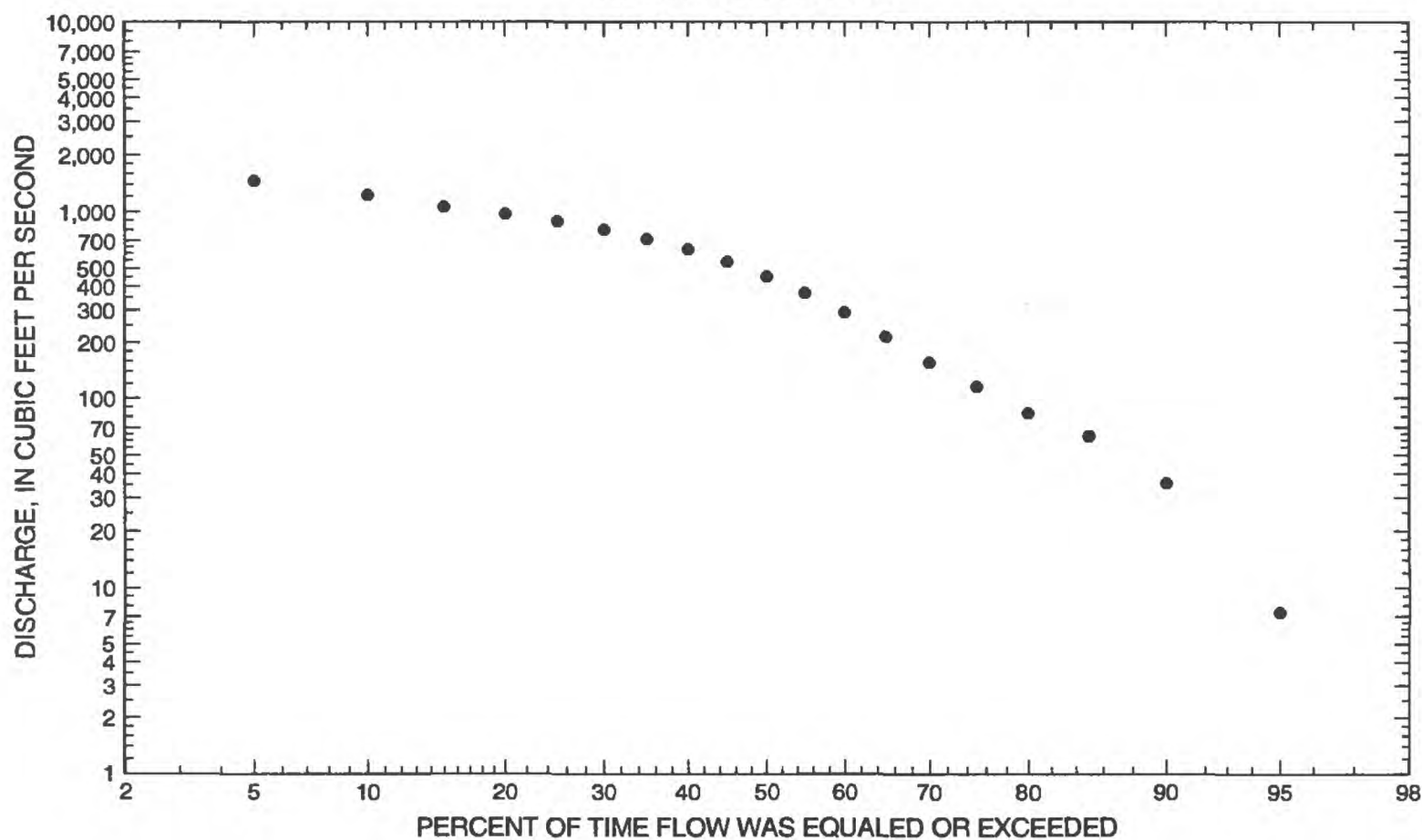
# 05075000 RED LAKE RIVER AT HIGH LANDING NEAR GOODRIDGE, MN--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of varlation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s))				
October	1,960	1951	2.11	1934	537	487	0.91	8.11	
November	1,730	1951	1.61	1934	508	421	0.83	7.69	
December	1,540	1951	0	1934	469	371	0.79	7.10	
January	1,420	1951	0	1934	466	372	0.80	7.05	
February	1,370	1951	0	m	463	370	0.80	7.01	
March	1,450	1951	0	m	504	396	0.78	7.62	
April	1,980	1951	24.7	1933	682	542	0.79	10.3	
May	3,180	1950	5.58	1933	676	610	0.90	10.2	
June	2,160	1950	1.04	1936	673	539	0.80	10.2	
July	2,470	1975	5.92	1934	588	509	0.87	8.89	
August	1,480	1975	0.026	1934	516	426	0.83	7.80	
September	1,730	1950	0	1934	531	445	0.84	8.02	
Annual	1,410	1951	6.21	1934	551	399	0.72	100	

Annual flow duration



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

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	1.40	0.76	2.00	29.9	19.8	8.90	12.6	8.64	3.85	7.28	6.82	4.50	7.40
90	33.5	29.3	44.0	58.8	42.6	32.0	37.8	29.4	24.3	31.7	37.6	29.8	35.7
85	60.8	54.9	74.4	82.9	60.0	66.4	68.7	66.1	56.5	61.4	64.0	50.9	63.2
80	74.3	68.3	104	108	78.2	88.7	93.9	88.4	72.1	80.1	79.0	71.0	83.8
75	107	112	134	151	96.8	119	118	106	101	117	118	107	116
70	141	137	175	196	140	200	156	137	156	155	159	148	156
65	184	188	217	259	263	286	202	195	231	201	208	202	217
60	252	252	277	346	331	377	277	277	306	256	262	274	290
55	335	353	350	436	449	477	383	359	374	312	334	356	370
50	466	446	424	537	550	620	525	440	439	378	408	460	455
45	520	506	500	635	650	746	632	522	514	450	501	528	543
40	575	564	577	729	752	868	706	602	589	547	589	576	631
35	635	633	661	817	861	943	781	681	701	663	658	624	717
30	705	705	749	903	996	1,020	857	768	816	807	727	706	803
25	775	768	825	1,000	1,130	1,090	935	856	901	909	815	788	891
20	849	826	896	1,160	1,250	1,170	1,010	944	986	1,010	907	849	980
15	929	885	967	1,340	1,360	1,310	1,090	1,050	1,070	1,100	1,020	911	1,070
10	1,010	968	1,090	1,570	1,480	1,460	1,280	1,160	1,220	1,270	1,140	972	1,230
5	1,090	1,100	1,220	1,940	1,800	1,610	1,490	1,270	1,390	1,450	1,360	1,120	1,460

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

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	41.4	34.5	25.7	20.9
0.95	1.05	202	145	124	99.0	80.6
0.90	1.11	328	260	225	184	150
0.80	1.25	559	483	424	356	293
0.50	2	1,340	1,260	1,120	974	820
0.20	5	2,660	2,480	2,240	1,970	1,710
0.10	10	3,570	3,200	2,910	2,550	2,260
0.04	25	4,660	3,960	3,610	3,150	2,850
0.02	50	5,400	4,410	4,020	3,500	3,200
0.01	100	6,070	4,770	4,360	3,770	3,490
0.005	200	6,690	5,060	4,620	3,990	3,720
0.002	500	7,410	ng	ng	ng	ng



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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1930	April 5	4.08	912	1964	October 24	7.32	1,170
1931	April 3	2.38	254	1965	April 13	11.42	2,740
1932	April 9	3.45	241	1966	April 3	12.68	3,340
1933	April 18	3.84	85.0	1967	March 30	10.84	2,480
1934	May 3	1.60	58.0	1968	July 18	11.98	2,770
1935	April 13	2.68	111	1969	April 10	10.49	2,320
1936	April 17	3.80	248	1970	June 16	9.90	2,120
1937	July 15	5.08	285	1971	April 8	10.54	1,610
1938	May 13	7.18	1,460	1972	May 29	8.75	1,580
1939	April 21	7.44	1,300	1973	September 25	7.93	1,290
1940	April 19	6.22	1,300	1974	April 28	11.07	2,670
1941	June 15	--	912	1975	July 7	13.39	4,060
1942	April 2	7.81	1,800	1976	October 25	8.56	1,890
1943	April 8	7.22	2,010	1977	May 19	5.31	667
1944	April 11	9.20	1,320	1978	April 8	11.93	2,440
1945	March 27	7.91	2,540	1979	April 25	12.30	3,660
1946	March 30	7.67	2,310	1980	April 5	9.05	1,500
1947	June 15	8.30	2,660	1981	June 29	5.71	577
1948	April 20	9.20	3,390	1982	April 15	10.37	1,800
1949	April 13	5.70	1,360	1983	October 12	8.54	1,510
1950	May 11	13.42	3,720	1984	June 9	10.03	2,210
1951	April 29	10.24	2,170	1985	August 18	11.61	2,490
1952	May 19	8.76	1,730	1986	April 29	10.82	2,470
1953	June 9	5.12	670	1987	May 26	6.48	961
1954	June 23	5.31	742	1988	April 4	7.75	600
1955	April 8	8.04	1,240	1989	April 14	7.55	600
1956	April 20	10.29	1,330	1990	March 13	5.65	150
1957	June 28	9.91	1,960	1991	July 13	5.32	154
1958	October 17	7.95	1,520	1992	April 21	--	390
1959	April 3	5.42	326	1993	July 26	10.74	1,860
1960	April 6	7.45	530	1994	July 8	10.66	2,020
1961	April 20	2.92	282	1995	March 19	11.58	2,720
1962	June 11	12.10	3,060	1996	April 19	12.64	3,100
1963	April 8	8.31	1,600	1997	April 15	10.73	2,260
Annual peak discharge, from highest to lowest, and corresponding gage height							
1975	July 7	13.39	4,060	1965	April 13	11.42	2,740
1950	May 11	13.42	3,720	1995	March 19	11.58	2,720
1979	April 25	12.30	3,660	1974	April 28	11.07	2,670
1948	April 20	9.20	3,390	1947	June 15	8.30	2,660
1966	April 3	12.68	3,340	1945	March 27	7.91	2,540
1996	April 19	12.64	3,100	1985	August 18	11.61	2,490
1962	June 11	12.10	3,060	1967	March 30	10.84	2,480
1968	July 18	11.98	2,770	1986	April 29	10.82	2,470

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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1978	April 8	11.93	2,440	1940	April 19	6.22	1,300
1969	April 10	10.49	2,320	1973	September 25	7.93	1,290
1946	March 30	7.67	2,310	1955	April 8	8.04	1,240
1997	April 15	10.73	2,260	1964	October 24	7.32	1,170
1984	June 9	10.03	2,210	1987	May 26	6.48	961
1951	April 29	10.24	2,170	1930	April 5	4.08	912
1970	June 16	9.90	2,120	1941	June 15	--	912
1994	July 8	10.66	2,020	1954	June 23	5.31	742
1943	April 8	7.22	2,010	1977	May 19	5.31	667
1957	June 28	9.91	1,960	1953	June 9	5.12	670
1976	October 25	8.56	1,890	1988	April 4	7.75	600
1993	July 26	10.74	1,860	1989	April 14	7.55	600
1942	April 2	7.81	1,800	1981	June 29	5.71	577
1982	April 15	10.37	1,800	1960	April 6	7.45	530
1952	May 19	8.76	1,730	1992	April 21	--	390
1971	April 8	10.54	1,610	1959	April 3	5.42	326
1963	April 8	8.31	1,600	1937	July 15	5.08	285
1972	May 29	8.75	1,580	1961	April 20	2.92	282
1958	October 17	7.95	1,520	1931	April 3	2.38	254
1983	October 12	8.54	1,510	1936	April 17	3.80	248
1980	April 5	9.05	1,500	1932	April 9	3.45	241
1938	May 13	7.18	1,460	1991	July 13	5.32	154
1949	April 13	5.70	1,360	1990	March 13	5.65	150
1956	April 20	10.29	1,330	1935	April 13	2.68	111
1944	April 11	9.20	1,320	1933	April 18	3.84	85.0
1939	April 21	7.44	1,300	1934	May 3	1.60	58.0

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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1930	253.0	232.9	206.5	154.8	118.5	239.6	486.8	566.3	388.2	228.5	126.0	86.6	258.0
1931	88.1	98.8	87.0	90.1	119.7	140.8	175.2	137.6	101.4	37.7	17.9	9.07	91.7
1932	21.9	44.0	23.3	29.5	11.9	17.0	67.7	11.2	5.81	12.3	11.8	3.86	21.7
1933	16.4	28.8	13.6	10.3	5.14	4.78	24.7	5.58	5.25	12.1	11.4	3.56	11.8
1934	2.11	1.61	0	0	0	0.513	25.8	26.5	11.9	5.92	0.026	0	6.21
1935	6.90	10.1	4.77	2.00	1.05	17.8	47.2	47.5	37.3	16.1	6.22	7.38	17.1
1936	6.64	4.45	2.69	0.487	0	0	67.7	11.4	1.04	7.27	0.394	1.84	8.60
1937	7.36	2.41	1.36	0.206	0	0	38.6	35.5	17.2	80.3	86.7	46.0	26.5
1938	21.8	28.6	21.5	25.1	28.4	110.5	41.1	735.5	129.8	116.5	93.5	134.7	125.1
1939	140.3	136.3	138.7	126.5	108.9	119.0	320.0	262.1	240.7	136.8	113.9	198.3	170.0
1940	232.3	217.7	181.3	179.0	186.6	211.6	510.7	433.7	378.0	172.6	141.9	148.9	249.2
1941	162.8	187.2	184.2	189.7	187.5	204.8	330.3	110.2	509.9	95.5	210.4	355.2	226.3
1942	325.6	531.8	369.7	415.5	414.3	628.7	860.3	748.7	502.4	188.9	180.3	481.8	469.8
1943	271.4	343.9	333.5	340.6	345.0	354.8	1,052	846.2	964.9	570.7	749.0	790.7	579.9
1944	747.3	672.7	497.7	488.7	524.1	508.7	794.3	746.0	962.9	771.2	769.0	908.2	698.7
1945	876.6	1,063	948.4	716.8	714.3	1,274	1,601	1,274	1,010	691.3	497.5	617.6	940.8
1946	785.8	672.9	553.2	550.0	503.6	881.9	1,253	971.0	794.4	449.5	367.5	421.4	684.1
1947	525.6	539.5	467.1	455.5	409.3	404.5	1,197	1,304	1,936	846.5	719.3	945.2	812.1
1948	1,046	886.1	764.5	687.1	569.0	637.1	1,790	1,467	884.1	613.7	447.5	399.5	849.3
1949	369.5	346.2	283.9	274.8	268.6	384.5	753.5	570.4	655.8	384.5	522.5	524.6	445.0
1950	619.2	566.6	521.6	517.7	473.6	531.0	1,559	3,179	2,161	1,869	1,388	1,733	1,264
1951	1,955	1,730	1,539	1,424	1,366	1,453	1,980	1,791	1,573	1,158	453.1	463.8	1,407
1952	464.2	600.3	856.8	1,072	1,068	1,055	948.2	1,354	1,433	1,253	621.4	533.1	938.2
1953	372.4	285.6	309.9	311.0	328.5	331.2	163.8	258.6	405.8	288.7	305.8	290.4	304.3
1954	250.0	204.3	226.1	216.9	227.0	229.5	389.0	420.8	585.7	569.0	368.4	268.6	330.1
1955	252.2	326.7	325.3	273.6	297.4	327.7	549.3	307.6	278.4	276.9	261.2	231.9	308.7
1956	196.9	148.7	145.1	148.4	150.1	153.4	556.2	370.7	195.1	170.6	186.5	189.0	217.3
1957	236.7	245.3	207.7	184.4	146.2	227.6	325.6	98.3	671.2	1,252	1,180	1,140	494.6
1958	1,467	1,304	658.8	669.1	653.5	878.4	722.2	312.2	333.7	441.2	233.8	56.7	644.5
1959	43.6	35.9	38.5	47.1	45.9	66.4	120.0	45.5	36.4	43.4	49.1	38.8	50.9
1960	149.4	142.8	146.9	136.0	126.3	138.4	229.2	40.1	49.9	42.3	38.7	18.3	104.7
1961	83.0	108.4	37.3	36.5	32.3	62.4	95.9	33.5	41.0	48.8	32.8	76.8	57.3
1962	122.2	86.9	45.7	47.8	48.9	47.7	205.5	487.5	1,469	1,136	1,017	1,235	496.7
1963	1,401	1,210	863.2	900.6	886.8	915.5	1,036	1,014	1,003	677.0	618.6	830.1	946.0
1964	1,068	586.5	535.9	498.8	470.3	289.4	264.1	162.4	235.0	144.1	100.2	94.4	371.0



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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1965	276.3	546.5	593.5	591.6	592.0	615.5	1,021	610.5	788.5	778.8	681.5	799.8	657.1
1966	1,044	991.0	1,014	977.7	966.4	968.4	1,623	1,683	1,229	989.2	1,046	1,139	1,139
1967	1,130	1,057	941.3	922.3	1,003	1,136	1,186	1,292	1,181	903.1	782.0	792.3	1,027
1968	422.2	352.7	264.0	224.9	205.9	253.0	93.4	43.4	271.5	1,080	662.9	672.8	380.2
1969	575.8	822.8	1,018	1,086	1,167	1,125	1,395	1,311	1,230	920.3	810.5	1,170	1,050
1970	1,309	1,122	990.3	952.4	918.0	898.1	861.6	1,316	1,257	892.9	830.9	1,004	1,030
1971	818.9	715.7	676.3	656.0	743.4	869.0	803.9	943.7	927.6	683.8	632.7	408.6	740.2
1972	512.0	711.5	741.2	843.5	896.6	904.7	1,017	1,123	1,060	784.1	1,104	1,170	904.8
1973	964.8	687.7	559.9	520.1	564.8	539.9	207.1	399.8	300.3	189.4	233.9	641.1	483.7
1974	989.4	1,072	858.5	874.2	905.0	814.0	1,346	1,813	1,363	1,428	1,283	1,290	1,171
1975	1,387	1,146	914.2	789.4	727.9	692.8	1,229	1,397	1,545	2,474	1,478	1,579	1,284
1976	1,791	1,377	816.8	1,127	1,040	966.5	1,115	1,199	1,062	855.9	971.4	674.1	1,083
1977	231.4	172.0	125.9	119.2	126.6	136.1	113.0	123.1	90.8	105.5	95.3	110.9	129.3
1978	244.4	304.4	440.4	510.5	525.9	544.8	1,085	657.3	975.5	1,005	607.3	370.8	605.8
1979	385.5	433.1	410.0	410.0	415.1	426.1	1,335	1,345	1,261	1,224	1,117	1,031	817.3
1980	964.7	748.1	821.0	821.4	845.2	847.4	784.5	674.1	628.5	246.9	160.7	104.2	636.9
1981	80.6	78.3	60.1	60.3	71.3	103.0	82.0	75.9	123.1	361.5	457.5	457.5	168.2
1982	777.0	800.9	722.3	680.0	682.9	717.4	665.3	1,149	1,081	1,116	1,017	940.8	863.7
1983	1,285	1,036	946.8	944.4	849.6	542.9	825.5	772.7	822.3	791.5	703.9	808.7	860.8
1984	591.9	947.6	804.2	773.5	814.8	824.5	879.4	645.3	756.7	1,009	809.3	575.4	785.8
1985	280.0	524.5	849.7	893.2	890.0	915.7	510.7	847.0	1,178	907.4	1,396	1,122	859.5
1986	1,199	966.0	779.0	805.2	824.6	1,048	1,641	1,391	1,286	1,042	990.1	1,000	1,082
1987	713.3	595.6	696.8	702.3	662.1	577.5	280.8	286.5	315.8	221.9	277.9	269.5	466.2
1988	104.5	91.6	86.7	84.4	84.6	123.6	186.4	82.7	91.5	78.6	87.4	75.7	98.1
1989	69.5	72.3	74.0	75.0	73.0	73.5	251.2	89.5	94.1	89.9	91.2	73.6	93.8
1990	60.5	62.4	62.6	62.8	64.1	90.4	78.3	74.6	88.4	79.2	73.8	66.1	72.0
1991	60.0	61.6	61.8	62.0	62.1	81.7	69.2	72.3	66.4	94.7	73.2	63.7	69.2
1992	69.1	58.7	58.8	61.5	63.3	132.8	226.1	125.1	88.6	108.1	111.4	262.3	113.6
1993	201.7	152.1	540.8	540.0	536.8	624.2	610.9	640.8	867.3	924.5	911.5	786.6	612.1
1994	837.3	618.8	609.0	600.8	607.9	498.5	277.8	393.5	702.6	685.2	721.8	806.2	613.5
1995	840.1	720.7	794.2	768.4	804.3	1,252	895.9	944.3	546.6	853.4	673.2	458.9	797.5
1996	523.0	913.7	903.2	883.9	993.1	1,019	1,559	1,356	1,185	1,100	1,045	945.8	1,035
1997	1,158	985.7	1,139	1,077	945.4	1,061	1,523	876.2	1,264	1,137	1,205	1,125	1,125

## 05075700 MUD RIVER NEAR GRYGLA, MN

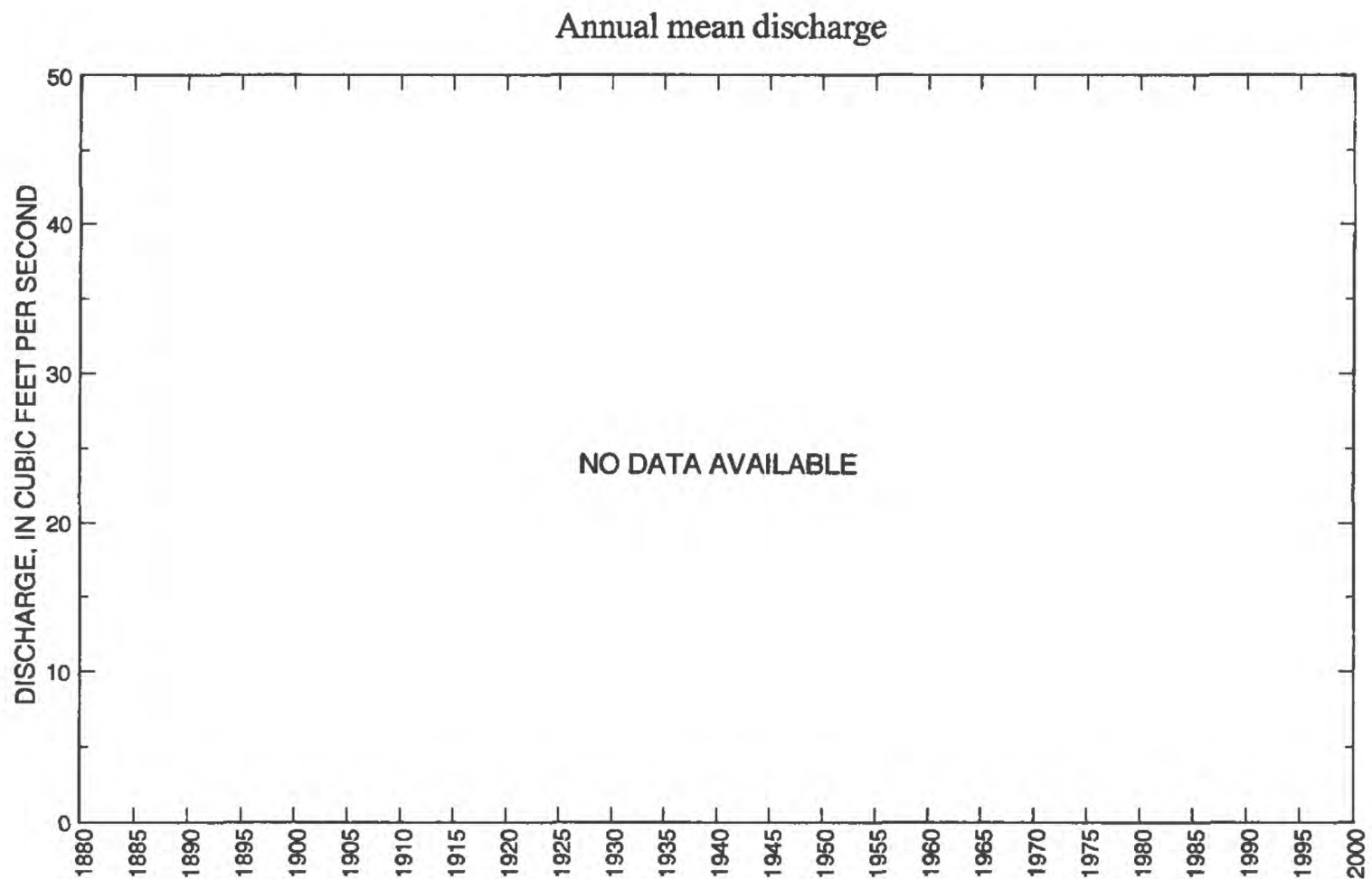
LOCATION.--Lat 48°19'31", long 95°44'35", in NE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec.23, T.156 N., R.40 W., Marshall County, Hydrologic Unit 09020304, at bridge on State Highway 89 and 6 mi west of Grygla.

DRAINAGE AREA.--150 mi<sup>2</sup>.

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

GAGE.--Crest-stage gage.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,950 ft<sup>3</sup>/s, Apr. 19, 1996, gage height, 18.57 ft; maximum gage height, 19.00 ft, Apr. 16, 1997, backwater from ice.





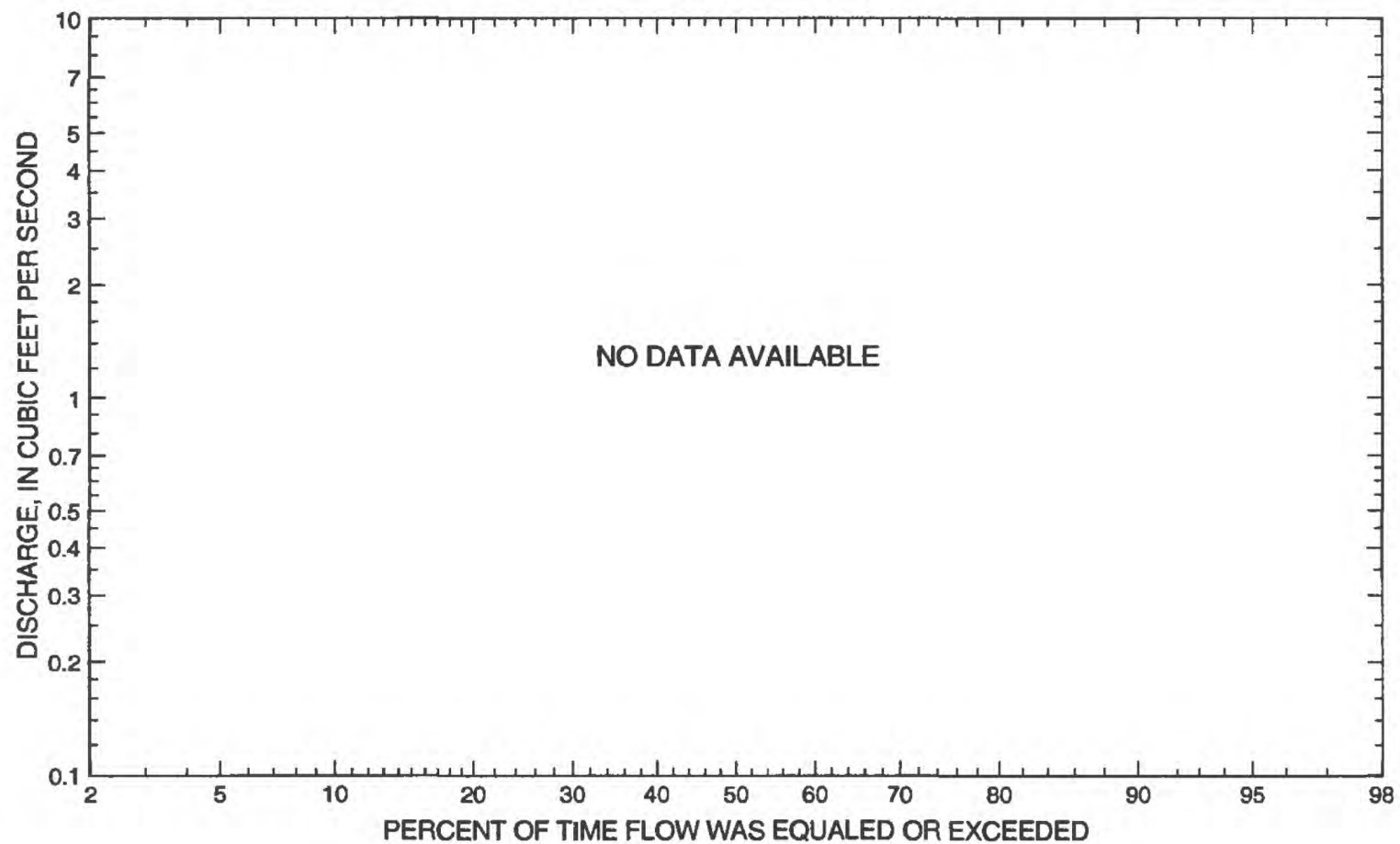
## 05075700 MUD RIVER NEAR GRYGLA, MN--Continued

Statistics of monthly and annual mean discharges

[--, no data]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	--	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
August	--	--	--	--	--	--	--	--
September	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--

Annual flow duration



# 05075700 MUD RIVER NEAR GRYGLA, MN--Continued

Monthly and annual flow duration, in cubic feet per second  
[--, no data]

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	--	--	--	--	--	--	--	--	--	--	--	--	--
90	--	--	--	--	--	--	--	--	--	--	--	--	--
85	--	--	--	--	--	--	--	--	--	--	--	--	--
80	--	--	--	--	--	--	--	--	--	--	--	--	--
75	--	--	--	--	--	--	--	--	--	--	--	--	--
70	--	--	--	--	--	--	--	--	--	--	--	--	--
65	--	--	--	--	--	--	--	--	--	--	--	--	--
60	--	--	--	--	--	--	--	--	--	--	--	--	--
55	--	--	--	--	--	--	--	--	--	--	--	--	--
50	--	--	--	--	--	--	--	--	--	--	--	--	--
45	--	--	--	--	--	--	--	--	--	--	--	--	--
40	--	--	--	--	--	--	--	--	--	--	--	--	--
35	--	--	--	--	--	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--	--	--	--

# 05075700 MUD RIVER NEAR GRYGLA, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given; --, no data]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /a)	Maximum mean discharge (ft <sup>3</sup> /a)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	--	--	--	--
0.95	1.05	ng	--	--	--	--
0.90	1.11	436	--	--	--	--
0.80	1.25	541	--	--	--	--
0.50	2	811	--	--	--	--
0.20	5	1,200	--	--	--	--
0.10	10	1,470	--	--	--	--
0.04	25	1,820	--	--	--	--
0.02	50	2,080	--	--	--	--
0.01	100	2,350	--	--	--	--
0.005	200	2,620	--	--	--	--
0.002	500	2,990	--	--	--	--

# 05075700 MUD RIVER NEAR GRYGLA, MN--Continued

## Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1979	April 26	18.49	1,480	1989	April 16	16.93	1,000
1980	April 6	16.38	670	1990	April 16	11.39	90.0
1981	June 28	15.12	455	1991	May 23	13.44	450
1982	April 15	16.90	800	1992	April 21	16.10	740
1983	June 23	16.34	670	1993	July 26	17.95	1,240
1984	June 8	16.55	715	1994	July 8	17.02	1,150
1985	June 28	17.19	1,330	1995	March 27	14.79	450
1986	March 30	17.47	960	1996	April 19	18.57	1,950
1987	March 23	16.13	644	1997	April 16	19.00	1,400
1988	April 4	14.62	450				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1996	April 19	18.57	1,950	1984	June 8	16.55	715
1979	April 26	18.49	1,480	1980	April 6	16.38	670
1997	April 16	19.00	1,400	1983	June 23	16.34	670
1985	June 28	17.19	1,330	1987	March 23	16.13	644
1993	July 26	17.95	1,240	1981	June 28	15.12	455
1994	July 8	17.02	1,150	1988	April 4	14.62	450
1989	April 16	16.93	1,000	1991	May 23	13.44	450
1986	March 30	17.47	960	1995	March 27	14.79	450
1982	April 15	16.90	800	1990	April 16	11.39	90.0
1992	April 21	16.10	740				

05075700 MUD RIVER NEAR GRYGLA, MN--Continued

Monthly and annual mean discharges, in cubic feet per second  
[--, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
--	--	--	--	--	--	--	--	--	--	--	--	--	--



## 05076000 THIEF RIVER NEAR THIEF RIVER FALLS, MN

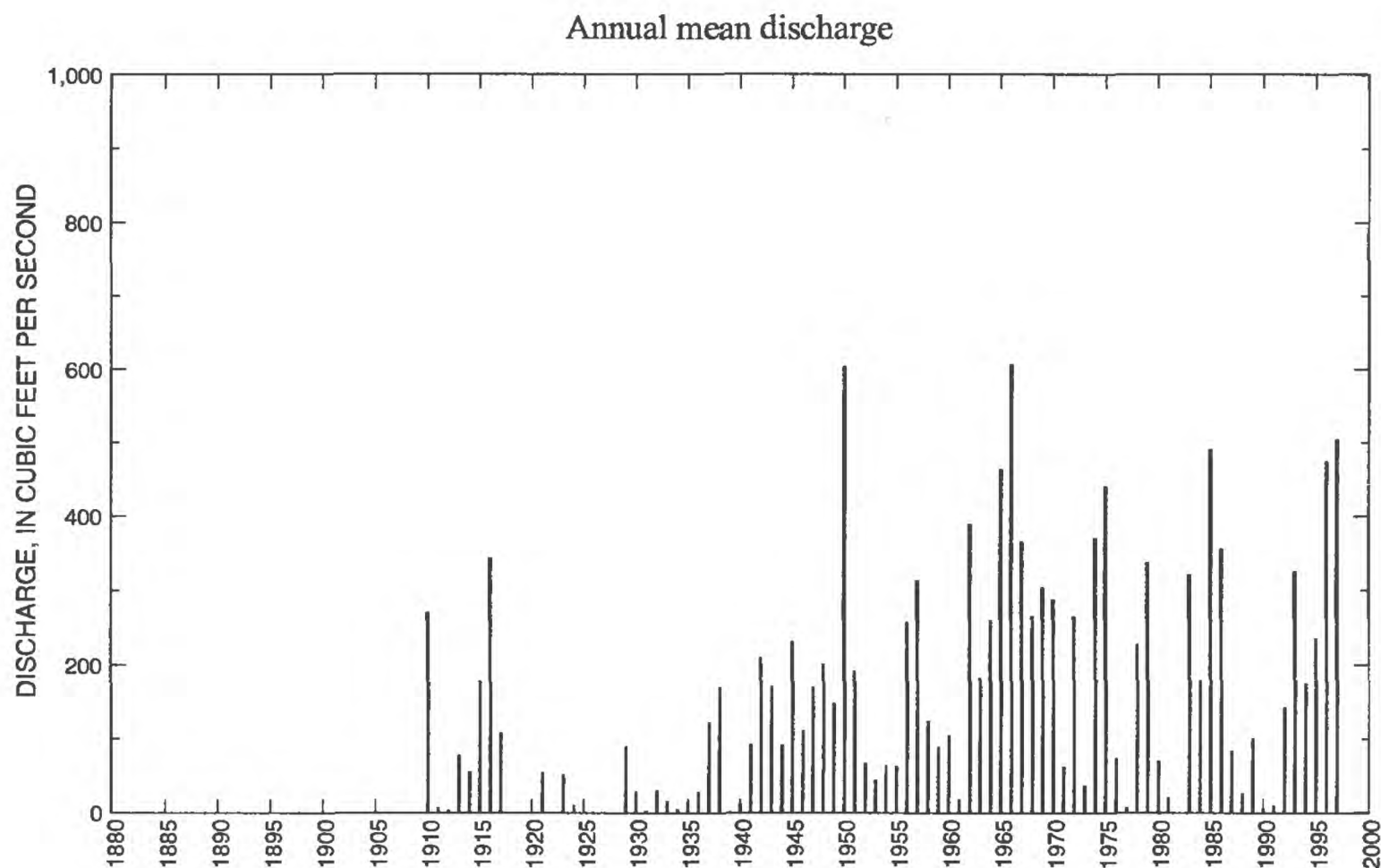
LOCATION.--Lat 48°11'08", long 96°10'11", in NW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.3, T.154 N., R.43 W., Marshall County, Hydrologic Unit 09020304, on right bank, 0.2 mi upstream from highway bridge, 5 mi north of Thief River Falls, 7 mi upstream from mouth, and 9 mi downstream from Mud Lake National Wildlife Refuge.

DRAINAGE AREA.--959 mi<sup>2</sup>.

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

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

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,610 ft<sup>3</sup>/s, May 13, 1950, gage height, 17.38 ft; no flow at times.



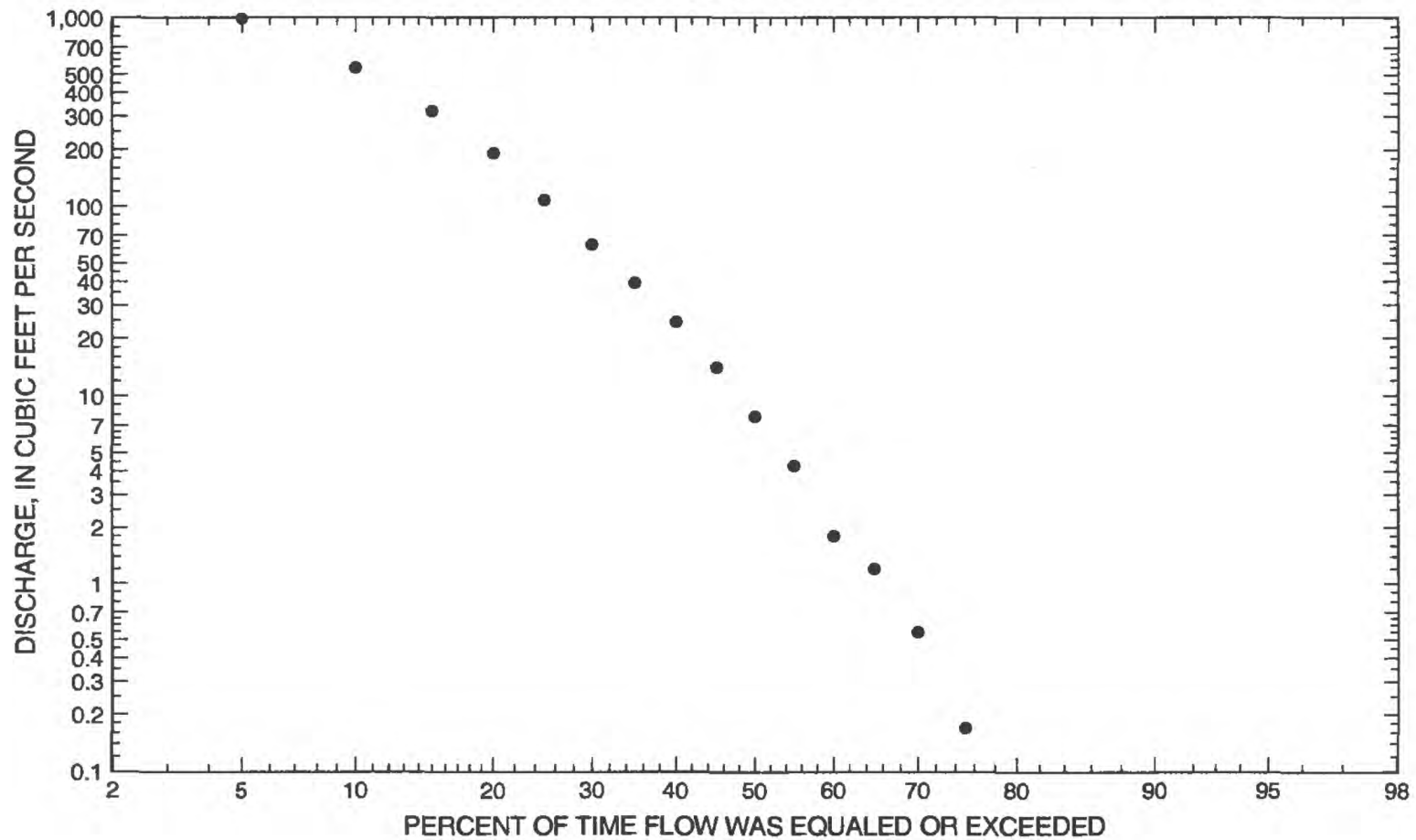
# 05076000 THIEF RIVER NEAR THIEF RIVER FALLS, MN--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	637	1986	0	m	87.4	148	1.69	4.24	
November	844	1972	0	m	67.5	128	1.90	3.27	
December	206	1945	0	m	20.3	42.2	2.07	0.99	
January	100	1910	0	m	5.68	14.7	2.58	0.28	
February	45.0	1910	0	m	3.43	8.60	2.51	0.17	
March	773	1995	0	m	75.8	144	1.90	3.67	
April	2,830	1966	7.75	1981	597	575	0.96	28.9	
May	4,270	1950	1.83	1990	492	687	1.40	23.8	
June	1,770	1962	0.032	1980	297	386	1.30	14.4	
July	2,100	1975	0	m	222	349	1.57	10.8	
August	1,010	1993	0	m	98.0	199	2.03	4.75	
September	1,010	1993	0	m	97.2	197	2.03	4.71	
Annual	607	1966	1.28	1939	171	155	0.90	100	

Annual flow duration



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

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	1.30	2.86	0.25	0	0	0	0	0	0	0
90	0	0	0	6.82	6.20	1.00	0.08	0	0	0	0	0	0
85	0	0	0	15.3	13.4	2.10	0.52	0	0	0	0	0	0
80	0	0	0	25.8	24.3	6.46	1.50	0.09	0.08	0	0.04	0	0
75	0	0	0	41.9	35.8	13.5	4.02	0.29	0.23	0.17	0.17	0	0.17
70	0	0	0	61.8	51.6	21.3	7.62	0.61	0.45	0.69	0.47	0.08	0.55
65	0	0	0.09	92.4	71.6	29.7	11.6	1.30	0.91	1.60	0.96	0.16	1.20
60	0	0	0.28	135	101	42.7	19.3	1.90	1.80	2.80	1.90	0.23	1.80
55	0.09	0	0.40	192	139	63.0	27.0	4.32	3.18	5.15	3.57	0.64	4.30
50	0.11	0.02	0.58	258	189	92.7	37.2	7.33	4.56	8.17	4.78	0.90	7.83
45	0.26	0.09	1.20	347	251	129	52.3	13.3	8.43	12.4	7.52	1.30	14.1
40	0.76	0.20	1.80	453	323	169	76.8	19.4	16.4	18.9	11.1	2.99	24.6
35	0.99	0.61	3.38	572	404	214	117	25.9	26.1	32.0	20.5	4.36	39.4
30	1.70	0.80	6.68	734	512	284	190	38.3	40.9	50.2	32.8	7.79	62.5
25	2.20	1.40	12.7	894	661	388	274	65.2	68.3	89.3	56.3	13.4	108
20	4.33	1.80	32.6	1,050	857	532	380	102	109	144	98.9	18.6	192
15	5.94	2.40	63.9	1,300	1,110	705	510	185	205	209	158	36.3	322
10	18.4	8.68	166	1,700	1,460	902	681	316	324	332	229	60.8	545
5	38.7	29.7	557	2,450	1,990	1,390	1,040	582	590	474	342	105	993

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

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	29.2	24.5	16.2	10.0
0.95	1.05	266	125	103	70.6	46.1
0.90	1.11	412	241	199	139	93.9
0.80	1.25	667	478	397	290	202
0.50	2	1,460	1,310	1,130	896	674
0.20	5	2,710	2,510	2,290	2,010	1,630
0.10	10	3,510	3,140	<sup>1</sup> 2,860	<sup>1</sup> 2,460	<sup>1</sup> 1,970
0.04	25	4,440	3,700	<sup>1</sup> 3,370	<sup>1</sup> 2,900	<sup>1</sup> 2,320
0.02	50	5,060	3,990	<sup>1</sup> 3,630	<sup>1</sup> 3,120	<sup>1</sup> 2,500
0.01	100	5,610	4,190	<sup>1</sup> 3,810	<sup>1</sup> 3,280	<sup>1</sup> 2,620
0.005	200	6,100	4,340	<sup>1</sup> 3,950	<sup>1</sup> 3,400	<sup>1</sup> 2,720
0.002	500	6,670	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1909	July 19	10.60	1,970	1955	April 8	10.72	958
1910	April 3	9.05	1,440	1956	April 21	10.57	1,840
1911	April 26	5.40	127	1957	September 3	9.97	1,630
1912	September 30	5.60	164	1958	October 17	7.67	828
1913	April 7	14.00	1,530	1959	April 5	8.48	950
1914	June 11	7.42	795	1960	April 6	12.11	1,100
1915	June 30	10.66	1,920	1961	March 24	7.49	441
1916	April 23	14.50	4,080	1962	June 10	12.68	2,800
1917	April 11	12.72	2,600	1963	April 8	11.43	2,180
1919	July 10	16.30	5,040	1964	August 2	12.05	2,480
1920	April 8	--	1,780	1965	April 12	14.99	4,110
1921	April 6	--	1,700	1966	April 3	15.66	3,320
1922	May 12	11.90	2,680	1967	April 21	13.26	3,100
1923	April 21	8.40	1,160	1968	July 18	10.84	1,950
1924	April 21	5.30	145	1969	April 13	13.55	3,190
1925	June 11	9.10	1,420	1970	June 17	12.72	2,820
1926	June 25	--	1,660	1971	April 9	11.40	1,780
1929	March 18	13.71	1,870	1972	April 18	11.73	2,340
1930	May 12	7.26	776	1973	September 29	7.86	871
1931	April 15	--	39.0	1974	April 21	13.37	3,160
1932	April 8	9.25	1,340	1975	July 2	14.17	3,260
1933	April 18	6.35	470	1976	April 1	12.75	1,350
1934	April 7	5.67	150	1977	May 19	6.35	403
1935	April 13	--	318	1978	April 18	12.57	2,740
1936	April 19	--	890	1979	April 24	14.11	3,590
1937	August 3	9.75	1,160	1980	April 7	10.45	1,710
1938	May 19	9.00	1,130	1981	June 28	7.08	620
1939	April 27	4.82	35.0	1982	May 4	11.27	2,130
1940	April 15	7.85	728	1983	March 7	14.19	1,500
1941	June 12	7.82	822	1984	June 9	9.80	1,520
1942	May 2	9.69	1,480	1985	June 28	11.27	2,130
1943	April 8	9.43	1,060	1986	May 1	11.82	2,420
1944	June 6	7.15	666	1987	March 26	13.23	1,570
1945	April 11	10.24	1,650	1988	April 4	10.37	1,170
1946	April 6	8.77	1,170	1989	April 16	14.31	2,300
1947	June 11	9.84	1,560	1990	April 1	6.11	150
1948	April 19	10.67	1,850	1991	May 23	6.07	314
1949	June 1	10.00	1,620	1992	April 22	--	1,220
1950	May 13	17.38	5,610	1993	August 31	--	2,180
1951	May 2	9.81	1,630	1994	July 9	11.38	1,960
1952	April 8	10.72	1,500	1995	March 29	11.78	2,080
1953	June 2	6.37	429	1996	May 18	13.86	3,350
1954	April 12	7.61	624	1997	April 22	15.20	4,120



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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)
Annual peak discharge, from highest to lowest, and corresponding gage height							
1950	May 13	17.38	5,610	1947	June 11	9.84	1,560
1919	July 10	16.30	5,040	1913	April 7	14.00	1,530
1997	April 22	15.20	4,120	1984	June 9	9.80	1,520
1965	April 12	14.99	4,110	1952	April 8	10.72	1,500
1916	April 23	14.50	4,080	1983	March 7	14.19	1,500
1979	April 24	14.11	3,590	1942	May 2	9.69	1,480
1996	May 18	13.86	3,350	1910	April 3	9.05	1,440
1966	April 3	15.66	3,320	1925	June 11	9.10	1,420
1975	July 2	14.17	3,260	1976	April 1	12.75	1,350
1969	April 13	13.55	3,190	1932	April 8	9.25	1,340
1974	April 21	13.37	3,160	1992	April 22	--	1,220
1967	April 21	13.26	3,100	1946	April 6	8.77	1,170
1970	June 17	12.72	2,820	1988	April 4	10.37	1,170
1962	June 10	12.68	2,800	1923	April 21	8.40	1,160
1978	April 18	12.57	2,740	1937	August 3	9.75	1,160
1922	May 12	11.90	2,680	1938	May 19	9.00	1,130
1917	April 11	12.72	2,600	1960	April 6	12.11	1,100
1964	August 2	12.05	2,480	1943	April 8	9.43	1,060
1986	May 1	11.82	2,420	1955	April 8	10.72	958
1972	April 18	11.73	2,340	1959	April 5	8.48	950
1989	April 16	14.31	2,300	1936	April 19	--	890
1963	April 8	11.43	2,180	1973	September 29	7.86	871
1993	August 31	--	2,180	1958	October 17	7.67	828
1982	May 4	11.27	2,130	1941	June 12	7.82	822
1985	June 28	11.27	2,130	1914	June 11	7.42	795
1995	March 29	11.78	2,080	1930	May 12	7.26	776
1909	July 19	10.60	1,970	1940	April 15	7.85	728
1994	July 9	11.38	1,960	1944	June 6	7.15	666
1968	July 18	10.84	1,950	1954	April 12	7.61	624
1915	June 30	10.66	1,920	1981	June 28	7.08	620
1929	March 18	13.71	1,870	1933	April 18	6.35	470
1948	April 19	10.67	1,850	1961	March 24	7.49	441
1956	April 21	10.57	1,840	1953	June 2	6.37	429
1920	April 8	--	1,780	1977	May 19	6.35	403
1971	April 9	11.40	1,780	1935	April 13	--	318
1980	April 7	10.45	1,710	1991	May 23	6.07	314
1921	April 6	--	1,700	1912	September 30	5.60	164
1926	June 25	--	1,660	1934	April 7	5.67	150
1945	April 11	10.24	1,650	1990	April 1	6.11	150
1951	May 2	9.81	1,630	1924	April 21	5.30	145
1957	September 3	9.97	1,630	1911	April 26	5.40	127
1949	June 1	10.00	1,620	1931	April 15	--	39.0
1987	March 26	13.23	1,570	1939	April 27	4.82	35.0

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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1909	--	--	--	--	--	--	--	--	--	444.0	395.7	299.7	--
1910	362.7	290.2	200.0	100.0	45.0	330.0	1,151	438.5	160.3	108.5	44.2	8.12	270.3
1911	0	0	0	0	0	12.2	46.2	6.88	10.1	1.34	0.242	0.483	6.42
1912	1.13	0.180	0	0	0	0.484	8.70	4.85	2.53	2.23	1.42	24.3	3.78
1913	41.4	32.7	14.0	10.4	8.79	7.03	656.9	112.1	26.9	12.8	8.47	9.53	77.9
1914	21.3	24.8	15.6	5.00	1.00	3.00	146.3	131.7	175.5	69.3	29.3	50.6	56.1
1915	91.5	84.4	62.6	42.0	33.0	59.0	293.0	246.6	550.3	544.9	88.0	32.4	177.8
1916	46.4	43.7	8.58	1.65	0.586	1.81	2,060	1,017	244.8	103.6	245.8	372.3	343.7
1917	160.4	109.0	12.7	5.00	3.00	4.29	831.1	122.4	32.8	19.0	2.03	3.55	108.1
1920	--	--	--	--	--	--	944.8	147.1	365.8	36.4	5.15	0.867	--
1921	6.76	1.10	0.200	0.200	0.200	0.300	441.7	48.8	121.2	22.0	8.35	15.0	55.0
1923	8.39	5.83	1.00	0.800	0.600	0.700	346.7	221.1	15.5	9.84	1.68	1.09	51.1
1924	1.71	2.80	1.50	1.00	0.700	2.00	49.3	25.0	19.0	15.1	2.62	0.113	10.0
1929	42.5	7.93	5.00	2.00	1.00	516.1	370.8	96.5	24.7	2.27	0.090	0	89.7
1930	0	0	0	0	0	0	149.3	164.8	25.8	3.32	0.045	0	28.7
1931	0	0	0	0	0	4.68	16.5	5.40	4.17	0.826	0.100	0	2.64
1932	0	0	0	0	0	0.265	342.5	25.3	0.527	0	0	0.253	30.3
1933	0.510	0.200	0	0	0	3.94	138.0	19.7	26.1	0.706	0	0	15.6
1934	0	0	0	0	0	0.145	47.6	4.63	0.460	1.53	0	0	4.48
1935	0	0	0	0	0	29.5	112.2	16.8	2.74	8.98	1.77	0.427	14.3
1936	0	0	0	0	0	0	278.8	58.3	2.55	0	0	0	28.0
1937	0	0	0	0	0	0	65.9	106.8	76.1	190.9	635.2	384.2	122.5
1938	61.1	11.1	8.31	4.58	6.00	131.3	129.6	926.1	624.3	131.7	0.219	0	170.6
1939	0	0	0	0	0	0.142	12.1	2.43	0.600	0.194	0	0	1.28
1940	0	0	0	0	0	0	129.0	21.0	0.977	0.010	0	0	12.4
1941	0	0	0	0	0	0	288.9	131.1	490.5	183.5	2.41	18.6	92.5
1942	165.1	5.53	3.00	0.323	0	139.5	944.3	904.9	208.3	21.1	55.6	70.1	210.5
1943	4.94	1.43	0.006	0	0	19.8	502.9	324.5	763.6	380.0	32.5	28.9	171.3
1944	4.80	0.280	0.035	0	0	0	72.3	32.8	414.8	256.8	129.4	196.6	92.0
1945	37.4	248.8	205.7	0.674	2.74	390.5	1,156	570.0	95.0	39.0	13.1	22.8	232.1
1946	8.79	4.02	5.98	0.277	0.146	269.6	804.2	226.5	16.2	9.67	0	0.873	112.1
1947	0.223	0.063	0.023	0.042	0.011	0.197	161.2	217.1	1,049	561.3	49.6	3.57	170.1
1948	8.78	55.5	74.9	1.91	0.655	19.5	993.0	978.2	35.7	62.7	94.1	108.0	202.8
1949	0.103	0.320	0.113	0.100	0.100	0.110	356.0	210.9	326.2	75.4	523.9	283.4	148.2
1950	43.8	78.0	58.2	26.9	7.63	0.758	740.4	4,274	1,279	616.5	35.2	24.5	604.3

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1951	141.6	4.37	0.858	0.545	8.08	71.2	955.7	941.6	110.0	11.5	5.92	48.8	192.2
1952	6.14	5.92	4.52	0.184	0.017	0.852	560.0	111.4	24.9	75.4	25.0	0.050	67.4
1953	0	0	0	0	0	39.0	75.9	157.4	208.7	48.7	0.448	2.51	44.5
1954	2.53	3.01	0.326	0.081	0.011	0.181	160.1	367.0	213.7	18.2	1.69	1.39	64.2
1955	0.190	0.593	0.145	0	0	0	255.9	91.1	373.8	42.6	5.24	0	63.6
1956	0	0.350	0.097	0	0	2.05	618.8	896.2	275.4	583.8	49.6	666.0	257.6
1957	60.2	226.2	152.7	0.939	0	169.5	605.2	606.6	498.4	639.5	150.0	647.2	313.6
1958	535.9	257.9	41.7	33.6	21.3	11.0	34.6	50.7	30.8	452.9	7.01	0.003	124.4
1959	0.126	1.34	0.187	0	0	26.9	513.9	285.7	65.8	116.9	30.2	24.0	88.8
1960	7.66	5.02	0.900	0.155	0	0.681	651.1	355.8	149.0	89.6	5.58	1.52	105.1
1961	0.619	2.12	0.081	0	0	54.5	59.3	73.2	2.60	0.110	0.097	14.8	17.4
1962	8.31	2.23	0.294	0	0	0.045	597.8	1,017	1,774	721.4	368.9	181.4	389.8
1963	16.2	9.08	4.01	0.123	0.229	68.1	974.5	575.4	423.5	100.2	16.0	1.18	182.0
1964	0.168	0.047	0	0	0	0	200.5	337.1	1,207	706.2	523.5	179.6	262.8
1965	512.7	188.7	13.6	1.57	0.171	1.00	1,818	1,405	1,055	430.9	37.1	96.8	463.6
1966	510.9	335.4	95.8	40.8	10.1	184.5	2,827	1,874	638.1	271.2	326.5	161.9	607.1
1967	14.8	31.6	12.1	1.32	1.43	55.9	1,779	1,751	509.8	212.3	20.7	1.75	366.6
1968	28.3	55.8	5.02	0.023	0.062	101.1	36.3	22.9	762.9	1,016	709.0	441.6	265.7
1969	214.0	253.3	102.5	42.6	32.0	17.0	1,678	1,141	158.2	9.33	1.80	0.735	304.1
1970	156.8	79.1	0.392	0.057	0	0	655.4	784.5	1,375	404.5	2.72	3.93	288.3
1971	98.9	56.7	1.28	1.22	0.964	7.66	408.8	125.6	34.7	12.1	1.06	8.73	62.9
1972	469.1	844.3	16.7	2.71	1.74	163.7	1,141	473.5	86.3	10.5	5.07	2.38	266.8
1973	61.8	3.82	0.062	0.008	0.001	125.5	26.4	32.6	11.2	0.819	4.93	177.8	37.2
1974	407.3	173.4	4.65	0.127	0.020	0.688	1,340	1,642	623.6	45.6	132.5	61.6	370.3
1975	36.7	154.4	3.28	2.51	2.39	19.2	1,131	1,291	331.4	2,103	71.8	103.0	441.1
1976	110.7	33.4	48.0	0.521	0.249	46.8	556.4	37.8	50.1	2.31	4.64	1.38	73.8
1977	1.18	0.101	0.005	0	0	0.685	28.2	34.0	8.87	1.69	0.017	8.91	6.98
1978	18.3	8.25	14.4	28.5	33.9	12.2	1,646	624.1	151.8	92.8	43.7	69.5	227.6
1979	160.5	26.4	5.60	4.51	9.92	9.66	1,231	1,788	655.7	129.7	12.7	11.3	338.2
1980	91.5	57.9	12.3	0.454	0	0.033	617.2	63.4	0.032	0	0	14.0	70.7
1981	4.16	5.05	0.681	0.014	1.63	16.9	7.75	6.13	83.2	105.4	3.38	14.6	20.8
1982	--	--	--	--	--	16.8	930.8	829.8	165.8	185.6	149.3	8.90	--
1983	369.2	314.3	102.6	21.4	2.47	608.5	655.6	358.2	443.9	576.6	195.6	187.8	321.4
1984	296.3	150.8	59.7	18.4	21.3	88.5	537.1	211.2	468.8	243.1	46.9	8.66	178.9
1985	75.7	57.2	2.28	0	0	315.0	750.4	748.9	1,003	1,136	841.7	943.0	491.3

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1986	636.6	213.0	46.2	7.74	2.96	319.7	1,367	1,248	248.5	28.4	9.66	122.3	355.6
1987	3.52	2.13	0.354	0.005	0	316.7	112.9	325.7	69.8	109.3	52.3	5.45	84.3
1988	2.78	1.55	0.739	0.162	0.027	9.94	244.9	18.9	31.6	0.444	0.115	13.0	26.7
1989	1.26	1.89	0.245	0.196	0.176	1.17	726.9	227.9	161.0	85.0	10.4	0.122	100.9
1990	0	0	0.021	0	0	22.3	14.5	1.83	11.9	2.79	0.008	0	4.46
1991	0	41.3	0.789	0	0	13.7	10.2	21.7	3.95	21.2	0.980	6.06	10.0
1992	3.98	5.51	2.81	2.55	2.89	116.4	636.6	412.0	57.8	61.0	33.7	389.6	143.1
1993	161.1	18.3	5.05	1.64	0.996	71.9	639.7	89.8	171.0	710.7	1,012	1,012	325.7
1994	232.8	136.5	10.7	4.44	0.023	138.3	90.4	94.0	77.9	913.8	136.8	239.9	174.8
1995	151.4	358.4	93.5	11.5	0.573	772.9	656.2	372.3	66.4	148.1	102.8	82.4	236.0
1996	104.2	46.4	18.9	3.36	1.54	57.4	1,070	2,114	1,176	690.4	360.2	31.2	474.2
1997	68.0	148.9	43.5	11.9	2.26	38.6	1,924	1,979	774.3	921.4	111.0	8.91	504.5



## 05077700 RUFFY BROOK NEAR GONVICK, MN

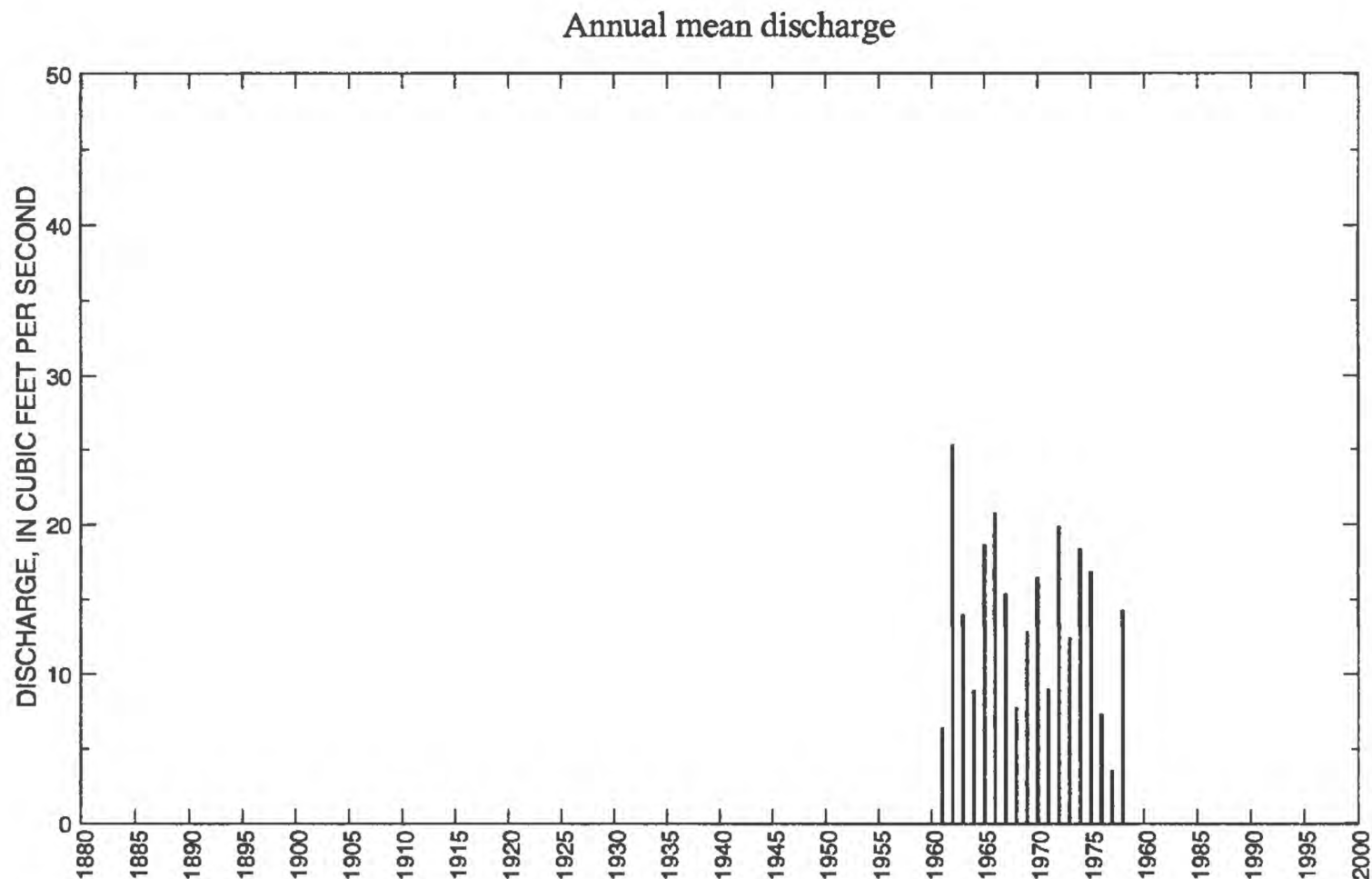
LOCATION.--Lat 47°44'50", long 95°24'45", in SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.5, T.149 N., R.37 W., Clearwater County, Hydrologic Unit 09020305, at culvert on County Highway 67, 4.0 mi upstream from mouth, and 4.8 mi east of Gonvick.

DRAINAGE AREA.--46.2 mi<sup>2</sup>.

PERIOD OF RECORD.--April 1960 to current. April 1960 to September 1978, operated as a continuous-record station. October 1978 to January 1986, operated as a high-flow partial-record station. February 1986 to October 1986, operated as a continuous-record station. November 1986 to current, operated as a high-flow partial-record station. Monthly and daily figures for Apr. 1, 1960, to June 30, 1960, published in Water Supply Paper 1913.

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 1,227.93 ft, adjustment of 1912 (levels by U.S. Army Corps of Engineers). Prior to Sept. 9, 1960, reference point at same site and datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 455 ft<sup>3</sup>/s, April 19, gage height, 5.78 ft; maximum gage height, 6.70 ft, July 7, 1962; no flow Feb. 20 to Mar. 6, 1968.



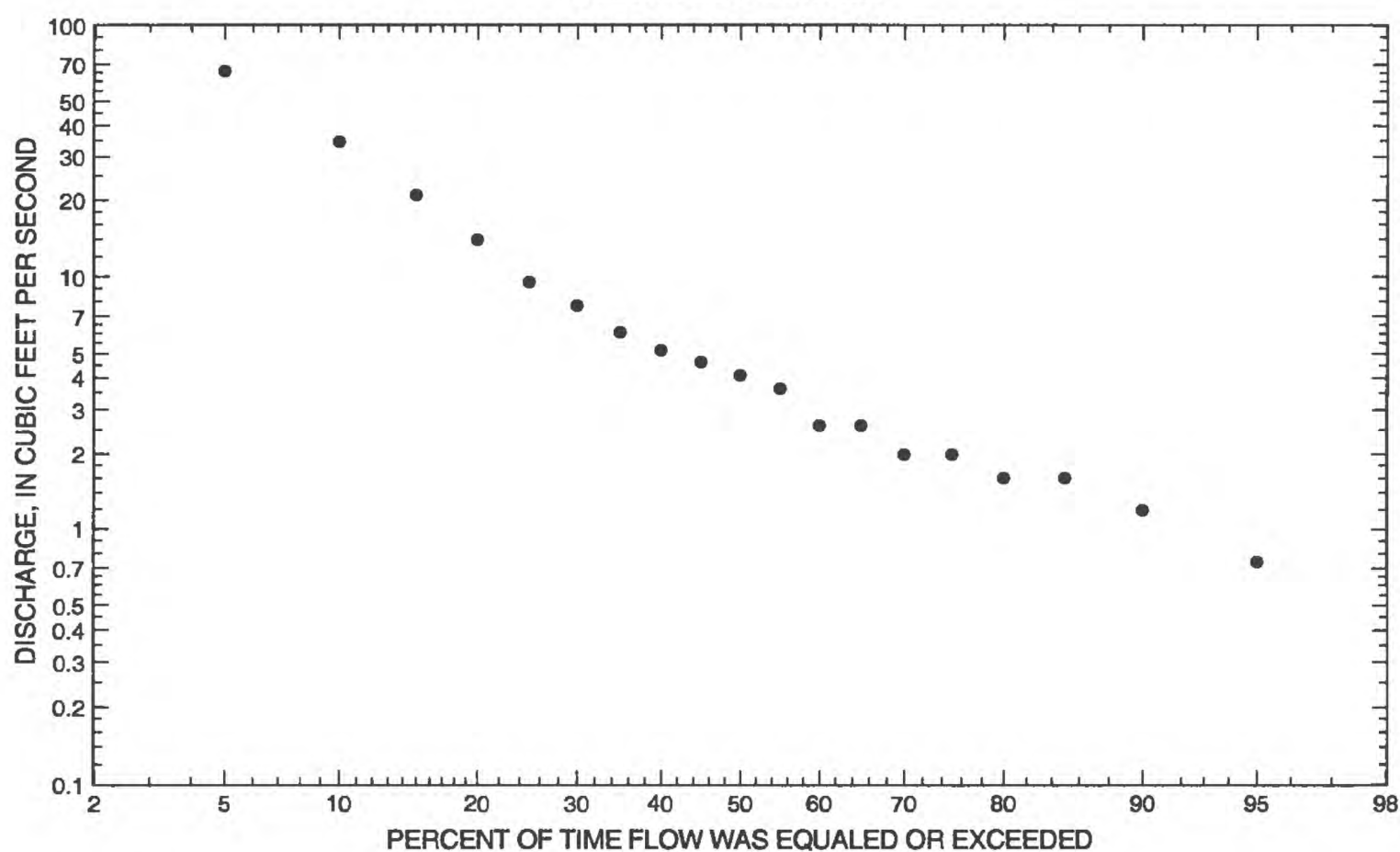


# 05077700 RUFFY BROOK NEAR GONVICK, MN--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	34.7	1972	1.15	1968	7.93	9.12	1.15	4.87	
November	31.4	1972	1.45	1977	6.87	6.88	1.00	4.22	
December	13.6	1978	0.314	1977	4.53	3.44	0.76	2.78	
January	8.99	1974	0.396	1977	3.17	2.20	0.69	1.95	
February	7.38	1974	0.393	1968	2.77	1.84	0.66	1.70	
March	37.5	1966	2.07	1971	12.4	11.9	0.97	7.60	
April	118	1966	6.91	1977	58.2	30.9	0.53	35.7	
May	105	1962	4.61	1977	29.1	22.4	0.77	17.9	
June	54.4	1962	2.29	1961	18.2	16.8	0.92	11.2	
July	57.3	1962	2.10	1961	9.31	13.7	1.47	5.72	
August	18.7	1966	1.09	1976	3.79	3.97	1.05	2.33	
September	59.3	1973	0.623	1967	6.57	12.8	1.94	4.04	
Annual	25.3	1962	3.56	1977	13.8	5.79	0.42	100	

Annual flow duration



# 05077700 RUFFY BROOK NEAR GONVICK, MN--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0.59	0.66	0.93	4.60	3.30	1.50	1.00	0.79	0.54	0.89	1.60	0.43	0.74
90	1.10	0.76	1.20	6.81	5.30	2.20	1.50	0.93	0.81	1.30	1.90	1.30	1.20
85	1.20	0.99	1.50	8.55	6.64	2.50	1.80	1.10	1.20	1.50	2.20	1.50	1.60
80	1.20	1.10	1.90	13.4	7.65	3.00	1.80	1.10	1.20	1.90	2.20	1.90	1.60
75	1.40	1.30	1.90	17.9	8.83	3.50	2.20	1.30	1.50	2.20	2.50	2.20	2.00
70	1.70	1.30	2.50	21.1	10.5	4.20	2.20	1.50	1.80	2.70	2.90	2.50	2.00
65	1.90	1.50	2.50	24.2	12.6	4.90	2.60	1.50	1.80	3.20	3.80	2.80	2.60
60	2.10	1.70	2.50	27.9	14.7	6.34	2.60	1.80	1.80	3.20	3.80	2.80	2.60
55	2.30	2.20	3.20	31.4	16.7	7.17	3.20	2.00	2.20	3.20	4.40	3.20	3.65
50	2.60	2.20	3.20	36.9	18.6	7.90	3.20	2.00	2.20	3.80	4.40	3.60	4.11
45	3.20	2.50	3.20	42.5	20.4	9.70	3.80	2.00	2.20	3.80	5.10	3.60	4.62
40	3.20	2.90	4.48	51.8	23.6	11.3	3.80	2.40	2.70	4.60	5.10	4.10	5.18
35	3.60	3.30	4.86	61.4	26.9	13.5	4.60	2.80	2.70	5.88	5.90	4.60	6.05
30	3.60	3.30	5.44	71.3	30.6	16.3	5.91	2.80	3.30	6.71	5.90	4.60	7.70
25	4.00	3.80	6.07	82.2	35.2	20.9	6.82	3.30	4.00	8.01	7.15	5.20	9.50
20	4.50	3.80	9.15	98.0	40.7	27.8	7.58	3.80	5.60	9.51	8.06	5.90	14.0
15	4.50	4.40	21.3	113	47.4	35.7	8.87	4.50	7.34	11.9	10.2	7.70	21.0
10	6.10	5.00	34.7	138	63.0	46.9	14.0	7.13	11.2	15.5	14.8	10.5	34.6
5	8.56	6.60	52.0	173	97.0	64.5	28.0	12.3	24.0	28.4	20.3	13.2	65.8

# 05077700 RUFFY BROOK NEAR GONVICK, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s) <sup>1</sup>			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	22.5	21.3	16.6	10.2
0.95	1.05	68.0	47.2	43.2	33.1	22.1
0.90	1.11	88.6	66.8	59.8	45.3	31.4
0.80	1.25	120	97.5	84.7	63.4	45.1
0.50	2	200	177	144	106	76.7
0.20	5	313	275	210	152	108
0.10	10	384	329	241	173	121
0.04	25	469	383	271	193	132
0.02	50	528	416	287	204	136
0.01	100	583	442	299	212	140
0.005	200	635	464	308	218	142
0.002	500	700	ng	ng	ng	ng

<sup>1</sup>Statistics computed using period of daily value record 1961-78.

