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.

NEW DOWNSTREAM ORDER OF LISTING GAGING STATIONS

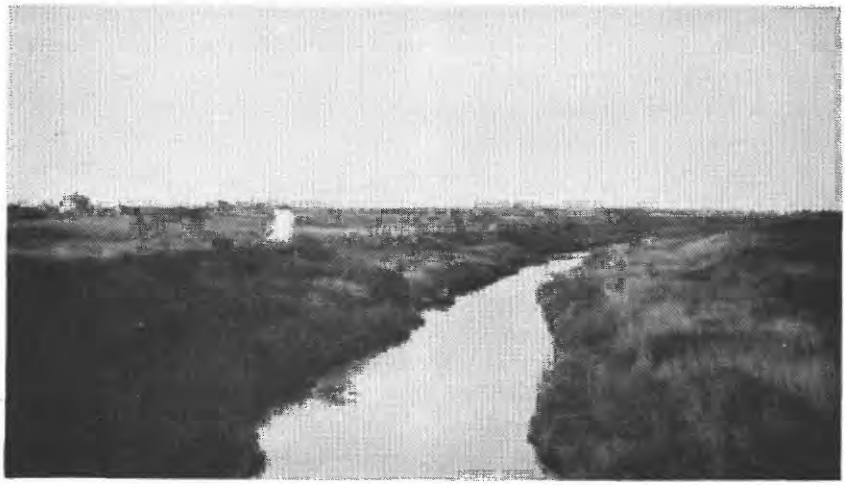
Beginning with the series of reports for the water year ending September 30, 1951, the order of listing gaging-station records has been changed. In this report, in a downstream direction along the main stem all stations on a tributary entering above a main-stem station are listed before that station. If a tributary enters between two main-stem stations, it iss 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 new 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 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 mean discharge is determined by the shifting-control method, in which correction factors based on individual discharge measurements and notes by engineers and observers are used in applying



A, CANNONBALL RIVER AT REGENT, N. DAK.

B, NORTH POPO AGIE RIVER NEAR LANDER, WYO.

FIGURE 1.—GAGING-STATION STRUCTURES.

