UPPER MISSOURI RIVER BASIN

MONTANA

LEVEL B STUDY

FLOW CHARACTERISTICS OF SELECTED STREAMS IN THE UPPER MISSOURI RIVER BASIN

TECHNICAL PAPER

MISSOURI RIVER BASIN COMMISSION

September 1978

CONTENTS

CONTENTS--continued

CONTENTS---continued

CONTENTS--continued

CONTENTS--continued

FACTORS FOR CONVERTING INCH-POUND UNITS TO METRIC UNITS

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

Multiply inch-pound units	By	To obtain SI units
acre	4.047×10^{-1}	square hectometer (hm^2)
	4.047×10^{-3}	square kilometer (km^2)
acre-foot (acre-ft)	1.233×10^{-3}	cubic hectometer (hm^3)
	1.233×10^{-6}	cubic kilometer (km^3)
cubic foot per second (ft^3/s)	2.832×10^{-2}	cubic meter per second (m^3/s)
foot (ft)	3.048×10^{-1}	meter (m)
mile (mi)	1.609×10^{0}	kilometer (km)
square mile (mi^2)	2.590×10^{0}	square kilometer (km^2)

UPPER MISSOURI RIVER BASIN LEVEL B STUDY

SURFACE WATER RESOURCE INVENTORY

FLOW CHARACTERISTICS OF SELECTED STREAMS IN THE UPPER MISSOURI RIVER BASIN THROUGH 1977

ABSTRACT

As a prerequisite to comprehensive planning for the development of resources in the Upper Missouri River Basin, knowledge of the flow characteristics of streams in the basin is necessary. Streamflow records are presented in this report for the Missouri River Basin from the headwaters to the Montana-North Dakota line.

For each gaging station selected for this report, a brief description is given for station location, drainage area, gage type, and notes on regulation and diversions, average discharge, and extremes. These data are followed by tables of monthly and annual flow statistics, high- and low-flow frequency data, flood-frequency data, and flow-duration information.

INTRODUCTION

Purpose and scope

The Missouri River Basin Commission (MRBC) is actively coordinating a Level B study of the upper Missouri River Basin. The purpose of the study, which is a combined effort of Federal and State agencies, is to prepare a framework plan that can be used for the orderly development of the area's land and water resources. Ad Hoc Work Groups were formed to analyze the water and related land resources and problems. One such work group is the Surface Water Resources Work Group.

The Surface Water Resources Work Group is made up of representatives of four Federal agencies and three State agencies. The objective of the work group is to describe the surface-water resources of the study area. The objective was met by assembling basic streamflow data from key gaging stations in the basin, establishing periods of record to be used in the study, and tabulating and disseminating flow data to pertinent study participants.

Acknowledgments

Data presented in this report are based on records of streamflow collected by the U.S. Geological Survey, Department of the Interior, in cooperation with the State of Montana and other Federal agencies.

The membership of the Surface Water Resources Work Group is as follows:

Federal Representatives

Ronald R. Shields, Team leader
U.S. Geological Survey

Derwood Mercer
U.S. Bureau of Reclamation

Stanley Hamilton
U.S. Department of Agriculture
Soil Conservation Service

Tom Sabin
U.S. Corps of Engineers

State Representatives

Carlene Farmer
Montana Department of Health
and Environmental Sciences

Don Brown
Montana Department of Fish and Game

Larry Brown
Montana Department of Natural
Resources and Conservation

The statistical summaries were prepared by the U.S. Geological Survey.

STREAMFLOW RECORDS

The streamflow records forming the basis for the data presented in this report were selected initially by members of Ad Hoc Group, Team No. 3. The records selected for the inventory were the same sites used in the Missouri River Basin Comprehensive Framework Study (Missouri Basin Inter-Agency Committee, 1966), with the addition of several sites which now have a sufficient period of record to make the statistical analysis of the data meaningful.

Data for 58 streamflow stations are presented in this report. Each station is assigned an index number in downstream order. The numbering system is the same as that used in all U.S. Geological Survey data reports.

Periods of record

Records through September 30, 1977 (or September 30 of last year of record, if discontinued prior to 1977) were used in computing monthly and annual mean discharges, flow-duration, annual high-flow, and instantaneous peak-flow data. Low-flow data were computed on basis of climatic years, ending March 31.

For 17 selected "Key" stations that represent major tributaries and main stream stations, a base period of 1940-75 was used to run the same statistics as were run for the period of record. By the use of a base period, streamflow data can be compared on a common basis.

Gaging-station description

The description of the gaging station gives the location, drainage area, period of record, notations of revisions of previously published records, type and history of gages, general remarks, average discharge, and extremes of discharge. The locations of the gaging station and the drainage area are obtained from the most accurate maps available. River mileage, given under "LOCATION" for some stations, is that determined and used by the Corps of Engineers. Periods for which published records are available for the present station or for stations generally equivalent to the present one are given under "PERIOD OF RECORD."

Previously published streamflow records of some stations have been found to be in error on the basis of data or information obtained later. Revisions of such records are usually published along with the current records in one of the annual or compilation reports. To make finding such revised records easier, a paragraph headed "REVISED RECORDS" has been added to the description of all stations for which revised records have been published. Listed therein are all the reports in which revisions have been published, each followed by the water years for which figures are revised in that report. In listing the water years only one number is given; for instance, 1965 indicates the water year October 1, 1964, to September 30, 1965. If no daily, monthly, or annual figures of discharge are affected by the revision, the fact is noted after the year dates as follows: "(M)" means that only the instantaneous maximum discharge was revised; "(m)" that only the instantaneous minimum was revised; and "(P)" that only peak discharges were revised. If the drainage area has been revised, the report in which the revised figure was first published is given. For all stations for which cubic feet per second per square mile and runoff in inches are published, a revision of the drainage area necessitates corresponding revision of all figures based on the drainage area.

The type of gage currently in use, the datum of the present gage above mean sea level, and a condensed history of the types, locations, and datums of previous gages used during the period of record are given under "GAGE." In references to datum of gage, the phrase "mean sea level" denotes "Sea Level Datum of 1929" as used by the Topographic Division of the Geological Survey unless otherwise qualified.

Information pertaining to the accuracy of the discharge records and to conditions which affect the natural flow of the gaging station is given under "REMARKS."

Average discharge is shown for the period of record used in processing the summaries and may differ slightly from the figure of average discharge published in other reports. The reason is that the average discharge is usually based on the entire period of record including incomplete years, whereas the average discharge in this report is based only on the complete years of record used in the statistical summaries.

Tabulations

Five tables are presented for each station: monthly and mean annual discharge, magnitude and probability of annual low flow, magnitude and probability of annual high flow, magnitude and probability of instantaneous peak flow (flood frequency), and duration of daily mean flow. Low-flow, high-flow, and flow-duration data were processed using U.S. Geological Survey computer program Daily Value Statistics (Program A 969). The program produces duration tables and low- and high-flow tables, and fits the data from the low- and high-flow tables to a log-Pearson Type III frequency distribution. The monthly and annual data were processed through the computer program Daily Values Monthly and Annual Statistics (Program W 4422).

Monthly and annual statistics

The monthly and annual mean discharge tabulations show for the period of record or base period: the maximum and minimum mean monthly and annual values, the mean (monthly and annual), the standard deviation from the mean, the coefficient of variation (percentage the standard deviation is of the mean), and the percent of annual runoff for each monthly mean.

Low-flow frequency curves

The low-flow tabulations show the data needed to plot a standard low-flow frequency curve using the log-Pearson Type III frequency distribution. The tabulations show lowest mean discharge for consecutive periods of 1, 3, 7, 14, 30, 60, 90, 120, and 183 days for indicated recurrence interval, in years, and exceedence probability, in percent for 2 yr. (50%), 5 yr. (20%), 10 yr. (10%), 20 yr. (5%), 50 yr. (2%), and 100 yr. (1%). Recurrence intervals were generally extended to only twice the period of record. Records of more than 40 years duration were extended to the 100 year (1%) interval.

High-flow frequency curves

The high-flow tabulations show the data needed to plot a high-flow frequency curve using the log-Pearson Type III frequency distribution. The tabulations show the highest mean discharge for consecutive periods of 1, 3, 7, 15, 30, 60, and 90 days for recurrence intervals, in years, and exceedence probability, in percent for 2 yr. (50%), 5 yr. (20%), 10 yr. (10%), 25 yr. (4%), 50 yr. (2%), and 100 yr. (1%). The criteria for extending records of high-flow data were the same as for the low-flow data.

Flood-frequency curves

The flood-flow tabulations show the data needed to plot the flood-frequency curves based on the period of record using the log-Pearson Type III frequency distribution. A -0.15 weighted skew is used as the regional skew for the State of Montana. This factor was determined by Johnson and Omang (1976). The flood-frequency curve is a graph showing the relationship between recurrence interval as abscissa and flood magnitude as ordinate. The table shows the magnitude and probability of instantaneous peak flow for recurrence interval in years, and exceedence probability, in percent for 1.25 yr. (80%), 2 yr. (50%), 5 yr. (20%), 10 yr. (10%), 25 yr. (4%), 50 yr. (2%), and 100 yr. (1%). The 100 yr. recurrence interval was estimated for all records.

Flow duration

The flow-duration tabulations show the data necessary to plot a standard flow-duration curve. The flow-duration curve is a cumulative frequency curve that shows the percentage of time that specified discharges are equaled or exceeded. The tabulations show the discharge, in ft^3/s, which was equaled or exceeded 1%, 5%, 10%, 15%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 95%, 98%, 99%, 99.5% and 99.9% of the time.

06016000 BEAVERHEAD RIVER AT BARRETTS, MT

LOCATION.--Lat 45°06'59", long 112°44'59", in SW¼SE¼ sec.19, T.8 S., R.9 W., Beaverhead County, Hydrologic Unit 10020002, on left bank 1 mi (2 km) upstream from Barretts, 2 mi (3 km) downstream from Grasshopper Creek, and 8.9 mi (14.3 km) southwest of Dillon.

DRAINAGE AREA.--2,737 mi² (7,089 km²).

PERIOD OF RECORD.--August 1907 to current year. Monthly discharge only for some periods, published in WSP 1309. Prior to October 1963, published as "at Barratts".

REVISED RECORDS.--WSP 1279: 1908 (M), 1910-12(M), 1935-36, WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 5,268.17 ft (1,605.738 m) above mean sea level. Prior to Oct. 19, 1934, nonrecording gages at same site and datum.

REMARKS.--Water-discharge records good. Some regulation by Lima Reservoir and nearly complete regulation by Clark Canyon Reservoir since August 1964. Diversions for irrigation of about 90,000 acres (364 km²) above station.

AVERAGE DISCHARGE.--70 years, 424 ft³/s (12.01 m³/s), 307,200 acre-ft/yr (379 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,720 ft³/s (105 m³/s) June 20, 1908, gage height, 6.1 ft (1.86 m); minimum recorded, 69 ft³/s (1.95 m³/s) Jan. 30, 1938, result of freezeup.

Monthly and annual mean discharges 1908-77

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	717	116	385	173	0.45	7.4
November	889	138	420	148	.35	8.1
December	586	133	355	107	.30	6.8
January	513	120	296	82.3	.28	5.7
February	456	132	290	72.3	.25	5.6
March	934	154	345	124	.36	6.7
April	1347	123	479	242	.50	9.2
May	1913	131	619	367	.59	12.0
June	2608	146	780	457	.59	15.1
July	1206	95.5	477	251	.53	9.2
August	1320	96.1	401	247	.60	7.7
September	1070	88.2	335	182	.54	6.5
Annual	738	168	424	144	.33	100

Magnitude and probability of annual low flow based on period of record 1908-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	181	135	112	96.1	80.0	70.8
7	185	137	115	99.4	83.7	74.4
30	191	141	119	103	87.5	78.0
14	202	148	125	108	90.6	80.4
30	216	159	133	114	94.7	83.4
60	241	176	146	124	101	87.6
90	259	190	158	133	109	93.9
120	277	207	174	149	123	107
183	317	232	192	162	131	113

Magnitude and probability of instantaneous peak flow based on period of record 1908-77

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
882	1340	1940	2320	2760	3080	3370

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1908-1977

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1280	1840	2190	2580	2850	3090
3	1210	1740	2060	2420	2670	2900
7	1080	1570	1880	2230	2470	2700
15	967	1430	1720	2070	2310	2550
30	837	1260	1540	1900	2160	2420
60	708	1060	1300	1600	1820	2050
90	643	944	1140	1390	1570	1740

Duration table of daily mean flow for period of record 1908-77

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99.5%	99.9%
1550	1100	780	630	550	440	380	335	305	275	230	180	150	125	112	103	90

Basin characteristics

Main channel slope (ft/mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,500 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)

06019500 RUBY RIVER ABOVE RESERVOIR, NEAR ALDER, MT

LOCATION.--Lat 45°10'31", long 112°08'52", in SW¼SW¼ sec.31, T.7 S., R.4 W., Madison County, Hydrologic Unit 10020003, on left bank at Fuller Hot Springs 0.4 mi (0.6 km) upstream from Cottonwood Creek, 6 mi (10 km) upstream from Ruby Dam, and 10 mi (16.9 km) south of Alder.

DRAINAGE AREA.--538 mi² (1,393 km²).

PERIOD OF RECORD.--May 1938 to current year. Monthly discharge only for May 1938, published in WSP 1309.

REVISED RECORDS.--WSP 1309: 1938(M). WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 5,440.2 ft (1,658.17 m) above mean sea level (river-profile survey). Prior to Oct. 1, 1938, nonrecording gage at bridge 1,500 ft (457 m) downstream at datum 5.2 ft (1.58 m) lower. Oct. 1, 1938, to Aug. 5, 1955, water-stage recorder at site 500 ft (152 m) downstream at datum 0.5 ft (0.15 m) lower.

REMARKS.--Records good. Diversions for irrigation of about 3,000 acres (12.1 km²) above station.

AVERAGE DISCHARGE.--39 years, 177 ft³/s (5.02 m³/s), 128,200 acre-ft/yr (158 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,670 ft³/s (47.3 m³/s) June 10, 1970, gage height, 5.62 ft (1.713 m); minimum daily, 35 ft³/s (0.99 m³/s) Jan. 23, 1962.

Monthly and annual mean discharges 1939-77

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	161	83.4	119	21.4	0.18	5.6
November	152	87.8	123	15.9	.13	5.8
December	170	80.3	112	16.6	.15	5.3
January	158	69.8	102	16.4	.16	4.8
February	135	72.2	101	12.7	.13	4.8
March	181	84.3	109	20.3	.19	5.1
April	288	94.6	161	50.7	.31	7.6
May	727	221	405	135	.33	19.1
June	1045	172	468	199	.43	22.1
July	482	74.8	190	79.2	.42	9.0
August	235	59.3	118	32.6	.28	5.6
September	156	75.6	111	22.5	.20	5.2
annual	252	119	177	37.2	.21	100

Magnitude and probability of annual low flow based on period of record 1939-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	78.0	62.4	53.9	46.9	39.4	34.7
3	79.7	64.1	55.7	48.9	41.5	36.8
7	82.5	67.4	59.5	53.0	46.1	41.6
14	86.8	72.4	64.7	58.5	51.7	47.3
30	92.2	78.6	71.4	65.4	58.9	54.7
60	96.0	84.1	78.2	73.5	68.3	65.0
90	97.9	87.9	83.5	80.3	77.0	75.0
183	103	92.3	87.7	84.2	80.7	78.5
183	109	97.8	93.0	89.4	85.8	83.6

Magnitude and probability of instantaneous peak flow based on period of record 1939-77

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
719	939	1210	1390	1590	1740	1880

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1939-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	812	1070	1230	1440	1590	1740
3	759	996	1150	1340	1470	1610
7	691	903	1040	1200	1320	1440
15	614	808	934	1090	1210	1320
30	539	706	817	959	1070	1170
60	432	562	647	752	830	908
90	345	455	519	598	655	710

Duration table of daily mean flow for period of record 1939-77

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time																
1%	2%	5%	10%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99.5	99.9
870	510	360	260	200	150	130	118	110	104	98	90	84	75	68	61	50

Basin characteristics

Main channel slope (ft/mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,000 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)
53.3	39.5	7280	100	92	1.07	29.8	6.1	13.0

BIG HOLE RIVER BASIN

06025500 BIG HOLE RIVER NEAR MELROSE, MT

LOCATION.--Lat 45°31'36", long 112°42'03", in SE¼SE¼SW¼ sec.34, T.3 S., R.9 W., Madison County, Hydrologic Unit 10020004, on left bank at downstream side of bridge on Interstate Highway 15 and U.S. Highway 91, 0.1 mi (0.2 km) downstream from Rock Creek, and 7 mi (11 km) south of Melrose.

DRAINAGE AREA.--2,476 mi² (6,413 km²).

PERIOD OF RECORD.--October 1923 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 5,032.87 ft (1,534.018 m) above mean sea level. Prior to June 14, 1927, water-stage recorder, and July 17, 1927, to Sept. 30, 1931, nonrecording gage, at site 1.7 mi (2.7 km) upstream at different datum.

REMARKS.--Records good except those for winter period, which are fair. Diversions for irrigation of about 136,000 acres (550 km²) above station.

AVERAGE DISCHARGE.--54 years, 1,157 ft³/s (32.77 m³/s), 838,200 acre-ft/yr (1.03 km³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 23,000 ft³/s (651 m³/s) June 14, 1927, when Kise River Reservoir dam failed (gage-height, 14.0 ft or 4.27 m, from floodmark, site and datum then in use), from rating curve extended above 8,000 ft³/s (227 m³/s); maximum discharge unaffected by dam failure, 14,300 ft³/s (405 m³/s) June 10, 1972, gage height, 8.04 ft (2.451 m); minimum observed, 49 ft³/s (1.39 m³/s) Aug. 17, 1931, gage height, 0.70 ft (0.213 m), site and datum then in use.

Monthly and annual mean discharges 1924-77

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	1109	184	507	211	0.42	3.7
November	1037	255	508	158	.31	3.7
December	763	223	398	126	.32	2.9
January	716	143	349	101	.29	2.5
February	800	143	363	110	.30	2.6
March	925	247	445	151	.34	3.2
April	3515	490	1526	699	.46	11.0
May	8294	1108	3449	1607	.47	24.9
June	8380	1023	4121	2032	.49	29.7
July	4120	254	1347	793	.59	9.7
August	1457	124	482	250	.52	3.4
September	870	137	377	191	.51	2.7
Annual	2024	486	1157	366	.32	100

Magnitude and probability of annual low flow based on period of record 1924-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	204	143	115	93.6	73.0	61.0
3	210	150	123	103	83.3	71.7
7	221	158	130	109	88.2	76.1
14	234	167	137	115	93.3	80.7
30	261	187	153	127	102	86.6
60	297	224	190	163	136	120
90	330	263	232	209	185	171
120	361	295	265	243	221	207
183	413	330	293	266	239	222

Magnitude and probability of instantaneous peak flow based on period of record 1924-77

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
4790	7310	10800	13200	16100	18200	20200

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1924-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	7130	10100	11700	13500	14600	15700
3	6860	9620	11200	12800	13800	14800
7	6270	8840	10300	11900	12900	13800
15	5540	7930	9360	11000	12000	13000
30	4870	6880	8020	9270	10100	10800
60	3860	5330	6140	7000	7550	8020
90	3140	4290	4940	5630	6080	6480

Duration table of daily mean flow for period of record 1924-77

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99%	99.9%
8000	4800	3100	2200	1500	850	600	480	415	360	315	265	220	175	145	122	82

Basin characteristics

Main channel slope (ft/mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,000 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)
15.4	112.6	7140	100	92	1.18	66.3	6.7	14.0

MISSOURI RIVER MAIN STEM

06027000 JEFFERSON RIVER NEAR SILVERSTAR, MT

LOCATION.--Lat 45°39', long 112°18', in SW¼ sec. 23, T.2 S., R.6 W., Madison County, Hydrologic Unit 10020005, on highway bridge 0.5 mi (0.8 km) west of Ironrod, 4 mi (6 km) southwest of Silverstar, and 7 mi (11 km) downstream from the confluence of the Beaverhead and Big Hole Rivers.

DRAINAGE.--7,683 mi² (19,899 km²).

PERIOD OF RECORD.--August 1910 to Sept 30, 1916, July 1920 to Sept. 1939.

REVISED RECORDS.--WSP 1309: 1911-16, 1922, 25, 1932-33, drainage area.

GAGE.--Wire-weight gage. Altitude of gage is 4,550 ft (1,387 m), by barometer. Aug. 11, 1910, to Sept. 30, 1916, and July 22 to Aug. 26, 1920, staff gage. Chain gage Aug. 26, 1920 to Sept. 30, 1939.

REMARKS.--Diversions for irrigation of about 300,000 (acres (1,214 km²) above station.

AVERAGE DISCHARGE.--25 years (1910-16, 1920-39), 1,714 ft³/s (48.5 m³/s), 124,200 acre-ft/yr (153 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--1910-16, 1920-39: Maximum discharge, 20,300 ft³/s (575 m³/s) June 16, 1927, when Wise River Reservoir dam failed, (gage height, 10.0 ft, (3.048 m) from graph of gage readings), from rating curve extended above 14,000 ft³/s (396 m³/s); minimum observed, 50 ft³/s (1.42 m³/s) Sept. 4, 1937 gage height, 0.85 ft, (0.259 m).

Monthly and annual mean discharges 1911-16, 21-39

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	1974	240	1037	514	0.50	5.0
November	2077	562	1288	407	.32	6.3
December	2254	527	1124	393	.35	5.5
January	1550	395	958	265	.28	4.6
February	1600	357	942	280	.30	4.5
March	2180	781	1174	326	.28	5.7
April	3725	1024	2245	705	.31	10.9
May	7833	1326	3898	1717	.44	18.9
June	10530	1049	4865	3061	.63	23.6
July	5125	177	1628	1228	.75	7.9
August	2030	78.3	652	494	.76	3.2
September	1886	91.7	800	525	.66	3.9
Annual	2950	698	1774	582	.33	100

Magnitude and probability of annual low flow based on period of record 1911,13-16,21-30,33-39

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	290	135	88.0	60.9	39.6	------
3	304	141	92.0	63.5	41.1	------
7	326	152	98.5	67.3	42.9	------
14	362	171	110	75.0	47.1	------
30	438	214	139	93.7	58.1	------
60	556	295	198	138	88.3	------
90	719	416	294	213	143	------
120	925	682	569	486	401	------
183	8130	869	741	643	540	------

Magnitude and probability of instantaneous peak flow based on period of record 1911-16,21-39,66

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.33	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
4860	7610	11700	14500	18200	21000	23800

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1911,13-16,21-30,33-39

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	8720	12700	14900	17300	18800	---------
3	8250	12000	14100	16300	17700	---------
7	7520	11000	13000	15200	16700	---------
15	6550	9720	11700	14000	15600	---------
30	5720	8360	10000	12000	13400	---------
60	4620	6450	7540	8790	9640	---------
90	3820	5260	6130	7130	7810	---------

Duration table of daily mean flow for period of record 1911, 13-16, 21-30, 33-39

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
10000	5600	3700	2800	2200	1600	1350	1200	1050	930	760	500	300	155	110	85	60

Basin characteristics

Main channel slope (ft/mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,000 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)

06033000 BOULDER RIVER NEAR BOULDER, MT

LOCATION.--Lat 46°12'40", long 112°05'25", in NE¼SW¼ sec.3, T.5 N., R.4 W., Jefferson County, Hydrologic Unit 10020006, on left bank at downstream side of highway bridge, 0.75 mi (1.21 km) downstream from Muskrat Creek and 2 mi (3 km) southeast of Boulder.

DRAINAGE.--381 mi^2 (987 km^2).

PERIOD OF RECORD.--April 1929 to December 1932, March 1934 to September 1972. Monthly discharge only for some periods published in WSP 1309.

REVISED RECORDS.--WSP 1279: 1931.

GAGE.--Water-stage recorder. Altitude of gage is 4,810 ft (1,466 m), by barometer. Prior to Aug. 29, 1946, chain gage at same site and datum.

REMARKS.--Diversions for irrigation of about 3,500 acres (14.2 km^2) above station.

AVERAGE DISCHARGE.--41 years, 121 ft^3/s (3.427 m^3/s), 87,660 acre ft/yr (108 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,490 ft^3/s (98.8 m^3/s) June 9, 1964 gage height, 10.90 ft (3.322 m)--no flow July 15-17, 21, 1931.

Monthly and annual mean discharges 1930-32, 35-72

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	113	5.85	35.9	21.3	0.59	2.5
November	71.2	9.09	34.4	12.1	.35	2.4
December	47.2	7.45	28.2	9.2	.33	1.9
January	42.1	10.1	26.1	8.3	.32	1.8
February	68.5	7.7	29.8	11.0	.37	2.1
March	117	20.7	45.7	20.9	.46	3.2
April	511	46	169	107	.63	11.7
May	961	143	488	182	.37	33.7
June	1027	102	441	264	.60	30.5
July	374	10.9	95.8	84	.88	6.6
August	84.8	7.11	26.6	18.1	.68	1.8
September	130	5.69	26.0	21.0	.81	1.8
Annual	211	51.8	121	41.9	.35	100

Magnitude and probability of annual low flow based on period of record 1930-72

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	11.5	6.0	3.6	2.1	0.80	0.30
3	11.9	6.3	3.9	2.3	1.0	.35
7	12.5	6.5	4.2	2.8	1.6	1.1
14	13.1	7.7	5.6	4.2	3.0	2.4
30	14.8	9.2	7.0	5.5	4.2	3.5
60	17.9	11.6	9.0	7.2	5.6	4.7
90	24.4	16.7	13.2	10.6	8.0	6.6
120	28.1	20.6	16.8	14.0	11.1	9.4
183	32.7	23.8	19.8	16.9	14.0	12.3

Magnitude and probability of instantaneous peak flow based on period of record 1929-72, 75

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
702	1120	1770	2230	2840	3310	3500

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1930-72

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1020	1510	1850	2280	2610	2940
3	930	1360	1650	2030	2300	2580
7	846	1220	1460	1760	1970	2180
15	738	1060	1260	1500	1670	1840
30	620	878	1040	1250	1390	1540
60	474	646	750	871	955	1030
90	369	502	580	670	731	787

Duration table of daily mean flow for period of record 1930-72

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.8%
1070	580	355	230	145	64	44	36	31	26.5	21.0	15.0	11.0	7.5	5.8	4.6	2.6

MISSOURI RIVER MAIN STEM

06034500 JEFFERSON RIVER AT SAPPINGTON, MT

LOCATION.--Lat 45°48'15", long 111°45'05", in SE¼ sec.29, T.1 N., R.1 W., Gallatin County, Hydrologic Unit 10020005, on right bank at upstream side of bridge on State Highway 287, 1 mi (2 km) northeast of Sappington and 5.5 mi (8.8 km) upstream from Willow Creek.

DRAINAGE.--9,277 mi² (24,027 km²).

PERIOD OF RECORD.--January to December 1895, September 1896 to December 1905, August 1938 to September, 1969. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1839: 1899, 1900, 1902 M, 1904(M). WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 4,170 ft (1,271 m) from topographic map. Prior to Sept. 17, 1896, staff gage and Sept. 17, 1896, to Dec. 31, 1905, chain gage, at railroad bridge 1.5 mi (2.4 km) upstream at different datum.

REMARKS.--Diversions for irrigation of about 345,000 acres (1,396 km²) above station. Some regulation by Lima Reservoir, Clark Canyon Reservoir (since 1964), by Ruby River Reservoir and several minor reservoirs.

AVERAGE DISCHARGE.--31 years (1896-1905, 1938-60), 2,121 ft³/s (60.1 m³/s) 1,536,000 acre-ft/yr, (1.89 km³/s).

EXTREMES FOR PERIOD OF RECORD.--1895, 1896-1905, 1938-60: Maximum discharge observed, 21,000 ft³/s (25.3m³/s) June 23, 1899 gage height, 9.65 ft (2.941 m), site and datum then in use, from rating curve extended above 10,000 ft³/s (283 m³/s) by logarithmic plotting; minimum, 134 ft³/s (3.79 m³/s) Aug. 12, 1940 gage height, 1.49 ft (0.45 m).

Monthly and annual mean discharges 1897-1900, 1902-05, 1939-69

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	2338	776	1388	460	0.33	5.5
November	3204	1057	1658	393	.24	6.6
December	2712	999	1428	325	.23	5.7
January	1890	545	1186	273	.23	4.7
February	2848	829	1295	365	.28	5.1
March	2060	924	1444	253	.18	5.7
April	5159	1084	2637	992	.38	10.5
May	8587	1211	4659	1960	.42	18.5
June	12190	1452	5739	2589	.45	22.8
July	4213	215	2032	989	.49	8.1
August	1749	166	745	371	.50	3.0
September	2487	469	969	414	.43	3.8
Annual	3354	1169	2100	507	.24	100

Magnitude and probability of annual low flow based on period of record 1897-1905, 1939-69

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	450	290	222	175	131	107
3	462	296	226	178	134	109
7	488	310	235	183	135	110
15	525	331	249	193	141	113
30	611	382	285	218	157	124
60	773	505	382	294	212	166
90	1070	748	574	442	313	242
120	1270	1040	914	805	685	608
183	1350	1170	1090	1030	965	928

Magnitude and probability of instantaneous peak flow based on period of record 1895, 1897-1905, 1939-69, 75

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
6400	9190	12900	15300	18300	20400	22500

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1897-1905, 39-69

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	8990	12100	13900	16000	17300	18600
3	8800	11800	13500	15400	16700	17900
7	8250	11100	12800	14700	16000	17200
15	7420	10200	11800	13600	14900	16000
30	6650	8980	10300	11800	12700	13600
60	5300	7020	7980	9030	9720	10300
90	4470	5840	6610	7460	8020	8520

Duration table of daily mean flow for period of record 1897-1905, 39-69

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
10300	6400	4600	3600	2600	1900	1600	1400	1300	1150	960	740	550	340	240	180	150

Basin characteristics

Main channel slope (ft/mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,000 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)

WILLOW CREEK BASIN

06035000 WILLOW CREEK NEAR HARRISON, MT

LOCATION.--Lat 45°43'21", long 111°44'17", in SW¼NW¼ sec.28, T.1 S., R.1 W., Madison County, Hydrologic Unit 10020005, on right bank 2.2 mi (3.5 km) upstream from Willow Creek Dam, 2.5 mi (4.0 km) northeast of Harrison, and 11 mi (18 km) upstream from mouth.

DRAINAGE AREA.--83.8 mi^2 (217 km^2).

PERIOD OF RECORD.--April 1938 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1559: Drainage area.

GAGE.--Water-stage recorder and concrete control. Altitude of gage is 4,750 ft (1,448 m), from topographic map. Prior to Oct. 8, 1946, water-stage recorder at datum 0.22 ft (0.067 m) higher, with different concrete control.

REMARKS.--Records good except those for winter period, which are poor. Diversions for irrigation of about 12,500 acres (50.6 km^2) of which 3,500 acres (14.2 km^2) is in Norwegian Creek drainage.

AVERAGE DISCHARGE.--39 years, 40.1 ft^3/s (1.135 m^3/s), 29,050 acre-ft/yr (35.8 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 813 ft^3/s (23.0 m^3/s) Feb. 3, 1963, gage height, 4.24 ft (1.292 m), from floodmarks, from rating curve extended above 300 ft^3/s (8.50 m^3/s); minimum, 1.4 ft^3/s (0.040 m^3/s) Sept. 17, 1956, gage height, 0.39 ft (0.119 m), from rating then in use.

Monthly and annual mean discharges 1939-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	63.4	3.06	29.8	18.3	0.61	6.2
November	56.5	9.4	34.3	12.0	.35	7.1
December	47.4	11.5	30.2	8.3	.28	6.2
January	43.6	10.0	24.8	6.5	.26	5.2
February	60.9	12.0	27.5	9.4	.34	5.7
March	44.7	18.0	31.6	6.0	.19	6.6
April	68.4	11.1	41.1	13.5	.33	8.5
May	151	11.8	58.5	34.7	.58	12.2
June	291	10.1	112	64.0	.57	23.3
July	278	5.78	61.4	52.0	.85	12.8
August	60.8	2.68	11.6	11.8	1.02	2.4
September	62.4	2.01	18.1	15.7	.86	3.8
Annual	76.0	19.2	40.1	14.8	.37	100

Magnitude and probability of annual low flow based on period of record 1939-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	4.4	2.8	2.2	1.9	1.5	1.3
3	4.5	2.9	2.3	1.9	1.6	1.4
7	4.8	3.0	2.4	2.0	1.6	1.4
14	5.3	3.3	2.6	2.1	1.7	1.5
30	6.5	3.8	2.9	2.3	1.8	1.5
60	9.1	5.0	3.6	2.8	2.1	1.7
90	17.7	10.0	7.1	5.2	3.6	2.8
120	23.3	15.7	12.2	9.7	7.3	6.0
183	27.2	20.5	17.4	15.1	12.7	11.3

Magnitude and probability of instantaneous peak flow based on period of record 1938-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
149	237	375	476	614	723	838

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1939-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	196	301	379	485	569	658
3	180	274	340	427	493	562
7	161	246	304	381	438	497
15	139	215	268	337	389	442
30	116	184	234	301	354	410
60	87.8	137	173	224	264	307
90	73.8	112	140	179	208	239

Duration table of daily mean flow for period of record 1939-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
235	122	77	59	50	40	35	30	25	20	14	6.5	4.5	3.3	2.8	2.4	1.9

Basin characteristics

Main channel slope (ft/mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,000 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)

MADISON RIVER BASIN

06037500 MADISON RIVER NEAR WEST YELLOWSTONE, MT

LOCATION.--Lat 44°39'20", long 111°04'00", in SW¼ sec.36, T.13 S., R.5 E., Yellowstone National Park, Hydrologic Unit 10070001, (unsurveyed), on left bank 0.25 mi (0.40 km) upstream from Riverside ranger station, 1.5 mi (2.4 km) east of West Yellowstone and west boundary of Yellowstone National Park, and 12.5 mi (20.1 km) downstream from confluence of Firehole and Gibbon Rivers.

