

# STREAMFLOW CHARACTERISTICS OF STREAMS IN THE UPPER RED RIVER OF THE NORTH BASIN, NORTH DAKOTA, MINNESOTA, AND SOUTH DAKOTA

By Gregg J. Wiche and Tara Williams-Sether

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## DEFINITION OF TERMS

Climatic year is the 12-month period April 1 through March 31. The climatic year is designated by the calendar year in which it begins.

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

Discharge is the volume of water in a stream at a given point and for a given period of time. Discharge is often used interchangeable with the term "streamflow".

Drainage area is the area, measured in a horizontal plane, enclosed by a topographic divide from which direct surface runoff from precipitation normally drains by gravity into the stream upstream from the station. Figures of drainage area given herein include all closed basins, or noncontributing areas, within the area unless otherwise specified.

Drainage basin is a part of the surface of the earth that is occupied by a drainage system, which consists of a surface stream or a body of impounded surface water together with all tributary surface streams and bodies of impounded surface water.

Gage height is the water-surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeable with the more general term "stage", although gage height is more appropriate when used with a reading on a gage.

Gaging station is a particular site on a stream, canal, lake, or reservoir where systematic observations of hydrologic data are obtained.

Ground water is the water in the ground that is in the zone of saturation, from which wells, springs, and ground-water runoff are supplied.

Hydrologic unit is a geographic area representing part or all of a surface drainage basin or distinct hydrologic feature as delineated by the Office of Water Data Coordination on the State Hydrologic Unit Maps; each hydrologic unit is identified by an eight-digit number.

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

Mean is the arithmetic average of a list of values.

Mean discharge is the arithmetic mean of individual discharges during a specific period.

Period of record is the time during which a stream-gaging station is in operation and for which the records are published.

Probability of occurrence is the likelihood that an event will occur. Probabilities are generally expressed as a decimal number between 0 and 1. If the probability is 0, the event will not occur; if the probability is 1, the event will occur absolutely. Probability also can be expressed as a percent, where 0 percent corresponds to 0 probability and 100 percent corresponds to a probability of 1.

Recurrence interval is the average time interval between occurrences of a hydrologic event of a given or greater magnitude, usually expressed in years.

Regulation is the artificial manipulation of the flow of a stream.

Stage see "gage height"

Standard deviation is a measure of the variability of the values in a list of values.

Stream-gaging station is a particular site on a stream where a record of discharge is obtained.

Streamflow see "discharge"

Surface water is the water on the surface of the earth.

Water year is the 12-month period October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months.

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## ABSTRACT

Statistical summaries of streamflow data for all active and inactive gaging stations for the Red River Basin upstream of and including Halstad, Minnesota, are presented in this report. The summaries for each streamflow-gaging station include (1) manuscript (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 annual high discharges, (7) probability of annual low discharges, (8) probability of seasonal low discharges, (9) annual peak discharge and corresponding gage height for the period of record, and (10) monthly and annual mean discharges for the period of record.

## INTRODUCTION

A part of the mission of the United States Geological Survey is the collection of systematic data to determine the quantity as well as the quality and use of surface and ground water. A total of 7,292 streamflow-gaging stations (as of 1994) were operated by the U. S. Geological Survey in the United States, Puerto Rico, and the Trust Territories of the Pacific Islands (Wahl and others, 1995). Of the 7,292 streamflow-gaging stations, 60 were operated in the Red River Basin upstream of Emerson, Manitoba, 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 time 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 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 must go to various sources to obtain the necessary statistics. These sources may only include active gaging stations listed in the most recent annual report and, thus, overlook information available for many inactive gaging stations.

The purpose of this report is to provide a comprehensive publication summarizing streamflow characteristics for all active and inactive gaging stations for the Red River Basin upstream of and including Halstad, Minnesota, excluding the Devils Lake Basin. Active and discontinued gaging stations that have a least 10 years of record are listed in table 1 and their locations are shown in figure 1.

**Table 1.** List of streamflow-gaging stations for which streamflow statistics are published in this report

Station number	Station name
05030000	Otter Tail River near Detroit Lakes, MN
05030500	Otter Tail River near Elizabeth, MN
05040000	Pelican River near Detroit Lakes, MN
05040500	Pelican River near Fergus Falls, MN
05046000	Otter Tail River below Orwell Dam near Fergus Falls, MN
05047500	Mustinka ditch above West Branch Mustinka River near Charlesville, MN
05048000	Mustinka ditch below West Branch Mustinka River near Charlesville, MN
05048500	West Branch Mustinka River below Mustinka Ditch near Charlesville, MN
05049000	Mustinka River above Wheaton, MN
05050000	Bois de Sioux River near White Rock, SD
05050500	Bois de Sioux River near Fairmont, ND
05051000	Rabbit Creek at Campbell, MN
05051500	Red River of the North at Wahpeton, ND
05051522	Red River of the North at Hickson, ND
05051600	Wild Rice River near Rutland, ND
05051700	Wild Rice River near Cayuga, ND
05053000	Wild Rice River near Abercrombie, ND
05054000	Red River of the North at Fargo, ND
05054500	Sheyenne River above Harvey, ND
05055000	Sheyenne River near Harvey, ND
05055100	North Fork Sheyenne River near Wellsburg, ND
05055200	Big Coulee near Maddock, ND
05055500	Sheyenne River at Sheyenne, ND
05056000	Sheyenne River near Warwick, ND
05057000	Sheyenne River near Cooperstown, ND
05057200	Baldhill Creek near Dazey, ND
05058000	Sheyenne River below Baldhill Dam, ND
05058500	Sheyenne River at Valley City, ND
05058700	Sheyenne River at Lisbon, ND
05059000	Sheyenne River near Kindred, ND
05059500	Sheyenne River at West Fargo, ND
05059600	Maple River near Hope, ND
05059700	Maple River near Enderlin, ND
05060000	Maple River near Mapleton, ND
05060500	Rush River at Amenia, ND
05061000	Buffalo River near Hawley, MN
05061500	South Branch Buffalo River at Sabin, MN
05062000	Buffalo River near Dilworth, MN
05062200	Elm River near Kelso, ND
05062500	Wild Rice River at Twin Valley, MN
05064000	Wild Rice River at Hendrum, MN
05064500	Red River of the North at Halstad, MN

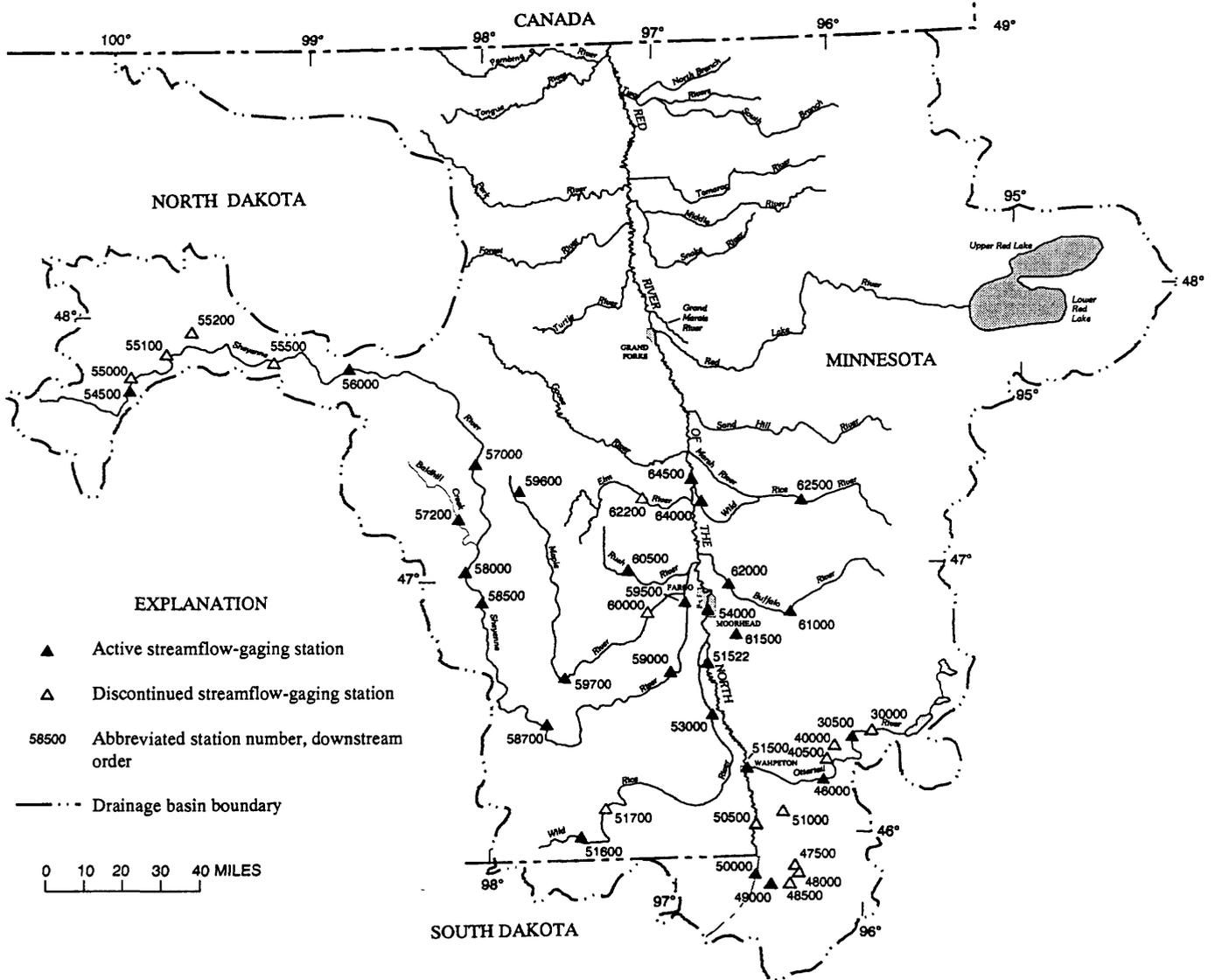


Figure 1. Location of streamflow-gaging stations for which streamflow statistics are published in this report.

## **HISTORY OF THE STREAM-GAGING PROGRAM IN NORTH DAKOTA**

Much of the history of the stream-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 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 as 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 stream-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 stream-gaging program, and, by 1947, 64 gaging stations were in operation. 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. Since 1987, the number of gaging stations in operation has been relatively stable at about 105 to 110.

## **EXPLANATION OF STATION SUMMARIES**

Station summaries are presented so that each station description and 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 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. manuscript (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 duration,
6. table of probability of annual high discharges,
7. table of probability of annual low discharges,
8. table of probability of seasonal low discharges,
9. table of annual peak discharge and corresponding gage height for the period of record, and
10. table of monthly and annual mean discharges for the period of record.

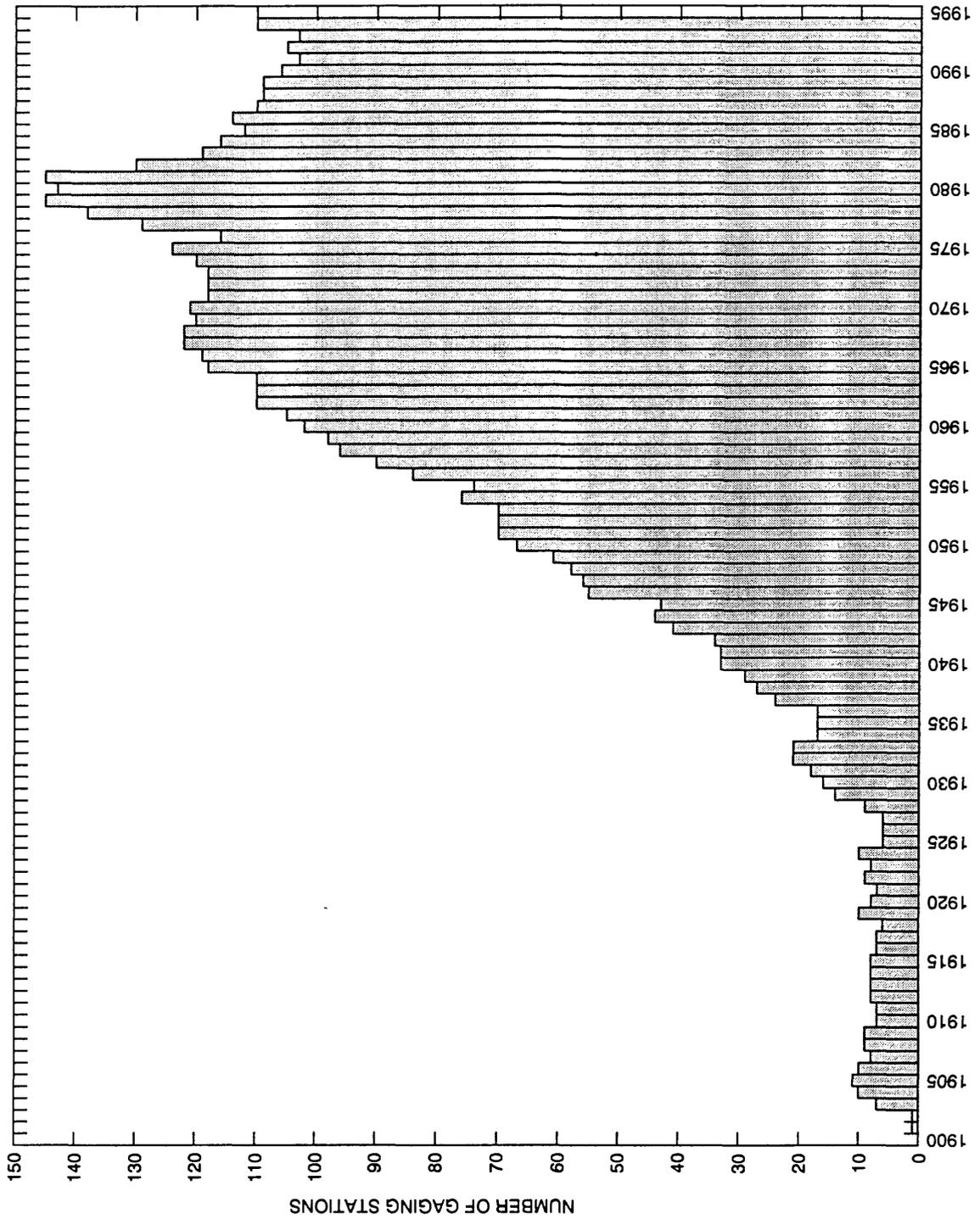


Figure 2. Number of streamflow-gaging stations in North Dakota, 1901-94.

Where both pre-regulation and post-regulation statistics are presented for a gaging station, the manuscript, graph of annual mean discharges, table of annual peak discharges and corresponding gage heights, and table of monthly and annual mean discharges are presented with the pre- and post-regulation data. The respective tables for the post-regulation data are presented in the same relative page formats.

## **Manuscripts**

The location, drainage area, period of record, and other information about each streamflow-gaging station included in this report are presented in manuscript form. 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 report. The following comments clarify information presented under the various headings of the station manuscript.

**LOCATION.**--Information on 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. In the case of discontinued gaging stations, the location is furnished using features in the vicinity at the time the gaging station was in operation. In many instances, the identifying features have been altered since the gaging station was discontinued.

**DRAINAGE AREA.**--Drainage area is measured using U.S. Geological Survey 7.5-minute topographic quadrangle maps. However, 7.5-minute topographic maps for drainage area computations were not available when some gaging stations were installed; therefore, the accuracy of drainage areas also varies. Drainage areas of discontinued gaging stations are those determined while the gaging station was in operation.

**PERIOD OF RECORD.**--The period of record is the period for which there are published records for the gaging station or for an equivalent gaging station. An equivalent gaging station is a gaging station that was in operation prior to the subject gaging station, and whose location is such that records from it can reasonably be considered equivalent with records from 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.

**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 corresponding to the highest gage height that occurred. If the maximum gage height did not occur on the same day as the maximum discharge, it is listed separately. Similarly, the minimum discharge is the instantaneous minimum 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 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 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 Otter Tail River near Detroit Lakes, MN (05053000) are used as an example. Each monthly value is the mean of the daily values for the month. 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 138 cubic feet per second ( $\text{ft}^3/\text{s}$ ), which occurred during water year 1945. Similarly, the minimum monthly mean discharge is the minimum value of all the monthly mean values. The minimum mean value for October is  $2.16 \text{ ft}^3/\text{s}$ , which occurred during water year 1957. The maximum and minimum monthly mean values can be found in the statistics of monthly and annual mean discharges table or by searching 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 values. The mean monthly discharge for October is  $29.2 \text{ ft}^3/\text{s}$ , and the standard deviation is  $28.9 \text{ ft}^3/\text{s}$ . The monthly mean discharge for October (mean of the mean monthly values) is the same as the mean of all October daily values for the period of record used. However, the standard deviation is smaller than the standard deviation obtained using all daily values. The standard deviation is smaller because the monthly values have less variability than the daily values.

The coefficient of variation is the ratio of the standard deviation to the mean, and it provides a comparison of the standard deviation in units of the mean. The coefficient of variation is dimensionless. Because monthly mean discharges are much greater in spring than in winter, the standard deviations also are 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 is the percent of the annual discharge that occurred during each month. It 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  $9.82 \text{ ft}^3/\text{s}$  occurred in 1940, and the maximum annual mean discharge of  $98.4 \text{ ft}^3/\text{s}$  occurred in 1966. The mean annual discharge for the period of record is  $53.7 \text{ ft}^3/\text{s}$ .

## Monthly and Annual Flow Duration

The monthly and annual flow duration table is a magnitude and frequency analysis of daily discharge values. It 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 figures are calculated for all complete water years. For example, if the 90-percent flow duration value for October is 2.80 ft<sup>3</sup>/s, then 90 percent of all October daily discharge values for the period of record were equal to or greater than 2.80 ft<sup>3</sup>/s.

## Probability of Occurrence of High or Low Discharges

The probabilities of occurrence of annual high discharges, annual low discharges, and seasonal low discharges are presented in three tables for each gaging station. Probability of occurrence is an estimate of the likelihood that a particular discharge in a stream will be equaled or exceeded in 1 year or, in the case of low flows, the likelihood that the discharge will not be equaled or exceeded during the year. The probability of occurrence of a high flow is called the exceedance probability, and the probability of occurrence of low flow is called the nonexceedance probability. For example, if the discharge for the 0.20 exceedance probability is listed as 255 ft<sup>3</sup>/s, then a 20 percent chance exists that a discharge equal to or greater than 255 ft<sup>3</sup>/s will occur once during the year.

Recurrence interval is another way of expressing annual probability and it is the reciprocal of 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 255 ft<sup>3</sup>/s on average once every 5 years.

The table of probability 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.

The table of probability of annual low discharges for each gaging station lists the minimum mean discharge for 1, 3, 7, 14, 30, 60, 90, 120, and 183 consecutive-day periods for selected nonexceedance probabilities and recurrence intervals. Values for the minimum mean discharges are computed from the annual low discharge values of the corresponding periods using the log-Pearson Type III distribution. If the log-Pearson Type III distribution curve fails to fit the data at the lower end, a graphical interpretation is made. Probabilities of annual low discharges are computed using values obtained for the climatic year (April 1 through March 31).

The table of probability of seasonal low discharges for each gaging station lists the minimum mean discharge for 1, 7, 14, and 30 consecutive-day periods for selected probabilities and recurrence intervals. These values are computed from the seasonal low mean values of the corresponding periods using the log-Pearson Type III distribution.

The annual low discharge and the seasonal low discharges that occur in any given year are sensitive to natural-channel processes, such as evapotranspiration and human-induced hydrologic modifications, such as the operation of many small water-storage reservoirs; the effects of surface-water withdrawal for agricultural, municipal, and industrial use; and the effects of return flow to the river. Thus, the statistics in tables are given for recurrence intervals that generally are within twice the period of record.

## **DATA CONSIDERATIONS**

### **Period of Record**

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 of record for each gaging station varies substantially. Subsequently, extreme high or low 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.

Differences in statistical data for pre- and post-regulation periods are not caused solely by regulation. Differences can be attributed to the length of record and climatic variability as expressed by hydrologic variability. By comparing a statistic that easily can be affected by regulation, such as the 7-day low flow, and a statistic that generally is unaffected by regulation, such as the mean annual discharge, a determination can be made about the effect of regulation. As an example, the annual 7-day low flow with a 10-year recurrence interval for the Red River of the North at Fargo is zero for the pre-regulation period (1901-41) and 17.9 ft<sup>3</sup>/s for the post-regulation period (1942-94). The effect of regulation on the mean annual discharge of the Red River of the North can be assumed to be negligible; however, the mean annual discharge is 403 ft<sup>3</sup>/s for the pre-regulation period and 741 ft<sup>3</sup>/s for the post-regulation period. Although annual 7-day low flow for a 10-year recurrence interval is much greater for the regulation period, the mean annual discharge for the regulated period also is much greater, indicating that regulation may happen to correspond to a relatively wet period in the Red River of the North Basin.

## **REFERENCES**

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- Hydrology Subcommittee of the Interagency Advisory Committee on Water Data, 1982, Guidelines for determining flood flow frequency: Hydrology Subcommittee Bulletin 17B, 28 p., 14 appendices.
- Wahl, K.L., Thomas, W.O., Jr., and Hirsch, R.M., 1995, Stream-gaging program of the U.S. Geological Survey: U.S. Geological Survey Circular 1123, 22 p.



# **STREAMFLOW STATISTICS**

## 05030000 OTTER TAIL RIVER NEAR DETROIT LAKES, MN

### Station Description

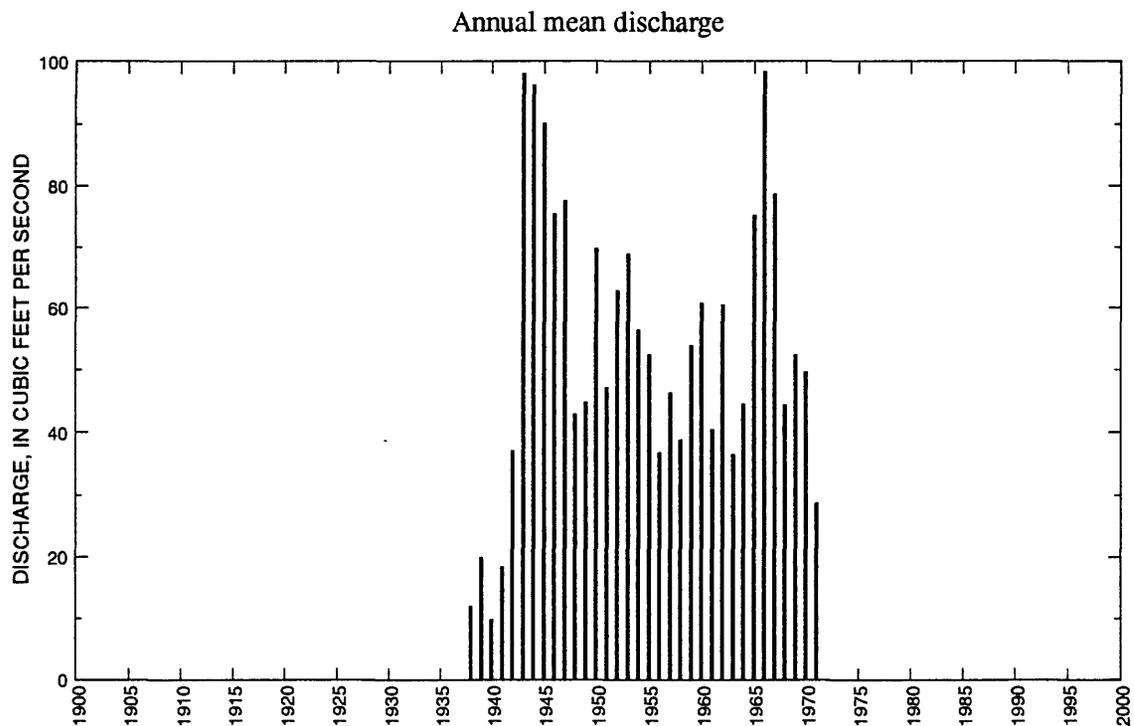
LOCATION.--Lat 46°50'12", long 95°41'57", in NE<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.23, T.139 N., R.40 W., Becker County, Hydrologic Unit 09020103, on right bank 10 ft upstream from highway bridge, 5 mi downstream from Height of Land Lake, and 7.5 mi east of city of Detroit Lakes.

DRAINAGE AREA.--270 mi<sup>2</sup>.

PERIOD OF RECORD.--March 1937 to September 1971.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 1,409.49 ft above sea level.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 371 ft<sup>3</sup>/s, June 26, 1943 (gage height, 4.78 ft, from graph based on partial record); maximum gage height, 6.96 ft, Jan. 27, 1950 (backwater from ice); minimum daily discharge, 0.10 ft<sup>3</sup>/s, Mar. 23, 1940.

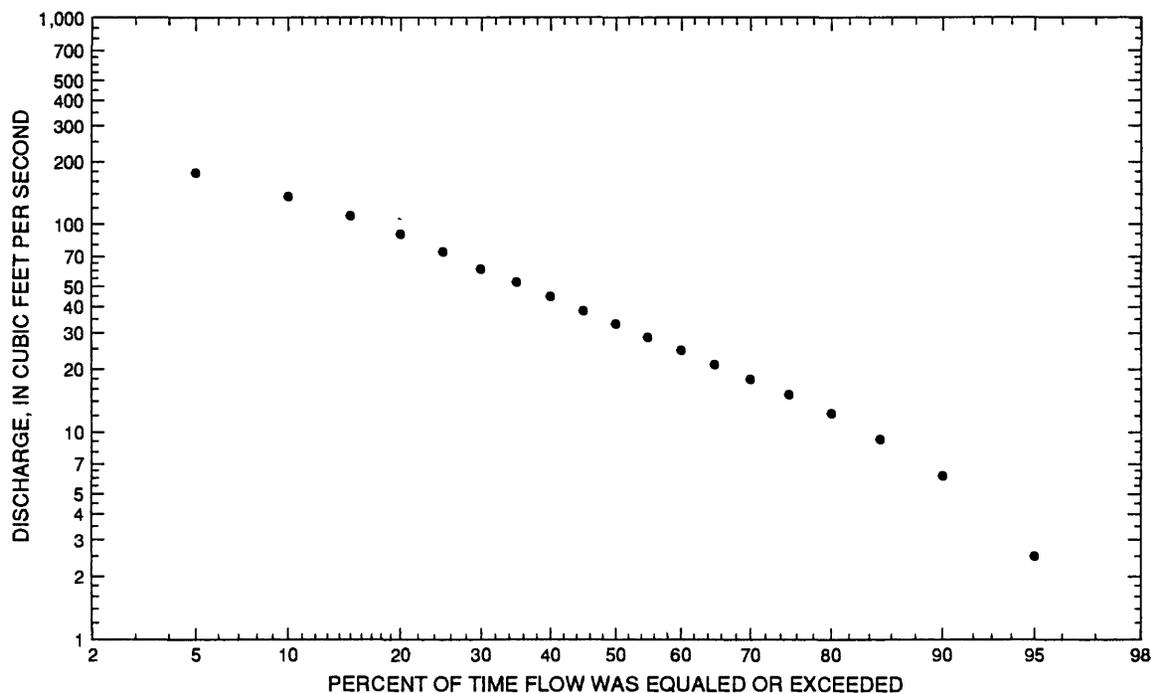


# 05030000 OTTER TAIL RIVER NEAR DETROIT LAKES, MN--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	138	1945	2.16	1957	29.2	28.9	0.99	4.61
November	105	1945	4.94	1958	25.2	22.6	0.90	3.98
December	77.6	1945	4.37	1938	26.3	20.0	0.76	4.15
January	57.0	1966	3.23	1938	24.4	17.4	0.71	3.85
February	60.1	1969	0.793	1940	24.5	15.7	0.64	3.87
March	83.2	1969	0.371	1940	33.9	19.6	0.58	5.36
April	190	1966	1.15	1938	77.8	48.3	0.62	12.3
May	265	1966	1.45	1940	115	65.6	0.57	18.2
June	284	1943	2.16	1940	114	71.1	0.62	18.0
July	206	1944	1.52	1940	77.1	51.8	0.67	12.2
August	288	1944	0.510	1940	49.8	57.5	1.15	7.87
September	238	1944	1.40	1970	35.6	42.8	1.20	5.63
Annual	98.4	1966	9.82	1940	53.7	23.6	0.44	100

Annual flow duration



# 05030000 OTTER TAIL RIVER NEAR DETROIT LAKES, MN--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equalled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	3.50	2.50	2.70	1.30	6.52	16.9	6.28	1.20	1.50	1.70	5.10	6.10	2.50
90	5.70	3.80	10.9	6.10	22.7	26.7	15.2	3.70	1.80	2.80	5.90	7.60	6.17
85	7.30	7.58	13.4	25.2	34.0	37.5	20.2	6.63	3.50	4.50	6.70	8.50	9.22
80	8.75	10.4	15.6	31.9	46.6	46.5	24.1	9.96	5.90	7.07	8.91	8.50	12.3
75	9.56	11.9	18.2	37.6	59.8	56.9	28.0	13.5	9.60	8.80	10.5	10.6	15.2
70	10.2	13.5	20.9	44.1	74.8	67.5	36.4	15.7	12.8	11.7	12.3	12.1	17.9
65	12.3	15.0	23.8	49.2	86.9	77.4	46.1	17.8	15.5	14.2	13.7	14.5	21.1
60	14.1	16.8	26.0	54.2	100	86.8	55.9	20.6	18.1	16.2	15.1	15.9	24.7
55	17.2	19.2	28.1	59.2	109	94.5	64.8	24.2	20.7	17.7	16.5	18.3	28.7
50	19.4	21.8	30.3	64.4	117	102	72.9	28.5	24.2	19.3	17.8	19.9	33.3
45	22.8	25.7	33.2	74.3	126	109	80.0	33.8	27.7	22.3	19.0	21.5	38.3
40	26.6	28.8	36.1	84.0	133	121	87.1	40.0	30.9	25.1	21.5	23.4	45.0
35	30.3	31.6	39.1	93.6	141	133	93.9	47.8	35.0	28.6	23.8	25.4	52.7
30	34.2	34.0	42.1	104	150	145	101	58.1	39.5	33.1	26.2	29.1	61.2
25	37.9	36.4	45.1	113	162	156	108	69.2	46.4	38.7	29.6	33.6	73.8
20	43.4	39.7	49.4	127	174	173	118	80.7	55.5	47.3	35.6	40.4	89.9
15	49.3	43.4	54.2	142	188	194	128	97.1	66.6	60.6	47.8	53.0	110
10	53.8	48.5	63.6	163	204	225	149	121	77.6	67.8	57.8	61.1	136
5	58.1	54.8	82.9	187	227	268	192	167	97.4	90.0	76.6	68.9	177

## 05030000 OTTER TAIL RIVER NEAR DETROIT LAKES, MN--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	37.6	37.4	32.7	25.9	22.1
0.95	1.05	62.7	61.6	56.4	48.7	43.5
0.90	1.11	80.4	78.5	73.4	65.7	59.9
0.80	1.25	106	103	98.6	91.4	84.8
0.50	2	171	164	161	155	147
0.20	5	255	242	239	234	223
0.10	10	306	288	284	278	264
0.04	25	363	341	334	324	306
0.02	50	401	375	366	352	331
0.01	100	436	407	394	376	352
0.005	200	467	436	420	397	369
0.002	500	506	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0.222	0.275	0.317	0.432	0.691	1.15	2.32	3.11	5.96
0.10	10	0.430	0.506	0.583	0.799	1.20	2.00	3.45	4.51	7.56
0.20	5	0.909	1.02	1.17	1.60	2.24	3.66	5.46	6.92	10.1
0.50	2	3.24	3.40	3.86	5.13	6.45	9.84	12.3	14.7	18.1

## 05030000 OTTER TAIL RIVER NEAR DETROIT LAKES, MN--Continued

Probability of seasonal low discharges

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	1.49	1.79	1.98	2.46	0.623	1.01	1.45	2.63
0.10	10	2.48	2.88	3.17	3.91	1.63	2.37	3.30	5.94
0.20	5	4.35	4.88	5.35	6.53	4.38	5.67	7.56	13.0
0.50	2	11.0	11.7	12.7	15.1	17.4	19.4	23.2	33.7
		June-July-August				September-October-November			
0.05	20	0.435	0.749	1.27	2.65	0.538	0.680	1.06	1.78
0.10	10	0.991	1.57	2.45	4.93	0.998	1.23	1.73	2.66
0.20	5	2.47	3.57	5.11	9.66	2.02	2.43	3.06	4.30
0.50	2	11.1	41.7	17.4	27.9	6.82	7.88	8.65	10.7

## 05030000 OTTER TAIL RIVER NEAR DETROIT LAKES, MN--Continued

Annual peak discharge and corresponding gage height, period of record

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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1937	June 20	3.53	54.0	1955	August 3	4.28	195
1938	June 3	3.67	73.0	1956	May 3	4.07	139
1939	March 23	4.83	239	1957	May 14	4.00	133
1940	September 21	3.45	42.0	1958	October 16	3.66	72.0
1941	May 15	3.66	68.0	1959	June 11	3.99	136
1942	June 16	3.88	112	1960	May 3	4.34	214
1943	June 26	4.78	371	1961	May 15	4.12	151
1944	August 22	4.68	336	1962	June 8	4.65	316
1945	May 13	4.29	198	1963	June 9	4.07	157
1946	July 21	4.26	190	1964	May 19	4.10	164
1947	May 2	4.35	212	1965	June 13	4.45	264
1948	April 30	3.93	119	1966	May 3	4.51	283
1949	July 31	4.00	133	1967	June 22	4.27	267
1950	May 29	4.71	332	1968	May 29	4.18	188
1951	June 2	4.26	190	1969	April 21	4.30	207
1952	April 21	4.16	167	1970	June 16	4.21	182
1953	June 15	4.36	218	1971	April 10	3.76	84.0
1954	May 5	4.27	193				
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1943	June 26	4.78	371	1970	June 16	4.21	182
1944	August 22	4.68	336	1952	April 21	4.16	167
1950	May 29	4.71	332	1964	May 19	4.10	164
1962	June 8	4.65	316	1963	June 9	4.07	157
1966	May 3	4.51	283	1961	May 15	4.12	151
1967	June 22	4.27	267	1956	May 3	4.07	139
1965	June 13	4.45	264	1959	June 11	3.99	136
1939	March 23	4.83	239	1949	July 31	4.00	133
1953	June 15	4.36	218	1957	May 14	4.00	133
1960	May 3	4.34	214	1948	April 30	3.93	119
1947	May 2	4.35	212	1942	June 16	3.88	112
1969	April 21	4.30	207	1971	April 10	3.76	84.0
1945	May 13	4.29	198	1938	June 3	3.67	73.0
1955	August 3	4.28	195	1958	October 16	3.66	72.0
1954	May 5	4.27	193	1941	May 15	3.66	68.0
1946	July 21	4.26	190	1937	June 20	3.53	54.0
1951	June 2	4.26	190	1940	September 21	3.45	42.0
1968	May 29	4.18	188				

# 05030000 OTTER TAIL RIVER NEAR DETROIT LAKES, 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
1937	--	7.25	--	3.23	--	--	1.26	22.3	45.3	17.9	6.10	31.8	--
1938	21.3	4.37	9.97	9.16	3.50	2.64	1.15	21.0	28.0	11.9	17.5	19.9	11.9
1939	14.4	10.3	9.97	10.2	10.2	26.7	70.2	16.5	21.5	16.2	15.8	18.6	19.9
1940	33.5	28.5	18.4	7.61	0.793	0.371	5.16	1.45	2.16	1.52	0.510	17.7	9.82
1941	18.3	17.3	18.5	18.5	19.2	24.5	19.6	30.0	25.8	21.0	5.32	3.09	18.4
1942	2.70	30.8	29.1	11.5	5.70	41.2	29.1	74.0	86.5	37.1	18.4	78.3	37.1
1943	93.0	72.8	73.3	21.5	32.1	50.4	87.5	151.5	284.3	202.8	77.3	27.5	98.1
1944	11.8	16.2	12.5	8.58	17.6	15.2	44.1	104.4	190.8	205.7	287.8	238.5	96.2
1945	138.5	105.1	77.6	52.8	32.4	67.5	176.0	190.0	134.3	23.9	27.2	54.0	90.1
1946	70.1	56.7	38.1	36.3	38.9	62.7	138.9	123.3	91.5	160.4	72.6	11.8	75.4
1947	57.4	69.2	51.4	49.0	41.7	43.3	127.0	175.0	169.9	104.4	27.5	13.8	77.6
1948	4.06	7.35	17.0	19.2	21.3	30.9	88.6	100.3	76.6	72.9	56.5	19.3	42.9
1949	9.43	11.0	8.57	7.85	8.30	16.1	74.5	84.5	65.5	93.0	116.0	38.1	44.7
1950	21.5	15.4	9.06	4.48	28.6	36.3	87.9	257.6	246.4	97.9	27.5	2.75	69.8
1951	5.40	6.37	7.65	5.65	20.5	55.1	74.6	148.7	141.6	65.0	16.4	17.0	47.1
1952	35.9	38.7	53.1	56.6	54.1	53.7	106.3	113.0	33.8	76.8	93.9	35.4	62.8
1953	14.6	8.67	9.01	7.09	7.79	33.2	86.7	124.6	188.6	115.4	146.5	81.9	68.9
1954	40.9	21.3	24.4	33.1	37.0	47.1	109.5	174.6	120.4	51.6	10.4	5.10	56.4
1955	13.6	13.5	14.1	10.2	17.0	24.7	53.8	79.6	69.0	83.5	161.3	84.8	52.3
1956	44.4	13.8	9.40	8.97	11.8	16.8	91.3	122.4	81.4	25.2	10.6	3.89	36.7
1957	2.16	6.97	7.91	10.0	10.6	18.0	65.3	121.6	103.0	102.0	57.8	47.8	46.3
1958	56.8	4.94	40.1	55.5	46.0	42.3	31.3	27.5	50.7	50.5	27.7	31.1	38.8
1959	16.4	27.7	63.7	48.3	27.4	18.3	44.0	52.9	99.9	106.0	83.2	56.9	53.9
1960	29.5	24.3	25.9	37.4	17.5	14.0	97.0	160.4	134.5	95.0	27.3	65.6	60.7
1961	32.0	21.7	24.1	38.5	41.4	24.4	40.5	115.9	89.9	34.0	11.1	11.4	40.4
1962	6.58	6.95	8.28	11.8	15.8	24.6	52.0	137.5	246.9	134.5	55.9	22.6	60.4
1963	16.5	17.5	19.8	16.5	12.1	20.5	41.6	52.7	116.0	58.5	31.8	33.8	36.5
1964	18.9	7.84	10.9	14.6	18.1	14.4	83.1	141.6	100.3	78.6	22.9	22.4	44.5
1965	23.1	22.8	25.8	25.4	26.1	31.7	136.7	187.9	224.7	116.9	51.0	28.7	75.2
1966	59.1	56.1	60.1	57.0	52.8	73.3	190.5	265.1	144.4	66.3	81.9	71.7	98.4
1967	38.9	36.7	36.0	31.6	31.9	46.3	156.3	184.3	193.9	148.8	34.4	2.64	78.6
1968	3.79	13.8	17.5	12.4	3.29	16.1	44.3	150.0	142.3	80.7	36.2	9.91	44.3
1969	18.3	25.0	29.2	44.5	60.1	83.2	148.8	143.1	51.9	17.2	4.61	3.06	52.3
1970	16.8	19.0	18.2	28.8	33.7	34.6	64.4	132.5	141.4	94.1	9.16	1.40	49.6
1971	2.86	13.6	20.0	25.4	31.9	39.6	53.9	40.4	38.5	32.2	13.4	34.8	28.8

## 05030500 OTTER TAIL RIVER NEAR ELIZABETH, MN

### Station Description

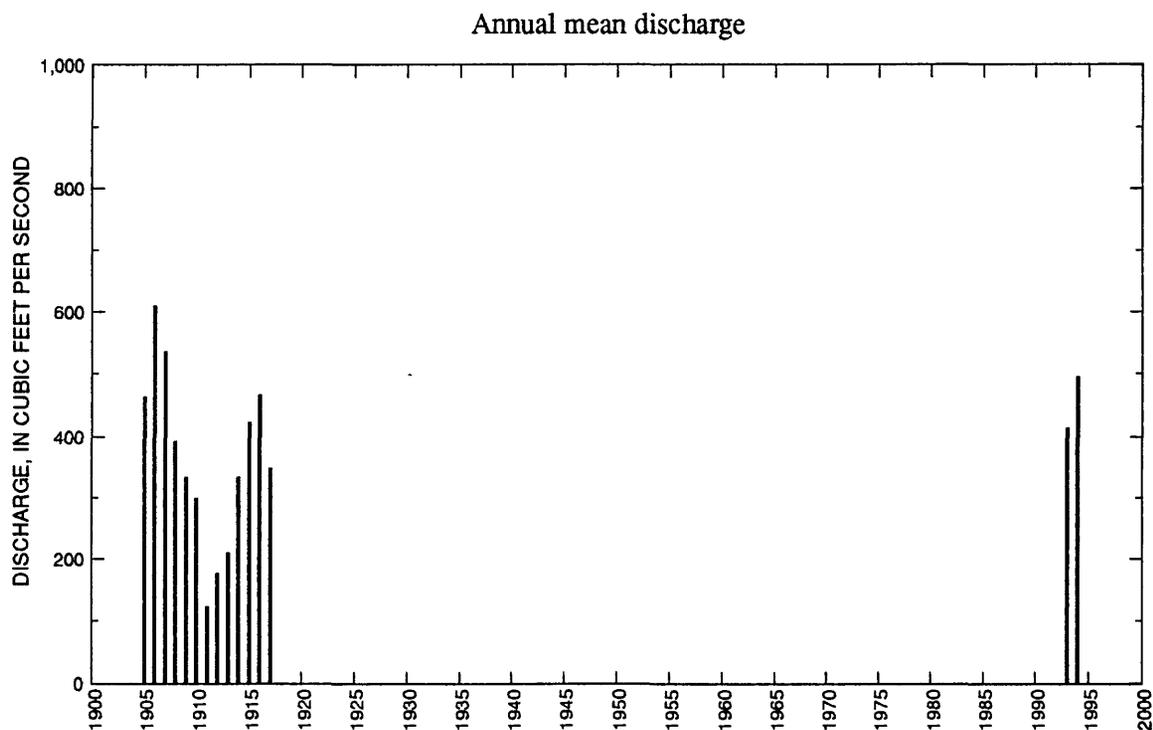
LOCATION.--Lat 46°22'10", long 96°01'02", in SW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.31, T.134 N., R.42 W., Ottertail County, Hydrologic Unit 09020103, on right bank, 2.5 mi below Taplin Gorge Dam, 5.0 mi above the Diversion Dam, 5.7 mi east of Elizabeth and 6.6 mi northeast of Fergus 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 WSP 1308. July 1992 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,250 ft above mean sea level, from topographic map. Nonrecording gage at same site 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); minimum daily discharge, 16.0 ft<sup>3</sup>/s, Sept. 13, 1910 (minimum gage height, 1.9 ft).

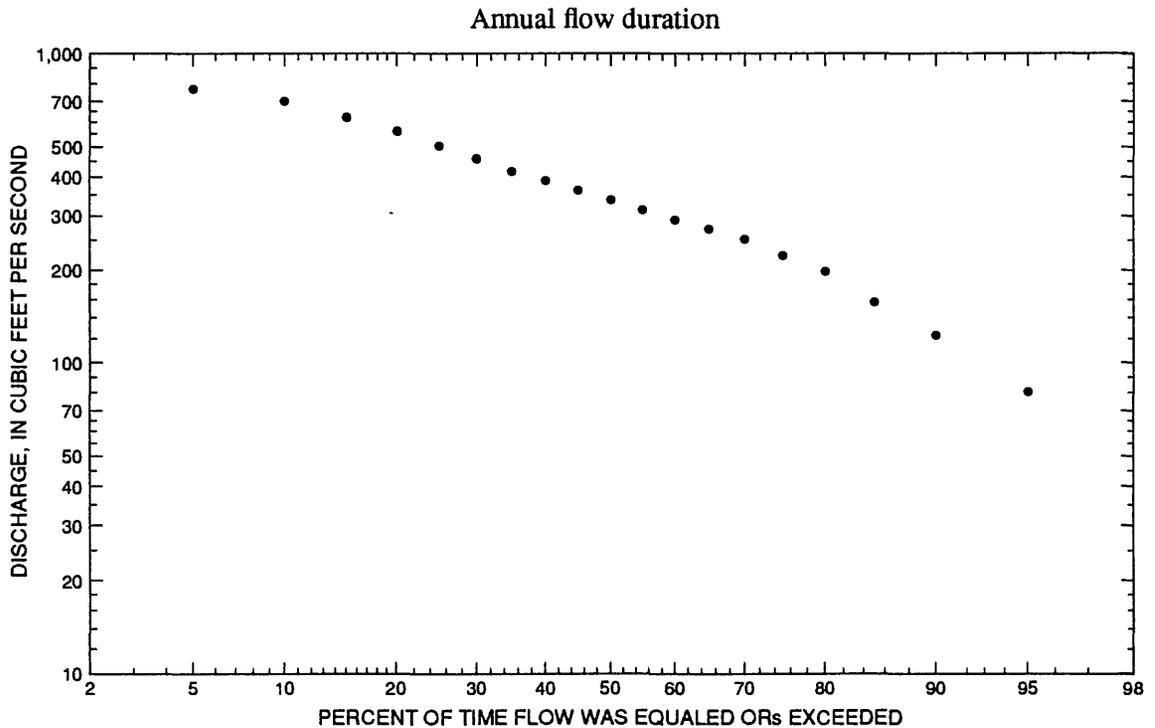


# 05030500 OTTER TAIL RIVER NEAR ELIZABETH, MN--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	740	1994	48.3	1911	386	207	0.54	8.63
November	688	1907	79.3	1911	360	178	0.49	8.04
December	489	1994	79.9	1911	303	132	0.44	6.77
January	400	1994	80.0	m	247	105	0.43	5.52
February	439	1994	70.0	1912	221	98.6	0.45	4.94
March	650	1907	70.0	1912	280	142	0.51	6.25
April	652	1907	180	1913	363	137	0.38	8.11
May	772	1906	221	1911	482	175	0.36	10.8
June	965	1906	169	1911	545	225	0.41	12.2
July	932	1906	108	1911	506	244	0.48	11.3
August	780	1905	64.8	1910	400	228	0.57	8.93
September	817	1993	32.6	1910	383	236	0.62	8.57
Annual	609	1906	123	1911	375	135	0.36	100



# 05030500 OTTER TAIL RIVER NEAR ELIZABETH, 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	81.5	72.2	73.0	168	228	204	110	86.0	45.1	82.4	88.7	80.6	81.0
90	83.0	80.1	109	201	258	245	170	116	92.6	136	122	109	124
85	94.8	85.2	127	225	294	281	227	146	139	159	144	136	158
80	117	88.9	177	242	307	322	252	188	191	182	164	154	199
75	188	158	185	254	317	340	282	212	207	213	213	172	223
70	193	185	202	274	358	375	316	243	218	292	270	218	253
65	198	196	207	284	394	422	389	294	262	316	314	276	273
60	240	223	248	304	425	481	437	314	300	325	326	290	293
55	248	232	254	315	442	514	474	346	326	335	336	306	315
50	257	237	259	339	454	572	513	369	342	344	353	330	339
45	277	242	267	358	487	596	547	394	359	389	374	340	363
40	284	249	277	383	526	622	608	428	393	436	391	351	390
35	292	258	309	407	538	652	657	463	444	460	411	367	419
30	301	262	339	436	572	689	701	514	500	507	433	377	458
25	321	267	364	460	605	713	720	564	553	558	462	387	505
20	331	272	379	496	682	735	738	643	618	587	550	416	562
15	378	288	397	526	729	766	767	714	692	618	572	465	622
10	0.49	338	445	562	748	851	802	760	753	651	605	485	705
5	0.49	423	0.49	637	778	957	848	799	796	712	660	505	769

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

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	198	187	181	172
0.95	1.05	ng	324	307	291	277
0.90	1.11	462	405	385	364	346
0.80	1.25	549	512	489	462	440
0.50	2	738	726	701	667	640
0.20	5	947	913	895	868	843
0.10	10	1,060	989	978	961	939
0.04	25	1,180	1,050	1,050	1,050	1,030
0.02	50	1,260	1,080	1,080	1,090	1,080
0.01	100	1,330	1,100	1,110	1,130	1,120
0.005	200	1,390	1,120	1,130	1,150	1,150
0.002	500	1,460	ng	ng	ng	ng

### Probability of annual low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	29.2	33.1	35.7	37.8	41.7	45.9	58.1	66.2	79.4
0.10	10	50.8	54.6	57.2	59.6	64.4	70.8	84.6	95.3	113
0.20	5	88.7	91.1	93.0	95.4	101	111	126	141	166
0.50	2	186	<sup>1</sup> 186	<sup>1</sup> 187	187	194	216	232	254	298

<sup>1</sup>Graphical interpretation.

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

Probability of seasonal low discharges

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	64.3	66.5	68.7	70.3	86.9	86.9	87.0	90.3
0.10	10	85.4	87.1	89.5	91.7	109	109	111	117
0.20	5	116	118	120	123	141	143	147	157
0.50	2	190	192	193	198	224	229	238	257
		June-July-August				September-October-November			
0.05	20	54.5	56.6	66.7	83.9	38.6	48.7	51.8	57.5
0.10	10	84.6	88.7	100	122	72.5	85.3	89.7	97.1
0.20	5	136	144	156	183	136	150	156	166
0.50	2	287	304	316	351	307	320	333	347

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

Annual peak discharge and corresponding gage height, period of record

[--, 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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1904	June 23	--	1,075	1913	July 5	3.85	758
1905	August 7	4.00	855	1914	June 27	2.40	584
1906	--	4.25	1,020	1915	July 19	2.80	837
1908	June 13	4.10	921	1916	June 29	3.00	982
1909	September 15	3.55	580	1917	October 1	2.45	613
1910	--	3.30	449	1993	September 20	8.10	842
1911	April 19	2.90	274	1994	October 3	8.09	840
1912	July 8	3.20	402				
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1904	June 23	--	1,075	1913	July 5	3.85	758
1906	--	4.25	1,020	1917	October 1	2.45	613
1916	June 29	3.00	982	1914	June 27	2.40	584
1908	June 13	4.10	921	1909	September 15	3.55	580
1905	August 7	4.00	855	1910	--	3.30	449
1993	September 20	8.10	842	1912	July 8	3.20	402
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

## 05040000 PELICAN RIVER NEAR DETROIT LAKES, MN

### Station Description

LOCATION.--Lat 46°43'26", long 95°54'56", in NE<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.31, T.138 N., R.41 W., Becker County, Hydrologic Unit 09020103, in upstream concrete retaining wall at highway crossing at Buck's Mill, 200 ft downstream from concrete millpond dam, and 6.5 mi southwest of city of Detroit Lakes.

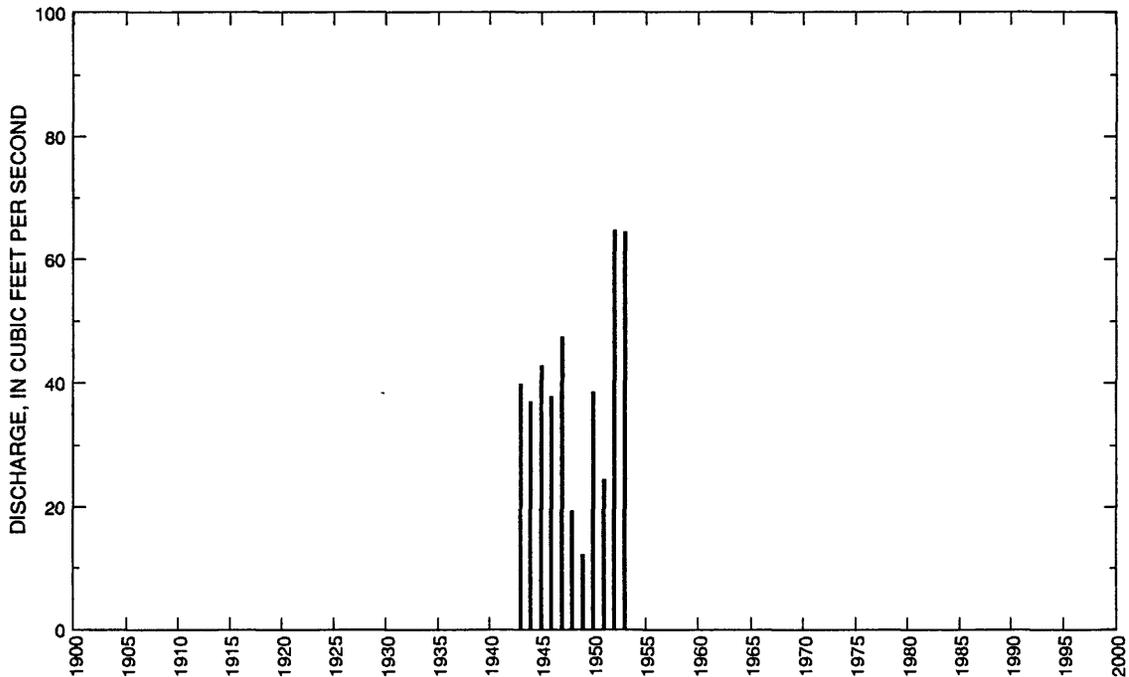
DRAINAGE AREA.--123 mi<sup>2</sup>.

PERIOD OF RECORD.--July 1942 to November 1953.

GAGE.--Staff gage. Datum of gage is 1,315 ft above sea level from topographic map.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 229 ft<sup>3</sup>/s, June 20, 1953 (gage height, 4.28 ft); maximum gage height, 4.40 ft, Aug. 15, 1952, affected by backwater from aquatic vegetation; minimum daily discharge, 0.1 ft<sup>3</sup>/s, Sept. 4, 1950, and many days during 1951.

Annual mean discharge

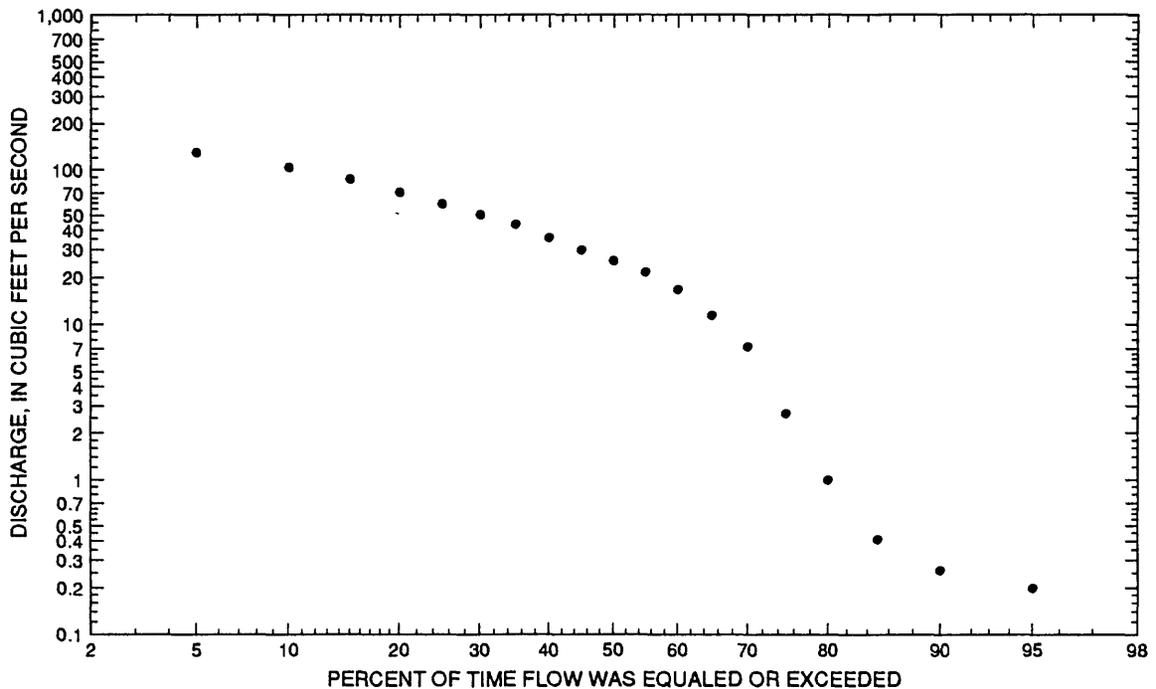


# 05040000 PELICAN RIVER NEAR DETROIT LAKES, MN—Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	70.0	1945	0.165	1951	17.4	22.4	1.29	3.76
November	46.3	1947	0.133	1951	13.7	17.6	1.29	2.98
December	56.5	1952	0.235	1949	18.9	22.0	1.16	4.10
January	55.4	1952	0.216	1950	18.4	18.8	1.02	4.00
February	41.4	1952	0.421	1949	16.6	14.2	0.85	3.61
March	77.2	1953	1.05	1949	28.2	21.4	0.76	6.13
April	131	1953	29.8	1944	77.9	31.8	0.41	16.9
May	167	1950	27.9	1949	82.9	38.1	0.46	18.0
June	198	1953	9.06	1952	71.5	57.2	0.80	15.5
July	118	1946	4.25	1945	53.2	37.8	0.71	11.5
August	147	1952	0.326	1945	35.4	43.5	1.23	7.69
September	111	1944	0.197	1950	26.8	37.7	1.41	5.81
Annual	64.8	1952	12.1	1949	39.0	16.5	0.42	100

Annual flow duration



# 05040000 PELICAN RIVER NEAR DETROIT LAKES, MN--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equalled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0.20	0.35	0.58	22.3	26.0	2.80	0.37	0.30	0.19	0.18	0.10	0.18	0.20
90	0.20	0.35	1.00	25.1	33.7	7.80	11.2	0.30	0.19	0.18	0.18	0.18	0.26
85	0.48	0.47	1.00	30.4	46.1	16.5	14.4	0.46	0.19	0.18	0.18	0.26	0.41
80	0.80	1.00	1.50	39.5	51.3	22.6	16.1	1.00	0.36	0.18	0.18	0.48	1.00
75	2.70	1.60	11.2	46.0	53.7	25.7	18.4	1.90	0.36	0.28	0.39	1.00	2.70
70	3.80	7.99	19.3	52.0	58.0	28.1	21.5	6.98	0.56	0.34	0.48	1.00	7.25
65	5.45	8.87	20.6	59.8	62.5	35.5	26.5	8.54	0.86	0.42	0.48	1.30	11.5
60	6.14	9.31	22.0	67.2	67.3	51.4	31.0	12.4	2.00	0.51	0.70	1.90	16.8
55	7.15	10.4	23.2	73.7	76.1	55.4	35.8	14.5	3.90	1.70	1.90	3.30	21.6
50	8.19	13.3	24.3	78.8	80.6	60.2	40.7	17.4	7.67	10.3	4.00	8.25	25.5
45	18.5	19.3	25.3	83.9	85.1	65.5	45.8	21.7	10.0	13.6	7.61	16.3	30.0
40	22.9	21.1	26.4	89.2	89.6	78.8	53.8	27.7	17.0	14.9	10.6	19.6	35.9
35	25.4	23.4	27.5	94.6	93.9	84.7	64.3	33.9	22.7	16.2	13.3	23.3	43.6
30	31.5	26.1	29.2	100	98.6	91.5	74.9	43.7	26.1	18.6	15.4	26.1	51.0
25	35.5	28.4	31.7	107	104	98.9	84.5	56.7	41.0	28.4	18.3	42.4	59.7
20	38.1	30.9	34.2	114	115	108	95.3	67.0	62.2	37.8	35.0	46.5	71.5
15	40.5	33.6	39.4	122	121	134	106	78.6	73.9	47.2	43.4	50.5	86.6
10	43.0	36.8	51.6	134	136	168	118	94.4	98.8	54.1	46.9	54.6	104
5	55.8	41.1	102	152	170	194	133	141	113	66.9	50.4	58.8	131

## 05040000 PELICAN RIVER NEAR DETROIT LAKES, MN--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	57.8	61.7	58.2	51.5	40.9
0.95	1.05	76.2	76.1	72.5	66.4	56.6
0.90	1.11	87.7	85.3	81.6	75.9	66.8
0.80	1.25	104	98.2	94.3	89.1	80.7
0.50	2	140	129	125	120	113
0.20	5	186	172	167	161	153
0.10	10	214	201	195	187	177
0.04	25	246	237	230	220	205
0.02	50	269	264	256	243	225
0.01	100	291	291	282	266	243
0.005	200	312	319	309	288	260
0.002	500	340	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0.064	<sup>1</sup> 0.064	<sup>1</sup> 0.065	<sup>1</sup> 0.066	<sup>1</sup> 0.067	<sup>1</sup> 0.068	<sup>1</sup> 0.069	0.069	0.257
0.10	10	0.089	<sup>1</sup> 0.089	<sup>1</sup> 0.090	<sup>1</sup> 0.090	0.091	0.106	0.116	0.130	0.516
0.20	5	0.143	0.143	0.144	0.151	0.177	0.242	0.261	0.295	1.18
0.50	2	0.470	0.491	0.561	0.625	0.808	1.35	1.45	1.65	5.32

<sup>1</sup>Graphical interpretation.

## 05040000 PELICAN RIVER NEAR DETROIT LAKES, MN--Continued

Probability of seasonal low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0.054	0.058	0.064	0.115	0.329	0.422	0.474	1.27
0.10	10	0.125	0.151	0.164	0.273	0.820	1.01	1.12	2.90
0.20	5	0.341	0.456	0.486	0.743	2.20	2.60	2.85	6.85
0.50	2	2.28	3.30	3.44	4.48	10.2	11.3	12.0	23.7
		June-July-August				September-October-November			
0.05	20	0.108	0.111	0.176	0.323	0.054	<sup>1</sup> 0.055	0.055	0.065
0.10	10	0.279	0.292	0.421	0.770	0.098	0.099	0.107	0.133
0.20	5	0.813	0.869	1.14	2.02	0.206	0.223	0.248	0.319
0.50	2	4.92	5.47	6.28	10.0	0.945	1.16	1.35	1.80

<sup>1</sup>Graphical interpretation.

## 05040000 PELICAN RIVER NEAR DETROIT LAKES, MN--Continued

Annual peak discharge and corresponding gage height, period of record

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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1943	June 26	3.84	136	1949	April 10	2.82	75.0
1944	September 2	3.82	136	1950	May 19	5.10	210
1945	April 22	3.54	115	1951	June 3	2.84	117
1946	July 18	4.07	145	1952	August 15	4.40	214
1947	May 2	3.86	133	1953	June 20	4.28	229
1948	May 7	3.20	94.0				
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1953	June 20	4.28	229	1947	May 2	3.86	133
1952	August 15	4.40	214	1951	June 3	2.84	117
1950	May 19	5.10	210	1945	April 22	3.54	115
1946	July 18	4.07	145	1948	May 7	3.20	94.0
1943	June 26	3.84	136	1949	April 10	2.82	75.0
1944	September 2	3.82	136				

# 05040000 PELICAN RIVER NEAR DETROIT LAKES, 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
1942	--	--	--	--	--	--	--	--	--	23.9	7.11	26.1	--
1943	14.5	14.6	19.2	29.5	27.2	25.2	70.2	82.8	104.8	67.6	18.9	3.15	39.8
1944	8.62	5.13	8.12	6.13	9.11	16.1	29.8	56.3	63.8	62.1	68.1	111.3	37.0
1945	70.0	44.0	43.2	37.5	33.5	49.3	100.3	79.9	51.0	4.25	0.326	0.213	42.8
1946	0.200	5.92	24.5	23.0	20.7	34.5	77.8	43.2	35.1	117.8	54.8	13.9	37.8
1947	48.4	46.3	51.6	35.8	26.8	27.5	95.7	114.3	84.6	36.0	1.02	0.423	47.4
1948	0.445	0.530	1.79	5.21	8.97	19.8	63.0	75.8	25.9	18.5	10.1	1.85	19.3
1949	0.239	0.220	0.235	0.384	0.421	1.05	41.8	27.9	9.63	28.4	29.8	3.98	12.1
1950	0.561	0.457	0.606	0.216	0.439	1.90	117.5	166.8	133.6	37.5	1.51	0.197	38.5
1951	0.165	0.133	0.797	8.00	13.2	23.9	46.0	64.3	70.9	33.1	16.2	15.6	24.4
1952	32.9	35.0	56.5	55.4	41.4	34.3	83.8	92.1	9.06	103.0	147.2	83.7	64.8
1953	13.5	2.61	1.43	1.56	1.38	77.2	130.8	108.8	198.0	105.9	70.1	61.2	64.5
1954	18.7	9.75	--	--	--	--	--	--	--	--	--	--	--

# 05040500 PELICAN RIVER NEAR FERGUS FALLS, MN

## Station Description

LOCATION.--Lat 46°20'10", long 96°07'00", in NE<sup>1</sup>/<sub>4</sub> sec.17, T.133 N., R.43 W., Otter Tail County, Hydrologic Unit 09020103, on right downstream wingwall of bridge on U.S. Highway 52, 3 mi northwest of Fergus Falls and 7.5 mi upstream from mouth.

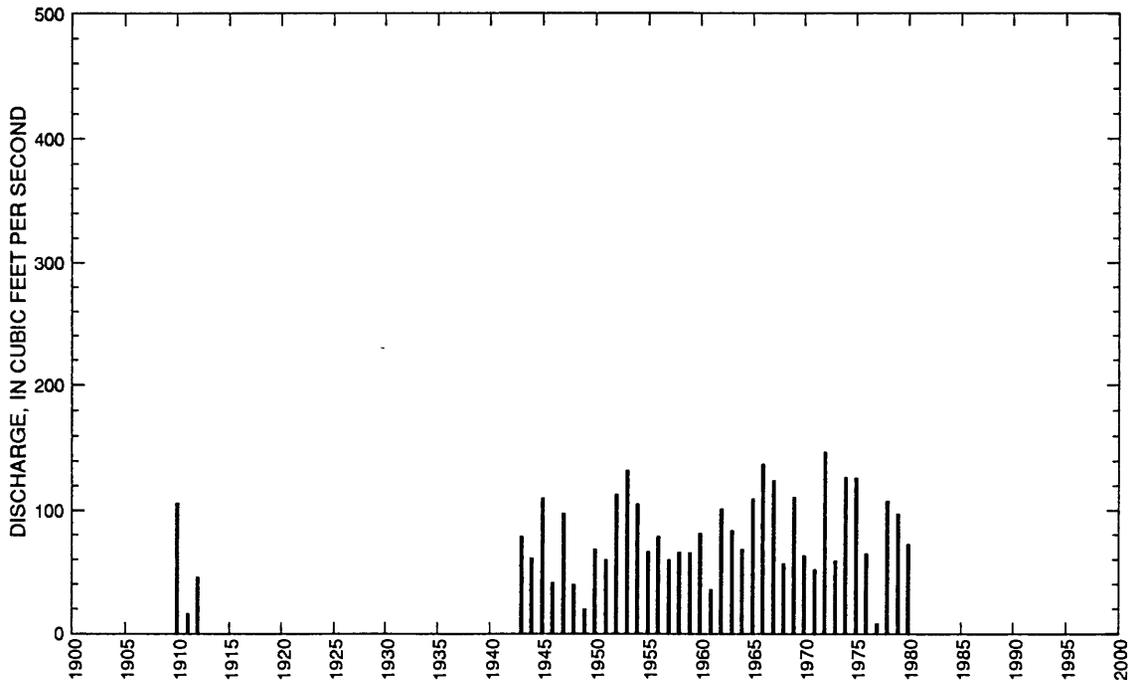
DRAINAGE AREA.--482 mi<sup>2</sup>.

PERIOD OF RECORD.--June 1909 to December 1913, July 1942 to September 1980.

GAGE.--Water-stage recorder. Datum of gage is 1,176.98 ft above sea level, datum of 1929. June 19, 1909, to Dec. 31, 1912, staff gage at site 1 mil downstream at different datum. July 1, 1942, to Nov. 6, 1955, staff gage and Nov. 7, 1955, to Sept. 30, 1963, water-stage recorder, at site 900 ft upstream at datum 3.00 ft higher.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 756 ft<sup>3</sup>/s, Mar. 29, 1943 (gage height, 8.53 ft, present datum); maximum gage height, 8.60 ft, Mar. 28, 1950 (backwater from ice, present datum); no flow for many days in 1946, and 1949-50; no flow at times in some years.

Annual mean discharge



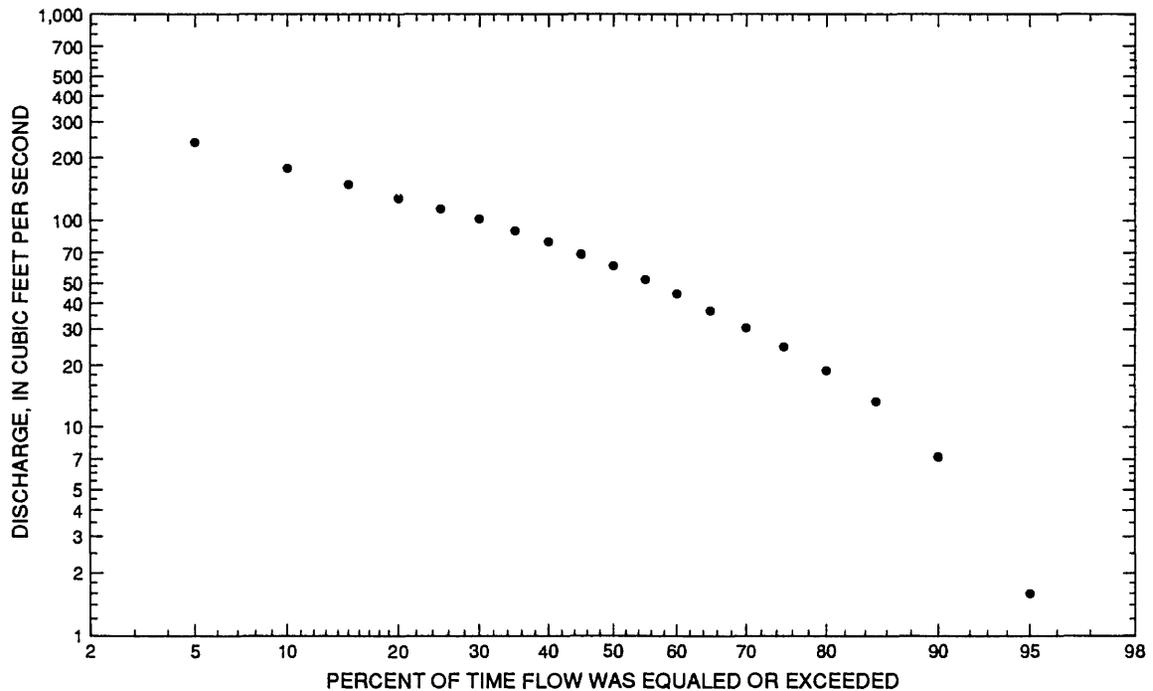
## 05040500 PELICAN RIVER NEAR FERGUS FALLS, MN—Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	173	1910	0.083	1977	52.4	39.1	0.75	5.50
November	142	1910	1.25	1977	49.9	38.6	0.78	5.24
December	132	1945	0.172	1977	42.0	37.9	0.90	4.41
January	125	1910	0	m	40.4	37.8	0.94	4.24
February	117	1945	0	m	39.2	34.7	0.89	4.11
March	186	1945	5.28	1962	68.5	49.9	0.73	7.20
April	320	1966	17.1	1977	156	71.7	0.46	16.4
May	310	1966	12.8	1977	161	76.4	0.47	16.9
June	356	1953	7.52	1977	137	83.0	0.61	14.4
July	266	1953	4.14	1977	88.1	61.0	0.69	9.25
August	179	1953	0.328	1976	62.0	47.0	0.76	6.51
September	189	1909	0.003	1976	55.4	43.2	0.78	5.82
Annual	147	1972	7.69	1977	79.4	34.4	0.43	100

Annual flow duration



**05040500 PELICAN RIVER NEAR FERGUS FALLS, MN--Continued**

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equalled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0.05	0	1.50	43.4	36.8	22.6	8.58	5.42	5.23	4.64	5.52	1.40	1.60
90	1.40	0.90	5.00	59.3	54.2	35.8	17.3	10.3	9.00	8.59	7.55	3.78	7.22
85	1.70	1.40	10.1	70.6	80.6	43.9	22.6	15.2	12.8	12.1	9.73	6.76	13.3
80	2.10	1.90	13.5	83.0	93.5	55.8	31.6	22.0	15.4	15.7	13.3	8.91	19.0
75	5.91	4.50	25.0	94.7	107	67.6	39.9	27.2	19.4	19.3	16.1	12.7	24.8
70	16.3	17.5	31.6	105	117	78.6	47.4	30.8	24.3	23.6	18.9	15.6	30.7
65	19.4	21.8	35.5	118	126	91.6	56.9	34.8	28.7	29.3	22.1	18.0	37.3
60	22.5	24.9	40.1	128	136	106	67.6	40.8	33.8	34.6	26.1	21.1	44.8
55	25.8	27.2	45.9	137	145	117	74.9	46.0	40.7	39.6	32.9	24.2	52.6
50	29.3	29.4	52.4	145	155	128	81.8	50.1	46.4	44.9	40.3	30.8	60.8
45	33.6	33.8	59.4	153	164	137	87.6	54.2	52.0	50.2	47.4	36.4	69.2
40	39.3	42.0	67.4	163	174	147	93.4	58.7	57.5	56.6	54.8	41.3	79.6
35	49.0	48.8	77.5	174	184	160	99.8	66.7	63.1	64.1	62.6	47.4	90.0
30	55.9	55.8	87.4	186	196	174	107	74.7	72.4	71.8	71.0	55.1	102
25	64.0	61.7	96.9	197	218	189	115	88.4	82.8	79.9	78.6	65.0	115
20	74.6	75.5	106	213	239	205	127	103	97.1	88.1	86.0	77.5	128
15	92.8	83.3	123	230	259	230	141	120	108	98.0	98.0	90.2	150
10	106	94.3	144	276	277	260	177	140	119	109	114	103	179
5	121	106	181	328	303	312	226	166	140	126	129	124	238

## 05040500 PELICAN RIVER NEAR FERGUS FALLS, MN--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	84.8	63.6	55.5	38.2	28.5
0.95	1.05	123	98.3	89.5	72.2	60.4
0.90	1.11	149	123	113	96.9	84.6
0.80	1.25	190	159	148	133	120
0.50	2	300	253	235	218	201
0.20	5	475	388	351	311	279
0.10	10	606	479	422	357	311
0.04	25	785	593	504	400	337
0.02	50	928	677	561	425	349
0.01	100	1,080	760	614	443	357
0.005	200	1,240	842	663	458	363
0.002	500	1,470	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0	0	0.124	1.35	2.14
0.10	10	0	0	0	0	0	0.612	0.778	2.87	4.68
0.20	5	1.86	2.09	2.50	2.62	2.94	3.45	3.60	6.49	10.5
0.50	2	11.4	12.2	13.8	14.4	15.6	18.0	22.7	22.9	33.0

## 05040500 PELICAN RIVER NEAR FERGUS FALLS, MN—Continued

Probability of seasonal low discharges

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
Non-exceedance probability	Recurrence interval (years)	December-January-February				March-April-May			
		0.05	20	0	0	0	0	0	0
0.10	10	0.059	0.059	0.063	0.081	0.141	1.37	2.69	13.0
0.20	5	3.02	3.07	3.20	3.58	6.57	6.85	7.53	22.0
0.50	2	18.8	19.1	19.7	21.0	31.9	32.5	33.8	51.6
		June-July-August				September-October-November			
0.05	20	2.34	4.07	5.56	<sup>1</sup> 6.80	1.32	2.39	2.90	4.30
0.10	10	5.33	7.78	9.84	<sup>1</sup> 11.0	2.88	4.56	5.37	7.42
0.20	5	11.3	14.3	17.0	20.5	6.12	8.58	9.81	12.7
0.50	2	33.1	36.1	39.5	57.7	19.6	23.4	25.6	30.2

<sup>1</sup>Graphical interpretation.

