

Figure 1.--Map of conterminous United States showing areas covered by 18 of the 20 volumes on surface water supply. The area covered by this report is shaded.

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)

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.....	1886-93.
B 151.....	Descriptions, measurements, gage heights, and ratings.....	1886-93.
16th A, pt. 2	Descriptive information only.	1893-94.
B 140.....	Descriptions, measurements, gage heights, ratings, and monthly discharge.	1895.
WSP 11.....	Gage heights.....	1896.
16th 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.	1896.
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.....	1899.
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.

Numbers of water-supply papers containing results of stream measurements in Colorado River basin, 1899-1959

Year	WSP	Year	WSP	Year	WSP	Year	WSP	Year	WSP
1899	a37, 36	1912	329	1925	609	1937	829	1949	1149
1900	50	1913	359	1926	629	1938	859	1950	1179
1901	66, 75	1914	369	1927	649	1939	879	1951	1213
1902	85	1915	409	1928	669	1940	899	1952	1243
1903	100	1916	439	1929	689	1941	929	1953	1283
1904	133	1917	459	1930	704	1942	959	1954	1343
1905	175, b177	1918	479	1931	719	1943	979	1955	1393
1906	211, b213	1919-20	509	1932	734	1944	1009	1956	1443
1907-8	249	1921	529	1933	749	1945	1039	1957	1513
1909	269	1922	549	1934	764	1946	1059	1958	1563
1910	289	1923	569	1935	789	1947	1089	1959	1633
1911	309	1924	589	1936	809	1948	1119		

a Green and Gunnison Rivers and Colorado River above Gunnison River.

b Below mouth of Gila River.

A compilation of records for the area covered by this report through September 1950 has been published as WSP 1313. That report contains a summary of monthly and annual discharges for all previously published records as well as some records not contained in the annual series of water-supply papers. All records were reexamined and revised where warranted. Estimates of discharge were made to fill short gaps whenever practical.

The reports listed in the foregoing table 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 147.....	Destructive floods in the United States in 1904.
WSP 162.....	Destructive floods in the United States in 1905.
WSP 771.....	Floods in the United States, magnitude and frequency.
WSP 847.....	Maximum discharges at stream-measurement stations through September 1938.
WSP 967-A.....	Floods of September 1939 in Colorado River basin below Boulder (Hoover) Dam.
WSP 994.....	Cloudburst floods in Utah, 1850 to 1938.
WSP 997.....	Floods in Colorado.
WSP 1260-E.....	Floods of April-June 1952 in Utah and Nevada.
WSP 1260-F.....	Summary of floods in the United States during 1952.
WSP 1320-E.....	Summary of floods in the United States during 1953.
WSP 1370-C.....	Summary of floods in the United States during 1954.

## RECORDS OF DISCHARGE COLLECTED BY AGENCIES OTHER THAN THE GEOLOGICAL SURVEY

The Agricultural Research Service of the United States Department of Agriculture has been collecting records of runoff near Safford, Ariz., beginning in 1940, from 4 areas of less than 800 acres, and near Tombstone, Ariz., beginning in 1954, from 8 areas ranging from 18 to 36,900 acres. Also, the Agricultural Engineering Department, University of Arizona, began collecting records in 1956 on an unnamed tributary to Pantano Wash, sec.28, T.14 S., R.15 E., half a mile upstream from mouth and  $9\frac{1}{2}$  miles east of Tucson, Ariz.

## HYDROLOGIC CONDITIONS

Runoff was generally median to deficient during the year except at times when it was excessive in scattered areas, particularly in Arizona. New monthly low runoff occurred in the following streams: San Juan River near Bluff, Utah, for March and May, San Juan River at Farmington, N. Mex., for March, Colorado River near Cisco, Utah, for April, and Salt River near Roosevelt, Ariz., for June. Near record lows occurred at other times in these or other streams in the Little Colorado River and Virgin River basins, Ariz., and the Green River basin, Utah. No noteworthy floods occurred during the year.

Figure 2 on page 12, for which records of three long-term gaging stations were used, shows a comparison of the monthly and yearly mean discharges for the 1959 water year with the median discharge for the period 1921-45.

