

Cfs-day is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, 1.983471 acre-feet, or 646,317 gallons, and represents a runoff of 0.0372 inch from 1 square mile.

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

Control designates a feature downstream from the gage that determines the stage-discharge relation at the gage. This feature may be a natural constriction of the channel, a long reach of the channel, or an artificial structure.

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

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

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

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.

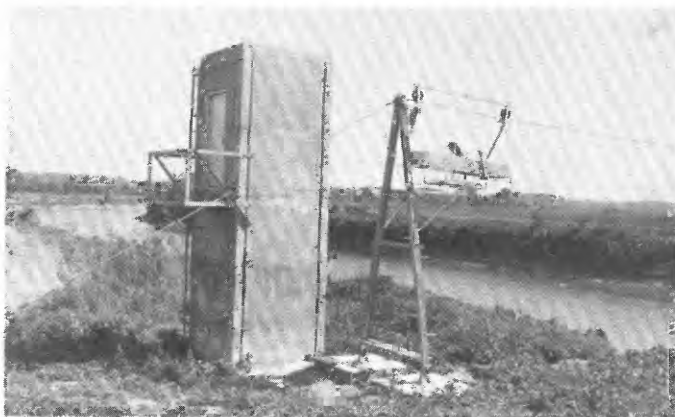
The order of listing used before the publication of the 1951 report listed first all stations on the main stem from headwaters toward mouth, then all stations on the uppermost tributary to the main stem from the tributary's source to mouth, and then all stations from source to mouth of the uppermost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