## 05040500 PELICAN RIVER NEAR FERGUS FALLS, MN--Continued

Annual peak discharge and corresponding gage height, period of record

[--, 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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1910	October 11	--	303	1961	April 24	2.33	135
1911	May 8	--	124	1962	May 24	3.45	365
1912	May 28	--	230	1963	March 29	4.11	230
1943	March 29	5.53	756	1964	May 8	4.47	274
1944	June 5	--	212	1965	April 9	6.34	551
1945	March 17	--	330	1966	April 1	4.73	560
1946	May 16	--	212	1967	March 30	6.99	655
1947	June 7	--	218	1968	May 15	4.05	194
1948	--	--	--	1969	April 12	5.30	710
1949	April 3	--	245	1970	June 20	4.38	350
1950	May 6	--	296	1971	July 3	4.16	251
1951	April 7	--	177	1972	May 30	4.60	420
1952	April 14	--	388	1973	March 25	3.97	163
1953	June 15	4.85	680	1974	April 12	6.08	725
1954	July 2	--	242	1975	April 19	6.72	585
1955	April 4	--	250	1976	March 26	5.11	186
1956	April 13	--	315	1977	May 14	3.70	129
1957	April 20	--	216	1978	April 6	5.41	635
1958	July 7	--	125	1979	April 18	5.08	610
1959	May 31	--	164	1980	April 5	5.86	495
1960	April 27	--	206				
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1943	March 29	5.53	756	1955	April 4	--	250
1974	April 12	6.08	725	1949	April 3	--	245
1969	April 12	5.30	710	1954	July 2	--	242
1953	June 15	4.85	680	1912	May 28	--	230
1967	March 30	6.99	655	1963	March 29	4.11	230
1978	April 6	5.41	635	1947	June 7	--	218
1979	April 18	5.08	610	1957	April 20	--	216
1975	April 19	6.72	585	1944	June 5	--	212
1966	April 1	4.73	560	1946	May 16	--	212
1965	April 9	6.34	551	1960	April 27	--	206
1980	April 5	5.86	495	1968	May 15	4.05	194
1972	May 30	4.60	420	1976	March 26	5.11	186
1952	April 14	--	388	1951	April 7	--	177
1962	May 24	3.45	365	1959	May 31	--	164
1970	June 20	4.38	350	1973	March 25	3.97	163
1945	March 17	--	330	1961	April 24	2.33	135
1956	April 13	--	315	1977	May 14	3.70	129
1910	October 11	--	303	1958	July 7	--	125
1950	May 6	--	296	1911	May 8	--	124
1964	May 8	4.47	274	1948	--	--	--
1971	July 3	4.16	251				

# 05040500 PELICAN RIVER 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; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1909	--	--	--	--	--	--	--	--	--	96.0	151.2	188.8	--
1910	172.9	141.5	125.0	125.0	80.0	180.0	188.3	148.5	70.8	18.5	9.15	5.58	105.7
1911	8.20	12.7	3.00	2.00	2.00	10.0	38.3	33.4	34.5	11.4	15.3	18.8	15.8
1912	35.7	22.4	10.0	2.00	2.00	8.00	71.3	181.7	98.9	33.1	42.0	36.2	45.4
1913	46.5	42.6	20.0	--	--	--	--	--	--	--	--	--	--
1942	--	--	--	--	--	--	--	--	--	23.5	10.8	19.4	--
1943	22.0	18.1	19.1	19.5	17.6	140.8	198.5	150.9	162.2	84.6	53.1	50.2	78.2
1944	58.1	22.9	14.7	20.4	13.4	20.6	72.8	111.2	145.7	88.5	64.6	100.9	61.1
1945	122.3	125.3	132.3	117.4	116.8	186.2	172.1	159.9	124.5	29.6	19.7	9.80	109.6
1946	8.11	6.67	1.63	0	0	51.0	97.2	127.7	53.7	55.0	43.6	44.3	41.0
1947	79.4	92.3	91.1	93.2	61.1	95.3	191.5	188.4	159.8	65.3	29.5	19.0	97.3
1948	38.9	27.6	12.1	3.82	1.67	20.0	128.9	118.3	50.7	29.6	26.8	12.1	39.2
1949	4.64	5.46	4.03	0.910	0	6.37	81.6	35.8	21.2	40.6	23.6	7.43	19.4
1950	8.48	7.73	1.60	0	0	18.1	139.9	248.6	194.9	118.9	49.4	27.9	68.2
1951	21.6	23.9	36.0	33.6	32.1	36.0	137.9	113.3	102.9	68.7	48.5	61.2	59.6
1952	68.3	89.6	104.9	117.4	98.9	99.0	231.4	150.8	85.1	97.2	106.2	105.5	112.8
1953	76.7	57.0	38.2	29.6	25.9	54.4	170.7	199.9	355.9	265.5	179.0	129.6	132.2
1954	110.7	116.3	94.1	57.5	64.3	125.7	161.1	167.3	150.6	107.4	56.5	47.0	105.1
1955	38.4	30.3	20.6	19.8	22.9	32.6	107.4	86.9	85.5	122.9	115.8	105.4	65.9
1956	108.0	64.5	28.8	25.5	27.9	35.4	207.4	195.1	127.9	52.3	47.5	20.3	78.4
1957	10.8	12.4	8.39	6.03	3.83	43.0	94.1	135.6	112.3	87.4	88.5	107.9	59.4
1958	87.2	76.5	56.6	49.4	41.5	55.0	69.2	52.8	52.3	107.9	65.2	70.3	65.5
1959	40.5	50.5	39.1	28.3	27.3	78.9	78.9	104.3	129.0	87.5	56.9	58.8	65.2
1960	66.1	58.6	55.0	65.1	58.0	60.6	149.2	174.5	125.1	71.8	40.9	46.8	80.9
1961	27.3	13.9	7.06	17.2	21.4	45.4	76.0	98.4	51.0	31.0	15.6	16.2	35.1
1962	13.3	14.2	8.03	2.80	0.971	5.28	138.4	205.4	291.1	236.2	156.4	131.8	100.7
1963	110.4	87.7	57.9	39.8	29.0	73.0	145.1	115.5	155.9	75.4	55.5	56.2	83.6
1964	34.3	23.9	16.3	17.7	25.7	37.0	180.7	224.2	139.9	54.9	33.5	32.7	68.3
1965	25.8	26.2	24.3	28.2	36.0	48.1	287.1	248.6	268.0	145.9	87.1	85.6	109.2
1966	99.7	80.1	73.3	58.8	49.9	90.3	319.7	309.5	225.6	116.8	127.9	92.5	137.3
1967	77.8	73.6	62.4	61.6	58.8	128.4	269.8	276.0	269.3	126.6	52.9	28.0	123.9
1968	17.1	14.7	18.9	4.27	1.46	15.9	114.6	145.5	141.3	91.7	55.7	52.2	56.1
1969	47.8	41.4	34.5	50.7	91.7	112.7	316.4	292.2	173.8	94.5	53.6	22.2	110.8
1970	21.8	16.2	16.6	20.2	26.4	36.7	134.2	161.6	188.2	86.6	37.9	13.3	63.3
1971	14.0	16.5	15.8	16.6	24.4	63.1	139.0	59.0	63.1	117.8	38.6	52.8	51.8

# 05040500 PELICAN RIVER 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; --, no data]

Year	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Annual
1972	60.7	114.0	126.8	114.5	111.6	184.6	199.7	286.8	203.8	133.6	136.6	89.6	147.0
1973	54.5	48.8	42.8	46.7	50.3	109.0	119.5	87.5	46.2	26.3	23.6	52.9	59.0
1974	86.2	101.0	91.5	93.0	97.0	96.3	166.2	247.8	279.5	120.8	86.1	55.6	126.7
1975	43.4	47.8	30.6	30.3	41.7	61.8	206.0	269.7	233.0	239.1	164.9	138.6	125.9
1976	100.2	78.5	60.7	58.6	74.5	120.1	134.8	101.1	37.2	10.3	0.328	0.003	64.7
1977	0.083	1.25	0.172	0	0	18.7	17.1	12.8	7.52	4.14	5.27	25.2	7.69
1978	50.3	103.6	85.9	95.9	78.7	94.2	254.2	215.5	126.8	103.0	50.7	34.7	107.8
1979	12.5	6.51	6.51	1.94	4.58	21.5	237.1	247.1	211.7	190.5	128.4	94.5	97.2
1980	68.5	79.5	66.7	82.0	84.3	90.9	168.3	121.9	61.9	18.6	11.2	14.9	72.2
1981	--	--	--	--	--	--	--	--	--	--	--	--	--

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

## Station Description

**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.

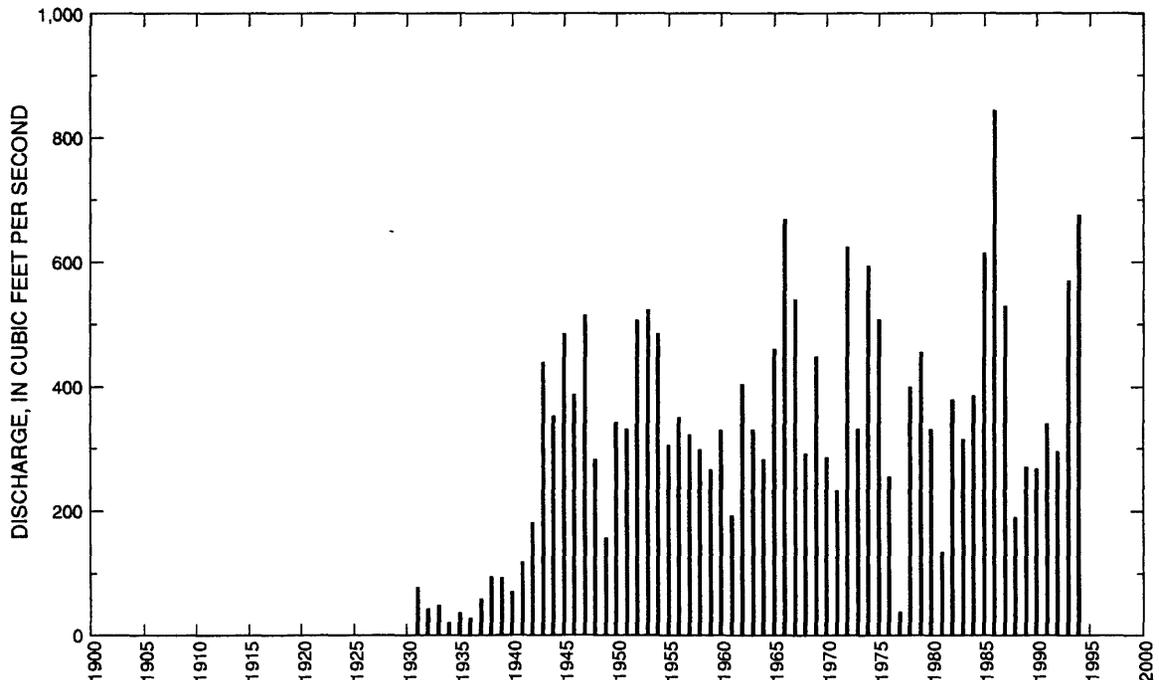
**DRAINAGE AREA.**--1,830 mi<sup>2</sup>, approximately.

**PERIOD OF RECORD.**--October 1930 to current year. Prior to October 1952, published as Otter Tail River below Pelican River near Fergus Falls. Monthly 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; maximum gage height, 5.60 ft, June 17, 1953; minimum discharge, 0.70 ft<sup>3</sup>/s, Aug. 5, 1970 (minimum gage height 1.28 ft), caused by regulation.

Annual mean discharge



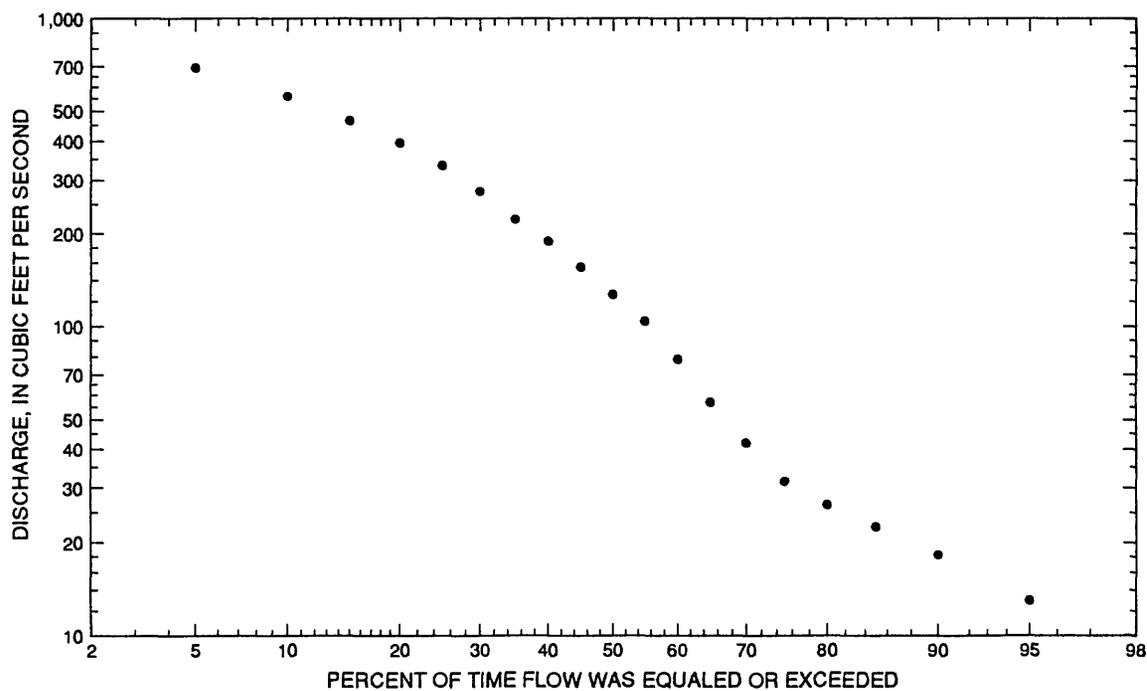
## 05046000 OTTER TAIL RIVER BELOW ORWELL DAM NEAR FERGUS FALLS, MN—Continued

Pre-regulation period, 1931-52

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

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	695	1945	10.5	1936	160	191	1.20	6.29
November	667	1945	13.7	1935	158	187	1.19	6.20
December	503	1945	14.1	1935	146	158	1.08	5.75
January	479	1952	15.1	1937	137	143	1.04	5.40
February	484	1952	10.8	1935	133	127	0.96	5.23
March	528	1945	23.5	1937	197	143	0.73	7.74
April	787	1952	39.5	1934	305	246	0.81	12.0
May	900	1947	18.0	1934	377	301	0.80	14.8
June	884	1950	14.2	1934	348	291	0.84	13.7
July	667	1950	12.8	1936	243	224	0.92	9.54
August	611	1946	11.5	1934	171	177	1.04	6.71
September	581	1944	7.99	1934	169	178	1.05	6.63
Annual	515	1947	20.4	1934	212	176	0.83	100

Annual flow duration, pre-regulation period



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

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

Percentage of days discharged or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	14.1	12.6	21.2	27.7	21.6	17.6	8.82	9.12	7.52	8.21	11.8	15.7	13.0
90	18.5	22.3	26.4	43.3	30.8	22.2	15.2	13.7	14.2	13.2	15.3	17.7	18.4
85	21.9	24.5	36.7	50.2	41.4	35.0	21.2	16.8	17.8	16.2	18.7	21.2	22.5
80	23.9	26.0	51.3	63.2	52.8	51.0	28.1	19.5	21.8	19.4	21.3	26.2	26.6
75	25.7	29.8	65.3	80.3	69.9	64.6	37.5	23.3	26.1	22.8	24.0	29.4	31.6
70	29.5	40.0	93.0	109	129	96.8	48.9	26.7	30.0	26.7	26.0	32.4	41.9
65	32.5	45.0	112	130	190	145	64.7	30.3	34.3	31.3	29.1	37.2	57.0
60	41.1	71.1	126	153	238	189	87.8	36.7	46.0	38.7	35.5	52.5	78.3
55	72.7	89.2	144	182	280	228	122	50.5	66.9	53.4	47.6	68.6	104
50	94.8	103	160	219	307	276	165	112	98.2	68.6	77.7	85.5	126
45	110	115	173	267	344	312	209	149	134	88.0	92.8	94.1	156
40	127	126	193	325	410	394	252	176	167	117	106	105	189
35	143	137	217	395	522	457	312	204	187	163	128	122	224
30	160	150	235	458	595	525	375	237	211	200	201	180	277
25	185	173	266	500	652	595	423	293	253	253	273	218	334
20	223	208	322	538	696	654	468	344	332	316	322	279	396
15	325	279	372	591	741	716	532	379	403	358	367	332	468
10	401	346	447	692	820	795	604	431	469	425	402	429	560
5	445	426	520	787	918	886	685	546	545	619	596	493	693

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

Probability of annual high discharges, pre-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	317	56.4	40.7	32.8	24.4
0.95	1.05	406	117	90.8	76.4	61.2
0.90	1.11	462	167	134	115	95.3
0.80	1.25	542	248	208	182	156
0.50	2	734	482	433	392	357
0.20	5	994	835	493	738	701
0.10	10	1,160	1,070	1,040	976	943
0.04	25	1,380	1,340	1,340	1,270	1,240
0.02	50	1,540	1,530	1,550	1,480	1,460
0.01	100	1,700	1,700	1,750	1,670	1,660
0.005	200	1,860	1,870	1,940	1,860	1,850
0.002	500	2,070	ng	ng	ng	ng

Probability of annual low discharges, pre-regulation period

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	1.63	3.66	4.70	5.33	6.56	7.53	8.54	9.30	11.3
0.10	10	2.55	5.60	7.10	8.03	9.82	11.3	12.7	13.9	17.0
0.20	5	4.54	9.55	11.9	13.4	16.2	18.7	20.8	22.8	28.0
0.50	2	15.3	28.2	33.9	37.8	44.5	50.7	55.9	61.4	74.2

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

Probability of seasonal low discharges, pre-regulation period

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	3.44	8.99	9.50	10.0	4.35	13.2	16.4	19.8
0.10	10	5.77	12.8	13.6	14.6	7.73	20.5	25.0	31.1
0.20	5	10.7	20.1	21.3	23.3	15.1	34.3	40.8	52.2
0.50	2	34.6	50.5	53.3	59.4	50.4	86.9	98.8	129
		June-July-August				September-October-November			
0.05	20	3.30	5.15	6.19	8.00	2.08	4.92	5.80	6.75
0.10	10	5.69	9.02	10.7	13.4	3.37	7.70	9.12	10.6
0.20	5	11.0	17.6	20.5	24.8	6.28	13.6	16.1	18.6
0.50	2	39.6	61.0	68.2	78.4	23.4	43.3	50.5	57.3

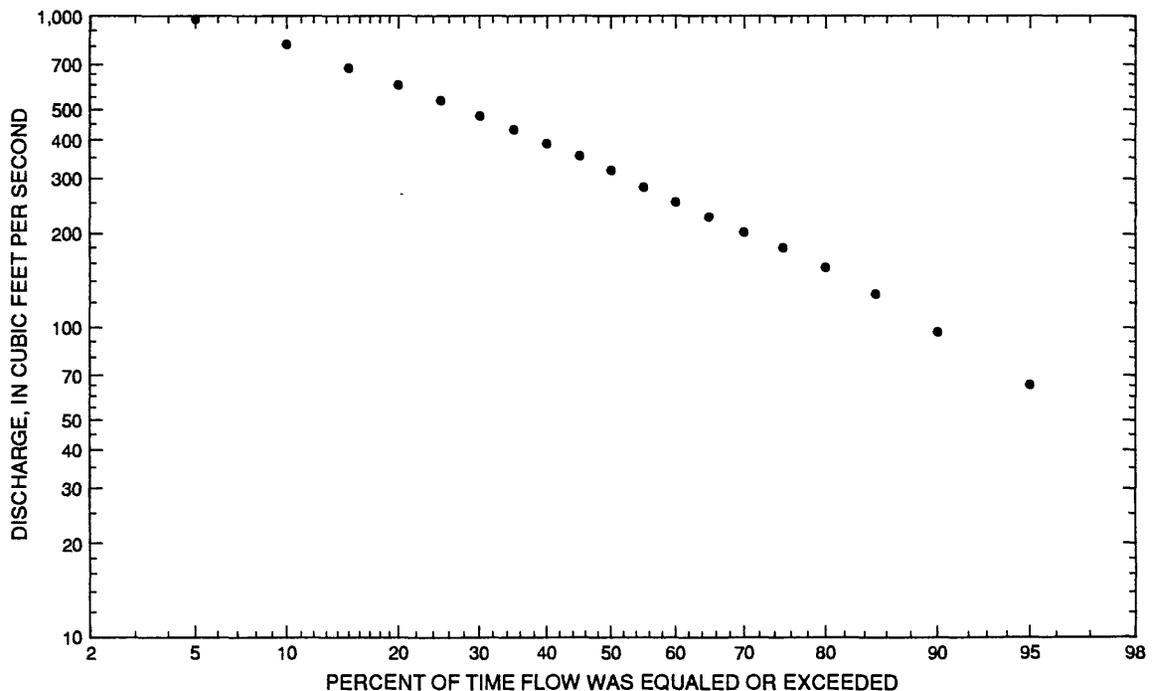
**05046000 OTTER TAIL RIVER BELOW ORWELL DAM NEAR  
FERGUS FALLS, MN--Continued**

Post-regulation period, 1953-94

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

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	973	1994	9.15	1977	274	207	0.75	5.87
November	831	1986	8.42	1977	286	200	0.70	6.13
December	706	1987	8.10	1977	271	180	0.66	5.81
January	603	1986	19.8	1977	262	150	0.57	5.62
February	647	1994	22.4	1977	270	137	0.51	5.79
March	724	1994	30.4	1977	360	140	0.39	7.72
April	1,050	1986	45.8	1977	539	204	0.38	11.6
May	1,430	1986	14.1	1977	656	311	0.47	14.0
June	1,420	1986	55.0	1977	661	352	0.53	14.2
July	1,250	1953	59.8	1977	491	282	0.57	10.5
August	1,080	1985	50.4	1977	329	256	0.78	7.05
September	1,030	1993	9.17	1976	268	226	0.84	5.73
Annual	842	1986	37.5	1977	389	162	0.42	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 discharged or equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	79.0	93.4	121	179	182	126	77.7	50.3	27.7	61.8	56.6	56.1	65.1
90	91.9	126	177	254	277	183	126	72.2	49.9	74.9	99.7	91.2	96.5
85	109	141	200	302	328	246	170	84.7	66.1	88.9	117	109	128
80	138	157	216	351	361	302	213	101	79.8	103	131	130	155
75	156	176	230	378	399	369	264	131	100	125	146	146	180
70	175	187	246	401	442	438	310	156	116	141	158	161	203
65	190	200	268	421	500	487	344	180	140	153	174	175	227
60	204	214	294	439	550	537	376	204	162	180	192	187	253
55	220	230	319	458	597	587	407	226	180	195	207	204	282
50	234	245	341	496	641	631	436	247	199	211	224	227	318
45	245	258	364	531	685	673	476	268	222	242	250	241	355
40	256	272	388	564	732	725	519	322	256	289	291	256	390
35	272	289	411	600	780	782	561	359	300	312	316	282	431
30	294	316	434	643	829	862	600	403	341	334	340	314	478
25	350	349	462	697	886	942	659	456	394	354	375	352	535
20	388	379	494	758	942	1,010	745	511	430	386	419	408	601
15	438	407	538	822	1,010	1,080	853	604	474	452	475	482	681
10	521	476	590	905	1,080	1,190	945	699	539	505	549	591	814
5	580	557	669	1,010	1,200	1,340	1,080	936	815	786	759	679	983

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

Probability of annual high discharges, post-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	206	196	172	147
0.95	1.05	446	350	332	301	271
0.90	1.11	535	448	425	391	359
0.80	1.25	657	585	556	519	486
0.50	2	930	884	849	808	771
0.20	5	1,250	1,200	1,160	1,120	1,070
0.10	10	1,420	1,340	1,320	1,270	1,210
0.04	25	1,620	1,480	1,480	1,420	1,340
0.02	50	1,740	1,560	1,560	1,500	1,400
0.01	100	1,850	1,620	1,630	1,570	1,460
0.005	200	1,950	1,670	1,690	1,620	1,500
0.002	500	2,070	ng	ng	ng	ng

Probability of annual low discharges, post-regulation period

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	11.7	13.9	14.9	16.1	19.5	29.7	34.2	36.8	45.7
0.10	10	18.1	20.5	23.0	25.5	30.8	45.8	53.4	58.0	69.2
0.20	5	29.7	32.4	38.0	43.0	51.6	73.7	86.3	94.4	108
0.50	2	70.9	74.4	91.8	106	124	159	183	198	218

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

Probability of seasonal low discharges, post-regulation period  
[ng, statistic not given]

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	34.8	37.2	39.1	41.3	32.0	53.1	66.7	ng
0.10	10	54.8	59.5	63.3	67.7	49.3	88.1	116	ng
0.20	5	88.6	97.3	104	112	78.3	143	192	ng
0.50	2	183	201	215	230	159	258	324	ng
		June-July-August				September-October-November			
0.05	20	15.9	26.5	33.9	61.2	16.4	17.8	20.2	28.7
0.10	10	26.2	39.7	49.5	81.5	25.5	27.7	31.5	44.0
0.20	5	46.2	63.7	77.2	115	42.7	46.2	52.7	71.6
0.50	2	122	151	175	224	108	116	130	164

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

Annual peak discharge and corresponding gage height, period of record

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

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

Annual peak discharge and corresponding gage height, period of record--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	May 23	--	1,100	1931	May 18	2.03	686
1975	June 21	4.09	1,090	1961	May 23	3.44	664
1956	May 29	4.05	1,080	1976	March 29	3.27	663
1987	June 30	3.97	1,050	1990	June 14	3.37	650
1991	July 1	4.00	1,050	1959	June 8	3.32	612
1952	April 10	3.91	1,040	1941	July 2	--	611
1978	April 9	4.07	1,040	1939	--	3.20	603
1970	June 22	3.88	935	1940	September 2	3.28	600
1980	April 9	3.84	903	1992	July 25	--	589
1948	May 18	--	900	1933	June 18	--	577
1964	May 11	3.73	861	1949	July 8	3.61	564
1982	May 29	3.71	849	1932	June 14	--	551
1960	May 26	3.66	810	1938	June 16	--	544
1984	June 15	3.64	808	1958	March 4	3.19	534
1957	May 23	3.70	794	1983	July 20	3.11	524
1946	July 19	--	777	1937	July 30	3.27	518
1971	April 9	3.53	755	1935	June 26	--	472
1942	June 6	3.52	747	1936	April 14	2.97	468
1963	June 17	3.65	745	1934	May 29	2.92	448
1955	August 6	3.53	730	1988	March 25	3.05	408
1968	May 14	3.37	714	1977	September 19	2.88	300
1973	March 15	3.48	714	1981	August 4	2.75	267

# 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	1,246	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

# 05047500 MUSTINKA DITCH ABOVE WEST BRANCH MUSTINKA RIVER NEAR CHARLESVILLE, MN

## Station Description

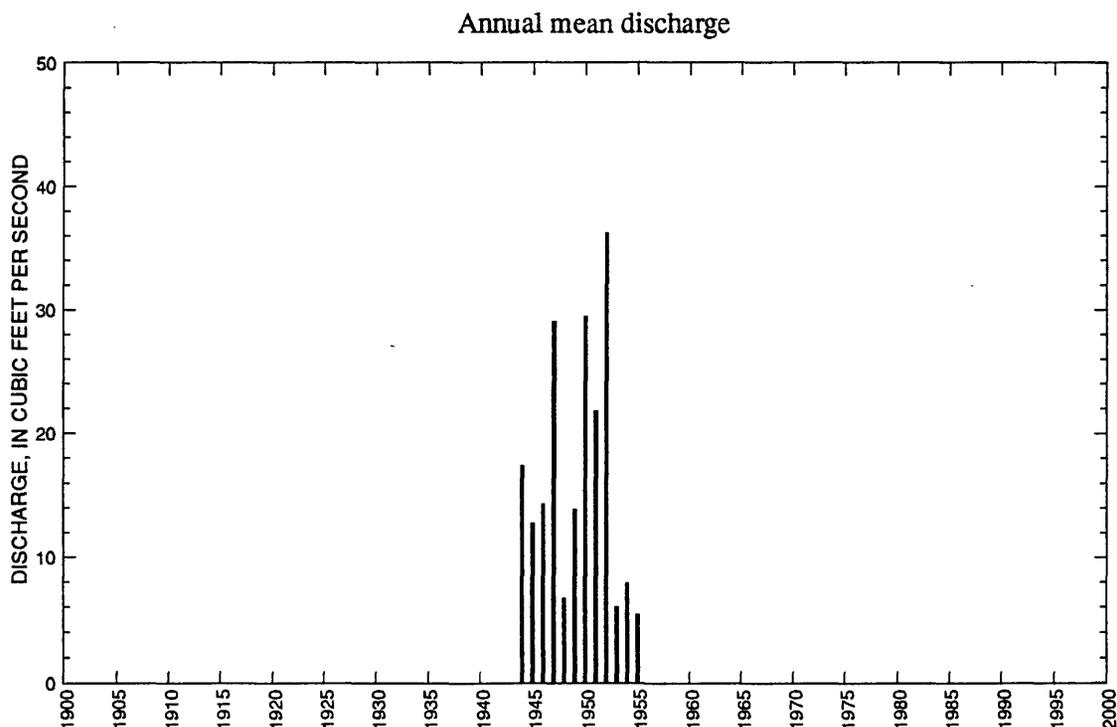
LOCATION.--Lat 45°53'25", long 96°21'30", in SW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.17, T.128 N., R.45 W., Traverse County, Hydrologic Unit 09020102, near right bank on upstream side of highway bridge, 0.2 mi upstream from West Branch Mustinka River, 6 mi southwest of Charlesville, and 7.8 mi northeast of Wheaton.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--April 1943 to September 1955. Monthly discharge only for some periods, published in Water-Supply Paper 1308. Prior to October 1949, published as "above Twelve Mile Creek near Charlesville".

GAGE.--Staff gage. Datum of gage is 990.00 ft above sea level, adjustment of 1912. Prior to May 11, 1948, reference mark at same site referred to same datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,550 ft<sup>3</sup>/s, Apr. 9, 1952; maximum gage height, 14.19 ft, Apr. 2, 1952; no flow for several months most years.



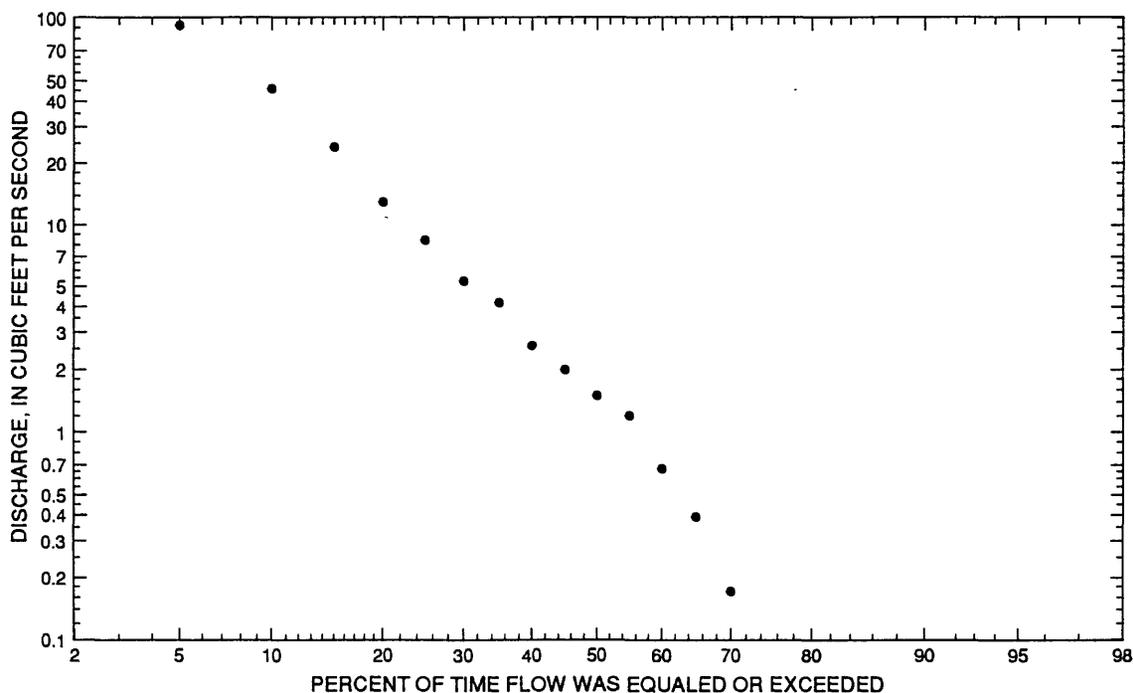
## 05047500 MUSTINKA DITCH ABOVE WEST BRANCH MUSTINKA RIVER NEAR CHARLESVILLE, MN--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	7.77	1952	0.068	1953	2.55	2.66	1.04	1.21
November	5.48	1947	0.440	1953	2.23	1.79	0.80	1.06
December	2.24	1952	0.032	1951	0.580	0.73	1.26	0.28
January	0.813	1952	0	m	0.130	0.25	2.01	0.06
February	0.304	1953	0	m	0.050	0.10	2.03	0.02
March	78.0	1946	0	m	18.7	26.1	1.40	8.88
April	311	1952	12.6	1949	86.6	93.2	1.08	41.2
May	153	1950	1.64	1949	39.2	42.8	1.09	18.7
June	89.2	1944	3.19	1946	29.1	27.9	0.96	13.9
July	111	1949	2.47	1948	24.4	29.6	1.21	11.6
August	25.4	1943	0.342	1945	4.60	6.75	1.47	2.19
September	8.63	1943	0	1953	2.00	2.40	1.20	0.95
Annual	36.2	1952	5.40	1955	16.8	10.3	0.62	100

Annual flow duration



**05047500 MUSTINKA DITCH ABOVE WEST BRANCH MUSTINKA RIVER NEAR CHARLESVILLE, 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	3.40	1.20	0.79	0.74	0	0	0	0	0	0
90	0	0	0	6.20	2.50	1.60	1.60	0.10	0	0	0.18	0	0
85	0	0	0	7.79	3.10	2.50	2.60	0.20	0	0.10	0.28	0	0
80	0	0	0	10.3	4.69	3.90	3.44	0.49	0	0.19	0.49	0	0
75	0	0	0	12.4	5.71	5.51	4.03	0.70	0.10	0.26	0.49	0	0
70	0	0	0	14.7	7.16	6.66	4.52	0.99	0.19	0.59	0.66	0	0.17
65	0	0	0	18.6	9.52	8.00	4.92	1.20	0.30	0.70	1.00	0	0.39
60	0	0	0	27.4	12.5	8.73	5.54	1.40	0.47	0.97	1.20	0	0.67
55	0	0	0	34.4	16.4	12.7	6.24	1.70	0.65	1.30	1.20	0	1.20
50	0	0	0	40.7	23.1	15.2	8.09	2.00	0.88	1.60	1.40	0.10	1.50
45	0	0	0	47.3	28.2	17.5	10.2	2.40	1.00	1.80	1.80	0.19	2.00
40	0	0	0.26	56.0	34.0	20.4	12.5	2.40	1.20	1.80	1.80	0.38	2.60
35	0	0	1.80	69.2	40.4	24.9	14.5	2.90	1.60	2.20	2.10	0.38	4.16
30	0	0	2.90	100	47.4	30.0	20.5	3.40	2.20	2.60	2.40	0.64	5.32
25	0	0	7.00	116	55.0	41.2	30.8	4.10	2.20	2.60	2.80	0.79	8.38
20	0.19	0	15.3	137	64.3	52.5	38.1	4.90	2.60	3.50	3.20	1.20	13.0
15	0.29	0	37.2	164	79.7	63.0	46.8	7.32	3.60	4.90	3.80	2.00	24.0
10	0.40	0	73.2	216	102	79.4	59.7	12.7	4.90	7.28	5.00	2.00	46.0
5	0.56	0.10	126	324	130	107	82.9	23.5	9.22	9.36	5.80	2.40	93.1

**05047500 MUSTINKA DITCH ABOVE WEST BRANCH MUSTINKA RIVER  
NEAR CHARLESVILLE, MN--Continued**

Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	45.2	38.6	30.9	21.4	16.1
0.95	1.05	78.5	66.2	52.2	37.0	27.8
0.90	1.11	105	87.9	68.9	49.4	37.0
0.80	1.25	149	124	96.4	69.8	52.1
0.50	2	290	235	183	133	98.6
0.20	5	559	440	346	250	183
0.10	10	784	607	481	345	251
0.04	25	1,120	854	685	485	350
0.02	50	1,420	1,060	859	602	432
0.01	100	1,740	1,290	1,050	730	522
0.005	200	2,100	1,540	1,270	869	619
0.002	500	2,640	ng	ng	ng	ng

Probability of annual low discharges

[ng, statistic not given]

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	ng	ng	ng	0	0	0.163
0.10	10	ng	ng	ng	ng	ng	ng	0	0.030	0.224
0.20	5	ng	ng	ng	ng	ng	ng	0	0.093	0.330
0.50	2	ng	ng	ng	ng	ng	ng	0	0.268	0.705

**05047500 MUSTINKA DITCH ABOVE WEST BRANCH MUSTINKA RIVER  
NEAR CHARLESVILLE, MN--Continued**

Probability of seasonal low discharges

[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	ng	0	0	0
0.10	10	ng	ng	ng	ng	ng	0	0	0
0.20	5	ng	ng	ng	ng	ng	0	0	0
0.50	2	ng	ng	ng	ng	ng	0	0	3.84
		June-July-August				September-October-November			
0.05	20	0	0	0.015	0.370	0	0	0	0
0.10	10	0	0	0.040	0.522	0	0	0	0
0.20	5	0	0.086	0.123	0.809	0	0	0	0.040
0.50	2	0.392	0.644	0.820	1.99	0	0.089	0.245	0.759

**05047500 MUSTINKA DITCH ABOVE WEST BRANCH MUSTINKA RIVER  
NEAR CHARLESVILLE, MN--Continued**

Annual peak discharge and corresponding gage height, period of record

[--, no data]

<b>Water year</b>	<b>Date</b>	<b>Gage height (feet)</b>	<b>Peak discharge (ft<sup>3</sup>/s)</b>	<b>Water year</b>	<b>Date</b>	<b>Gage height (feet)</b>	<b>Peak discharge (ft<sup>3</sup>/s)</b>
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1944	June 5	9.50	186	1950	May 9	--	440
1945	March 16	8.32	186	1951	April 7	--	534
1946	March 20	--	310	1952	April 9	14.19	1,550
1947	April 11	12.35	431	1953	June 27	--	77.0
1948	April 3	--	132	1954	June 8	8.84	280
1949	July 10	10.75	422	1955	July 13	2.17	162
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1952	April 9	14.19	1,550	1954	June 8	8.84	280
1951	April 7	--	534	1944	June 5	9.50	186
1950	May 9	--	440	1945	March 16	8.32	186
1947	April 11	12.35	431	1955	July 13	2.17	162
1949	July 10	10.75	422	1948	April 3	--	132
1946	March 20	--	310	1953	June 27	--	77.0

05047500 MUSTINKA DITCH ABOVE WEST BRANCH MUSTINKA RIVER NEAR CHARLESVILLE, 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	--	--	--	--	--	--	--	42.4	78.2	52.0	25.4	8.63	--
1944	3.48	1.70	0.048	0	0	3.49	17.7	53.3	89.2	32.4	4.64	3.38	17.4
1945	2.08	5.26	0.145	0	0	64.3	52.5	13.5	10.6	3.29	0.342	1.30	12.8
1946	0.897	0.503	0.290	0	0	78.0	62.2	6.99	3.19	15.1	1.14	2.30	14.3
1947	7.68	5.48	1.77	0.361	0.089	12.7	196.0	74.9	41.4	7.70	1.63	0.300	29.1
1948	0.668	0.807	0.039	0	0	0.645	58.0	12.7	4.15	2.47	1.09	0.147	6.66
1949	0.413	0.573	0.097	0	0	22.4	12.6	1.64	4.25	111.0	10.1	1.25	13.9
1950	2.63	3.18	0.629	0	0	22.3	121.1	152.9	26.0	21.0	2.56	0.423	29.5
1951	2.78	1.41	0.032	0	0.214	0	156.3	52.6	29.5	15.0	3.60	1.93	21.8
1952	7.77	3.52	2.24	0.813	0	0	311.0	69.4	16.3	22.5	3.36	1.53	36.2
1953	0.068	0.440	0.900	0.316	0.304	15.9	21.8	13.6	15.7	2.74	0.442	0	6.02
1954	0.135	1.35	0.097	0	0	2.93	14.8	13.4	47.0	7.45	3.58	4.46	7.90
1955	1.96	2.49	0.684	0.016	0	1.29	15.5	2.74	13.1	24.6	1.93	.290	5.40

# 05048000 MUSTINKA DITCH BELOW WEST BRANCH MUSTINKA RIVER NEAR CHARLESVILLE, MN

## Station Description

LOCATION.--Lat 45°53'20", long 96°21'45", in SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.18, T.128 N., R.45 W., Traverse County, Hydrologic Unit 09020102, on right bank 100 ft downstream from inlet structure to West Branch Mustinka River, 6 mi southwest of Charlesville, and 7.7 mi northeast of Wheaton.

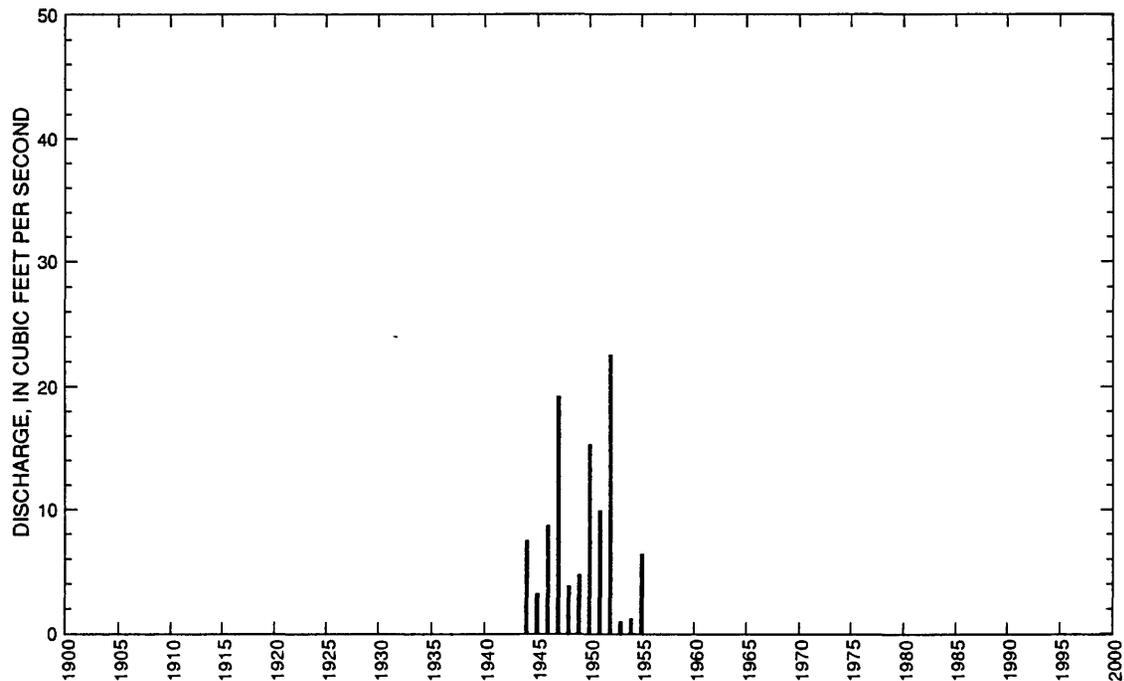
DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--April 1943 to September 1955. Prior to October 1949, published as "below Twelve Mile Creek near Charlesville".

GAGE.--Staff gage. Datum of gage is 987.00 ft above sea level, adjustment of 1912. Prior to May 11, 1948, reference mark and May 11, 1948, to July 10, 1955, staff gage, at site on West Branch Mustinka River 40 ft downstream from inlet to Mustinka ditch, at datum 3.00 ft higher.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 997 ft<sup>3</sup>/s, Apr. 9, 1952; maximum gage height, 13.73 ft, Apr. 2, 1952 (from floodmark); no flow for several months each year.

Annual mean discharge

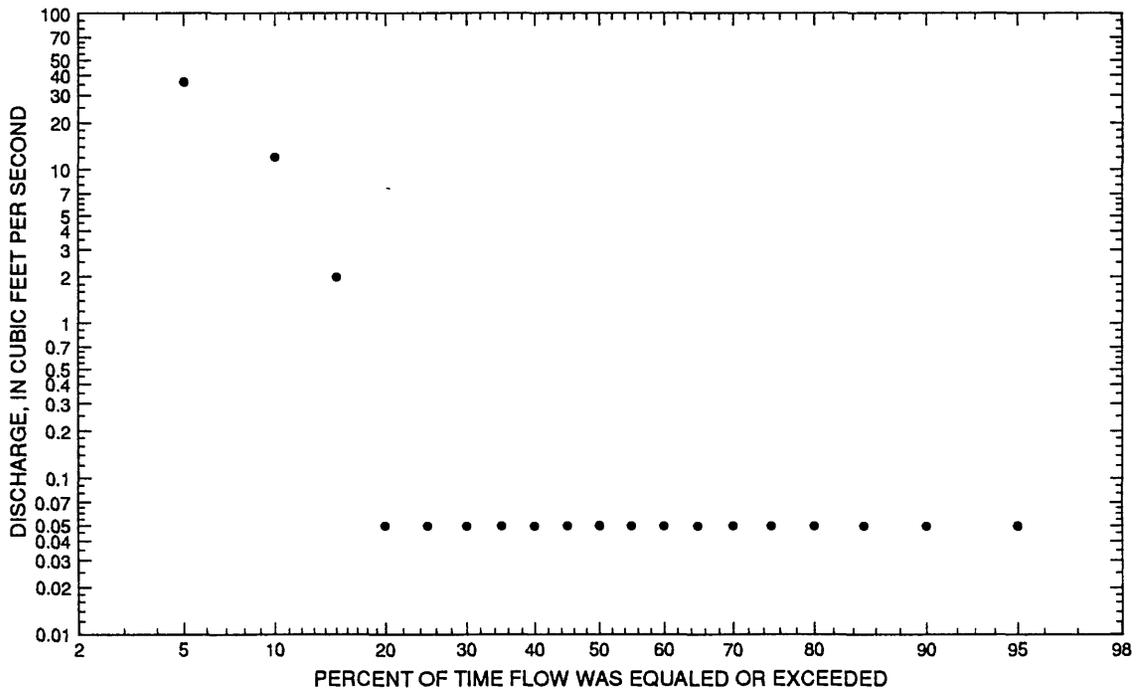


## 05048000 MUSTINKA DITCH BELOW WEST BRANCH MUSTINKA RIVER NEAR CHARLESVILLE, MN--Continued

Statistics of monthly and annual mean discharges  
[m, more than 1 year of occurrence; ng, statistic not given]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	0.032	1947	0	m	0	0.01	3.46	0
November	0.007	1944	0	m	0	0	3.46	0
December	0	m	0	m	0	0	ng	0
January	0	m	0	m	0	0	ng	0
February	0	m	0	m	0	0	ng	0
March	82.6	1946	0	m	13.8	23.7	1.72	12.9
April	252	1952	0.103	1953	55.9	82.8	1.48	52.4
May	74.4	1950	0	1949	11.9	20.5	1.73	11.2
June	66.7	1944	0	m	13.6	20.9	1.53	12.8
July	49.1	1955	0	m	11.0	17.5	1.59	10.3
August	3.88	1955	0	m	0.420	1.12	2.70	0.39
September	0.367	1955	0	m	0.030	0.10	3.35	0.03
Annual	22.5	1952	0.918	1953	8.60	7.01	0.81	100

Annual flow duration



**05048000 MUSTINKA DITCH BELOW WEST BRANCH MUSTINKA RIVER NEAR CHARLESVILLE, 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	0.05
90	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
85	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
80	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
75	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
70	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
65	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
60	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
55	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
50	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
45	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
40	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
35	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
30	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
25	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
20	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.05
15	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	2.00
10	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	12.1
5	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	36.6

**05048000 MUSTINKA DITCH BELOW WEST BRANCH MUSTINKA RIVER  
NEAR CHARLESVILLE, MN--Continued**

Probability of annual high discharges  
[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	19.9	11.9	7.49	3.18
0.95	1.05	ng	48.6	29.9	17.7	8.90
0.90	1.11	140	74.6	46.7	27.1	14.7
0.80	1.25	189	120	77.1	44.2	25.6
0.50	2	326	259	179	103	65.1
0.20	5	543	478	358	217	140
0.10	10	700	620	487	306	197
0.04	25	908	786	651	430	270
0.02	50	1,070	898	770	527	324
0.01	100	1,230	998	884	627	376
0.005	200	1,400	1,090	993	728	426
0.002	500	1,630	ng	ng	ng	ng

Probability of annual low discharges  
[ng, statistic not given]

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	ng	ng	ng	ng	ng	ng
0.10	10	ng	ng	ng	ng	ng	ng	ng	ng	ng
0.20	5	ng	ng	ng	ng	ng	ng	ng	ng	ng
0.50	2	ng	ng	ng	ng	ng	ng	ng	ng	ng

**05048000 MUSTINKA DITCH BELOW WEST BRANCH MUSTINKA RIVER  
NEAR CHARLESVILLE, MN--Continued**

Probability of seasonal low discharges

[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	ng	ng	ng	0
0.10	10	ng	ng	ng	ng	ng	ng	ng	0
0.20	5	ng	ng	ng	ng	ng	ng	ng	0
0.50	2	ng	ng	ng	ng	ng	ng	ng	0
		June-July-August				September-October-November			
0.05	20	ng	ng	ng	ng	ng	ng	ng	ng
0.10	10	ng	ng	ng	ng	ng	ng	ng	ng
0.20	5	ng	ng	ng	ng	ng	ng	ng	ng
0.50	2	ng	ng	ng	ng	ng	ng	ng	ng

**05048000 MUSTINKA DITCH BELOW WEST BRANCH MUSTINKA RIVER  
NEAR CHARLESVILLE, MN--Continued**

Annual peak discharge and corresponding gage height, period of record

[--, no data]

<b>Water year</b>	<b>Date</b>	<b>Gage height (feet)</b>	<b>Peak discharge (ft<sup>3</sup>/s)</b>	<b>Water year</b>	<b>Date</b>	<b>Gage height (feet)</b>	<b>Peak discharge (ft<sup>3</sup>/s)</b>
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1944	June 4	8.92	318	1950	May 9	9.31	374
1945	March 16	6.68	165	1951	April 7	--	500
1946	March 20	11.00	512	1952	April 9	13.73	997
1947	April 12	--	600	1953	June 27	4.86	47.0
1948	April 7	6.62	132	1954	June 8	7.91	207
1949	July 10	9.87	292	1955	July 13	5.12	318
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1952	April 9	13.73	997	1955	July 13	5.12	318
1947	April 12	--	600	1949	July 10	9.87	292
1946	March 20	11.00	512	1954	June 8	7.91	207
1951	April 7	--	500	1945	March 16	6.68	165
1950	May 9	9.31	374	1948	April 7	6.62	132
1944	June 4	8.92	318	1953	June 27	4.86	47.0

05048000 MUSTINKA DITCH WEST BRANCH MUSTINKA RIVER NEAR CHARLESVILLE, 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	--	--	--	--	--	--	--	10.9	48.9	13.0	1.53	0.027	--
1944	0	0.007	0	0	0	0.703	4.00	14.9	66.7	3.90	0	0	7.44
1945	0	0	0	0	0	29.3	5.48	0.119	2.91	0	0	0	3.19
1946	0	0	0	0	0	82.6	16.0	0.035	0.010	3.96	0	0	8.67
1947	0.032	0	0	0	0	16.3	176.8	25.8	13.6	0	0	0	19.2
1948	0	0	0	0	0	0	43.1	3.19	0	0	0	0	3.81
1949	0	0	0	0	0	8.82	1.41	0	0	45.3	0	0	4.71
1950	0	0	0	0	0	19.9	59.4	74.4	4.32	23.6	0	0	15.3
1951	0	0	0	0	0	0	110.9	7.53	1.91	0.103	0	0	9.92
1952	0	0	0	0	0	0	252.4	17.0	0.843	3.99	0	0	22.5
1953	0	0	0	0	0	6.70	0.103	0.029	4.03	0.077	0	0	0.918
1954	0	0	0	0	0	0	0.520	0.023	13.9	0	0	0	1.18
1955	0	0	0	0	0	1.10	0.443	0.745	20.2	49.1	3.88	0.367	6.39

# 05048500 WEST BRANCH MUSTINKA RIVER BELOW MUSTINKA DITCH NEAR CHARLESVILLE, MN

## Station Description

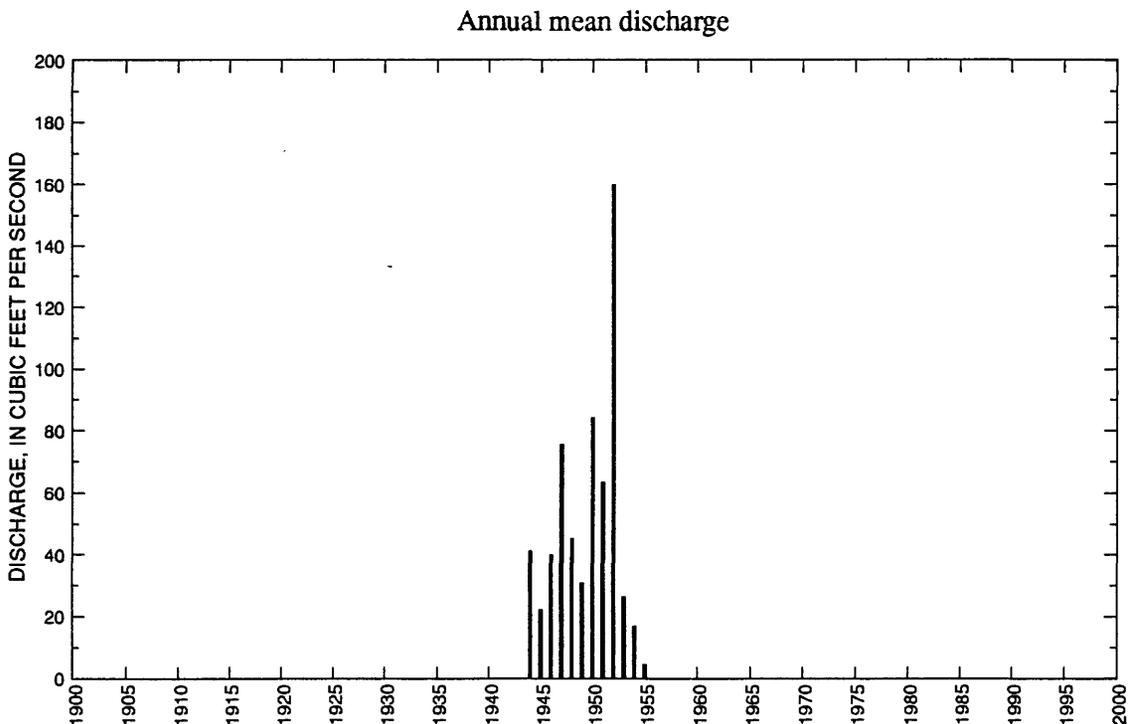
LOCATION.--Lat 45°53'20", long 96°21'45", in SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.18, T.128 N., R.45 W., Traverse County, Hydrologic Unit 09020102, on left bank 150 ft downstream from inlet from Mustinka ditch, 1.75 mi upstream from mouth, 6 mi southwest of Charlesville, and 7.8 mi northeast of Wheaton.

DRAINAGE AREA.--Not determined.

PERIOD OF RECORD.--April 1943 to September 1955. Monthly discharges only for some periods, published in WSP 1308. Prior to October 1949, published as Twelve Mile Creek below Mustinka ditch, near Charlesville.

GAGE.--Staff gage. Datum of gage is 990.00 ft above mean sea level, adjustment of 1912 (levels by Corps of Enigeers). Prior to May 11, 1948, reference mark and May 11, 1948, to July 10, 1955, staff gage, at site 110 ft upstream at same datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 13,700 ft<sup>3</sup>/s, Apr. 9, 1952 (gage height, 13.73 ft, from floodmarks), from rating curve extended above 1,200 ft<sup>3</sup>/s on basis of slope-area measurement of peak flow; no flow most winters.

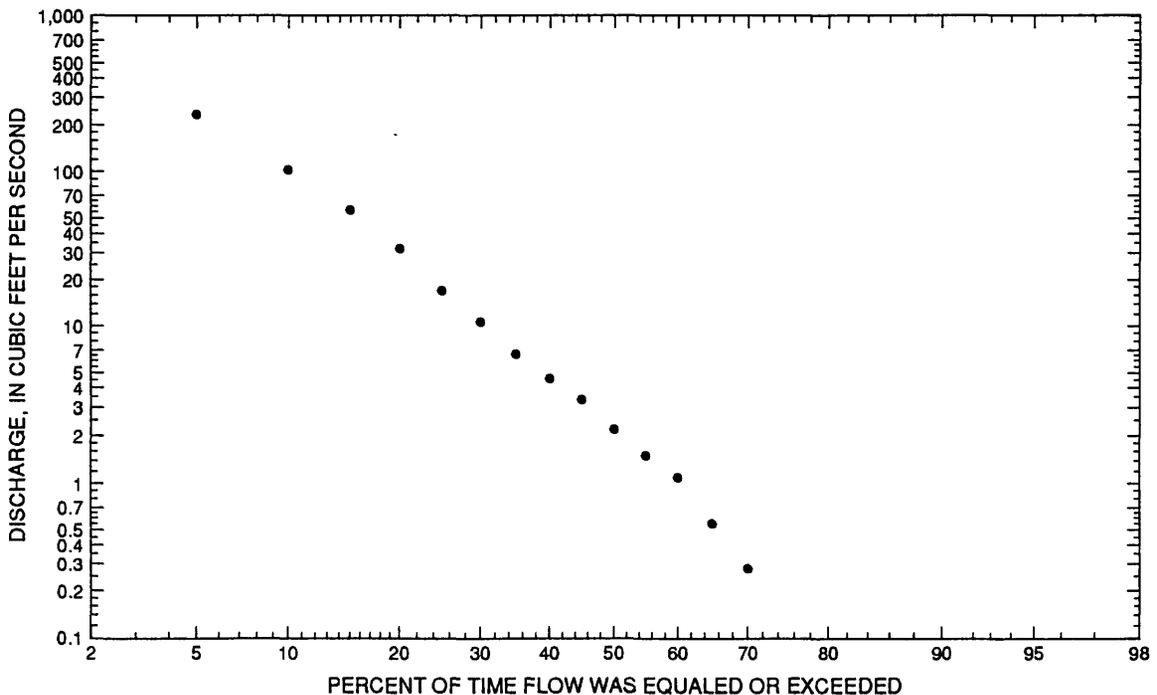


# 05048500 WEST BRANCH MUSTINKA RIVER BELOW MUSTINKA DITCH NEAR CHARLESVILLE, MN--Continued

Statistics of monthly and annual mean discharges  
[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	12.8	1947	0.200	1954	3.60	3.69	1.02	0.57
November	9.00	1947	0.487	1946	2.91	2.56	0.88	0.46
December	3.71	1952	0.035	1951	0.92	1.12	1.22	0.15
January	1.52	1947	0	m	0.29	0.53	1.84	0.05
February	0.821	1953	0	m	0.13	0.31	2.34	0.02
March	284	1946	0	1952	80.0	89.5	1.12	12.7
April	1,580	1952	27.8	1949	307	447	1.46	48.9
May	320	1950	1.99	1949	86.0	91.9	1.07	13.7
June	277	1944	0	1955	77.5	83.3	1.07	12.3
July	272	1949	5.46	1955	59.2	74.2	1.25	9.42
August	39.2	1943	0	1955	7.87	10.6	1.35	1.25
September	16.1	1943	0	m	3.05	4.40	1.44	0.49
Annual	160	1952	4.39	1955	50.8	41.7	0.82	100

Annual flow duration



**05048500 WEST BRANCH MUSTINKA RIVER BELOW MUSTINKA DITCH NEAR CHARLESVILLE, MN--Continued**

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharged or equalled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	5.87	0.90	0.05	0.05	0	0	0	0.18	0	0
90	0	0	0	10.4	2.70	1.70	2.20	0	0	0.10	0.40	0	0
85	0	0	0	15.7	6.16	3.10	2.90	0.18	0	0.20	0.54	0	0
80	0	0	0	22.7	10.1	5.13	4.91	0.45	0	0.35	0.74	0	0
75	0	0	0	29.0	13.3	7.89	6.31	0.79	0	0.60	0.86	0	0
70	0	0	0	35.4	17.0	11.7	8.74	1.40	0	1.00	1.00	0	0.28
65	0	0	0	44.1	22.3	15.1	11.2	1.70	0.27	1.40	1.20	0.10	0.55
60	0	0	0	55.3	28.9	18.9	13.8	2.50	0.38	1.70	1.60	0.20	1.10
55	0	0	0	67.0	40.7	24.8	16.4	3.00	0.76	1.70	1.90	0.28	1.50
50	0	0	0.74	88.5	56.2	34.1	20.3	3.60	1.20	2.10	1.90	0.40	2.20
45	0	0	2.30	111	65.7	41.6	25.8	4.30	1.50	2.10	2.20	0.50	3.39
40	0	0	5.03	150	75.6	49.7	32.3	4.30	2.10	2.50	2.20	0.56	4.59
35	0	0	9.86	190	86.1	60.9	41.0	5.66	2.50	2.50	2.90	0.80	6.62
30	0.10	0	17.5	231	97.1	73.9	49.1	6.31	2.90	3.00	2.90	1.00	10.7
25	0.19	0	41.3	285	111	94.3	56.0	8.13	3.40	3.50	3.40	1.10	17.1
20	0.56	0	65.9	360	126	122	69.7	11.3	4.10	4.20	4.00	1.80	32.1
15	0.74	0	110	467	160	149	86.4	14.2	4.80	6.02	4.70	2.50	56.6
10	1.50	0.58	242	669	202	185	117	25.4	7.52	10.1	6.40	2.80	103
5	1.50	1.00	496	1,060	282	303	203	38.3	16.5	13.9	9.47	4.00	235

**05048500 WEST BRANCH MUSTINKA RIVER BELOW MUSTINKA DITCH NEAR CHARLESVILLE, MN--Continued**

Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	104	123	68.0	35.8	19.8
0.95	1.05	213	205	136	80.4	49.5
0.90	1.11	312	276	196	121	77.8
0.80	1.25	496	403	304	195	130
0.50	2	1,210	882	695	458	312
0.20	5	2,940	2,100	1,560	998	661
0.10	10	4,680	3,420	2,370	1,460	933
0.04	25	7,690	5,920	3,690	2,130	1,300
0.02	50	10,600	8,550	4,880	2,700	1,590
0.01	100	14,200	12,000	6,280	3,320	1,870
0.005	200	18,400	16,600	7,900	3,970	2,160
0.002	500	25,400	ng	ng	ng	ng

Probability of annual low discharges

[ng, statistic not given]

Non-exceedance probability	Recurrence Interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	ng	ng	ng	0	0.043	0.204
0.10	10	ng	ng	ng	ng	ng	ng	0	0.077	0.296
0.20	5	ng	ng	ng	ng	ng	ng	0	0.148	0.459
0.50	2	ng	ng	ng	ng	ng	ng	0.019	0.445	1.05

**05048500 WEST BRANCH MUSTINKA RIVER BELOW MUSTINKA DITCH NEAR CHARLESVILLE, MN--Continued**

Probability of seasonal low discharges  
[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	ng	0	0	0
0.10	10	ng	ng	ng	ng	ng	0	0	0.108
0.20	5	ng	ng	ng	ng	ng	0	0	1.45
0.50	2	ng	ng	ng	ng	ng	0	0	12.9
		June-July-August				September-October-November			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0.422	0	0	0	0.009
0.20	5	0	0	0.165	1.08	0	0	0	0.115
0.50	2	0.947	1.31	1.74	3.56	0	0.142	0.318	0.860

**05048500 WEST BRANCH MUSTINKA RIVER BELOW MUSTINKA DITCH NEAR CHARLESVILLE, MN--Continued**

Annual peak discharge and corresponding gage height, period of record

[--, no data]

<b>Water year</b>	<b>Date</b>	<b>Gage height (feet)</b>	<b>Peak discharge (ft<sup>3</sup>/s)</b>	<b>Water year</b>	<b>Date</b>	<b>Gage height (feet)</b>	<b>Peak discharge (ft<sup>3</sup>/s)</b>
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1944	June 4	8.92	1,030	1950	March 28	10.51	1,140
1945	March 15	--	490	1951	April 7	--	2,800
1946	March 20	--	1,580	1952	April 9	13.73	13,700
1947	April 12	10.65	1,720	1953	March 23	7.10	532
1948	March 30	10.95	1,670	1954	June 8	7.91	794
1949	July 10	9.87	1,280	1955	April 1	--	178
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1952	April 9	13.73	13,700	1950	March 28	10.51	1,140
1951	April 7	--	2,800	1944	June 4	8.92	1,030
1947	April 12	10.65	1,720	1954	June 8	7.91	794
1948	March 30	10.95	1,670	1953	March 23	7.10	532
1946	March 20	--	1,580	1945	March 15	--	490
1949	July 10	9.87	1,280	1955	April 1	--	178

05048500 WEST BRANCH MUSTINKA RIVER BELOW MUSTINKA DITCH NEAR CHARLESVILLE, 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	--	--	--	--	--	--	--	81.5	213.9	91.1	39.2	16.1	--
1944	5.82	2.39	0.500	0	0	13.1	44.0	95.9	276.9	45.9	6.78	5.63	41.2
1945	2.58	6.57	0.268	0	0	121.8	63.1	19.0	42.4	7.12	0.948	0.663	22.2
1946	0.810	0.487	0.335	0	0	284.1	111.1	18.0	6.66	45.2	3.09	2.92	39.8
1947	12.8	9.00	2.56	1.52	0.746	28.2	579.6	149.5	104.9	21.0	1.42	0.453	75.5
1948	1.71	1.43	0.510	0.097	0	161.0	294.1	57.9	13.5	7.65	3.98	0.130	45.1
1949	0.397	0.760	0.113	0	0	40.9	27.8	1.99	6.62	271.6	13.8	1.51	30.9
1950	5.00	3.89	0.790	0	0	147.1	334.9	320.1	60.3	124.1	7.76	0.487	84.2
1951	3.15	1.58	0.035	0	0	0.242	522.1	113.4	78.4	39.7	4.56	2.26	63.4
1952	7.25	3.36	3.71	1.15	0	0	1,582	194.8	40.7	86.5	16.2	4.27	159.9
1953	0.361	0.860	1.13	0.655	0.821	136.8	63.6	34.3	58.7	16.3	0.552	0	26.3
1954	0.200	1.65	0.126	0	0	17.4	35.1	29.1	104.4	8.17	4.01	5.25	17.0
1955	3.15	2.92	0.906	0.029	0	8.75	28.9	2.60	0	5.46	0	0	4.39

## 05049000 MUSTINKA RIVER ABOVE WHEATON, MN

### Station Description

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, about 8 mi above Lake Traverse.