DRAINAGE.--420 mi^2 (1,088 km^2).

PERIOD OF RECORD.--June 1913 to December 1917, July 1918 to October 1921, June 1922 to September 1973; monthly discharge only for some periods; published in WSP 1309.

REVISED RECORDS.--WSP 1439: 1942. WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 6,650 ft (2,027 m) from topographic map. Prior to Oct. 20, 1918, staff gage and Oct. 20, 1918, to June 29, 1930, staff gage or water-stage recorder, at sites 2.5 mi (4.0 km) upstream at different datums. Supplementary staff gage 0.25 mi (0.40 km) downstream at different datum used at times during 1927-30.

REMARKS.--Records good. No regulation or diversion above station.

AVERAGE DISCHARGE.--58 years (1913-17, 1918-21, 1922-73), 488 ft^3/s (13.82 m^3/s), 15.78 in/yr (401 mm/yr), 353,600 acre ft/yr (436 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--1913-60: Maximum discharge, 2,150 ft^3/s (60.8 m^3/s) May 24, 1956 gage height, 3.44 ft (1.049 m); maximum gage height, about 10.0 ft (3.048 m) Jan. 8, 1937 (ice jam); minimum discharge, 100 ft^3/s (2.83 m^3/s) (estimated) February 7, 1933.

Monthly and annual mean discharges 1914-73

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	710	297	428	85.2	0.20	7.3
November	697	297	418	70.1	.17	7.1
December	568	304	409	58.6	.14	6.9
January	582	304	397	56.1	.14	6.8
February	572	303	393	51.7	.13	6.7
March	539	313	398	49.6	.12	6.8
April	671	369	481	74.1	.15	8.2
May	1212	388	808	175	.22	13.8
June	1416	341	804	278	.35	13.7
July	917	282	494	136	.28	8.4
August	759	273	425	89.3	.21	7.2
September	704	282	419	83.3	.20	7.1
Annual	664	337	488	78.3	.16	100

Magnitude and probability of annual low flow based on period of record 1914-73

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	334	295	277	263	248	238
3	339	302	285	271	257	248
7	348	311	294	281	267	258
14	355	316	298	284	270	260
30	364	324	304	289	274	264
60	372	330	310	294	278	267
90	380	337	316	300	282	271
120	390	347	326	309	291	280
183	399	356	336	321	305	295

Magnitude and probability of instantaneous peak flow based on period of record 1913-73

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
1070	1330	1630	1810	2020	2160	2290

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1914-73

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1250	1540	1710	1910	2050	2170
3	1180	1460	1620	1810	1940	2060
7	1110	1390	1560	1750	1890	2010
15	1040	1300	1460	1640	1770	1880
30	949	1180	1320	1470	1580	1680
60	812	996	1100	1220	1300	1380
90	710	862	950	1050	1120	1190

Duration table of daily mean flow for period of record 1914-73

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
1350	940	730	620	560	480	445	420	400	380	360	340	320	300	290	280	265

06041000 MADISON RIVER BELOW ENNIS LAKE, NEAR MCALLISTER, MT

LOCATION.--Lat 45°29'25", long 111°38'00", in NW¼ sec.17, T.4 S., R.1 E., Madison County, Hydrologic Unit 10020007, on right bank 500 ft (152 m) downstream from Madison powerplant, 1.5 mi (2.4 km) downstream from Ennis Lake, and 5.7 mi (9.2 km) northeast of McAllister.

DRAINAGE AREA.--2,186 mi² (5,662 km²).

PERIOD OF RECORD.--October 1901 to December 1905, October 1906 to current year. Prior to October 1938 adjusted monthly runoff only, published in WSP 1309. Published as "below Madison Reservoir" 1938-49. Records published as "near Red Bluff" 1890-94 and as "near Norris" 1910 are not equivalent and are published as "near Norris" in WSP 1309.

REVISED RECORDS.--WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 4,700 ft (1,433 m), from topographic map. Prior to May 7, 1941, nonrecording gage in wooden stilling well at present site at different datum. May 7, 1941, to Jan. 13, 1945, nonrecording gages in concrete stilling well at present site and datum.

REMARKS.--Water-discharge records good. Flow regulated by Hebgen and Ennis Lakes. Diversions for irrigation of about 23,000 acres (93.1 km²) above station.

AVERAGE DISCHARGE.--39 years (1938-77), 1,762 ft³/s (49.90 m³/s), 1,277,000 acre-ft/yr (1.57 km³/yr), unadjusted.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,550 ft³/s (270 m³/s) June 12, 1970, gage height, 8.01 ft (2.441 m); minimum daily, 210 ft³/s (5.95 m³/s) Aug. 25, 26, 1959.

Monthly and annual mean discharges 1939-77

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	2963	810	1987	589	0.30	9.4
November	3318	961	1969	588	.30	9.3
December	3243	975	1535	361	.24	7.3
January	1769	767	1398	236	.17	6.6
February	2336	781	1390	291	.21	6.6
March	2088	891	1415	332	.23	6.7
April	3008	717	1557	628	.40	7.4
May	4189	859	1866	737	.39	8.8
June	5180	1142	2952	1076	.36	14.0
July	3454	972	1853	552	.30	8.7
August	2339	1044	1576	275	.17	7.4
September	2289	934	1649	342	.21	7.8
Annual	2423	1047	1762	307	.17	100

Magnitude and probability of annual low flow based on period of record 1939-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	895	690	548	429	306	235
3	947	745	605	485	358	283
7	988	790	677	583	482	418
14	1030	829	721	634	540	481
30	1080	883	784	707	625	574
60	1180	981	885	810	730	679
90	1260	1060	954	870	780	721
120	1300	1110	1000	918	825	765
183	1400	1190	1080	992	899	839

Magnitude and probability of instantaneous peak flow based on period of record 1943-77

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
3730	4930	6430	7360	8460	9230	9980

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1939-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	4510	5950	6850	7950	8750	9520
3	4340	5700	6550	7590	8330	9060
7	4060	5260	6000	6890	7510	8110
15	3720	4720	5310	5990	6460	6890
30	3330	4150	4600	5070	5380	5650
60	2800	3340	3740	4080	4290	4470
90	2450	2980	3270	3610	3830	4040

Duration table of daily mean flow for period of record 1939-77

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
4750	3300	2700	2400	2200	1850	1650	1580	1490	1370	1220	1050	910	810	740	690	620

Basin characteristics

Main channel slope (ft/mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,000 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)

06043500 GALLATIN RIVER NEAR GALLATIN GATEWAY, MT

LOCATION.--Lat 45°29'51", long 111°16'09", in SE¼SE¼SE¼ sec.7, T.4 S., R.4 E., Gallatin County, Hydrologic Unit 10020008, on left bank 0.3 mi (0.5 km) downstream from Spanish Creek, 7.3 mi (11.7 km) south of Gallatin Gateway, and at mile 42.5 (68.4 km).

DRAINAGE AREA.--825 mi² (2,137 km²).

PERIOD OF RECORD.--August 1889 to September 1894, June 1930 to September 1969, annual maximum, water years 1970-71, October 1971 to current year. Monthly discharge only for some periods, published in WSP 1309. Published as West Gallatin River near Bozeman 1889-94.

REVISED RECORDS.--WSP 1389: 1892(M), 1893-94. WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 5,167.7 ft (1,575.11 m) above mean sea level. Prior to Oct. 20, 1932, nonrecording gages at several different sites and datums within 0.8 mi (1.3 km) of present site.

REMARKS.--Records good. Diversions for irrigation of about 1,400 acres (5.67 km²) above station.

AVERAGE DISCHARGE.--50 years, 814 ft³/s (23.05 m³/s), 589,700 acre-ft/yr (727 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,690 ft³/s (274 m³/s) June 17, 1974, gage height, 7.38 ft (2.249 m); minimum, 117 ft³/s (3.31 m³/s) Jan. 19, 1935, gage height, 0.68 ft (0.207 m).

thly and annual mean discharges 1891-94, 1931-69, 72-77

th	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
ober	743	238	461	121	0.26	4.7
mber	589	247	388	86.9	.22	4.0
mber	549	214	326	70.4	.22	3.3
ary	468	200	307	60.9	.20	3.2
ary	430	220	307	55.6	.18	3.1
	465	206	309	60.5	.20	3.2
	856	263	480	145	.30	4.9
	3135	873	1731	579	.33	17.8
	5056	643	2991	989	.33	30.8
	3669	345	1323	609	.46	13.6
ust	998	269	611	172	.28	6.3
ember	788	233	494	123	.25	5.1
nal	1184	408	814	184	.23	100

Magnitude and probability of annual low flow based on period of record 1890-94, 1931-69, 72-77

Period (consecutive Days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	236	199	183	171	159	153
3	246	207	191	179	166	159
7	259	219	202	189	176	168
14	271	231	213	200	186	17[illegible]
30	283	242	224	210	196	18[illegible]
60	291	252	234	221	208	200
90	296	256	239	226	212	20[illegible]
120	302	261	243	229	215	20[illegible]
183	331	283	261	244	227	216

itude and probability of instantaneous peak flow
d on period of record 1890-94, 1931-77
charge, in ft³/s, for indicated recurrence interval,
ears, and exceedence probability, in percent

[illegible]	[illegible]	[illegible]	10	25	50	100
[illegible]	50%	[illegible]	10%	4%	2%	1%
270	5120	6810	7850	9080	9940	10800

ighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1890-94, 1931-69, 72-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	4670	6100	6920	7850	8470	9040
3	4410	5790	6590	7510	8140	8710
7	4100	5360	6080	6880	7420	7900
15	3710	4820	5420	6080	6500	6880
30	3250	4110	4560	5010	5290	5520
60	2570	3210	3540	3880	4090	4270
90	2050	2540	2800	3070	3240	3380

Duration table of daily mean flow for period of record 1890-94, 1931-69, 72-77

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time																
[illegible]	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
50	2950	2000	1380	990	615	500	430	375	335	300	270	250	228	218	208	191

Basin characteristics

nel e mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,000 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)
16.8	59.5	7,960	100	96	1.03	84.3	4.9	18.0

GALLATIN RIVER BASIN

06048000 EAST GALLATIN RIVER AT BOZEMAN, MT

LOCATION.--Lat 45°42'00", long 111°01'45", near center of south line of sec.31, T.1 S., R.6 E., Gallatin County, Hydrologic Unit 10020008, on left bank 100 ft (30.5 m) upstream from highway bridge, 500 ft (152 m) downstream from Bozeman Creek, 0.5 mi (0.8 km) upstream from Bridger Creek, and 0.5 mi (0.8 km) north of Bozeman.

DRAINAGE.--148 mi^2 (383 km^2).

PERIOD OF RECORD.--August 1939 to September 1961.

REVISED RECORDS.--WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 4,701.6 ft (1,433.05 m) above mean sea level, datum of 1929, unadjusted.

REMARKS.--Records good except for winter periods, which are poor. Diversions for irrigation of about 4,000 acres (16.2 km^2) above station. Some diurnal fluctuation caused by mill above station.

AVERAGE DISCHARGE.--22 years, 84.6 ft^3/s (2.396 m^3/s), 61,290 acre-ft/yr (75.6 hm^3/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,240 ft^3/s (35.1 m^3/s) June 4, 1953 gage height, 6.09 ft (1.856 m), from high-water mark in well; minimum, 12 ft^3/s (0.340 m^3/s) Dec. 9, 1944, Mar. 24-26, 1955.

Monthly and annual mean discharges 1940-61

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	86.4	29.8	32.5	11.6	0.22	5.2
November	74.7	30.9	50.5	10.5	.21	5.0
December	74.8	28.1	45.5	10.4	.23	4.5
January	64.4	23.3	38.7	8.4	.22	3.8
February	55.5	27.9	42.3	7.8	.18	4.1
March	124	26.4	60.1	20.3	.34	5.9
April	329	67.9	158	77.2	.49	15.6
May	529	89.9	236	108	.46	23.3
June	343	46.4	178	83.1	.47	17.5
July	134	23.0	62.9	24.5	.39	6.2
August	96.1	19.1	41.9	16.6	.40	4.1
September	82.9	31.7	48.6	11.7	.24	4.8
Annual	156	50.2	84.6	24.2	.29	100

Magnitude and probability of annual low flow based on period of record 1940-61

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	22.7	17.7	15.3	13.6	---	---
3	24.0	18.5	15.8	13.7	---	---
7	26.0	21.2	18.9	17.2	---	---
14	29.3	24.8	22.6	20.9	---	---
30	33.1	28.0	25.5	23.4	---	---
60	36.5	32.0	29.8	28.0	---	---
90	39.5	35.1	33.0	31.3	---	---
120	42.1	37.1	34.7	32.7	---	---
183	44.6	39.1	36.6	34.6	---	---

Magnitude and probability of instantaneous peak flow based on period of record 1939-61

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
	553	828	1010	1250	1430	---

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1940-61

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	441	674	845	1080	1270	---
3	392	593	742	949	1120	---
7	342	502	619	780	909	---
15	304	426	510	617	698	---
30	261	357	418	493	548	---
60	217	300	356	426	478	---
90	185	252	297	352	393	---

Duration table of daily mean flow for period of record 1940-61

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
465	270	190	140	102	71	57	51	46	42	39	33	29	24	21	19	16

GALLATIN RIVER BASIN

06048500 BRIDGER CREEK NEAR BOZEMAN, MT

LOCATION.--Lat 45°42'20", long 110°57'40", in NE¼SE¼ sec.34, T.1 S., R.6 E., Gallatin County, Hydrologic Unit 10020008, on right bank 3.6 mi (5.8 km) upstream from mouth and 3.5 mi (5.6 km) northeast of Bozeman.

DRAINAGE.--62.5 mi^2 (162 km^2).

PERIOD OF RECORD.--October 1945 to September 1969, April 1971 to June 1972. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1309: 1948. WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 4,960 ft (1,511 m) (from topographic map). Prior to June 28, 1946, staff gage at same site and datum.

REMARKS.--Records good, except for winter periods which are poor. Diversions for irrigation of about 1,200 acres (4.86 km^2) above station.

AVERAGE DISCHARGE.--24 years (1945-69), 36.6 ft^3/s (1.04 m^3/s) 26,500 acre-ft/yr (32.7 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 902 ft^3/s (25.5 m^3/s) June 3, 1953 gage height, 4.90 ft (1.494 m) from reconstructed gage-height graph, from rating curve extended above 380 ft^3/s (10.8 m^3/s); minimum, 0.9 ft^3/s (0.025 m^3/s) Mar. 23, 1953, August 30, 1954.

nthly and annual mean discharges 1946-69

th	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
ober	22.3	6.08	10.8	4.3	0.40	2.4
ember	21.7	5.75	10.3	3.8	.37	2.3
ember	17.1	4.06	8.67	4.0	.46	2.0
uary	15.3	2.98	7.19	3.4	.47	1.6
ruary	33.5	2.85	8.92	6.4	.71	2.0
ch	44.6	2.77	15.5	11.3	.73	3.5
il	148	20.2	64.7	35.8	.55	14.6	
	333	54.0	158	70.0	.44	35.6
e	240	32.4	104	55.5	.53	23.3
y	83.5	10.8	31.9	16.4	.51	7.2
ust	38.5	3.88	13.6	7.47	.55	3.1
tember	29.2	5.23	10.9	5.87	.54	2.4
ual	69.8	16.5	36.6	13.8	.38	100

Magnitude and probability of annual low flow based on period of record 1947-68

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	3.39	2.22	1.73	1.40	---	---
3	3.76	2.48	1.94	1.57	---	---
7	4.36	2.92	2.32	1.89	---	---
14	4.88	3.42	2.81	2.39	---	---
30	5.49	3.98	3.38	2.96	---	---
60	6.07	4.48	3.82	3.35	---	---
90	6.65	4.95	4.25	3.74	---	---
120	7.27	5.38	4.61	4.06	---	---
183	7.95	6.07	5.32	4.80	---	---

nitude and probability of instantaneous peak flow
ed on period of record 1945-69
charge, in ft^3/s, for indicated recurrence interval,
ears, and exceedence probability, in percent

25	2	5	10	25	50	100
1%	50%	20%	10%	4%	2%	1%
?	295	462	580	735	854	975

ighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1946-68

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	257	407	521	680	810	---
3	240	376	477	617	729	---
7	220	334	414	521	604	---
15	192	280	340	416	473	---
30	163	232	276	330	370	---
60	129	182	216	259	291	---
90	103	143	169	201	224	---

Duration table of daily mean flow for period of record 1946-68

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
	160	102	65	46	25	16	12	9.5	7.8	6.6	5.5	4.5	3.5	2.8	2.4	1.8

06052500 GALLATIN RIVER AT LOGAN, MT

LOCATION.--Lat 45°53'07", long 111°26'15", in NE¼ sec.35, T.2 N., R.2 E., Gallatin County, Hydrologic Unit 10020008, on right bank at former county road bridge site, 0.5 mi (0.8 km) west of Logan and 6 mi (10 km) upstream from mouth.

DRAINAGE AREA.--1,795 mi² (4,649 km²).

PERIOD OF RECORD.--September 1893 to December 1905, August 1928 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1389: 1898-99, 1903, 1905, 1929(M), 1935-36(M), 1938-39(M), 1941(M). WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 4,086.42 ft (1,245.541 m) above mean sea level. Prior to Aug. 10, 1928, nonrecording gages at several sites within 0.5 mi (0.8 km) of present site at various datums. Aug. 10, 1928, to Oct. 7, 1941, nonrecording gage at present site and datum.

REMARKS.--Records good except those for winter period, which are fair. Some regulation by Middle Creek Reservoir. Diversions for irrigation of about 110,000 acres (445 km²).

AVERAGE DISCHARGE.--61 years, 1,053 ft³/s (29.82 m³/s), 762,900 acre-ft/yr (941 hm³/yr).

EXTRENES FOR PERIOD OF RECORD.--Maximum discharge observed, 9,840 ft³/s (279 m³/s) June 21, 1899, gage height, 6.25 ft (1.905 m), site and datum then in use; maximum gage height, 11.88 ft. (3.621 m) Feb. 5, 1963, from floodmark (backwater from ice); minimum discharge observed, 130 ft³/s (3.68 m³/s) July 19, 1939, gage height, 2.04 ft (0.622 m).

Monthly and annual mean discharges 1894-1905, 29-77

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	1218	333	752	224	0.30	6.0
November	1186	328	809	188	.23	6.4
December	1049	450	749	137	.18	5.9
January	971	400	684	128	.19	5.4
February	1249	585	704	151	.21	5.6
March	1290	478	788	150	.19	6.2
April	1993	429	1034	318	.31	8.2
May	4686	176	2081	930	.45	16.5
June	5675	280	2962	1379	.47	23.4
July	3899	162	960	652	.68	7.6
August	1022	167	472	188	.40	3.7
September	1269	238	645	226	.35	5.1
Annual	1645	454	1053	288	.27	100

Magnitude and probability of annual low flow based on period of record 1894-1905, 29-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	321	231	193	165	137	121
3	326	237	199	171	144	128
7	340	248	208	179	150	134
14	357	258	215	184	154	136
30	389	276	229	195	161	141
60	461	323	263	220	178	153
90	567	402	325	267	211	177
120	715	558	464	386	303	252
183	765	611	521	446	365	314

Magnitude and probability of instantaneous peak flow based on period of record 1895-1900, 1902-05, 29-77

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
3590	4900	6590	7650	8930	9840	10700

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1894-1905, 29-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	5020	6670	7410	8070	8420	8680
3	4720	6320	7080	7770	8150	8440
7	4320	5840	6590	7320	7730	8070
15	3840	5300	6080	6880	7370	7780
30	3270	4590	5320	6100	6600	7040
60	2560	3550	4110	4730	5140	5510
90	2070	2830	3270	3770	4100	4410

Duration table of daily mean flow for period of record 1894-1905, 29-77

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	25%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%
5400	3300	2050	1480	1200	950	830	750	680	610	540	420	325	240	195	180	160

Basin characteristics

Main channel slope (ft/mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,000 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)

MISSOURI RIVER MAIN STEM

06054500 MISSOURI RIVER AT TOSTON, MT

LOCATION.--Lat 46°08'46", long 111°25'18", in SE¼NW¼ sec.36, T.5 N., R.2 E., Broadwater County, Hydrologic Unit 10030101, on left bank 2 mi (3 km) southeast of Toston, 4.8 mi (7.7 km) upstream from Crow Creek, 7.8 mi (12.6 km) downstream from Sixteenmile Creek, and at mile 2,290.1 (3,684.4 km)

DRAINAGE AREA.--14,669 mi² (37,993 km²).

PERIOD OF RECORD.--April 1890 to February 1891, April 1910 to December 1916, April 1941 to current year. Monthly discharge only for some periods, published in WSP 1309.

GAGE.--Water-stage recorder. Datum of gage is 3,905.68 ft (1,190.451 m) above mean sea level. Prior to Dec. 20, 1916, nonrecording gages at site 2.5 mi (4.0 km) downstream at different datums.

REMARKS.--Water-discharge records good. Some regulation by six reservoirs on tributaries, and Clark Canyon Reservoir. Diversions for irrigation of about 555,400 acres (2,250 km²) of which 12,000 acres (48.6 km²) lies below station.

AVERAGE DISCHARGE.--42 years, 5,371 ft³/s (152.0 m³/s), 3,891,000 acre-ft/yr (4.80 km³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 32,000 ft³/s (906 m³/s) June 6, 1948, gage height, 11.77 ft (3.587 m); minimum, 562 ft³/s (15.9 m³/s) Apr. 30, 1941, gage height, 1.68 ft (0.512 m).

onthly and annual mean discharges 1911-16, 42-77

onth	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
tober	6778	2562	4445	928	0.21	6.9
vember	6550	2815	4711	840	.18	7.4
cember	5968	2569	3801	669	.18	5.9
nuary	4610	2165	3335	556	.17	5.2
bruary	5217	2410	3749	594	.16	5.9
rch	6900	2835	4129	806	.20	6.5
ril	10100	2388	5828	1865	.32	9.1
y	18400	3127	8971	3522	.39	14.0
ne	21800	3997	13180	5023	.38	20.6
ly	14200	1389	5425	2562	.47	8.5
gust	5730	1072	2848	1086	.38	4.5
ptember	5339	2031	3533	831	.23	5.5
nual	7509	2927	5371	1055	.20	100

Magnitude and probability of annual low flow based on period of record 1911-16, 42-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	1660	1230	1030	875	720	627
3	1770	1330	1120	960	796	697
7	1980	1510	1280	1110	923	811
14	2200	1670	1400	1190	973	842
30	2470	1860	1560	1320	1070	922
60	2770	2150	1830	1580	1330	1170
90	3260	2640	2300	2020	1720	1520
120	3590	3150	2910	2710	2480	2330
183	3940	3490	3260	3070	2870	2730

gnitude and probability of instantaneous peak flow sed on period of record 1890,1910-16, 41-77

scharge, in ft³/s, for indicated recurrence interval, years, and exceedence probability, in percent

1.22	2	5	10	25	50	100
82%	50%	20%	10%	4%	2%	1%
800	18700	24700	28300	32600	35600	38400

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1911-16, 42-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	18900	24700	27800	31000	33100	34900
3	18500	24200	27200	30400	32300	34000
7	17600	23100	26100	29200	31100	32700
15	16200	21500	24300	27200	29000	30600
30	14400	19000	21500	24200	25800	27300
60	11700	15100	16900	18700	19800	20800
90	9960	12700	14100	15500	16400	17200

Duration table of daily mean flow for period of record 1911-16, 42-77

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
500	14000	9900	7600	6300	5100	4500	4200	3850	3550	3100	2550	2100	1700	1400	1200	880

Basin characteristics

in annel ope (ft/mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,000 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)

PRICKLY PEAR CREEK BASIN

06061500 PRICKLY PEAR CREEK NEAR CLANCY, MT

LOCATION.--Lat 46°31'05", long 111°56'45", in NE¼SW¼ sec.23, T.9 N., R.3 W., Jefferson County, Hydrologic Unit 10030101, on right bank 100 ft (30.5 m) upstream from bridge on U. S. Highway 91, 3.5 mi (5.6 km) downstream from Lump Gulch Creek, 4 mi (6 km) northeast of Clancy, and 7 mi (11.3 km) southeast of Helena.

DRAINAGE.--192 mi^2 (497 km^2).

PERIOD OF RECORD.--July 1908 to September 1916, July 1921 to September 1933, October 1945 to October 1953, October 1954 to September 1969. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1086: 1946(m). WSP 1309: 1925, 1927, 1933, 1931 (M), 1948 (M). WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 4,067.1 ft (1,239.65 m) above mean sea level, datum of 1929. Prior to July 12, 1910, staff gage at site 1.2 mi (1.9 m) upstream at different datum. July 12, 1910, to September 30, 1916, and July 28, 1921, to Aug. 12, 1933, staff gage at site 2.2 mi (3.5 km) upstream at different datum.

REMARKS.--Records good, except for winter periods which are poor. Diversions for irrigation of about 700 acres (2.83 km^2) above station.

AVERAGE DISCHARGE.--43 years, 48.3 ft^3/s (1.37 m^3/s) 34,990 acre-ft/yr (43.1 hm^3/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, about 900 ft^3/s (25.5 m^3/s) about June 9, 1927 (estimated on basis of hydrographic comparison); minimum, 0.5 ft^3/s (0.014 m^3/s) Jan. 26, 1958 gage height 0.40 ft (0.122 m^3/s) ice jam upstream.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge, 1200 ft^3/s (34.0 m^3/s) June 19, 1975, gage height 6.56 ft (2.000 m).

Monthly and annual mean discharges 1909-16, 22-33, 46-69

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	70.0	12.9	31.2	14.0	0.45	5.4
November	60.0	14.9	29.9	11.1	.37	5.2
December	40.0	12.0	24.1	7.16	.30	4.1
January	30.0	9.94	21.1	5.31	.25	3.6
February	57.2	12.0	24.0	8.22	.34	4.1
March	80.0	16.6	31.6	13.3	.42	5.5
April	131	22.9	53.7	21.6	.40	9.3
May	194	38.4	109	36.8	.34	18.9
June	450	27.4	139	86.1	.62	23.9
July	141	10.2	57.4	33.0	.57	9.9
August	75.7	6.33	29.4	14.9	.50	5.1
September	71.4	9.32	29.1	15.0	.52	5.0
Annual	84.7	18.5	48.3	15.7	.33	100

Magnitude and probability of annual low flow based on period of record 1910-16, 23-33, 47-68

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	13.4	9.30	7.5	6.33	5.20	4.48
3	13.9	9.71	7.93	6.66	5.40	4.7
7	14.9	10.6	8.67	7.28	5.90	5.1
14	15.8	11.4	9.43	7.93	6.50	5.6
30	17.4	12.8	10.5	8.8	7.10	6.1
60	19.7	14.6	11.9	9.9	8.20	6.6
90	21.2	16.3	13.8	12.0	9.90	8.9
120	22.6	17.4	14.9	13.1	11.1	10.0
183	24.1	18.2	15.7	13.8	11.9	10.9

Magnitude and probability of instantaneous peak flow based on period of record 1911-16, 23-33, 46-69, 75

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
166	273	445	574	751	893	1040

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1910-16, 22-33, 46-68

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	233	363	452	567	653	738
3	210	323	401	502	578	655
7	187	286	355	447	518	591
15	168	255	315	395	456	518
30	148	220	269	331	376	422
60	122	175	208	247	274	300
90	102	143	167	195	214	231

Duration table of daily mean flow for period of record 1910-16, 22-33, 46-68

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99.5%	99.9%
265	150	105	78	64	47	36	30	26	23	20	17	14	11.5	9.6	7.8	5.7

PRICKLY PEAR CREEK BASIN

06062500 TENMILE CREEK NEAR RIMINI, MT

LOCATION.--Lat 46°31'27", long 112°15'22", in NW¼SW¼NE¼ sec.20, T.9 N., R.5 W., Lewis and Clark County, Hydrologic Unit 10030101, Helena National Forest, on left bank at U.S. Forest Service Moose Creek picnic grounds, 500 ft (152 m) upstream from Moose Creek and 2.5 mi (4.0 km) north of Rimini.

DRAINAGE AREA.--32.7 mi² (84.7 km²).

PERIOD OF RECORD.--October 1914 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1309: 1917, 1921, 1924-25. WSP 1509: 1915, 1916-17(M), 1920(M), 1927(M), 1928-30, 1947(M), 1948, 1950(M). WSP 1559: Drainage area. WSP 1709: 1959.

GAGE.--Water-stage recorder and concrete control since Oct. 20, 1937. Altitude of gage is 4,850 ft (1,478 m), from topographic map. Prior to Dec. 17, 1934, water-stage recorder at site 40 ft (12 m) downstream at different datum and different control.

REMARKS.--Records good. Flow regulated by Chessman and Scott Reservoirs on tributaries above station, combined capacity, 2,340 acre-ft (2.89 hm³). Small diversions above station for water supply for city of Helena.

AVERAGE DISCHARGE.--63 years, 17.7 ft³/s (0.501 m³/s), 12,820 acre-ft/yr (15.8 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 995 ft³/s (28.2 m³/s) June 19, 1975, gage height, 4.89 ft (1.490 m); maximum gage height, 4.98 ft (1.518 m), May 27, 1917, site and datum then in use; no flow at times.

Monthly and annual mean discharges 1915-77

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	23.1	0.19	2.8	4.1	1.42	1.3
November	9.6	.22	2.2	2.2	1.02	1.0
December	9.7	.17	1.8	1.8	1.03	.8
January	7.0	.14	1.5	1.3	.86	.7
February	5.1	.10	1.4	1.1	.81	.7
March	15.0	.17	2.4	2.4	.99	1.2
April	66.7	1.5	17.5	14.6	.83	8.3
May	300	16.4	85.9	45.9	.53	40.6
June	346	6.6	79.9	69.0	.86	37.8
July	66.4	.54	12.1	14.4	1.18	5.7
August	12	.16	2.2	2.3	1.06	1.0
September	18.1	.23	1.9	2.8	1.47	.9
Annual	53.1	3.6	17.7	9.8	.55	100

Magnitude and probability of annual low flow based on period of record 1915-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	0.32	0.13	0	0	0	0
3	.33	.15	0	0	0	0
7	.39	.16	.1	.05	0	0
14	.45	.19	.12	.09	.06	.04
30	.55	.26	.18	.13	.09	.07
60	.72	.37	.27	.21	.16	.14
90	.95	.47	.33	.25	.18	.15
120	1.08	.53	.37	.27	.19	.15
183	1.41	.70	.49	136	.26	.21

Magnitude and probability of instantaneous peak flow based on period of record 1915-77

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
126	223	376	484	625	732	840

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1915-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	185	302	379	474	541	605
3	172	277	343	422	475	525
7	153	245	302	368	414	456
15	130	208	258	316	356	393
30	108	173	216	268	304	339
60	77	124	155	193	220	246
90	58	92	113	140	158	176

Duration table of daily mean flow for period of record 1915-77

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
215	100	52	29	16	5.9	3.2	2.0	1.3	0.92	.6	.43	.32	.23	.18	.15	.01

Basin characteristics

Main channel slope (ft/mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,000 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)

PRICKLY PEAR CREEK BASIN

06063000 TENMILE CREEK NEAR HELENA, MT

LOCATION.--Lat 46°36'20", long 112°05'20", near center of SE¼ sec.22, T.10 N., R.4 W., Lewis and Clark County, Hydrologic Unit 10030101, on right bank at Broadwater Hotel, 1.5 mi (2.4 km) west of Helena and 2.5 mi (4.0 km) upstream from Sevenmile Creek.

DRAINAGE.--102 mi^2 (264 km^2).

PERIOD OF RECORD.--July 1908 to September 1954.

GAGE.--Water-stage recorder and concrete control. Altitude of gage is 3,960 ft (1,207 m), from topographic map. Prior to September 18, 1925, staff gage and Sept. 18, 1925, to Mar. 15, 1929, water-stage recorder, at site 100 ft (30.5 m) downstream at different datum.

REMARKS.--Diversions for irrigation of about 1,200 acres (4.86 km^2) above station and for water supply of Helena.

AVERAGE DISCHARGE.--46 years (1908-54), 27.2 ft^3/s (0.77 m^3/s) 19,690 acre-ft/yr (24.3 hm^3/s).

EXTREMES FOR PERIOD OF RECORD.--1908-54: Maximum discharge, 995 ft^3/s (28.2 m^3/s) May 28, 1917, computed from graph based on gage readings; maximum gage height, 6.58 ft (2.001 m) June 11, 1927, site and datum then in use; no flow at times.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge, 1360 ft^3/s (38.5 m^3/s) result of current meter measurement June 19, 1975.

