

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

The drainage area of a stream at a specified location is that area, measured in a horizontal plane, which is so enclosed by a topographic divide that direct surface runoff from precipitation normally would drain by gravity into the river above the specified point. Figures of drainage area given herein include all closed basins, or noncontributing areas, within the area unless otherwise noted.

DOWNSTREAM ORDER OF LISTING GAGING STATIONS

Beginning with the series of reports for the water year ending September 30, 1951, the order of listing gaging-station records was changed. In this report, in a downstream direction along the main stem all stations on a tributary entering above a main-stem station are listed before that station. If a tributary enters between two main-stem stations, it is listed between them. A similar order is followed in listing stations on first rank, second rank, and other ranks of tributaries. To indicate the rank of any tributary on which a gaging station is situated and the stream to which it is immediately tributary, each indentation in the listing of gaging stations in the table of contents of this report represents one rank. This downstream order and system of indentation show which gaging stations are on tributaries between any two stations on a main stem and the rank of the tributary on which each gaging station is situated.

The order of listing used before the publication of the 1951 report listed first all stations on the main stem from headwaters toward mouth, then all stations on the uppermost tributary to the main stem from the tributary's source to mouth, and then all stations from source to mouth of the uppermost tributary to the tributary.

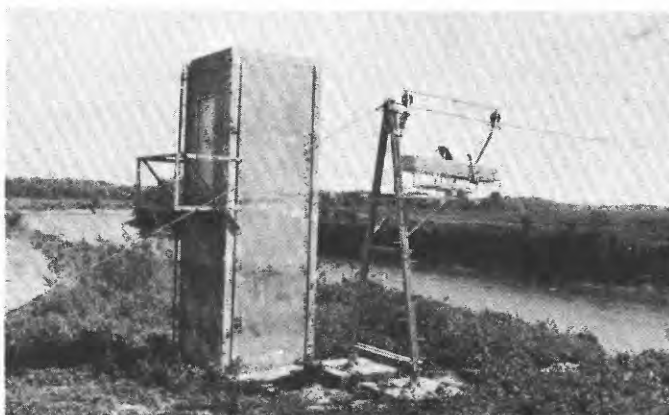
EXPLANATION OF DATA

The base data collected at gaging stations consist of records of stage and measurements of discharge. In addition, observations of factors affecting the stage-discharge relation, weather records, and other information are used to supplement base data in determining the daily flow. The records of stage are obtained either from direct readings on a nonrecording gage or from a water-stage recorder that gives a continuous record of fluctuations. Measurements of discharge are made with a current meter by the general methods adopted by the Geological Survey on the basis of experience in stream gaging since 1888. These methods are described in Water-Supply Paper 888 and are also outlined in standard textbooks on the measurement of stream discharge. Typical structures in use at gaging stations are shown in figure 1.

Rating tables giving the discharge for any stage are prepared from stage-discharge relation curves defined by discharge measurements. If extensions to the rating curves are necessary to define the extremes of discharge, they are made on the basis of indirect measurements of peak discharge (such as slope-area or contracted-opening measurements, computation of flow over dams or weirs, and by other methods), velocity-area studies, and logarithmic plotting. The application of the daily mean gage height to those rating tables gives the daily mean discharge, from which the monthly and the yearly mean discharge are computed. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features that form the control, the daily



A, South Platte River at South Platte, Colo.



B, Nishnabotna River Above Hamburg, Iowa.



C, Republican River at Trenton, Nebr.

FIGURE 1.—GAGING-STATION STRUCTURES.