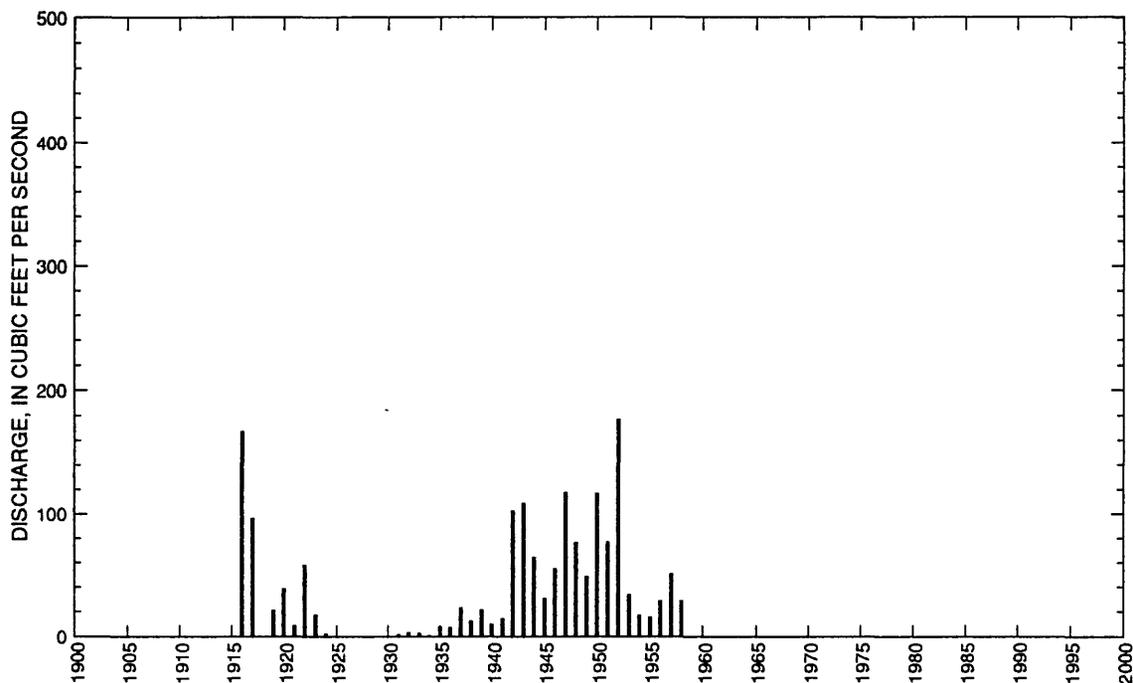
DRAINAGE AREA.--834 mi<sup>2</sup>.

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, 7,320 ft<sup>3</sup>/s, Apr. 10, 1952 (gage height, 16.56 ft); maximum gage height, 20.01 ft, Mar. 29, 1989; no flow at times in most years.

Annual mean discharge



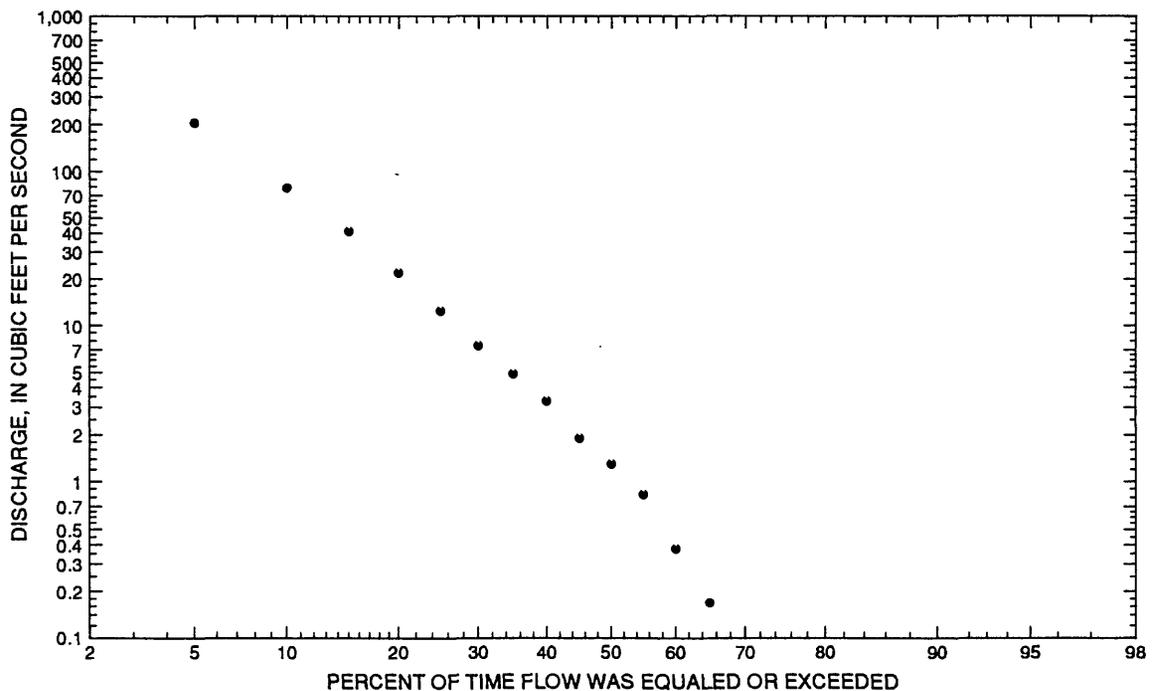
## 05049000 MUSTINKA RIVER ABOVE WHEATON, MN—Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
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 annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			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	77.4	35.8	23.6	14.5	9.19
0.90	1.11	136	76.2	52.0	32.4	20.4
0.80	1.25	260	174	123	78.2	49.1
0.50	2	817	649	493	320	202
0.20	5	2,270	1,760	1,420	935	606
0.10	10	3,700	2,640	2,200	1,450	957
0.04	25	6,010	3,780	3,230	2,140	1,440
0.02	50	8,080	4,570	3,980	2,640	1,800
0.01	100	10,400	5,310	4,690	3,100	2,140
0.005	200	13,000	5,970	5,340	3,530	2,470
0.002	500	16,800	ng	ng	ng	ng

Probability of annual low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0	0
0.20	5	0	0	0	0	0	0	0	0	0
0.50	2	0	0	0	0	0	0	0	0.196	0.361

**05049000 MUSTINKA RIVER ABOVE WHEATON, MN--Continued**

Probability of seasonal low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0.120
0.20	5	0	0	0	0	0	0	0	0.762
0.50	2	0	0	0	0	0	0	0.355	7.43
		June-July-August				September-October-November			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0
0.20	5	0	0	0	0.139	0	0	0	0
0.50	2	0.314	0.422	0.468	1.43	0	0	0	0.062

## 05049000 MUSTINKA RIVER ABOVE WHEATON, MN—Continued

Annual peak discharge and corresponding gage height, period of record

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

## 05049000 MUSTINKA RIVER ABOVE WHEATON, MN--Continued

Annual peak discharge and corresponding gage height, period of record--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)
<b>Annual peak discharge, from highest to lowest, and corresponding gage height--Continued</b>							
1941	June 23	--	240	1933	March 2	4.84	78.0
1992	March 7	5.45	220	1924	April 5	2.65	45.0
1990	April 4	3.83	130	1931	June 10	1.80	41.0
1935	March 17	--	120	1934	April 10	1.36	9.10

<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

### Station Description

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.

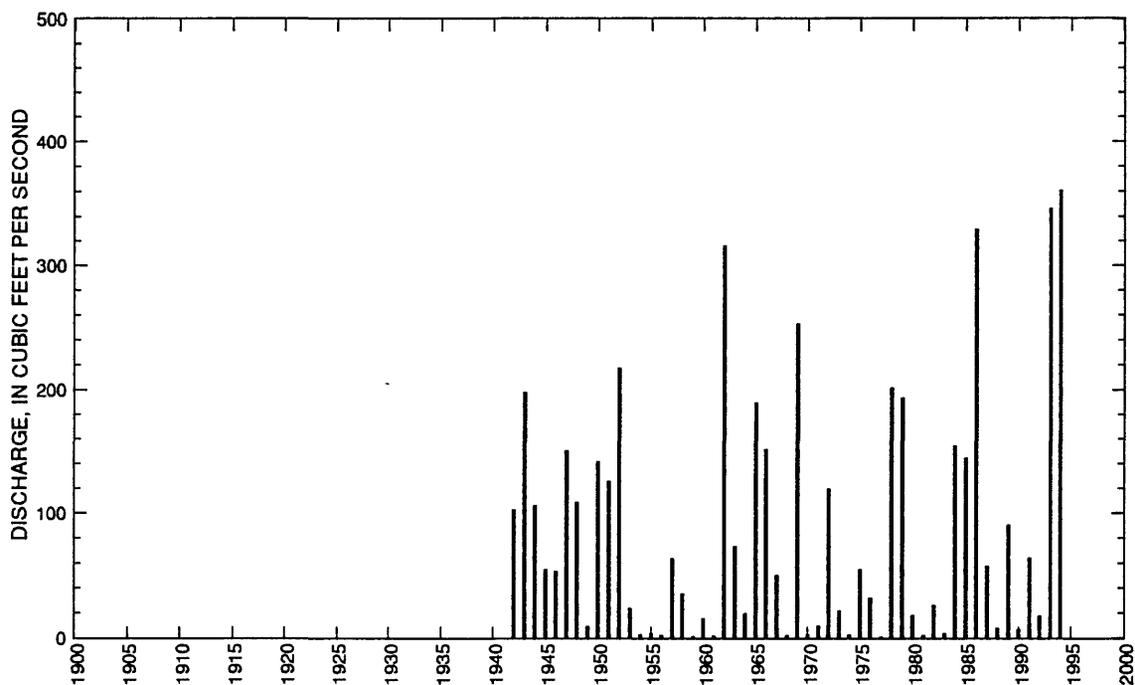
DRAINAGE AREA.--1,160 mi<sup>2</sup>, approximately.

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

GAGE.--Water-stage recorder. Datum of gage is 960.00 ft, 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, 3,770 ft<sup>3</sup>/s, Apr. 19-21, 1969; maximum gage height, 15.07 ft, Apr. 19-21, 1969 (from floodmark); no flow at times in most years.

Annual mean discharge



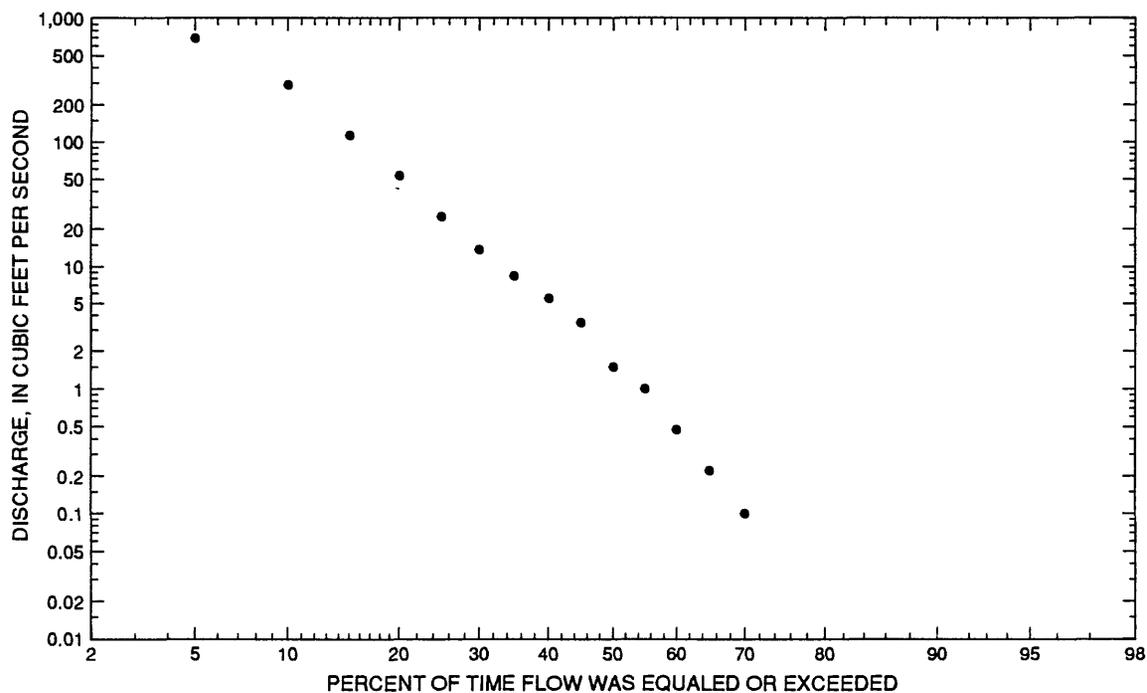
## 05050000 BOIS DE SIOUX RIVER NEAR WHITE ROCK, SD--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	535	1994	0	m	25.8	88.4	3.43	2.42
November	258	1985	0	m	11.8	38.4	3.26	1.11
December	57.5	1985	0	m	4.87	11.3	2.32	0.46
January	36.0	1987	0	m	2.59	6.51	2.51	0.24
February	53.0	1966	0	m	3.31	8.74	2.64	0.31
March	227	1985	0	m	28.8	53.8	1.87	2.70
April	1,320	1969	0	1942	216	289	1.34	20.2
May	1,310	1969	0.228	1977	260	367	1.41	24.4
June	1,100	1986	0.010	1977	235	304	1.29	22.0
July	1,040	1962	0	m	167	253	1.51	15.6
August	1,180	1993	0	m	74.9	225	3.00	7.02
September	1,060	1993	0	m	37.0	152	4.10	3.47
Annual	360	1994	0.377	1977	89.2	99.4	1.11	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	0.530	0.550	0	0	0	0	0	0	0	0
90	0	0	0	1.60	1.10	0.250	0	0	0	0	0	0	0
85	0	0	0	2.61	1.60	0.720	0.090	0	0	0	0	0	0
80	0	0	0	3.47	2.98	1.50	0.180	0	0	0	0	0	0
75	0	0	0	4.84	4.01	2.10	0.360	0.060	0.040	0	0	0	0
70	0	0	0.020	6.92	6.25	4.64	0.750	0.130	0.080	0.080	0.100	0	0.100
65	0	0	0.220	8.77	8.60	7.30	2.20	0.180	0.170	0.110	0.190	0	0.220
60	0	0	0.620	14.7	13.4	11.4	4.75	0.540	0.240	0.230	0.370	0	0.470
55	0	0	1.20	20.9	24.4	20.3	7.12	1.10	0.480	0.320	0.510	0.030	1.00
50	0	0	2.41	28.7	43.1	38.2	11.1	3.06	0.690	0.460	0.700	0.130	1.50
45	0	0	3.76	46.7	76.6	62.7	21.8	4.27	0.980	0.650	0.970	0.240	3.46
40	0	0	6.12	72.5	128	102	35.7	6.77	2.00	0.920	0.970	0.560	5.50
35	0.160	0	8.57	121	183	175	72.7	11.1	3.11	1.30	1.90	0.750	8.42
30	0.450	0.280	12.5	176	254	284	127	16.9	4.47	2.76	3.54	1.30	13.8
25	1.20	0.640	17.8	252	401	417	208	26.1	6.79	3.90	5.16	3.30	24.9
20	2.70	3.51	25.9	368	594	535	320	43.6	10.3	5.88	7.07	4.55	52.5
15	4.95	6.50	44.3	597	788	658	481	91.0	20.2	14.8	10.2	6.11	114
10	7.87	9.69	74.2	771	945	812	651	153	53.1	55.4	19.4	15.1	289
5	17.1	15.0	138	998	1,100	1,020	870	333	152	112	67.0	29.6	694

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

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	17.2	4.29	2.88	1.87	1.14
0.95	1.05	51.0	20.2	15.1	10.9	7.13
0.90	1.11	87.1	42.3	33.5	25.2	17.2
0.80	1.25	160	96.2	80.5	64.1	45.7
0.50	2	454	370	339	395	229
0.20	5	1,110	1,080	1,060	988	841
0.10	10	1,670	1,710	1,730	1,660	1,480
0.04	25	2,470	2,600	2,700	2,660	2,480
0.02	50	3,120	3,290	3,460	3,460	3,330
0.01	100	3,800	3,970	4,230	4,270	4,220
0.005	200	4,490	4,640	4,980	5,080	5,140
0.002	500	5,430	ng	ng	ng	ng

### Probability of annual low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0	0
0.20	5	0	0	0	0	0	0	0	0	0.065
0.50	2	0	0	0	0	0	0	0.016	0.253	1.18

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

Probability of seasonal low discharges

Non-exceedance probability	Recurrence Interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0.015
0.20	5	0	0	0	0	0	0	0	0.381
0.50	2	0	0	0	0	0	0.073	0.521	3.74
		June-July-August				September-October-November			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0
0.20	5	0	0	0	0.094	0	0	0	0
0.50	2	0.111	0.292	0.773	2.42	0	0.045	0.094	0.274

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

Annual peak discharge and corresponding gage height, period of record

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

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

Annual peak discharge and corresponding gage height, period of record--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)
<b>Annual peak discharge, from highest to lowest, and corresponding gage height--Continued</b>							
1973	March 27	7.00	381	1960	June 11	7.31	131
1956	August 8	6.94	303	1961	September 14	5.16	125
1949	July 14	--	210	1954	September 17	4.67	124
1964	April 22	5.44	209	1969	October 14	4.68	102
1971	June 26	5.93	188	1990	March 13	4.85	89.0
1953	May 27	--	187	1968	April 23	3.94	58.0
1988	April 12	5.84	180	1974	May 1	4.22	54.0
1980	June 14	6.19	169	1959	July 5	--	43.0
1955	July 11	6.01	152	1977	March 13	5.52	27.0
1982	November 29	6.63	150	1981	July 19	4.16	27.0
1992	August 1	7.17	139				

<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	7.7
1944	7.56	11.0	1.38	0	0	3.66	157.0	252.8	598.1	225.0	15.8	4.80	6.1
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	0.2
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	5.7
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	8.9
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	1.2
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	3.4
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	0.2

## 05050500 BOIS DE SIOUX RIVER NEAR FAIRMOUNT, ND

### Station Description

LOCATION.--Lat 46°03'00", long 96°33'25", on line between secs.22 and 27, T.130 N., R.47 W., Richland County, Hydrologic Unit 09020101, at bridge on Minnesota Highway 55 and North Dakota Highway 11, 0.75 mi upstream from Minneapolis, St. Paul & Sault Ste. Marie Railway bridge, 2 mi east of Fairmount, 5 mi west of Tenny, Minn., and 15 mi downstream from Lake Traverse.

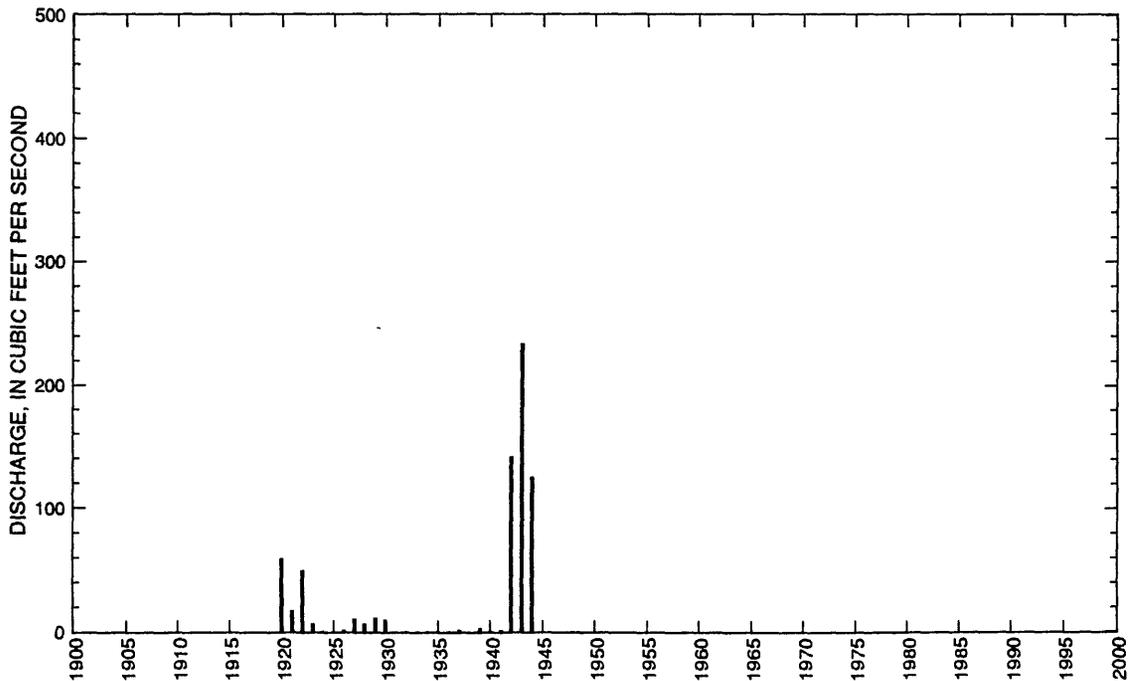
DRAINAGE AREA.--1,540 mi<sup>2</sup>, approximately.

PERIOD OF RECORD.--April 1919 to September 1944.

GAGE.--Chain gage. Datum of gage is 952.13 ft above sea level, adjustment of 1912. Prior to October 1919, staff gage at same site at datum 10.00 ft higher. Apr. 1, 1920, to Sept. 30, 1939, staff gage at site 0.75 mi downstream at datum 8.95 ft higher. Oct. 1, 1939, to Dec. 5, 1940, staff gage at present site at datum 10.00 ft higher.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,430 ft<sup>3</sup>/s, Apr. 4, 1943; maximum gage height, 16.40 ft, Apr. 4, 1943; no flow at times in most years.

Annual mean discharge



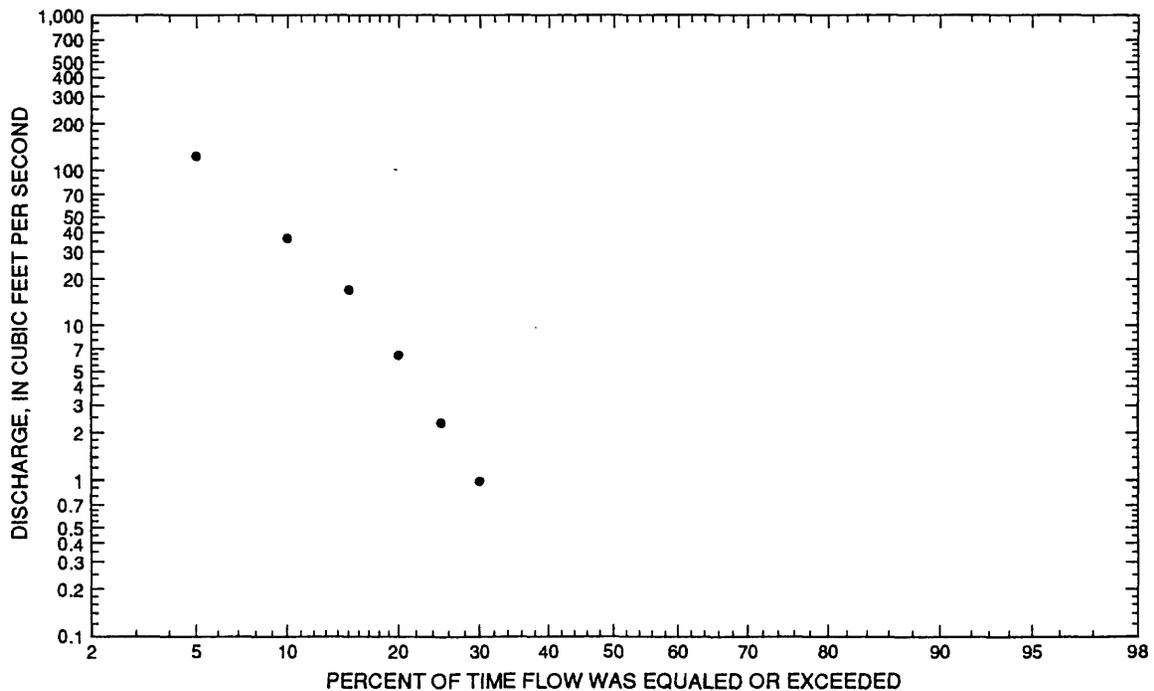
# 05050500 BOIS DE SIOUX RIVER NEAR FAIRMOUNT, ND—Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	57.4	1943	0	m	5.08	13.5	2.66	1.61
November	23.5	1921	0	m	1.83	5.01	2.73	0.58
December	14.8	1921	0	m	0.770	2.99	3.89	0.24
January	6.74	1921	0	m	0.270	1.35	5.00	0.09
February	8.64	1930	0	m	0.490	1.81	3.70	0.16
March	72.3	1943	0	m	11.7	19.6	1.67	3.72
April	625	1943	0	m	55.8	133	2.38	17.7
May	928	1943	0	m	73.4	191	2.60	23.3
June	726	1943	0	m	81.8	203	2.48	25.9
July	662	1942	0	m	56.1	149	2.66	17.8
August	208	1942	0	m	14.6	42.2	2.89	4.63
September	250	1942	0	m	13.5	49.3	3.66	4.27
Annual	233	1943	0	m	26.8	57.1	2.13	100

Annual flow duration



05050500 BOIS DE SIOUX RIVER NEAR FAIRMOUNT, 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	0.21	0.05	0.05	0	0	0	0.05	0	0	0	0	0	0
90	0.42	0.11	0.05	0	0	0	0.05	0	0	0	0	0	0
85	0.63	0.16	0.05	0	0	0	0.05	0	0	0	0	0	0
80	0.83	0.21	0.05	0	0	0	0.05	0	0	0	0	0	0
75	1.04	0.27	0.05	0	0	0	0.05	0	0	0	0	0	0
70	1.25	0.32	0.05	0	0	0	0.05	0	0	0	0	0	0
65	1.46	0.37	0.05	0	0	0	0.05	0	0	0	0	0	0
60	1.67	0.43	0.05	0	0	0	0.05	0	0	0	0	0	0
55	1.88	0.48	0.05	0.99	0	0	0.05	0	0	0	0	0	0
50	2.08	0.53	0.05	1.80	0.54	0.41	0.05	0	0	0	0	0	0
45	2.29	0.58	0.05	6.27	9.12	4.29	2.00	0	0	0	0	0	0
40	2.50	0.64	0.05	9.16	13.4	7.54	2.70	0	0	0	0	0	0
35	2.71	0.69	0.05	18.0	17.9	9.63	4.94	0.84	0.16	0.59	0	0	0
30	2.92	0.74	2.00	27.2	23.0	15.2	8.38	1.70	0.89	1.00	0	0	0.99
25	3.13	0.80	8.72	35.5	29.7	20.6	19.2	1.70	3.00	2.00	0.66	0	2.30
20	3.33	0.85	14.1	43.8	36.5	36.1	31.3	7.76	4.77	2.00	0.93	0	6.37
15	3.54	0.90	28.3	64.2	144	80.6	50.5	24.0	8.77	4.00	1.90	0	17.1
10	3.75	0.96	46.2	164	202	184	71.7	48.5	23.5	13.8	6.51	0.40	36.4
5	3.96	3.00	57.9	309	397	730	564	68.7	54.0	36.6	12.7	2.70	124

**05050500 BOIS DE SIOUX RIVER NEAR FAIRMOUNT, ND--Continued**

Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum average 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	0	0	0	0
0.80	1.25	ng	0	0	0	0
0.50	2	27.8	24.1	20.4	15.5	11.1
0.20	5	226	213	199	180	155
0.10	10	590	525	485	436	385
0.04	25	1,490	1,230	1,100	939	832
0.02	50	2,570	2,060	1,780	1,450	1,270
0.01	100	4,070	3,330	2,750	2,110	1,820
0.005	200	6,040	5,050	3,990	2,880	2,430
0.002	500	9,420	ng	ng	ng	ng

Probability of annual low discharges

[ng, statistic not given]

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	ng	ng	ng	ng	0	0
0.10	10	ng	ng	ng	ng	ng	ng	ng	0	0
0.20	5	ng	ng	ng	ng	ng	ng	ng	0	0
0.50	2	ng	ng	ng	ng	ng	ng	ng	0	0

05050500 BOIS DE SIOUX RIVER NEAR FAIRMOUNT, ND--Continued

Probability of seasonal low discharges

[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	0	0	0	0
0.10	10	ng	ng	ng	ng	0	0	0	0
0.20	5	ng	ng	ng	ng	0	0	0	0
0.50	2	ng	ng	ng	ng	0	0	0	0.062
		June-July-August				September-October-November			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0
0.20	5	0	0	0	0	0	0	0	0
0.50	2	0	0	0	0	0	0	0	0

## 05050500 BOIS DE SIOUX RIVER NEAR FAIRMOUNT, ND--Continued

Annual peak discharge and corresponding gage height, period of record

[--, 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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1920	April 2	5.00	250	1933	--	5.70	0
1921	April 2	--	67.0	1934	--	5.70	0
1922	April 21	5.70	390	1935	--	5.70	0
1923	April 14	3.65	80.0	1936	April 13	5.70	2.50
1924	--	--	0	1937	May 1	3.15	20.0
1925	--	--	0	1938	--	5.70	0
1926	March 18	--	32.0	1939	March 29	5.40	105
1927	April 2	3.50	70.0	1940	--	--	0
1928	--	3.50	40.0	1941	June 21	--	130
1929	--	3.90	53.0	1942	June 7	11.72	1,180
1930	--	3.90	64.0	1943	April 4	16.40	1,430
1931	--	5.70	0	1944	June 23	--	1,180
1932	--	5.70	0				
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1943	April 4	16.40	1,430	1926	March 18	--	32.0
1944	June 23	--	1,180	1937	May 1	3.15	20.0
1942	June 7	11.72	1,180	1936	April 13	5.70	2.50
1922	April 21	5.70	390	1924	--	--	0
1920	April 2	5.00	250	1925	--	--	0
1941	June 21	--	130	1931	--	5.70	0
1939	March 29	5.40	105	1932	--	5.70	0
1923	April 14	3.65	80.0	1933	--	5.70	0
1927	April 2	3.50	70.0	1934	--	5.70	0
1921	April 2	--	67.0	1935	--	5.70	0
1930	--	3.90	64.0	1938	--	5.70	0
1929	--	3.90	53.0	1940	--	--	0
1928	--	3.50	40.0				

# 05050500 BOIS DE SIOUX RIVER NEAR FAIRMOUNT, 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	--	--	--	--	--	--	6.91	12.4	12.5	39.7	52.7	25.0	--
1920	15.0	7.00	3.00	0	0	50.0	169.1	158.8	136.2	67.1	49.5	49.6	58.8
1921	38.0	23.5	14.8	6.74	3.18	10.9	39.2	32.6	20.3	6.94	0.581	4.33	16.8
1922	1.71	0.577	0	0	0	13.6	263.6	210.1	64.3	27.7	4.45	0.147	48.9
1923	0	0	0	0	0	0.677	38.5	22.3	8.67	2.23	0	0	6.01
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	12.1	0	0	0	0	0	0	1.03
1927	0	0	0	0	0.429	17.5	41.7	11.6	20.5	21.3	2.94	4.77	10.1
1928	2.39	0.433	0	0	0	14.9	27.8	14.6	4.17	3.16	2.16	0.567	5.86
1929	1.55	0.800	0	0	0	24.2	37.1	36.3	18.7	8.23	2.32	0.500	10.8
1930	2.00	1.00	0	0	8.64	56.4	9.50	19.4	9.37	3.19	0	0	9.17
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0.310	0	0	0	0	0	0.025
1937	0	0	0	0	0	0	4.33	4.90	0	0	0	0	0.773
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	13.1	13.6	0.177	0.330	0.145	0	0	2.28
1940	0	0	0	0	0	0	0	0	0	0	0	0	0
1941	0	0	0	0	0	0.503	1.30	0.174	6.12	1.83	0.842	1.90	1.05
1942	1.23	0.713	0.103	0	0	3.55	12.0	148.7	393.6	661.7	207.6	249.5	140.8
1943	57.4	3.32	0	0	0	72.3	624.9	927.6	725.5	340.7	34.8	4.75	233.3
1944	7.66	8.51	1.33	0	0	3.29	160.6	308.1	705.2	274.0	21.7	8.99	124.6

## 05051000 RABBIT CREEK AT CAMPBELL, MN

### Station Description

LOCATION.--Lat 46°05'40", long 96°24'40", in SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.2, T.130 N., R.46 W., Wilken County, Hydrologic Unit 09020101, near center of span on upstream side of highway bridge in Campbell, 1 mi downstream from South Fork and 10 mi upstream from mouth.

DRAINAGE AREA.--266 mi<sup>2</sup>.

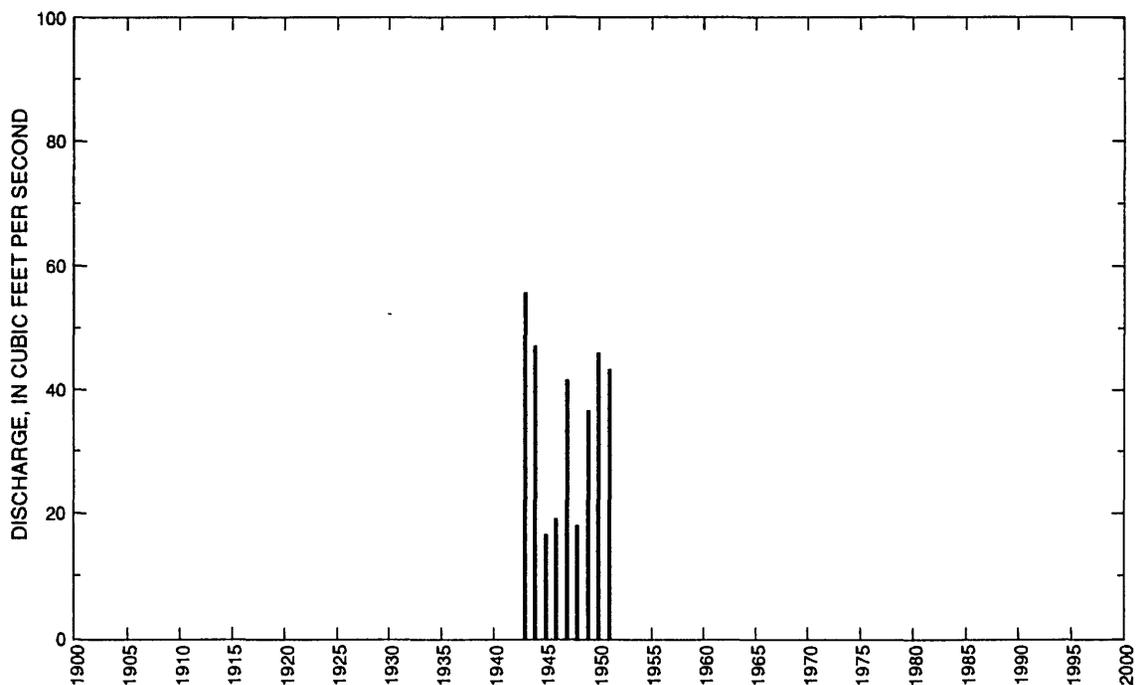
PERIOD OF RECORD.--June 1942 to November 1951.

GAGE.--Wire-weight gage. Datum of gage is 970 ft (from topographic map). Prior to Mar. 29, 1943, staff gage and Apr. 8, 1943, to Aug. 10, 1948, chain gage, at same site and datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,940 ft<sup>3</sup>/s, Apr. 7, 1951 (gage height, 12.10 ft); maximum gage height, 15.07 ft, Apr. 2, 1943, from floodmark (backwater from ice); no flow during large part of each year.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge 7,000 ft<sup>3</sup>/s, April 1952 (gage height, 16.4 ft, backwater from ice).

Annual mean discharge



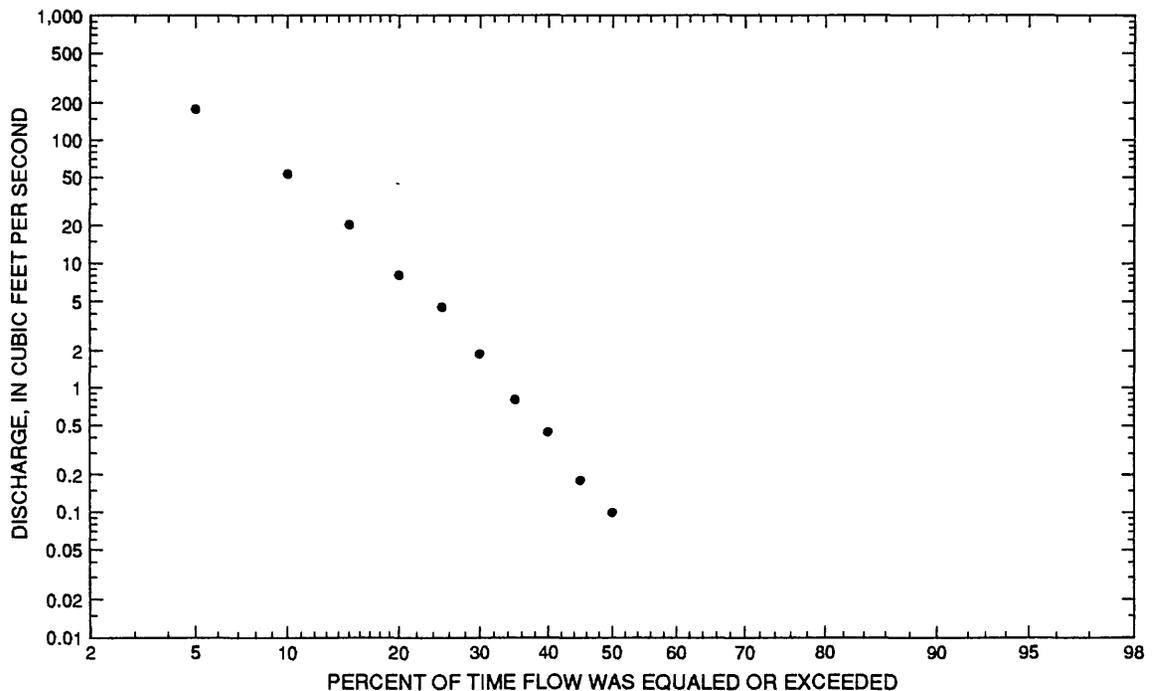
## 05051000 RABBIT CREEK AT CAMPBELL, MN--Continued

Statistics of monthly and annual mean discharges

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

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	1.56	1944	0	m	0.590	0.61	1.03	0.14
November	2.20	1944	0	m	0.530	0.68	1.29	0.12
December	0.226	1944	0	m	0.040	0.08	1.87	0.01
January	0	m	0	m	0	0	ng	0
February	0	m	0	m	0	0	ng	0
March	188	1946	4.55	1951	60.2	70.1	1.16	13.9
April	488	1951	14.3	1945	202	196	0.97	46.9
May	279	1951	0.190	1946	55.2	101	1.83	12.8
June	324	1944	0	1946	56.8	107	1.89	13.1
July	335	1949	0.168	1945	51.5	108	2.10	11.9
August	24.1	1943	0	m	4.11	8.33	2.03	0.95
September	4.67	1943	0	m	0.670	1.51	2.27	0.15
Annual	55.7	1943	16.5	1945	36.0	14.5	0.40	100

Annual flow duration



# 05051000 RABBIT CREEK AT CAMPBELL, 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	0
90	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
85	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
80	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
75	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
70	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
65	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
60	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
55	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
50	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.10
45	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.18
40	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.44
35	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.80
30	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	1.90
25	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	4.49
20	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	8.04
15	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	20.4
10	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	53.1
5	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	177

## 05051000 RABBIT CREEK AT CAMPBELL, MN--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	258	281	312	229	119
0.95	1.05	421	433	420	301	166
0.90	1.11	548	536	490	347	197
0.80	1.25	754	684	591	411	238
0.50	2	1,400	1,040	839	561	333
0.20	5	2,610	1,500	1,180	755	448
0.10	10	3,630	1,770	1,410	877	516
0.04	25	5,160	2,090	1,700	1,020	592
0.02	50	6,490	2,300	1,910	1,130	643
0.01	100	7,980	2,500	2,120	1,230	691
0.005	200	9,660	2,690	2,340	1,330	735
0.002	500	12,200	ng	ng	ng	ng

### Probability of annual low discharges

[ng, statistic not given]

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	ng	ng	ng	ng	0	0
0.10	10	ng	ng	ng	ng	ng	ng	ng	0	0
0.20	5	ng	ng	ng	ng	ng	ng	ng	0	0
0.50	2	ng	ng	ng	ng	ng	ng	ng	0	0.061

## 05051000 RABBIT CREEK AT CAMPBELL, MN--Continued

Probability of seasonal low discharges

[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	ng	ng	0	0.199
0.10	10	ng	ng	ng	ng	ng	ng	0	0.444
0.20	5	ng	ng	ng	ng	ng	ng	0	1.06
0.50	2	ng	ng	ng	ng	ng	ng	0	4.09
June-July-August				September-October-November					
0.05	20	0	0	0	0	ng	ng	ng	0
0.10	10	0	0	0	0	ng	ng	ng	0
0.20	5	0	0	0	0	ng	ng	ng	0
0.50	2	0	0	0	0.233	ng	ng	ng	0

## 05051000 RABBIT CREEK AT CAMPBELL, MN—Continued

Annual peak discharge and corresponding gage height, period of record

[--, 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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1943	April 3	--	1,850	1948	April 3	10.82	734
1944	June 4	11.88	1,860	1949	July 9	9.53	1,300
1945	March 15	--	495	1950	May 9	--	1,430
1946	March 21	--	674	1951	April 7	12.10	1,940
1947	April 11	10.05	1,410	1952	April <sup>1</sup>	16.40	7,000
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1952	April <sup>1</sup>	16.40	7,000	1947	April 11	10.05	1,410
1951	April 7	12.10	1,940	1949	July 9	9.53	1,300
1944	June 4	11.88	1,860	1948	April 3	10.82	734
1943	April 3	--	1,850	1946	March 21	--	674
1950	May 9	--	1,430	1945	March 15	--	495

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

# 05051000 RABBIT CREEK AT CAMPBELL, 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	1.07	0.893	0	0	0	45.7	417.9	14.2	122.2	42.7	24.1	4.67	55.7
1944	1.56	2.20	0.226	0	0	10.2	37.1	175.7	323.6	16.3	0.439	0.160	47.1
1945	0	0	0.032	0	0	174.5	14.3	0.894	5.20	0.168	0	0	16.5
1946	0	0.020	0	0	0	188.5	27.9	0.190	0	9.20	0.026	0	19.1
1947	0.968	0.643	0	0	0	33.5	436.2	10.5	20.5	0.690	0	0.190	41.5
1948	0	0	0	0	0	20.0	196.1	2.63	0.150	0.219	0.135	0	18.0
1949	0	0	0	0	0	39.3	24.8	3.83	16.3	335.0	11.2	0.487	36.5
1950	0.494	0.633	0.090	0	0	25.6	180.9	279.2	2.89	56.3	0.552	0.113	45.9
1951	0.477	0.183	0.016	0	0	4.55	487.5	9.73	20.0	2.88	0.503	0.380	43.3
1952	1.37	0.737	--	--	--	--	--	--	--	--	--	--	--

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

### Station Description

**LOCATION.**--Lat 46°15'55", long 96°35'40", in NE<sup>1</sup>/<sub>4</sub> 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.

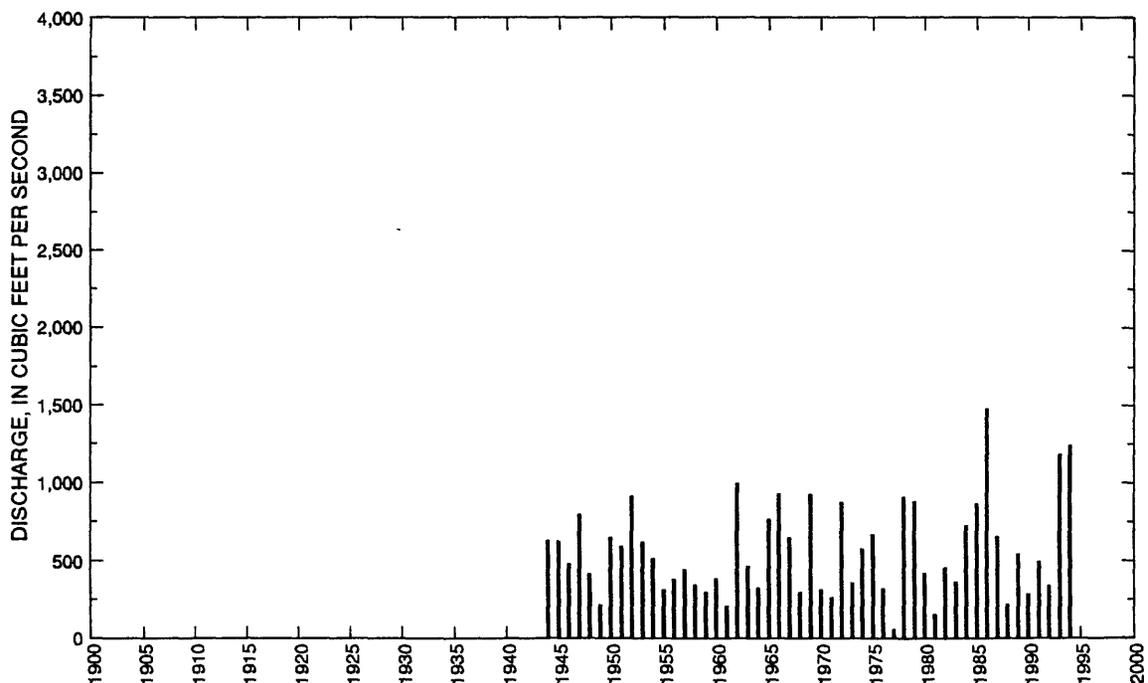
**PERIOD OF RECORD.**--April 1942 to October 1942, March 1943 to current year. Gage-height records collected in this vicinity since 1917 are contained in reports of the National Weather Service.

**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, 9,200 ft<sup>3</sup>/s, Apr. 10, 1969 (gage height, 16.34 ft); maximum gage height, 17.95 ft, Apr. 5, 1989; minimum daily discharge, 1.7 ft<sup>3</sup>/s, Aug. 28 to Sept. 5, 1976, and Sept. 9-10, 1976; minimum 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 and has not been exceeded since.

Annual mean discharge



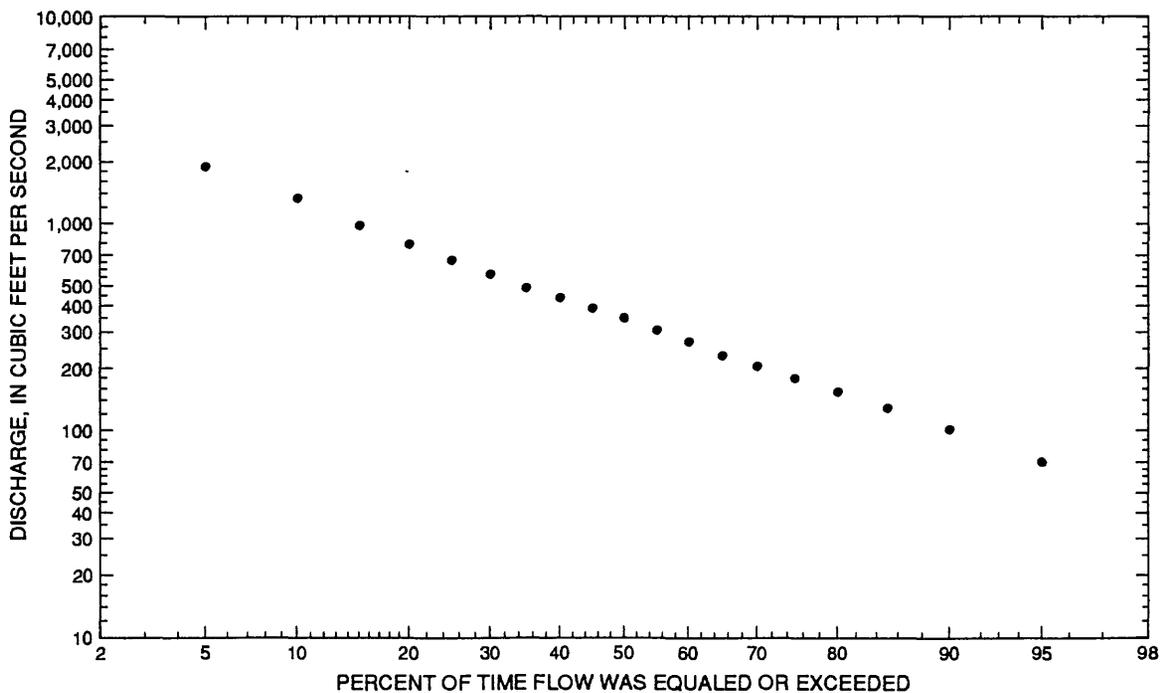
# 05051500 RED RIVER OF THE NORTH AT WAHPETON, ND--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	1,600	1994	5.72	1977	320	287	0.90	4.69
November	952	1987	7.40	1977	296	211	0.71	4.34
December	820	1987	6.60	1977	266	180	0.68	3.90
January	678	1986	8.81	1977	258	159	0.61	3.78
February	687	1987	18.0	1977	268	151	0.57	3.92
March	1,970	1994	84.3	1977	604	426	0.70	8.85
April	4,440	1969	138	1977	1,230	963	0.78	18.1
May	3,080	1986	22.5	1977	1,020	669	0.65	15.0
June	2,680	1962	90.0	1977	1,030	665	0.65	15.0
July	2,790	1993	65.6	1977	777	610	0.79	11.4
August	2,500	1993	53.5	m	419	434	1.03	6.14
September	2,150	1993	2.18	1976	332	365	1.10	4.87
Annual	1,480	1986	54.0	1977	564	300	0.53	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 equalled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	73.3	88.1	137	229	198	164	97.9	55.4	34.8	64.2	64.2	54.2	70.8
90	88.8	104	175	331	293	217	165	81.6	54.8	78.8	89.4	78.2	101
85	102	118	201	399	362	280	214	101	74.3	95.2	107	103	129
80	121	134	226	443	420	368	253	133	94.1	113	121	118	155
75	142	148	244	484	482	446	309	160	115	130	133	132	180
70	153	166	262	525	555	512	359	187	134	148	147	148	206
65	166	183	290	587	658	595	398	212	156	166	164	164	233
60	181	201	320	650	728	687	445	236	178	187	182	179	370
55	199	219	354	714	792	778	501	263	196	211	202	194	308
50	218	234	390	789	860	864	568	306	215	237	230	209	350
45	236	250	431	876	929	946	641	340	254	282	263	227	392
40	256	278	468	986	1,010	1,040	710	368	295	308	300	249	442
35	278	304	502	1,120	1,110	1,180	800	397	334	334	331	294	493
30	323	330	543	1,300	1,240	1,330	925	450	375	367	362	342	571
25	362	355	612	1,530	1,420	1,490	1,040	509	418	404	399	380	666
20	395	385	725	1,730	1,630	1,640	1,180	586	472	450	437	417	794
15	429	428	865	2,000	1,830	1,790	1,420	681	533	503	518	458	980
10	500	495	1,180	2,490	2,040	2,030	1,670	819	643	644	627	519	1,340
5	592	601	1,930	4,180	2,430	2,470	2,200	1,120	911	888	781	670	1,900

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

Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	333	293	257	223	181
0.95	1.05	657	569	486	415	354
0.90	1.11	923	797	673	570	493
0.80	1.25	1,360	1,180	986	824	719
0.50	2	2,700	2,360	1,970	1,600	1,380
0.20	5	4,940	4,460	3,760	2,950	2,410
0.10	10	6,580	6,060	5,170	3,970	3,130
0.04	25	8,720	8,260	7,170	5,370	4,020
0.02	50	10,300	9,990	8,790	6,470	4,670
0.01	100	12,000	11,800	10,500	7,620	5,300
0.005	200	13,600	13,600	12,300	8,800	5,910
0.002	500	15,700	ng	ng	ng	ng

Probability of annual low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	7.50	8.87	10.7	13.3	16.5	25.4	32.8	35.8	44.6
0.10	10	13.0	15.7	19.5	24.0	30.2	44.8	55.0	59.7	71.1
0.20	5	24.2	29.7	37.3	45.3	57.0	80.2	94.1	102	117
0.50	2	69.5	84.6	104	121	146	183	203	218	244

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

Probability of seasonal low discharges

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	26.3	31.5	33.4	39.0	50.3	64.4	73.3	108
0.10	10	42.3	52.1	55.7	62.6	76.9	101	115	156
0.20	5	70.3	88.1	94.5	103	120	158	180	234
0.50	2	153	189	201	212	232	286	323	448
		June-July-August				September-October-November			
0.05	20	12.2	16.6	30.9	71.3	9.51	14.1	16.7	22.1
0.10	10	24.2	33.0	50.7	95.6	16.7	25.4	30.3	40.5
0.20	5	51.0	68.8	88.4	137	31.5	48.2	57.3	76.5
0.50	2	165	210	224	272	91.6	133	155	196

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

Annual peak discharge and corresponding gage height, period of record

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

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

Annual peak discharge and corresponding gage height, period of record--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)
<b>Annual peak discharge, from highest to lowest, and corresponding gage height--Continued</b>							
1949	July 10	9.24	2,290	1959	May 27	6.17	1,050
1957	April 22	8.82	2,290	1971	March 18	6.74	927
1992	March 8	8.46	2,000	1988	March 27	5.58	911
1956	April 14	7.88	1,980	1990	March 18	5.72	900
1954	June 9	7.59	1,860	1983	March 13	5.70	880
1987	October 1	7.46	1,770	1958	April 15	5.59	866
1964	May 6	7.39	1,700	1968	May 18	4.95	708
1970	April 8	6.93	1,450	1961	June 8	4.72	548
1974	May 24	6.14	1,250	1977	June 25	4.49	526
1973	March 15	6.08	1,220	1981	August 2	4.54	512
1955	April 2	6.99	1,150				

# 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

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

### Station Description

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.

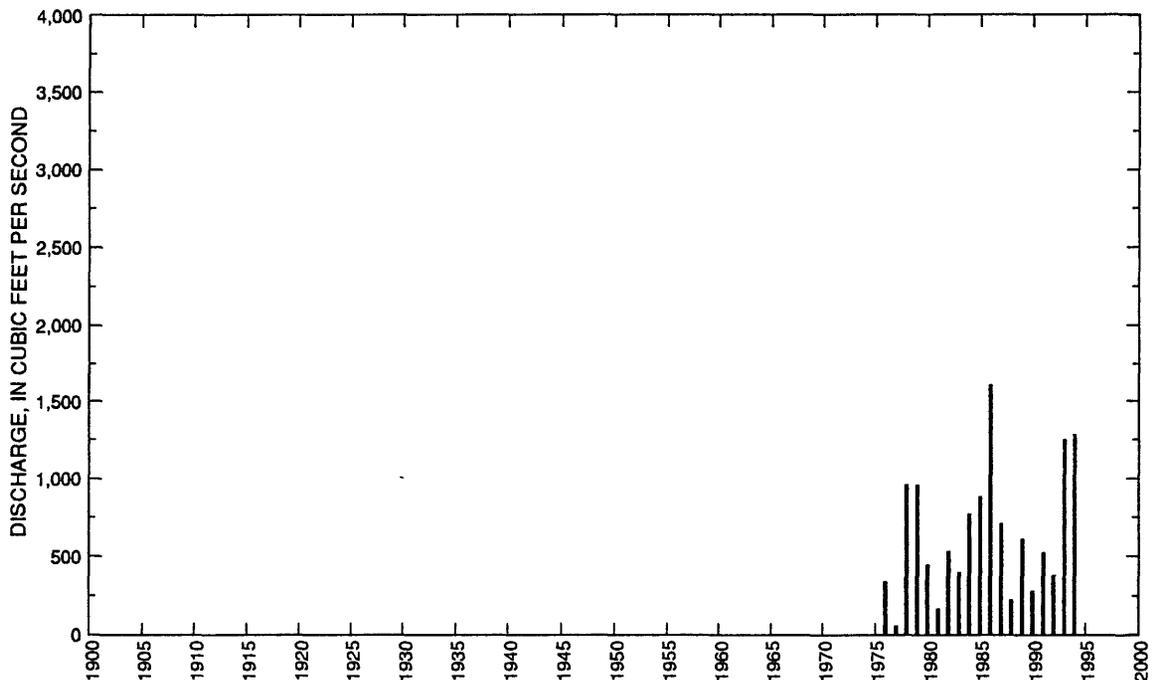
DRAINAGE AREA.--4,300 mi<sup>2</sup>, approximately.

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, 12,900 ft<sup>3</sup>/s, Apr. 7, 1989; maximum gage height, 35.81 ft, Apr. 7, 1989; no flow from Oct. 26, 1977, to Jan. 9, 1978.

Annual mean discharge

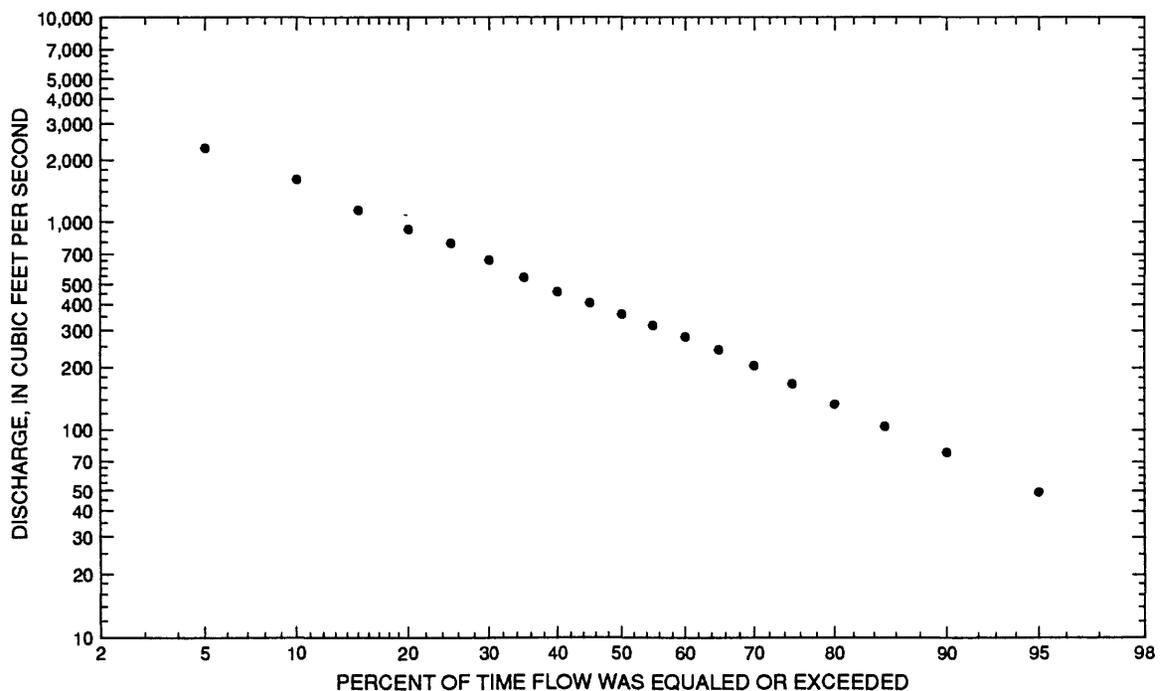


## 05051522 RED RIVER OF THE NORTH AT HICKSON, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	1,560	1994	2.02	1977	388	418	1.08	4.99
November	900	1987	0	1977	310	265	0.86	3.98
December	817	1986	0	1977	270	226	0.84	3.47
January	747	1986	4.95	1977	261	198	0.76	3.35
February	745	1987	14.0	1977	305	202	0.66	3.92
March	2,080	1994	75.9	1977	783	503	0.64	10.1
April	4,160	1978	165	1977	1,710	1,430	0.84	21.9
May	3,390	1986	22.0	1977	1,010	837	0.83	13.0
June	2,480	1986	86.4	1977	951	707	0.74	12.2
July	2,670	1993	73.4	1977	834	735	0.88	10.7
August	2,670	1993	35.6	1977	515	600	1.16	6.63
September	2,140	1993	12.6	1976	445	558	1.25	5.71
Annual	1,600	1986	53.1	1977	649	418	0.64	100

Annual flow duration



**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.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	7.43	26.7	126	202	47.0	156	73.5	36.0	23.7	2.30	23.7	34.2	49.5
90	63.0	95.0	185	287	246	196	92.3	73.2	43.4	63.5	64.9	57.5	77.6
85	82.6	104	223	401	337	223	123	82.5	56.2	74.3	79.2	70.7	104
80	94.6	118	267	447	381	269	172	95.2	73.3	98.6	100	88.2	133
75	102	142	331	498	425	323	202	136	92.3	119	117	108	167
70	118	184	377	563	470	425	263	175	121	132	128	120	205
65	139	215	404	663	528	491	327	217	150	145	137	130	241
60	169	242	432	750	612	562	373	264	174	175	154	153	279
55	200	262	460	807	716	638	455	309	202	201	183	195	317
50	228	279	488	890	782	730	543	348	232	226	205	222	360
45	247	296	523	1,030	863	824	645	385	263	275	238	251	405
40	267	312	584	1,270	972	925	766	422	295	307	293	268	462
35	287	329	653	1,550	1,060	1,100	963	460	331	337	341	283	543
30	314	349	725	1,740	1,140	1,250	1,120	533	379	373	374	323	658
25	355	373	793	2,110	1,310	1,420	1,240	689	466	416	408	360	790
20	400	417	901	2,550	1,590	1,610	1,460	795	633	522	472	397	923
15	454	576	1,210	3,240	1,880	1,820	1,780	898	901	851	675	456	1,140
10	569	672	1,750	4,320	2,220	2,080	2,020	1,070	1,080	1,050	819	641	1,600
5	708	738	2,540	6,090	2,680	2,640	2,360	1,940	2,050	1,420	917	813	2,280

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

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	187	166	150	114	99.4
0.95	1.05	460	423	380	297	258
0.90	1.11	722	673	602	477	408
0.80	1.25	1,210	1,140	1,020	813	683
0.50	2	3,010	2,870	2,550	2,030	1,610
0.20	5	6,750	6,390	5,680	4,400	3,270
0.10	10	9,900	9,260	8,270	6,260	4,460
0.04	25	14,500	13,300	11,900	8,800	5,980
0.02	50	18,200	16,600	14,900	10,700	7,060
0.01	100	22,200	19,900	18,000	12,700	8,100
0.005	200	26,400	23,400	21,200	14,700	9,090
0.002	500	32,200	ng	ng	ng	ng

### Probability of annual low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0	0	4.42	8.41	18.9
0.10	10	9.94	11.7	13.2	18.0	20.8	36.8	<sup>1</sup> 37.2	<sup>1</sup> 37.5	37.9
0.20	5	20.3	23.5	28.6	35.3	41.7	61.2	<sup>1</sup> 67.0	<sup>1</sup> 73.0	79.3
0.50	2	62.6	69.7	89.9	99.9	118	141	236	<sup>1</sup> 238	240

<sup>1</sup>Graphical interpretation.

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

Probability of seasonal low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0	0	0	0	39.7	48.9	52.7	71.1
0.10	10	42.0	48.3	51.7	55.8	74.8	90.6	100	133
0.20	5	65.2	76.6	82.4	89.9	140	165	186	252
0.50	2	134	160	171	188	312	349	392	600
		June-July-August				September-October-November			
0.05	20	12.5	16.7	25.4	47.9	0	0	0	0
0.10	10	23.1	30.7	44.0	73.1	21.7	28.0	31.7	38.1
0.20	5	46.6	61.3	82.1	120	34.3	45.5	51.7	63.2
0.50	2	159	199	237	293	79.1	107	123	150

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

Annual peak discharge and corresponding gage height, period of record

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

# 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	3,394	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

## 05051600 WILD RICE RIVER NEAR RUTLAND, ND

### Station Description

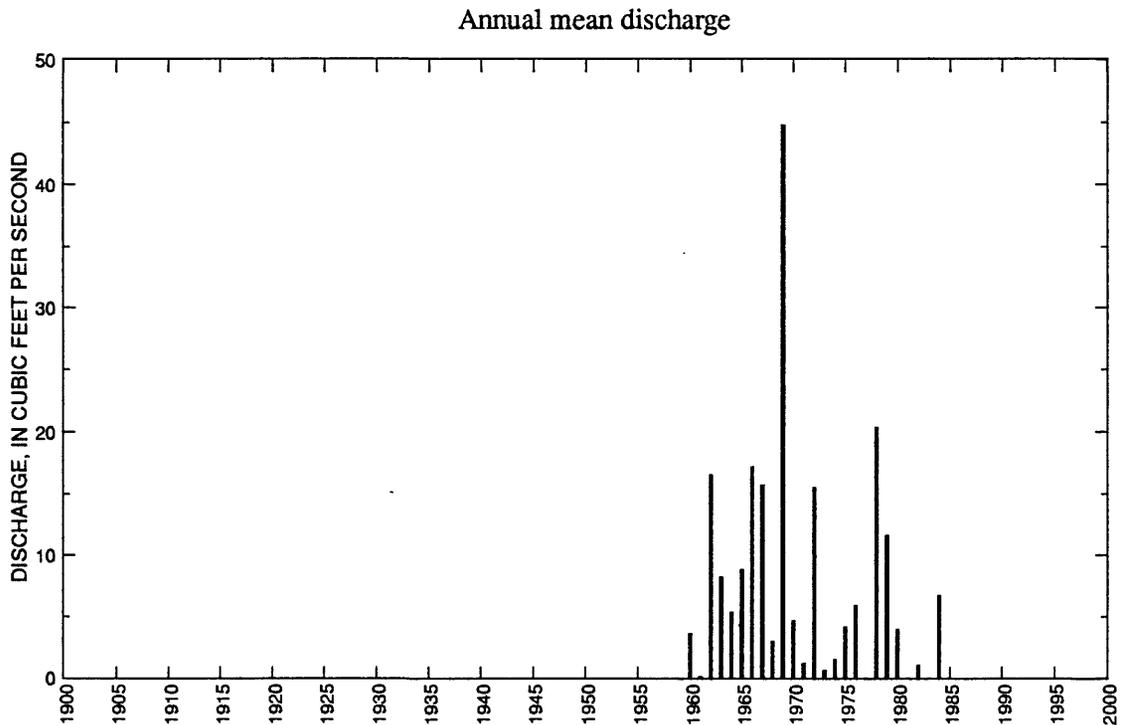
LOCATION.--Lat 46°01'20", long 97°30'40", in SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.36, T.130 N., R.55 W., Sargent County, Hydrologic Unit 09020105, on right bank 1,000 ft upstream from bridge on county highway, 2 mi south of Rutland, and 10 mi upstream from Lake Tewaukon.

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, 1,270 ft<sup>3</sup>/s, Apr. 8, 1969; maximum gage height, 8.78 ft, Apr. 8, 1969; no flow at times each year.



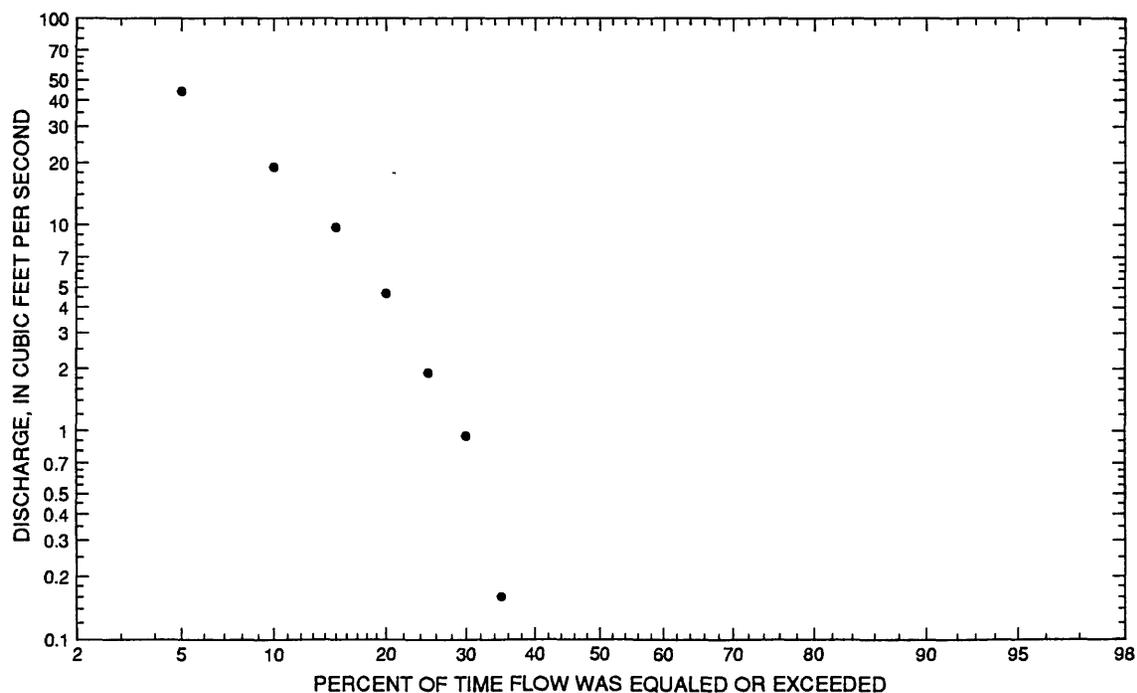
## 05051600 WILD RICE RIVER NEAR RUTLAND, ND--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	4.81	1963	0	m	0.540	1.18	2.19	0.54
November	5.87	1963	0	m	0.360	1.23	3.44	0.36
December	2.90	1963	0	m	0.140	0.59	4.19	0.14
January	0.103	1963	0	m	0	0.02	4.90	0
February	1.00	1976	0	m	0.070	0.22	3.40	0.07
March	138	1966	0	m	17.7	30.6	1.73	17.6
April	348	1969	0	m	40.6	65.8	1.62	40.5
May	69.3	1986	0	m	13.4	19.0	1.41	13.4
June	61.4	1967	0	m	9.38	15.2	1.62	9.35
July	103	1993	0	m	13.6	24.7	1.82	13.5
August	47.0	1993	0	m	3.41	9.01	2.64	3.39
September	9.07	1969	0	m	1.20	2.43	2.03	1.19
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	0	0	0	0	0	0	0	0	0
75	0	0	0	0.18	0	0	0	0	0	0	0	0	0
70	0	0	0	1.20	0.28	0	0	0	0	0	0	0	0
65	0	0	0	4.28	0.69	0	0	0	0	0	0	0	0
60	0	0	0	6.94	1.30	0.20	0	0	0	0	0	0	0
55	0	0	0	9.59	2.30	0.68	0	0	0	0	0	0	0
50	0	0	0	13.5	4.45	1.20	0.32	0	0	0	0	0	0
45	0	0	0	16.7	6.63	1.70	0.84	0	0	0	0	0	0
40	0	0	0.04	20.1	8.31	3.50	2.20	0	0	0	0	0	0
35	0	0	0.14	23.8	10.2	4.77	4.33	0.30	0	0	0	0	0.16
30	0	0	0.39	28.0	12.4	6.94	8.09	0.92	0.08	0	0	0	0.94
25	0	0	1.50	35.4	14.9	10.0	11.6	1.60	0.67	0	0	0	1.90
20	0	0	8.33	48.2	18.1	13.2	15.8	2.20	2.10	0.23	0	0	4.66
15	0	0	16.5	64.1	23.0	17.9	25.3	4.44	2.70	0.91	0.07	0	9.72
10	0	0	36.7	91.7	36.3	29.0	47.5	7.16	4.53	2.00	0.52	0	19.0
5	0	0	106	180	65.6	48.5	69.0	24.1	7.00	3.60	2.00	0.76	44.1

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

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average 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	21.3	14.1	12.0	9.93	7.48
0.50	2	91.0	76.0	65.7	51.9	37.1
0.20	5	316	249	214	160	104
0.10	10	560	419	357	257	156
0.04	25	974	677	569	395	223
0.02	50	1,350	898	748	506	272
0.01	100	1,780	1,140	940	621	317
0.005	200	2,260	1,390	1,130	734	359
0.002	500	2,950	ng	ng	ng	ng

### Probability of annual low discharges

[ng, statistic not given]

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	ng	ng	ng	ng	0	0
0.10	10	ng	ng	ng	ng	ng	ng	ng	0	0
0.20	5	ng	ng	ng	ng	ng	ng	ng	0	0
0.50	2	ng	ng	ng	ng	ng	ng	ng	0	0

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

Probability of seasonal low discharges

[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	ng	0	0	0
0.10	10	ng	ng	ng	ng	ng	0	0	0
0.20	5	ng	ng	ng	ng	ng	0	0	0
0.50	2	ng	ng	ng	ng	ng	0	0	0.518
		June-July-August				September-October-November			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0
0.20	5	0	0	0	0	0	0	0	0
0.50	2	0	0	0	0	0	0	0	0

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

Annual peak discharge and corresponding gage height, period of record

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

# 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	0	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	0	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	--
1994	--	--	--	--	--	83.2	89.7	45.6	4.41	14.0	2.69	2.62	--

## 05051700 WILD RICE RIVER NEAR CAYUGA, ND

### Station Description

LOCATION.--Lat 46°07'30", long 97°21'40", on line between secs.29 and 30, T.131 N., R.53 W., Sargent County, Hydrologic Unit 09020105, on left bank 20 ft downstream from county highway bridge, 1.2 mi downstream from Shortfoot Creek, 2.5 mi downstream from Crooked Creek, and 3.5 mi northeast of Cayuga.