Monthly and annual mean discharges 1909-54

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	39.9	0.62	8.4	8.3	0.99	2.6
November	25.9	.99	8.3	6.1	.73	2.5
December	19.3	.75	6.3	4.6	.73	1.9
January	19.3	.85	5.5	3.9	.71	1.7
February	13.9	1.59	5.3	3.0	.57	1.6
March	31.2	1.80	9.8	6.9	.70	3.0
April	111	5.2	36.2	24.2	.67	11.1
May	381	22.7	115	78.1	.68	35.4
June	423	3.7	106	99.0	.93	32.6
July	117	0	18.4	22.6	1.23	5.6
August	19.6	0	3.2	4.8	1.50	1.0
September	19.5	0	3.2	4.2	1.29	1.0
Annual	73.5	4.38	27.2	16.8	.62	100

Magnitude and probability of annual low flow based on period of record 1909-54

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	0.32	0.08	0	0	0	0
3	.36	.1	0	0	0	0
7	.42	.14	.02	0	0	0
14	.48	.15	.03	0	0	0
30	.70	.28	.11	.01	0	0
60	1.2	.38	.14	.02	0	0
90	2.9	1.1	.54	.25	.10	.01
120	4.2	2.3	1.63	1.22	.87	.68
183	6.0	3.37	2.46	1.88	1.38	1.12

Magnitude and probability of instantaneous peak flow based on period of record 1909-54, 75

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.5	2	5	10	25	50	100
66%	50%	20%	10%	4%	2%	1%
135	262	496	682	949	1170	1410

Weighted skew --0.15

Magnitude and probability of annual high flow based on period of record 1909-54

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	230	420	560	748	891	1040
3	212	392	524	700	835	972
7	187	346	464	620	740	861
15	159	291	390	523	626	731
30	130	241	327	446	541	641
60	98	175	233	310	370	431
90	75.4	134	176	231	272	314

Duration table of daily mean flow for period of record 1909-54

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
300	160	72	44	28	15	9.5	6.4	4.6	3.1	1.8	.85	.45	.1	0	0	0

DEARBORN RIVER BASIN

06073000 DEARBORN RIVER NEAR CLEMONS, MT

LOCATION.--Lat 47°17'30", long 112°27'00", in SE¼SE¼ sec.23, T.18 N., R.7 W., Lewis and Clark County, Hydrologic Unit 10030102, on right bank 300 ft (91.4 m) upstream from highway bridge, 0.5 mi (0.8 km) southeast of former post office at Clemons, 2 mi (3 km) downstream from Falls Creek, and 14 mi (23 km) south of Augusta.

DRAINAGE.--123 mi^2 (319 km^2).

PERIOD OF RECORD.--April 1921 to September 1923, May 1929 to September 1953, May 1908 to December 1911, at site 2.5 mi (4.0 km) upstream; records not equivalent owing to tributary inflow (published as "above Falls Creek, near Clemons" in WSP 1309). Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1309: 1921, 1930, 1931.

GAGE.--Water-stage recorder. Altitude of gage is 4,560 ft (1,390 m) by barometer. Prior to Apr. 8, 1931, wire-weight gage at same site and datum.

REMARKS.--Diversions for irrigation of about 2,500 acres (10.1 km^2) in Flat Creek drainage, all of which lies below station.

AVERAGE DISCHARGE.--26 years (1921-23, 1929-53), 116 ft^3/s (3.29 m^3/s) 83,980 acre-ft/yr (104 hm^3/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,200 ft^3/s (90.6 m^3/s) June 4, 1953 gage height 6.20 ft (1.890 m); minimum, 7.4 ft^3/s (0.210 m^3/s) Oct. 22, 23, 1936; gage height, 0.64 ft (0.196 m).

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge, 17,400 ft^3/s (493 m^3/s) June 9, 1964, gage height 9.15 ft (2.789 m).

onthly and annual mean discharges 1922-23, 30-53

onth	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
tober	111	11.0	43.7	24.5	0.56	3.2
vember	125	22.1	44.8	23.8	.53	3.2
cember	96.8	20.0	39.2	19.4	.50	2.8
nuary	65.3	18.4	32.6	12.0	.37	2.4
bruary	50.6	18.0	31.1	10.7	.34	2.3
rch	104	18.1	36.4	18.0	.49	2.6
ril	440	25.0	129	105	.81	9.3
y	675	50.0	375	160	.43	27.0
ne	1210	23.3	451	309	.68	32.5
ly	364	13.5	123	101	.82	8.8
gust	213	10.5	47.5	43.2	.91	3.4
ptember	109	9.35	34.6	22.4	.65	2.5
nual	214	24.4	116	55.3	.48	100

Magnitude and probability of annual low flow based on period of record 1922-23, 31-53

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	15.7	10.9	8.8	7.4	---	---
3	15.9	10.9	8.9	7.5	---	---
7	16.5	11.4	9.4	7.9	---	---
14	17.3	11.9	9.8	8.3	---	---
30	18.9	12.9	10.5	8.9	---	---
60	23.1	15.5	12.4	10.1	---	---
90	26.3	18.0	14.3	11.8	---	---
120	29.1	20.3	16.6	13.9	---	---
183	31.9	22.8	19.2	16.8	---	---

gnitude and probability of instantaneous peak flow sed on period of record 1921-23, 29-53, 64, 75

scharge, in ft^3/s, for indicated recurrence interval, years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
991	1190	2810	4370	6930	9300	12100

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1922-23, 30-53

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1090	1790	2120	2400	2540	---
3	1010	1630	1910	2160	2270	---
7	850	1350	1580	1780	1870	---
15	684	1080	1270	1430	1520	---
30	542	853	1010	1150	1220	---
60	422	653	762	857	905	---
90	326	514	610	700	749	---

Duration table of daily mean flow for period of record 1922-23, 31-53

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99.5%	99.9%
020	510	320	200	130	71	51	40	33	29	25	20	16	12	10.5	9.0	7.0

DEARBORN RIVER BASIN

06073500 DEARBORN RIVER NEAR CRAIG, MT

LOCATION.--Lat 47°11'56", long 112°05'27", in NW¼NE¼SE¼ sec.27, T.17 N., R.4 W., Lewis and Clark County, Hydrologic Unit 10030102, on right bank 20 ft (6.1 m) upstream from bridge on State Highway 287, 7.6 mi (12.8 km) downstream from South Fork, 10.6 mi (17.9 km) northwest of Craig, and 19.4 mi (32.8 km) upstream from mouth.

DRAINAGE.--325 mi^2 (842 km^2).

PERIOD OF RECORD.--October 1945 to September 1969.

GAGE.--Water-stage recorder. Altitude of gage is 3,790 ft (1,155 m) from topographic map. Prior to Oct. 1, 1946, nonrecording gage; Oct. 1, 1946 to June 9, 1964, water-stage recorder on upstream side of bridge; June 10, 1964 to May 31, 1965, non-recording gage at present datum.

REMARKS.--Records good, except for winter periods, which are poor. Diversions for irrigation of about 3,300 acres (13.4 km^2) of which about 2,500 acres (10.1 km^2) lies in Flat Creek drainage which is tributary below station.

AVERAGE DISCHARGE.--24 years, 218 ft^3/s (6.17 m^3/s) 157,900 acre-ft/yr (195 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 15,400 ft^3/s (436 m^3/s) June 9, 1964, gage height, 13.5 ft (4.115 m) from flood marks, from rating curve extended above 7,000 ft^3/s (198 m^3/s) on basis of slope-area measurement of peak flow; minimum, 8.0 ft^3/s (0.227 m^3/s) Aug. 17, 1961.

Monthly and annual mean discharges 1946-69

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	187	17.0	74.8	38.2	0.51	2.8
November	165	36.4	76.0	31.3	.41	2.9
December	155	36.4	68.4	28.6	.42	2.6
January	104	30.0	56.6	17.6	.31	2.2
February	113	35.9	60.2	18.2	.30	2.3
March	187	39.9	85.9	36.6	.43	3.3
April	519	51.0	242	131	.54	9.3
May	1155	275	734	279	.38	28.2
June	2104	277	855	598	.70	32.8
July	583	55.9	229	139	.61	8.8
August	163	16.1	70	39.8	.57	2.7
September	173	18.8	55.1	33.3	.61	2.1
Annual	363	89.1	218	82.2	.38	100

Magnitude and probability of annual low flow based on period of record 1946-69

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	25.7	18.2	14.7	12.0	9.3	---
3	26.8	19.5	16.0	13.3	10.7	---
7	28.7	20.8	17.1	14.4	11.6	---
14	30.9	22.0	18.0	15.0	12.1	---
30	35.9	25.0	20.0	16.4	12.8	---
60	41.9	31.0	25.8	21.8	17.8	---
90	50.7	41.4	37.1	33.9	30.6	---
120	57.0	45.7	41.0	37.7	34.5	---
183	66.5	51.8	45.8	41.5	37.3	---

Magnitude and probability of instantaneous peak flow based on period of record 1946-69, 75

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
1180	2310	4420	6130	8630	10700	13000

Weighted skew --0.15

Magnitude and probability of annual high flow based on period of record 1946-69

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1750	3360	5060	8280	11700	---
3	1600	2910	4210	6500	8820	---
7	1370	2310	3160	4540	5850	---
15	1120	1820	2420	3380	4240	---
30	907	1430	1850	2480	3020	---
60	721	1100	1390	1780	2090	---
90	581	872	1080	1350	1560	---

Duration table of daily mean flow for period of record 1946-69

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
1700	870	590	400	255	145	99	77	63	55	47	37	30	23.5	18.5	16	13

SMITH RIVER BASIN

06077000 SHEEP CREEK NEAR WHITE SULPHUR SPRINGS, MT

LOCATION.--Lat 46°46'05", long 110°48'33", in SW¼SW¼SE¼ sec.26, T.12 N., R.7 E., Meagher County, Hydrologic Unit 10030103, on right bank 7 mi (11 km) upstream from Moose Creek and 16 mi (26 km) north of White Sulphur Springs.

DRAINAGE.--54.4 mi^2 (141 km^2).

PERIOD OF RECORD.--July 1941 to September 1972.

REVISED RECORDS.--WSP 1309: 1942(M). WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 5,820 ft (1,774 m), by barometer. Prior to Oct. 1, 1942, wire-weight gage at site 1,000 ft (304.8 m) upstream at datum 7.03 ft (2.142 m) higher and Oct. 1, 1942, to May 3, 1955, at site 700 ft (213 m) upstream at datum 5.33 ft (1.624 m) higher.

REMARKS.--Records good except for winter period, which are poor. Diversions for irrigation of about 200 acres (0.81 km^2) above station.

AVERAGE DISCHARGE.--31 years, 31.9 ft^3/s (0.903 m^3/s) 23,110 acre-ft/yr (28.5 hm^3/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 460 ft^3/s (13.0 m^3/s) June 4, 1953 gage height, 5.80 ft (1.768 m) from graph based on gage readings, site and datum then in use; minimum daily, 3.5 ft^3/s (0.10 m^3/s) Jan. 18-20, 1943.

thly and annual mean discharges 1942-72,

th	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
ober	34.1	9.93	15.6	4.6	0.29	4.1
ember	23.7	8.28	12.9	3.2	.25	3.4
ember	17.4	6.08	10.4	2.3	.22	2.7
uary	13.4	5.90	9.2	1.9	.20	2.4
ruary	14.2	6.18	9.1	1.9	.20	2.4
ch	21.3	6.21	9.3	2.8	.30	2.5
il	46.7	9.03	20.6	10.8	.53	5.4
	169	46.2	94.8	35.3	.37	24.8
e	232	43.8	115	56.3	.49	30.2
y	83.7	19.1	43.2	13.9	.32	11.3
ust	38.9	11.3	23.2	6.5	.28	6.1
tember	36.3	9.99	18.0	5.0	.28	4.7
ual	50.7	17.9	31.9	8.3	.26	100

Magnitude and probability of annual low flow based on period of record 1942-72

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	5.82	4.74	4.23	3.84	3.43	---
3	6.17	5.02	4.46	4.03	3.57	---
7	6.73	5.56	5.00	4.54	4.06	---
15	7.25	6.00	5.39	4.92	4.43	---
30	7.83	6.61	6.04	5.61	5.15	---
60	8.42	7.04	6.39	5.88	5.35	---
90	8.68	7.43	6.87	6.45	6.02	---
183	9.00	7.77	7.27	6.91	6.57	---
183	10.2	8.81	8.28	7.92	7.60	---

itude and probability of instantaneous peak flow
ed on period of record 1942-72, 75

charge, in ft^3/s, for indicated recurrence interval, ears, and exceedence probability, in percent						
33	2	5	10	25	50	100
%	50%	20%	10%	4%	2%	1%
	214	306	367	444	502	560

ighted skew =-0.15

Magnitude and probability of annual high flow based on period of record 1942-72

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	191	276	339	427	498	---
3	182	262	321	404	471	---
7	168	240	293	368	428	---
15	151	214	262	327	381	---
30	131	185	224	278	322	---
60	102	138	163	196	221	---
90	82	109	126	147	163	---

Duration table of daily mean flow for period of record 1942-72

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
5	120	80	57	43	25	18.5	15.0	12.5	10.8	9.3	7.9	6.8	5.9	5.4	5.1	4.4

SMITH RIVER BASIN

06077500 SMITH RIVER NEAR EDEN, MT

LOCATION.--Lat 47°11'24", long 111°23'12", on SW¼SW¼ sec.29, T.17 N., R.3 E., Cascade County, Hydrologic Unit 10030103, on left bank 0.3 mi (0.5 km) upstream from Mullens Creek, 2.3 mi (3.7 km) upstream from Hound Creek, and 7.6 mi (12.2 km) southwest of Eden.

DRAINAGE.--1,594 mi^2 (4,128 km^2).

PERIOD OF RECORD.--April 1951 to September 1969.

REVISED RECORDS.--WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 3,500 ft (1,067 m), by barometer.

REMARKS.--Records good, except for winter period. Diversions for irrigation of about 24,500 acres (99.2 km^2) above station. Flow affected by storage in Smith River Reservoir.

AVERAGE DISCHARGE.--18 years 338 ft^3/s (9.57 m^3/s), 244,900 acre-ft/yr (302 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 12,300 ft^3/s (348 m^3/s) June 4, 1953 gage height, 10.46 ft (3.188 m), from rating curve extended above 3,800 ft^3/s (108 m^3/s) on basis of slope-area measurement of peak flow; minimum discharge observed, 3.1 ft^3/s (0.09 m^3/s) Sept. 1, 1961, gage height, -0.17 ft (-0.052 m), result of discharge measurement.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in June 1908 was about a foot lower than in 1953, from information from local residents.

Monthly and annual mean discharges 1952-69

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	501	52.3	169	111	0.66	4.1
November	370	57.4	150	81.4	.54	3.7
December	260	31.0	110	61.7	.56	2.7
January	211	42.8	99.4	52.0	.52	2.4
February	350	48.7	137	77.8	.57	3.4
March	372	63.3	179	80.5	.45	4.4
April	1157	137	393	258	.66	9.6
May	2089	289	955	517	.54	23.5
June	3119	279	1190	869	.73	29.3
July	833	36.3	374	222	.59	9.2
August	344	15.7	158	93.4	.59	3.9
September	537	29.6	154	124	.80	3.8
Annual	614	107	338	159	.47	100

Magnitude and probability of annual low flow based on period of record 1952-69

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	28.5	11.3	6.8	4.3	2.5	---
3	35.3	15.2	9.2	5.9	3.6	---
7	49.2	22.5	13.5	8.4	4.7	---
14	60.7	30.2	19.2	12.6	7.4	---
30	71.4	40.9	28.7	20.7	13.7	---
60	79.8	48.3	35.8	27.5	20.0	---
90	91.5	56.8	43.3	34.2	25.9	---
120	101	69.9	56.5	48.0	40.0	---
183	125	89.8	76.8	68.2	60.1	---

Magnitude and probability of instantaneous peak flow based on period of record 1952-69, 75

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.33	2	5	10	25	50	100
50%	50%	20%	10%	4%	2%	1%
1130	2200	4160	5750	8040	9940	12000

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1952-69

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1780	3300	4800	7470	10200	---
3	1660	3000	4270	6450	8590	---
7	1530	2640	3620	5200	6660	---
15	1360	2290	3070	4280	5360	---
30	1210	2020	2680	3660	4490	---
60	963	1570	2030	2660	3170	---
90	785	1250	1580	2020	2360	---

Duration table of daily mean flow for period of record 1952-69

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99.5%	99.9%
2650	1300	810	560	430	285	200	160	130	105	66	60	45	29.5	21.5	15.5	5.0

Basin characteristics..

MISSOURI RIVER MAIN STEM

06078200 MISSOURI RIVER NEAR ULM, MT

LOCATION.--Lat 47°26'09", long 111°23'07", in NE¼NW¼NW¼ sec.5, T.19 N., R.3 E., Cascade County, Hydrologic Unit 10030102, on left bank 5.6 mi (9.0 km) east of Ulm and 9.1 mi (14.6 km) downstream from Smith River.

DRAINAGE AREA.--20,941 mi² (54,237 km²).

PERIOD OF RECORD.--August 1957 to current year.

GAGE.--Water-stage recorder. Datum of gage is 3,313.27 ft (1,009.885 m) above mean sea level.

REMARKS.--Records good except those for winter period, which are poor. Flow regulated by 10 smaller irrigation reservoirs and powerplants, Clark Canyon Reservoir, and Canyon Ferry Reservoir. Diversions for irrigation of about 630,400 acres (2,500 mk³) above station.

AVERAGE DISCHARGE.--20 years, 6,782 ft³/s (192.1 m³/s), 4,913,600 acre-ft/yr (6.06 km³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 27,500 ft³/s (779 m³/s) June 22, 1964, gage height, 14.44 ft (4.401 m); maximum gage height, 14.64 ft (4.462 m) June 22, 1975; minimum daily discharge, 1,700 ft³/s (48.1 m³/s) June 17, 1961.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in June 1953 reached a stage of about 17 ft (5.2 m); discharge, 35,000 ft³/s (990 m³/s). Flood in June 1948 reached a stage of about 16 ft (4.9 m); discharge, 32,000 ft³/s (906 m³/s), from information by local residents.

Monthly and annual mean discharges 1958-77

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	11230	3179	5374	1707	0.32	6.6
November	9497	3451	5782	1578	.27	7.1
December	10690	4092	5968	1387	.23	7.3
January	7179	4442	5849	841	.14	7.2
February	7358	4028	5874	1041	.17	7.2
March	9652	3562	6054	1634	.27	7.5
April	12070	3070	7003	2688	.38	8.6
May	19800	3501	10180	4472	.44	12.5
June	21850	2965	11650	5360	.46	14.3
July	19480	3114	7970	3963	.50	9.8
August	7701	3081	4958	1278	.26	6.1
September	6954	2283	4699	1258	.27	5.8
annual	9653	3986	6782	1533	.23	100

Magnitude and probability of annual low flow based on period of record 1958-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	2930	2320	2070	1890	1700	-----
3	3190	2540	2260	2060	1850	-----
7	3490	2740	2420	2180	1940	-----
14	3650	2920	2600	2360	2120	-----
30	3920	3150	2800	2540	2270	-----
60	4220	3440	3090	2830	2570	-----
90	4560	3780	3440	3190	2940	-----
120	4910	4070	3680	3380	3070	-----
183	5380	4500	4070	3740	3380	-----

Magnitude and probability of instantaneous peak flow based on period of record 1948,53,58-77

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent

1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
13000	18600	26100	31100	37200	41700	46100

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1958-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	17100	23000	26000	29000	30700	------
3	16600	22500	25600	28600	30400	------
7	15900	21600	24600	27600	29400	------
15	15000	20500	23500	26700	28700	------
30	13400	18500	21400	24600	26700	------
60	11700	15700	18000	20600	22300	------
90	10400	13800	15900	18200	19900	------

Duration table of daily mean flow for period of record 1958-77

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
22700	15000	11400	9300	8000	6800	6300	5900	5400	5000	4400	3800	3350	2850	2600	2400	2200

Basin characteristics

Main channel slope (ft/mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,000 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)

SUN RIVER BASIN

06078500 NORTH FORK SUN RIVER NEAR AUGUSTA, MT

LOCATION.--Lat 47°38'30", long 112°51'30", in SW¼SW¼ sec.23, T.22 N., R.10 W., Teton County, Hydrologic Unit 10030104, on left bank 400 ft (121.9 m) upstream from Arsenic Creek, 1 mi (2 km) upstream from confluence with South Fork, 25 mi (40 km) northwest of Augusta.

DRAINAGE.--258 mi^2 (668 km^2).

PERIOD OF RECORD.--May 1911 to September 1912, October 1945 to September 1968. Monthly discharge only for some periods, published in WSP 1309. Prior to October 1959, published as North Fork of North fork Sun River near Augusta.

GAGE.--Water-stage recorder. Datum of gage is 4,785.72 ft (1,458.697 m) above mean sea level (levels by Bureau of Reclamation). May 27, 1911, to Sept. 30, 1912, staff gage near present site at different datum. Oct. 1, 1945, to July 22, 1946, wire-weight gage at site 0.75 mi (1.21 km) downstream at different datum. July 23, 1946, to June 8, 1964, water-stage recorder at present site and datum. June 20, 1964, to Sept. 11, 1964 staff gage at site three-quarters of a mile downstream at different datum.

REMARKS.--Records good, except those for winter period, which are poor. No regulation or diversion above station.

AVERAGE DISCHARGE.--24 years (1911-12, 1945-68), 360 ft^3/s (10.2 m^3/s) 260,800 acre-ft/yr (322 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 51,100 ft^3/s (1447 m^3/s) on June 8, 1964, gage height, 7.03 ft (2.143 m); minimum, 27 cfs Nov. 21, 1949, gage height, 0.79 ft (0.241 m).

Monthly and annual mean discharges 1912, 46-68

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	286	72.2	122	50.9	0.42	2.8
November	191	65.0	102	29.9	.29	2.4
December	152	59.2	83	23.5	.28	1.9
January	95.7	43.1	66.6	13.4	.20	1.6
February	100	46.6	66.3	13.8	.21	1.5
March	113	43.8	67.7	16.6	.25	1.6
April	512	75.9	225	138	.61	5.2
May	1925	688	1257	331	.26	29.2
June	3219	729	1543	603	.39	35.8
July	1010	203	483	228	.47	11.2
August	249	95.2	167	40.5	.24	3.9
September	247	83.5	124	36.3	.29	2.9
Annual	468	253	360	67.7	0.19	100

Magnitude and probability of annual low flow based on period of record

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	41.3	35.4	32.6	30.4	---	---
3	43.4	36.8	33.5	30.9	---	---
7	46.9	39.7	36.3	33.6	---	---
14	50.6	43.7	40.6	38.1	---	---
30	56.7	49.1	45.6	42.8	---	---
60	60.9	52.7	49.1	46.3	---	---
90	63.5	55.2	51.6	48.9	---	---
120	67.5	58.6	55.1	52.7	---	---
183	80.1	67.2	62.2	58.7	---	---

Magnitude and probability of instantaneous peak flow based on period of record 1911-12, 46-68

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
2030	3450	5730	7420	9690	11500	13300

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	2500	3710	5290	8790	---	---
3	2360	3450	4680	7100	---	---
7	2220	3090	3880	5180	---	---
15	2050	2710	3210	3910	---	---
30	1830	2320	2650	3050	---	---
60	1440	1770	1970	2190	---	---
90	1110	1350	1490	1660	---	---

Duration table of daily mean flow for period of record

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	75%	80%	85%	90%	95%	98%	99%
2800	1700	1200	730	440	205	140	110	91	77	67	56	51	46	42	39	31

SUN RIVER BASIN

06081500 WILLOW CREEK NEAR AUGUSTA, MT

LOCATION.--Lat 47°33', long 112°28', in NW¼SW¼ sec.26, T.21 N., R.7 W., Lewis and Clark County, Hydrologic Unit 10030104, just downstream from Little Willow Creek and 5 mi (8 km) northwest of Augusta.

DRAINAGE.--96.1 mi^2 (249 km^2) approximately.

PERIOD OF RECORD.--June 1905 to September 1925.

REVISED RECORDS.--WSP 1309: 1906, 1907, 1908, 1909.

GAGE.--Chain gage. Altitude of gage is 4,150 ft (1,265 m), by barometer. Prior to Aug. 22, 1905, staff gage at same site and datum.

REMARKS.--Diversions for irrigation of about 2,000 acres (8.09 km^2) above station.

AVERAGE DISCHARGE.--20 years, 28.4 ft^3/s (0.804 m^3/s), 20,580 acre-ft/yr (25.4 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,150 ft^3/s (32.6 m^3/s) June 23, 1916, gage height, 10.8 ft (3.292 m), from floodmarks; no flow July 17, 1910.

Monthly and annual mean discharges 1906-10, 1912-25

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	30.4	0.85	12.7	7.8	0.61	3.8
November	24.5	1.00	12.1	6.2	.51	3.6
December	26.0	4.64	10.2	5.3	.52	3.1
January	37.4	3.68	10.1	8.1	.80	3.1
February	70.0	1.71	14.1	16.9	1.20	4.2
March	47.6	4.65	15.8	11.0	.70	4.8
April	49.7	8.19	23.8	13.2	.56	7.1
May	320	4.82	67.5	69.0	1.02	20.1
June	363	1.89	98.7	107	1.09	29.4
July	211	1.00	39.0	47.6	1.22	11.6
August	52.9	.45	17.9	14.6	.82	5.3
September	34.8	.23	13.2	10.2	.77	3.9
Annual	77.4	7.17	28.4	19.9	.70	100

Magnitude and probability of annual low flow based on period of record 1906-10, 1912-25

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	3.50	1.10	0.40	0.05	---	---
3	3.54	1.20	.60	.31	---	---
7	3.69	1.30	.67	.36	---	---
15	3.99	1.43	.74	.40	---	---
30	4.56	1.66	.85	.46	---	---
60	5.18	2.03	1.11	.63	---	---
90	5.96	2.67	1.61	1.02	---	---
120	7.76	3.87	2.50	1.67	---	---
183	9.94	5.91	4.48	3.56	---	---

Magnitude and probability of instantaneous peak flow based on period of record 1905-10, 12-25

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
65.1	173	442	710	1160	1590	2100

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1906-10, 1912-25

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	165	429	707	1200	---	---
3	144	365	599	1020	---	---
7	123	306	502	862	---	---
15	102	249	405	692	---	---
30	83.1	188	293	476	---	---
60	65.2	136	203	314	---	---
90	54.0	108	156	234	---	---

Duration table of daily mean flow for period of record 1906-10, 1912-25

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.8%
290	90	55	41	33	22.5	17.5	13.5	10.5	8.4	6.4	3.7	2.0	1.0	.65	.45	.22

06088500 MUDDY CREEK AT VAUGHN, MT

LOCATION.--Lat 47°33'42", long 111°32'33", near center of S½NE¼ sec.24, T.21 N., R.1 E., Cascade County, Hydrologic Unit 10030104, on right bank near 30 ft (9.1 m) upstream from old highway bridge at Vaughn, 1.5 mi (2.4 km) upstream from mouth.

DRAINAGE AREA.--314 mi^2 (813 km^2).

PERIOD OF RECORD.--May 1925 to February 1926, April 1934 to September 1968, July 1971 to current year.

REVISED RECORDS.--WSP 856: 1937. WSP 1509: 1934-35, 1941(M). WSP 1559: 1956. WSP 1629: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 3,350 ft (1.021 m), from topographic map. May 21, 1925, to Feb. 8, 1926, nonrecording gage at site 500 ft (152 m) downstream at different datum. Apr. 19, 1934, to Sept. 30, 1955, at present site at datum 1.00 ft (0.305 m) higher. May 18, 1955, to Apr. 25, 1960, and Sept. 24, 1962, to Sept. 30, 1968, auxiliary crest-stage gage. Oct. 1, 1955, to Sept. 30, 1968, nonrecording gage at bridge 30 ft (9.1 m) downstream at present datum.

REMARKS.--Water-discharge records good except those for winter period, which are poor. Natural flow increased by wastage from Sun River Canal and by return flow from irrigation. Diversions for irrigation of about 700 acres (2.83 km^2) above station. Pumped diversions from Muddy Creek above station in SW¼ sec. 2, T.22 N., R.1 W., to supplement water supply for Benton Lake Wildlife Refuge are listed below.

AVERAGE DISCHARGE.--40 years (1934-68, 1971-77), 125 ft^3/s (3.540 m^3/s), 90,560 acre-ft/yr (112 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 7,600 ft^3/s (215 m^3/s) June 4, 1953, gage height, 17.7 ft, (5.40 m), present datum, from floodmarks, from rating curve extended above 3,000 ft^3/s (85.0 m^3/s), on basis of slope-area measurement of peak flow; minimum, 2.0 ft^3/s (0.057 m^3/s) Mar. 16, 17, 1972, gage height, 1.20 ft (0.366 m), result of ice jams upstream.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in June 1908 reached a stage of about 24 ft (7.3 m), present datum (discharge not determined); flood in June 1932 reached a stage of about 19 ft (5.8 m), present datum (discharge not determined); from information by local residents.

Monthly and annual mean discharges 1935-68, 72-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	200	47.5	111	32	0.29	7.4
November	113	32.6	62.8	14	.22	4.2
December	131	19.9	46.1	17.9	.39	3.1
January	66.6	17.3	34.3	10.5	.31	2.3
February	96.9	10.0	36.9	15.3	.42	2.5
March	145	22.8	51.6	28.3	.55	3.4
April	182	18.3	41.6	26.1	.63	2.8
May	305	52.6	134	56.9	.43	9.0
June	480	86.0	237	93.2	.39	15.9
July	416	78.1	260	81.3	.31	17.4
August	488	122	296	84.6	.29	19.8
September	270	68.6	183	50.2	.27	12.2
Annual	185	61.2	125	29.0	.23	100

Magnitude and probability of annual low flow based on period of record 1935-68, 72-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	14.9	10.7	8.60	6.97	5.34	4.39
3	15.5	11.5	9.50	7.97	6.41	5.48
7	16.9	13.0	11.0	9.50	7.93	6.98
15	20.0	15.7	13.4	11.6	9.72	8.54
30	24.3	19.2	16.5	14.2	11.9	10.4
60	28.8	23.0	20.3	18.3	16.3	15.0
90	31.8	26.3	24.1	22.5	21.0	20.1
120	34.8	29.4	27.3	25.9	24.5	23.6
183	42.2	36.2	33.7	31.9	30.1	29.1

Magnitude and probability of instantaneous peak flow based on period of record 1925, 34-37, 39-68, 71-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
359	638	1190	1670	2450	3150	3980

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1935-68, 72-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	510	889	1310	2160	3120	4480
3	442	693	952	1430	1930	2590
7	388	562	727	1010	1280	1620
15	347	473	575	727	859	1010
30	320	415	472	541	589	635
60	291	369	409	451	477	500
90	269	340	377	416	440	460

Duration table of daily mean flow for period of record 1935-68, 72-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99.3%
480	355	290	250	215	155	115	75	53	42	33	26	21.5	17.0	14.5	11.8	7.8

SUN RIVER BASIN

06089000 SUN RIVER NEAR VAUGHN, MT

LOCATION.--Lat 47°31'37", long 111°29'05", in NW¼SE¼SW¼ sec.33, T.21 N., R.2 E., Cascade County, Hydrologic Unit 10030104, on right bank 3.7 mi (6.0 km) downstream from Muddy Creek, 3.6 mi (5.8 km) southeast of Vaughn, and at mile 14.6 (23.5 km).

DRAINAGE AREA.--1,854 mi² (4,802 km²).

PERIOD OF RECORD.--July to October 1897 (gage heights and discharge measurements only, published as "near Great Falls"), April 1934 to current year. Monthly discharge only for April 1934, published in WSP 1309.

REVISED RECORDS.--WSP 786: 1934. WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 3,317.12 ft (1,011.058 m) above mean sea level. July 11 to Oct. 30, 1897, nonrecording gage at site 0.8 mi (1.3 km) upstream at different datum. Apr. 19 to Aug. 3, 1934, nonrecording gage at present site and datum.

REMARKS.--Water-discharge records good except those for winter period, which are poor. Flow regulated by Gibson, Pishkun, Willow Creek, and Nilan Reservoirs. Diversions for irrigation of about 110,000 acres (455 km²) above station.

AVERAGE DISCHARGE.--43 years, 735 ft³/s (20.82 m³/s), 532,500 acre-ft/yr (657 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 53,500 ft³/s (1,520 m³/s) June 9, 1964, 42,200 ft³/s (1,200 m³/s) in main channel, plus 11,300 ft³/s (320 m³/s) in bypass channel, gage height, 23.4 ft (7.13 m), from floodmark; minimum, 20 ft³/s (0.566 m³/s) Apr. 24, 1944.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of June 1964 exceeded the stage of the June 1908 flood by about 3 ft (0.9 m) and is the highest since 1908, from information by local residents.

Monthly and annual mean discharges 1935-77

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	779	143	383	136	0.35	4.3
November	772	149	334	127	.38	3.8
December	730	114	301	128	.43	3.4
January	494	66.5	250	89.1	.36	2.8
February	501	82.4	260	100	.38	2.9
March	868	133	322	170	.53	3.7
April	2058	93.3	472	378	.80	5.4
May	4333	87.1	1639	1025	.63	18.6
June	8014	280	2987	2129	.71	33.9
July	2508	265	847	545	.64	9.6
August	1025	250	579	189	.33	6.6
September	796	164	443	135	.31	5.0
Annual	1307	210	735	305	.41	100

Magnitude and probability of annual low flow based on period of record 1935-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	126	78.2	58.7	45.5	33.4	26.9
3	136	86.7	66.3	52.1	39.0	31.7
7	145	97.1	77.4	63.4	50.1	42.6
14	156	109	90.2	76.6	63.5	55.9
30	183	128	105	88.2	71.7	62.2
60	207	149	124	106	88.2	77.8
90	226	165	139	119	100	88.9
120	242	178	150	129	108	96.2
183	278	202	170	147	123	109

Magnitude and probability of instantaneous peak flow based on period of record 1934-77

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
2850	5970	12000	16900	24100	30100	36600

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1935-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	5940	11000	14300	18400	21200	23800
3	5540	9860	12500	15500	17500	19100
7	4870	8230	10100	12000	13100	14000
15	4020	6700	8160	9630	10500	11200
30	3180	5340	6570	7860	8650	9300
60	2260	3710	4550	5450	6000	6470
90	1740	2790	3410	4100	4540	4930

Duration table of daily mean flow for period of record 1935-77

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
6200	2850	1450	930	740	540	430	370	310	270	225	175	140	110	90	77	55

Basin characteristics

Main channel slope (ft/mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,000 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)

BELT CREEK BASIN

06090500 BELT CREEK NEAR MONARCH, MT

LOCATION.--Lat 47°12'27", long 110°55'53", in NW¼SE¼NW¼ sec.26, T.17 N., R.6 E., Cascade County, Hydrologic Unit 10030105, on left bank 0.4 mi (0.6 km) south of Riceville and 8.9 mi (14.3 km) northwest of Monarch.

