

Figure 1.--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.

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. 2do.....	1884 to June 30, 1891.
13th A, pt. 3do.....	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.
WSP 11.....	Gage heights.....	1896.
18th 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.	1898.
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.....	1900.
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, 1899-1958

Year	WSP	Year	WSP	Year	WSP	Year	WSP	Year	WSP
1899	a37,38	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		
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.

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 5 areas ranging from 594 to 38,400 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 during the 1958 water year was above median in the upper basin except during July to September when runoff was deficient over most of this part of the basin. In the lower basin, streamflow ranged from excessive in the northern part to deficient in the southern part during October to January; well above median during February to June and September; and deficient during July and August. No noteworthy floods occurred during the water year. For three key gaging stations in the area covered by this report, a comparison of monthly and annual mean discharges during the 1958 water year with the median discharges for the 25-year period 1921-45 is shown in figure 2 on the following page.

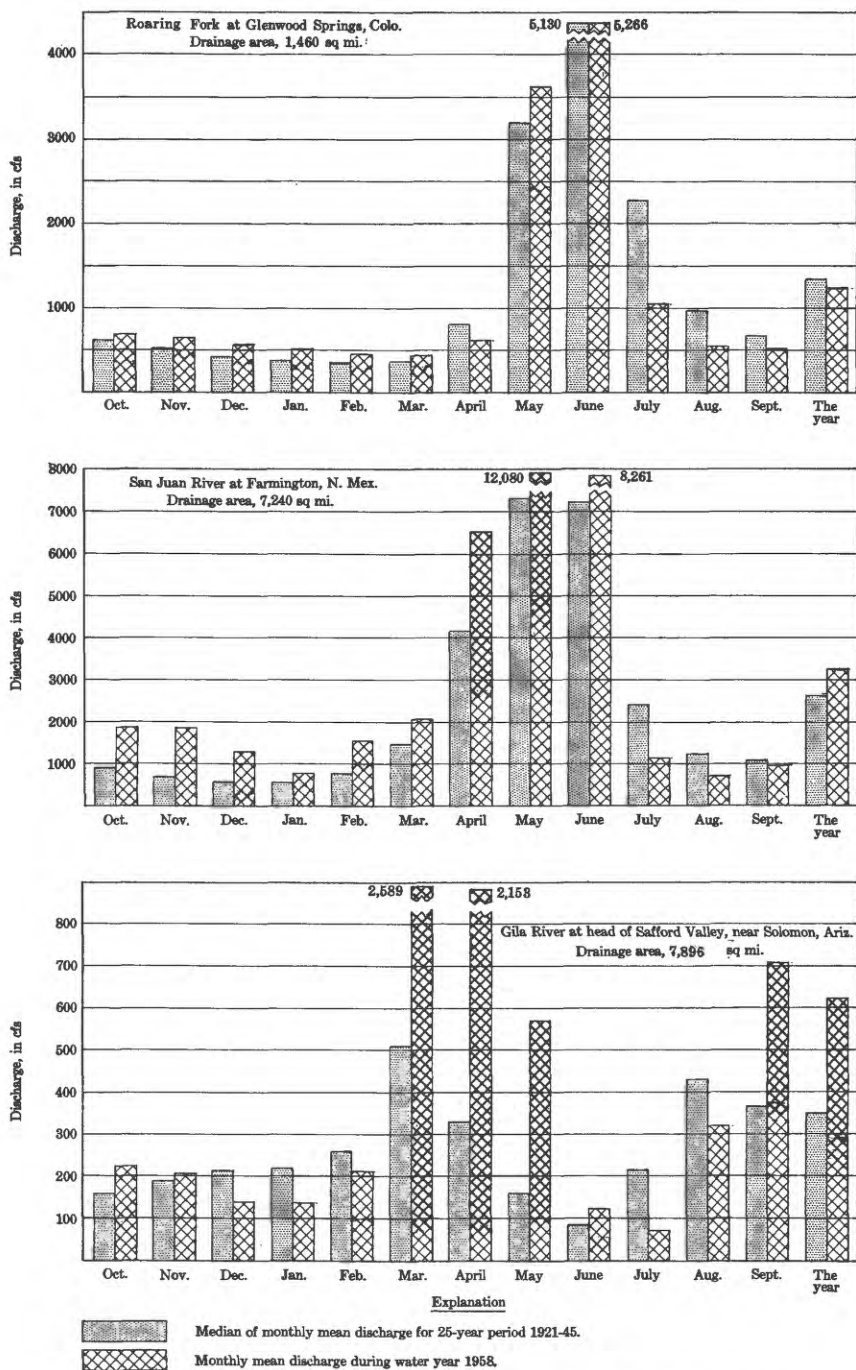
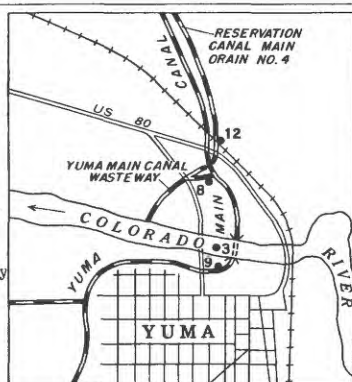


Figure 2. Comparison of discharge at three key gaging stations during 1958 water year with median discharge for 25-year period.

