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

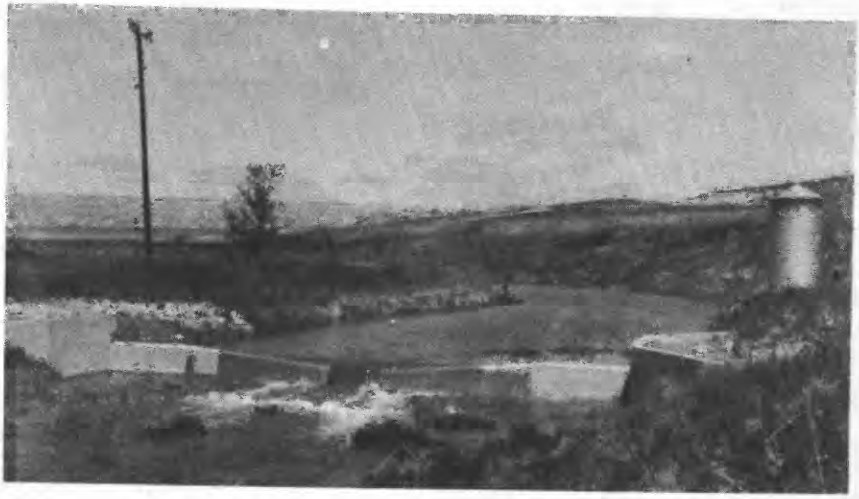
Beginning with the series of reports for the water year ending September 30, 1951, the order of listing gaging-station records was changed. In this report, in a downstream direction along the main stem all stations on a tributary entering above a main-stem station are listed before that station. If a 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 indention in the listing of gaging stations in the table of contents of this report represents one rank. This downstream order and system of indention 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 frequent or



A, NIOBRARA RIVER BELOW BOX RESERVOIR, NEBR.

B, NORTH POPO AGIE RIVER NEAR LANDER, WYO.

FIGURE 1.—GAGING-STATION STRUCTURES.

