

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.

NEW DOWNSTREAM ORDER OF LISTING GAGING STATIONS

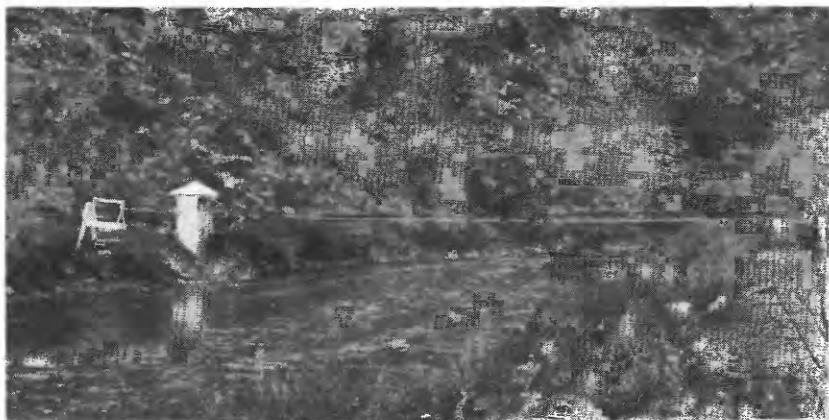
Beginning with the series of reports for the water year ending September 30, 1951, the order of listing gaging-station records has been changed. In this report, in a downstream direction along the main stem all stations on a tributary entering above a main-stem station are listed before that station.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

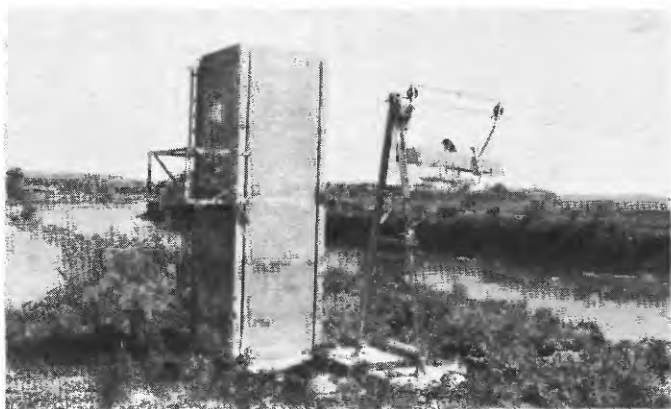
EXPLANATION OF DATA

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 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,



A, SOUTH PLATTE RIVER AT SOUTH PLATTE, COLO.



B, NISHNABOTNA RIVER ABOVE HAMBURG, IOWA.



C, REPUBLICAN RIVER AT TRENTON, NEBR.

FIGURE 1.—GAGING-STATION STRUCTURES.

Republican River near Bloomington, Nebr.

Location.--Lat 40°04'00", long. 99°02'10" (revised), in NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 8, T. 1 N., R. 15 W., on right bank 600 ft downstream from highway bridge, 2 miles south of Bloomington, 2 $\frac{1}{2}$ miles downstream from Cottonwood Creek, 9 $\frac{1}{2}$ miles downstream from Turkey Creek, and 13 $\frac{1}{2}$ miles downstream from Harlan County dam.

Drainage area.--20,800 sq mi, of which only 15,100 sq mi contribute directly to surface runoff.

Records available.--April 1929 to September 1951.

Gage.--Water-stage recorder. Datum of gage is 1,824.15 ft above mean sea level, datum of 1929 (levels by Corps of Engineers). Prior to Apr. 13, 1935, chain gage at site 600 ft upstream at datum 1.00 ft higher and Apr. 13, 1935, to Nov. 19, 1939, at present datum.

Average discharge.--22 years, 749 cfs.

Extremes.--Maximum discharge during year, 11,500 cfs May 22 (gage height, 7.14 ft); minimum daily, 109 cfs Dec. 7.

1929-51: Maximum discharge, 260,000 cfs June 1, 1935 (gage height, 20.4 ft, from floodmarks, site then in use), by slope-area determination; minimum daily, 6.8 cfs Oct. 6, 7, 1936.

Remarks.--Records fair except those for periods of ice effect, doubtful or no gage-height record, or indefinite stage-discharge relation, which are poor. Discharge measurements generally made once a week. Natural flow affected by irrigation development above station and, since 1949, by storage in Bonny and Enders Reservoirs and Harry Strunk Lake.

Revisions.--W 1086: Drainage area.