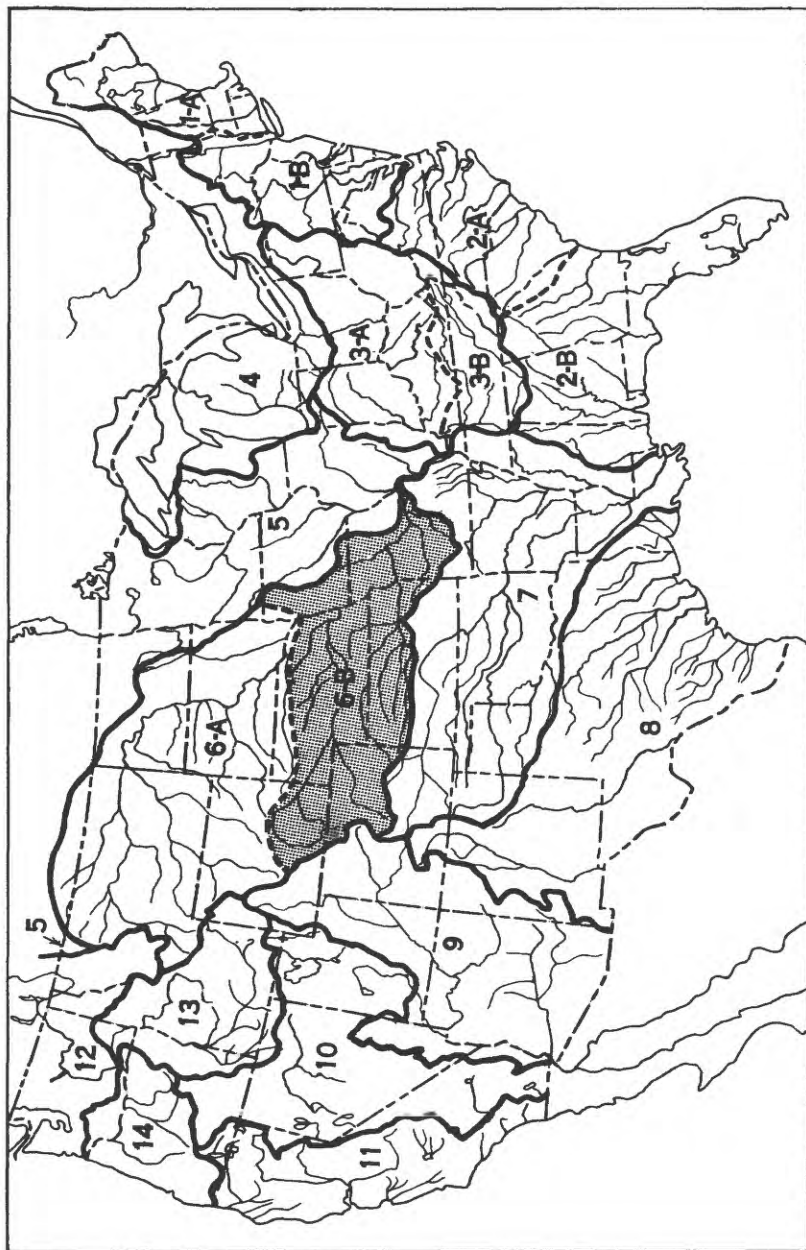


Figure 2.--Map of the United States showing areas covered by the 18 annual volumes on surface water supply. The area covered by this report is shaded.

Streamflow data for the years 1884-1901, in reports of the Geological Survey--Continued

(A = Annual Reports; B = Bulletin; W = Water-Supply Paper)

Report	Character of data	Year
W 11.....	Gage heights.....	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge..	1895-96.
W 15.....	Descriptions, measurements, and gage heights of streams east of the Mississippi River, and Missouri River and tributaries above Kansas River.	1897.
W 16.....	Descriptions, measurements, and gage heights of streams west of the Mississippi River, except Missouri River and tributaries above Kansas River.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge.	1897.
W 27.....	Measurements, ratings, and gage heights of streams east of the Mississippi River, and Missouri River and tributaries.	1898.
W 28.....	Measurements, ratings, and gage heights of streams west of the Mississippi River, except Missouri River and tributaries.	1898.
20th A, pt. 4	Monthly discharge.....	1898.
W 35 to 39...	Descriptions, measurements, gage heights, and ratings.....	1899.
21st A, pt. 4	Monthly discharge.....	1899.
W 47 to 52...	Descriptions, measurements, gage heights, and ratings.....	1900.
22d A, pt. 4	Monthly discharge.....	1900.
W 65, 66.....	Descriptions, measurements, gage heights, and ratings.....	1901.
W 75.....	Monthly discharge.....	1901.

Reports on surface-water supply containing records from 1899 to date for drainage basins in this report are listed below. The data for any particular gaging station will, in general, be found in the reports covering the years during which the station was maintained. Before 1951, records for the Missouri River basin below Sioux City, Iowa, were included with those of the other rivers of the Missouri River basin.

