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

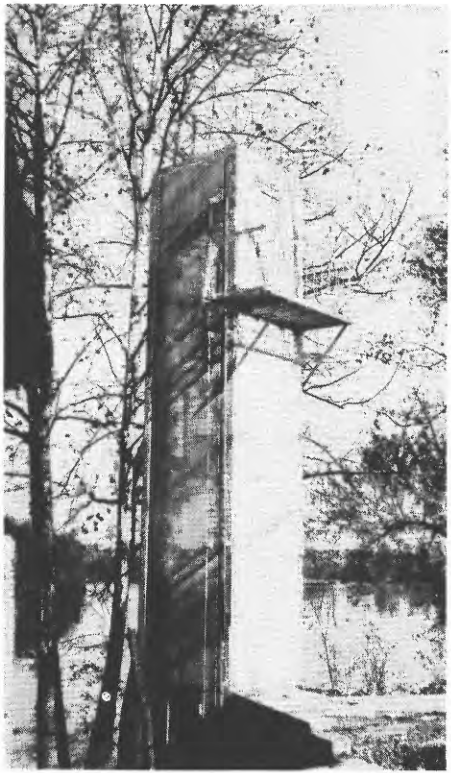
Beginning with the series of reports for the water year ending September 30, 1951, the order of listing gaging-station records has been changed. In this report, in a downstream direction along the main stem all stations on a tributary entering above a main-stem station are listed before that station. If a tributary enters between two main-stem stations, it 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 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 is 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. Tennessee River at Knoxville, Tenn.

