as follows:

Cubic foot per second (cfs) is the rate of discharge of a stream whose channel is 1 square foot in cross-sectional area and whose average velocity is 1 foot per second.

Cubic feet per second per square mile (cfsm) is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

Runoff, in inches is the depth to which an area would be covered if all the water draining from it in a given period were uniformly distributed on its surface. The term is used for comparing runoff with rainfall, which is also usually expressed in inches.

Acre-foot is the quantity of water required to cover an acre to the depth of 1 foot and is equivalent to 43,560 cubic feet. The term is commonly used in relation to storage for irrigation.

Cfs-day is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, 1.983471 acre-feet, or 646,317 gallons, and represents a runoff of 0.0372 inch from 1 square mile.

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.

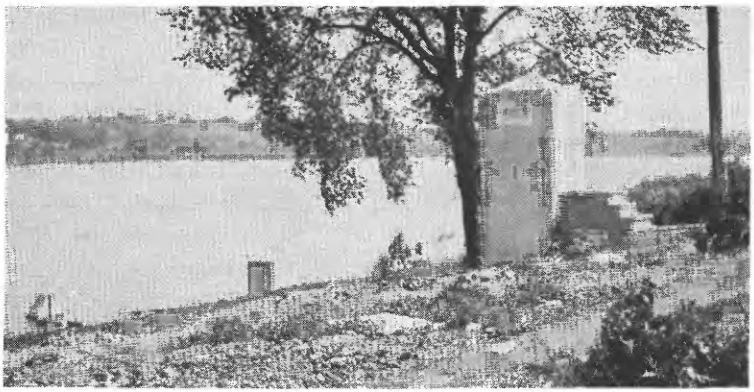
Contents is the volume of water in a reservoir. Unless otherwise indicated, volume is computed on the basis of a level pool and does not include bank storage.

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.

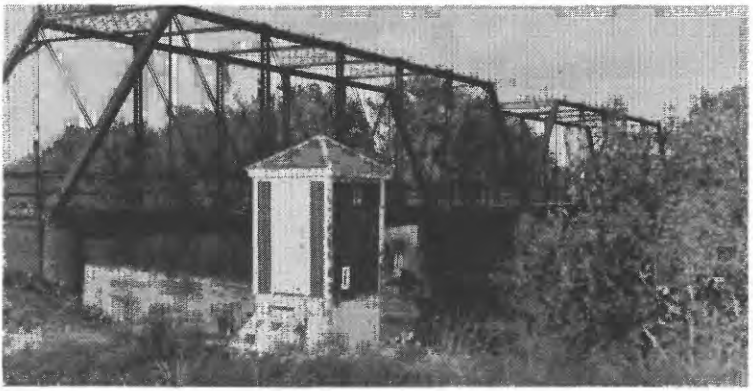
NEW DOWNSTREAM ORDER OF LISTING GAGING STATIONS

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.

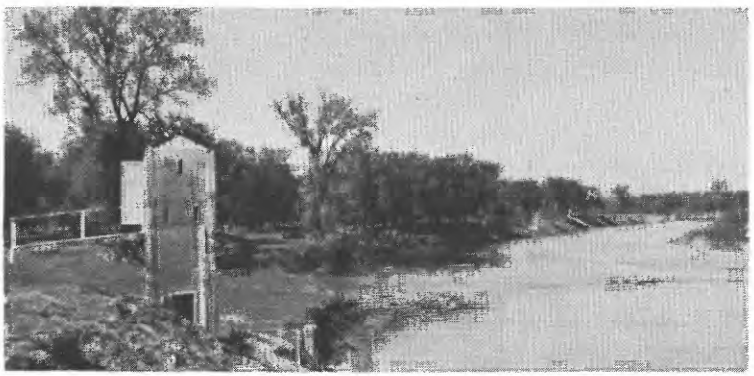
The order of listing used before the publication of the 1951 report listed first all stations on the main stem from headwaters toward mouth, then all stations on the uppermost tributary to the main stem from the tributary's source to mouth, and then all stations from source to mouth of the uppermost tributary to the tributary.



A, MISSISSIPPI RIVER AT LE CLAIRE, IOWA



B, ROCK RIVER AT AFTON, WIS.



C, MINNESOTA RIVER NEAR CARVER, MINN.

FIGURE 1.—GAGING-STATION STRUCTURES.

