A. JAMES RIVER AT SCOTTSVILLE, VA.

B. ROANOKE RIVER AT NIAGARA, VA.

FIGURE 1.—GAGING-STATION STRUCTURES.

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 specific 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 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,

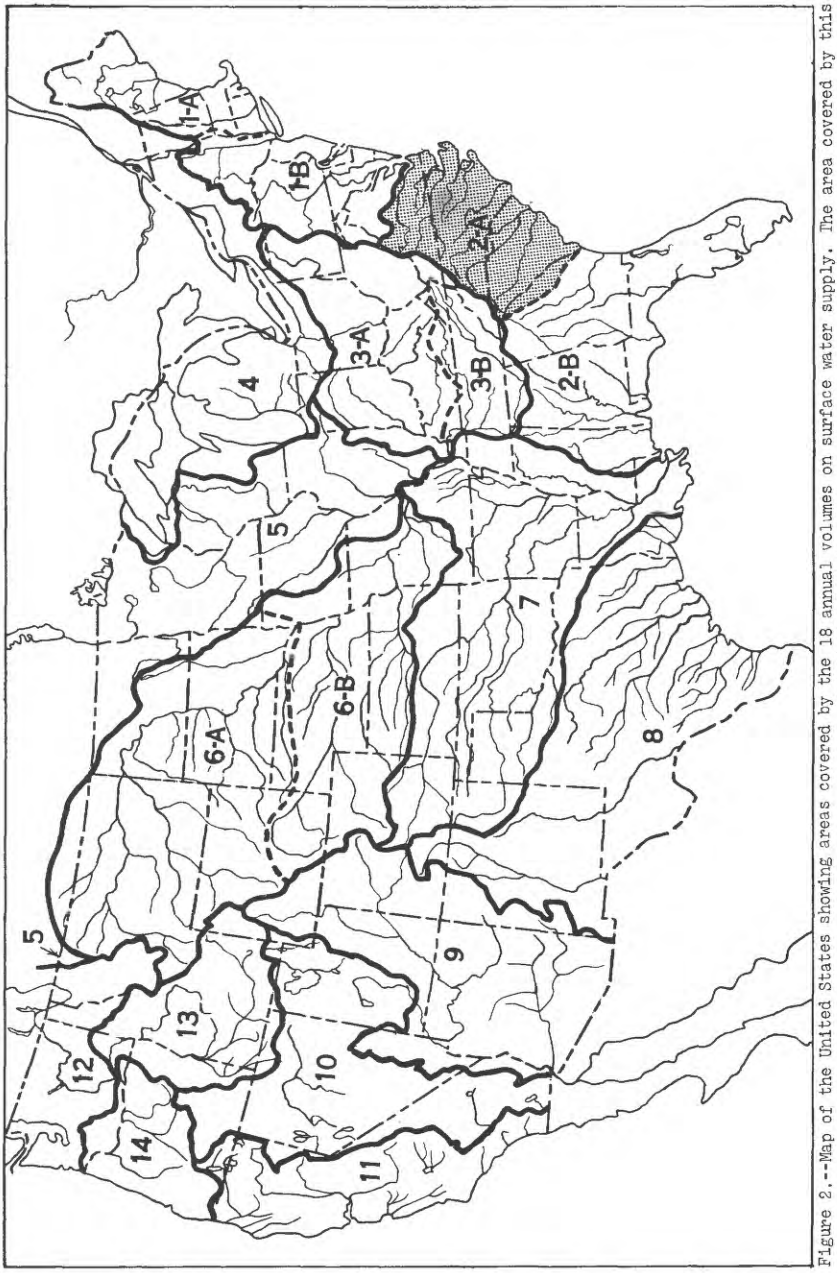

Figure 2.--Map of the United States showing areas covered by the 18 annual volumes on surface water supply. The area covered by this report is shaded.

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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 herein. 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. 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 South Atlantic slope basins, James River to Savannah River, were included with those for the South Atlantic slope and eastern Gulf of Mexico basins.

Numbers of water-supply papers containing results of stream measurements in the South Atlantic slope basins, James River to Savannah River, 1899-1956

Year	WSP	Year	WSP	Year	WSP	Year	WSP	Year	WSP
1899	a35, 36	1912	322	1925	602	1937	822	1949	1142
1900	48	1913	352	1926	622	1938	852	1950	1172
1901	65, 75	1914	382	1927	642	1939	872	1951	1203
1902	a82, 83	1915	402	1928	662	1940	892	1952	1233
1903	a97, 98	1916	432	1929	682	1941	922	1953	1273
1904	b126, 127	1917	452	1930	697	1942	952	1954	1333
1905	b167, 168	1918	472	1931	712	1943	972	1955	1383
1906	b203, 204	1919-20	502	1932	727	1944	1002	1956	1433
1907-8	242	1921	522	1933	742	1945	1032		
1909	262	1922	542	1934	757	1946	1052		
1910	282	1923	562	1935	782	1947	1082		
1911	302	1924	582	1936	802	1948	1112		

a James River only.
b Susquehanna River to Yadkin 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 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 872 for the South Atlantic slope basins, James River to Savannah River), 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 only such report for any part of the area covered by this report is Water-Supply Paper 197, "Water resources of Georgia, 1895-1905."

