





























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 references 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.

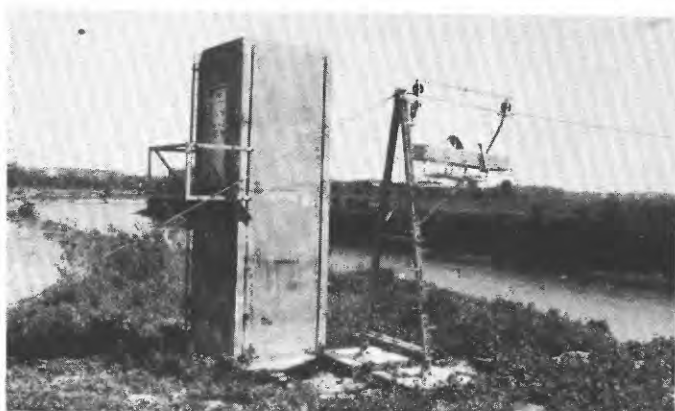
#### EXPLANATION OF DATA

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.

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 determinations of peak discharge (such as slope-area or contracted-opening determinations, 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



*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**









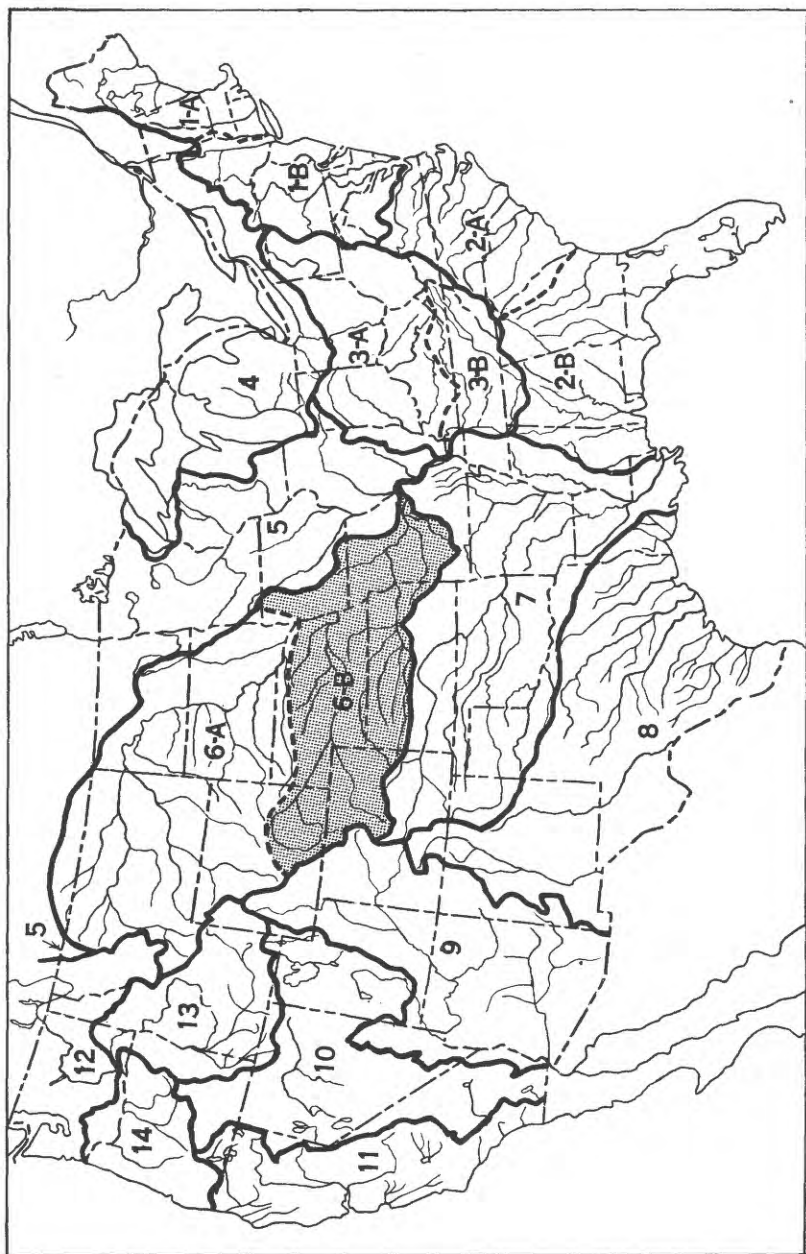


Figure 2.--Map of the United States showing areas covered by the 13 annual volumes on surface water supply. The area covered by this report is shaded.

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

(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. 2	.....do.....	1884 to June 30, 1891.
13th A, pt. 3	Monthly discharge and descriptive information.....	1884-32.
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.....	1896.
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.