# 05077700 RUFFY BROOK NEAR GONVICK, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1960	April 17	4.45	74.0	1979	April 20	4.94	284
1961	April 20	3.74	66.0	1980	April 5	3.36	137
1962	July 7	6.70	364	1981	June 28	--	150
1963	May 28	5.48	225	1982	April 15	4.59	249
1964	April 16	4.45	134	1983	March 7	4.81	175
1965	April 13	6.38	412	1984	March 26	4.03	195
1966	April 2	5.53	265	1985	May 13	4.91	281
1967	March 30	6.35	453	1986	March 29	4.61	190
1968	June 10	2.70	76.0	1987	July 22	6.05	395
1969	April 9	6.62	232	1988	April 4	5.20	165
1970	April 29	5.28	279	1989	April 5	4.44	178
1971	April 8	5.40	176	1990	June 20	--	30.0
1972	April 17	4.87	237	1991	July 3	2.29	66.0
1973	September 2	3.94	156	1992	March 7	3.25	98.0
1974	April 12	5.80	268	1993	March 29	3.74	169
1975	April 17	5.74	364	1994	July 19	2.85	112
1976	March 29	5.25	147	1995	March 13	6.10	200
1977	September 24	2.05	47.0	1996	April 19	5.78	455
1978	April 7	5.67	357	1997	April 14	5.24	390
Annual peak discharge, from highest to lowest, and corresponding gage height							
1996	April 19	5.78	455	1986	March 29	4.61	190
1967	March 30	6.35	453	1989	April 5	4.44	178
1965	April 13	6.38	412	1971	April 8	5.40	176
1987	July 22	6.05	395	1983	March 7	4.81	175
1997	April 14	5.24	390	1993	March 29	3.74	169
1962	July 7	6.70	364	1988	April 4	5.20	165
1975	April 17	5.74	364	1973	September 2	3.94	156
1978	April 7	5.67	357	1981	June 28	--	150
1979	April 20	4.94	284	1976	March 29	5.25	147
1985	May 13	4.91	281	1980	April 5	3.36	137
1970	April 29	5.28	279	1964	April 16	4.45	134
1974	April 12	5.80	268	1994	July 19	2.85	112
1966	April 2	5.53	265	1992	March 7	3.25	98.0
1982	April 15	4.59	249	1968	June 10	2.70	76.0
1972	April 17	4.87	237	1960	April 17	4.45	74.0
1969	April 9	6.62	232	1961	April 20	3.74	66.0
1963	May 28	5.48	225	1991	July 3	2.29	66.0
1995	March 13	6.10	200	1977	September 24	2.05	47.0
1984	March 26	4.03	195	1990	June 20	--	30.0

# 05077700 RUFFY BROOK NEAR GONVICK, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1960	--	--	--	--	--	--	31.5	10.3	25.2	4.73	3.28	2.25	--
1961	1.60	2.47	1.75	0.932	0.889	6.44	26.3	26.8	2.29	2.10	1.17	4.10	6.43
1962	3.22	3.53	1.76	1.21	1.69	2.68	60.9	104.8	54.4	57.3	3.38	7.28	25.3
1963	4.26	5.53	3.89	1.87	1.02	10.9	31.9	38.2	53.2	7.98	6.89	2.17	14.0
1964	1.97	2.12	1.35	1.22	1.37	2.32	50.1	22.4	12.7	4.45	1.58	5.67	8.89
1965	5.92	3.61	2.91	2.50	1.72	2.56	92.9	51.6	49.2	5.26	2.45	4.75	18.7
1966	10.2	5.15	4.84	4.18	2.76	37.5	118.2	33.6	6.83	4.33	18.7	2.94	20.8
1967	5.08	5.11	2.49	2.09	2.33	30.3	71.3	28.7	29.4	6.19	1.94	0.623	15.4
1968	1.15	1.71	4.58	2.76	0.393	14.2	22.4	10.6	23.9	7.62	1.82	2.62	7.80
1969	5.09	3.41	3.00	2.06	3.64	3.10	74.1	34.1	16.1	3.55	5.04	2.53	12.9
1970	12.4	10.0	5.79	4.59	4.33	4.66	85.8	38.5	25.7	3.96	1.41	1.56	16.5
1971	4.48	6.38	4.06	1.44	1.22	2.07	54.2	16.8	7.71	4.85	2.14	3.18	9.01
1972	34.7	31.4	8.23	6.61	4.79	17.8	74.1	29.9	9.50	11.8	8.38	2.54	19.9
1973	5.54	8.31	3.71	4.09	4.83	33.9	12.8	8.74	2.52	3.22	3.12	59.3	12.5
1974	28.9	8.30	11.5	8.99	7.38	5.81	85.2	43.9	12.3	2.87	3.20	2.15	18.4
1975	3.19	5.01	3.66	3.32	4.08	5.73	89.6	27.2	13.8	38.2	2.93	6.44	16.9
1976	5.13	6.51	4.11	3.55	3.58	18.5	35.2	5.42	2.60	2.14	1.09	0.694	7.35
1977	1.21	1.45	0.314	0.396	0.998	3.79	6.91	4.61	3.39	3.88	1.89	13.9	3.56
1978	13.1	13.7	13.6	5.25	2.80	3.99	91.7	10.9	5.61	5.23	2.70	3.78	14.3
1986	--	--	--	--	--	28.8	48.8	35.0	7.89	6.62	2.73	2.99	--
1987	3.52	--	--	--	--	--	--	--	--	--	--	--	--



## 05078000 CLEARWATER RIVER AT PLUMMER, MN

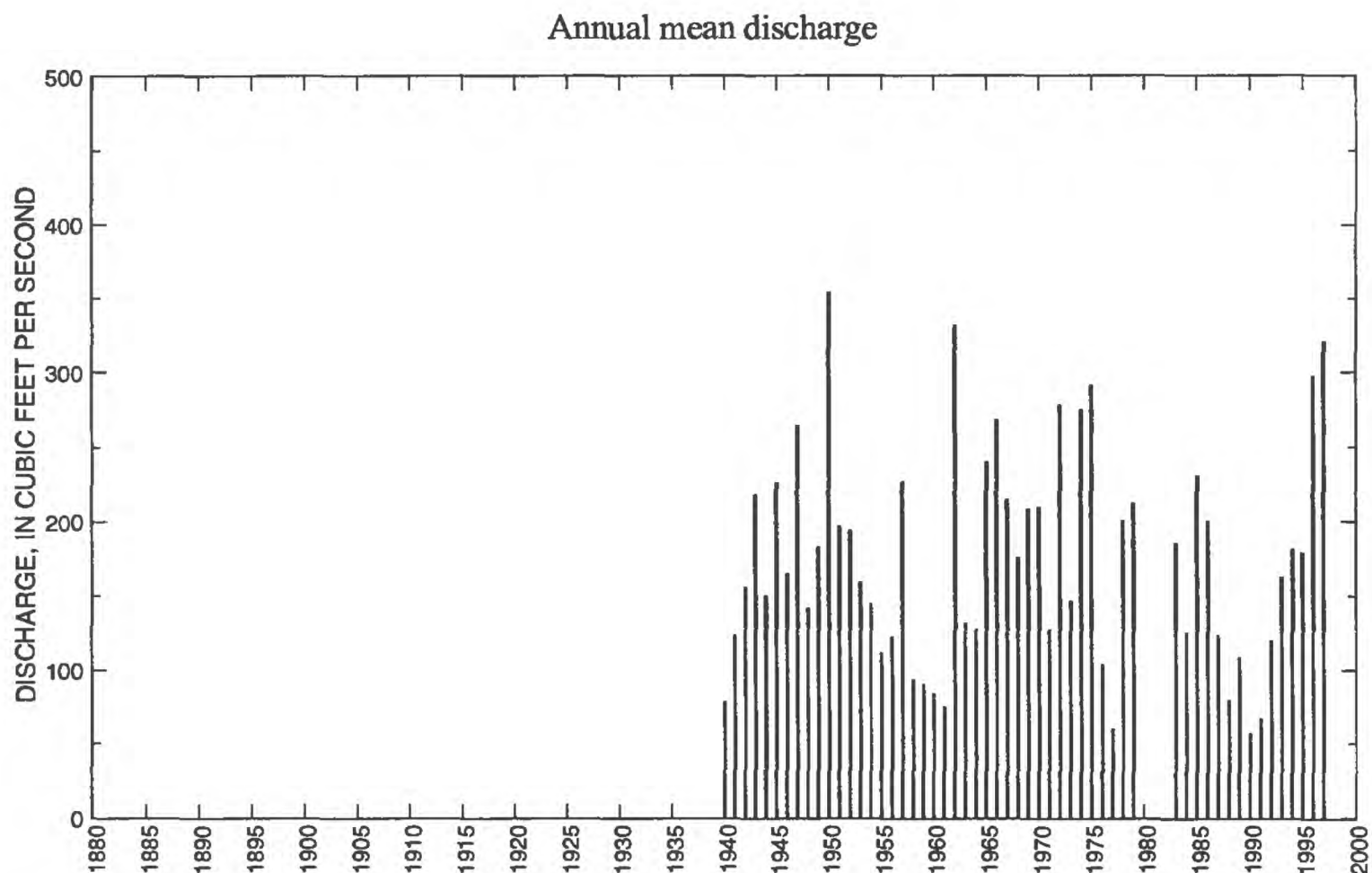
**LOCATION.**--Lat 47°55'24", long 96°02'46", in SE<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.4, T.151 N., R.42 W., Red Lake County, Hydrologic Unit 09020305, on right bank 200 ft downstream from Soo Line Railroad bridge, 300 ft downstream from bridge on U.S. Highway 59, 0.9 mi northwest of railroad depot in Plummer, and 8 mi upstream from Hill River.

**DRAINAGE AREA.**--512 mi<sup>2</sup>.

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

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

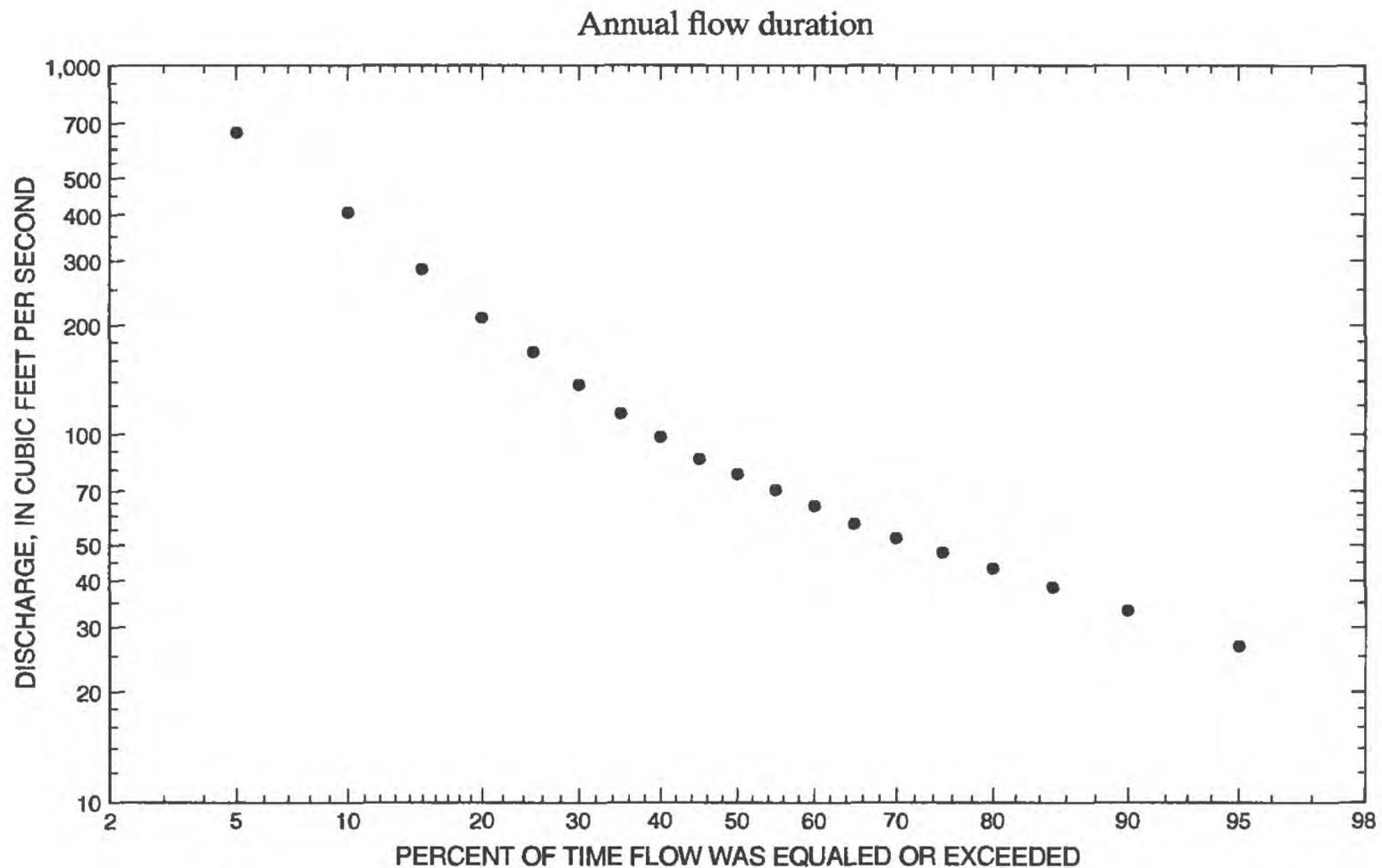
**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 3,940 ft<sup>3</sup>/s, Apr. 25, 1979, gage height, 12.31 ft; maximum gage height, 12.74 ft, Apr. 16, 1997, backwater from ice; minimum daily discharge, 2.6 ft<sup>3</sup>/s, May 16, 1977, gage height, 1.71.



# 05078000 CLEARWATER RIVER AT PLUMMER, MN--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean	Standard deviation (ft³/s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft³/s)	Water year of occurrence	Discharge (ft³/s)	Water year of occurrence	Discharge (ft³/s)			
October	483	1972	21.5	1941	116	97.5	0.84	5.57
November	503	1972	23.8	1991	92.0	69.3	0.75	4.40
December	140	1978	24.4	1990	64.0	25.2	0.39	3.07
January	90.1	1952	18.4	1940	51.8	17.4	0.34	2.48
February	98.4	1974	19.0	1940	48.3	17.2	0.36	2.31
March	445	1995	22.8	1940	114	98.2	0.86	5.47
April	1,470	1997	26.8	1977	542	379	0.70	26.0
May	1,970	1950	7.52	1977	355	322	0.91	17.0
June	1,140	1962	30.1	1991	252	223	0.89	12.1
July	1,070	1997	16.0	1940	223	211	0.95	10.7
August	507	1985	13.3	1940	124	104	0.84	5.92
September	666	1973	14.1	1940	106	98.4	0.93	5.06
Annual	354	1950	57.0	1990	175	73.6	0.42	100



# 05078000 CLEARWATER RIVER AT PLUMMER, MN--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	25.4	25.9	27.1	34.7	35.4	34.2	29.2	22.5	21.2	27.0	31.1	29.6	26.6
90	29.5	28.7	31.0	56.0	60.0	45.5	43.4	30.0	29.0	35.0	38.7	36.0	33.2
85	32.8	30.6	33.8	76.2	81.0	57.6	53.1	36.7	34.6	40.9	43.3	38.6	38.5
80	35.7	32.5	36.1	96.2	101	72.2	61.6	41.8	39.4	44.2	46.7	40.6	43.3
75	38.1	34.1	39.8	128	120	86.8	70.1	45.9	44.4	47.4	50.5	44.8	47.8
70	40.7	36.3	43.8	163	141	99.8	79.1	50.3	50.1	50.3	54.5	47.8	52.2
65	43.4	39.0	46.7	198	162	111	89.3	55.0	55.1	54.3	58.5	51.7	57.0
60	45.5	41.4	49.6	230	181	123	99.9	60.9	61.1	59.4	62.6	54.7	63.8
55	47.8	44.5	53.0	276	204	135	111	68.2	67.3	67.9	67.8	57.4	70.6
50	50.8	46.6	56.4	335	228	149	128	77.2	73.6	73.5	73.5	59.7	78.2
45	53.9	48.5	60.8	395	259	167	147	89.0	80.5	81.0	80.2	63.4	85.9
40	55.9	50.3	66.1	458	293	188	168	103	87.5	97.9	87.0	68.4	98.3
35	58.4	53.1	73.8	538	337	213	189	115	94.8	113	93.9	72.2	114
30	61.6	56.7	83.0	638	386	253	219	130	103	131	102	75.8	137
25	65.1	61.0	93.4	742	439	302	261	147	114	152	110	79.4	169
20	70.3	66.2	104	858	516	361	312	170	133	172	122	83.9	210
15	73.1	70.3	159	1,020	623	439	374	207	172	193	137	88.9	285
10	76.5	73.8	294	1,340	785	538	471	270	231	246	166	96.2	407
5	83.0	79.3	494	1,910	1,100	786	703	389	312	322	199	108	664

## 05078000 CLEARWATER RIVER AT PLUMMER, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedsnce probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean dischrge (ft <sup>3</sup> /s)			
			3-dsy period	7-dsy period	15-day period	30-day period
0.99	1.01	311	<sup>1</sup> 303	285	228	169
0.95	1.05	493	466	413	331	253
0.90	1.11	626	577	505	405	313
0.80	1.25	831	749	647	519	405
0.50	2	1,410	1,240	1,050	843	656
0.20	5	2,330	2,050	1,740	1,390	1,060
0.10	10	3,010	2,680	2,280	1,820	1,350
0.04	25	3,930	3,560	3,050	2,430	1,750
0.02	50	4,650	4,290	3,700	2,940	2,060
0.01	100	5,400	5,070	4,400	3,490	2,390
0.005	200	6,180	5,900	5,170	4,100	2,740
0.002	500	7,260	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

# 05078000 CLEARWATER RIVER AT PLUMMER, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1939	April 27	--	380	1969	April 11	11.89	3,630
1940	April 16	6.98	840	1970	April 26	9.48	2,080
1941	June 8	6.57	756	1971	April 10	8.32	1,520
1942	April 3	6.12	722	1972	April 16	10.33	2,550
1943	April 21	6.43	800	1973	September 6	7.98	1,270
1944	August 10	8.12	1,160	1974	April 22	10.31	2,540
1945	March 28	6.76	952	1975	July 4	11.19	2,960
1946	March 23	8.09	1,030	1976	April 1	8.86	1,250
1947	June 11	8.34	1,420	1977	September 27	4.85	429
1948	April 25	6.80	929	1978	April 13	11.40	3,270
1949	June 1	9.08	1,870	1979	April 25	12.31	3,940
1950	May 6	11.33	3,630	1980	April 8	6.57	898
1951	May 3	7.22	1,110	1981	June 29	7.37	1,150
1952	April 15	8.10	1,440	1982	April 16	8.71	1,700
1953	July 5	6.23	834	1983	March 7	10.17	1,200
1954	April 13	8.52	1,640	1984	June 9	9.07	1,880
1955	April 6	9.64	1,800	1985	August 19	8.59	1,650
1956	April 21	9.58	2,240	1986	May 1	8.03	1,430
1957	June 27	11.84	3,570	1987	July 27	7.62	1,290
1958	July 6	6.08	822	1988	April 7	8.22	900
1959	April 6	6.37	702	1989	April 15	9.34	1,200
1960	April 7	8.18	710	1990	June 22	4.67	393
1961	April 25	4.88	461	1991	July 7	5.39	565
1962	June 9	11.90	3,640	1992	August 26	6.60	776
1963	April 4	7.54	966	1993	July 28	7.20	954
1964	April 17	8.57	1,640	1994	July 9	9.22	1,440
1965	April 12	11.88	3,620	1995	March 18	9.08	1,610
1966	April 3	10.73	2,000	1996	April 19	11.68	3,320
1967	April 3	10.19	2,470	1997	April 16	12.74	2,700
1968	June 18	11.00	3,000				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1979	April 25	12.31	3,940	1967	April 3	10.19	2,470
1962	June 9	11.90	3,640	1956	April 21	9.58	2,240
1950	May 6	11.33	3,630	1970	April 26	9.48	2,080
1969	April 11	11.89	3,630	1966	April 3	10.73	2,000
1965	April 12	11.88	3,620	1984	June 9	9.07	1,880
1957	June 27	11.84	3,570	1949	June 1	9.08	1,870
1996	April 19	11.68	3,320	1955	April 6	9.64	1,800
1978	April 13	11.40	3,270	1982	April 16	8.71	1,700
1968	June 18	11.00	3,000	1985	August 19	8.59	1,650
1975	July 4	11.19	2,960	1954	April 13	8.52	1,640
1997	April 16	12.74	2,700	1964	April 17	8.57	1,640
1972	April 16	10.33	2,550	1995	March 18	9.08	1,610
1974	April 22	10.31	2,540	1971	April 10	8.32	1,520



# 05078000 CLEARWATER RIVER AT PLUMMER, MN--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1952	April 15	8.10	1,440	1988	April 7	8.22	900
1994	July 9	9.22	1,440	1980	April 8	6.57	898
1986	May 1	8.03	1,430	1940	April 16	6.98	840
1947	June 11	8.34	1,420	1953	July 5	6.23	834
1987	July 27	7.62	1,290	1958	July 6	6.08	822
1973	September 6	7.98	1,270	1943	April 21	6.43	800
1976	April 1	8.86	1,250	1992	August 26	6.60	776
1983	March 7	10.17	1,200	1941	June 8	6.57	756
1989	April 15	9.34	1,200	1942	April 3	6.12	722
1944	August 10	8.12	1,160	1960	April 7	8.18	710
1981	June 29	7.37	1,150	1959	April 6	6.37	702
1951	May 3	7.22	1,110	1991	July 7	5.39	565
1946	March 23	8.09	1,030	1961	April 25	4.88	461
1963	April 4	7.54	966	1977	September 27	4.85	429
1993	July 28	7.20	954	1990	June 22	4.67	393
1945	March 28	6.76	952	1939	April 27	--	380
1948	April 25	6.80	929				

# 05078000 CLEARWATER RIVER AT PLUMMER, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1939	--	--	--	--	--	--	--	108.7	46.6	30.7	18.5	38.2	--
1940	44.3	47.3	27.6	18.4	19.0	22.8	320.3	333.0	71.6	16.0	13.3	14.1	78.9
1941	21.5	37.3	28.5	28.2	30.3	30.2	388.6	178.5	378.7	161.7	67.6	141.9	123.9
1942	301.3	154.6	50.1	29.7	28.6	128.7	419.6	367.2	60.9	29.5	44.5	255.7	156.2
1943	245.1	85.8	52.9	36.6	26.1	32.3	652.1	512.1	530.1	234.4	115.6	95.8	218.5
1944	72.8	75.3	42.2	28.3	29.8	33.9	150.6	245.0	273.3	218.0	381.6	252.4	150.5
1945	223.0	205.9	136.8	46.9	48.2	350.7	832.7	462.4	133.4	88.3	65.0	121.5	226.6
1946	183.9	100.4	69.0	55.2	41.7	318.0	633.2	226.5	129.2	130.8	44.0	51.8	165.6
1947	150.4	108.3	49.9	44.3	43.6	74.0	630.3	835.3	778.4	269.4	83.6	105.5	264.7
1948	127.0	84.3	69.0	50.9	33.9	38.9	637.8	451.8	55.0	77.4	48.7	34.7	142.4
1949	29.2	42.9	38.8	32.6	28.1	33.5	240.2	209.5	615.3	269.6	412.8	245.0	183.3
1950	122.6	118.7	74.7	59.0	50.2	53.9	525.4	1,974	568.3	433.8	145.2	95.1	354.5
1951	159.5	126.6	80.0	76.0	68.0	72.1	607.4	715.2	157.5	56.2	59.4	181.9	196.9
1952	152.1	106.7	100.9	90.1	76.9	121.8	724.0	273.5	113.3	413.7	104.2	55.5	194.4
1953	45.2	59.3	54.9	47.5	48.0	156.5	312.6	332.3	344.4	344.4	103.4	60.6	159.6
1954	54.8	66.6	80.0	69.6	78.4	103.0	639.3	288.5	186.0	65.2	54.8	60.1	145.1
1955	63.5	62.3	54.5	44.0	37.4	44.1	578.5	158.6	182.3	71.4	30.9	23.6	112.1
1956	47.9	44.8	46.3	47.1	45.4	46.2	533.3	328.5	129.7	55.2	60.1	98.4	123.1
1957	43.7	90.2	39.9	37.2	40.5	111.7	704.2	213.4	916.6	356.2	48.0	138.8	227.3
1958	114.8	135.9	60.2	45.6	42.4	69.7	81.5	74.7	168.9	259.2	37.3	33.3	93.9
1959	49.9	49.8	38.5	35.5	31.0	63.1	223.7	200.9	215.8	97.4	46.3	39.1	91.0
1960	49.0	40.1	41.1	39.2	33.8	37.4	317.1	122.2	174.6	75.5	36.9	54.5	84.7
1961	38.5	52.7	46.6	31.9	26.3	83.7	210.1	218.7	47.1	41.1	29.1	76.5	75.4
1962	65.7	54.6	37.5	30.5	28.9	33.2	502.7	1,151	1,140	671.0	133.2	126.8	332.3
1963	69.7	85.5	70.6	31.2	25.5	133.3	363.2	217.2	382.1	103.7	59.1	45.4	132.1
1964	44.3	45.5	38.6	30.8	31.9	35.1	489.8	314.5	297.3	97.9	37.8	85.6	128.5
1965	106.0	67.0	51.9	42.2	39.8	43.7	1,152	510.0	629.6	109.5	47.0	100.4	240.5
1966	234.7	91.3	74.5	65.6	56.1	272.2	1,391	514.1	127.4	64.0	220.6	113.2	268.7
1967	83.0	80.2	61.8	62.0	58.9	110.7	1,050	558.5	332.7	122.6	37.6	29.9	215.2
1968	48.1	50.6	58.0	44.3	45.3	233.5	243.7	149.7	270.7	613.1	247.4	101.2	176.3
1969	104.3	83.4	69.5	56.0	56.2	80.6	1,086	411.6	275.3	117.2	100.6	75.4	209.1
1970	196.0	139.9	85.6	85.3	68.0	46.7	759.5	638.2	324.4	92.0	44.1	42.2	210.2
1971	80.2	154.4	103.5	76.8	43.0	57.9	463.1	176.4	138.3	89.6	78.0	81.9	128.4
1972	483.1	503.4	101.9	68.3	74.6	212.5	933.4	427.5	140.8	119.1	195.7	85.8	278.5
1973	96.5	103.6	79.5	49.0	43.9	332.5	74.1	54.5	38.5	34.2	187.5	666.4	146.7

# 05078000 CLEARWATER RIVER AT PLUMMER, MN--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1974	407.1	143.4	98.6	78.3	98.4	99.5	1,027	695.5	254.3	57.6	267.6	75.5	275.6
1975	78.8	110.5	86.4	76.7	66.2	70.7	1,094	585.7	218.9	843.7	158.1	98.6	291.5
1976	97.9	121.5	88.8	74.2	71.5	131.8	378.7	31.6	57.6	86.5	100.5	14.4	104.3
1977	25.4	39.7	36.4	34.2	34.0	33.4	26.8	7.52	51.8	164.4	67.9	197.4	59.9
1978	192.6	156.9	139.9	75.6	54.1	58.2	1,169	106.8	95.4	167.1	100.6	100.6	200.7
1979	56.9	46.8	44.0	48.8	68.3	41.6	1,110	392.8	179.6	268.4	229.7	70.8	212.8
1980	50.5	--	--	--	--	--	--	--	--	--	--	--	--
1982	--	--	--	--	--	127.7	783.1	546.5	156.4	293.1	115.5	45.6	--
1983	228.1	66.3	58.6	55.8	46.1	347.5	297.5	156.1	347.1	265.8	223.0	127.1	185.8
1984	142.5	75.6	68.5	55.3	64.2	170.7	155.9	107.5	464.9	110.2	71.9	26.3	125.8
1985	191.9	156.2	85.2	57.8	44.9	199.1	213.7	498.5	278.0	341.2	506.8	180.6	231.2
1986	201.4	94.8	88.5	66.2	70.4	273.0	599.6	514.6	132.8	182.7	93.6	75.8	200.2
1987	55.7	63.3	69.4	55.0	50.0	127.3	56.7	249.0	115.1	337.4	204.8	92.0	124.0
1988	59.5	51.4	51.8	48.1	47.5	98.7	292.9	66.5	42.0	75.9	74.4	51.8	79.9
1989	48.5	37.9	44.9	68.6	48.8	48.5	513.6	147.8	131.8	99.3	62.8	63.1	109.3
1990	39.0	30.6	24.4	33.4	35.0	40.8	43.6	72.1	172.3	95.7	70.2	26.0	57.0
1991	23.5	23.8	31.8	29.7	29.4	35.7	30.5	31.7	30.1	347.2	95.4	95.8	67.6
1992	37.1	43.9	44.2	35.1	33.4	64.1	155.1	129.3	73.8	301.0	227.5	296.3	120.3
1993	57.6	59.9	57.6	55.5	51.5	108.5	330.1	139.8	203.9	406.3	352.5	124.3	163.0
1994	55.7	51.8	57.6	54.0	53.4	88.6	209.5	293.9	341.4	646.6	159.7	154.6	181.5
1995	139.9	111.7	88.5	68.5	62.0	444.9	208.0	301.6	87.3	344.9	134.2	147.9	179.7
1996	319.5	103.4	64.3	71.4	73.6	84.0	1,340	926.8	218.8	187.0	138.0	51.1	298.0
1997	56.3	113.1	76.6	72.4	71.8	80.1	1,472	281.0	327.3	1,072	154.1	75.0	321.1

## 05078230 LOST RIVER AT OKLEE, MN

LOCATION.--Lat 47°50'35", long 95°51'30", in SE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec.2, T.150 N., R.41 W., Red Lake County, Hydrologic Unit 09020305, on downstream side of bridge on State Highway 222 at northwest edge of Oklee and 12 mi upstream from mouth.

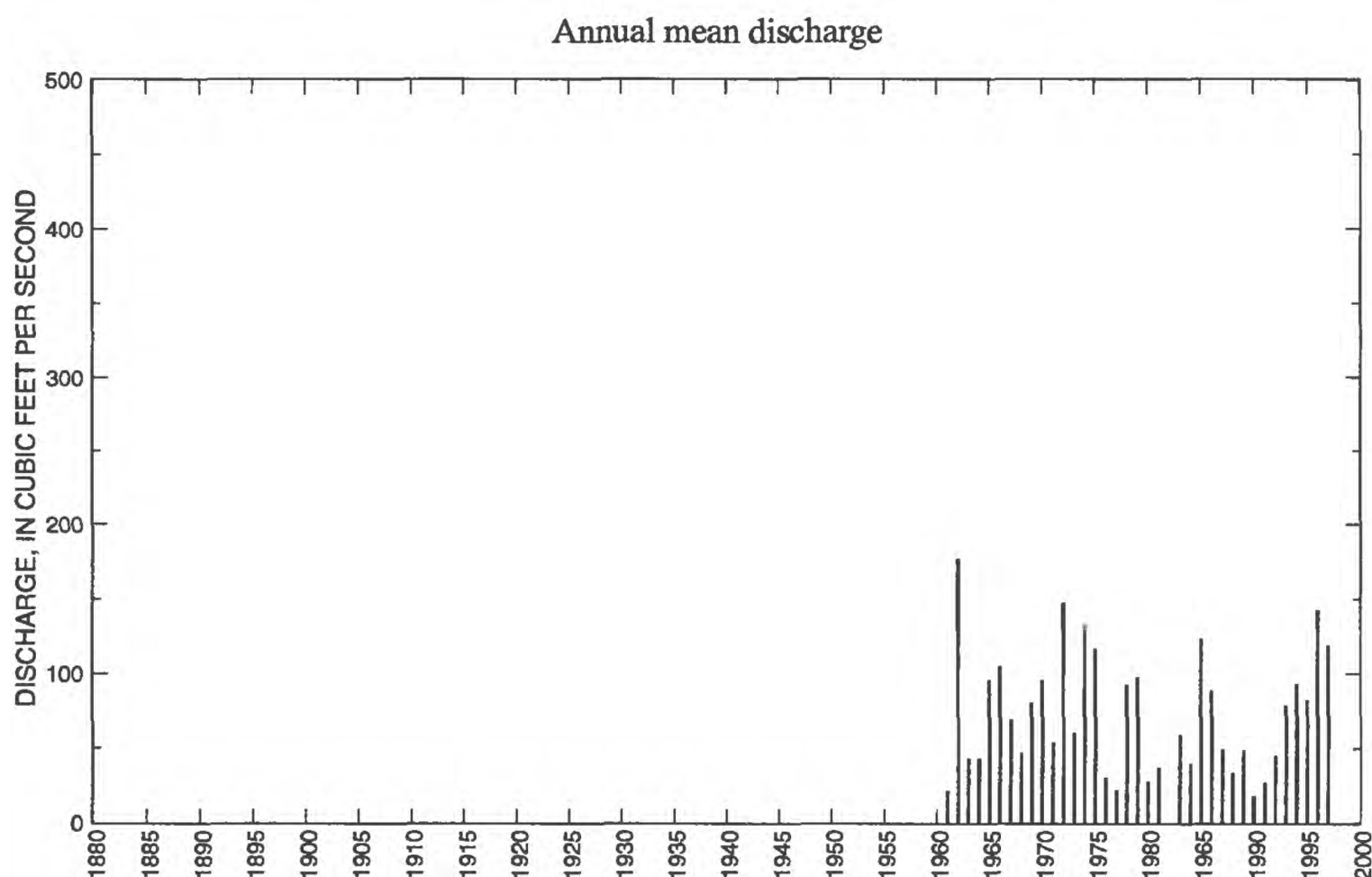
DRAINAGE AREA.--266 mi<sup>2</sup>.

PERIOD OF RECORD.--April 1960 to September 1981, February 1982 to current year. Monthly and daily figures for April 1960, to June 1960, published in Water Supply Paper 2113.

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

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,210 ft<sup>3</sup>/s, Apr. 11, 1969, gage height, 14.91 ft, from floodmark; maximum gage height, 16.91 ft, Apr. 8, 1997, backwater from ice; no flow at times.

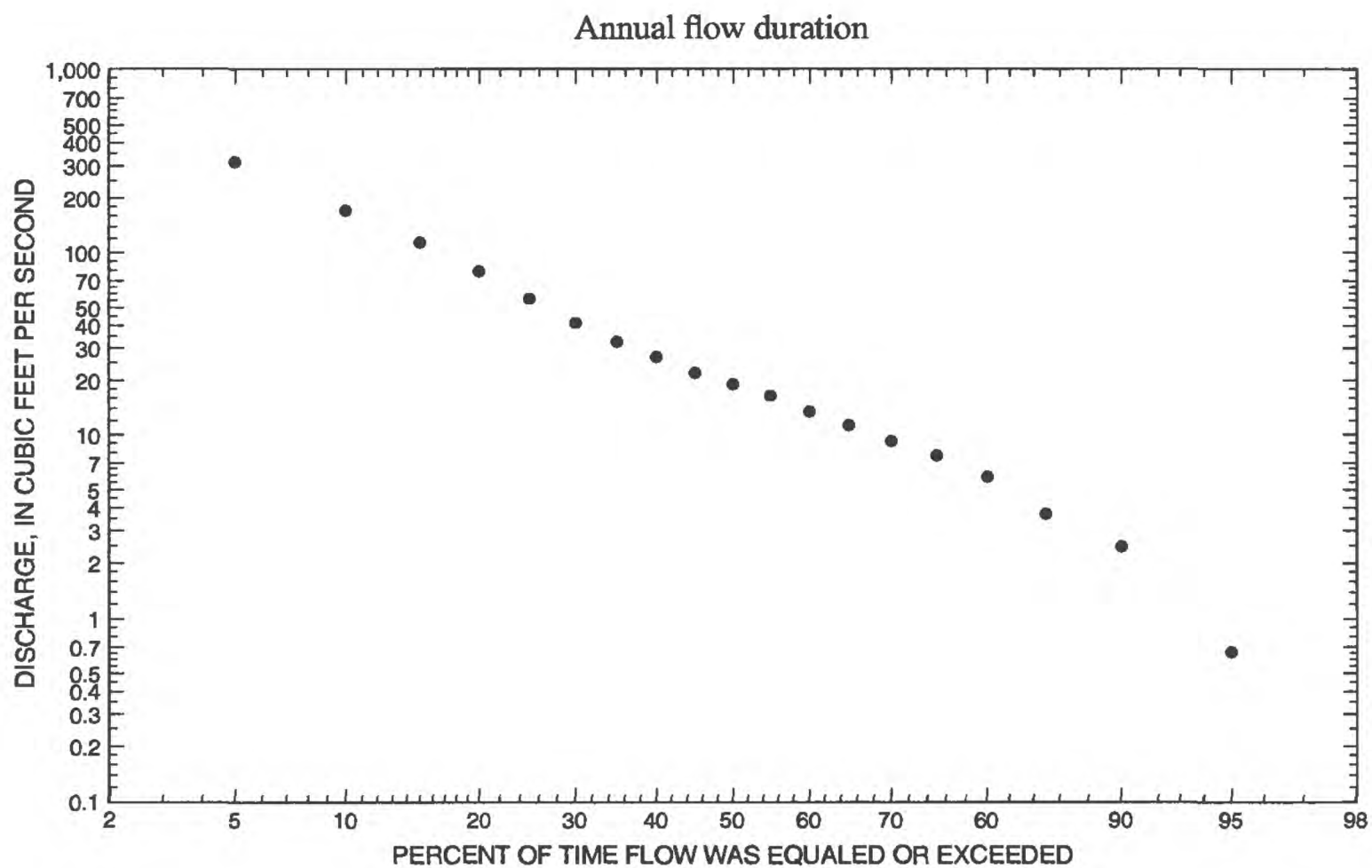
EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known since at least 1897, 18.39 ft, present datum, Apr. 21, 1950, from floodmarks, discharge, 2,790 ft<sup>3</sup>/s.



## 05078230 LOST RIVER AT OKLEE, MN--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentaga of annual discharge
	Discharga (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Watar year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	470	1972	1.02	1991	48.4	82.0	1.70	5.48
November	232	1972	1.11	1977	31.2	38.8	1.25	3.53
December	56.6	1978	0.050	1977	14.3	11.4	0.79	1.62
January	26.2	1997	0.002	1977	8.95	6.72	0.75	1.01
February	25.8	1984	0	1977	8.38	6.35	0.76	0.95
March	243	1995	0.190	1964	72.9	70.8	0.97	8.26
April	904	1996	29.5	1991	312	251	0.80	35.4
May	622	1962	10.5	1980	134	122	0.91	15.2
June	657	1962	8.20	1980	89.1	113	1.27	10.1
July	442	1962	1.99	1961	85.2	107	1.25	9.66
August	350	1985	1.17	1961	40.0	72.5	1.82	4.53
September	330	1973	0	1990	38.0	60.4	1.59	4.30
Annual	177	1962	18.2	1990	73.5	40.8	0.56	100





# 05078230 LOST RIVER AT OKLEE, MN--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0.19	0	0.18	22.8	11.3	5.73	2.30	0.58	0.23	1.30	1.50	0.96	0.66
90	0.64	0.18	1.60	29.2	18.1	8.45	4.23	0.83	0.71	1.90	2.50	2.20	2.46
85	1.70	0.67	3.78	37.6	23.7	11.4	5.63	1.70	1.60	3.63	6.89	2.80	3.71
80	2.20	2.10	7.15	48.3	29.6	14.0	7.46	2.71	2.90	4.96	8.48	4.19	5.88
75	2.20	2.60	8.18	61.4	35.3	16.6	10.3	3.78	4.49	7.22	10.1	5.02	7.67
70	3.52	3.10	9.21	78.3	41.7	19.6	13.2	4.36	5.68	9.20	12.3	5.62	9.24
65	4.73	5.44	10.4	93.8	49.8	23.6	16.2	6.04	7.77	11.2	14.7	7.13	11.3
60	5.49	6.74	12.2	108	61.8	27.8	18.9	7.61	9.71	14.7	17.5	8.31	13.5
55	6.79	7.53	13.9	125	72.1	32.2	21.6	9.57	11.6	17.6	20.0	9.82	16.4
50	7.92	8.24	16.4	143	82.1	36.6	25.3	12.1	14.0	20.0	22.4	12.6	19.1
45	9.47	8.50	18.8	170	91.9	41.7	30.2	14.4	16.4	22.3	24.9	14.6	22.2
40	10.3	8.76	21.7	204	103	49.7	36.5	17.1	19.1	25.8	27.7	16.3	26.8
35	11.1	9.78	27.7	243	118	62.2	44.5	20.4	22.6	31.7	30.5	18.0	32.6
30	12.5	10.6	39.5	296	137	76.3	56.0	24.2	26.6	38.7	33.7	19.7	41.2
25	13.5	11.4	60.9	367	161	96.7	73.3	29.5	32.6	46.9	37.0	21.3	56.1
20	14.5	14.4	95.1	449	187	117	104	37.4	41.6	60.3	41.4	22.9	79.0
15	16.3	15.8	140	552	225	145	150	52.2	57.0	76.1	47.6	25.3	114
10	18.9	17.3	209	786	288	198	222	81.7	91.5	106	58.7	29.0	172
5	23.7	20.1	334	1,310	451	366	401	144	158	175	80.5	35.5	316

## 05078230 LOST RIVER AT OKLEE, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	106	93.3	66.0	49.9
0.95	1.05	318	216	176	124	91.9
0.90	1.11	437	307	243	171	125
0.80	1.25	632	460	354	249	179
0.50	2	1,200	928	693	484	339
0.20	5	2,130	1,710	1,280	889	606
0.10	10	2,800	2,280	1,720	1,190	803
0.04	25	3,660	3,020	2,320	1,610	1,070
0.02	50	4,310	3,580	2,800	1,930	1,270
0.01	100	4,950	4,130	3,280	2,270	1,470
0.005	200	5,590	4,680	3,780	2,610	1,680
0.002	500	6,430	ng	ng	ng	ng

## 05078230 LOST RIVER AT OKLEE, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1950	April 21	18.39	2,790	1979	April 20	14.63	2,140
1961	April 23	<sup>1</sup> 4.34	279	1980	April 3	9.95	670
1962	May 24	<sup>1</sup> 8.72	1,490	1981	September 8	12.98	1,560
1963	June 4	<sup>1</sup> 5.13	355	1982	April 16	12.04	1,320
1964	April 16	<sup>1</sup> 6.07	472	1983	March 7	13.29	520
1965	April 12	11.12	1,780	1984	June 9	9.13	626
1966	April 2	12.60	2,240	1985	August 18	15.03	2,320
1967	March 31	14.17	2,880	1986	March 30	13.50	1,720
1968	July 17	7.35	551	1987	July 24	9.00	661
1969	April 11	14.91	3,210	1988	April 4	9.68	620
1970	April 25	12.76	2,300	1989	April 6	13.57	940
1971	April 8	12.34	1,430	1990	June 21	5.89	134
1972	April 15	13.98	2,070	1991	September 10	6.60	247
1973	September 4	11.27	1,030	1992	March 9	12.33	500
1974	August 15	12.91	2,270	1993	March 30	12.47	1,000
1975	April 19	14.66	2,120	1994	July 8	--	1,270
1976	March 31	11.70	920	1995	March 14	13.05	900
1977	July 3	9.40	855	1996	April 20	16.89	2,790
1978	April 9	16.64	3,140	1997	April 15	14.54	2,030
Annual peak discharge, from highest to lowest, and corresponding gage height							
1969	April 11	14.91	3,210	1994	July 8	--	1,270
1978	April 9	16.64	3,140	1973	September 4	11.27	1,030
1967	March 31	14.17	2,880	1993	March 30	12.47	1,000
1950	April 21	18.39	2,790	1989	April 6	13.57	940
1996	April 20	16.89	2,790	1976	March 31	11.70	920
1985	August 18	15.03	2,320	1995	March 14	13.05	900
1970	April 25	12.76	2,300	1977	July 3	9.40	855
1974	August 15	12.91	2,270	1980	April 3	9.95	670
1966	April 2	12.60	2,240	1987	July 24	9.00	661
1979	April 20	14.63	2,140	1984	June 9	9.13	626
1975	April 19	14.66	2,120	1988	April 4	9.68	620
1972	April 15	13.98	2,070	1968	July 17	7.35	551
1997	April 15	14.54	2,030	1983	March 7	13.29	520
1965	April 12	11.12	1,780	1992	March 9	12.33	500
1986	March 30	13.50	1,720	1964	April 16	<sup>1</sup> 6.07	472
1981	September 8	12.98	1,560	1963	June 4	<sup>1</sup> 5.13	355
1962	May 24	<sup>1</sup> 8.72	1,490	1961	April 23	<sup>1</sup> 4.34	279
1971	April 8	12.34	1,430	1991	September 10	6.60	247
1982	April 16	12.04	1,320	1990	June 21	5.89	134

<sup>1</sup>Gage height recorded using datum 8 feet higher.

# 05078230 LOST RIVER AT OKLEE, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1960	--	--	--	--	--	--	172.2	65.6	198.0	79.2	1.85	1.52	--
1961	2.93	8.82	7.31	1.81	0.389	32.5	109.6	68.3	10.6	1.99	1.17	16.6	21.8
1962	14.6	13.5	4.64	2.70	1.99	8.03	265.3	622.0	656.9	442.3	39.3	45.4	177.1
1963	18.8	24.0	12.7	2.37	0.104	32.0	147.7	87.2	141.2	41.8	4.44	7.08	43.2
1964	2.71	1.81	1.25	0.203	0.048	0.190	223.5	127.6	94.2	22.3	4.48	39.7	42.9
1965	30.1	18.3	5.28	5.11	3.34	2.88	537.9	237.1	249.9	40.1	8.43	18.2	95.9
1966	65.8	35.8	22.6	6.50	2.70	80.6	744.8	210.5	39.9	9.46	31.3	11.4	104.8
1967	9.29	9.87	6.16	6.72	8.95	142.1	345.9	175.0	98.7	23.2	2.99	1.27	69.2
1968	2.50	2.94	4.39	1.35	0.276	133.8	120.1	57.5	91.8	124.5	6.92	13.4	46.8
1969	22.1	14.3	10.9	8.91	10.8	9.34	590.5	153.2	66.8	26.3	36.0	19.0	80.3
1970	77.2	55.7	21.2	12.2	9.57	11.6	571.1	235.0	134.2	8.78	3.14	7.46	95.2
1971	21.2	44.3	14.4	7.47	7.76	28.0	342.6	62.0	25.4	22.5	21.2	57.1	54.2
1972	470.0	231.8	31.2	12.2	9.28	165.0	502.5	217.1	45.7	32.8	30.4	18.7	147.4
1973	20.4	22.3	5.21	4.11	7.63	179.3	66.4	42.5	9.82	7.55	31.2	330.3	60.5
1974	146.5	43.6	20.9	16.1	16.9	20.4	677.2	270.7	66.3	8.68	281.4	17.4	132.4
1975	24.5	34.8	18.1	14.4	15.0	20.4	677.4	217.8	80.2	275.3	14.1	5.22	116.4
1976	7.71	12.7	2.49	2.69	5.70	77.3	186.5	21.9	19.6	20.0	8.42	0.826	30.4
1977	2.22	1.11	0.050	0.002	0	15.5	48.9	16.7	17.0	75.4	6.93	83.5	22.3
1978	73.7	74.3	56.6	16.6	7.54	21.9	726.3	64.7	25.3	22.9	10.9	15.4	92.4
1979	7.71	6.40	4.11	2.09	2.87	19.5	677.9	132.5	94.0	148.1	72.5	8.54	97.7
1980	16.8	22.2	13.4	11.2	10.0	12.4	213.7	10.5	8.20	3.49	7.34	8.43	27.8
1981	12.9	19.7	3.26	2.75	8.70	26.4	29.6	16.9	23.3	60.0	72.9	171.1	37.3
1982	--	--	--	--	--	45.8	512.5	272.0	36.8	98.0	10.3	3.16	--
1983	82.9	22.5	15.4	11.1	11.7	164.4	97.2	71.6	113.6	66.9	28.9	19.2	59.1
1984	51.1	32.2	17.8	14.0	25.8	78.2	103.4	22.0	113.0	14.6	2.30	1.74	39.5
1985	86.4	55.9	11.8	5.44	5.55	164.8	148.0	239.0	130.6	204.8	350.5	61.9	123.3
1986	100.8	33.9	27.6	19.8	16.0	241.6	370.4	190.0	22.5	16.0	7.10	14.6	88.7
1987	12.4	9.27	8.34	7.51	8.77	175.2	45.8	137.4	26.8	105.9	32.9	17.3	49.6
1988	17.2	35.4	19.3	14.5	6.94	76.9	189.3	24.0	12.3	4.44	2.59	2.26	33.6
1989	3.86	8.45	8.74	8.69	8.00	13.7	369.0	66.9	60.0	33.7	2.12	6.65	48.8
1990	3.82	10.0	4.61	2.70	2.91	39.8	46.7	24.7	54.3	18.7	9.51	0	18.2
1991	1.02	1.77	1.05	0.246	0.684	20.0	29.5	73.2	27.9	85.1	17.9	67.5	27.3
1992	24.7	21.3	22.7	17.2	15.9	113.8	83.9	39.8	12.9	29.4	65.0	90.8	44.9
1993	20.4	33.1	18.9	11.3	9.32	116.9	160.0	52.5	101.7	204.7	154.7	57.1	78.8
1994	34.5	24.6	18.1	11.9	11.2	123.1	130.3	111.1	163.9	364.3	50.8	67.7	93.3

05078230 LOST RIVER AT OKLEE, MN--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1995	76.3	54.0	20.9	11.3	9.63	243.2	118.2	140.9	19.5	159.2	36.7	93.3	82.6
1996	143.4	51.9	23.5	23.0	18.7	19.7	904.0	381.5	68.8	42.6	24.9	15.5	142.5
1997	32.5	29.3	30.3	26.2	21.1	19.5	583.0	120.3	223.4	294.6	24.6	26.4	119.0



## 05078500 CLEARWATER RIVER AT RED LAKE FALLS, MN

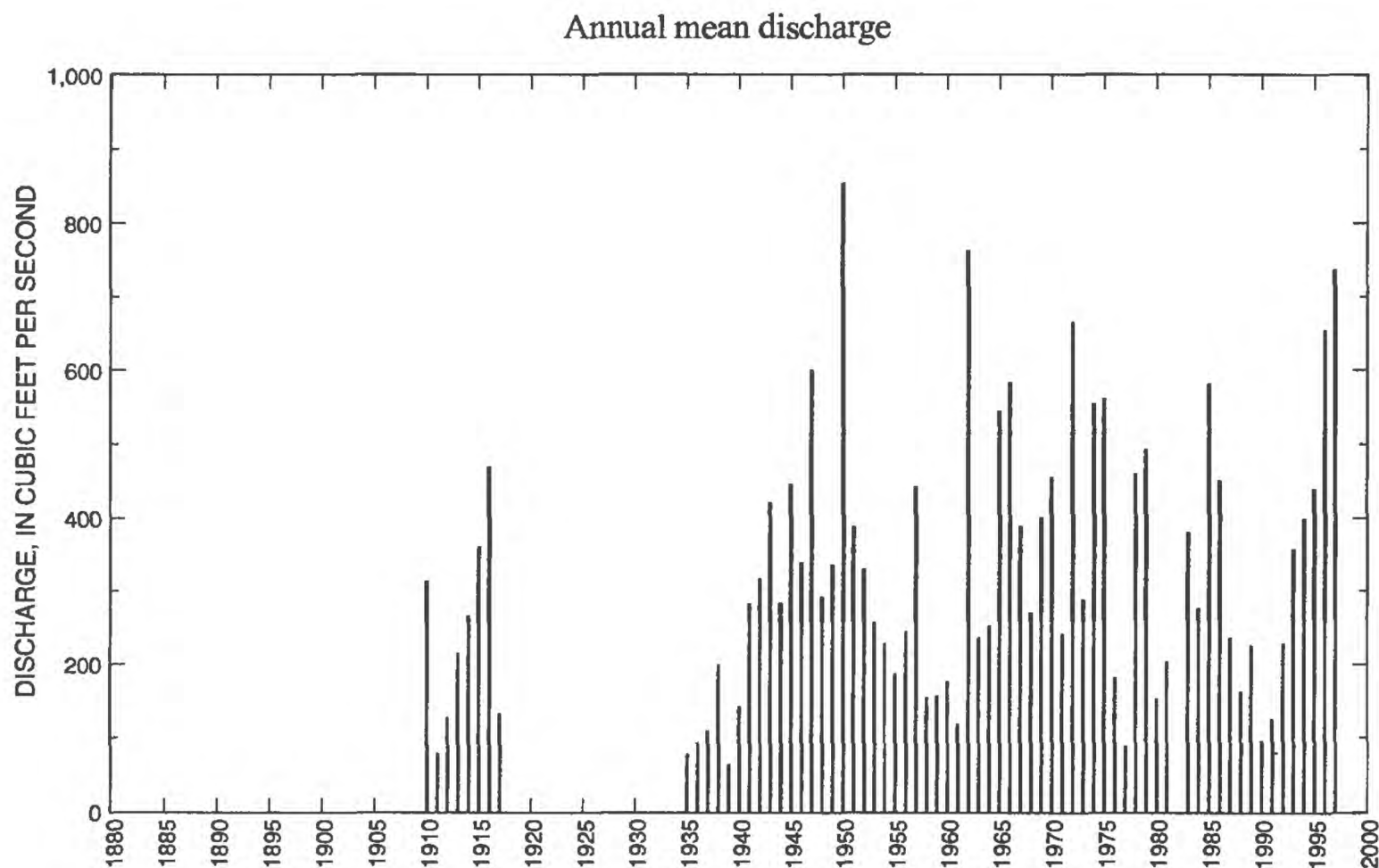
**LOCATION.**--Lat 47°53'15", long 96°16'25", in NW<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec.22, T.151 N., R.44 W., Red Lake County, Hydrologic Unit 09020305, on left bank 40 ft downstream from Great Northern Railroad bridge in Red Lake Falls, 1.4 mi upstream from mouth, and 3 mi downstream from Badger Creek.

**DRAINAGE AREA.**--1,370 mi<sup>2</sup>, approximately.

**PERIOD OF RECORD.**--June 1909 to September 1917, October 1934 to September 1981, March 1982 to current year. Annual maximum only for October 1918 to September 1919. Monthly discharge only for October, November, 1934, published in Water Supply Paper 1308. October 1981 to February 1982, operated as a high-flow partial-record station.

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

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 10,300 ft<sup>3</sup>/s, Apr. 25, 1979, gage height, 12.38 ft; maximum gage height, 15.85 ft, Mar. 6, 1983, highwater mark, backwater from ice; no flow at times.

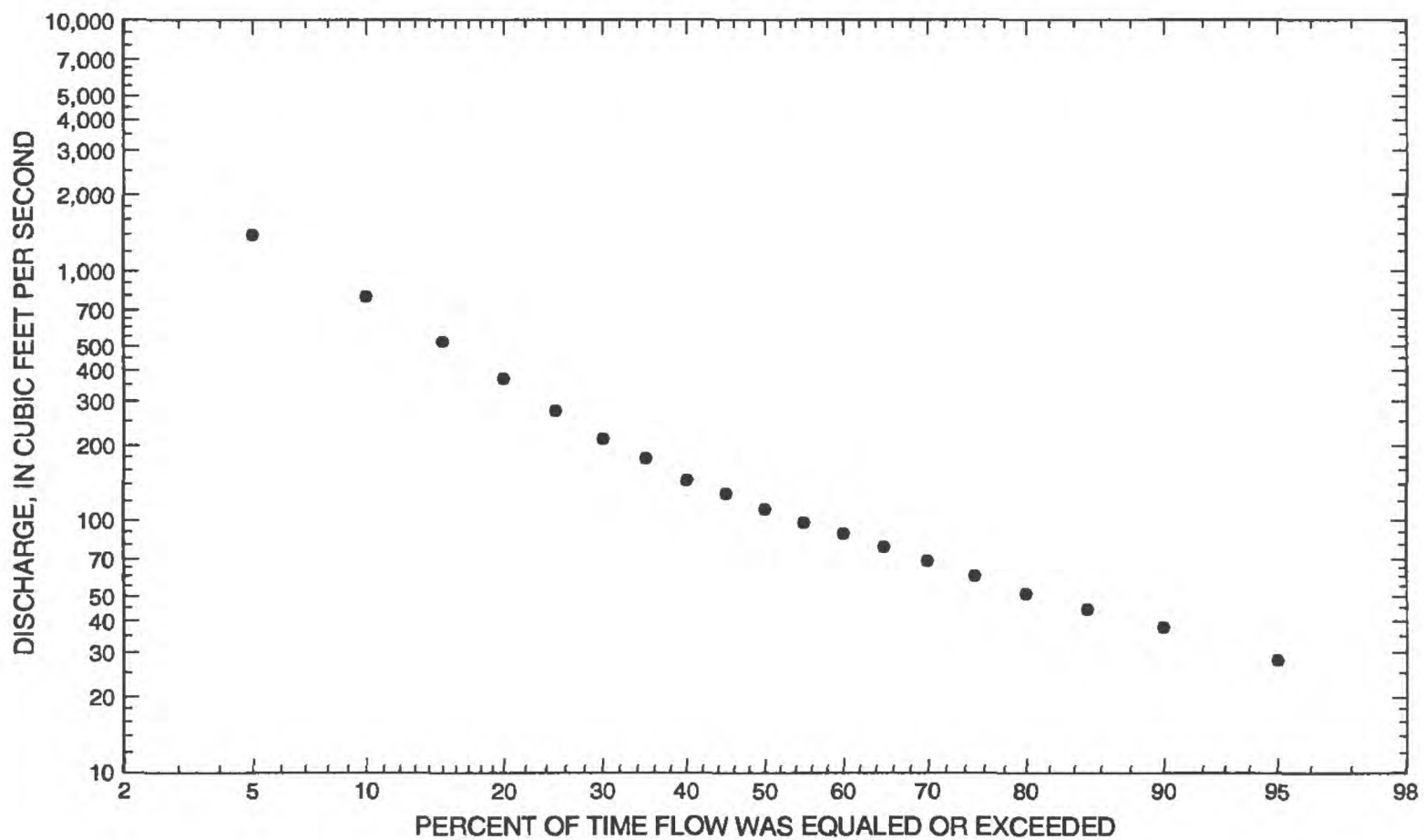


# 05078500 CLEARWATER RIVER AT RED LAKE FALLS, MN--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	1,350	1972	10.0	1935	188	218	1.16	4.80	
November	1,230	1972	19.0	1935	139	153	1.10	3.55	
December	260	1910	21.4	1937	88.6	50.4	0.57	2.26	
January	220	1910	21.4	1940	71.2	37.2	0.52	1.82	
February	150	1984	19.1	1937	65.7	31.9	0.49	1.68	
March	1,140	1995	13.6	1937	236	269	1.14	6.01	
April	3,510	1997	61.0	1981	1,180	936	0.79	30.1	
May	5,060	1950	32.2	1977	684	727	1.06	17.4	
June	3,040	1962	26.5	1980	484	503	1.04	12.3	
July	2,390	1997	8.34	1936	399	450	1.13	10.2	
August	1,690	1985	1.49	1936	206	273	1.32	5.26	
September	1,270	1973	2.92	1936	179	192	1.08	4.56	
Annual	855	1950	64.4	1939	324	183	0.56	100	

Annual flow duration



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

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	28.1	25.2	25.5	76.5	78.1	48.0	28.0	22.5	19.3	25.9	31.0	25.8	28.1
90	32.5	31.3	33.5	123	118	65.3	46.2	33.5	30.2	36.9	40.5	38.1	37.7
85	37.4	34.8	39.4	160	146	82.3	61.2	41.8	38.2	45.5	47.5	43.2	44.5
80	40.4	37.2	44.2	195	174	98.7	73.9	51.1	45.8	52.6	53.2	47.4	51.3
75	43.0	40.0	49.0	247	202	118	87.5	60.0	55.1	59.0	61.2	51.4	60.1
70	46.8	43.5	54.1	320	233	143	101	68.6	64.6	67.8	68.9	55.1	69.1
65	49.7	46.8	59.4	392	272	165	118	77.2	74.3	77.3	76.1	58.7	78.5
60	52.3	50.0	65.4	463	313	189	135	86.8	84.2	85.3	83.5	63.5	88.2
55	59.7	54.9	72.9	540	351	218	156	96.6	94.6	93.4	91.1	70.1	97.8
50	64.6	60.8	81.1	652	404	250	178	106	105	105	100	78.1	111
45	70.5	66.2	90.7	776	462	286	216	120	116	117	111	84.6	128
40	76.0	70.5	101	925	523	330	256	137	130	131	123	90.2	145
35	80.5	75.0	112	1,120	616	388	300	153	143	146	135	97.5	177
30	84.9	79.9	124	1,340	713	471	361	178	163	176	149	106	212
25	89.3	86.6	148	1,560	841	564	440	203	190	215	165	114	274
20	95.5	95.6	185	1,850	1,000	678	550	246	232	259	186	123	370
15	104	102	308	2,250	1,190	831	721	310	304	325	212	134	523
10	119	116	621	2,920	1,480	1,070	989	444	433	423	258	152	789
5	146	130	1,270	4,260	2,150	1,680	1,520	810	630	626	337	193	1,390

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

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedsnce probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean dischrge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-dsy period
0.99	1.01	484	417	364	273	197
0.95	1.05	874	724	623	478	353
0.90	1.11	1,180	966	825	640	476
0.80	1.25	1,680	1,360	1,150	903	676
0.50	2	3,180	2,570	2,160	1,700	1,280
0.20	5	5,710	4,730	3,960	3,120	2,330
0.10	10	7,610	6,450	5,390	4,220	3,140
0.04	25	10,200	8,910	7,460	5,780	4,260
0.02	50	12,200	10,900	9,170	7,050	5,150
0.01	100	14,300	13,100	11,000	8,390	6,090
0.005	200	16,500	15,500	13,000	9,830	7,070
0.002	500	19,400	ng	ng	ng	ng

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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1910	March 22	9.50	1,960	1962	June 10	10.96	8,600
1911	June 9	7.92	793	1963	July 13	6.15	2,300
1912	September 29	--	1,110	1964	April 17	6.58	3,050
1913	April 8	--	3,320	1965	April 13	10.86	8,680
1914	June 12	4.70	1,340	1966	April 3	11.02	8,920
1915	June 29	6.91	3,320	1967	March 31	9.32	5,820
1916	April 15	--	3,990	1968	July 18	7.30	3,550
1917	April 11	--	1,250	1969	April 12	11.82	9,740
1919	--	--	6,700	1970	April 26	9.32	5,630
1935	March 27	5.02	696	1971	April 10	7.58	3,500
1936	April 17	--	1,260	1972	April 16	9.95	6,720
1937	May 1	--	1,010	1973	March 15	7.42	2,900
1938	May 14	5.95	2,220	1974	April 22	10.08	6,920
1939	April 20	3.80	830	1975	April 19	10.34	7,310
1940	April 15	11.43	3,100	1976	April 3	6.84	3,120
1941	June 8	--	3,290	1977	July 5	4.13	866
1942	March 27	10.04	2,200	1978	April 9	11.56	9,890
1943	April 7	--	2,780	1979	April 25	12.38	10,300
1944	August 10	7.42	3,210	1980	April 8	5.59	1,910
1945	March 27	--	2,680	1981	September 8	6.97	3,160
1946	March 22	--	3,380	1982	April 15	7.76	4,160
1947	April 15	--	5,430	1983	June 13	7.05	3,190
1948	April 7	--	3,000	1984	June 9	8.85	5,450
1949	June 2	7.30	3,360	1985	August 19	9.86	7,120
1950	May 6	11.28	9,310	1986	April 30	7.39	3,720
1951	April 10	6.52	2,880	1987	May 27	5.93	2,170
1952	April 16	6.17	2,550	1988	April 7	6.05	2,270
1953	July 5	4.44	1,120	1989	April 7	7.62	2,550
1954	April 14	6.16	2,540	1990	June 22	3.77	652
1955	April 8	7.25	3,660	1991	September 16	4.45	1,040
1956	April 21	8.67	5,560	1992	August 25	--	1,640
1957	June 28	9.98	6,840	1993	March 30	9.88	3,200
1958	July 7	4.65	1,320	1994	July 8	8.99	5,350
1959	April 4	6.30	1,960	1995	March 30	13.25	3,110
1960	April 6	8.47	4,010	1996	April 19	12.24	9,400
1961	April 26	3.97	884	1997	April 15	11.10	7,860
Annual peak discharge, from highest to lowest, and corresponding gage height							
1979	April 25	12.38	10,300	1965	April 13	10.86	8,680
1978	April 9	11.56	9,890	1962	June 10	10.96	8,600
1969	April 12	11.82	9,740	1997	April 15	11.10	7,860
1996	April 19	12.24	9,400	1975	April 19	10.34	7,310
1950	May 6	11.28	9,310	1985	August 19	9.86	7,120
1966	April 3	11.02	8,920	1974	April 22	10.08	6,920



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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1957	June 28	9.98	6,840	1973	March 15	7.42	2,900
1919		--	6,700	1951	April 10	6.52	2,880
1967	March 31	9.32	5,820	1943	April 7	--	2,780
1970	April 26	9.32	5,630	1945	March 27	--	2,680
1956	April 21	8.67	5,560	1952	April 16	6.17	2,550
1984	June 9	8.85	5,450	1989	April 7	7.62	2,550
1947	April 15	--	5,430	1954	April 14	6.16	2,540
1994	July 8	8.99	5,350	1963	July 13	6.15	2,300
1982	April 15	7.76	4,160	1988	April 7	6.05	2,270
1960	April 6	8.47	4,010	1938	May 14	5.95	2,220
1916	April 15	--	3,990	1942	March 27	10.04	2,200
1986	April 30	7.39	3,720	1987	May 27	5.93	2,170
1955	April 8	7.25	3,660	1910	March 22	9.50	1,960
1968	July 18	7.30	3,550	1959	April 4	6.30	1,960
1971	April 10	7.58	3,500	1992	August 25	--	1,640
1946	March 22	--	3,380	1914	June 12	4.70	1,340
1949	June 2	7.30	3,360	1958	July 7	4.65	1,320
1913	April 8	--	3,320	1936	April 17	--	1,260
1915	June 29	6.91	3,320	1917	April 11	--	1,250
1941	June 8	--	3,290	1953	July 5	4.44	1,120
1944	August 10	7.42	3,210	1912	September 29	--	1,110
1993	March 30	9.88	3,200	1991	September 16	4.45	1,040
1983	June 13	7.05	3,190	1937	May 1	--	1,010
1981	September 8	6.97	3,160	1961	April 26	3.97	884
1976	April 3	6.84	3,120	1977	July 5	4.13	866
1995	March 30	13.25	3,110	1939	April 20	3.80	830
1940	April 15	11.43	3,100	1911	June 9	7.92	793
1964	April 17	6.58	3,050	1935	March 27	5.02	696
1948	April 7	--	3,000	1990	June 22	3.77	652

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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1909	--	--	--	--	--	--	--	--	--	509.8	1,189	387.4	--
1910	382.0	280.2	260.0	220.0	115.0	646.6	1,304	323.7	118.1	31.9	33.5	38.5	313.1
1911	43.1	48.0	50.0	45.0	45.0	55.0	236.6	91.6	180.5	26.1	67.9	60.3	78.8
1912	80.0	75.5	65.0	30.0	35.0	38.0	317.0	240.7	108.5	135.9	69.4	337.1	127.3
1913	365.4	79.9	60.0	34.9	28.9	32.6	1,291	300.7	120.3	100.0	84.7	87.8	215.1
1914	125.4	97.0	64.5	55.2	71.7	75.5	306.9	540.5	862.7	613.4	177.5	198.3	266.2
1915	177.3	141.2	57.1	50.0	50.0	60.0	674.7	493.4	988.5	1,368	155.2	99.9	360.9
1916	120.0	91.5	78.5	68.4	76.0	64.0	2,099	1,395	785.1	607.0	133.4	137.1	470.1
1917	106.5	62.4	57.1	70.0	70.0	108.5	625.4	213.5	85.7	66.6	58.0	70.1	132.5
1935	10.0	19.0	22.8	31.7	33.6	160.4	255.0	191.4	89.2	51.6	26.7	45.0	78.1
1936	29.8	27.2	26.8	29.1	24.2	23.3	539.5	348.7	67.8	8.34	1.49	2.92	93.8
1937	18.0	24.5	21.4	24.5	19.1	13.6	249.2	344.9	207.0	97.9	116.8	180.1	109.9
1938	102.9	59.3	28.2	32.5	42.6	185.3	164.4	1,277	309.2	115.5	28.8	22.2	199.3
1939	24.9	32.6	30.9	34.8	24.4	20.0	274.9	172.6	59.9	39.2	17.4	42.3	64.4
1940	54.0	48.0	39.6	21.4	25.3	32.6	855.5	497.6	93.1	27.1	13.4	20.7	143.5
1941	29.8	50.4	57.2	51.8	38.7	29.7	1,029	313.5	1,038	231.6	111.3	430.8	282.5
1942	537.0	224.6	74.8	34.5	32.4	460.0	754.6	830.0	107.4	53.2	94.5	590.3	317.3
1943	310.6	108.8	59.9	48.6	45.9	79.4	1,561	868.3	1,293	355.7	210.6	125.4	421.5
1944	98.0	101.3	68.7	38.8	47.2	42.5	284.5	438.0	631.1	391.5	847.6	414.8	284.2
1945	332.5	350.1	213.1	65.3	51.6	979.1	1,737	850.0	268.0	133.1	101.8	266.7	446.7
1946	321.9	143.9	105.5	80.2	60.2	993.2	1,263	462.1	258.2	263.5	47.2	60.6	339.6
1947	187.2	154.7	92.7	71.8	52.2	94.2	2,346	1,609	1,850	499.2	130.0	132.1	600.5
1948	156.3	107.3	79.2	53.4	29.9	61.5	1,946	731.5	104.5	137.5	75.9	44.2	292.6
1949	39.5	50.6	42.1	41.4	38.1	46.6	563.2	377.5	1,154	608.5	778.1	293.4	336.6
1950	158.5	167.7	99.5	67.4	57.5	58.9	2,262	5,059	1,013	906.9	214.1	119.1	854.7
1951	238.6	167.9	103.4	89.7	82.9	98.2	1,891	1,339	241.4	75.6	78.9	259.4	388.6
1952	179.4	139.3	119.5	108.7	97.4	142.7	1,454	450.3	226.1	822.9	152.9	78.0	330.6
1953	66.4	51.1	56.5	63.6	65.8	251.4	551.6	563.5	550.0	626.3	147.2	92.3	258.1
1954	81.3	87.5	87.9	79.2	88.3	134.9	1,118	505.5	326.2	94.9	72.5	72.5	228.3
1955	72.2	69.8	58.1	46.8	39.3	48.0	1,108	257.6	367.2	114.7	41.8	25.5	186.4
1956	49.1	47.9	51.9	49.5	47.7	48.5	1,318	754.4	253.1	74.8	71.5	182.3	244.5
1957	56.1	148.4	57.5	42.6	39.9	253.5	1,271	430.1	1,584	1,015	88.0	353.5	444.0
1958	214.8	258.1	83.8	61.6	54.3	106.9	145.8	133.3	245.3	469.0	48.2	35.2	155.3
1959	63.4	72.2	44.3	41.7	35.5	132.1	462.9	340.3	372.1	174.6	86.8	55.2	156.8
1960	70.9	54.1	54.3	43.4	37.6	53.5	741.1	280.1	520.4	179.4	41.9	64.2	177.4

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1961	45.5	77.8	52.3	32.6	26.9	158.3	406.2	370.4	73.8	42.1	28.5	103.6	118.4
1962	100.4	72.7	47.7	43.9	41.8	46.7	1,112	2,459	3,042	1,613	316.4	245.1	763.8
1963	128.7	155.0	118.4	52.3	30.0	181.4	649.4	389.7	644.8	352.2	78.4	52.0	236.2
1964	45.9	53.0	50.7	42.0	45.5	60.3	1,028	666.7	631.5	211.5	50.9	155.2	252.2
1965	194.9	114.0	64.8	56.4	47.7	53.5	2,778	1,231	1,437	296.1	97.9	194.9	545.0
1966	538.2	185.6	143.7	102.0	75.1	411.1	3,458	1,247	280.3	112.0	288.0	171.1	583.7
1967	108.5	107.0	83.8	81.1	73.4	354.4	2,024	1,025	567.4	183.0	55.9	34.7	390.9
1968	57.8	65.0	69.8	63.0	64.8	526.8	420.4	262.3	485.8	819.8	265.5	126.0	270.0
1969	141.6	108.0	86.5	76.0	75.6	95.4	2,487	853.9	464.7	175.9	164.5	100.4	400.9
1970	291.1	224.0	136.0	134.8	97.7	76.0	2,115	1,352	786.0	159.1	54.3	56.1	456.1
1971	121.1	230.5	119.7	101.8	60.7	119.8	1,160	327.1	212.8	136.5	123.8	184.6	240.8
1972	1,350	1,233	185.1	103.5	103.3	818.5	2,336	995.0	269.8	169.6	292.0	141.5	666.0
1973	152.5	165.5	90.3	70.7	62.1	898.0	254.8	148.9	67.3	56.2	219.0	1,267	287.9
1974	804.0	235.2	128.1	97.6	120.0	118.8	2,542	1,601	475.7	84.2	341.9	103.1	554.8
1975	117.2	153.3	110.4	108.7	101.4	124.2	2,640	1,215	469.8	1,402	190.5	110.2	562.6
1976	112.3	135.1	96.9	89.8	97.2	253.0	974.6	102.6	81.5	121.1	113.0	15.5	181.9
1977	27.7	41.4	38.3	36.2	36.1	79.8	108.0	32.2	77.5	238.1	75.9	274.2	88.8
1978	325.3	275.2	246.5	165.5	125.5	113.4	3,233	302.0	200.0	256.7	175.8	136.2	460.2
1979	65.1	56.3	54.3	52.2	85.2	85.8	2,905	845.4	468.7	778.1	429.2	107.8	493.5
1980	72.6	200.1	116.4	94.5	103.4	110.5	730.0	68.4	26.5	104.7	116.8	108.9	153.4
1981	80.9	87.5	59.9	50.3	55.5	62.7	61.0	71.2	379.4	545.8	369.0	621.4	204.0
1982	--	--	--	--	--	351.0	2,089	1,178	288.6	455.6	159.0	47.3	--
1983	418.5	145.5	117.3	99.8	90.1	864.8	589.4	315.5	818.7	461.4	374.6	260.8	381.3
1984	285.9	175.6	126.3	91.1	149.7	447.7	555.3	212.1	1,007	167.9	92.4	23.7	276.8
1985	376.8	251.4	141.5	84.2	65.2	588.9	596.0	1,134	605.0	918.0	1,686	471.4	581.8
1986	454.3	208.9	164.3	125.7	125.2	591.5	1,747	1,252	254.2	241.3	138.1	102.8	451.7
1987	100.8	101.4	104.0	83.7	75.0	440.4	204.1	533.0	228.6	491.3	314.9	128.3	235.9
1988	89.8	89.7	77.9	89.9	94.0	330.5	727.8	137.5	75.5	89.5	95.6	63.1	163.0
1989	62.8	59.8	71.9	88.2	74.5	81.4	1,349	343.7	264.3	172.5	76.8	77.0	225.7
1990	44.8	35.4	25.5	35.4	41.9	105.6	217.1	133.9	297.8	116.9	70.2	25.5	95.8
1991	27.3	32.5	35.6	35.5	33.8	77.5	94.9	167.0	90.3	488.2	133.5	284.7	125.8
1992	82.1	92.1	89.5	73.6	69.1	445.9	361.6	243.2	90.6	322.1	363.5	507.6	228.9
1993	104.5	93.8	87.8	83.0	83.0	408.9	844.0	247.2	360.0	841.4	833.8	278.1	357.3
1994	100.5	99.4	121.7	86.2	72.6	196.9	497.7	564.1	711.8	1,673	299.8	339.4	399.4
1995	365.8	318.2	182.3	153.5	127.5	1,136	666.8	733.0	199.5	768.6	263.5	325.3	439.9

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1996	773.7	234.1	161.6	149.0	140.7	148.1	3,347	2,057	372.6	217.6	202.0	71.6	655.2
1997	101.3	177.9	126.1	121.6	124.7	134.1	3,507	700.7	1,058	2,389	284.3	123.3	737.2



## 05079000 RED LAKE RIVER AT CROOKSTON, MN

**LOCATION.**--Lat 47°46'32", long 96°36'33", in SW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.30, T.150 N., R.46 W., Polk County, Hydrologic Unit 09020303, on right bank 100 ft upstream from Sargent Street bridge in Crookston, 0.3 mi downstream from Interstate Power Co.'s dam, 0.6 mi downstream from bridge on U.S. Highway 75, and 53 mi upstream from mouth.

