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COMPILATION OF  
FLOOD DATA IN ARIZONA  
1862—1953

By Winchell Smith and Wilbur L. Heckler

Prepared in cooperation with the  
ARIZONA STATE LAND DEPARTMENT

Roger Ernst, Commissioner

Open-file report

Tucson, Arizona

August 1955

Smith, Winchell

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## CONTENTS

	Page		Page
Introduction .....	1	Flood records—Continued	
Administration and acknowledgments .....	1	Maximum floods known .....	3
Physiography .....	1	Flood-frequency methods .....	3
Storm precipitation .....	1	Gaging station records .....	3
Flood characteristics .....	2	Literature cited .....	109
Flood records .....	2	Index of flood records .....	111
Miscellaneous flood data .....	2	<p><u>Note:</u> See bar graph, p. 8, for list of gaging stations and page numbers where data appear in this report.</p>	

## ILLUSTRATIONS

		Page
Figure 1.	Discharge hydrographs for Gila River below Blue Creek near Virden, N. Mex. ....	3
2.	Map of Arizona showing location of gaging stations and miscellaneous flood records .....	4
3.	Bar graph showing period of record of maximum annual peaks at gaging stations .....	8
4.	Unit discharge versus drainage area for maximum discharges in Arizona .....	10
5.	Annual flood plot, Colorado River at Lees Ferry, Ariz. ....	11
6.	Annual flood plot, Gila River at head of Safford Valley, near Solomon, Ariz. ....	11
7.	Annual flood plot, San Pedro River at Charleston, Ariz. ....	12
8.	Annual flood plot, Santa Cruz River at Tucson, Ariz. ....	12
9.	Annual flood plot, Salt River near Roosevelt, Ariz. ....	13
10.	Annual flood plot, Verde River below Tangle Creek, above Horseshoe Dam, Ariz. ....	13

## TABLES

		Page
Table 1.	Miscellaneous flood data .....	5

# COMPILATION OF FLOOD DATA IN ARIZONA 1862—1953

By Winchell Smith and Wilbur L. Heckler

## INTRODUCTION

The use of flood magnitude and frequency data is necessary for the economical design of structures such as bridges, levees, buildings on a flood plain, and dams, or for other planning or construction activities that might be affected by floods. When loss of life or extensive damage would result from failure or overtopping of the planned structure, it is necessary that the design flood be of such magnitude that it will probably never be exceeded. However, for most structures, economy usually will be achieved by designing for floods with an average frequency about the same as the expected life of the structure. This is particularly true when the loss caused by a flood greater than the design flood would be less than the additional cost of providing for safe passage of the larger floods.

Satisfactory solution of the problems related to floods depends upon reliable records of flood occurrences. The purpose of this report is to present in convenient and usable form all reliable flood data currently available for streams within the State of Arizona.

The scope of this report has purposely been limited to the presentation of flood records. A comprehensive study of flood-frequency data on an areal basis is planned for the entire Colorado River basin. That study will include analysis of all usable flood records from gaging stations operated within the basin. The records presented herein constitute an interim report on flood data.

### Administration and acknowledgments

This report was prepared in cooperation with the State of Arizona, Roger Ernst, Land Commissioner, under the direction of John H. Gardiner, District Engineer, Surface Water Branch, Water Resources Division, U. S. Geological Survey. Review of gaging-station records was made by J. S. Gatewood, hydraulic engineer.

### Physiography

For this report the State of Arizona may be divided into three general physiographic regions: (1) The plateau region, (2) the mountain region, and (3) the desert region.

The northern plateau and the southern desert regions are separated by the mountain region which originates in New Mexico and enters Arizona just below the center of the eastern boundary. This region is a broad band of rugged mountains curving north in the west-central area, and extending to the northwest corner. The sharp escarpment of the Mogollon rim

divided the steep-sloped canyons to the south from the gentler sloping plateau region to the north. Drainage is thus predominantly to the south and southwest through the narrow valleys of the San Francisco, Black, White, Salt, Verde, Agua Fria and Hassayampa Rivers. These rivers are all tributary to the Gila River, which heads at the continental divide in western New Mexico in the extension of this same mountain region and flows across the southern part of Arizona, from east to west, entering the Colorado River at Yuma. This river drains nearly half of the State, forming the southern boundary of the mountain region in the eastern half, and bisecting the desert region in the southwest.

The plateau region is a tableland ranging in altitude from about 4,000 to 7,000 feet occupying the north and northeastern third of the State. This is a portion of the Colorado plateau province extending into Arizona from the north. It is bounded by the Mogollon rim to the south and terminated on the west by the portion of the mountain region that projects to the northern border. In contrast to the general topography are deeply incised canyons and occasional projecting mountains which rise as high as 12,700 feet. The region is drained chiefly by the Little Colorado River, which cuts across diagonally on a northwesterly course. Tributaries enter from both the north and the south.

The southern and western parts of the State, covering about one half of the total area, compose the desert region. In this region isolated northwest trending mountain ranges are separated by broad, gently sloping alluvial valleys. Drainage is predominantly from the south to the Gila River. Principal tributaries are the San Simon, San Pedro, and Santa Cruz Rivers, which flow in a northwesterly direction before joining the Gila. In the southwestern part of the desert area tributary washes enter the Gila from both the north and the south. In the west-central portion a separate drainage system, the Bill Williams River basin, drains directly to the Colorado River.

### Storm precipitation

Mean annual precipitation in Arizona ranges from 4 inches at Yuma, in the desert region, to more than 30 inches in the higher parts of the mountain region. Altitude is the chief factor controlling the amount of precipitation at any given point in the State. Directional aspect of the mountain barriers to the storm movement is also an important factor.

Storms may occur at any time during the year, but most of them occur in two distinct periods: during the summer, July to early October, or during the winter, December to February. Flood-producing storms are

of three distinct types: summer thunderstorms of the cloudburst type, which are generally local in extent; general winter storms of the cyclonic type, one of which may cover a large part of the State; and occasional tropical hurricanes, which may cover about a quarter of the State.

The water vapor carried by the summer storms generally originates in the Atlantic or Caribbean areas, moves into the State from the southeast, and is precipitated in numerous local thunderstorms. Nearly all the floods in the southern and southwest desert area result from this type of storm. Summer storms are less frequent in the mountain and plateau regions. In the upper reaches of the Little Colorado and its tributaries entering from the north and northwest about three-quarters of the floods result from summer storms.

The rare tropical hurricanes coming from the south and southwest concentrate in the western part of the desert region, extending into the Bill Williams River basin, which is not subject to frequent summer storms. Storms of the hurricane type occur less than once a year on the average, during the period August to early October. They are of larger extent than the usual summer storms, are short and intense, and result in serious floods.

Winter storms, originating over the Pacific Ocean, usually cover large areas. These storms move into the State from the west or northwest, are intercepted in the mountain region, and provide the bulk of the annual precipitation in this region in the form of both rain and snow. The spring snow melt often produces annual maxima in the mountain region, but maxima for the period of record are in almost all cases the result of winter rain upon accumulated snow.

### FLOOD CHARACTERISTICS

Arizona has been deservedly noted for its flash floods. Newspaper accounts frequently tell of persons trapped in "dry washes" by floods arriving without warning. Floods of this type are the dominant feature of runoff in the desert region, and to a lesser extent in the mountain and plateau regions. A typical flood on a small drainage area will come down a dry channel without warning, reach its peak within a few minutes, and rapidly recede. Within a period of a few hours the channel will be dry. This same pattern is repeated on a modified scale on the major streams of the desert areas. Peaks occur within a very short time after the start of a rise, and total runoff from a given storm will be completed within a period of 24 to 48 hours. Floods in the mountain region are less flashy. Some annual maxima result entirely from snow melt in which case peak flow may not exceed the mean daily flow by a great amount. Other floods may result from general winter storms, and are characterized by broad flood crests of several hours duration. Many streams are affected by both summer and winter storms. The Gila River above Blue Creek, near Virden, N. Mex., is typical in this respect; flood hydrographs are presented (figure 1) to indicate the striking differences between typical summer and winter floods. Note that for the summer flood of September 6, 1940, peak discharge was 11,000 cfs and total three-day runoff was 1,390 cfs-days, while for the winter flood of February 16-18, 1937, peak discharge was 9,070 cfs and total three-day runoff was 11,430 cfs-days.

### FLOOD RECORDS

Streamflow records collected by the Geological Survey and cooperating parties provided the bulk of the data tabulated in this report. Data from sources other than Geological Survey files have been credited to the party or agency furnishing the information. Data are presented in a following section of this report entitled "Gaging-Station records", beginning on page 3.

All records included were reviewed and in some instances changes or revisions were made. Revisions are not designated in this report because the review was made prior to publication of Water-Supply Paper 1313 (Compilation of records of surface waters of the United States through September 1950, Part 9, Colorado River basin) and all revisions of annual maxima made were published therein. Lists of supplementary peaks given herein include many that have not been previously published. Rules and procedures pertaining to selection and publication of supplementary peaks were revised in 1948; consequently it has been necessary to re-analyze earlier records on the same basis that is currently in use. Supplementary peaks have been included for non-recording gages where sufficient data were available to permit graphing of accurate gage-height records.

For each gaging station a description and table of annual maxima and peaks above a selected base discharge are given. Stations are listed in the same downstream order used in current water-supply papers. Stations are numbered and their location is shown by index number on the map presented as figure 2. The period of record at each station is indicated on the bar graph, figure 3.

### Miscellaneous flood data

Where other data are not available, information about isolated flood events is a help in evaluating the flood potential of an ungaged area. A listing of miscellaneous flood observations is therefore included, even though nothing is known regarding the frequency of such events. This list is presented as table 1.

Many of the floods listed come from short-term gaging-station records which, because of their brevity, are not included elsewhere within the body of the report. Floods listed for these points are merely the maxima observed during the period of record, which is indicated, and may not be significant flood events. Observations of floods at points other than short-term gaging stations were made in most cases because of the outstanding magnitude of the particular event. Unless otherwise indicated, data in the listing have been published previously in various Geological Survey publications. Reference to information from other sources has been placed in footnotes. Senate Document 436 (65th Congress) includes listings of several hundred estimates of peak flow on the Gila River and its tributaries upstream from San Carlos, Ariz. The bulk of these estimates were for floods in January and October 1916, which were record events in that area. This group of estimates and many others to be found in reports of other agencies have not been included in this report because bases for the estimates are not known.



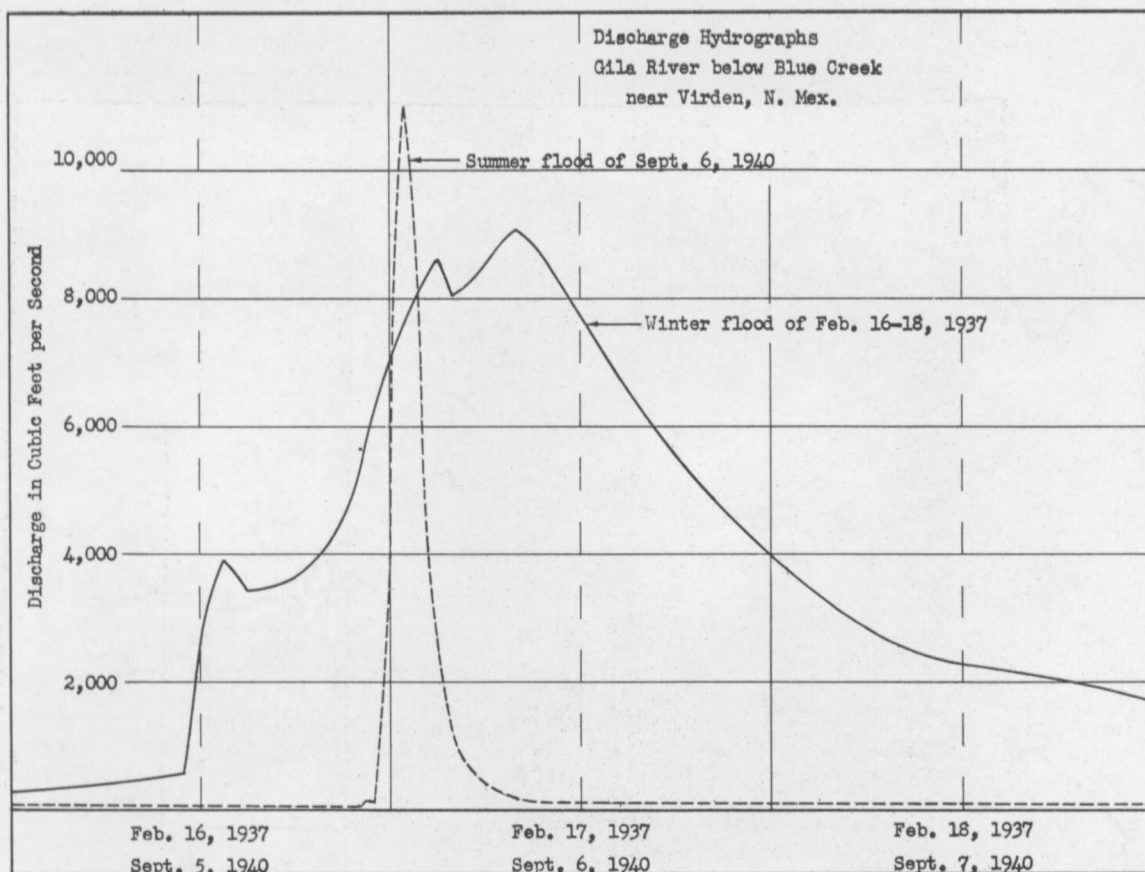


Figure 1. --Discharge hydrographs for Gila River below Blue Creek near Virden, N. Mex.

#### Maximum floods known

Maximum known flood stages and discharges of Arizona streams are shown in the tables accompanying the gaging station records presented in a following section of this report. Known peak discharges at other than gaging stations are listed in table 1.

Maximum flood discharges at both gaging stations and miscellaneous sites are portrayed graphically in figure 4. This figure shows the tabulated discharges per square mile arrayed against drainage area. Figure 4 is useful for a general comparison of individual peak discharges with the peak floods experienced, and may be used as a guide to the possible maximum discharge of a stream in any area of the State.

#### FLOOD-FREQUENCY METHODS

Methods of computing flood frequency are discussed in the references listed in the bibliography (see page 109). Reports by Bodhaine, Carter, Cragwall, and Dalrymple discuss in detail the methods recommended by engineers of the Water Resources Division of the Geological Survey.

Illustrative frequency diagrams have been plotted from several of the long-term records in this report (see figures 5-10). Recurrence intervals in these plots were computed as recommended in the

references above, from the formula  $T = (N + 1) / M$ , where  $T$  equals the recurrence interval in years,  $N$  equals the number of years of record, and  $M$  equals relative magnitude of the event, beginning with the highest as 1 down to the lowest as a number equal to  $N$ . The annual floods are plotted on a special probability chart. On this form the frequency curve will tend to be a straight line. Discharges are plotted to an arithmetic scale as the ordinate; the abscissa (scale of recurrence intervals) is specially graduated according to the theory of extreme values.

It is emphasized that analysis of flood data on a regional basis is preferable to use of single records as illustrated herein. However, regional analysis of this type should include additional data from areas adjacent to Arizona, which are not yet available. Such studies will be carried forward by the Geological Survey as soon as possible.

#### GAGING-STATION RECORDS

This section contains a brief description of the gaging station and a tabulation of flood peaks for each gaging station furnishing data for this report. Terms used in presenting these data are explained below.