B. Nantahala River near Rainbow Springs, N. C.

Figure 1 - GAGING STATION STRUCTURES

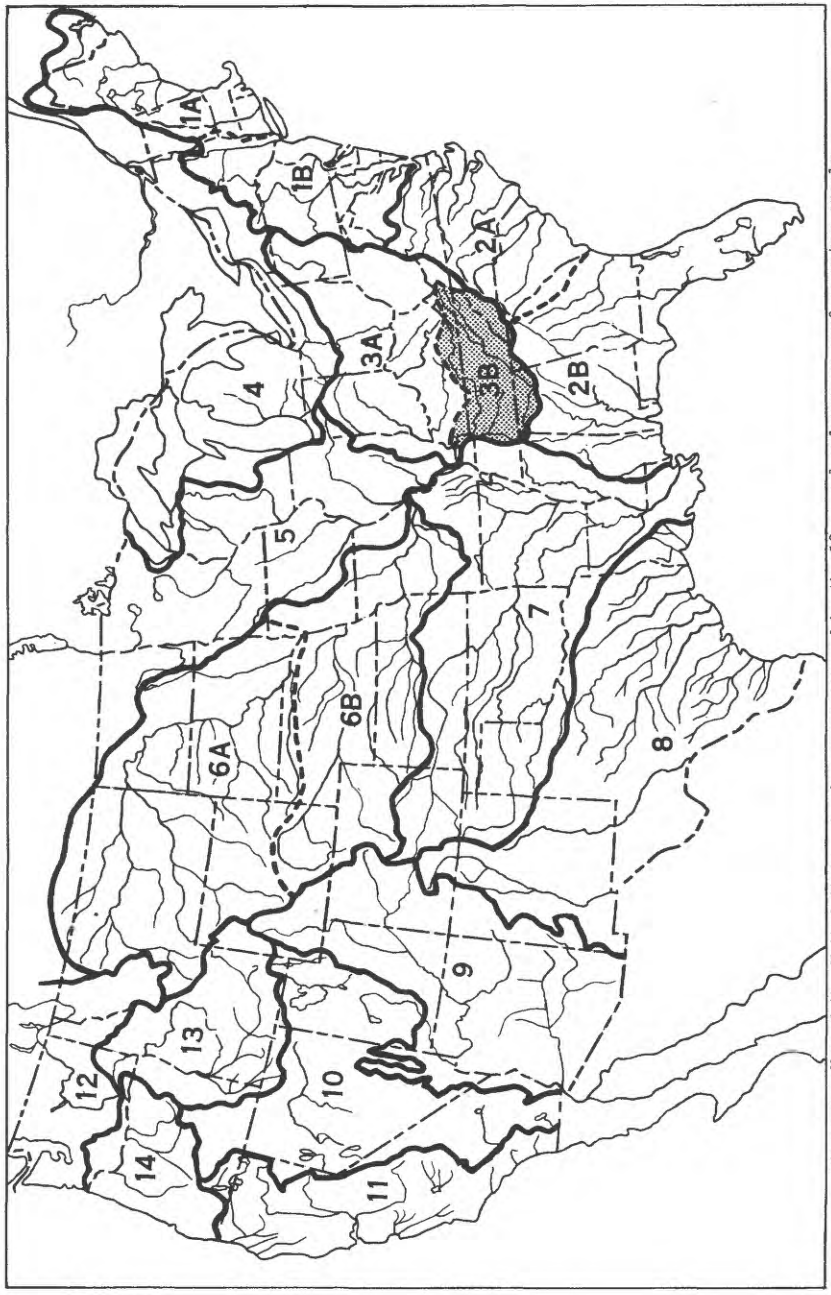


Figure 2.--Map of the United States showing areas covered by the 18 annual volumes on surface water supply. The shaded portion represents the area covered by this volume.

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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 Cumberland and Tennessee River basins were included with those of the other rivers of the Ohio River basin.

Numbers of water-supply papers containing results of stream measurements in Cumberland and Tennessee River basins, 1899-1951

Year	W.S.P.	Year	W.S.P.	Year	W.S.P.	Year	W.S.P.
1899.....	36	1913.....	353	1927.....	643	1940.....	893
1900.....	48	1914.....	383	1928.....	663	1941.....	923
1901.....	65, 75	1915.....	403	1929.....	683	1942.....	953
1902.....	83	1916.....	433	1930.....	698	1943.....	973
1903.....	98	1917.....	453	1931.....	713	1944.....	1003
1904.....	128	1918.....	473	1932.....	728	1945.....	1033
1905.....	169	1919-20...	503	1933.....	743	1946.....	1053
1906.....	205	1921.....	523	1934.....	758	1947.....	1083
1907-8....	243	1922.....	543	1935.....	783	1948.....	1113
1909.....	263	1923.....	563	1936.....	803	1949.....	1143
1910.....	283	1924.....	583	1937.....	823	1950.....	1173
1911.....	303	1925.....	603	1938.....	853	1951.....	1206
1912.....	323	1926.....	623	1939.....	873		

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 873 for the Cumberland and Tennessee River basins) 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.