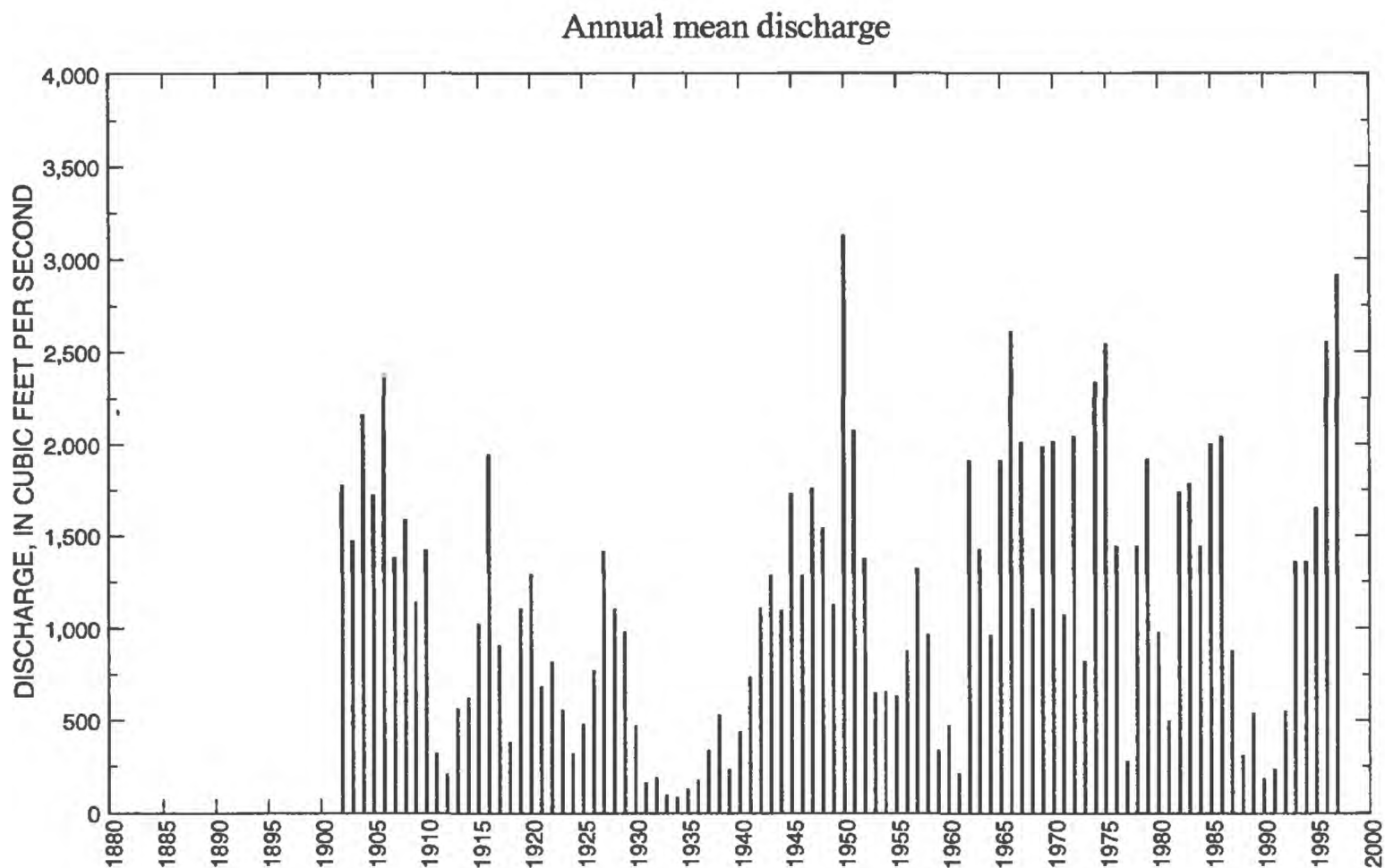
**DRAINAGE AREA.**--5,280 mi<sup>2</sup>, approximately.

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

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

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 28,400 ft<sup>3</sup>/s, Apr. 12, 1969, gage height, 27.33 ft; maximum gage height, 28.40, Apr. 17, 1997, from highwater mark, backwater from ice; minimum daily discharge, 0.0 ft<sup>3</sup>/s, July 13, 1960, caused by regulation of powerplant upstream.

**EXTREMES OUTSIDE PERIOD OF RECORD.**--Flood of April 1897 reached a stage of 25.20 on April 11, discharge 18,900 ft<sup>3</sup>/s.



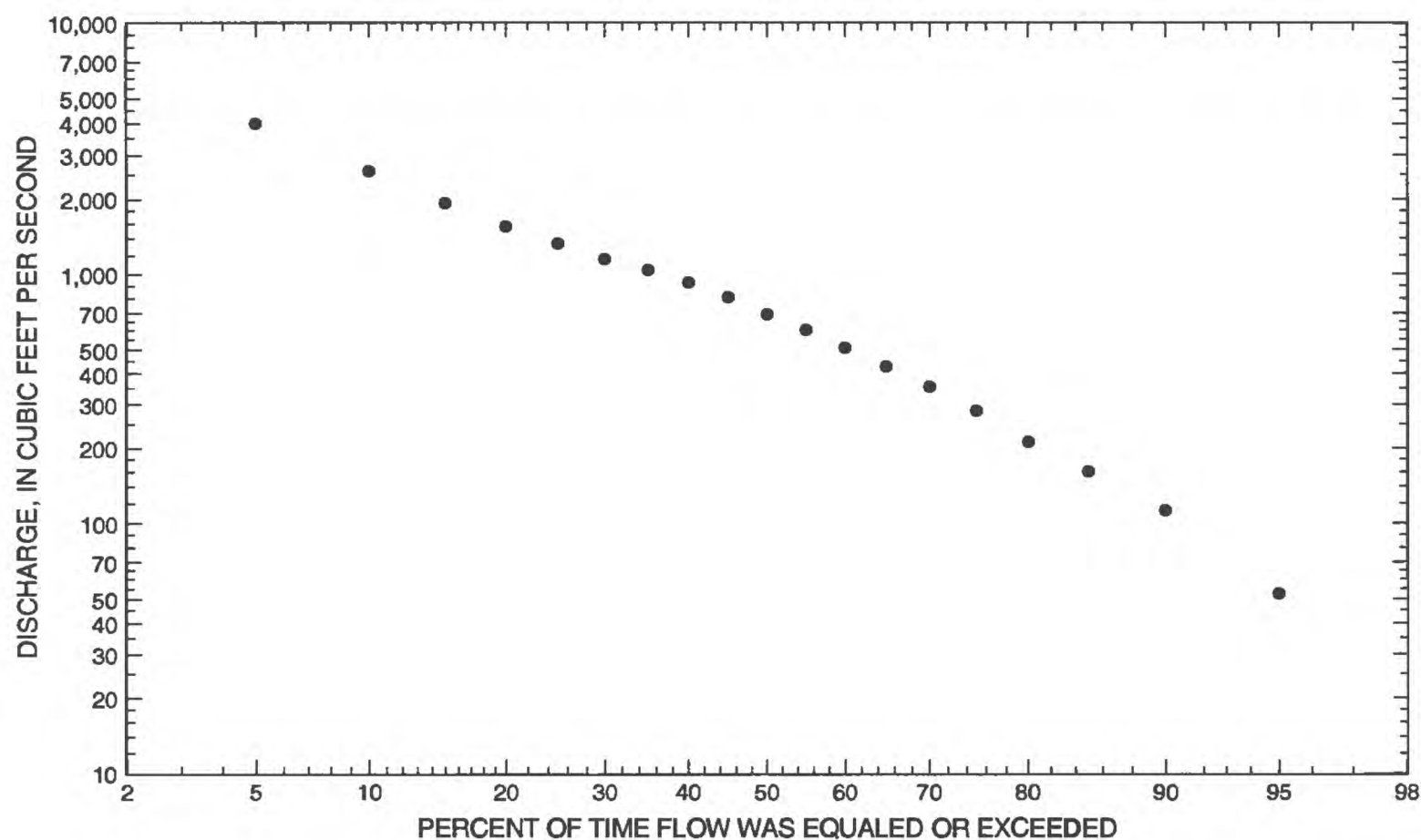


# 05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Coefficient of variation	Percentage of annual diacharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Diacharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Standard deviation (ft <sup>3</sup> /s)		
October	2,840	1972	8.02	1937	827	689	0.83	5.95
November	3,170	1972	10.1	1937	685	558	0.81	4.93
December	1,900	1904	5.34	1937	569	437	0.77	4.10
January	1,660	1951	15.6	1934	511	391	0.76	3.68
February	1,460	1951	17.8	1937	487	364	0.75	3.51
March	4,260	1995	24.9	1936	977	907	0.93	7.04
April	11,900	1997	232	1981	3,070	2,470	0.80	22.1
May	15,300	1950	154	1934	2,100	2,090	0.99	15.1
June	7,200	1962	80.4	1934	1,670	1,300	0.78	12.0
July	6,850	1975	26.2	1936	1,340	1,290	0.96	9.66
August	3,870	1985	12.3	1934	833	740	0.89	6.00
September	3,010	1905	8.87	1934	819	642	0.78	5.90
Annual	3,130	1950	83.6	1934	1,150	725	0.63	100

Annual flow duration



# 05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	30.9	33.5	63.2	242	213	128	54.3	26.9	24.8	26.3	38.0	31.3	52.5
90	76.0	74.5	121	367	295	218	137	76.0	79.1	103	100	78.5	112
85	108	100	150	512	421	320	212	142	123	142	138	116	161
80	146	131	194	658	557	425	288	185	195	191	181	161	212
75	170	162	249	808	680	551	368	240	248	248	218	190	283
70	199	191	333	971	784	671	477	291	309	302	283	241	355
65	237	234	400	1,160	923	796	595	352	393	360	329	294	430
60	323	332	461	1,380	1,060	934	732	432	502	451	380	348	510
55	382	397	524	1,640	1,200	1,070	837	523	578	549	439	410	601
50	449	441	591	1,930	1,340	1,230	949	617	674	650	510	486	695
45	504	480	665	2,230	1,530	1,410	1,080	715	788	763	587	549	813
40	554	533	788	2,610	1,760	1,610	1,210	815	896	876	675	612	931
35	614	590	893	3,060	2,030	1,820	1,340	916	1,000	986	786	675	1,050
30	687	655	977	3,580	2,430	2,040	1,500	1,040	1,100	1,090	904	769	1,160
25	785	751	1,080	4,120	2,930	2,310	1,700	1,180	1,210	1,200	1,020	867	1,330
20	913	855	1,200	4,790	3,440	2,620	1,990	1,360	1,350	1,350	1,150	960	1,560
15	992	951	1,440	5,680	3,970	3,010	2,380	1,570	1,500	1,530	1,300	1,070	1,950
10	1,080	1,030	2,140	7,160	4,620	3,570	2,960	1,870	1,740	1,850	1,530	1,180	2,600
5	1,220	1,120	3,720	10,200	5,780	4,560	4,030	2,330	2,100	2,280	1,880	1,440	4,010

## 05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s) <sup>1</sup>	Maximum mean discharge (ft <sup>3</sup> /a)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	878	657	537	402	322
0.95	1.05	1,800	1,400	1,160	892	701
0.90	1.11	2,550	2,030	1,700	1,320	1,030
0.80	1.25	3,810	3,090	2,600	2,040	1,580
0.50	2	7,570	6,330	5,370	4,270	3,290
0.20	5	13,600	11,600	9,910	7,930	6,150
0.10	10	17,900	15,400	13,100	10,500	8,180
0.04	25	23,200	20,100	17,000	13,700	10,800
0.02	50	27,100	23,500	19,900	15,900	12,600
0.01	100	30,900	26,800	22,700	18,100	14,500
0.005	200	34,600	30,000	25,300	20,200	16,200
0.002	500	39,300	ng	ng	ng	ng

<sup>1</sup>Historic adjustment applied.

# 05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
<sup>1</sup> 1897	April 11	25.20	18,900	1947	June 12	18.08	12,400
1902	May 21	10.00	5,170	1948	April 19	--	9,520
1904	April 24	20.42	13,700	1949	June 2	17.43	10,700
1905	May 13	14.50	8,730	1950	May 7	25.70	27,400
1906	April 15	21.00	14,600	1951	April 7	19.00	12,600
1907	April 4	12.04	6,330	1952	April 11	12.65	6,320
1908	April 10	17.00	10,700	1953	March 24	8.01	2,560
1909	July 21	8.77	3,680	1954	April 12	11.37	5,330
1910	March 20	14.20	7,920	1955	April 8	18.30	12,400
1911	June 10	8.45	3,620	1956	April 20	19.78	14,000
1912	September 29	--	2,120	1957	June 29	18.10	11,800
1913	April 8	--	7,170	1958	July 7	8.62	3,370
1914	June 12	7.40	2,630	1959	April 5	11.72	5,630
1915	June 29	14.25	7,860	1960	April 6	12.56	5,520
1916	April 17	21.80	15,900	1961	March 27	5.67	1,450
1917	April 11	--	5,480	1962	June 11	21.90	16,700
1918	April 2	6.50	1,950	1963	April 9	13.25	6,820
1919	July 5	21.10	14,900	1964	June 20	11.74	5,550
1920	March 25	23.30	9,520	1965	April 14	23.51	19,400
1922	May 13	13.00	6,910	1966	April 3	24.41	21,500
1923	April 20	--	5,820	1967	April 1	23.49	19,300
1924	April 23	5.20	1,140	1968	July 19	17.17	11,100
1925	June 9	13.50	7,300	1969	April 12	27.33	28,400
1926	March 24	12.30	6,500	1970	April 26	19.05	13,300
1927	April 13	14.00	7,700	1971	April 10	20.74	15,300
1928	April 8	--	3,910	1972	April 16	20.28	14,700
1929	March 19	14.90	7,620	1973	September 26	10.86	4,960
1930	May 13	10.30	4,770	1974	April 23	22.89	16,400
1931	March 26	4.93	1,030	1975	April 18	21.97	15,600
1932	April 9	9.78	4,390	1976	April 3	19.45	12,500
1933	April 2	5.92	1,440	1977	May 20	8.66	3,440
1934	April 8	6.89	1,490	1978	April 7	23.11	18,100
1935	March 27	8.38	2,490	1979	April 26	24.99	21,900
1936	April 18	11.33	4,540	1980	April 9	12.31	6,600
1937	August 4	10.25	3,750	1981	June 29	13.56	7,120
1938	May 10	12.62	5,910	1982	April 17	16.12	9,320
1939	April 24	8.92	3,050	1983	June 23	13.98	7,330
1940	April 16	14.73	6,000	1984	June 10	20.71	14,400
1941	June 9	--	6,190	1985	August 19	16.38	9,580
1942	March 28	--	7,090	1986	April 1	19.47	11,500
1943	April 8	16.88	9,420	1987	May 28	11.22	5,360
1944	August 11	12.20	5,770	1988	April 8	10.90	5,090
1945	March 28	15.96	9,130	1989	April 17	16.11	8,800
1946	March 24	--	9,020	1990	June 23	4.60	916



# 05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height--Continued							
1991	June 13	6.99	2,200	1995	March 16	18.27	10,300
1992	April 28	--	2,460	1996	April 20	24.84	21,700
1993	April 1	18.24	7,400	1997	April 18	--	28,000
1994	July 10	20.41	13,600				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1969	April 12	27.33	28,400	1946	March 24	--	9,020
1997	April 18	--	28,000	1989	April 17	16.11	8,800
1950	May 7	25.70	27,400	1905	May 13	14.50	8,730
1979	April 26	24.99	21,900	1910	March 20	14.20	7,920
1996	April 20	24.84	21,700	1915	June 29	14.25	7,860
1966	April 3	24.41	21,500	1927	April 13	14.00	7,700
1965	April 14	23.51	19,400	1929	March 19	14.90	7,620
1967	April 1	23.49	19,300	1993	April 1	18.24	7,400
1897	April 11	25.20	18,900	1983	June 23	13.98	7,330
1978	April 7	23.11	18,100	1925	June 9	13.50	7,300
1962	June 11	21.90	16,700	1913	April 8	--	7,170
1974	April 23	22.89	16,400	1981	June 29	13.56	7,120
1916	April 17	21.80	15,900	1942	March 28	--	7,090
1975	April 18	21.97	15,600	1922	May 13	13.00	6,910
1971	April 10	20.74	15,300	1963	April 9	13.25	6,820
1919	July 5	21.10	14,900	1980	April 9	12.31	6,600
1972	April 16	20.28	14,700	1926	March 24	12.30	6,500
1906	April 15	21.00	14,600	1907	April 4	12.04	6,330
1984	June 10	20.71	14,400	1952	April 11	12.65	6,320
1956	April 20	19.78	14,000	1941	June 9	--	6,190
1904	April 24	20.42	13,700	1940	April 16	14.73	6,000
1994	July 10	20.41	13,600	1938	May 10	12.62	5,910
1970	April 26	19.05	13,300	1923	April 20	--	5,820
1951	April 7	19.00	12,600	1944	August 11	12.20	5,770
1976	April 3	19.45	12,500	1959	April 5	11.72	5,630
1947	June 12	18.08	12,400	1964	June 20	11.74	5,550
1955	April 8	18.30	12,400	1960	April 6	12.56	5,520
1957	June 29	18.10	11,800	1917	April 11	--	5,480
1986	April 1	19.47	11,500	1987	May 28	11.22	5,360
1968	July 19	17.17	11,100	1954	April 12	11.37	5,330
1908	April 10	17.00	10,700	1902	May 21	10.00	5,170
1949	June 2	17.43	10,700	1988	April 8	10.90	5,090
1995	March 16	18.27	10,300	1973	September 26	10.86	4,960
1985	August 19	16.38	9,580	1930	May 13	10.30	4,770
1920	March 25	23.30	9,520	1936	April 18	11.33	4,540
1948	April 19	--	9,520	1932	April 9	9.78	4,390
1943	April 8	16.88	9,420	1928	April 8	--	3,910
1982	April 17	16.12	9,320	1937	August 4	10.25	3,750
1945	March 28	15.96	9,130	1909	July 21	8.77	3,680



# 05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1911	June 10	8.45	3,620	1912	September 29	--	2,120
1977	May 20	8.66	3,440	1918	April 2	6.50	1,950
1958	July 7	8.62	3,370	1934	April 8	6.89	1,490
1939	April 24	8.92	3,050	1961	March 27	5.67	1,450
1914	June 12	7.40	2,630	1933	April 2	5.92	1,440
1953	March 24	8.01	2,560	1924	April 23	5.20	1,140
1935	March 27	8.38	2,490	1931	March 26	4.93	1,030
1992	April 28	--	2,460	1990	June 23	4.60	916
1991	June 13	6.99	2,200				

<sup>1</sup>Reported by Professor E.F. Chandler.

# 05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1901	--	--	--	--	--	--	--	--	2,911	3,789	1,775	1,349	--
1902	1,550	1,220	612.0	522.0	605.0	2,441	2,185	4,117	3,898	1,914	1,165	1,027	1,778
1903	1,181	1,346	969.0	880.0	795.0	1,010	4,360	2,318	1,815	995.5	671.0	1,388	1,475
1904	1,934	1,308	1,900	627.0	504.0	490.0	6,655	5,444	3,341	1,815	937.9	1,020	2,164
1905	1,021	892.7	638.0	495.0	504.0	828.0	1,988	3,196	2,077	2,947	3,031	3,009	1,726
1906	2,261	1,675	1,600	1,500	1,020	1,500	8,116	3,783	2,545	1,801	1,516	1,255	2,381
1907	983.2	835.7	700.0	650.0	460.0	1,264	4,372	2,078	2,183	1,225	854.4	994.5	1,383
1908	1,040	668.2	626.0	467.0	508.0	620.0	4,662	3,750	3,046	1,340	1,188	1,185	1,589
1909	860.1	803.1	437.0	479.8	385.0	657.7	2,243	1,517	977.0	1,677	2,282	1,341	1,142
1910	1,484	1,150	946.0	754.0	700.0	3,626	4,117	1,983	1,064	546.2	351.5	333.1	1,424
1911	293.2	216.8	219.0	150.0	120.0	434.0	657.6	450.0	977.1	142.3	109.4	81.4	320.8
1912	98.4	63.7	80.0	31.0	37.0	43.0	391.4	313.3	236.2	309.6	296.9	636.3	211.0
1913	697.0	362.1	165.0	137.3	125.4	117.6	3,350	725.1	365.5	276.9	255.7	266.1	568.3
1914	309.6	264.3	180.1	203.2	203.9	454.8	1,389	1,080	1,497	1,001	375.5	548.1	625.8
1915	546.1	603.8	465.5	383.9	452.9	542.9	1,335	1,340	2,354	2,962	712.4	599.7	1,027
1916	600.6	483.5	558.4	450.4	461.7	689.5	6,664	4,459	3,170	2,781	1,467	1,617	1,947
1917	1,087	871.1	621.5	386.5	430.5	736.5	3,400	1,437	879.5	643.9	273.7	160.4	910.0
1918	269.8	287.8	196.5	127.7	91.4	669.1	644.0	725.2	712.1	331.6	353.6	196.8	385.4
1919	191.4	320.0	268.0	223.0	217.0	538.8	1,466	914.6	912.9	5,581	2,044	505.6	1,109
1920	620.0	441.0	357.0	386.0	422.0	3,450	3,976	1,452	1,990	1,390	658.8	543.2	1,307
1921	548.9	486.0	486.0	472.0	455.0	441.0	1,598	959.2	1,193	551.2	516.6	547.2	686.8
1922	520.9	419.7	440.0	300.0	350.0	380.0	2,567	2,605	962.5	517.6	281.5	478.0	819.2
1923	327.6	468.7	239.8	190.0	170.0	160.0	2,136	1,292	693.2	534.4	236.1	273.8	559.7
1924	341.9	312.0	271.0	167.7	172.4	258.4	690.3	676.9	477.8	237.4	161.8	68.7	319.8
1925	163.4	116.8	97.4	89.4	57.1	452.6	580.7	725.0	2,673	579.5	68.2	195.2	482.2
1926	648.4	501.0	443.2	447.9	385.2	1,845	1,376	714.4	1,347	887.7	363.7	313.3	774.7
1927	410.6	440.0	320.0	240.0	180.0	628.7	3,981	5,201	2,710	1,094	847.1	897.5	1,416
1928	845.3	664.3	550.0	450.0	470.0	1,339	2,090	1,394	1,871	1,148	1,009	1,439	1,105
1929	938.5	782.3	719.6	669.4	474.6	3,234	1,933	1,210	764.7	468.5	301.9	237.8	982.5
1930	255.2	259.0	203.5	165.6	137.8	287.0	1,494	1,679	633.5	348.7	146.6	102.0	477.2
1931	125.9	175.2	178.5	118.1	148.7	263.5	361.7	231.2	225.0	77.6	30.5	21.1	162.8
1932	34.1	99.7	70.9	52.9	56.5	219.5	1,297	317.8	81.0	37.2	19.1	12.8	190.3
1933	12.2	30.9	27.2	23.0	29.4	108.2	609.0	162.5	122.7	36.7	15.4	13.3	98.7
1934	8.79	11.7	20.0	15.6	18.5	130.8	501.2	153.6	80.4	44.2	12.3	8.87	83.6
1935	10.5	23.6	20.9	16.1	21.2	341.3	519.9	283.6	159.0	90.3	32.1	56.7	131.5

# 05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1936	31.3	31.3	28.9	31.8	25.0	24.9	1,366	470.2	91.3	26.2	13.2	10.4	177.9
1937	8.02	10.1	5.34	19.8	17.8	26.2	403.7	716.2	382.5	704.2	1,161	577.6	338.5
1938	167.3	92.2	35.9	59.0	80.7	619.6	293.2	3,328	1,041	347.7	108.8	142.3	531.4
1939	155.3	132.6	153.4	157.1	142.0	200.6	659.7	413.0	310.0	180.4	92.9	235.6	235.7
1940	287.9	266.3	241.3	156.9	173.8	186.0	2,016	1,005	481.8	216.5	149.6	143.1	442.0
1941	214.9	243.8	182.3	209.4	211.8	196.9	2,647	738.3	2,536	506.7	305.2	892.0	735.6
1942	1,087	711.0	539.9	448.1	477.9	1,561	2,911	2,829	816.4	287.3	341.5	1,276	1,109
1943	578.1	355.0	312.9	363.2	337.9	529.0	3,966	2,270	3,449	1,416	930.7	951.5	1,286
1944	865.1	683.4	499.8	413.5	448.6	493.9	1,329	1,229	2,283	1,484	1,907	1,533	1,097
1945	1,275	1,549	1,187	709.7	700.0	3,406	5,202	2,901	1,392	860.8	572.8	969.2	1,729
1946	1,088	737.3	600.3	569.4	542.1	3,620	3,867	1,745	1,013	764.1	350.3	464.5	1,284
1947	751.9	590.1	527.7	496.5	454.3	634.5	4,262	3,308	5,572	2,472	941.2	1,133	1,760
1948	1,232	892.3	979.0	912.9	637.9	675.8	6,552	3,409	1,071	954.7	659.3	566.9	1,542
1949	400.9	400.9	331.5	351.6	353.6	476.4	2,587	1,256	2,931	1,214	1,978	1,260	1,128
1950	854.8	866.3	600.0	664.5	655.4	793.5	5,760	15,290	4,702	3,602	1,670	1,872	3,129
1951	2,352	1,778	1,763	1,663	1,464	1,631	5,573	4,265	1,947	1,216	522.8	729.3	2,076
1952	682.4	685.4	1,049	1,140	1,210	1,178	3,236	1,942	1,707	2,326	858.8	599.6	1,384
1953	415.7	371.9	359.3	367.4	375.7	841.0	890.2	1,033	1,252	1,037	452.4	392.8	650.4
1954	356.1	342.7	328.4	293.7	302.8	412.5	1,860	1,305	1,209	673.8	433.8	358.5	656.2
1955	347.2	407.4	389.3	321.6	337.4	365.5	2,593	706.6	1,118	487.0	270.6	258.5	630.9
1956	261.6	178.5	189.2	226.1	230.7	230.1	3,408	2,489	847.6	874.5	301.2	1,292	874.9
1957	360.4	611.7	355.2	231.1	118.4	669.3	2,510	1,272	2,797	3,333	1,375	2,188	1,321
1958	2,295	1,806	782.7	827.0	776.0	1,001	981.0	485.3	603.6	1,532	364.2	103.8	965.7
1959	97.4	117.7	74.5	73.9	83.8	298.4	1,519	685.5	481.1	317.8	182.6	128.9	338.0
1960	219.8	211.4	200.9	184.6	176.6	191.0	2,280	755.9	942.7	420.7	70.5	85.1	475.5
1961	115.6	173.6	71.6	64.5	68.3	405.5	661.4	569.6	92.9	89.7	52.7	184.8	213.0
1962	217.0	142.6	69.5	79.0	82.0	103.0	2,849	4,720	7,205	3,796	1,905	1,733	1,912
1963	1,517	1,370	939.3	983.2	882.1	1,263	3,192	2,074	2,221	1,245	652.1	799.2	1,427
1964	1,077	598.6	455.9	544.2	513.1	361.6	1,841	1,307	2,505	1,157	754.5	464.5	963.2
1965	996.2	820.1	614.2	622.3	634.6	635.5	7,321	3,820	3,866	1,813	795.1	1,140	1,919
1966	2,406	1,369	1,219	1,086	1,040	1,685	10,260	5,254	2,398	1,389	1,755	1,488	2,611
1967	1,201	1,152	1,108	1,053	1,079	1,459	6,833	4,750	2,519	1,324	837.9	833.7	2,011
1968	540.7	390.4	344.0	312.6	260.5	1,212	841.3	399.1	2,151	3,616	1,857	1,316	1,107
1969	950.5	1,155	1,250	1,245	1,240	1,220	7,840	3,651	2,024	1,180	938.3	1,228	1,988
1970	1,787	1,333	1,065	1,114	1,036	1,039	5,595	3,890	4,061	1,535	813.3	965.4	2,017

# 05079000 RED LAKE RIVER AT CROOKSTON, MN--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1971	932.5	943.1	790.0	772.4	860.5	983.2	2,995	1,428	1,169	792.3	656.7	563.1	1,072
1972	2,836	3,172	1,055	902.4	921.7	2,290	5,409	2,976	1,601	939.1	1,177	1,278	2,044
1973	1,114	680.9	658.2	603.7	606.8	1,695	554.7	615.9	407.4	244.1	496.0	2,191	822.6
1974	2,301	1,319	985.8	928.4	1,007	1,003	6,856	5,755	2,755	1,621	2,024	1,456	2,337
1975	1,580	1,429	915.1	994.2	906.8	934.2	6,064	4,697	2,509	6,851	1,788	1,747	2,544
1976	1,966	1,604	1,092	1,337	1,238	1,602	3,409	1,340	1,149	915.5	990.6	669.3	1,441
1977	279.6	183.8	194.8	176.6	181.0	276.6	429.1	366.0	224.6	384.1	191.3	450.9	278.5
1978	628.5	670.0	731.9	623.9	622.1	693.2	7,509	1,798	1,289	1,360	832.4	610.3	1,442
1979	613.1	520.3	503.9	490.0	506.2	556.6	7,678	4,489	2,613	2,322	1,571	1,166	1,919
1980	1,138	936.5	1,201	1,085	1,038	1,070	2,658	808.7	642.7	384.9	415.1	381.3	977.7
1981	186.2	179.9	138.2	125.8	150.2	237.3	231.8	236.8	887.5	1,349	873.1	1356	497.0
1982	1,768	1,131	965.5	982.6	914.3	992.9	4,540	3,456	1,712	2,007	1,355	992.3	1,737
1983	2,193	1,538	1,305	1,087	956.8	2,576	2,384	1,510	2,613	1,973	1,778	1,476	1,787
1984	1,385	1,256	1,022	967.1	1,039	1,787	2,463	1,166	3,498	1,346	821.7	572.0	1,440
1985	803.4	908.6	1,030	1,002	941.4	2,117	1,900	2,728	2,942	3,013	3,868	2,697	2,003
1986	2,416	1,405	1,048	992.9	953.9	2,345	5,623	4,336	1,777	1,301	1,085	1,181	2,043
1987	852.3	662.2	806.5	721.0	694.6	1,919	880.3	1,305	728.5	837.5	671.8	441.3	880.4
1988	226.6	199.6	170.8	160.0	160.0	506.7	1,416	235.4	187.7	147.9	168.1	193.2	313.1
1989	137.9	128.3	139.4	181.3	152.3	152.7	3,546	876.8	537.5	337.4	167.1	156.1	539.9
1990	115.7	96.6	78.0	96.0	103.3	248.9	415.5	221.3	448.9	179.8	138.6	82.9	185.3
1991	95.6	116.6	104.0	94.3	91.7	184.5	236.7	353.7	251.9	635.5	217.6	446.7	236.6
1992	170.6	145.1	146.4	145.8	145.7	1,002	1,381	919.2	242.6	521.7	559.2	1,253	552.7
1993	532.9	261.8	594.4	579.9	593.4	896.9	2,638	988.7	1,479	2,453	2,836	2,414	1,358
1994	1,226	723.2	729.4	661.5	600.2	1,298	1,141	1,234	1,815	4,375	1,168	1,325	1,366
1995	1,625	1,458	1,088	885.2	872.5	4,257	2,636	2,242	854.9	1,786	1,063	943.8	1,651
1996	1,531	1,268	1,193	1,040	1,130	1,234	8,295	7,059	3,066	2,167	1,614	1,056	2,553
1997	1,287	1,669	1,452	1,154	1,029	1,132	11,870	3,850	3,263	5,416	1,554	1,344	2,916



## 05079901 BURNHAM CREEK NEAR CROOKSTON, MN

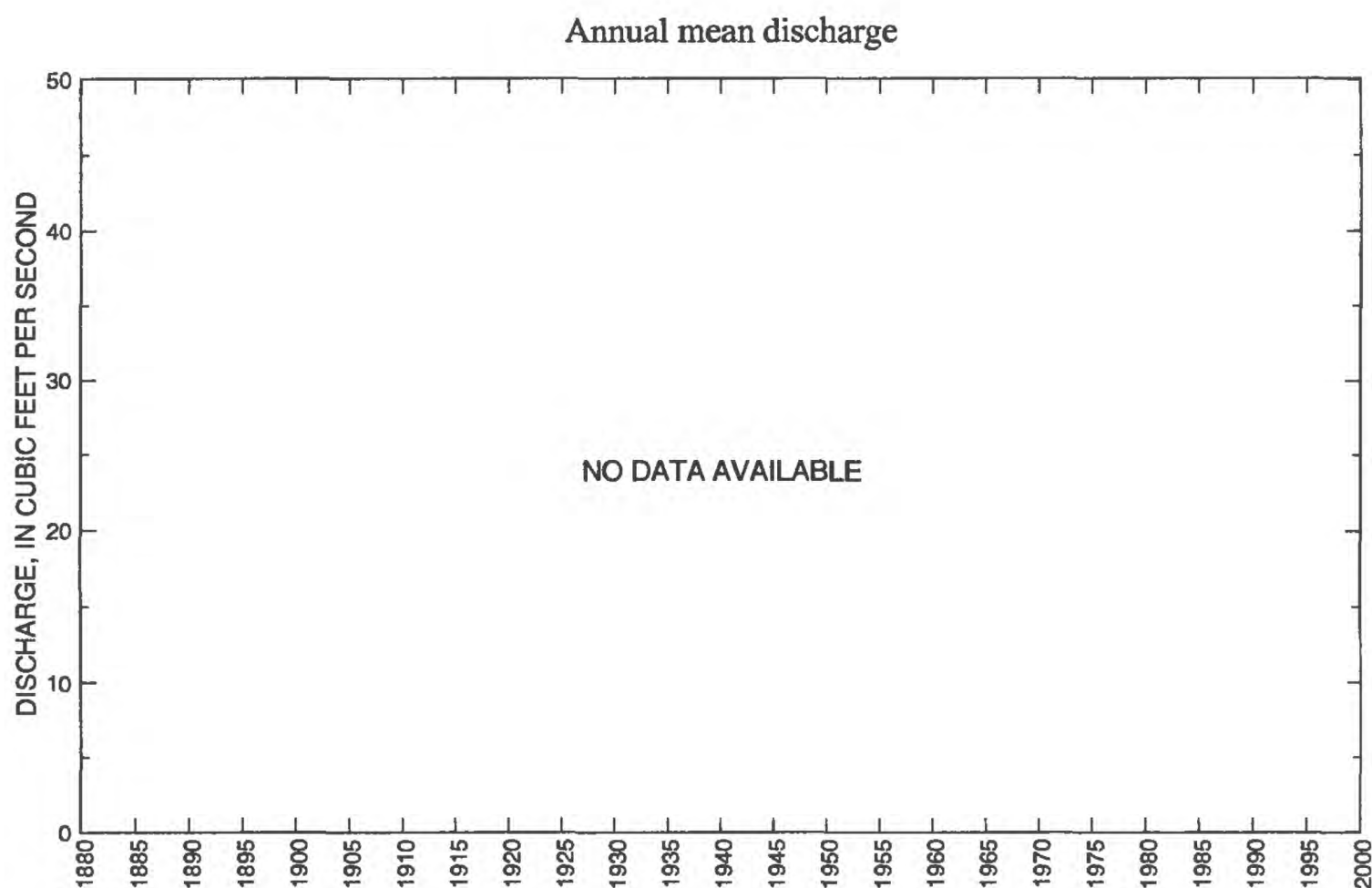
LOCATION.--Lat 47°43'59", long 96°39'52", in SE<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.10, T.149 N., R.47 W., Polk County, Hydrologic Unit 09020303, at triple box culvert on U.S. Highway 75, 0.75 mi northeast of Girard, 3 mi southwest of Crookston, and 7 mi above mouth.

DRAINAGE AREA.--134 mi<sup>2</sup>.

PERIOD OF RECORD.--Water year 1986 to current year.

GAGE.--Crest-stage gage.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,000 ft<sup>3</sup>/s, Apr. 15, 1997, gage height, 22.63 ft.





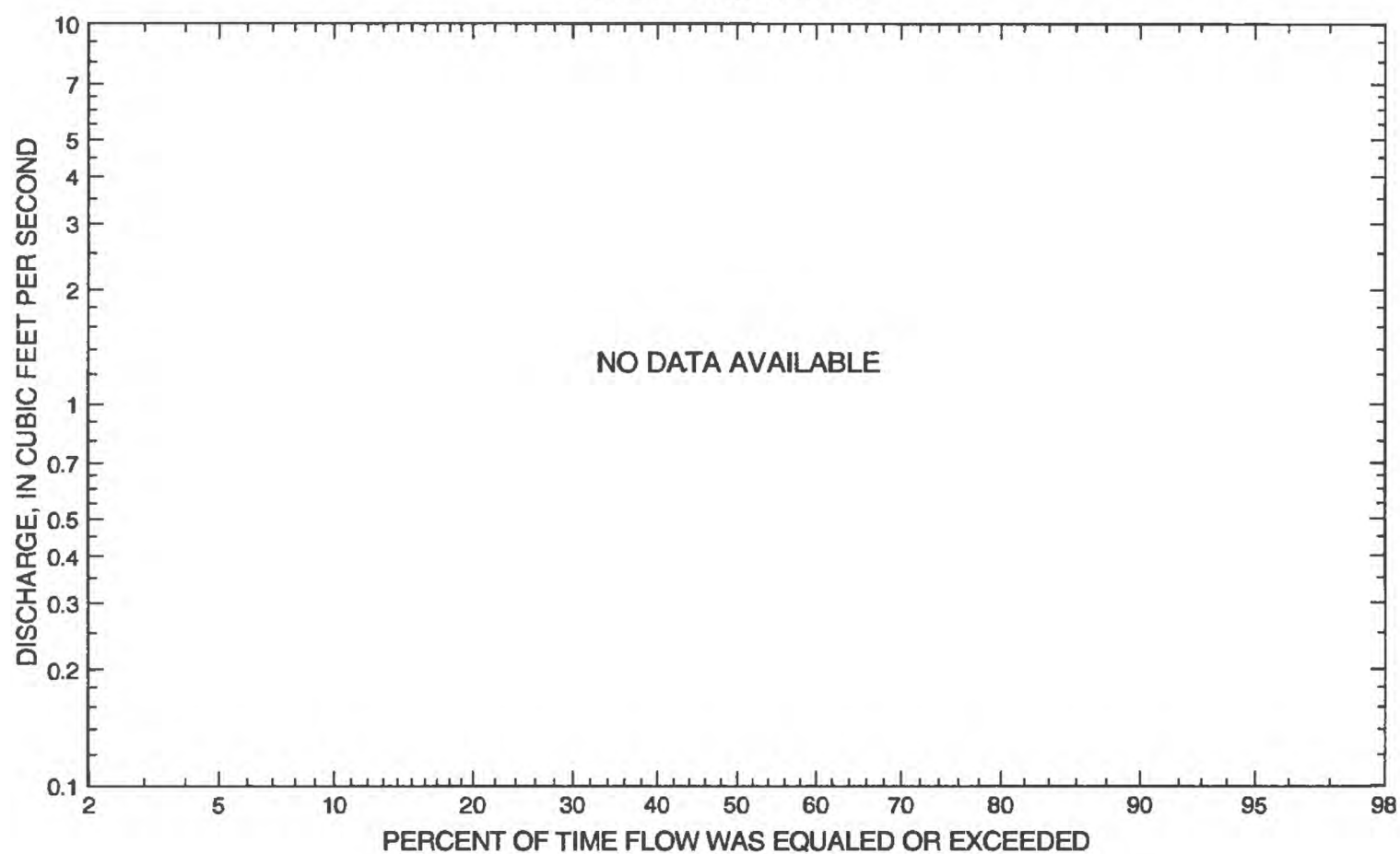
# 05079901 BURNHAM CREEK NEAR CROOKSTON, MN--Continued

Statistics of monthly and annual mean discharges

[--, no data]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /a)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	--	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
August	--	--	--	--	--	--	--	--
September	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--

Annual flow duration



# 05079901 BURNHAM CREEK NEAR CROOKSTON, MN--Continued

Monthly and annual flow duration, in cubic feet per second

[--, no data]

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	--	--	--	--	--	--	--	--	--	--	--	--	--
90	--	--	--	--	--	--	--	--	--	--	--	--	--
85	--	--	--	--	--	--	--	--	--	--	--	--	--
80	--	--	--	--	--	--	--	--	--	--	--	--	--
75	--	--	--	--	--	--	--	--	--	--	--	--	--
70	--	--	--	--	--	--	--	--	--	--	--	--	--
65	--	--	--	--	--	--	--	--	--	--	--	--	--
60	--	--	--	--	--	--	--	--	--	--	--	--	--
55	--	--	--	--	--	--	--	--	--	--	--	--	--
50	--	--	--	--	--	--	--	--	--	--	--	--	--
45	--	--	--	--	--	--	--	--	--	--	--	--	--
40	--	--	--	--	--	--	--	--	--	--	--	--	--
35	--	--	--	--	--	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--	--	--	--

# 05079901 BURNHAM CREEK NEAR CROOKSTON, MN--Continued

Probability of occurrence of annual high discharges

[--, no data]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	18.1	--	--	--	--
0.95	1.05	54.9	--	--	--	--
0.90	1.11	95.9	--	--	--	--
0.80	1.25	183	--	--	--	--
0.50	2	574	--	--	--	--
0.20	5	1,600	--	--	--	--
0.10	10	2,620	--	--	--	--
0.04	25	4,290	--	--	--	--
0.02	50	5,790	--	--	--	--
0.01	100	7,500	--	--	--	--
0.005	200	9,410	--	--	--	--
0.002	500	12,200	--	--	--	--

# 05079901 BURNHAM CREEK NEAR CROOKSTON, MN--Continued

## Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1986	March 29	17.04	450	1992	March 7	15.80	205
1987	March 22	15.77	310	1993	March 29	17.50	880
1988	April 4	15.22	190	1994	July 8	19.25	1,340
1989	April 4	20.44	1,900	1995	March 27	18.25	1,260
1990	March 31	11.09	55.0	1996	April 15	18.94	1,950
1991	June 11	13.87	96.0	1997	April 15	22.63	3,000
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 15	22.63	3,000	1986	March 29	17.04	450
1996	April 15	18.94	1,950	1987	March 22	15.77	310
1989	April 4	20.44	1,900	1992	March 7	15.80	205
1994	July 8	19.25	1,340	1988	April 4	15.22	190
1995	March 27	18.25	1,260	1991	June 11	13.87	96.0
1993	March 29	17.50	880	1990	March 31	11.09	55.0

05079901 BURNHAM CREEK NEAR CROOKSTON, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[--, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
--	--	--	--	--	--	--	--	--	--	--	--	--	--



## 05082500 RED RIVER OF THE NORTH AT GRAND FORKS, ND

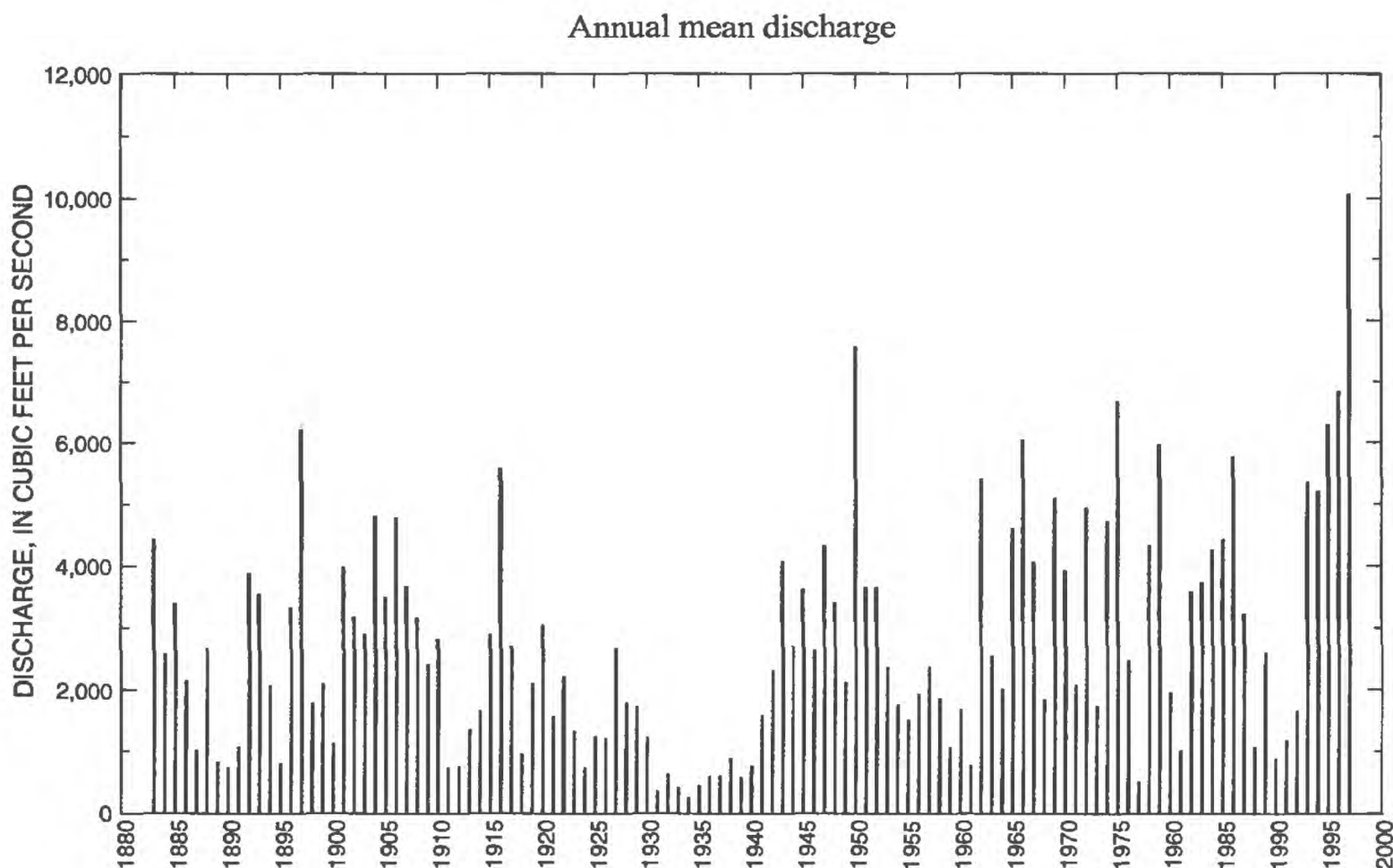
**LOCATION.**--Lat 47°55'38", long 97°01'34", in sec.2, T.151 N., R.50 W., Grand Forks County, Hydrologic Unit 09020301, on right bank 200 ft upstream from the DeMers Avenue bridge, 0.4 mi downstream from Red Lake River, and at river mile 297.6.

**DRAINAGE AREA.**--30,100 mi<sup>2</sup>, approximately, including 3,800 mi<sup>2</sup> in closed basins.

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

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

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 137,000 ft<sup>3</sup>/s, Apr. 18, 1997, gage height, 52.21 ft, maximum observed flow affected by breakout flow from the Red River of the North about 20 river miles upstream of gage; maximum gage height, 54.35 ft, Apr. 22, 1997, from floodmarks; minimum daily discharge, 1.8 ft<sup>3</sup>/s, Sept. 2, 1977, caused by unusual regulation during repair of dam at Grand Forks.

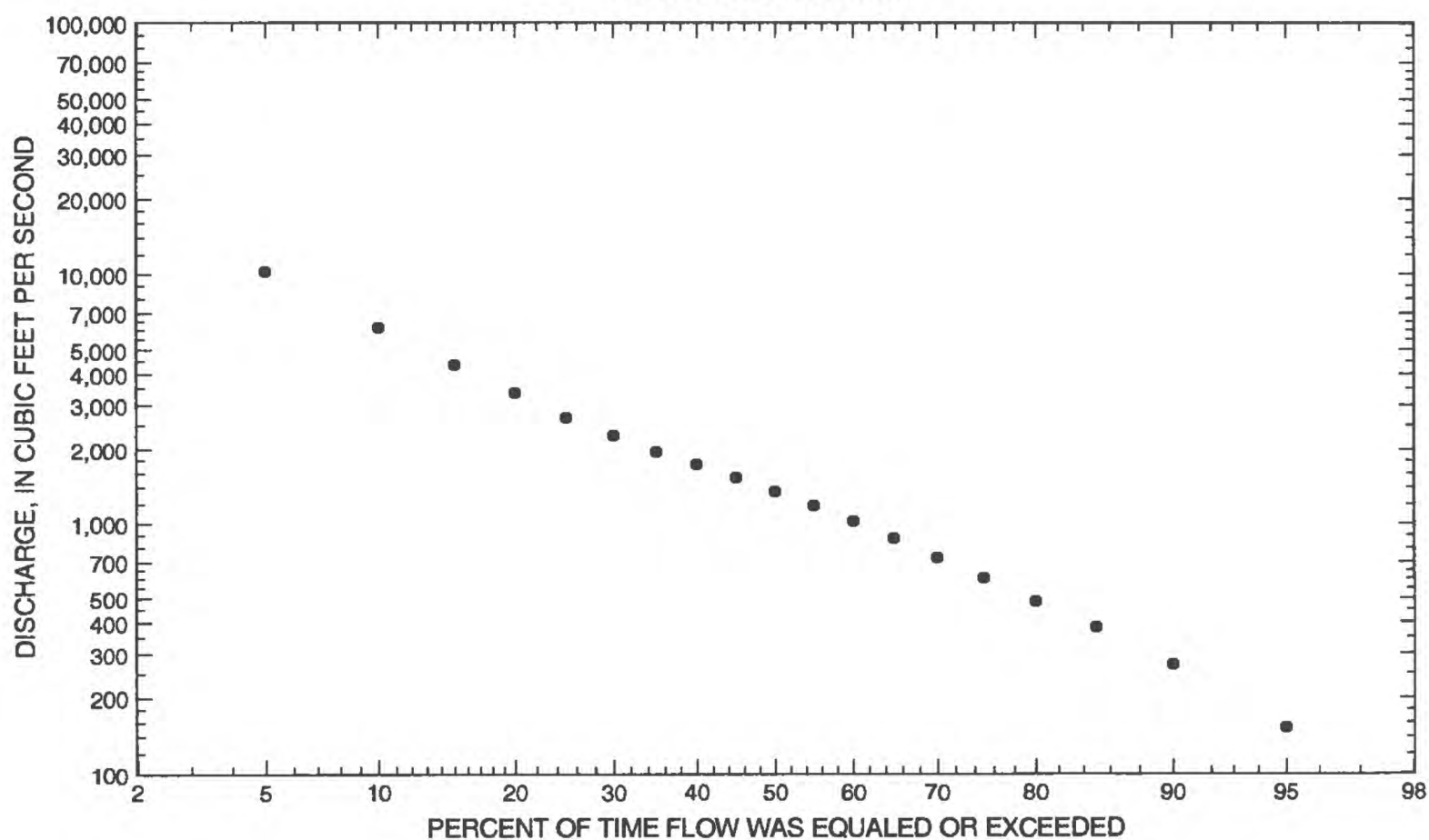


# 05082500 RED RIVER OF THE NORTH AT GRAND FORKS, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Standard deviation (ft <sup>3</sup> /s)		
October	5,690	1901	12.1	1937	1,430	1,140	0.79	4.29
November	5,220	1972	30.5	1937	1,250	908	0.73	3.74
December	3,070	1972	17.8	1937	1,000	690	0.69	3.00
January	2,030	1996	18.8	1937	824	563	0.68	2.47
February	1,920	1996	2.87	1937	787	538	0.68	2.36
March	15,400	1995	42.1	1937	2,260	2,530	1.12	6.77
April	56,200	1997	954	1938	9,920	9,200	0.93	29.7
May	36,500	1950	373	1934	5,430	5,390	0.99	16.3
June	19,300	1962	151	1934	3,960	3,080	0.78	11.9
July	25,300	1975	88.8	1936	3,320	3,560	1.07	9.93
August	17,000	1993	30.6	1934	1,790	2,050	1.15	5.36
September	6,250	1993	20.3	1936	1,420	1,120	0.79	4.26
Annual	10,100	1997	244	1934	2,760	1,840	0.67	100

Annual flow duration



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

Monthly and annual flow duration, in cubic feet per second<sup>1</sup>

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	57.8	62.5	209	1,000	753	459	225	114	73.0	93.9	104	68.7	152
90	151	160	324	1,410	1,070	781	412	223	212	268	265	178	271
85	205	211	419	1,660	1,350	1,010	604	367	349	352	363	250	383
80	254	253	525	2,020	1,600	1,240	746	445	443	412	413	309	485
75	317	330	618	2,380	1,830	1,490	915	507	498	485	477	376	602
70	380	391	708	2,830	2,070	1,720	1,160	625	576	563	571	446	730
65	457	452	808	3,360	2,330	1,950	1,380	782	744	661	659	581	877
60	541	536	911	3,970	2,620	2,210	1,610	921	876	814	759	665	1,030
55	645	622	1,040	4,670	2,950	2,520	1,880	1,040	1,020	936	868	745	1,190
50	732	680	1,180	5,350	3,300	2,880	2,200	1,150	1,160	1,120	985	819	1,350
45	801	738	1,350	6,280	3,680	3,300	2,480	1,280	1,290	1,270	1,100	902	1,540
40	895	825	1,550	7,530	4,170	3,740	2,780	1,460	1,400	1,410	1,230	1,080	1,740
35	1,070	913	1,750	9,040	4,780	4,210	3,140	1,700	1,520	1,560	1,380	1,200	1,950
30	1,210	1,070	1,960	10,800	5,610	4,750	3,560	1,970	1,720	1,720	1,540	1,300	2,290
25	1,350	1,270	2,160	13,000	6,580	5,320	4,040	2,220	1,920	1,920	1,710	1,460	2,690
20	1,480	1,460	2,670	15,800	7,490	5,960	4,700	2,550	2,190	2,160	1,920	1,660	3,370
15	1,610	1,580	3,640	19,900	8,630	6,900	5,650	2,960	2,500	2,570	2,180	1,840	4,370
10	1,750	1,700	5,930	24,700	10,900	8,200	7,270	3,730	3,120	3,160	2,490	2,020	6,200
5	1,890	1,910	10,600	33,000	16,500	11,100	11,100	5,200	4,230	3,820	2,910	2,310	10,300

<sup>1</sup>Statistics computed using period of daily value record 1904 to current year.

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

Probability of occurrence of annual high discharges

[ng, statistic not given]

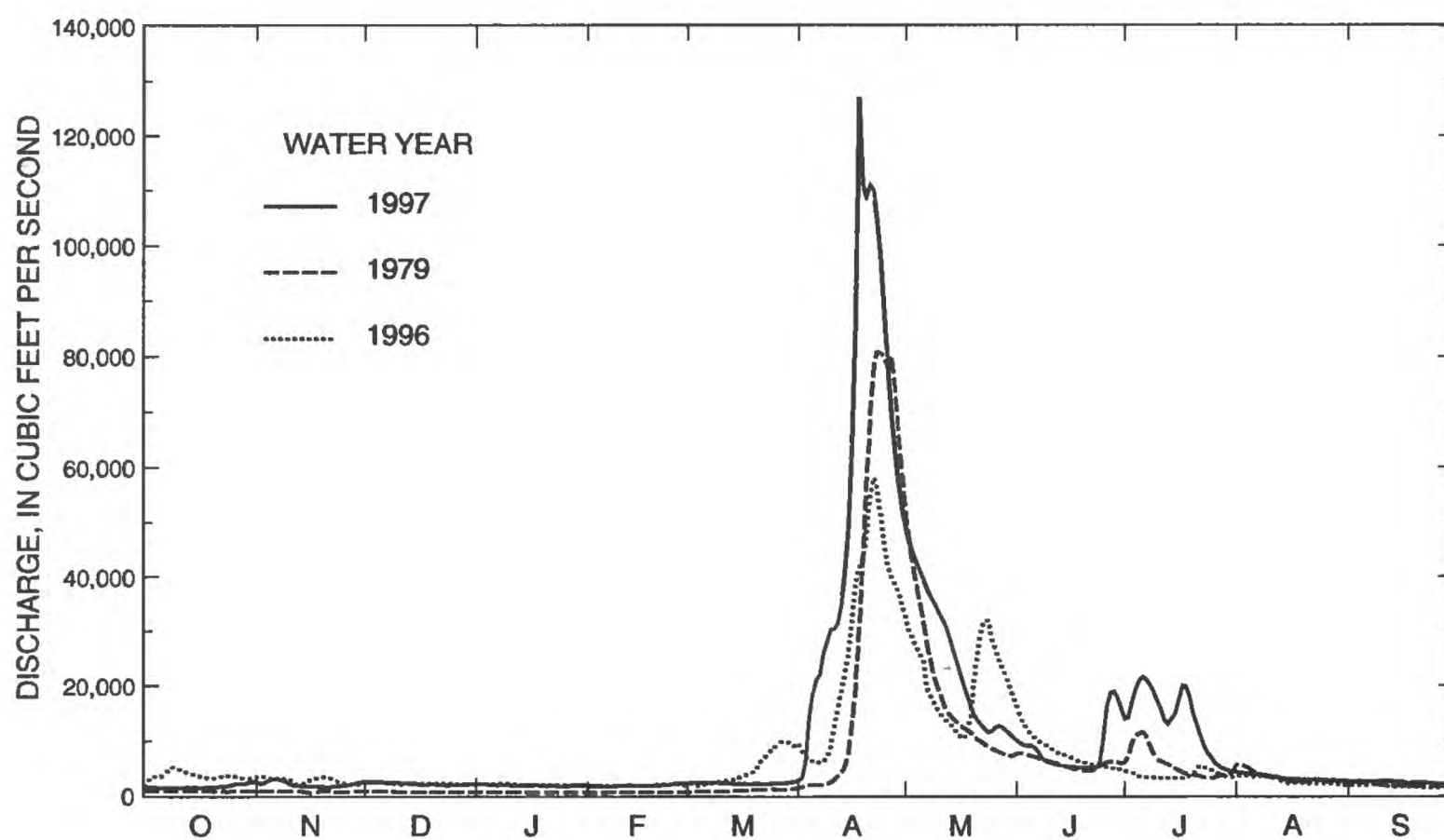
Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s) <sup>2</sup>	Maximum mean discharge (ft <sup>3</sup> /s) <sup>1</sup>			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	1,660	1,660	1,500	1,250	1,030
0.95	1.05	3,290	3,290	2,980	2,460	1,970
0.90	1.11	4,700	4,680	4,250	3,500	2,760
0.80	1.25	7,150	7,050	6,430	5,300	4,140
0.50	2	15,500	14,800	13,700	11,400	8,750
0.20	5	32,600	29,500	27,800	23,600	18,000
0.10	10	47,300	41,500	39,500	34,100	25,900
0.04	25	69,700	58,700	56,600	49,800	37,800
0.02	50	89,000	72,900	70,900	63,300	48,100
0.01	100	110,000	88,100	86,400	78,100	59,600
0.005	200	134,000	104,000	103,000	94,500	72,300
0.002	500	169,000	ng	ng	ng	ng

<sup>1</sup>Statistics computed using period of daily value record 1904 to current year.

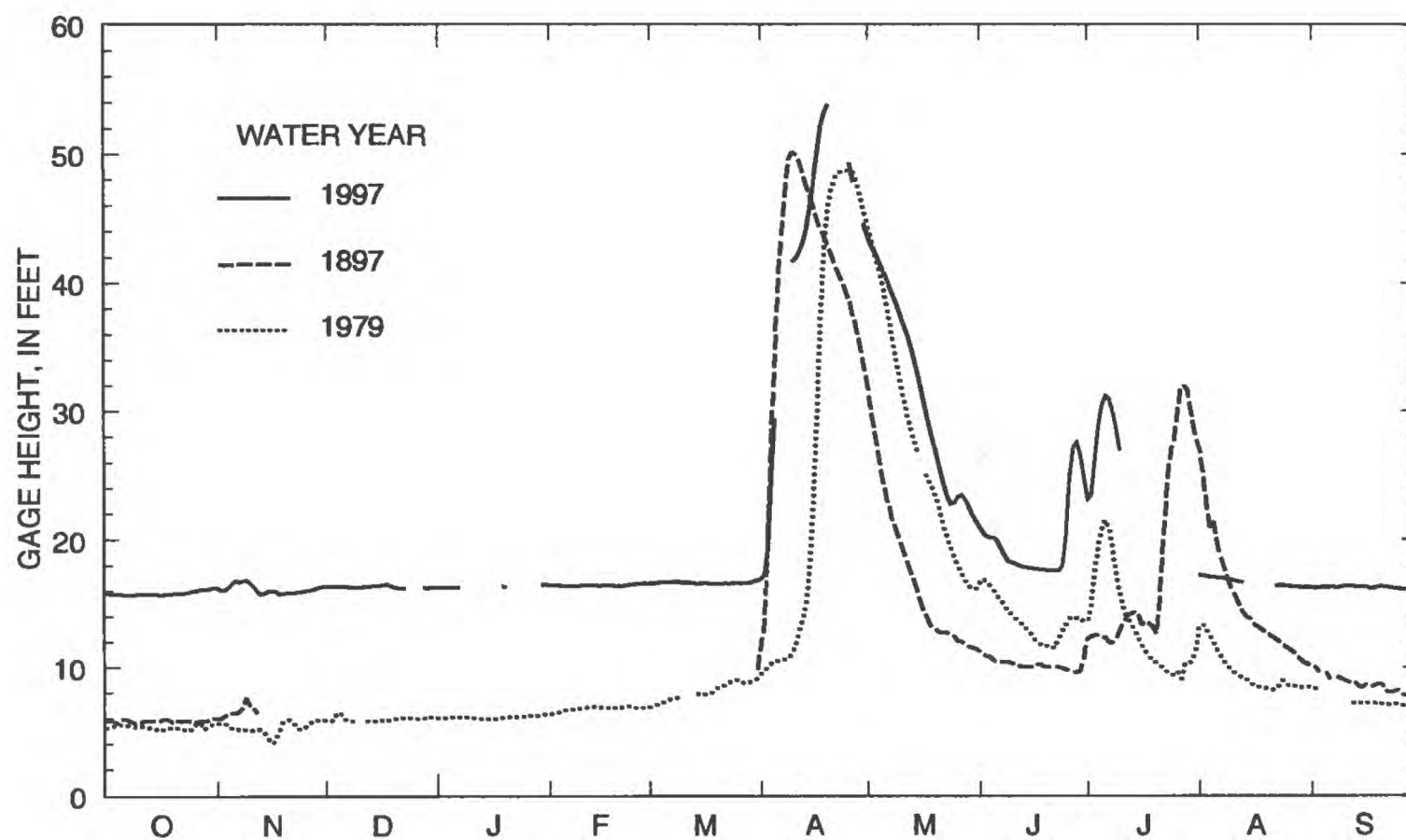
<sup>2</sup>From U.S. Army Corps of Engineers, May 2000.

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

Highest daily mean discharge for period of record



Highest daily mean gage height for period of record





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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1882	April 18	48.00	75,000	1927	April 13	20.00	10,600
1883	April 26	42.20	38,600	1928	April 2	21.80	12,200
1884	April 16	31.10	20,600	1929	March 24	--	17,100
1885	April 17	23.10	13,000	1930	April 7	18.90	9,610
1886	May 3	20.60	10,800	1931	April 10	6.48	1,630
1887	April 15	16.30	7,300	1932	April 10	22.07	10,400
1888	April 19	29.50	19,000	1933	April 3	15.18	4,380
1889	April 1	12.00	3,000	1934	April 12	10.02	3,210
1890	April 15	10.60	3,470	1935	March 29	13.07	2,920
1891	April 13	17.70	6,000	1936	April 18	25.00	14,500
1892	April 17	33.40	23,000	1937	May 4	11.57	4,180
1893	April 24	45.50	53,300	1938	May 12	15.49	6,600
1894	April 24	26.90	16,400	1939	April 6	20.13	6,720
1895	April 6	9.90	2,000	1940	April 18	21.88	10,000
1896	May 30	32.00	21,600	1941	April 12	27.86	13,400
1897	April 10	50.20	85,000	1942	April 5	24.10	11,000
1898	April 14	15.00	4,500	1943	April 12	38.16	28,200
1899	April 17	20.90	9,000	1944	August 13	19.79	10,400
1900	April 10	13.20	4,000	1945	March 29	--	21,300
1901	April 7	26.30	14,000	1946	March 27	33.10	22,000
1902	March 30	26.00	15,000	1947	April 21	40.60	35,000
1903	April 11	28.00	18,800	1948	April 16	41.68	34,200
1904	April 27	40.65	33,000	1949	April 10	29.11	15,200
1905	May 16	26.11	16,800	1950	May 12	45.61	54,000
1906	April 18	36.00	27,600	1951	April 12	33.52	23,600
1907	April 7	39.95	30,400	1952	April 20	--	23,900
1908	April 11	32.80	20,500	1953	June 25	24.63	14,600
1909	July 30	18.80	9,260	1954	April 15	18.63	9,620
1910	March 22	30.70	18,500	1955	April 10	26.17	15,400
1911	June 12	10.70	3,520	1956	April 23	32.43	21,400
1912	April 8	12.73	4,730	1957	July 2	24.67	14,700
1913	April 8	26.70	17,200	1958	July 9	16.03	7,500
1914	June 16	17.50	8,240	1959	April 6	--	6,300
1915	July 3	30.80	21,500	1960	April 12	28.88	17,200
1916	April 23	37.70	29,000	1961	March 28	9.75	3,400
1917	April 8	33.90	21,600	1962	June 16	34.45	26,600
1918	March 28	11.30	4,480	1963	April 11	21.23	10,800
1919	July 8	23.20	13,600	1964	April 19	22.71	13,200
1920	March 31	--	30,300	1965	April 17	44.92	52,000
1921	April 10	20.90	11,500	1966	April 4	45.55	55,000
1922	April 11	28.72	19,000	1967	April 4	37.50	28,200
1923	April 22	26.15	16,200	1968	June 11	20.03	9,420
1924	May 2	8.20	2,530	1969	April 16	45.69	53,500
1925	June 12	19.00	9,690	1970	April 28	34.30	23,700
1926	March 28	18.10	7,720	1971	April 11	27.86	15,800

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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height--Continued							
1972	April 17	38.50	31,400	1985	May 19	25.90	17,800
1973	March 20	27.32	11,300	1986	April 2	37.00	31,900
1974	April 19	40.25	34,300	1987	March 29	33.19	17,500
1975	July 14	43.08	42,800	1988	April 5	21.16	8,500
1976	April 3	34.58	23,600	1989	April 13	43.21	39,600
1977	April 10	8.52	2,190	1990	April 5	17.56	5,040
1978	April 11	45.73	54,200	1991	July 8	17.63	4,870
1979	April 23	48.63	82,000	1992	March 12	23.30	8,000
1980	April 6	31.01	22,000	1993	August 3	36.39	26,200
1981	July 1	14.68	6,710	1994	July 12	34.30	26,800
1982	April 12	37.18	23,900	1995	March 31	39.81	34,800
1983	April 6	29.17	14,300	1996	April 21	45.93	58,400
1984	April 2	37.06	32,300	1997	April 18	52.21	<sup>1</sup> 137,000
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 18	--	137,000	1993	August 3	36.39	26,200
1897	April 10	50.20	85,000	1952	April 20	--	23,900
1979	April 23	48.63	82,000	1982	April 12	37.18	23,900
1882	April 18	48.00	75,000	1970	April 28	34.30	23,700
1996	April 21	45.93	58,400	1951	April 12	33.52	23,600
1966	April 4	45.55	55,000	1976	April 3	34.58	23,600
1978	April 11	45.73	54,200	1892	April 17	33.40	23,000
1950	May 12	45.61	54,000	1946	March 27	33.10	22,000
1969	April 16	45.69	53,500	1980	April 6	31.01	22,000
1893	April 24	45.50	53,300	1896	May 30	32.00	21,600
1965	April 17	44.92	52,000	1917	April 8	33.90	21,600
1975	July 14	43.08	42,800	1915	July 3	30.80	21,500
1989	April 13	43.21	39,600	1956	April 23	32.43	21,400
1883	April 26	42.20	38,600	1945	March 29	--	21,300
1947	April 21	40.60	35,000	1884	April 16	31.10	20,600
1995	March 31	39.81	34,800	1908	April 11	32.80	20,500
1974	April 19	40.25	34,300	1888	April 19	29.50	19,000
1948	April 16	41.68	34,200	1922	April 11	28.72	19,000
1904	April 27	40.65	33,000	1903	April 11	28.00	18,800
1984	April 2	37.06	32,300	1910	March 22	30.70	18,500
1986	April 2	37.00	31,900	1985	May 19	25.90	17,800
1972	April 17	38.50	31,400	1987	March 29	33.19	17,500
1907	April 7	39.95	30,400	1913	April 8	26.70	17,200
1920	March 31	--	30,300	1960	April 12	28.88	17,200
1916	April 23	37.70	29,000	1929	March 24	--	17,100
1943	April 12	38.16	28,200	1905	May 16	26.11	16,800
1967	April 4	37.50	28,200	1894	April 24	26.90	16,400
1906	April 18	36.00	27,600	1923	April 22	26.15	16,200
1994	July 12	34.30	26,800	1971	April 11	27.86	15,800
1962	June 16	34.45	26,600	1955	April 10	26.17	15,400

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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1949	April 10	29.11	15,200	1914	June 16	17.50	8,240
1902	March 30	26.00	15,000	1992	March 12	23.30	8,000
1957	July 2	24.67	14,700	1926	March 28	18.10	7,720
1953	June 25	24.63	14,600	1958	July 9	16.03	7,500
1936	April 18	25.00	14,500	1887	April 15	16.30	7,300
1983	April 6	29.17	14,300	1939	April 6	20.13	6,720
1901	April 7	26.30	14,000	1981	July 1	14.68	6,710
1919	July 8	23.20	13,600	1938	May 12	15.49	6,600
1941	April 12	27.86	13,400	1959	April 6	--	6,300
1964	April 19	22.71	13,200	1891	April 13	17.70	6,000
1885	April 17	23.10	13,000	1990	April 5	17.56	5,040
1928	April 2	21.80	12,200	1991	July 8	17.63	4,870
1921	April 10	20.90	11,500	1912	April 8	12.73	4,730
1973	March 20	27.32	11,300	1898	April 14	15.00	4,500
1942	April 5	24.10	11,000	1918	March 28	11.30	4,480
1886	May 3	20.60	10,800	1933	April 3	15.18	4,380
1963	April 11	21.23	10,800	1937	May 4	11.57	4,180
1927	April 13	20.00	10,600	1900	April 10	13.20	4,000
1932	April 10	22.07	10,400	1911	June 12	10.70	3,520
1944	August 13	19.79	10,400	1890	April 15	10.60	3,470
1940	April 18	21.88	10,000	1961	March 28	9.75	3,400
1925	June 12	19.00	9,690	1934	April 12	10.02	3,210
1954	April 15	18.63	9,620	1889	April 1	12.00	3,000
1930	April 7	18.90	9,610	1935	March 29	13.07	2,920
1968	June 11	20.03	9,420	1924	May 2	8.20	2,530
1909	July 30	18.80	9,260	1977	April 10	8.52	2,190
1899	April 17	20.90	9,000	1895	April 6	9.90	2,000
1988	April 5	21.16	8,500	1931	April 10	6.48	1,630

<sup>1</sup>Maximum observed flow affected by breakout flow from the Red River of the North about 20 river miles upstream of gage. The breakout flow re-entered the Red Lake River about 2 river miles upstream of the gage. Peak discharge of 114,000 ft<sup>3</sup>/s, Apr. 22, 1997, gage height, 54.35 ft, to be used in frequency analyses.