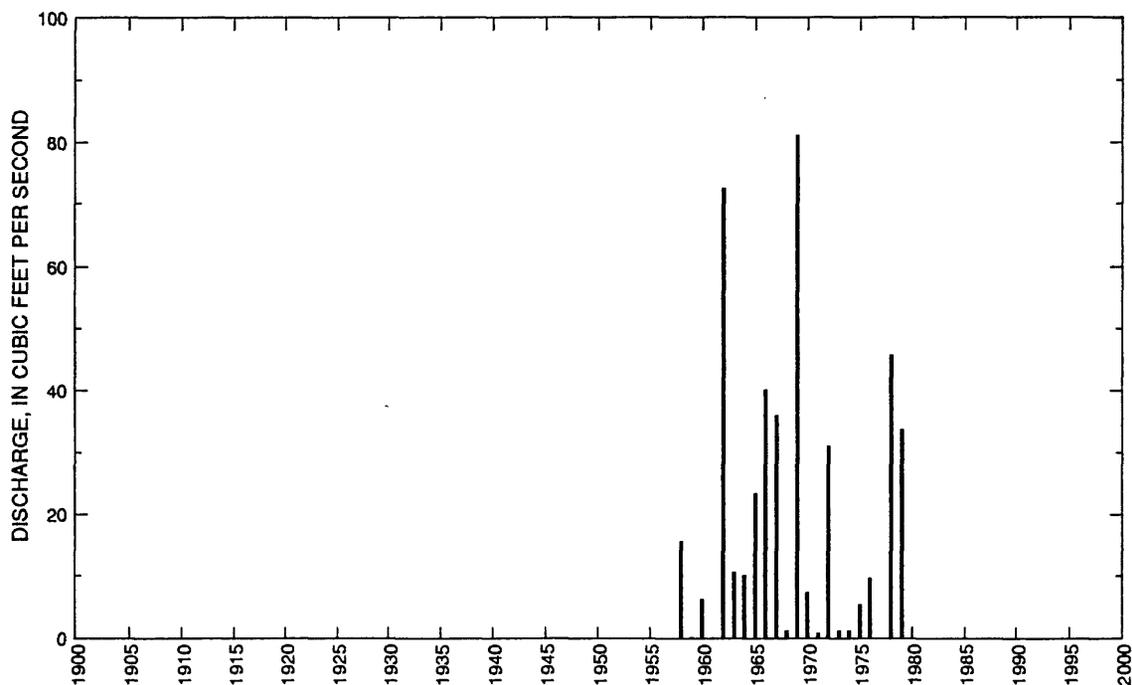
DRAINAGE AREA.--955 mi<sup>2</sup>, of which about 390 mi<sup>2</sup> is probably noncontributing.

PERIOD OF RECORD.--May 1956 to September 1979.

GAGE.--Water-stage recorder. Datum of gage is 1,095.64 ft National Geodetic Vertical Datum of 1929. Prior to Oct. 9, 1957, nonrecording gage 0.8 mi upstream at different datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,710 ft<sup>3</sup>/s, Apr. 12, 1969 (gage height, 9.32 ft); maximum gage height, 10.90 ft, Apr. 7, 1969, backwater from ice; no flow at times each year.

Annual mean discharge



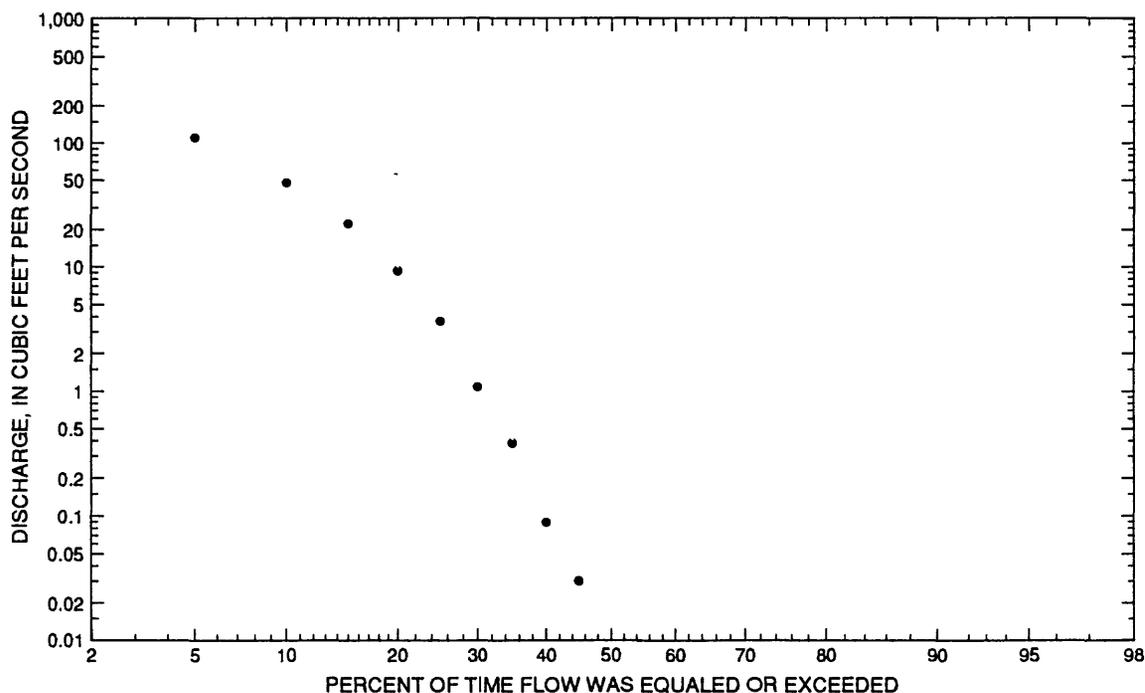
## 05051700 WILD RICE RIVER NEAR CAYUGA, ND--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	11.2	1958	0	m	0.990	2.94	2.97	0.42
November	16.2	1958	0	m	1.23	3.92	3.18	0.52
December	5.35	1958	0	m	0.390	1.22	3.10	0.17
January	0.719	1958	0	m	0.040	0.15	4.23	0.02
February	3.31	1976	0	m	0.210	0.74	3.54	0.09
March	273	1966	0	m	26.8	62.9	2.34	11.4
April	715	1969	0	m	99.0	159	1.60	42.0
May	153	1969	0	m	38.4	46.5	1.21	16.3
June	161	1962	0	m	28.1	42.6	1.52	11.9
July	351	1962	0	m	35.1	78.4	2.24	14.9
August	58.7	1962	0	m	5.05	12.8	2.53	2.14
September	2.28	1969	0	m	0.390	0.66	1.72	0.16
Annual	81.1	1969	0.009	1977	19.6	23.5	1.20	100

Annual flow duration



05051700 WILD RICE RIVER NEAR CAYUGA, 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	0.06	0	0	0	0	0	0	0	0	0
80	0	0	0	0.79	0.14	0	0	0	0	0	0	0	0
75	0	0	0	1.60	1.30	0.12	0	0	0	0	0	0	0
70	0	0	0	2.59	2.60	0.31	0	0	0	0	0	0	0
65	0	0	0	3.99	3.90	0.58	0.03	0	0	0	0	0	0
60	0	0	0	11.7	5.35	1.10	0.15	0	0	0	0	0	0
55	0	0	0.05	23.2	8.49	2.00	0.86	0	0	0	0	0	0
50	0	0	0.08	33.6	13.5	3.98	1.70	0	0	0	0	0	0
45	0	0	0.15	49.5	19.0	5.97	3.60	0	0	0	0	0	0.03
40	0	0	0.29	66.2	24.0	9.60	6.83	0.13	0	0	0	0	0.09
35	0	0	0.80	80.2	34.7	13.6	13.7	0.57	0	0	0.02	0	0.38
30	0	0	2.20	94.9	42.1	22.5	21.9	1.00	0	0.02	0.03	0	1.10
25	0	0	4.49	111	50.2	36.2	28.0	1.80	0.04	0.03	0.03	0	3.67
20	0	0	7.95	128	62.0	45.0	34.3	3.96	0.20	0.05	0.05	0.04	9.33
15	0	0	22.3	173	82.5	60.2	45.2	8.00	0.39	0.09	0.18	0.05	22.4
10	0	0.04	45.2	253	116	88.6	92.9	13.8	0.73	0.49	0.74	0.90	48.0
5	0.04	0.10	175	394	165	157	215	25.7	2.10	7.70	11.4	3.10	110

## 05051700 WILD RICE RIVER NEAR CAYUGA, ND--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	0.101	0.066	0.036	0.020
0.95	1.05	12.1	1.48	0.986	0.580	0.358
0.90	1.11	24.3	5.08	3.44	2.12	1.37
0.80	1.25	53.1	18.8	13.2	8.58	5.80
0.50	2	198	138	107	76.9	54.8
0.20	5	586	548	481	385	279
0.10	10	951	913	861	728	526
0.04	25	1,500	1,370	1,400	1,250	895
0.02	50	1,950	1,680	1,790	1,660	1,180
0.01	100	2,420	1,940	2,160	2,050	1,440
0.005	200	2,910	2,150	2,480	2,420	1,690
0.002	500	3,550	ng	ng	ng	ng

### Probability of annual low discharges

[ng, statistic not given]

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	ng	ng	ng	0	0	0
0.10	10	ng	ng	ng	ng	ng	ng	0	0	0
0.20	5	ng	ng	ng	ng	ng	ng	0	0	0
0.50	2	ng	ng	ng	ng	ng	ng	0	0	0

05051700 WILD RICE RIVER NEAR CAYUGA, ND--Continued

Probability of seasonal low discharges

[ng, statistic not given]

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	0	0	0	0
0.10	10	ng	ng	ng	ng	0	0	0	0
0.20	5	ng	ng	ng	ng	0	0	0	0
0.50	2	ng	ng	ng	ng	0	0	0.007	0.878
		June-July-August				September-October-November			
0.05	20	0	0	0	0	ng	ng	ng	0
0.10	10	0	0	0	0	ng	ng	ng	0
0.20	5	0	0	0	0	ng	ng	ng	0
0.50	2	0	0	0	0	ng	ng	ng	0

## 05051700 WILD RICE RIVER NEAR CAYUGA, ND--Continued

Annual peak discharge and corresponding gage height

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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1957	April 19	6.07	150	1969	April 12	9.32	1,710
1958	April 15	5.08	131	1970	June 17	4.24	177
1959	June 12	3.51	54.0	1971	March 14	4.02	55.0
1960	April 19	4.40	123	1972	March 27	6.05	488
1961	March 12	2.77	1.20	1973	July 1	3.88	114
1962	July 6	8.95	1,080	1974	March 7	3.62	53.0
1963	June 10	3.95	107	1975	July 1	7.66	636
1964	April 27	4.30	153	1976	March 28	4.30	185
1965	April 14	6.08	375	1977	March 26	2.98	3.60
1966	March 19	7.28	757	1978	April 4	6.24	499
1967	July 8	5.72	309	1979	April 12	7.29	600
1968	July 17	3.63	55.0				
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1969	April 12	9.32	1,710	1957	April 19	6.07	150
1962	July 6	8.95	1,080	1958	April 15	5.08	131
1966	March 19	7.28	757	1960	April 19	4.40	123
1975	July 1	7.66	636	1973	July 1	3.88	114
1979	April 12	7.29	600	1963	June 10	3.95	107
1978	April 4	6.24	499	1968	July 17	3.63	55.0
1972	March 27	6.05	488	1971	March 14	4.02	55.0
1965	April 14	6.08	375	1959	June 12	3.51	54.0
1967	July 8	5.72	309	1974	March 7	3.62	53.0
1976	March 28	4.30	185	1977	March 26	2.98	3.60
1970	June 17	4.24	177	1961	March 12	2.77	1.20
1964	April 27	4.30	153				

# 05051700 WILD RICE RIVER NEAR CAYUGA, 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
1958	11.2	16.2	5.35	0.719	1.20	33.4	100.6	16.3	0.997	0.351	0	0	15.5
1959	0	0	0	0	0	0	0	0	1.82	0.116	0	0	0.159
1960	0.010	0.030	0.050	0.040	0.040	4.99	54.0	15.3	0.447	0	0	0	6.19
1961	0	0	0	0	0.018	0.200	0	0.032	0	0	0	0	0.021
1962	0.006	0	0	0	0	7.14	148.3	135.5	161.3	351.4	58.7	1.66	72.5
1963	0.019	0.367	2.28	0.023	0	8.92	30.3	16.5	58.7	9.32	0	0	10.5
1964	0	0	0	0	0	0.110	66.3	36.5	7.60	10.8	0.681	0.053	10.1
1965	0	0	0	0	0	0	156.9	45.1	46.1	28.5	5.35	0.520	23.4
1966	1.48	0.491	0.006	0	0	273.3	109.9	50.3	14.1	16.0	10.5	0.467	40.1
1967	8.65	9.65	9.14	0.003	0	14.0	77.3	80.8	127.4	105.5	5.14	0	35.9
1968	0	0	0	0	0	0.177	1.76	5.27	2.17	3.32	0	1.26	1.17
1969	0.066	0.039	0.006	0	0	0	715.0	152.9	49.6	42.4	17.4	2.28	81.1
1970	0.032	0.033	0.014	0.010	0.015	3.17	19.6	18.0	43.7	3.78	0	0	7.34
1971	0.002	0.010	0.002	0	0	5.07	2.50	0.031	0.011	1.57	0.005	0.002	0.774
1972	0.033	0.168	0.019	0	0	133.3	95.1	95.9	39.1	5.65	0.659	0.011	31.0
1973	0.028	0.016	0.002	0	0	2.14	2.35	0.477	5.85	2.03	0	0.767	1.14
1974	0.172	0.045	0.009	0	0	7.97	2.58	2.45	0.184	0	0	0	1.13
1975	0	0	0	0	0	0	6.67	5.68	10.7	39.4	0.969	0.082	5.35
1976	0.011	0.051	0	0	3.31	37.1	67.0	8.57	0.009	0	0	0	9.62
1977	0	0	0	0	0	0.073	0.035	0	0	0	0	0	0.009
1978	0	0	0	0	0	58.5	257.0	62.9	32.2	127.7	7.43	1.38	45.7
1979	0.061	0	0	0	0	0.850	265.6	96.8	15.3	23.6	4.16	0.005	33.7

## 05053000 WILD RICE RIVER NEAR ABERCROMBIE, ND

### Station Description

**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.

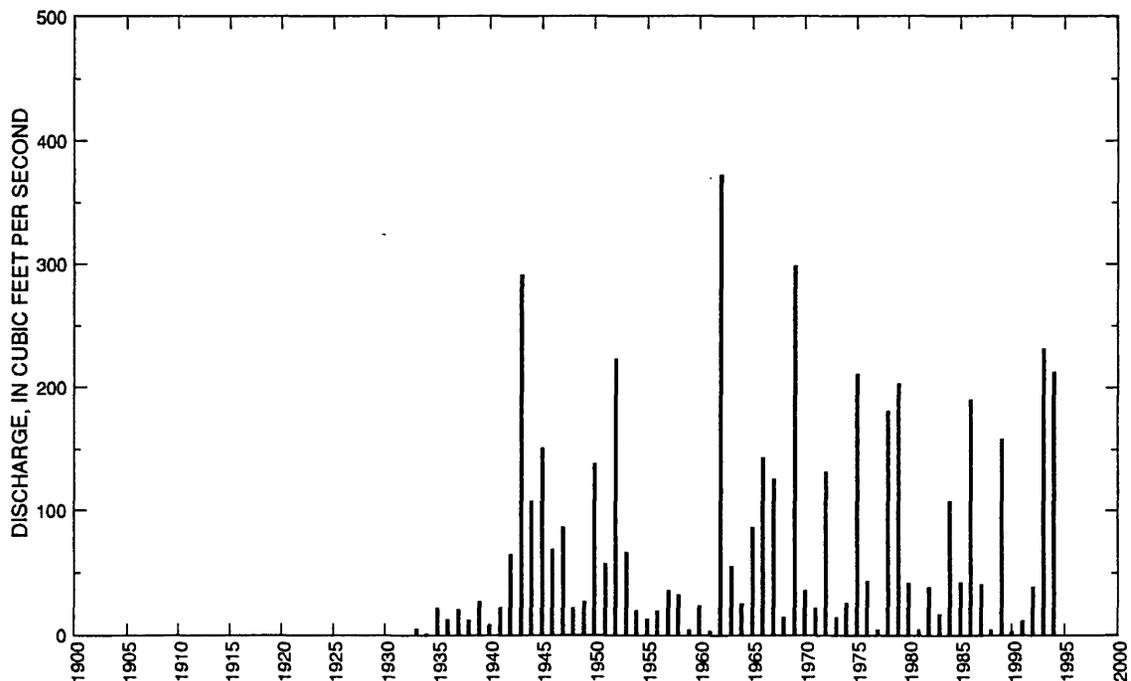
**PERIOD OF RECORD.**--April 1932 to current year. Monthly discharge only for some periods, published in Water-Supply Paper 1308.

**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; maximum gage height, 24.58 ft, Apr. 11, 1969; 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.

Annual mean discharge



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

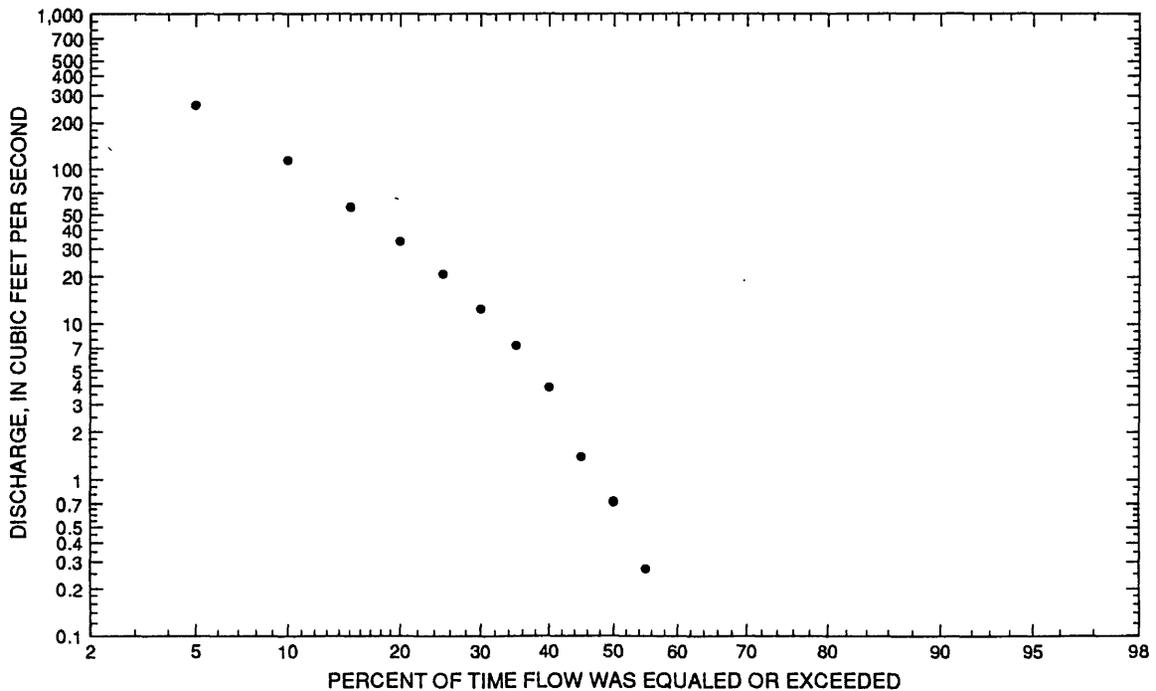
Pre-regulation period, 1933-57

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

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	111	1943	0	m	6.17	22.2	3.60	0.86
November	60.4	1943	0	m	4.98	13.4	2.69	0.69
December	19.2	1943	0	m	2.21	4.77	2.16	0.31
January	6.69	1943	0	m	0.450	1.35	2.99	0.06
February	1.83	1943	0	m	0.240	0.47	1.93	0.03
March	1,010	1945	0	m	118	219	1.85	16.4
April	2,350	1952	3.71	1934	332	570	1.71	46.2
May	594	1950	0.110	1934	91.1	131	1.44	12.7
June	707	1943	0.357	1936	87.2	156	1.79	12.1
July	464	1944	0	m	51.5	109	2.12	7.16
August	134	1944	0	m	12.7	28.1	2.21	1.76
September	100	1942	0	m	11.8	28.8	2.44	1.64
Annual	291	1943	0.482	1934	60.6	72.2	1.19	100

Annual flow duration, pre-regulation period



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

Monthly and annual flow duration, in cubic feet per second, pre-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	4.41	0.25	0	0	0	0	0	0	0	0
90	0	0	0	9.03	2.90	0.10	0	0	0	0	0	0	0
85	0	0	0	13.4	5.44	0.98	0	0	0	0	0	0	0
80	0	0	0	18.1	7.44	1.70	0	0	0	0	0	0	0
75	0	0	0	23.1	9.62	3.28	0.40	0	0	0	0	0	0
70	0	0	0	29.4	13.2	4.48	1.20	0	0	0	0	0	0
65	0	0	0	39.0	16.1	5.83	2.80	0.17	0	0	0	0	0
60	0	0	0.19	46.0	19.4	7.68	5.18	0.46	0	0	0	0	0
55	0	0	0.35	52.9	22.7	9.93	8.77	0.76	0	0	0	0	0.27
50	0	0	0.64	71.0	31.2	14.1	11.9	1.30	0	0	0	0	0.72
45	0	0	0.88	93.7	37.5	19.9	14.9	2.10	0	0	0	0	1.40
40	0	0	1.60	124	45.4	27.2	19.9	2.70	0.20	0	0	0	3.93
35	0	0	4.62	162	57.3	37.9	23.1	4.67	0.41	0	0	0.10	7.32
30	0	0	18.5	207	72.4	49.0	26.6	5.37	1.00	0.19	0.29	1.00	12.5
25	0.20	0	40.2	265	93.0	76.7	34.3	8.18	1.70	1.30	2.30	1.40	20.8
20	0.57	0.27	76.8	355	130	126	42.9	12.3	4.49	2.60	5.02	2.00	33.8
15	0.75	0.60	138	475	174	173	60.0	21.3	14.0	6.27	6.71	2.90	56.6
10	0.86	0.75	262	707	224	255	101	32.1	46.1	8.67	11.2	8.56	114
5	1.90	1.20	816	1,750	335	519	342	52.3	90.2	23.2	38.3	15.1	259

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

Probability of annual high discharges, pre-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	13.1	11.2	7.61	4.56
0.95	1.05	145	55.9	45.4	30.0	19.0
0.90	1.11	223	111	88.7	58.1	37.5
0.80	1.25	367	237	186	122	79.9
0.50	2	906	799	631	417	277
0.20	5	2,090	2,040	1,670	1,140	748
0.10	10	3,160	3,020	2,530	1,770	1,150
0.04	25	4,810	4,280	3,710	2,670	1,690
0.02	50	6,240	5,180	4,590	3,380	2,110
0.01	100	7,840	6,020	5,460	4,100	2,520
0.005	200	9,610	6,790	6,290	4,810	2,920
0.002	500	12,200	ng	ng	ng	ng

Probability of annual low discharges, pre-regulation period

[ng, statistic not given]

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	0	0	0	0	0	0
0.10	10	ng	ng	ng	0	0	0	0	0	0
0.20	5	ng	ng	ng	0	0	0	0	0	0
0.50	2	ng	ng	ng	0	0	0	0	0	0

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

Probability of seasonal low discharges, pre-regulation period

[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence Interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	0	0	0	0	0	0	0
0.10	10	ng	0	0	0	0	0	0	0
0.20	5	ng	0	0	0	0	0	0	0.992
0.50	2	ng	0	0	0	0	0	0.256	12.2
		June-July-August				September-October-November			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0
0.20	5	0	0	0	0	0	0	0	0
0.50	2	0	0.085	0.518	1.71	0	0	0	0

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

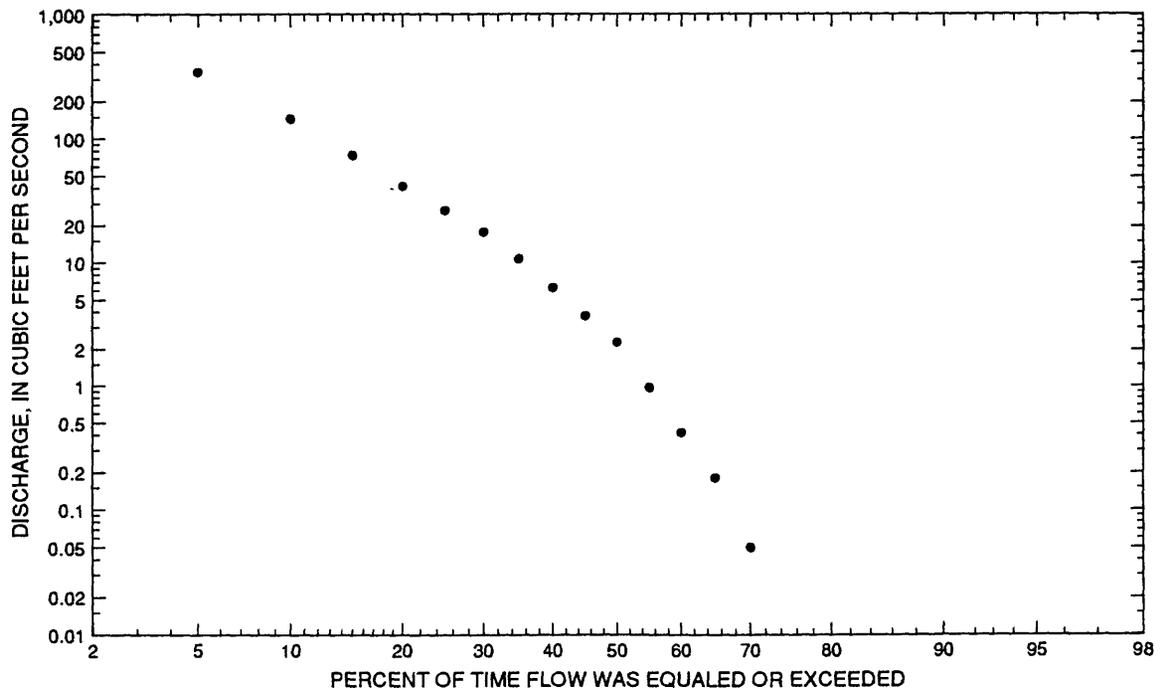
Post-regulation period, 1958-94

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

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	71.6	1987	0	m	6.59	13.8	2.10	0.64
November	37.5	1987	0	m	5.40	8.70	1.61	0.52
December	18.8	1987	0	m	3.15	4.71	1.50	0.30
January	14.5	1994	0	m	1.34	2.65	1.98	0.13
February	37.6	1984	0	m	2.65	7.33	2.77	0.26
March	902	1966	0	m	152	227	1.50	14.6
April	3,080	1969	2.81	1991	432	647	1.50	41.7
May	728	1962	1.43	1988	121	181	1.49	11.7
June	929	1962	0.085	1988	108	185	1.72	10.4
July	1,790	1962	0	1961	158	376	2.39	15.2
August	462	1993	0	m	35.4	94.2	2.67	3.42
September	159	1986	0	m	10.7	30.3	2.84	1.03
Annual	372	1962	2.70	1990	86.3	94.4	1.09	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 equalled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0	0	0	0.95	0.65	0.05	0	0	0	0	0	0	0
90	0	0	0	6.19	2.00	0.21	0.03	0	0	0	0	0	0
85	0	0	0	11.0	4.98	0.64	0.10	0	0	0	0	0	0
80	0	0	0	17.3	7.10	2.00	0.32	0	0	0	0	0	0
75	0	0	0.24	23.4	10.7	3.46	1.00	0.02	0	0	0	0	0
70	0	0	0.35	31.5	16.0	6.62	2.26	0.04	0	0	0	0	0.05
65	0	0	0.78	45.7	21.9	9.74	3.78	0.08	0	0	0	0	0.18
60	0	0	1.70	65.3	28.5	13.4	5.79	0.17	0	0	0	0	0.42
55	0.04	0.02	4.24	87.7	36.0	17.1	8.15	0.24	0.03	0	0.03	0.41	0.97
50	0.23	0.09	10.3	116	43.9	21.9	13.0	0.50	0.10	0.03	0.13	1.10	2.26
45	0.36	0.16	17.0	145	53.4	28.2	18.4	1.40	0.18	0.08	0.59	1.40	3.72
40	0.56	0.30	22.8	176	63.9	35.7	24.5	2.00	0.35	0.19	2.10	1.80	6.31
35	0.87	0.40	28.2	215	78.6	43.9	32.1	4.52	0.67	0.47	4.37	2.30	10.8
30	1.40	0.55	35.6	263	95.1	54.9	46.4	8.60	1.30	1.60	5.30	2.90	17.6
25	1.70	0.74	47.9	322	116	70.4	65.2	16.1	2.96	3.87	6.72	4.41	26.4
20	1.70	1.00	80.5	429	144	94.5	102	26.6	6.79	6.09	9.52	5.36	41.5
15	2.10	1.90	140	653	189	148	181	44.4	12.8	13.8	13.4	6.61	74.1
10	2.70	3.21	301	1,130	289	251	307	78.8	22.6	25.0	19.3	8.94	144
5	5.71	8.25	908	2,100	524	551	991	193	57.7	39.7	25.8	16.0	348

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

Probability of annual high discharges, post-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
			0.99	1.01	15.0	10.9
0.95	1.05	58.8	45.5	35.5	27.0	21.2
0.90	1.11	116	92.2	71.6	52.9	39.9
0.80	1.25	251	206	160	115	83.2
0.50	2	953	833	657	454	307
0.20	5	3,030	2,800	2,280	1,550	1,000
0.10	10	5,190	4,910	4,100	2,790	1,770
0.04	25	8,770	8,500	7,330	5,020	3,140
0.02	50	12,000	11,800	10,400	7,170	4,460
0.01	100	15,600	15,600	14,000	9,750	6,050
0.005	200	19,700	19,800	18,200	12,800	7,900
0.002	500	25,500	ng	ng	ng	ng

Probability of annual low discharges, post-regulation period

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0	0
0.20	5	0	0	0	0	0	0	0	0	0
0.50	2	0	0	0	0	0	0.023	0.179	0.434	0.870

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

Probability of seasonal low discharges, post-regulation period

Non-exceedance probability	Recurrence Interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0.364
0.20	5	0	0	0	0	0	0	0	1.70
0.50	2	0	0	0	0.088	0.090	0.440	1.54	14.2
		June-July-August				September-October-November			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0
0.20	5	0	0	0	0.031	0	0	0	0
0.50	2	0.037	0.142	0.279	1.20	0	0	0	0

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

Annual peak discharge and corresponding gage height, period of record

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

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

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

# 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	--	--	--	--	0.429	--	--	5.80	3.26	0.706	0	0	--
1933	0	0	0	0	0	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	0.355	0	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

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

### Station Description

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

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

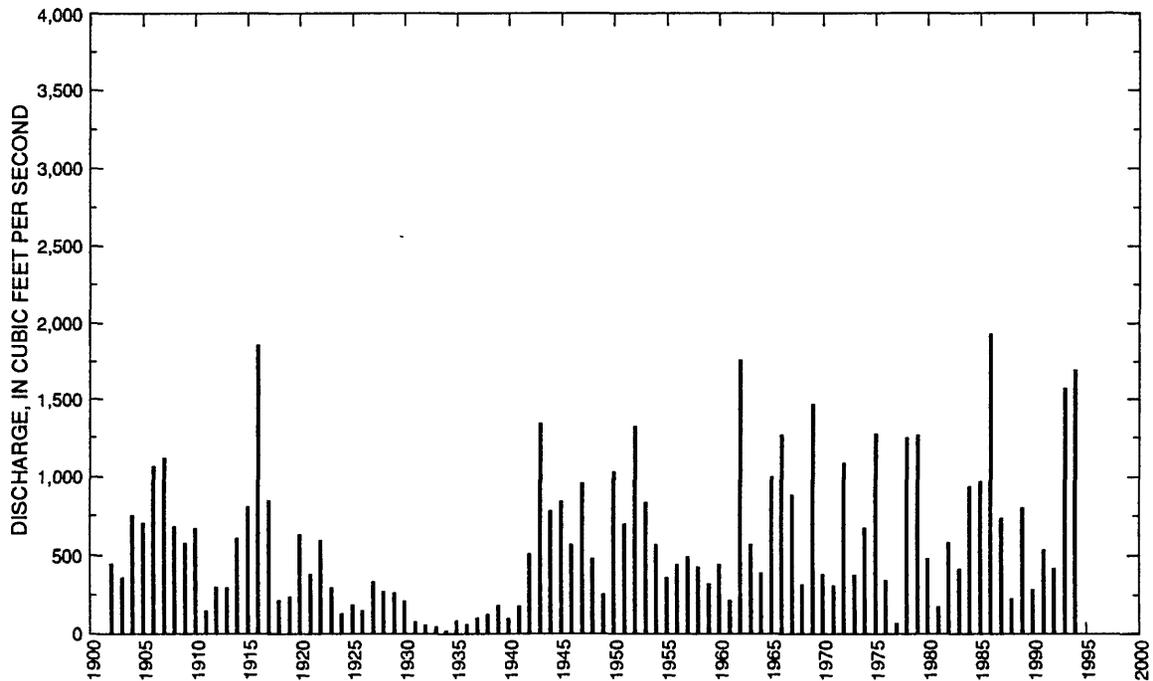
PERIOD OF RECORD.--May 1901 to current year. Published as "at Moorhead, Minn.", 1901. Monthly discharge only for some periods, published in Water-Supply Paper 1308.

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, 25,300 ft<sup>3</sup>/s, Apr. 15, 1969; maximum gage height, 37.34 ft, Apr. 15, 1969; no flow for many days in each year during 1932-41, Sept. 30 and 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.

Annual mean discharge



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

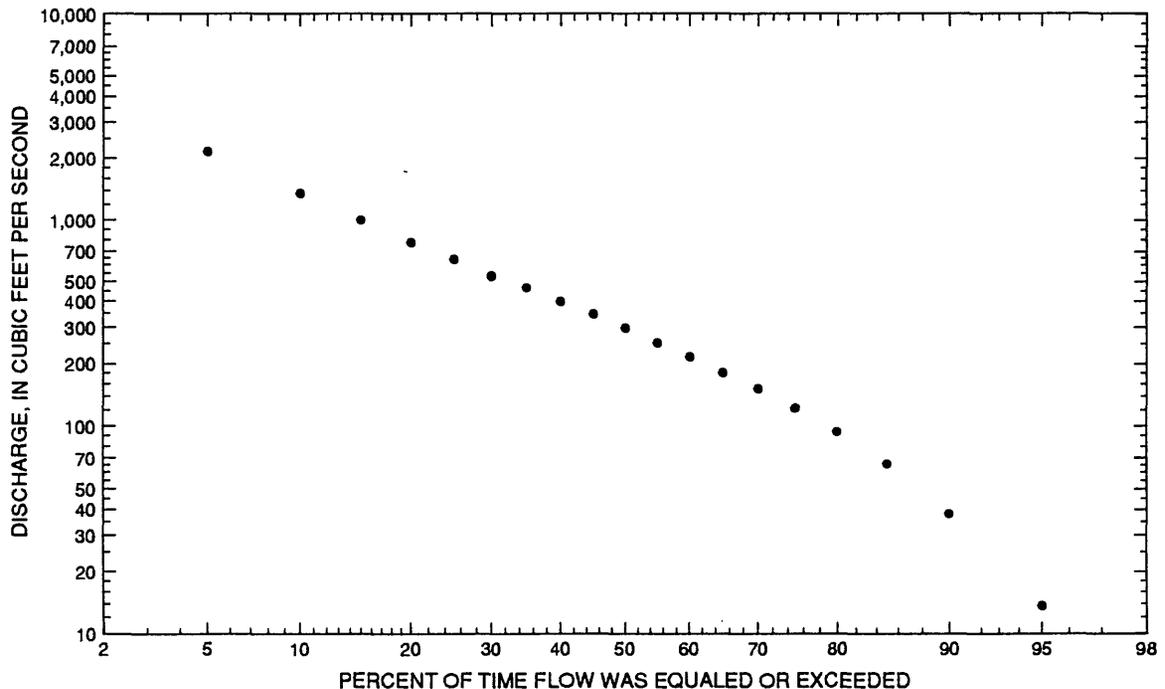
Period of record, 1902-94

Statistics of monthly and annual mean discharges, period of record

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	1,740	1994	0	m	306	306	1.00	4.29
November	942	1907	0	1937	266	221	0.83	3.73
December	800	1987	0	1938	220	185	0.84	3.08
January	740	1986	0	m	202	167	0.83	2.84
February	778	1987	0.179	1933	202	160	0.79	2.84
March	3,760	1966	26.8	1937	661	680	1.03	9.27
April	9,920	1969	102	1934	1,700	1,940	1.14	23.8
May	4,590	1986	8.12	1934	995	860	0.86	14.0
June	5,120	1962	2.87	1936	1,010	883	0.88	14.1
July	5,690	1962	0	m	847	1,080	1.27	11.9
August	3,290	1993	0	m	411	516	1.25	5.77
September	2,280	1993	0	m	316	371	1.17	4.43
Annual	1,930	1986	17.5	1934	596	451	0.76	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

Percentage of days discharge equalled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	8.43	12.8	48.9	156	88.7	54.4	20.7	2.00	0.49	4.14	7.89	6.39	13.7
90	24.3	26.5	84.1	236	201	143	63.7	23.0	13.7	23.8	27.0	21.8	38.1
85	37.5	39.7	115	306	269	189	105	39.1	30.6	49.2	49.4	37.7	66.0
80	49.2	64.9	152	363	323	243	153	61.9	48.4	68.5	73.6	58.6	94.0
75	68.7	80.6	177	418	376	304	201	91.9	69.7	86.8	92.0	72.1	122
70	85.1	92.7	204	474	429	371	251	124	93.1	107	109	92.0	152
65	103	109	234	532	490	441	302	154	113	132	125	107	182
60	126	126	270	610	561	518	356	182	138	156	141	122	217
55	143	146	315	698	632	599	412	209	165	182	164	146	252
50	160	168	357	797	730	712	481	245	190	212	190	168	298
45	186	191	398	912	828	824	571	288	216	247	226	190	349
40	214	215	440	1,050	931	942	669	340	270	288	268	215	403
35	240	240	485	1,250	1,040	1,060	779	401	327	333	315	244	468
30	266	265	530	1,490	1,140	1,180	896	466	378	382	361	280	532
25	298	296	602	1,810	1,290	1,400	1,060	538	433	435	404	325	639
20	352	329	718	2,260	1,520	1,620	1,220	616	504	492	447	380	778
15	406	364	891	2,770	1,790	1,930	1,480	769	576	562	520	440	1,000
10	462	430	1,290	3,920	2,120	2,260	1,810	984	746	736	597	514	1,360
5	559	544	2,730	6,800	2,750	3,040	2,790	1,360	1,010	914	744	618	2,170

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

Probability of annual high discharges, period of record  
[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s) <sup>1</sup>	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	301	264	220	176	138
0.95	1.05	609	531	449	356	285
0.90	1.11	884	770	655	517	416
0.80	1.25	1,380	1,200	1,030	810	652
0.50	2	3,210	2,810	2,450	1,900	1,500
0.20	5	7,330	6,500	5,780	4,410	3,320
0.10	10	11,200	10,000	9,010	6,830	4,970
0.04	25	17,600	15,900	14,500	10,900	7,560
0.02	50	23,400	21,400	19,600	14,600	9,860
0.01	100	30,300	27,900	25,700	19,100	12,500
0.005	200	38,300	35,600	33,000	24,300	15,400
0.002	500	50,800	ng	ng	ng	ng

<sup>1</sup>Historic adjustment made to Log Pearson Type III peak frequency.

Probability of annual low discharges, period of record

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0	0.407	3.61	6.28	6.16
0.10	10	0	0.371	1.32	2.24	2.70	4.82	12.1	17.4	18.5
0.20	5	11.0	12.6	18.0	18.9	22.5	26.0	35.4	43.8	54.6
0.50	2	59.8	64.9	71.8	90.7	121	150	<sup>1</sup> 151	153	214

<sup>1</sup>Graphical interpretation.

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

Probability of seasonal low discharges, period of record

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0	0	0	1.84	7.15	18.2	18.5	56.5
0.10	10	9.66	14.4	17.3	<sup>1</sup> 21.0	22.8	37.7	45.0	91.8
0.20	5	28.7	36.4	40.7	<sup>1</sup> 45.0	62.2	79.0	105	156
0.50	2	102	113	119	153	211	220	290	370
		June-July-August				September-October-November			
0.05	20	0	0	0.331	6.27	0	0	0	0.390
0.10	10	7.24	13.0	<sup>1</sup> 17.8	22.5	0.255	5.01	<sup>1</sup> 6.80	8.58
0.20	5	27.0	38.9	42.3	61.4	14.2	22.8	24.8	37.1
0.50	2	135	158	242	245	91.5	108	152	188

<sup>1</sup>Graphical interpretation.

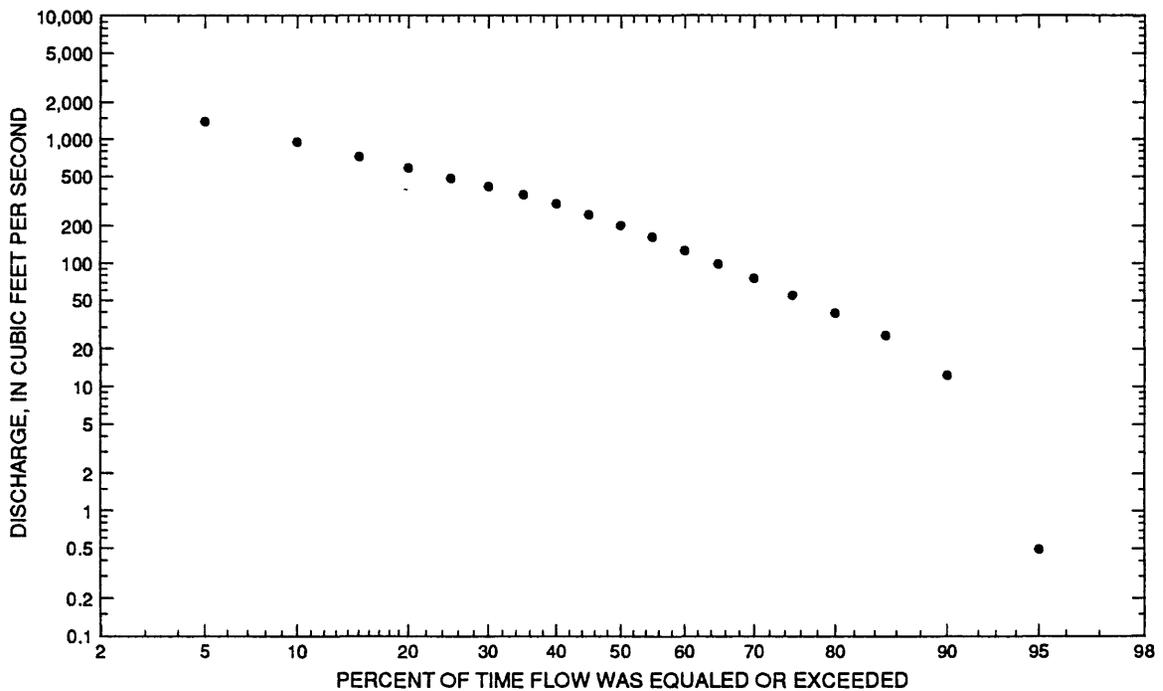
# 05054000 RED RIVER OF THE NORTH AT FARGO, ND--Continued

Pre-regulation period, 1902-41

Statistics of monthly and annual mean discharges, pre-regulation period  
[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	1,030	1917	0	m	266	288	1.08	5.51
November	942	1907	0	1937	230	236	1.02	4.77
December	600	1907	0	1938	166	175	1.05	3.44
January	504	1907	0	m	133	138	1.04	2.75
February	367	1907	0.179	1933	119	110	0.92	2.47
March	2,130	1910	26.8	1937	522	528	1.01	10.8
April	6,080	1916	102	1934	971	1,140	1.17	20.1
May	2,540	1916	8.12	1934	642	547	0.85	13.3
June	2,200	1907	2.87	1936	647	590	0.91	13.4
July	5,460	1916	0	m	562	907	1.62	11.6
August	1,850	1916	0	m	308	410	1.33	6.38
September	1,250	1916	0	m	261	318	1.22	5.42
Annual	1,850	1916	17.5	1934	403	374	0.93	100

Annual flow duration, pre-regulation period



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

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

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0.05	0.05	32.6	90.0	50.1	11.5	0.49	0.49	0.05	0.05	0.05	0	0.49
90	4.83	9.13	46.5	153	92.3	50.3	16.1	0.49	0.05	4.22	4.94	0.32	12.4
85	14.2	18.4	59.8	205	156	110	40.7	10.2	6.12	13.4	16.6	14.0	25.7
80	22.1	24.3	77.3	256	209	151	69.6	22.5	13.4	23.7	26.1	20.6	39.5
75	32.8	33.1	98.0	308	263	188	94.1	30.5	23.6	39.7	39.4	29.4	55.6
70	37.0	38.0	121	344	305	229	120	43.3	42.5	54.8	54.3	36.4	75.7
65	41.0	44.1	143	383	341	278	162	60.2	64.4	76.9	76.7	44.9	98.6
60	46.4	52.1	162	431	378	328	199	89.4	86.4	95.1	94.9	61.1	127
55	53.1	69.5	197	478	426	381	236	115	105	110	114	74.0	162
50	71.6	79.0	272	524	474	433	274	143	130	146	134	87.4	203
45	89.4	88.3	372	585	527	494	312	174	163	192	154	114	250
40	111	101	407	653	594	559	370	213	206	227	210	140	304
35	137	115	440	741	661	624	429	268	254	285	266	186	358
30	171	144	474	892	748	755	527	385	336	373	345	243	420
25	223	204	545	1,110	857	890	649	462	388	443	389	290	481
20	274	228	634	1,340	977	1,040	825	521	438	495	429	331	585
15	308	253	791	1,880	1,140	1,190	1,080	621	553	560	476	382	720
10	356	294	1,100	2,640	1,340	1,570	1,360	878	756	760	582	467	963
5	419	343	2,000	3,020	1,880	2,160	1,860	1,260	994	889	733	584	1,400

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

Probability of annual high discharges, pre-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	224	213	174	138	106
0.95	1.05	436	404	340	270	208
0.90	1.11	615	563	482	382	295
0.80	1.25	922	834	727	576	446
0.50	2	1,920	1,730	1,550	1,220	956
0.20	5	3,830	3,460	3,160	2,470	1,970
0.10	10	5,390	4,910	4,510	3,520	2,840
0.04	25	7,660	7,070	6,530	5,060	4,140
0.02	50	9,530	8,900	8,240	6,360	5,250
0.01	100	11,600	10,900	10,100	7,770	6,470
0.005	200	13,700	13,100	12,200	9,310	7,820
0.002	500	16,800	ng	ng	ng	ng

Probability of annual low discharges, pre-regulation period

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0	0	0	0	1.42
0.10	10	0	0	0	0	0	0.119	2.30	4.37	4.87
0.20	5	0	0	0	0	0.712	3.64	9.93	15.0	17.5
0.50	2	35.4	40.6	47.2	51.8	74.0	63.6	66.7	79.0	111

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

Probability of seasonal low discharges, pre-regulation period

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0	0	0	0	0	5.71	6.08	29.2
0.10	10	0	0	0	0	8.92	14.9	16.9	51.2
0.20	5	6.21	10.7	13.8	15.7	26.8	36.4	47.6	95.0
0.50	2	48.7	55.8	59.4	64.0	120	137	195	259
		June-July-August				September-October-November			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0.004	3.63	0	0	0	0
0.20	5	8.61	12.6	<sup>1</sup> 16.4	20.2	0.896	5.19	<sup>1</sup> 7.34	9.49
0.50	2	80.9	98.3	139	<sup>1</sup> 160	60.2	80.4	111	133

<sup>1</sup>Graphical interpretation.

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

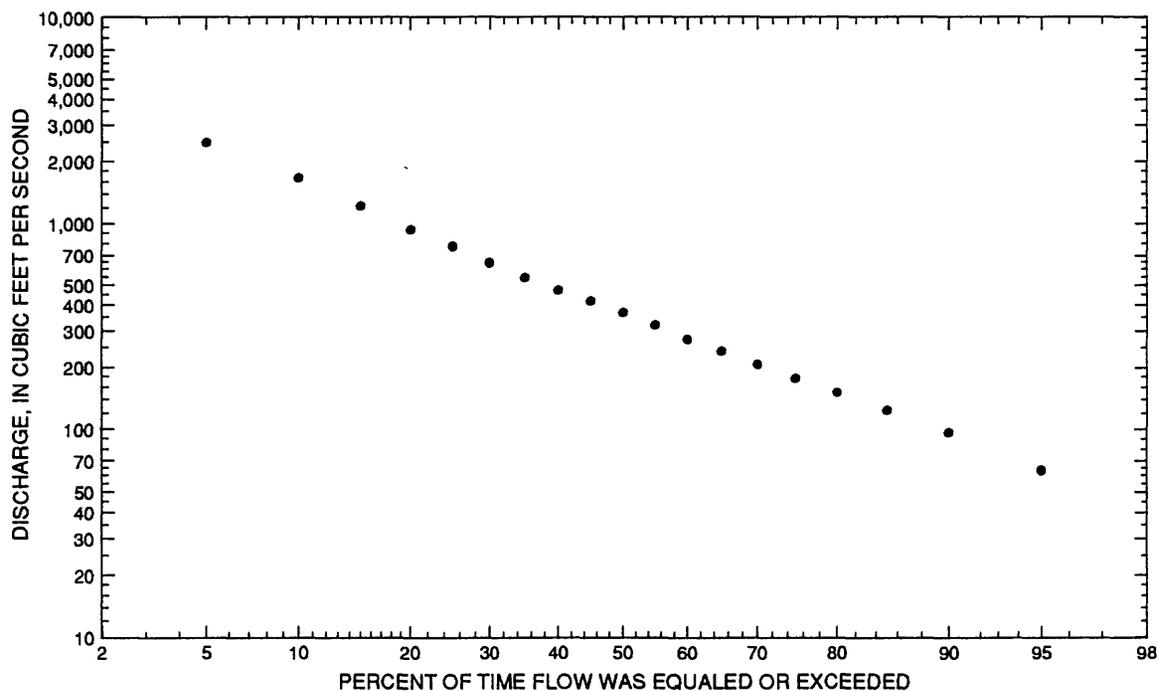
Post-regulation period, 1942-94

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

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	1,740	1994	3.77	1977	336	318	0.95	3.78
November	893	1987	12.0	1977	293	207	0.70	3.30
December	800	1987	11.7	1977	261	184	0.71	2.93
January	740	1986	14.8	1977	255	169	0.66	2.87
February	778	1987	19.0	1977	265	163	0.62	2.98
March	3,760	1966	85.2	1977	766	763	1.00	8.62
April	9,920	1969	194	1977	2,250	2,230	0.99	25.3
May	4,590	1986	77.1	1977	1,260	957	0.76	14.2
June	5,120	1962	91.1	1977	1,280	973	0.76	14.4
July	5,690	1962	63.0	1988	1,070	1,150	1.08	12.0
August	3,290	1993	18.5	1977	491	576	1.17	5.53
September	2,280	1993	12.3	1976	359	406	1.13	4.03
Annual	1,930	1986	64.7	1977	741	454	0.61	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	64.0	81.3	119	266	242	168	102	44.7	25.9	50.8	53.8	53.0	63.5
90	77.9	92.6	164	350	320	224	162	74.0	44.5	65.7	80.6	74.5	96.9
85	92.3	112	192	421	385	300	223	112	67.0	86.6	96.7	91.8	124
80	112	125	212	490	447	393	286	142	90.5	108	112	106	151
75	131	139	232	564	539	483	351	167	112	128	126	119	178
70	145	157	255	660	636	602	410	189	132	148	140	133	208
65	159	176	279	743	730	701	469	213	155	168	157	157	239
60	174	193	319	831	823	794	538	238	176	189	175	174	273
55	193	209	362	927	904	884	612	265	195	217	196	188	321
50	214	230	404	1,060	985	983	686	315	214	246	226	202	369
45	232	250	438	1,250	1,070	1,080	769	360	264	278	261	219	420
40	248	272	468	1,470	1,180	1,250	866	402	322	311	296	239	472
35	272	296	498	1,690	1,320	1,430	995	443	367	347	337	275	544
30	306	319	555	1,950	1,450	1,570	1,140	524	407	382	377	325	645
25	351	345	628	2,290	1,640	1,720	1,300	609	454	425	412	371	775
20	400	376	796	2,800	1,840	1,940	1,480	700	504	469	460	418	930
15	444	420	995	3,840	2,110	2,180	1,680	821	605	541	526	473	1,220
10	507	498	1,490	5,850	2,520	2,550	2,080	995	756	680	615	528	1,670
5	611	627	3,070	9,190	3,250	3,420	3,270	1,270	1,010	927	755	628	2,480

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

Probability of annual high discharges, post-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	522	391	319	252	222
0.95	1.05	1,010	814	670	524	447
0.90	1.11	1,430	1,190	985	765	640
0.80	1.25	2,150	1,860	1,550	1,200	977
0.50	2	4,590	4,210	3,610	2,750	2,120
0.20	5	9,500	9,130	8,080	6,100	4,390
0.10	10	13,700	13,400	12,100	9,110	6,320
0.04	25	20,100	20,000	18,500	13,800	9,190
0.02	50	25,600	25,700	24,100	18,000	11,600
0.01	100	31,700	32,100	30,500	22,700	14,300
0.005	200	38,500	39,100	37,700	28,100	17,200
0.002	500	48,500	ng	ng	ng	ng

Probability of annual low discharges, post-regulation period

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	1.83	4.06	9.63	<sup>1</sup> 13.6	17.6	29.0	36.3	40.5	49.9
0.10	10	8.85	10.6	17.9	<sup>1</sup> 23.7	29.5	44.8	54.9	61.0	73.6
0.20	5	23.9	25.9	33.7	40.7	52.4	72.5	86.8	95.8	113
0.50	2	85.3	89.5	92.9	130	133	161	184	200	232

<sup>1</sup>Graphical interpretation.

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

Probability of seasonal low discharges, post-regulation period

[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	30.4	34.8	36.7	40.9	ng	59.9	75.8	154
0.10	10	44.0	51.2	54.5	60.6	ng	93.7	112	186
0.20	5	67.0	78.9	84.7	93.5	ng	148	169	237
0.50	2	138	163	175	191	ng	278	304	403
		June-July-August				September-October-November			
0.05	20	11.2	21.8	33.1	55.2	8.54	11.9	<sup>1</sup> 16.8	21.7
0.10	10	23.7	38.3	53.9	82.9	19.5	22.7	<sup>1</sup> 30.4	38.2
0.20	5	53.2	72.2	93.7	133	35.7	43.3	52.2	70.6
0.50	2	187	209	242	308	93.0	121	173	186

<sup>1</sup>Graphical interpretation.

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

Annual peak discharge and corresponding gage height, period of record

[--, 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, period of record--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)
<b>Annual peak discharge, by year, and corresponding gage height--Continued</b>							
1990	June 2	15.40	1,220	1993	April 5	28.27	10,100
1991	July 6	16.99	2,630	1994	April 3	26.69	11,200
1992	June 19	16.93	2,590				
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1969	April 15	37.34	25,300	1960	April 8	12.48	3,900
<sup>1</sup> 1897	April 7	39.10	25,000	1939	March 31	13.00	3,870
<sup>1</sup> 1882	April 11	36.80	20,000	1956	April 16	12.54	3,870
1989	April 9	35.39	18,900	1928	March 28	13.30	3,840
1978	April 2	34.41	17,500	1948	April 10	12.45	3,390
1979	April 19	34.93	17,300	1942	June 11	12.27	3,380
1952	April 16	28.79	16,300	1987	March 27	17.75	3,300
1943	April 7	28.40	16,000	1976	March 30	18.70	3,200
1975	July 4	33.26	13,200	1914	June 12	16.10	3,140
1965	April 15	30.50	11,400	1915	July 3	9.73	3,130
1994	April 3	26.69	11,200	1906	April 9	14.50	3,050
1966	March 22	30.16	10,700	1955	April 4	11.12	2,760
1993	April 5	28.27	10,100	1949	July 12	11.27	2,660
1962	June 14	22.83	9,580	1927	March 19	9.10	2,650
1984	April 1	28.27	9,550	1991	July 6	16.99	2,630
1947	April 15	22.93	9,300	1908	June 13	13.70	2,600
1986	April 2	27.19	8,640	1992	June 19	16.93	2,590
1951	April 11	20.73	8,010	1957	April 24	11.10	2,540
1950	April 7	20.88	7,800	1970	June 18	16.27	2,480
1916	July 11	--	7,740	1903	April 6	12.90	2,450
1945	March 22	20.70	7,700	1964	April 18	16.22	2,400
1972	March 24	25.36	7,250	1958	July 6	10.90	2,280
1907	May 30	28.80	7,000	1921	April 6	8.40	1,970
1953	June 1	18.05	6,720	1973	March 15	16.41	1,950
1920	March 28	17.20	6,200	1954	July 4	10.53	1,920
1946	March 27	17.13	5,970	1971	July 7	15.87	1,910
1982	April 4	25.07	5,920	1909	May 30	--	1,780
1967	June 19	22.34	5,900	1983	July	15.99	1,750
1980	April 5	20.74	5,470	1981	May 24	15.84	1,710
1917	April 3	17.80	5,240	1926	March 24	8.00	1,600
1904	April 20	20.30	5,220	1913	July 8	10.90	1,560
1922	April 11	14.70	5,200	1937	April 12	10.17	1,390
1910	March 19	22.20	5,000	1941	April 3	10.10	1,390
1963	June 14	19.97	4,930	1938	May 2	10.02	1,350
1985	June 5	20.08	4,690	1930	March 17	10.00	1,340
1929	March 20	12.80	4,440	1959	July 8	10.42	1,250
1905	May 17	17.40	4,250	1990	June 2	15.40	1,220
1944	June 10	14.26	4,150	1902	May 23	9.50	1,180
1974	April 14	20.25	4,150	1912	May 14	9.60	1,100
1923	June 29	11.60	3,960	1936	April 14	9.90	1,050

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

Annual peak discharge and corresponding gage height, period of record--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)
<b>Annual peak discharge, from highest to lowest, and corresponding gage height--Continued</b>							
1940	April 8	9.63	1,030	1968	April 30	14.71	788
1961	June 9	9.24	1,020	1919	April 6	6.50	680
1988	March 11	15.10	981	1911	April 11	7.70	608
1935	March 20	9.72	942	1933	April 5	9.04	605
1925	June 21	7.00	940	1924	April 30	6.20	530
1977	July 4	14.99	878	1931	April 3	8.55	365
1932	April 11	9.45	875	1934	April 10	8.55	323
1918	March 31	6.87	874				

<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	1,07.5	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	949.4	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	0	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	1,550	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	183.0	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	1,641	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

## 05054500 SHEYENNE RIVER ABOVE HARVEY, ND

### Station Description

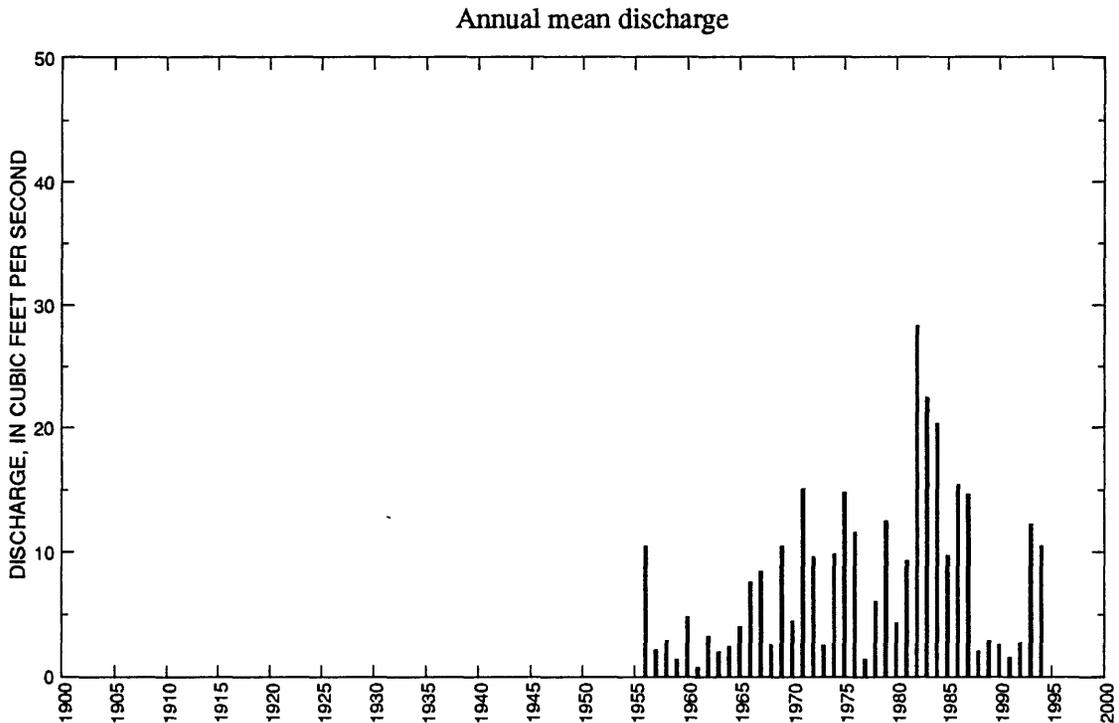
LOCATION.--Lat 47°42'10", long 99°56'55", in SW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.24, T.149 N., R.73 W., Wells County, Hydrologic Unit 09020202, on right bank just downstream from county road, and 4.5 mi south of Harvey.

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, backwater from ice; no flow at times most years.



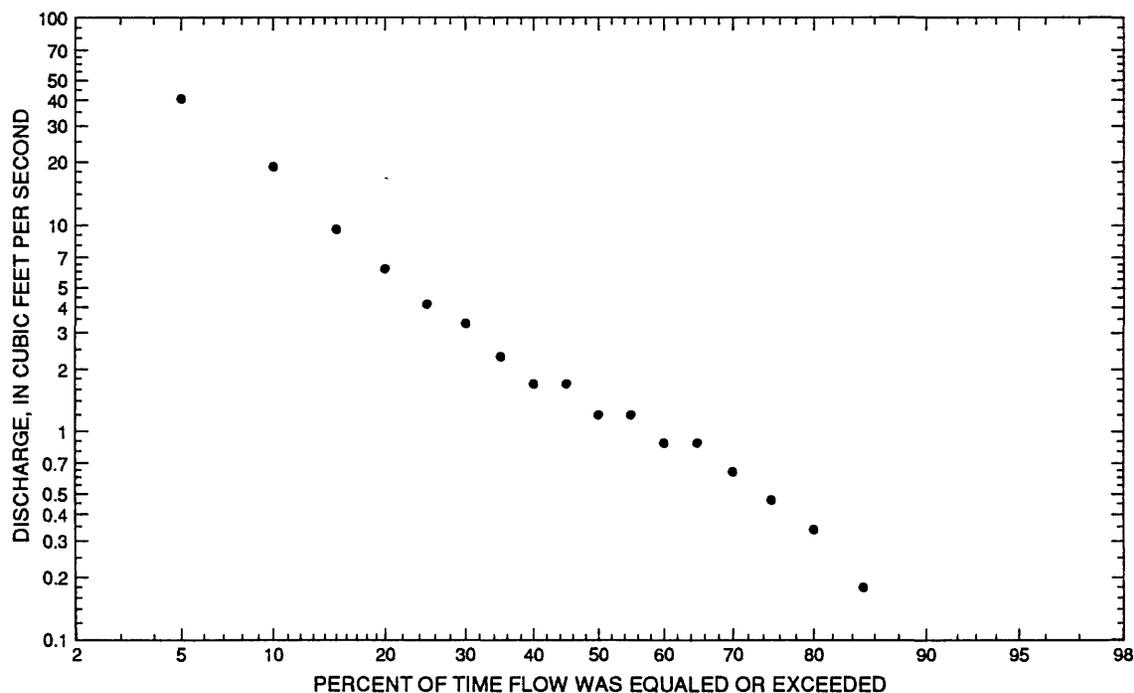
## 05054500 SHEYENNE RIVER ABOVE HARVEY, ND--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	11.8	1983	0.432	1991	2.47	2.48	1.00	2.60
November	10.4	1983	0.265	1977	2.15	1.69	0.78	2.26
December	6.27	1983	0.090	1962	0.910	1.03	1.12	0.96
January	4.10	1983	m	1959	0.480	0.89	1.86	0.50
February	26.7	1983	m	1956	2.61	5.56	2.13	2.75
March	123	1982	0	1969	25.8	30.7	1.19	27.1
April	100	1969	2.13	1991	28.4	31.0	1.09	29.9
May	62.1	1984	1.59	1977	13.3	15.5	1.16	14.0
June	54.0	1971	0.303	1961	7.52	9.53	1.27	7.91
July	58.9	1993	0.071	1961	7.00	12.7	1.82	7.36
August	25.6	1985	m	1959	2.68	5.28	1.97	2.82
September	4.79	1977	0.061	1976	1.72	1.32	0.77	1.81
Annual	28.3	1982	0.760	1961	7.94	6.52	0.82	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	1.70	1.10	0.53	0.08	0	0.07	0.37	0.48	0	0
90	0	0	0	2.10	1.50	0.80	0.29	0	0.21	0.44	0.62	0	0
85	0	0	0	2.60	1.80	0.99	0.39	0.14	0.36	0.64	0.80	0.09	0.18
80	0	0	0.19	2.60	2.10	1.20	0.53	0.25	0.43	0.77	1.00	0.14	0.34
75	0	0	0.40	3.20	2.50	1.50	0.72	0.33	0.52	1.10	1.00	0.17	0.47
70	0	0	0.85	3.90	2.50	1.80	0.72	0.45	0.62	1.10	1.20	0.26	0.64
65	0	0	1.40	3.90	3.00	1.80	0.97	0.60	0.74	1.10	1.30	0.40	0.88
60	0	0	2.30	5.61	3.60	2.30	1.30	0.60	0.89	1.30	1.30	0.50	0.88
55	0	0	2.90	6.93	4.20	2.80	1.30	0.80	0.89	1.30	1.50	0.50	1.20
50	0.09	0.09	4.71	11.3	6.04	2.80	1.80	0.80	1.10	1.30	1.70	0.62	1.20
45	0.19	0.20	5.51	15.7	7.27	3.50	2.40	0.80	1.30	1.60	1.70	0.62	1.70
40	0.23	0.20	7.13	19.9	8.63	4.30	2.40	1.10	1.30	1.60	1.90	0.77	1.70
35	0.28	0.34	13.0	24.9	10.7	5.63	3.45	1.10	1.50	1.60	1.90	0.77	2.30
30	0.42	0.45	20.0	32.1	13.5	6.78	3.97	1.40	1.50	1.90	2.20	0.96	3.33
25	0.42	0.78	28.7	39.0	17.4	8.08	4.80	1.40	1.80	2.30	2.20	1.20	4.14
20	0.51	1.00	41.9	46.6	21.7	10.4	6.32	1.90	2.20	2.80	2.50	1.20	6.16
15	0.75	1.80	64.5	57.7	26.1	14.2	8.45	2.60	2.60	3.40	2.80	1.50	9.56
10	1.10	4.13	92.8	75.7	35.2	18.4	16.0	4.60	3.10	4.10	3.70	1.50	19.0
5	2.40	13.8	133	110	53.4	27.4	27.9	9.94	4.50	8.59	5.40	2.80	40.5

## 05054500 SHEYENNE RIVER ABOVE HARVEY, ND--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	5.50	3.44	2.71	2.02	1.64
0.95	1.05	14.3	9.76	7.70	5.51	4.15
0.90	1.11	23.2	16.3	12.9	9.09	6.65
0.80	1.25	40.4	29.3	23.0	16.1	11.5
0.50	2	108	79.9	62.3	44.0	30.7
0.20	5	264	189	145	106	75.5
0.10	10	406	282	214	161	117
0.04	25	625	414	311	243	182
0.02	50	813	520	387	312	239
0.01	100	1,020	631	466	386	302
0.005	200	1,250	744	545	464	373
0.002	500	1,580	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0	0	0	0.117	0.348
0.10	10	0	0	0	0	0	0	0.020	0.175	0.440
0.20	5	0	0	0	0	0	0	0.074	0.279	0.588
0.50	2	0	0	0	0	0	0.103	0.307	0.642	1.04

## 05054500 SHEYENNE RIVER ABOVE HARVEY, ND--Continued

Probability of seasonal low discharges

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0	0	0	0	0	0	0	0.279
0.10	10	0	0	0	0	0	0	0	0.629
0.20	5	0	0	0	0	0	0	0.132	1.36
0.50	2	0	0	0	0	0.279	0.521	1.52	4.53
		June-July-August				September-October-November			
0.05	20	0	0	0	0	0	0	0.048	0.179
0.10	10	0	0	0	0.067	0.068	0.086	0.125	0.286
0.20	5	0	0.082	0.175	0.217	0.171	0.239	0.282	0.475
0.50	2	0.324	0.411	0.546	0.962	0.441	0.618	0.794	1.05

## 05054500 SHEYENNE RIVER ABOVE HARVEY, ND--Continued

Annual peak discharge and corresponding gage height, period of record

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

# 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

## 05055000 SHEYENNE RIVER NEAR HARVEY, ND

### Station Description

**LOCATION.**--Lat 47°47'25", long 99°53'25", in SE<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.21, T.150 N., R.72 W., Wells County, Hydrologic Unit 09020202, 90 ft north of Harvey Water Works, 0.4 mi upstream from small tributary, and 2.25 mi northeast of Harvey.

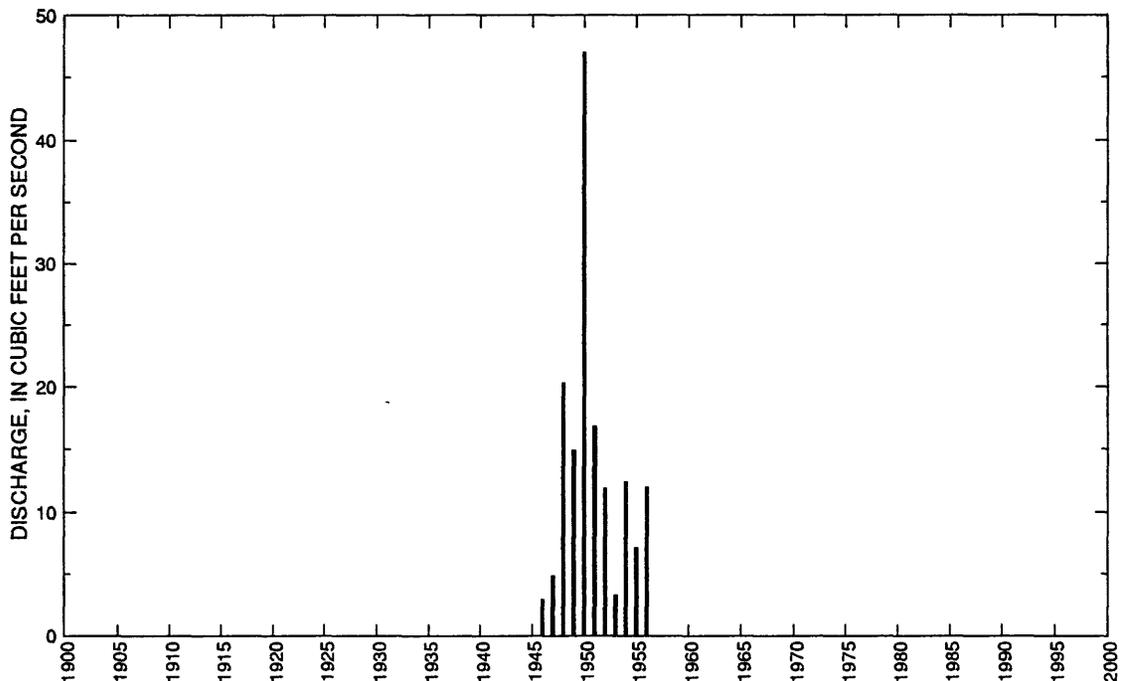
**DRAINAGE AREA.**--534 mi<sup>2</sup> (revised), of which about 360 mi<sup>2</sup> is probably noncontributing.