The description of each gaging station includes paragraphs on: Location; drainage area; gage; stage-

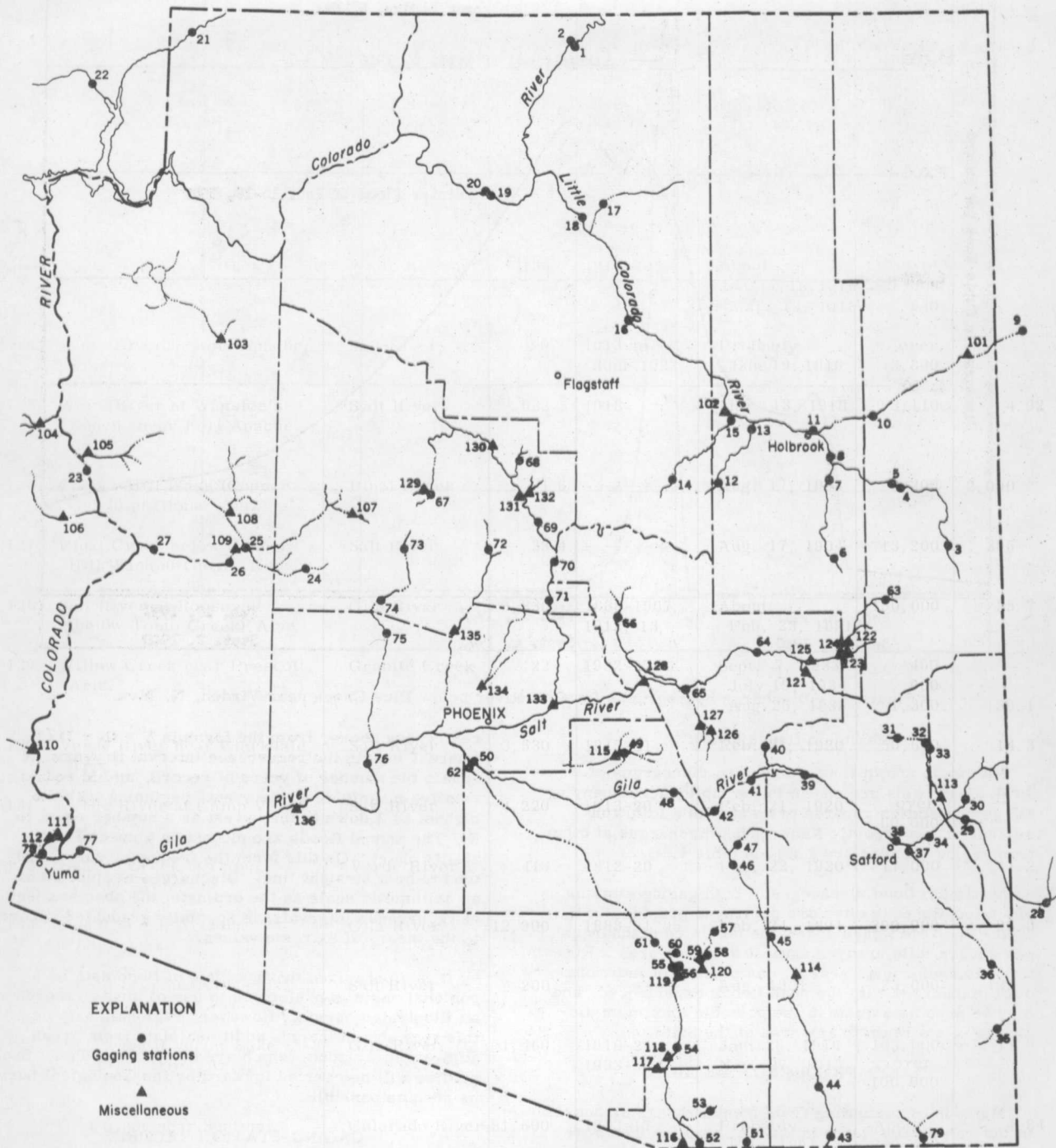


Figure 2. --Map of Arizona showing location of gaging stations and miscellaneous flood records.



## GAGING-STATION RECORDS

5

Table 1. --Miscellaneous flood data

Index no.	Stream and place of determination	Tributary to	Drainage area (sq mi)	Period of record	Date	Maximum discharge	
						Cfs	Cfs per sq mi
101	Black Creek near Houck, Ariz.	Puerco River	648	Oct. 1943 to Jan. 1945	Sept. 26, 1944	1,380	2.13
102	Salt Creek near Winslow, Ariz.	Little Colorado River	287	Oct. 1940 to June 1941	Aug. 14 or 15, 1940	2,800	10.1
103	Truxton Canyon near Kingman, Ariz.	Red Lake Basin	417	-----	July or Aug. 1904	49,000	118
104	Piute Wash at box canyon 8.5 mi northwest of Needles, Calif.	Colorado River	770	-----	Sept. 12, 1939	30,000	39.0
105	Sacramento Wash at mouth near Topock, Ariz.	Colorado River	1,430	-----	Sept. 6, 1939	15,000	10.5
106	Chemehuevi Wash at Needles-Vidal highway near Needles, Calif.	Colorado River	270	-----	Sept. 25, 1939	12,000	44.4
107	Kirkland Creek at Yava, Ariz.	Santa Maria River	335	Nov. 1940 to July 1942	Mar. 14, 1941	4,300	12.8
108	Big Sandy River below Burro Creek, at Signal, Ariz.	Bill Williams River	2,670	-----	Sept. 6, 1939	about 100,000	37.5
109	Bill Williams River at confluence of Big Sandy and Santa Maria Rivers, near Alamo, Ariz.	Colorado River	4,330	-----	Sept. 6, 1939	77,000	17.8
110	Arroyo Seco at mouth, 21 miles upstream from Picacho, Calif.	Colorado River	450	-----	Sept. 5, 1939	40,000	88.9
111	Wash at All-American Canal, near Yuma, Ariz.	Colorado River	35.3	-----	Sept. 5, 1939	5,000	142
112	Picacho Wash at All American Canal, near Yuma, Ariz.	Colorado River	41.5	-----	Sept. 5, 1939	37,000	892
113	Eagle Creek above Pumping Plant near Morenci, Ariz.	Gila River	613	1944-53	Feb. 10, 1932	13,000	21.2
114	Wash above Gunters Ranch 12½ miles north of Pomerene, Ariz.	San Pedro River	3.8	-----	Sept. 26, 1948	6,700	1,760
115	Queen Creek near Florence Junction, Ariz.	Gila River	191	1939-41	Aug. 7, 1939	13,200	69.1
116	Nogales Wash at Nogales, Ariz.	Santa Cruz River	37	Apr. 1932 to Feb. 1934	July 29 or Aug. 15, 1931	4,400	119
117	Sopori Wash 3 miles above mouth and 2 miles northwest of Amado, Ariz.	Santa Cruz River	161	-----	Aug. 15, 1948	16,000	99.4
118	Wash ¼ mile above mouth and 5 miles northeast of Amado, Ariz.	Santa Cruz River	10.3	-----	Sept. 26, 1948	2,000	194
119	Julian Wash at Highway 80 near Tucson, Ariz.	Santa Cruz River	26.1	-----	Aug. 1945	a 3,000	115

## FLOODS IN ARIZONA

Table 1. --Miscellaneous flood data--Continued

Index no	Stream and place of determination	Tributary to	Drainage area (sq mi)	Period of record	Date	Maximum discharge	
						Cfs	Cfs per sq mi
120	Pantano Wash near Tucson, Ariz.	Rillito Creek	602	June 1940 to Mar. 1941	Aug. 13, 1940	9,200	15.3
121	Black River near Fort Apache, Ariz.	Salt River	1,230	1912-18	Dec. 20, 1914 Jan. 28, 1915	18,000 over 18,000	-
122	White River at White River, Ariz.	Salt River	357	1917-22	Nov. 1919 or Feb. 1920 Aug. 4, 5, 1921	over 2,700 2,700	-
123	East Fork White River at Fort Apache, Ariz.	White River	135	1912-20	About Jan. 17, 18, 1916 Mar. 13, 1918	over 1,000 640	-
124	White River at Fort Apache, Ariz.	Salt River	499	1913 to June 1922	Probably Jan. 19, 1916	over 3,830	-
125	White River at Wanslee's Ranch, near Fort Apache, Ariz.	Salt River	632	1918	Mar. 13, 1918	3,110	4.92
126	Cooper Hill Wash (Copper Gulch) at Globe, Ariz.	Pinal Creek	1.6	-----	Aug. 17, 1904	3,200	<sup>c</sup> 2,000
127	Pinal Creek below Copper Hill Wash at Globe, Ariz.	Salt River	33.4	-----	Aug. 17, 1904	13,200	395
128	Salt River at Roosevelt (below Tonto Creek), Ariz.	Gila River	5,830	1888-1907 1912, 13	About Feb. 23, 1891	150,000	25.7
129	Willow Creek near Prescott, Ariz.	Granite Creek	22	1932-37	Sept. 7, 1933 July 19, 1934 Aug. 25, 1935	450 900 1,300	- 59.1
130	Verde River near Clarkdale, Ariz.	Salt River	3,530	1915-21	Feb. 21, 1920	50,600	14.3
131	Verde River at Camp Verde, Ariz.	Salt River	4,220	1913-20	Feb. 21, 1920	over 60,000	-
132	Beaver Creek at Camp Verde, Ariz.	Verde River	413	1912-20	Feb. 22, 1920	17,000	41.2
133	Salt River at Arizona Dam, Ariz.	Gila River	12,900	1888-91, 95	Feb. 24, 1891	300,000	23.3
134	Cave Creek near Phoenix, Ariz.	Salt River	200	-----	Aug. 1921	<sup>b</sup> 25,000	125
135	Agua Fria River at Lake Pleasant Dam, Ariz.	Gila River	1,460	1910-24 1933-53	Jan. 28, 1916 Nov. 27, 1919	105,000 over 100,900	71.9
136	Gila River near Sentinel, Ariz.	Colorado River	51,600	1913-17	Probably Feb. 1891	About 250,000	4.84

Note. --Senate Document No. 436, published in 1919 under title "Gila River Flood Control", lists several hundred estimates of peak flow on Gila River tributaries above San Carlos, Ariz.

a From House Document No. 274 (80th Congress)

b From "Low Dams" prepared by the Subcommittee on Small Storage Projects of the Water Resources Committee of the National Resources Committee, Washington, D. C., 1938.

c Not plotted on figure 4.

discharge relation; historical data, where available; and remarks, including pertinent general information.

Location and drainage areas are obtained from the most accurate maps available, and the areas have been computed in accordance with procedures recommended by the Federal Inter-Agency River Basin Committee.

The gage paragraph is given to indicate type of gage and periods of use. Flood records from recording gages are generally more reliable than those from non-recording gages where local observers must be depended upon.

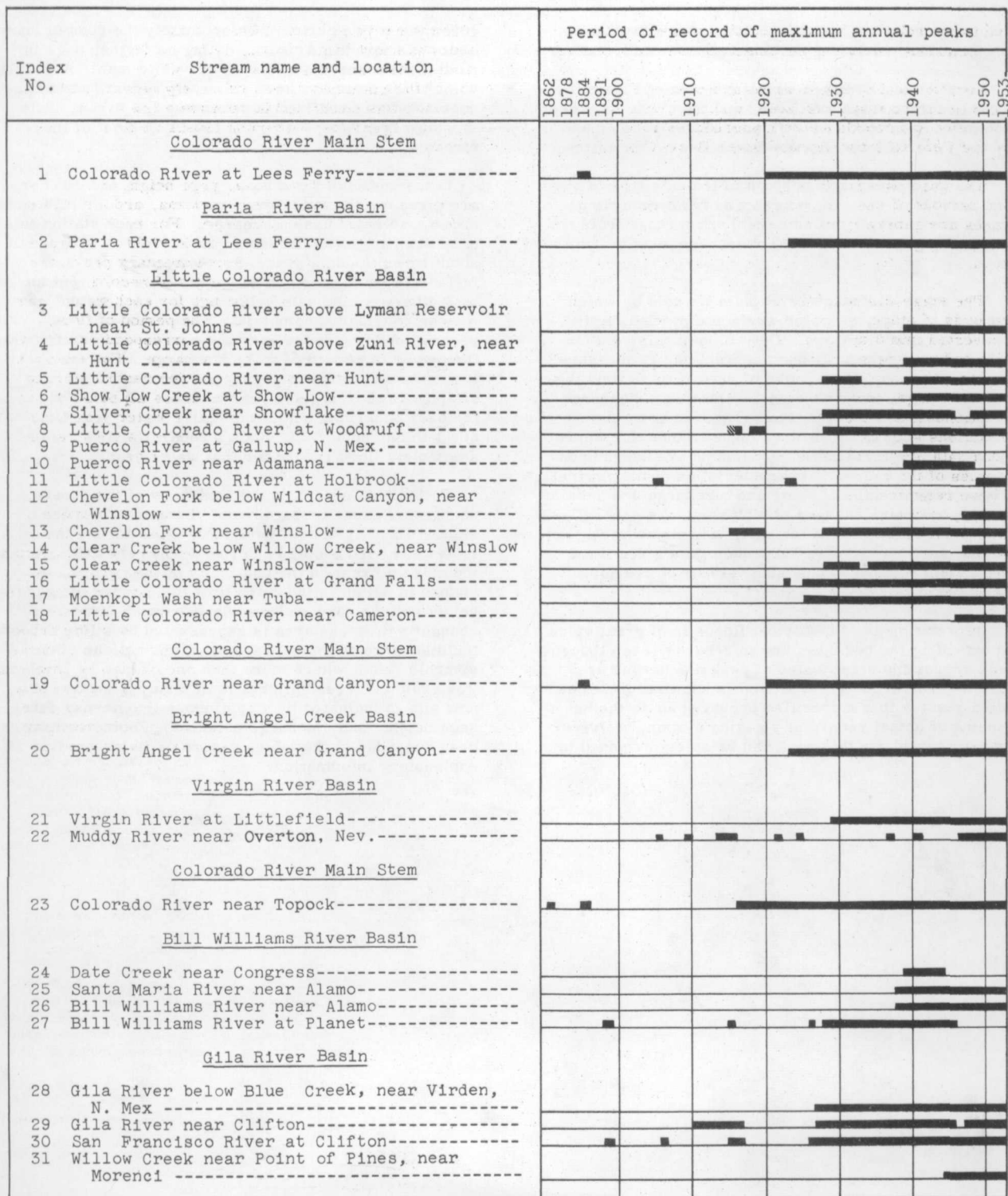
The stage-discharge relation is the tool by which records of stage, or water-surface elevation, are converted into discharge. Definition of this relationship is based primarily upon current-meter measurements. In many cases peaks of record lie beyond the defined range, and extensions of the stage-discharge relationship are made on the basis of indirect determinations such as slope-area measurements. Where such data are unavailable, extensions are based upon studies of the hydraulic characteristics of the channel. These relationships of stage and discharge are seldom stable; however, changes at high stage are generally less pronounced than at low stage and consequently definition obtained in years subsequent to a given flood period can be used in checking validity of previous flood computations.

Information as to historical floods is of great value in extending the period of known records, even though only approximate estimates of peak discharges are known. For example, if a flood is known to have been the highest within a specified period prior to the beginning of actual record at a gaging station, the recurrence interval for this peak can be safely extended to

cover the entire period. Unfortunately the span of known history is short in Arizona, dating no farther back in most places than the advent of the white man. As settlement of the State has been relatively recent, and as the population was confined to relatively few areas, little is known regarding historical floods on most of the streams.

In the tables of flood data, gage height and discharge are given for the water-year maxima, and for all floods above a selected base discharge. For each station this base discharge was chosen so as to yield an average of about three floods a year. Supplementary peaks are included even for incomplete years of record, but unless otherwise indicated, listings for each water year may be considered complete. The period of flood records in some cases does not correspond exactly with the period of record of daily discharge. For example, it may be known that a gaging-station record starting after October of a given year includes all peaks above the base occurring within the entire water year October 1 to September 30. Such a record is considered a complete flood record for that water year.

To indicate breaks in the continuity of the record, change in datum, or significant changes in location a standardized system of horizontal lines across the tables has been adopted. A line across the date columns indicates a break in the continuity of the record. A change in datum is indicated by a line across the gage-height column, and a change in site which involves a change in drainage area is represented by a line across the discharge column. Various combinations of these symbols result where more than one change is involved. For example, reestablishment of a gaging station at a new site is indicated by a continuous line across date, gage height, and discharge columns. Footnotes have been appended to the tables regarding items needing explanatory information.