POINTS AT WHICH STREAMFLOW RECORDS ARE TAKEN

1. Colorado River at Imperial Dam
2. Gila River near Dome
3. Colorado River at Yuma
4. Colorado River at international boundary above Morelos Dam, near Andrade, Calif.
- Diversions and return flows at and below Imperial Dam:
5. Gila Gravity Main Canal at Imperial Dam
6. All-American Canal near Imperial Dam
7. Yuma Main Canal at siphon-drop powerplant
8. Yuma Main Canal wasteway at Yuma
9. Yuma Main Canal below Colorado River siphon, at Yuma
10. All-American Canal above Pilot Knob wasteway
11. Pilot Knob powerplant and wasteway near Pilot Knob
- Return surface flows from Yuma project:
- To Colorado River:
12. Reservation Canal Main Drain No. 4
13. Drain 8-B
14. Cooper wasteway
15. Eleven-mile wasteway
16. Twenty-one mile wasteway
- Across Arizona-Sonora boundary
17. Main drain
18. East Main Canal



DETAIL MAP OF AREA A

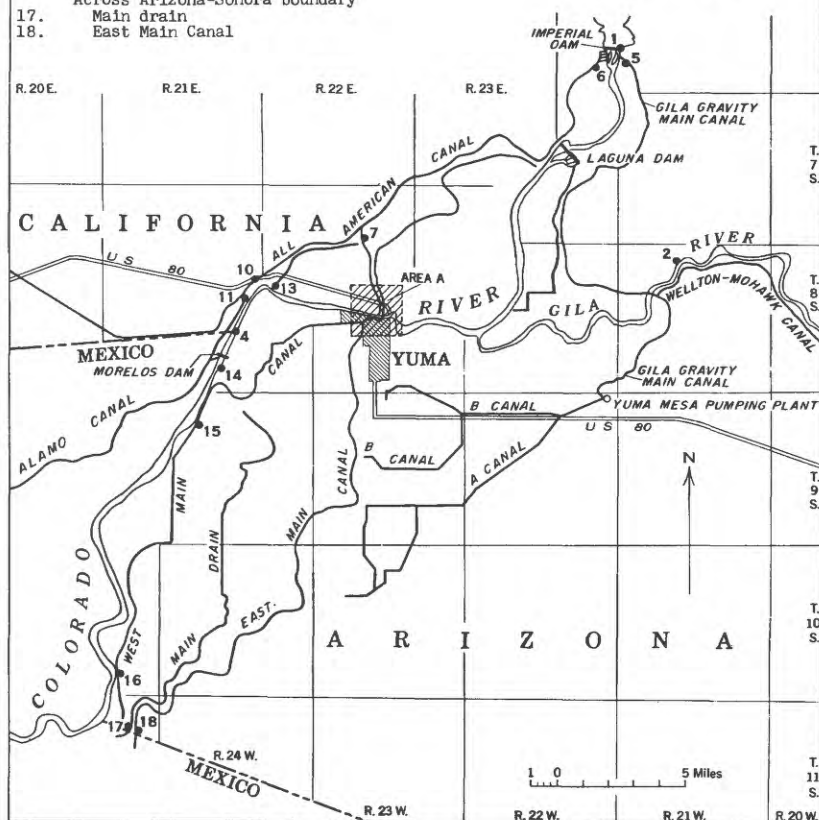


Figure 3.--Gaging stations in vicinity of Yuma, Ariz.

5220. Colorado River at international boundary above Morelos Dam, near Andrade, Calif.

Location.--Lat 32°43'00", long 114°43'00", in NE $\frac{1}{4}$ SE $\frac{1}{4}$ 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 1958.

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 discharge during year, 21,980 cfs Mar. 18; maximum elevation, 114.24 ft Jan. 28; minimum discharge, 697 cfs Oct. 4; minimum elevation, 103.57 ft Oct. 4.
1950-58: Maximum discharge, 25,390 cfs Jan. 1, 1953 (elevation, 112.17 ft); minimum, 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.