Numbers of water-supply papers containing results of stream measurements in Missouri River basin below Sioux City, Iowa, 1899-1952

Year	W.S.P.	Year	W.S.P.	Year	W.S.P.	Year	W.S.P.	Year	W.S.P.
1899	37	1911	306	1923	566	1935	746	1943	976
1900	49,a50	1912	326	1924	586	1934	761	1944	1006
1901	66,75	1913	356	1925	606	1935	786	1945	1036
1902	84	1914	366	1926	626	1936	806	1946	1056
1903	99	1915	406	1927	646	1937	826	1947	1086
1904	150,b131	1916	436	1928	666	1938	856	1948	1116
1905	172	1917	456	1929	686	1939	876	1949	1146
1906	208	1918	476	1930	701	1940	896	1950	1176
1907-8	246	1919-20	506	1931	716	1941	926	1951	1210
1909	266	1921	526	1932	731	1942	956	1952	1240
1910	286	1922	546						

a Loup, Platte, and Elkhorn Rivers and tributaries below Platte River.
b Platte and Kansas Rivers.

The records at most of the stations discussed in these reports extend over many years. Miscellaneous measurements at many points other than regular gaging stations have been made each year and are published under "Miscellaneous discharge measurements" at the end of each report. The streams and points of measurement are listed in the same order as the streams and gaging stations in the body of the report. An index of the records obtained before 1904 has been published in Water-Supply Paper 119.

Each of the reports on the surface-water supply for the year 1939 (Water-Supply Paper 876 for the Missouri River basin below Sioux City, Iowa) contains, for the area included in that report, a summary of yearly discharge at gaging stations at which 10 or more complete years of record had been collected. These summaries were reprinted separately.

Reports also have been published that are compilations of records for various areas, usually a single State or drainage basin. These reports contain records previously published (some of which may have been revised), as well as some records not contained in the annual series of water-supply papers. The following table lists reports of this type for the Missouri River basin below Sioux City, Iowa.