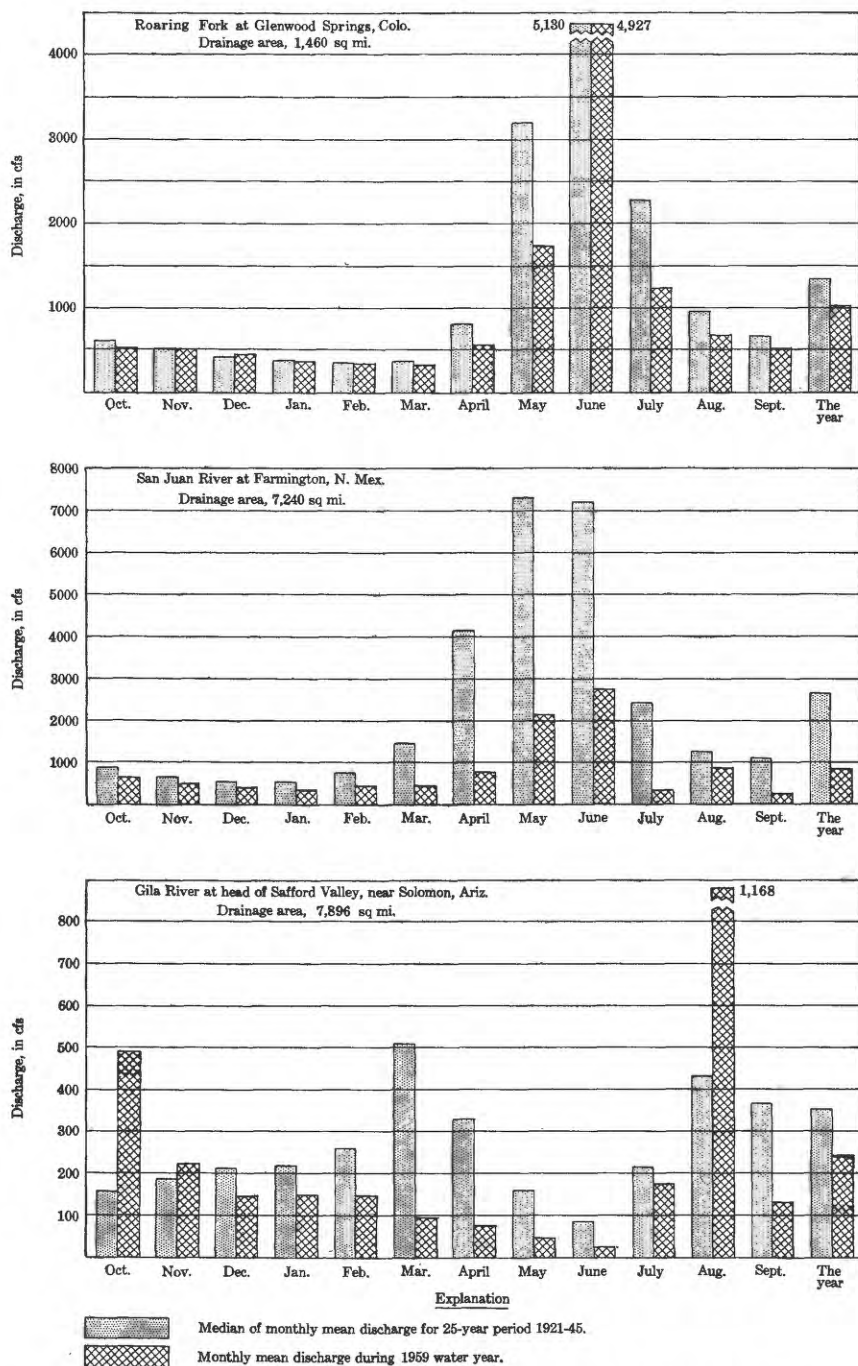


Figure 2. Comparison of discharge at three key gaging stations during 1959 water year with median discharge for 25-year period.







































































































































































































































































































































































































































































































































































































































































































































































































































































































































































































































