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	270	203	358	259	166	630	431	738	1,330	2,080	1,680	518
2	458	203	345	259	154	564	431	582	1,510	1,770	1,300	541
3	445	193	302	243	144	570	436	496	1,360	1,660	957	2,390
4	354	193	267	292	142	600	431	452	1,190	1,390	880	4,120
5	354	200	223	322	154	582	452	405	1,050	1,220	1,040	6,990
6	298	206	110	308	177	558	479	367	1,240	1,140	762	7,520
7	270	206	109	272	193	535	468	356	1,280	1,050	792	7,960
8	252	210	114	246	195	512	468	314	1,380	878	756	8,010
9	248	217	140	254	200	501	490	310	4,290	922	971	8,880
10	241	210	159	281	214	524	529	302	3,880	908	756	9,020
11	237	193	173	266	212	380	524	290	2,670	4,090	654	8,310
12	227	210	187	239	214	227	490	278	3,360	8,660	1,180	6,370
13	217	223	215	239	243	340	474	278	3,190	7,110	2,570	5,180
14	217	248	202	254	278	327	462	318	2,320	7,570	2,250	3,840
15	210	310	188	282	325	460	490	318	1,980	6,570	2,420	2,900
16	203	318	427	317	303	582	462	3,980	1,830	5,520	3,580	2,190
17	200	298	479	327	293	672	405	4,920	1,750	4,960	3,180	1,720
18	193	286	382	300	330	570	377	e2,500	1,560	3,720	2,290	1,360
19	a193	294	349	274	566	524	372	e2,000	3,390	5,540	1,360	1,160
20	a200	298	332	366	831	501	405	e2,000	2,970	5,070	1,040	1,060
21	a200	294	314	378	929	490	468	7,670	a3,500	3,590	873	964
22	a200	298	310	420	950	484	452	10,000	a2,500	2,640	738	908
23	a210	282	323	396	859	452	405	5,090	a4,000	2,120	696	852
24	a230	249	332	321	762	436	400	3,780	a4,500	2,520	690	810
25	252	234	332	326	654	421	391	3,440	a4,000	2,700	660	786
26	252	227	318	321	606	410	377	3,660	a3,700	2,240	630	774
27	244	227	263	182	553	405	400	a2,410	a3,500	1,880	1,020	726
28	237	237	248	182	690	436	396	a2,110	a2,800	1,650	696	680
29	223	266	241	178	-	421	437	1,740	2,550	2,560	541	660
30	220	372	244	175	-	415	1,010	1,560	2,520	1,840	636	636
31	217	-	263	172	-	426	-	1,570	-	1,880	612	-
Total	7,772	7,405	8,309	8,661	11,337	14,955	13,812	64,214	77,080	97,748	38,210	97,845
Mean	251	247	268	279	405	482	460	2,071	2,569	3,153	1,233	3,262
ac-ft	15,420	14,690	16,480	17,180	22,490	29,660	27,400	127,400	152,900	195,900	75,790	194,100

Calendar year 1950: Max 6,030 Min 68 Mean 634 Ac-ft 459,000
 Water year 1950-51: Max 10,000 Min 108 Mean 1,226 Ac-ft 887,400

Peak discharge (base, 7,400 cfs)--May 22 (9 a.m.) 11,500 cfs (7.14 ft); July 14 (4 p.m.) 8,740 cfs (7.04 ft); Sept. 9 (2 p.m.) 9,470 cfs (7.09 ft).

a No gage-height record; discharge estimated on basis of weather records and flow at Guide Rock and near Orleans.

d Computed from doubtful gage-height record.

e Stage-discharge relation indefinite; discharge estimated on basis of weather records and flow at Guide Rock and near Orleans.

Note.--Stage-discharge relation affected by ice Dec. 5-16, Jan. 1 to Feb. 19.

Center Creek at Franklin, Nebr.

Location.--Lat 40°05'30", long. 96°57'50", in SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 36, T. 2 N., R. 15 W., at downstream side of left abutment of bridge on State Highway 3 at Franklin, $1\frac{1}{4}$ miles upstream from mouth.

Drainage area.--111 sq mi.

Records available.--April 1948 to September 1951.

Gage.--Staff gage read twice daily. Datum of gage is 1,828.07 ft above mean sea level, datum of 1929.

Extremes.--Maximum discharge during year, 815 cfs July 11 (gage height, 3.0 ft from graph based on gage readings); minimum daily, 0.8 cfs Jan. 3, 4, Feb. 1.

1948-51: Maximum discharge, 3,150 cfs Sept. 20, 1950 (gage height, 6.8 ft, from floodmark), from rating curve extended above 420 cfs on basis of slope-area determination of peak flow; no flow at times during 1948, 1949.