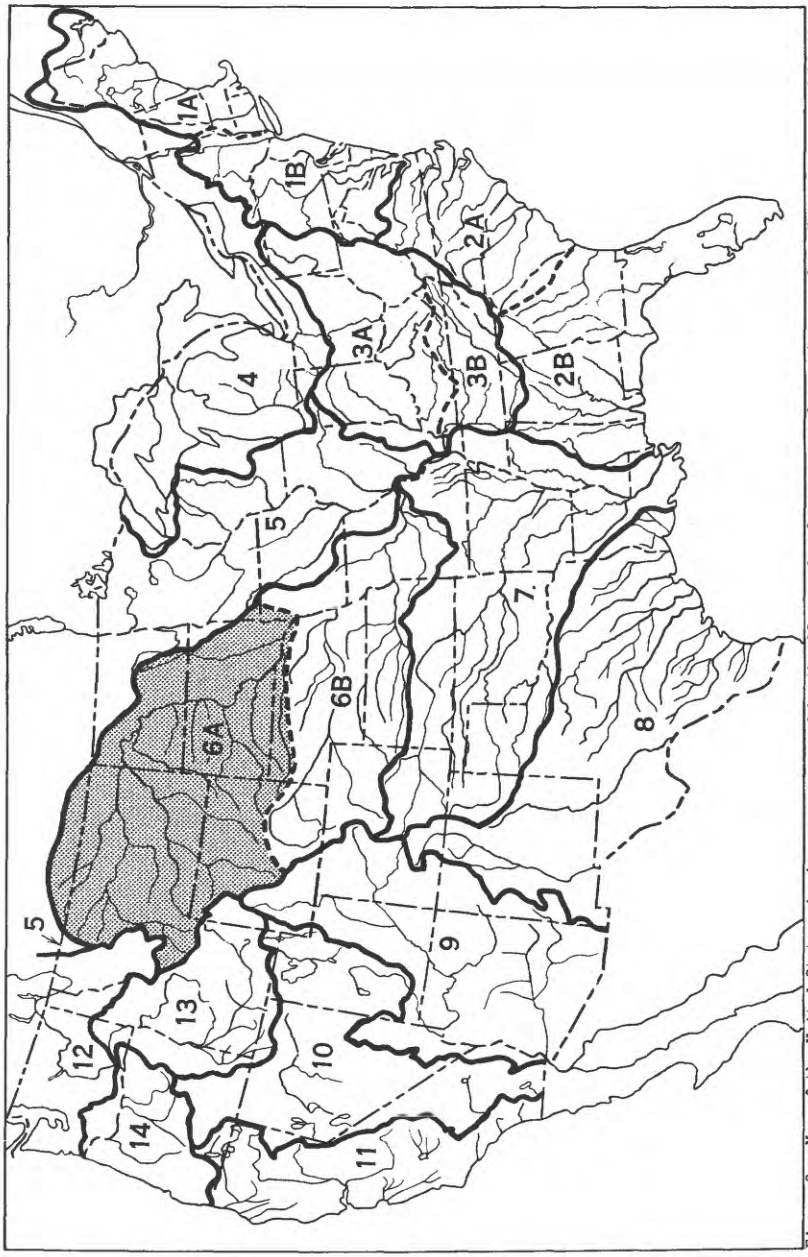


Figure 2.--Map of the United States showing areas covered by the 18 annual volumes on surface water supply. The area covered by this report is shaded.

Streamflow data for the years 1884-1901, in reports of the Geological Survey--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 stream 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 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, 1899-1951

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

a Gallatin River.

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 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.

Reports containing compilations of records of discharge by States and drainage basins

Water-Supply Paper	Period	Report
230.....	1894-1906	Surface water supply of Nebraska.
469.....	1894-1921	Surface waters of Wyoming and their utilization.
491.....	1898-1917	Water supply of St. Mary and Milk Rivers (Mont., Canada).
917.....	1861-1938	Surface waters of Missouri and St. Mary River basins (Mont.).

Records of discharge have been published also in State reports. Some of these are not contained in the publications of the Geological Survey or are revisions of records previously published in its water-supply papers. The following table contains a list of these reports for the area covered by this report.

State reports containing compilations of records of discharge

State	Period	Report	Issued by
Iowa.....	1873-1932	Stream-flow records of Iowa.....	State Planning Board.
Do.....	1873-1940	Water-Supply Bull. 1, Summaries of yearly and flood flow relating to Iowa streams.	Iowa Geological Survey.
Do.....	1941-42	Water-Supply Bull. 2, Surface water resources of Iowa.	Do.
Do.....	1942-50	Water-Supply Bull. 3, Surface water resources of Iowa.	Do.
Montana.....	1889-1911	5th biennial report.....	Office of the State Engineer
Do.....	1881-1938	Special Rept. 10, vols. 1-4, Water resources of Montana:	Montana Agricultural Experiment Station.
Nebraska.....	1894-1914	1st hydrographic report.....	Bureau of Water Power, Irrigation, and Drainage.
Do.....	1914-28	2nd hydrographic report.....	Do.
North Dakota..	1919-21	Report to Governor of North Dakota on flood control.	State chief engineer.
Do.....	1882-1938	Surface water in North Dakota.....	State Planning Board.
Do.....	1882-1944	Supplement B, 4th biennial report.....	State Water Conservation Commission.

Note.--In addition to the records contained in the reports listed above, the following States have issued annual or biennial reports in which are contained records of discharge: Montana, Nebraska, North Dakota, South Dakota, and Wyoming.

The reports listed in the foregoing tables contain the customary records of discharge collected during the systematic operation of gaging stations. Detailed information on the stage and discharge of many streams during major floods has been included in special reports on these floods published by the Geological Survey. The more recent of these special reports also contain other pertinent hydrologic information and analyses and compilations of data relating to earlier notable floods. The following list gives the numbers and titles of these reports:

Water-Supply Paper	Title
147.....	Destructive floods in the United States in 1904.
162.....	Destructive floods in the United States in 1905.
520-G.....	Some floods in the Rocky Mountain region.
771.....	Floods in the United States, magnitude and frequency.
847.....	Maximum discharges at stream-measurement stations through September 1938.
1137-A.....	Missouri River Basin Floods of April-May 1950 in North and South Dakota.

RECORDS OF DISCHARGE COLLECTED BY AGENCIES OTHER THAN THE GEOLOGICAL SURVEY

During the water year 1951, no continuous records of discharge collected by agencies other than the Geological Survey were reported for the area covered by this report.