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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1882	--	--	--	--	--	--	26,380	13,870	7,080	5,660	5,300	2,160	--
1883	2,180	2,290	2,130	1,500	1,630	1,520	16,820	14,420	5,020	2,660	1,730	1,310	4,430
1884	1,260	1,270	1,070	815.0	697.0	716.0	10,980	4,760	3,570	2,270	1,520	2,330	2,590
1885	2,990	2,600	2,080	1,580	1,270	1,150	6,730	4,320	4,790	5,670	4,950	2,560	3,400
1886	1,850	1,690	1,270	815.0	697.0	1,560	6,340	6,060	2,610	1,550	740.0	540.0	2,150
1887	610.0	600.0	587.0	410.0	326.0	342.0	3,010	1,770	1,240	1,200	1,240	880.0	1,020
1888	660.0	590.0	410.0	296.0	242.0	236.0	9,330	4,340	8,530	4,650	1,990	980.0	2,670
1889	900.0	960.0	698.0	538.0	515.0	974.0	2,020	1,180	710.0	600.0	490.0	490.0	840.0
1890	510.0	640.0	470.0	340.0	283.0	289.0	1,830	990.0	1,300	1,040	610.0	560.0	739.0
1891	700.0	800.0	641.0	493.0	429.0	450.0	3,410	1,440	1,280	1,330	1,160	800.0	1,080
1892	1,470	1,190	995.0	815.0	758.0	2,030	17,400	8,760	7,280	3,410	1,380	1,180	3,880
1893	1,020	855.0	665.0	493.0	429.0	441.0	16,000	15,240	3,250	2,110	1,120	820.0	3,550
1894	840.0	580.0	587.0	429.0	391.0	441.0	10,000	5,900	2,980	1,520	760.0	530.0	2,070
1895	730.0	790.0	587.0	429.0	391.0	454.0	1,110	920.0	1,460	1,440	760.0	550.0	803.0
1896	550.0	891.0	470.0	296.0	410.0	1,200	6,740	12,400	12,000	2,650	1,410	1,110	3,330
1897	1,060	1,230	960.0	758.0	697.0	826.0	39,850	8,640	3,220	9,080	6,640	2,500	6,270
1898	1,820	1,580	1,150	910.0	990.0	1,330	2,570	1,920	2,840	3,440	1,510	1,200	1,780
1899	1,330	1,120	800.0	590.0	550.0	650.0	4,270	3,540	4,910	3,850	2,010	1,500	2,100
1900	1,370	1,260	1,040	740.0	560.0	800.0	2,020	1,060	630.0	670.0	890.0	2,470	1,130
1901	5,690	4,590	2,740	1,830	1,500	1,620	10,700	4,590	3,470	6,810	2,510	1,520	3,980
1902	2,020	1,640	1,200	950.0	1,080	3,900	5,950	8,180	6,450	3,160	1,850	1,703	3,180
1903	1,637	2,544	1,900	1,600	1,420	2,100	10,626	5,388	3,342	1,443	1,050	1,891	2,906
1904	2,982	2,204	1,960	1,140	900.0	1,020	21,270	12,900	6,020	3,920	1,758	1,613	4,796
1905	1,854	1,686	1,250	900.0	900.0	1,724	3,760	8,137	4,824	5,677	6,564	4,506	3,501
1906	3,344	2,705	1,900	1,750	1,590	1,890	19,850	8,220	6,062	4,561	3,181	2,467	4,787
1907	2,202	2,153	1,630	1,400	1,090	3,070	14,800	4,553	5,999	3,293	1,995	1,951	3,671
1908	1,965	1,442	1,200	890.0	800.0	1,960	9,852	5,788	7,135	3,295	1,972	1,758	3,164
1909	1,443	1,252	830.0	703.0	564.0	925.1	4,340	3,094	3,200	3,780	5,592	3,177	2,417
1910	2,232	1,900	2,430	1,517	1,301	8,416	7,845	4,340	1,947	859.5	490.3	425.9	2,819
1911	413.3	394.6	310.6	210.0	185.0	760.0	1,875	1,504	1,759	578.0	392.3	391.3	731.5
1912	463.2	370.0	340.0	140.0	110.0	300.0	2,471	1,670	1,128	698.0	558.9	755.5	749.2
1913	1,297	802.0	422.0	318.0	233.0	282.0	7,062	1,816	1,194	1,032	759.8	1,029	1,350
1914	1,046	1,145	793.0	509.0	428.0	911.0	2,986	2,557	4,360	2,837	1,092	1,185	1,656
1915	1,265	1,345	1,170	780.0	740.0	1,167	4,154	3,218	5,748	11,040	2,411	1,552	2,897
1916	1,614	1,408	1,239	840.0	670.0	1,070	22,170	10,990	6,821	11,350	4,925	3,964	5,582

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1917	3,054	2,768	1,775	1,216	928.5	1,763	11,720	4,776	2,192	1,176	597.2	487.0	2,702
1918	588.2	797.4	446.7	265.5	200.2	1,490	1,811	1,850	1,965	843.1	722.8	567.6	965.0
1919	407.2	653.2	672.9	399.1	343.5	1,100	5,276	3,225	1,751	6,662	3,156	1,423	2,101
1920	1,171	900.0	700.0	690.0	670.0	7,054	11,360	3,714	4,635	3,315	1,426	1,035	3,053
1921	1,177	1,072	1,033	800.0	730.0	1,554	4,862	1,870	2,724	1,375	800.0	800.0	1,565
1922	649.9	607.4	655.2	384.5	418.2	3,141	9,607	6,200	2,777	1,148	508.3	512.7	2,220
1923	508.8	720.1	504.5	404.3	303.7	404.3	5,448	3,188	1,568	1,884	587.8	473.1	1,333
1924	478.2	501.3	433.7	235.9	213.1	545.7	1,783	2,008	1,054	750.4	423.0	335.6	730.9
1925	553.3	410.7	206.5	129.8	140.0	1,107	2,197	1,405	5,768	2,165	388.5	503.4	1,246
1926	844.8	702.1	622.7	480.0	480.0	2,431	3,870	1,090	1,900	1,300	460.0	420.0	1,217
1927	830.1	750.3	444.2	335.8	305.7	4,397	8,161	7,538	4,564	2,223	1,237	1,208	2,675
1928	1,106	959.6	730.0	580.0	600.0	2,489	4,869	2,232	2,330	2,131	1,307	2,233	1,795
1929	1,429	1,263	942.5	869.5	637.2	6,867	3,725	2,089	1,321	782.8	390.6	292.9	1,727
1930	398.1	395.5	308.7	194.1	293.6	3,937	3,918	3,111	1,152	591.3	202.4	150.6	1,227
1931	196.6	251.0	194.5	161.3	273.4	477.0	1,092	612.3	492.3	276.8	136.3	59.5	351.2
1932	110.9	198.6	132.6	159.7	207.3	1,173	3,933	919.5	401.1	177.6	58.6	43.4	622.9
1933	36.0	82.7	57.4	38.6	33.6	926.9	2,254	767.6	428.2	116.5	41.5	31.3	401.0
1934	31.7	79.0	52.5	39.0	40.7	419.2	1,540	373.3	150.9	153.3	30.6	20.7	243.7
1935	40.6	73.0	40.7	27.7	31.8	898.1	1,521	856.1	503.1	666.2	404.4	183.8	439.1
1936	103.1	83.3	70.6	58.6	54.3	63.7	4,829	1,482	274.3	88.8	32.1	20.3	592.0
1937	12.1	30.5	17.8	18.8	2.87	42.1	1,485	1,636	922.0	767.0	1,333	793.8	590.8
1938	316.2	213.5	55.9	61.3	89.5	1,309	954.1	4,560	1,992	697.3	189.7	208.2	894.3
1939	216.0	190.2	199.4	237.1	228.6	454.5	3,126	911.6	686.6	387.6	118.2	225.4	579.5
1940	323.6	335.5	282.3	161.3	170.0	229.0	4,088	1,955	960.8	296.7	212.1	170.7	761.8
1941	245.3	344.4	281.9	334.2	357.9	448.1	7,013	2,166	4,704	986.3	756.0	1,602	1,594
1942	1,725	1,104	879.7	545.5	573.2	1,623	5,343	6,695	3,599	1,650	1,032	3,062	2,323
1943	1,526	1,062	733.9	772.6	680.4	1,068	18,310	5,760	10,390	4,972	2,282	1,616	4,085
1944	1,341	1,172	921.0	696.8	651.7	633.9	3,311	3,351	5,425	5,899	5,030	4,167	2,719
1945	2,392	2,321	1,668	1,377	1,373	9,093	12,190	5,862	3,161	1,627	1,017	1,336	3,624
1946	1,696	1,213	951.9	863.2	767.3	6,452	9,541	3,466	2,046	2,239	1,227	1,188	2,643
1947	1,741	1,438	1,112	1,075	838.9	1,377	19,620	7,486	10,320	4,287	1,413	1,393	4,329
1948	1,599	1,330	1,255	1,106	913.1	1,041	19,800	7,817	2,502	1,694	1,157	891.6	3,409
1949	599.9	593.6	463.2	417.1	443.9	679.4	6,780	2,657	4,843	3,306	3,065	1,612	2,121
1950	1,072	1,172	1,038	781.0	731.4	1,057	24,100	36,510	11,080	7,761	3,029	2,226	7,580
1951	2,722	1,987	2,037	1,929	1,821	2,269	14,380	8,193	4,087	2,249	1,113	1,427	3,680



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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1952	1,314	1,270	1,850	1,747	1,869	1,968	16,630	5,318	3,493	5,622	1,838	1,261	3,670
1953	871.9	763.9	672.3	575.5	606.8	1,906	3,152	3,071	8,945	4,526	2,036	1,220	2,364
1954	864.8	935.6	846.7	812.9	852.9	1,616	4,809	3,516	3,287	2,090	868.2	694.2	1,766
1955	639.5	697.4	680.6	725.2	666.4	683.5	5,598	1,708	2,237	2,153	1,576	779.1	1,510
1956	751.8	525.5	376.1	433.9	470.3	540.3	8,927	5,054	2,755	1,407	699.1	1,451	1,941
1957	494.7	786.5	515.5	416.1	428.9	1,552	4,416	3,084	4,251	5,760	2,471	4,266	2,374
1958	3,245	2,809	1,511	1,327	1,272	1,928	2,606	1,357	1,282	3,647	824.4	443.6	1,860
1959	397.6	464.2	324.5	375.8	374.6	923.2	2,995	1,605	2,432	1,850	645.9	474.5	1,072
1960	496.5	445.9	433.7	499.8	481.4	556.3	8,764	3,115	2,599	1,775	480.8	560.5	1,675
1961	343.2	471.8	317.1	297.1	325.7	1,677	1,700	2,141	894.0	400.9	218.1	334.6	762.6
1962	575.8	383.0	220.5	199.0	217.1	313.5	10,640	9,754	19,340	13,970	5,887	3,231	5,404
1963	2,334	2,113	1,583	1,305	1,104	1,962	5,767	3,343	6,245	2,459	1,114	1,195	2,541
1964	1,386	930.0	801.9	763.1	736.0	705.5	6,295	4,039	4,550	2,318	992.7	703.3	2,013
1965	1,533	1,262	872.4	945.6	909.8	930.2	24,480	8,110	8,261	4,315	1,955	1,879	4,604
1966	3,870	2,337	2,153	1,892	1,812	10,250	25,360	10,870	5,228	2,956	3,495	2,308	6,048
1967	1,906	1,798	1,789	1,703	1,602	2,708	16,910	9,270	5,987	3,153	1,178	861.7	4,067
1968	773.5	704.0	718.5	591.9	540.0	1,877	2,541	1,880	4,580	4,193	2,155	1,550	1,844
1969	1,465	1,657	1,608	1,495	1,512	2,111	28,690	12,070	4,518	3,246	1,503	1,432	5,094
1970	1,953	1,816	1,479	1,411	1,536	1,676	14,150	8,235	9,791	2,897	1,091	1,159	3,922
1971	1,131	1,415	1,134	1,100	1,154	2,423	7,096	3,035	2,175	2,124	1,028	1,235	2,085
1972	4,290	5,218	3,073	1,827	1,480	8,595	15,700	7,597	5,197	2,276	2,267	1,905	4,949
1973	1,800	1,409	1,163	1,124	1,162	5,467	1,959	1,356	1,029	559.8	736.7	3,067	1,739
1974	3,737	2,421	1,945	1,701	1,658	2,048	16,670	13,150	5,928	2,860	2,699	1,793	4,721
1975	1,939	1,972	1,240	1,301	1,434	1,740	18,740	14,640	6,173	25,270	3,004	2,228	6,677
1976	2,345	2,315	1,772	1,705	1,699	3,704	9,237	2,515	1,556	1,106	976.3	700.2	2,463
1977	406.6	300.3	196.1	215.0	215.4	493.5	1,335	834.4	549.2	592.4	227.3	593.9	496.8
1978	1,223	1,084	1,360	1,285	1,113	2,504	30,180	4,977	3,151	3,065	1,405	972.6	4,337
1979	879.7	803.5	761.2	683.5	683.0	962.3	31,480	18,330	5,958	5,773	3,300	1,941	5,962
1980	1,652	1,832	1,522	1,341	1,404	1,853	8,707	1,848	1,451	669.4	456.1	767.4	1,948
1981	424.1	436.4	353.4	292.4	386.2	936.5	978.9	1,352	1,270	2,415	1,468	1,804	1,014
1982	2,473	1,820	1,129	1,136	1,071	2,380	17,400	6,015	3,353	3,200	1,898	1,268	3,590
1983	3,687	2,347	1,909	1,600	1,473	7,695	7,047	2,994	5,036	6,028	2,614	2,486	3,756
1984	2,153	2,021	1,935	1,679	1,813	5,607	15,460	3,846	11,530	3,062	1,482	954.8	4,274
1985	2,227	2,018	1,444	1,388	1,357	5,792	4,898	9,056	7,508	6,016	6,473	4,702	4,428
1986	3,966	2,427	2,026	1,889	1,828	6,540	19,580	14,630	6,191	4,369	2,407	3,175	5,762

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1987	3,335	2,009	2,047	1,715	1,790	8,049	7,556	3,460	2,481	3,323	1,914	1,015	3,236
1988	644.8	658.6	619.6	452.7	520.0	2,939	4,320	1,096	641.8	295.7	312.7	373.1	1,071
1989	312.5	341.4	259.5	278.3	357.9	507.4	21,850	3,328	2,047	862.0	443.5	944.5	2,606
1990	500.4	442.6	248.2	189.9	258.2	1,067	2,476	1,502	2,078	946.1	452.5	356.7	876.4
1991	350.8	316.2	218.0	195.0	304.0	764.3	1,587	2,821	2,008	3,027	1,035	1,352	1,170
1992	672.2	494.5	468.7	519.0	524.2	4,219	2,692	1,975	1,982	2,691	1,441	2,118	1,654
1993	1,042	756.7	879.5	809.5	1,090	2,192	13,760	3,398	4,493	12,220	17,050	6,251	5,353
1994	3,537	1,930	2,016	1,570	1,519	6,458	12,460	6,496	5,752	12,930	3,590	3,910	5,202
1995	5,127	3,575	2,456	1,819	1,785	15,370	18,530	10,110	4,175	7,299	2,665	2,120	6,280
1996	3,628	2,781	2,225	2,030	1,922	5,037	28,330	20,570	7,563	3,750	2,657	1,677	6,839
1997	1,715	2,098	2,176	1,873	1,874	2,250	56,210	24,940	8,483	13,680	3,264	2,411	10,070

## 05083500 RED RIVER OF THE NORTH AT OSLO, MN

LOCATION.--Lat 48°11'40", long 97°08'30", in SW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.36, T.155 N., R.51 W., Walsh County, Hydrologic Unit 09020306, on bridge crossing the Red River 0.5 mi west of Oslo, Minn.

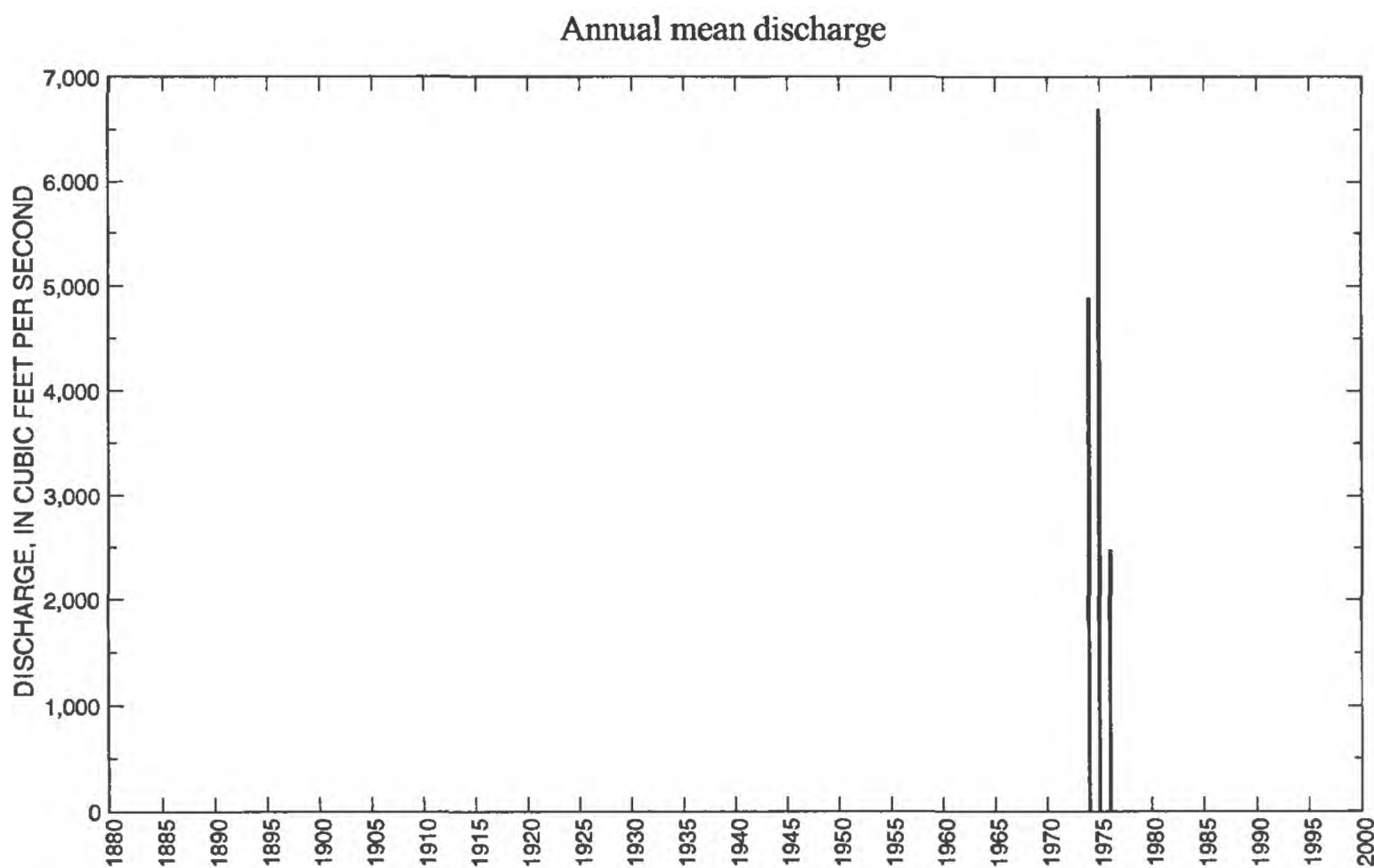
DRAINAGE AREA.--31,200 mi<sup>2</sup>, approximately, including 3,800 mi<sup>2</sup> in closed basins.

PERIOD OF RECORD.--1936 to 1937, 1941 to 1943, 1945 to 1960, 1974 to 1976, operated as a continuous-record gaging station; 1985 to current, operated as a crest-stage station.

GAGE.--Wire-weight gage. Datum of gage is 772.65 ft above mean sea level, datum of 1929. Prior to Apr. 2, 1948, staff gage on railroad bridge 200 ft upstream and Apr. 3, 1948, to Sept. 8, 1959, wire-weight gage at bridge 620 ft downstream, both at datum 5.00 ft higher.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 120,000 ft<sup>3</sup>/s, Apr. 23, 1997, gage height, 38.00 ft; no flow at times.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known, about 37.5 ft in 1897, present datum.

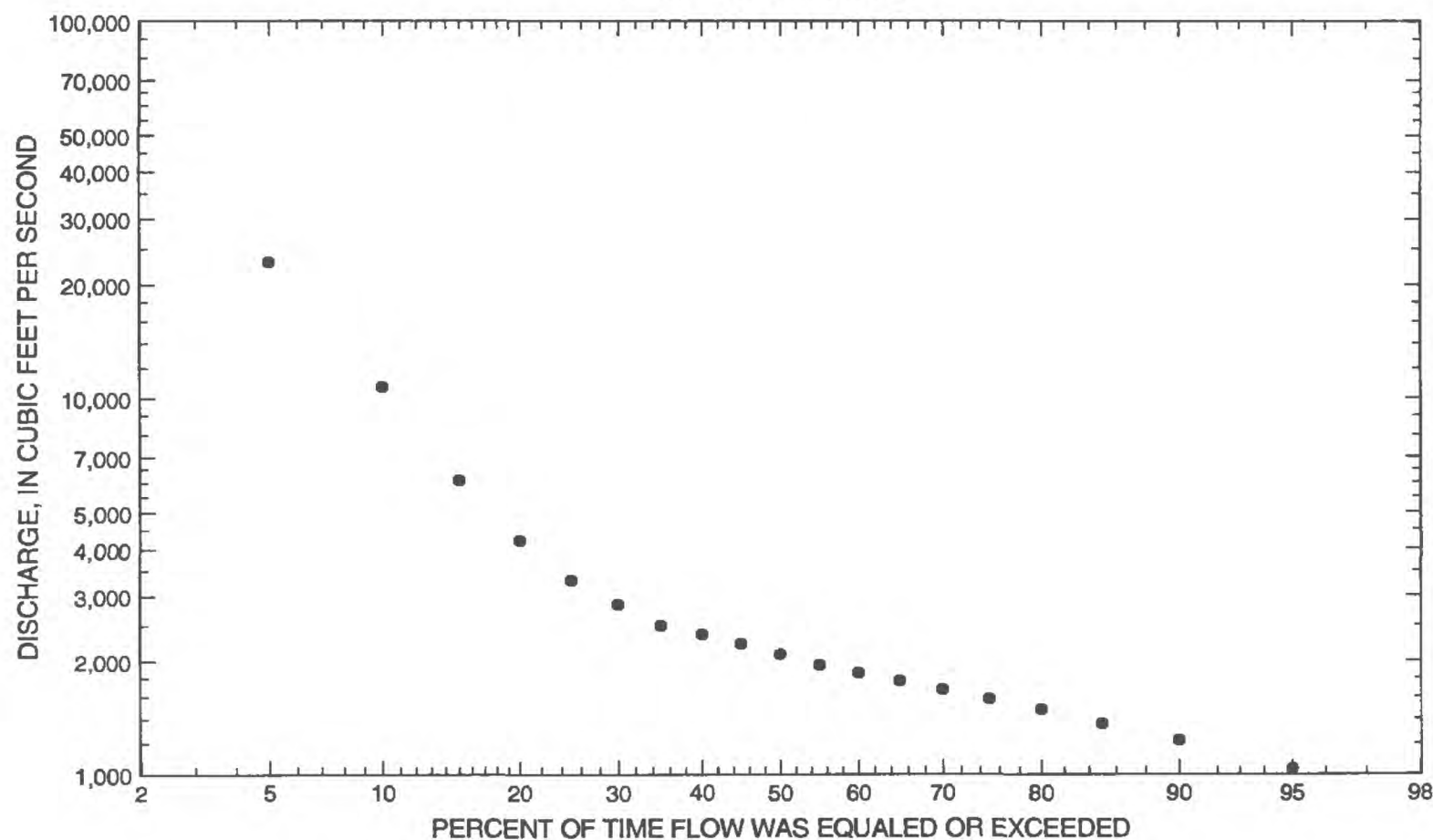


# 05083500 RED RIVER OF THE NORTH AT OSLO, MN--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	3,770	1974	13.8	1937	2,020	1,550	0.77	5.14	
November	2,440	1974	2,020	1975	2,270	222	0.10	5.79	
December	1,940	1974	1,240	1975	1,650	368	0.22	4.22	
January	1,740	1974	1,300	1975	1,580	244	0.15	4.03	
February	1,680	1976	1,430	1975	1,590	139	0.09	4.06	
March	3,310	1976	1,730	1975	2,350	837	0.36	6.00	
April	27,000	1950	1,520	1937	9,710	6,700	0.69	24.8	
May	40,900	1950	1,430	1958	6,780	8,540	1.26	17.3	
June	11,800	1950	286	1936	4,150	3,090	0.74	10.6	
July	25,600	1975	92.9	1936	4,560	5,790	1.27	11.6	
August	3,170	1949	31.2	1936	1,630	1,040	0.64	4.16	
September	2,240	1975	18.9	1936	904	808	0.89	2.31	
Annual	6,700	1975	2,480	1976	4,690	2,120	0.45	100	

Annual flow duration



05083500 RED RIVER OF THE NORTH AT OLSO, MN--Continued

Monthly and annual flow duration, in cubic feet per second

[ng, statistic not given because of less than 10 years of record]

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
90	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
85	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
80	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
75	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
70	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
65	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
60	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
55	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
50	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
45	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
40	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
35	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
30	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
25	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
20	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
15	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
10	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng
5	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng



# 05083500 RED RIVER OF THE NORTH AT OSLO, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	ng	ng	ng	ng
0.95	1.05	ng	ng	ng	ng	ng
0.90	1.11	ng	ng	ng	ng	ng
0.80	1.25	ng	ng	ng	ng	ng
0.50	2	ng	ng	ng	ng	ng
0.20	5	ng	ng	ng	ng	ng
0.10	10	ng	ng	ng	ng	ng
0.04	25	ng	ng	ng	ng	ng
0.02	50	ng	ng	ng	ng	ng
0.01	100	ng	ng	ng	ng	ng
0.005	200	ng	ng	ng	ng	ng
0.002	500	ng	ng	ng	ng	ng

# 05083500 RED RIVER OF THE NORTH AT OSLO, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)
Annual peak discharge, by year, and corresponding gage height							
1936	April 18	--	15,000	1959	April 7	10.78	7,200
1937	May 4	6.47	4,070	1960	April 12	--	17,100
1942	April 4	--	12,500	1974	April 19	--	<sup>1</sup> 33,000
1943	April 13	29.16	31,500	1975	April 23	--	<sup>1</sup> 42,500
1945	March 26	--	24,000	1976	April 5	--	<sup>1</sup> 23,200
1946	March 30	25.11	--	1985	May 20	24.43	17,800
1947	April 22	--	33,800	1986	April 3	34.20	30,000
1948	April 17	--	41,400	1987	March 30	31.76	18,500
1949	April 10	24.08	18,700	1988	April 6	20.10	11,500
1950	May 10	31.83	63,000	1989	April 14	36.72	33,500
1951	April 12	25.46	24,800	1990	April 5	15.64	4,900
1952	April 21	--	24,800	1991	July 10	12.04	5,200
1953	June 25	17.55	14,900	1992	March 15	22.47	8,200
1954	April 15	12.39	9,790	1993	April 7	--	28,100
1955	April 10	19.46	16,400	1994	July 13	30.86	26,600
1956	April 24	25.50	22,500	1995	April 1	35.35	35,000
1957	July 2	17.42	14,900	1996	April 22	36.95	59,200
1958	July 10	10.29	7,890	1997	April 23	38.00	120,000
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 23	38.00	120,000	1949	April 10	24.08	18,700
1950	May 10	31.83	63,000	1987	March 30	31.76	18,500
1996	April 22	36.95	59,200	1985	May 20	24.43	17,800
1975	April 23	--	<sup>1</sup> 42,500	1960	April 12	--	17,100
1948	April 17	--	41,400	1955	April 10	19.46	16,400
1995	April 1	35.35	35,000	1936	April 18	--	15,000
1947	April 22	--	33,800	1953	June 25	17.55	14,900
1989	April 14	36.72	33,500	1957	July 2	17.42	14,900
1974	April 19	--	<sup>1</sup> 33,000	1942	April 4	--	11,900
1943	April 13	29.16	31,500	1988	April 6	20.10	11,500
1986	April 3	34.20	30,000	1954	April 15	12.39	9,790
1993	April 7	--	28,100	1992	March 15	22.47	8,200
1994	July 13	30.86	26,600	1958	July 10	10.29	7,890
1951	April 12	25.46	24,800	1959	April 7	10.78	7,200
1952	April 21	--	24,800	1991	July 10	12.04	5,200
1945	March 26	--	24,000	1990	April 5	15.64	4,900
1976	April 5	--	<sup>1</sup> 23,200	1937	May 4	6.47	4,070
1956	April 24	25.50	22,500	1946	March 30	25.11	--

<sup>1</sup>Daily mean.

# 05083500 RED RIVER OF THE NORTH AT OSLO, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1936	--	--	--	--	--	--	5,111	1,634	286.4	92.9	31.2	18.9	--
1937	13.8	--	--	--	--	--	1,521	1,715	935.2	--	--	--	--
1941	--	--	--	--	--	--	--	--	--	--	--	--	--
1942	--	--	--	--	--	--	6,819	6,405	--	1,695	--	--	--
1943	--	--	--	--	--	--	--	--	--	--	--	--	--
1945	--	--	--	--	--	--	12,910	5,982	3,314	--	--	--	--
1946	--	--	--	--	--	--	10,230	3,471	2,074	--	--	--	--
1947	--	--	--	--	--	--	--	7,775	10,690	4,502	--	--	--
1948	--	--	--	--	--	--	--	8,278	2,508	--	--	--	--
1949	--	--	--	--	--	--	--	2,791	5,193	3,400	3,171	--	--
1950	--	--	--	--	--	--	27,050	40,940	11,750	7,936	--	--	--
1951	--	--	--	--	--	--	15,340	8,444	4,310	--	--	--	--
1952	--	--	--	--	--	--	17,260	5,556	3,604	5,762	2,033	--	--
1953	--	--	--	--	--	--	3,266	3,068	9,069	4,738	2,124	--	--
1954	--	--	--	--	--	--	4,967	3,583	3,336	2,167	--	--	--
1955	--	--	--	--	--	--	6,010	1,826	2,424	2,219	1,625	--	--
1956	--	--	--	--	--	--	9,280	5,602	2,979	1,479	763.1	--	--
1957	--	--	--	--	--	--	4,573	3,271	4,363	6,140	2,470	--	--
1958	--	--	--	--	--	--	2,686	1,433	1,359	3,739	915.4	427.8	--
1959	--	--	--	--	--	--	3,496	1,696	2,530	1,972	724.0	499.3	--
1960	--	--	--	--	--	--	9,289	3,328	2,699	1,954	541.1	607.0	--
1974	3,768	2,443	1,945	1,735	1,654	2,023	17,290	13,940	6,293	3,000	2,742	1,813	4,891
1975	1,944	2,020	1,240	1,299	1,431	1,732	17,610	15,830	5,887	25,590	3,087	2,243	6,699
1976	2,335	2,350	1,773	1,707	1,685	3,306	9,705	2,625	1,546	1,125	993.2	716.8	2,481

## 05084000 FOREST RIVER NEAR FORDVILLE, ND

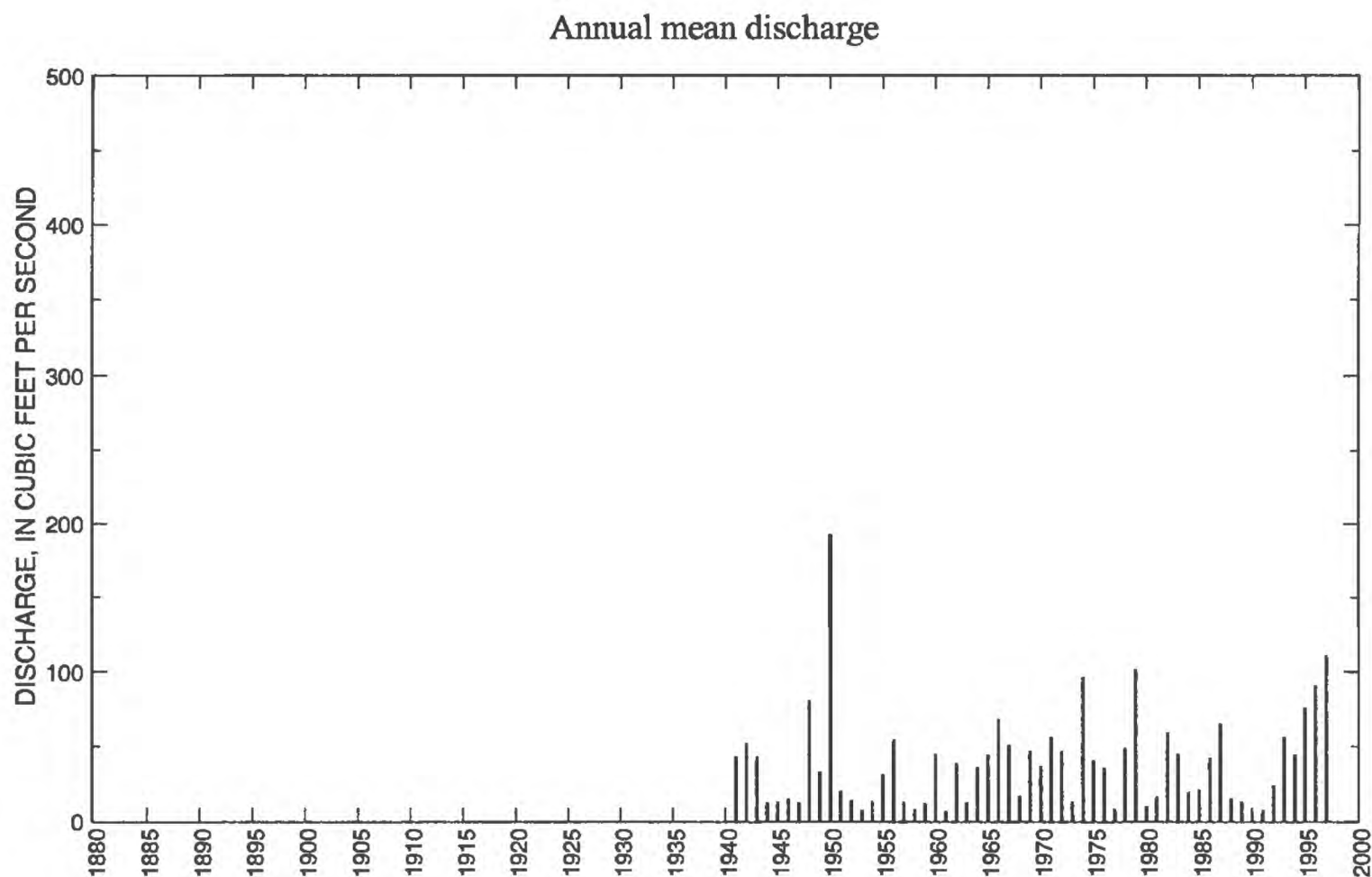
LOCATION.--Lat 48°11'50", long 97°43'49", on line between secs.32 and 33, T.155 N., R.55 W., Walsh County, Hydrologic Unit 09020308, on right bank 50 ft upstream from highway bridge, 0.5 mi downstream from South Branch, and 3 mi southeast of Fordville.

DRAINAGE AREA.--456 mi<sup>2</sup>, of which about 120 mi<sup>2</sup> is probably noncontributing.

PERIOD OF RECORD.--April 1940 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,035 ft above sea level, from topographic map. Prior to July 21, 1951, nonrecording gage at site 50 ft downstream at same datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 16,400 ft<sup>3</sup>/s, Apr. 18, 1950, gage height, 14.48 ft; no flow at times.



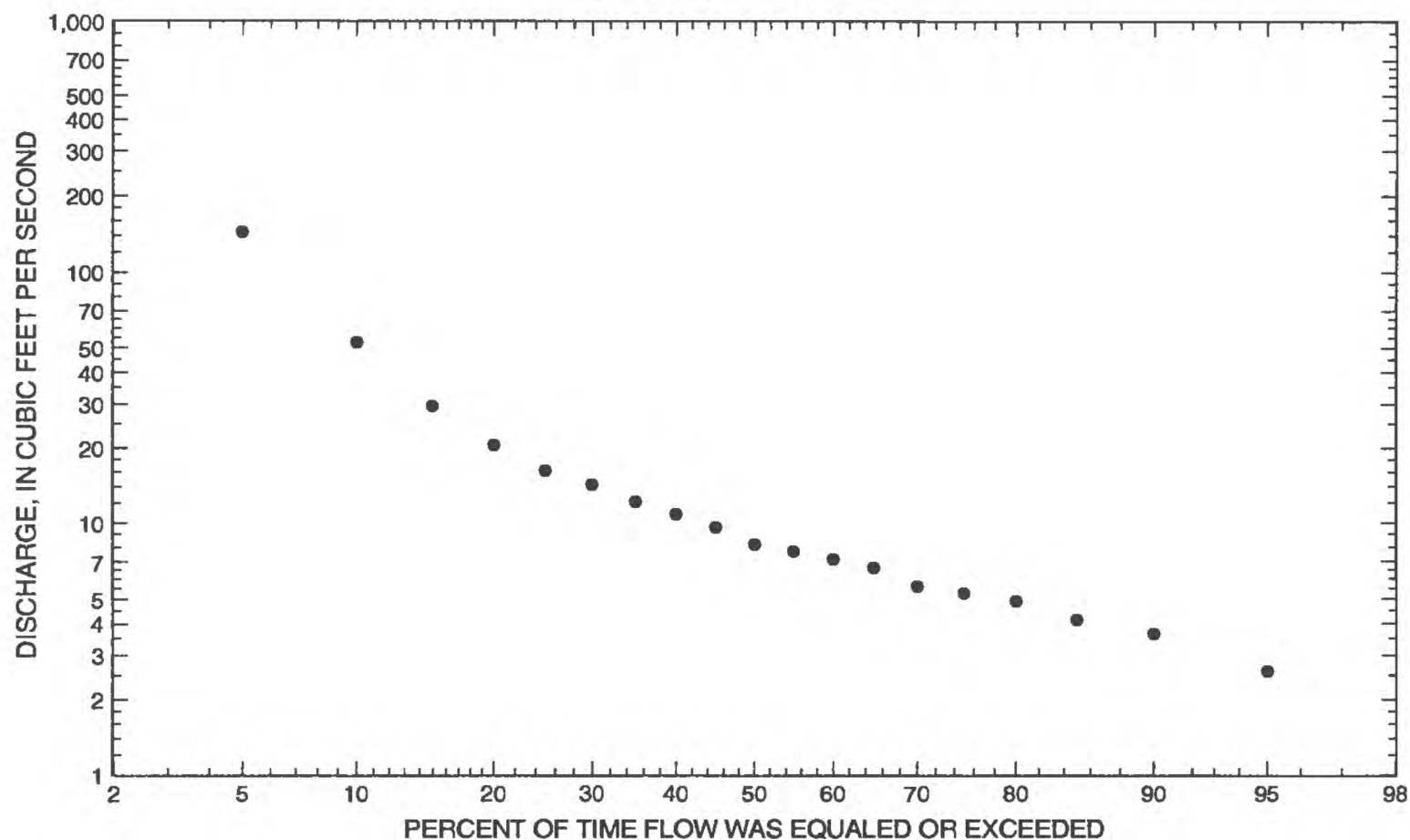
# 05084000 FOREST RIVER NEAR FORDVILLE, ND--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	57.9	1983	1.52	1941	10.3	8.38	0.81	2.19	
November	23.7	1983	2.03	1941	9.02	4.36	0.48	1.91	
December	19.2	1983	2.06	1941	7.47	3.57	0.48	1.59	
January	16.3	1986	2.70	1941	6.53	2.84	0.43	1.39	
February	29.9	1981	1.21	1963	7.43	4.50	0.61	1.58	
March	323	1995	4.07	1941	64.3	73.3	1.14	13.7	
April	1,180	1950	9.46	1991	211	247	1.17	44.8	
May	1,040	1950	7.07	1961	70.3	157	2.23	14.9	
June	255	1964	2.74	1940	34.4	44.6	1.30	7.29	
July	232	1982	3.34	m	28.0	45.8	1.64	5.94	
August	280	1993	1.64	1945	13.2	36.8	2.79	2.81	
September	53.3	1993	0.913	1940	8.92	7.54	0.84	1.89	
Annual	193	1950	6.37	1990	39.7	33.4	0.84	100	

Annual flow duration





# 05084000 FOREST RIVER NEAR FORDVILLE, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	2.70	2.00	3.70	8.06	6.72	4.10	2.40	1.40	2.10	2.30	3.50	3.00	2.60
90	3.00	2.70	4.76	10.6	8.23	5.60	3.00	2.20	2.90	3.20	3.90	3.30	3.64
85	3.50	3.60	5.28	13.0	10.0	6.47	3.70	2.80	2.90	3.80	4.30	3.70	4.13
80	3.80	3.60	5.89	14.7	11.3	7.57	3.70	2.80	3.40	4.50	4.70	4.20	4.88
75	4.50	4.10	6.41	17.0	12.7	8.15	4.92	3.50	4.00	4.50	5.20	4.70	5.24
70	4.50	4.70	7.00	19.9	13.7	9.67	5.60	3.50	4.00	5.63	5.80	5.20	5.59
65	4.90	4.70	7.32	23.1	14.7	11.8	6.25	4.53	4.80	6.10	6.30	5.20	6.62
60	4.90	5.40	7.64	29.3	16.0	13.1	7.18	4.97	4.80	6.62	7.00	5.80	7.16
55	5.30	5.40	8.68	35.7	17.6	14.5	7.61	5.50	5.99	7.20	7.00	5.80	7.69
50	5.80	6.30	9.22	46.5	19.3	16.0	8.04	5.85	6.41	7.90	7.70	6.50	8.23
45	6.30	6.30	10.9	61.3	21.8	17.6	10.1	6.21	6.87	8.35	8.50	6.50	9.60
40	6.80	7.28	12.2	82.3	25.2	19.7	11.7	6.97	7.34	9.32	8.50	7.30	10.8
35	6.80	7.57	14.2	106	29.5	22.1	13.1	7.33	8.01	9.82	9.30	7.30	12.2
30	7.40	7.86	18.7	140	34.4	24.9	14.9	7.70	8.48	11.4	10.7	8.63	14.2
25	7.40	8.15	31.4	188	41.6	29.3	17.8	9.18	9.45	12.3	11.7	9.20	16.2
20	8.10	8.91	56.6	250	55.7	35.1	24.0	10.3	11.1	13.3	12.7	9.20	20.6
15	8.80	10.3	104	344	81.1	44.3	36.6	13.5	13.6	15.1	13.6	11.2	29.4
10	11.1	11.9	200	523	123	59.6	55.4	17.6	17.9	17.7	14.9	12.6	52.6
5	13.0	13.0	368	894	264	109	111	29.2	24.9	25.2	18.5	13.9	145

# 05084000 FOREST RIVER NEAR FORDVILLE, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	16.1	11.6	10.1	7.86	7.23
0.95	1.05	62.8	44.0	35.5	26.7	20.8
0.90	1.11	123	84.3	65.4	48.4	35.1
0.80	1.25	262	175	130	94.0	64.1
0.50	2	964	593	413	286	183
0.20	5	2,940	1,630	1,080	715	457
0.10	10	4,890	2,560	1,670	1,070	704
0.04	25	8,020	3,910	2,500	1,570	1,080
0.02	50	10,700	4,990	3,170	1,950	1,390
0.01	100	13,700	6,100	3,860	2,340	1,720
0.005	200	16,900	7,230	4,550	2,720	2,080
0.002	500	21,400	ng	ng	ng	ng

# 05084000 FOREST RIVER NEAR FORDVILLE, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)
Annual peak discharge, by year, and corresponding gage height							
1940	April 17	3.60	130	1969	April 11	8.80	3,290
1941	April 8	8.03	2,250	1970	April 8	7.68	2,380
1942	April 4	9.73	3,650	1971	April 8	8.39	2,800
1943	June 9	6.72	1,620	1972	April 14	6.43	1,500
1944	April 5	5.89	400	1973	June 17	3.56	384
1945	March 27	3.15	243	1974	May 20	9.86	5,050
1946	March 20	6.14	950	1975	April 12	5.68	1,270
1947	March 23	7.40	700	1976	March 29	5.46	1,100
1948	April 18	14.15	14,600	1977	July 14	2.43	100
1949	April 7	5.64	1,470	1978	April 6	5.50	1,200
1950	April 18	14.48	16,400	1979	April 20	9.98	5,200
1951	March 29	--	500	1980	April 2	2.55	105
1952	July 2	3.94	825	1981	April 2	2.73	180
1953	May 30	2.04	130	1982	July 25	6.49	1,760
1954	June 15	4.29	1,020	1983	March 7	5.23	995
1955	March 31	8.46	3,000	1984	March 24	3.92	386
1956	June 6	8.14	3,370	1985	March 13	5.45	625
1957	March 22	3.53	356	1986	March 17	5.79	1,380
1958	July 4	1.87	17.0	1987	April 5	6.00	1,410
1959	April 4	2.91	321	1988	March 24	3.23	229
1960	April 7	7.55	2,810	1989	April 16	2.79	158
1961	March 19	2.69	65.0	1990	June 3	1.67	17.0
1962	April 6	7.69	2,600	1991	September 18	--	77.0
1963	July 8	3.67	590	1992	March 7	--	530
1964	June 19	9.03	3,960	1993	July 26	5.72	1,090
1965	April 11	10.22	4,730	1994	March 21	4.66	721
1966	March 21	7.14	1,580	1995	March 19	--	1,500
1967	March 30	7.40	2,030	1996	May 17	7.30	2,900
1968	March 8	4.48	500	1997	April 4	6.84	2,050
Annual peak discharge, from highest to lowest, and corresponding gage height							
1950	April 18	14.48	16,400	1970	April 8	7.68	2,380
1948	April 18	14.15	14,600	1941	April 8	8.03	2,250
1979	April 20	9.98	5,200	1997	April 4	6.84	2,050
1974	May 20	9.86	5,050	1967	March 30	7.40	2,030
1965	April 11	10.22	4,730	1982	July 25	6.49	1,760
1964	June 19	9.03	3,960	1943	June 9	6.72	1,620
1942	April 4	9.73	3,650	1966	March 21	7.14	1,580
1956	June 6	8.14	3,370	1972	April 14	6.43	1,500
1969	April 11	8.80	3,290	1995	March 19	--	1,500
1955	March 31	8.46	3,000	1949	April 7	5.64	1,470
1996	May 17	7.30	2,900	1987	April 5	6.00	1,410
1960	April 7	7.55	2,810	1986	March 17	5.79	1,380
1971	April 8	8.39	2,800	1975	April 12	5.68	1,270
1962	April 6	7.69	2,600	1978	April 6	5.50	1,200

# 05084000 FOREST RIVER NEAR FORDVILLE, ND--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1976	March 29	5.46	1,100	1973	June 17	3.56	384
1993	July 26	5.72	1,090	1957	March 22	3.53	356
1973	June 17	3.56	384	1959	April 4	2.91	321
1983	March 7	5.23	995	1945	March 27	3.15	243
1946	March 20	6.14	950	1988	March 24	3.23	229
1952	July 2	3.94	825	1981	April 2	2.73	180
1994	March 21	4.66	721	1989	April 16	2.79	158
1947	March 23	7.40	700	1940	April 17	3.60	130
1985	March 13	5.45	625	1953	May 30	2.04	130
1963	July 8	3.67	590	1980	April 2	2.55	105
1992	March 7	--	530	1977	July 14	2.43	100
1951	March 29	--	500	1991	September 18	--	77.0
1968	March 8	4.48	500	1961	March 19	2.69	65.0
1944	April 5	5.89	400	1958	July 4	1.87	17.0
1984	March 24	3.92	386	1990	June 3	1.67	17.0

# 05084000 FOREST RIVER NEAR FORDVILLE, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1940	--	--	--	--	--	--	21.6	7.28	2.74	8.08	6.97	0.913	--
1941	1.52	2.03	2.06	2.70	2.91	4.07	462.8	9.71	22.6	3.34	2.55	12.0	43.5
1942	24.9	8.92	4.92	3.13	3.60	156.7	368.3	25.9	9.56	6.65	11.9	3.65	52.3
1943	2.70	2.91	3.05	3.26	3.78	133.7	41.0	14.1	154.2	144.9	10.4	5.33	43.5
1944	4.46	4.89	4.86	3.94	2.81	5.69	83.0	13.5	17.2	5.27	4.41	4.78	12.8
1945	2.83	8.53	6.50	3.71	4.92	82.6	20.3	11.5	8.79	3.91	1.64	2.82	13.3
1946	2.96	3.71	3.80	4.59	4.22	121.7	20.0	7.21	7.02	3.97	2.30	4.30	15.6
1947	4.59	4.25	4.24	3.21	2.17	65.5	41.6	9.00	7.45	5.89	3.41	3.52	13.0
1948	4.87	4.65	5.62	5.00	5.00	5.21	869.0	45.7	21.3	8.91	8.45	3.94	81.2
1949	4.30	5.17	3.79	3.00	3.00	4.81	334.0	17.8	7.61	11.0	5.13	3.58	33.3
1950	8.48	7.39	6.51	4.61	5.64	11.6	1,182	1,037	23.2	11.3	6.83	8.78	193.1
1951	8.29	8.67	8.35	7.77	7.29	57.0	104.0	13.8	10.5	5.23	6.74	5.80	20.3
1952	6.52	8.37	5.74	6.32	7.62	19.2	61.0	9.23	6.13	30.5	4.28	4.45	14.1
1953	4.67	5.74	5.17	4.92	6.00	7.59	9.59	17.4	17.8	6.26	3.67	4.49	7.77
1954	5.76	6.18	4.37	3.46	8.18	27.5	26.8	12.0	46.0	5.87	11.4	7.33	13.7
1955	5.78	6.75	6.48	4.93	5.11	92.8	166.1	14.7	64.1	5.59	3.88	3.98	31.6
1956	6.03	5.04	3.16	4.97	5.34	6.32	393.3	59.2	144.5	22.5	6.49	11.0	55.0
1957	11.4	12.5	7.13	5.29	6.43	50.3	14.0	14.5	11.9	5.91	6.48	13.5	13.3
1958	10.3	9.42	7.70	7.26	7.03	9.12	10.2	10.2	9.92	8.33	3.82	3.68	8.08
1959	6.31	5.72	4.79	4.40	5.37	20.5	66.9	14.4	7.29	3.76	2.40	3.39	12.1
1960	6.02	5.51	5.46	5.33	4.77	34.5	447.4	17.7	8.24	5.99	4.82	4.40	45.3
1961	3.92	6.59	6.15	4.01	3.64	24.1	12.3	7.07	4.26	3.81	2.69	3.51	6.87
1962	5.53	5.09	3.85	4.61	6.01	9.20	258.4	30.1	117.1	11.5	9.61	9.55	38.8
1963	11.0	11.3	8.03	4.01	1.21	21.8	14.9	12.6	27.8	29.2	4.74	3.38	12.6
1964	4.81	6.83	5.18	5.57	7.15	6.99	91.9	14.7	254.9	24.0	9.86	9.95	36.4
1965	9.83	8.42	5.88	6.05	7.57	8.87	369.6	39.3	41.5	15.7	8.52	21.4	44.8
1966	22.5	11.2	10.2	7.07	8.42	278.4	200.7	172.7	48.9	34.2	12.8	10.2	68.6
1967	11.9	13.5	17.8	12.8	10.9	132.3	184.4	180.3	24.1	11.0	6.27	6.38	51.2
1968	9.90	8.95	8.41	8.17	10.5	78.6	20.1	16.1	12.5	17.3	8.68	7.97	17.3
1969	8.91	9.86	7.07	6.86	8.31	10.0	434.1	40.9	22.6	10.5	5.72	6.67	47.2
1970	8.04	9.85	10.8	7.57	8.41	7.90	276.8	65.3	20.1	15.8	7.30	7.62	36.9
1971	14.2	11.6	8.76	7.25	9.02	16.1	460.0	38.3	21.7	71.5	14.4	10.7	56.6
1972	14.2	17.6	11.1	7.20	6.93	204.4	214.3	47.4	17.4	7.84	6.58	7.26	46.9
1973	7.97	8.89	5.57	9.15	10.0	46.2	14.4	15.7	25.0	4.93	4.24	6.01	13.2
1974	11.6	9.99	9.18	8.00	7.50	8.02	489.5	453.7	118.3	20.9	14.4	9.03	96.8



# 05084000 FOREST RIVER NEAR FORDVILLE, ND--Continued

## Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1975	12.4	13.7	10.6	8.11	7.58	16.4	250.7	69.0	16.8	70.8	6.12	6.61	40.7
1976	8.02	9.25	9.47	9.12	8.47	143.5	187.3	22.3	13.1	7.23	5.36	5.60	35.7
1977	4.04	4.62	7.36	8.04	6.11	14.3	14.0	14.2	6.66	9.17	3.22	11.5	8.62
1978	13.5	7.95	6.04	2.99	2.40	76.2	349.3	43.6	53.3	20.2	8.83	6.22	49.0
1979	7.91	6.68	5.49	5.85	7.28	9.61	776.9	321.3	32.5	22.4	7.88	21.5	101.7
1980	9.04	5.46	3.57	7.12	7.58	15.4	43.9	9.34	4.48	3.34	6.25	9.15	10.3
1981	9.84	13.5	6.21	4.98	29.9	37.5	33.5	15.9	14.8	9.85	9.78	16.2	16.7
1982	14.5	9.92	8.01	3.94	3.72	79.9	198.7	37.5	60.8	232.2	52.6	7.56	59.5
1983	57.9	23.7	19.2	10.1	18.5	168.2	143.4	31.1	20.4	20.6	11.8	18.5	45.4
1984	10.6	9.86	4.69	7.32	16.4	63.2	58.5	24.6	19.2	9.00	5.22	8.62	19.7
1985	6.25	6.27	5.99	6.59	4.47	119.0	38.0	24.6	20.1	4.85	5.70	12.9	21.4
1986	19.9	21.9	18.4	16.3	9.03	197.1	58.9	43.0	23.5	70.5	15.4	12.6	42.6
1987	16.0	11.2	8.79	9.61	12.1	114.5	489.4	50.8	24.0	31.5	9.44	10.7	65.4
1988	9.74	9.50	8.91	7.48	11.9	41.3	43.0	21.6	15.3	3.58	1.99	10.8	15.4
1989	17.9	5.77	6.72	6.99	4.64	5.78	56.7	27.0	12.7	7.72	4.30	5.54	13.5
1990	8.88	8.23	6.80	4.90	4.44	4.90	12.6	8.79	7.87	4.72	1.82	2.50	6.37
1991	3.15	4.11	4.90	4.28	5.55	7.29	9.46	10.9	6.74	18.5	3.93	14.1	7.74
1992	9.45	13.3	8.53	6.99	10.5	156.3	42.6	16.1	8.30	8.55	4.74	4.99	24.3
1993	4.89	7.10	7.46	6.29	4.91	17.4	65.2	18.4	28.0	176.7	279.9	53.3	56.4
1994	20.9	13.4	12.1	7.83	8.44	164.4	120.6	42.7	74.7	47.8	11.5	10.4	44.8
1995	23.0	18.2	11.7	11.5	11.3	323.0	255.3	106.1	52.5	72.7	14.6	8.87	76.2
1996	11.1	12.4	11.9	12.9	10.9	110.9	484.2	335.4	76.7	17.5	7.64	5.54	91.3
1997	11.0	12.0	11.3	12.9	10.6	12.1	725.9	269.5	35.7	161.0	54.6	18.2	111.1

## 05085000 FOREST RIVER AT MINTO, ND

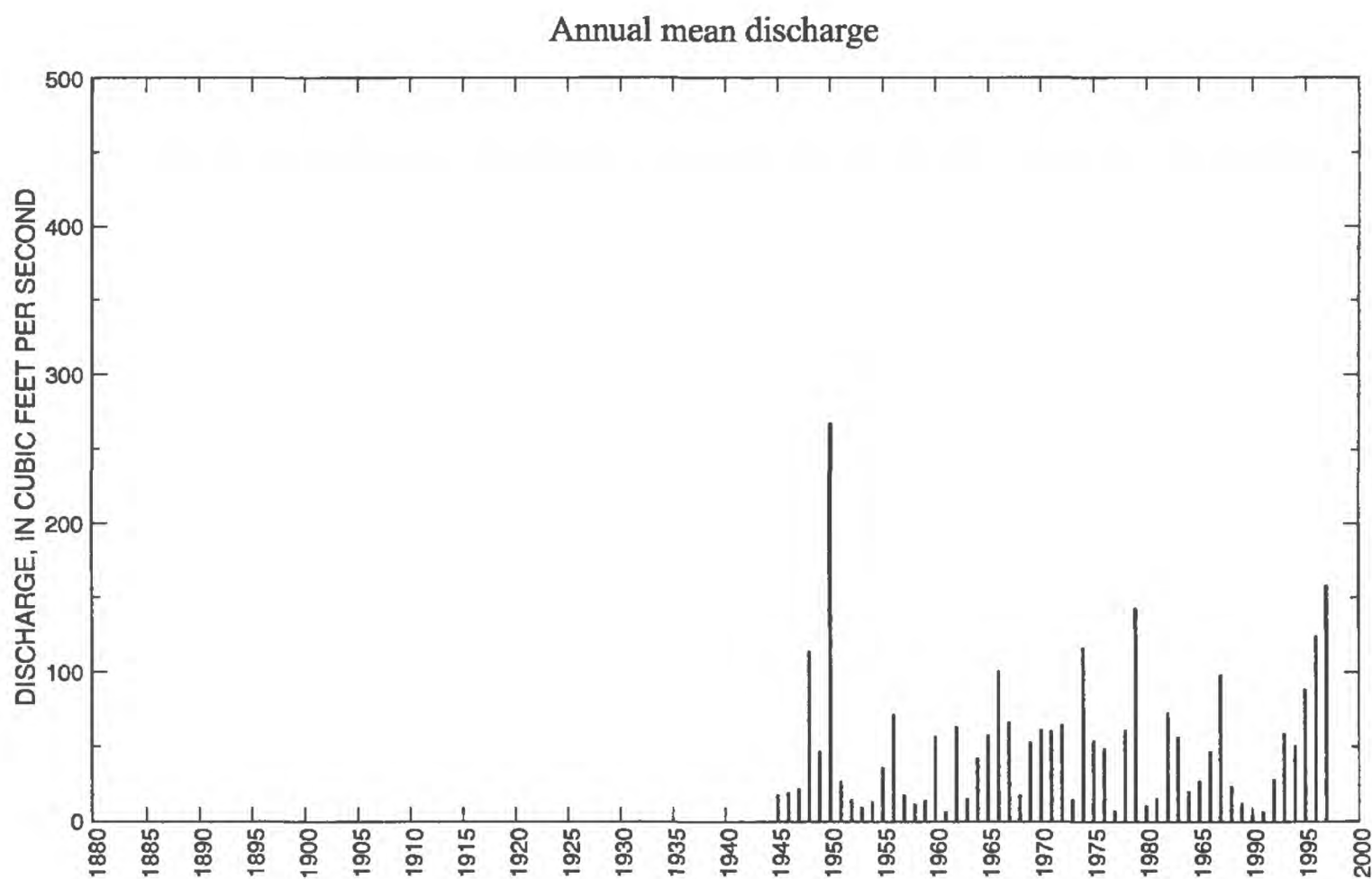
LOCATION.--Lat 48°16'10", long 97°22'10", in SE<sup>1</sup>/<sub>4</sub> sec.51, T.156 N., R.52 W., Walsh County, Hydrologic Unit 09020308, on right bank 30 ft upstream from dam in Minto, 150 ft upstream from Burlington Northern Railway bridge, and 900 ft east of U.S. Highway 81.

DRAINAGE AREA.--740 mi<sup>2</sup>, of which about 120 mi<sup>2</sup> is probably noncontributing.

PERIOD OF RECORD.--April 1944 to current year.

GAGE.--Water-stage recorder. Datum of gage is 806.95 ft above sea level. Prior to July 15, 1954, nonrecording gage at site 400 ft upstream at same datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 16,600 ft<sup>3</sup>/s, Apr. 18, 1950; maximum gage height, 11.80 ft, Apr. 19, 1948, and Apr. 18, 1950; no flow at times.



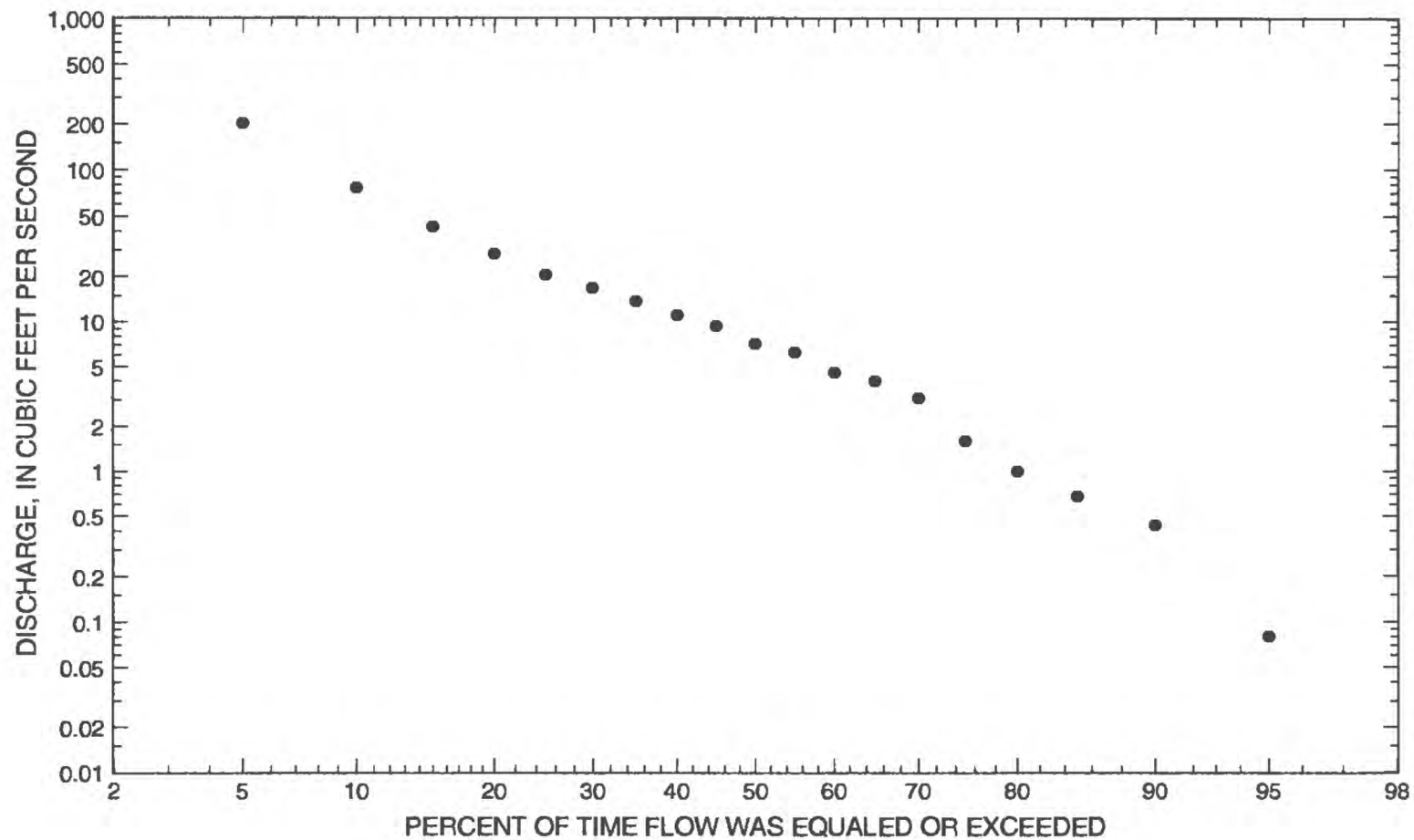
# 05085000 FOREST RIVER AT MINTO, ND--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /a)			
October	59.1	1983	0	1991	9.36	8.97	0.96	1.53
November	23.6	1983	0.971	1991	9.00	5.06	0.56	1.47
December	13.4	1983	0.291	1990	5.07	3.53	0.70	0.83
January	9.66	1983	0	m	2.62	2.63	1.00	0.43
February	17.3	1981	0	m	2.14	3.19	1.49	0.35
March	438	1966	0	1962	65.7	97.5	1.48	10.7
April	1,570	1950	21.9	1953	309	348	1.13	50.5
May	1,520	1950	10.6	1946	103	221	2.15	16.8
June	267	1964	4.21	1991	47.0	57.7	1.23	7.68
July	348	1997	1.87	1980	34.2	58.5	1.71	5.59
August	328	1993	0	1946	16.3	46.0	2.82	2.66
September	69.0	1993	0	m	9.03	12.2	1.35	1.47
Annual	268	1950	4.36	1990	51.5	48.0	0.93	100

Annual flow duration



# 05085000 FOREST RIVER AT MINTO, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	3.72	11.4	5.73	1.80	0	0	0.05	1.90	0.34	0.08
90	0.20	0	0	15.7	13.8	7.59	2.90	0.51	0.09	1.00	2.50	0.54	0.44
85	0.25	0	0.12	22.3	15.9	9.98	3.70	0.99	0.39	2.10	3.00	0.86	0.68
80	0.39	0.08	0.24	26.4	17.8	12.4	5.30	1.90	0.73	2.70	4.10	1.10	1.00
75	0.48	0.18	0.48	31.5	19.2	14.0	6.19	1.90	1.30	4.18	4.10	1.70	1.60
70	0.59	0.24	0.68	37.4	20.5	15.5	6.81	3.13	1.80	4.84	4.80	2.20	3.11
65	0.73	0.41	0.68	44.6	21.9	17.0	8.70	3.73	2.50	5.31	5.70	2.80	4.02
60	0.91	0.41	0.96	52.8	23.4	18.5	10.2	4.27	4.11	6.00	5.70	2.80	4.56
55	1.10	0.53	1.40	64.9	26.0	20.2	12.3	5.29	4.89	6.34	7.06	3.50	6.26
50	1.40	0.70	1.90	79.3	29.5	22.9	13.8	6.23	5.34	6.67	7.86	3.50	7.15
45	1.70	0.91	2.99	101	35.5	26.1	15.4	7.16	6.49	8.08	8.41	4.71	9.41
40	1.70	1.20	4.01	128	42.6	29.7	17.5	7.94	7.20	8.99	9.24	5.20	11.2
35	2.70	1.50	5.61	166	50.0	33.8	19.9	8.72	7.90	10.1	9.72	5.91	13.9
30	3.30	2.00	9.27	217	60.0	38.4	23.2	10.7	9.00	11.2	11.2	6.44	17.1
25	3.30	2.60	18.5	278	78.5	44.4	27.5	12.3	10.1	12.8	12.3	7.40	20.8
20	5.12	2.60	40.2	360	98.6	53.0	34.2	14.1	12.8	14.1	13.5	7.83	28.4
15	5.75	4.15	98.8	504	130	64.7	44.4	17.5	15.3	15.3	15.0	9.62	43.0
10	6.71	5.04	191	787	189	82.9	66.0	22.8	19.6	17.6	16.5	11.3	77.2
5	8.14	6.46	406	1,350	384	152	118	46.3	28.2	22.9	19.4	13.3	203

# 05085000 FOREST RIVER AT MINTO, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	40.6	26.6	23.1	17.4	13.8
0.95	1.05	110	74.8	61.2	45.7	33.5
0.90	1.11	184	127	101	74.6	52.9
0.80	1.25	336	235	181	132	90.6
0.50	2	1,000	717	524	368	243
0.20	5	2,790	2,010	1,420	943	617
0.10	10	4,630	3,340	2,310	1,490	983
0.04	25	7,780	5,600	3,830	2,370	1,590
0.02	50	10,800	7,730	5,240	3,150	2,150
0.01	100	14,300	10,200	6,900	4,040	2,800
0.005	200	18,400	13,100	8,820	5,040	3,560
0.002	500	24,900	ng	ng	ng	ng



# 05085000 FOREST RIVER AT MINTO, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
<sup>1</sup> 1882	April	--	2,200	1969	April 12	7.67	3,960
<sup>1</sup> 1897	April	--	1,850	1970	April 9	7.04	2,220
<sup>1</sup> 1907	April	--	1,750	1971	April 10	5.84	2,460
<sup>1</sup> 1916	April	--	1,600	1972	March 17	5.96	2,120
1944	April 10	5.00	650	1973	June 19	1.93	208
1945	March 27	2.11	250	1974	April 16	7.79	4,580
1946	March 22	--	1,000	1975	April 15	6.73	1,600
1947	March 25	4.12	1,100	1976	March 31	7.03	1,500
1948	April 19	11.80	11,500	1977	April 10	1.58	77.0
1949	April 7	8.19	2,020	1978	March 31	6.52	1,600
1950	April 18	11.80	16,600	1979	April 20	8.93	6,730
1951	April 5	3.60	900	1980	April 1	2.01	167
1952	April 2	2.78	370	1981	June 28	2.04	176
1953	June 4	3.53	910	1982	July 26	4.07	1,140
1954	June 16	2.61	391	1983	March 15	3.52	820
1955	April 2	8.56	4,200	1984	March 26	2.77	394
1956	April 21	6.63	2,930	1985	March 14	3.39	640
1957	March 23	2.72	461	1986	March 19	3.40	690
1958	June 10	2.72	463	1987	April 4	6.91	2,360
1959	April 2	2.45	338	1988	May 29	3.71	945
1960	April 6	5.60	2,050	1989	April 18	2.49	371
1961	March 22	1.90	147	1990	April 15	1.56	58.0
1962	April 19	6.68	2,400	1991	April 4	1.54	60.0
1963	March 24	2.54	250	1992	March 8	3.34	640
1964	June 21	4.31	1,460	1993	July 28	3.70	705
1965	April 12	7.48	3,710	1994	March 26	--	533
1966	March 21	7.82	3,100	1995	March 19	5.41	1,680
1967	March 31	7.22	3,070	1996	April 13	8.53	3,500
1968	March 27	2.31	315	1997	April 20	--	2,140
Annual peak discharge, from highest to lowest, and corresponding gage height							
1950	April 18	11.80	16,600	1970	April 9	7.04	2,220
1948	April 19	11.80	11,500	<sup>1</sup> 1882	April	--	2,200
1979	April 20	8.93	6,730	1997	April 20	--	2,140
1974	April 16	7.79	4,580	1972	March 17	5.96	2,120
1955	April 2	8.56	4,200	1960	April 6	5.60	2,050
1969	April 12	7.67	3,960	1949	April 7	8.19	2,020
1965	April 12	7.48	3,710	<sup>1</sup> 1897	April	--	1,850
1996	April 13	8.53	3,500	<sup>1</sup> 1907	April	--	1,750
1966	March 21	7.82	3,100	1995	March 19	5.41	1,680
1967	March 31	7.22	3,070	<sup>1</sup> 1916	April	--	1,600
1956	April 21	6.63	2,930	1975	April 15	6.73	1,600
1971	April 10	5.84	2,460	1978	March 31	6.52	1,600
1962	April 19	6.68	2,400	1976	March 31	7.03	1,500
1987	April 4	6.91	2,360	1964	June 21	4.31	1,460

## 05085000 FOREST RIVER AT MINTO, ND--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1982	July 26	4.07	1,140	1984	March 26	2.77	394
1947	March 25	4.12	1,100	1954	June 16	2.61	391
1946	March 22	--	1,000	1989	April 18	2.49	371
1988	May 29	3.71	945	1952	April 2	2.78	370
1953	June 4	3.53	910	1959	April 2	2.45	338
1951	April 5	3.60	900	1968	March 27	2.31	315
1983	March 15	3.52	820	1945	March 27	2.11	250
1993	July 28	3.70	705	1963	March 24	2.54	250
1986	March 19	3.40	690	1973	June 19	1.93	208
1944	April 10	5.00	650	1981	June 28	2.04	176
1985	March 14	3.39	640	1980	April 1	2.01	167
1992	March 8	3.34	640	1961	March 22	1.90	147
1994	March 26	--	533	1977	April 10	1.58	77.0
1958	June 10	2.72	463	1991	April 4	1.54	60.0
1957	March 23	2.72	461	1990	April 15	1.56	58.0

<sup>1</sup>Determined by U.S. Army Corps of Engineers; not used in statistics.