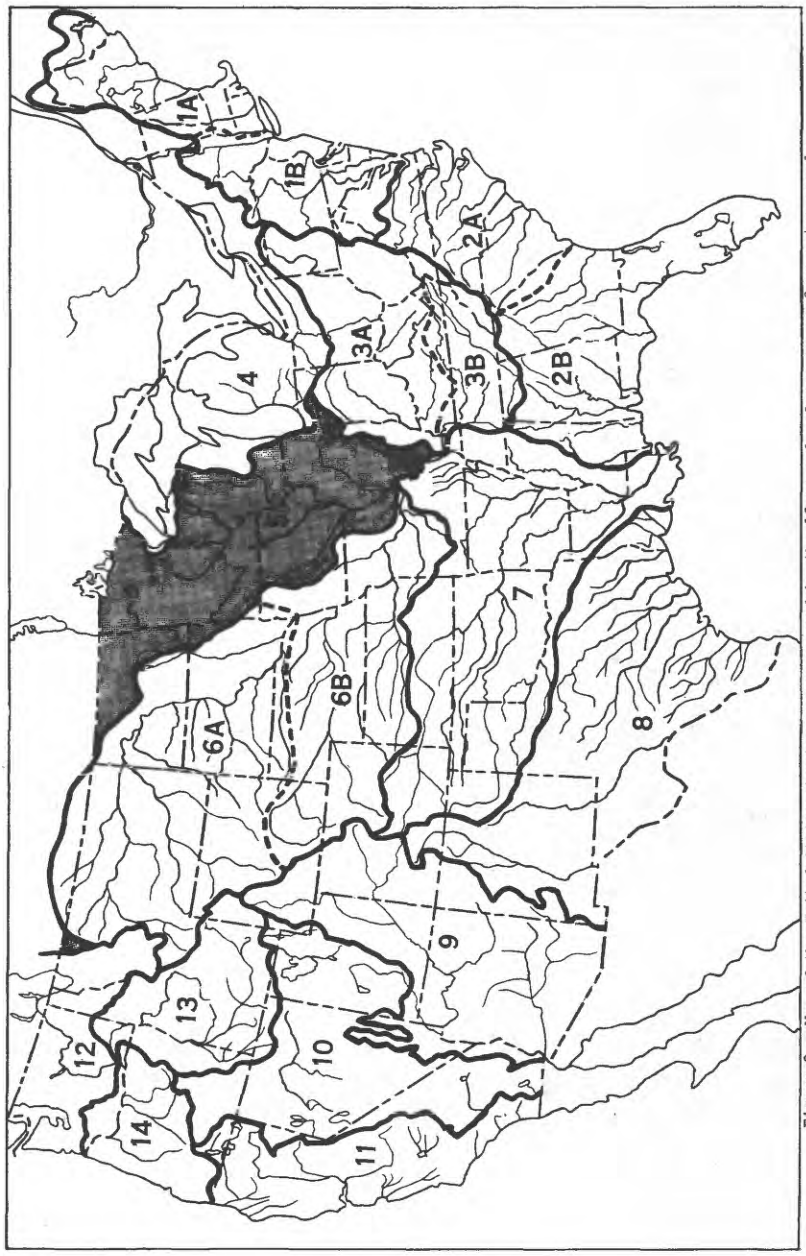


Figure 2.--Map of the United States showing areas covered by the 18 annual volumes on surface water supply. The area covered by this report is shaded.

Water-supply papers and other publications of the Geological Survey containing data on the water resources of the United States may be purchased or consulted as follows:

1. Copies may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., who will, on application, furnish lists giving prices. A list of Geological Survey publications may also be obtained by applying to the Director, Geological Survey, Washington, D. C.

2. Sets of the reports may be consulted in the libraries of the principal cities in the United States.

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 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 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.

Numbers of water-supply papers containing results of stream measurements in Hudson Bay and Upper Mississippi River basins, 1899-1951

Year	W.S.P.	Year	W.S.P.	Year	W.S.P.	Year	W.S.P.
1899.....	36	1913.....	355	1927.....	645	1940.....	895
1900.....	49	1914.....	385	1928.....	665	1941.....	925
1901.....	a65,66,75	1915.....	405	1929.....	685	1942.....	955
1902.....	a83,85	1916.....	435	1930.....	700	1943.....	975
1903.....	a98,99,b100	1917.....	455	1931.....	715	1944.....	1005
1904.....	a128,130	1918.....	475	1932.....	730	1945.....	1035
1905.....	171	1919-20...	505	1933.....	745	1946.....	1055
1906.....	207	1921.....	525	1934.....	760	1947.....	1085
1907-8....	245	1922.....	545	1935.....	785	1948.....	1115
1909.....	265	1923.....	565	1936.....	805	1949.....	1145
1910.....	285	1924.....	585	1937.....	825	1950.....	1175
1911.....	305	1925.....	605	1938.....	855	1951.....	1208
1912.....	325	1926.....	625	1939.....	875		

a Tributaries of Mississippi River from east.
b Hudson Bay only.