— Peak stage and discharge

Figure 3.--Bar graph showing period of record



## GAGING-STATION RECORDS

9

Index No.	Stream name and location	Period of record of maximum annual peaks										
		1862 1878 1884 1891 1900	1910	1920	1930	1940	1950	1953				
32	Willow Creek near Double Circle Ranch, near Morenci-----											
33	Eagle Creek near Double Circle Ranch, near Morenci-----											
34	Gila River at head of Safford Valley, near Solomon-----											
35	Cave Creek near Paradise-----											
36	San Simon Creek near San Simon-----											
37	San Simon Creek near Solomon-----											
38	Gila River at Safford-----											
39	Gila River at Calva-----											
40	San Carlos River near Peridot-----											
41	Gila River below Coolidge Dam-----											
42	Gila River at Winkelman-----											
43	San Pedro River at Palominas-----											
44	San Pedro River at Charleston-----											
45	San Pedro River near Redington-----											
46	San Pedro River near Mammoth-----											
47	Aravaipa Creek near Feldman-----											
48	Gila River at Kelvin-----											
49	Queen Creek at Whitlow dam site, near Superior -----											
50	Gila River near Laveen-----											
51	Santa Cruz River near Lochiel-----											
52	Santa Cruz River near Nogales-----											
53	Sonoita Creek near Patagonia-----											
54	Santa Cruz River at Continental-----											
55	Santa Cruz River at Tucson-----											
56	Tucson Arroyo at Vine Ave Tucson-----											
57	Sabino Creek near Mount Lemmon-----											
58	Sabino Creek near Tucson-----											
59	Rillito Creek near Wrightstown-----											
60	Rillito Creek near Tucson-----											
61	Santa Cruz River at Cortaro-----											
62	Santa Cruz River near Laveen-----											
63	White River near McNary-----											
64	Salt River near Chrysotile-----											
65	Salt River near Roosevelt-----											
66	Tonto Creek above Gun Creek, near Roosevelt-----											
67	Granite Creek near Prescott-----											
68	Oak Creek near Cornville-----											
69	Verde River near Camp Verde-----											
70	Verde River below East Verde River, near Pine -----											
71	Verde River below Tangle Creek above Horseshoe Dam -----											
72	Agua Fria River near Mayer-----											
73	Hassayampa River near Wagoner-----											
74	Hassayampa River at Box dam site, near Wickenburg -----											
75	Hassayampa River near Morristown-----											
76	Gila River below Gillespie Dam-----											
77	Gila River near Dome-----											
78	Colorado River at Yuma-----											
	<u>Whitewater Draw Basin</u>											
79	Whitewater Draw near Douglas-----											

▨ Peak stage only

of maximum annual peaks at gaging stations.



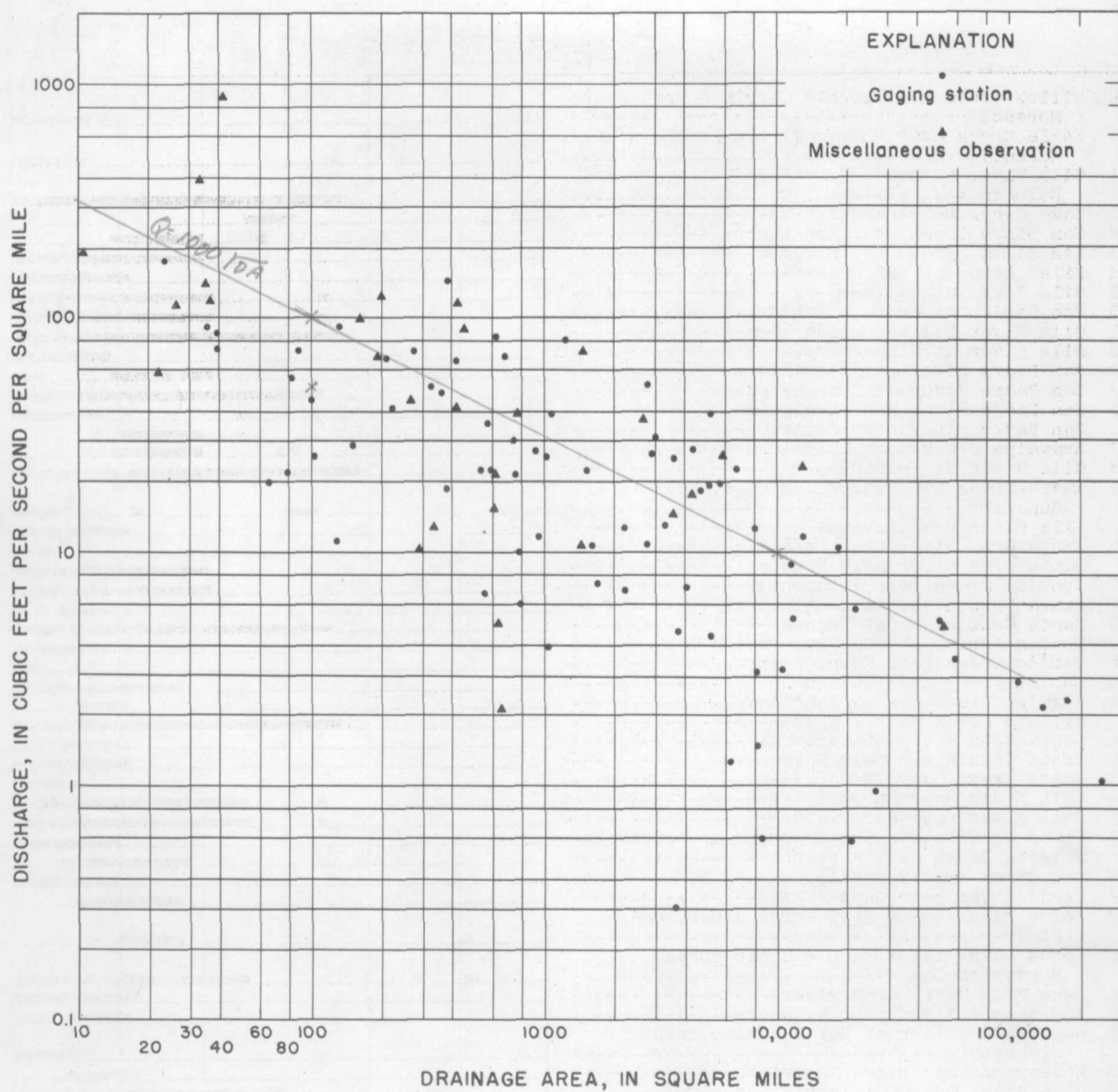


Figure 4. --Unit discharge versus drainage area for maximum discharges in Arizona.

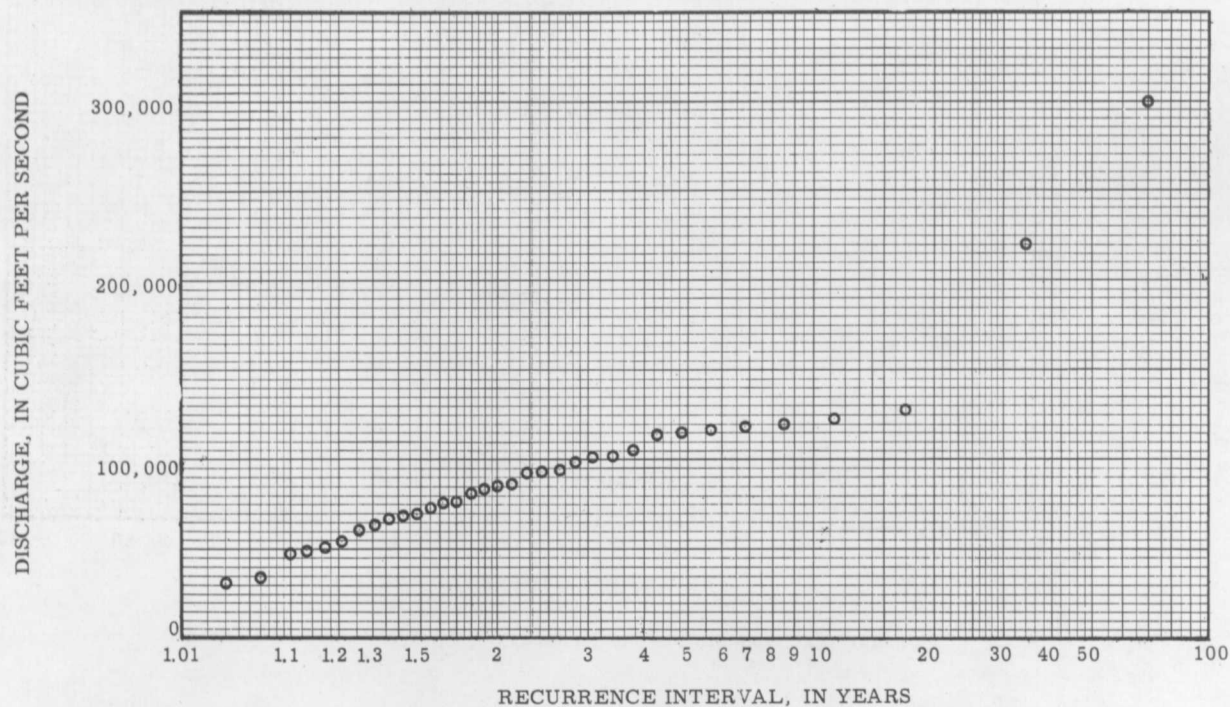


Figure 5. --Annual flood plot, Colorado River at Lees Ferry, Ariz.

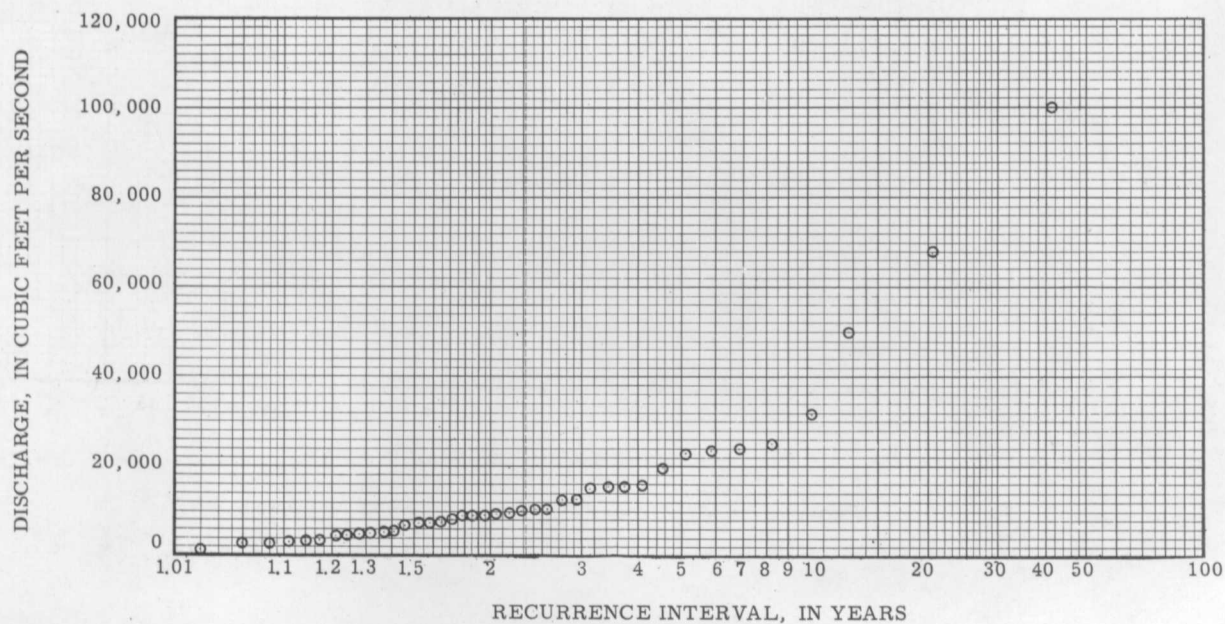


Figure 6. --Annual flood plot, Gila River at head of Safford Valley, near Solomon, Ariz.

## FLOODS IN ARIZONA

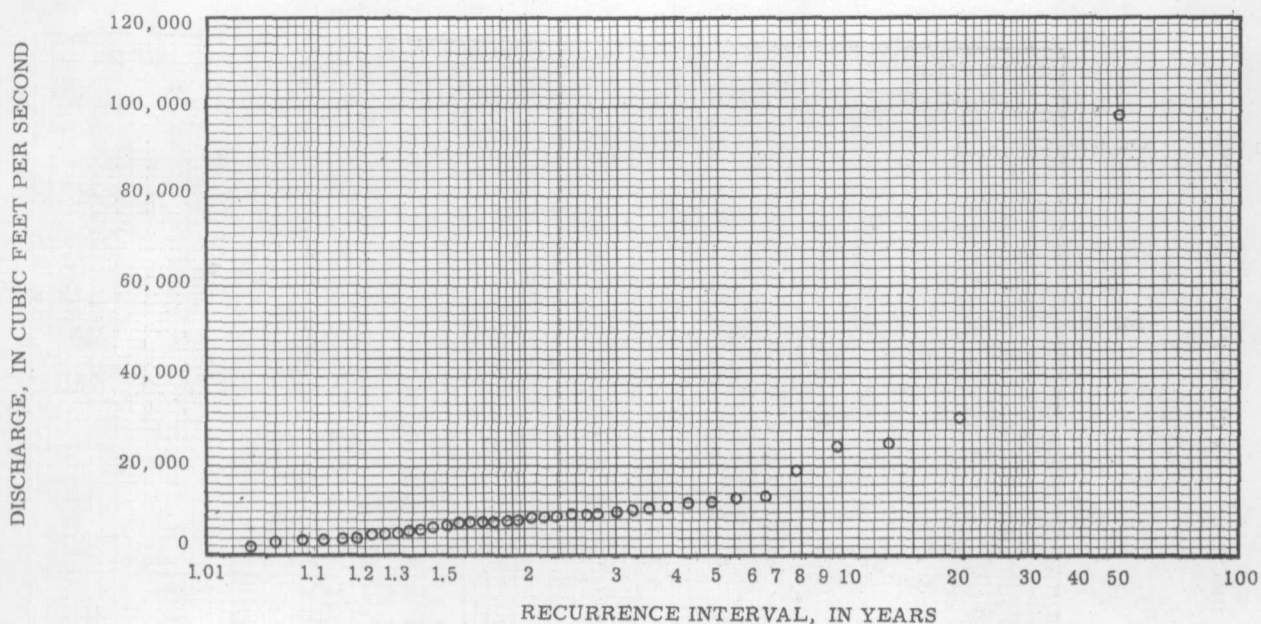


Figure 7. --Annual flood plot, San Pedro River at Charleston, Ariz.

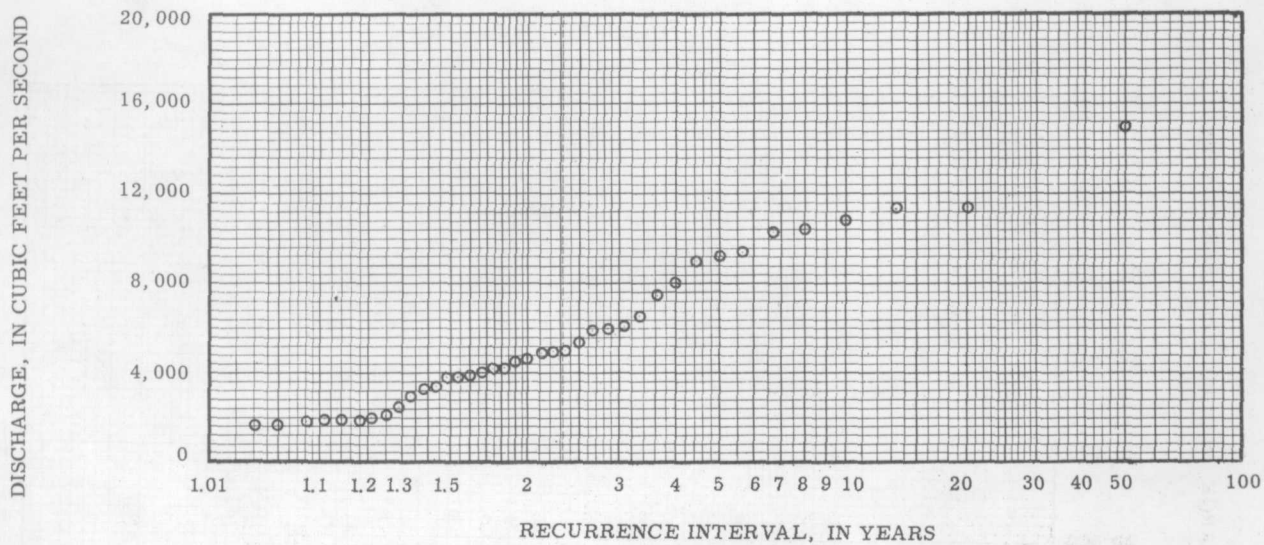


Figure 8. --Annual flood plot, Santa Cruz River at Tucson, Ariz.