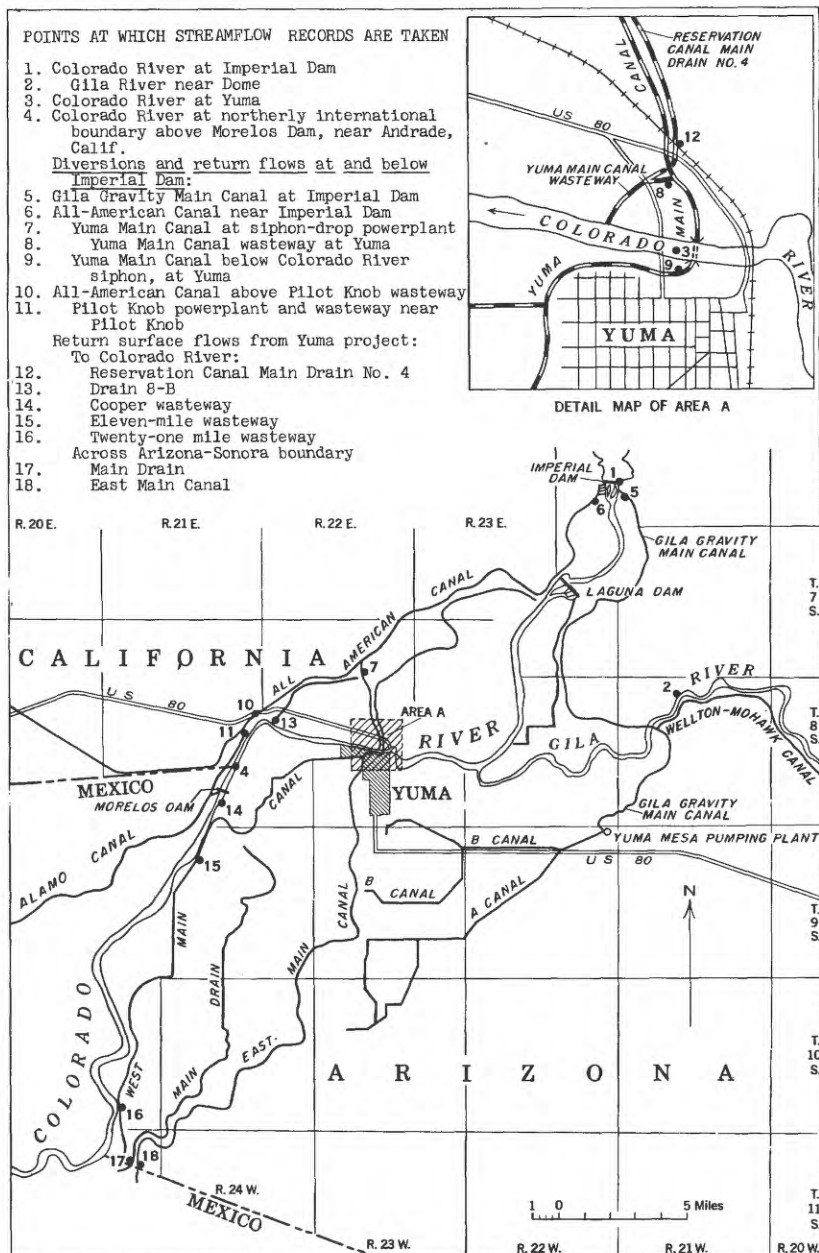


Figure 3.--Gaging stations in vicinity of Yuma, Ariz.

5220. Colorado River at northerly international boundary above Morelos Dam, near Andrade, Calif.  
(Formerly published as Colorado River at international boundary above Morelos Dam near Andrade, Calif.)

Location.--Lat 32°43'00", long 114°43'00", in NE 1/4 sec. 21, T. 8 S., R. 24 W., Gila and Salt River meridian, on left bank at northerly international boundary, half a mile east of Andrade, 1.1 miles upstream from Morelos Dam, 1.1 miles downstream from Rockwood Gate, and 7.2 miles downstream from gaging station on Colorado River at Yuma.

Drainage area.--243,000 sq mi, approximately, including all closed basins entirely within the drainage boundary.

Records available.--January 1950 to September 1959. Prior to October 1958, published as "at international boundary."

Gage.--Water-stage recorder. Datum of gage is at mean sea level, datum of 1929, leveling of 1941. Supplementary water-stage recorder 1,450 ft upstream at same datum.

Extremes.--Maximum daily discharge during year, 11,640 cfs Dec. 16; maximum elevation, 111.56 ft Dec. 16; minimum daily discharge, 1,910 cfs May 14, 15; minimum elevation, 103.72 ft Sept. 29.

1950-59: Maximum discharge, 25,390 cfs Jan. 1, 1953; maximum elevation, 114.24 ft Jan. 28, 1958; minimum discharge, 570 cfs Feb. 24, 1956 (elevation, 103.00 ft).

Remarks.--This record shows water passing northerly international boundary. Minor diversions to the United States below this station from river and by pumping from ground water for irrigation in the floodway between river and Yuma levee. Discharge measurements generally made six times a week.

Cooperation.--Records furnished by International Boundary and Water Commission, United States Section.

Revisions (water years).--WSP 1563: 1956 (monthly figure only).