DRAINAGE AREA.--368 mi^2 (953 km^2).

PERIOD OF RECORD.--April 1951 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 3,960 ft (1,207 m), by barometer.

REMARKS.--Records good except those for winter period, which are poor. No regulation or diversion above station.

AVERAGE DISCHARGE.--25 years, 189 ft^3/s (5.353 m^3/s), 136,900 acre-ft/yr (169 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 11,000 ft^3/s (312 m^3/s) June 4, 1953, gage height, 10.12 ft (3.085 m), from rating curve extended above 2,500 ft^3/s (70.8 m^3/s) on basis of slope-area measurement of peak flow, no flow Feb. 21, Dec. 24, 1962, caused by ice jams upstream.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in 1908 was several feet lower than in 1953, from information by local residents.

Monthly and annual mean discharges 1952-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	264	28.7	65.9	47.4	0.72	3.0
November	120	20.9	47.8	22.9	.48	2.1
December	72.6	8.84	33.7	16.5	.49	1.5
January	52.9	4.68	27.6	12.8	.46	1.2
February	55.2	9.43	29.9	12.7	.42	1.3
March	106	6.71	35.3	20.6	.58	1.6
April	385	30.3	123	91.8	.75	6.5
May	1569	226	671	322	.48	30.0
June	2213	189	818	563	.69	36.6
July	576	49.7	221	130	.59	9.9
August	174	24.0	90.6	40.9	.45	4.1
September	221	28.1	71.3	39.6	.56	3.2
Annual	345	62.3	189	86.0	.46	100

Magnitude and probability of annual low flow based on period of record 1952-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	12.7	5.06	2.79	1.61	0.81	---
3	13.7	6.58	4.24	2.86	1.77	---
7	16.3	8.39	5.59	3.87	2.47	---
15	19.0	9.91	6.53	4.44	2.75	---
30	21.9	12.2	8.41	5.98	3.92	---
60	24.8	15.6	11.9	9.36	7.04	---
90	26.0	17.4	14.0	11.6	9.32	---
183	28.0	19.0	15.3	12.7	10.3	---
183	34.6	23.8	19.6	16.8	14.2	---

Magnitude and probability of instantaneous peak flow based on period of record 1952-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	5	10	25	50	100	
80%	50%	20%	10%	4%	2%	1%
950	1670	2880	3800	5070	6090	7170

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1952-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1420	2570	3700	5700	7710	---
3	1340	2300	3160	4570	5890	---
7	1190	1950	2580	3560	4430	---
15	1050	1660	2150	2880	3510	---
30	900	1440	1860	2460	2960	---
60	680	1070	1360	1740	2040	---
90	528	819	1020	1280	1480	---

Duration table of daily mean flow for period of record 1952-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
1900	900	500	320	210	105	71	55	44	36	30	21	15	9.8	5.8	3.6	2.9

MISSOURI RIVER MAIN STEM

06090800 MISSOURI RIVER AT FORT BENTON, MT

LOCATION.--Lat 47°49'03", long 110°39'59", in SE¼SE¼ sec.23, T.24 N., R.8 E., Chouteau County, Hydrologic Unit 10030102, on left bank at downstream side of abandoned highway bridge at Fort Benton, 3.8 mi (6.1 km) upstream from Shonkin Creek, and at mile 2,073.2 (3,335.8 km).

DRAINAGE AREA.--24,749 mi² (64,100 km²).

PERIOD OF RECORD.--October 1890 to current year. Records for June 1881 to September 1890, published in WSP 546 and 701, have been found to be unreliable and should not be used.

REVISED RECORDS.--WSP 746: 1932. WSP 1146: 1891-1907, 1908(M), 1909-18, 1937-38. WSP 1209: 1948(P). WSP 1309: 1929(M). WSP 1629: Drainage area. See also PERIOD OF RECORD.

GAGE.--Water-stage recorder. Datum of gage is 2,614.05 ft (796.762 m) above mean sea level. Prior to Oct. 11, 1920, nonrecording gages, and Oct. 11, 1920, to Apr. 25, 1924, water-stage recorder, all at present site at datum 1.00 ft (0.305 m) higher.

REMARKS.--Records good. Flow regulated by 18 smaller irrigation reservoirs and powerplants, Clark Canyon Reservoir, and Canyon Ferry Reservoir. Diversions for irrigation of about 750,400 acres 3,040 km²) above station. Extreme diurnal fluctuation caused by powerplant at Morony Dam.

AVERAGE DISCHARGE.--87 years, 7,760 ft³/s (219.8 m³/s), 5,622,000 acre-ft/yr (6.93 km³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge observed, about 140,000 ft³/s (3,960 m³/s) June 6, 1908, gage height, 18.5 ft (5.64 m), present datum, from rating curve extended above 63,000 ft³/s (1,780 m³/s); minimum, 320 ft³/s (9.06 m³/s) July 5, 1936, gage height, -0.50 ft (-0.15 m); minimum daily, 627 ft³/s (17.8 m³/s) July 5, 1936.

Monthly and annual mean discharges 1891-1977

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	12610	2441	5234	1605	0.31	5.6
November	10850	2789	5382	1491	.28	5.8
December	11640	2446	4999	1409	.28	5.3
January	8199	2377	4723	1406	.30	5.1
February	8783	2492	5041	1485	.29	5.4
March	11800	2986	6103	1700	.28	6.6
April	15540	3574	8358	2860	.34	9.0
May	28600	4144	14480	5882	.41	15.6
June	53620	4055	19920	10450	.52	21.4
July	26580	2433	9354	5347	.57	10.0
August	9225	1576	4854	1633	.34	5.2
September	8428	1890	4652	1402	.30	5.0
Annual	11850	3619	7760	2047	.26	100

Magnitude and probability of annual low flow based on period of record 1891-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	2720	1940	1550	1260	968	799
3	3030	2290	1930	1660	1380	1210
7	3280	2490	2130	1860	1590	1420
15	3440	2630	2260	1990	1710	1540
30	3600	2800	2440	2170	1900	1730
60	3880	3060	2690	2410	2130	1950
90	4270	3390	2980	2670	2340	2140
120	4580	3710	3310	3010	2700	2500
183	5060	4160	3740	3430	3100	2900

Magnitude and probability of instantaneous peak flow based on period of record 1891-77

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
18900	27300	41000	51500	66300	78800	92300

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1891-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	26400	40300	49900	62400	71900	81500
3	25800	39100	48000	59000	67000	74900
7	25100	37200	44500	53100	58900	64300
15	23400	34400	40900	48200	53100	57500
30	20900	30700	36700	43400	48000	52100
60	17500	24900	29300	34200	37400	40400
90	14700	20600	24100	28000	30700	33100

Duration table of daily mean flow for period of record 1891-77

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	99.5%	99.9%
35500	21500	15200	11800	9400	7300	6200	5500	4900	4500	4050	3500	3000	2550	2250	2000	1550

Basin characteristics

Main channel slope (ft/mi)	Stream length (mi)	Main basin elevation (ft above msl)	Basin above 5,000 ft elevation (percent)	Basin above 6,000 ft elevation (percent)	Area of lakes, ponds, swamps (percent)	Forested area (percent)	Soil index	Mean annual precipitation (in)

06092000 TWO MEDICINE RIVER NEAR BROWNING, MT

LOCATION.--Lat 48°28'25", long 112°48'06", in NW¼SW¼SE¼ sec.6, T.31 N., R.9 W., Glacier County, Hydrologic Unit 10030201, on right bank 1,000 ft (305 m) upstream from bridge on U. S. Highway 89, 11 mi (18 km) southeast of Browning, and 15 mi (24 km) upstream from Badger Creek.

DRAINAGE AREA.--317 mi^2 (821 km^2).

PERIOD OF RECORD.--April 1907 to October 1924, May 1951 to September 1977. Monthly discharge only for some periods, published in WSP 1309. Published as Two Medicine River at Family 1907-24. October 1957 to September 1964, published as Two Medicine Creek near Browning.

REVISED RECORDS.--WSP 1309: 1908, 1910, 1913, 1916, 1918. WSP 1559: 1915(M), 1917-18(M), 1921-24. WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 3,930 ft (1,198 m), from topographic map. Prior to Nov. 1, 1924, nonrecording gage at several sites within 3 mi (5 km) of present site at various datum. May 1, 1951, to Sept. 30, 1964, and Oct. 1, 1964, to Sept. 27, 1967, water-stage recorder at site 150 ft (45.7 m) downstream at datums 2.00 ft (0.610 m) higher and present datum, respectively.

REMARKS.--Records fair except those for winter period, which are poor. Flow regulated by Lower Two Medicine Lake. Diversions above station into Two Medicine Canal for irrigation of about 10,000 acres (40.5 km^2) below station.

AVERAGE DISCHARGE.--43 years, 378 ft^3/s (10.70 m^3/s), 273,900 acre-ft/yr (338 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 100,000 ft^3/s (2,830 m^3/s) June 8, 1964, gage height, 15.5 ft (4.72 m) from floodmark in gage well, 16.0 ft (4.88 m) from outside flood mark, present datum; minimum, 1.1 ft^3/s (0.031 m^3/s) Aug. 16, 1966.

Monthly and annual mean discharges 1908-24, 52-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	474	2.38	132	100	0.76	2.9
November	332	24.2	114	69.8	.61	2.5
December	378	20.7	91.4	64.0	.70	2.0
January	440	29.5	84.8	67.2	.79	1.8
February	280	33.6	89.7	51.2	.57	1.9
March	592	27.3	134	113	.84	2.9
April	940	109	481	230	.48	10.5
May	2236	286	1398	415	.30	30.4
June	4823	91.3	1496	924	.62	32.6
July	1132	19.7	382	266	.70	8.3
August	283	5.43	92	73	.79	2.0
September	596	3.38	102	106	1.04	2.2
Annual	625	70.6	377	113	.30	100

Magnitude and probability of annual low flow based on period of record 1908-24, 52-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	14.2	4.94	2.73	1.64	0.90	0.60
3	15.3	5.36	2.96	1.78	.97	.64
7	18.0	6.67	3.79	2.33	1.31	.88
14	24.8	9.87	5.59	3.36	1.77	1.13
30	35.3	15.2	8.66	5.09	2.60	1.59
60	45.7	24.6	16.4	11.3	7.08	5.03
90	65.0	41.2	30.5	23.0	16.1	12.3
120	72.4	51.2	43.1	37.6	32.3	29.3
183	99.4	66.3	52.8	43.5	34.6	29.6

Magnitude and probability of instantaneous peak flow based on period of record 1908-24, 52-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
1740	3470	7500	11600	18900	26300	35800

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1908-24, 52-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	2610	5010	7890	14000	21400	32500
3	2430	4350	6360	10100	14100	19400
7	2250	3650	4780	6480	7950	9610
15	2010	3030	3740	4670	5370	6100
30	1800	2590	3040	3540	3860	4150
60	1510	1990	2190	2360	2440	2490
90	1230	1550	1650	1720	1750	1760

Duration table of daily mean flow for period of record 1908-24, 52-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99.5%	99.9%
2950	1600	1100	780	530	250	155	110	85	67	52	35	20.5	8.7	4.4	3.1	1.8

06092500 BADGER CREEK NEAR BROWNING, MT

LOCATION.--Lat 48°21'03", long 112°50'27", in NE¼ sec.24, T.30N., R.10 W., Glacier County, Hydrologic Unit 10030201, on right bank just upstream from point of diversion to Four Horns Canal, 15 mi (24 km) upstream from mouth and 17 mi (27 km) southeast of Browning.

DRAINAGE.--133 mi^2 (344 km^2).

PERIOD OF RECORD.--May 1951 to current year.

REVISED RECORDS.--WSP 1729: 1951(M).

GAGE.--Water-stage recorder and control consisting of concrete diversion dam and two taintor gates (regularly closed). Datum of gage is 4,179.26 ft (1,273.838 m) above mean sea level (Bureau of Reclamation bench mark).

REMARKS.--Records fair except those for winter period which are poor. Water diverted into Four Horns Canal at station for irrigation of about 6,000 acres below station. Figures of discharge given herein are sum of flow over diversion dam and that diverted by Four Horns Canal.

AVERAGE DISCHARGE.--22 years, 229 ft^3/s (6.49 m^3/s), 23.38 in/yr (594 mm/yr), 165,900 acre-ft/yr (205 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 49,700 ft^3/s (7,410 m^3/s) June 8, 1964; gage height, 10.37 ft (3.16 m), from rating curve extended above 2,000 ft (56.6 m^3/s) on basis of slope-area measurement of peak flow; minimum daily, 25 ft^3/s (0.708 m^3/s) Dec. 11-15, 1963.

Monthly and annual mean discharges 1952-73

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	207	91.4	132	32.0	0.24	4.8
November	156	79.4	112	21.1	.19	4.0
December	139	57.1	94.6	22.1	.23	3.4
January	125	55.2	83.5	17.5	.21	3.0
February	184	63.0	91.8	23.3	.25	3.3
March	176	57.7	95.5	26.0	.27	3.5
April	303	78.4	179	71.1	.40	6.5
May	915	466	651	129	.20	23.5
June	1737	318	753	344	.46	27.2
July	653	139	287	112	.39	10.4
August	244	94.2	158	33.2	.21	5.7
September	194	101	128	24.3	.19	4.9
Annual	297	159	229	37.9	.17	100

Magnitude and probability of annual low flow based on period of record 1952-73

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	48.3	37.0	32.1	28.6	25.1	---
3	50.7	38.7	33.4	29.5	25.6	---
7	54.6	41.7	35.8	31.5	27.1	---
14	59.9	47.0	41.3	36.9	32.6	---
30	70.0	57.2	50.8	45.6	40.1	---
60	77.8	68.2	63.4	59.5	55.4	---
90	83.2	73.5	68.7	64.8	60.6	---
120	88.7	78.0	72.4	67.8	62.7	---
183	99.6	86.6	80.1	74.8	69.1	---

Magnitude and probability of instantaneous peak flow based on period of record 1952-73

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	5	2	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
900	1800	4010	6300	10800	16300	25300

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1952-73

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1230	2240	3600	6840	11200	---
3	1170	1920	2730	4270	5960	---
7	1060	1570	2030	2790	3520	---
15	978	1370	1680	2130	2500	---
30	864	1160	1370	1660	1890	---
60	687	883	1010	1180	1300	---
90	553	696	786	896	975	---

Duration table of daily mean flow for period of record 1952-73

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99.5%	99.9%
1350	800	560	380	275	180	142	124	112	102	91	88	65	52	45	40	32

06095000 BIRCH CREEK NEAR DUPUYER, MT

LOCATION.--Lat 48°15', long 112°39', near center of sec.28, T.29 N., R.8 W., Pondera County, Hydrologic Unit 10030201, 0.5 mi (0.8 km) upstream from 8 canal headgates and 8 mi (13 km) northwest of Dupuyer.

DRAINAGE.--105 mi^2 (272 km), approximately.

PERIOD OF RECORD.--August 1907 to September 1937.

REVISED RECORDS.--WSP 1309: 1909, 1912, 1917, 1918.

GAGE.--Staff gage. Altitude of gage is 4,180 ft (1,274 km) from topographic map. Prior to June 29, 1927, staff or chain gages at several sites within 0.5 mi (0.8 km) described site at different datums.

REMARKS.--Several small diversions for irrigation above station. Flow regulated by Swift Dam since 1913.

COOPERATION.--Records furnished by Valier-Montana Land and Water Co.

AVERAGE DISCHARGE.--30 years (1907-37), 159 ft^3/s (4.50 m^3/s), 115,200 acre-ft/yr (142 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge not determined, occurred about June 6, 1908; minimum observed, 3 ft^3/s (0.085 m^3/s) Apr. 7, 1921, and Apr. 4-6, 8, 9, 1937, but may have been less during periods of ice effect.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge, 887,000 ft^3/s (24,950 m^3/s) about 1200 hours June 8, 1964 from slope-area measurement (result of failure of Swift Dam).

Monthly and annual mean discharges 1909-37

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	366	12.7	93.9	76.2	0.81	5.1
November	492	6.0	69.0	95.2	1.38	3.7
December	118	6.9	38.7	38.7	1.00	2.1
January	140	6.0	33.5	36.4	1.09	1.8
February	212	4.0	37.7	49.6	1.32	2.0
March	310	5.68	42.2	60.1	1.43	2.3
April	340	7.83	97.2	80.4	.83	5.2
May	607	61.4	323	137	.42	17.4
June	1364	101	463	278	.60	25.0
July	707	71.9	332	147	.44	17.9
August	418	44.6	212	116	.55	11.4
September	300	26.3	113	72.2	.64	6.1
Annual	315	45.6	154	59.1	.38	100

Magnitude and probability of annual low flow based on period of record 1909-37

Period (consecutive Days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	9.40	4.23	2.98	2.31	1.79	---
3	9.82	4.65	3.39	2.70	2.16	---
7	10.2	4.95	3.66	2.95	2.40	---
14	10.6	5.22	3.88	3.14	2.57	---
30	11.4	5.55	4.10	3.30	2.67	---
60	13.2	6.39	4.67	3.73	2.98	---
90	14.1	6.92	5.10	4.09	3.30	---
120	16.2	7.77	5.62	4.42	3.47	---
183	25.2	11.2	7.50	5.46	3.87	---

Magnitude and probability of instantaneous peak flow based on period of record 1909-37, 64

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	5	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
324	1070	3670	7080	14400	23000	35200

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1909-37

Period (consecutive Days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	738	1380	2100	3550	5190	---
3	711	1220	1730	2640	3570	---
7	652	1040	1380	1920	2420	---
15	579	880	1120	1470	1770	---
30	501	727	895	1130	1320	---
60	426	594	705	846	951	---
90	378	514	595	689	754	---

Duration table of daily mean flow for period of record 1909-37

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	50%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
900	520	405	340	280	175	110	81	45	20	11.5	7.7	6.0	5.0	4.5	4.2	3.7

MARIAS RIVER BASIN

06098000 DUPUYER CREEK NEAR VALIER, MT

LOCATION.--Lat 48°14'10", long 112°23'50", in NW¼ sec.33, T.29 N., R.6 W., Pondera County, Hydrologic Unit 10030201, 6 m (10 km) downstream from Sheep Creek and 8 mi (13 km) southwest of Valier.

DRAINAGE.--137 mi^2 (355 km^2).

PERIOD OF RECORD.--July 1912 to September 1937.

REVISED RECORDS.--WSP 1309: 1920 (monthly runoff). Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 3,920 ft (1,915 m), from topographic map. Prior to Apr. 20, 1925, staff or chain gage at same site and datum.

REMARKS.--Several small diversions for irrigation above station.

COOPERATION.--Records furnished by the Valier-Montana Land and Water Co.

AVERAGE DISCHARGE.--25 years, 49.3 ft^3/s (1.40 m^3/s), 35,720 acre-ft/yr (44.0 hm^3/s).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 3,330 ft^3/s (94.3 m^3/s), June 7, 1934, gage height, 7.40 ft (2.256 m), from graph based on gage readings; no flow at times in several years.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge, 21,600 ft^3/s (612 m^3/s) June 8, 1964, result of slope-area measurement.

Monthly and annual mean discharges 1913-37

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	77.5	0	27.9	21.8	0.78	4.7
November	60.6	.43	27.3	16.4	.60	4.6
December	52.0	5.35	20.3	12.8	.63	3.4
January	62.0	5.32	22.2	16.3	.73	3.7
February	90.0	4.17	25.5	19.6	.77	4.3
March	127	14.1	36.6	25.9	.71	6.2
April	147	11.1	66.8	38.6	.58	11.3
May	437	4.03	115	99.1	.86	19.4
June	707	1.37	152	178	1.17	25.7
July	265	0	49.7	59.4	1.20	8.4
August	125	0	27.3	29.8	1.09	4.6
September	90.7	0	21.8	22.1	1.01	3.7
Annual	150	8.37	49.3	35.6	.72	100

Magnitude and probability of annual low flow based on period of record 1913-37

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	4.25	0.95	0.02	0	0	---
3	4.75	1.00	.05	0	0	---
7	5.50	1.50	.16	.02	0	---
14	6.50	2.20	.31	.04	.01	---
30	9.80	2.50	.50	.05	.02	---
60	13.0	3.35	.92	.17	.04	---
90	14.5	4.40	1.30	.20	.05	---
120	18.0	5.60	1.60	.20	.05	---
183	18.9	6.51	3.06	1.47	.65	---

Magnitude and probability of instantaneous peak flow based on period of record 1913-37

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
150	511	1660	3000	5570	8240	11700

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1913-37

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	2830	2020	1200	738	288	---
3	2170	1570	955	599	244	---
7	1490	1120	717	470	205	---
15	1150	879	576	384	172	---
30	823	640	430	293	138	---
60	553	443	310	219	109	---
90	435	356	252	181	93	---

Duration table of daily mean flow for period of record 1913-37

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99.5%	99.9%
360	155	105	80	65	45	33.5	25.5	19.0	14.0	9.7	5.0	1.8	.01	0	0

MARIAS RIVER BASIN

06099000 CUT BANK CREEK AT CUT BANK, MT

LOCATION.--Lat 48°38'00", long 112°20'40", in SW¼SE¼NE¼ sec.11, T.33 N., R.6 W., Glacier County, Hydrologic Unit 10030202, on right bank at highway bridge, 0.7 mi (1.1 km) west of Cut Bank and 17 mi (27 km) upstream from confluence with Two Medicine Creek.

DRAINAGE.--1,065 mi^2 (2,758 km^2).

PERIOD OF RECORD.--August 1905 to October 1919, May to July 1920, May 1922 to October 1924, May 1951 to September 1973. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1309: 1907-8, 1910-11, 1924-25. WSP 1509: 1911, 1916 (M). WSP 1559: 1905(M), 1908(M). WSP 1709: 1959. WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 3,550 ft (1,082 m), from topographic map. Prior to May 12, 1922 nonrecording gages at several sites 0.5 mi (0.8 km) upstream at various datums. May 22, 1922 to Nov. 1, 1924, nonrecording at present site at different datum.

REMARKS.--Records good except for those of winter period which are poor. Few minor diversions for irrigation of hay meadows above station. Natural flow of stream affected by water from Two Medicine Canal which irrigates land above station. Records of chemical analyses for the period November 1950 to September 1951 are published in reports of Geological Survey.

AVERAGE DISCHARGE.--38 years (1906-19, 1922-24, 1951-73), 196 ft^3/s (5.55 m^3/s), 142,000 acre-ft/yr (175 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--1905-20, 1922-24, 1951-73: Maximum discharge, 16,600 ft^3/s (470 m^3/s) June 9, 1964, gage height 13.93 ft (4.246 m), 14.2 ft (4.33 m) from floodmarks, from rating curve extended above 12,200 ft^3/s (340 m^3/s) on basis of slope-area measurement of peak flow; minimum observed, 4 ft^3/s (0.113 m^3/s) Dec. 1, 1905 (gage height, 2.4 ft (0.732 m) site and datum then in use).

Monthly and annual mean discharges 1906-19, 1923-24, 1952-73

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	268	15.2	89.5	50.8	0.57	3.8
November	141	28.1	73.5	29.1	.40	3.1
December	125	16.3	45.5	24.2	.53	2.0
January	90	10.0	34.3	18.8	.55	1.5
February	150	16.0	50.1	36.1	.72	2.2
March	1053	6.9	158	184	1.17	6.7
April	664	92.7	264	155	.59	11.2
May	894	279	520	162	.31	22.2
June	1631	288	680	314	.46	28.9
July	536	74.5	257	123	.48	10.9
August	233	30.6	98.2	48.7	.50	4.2
September	298	17.3	78.2	54.8	.70	3.3
Annual	317	110	196	55.8	.28	100

Magnitude and probability of annual low flow based on period of record 1906-19, 23, 24, 52-73

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	14.4	8.5	6.4	5.1	3.9	3.3
3	15.1	9.4	7.4	6.1	4.9	4.2
7	17.2	11.1	8.8	7.3	5.9	5.1
14	19.3	13.1	10.6	9.0	7.4	6.5
30	22.2	15.5	12.8	11.0	9.2	8.2
60	26.8	20.3	17.9	16.4	15.0	14.2
90	32.7	24.3	21.2	19.1	17.2	16.1
120	39.8	29.5	25.6	22.8	20.2	18.7
183	68.4	47.2	39.1	33.6	28.5	25.5

Magnitude and probability of instantaneous peak flow based on period of record 1906-12, 14-20, 22-24, 51-73, 75

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
989	1930	3790	5400	7870	10800	12500

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1906-19, 23, 24, 52-73

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1410	2620	3840	6080	8420	11500
3	1200	2050	2850	4250	5630	7370
7	1010	1600	2120	2950	3730	4650
15	854	1270	1580	2040	2420	2830
30	732	1020	1210	1450	1630	1820
60	600	800	926	1080	1190	1300
90	500	666	770	895	984	1070

Duration table of daily mean flow for period of record 1906-19, 23, 24, 52-73

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	2%	5%	10%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	97.5%	98.8%	99.6%
1300	730	520	400	310	180	118	87	65	50	37	26	20	15.5	12.8	10.4	6.2

06099500 MARIAS RIVER NEAR SHELBY, MT

LOCATION.--Lat 48°25'38", Long 111°53'20", in E½NW¼SE¼ sec.20, T.31 N., R.2 W., Toole County, Hydrologic Unit 10030203, on left bank 200 ft (61 m) downstream from bridge on U. S. Highway 91, 5.1 mi (8.2 km) south of Shelby, 24 mi (39 km) downstream from Cut Bank Creek, and at mile 168 (270 km).

DRAINAGE AREA.--3,242 mi^2 (8,397 km^2), of which 518 mi^2 (1,342 km^2) is probably noncontributing.

PERIOD OF RECORD.--April 1902 to December 1904, May 1905 to December 1906, May 1907 to January 1908, April 1911 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1309: 1903-4, 1918, 1921, 1933, 1935, 1947. WSP 1509: 1902, 1912(M), 1916, 1943(M). WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 3,087.72 ft (941.137 m) above mean sea level. Prior to Dec. 23, 1947, nonrecording gage or water-stage recorder at several sites within 1,000 ft (305 m) of present site at approximately the same datum.

REMARKS.--Records good except those for winter period, which are poor. Some regulation by Lower Two Medicine Lake, Four Horns Reservoir, Swift Reservoir and Lake Frances, having a combined capacity of 172,630 acre-ft (213 hm^3). Diversions for irrigation of about 50,000 acres (202 km^2) above station and about 15,000 acres (60.7 km^2) below.

AVERAGE DISCHARGE.--69 years, (1902-4, 1905-6, 1911-77), 953 ft^3/s (26.99 m^3/s), 690,500 acre-ft/yr (851 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 241,000 ft^3/s,(6,830 m^3/s) June 9, 1964, largely due to failure of Swift Dam, gage height, 23.64 ft (7.205 m), from floodmark, from rating curve extended above 34,000 ft^3/s (963 m^3/s) on basis of slope-area measurement of peak flow; minimum observed, 10 ft^3/s (0.283 m^3/s) Aug. 20, 1919.

Monthly and annual mean discharges

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	1448	101	430	249	0.58	3.7
November	1400	132	389	213	.55	3.4
December	863	103	301	150	.50	2.6
January	700	41.9	256	133	.52	2.2
February	900	58.7	312	193	.62	2.7
March	2300	146	579	425	.73	5.0
April	3149	280	1196	611	.51	10.3
May	5300	711	2877	1094	.38	24.8
June	10190	409	3331	2212	.66	28.7
July	3980	147	1140	828	.73	9.8
August	1100	79	413	249	.60	3.5
September	1853	86	381	291	.76	3.3
Annual	1929	302	953	372	.39	100

Magnitude and probability of annual low flow based on period of record

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	133	77.1	53.5	37.8	24.3	17.6
3	133	81.6	60.3	45.8	32.6	25.6
7	143	89.8	67.1	51.4	37.0	29.2
14	155	99.4	74.8	57.6	41.6	32.9
30	174	114	87.7	68.9	51.1	41.2
60	199	140	115	96.2	77.9	67.3
90	229	164	137	117	97.9	86.6
120	259	184	155	134	115	104
183	350	241	197	166	137	120

Magnitude and probability of instantaneous peak flow based on period of record 1902-07, 11-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
3270	5900	12700	20500	36200	54100	79400

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1903-04, 06, 1912-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	4920	9620	15200	27000	41000	62000
3	4830	8870	13000	20500	28400	38700
7	4540	7670	10300	14400	18100	22200
15	4120	6520	8220	10500	12200	13900
30	3610	5520	6770	8300	9390	10500
60	2990	4400	5250	6230	6880	7480
90	2450	3560	4210	4930	5410	5840

Duration table of daily mean flow for period of record 1903-04, 12-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	50%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
6400	3650	2500	1850	1400	780	540	420	340	275	220	165	130	100	80	61	29

MARIAS RIVER BASIN

06101500 MARIAS RIVER NEAR CHESTER, MT

LOCATION.--Lat 48°18'21", long 111°04'44", in SW¼SW¼ sec.34, T.30 N., R.5 E., Liberty County, Hydrologic Unit 10030203, on left bank 2.0 mi (3.2 km) downstream from Tiber Dam, 4.3 mi (6.9 km) upstream from Pondera Coulee, and 15 mi (24 km) southwest of Chester.

DRAINAGE AREA.--4,927 mi^2 (12,761 km^2), of which 518 mi^2 (1,342 km^2) is probably noncontributing.

PERIOD OF RECORD.--April to September 1921, October 1945 to September 1947, October 1955 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1629: Drainage area.

GAGE.--Water-stage Recorder. Datum of gage is 2,814.03 ft (857.716 m) above mean sea level (Bureau of Reclamation bench mark). Prior to Oct. 1, 1921, nonrecording gage at bridge 2.5 mi (4.0 km) downstream at different datum. Oct. 4, 1945, to Sept. 30, 1946, nonrecording gage at site 3 mi (5 km) downstream at different datum.

REMARKS.--Records excellent. Flow completely regulated by Lake Elwell (Tiber Reservoir) since Oct. 28, 1955.

AVERAGE DISCHARGE.--24 years (1945-47, 1955-77), 907 ft^3/s (25.69 m^3/s), 657,100 acre-ft/yr (810 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge not determined, occurred about Mar. 20, 1947; minimum probably less than 0.2 ft^3/s (0.0006 m^3/s) during period of no gage-height record Oct. 29 to Nov. 10, 1955, when gates at dam were closed.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in June 1948 reached a stage of 16 ft (5 m), present datum.

Monthly and annual mean discharges 1946-47, 56-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	2758	260	822	541	0.66	7.6
November	1488	0.4	640	415	.65	5.9
December	989	15.7	381	216	.57	3.5
January	803	35.0	297	157	.53	2.7
February	894	35.0	379	241	.64	3.5
March	2400	47.7	598	516	.86	5.5
April	2109	46.1	899	527	.59	8.3
May	3541	51.0	1570	813	.52	14.4
June	6254	58.9	2035	1315	.65	18.7
July	5325	57.5	1315	1101	.84	12.1
August	2909	82.5	981	837	.85	9.0
September	3063	173	950	644	.68	8.8
Annual	1488	97.5	907	356	.39	100

Magnitude and probability of annual low flow based on period of record 1946-47, 56-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	---	---	---	---	---	---
3	---	---	---	---	---	---
7	---	---	---	---	---	---
15	---	---	---	---	---	---
30	---	---	---	---	---	---
60	314	139	68.5	32.6	11.7	---
90	328	160	92.8	53.5	25.8	---
120	347	173	104	62.4	32.1	---
183	479	243	146	88.2	45.5	---

Magnitude and probability of instantaneous peak flow based on period of record 1921, 46, 56-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
1900	2930	4460	5510	6860	7890	8930

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1946-47, 56-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	2710	4360	5590	7310	8700	---
3	2660	4290	5520	7250	8640	---
7	2570	4180	5390	7070	8430	---
15	2470	4020	5130	6600	7740	---
30	2310	3630	4440	5370	5990	---
60	2100	3000	3380	3690	3830	---
90	1870	2660	2960	3170	3260	---

Duration table of daily mean flow for period of record 1946-47, 56-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99.5%	99.9%
4300	2500	1950	1650	1450	1150	870	560	430	340	245	155	100	48	27	0.9	0.3

06102000 MARIAS RIVER NEAR BRINKMAN, MT

LOCATION.--Lat 48°16', long 110°42', in SE¼SE¼ sec.17, T.29 N., R.8 E., Hill County, Hydrologic Unit 10030203, on left bank 4 mi (6 km) southwest of Brinkman Post Office, 14 mi (23 km) downstream from Cottonwood Creek, and 30 mi (48 km) north of Fort Benton.

DRAINAGE.--6,425 mi^2 (16,641 km^2), of which 518 mi^2 (1,342 km^2) is probably noncontributing.

PERIOD OF RECORD.--October 1921 to September 1956.

REVISED RECORDS.--WSP 1309: 1922, 23, 24, 25, 26, 27, 28, 1930, 31.

GAGE.--Water-stage recorder. Datum of gage is 2,677.25 ft (816.025 m) above mean sea level, adjustment of 1912. Prior to October 6, 1931, cantilever gage at site 2,800 ft (853 m) downstream at datum 0.64 ft (0.195 m) higher. Oct. 6, 1931, to July 1, 1939, water-stage recorder at site 1,600 ft (488 m) downstream at present datum.

REMARKS.--Diversions for irrigation of about 65,000 acres (263 km^2) above station. Flow regulated by Tiber Reservoir since Oct. 28, 1955, and four other reservoirs having a combined capacity of 177,870 acre-ft (219 hm^3).