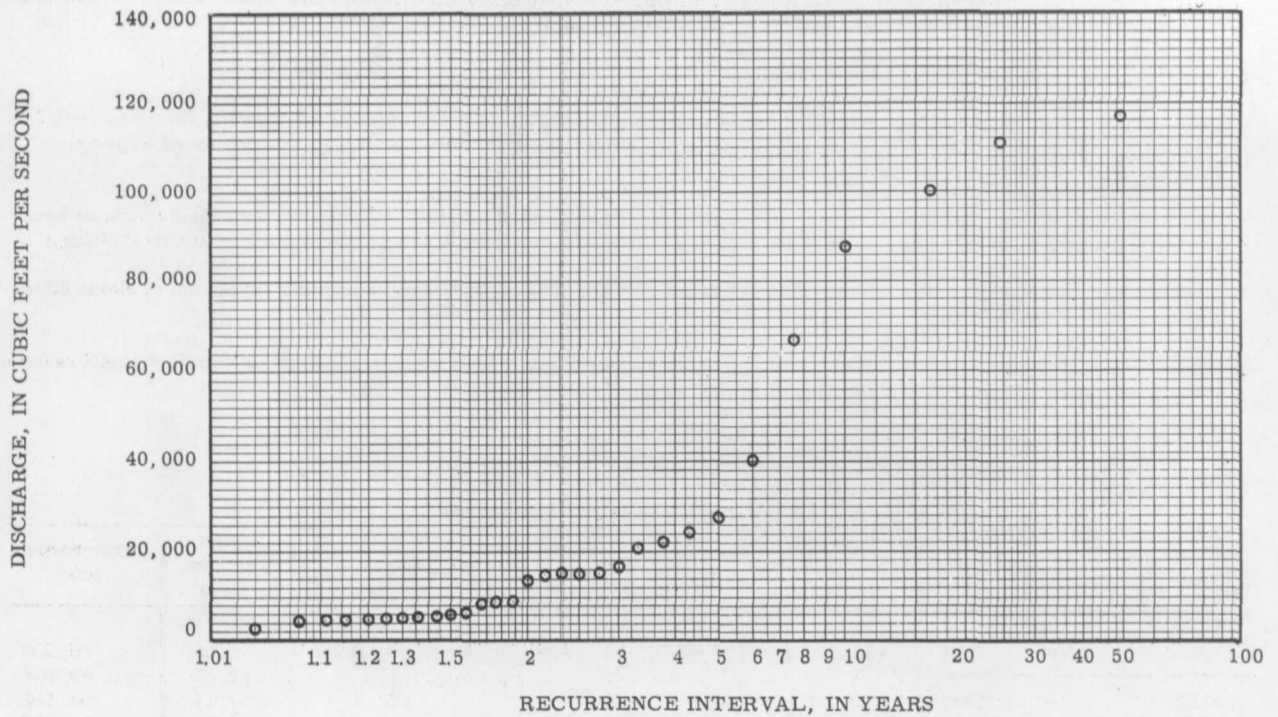


Figure 9. --Annual flood plot, Salt River near Roosevelt, Ariz.

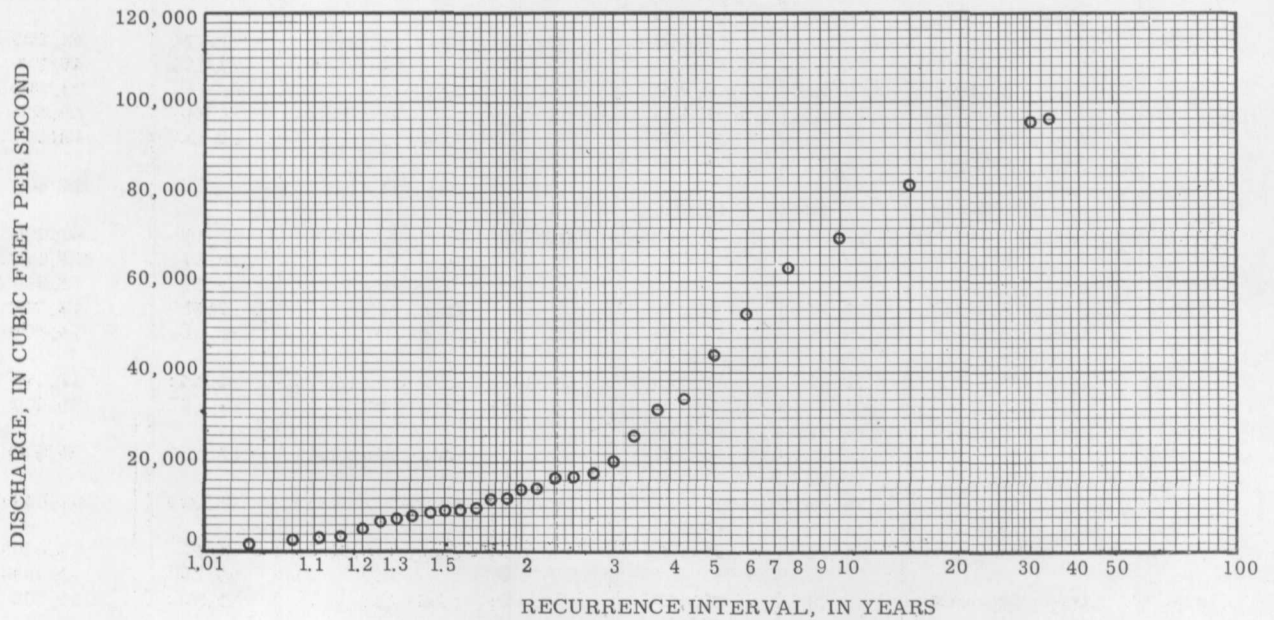


Figure 10. --Annual flood plot, Verde River below Tangle Creek, above Horseshoe Dam, Ariz.



## FLOODS IN ARIZONA

## Colorado River Main Stem

## (1) Colorado River at Lees Ferry, Ariz.

Location. --Lat 36°51'45", long. 111°36'15", in NE $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 13, T. 40 N., R. 7 E., at head of Marble Gorge, at Lees Ferry, just upstream from Paria River, 28 miles downstream from Utah-Arizona State line, 61.5 miles upstream from Little Colorado River, and 79 miles downstream from San Juan River.

Drainage area. --107,900 sq mi, approximately.

Gage. --Recording gage since Jan. 19, 1923. Datum of gage is 3,106.16 ft above mean sea level, datum of 1929. June 13, 1921, to Jan. 18, 1923, non-recording gages within 400 ft of present gage, all referenced to present datum.

Stage-discharge relation. --Defined by current-meter measurements below 120,000 cfs and extended above on basis of discharge computed for flood of June 18, 1921, at station near Grand Canyon. Relation subject to shifting.

Historical data. --Flood of about July 7, 1884, reached a stage of 31.5 ft, from floodmarks at mouth of Paria River, discharge about 300,000 cfs.

Remarks. --Flood record slightly affected by storage and diversions above station. Combined capacity of all reservoirs above station was about 1,700,000 acre-feet in 1950.

Base for partial-duration series, 35,000 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1884	July 7, 1884	31.5	300,000	1929	Mar. 14, 1929	12.00	36,300
1921	June 18, 1921	26.5	220,000		Apr. 7	12.66	42,000
1922	May 10, 1922	16.90	86,800		23	12.94	43,900
	31,	19.8	116,000		May 29	18.89	114,000
	June 12	19.0	110,000		June 12	17.55	101,000
1923	May 14, 1923	14.84	74,000		Aug. 3	14.36	62,500
	31	17.5	98,300		7	15.27	73,300
	June 19	16.64	90,600		13	15.07	71,000
	Sept. 20	13.81	57,800		Sept. 9	13.06	46,500
1924	Apr. 18, 1924	12.98	47,300		24	13.51	50,400
	27	12.20	38,500	1930	Apr. 16, 1930	12.67	42,100
	May 23	14.56	67,600		28	13.21	46,700
	June 17	15.2	76,200		June 3	15.15	73,300
1925	Apr. 21, 1925	11.88	35,500		16	14.64	65,600
	June 3	13.60	54,900		Aug. 12	13.43	48,100
	25	13.4	52,500	1931	May 21, 1931	12.05	34,600
1926	Oct. 6, 1925	12.37	36,500	1932	Apr. 23, 1932	12.89	40,900
	May 9, 1926	15.09	73,000		May 26	18.30	102,000
	29	16.7	86,500		June 28	15.38	72,300
	July 14	12.40	37,600		July 14	12.97	42,000
1927	May 8, 1927	14.51	66,000		Aug. 30	14.01	54,800
	22	16.71	91,200	1933	June 5, 1933	16.45	82,700
	June 22	15.07	72,800		July 9	12.13	35,300
	July 1	20.35	127,000	1934	May 16, 1934	11.05	25,300
	Sept. 11	14.43	63,500	1935	June 19, 1935	18.90	105,000
	13	20.23	126,000	1936	May 9, 1936	15.37	69,000
1928	May 14, 1928	16.68	90,500		23	16.14	76,300
	June 3	19.55	115,000		July 13	12.22	35,300



## GAGING-STATION RECORDS

15

Colorado River Main Stem

(1) Colorado River at Lees Ferry, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1937	Apr. 19, 1937	13.14	47,000	1945	May 17, 1945	14.90	64,400
	May 20	16.88	84,800		31	13.90	52,400
	June 2	15.13	68,000		June 11	14.18	55,800
1938	May 4, 1938	15.75	72,500		18	14.14	55,100
		15.80	73,500				
	June 8	18.45	101,000	1946	May 2, 1946	12.72	39,400
	26	16.13	77,300		June 14	13.66	50,400
1939	May 9, 1939	13.70	49,700	1947	May 13, 1947	16.26	80,400
	26	13.86	49,700		June 14	15.22	67,300
	June 8,	13.19	43,600		24	15.55	71,600
1940	May 18, 1940	13.54	47,200		Aug. 5	12.54	38,500
	June 5	12.96	42,400	1948	24	13.50	47,100
1941	May 17, 1941	20.51	120,000		Oct. 16, 1947	12.88	41,200
	June 22	16.10	77,200		Apr. 25, 1948	14.30	54,000
1942	Oct. 15, 1941	16.47	89,200		May 11	13.95	50,500
	27	12.97	42,700		25	17.76	92,400
	Apr. 8, 1942	14.06	56,000	1949	May 2, 1949	13.94	52,700
	17	15.45	70,300		June 22	20.0	119,000
	26	15.42	71,500	1950	Apr. 27, 1950	12.45	37,400
	May 15	14.90	64,500		June 6	14.81	60,600
	30	17.30	92,800		July 10	12.81	40,700
1943	May 7, 1943	14.45	59,600	1951	June 1, 1951	15.27	67,300
	June 5	15.14	68,600		25	14.78	62,800
1944	May 19, 1944	17.20	94,400	1952	May 9, 1952	19.9	113,000
	June 4	16.71	84,200		June 12	21.15	123,000
				1953	June 17, 1953	15.60	69,600

a From floodmarks.

b Estimated.

c Annual peak.

Paria River Basin

(2) Paria River at Lees Ferry, Ariz.

Location. --Lat 36°52'15", long. 111°36'30", in NW¼NE¼ sec. 13, T. 40 N., R. 7 E., half a mile upstream from mouth and 1 mile northwest of Lees Ferry.

Drainage area. --1,570 sq mi, approximately.

Gage. --Recording gage at present site since Sept. 11, 1929. Datum of gage is 3,123.40 ft above mean sea level, datum of 1929.

Nov. 22, 1923, to Oct. 5, 1925, staff gage 2,000 ft upstream at different datum.

Oct. 13, 1925, to Sept. 11, 1929, staff gage at present site and datum.

Stage-discharge relation. --Defined by current-meter measurements to 2,000 cfs; extended above by float-area determination at gage height 16.3 ft, and several determinations of increase in flow of Colorado River below mouth of Paria River. Relation subject to shifting.

Remarks. --Flood records unaffected by small irrigation diversions above station.  
Base for partial-duration series, 1,400 cfs.

Bank-full stage. --20 ft.

## FLOODS IN ARIZONA

## Paria River Basin

(2) Paria River at Lees Ferry, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1924	Sept. 10, 1924	6.0	<sup>c</sup> 4,330	1938	Mar. 3, 1938	11.22	7,440
1925	Sept. 19, 1925	6.5	<sup>c</sup> 4,800		June 29	7.56	1,960
1926	Oct. 5, 1925	<sup>a</sup> 16.3	<sup>c</sup> 16,100		Sept. 1	7.72	2,170
1927	Sept. 13, 1927	<sup>a</sup> 16.0	<sup>c</sup> 14,300	1939	Sept. 7, 1939	11.31	7,040
1928	July 16, 1928	7.50	<sup>c</sup> 2,960		11	7.92	1,990
1929	July 11, 1929	7.1	2,240		13	12.9	9,800
	28	8.2	3,440	1940	Jan. 12, 1940	7.4	1,480
	31	8.6	3,920		Aug. 24	10.1	5,130
	Aug. 2	13.8	12,000		Sept. 6	16.0	14,000
	4	8.0	3,210		14	11.2	5,800
	Sept. 3	7.9	3,100		18	12.4	7,800
	8	10.2	6,000	1941	Oct. 26, 1940	7.95	2,060
1930	July 30, 1930	7.80	2,540		July 24, 1941	12.3	7,500
	Aug. 8	7.17	1,730	1942	Oct. 28, 1941	7.50	1,680
	11	11.0	7,150	1943	Aug. 17, 1943	8.50	2,830
	Sept. 8	7.48	2,110		22	9.8	4,680
	30	7.21	1,780		Sept. 28	7.7	1,890
1931	Nov. 18, 1930	7.53	2,190	1944	Oct. 19, 1943	12.1	8,400
1932	Feb. 9, 1932	9.53	4,880	1945	Aug. 1, 1945	7.55	1,740
	July 13	9.87	5,260		13	8.10	2,340
	Aug. 9	7.22	1,530		Sept. 3	8.83	3,290
	22	7.49	1,880	1946	Oct. 16, 1945	9.30	3,930
	28	13.0	10,500		July 25, 1946	10.0	4,980
1933	July 18, 1933	7.82	2,300		Aug. 11	7.55	1,740
	Aug. 7	7.35	1,690		15	8.94	3,430
	22	8.81	3,660		17	9.94	4,830
	Sept. 9	8.35	3,020		24	8.90	3,360
1934	May 29, 1934	8.54	3,290	1947	Oct. 29, 1946	7.64	1,590
	Aug. 29	11.8	8,400		Aug. 22, 1947	11.77	7,650
1935	Sept. 1, 1935	8.12	2,700		28	7.90	1,620
1936	July 11, 1936	11.95	8,700	1948	Aug. 5, 1948	11.6	6,150
	26	7.30	1,630	1949	Sept. 29, 1949	10.0	3,410
	28	8.18	2,780	1950	July 19, 1950	8.17	1,340
	Aug. 4	7.80	2,270	1951	Aug. 4, 1951	11.5	4,480
	6	9.44	4,610		29	11.5	4,180
	17	8.09	2,660	1952	Sept. 22, 1952	9.0	1,830
	31	9.62	4,880	1953	July 18, 1953	9.7	2,100
	Sept. 2	11.45	7,840		Aug. 27	12.8	6,400
	12	8.73	3,550				
1937	Oct. 20, 1936	7.24	1,560				
	Feb. 7, 1937	8.12	2,700				
	July 9	7.99	2,520				
	Aug. 29	8.85	3,720				

<sup>a</sup> From floodmark.<sup>c</sup> Annual peak; peaks other than annual not known.

## GAGING-STATION RECORDS

17

## Little Colorado River Basin

(3) Little Colorado River above Lyman Reservoir, near St. Johns, Ariz.

Location. --Lat 34°20', long. 109°22', in NE¼SE¼ sec. 27, T. 11 N., R. 28 E., 1 mile downstream from Coyote Creek, 4½ miles upstream from Lyman Dam, and 13 miles south of St. Johns.

Drainage area. --747 sq mi.

Gage. --Recording gage at present site since Oct. 27, 1940. Staff gages at various sites and datums within 1 mile upstream Apr. 10-26, Aug. 2 to Oct. 27, 1940. Apr. 27 to July 25, 1940, recording gage 600 ft upstream at datum 1.70 ft higher.

Altitude of gage is about 6,050 ft (from topographic map).

All gage heights listed referenced to present site and datum.

Stage-discharge relation. --Defined by current-meter measurements below 500 cfs and extended above by slope-area determination at gage height 17.1 ft. Relation subject to shifting.

Historical data. --Flood of July 25, 1940, (gage height, 17.1 ft, present datum, from flood marks) was considered highest in previous 40 years by local residents.

Remarks. --Flood records not materially affected by diversions for irrigation and many small reservoirs totaling about 15,000 acre-ft above station.