A. South Platte River at South Platte, Colo.



B. Nishnahotna River Above Hamburg, Iowa.



C. Republican River at Trenton, Nebr.

FIGURE 1.—GAGING-STATION STRUCTURES

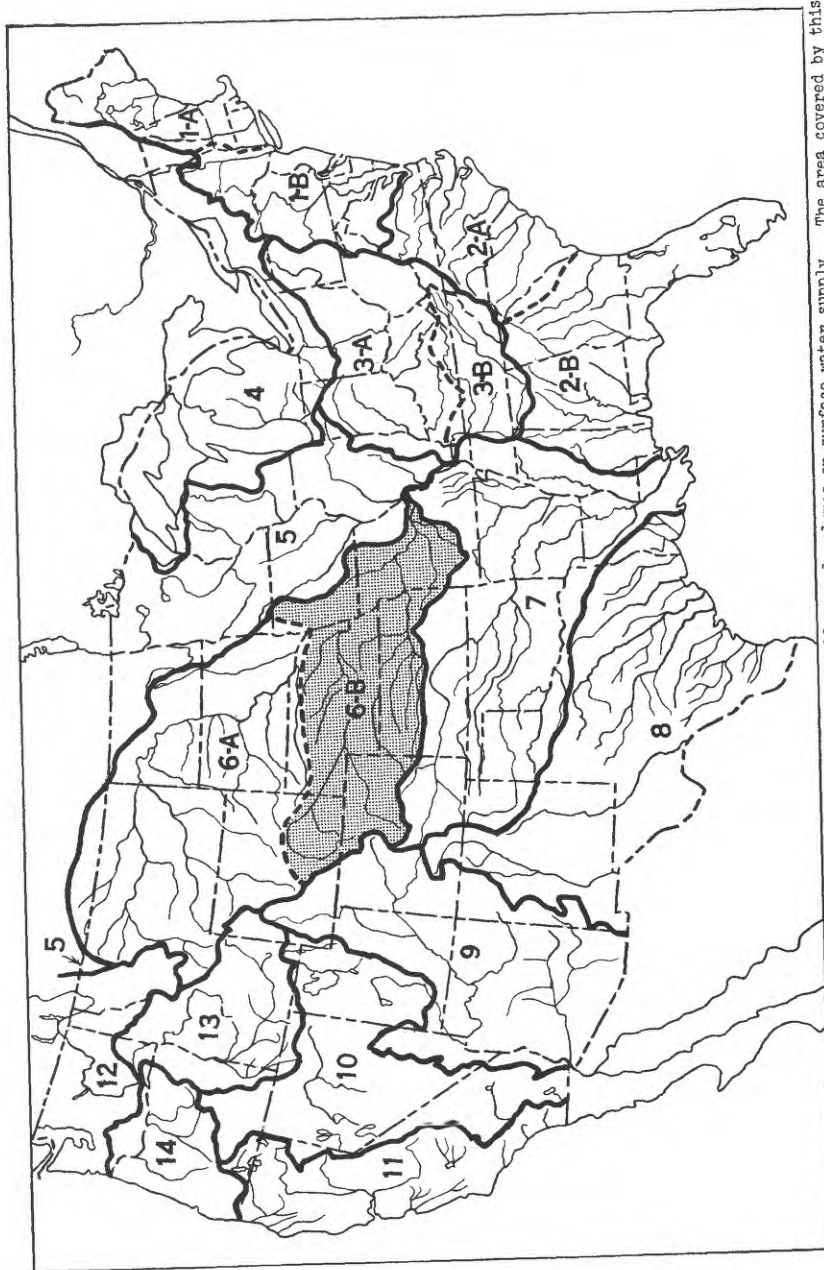


Figure 2.--Map of the United States showing areas covered by the 18 annual volumes on surface water supply. The area covered by this report is shaded.

2. Sets of the reports may be consulted in the libraries of the principal cities in the United States.

3. Sets are available for consultation in the offices of the Water Resources Division of the Geological Survey. Addresses of the offices in the area covered by this report are given on page 2.

Early records of the flow of streams in the United States are published in the reports listed below. In many of these reports records for years earlier than those indicated have been included for some streams.

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

(A = Annual Report; B = Bulletin)

Report	Character of data	Year
10th A, pt. 2	Descriptive information only.	
11th A, pt. 2	Monthly discharge and descriptive information.....	1884 to September 1890.
12th A, pt. 2do.....	1884 to June 30, 1891.
13th A, pt. 3	Monthly discharge and descriptive information.....	1884-92.
14th A, pt. 2	Monthly discharge.....	1888-93.
B 131.....	Descriptions, measurements, gage heights, and ratings.....	1893-94.
16th A, pt. 2	Descriptive information only.	
B 140.....	Descriptions, measurements, gage heights, ratings, and monthly discharge.	1895.
WSP 11.....	Gage heights.....	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge..	1895-96.
WSP 15.....	Descriptions, measurements, and gage heights of streams east of the Mississippi River, and Missouri River and tributaries above Kansas River.	1897.
WSP 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.
WSP 27.....	Measurements, ratings, and gage heights of streams east of the Mississippi River, and Missouri River and tributaries.	1898.
WSP 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.
WSP 35 to 39.	Descriptions, measurements, gage heights, and ratings.....	1899.
21st A, pt. 4	Monthly discharge.....	1899.
WSP 47 to 52.	Descriptions, measurements, gage heights, and ratings.....	1900.
22d A, pt. 4.	Monthly discharge.....	1900.
WSP 65, 66.	Descriptions, measurements, gage heights, and ratings.....	1901.
WSP 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.

Number of water-supply papers containing results of stream measurements in Missouri River basin below Sioux City, Iowa, 1899-1955

Year	WSP	Year	WSP	Year	WSP	Year	WSP	Year	WSP
1899	37	1911	306	1923	566	1934	761	1945	1036
1900	49,a50	1912	326	1924	586	1935	786	1946	1056
1901	66,75	1913	356	1925	606	1936	806	1947	1086
1902	64	1914	386	1926	626	1937	826	1948	1116
1903	99	1915	406	1927	646	1938	856	1949	1146
1904	130,b131	1916	436	1928	666	1939	876	1950	1176
1905	172	1917	456	1929	686	1940	896	1951	1210
1906	208	1918	476	1930	701	1941	926	1952	1240
1907-8	246	1919-20	506	1931	716	1942	956	1953	1280
1909	266	1921	526	1932	731	1943	976	1954	1340
1910	286	1922	546	1933	746	1944	1006	1955	1390

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. Discharge measurements at many points other than regular gaging stations have been made each year and are published 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.