Remarks.--Records poor. Discharge measurements generally made twice a month. Natural flow affected by irrigation development above station.

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	3.1	2.9	4.2	5.0	0.8	5.4	5.0	7.8	6.4	3.4	3.6	2.8
2	6.2	3.1	4.4	4.2	1.0	5.4	4.6	7.3	6.2	3.2	3.4	2.8
3	4.6	3.1	4.5	1.6	1.2	4.7	4.2	7.3	5.6	3.2	5.0	2.8
4	4.8	3.4	4.2	1.6	1.6	7.1	4.2	7.3	5.8	3.4	3.1	5.2
5	4.8	3.2	3.3	1.1	2.0	9.4	4.7	7.5	6.7	3.4	2.5	6.9
6	4.7	3.1	4.0	1.5	2.7	9.4	4.7	6.4	8.0	3.4	2.5	6.9
7	4.1	3.1	4.6	2.5	2.9	9.4	4.4	6.4	7.8	3.4	2.6	7.1
8	4.2	3.2	4.5	1.5	3.5	4.2	4.4	7.1	6.7	3.4	2.2	7.1
9	4.4	3.4	4.8	2.1	4.1	4.3	4.4	7.5	7.3	3.5	2.4	6.7
10	4.7	3.8	5.6	4.0	5.3	8.3	4.4	7.3	7.3	3.6	2.8	5.6
11	4.7	3.7	5.3	7.1	7.1	6.3	4.6	7.5	8.3	4.75	2.5	5.2
12	4.7	3.8	5.7	5.8	5.4	6.6	4.4	7.5	6.0	3.75	2.5	5.2
13	4.2	4.2	6.2	10	2.5	8.4	4.0	7.5	5.4	2.24	2.6	4.8
14	4.2	6.2	5.6	10	1.4	12	4.0	7.8	5.4	108	2.4	4.7
15	4.2	5.6	5.0	5.9	1.7	12	4.0	7.8	4.1	58	2.2	4.0
16	3.8	5.0	3.9	6.4	2.8	12	4.0	9.9	3.2	23	2.2	3.6
17	4.1	4.8	3.6	6.6	4.3	13	4.1	13	2.8	14	2.2	3.6
18	4.0	4.7	3.5	6.9	5.2	12	4.0	13	2.9	8.0	2.2	3.6
19	3.6	5.0	4.0	8.8	5.5	12	4.7	12	2.8	7.1	2.4	3.6
20	3.6	5.0	2.9	9.2	5.6	13	8.3	12	3.0	7.1	2.2	3.4
21	3.6	5.6	3.5	7.5	5.4	14	13	12	3.1	7.1	2.4	3.2
22	3.6	5.6	4.3	8.8	5.0	9.7	17	8.0	3.5	7.1	2.2	3.0
23	3.2	5.4	4.7	8.3	5.4	9.7	17	4.1	3.2	5.8	3.0	3.0
24	3.2	4.4	5.0	12	5.0	8.8	15	4.2	3.2	5.4	2.6	3.0
25	3.2	4.7	4.5	11	5.0	8.6	13	4.4	3.2	4.7	2.6	3.0
26	3.2	4.9	2.3	5.5	5.0	7.1	13	4.4	3.2	4.4	2.6	3.2
27	3.2	5.2	1.6	3.2	5.0	7.5	12	4.7	3.5	4.2	2.5	3.2
28	3.2	6.8	2.3	2.0	20	7.1	10	5.2	3.5	4.1	2.2	3.1
29	3.4	5.4	2.9	1.5	-	7.3	12	5.2	3.5	4.0	2.2	3.0
30	3.2	4.6	3.8	1.1	-	5.2	33	5.2	3.4	4.0	2.2	3.0
31	3.0	-	4.5	.9	-	6.0	-	5.6	-	3.8	2.9	-
Total	122.9	133.1	129.2	162.0	122.4	266.9	246.1	232.9	145.2	1,388.7	80.9	126.3
Mean	3.96	4.44	4.17	5.23	4.37	8.61	8.20	7.51	4.84	44.8	2.61	4.21
Ac-ft	244	264	256	321	243	529	488	462	286	2,750	160	251

Calendar year 1950: Max 639 Min 0.5 Mean 7.44 Ac-ft 5,390
 Water year 1950-51: Max 475 Min 0.8 Mean 8.65 Ac-ft 6,260

Note.--Stage-discharge relation affected by ice Nov. 9-13, 23-26, Dec. 3 to Feb. 20, Mar. 3, 6-13.