Base for partial-duration series, 400 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	July 25, 1940	17.1	16,000	1947	July 22, 1947	9.8	1,460
1941	May 7, 1941	7.12	1,510		Aug. 10	9.05	900
	July 23	8.56	2,520		18	8.5	634
	Aug. 12	5.3	642		22	9.98	1,620
1942	Aug. 10, 1942	4.54	379		26	8.78	830
1943	Aug. 7, 1943	5.62	768		29	7.82	402
	22	8.37	2,360	1948	Apr. 17, 1948	8.22	732
1944	Aug. 15, 1944	9.57	3,400	1949	Apr. 24, 1949	6.80	524
	23	6.65	1,250		July 12	6.41	426
1945	July 30, 1945	6.12	661		Aug. 2	8.35	1,000
	Aug. 6	5.54	441		8	7.60	638
	11	6.29	740	1950	July 18, 1950	4.84	181
1946	July 18, 1946	8.5	1,400	1951	July 21, 1951	9.7	1,550
	21	6.70	520		Aug. 2	12.4	3,200
	Aug. 4	13.1	6,000		4	7.95	484
	7	11.4	3,820	1952	Apr. 17, 1952	7.05	489
	12	7.88	880		Aug. 16	8.2	972
	28	7.33	495		28	9.6	1,570
	Sept. 20	8.42	1,000	1953	Aug. 10, 1953	5.75	229

c Annual peak.

## FLOODS IN ARIZONA

Little Colorado River Basin

(4) Little Colorado River above Zuni River, near Hunt, Ariz.

Location. --Lat 34°38', long. 109°40', in SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 2, T. 14 N., R. 25 E., 500 ft upstream from Zuni River, and 3 miles northwest of Hunt.

Drainage area. --3,680 sq mi, approximately (including 830 sq mi in closed basin surrounding Quemado, N. Mex.).

Gage. --Recording gage since March 1940. Altitude of gage is 5,400 ft (from river-profile map).

Stage-discharge relation. --Defined by current-meter measurements below 500 cfs and extended above. Relation subject to minor shifting.

Remarks. --Flood records are affected by irrigation diversions and many reservoirs (combined capacity, about 44,000 acre-ft in 1940 and 54,000 acre-ft in 1950) above station.

Base for partial-duration series, 70 cfs.

Bank-full stage. --10 ft.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	July 26, 1940	3.46	577	1947	Aug. 4, 1947	2.86	301
	Aug. 21	2.69	186		9	2.43	139
	27	2.97	298		14	2.25	92
	Sept. 8	2.48	126		22	2.35	122
	18	2.37	101		26	2.55	187
	24	2.40	107				
1941	Mar. 15, 1941	2.56	150	1948	Sept. 17, 1948	2.17	75
	May 11	3.37	516	1949	Aug. 3, 1949	2.28	99
	July 26	2.96	289		7	2.68	244
1942	Oct. 7, 1941	1.98	37		10	3.11	478
1943	Sept. 26, 1943	1.61	11	1950	July 7, 1950	2.41	140
1944	Sept. 26, 1944	2.36	101	1951	Aug. 28, 1951	2.19	70
1945	Aug. 11, 1945	2.79	226	1952	July 27, 1952	2.12	67
	13	4.13	1,100	1953	July 27, 1953	2.02	62
	21	2.41	115				
	23	2.22	88				
1946	July 18, 1946	2.38	122				
	23	2.37	119				
	Aug. 4	3.60	745				
	8	2.80	274				
	12	2.76	257				
	14	2.56	180				
	21	2.55	177				
	Sept. 19	2.42	136				
	21	2.37	122				



## GAGING-STATION RECORDS

19

Little Colorado River Basin

(5) Little Colorado River near Hunt, Ariz.

Location. --Lat 34°39', long. 109°42', in NE¼NW¼ sec. 4, T. 14 N., R. 25 E., at bridge on U. S. Highway 260, 2 miles downstream from Zuni River and 5 miles northwest of Hunt.

Drainage area. --6,280 sq mi, approximately (including 830 sq mi in closed basin surrounding Quemado, N. Mex.).

Gage. --Recording gage at present site since Apr. 11, 1940. Datum of gage is 5,371.59 ft above mean sea level, datum of 1929.

May 1929 to October 1933, recording gage at site of former bridge 40 ft downstream. Datum was 0.16 ft lower prior to Sept. 1, 1931, and 2.16 ft lower Sept. 1, 1931, to October 1933.

Stage-discharge relation. --Defined by current-meter measurements below 3,500 cfs and extended above by logarithmic plotting. Shifts in relation occur.

Remarks. --Flood record not materially affected by diversions and reservoirs (combined capacity, about 54,000 acre-ft in 1938 and 63,000 acre-ft in 1950) above station.

Base for partial-duration series, 600 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1929	July 28, 1929	17.0	8,000	1941	Mar. 15, 1941	7.41	816
	Aug. 1	9.9	2,950		Apr. 3	7.22	767
	8	6.90	1,400		May 10	6.71	636
	13	7.78	1,800		July 25	8.96	1,560
	22	6.15	1,080		Sept. 30	7.34	854
	Sept. 3	5.50	850	1942	Oct. 4, 1941	6.99	725
	6	6.44	1,220		Aug. 11, 1943	6.40	508
1930	23	11.6	3,960	1943	Sept. 30, 1944	7.51	451
	Oct. 16, 1929	4.74	716		Aug. 13, 1945	10.87	1,590
	July 18, 1930	3.96	729	1946	Aug. 5, 1946	13.90	2,390
	21	3.75	663		8	12.78	1,840
	Aug. 7	4.66	965		12	11.34	1,400
1931	10	3.60	624		Sept. 19	9.09	710
	July 19, 1931	3.99	764	1947	Aug. 4, 1947	8.94	662
	28	10.05	3,310		23	10.50	1,290
	31	4.9	1,070	1948	Oct. 14, 1947	9.49	925
	Aug. 5	10.5	3,600		Aug. 7, 1949	13.8	2,360
	9	3.66	718	1949	9	16.87	4,050
	31	3.43	653		July 24, 1950	6.42	119
	Sept. 16	5.44	653	1951	Aug. 28, 1951	9.74	531
1932	28	5.40	643		Sept. 22, 1952	9.07	395
	Oct. 2, 1931	6.98	1,070	1952	July 18, 1953	7.02	42
	Mar. 27, 1932	5.53	604				
	Apr. 14	6.20	617				
	July 30	7.13	905				
	Aug. 22	7.31	980				
	29	7.83	1,200				
1933	July 24, 1933	12.4	3,600				
	30	6.50	662				
	Aug. 10	6.70	735				
	Sept. 10	7.39	1,010				
1940	July 26, 1940	10.34	2,110				
	29	7.11	629				
	Aug. 15	7.55	838				
	26	8.30	1,120				
	Sept. 6	7.52	918				



## FLOODS IN ARIZONA

Little Colorado River Basin

(6) Show Low Creek at Show Low, Ariz.

Location. --Lat 34°15'10", long. 110°01'40", in NE¼ sec. 20, T. 10 N., R. 22 E., at bridge on U. S. Highway 60 at Show Low.

Drainage area. --87.0 sq mi.

Gage. --Recording gage since January 1940 except July 26, 1951, to Apr. 5, 1952, when staff gages at or near present site were used. Datum of gage is 6,309.22 ft above mean sea level, datum of 1929. All gage heights reduced to present datum.

Stage-discharge relation. --Defined by current-meter measurements below 510 cfs and extended above on basis of slope-area determination at 9.9-ft.

Remarks. --Records prior to March 1945 compiled by Bureau of Reclamation.

Flood record prior to spring of 1953 slightly affected by irrigation diversions and several reservoirs (combined capacity 2,400 acre-ft) above station. Flood record greatly affected after completion of Jaques Dam in spring of 1953 increasing total capacity of reservoirs above station to 8,800 acre-ft.

Base for partial-duration series, 150 cfs.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1941	Mar. 14, 1941	9.30	<sup>c</sup> 3,200	1949	Dec. 23, 1948	3.74	290
1942	Oct. 13, 1941	3.12	<sup>c</sup> 211		Jan. 13, 1949	5.38	840
1943	Mar. 5, 1943	5.22	<sup>c</sup> 768		Feb. 23	5.04	740
1944	Mar. 16, 1944	4.00	<sup>c</sup> 472		Mar. 7	5.22	800
1945	Mar. 10, 1945	3.57	302		Aug. 6	3.73	330
	27	3.18	211	1950	Mar. 3, 1950	3.34	238
1946	July 14, 1946	7.8	750	1951	Aug. 28, 1951	3.10	170
	Sept. 19	6.71	1,200	1952	Dec. 31, 1951	-	<sup>b</sup> 2,500
1947	Nov. 25, 1946	3.96	166		Jan. 13, 1952	8.0	3,000
1948	Oct. 14, 1947	5.18	618		18	9.9	6,250
	Dec. 2	3.61	151		Mar. 17	-	<sup>b</sup> 1,000
	Feb. 18, 1948	3.37	153		31	4.34	238
	Mar. 18	3.56	202		Apr. 27	6.39	1,190
	24	3.77	248	1953	Mar. 8, 1953	5.06	<sup>d</sup> 444
	July 27	5.03	640				

<sup>b</sup> Estimated.

<sup>c</sup> Annual Peak.

<sup>d</sup> May be affected by storage in Lake Show Low.

## GAGING-STATION RECORDS

21

## Little Colorado River Basin

(7) Silver Creek near Snowflake, Ariz. \*

Location. --Lat 34°40'00", long, 110°02'30", in SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 29, T. 15 N., R. 22 E., on left bank 6 miles upstream from mouth and 14 miles north of Snowflake.

Drainage area. --886 sq mi at present site. 942 sq mi at site used prior to October 1950.

Gage. --Recording gage since April 1929. Prior to October 1950, at site  $5\frac{1}{2}$  miles downstream. Altitude of present gage is 5,245 ft (from river-profile map). Altitude of gage at former site was 5,196 ft (from river-profile map).

Stage-discharge relation. --For site in use prior to October 1950, defined by current-meter measurements below 3,700 cfs and extended above on basis of slope-area determination at 11,000 cfs. At present site, defined by current-meter measurements below 4,000 cfs and extended above on basis of relation at former site. Relations at both sites stable.

Remarks. --Flood record prior to 1953 not significantly affected by irrigation and storage above station. Completion of Jaques Dam in spring of 1953 increased total capacity of reservoirs above station from 7,500 acre-ft to 13,700 acre-ft not including Lone Pine Reservoir. This flood record is a combination of records published for station near Woodruff through water year 1952 (listed here through 1950) and present gage established in 1950. Records for 1951 and 1952 indicate that flood flows at these two points are almost identical.

Base for partial-duration series, 1,000 cfs.

\*Published as "near Woodruff", prior to 1952.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1929	July 21, 1929	11.67	10,500	1940	July 16, 1940	6.74	2,680
	25	6.45	3,050		26	12.37	11,000
	31	3.66	1,020		Aug. 19	5.33	1,510
	Aug. 3	3.98	1,100		25	5.48	1,610
	7	4.47	1,440		Sept. 12	5.98	2,000
	Sept. 23	6.47	3,070		27	4.86	1,210
1930	July 12, 1930	4.57	1,520	1941	Jan. 12, 1941	5.30	1,480
	Aug. 11	6.40	3,000		Mar. 15	7.61	3,700
1931	July 16, 1931	4.25	1,290		Sept. 28	5.55	1,640
	24	4.28	1,310	1942	Oct. 3, 1941	4.33	932
	Aug. 7	5.49	2,200		July 24, 1943	5.24	1,360
	Sept. 6	6.24	2,850	1943	Aug. 2	5.32	1,400
1932	Feb. 9, 1932	11.35	9,900		31	7.08	3,120
	Mar. 1	4.01	1,120	1944	Aug. 25, 1944	3.49	416
	July 9	4.60	1,530	1945	July 29, 1945	5.68	1,730
1933	Aug. 20, 1933	5.07	1,780		Aug. 5	5.25	1,400
	Sept. 10	7.83	4,600		11	7.06	3,230
1934	-	-	<sup>b</sup> 2,000	1946	July 21, 1946	4.94	1,140
1935	Sept. 27, 1935	6.22	<sup>c</sup> 2,820		Aug. 5	4.81	1,040
					Sept. 19	5.67	1,680
1936	July 25, 1936	7.60	4,300	1949	Jan. 13, 1949	6.88	<sup>c</sup> 2,900
	30	4.12	1,060		July 7, 1950	4.93	<sup>c</sup> 1,160
	Aug. 4	4.28	1,180	1951	Aug. 28, 1951	10.5	3,780
	6	5.18	1,890		Dec. 31, 1951	10.3	3,620
1937	Feb. 7, 1937	7.57	4,300	1952	Jan. 13, 1952	12.4	5,220
	Mar. 15	4.59	1,400		19	18.0	10,100
	17	4.69	1,480		July 6	6.6	1,260
1938	Mar. 4, 1938	6.28	2,900		Aug. 20	9.9	3,330
	Aug. 7	5.51	2,140		Sept. 22	8.8	2,530
	8	6.52	3,100	1953	July 16, 1953	5.9	1,060
	Sept. 1	4.13	1,090		29	4.64	1,460
1939	Aug. 6, 1939	4.44	1,310				
	29	4.64	1,460				

<sup>b</sup> Estimated.

<sup>c</sup> Annual peak.

## Little Colorado River Basin

## (8) Little Colorado River at Woodruff, Ariz. \*

Location. --Lat 34°47', long. 110°03', in NE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 17, T. 16 N., R. 22 E., at county bridge in Woodruff, and 3  $\frac{3}{4}$  miles downstream from Silver Creek.

Drainage area. --8,100 sq mi. approximately.

Gage. --Recording gage at present site and datum since Sept. 22, 1949. Datum of gage is 5,129.0 ft above mean sea level (from river-profile survey, based on datum of 1929).

1915-19, recording gage  $1\frac{1}{2}$  miles downstream, at different datum.

April 1929 to Sept. 21, 1949, recording gage 800 ft downstream from preceding gage and  $5\frac{1}{2}$  miles downstream from Silver Creek at datum 5.5 ft lower than present gage.

Stage-discharge relation. --Defined by current meter measurements at present site. At site in use prior to 1929 relation was defined by current meter measurements below 2,000 cfs and extended above. That for site 1929-49 was defined by current meter measurements below 6,800 cfs and extended above on basis of slope-area determination at 13.45 ft. Relations stable.

Historical data. --Flood of Jan. 19, 1916, discharge undetermined (gage height, 12.7 ft, from floodmark, datum then in use), is believed to be greater than flood of Dec. 5, 1919.

Remarks. --Flood record partially affected by diversions and storage above station. Combined capacity of all reservoirs above station, about 73,000 acre-ft, not including Lone Pine Reservoir.

Base for partial-duration series, 1,900 cfs.

\*Published as "near Woodruff", 1916-20, 1929-48.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1916	Jan. 19, 1916	<sup>a</sup> 12.7	-	1934	-	-	<sup>b</sup> 2,500
1917	Apr. 18, 1917	5.0	<sup>c</sup> 2,800	1935	Sept. 28, 1935	9.3	<sup>c</sup> 5,400
1919	July 19, 1919	5.4	<sup>c</sup> 4,600	1936	July 10, 1936	6.32	2,170
1920	Dec. 5, 1919	12.0	<sup>c</sup> 25,000		25	11.0	8,300
					Sept. 21	6.70	2,410
1929	July 21, 1929	12.45	10,700	1937	Feb. 7, 1937	9.3	5,640
	26	8.05	3,320		July 28	6.3	2,300
	29	11.6	9,050				
	31	7.0	2,180	1938	Mar. 4, 1938	7.10	2,880
	Aug. 2	8.25	3,600		Aug. 7	5.92	2,070
	8	7.45	2,590		8	7.20	2,960
	13	7.65	2,810				
	Sept. 23	12.4	10,600	1939	Aug. 6, 1939	3.95	1,180
1930	Aug. 2, 1930	7.9	3,120	1940	July 16, 1940	6.50	2,670
	11	11.05	8,000		26	13.45	13,000
1931	July 24, 1931	8.3	3,680		Aug. 15	8.5	4,540
	29	9.2	5,000		19	6.1	2,400
	Aug. 7	10.90	7,750		25	5.6	2,120
	10	6.5	1,920		Sept. 12	8.2	4,210
	22	7.45	2,660		18	5.35	2,020
	Sept. 7	7.4	2,610	1941	Jan. 12, 1941	7.0	3,090
1932	Feb. 10, 1932	12.1	10,200		Mar. 15	9.45	6,050
	July 9	8.6	4,350		Sept. 28	8.4	4,690
	Aug. 20	6.3	1,980	1942	Oct. 3, 1941	4.70	1,670
1933	July 7, 1933	7.1	2,640	1943	Aug. 2, 1943	5.2	1,920
	24	8.2	3,810		31	7.46	3,590
	Aug. 6	6.6	2,280				
	Sept. 11	11.0	8,300	1944	Sept. 28, 1944	3.70	1,140

Little Colorado River Basin

(8) Little Colorado River at Woodruff, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1945	July 23, 1945	8.42	4,690	1949	Jan. 14, 1949	10.1	2,600
	29	5.71	2,170		July 20	9.9	2,400
	Aug. 11	7.67	3,810		Aug. 8	13.1	7,540
	20	5.52	2,070	1950	July 19, 1950	9.85	2,050
1946	July 22, 1946	5.60	1,990		Aug. 28, 1951	19.75	8,290
	Aug. 5	6.52	2,580	1952	Dec. 31, 1951	11.24	2,580
	Sept. 19	7.8	3,880		Jan. 14, 1952	13.84	4,180
1947	Aug. 5, 1947	6.90	3,000	1953	19	21.9	10,200
	10	5.63	2,160		July 6	10.42	2,250
	13	6.10	2,440		Aug. 20	11.45	2,950
	23	7.56	3,700		Sept. 22	13.93	4,440
	29	8.26	4,560		July 29, 1953	11.32	2,770
1948	Oct. 14, 1947	8.30	4,560				
	Sept. 27	9.76	1,920				

<sup>a</sup> From floodmarks.<sup>b</sup> Estimated.<sup>c</sup> Annual Peak.