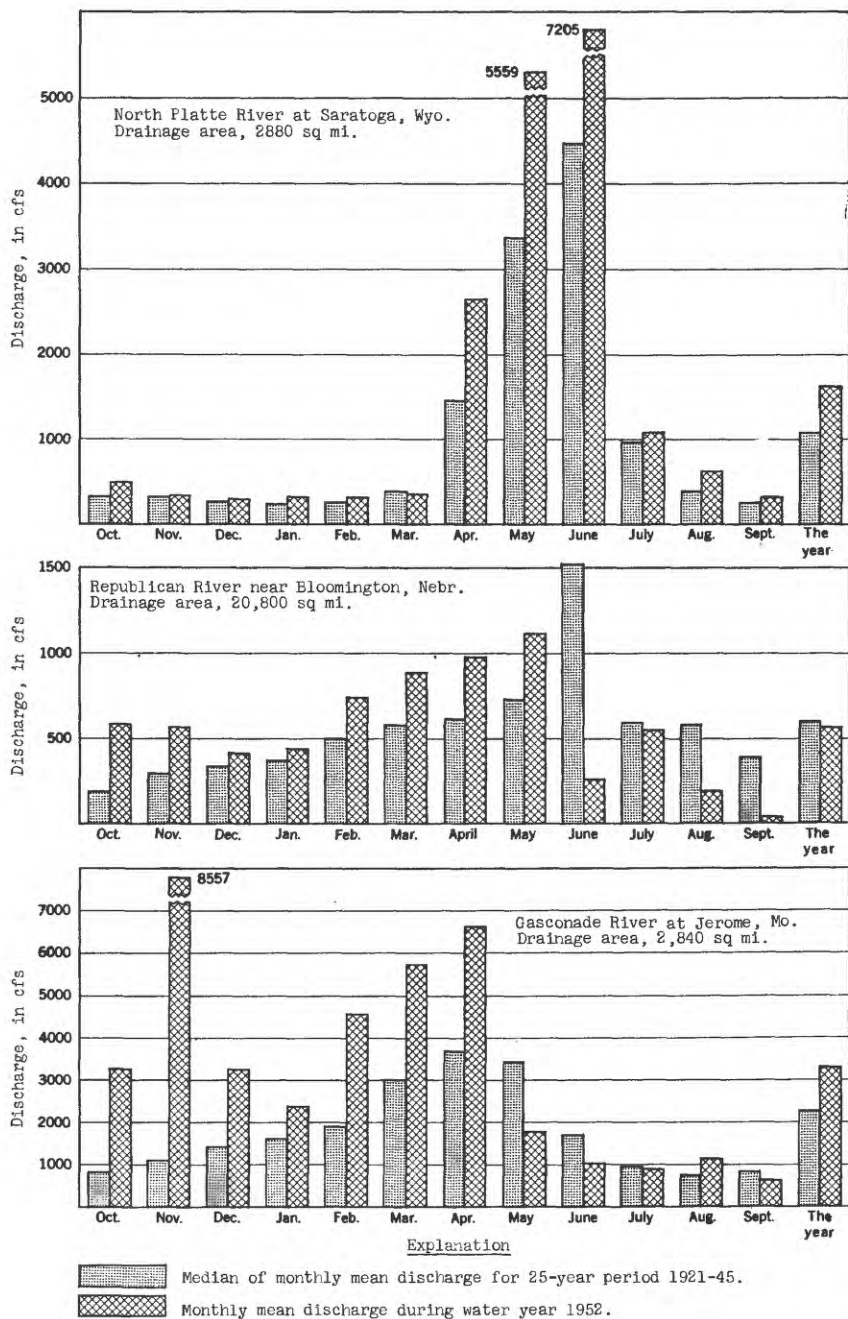


Figure 3.--Comparison of discharge at three key gaging stations during 1952 water year with median discharge for 25-year period.

MISSOURI RIVER MAIN STEM

Missouri River at Sioux City, Iowa

Location.--Lat 42°29', long. 96°25', in sec. 17, T. 29 N., R. 9 E., sixth principal meridian, on right bank on upstream side of bridge on U. S. Highway 77 at Sioux City, 2.5 miles downstream from Big Sioux River.

Drainage area.--314,600 sq mi, approximately.

Records available.--October 1897 to September 1952 in reports of Geological Survey (October 1897 to September 1928 and October 1931 to September 1938, monthly discharge only, based on record for station at Williston, N. D., in Circular 108). January 1879 to December 1890 (monthly discharges only) in House Document 238, 73d Congress, 2d session, Missouri River. Gage-height records collected in this vicinity September 1878 to December 1899 are contained in reports of Missouri River Commission and since July 1889 are contained in reports of U. S. Weather Bureau.

Gage.--Water-stage recorder. Datum of gage is 1,076.96 ft above mean sea level, datum of 1929. Sept. 2, 1878, to Dec. 31, 1905, staffs, cable, and chain gages at various locations within 1.7 miles of present site and at various datums. Jan. 1, 1906, to Feb. 14, 1935, chain gage at present site and datum.

Average discharge.--17 years (1928-31, 1938-52), 31,120 cfs.

Extremes.--Maximum discharge during year, 441,000 cfs Apr. 14; maximum gage height, 24.28 ft Apr. 14; minimum daily discharge, 6,800 cfs Dec. 24-26; minimum gage height, 0.56 ft Dec. 15.

1928-31, 1938-52: Maximum discharge, that of Apr. 14, 1952; maximum gage height, that of Apr. 14, 1952; minimum discharge, 2,500 cfs Dec. 29, 1941; minimum gage height observed, -3.34 ft Dec. 27, 1946.

Remarks.--Records good except those for period of ice effect, which are fair. Low-water flow regulated by Fort Peck Reservoir. Discharge measurements generally made six times a month, three times a month during winter.

Revisions (water years).--W 716: 1929-30. W 876: Drainage area.