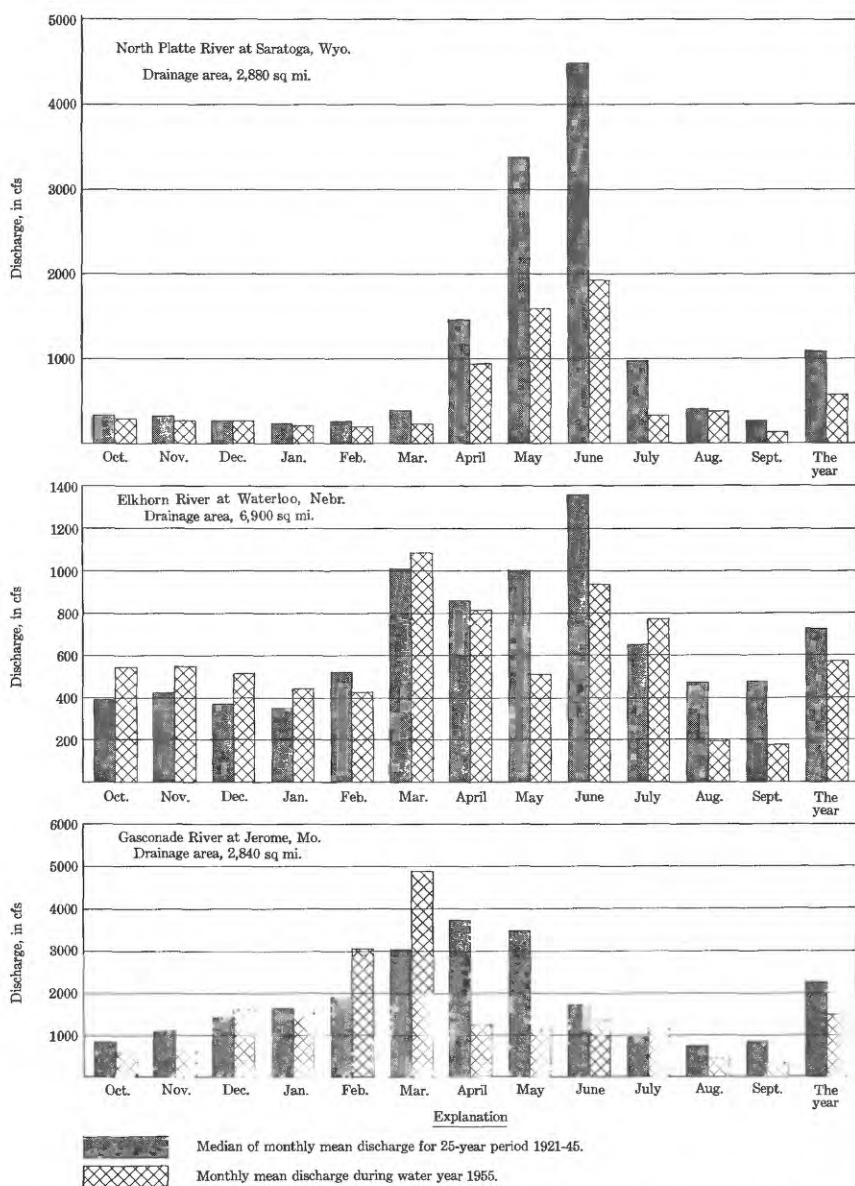


Figure 3. Comparison of discharge at three key gaging stations during 1955 water year with median discharge for 25-year period.

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 1955 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 discharge 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, staff, cable, and chain gages at various locations within 1.7 miles of present site at various datums. Jan. 1, 1906, to Feb. 14, 1935, chain gage at present site and datum.

Average discharge.--20 years (1928-31, 1938-55), 30,370 cfs (21,990,000 acre-ft per year).

Extremes.--Maximum discharge during year, 56,200 cfs Mar. 12; maximum gage height, 6.19 ft July 10; minimum daily discharge, 6,200 cfs Jan. 15, 16; minimum gage height, -1.13 ft Jan. 12.

1928-31, 1938-55: Maximum discharge, 441,000 cfs Apr. 14, 1952; maximum gage height, 24.28 ft 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 periods of ice effect, which are fair. Flow partly regulated by upstream main stem reservoirs. Discharge measurements generally made 6 times a month, 3 times a month during winter.