(9) Puerco River at Gallup, N. Mex.

Location. --Lat 35°32', long. 108°44', in SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 15, T. 15 N., R. 18 W., 1,500 ft upstream from Second Street Bridge in Gallup and half a mile upstream from Little Puerco Wash.

Drainage area. --558 sq mi.

Gage. --Recording gage, May 1940 to July 12, 1946. Datum of gage is 6,490.36 ft above mean sea level, datum of 1929.

Stage-discharge relation. --Defined by current-meter measurements below 340 cfs; extended above on basis of slope-area determinations. Relation subject to small shifts.

Remarks. --Flood record unaffected by irrigation diversions above station. Base for partial-duration series, 1,200 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	July 27, 1940	5.0	1,450	1944	Sept. 27, 1944	4.30	1,040
	Sept. 11	4.92	1,380		July 23, 1945	5.90	2,270
	21	7.35	3,500	1945	30	6.43	2,760
1941	July 24, 1941	5.48	1,830		Aug. 5	5.14	1,640
	Aug. 10	4.8	1,230		7	5.46	1,880
	Sept. 17	5.2	1,620		9	4.7	1,310
	28	7.65	3,700		11	5.50	1,920
					31	4.73	1,340
1942	Oct. 3, 1941	5.0	1,480				
1943	July 21, 1943	4.66	1,260				
	31	5.75	2,280				
	Aug. 10	4.47	1,270				
	25	5.08	1,720				



## FLOODS IN ARIZONA

Little Colorado River Basin

(10) Puerco River near Adamana, Ariz.

Location. --Lat 34°58'45", long. 109°47'40", in NE $\frac{1}{4}$  sec. 9, T. 18 N., R. 24 E., at bridge on State Highway 63 in Petrified Forest National Monument, a quarter of a mile downstream from Dead Wash, and 1 $\frac{1}{2}$  miles east of Adamana.

Drainage area. --2,760 sq mi, approximately.

Gage. --Recording gage, March 1940 to September 1949. Datum of gage is 5,312.92 ft above mean sea level, datum of 1929.

Stage-discharge relation. --Defined by current-meter measurements below 17,000 cfs; extended above by logarithmic plotting. Relation affected by very large shifts.

Remarks. --Flood record unaffected by irrigation diversions above station. Base for partial-duration series, 3,000 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	Aug.: 14, 1940	5.85	7,000	1945	Feb. 3, 1945	7.40	5,740
	21	5.37	5,200		July 30	6.98	4,150
	23	5.9	7,500	1946	Aug. 10, 1946	7.40	7,970
1941	Jan. 11, 1941	5.27	5,960		12	10.4	30,000
	Mar. 15	7.1	7,400	1947	Aug. 10, 1947	8.6	22,000
	May 24	7.9	11,400		13	5.6	7,500
	Aug. 8	6.48	4,650		22	5.7	8,440
	10	6.5	4,650		30	7.7	15,800
	14	6.08	3,090		Sept. 9	5.95	6,420
	17	6.18	3,250		1948	Oct. 14, 1947	7.3
	Sept. 29	9.5	22,600	July 28, 1948		7.3	7,060
1942	Oct. 4, 1941	9.1	19,400	Sept. 26		5.6	4,020
	14	7.4	8,780	1949	Feb. 24, 1949	5.11	3,010
1943	Aug. 28, 1943	6.53	4,530		July 24	5.95	3,710
	Sept. 26	6.8	4,800		Aug. 3	5.75	3,120
1944	Sept. 26, 1944	7.2	4,700		8	6.9	8,040
					Sept. 13	6.25	4,700

Little Colorado River Basin

(11) Little Colorado River at Holbrook, Ariz.

Location. --Lat 34°53'50", long. 110°09'40", in SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 6, T. 17 N., R. 21 E., at bridge on U. S. Highway 260 at Holbrook and 2 $\frac{1}{2}$  miles downstream from Puerco River.

Drainage area. --11,300 sq mi, approximately.

Gage. --Recording gage at present site and datum since Sept. 14, 1949. Datum of gage is 5,062.87 ft above mean sea level, datum of 1929. 1905-9, staff gage at former highway bridge just upstream from present bridge at different datum.

Stage-discharge relation. --Defined by current meter measurements since 1950. Relation in use during 1906 water year was apparently defined below about 3,500 cfs and extended above.

Historical data. --Flood peak of 60,000 cfs, Sept. 19, 1923, was computed from cross section and slope of water surface by Corps of Engineers, whose studies indicate that this was probably the greatest flood since 1870.

Remarks. --Flood records partially affected by diversions and storage above station. Base for partial duration series, 3,000 cfs.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1906	Nov. 27, 1905	-	<sup>e</sup> 20,200	1952	Dec. 31, 1951	6.80	3,190
					Jan. 14, 1952	7.55	4,700
1923	Sept. 19, 1923	-	<sup>c</sup> 60,000		19	8.70	8,400
					July 6	6.98	3,120
1950	July 19, 1950	7.68	2,960		Aug. 20	6.95	3,040
					28	8.00	6,000
1951	Aug. 28, 1951	8.80	8,700		Sept. 22	7.45	4,400
				1953	July 29, 1953	7.53	6,030

<sup>c</sup> Annual peak.

<sup>e</sup> Maximum daily discharge.

<sup>f</sup> Computed by Corps of Engineers.

(12) Chevelon Fork below Wildcat Canyon, near Winslow, Ariz.

Location. --Lat 34°38', long. 110°43', in SW $\frac{1}{4}$  sec. 36, T. 15 N., R. 15 E., three-eighths of a mile downstream from Wildcat Canyon and 25 miles south of Winslow.

Drainage area. --275 sq mi.

Gage. --Recording gage since May 1947. Datum of gage is 5,905.16 ft above mean sea level, datum of 1929 (Bureau of Reclamation benchmark).

Stage-discharge relation. --Defined by current meter measurements below 6,300 cfs and extended above on basis of slope-area determinations at gage heights 13.7 and 18.2 ft. Relation subject to shifting at high stage.

Remarks. --No regulation or diversion above station. Base for partial-duration series, 400 cfs.

## FLOODS IN ARIZONA

## Little Colorado River Basin

(12) Chevelon Fork below Wildcat Canyon, near Winslow, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1948	Mar. 31, 1948	5.08	689	1951	May 4, 1951	4.97	618
	Apr. 5	5.43	877		Aug. 29	13.7	8,940
	12	5.51	931	1952	Dec. 31, 1951	10.3	4,710
1949	Dec. 23, 1948	5.34	808		Jan. 18, 1952	18.2	19,800
	28	5.02	614		Apr. 8	7.34	2,290
	Mar. 8, 1949	4.72	493		15	6.24	1,400
	20	6.08	1,210		20	6.18	1,370
	Apr. 14	6.23	1,290	1953	Mar. 11, 1953	4.97	653
1950	Feb. 8, 1950	4.73	524				
	28	5.08	726				

(13) Chevelon Fork near Winslow, Ariz.

Location. --Lat 34°56', long. 110°31', in SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 27, T. 18 N., R. 17 E., 3 miles upstream from mouth and 12 miles southeast of Winslow.

Drainage area. --1,010 sq mi, approximately, including some area which is probably noncontributing.

Gage. --Recording gage at present site and datum since June 3, 1929. Altitude of gage is 4,905 ft (from river-profile map). Dec. 18, 1915, to Dec. 5, 1919, recording gage 500 ft downstream at datum 1.02 ft higher. Mar. 30 to July 2, 1929, staff gage 500 ft downstream at different datum.

Stage-discharge relation. --Defined by current-meter measurements below 4,000 cfs; extended above on basis of slope-area determination at 19.8 ft. Relation subject to shifts.

Remarks. --Base for partial-duration series, 500 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1916	Jan. 19, 1916	13.0	9,500	1933	May 2, 1933	4.44	565
1917	Apr. 24, 1917	5.30	1,300		July 24	4.82	643
					Sept. 20	5.41	1,060
1918	Mar. 13, 1918	11	6,200	1934-35	-	8.05	2,700
1919	Apr. 1, 1919	5.37	1,110	1936	Apr. 12, 1936	5.88	1,350
1920	Dec. 5, 1919	12.9	9,000		July 10	4.83	753
					28	4.30	516
1929	Apr. 4, 1929	17.8	16,100		Aug. 3	4.53	611
					Sept. 10	5.04	864
1930	Mar. 27, 1930	4.87	519	1937	Feb. 8, 1937	6.66	1,820
	Apr. 7	4.70	502		15	5.86	1,340
1931	Mar. 19, 1931	4.86	548		Mar. 17	5.90	1,360
				Apr. 3	4.80	738	
1932	Feb. 10, 1932	8.58	3,100	12	5.75	1,320	
	Mar. 2	4.71	748	Aug. 31	4.72	699	
	10	4.28	587	1938	Mar. 1, 1938	5.84	1,330
	20	5.58	1,340		4	14.15	9,400
	26	5.58	1,370		13	8.17	2,090

## Little Colorado River Basin

(13) Chevelon Fork near Winslow, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1939	Mar. 23, 1939	7.00	1,120	1946	Sept. 18, 1946	5.30	509
	Apr. 5	7.29	1,360		20	6.24	892
	Aug. 3	8.74	2,410	1947	Nov. 16, 1946	5.34	526
1940	July 25, 1940	7.01	1,180		25	7.49	1,550
	Aug. 23	6.38	845		Aug. 4, 1947	8.84	2,460
1941	Jan. 11, 1941	6.35	795	1948	Apr. 1, 1948	5.86	616
	Feb. 17	6.83	1,090		6	6.23	780
	22	6.80	1,090		13	6.30	825
	Mar. 3	5.60	582		Aug. 4	6.17	758
	15	7.52	1,630	1949	Mar. 9, 1949	5.58	540
	Apr. 2	6.05	820		21	6.88	1,120
	18	5.54	582		Apr. 14	6.95	1,150
	27	6.36	1,030	1950	Mar. 1, 1950	5.59	616
	May 4	7.15	1,530		Aug. 30, 1951	13.4	7,200
	1942	Apr. 6, 1942	6.52	985	1952	Dec. 31, 1951	10.9
1943	Mar. 7, 1943	6.11	932	Jan. 19, 1952		19.8	25,300
	11	6.82	1,330	Apr. 7	9.59	2,180	
1944	Apr. 6, 1944	6.87	1,180	15	8.30	1,130	
	13	5.90	713	21	8.36	1,320	
	Sept. 26	6.14	822	1953	Mar. 12, 1953	6.97	650
1945	Apr. 10, 1945	6.50	1,060				
	19	7.30	1,460				
	Aug. 4	9.03	2,620				

<sup>a</sup> From floodmark.<sup>b</sup> Estimated.<sup>c</sup> Annual peak.<sup>d</sup> Annual peak for 1934 or 1935 water year occurred between Feb. 6, 1934, and Sept. 23, 1935.

(14) Clear Creek below Willow Creek, near Winslow, Ariz.

Location. --Lat 34°40', long. 111°00', in NW¼NE¼ sec. 30, T. 15 N., R. 13 E., 2 miles downstream from Willow Creek and 30 miles southwest of Winslow.

Drainage area. --321 sq mi.

Gage. --Recording gage since June 1947. Altitude of gage is about 6,000 ft (from Forest Service map).

Stage-discharge relation. --Defined by current-meter measurements below 1,900 cfs, and extended above on basis of area-velocity studies and logarithmic plotting. Relation is stable.

Remarks. --No regulation or diversion above station. Base for partial-duration series, 500 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1948	Apr. 12, 1948	9.54	1,810	1951	May 5, 1951	7.21	708
					Aug. 29	16.3	8,090
1949	Dec. 23, 1948	8.14	1,090	1952	Dec. 31, 1951	15.2	6,730
	28	7.55	842		Jan. 18, 1952	21.5	16,400
	Mar. 8, 1949	7.34	766		Apr. 7	10.27	2,180
	20	9.0	1,520		20	10.83	2,580
	Apr. 15	9.75	1,990		Aug. 15	6.73	574
1950	Feb. 8, 1950	6.80	594	1953	Mar. 11, 1953	6.54	497
	28	8.17	1,090				



## FLOODS IN ARIZONA

## Little Colorado River Basin

(15) Clear Creek near Winslow, Ariz.

Location. --Lat 34°58', long. 110°38', in SE $\frac{1}{4}$  sec. 9, T. 18 N., R. 16 E., at county highway bridge, 1 $\frac{1}{2}$  miles upstream from mouth, and 5 miles southeast of Winslow. Control for station is crest of diversion dam 1,200 ft downstream.

Drainage area. --607 sq mi.

Gage. --Recording gage at present site since July 3, 1929. Datum of gage is 4,861.32 ft above mean sea level, datum of 1929. Datum was 4.03 ft higher prior to July 10, 1931. Mar. 25 to July 2, 1929, staff gage at same site at datum 4.03 ft higher.

Stage-discharge relation. --Defined by current-meter measurements below 13,500 cfs; extended above on basis of velocity-area studies and slope-area determination at gage height 13.4 ft. Rating stabilized by diversion dam 1,200 ft downstream.

Historical data. --Floodmarks 3 ft higher than the stage of the flood of Apr. 4, 1929, were observed 1,850 ft downstream from gage in 1929.

Remarks. --Flood records not affected by small diversions above station. Base for partial-duration series, 500 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1929	Apr. 4, 1929	14.1	50,000	1941	Oct. 7, 1940	6.12	852
1930	Mar. 27, 1930	1.83	507		Dec. 13	5.83	558
	Apr. 10	2.28	1,080		19	5.82	549
1931	Mar. 24, 1931	2.13	850		Feb. 13, 1941	5.81	540
	Apr. 4	1.85	532		17	6.57	1,380
	30	2.04	740		22	6.87	1,800
	Aug. 30	5.93	581		Mar. 3	6.33	1,090
1932	Feb. 10, 1932	9.08	6,100		15	7.73	3,300
	Mar. 3	6.15	826		Apr. 2	6.30	1,050
	10	6.07	718		13	6.31	1,060
	20	6.96	2,080		18	6.34	1,100
	Apr. 2	6.98	2,120		27	6.95	1,920
	16	6.50	1,360		May 5	6.96	1,930
1933	Mar. 30, 1933	5.86	577	1942	Apr. 6, 1942	6.97	1,940
	Apr. 5	6.06	780	1943	Mar. 7, 1943	6.35	1,130
	May 4	5.92	635		11	6.64	1,500
	July 31	5.83	548		30	5.88	606
	1934 or 1935	9.15	6,300	1944	Mar. 27, 1944	5.84	506
1936	Apr. 14, 1936	6.71	1,680		Apr. 8	6.71	1,500
1937	Feb. 8, 1937	7.39	2,580		17	6.42	1,120
	16	7.14	2,290		28	6.28	948
	Mar. 14	7.03	2,100		May 4	6.44	1,140
	17	7.43	2,790		12	6.21	871
	Apr. 4	6.26	1,000	1945	Apr. 3, 1945	5.80	530
	16	7.00	2,050		10	6.42	1,180
1938	Mar. 4, 1938	14.3	26,200		22	7.14	2,230
	13	7.14	2,300	1946	Apr. 9, 1946	6.03	756
1939	Mar. 23, 1939	6.45	1,260		July 22	5.81	540
	Apr. 4	6.62	1,500		Sept. 20	6.34	1,100
1940	Aug. 15, 1940	6.85	1,840	1947	Nov. 16, 1946	6.01	736
					25	6.83	1,740
					Dec. 29	5.87	596
					Aug. 13, 1947	6.34	1,100
					Sept. 19	5.99	715

Little Colorado River Basin

(15) Clear Creek near Winslow, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1948	Apr. 1, 1948	5.94	645	1951	May 6, 1951	5.96	647
	13	6.90	1,810		Aug. 30	9.95	8,530
1949	Dec. 29, 1948	6.02	705	1952	Dec. 31, 1951	9.57	7,940
	Mar. 9, 1949	—	<sup>b</sup> 710		Jan. 19, 1952	13.4	22,500
	21	6.52	1,270		Apr. 8	7.14	2,580
	30	—	<sup>b</sup> 550		21	7.38	3,030
	Apr. 16	7.00	1,970		May 5	6.05	980
1950	Mar. 1, 1950	6.30	1,000	1953	Mar. 27, 1953	5.80	524
	July 7	5.95	638		Aug. 27	6.03	695

<sup>a</sup> From floodmark.<sup>b</sup> Estimated.<sup>c</sup> Annual peak.<sup>d</sup> Annual peak for 1934 or 1935 water year occurred between Feb. 6, 1934, and Sept. 24, 1935.