Discharge, in cubic feet per second, water year October 1958 to September 1959

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	4,200	3,110	8,220	7,800	6,130	3,670	2,540	3,790	3,520	4,050	5,530	4,470
2	4,470	2,890	8,430	7,470	6,350	3,170	2,400	3,230	3,290	4,200	6,440	4,400
3	3,330	2,820	8,630	7,100	6,330	2,850	2,230	3,200	3,340	4,460	6,700	4,470
4	3,480	2,770	8,390	7,020	5,240	2,910	2,310	2,820	3,220	4,800	7,570	4,250
5	3,760	2,770	8,050	7,150	5,880	2,190	2,870	2,660	3,170	5,380	8,810	4,130
6	4,280	2,540	8,780	8,440	5,470	2,190	4,320	3,120	3,140	5,380	7,220	4,090
7	3,960	2,360	9,230	7,440	5,250	2,590	3,670	2,620	3,290	4,770	6,860	4,160
8	4,100	2,670	8,960	7,780	5,530	2,660	4,250	2,540	3,130	4,600	7,680	4,380
9	3,360	3,740	10,310	8,300	6,300	2,410	6,060	2,220	2,810	4,390	7,560	4,340
10	3,490	5,120	8,800	7,740	6,960	2,630	4,760	2,210	2,950	4,330	7,020	3,960
11	4,130	4,740	8,780	7,930	7,890	2,750	4,930	2,200	3,140	4,430	6,590	4,020
12	4,860	5,570	8,670	8,280	8,720	2,710	5,150	2,090	3,220	4,580	6,180	4,250
13	5,110	6,050	8,740	8,180	8,960	3,020	5,590	2,030	3,080	4,630	5,500	4,580
14	4,720	4,370	9,430	7,400	8,610	3,500	5,840	1,910	3,120	4,720	5,340	3,980
15	3,890	5,500	9,750	7,610	8,030	3,740	5,700	1,910	3,340	4,630	4,780	3,970
16	3,180	5,840	11,640	7,810	7,590	3,470	5,480	1,980	3,380	4,610	4,770	4,310
17	3,340	6,250	9,040	7,300	7,080	3,520	5,190	2,080	3,220	5,580	4,460	4,040
18	3,180	6,010	9,160	7,480	6,350	3,750	5,250	2,010	3,080	4,840	4,580	4,170
19	3,480	6,850	9,160	7,800	5,320	3,490	5,420	2,020	3,220	4,970	4,780	3,820
20	2,740	6,700	8,940	8,260	4,810	3,100	5,140	2,120	3,200	5,150	4,400	3,670
21	2,870	6,010	8,450	6,540	4,170	2,840	5,590	2,100	3,210	4,940	4,940	3,710
22	2,920	6,570	7,890	6,180	4,350	2,380	5,420	1,940	3,400	5,100	5,220	3,640
23	2,630	6,850	8,100	5,590	3,820	2,780	4,940	2,250	3,450	4,970	5,210	3,440
24	2,820	6,400	8,200	5,380	4,730	2,860	4,930	2,380	3,280	4,860	5,590	3,030
25	2,430	7,330	9,340	5,840	4,310	2,860	5,190	2,930	3,140	4,690	5,760	2,180
26	2,890	6,040	8,150	5,560	4,380	2,800	5,210	3,760	3,450	4,970	6,130	2,040
27	3,220	6,400	7,570	7,260	3,970	2,850	5,120	3,490	3,500	4,980	5,320	2,140
28	3,640	6,140	7,660	4,150	3,560	3,000	5,220	3,500	3,480	4,900	5,190	1,920
29	3,670	6,120	7,640	5,630	---	3,100	5,010	3,650	3,820	5,350	5,320	1,970
30	2,200	6,940	8,200	5,380	4,730	2,860	4,440	3,640	4,290	4,860	5,290	2,310
31	3,490	---	8,990	5,890	---	2,560	---	3,920	---	5,050	5,050	---
Total	112,840	153,450	269,610	217,780	166,090	91,240	140,060	82,750	98,830	149,530	161,850	109,940
Mean	3,640	5,115	8,697	7,025	5,932	2,943	4,669	2,669	3,294	4,824	5,868	3,665
Ac-ft	223,810	304,360	534,760	431,960	329,430	180,970	277,600	164,130	196,030	296,590	360,690	218,060
Calendar year 1958: Max	18,290				2,020					5,908,260		
Water year 1958-59: Max	11,640				1,910					3,518,590		













































































