Stage-discharge relation is the relation between gage height and the amount of water flowing in a channel, expressed as volume per unit of time.

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 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.

DOWNSTREAM ORDER OF LISTING GAGING STATIONS

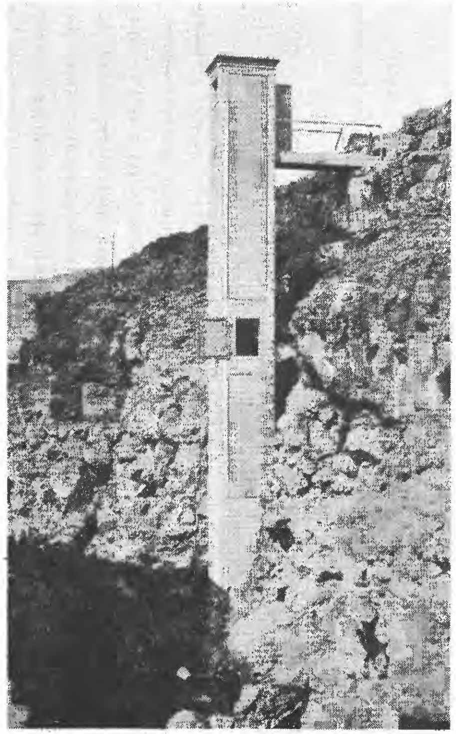
Beginning with the series of reports for the water year ending September 30, 1951, the order of listing gaging-station records was changed. In this report, in a downstream direction along the main stem all stations on a tributary entering above a main-stem station are listed before that station. If a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

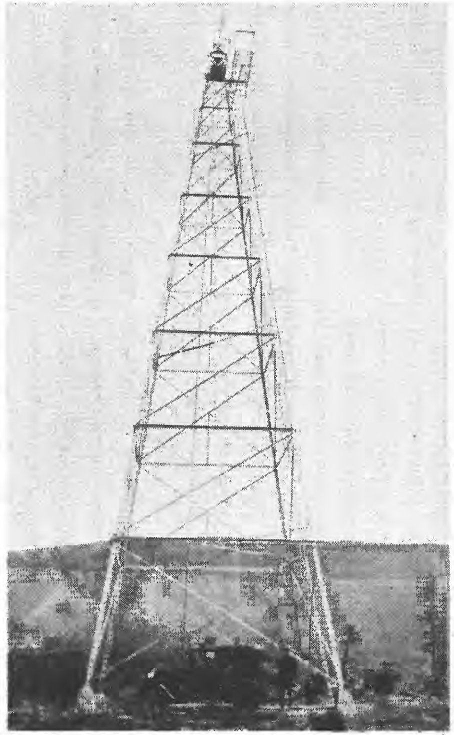
EXPLANATION OF DATA

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



A, COLUMBIA RIVER AT TRINIDAD, WASH.
Recording-gage shelter and stilling well.



B, COLUMBIA RIVER AT TRINIDAD, WASH.
East cable tower.