## (16) Little Colorado River at Grand Falls, Ariz.

Location. --Lat 35°26', long. 111°12', in T. 24 N., R. 11 E., unsurveyed, 1,000 ft downstream from Grand Falls on Navajo Indian Reservation, 4½ miles upstream from Dinnebito Wash, 30 miles northeast of Flagstaff, and 96 miles upstream from mouth.

Drainage area. --21,200 sq mi approximately.

Gage. --Recording gage since Jan. 5, 1926. Altitude of gage is 4,440 ft (from river-profile map). October 1925 to Jan. 5, 1926, staff gage at same site and datum.

Stage-discharge relation. --Defined by current-meter measurements.

Historical data. --The flood of Sept. 19, 1923, discharge about 120,000 cfs (gage height, 47.0 ft, from floodmarks), was believed to be the largest since 1870 by the Corps of Engineers.

Remarks. --Flood records slightly affected by diversions and storage above station. Combined capacity of all reservoirs above station about 73,000 acre-ft in 1953, not including Lone Pine Reservoir and Lake Mary. Base for partial-duration series, 4,000 cfs.

## FLOODS IN ARIZONA

## Little Colorado River Basin

(16) Little Colorado River at Grand Falls, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1923	Sept. 19, 1923	<sup>a</sup> 47.0	<sup>b</sup> 120,000	1939	Apr. 5, 1939	13.21	6,680
1926	Apr. 8, 1926	14.0	8,040	1940	July 27, 1940	19.57	20,100
	Sept. 12	14.88	9,630		Aug. 15	13.59	7,350
	27	22.5	27,800		24	11.77	4,650
1927	Feb. 18, 1927	14.83	9,540		26	11.96	4,910
	June 28	22.9	28,800		Sept. 14	11.60	4,390
	Sept. 6	13.36	6,950		19	11.65	4,390
	12	16.67	13,200		22	13.42	7,010
	18	14.6	9,120	1941	Oct. 1, 1940	11.59	4,390
1928	Feb. 7, 1928	9.50	2,140		Dec. 26	12.58	5,750
1929	Nov. 2, 1928	11.6	4,640		31	12.66	5,900
	Apr. 5, 1929	30.0	50,500		Jan. 12, 1941	17.07	14,200
	July 23	14.9	9,920		Feb. 22	12.40	5,460
	27	21.5	25,200		Mar. 15	18.30	17,000
	29	21.1	24,100		Apr. 27	12.69	5,900
	31	14.95	10,000		May 6	11.28	4,020
	Aug. 5	11.65	4,760		25	11.95	4,910
	9	11.95	5,180		Aug. 11	11.72	4,520
	13	16.05	12,200		16	12.67	5,650
	Sept. 6	12.84	6,490		Sept. 30	18.0	16,000
	24	18.0	16,500	1942	Oct. 4, 1941	14.55	8,760
1930	July 13, 1930	14.35	8,670		14	14.2	8,050
	19	16.9	13,700	1943	Sept. 28, 1943	11.23	3,900
	Aug. 8	12.85	6,110	1944	Sept. 29, 1944	12.32	5,320
	11	14.24	8,470	1945	Aug. 12, 1945	11.80	4,650
1931	Aug. 1, 1931	13.0	6,530	1946	July 22, 1946	11.3	4,020
	7	12.71	6,070		Aug. 13	11.61	4,390
1932	Oct. 4, 1931	11.78	4,510		Sept. 19	16.5	12,900
	Nov. 12	13.35	6,920	1947	Aug. 11, 1947	11.32	4,020
	Feb. 10, 1932	23.8	31,000		14	11.5	4,260
	Mar. 3	12.22	5,160		24	15.45	10,600
	21	11.60	4,340		27	11.68	4,520
	Aug. 30	12.22	5,160		31	13.24	6,680
1933	July 26, 1933	12.63	5,760	1948	Oct. 16, 1947	16.27	12,400
	Sept. 12	13.69	7,500		Aug. 6, 1948	12.42	5,460
1934	Oct. 7, 1933	12.05	4,920	1949	Aug. 9, 1949	15.3	10,400
	Aug. 29, 1934	11.9	4,720	1950	July 18, 1950		<sup>b</sup> 3,500
1935	Apr. 10, 1935	13.6	7,350	1951	Aug. 30, 1951	15.2	10,200
	Aug. 5	12.70	5,870	1952	Jan. 1, 1952	14.71	9,300
	25	12.45	5,500		20	21.9	26,100
1936	Aug. 6, 1936	12.37	5,430		Apr. 9	11.35	4,140
1937	Feb. 9, 1937	20.25	21,800	1953	July 31, 1953	11.45	4,140
	16	14.17	8,580				
	Mar. 18	14.24	8,400				
1938	Mar. 5, 1938	26.1	38,000				
	14	11.94	4,780				
	Aug. 9	11.61	4,390				

<sup>a</sup> From floodmarks.<sup>b</sup> Estimated.

## Little Colorado River Basin

(17) Moenkopi Wash near Tuba, Ariz.\*

Location. --Lat 36°02', long. 111°24', in T. 31 N., R. 9 E., unsurveyed, on Navajo Indian Reservation, at bridge on U. S. Highway 89, 9 miles upstream from mouth, 11 miles north of Cameron, and 11 miles southwest of Tuba.

Drainage area. --2,440 sq mi, approximately, at present site; 2,220 sq mi, approximately, at site used prior to June 23, 1941.

Gage. --Recording gage at present site and datum since June 23, 1941. Datum of gage is 4,310.96 ft above mean sea level (from Arizona Highway Department benchmark). July 13, 1926, to Aug. 17, 1929, staff gages at site 8 miles upstream at different datum. Aug. 18, 1929, to June 22, 1941, recording gage at site of staff gages at datum 0.96 ft higher.

Stage-discharge relation. --Defined by current-meter measurements below 5,000 cfs; extended above by several slope-area determinations. Relation subject to large shifts.

Remarks. --Flood record unaffected by irrigation diversions above station. Base for partial-duration series, 1,400 cfs.

\*Published as "near Tuba City" prior to 1933.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1926	Sept. 26, 1926	19.0	c 5,260	1936	Aug. 1, 1936	4.49	1,690
					4	8.5	7,230
1927	Sept. 17, 1927	24.0	c 12,900		6		b 2,500
					30	8.9	7,940
1928	Aug. 26, 1928	9.0	c 3,800		Sept. 2	10.5	11,000
					13	4.72	1,890
1929	July 18, 1929	7.0	2,800		22	6.42	3,960
	26	8.6	4,520				
	30	6.1	2,040	1937	July 9, 1937	6.5	4,100
	Aug. 4	15.4	15,100		12	5.42	2,660
	Sept. 4	12.7	10,300		28	5.8	3,150
	21	9.3	5,390		Sept. 2	9.0	8,120
					30	8.4	7,060
1930	July 11, 1930	7.74	3,540				
	12	10.0	6,300	1938	Aug. 9, 1938	4.47	1,640
	13	13.6	11,800		31	6.0	3,410
	19	8.4	4,280		Sept. 4	7.3	5,270
	Aug. 1	7.9	3,700				
	4	12.2	9,520	1939	Sept. 11, 1939	8.30	6,890
	8	14.9	14,100				
	10	14.5	13,400	1940	Aug. 22, 1940	4.68	1,890
	Sept. 8	5.95	1,920		24	5.62	2,900
					Sept. 14	6.74	4,380
1931	Sept. 15, 1931	6.95	2,760		17	5.34	2,600
					23	7.74	5,740
1932	Aug. 28, 1932	9.22	5,300		28	6.27	3,820
					30	8.7	7,580
1933	July 7, 1933	8.48	4,380				
	9	8.10	3,920	1941	Oct. 5, 1940	7.05	4,820
	Aug. 20	6.06	2,010		Aug. 16, 1941	6.79	5,240
					Sept. 13	4.38	2,220
1934	Oct. 3, 1933	8.5	4,400		18	6.22	4,420
	5	5.26	1,410				
	9	5.28	1,430	1942	Oct. 3, 1941	7.26	5,800
	11	7.18	2,980		13	8.0	7,000
	Aug. 8, 1934	5.7	1,740				
	28	12.85	14,500	1943	Dec. 25, 1942	4.44	2,370
					July 31, 1943	4.67	2,500
1935	Aug. 25, 1935	4.96	2,160		Aug. 10	3.84	1,700
	Sept. 1	5.08	2,320		17	8.1	7,150



## FLOODS IN ARIZONA

Little Colorado River Basin

(17) Moenkopi Wash near Tuba, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1944	Sept. 27, 1944	3.11	964	1949	Aug. 9, 1949	4.78	2,210
1945	July 23, 1945	7.18	5,640	1950	Oct. 19, 1949	5.55	2,480
	31	7.20	5,640		July 25, 1950	6.0	2,890
	Aug. 1	7.60	6,290		Aug. 5	4.6	1,500
	8	3.99	1,700		Sept. 20	5.0	1,500
	12	4.70	2,370				
	18	4.40	2,070	1951	Sept. 30, 1951	8.5	5,000
1946	Dec. 23, 1945	4.10	1,790	1952	Oct. 1, 1951	4.79	1,430
	July 20, 1946	4.10	1,790		Aug. 28, 1952	7.4	3,530
	Aug. 12	6.03	3,910		Sept. 21	12.3	10,000
	28	4.53	2,220				
1947	Aug. 14, 1947	4.11	1,790	1953	July 18, 1953	8.30	3,550
	17	5.15	2,860		30	9.35	5,700
	21	4.55	2,220		Aug. 28	6.15	2,250
1948	Oct. 13, 1947	8.0	6,980				
	June 2, 1948	3.82	1,520				
	July 25	3.68	1,440				
	Aug. 5	4.45	2,120				

<sup>b</sup> Estimated.<sup>c</sup> Annual peak.

(18) Little Colorado River near Cameron, Ariz.

Location. --Lat 35°56', long. 111°34', unsurveyed, on Navajo Indian Reservation, 3 miles downstream from Coconino dam site, 9½ miles downstream from Moenkopi Wash, 9½ miles northwest of Cameron, and 45.5 miles upstream from mouth.

Drainage area. --26,500 sq mi, approximately.

Gage. --Recording gage since June 1947. Altitude of gage is 3,990 ft (from river-profile map).

Stage-discharge relation. --Defined by current-meter measurements below 17,000 cfs and extended above. Relation stable.

Remarks. --Flood records unaffected by diversions and storage above station. Base for partial-duration series, 4,000 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1947	Aug. 9, 1947	19.60	21,900	1951	July 29, 1951	8.7	4,100
1948	Oct. 14, 1947	17.9	18,600		Aug. 30	14.0	11,700
	16	14.5	12,600		Sept. 30	8.96	4,460
	Aug. 6, 1948	9.93	5,580	1952	Jan. 2, 1952	12.45	9,140
1949	Aug. 9, 1949	14.35	12,400		21	20.7	24,900
1950	July 18, 1950	8.93	4,340		Apr. 9	8.62	4,100
					Sept. 21	18.7	20,100
				1953	July 30, 1953	10.3	6,230

## GAGING-STATION RECORDS

33

## Colorado River Main Stem

(19) Colorado River near Grand Canyon, Ariz.\*

Location. --Lat 36°05'55", long.112°05'30", a quarter of a mile upstream from Bright Angel Creek, 11 miles by trail northeast of Grand Canyon, Coconino County, 26 miles downstream from Little Colorado River, and 267 miles upstream from Hoover Dam.

Drainage area. --137,800 sq mi, approximately.

Gage. --Recording gage since Dec. 9, 1922; supplemented by recording gage 400 ft upstream used for records at lower stages, since Oct. 1, 1934. Datum of both gages is 2,418.7 ft above mean sea level, preliminary datum of 1929. Staff gage at same site and datum Nov. 12 to Dec. 9, 1922. Relation subject to minor shifting.

Stage-discharge relation. --Defined by current-meter measurements below 120,000 cfs; extended above by logarithmic plotting.

Historical data. --Flood of about July 8, 1884, gage height unknown, was estimated as 300,000 cfs on basis of flood studies at Lees Ferry.

Remarks. --Flood record slightly affected by transmountain diversions, irrigation diversions, storage reservoirs, and return flow from irrigated areas. Base for partial-duration series, 35,000 cfs.

\* Published as "at Bright Angel Creek, near Grand Canyon", prior to 1944.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1884	July 8, 1884	-	b 300,000	1929	Mar. 14, 1929	15.65	37,600
1921	June 19, 1921	a 37.5	c 220,000		Apr. 6	21.1	64,900
1922	June 1, 1922	-	b e 115,000		23	16.92	43,700
1923	May 15, 1923	22.47	73,600		May 29	27.5	111,000
	31	26.45	98,600		June 13,	25.9	98,800
	Aug. 15	15.5	36,800		July 30	21.0	64,300
	Sept. 19	28.5	112,000		Aug. 7	21.8	69,100
1924	Nov. 12, 1923	16.3	41,400		13	21.9	69,800
	Dec. 28	19.37	57,000	1930	Sept. 10	17.15	45,400
	Apr. 18, 1924	17.42	46,900		24	19.7	57,300
	27	15.65	38,400				
	May 23	21.0	66,200		Apr. 18, 1930	16.08	41,700
	June 18	22.4	74,000		29	16.94	45,800
1925	June 3, 1925	18.75	53,700		June 4	21.6	71,000
	25	18.42	52,000		16	20.35	63,200
	Sept. 5	15.44	38,600		Aug. 12	19.9	60,500
1926	Oct. 7, 1925	15.20	37,800	1931	May 22, 1931	14.36	34,600
	May 9, 1926	22.17	74,000	1932	Feb. 11, 1932	18.30	53,800
	29	24.27	85,600		Apr. 23	15.82	41,200
	July 14	15.80	38,800		May 26	26.1	102,000
	Sept. 27	16.07	40,100		June 29	22.1	72,900
1927	May 8, 1927	20.8	65,200		July 14	16.70	42,400
	23	24.5	92,900		Aug. 30	19.07	54,900
	June 22	22.23	73,400	1933	June 5, 1933	23.41	81,500
	July 2	29.25	127,000		July 9	15.26	35,400
	Sept. 11	21.20	67,200	1934	May 17, 1934	12.32	25,500
	15	28.9	124,000	1935	June 19, 1935	26.82	105,000
1928	May 14, 1928	24.4	88,900	1936	May 9, 1936	21.55	68,300
	June 3	27.85	115,000		24	22.64	76,300
					Aug. 7	16.03	36,400

## FLOODS IN ARIZONA

Colorado River Main Stem

(19) Colorado River near Grand Canyon, Ariz.--Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1937	Apr. 20, 1937	17.46	46,200	1946	May 3, 1946	16.30	39,400
	May 21	23.90	85,300		June 14	18.65	50,100
	June 3	21.08	66,300	1947	May 14, 1947	23.10	80,100
1938	Mar. 5, 1938	19.85	54,500		June 13	21.50	65,700
	May 4	22.20	70,900		25	22.1	69,400
	22	22.12	72,100		Aug. 19	15.7	36,600
	June 8	26.38	100,000		25	20.22	58,600
1939	May 10, 1939	17.75	46,200	1948	Oct. 15, 1947	18.7	49,300
	26	18.07	49,000		Apr. 25, 1948	19.00	54,500
	June 9	16.78	41,900		May 11	18.00	48,600
1940	May 18, 1940	17.66	46,800		26	24.90	89,800
	June 6	16.60	42,200	1949	May 3, 1949	18.55	50,800
1941	May 17, 1941	28.86	120,000		June 22	27.95	112,000
	June 23	22.98	76,600	1950	Apr. 28, 1950	15.92	37,000
1942	Oct. 16, 1941	24.75	88,700		June 6	20.55	58,400
	28	16.55	42,000		July 10	16.40	40,500
	Apr. 9, 1942	19.25	53,800	1951	June 1, 1951	21.00	63,700
	18	21.65	67,600		25	20.05	59,000
	26	21.9	69,800	1952	Jan. 21, 1952	16.75	40,100
	May 15	20.90	63,700		May 9	27.7	110,000
	31	25.18	91,800		June 12	29.05	122,000
1943	May 8, 1943	20.70	58,500	1953	June 17, 1953	21.80	68,500
	June 6	21.39	66,800				
1944	May 20, 1944	25.1	93,400				
1945	May 17, 1945	21.40	63,300				
	31	19.25	52,900				
	June 11	19.65	54,900				
	18	19.5	54,100				

<sup>a</sup> From floodmarks.<sup>b</sup> Estimated on basis of flood record for station at Lees Ferry.<sup>c</sup> Annual peak.