AVERAGE DISCHARGE.--34 years (1921-55), 952 ft^3/s (27.0 m^3/s), 689,200 acre-ft^3/yr (850 hm^3/yr), prior to operation of Tiber Reservoir.

EXTREMES FOR PERIOD OF RECORD.--1921-56: Maximum discharge, 50,700 ft^3/s (1436 m^3/s) June 19, 1948 (gage height, 21.0 ft (6.401 m) from floodmark); minimum daily, 1 ft^3/s (.028 m^3/s), Dec. 17, 1955.

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge known about 70,000 ft^3/s (1982 m^3/s) occurred during flood of 1908, gage height about 24.0 ft (7.315 m) present datum.

Monthly and annual mean discharges 1922-56

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	1473	84.7	412	287	0.70	3.7
November	1600	9.63	394	303	.77	3.6
December	803	14.7	296	172	.58	2.7
January	700	31.9	226	133	.59	2.0
February	1000	39.2	299	241	.80	2.7
March	2400	134	613	498	.81	5.5
April	3213	86.1	1229	758	.62	11.0
May	5365	48.2	2607	1184	.45	23.4
June	11350	64.4	3166	2519	.80	28.5
July	3455	51.7	1141	852	.75	10.3
August	1107	84.4	390	277	.71	3.5
September	1368	87.0	348	264	.76	3.1
Annual	1987	109	928	463	.50	100

Magnitude and probability of annual low flow based on period of record 1922-56

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	132	56.4	26.8	12.1	4.1	---
3	134	59.5	29.2	13.8	4.9	---
7	139	63.5	32.9	16.6	6.5	---
14	149	70.8	39.0	21.2	9.3	---
30	169	83.1	46.6	25.7	11.5	---
60	195	108	69.0	44.1	24.5	---
90	229	129	86.2	58.5	35.5	---
120	254	140	95.6	67.2	43.2	---
183	331	195	144	111	81.6	---

Magnitude and probability of instantaneous peak flow based on period of record 1908, 22-56

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
2880	6050	12700	18600	28100	36600	46400

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1922-56

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	4890	9840	14700	23400	32000	---
3	4670	9010	13000	19500	25500	---
7	4320	7890	10800	15100	18700	---
15	3840	6590	8530	11000	12900	---
30	3370	5560	6930	8520	9590	---
60	2940	4550	5330	6040	6410	---
90	2470	3750	4310	4790	5020	---

Duration table of daily mean flow for period of record 1922-56

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
5600	3500	2450	1800	1400	780	510	380	300	240	185	125	84	52	35	22	4.2

MARIAS RIVER BASIN

06106000 DEEP CREEK NEAR CHOTEAU, MT

LOCATION.--Lat 47°45', long 112°14', in SW¼NW¼ sec.15, T.23 N., R.5 W., Teton County, Hydrologic Unit 10030205, 2 mi (3 km) downstream from Willow Creek and 5 mi (8 km) southwest of Choteau.

DRAINAGE.--240 mi^2 (622 km^2), approximately.

PERIOD OF RECORD.--April 1911 to December 1924.

GAGE.--Nonrecording gage. Altitude of gage is 3,860 ft (1,177 m) by barometer.

REMARKS.--Several small diversions for irrigation above station.

AVERAGE DISCHARGE.--13 years. 70.4 ft^3/s (1.99 m^3/s), 51,000 acre-ft/yr (62.9 hm^3/s).

EXTREMES FOR PERIOD OF RECORD.--1911-24: Maximum discharge observed 3,700 ft^3/s (105 m^3/s) revised June 21, 1916, gage height 10.5 ft (3.200 m), from rating curve extended above 1,300 ft^3/s (36.8 m^3/s) by logarithimic plotting; minimum observed, 3.0 ft^3/s (0.085 m^3/s) July 23-27, 1919, gage height, 4.90 ft (1.494 m).

EXTREMES OUTSIDE PERIOD OF RECORD.--Maximum discharge, 41,800 ft^3/s (1184 m^3/s) June 8, 1964 from slope-area measurement at site downstream.

Monthly and annual mean discharges 1912-24

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	88.9	11.0	36.2	20.9	0.58	4.3
November	67.4	13.5	34.5	13.2	.38	4.1
December	87.2	15.0	30.6	18.8	.61	3.6
January	75.0	13.0	23.4	16.6	.71	2.8
February	51.0	12.0	22.1	10.8	.49	2.6
March	85.9	13.0	39.2	19.9	.51	4.6
April	149	29.8	70.9	34.6	.49	8.4
May	584	50.3	190	130	.68	22.4
June	753	24.5	225	205	.91	26.5
July	529	10.8	100	129	1.28	11.8
August	112	8.37	42.5	28.5	.67	5.0
September	77.2	8.57	33.0	21.3	.64	3.9
Annual	165	28.2	71.8	40.8	.57	100

Magnitude and probability of annual low flow based on period of record 1912-24

Period (consecutive Days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	13.5	7.90	5.56	4.01	---	---
3	14.0	8.15	5.69	4.06	---	---
7	14.0	8.75	6.53	4.99	---	---
15	14.1	9.52	7.54	6.13	---	---
30	15.0	10.2	8.09	6.59	---	---
60	16.9	11.7	9.68	8.23	---	---
90	18.3	12.6	10.6	9.19	---	---
120	20.4	14.1	11.7	10.0	---	---
183	25.9	19.3	16.7	15.0	---	---

Magnitude and probability of instantaneous peak flow based on period of record 1911-24, 64

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
221	781	2620	4830	9130	13700	19500

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1912-24

Period (consecutive Days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	504	1160	1820	2990	---	---
3	415	916	1400	2240	---	---
7	337	734	1130	1820	---	---
15	275	581	886	1430	---	---
30	225	451	665	1020	---	---
60	178	332	465	671	---	---
90	147	259	355	503	---	---

Duration table of daily mean flow for period of record 1912-24

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
610	235	145	105	84	57	44	35	28	23	18.5	14.0	11.0	8.8	7.4	6.3	4.1

Basin characterization

MARIAS RIVER BASIN

06108000 TETON RIVER NEAR DUTTON, MT

LOCATION.--Lat 47°55'45", long 111°33'12", near center of south line of SW¼ sec.12, T.25 N., R.1 E., Teton County, Hydrologic Unit 10030205, on right bank 1,500 ft (457 m) upstream from Kerr Bridge, 0.9 mi (1.4 km) downstream from Hunt Coulee, and 9.5 mi (15.3 km) northeast of Dutton.

DRAINAGE AREA.--1,307 mi^2 (3,385 km^2). Area at site used prior to July 17, 1965, 1,308 mi^2 (3,388 km^2).

PERIOD OF RECORD.--August 1954 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 3,235 ft (986 m), from topographic map. Prior to July 17, 1965, water-stage recorder at site 1,800 ft (549 m) downstream at datum 1.97 ft (0.600 m) lower.

REMARKS.--Records good except those for winter period, which are poor. Water is diverted on left bank in sec.34, T.25 N., R.7 W., for storage in Bynum Reservoir (usable capacity, 75,000 acre-ft or 92.5 hm^3). Diversions for irrigation of about 44,000 acres (178 km^2) above station.

AVERAGE DISCHARGE.--23 years, 165 ft^3/s (4.67 m^3/s), 119,500 acre-ft/yr (147 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 71,300 ft^3/s (2,020 m^3/s), June 9, 1964, gage height, 20.48 ft (6.242 m), present site and datum, from floodmark, from slope-area measurement of peak flow; minimum discharge, 5.0 ft^3/s (0.142 m^3/s) Oct. 12, 1973.

Monthly and annual mean discharges 1955-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	223	17.9	82.6	52.4	0.63	4.2
November	176	26.2	81.8	39.5	.48	4.1
December	209	29.6	74.7	46.4	.62	3.8
January	167	26.7	59.1	27.3	.46	3.0
February	267	34.4	90.8	66.6	.73	4.6
March	819	47.1	194	179	.92	9.7
April	495	61.6	179	110	.62	9.0
May	957	44.0	320	253	.79	16.1
June	2727	48.1	537	623	1.16	27.0
July	551	21.3	200	153	.76	10.1
August	263	9.55	92.5	65.2	.70	4.6
September	183	14.2	75.2	45.0	.60	3.8
Annual	350	55.6	165	82.9	.50	100

Magnitude and probability of annual low flow based on period of record 1955-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	24.2	14.1	10.2	7.57	5.28	---
3	26.7	15.6	11.2	8.20	5.61	---
7	30.0	17.7	12.7	9.39	6.43	---
15	33.3	20.4	15.1	11.4	8.18	---
30	36.7	23.3	17.8	14.1	10.6	---
60	41.9	27.1	21.3	17.3	13.6	---
120	48.7	32.4	25.8	21.2	16.9	---
183	53.2	37.4	31.6	27.6	23.9	---
183	79.9	53.2	43.4	36.9	30.8	---

Magnitude and probability of instantaneous peak flow based on period of record 1955-77.

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent

1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
481	1480	4340	7480	13200	18900	25900

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1955-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1020	2740	5080	10600	18000	---
3	855	2240	3940	7680	12300	---
7	731	1700	2790	4930	7280	---
15	592	1290	2000	3260	4520	---
30	486	991	1450	2170	2830	---
60	364	702	989	1420	1800	---
90	304	566	781	1100	1370	---

Duration table of daily mean flow for period of record 1955-77

Discharge, in ft^3/s, which has equaled or exceeded for indicated percent of time

1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99%
1200	510	335	250	200	138	105	83	67	55	45	35	28	20	15.5	11.0	6.3

Basin characteristics

06109500 MISSOURI RIVER AT VIRGELLE, MT

LOCATION.--Lat 48°00'14", long 110°15'19", in SW¼SW¼SE¼ sec.13, T.26 N., R.11 E., Chouteau County, Hydrologic Unit 10040101, on left bank 0.2 mi (0.3 km) upstream from Virgelle ferry, 0.6 mi (1.0 km) southwest of Virgelle, 3.4 mi (5.5 km) downstream from Spring Coulee, and at mile 2,032.6 (3,270.5 km).

DRAINAGE AREA.--34,379 mi^2 (89,042 km^2).

PERIOD OF RECORD.--February 1935 to current year. Prior to October 1953, published as "at Loma."

REVISED RECORDS.--WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 2,507.50 ft (764.286 m) above mean sea level. Prior to Sept. 30, 1953, water-stage recorder at Loma, 18 mi (29 km) upstream, at datum 2,543.40 ft (775.228 m) above mean sea level.

REMARKS.--Water-discharge records excellent except those for winter period, which are fair. Flow regulated by 23 smaller irrigation reservoirs and powerplants, Clark Canyon Reservoir, Canyon Ferry Reservoir and Tiber Reservoir. Diversions for irrigation of about 850,400 acres (3,440 km^2) above station.

AVERAGE DISCHARGE.--42 years, 8,567 ft^3/s (242.6 m^3/s), 6,207,000 acre-ft/yr (7.65 km^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 122,000 ft^3/s (3,460 m^3/s) June 5, 1953, gage height, 23.4 ft (7.13 m), from floodmark, from rating curve for former site at Loma extended above 66,000 ft^3/s (1,870 m^3/s), adjusted to present site; minimum daily, 638 ft^3/s (18.1 m^3/s) July 5, 1936.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood in June 1908 reached a stage about 2 ft (0.61 m) higher than that of June 5, 1953, from information by local residents.

Monthly and annual mean discharges 1936-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	15340	3533	6180	2063	0.33	6.0
November	12470	3207	6319	1844	.29	6.2
December	12220	3221	6125	1765	.29	6.0
January	8997	2716	5875	1671	.28	5.8
February	10240	2600	6267	1877	.30	6.1
March	12360	3784	7127	2132	.30	7.0
April	17720	4062	8967	3465	.39	8.8
May	28260	4855	14410	6077	.42	14.1
June	51960	4646	19640	10630	.54	19.2
July	29670	3704	9821	5084	.52	9.6
August	11880	2821	5875	2118	.36	5.7
September	11590	2838	5594	1841	.33	5.5
Annual	13660	4152	8566	2412	.28	100

Magnitude and probability of annual low flow based on period of record 1936-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	3600	2530	1950	1510	1080	841
3	3840	2990	2590	2290	1990	1800
7	4350	3380	2920	2570	2200	1970
14	4520	3540	3070	2720	2360	2140
30	4660	3670	3220	2880	2530	2310
60	4930	3910	3440	3080	2720	2500
90	5380	4280	3750	3330	2900	2630
120	5690	4520	3950	3500	3030	2740
183	6140	4870	4260	3780	3280	2970

Magnitude and probability of instantaneous peak flow based on period of record 1935-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
18100	28000	43700	55500	72000	85200	99400

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1936-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	25300	41700	55900	78400	99100	123000
3	24800	40000	52500	71600	88300	107000
7	24100	37300	47300	61300	72600	84800
15	22300	33900	42100	53000	61400	70100
30	20100	29900	36500	45000	51400	57800
60	17100	24300	29000	34500	38400	42200
90	14600	20500	24400	29100	32500	35800

Duration table of daily mean flow for period of record 1936-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
34500	21000	16000	12500	10500	8400	7300	6600	6000	5500	4850	4050	3550	3050	2750	2500	2050

Basin characteristics

JUDITH RIVER BASIN

06110000 JUDITH RIVER NEAR UTICA, MT

LOCATION.--Lat 46°53'30", long 110°13'54", in NW¼ sec.17, T.13 N., R.12 E., Judith Basin County, on left bank at Noel Ranch, 4 mi (6 km) downstream from confluence of South and Middle Forks, 9 mi (14 km) southwest of Utica, and at mile 99.3 (159.8 km).

DRAINAGE AREA. 328 mi^2 (850 km^2).

PERIOD OF RECORD.--October 1919 to September 1975. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 896: 1939. WSP 1309: 1920, 1922(M), 1925, 1927(M), 1929-30, 1931(M), 1936(M), 1938(M).

GAGE.--Water-stage recorder. Concrete control since October 1938. Altitude of gage is 4,790 ft (1,460 m), by barometer. Prior to June 6, 1937, nonrecording gage at present site and datum.

REMARKS.--Records good except those for winter period, which are fair. Few minor diversions for irrigation of hay meadows above station.

AVERAGE DISCHARGE.--56 years, 54.8 ft^3/s (1.552 m^3/s), 39,700 acre-ft/yr (49.0 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,750 ft^3/s (49.6 m^3/s) June 20, 1975, gage height, 6.52 ft (1.987 m); no flow Mar. 19-21, 1933.

Monthly and annual mean discharges 1920-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	50.4	1.13	12.5	9.36	0.75	1.9
November	33.0	.75	9.3	6.57	.71	1.4
December	25.2	.50	6.01	4.06	.68	.9
January	18.0	.40	3.68	2.78	.76	.6
February	30.0	.30	3.26	4.19	1.29	.5
March	51.0	.21	3.86	7.13	1.85	.6
April	129	.25	22.5	31.9	1.42	3.4
May	475	8.87	194	108	.56	29.6
June	835	33.1	271	184	.68	41.3
July	286	9.6	85	60.6	.71	13.0
August	97	4.4	28.5	20.5	.72	4.3
September	50.8	1.51	16.2	10.9	.67	2.5
Annual	141	8.76	54.8	28.8	.53	100

Magnitude and probability of annual low flow based on period of record 1920-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1.25	0.54	0.30	0.17	0.08	0
3	1.30	.55	.32	.18	.09	0
7	1.33	.56	.34	.22	.13	0.09
14	1.41	.61	.38	.25	.16	.11
30	1.56	.71	.46	.31	.20	.14
60	1.82	.91	.61	.44	.30	.23
90	2.16	1.08	.73	.52	.35	.27
120	2.59	1.28	.86	.60	.40	.30
183	4.19	2.04	1.35	.95	.63	.47

Magnitude and probability of instantaneous peak flow based on period of record 1920-75

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
256	474	815	1050	1350	1580	1790

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1920-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	438	719	890	1080	1200	1310
3	422	685	842	1010	1120	1220
7	388	624	761	909	1000	1080
15	344	552	675	810	897	972
30	300	482	589	706	781	847
60	231	367	442	520	567	606
90	177	281	339	398	433	462

Duration table of daily mean flow for period of record 1920-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	2%	10%	15%	25%	50%	75%	90%	95%	98%	99%	99.5%	99.8%	99.9%	99.95%	99.98%
570	300	170	105	62	28	14.5	9.5	6.0	3.8	2.4	1.4	1.0	0.55	0.34	0.24	0.10

Basin characteristics

JUDITH RIVER BASIN

06111500 BIG SPRING CREEK NEAR LEWISTOWN, MT

LOCATION.--Lat 47°00'20", long 109°21'00", in SW¼NW¼ sec.5, T.14 N., R.19 E., Fergus County, Hydrologic Unit, 10040103, on upstream side of wingwall of old highway bridge, 0.5 mi (0.8 km) downstream from Big Springs and 5 mi (8 km) southeast of Lewistown.

DRAINAGE.--20.9 mi^2 (54.1 km^2).

PERIOD OF RECORD.--June 1932 to September 1957.

GAGE.--Water-stage recorder. Altitude of gage is 4,130 ft (1,259 m) by barometer. Prior to Aug. 27, 1955, staff gage on downstream left wingwall.

REMARKS.--The City of Lewistown diverts water above station for municipal supply.

AVERAGE DISCHARGE.--25 years, 107 ft^3/s (3.03 m^3/s) 77,460 acre-ft/yr (95.5 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--1932-57: Maximum discharge, 250 ft^3/s (7.08 m^3/s) May 30, 1953, gage height, 1.95 ft (0.594 m) from floodmark, from rating curve extended above 120 ft^3/s (3.40 m^3/s); minimum observed, 76 ft^3/s (2.15 m^3/s) Feb. 1-8.

Monthly and annual mean discharges 1933-57

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	154	90.5	109	13.1	0.12	8.4
November	157	88.2	108	13.4	.12	8.4
December	157	88.3	108	13.8	.13	8.4
January	155	84.3	106	14.5	.14	8.3
February	145	77.0	106	13.3	.13	8.2
March	136	80.1	108	13.1	.12	8.3
April	128	81.0	107	11.0	.10	8.3
May	156	82.1	106	14.2	.13	8.2
June	144	82.7	109	13.6	.12	8.5
July	143	84.0	106	11.2	.11	8.3
August	140	86.0	106	10.6	.10	8.3
September	145	90.0	109	11.2	.10	8.4
Annual	134	87.2	107	10.4	.10	100

Magnitude and probability of annual low flow based on period of record 1933-57

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	5%	2%	1%
1	94.7	87.3	83.7	80.9	77.9	---
3	95.3	87.6	83.9	80.9	77.7	---
7	95.9	88.0	84.1	81.0	77.6	---
14	96.8	88.7	84.5	81.1	77.4	---
30	97.9	89.8	85.5	82.0	78.0	---
60	99.8	91.7	87.3	83.7	79.6	---
90	101	93.2	88.9	85.2	81.0	---
120	102	93.8	89.4	85.6	81.3	---
183	104	95.4	90.7	86.7	82.1	---

Magnitude and probability of instantaneous peak flow based on period of record 1932-40

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
104	126	151	165	182	193	203

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1933-57

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	127	158	181	214	242	---
3	123	148	167	195	218	---
7	121	141	156	177	193	---
15	118	134	145	161	173	---
30	115	128	138	150	160	---
60	112	124	133	145	154	---
90	111	123	132	144	153	---

Duration table of daily mean flow for period of record 1933-57

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99.3%	99.9%
155	135	128	121	118	112	108	104	101	98	95	91	88	85	83	81	79

Basin characteristics

MISSOURI RIVER MAIN STEM

06115200 MISSOURI RIVER NEAR LANDUSKY, MT

LOCATION.--Lat 47°37'51", long 108°41'13", in NW¼NE¼ sec.31, T.22 N., R.24 E., Fergus County, Hydrologic Unit 10040104, Fort Peck Game Range, on right bank 380 ft (116 m) upstream from bridge on U. S. Highway 191, 0.9 mi (1.4 km) upstream from Armells Creek, 20 mi (32 km) south of Landusky, and at mile 1,921.61 (3,091.87 km).

DRAINAGE AREA.--40,987 mi^2 (106,156 km^2). Area at site used prior to Dec. 13, 1968, 40,763 mi^2 (105,576 km^2).

PERIOD OF RECORD.--February 1934 to current year. Prior to October 1968, published as "at powerplant ferry, near Zortman."

REVISED RECORDS.--WSP 1729: Drainage Area.

GAGE.--Water-stage recorder. Datum of gage is 2,239.96 ft (682.740 m) above mean sea level (state highway bench mark). Prior to Feb. 7, 1935, nonrecording gage, and Feb. 7, 1935, to Dec. 12, 1968, water-stage recorder, at site 16.5 mi (26.5 km) upstream at datum 33.06 ft (10.077 m) higher.

REMARKS.--Water-discharge records good except those for winter period, which are poor. Flow regulated by 24 smaller irrigation reservoirs and powerplants, Clark Canyon Reservoir, Canyon Ferry Reservoir, and Tiber Reservoir. Diversions for irrigation of about 870,400 acres (3,520 km^2) above station.

AVERAGE DISCHARGE.--43 years, 9,288 ft^3/s (263.0 m^3/s), 6,729,000 acre-ft/yr (8.30 km^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 137,000 ft^3/s (3,880 m^3/s); June 6, 1953; gage height, 22.20 ft (6.767 m), from graph based on gage readings, site and datum then in use; maximum gage height, 30.16 ft (9.193 m) Mar. 19, 1947 (ice jam), from floodmark, site and datum then in use; minimum discharge, 1,120 ft^3/s (31.7 m^3/s) July 8, 1936.

Monthly and annual mean discharges 1935-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	16480	3270	6611	2211	0.33	6.0
November	13920	3581	6793	1934	.28	6.1
December	13180	3121	6475	1856	.29	5.8
January	9742	2805	6149	1725	.28	5.6
February	11380	674	6640	2342	.35	6.0
March	16200	4884	8287	2523	.30	7.5
April	19240	4338	9953	3768	.38	9.0
May	30510	5257	15330	6508	.42	13.8
June	55270	4939	21370	11880	.56	19.3
July	33590	3956	10850	5777	.53	9.8
August	12620	2075	6340	2357	.37	5.7
September	12310	2501	5983	1980	.33	5.4
Annual	15280	4438	9288	2674	.29	100

Magnitude and probability of annual low flow based on period of record 1935-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	3520	2500	2050	1720	1390	1200
3	3920	2800	2280	1900	1520	1300
7	4430	3290	2750	2340	1920	1670
15	4750	3640	3120	2720	2310	2060
30	5040	3890	3340	2920	2491	2230
60	5310	4160	3610	3190	2760	2490
90	5800	4550	3920	3430	2910	2590
120	6100	4800	4140	3620	3080	2740
183	6660	5260	4590	4060	3510	3170

Magnitude and probability of instantaneous peak flow based on period of record 1934-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
19600	31200	50000	64100	83600	99400	116000

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1935-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	27900	46300	62400	87900	111000	139000
3	27000	44300	58900	81400	102000	125000
7	25900	40800	52400	69100	83100	98500
15	23900	36800	46300	59500	70000	81200
30	21600	32500	40100	50100	57700	65600
60	18300	26300	31500	37800	42400	46800
90	15700	22300	26600	32000	35900	39800

Duration table of daily mean flow for period of record 1935-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99.3%	99.7%
39000	23000	17000	13200	11200	9100	7900	7200	6600	5900	5300	4400	3800	3200	2800	2500	1900

Basin characteristics

MUSSELSHELL RIVER BASIN

06115500 NORTH FORK MUSSELSHELL RIVER NEAR DELPINE, MT

LOCATION.--Lat 46°36'36", long 110°34'30", in SW¼SE¼ sec.22, T.10 N., R.9 E., Meagher County, Hydrologic Unit 10040201, on right hand 0.5 mi (0.8 km) upstream from high-water line of Bair Reservoir at elevation 5,330 ft (1,630 m), 3 mi (5 km) downstream from Lion Creek, and 4 mi (6 km) northwest of Delpine.

DRAINAGE AREA.--31.4 mi^2 (81.3 km^2).

PERIOD OF RECORD.--May 1940 to current year.

REVISED RECORDS.--WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 5,380 ft (1,640 m) by barometer.

REMARKS.--Records fair except those for winter period, which are poor. Small diversions for irrigation of hay meadows above station.

AVERAGE DISCHARGE.--36 years, 12.2 ft^3/s (0.346 m^3/s), 8,840 acre-ft/yr (10.9 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 423 ft^3/s (12.0 m^3/s) Apr. 1, 1950, gage height, 4.63 ft (1.411 m), from rating curve extended above 150 ft $/s^3$(4.25 m^3/s); minimum, 1.6 ft^3/s (0.045 m^3/s) Aug. 16, 1941, gage height, 0.32 ft (0.098 m).

Monthly and annual mean discharges 1941-76

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	15.7	2.92	6.90	2.90	0.42	4.8
November	12.9	3.92	7.44	1.89	.25	5.2
December	12.2	4.18	6.37	1.68	.26	4.4
January	8.86	3.57	5.73	1.32	.23	4.0
February	15.0	2.96	6.31	2.20	.35	4.4
March	28.7	2.41	9.21	5.31	.58	6.4
April	41.0	5.62	18.1	8.87	.49	12.6
May	50.5	5.19	25.8	12.6	.49	17.9
June	65.2	5.31	28.7	14.5	.50	19.9
July	28.6	3.25	13.5	6.24	.46	9.3
August	16.7	2.64	8.76	3.8	.43	6.1
September	15.9	2.98	7.19	3.18	.44	5.0
Annual	20.0	5.79	12.2	3.57	.29	100

Magnitude and probability of annual low flow based on period of record 1941-76

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	3.18	2.53	2.25	2.04	1.84	---
3	3.36	2.69	2.40	2.18	1.97	---
7	3.66	2.90	2.56	2.30	2.05	---
15	3.81	3.06	2.75	2.52	2.29	---
30	4.21	3.41	3.06	2.79	2.52	---
60	4.78	3.91	3.50	3.18	2.85	---
90	5.25	4.35	3.92	3.58	3.22	---
120	5.60	4.64	4.22	3.91	3.60	---
183	6.52	5.41	4.99	4.70	4.43	---

Magnitude and probability of instantaneous peak flow based on period of record 1941-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
46.5	87.0	158	213	290	353	419

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1941-76

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	53.7	86.2	109	137	159	---
3	47.3	72.3	88.2	107	120	---
7	43.0	63.6	75.4	88.4	96.8	---
15	38.6	54.9	63.6	72.5	77.9	---
30	34.5	48.4	55.5	62.7	66.9	---
60	29.2	40.4	46.0	51.6	54.9	---
90	25.7	35.4	40.3	45.3	48.2	---

Duration table of daily mean flow for period of record 1941-76

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99%
57	37	27	21	17	12	9.4	7.7	6.7	5.8	5.2	4.4	3.8	3.2	2.8	2.6	2.1

Basin characteristics

MUSSELSHELL RIVER BASIN

06118500 SOUTH FORK MUSSELSHELL RIVER ABOVE MARTINSDALE

LOCATION.--Lat 46°27'21", long 110°22'54", in NW¼ sec.17, T.8 N., R.11 E., Meagher County, Hydrologic Unit 10040201, on left bank 2 mi (3 km) downstream from Cottonwood Creek, 3 mi (5 km) west of Martinsdale, and [illegible] upstream from confluence with North Fork.

DRAINAGE AREA.--287 mi² (743 km²).

PERIOD OF RECORD.--October 1941 to current year. Monthly discharge only November 1941 to [illegible] published in WSP 1309.

REVISED RECORDS.--WSP 1309: 1942(M), 1944(M). WSP 1729: Drainage area. WRD MT-75-1: [illegible]), 1967.

GAGE.--Water-stage recorder. Altitude of gage is 4,900 ft (1,490 m), by barometer. Prior [illegible], 1942, non-recording gage at same site and datum.

REMARKS.--Records good except for winter period, which are poor. Diversions for irrigation [illegible] 6,600 acres (26.7 km²) of which 250 acres (1.01 km²) is below station.

AVERAGE DISCHARGE.--36 years, 87.8 ft³/s (2,487 m³/s), 63,610 acre-ft³/yr (78.4 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 5,240 ft³/s (148 m³/s), June 19, 1975, gage height, 7.27 ft (2.216 m); minimum, 0.1 ft³/s (0.003 m³/s) Aug. 28 to Sept. 2, 1949, Mar. 29, 1950.

Monthly and annual mean discharges 1942-77

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	94.8	4.05	30.6	19.0	0.62	2.9
November	60.0	12.7	27.8	11.0	.39	2.6
December	58.1	9.42	22.5	10.9	.48	2.1
January	51.2	7.73	18.6	8.12	.44	1.8
February	41.4	7.84	20.5	7.51	.37	2.0
March	106	4.63	32.7	20.2	.62	3.1
April	370	14.8	111	73.2	.66	10.5
May	783	40.5	319	161	.51	30.2
June	1320	67.3	351	245	.70	33.3
July	370	5.01	74.6	63.3	.85	7.1
August	81.7	.91	24.3	18.4	.75	2.3
September	105	.44	22.5	18.3	.81	2.1
Annual	212	22.9	87.8	38.1	.43	100

Magnitude a[illegible] based on pe[illegible] record 1942-77

Period (consecutive days)	Di[illegible] re[illegible] ex[illegible]
	2
	50[illegible]
1	6.2[illegible]
3	6.8[illegible]
7	7.90
14	9.0[illegible]
30	11.5
60	13.5
90	17.1
120	19.2
183	24.0

[illegible]bility of annual low flow record 1942-77

[illegible], in ft³/s, for indicated [illegible]e interval, in years, and [illegible]e probability, in percent

[illegible]	10	25	50	100
[illegible]	10%	4%	2%	1%
[illegible]95	0.87	0.40	0.15	---
[illegible]18	.98	.45	.17	---
[illegible]73	1.26	.59	.22	---
[illegible]26	1.54	.73	.28	---
[illegible]03	2.70	1.45	.64	---
[illegible]44	6.29	4.81	3.45	---
[illegible]8	9.26	7.38	5.55	---
[illegible]	12.1	10.5	8.94	---
[illegible]	14.2	12.1	10.1	---

Magnitude and probability of instantaneous peak flow based on period of record 1942-77

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
457	751	1230	1590	2090	2490	2910

Weighted skew = -0.15

Magnitude and pro[illegible]bility of annual high flow based on period of record 1942-77

Period (consecutive days)	Discharge[illegible] interval[illegible] in percen[illegible]	[illegible], in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent			
	2	[illegible]	10	25	50	100
	50%	[illegible]	10%	4%	2%	1%
1	666	[illegible]	1510	2110	2640	---
3	626	[illegible]	1300	1700	2030	---
7	563	[illegible]	1090	1360	1560	---
15	492	[illegible]	947	1170	1340	---
30	432	[illegible]	804	969	1080	---
60	332	[illegible]	585	681	740	---
90	259	[illegible] 383	451	524	569	---

Duration table of daily mean flow for period of record 1942-77

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	50%	65%	80%	85%	90%	95%	96%	97%	98%	99.5%	99.8%	99.9%
790	410	245	160	110	53	35	27	22	18	14.5	11.5	8.4	4.5	2.2	0.85	0.30

Basin characteristics

MUSSELSHELL RIVER BASIN

06120500 MUSSELSHELL RIVER AT HARLOWTON, MT

LOCATION.--Lat 46°25'48", long 109°50'24", in NE¼ sec.28, T.8 N., R.15 E., Wheatland County, Hydrologic Unit 10040201, on left bank 350 ft (107 m) downstream from bridge on U. S. Highway 191, 1 mi (2 km) southwest of Harlowton, and 6 mi (10 km) upstream from American Fork.

DRAINAGE AREA.--1,125 mi^2 (2,914 km^2).

PERIOD OF RECORD.--July 1907 to November 1929, March 1930 to December 1932, April to August 1933, February 1934 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1309: 1912, 1915(M), 1918, 1925. WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 4,160 ft (1,270 m), by barometer. Prior to Dec. 8, 1937, non-recording gages at site 1.2 mi (1.9 km) downstream at different datums. Dec. 8, 1937, to Aug. 26, 1955, non-recording gage at bridge 300 ft (90 m) upstream at different datums.

REMARKS.--Records good, except those for winter period which are poor. Some regulation by Bair and Martinsdale Reservoirs. Diversions for irrigation of about 37,000 acres (150 km^2) above station, of which 2,300 acres (9.31 km^2) is flood irrigated.

AVERAGE DISCHARGE.--67 years (1907-29, 1930-32, 1934-77), 162 ft^3/s (4.587 m^3/s) 117,400 acre-ft/yr (145 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge observed, 7,270 ft^3/s (206 m^3/s) June 20, 1975, gage height, 10.01 ft (3.051 m); no flow at times.