Numbers of water-supply papers containing results of stream measurements in Missouri River basin below Sioux City, Iowa, 1899-1954

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	84	1914 <sup>a</sup>	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	1260
1909	266	1921	526	1932	731	1943	976	1954	1340
1910	286	1922	546	1933	746	1944	1006		

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 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.







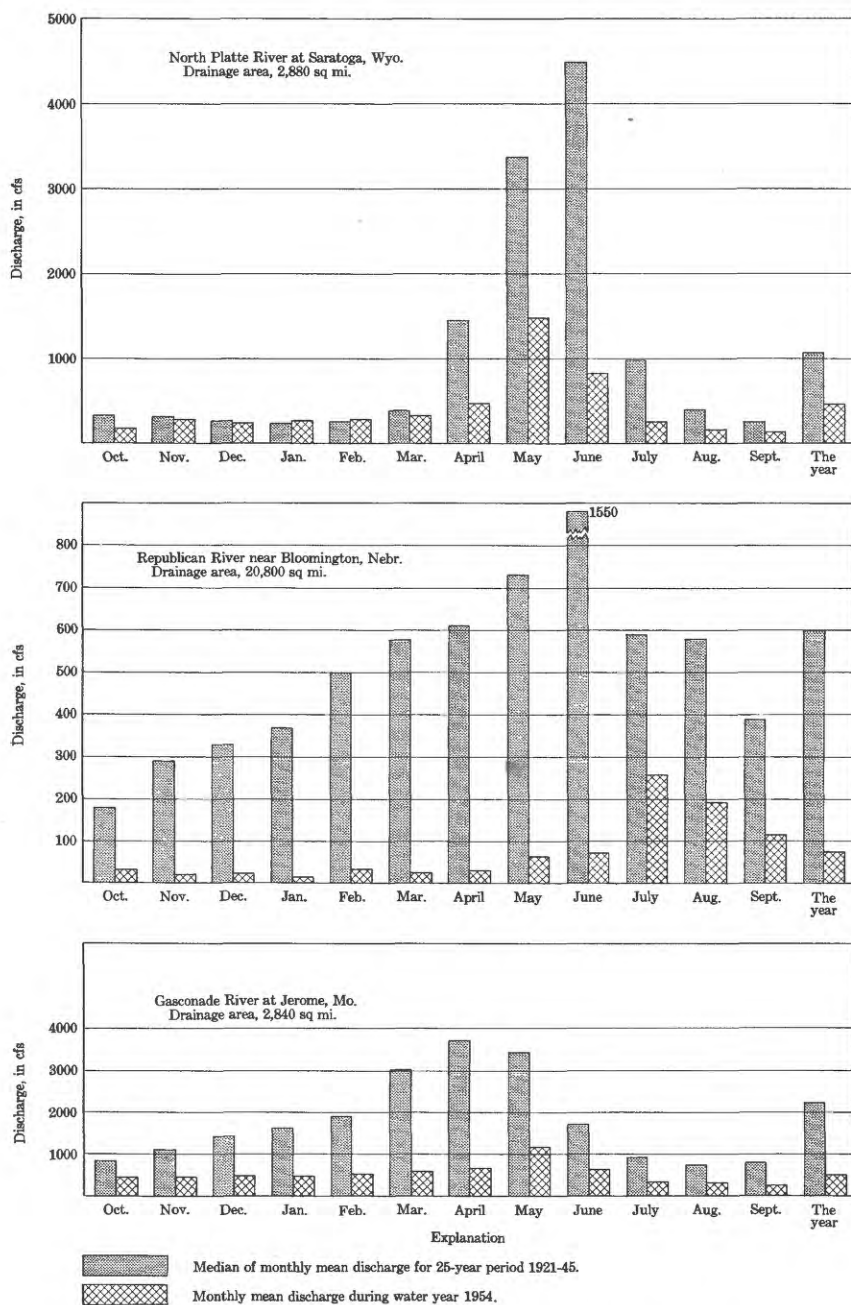


Figure 3. Comparison of discharge at three key gaging stations during 1954 water year with median discharge for 25-year period.

## 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 1954 in reports of Geological Survey (October 1897 to August 1928 and October 1931 to September 1938, monthly discharge only, based on record for station at Williston, N. Dak., in Cir. 108). January 1879 to December 1890 (monthly discharges only) in House Document 238, 73rd Congress, 2d session. 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 and at various datums. Jan. 1, 1906, to Feb. 14, 1935, chain gage at present site and datum.

Average discharge.--19 years (1928-31, 1938-54), 30,800 cfs (22,300,000 acre-ft per year).

Extremes.--Maximum discharge during year, 51,300 cfs June 21 (gage height, 6.83 ft); minimum daily, 8,000 cfs Dec. 27, 28, Jan. 17, 18; minimum gage height, -1.40 ft Nov. 24. 1928-31, 1938-54: 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 period of ice effect, which are fair. Discharge measurements generally made six times a month, three times a month during winter. Flow partly regulated by upstream main stem reservoirs.