HYDROLOGIC CONDITIONS

The water year 1951 was characterized by above-normal runoff over most of the Missouri River basin above Sioux City, Iowa. Although local floods occurred in widely scattered sections at various times during the year, no major floods were reported except in the Big Sioux River basin, in the extreme northwestern corner of Iowa, where the greatest flood of recent years occurred during early April.

For three key stations in the area covered by this report, a comparison of monthly and annual mean discharges during the 1951 water year with the median for the 25-year period 1921-45 is shown in figure 3 on the following page.

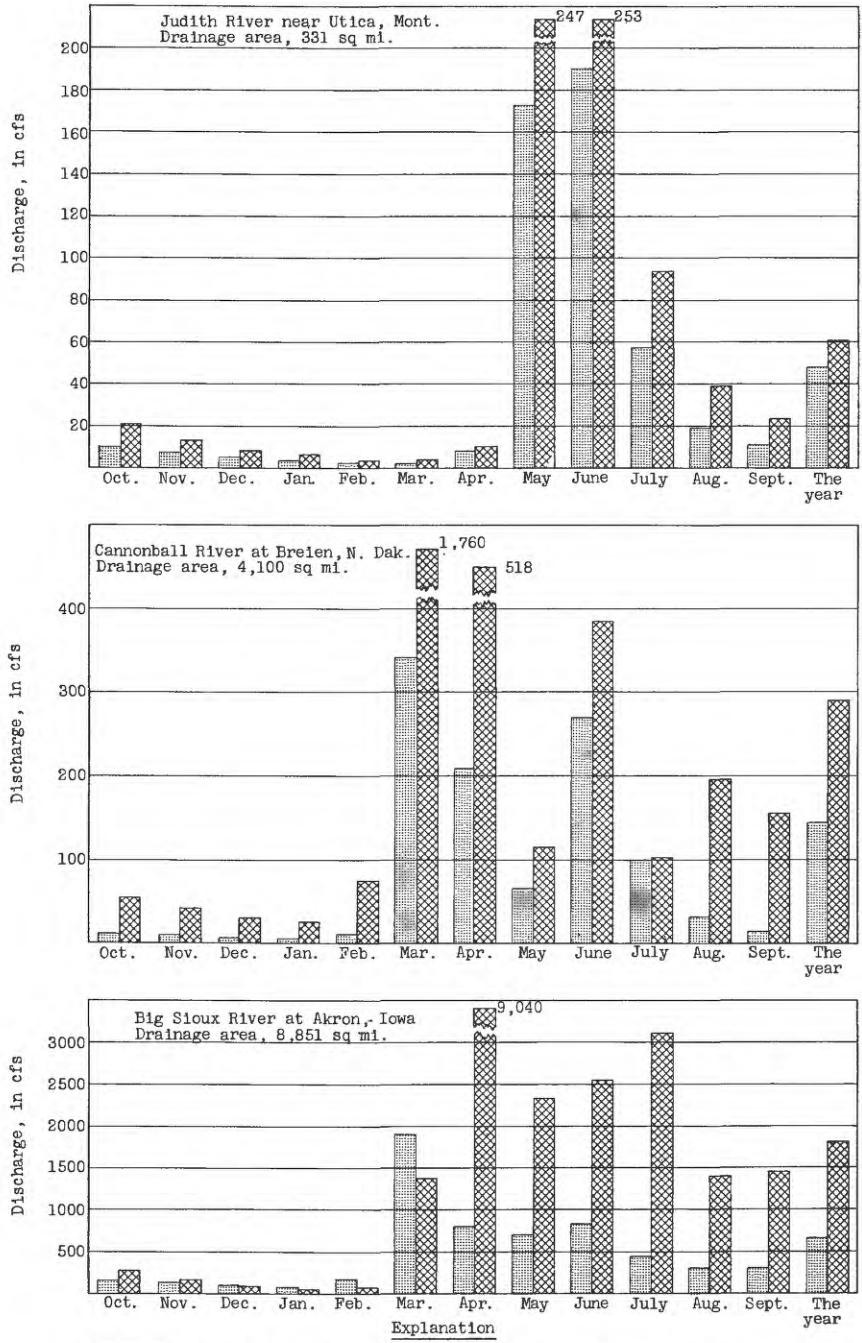


Figure 3.--Comparison of discharge at three key gaging stations during 1951 water year with median discharge for 25-year period.