The records at most of the stations discussed in these reports extend over many years.

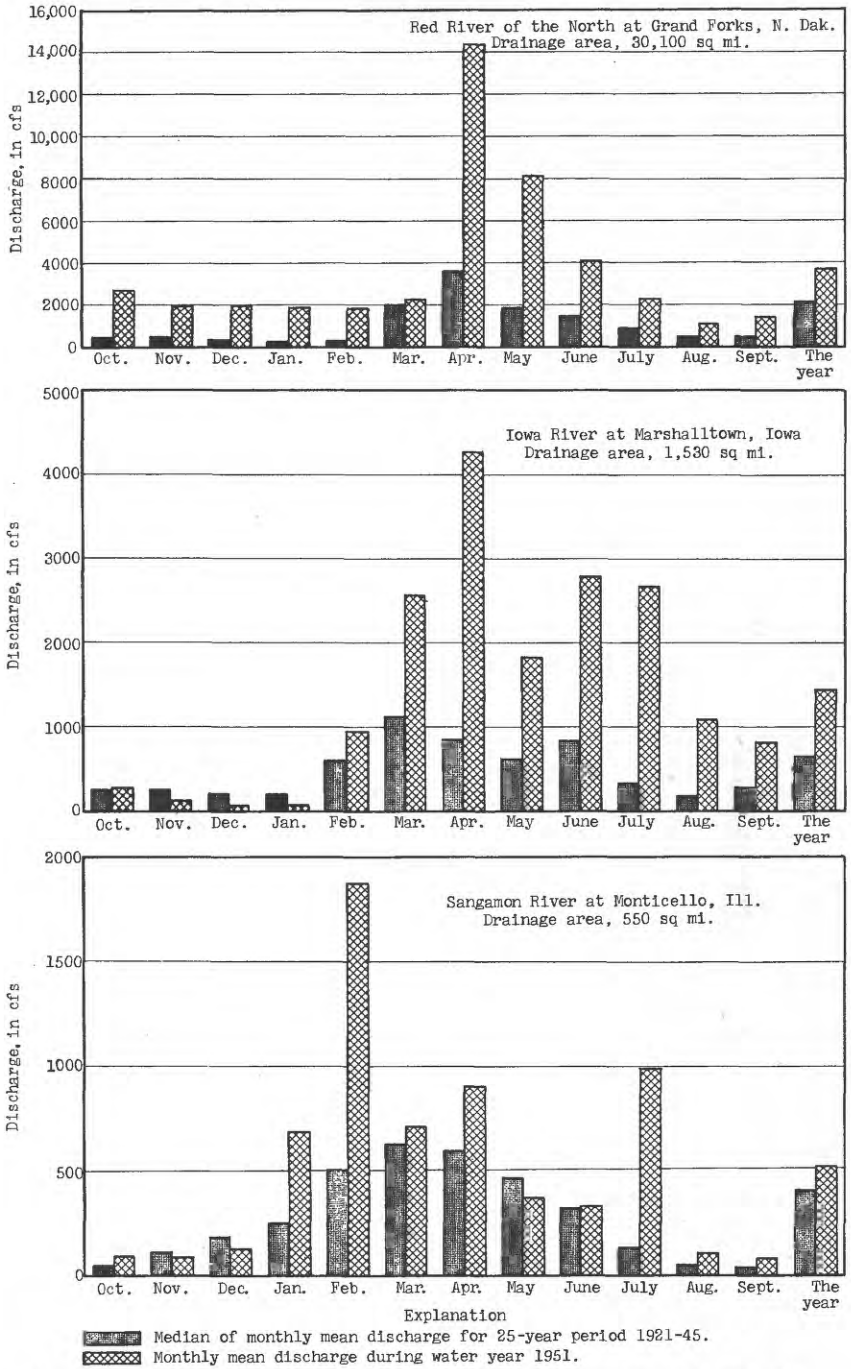


Figure 3.--Comparison of discharge at three key stations during 1951 water year with median discharge for 25-year period.

HUDSON BAY BASIN

SASKATCHEWAN RIVER BASIN

Belly River at international boundary

(International gaging station)

Location.--Lat 48°59'50" (revised), long. 113°40'50", in NW¼ sec. 2, T. 37 N., R. 16 W. (unsurveyed), on right bank 200 ft upstream from international boundary, 11 miles southeast of Waterton Park, Alberta, and 15 miles northwest of Babb, Mont.

Drainage area.--74.8 sq mi.

Records available.--May 1947 to September 1951.

Gage.--Water-stage recorder. Prior to Sept. 26, 1947, staff gage at same site and datum.