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

Discharge, in cubic feet per second, water year October 1953 to September 1954

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	31,300	31,300	18,500	9,300	12,100	30,100	32,200	31,300	31,000	25,400	33,200	28,600
2	31,300	29,800	18,500	9,600	12,200	27,400	30,700	31,900	33,600	27,100	34,300	28,600
3	31,900	28,900	18,300	10,000	12,300	23,800	29,200	29,800	34,000	27,100	35,000	30,100
4	32,600	27,700	18,500	10,500	12,400	18,100	28,000	28,900	32,200	28,300	34,300	30,100
5	33,200	26,600	18,300	11,000	12,400	15,600	26,900	28,600	32,600	29,500	33,600	30,700
6	33,200	25,300	18,100	11,400	12,400	14,800	25,800	28,000	30,400	29,800	33,600	30,100
7	33,600	24,000	20,100	11,700	12,400	14,200	25,600	28,600	29,200	29,200	35,000	31,600
8	33,200	22,800	19,600	12,000	12,400	13,600	24,800	29,500	32,200	28,900	35,700	31,600
9	33,600	22,100	19,200	11,500	12,400	14,200	25,000	29,200	34,300	29,500	33,200	32,200
10	33,200	21,200	16,300	11,000	12,400	17,500	24,800	28,900	30,700	29,200	29,200	34,300
11	33,200	20,300	16,700	10,500	12,400	22,800	21,700	28,000	31,600	29,200	29,500	36,400
12	33,600	19,400	15,000	10,000	12,400	26,400	23,400	27,400	28,300	29,800	30,100	32,200
13	33,600	18,500	13,600	9,600	12,400	22,800	25,200	26,500	24,400	29,500	30,700	31,900
14	33,200	17,500	12,500	9,000	12,400	19,000	26,200	25,700	23,700	28,900	30,700	32,600
15	32,900	16,900	12,200	8,500	12,400	16,200	27,400	25,700	24,400	28,600	30,100	32,600
16	33,200	16,500	12,100	8,200	15,000	14,800	26,200	26,800	25,000	29,800	29,800	32,900
17	33,900	16,500	12,000	8,000	19,000	15,800	26,000	27,700	25,200	33,200	29,500	32,200
18	33,600	16,500	11,600	8,000	21,000	20,300	26,200	28,000	27,100	34,600	30,400	31,900
19	33,200	15,300	11,300	9,000	21,000	25,300	27,100	28,000	36,800	33,600	30,100	31,300
20	33,600	13,800	12,000	10,000	16,000	29,500	27,100	28,000	48,300	32,900	29,500	31,900
21	33,900	12,800	11,000	10,500	15,800	31,000	27,700	27,700	49,500	32,900	28,300	31,900
22	33,200	11,800	10,500	11,000	16,000	32,600	28,000	27,400	45,900	33,600	28,600	31,600
23	32,600	10,800	9,800	11,500	17,700	34,200	28,600	27,700	45,900	33,600	30,700	31,300
24	32,200	10,800	8,200	12,000	16,800	35,000	28,600	28,300	42,300	34,000	31,000	30,400
25	32,200	11,000	8,800	12,000	21,000	34,900	28,300	29,200	38,800	34,300	28,300	29,800
26	31,900	12,100	8,200	12,000	24,600	32,900	28,300	29,500	34,000	33,200	26,500	29,800
27	31,900	13,700	8,000	12,000	28,000	31,900	28,300	30,400	27,700	32,600	25,500	30,400
28	31,300	15,100	8,000	12,000	30,100	33,200	28,300	29,500	26,500	34,000	27,100	29,500
29	30,700	17,300	8,600	12,000	-	34,200	28,900	30,400	26,000	33,600	31,300	30,400
30	30,700	16,100	8,600	12,000	-	33,200	30,400	30,100	25,000	33,200	29,500	29,500
31	31,300	-	9,000	12,000	-	32,600	-	32,900	-	33,600	28,000	-
Total	1,013	564,400	415,900	327,800	449,400	768,900	814,900	889,600	978,600	962,700	953,300	936,400
Mean	32,680	18,810	13,420	10,570	16,050	24,800	27,160	28,700	32,620	31,050	30,750	31,280
Ac-ft	2,009	1,119	824,900	650,200	891,400	1,525	1,616	1,764	1,941	1,909	1,891	1,861
Calendar year 1953: Max			105,000		Min 8,000	Mean 31,420	Ac-ft 22,750,000					
Water year 1953-54: Max			49,500		Min 8,000	Mean 24,870	Ac-ft 18,000,000					

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

† Expressed in thousands.

Note.--Stage-discharge relation affected by ice Dec. 20 to Feb. 19.





































































































































































































































































































































































































































































































































































































































































































































































































































































































































































