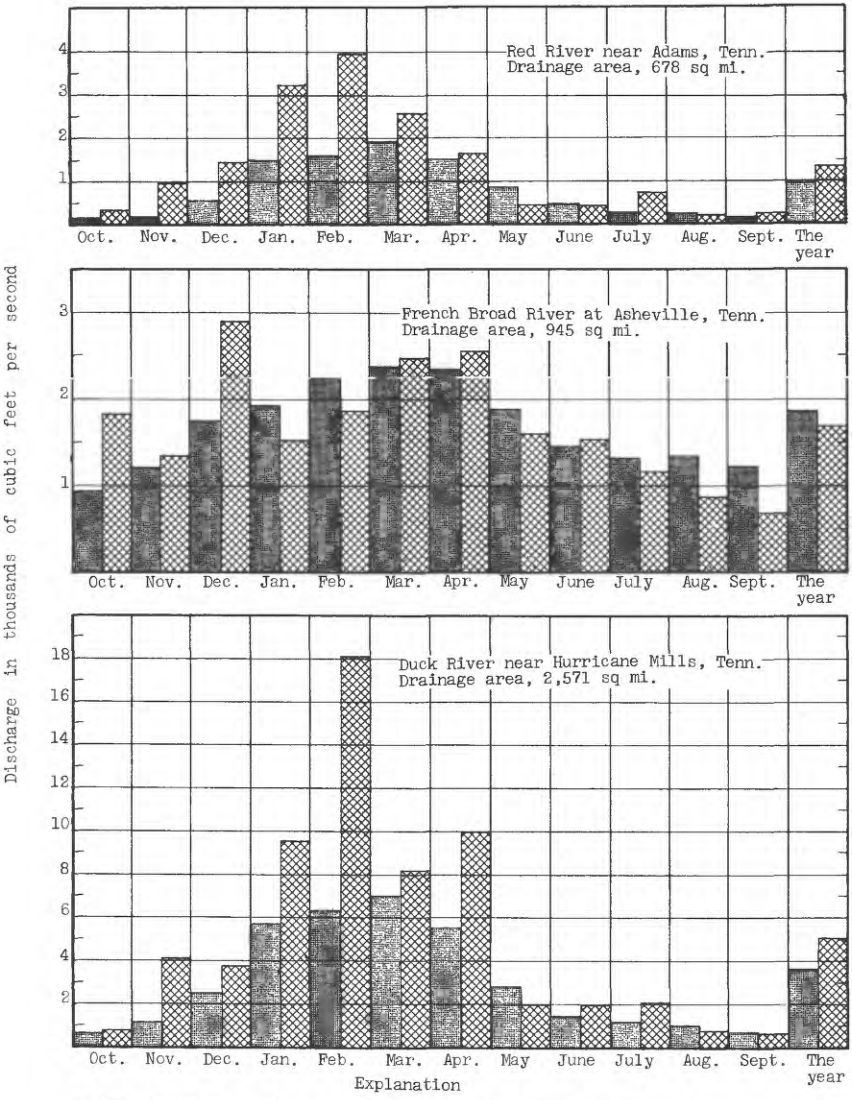

Figure 3.--Comparison of discharge at three key stations during 1951 water year with median discharge for 25-year period.

CUMBERLAND RIVER BASIN

Poor Fork at Cumberland, Ky.

Location.--Lat 36°58'25", long. 82°59'35", at left end downstream side of Second Street Bridge at Cumberland, Harlan County, 0.1 mile upstream from Cloverlick Creek and 0.5 mile downstream from Looney Creek.

Drainage area.--82.1 sq mi.

Records available.--March 1940 to September 1951.

Gage.--Water-stage recorder. Datum of gage is 1,415.15 ft above mean sea level, datum of 1929, supplementary adjustment of 1936.

Average discharge.--11 years, 138 cfs.

Extremes.--Maximum discharge during year, 3,400 cfs Dec. 7 (gage height, 6.36 ft); from rating curve extended above 1,800 cfs by logarithmic plotting; minimum daily, 11 cfs Aug. 30.

1940-51: Maximum discharge, 7,500 cfs Jan. 7, 1946 (gage height, 9.65 ft), from rating curve extended above 2,900 cfs by logarithmic plotting; minimum, 2.1 cfs Oct. 8, 9, 1941.

Flood in January 1927 reached a stage about 0.5 ft higher than that of Jan. 7, 1946 (discharge, 12,000 cfs, estimated by Corps of Engineers).

Remarks.--Records fair except those for periods of no gage-height record, which are poor.

Revisions (water years).--W 923: 1940(M).