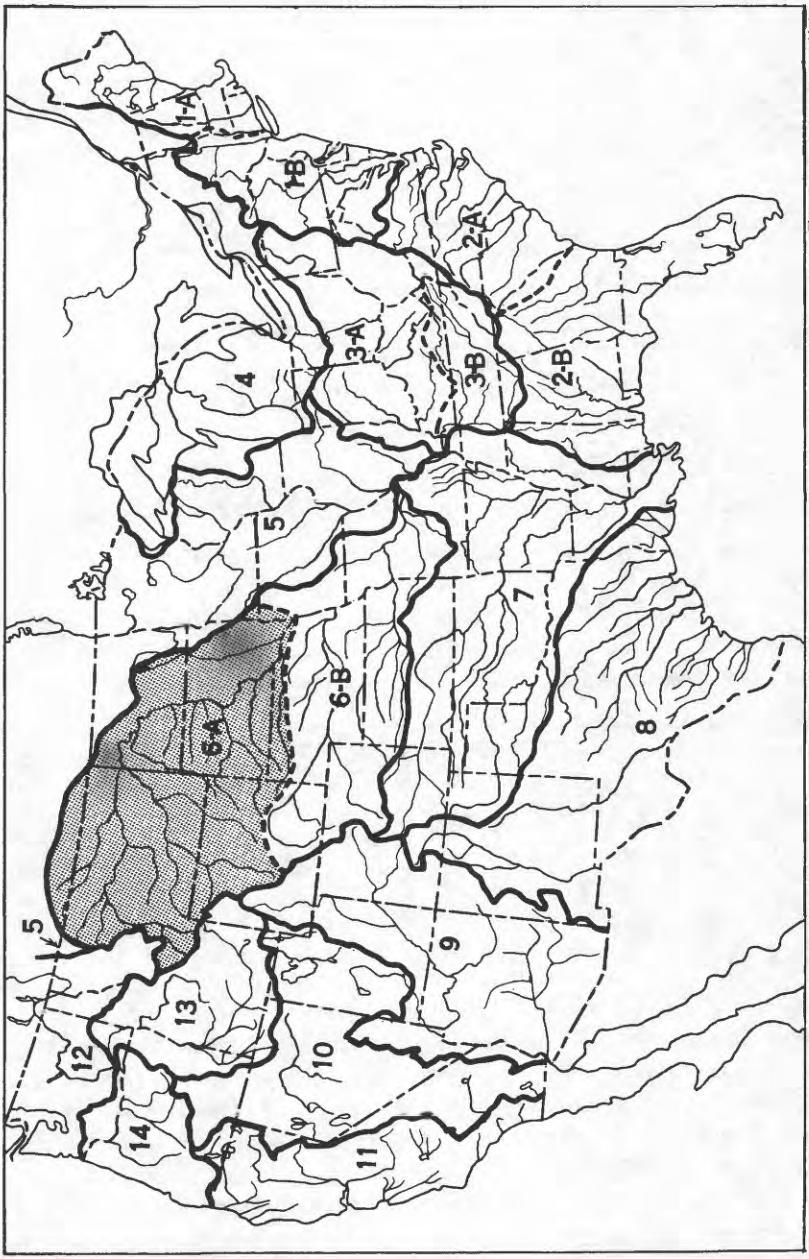


Figure 2.--Map of the United States showing areas covered by the 18 annual volumes on surface-water supply. The area covered by this report is shaded.

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

(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	....do	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 above 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 above Sioux City, Iowa, 1899-1954

Year	WSP	Year	WSP	Year	WSP	Year	WSP	Year	WSP
1899	a36, 37	1911	306	1923	566	1934	761	1945	1036
1900	49	1912	326	1924	586	1935	786	1946	1056
1901	66, 75	1913	356	1925	606	1936	806	1947	1086
1902	84	1914	386	1926	626	1937	826	1948	1116
1903	99	1915	406	1927	646	1938	856	1949	1146
1904	130	1916	436	1928	666	1939	876	1950	1176
1905	172	1917	456	1929	686	1940	896	1951	1209
1906	208	1918	476	1930	701	1941	926	1952	1239
1907-8	246	1919-20	506	1931	716	1942	956	1953	1279
1909	266	1921	526	1932	731	1943	976	1954	1339
1910	286	1922	546	1933	746	1944	1006		

a Gallatin River.

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 above 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 Missouri River basin above Sioux City, Iowa.