# 05085000 FOREST RIVER AT MINTO, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1944	--	--	--	--	--	--	90.0	24.1	20.8	7.42	1.76	7.22	--
1945	2.44	14.7	11.2	2.55	1.64	89.6	47.3	20.1	15.2	5.59	2.90	0.987	18.0
1946	2.12	2.76	1.05	0.500	0.196	154.9	42.2	10.6	8.90	5.36	0	2.98	19.5
1947	5.07	5.83	2.74	0.497	0.021	90.0	96.7	17.2	15.5	19.6	5.37	3.65	21.9
1948	3.91	6.10	5.23	3.45	0.755	0.177	1,189	106.3	40.5	18.7	9.51	4.74	114.2
1949	4.05	7.01	3.68	1.14	0.500	0.594	482.5	37.5	17.4	11.2	3.30	0.653	47.0
1950	5.61	6.97	5.00	0.700	0.700	0.797	1,573	1,515	54.1	28.3	8.05	8.93	267.9
1951	8.41	9.24	4.58	3.65	4.50	31.2	198.7	27.4	15.5	6.48	9.32	8.42	27.1
1952	6.38	6.71	4.10	1.10	0.686	3.57	96.0	16.4	7.57	29.1	5.35	3.01	14.9
1953	2.21	4.19	1.97	0.574	0.079	2.98	21.9	16.5	51.4	10.1	2.14	0.270	9.50
1954	1.80	4.57	2.42	0.281	0.232	24.7	39.8	18.3	43.8	10.0	11.1	6.43	13.6
1955	7.01	6.57	4.00	1.31	0.514	0.032	291.1	22.1	92.4	11.2	2.85	1.69	36.3
1956	5.16	5.31	1.96	0.526	0.476	0.584	511.3	87.9	208.8	26.7	11.0	14.0	72.0
1957	9.96	15.8	6.44	4.47	1.53	47.1	25.8	20.4	14.9	6.45	7.78	56.6	18.1
1958	12.8	14.2	6.85	2.62	0.843	6.00	24.9	16.3	40.9	12.8	3.80	2.07	12.0
1959	7.73	6.53	0.710	0.268	0.100	10.8	107.2	18.4	11.0	5.71	2.15	0.440	14.2
1960	5.57	4.57	3.71	1.87	0.986	20.6	605.9	30.7	15.2	4.63	1.90	0.937	57.3
1961	1.62	4.11	0.742	0.635	0	23.4	24.4	11.6	5.18	5.64	0.513	0	6.51
1962	2.48	3.35	1.06	0.190	0	0	398.4	63.2	266.5	20.2	11.8	8.21	64.0
1963	13.2	15.8	4.87	0.945	0	42.2	34.5	18.9	22.7	26.5	3.73	0.797	15.4
1964	3.15	5.35	1.13	0.152	0.093	0.261	138.7	28.0	266.6	50.5	12.1	10.4	42.6
1965	12.6	10.1	4.99	3.79	2.77	2.84	481.4	63.0	71.9	23.4	11.5	16.0	58.2
1966	25.8	15.8	11.6	4.96	2.14	438.2	355.8	228.5	57.3	36.5	17.6	9.88	101.1
1967	10.9	10.8	8.15	3.54	2.48	123.9	358.8	210.7	39.4	17.4	8.90	5.71	66.8
1968	4.76	10.3	5.57	2.02	1.55	66.5	46.0	21.3	18.7	16.6	11.8	10.5	18.0
1969	8.91	10.9	5.61	0.822	0.407	0.456	521.5	53.3	20.2	12.3	4.70	5.14	53.2
1970	6.50	7.93	5.99	5.38	2.26	0.794	479.5	139.5	41.9	39.8	11.4	6.53	62.0
1971	9.14	10.8	4.40	0.896	0.947	7.45	512.3	59.5	30.4	67.1	21.0	11.6	60.9
1972	12.3	14.6	5.64	0.801	0.259	269.8	356.3	71.9	31.2	10.0	4.51	4.42	65.1
1973	8.08	7.82	2.04	0.400	0.526	59.5	39.9	18.9	28.4	6.15	1.47	4.46	14.9
1974	11.7	4.40	3.09	2.55	0.587	0.913	660.7	485.7	176.3	27.5	19.6	7.60	116.6
1975	13.3	14.8	8.46	5.86	3.68	5.45	285.2	162.4	28.9	108.5	9.28	6.54	54.5
1976	11.1	9.54	3.75	3.60	4.14	108.1	387.6	34.6	17.5	8.50	2.90	1.53	49.1
1977	1.40	2.19	0.489	0	0	11.0	32.9	17.7	10.9	6.79	3.14	4.16	7.57
1978	9.04	5.10	1.29	0.958	0.168	74.5	495.4	56.4	61.2	26.4	8.17	8.64	61.9

# 05085000 FOREST RIVER AT MINTO, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1979	5.48	3.07	2.12	2.00	1.35	1.00	1,189	363.0	63.6	63.4	12.1	17.2	142.9
1980	8.14	8.25	4.35	1.04	1.33	8.16	70.2	12.6	7.33	1.87	1.32	2.98	10.6
1981	5.34	10.4	8.19	4.10	17.3	33.3	38.8	15.2	21.5	12.3	4.83	15.3	15.5
1982	20.5	11.7	8.35	1.54	0.301	33.6	329.2	63.0	60.0	235.8	96.4	13.9	73.1
1983	59.1	23.6	13.4	9.66	12.5	236.9	197.3	52.5	32.6	18.7	7.92	17.1	57.0
1984	9.15	15.0	3.53	0.784	4.48	53.3	89.0	26.7	26.0	9.92	3.13	3.77	20.3
1985	3.94	3.60	1.56	0.121	0.001	175.4	63.7	31.2	26.5	5.25	6.08	8.53	27.4
1986	18.5	21.3	8.60	6.37	5.09	190.0	113.1	86.2	16.2	60.1	21.0	12.5	47.0
1987	20.1	10.9	8.71	9.65	7.31	122.3	848.6	81.9	28.6	27.3	15.0	7.68	98.4
1988	12.1	11.1	11.4	6.32	0.674	40.0	98.7	70.7	30.0	4.73	2.11	0.253	24.0
1989	5.20	3.20	1.10	1.14	1.10	1.00	90.6	30.9	8.74	2.32	0.150	0.011	12.1
1990	1.18	1.73	0.291	0	0	0.600	26.4	11.2	8.28	2.75	0.019	0	4.36
1991	0	0.971	0.831	0	0	2.87	23.0	14.0	4.21	14.5	6.44	12.3	6.61
1992	11.5	10.3	8.67	7.14	5.98	186.7	60.7	24.0	15.0	6.80	3.49	0.635	28.6
1993	2.71	5.38	3.61	1.58	2.74	13.1	97.6	23.7	21.8	132.6	327.6	69.0	59.0
1994	20.7	17.2	11.1	6.19	4.56	153.1	164.7	52.5	86.3	64.8	13.7	14.9	51.0
1995	12.9	10.6	9.06	6.64	6.03	392.1	308.4	143.7	61.9	76.1	20.2	11.2	88.8
1996	13.7	14.0	12.9	8.53	3.94	115.9	802.8	382.0	93.9	31.3	15.3	6.98	124.6
1997	9.63	9.99	6.20	3.19	2.86	2.79	1,040	322.1	58.6	348.5	72.1	28.5	158.6

## 05086900 MIDDLE RIVER NEAR NEWFOLDEN, MN

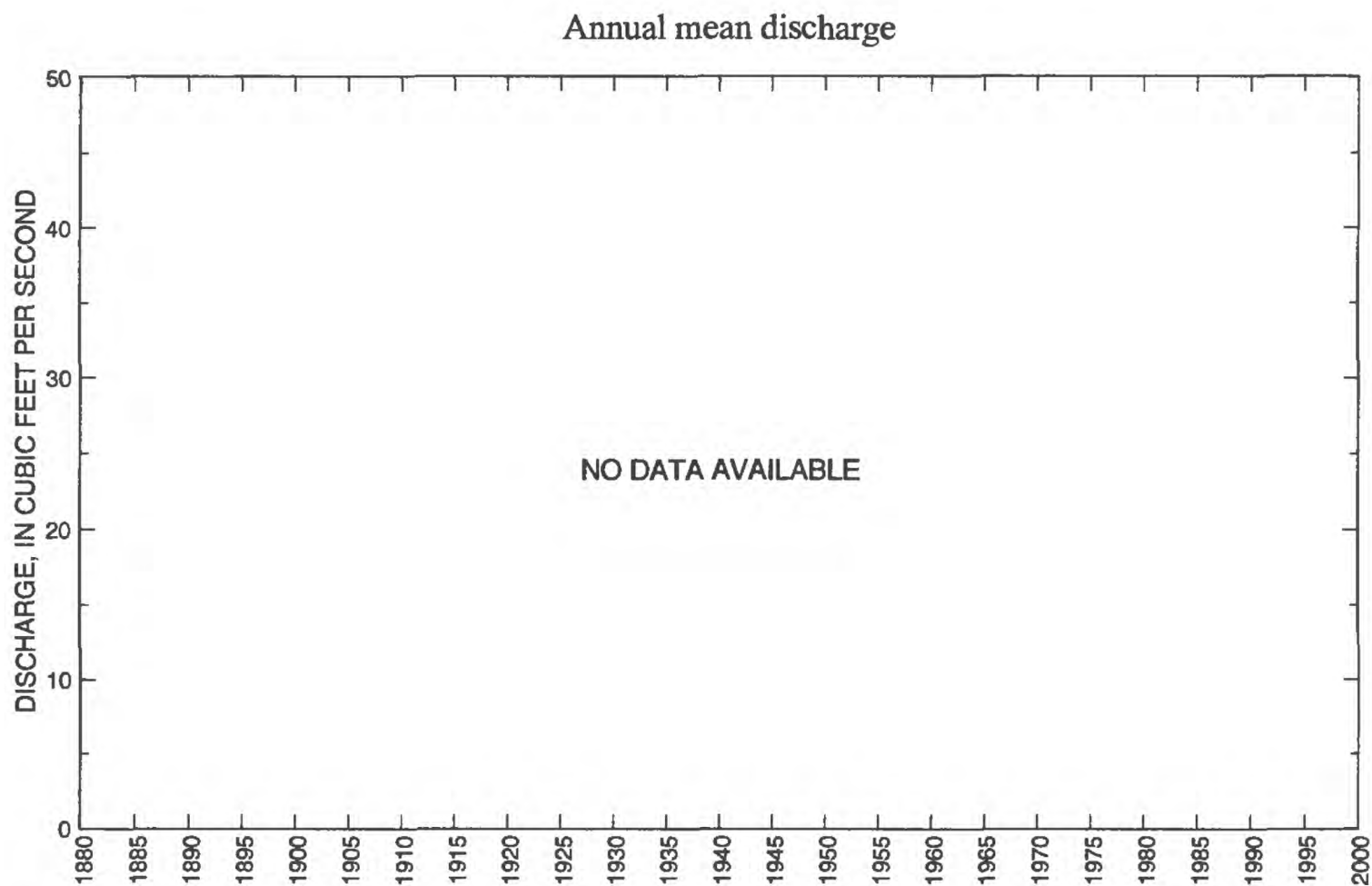
LOCATION.--Lat 48°22'04", long 96°16'47", in NE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec.3, T.156 N., R.44 W., Marshall County, Hydrologic Unit 09020309, at bridge on township road and 2.0 mi northeast of Newfolden.

DRAINAGE AREA.--88.8 mi<sup>2</sup>.

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

GAGE.--Crest-stage gage.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,300 ft<sup>3</sup>/s, May 18, 1996, gage height, 18.31 ft; maximum gage height, 18.71 ft, Apr. 19, 1997.





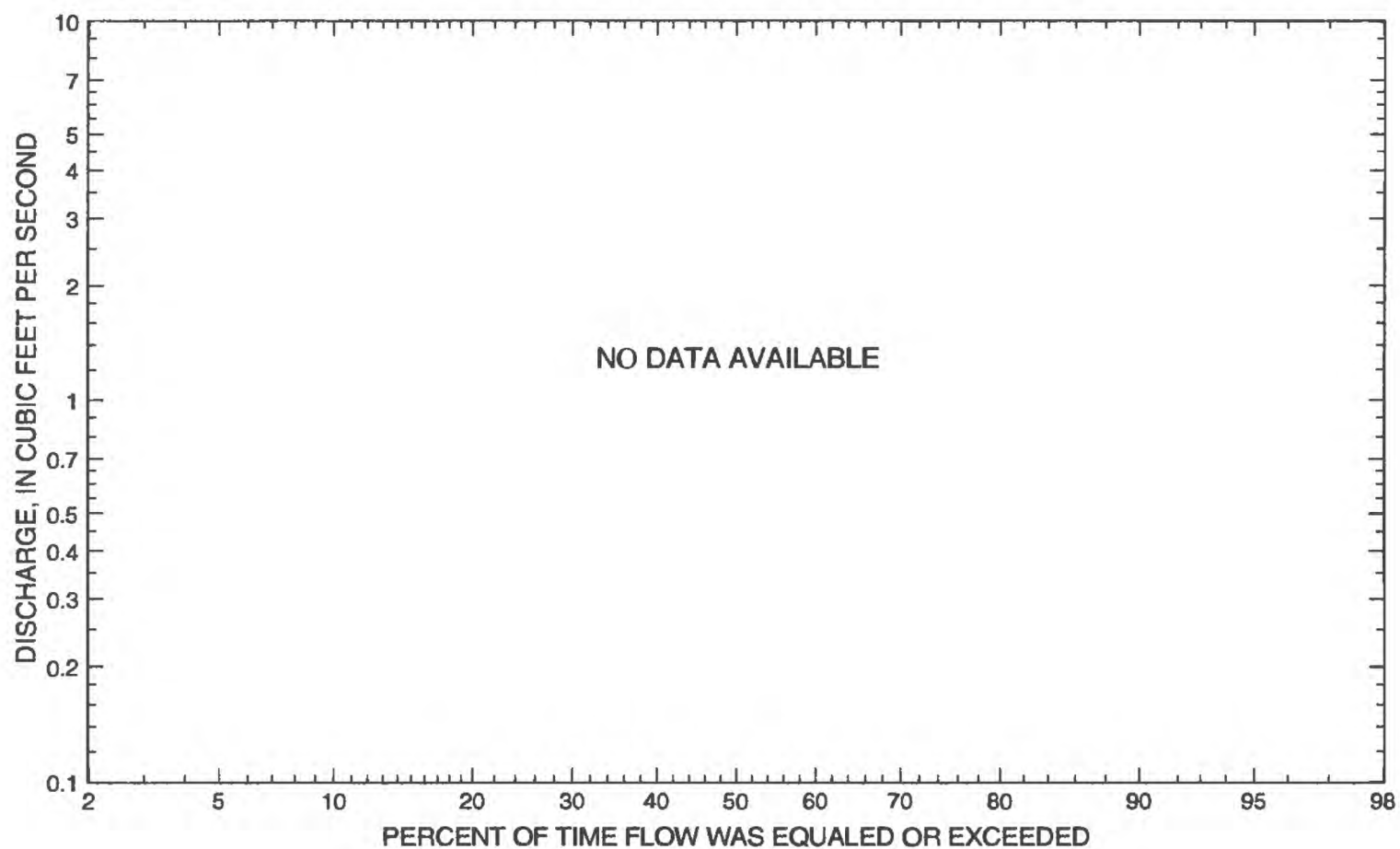
# 05086900 MIDDLE RIVER NEAR NEWFOLDEN, MN--CONTINUED

Statistics of monthly and annual mean discharges

[--, no data]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /a)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	--	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
August	--	--	--	--	--	--	--	--
September	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--

Annual flow duration



# 05086900 MIDDLE RIVER NEAR NEWFOLDEN, MN--CONTINUED

Monthly and annual flow duration, in cubic feet per second

[--, no data]

Percentage of days discharge equaled or exceeded	Jen.	Feb.	March	April	Mey	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	--	--	--	--	--	--	--	--	--	--	--	--	--
90	--	--	--	--	--	--	--	--	--	--	--	--	--
85	--	--	--	--	--	--	--	--	--	--	--	--	--
80	--	--	--	--	--	--	--	--	--	--	--	--	--
75	--	--	--	--	--	--	--	--	--	--	--	--	--
70	--	--	--	--	--	--	--	--	--	--	--	--	--
65	--	--	--	--	--	--	--	--	--	--	--	--	--
60	--	--	--	--	--	--	--	--	--	--	--	--	--
55	--	--	--	--	--	--	--	--	--	--	--	--	--
50	--	--	--	--	--	--	--	--	--	--	--	--	--
45	--	--	--	--	--	--	--	--	--	--	--	--	--
40	--	--	--	--	--	--	--	--	--	--	--	--	--
35	--	--	--	--	--	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--	--	--	--

# 05086900 MIDDLE RIVER NEAR NEWFOLDEN, MN--CONTINUED

Probability of occurrence of annual high discharges

[--, no data]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /a)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	16.9	--	--	--	--
0.95	1.05	38.7	--	--	--	--
0.90	1.11	59.7	--	--	--	--
0.80	1.25	101	--	--	--	--
0.50	2	270	--	--	--	--
0.20	5	710	--	--	--	--
0.10	10	1,170	--	--	--	--
0.04	25	1,980	--	--	--	--
0.02	50	2,770	--	--	--	--
0.01	100	3,740	--	--	--	--
0.005	200	4,930	--	--	--	--
0.002	500	6,850	--	--	--	--

# 05086900 MIDDLE RIVER NEAR NEWFOLDEN, MN--CONTINUED

Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1979	April 25	17.10	1,000	1989	April 17	15.93	600
1980	April 6	14.32	270	1990	March 14	12.80	46.0
1981	June 28	13.46	55.0	1991	July 8	13.27	74.0
1982	April 15	15.29	270	1992	April 1	13.86	115
1983	March 7	15.87	225	1993	August 31	16.67	550
1984	June 10	15.02	360	1994	March 22	14.40	50.0
1985	June 27	16.16	610	1995	March 16	15.50	340
1986	May 1	14.37	282	1996	May 18	18.31	2,300
1987	March 25	14.59	215	1997	April 19	18.71	2,000
1988	April 4	13.64	100				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1996	May 18	18.31	2,300	1982	April 15	15.29	270
1997	April 19	18.71	2,000	1983	March 7	15.87	225
1979	April 25	17.10	1,000	1987	March 25	14.59	215
1985	June 27	16.16	610	1992	April 1	13.86	115
1989	April 17	15.93	600	1988	April 4	13.64	100
1993	August 31	16.67	550	1991	July 8	13.27	74.0
1984	June 10	15.02	360	1981	June 28	13.46	55.0
1995	March 16	15.50	340	1994	March 22	14.40	50.0
1986	May 1	14.37	282	1990	March 14	12.80	46.0
1980	April 6	14.32	270				

05086900 MIDDLE RIVER NEAR NEWFOLDEN, MN--CONTINUED

Monthly and annual mean discharges, in cubic feet per second

[--, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
--	--	--	--	--	--	--	--	--	--	--	--	--	--



## 05087500 MIDDLE RIVER AT ARGYLE, MN

**LOCATION.**--Lat 48°20'25", long 96°48'58", in NE<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec.15, T.156 N., R.48 W., Marshall County, Hydrologic Unit 09020309, on left bank 30 ft upstream of bridge on County Highway 4 in Argyle and 14 mi upstream from mouth.

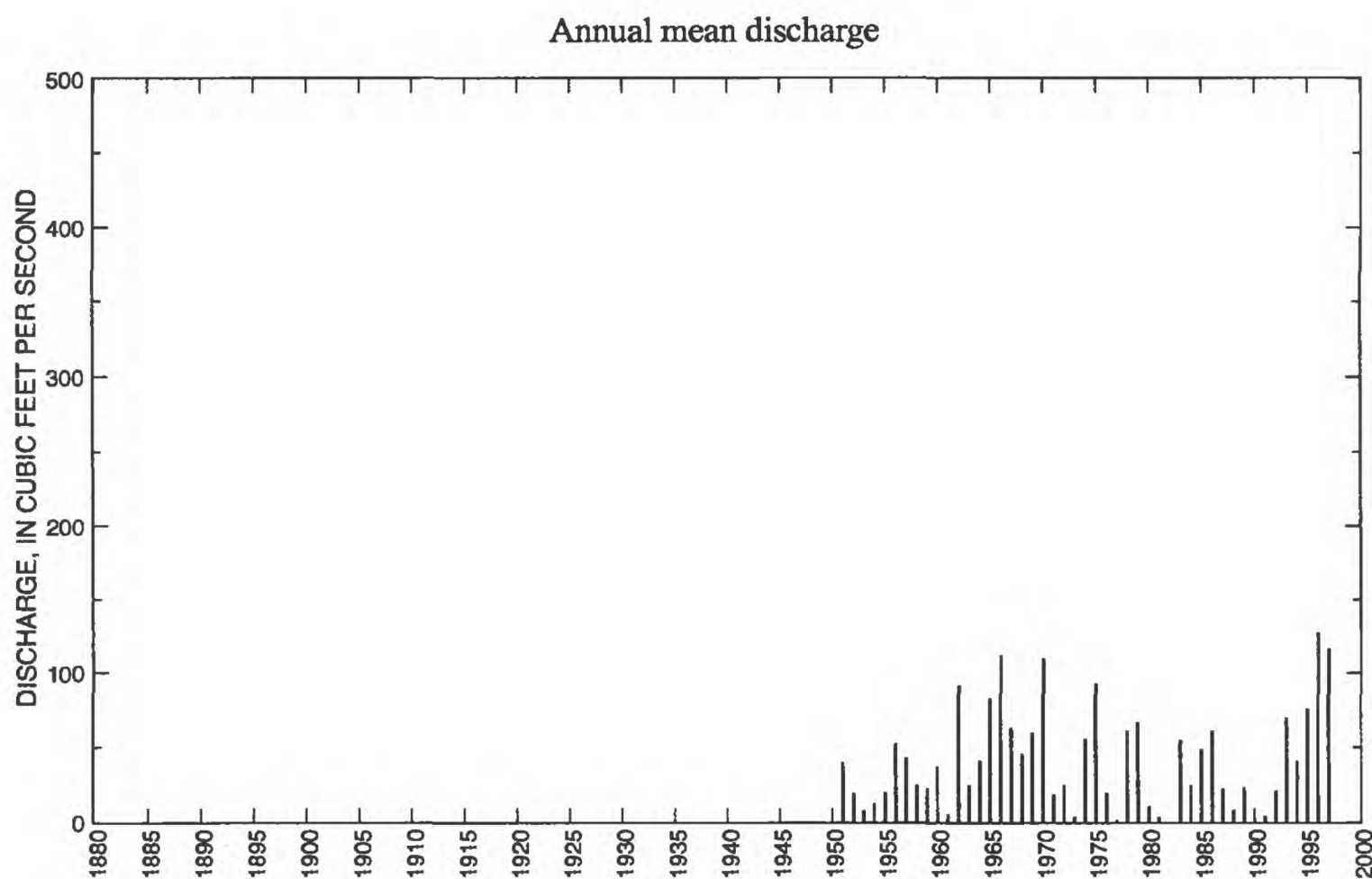
**DRAINAGE AREA.**--265 mi<sup>2</sup>.

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

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

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 5,020 ft<sup>3</sup>/s, May 19, 1996, gage height, 18.27 ft, from floodmark; no flow at times.

**EXTREMES OUTSIDE PERIOD OF RECORD.**--Flood of April 1950 reached a stage of 15.25 ft present datum, site then in use, from floodmarks.



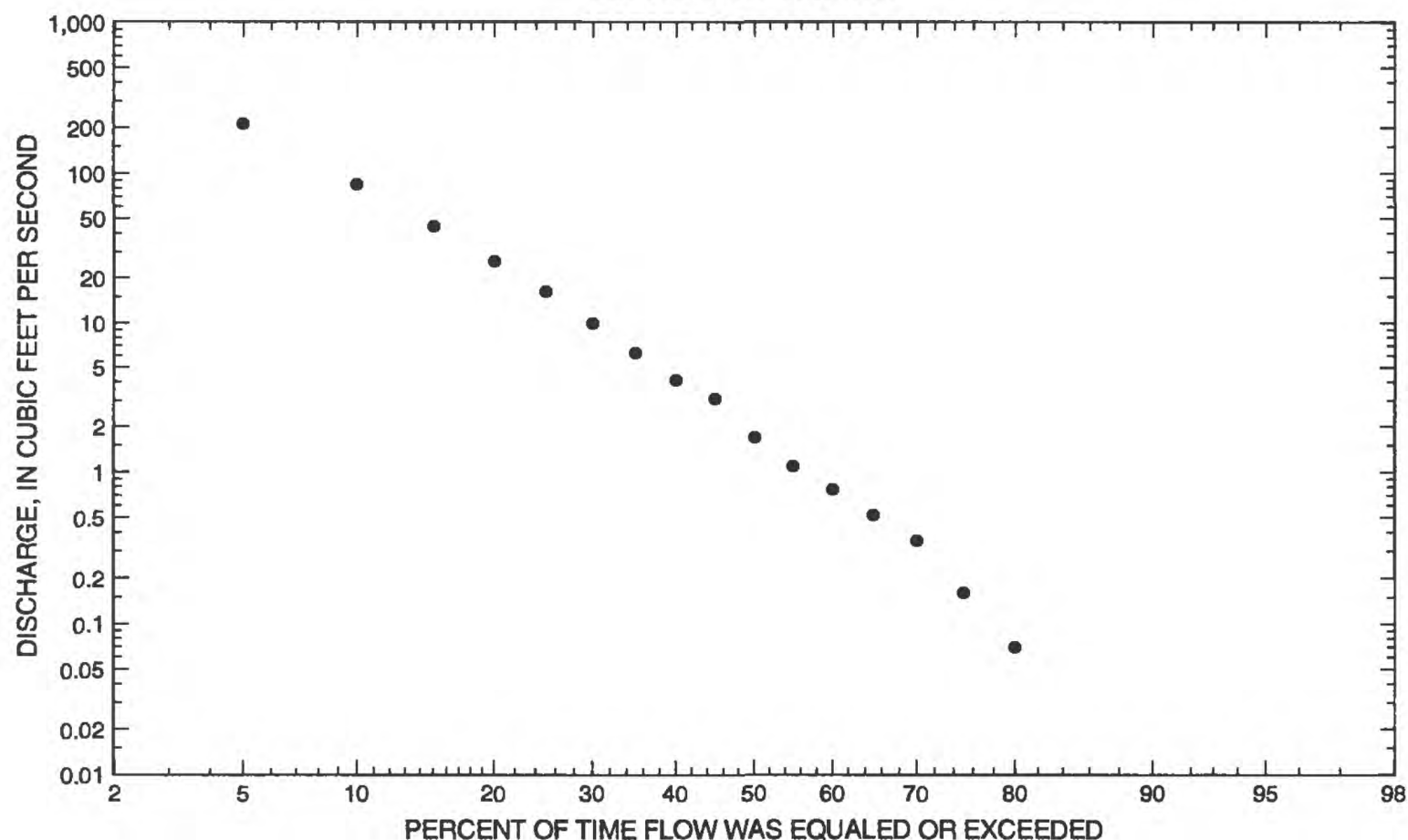
## 05087500 MIDDLE RIVER AT ARGYLE, MN--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	94.1	1983	0	m	9.84	20.1	2.04	1.91
November	108	1995	0	m	7.51	16.9	2.25	1.46
December	22.2	1995	0	m	2.85	4.19	1.47	0.55
January	8.77	1995	0	m	1.25	1.67	1.33	0.24
February	3.72	1995	0	m	0.86	1.01	1.17	0.17
March	335	1995	0	m	30.8	62.0	2.02	5.97
April	966	1997	0.197	1991	222	217	0.98	43.1
May	896	1996	2.12	1981	89.7	143	1.60	17.4
June	660	1970	0.366	1973	66.5	126	1.89	12.9
July	688	1975	0	1961	57.8	116	2.00	11.2
August	264	1993	0	1961	10.7	38.3	3.58	2.07
September	272	1993	0	m	15.6	48.8	3.13	3.02
Annual	127	1996	1.60	1977	43.0	33.7	0.79	100

Annual flow duration



# 05087500 MIDDLE RIVER AT ARGYLE, MN--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	0.27	1.10	0.19	0	0	0	0	0	0	0
90	0	0	0	2.00	3.32	1.20	0.15	0	0	0	0	0	0
85	0	0	0	6.04	4.50	2.67	0.48	0	0	0	0.04	0.02	0
80	0	0	0	12.1	7.08	3.77	1.00	0.02	0	0	0.18	0.10	0.07
75	0	0	0.03	18.1	12.8	5.15	1.50	0.10	0	0.03	0.24	0.10	0.16
70	0.10	0.02	0.23	27.5	16.5	6.66	3.12	0.14	0	0.09	0.33	0.27	0.35
65	0.20	0.10	0.46	39.2	20.5	8.39	3.77	0.19	0.04	0.16	0.46	0.46	0.52
60	0.37	0.12	0.66	51.9	24.6	11.1	5.05	0.37	0.12	0.22	0.63	0.59	0.77
55	0.56	0.31	0.66	66.3	29.0	13.5	6.40	0.51	0.16	0.29	1.20	0.76	1.10
50	0.56	0.45	0.93	82.1	33.8	16.1	8.61	0.99	0.23	0.40	1.60	0.98	1.70
45	0.70	0.55	1.30	103	38.5	19.0	11.7	1.40	0.33	0.54	2.30	1.60	3.09
40	0.86	0.80	1.90	128	45.3	22.0	15.3	1.90	0.66	1.00	3.64	1.60	4.12
35	1.10	0.97	1.90	159	53.1	26.8	20.6	2.91	0.94	1.90	4.61	2.70	6.28
30	1.30	1.20	3.08	208	63.8	32.4	28.6	3.92	1.30	3.97	5.16	2.70	9.94
25	1.60	1.40	3.88	264	83.1	41.7	39.4	5.56	3.00	9.06	6.99	4.00	16.3
20	2.00	1.40	7.86	327	110	55.6	52.4	7.91	5.64	12.1	8.95	4.61	25.9
15	2.50	1.70	21.2	442	147	80.5	73.9	12.3	10.3	15.6	13.3	5.15	44.5
10	3.10	2.10	73.2	610	201	143	122	18.4	20.5	26.9	18.4	6.28	84.2
5	3.80	3.00	183	890	340	342	254	36.2	52.2	55.0	26.1	9.58	213

# 05087500 MIDDLE RIVER AT ARGYLE, MN--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	17.8	16.3	12.5	9.15
0.95	1.05	108	66.4	57.6	41.9	28.7
0.90	1.11	180	123	104	74.2	49.5
0.80	1.25	318	242	200	139	90.3
0.50	2	839	707	563	379	241
0.20	5	1,910	1,590	1,230	820	522
0.10	10	2,760	2,210	1,700	1,130	725
0.04	25	3,950	2,950	2,250	1,500	976
0.02	50	4,870	3,440	2,610	1,750	1,150
0.01	100	5,790	3,880	2,940	1,970	1,310
0.005	200	6,720	4,270	3,220	2,170	1,460
0.002	500	7,940	ng	ng	ng	ng

# 05087500 MIDDLE RIVER AT ARGYLE, MN--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1945	March 30	10.80	939	1974	April 23	14.65	2,070
1950	April	15.25	2,790	1975	July 3	16.59	4,260
1951	April 9	11.75	1,220	1976	April 3	10.21	631
1952	April 11	9.89	612	1977	May 28	2.50	24.0
1953	March 31	6.65	112	1978	April 10	14.45	1,320
1954	June 18	--	128	1979	April 20	15.29	2,140
1955	June 9	9.87	527	1980	April 9	6.91	357
1956	July 11	13.18	1,390	1981	July 3	3.97	107
1957	September 7	10.73	734	1982	April 18	9.96	711
1958	July 9	11.38	846	1983	March 9	14.17	1,020
1959	April 5	11.23	570	1984	June 12	9.10	513
1960	April 10	12.60	903	1985	June 29	12.58	939
1961	March 27	6.77	135	1986	March 31	13.43	1,040
1962	June 12	14.12	1,620	1987	March 28	11.78	550
1963	April 11	11.28	825	1988	June 1	7.21	357
1964	June 22	12.40	900	1989	April 18	15.25	1,550
1965	April 12	15.29	2,590	1990	April 4	4.86	60.0
1966	April 3	16.00	1,820	1991	July 8	--	87.0
1967	April 23	13.41	1,320	1992	March 9	9.87	350
1968	July 20	12.87	1,120	1993	September 3	14.18	1,180
1969	April 11	15.92	2,530	1994	September 19	11.30	707
1970	May 31	14.82	2,200	1995	March 16	14.22	1,300
1971	April 9	11.74	773	1996	May 19	18.27	5,020
1972	April 17	10.12	729	1997	April 19	17.96	4,330
1973	March 15	5.10	93.0				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1996	May 19	18.27	5,020	1968	July 20	12.87	1,120
1997	April 19	17.96	4,330	1986	March 31	13.43	1,040
1975	July 3	16.59	4,260	1983	March 9	14.17	1,020
1950	April	15.25	2,790	1945	March 30	10.80	939
1965	April 12	15.29	2,590	1985	June 29	12.58	939
1969	April 11	15.92	2,530	1960	April 10	12.60	903
1970	May 31	14.82	2,200	1964	June 22	12.40	900
1979	April 20	15.29	2,140	1958	July 9	11.38	846
1974	April 23	14.65	2,070	1963	April 11	11.28	825
1966	April 3	16.00	1,820	1971	April 9	11.74	773
1962	June 12	14.12	1,620	1957	September 7	10.73	734
1989	April 18	15.25	1,550	1972	April 17	10.12	729
1956	July 11	13.18	1,390	1982	April 18	9.96	711
1967	April 23	13.41	1,320	1994	September 19	11.30	707
1978	April 10	14.45	1,320	1976	April 3	10.21	631
1995	March 16	14.22	1,300	1952	April 11	9.89	612
1951	April 9	11.75	1,220	1959	April 5	11.23	570
1993	September 3	14.18	1,180	1987	March 28	11.78	550



# 05087500 MIDDLE RIVER AT ARGYLE, MN--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1955	June 9	9.87	527	1953	March 31	6.65	112
1984	June 12	9.10	513	1981	July 3	3.97	107
1980	April 9	6.91	357	1973	March 15	5.10	93.0
1988	June 1	7.21	357	1991	July 8	--	87.0
1992	March 9	9.87	350	1990	April 4	4.86	60.0
1961	March 27	6.77	135	1977	May 28	2.50	24.0
1954	June 18	--	128				

# 05087500 MIDDLE RIVER AT ARGYLE, MN--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1945	--	--	--	--	--	--	289.0	73.7	26.5	15.0	4.81	19.5	--
1951	11.0	7.79	5.11	3.21	2.75	4.16	336.9	72.0	7.18	1.53	3.03	27.5	39.9
1952	11.9	4.93	3.61	1.03	1.93	3.42	177.5	19.6	3.50	6.03	0.394	0	19.3
1953	0.035	0.503	0.052	0	0	15.7	33.2	22.0	16.9	3.45	0.245	0	7.68
1954	0	0	0	0	0	0	51.8	39.8	50.7	6.26	0.190	0	12.4
1955	0.052	0.143	0.094	0.026	0	0	70.7	23.9	137.4	8.82	0.371	0	19.9
1956	0.439	0.007	0.129	0.045	0	0	132.3	131.8	26.9	312.6	11.8	7.32	52.3
1957	1.79	33.4	5.50	1.94	1.56	39.8	68.6	42.0	64.7	87.6	3.77	163.4	42.7
1958	40.6	23.5	7.41	2.50	1.70	3.76	12.2	5.32	4.85	186.7	5.28	0.153	24.8
1959	0.271	0.550	0.645	0.200	0	1.61	209.0	29.9	15.7	9.97	4.36	2.43	22.7
1960	12.5	10.4	4.31	2.10	1.11	1.68	307.1	49.9	49.2	10.4	0.887	0.223	37.1
1961	0.316	0.423	0.574	0.326	0.193	23.0	27.3	10.8	0.773	0	0	1.47	5.45
1962	8.23	2.93	0.923	0.377	0.129	0	244.9	298.9	481.9	43.9	7.34	7.60	91.2
1963	2.63	4.19	3.48	0.406	0	18.7	188.6	41.7	30.6	6.88	4.67	0.143	25.0
1964	0.013	0.177	0.032	0	0	0	73.8	44.6	306.1	40.4	28.2	8.43	41.4
1965	27.0	12.9	3.94	2.56	1.17	1.37	577.3	158.8	102.1	92.2	5.02	7.96	82.4
1966	64.5	21.6	8.54	4.05	1.92	93.0	747.1	231.9	32.7	107.2	24.2	4.74	111.7
1967	5.05	1.93	0.913	0.652	0.529	15.6	472.5	236.2	21.0	4.91	0.158	0	63.1
1968	0.535	1.63	0.600	0	0.131	26.0	19.2	4.04	232.7	205.0	28.1	27.9	45.5
1969	23.3	13.0	5.41	0.900	1.65	2.97	552.6	63.2	47.1	11.5	1.18	0.217	59.7
1970	0.174	0.423	0.481	0.358	0.036	0	302.6	330.3	659.8	25.4	2.75	0.873	109.7
1971	2.07	4.52	2.27	1.55	1.44	6.17	162.0	27.8	12.1	3.39	0.261	0.090	18.5
1972	0.703	7.67	2.82	0.361	0.059	20.6	211.8	36.0	17.4	2.22	0.019	0.023	24.7
1973	0.005	0.173	0.003	0	0	34.8	6.42	3.30	0.366	0.001	0.023	0.078	3.82
1974	1.91	2.43	0.046	0.105	0.056	0	426.2	191.7	45.0	3.01	0.493	0.351	55.7
1975	0.349	0.610	0.653	0.795	0.380	1.24	224.5	125.8	46.0	687.7	11.0	1.54	92.7
1976	1.17	4.32	1.70	1.69	1.80	21.1	189.1	16.3	3.29	1.30	0.071	0	19.9
1977	0	0	0	0	0	0.745	10.3	4.38	3.25	0.222	0.319	0.074	1.60
1978	0.079	4.46	4.04	1.24	0.831	13.4	479.2	116.7	48.9	61.3	7.11	1.07	61.2
1979	0.395	1.57	1.24	0.871	0.615	1.42	611.2	126.8	47.7	12.3	1.61	0.667	66.7
1980	0.295	1.63	1.33	1.27	1.04	2.00	112.6	6.72	0.793	0.018	0.138	0.594	10.6
1981	0.302	0.075	0.051	0.014	0.506	5.51	5.38	2.12	8.40	21.3	0.044	0.774	3.74
1982	--	--	--	--	--	9.36	284.1	102.3	16.2	52.3	11.7	0.495	--
1983	94.1	24.0	15.8	4.65	3.32	217.1	155.7	56.7	61.3	19.7	0.999	0.313	54.8
1984	4.17	6.90	3.99	1.64	1.05	57.7	112.8	22.4	90.7	3.09	0.147	0.012	25.2

# 05087500 MIDDLE RIVER AT ARGYLE, MN--Continued

## Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1985	0.256	0.479	0.341	0.140	0.142	68.7	83.2	41.9	253.5	74.5	29.5	35.9	49.0
1986	52.5	9.39	3.86	3.71	3.30	124.8	314.3	185.2	34.4	2.79	0.543	0.186	61.4
1987	0.478	0.829	0.600	0.600	0.600	118.2	117.1	19.6	9.06	1.57	0.340	0.023	22.5
1988	0.065	0.490	0.307	0.088	0.060	0.351	57.3	12.0	26.9	0.855	0.008	0.011	8.10
1989	0	0	0.019	0.010	0.014	0.022	231.1	28.4	28.1	2.95	0.086	0.002	24.0
1990	0	0.016	0	0	0	9.62	13.3	2.74	4.69	2.25	0.018	0	2.72
1991	0	0	0	0	0.014	0.084	0.197	4.63	3.65	40.6	3.38	0.353	4.48
1992	0.317	1.54	2.22	0.842	0.440	85.6	102.8	38.3	5.20	12.2	0.505	0.681	20.9
1993	1.23	0.465	1.25	0.754	0.691	9.01	120.4	16.1	51.6	97.9	264.5	272.4	69.8
1994	14.4	10.7	5.89	2.67	1.12	47.9	53.3	30.7	10.9	145.6	24.4	138.5	40.7
1995	54.8	107.7	22.2	8.77	3.72	335.0	136.8	108.4	12.1	93.8	11.5	10.1	76.1
1996	9.42	5.10	3.88	2.46	1.41	1.48	574.8	895.8	14.4	10.7	3.43	1.15	127.4
1997	3.35	9.76	4.62	2.75	2.34	2.48	965.6	151.5	17.4	237.3	4.15	3.03	116.5

## 05090000 PARK RIVER AT GRAFTON, ND

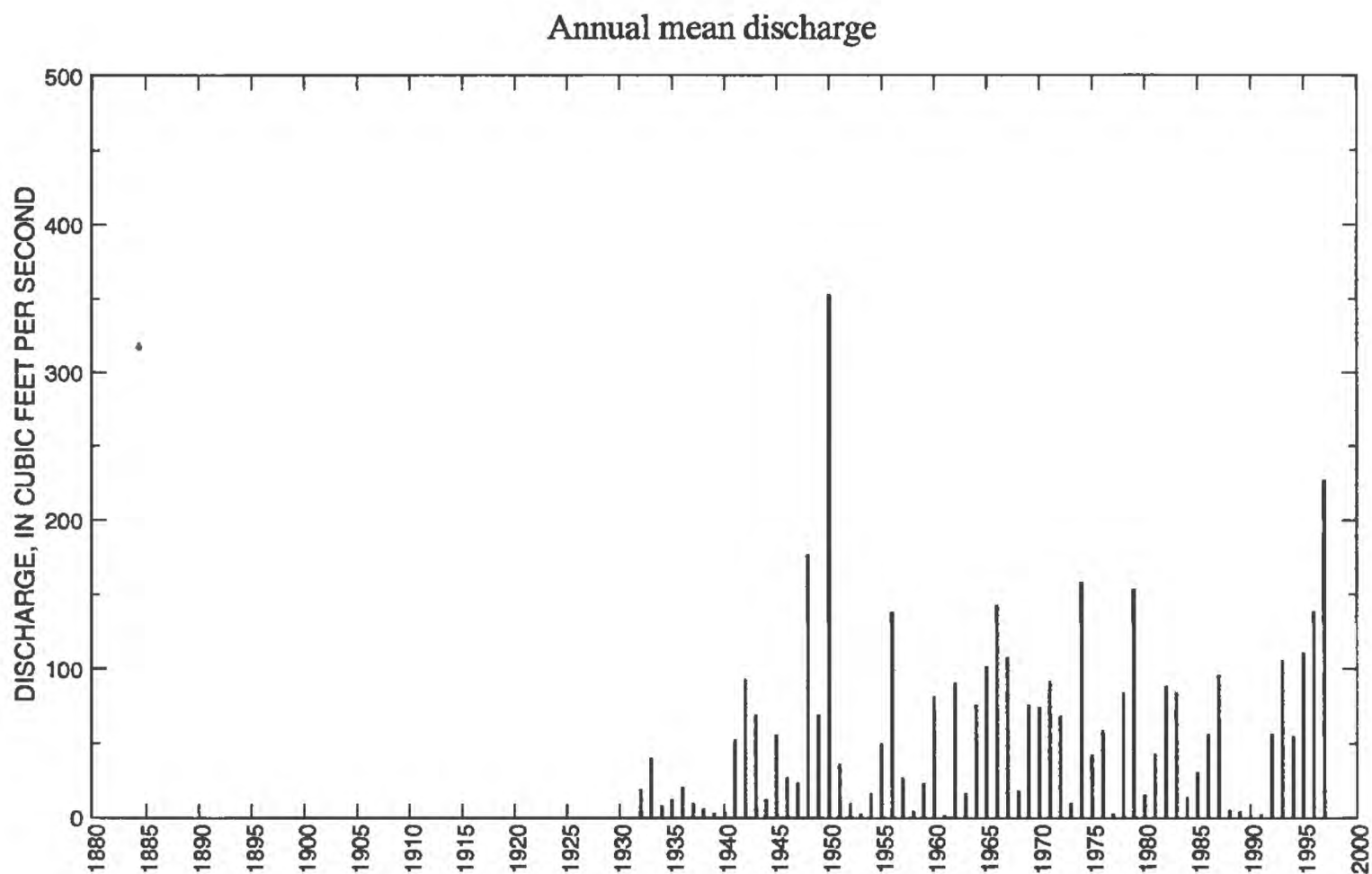
**LOCATION.**--Lat 48°25'29", long 97°24'42", in NE<sup>1</sup>/<sub>4</sub> sec.13, T.157 N., R.53 W., Walsh County, Hydrologic Unit 09020310, on right bank just upstream of U.S. Highway 81 bridge in Grafton and 3.5 mi downstream from South Branch.

**DRAINAGE AREA.**--695 mi<sup>2</sup>, approximately.

**PERIOD OF RECORD.**--April 1931 to current year. Monthly discharge only for some periods, published in Water Supply Paper 1308.

**GAGE.**--Water-stage recorder. Datum of gage is 811.00 ft above sea level. Prior to Oct.1, 1984, gage located on right bank 30 ft upstream of Wakeman Avenue bridge. Datum of gage was 807.39 ft. Prior to Sept. 30, 1940, nonrecording gage at site 30 ft downstream at same datum. Oct. 1, 1940, to Sept. 17, 1946, nonrecording gage at site 2 mi downstream above masonry dam at same datum. Sept. 18, 1946, to July 25, 1952, nonrecording gage at site 30 ft downstream at same datum.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 12,600 ft<sup>3</sup>/s, Apr. 19, 1950, gage height, 20.13 ft; no flow at times.



# 05090000 PARK RIVER AT GRAFTON, ND--Continued

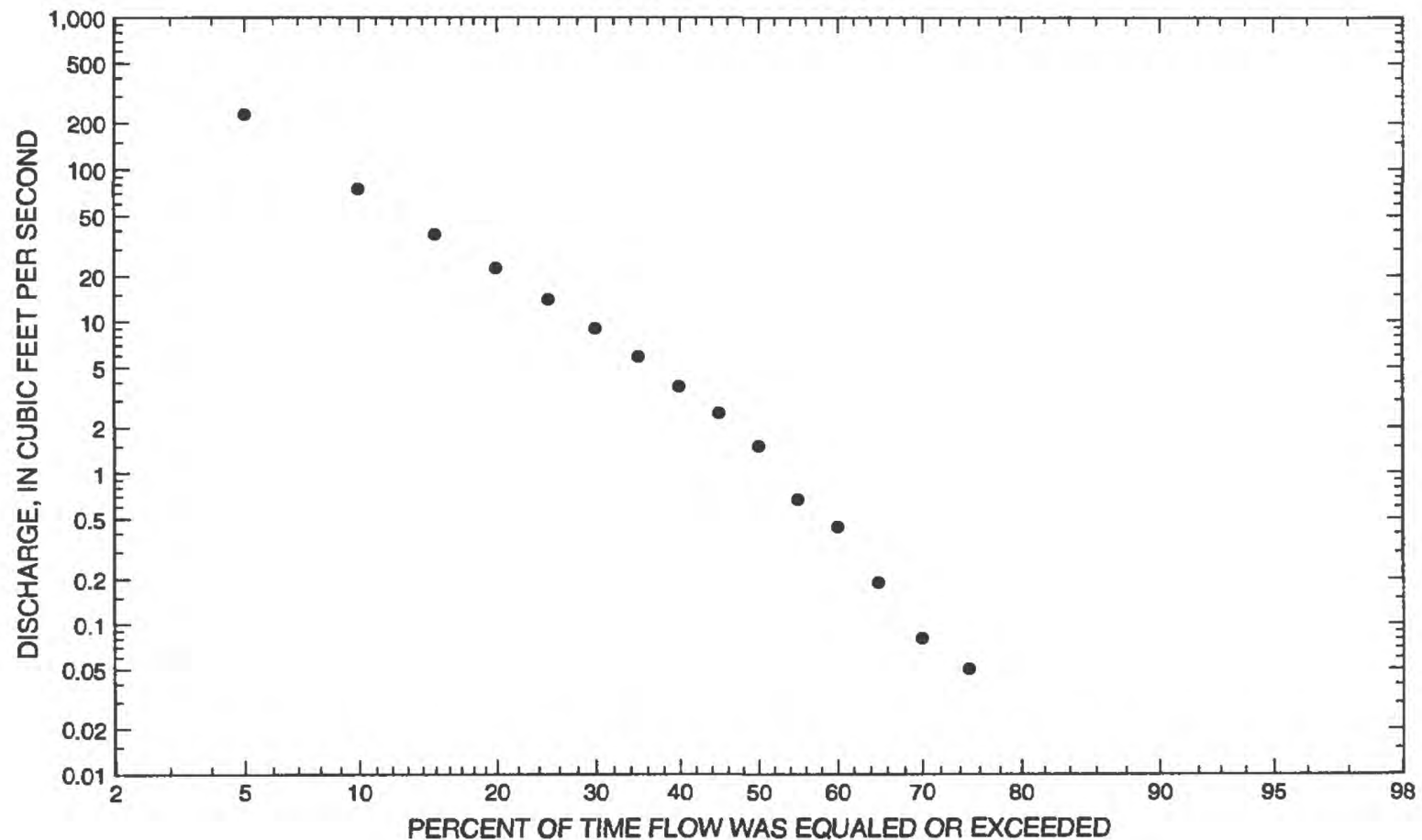
Post-regulation period, 1950-97

Statistics of monthly and annual mean discharges, post-regulation period

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	69.9	1983	0	m	6.33	14.0	2.22	0.78
November	31.3	1981	0	m	4.08	6.09	1.49	0.50
December	17.4	1983	0	m	2.81	3.98	1.42	0.34
January	13.9	1983	0	m	1.74	2.96	1.70	0.21
February	45.7	1981	0	m	3.05	6.89	2.26	0.37
March	654	1995	0	1991	72.9	134	1.84	8.95
April	2,050	1950	0	1991	450	493	1.10	55.3
May	2,070	1950	2.33	1961	153	326	2.13	18.7
June	576	1964	0	1961	53.8	90.6	1.68	6.60
July	441	1997	0	1990	40.3	91.1	2.26	4.95
August	569	1993	0	m	17.7	81.7	4.62	2.17
September	151	1957	0	m	9.17	25.2	2.74	1.13
Annual	353	1950	1.38	1990	67.7	66.7	0.98	100

Annual flow duration





# 05090000 PARK RIVER AT GRAFTON, ND--Continued

Monthly and annual flow duration, in cubic feet per second, post-regulation period

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	3.81	2.27	0.13	0	0	0	0	0	0	0
90	0	0	0	7.45	3.61	0.82	0.09	0	0	0	0	0	0
85	0	0	0.08	10.4	5.47	2.78	0.09	0	0	0	0	0	0
80	0	0	0.16	14.5	8.77	4.11	0.42	0	0	0	0.03	0.03	0.08
75	0	0	0.32	19.7	12.4	6.20	0.60	0.06	0	0	0.05	0.09	0.08
70	0	0.09	0.64	27.0	16.4	8.33	1.30	0.09	0.04	0.03	0.10	0.09	0.18
65	0.05	0.16	0.91	36.4	20.5	10.4	1.90	0.18	0.08	0.08	0.16	0.19	0.42
60	0.10	0.16	1.80	50.2	24.8	14.2	3.24	0.26	0.08	0.08	0.21	0.19	0.96
55	0.19	0.42	2.66	70.1	30.2	17.6	4.60	0.38	0.11	0.15	0.44	0.39	1.50
50	0.19	0.78	3.36	93.8	35.5	21.1	6.60	0.54	0.16	0.20	0.95	0.64	2.49
45	0.37	0.78	4.18	122	44.5	25.0	8.48	0.78	0.23	0.27	1.20	1.00	3.58
40	0.72	1.50	5.84	168	54.0	29.5	11.0	1.60	0.46	0.50	1.60	1.30	5.48
35	0.91	1.50	7.83	233	68.1	34.2	15.1	2.49	0.92	1.20	2.00	2.20	7.85
30	1.40	2.00	9.24	306	83.3	39.6	19.1	3.63	1.30	1.70	3.35	2.20	11.0
25	1.80	2.77	13.6	393	109	45.0	23.6	5.15	3.13	3.06	5.65	3.58	16.7
20	2.20	3.41	20.9	526	148	58.0	31.2	7.30	4.23	4.77	7.67	5.38	26.5
15	3.50	4.21	74.1	764	213	80.2	45.2	12.0	6.29	7.65	9.55	7.48	44.1
10	5.67	7.16	166	1,280	319	120	71.1	21.4	16.4	16.8	13.1	8.34	91.3
5	9.19	10.5	551	2,370	600	221	161	42.7	45.8	32.9	18.3	12.3	273

## 05090000 PARK RIVER AT GRAFTON, ND--Continued

Probability of occurrence of annual high discharges, post-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	12.3	5.16	4.40	3.81	3.00
0.95	1.05	56.3	32.5	26.8	21.2	15.3
0.90	1.11	118	77.5	63.1	47.9	33.5
0.80	1.25	272	202	162	118	79.6
0.50	2	1,120	941	744	511	330
0.20	5	3,640	3,090	2,440	1,610	1,030
0.10	10	6,190	5,070	4,000	2,630	1,680
0.04	25	10,300	7,870	6,240	4,080	2,620
0.02	50	13,800	10,000	7,970	5,200	3,370
0.01	100	17,500	12,100	9,660	6,310	4,130
0.005	200	21,600	14,100	11,300	7,390	4,880
0.002	500	27,100	ng	ng	ng	ng

# 05090000 PARK RIVER AT GRAFTON, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
<sup>1</sup> 1882	--	16.00	--	1964	June 20	14.01	2,140
<sup>1</sup> 1897	April 15	18.14	3,480	1965	April 13	18.21	5,710
<sup>1</sup> 1916	April	17.64	3,140	1966	April 4	16.08	2,790
1932	April 10	--	750	1967	May 9	14.46	2,290
1933	April 2	15.20	2,200	1968	March 28	9.85	630
1934	April 9	6.61	393	1969	April 13	18.13	4,990
1935	March 28	8.34	443	1970	April 29	12.09	1,520
1936	April 14	13.68	1,200	1971	April 10	16.42	3,600
1937	April 10	8.21	380	1972	April 14	14.30	2,150
1938	March 21	6.12	291	1973	March 27	8.82	251
1939	March 30	7.68	150	1974	April 16	17.03	3,660
1940	April 20	5.83	210	1975	April 17	11.10	900
1941	April 13	13.04	1,830	1976	April 4	14.06	2,000
1942	April 6	15.46	4,310	1977	May 5	7.57	40.0
1943	March 28	13.15	1,430	1978	April 8	17.10	3,700
1944	April 12	5.55	563	1979	April 22	19.56	8,740
1945	March 16	10.88	1,180	1980	April 7	9.09	399
1946	March 23	11.40	1,490	1981	April 3	9.51	471
1947	April 4	9.70	520	1982	April 1	12.26	1,420
1948	April 19	20.06	11,700	1983	March 7	12.34	1,360
1949	April 11	16.94	2,530	1984	March 27	8.72	269
1950	April 19	20.13	12,600	1985	March 19	9.74	1,000
1951	April 6	13.34	1,640	1986	March 24	9.48	859
1952	April 5	6.66	180	1987	April 7	13.44	3,220
1953	June 5	5.45	125	1988	April 6	7.79	143
1954	June 16	7.24	478	1989	April 24	7.79	143
1955	April 3	16.84	2,100	1990	April 21	7.28	24.0
1956	April 22	16.25	4,200	1991	May 23	7.47	48.0
1957	September 3	10.96	1,300	1992	March 8	9.90	1,030
1958	April 7	5.70	41.0	1993	July 30	12.22	2,420
1959	April 6	12.29	1,200	1994	March 22	10.49	800
1960	April 15	15.40	2,770	1995	March 20	11.82	2,200
1961	April 27	7.51	40.0	1996	April 16	14.53	3,400
1962	April 20	18.27	5,900	1997	April 21	15.40	5,250
1963	June 6	8.78	344				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1950	April 19	20.13	12,600	1956	April 22	16.25	4,200
1948	April 19	20.06	11,700	1978	April 8	17.10	3,700
1979	April 22	19.56	8,740	1974	April 16	17.03	3,660
1962	April 20	18.27	5,900	1971	April 10	16.42	3,600
1997	April 21	15.40	5,250	<sup>1</sup> 1897	April 15	18.14	3,480
1965	April 13	18.21	5,710	1996	April 16	14.53	3,400
1969	April 13	18.13	4,990	1987	April 7	13.44	3,220
1942	April 6	15.46	4,310	<sup>1</sup> 1916	April	17.64	3,140

# 05090000 PARK RIVER AT GRAFTON, ND--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1966	April 4	16.08	2,790	1932	April 10	--	750
1960	April 15	15.40	2,770	1968	March 28	9.85	630
1949	April 11	16.94	2,530	1944	April 12	5.55	563
1993	July 30	12.22	2,420	1947	April 4	9.70	520
1967	May 9	14.46	2,290	1954	June 16	7.24	478
1933	April 2	15.20	2,200	1981	April 3	9.51	471
1995	March 20	11.82	2,200	1935	March 28	8.34	443
1972	April 14	14.30	2,150	1980	April 7	9.09	399
1964	June 20	14.01	2,140	1934	April 9	6.61	393
1955	April 3	16.84	2,100	1937	April 10	8.21	380
1976	April 4	14.06	2,000	1963	June 6	8.78	344
1941	April 13	13.04	1,830	1938	March 21	6.12	291
1951	April 6	13.34	1,640	1984	March 27	8.72	269
1970	April 29	12.09	1,520	1973	March 27	8.82	251
1946	March 23	11.40	1,490	1940	April 20	5.83	210
1943	March 28	13.15	1,430	1952	April 5	6.66	180
1982	April 1	12.26	1,420	1939	March 30	7.68	150
1983	March 7	12.34	1,360	1988	April 6	7.79	143
1957	September 3	10.96	1,300	1989	April 24	7.79	143
1936	April 14	13.68	1,200	1953	June 5	5.45	125
1959	April 6	12.29	1,200	1991	May 23	7.47	48.0
1945	March 16	10.88	1,180	1958	April 7	5.70	41.0
1992	March 8	9.90	1,030	1961	April 27	7.51	40.0
1985	March 19	9.74	1,000	1977	May 5	7.57	40.0
1975	April 17	11.10	900	1990	April 21	7.28	24.0
1986	March 24	9.48	859	<sup>1</sup> 1882	--	16.00	--
1994	March 22	10.49	800				

<sup>1</sup>Determined by U.S. Army Corps of Engineers; not used in statistics.



# 050900000 PARK RIVER AT GRAFTON, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1931	--	--	--	--	--	--	--	12.5	3.04	0.984	0.194	0.100	--
1932	0.100	0.400	0.100	0	2.00	15.0	185.0	21.7	5.58	0.268	0	0	19.0
1933	1.00	0.800	0	0	0	40.0	411.4	22.3	12.2	0.500	0.200	0	40.3
1934	0	0	0	0	0.050	15.0	78.0	2.16	0.413	0.013	0	0.080	7.91
1935	0	0	0	0	0	68.9	65.9	6.07	3.91	2.00	0.500	0	12.3
1936	0	0	0	0	0	0	227.0	12.0	13.0	0.035	0	0	20.7
1937	0	0	0	0	0	0	90.2	21.1	3.69	4.75	1.17	0	10.0
1938	0	0	0	0	0	53.7	5.40	5.88	0.347	4.71	0	0	5.93
1939	0	0	0	0	0	8.77	23.7	2.05	2.83	0.123	0	0	3.11
1940	0	0	0	0	0	0	38.0	4.20	0.377	0.135	0.271	0	3.54
1941	0	0	0	0	0	0.377	577.3	17.6	12.0	1.48	0.232	31.8	52.7
1942	32.7	8.40	3.12	0	0	119.7	872.8	59.6	16.4	3.48	3.38	3.29	92.9
1943	0.274	0.727	0.045	0.097	0.107	256.4	170.1	30.1	202.3	150.6	12.7	0.253	68.9
1944	0.016	0.750	0.706	0.006	0	0.326	111.0	7.11	8.32	2.42	11.4	7.81	12.4
1945	0.835	14.5	6.99	0.265	0.229	410.0	134.3	56.7	31.5	7.34	0.845	0.610	55.9
1946	0.161	0.210	0.139	0.100	0.125	236.7	68.5	9.54	4.93	1.27	0.129	0.373	27.2
1947	0.381	0.190	0.039	0	0	4.74	169.8	9.75	20.8	62.0	12.7	3.74	23.6
1948	1.28	2.51	2.41	0.484	0.117	0.465	1,809	217.5	37.8	45.2	30.5	2.33	177.0
1949	0.484	1.03	0.384	0.226	0.200	0.310	768.8	51.4	11.5	2.28	1.15	0.060	69.0
1950	0.387	0.187	0.100	0.100	0.100	0.171	2,051	2,071	65.0	21.2	12.9	1.26	352.9
1951	2.18	1.61	2.11	1.10	0.568	12.1	331.1	33.8	6.43	0.706	2.98	41.3	36.0
1952	34.1	1.33	0.574	0.097	0	0.197	46.9	8.24	0.393	0.226	0	22.1	9.48
1953	0	0.027	0.806	0.206	0	2.22	8.09	5.26	10.1	1.15	0.048	0.197	2.34
1954	0.065	0.690	0.174	0.016	1.49	5.90	16.1	13.6	130.9	19.0	6.04	4.87	16.5
1955	4.87	3.92	1.17	0.200	0.200	0.800	445.3	46.4	76.8	10.5	1.30	11.8	49.8
1956	0.439	0	0	0	0	11.9	1,013	446.8	164.3	19.6	3.38	7.50	138.0
1957	7.23	8.14	3.09	1.58	5.45	57.5	48.0	22.8	10.4	1.88	4.66	151.2	26.7
1958	6.90	7.16	4.33	1.69	1.36	3.63	17.9	3.96	2.68	2.85	0.077	0	4.38
1959	1.26	0	0.190	0.400	0	0.661	243.0	27.0	5.85	3.28	0.032	0.007	23.2
1960	0	0.070	0.065	0.045	0.014	1.04	942.0	34.2	11.3	1.05	0.029	0.423	81.3
1961	0.526	0	0	0	0	3.17	12.6	2.33	0	0.058	0.052	0.040	1.56
1962	0.019	0.857	0.287	0.084	2.92	10.2	716.6	103.3	232.8	18.6	11.0	0.117	90.5
1963	0.248	0.483	0.081	0	0.239	30.3	25.7	8.74	105.3	17.2	8.83	0	16.4
1964	0.416	0.023	0	0.074	0.745	0.729	221.6	58.3	575.9	64.2	2.63	1.16	76.2
1965	6.69	1.99	0.400	0.110	1.48	5.83	892.6	162.7	85.2	22.0	9.93	37.8	101.4



# 05090000 PARK RIVER AT GRAFTON, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1966	46.1	15.7	9.72	2.09	0.193	297.6	637.5	441.0	84.9	136.0	33.3	2.03	142.9
1967	0.923	1.22	1.88	1.13	1.33	110.5	636.7	513.0	23.3	1.98	0.085	0	107.9
1968	0.032	0.130	0.050	0.024	1.68	83.4	46.4	50.9	23.2	9.40	0.263	0.107	18.1
1969	0.161	0.076	0.115	0.081	2.27	8.02	859.5	30.6	14.5	7.12	0.418	2.25	76.1
1970	0.438	0.089	2.47	0.268	0.125	0.597	633.7	207.7	38.7	15.0	0.291	0.010	74.5
1971	0.013	3.20	0.788	0.010	0.633	17.0	876.1	57.4	75.7	74.7	4.96	0.034	91.7
1972	5.34	6.67	0.426	0.002	3.86	320.9	417.4	57.2	9.56	0.218	0.024	1.91	68.5
1973	0.041	0.075	3.25	0.724	0.311	62.7	28.2	12.4	9.45	0.383	0.918	0.567	10.0
1974	5.47	5.51	7.41	1.60	1.82	8.50	1,078	687.7	100.7	5.58	4.54	0.762	158.7
1975	0.211	4.02	8.68	5.09	3.29	3.63	245.9	145.9	15.4	79.6	0.499	0.274	42.8
1976	0.797	7.36	6.97	5.17	4.55	33.8	542.4	26.7	81.7	3.69	0.400	0.375	58.7
1977	0.229	1.70	2.12	2.19	2.00	6.06	8.83	4.86	1.54	0.127	0.092	0.057	2.48
1978	0.210	2.41	2.50	2.40	1.45	19.8	864.6	98.9	22.4	4.61	0.349	2.02	84.3
1979	0.181	5.23	4.12	0.916	0.768	2.37	1,450	285.0	47.0	54.2	6.20	4.46	153.9
1980	0.311	5.57	4.28	2.44	1.32	2.29	92.4	12.3	24.5	0.669	2.01	39.6	15.4
1981	40.3	31.3	14.1	5.42	45.7	112.5	108.2	28.3	50.7	59.1	9.49	10.7	42.9
1982	8.76	7.50	6.29	5.39	3.38	29.0	497.5	111.5	98.0	254.3	38.6	1.47	88.5
1983	69.9	22.1	17.4	13.9	10.4	399.6	319.9	58.3	74.1	20.4	0.646	0.134	84.3
1984	1.29	4.95	0.974	0.471	1.71	36.7	77.6	21.1	17.1	2.25	1.27	0.059	13.7
1985	2.76	7.67	1.63	0	0.114	217.8	68.5	21.1	13.4	2.26	25.3	2.19	30.6
1986	10.2	7.19	1.27	8.25	11.2	228.1	195.2	106.9	18.2	55.4	23.2	8.35	56.5
1987	0.769	0.484	0.353	0.341	1.98	97.3	988.3	47.5	14.3	9.39	4.60	0.079	96.2
1988	0.072	0.090	0.191	0.116	0.737	3.85	42.6	7.89	5.52	0.980	0.182	0	5.13
1989	0.042	0.040	0.011	0	0.002	2.32	32.5	10.9	1.55	0.291	0.025	0.003	3.96
1990	0.005	0.432	0.093	0.018	0	0.359	9.60	4.42	1.66	0	0	0	1.38
1991	0	0	0	0	0	0	0	5.11	1.68	16.0	2.24	1.13	2.22
1992	1.24	4.49	8.97	10.1	4.74	357.7	217.6	36.1	23.3	5.57	4.35	0.208	56.4
1993	0	0.012	0.232	0.105	10.8	20.7	91.8	59.4	26.9	398.4	568.6	72.8	105.5
1994	27.3	13.8	10.5	6.58	5.85	199.0	221.5	109.5	36.2	21.2	2.10	0.127	54.7
1995	0.305	7.15	2.70	0.824	0.800	654.2	433.0	119.8	29.7	43.0	23.4	4.93	110.8
1996	0.496	0.039	0.055	0.183	6.55	9.28	1,072	494.7	72.0	10.3	6.90	0.393	138.6
1997	14.6	3.12	1.93	2.13	2.29	9.30	1,794	401.1	43.3	440.9	20.7	3.56	227.3

## 05092000 RED RIVER OF THE NORTH AT DRAYTON, ND

LOCATION.--Lat 48°34'20", long 97°08'50", in SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.24, T.159 N., R.51 W., Pembina County, Hydrologic Unit 09020311, on downstream side of bridge on North Dakota State Highway 11, at the North Dakota-Minnesota border, 1.5 mi northeast of Drayton, and at mile 206.7.