Correction.--Figure of runoff for September 1956 should be 158,680 acre-ft. This figure supersedes that published in WSP 1443.

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

Discharge, in cubic feet per second, water year October 1957 to September 1958

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,300	5,920	14,010	16,950	17,050	4,640	13,180	13,080	5,720	4,330	6,750	4,390
2	1,040	5,810	13,750	17,110	16,380	5,950	13,340	12,860	5,120	3,970	6,540	4,220
3	844	5,990	13,790	17,560	12,960	9,510	14,110	12,860	5,850	4,390	6,760	4,500
4	775	5,770	13,070	17,470	12,750	13,220	14,780	13,520	5,050	4,500	6,480	5,780
5	594	5,700	11,910	18,290	11,080	13,230	15,520	13,620	4,580	4,410	5,880	4,170
6	952	5,770	11,760	17,470	10,890	11,940	16,620	13,580	4,330	4,760	6,430	4,810
7	970	6,780	11,300	16,990	6,520	13,710	16,430	12,860	4,260	5,770	6,760	5,120
8	1,160	6,700	11,720	17,350	6,280	13,800	16,610	13,420	4,540	5,380	5,400	4,640
9	1,570	5,730	11,670	17,570	6,030	15,900	15,670	12,730	5,190	5,440	5,320	4,380
10	1,950	5,550	10,920	17,190	7,520	14,850	15,710	12,930	4,350	5,360	5,400	3,980
11	2,840	5,820	11,490	17,430	8,760	13,980	14,780	12,090	5,080	4,900	5,320	3,510
12	4,160	5,430	11,350	17,560	6,900	14,870	13,970	9,600	4,560	3,930	5,040	3,680
13	4,970	5,050	12,450	17,850	7,720	15,200	13,720	9,640	4,770	4,080	5,480	3,750
14	5,300	5,110	12,790	16,890	5,590	16,110	13,180	8,130	4,270	5,250	5,580	3,790
15	5,260	5,840	13,110	17,350	5,820	16,790	13,240	8,530	5,190	4,580	5,710	4,080
16	4,140	6,010	12,660	17,430	5,900	15,980	12,860	7,040	6,030	4,780	5,540	3,810
17	2,200	6,540	12,650	17,520	5,810	16,830	12,620	6,460	5,410	4,410	6,240	3,910
18	1,980	6,950	13,740	17,190	6,670	17,750	12,090	5,280	5,500	4,500	6,460	3,620
19	2,160	6,870	13,460	16,890	4,780	17,280	11,930	3,350	5,280	4,330	5,720	3,240
20	1,760	7,190	13,180	16,800	6,570	16,560	12,090	4,280	5,460	4,650	6,190	3,480
21	2,290	7,650	12,200	15,580	5,690	15,710	12,270	2,020	4,140	5,460	6,340	4,470
22	1,870	8,690	12,440	16,060	6,590	14,960	11,510	3,730	4,940	4,780	5,420	4,790
23	1,920	8,100	12,010	16,100	6,700	15,670	11,890	5,080	5,600	5,070	5,520	4,070
24	1,990	10,220	12,570	15,990	6,150	14,420	13,620	5,380	4,450	6,290	5,540	3,880
25	1,950	11,450	13,560	14,680	6,700	14,590	11,890	5,780	4,870	4,980	5,180	3,680
26	2,130	12,420	11,850	15,220	5,350	13,270	12,240	5,800	5,070	5,400	5,280	3,560
27	1,920	13,690	11,070	16,100	6,200	13,070	12,560	6,320	4,740	5,220	5,180	3,350
28	3,530	14,360	10,640	17,820	4,190	13,530	12,060	4,240	4,030	5,040	5,140	3,660
29	5,040	13,930	10,730	16,990	-	12,310	12,590	6,080	4,200	4,780	5,030	3,760
30	4,820	13,840	11,040	17,600	-	13,100	12,760	4,760	5,010	5,460	4,740	3,650
31	5,820	-	13,830	16,950	-	13,180	-	5,710	-	6,540	4,630	-
Total	79,605	234,360	382,720	525,850	219,560	431,920	405,640	260,860	147,570	152,720	177,000	121,730
Mean	2,568	7,412	12,346	16,963	7,081	13,933	13,521	8,415	4,919	4,966	5,710	4,058
Ac-ft	157,890	464,850	758,110	1,043,000	435,480	856,700	804,580	517,410	292,700	302,920	351,070	241,450
Calendar year 1957: Max			14,360		Min 604	Mean 3,941		Ac-ft 2,853,580				
Water year 1957-58: Max			18,290		Min 775	Mean 8,601		Ac-ft 6,227,180				