FIGURE 1.—GAGING STATION STRUCTURES

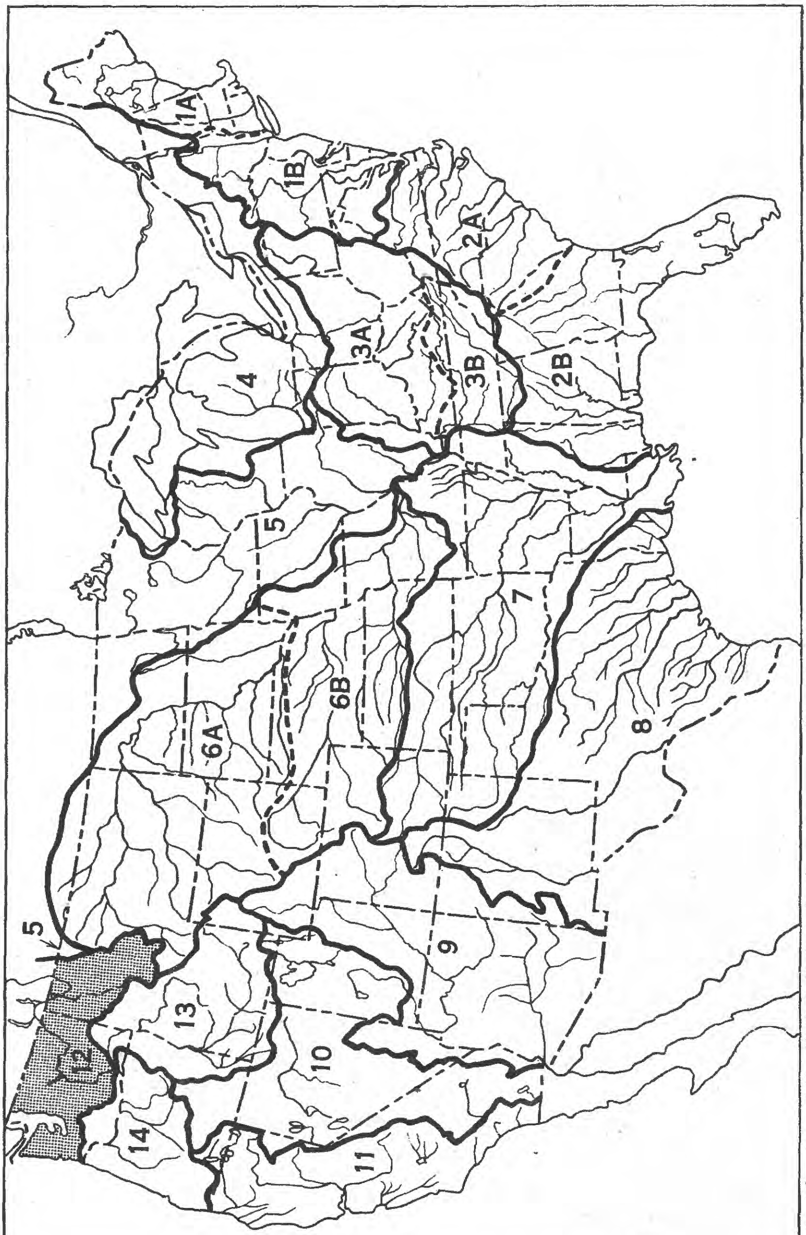


Figure 3.--Map of the United States showing areas covered by the 18 annual volumes on surface-water supply. The area covered by this report is shaded.

Early records of the flow of streams in the United States are published in the reports listed below. 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; W = Water-Supply Paper)

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.
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 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.
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.

Numbers of water-supply papers containing results of stream measurements in Pacific slope basins in Washington and upper Columbia River basin, 1899-1952

Year	W.S.P.	Year	W.S.P.	Year	W.S.P.	Year	W.S.P.	Year	W.S.P.
1899	38	1911	312	1923	572	1933	752	1943	982
1900	51	1912	332-A	1924	592	1934	767	1944	1012
1901	66, 75	1913	362-A	1925	612	1935	792	1945	1042
1902	85	1914	392	1926	632	1936	812	1946	1062
1903	100	1915	412	1927	652	1937	832	1947	1092
1904	135	1916	442	1928	672	1938	862	1948	1122
1905	178	1917	462	1929	692	1939	882	1949	1152
1906	214	1918	482	1930	707	1940	902	1950	1182
1907-8	252	1919-20	512	1931	722	1941	932	1951	1216
1909	272	1921	532	1932	737	1942	962	1952	1246
1910	292	1922	552						

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 882 for the Pacific slope basins in Washington and upper Columbia River basin) 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