Monthly and annual mean discharges 1908-29, 31-32, 35-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	226	0	74.1	48.4	0.65	3.9
November	176	0	80.7	38.7	.48	4.2
December	206	0	69.3	35.9	.52	3.6
January	250	0	58.7	33.4	.57	3.1
February	150	10	62.6	29.8	.48	3.3
March	500	20.4	118	88.9	.75	6.2
April	632	22.1	195	136	.70	10.2
May	1957	11.8	435	341	.78	22.8
June	2467	27.9	531	468	.88	27.8
July	751	0.84	154	142	.93	8.1
August	275	0	68.9	63	.91	3.6
September	254	0	60.0	52.7	.88	3.2
Annual	483	21.1	162	85.4	.53	100

Magnitude and probability of annual low flow based on period of record 1908-29, 31-32, 35-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	16.5	1.5	0.01	0	0	0
3	18.0	2.0	.02	0	0	0
7	20.0	2.2	.03	0	0	0
14	24.0	2.4	.04	0	0	0
30	28.0	4.2	.06	0	0	0
60	38.0	7.6	1.8	0.25	0	0
90	53.0	19.0	7.5	2.7	.45	.1
120	57.0	32.0	23.0	15.0	8.0	6.0
183	71.8	44.9	33.8	26.3	19.3	15.5

Magnitude and probability of instantaneous peak flow based on period of record 1909-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
514	1060	2030	2770	3760	4540	5330

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1908-29, 31-32, 35-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1040	1900	2480	3190	3690	4150
3	968	1730	2210	2770	3140	3470
7	855	1530	1950	2420	2730	2990
15	731	1330	1700	2100	2360	2580
30	612	1110	1420	1760	1980	2160
60	461	829	1060	1320	1490	1640
90	374	652	824	1020	1150	1260

Duration table of daily mean flow for period of record 1908-29, 31-32, 35-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	2%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
1150	670	400	250	180	120	93	75	63	51	41	24	7.8	0.1	---	---	---

Basin characteristics

MUSSELSHELL RIVER BASIN

06127900 FLATWILLOW CREEK NEAR FLATWILLOW, MT

LOCATION.--Lat 46°48', long 108°37', in NE¼ sec.19, T.12 N., R.25 E., Petroleum County, Hydrologic Unit 10040203, 10 mi (16 km) southwest of Flatwillow and 14 mi (23 km) upstream from Pike Creek.

DRAINAGE.--188 mi^2 (487 km^2). At site used prior to Apr. 17, 1918, 202 mi^2 (523 km^2).

PERIOD OF RECORD.--May 1911 to September 1932, February 1934 to September 1956. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1309: 1912, 1913, 1917, 1927, 1939 (monthly runoff).

GAGE.--Wire-weight gage and masonary control. Altitude of gage is 3,560 ft (1,085 m) by barometer. Prior to Apr. 17, 1918, staff gage at site 5 mi (8 km) downstream at different datum. Apr. 17, 1918 to Apr. 15, 1925, staff gage at present site at different datum. Apr. 16, 1925, to Sept. 30, 1932, wire-weight gage at site 300 ft (91.4 m) upstream at different datum.

REMARKS.--Diversions for irrigation of about 9,000 acres (36.4 km^2) above station. Diversion for irrigation increased about 1930 and reduced average flow past station.

AVERAGE DISCHARGE.--19 years (1911-30), 46.2 ft^3/s (1.31 m^3/s) 33,470 acre-ft/yr (41.3 hm^3/yr); 24 years 1930-32, 1934-56, 14.3 ft^3/s (0.40 m^3/s) 10,350 acre-ft/yr (12.8 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--1911-32, 1934-56: Maximum discharge observed, 954 ft^3/s (27.0 m^3/s) June 4-11, 1917; no flow at times.

Monthly and annual mean discharges 1912-32, 35-56

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	52.4	0	13.8	15.3	1.11	4.1
November	51.3	0	15.1	14.7	.97	4.5
December	45.0	0	13.4	12.6	.94	4.0
January	40.9	0	11.7	10.8	.93	3.5
February	52.7	0	13.6	12.7	.94	4.0
March	78.6	0	24.4	20.0	.82	7.2
April	163	0	44.4	43.4	.98	13.2
May	495	0	62.6	89.8	1.43	18.5
June	675	0	81.0	115	1.42	24.0
July	130	0	33.5	36.2	1.08	9.9
August	122	0	13.8	22.1	1.60	4.1
September	57.8	0	10.2	14.0	1.38	3.0
Annual	134	0	28.5	26.4	.93	100

Magnitude and probability of annual low flow based on period of record 1912-32, 35-56

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	0	0	0	0	0	0
3	0	0	0	0	0	0
7	0	0	0	0	0	0
14	0.03	0	0	0	0	0
30	.24	0	0	0	0	0
60	1.1	0	0	0	0	0
90	4.2	0.07	0	0	0	0
183	5.8	.50	0.01	0	0	0
183	10.0	1.85	.04	0	0	0

Magnitude and probability of instantaneous peak flow based on period of record 1911-32, 34-56

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	5	10	25	50	100	
80%	50%	20%	10%	4%	2%	1%
69.7	152	317	456	663	839	1030

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1912-32, 35-56

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
3	145	292	417	604	763	939
7	123	257	379	574	751	955
15	105	232	351	546	726	938
30	92.1	208	313	481	631	803
60	74.9	175	266	409	536	678
90	59.1	137	206	309	398	495
120	49.8	115	170	252	319	391

Duration table of daily mean flow for period of record 1912-32, 35-56

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	50%	70%	80%	90%	95%	98%	99%	99.5%	99.6%	99.7%	99.8%	99.9%
250	104	65	48	39	27.5	19.5	12.5	8.3	3.6	0.10	0	---	---	---	---	---

MUSSELSHELL RIVER BASIN

06130500 MUSSELSHELL RIVER AT MOSBY, MT

LOCATION.--Lat 46°59'41", long 107°53'18", in NW¼NW¼ sec.11, T.14 N., R.30 E., Petroleum County, Hydrologic Unit 10040205, near center of downstream side of bridge on State Highway 20, 0.3 mi (0.5 km) west of Mosby, 10.9 mi (17.5 km) downstream from Flatwillow Creek, and at mile 60.0 (96.5 km).

DRAINAGE AREA.--7,846 mi^2 (20,321 km^2).

PERIOD OF RECORD.--May to November 1929, March 1930 to September 1932, February 1934 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1559: 1935-36. WSP 1729: Drainage area.

GAGE.--Nonrecording gage. Altitude of gage is 2,500 ft (760 m), by barometer. Dec. 6, 1962, to Mar. 14, 1966, water-stage recorder at site 900 ft (274 m) downstream at different datum. Mar. 15, 1966, to Dec. 11, 1973, water-stage recorder and nonrecording gages at site 100 ft (30 m) downstream at same datum. See WSP 2116 for history of changes prior to 1962.

REMARKS.--Water-discharge records fair except those for winter period which are poor. Some regulation by Bair, Martinsdale and Deadman's Basin Reservoirs. Diversions for irrigation of about 103,000 acres (417 km^2) above station.

AVERAGE DISCHARGE.--45 years (1930-32, 1934-77), 265 ft^3/s (7.50 m^3/s) 192,000 acre-ft/yr (237 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 18,000 ft^3/s (510 m^3/s) June 18, 1944, gage height, 14.43 ft (4.307 m), from rating curve extended above 10,000 ft^3/s (283 m^3/s); no flow at times.

Monthly and annual mean discharges 1931-32, 35-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	304	0	63.6	67.4	1.06	2.1
November	280	0	71.5	63.7	.89	2.3
December	252	0	70.7	62.3	.88	2.3
January	310	0	68.1	62.6	.92	2.2
February	1858	0	189	328	1.74	6.1
March	1698	0	386	384	.99	12.5
April	1273	3.14	297	309	1.04	9.6
May	3772	0	500	707	1.41	16.2
June	4967	1.91	954	1111	1.16	30.9
July	2153	0	306	443	1.45	9.9
August	465	0	98.2	105	1.07	3.2
September	331	0	84.5	87.5	1.04	2.7
Annual	1006	16.39	265	202	.76	100

Magnitude and probability of annual low flow based on period of record 1931-32, 35-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1.0	0	0	0	0	0
7	1.2	0	0	0	0	0
14	1.9	0	0	0	0	0
30	2.6	0	0	0	0	0
60	11.8	0.1	0	0	0	0
90	28.0	.45	0	0	0	0
120	40.0	7.40	.04	0	0	0
183	63.0	16.0	5.8	1.8	.5	0
183	100	38.0	20.0	10.0	2.8	1.0

Magnitude and probability of instantaneous peak flow based on period of record 1929, 31-32, 34-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.52	2	5	10	25	50	100
66%	50%	20%	10%	4%	2%	1%
1860	4080	8600	12500	18400	23400	29000

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1931-32, 35-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	3140	6660	9460	13300	16400	19500
7	2480	5280	7400	10200	12300	14300
14	1940	4130	5690	7600	8910	10100
30	1480	3160	4280	5590	6440	7180
60	1060	2260	3120	4160	4880	5540
90	706	1550	2180	2980	3560	4120
120	552	1200	1690	2310	2760	3190

Duration table of daily mean flow for period of record 1931-32, 35-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99%	99.5%
3200	1120	630	410	290	165	100	85	65	42	17	0.01	0	---	---	---	---

BIG DRY CREEK BASIN

06131000 BIG DRY CREEK NEAR VAN NORMAN, MT

LOCATION.--Lat 47°20'57", long 106°21'33", in NW¼SE¼NW¼ sec.3, T.18 N., R.42 E., Garfield County, Hydrologic Unit 10040105, on left bank 500 ft (150 m) downstream from Little Dry Creek, 3.2 mi (5.1 km) northeast of Van Norman Post Office, and 26 mi (42 km) east of Jordan.

DRAINAGE AREA.--2,554 mi^2 (6,615 km^2).

PERIOD OF RECORD.--October 1939 to July 1969, July 1970 to current year (discharge measurements only, October 1947 to March 1949). Prior to July 1970, published as "Dry Creek near Van Norman."

REVISED RECORDS.--WSP 1309: 1947(M). WSP 1559: 1944(M), 1947. WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 2,300 ft (710 m), by barometer.

REMARKS.--Records poor. Few small diversions for irrigation of hay meadows above station.

AVERAGE DISCHARGE.--34 years (1939-47, 1949-68, 1970-77), 50.9 ft^3/s (1.441 m^3/s), 36,880 acre-ft/yr (45.5 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 24,600 ft^3/s (697 m^3/s) Mar. 21, 1947, gage height, 13.39 ft (4.081 m); maximum gage height, 15.26 ft (4.651 m) Mar. 21, 1947 (ice jam); no flow at times each year.

Monthly and annual mean discharges 1940-47, 50-68, 71-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	31.6	0	4.39	7.52	1.71	0.7
November	11.3	0	2.70	2.75	1.02	.4
December	33.7	0	2.79	6.09	2.18	.5
January	42.6	0	3.04	9.63	3.17	.5
February	494	0	60.8	123	2.03	10
March	1760	2.75	264	453	1.71	43.5
April	2043	1.05	107	354	3.30	17.7
May	300	.21	27.4	62	2.27	4.5
June	552	.99	71.2	116	1.64	11.7
July	361	0	33.8	68.4	2.02	5.5
August	367	0	21.3	63.2	2.97	3.5
September	98.2	0	8.61	19.2	2.24	1.4
Annual	199	2.27	50.9	50.8	1.00	100

Magnitude and probability of annual low flow based on period of record 1940-47, 50-68, 71-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	0	0	0	0	0	---
3	0	0	0	0	0	---
7	0	0	0	0	0	---
15	0	0	0	0	0	---
30	0	0	0	0	0	---
60	0.13	0	0	0	0	---
90	.56	0.11	0.01	0	0	---
183	1.05	.25	.10	.03	0	---
183	10.6	3.36	1.73	.97	.48	---

Magnitude and probability of instantaneous peak flow based on period of record 1940-48, 50-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
796	2590	7830	13600	23900	34100	46500

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1940-47, 50-68, 71-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1920	5930	9960	16400	22100	---
3	1290	4130	7200	12500	17600	---
7	746	2340	4080	7150	10100	---
15	421	1250	2110	3590	4970	---
30	250	712	1180	1970	2690	---
60	146	401	645	1030	1370	---
90	106	281	443	693	906	---

Duration table of daily mean flow for period of record 1940-47, 50-68, 71-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.8%	99.9%
830	125	45	23.5	14.5	6.7	3.7	2.1	1.1	.5	.1	0	---	---	---	---	---	---

06132000 MISSOURI RIVER BELOW FORT PECK DAM, MT

LOCATION.--Lat 48°02'39", long 106°21'21", in NW¼ sec.6, T.26 N., R.42 E., McCone County, Hydrologic Unit 10060001, on right bank 2 mi (3 km) upstream from Milk River, 6 mi (10 km) south of Nashua, 8 mi (13 km) downstream from Fort Peck Dam, and at mile 1,763.5 (2,837.5 km).

DRAINAGE AREA.--57,556 mi^2 (149,070 km^2).

PERIOD OF RECORD.--March 1934 to current year.

REVISED RECORDS.--WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 2,018.00 ft (615.086 m) above mean sea level (Corps of Engineers bench mark). Prior to Apr. 14, 1938, at site 0.7 mi (1.1 km) upstream at different datum; Apr. 14, 1938, to Sept. 30, 1963, at present site at datum 2.00 ft (0.610 m) higher, all water-stage recorders. Since Oct. 1, 1969, published discharge is determined by flowmeters at Fort Peck Dam.

REMARKS.--Water-discharge records good. Flow completely regulated by Fort Peck Lake. Diversions for irrigation of about 880,400 acres (3,560 km^2) above station.

COOPERATION.--Records since Oct. 1, 1969, furnished by Corps of Engineers; 4 discharge measurements made and records reviewed by Geological Survey. Records for March 1934 to September 1969 collected and computed by Geological Survey.

AVERAGE DISCHARGE.--5 years (1934-39, prior to Fort Peck Lake reaching operational level), 6,347 ft^3/s (179.7 m^3/s), 4,598,000 acre-ft/yr (5.67 km^3/yr); 34 years (1943-77, after operational level in Fort Peck Lake was reached), 9,816 ft^3/s (278.0 m^3/s), 7,112,000 acre-ft/yr (8.77 km^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 51,000 ft^3/s (1,440 m^3/s) including 32,000 ft^3/s (906 m^3/s) inflow from spillway 1 mi (2 km) downstream from station, Aug. 8, 1946; maximum gage height observed, 12.30 ft (3.749 m) Mar. 10, 1936 (ice jam), site and datum then in use; maximum daily reverse flow, 400 ft^3/s (11.3 m^3/s) Mar. 29, 1943 (backwater from Milk River).

Monthly and annual mean discharges 1935-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	28800	1036	11730	7907	0.67	11.0
November	19840	1102	8494	4383	.52	8.0
December	13330	1007	7490	3555	.47	7.1
January	14010	879	7600	4095	.54	7.1
February	15000	1010	7403	4948	.65	7.0
March	13360	814	6961	3862	.65	6.5
April	14600	583	7053	3751	.53	6.6
May	15830	950	7702	4271	.55	7.2
June	26190	685	7925	5361	.68	7.5
July	35030	964	9562	6353	.66	9.0
August	26180	2284	12360	6554	.53	11.6
September	27120	2277	12140	7402	.61	11.4
Annual	14950	3650	8896	3096	.35	100

Magnitude and probability of annual low flow based on period of record 1935-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	2380	850	425	215	---	---
3	2820	1050	500	250	---	---
7	2920	1280	720	370	---	---
14	3240	1440	850	521	283	182
30	3600	1750	1120	747	455	318
60	4060	2010	1310	885	550	391
90	4540	2250	1450	977	600	422
120	4940	2440	1570	1050	636	444
183	5690	3040	2040	1410	894	643

Magnitude and probability of instantaneous peak flow based on period of record 1935-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
13900	19900	28000	33200	39600	44200	48700

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1935-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	19000	25700	29500	33900	36700	39300
3	18500	25100	28800	33000	35800	38300
7	18000	24300	28000	32400	35400	38200
15	17000	23400	27400	32300	35800	39200
30	16000	22200	26300	31400	35100	38800
60	14500	19900	23400	27800	31100	34400
90	12900	17300	20400	24300	27300	30300

Duration table of daily mean flow for period of record 1935-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99.5%	99.9%
29000	21000	15800	14200	13000	11400	9700	8100	6800	5400	3850	1800	1100	930	760	630	300

06134500 MILK RIVER AT MILK RIVER, ALBERTA

(International gaging station)

LOCATION (revised).--Lat 49°08'37", long 112°04'44", in NE¼ sec.21, T.2, R.16 W., fourth meridan, in Alberta, Hydrologic Unit 10050002, on right bank 5 ft (1.5 m) downstream from highway bridge at Milk River, Alberta, and 22 mi (35 km) downstream from North Milk River.

DRAINAGE AREA.--1,036 mi^2 (2,683 km^2).

PERIOD OF RECORD.--June 1909 to October 1910 (no winter records), April 1911 to current year. Monthly discharge only for June 1909, published in WSP 1309.

REVISED RECORDS.--WSP 1309: 1912. WSP 1559: 1916, 1927(M), 1947(M). WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 3,402.78 ft (1,037.167 m) above mean sea level (Geodetic Surveys of Canada datum). Prior to June 17, 1919, nonrecording gages, and June 17, 1919, to Nov. 2, 1921, water-stage recorder all at several sites 300 ft (91 m) upstream at datum 0.61 ft (0.186 m) higher. Nov. 3, 1921, to Aug. 28, 1947, water-stage recorder at site 60 ft (18 m) upstream at present datum. Aug. 29, 1947, to Nov. 10, 1976, water-stage recorder located 700 ft (213 m) downstream on left bank at present datum.

REMARKS.--Records good except those for winter period, which are poor. Since 1917, flow increased during irrigation season by water from St. Mary Canal. Several small diversions for irrigation above station.

COOPERATION.--This is one of a number of stations which are maintained jointly by Canada and the United States.

AVERAGE DISCHARGE.--61 years (1916-77), 327 ft^3/s (9.261 m^3/s), 236,900 acre-ft/yr (292 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,170 ft^3/s (260 m^3/s) June 21, 1975, gage height, 10.58 ft (3.225 m); maximum gage height, 11.41 ft (3.478 m) May 22, 1927; no flow at times.

NOTE.--Differences between figures published herein and corresponding figures in reports of the Water Survey of Canada are due to variations in automated program techniques.

Monthly and annual mean discharges 1912-18, 20-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	555	12.2	106	95.3	0.90	2.8
November	216	10.4	64.5	44.3	.69	1.7
December	133	2.06	36.3	26.3	.73	1.0
January	268	0	33.2	44.5	1.34	.9
February	551	0	63.7	90.9	1.43	1.7
March	1025	3.44	206	187	.91	5.5
April	1383	94.5	498	263	.53	13.2
May	1179	160	631	240	.38	16.7
June	1633	71.4	680	251	.37	18.0
July	965	25.2	584	185	.32	15.5
August	795	21.8	527	196	.37	14.0
September	713	20.8	340	220	.65	9.0
Annual	489	77.8	317	90.8	.29	100

Magnitude and probability of annual low flow based on period of record 1912-18, 20-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	6.10	1.30	0.11	0.01	0	0
3	7.00	1.60	.15	.02	0	0
7	8.30	1.75	.37	.02	0	0
14	9.50	2.40	.93	.19	0.02	0
30	13.5	5.00	2.00	.80	.15	0
60	21.0	7.30	3.40	1.40	.34	0.1
90	25.0	10.1	5.80	3.10	1.20	.8
183	33.3	15.2	9.31	5.91	3.37	2.24
365	71.7	38.3	26.7	19.5	13.4	10.4

Magnitude and probability of instantaneous peak flow based on period of record 1909, 1913-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
1090	1950	3540	4880	6930	8720	10800

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1912-18, 20-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1660	2790	3730	5180	6450	7910
3	1440	2280	2950	3930	4770	5690
7	1170	1760	2200	2830	3350	3910
15	976	1360	1630	1990	2270	2560
30	847	1090	1230	1390	1500	1610
60	758	935	1020	1100	1150	1190
90	716	860	914	956	975	988

Duration table of daily mean flow for period of record 1912-18, 20-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	25%	30%	40%	50%	60%	70%	80%	90%	95%	99.5%	99.9%
1400	900	770	680	610	470	300	140	76	49	30	14	7.1	2.8	1.0	.01	0

MILK RIVER BASIN

06143000 MILK RIVER AT LOHMAN, MT

LOCATION.--Lat 48°36', long 109°24', in SE¼ sec.20, T.33 N., R.18 E., Blaine County, hydrologic unit 10050004, on right bank 0.5 mi (0.8 km) downstream from Fort Belknap diversion dam, and 0.7 mi (1.1 km) north of Lohman.

DRAINAGE.--6,166 mi^2 (15,970 km^2).

PERIOD OF RECORD.--June 1918 to August 1921 (irrigation season only) October 1922 to December 1925, March 1934 to Sept. 1951. Monthly discharge only for some periods, published in WSP 1309.

GAGE.--Water-stage recorder. Altitude of gage is 2,420 ft (738 m) from topographic map. Prior to Jan. 7, 1934, wire-weight gage on county bridge 0.2 mi (0.3 km) downstream at different datum.

REMARKS.--Flow increase by water from St. Mary Canal since 1917 and regulated by Fresno Dam since 1939. Diversions for irrigation of about 5,000 acres (20.2 km^2) above station. Fort Belknap Canal diverts water 0.5 mi (0.8 km) above station for use below.

AVERAGE DISCHARGE.--20 years (1922-25, 1934-51), 274 ft^3/s (7.76 m^3/s) 198,400 acre-ft/yr (244 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--1918-21, 1922-25, 1934-51: Maximum discharge, 3,450 ft^3/s (97.7 m^3/s) Mar. 21, 1939, gage height, 12.08 ft (3.682 m); maximum gage height, 14.63 ft (4.459 m) Mar. 22, 1947 (ice jam); no flow at times.

Monthly and annual mean discharges 1923-25, 35-51

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	406	0.65	94.2	115	1.22	3.0
November	99.7	1.3	42.2	31	.73	1.3
December	90.7	.5	38.0	24.7	.65	1.2
January	60.5	.5	25.4	18.9	.74	.8
February	326	1.0	50.6	73.2	1.45	1.6
March	748	45.5	249	229	.92	7.8
April	1305	41.8	413	315	.76	13.0
May	1150	220	508	234	.46	16.0
June	1236	172	587	283	.48	18.5
July	1070	203	503	209	.42	15.9
August	805	160	415	137	.33	13.1
September	644	40.8	246	150	.61	7.8
Annual	415	141	274	77.2	.28	100

Magnitude and probability of annual low flow based on period of record 1923-25, 35-51

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	8.0	1.1	0.04	0	---	---
3	8.2	1.4	.32	0.02	0	---
7	7.9	1.3	.39	.12	0.03	---
14	9.5	2.10	.83	.35	.12	---
30	12.5	2.85	1.10	.45	.15	---
60	20.8	5.80	2.43	1.06	.36	---
90	24.4	7.63	3.44	1.61	.61	---
183	27.6	10.5	5.54	3.04	1.41	---
183	67.6	42.5	33.7	28.0	22.8	---

Magnitude and probability of instantaneous peak flow based on period of record 1919, 23, 25, 35-51

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
874	1580	2800	3740	5040	6100	7220

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1923-25, 35-51

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	1570	2700	3530	4630	5490	---
3	1440	2370	3030	3880	4510	---
7	1260	1940	2390	2960	3380	---
15	1010	1460	1760	2140	2419	---
30	799	1110	1320	1590	1800	---
60	647	865	1010	1210	1360	---
90	596	785	908	1060	1180	---

Duration table of daily mean flow for period of record 1923-25, 35-51

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99.6%	99.9%
1100	840	680	580	500	390	255	115	65	41	29	13	3.3	1.0	0.64	0.42	0.3

MILK RIVER BASIN

06154500 PEOPLES CREEK NEAR DODSON, MT

LOCATION.--Lat 48°20'34", long 108°21'32", in SE¼NW¼ sec.21, T.30 N., R.26 E., Phillips County, Hydrologic Unit 10050009, on right bank 0.8 mi (1.29 km) upstream from Indian Service diversions, 6.5 mi (10.5 km) southwest of Dodson, and 7 mi (11 km) upstream from mouth.

PERIOD OF RECORD.--April 1913 to November 1921 (fragmentary), June 1951 to September 1973. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 2,310 ft (704 m) by barometer. Prior to June 1951, chain gage at site 2 mi (3 km) downstream at different datum. June 1, 1951 to Aug. 11, 1956, water-stage recorder at site 300 ft (91.4 m) downstream at present datum.

REMARKS.--Records good except those for winter period, which are poor. Diversions for irrigation of about 700 acres (2.83 km^2) above station.

AVERAGE DISCHARGE.--22 years, 32.4 ft^3/s (0.92 m^3/s), 23,470 acre-ft/yr (28.9 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum daily discharge, 3,940 ft^3/s (112 m^3/s) June 9, 1972, gage height, 11.94 ft (3.639 m) from floodmark; maximum gage height, 17.05 ft (5.197 m) Mar. 29, 1952 (ice jam), from flood mark in gagehouse; no flow at times.

Monthly and annual mean discharges 1952-73

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	24.3	0	4.26	6.15	1.44	1.1
November	19	0	4.68	5.48	1.17	1.3
December	13.1	0	3.30	4.08	1.24	.9
January	64.1	0	5.37	15.2	2.83	1.4
February	369	0	33.9	80.9	2.39	9.0
March	374	0.76	96.3	106	1.10	25.7
April	521	.57	84.9	139	1.63	22.7
May	463	.34	62.0	102	1.65	16.6
June	332	.03	49.7	76.2	1.53	13.3
July	125	0	23.1	35.8	1.55	6.2
August	25.6	0	3.11	5.57	1.79	.8
September	40.3	0	3.83	9.1	2.37	1.0
Annual	92.6	1.18	32.4	28.0	.86	100

Magnitude and probability of annual low flow based on period of record 1952-73

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	0	0	0	0	0	---
3	0	0	0	0	0	---
7	0	0	0	0	0	---
15	0	0	0	0	0	---
30	0	0	0	0	0	---
60	0.06	0	0	0	0	---
90	.59	0	0.02	0	0	---
120	.89	0.10	.02	0	0	---
183	9.73	2.87	1.36	0.70	0.31	---

Magnitude and probability of instantaneous peak flow based on period of record 1952-73

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
363	862	1980	3010	4660	6150	7860

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1952-73

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	684	1610	2470	3850	5080	---
3	534	1290	2000	3160	4200	---
7	384	925	1420	2180	2840	---
15	241	579	882	1350	1750	---
30	152	363	546	813	1030	---
60	98.0	235	351	517	650	---
90	75.2	175	256	369	457	---

Duration table of daily mean flow for period of record 1952-73

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99.5%	99.9%
510	128	59	36	24.5	12.0	6.2	2.7	0.95	0.15	0	---	---	---	---	---	---

MILK RIVER BASIN

06174500 MILK RIVER AT NASHUA, MT

LOCATION.--Lat 48°07'52", long 106°21'50", in NE¼NE¼ sec.1, T.27 N., R.41 E., Valley County, Hydrologic Unit 10050012, on right bank at downstream side of former highway bridge site, 0.6 mi (1.0 km) southwest of Nashua, 2.0 mi (3.2 km) upstream from Porcupine Creek, and at mile 24.0 (38.6 km).

DRAINAGE AREA.--22,332 mi² (57,840 km²).

PERIOD OF RECORD.--October 1939 to current year.

REVISED RECORDS.--WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 2,027.75 ft (618.058 m) above mean sea level.

REMARKS.--Water-discharge records good except those for winter period, which are poor. Flow increased during irrigation season by water from St. Mary Canal which diverts from the St. Mary River near Babb. Flow regulated by Fresno Reservoir, two reservoirs in Lodge Creek basin in Saskatchewan, and four reservoirs in Frenchman River basin in Saskatchewan. Diversions for irrigation of about 140,000 acres (567 km²) above station.

AVERAGE DISCHARGE.--38 years, 694 ft³/s (19.65 m³/s) 502,800 acre-ft/yr (620 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 45,300 ft³/s (1,280 m³/s) Apr. 18, 1952, gage height, 31.38 ft (9.545 m); minimum, 0.6 ft³/s (0.017 m³/s) July 15, 1961, gage height, 1.96 ft (0.597 m).

Monthly and annual mean discharges 1940-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	542	56.8	199	128	0.64	2.4
November	691	84.5	221	128	.58	2.7
December	363	46.1	160	69.1	.43	1.9
January	843	36.0	142	128	.90	1.7
February	796	38.9	209	183	.87	2.5
March	3661	88.5	1056	939	.89	12.7
April	20930	26.6	2687	3769	1.40	32.2
May	5207	38.8	1218	1552	1.27	14.6
June	6611	96.3	1146	1255	1.10	13.7
July	3578	14.6	717	819	1.14	8.6
August	997	23.1	337	254	.75	4.1
September	667	59.9	243	148	.61	2.9
Annual	2359	93.2	694	469	.68	100

Magnitude and probability of annual low flow based on period of record 1940-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	46.3	18.4	9.23	4.64	1.88	0.95
3	48.9	20.2	10.5	5.45	2.31	1.21
7	55.8	23.3	12.1	6.28	2.64	1.37
14	61.2	28.7	17.3	10.7	5.77	3.68
30	82.8	44.7	30.0	20.7	13.0	9.29
60	103	63.3	47.4	36.7	27.0	21.8
90	118	76.0	59.3	47.8	37.1	31.1
183	134	89.9	72.7	60.9	49.7	43.4
365	272	154	111	83.2	59.3	46.9

Magnitude and probability of instantaneous peak flow based on period of record 1940-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
2860	6180	12700	18100	26200	32900	40200

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1940-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	6450	12400	16500	21600	25200	28600
3	6190	11900	15700	20200	23300	26100
7	5510	10900	14600	19100	22200	25000
15	4400	9010	12300	16600	19600	22500
30	3070	6350	8800	12000	14400	16700
60	1960	4020	5590	7700	9310	10900
90	1510	3070	4280	5930	7210	8520

Duration table of daily mean flow for period of record 1940-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	30%	50%	70%	80%	90%	95%	98%	99%	99.5%	99.8%	99.9%	99.95%	99.98%
7900	3300	1350	820	570	360	250	195	155	128	99	67	46	27	18.5	13.5	6.4

06177000 MISSOURI RIVER NEAR WOLF POINT, MT

LOCATION.--Lat 48°03'57", long 105°32'12", in SW¼NW¼ sec.28, T.27 N., R.48 E., McCone County, Hydrologic Unit 10060001, on right bank 500 ft (150 m) downstream from bridge on State Highway 13, 5 mi (8 km) southeast of Wolf Point, 7.8 mi (12.6 km) downstream from Wolf Creek, and at mile 1,701.4 (2,737.6 km).

DRAINAGE AREA.--82,290 mi² (213,131 km²).

PERIOD OF RECORD.--September 1928 to current year.

REVISED RECORDS.--WSP 1146: 1931. WSP 1729: Drainage area.

GAGE.--Water-stage recorder and nonrecording gage. Datum of gage is 1,958.57 ft (596.972 m) above mean sea level. Prior to Apr. 13, 1930, nonrecording gages at Wolf Point ferry landing 5.5 mi (8.8 km) upstream at different datum.

REMARKS.--Records fair except those for winter period, which are poor. Flow partly regulated by Fort Peck Lake and many other reservoirs above station. Diversions for irrigation of about 1,010,400 acres (4,090 km²) above station.

AVERAGE DISCHARGE.--11 years (1928-39, prior to Fort Peck Lake reaching operational level), 7,219 ft³/s (204.4 m³/s), 5,230,000 acre-ft/yr (6.45 km³/yr); 34 years (1943-77, after operational level was reached), 10,480 ft³/s (296.8 m³/s), 7,590,000 acre-ft/yr (9.36 km³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 66,800 ft³/s (1,890 m³/s) Mar. 25, 1939, gage height, 14.4 ft (4.39 m), ice present, from rating curve extended above 39,000 ft³/s (1,100 m³/s); maximum gage height, 15.64 ft (4.767 m) Mar. 27, 1960 (backwater from ice); minimum daily discharge, 320 ft³/s (9.06 m³/s) Dec. 10, 1941.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of June 14, 1908, reached a stage of about 20 ft (6.1 m), present site and datum.

Monthly and annual mean discharges 1929-77

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	29130	1149	11020	7891	0.72	9.9
November	20830	1177	8224	4426	.54	7.4
December	13420	1145	6918	3504	.51	6.2
January	14270	914	7134	3939	.55	6.4
February	15820	1050	7364	4667	.63	6.6
March	17080	2301	8407	4097	.49	7.6
April	27180	1470	10050	4921	.49	9.0
May	17300	1182	9369	4998	.53	8.4
June	26040	1268	9940	6283	.63	8.9
July	36270	1171	9760	6331	.65	8.8
August	27110	2397	11730	6778	.58	10.5
September	27150	2300	11490	7442	.65	10.3
Annual	15850	4103	9289	3198	.34	100

Magnitude and probability of annual low flow based on period of record 1929-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	2620	1290	858	598	389	288
3	2790	1410	945	667	441	330
7	2960	1580	1110	821	576	452
14	3260	1770	1250	929	654	513
30	3720	2050	1440	1060	739	572
60	4230	2330	1640	1200	823	632
90	4740	2600	1810	1310	878	663
120	5210	2920	2050	1490	1010	770
183	6310	3860	2860	2180	1570	1240

Magnitude and probability of instantaneous peak flow based on period of record 1929-77

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
16900	23100	31700	37300	44500	49800	55100

Weighted skew = -.15

Magnitude and probability of annual high flow based on period of record 1929-77

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	22000	30000	35500	42600	48000	53500
3	21300	28600	33300	39200	43600	47900
7	20300	27300	31700	37200	41300	45200
15	19100	25800	30000	35000	38600	42000
30	17500	23700	27500	32000	35200	38300
60	15500	20800	24000	28000	30900	33700
90	13800	18200	21100	24600	27200	29800

Duration table of daily mean flow for period of record 1929-77

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99.5%	99.9%
28500	21500	18000	16000	14500	11800	9800	8100	6700	5300	4050	2650	1250	1160	1050	970	610

REDWATER RIVER BASIN

06177500 REDWATER RIVER AT CIRCLE, MT

LOCATION.--Lat 47°24'51", long 105°34'30", in SW¼SW¼ sec.11, T.19 N., R.48 E., McCone County, Hydrologic Unit 10060002, on left bank at Circle, 1 mi (2 km) upstream from Horse Creek, and at mile 79.6 (128 km).

DRAINAGE AREA.--547 mi^2 (1,417 km^2).