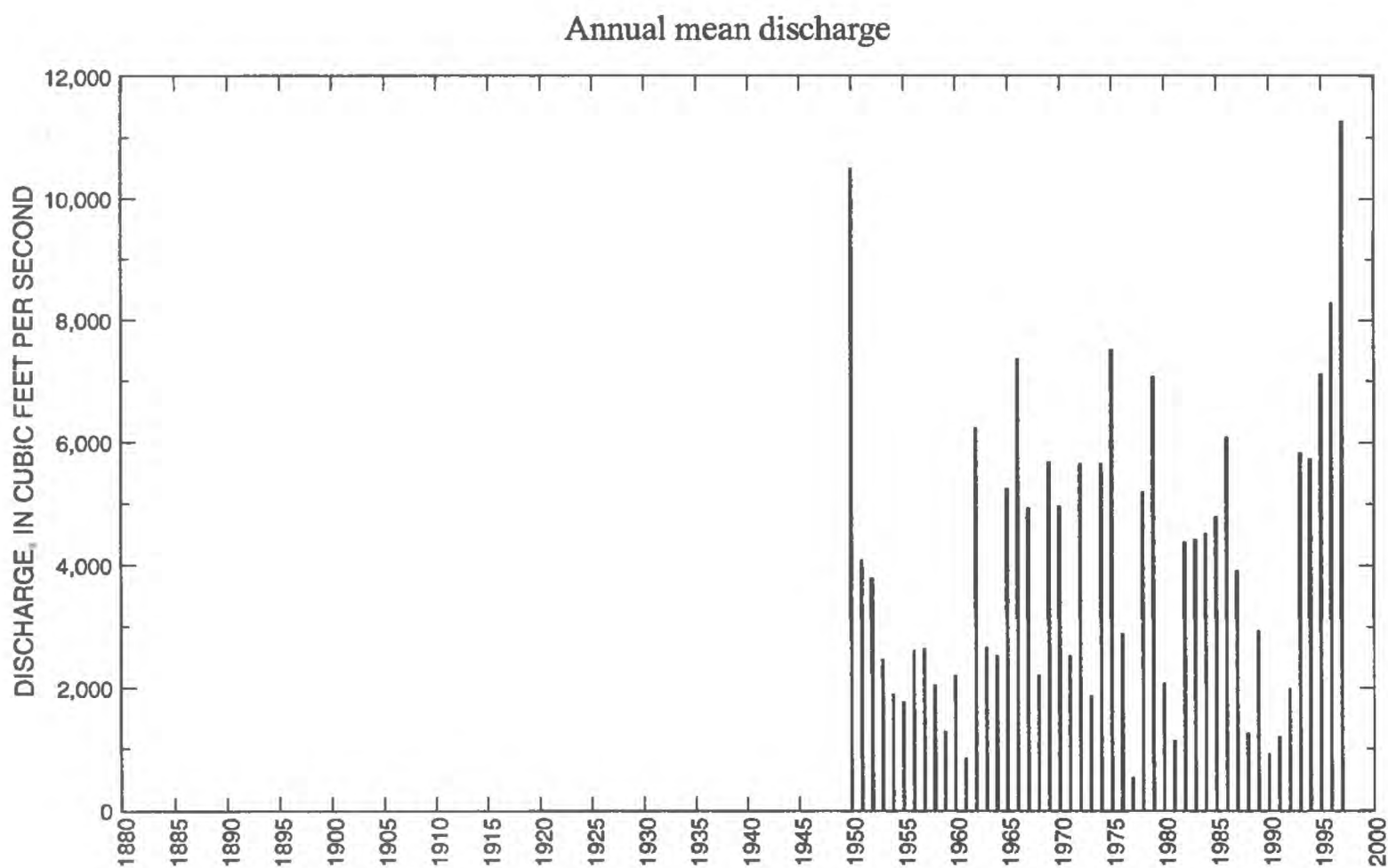
DRAINAGE AREA.--34,800 mi<sup>2</sup>, approximately, includes 3,800 mi<sup>2</sup> in closed basins.

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

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

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 124,000 ft<sup>3</sup>/s, Apr. 24, 1997, gage height, 45.55 ft; minimum discharge, 7.7 ft<sup>3</sup>/s, Oct. 16, 1936, gage height, 1.75 ft.

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

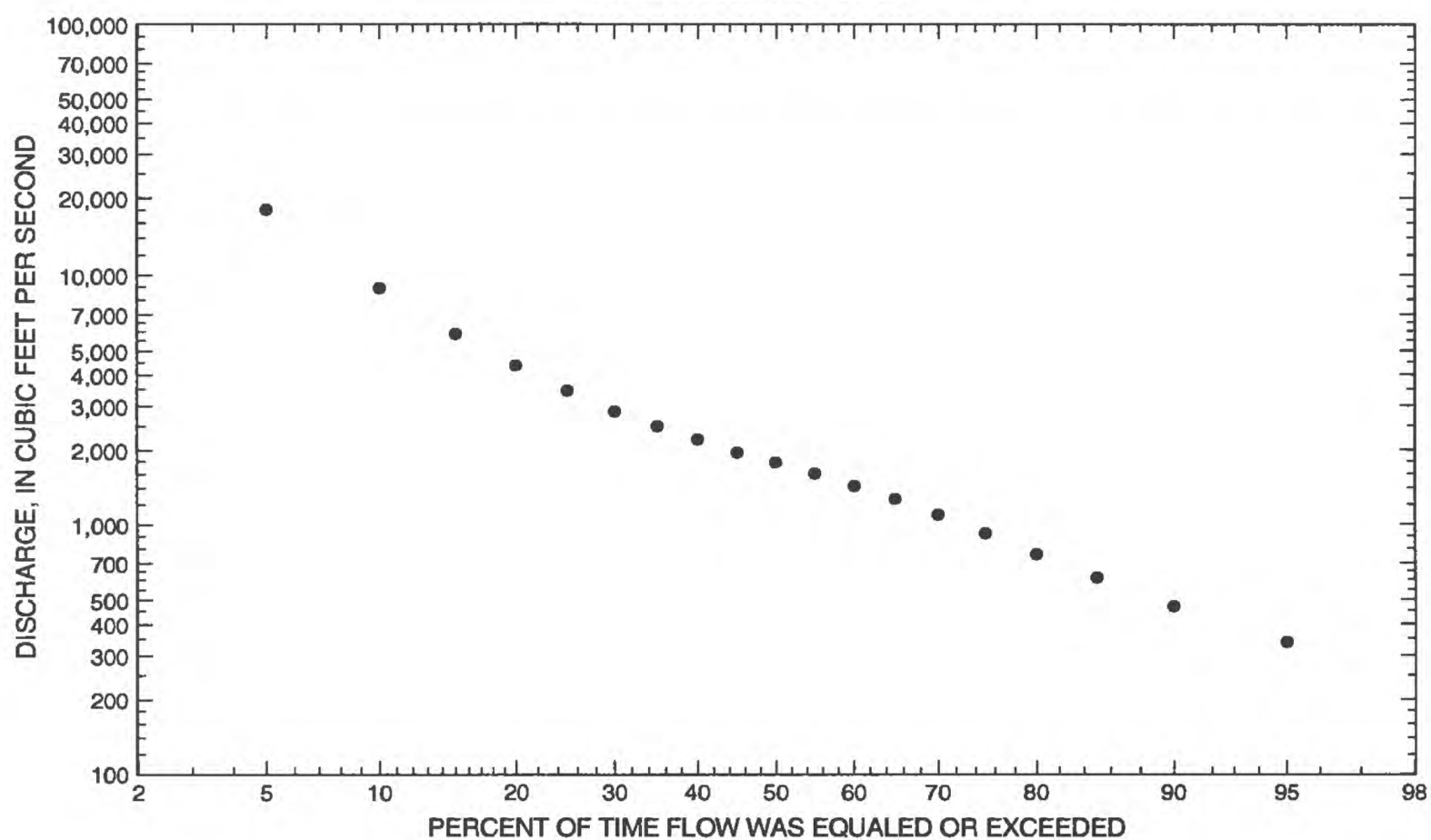


# 05092000 RED RIVER OF THE NORTH AT DRAYTON, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	5,190	1995	13.8	1937	1,800	1,350	0.75	3.82	
November	5,650	1972	277	1977	1,570	1,070	0.68	3.32	
December	3,070	1972	149	1977	1,250	756	0.60	2.65	
January	2,060	1966	174	1990	1,100	612	0.56	2.32	
February	1,980	1996	201	1977	1,060	558	0.52	2.25	
March	15,700	1995	280	1962	2,940	2,990	1.02	6.23	
April	54,700	1997	1,280	1981	14,500	11,100	0.77	30.7	
May	58,900	1950	938	1977	8,930	10,600	1.19	18.9	
June	23,400	1962	399	1936	5,180	4,170	0.80	11.0	
July	28,200	1975	118	1936	4,670	4,760	1.02	9.89	
August	21,600	1993	50.1	1936	2,400	3,120	1.30	5.07	
September	7,910	1993	27.4	1936	1,820	1,440	0.79	3.85	
Annual	11,300	1997	536	1977	4,060	2,510	0.62	100	

Annual flow duration



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

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	197	226	361	1,160	1,150	787	430	251	290	310	350	228	338
90	279	326	486	1,670	1,500	1,140	720	415	473	391	437	312	469
85	366	388	598	2,120	1,760	1,490	1,140	577	558	478	516	394	611
80	435	461	688	2,540	2,150	1,790	1,500	794	681	582	610	489	759
75	531	541	839	3,080	2,490	2,030	1,800	938	814	722	694	595	920
70	618	605	1,010	3,890	2,800	2,290	2,080	1,040	930	832	771	705	1,090
65	738	718	1,190	4,770	3,150	2,590	2,380	1,150	1,040	925	845	787	1,260
60	805	810	1,320	5,720	3,460	2,960	2,640	1,300	1,150	1,020	967	869	1,430
55	917	975	1,440	6,960	3,800	3,360	2,900	1,450	1,270	1,190	1,140	1,030	1,600
50	1,140	1,110	1,570	8,740	4,300	3,710	3,200	1,610	1,420	1,380	1,350	1,170	1,780
45	1,300	1,220	1,710	11,100	4,890	4,130	3,510	1,830	1,580	1,560	1,530	1,310	1,960
40	1,360	1,390	1,850	13,400	5,850	4,570	3,870	2,070	1,790	1,740	1,700	1,480	2,200
35	1,430	1,440	2,010	16,000	7,110	5,030	4,230	2,280	2,000	1,920	1,880	1,610	2,490
30	1,530	1,480	2,170	18,900	8,540	5,650	4,690	2,510	2,170	2,160	2,020	1,720	2,860
25	1,610	1,550	2,360	21,600	10,100	6,420	5,200	2,770	2,340	2,440	2,170	1,840	3,470
20	1,680	1,630	2,650	24,200	12,700	7,440	6,050	3,050	2,560	3,030	2,330	1,990	4,370
15	1,830	1,730	3,780	27,700	16,500	8,970	7,330	3,490	2,820	3,470	2,600	2,140	5,870
10	1,950	1,810	7,080	32,500	22,100	11,200	9,960	4,180	3,350	3,990	2,960	2,320	8,940
5	2,040	1,890	12,700	45,300	32,800	15,000	15,700	6,370	4,880	4,670	3,610	2,530	18,100

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

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /a) <sup>2</sup>	Maximum mean discharge (ft <sup>3</sup> /s) <sup>1</sup>			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	2,580	2,550	2,300	1,810	1,360
0.95	1.05	4,570	<sup>3</sup> 4,460	<sup>3</sup> 4,200	3,880	2,920
0.90	1.11	6,180	<sup>3</sup> 6,100	<sup>3</sup> 6,000	5,670	4,290
0.80	1.25	8,890	<sup>3</sup> 8,850	<sup>3</sup> 8,800	<sup>3</sup> 8,600	6,690
0.50	2	17,700	<sup>3</sup> 17,500	<sup>3</sup> 17,000	<sup>3</sup> 16,000	14,700
0.20	5	34,900	<sup>3</sup> 34,200	<sup>3</sup> 33,900	<sup>3</sup> 32,100	29,900
0.10	10	49,600	<sup>3</sup> 49,000	<sup>3</sup> 48,200	<sup>3</sup> 46,000	41,900
0.04	25	72,000	<sup>3</sup> 70,400	<sup>3</sup> 69,000	<sup>3</sup> 66,000	58,900
0.02	50	91,200	<sup>3</sup> 90,200	<sup>3</sup> 89,600	88,100	72,600
0.01	100	113,000	<sup>3</sup> 112,000	<sup>3</sup> 110,000	104,000	86,800
0.005	200	137,000	136,000	131,000	121,000	102,000
0.002	500	173,000	ng	ng	ng	ng

<sup>1</sup>Statistics computed using period of daily value record 1950-97.

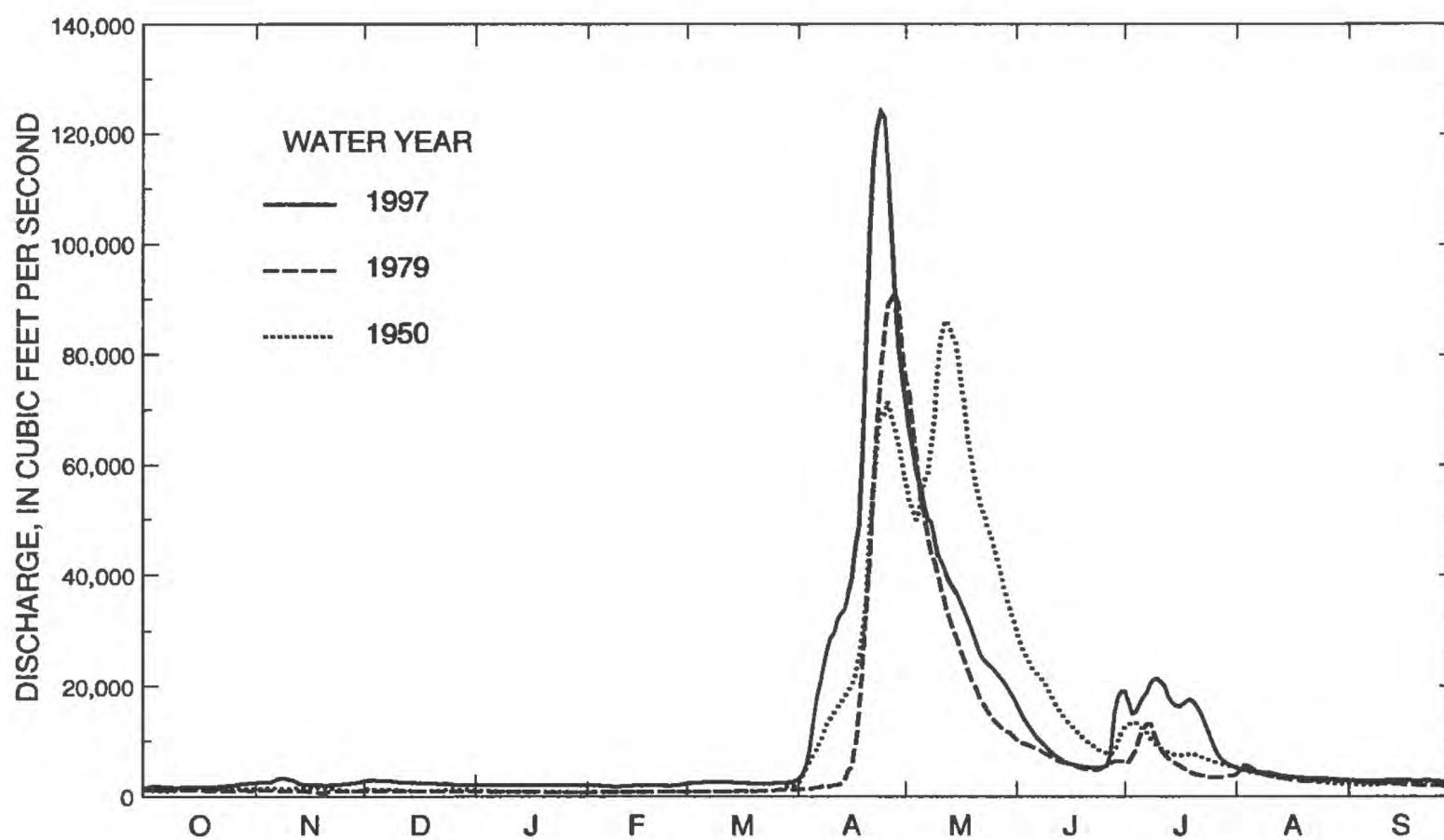
<sup>2</sup>From U.S. Army Corps of Engineers, May 2000.

<sup>3</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

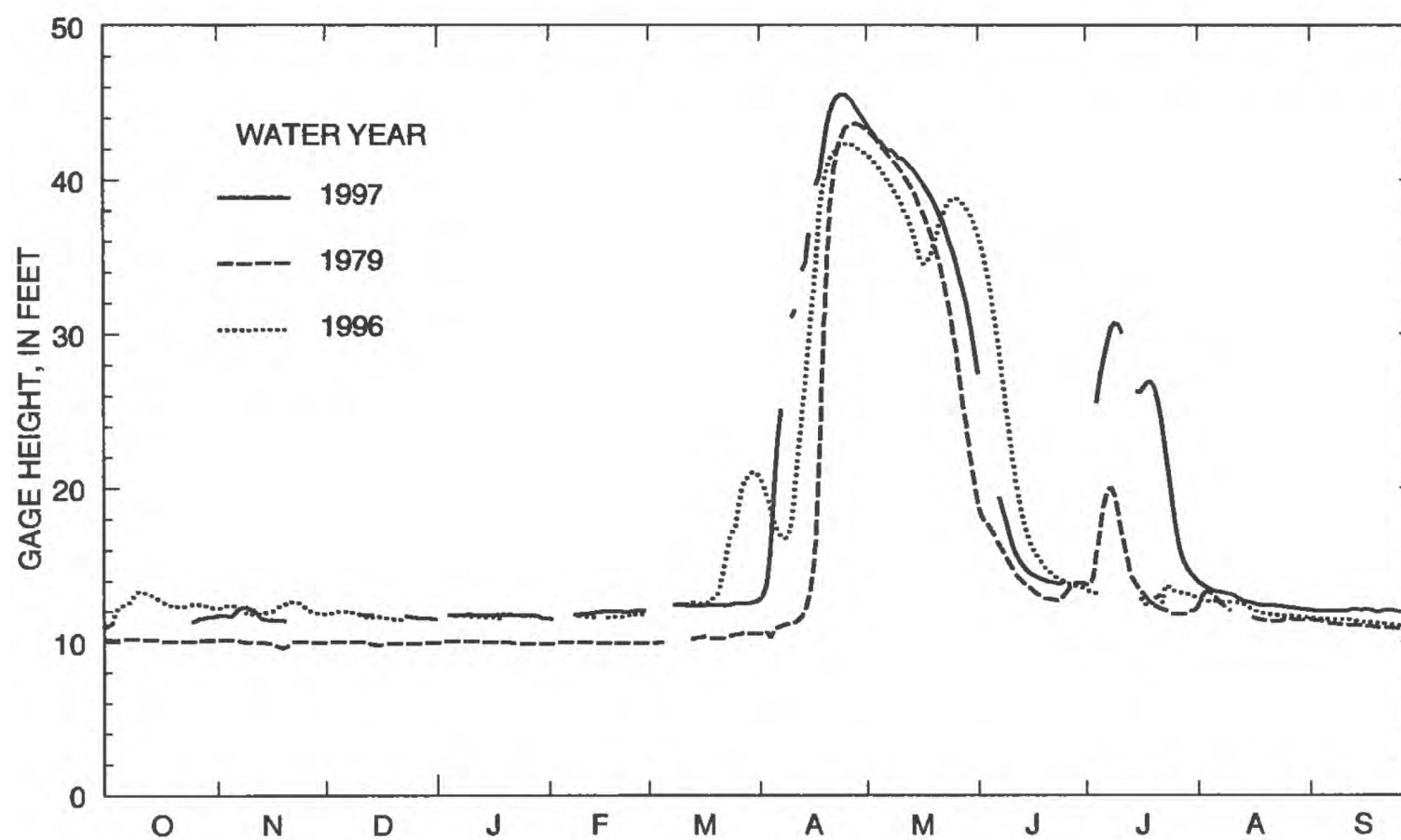


# 05092000 RED RIVER OF THE NORTH AT DRAYTON, ND--Continued

Highest daily mean discharge for period of record



Highest daily mean gage height for period of record



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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1897	April	41.00	--	1968	July 23	20.41	12,500
1936	April 19	--	16,600	1969	April 19	41.08	59,000
1937	May 5	--	4,530	1970	April 29	38.20	31,700
1941	April 15	32.00	22,800	1971	April 11	29.50	23,400
1942	April 7	--	21,900	1972	April 20	34.75	31,100
1943	April 17	33.66	28,700	1973	March 25	24.49	13,400
1944	April 18	21.05	12,300	1974	April 25	--	43,900
1945	April 2	31.70	24,600	1975	May 4	39.80	44,000
1946	March 30	--	23,000	1976	April 7	35.00	27,600
1947	April 28	33.12	29,300	1977	April 9	12.12	3,400
1948	April 21	39.81	57,000	1978	April 16	41.19	56,200
1949	April 12	--	27,900	1979	April 28	43.66	92,900
1950	May 12	41.58	86,500	1980	April 10	29.00	22,400
1951	April 15	30.10	24,600	1981	July 3	13.96	7,520
1952	April 25	--	23,900	1982	April 17	36.78	35,500
1953	June 26	20.00	14,700	1983	April 9	30.88	21,300
1954	April 15	16.38	11,100	1984	April 6	--	32,400
1955	April 11	27.28	18,000	1985	May 21	28.12	17,700
1956	April 27	35.16	28,000	1986	April 7	36.59	29,700
1957	July 4	22.33	14,100	1987	April 7	36.61	27,600
1958	July 12	14.53	7,850	1988	April 7	22.12	13,900
1959	April 8	23.78	11,200	1989	April 19	39.35	41,800
1960	April 14	33.71	24,700	1990	April 7	15.54	5,080
1961	March 31	12.98	3,600	1991	July 11	13.26	4,940
1962	April 24	36.26	32,300	1992	March 16	23.28	8,800
1963	April 12	20.42	12,900	1993	August 14	36.48	27,600
1964	April 20	23.60	15,600	1994	April 6	33.57	27,900
1965	April 22	40.43	47,200	1995	April 1	--	37,800
1966	April 8	42.15	67,500	1996	April 25	42.41	61,300
1967	April 8	36.70	32,200	1997	April 25	45.55	124,000
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 25	45.55	124,000	1982	April 17	36.78	35,500
1979	April 28	43.66	92,900	1984	April 6	--	32,400
1950	May 12	41.58	86,500	1962	April 24	36.26	32,300
1966	April 8	42.15	67,500	1967	April 8	36.70	32,200
1996	April 25	42.41	61,300	1970	April 29	38.20	31,700
1969	April 19	41.08	59,000	1972	April 20	34.75	31,100
1948	April 21	39.81	57,000	1986	April 7	36.59	29,700
1978	April 16	41.19	56,200	1947	April 28	33.12	29,300
1965	April 22	40.43	47,200	1943	April 17	33.66	28,700
1975	May 4	39.80	44,000	1956	April 27	35.16	28,000
1974	April 25	--	43,900	1949	April 12	--	27,900
1989	April 19	39.35	41,800	1994	April 6	33.57	27,900
1995	April 1	--	37,800	1976	April 7	35.00	27,600

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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1987	April 7	36.61	27,600	1957	July 4	22.33	14,100
1993	August 14	36.48	27,600	1988	April 7	22.12	13,900
1960	April 14	33.71	24,700	1973	March 25	24.49	13,400
1945	April 2	31.70	24,600	1963	April 12	20.42	12,900
1951	April 15	30.10	24,600	1968	July 23	20.41	12,500
1952	April 25	--	23,900	1944	April 18	21.05	12,300
1971	April 11	29.50	23,400	1959	April 8	23.78	11,200
1946	March 30	--	23,000	1954	April 15	16.38	11,100
1941	April 15	32.00	22,800	1992	March 16	23.28	8,800
1980	April 10	29.00	22,400	1958	July 12	14.53	7,850
1942	April 7	--	21,900	1981	July 3	13.96	7,520
1983	April 9	30.88	21,300	1990	April 7	15.54	5,080
1955	April 11	27.28	18,000	1991	July 11	13.26	4,940
1985	May 21	28.12	17,700	1937	May 5	--	4,530
1936	April 19	--	16,600	1961	March 31	12.98	3,600
1964	April 20	23.60	15,600	1977	April 9	12.12	3,400
1953	June 26	20.00	14,700	1897	April	41.00	--

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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1936	--	--	--	--	--	--	5,768	1,826	398.9	117.8	50.1	27.4	--
1937	13.8	--	--	--	--	--	1,729	1,952	968.4	--	--	--	--
1941	--	--	--	--	--	--	--	--	--	--	--	--	--
1942	--	--	--	--	--	--	11,400	--	--	--	--	--	--
1943	--	--	--	--	--	--	--	--	--	--	--	--	--
1944	--	--	--	--	--	--	--	--	--	--	--	--	--
1945	--	--	--	--	--	--	15,870	6,780	3,504	--	--	--	--
1946	--	--	--	--	--	--	12,430	3,687	2,132	--	--	--	--
1947	--	--	--	--	--	--	--	10,360	11,140	5,267	1,762	--	--
1948	--	--	--	--	--	--	--	12,700	3,096	2,067	--	--	--
1949	--	--	--	--	--	--	11,440	2,977	5,460	3,425	3,265	1,737	--
1950	1,125	1,283	1,069	798.1	729.6	978.7	31,120	58,890	15,360	8,463	3,325	2,300	10,510
1951	2,954	1,987	2,013	1,974	1,830	2,281	17,170	9,022	4,466	2,441	1,245	1,711	4,085
1952	1,360	1,285	1,742	1,639	1,876	1,989	16,590	6,534	3,559	5,676	2,121	1,322	3,797
1953	906.5	812.3	695.5	599.7	619.3	1,669	3,643	3,068	8,839	5,236	2,229	1,320	2,472
1954	864.0	928.2	894.2	809.7	845.4	1,597	5,472	3,862	3,693	2,237	981.3	691.5	1,906
1955	658.3	730.7	683.2	722.6	652.5	661.0	7,273	2,084	3,016	2,271	1,684	862.7	1,771
1956	849.2	607.2	431.0	423.5	451.0	523.9	10,930	8,233	3,963	2,503	908.0	1,616	2,613
1957	599.2	1,080	562.9	441.0	426.8	1,320	4,856	3,728	3,833	6,863	2,614	5,392	2,649
1958	3,625	3,324	1,632	1,356	1,286	1,894	2,986	1,527	1,476	3,990	976.9	479.9	2,052
1959	416.1	498.1	362.3	368.4	382.9	775.8	5,005	1,769	2,587	2,132	776.5	547.8	1,300
1960	547.5	550.2	465.2	572.9	563.4	544.8	13,490	3,778	2,807	2,151	563.7	684.0	2,212
1961	345.2	489.7	356.5	337.1	336.4	1,667	2,097	2,375	1,060	472.0	260.6	368.2	849.5
1962	663.3	422.5	241.1	200.5	203.0	279.5	14,090	9,922	23,420	14,970	6,987	3,390	6,237
1963	2,379	2,114	1,602	1,343	1,120	1,743	6,430	3,511	6,511	2,850	1,172	1,197	2,662
1964	1,435	1,025	787.7	774.2	763.6	694.8	7,567	4,700	7,483	3,227	1,301	694.7	2,529
1965	1,770	1,313	843.3	884.8	872.9	987.4	25,310	13,030	9,178	5,034	2,042	1,915	5,256
1966	4,098	2,497	2,258	2,065	1,826	7,663	38,390	14,400	5,895	3,581	3,512	2,431	7,376
1967	1,847	1,729	1,576	1,710	1,550	2,213	22,710	14,520	5,993	3,278	1,315	876.2	4,939
1968	840.5	724.7	659.3	524.5	535.5	1,713	3,531	2,185	5,594	5,739	2,570	1,899	2,211
1969	1,600	1,865	1,660	1,525	1,576	2,153	27,480	18,730	5,060	3,548	1,666	1,471	5,693
1970	1,968	1,924	1,726	1,381	1,401	1,544	17,340	13,940	12,470	3,727	1,131	1,201	4,973
1971	1,105	1,357	1,096	1,065	1,131	2,640	11,130	3,480	2,429	2,471	1,135	1,413	2,532
1972	4,463	5,653	3,072	1,861	1,449	7,256	22,230	9,171	6,079	2,395	2,439	2,079	5,666
1973	1,775	1,473	1,149	1,126	1,197	6,106	2,450	1,575	1,200	578.7	801.9	3,008	1,874



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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1974	4,412	2,707	2,014	1,744	1,672	2,016	18,950	18,260	7,633	3,297	3,232	1,967	5,668
1975	1,951	2,079	1,284	1,329	1,435	1,686	16,280	22,890	5,971	28,240	4,003	2,479	7,527
1976	2,364	2,573	1,724	1,630	1,729	3,298	13,300	3,016	1,914	1,359	1,163	712.8	2,886
1977	375.1	276.6	149.3	197.4	201.4	428.5	1,793	938.1	676.4	638.6	243.3	521.0	536.3
1978	1,287	1,121	1,449	1,343	1,124	2,171	36,740	7,427	3,798	3,710	1,537	1,074	5,206
1979	986.1	813.6	797.1	725.2	723.2	879.7	29,260	32,090	6,653	6,268	3,341	2,097	7,076
1980	1,661	1,800	1,491	1,388	1,463	1,654	10,040	2,072	1,532	758.1	488.8	846.2	2,087
1981	556.1	650.7	411.0	304.2	339.6	1,233	1,275	1,365	1,311	2,765	1,509	1,897	1,140
1982	2,571	1,903	1,186	1,112	1,041	1,946	23,650	7,805	3,705	4,246	2,292	1,263	4,386
1983	4,272	2,457	2,114	1,607	1,471	9,329	10,940	3,388	5,122	6,550	2,886	2,941	4,437
1984	2,195	1,978	1,805	1,581	1,582	4,443	19,240	4,246	11,920	3,331	1,442	975.3	4,534
1985	2,208	2,152	1,540	1,326	1,323	6,441	5,751	9,248	8,252	6,962	7,247	4,909	4,803
1986	3,845	2,428	2,313	1,977	1,681	5,311	21,630	16,860	6,437	4,764	2,715	2,993	6,090
1987	3,496	2,037	2,339	1,845	1,673	7,776	15,170	3,427	2,984	2,865	2,502	1,096	3,938
1988	763.6	767.4	695.9	461.5	513.1	2,419	6,250	1,427	946.4	347.7	274.5	328.7	1,262
1989	350.0	332.2	271.0	269.5	356.4	424.8	23,900	4,576	2,292	1,145	451.5	1,048	2,930
1990	474.4	450.9	285.2	174.4	251.8	1,117	2,848	1,513	1,989	1,109	434.7	364.4	917.6
1991	316.6	336.5	245.3	187.0	289.6	680.2	1,894	2,746	2,056	3,179	1,104	1,405	1,208
1992	792.4	593.9	521.7	520.7	500.4	4,887	4,205	2,657	2,176	2,984	1,556	2,557	2,000
1993	1,142	729.2	821.0	813.0	998.0	1,572	15,000	3,915	4,585	10,760	21,580	7,912	5,845
1994	3,800	2,029	1,858	1,539	1,488	7,433	15,550	6,835	6,070	13,920	3,986	4,211	5,748
1995	5,194	4,005	2,721	1,966	1,770	15,720	25,360	11,240	4,526	7,816	2,736	2,259	7,133
1996	3,335	2,924	2,183	2,052	1,978	4,981	30,880	31,420	10,930	4,052	2,951	1,766	8,286
1997	1,735	2,319	2,363	1,973	1,854	2,373	54,710	37,500	9,020	14,980	3,654	2,723	11,280



## 05094000 SOUTH BRANCH TWO RIVERS AT LAKE BRONSON, MN

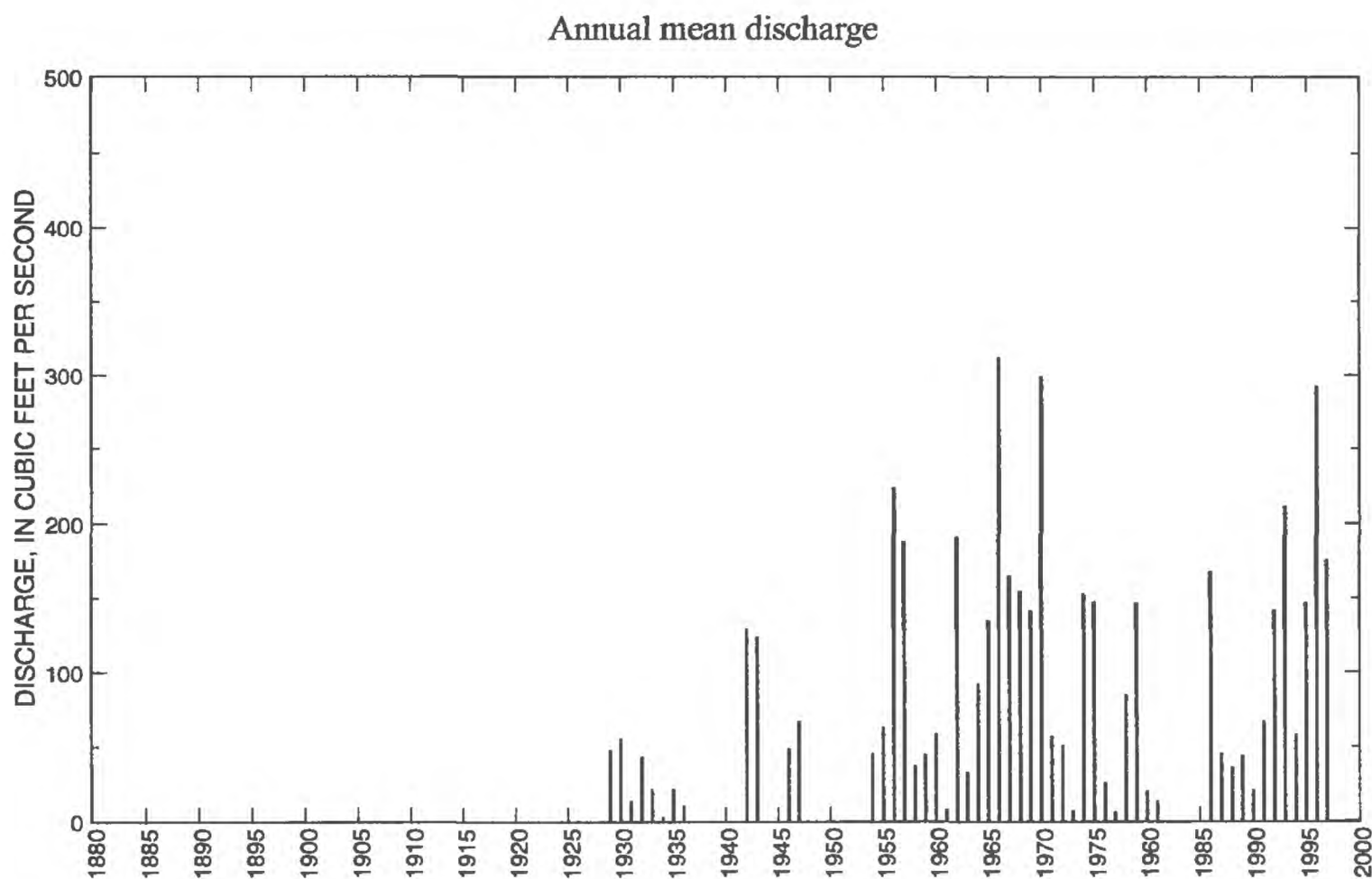
LOCATION.--Lat 48°43'50", long 96°39'50", in SW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.30, T.161 N., R.46 W., Kittson County, Hydrologic Unit 09020312, on left bank 70 ft upstream from culvert on U.S. Highway 59 at Lake Bronson and 3.4 mi downstream from dam at outlet of Bronson Lake.

DRAINAGE AREA.--444 mi<sup>2</sup>.

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

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

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,410 ft<sup>3</sup>/s, Apr. 5, 1966, gage height, 18.23 ft; no flow at times.

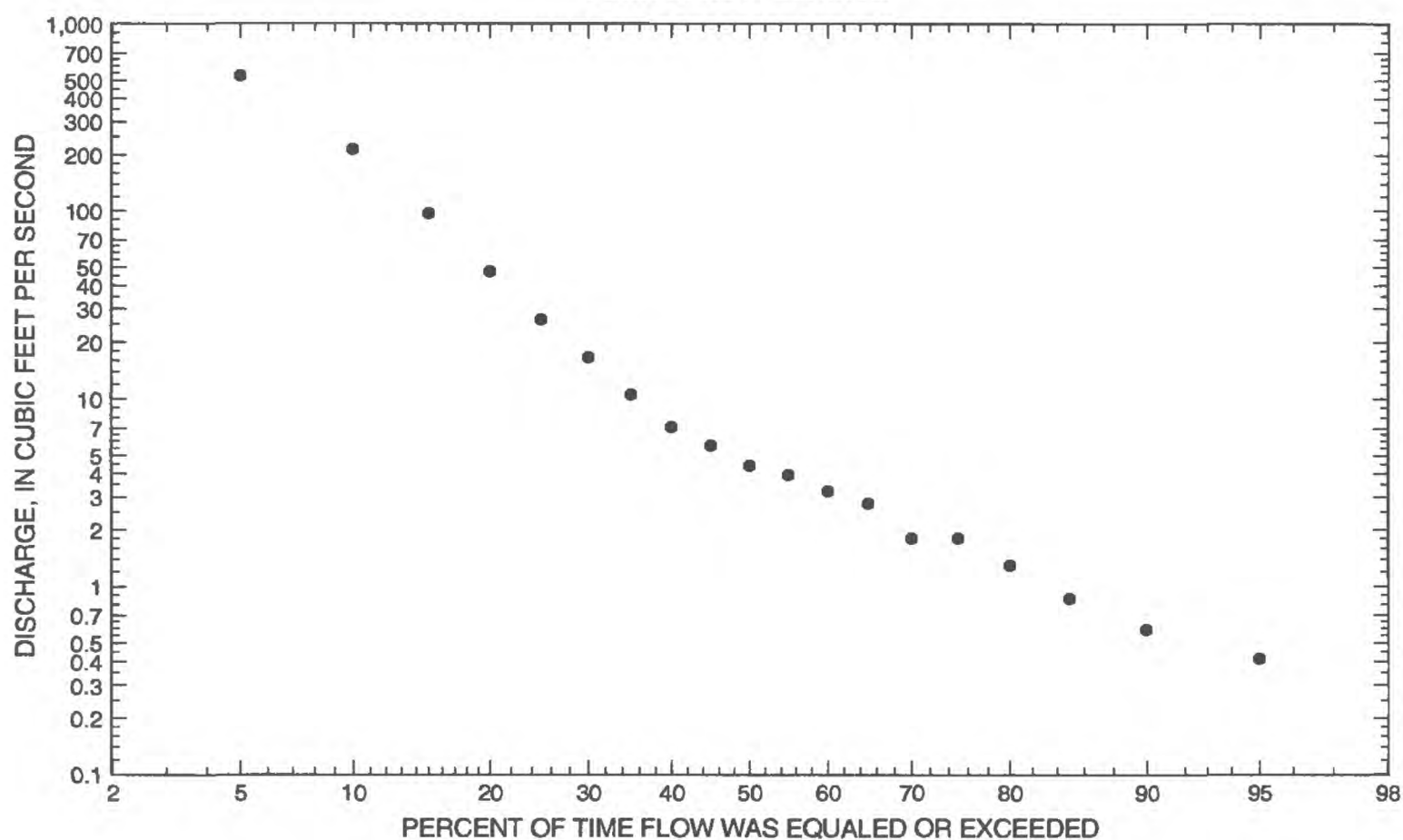


# 05094000 SOUTH BRANCH TWO RIVERS AT LAKE BRONSON, MN--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffil- cient of varlation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s))				
October	153	1958	0.400	1991	19.5	34.2	1.75	1.74	
November	97.0	1995	0.381	1990	13.0	22.2	1.71	1.15	
December	34.5	1992	0.131	1987	4.83	5.73	1.19	0.43	
January	12.1	1992	0.116	1987	2.90	2.62	0.90	0.26	
February	23.6	1981	0.120	1987	3.42	4.09	1.20	0.30	
March	690	1995	0.658	1934	69.9	124	1.77	6.22	
April	1,980	1966	0.539	1991	428	418	0.98	38.1	
May	1,500	1996	0.984	1991	219	320	1.46	19.4	
June	1,340	1970	1.43	1980	161	263	1.63	14.3	
July	1,140	1956	0.437	1988	110	218	1.98	9.79	
August	1,350	1993	0.089	1988	48.6	185	3.80	4.33	
September	525	1957	0	1937	44.3	104	2.36	3.94	
Annual	312	1966	2.89	1934	94.3	80.8	0.86	100	

Annual flow duration



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

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0.25	0.18	0.46	2.10	2.20	1.10	0.53	0.24	0.32	0.41	0.38	0.36	0.41
90	0.34	0.38	0.63	4.51	3.74	2.00	1.40	0.71	0.60	0.84	0.47	0.43	0.59
85	0.47	0.55	1.10	8.84	5.01	3.98	1.90	1.00	0.81	1.10	0.75	0.51	0.86
80	0.55	0.80	1.60	16.8	7.92	5.05	2.99	1.50	1.10	1.40	0.95	0.74	1.30
75	1.00	0.97	1.60	26.4	12.8	5.77	3.87	1.50	1.50	1.70	1.20	1.50	1.80
70	1.40	1.20	1.60	36.4	17.7	8.39	4.40	2.10	1.50	1.70	1.90	1.80	1.80
65	1.40	1.40	2.10	56.4	22.6	12.1	5.27	2.10	2.00	2.20	2.40	1.80	2.77
60	1.70	1.70	2.10	81.4	28.2	14.8	6.64	2.10	2.00	2.80	2.40	2.20	3.24
55	2.00	1.70	3.18	111	34.3	18.6	8.02	3.43	2.87	3.50	3.00	2.60	3.92
50	2.00	1.70	3.60	147	44.5	24.0	11.0	3.86	3.34	4.48	3.00	2.60	4.42
45	2.30	2.10	4.11	189	63.9	31.4	14.6	4.51	3.80	4.93	4.11	2.60	5.64
40	2.30	2.10	4.87	239	89.1	42.2	18.3	4.95	4.54	5.38	4.59	3.20	7.14
35	2.70	2.50	6.25	305	121	57.8	22.8	6.57	5.73	6.48	5.25	3.80	10.6
30	2.70	3.00	11.0	389	178	83.9	31.9	7.85	8.10	9.55	6.37	4.50	16.7
25	3.20	3.00	16.9	508	257	144	49.9	11.4	13.8	13.0	9.27	4.50	26.5
20	3.80	3.70	34.3	689	337	217	81.0	17.2	22.9	20.0	14.5	6.83	47.6
15	5.20	4.50	58.8	946	424	304	137	29.0	44.1	29.7	23.7	8.68	96.9
10	6.47	6.83	147	1,280	643	430	238	76.1	106	53.9	34.4	12.3	215
5	9.20	10.6	499	1,950	1,030	770	655	217	242	103	58.3	16.3	532

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

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	60.7	43.7	26.5	16.8
0.95	1.05	344	176	136	89.9	57.2
0.90	1.11	476	292	233	159	102
0.80	1.25	692	507	419	296	191
0.50	2	1,350	1,240	1,070	788	516
0.20	5	2,480	2,470	2,170	1,630	1,090
0.10	10	3,330	3,280	2,910	2,190	1,470
0.04	25	4,470	4,240	3,760	2,810	1,910
0.02	50	5,360	4,880	4,310	3,210	2,200
0.01	100	6,260	5,440	4,790	3,550	2,450
0.005	200	7,190	5,940	5,220	3,840	2,670
0.002	500	8,450	ng	ng	ng	ng

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

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1929	March 20	9.00	940	1968	July 19	11.08	2,290
1930	May 15	10.90	1,820	1969	April 14	14.01	3,520
1931	April 9	6.00	300	1970	April 14	14.51	4,140
1932	April 11	9.70	1,310	1971	April 8	9.00	1,500
1933	April 4	7.58	415	1972	April 15	8.50	1,480
1934	April 10	5.00	64.0	1973	March 14	10.18	800
1935	April 13	7.21	565	1974	April 24	11.35	2,460
1936	April 19	6.64	358	1975	July 6	10.37	1,960
1937	May 4	7.02	594	1976	April 1	7.24	980
1941	April 11	10.09	1,580	1977	April 8	5.06	219
1942	April 1	12.05	2,210	1978	April 12	12.12	2,770
1943	April 11	8.31	1,050	1979	April 22	13.17	3,340
1944	June 12	7.46	820	1980	April 8	6.90	820
1945	April 16	6.96	670	1981	June 30	5.39	340
1946	March 26	7.03	668	1982	April 2	7.94	1,040
1947	June 17	9.07	1,290	1983	March 8	9.33	1,530
1954	June 16	7.03	567	1984	April 3	6.45	623
1955	June 9	8.33	1,020	1985	June 26	12.16	2,790
1956	April 24	12.79	2,650	1986	March 29	11.47	2,510
1957	July 8	10.52	1,810	1987	March 27	7.62	996
1958	September 23	6.29	355	1988	March 24	8.46	1,170
1959	April 8	8.60	1,110	1989	April 19	10.78	2,100
1960	April 11	8.72	1,270	1990	April 1	7.10	784
1961	March 26	6.86	451	1991	July 13	11.35	2,160
1962	June 13	12.82	2,960	1992	April 2	10.82	1,870
1963	April 8	7.56	1,570	1993	August 10	12.87	3,050
1964	June 14	10.88	2,210	1994	March 26	--	850
1965	April 15	12.30	2,780	1995	March 28	10.56	2,080
1966	April 5	18.23	5,410	1996	April 22	14.45	4,290
1967	April 21	11.43	2,430	1997	April 20	14.58	4,260
Annual peak discharge, from highest to lowest, and corresponding gage height							
1966	April 5	18.23	5,410	1974	April 24	11.35	2,460
1996	April 22	14.45	4,290	1967	April 21	11.43	2,430
1997	April 20	14.58	4,260	1968	July 19	11.08	2,290
1970	April 14	14.51	4,140	1942	April 1	12.05	2,210
1969	April 14	14.01	3,520	1964	June 14	10.88	2,210
1979	April 22	13.17	3,340	1991	July 13	11.35	2,160
1993	August 10	12.87	3,050	1989	April 19	10.78	2,100
1962	June 13	12.82	2,960	1995	March 28	10.56	2,080
1985	June 26	12.16	2,790	1975	July 6	10.37	1,960
1965	April 15	12.30	2,780	1992	April 2	10.82	1,870
1978	April 12	12.12	2,770	1930	May 15	10.90	1,820
1956	April 24	12.79	2,650	1957	July 8	10.52	1,810
1986	March 29	11.47	2,510	1941	April 11	10.09	1,580



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

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1963	April 8	7.56	1,570	1980	April 8	6.90	820
1983	March 8	9.33	1,530	1973	March 14	10.18	800
1971	April 8	9.00	1,500	1990	April 1	7.10	784
1972	April 15	8.50	1,480	1945	April 16	6.96	670
1932	April 11	9.70	1,310	1946	March 26	7.03	668
1947	June 17	9.07	1,290	1984	April 3	6.45	623
1960	April 11	8.72	1,270	1937	May 4	7.02	594
1988	March 24	8.46	1,170	1954	June 16	7.03	567
1959	April 8	8.60	1,110	1935	April 13	7.21	565
1943	April 11	8.31	1,050	1961	March 26	6.86	451
1982	April 2	7.94	1,040	1933	April 4	7.58	415
1955	June 9	8.33	1,020	1936	April 19	6.64	358
1987	March 27	7.62	996	1958	September 23	6.29	355
1976	April 1	7.24	980	1981	June 30	5.39	340
1929	March 20	9.00	940	1931	April 9	6.00	300
1994	March 26	--	850	1977	April 8	5.06	219
1944	June 12	7.46	820	1934	April 10	5.00	64.0

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

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1929	10.0	8.13	3.71	2.16	2.00	311.9	160.7	36.1	23.0	7.39	1.00	1.50	47.7
1930	5.50	4.93	2.82	1.98	1.00	1.52	159.6	440.5	20.3	14.4	3.72	3.37	55.5
1931	4.94	4.19	2.95	2.16	2.00	24.9	83.1	15.6	8.97	4.98	4.45	3.47	13.4
1932	4.44	5.41	4.42	3.48	2.43	2.55	360.8	117.3	8.06	4.41	4.91	2.16	43.0
1933	2.88	3.87	2.74	2.00	1.36	14.6	191.5	21.2	14.2	2.28	2.46	2.25	21.6
1934	1.62	1.25	0.665	0.465	0.400	0.658	20.0	2.85	1.83	1.37	1.82	1.99	2.89
1935	4.60	3.72	2.24	1.00	0.800	29.5	163.8	35.4	7.24	4.46	1.92	2.84	21.4
1936	3.25	3.47	2.24	1.74	1.50	2.10	83.4	18.8	2.93	1.69	3.91	2.55	10.5
1937	23.9	--	--	--	--	--	--	182.1	13.9	2.30	1.65	0	--
1941	--	--	--	--	--	--	453.9	41.2	178.2	11.6	4.80	19.7	--
1942	131.1	23.6	5.99	3.00	2.57	154.4	675.4	456.5	45.7	5.83	15.6	35.0	129.9
1943	6.85	3.36	2.03	1.71	2.59	35.3	459.0	253.9	607.3	113.7	7.80	1.54	124.0
1944	0.887	--	--	--	--	--	79.9	13.2	402.7	55.9	11.5	14.0	--
1945	6.65	23.0	11.6	--	--	--	417.9	197.5	44.0	16.2	9.47	51.5	--
1946	34.2	12.6	5.58	3.41	2.41	220.4	248.4	29.8	5.76	15.0	3.72	2.99	48.9
1947	1.24	3.34	5.08	3.20	1.38	12.5	184.4	33.8	478.3	32.3	43.1	12.2	67.0
1954	5.32	0.867	1.16	2.45	6.36	2.80	208.5	135.2	167.7	9.79	5.51	3.97	45.6
1955	4.94	4.00	2.98	2.72	2.46	14.9	256.8	70.0	369.6	24.9	4.53	5.06	63.0
1956	8.25	3.78	3.30	3.58	3.88	34.2	711.8	445.2	192.5	1,136	40.6	97.6	224.3
1957	10.6	87.5	9.87	7.42	5.51	158.8	263.4	108.7	233.5	725.1	116.7	524.6	188.1
1958	153.0	77.0	13.8	8.48	2.12	2.16	47.7	14.8	6.74	98.7	4.77	9.68	36.9
1959	1.74	1.12	0.555	0.265	0.218	26.3	372.7	74.4	42.6	11.7	2.31	6.24	44.7
1960	22.4	11.3	4.30	4.78	4.79	4.95	534.2	55.2	53.5	13.1	3.86	1.33	58.8
1961	2.77	2.03	1.67	1.44	13.5	26.7	23.1	14.0	2.74	4.50	2.65	0.757	7.96
1962	2.54	1.36	4.43	3.63	3.21	30.3	369.6	655.4	1,031	109.5	77.3	11.8	191.4
1963	7.15	9.85	3.40	1.32	1.01	28.9	287.2	23.9	20.8	4.50	3.43	3.17	32.6
1964	2.59	1.21	0.745	0.600	0.600	0.765	196.3	118.8	742.9	40.2	7.09	6.72	92.2
1965	4.92	6.05	4.77	4.65	4.53	4.52	907.0	403.9	188.4	57.8	6.00	34.3	135.0
1966	99.4	16.0	13.8	10.8	8.91	11.7	1,977	913.2	250.3	282.9	124.9	41.6	312.2
1967	10.2	3.23	3.28	1.71	1.16	22.7	1,157	664.5	110.0	4.38	5.70	2.84	165.2
1968	2.07	2.79	2.26	1.55	1.35	125.3	69.0	5.66	502.8	707.0	193.9	239.7	154.7
1969	74.9	31.1	9.92	5.43	4.83	3.31	1,158	299.1	104.3	10.6	4.45	6.21	141.8
1970	3.71	2.45	2.07	1.97	1.67	3.06	751.4	1,338	1,336	131.1	12.3	6.55	299.1
1971	15.8	35.5	4.54	3.53	2.51	32.2	516.6	58.3	13.5	5.09	3.35	2.98	57.4
1972	2.06	11.0	4.55	2.55	2.79	65.6	444.6	42.9	31.0	4.51	3.68	4.18	51.1

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

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1973	3.98	2.21	1.86	2.96	6.01	46.2	5.57	5.46	3.38	4.15	1.81	4.26	7.37
1974	7.94	4.78	2.59	1.86	1.70	1.61	882.1	634.7	253.2	12.3	30.4	8.30	153.2
1975	4.39	3.78	2.89	2.23	1.67	1.26	607.7	526.3	130.1	474.7	5.18	5.03	147.9
1976	4.15	3.55	3.28	1.99	1.68	59.0	207.7	10.4	7.81	4.16	3.02	3.38	25.7
1977	7.47	1.06	0.463	0.598	0.847	2.76	35.8	3.87	13.9	2.28	4.31	2.34	6.27
1978	0.780	0.420	2.06	2.52	1.85	2.04	778.3	103.1	27.9	102.3	5.51	1.33	85.1
1979	3.92	1.99	1.29	1.94	2.29	14.7	992.1	489.8	203.2	52.8	3.24	2.73	147.0
1980	5.60	0.993	2.55	2.14	1.83	3.32	216.9	4.14	1.43	3.12	1.31	0.960	20.1
1981	1.03	1.64	5.04	0.989	23.6	39.5	9.71	6.71	36.9	34.3	0.941	0.874	13.4
1982	6.13	--	--	--	--	--	--	--	--	--	--	--	--
1985	--	--	--	--	--	--	280.9	211.8	482.8	385.6	360.3	279.5	--
1986	112.9	32.6	16.8	4.82	2.54	361.8	818.6	574.8	33.6	14.0	8.53	25.6	167.9
1987	5.59	0.418	0.131	0.116	0.120	200.7	288.3	35.2	9.43	7.52	1.29	0.656	45.8
1988	0.430	1.55	1.38	0.661	0.600	253.3	165.2	4.34	3.37	0.437	0.089	0.523	36.1
1989	1.57	0.503	0.549	0.338	0.177	1.49	407.2	35.9	68.0	17.3	2.99	1.10	44.3
1990	21.6	0.381	0.378	0.322	0.291	115.9	60.1	3.50	6.69	10.2	27.0	3.17	21.0
1991	0.400	0.484	0.413	0.346	2.90	10.2	0.539	0.984	13.4	527.4	27.4	217.2	67.4
1992	76.0	69.4	34.5	12.1	12.5	200.8	1,010	170.9	20.5	16.8	6.28	88.2	142.2
1993	34.6	0.527	0.443	0.472	0.520	5.93	201.1	46.2	107.8	340.4	1,349	431.6	211.9
1994	34.8	24.1	9.59	6.08	3.94	199.5	112.3	24.6	10.3	29.5	19.3	225.5	58.4
1995	65.7	97.0	13.3	6.46	3.98	689.5	187.7	259.5	42.6	245.0	119.7	18.7	147.6
1996	17.1	22.4	8.77	6.59	7.32	10.7	1,351	1,500	362.1	148.1	45.0	31.5	292.5
1997	1.94	8.51	4.02	0.191	9.58	6.42	1,352	477.0	80.7	164.7	5.64	7.82	175.9

## 05099100 SNOWFLAKE CREEK NEAR SNOWFLAKE, MB

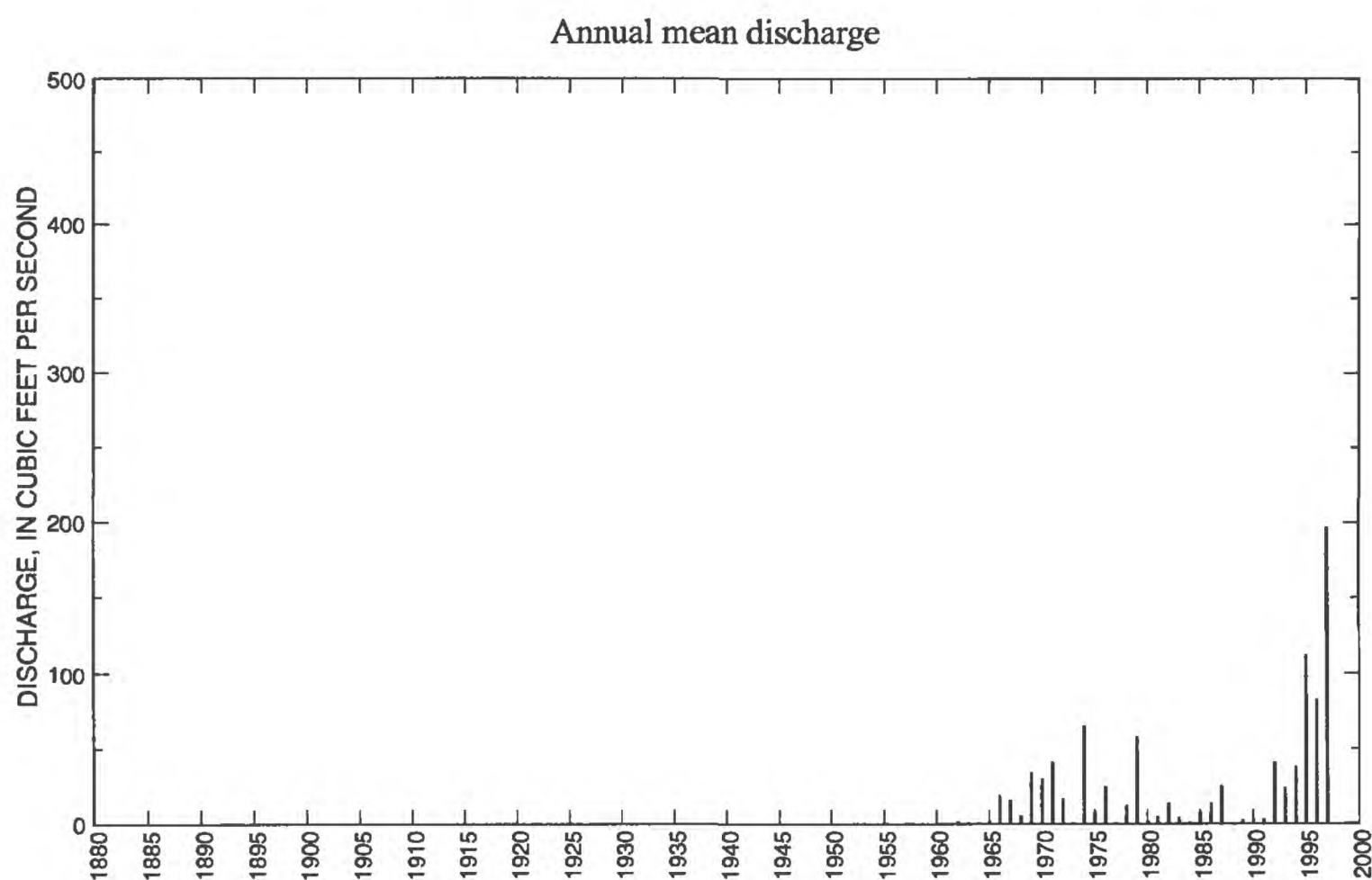
LOCATION.--Lat 49°01'17", long 98°36'13", in SW<sup>1</sup>/<sub>4</sub> sec.10, T.1., R.9 W., first meridian, Hydrologic Unit 09020313, at traffic bridge, 2.5 mi east, and 1.5 mi south of Snowflake, Manitoba.

DRAINAGE AREA.--348 mi<sup>2</sup>.

PERIOD OF RECORD.--March 1961 to current year.

GAGE.--Water-stage recorder since March 1968 and nonrecording gage prior thereto. Datum of gage is Geodetic Survey of Canada Datum of 1929. Prior to Jan. 1, 1987, recording gage at same site at datum of 1,221.66 ft above Geodetic Survey of Canada Datum of 1929. Prior to Apr. 2, 1964, nonrecording gage at present site and datum. Apr. 2, 1964, to May 10, 1965, nonrecording gage at site 0.5 mi downstream at present datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 2,710 ft<sup>3</sup>/s, July 12, 1997, gage height, unknown; maximum gage height, 1,232.08, Apr. 24, 1997; no flow at times.



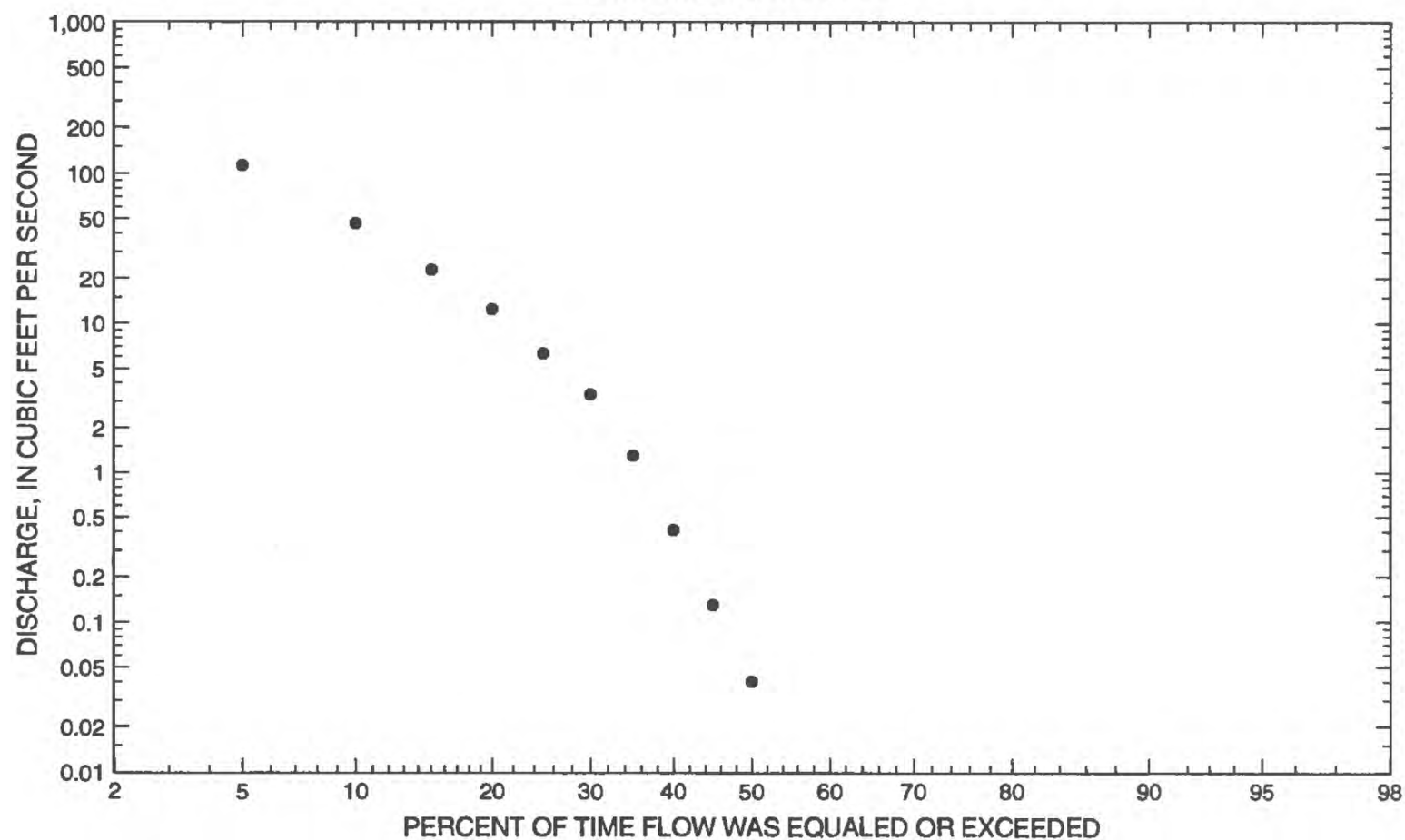
# 05099100 SNOWFLAKE CREEK NEAR SNOWFLAKE, MB--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standards deviation (ft <sup>3</sup> /s)	Coeffi- cient of vsrlation	Percentsge of snnusl discharge
	Dischsrge (ft <sup>3</sup> /s)	Water year of occurrence	Dischsrge (ft <sup>3</sup> /s)	Water year of occurrence	Dischsrge (ft <sup>3</sup> /s)				
October	70.5	1995	0	m	5.95	16.6	2.80	2.01	
November	39.9	1995	0	m	2.57	7.85	3.06	0.87	
December	7.67	1995	0	m	0.30	1.29	4.24	0.10	
January	1.36	1995	0	m	0.04	0.23	5.29	0.01	
February	4.90	1981	0	m	0.15	0.82	5.34	0.05	
March	74.6	1995	0	m	7.62	14.5	1.91	2.58	
April	668	1995	0.225	1973	123	165	1.34	41.7	
May	945	1997	0.061	1988	94.4	182	1.93	32.0	
June	123	1974	0	m	22.5	31.9	1.42	7.61	
July	529	1997	0	m	22.3	86.4	3.87	7.56	
August	139	1997	0	m	10.3	27.8	2.71	3.47	
September	99.7	1993	0	m	6.09	17.8	2.92	2.06	
Annual	197	1997	0.378	1988	25.3	39.1	1.54	100	

Annual flow duration





# 05099100 SNOWFLAKE CREEK NEAR SNOWFLAKE, MB--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0.28	0.11	0	0	0	0	0	0	0	0
85	0	0	0	0.60	0.23	0	0	0	0	0	0	0	0
80	0	0	0	1.30	0.46	0.03	0	0	0	0	0	0	0
75	0	0	0	2.96	0.66	0.17	0	0	0	0	0	0	0
70	0	0	0	4.47	1.30	0.61	0	0	0	0	0	0	0
65	0	0	0	7.37	2.72	1.60	0.04	0	0	0	0	0	0
60	0	0	0	12.7	5.68	2.20	0.24	0	0	0	0	0	0
55	0	0	0	17.7	12.9	4.57	0.71	0	0	0	0	0	0
50	0	0	0	22.5	20.9	8.18	1.40	0.13	0	0.03	0	0	0.04
45	0	0	0	29.7	29.5	11.6	3.46	0.46	0.05	0.06	0	0	0.13
40	0	0	0.16	41.8	39.4	14.5	4.97	0.86	0.17	0.08	0.04	0	0.41
35	0	0	0.37	60.3	51.7	16.8	7.06	1.60	0.40	0.27	0.09	0	1.30
30	0	0	1.20	87.1	67.2	19.0	9.21	3.30	1.20	0.50	0.20	0	3.35
25	0	0	2.20	148	87.1	22.8	12.2	4.86	2.20	1.20	0.34	0	6.34
20	0	0	4.64	211	120	28.4	15.5	6.85	4.30	3.14	1.00	0	12.5
15	0	0	7.85	287	184	40.2	20.9	9.62	7.25	4.71	2.30	0.04	23.0
10	0	0	13.8	399	288	63.7	30.0	21.2	15.6	14.5	4.44	0.16	46.3
5	0.07	0.04	47.2	577	452	100	47.9	71.7	36.7	33.8	13.9	1.40	113

# 05099100 SNOWFLAKE CREEK NEAR SNOWFLAKE, MB--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	4.40	3.22	2.21	1.50	0.937
0.95	1.05	14.5	9.95	7.07	5.00	3.32
0.90	1.11	26.6	17.9	13.0	9.40	6.41
0.80	1.25	53.4	35.7	26.7	19.9	14.1
0.50	2	186	128	102	81.3	60.9
0.20	5	575	432	372	318	251
0.10	10	992	795	716	636	516
0.04	25	1,720	1,500	<sup>1</sup> 1,340	<sup>1</sup> 1,170	<sup>1</sup> 924
0.02	50	2,400	2,230	<sup>1</sup> 1,980	<sup>1</sup> 1,720	<sup>1</sup> 1,360
0.01	100	3,220	3,180	<sup>1</sup> 2,830	<sup>1</sup> 2,460	<sup>1</sup> 1,940
0.005	200	4,160	<sup>1</sup> 4,100	<sup>1</sup> 3,890	<sup>1</sup> 3,380	<sup>1</sup> 2,670
0.002	500	5,620	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

# 05099100 SNOWFLAKE CREEK NEAR SNOWFLAKE, MB--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water years	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1961	March 27	1,224.21	13.6	1980	April 5	1,225.71	67.0
1962	April 18	1,226.41	101	1981	May 22	1,225.67	82.0
1963	March 21	1,226.39	9.90	1982	June 6	1,228.38	505
1964	April 9	1,224.18	21.7	1983	April 6	1,225.87	56.0
1965	April 11	1,225.12	44.0	1984	March 26	1,224.75	14.9
1966	April 14	1,226.36	227	1985	April 8	1,226.68	190
1967	April 20	1,226.54	310	1986	June 3	1,228.07	427
1968	August 25	1,224.01	79.4	1987	April 5	1,228.77	438
1969	April 11	1,227.39	653	1988	April 3	1,225.34	29.0
1970	April 25	1,226.27	279	1989	April 14	1,226.64	185
1971	April 12	--	658	1990	April 3	1,226.57	155
1972	April 16	--	402	1991	July 12	1,226.63	188
1973	March 18	--	21.2	1992	April 8	1,228.86	600
1974	May 21	1,227.64	823	1993	July 28	1,226.69	155
1975	April 28	1,224.64	158	1994	April 15	1,227.84	378
1976	April 8	--	344	1995	April 14	1,229.87	1,210
1977	May 19	1,225.43	29.0	1996	April 25	1,230.59	1,080
1978	April 27	1,226.31	247	1997	July 12	--	2,710
1979	April 21	1,229.94	1,130				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	July 12	--	2,710	1991	July 12	1,226.63	188
1995	April 14	1,229.87	1,210	1989	April 14	1,226.64	185
1979	April 21	1,229.94	1,130	1975	April 28	1,224.64	158
1996	April 25	1,230.59	1,080	1990	April 3	1,226.57	155
1974	May 21	1,227.64	823	1993	July 28	1,226.69	155
1971	April 12	--	658	1962	April 18	1,226.41	101
1969	April 11	1,227.39	653	1981	May 22	1,225.67	82.0
1992	April 8	1,228.86	600	1968	August 25	1,224.01	79.4
1982	June 6	1,228.38	505	1980	April 5	1,225.71	67.0
1987	April 5	1,228.77	438	1983	April 6	1,225.87	56.0
1986	June 3	1,228.07	427	1965	April 11	1,225.12	44.0
1972	April 16	--	402	1977	May 19	1,225.43	29.0
1994	April 15	1,227.84	378	1988	April 3	1,225.34	29.0
1976	April 8	--	344	1964	April 9	1,224.18	21.7
1967	April 20	1,226.54	310	1973	March 18	--	21.2
1970	April 25	1,226.27	279	1984	March 26	1,224.75	14.9
1978	April 27	1,226.31	247	1961	March 27	1,224.21	13.6
1966	April 14	1,226.36	227	1963	March 21	1,226.39	9.90
1985	April 8	1,226.68	190				

# 05099100 SNOWFLAKE CREEK NEAR SNOWFLAKE, MB--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1961	--	--	--	--	--	2.04	2.65	0.955	0.400	0	0	0	--
1962	0	0	0	0	0	0	16.4	0.887	0	0	0	0	1.43
1963	0	0	0	0	0	2.36	0.677	0.603	3.01	0.594	0.035	0	0.608
1964	0	0	0	0	0	1.81	6.63	0.297	0.167	0.023	0	0	0.737
1965	0	0	0	0	0	0.284	12.6	2.95	2.80	0.826	0.074	1.73	1.76
1966	3.03	1.39	0	0	0	22.0	122.7	57.5	14.8	8.27	3.89	1.25	19.6
1967	0.345	0.067	0	0	0	6.32	46.4	97.7	24.9	9.50	2.07	1.46	15.8
1968	12.3	3.52	0.023	0	0	4.93	14.1	3.93	0.257	4.37	10.9	6.04	5.05
1969	0.737	0.078	0	0	0	0	266.9	103.7	22.1	12.1	4.14	0.183	34.0
1970	0.010	0	0	0	0	0	73.6	155.2	79.0	34.9	11.0	8.22	30.3
1971	2.37	0.859	0	0	0	0	295.6	139.4	22.5	25.8	5.86	2.97	41.2
1972	2.52	0.461	0.085	0	0	16.8	126.7	52.0	5.55	0.226	0	0	16.9
1973	0	0	0	0	0	5.25	0.225	0.081	0	0	0	0	0.471
1974	0	0	0	0	0	0	233.1	382.9	123.0	22.8	9.67	6.84	65.1
1975	4.78	3.17	0.442	0.008	0	4.15	26.0	36.5	11.8	0.981	0.086	0.166	7.37
1976	0.229	0.047	0	0	0	0.597	200.5	61.6	18.2	10.2	6.63	1.60	24.8
1977	0.039	0	0	0	0	0.281	2.62	1.65	0.273	0.001	0	0.096	0.413
1978	0.008	0	0	0	0	0.474	99.8	43.5	2.25	0.688	0.394	0.007	12.2
1979	0	0	0	0	0	0	222.1	390.5	59.7	18.8	1.75	2.50	58.3
1980	0.067	0.083	0.014	0	0	0.161	12.8	2.03	0.051	0	0.001	0.201	1.27
1981	2.61	5.24	0.308	0	4.90	5.92	21.1	10.7	4.07	0.573	0.112	0.023	4.59
1982	0.074	0.037	0	0	0	5.93	61.9	23.2	67.6	4.35	0.280	0	13.5
1983	0.205	0.152	0.746	0	0.005	7.36	23.6	7.41	0.341	5.16	2.22	0.011	3.94
1984	0.055	0.058	0.002	0	0.021	3.88	2.99	2.00	0.059	0	0	0	0.759
1985	0	0	0	0	0	22.1	56.5	3.94	4.23	2.22	0.112	0	7.40
1986	0.389	0.086	0	0	0	20.4	54.2	40.4	41.8	6.55	0.228	0	13.7
1987	0	0	0	0	0	0.016	251.6	48.9	7.99	0.077	1.63	0.072	25.6
1988	0.020	0.007	0	0	0.082	1.45	2.95	0.061	0	0	0	0	0.378
1989	0	0	0	0	0	0	24.4	1.03	0.010	0	0	0	2.09
1990	0	0	0	0	0.010	1.50	14.2	0.366	16.9	2.15	0.032	0.001	2.90
1991	0	0	0	0	0	5.86	4.57	1.30	5.85	14.0	0.528	0	2.70
1992	2.08	1.02	0	0.041	0	42.5	353.3	77.3	13.7	4.92	0.823	0.029	41.0
1993	0	0.254	0	0	0	0.309	41.2	29.2	15.0	35.7	70.4	99.7	24.4
1994	68.6	25.7	1.51	0.078	0	19.5	219.9	79.7	17.9	6.28	5.72	12.8	38.1
1995	70.5	39.9	7.67	1.36	0.488	74.6	668.4	315.7	86.3	33.2	20.8	35.3	112.7

05099100 SNOWFLAKE CREEK NEAR SNOWFLAKE, MB--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1996	12.7	0.965	0.045	0	0	2.85	390.3	372.3	62.5	31.5	81.5	34.0	82.4
1997	30.4	9.34	0.133	0.054	0.004	0.035	586.8	945.0	96.2	529.4	138.9	10.1	197.3



## 05099150 MOWBRAY CREEK NEAR MOWBRAY, MB

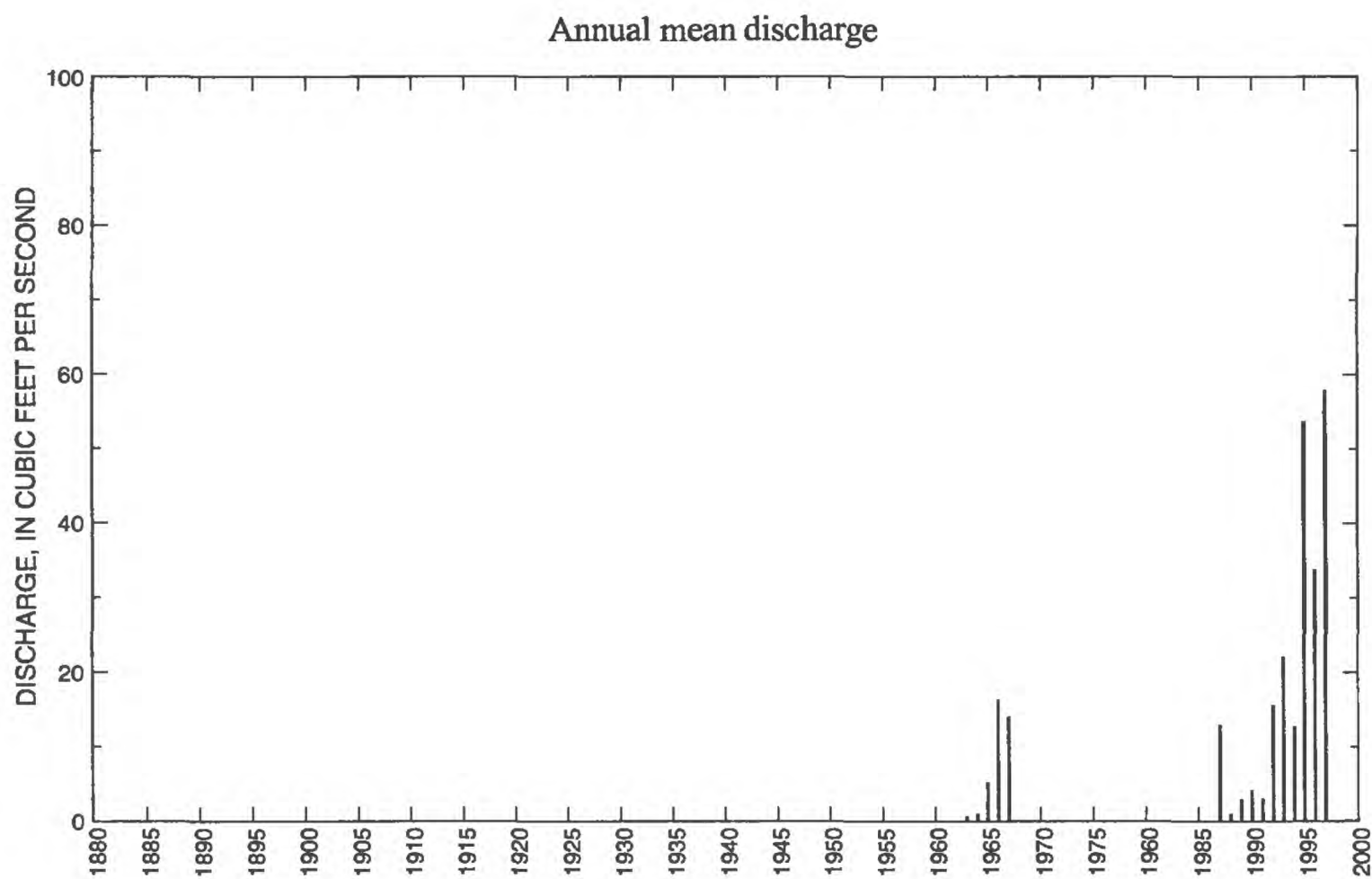
LOCATION.--Lat 49°00'00", long 98°27'15", in SE<sup>1</sup>/<sub>4</sub> sec.3, T.1, R.8 W., first meridian, Hydrologic Unit 09020313, on downstream side of bridge on Municipal Road on international boundary and 1.5 mi east of Mowbray, Manitoba.