**PERIOD OF RECORD.**--October 1945 to September 1956.

**GAGE.**--Staff gage. Datum of gage is 1,520.10 ft above mean sea level, datum of 1929. Prior to June 11, 1946, staff gage at site 3 mi upstream at different datum.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 1,430 ft<sup>3</sup>/s, Apr. 18, 1950 (gage height, 6.62 ft); maximum gage height, 6.95, Apr. 17, 1950, affected by ice; no flow during several months in most years.

Annual mean discharge



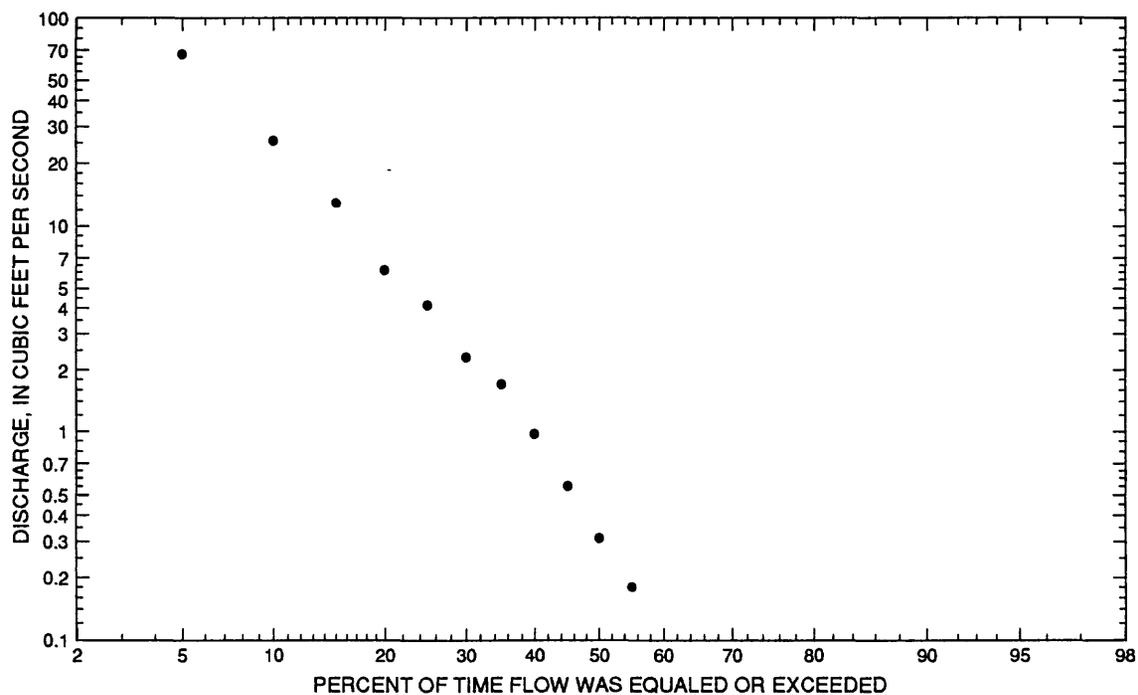
## 05055000 SHEYENNE RIVER NEAR HARVEY, ND--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	3.33	1955	0	m	0.530	1.01	1.90	0.32
November	2.66	1955	0	m	0.580	0.87	1.50	0.35
December	1.77	1955	0	m	0.540	0.71	1.32	0.32
January	1.77	1951	0	m	0.200	0.52	2.58	0.12
February	8.93	1954	0	m	0.880	2.68	3.03	0.53
March	23.9	1947	0.161	1948	9.25	8.83	0.950	5.50
April	324	1950	7.16	1946	99.5	102	1.03	59.1
May	201	1950	1.15	1946	29.3	57.5	1.97	17.4
June	86.2	1954	0.193	1946	20.2	25.2	1.25	12.0
July	27.0	1954	1.15	1949	5.72	7.32	1.28	3.40
August	5.42	1954	0	m	0.720	1.59	2.20	0.43
September	5.72	1954	0	m	0.860	1.82	2.12	0.51
Annual	47.0	1950	2.93	1946	14.0	12.3	0.880	100

Annual flow duration



**05055000 SHEYENNE RIVER NEAR 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	2.80	1.00	0	0	0	0	0	0	0	0
90	0	0	0	3.40	1.80	0.10	0.18	0	0	0	0	0	0
85	0	0	0	4.10	1.80	0.33	0.26	0	0	0	0	0	0
80	0	0	0	6.02	2.30	0.85	0.47	0	0	0	0	0	0
75	0	0	0	10.5	3.00	2.20	0.57	0	0	0	0	0	0
70	0	0	0	14.1	4.00	2.80	0.84	0	0	0	0	0	0
65	0	0	0	19.9	4.78	3.60	1.20	0	0	0	0	0	0
60	0	0	0	24.9	5.42	4.63	1.50	0	0	0	0	0	0
55	0	0	0	29.8	5.92	5.97	1.50	0	0	0	0	0	0.18
50	0	0	0	36.1	7.04	6.80	1.80	0	0	0	0	0	0.31
45	0	0	0.53	45.0	9.31	9.48	2.20	0.10	0	0	0.10	0.20	0.55
40	0	0	0.64	57.2	13.2	12.2	2.70	0.18	0	0	0.27	0.40	0.97
35	0	0	3.00	72.3	16.5	14.9	3.30	0.28	0.10	0.20	0.48	0.49	1.70
30	0.10	0	4.74	88.8	19.8	17.4	4.00	0.38	0.19	0.47	0.67	0.60	2.30
25	0.10	0	6.12	115	22.9	20.6	5.14	0.59	0.30	0.75	1.00	0.90	4.15
20	0.10	0	10.4	159	27.0	26.1	6.77	0.79	0.49	0.95	1.30	1.30	6.14
15	0.20	0.51	16.5	202	33.8	37.0	9.17	0.91	0.79	1.20	1.50	1.50	13.0
10	0.49	0.74	29.9	256	73.4	59.4	13.0	1.60	1.70	1.50	1.60	1.60	25.8
5	1.40	0.88	52.6	398	141	88.0	26.7	4.00	5.30	3.10	2.30	2.00	67.0

## 05055000 SHEYENNE RIVER NEAR HARVEY, ND--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	29.6	13.4	11.9	9.08	6.34
0.95	1.05	63.4	33.2	28.4	21.4	14.6
0.90	1.11	93.8	52.5	44.1	32.8	22.1
0.80	1.25	148	89.3	73.6	53.9	36.0
0.50	2	342	231	184	130	85.9
0.20	5	744	545	423	287	189
0.10	10	1,090	826	634	419	276
0.04	25	1,620	1,250	955	612	405
0.02	50	2,080	1,620	1,230	772	513
0.01	100	2,580	2,020	1,530	942	628
0.005	200	3,120	2,460	1,850	1,120	752
0.002	500	3,920	ng	ng	ng	ng

### Probability of annual low discharges

[ng, statistic not given]

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	ng	ng	ng	0	0	0
0.10	10	ng	ng	ng	ng	ng	ng	0	0	0
0.20	5	ng	ng	ng	ng	ng	ng	0	0	0
0.50	2	ng	ng	ng	ng	ng	ng	0	0	0.025

**05055000 SHEYENNE RIVER NEAR HARVEY, ND--Continued**

Probability of seasonal low discharges

[ng, statistic not given]

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	ng	ng	0	0.100
0.10	10	ng	ng	ng	ng	ng	ng	0	0.240
0.20	5	ng	ng	ng	ng	ng	ng	0	0.600
0.50	2	ng	ng	ng	ng	ng	ng	0	2.58
		June-July-August				September-October-November			
0.05	20	ng	0	0	0	ng	ng	0	0
0.10	10	ng	0	0	0	ng	ng	0	0
0.20	5	ng	0	0	0	ng	ng	0	0
0.50	2	ng	0	0	0.120	ng	ng	0	0

## 05055000 SHEYENNE RIVER NEAR HARVEY, ND--Continued

Annual peak discharge and corresponding gage height, period of record

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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1946	March 21	2.26	132	1952	April 7	5.23	258
1947	March 23	5.44	200	1953	June 30	3.60	60.0
1948	April 18	6.45	1,220	1954	June 17	5.57	351
1949	April 7	6.20	846	1955	March 31	4.76	120
1950	April 18	6.62	1,430	1956	April 10	5.65	316
1951	April 7	5.85	340				
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1950	April 18	6.62	1,430	1952	April 7	5.23	258
1948	April 18	6.45	1,220	1947	March 23	5.44	200
1949	April 7	6.20	846	1946	March 21	2.26	132
1954	June 17	5.57	351	1955	March 31	4.76	120
1951	April 7	5.85	340	1953	June 30	3.60	60.0
1956	April 10	5.65	316				

# 05055000 SHEYENNE RIVER NEAR 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
1946	0	0.293	0.400	0.097	0	23.2	7.16	1.15	0.193	2.25	0.013	0	2.93
1947	0	0.047	0.032	0	0	23.9	15.6	3.86	7.12	6.81	0.361	0.167	4.85
1948	0.577	0.677	0.619	0.113	0	0.161	210.1	29.3	3.24	1.19	0.239	0	20.3
1949	0	0	0	0	0	0.290	164.7	7.70	6.83	1.15	0	0	14.9
1950	0	0	0	0	0	3.42	324.2	200.7	30.7	4.94	0.271	0.117	47.0
1951	0.813	1.49	1.46	1.77	0.804	2.16	124.7	22.5	39.6	4.50	1.02	2.83	16.8
1952	1.13	1.22	1.54	0	0	5.90	114.1	10.6	3.19	6.55	0.029	0	11.9
1953	0	0	0	0	0	6.91	7.64	12.5	8.65	3.11	0	0	3.25
1954	0	0	0.081	0.045	8.93	5.16	8.44	3.21	86.2	27.0	5.42	5.72	12.4
1955	3.33	2.66	1.77	0.213	0	18.1	32.4	10.9	13.8	2.28	0.081	0	7.13
1956	0	0	0	0	0	12.6	85.6	19.5	22.9	3.19	0.519	0.597	12.0

# 05055100 NORTH FORK SHEYENNE RIVER NEAR WELLSBURG, ND

## Station Description

LOCATION.--Lat 47°52'34", long 99°43'05", at north line of sec.26, T.151 N., R.71 W., Benson County, Hydrologic Unit 09020202, on right bank 7 ft downstream from bridge on county highway, 1 mi upstream from mouth, and 3.5 mi northeast of Wellsburg.

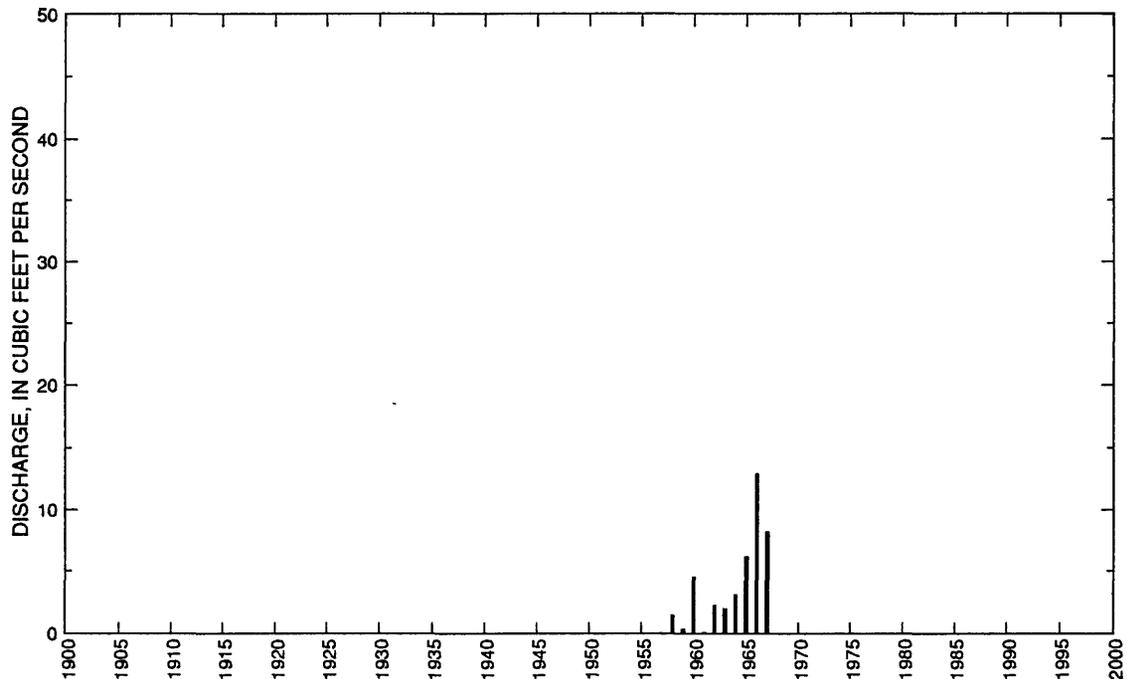
DRAINAGE AREA.--693 mi<sup>2</sup>, of which about 490 mi<sup>2</sup> is probably noncontributing (includes 227 mi<sup>2</sup> in closed basins).

PERIOD OF RECORD.--September 1957 to September 1967.

GAGE.--Water-stage recorder. Altitude of gage is 1,455 ft (from topographic map).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, about 240 ft<sup>3</sup>/s, Mar. 16, 1966; maximum gage height, 6.02 ft, Mar. 16, 1966 (backwater from ice); no flow for several months each year.

Annual mean discharge



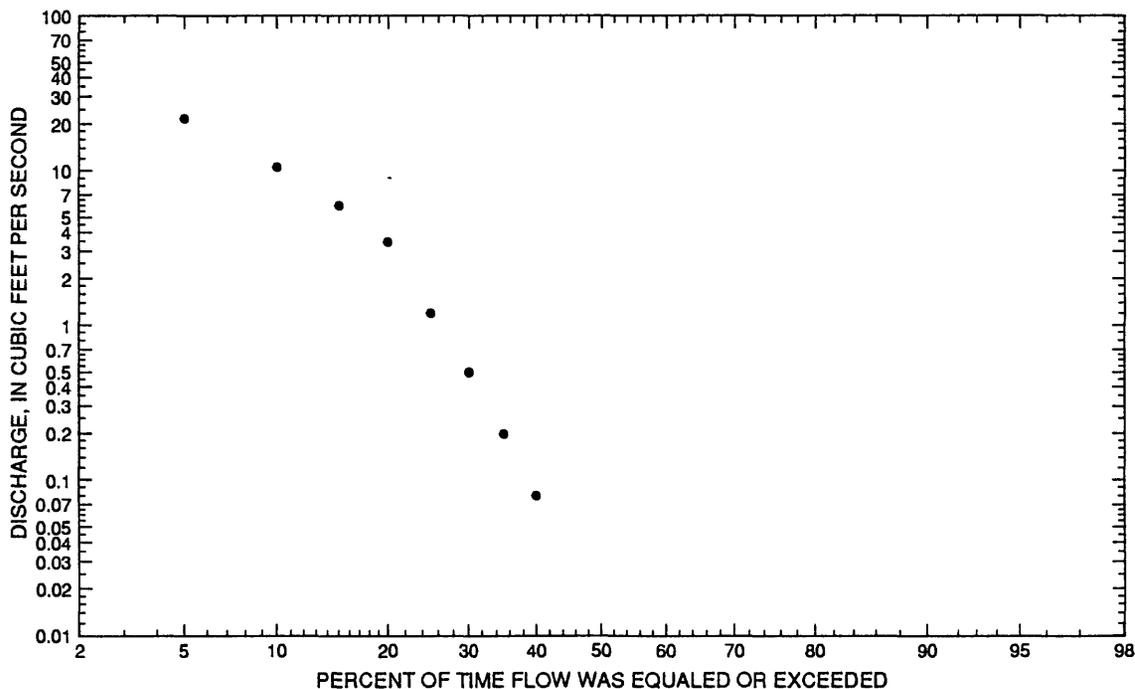
# 05055100 NORTH FORK SHEYENNE RIVER NEAR WELLSBURG, ND--Continued

Statistics of monthly and annual mean discharges

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

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	11.0	1966	0	m	1.17	3.46	2.96	2.39
November	4.00	1966	0	m	0.530	1.28	2.42	1.08
December	0.303	1966	0	m	0.040	0.10	2.72	0.07
January	ng	ng	0	m	0	0	ng	0
February	0.368	1958	0	m	0.040	0.12	3.10	0.08
March	79.5	1966	0	1961	12.5	25.7	2.06	25.6
April	42.5	1960	0.803	1961	15.6	14.2	0.91	31.9
May	25.6	1967	0.245	1959	6.96	7.70	1.11	14.2
June	14.7	1964	0	1961	5.05	5.09	1.01	10.3
July	22.3	1965	0	m	4.18	6.77	1.62	8.54
August	11.9	1963	0	m	2.04	4.30	2.11	4.16
September	8.39	1965	0	m	0.850	2.65	3.13	1.73
Annual	12.9	1966	0.095	1961	4.10	4.01	0.98	100

Annual flow duration



05055100 NORTH FORK SHEYENNE RIVER NEAR WELLSBURG, ND--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	0
90	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
85	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
80	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
75	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
70	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
65	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
60	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
55	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
50	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
45	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
40	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.08
35	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.20
30	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.50
25	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	1.20
20	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	3.45
15	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	5.99
10	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	10.7
5	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	21.8

## 05055100 NORTH FORK SHEYENNE RIVER NEAR WELLSBURG, ND--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	0.500	0.296	0.322	0.350	0.299
0.95	1.05	2.20	1.87	1.86	1.75	1.29
0.90	1.11	4.80	4.42	4.23	3.71	2.57
0.80	1.25	11.5	11.2	10.3	8.41	5.51
0.50	2	50.3	48.7	41.9	30.8	19.0
0.20	5	175	145	119	81.2	49.8
0.10	10	307	223	180	120	74.6
0.04	25	527	323	257	168	107
0.02	50	723	393	310	202	131
0.01	100	940	455	358	231	154
0.005	200	1,180	511	400	258	175
0.002	500	1,510	ng	ng	ng	ng

### Probability of annual low discharges

[ng, statistic not given]

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	ng	ng	ng	ng	ng	ng
0.10	10	ng	ng	ng	ng	ng	ng	ng	ng	ng
0.20	5	ng	ng	ng	ng	ng	ng	ng	ng	ng
0.50	2	ng	ng	ng	ng	ng	ng	ng	ng	ng

**05055100 NORTH FORK SHEYENNE RIVER NEAR WELLSBURG, ND--Continued**

Probability of seasonal low discharges

[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	ng	ng	0	0
0.10	10	ng	ng	ng	ng	ng	ng	0	0
0.20	5	ng	ng	ng	ng	ng	ng	0	0.035
0.50	2	ng	ng	ng	ng	ng	ng	0	0.300
		June-July-August				September-October-November			
0.05	20	ng	ng	ng	0	ng	ng	ng	ng
0.10	10	ng	ng	ng	0	ng	ng	ng	ng
0.20	5	ng	ng	ng	0	ng	ng	ng	ng
0.50	2	ng	ng	ng	0	ng	ng	ng	ng

## 05055100 NORTH FORK SHEYENNE RIVER NEAR WELLSBURG, ND—Continued

Annual peak discharge and corresponding gage height, period of record

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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1958	April 2	2.94	29.0	1963	August 3	3.52	32.0
1959	March <sup>1</sup>	2.10	4.70	1964	June 20	3.64	51.0
1960	April 2	3.39	216	1965	July 23	4.78	115
1961	April 21	1.92	1.70	1966	March 16	6.02	240
1962	March 29	2.75	51.0	1967	March 26	4.00	180
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1966	March 16	6.02	240	1964	June 20	3.64	51.0
1960	April 2	3.39	216	1963	August 3	3.52	32.0
1967	March 26	4.00	180	1958	April 2	2.94	29.0
1965	July 23	4.78	115	1959	March <sup>1</sup>	2.10	4.70
1962	March 29	2.75	51.0	1961	April 21	1.92	1.70

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

05055100 NORTH FORK SHEYENNE RIVER NEAR WELLSBURG, 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
1958	0.629	1.28	0.048	0	0.368	2.21	10.1	0.586	0.084	2.47	0.007	0	1.48
1959	0	0	0	0	0	1.99	1.60	0.245	0.020	0	0	0	0.323
1960	0	0	0	0	0	1.00	42.5	4.73	6.02	0.203	0	0	4.48
1961	0	0	0	0	0	0	0.803	0.345	0	0	0	0	0.095
1962	0	0	0	0	0	5.90	6.81	7.57	4.90	1.16	0.074	0	2.21
1963	0	0	0	0	0	0.045	4.02	4.01	0.807	2.95	11.9	0.003	2.00
1964	0	0	0	0	0.007	0.452	13.5	4.52	14.7	4.41	0.023	0.030	3.12
1965	0.077	0.023	0	0	0	0.045	16.9	9.49	8.21	22.3	8.12	8.39	6.15
1966	11.0	4.00	0.303	0	0	79.5	27.3	12.5	11.0	7.27	0.247	0.049	12.9
1967	0	0	0	0	0	34.0	32.4	25.6	4.73	1.02	0	0	8.20

## 05055200 BIG COULEE NEAR MADDOCK, ND

### Station Description

LOCATION.--Lat 47°55'10", long 99°34'47", on north line of sec.11, T.151 N., R.70 W., Benson County, Hydrologic Unit 09020202, at culvert on county highway, 3.5 mi southwest of Maddock.

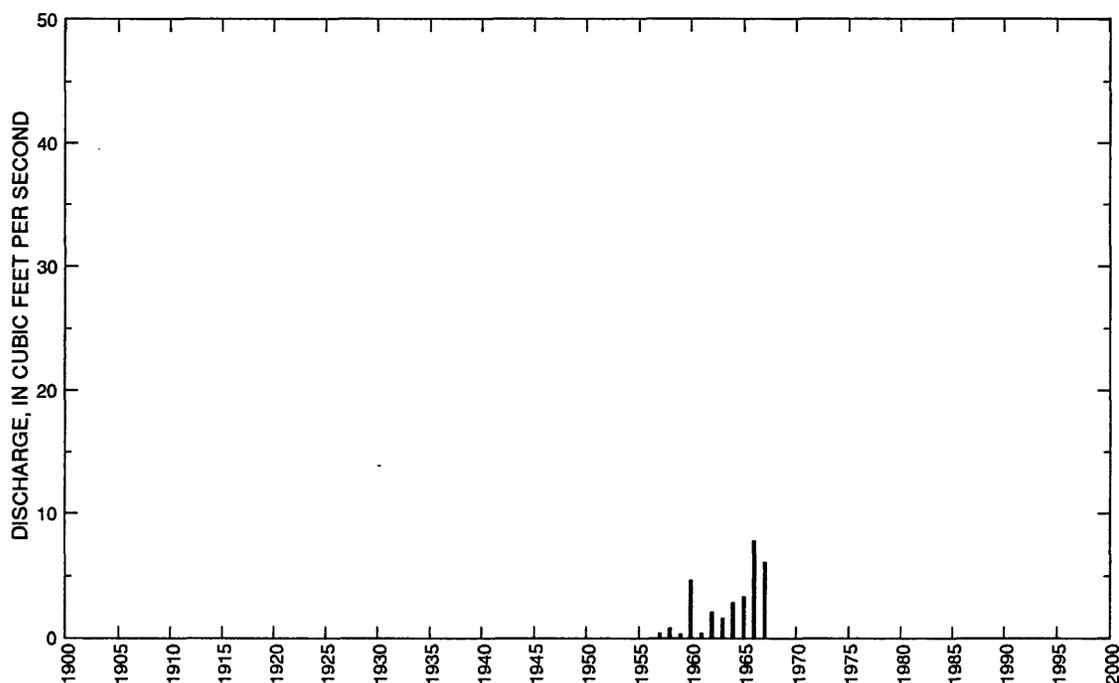
DRAINAGE AREA.--146 mi<sup>2</sup>, of which about 49 mi<sup>2</sup> is probably noncontributing.

PERIOD OF RECORD.--October 1956 to September 1967. Annual maximums, water years 1969-73.

GAGE.--Nonrecording gage. Prior to Oct. 20, 1964, water-stage recorder at site 3 mi upstream at different datum. June 22, 1965, to June 17, 1966, water-stage recorder and June 18, 1966, to Sept. 30, 1967, nonrecording gage, at present site and datum.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 810 ft<sup>3</sup>/s, Apr. 8, 1971; maximum gage height, 12.00 ft, Apr. 8, 1971; no flow during part of each year.

Annual mean discharge



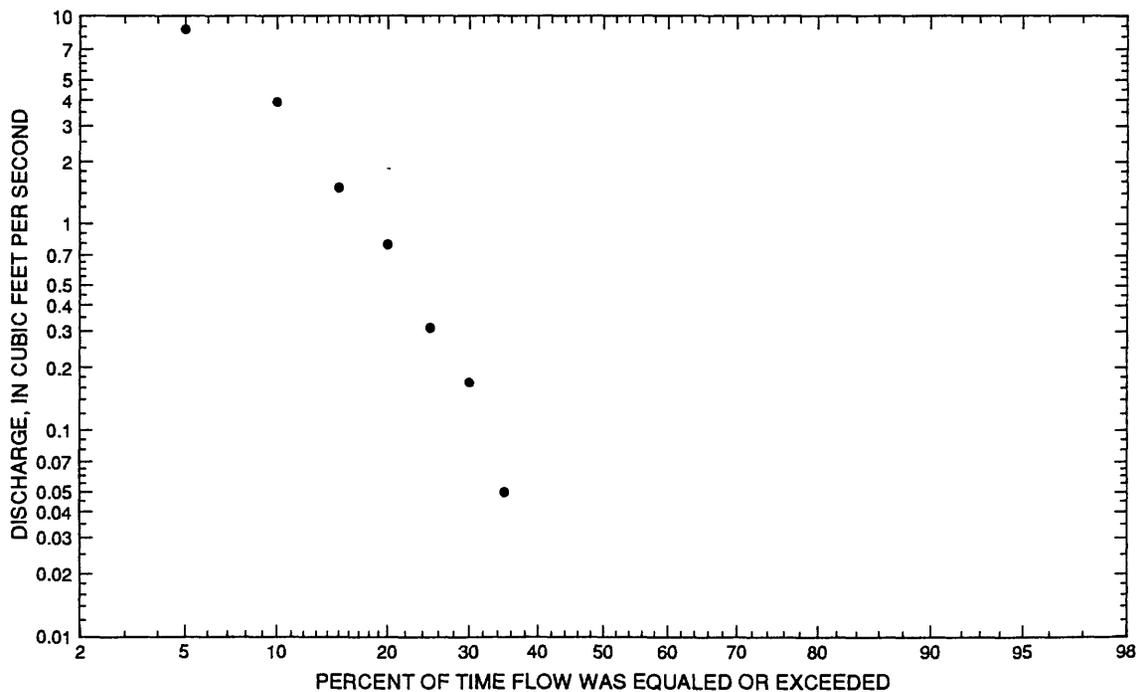
## 05055200 BIG COULEE NEAR MADDOCK, ND--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	4.10	1966	0	m	0.380	1.23	3.26	1.16
November	0.914	1966	0	m	0.090	0.27	2.92	0.29
December	0.419	1966	0	m	0.040	0.13	3.32	0.12
January	0.085	1966	0	m	0.010	0.03	3.32	0.02
February	2.29	1958	0	m	0.210	0.69	3.32	0.64
March	69.6	1966	0.065	1964	14.7	22.2	1.52	45.1
April	28.0	1960	0.010	1957	7.73	9.42	1.22	23.8
May	12.3	1967	0	1959	2.96	3.72	1.26	9.09
June	14.1	1964	0	m	2.58	4.26	1.65	7.93
July	12.0	1963	0	m	2.67	4.03	1.51	8.22
August	4.21	1965	0	m	0.810	1.66	2.04	2.50
September	3.65	1965	0	m	0.390	1.09	2.82	1.19
Annual	7.74	1966	0.331	1959	2.73	2.50	0.92	100

Annual flow duration



# 05055200 BIG COULEE NEAR MADDOCK, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharge equaled or exceeded	Monthly and annual flow duration, in cubic feet per second												
	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	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0.10	0.10	0.10	0	0	0	0	0	0	0
65	0	0	0	0.19	0.10	0.18	0	0	0	0	0	0	0
60	0	0	0	0.19	0.20	0.26	0	0	0	0	0	0	0
55	0	0	0	0.45	0.29	0.39	0.10	0	0	0	0	0	0
50	0	0	0.10	0.70	0.50	0.47	0.10	0	0	0	0	0	0
45	0	0	0.16	1.70	0.60	0.57	0.23	0	0	0	0	0	0
40	0	0	0.70	2.60	1.20	1.00	0.34	0	0	0	0	0	0
35	0	0	0.89	3.20	1.70	1.20	0.52	0	0	0	0	0	0.05
30	0	0	1.80	3.90	2.10	1.20	0.64	0.02	0	0	0	0	0.17
25	0	0	4.15	6.28	3.00	1.50	0.96	0.12	0	0	0	0	0.31
20	0	0	6.33	8.06	4.20	1.80	1.40	0.19	0	0	0	0	0.79
15	0	0	15.9	12.3	6.13	2.70	2.70	0.50	0.09	0.03	0.10	0	1.50
10	0	0	29.1	17.3	7.74	3.90	4.84	1.00	0.83	0.12	0.15	0	3.91
5	0	0	113	33.0	12.9	9.00	12.5	5.15	1.90	2.50	0.82	0.35	8.72

## 05055200 BIG COULEE NEAR MADDOCK, ND--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence Interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	4.80	5.03	3.07	1.70	0.862
0.95	1.05	15.1	11.1	6.86	3.84	1.96
0.90	1.11	26.5	16.8	10.5	5.90	3.03
0.80	1.25	50.5	27.4	17.3	9.89	5.10
0.50	2	154	67.2	44.8	26.2	13.7
0.20	5	404	158	113	67.9	36.3
0.10	10	631	242	182	111	60.0
0.04	25	976	378	300	186	102
0.02	50	1,270	500	413	260	144
0.01	100	1,580	640	549	350	195
0.005	200	1,910	799	711	458	257
0.002	500	2,360	ng	ng	ng	ng

### Probability of annual low discharges

[ng, statistic not given]

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	ng	ng	ng	ng	ng	0
0.10	10	ng	ng	ng	ng	ng	ng	ng	ng	0
0.20	5	ng	ng	ng	ng	ng	ng	ng	ng	0
0.50	2	ng	ng	ng	ng	ng	ng	ng	ng	0

**05055200 BIG COULEE NEAR MADDOCK, ND—Continued**

Probability of seasonal low discharges

[ng, statistic not given]

Non-exceedance probability	Recurrence Interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	ng	ng	0	0
0.10	10	ng	ng	ng	ng	ng	ng	0	0
0.20	5	ng	ng	ng	ng	ng	ng	0	0.006
0.50	2	ng	ng	ng	ng	ng	ng	0.012	0.119
		June-July-August				September-October-November			
0.05	20	ng	ng	ng	0	ng	ng	ng	ng
0.10	10	ng	ng	ng	0	ng	ng	ng	ng
0.20	5	ng	ng	ng	0	ng	ng	ng	ng
0.50	2	ng	ng	ng	0	ng	ng	ng	ng

## 05055200 BIG COULEE NEAR MADDOCK, ND—Continued

Annual peak discharge and corresponding gage height, period of record

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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1957	March 21	1.95	33.0	1965	April 8	5.95	99.0
1958	February 25	2.05	21.0	1966	March 14	6.54	310
1959	March 13	2.10	42.0	1967	March 24	7.00	440
1960	March 27	2.50	262	1969	April 11	7.00	750
1961	March 15	2.15	145	1970	April 6	10.35	200
1962	March 26	2.27	209	1971	April 8	12.00	810
1963	July 27	1.94	104	1972	March	9.30	292
1964	June 18	2.45	159	1973	May 9	6.95	10.0
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1971	April 8	12.00	810	1964	June 18	2.45	159
1969	April 11	7.00	750	1961	March 15	2.15	145
1967	March 24	7.00	440	1963	July 27	1.94	104
1966	March 14	6.54	310	1965	April 8	5.95	99.0
1972	March	9.30	292	1959	March 13	2.10	42.0
1960	March 27	2.50	262	1957	March 21	1.95	33.0
1962	March 26	2.27	209	1958	February 25	2.05	21.0
1970	April 6	10.35	200	1973	May 9	6.95	10.0

# 05055200 BIG COULEE NEAR MADDOCK, 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	0	0	0	0	0	2.67	0.010	0.348	0.203	0.206	0.271	0.483	0.355
1958	0.006	0	0	0	2.29	1.65	1.98	0.271	0.267	3.31	0	0	0.804
1959	0	0	0	0	0	3.88	0.013	0	0	0	0	0	0.331
1960	0	0	0	0	0	21.7	28.0	4.40	1.62	0.097	0	0	4.65
1961	0	0	0	0	0	4.17	0.160	0.074	0	0	0	0	0.374
1962	0	0	0	0	0	14.0	4.76	4.02	1.56	0.129	0	0	2.06
1963	0	0	0	0	0	0.155	0.383	1.15	0.473	12.0	4.13	0	1.55
1964	0	0	0	0	0	0.065	17.3	1.36	14.1	1.69	0	0	2.84
1965	0	0	0	0	0	1.49	17.9	2.43	1.07	8.84	4.21	3.65	3.30
1966	4.10	0.914	0.419	0.085	0	69.6	5.17	6.19	2.55	1.87	0.310	0.127	7.74
1967	0.055	0.119	0	0	0	41.9	9.35	12.3	6.55	1.27	0.032	0	6.04

## 05055500 SHEYENNE RIVER AT SHEYENNE, ND

### Station Description

LOCATION.--Lat 47°50'20", long 99°07'30", in NE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.5, T.150 N., R.66 W., Wells County, Hydrologic Unit 09020202, at recreation-pool dam, 1 mi north of Sheyenne.

DRAINAGE AREA.--1,790 mi<sup>2</sup> (revised), approximately, of which about 1,130 mi<sup>2</sup> is probably noncontributing (includes 227 mi<sup>2</sup> in closed basins).

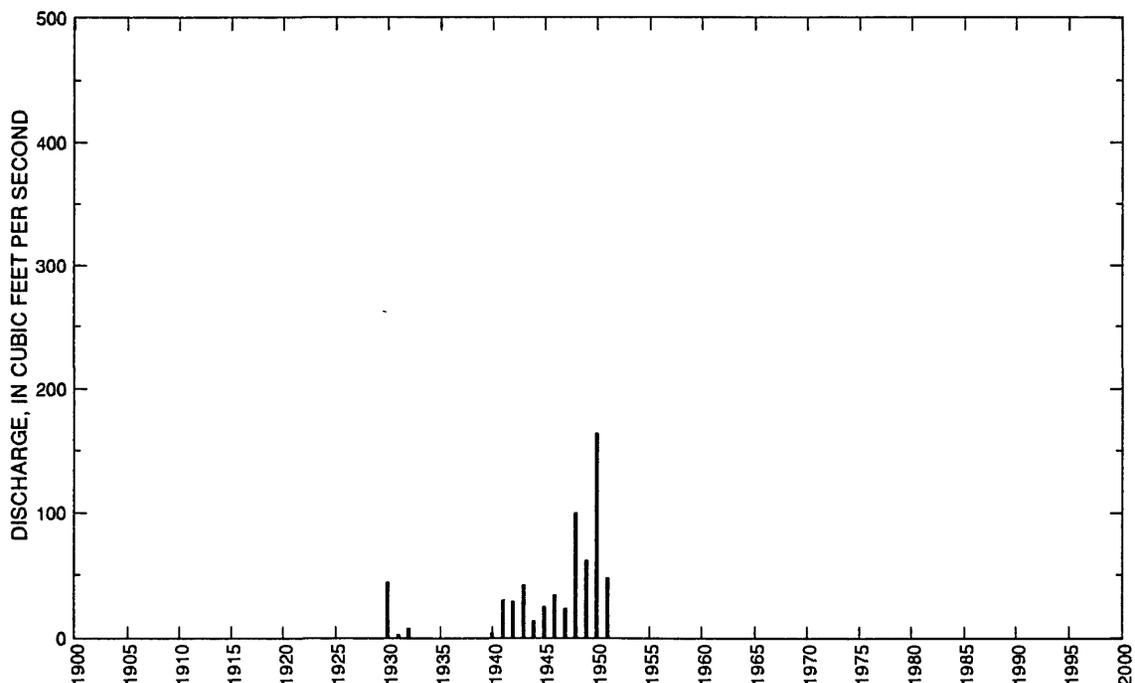
PERIOD OF RECORD.--April 1929 to June 1933, October 1939 to September 1951. Monthly discharge only for some periods, published in Water-Supply Paper 1308.

GAGE.--Staff gage. Datum of gage is 1,412.54 ft above mean sea level, datum of 1929. Prior to Mar. 28, 1940, wire-weight and staff gages at points within 300 ft of present site, at different datums.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,940 ft<sup>3</sup>/s, Apr. 18, 1950 (gage height, 8.31 ft); maximum gage height, 8.51 Apr. 18-19, 1948; no flow at times in each year.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in 1919 reached a stage about 3 ft higher than that of April 1948.

Annual mean discharge



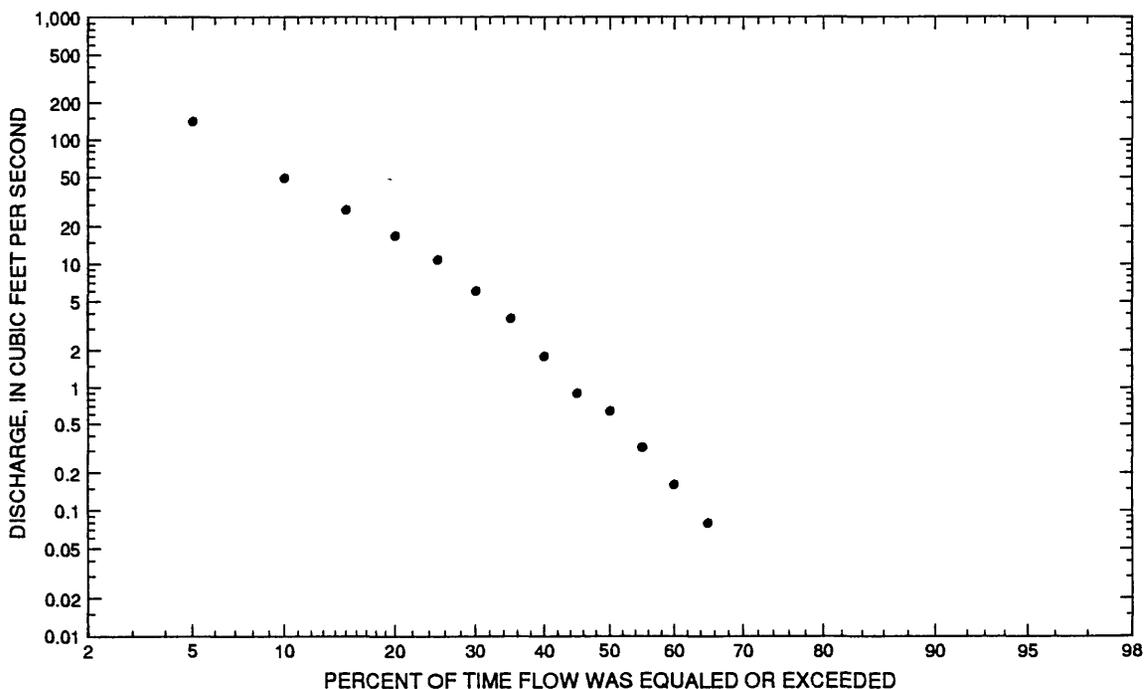
## 05055500 SHEYENNE RIVER AT SHEYENNE, ND—Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	6.00	1942	0	m	0.730	1.60	2.21	0.15
November	10.1	1945	0	m	1.60	2.75	1.72	0.33
December	5.24	1945	0	m	0.860	1.43	1.65	0.18
January	1.34	1951	0	m	0.210	0.37	1.76	0.04
February	217	1930	0	m	14.9	54.1	3.64	3.09
March	256	1946	0	1940	81.0	100	1.24	16.8
April	1,280	1950	8.09	1944	281	393	1.39	58.5
May	609	1950	2.19	1931	64.3	144	2.23	13.4
June	60.9	1950	0.350	1931	17.6	19.6	1.11	3.65
July	73.4	1946	0	1940	10.7	17.7	1.66	2.22
August	24.1	1942	0	m	3.52	6.28	1.78	0.73
September	40.1	1944	0	m	4.44	10.8	2.43	0.92
Annual	164	1950	2.63	1931	41.7	42.1	1.01	100

Annual flow duration



**05055500 SHEYENNE RIVER AT SHEYENNE, 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	3.80	1.70	0	0	0	0	0	0	0	0
90	0	0	0	8.06	2.80	0.19	0	0	0	0	0	0	0
85	0	0	0	12.8	4.16	0.45	0.17	0	0	0	0	0	0
80	0	0	0	17.0	5.38	0.69	0.17	0	0	0	0	0	0
75	0	0	0	23.0	6.75	1.60	0.17	0	0	0	0	0	0
70	0	0	0.10	28.8	8.57	2.50	0.36	0	0	0	0	0	0
65	0	0	0.10	34.9	10.2	3.10	0.76	0	0	0	0	0.10	0.08
60	0	0	0.18	41.2	12.9	5.13	1.30	0	0	0	0	0.20	0.16
55	0	0	0.95	50.0	15.0	6.02	1.60	0.10	0	0	0	0.20	0.32
50	0	0	0.95	59.5	17.1	7.86	2.70	0.10	0	0	0.10	0.20	0.64
45	0	0	1.30	71.2	20.2	9.82	4.49	0.29	0.04	0	0.27	0.39	0.90
40	0.10	0	4.76	86.4	24.0	13.1	6.36	0.86	0.04	0	0.44	0.44	1.80
35	0.10	0.10	10.7	113	27.9	16.2	8.66	0.86	0.49	0	0.99	0.44	3.67
30	0.10	0.10	31.3	148	32.6	21.1	10.4	1.30	0.49	0.10	1.60	0.66	6.08
25	0.20	0.17	50.1	196	41.6	27.3	12.5	2.00	0.65	0.27	1.90	0.99	10.9
20	0.30	0.40	89.7	281	54.9	30.9	15.1	2.50	1.10	0.64	1.90	0.99	17.0
15	0.49	0.40	137	486	68.5	37.2	19.0	3.90	3.58	1.20	3.10	1.70	27.2
10	0.89	1.20	292	958	118	47.2	23.8	9.80	9.40	3.20	5.00	2.50	49.1
5	1.20	9.79	495	1,640	298	69.2	30.8	16.8	21.6	0	6.55	3.80	141

## 05055500 SHEYENNE RIVER AT SHEYENNE, ND--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	24.9	10.7	10.6	9.74	7.90
0.95	1.05	83.8	48.7	43.6	34.2	24.9
0.90	1.11	151	99.2	85.5	63.0	43.8
0.80	1.25	292	216	180	125	83.2
0.50	2	888	749	600	400	250
0.20	5	2,230	1,930	1,540	1,050	640
0.10	10	3,350	2,850	2,300	1,630	986
0.04	25	4,930	4,010	3,290	2,450	1,500
0.02	50	6,160	4,820	4,020	3,120	1,910
0.01	100	7,410	5,570	4,710	3,800	2,360
0.005	200	8,650	6,240	5,360	4,490	2,810
0.002	500	10,300	ng	ng	ng	ng

### Probability of annual low discharges

[ng, statistic not given]

Non-exceedance probability	Recurrence Interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	0	0	0	0	0	0
0.10	10	ng	ng	ng	0	0	0	0	0	0
0.20	5	ng	ng	ng	0	0	0	0	0	0
0.50	2	ng	ng	ng	0	0	0	0.017	0.140	0.241

05055500 SHEYENNE RIVER AT SHEYENNE, ND--Continued

Probability of seasonal low discharges

[ng, statistic not given]

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	0	0	0	0	0	0	0
0.10	10	ng	0	0	0	0	0	0	0.118
0.20	5	ng	0	0	0	0	0	0	0.709
0.50	2	ng	0	0	0	0.109	0.176	0.521	5.49
		June-July-August				September-October-November			
0.05	20	ng	0	0	0	ng	ng	0	0
0.10	10	ng	0	0	0	ng	ng	0	0
0.20	5	ng	0	0	0.014	ng	ng	0	0
0.50	2	ng	0	0.076	0.560	ng	ng	0	0

## 05055500 SHEYENNE RIVER AT SHEYENNE, ND—Continued

Annual peak discharge and corresponding gage height, period of record

[--, 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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1930	February 24	8.79	990	1944	September 1	4.94	537
1931	April 9	2.81	58.0	1945	March 14	5.70	932
1932	--	--	--	1946	March 21	5.88	1,120
1933	March 2	6.08	296	1947	March 25	6.22	750
1940	April 16	3.92	63.0	1948	April 18	8.51	3,840
1941	April 3	5.76	847	1949	April 9	7.15	2,080
1942	April 5	6.38	1,140	1950	April 18	8.31	3,940
1943	March 27	7.22	1,150	1951	April 9	6.25	1,420
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1950	April 18	8.31	3,940	1945	March 14	5.70	932
1948	April 18	8.51	3,840	1941	April 3	5.76	847
1949	April 9	7.15	2,080	1947	March 25	6.22	750
1951	April 9	6.25	1,420	1944	September 1	4.94	537
1943	March 27	7.22	1,150	1933	March 2	6.08	296
1942	April 5	6.38	1,140	1940	April 16	3.92	63.0
1946	March 21	5.88	1,120	1931	April 9	2.81	58.0
1930	February 24	8.79	990				

# 05055500 SHEYENNE RIVER AT SHEYENNE, 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
1929	--	--	--	--	--	--	--	11.0	10.1	0.258	0.052	0	--
1930	0.113	3.29	0.500	0	217.4	246.9	47.7	25.5	1.60	0.200	0.048	0	44.2
1931	0	0.500	0.200	0	0	1.55	26.7	2.19	0.350	0.339	0	0	2.63
1932	0	0	0	0	10.0	29.2	31.3	9.81	8.77	1.64	1.00	0.500	7.64
1933	0	0	0	0	8.76	111.5	84.4	7.57	0.353	--	--	--	--
1940	0	0	0	0	0	0	19.3	18.5	2.12	0	0	0	3.32
1941	0	0	0	0	0	49.6	262.5	12.6	4.09	6.35	0.935	20.8	29.5
1942	6.00	5.67	3.25	0.677	0.500	12.0	213.9	42.0	25.1	9.27	24.1	4.00	28.7
1943	3.05	1.64	0.545	0.194	0.093	227.0	177.1	35.0	48.2	8.61	0.181	0	42.0
1944	0	0	0	0	0	0.290	8.09	58.5	30.7	8.71	11.1	40.1	13.1
1945	0.310	10.1	5.24	0.403	0.200	213.4	35.3	10.6	7.37	0.926	3.80	0.040	24.3
1946	0.119	0.017	0.777	0.471	0	256.2	51.9	6.03	2.81	73.4	5.80	1.37	33.7
1947	1.13	2.01	0.910	0.032	0	125.2	97.8	14.9	9.24	19.9	5.27	0.150	23.2
1948	0.294	0.417	0.200	0.119	0.100	0.213	1,068	122.9	13.7	8.93	0.655	0	100.0
1949	0	0.157	0.181	0.048	0	0.839	677.8	36.7	20.1	8.08	0	0	61.3
1950	0.206	0.247	0.635	0.035	0	11.3	1,275	609.2	60.9	16.1	2.58	0.600	164.2
1951	0.381	1.62	1.39	1.34	0.714	10.4	426.5	70.6	53.0	7.87	0.871	3.56	47.8

## 05056000 SHEYENNE RIVER NEAR WARWICK, ND

### Station Description

**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, 3.3 mi south of Warwick.

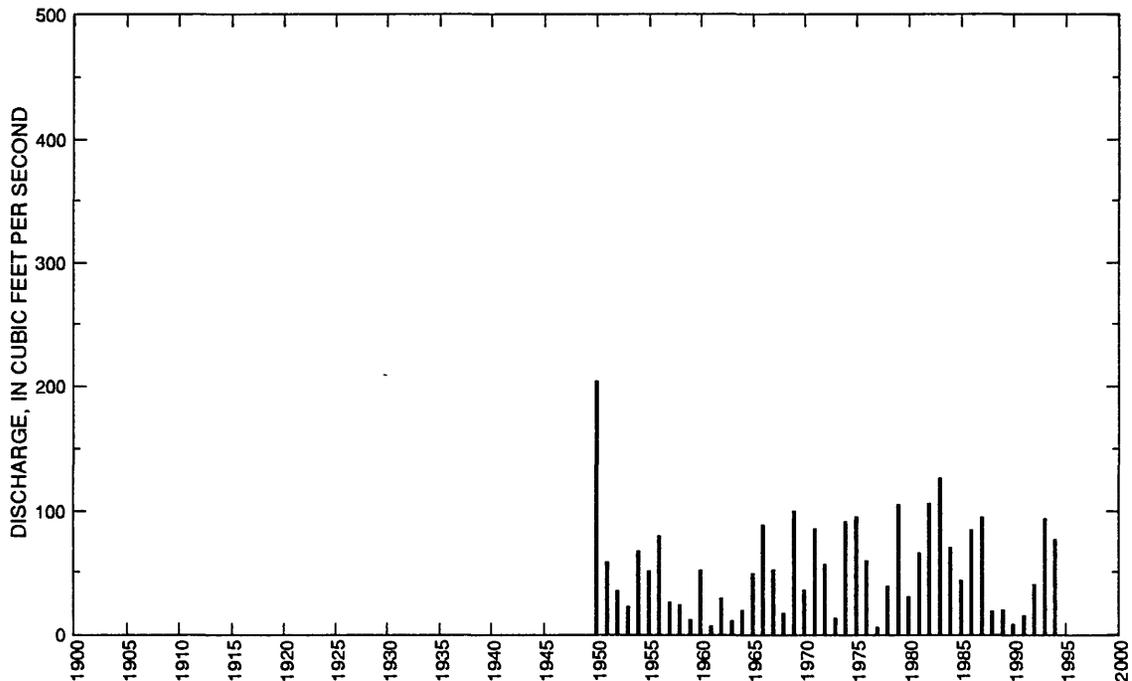
**DRAINAGE AREA.**--2,070 mi<sup>2</sup>, approximately, of which about 1,310 mi<sup>2</sup> is probably noncontributing (includes 227 mi<sup>2</sup> in closed basins).

**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, 7.83 ft, Apr. 18, 1956; no flow Aug. 7 to Sept. 1, and Sept. 3-9, 1961.

Annual mean discharge

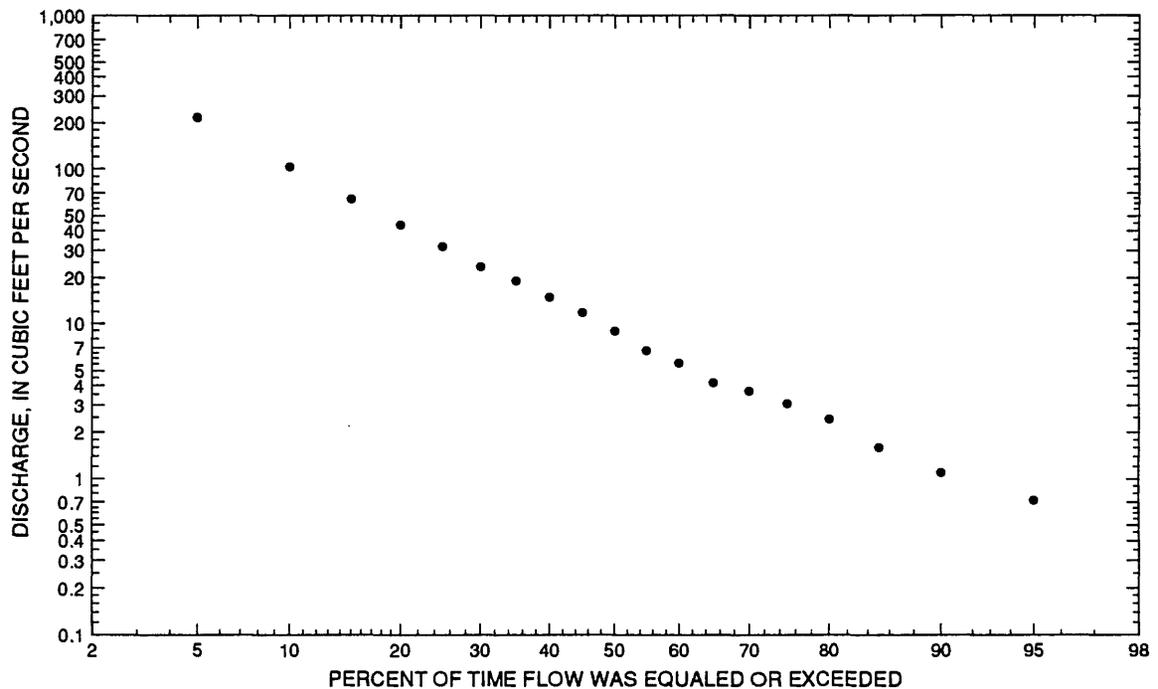


# 05056000 SHEYENNE RIVER NEAR WARWICK, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	73.2	1983	1.16	1953	12.7	15.3	1.20	1.93
November	50.3	1981	1.28	1961	11.4	9.54	0.84	1.73
December	29.6	1983	0.765	1961	6.98	5.69	0.82	1.06
January	26.3	1983	0.474	1990	4.77	4.47	0.94	0.72
February	154	1981	0.754	1990	9.80	24.1	2.46	1.49
March	793	1983	1.46	1964	118	175	1.48	17.9
April	1,420	1950	15.8	1977	268	291	1.09	40.7
May	854	1950	10.4	1990	98.2	148	1.51	14.9
June	326	1954	1.75	1961	53.4	61.5	1.15	8.10
July	299	1993	0.356	1989	40.7	58.7	1.44	6.17
August	423	1993	0.090	1961	23.8	63.8	2.68	3.61
September	63.0	1957	0.707	1961	11.5	14.4	1.25	1.75
Annual	204	1950	5.31	1977	54.9	40.0	0.73	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	0.89	0.94	1.10	14.9	10.9	2.00	0.55	0.25	0.52	0.95	1.60	0.91	0.72
90	1.20	1.20	1.50	20.3	15.6	4.41	0.94	0.52	0.84	0.95	2.10	2.00	1.10
85	1.40	1.40	2.40	24.7	18.3	6.72	1.60	0.74	0.84	1.30	2.70	2.00	1.60
80	1.90	1.40	2.40	29.4	21.0	9.77	2.70	1.10	1.10	1.80	3.50	2.80	2.45
75	1.90	1.80	4.01	34.5	23.6	12.2	4.18	1.50	1.30	2.10	4.00	2.80	3.08
70	2.30	1.80	4.49	40.0	26.1	14.5	5.35	1.50	1.30	2.50	4.00	3.30	3.71
65	2.30	2.20	4.97	46.6	29.7	16.7	6.71	2.20	1.70	2.90	5.30	3.80	4.18
60	2.70	2.20	5.94	56.0	33.9	19.4	9.02	2.20	2.10	3.40	6.10	3.80	5.62
55	3.10	2.70	7.18	72.0	38.0	22.4	11.9	3.69	2.70	4.00	7.55	4.50	6.81
50	3.10	2.70	11.6	88.8	43.0	26.3	14.5	4.75	3.40	4.70	8.31	4.50	9.04
45	3.60	3.40	19.4	111	50.0	31.3	17.0	5.42	5.08	7.01	9.10	5.20	11.9
40	3.60	3.40	27.3	139	59.8	38.0	19.8	7.84	6.38	8.51	11.1	5.20	15.0
35	4.20	4.28	39.5	169	72.7	45.8	22.9	10.7	7.80	11.2	12.6	6.68	19.1
30	4.90	4.74	58.2	203	84.8	54.9	28.4	14.0	11.4	13.7	13.9	7.63	23.6
25	4.90	5.36	79.8	243	98.5	65.7	34.4	17.5	14.0	16.3	16.2	8.86	31.7
20	6.86	6.74	108	329	118	77.1	42.3	22.7	17.0	20.6	18.1	10.6	43.6
15	8.24	8.13	158	465	138	89.4	58.9	31.8	21.2	27.5	20.2	13.0	64.6
10	9.82	9.99	351	698	180	116	88.8	46.9	28.9	34.4	22.6	15.3	104
5	12.6	17.9	775	1,320	301	198	162	77.4	43.6	49.1	33.2	18.8	217

## 05056000 SHEYENNE RIVER NEAR WARWICK, ND--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	32.8	22.8	16.8	13.1	12.1
0.95	1.05	92.4	70.5	55.7	42.8	34.4
0.90	1.11	154	123	99.9	75.9	57.5
0.80	1.25	278	230	192	144	103
0.50	2	771	674	580	421	275
0.20	5	1,880	1,680	1,450	1,020	631
0.10	10	2,840	2,560	2,180	1,500	920
0.04	25	4,260	3,830	3,210	2,160	1,320
0.02	50	5,440	4,860	4,020	2,660	1,630
0.01	100	6,680	5,930	4,840	3,160	1,950
0.005	200	7,990	7,030	5,650	3,640	2,260
0.002	500	9,800	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0.004	0.005	0.086	0.202	0.340	0.545	0.733	0.933	1.29
0.10	10	0.076	0.090	0.207	0.354	0.526	0.746	0.987	1.29	1.75
0.20	5	0.263	0.303	0.458	0.618	0.833	1.10	1.43	1.91	2.56
0.50	2	1.11	1.24	1.37	1.52	1.87	2.35	3.00	4.06	5.38

## 05056000 SHEYENNE RIVER NEAR WARWICK, ND--Continued

Probability of seasonal low discharges

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0.594	0.723	0.794	0.865	0.865	0.987	1.24	2.89
0.10	10	0.803	0.944	1.03	1.12	1.12	1.33	1.70	4.52
0.20	5	1.15	1.30	1.40	1.54	1.58	1.95	2.57	7.70
0.50	2	2.23	2.40	2.56	2.87	3.38	4.42	6.15	20.5
		June-July-August				September-October-November			
0.05	20	0.044	0.097	0.202	0.328	0.060	0.276	0.425	0.581
0.10	10	0.144	0.252	0.423	0.642	0.229	0.451	0.625	0.860
0.20	5	0.429	0.634	0.896	1.37	0.487	0.773	1.01	1.39
0.50	2	2.00	2.57	3.11	4.88	1.63	2.11	2.64	3.60

## 05056000 SHEYENNE RIVER NEAR WARWICK, ND--Continued

Annual peak discharge and corresponding gage height, period of record

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

## 05056000 SHEYENNE RIVER NEAR WARWICK, ND--Continued

Annual peak discharge and corresponding gage height, period of record

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							
1961	March 26	2.55	81.0	1990	June 5	2.52	66.0
1977	May 5	2.64	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	3.48	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	23.5
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	2.20	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	3.21	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

## 05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND

### Station Description

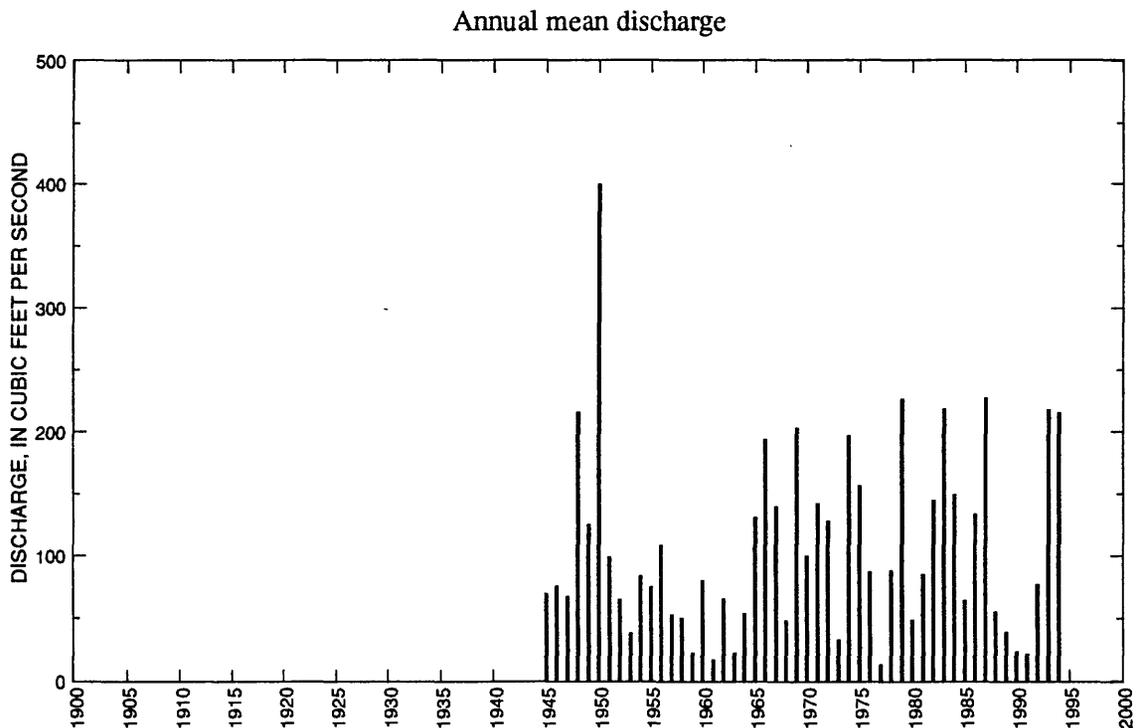
**LOCATION.**--Lat 47°25'58", long 98°01'38", in NW<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.26, T.146 N., R.58 W., Griggs County, Hydrologic Unit 09020203, on right bank at Ueland Dam 0.7 mi downstream from State Highway 200, and 5 mi east of Cooperstown.

**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 bench mark). 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; maximum gage height, 18.69 ft, Apr. 17, 1950; 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, and Aug. 24-25, 1963.

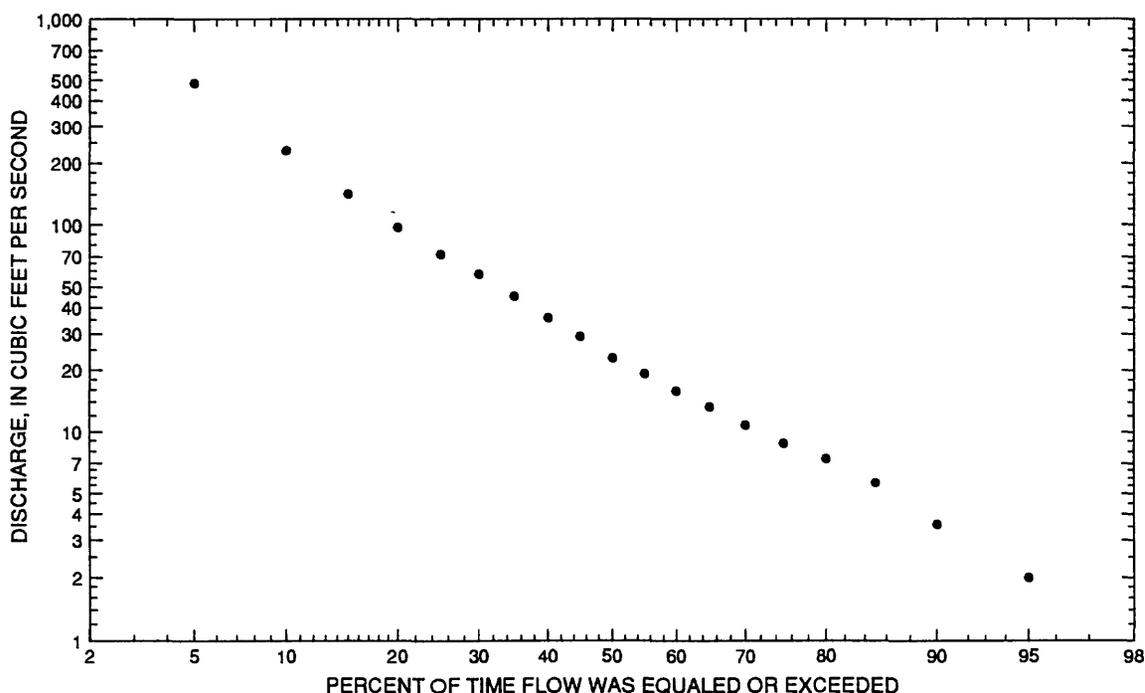


# 05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	114	1983	0.829	1964	25.8	26.0	1.01	1.99
November	71.0	1986	2.83	1977	25.2	17.5	0.70	1.94
December	61.0	1983	3.14	1977	16.4	11.4	0.69	1.27
January	31.4	1994	1.94	1964	10.6	6.66	0.63	0.82
February	48.2	1954	0	1963	11.4	12.6	1.10	0.88
March	1,090	1983	2.14	1964	166	235	1.41	12.9
April	2,290	1950	42.4	1991	549	521	0.95	42.4
May	1,950	1950	37.3	1961	209	313	1.50	16.2
June	435	1974	6.66	1961	113	92.2	0.81	8.76
July	640	1993	3.84	1961	84.0	105	1.25	6.49
August	1,030	1993	0.681	1961	51.7	148	2.85	4.00
September	321	1994	0	1959	31.7	57.3	1.81	2.45
Annual	399	1950	13.2	1977	108	77.0	0.71	100

Annual flow duration



# 05057000 SHEYENNE RIVER NEAR COOPERSTOWN, 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	2.00	1.10	2.20	39.6	36.7	14.8	5.27	0.38	0.28	0.79	4.30	3.10	2.00
90	3.10	2.30	4.00	58.8	42.7	22.9	10.9	1.60	0.54	1.20	7.14	5.43	3.58
85	3.50	3.40	5.76	71.2	48.9	29.9	14.6	3.33	1.00	2.50	8.65	6.39	5.66
80	4.70	3.40	6.71	82.8	54.0	34.2	17.6	4.94	2.00	4.15	11.2	7.26	7.38
75	5.40	5.03	7.67	96.4	59.1	39.0	20.7	6.43	2.83	5.41	12.5	7.85	8.77
70	6.20	6.08	8.83	112	64.3	44.6	23.9	7.86	3.70	6.70	14.2	9.16	10.8
65	7.29	6.47	10.7	130	70.1	50.9	27.6	8.96	4.87	9.26	15.6	10.6	13.2
60	7.76	6.85	12.9	162	77.1	57.7	31.6	11.7	6.69	12.7	16.7	11.7	15.9
55	8.23	7.50	15.8	205	84.8	66.2	36.5	13.6	8.49	15.4	18.3	12.8	19.2
50	8.67	7.84	20.2	255	93.0	74.7	41.8	15.8	11.8	17.9	20.0	14.0	22.8
45	9.43	8.17	28.4	303	107	83.3	47.8	18.4	15.2	20.4	21.6	15.1	29.0
40	10.0	9.29	42.1	365	124	92.9	54.0	21.0	18.1	23.1	23.2	16.3	35.8
35	11.5	9.94	61.2	444	150	103	61.8	25.5	21.7	26.3	25.8	17.9	45.5
30	12.8	10.6	103	546	174	117	72.1	30.0	26.4	30.6	29.3	19.6	57.7
25	13.9	11.9	157	675	210	135	87.8	37.0	33.2	36.5	34.0	21.7	72.2
20	15.5	13.7	212	822	248	158	111	45.4	41.5	43.3	40.3	24.0	97.4
15	18.0	15.9	316	1,010	303	194	143	60.7	50.2	51.4	49.2	26.6	141
10	21.7	18.2	540	1,380	392	246	187	83.3	66.0	61.9	54.7	32.5	230
5	26.1	28.1	928	2,160	671	352	288	150	120	87.2	63.2	42.7	484

**05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND--Continued**

Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	66.8	52.4	46.9	43.4	38.8
0.95	1.05	165	140	126	111	90.8
0.90	1.11	260	227	205	177	139
0.80	1.25	438	394	356	299	226
0.50	2	1,100	1,010	913	744	532
0.20	5	2,490	2,280	2,030	1,630	1,130
0.10	10	3,670	3,310	2,930	2,350	1,620
0.04	25	5,400	4,760	4,170	3,340	2,320
0.02	50	6,820	5,900	5,130	4,120	2,870
0.01	100	8,340	7,070	6,110	4,920	3,450
0.005	200	9,940	8,250	7,080	5,730	4,050
0.002	500	12,200	ng	ng	ng	ng

Probability of annual low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0	0.627	2.06	2.88	3.16
0.10	10	0	0.027	0.103	0.149	0.462	1.17	2.86	3.92	4.36
0.20	5	0.254	0.347	0.493	0.655	1.24	2.30	4.22	5.62	6.37
0.50	2	2.52	2.66	2.90	3.48	4.28	6.57	8.46	10.7	12.8

05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND--Continued

Probability of seasonal low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0.456	0.531	0.898	1.24	1.47	<sup>1</sup> 2.79	<sup>1</sup> 4.11	5.44
0.10	10	1.25	<sup>1</sup> 1.42	1.59	2.05	2.11	<sup>1</sup> 2.29	2.47	8.92
0.20	5	2.37	2.38	2.76	3.36	3.21	3.55	4.82	15.8
0.50	2	5.65	6.22	6.24	7.02	7.37	12.0	15.2	43.4
		June-July-August				September-October-November			
0.05	20	0	0.116	0.395	1.33	0	0.024	0.181	0.395
0.10	10	0.094	0.475	1.05	2.54	0	0.196	0.451	0.896
0.20	5	1.11	1.72	2.67	5.16	0.399	0.734	1.14	2.05
0.50	2	8.08	9.41	10.5	16.2	3.68	4.63	5.15	7.80

<sup>1</sup>Graphical interpretation.