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

Discharge, in cubic feet per second, water year October 1954 to September 1955

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	30,200	16,100	10,500	11,300	9,200	10,400	25,100	25,700	29,500	27,500	9,900	33,000
2	32,000	13,500	11,500	10,300	9,400	11,000	24,500	25,400	30,900	26,600	1,800	34,800
3	31,200	12,900	12,500	10,400	9,600	12,000	23,600	25,400	30,600	27,200	9,000	38,500
4	32,000	14,500	12,500	10,400	10,000	13,000	23,000	25,700	31,200	27,800	13,500	36,500
5	32,300	14,300	12,100	10,500	10,300	15,000	23,000	26,300	31,200	28,600	21,600	35,400
6	31,600	13,900	11,900	10,700	10,600	16,000	23,300	26,300	29,500	27,800	27,800	34,400
7	29,500	13,900	11,700	10,900	11,000	17,000	23,600	27,200	29,200	28,100	35,100	32,300
8	28,100	13,900	10,500	11,100	11,000	18,000	23,900	28,400	28,400	29,200	35,800	32,000
9	27,500	13,500	10,900	10,500	10,300	19,000	24,500	31,200	26,900	28,600	34,000	33,000
10	28,400	12,700	11,700	10,000	9,600	20,000	25,400	31,200	27,500	34,800	35,400	33,700
11	29,800	13,100	11,900	10,000	9,000	21,000	25,700	30,600	29,800	31,200	33,000	33,700
12	31,200	12,300	11,900	9,600	8,600	30,000	25,400	29,800	30,600	29,200	32,600	33,700
13	31,200	12,100	12,100	9,000	8,200	32,600	25,700	30,200	31,200	29,800	32,000	35,400
14	32,300	11,900	11,900	8,000	7,800	29,800	26,900	30,200	30,600	32,000	32,000	33,000
15	32,000	11,700	10,400	8,200	8,200	24,500	27,800	29,500	28,600	28,600	32,000	33,400
16	31,200	11,700	12,100	6,200	8,600	20,800	27,200	29,200	28,100	28,400	31,600	33,400
17	28,800	10,500	12,500	6,400	9,200	19,200	26,900	29,500	28,800	28,800	31,600	33,400
18	29,800	11,500	12,500	6,600	10,000	17,200	27,200	29,800	31,200	29,200	31,600	32,600
19	30,600	11,500	12,900	7,000	10,700	17,200	26,900	30,200	30,200	28,400	32,500	32,600
20	31,200	11,500	12,900	7,200	10,500	16,800	26,900	30,600	30,600	30,200	32,300	33,000
21	30,200	11,700	12,100	7,400	9,000	15,500	26,900	29,200	30,200	31,600	32,300	33,000
22	30,600	11,700	10,700	7,600	8,000	14,700	26,300	28,400	29,800	29,800	32,000	34,000
23	30,900	11,500	11,500	7,800	6,900	15,100	25,700	28,400	28,100	30,200	31,200	34,000
24	30,600	10,200	12,300	8,000	7,200	17,000	26,000	28,800	27,800	28,800	31,200	30,600
25	30,600	11,100	12,500	8,200	7,600	17,000	27,200	29,200	27,800	30,200	32,600	30,900
26	30,900	11,100	12,500	8,400	8,000	15,100	27,800	31,200	28,100	31,600	35,100	32,000
27	29,500	11,300	12,500	8,600	8,600	17,200	25,700	28,800	28,600	32,600	36,200	32,600
28	28,100	11,300	10,700	8,600	9,400	23,600	25,400	33,400	27,500	35,000	34,800	32,300
29	26,000	11,500	8,750	8,600	-	25,100	25,700	33,400	27,800	20,000	33,700	31,200
30	24,200	11,500	10,700	8,800	-	24,800	26,000	32,300	28,100	13,900	32,600	31,200
31	19,500	-	11,300	8,900	-	26,300	-	29,600	-	12,900	32,300	-
Total	922,000	369,900	363,450	273,400	256,500	591,900	769,200	909,100	678,800	877,200	913,100	995,600
Mean	29,740	12,330	11,720	8,820	8,160	19,090	25,640	32,600	29,290	28,300	29,450	33,190
Ac-ft	1,629	735,700	720,900	542,300	506,800	1,174	1,526	1,803	1,743	1,740	1,611	1,975

Calendar year 1954: Max 49,500 Min 8,000 Mean 23,940 Ac-ft 17,330,000
 Water year 1954-55: Max 36,500 Min 6,200 Mean 22,250 Ac-ft 16,110,000

Peak discharge (base, 80,000 cfs).--No peak above base.

* Expressed in thousands.

Note.--Stage-discharge relation affected by ice Jan. 13 to Mar. 12, Mar. 27.