DRAINAGE AREA.--93.9 mi<sup>2</sup>.

PERIOD OF RECORD.--March 1962 to current year. Seasonal records only most years.

GAGE.--Water-stage recorder. Datum of gage is Geodetic Survey of Canada Datum of 1929.  
Nonrecording gage prior to 1971.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,470 ft<sup>3</sup>/s, Apr. 23, 1997, gage height, 1,534.81 ft; maximum gage height, 1,534.83, Apr. 21, 1997, backwater from ice; no flow at times.



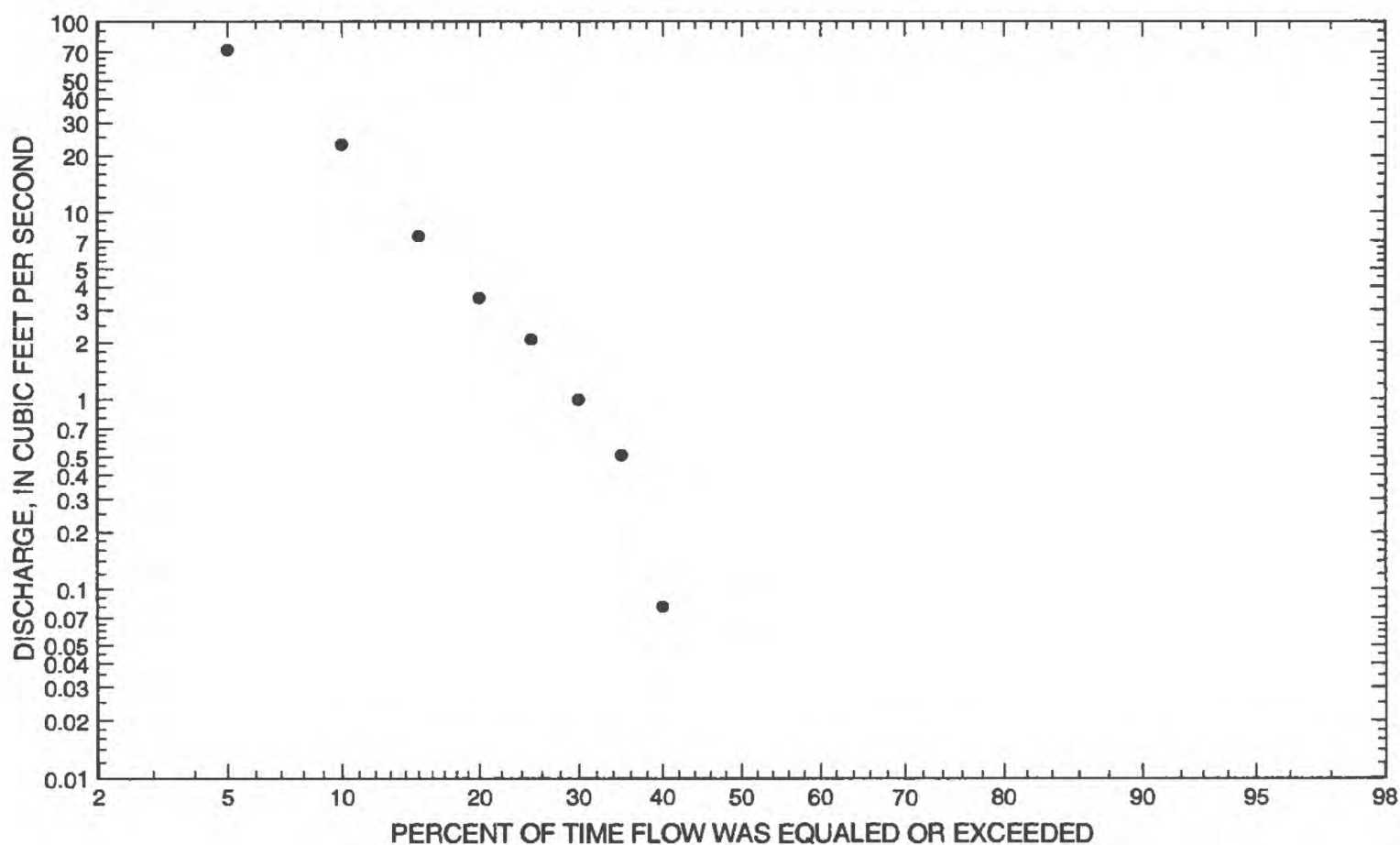
# 05099150 MOWBRAY CREEK NEAR MOWBRAY, MB--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	56.5	1995	0	m	2.30	9.67	4.21	1.57	
November	16.4	1995	0	m	1.11	4.08	3.68	0.76	
December	1.35	1995	0	m	0.09	0.34	3.79	0.06	
January	0.080	1995	0	m	0	0.02	4.12	0	
February	5.68	1981	0	m	0.32	1.34	4.17	0.22	
March	122	1995	0	m	12.6	25.4	2.02	8.57	
April	344	1997	1.05	1973	80.7	87.1	1.08	55.1	
May	159	1974	0.009	1973	21.0	39.1	1.86	14.3	
June	58.0	1995	0	m	6.84	11.6	1.69	4.67	
July	189	1997	0	m	10.1	32.6	3.24	6.87	
August	161	1995	0	m	9.53	34.9	3.66	6.50	
September	28.6	1995	0	m	2.02	5.67	2.81	1.38	
Annual	57.9	1997	0.589	1963	16.1	18.0	1.12	100	

## Annual flow duration



# 05099150 MOWBRAY CREEK NEAR MOWBRAY, MB--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0	0
85	0	0	0	0.26	0	0	0	0	0	0	0	0	0
80	0	0	0	0.93	0.04	0	0	0	0	0	0	0	0
75	0	0	0	1.70	0.29	0	0	0	0	0	0	0	0
70	0	0	0	2.40	0.57	0.22	0	0	0	0	0	0	0
65	0	0	0	4.69	0.79	0.42	0	0	0	0	0	0	0
60	0	0	0	6.77	1.50	0.78	0	0	0	0	0	0	0
55	0	0	0	10.8	1.50	1.10	0.15	0	0	0	0	0	0
50	0	0	0	16.7	2.20	1.50	0.30	0	0	0	0	0	0
45	0	0	0	22.4	3.31	1.50	0.42	0	0	0	0	0	0
40	0	0	0	29.4	4.50	2.00	0.82	0.04	0	0	0	0	0.08
35	0	0	0	38.7	6.43	2.98	1.60	0.37	0	0	0	0	0.51
30	0	0	0.04	52.6	9.33	3.51	1.60	0.72	0	0.04	0	0	1.00
25	0	0	0.54	75.5	14.4	4.26	3.34	1.00	0.27	0.35	0.04	0	2.10
20	0	0	1.70	104	21.1	5.71	4.57	1.40	0.60	0.86	0.11	0	3.48
15	0	0	5.88	154	33.5	8.59	7.67	1.90	1.30	2.10	0.17	0	7.46
10	0	0	18.1	243	52.5	13.8	15.2	4.34	4.15	3.41	0.61	0.04	23.0
5	0	0	60.8	426	103	30.9	37.8	21.6	11.9	5.51	5.50	0.70	71.9

## 05099150 MOWBRAY CREEK NEAR MOWBRAY, MB--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	7.00	3.18	2.85	2.02	1.41
0.95	1.05	24.1	14.2	11.7	7.92	5.37
0.90	1.11	43.9	29.1	23.4	15.5	10.3
0.80	1.25	85.8	64.2	50.4	33.2	21.7
0.50	2	264	233	184	122	77.0
0.20	5	666	646	533	370	225
0.10	10	1,000	<sup>1</sup> 980	856	616	366
0.04	25	1,470	<sup>1</sup> 1,450	1,340	1,010	585
0.02	50	1,840	1,830	1,730	1,350	771
0.01	100	2,210	2,180	2,130	1,720	971
0.005	200	2,570	2,520	<sup>1</sup> 2,320	2,110	1,180
0.002	500	3,040	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

# 05099150 MOWBRAY CREEK NEAR MOWBRAY, MB--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1962	April 20	1,531.73	305	1980	May 29	1,532.27	310
1963	June 25	1,528.95	9.20	1981	May 22	1,530.96	126
1964	April 16	1,529.57	22.8	1982	April 14	1,532.80	350
1965	April 13	1,531.36	202	1983	April 7	1,531.49	155
1966	March 29	1,533.86	305	1984	June 10	1,530.45	68.0
1967	April 24	1,532.42	392	1985	March 22	1,532.92	484
1968	April 9	1,529.33	17.6	1986	March 28	1,533.79	643
1969	April 15	1,532.23	377	1987	April 6	1,534.57	943
1970	April 27	1,532.23	372	1988	April 3	1,530.80	55.0
1971	April 12	1,532.93	630	1989	April 19	1,532.59	392
1972	March 21	1,531.35	138	1990	April 7	1,531.64	137
1973	March 18	--	67.0	1991	May 31	1,531.75	133
1974	April 21	1,533.00	670	1992	April 1	1,534.10	685
1975	April 15	1,530.47	59.0	1993	August 3	1,533.25	317
1976	April 7	1,532.47	455	1994	April 2	1,533.99	784
1977	September 8	1,529.91	29.0	1995	March 25	1,534.23	625
1978	April 11	1,532.44	378	1996	April 16	1,534.39	1,110
1979	April 24	1,533.00	777	1997	April 23	1,534.81	1,470
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 23	1,534.81	1,470	1993	August 3	1,533.25	317
1996	April 16	1,534.39	1,110	1980	May 29	1,532.27	310
1987	April 6	1,534.57	943	1962	April 20	1,531.73	305
1994	April 2	1,533.99	784	1966	March 29	1,533.86	305
1979	April 24	1,533.00	777	1965	April 13	1,531.36	202
1992	April 1	1,534.10	685	1983	April 7	1,531.49	155
1974	April 21	1,533.00	670	1972	March 21	1,531.35	138
1986	March 28	1,533.79	643	1990	April 7	1,531.64	137
1971	April 12	1,532.93	630	1991	May 31	1,531.75	133
1995	March 25	1,534.23	625	1981	May 22	1,530.96	126
1985	March 22	1,532.92	484	1984	June 10	1,530.45	68.0
1976	April 7	1,532.47	455	1973	March 18	--	67.0
1967	April 24	1,532.42	392	1975	April 15	1,530.47	59.0
1989	April 19	1,532.59	392	1988	April 3	1,530.80	55.0
1978	April 11	1,532.44	378	1977	September 8	1,529.91	29.0
1969	April 15	1,532.23	377	1964	April 16	1,529.57	22.8
1970	April 27	1,532.23	372	1968	April 9	1,529.33	17.6
1982	April 14	1,532.80	350	1963	June 25	1,528.95	9.20



# 05099150 MOWBRAY CREEK NEAR MOWBRAY, MB--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1962	--	--	--	--	--	0	62.2	2.38	2.93	0.106	0	0	--
1963	0	0	0	0	0	0.361	1.06	0.084	3.82	1.43	0.313	0.020	0.589
1964	0	0	0	0	0	0	9.45	0.887	0.510	0.223	0	0	0.910
1965	0	0	0	0	0	0	49.7	11.7	1.89	0.032	0	0	5.24
1966	0	0	0	0	0	49.9	89.9	46.8	5.23	2.03	1.34	0.363	16.3
1967	0	0	0	0	0	1.84	103.6	60.1	2.38	0.068	0	0	14.0
1968	0	--	--	--	--	2.53	6.23	0.034	0	0	0	0	--
1969	0	--	--	--	--	--	129.3	6.37	13.0	5.29	1.19	--	--
1970	0	--	--	--	--	0	114.7	31.9	27.6	21.3	1.57	0.293	--
1971	--	--	--	--	--	0	206.2	12.8	3.23	1.17	0	0	--
1972	0	--	--	--	--	28.9	40.2	4.94	0.584	0	0	0	--
1973	0	--	--	--	--	10.6	1.05	0.009	0	0	0	0	--
1974	0	--	--	--	--	0	207.7	159.1	16.0	0.864	0	0	--
1975	0	--	--	--	--	0	18.6	10.3	0.170	0.079	0	0	--
1976	0	--	--	--	--	0	120.7	2.15	0.843	0.305	0.125	0	--
1977	0	--	--	--	--	0.018	2.79	0.061	0	0	0	3.55	--
1978	0.015	--	--	--	--	0.161	107.0	7.18	1.10	1.00	0.065	0	--
1979	0	--	--	--	--	0	177.9	80.5	0.844	8.83	3.98	8.03	--
1980	4.57	--	--	--	--	0.155	14.8	7.89	3.49	1.14	1.66	2.03	--
1981	5.15	--	--	--	5.68	12.9	4.17	2.08	1.11	0.419	0.913	0.197	--
1982	0.316	--	--	--	--	1.13	33.4	5.87	5.00	3.92	0.148	0.012	--
1983	2.55	--	--	--	--	17.7	35.9	2.94	0.971	0.391	0.168	0	--
1984	0	--	--	--	--	4.73	3.80	1.65	8.96	0.031	0	0	--
1985	0	--	--	--	--	62.0	18.4	0.827	7.50	15.0	8.92	3.15	--
1986	2.79	--	--	0	0	50.4	38.6	11.8	32.0	5.00	2.95	0.108	--
1987	0.037	0	0	0	0	0	155.2	0.384	1.01	0.015	1.74	0.075	13.0
1988	1.87	0.634	0.036	0	0.100	1.73	8.06	0.050	0	0	0	0	1.03
1989	0	0	0	0	0	0	33.9	2.04	0.056	0	0	0	2.96
1990	0	0	0	0	0	2.33	31.2	1.30	15.3	0.225	0.105	0.014	4.16
1991	0	0	0	0	0	6.89	2.38	4.76	14.0	6.99	0.998	0	3.01
1992	0.013	0.046	0	0	0	39.5	142.6	5.32	0.868	0.972	0	0	15.6
1993	0	0	0	0	0	0.789	46.0	6.49	8.08	55.6	140.5	6.40	22.2
1994	1.27	0.457	0.035	0	0	22.4	107.5	3.47	1.36	0.355	1.37	16.9	12.8
1995	56.5	16.4	1.35	0.080	0	122.5	117.8	67.6	58.0	9.65	161.1	28.6	53.7
1996	2.60	0.111	0	0	0	0	319.8	39.0	6.78	30.5	10.8	0.795	33.9
1997	0.448	0.089	0	0	0	0	344.5	153.5	1.53	189.2	3.14	0.086	57.9

## 05099300 PEMBINA RIVER NEAR WINDYGATES, MB

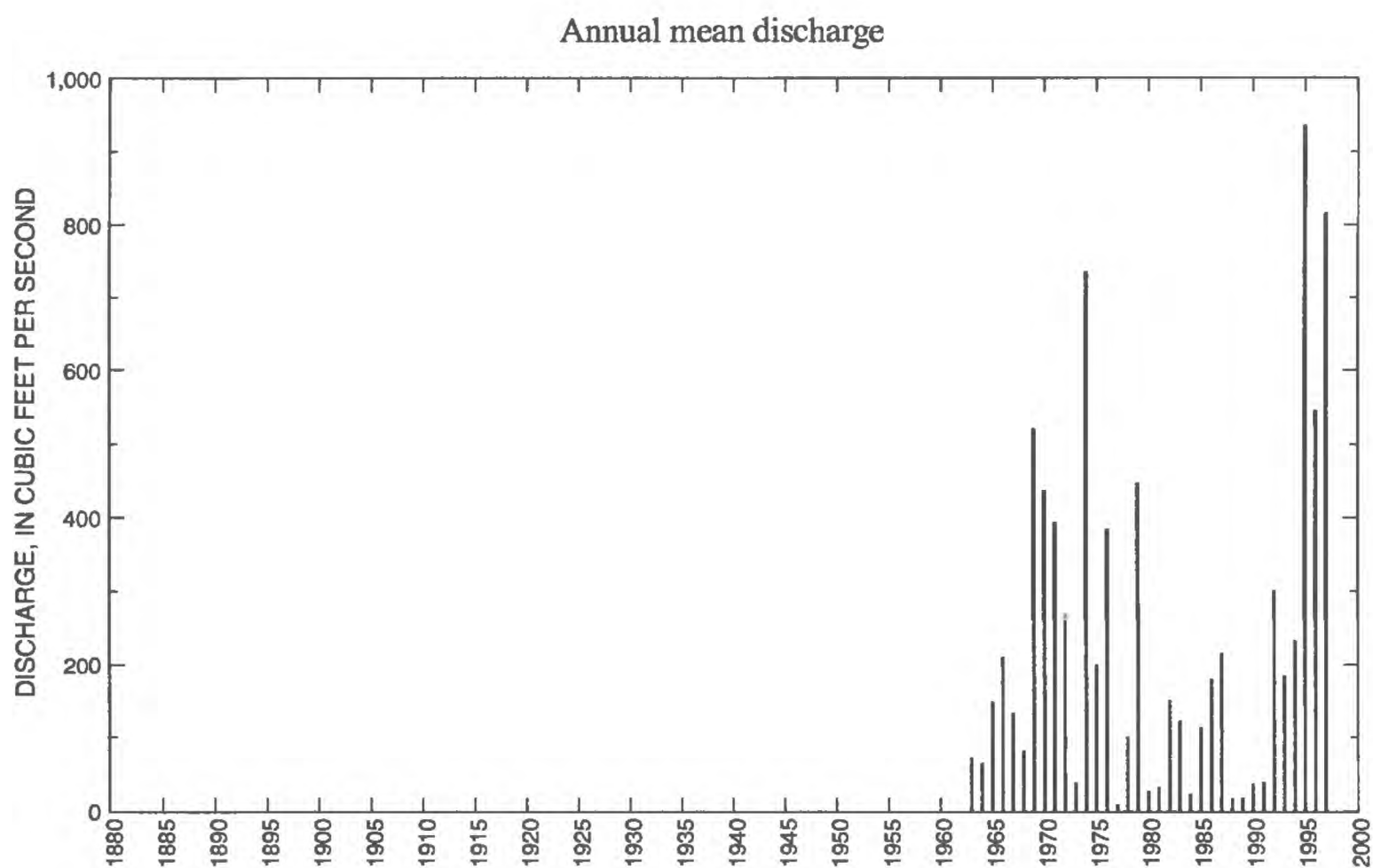
LOCATION.--Lat 49°01'53", long 98°16'40", in SE<sup>1</sup>/<sub>4</sub> sec.13, T.1, R.7 W., first meridian, Hydrologic Unit 09020313, on left bank 0.2 mi downstream from bridge and 3 mi northeast of Windygates, Manitoba.

DRAINAGE AREA.--3,020 mi<sup>2</sup>.

PERIOD OF RECORD.--April 1962 to current year.

GAGE.--Water-stage recorder. Datum of gage is Geodetic Survey of Canada Datum of 1929. Prior to Jan. 1, 1985, datum of gage at 1,102.02 ft above Geodetic Survey of Canada Datum of 1929.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,700 ft<sup>3</sup>/s, Apr. 26, 1997, gage height, 1,122.27 ft; no flow at times.



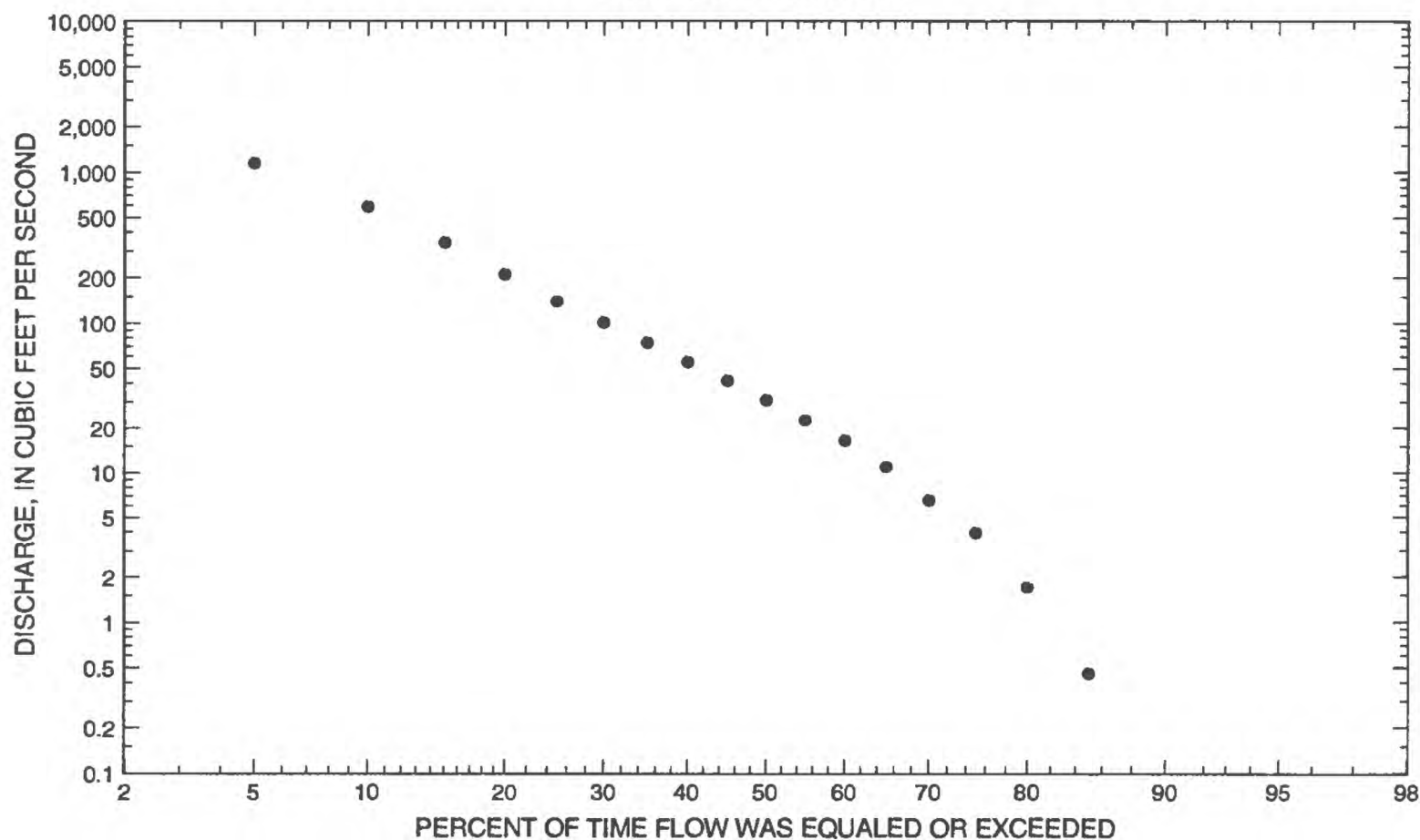
# 05099300 PEMBINA RIVER NEAR WINDYGATES, MB--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharga (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharga (ft <sup>3</sup> /s)				
October	343	1969	0	m	56.6	84.7	1.50	2.03	
November	391	1995	0	m	36.6	70.9	1.94	1.31	
December	195	1995	0	m	16.8	34.1	2.02	0.60	
January	82.7	1995	0	m	8.39	15.0	1.78	0.30	
February	64.9	1995	0	m	7.33	13.4	1.83	0.26	
March	949	1995	0	m	92.7	181	1.95	3.33	
April	4,240	1995	21.3	1977	1,050	1,150	1.10	37.6	
May	3,620	1974	27.0	1988	851	1,010	1.19	30.6	
June	1,510	1974	4.03	1988	325	357	1.10	11.7	
July	1,130	1997	0.070	1988	161	215	1.33	5.79	
August	719	1993	0	1988	109	156	1.43	3.92	
September	544	1993	0	m	73.4	105	1.43	2.64	
Annual	936	1995	9.61	1977	236	239	1.01	100	

Annual flow duration



# 05099300 PEMBINA RIVER NEAR WINDYGATES, MB--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	8.70	29.9	13.0	0.66	0	0	0	0	0	0
90	0	0	0	21.8	50.2	24.0	3.21	0.45	0.04	0.10	0.63	0	0
85	0	0	0	41.8	65.3	33.7	11.1	1.40	0.59	2.10	2.40	0.12	0.46
80	0	0	0	68.4	80.0	49.4	20.8	4.66	1.60	3.51	3.00	0.75	1.70
75	0	0	0.43	94.6	101	75.5	31.3	11.0	3.97	6.81	4.55	1.70	3.91
70	0	0	1.20	124	156	92.1	39.2	24.6	13.9	12.0	5.46	2.20	6.50
65	0.44	0	2.30	153	208	111	49.5	34.7	22.7	15.8	6.51	2.20	10.9
60	1.10	0.28	4.86	196	271	132	62.2	44.0	29.6	20.4	8.01	2.80	16.5
55	1.50	0.72	7.69	269	359	158	74.5	50.9	36.1	25.2	10.6	4.28	22.5
50	2.30	1.50	10.2	361	466	185	86.7	57.7	42.2	30.1	14.0	5.16	30.7
45	4.08	1.90	11.8	518	562	216	102	65.7	48.4	35.3	18.0	6.64	41.5
40	4.71	3.10	14.0	642	637	256	120	77.4	59.0	40.4	22.7	9.20	55.0
35	6.22	3.10	16.7	745	734	305	140	89.1	70.1	46.7	26.9	12.3	74.4
30	8.82	6.63	24.4	914	861	361	167	106	84.4	54.1	32.4	16.5	101
25	11.3	10.8	33.5	1,170	1,060	418	193	125	98.9	62.6	38.4	20.5	139
20	16.4	13.4	50.4	1,590	1,370	517	242	155	114	75.6	43.5	24.1	210
15	18.6	15.3	80.8	2,320	1,840	655	299	198	129	91.3	54.3	29.1	341
10	21.5	17.5	159	2,990	2,250	859	386	260	163	111	68.6	36.9	583
5	25.7	21.9	568	4,370	3,220	1,160	589	403	287	278	162	57.5	1,140

# 05099300 PEMBINA RIVER NEAR WINDYGATES, MB--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	71.3	49.2	41.6	31.3	21.7
0.95	1.05	176	124	108	86.4	66.9
0.90	1.11	283	202	178	147	118
0.80	1.25	496	366	325	274	230
0.50	2	1,410	1,130	1,020	878	762
0.20	5	3,870	3,500	3,130	2,680	2,290
0.10	10	6,450	6,300	5,610	4,710	3,910
0.04	25	11,000	<sup>1</sup> 10,800	10,400	8,490	6,740
0.02	50	15,400	<sup>1</sup> 15,200	<sup>1</sup> 14,500	12,300	9,430
0.01	100	20,800	<sup>1</sup> 20,500	<sup>1</sup> 19,800	17,100	12,600
0.005	200	27,400	<sup>1</sup> 27,000	<sup>1</sup> 26,000	23,100	16,400
0.002	500	37,800	ng	ng	ng	ng

<sup>1</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.



# 05099300 PEMBINA RIVER NEAR WINDYGATES, MB--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1962	April 21	1,108.51	1,610	1980	April 6	--	327
1963	June 6	1,105.17	255	1981	May 22	1,107.31	526
1964	May 10	1,105.62	323	1982	June 6	1,110.89	1,920
1965	April 14	1,109.75	1,460	1983	April 8	1,109.29	1,160
1966	April 3	1,110.94	1,700	1984	June 16	1,103.63	491
1967	April 21	1,111.06	1,890	1985	April 5	1,108.93	1,220
1968	March 24	1,108.51	744	1986	March 28	1,109.49	1,230
1969	April 19	1,119.31	8,170	1987	April 8	1,111.90	2,540
1970	April 28	1,115.01	3,800	1988	April 4	1,106.75	178
1971	April 10	1,115.04	5,910	1989	April 16	1,106.79	441
1972	April 12	--	1,620	1990	April 3	1,108.50	794
1973	August 8	--	145	1991	July 12	1,107.33	487
1974	April 26	1,121.52	11,500	1992	April 8	1,113.73	3,080
1975	May 14	1,109.76	1,510	1993	July 28	1,109.73	1,140
1976	April 17	1,115.13	4,210	1994	April 13	1,109.94	1,380
1977	May 21	1,105.47	153	1995	April 21	1,119.50	7,420
1978	April 9	1,110.88	1,090	1996	April 25	1,118.40	6,570
1979	May 2	1,116.63	5,440	1997	April 26	1,122.27	13,700
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 26	1,122.27	13,700	1994	April 13	1,109.94	1,380
1974	April 26	1,121.52	11,500	1986	March 28	1,109.49	1,230
1969	April 19	1,119.31	8,170	1985	April 5	1,108.93	1,220
1995	April 21	1,119.50	7,420	1983	April 8	1,109.29	1,160
1996	April 25	1,118.40	6,570	1993	July 28	1,109.73	1,140
1971	April 10	1,115.04	5,910	1978	April 9	1,110.88	1,090
1979	May 2	1,116.63	5,440	1990	April 3	1,108.50	794
1976	April 17	1,115.13	4,210	1968	March 24	1,108.51	744
1970	April 28	1,115.01	3,800	1981	May 22	1,107.31	526
1992	April 8	1,113.73	3,080	1984	June 16	1,103.63	491
1987	April 8	1,111.90	2,540	1991	July 12	1,107.33	487
1982	June 6	1,110.89	1,920	1989	April 16	1,106.79	441
1967	April 21	1,111.06	1,890	1980	April 6	--	327
1966	April 3	1,110.94	1,700	1964	May 10	1,105.62	323
1972	April 12	--	1,620	1963	June 6	1,105.17	255
1962	April 21	1,108.51	1,610	1988	April 4	1,106.75	178
1975	May 14	1,109.76	1,510	1977	May 21	1,105.47	153
1965	April 14	1,109.75	1,460	1973	August 8	--	145

# 05099300 PEMBINA RIVER NEAR WINDYGATES, MB--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1962	--	--	--	--	--	--	421.2	204.9	155.8	54.9	77.4	96.0	--
1963	38.5	16.9	23.4	9.85	0	40.9	135.0	166.3	182.4	96.3	97.9	60.8	72.6
1964	27.3	11.5	3.35	0.816	0	0	231.6	282.8	120.4	35.5	44.4	34.1	66.0
1965	23.1	8.05	1.13	0	0	0	460.4	646.1	382.4	125.1	56.4	80.4	148.9
1966	63.0	40.2	29.4	12.3	2.26	143.4	1,032	696.9	283.5	132.5	65.9	25.8	210.8
1967	10.7	6.41	2.69	4.71	3.46	31.0	596.7	654.7	214.2	63.5	16.4	0.587	134.0
1968	17.2	9.26	2.94	0.444	0	264.1	129.2	69.8	30.6	18.5	112.4	325.4	81.6
1969	343.0	170.5	45.3	19.1	14.1	15.6	3,112	1,538	476.4	289.5	153.9	88.8	521.6
1970	60.3	42.3	22.3	15.0	12.4	12.0	1,095	1,868	1,075	633.2	260.5	130.8	437.4
1971	76.0	42.8	14.4	9.42	9.60	11.4	2,026	1,299	465.6	343.7	292.0	141.4	394.4
1972	81.3	57.4	37.3	18.7	13.9	270.6	1,205	774.7	314.2	197.5	164.5	97.3	269.1
1973	72.3	28.5	5.05	2.86	3.01	56.3	74.4	49.4	33.0	45.8	50.9	45.1	39.1
1974	50.7	32.7	14.7	8.74	11.2	11.8	3,003	3,616	1,512	368.1	116.2	76.8	736.5
1975	44.1	33.3	13.2	6.51	3.72	6.87	256.9	1,175	547.4	190.5	72.2	35.2	200.1
1976	29.7	21.0	8.98	11.5	44.5	41.2	2,630	1,303	378.4	114.5	42.7	25.3	385.4
1977	19.4	8.78	0.223	0	0	2.90	21.3	34.7	18.9	4.96	0.312	3.30	9.61
1978	8.55	2.36	0.798	0.242	0	2.42	616.1	368.2	112.7	48.3	30.6	23.2	101.0
1979	12.1	5.32	2.68	0.953	0.235	1.06	1,352	2,934	743.7	194.5	50.4	45.4	447.9
1980	39.2	28.7	9.40	1.87	0.660	1.35	149.2	76.8	22.7	1.54	1.41	0.988	27.7
1981	1.84	4.65	2.56	0	6.04	51.8	189.9	98.4	26.9	10.8	3.26	1.19	33.1
1982	2.62	3.09	0.816	0	0	11.9	426.5	589.5	454.6	187.4	91.7	46.3	151.5
1983	42.0	19.2	7.05	3.58	0.933	45.0	686.7	427.5	175.2	61.6	13.9	4.88	123.9
1984	10.1	5.86	1.75	0.019	0.189	7.34	69.2	78.0	97.2	13.7	0.916	0.061	23.6
1985	0.712	0.769	0.187	0	0	320.2	666.7	198.5	94.7	49.0	18.1	24.1	114.5
1986	30.2	15.7	5.27	6.21	3.03	280.0	654.7	611.5	303.6	116.3	85.1	49.6	180.7
1987	24.6	9.73	4.83	4.16	2.95	5.22	1,552	685.3	175.2	51.1	36.9	53.8	216.4
1988	49.7	24.1	15.3	0.247	0.166	17.6	65.9	27.0	4.03	0.070	0	0	17.0
1989	0	0	0	0	0	0	119.4	72.7	25.7	1.25	0.004	0	18.2
1990	0	0	0	0	0	16.3	230.3	86.3	88.0	29.4	0.977	0.100	37.5
1991	0	0	0	0	0.084	14.4	49.0	29.9	108.1	196.9	70.1	10.2	40.2
1992	5.86	6.29	5.28	3.64	4.67	279.7	2,391	731.7	155.3	49.1	9.16	2.88	301.7
1993	3.27	3.32	1.76	1.87	1.17	18.6	393.9	196.8	94.7	233.1	719.1	543.5	184.9
1994	257.0	124.3	56.9	27.0	17.4	275.4	1,043	482.2	176.0	122.1	85.0	130.1	233.4
1995	330.3	390.6	195.1	82.7	64.9	949.0	4,241	2,666	1,173	374.8	572.5	183.0	936.2
1996	95.0	50.5	25.5	18.7	17.7	23.3	2,745	2,304	708.1	224.7	218.8	137.3	546.3
1997	109.8	54.7	28.8	22.1	17.6	16.2	3,601	3,596	767.4	1,128	298.4	119.2	816.3

## 05100000 PEMBINA RIVER AT NECHE, ND

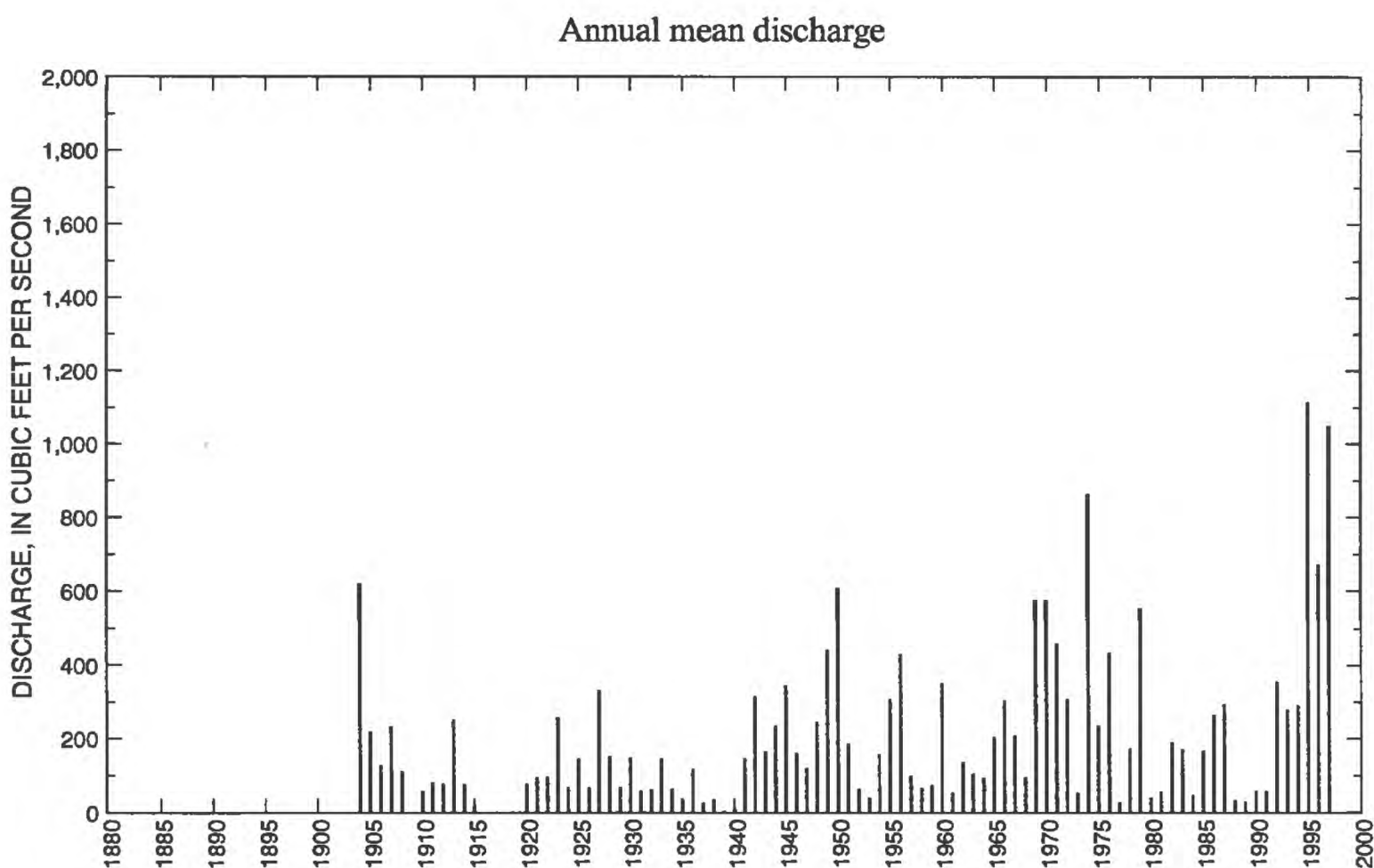
LOCATION.--Lat 48°59'20", long 97°33'05", in SE<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec.31, T.164 N., R.53 W., Pembina County, Hydrologic Unit 09020313, on right bank 0.3 mi east of State Highway 18 and at north edge of Neche.

DRAINAGE AREA.--3,410 mi<sup>2</sup>, approximately.

PERIOD OF RECORD.--May 1903 to September 1908, June 1909 to September 1915, April 1919 to current year. Monthly discharge only for some periods, published in Water Supply Paper 1308.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 809.69 ft above sea level. Prior to May 24, 1932, nonrecording gage at Burlington Northern Railway bridge 1 mi upstream, at same datum. May 25, 1932, to Apr. 17, 1939, nonrecording gage on bridge on State Highway 18, 500 ft downstream from railway bridge, at same datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 15,100 ft<sup>3</sup>/s, Apr. 27, 1997, gage height, 24.20 ft; maximum gage height, 24.51 ft, Apr. 21, 1997, backwater from ice; no flow at times.



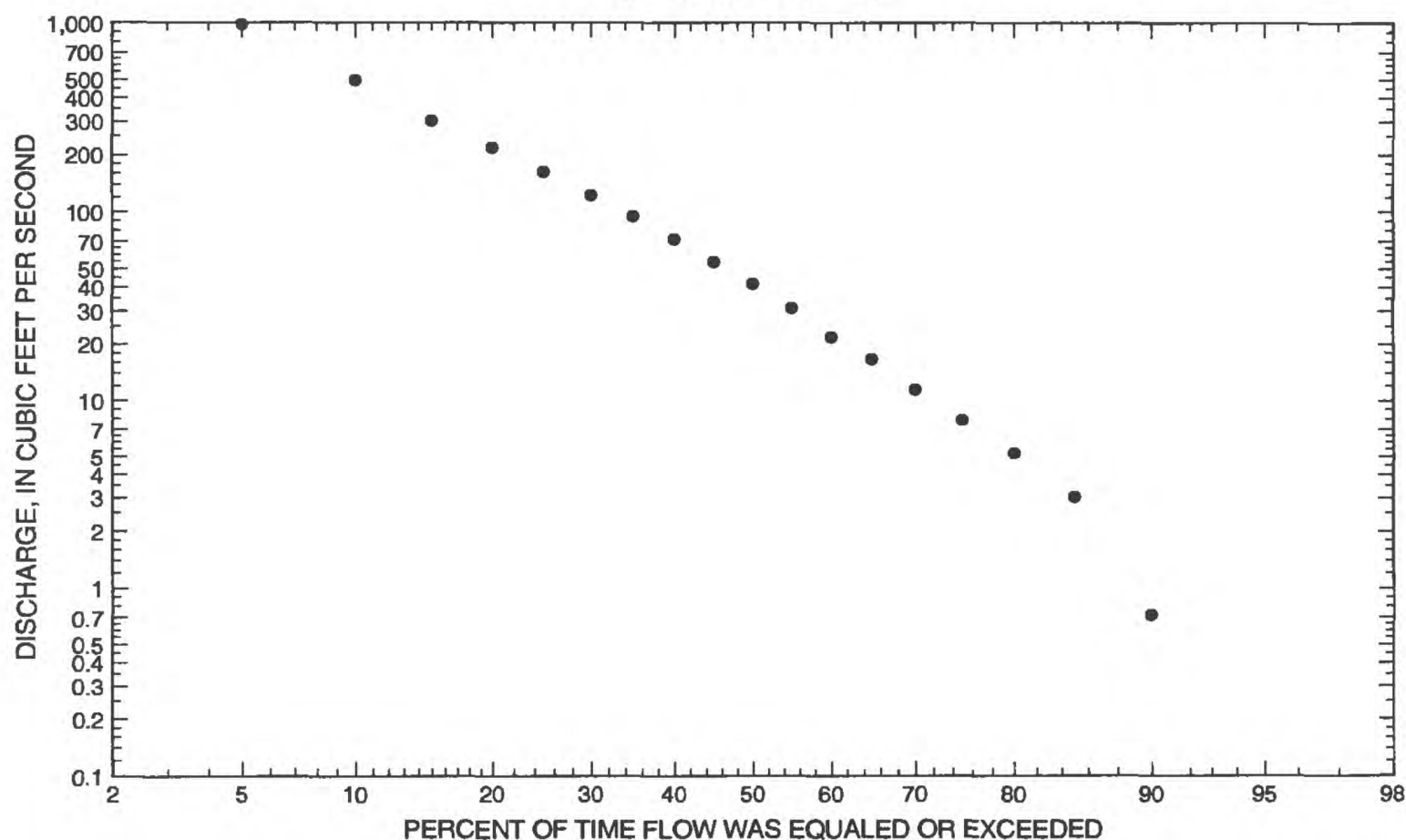
# 05100000 PEMBINA RIVER AT NECHE, ND--Continued

## Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean		Standard deviation (ft <sup>3</sup> /s)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)				
October	644	1995	0	m	75.6	93.4	1.24	2.96	
November	486	1995	0	m	49.0	65.0	1.33	1.92	
December	261	1995	0	m	23.2	35.4	1.53	0.91	
January	120	1995	0	m	12.0	17.5	1.46	0.47	
February	65.8	1995	0	m	8.39	11.5	1.37	0.33	
March	1,220	1995	0	m	99.8	192	1.92	3.90	
April	4,410	1997	24.7	1939	874	944	1.08	34.1	
May	4,770	1997	11.8	1939	717	962	1.34	28.0	
June	1,780	1974	6.56	1940	329	355	1.08	12.8	
July	1,510	1997	0	1940	182	229	1.26	7.10	
August	946	1993	0	1939	111	172	1.55	4.34	
September	648	1993	0	m	79.8	106	1.33	3.12	
Annual	1,120	1995	3.96	1939	215	218	1.01	100	

Annual flow duration





# 05100000 PEMBINA RIVER AT NECHE, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharged or equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	8.10	46.2	24.7	6.66	0.49	0	0.05	0.54	0	0
90	0.02	0	0	25.9	68.8	42.1	13.6	3.27	0.49	1.20	3.00	0.49	0.72
85	0.26	0	0.07	68.2	95.4	58.5	20.8	6.52	2.30	5.69	5.27	1.80	3.01
80	0.86	0.17	0.72	104	120	77.9	29.8	9.53	6.12	10.9	8.20	2.30	5.21
75	1.60	0.70	1.60	139	144	97.5	39.9	14.2	10.2	16.7	12.1	4.18	7.83
70	2.10	1.60	2.87	174	171	116	50.4	20.5	14.7	24.1	14.8	5.18	11.4
65	3.39	1.60	3.72	206	190	135	61.7	26.9	20.1	29.6	17.4	6.66	16.6
60	4.17	2.20	4.35	238	209	154	72.0	32.8	27.6	36.1	22.1	8.83	21.9
55	4.75	2.90	6.26	282	245	173	82.8	41.0	36.9	42.9	28.1	11.2	31.1
50	5.88	4.06	8.23	329	297	201	97.8	52.0	46.8	49.8	31.9	13.6	41.8
45	7.69	4.51	10.4	403	369	230	113	63.9	55.4	56.7	35.9	16.2	54.4
40	8.76	5.45	13.6	496	450	266	130	75.9	62.4	63.5	40.4	18.8	72.1
35	10.6	7.27	16.8	622	550	304	151	91.4	69.5	75.3	44.9	21.2	95.2
30	12.2	8.67	25.0	775	688	353	187	108	84.6	87.5	53.9	23.6	122
25	15.1	10.9	34.2	1,010	846	405	225	130	103	102	64.5	27.6	163
20	17.7	13.2	47.9	1,330	1,020	487	265	159	124	119	76.9	31.8	219
15	21.4	15.8	116	1,750	1,360	594	324	200	158	138	91.1	39.0	302
10	30.3	20.1	208	2,360	1,960	744	425	250	209	174	110	50.3	496
5	43.8	33.7	507	3,670	2,850	1,160	647	430	289	240	156	87.0	987



# 05100000 PEMBINA RIVER AT NECHE, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	70.8	59.8	51.0	40.8
0.95	1.05	265	174	148	121	96.6
0.90	1.11	396	276	235	190	151
0.80	1.25	638	476	406	324	258
0.50	2	1,560	1,290	1,100	867	695
0.20	5	3,720	3,270	2,820	2,230	1,800
0.10	10	5,790	5,210	4,490	3,580	2,910
0.04	25	9,210	8,390	7,260	5,880	4,810
0.02	50	12,400	11,300	9,800	8,040	6,620
0.01	100	16,100	14,700	12,800	10,600	8,780
0.005	200	20,500	18,600	16,200	13,600	11,300
0.002	500	27,200	ng	ng	ng	ng

# 05100000 PEMBINA RIVER AT NECHE, ND--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1904	May 2	20.90	4,300	1953	June 10	6.74	250
1905	April 5	9.80	1,370	1954	July 7	7.97	846
1906	April 4	9.00	800	1955	April 5	20.11	2,700
1907	May 14	13.60	2,190	1956	April 27	20.90	5,200
1908	April 10	7.70	927	1957	March 27	7.63	661
1910	March 15	6.50	685	1958	April 7	7.17	442
1911	March 23	8.90	900	1959	April 5	14.40	1,800
1912	July 29	8.50	1,000	1960	April 14	21.00	4,040
1913	April 7	21.50	3,870	1961	April 3	9.49	372
1914	April 18	4.80	388	1962	April 21	20.97	3,650
1915	April 7	6.20	180	1963	July 28	10.55	1,150
1919	April 15	15.10	2,430	1964	April 17	10.07	1,080
1920	April 19	7.10	361	1965	April 13	19.21	3,600
1921	April 13	7.40	733	1966	April 3	21.20	4,300
1922	April 7	--	1,300	1967	April 23	16.83	2,900
1923	April 20	17.80	3,120	1968	March 28	9.34	734
1924	April 20	6.70	674	1969	April 21	21.32	7,360
1925	March 28	18.30	2,350	1970	April 27	21.47	7,070
1926	July 6	5.00	318	1971	April 12	22.22	7,350
1927	May 12	17.80	3,110	1972	April 16	15.87	2,550
1928	March 25	--	1,270	1973	March 27	8.27	224
1929	March 21	9.00	750	1974	April 28	22.92	10,300
1930	April 8	19.00	2,900	1975	May 18	11.03	1,500
1931	April 9	13.00	1,580	1976	April 19	19.87	4,430
1932	April 9	13.60	1,240	1977	May 21	9.26	261
1933	May 26	--	1,180	1978	April 11	19.31	3,800
1934	April 9	9.76	780	1979	April 20	23.64	9,500
1935	June 18	5.38	364	1980	April 7	8.85	435
1936	April 15	17.34	2,530	1981	April 1	9.28	285
1937	June 8	4.32	237	1982	June 8	11.68	1,520
1938	March 20	8.11	730	1983	April 9	11.86	1,630
1939	April 4	6.30	52.0	1984	April 7	9.35	312
1940	April 20	7.97	816	1985	March 20	13.97	1,750
1941	April 14	18.23	2,830	1986	March 24	14.83	2,390
1942	April 7	19.96	3,550	1987	April 7	21.41	5,510
1943	March 27	12.82	1,400	1988	April 6	8.74	420
1944	August 6	--	1,200	1989	April 17	10.08	1,000
1945	March 29	16.54	2,440	1990	April 3	10.50	1,000
1946	March 24	16.27	2,070	1991	June 16	10.22	888
1947	April 11	10.19	1,320	1992	April 1	19.59	3,900
1948	April 21	20.36	3,770	1993	July 30	18.10	3,580
1949	April 22	20.83	5,010	1994	April 2	13.24	2,040
1950	April 20	21.58	10,700	1995	April 23	23.30	8,500
1951	April 7	14.95	2,000	1996	April 18	--	7,500
1952	April 3	8.18	550	1997	April 26	24.20	15,100

# 05100000 PEMBINA RIVER AT NECHE, ND--Continued

Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /a)
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 26	24.20	15,100	1975	May 18	11.03	1,500
1950	April 20	21.58	10,700	1943	March 27	12.82	1,400
1974	April 28	22.92	10,300	1905	April 5	9.80	1,370
1979	April 20	23.64	9,500	1947	April 11	10.19	1,320
1995	April 23	23.30	8,500	1922	April 7	--	1,300
1996	April 18	--	7,500	1928	March 25	--	1,270
1969	April 21	21.32	7,360	1932	April 9	13.60	1,240
1971	April 12	22.22	7,350	1944	August 6	--	1,200
1970	April 27	21.47	7,070	1933	May 26	--	1,180
1987	April 7	21.41	5,510	1963	July 28	10.55	1,150
1956	April 27	20.90	5,200	1964	April 17	10.07	1,080
1949	April 22	20.83	5,010	1912	July 29	8.50	1,000
1976	April 19	19.87	4,430	1989	April 17	10.08	1,000
1904	May 2	20.90	4,300	1990	April 3	10.50	1,000
1966	April 3	21.20	4,300	1908	April 10	7.70	927
1960	April 14	21.00	4,040	1911	March 23	8.90	900
1992	April 1	19.59	3,900	1991	June 16	10.22	888
1913	April 7	21.50	3,870	1954	July 7	7.97	846
1978	April 11	19.31	3,800	1940	April 20	7.97	816
1948	April 21	20.36	3,770	1906	April 4	9.00	800
1962	April 21	20.97	3,650	1934	April 9	9.76	780
1965	April 13	19.21	3,600	1929	March 21	9.00	750
1993	July 30	18.10	3,580	1968	March 28	9.34	734
1942	April 7	19.96	3,550	1921	April 13	7.40	733
1923	April 20	17.80	3,120	1938	March 20	8.11	730
1927	May 12	17.80	3,110	1910	March 15	6.50	685
1930	April 8	19.00	2,900	1924	April 20	6.70	674
1967	April 23	16.83	2,900	1957	March 27	7.63	661
1941	April 14	18.23	2,830	1952	April 3	8.18	550
1955	April 5	20.11	2,700	1958	April 7	7.17	442
1972	April 16	15.87	2,550	1980	April 7	8.85	435
1936	April 15	17.34	2,530	1988	April 6	8.74	420
1945	March 29	16.54	2,440	1914	April 18	4.80	388
1919	April 15	15.10	2,430	1961	April 3	9.49	372
1986	March 24	14.83	2,390	1935	June 18	5.38	364
1925	March 28	18.30	2,350	1920	April 19	7.10	361
1907	May 14	13.60	2,190	1926	July 6	5.00	318
1946	March 24	16.27	2,070	1984	April 7	9.35	312
1994	April 2	13.24	2,040	1981	April 1	9.28	285
1951	April 7	14.95	2,000	1977	May 21	9.26	261
1959	April 5	14.40	1,800	1953	June 10	6.74	250
1985	March 20	13.97	1,750	1937	June 8	4.32	237
1983	April 9	11.86	1,630	1973	March 27	8.27	224
1931	April 9	13.00	1,580	1915	April 7	6.20	180
1982	June 8	11.68	1,520	1939	April 4	6.30	52.0

# 05100000 PEMBINA RIVER AT NECHE, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1903	--	--	--	--	--	--	--	201.7	149.0	60.3	33.0	33.0	--
1904	40.0	30.0	15.0	8.00	4.00	2.00	1,490	2,640	1,693	838.8	384.8	301.7	621.1
1905	235.0	170.0	130.0	59.0	20.0	200.0	480.0	447.4	485.3	206.1	97.0	93.9	219.3
1906	118.8	80.0	20.0	10.0	5.00	2.00	408.0	192.5	271.4	175.1	130.8	147.2	130.0
1907	143.9	97.0	15.0	5.00	2.00	3.00	170.0	1,601	507.2	155.8	54.3	34.8	234.7
1908	55.2	38.0	19.0	6.00	3.00	3.00	328.0	473.9	223.9	87.8	52.1	60.9	112.6
1909	--	--	--	--	--	--	--	--	329.0	129.0	48.3	27.7	--
1910	45.9	35.0	5.00	3.00	2.00	211.0	165.5	119.8	60.4	34.9	6.87	3.93	58.1
1911	6.39	3.00	2.00	1.00	0.500	198.0	293.7	230.6	153.9	49.2	24.1	5.73	81.0
1912	19.6	15.0	10.0	5.00	2.00	7.00	158.2	174.2	148.3	129.1	85.5	180.7	77.8
1913	191.1	120.0	50.0	20.0	10.0	5.00	1,674	529.5	191.1	106.5	69.5	61.8	251.5
1914	63.6	50.0	20.0	10.0	10.0	50.0	271.7	220.1	134.5	48.4	13.4	12.9	75.5
1915	31.7	21.1	9.00	6.00	5.00	9.00	45.7	25.3	24.6	20.3	8.74	7.77	17.9
1919	--	--	--	--	--	--	820.8	376.9	164.0	87.0	29.7	34.4	--
1920	88.5	65.0	30.0	20.0	15.0	28.0	178.5	228.2	148.6	76.7	17.6	18.3	76.2
1921	126.6	95.0	60.0	30.0	20.0	20.0	358.1	168.6	96.6	113.1	18.8	16.2	93.7
1922	106.2	53.6	30.0	8.00	4.50	40.9	449.8	242.9	139.5	26.5	9.35	38.5	95.7
1923	68.0	73.9	33.0	20.0	10.0	11.0	1,145	1,130	315.0	86.3	89.2	104.3	257.5
1924	113.9	90.3	23.0	4.00	3.00	7.00	219.5	156.5	98.5	54.0	14.4	20.5	67.0
1925	169.1	105.5	20.0	2.00	2.00	384.8	420.2	196.6	252.9	113.5	19.0	55.1	145.6
1926	143.1	67.0	25.0	12.0	3.00	58.5	145.2	100.5	96.0	93.0	13.3	47.6	67.3
1927	58.5	43.0	31.0	15.0	4.00	281.2	1,046	1,160	569.7	302.9	189.7	272.5	332.2
1928	230.0	123.2	50.0	40.0	25.0	322.5	357.2	208.6	180.8	152.0	59.4	71.6	152.0
1929	121.5	44.8	22.4	12.0	8.00	183.5	219.7	109.9	79.4	6.21	3.85	4.77	68.3
1930	19.0	45.8	8.00	2.00	1.00	1.00	928.0	458.0	215.8	85.7	15.9	11.9	148.9
1931	25.8	11.2	2.70	7.20	6.60	45.2	462.9	102.7	22.3	10.8	2.07	0.390	58.0
1932	0.635	4.92	1.04	0.132	3.45	14.1	422.9	185.7	71.2	21.1	6.10	1.84	60.7
1933	7.53	8.02	2.71	0	0	17.9	720.7	554.5	319.8	74.5	27.2	28.9	146.7
1934	47.2	24.1	9.60	4.74	4.81	75.2	343.3	153.5	67.7	19.9	1.37	0.100	62.6
1935	1.68	1.07	0.084	0	0	12.6	144.1	64.2	108.2	62.4	23.5	14.9	36.0
1936	14.0	5.01	2.19	0.568	0.038	0	681.3	428.4	196.5	57.0	20.7	25.3	118.7
1937	14.1	7.08	3.53	0.555	0	0	112.1	74.8	65.5	14.3	12.5	0.403	25.4
1938	0.813	0.363	0.168	0	0	179.4	101.0	78.3	36.6	12.5	0.052	0	34.4
1939	0	0	0	0	0	0	24.7	11.8	10.8	0.603	0	0	3.96
1940	0	0	0	0	0	0	94.0	35.5	6.56	0	7.06	0	11.8



# 05100000 PEMBINA RIVER AT NECHE, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1941	0	0	0	0	0	0	995.8	384.5	174.5	61.7	28.1	134.6	147.5
1942	121.8	51.8	26.3	3.53	1.09	45.7	1,900	977.1	365.0	129.2	100.1	68.4	315.4
1943	50.6	33.9	9.51	6.51	5.45	155.1	500.6	301.9	314.7	226.5	206.9	180.9	166.4
1944	122.9	72.0	39.7	7.37	3.65	3.74	273.9	203.7	255.2	563.8	810.9	463.0	235.9
1945	203.2	233.7	105.0	42.9	49.5	740.8	1,080	759.4	439.3	257.0	142.4	96.4	346.9
1946	66.8	35.6	21.7	8.98	8.96	568.4	674.0	290.2	113.4	67.5	32.0	20.3	159.7
1947	29.5	22.8	7.39	1.76	1.20	1.03	609.0	291.9	199.8	87.9	122.4	65.0	119.8
1948	53.5	28.1	15.4	14.1	5.48	5.03	930.2	888.5	412.9	312.0	197.0	117.2	248.3
1949	66.6	45.7	20.6	12.8	12.0	11.5	2,428	1,569	656.9	272.5	142.4	69.1	441.9
1950	56.6	41.7	17.8	8.81	7.04	9.58	1,804	2,887	1,211	598.4	408.3	222.5	608.7
1951	151.8	87.8	37.4	31.5	25.0	38.4	844.5	512.7	265.6	120.2	67.3	48.6	185.8
1952	28.9	15.7	7.29	1.29	1.00	1.28	283.5	204.4	123.0	70.5	20.6	4.52	63.4
1953	3.58	6.05	1.36	0.216	0.100	0.926	71.1	46.5	157.6	90.8	64.0	14.7	38.1
1954	8.82	9.57	3.65	1.06	0.318	9.25	94.6	80.6	389.8	686.6	401.2	205.7	158.7
1955	143.9	76.5	28.0	10.5	16.1	13.6	1,511	854.5	579.3	303.6	109.1	57.0	308.3
1956	53.3	25.0	14.5	8.84	8.55	12.1	1,180	2,264	881.2	377.2	182.5	139.7	429.8
1957	100.0	63.2	20.0	15.7	7.68	118.4	275.4	202.1	134.9	63.9	77.6	116.5	99.8
1958	165.2	86.7	61.5	35.1	21.1	24.2	205.5	125.5	38.8	31.9	5.19	2.31	67.1
1959	5.34	3.82	0.326	0.145	0.100	0.748	500.3	166.4	140.0	39.8	18.0	10.8	73.4
1960	31.9	61.7	100.3	66.0	39.7	23.0	1,833	1,252	480.5	203.3	94.3	44.0	351.4
1961	26.6	19.4	5.28	4.36	1.96	49.1	268.4	182.6	56.7	13.6	2.42	3.64	52.9
1962	4.23	3.09	0.958	0.403	0.132	1.03	672.8	377.5	296.5	114.6	83.1	99.8	137.6
1963	62.2	31.5	22.1	18.4	1.67	91.1	196.7	192.0	268.5	171.9	127.1	74.3	105.2
1964	45.4	22.0	6.60	3.29	3.22	2.74	328.8	328.5	203.4	73.1	49.6	57.3	93.5
1965	43.9	22.7	6.98	4.41	3.72	2.76	862.6	701.7	453.5	181.6	74.7	94.5	204.4
1966	85.0	51.0	34.1	21.5	16.4	139.1	1,547	964.9	389.5	241.8	113.3	44.7	304.2
1967	25.9	15.8	7.27	8.10	8.40	26.6	921.7	1,010	317.9	105.1	38.4	13.3	208.6
1968	22.1	19.2	6.26	2.60	1.80	155.8	204.9	143.6	70.0	43.7	138.4	342.8	95.7
1969	377.8	191.1	56.4	23.3	17.0	23.5	3,146	1,805	621.5	364.1	183.5	121.2	577.3
1970	80.8	58.4	29.3	17.4	15.2	11.8	1,613	2,313	1,465	809.9	322.4	180.1	578.2
1971	118.4	77.5	24.4	14.6	13.8	16.1	2,398	1,517	581.0	343.7	266.2	157.3	460.6
1972	104.6	69.9	34.5	17.3	10.9	395.6	1,330	891.7	356.6	198.9	178.0	110.8	308.2
1973	74.9	35.2	8.47	2.81	2.70	90.7	101.3	71.0	51.3	63.5	61.6	62.0	52.4
1974	60.8	38.5	20.8	10.6	6.20	11.7	3,028	4,618	1,777	529.9	149.6	99.0	865.4
1975	64.8	38.8	21.6	11.9	7.29	8.21	361.8	1,221	664.7	264.1	100.8	50.1	236.0



# 05100000 PEMBINA RIVER AT NECHE, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1976	44.0	28.2	12.0	13.2	15.0	30.7	2,766	1,450	502.5	251.7	85.2	41.2	434.6
1977	28.0	14.7	2.53	2.19	2.30	15.3	69.2	80.0	49.0	18.9	5.74	25.5	26.2
1978	29.1	10.9	6.01	3.01	0.429	0.063	1,170	519.0	194.6	68.1	46.8	49.8	174.3
1979	24.9	11.7	5.06	3.74	3.27	4.76	1,991	3,284	867.0	288.5	80.4	62.0	554.7
1980	45.8	27.5	13.2	6.45	5.03	5.83	205.0	84.3	36.6	11.2	11.5	12.9	38.6
1981	21.0	24.9	5.81	1.37	25.1	112.2	220.7	137.2	65.7	28.2	14.1	6.27	55.2
1982	13.9	11.1	3.65	0.989	0.019	33.4	605.2	644.5	520.8	261.5	133.8	61.2	191.2
1983	81.3	28.8	20.7	12.8	5.42	172.3	917.7	456.2	274.6	73.1	22.9	12.6	173.1
1984	24.4	19.0	2.39	0.534	0	25.6	148.1	164.0	138.3	32.9	6.99	2.31	47.0
1985	7.24	4.45	2.26	0.065	0	494.5	832.0	264.6	136.6	136.3	81.4	45.1	167.5
1986	56.5	42.1	17.8	15.2	8.41	571.4	927.2	771.6	382.5	179.2	133.4	65.4	265.4
1987	49.5	17.4	12.2	13.6	17.3	48.5	1,997	878.4	264.3	113.8	61.7	64.8	294.0
1988	65.8	36.1	18.3	4.23	2.17	44.4	145.9	53.9	16.5	3.27	0.439	0.101	32.6
1989	0.400	2.67	3.06	0.182	0	0	177.8	102.8	56.2	12.9	0.588	0	29.6
1990	0	4.25	0.003	0	0	0.823	316.1	122.3	185.1	60.0	6.16	0.194	57.6
1991	0.043	1.15	0.095	0.019	0	9.25	74.9	73.5	148.1	260.3	99.2	17.5	57.4
1992	12.1	11.2	8.48	8.17	8.06	438.1	2,554	889.2	230.7	90.4	29.0	11.9	355.8
1993	9.13	12.9	7.35	4.74	3.46	31.7	540.2	293.2	206.5	648.7	946.3	648.4	280.9
1994	319.0	187.6	105.1	46.6	36.2	395.4	1,146	543.6	234.3	176.8	114.8	187.1	291.5
1995	643.5	486.1	260.6	120.0	65.8	1,216	4,382	3,183	1,291	478.9	881.8	345.7	1,116
1996	155.9	79.5	45.5	23.1	13.1	14.6	3,164	2,784	917.1	419.0	308.1	184.0	674.7
1997	131.2	77.7	40.2	39.5	37.1	38.9	4,412	4,770	968.9	1,509	431.8	164.0	1,056

## 05101000 TONGUE RIVER AT AKRA, ND

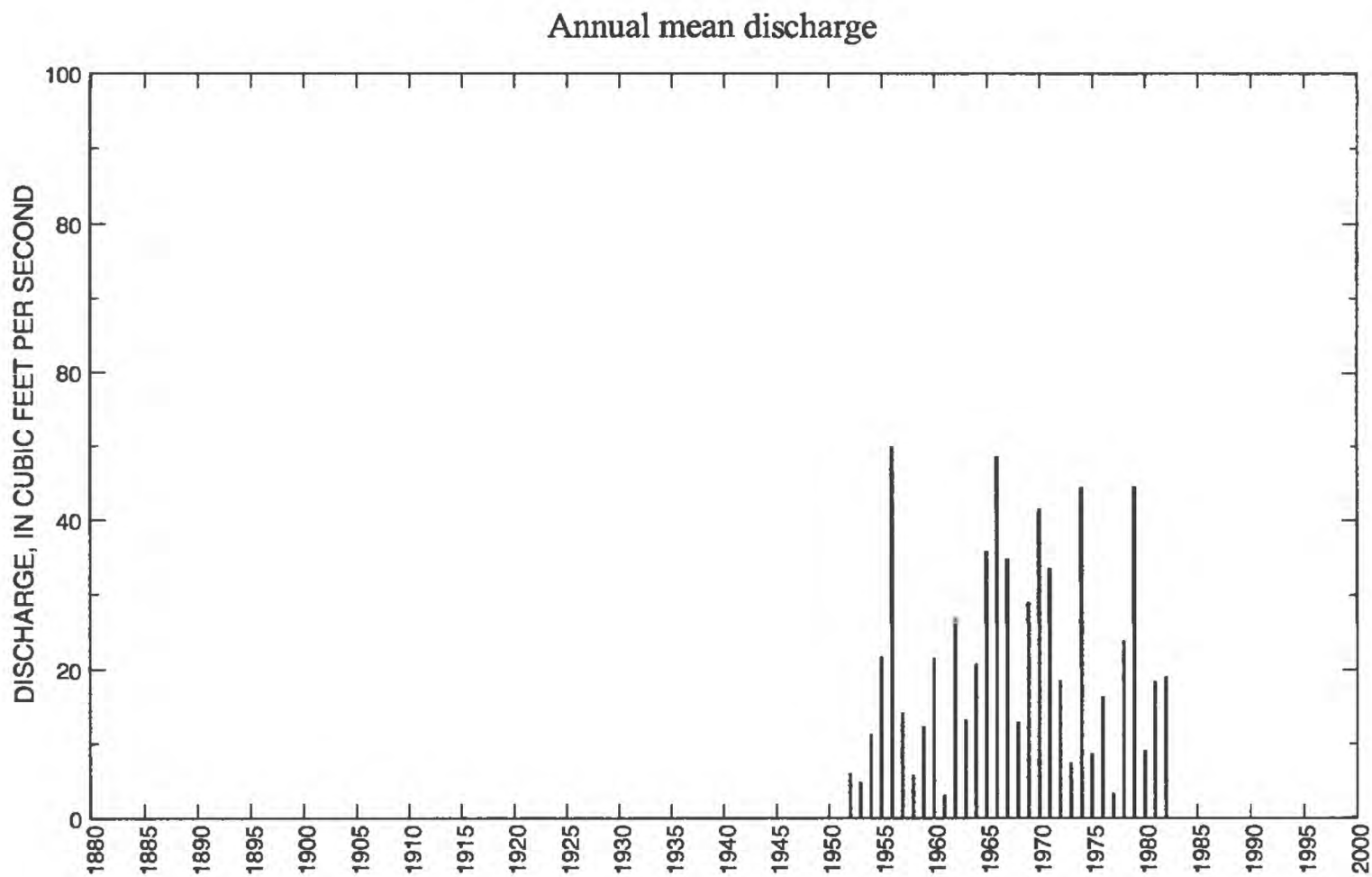
LOCATION.--Lat 48°46'42", long 97°44'43", in SW<sup>1</sup>/<sub>4</sub> sec.10, T.161 N., R.55 W., Pembina County, Hydrologic Unit 09020313, on left bank 300 ft downstream from Renwick Dam, 0.9 mi northwest of Akra, and 6 mi west of Cavalier.