Discharge, in cubic feet per second, water year October 1951 to September 1952

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	38,600	44,200	19,900	7,000	19,000	25,800	110,000	77,200	45,300	48,000	29,100	31,800
2	39,400	44,200	18,400	8,000	19,000	25,000	102,000	73,100	43,500	59,000	29,500	31,000
3	41,100	44,200	17,400	9,000	20,000	24,300	108,000	71,000	47,600	60,000	29,100	29,800
4	47,400	44,200	16,500	9,400	20,000	23,600	152,000	66,800	58,000	51,200	27,600	29,800
5	50,700	44,200	18,600	9,700	21,000	24,400	159,000	62,000	58,000	45,800	25,300	30,200
6	48,800	43,300	60,800	10,000	21,600	25,300	178,000	59,500	54,500	45,300	24,600	30,600
7	46,900	44,600	41,100	10,200	22,000	25,900	203,000	58,300	55,000	53,000	24,600	30,600
8	50,200	44,600	29,900	10,300	23,000	25,600	222,000	57,100	55,500	47,100	24,600	30,600
9	48,300	44,600	24,700	10,400	23,000	24,400	237,000	56,800	55,500	44,000	25,000	30,600
10	42,800	42,400	21,000	10,500	24,000	25,300	255,000	58,600	55,000	40,000	26,400	31,000
11	40,700	43,300	19,000	10,700	25,000	26,500	265,000	66,000	53,500	39,600	27,900	31,000
12	41,100	43,100	17,000	11,000	26,000	26,800	326,000	71,600	52,000	39,200	27,600	30,200
13	43,700	43,100	14,500	11,500	27,000	29,000	402,000	67,300	49,800	39,600	29,100	30,200
14	44,200	45,100	10,500	12,200	28,000	24,400	438,000	62,100	45,800	37,900	29,500	30,200
15	45,100	42,400	9,000	12,600	30,000	25,600	428,000	60,500	44,400	37,100	29,800	29,800
16	45,100	39,400	7,600	13,000	32,000	24,700	369,000	63,400	47,600	37,100	31,000	29,500
17	44,200	38,200	7,400	13,000	35,000	26,800	282,000	68,600	55,000	36,200	31,800	28,700
18	44,200	37,800	7,200	13,700	41,700	30,600	186,000	67,900	66,500	35,000	32,200	27,900
19	44,200	37,400	7,200	14,000	37,000	34,800	139,000	62,100	74,000	33,800	33,000	28,700
20	46,000	38,200	7,200	15,000	32,000	36,700	121,000	58,000	70,800	32,600	33,800	29,100
21	48,800	37,400	7,000	15,000	30,000	35,900	112,000	54,700	62,500	31,000	35,400	29,800
22	50,200	36,700	7,000	16,000	29,000	33,000	104,000	53,000	60,000	29,800	35,000	30,200
23	49,200	37,000	7,000	17,000	28,600	29,800	98,400	51,500	58,000	29,100	34,200	29,800
24	47,400	34,400	6,800	17,500	27,700	27,700	91,600	49,400	55,500	27,900	33,800	29,500
25	48,800	33,000	6,800	18,000	27,000	28,600	87,000	47,100	53,500	26,800	33,800	29,500
26	48,300	30,300	6,800	18,000	27,000	30,300	84,700	45,400	51,600	25,000	33,800	29,100
27	46,400	29,300	7,000	18,000	26,800	31,300	86,500	53,000	51,600	23,900	31,800	29,100
28	43,300	28,000	7,000	18,000	26,800	33,600	90,000	52,500	49,800	22,800	31,800	28,700
29	42,000	24,100	7,000	18,000	25,900	43,300	88,700	51,800	48,400	22,400	33,400	28,700
30	44,200	20,900	7,000	18,000	-	47,800	83,100	51,300	46,600	23,900	33,800	29,500
31	44,200	-	7,000	18,300	-	111,000	-	49,200	-	26,800	32,600	-
Total	14,405.5	11,666.8	451,300	413,000	775,100	1,016.3	15,608	16,222.1	15,020.9	14,509.9	940,900	895,200
Mean	45,340	38,890	14,560	13,320	26,730	32,780	186,900	59,570	54,070	37,130	30,350	29,640
Ac-ft	2,788	2,314	895,100	819,200	1,537	2,016	11,120	3,663	3,217	2,283	1,866	1,776
Calendar year 1951:	Max	149,000		Min	6,800		Mean	39,790	Ac-ft	28,800,000		
Water year 1951-52:	Max	438,000		Min	6,800		Mean	47,250	Ac-ft	34,290,000		

Peak discharge (base, 80,000 cfs).--Apr. 14 (6 p.m.) 441,000 cfs (24.27 ft).

* Expressed in thousands.

g Computed from once-daily wire-weight-gage readings.

Note.--Stage-discharge relation affected by ice Dec. 10 to Mar. 19.