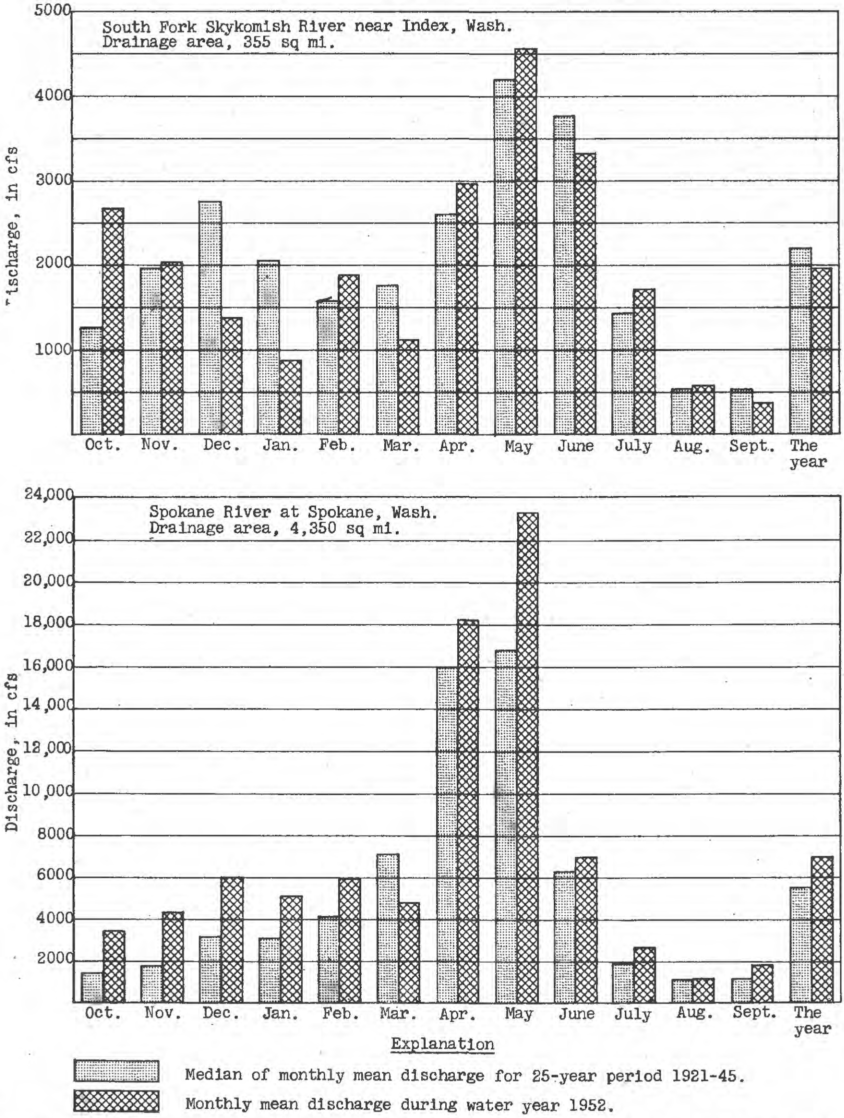


Figure 3.--Comparison of discharge at two key gaging stations during 1952 water year with median discharge for 25-year period.

Pacific slope basins north of Columbia River

NASELLE RIVER BASIN

Naselle River near Naselle, Wash.

Location.--Lat 46°22'25", long. 123°44'45", in SW¼ sec. 1, T. 10 N., R. 9 W., on left bank 150 ft downstream from road crossing, 1½ miles upstream from Salmon Creek, and 3½ miles east of Naselle.

Drainage area.--55.3 sq mi.

Records available.--May 1929 to September 1952.

Gage.--Staff gage and crest-stage indicator; gage read twice daily. Altitude of gage is 24 ft above mean sea level (by barometer).

Average discharge.--23 years, 426 cfs.

Extremes.--Maximum discharge during year, 5,760 cfs Feb. 4 (gage height, 10.95 ft); minimum observed, 30 cfs Sept. 21-30 (gage height, 1.70 ft).
1929-52: Maximum discharge, 10,400 cfs Jan. 22, 1935 (gage height, 15.9 ft, from floodmarks), from rating curve extended above 3,900 cfs; minimum observed, 19 cfs Sept. 12, 14, 1949, Sept. 21-24, 1951.