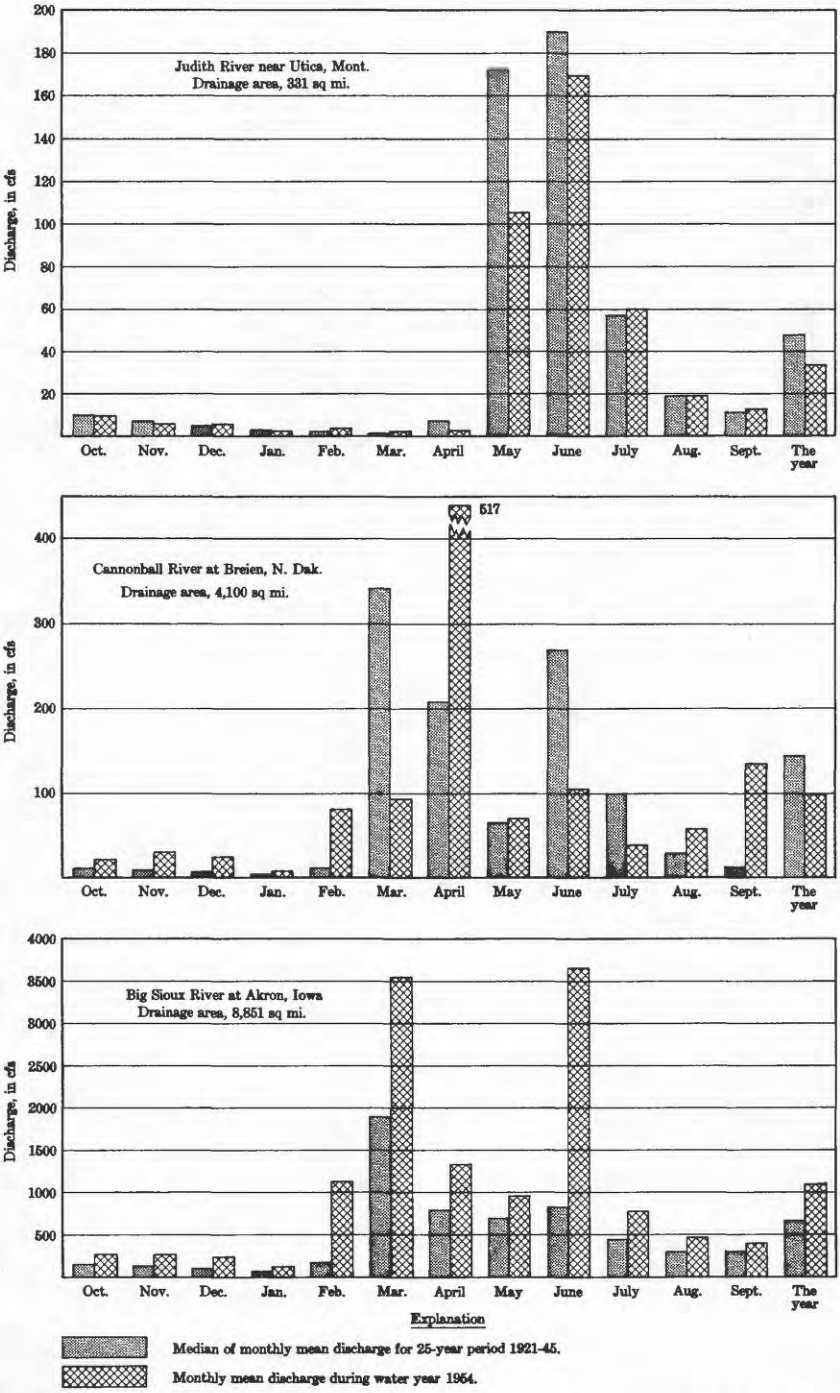


Figure 3. Comparison of discharge at three key gaging stations during 1954 water year with median discharge for 25-year period.

MISSOURI RIVER MAIN STEM

Red Rock River at Kennedy Ranch, near Lakeview, Mont.

Location.--Lat 44°39', long. 112°03', near center of sec. 2, T. 14 S., R. 4 W., on right bank at Kennedy Ranch, 4 miles upstream from Long Creek and 14 miles northwest of Lakeview.

Drainage area.--318 sq mi.

Records available.--July 1936 to September 1954 (no winter records 1943-54).

Gage.--Water-stage recorder and wooden control. Datum of gage is 6,596.37 ft above mean sea level, unadjusted. Prior to Sept. 30, 1936, staff gage and Oct. 1, 1936, to Aug. 27, 1942, water-stage recorder at site 1 mile upstream at different datum.

Extremes.--Maximum discharge recorded during year, 546 cfs Apr. 23 (gage height, 3.54 ft); maximum gage height recorded, 5.4 ft Apr. 19 (ice jam); minimum discharge observed, 12 cfs Nov. 18 (discharge measurement).

1936-54: Maximum discharge recorded, 1,360 cfs Apr. 30, 1952 (gage height, 5.24 ft); minimum, 1.5 cfs Sept. 2, 1940.

Revisions.--The maximum discharge for the water year 1937 has been revised to 964 cfs Apr. 28, 1937 (gage height, 3.52 ft), superseding figure published in WSP 826.

Remarks.--Records good except those for periods of ice effect or no gage-height record, which are poor. Diversions for irrigation of about 6,000 acres above station.

Revisions (water years).--WSP 1086: 1946. Revised figures of discharge, in cubic feet per second, for high-water period in the water year 1937, superseding those published in WSP 826, are given herewith:

Date	Discharge	Date	Discharge	Date	Discharge
1937		1937-Con.		1937-Con.	
Apr. 26	757	May 5	560	May 14	206
27	829	6	490	15	193
28	937	7	425	16	191
29	937	8	367	17	186
30	905	9	322	18	208
May 1	880	10	317	19	199
2	851	11	237	20	190
3	770	12	222		
4	666	13	237		

Month	Cfs-days	Maximum	Minimum	Mean	Runoff in acre-feet
April 1937.....	7,066	937	33	236	14,040
May.....	9,190	880	96	296	18,200
Water year 1936-37.....	23,331.3	937	3.4	63.9	46,260
Calendar year 1937.....	22,726.9	937	-	62.3	45,060