PERIOD OF RECORD.--April to November 1929, March to November 1930, July 1931 to December 1932, March to June 1933, February to November 1934, April 1935 to December 1936, April 1937 to June 1972, October 1974 to current year. Monthly discharge only for some periods, published in WSP 1309. Prior to October 1967, published as Redwater Creek at Circle.

REVISED RECORDS.--WSP 1006: 1929-30, 1932-33, 1935-39. WSP 1509: 1929, 1934. WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Sharp-crested weir since Sept. 24, 1938. Altitude of gage is 2,380 ft (725.4 m), by barometer. Prior to June 1, 1941, and Mar. 23, 1943, to Feb. 16, 1948, nonrecording gage at site 0.3 mi (0.5 km) upstream at same datum. June 1, 1941, to Mar. 22, 1943, nonrecording gage at site 200 ft (61.0 m) upstream at datum 2.8 ft (0.85 m) lower. Feb. 26, 1948, to May 7, 1950, nonrecording gage at site 200 ft (61.0 m) upstream at present datum.

REMARKS.--Water-discharge records fair except those for winter period which are poor. Few minor diversions for irrigation of hay meadows above station.

AVERAGE DISCHARGE.--39 years (1931-32, 1935-36, 1937-71, 1975-77) 13.7 ft^3/s (0.39 m^3/s), 9,930 acre-ft/yr (12.2 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,730 ft^3/s (191 m^3/s) July 14, 1957, gage height, 12.77 ft (3.892 m); no flow at times most years.

Monthly and annual mean discharges 1932, 36, 38-71, 75-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	0.81	0	0.18	0.21	1.14	0.1
November	1.09	0	.17	.22	1.31	.1
December	8.58	0	.31	1.32	4.24	.2
January	6.13	0	.23	.96	4.27	.1
February	141	0	17.8	37.2	2.08	10.9
March	368	0.05	89.1	116	1.30	54.3
April	418	.07	19.6	64.1	3.27	12.0
May	17.4	.02	3.3	4.28	1.30	2.0
June	167	0	16.8	32.3	1.93	10.2
July	116	0	13.6	29.2	2.14	8.3
August	37.4	0	2.65	7.37	2.78	1.6
September	4.23	0	.33	.74	2.26	.2
Annual	61.6	.04	13.7	13.5	.99	100

Magnitude and probability of annual low flow based on period of record 1932, 36, 38-71, 75-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	0	0	0	0	0	0
3	0	0	0	0	0	0
7	0	0	0	0	0	0
14	0	0	0	0	0	0
30	0	0	0	0	0	0
60	0	0	0	0	0	0
90	0.03	0	0	0	0	0
120	.06	0	0	0	0	0
183	1.97	0.36	0.13	0.06	0.02	0.01

Magnitude and probability of instantaneous peak flow based on period of record 1929-30, 32-71, 75-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
116	679	3220	6700	13800	21400	31100

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1932, 36, 38-71, 75-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	514	1970	3290	5030	6240	7320
3	357	1290	2100	3110	3780	4350
7	221	760	1200	1730	2060	2340
15	127	416	641	903	1060	1200
30	75.2	230	342	463	534	589
60	45.8	129	182	235	263	284
90	33.5	90.1	124	156	172	183

Duration table of daily mean flow for period of record 1932, 36, 38-71, 75-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	50%	40%	50%	60%	70%	80%	90%	95%	98%	99.5%	99.9%
295	26	7.0	3.5	2.1	0.80	0.36	0.20	0.13	0.01	0	---	---	---	---	---	---	---

POPLAR RIVER BASIN

06181000 POPLAR RIVER NEAR POPLAR, MT

LOCATION.--Lat 48°10'15", long 105°10'42", in NE¼NE¼ sec.19, T.28 N., R.51 E., Roosevelt County, Hydrologic Unit 10060003, on right bank 4 mi (6 km) north of Poplar and 11 mi (18 km) upstream from mouth.

DRAINAGE AREA.--3,174 mi^2 (8,221 km^2).

PERIOD OF RECORD.--August 1908 to October 1924, August 1947 to September 1969, June 1975 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1176: 1948. WSP 1389: 1911. WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 1,970 ft (600 m), from topographic map. Prior to May 1, 1911, nonrecording gage at site 4.2 mi (6.8 km) upstream at different datum. May 1, 1911, to Oct. 4, 1913, nonrecording gage at site 14 mi (23 km) upstream at different datum. Oct. 5, 1913, to Oct. 31, 1924, nonrecording gage at site 2.2 mi (3.5 km) upstream at different datum. Aug. 10, 1947, to Sept. 30, 1969, water-stage recorder at present site and datum.

REMARKS.--Water-discharge records good except those for winter period, which are poor. Diversions for irrigation of about 5,500 acres (22.3 km^2) above station.

AVERAGE DISCHARGE.--40 years (1908-24, 1947-69, 1975-77), 134 ft^3/s (3.795 m^3/s), 97,100 acre-ft/yr (120 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 37,400 ft^3/s (1,060 m^3/s), Apr. 6, 1954, gage height, 17.86 ft (5.444 m), from floodmark; no flow at times.

EXTREMES OUTSIDE PERIOD OF RECORD.--Flood of July 10, 1946, reached a stage of 18.1 ft (5.52 m), from floodmark, discharge, 40,000 ft^3/s (1,130 m^3/s), from slope-area measurement of peak flow made at site 20 mi (32 km) upstream.

Monthly and annual mean discharges 1909-24, 48-69, 76-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	81.5	2.19	31.0	22.1	0.71	1.9
November	93.5	4.25	29.8	17.3	.58	1.9
December	50.0	1.37	18.6	11.4	.61	1.2
January	30.0	.01	9.7	7.87	.81	.6
February	99.1	.10	14.3	18.4	1.29	.9
March	2445	.18	297	464	1.56	18.4
April	4918	61.4	857	1157	1.35	53.1
May	421	27.3	136	99.5	.73	8.4
June	336	8.12	98.2	80.6	.82	6.1
July	222	2.93	66.8	64.9	.97	4.1
August	180	.06	27.6	33.1	1.20	1.7
September	206	.55	27.3	34.5	1.27	1.7
Annual	435	29.0	134	105	.79	100

Magnitude and probability of annual low flow based on period of record 1909-24, 48-69, 76-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	1.35	0.21	0.01	0	0	---
3	1.50	.26	.05	0	0	---
7	1.75	.30	.06	0	0	---
14	2.05	.37	.12	0.01	0	---
30	3.0	.60	.20	.06	0	---
60	4.27	1.01	.41	.18	0.07	---
90	7.49	2.20	.98	.45	.17	---
120	12.6	4.96	2.57	1.36	.60	---
183	45.2	21.3	13.4	8.74	5.17	---

Magnitude and probability of instantaneous peak flow based on period of record 1909, 15, 21, 23, 46,48-63,65-69,75-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.23	2	5	10	25	50	100
81%	50%	20%	10%	4%	2%	1%
990	3360	10900	19700	36700	54500	77300

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1909-24, 48-69, 76-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	2110	6690	12500	24700	38800	---
3	1760	5510	10300	20700	33000	---
7	1350	3850	6870	13100	20000	---
15	932	2420	4140	7550	11300	---
30	643	1510	2430	4140	5930	---
60	406	881	1360	2210	3060	---
90	305	630	946	1490	2030	---

Duration table of daily mean flow for period of record 1909-24, 48-69, 76-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%
1700	410	195	128	91	53	35	24.5	18.5	14.0	9.0	3.1	0.95	0.28	0.14	0.11	0.07

BIG MUDDY CREEK BASIN

06182500 BIG MUDDY CREEK AT DALEVIEW, MT

LOCATION.--Lat 48°54'40", long 104°56'42", near center of north line of sec.5, T.36 N., R.52 E., Sheridan County, Hydrologic Unit 10060006, on right bank 0.5 mi (0.8 km) west of Daleview, 0.5 mi (0.8 km) upstream from Whitetail Creek and 6 mi (10 km) north of Redstone and at mile 149.6.

DRAINAGE.--279 mi^2 (723 km^2).

PERIOD OF RECORD.--August 1947 to June 1972.

REVISED RECORDS.--WSP 1209: 1948(M). WSP 1309: Drainage area. WSP 1389: 1948. WSP 1559: 1955.

GAGE.--Water-stage recorder. Altitude of gage is 2,120 ft (646 m), by barometer.

REMARKS.--Records poor. No known regulation. Diversions for irrigation of about 90 acres (0.36 km^2) above station.

AVERAGE DISCHARGE. 24 years, 15.7 ft^3/s (0.445 m^3/s) 11,370 acre-ft/yr (14.0 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 6,360 ft^3/s, Apr. 7, 1952, gage height, 17.15 ft (5.227 m) from rating curve extended above 1,300 ft^3/s (36.8 m^3/s) on basis of slope-area measurement of peak flow; no flow at times.

Monthly and annual mean discharges 1948-72

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	8.13	0.90	2.07	1.47	0.71	1.1
November	3.67	.84	1.79	.68	.38	.9
December	3.53	.01	.90	.85	.94	.5
January	3.52	0	.39	.72	1.83	.2
February	38.3	0	3.20	8.54	2.67	1.6
March	282	.04	53.1	75.1	1.42	27.3
April	534	4.27	99.5	141	1.42	51.1
May	59.4	2.04	12.5	14.1	1.13	6.4
June	96.2	.84	13.4	22.4	1.68	6.9
July	26.4	.46	3.87	6.13	1.58	2.0
August	18.6	0	2.19	3.91	1.79	1.1
September	10.4	0	1.81	2.48	1.37	.9
Annual	45.1	3.32	15.7	11.1	.71	100

Magnitude and probability of annual low flow based on period of record 1948-71

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	0	0	0	0	0	---
3	0	0	0	0	0	---
7	0	0	0	0	0	---
15	0	0	0	0	0	---
30	0	0	0	0	0	---
60	0.03	0	0	0	0	---
90	.21	0.01	0	0	0	---
120	.54	.23	.14	0.09	0.05	---
183	3.07	1.28	.81	.55	.35	---

Magnitude and probability of instantaneous peak flow based on period of record 1948-72

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
354	982	2610	4280	7160	9920	13200

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1948-71

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	759	1810	2770	4250	5540	---
3	543	1260	1900	2860	3680	---
7	329	737	1100	1660	2140	---
15	186	402	600	918	1210	---
30	110	227	330	490	631	---
60	61.6	122	174	254	323	---
90	44.1	84.2	118	167	210	---

Duration table of daily mean flow for period of record 1948-71

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
290	35	13	7.4	5.0	2.8	2.0	1.5	1.05	0.65	0.18	0	---	---	---	---	---

MISSOURI RIVER MAIN STEM

06185500 MISSOURI RIVER NEAR CULBERTSON, MT

LOCATION.--Lat 48°07'24", long 104°28'30", in SE¼NW¼ sec.3, T.27 N., R.56 E., Richland County, Hydrologic Unit 10060005, on right bank at downstream side of bridge on State Highway 16, 3 mi (5 km) southeast of Culbertson, 9.6 mi (15.4 km) downstream from Big Muddy Creek, and at mile 1,620.76 (2,607.80 km).

DRAINAGE AREA.--91,557 mi^2 (237,133 km^2).

PERIOD OF RECORD.--July 1941 to December 1951, April 1958 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,883.4 ft (574.06 m) above mean sea level, datum of 1929 (Corps of Engineers bench mark). July 1 to Nov. 6, 1941, water-stage recorder at site 400 ft (120 m) upstream at datum 0.11 ft (0.034 m) higher. Nov. 7, 1941, to Aug. 17, 1950, water-stage recorder at site 580 ft (177 m) downstream at present datum. Aug. 18, 1950, to December 31, 1951, nonrecording gage on bridge at present datum. Apr. 1, 1958, to Nov. 1, 1967, water-stage recorder at site 500 ft (150 m) downstream at present datum.

REVISIONS.--WSP 1729: Drainage area.

REMARKS.--Water-discharge records good except for winter period which are poor. Flow partly regulated by Fort Peck Lake and many other reservoirs above station. Diversions for irrigation of about 1,030,400 acres (4,170 km^2) above station.

AVERAGE DISCHARGE.--27 years (1943-51, 1958-77, after operational level at Fort Peck Lake was reached), 10,710 ft^3/s (303.3 m^3/s), 7,759,000 acre-ft/yr (9.57 km^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 78,200 ft^3/s (2,210 m^3/s) Mar. 26, 1943, gage height, 14.80 ft (4.511 m), from rating curve extended above 30,000 ft^3/s (850 m^3/s); maximum gage height, 19.14 ft (5.834 m) Mar. 23, 1960 (backwater from ice); minimum daily discharge, 575 ft^3/s (16.3 m^3/s) Nov. 22, 1941.

Monthly and annual mean discharges 1942-51, 59-77

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	28570	1237	12320	6727	0.55	9.9
November	22440	1126	9826	4779	.49	7.9
December	15280	1061	8426	3303	.39	6.8
January	14340	1010	8769	3905	.45	7.1
February	17450	1167	9465	5195	.55	7.6
March	20690	2674	10350	5081	.49	8.4
April	21310	1965	10930	5122	.47	8.8
May	18240	1353	9326	5280	.57	7.5
June	26650	1366	9260	5878	.63	7.5
July	37050	1273	10240	6874	.67	8.3
August	25300	3823	12430	5597	.45	10
September	26590	4186	12680	6079	.48	10.2
Annual	16580	4083	10360	3141	.30	100

Magnitude and probability of annual low flow based on period of record 1942-51, 59-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	3380	1660	1080	735	460	---
3	3510	1740	1140	777	490	---
7	3800	1910	1260	871	555	---
15	4130	2130	1430	996	644	---
30	4510	2360	1590	1120	728	---
60	5160	2680	1780	1230	779	---
90	5840	3070	2040	1390	866	---
120	6320	3390	2270	1560	979	---
183	7680	4520	3200	2320	1550	---

Magnitude and probability of instantaneous peak flow based on period of record 1942-51, 59-77

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%
17400	24300	33800	40000	47700	53400	59000

Weighted skew = -0.15

Magnitude and probability of annual high flow based on period of record 1942-51, 59-77

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	22400	31900	39900	52100	62900	---
3	21800	30200	36700	46100	54000	---
7	20900	28100	33500	40900	46900	---
15	19700	25800	29800	35000	39000	---
30	17900	23100	26600	31000	34400	---
60	15800	20300	23500	27800	31100	---
90	14200	18300	21100	24900	27800	---

Duration table of daily mean flow for period of record 1942-51, 59-77

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	97%	98.5%	99.9%
29500	21000	17500	16000	15000	13200	11400	9600	8100	6900	5300	3150	1650	1220	1100	1010	750

Statistical Data for Base Period 1940-75

for Key Stations

05019500 RUBY RIVER ABOVE RESERVOIR, NEAR ALDER, MT

LOCATION.--Lat 45°10'31", long 112°08'52", in SW¼SW¼ sec.31, T.7 S., R.4 W., Madison County, Hydrologic Unit 10020003, on left bank at Puller Hot Springs 0.4 mi (0.6 km) upstream from Cottonwood Creek, 6 mi (10 km) upstream from Ruby Dam, and 10.5 mi (16.9 km) south of Alder.

DRAINAGE AREA.--538 mi^2 (1,393 km^2).

PERIOD OF RECORD.--May 1938 to current year. Monthly discharge only for May 1938, published in WSP 1309.

REVISED RECORDS.--WSP 1309: 1938(M). WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 5,440.2 ft (1,658.17 m) above mean sea level (river-profile survey). Prior to October 1, 1938, nonrecording gage at bridge 1,500 ft (457 m) downstream at datum 5.2 ft (1.58 m) lower. Oct. 1, 1938, to August 5, 1955, water-stage recorder at site 500 ft (152 m) downstream at datum 0.5 ft (0.15 m) lower.

REMARKS.--Records good. Diversions for irrigation of about 3,000 acres (12.1 km^2) above station.

AVERAGE DISCHARGE.--39 years, 177 ft^3/s (5.02 m^3/s), 128,200 acre-ft/yr (158 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,670 ft^3/s (47.3 m^3/s) June 10, 1970, gage height, 5.62 ft (1.713 m); minimum daily, 35 ft^3/s (0.99 m^3/s) Jan. 23, 1962.

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	161	83.40	117	20.4	0.17	5.50
November	152	87.80	122	15.5	.13	5.80
December	170	80.30	111	16.5	.15	5.30
January	158	69.80	103	16.0	.16	4.80
February	135	79.20	102	12.7	.13	4.80
March	181	84.30	108	20.9	.19	5.10
April	288	94.60	158	51.2	.32	7.40
May	694	221	403	128	.32	9.0
June	1045	202	476	203	.43	22.5
July	482	74.80	192	81.6	.43	9.00
August	235	59.30	119	32.6	.28	5.60
September	156	75.60	110	21.5	.19	5.20
Annual			177	36.7	.21	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	78.2	62.7	54.2	47.1	39.5	
3	79.9	64.4	56.0	49.2	41.8	
7	82.6	67.8	59.9	53.5	46.6	
15	87.0	72.9	65.3	59.2	52.4	
30	92.1	79.2	72.3	66.7	60.5	
60	95.7	84.6	79.3	75.0	70.4	
90	97.5	88.1	84.1	81.2	78.4	
183	102	92.6	88.4	85.3	82.2	
273	108	97.7	93.1	89.8	86.4	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	1.25	2	10	25	50	100
	80%	50%	10%	4%	2%	1%
1	818	1070	1240	1440	1580	
3	764	1000	1150	1330	1470	
7	696	908	1040	1200	1320	
15	617	811	936	1090	1200	
30	544	710	820	958	1060	
60	436	565	649	752	828	
90	357	458	521	599	654	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	2%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
880	530	360	270	195	148	128	120	112	105	98	90	84	76	69	62	50

06025500 BIG HOLE RIVER NEAR MELROSE, MT

LOCATION.--Lat 45°31'36", long 112°42'03", in SE¼SE¼SW¼ sec.34, T.3 S., R.9 W., Madison County, Hydrologic Unit 10020004, on left bank at downstream side of bridge on Interstate Highway 15 and U. S. Highway 91, 0.1 mi (0.2 km) downstream from Rock Creek, and 7 mi (11 km) south of Melrose.

DRAINAGE AREA.--2,476 mi^2 (6,413 km^2).

PERIOD OF RECORD.--October 1923 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 5,032.87 ft (1,534.018 m) above mean sea level. Prior to June 14, 1927, water-stage recorder, and July 17, 1927, to Sept. 30, 1931, nonrecording gage, at site 1.7 mi (2.7 km) upstream at different datum.

REMARKS.--Records good except those for winter period, which are fair. Diversions for irrigation of about 136,000 acres (550 km^2) above station.

AVERAGE DISCHARGE.--54 years, 1,157 ft^3/s (32.77 m^3/s), 838,200 acre-ft/yr (1.03 km^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 23,000 ft^3/s (651 m^3/s) June 14, 1927, when Wise River Reservoir dam failed (gage-height, 14.0 ft or 4.27 m, from floodmark, site and datum then in use), from rating curve extended above 8,000 ft^3/s (227 m^3/s); maximum discharge unaffected by dam failure, 14,300 ft^3/s (405 m^3/s) June 10, 1972, gage height, 8.04 ft (2.451 m); minimum observed, 49 ft^3/s (1.39 m^3/s) Aug. 17, 1931, gage height, 0.70 ft (0.213 m), site and datum then in use.

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	1109	262	522	205	0.39	3.50
November	886	314	519	132	.25	3.50
December	736	243	394	108	.27	2.70
January	530	229	343	77.0	.22	2.30
February	800	246	359	105	.28	2.50
March	852	265	450	135	.30	3.00
April	3515	490	1536	742	.48	10.40
May	7174	1499	3611	1495	.41	24.40
June	8380	1173	4639	1955	.42	31.30
July	4120	356	1511	766	.51	10.20
August	1457	127	528	257	.49	3.60
September	870	190	393	180	.46	2.60
Annual			1235	337	.27	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	206	156	131	112	91.2	
3	215	164	138	117	95.6	
7	229	174	146	124	101	
15	243	184	154	131	108	
30	276	210	176	148	120	
60	313	251	219	193	166	
90	339	285	259	239	218	
120	363	312	289	272	255	
183	416	350	323	304	285	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	7920	10700	12200	13700	14600	
3	7610	10200	11500	12800	13600	
7	6950	9390	10700	12000	12800	
15	6230	8500	9710	11000	11700	
30	5490	7380	8310	9200	9710	
60	4290	5640	6300	6930	7290	
90	3500	4550	5070	5580	5870	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
10	20	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%
8300	5200	3400	2350	1750	900	630	490	420	370	328	280	240	204	175	142	96

06041000 MADISON RIVER BELOW ENNIS LAKE, NEAR MCALLISTER, MT

LOCATION.--Lat 45°29'25", long 111°38'00", in NW¼ sec.17, T.4 S., R.1 E., Madison County, Hydrologic Unit 10020007, on right bank 500 ft (152 m) downstream from Madison powerplant, 1.5 mi (2.4 km) downstream from Ennis Lake, and 5.7 mi (9.2 km) northeast of McAllister.

DRAINAGE AREA.--2,186 mi^2 (5,662 km^2).

PERIOD OF RECORD.--October 1901 to December 1905, October 1906 to current year. Prior to October 1938 adjusted monthly runoff only, published in WSP 1309. Published as "below Madison Reservoir" 1938-49. Records published as "near Red Bluff" 1890-94 and as "near Norris" 1910 are not equivalent and are published as "near Norris" in WSP 1309.

REVISED RECORDS.--WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 4,700 ft (1,433 m), from topographic map. Prior to May 7, 1941, non-recording gage in wooden stilling well at present site at different datum. May 7, 1941, to Jan. 13, 1945, nonrecording gages in concrete stilling well at present site and datum.

REMARKS.--Water-discharge records good. Flow regulated by Hebgen and Ennis Lakes. Diversions for irrigation of about 23,000 acres (93.1 km^2) above station.

AVERAGE DISCHARGE.--39 years (1938-77), 1,762 ft^3/s (49.90 m^3/s), 1,277,000 acre-ft/yr (1.57 km^3/yr), unadjusted.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,550 ft^3/s (270 m^3/s) June 12, 1970, gage height, 8.01 ft (2.441 m); minimum daily, 210 ft^3/s (5.95 m^3/s) Aug. 25, 26, 1959.

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	2963	810	1976	583	0.30	9.30
November	3318	961	1959	575	.29	9.30
December	3243	975	1531	371	.24	7.20
January	1769	767	1396	241	.17	6160
February	2336	761	1394	296	.21	6.60
March	2020	891	1384	312	.23	6.60
April	3008	717	1532	619	.40	7.20
May	4189	859	1839	704	.38	8.70
June	5180	1142	3023	1073	.35	14.30
July	3454	972	1877	560	.30	8.90
August	2339	1044	1576	273	.17	7.50
September	2298	934	1648	355	.22	7.80
Annual			1761	308	.18	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	892	678	535	416	295	
3	943	732	590	472	347	
7	981	781	667	573	472	
14	1030	821	712	624	530	
30	1080	875	776	698	616	
60	1170	974	877	801	720	
90	1250	1050	945	861	769	
120	1300	1100	997	910	814	
183	1400	1190	1070	984	886	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.45	2	5	10	25	50	100
69%	50%	20%	10%	4%	2%	1%

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	4640	6090	6980	8020	8760	
3	4460	5840	6670	7660	8350	
7	4150	5380	6110	6960	7550	
15	3780	4810	5400	6070	6510	
30	3380	4210	4650	5120	5420	
60	2810	3440	3760	4100	4300	
90	2450	2980	3290	3620	3850	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.33%	99.67%
4750	3300	2750	2400	2200	1900	1700	1550	1480	1380	1220	1040	900	810	740	670	520

GALLATIN RIVER BASIN

06043500 GALLATIN RIVER NEAR GALLATIN GATEWAY, MT

LOCATION.--Lat 45°29'51", long 111°16'09", in SE¼SE¼SE¼ sec.7, T.4 S., R.4 E., Gallatin County, Hydrologic Unit 10020008, on left bank 0.3 mi (0.5 km) downstream from Spanish Creek, 7.3 mi (11.7 km) south of Gallatin Gateway, and at mile 42.5 (68.4 km).

DRAINAGE AREA.--825 mi^2 (2,137 km^2).

PERIOD OF RECORD.--August 1889 to September 1894, June 1930 to September 1969, annual maximum, water years 1970-71, October 1971 to current year. Monthly discharge only for some periods, published in WSP 1309. Published as West Gallatin River near Bozeman 1889-94.

REVISED RECORDS.--WSP 1389: 1892(M), 1893-94. WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 5,167.7 ft (1,575.11 m) above mean sea level. Prior to Oct. 20, 1932, non-recording gages at several different sites and datums within 0.8 mi (1.3 km) of present site.

REMARKS.--Records good. Diversions for irrigation of about 1,400 acres (5.67 km^2) above station.

AVERAGE DISCHARGE.--50 years, 814 ft^3/s (23.05 m^3/s), 589,700 acre-ft/yr (727 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 9,690 ft^3/s (274 m /s) June 17, 1974, gage height, 7.38 ft (2.249 m); minimum, 117 ft^3/s (3.31 m^3/s) Jan. 19, 1935, gage height, 0.68 ft (0.207 m).

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	721	334	466	100	0.22	4.60
November	589	275	391	73.0	.19	3.90
December	488	234	323	55.6	.17	3.20
January	428	228	306	49.1	.16	3.00
February	407	227	305	46.6	.15	3.00
March	465	236	310	55.1	.18	3.10
April	856	287	481	157	.33	4.80
May	3038	873	1753	545	.31	17.4
June	5056	1534	3142	883	.28	31.3
July	3669	602	1430	602	.42	14.2
August	998	424	640	150	.23	6.40
September	788	371	517	99.9	.19	5.10
Annual			839	154	.18	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	236	205	191	180	170	
7	246	212	197	185	173	
30	260	225	210	198	186	
15	271	238	223	212	201	
30	284	252	237	227	216	
60	291	259	244	234	223	
90	296	262	248	237	226	
120	301	267	253	242	232	
183	330	292	276	264	253	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
2	5	10	25	50	100	
50%	20%	10%	4%	2%	1%	

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	4850	6100	6860	7760	8390	
7	4600	5810	6560	7450	8080	
30	4260	5390	6070	6890	7480	
15	3830	4800	5380	6060	6540	
30	3330	4120	4590	5140	5510	
60	2550	3220	3540	3910	4160	
90	2110	2560	2800	3080	3260	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99%	
4900	3100	2200	1500	1050	660	520	440	385	350	310	270	250	230	228	220	200

GALLATIN RIVER BASIN

06052500 GALLATIN RIVER AT LOGAN, MT

LOCATION.--Lat 45°53'07", long 111°26'15", in NE¼ sec.35, T.2 N., R.2 E., Gallatin County, Hydrologic Unit 10020008, on right bank at former county road bridge site, 0.5 mi (0.8 km) west of Logan and 6 mi (10 km) upstream from mouth.

DRAINAGE AREA.--1,795 mi^2 (4,649 km^2).

PERIOD OF RECORD.--September 1893 to December 1905, August 1928 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1389: 1898-99, 1903, 1905, 1929(M), 1935-36(M), 1938-39(M), 1941(M). WSP 1559: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 4,086.42 ft (1,245.541 m) above mean sea level. Prior to Aug. 10, 1928, nonrecording gages at several sites within 0.5 mi (0.8 km) of present site at various datums. Aug. 10, 1928, to Oct. 2, 1941, nonrecording gage at present site and datum.

REMARKS.--Records good except those for winter period, which are fair. Some regulation by Middle Creek Reservoir. Diversions for irrigation of about 110,000 acres (445 km^2) above station.

AVERAGE DISCHARGE.--61 years, 1,053 ft^3/s (29.82 m^3/s), 762,900 acre-ft/yr (941 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge observed, 9,840 ft^3/s (279 m^3/s) June 21, 1899, gage height, 8.25 ft (1.905 m), site and datum then in use; maximum gage height, 11.88 ft (3.621 m) Feb. 5, 1963, from floodmark (backwater from ice); minimum discharge observed, 130 ft^3/s (3.68 m^3/s) July 19, 1939, gage height 2.04 ft (0.622 m).

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	1218	524	824	210	0.25	6.00
November	1177	567	889	156	.18	6.50
December	1011	580	807	106	.13	5.90
January	913	539	722	101	.14	5.30
February	1249	569	757	126	.17	5.50
March	1290	626	850	131	.15	6.20
April	1993	574	1122	334	.30	8.20
May	4540	771	2148	813	.38	15.70
June	5675	981	3186	1347	.42	23.1
July	3899	292	1131	706	.62	8.20
August	1022	327	537	179	.33	3.90
September	1269	443	754	201	.27	5.50
Annual			1143	270	.24	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	357	292	265	245	224	
3	365	298	270	249	228	
7	381	310	280	258	235	
14	402	327	294	269	244	
30	442	353	315	288	261	
60	533	421	371	333	296	
90	655	529	465	415	360	
120	746	666	627	595	551	
183	798	702	655	617	576	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.33	2	5	10	25	50	100
75%	50%	20%	10%	4%	2%	1%

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive Days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	5010	6690	7620	8630	9290	
3	4770	6370	7250	8200	8810	
7	4380	5870	6690	7590	8180	
15	3910	5320	6130	7020	7610	
30	3430	4670	5370	6130	6630	
60	2750	3700	4220	4790	3150	
90	2250	2990	3400	3840	4120	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	25%	30%	35%	40%	50%	60%	70%	80%	85%	90%	95%	98%
5600	3350	2300	1650	1250	1000	890	820	770	710	630	520	410	345	310	290	240

MISSOURI RIVER MAIN STEM

06054500 MISSOURI RIVER AT TOSTON, MT

LOCATION.--Lat 46°08'46", long 111°25'18", in SE¼NW¼ sec.36, T.5 N., R.2 E., Broadwater County, Hydrologic Unit 10030101, on left bank 2 mi (3 km) southeast of Toston, 4.8 mi (7.7 km) upstream from Crow Creek, 7.8 mi (12.6 km) downstream from Sixteenmile Creek, and at mile 2,296.1 (3,694.4 km).

DRAINAGE AREA.--14,669 mi^2 (37,993 km^2).

PERIOD OF RECORD. April 1890 to February 1891, April 1910 to December 1916, April 1941 to current year. Monthly discharge only for some periods, published in WSP 1309.

GAGE.--Water-stage recorder. Datum of gage is 3,905.68 ft (1,190.451 m) above mean sea level. Prior to Dec. 20, 1916, non-recording gages at site 2.5 mi (4.0 km) downstream at different datums.

REMARKS.--Water-discharge records excellent. Some regulation by six reservoirs on tributaries and Clark Canyon Reservoir. Diversions for irrigation of about 555,400 acres (2,250 km^2) of which 12,000 acres (48.6 km^2) lies below station.

AVERAGE DISCHARGE.--42 years, 5,371 ft^3/s (152.0 m^3/s), 3,891,000 acre-ft/yr (4.80 km^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 32,000 ft^3/s (906 m^3/s) June 6, 1948, gage height, 11.77 ft (3.587 m); minimum, 562 ft^3/s (15.9 m^3/s) Apr. 30, 1941, gage height, 1.68 ft (0.512 m).

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	5938	2875	4378	801	0.18	7.00
November	6550	3673	4757	744	.16	7.60
December	5968	2816	3816	565	.15	6.10
January	4219	2464	3411	461	.14	5.50
February	4872	2648	3744	523	.14	6.00
March	5676	2835	4043	690	.17	6.50
April	10090	2388	5658	1926	.34	9.10
May	14710	3127	8554	3186	.37	13.7
June	21330	3997	12750	4891	.38	20.4
July	14240	1389	5239	2514	.48	8.40
August	5729	1072	2640	891	.34	4.20
September	5004	2031	3421	736	.22	5.50
Annual			5230	1010	.19	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	1710	1250	1020	852	681	
3	1790	1320	1090	922	749	
7	1980	1490	1250	1060	858	
15	2200	1650	1360	1140	914	
30	2460	1830	1510	1260	1010	
60	2770	2120	1790	1530	1260	
90	3280	2640	2280	1980	1650	
120	3630	3180	2910	2680	2420	
183	3960	3520	3270	3060	2820	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
2	5	10	25	50	100	
50%	20%	10%	4%	2%	1%	

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	18400	24000	27000	30300	32300	
3	18000	23500	26400	29600	31500	
7	17100	22400	25200	28200	30000	
15	15600	20600	23200	26100	27900	
30	13900	18200	20700	23300	25000	
60	11300	14500	16200	17900	19000	
90	9600	12200	13600	15000	15900	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	2%	5%	10%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99%	99.5%
20500	14000	9600	7400	6200	5000	4400	4100	3800	3500	3100	2500	2100	1700	1400	1150	880

SUN RIVER BASIN

06089000 SUN RIVER NEAR VAUGHN, MT

LOCATION.--Lat 47°31'37", long 111°29'05", in NW¼SE¼SW¼ sec.33, T.21 N., R.2 E., Cascade County, Hydrologic Unit 10030104, on right bank 3.7 mi (6.0 km) downstream from Muddy Creek, 3.6 mi (5.8 km) southeast of Vaughn, and at mile 14.6 (23.5 km).

DRAINAGE AREA.--1,854 mi^2 (4,802 km^2).

PERIOD OF RECORD.--July to October 1897 (gage heights and discharge measurements only, published as "near Great Falls"), April 1934 to current year. Monthly discharge only for April 1934, published in WSP 1309.

REVISED RECORDS.--WSP 786: 1934. WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 3,317.12 ft (1,011.058 m) above mean sea level. July 11 to Oct. 30, 1897, non-recording gage at site 0.8 mi (1.3 km) upstream at different datum. Apr. 19 to Aug. 3, 1934, nonrecording gage at present site and datum.

REMARKS.--Water-discharge records good except those for winter period, which are poor. Flow regulated by Gibson, Pishkun, Willow Creek, and Nilan Reservoirs. Diversions for irrigation of about 170,000 acres (445 km^2) above station.