Extremes.--Maximum discharge during year, 1,570 cfs June 24 (gage height, 5.28 ft); minimum daily, 45 cfs Mar. 9, 10, 14.
1947-51: Maximum discharge, 1,810 cfs June 17, 1948; maximum gage height, 5.57 ft June 23, 1950; minimum daily, 12 cfs Feb. 12, 13, 1949.

Remarks.--Records good except those for periods of ice effect or no gage-height record, which are poor. No regulation or diversion.

Cooperation.--This is one of the international gaging stations maintained jointly by the United States and Canada under the Boundary Waters Treaty. The records have been collected and compiled jointly with the Water Resources Division, Department of Resources and Development, Canada.

Rating table, water year 1950-51, except periods of ice effect
(gage height, in feet, and discharge, in cubic feet per second)
(Shifting-control method used Oct. 1-9, Aug. 7 to Sept. 30)

1.9	42	3.0	318
2.2	78	4.0	795
2.6	173	5.1	1,440

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	109	451	165	120	65	80	65	530	433	828	469	385
2	100	389	155	115	75	70	65	446	389	883	451	420
3	96	343	140	105	75	70	65	394	373	905	433	420
4	96	306	150	100	75	65	64	360	361	1,000	*433	398
5	100	302	140	105	70	60	62	364	398	1,040	411	373
6	116	298	150	100	70	55	68	*442	365	1,090	389	347
7	128	282	155	100	70	50	75	555	360	1,050	377	331
8	135	263	170	90	65	50	76	640	347	949	356	326
9	159	235	185	*100	100	45	80	705	*352	905	331	310
10	199	210	185	95	115	45	78	617	394	878	314	302
11	*222	199	190	95	125	50	76	971	511	790	310	298
12	236	185	*140	95	130	50	86	1,110	680	740	298	282
13	255	165	130	90	100	50	109	1,080	800	756	286	270
14	270	180	120	100	105	45	107	949	922	812	286	251
15	294	170	120	100	115	55	116	768	1,140	856	274	*236
16	294	153	120	110	110	*55	125	690	1,320	872	267	222
17	290	159	120	105	105	60	145	762	1,210	866	255	212
18	298	135	111	100	100	60	185	932	1,010	856	248	205
19	318	145	107	95	95	60	165	971	883	850	244	202
20	433	155	111	100	95	70	155	888	817	817	240	226
21	492	159	116	100	90	70	149	822	725	740	230	222
22	446	113	116	100	85	60	142	878	660	660	219	240
23	381	140	128	90	85	55	135	1,070	635	605	226	236
24	322	165	135	85	85	55	128	1,270	1,340	585	226	240
25	282	195	165	80	90	60	130	1,160	1,420	590	219	394
26	262	233	190	80	85	60	148	927	1,300	580	216	570
27	294	222	175	80	80	60	186	784	1,120	555	218	550
28	310	*233	165	75	80	70	259	720	954	540	263	497
29	331	219	155	70	-	70	352	630	*812	535	267	469
30	424	195	140	65	-	60	464	570	751	516	343	502
31	*487	-	130	60	-	65	-	497	-	492	368	-
Total	8,199	6,599	4,479	2,905	2,560	1,630	4,060	23,702	22,822	24,141	9,465	9,936
Mean	264	220	144	93.7	91.4	59.0	135	765	761	779	305	331
Cfsm	3.53	2.94	1.93	1.25	1.22	0.789	1.80	10.2	10.2	10.4	4.08	4.43
In.	4.08	3.28	2.23	1.44	1.27	0.91	2.02	11.78	11.35	12.00	4.70	4.94
Ac-ft	16,260	13,090	8,880	5,760	5,080	3,230	8,050	47,010	45,270	47,880	18,770	19,710

Calendar year 1950: Max 1,750 Min 35 Mean 309 Cfsm 4.13 In. 56.12 Ac-ft 223,900
Water year 1950-51: Max 1,420 Min 45 Mean 331 Cfsm 4.43 In. 60.00 Ac-ft 239,400

Peak discharge (base, 600 cfs).--May 12 (9:30 a.m.) 1,140 cfs (4.62 ft); May 24 (12 m.) 1,290 cfs (4.87 ft); June 16 (6 to 7 p.m.) 1,340 cfs (4.96 ft); June 24 (3 p.m.) 1,570 cfs (5.28 ft); July 6 (6 a.m.) 1,100 cfs (4.55 ft).

* Discharge measurement made on this day.

Note.--Stage-discharge relation affected by ice Nov. 9, 10, 12-14, 18-20, 23, 24, Nov. 30 to Dec. 16, Dec. 25 to Apr. 3, 7, 18-23 (no gage-height record Mar. 6-13, Apr. 21-23).