DRAINAGE AREA.--160 mi<sup>2</sup>.

PERIOD OF RECORD.--April to June 1950 (Water Supply Paper 1137-B), October 1951 to current year. Seasonal record since 1983.

GAGE.--Water-stage recorder. Datum of gage is 930.00 ft above sea level. Prior to July 10, 1954, nonrecording gage 1.2 mi downstream at datum 30.00 ft lower. July 23, 1954, to Dec. 19, 1973, water stage recorder 2.7 mi downstream at datum 9.10 ft lower.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 11,800 ft<sup>3</sup>/s, Apr. 18, 1950, site and datum then in use, from indirect measurement of peak flow, gage height, 48.70 ft, from floodmark; no flow at times.

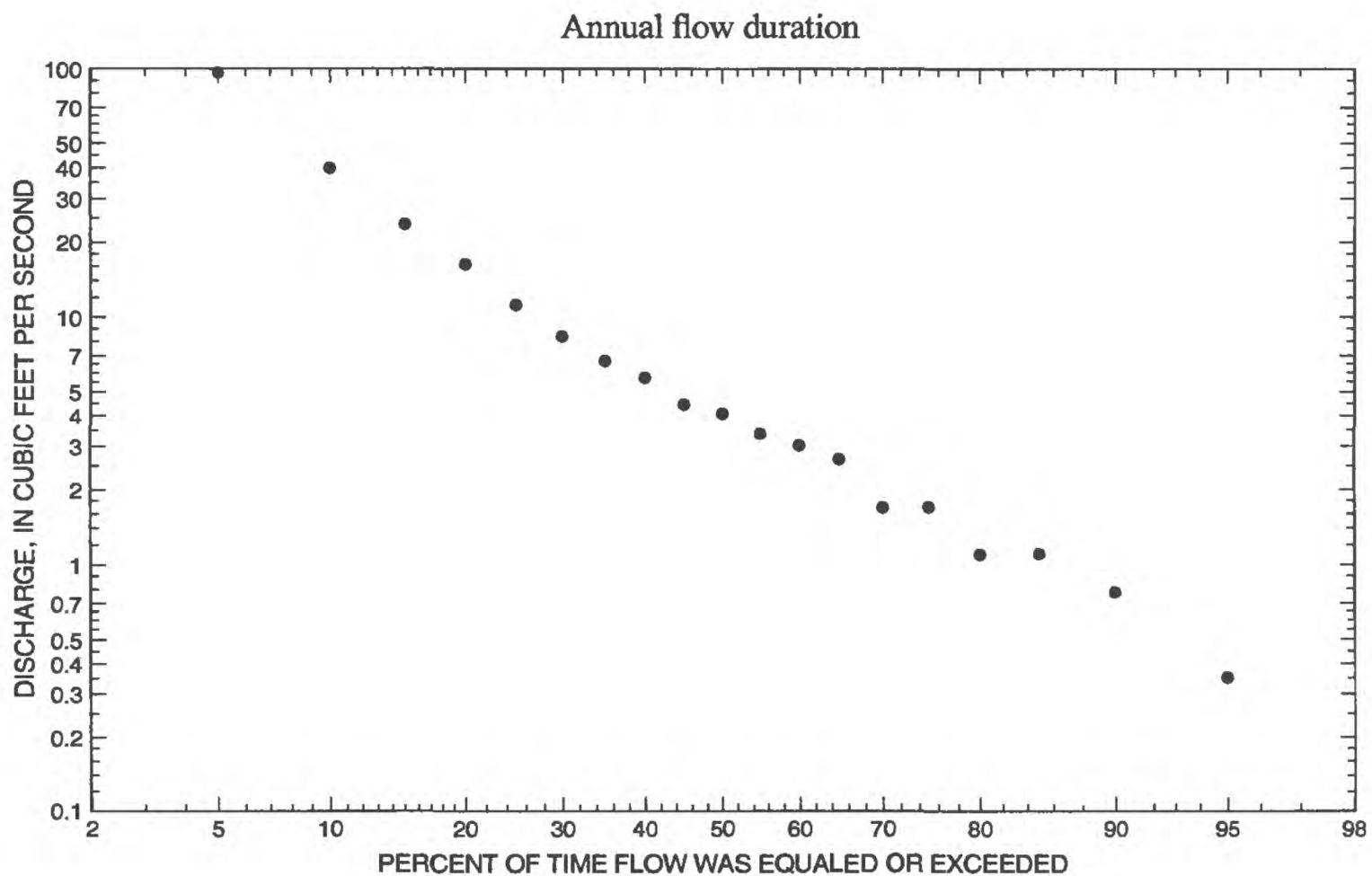


# 05101000 TONGUE RIVER AT AKRA, ND--Continued

Post-regulation period, 1955-97

Statistics of monthly and annual mean discharges, post-regulation period

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /s)	Coeffi- cient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	30.1	1981	0.513	1962	6.70	6.60	0.98	2.45
November	22.7	1981	0.560	1976	7.26	5.17	0.71	2.65
December	12.9	1971	0.700	1976	4.82	3.25	0.68	1.76
January	7.27	1971	1.23	1955	3.42	1.70	0.50	1.25
February	18.7	1981	0.571	1962	3.91	3.58	0.92	1.43
March	135	1966	0.216	1964	24.0	30.6	1.28	8.75
April	318	1997	0.428	1991	117	97.8	0.84	42.8
May	293	1997	1.63	1980	56.8	73.2	1.29	20.8
June	78.7	1964	0.473	1988	18.3	18.9	1.03	6.69
July	216	1997	0.086	1978	16.9	35.6	2.11	6.17
August	144	1993	0.208	1988	7.98	21.8	2.73	2.92
September	28.3	1980	0.096	1989	6.62	7.30	1.10	2.42
Annual	50.1	1956	3.11	1961	22.9	14.1	0.62	100



# 05101000 TONGUE RIVER AT AKRA, ND--Continued

Monthly and annual flow duration, in cubic feet per second, post-regulation period

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0.97	0.60	0.16	0.47	2.10	0.30	0.13	0.16	0.14	0.47	1.10	0.64	0.47
90	1.20	0.70	0.43	1.90	4.23	1.40	0.45	0.40	0.24	0.69	1.40	1.20	0.67
85	1.30	1.10	1.20	6.34	5.61	1.90	1.10	0.54	0.44	1.00	1.80	1.30	0.96
80	1.60	1.30	1.50	9.74	6.65	3.14	1.50	0.73	0.58	1.30	2.20	1.70	1.40
75	1.80	1.50	1.50	13.0	8.41	3.70	2.10	0.98	0.78	1.50	2.20	1.90	1.90
70	2.00	1.80	1.90	16.9	10.3	4.29	2.10	1.30	1.00	1.80	2.80	2.40	1.90
65	2.00	1.80	3.10	21.5	13.1	5.15	3.27	1.30	1.40	2.20	2.80	2.80	2.89
60	2.40	1.80	3.10	26.8	15.6	5.67	3.70	1.80	1.90	2.70	3.60	3.10	3.30
55	2.40	2.10	4.29	33.2	18.2	7.24	4.19	1.80	2.50	3.30	4.68	3.10	3.90
50	3.00	2.50	5.18	46.7	20.9	8.40	4.73	2.40	2.50	3.30	5.09	3.50	4.32
45	3.30	2.90	5.85	60.4	24.1	10.5	6.04	2.40	3.83	4.00	5.49	4.00	4.75
40	3.30	3.40	8.72	76.7	29.0	12.4	7.10	3.42	4.56	5.17	6.36	4.50	6.14
35	3.70	3.40	13.4	95.0	35.7	14.4	8.09	3.92	5.36	5.84	7.41	4.50	7.15
30	4.10	4.00	18.2	118	44.7	16.4	9.06	4.57	6.82	6.55	7.89	5.70	9.49
25	4.50	4.00	25.0	147	57.2	20.5	12.3	5.29	7.80	7.74	9.43	5.70	12.6
20	4.50	4.00	32.7	183	73.7	26.2	15.9	7.42	9.71	9.93	11.0	6.50	16.8
15	5.00	5.90	42.8	261	100	34.0	21.1	9.73	12.5	12.8	13.9	7.95	24.7
10	5.60	6.91	56.1	381	157	48.7	29.9	13.0	16.9	15.7	16.6	9.57	43.8
5	6.80	11.5	116	511	283	74.9	53.9	19.9	24.6	21.3	21.3	13.3	108

## 05101000 TONGUE RIVER AT AKRA, ND--Continued

Probability of occurrence of annual high discharges, post-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /a)	Maximum mean discharge (ft <sup>3</sup> /a) <sup>1</sup>			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	12.3	<sup>2</sup> 11.8	10.9	8.45	5.87
0.95	1.05	34.5	<sup>2</sup> 33.7	32.3	23.9	16.4
0.90	1.11	56.9	<sup>2</sup> 55.7	54.2	39.6	27.1
0.80	1.25	100	<sup>2</sup> 98.0	95.8	69.4	47.3
0.50	2	261	<sup>2</sup> 251	242	177	121
0.20	5	582	<sup>2</sup> 560	502	380	261
0.10	10	836	789	682	532	368
0.04	25	1,180	1,030	900	727	507
0.02	50	1,450	1,190	1,050	870	610
0.01	100	1,710	1,330	1,190	1,010	711
0.005	200	1,970	1,460	1,310	1,140	808
0.002	500	2,310	ng	ng	ng	ng

<sup>1</sup>Statistics computed using period of daily value record 1955-82.

<sup>2</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.



# 05101000 TONGUE RIVER AT AKRA, ND--Continued

Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1950	April 18	48.70	11,800	1975	April 25	10.38	76.0
1952	April 1	38.48	260	1976	April 9	13.31	313
1953	May 31	35.86	178	1977	July 18	10.40	64.0
1954	June 12	35.53	187	1978	April 10	14.28	429
1955	April 2	13.23	700	1979	April 22	16.75	900
1956	April 19	14.23	1,350	1980	April 6	11.86	180
1957	March 22	6.12	340	1981	March 25	10.73	76.0
1958	July 5	2.38	78.0	1982	April 14	12.95	308
1959	April 5	9.04	485	1983	April 8	12.89	354
1960	April 14	8.67	654	1984	April 14	12.89	33.0
1961	March 27	4.56	60.0	1985	March 20	12.13	243
1962	April 23	7.03	473	1986	March 25	12.35	275
1963	June 12	4.57	210	1987	April 8	13.79	480
1964	June 20	5.38	286	1988	April 6	8.71	38.0
1965	April 14	8.10	580	1989	April 24	9.48	49.0
1966	April 2	7.35	492	1990	April 24	8.82	15.0
1967	May 9	6.28	412	1991	June 19	9.45	35.0
1968	March 27	5.55	160	1992	March 9	10.77	80.0
1969	April 14	7.85	606	1993	July 29	14.11	492
1970	April 29	7.99	567	1994	April 12	14.11	138
1971	April 12	7.75	568	1995	March 21	12.98	341
1972	April 16	5.79	325	1996	April 19	14.21	523
1973	March 24	9.85	118	1997	April 23	16.05	737
1974	April 22	15.61	595				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1950	April 18	48.70	11,800	1983	April 8	12.89	354
1956	April 19	14.23	1,350	1995	March 21	12.98	341
1979	April 22	16.75	900	1957	March 22	6.12	340
1997	April 23	16.05	737	1972	April 16	5.79	325
1955	April 2	13.23	700	1976	April 9	13.31	313
1960	April 14	8.67	654	1982	April 14	12.95	308
1969	April 14	7.85	606	1964	June 20	5.38	286
1974	April 22	15.61	595	1986	March 25	12.35	275
1965	April 14	8.10	580	1952	April 1	38.48	260
1971	April 12	7.75	568	1985	March 20	12.13	243
1970	April 29	7.99	567	1963	June 12	4.57	210
1996	April 19	14.21	523	1954	June 12	35.53	187
1966	April 2	7.35	492	1980	April 6	11.86	180
1993	July 29	14.11	492	1953	May 31	35.86	178
1959	April 5	9.04	485	1968	March 27	5.55	160
1987	April 8	13.79	480	1994	April 12	14.11	138
1962	April 23	7.03	473	1973	March 24	9.85	118
1978	April 10	14.28	429	1992	March 9	10.77	80.0
1967	May 9	6.28	412	1958	July 5	2.38	78.0

## 05101000 TONGUE RIVER AT AKRA, ND--Continued

Annual peak discharge and corresponding gage height--Continued

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height--Continued							
1975	April 25	10.38	76.0	1988	April 6	8.71	38.0
1981	March 25	10.73	76.0	1991	June 19	9.45	35.0
1977	July 18	10.40	64.0	1984	April 14	12.89	33.0
1961	March 27	4.56	60.0	1990	April 24	8.82	15.0
1989	April 24	9.48	49.0				

# 05101000 TONGUE RIVER AT AKRA, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1951	--	--	--	--	--	--	450.9	586.9	40.7	--	--	--	--
1952	3.54	2.81	2.07	1.25	1.00	4.57	46.8	5.90	1.91	1.24	0.542	0.583	5.97
1953	1.25	0.880	0.065	0.506	0.236	2.03	9.84	18.9	15.5	2.41	4.64	1.68	4.84
1954	2.59	2.52	1.24	0.635	1.09	7.06	36.0	18.5	51.7	4.13	3.09	7.32	11.3
1955	5.54	4.68	1.92	1.23	1.60	1.61	167.5	18.1	22.5	34.9	2.01	1.95	21.8
1956	17.4	4.39	3.03	3.40	4.23	3.92	294.2	208.8	32.7	13.9	4.69	11.8	50.1
1957	5.77	15.8	5.90	2.88	1.50	40.1	28.5	21.5	13.2	6.25	7.78	20.6	14.2
1958	6.21	5.53	3.34	2.21	2.38	9.41	15.6	6.38	3.95	11.9	1.12	0.953	5.77
1959	2.70	2.21	1.70	2.10	1.86	5.54	100.0	20.2	7.91	2.65	0.994	2.45	12.4
1960	3.71	3.06	3.37	2.64	2.03	1.85	196.6	38.2	6.22	2.23	1.09	1.00	21.6
1961	1.76	3.14	1.26	1.37	0.829	13.7	9.20	3.93	0.733	0.465	0.477	0.277	3.11
1962	0.513	2.51	2.00	1.28	0.571	0.494	128.9	81.7	66.8	21.3	9.92	7.42	26.9
1963	9.45	12.8	1.51	4.86	5.22	5.16	11.4	9.50	67.4	17.0	8.44	7.34	13.3
1964	6.18	3.82	6.55	2.01	1.43	0.216	83.2	35.6	78.7	17.8	4.38	11.0	20.8
1965	19.0	10.5	5.41	4.46	2.59	5.58	214.6	107.1	36.4	10.6	5.91	9.67	35.9
1966	14.1	8.21	9.74	5.15	3.04	134.9	206.1	143.9	13.3	31.4	8.20	3.52	48.7
1967	7.71	13.2	4.77	3.05	2.88	35.1	159.0	181.2	1.91	2.94	0.871	3.21	34.8
1968	1.14	4.85	10.2	6.12	5.12	19.9	26.3	38.4	15.9	14.3	7.98	5.27	13.0
1969	7.19	9.02	9.03	2.34	3.25	6.34	256.4	37.3	10.8	7.66	1.17	0.561	29.0
1970	0.783	5.40	7.60	6.40	6.37	5.52	215.6	190.8	46.5	6.45	4.25	3.18	41.6
1971	7.75	14.3	12.9	7.27	2.11	1.88	253.1	39.8	46.7	15.2	2.16	1.09	33.5
1972	2.45	12.3	3.53	2.16	3.45	50.9	110.1	22.6	5.36	5.29	2.50	3.02	18.6
1973	5.73	3.88	3.14	3.43	3.80	36.0	13.7	8.53	4.03	3.51	1.28	0.883	7.37
1974	3.07	3.52	4.37	4.29	3.20	11.4	246.9	224.8	27.3	2.77	0.972	0.653	44.5
1975	4.10	9.31	6.75	5.37	4.52	3.67	31.2	27.6	3.17	3.02	3.34	2.67	8.73
1976	1.46	0.560	0.700	3.99	4.56	4.73	141.8	5.45	30.8	1.79	2.00	1.62	16.4
1977	1.22	2.23	1.95	1.72	1.66	7.09	4.03	4.26	4.30	7.67	1.60	2.08	3.33
1978	3.54	8.24	10.3	3.65	9.07	13.7	205.6	30.8	3.48	0.086	0.805	0.206	23.9
1979	2.87	2.29	1.31	1.65	8.35	19.2	249.7	184.1	23.3	18.2	4.06	20.2	44.6
1980	5.19	5.39	4.90	4.74	4.21	7.27	37.1	1.63	0.828	0.741	9.62	28.3	9.09
1981	30.1	22.7	5.08	4.60	18.7	28.8	47.3	19.9	19.6	6.28	6.63	13.6	18.5
1982	11.0	9.38	2.74	1.29	0.834	12.7	97.9	37.6	27.6	14.8	6.04	7.77	19.1
1983	--	--	--	--	--	54.6	111.5	18.6	7.82	3.51	1.56	2.85	--
1984	--	--	--	--	--	2.67	22.1	9.32	7.83	7.86	0.900	3.26	--
1985	--	--	--	--	--	76.9	56.0	13.0	11.0	12.0	28.9	17.9	--

# 05101000 TONGUE RIVER AT AKRA, ND--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1986	--	--	--	--	--	82.3	124.9	68.0	10.8	22.8	10.9	19.6	--
1987	--	--	--	--	--	39.6	269.7	20.5	7.61	3.28	0.821	1.64	--
1988	--	--	--	--	--	5.27	14.1	6.81	0.473	0.453	0.208	0.244	--
1989	--	--	--	--	--	15.5	14.4	4.96	5.04	0.936	1.54	0.096	--
1990	--	--	--	--	--	1.55	6.27	6.76	6.12	1.95	1.43	1.41	--
1991	--	--	--	--	--	0.734	0.428	10.5	17.4	6.10	6.29	3.69	--
1992	--	--	--	--	--	34.4	21.3	15.6	7.66	8.52	3.45	7.19	--
1993	--	--	--	--	--	20.8	48.0	32.1	23.6	107.3	143.7	25.9	--
1994	--	--	--	--	--	40.2	71.7	12.5	3.13	5.16	9.67	4.39	--
1995	--	--	--	--	--	119.6	153.4	39.2	9.00	17.7	4.72	8.42	--
1996	--	--	--	--	--	33.8	250.7	143.7	27.5	31.0	8.10	7.31	--
1997	--	--	--	--	--	15.7	317.8	293.3	20.7	216.4	10.7	8.36	--

## 05102490 RED RIVER OF THE NORTH AT PEMBINA, ND

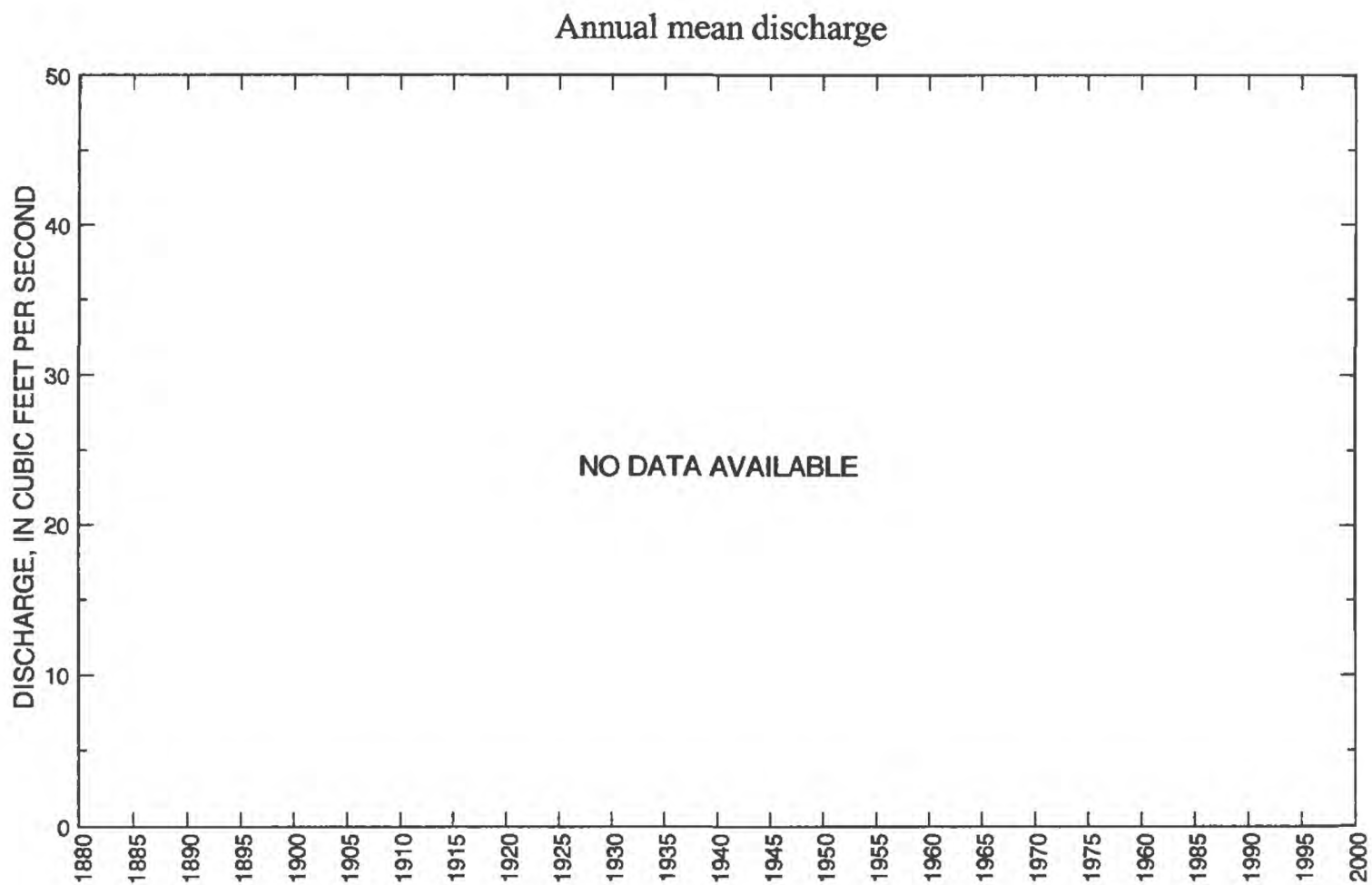
LOCATION.--Lat 48°58'17", long 97°14'16", in NE<sup>1</sup>/<sub>4</sub> sec.4, T.163 N., R.51 W., Pembina County, Hydrologic Unit 09020311, on bridge crossing the Red River of the North 0.2 mi north of Pembina.

DRAINAGE AREA.--40,200 mi<sup>2</sup>.

PERIOD OF RECORD.--Water year 1985 to current year.

GAGE.--Crest-stage gage.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 141,000 ft<sup>3</sup>/s, Apr. 26, 1997, gage height, 794.39 ft.





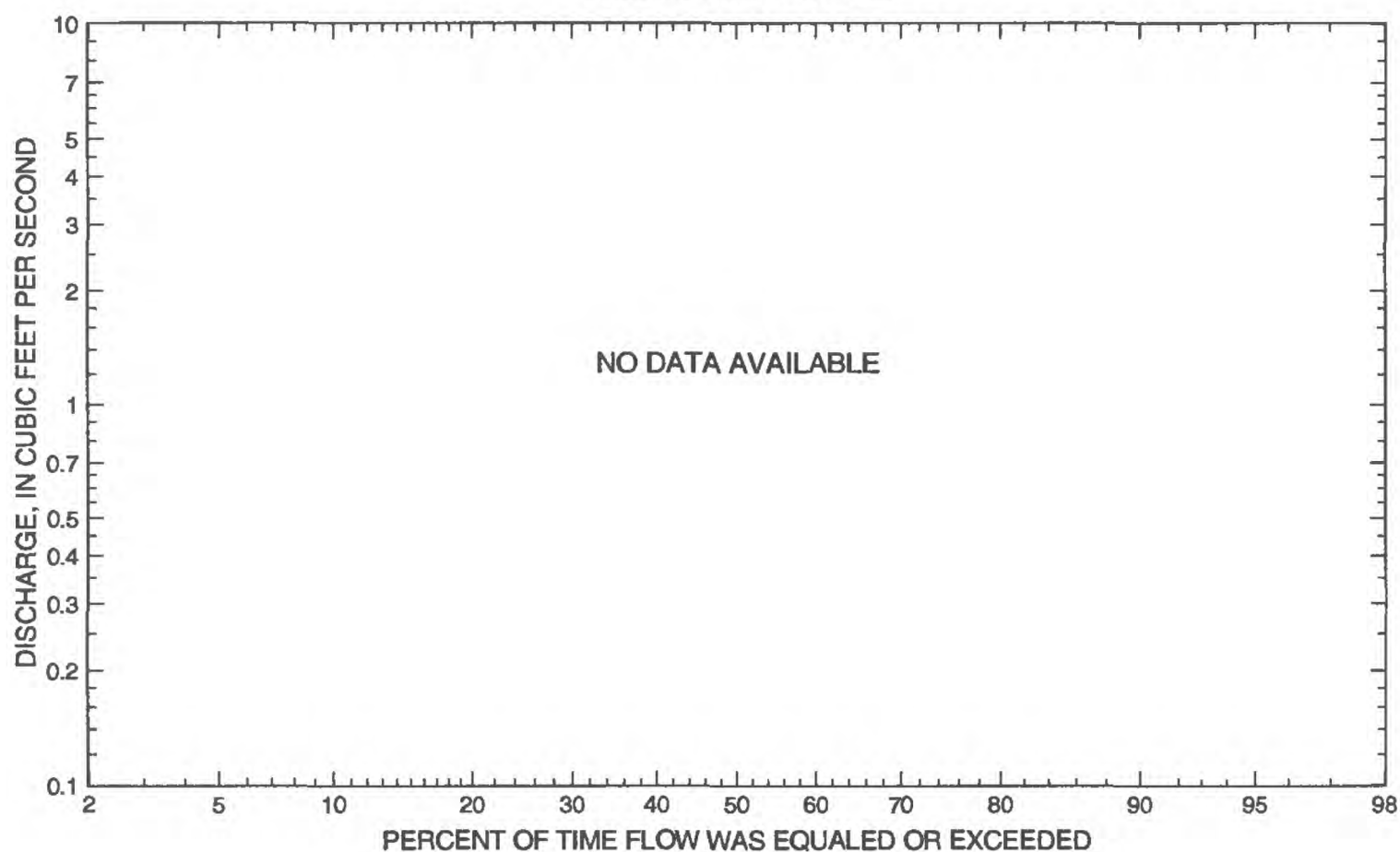
# 05102490 RED RIVER OF THE NORTH AT PEMBINA, ND--Continued

Statistics of monthly and annual mean discharges

[--, no data]

Month	Maximum		Minimum		Mean	Standard deviation (ft <sup>3</sup> /a)	Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)			
October	--	--	--	--	--	--	--	--
November	--	--	--	--	--	--	--	--
December	--	--	--	--	--	--	--	--
January	--	--	--	--	--	--	--	--
February	--	--	--	--	--	--	--	--
March	--	--	--	--	--	--	--	--
April	--	--	--	--	--	--	--	--
May	--	--	--	--	--	--	--	--
June	--	--	--	--	--	--	--	--
July	--	--	--	--	--	--	--	--
August	--	--	--	--	--	--	--	--
September	--	--	--	--	--	--	--	--
Annual	--	--	--	--	--	--	--	--

Annual flow duration



05102490 RED RIVER OF THE NORTH AT PEMBINA, ND--Continued

Monthly and annual flow duration, in cubic feet per second  
[--, no data]

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	--	--	--	--	--	--	--	--	--	--	--	--	--
90	--	--	--	--	--	--	--	--	--	--	--	--	--
85	--	--	--	--	--	--	--	--	--	--	--	--	--
80	--	--	--	--	--	--	--	--	--	--	--	--	--
75	--	--	--	--	--	--	--	--	--	--	--	--	--
70	--	--	--	--	--	--	--	--	--	--	--	--	--
65	--	--	--	--	--	--	--	--	--	--	--	--	--
60	--	--	--	--	--	--	--	--	--	--	--	--	--
55	--	--	--	--	--	--	--	--	--	--	--	--	--
50	--	--	--	--	--	--	--	--	--	--	--	--	--
45	--	--	--	--	--	--	--	--	--	--	--	--	--
40	--	--	--	--	--	--	--	--	--	--	--	--	--
35	--	--	--	--	--	--	--	--	--	--	--	--	--
30	--	--	--	--	--	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--	--	--	--	--	--
20	--	--	--	--	--	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--	--	--	--	--	--	--

# 05102490 RED RIVER OF THE NORTH AT PEMBINA, ND--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given; --, no data]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	--	--	--	--
0.95	1.05	ng	--	--	--	--
0.90	1.11	ng	--	--	--	--
0.80	1.25	ng	--	--	--	--
0.50	2	ng	--	--	--	--
0.20	5	ng	--	--	--	--
0.10	10	ng	--	--	--	--
0.04	25	ng	--	--	--	--
0.02	50	ng	--	--	--	--
0.01	100	ng	--	--	--	--
0.005	200	ng	--	--	--	--
0.002	500	ng	--	--	--	--

# 05102490 RED RIVER OF THE NORTH AT PEMBINA, ND--Continued

## Annual peak discharge and corresponding gage height

Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet)	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
1985	March 27	772.25	18,100	1992	April 4	764.80	15,800
1986	April 8	781.60	34,300	1993	August 16	769.99	31,900
1987	April 9	784.05	37,000	1994	April 7	767.55	26,900
1988	April 8	767.16	15,700	1995	March 30	786.40	42,000
1989	April 23	785.30	38,400	1996	April 26	790.95	66,400
1990	April 10	761.75	5,470	1997	April 26	794.39	141,000
1991	July 12	757.59	5,690				
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 26	794.39	141,000	1994	April 7	767.55	26,900
1996	April 26	790.95	66,400	1985	March 27	772.25	18,100
1995	March 30	786.40	42,000	1992	April 4	764.80	15,800
1989	April 23	785.30	38,400	1988	April 8	767.16	15,700
1987	April 9	784.05	37,000	1991	July 12	757.59	5,690
1986	April 8	781.60	34,300	1990	April 10	761.75	5,470
1993	August 16	769.99	31,900				

05102490 RED RIVER OF THE NORTH AT PEMBINA, ND--Continued

Monthly and annual mean discharges, in cubic feet per second

[--, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
--	--	--	--	--	--	--	--	--	--	--	--	--	--



## 05102500 RED RIVER OF THE NORTH AT EMERSON, MB

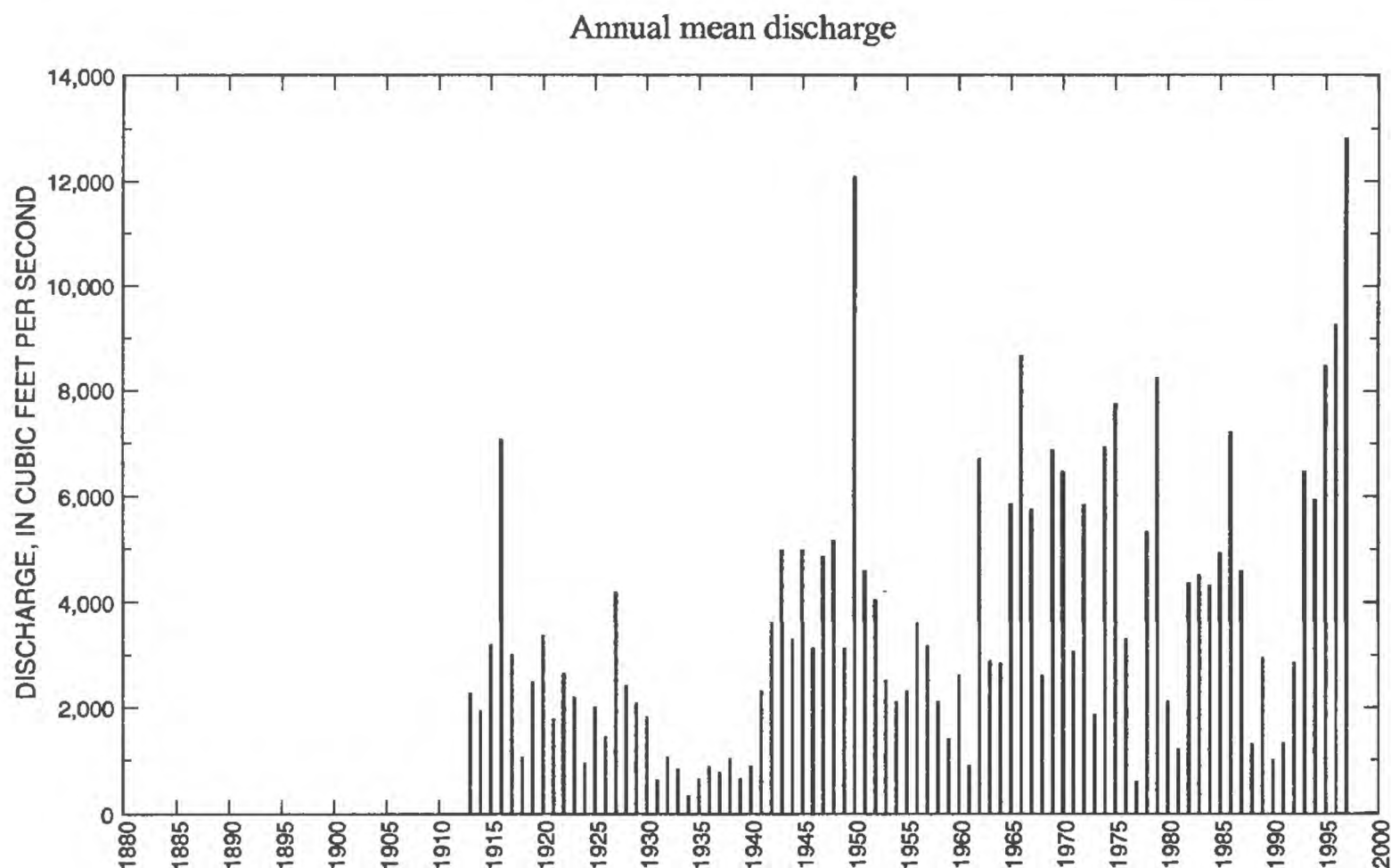
**LOCATION.**--Lat 49°00'30", long 97°12'40", in sec.2, T.1, R.2 E., Hydrologic Unit 09020311, on right bank 1,500 ft downstream from Canadian National Railway bridge in Emerson, 0.8 mi downstream from international boundary, 3.6 mi downstream from Pembina River, and at mile 154.3.

**DRAINAGE AREA.**--40,200 mi<sup>2</sup>, approximately, includes 3,800 mi<sup>2</sup> in closed basins.

**PERIOD OF RECORD.**--March to November 1902 (gage heights only), May 1912 to September 1929 (monthly discharge only, published in WSP 1308), October 1929 to current year.

**GAGE.**--Water-stage recorder. Datum of gage is Geodetic Survey of Canada Datum of 1929. See WSP 1728 or 1913 for history of changes prior to Apr. 10, 1953.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 133,000 ft<sup>3</sup>/s, Apr. 26, 1997, gage height, 92.41 ft; minimum daily discharge, 0.9 ft<sup>3</sup>/s, Feb. 6-8, 1937.

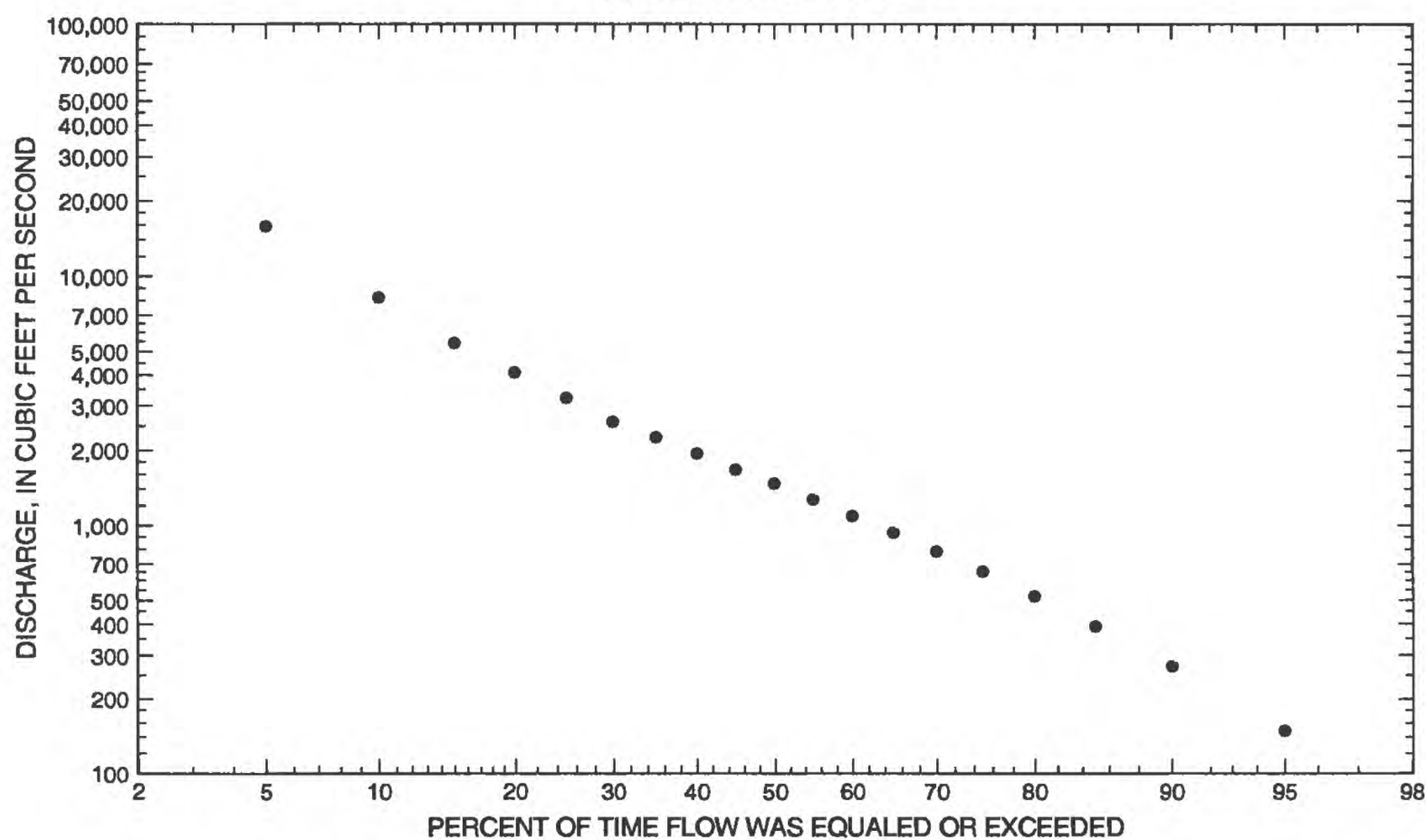


# 05102500 RED RIVER OF THE NORTH AT EMERSON, MB--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean		Coefficient of variation	Percentage of annual discharge
	Discharge (ft <sup>3</sup> /s)	Water year of occurrence	Discharge (ft <sup>3</sup> /a)	Water year of occurrence	Discharge (ft <sup>3</sup> /s)	Standard deviation (ft <sup>3</sup> /s)		
October	6,020	1995	28.7	1937	1,540	1,280	0.83	3.54
November	5,160	1972	23.8	1937	1,370	1,060	0.77	3.14
December	2,940	1995	33.5	1937	1,000	738	0.74	2.31
January	2,050	1951	7.05	1937	827	594	0.72	1.90
February	2,090	1997	1.21	1937	790	552	0.70	1.82
March	15,300	1995	2.25	1937	2,230	2,540	1.14	5.14
April	48,900	1997	1,280	1938	13,400	10,100	0.75	30.8
May	72,800	1950	663	1934	9,300	12,400	1.34	21.4
June	25,400	1962	196	1934	5,100	4,570	0.89	11.7
July	28,000	1975	121	1936	4,160	4,450	1.07	9.56
August	27,000	1993	46.6	1934	2,100	3,130	1.49	4.83
September	10,000	1993	23.8	1934	1,640	1,600	0.97	3.78
Annual	12,800	1997	333	1934	3,630	2,610	0.72	100

Annual flow duration



# 05102500 RED RIVER OF THE NORTH AT EMERSON, MB--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equalled or exceeded	Jan.	Feb.	Merch	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	56.4	53.0	164	1,030	1,050	586	296	130	80.0	86.7	116	66.7	148
90	155	165	265	1,650	1,430	926	482	247	213	249	276	187	270
85	184	214	354	2,070	1,730	1,290	701	370	333	352	349	236	393
80	235	261	433	2,660	2,100	1,530	946	472	444	430	463	301	518
75	310	325	523	3,210	2,450	1,800	1,190	598	547	532	568	389	648
70	397	388	625	3,810	2,730	2,120	1,470	763	681	660	684	521	783
65	452	453	727	4,650	3,030	2,360	1,780	929	831	786	785	603	934
60	515	521	829	5,660	3,430	2,630	2,090	1,080	959	901	870	665	1,100
55	594	604	942	6,770	3,820	2,950	2,420	1,230	1,080	1,000	970	722	1,270
50	718	691	1,070	8,010	4,220	3,340	2,780	1,370	1,200	1,190	1,080	822	1,470
45	825	773	1,200	9,740	4,760	3,810	3,170	1,530	1,340	1,350	1,250	928	1,670
40	909	856	1,370	11,800	5,430	4,370	3,550	1,720	1,500	1,500	1,400	1,030	1,940
35	1,000	954	1,560	14,200	6,360	5,020	3,940	1,930	1,690	1,680	1,540	1,140	2,240
30	1,130	1,050	1,750	17,000	7,660	5,720	4,440	2,210	1,910	1,860	1,710	1,280	2,600
25	1,270	1,190	2,000	20,000	9,430	6,530	5,040	2,540	2,160	2,060	1,910	1,460	3,220
20	1,410	1,360	2,240	23,400	12,100	7,610	5,780	2,890	2,450	2,350	2,130	1,690	4,090
15	1,560	1,510	2,870	27,300	16,500	9,120	6,990	3,460	2,790	2,850	2,400	1,920	5,410
10	1,760	1,650	4,980	31,700	24,900	11,300	9,370	4,150	3,280	3,540	2,720	2,160	8,260
5	1,960	1,820	10,100	40,700	36,900	15,800	13,600	5,410	4,510	4,360	3,450	2,390	15,900

## 05102500 RED RIVER OF THE NORTH AT EMERSON, MB--Continued

Probability of occurrence of annual high discharges

[ng, statistic not given]

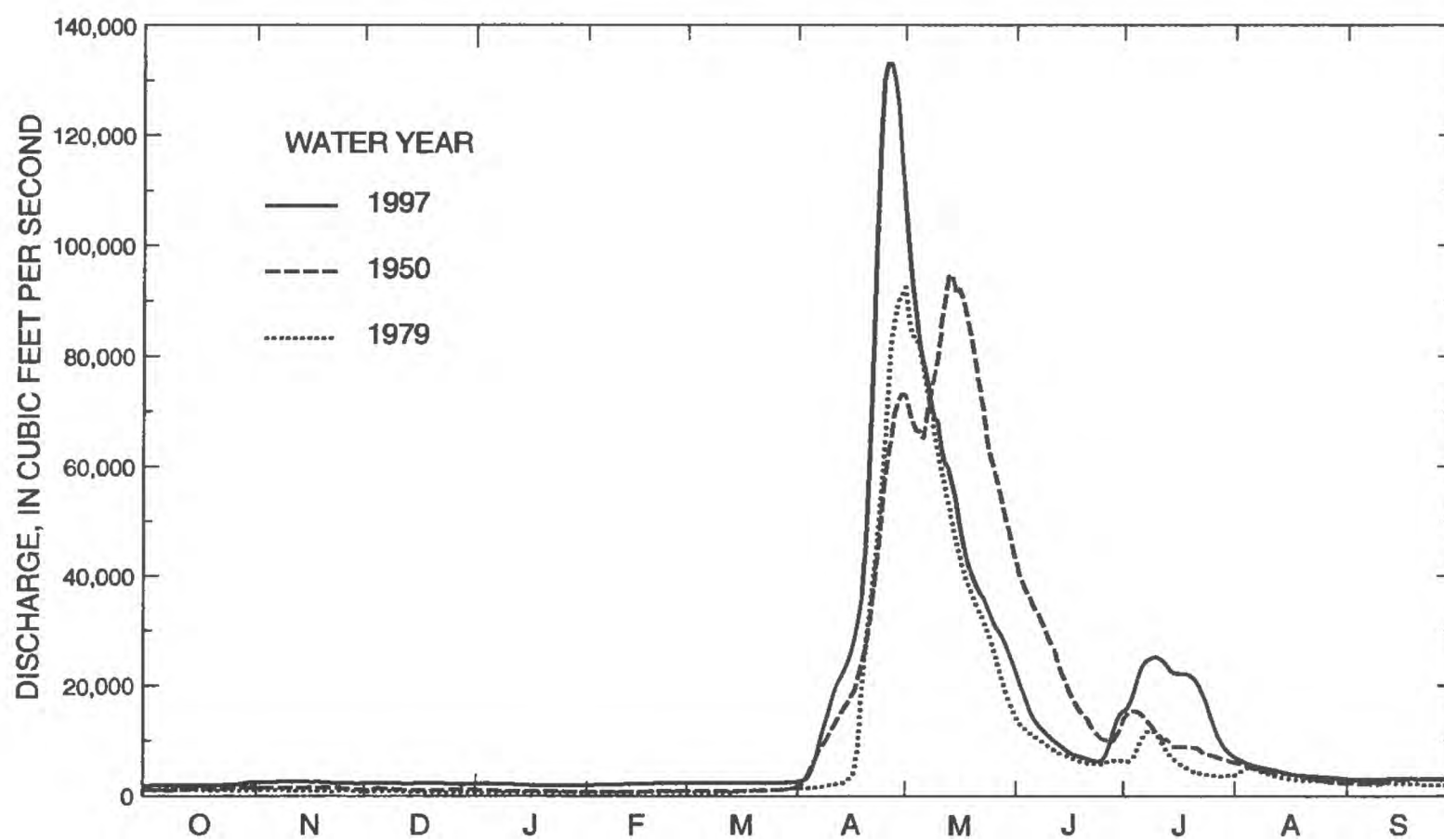
Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s) <sup>1</sup>	Maximum mean discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	3,380	2,990	2,700	2,190	1,670
0.95	1.05	5,730	5,410	4,970	4,080	3,080
0.90	1.11	7,580	7,340	6,810	5,640	4,240
0.80	1.25	10,600	10,500	9,860	8,270	6,230
0.50	2	20,200	<sup>2</sup> 20,000	19,400	16,800	12,900
0.20	5	38,300	38,000	36,800	33,000	26,200
0.10	10	53,300	51,900	50,600	46,400	37,800
0.04	25	75,800	71,600	70,300	66,100	55,700
0.02	50	95,000	87,600	86,400	82,600	71,300
0.01	100	116,000	105,000	104,000	101,000	89,000
0.005	200	140,000	123,000	122,000	120,000	109,000
0.002	500	175,000	ng	ng	ng	ng

<sup>1</sup>From U.S. Army Corps of Engineers.

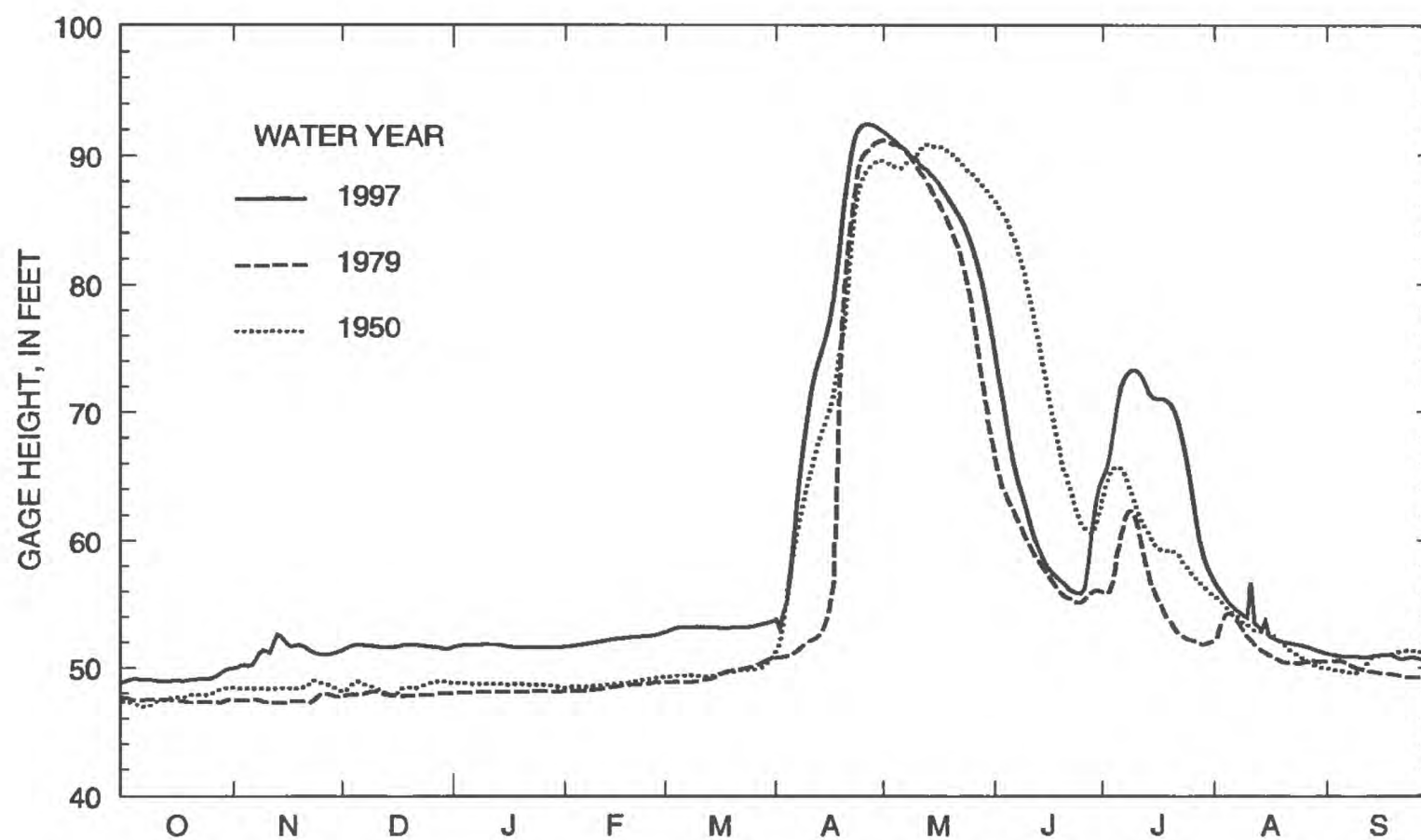
<sup>2</sup>Statistical adjustment based on correlation between 3-, 7-, 15-, and 30-consecutive-day periods.

# 05102500 RED RIVER OF THE NORTH AT EMERSON, MB--Continued

Highest daily mean discharge for period of record



Highest daily mean gage height for period of record





# 05102500 RED RIVER OF THE NORTH AT EMERSON, MB--Continued

Annual peak discharge and corresponding gage height

[--, no data]

Water year	Date	Gage height (feet) <sup>1</sup>	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet) <sup>1</sup>	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, by year, and corresponding gage height							
<sup>2</sup> 1861	--	95.00	--	1954	April 17	--	11,500
<sup>2</sup> 1882	--	90.00	--	1955	April 10	72.25	24,000
<sup>2</sup> 1897	--	91.00	--	1956	April 27	81.02	33,800
1913	April 11	74.52	25,600	1957	July 4	65.37	15,300
1914	June 19	58.36	7,260	1958	July 12	57.17	7,940
1915	July 9	69.06	20,100	1959	April 10	--	15,700
1916	April 24	85.74	46,200	1960	April 13	77.65	30,500
1917	April 12	--	25,900	1961	March 31	57.26	4,320
1918	April 3	--	4,990	1962	April 25	81.93	33,400
1919	July 12	--	13,400	1963	April 13	64.14	13,800
1920	April 16	--	26,700	1964	June 25	66.82	17,500
1921	April 15	--	12,800	1965	April 26	85.19	46,200
1922	April 14	69.40	18,900	1966	April 11	89.15	66,800
1923	April 25	74.98	26,000	1967	April 9	80.79	33,600
1924	April 28	57.25	6,320	1968	July 24	64.12	13,900
1925	June 21	--	17,500	1969	April 26	87.52	54,700
1926	April 1	61.02	8,000	1970	April 29	84.67	39,600
1927	May 16	71.58	20,500	1971	April 16	--	26,600
1928	April 6	67.91	16,800	1972	April 24	78.16	30,700
1929	April 1	--	19,200	1973	March 27	--	14,700
1930	April 10	72.51	20,800	1974	April 28	86.51	43,500
1931	April 10	59.29	7,940	1975	May 8	84.32	42,800
1932	April 15	71.64	18,900	1976	April 6	79.06	32,900
1933	April 9	--	11,000	1977	April 10	53.75	4,590
1934	April 13	--	4,800	1978	April 18	86.89	50,600
1935	April 3	59.65	5,470	1979	May 1	91.19	92,700
1936	April 21	68.16	18,000	1980	April 10	73.54	21,700
1937	May 7	56.55	5,840	1981	July 4	55.19	6,150
1938	May 20	--	7,530	1982	April 18	81.15	34,000
1939	April 10	60.77	6,700	1983	April 9	77.29	25,800
1940	April 21	66.84	14,600	1984	April 8	--	30,200
1941	April 16	76.94	27,800	1985	March 29	--	16,700
1942	April 10	78.77	27,900	1986	April 7	--	34,200
1943	April 20	77.54	29,500	1987	April 9	--	37,400
1944	April 19	66.82	12,300	1988	April 8	64.89	15,700
1945	April 4	--	29,400	1989	April 23	84.30	42,700
1946	April 5	--	24,100	1990	April 10	60.90	5,510
1947	April 28	76.07	28,400	1991	July 12	56.15	5,690
1948	April 27	87.62	51,800	1992	April 4	74.19	15,800
1949	April 15	77.13	29,200	1993	August 16	79.02	31,900
1950	May 13	90.89	95,500	1994	April 9	75.90	26,900
1951	April 15	74.55	26,600	1995	April 2	84.80	42,400
1952	April 24	--	24,200	1996	April 26	89.10	66,700
1953	June 28	63.70	14,500	1997	April 26	92.41	133,000

# 05102500 RED RIVER OF THE NORTH AT EMERSON, MB--Continued

## Annual peak discharge and corresponding gage height--Continued

[--, no data]

Water year	Date	Gage height (feet) <sup>1</sup>	Peak discharge (ft <sup>3</sup> /s)	Water year	Date	Gage height (feet) <sup>1</sup>	Peak discharge (ft <sup>3</sup> /s)
Annual peak discharge, from highest to lowest, and corresponding gage height							
1997	April 26	92.41	133,000	1930	April 10	72.51	20,800
1950	May 13	90.89	95,500	1927	May 16	71.58	20,500
1979	May 1	91.19	92,700	1915	July 9	69.06	20,100
1966	April 11	89.15	66,800	1929	April 1	--	19,200
1996	April 26	89.10	66,700	1922	April 14	69.40	18,900
1969	April 26	87.52	54,700	1932	April 15	71.64	18,900
1948	April 27	87.62	51,800	1936	April 21	68.16	18,000
1978	April 18	86.89	50,600	1925	June 21	--	17,500
1916	April 24	85.74	46,200	1964	June 25	66.82	17,500
1965	April 26	85.19	46,200	1928	April 6	67.91	16,800
1974	April 28	86.51	43,500	1985	March 29	--	16,700
1975	May 8	84.32	42,800	1992	April 4	74.19	15,800
1989	April 23	84.30	42,700	1959	April 10	--	15,700
1995	April 2	84.80	42,400	1988	April 8	64.89	15,700
1970	April 29	84.67	39,600	1957	July 4	65.37	15,300
1987	April 9	--	37,400	1973	March 27	--	14,700
1986	April 7	--	34,200	1940	April 21	66.84	14,600
1982	April 18	81.15	34,000	1953	June 28	63.70	14,500
1956	April 27	81.02	33,800	1968	July 24	64.12	13,900
1967	April 9	80.79	33,600	1963	April 13	64.14	13,800
1962	April 25	81.93	33,400	1919	July 12	--	13,400
1976	April 6	79.06	32,900	1921	April 15	--	12,800
1993	August 16	79.02	31,900	1944	April 19	66.82	12,300
1972	April 24	78.16	30,700	1954	April 17	--	11,500
1960	April 13	77.65	30,500	1933	April 9	--	11,000
1984	April 8	--	30,200	1926	April 1	61.02	8,000
1943	April 20	77.54	29,500	1931	April 10	59.29	7,940
1945	April 4	--	29,400	1958	July 12	57.17	7,940
1949	April 15	77.13	29,200	1938	May 20	--	7,530
1947	April 28	76.07	28,400	1914	June 19	58.36	7,260
1942	April 10	78.77	27,900	1939	April 10	60.77	6,700
1941	April 16	76.94	27,800	1924	April 28	57.25	6,320
1994	April 9	75.90	26,900	1981	July 4	55.19	6,150
1920	April 16	--	26,700	1937	May 7	56.55	5,840
1951	April 15	74.55	26,600	1991	July 12	56.15	5,690
1971	April 16	--	26,600	1990	April 10	60.90	5,510
1923	April 25	74.98	26,000	1935	April 3	59.65	5,470
1917	April 12	--	25,900	1918	April 3	--	4,990
1983	April 9	77.29	25,800	1934	April 13	--	4,800
1913	April 11	74.52	25,600	1977	April 10	53.75	4,590
1952	April 24	--	24,200	1961	March 31	57.26	4,320
1946	April 5	--	24,100	<sup>2</sup> 1861	--	95.00	--
1955	April 10	72.25	24,000	<sup>2</sup> 1882	--	90.00	--
1980	April 10	73.54	21,700	<sup>2</sup> 1897	--	91.00	--

<sup>1</sup>Datum is 700 feet Geodetic Survey of Canada Datum of 1929.

<sup>2</sup>Data source unknown. Not used in statistics.

# 05102500 RED RIVER OF THE NORTH AT EMERSON, MB--Continued

Monthly and annual mean discharges, in cubic feet per second

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1912	--	--	--	--	--	--	--	--	1,754	1,209	1,052	1,140	--
1913	2,280	1,407	786.5	498.7	301.8	399.0	13,360	3,180	1,756	1,338	956.7	1,210	2,282
1914	1,188	1,353	990.3	536.0	500.7	788.5	4,147	3,246	4,414	3,488	1,379	1,334	1,949
1915	1,378	1,395	1,006	894.2	867.7	992.7	5,100	3,743	5,020	13,150	2,947	1,797	3,208
1916	1,816	1,602	1,146	896.2	789.3	921.1	28,940	20,740	7,936	10,740	5,107	4,220	7,066
1917	3,211	2,804	1,996	1,258	1,043	1,138	14,000	5,783	2,585	1,467	643.8	465.4	3,028
1918	678.9	900.5	566.8	238.4	221.6	1,072	2,428	1,810	2,296	991.0	729.8	665.6	1,051
1919	408.6	675.3	577.3	469.8	423.5	594.7	7,721	3,961	2,148	7,789	3,645	1525	2,506
1920	1,165	798.7	726.5	812.3	903.1	2,926	18,360	4,216	4,863	3,358	1,543	1,134	3,382
1921	1,210	1,241	1,015	811.2	782.1	1,140	6,393	2,610	2,762	1,782	880.8	839.0	1,786
1922	836.3	721.6	659.9	467.1	379.1	1,977	12,740	8,011	3,375	1,494	640.7	597.8	2,658
1923	500.3	730.1	375.5	305.2	327.1	396.2	10,120	7,735	2,014	2,457	816.0	598.7	2,201
1924	609.6	611.1	400.4	225.3	237.1	306.3	2,832	3,089	1,342	897.3	406.8	356.1	942.9
1925	707.0	529.1	208.8	140.8	185.3	1,073	4,830	1,649	10,540	3,399	519.2	559.1	2,021
1926	936.1	888.8	656.8	466.9	518.9	1,688	5,316	1,344	2,574	2,107	486.5	451.6	1,451
1927	973.4	816.0	493.3	416.5	390.5	3,996	13,400	14,670	8,721	3,312	1,592	1,484	4,199
1928	1,369	1,102	803.8	602.7	670.6	1,951	7,582	2,848	3,295	4,534	1,920	2,457	2,425
1929	1,823	1,600	1,092	1,050	884.1	5,880	6,780	2,650	1,696	754.1	423.2	322.8	2,084
1930	453.5	479.5	294.1	200.1	179.2	2,893	8,703	5,164	1,923	1,063	362.9	215.4	1,830
1931	231.7	267.3	235.9	176.0	199.6	959.6	3,385	881.0	660.1	356.4	157.5	81.0	631.0
1932	84.8	220.5	187.0	166.5	138.0	1,364	7,809	1,925	586.0	256.1	62.5	40.0	1,063
1933	46.0	121.4	89.0	54.0	49.4	861.9	5,839	1,548	1,026	253.4	73.1	45.9	830.2
1934	48.8	84.8	46.0	54.3	32.5	491.8	2,178	662.6	196.1	138.2	46.6	23.6	333.0
1935	47.0	77.2	41.7	14.0	26.9	749.0	3,325	1,173	438.2	1,082	514.1	268.7	647.3
1936	116.8	77.8	59.2	56.8	54.0	58.2	6,739	2,602	583.3	120.6	79.3	66.8	878.3
1937	28.6	23.7	33.3	7.05	1.21	2.25	2,025	2,886	1,059	830.4	1,565	818.3	777.4
1938	401.7	280.8	72.5	53.3	75.9	1,453	1,282	4,870	2,584	854.8	217.5	193.4	1,035
1939	199.8	207.2	181.9	197.6	255.4	259.9	3,717	1,193	658.7	565.8	187.5	230.3	651.8
1940	357.0	384.5	278.0	135.3	148.2	224.2	5,085	2,232	1,053	357.2	255.1	186.8	886.8
1941	236.1	392.4	296.0	312.0	348.0	361.7	13,650	3,120	5,284	1,426	755.4	1,853	2,320
1942	3,065	1,389	887.5	565.1	635.1	1,962	16,530	8,966	4,187	1,809	1,254	3,110	3,694
1943	1,643	1,135	775.0	797.7	699.7	1,207	23,130	7,258	12,440	6,497	2,584	1,818	4,984
1944	1,473	1,432	926.1	662.6	736.1	767.8	4,349	3,776	6,947	6,806	6,003	5,909	3,315
1945	2,906	4,026	2,733	1,294	1,365	9,121	20,150	8,646	4,043	2,187	1,309	1,776	4,965
1946	1,975	1,398	988.1	944.9	790.9	5,738	14,640	4,119	2,223	2,442	1,273	1,167	3,142



# 05102500 RED RIVER OF THE NORTH AT EMERSON, MB--Continued

Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1947	1,661	1,617	1,169	1,031	897.2	1,057	17,830	11,940	12,050	5,785	2,029	1,571	4,882
1948	1,865	1,653	1,346	1,084	844.6	851.0	24,890	20,050	3,858	3,139	1,661	1,009	5,182
1949	673.7	711.9	556.5	449.0	453.9	596.5	14,720	5,092	6,070	3,414	3,289	1,806	3,146
1950	1,146	1,387	1,066	827.3	747.9	926.8	26,540	72,820	22,300	10,110	3,805	2,617	12,100
1951	3,330	2,073	2,160	2,053	1,800	2,287	19,650	10,860	4,941	2,742	1,461	1,955	4,605
1952	1,581	1,413	1,906	1,788	1,914	2,009	17,150	7,663	3,815	5,878	2,285	1,376	4,056
1953	945.3	863.9	697.9	609.6	610.6	1,365	4,064	3,151	8,890	5,531	2,301	1,317	2,531
1954	892.9	961.2	935.6	834.4	847.3	1,376	5,823	4,230	4,283	2,958	1,436	895.4	2,124
1955	816.1	828.9	717.8	731.7	652.1	653.5	10,600	3,226	4,286	2,741	1,815	941.9	2,328
1956	941.9	604.1	449.8	431.5	455.4	509.3	12,750	14,560	5,427	4,092	1,156	2,028	3,617
1957	682.2	1,325	613.7	442.7	407.6	1,445	5,882	4,537	4,202	9,284	2,880	6,388	3,183
1958	3,776	3,381	1,714	1,383	1,305	1,867	3,330	1,648	1,424	4,055	1,005	458.9	2,118
1959	430.0	488.6	358.1	348.2	342.6	632.7	6049	2,110	2,747	2,067	758.6	543.9	1,404
1960	563.7	587.6	627.5	617.8	556.6	471.0	16,530	5,206	3,110	2,283	589.4	619.2	2,630
1961	341.9	555.3	379.2	344.7	292.7	1,721	2,592	2,400	1,111	441.4	274.5	266.7	895.7
1962	593.9	410.8	262.5	197.8	199.9	225.1	14,750	12,010	25,430	16,060	7,212	3,368	6,734
1963	2,450	2,177	1,636	1,246	1,074	1,515	7,847	3,739	7,490	3,049	1,315	1,213	2,891
1964	1,395	966.3	696.8	767.1	754.5	685.7	8,474	5,455	9,511	3,625	1,321	671.8	2,849
1965	1,701	1,390	910.0	909.8	890.4	950.2	24,980	18,580	10,030	5,632	2,345	2,096	5,867
1966	4,417	3,337	2,760	1,879	1,648	5,841	45,820	20,250	7,007	4,752	3,785	2,894	8,690
1967	1,992	2,132	1,824	1,632	1,477	2,086	25,420	20,000	6,548	3,588	1,487	951.1	5,763
1968	905.8	963.3	672.9	491.5	493.4	1,434	4,883	2,502	6,037	6,866	3,292	2,994	2,628
1969	2,204	2,143	1,956	1,696	1,613	2,173	29,160	27,410	6,454	4,023	2,076	1,656	6,891
1970	2,084	2,043	1,571	1,454	1,411	1,578	19,180	22,960	16,950	5,515	1,614	1,400	6,484
1971	1,282	1,667	1,094	1,033	998.7	1,960	14,470	5,486	3,252	2,909	1,462	1,499	3,086
1972	4,021	5,163	2,681	1,963	1,598	6,832	23,910	10,890	6,367	2,482	2,479	2,058	5,855
1973	1,834	1,709	1,153	1,112	1,116	5,817	2,707	1,716	1,311	622.0	779.5	2,567	1,874
1974	4,152	2,613	2,079	1,713	1,688	2,022	19,340	29,660	10,760	3,744	3,262	2,051	6,948
1975	1,937	2,141	1,358	1,314	1,412	1,651	12,950	27,310	6,923	28,020	4,713	2,560	7,760
1976	2,429	2,409	1,564	1,523	1,643	2,794	17,430	4,398	2,375	1,554	1,119	728.1	3,313
1977	387.3	313.7	176.9	180.4	189.8	400.2	2,101	1,202	861.5	636.0	260.7	533.7	603.2
1978	1,423	1,126	1,293	1,226	987.4	1,737	36,030	10,240	3,870	3,615	1,730	1,118	5,345
1979	957.7	872.4	646.8	562.3	578.9	774.6	26,080	49,220	8,093	6,432	3,371	2,227	8,370
1980	1,750	1,955	1,526	1,351	1,331	1,479	10,140	2,399	1,630	860.9	484.5	837.0	2,133
1981	550.6	656.9	358.6	292.1	296.4	1,471	1,807	1,386	1,582	2,737	1,517	1,808	1,210

# 05102500 RED RIVER OF THE NORTH AT EMERSON, MB--Continued

## Monthly and annual mean discharges, in cubic feet per second--Continued

[Data were not rounded in accordance with U.S. Geological Survey publication standards; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1982	2,402	1,963	1,104	1,151	1,055	1,754	22,080	8,865	4,261	4,090	2,465	1,346	4,372
1983	4,332	2,535	1,935	1,614	1,377	9,361	12,530	3,948	4,835	6,393	2,500	2,794	4,526
1984	2,138	2,107	1,723	1,380	1,274	2,896	19,140	4,253	11,580	3,399	1,531	959.1	4,337
1985	1,850	1,862	1,444	1,207	1,154	6,461	7,385	9,120	7,935	7,374	7,342	5,858	4,938
1986	4,533	2,808	2,098	2,014	1,812	6,091	26,820	22,310	7,367	5,014	2,845	2,917	7,233
1987	3,596	2,084	1,983	1,804	1,616	6,895	22,500	4,242	3,682	3,109	2,612	1,109	4,597
1988	831.1	838.2	702.9	471.3	510.2	2,258	6,623	1,444	1,088	463.5	281.7	332.3	1,315
1989	337.3	309.9	256.6	262.9	379.8	396.8	21,480	6,886	2,692	1,138	430.9	1,045	2,952
1990	451.3	375.1	258.0	172.5	261.1	1,147	3,531	1,661	2,178	1,191	464.8	365.8	1,004
1991	298.6	314.6	232.1	177.1	245.6	594.4	2,097	2,821	2,306	3,971	1,295	1,578	1,334
1992	861.3	888.0	572.4	552.0	553.0	7,055	10,130	4,510	2,509	2,976	1,276	2,617	2,875
1993	1,213	852.0	930.8	858.4	1,016	1,310	15,000	4,136	4,630	10,530	27,000	10,010	6,489
1994	4,231	2,786	2,048	1,495	1,503	5,415	17,570	7,549	6,099	13,320	4,416	4,772	5,950
1995	6,015	5,033	2,945	1,958	1,781	15,340	33,550	14,280	6,050	8,323	3,792	2,719	8,500
1996	3,458	3,215	2,285	1,889	1,795	3,777	28,910	41,370	14,870	4,721	3,101	1,786	9,274
1997	1,891	2,381	2,185	1,974	2,087	2,307	48,890	54,650	10,810	18,890	4,297	2,952	12,830