AVERAGE DISCHARGE.--43 years, 735 ft^3/s (20.82 m^3/s), 532,500 acre-ft/yr (657 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 53,500 ft^3/s (1,520 m^3/s) June 9, 1964, 42,200 ft^3/s (1,200 m^3/s) in main channel, plus 11,300 ft^3/s (320 m^3/s) in bypass channel, gage height, 23.4 ft (7.13 m), from floodmark; minimum, 20 ft^3/s (0.566 m^3/s) April 24, 1944.

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	779	227	394	123	0.31	4.20
November	623	163	342	104	.30	3.70
December	618	154	309	107	.35	3.30
January	494	118	261	84.1	.32	2.80
February	489	143	272	86.0	.32	2.90
March	868	133	340	175	.51	3.70
April	2058	93.30	500	390	.78	5.40
May	3620	87.10	1609	963	.60	17.3
June	8014	280	3269	2181	.67	35.2
July	2508	333	915	560	.61	9.80
August	1025	250	612	179	.29	6.60
September	796	242	473	116	.25	5.10
Annual			774	296	.38	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	141	86.4	63.4	47.6	33.4	
3	150	96.2	72.4	55.6	40.1	
7	158	106	83.8	67.7	52.3	
14	168	121	101	87.5	73.9	
30	191	143	122	106	91.2	
60	218	164	141	124	106	
90	238	184	159	141	123	
120	255	198	172	153	133	
183	295	225	193	169	145	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	6400	11600	15100	19400	22400	
3	6040	10500	13300	16300	18200	
7	5340	8750	10500	12300	13200	
15	4440	7090	8430	9680	10400	
30	3470	5620	6790	7960	8640	
60	2440	3880	4680	5500	6000	
90	1880	2920	3520	4150	4550	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time															
1%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	99.5%	99.9%
6700	3100	1650	980	770	550	450	380	330	290	245	200	160	128	108	94	66

MISSOURI RIVER MAIN STEM

06090800 MISSOURI RIVER AT FORT BENTON, MT

LOCATION.--Lat 47°49'03", long 110°39'59", in SE¼SE¼ sec.23, T.24 N., R.8 E., Chouteau County Hydrologic Unit 10030102, on left bank at downstream side of abandoned highway bridge at Fort Benton, 3.8 mi (6.1 km) upstream from Shonkin Creek, and at mile 2,073.2 (3,335.8 km).

DRAINAGE AREA.--24,749 mi^2 (64,100 km^2).

PERIOD OF RECORD.--October 1890 to current year. Records for June 1881 to September 1890, published in WSP 546 and 761, have been found to be unreliable and should not be used.

REVISED RECORDS.--WSP 746: 1932. WSP 1146: 1891-1907, 1908(M), 1909-18, 1937-38. WSP 1209: 1948(P). WSP 1309: 1929(M). WSP 1629: Drainage area. See also PERIOD OF RECORD.

GAGE.--Water-stage recorder. Datum of gage is 2,614.05 ft (796.762 m) above mean sea level. Prior to Oct. 11, 1920, non-recording gages, and Oct. 11, 1920, to Apr. 25, 1924, water-stage recorder, all at present site at datum 1.00 ft (0.305 m) higher.

REMARKS.--Records good. Flow regulated by 18 smaller irrigation reservoirs and powerplants, Clark Canyon Reservoir, and Canyon Ferry Reservoir. Diversions for irrigation of about 750,400 acres (3,040 km^2) above station. Extreme diurnal fluctuation caused by powerplant at Morony Dam.

AVERAGE DISCHARGE.--87 years, 7,760 ft^3/s (219.8 m^3/s), 5,622,000 acre-ft/yr (6.93 km^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge observed, about 140,000 ft^3/s (3,960 m^3/s) June 6, 1908, gage height, 18.5 ft (5.64 m), present datum, from rating curve extended above 63,000 ft^3/s (1,780 m^3/s); minimum, 320 ft^3/s (9.06 m^3/s) July 5, 1936, gage height, -0.50 ft (-0.15 m); minimum daily, 627 ft^3/s (17.8 m^3/s) July 5, 1936.

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	12610	3150	5506	1641	0.30	6.00
November	10850	3284	5758	1490	.26	6.30
December	11640	3244	5733	1399	.24	6.20
January	8199	3152	5632	1304	.23	6.10
February	8783	3033	5918	1453	.25	6.40
March	10750	3931	6428	1592	.25	7.00
April	14810	3574	7933	2953	.37	8.70
May	22080	4144	12430	5161	.42	13.6
June	36690	5374	17400	8225	.46	19.0
July	23170	3393	8688	3987	.46	9.50
August	9225	3038	5227	1458	.28	5.70
September	8428	2920	5044	1330	.26	5.50
Annual			7639	1655	.24	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	2910	2260	1970	1760	1540	
3	3460	2830	2550	2350	2140	
7	3890	3230	2940	2710	2480	
14	4050	3370	3060	2830	2590	
30	4240	3530	3200	2960	2700	
60	4510	3780	3440	3190	2920	
90	4960	4250	2920	3660	3380	
120	5310	4540	4150	3840	3500	
183	5670	4780	4360	4020	3660	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
2	5	10	25	50	100	
50%	20%	10%	4%	2%	1%	

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	23400	36200	45800	59500	70600	
3	22900	34800	43300	54600	63500	
7	22100	32400	39100	47500	53500	
15	20400	29300	34700	41200	45700	
30	18200	25800	30400	35700	39300	
60	15200	21000	24300	28000	30400	
90	12900	17700	20500	23900	26200	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	2%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.8%
29500	20000	14000	11000	9100	7300	6400	5900	5500	5100	4700	4000	3500	3100	2900	2500	2300

MARIAS RIVER BASIN

06099500 MARIAS RIVER NEAR SHELBY, MT

LOCATION.--Lat 48°25'38", long 111°53'20", in E½NW¼SE¼ sec.20, T.31 N., R.2 W., Toole County, Hydrologic Unit 10030203, on left bank 200 ft (61 m) downstream from bridge on U. S. Highway 91, 5.1 mi (8.2 km) south of Shelby, 24 mi (39 km) downstream from Cut Bank Creek, and at mile 168 (270 km).

DRAINAGE AREA.--3,242 mi^2 (8,397 km^2), of which 518 mi^2 (1,342 km^2) is probably noncontributing.

PERIOD OF RECORD.--April 1902 to December 1904, May 1905 to December 1906, May 1907 to January 1908, April 1911 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1309: 1903-4, 1918, 1921, 1933, 1935, 1947. WSP 1509: 1902, 1912(M), 1916, 1943(M). WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 3,087.72 ft (941.137 m) above mean sea level. Prior to Dec. 23, 1947, nonrecording gage or water-stage recorder at several sites within 1,000 ft (305 m) of present site at approximately the same datum.

REMARKS.--Records good except those for winter period, which are poor. Some regulation by Lower Two Medicine Lake, Four Horns Reservoir, Swift Reservoir and Lake Frances, having a combined capacity of 172,630 acre-ft (213 hm^3). Diversions for irrigation of about 50,000 acres (202 km^2) above station and about 15,000 acres (60.7 km^2) below.

AVERAGE DISCHARGE.--69 years, (1902-4, 1905-6, 1911-77), 953 ft^3/s (26.99 m^3/s), 690,500 acre-ft/yr (851 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 241,000 ft^3/s (6,830 m^3/s) June 9, 1964, largely due to failure of Swift Dam, gage height, 23.64 ft (7.205 m), from floodmark, from rating curve extended above 34,000 ft^3/s (963 m^3/s) on basis of slope-area measurement of peak flow; minimum observed, 10 ft^3/s (0.283 m^3/s) Aug. 20, 1919.

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	1448	125	414	241	0.58	3.50
November	793	132	356	146	.41	3.00
December	768	120	294	153	.52	2.50
January	478	90.5	234	91.3	.39	2.00
February	779	96.6	312	172	.55	2.60
March	2300	164	627	504	.80	5.20
April	2359	373	1128	560	.50	9.50
May	4801	744	2891	1023	.35	24.1
June	10190	711	3706	2492	.67	31.1
July	3430	147	1199	799	.65	10.0
August	1052	143	402	225	.56	3.40
September	1133	134	365	196	.54	3.10
Annual			995	375	.38	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	109	81.6	71.0	63.6	56.6	
7	115	86.3	74.7	66.6	58.7	
14	127	96.0	83.8	75.3	67.1	
30	142	107	93.8	84.3	75.2	
60	162	124	110	100	91.1	
90	194	148	129	116	103	
183	223	170	149	134	119	
273	253	191	166	148	130	
183	342	241	202	174	148	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	5500	11900	20600	41200	68700	
3	5290	10600	16700	29400	44100	
7	4800	8750	12600	19200	25900	
15	4320	7240	9560	13000	15800	
30	3850	6040	7570	9540	11000	
60	3150	4700	5690	6880	7730	
90	2560	3770	4520	5410	6020	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	2%	10%	15%	20%	30%	40%	50%	60%	70%	80%	85%	90%	95%	98%	99.5%	99.9%
6600	4400	2700	1900	1400	770	530	410	330	270	220	170	140	115	100	81	74

MISSOURI RIVER MAIN STEM

06109500 MISSOURI RIVER AT VIRGELLE, MT

LOCATION.--Lat 48°00'14", long 110 15'19", in SW¼SW¼SE¼ sec.13, T.26 N., R.11 E., Chouteau County, Hydrologic Unit 10040101, on left bank 0.2 mi (0.3 km) upstream from Virgelle Ferry, 0.6 mi (1.0 km) southwest of Virgelle, 3.4 mi (5.5 km) downstream from Spring Coulee, and at mile 2,032.6 (3,270.5 km).

DRAINAGE AREA.--34,379 mi (89,042 km).

PERIOD OF RECORD.--February 1935 to current year. Prior to October 1953, published as "at Loma."

REVISED RECORDS.--WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 2,507.50 ft (764.286 m) above mean sea level. Prior to Sept. 30, 1953, water-stage recorder at Loma, 18 mi (29 km) upstream, at datum 2,543.40 ft (775.228 m) above mean sea level.

REMARKS.--Water-discharge records excellent except those for winter period, which are good. Flow regulated by 23 smaller irrigation reservoirs and powerplants, Clark Canyon Reservoir, Canyon Ferry Reservoir and Tiber Reservoir. Diversions for irrigation of about 850,400 acres (3,440 km) above station.

AVERAGE DISCHARGE.--42 years, 8,547 ft /s (242.4 m /s), 6,207,000 acres-ft/yr (7.65 km /yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 122,000 ft /s (3,460 m /s) June 5, 1953, gage height, 23.4 ft (7.13 m), from floodmark, from rating curve for former site at Loma extended above 66,000 ft /s (1,870 m /s), adjusted to present site; minimum daily, 638 ft /s (18.1 m /s) July 5, 1936.

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	15340	3562	6283	1982	0.32	5.90
November	12470	3556	6424	1633	.25	6.00
December	12220	3432	6241	1482	.24	5.90
January	8881	3177	6047	1419	.23	5.70
February	10240	3179	6517	1657	.25	6.10
March	12360	4405	7386	2022	.27	7.00
April	17720	4062	9241	3439	.37	8.70
May	27150	4855	14680	5883	.40	13.8
June	51960	7169	21060	10770	.51	19.8
July	29670	3704	10460	5060	.48	9.80
August	11880	3358	6154	2040	.33	5.80
September	11590	3207	5842	1747	.30	5.50
Annual			8859	2209	.25	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	3500	2770	2440	2190	1930	
3	3960	3250	2930	2700	2460	
7	4480	3740	3390	3130	2860	
15	4670	3910	3550	3280	2990	
30	4840	4020	3640	3350	3040	
60	5120	4270	3870	3550	3230	
90	5600	4750	4320	3980	3610	
120	5940	5020	4540	4150	3710	
183	6380	5330	4800	4370	3910	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
2	5	10	25	50	100	200
50%	20%	10%	4%	2%	1%	0.5%

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	26700	44000	59100	83300	106000	
3	26200	42100	55300	75600	93500	
7	25300	38900	49300	63900	75000	
15	23600	35200	43500	54600	63200	
30	21200	31000	37600	46000	52300	
60	17900	25100	29500	34700	38300	
90	15300	21200	24800	29300	32400	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	25%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99.5%	99.9%
37000	22000	16000	13000	10500	8400	7400	6700	6100	5600	5100	4500	3900	3500	3200	2900	2500

06110000 JUDITH RIVER NEAR UTICA, MT

LOCATION.--Lat 46°53'30", long 110°13'54", in NW¼ sec.17, T.13 N., R.12 E., Judith Basin County, on left bank at Noel Ranch, 4 mi (6 km) downstream from confluence of South and Middle Forks, 9 mi (14 km) southwest of Utica, and at mile 99.3 (159.8 km).

DRAINAGE AREA.--328 mi^2 (850 km^2).

PERIOD OF RECORD.--October 1919 to September 1975. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 896[illegible] 1939. WSP 1309: 1920, 1922(M), 1925, 1927(M), 1929-30, 1931(M), 1936(M), 1938(M).

GAGE.--Water-stage recorder. Concrete control since October 1938. Altitude of gage is 4,790 ft (1,460 m), by barometer. Prior to June 6, 1937, nonrecording gage at present site and datum.

REMARKS.--Records good except those for winter period which are fair. Few minor diversions for irrigation of hay meadows above station.

AVERAGE DISCHARGE.--56 years, 54.8 ft^3/s (1.552 m^3/s), 39,700 acre-ft/yr (49.0 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 1,750 ft^3/s (49.6 m^3/s) June 20, 1975, gage height, 6.52 ft (1.987 m); no flow Mar. 19-21, 1933.

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	50.40	1.77	12.8	8.91	0.69	1.90
November	28.0	1.31	9.01	5.13	.57	1.30
December	14.90	1.01	5.79	2.82	.49	.80
January	8.46	.64	3.46	1.64	.47	.50
February	5.73	.53	2.52	1.25	.50	.40
March	16.10	.54	2.79	2.88	1.03	.40
April	106	.43	19.6	27.0	1.38	2.80
May	475	8.87	197	101	.52	28.4
June	835	66.30	305	183	.60	44.0
July	286	9.61	88.0	54.7	.62	12.7
August	77.0	6.15	29.8	18.5	.62	4.30
September	50.80	3.35	17.3	10.6	.61	2.50
Annual			57.8	27.2	.47	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	[illegible]	[illegible]	10	20	50	100
	[illegible]%	[illegible]%	10%	[illegible]%	[illegible]%	[illegible]%
1	1.33	0.74	0.54	0.41	0.29	
7	1.33	.78	.58	.45	.33	
[illegible]	1.42	.84	.62	.48	.35	
14	1.52	.91	.68	.53	.40	
30	1.70	1.05	.79	.63	.47	
60	1.94	1.20	.91	.72	.54	
90	2.25	1.37	1.02	.79	.58	
120	2.66	1.55	1.13	.86	.61	
183	4.32	2.37	1.66	1.21	.83	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	100
[illegible]%	[illegible]%	[illegible]%	10%	[illegible]%	[illegible]%	1%

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	[illegible]	[illegible]	[illegible]	25	50	100
	[illegible]%	[illegible]%	[illegible]%	[illegible]%	[illegible]%	[illegible]%
1	464	754	963	1240	1460	
3	447	716	903	1150	1330	
[illegible]	413	648	807	1010	1150	
15	368	574	710	876	995	
30	324	503	616	748	840	
60	248	378	454	538	592	
90	190	288	344	402	439	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	[illegible]%	[illegible]%	[illegible]%	[illegible]%	0.5%	[illegible]%	[illegible]%	[illegible]%	[illegible]%	[illegible]%	[illegible]%	50.5%	99.5%
620	320	180	110	68	27	15	9.2	6.0	3.9	2.6	1.6	1.3	.84	.60	.52	.4

06115200 MISSOURI RIVER NEAR LANDUSKY, MT

LOCATION.--Lat 47°37'51", long 108°41'13", in NW¼NE¼ sec.31, T.22 N., R.24 E., Fergus County, Hydrologic Unit 10040104, Fort Peck Game Range, on right bank 330 ft (125 m) upstream from bridge on U. S. Highway 191, 0.9 mi (1.4 km) upstream from Armells Creek, 20 mi (32 km) south of Landusky, and at mile 1,921.61 (3,091.87 km).

DRAINAGE AREA.--40,987 mi^2 (106,156 km^2). Area at site used prior to Dec. 13, 1968, 40,763 mi^2 (105,576 km^2).

PERIOD OF RECORD.--February 1934 to current year. Prior to October 1968, published as "at powerplant ferry, near Zortman."

REVISED RECORDS.--WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 2,239.96 ft (682.740 m) above mean sea level (State Highway bench mark). Prior to Feb. 7, 1935, nonrecording gage, and Feb. 7, 1935, to Dec. 12, 1968, water-stage recorder, at site 16.5 mi (26.5 km) upstream at datum 33.06 ft (10.077 m) higher.

REMARKS.--Water-discharge records good except for those for winter period, which are poor. Flow regulated by 24 smaller irrigation reservoirs and powerplants, Clark Canyon Reservoir, Canyon Ferry Reservoir and Tiber Reservoir. Diversions for irrigation of about 870,400 acres (3,520 km^2) above station.

AVERAGE DISCHARGE.--43 years, 9,288 ft^3/s (263.0 m^3/s), 6,729,000 acre-ft/yr (8.30 km^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 137,000 ft^3/s (3,880 m^3/s) June 6, 1953, gage height, 22.20 ft (6.767 m), from graph based on gage readings, site and datum then in use; maximum gage height, 30.16 ft (9.193 m) Mar. 19, 1947 (ice jam), from floodmark, site and datum then in use; minimum discharge, 1,120 ft^3/s (31.7 m^3/s) July 8, 1936.

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	16480	3847	6823	2071	0.30	5.8
November	13920	3701	6975	1755	.25	6.0
December	13180	3759	6745	1612	.24	5.8
January	9742	3466	6408	1427	.22	5.5
February	11380	3703	7074	1823	.26	6.1
March	16200	5089	8581	2479	.29	7.4
April	19240	4338	10240	3820	.37	8.7
May	30510	5257	15790	6373	.40	13.5
June	55270	7903	23200	12050	.52	19.9
July	33590	3956	11730	5732	.49	10.1
August	12620	3481	6789	2168	.32	5.8
September	12310	3479	6352	1612	.25	5.4
Annual	15280	4838	9723	2425	.25	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	3670	2820	2450	2170	1900	
3	4090	3180	2780	2480	2170	
7	4600	3750	3370	3070	2770	
14	4960	4140	3760	3470	3170	
30	5270	4410	4000	3680	3340	
60	5550	4680	4270	3960	3620	
90	6070	5200	4750	4380	3990	
120	6420	5460	4950	4520	4060	
183	6990	5870	5300	4840	4340	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	30100	50000	67130	94000	118400	
3	29200	47800	63200	86700	107300	
7	27900	43600	55600	72500	86500	
15	25800	39100	48700	61600	71800	
30	23200	34200	41700	51400	58600	
60	19600	27500	32400	38100	42100	
90	16700	23300	27300	32200	35700	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	80%	90%
40000	24000	18000	14000	11800	9500	8100	7300	6800	6300	5700	4900	4200	3800	3500	3200	2600

06120500 MUSSELSHELL RIVER AT HARLOWTON, MT

LOCATION.--Lat 46°25'48", long 109°50'24", in NE¼ sec.28, T.8 N., R.15 E., Wheatland County, Hydrologic Unit 10040201, on left bank 350 ft (107 m) downstream from bridge on U. S. Highway 191, 1 mi (2 km) southwest of Harlowton, and 6 mi (10 km) upstream from American Fork.

DRAINAGE AREA.--1,125 mi^2 (2,914 km^2).

PERIOD OF RECORD.--July 1907 to November 1929, March 1930 to December 1932, April to August 1933, February 1934 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1309: 1912, 1915(M), 1918, 1925. WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Altitude of gage is 4,160 ft (1,270 m) by barometer. Prior to Dec. 8, 1937, nonrecording gages at site 1.2 mi (1.9 km) downstream at different datums. Dec. 8, 1937, to Aug. 26, 1955, nonrecording gage at bridge 300 ft (90 m) upstream at different datums.

REMARKS.--Records good except those for winter period, which are poor. Some regulation by Bair and Martinsdale Reservoirs. Diversions for irrigation of about 37,000 acres (150 km^2) above station, of which 2,300 acres (9.31 km^2) is flood irrigated.

AVERAGE DISCHARGE.--67 years (1907-29, 1930-32, 1934-77), 163 ft^3/s (4.62 m^3/s) 118,100 acre-ft/yr (146 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge observed, 7,270 ft^3/s (206 m^3/s) June 20, 1975, gage height 10.01 ft (3.051 m); no flow at times.

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	191	4.36	74.2	41.0	0.55	4.00
November	176	15.50	81.8	34.5	.42	4.50
December	175	21.30	70.8	29.5	.42	3.80
January	97.8	22.50	58.0	18.8	.32	3.20
February	126	25.10	65.7	26.0	.40	3.60
March	282	35.80	109	69.2	.63	6.00
April	632	31.10	172	145	.84	9.40
May	1037	23.40	361	270	.75	19.7
June	1842	29.90	526	438	.83	28.6	
July	751	21.50	163	135	.83	8.90
August	192	4.29	81.6	46.4	.57	4.50
September	294	.66	68.4	44.9	.66	3.70
Annual			153	76.8	.50	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	24.5	12.5	7.81	4.96	2.76	1.79
7	26.4	13.7	8.54	5.38	2.96	1.89
14	28.8	15.2	9.51	5.99	3.26	2.07
30	32.7	17.2	10.7	6.73	3.65	2.30
60	40.4	22.1	13.8	8.67	4.65	2.90
90	52.7	28.4	16.6	9.44	4.34	2.38
120	56.0	36.1	26.6	19.7	13.5	10.1
183	62.4	40.8	30.7	23.4	16.6	12.9
365	72.3	47.0	36.0	28.3	21.1	17.1

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	960	1800	2370	3070	3560	4020
7	901	1640	2100	2640	2990	3310
14	796	1420	1800	2200	2460	2680
30	679	1230	1560	1920	2150	2350
60	562	1020	1300	1610	1810	1980
90	410	739	957	1220	1400	1570
120	331	579	744	944	1080	1210

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	2%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	60%	70%	80%	90%	95%
1300	590	350	220	160	110	90	76	65	56	45	33	25	15	5.8	2.9	1.0

MUSSELSHELL RIVER BASIN

0613050 MUSSELSHELL RIVER AT MOSBY, MT

LOCATION.--Lat 46°59'41", long 107°53'18", in NW¼NW¼ sec.11, T.14 N., R.30 E., Petroleum County, Hydrologic Unit 10040205, near center of downstream side of bridge on State Highway 20, 0.3 mi (0.5 km) west of Mosby, 10.9 mi (17.5 km) downstream from Flatwillow Creek, and at mile 60.0 (96.5 km).

DRAINAGE AREA.--7,846 mi^2 (20,321 km^2).

PERIOD OF RECORD.--May to November 1929, March 1930 to September 1932, February 1934 to current year. Monthly discharge only for some periods, published in WSP 1309.

REVISED RECORDS.--WSP 1559: 1935-36. WSP 1729: Drainage area.

GAGE.--Nonrecording gage. Altitude of gage is 2,500 ft (760 m), by barometer. Dec. 6, 1962, to Mar. 14, 1966, water-stage recorder at site 900 ft (274 m) downstream at different datum. Mar. 15, 1966, to Dec. 11, 1973, water-stage recorder and nonrecording gages at site 100 ft (30 m) downstream at same datum. See WSP 2116 for history of changes prior to 1962.

REMARKS.--Water-discharge records fair except those for winter periods, which are poor. Some regulation by Bair, Martinsdale, and Deadman's Basin Reservoirs. Diversions for irrigation of about 103,000 acres (417 km^2) above station.

AVERAGE DISCHARGE.--45 years (1930-32, 1934-77), 265 ft^3/s (7.50 m^3/s) 192,000 acre-ft/yr (237 hm^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 18,000 ft^3/s (510 m^3/s) June 18, 1944, gage height, 14.43 ft (4.397 m), from rating curve extended above 10,000 ft^3/s (283 m^3/s); no flow at times.

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	252	.00	66.3	58.8	0.89	1.90
November	207	.00	76.4	52.4	.69	2.20
December	248	.00	73.4	52.2	.71	2.10
January	174	.00	67.5	50.7	.75	2.00
February	1858	12.10	208	362	1.74	6.00
March	1698	18.80	413	399	.97	11.9
April	1273	6.25	333	333	1.00	9.60
May	3772	12.80	572	763	1.33	16.5
June	4967	10.00	1104	1219	1.10	31.7
July	2153	.00	342	467	1.36	9.90
August	465	.00	113	111	.98	3.30
September	331	.00	102	89.6	.88	2.90
Annual			288	209	.73	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	3.3	0	0	0	0	
3	3.9	0	0	0	0	
7	5.2	0	0	0	0	
14	7.0	.17	0	0	0	
30	19	4.5	.44	0	0	
60	38	15	4.0	.3	0	
90	52	22	10	2.0	0	
120	81	34	18	9	4.2	
183	110	45	26	16	8.7	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.01	2	5	10	25	50	100
99%	50%	20%	10%	4%	2%	1%

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	3250	6890	9750	13700	16700	
3	2610	5500	7670	10500	12600	
7	2100	4370	5920	7740	8950	
15	1650	3370	4450	5610	6320	
30	1200	2460	3300	4250	4870	
60	805	1690	2310	3050	3560	
90	626	1310	1800	2400	2820	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	2%	5%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.38	99.8
4500	1200	650	410	270	175	120	88	65	47	31	9.0	0.2	--	--	--	--

MILK RIVER BASIN

06174500 MILK RIVER AT NASHUA, MT

LOCATION.--Lat 48°07'52", long 106°21'50", in NE¼NE¼ sec.1, T.27 N., R.41 E., Valley County, Hydrologic Unit 10050012, on right bank at downstream side of former highway bridge site, 0.6 mi (1.0 km) southwest of Nashua, 2.0 mi (3.2 km) upstream from Porcupine Creek, and at mile 24.0 (38.6 km).

DRAINAGE AREA.--22,332 mi² (57,840 km²).

PERIOD OF RECORD.--October 1939 to current year.

REVISED RECORDS.--WSP 1729: Drainage area.

GAGE.--Water-stage recorder. Datum of gage is 2,027.75 ft (618.058 m) above mean sea level.

REMARKS.--Water-discharge records good except those for winter period, which are poor. Flow increased during irrigation season by water from St. Mary Canal which diverts from the St. Mary River near Babb. Flow regulated by Fresno Reservoir, two reservoirs in Lodge Creek basin in Saskatchewan, and four reservoirs in Frenchman River Basin in Saskatchewan. Diversions for irrigation of about 140,000 acres (567 km²) above station.

AVERAGE DISCHARGE.--38 years, 694 ft³/s (19.65 m³/s) 502,800 acre-ft/yr (620 hm³/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 45,300 ft³/s (1,280 m³/s) Apr. 18, 1952, gage height, 31.38 ft (9.545 m); Minimum, 0.6 ft³/s (0.017 m³/s) July 15, 1961, gage height, 1.96 ft (0.597 m).

Monthly and annual mean discharges 1940-75

Month	Maximum (ft³/s)	Minimum (ft³/s)	Mean (ft³/s)	Standard deviation (ft³/s)	Coefficient of variation	Percent of annual runoff
October	542	56.8	192	126	0.65	2.30
November	547	84.5	208	104	.50	2.50
December	315	46.1	155	62.	.40	1.80
January	843	35.0	139	128	.92	1.60
February	796	33.9	199	181	.91	2.40
March	3661	68.3	1029	911	.89	12.1
April	20930	60.6	2792	3843	1.38	32.9
May	5207	38.8	1277	1574	1.23	15.1
June	6611	96.3	1183	1277	1.08	14.0
July	3578	14.6	713	822	1.15	8.40
August	997	45.1	341	254	.74	4.00
September	667	59.9	247	149	.60	2.90
Annual			706	473	.67	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	48.3	19.8	9.93	4.93	1.96	
3	50.7	21.5	11.1	5.72	2.36	
7	57.8	24.7	12.7	6.50	2.66	
14	63.3	30.6	18.6	11.5	6.25	
30	84.4	47.5	32.8	23.2	15.0	
60	104	68.5	52.0	42.0	31.6	
90	120	81.1	63.9	51.6	39.8	
183	135	93.2	75.3	62.7	50.4	
183	275	161	119	90.4	65.4	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft³/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	6600	12400	16500	21800	25700	
3	6380	11900	15700	20200	23300	
7	5710	11000	14600	18900	21800	
15	4570	9130	12400	16500	19400	
30	3200	6490	8890	12000	14300	
60	2050	4110	5670	7740	9300	
90	1570	3140	4350	5980	7230	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft³/s, which was equaled or exceeded for indicated percent of time																
1%	3%	10%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.8%	99.9%
8400	3300	1500	890	610	370	260	200	160	130	99	67	49	22	.2	.1	.1

MISSOURI RIVER MAIN STEM

06177000 MISSOURI RIVER NEAR WOLF POINT, MT

LOCATION.--Lat 48°03'57", long 105°32'12", in SW¼NW¼ sec.28, T.27 N., R.48 E., McCone County, Hydrologic Unit 10060001, on right bank 500 ft (150 m) downstream from bridge on State Highway 13, 5 mi (8 km) southeast of Wolf Point, 7.8 mi (12.6 km) downstream from Wolf Creek, and at mile 1,701.4 (2,737.6 km).

DRAINAGE AREA.--82,290 mi^2 (213,131 km^2).

PERIOD OF RECORD.--September 1928 to current year.

REVISED RECORDS.--WSP 1146: 1931. WSP 1729: Drainage area.

GAGE.--Water-stage recorder and nonrecording gage. Datum of gage is 1,958.57 ft (596.972 m) above mean sea level. Prior to Apr. 13, 1930, nonrecording gages at Wolf Point ferry landing 5.5 mi (8.8 km) upstream at different datum.

REMARKS.--Records good except those for winter period, which are poor. Flow partly regulated by Fort Peck Lake and many other reservoirs above station. Diversions for irrigation of about 1,010,400 acres (4,090 km^2) above station.

AVERAGE DISCHARGE.--11 years (1928-39, prior to Fort Peck Lake reaching operational level), 7,219 ft^3/s (204.4 m^3/s), 5,230,000 acre-ft/yr (6.45 km^3/yr); 34 years (1943-77, after operational level was reached), 10,480 ft^3/s (296.8 m^3/s), 7,590,000 acre-ft/yr (9.36 km^3/yr).

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 66,800 ft^3/s (1,890 m^3/s) Mar. 25, 1939, gage height, 14.4 ft (4.39 m), ice present, from rating curve extended above 39,000 ft^3/s (1,100 m^3/s); maximum gage height, 15.64 ft (4.767 m) Mar. 27, 1960 (backwater from ice); minimum daily discharge, 320 ft^3/s (9.06 m^3/s) Dec. 10, 1941.

Monthly and annual mean discharges 1940-75

Month	Maximum (ft^3/s)	Minimum (ft^3/s)	Mean (ft^3/s)	Standard deviation (ft^3/s)	Coefficient of variation	Percent of annual runoff
October	29130	1149	12830	8276	0.65	11.0
November	20830	1177	8870	4351	.49	7.60
December	13420	1145	7636	3310	.43	6.50
January	14270	914	7807	3839	.49	6.70
February	15680	1050	7768	4595	.59	6.70
March	14050	2301	7765	3953	.51	6.70
April	27180	1470	9915	5111	.52	8.50
May	17300	1182	8557	4848	.57	7.30
June	26040	1268	8105	5091	.63	6.90
July	36270	1171	10220	6885	.67	8.80
August	27110	3515	13680	6537	.48	11.7
September	27150	3730	13570	7297	.54	11.6
Annual			9737	3258	.33	100

Magnitude and probability of annual low flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	20	50	100
	50%	20%	10%	5%	2%	1%
1	2850	1320	822	538	320	
3	3080	1460	925	611	369	
7	3300	1680	1120	783	507	
14	3600	1870	1270	891	582	
30	3970	2090	1410	991	644	
60	4540	2350	1560	1080	684	
90	5150	2670	1760	1190	738	
120	5620	2990	1990	1370	864	
183	6600	3840	2720	1980	1330	

Magnitude and probability of instantaneous peak flow based on period of record

Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent						
1.25	2	5	10	25	50	100
80%	50%	20%	10%	4%	2%	1%

Weighted skew =

Magnitude and probability of annual high flow based on period of record 1940-75

Period (consecutive days)	Discharge, in ft^3/s, for indicated recurrence interval, in years, and exceedence probability, in percent					
	2	5	10	25	50	100
	50%	20%	10%	4%	2%	1%
1	20600	27500	32000	37700	41900	
3	20100	26800	31200	36700	40800	
7	19400	25900	30100	35300	39100	
15	18400	24900	29200	34400	38300	
30	17300	23600	27800	33000	36900	
60	15400	21000	24600	29600	33200	
90	13600	18400	21700	26100	29400	

Duration table of daily mean flow for period of record 1940-75

Discharge, in ft^3/s, which was equaled or exceeded for indicated percent of time																
1%	5%	10%	15%	20%	30%	40%	50%	60%	70%	80%	90%	95%	98%	99%	99.5%	99.9%
30000	23000	18000	15000	14000	12000	10300	8500	7400	6100	4700	2500	1300	1170	1070	940	69

REFERENCES

Johnson, M. V., and Omang, R. J., 1976, A method for estimating magnitude and frequency of floods in Montana: U.S. Geological Survey Open-File Report 75-650, 35 p.

Missouri Basin Inter-Agency Committee, 1966, Comprehensive framework study--Streamflow characteristics, Upper Missouri River tributaries: U.S. Geological Survey report, 148 p.