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
Georgia.....	1895-1906	Bull. 16, Water powers of Georgia.....	Geological Survey of Georgia.
Do.....	1907-19	Bull. 38, Water powers of Georgia.....	Do.
North Carolina	1889-1923	Bull. 34, Discharge records of North Carolina streams.	Department of Conservation and Development.
Do.....	1889-1936	Bull. 39, Discharge records of North Carolina streams.[1]	Do.
Do.....	1866-1945	Hydrologic data on the Neuse River basin...	Do.
Do.....	1820-1945	Hydrologic data on the Cape Fear River basin.	Do.
Do.....	1866-1945	Hydrologic data on the Yadkin-Pee Dee River basin.	Do.
Do.....	1872-1945	Hydrologic data on the Catawba and Broad River basins.	Do.
South Carolina	1884-1946	Bull. 17, Summary of records of surface water supply of South Carolina.	South Carolina Research, Planning and Development Board.
Virginia.....	1895-1927	Bull. 31, Water resources of Virginia.....	Virginia Geological Survey.
Do.....	1927-42	Bull. 5, Surface water supply of Virginia (James River basin).	Do.
Do.....	1927-42	Bull. 6, Surface water supply of Virginia (Roanoke and Chowan River basins).	Do.
Do.....	1942-50	Bull. 13, Surface water supply of Virginia (James River basin).	Do.
Do.....	1942-50	Bull. 14, Surface water supply of Virginia (Chowan and Roanoke River basins).	Do.
Do.....	1951-55	Bull. 17, Surface water supply of Virginia (James River basin).	Department of Conservation and Development.
Do.....	1951-55	Bull. 18, Surface water supply of Virginia (Chowan and Roanoke River basins).	Do.

[1] Contains records of maximum and minimum daily, weekly, and monthly discharge and yearly mean discharge.

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:

Report

WSP 96: Destructive floods in the United States in 1903.
WSP 771: Floods in the United States, magnitude and frequency.
WSP 800: The floods of March 1936, Part 3, Potomac, James, and upper Ohio Rivers.
WSP 846: Maximum discharges at stream-measurement stations through September 1938.
WSP 1066: Floods of August 1940 in southeastern States.
WSP 1137-I: Summary of floods in the United States during 1950.
Cir. 100: Floods in Georgia, frequency and magnitude.

RECORDS OF DISCHARGE COLLECTED BY AGENCIES OTHER THAN THE GEOLOGICAL SURVEY

The city of Lynchburg, Va., has collected records of daily discharge of Pedlar River at Pedlar Dam, Va., since August 1921 and the Agricultural Research Service of the United States Department of Agriculture has collected records of runoff from 3 areas of less than 20 acres each near Chatham, Va., 1938-48; peaks only since 1948.

HYDROLOGIC CONDITIONS

During the water year 1956 the drought in the southeast continued. In November, December, January, June, and August the flow of Yadkin River at Wilkesboro, N. C., was record-low for the respective months. The yearly mean flow for the Wilkesboro gaging station and for Slate River at Arvonia, Va., was also record-low. There were only two noteworthy departures from the drought conditions. In October the flow of Blackwater River at Zuni, Va., was record-high for the month. In July, flash floods in the Candor-Robbins area of North Carolina followed rains of 9 to 13 inches in 10 hours over an area of about 150 square miles; at the gaging station on Bear Creek at Robbins the flood was believed to be the greatest in more than 50 years. For three key gaging stations in the area covered by this report a comparison of monthly and yearly mean discharges for the 1956 water year with the median discharges for the 25-year period 1921-45 is shown in figure 3 on opposite page.