## 05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND--Continued

Annual peak discharge and corresponding gage height, period of record

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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1945	March 20	10.50	1,000	1970	April 8	12.80	1,220
1946	April 2	10.68	964	1971	April 17	16.31	2,310
1947	April 8	13.89	1,150	1972	March 27	12.26	1,120
1948	April 23	18.10	5,600	1973	March 15	7.52	260
1949	April 17	15.95	2,290	1974	April 15	16.40	2,460
1950	April 17	18.69	7,830	1975	April 25	15.35	1,490
1951	April 19	11.05	989	1976	April 2	13.45	1,450
1952	April 14	13.02	1,240	1977	April 5	5.49	136
1953	July 3	6.22	271	1978	April 12	14.13	1,460
1954	June 26	9.32	682	1979	April 20	17.87	4,680
1955	April 11	11.41	1,060	1980	April 9	10.57	750
1956	April 24	16.32	2,600	1981	March 23	8.61	500
1957	September 4	6.68	280	1982	April 12	15.83	1,900
1958	April 7	7.04	340	1983	April 12	16.24	1,610
1959	April 1	7.95	360	1984	April 3	15.13	1,850
1960	April 14	13.38	1,340	1985	March 23	11.74	930
1961	April 3	5.13	120	1986	March 23	15.56	1,760
1962	April 11	12.69	900	1987	April 5	18.21	4,840
1963	April 6	7.25	300	1988	April 5	10.96	389
1964	June 23	10.34	795	1989	April 16	11.95	796
1965	April 15	16.03	2,320	1990	June 30	10.30	159
1966	March 23	17.62	3,040	1991	May 6	7.09	84.0
1967	March 31	15.75	2,160	1992	March 16	13.72	1,100
1968	March 29	8.31	415	1993	July 25	18.33	2,780
1969	April 17	18.07	5,050	1994	April 1	15.31	1,750
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1950	April 17	18.69	7,830	1978	April 12	14.13	1,460
1948	April 23	18.10	5,600	1976	April 2	13.45	1,450
1969	April 17	18.07	5,050	1960	April 14	13.38	1,340
1987	April 5	18.21	4,840	1952	April 14	13.02	1,240
1979	April 20	17.87	4,680	1947	April 8	13.89	1,150
1966	March 23	17.62	3,040	1970	April 8	12.80	1,220
1993	July 25	18.33	2,780	1972	March 27	12.26	1,120
1956	April 24	16.32	2,600	1992	March 16	13.72	1,100
1974	April 15	16.40	2,460	1955	April 11	11.41	1,060
1965	April 15	16.03	2,320	1945	March 20	10.50	1,000
1971	April 17	16.31	2,310	1951	April 19	11.05	989
1949	April 17	15.95	2,290	1946	April 2	10.68	964
1967	March 31	15.75	2,160	1970	April 8	11.25	964
1982	April 12	15.83	1,900	1985	March 23	11.74	930
1984	April 3	15.13	1,850	1962	April 11	12.69	900
1986	March 23	15.56	1,760	1989	April 16	11.95	796
1994	April 1	15.31	1,750	1964	June 23	10.34	795
1983	April 12	16.24	1,610	1980	April 9	10.57	750
1975	April 25	15.35	1,490	1954	June 26	9.32	682

## 05057000 SHEYENNE RIVER NEAR COOPERSTOWN, ND--Continued

Annual peak discharge and corresponding gage height, period of record--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)
<b>Annual peak discharge, from highest to lowest, and corresponding gage height--Continued</b>							
1981	March 23	8.61	500	1953	July 3	6.22	271
1968	March 29	8.31	415	1973	March 15	7.52	260
1988	April 5	10.96	389	1990	June 30	10.30	159
1959	April 1	7.95	360	1977	April 5	5.49	136
1958	April 7	7.04	340	1961	April 3	5.13	120
1963	April 6	7.25	300	1991	May 6	7.09	84.0
1957	September 4	6.68	280				

# 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

## 05057200 BALDHILL CREEK NEAR DAZEY, ND

### Station Description

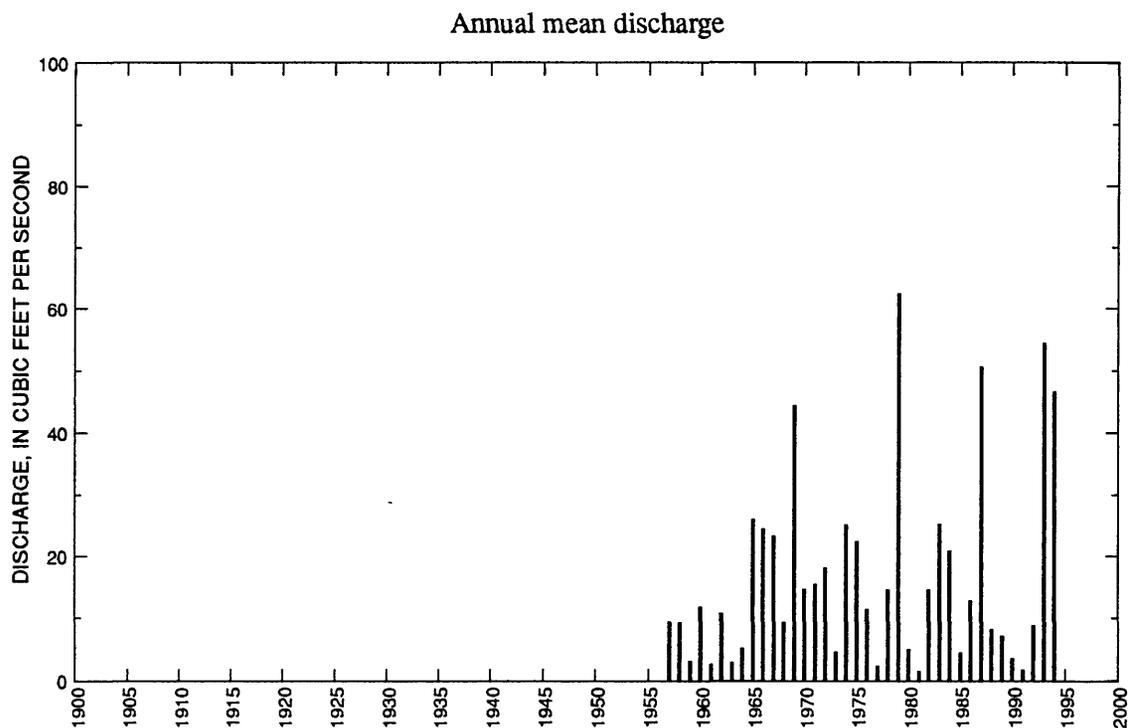
LOCATION.--Lat 47°13'45", long 98°07'28", in NW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.2, T.143 N., R.59 W., Barnes County, Hydrologic Unit 09020203, on left bank 500 ft upstream from bridge on county highway, 4.5 mi northeast of Dazey, and 14 mi upstream from 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; maximum gage height, 17.78 ft, Apr. 19, 1979; minimum discharge, no flow at times.



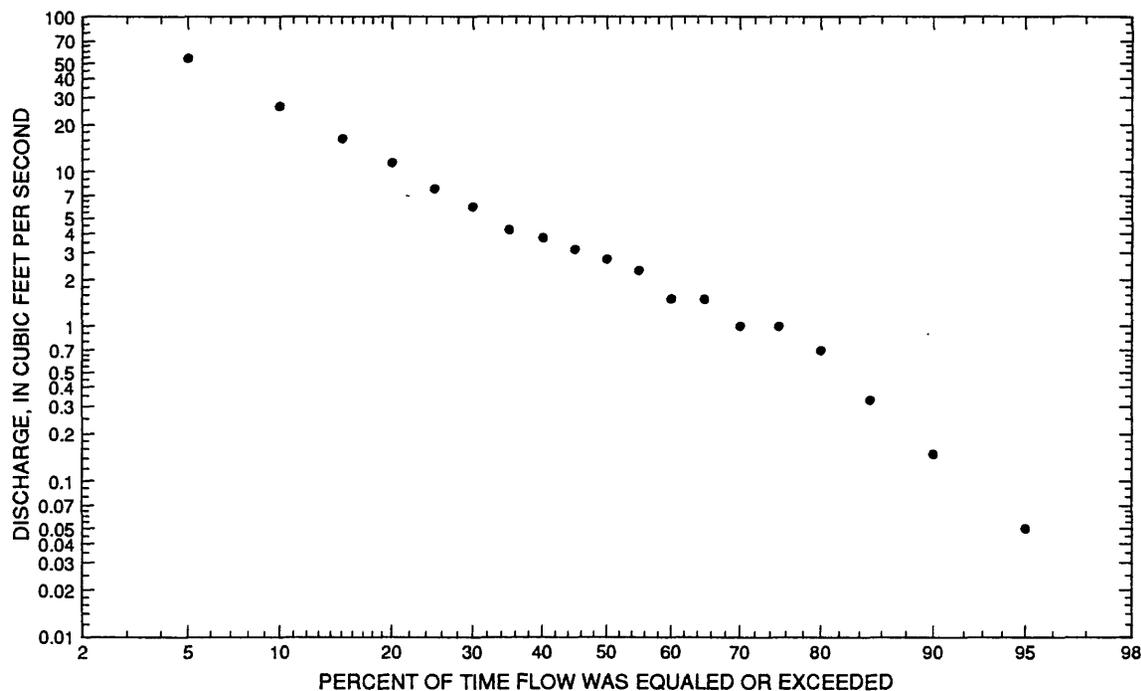
## 05057200 BALDHILL CREEK NEAR DAZEY, ND--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	29.8	1958	0.473	1992	4.33	5.30	1.23	2.15
November	20.5	1958	0.380	1960	3.86	3.45	0.90	1.92
December	7.42	1958	0.155	1959	2.16	1.73	0.80	1.07
January	5.38	1994	0	m	0.930	1.07	1.15	0.46
February	5.37	1983	0	m	1.34	1.61	1.20	0.67
March	270	1987	0.587	1964	47.8	63.9	1.34	23.7
April	654	1979	2.44	1981	85.7	131	1.53	42.6
May	82.0	1979	1.71	1981	16.9	16.0	0.94	8.39
June	50.6	1970	0.907	1961	11.8	11.7	0.99	5.87
July	273	1993	0.021	1989	14.5	43.7	3.01	7.21
August	133	1993	0.076	1984	5.97	21.1	3.53	2.96
September	58.5	1957	0.094	1984	6.07	13.2	2.18	3.01
Annual	62.4	1979	1.52	1981	16.8	15.8	0.94	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	0.08	2.10	1.70	0.75	0.08	0.02	0.10	0.37	0.88	0.09	0.05
90	0	0	0.11	3.40	2.40	1.20	0.22	0.12	0.19	0.63	1.20	0.26	0.15
85	0	0	0.45	5.76	3.40	1.50	0.44	0.31	0.34	1.00	1.40	0.50	0.33
80	0.09	0.07	0.89	6.35	4.00	1.80	0.61	0.58	0.61	1.00	1.70	0.77	0.70
75	0.11	0.10	1.20	7.92	4.80	2.90	0.86	0.58	0.82	1.40	2.00	0.77	1.00
70	0.20	0.12	1.80	9.18	6.14	3.60	1.20	0.80	0.82	1.80	2.00	0.96	1.00
65	0.20	0.20	2.55	12.3	6.91	3.60	1.70	0.80	1.10	1.80	2.00	1.20	1.50
60	0.27	0.20	3.06	15.1	8.11	4.93	2.40	1.10	1.10	2.30	2.40	1.20	1.50
55	0.37	0.26	3.62	18.0	8.92	5.66	2.90	1.10	1.50	2.30	2.40	1.50	2.31
50	0.51	0.34	4.41	21.2	10.9	6.42	3.39	1.50	1.50	2.30	2.80	1.50	2.74
45	0.70	0.56	6.67	24.7	12.9	7.66	3.94	1.50	2.00	3.00	2.80	1.80	3.17
40	0.82	0.72	8.37	30.4	14.8	9.36	5.00	1.50	2.00	3.00	3.40	1.80	3.76
35	0.82	0.92	13.2	39.2	17.2	10.8	6.15	2.00	2.60	3.00	3.40	1.80	4.26
30	1.10	1.20	18.9	49.5	20.2	12.7	7.55	2.00	2.60	4.16	4.00	2.30	5.98
25	1.30	1.50	27.5	64.4	22.6	14.5	10.1	3.44	3.64	4.54	4.00	2.80	7.78
20	1.50	1.50	43.0	84.2	25.6	16.7	12.5	4.14	4.27	5.28	4.70	2.80	11.5
15	1.80	2.00	64.2	119	29.2	20.8	17.3	5.27	5.42	6.53	5.85	3.50	16.5
10	2.10	3.73	125	176	35.9	26.7	23.5	7.17	9.50	8.70	6.65	4.53	26.3
5	2.90	5.08	281	331	48.3	38.4	41.5	14.6	26.2	14.9	8.70	5.92	54.6

## 05057200 BALDHILL CREEK NEAR DAZEY, ND--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	8.30	3.56	3.04	2.54	2.43
0.95	1.05	24.1	12.2	10.4	8.48	7.10
0.90	1.11	42.1	22.9	19.4	15.6	12.3
0.80	1.25	81.6	47.9	40.1	31.4	23.1
0.50	2	279	182	148	110	72.4
0.20	5	912	626	489	338	206
0.10	10	1,660	1,150	876	581	342
0.04	25	3,110	2,150	1,580	1,000	573
0.02	50	4,620	3,160	2,280	1,390	787
0.01	100	6,570	4,430	3,130	1,860	1,040
0.005	200	9,030	5,990	4,140	2,390	1,330
0.002	500	13,200	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0	0	0.064	0.285	0.594
0.10	10	0	0	0	0	0	0	0.115	0.395	0.727
0.20	5	0	0	0	0	0.020	0.094	0.224	0.581	0.946
0.50	2	0.072	0.078	0.097	0.131	0.200	0.371	0.682	1.18	1.67

**05057200 BALDHILL CREEK NEAR DAZEY, ND--Continued**

Probability of seasonal low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0	0	0	0	0	0	0	1.13
0.10	10	0	0	0	0	0	0.037	0.228	1.69
0.20	5	0	0	0	0.032	0.129	0.179	0.553	2.72
0.50	2	0.129	0.156	0.208	0.292	0.645	0.985	2.08	6.62
		June-July-August				September-October-November			
0.05	20	0	0	0	0.070	0	0	0.028	0.224
0.10	10	0	0	0.046	0.164	0.024	0.052	0.095	0.359
0.20	5	0.064	0.096	0.167	0.368	0.094	0.181	0.277	0.619
0.50	2	0.568	0.722	0.926	1.32	0.594	0.930	1.23	1.64

## 05057200 BALDHILL CREEK NEAR DAZEY, ND--Continued

Annual peak discharge and corresponding gage height, period of record

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

# 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	--	--	--	0.681	--	--	118.0	12.1	10.6	3.25	1.75	1.84	--
1957	1.47	4.56	1.75	1.90	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	1.28	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

## 05058000 SHEYENNE RIVER BELOW BALDHILL DAM, ND

### Station Description

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.

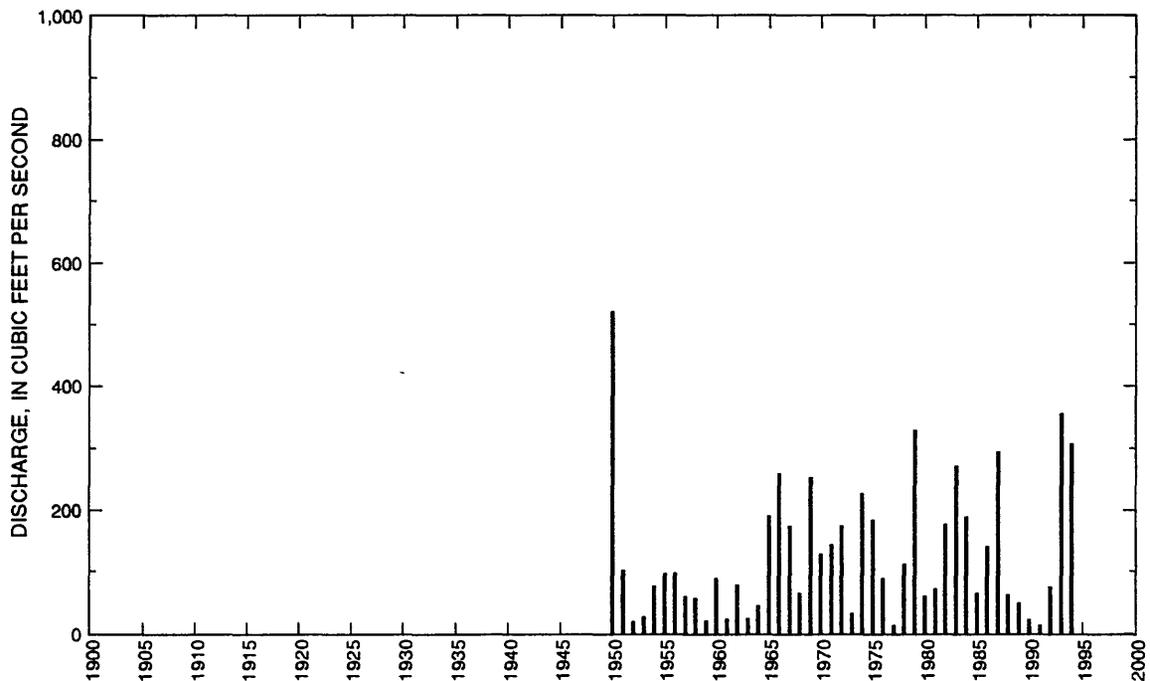
DRAINAGE AREA.--7,470 mi<sup>2</sup>, approximately, of which about 5,560 mi<sup>2</sup> is probably noncontributing, including 3,800 mi<sup>2</sup> in closed basin.

PERIOD OF RECORD.--October 1949 to current year. Monthly discharge only for some periods, published in WSP 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, 36.26 ft, Apr. 24, 1979; minimum discharge, no flow at times in 1950 and 1952-53.

Annual mean discharge

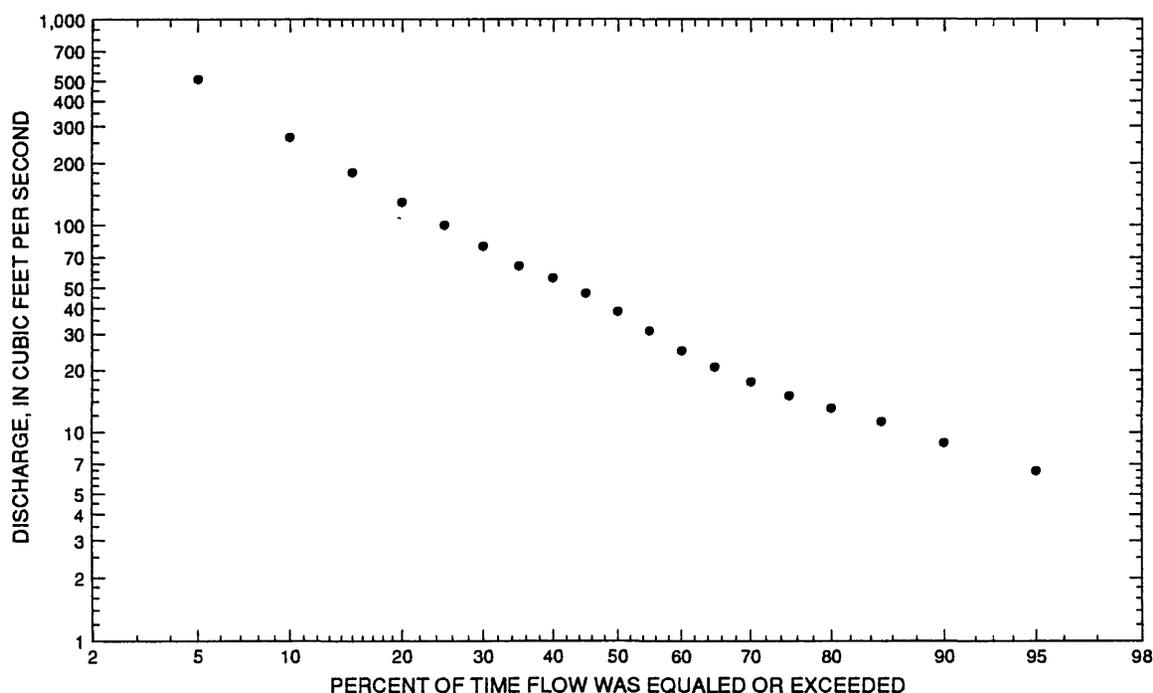


# 05058000 SHEYENNE RIVER BELOW BALDHILL DAM, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	153	1982	1.92	1956	40.9	42.7	1.04	2.62
November	156	1980	5.27	1956	58.7	51.1	0.87	3.76
December	191	1987	4.32	1980	56.5	43.7	0.77	3.62
January	140	1986	3.64	1956	53.9	36.3	0.67	3.45
February	200	1969	7.66	1956	61.1	52.1	0.85	3.91
March	1,240	1983	7.81	1955	173	269	1.55	11.1
April	1,940	1969	2.07	1953	475	512	1.08	30.4
May	2,910	1950	6.86	1959	251	477	1.90	16.1
June	1,150	1950	5.88	1958	148	191	1.29	9.46
July	1,270	1993	7.28	1959	115	203	1.77	7.36
August	1,560	1993	6.72	1977	74.2	231	3.11	4.76
September	577	1994	0.807	1955	53.3	103	1.93	3.42
Annual	521	1950	12.8	1991	130	111	0.86	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	7.66	8.48	6.53	2.00	7.49	7.73	7.27	2.40	2.10	2.30	8.62	7.91	6.53
90	9.68	9.06	9.64	8.05	9.06	10.2	9.72	7.63	7.47	7.45	10.6	9.87	8.92
85	13.5	11.5	13.0	9.81	11.7	12.2	11.3	9.17	9.53	8.99	13.2	15.5	11.2
80	18.1	14.5	16.7	11.7	13.2	13.5	13.4	10.3	10.7	10.5	15.1	18.9	13.1
75	23.8	20.0	20.9	13.9	14.6	15.4	14.9	12.4	12.5	11.5	17.1	24.4	15.0
70	26.7	24.0	26.4	26.4	19.7	18.7	16.4	13.9	14.1	12.5	19.8	29.9	17.5
65	31.2	27.1	35.3	45.8	33.3	26.0	18.7	15.3	15.4	14.1	23.3	37.3	20.8
60	42.3	35.9	50.8	68.7	45.7	33.0	21.5	16.9	16.5	15.2	28.0	41.2	24.9
55	46.5	45.6	56.9	103	60.8	41.1	24.8	18.6	17.6	16.3	33.6	44.8	31.0
50	50.1	50.3	63.8	146	81.2	53.4	28.9	20.3	18.7	17.9	40.0	47.1	38.7
45	53.6	54.1	72.4	230	114	67.4	35.2	22.1	19.8	19.9	44.9	49.3	47.3
40	56.9	57.6	84.2	290	145	82.2	45.2	24.9	22.9	21.9	49.2	51.6	55.6
35	60.2	61.4	102	357	172	100	60.3	27.8	26.3	28.0	53.1	54.8	63.9
30	65.5	67.9	130	446	197	129	77.5	31.6	32.1	35.4	58.9	60.0	79.4
25	72.0	78.6	173	581	273	172	96.9	38.5	39.6	42.7	80.7	68.6	100
20	80.3	91.5	208	827	317	218	138	49.1	50.3	60.4	96.7	85.7	130
15	97.2	104	251	1,110	389	286	203	69.4	66.9	79.7	110	109	181
10	115	130	323	1,440	496	355	283	120	94.5	115	130	125	266
5	136	208	827	1,940	966	518	465	248	240	168	177	152	511

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

Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	29.1	15.3	14.6	14.4	14.3
0.95	1.05	100	64.1	57.6	50.1	42.8
0.90	1.11	181	126	111	92.4	74.2
0.80	1.25	350	265	230	184	139
0.50	2	1,030	875	766	597	422
0.20	5	2,450	2,190	2,010	1,610	1,130
0.10	10	3,560	3,210	3,050	2,520	1,790
0.04	25	5,020	4,500	4,470	3,880	2,840
0.02	50	6,080	5,400	5,540	4,990	3,760
0.01	100	7,100	6,240	6,600	6,160	4,770
0.005	200	8,070	7,000	7,620	7,380	5,880
0.002	500	9,260	ng	ng	ng	ng

Probability of annual low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0.006	0.015	0.258	2.08	3.92	4.68	6.15	7.62
0.10	10	0.090	0.201	0.430	0.870	3.10	5.02	6.15	7.91	10.5
0.20	5	0.580	0.938	1.71	2.48	4.48	6.84	8.63	10.8	15.4
0.50	2	4.01	5.73	7.95	8.97	10.2	12.9	16.9	20.5	30.6

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

Probability of seasonal low discharges

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence Interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	2.88	4.67	5.46	6.14	1.43	1.56	2.03	3.05
0.10	10	5.06	7.13	8.11	9.38	2.60	3.00	3.72	5.85
0.20	5	9.34	11.5	12.7	15.1	5.10	6.23	7.45	12.3
0.50	2	24.7	26.2	27.9	33.2	16.1	21.2	25.1	43.7
		June-July-August				September-October-November			
0.05	20	0.204	1.53	<sup>1</sup> 2.78	4.03	0.077	0.443	1.26	3.23
0.10	10	1.46	3.26	<sup>1</sup> 4.43	5.60	0.330	1.21	2.41	4.84
0.20	5	3.63	5.18	5.22	8.37	1.23	3.32	4.81	7.69
0.50	2	10.8	11.0	16.6	18.3	7.34	13.1	13.9	17.3

<sup>1</sup>Graphical interpretation.

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

Annual peak discharge and corresponding gage height, period of record

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

# 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	44.0	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

## 05058500 SHEYENNE RIVER AT VALLEY CITY, ND

### Station Description

**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.

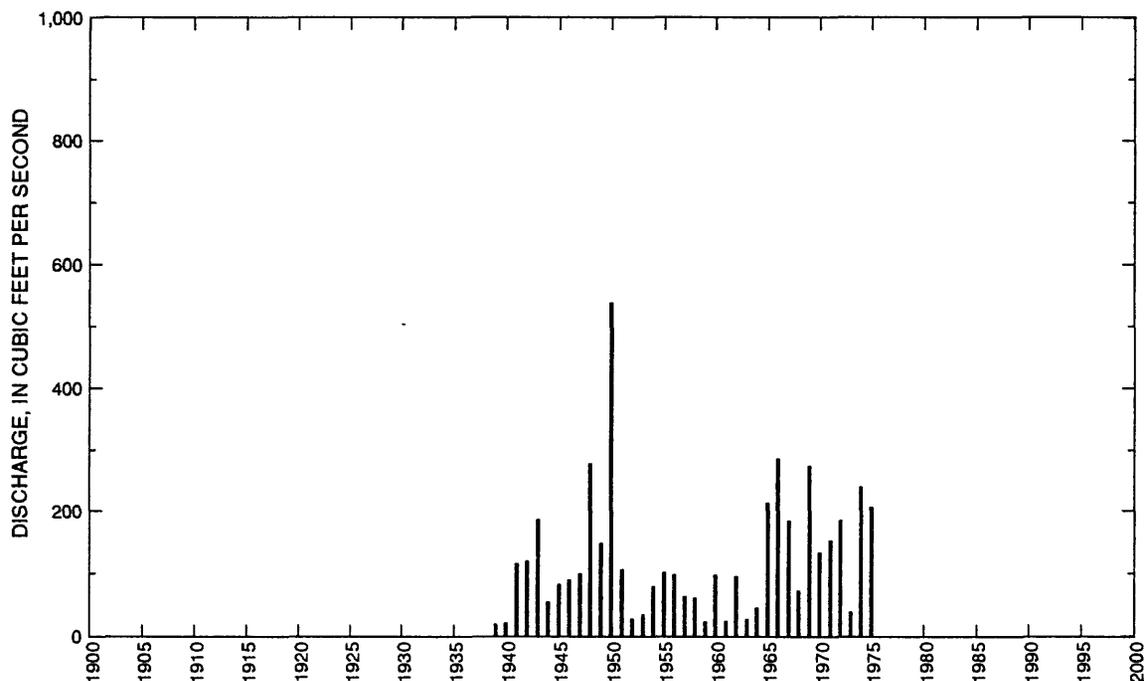
**DRAINAGE AREA.**--7,810 mi<sup>2</sup>, approximately, of which about 5,700 mi<sup>2</sup> is probably noncontributing, includes 3,800 mi<sup>2</sup> in closed basins.

**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 WSP 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, 4,580 ft<sup>3</sup>/s, Apr. 28, 1948, gage height, 17.51 ft; maximum gage height, 18.05 ft, July 16 1993; no flow for several periods during 1938-41.

Annual mean discharge



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

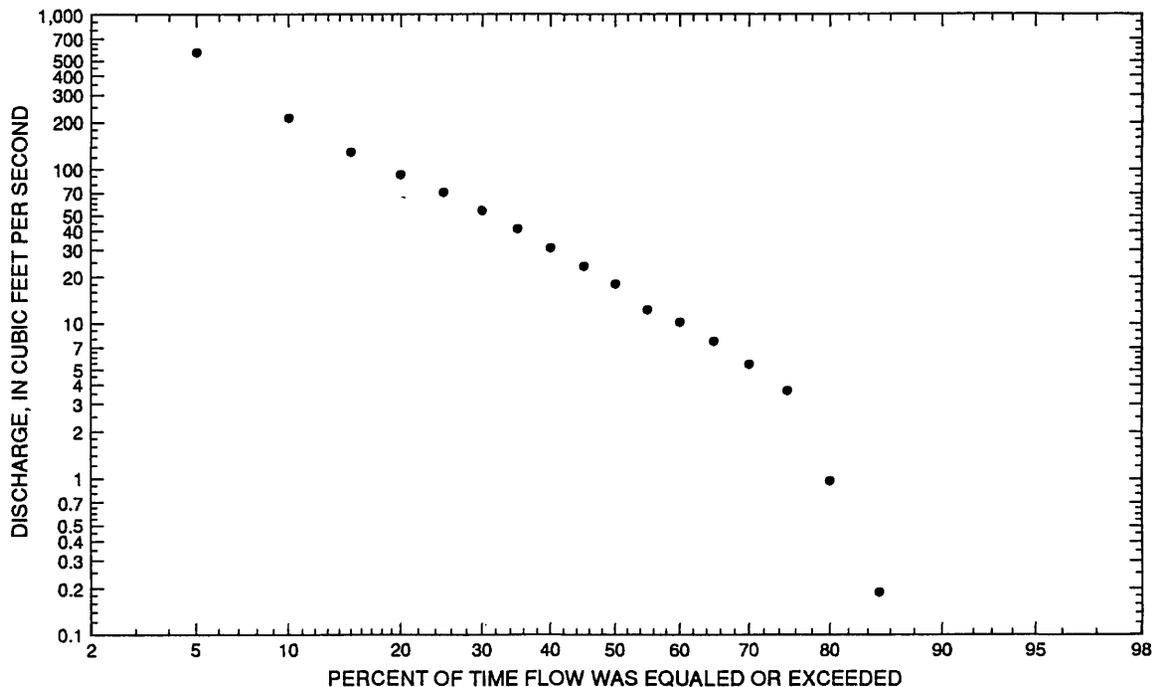
## Pre-regulation period

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

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	51.9	1942	0.048	m	15.5	17.4	1.12	1.18
November	54.7	1945	0	m	19.8	17.0	0.86	1.50
December	21.6	1942	0	1940	11.1	9.43	0.85	0.85
January	15.3	1947	0	m	6.18	5.03	0.81	0.47
February	20.0	1943	0	m	6.21	5.95	0.96	0.47
March	470	1943	0	1940	168	187	1.11	12.8
April	2,080	1948	45.3	1938	702	637	0.91	53.4
May	960	1948	21.1	1939	177	256	1.44	13.5
June	407	1943	8.43	1938	109	109	1.00	8.29
July	131	1943	0.316	1940	52.2	38.6	0.74	3.97
August	74.5	1944	0.026	1939	26.7	23.5	0.88	2.03
September	100	1944	0.010	1939	20.3	29.9	1.47	1.55
Annual	277	1948	18.4	1939	110	74.9	0.68	100

## Annual flow duration, pre-regulation period



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

Monthly and annual flow duration, in cubic feet per second, pre-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	33.0	19.0	3.53	0	0	0	0	0	0	0
90	0	0	0	53.0	26.7	6.25	0.10	0	0	0	0	0	0
85	0	0	0.60	82.1	33.9	10.0	2.00	0.40	0	0	0	0	0.19
80	0.18	0.18	2.40	106	52.5	19.0	9.60	1.00	0.10	0.18	0.10	0.10	0.97
75	0.26	0.28	4.65	131	60.2	25.2	15.9	2.50	0.20	0.26	0.28	0.18	3.67
70	0.67	2.10	5.78	148	64.1	34.4	22.1	4.74	0.25	0.57	1.70	0.55	5.43
65	3.10	3.80	6.34	178	67.9	50.9	27.2	6.77	1.00	0.69	6.40	4.40	7.64
60	3.70	3.80	8.58	213	72.4	63.4	31.8	9.06	1.60	1.00	12.8	6.79	10.2
55	5.19	3.80	10.8	254	79.3	72.2	36.1	11.5	2.60	3.30	16.3	7.96	12.3
50	5.86	4.94	13.3	321	86.3	80.5	40.4	15.2	4.99	6.65	18.1	8.50	18.1
45	6.39	5.39	17.2	468	94.3	87.4	45.0	19.1	6.91	11.3	19.8	9.89	23.7
40	7.28	5.85	21.9	687	104	94.2	49.7	22.6	10.8	17.3	21.7	11.7	31.1
35	8.41	6.35	35.0	815	122	101	56.1	26.2	16.0	20.7	23.6	13.0	41.1
30	9.74	7.11	56.8	969	147	116	64.0	30.0	24.7	23.3	25.6	14.6	54.0
25	10.2	7.48	98.8	1,120	174	136	74.9	34.9	30.2	26.1	28.1	16.6	70.7
20	10.6	7.85	220	1,280	205	162	87.3	41.4	35.0	30.5	32.3	18.3	91.7
15	11.1	9.58	450	1,450	236	195	99.7	51.6	40.1	38.4	40.6	20.0	130
10	11.5	11.7	672	1,710	287	243	114	66.2	55.1	46.9	49.1	30.3	212
5	12.9	15.7	921	2,250	417	360	140	102	83.0	56.1	62.9	34.7	570

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

Probability of annual high discharges, pre-regulation period

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	113	127	96.5	81.0	56.8
0.95	1.05	239	252	205	174	124
0.90	1.11	349	358	299	254	184
0.80	1.25	540	538	462	396	291
0.50	2	1,170	1,120	1,000	863	651
0.20	5	2,350	2,200	2,020	1,730	1,340
0.10	10	3,280	3,060	2,830	2,420	1,900
0.04	25	4,580	4,270	3,950	3,370	2,690
0.02	50	5,620	5,260	4,850	4,130	3,320
0.01	100	6,710	6,300	5,790	4,910	3,990
0.005	200	7,840	7,400	6,770	5,720	4,680

Probability of annual low discharges, pre-regulation period

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0	0
0.20	5	0	0	0	0	0	0	0	0	0.559
0.50	2	0.553	0.685	0.903	1.34	2.57	5.76	7.01	9.74	13.6

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

Probability of seasonal low discharges, pre-regulation period

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	8.12
0.20	5	0	0.056	0.066	0.086	0.493	0.914	2.12	18.9
0.50	2	0.875	1.16	2.58	4.54	3.38	4.76	8.51	43.1
		June-July-August				September-October-November			
0.05	20	0	0	0	0.036	0	0	0	0
0.10	10	0	0	0.002	0.197	0	0	0	0
0.20	5	0.135	0.349	0.503	1.14	0	0	0	0.049
0.50	2	3.36	6.53	9.91	13.6	0.865	1.53	1.98	3.11

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

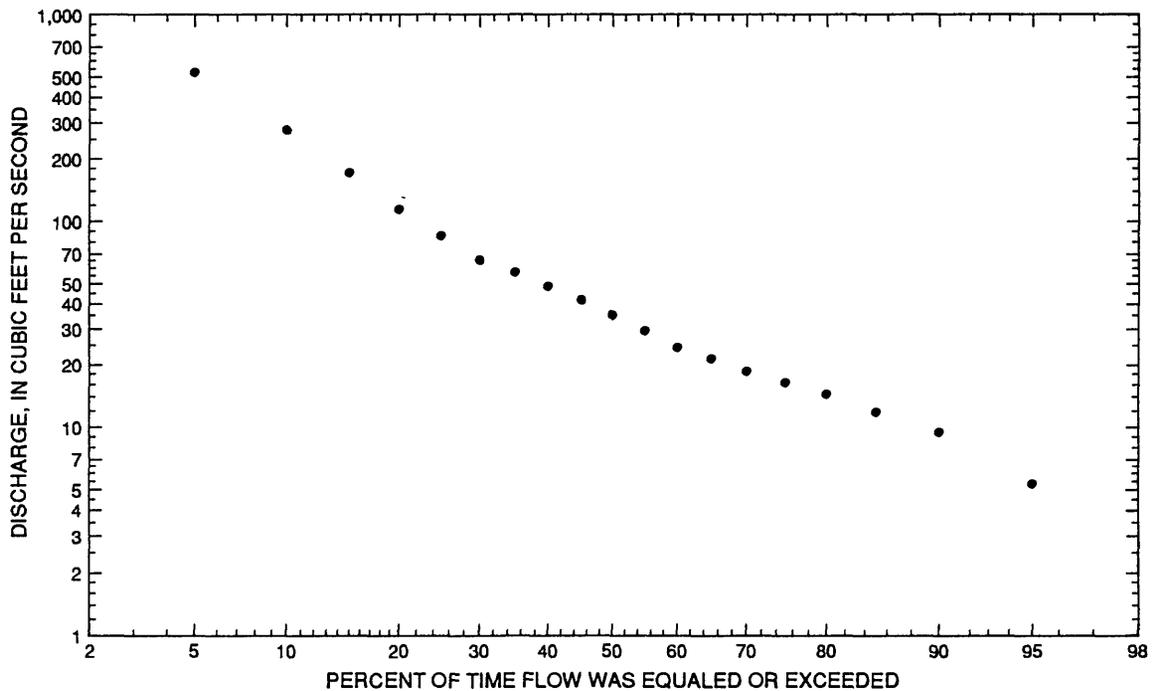
## Post-regulation period

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

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	116	1983	1.29	1956	30.5	33.0	1.08	1.83
November	192	1983	2.19	1956	48.9	45.0	0.92	2.93
December	155	1972	6.27	1956	49.2	31.5	0.64	2.94
January	119	1972	2.66	1956	50.8	29.3	0.58	3.04
February	300	1994	7.17	1956	70.1	6,801	0.97	4.20
March	1,230	1966	10.0	1964	164	233	1.42	9.81
April	2,090	1969	3.19	1953	547	569	1.04	32.8
May	2,980	1950	9.77	1959	302	570	1.89	18.1
June	1,230	1950	8.49	1958	201	236	1.17	12.0
July	501	1994	10.2	1963	112	110	0.98	6.69
August	216	1966	7.94	1963	38.9	47.6	1.22	2.33
September	507	1994	2.29	m	55.7	109	1.96	3.34
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	10.9	8.93	9.34	3.88	10.4	9.73	8.16	2.50	1.60	1.30	7.50	9.32	5.36
90	15.7	14.1	14.0	9.53	12.4	13.6	10.5	5.63	3.84	4.39	11.3	14.7	9.54
85	20.0	17.9	17.0	14.3	14.5	16.6	13.4	8.33	8.00	6.98	13.1	18.9	11.9
80	23.4	21.1	20.5	18.4	17.1	19.5	15.9	10.8	10.5	10.6	14.4	24.8	14.5
75	25.8	23.1	24.7	27.2	19.9	23.0	18.1	12.5	12.4	12.2	15.6	27.1	16.5
70	30.0	26.7	30.2	38.3	28.1	29.8	20.4	13.8	14.0	13.4	17.9	30.7	18.7
65	38.0	29.9	38.2	58.5	37.6	41.0	24.7	15.0	15.3	14.3	21.2	36.7	21.6
60	40.8	35.2	48.9	79.9	58.7	53.2	28.6	16.3	16.3	15.1	24.7	40.5	24.5
55	43.7	42.3	57.7	127	74.3	68.2	33.8	17.6	17.3	15.9	27.4	43.1	29.6
50	47.2	46.3	65.5	193	104	83.8	41.4	19.0	18.3	16.8	30.5	45.8	35.4
45	50.7	51.3	75.8	260	134	105	48.6	20.4	19.3	17.9	37.2	48.0	42.0
40	53.3	57.5	88.1	318	169	128	60.3	21.8	20.9	19.2	42.8	50.0	48.9
35	55.9	63.8	105	401	204	158	77.3	23.3	23.6	20.5	48.2	51.9	57.3
30	58.4	68.4	134	566	248	197	101	26.4	26.5	21.8	53.5	53.9	65.7
25	63.1	75.2	181	799	306	268	129	31.5	32.5	26.5	60.5	57.2	86.0
20	72.3	94.8	231	1,000	372	315	190	40.0	40.8	37.8	84.0	62.5	115
15	84.8	124	272	1,290	461	378	252	67.3	61.4	45.3	98.8	77.2	173
10	98.5	183	332	1,690	655	466	332	101	110	68.3	111	94.8	279
5	112	241	762	2,340	1,230	629	427	183	296	112	153	113	528

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

Probability of annual high discharges, post-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	35.2	24.3	17.7	16.3
0.95	1.05	201	108	78.3	56.9	47.5
0.90	1.11	316	185	138	101	80.5
0.80	1.25	523	337	262	193	147
0.50	2	1,200	911	773	586	415
0.20	5	2,320	2,040	1,900	1,500	1,020
0.10	10	3,100	2,900	2,840	2,310	1,550
0.04	25	4,030	4,120	4,160	3,490	2,330
0.02	50	4,680	4,830	5,180	4,440	2,960
0.01	100	5,280	5,620	6,220	5,450	3,640
0.005	200	5,830	6,370	7,260	6,480	4,340

Probability of annual low discharges, post-regulation period

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	<sup>1</sup> 0.190	0.309	0.810	1.35	2.32	3.30	4.31	5.43	7.01
0.10	10	<sup>1</sup> 0.200	0.605	1.41	2.18	3.61	4.76	6.14	7.44	9.96
0.20	5	<sup>1</sup> 0.800	1.27	2.58	3.70	5.76	7.20	9.15	10.7	14.8
0.50	2	<sup>1</sup> 1.80	4.24	6.66	8.52	11.7	14.4	17.9	20.2	28.9

<sup>1</sup>Graphical interpretation.

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

Probability of seasonal low discharges, post-regulation period

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	3.76	4.64	5.97	7.30	0.687	1.76	2.86	4.06
0.10	10	6.74	7.88	9.59	12.1	1.48	3.10	4.67	7.38
0.20	5	12.2	13.6	15.7	20.1	3.49	5.96	8.39	14.7
0.50	2	27.6	29.8	32.3	39.8	14.5	18.9	25.0	48.4
		June-July-August				September-October-November			
0.05	20	0.339	1.84	3.05	6.77	0.373	1.18	1.81	2.70
0.10	10	0.792	2.83	4.02	7.72	0.744	2.13	3.01	4.19
0.20	5	1.90	4.53	5.64	9.40	1.60	3.99	5.24	6.82
0.50	2	6.49	9.79	10.8	15.7	5.62	10.4	12.5	15.4

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

Annual peak discharge and corresponding gage height, period of record

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

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

Annual peak discharge and corresponding gage height, period of record--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)
<b>Annual peak discharge, from highest to lowest, and corresponding gage height--Continued</b>							
1972	April 16	7.23	1,070	1981	April 2	5.91	542
1945	March 24	7.06	1,020	1940	April 8	5.14	525
1959	June 27	7.02	988	1944	June 3	4.50	399
1989	March 30	8.38	850	1939	April 6	4.34	342
1980	August 29	7.00	765	1990	July 11	4.59	278
1973	March 14	6.32	761	1961	March 2	4.01	251
1954	July 13	6.29	726	1958	July 17	4.21	248
1985	May 17	6.37	680	1938	March 29	3.90	244
1952	March 31	6.02	650	1988	February 28	4.80	150
1964	June 28	6.56	643	1963	July 26	3.39	78.0
1957	September 4	6.48	627	1991	August 24	3.37	77.0

# 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	1.65	0.026	0.010	18.4
1940	0.048	0	0	0	0	0	172.1	62.0	8.50	0.316	1.72	0.063	20.2
1941	0.048	0	0.016	0	0	68.0	953.3	116.8	131.7	59.8	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	109.1	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	294.8	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	--

## 05058700 SHEYENNE RIVER AT LISBON, ND

### Station Description

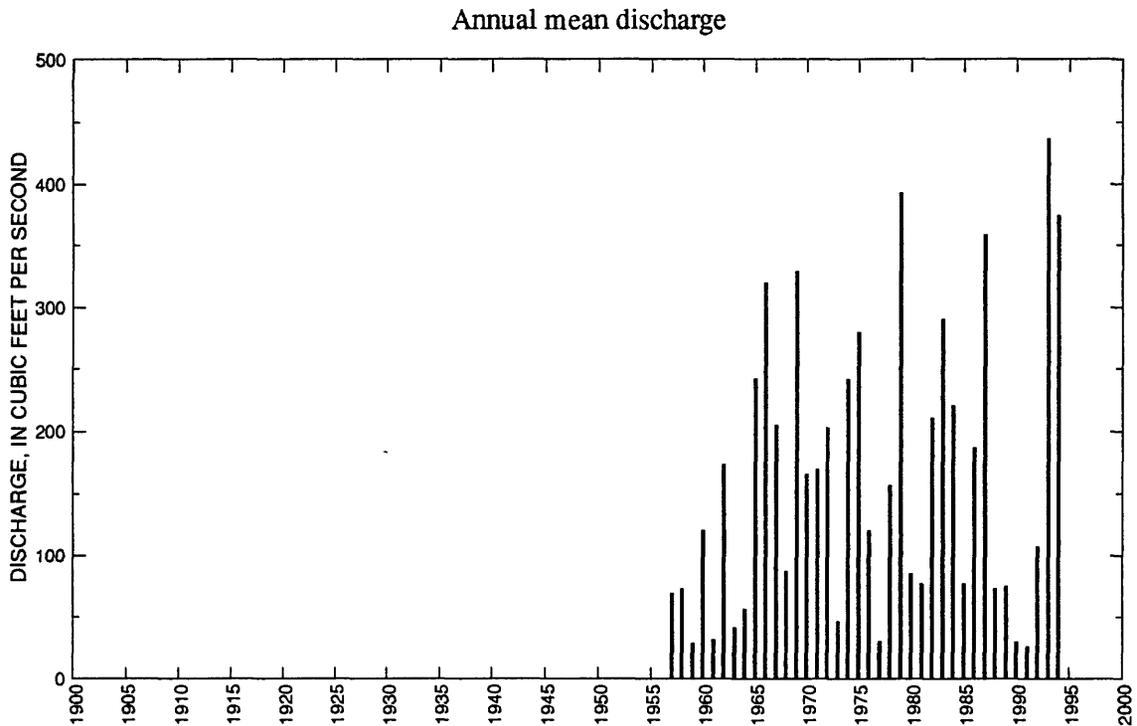
LOCATION.--Lat 46°26'49", long 97°40'44", on line between secs.1 and 2, T.134 N., R.56 W., Ransom County, Hydrologic Unit 09020204, on left bank 150 ft downstream from dam at State Fish Hatchery at north edge of city of Lisbon, 3 mi upstream from Timber Coulee, and at mile 162.1.

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, 5,270 ft<sup>3</sup>/s, July 1, 1975 (gage height, 19.04 ft); minimum discharge, no flow Sept. 19-21 and Oct. 23-24, 1956, and Aug. 16, 1961 (gage height, 1.53 ft).

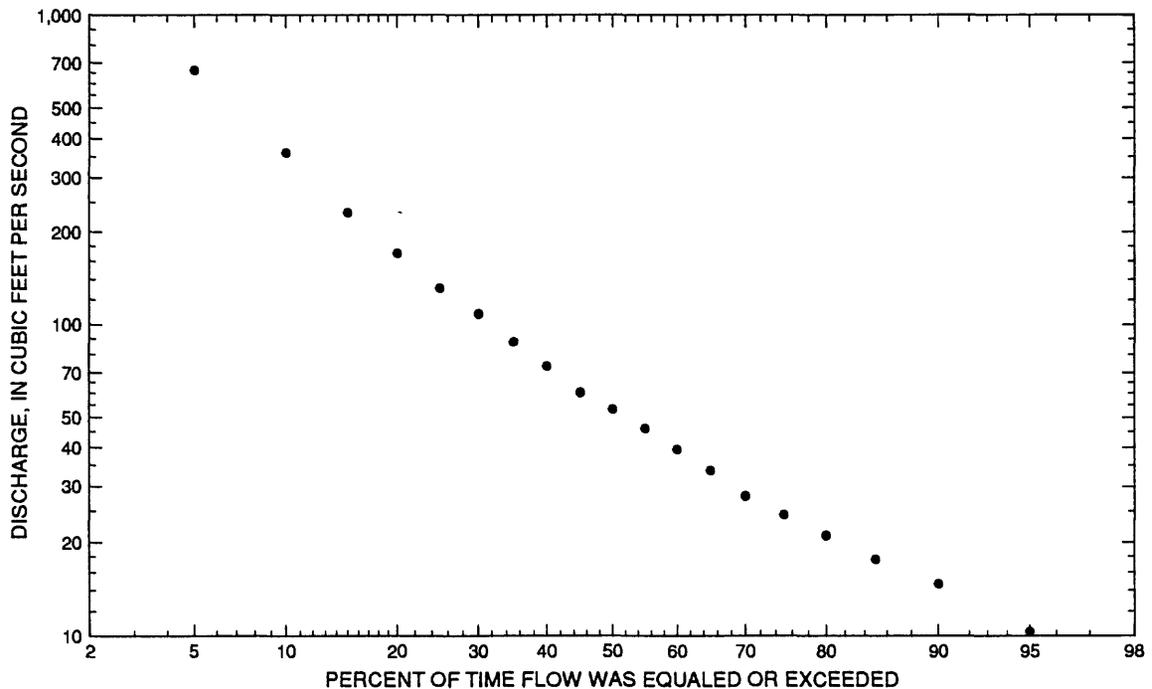


## 05058700 SHEYENNE RIVER AT LISBON, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	150	1994	7.66	1957	49.2	42.8	0.87	2.51
November	195	1983	12.2	1991	66.2	50.2	0.76	3.38
December	191	1994	8.69	1991	64.0	48.0	0.75	3.27
January	140	1986	8.15	1991	59.9	39.3	0.66	3.06
February	202	1969	10.7	1991	72.6	53.6	0.74	3.71
March	1,330	1987	30.9	1990	294	325	1.11	15.0
April	2,550	1969	20.3	1991	606	598	0.99	31.0
May	1,990	1979	17.5	1959	261	359	1.38	13.3
June	555	1974	14.8	1961	157	139	0.88	8.03
July	1,420	1993	6.07	1973	160	273	1.70	8.18
August	1,940	1993	6.54	1961	103	314	3.05	5.26
September	561	1994	5.25	1959	65.5	113	1.72	3.34
Annual	437	1993	25.9	1991	163	117	0.72	100

Annual flow duration



# 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	14.1	14.6	20.2	21.4	17.3	14.6	5.62	5.36	6.45	7.57	14.5	12.6	10.3
90	15.8	16.3	26.6	29.3	21.6	20.3	10.1	7.52	9.72	11.2	18.2	16.0	14.7
85	19.9	18.2	42.3	37.7	25.0	25.4	14.3	9.86	12.0	13.9	20.9	20.7	17.7
80	23.5	23.1	49.6	50.3	30.8	32.2	17.3	11.8	13.6	16.2	23.6	26.5	21.0
75	28.3	30.9	61.9	65.7	38.4	38.6	20.0	14.1	15.5	18.4	26.6	32.0	24.5
70	33.5	39.1	73.8	85.1	48.7	45.3	22.9	15.8	17.6	20.2	29.8	36.6	28.1
65	37.5	42.6	82.6	112	57.0	52.9	25.7	17.5	19.7	22.0	33.3	40.2	33.8
60	43.2	45.8	94.3	140	75.4	60.9	30.0	19.5	21.7	23.9	37.2	43.6	39.5
55	47.6	50.6	111	209	108	69.9	35.6	21.4	23.8	26.2	41.7	46.9	46.1
50	51.5	57.9	132	316	134	79.5	43.9	23.4	25.8	29.4	46.8	50.4	53.2
45	55.2	64.3	153	396	162	89.9	52.4	26.3	28.8	32.5	52.1	54.2	60.4
40	61.1	69.6	190	487	193	106	61.0	29.8	31.9	35.7	58.1	58.0	73.4
35	68.3	79.9	229	601	231	130	78.0	35.2	36.4	43.9	65.1	64.1	88.2
30	75.6	91.9	264	748	273	162	97.3	44.6	42.0	53.5	78.0	72.0	109
25	87.7	100	305	927	336	194	135	56.9	49.4	65.8	96.3	87.9	131
20	106	112	381	1,140	434	240	172	73.9	59.9	82.1	110	108	171
15	123	130	506	1,380	515	288	230	107	76.8	104	133	129	232
10	134	167	902	1,820	661	378	367	166	123	142	151	153	360
5	150	254	1,500	2,490	901	508	600	352	305	195	243	189	661

## 05058700 SHEYENNE RIVER AT LISBON, ND--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	131	87.1	49.3	30.2	22.6
0.95	1.05	273	196	129	87.1	65.0
0.90	1.11	396	295	209	147	110
0.80	1.25	609	475	363	267	200
0.50	2	1,320	1,110	948	753	568
0.20	5	2,660	2,410	2,210	1,850	1,420
0.10	10	3,740	3,510	3,280	2,800	2,180
0.04	25	5,280	5,130	4,850	4,200	3,330
0.02	50	6,520	6,480	6,140	5,360	4,290
0.01	100	7,840	7,930	7,510	6,580	5,320
0.005	200	9,220	9,480	8,940	7,860	6,420
0.002	500	11,200	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0.044	0.389	1.80	3.36	5.73	8.20	9.37	10.4	14.6
0.10	10	0.305	0.998	2.65	4.26	6.74	9.44	11.0	12.5	17.9
0.20	5	1.42	2.57	4.14	5.75	8.40	11.5	13.6	16.0	23.1
0.50	2	8.05	9.17	<sup>1</sup> 9.88	10.6	13.9	18.6	22.6	27.2	38.8

<sup>1</sup>Graphical interpretation.

## 05058700 SHEYENNE RIVER AT LISBON, ND--Continued

Probability of seasonal low discharges

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	4.80	8.51	9.60	11.6	8.25	10.1	11.4	14.8
0.10	10	7.76	11.6	13.0	15.6	11.4	13.9	16.1	22.9
0.20	5	13.1	16.6	18.4	22.0	16.9	20.5	24.4	38.1
0.50	2	30.3	32.1	34.9	40.6	35.2	43.3	54.7	94.3
		June-July-August				September-October-November			
0.05	20	1.58	2.47	3.68	5.52	0.224	2.77	4.88	8.26
0.10	10	2.42	3.47	4.81	7.11	0.837	4.10	6.41	10.0
0.20	5	3.85	5.33	6.86	10.0	2.99	6.43	8.98	12.9
0.50	2	9.54	12.7	15.0	21.6	13.9	14.3	17.5	22.2

## 05058700 SHEYENNE RIVER AT LISBON, ND—Continued

Annual peak discharge and corresponding gage height, period of record

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

# 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	40.1	5.25
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

## 05059000 SHEYENNE RIVER NEAR KINDRED, ND

### Station Description

**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.

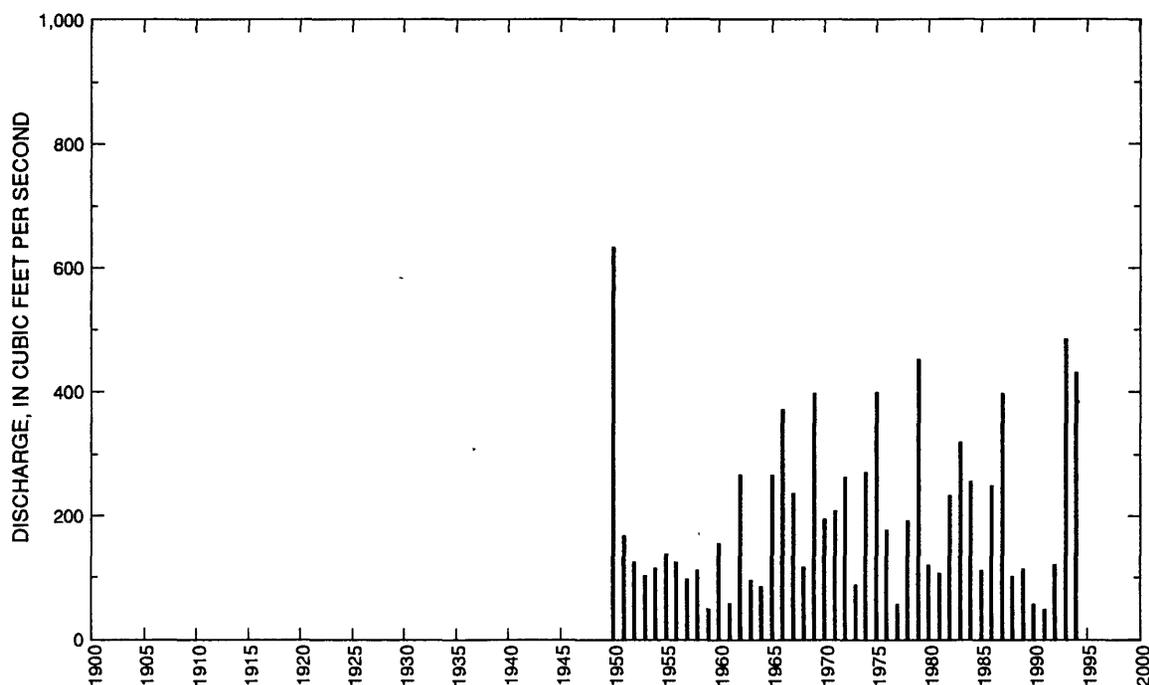
**PERIOD OF RECORD.**--July 1949 to current year.

**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, non recording gage at same site and datum.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 4,690 ft<sup>3</sup>/s, Apr. 15, 1969; maximum gage height, 21.66 ft, July 6, 1975; 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 22.1 ft from floodmarks, discharge about 3,600 ft<sup>3</sup>/s.

Annual mean discharge

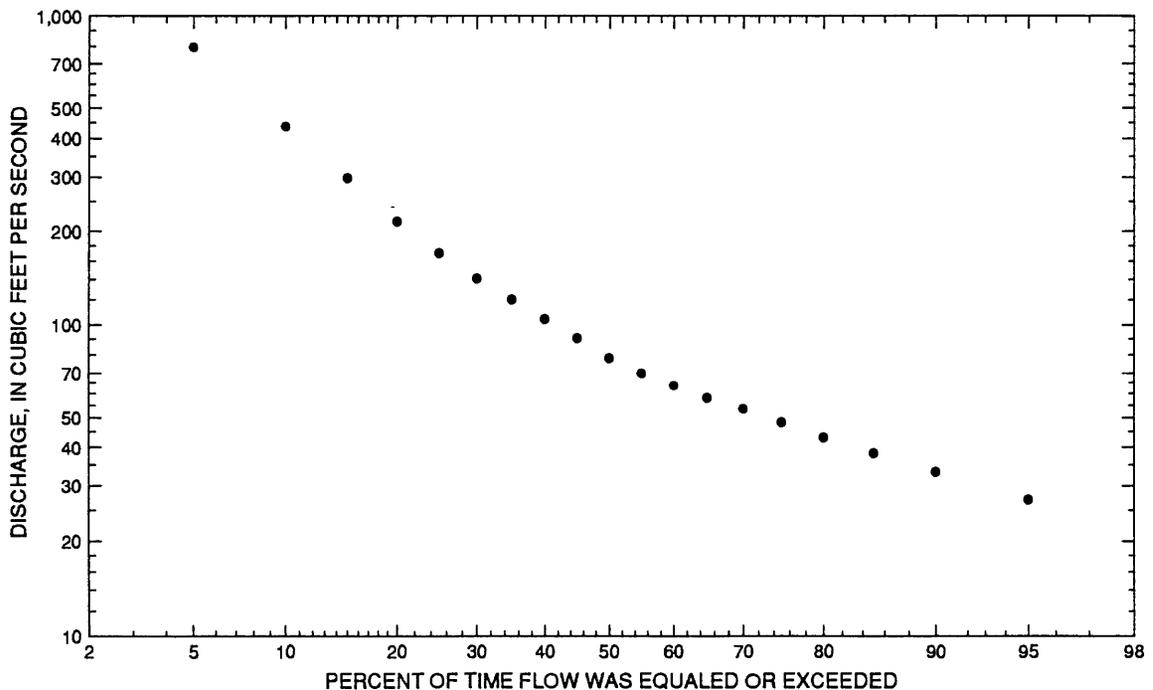


## 05059000 SHEYENNE RIVER NEAR KINDRED, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	224	1994	24.6	1957	71.2	44.2	0.62	2.92
November	232	1980	22.7	1956	82.2	51.0	0.62	3.37
December	247	1994	17.6	1956	75.3	51.1	0.68	3.09
January	170	1987	17.5	1991	69.3	42.5	0.61	2.85
February	221	1976	26.6	1991	77.8	48.9	0.63	3.19
March	1,260	1987	35.1	1956	277	284	1.02	11.4
April	2,460	1969	71.7	1991	673	567	0.84	27.6
May	3,050	1950	53.6	1990	410	567	1.38	16.8
June	1,940	1950	48.4	1961	254	297	1.17	10.4
July	1,470	1975	26.7	1988	228	312	1.37	9.34
August	2,230	1993	22.5	1977	134	329	2.46	5.49
September	483	1993	25.1	1959	83.8	98.6	1.18	3.44
Annual	633	1950	48.0	1991	203	137	0.67	100

Annual flow duration



# 05059000 SHEYENNE RIVER NEAR KINDRED, ND--Continued

Monthly and annual flow duration, in cubic feet per second

Percentage of days discharged or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	22.2	27.1	33.3	71.6	56.5	51.2	28.8	20.7	23.3	25.9	27.5	21.3	27.2
90	27.2	31.2	44.7	89.5	64.6	59.4	36.5	24.8	28.3	30.5	32.9	31.0	33.5
85	33.2	35.1	52.3	108	71.1	65.9	44.3	28.6	30.4	35.1	37.9	35.8	38.3
80	36.0	38.7	60.4	128	79.6	73.0	51.9	31.9	32.6	38.8	41.1	39.8	43.2
75	39.3	42.7	69.4	152	90.2	81.2	59.0	35.0	35.0	41.4	43.7	43.5	48.6
70	44.1	46.2	81.1	172	101	91.9	65.9	38.2	37.4	43.9	46.2	46.2	53.6
65	48.0	48.7	95.0	202	114	105	73.1	41.5	40.2	46.5	49.7	48.8	58.4
60	50.0	51.4	108	248	131	123	80.5	45.0	43.4	49.2	54.1	50.9	64.0
55	51.9	55.9	124	304	160	137	90.5	48.6	47.3	51.8	58.9	53.0	69.8
50	55.2	60.5	140	390	209	154	103	52.3	51.1	54.4	63.5	56.1	78.4
45	58.9	65.2	153	461	243	175	118	56.4	54.9	58.1	68.0	59.1	90.8
40	63.4	71.9	172	552	281	200	135	62.0	59.6	62.0	72.8	62.8	105
35	69.0	78.8	212	683	320	226	155	69.0	65.4	65.8	80.4	67.1	121
30	73.5	90.4	259	814	367	259	179	81.2	74.2	74.1	90.9	80.7	142
25	88.6	98.7	303	951	448	304	223	99.9	82.9	84.7	107	99.0	170
20	105	109	362	1,130	528	352	299	125	93.7	98.5	121	116	217
15	122	118	443	1,340	617	398	380	170	107	116	138	133	298
10	144	141	583	1,680	854	487	478	232	134	133	160	150	436
5	166	188	1,170	2,170	1,450	672	676	354	286	189	200	181	794

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

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	137	104	79.7	68.7	61.4
0.95	1.05	276	225	184	155	128
0.90	1.11	392	332	279	233	187
0.80	1.25	591	519	450	374	293
0.50	2	1,220	1,140	1,040	866	668
0.20	5	2,380	2,300	2,160	1,844	1,460
0.10	10	3,270	3,200	3,050	2,650	2,150
0.04	25	4,510	4,460	4,290	3,820	3,220
0.02	50	5,500	5,450	5,270	4,770	4,140
0.01	100	6,520	6,480	6,280	5,780	5,180
0.005	200	7,590	7,540	7,310	6,840	6,320
0.002	500	9,050	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	10.9	12.8	14.2	16.3	18.4	21.2	23.4	25.6	28.6
0.10	10	13.0	14.8	16.1	18.1	20.6	24.1	26.6	29.3	33.1
0.20	5	16.3	17.9	19.0	21.0	24.1	28.4	31.6	35.1	40.0
0.50	2	25.3	26.6	27.9	30.0	34.6	41.1	46.0	51.2	59.2

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

Probability of seasonal low discharges

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence Interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	13.3	16.0	18.0	20.8	24.3	26.3	28.7	41.4
0.10	10	16.7	19.9	22.1	25.0	29.2	31.8	34.9	51.8
0.20	5	22.2	26.0	28.2	31.4	36.8	40.6	45.1	68.9
0.50	2	37.9	43.1	45.8	49.3	59.4	68.2	78.1	125
		June-July-August				September-October-November			
0.05	20	13.5	16.4	18.1	20.4	12.1	17.3	19.0	23.0
0.10	10	16.2	19.3	21.3	24.6	14.9	19.9	21.8	26.1
0.20	5	20.7	24.2	26.6	31.5	19.0	24.0	26.2	30.8
0.50	2	34.9	39.4	43.8	54.5	30.5	35.7	39.0	44.7

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

Annual peak discharge and corresponding gage height, period of record

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

# 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	--	--	44.2	29.7	--	200.6	1,575	3,053	1,938	--	93.4	32.0	--
1950	34.8	39.7	47.6	50.0	50.0	87.3	682.7	530.5	184.4	401.4	174.4	57.4	633.3
1951	51.0	64.1	47.4	45.5	59.0	62.1	787.4	116.8	73.4	75.9	59.0	71.2	167.1
1952	61.5	86.7	47.4	34.7	45.6	128.3	99.3	138.9	288.7	267.8	38.9	41.2	123.7
1953	42.8	43.5	35.5	--	--	--	--	--	--	--	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	246.4	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	1165	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

## 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.

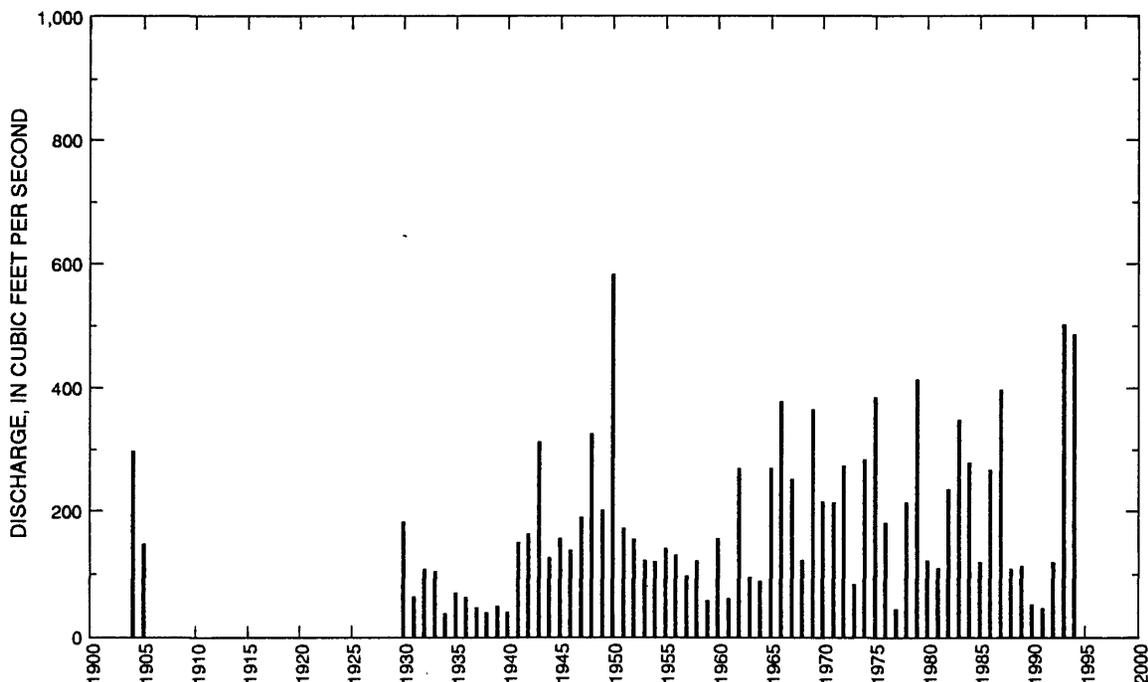
**DRAINAGE AREA.**--8,870 mi<sup>2</sup>, approximately, of which about 5,780 mi<sup>2</sup> is probably noncontributing, including 3,800 mi<sup>2</sup> in closed basins.

**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" 1902-7, 1919. Records for March to November 1902 and November 1905 to June 1907, published in WSP 100, 171, 207, and 245, have been found to be unreliable and should not be used. Monthly discharge only for some periods, published in WSP 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 WSP 1728 or 1913 for history of changes prior to June 27, 1933.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 3,480 ft<sup>3</sup>/s, Apr. 21, 1979; maximum gage height, 22.25 ft, July 5, 1975; minimum daily discharge, 1.0 ft<sup>3</sup>/s, Sept. 23, 1976.