Rating tables, water year 1950-51 (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Nov. 17		Nov. 18 to Sept. 25				Sept. 26-30	
0.25	12	0.1	10	1.5	230	0.65	18
.3	14	.3	20	2.0	420	.7	25
.5	27	.5	36	3.0	960	.8	40
.7	48	.7	62	5.0	2,310		
1.1	120	1.0	110				

Discharge, in cubic feet per second, water year October 1950 to September 1951

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	g22	g14	g89	59	2,280	*260	324	308	g130	g32	g26	g60
2	g21	g17	445	65	1,070	215	466	320	g120	g29	g21	g119
3	g19	g13	680	66	456	198	750	852	g110	g26	g16	g40
4	g21	90	1,380	148	308	328	*480	448	g86	g36	g16	g22
5	g20	113	*460	178	230	696	332	396	g152	g46	g18	g18
6	g19	64	251	155	*190	510	251	456	g144	g36	g19	184
7	g12	37	1,940	152	372	408	212	480	g120	g32	g19	g126
8	g13	29	1,070	138	360	356	203	416	g130	g27	g19	g40
9	29	g25	456	120	264	296	168	296	g150	g20	g23	g33
10	29	34	304	114	209	239	158	*221	g242	g19	g22	g25
11	g20	g30	218	128	180	203	150	188	g188	g24	g20	g21
12	g20	g30	172	114	162	185	479	158	g126	g20	g18	g20
13	*g18	g26	134	106	148	190	510	a140	g134	g18	g18	g34
14	g16	g24	112	248	140	190	376	a140	g124	g34	g17	684
15	g14	g22	106	1,430	130	182	316	a130	g99	122	g17	g245
16	g14	g22	99	600	136	168	340	a110	g89	g51	g26	g106
17	g14	g20	92	368	150	170	308	a90	g92	g34	g20	g69
18	g12	g21	82	*284	140	482	248	a70	g69	g26	g16	g48
19	g14	g24	70	245	198	540	209	72	g55	g20	g18	g38
20	g12	164	75	212	328	610	172	65	g48	g18	g14	g32
21	g14	364	68	180	1,480	436	140	g126	*g51	g18	g14	g23
22	g14	198	62	144	828	308	138	g126	g48	g17	g13	g21
23	23	132	63	132	440	233	134	g214	g69	g39	g13	g24
24	27	g126	68	134	300	251	116	g300	g55	239	g14	g30
25	g19	g138	66	116	230	239	110	g192	g46	448	g13	g36
26	g15	g112	62	105	203	230	151	g162	g46	g124	g13	g31
27	g17	g84	58	101	296	200	245	g340	g51	*g70	g12	26
28	a20	g79	54	103	296	215	206	g280	g36	g51	g12	25
29	g15	g73	68	205	-	498	188	g260	g51	g41	g12	19
30	g14	g72	65	384	-	560	245	g224	g36	g33	g11	18
31	g16	-	63	555	-	416	-	g168	-	g30	*g12	-
Total	553	2,197	8,932	7,089	11,524	10,012	8,125	7,748	2,897	1,780	522	2,217
Mean	17.8	73.2	288	229	412	323	271	250	96.6	57.4	16.8	73.9
Cfsm	0.217	0.892	3.51	2.79	5.02	3.93	3.30	3.05	1.18	0.699	0.205	0.900
In.	0.25	1.00	4.05	3.21	5.22	4.54	3.68	3.51	1.31	0.81	0.24	1.00

Calendar year 1950: Max 2,690 Min 12 Mean 185 Cfsm 2.25 In. 30.60
Water year 1950-51: Max 2,280 Min 11 Mean 174 Cfsm 2.12 In. 28.82

Peak discharge (base, 1,200 cfs).--Dec. 4 (6:30 a.m.) 1,940 cfs (4.54 ft); Dec. 7 (2 p.m.) 3,400 cfs (6.36 ft); Jan. 15 (6 a.m.) 1,850 cfs (4.42 ft); Feb. 1 (3 p.m.) 3,290 cfs (6.22 ft); Feb. 21 (1 p.m.) 1,850 cfs (4.41 ft).

* Discharge measurement made on this day.

a No gage-height record; discharge estimated on basis of recorder graph, weather records, and records for Cumberland River near Harlan.

g Computed from twice-daily wire-weight gage readings.