Remarks.--Records good. No diversion or regulation.

Revisions.--W 1216: Drainage area.

Rating tables, water year 1951-52 (gage height, in feet, and discharge, in cubic feet per second)

Oct. 1 to Feb. 3		Feb. 4 to Sept. 30			
2.5	170	1.7	30	4.0	750
3.0	305	2.0	75	6.0	1,860
4.0	680	2.5	187	10.0	4,900
6.0	1,770	3.0	345		
10.0	4,900				

Discharge, in cubic feet per second, water year October 1951 to September 1952

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	644	269	1,530	281	2,590	269	575	260	85	83	41	44
2	1,270	245	985	266	1,620	257	633	221	83	73	40	41
3	885	251	1,060	*245	1,880	278	567	198	*83	68	37	41
4	556	256	1,360	235	4,310	345	507	179	128	68	37	40
5	392	260	1,650	260	2,060	359	455	166	113	68	37	37
6	302	242	1,290	238	1,240	394	404	154	103	64	37	44
7	251	232	920	228	945	359	362	147	93	61	40	45
8	215	*225	688	225	700	331	317	144	89	57	40	48
9	190	266	548	466	615	317	289	135	83	54	38	51
10	172	588	466	452	539	1,160	266	128	83	54	37	45
11	212	780	400	438	539	970	239	124	95	54	37	40
12	238	1,120	354	389	535	*795	233	122	115	54	35	37
13	508	1,010	319	361	443	678	233	130	93	52	35	37
14	700	875	287	368	*435	599	227	156	87	51	36	37
15	700	700	284	354	412	531	204	124	87	50	38	37
16	660	612	330	319	398	463	187	115	99	48	40	35
17	608	496	375	293	370	642	177	109	133	48	37	35
18	720	424	1,670	520	334	642	166	103	107	48	37	35
19	1,530	378	1,120	770	314	567	187	105	95	46	37	32
20	1,820	340	765	600	303	535	159	124	95	46	37	32
21	1,270	305	1,380	568	269	491	149	156	97	48	35	30
22	1,160	263	1,770	484	257	459	139	128	91	*48	44	30
23	1,850	240	1,040	496	260	495	133	119	87	59	75	30
24	1,580	225	720	1,260	257	696	128	111	87	73	51	*30
25	1,100	375	556	1,200	303	633	124	105	83	52	59	30
26	780	965	473	1,200	328	559	122	99	81	50	115	30
27	632	810	424	1,560	303	495	164	95	83	48	*79	30
28	528	1,300	375	1,160	275	471	161	95	83	48	61	30
29	424	1,460	445	1,520	275	687	169	99	87	48	54	30
30	350	1,320	340	4,310	-	692	*338	93	97	48	52	30
31	302	-	296	2,710	-	656	-	87	-	44	48	-
Total	22,549	16,832	24,220	23,776	23,109	16,825	8,014	4,131	2,825	1,713	1,426	1,093
Mean	727	561	781	767	797	543	267	133	94.2	55.3	46.0	36.4
Cfsm	13.1	10.1	14.1	13.9	14.4	9.82	4.83	2.41	1.70	1.00	0.832	0.658
In.	15.16	11.32	16.29	15.99	15.54	11.32	5.39	2.78	1.90	1.15	0.96	0.74
Ac-ft	44,730	33,390	48,040	47,160	45,840	33,370	15,900	8,190	5,600	3,400	2,830	2,170

Calendar year 1951: Max 5,440 Min 19 Mean 452 Cfsm 8.17 In. 110.95 Ac-ft 327,300
Water year 1951-52: Max 4,310 Min 30 Mean 400 Cfsm 7.23 In. 98.54 Ac-ft 290,600

Peak discharge (base, 3,600 cfs).--Jan. 30 (1:30 p.m.) 5,440 cfs (10.60 ft); Feb. 4 (time unknown) 5,760 cfs (10.95 ft).
* Discharge measurement made on this day.