Annual mean discharge



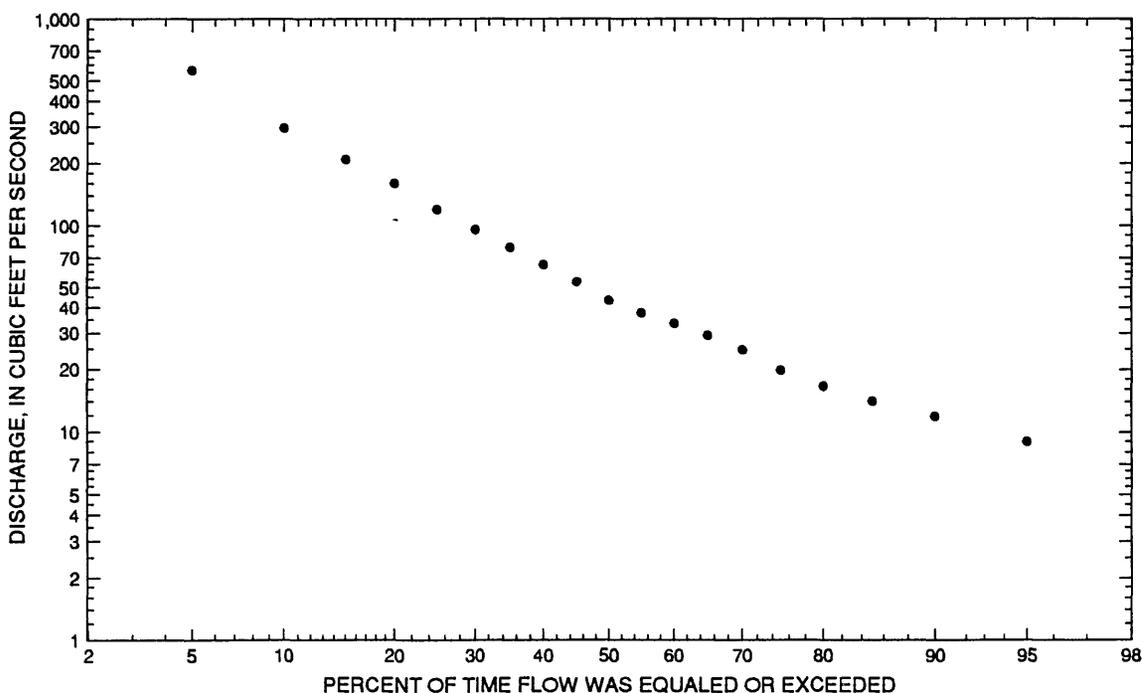
# 05059500 SHEYENNE RIVER AT WEST FARGO, ND--Continued

## Pre-regulation period

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

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	93.2	1905	9.88	1937	39.2	27.8	0.71	2.29
November	92.5	1945	12.4	1937	42.2	25.8	0.61	2.46
December	60.7	1945	7.48	1937	30.2	17.8	0.59	1.77
January	44.5	1945	6.37	1940	22.4	12.0	0.53	1.31
February	61.7	1930	5.47	1937	25.7	15.3	0.60	1.50
March	838	1930	6.76	1940	171	203	1.19	10.0
April	1,660	1943	116	1938	654	515	0.79	38.2
May	1,630	1948	56.2	1934	330	362	1.10	19.2
June	769	1943	25.2	1934	186	160	0.86	10.8
July	272	1943	14.7	1934	96.6	71.0	0.74	5.64
August	303	1905	7.46	1936	68.7	66.2	0.96	4.01
September	185	1944	8.37	1936	46.7	44.2	0.95	2.73
Annual	326	1948	37.1	1934	136	88.4	0.65	100

## Annual flow duration, pre-regulation period



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

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

Percentage of days discharge equaled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	6.40	5.30	6.77	91.0	56.4	28.1	13.5	7.80	6.90	8.91	12.6	8.20	8.96
90	8.20	8.41	11.8	120	67.5	36.7	16.5	10.3	8.64	11.4	14.7	10.6	11.9
85	10.3	10.2	14.7	147	80.1	47.9	19.8	12.5	10.6	12.9	15.8	11.9	14.1
80	10.9	12.0	20.0	177	93.1	59.8	26.4	15.9	12.8	14.1	16.8	13.3	16.6
75	12.0	13.1	26.1	204	106	69.2	33.5	21.5	16.4	15.6	18.3	14.6	19.8
70	12.9	14.3	31.4	228	122	87.2	40.5	26.3	18.9	17.6	19.7	16.2	24.9
65	14.3	15.2	36.1	252	140	101	49.8	30.2	20.5	20.2	21.6	18.4	29.0
60	15.7	16.2	40.0	276	157	110	58.8	34.1	23.2	23.8	30.2	20.1	33.4
55	17.4	17.3	45.1	323	174	121	70.9	39.2	25.7	26.1	33.5	22.7	37.9
50	21.1	20.4	54.6	393	192	144	78.4	47.2	29.0	30.3	37.1	26.2	43.6
45	25.0	23.8	78.1	474	213	162	88.0	54.4	34.2	32.9	41.5	30.0	53.3
40	26.8	27.4	91.9	550	240	176	100	61.1	38.5	36.0	45.0	34.6	65.0
35	29.2	30.7	102	649	273	191	116	67.8	44.3	42.5	47.9	37.9	78.9
30	30.9	32.2	129	799	296	211	130	76.2	53.3	55.5	56.0	41.0	96.1
25	32.9	33.8	164	992	336	239	144	85.1	62.2	65.4	65.0	44.6	120
20	35.4	37.4	209	1,140	698	287	157	96.4	76.0	71.6	69.7	49.1	160
15	39.9	40.8	317	1,330	486	312	181	118	89.9	77.2	77.0	56.1	209
10	41.2	43.9	487	1,650	681	360	206	147	105	84.4	83.4	61.1	297
5	42.4	49.4	838	2,060	1,210	511	240	215	148	91.7	93.4	64.1	565

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

Probability of annual high discharges, pre-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	163	136	123	103	90.5
0.95	1.05	295	240	213	177	151
0.90	1.11	398	324	284	237	199
0.80	1.25	564	461	403	339	281
0.50	2	1,040	887	784	673	552
0.20	5	1,820	1,660	1,520	1,350	1,110
0.10	10	2,390	2,280	2,130	1,940	1,610
0.04	25	3,130	3,180	3,070	2,880	2,420
0.02	50	3,690	3,920	3,880	3,710	3,160
0.01	100	4,260	4,720	4,780	4,680	4,030
0.005	200	4,840	5,580	5,790	5,780	5,050
0.002	500	5,600	ng	ng	ng	ng

Probability of annual low discharges, pre-regulation period

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	3.07	3.49	3.76	4.28	5.12	5.96	6.67	7.54	8.21
0.10	10	4.30	4.82	5.14	5.72	6.68	7.68	8.60	9.64	10.5
0.20	5	6.34	7.00	7.38	8.00	9.14	10.3	11.6	12.9	14.0
0.50	2	12.6	13.4	13.9	14.6	16.1	17.8	19.8	22.2	24.6

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

Probability of seasonal low discharges, pre-regulation period

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	3.73	4.41	4.90	5.97	6.27	6.34	6.49	15.3
0.10	10	5.23	6.02	6.55	7.70	8.63	8.97	9.48	23.7
0.20	5	7.69	8.59	9.14	10.4	12.7	13.6	14.9	38.3
0.50	2	14.8	15.8	16.4	47.7	26.5	30.4	34.7	82.3
		June-July-August				September-October-November			
0.05	20	4.97	5.97	6.48	8.27	4.35	5.11	5.47	5.98
0.10	10	7.29	8.76	9.53	12.3	6.01	6.83	7.29	8.00
0.20	5	11.4	13.7	14.9	19.4	8.75	9.72	10.3	11.4
0.50	2	25.1	30.2	33.6	43.7	17.2	19.1	20.3	22.7

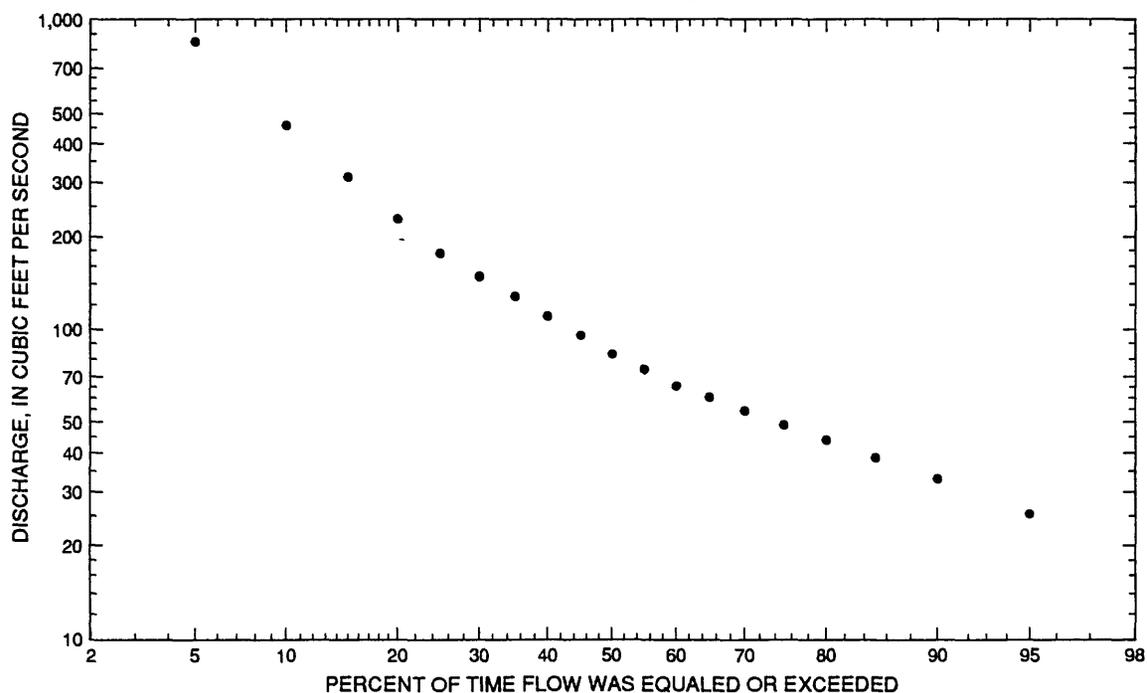
# 05059500 SHEYENNE RIVER AT WEST FARGO, ND--Continued

## Post-regulation period

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

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	246	1994	18.5	1992	73.4	48.1	0.66	2.95
November	241	1980	18.9	1977	84.3	55.8	0.66	3.38
December	227	1987	9.15	1977	76.5	52.2	0.68	3.07
January	176	1987	8.40	1977	69.8	43.8	0.63	2.80
February	223	1994	16.4	1977	78.0	48.1	0.62	3.13
March	1,120	1987	34.0	1956	252	255	1.01	10.1
April	1,790	1969	65.2	1991	692	525	0.76	27.8
May	2,650	1950	54.0	1959	424	513	1.21	17.0
June	1,780	1950	40.2	1977	269	284	1.05	10.8
July	1,360	1975	26.8	1988	246	320	1.30	9.87
August	2,220	1993	21.1	1988	141	328	2.33	5.65
September	532	1993	7.43	1976	85.3	104	1.22	3.42
Annual	584	1950	44.5	1977	208	134	0.65	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	20.6	22.2	35.7	74.4	55.4	48.4	30.5	20.9	21.2	24.8	24.2	19.8	25.4
90	24.9	30.2	44.3	97.8	67.4	59.9	38.2	25.4	27.2	29.9	29.9	26.6	32.9
85	30.9	36.2	52.7	121	79.5	69.6	49.0	29.8	30.7	33.5	36.4	34.4	38.5
80	34.7	40.6	59.5	138	90.2	79.0	57.4	34.2	34.1	37.1	40.8	38.9	43.8
75	37.8	44.8	66.0	161	102	90.8	64.9	38.0	36.6	40.2	44.5	43.9	48.9
70	40.7	48.0	73.9	191	113	104	72.2	41.7	39.2	42.9	47.5	48.4	54.3
65	44.2	50.4	83.8	222	125	118	82.9	45.2	41.8	46.3	51.4	51.2	59.8
60	47.7	53.1	97.2	279	144	130	95.3	48.5	45.4	49.7	56.1	54.0	65.4
55	51.1	56.9	113	343	174	145	108	51.8	49.0	53.2	60.0	56.0	73.6
50	56.6	63.5	130	418	227	164	120	56.5	52.7	56.5	64.6	58.1	82.9
45	64.6	68.1	145	494	260	188	132	61.3	56.5	59.7	69.9	60.2	95.8
40	70.2	74.7	163	615	304	214	148	67.8	60.2	64.0	75.7	64.5	110
35	73.7	83.0	188	733	364	241	166	75.2	65.7	70.1	82.4	71.0	128
30	77.2	93.4	233	887	429	281	190	90.1	75.9	77.3	91.6	82.5	149
25	90.7	99.1	275	1,020	524	331	245	112	87.4	85.5	109	96.3	176
20	108	106	312	1,200	591	370	319	136	98.7	98.2	120	116	228
15	120	120	360	1,290	679	428	402	196	109	124	137	136	314
10	149	145	498	1,770	919	526	499	255	132	145	175	149	459
5	165	176	1,040	2,220	1,570	807	852	379	319	193	210	187	850

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

Probability of annual high discharges, post-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	124	85.6	75.4	67.2	57.2
0.95	1.05	264	210	186	158	128
0.90	1.11	383	324	287	242	191
0.80	1.25	586	526	470	391	305
0.50	2	1,220	1,180	1,070	902	698
0.20	5	2,310	2,270	2,130	1,860	1,470
0.10	10	3,100	3,030	2,890	2,600	2,110
0.04	25	4,130	3,960	3,860	3,600	3,020
0.02	50	4,900	4,610	4,560	4,370	3,760
0.01	100	5,650	5,220	5,230	5,160	4,550
0.005	200	6,400	5,800	5,880	5,950	5,380
0.002	500	7,370	ng	ng	ng	ng

Probability of annual low discharges, post-regulation period

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	5.25	6.23	7.81	9.27	14.5	17.1	19.6	21.9	24.9
0.10	10	8.61	9.76	11.6	13.4	17.9	21.0	23.9	26.5	30.4
0.20	5	14.3	15.6	17.6	19.8	23.0	27.0	30.4	33.6	38.6
0.50	2	28.7	30.9	32.8	35.8	36.8	43.1	48.1	52.8	61.2

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

Probability of seasonal low discharges, post-regulation period

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	13.0	14.1	14.9	16.4	20.8	27.0	31.1	41.6
0.10	10	17.0	18.4	19.7	21.6	26.6	32.4	37.2	51.9
0.20	5	23.1	25.3	27.1	29.6	35.6	40.9	47.0	68.8
0.50	2	39.9	44.5	47.5	51.4	61.6	66.4	78.0	124
		June-July-August				September-October-November			
0.05	20	11.9	14.2	17.2	20.6	6.30	9.52	10.6	17.2
0.10	10	15.6	18.0	21.1	25.4	10.5	14.6	15.9	22.0
0.20	5	21.7	24.3	27.3	33.3	17.7	22.8	24.4	29.1
0.50	2	40.6	43.9	47.8	59.8	35.6	42.6	45.5	48.2

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

Annual peak discharge and corresponding gage height, period of record

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

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

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

# 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

## 05059600 MAPLE RIVER NEAR HOPE, ND

### Station Description

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.

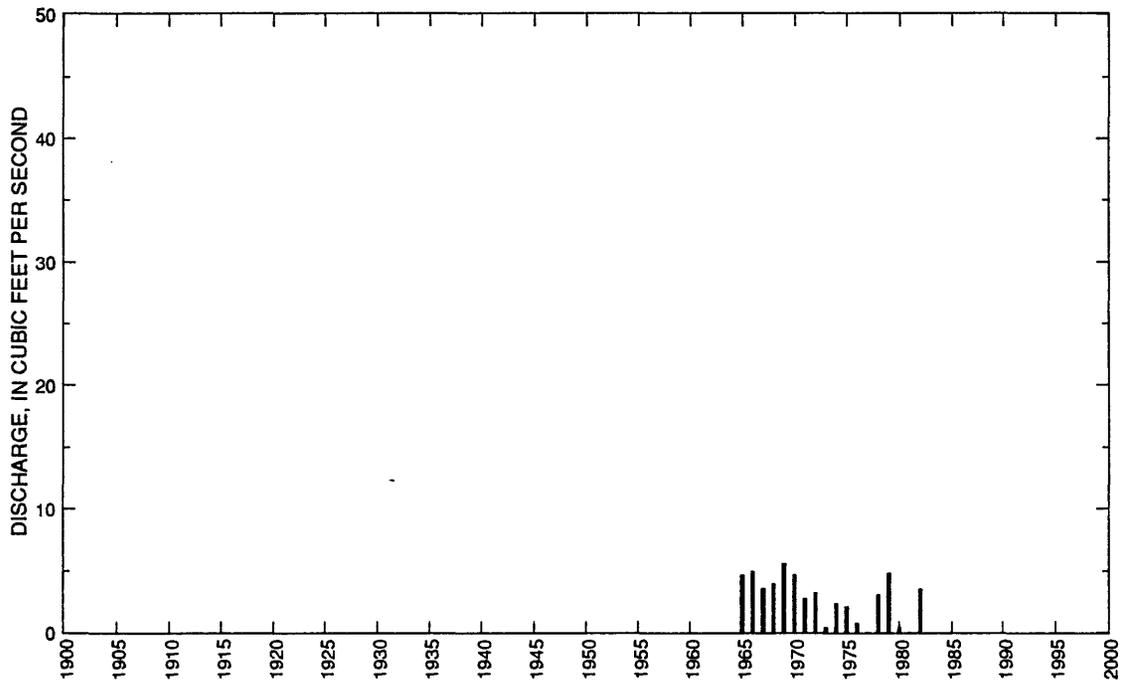
DRAINAGE AREA.--20.2 mi<sup>2</sup>, of which about 2.8 mi<sup>2</sup> is probably noncontributing.

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; maximum gage height, 7.53 ft, July 24, 1993; minimum discharge, no flow for several months each year.

Annual mean discharge



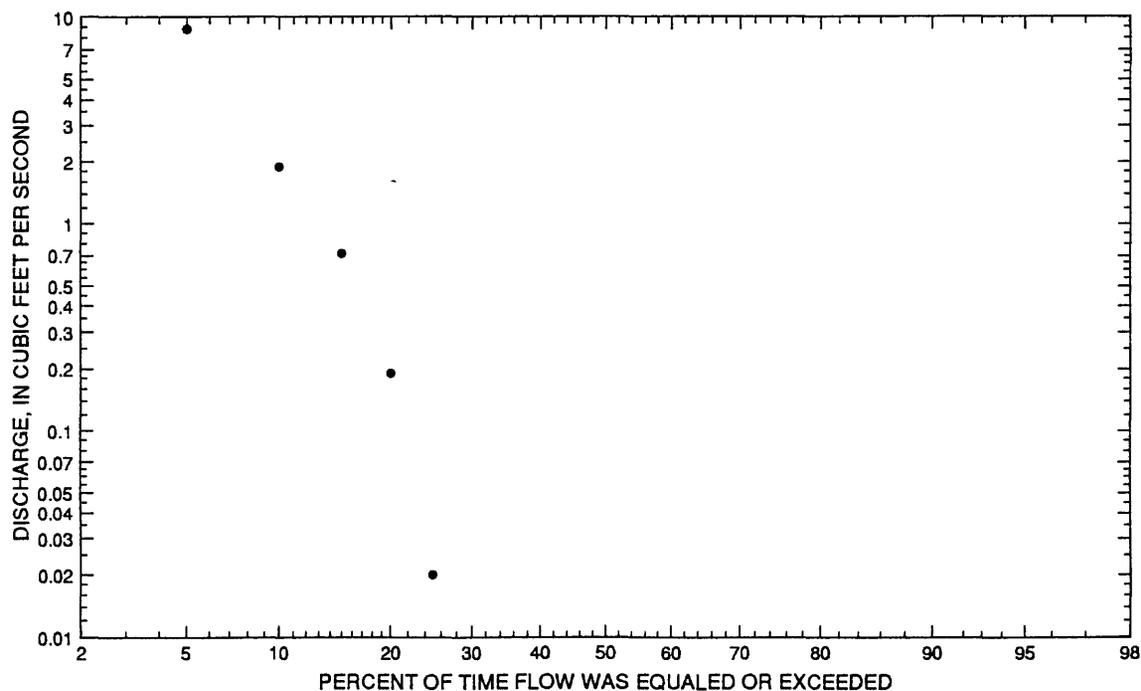
## 05059600 MAPLE RIVER NEAR HOPE, ND--Continued

Statistics of monthly and annual mean discharges

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

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	1.07	1966	0	m	0.060	0.25	4.19	0.18
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	9.12	10.6	1.17	26.7
April	56.5	1969	0.007	1991	13.8	16.8	1.22	40.3
May	11.9	1972	0	m	2.13	2.84	1.33	6.23
June	34.5	1968	0	m	2.85	6.77	2.38	8.34
July	65.3	1993	0	m	5.06	12.9	2.55	14.8
August	7.95	1993	0	m	0.580	1.90	3.30	1.69
September	15.3	1994	0	m	0.590	2.80	4.74	1.73
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

[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	0
90	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
85	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
80	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
75	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
70	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
65	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
60	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
55	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
50	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
45	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
40	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
35	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
30	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0
25	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.02
20	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.19
15	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	0.72
10	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	1.90
5	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	ng	8.82

## 05059600 MAPLE RIVER NEAR HOPE, ND--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			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	25.5	2.29	1.44	0.838	0.498
0.80	1.25	53.0	13.4	8.28	4.81	2.83
0.50	2	177	122	73.6	42.5	24.6
0.20	5	465	327	194	111	64.0
0.10	10	705	400	236	135	77.5
0.04	25	1,030	439	257	148	84.3
0.02	50	1,280	449	263	151	86.1
0.01	100	1,530	453	265	152	86.8
0.005	200	1,760	455	266	152	87.1
0.002	500	2,060	ng	ng	ng	ng

### Probability of annual low discharges

[ng, statistic not given]

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	ng	ng	ng	ng	ng	ng
0.10	10	ng	ng	ng	ng	ng	ng	ng	ng	ng
0.20	5	ng	ng	ng	ng	ng	ng	ng	ng	ng
0.50	2	ng	ng	ng	ng	ng	ng	ng	ng	ng

## 05059600 MAPLE RIVER NEAR HOPE, ND--Continued

Probability of seasonal low discharges

[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence Interval (years)	December-January-February				March-April-May			
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	ng	ng	0	0
0.10	10	ng	ng	ng	ng	ng	ng	0	0
0.20	5	ng	ng	ng	ng	ng	ng	0	0
0.50	2	ng	ng	ng	ng	ng	ng	0	0.123
		June-July-August				September-October-November			
0.05	20	ng	0	0	0	ng	ng	ng	ng
0.10	10	ng	0	0	0	ng	ng	ng	ng
0.20	5	ng	0	0	0	ng	ng	ng	ng
0.50	2	ng	0	0	0	ng	ng	ng	ng

## 05059600 MAPLE RIVER NEAR HOPE, ND--Continued

Annual peak discharge and corresponding gage height, period of record

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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1965	April 10	4.43	575	1980	March 29	3.18	33.0
1966	March 14	3.18	150	1981	June 21	1.88	0980
1967	April 20	3.88	248	1982	April 1	5.56	850
1968	June 10	4.78	734	1983	March 13	4.29	160
1969	April 9	4.50	540	1984	March 24	4.81	300
1970	April 25	4.03	349	1985	March 12	3.29	73.0
1971	April 2	4.52	145	1986	March 17	3.69	100
1972	May 27	4.65	465	1987	March 21	6.47	360
1973	March 14	2.92	59.0	1988	March 24	3.78	75.0
1974	April 10	3.80	232	1989	April 5	4.11	217
1975	April 18	3.48	122	1990	June 13	3.08	4.10
1976	March 24	3.38	104	1991	May 24	3.33	19.0
1977	July 5	1.70	0910	1992	March 4	4.11	100
1978	March 26	4.19	175	1993	July 24	7.53	585
1979	April 18	5.86	900	1994	July 8	5.30	234
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1979	April 18	5.86	900	1983	March 13	4.29	160
1982	April 1	5.56	850	1966	March 14	3.18	150
1968	June 10	4.78	734	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
1967	April 20	3.88	248	1980	March 29	3.18	33.0
1994	July 8	5.30	234	1991	May 24	3.33	19.0
1974	April 10	3.80	232	1990	June 13	3.08	4.10
1989	April 5	4.11	217	1981	June 21	1.88	0980
1978	March 26	4.19	175	1977	July 5	1.70	0910

# 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	--

## 05059700 MAPLE RIVER NEAR ENDERLIN, ND

### Station Description

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.

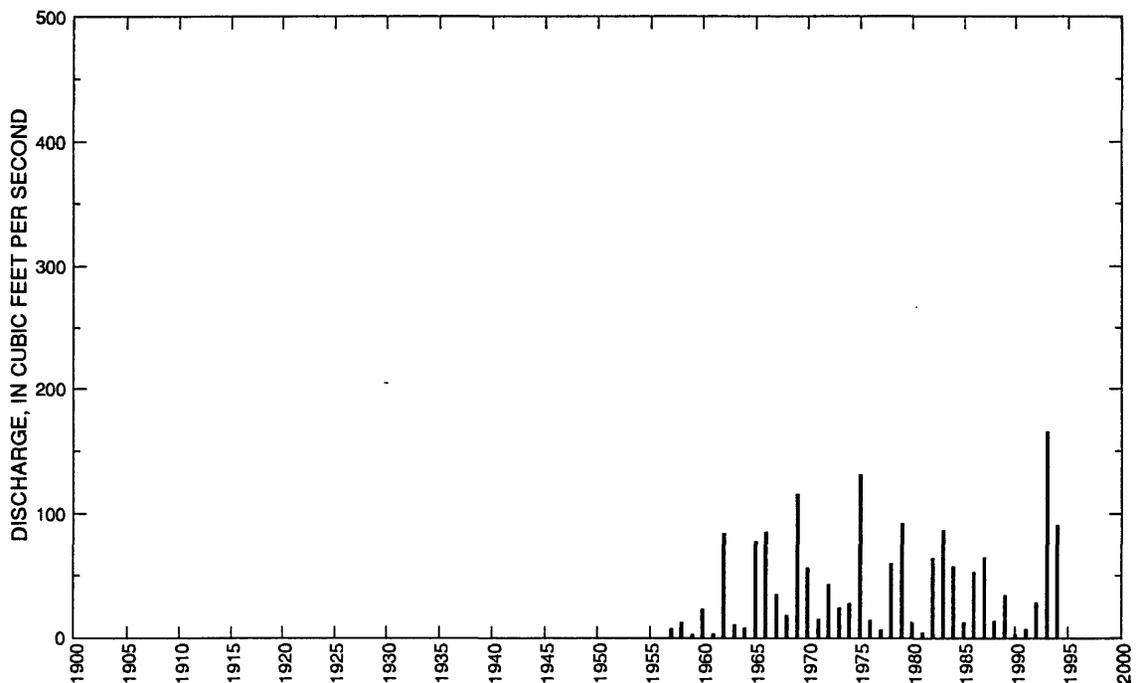
DRAINAGE AREA.--843 mi<sup>2</sup>, of which about 47 mi<sup>2</sup> is probably noncontributing.

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; maximum gage height, 15.41 ft, June 30, 1975; minimum daily discharge, 0.1 ft<sup>3</sup>/s, Dec. 7-9, 1963; minimum gage height, 1.90 ft, Oct. 5, 1956.

Annual mean discharge

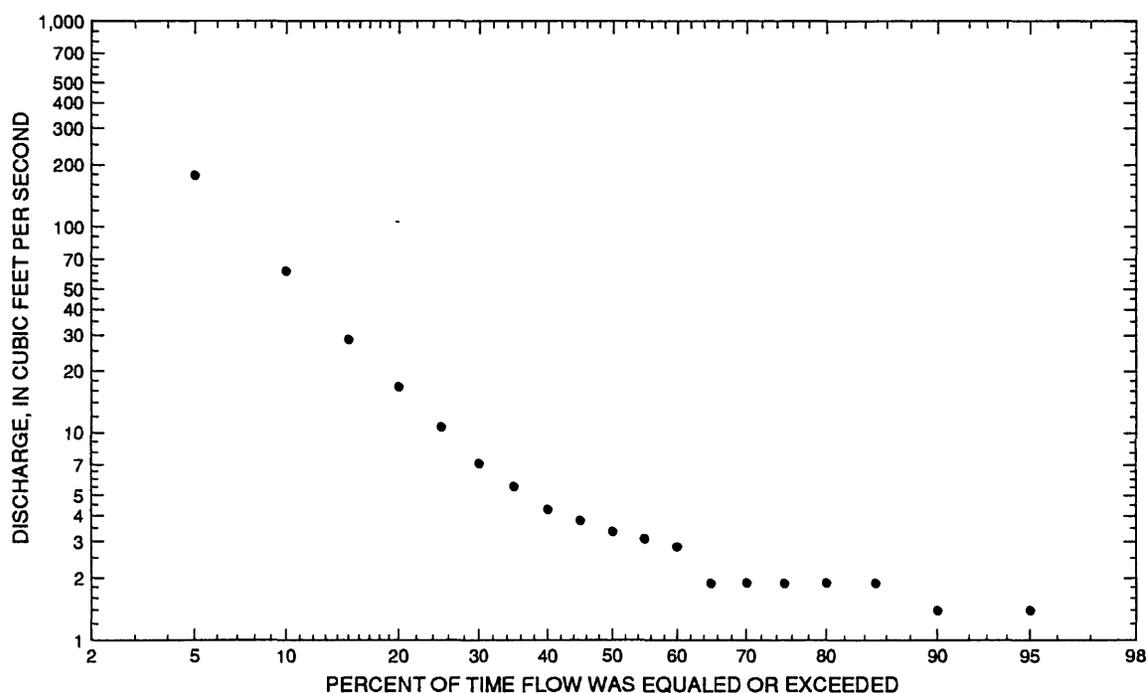


## 05059700 MAPLE RIVER NEAR ENDERLIN, ND--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	16.6	1966	1.52	1993	4.16	3.31	0.80	0.81
November	13.3	1958	1.49	1961	4.12	2.76	0.67	0.80
December	5.87	1958	1.32	1961	2.97	1.24	0.42	0.58
January	4.05	1976	1.21	1969	2.37	0.69	0.29	0.46
February	11.9	1976	1.30	1969	2.94	2.05	0.70	0.57
March	622	1966	2.10	1969	113	157	1.39	22.0
April	1,230	1969	2.06	1991	207	273	1.32	40.3
May	191	1970	2.19	1992	40.4	48.8	1.21	7.88
June	424	1975	2.26	1988	39.3	87.1	2.22	7.65
July	874	1993	1.44	1961	64.6	168	2.60	12.6
August	506	1993	1.33	1961	23.5	83.4	3.55	4.58
September	111	1994	1.28	1984	9.27	19.5	2.10	1.81
Annual	165	1993	2.14	1990	43.1	40.6	0.94	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	2.10	1.30	1.30	1.30	1.30	1.50	1.60	1.20	1.40
90	1.60	1.40	2.00	2.90	2.60	2.10	1.70	1.30	1.60	1.70	1.90	1.60	1.40
85	1.70	1.60	2.00	4.67	3.20	2.10	1.70	1.70	1.60	1.70	1.90	1.60	1.90
80	1.80	1.80	2.00	6.48	3.80	2.80	2.20	1.70	1.60	1.90	2.10	1.80	1.90
75	1.80	1.80	2.00	11.0	5.00	2.80	2.20	1.70	2.00	2.10	2.30	1.80	1.90
70	1.90	1.80	2.92	16.9	5.91	4.08	2.90	2.10	2.00	2.10	2.30	2.10	1.90
65	2.00	1.80	3.33	21.4	7.29	4.64	2.90	2.10	2.00	2.30	2.50	2.10	1.90
60	2.00	1.80	3.77	27.3	9.05	5.23	2.90	2.10	2.40	2.50	2.50	2.10	2.84
55	2.10	1.80	4.54	37.5	11.6	6.24	4.04	2.60	2.40	2.50	2.50	2.40	3.11
50	2.20	2.10	5.78	51.2	14.1	6.85	4.89	2.60	2.40	2.80	2.80	2.40	3.38
45	2.20	2.10	8.33	69.2	17.8	8.94	5.70	2.60	2.40	2.80	3.10	2.40	3.79
40	2.20	2.40	13.2	92.7	22.5	11.2	7.07	3.20	3.00	3.10	3.40	2.70	4.32
35	2.40	2.40	21.6	121	26.6	13.5	10.9	3.20	3.60	3.40	3.70	2.70	5.56
30	2.50	2.40	34.6	150	32.5	15.5	15.1	4.84	3.60	4.10	4.10	3.10	7.16
25	2.70	2.70	56.3	195	41.7	18.0	20.5	5.90	5.40	4.50	4.90	3.60	10.7
20	2.80	2.70	96.3	268	54.5	23.9	26.9	8.53	6.97	4.90	5.40	3.60	16.8
15	3.00	3.10	169	384	73.5	33.2	44.8	14.2	8.79	5.90	5.90	4.10	28.7
10	3.30	3.90	347	533	102	53.7	91.4	23.6	16.0	7.80	7.80	4.70	61.8
5	4.00	4.50	731	806	170	116	289	71.4	31.3	13.3	11.0	6.20	179

## 05059700 MAPLE RIVER NEAR ENDERLIN, ND--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	11.8	3.88	2.67	1.98	1.58
0.95	1.05	44.3	20.8	15.4	11.3	8.40
0.90	1.11	85.9	46.7	35.6	25.9	18.7
0.80	1.25	184	115	89.9	64.8	45.2
0.50	2	700	514	410	290	192
0.20	5	2,300	1,730	1,370	947	602
0.10	10	4,040	2,950	2,290	1,570	981
0.04	25	7,080	4,830	3,660	2,470	1,530
0.02	50	9,950	6,400	4,760	3,190	1,960
0.01	100	13,300	8,040	5,870	3,910	2,390
0.005	200	17,200	9,730	6,970	4,610	2,810
0.002	500	23,000	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0.44	0.48	0.92	1.14	1.27	1.33	1.41	1.49	1.54
0.10	10	0.69	0.77	1.06	1.24	1.36	1.45	1.55	1.65	1.70
0.20	5	1.06	1.17	1.24	1.37	1.49	1.62	1.76	1.88	1.97
0.50	2	1.72	1.81	1.65	1.72	1.84	2.03	2.28	2.52	2.78

## 05059700 MAPLE RIVER NEAR ENDERLIN, ND--Continued

Probability of seasonal low discharges

[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	1.05	1.27	1.34	0.58	1.49	<sup>1</sup> 1.52	1.70
0.10	10	ng	1.20	1.36	1.44	0.97	1.61	1.65	2.30
0.20	5	ng	1.40	1.50	1.59	1.54	1.82	2.00	3.41
0.50	2	ng	1.85	1.87	1.98	2.50	2.53	3.35	8.00
		June-July-August				September-October-November			
0.05	20	0.88	1.09	1.20	1.37	0.94	1.18	1.30	1.41
0.10	10	1.02	1.22	1.30	1.50	1.06	1.29	1.42	1.54
0.20	5	1.25	1.43	1.51	1.78	1.25	1.47	1.60	1.75
0.50	2	1.96	2.16	2.32	3.04	1.84	2.05	2.23	2.48

<sup>1</sup>Graphical interpretation.

## 05059700 MAPLE RIVER NEAR ENDERLIN, ND--Continued

Annual peak discharge and corresponding gage height, period of record

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

# 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	--	--	--	2.02	1.92	--	--	--	11.2	1.79	4.37	6.35	--
1957	2.55	3.09	2.35	2.74	9.18	3.06	5.87	3.46	6.64	9.44	13.7	28.1	6.85
1958	7.94	13.3	5.87	2.03	2.15	25.7	45.8	5.22	10.4	15.8	2.73	2.31	12.2
1959	2.15	3.26	3.00	1.72	1.97	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

## 05060000 MAPLE RIVER NEAR MAPLETON, ND

### Station Description

**LOCATION.**--Lat 46°51'40", long 97°06'10", in SW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.10, T.139 N., R.51 W., Cass County, on left bank 25 ft upstream from dam, 3 mi southwest of Mapleton, and 20 mi upstream from mouth.

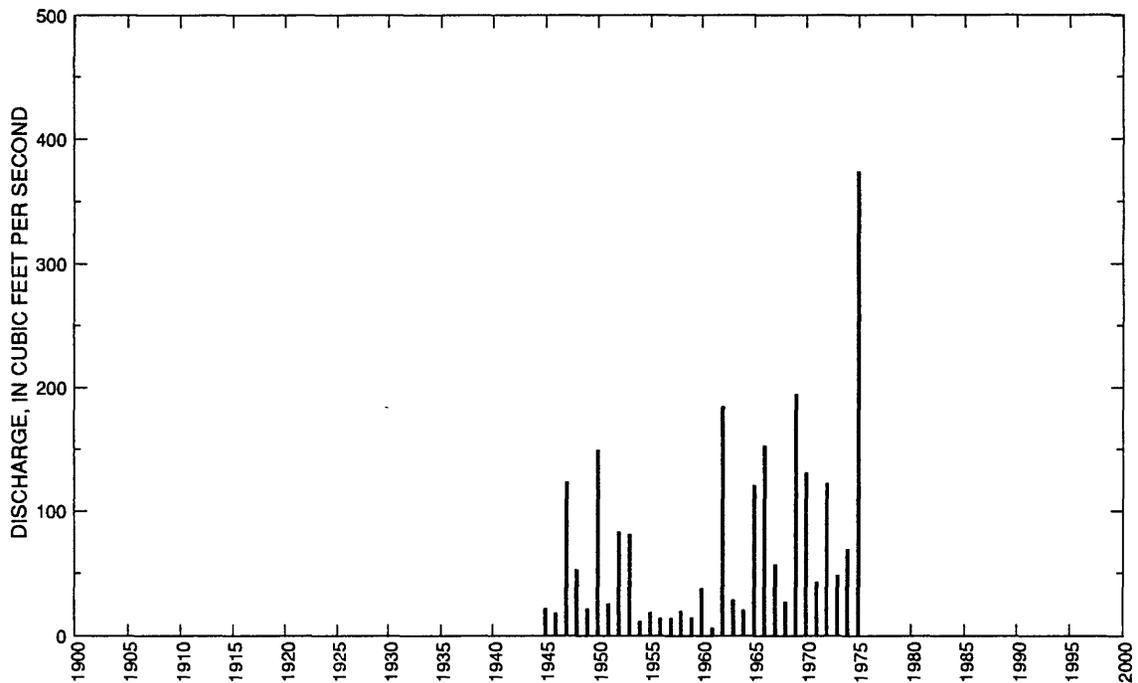
**DRAINAGE AREA.**--1,450 mi<sup>2</sup>, of which about 71 mi<sup>2</sup>, is probably noncontributing.

**PERIOD OF RECORD.**--April 1944 to September 1975. Prior to October 1958, published as "at Mapleton".

**GAGE.**--Water-stage recorder and rubble masonry dam. Datum of gage is 893.53 ft above mean sea level (levels by Soil Conservation Service). Prior to Oct. 1, 1958, nonrecording gage at site 7 mi downstream at different datum.

**EXTREMES** since Oct. 1, 1958.--Maximum discharge, 11,600 ft<sup>3</sup>/s, July 2, 1975 (gage height, 15.03 ft); maximum gage height, 18.9 ft, Apr. 6, 1952; no flow for many days.

Annual mean discharge



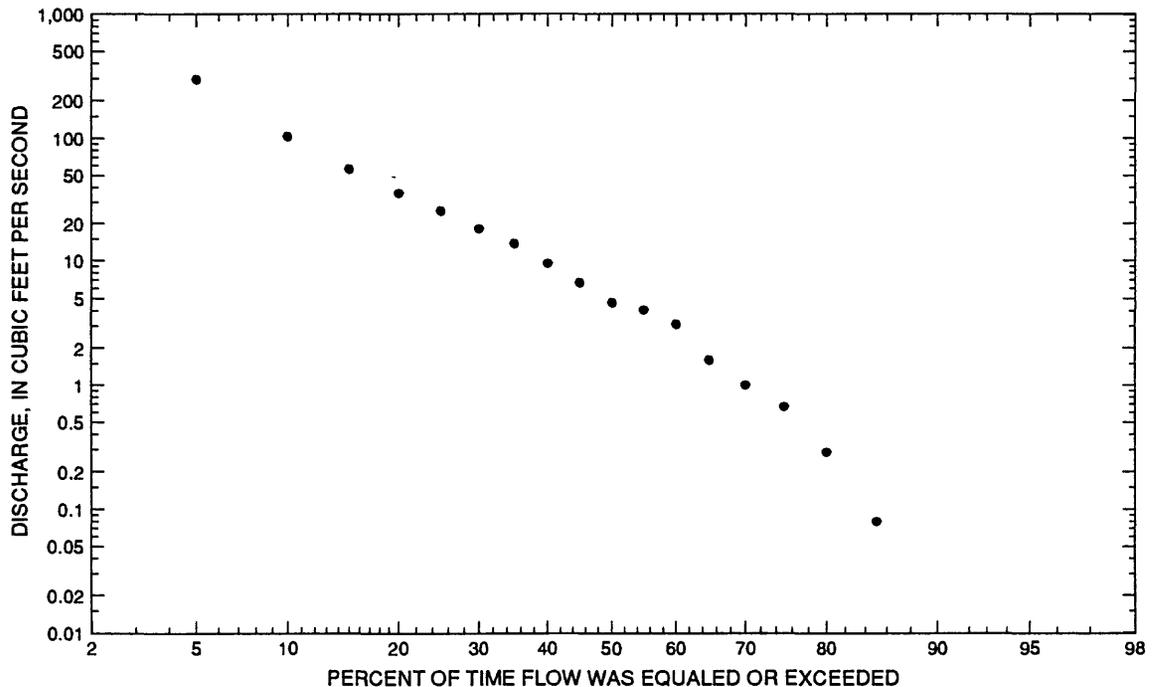
## 05060000 MAPLE RIVER NEAR MAPLETON, ND--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	49.1	1972	0	m	7.94	11.8	1.49	0.92
November	36.2	1972	0	1961	8.84	8.28	0.94	1.02
December	12.2	1963	0	1961	3.70	3.32	0.90	0.43
January	4.30	1973	0	m	1.12	1.25	1.12	0.13
February	4.85	1973	0	m	0.620	1.12	1.81	0.07
March	1,040	1966	0	m	95.1	208	2.18	11.0
April	1,710	1969	13.9	1959	385	435	1.13	44.6
May	620	1950	6.30	1955	104	145	1.40	12.0
June	353	1947	1.71	1961	94.2	160	1.70	10.9
July	2,380	1975	0	1961	132	434	3.29	15.3
August	267	1962	0	m	20.8	48.1	2.31	2.41
September	65.8	1962	0	m	11.0	15.0	1.35	1.28
Annual	374	1975	11.1	1954	73.5	78.8	1.07	100

Annual flow duration



**05060000 MAPLE RIVER NEAR 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	9.52	6.39	3.65	0.58	0	0	0	0.05	0	0
90	0	0	0	16.8	8.53	4.86	1.20	0	0	0	1.30	0.10	0
85	0	0	0	21.0	10.8	5.52	3.12	0.20	0	0	1.90	0.40	0.08
80	0	0	0	28.8	14.2	7.39	4.25	0.38	0.10	0.26	2.30	0.72	0.29
75	0.10	0	0.05	37.7	16.5	9.09	6.24	0.74	0.20	0.65	2.80	0.87	0.67
70	0.10	0	0.10	46.0	19.0	11.3	7.44	1.40	0.38	1.00	3.40	1.10	1.00
65	0.12	0	0.15	54.8	21.6	13.9	8.47	2.00	0.94	1.30	4.20	1.30	1.60
60	0.18	0.02	0.15	67.1	24.6	16.5	11.1	3.28	1.50	2.10	4.20	1.50	3.12
55	0.38	0.10	0.31	85.3	28.2	19.8	12.9	4.14	2.30	2.70	5.50	1.90	4.01
50	0.46	0.10	0.67	109	32.1	23.6	15.6	4.69	2.90	3.40	5.99	2.30	4.60
45	0.67	0.20	2.56	136	36.8	29.4	18.0	6.27	3.60	3.40	6.47	2.80	6.70
40	0.98	0.20	5.71	170	43.3	34.8	21.1	7.58	5.21	4.68	6.82	3.30	9.55
35	0.98	0.30	11.3	218	54.9	40.0	24.9	10.2	6.51	5.22	7.17	3.30	13.7
30	1.20	0.43	18.4	289	75.6	45.2	30.6	12.8	7.94	5.96	8.34	4.10	18.3
25	1.70	0.43	27.8	382	98.0	54.9	39.0	16.0	13.0	7.05	11.5	5.49	25.5
20	1.70	0.76	41.4	512	120	69.8	54.9	20.9	18.2	8.77	13.8	6.30	35.9
15	2.60	1.10	84.1	695	153	100	74.7	30.1	25.0	12.8	17.7	7.23	56.0
10	3.10	1.90	207	1,020	235	158	122	44.6	32.6	22.2	21.9	8.12	103
5	3.70	3.40	521	1,950	425	363	362	72.5	47.0	34.3	27.8	11.2	295

## 05060000 MAPLE RIVER NEAR MAPLETON, ND--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	47.6	43.5	35.3	26.6	22.5
0.95	1.05	131	119	91.7	66.6	50.2
0.90	1.11	219	197	150	107	76.7
0.80	1.25	396	355	267	187	127
0.50	2	1,140	1,020	771	524	329
0.20	5	2,980	2,650	2,090	1,390	832
0.10	10	4,740	4,220	3,420	2,260	1,340
0.04	25	7,560	6,740	5,700	3,730	2,200
0.02	50	10,100	8,990	7,850	5,120	3,030
0.01	100	12,900	11,500	10,400	6,770	4,030
0.005	200	16,100	14,400	13,400	8,700	5,220
0.002	500	20,700	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0	0	0	0.165	0.450
0.10	10	0	0	0	0	0	0	0	0.303	0.738
0.20	5	0	0	0	0	0	0	0.044	0.525	1.18
0.50	2	0	0	0	0	0	0.103	0.436	1.35	2.74

## 05060000 MAPLE RIVER NEAR MAPLETON, ND--Continued

Probability of seasonal low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0.09
0.20	5	0	0	0	0	0	0	0	0.71
0.50	2	0	0.02	0.08	0.16	0	0.14	0.50	8.09
		June-July-August				September-October-November			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0.15	0	0	0	0
0.20	5	0.02	0.15	0.24	0.68	0	0	0	0.18
0.50	2	1.42	2.04	2.66	4.90	0.46	0.64	0.83	1.87

## 05060000 MAPLE RIVER NEAR MAPLETON, ND--Continued

Annual peak discharge and corresponding gage height, period of record

[--, 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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1944	April 8	8.16	177	1961	March 10	1.42	49.0
1945	April 12	8.59	373	1962	April 5	12.48	2,740
1946	March 21	13.15	550	1963	April 8	7.19	779
1947	April 14	18.04	3,880	1964	April 15	5.65	314
1948	April 7	17.28	1,500	1965	April 12	13.22	3,210
1949	April 3	14.75	850	1966	March 17	13.46	3,610
1950	April 2	17.73	1,980	1967	April 21	9.29	1,420
1951	April 7	12.50	750	1968	June 23	5.20	302
1952	April 6	18.90	3,850	1969	April 11	14.00	7,000
1953	June 17	18.62	4,840	1970	May 30	12.39	3,340
1954	March 21	8.62	200	1971	March 19	6.82	778
1955	April 2	12.40	500	1972	March 17	12.27	2,430
1956	April 14	11.51	630	1973	March 15	--	1,300
1957	June 14	8.52	430	1974	April 13	10.30	1,970
1958	April 10	7.57	195	1975	July 2	15.03	11,600
1959	June 12	5.58	1,160	1976	March 27	7.50	1,000
1960	April 7	5.65	1,220				
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1975	July 2	15.03	11,600	1976	March 27	7.50	1,000
1969	April 11	14.00	7,000	1949	April 3	14.75	850
1953	June 17	18.62	4,840	1963	April 8	7.19	779
1947	April 14	18.04	3,880	1971	March 19	6.82	778
1952	April 6	18.90	3,850	1951	April 7	12.50	750
1966	March 17	13.46	3,610	1956	April 14	11.51	630
1970	May 30	12.39	3,340	1946	March 21	13.15	550
1965	April 12	13.22	3,210	1955	April 2	12.40	500
1962	April 5	12.48	2,740	1957	June 14	8.52	430
1972	March 17	12.27	2,430	1945	April 12	8.59	373
1950	April 2	17.73	1,980	1964	April 15	5.65	314
1974	April 13	10.30	1,970	1968	June 23	5.20	302
1948	April 7	17.28	1,500	1954	March 21	8.62	200
1967	April 21	9.29	1,420	1958	April 10	7.57	195
1973	March 15	--	1,300	1944	April 8	8.16	177
1960	April 7	5.65	1,220	1961	March 10	1.42	49.0
1959	June 12	5.58	1,160				

# 05060000 MAPLE RIVER NEAR 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
1959	1.90	2.46	0.306	0	0	10.2	13.9	8.35	113.2	21.0	1.10	0	14.3
1960	0.771	1.84	1.10	0.823	0.400	70.3	360.2	15.8	5.82	2.01	0	0	37.9
1961	0	0	0	0	0	30.1	18.0	17.3	1.71	0	0	3.98	5.98
1962	22.8	3.38	2.05	0.442	0.171	0.913	693.4	212.6	170.4	760.9	267.2	65.8	184.3
1963	30.5	28.4	12.2	0.765	0	15.5	159.7	33.2	34.9	12.6	6.67	5.63	28.3
1964	3.15	5.12	1.06	0.100	0.100	5.87	110.8	39.1	49.2	17.1	8.65	4.00	20.2
1965	4.00	6.69	1.38	1.20	0.561	0.300	1,149	92.5	42.4	64.6	58.2	40.1	120.6
1966	38.4	21.2	10.9	3.07	1.09	1,040	456.7	149.5	43.3	22.6	21.1	8.65	152.8
1967	6.33	6.02	1.88	0.817	0.851	78.7	379.0	168.7	28.8	6.55	1.22	0.651	56.6
1968	2.97	5.25	2.46	0.267	0.166	46.6	61.5	30.8	116.2	41.2	11.8	6.17	27.0
1969	5.35	6.91	3.01	0.049	0	0	1,708	151.5	35.6	373.4	35.5	22.0	194.0
1970	15.7	13.3	7.10	3.78	2.13	41.3	522.3	428.5	477.9	32.9	7.05	27.4	131.3
1971	9.00	12.3	2.11	0.486	0.002	206.5	129.8	27.5	38.8	54.7	5.80	27.7	43.1
1972	49.1	36.2	11.2	3.57	1.94	478.0	271.9	374.8	108.4	41.7	52.1	28.9	122.3
1973	7.17	14.4	6.70	4.30	4.85	402.5	79.9	23.7	8.09	1.04	1.93	12.7	47.8
1974	9.16	7.63	3.81	0.228	0.052	0.328	557.8	171.7	49.2	13.5	16.0	7.14	69.3
1975	2.51	15.7	4.53	1.16	0	0.941	1,305	327.6	345.5	2,375	50.3	27.2	373.7

## 05060500 RUSH RIVER AT AMENIA, ND

### Station Description

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.

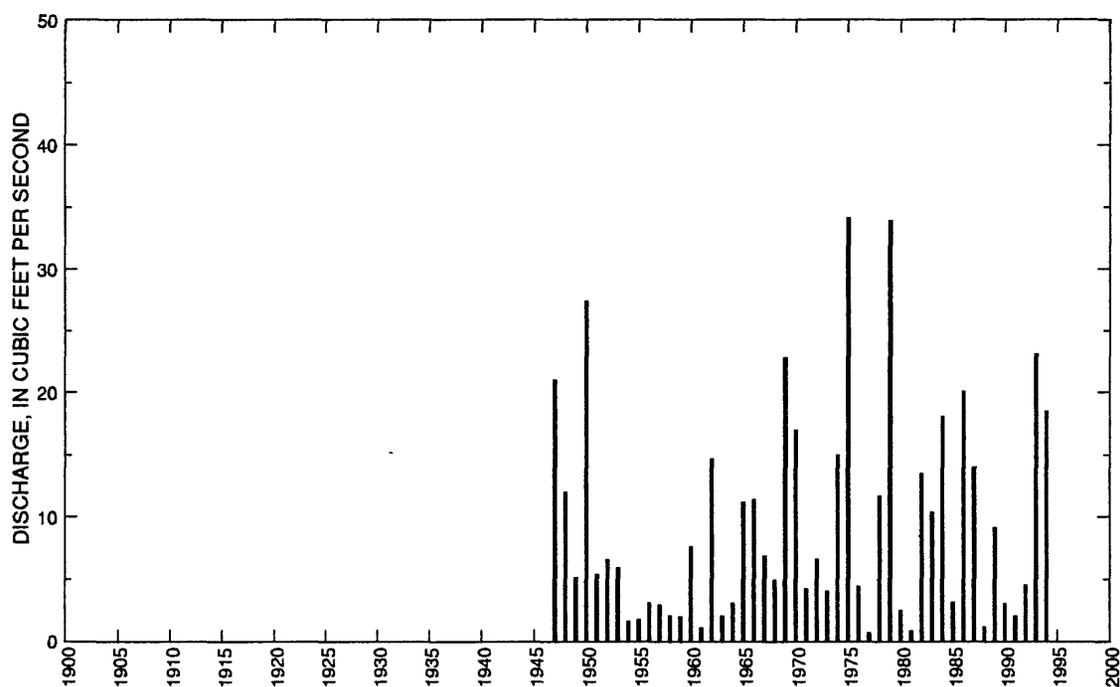
DRAINAGE AREA.--116 mi<sup>2</sup>.

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 WSP 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, maximum gage height, 11.6 ft, Apr. 11, 1965, and Apr. 18, 1975; no flow for periods each year.

Annual mean discharge



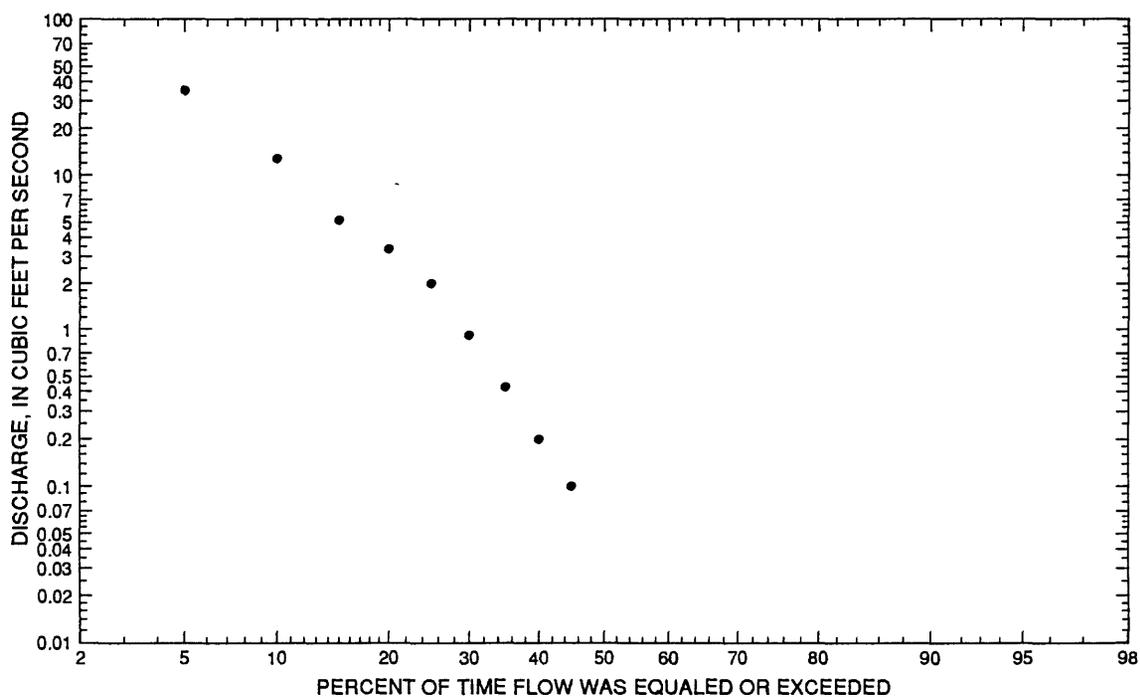
## 05060500 RUSH RIVER AT AMENIA, ND--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	11.4	1983	0	m	0.660	1.86	2.83	0.57
November	3.50	1983	0	m	0.570	0.88	1.55	0.50
December	1.24	1963	0	m	0.130	0.27	2.03	0.12
January	0.448	1987	0	m	0.010	0.07	4.85	0.01
February	2.21	1976	0	m	0.130	0.44	3.42	0.11
March	136	1984	0	m	20.8	28.0	1.34	18.2
April	382	1979	1.12	1981	59.9	82.0	1.37	52.2
May	81.3	1949	0.119	1955	10.7	15.5	1.45	9.33
June	48.9	1953	0.009	1988	9.13	12.3	1.34	7.95
July	168	1993	0	m	10.1	26.5	2.62	8.82
August	22.3	1993	0	m	1.25	4.43	3.55	1.09
September	40.1	1994	0	m	1.26	5.84	4.62	1.10
Annual	34.1	1975	0.678	1977	9.55	8.69	0.91	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	Jan.	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	0.42	0	0	0	0	0	0	0	0
85	0	0	0	1.40	0.79	0.04	0	0	0	0	0	0	0
80	0	0	0	2.00	1.10	0.17	0	0	0	0	0	0	0
75	0	0	0	3.23	1.10	0.32	0	0	0	0	0	0	0
70	0	0	0	3.83	1.50	0.61	0	0	0	0	0	0	0
65	0	0	0	4.70	2.00	0.83	0.02	0	0	0	0	0	0
60	0	0	0	6.17	2.00	1.10	0.08	0	0	0	0	0	0
55	0	0	0	7.68	3.25	1.10	0.16	0	0	0	0	0	0
50	0	0	0	10.4	3.94	1.60	0.32	0	0	0	0	0	0
45	0	0	0.15	13.7	4.46	2.10	0.45	0	0	0	0.10	0	0.10
40	0	0	0.85	17.0	5.44	3.20	0.64	0	0	0	0.18	0	0.20
35	0	0	2.40	22.1	6.04	4.03	0.90	0	0	0	0.26	0	0.43
30	0	0	4.29	28.6	8.12	4.75	1.30	0.02	0	0	0.53	0.02	0.92
25	0	0	8.18	38.6	10.2	6.67	1.80	0.09	0.02	0.10	0.76	0.10	2.00
20	0	0	16.0	54.7	12.5	8.97	3.76	0.16	0.10	0.27	0.91	0.10	3.36
15	0	0	26.3	88.1	17.2	13.4	6.91	0.48	0.24	0.59	1.30	0.26	5.17
10	0	0	58.9	155	23.9	19.9	16.2	1.40	0.77	0.98	1.90	0.37	12.9
5	0.08	0.18	122	275	41.0	37.6	43.0	5.86	3.39	2.70	2.70	0.52	35.4

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

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	12.9	8.39	5.40	3.56	2.92
0.95	1.05	33.9	21.2	14.2	9.59	7.08
0.90	1.11	55.8	34.5	23.4	15.9	11.2
0.80	1.25	100	61.3	42.2	28.6	19.1
0.50	2	293	179	124	82.7	50.9
0.20	5	806	501	344	220	128
0.10	10	1,330	844	571	355	202
0.04	25	2,240	1,450	964	578	324
0.02	50	3,100	2,060	1,340	781	435
0.01	100	4,130	2,790	1,790	1,020	564
0.005	200	5,340	3,680	2,320	1,280	712
0.002	500	7,240	ng	ng	ng	ng

### Probability of annual low discharges

[ng, statistic not given]

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	ng	ng	ng	0	0	0
0.10	10	ng	ng	ng	ng	ng	ng	0	0	0
0.20	5	ng	ng	ng	ng	ng	ng	0	0	0
0.50	2	ng	ng	ng	ng	ng	ng	0	0	0.044

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

Probability of seasonal low discharges

[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	0	0	0	0
0.10	10	ng	ng	ng	ng	0	0	0	0
0.20	5	ng	ng	ng	ng	0	0	0	0.232
0.50	2	ng	ng	ng	ng	0	0	0	1.90
		June-July-August				September-October-November			
0.05	20	0	0	0	0	ng	0	0	0
0.10	10	0	0	0	0	ng	0	0	0
0.20	5	0	0	0	0	ng	0	0	0
0.50	2	0	0	0	0	ng	0	0	0

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

Annual peak discharge and corresponding gage height, period of record

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

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

Annual peak discharge and corresponding gage height, period of record--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)
<b>Annual peak discharge, from highest to lowest, and corresponding gage height--Continued</b>							
1971	April 2	6.20	97.0	1991	May 25	--	43.0
1958	July 5	5.40	77.0	1977	May 31	5.02	41.0
1963	April 7	5.30	68.0	1988	April 1	--	30.0
1990	June 4	6.01	64.0	1961	March 6	6.06	25.0
1980	April 1	--	63.0	1981	May 27	5.14	22.0

# 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	0.161	0	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

## 05061000 BUFFALO RIVER NEAR HAWLEY, MN

### Station Description

**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, 2 mi southwest of Hawley.

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

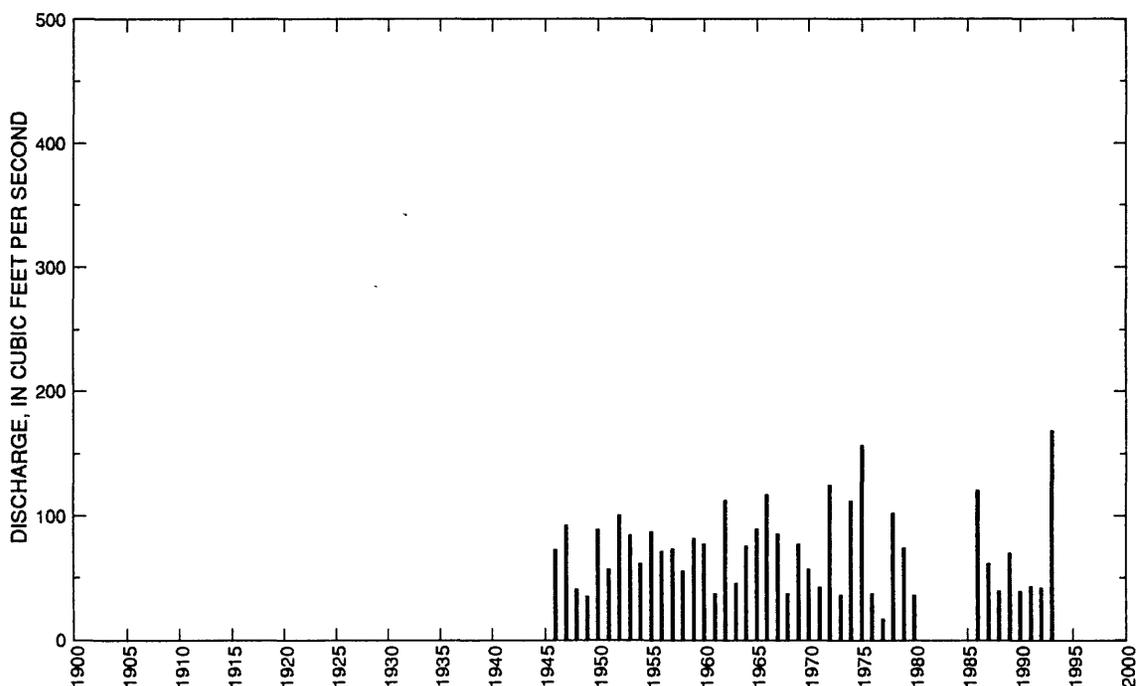
**PERIOD OF RECORD.**--March 1945 to current year, WY 1981 (annual maximum only), March 1982 to September 1985 (no winter records).

**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, 2,050 ft<sup>3</sup>/s, July 1, 1975; maximum gage height, 10.40 ft, July 18, 1993; minimum discharge, 2.8 ft<sup>3</sup>/s, Aug. 26, 1977; minimum gage height, 3.15 ft, June 27 and July 26, 1977.

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

Annual mean discharge

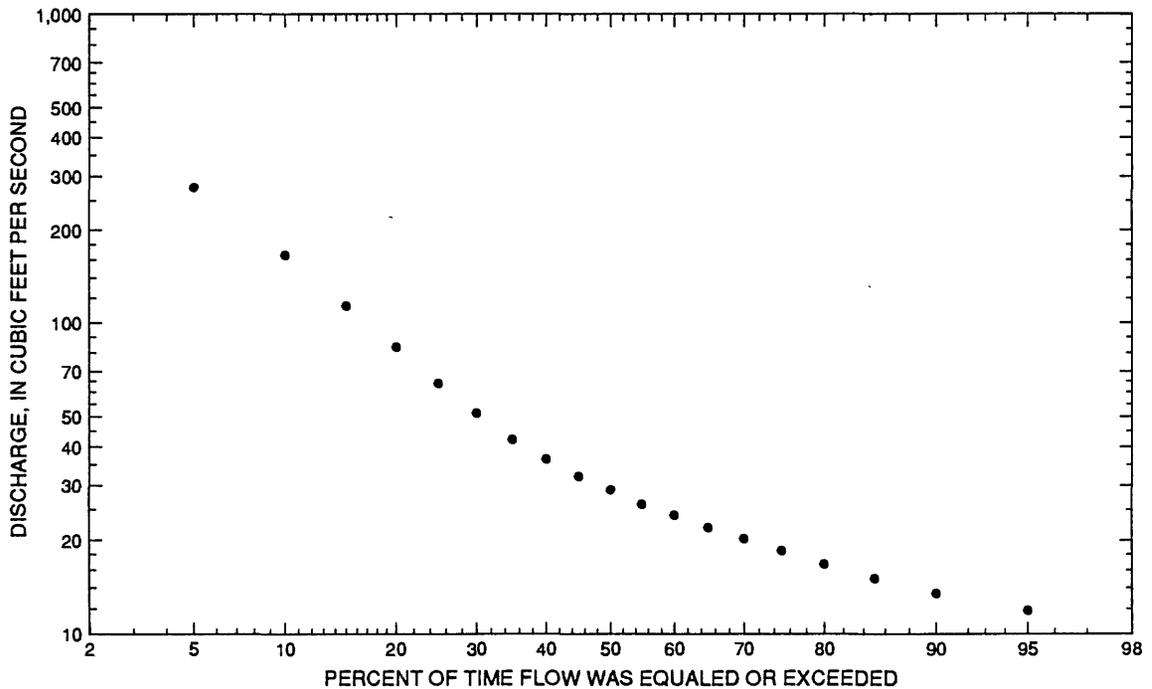


# 05061000 BUFFALO RIVER NEAR HAWLEY, MN--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	151	1974	11.6	1979	36.3	29.3	0.81	4.14
November	176	1972	12.2	1977	33.8	26.4	0.78	3.86
December	63.8	1972	10.6	1977	23.4	11.2	0.48	2.67
January	54.7	1981	9.94	1962	19.8	9.16	0.46	2.26
February	99.6	1981	9.87	1949	20.7	13.8	0.67	2.36
March	434	1966	15.0	1969	80.7	81.2	1.01	9.22
April	792	1978	33.3	1981	251	176	0.70	28.6
May	372	1985	21.5	1977	123	85.2	0.69	14.0
June	530	1962	12.7	1977	98.3	95.5	0.97	11.2
July	784	1993	10.1	1976	99.0	154	1.56	11.3
August	472	1955	5.87	1976	52.4	92.4	1.76	5.99
September	182	1957	8.52	1976	37.9	34.8	0.92	4.33
Annual	168	1993	16.7	1977	72.7	34.0	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 equalled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	11.1	11.1	14.2	34.3	29.7	18.5	11.1	8.11	9.06	12.3	14.6	12.4	11.9
90	12.2	12.3	15.8	45.7	36.7	23.2	14.9	9.95	11.2	13.9	16.4	13.3	13.5
85	12.8	12.9	17.3	53.7	41.8	27.7	17.8	11.5	12.7	15.7	17.9	13.9	15.1
80	13.3	13.6	18.8	61.7	46.5	31.7	20.3	13.8	14.3	17.1	19.4	14.7	16.8
75	13.8	14.2	20.5	72.2	51.7	36.0	22.7	15.7	15.7	18.5	21.0	15.5	18.5
70	14.4	14.6	22.0	85.8	57.8	40.6	25.4	17.4	17.1	20.4	22.4	16.6	20.3
65	14.9	15.1	23.5	100	64.8	45.5	28.2	18.9	18.9	22.2	23.3	18.1	22.0
60	15.9	15.9	25.7	118	72.1	50.7	32.0	20.4	20.9	23.7	24.3	18.9	24.1
55	16.6	16.8	28.3	138	80.3	56.2	36.0	22.2	22.7	25.0	25.2	19.9	26.2
50	17.5	17.8	31.3	166	88.7	62.6	40.3	23.9	25.7	26.5	26.1	20.9	29.0
45	18.5	18.8	34.7	196	97.0	69.0	45.3	26.5	29.0	28.2	27.0	21.7	32.2
40	19.3	19.8	39.9	225	109	75.5	51.2	29.2	31.4	30.1	29.0	22.8	36.6
35	20.1	20.8	50.2	254	123	83.4	58.4	32.3	34.1	32.2	30.6	24.1	42.3
30	21.6	22.1	62.1	286	140	93.4	69.1	35.8	37.5	35.1	32.4	25.4	51.3
25	23.8	23.8	78.0	329	160	106	86.6	42.4	41.8	38.6	35.5	27.2	64.2
20	27.1	26.2	99.1	381	182	124	108	49.6	48.6	45.5	39.3	30.0	83.9
15	29.4	27.9	129	454	211	152	137	64.5	58.8	56.3	47.9	36.7	114
10	32.3	29.9	192	580	248	196	192	91.2	81.0	76.1	58.8	39.8	167
5	38.5	36.7	306	779	314	272	365	189	125	105	77.4	46.4	276

## 05061000 BUFFALO RIVER NEAR HAWLEY, MN--Continued

Probability of annual high discharges]

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	76.6	67.5	57.0	49.3	44.4
0.95	1.05	154	133	114	95.2	81.6
0.90	1.11	218	187	161	133	111
0.80	1.25	326	278	241	195	158
0.50	2	661	562	489	388	297
0.20	5	1,240	1,060	923	723	525
0.10	10	1,680	1,440	1,250	977	690
0.04	25	2,270	1,950	1,690	1,320	907
0.02	50	2,720	2,350	2,040	1,590	1,070
0.01	100	3,180	2,770	2,390	1,870	1,240
0.005	200	3,640	3,190	2,740	2,160	1,410
0.002	500	4,310	ng	ng	ng	ng

Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	5.26	5.62	6.28	6.83	7.46	8.59	9.75	11.1	12.2
0.10	10	6.43	6.78	7.35	7.87	8.52	9.67	10.9	12.3	13.6
0.20	5	8.10	8.43	8.87	9.35	10.0	11.2	12.6	14.0	15.6
0.50	2	12.1	12.4	12.7	13.1	13.9	15.2	16.8	18.5	21.3

## 05061000 BUFFALO RIVER NEAR HAWLEY, MN--Continued

Probability of seasonal low discharges

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	9.10	9.23	9.31	9.64	11.0	11.9	13.3	16.2
0.10	10	9.95	10.1	10.2	10.6	12.3	13.3	14.8	19.3
0.20	5	11.2	11.4	11.6	12.0	14.2	15.4	17.1	24.3
0.50	2	14.6	14.9	15.2	15.7	18.9	21.1	23.4	40.2
June-July-August				September-October-November					
0.05	20	5.51	6.53	7.08	8.12	6.55	7.59	8.37	10.1
0.10	10	6.98	8.03	8.68	10.0	7.96	9.13	9.97	11.6
0.20	5	9.27	10.4	11.2	13.1	10.1	11.5	12.4	14.1
0.50	2	15.8	17.2	18.9	22.4	15.6	18.0	19.2	21.2

## 05061000 BUFFALO RIVER NEAR HAWLEY, MN--Continued

Annual peak discharge and corresponding gage height, period of record

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

## 05061000 BUFFALO RIVER NEAR HAWLEY, MN--Continued

Annual peak discharge and corresponding gage height, period of record--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)
<b>Annual peak discharge, from highest to lowest, and corresponding gage height--Continued</b>							
1971	April 2	6.45	382	1961	May 16	5.28	246
1988	April 2	6.12	350	1992	July 11	5.66	237
1987	March 25	6.06	330	1968	March 28	4.97	202
1948	April 13	--	297	1958	July 5	4.86	195
1949	April 7	6.67	256	1973	March 18	4.88	172
1963	August 12	5.48	253	1977	July 4	5.31	121
1991	May 6	--	248	1981	July 31	4.47	74.0

# 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	34.6	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	--	--	--	--	--	--	--	--	--	--	--	--	--

## 05061500 SOUTH BRANCH BUFFALO RIVER AT SABIN, MN

### Station Description

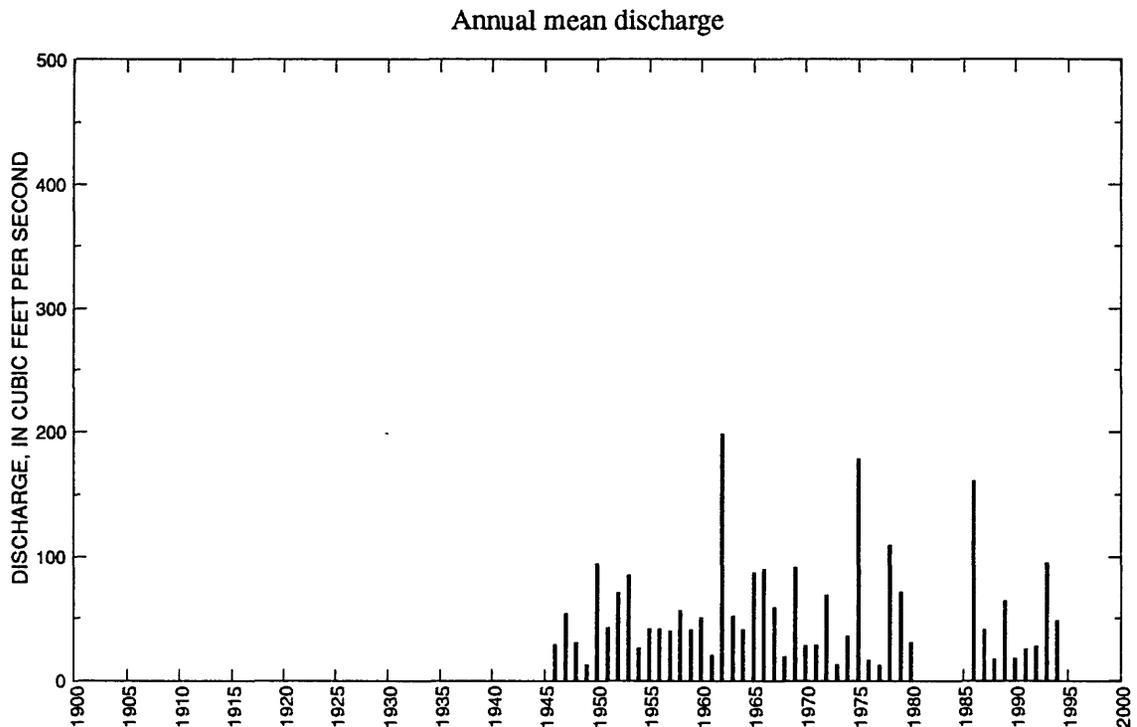
LOCATION.--Lat 46°46'20", long 96°37'40", in SW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec.9, T.138 N., R.47 W., Clay County, Hydrologic Unit 09020106, near center of span on downstream side of highway bridge, 0.3 mi downstream from Stony Creek and 1 mi east of Sabin.

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

PERIOD OF RECORD.--March 1945 to current year, WY 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, 19.9 ft); no flow for many days most years.