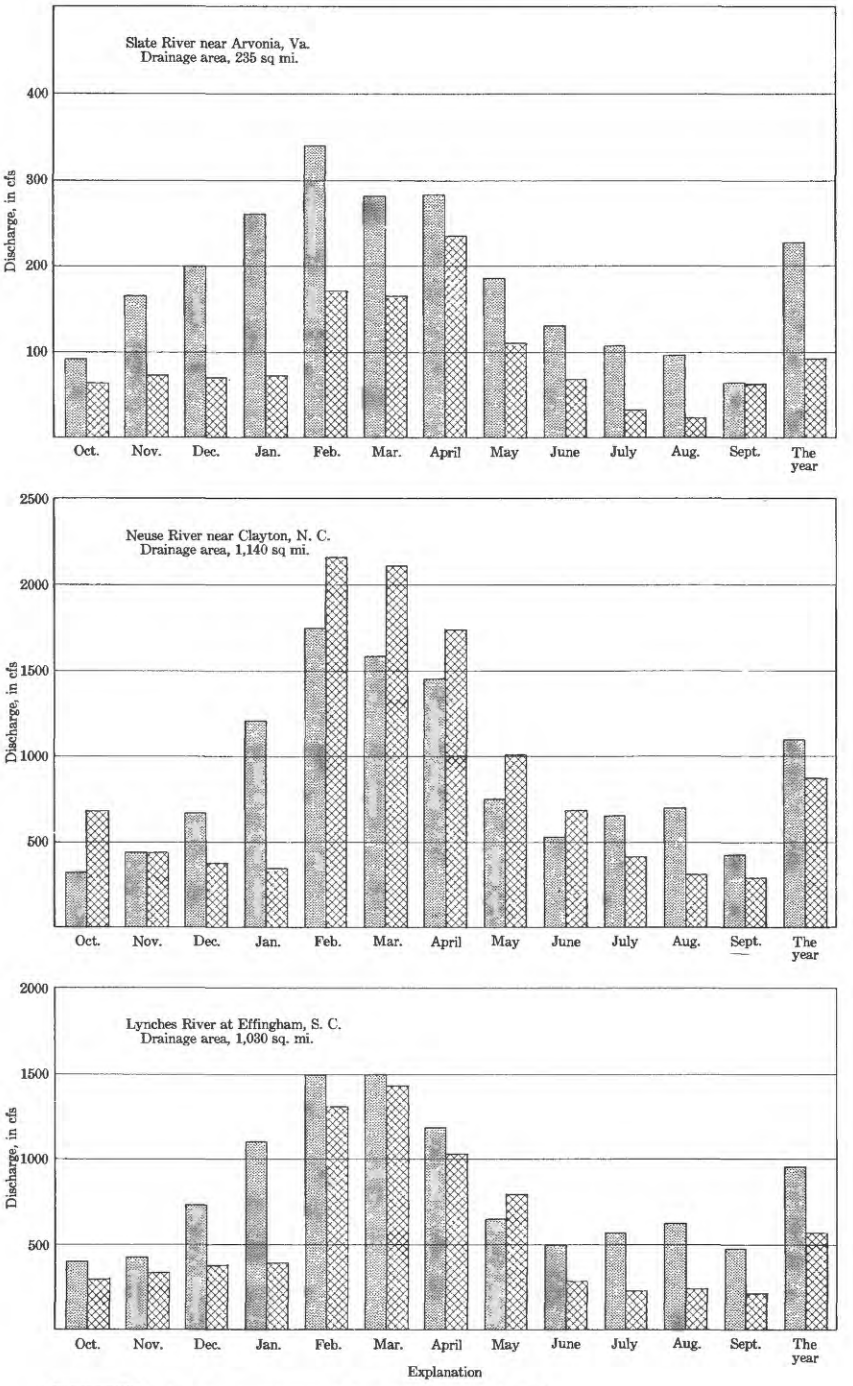

Figure 3. Comparison of discharge at three key gaging stations during 1956 water year with median discharge for 25-year period.

JAMES RIVER BASIN

Bolar Spring at Bolar, Va.

Location.--Lat 38°13'05", long 79°40'40", in Highland County, 1,000 ft north of Bolar, which is on county line between Bath and Highland Counties.

Records available.--August 1947, October 1949 to September 1956 (discharge measurements only), discontinued.

Extremes.--1947, 1949-56: Maximum discharge measured, 17.6 cfs Feb. 3, 1950; minimum measured, 2.97 cfs Oct. 6, 1954.

Remarks.--Discharge measurements generally made once a month 75 ft downstream from source.

Discharge measurements, in cubic feet per second, water year October 1955 to September 1956

Oct. 12	4.48	Apr. 24	6.79
Nov. 7	3.81	May 15	6.75
Dec. 5	3.54	June 18	5.97
Jan. 9	4.29	July 23	3.73
Feb. 6	6.88	Aug. 27	4.39
Mar. 21	8.44	Sept.17	3.75

Muddy Run Spring near Warm Springs, Va.

Location.--Lat 38°06'25", long 79°45'05", 2.7 miles upstream from Jackson River and 3.9 miles northeast of intersection of U. S. Highway 220 and State Highway 39 at Warm Springs, Bath County.

Records available.--June 1946 to September 1956 (discharge measurements only), discontinued.

Extremes.--1946-56: Maximum discharge measured, 12.3 cfs Feb. 3, 1950; minimum measured, that of Sept. 17, 1956.

Remarks.--Discharge measurements generally made once a month 50 ft downstream from spring.

Discharge measurements, in cubic feet per second, water year October 1955 to September 1956

Oct. 12	3.09	Apr. 24	8.39
Nov. 7	3.41	May 15	5.76
Dec. 5	2.86	June 18	4.82
Jan. 9	2.37	July 23	2.76
Feb. 6	8.55	Aug. 27	3.03
Mar. 21	8.28	Sept.17	2.09