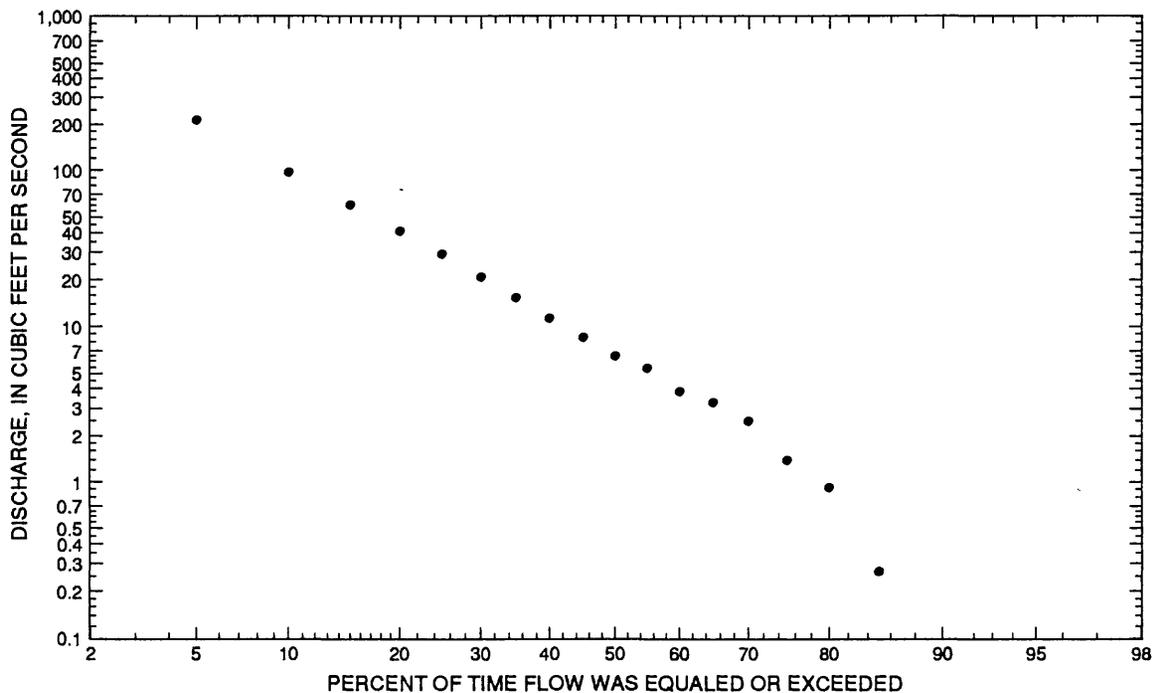
# 05061500 SOUTH BRANCH BUFFALO RIVER AT SABIN, MN--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	51.1	1978	0.023	1977	13.9	13.7	0.98	2.09
November	76.7	1972	2.05	1977	14.2	13.1	0.92	2.12
December	23.5	1978	0.006	1961	4.95	4.90	0.99	0.74
January	13.1	1978	0	m	1.67	2.59	1.55	0.25
February	14.0	1987	0	m	1.62	2.63	1.63	0.24
March	581	1966	0	m	104	137	1.32	15.6
April	928	1969	27.9	1973	254	233	0.92	38.0
May	580	1962	8.28	1980	76.7	98.5	1.28	11.5
June	1,070	1962	1.30	1976	93.1	184	1.97	14.0
July	1,110	1975	0	1988	77.4	182	2.35	11.6
August	152	1993	0	1976	12.1	25.3	2.09	1.81
September	174	1986	0	1976	13.9	29.3	2.11	2.09
Annual	198	1962	12.2	1977	55.8	42.5	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	23.6	5.47	1.40	0.05	0	0	0.49	2.10	0	0
90	0	0	0	30.2	11.7	2.87	1.50	0	0.17	1.10	3.10	0	0
85	0	0	0	35.5	15.6	4.24	2.25	0.37	0.43	2.00	3.80	0.36	0.27
80	0	0	0	42.4	18.6	6.07	2.79	0.71	0.78	2.60	4.98	0.69	0.93
75	0	0	0.18	49.9	21.6	7.71	3.35	0.98	1.40	3.54	5.74	0.87	1.40
70	0	0	0.52	58.0	24.8	8.97	4.00	1.40	2.00	4.27	6.87	1.30	2.51
65	0.10	0	1.10	66.0	28.0	11.3	5.55	1.90	2.00	4.97	7.32	1.70	3.29
60	0.18	0	2.56	75.9	32.3	13.5	6.64	2.60	2.70	6.02	7.77	2.10	3.88
55	0.26	0.02	3.53	86.5	36.5	15.9	8.23	3.12	2.70	6.49	8.78	2.60	5.41
50	0.46	0.08	4.95	98.6	40.8	18.8	11.1	3.63	4.07	6.96	9.30	3.30	6.50
45	0.55	0.27	7.82	112	45.2	22.9	14.1	4.09	4.60	8.87	11.4	3.30	8.56
40	0.96	0.88	16.7	128	49.5	27.7	17.8	4.55	5.43	10.0	12.6	4.46	11.4
35	1.40	1.10	31.2	154	55.2	34.2	22.8	6.04	6.84	12.0	13.7	5.14	15.4
30	1.70	1.80	49.4	187	62.6	42.3	30.1	7.25	7.98	14.0	14.8	5.64	20.9
25	2.00	2.30	74.6	231	70.0	54.3	40.9	8.56	9.88	18.2	17.1	6.45	29.1
20	2.40	2.90	104	318	85.5	73.7	58.5	11.9	12.5	22.4	20.0	7.10	41.0
15	4.20	3.96	157	464	107	103	84.2	16.8	17.1	28.2	24.7	8.97	59.8
10	5.21	5.07	251	654	142	174	126	24.7	26.5	36.3	31.0	11.7	97.4
5	6.44	6.27	480	1,010	226	396	315	46.3	62.5	52.1	42.0	17.3	214

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

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	83.7	66.0	54.8	37.9	30.1
0.95	1.05	185	144	117	81.8	61.4
0.90	1.11	279	217	175	121	88.7
0.80	1.25	452	354	280	194	137
0.50	2	1,100	882	673	454	302
0.20	5	2,540	2,140	1,570	1,010	637
0.10	10	3,880	3,370	2,410	1,510	924
0.04	25	5,990	5,430	3,770	2,280	1,350
0.02	50	7,870	7,350	5,010	2,950	1,720
0.01	100	10,000	9,620	6,450	3,700	2,120
0.005	200	12,400	12,300	8,100	4,540	2,570
0.002	500	16,100	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0	0	0	0.100	1.07
0.10	10	0	0	0	0	0	0	0	0.241	1.49
0.20	5	0	0	0	0	0	0	0.038	0.609	2.23
0.50	2	0	0	0	0	0	0.188	0.721	2.45	4.80

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

Probability of seasonal low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	0	0	0	0	0	0	0	0
0.10	10	0	0	0	0	0	0	0	0.308
0.20	5	0	0	0	0	0	0	0	2.34
0.50	2	0.068	0.068	0.070	0.100	0.312	0.550	1.90	20.9
		June-July-August				September-October-November			
0.05	20	0	0	0	0	0	0	0	0.297
0.10	10	0	0	0	0.073	0.032	0.058	0.190	0.610
0.20	5	0.151	0.264	0.529	0.647	0.201	0.357	0.679	1.24
0.50	2	0.951	1.39	1.75	4.21	0.966	1.64	2.26	3.87

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

Annual peak discharge and corresponding gage height, period of record

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

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

Annual peak discharge and corresponding gage height, period of record--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)
<b>Annual peak discharge, from highest to lowest, and corresponding gage height--Continued</b>							
1981	May 23	11.33	500	1991	May 4	10.30	285
1970	April 9	10.70	432	1961	May 18	9.09	248
1992	June 20	10.94	414	1977	June 3	9.05	234
1954	March 24	10.90	390	1968	April 10	8.25	230
1976	March 26	11.10	369	1990	April 1	9.22	178
1971	September 6	9.32	326	1988	March 9	10.64	175
1949	April 5	9.08	324	1973	March 16	7.33	132

# 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

## 05062000 BUFFALO RIVER NEAR DILWORTH, MN

### Station Description

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.

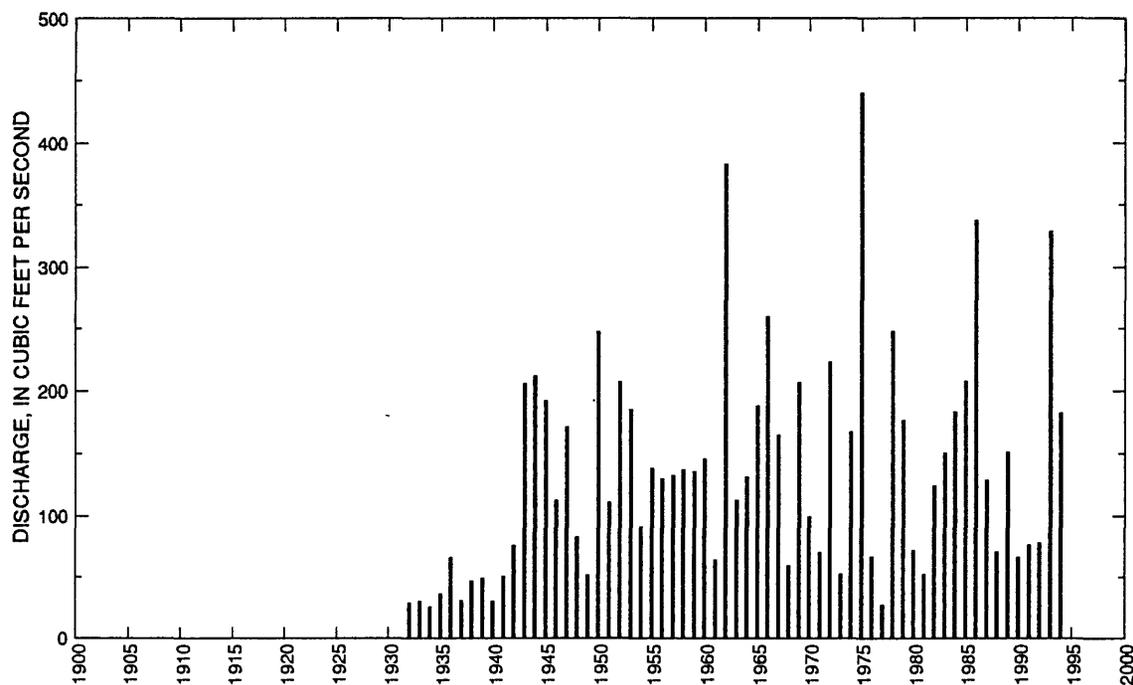
DRAINAGE AREA.--1,040 mi<sup>2</sup>, approximately.

PERIOD OF RECORD.--March 1931 to current year. Monthly discharge only for some periods, published in WSP 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, 27.1 ft); no flow at times in 1936.

Annual mean discharge

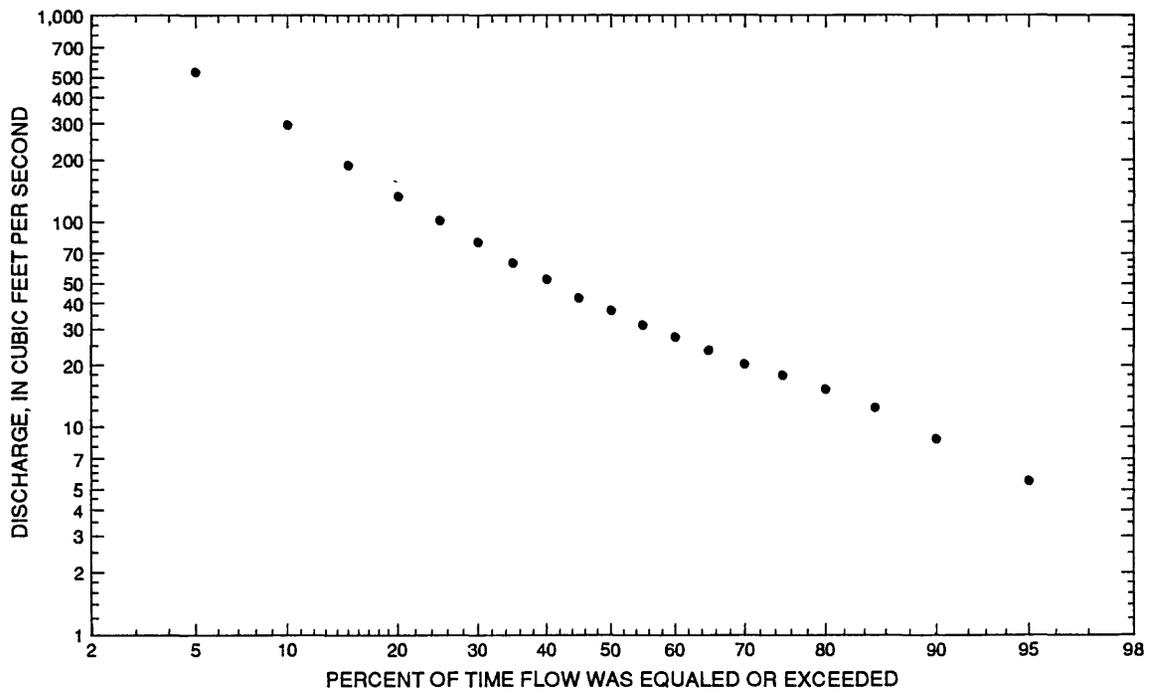


## 05062000 BUFFALO RIVER NEAR DILWORTH, MN--Continued

Statistics of monthly and annual mean discharges  
[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	186	1958	5.48	1940	50.5	46.4	0.92	3.15
November	305	1972	8.74	1937	48.0	44.2	0.92	3.00
December	97.0	1972	4.75	1938	29.2	19.4	0.66	1.82
January	53.5	m	0.868	1940	19.3	12.1	0.63	1.21
February	61.1	1984	0.759	1940	19.4	12.7	0.65	1.21
March	1,310	1966	2.26	1940	176	239	1.36	11.0
April	1,980	1978	33.5	1931	535	478	0.89	33.4
May	909	1986	27.2	1931	216	194	0.90	13.5
June	2,140	1962	15.1	1934	197	310	1.58	12.3
July	2,810	1975	2.23	1936	185	412	2.23	11.5
August	910	1993	0	1936	72.9	151	2.07	4.55
September	518	1944	0.790	1936	54.1	81.6	1.51	3.38
Annual	440	1975	25.6	1934	135	90.1	0.67	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	4.24	43.9	30.0	16.9	4.48	1.40	3.10	7.56	10.1	5.90	5.52
90	5.85	5.04	10.3	67.9	43.7	21.9	8.33	4.83	5.24	10.1	12.7	8.38	8.74
85	8.24	7.34	13.7	87.3	54.6	27.8	12.6	6.71	7.16	13.7	16.5	10.5	12.4
80	8.86	9.04	16.0	102	64.7	33.0	16.7	9.36	10.3	16.5	18.9	14.0	15.3
75	11.2	11.2	18.3	117	74.3	39.9	21.0	12.0	12.4	19.2	22.3	15.7	17.8
70	12.7	13.2	20.7	132	85.6	47.9	25.1	14.5	14.5	21.5	24.9	17.3	20.3
65	13.7	14.1	23.7	157	96.5	56.7	29.2	17.0	16.8	25.3	28.0	19.0	23.7
60	14.7	15.0	27.4	186	108	65.3	34.7	19.3	19.7	27.4	30.6	20.6	27.4
55	15.9	15.9	31.9	220	121	73.5	40.4	21.6	22.8	19.4	32.9	22.1	31.5
50	17.0	17.1	37.0	260	139	84.4	48.4	23.9	26.0	32.3	35.7	23.6	37.0
45	18.2	18.4	43.5	311	157	96.6	58.2	28.7	29.4	35.4	38.9	25.0	42.6
40	19.8	19.6	51.3	370	176	110	71.0	34.1	32.9	38.5	43.7	28.0	52.4
35	21.4	21.5	61.6	436	199	127	85.6	40.5	38.8	42.3	49.6	30.1	63.2
30	23.5	23.7	89.1	512	227	149	107	48.3	45.9	50.0	55.1	32.8	79.5
25	25.8	26.1	124	619	260	180	133	56.6	54.0	60.8	62.0	36.4	102
20	28.3	28.7	170	786	300	228	172	71.0	66.9	75.4	69.1	42.2	134
15	31.0	31.3	248	1,000	352	286	239	93.2	86.7	91.4	76.2	51.9	189
10	36.3	37.1	405	1,320	429	399	354	148	128	118	84.7	61.8	295
5	47.4	47.5	834	1,970	620	682	694	298	212	162	120	70.0	533

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

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum Instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	135	114	90.2	69.2
0.95	1.05	258	260	225	176	134
0.90	1.11	375	368	322	250	189
0.80	1.25	586	563	493	379	283
0.50	2	1,360	1,270	1,100	825	595
0.20	5	3,120	2,870	2,390	1,750	1,210
0.10	10	4,780	4,400	3,560	2,570	1,720
0.04	25	7,480	6,960	5,420	3,840	2,490
0.02	50	9,970	9,350	7,080	4,960	3,130
0.01	100	12,900	12,200	8,980	6,220	3,850
0.005	200	16,300	15,600	11,100	7,640	4,620
0.002	500	21,600	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0.401	0.478	0.547	0.679	0.990	1.25	2.77	4.76	6.70
0.10	10	1.07	1.23	1.38	1.68	2.23	2.84	4.54	6.84	9.16
0.20	5	2.70	3.00	3.32	3.91	4.77	6.29	7.70	10.3	13.2
0.50	2	9.38	9.93	10.6	11.8	13.1	16.7	17.1	20.2	25.5

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

### Probability of seasonal low discharges

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	1.64	1.70	1.78	2.07	3.38	3.69	4.03	9.30
0.10	10	3.38	3.52	3.70	4.06	5.34	5.77	6.51	14.9
0.20	5	6.87	7.16	7.50	7.84	8.74	9.45	11.0	25.4
0.50	2	16.5	17.1	17.6	17.9	18.8	21.0	25.4	63.3
		June-July-August				September-October-November			
0.05	20	0.702	1.08	1.55	2.37	1.42	2.29	<sup>1</sup> 2.84	3.40
0.10	10	1.71	2.38	3.07	4.34	2.68	3.78	<sup>1</sup> 4.65	5.53
0.20	5	4.12	5.23	6.23	8.24	5.10	6.46	7.13	9.50
0.50	2	14.8	17.0	19.0	23.8	13.5	15.9	20.3	23.4

<sup>1</sup>Graphical interpretation.

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

Annual peak discharge and corresponding gage height, period of record

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

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

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

# 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

## 05062200 ELM RIVER NEAR KELSO, ND

### Station Description

LOCATION.--Lat 47°17'30", long 97°06'50", in sec.23, T.144 N., R.51 W., Traill County, Hydrologic Unit 09020107, on left bank 50 ft upstream from county road, 4.0 mi south and 3.4 mi west of Kelso.

DRAINAGE AREA.--199 mi<sup>2</sup>.

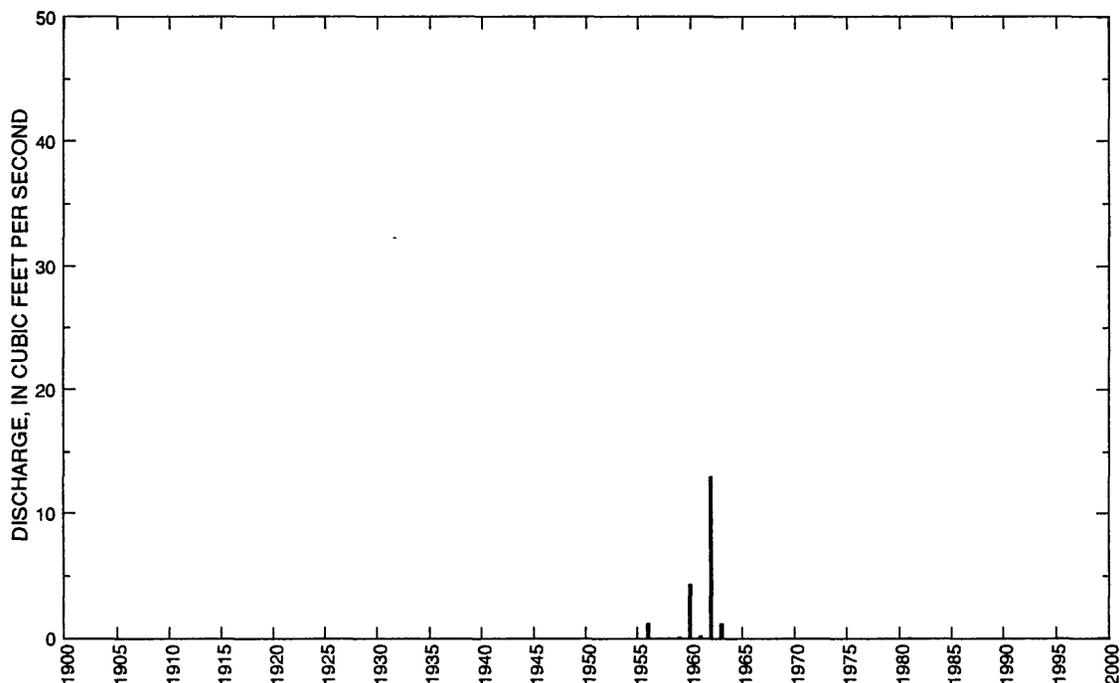
PERIOD OF RECORD.--December 1955 to September 1963, 1964-73 (annual maximum only), October 1980 to August 1986 (seasonal records only since 1982).

GAGE.--Water-stage recorder. Elevation of gage is 893 ft above National Geodetic Vertical Datum of 1929, from topographic map. Prior to September 1973, gage located at site 1 mile upstream at datum of 887.60 ft above National Geodetic Vertical Datum of 1929, Emerson-Crookston supplementary adjustment of 1941.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,000 ft<sup>3</sup>/s, occurred during Mar. 1966; maximum gage height, 13.75 ft, Mar. 6, 1983, from floodmark, backwater from ice; no flow at times each year.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum stage known since 1925, about 14 ft in 1950, from information by local resident.

Annual mean discharge



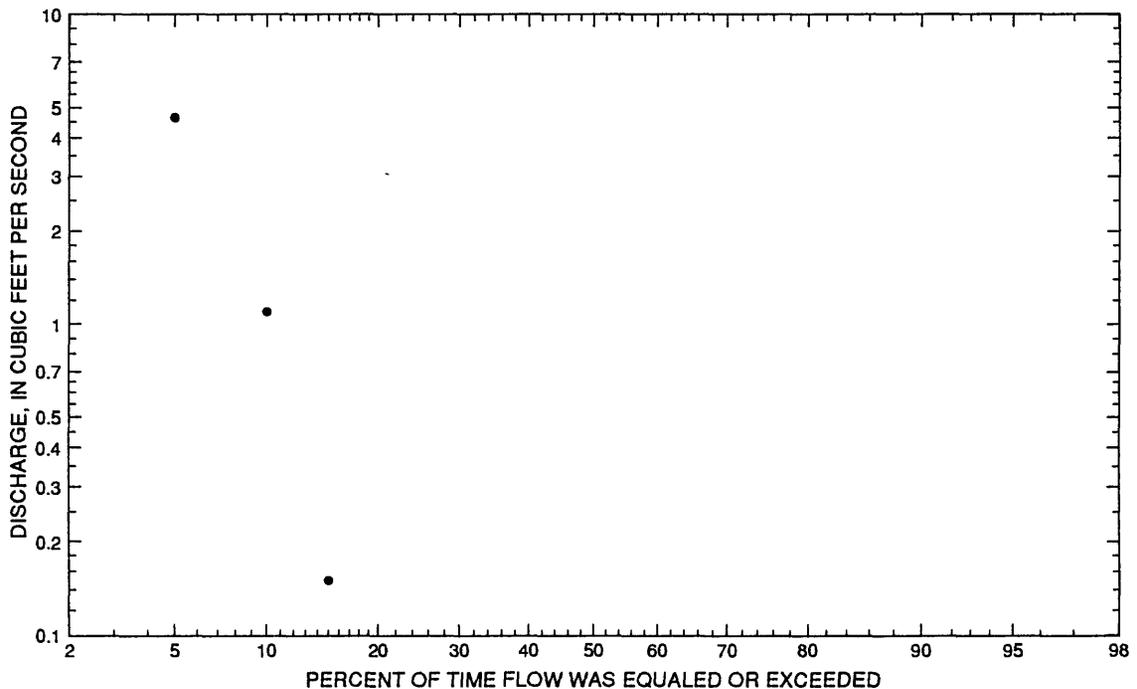
## 05062200 ELM RIVER NEAR KELSO, ND--Continued

Statistics of monthly and annual mean discharges

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	1.11	1963	0	m	0.150	0.37	2.40	0.15
November	0.590	1963	0	m	0.070	0.20	3.00	0.06
December	0.500	1963	0	m	0.060	0.17	3.00	0.05
January	0.026	1963	0	m	0	0.01	3.00	0
February	0.009	1981	0	m	0	0	3.00	0
March	147	1984	0	m	30.6	52.2	1.71	29.8
April	240	1982	0	1958	45.0	66.4	1.48	43.8
May	24.5	1986	0	m	5.26	7.42	1.41	5.12
June	111	1983	0	m	15.9	37.0	2.32	15.5
July	37.6	1962	0	m	4.61	10.9	2.37	4.49
August	4.00	1983	0	m	0.42	1.10	2.60	0.41
September	5.19	1962	0	m	0.58	1.73	3.00	0.56
Annual	13.0	1962	0	1958	2.22	4.27	1.93	100

Annual flow duration



**05062200 ELM RIVER NEAR KELSO, 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	0.05	0	0	0	0
90	0	0	0	0	0	0	0	0	0.05	0	0	0	0
85	0	0	0	0	0	0	0	0	0.05	0	0	0	0
80	0	0	0	0	0	0	0	0	0.05	0	0	0	0
75	0	0	0	0.04	0	0	0	0	0.05	0	0	0	0
70	0	0	0	0.09	0	0	0	0	0.05	0	0	0	0
65	0	0	0	0.25	0	0	0	0	0.05	0	0	0	0
60	0	0	0	0.89	0.10	0	0	0	0.05	0	0	0	0
55	0	0	0	4.51	0.37	0	0	0	0.05	0	0	0	0
50	0	0	0	8.10	0.58	0	0	0	0.05	0	0	0	0
45	0	0	0	10.9	1.10	0.10	0	0	0.05	0	0	0	0
40	0	0	0.04	15.6	1.70	0.61	0	0	0.05	0	0	0	0
35	0	0	0.30	20.2	2.70	1.30	0	0	0.05	0	0	0	0
30	0	0	1.10	30.0	4.47	2.20	0	0	0.05	0	0	0	0
25	0	0	1.60	42.0	5.88	2.80	0.24	0	0.05	0	0	0	0
20	0	0	4.74	65.0	7.56	4.41	1.00	0	0.05	0	0	0	0
15	0	0	33.7	99.6	11.2	5.59	4.28	0.20	0.05	0	0	0	0.15
10	0	0	109	166	14.9	22.0	7.90	1.90	0.05	0.49	0	0	1.10
5	0	0	225	291	22.4	80.0	27.7	2.80	3.60	1.30	0.47	0.10	4.64

## 05062200 ELM RIVER NEAR KELSO, ND--Continued

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average 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	9.00	0	0	0	0
0.80	1.25	26.5	0.202	0.158	0.115	0.072
0.50	2	158	7.67	5.79	4.22	2.55
0.20	5	660	83.3	64.2	47.2	27.4
0.10	10	1,220	229	182	134	76.1
0.04	25	2,160	570	468	348	193
0.02	50	2,980	970	819	611	334
0.01	100	3,860	1,520	1,320	988	532
0.005	200	4,780	2,180	1,950	1,470	779
0.002	500	6,020	ng	ng	ng	ng

### Probability of annual low discharges

[ng, statistic not given]

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	ng	ng	ng	ng	ng	ng	ng	ng	ng
0.10	10	ng	ng	ng	ng	ng	ng	ng	ng	ng
0.20	5	ng	ng	ng	ng	ng	ng	ng	ng	ng
0.50	2	ng	ng	ng	ng	ng	ng	ng	ng	ng

05062200 ELM RIVER NEAR KELSO, ND--Continued

Probability of seasonal low discharges

[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	ng	ng	0	0
0.10	10	ng	ng	ng	ng	ng	ng	0	0
0.20	5	ng	ng	ng	ng	ng	ng	0	0
0.50	2	ng	ng	ng	ng	ng	ng	0	0.083
		June-July-August				September-October-November			
0.05	20	ng	ng	0	0	ng	ng	ng	ng
0.10	10	ng	ng	0	0	ng	ng	ng	ng
0.20	5	ng	ng	0	0	ng	ng	ng	ng
0.50	2	ng	ng	0	0	ng	ng	ng	ng

## 05062200 ELM RIVER NEAR KELSO, ND—Continued

Annual peak discharge and corresponding gage height, period of record

[--, 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)
<b>Annual peak discharge, by year, and corresponding gage height</b>							
1956	June 4	6.80	102	1968	--	6.73	117
1957	March 24	4.75	3.00	1969	--	12.16	930
1958	--	--	0	1970	--	9.58	452
1959	March 20	4.55	3.20	1971	March <sup>1</sup>	7.28	140
1960	April 1	7.76	165	1972	April 14	10.60	635
1961	March 18	4.81	9.90	1973	March <sup>1</sup>	8.58	265
1962	April 8	9.51	440	1981	February 27	--	0.050
1963	April 7	5.80	53.0	1982	April 2	12.93	500
1964	--	5.14	20.0	1983	March 17	10.10	310
1965	April <sup>1</sup>	11.73	850	1984	March 26	13.75	747
1966	March <sup>1</sup>	12.48	1,000	1985	March 17	8.95	255
1967	April <sup>1</sup>	8.72	300	1986	March 23	10.22	362
<b>Annual peak discharge, from highest to lowest, and corresponding gage height</b>							
1966	March <sup>1</sup>	12.48	1,000	1985	March 17	8.95	255
1969	--	12.16	930	1960	April 1	7.76	165
1965	April <sup>1</sup>	11.73	850	1971	March <sup>1</sup>	7.28	140
1984	March 26	13.72	747	1968	--	6.73	117
1972	April 14	10.60	635	1956	June 4	6.80	102
1982	April 2	12.93	500	1963	April 7	5.80	53.0
1970	--	9.58	452	1964	--	5.14	20.0
1962	April 8	9.51	440	1961	March 18	4.81	9.90
1986	March 23	10.22	362	1959	March 20	4.55	3.20
1983	March 17	10.10	310	1957	March 24	4.75	3.00
1967	April <sup>1</sup>	8.72	300	1981	February 27	--	0.050
1973	March <sup>1</sup>	8.58	265	1958	--	--	0

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

# 05062200 ELM RIVER NEAR KELSO, 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	0	0	0	0	0	0	10.2	2.08	2.07	0	0	0	1.18
1957	0	0	0	0	0	0.274	0.117	0	0	0	0	0	0.033
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0.713	0.190	0	0	0	0	0	0.076
1960	0	0	0	0	0	5.16	46.8	0.155	0.010	0	0	0	4.29
1961	0	0	0	0	0	1.87	0.213	0.052	0	0	0	0	0.181
1962	0.277	0	0	0	0	0	91.5	11.4	8.94	37.6	1.43	5.19	13.0
1963	1.11	0.590	0.500	0.026	0	1.72	8.83	0.919	0.487	0	0	0	1.18
1981	0	0	0	0	0	0.007	0.012	0	0	0	0	0	0.002
1982	--	--	--	--	--	4.72	240.1	14.5	2.35	2.83	0	--	--
1983	--	--	--	--	--	131.0	68.3	9.03	111.4	20.5	4.00	--	--
1984	--	--	--	--	--	146.7	54.6	8.29	94.1	0.535	0	--	--
1985	--	--	--	--	--	50.3	11.7	2.69	1.05	0	0.323	--	--
1986	--	--	--	--	--	85.2	97.6	24.5	2.79	3.05	0.158	--	--

## 05062500 WILD RICE RIVER AT TWIN VALLEY, MN

### Station Description

**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.

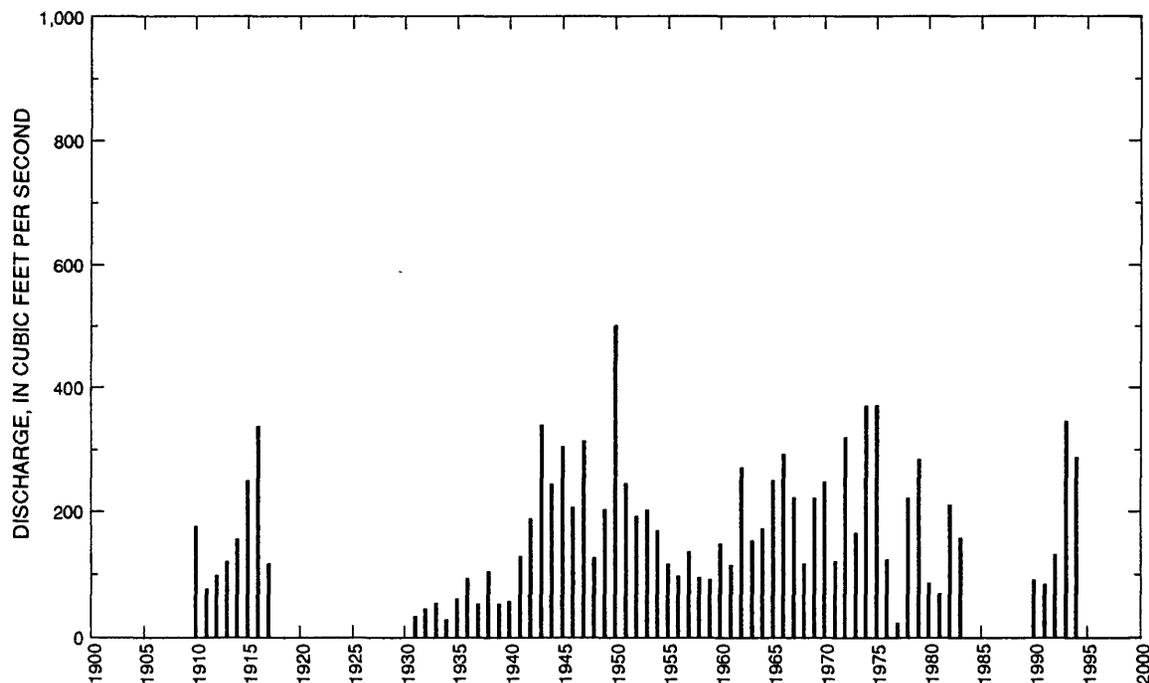
**DRAINAGE AREA.**--888 mi<sup>2</sup>.

**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 WSP 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 bench mark). June 1909 to September 1917, nonrecording gage at site 0.2 mi downstream at different datum. July 23, 1930, to Nov. 24, 1934, nonrecording gage at highway bridge 100 ft downstream from present site at present datum. Nov. 25, 1934, to Aug. 2, 1950, water-stage recorder 80 ft upstream from present site at present datum.

**EXTREMES FOR PERIOD OF RECORD.**--Maximum discharge, 9,200 ft<sup>3</sup>/s, July 22, 1909 (gage height, 20.0 ft, from rating curve extended above 3,300 ft<sup>3</sup>/s); minimum discharge, 0.5 ft<sup>3</sup>/s, Nov. 4, 1939.

Annual mean discharge

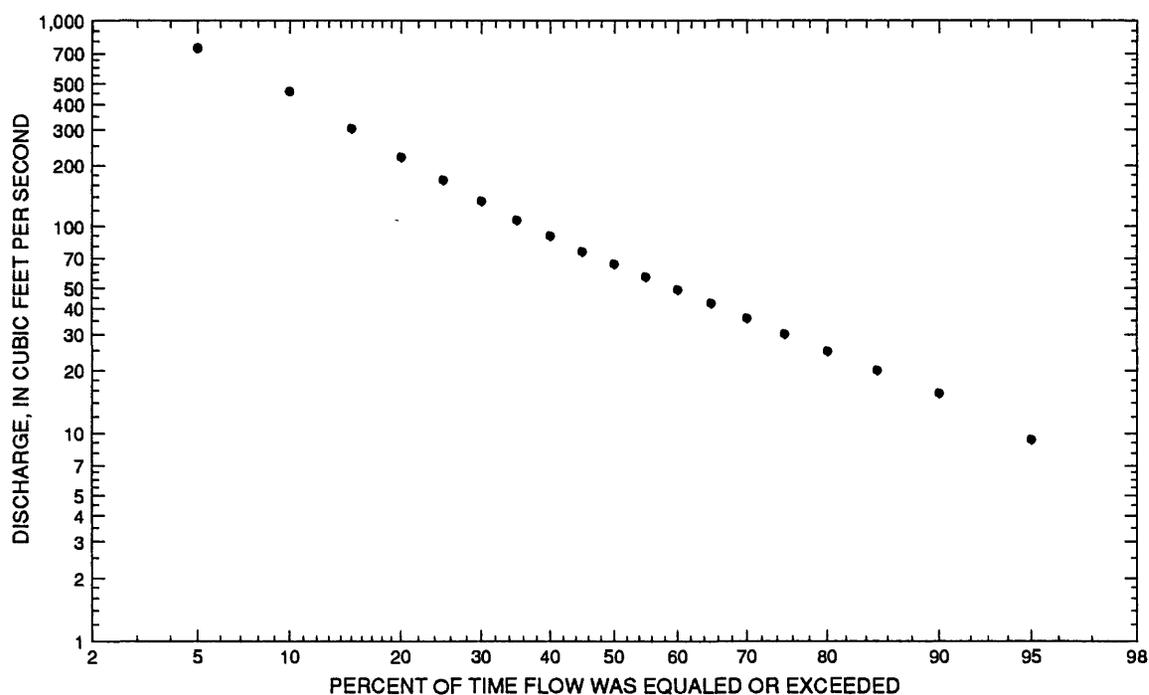


## 05062500 WILD RICE RIVER AT TWIN VALLEY, MN—Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean			
	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)	Coeffi- cient of variation	Percentage of annual discharge
October	614	1974	6.10	1933	84.2	95.9	1.14	3.97
November	488	1972	9.31	1933	73.5	68.6	0.93	3.46
December	123	1972	6.00	1933	49.8	31.9	0.64	2.35
January	100	1910	4.00	1933	38.3	23.0	0.60	1.81
February	90.8	1994	4.00	1933	35.5	20.2	0.57	1.67
March	747	1945	12.8	1940	129	141	1.09	6.08
April	1,540	1979	73.8	1931	562	419	0.75	26.5
May	2,260	1950	30.9	1977	414	338	0.82	19.5
June	1,560	1943	26.4	1977	306	294	0.96	14.4
July	1,920	1909	8.04	1934	236	332	1.40	11.1
August	1,020	1993	3.02	1932	107	180	1.69	5.02
September	788	1973	2.96	1936	86.7	123	1.42	4.08
Annual	500	1950	22.7	1977	174	102	0.59	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 exceeded or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	8.90	9.50	15.9	68.1	66.4	38.6	12.3	4.65	3.50	7.63	12.5	7.40	9.37
90	10.7	11.8	20.0	92.5	91.7	55.9	22.9	7.38	6.08	11.9	17.2	12.8	15.6
85	15.1	13.8	23.8	124	122	70.3	31.9	13.0	10.3	15.0	22.0	17.7	20.1
80	16.6	16.9	27.2	146	152	83.3	39.8	18.6	13.6	18.4	25.3	20.1	24.8
75	18.9	19.8	30.6	170	172	99.7	49.7	23.0	17.5	22.4	28.4	21.7	30.1
70	22.5	22.6	34.8	194	194	117	58.7	27.0	21.7	26.9	32.3	25.7	35.9
65	15.3	24.6	39.8	224	218	136	66.3	31.3	25.5	32.0	38.8	30.3	42.5
60	18.8	26.2	45.3	270	244	151	73.9	36.3	30.9	37.2	44.5	35.3	49.3
55	32.1	29.6	51.2	318	276	166	85.6	41.4	35.7	42.9	49.6	39.1	56.8
50	34.7	32.7	56.2	361	312	183	98.4	48.4	42.2	50.3	55.7	43.6	65.5
45	37.7	36.6	61.1	413	351	207	113	56.4	50.4	57.6	62.1	48.9	75.7
40	42.5	39.4	67.1	476	394	238	131	65.3	59.5	68.2	71.0	53.8	90.1
35	46.2	42.7	73.6	549	441	270	157	75.4	69.3	82.8	81.8	58.4	108
30	49.0	46.3	84.3	628	490	309	195	87.3	82.1	100	90.9	63.2	134
25	55.1	49.8	104	784	545	363	239	102	101	116	99.1	68.8	170
20	60.1	53.2	146	922	610	425	306	124	131	133	109	76.7	220
15	64.9	59.7	194	1,080	695	512	393	162	165	153	122	90.2	305
10	69.7	64.6	280	1,280	803	663	526	224	206	184	138	101	461
5	87.2	74.8	528	1,700	1,130	1,010	846	397	301	247	171	118	745

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

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	126	101	88.9	80.4	70.3
0.95	1.05	265	218	197	174	148
0.90	1.11	386	321	291	254	214
0.80	1.25	599	498	452	388	322
0.50	2	1,310	1,070	960	797	649
0.20	5	2,680	2,090	1,820	1,460	1,170
0.10	10	3,790	2,870	2,430	1,910	1,530
0.04	25	5,390	3,910	3,210	2,480	1,980
0.02	50	6,690	4,710	3,790	2,880	2,290
0.01	100	8,060	5,520	4,350	3,260	2,600
0.005	200	9,520	6,330	4,890	3,630	2,890
0.002	500	11,600	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	2.46	2.74	2.99	3.42	4.10	5.20	6.79	8.35	9.66
0.10	10	3.76	4.22	4.58	5.15	6.07	7.61	9.70	11.9	13.9
0.20	5	6.12	6.86	7.39	8.17	9.46	11.7	14.5	17.6	21.1
0.50	2	14.1	15.6	16.6	17.9	20.2	24.2	28.6	34.1	43.2

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

Probability of seasonal low discharges

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	5.88	6.59	6.89	7.28	9.98	11.1	12.3	19.9
0.10	10	8.31	9.09	9.46	10.0	13.6	14.9	16.3	26.1
0.20	5	12.4	13.2	13.7	14.5	19.3	20.8	22.5	36.5
0.50	2	24.7	25.5	26.1	27.6	34.1	36.9	40.4	72.1
		June-July-August				September-October-November			
0.05	20	3.21	4.02	4.58	6.09	2.90	3.69	4.21	5.19
0.10	10	5.11	6.53	7.49	9.97	4.50	5.78	6.60	8.16
0.20	5	8.86	11.4	13.2	17.5	7.48	9.67	11.1	13.7
0.50	2	24.2	30.5	35.3	46.7	18.7	24.0	27.3	33.6

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

Annual peak discharge and corresponding gage height, period of record

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

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

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

# 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	34.7	79.5	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	717.5	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

## 05064000 WILD RICE RIVER AT HENDRUM, MN

### Station Description

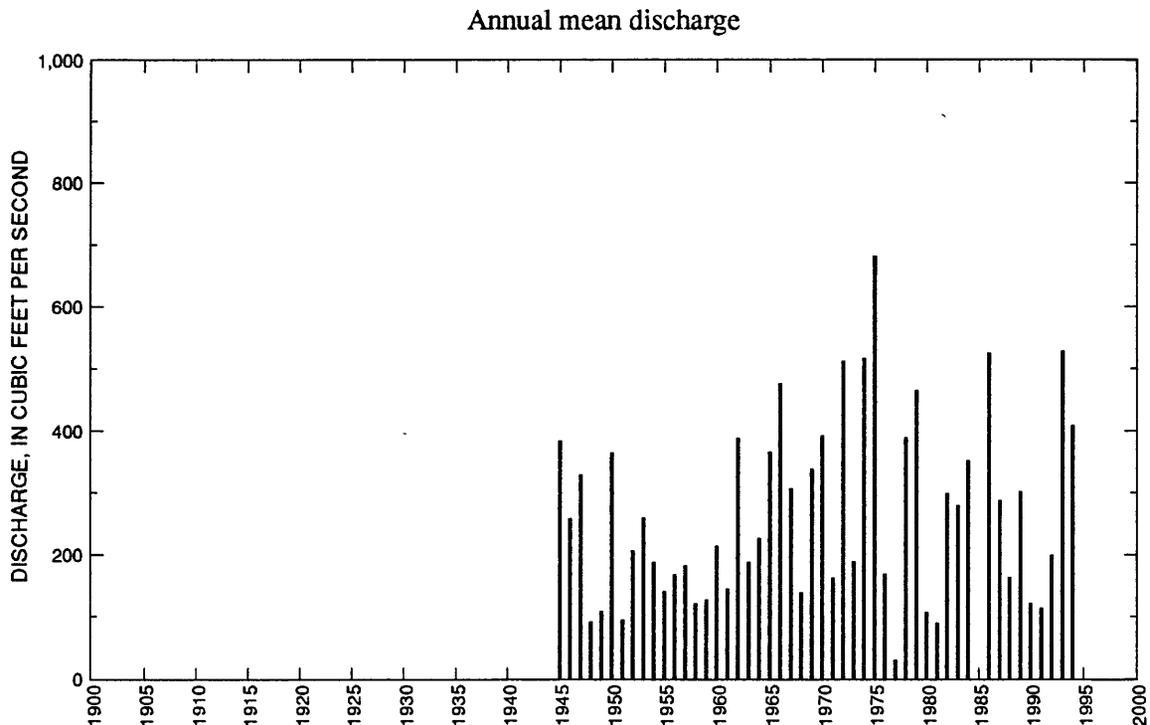
**LOCATION.**--Lat 47°16'05", long 96°47'50", in SE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec.19, T.144 N., R.48 W., Norman County, Hydrologic Unit 09020108, on right bank 30 ft downstream from highway bridge, 0.5 mi east of Hendrum and 4 mi upstream from mouth.

**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, 9,350 ft<sup>3</sup>/s, Apr. 10, 1978 (gage height, 31.4 ft); maximum gage height, 32.3 ft, Apr. 21, 1979; minimum discharge, 0 ft<sup>3</sup>/s for some days in 1948-49.



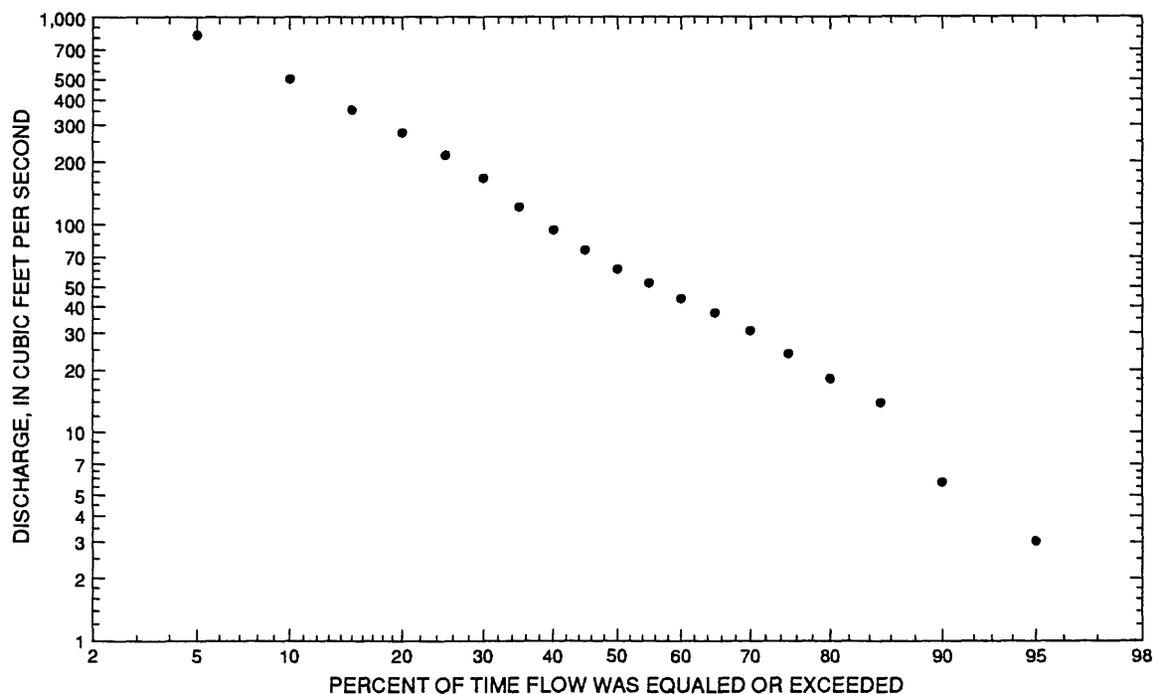
# 05064000 WILD RICE RIVER AT HENDRUM, MN—Continued

## Pre-regulation period

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

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	299	1945	0.435	1949	79.8	92.1	1.15	3.18
November	228	1945	3.32	1949	70.3	66.9	0.95	2.80
December	152	1952	1.73	1949	51.3	42.9	0.84	2.04
January	99.2	1952	0.800	1949	35.4	27.8	0.79	1.41
February	83.1	1952	0.400	1949	32.6	24.5	0.75	1.30
March	1,080	1945	0.461	1949	191	285	1.49	7.61
April	1,790	1947	173	1958	799	507	0.63	31.8
May	1,630	1950	99.0	1949	451	346	0.77	17.9
June	888	1953	9.15	1952	321	239	0.74	12.8
July	1,120	1944	8.82	1951	246	263	1.07	9.80
August	960	1944	3.93	1948	132	222	1.68	5.24
September	762	1944	0.183	1948	104	185	1.78	4.12
Annual	384	1945	90.4	1948	198	92.0	0.46	100

Annual flow duration, pre-regulation period



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

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

Percentage of days discharge equalled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	0.80	0.40	0.40	109	68.9	13.7	12.1	3.84	0.42	0.57	3.40	1.60	3.04
90	3.10	2.50	2.50	168	107	35.0	20.9	5.35	3.91	6.24	5.40	3.40	5.77
85	4.20	3.40	4.10	201	135	64.7	36.1	6.79	6.43	12.6	9.22	6.73	13.9
80	12.6	11.9	20.7	235	177	92.5	45.0	13.3	10.1	14.7	15.6	14.5	18.2
75	14.1	13.9	23.7	278	218	116	55.1	19.4	13.6	17.1	20.9	16.9	23.9
70	15.3	17.2	26.5	333	252	151	65.7	24.0	16.6	19.6	26.7	22.3	30.6
65	17.3	19.2	30.7	386	284	185	75.7	27.8	20.3	22.9	35.8	29.9	37.3
60	21.3	20.6	35.2	434	314	209	91.5	32.4	24.7	27.8	41.1	35.5	43.9
55	26.2	24.6	40.4	487	345	226	113	38.3	31.1	33.8	45.1	41.2	52.1
50	32.7	30.9	45.7	550	376	244	134	47.6	35.8	40.1	48.6	45.7	60.9
45	37.8	34.1	59.4	624	407	264	155	62.1	40.2	45.5	52.6	48.9	75.3
40	42.1	37.1	78.1	721	437	285	181	73.0	46.0	51.0	58.1	53.4	93.8
35	46.1	40.0	88.0	833	466	312	218	86.9	54.3	57.5	64.8	59.8	121
30	50.3	43.4	97.9	853	494	340	260	107	70.2	64.0	75.7	64.6	166
25	54.5	47.0	125	1,100	539	383	304	135	93.6	98.8	95.4	69.6	216
20	58.5	53.7	182	1,270	592	438	366	167	120	179	120	76.7	275
15	63.3	62.4	254	1,510	674	511	448	208	170	209	147	91.3	355
10	75.3	71.6	403	1,780	789	633	593	293	238	243	180	117	502
5	90.4	81.6	1,310	2,220	1,040	1,040	800	576	511	280	234	146	829

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

Probability of annual high discharges, pre-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	355	312	279	233	167
0.95	1.05	615	543	482	394	293
0.90	1.11	808	716	632	512	386
0.80	1.25	1,100	983	685	692	528
0.50	2	1,890	1,720	1,500	1,170	901
0.20	5	3,030	2,810	2,430	1,850	1,420
0.10	10	3,770	3,550	3,050	2,300	1,750
0.04	25	4,670	4,480	3,830	2,850	2,130
0.02	50	5,320	5,150	4,390	3,240	2,400
0.01	100	5,930	5,800	4,940	3,610	2,650
0.005	200	6,520	6,440	5,470	3,970	2,880
0.002	500	7,260	ng	ng	ng	ng

Probability of annual low discharges, pre-regulation period

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0	0	0	0	0.440	0.846	1.50	1.93	2.52
0.10	10	0.800	1.13	1.31	2.11	<sup>1</sup> 2.20	2.28	3.35	4.12	5.21
0.20	5	2.36	3.23	3.66	4.78	<sup>1</sup> 5.50	6.20	7.72	9.17	11.4
0.50	2	9.52	11.9	13.2	14.1	20.2	23.6	25.9	30.2	38.4

<sup>1</sup>Graphical interpretation.

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

Probability of seasonal low discharges, pre-regulation period

Non-exceedance probability	Recurrence interval (years)	Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
		1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	1.16	1.18	1.19	1.27	1.09	1.10	1.16	1.67
0.10	10	2.67	2.75	2.79	2.96	2.72	2.76	2.97	5.00
0.20	5	6.40	6.62	6.77	7.15	6.98	7.18	8.00	15.8
0.50	2	22.7	23.5	24.2	25.4	26.4	28.6	34.7	86.9
		June-July-August				September-October-November			
0.05	20	1.24	2.02	2.87	4.08	0	0	0	0.519
0.10	10	2.27	3.39	4.59	6.69	1.13	1.39	2.33	1.86
0.20	5	4.67	6.36	8.19	12.2	3.41	4.26	5.81	6.75
0.50	2	18.0	21.5	25.6	38.8	14.8	19.4	21.9	38.3

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

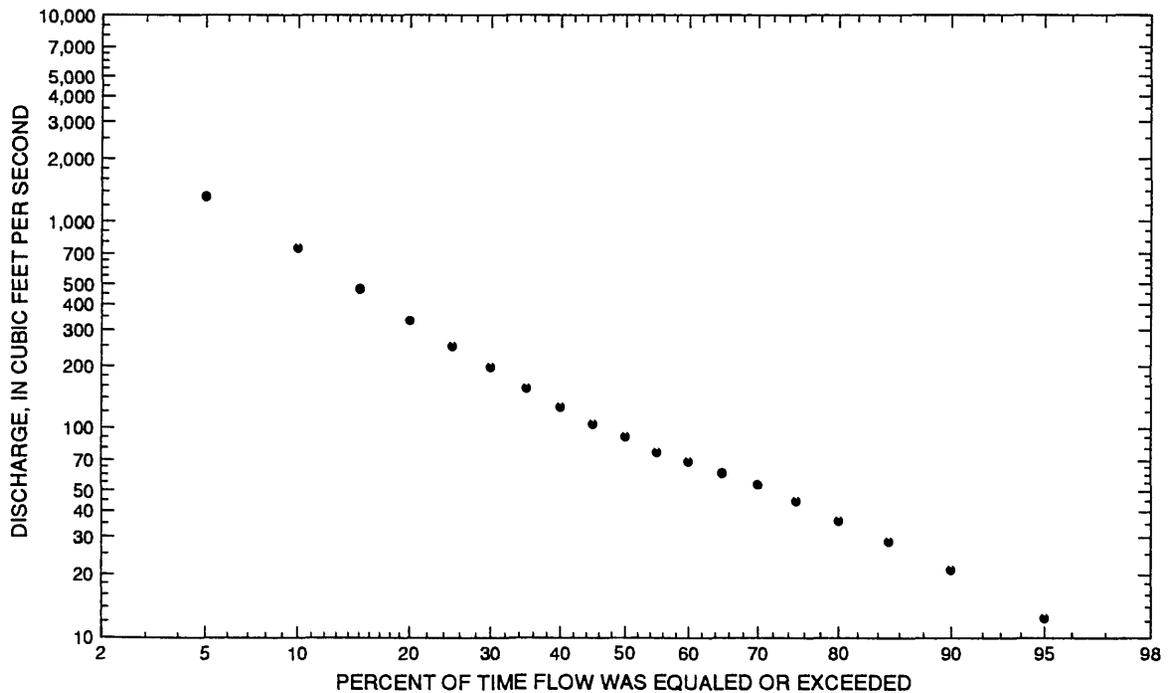
## Post-regulation period

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

[m, more than 1 year of occurrence]

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	744	1972	7.68	1977	133	165	1.24	3.58
November	784	1972	10.3	1977	122	137	1.12	3.27
December	160	1972	1.08	1977	69.2	43.5	0.63	1.85
January	121	1986	0.092	1977	51.4	28.4	0.55	1.38
February	124	1984	0.219	1977	50.5	27.6	0.55	1.35
March	1,480	1966	23.4	1965	314	344	1.10	8.41
April	3,260	1978	106	1981	1,240	916	0.74	33.2
May	2,070	1985	56.1	1977	625	483	0.77	16.8
June	1,780	1962	36.7	1977	472	440	0.93	12.7
July	3,140	1975	11.9	1980	379	600	1.58	10.2
August	1,830	1993	1.07	1977	156	319	2.05	4.17
September	824	1973	0.722	1976	120	164	1.37	3.22
Annual	682	1975	28.9	1977	303	159	0.53	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 equalled or exceeded	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
95	7.36	5.55	18.6	104	86.9	46.1	14.9	2.40	4.03	13.3	18.3	13.5	12.4
90	14.9	18.0	25.3	158	133	72.1	25.6	10.1	11.2	20.5	27.1	17.6	21.1
85	19.4	21.6	28.8	200	182	95.2	49.2	14.9	14.4	25.6	33.1	23.3	28.9
80	25.8	25.5	37.3	244	209	117	63.7	21.3	18.1	31.0	39.5	29.9	36.2
75	29.6	29.5	49.5	294	239	140	72.1	27.8	22.9	36.6	46.6	33.8	45.0
70	33.4	33.6	55.7	357	265	166	81.8	33.8	29.3	42.7	54.4	37.2	53.9
65	37.3	38.3	61.1	423	291	188	93.6	40.2	36.7	48.8	63.3	44.5	61.6
60	41.4	43.2	66.5	500	330	207	109	46.6	44.2	58.2	72.2	51.6	69.3
55	47.2	47.2	73.1	596	376	232	126	55.7	51.7	68.4	82.4	55.9	77.1
50	52.7	51.1	79.7	706	421	263	146	65.0	60.0	77.0	92.4	60.2	90.9
45	56.5	54.9	86.3	834	472	293	166	75.2	68.2	85.2	102	66.1	105
40	60.2	58.5	104	965	541	328	188	85.5	79.7	93.4	112	73.2	127
35	64.0	62.1	134	1,100	634	374	217	98.7	91.9	110	121	80.8	156
30	68.0	65.6	205	1,300	700	444	262	117	106	132	132	91.2	198
25	72.1	69.2	289	1,560	787	539	334	140	120	156	146	102	250
20	76.1	73.2	411	1,920	890	638	424	176	152	180	166	113	332
15	80.2	79.4	592	2,240	1,020	787	524	226	207	224	187	124	476
10	89.6	85.5	846	3,100	1,280	1,010	759	298	294	294	210	138	744
5	100	91.6	1,400	4,510	1,920	1,760	1,540	525	486	456	290	153	1,320

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

Probability of annual high discharges, post-regulation period

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	ng	250	202	165	133
0.95	1.05	870	562	465	372	299
0.90	1.11	1,160	833	697	552	442
0.80	1.25	1,620	1,300	1,100	861	682
0.50	2	2,980	2,750	2,380	1,830	1,400
0.20	5	5,270	5,140	4,550	3,430	2,500
0.10	10	6,990	6,800	6,090	4,550	3,220
0.04	25	9,340	8,870	8,040	5,960	4,070
0.02	50	11,200	10,400	9,450	6,960	4,650
0.01	100	13,100	11,800	10,800	7,930	5,180
0.005	200	15,100	13,100	12,100	8,850	5,670
0.002	500	17,900	ng	ng	ng	ng

Probability of annual low discharges, post-regulation period

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	0.336	0.384	0.434	0.596	1.01	1.90	3.13	6.78	10.5
0.10	10	1.18	1.31	1.47	1.88	2.92	5.18	7.56	12.6	17.1
0.20	5	4.14	4.50	4.96	5.92	8.40	13.5	17.7	23.4	28.8
0.50	2	22.0	23.1	25.0	27.3	32.8	42.2	49.2	54.3	64.5

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

Probability of seasonal low discharges, post-regulation period

[ng, statistic not given]

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	ng	ng	ng	ng	5.02	5.46	6.70	28.0
0.10	10	ng	ng	ng	ng	11.5	12.0	13.5	38.6
0.20	5	ng	ng	ng	ng	25.1	25.5	27.4	57.2
0.50	2	ng	ng	ng	ng	59.8	64.7	70.7	123
		June-July-August				September-October-November			
0.05	20	0.873	1.09	1.66	3.99	1.07	1.44	1.86	4.11
0.10	10	2.63	3.26	4.43	8.38	3.28	4.10	5.00	8.52
0.20	5	8.11	9.89	12.2	18.7	9.70	11.5	13.3	18.2
0.50	2	38.7	45.2	50.9	65.2	36.7	43.2	47.2	54.6

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

Annual peak discharge and corresponding gage height, period of record

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

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

Annual peak discharge and corresponding gage height, period of record--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)
<b>Annual peak discharge, from highest to lowest, and corresponding gage height--Continued</b>							
1980	April 5	17.36	1,800	1990	April 1	14.26	1,100
1963	June 3	13.89	1,670	1961	May 17	10.66	1,080
1953	June 18	16.88	1,650	1991	May 6	10.27	952
1973	September 6	13.03	1,630	1949	July 11	--	738
1960	April 8	16.48	1,600	1968	March 29	11.26	726
1971	April 10	13.20	1,500	1958	July 7	8.16	633
1987	July 25	14.26	1,500	1959	April 6	8.92	540
1957	September 4	--	1,250	1977	April 11	5.55	245
1988	April 8	11.30	1,190				

# 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

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

### Station Description

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.

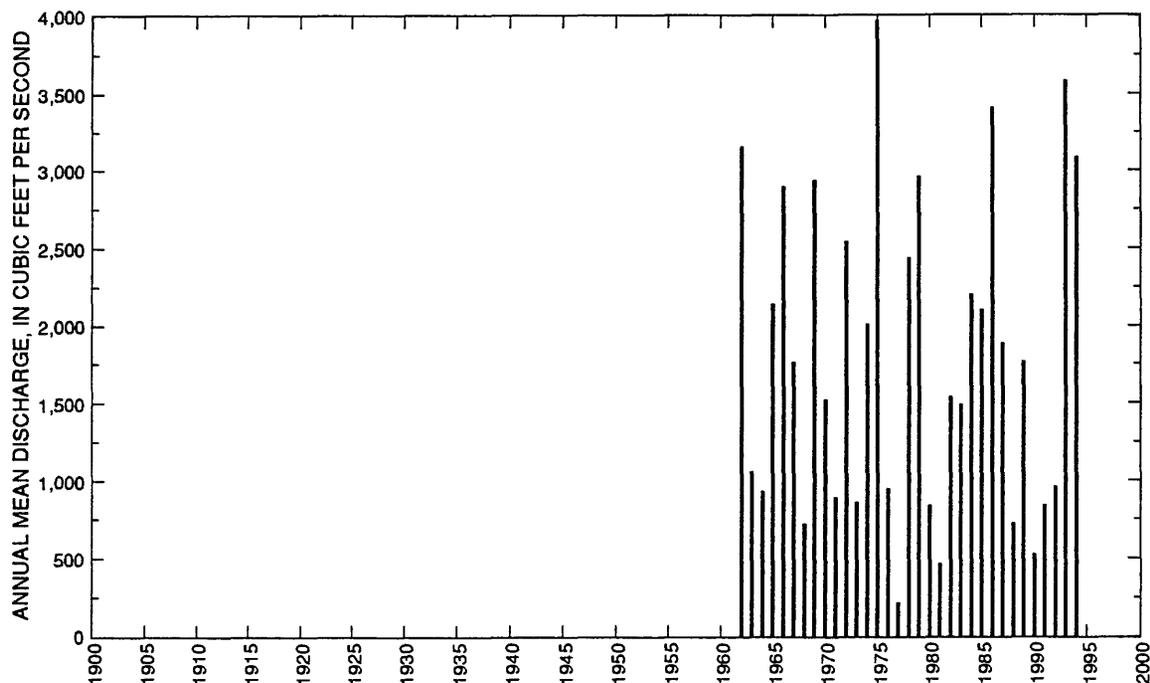
PERIOD OF RECORD.--April 1936 to June 1937 (no winter records), April 1942 to September 1960 (spring and summer months only), May 1961 to current year.

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, 42,000 ft<sup>3</sup>/s, Apr. 22, 1979 (gage height, 39.0 ft); minimum discharge, 5.4 ft<sup>3</sup>/s, Oct. 8, 9, and 12-14, 1936.

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

### Annual mean discharge

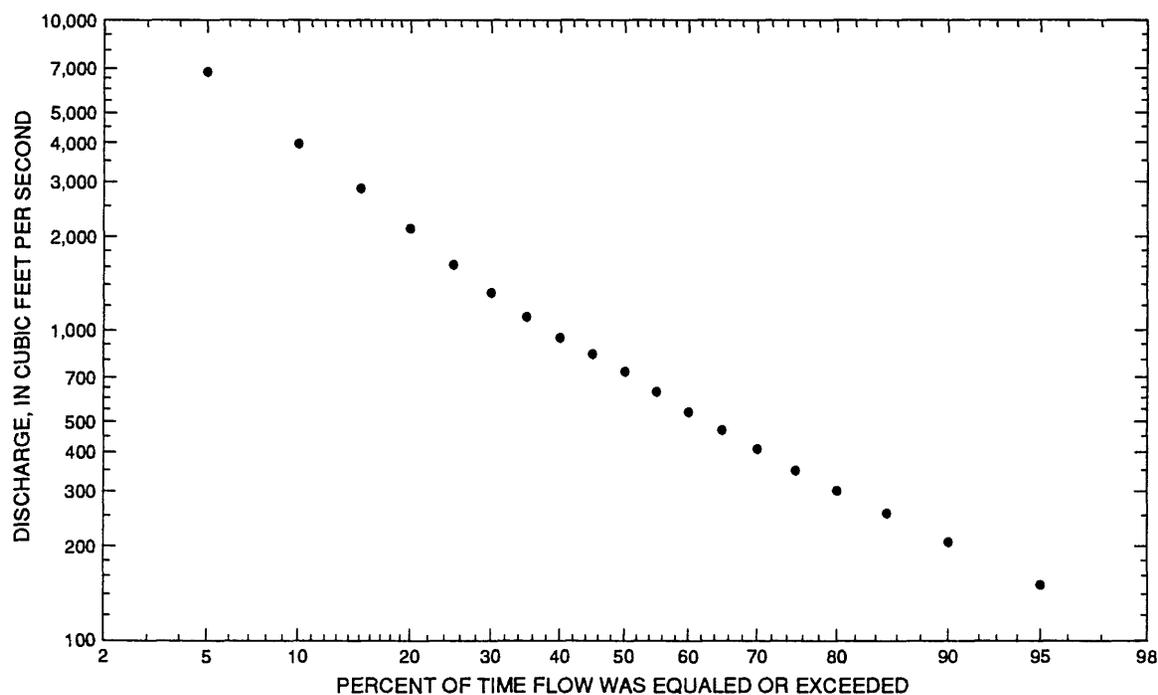


# 05064500 RED RIVER OF THE NORTH AT HALSTAD, MN--Continued

Statistics of monthly and annual mean discharges

Month	Maximum		Minimum		Mean			
	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)	Coefficient of variation	Percentage of annual discharge
October	2,190	1987	61.5	1977	704	540	0.77	3.29
November	1,770	1972	92.3	1977	650	402	0.62	3.04
December	1,250	1987	51.2	1977	513	325	0.63	2.40
January	1,020	1987	32.1	1977	432	275	0.64	2.02
February	1,050	1987	45.9	1977	445	252	0.57	2.08
March	9,430	1966	249	1962	2,050	2,060	1.00	9.60
April	20,100	1969	705	1981	6,620	5,280	0.80	31.0
May	8,990	1979	449	1977	3,070	2,270	0.74	14.3
June	10,300	1962	242	1977	2,530	1,990	0.79	11.8
July	20,100	1975	153	1988	2,550	3,890	1.52	11.9
August	11,700	1993	59.5	1977	1,110	2,010	1.81	5.19
September	3,360	1993	38.4	1976	712	702	0.99	3.33
Annual	3,970	1975	214	1977	1,800	1,030	0.57	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	96.8	145	219	746	613	416	191	108	116	144	193	118	149
90	132	166	268	930	809	504	262	172	156	191	229	156	206
85	145	183	311	1,060	911	624	368	209	187	221	270	204	255
80	182	220	380	1,250	1,030	785	484	244	210	263	298	236	301
75	221	238	438	1,500	1,160	939	628	283	237	298	325	256	349
70	259	265	488	1,760	1,310	1,110	765	324	267	325	356	282	408
65	292	299	535	2,080	1,500	1,300	900	361	294	358	406	317	471
60	313	325	608	2,550	1,760	1,500	1,030	397	321	396	452	356	539
55	333	366	703	3,190	2,020	1,710	1,150	494	371	436	496	396	629
50	355	407	815	3,760	2,280	1,950	1,300	565	426	493	553	440	730
45	387	444	910	4,340	2,580	2,160	1,480	638	484	561	618	469	834
40	440	472	1,030	5,030	2,830	2,390	1,650	731	563	614	699	502	946
35	470	496	1,180	5,730	3,050	2,650	1,840	853	657	666	752	552	1,110
30	525	526	1,380	7,070	3,370	2,930	2,080	1,010	751	719	807	636	1,320
25	609	562	1,850	8,600	3,740	3,250	2,390	1,150	842	830	863	719	1,620
20	700	662	2,560	10,700	4,170	3,620	2,780	1,330	1,010	1,030	935	811	2,110
15	780	751	3,710	13,000	4,900	4,080	3,290	1,540	1,310	1,310	1,040	917	2,840
10	885	854	5,030	17,100	6,110	4,850	4,540	1,840	1,600	1,570	1,240	1,060	3,960
5	954	946	8,940	24,300	9,390	7,210	9,560	3,390	2,410	2,080	1,460	1,150	6,810

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

### Probability of annual high discharges

[ng, statistic not given]

Exceedance probability	Recurrence interval (years)	Maximum instantaneous (ft <sup>3</sup> /s)	Maximum average discharge (ft <sup>3</sup> /s)			
			3-day period	7-day period	15-day period	30-day period
0.99	1.01	1,420	1,090	841	691	546
0.95	1.05	2,690	2,300	1,910	1,570	1,260
0.90	1.11	3,720	3,350	2,870	2,370	1,910
0.80	1.25	5,430	5,170	4,580	3,790	3,050
0.50	2	10,700	11,100	10,400	8,710	6,840
0.20	5	20,000	22,100	21,200	18,200	13,700
0.10	10	27,000	30,600	29,700	25,900	18,900
0.04	25	36,700	42,400	41,300	36,700	25,800
0.02	50	44,400	51,700	50,400	45,300	31,000
0.01	100	52,400	61,300	59,800	54,300	36,200
0.005	200	60,600	71,200	69,300	63,700	41,400
0.002	500	71,900	ng	ng	ng	ng

### Probability of annual low discharges

Non- exceed- ance prob- ability	Recur- rence inter- val (years)	Minimum average discharge (ft <sup>3</sup> /s)								
		Number of consecutive days								
		1	3	7	14	30	60	90	120	183
0.05	20	34.3	37.1	44.3	53.2	65.0	81.4	97.8	112	124
0.10	10	56.1	59.2	67.3	77.7	92.5	114	137	156	172
0.20	5	95.8	98.6	107	119	138	167	199	225	250
0.50	2	223	225	233	247	273	318	370	413	468

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

Probability of seasonal low discharges

		Minimum average discharge (ft <sup>3</sup> /s)							
		Number of consecutive days							
Non-exceedance probability	Recurrence interval (years)	1	7	14	30	1	7	14	30
		December-January-February				March-April-May			
0.05	20	66.6	68.5	69.8	78.4	128	136	160	273
0.10	10	98.9	102	105	115	177	190	217	347
0.20	5	153	159	165	176	253	274	306	472
0.50	2	307	322	335	348	454	501	546	891
		June-July-August				September-October-November			
0.05	20	45.5	66.0	82.2	108	44.9	69.8	79.0	97.1
0.10	10	78.8	103	123	159	72.9	97.3	108	134
0.20	5	145	172	196	249	123	144	158	193
0.50	2	394	421	458	568	282	292	313	373

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

Annual peak discharge and corresponding gage height, period of record

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

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

Annual peak discharge and corresponding gage height, period of record--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)
<b>Annual peak discharge, from highest to lowest, and corresponding gage height--Continued</b>							
1994	April 3	--	16,600	1988	March 28	12.42	5,010
1972	March 24	28.96	16,200	1957	June 24	12.20	4,980
1948	April 10	--	16,000	1954	April 13	11.44	4,660
1962	June 16	24.70	15,900	1958	July 8	11.31	4,420
1967	April 23	22.71	13,800	1981	May 25	10.57	3,920
1953	June 22	22.78	13,600	1959	June 13	10.13	3,780
1945	March 23	23.60	13,300	1991	July 8	9.99	3,700
1982	April 9	27.13	13,200	1990	April 10	8.55	2,880
1951	April 10	22.43	12,900	1937	April 15	9.39	2,660
1956	April 15	23.67	12,900	1968	June 19	7.80	2,350
1980	April 5	21.98	12,900	1977	May 7	7.50	2,050
1970	April 10	22.36	11,600	1961	May 22	6.96	1,900
1985	May 13	19.07	10,400				

# 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	2,939
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