## GAGING-STATION RECORDS

35

Bright Angel Creek Basin

(20) Bright Angel Creek near Grand Canyon, Ariz.

Location. --Lat 36°05'55", long. 112°05'40", 1,000 ft upstream from mouth, and 11 miles by trail from Grand Canyon, Coconino County.

Drainage area. --98.4 sq mi.

Gage. --Recording gage at present site and datum since Apr. 22, 1943. Datum of gage is 2,452.1 ft above mean sea level, preliminary datum of 1929. October 20, 1923, to Jan. 29, 1933, staff gages 200 ft upstream at several different datums. January 30, 1933, to Aug. 19, 1936, recording gage 200 ft upstream at datum 4.5 ft higher. August 25, 1936, to Apr. 21, 1943, staff gages at several sites from 300 ft downstream to 2,200 ft upstream at different datums.

Stage-discharge relation. --Defined by current-meter measurements below 250 cfs; extended above on basis of slope-area determination. Relation subject to shifting.

Remarks. --Flood record not affected by small irrigation diversions above gage. Base for partial-duration series, 130 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1924	July 3, 1924	2.6	220	1936	Apr. 25, 1936	4.49	241
	Sept. 10	4.7	530		July 19	6.00	633
					26	5.85	574
1925	Sept. 17, 1925	1.85	122		Aug. 19	15.0	4,400
					Sept. 9	4.95	320
1926	Apr. 8, 1926	2.50	228		21	5.3	391
	29	2.75	266				
	May 5	2.9	290	1937	Feb. 6, 1937	2.95	179
	July 27	6.5	1,000		14	4.3	915
1927	Feb. 16, 1927	3.6	450		Apr. 27	3.35	366
	27	2.5	217		May 4	3.5	442
	Apr. 29	2.84	421		July 8	2.95	473
	May 16	2.20	175		29	4.4	2,000
	Aug. 4	2.4	208		Sept. 30	3.6	1,000
	Sept. 16	6.0	1,000	1938	Dec. 12, 1937	2.0	206
1928	Mar. 28, 1928	1.50	150		Feb. 28, 1938	2.05	211
	May 3	1.75	187		Mar. 3	3.00	491
1929	May 6, 1929	1.5	135		12	1.95	160
	July 10	1.7	173		Apr. 21	3.20	575
	Sept. 8	1.65	154		May 16	2.4	273
1930	Feb. 23, 1930	1.25	113		July 25	1.90	140
1931	June 25, 1931	.70	45		Sept. 3	1.90	140
1932	Feb. 9, 1932	3.5	500	1939	Apr. 14, 1939	1.82	133
	Apr. 19	3.15	352		Sept. 6	2.4	270
	May 13	3.30	386		13	1.90	150
1933	Aug. 7, 1933	4.26	186	1940	Feb. 26, 1940	2.0	168
	17	4.25	184		Apr. 15	2.20	228
1934	Oct. 9, 1933	4.95	250		22	2.25	233
1935	Apr. 23, 1935	4.81	241		Aug. 21	1.86	137
	May 11	4.80	241		24	3.30	602
	26	4.39	175		Sept. 12	2.90	416
	July 13	4.20	148		17	2.60	314
	20	4.95	270	1941	Oct. 5, 1940	2.8	397
					Dec. 24	2.65	352
					Feb. 21, 1941	2.57	400
					May 13	4.10	848
					25	3.80	496



## FLOODS IN ARIZONA

Bright Angel Creek Basin

(20) Bright Angel Creek near Grand Canyon, Ariz--Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1942	Apr. 16, 1942 23	2.90	178	1948	Aug. 5, 1948 Sept. 16	6.8	1,900
		3.20	264			3.05	242
1943	Apr. 23, 1943 Aug. 4 15	1.99	426	1949	Apr. 28, 1949 June 11	2.71	206
		1.44	141			3.00	152
		1.90	340	1950	Oct. 18, 1949 Apr. 23, 1950 July 18	3.20	197
1944	May 15, 1944	2.00	199			2.90	146
						3.1	188
1945	May 3, 1945 July 30 Aug. 11	2.27	259	1951	Aug. 29, 1951	3.30	193
		2.27	297				
		1.60	133	1952	Oct. 31, 1951 Dec. 30 May 5, 1952 July 29 Sept. 21	3.20	173
1946	Apr. 7, 1946 24	1.70	133			3.60	349
		1.81	159			3.57	672
	July 19 22	1.82	172			2.51	257
		4.50	840			2.35	194
	Aug. 14 Sept. 30	2.22	207	1953	Aug. 27, 1953	4.14	930
		2.55	178				
1947	Aug. 8, 1947 11 27	3.06	290				
		2.70	200				
		3.10	310				

Note. --Peaks for period prior to Jan. 29, 1933, and Aug. 19, 1936, to Apr. 23, 1943, were obtained from a staff-gage record and were either from floodmarks or were maximum peaks observed.

## GAGING STATION RECORDS

37

## Virgin River Basin

(21) Virgin River at Littlefield, Ariz.

Location. --Lat 36°53', long. 113°56', in SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 4, T. 40 N., R. 15 W., three-eighths of a mile downstream from Beaverdam Wash, three-eighths of a mile upstream from Littlefield, and 36 miles upstream from water line of Lake Mead at elevation 1,221 ft above mean sea level.

Drainage area. --5,090 sq mi, approximately.

Gage. --Recording gage at present site and datum since Apr. 1, 1942. Datum of gage is 1,763.68 ft above mean sea level, datum of 1929. October 8, 1929, to May 27, 1933, staff gage 300 ft upstream at datum 2.53 ft higher. May 28, 1933, to Mar. 31, 1942, staff gage at present site at datum 2.53 ft higher prior to Nov. 8, 1939, and 2.00 ft higher Nov. 8, 1939, to Mar. 31, 1942.

Stage-discharge relation. --Defined by current-meter measurements below 2,500 cfs; extended above on basis of slope-area determination at 22,000 cfs. Relation subject to shifting.

Remarks. --Flood record not materially affected by irrigation diversions above station. Base for partial-duration series, 1,600 cfs.

Bank-full stage. --18 ft.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1930	Aug. 9, 1930	8.65	<sup>c</sup> 6,500	1945	Feb. 3, 1945	6.57	4,170
1931	Nov. 18, 1931	6.50	<sup>c</sup> 3,000		Mar. 16	5.15	1,790
1932	Aug. 27, 1932	<sup>a</sup> 11	<sup>c</sup> 18,000		Aug. 4	5.51	2,520
1933	May 1, 1933	-	<sup>b</sup> <sup>c</sup> 1,500		12	6.08	3,410
1934	Dec. 14, 1933	4.20	<sup>c</sup> 1,220		18	5.01	1,900
1935	Aug. 16, 1935	5.00	<sup>c</sup> 1,900		Sept. 3	5.75	2,880
1936	July 10, 1936	7.0	<sup>c</sup> 2,710	1946	Oct. 12, 1945	5.77	2,880
1937	Feb. 7, 1937	5.00	<sup>c</sup> 1,440		Aug. 5, 1946	5.83	3,020
1938	Mar. 3, 1938	<sup>a</sup> 10.3	<sup>c</sup> 22,000		12	6.95	5,010
1939	Sept. 12, 1939	7.5	<sup>c</sup> 13,000	1947	Oct. 2, 1946	7.25	4,300
1940	Sept. 18, 1940	7.4	<sup>c</sup> 11,000		29	9.35	9,400
1941	Mar. 2, 1941	5.00	<sup>c</sup> 6,000		Nov. 14	7.81	5,140
	July 25	5.00	<sup>c</sup> 6,000		24	8.33	6,640
1942	Oct. 13, 1941	6.30	3,740		Dec. 28	6.69	2,790
	Apr. 14, 1942	4.84	1,630		Aug. 10, 1947	7.28	3,950
	23	5.7	2,800		13	6.05	1,660
	Aug. 10	5.3	2,200	1948	Sept. 16, 1948	5.19	1,090
1943	Jan. 23, 1943	5.13	2,080	1949	Sept. 8, 1949	5.77	1,690
	Feb. 23	4.67	1,630		10	6.35	2,290
	Mar. 11	5.62	2,660	1950	July 8, 1950	6.38	2,470
	Aug. 2	4.89	1,790		18	7.34	3,450
	17	4.77	1,650		Sept. 8	5.99	1,700
1944	May 9, 1944	4.99	1,900	1951	Aug. 4, 1951	10.53	12,000
					30	8.05	4,260
				1952	Dec. 30, 1951	8.70	7,170
					Apr. 8, 1952	6.14	2,400
					28	7.40	3,840
					May 4	7.26	3,060
					June 4	6.00	2,280
				1953	July 26, 1953	5.46	1,700
					31	5.71	1,950
					Aug. 2	7.74	4,500
					27	8.66	5,490

<sup>a</sup> From floodmarks.

<sup>b</sup> Estimated.

<sup>c</sup> Annual peak.

Virgin River Basin

(22) Muddy River near Overton, Nev.\*

Location. --Lat 36°38', long. 114°30', in NW¼NE¼ sec. 21, T. 15 S., R. 67 E., at Wells Siding diversion dam, 2 miles northwest of Logandale, 5 miles downstream from Meadow Valley Wash, 6½ miles northwest of Overton, and 7½ miles southeast of Moapa.

Drainage area. --About 8,180 sq mi, of which about 4,230 sq mi contribute directly to surface runoff, for site near Overton, 1948-50. About 200 sq mi greater for sites near St. Thomas, 1913-16 (now submerged by Lake Mead).

Gage. --Recording gage at present site since Dec. 13, 1947. Datum of gage is 1,432.16 ft above mean sea level, datum of 1929 (Bureau of Reclamation bench mark). June 1913 to September 1916, staff gages at two separate sites 14½ and 15 miles downstream at different datums. Altitude of gage is 1,100 ft (from river profile map).

Stage-discharge relation. --Crest of diversion dam forms control at present site. Relation defined by current-meter measurements below 400 cfs and extended above. Water may also be bypassed downstream through a 4-ft pipe below crest elevation. Relation subject to shifting resulting from operational changes of crest conditions. Relation at former site defined by current-meter measurements below 300 cfs and extended above on basis of slope-area determination at 6,500 cfs. Relation subject to shifting.

Historical data. --Studies by the Corps of Engineers indicate the flood of Aug. 11, 1941, to be the highest since 1906.

Remarks. --Flood records in medium and low range affected to an unknown degree by diversions above station. Records at present site show discharge below Wells Siding dam and do not include diversions at this point which may total about 200 cfs. Large floods are probably not significantly affected. Gage heights are not listed because of complex stage-discharge relation. Only annual peaks are shown. Discharges 1906, 1910, 1922, 1925, 1938, 1941, 1947, and 1948 estimated by Corps of Engineers, U. S. Army, Nevada State Engineers office, U. S. Soil Conservation Service, U. S. Bureau of Reclamation, and/or U. S. Office of Indian Affairs.

\* Published as "near St. Thomas", 1913-16.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1906	Mar. 25, 1906	-	8,850	1941	Aug. 11, 1941	-	12,000
1910	Jan. 1, 1910	-	7,000	1947	Oct. 28-30, 1946	-	7,800
1914	Feb. 22, 1914	-	6,500	1948	Feb. 29, 1948	-	<sup>h</sup> 111
1915	Feb. 11, 1915	-	820	1949	Feb. 5, 9-11, 1949	-	36
1916	Jan. 20, 1916	-	1,700	1950	Dec. 26, 27, 1949	-	30
1922	Jan. 2, 1922	-	8,110	1951	Apr. 19, 1951	-	360
1925	Sept. 18, 1925	-	10,200	1952	Mar. 28, 1952	-	562
1938	Mar. 3, 1938	-	10,000	1953	Jan. 19, 1953	-	37

<sup>h</sup> Probably annual maximum, peaks October to Dec. 12, 1947 not known.

## Colorado River Main Stem

(23) Colorado River near Topock, Ariz.

Location. --Lat 34°41'15", long. 114°27'45", in SW¼NW¼ sec. 13, T. 15 N., R. 21 W., Gila and Salt River meridian, 2.7 miles downstream from Topock, 39.5 miles upstream from Parker Dam, and 49 miles downstream from Davis Dam.

Drainage area. --172,300 sq mi, approximately.

Gage. --Recording gage at present site since Dec. 3, 1922. Datum of gage is 423.02 ft above mean sea level, datum of 1929. Prior to Dec. 3, 1922, at site about 1 mile upstream at different datum. Since May 1, 1939, auxiliary recording gage at bridge at Topock 2.7 miles upstream at datum 13.33 ft higher.

Stage-discharge relation. --Defined by current-meter measurements. Relation subject to large shifts.

Historical data. --A discharge of about 300,000 cfs (based on determination for station at Lees Ferry) occurred about July 10, 1884. Discharge in excess of 400,000 cfs (estimated) probably occurred within the period 1857-68 and most likely in 1862. Gage heights listed for these floods are elevations above sea level, Atlantic and Pacific Railroad datum.

Remarks. --Flood records prior to Feb. 1, 1935, not appreciably affected by storage and diversions above station. Discharge controlled by Hoover Dam since Feb. 1, 1935, and by Davis Dam since Jan. 17, 1950. Base for partial-duration series, 40,000 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1862	-	500.5	<sup>b</sup> 400,000	1925	June 6, 1925	14.70	51,200
1884	July 10, 1884	492.0	<sup>b</sup> 300,000		28	13.86	48,500
1917	June 1917	27	156,000	1926	May 12, 1926	18.15	68,600
1918	Mar. 14, 1918	11.9	45,500		June 1	19.80	84,800
	May 16	13.1	53,500	1927	May 13, 1927	16.88	64,300
	30	13.65	57,000		25	19.54	87,900
	June 30	15.55	94,000		June 24	16.20	70,800
	July 17	8.8	56,000		July 5	22.2	107,000
1919	May 12, 1919	11.75	45,000		Sept. 17	21.63	107,000
	June 5	14.65	78,500	1928	May 17, 1928	19.90	86,300
	July 21	10.8	42,100		June 7	22.73	112,000
1920	Feb. 26, 1920	16.3	61,000	1929	Apr. 8, 1929	17.62	48,100
	June 1	26.1	156,000		25	16.15	44,300
	July 6	-	<sup>b</sup> 57,000		June 1	21.9	101,000
1921	May 12, 1921	15.5	80,800		Aug. 10	15.98	60,600
	June 22	28.4	<sup>b</sup> 200,000		16	15.82	59,200
	Aug. 5	10.75	62,300		Sept. 12	14.47	42,500
	27	14.2	68,000		27	16.00	48,600
1922	Mar. 22, 1922	11.36	41,700	1930	May 1, 1930	16.60	44,200
	May 13	18.0	87,800		June 6	19.74	65,100
	June 3	20.95	125,000		19	17.90	60,700
1923	May 17, 1923	16.9	74,200		Aug. 14	18.35	57,100
	June 3	18.6	103,000	1931	May 24, 1931	15.82	32,000
	22	16.45	97,400	1932	Feb. 13, 1932	19.40	49,200
	Sept. 22	18.3	85,300		Apr. 26	16.95	41,200
1924	Dec. 31, 1923	13.7	51,100		May 30	23.75	97,100
	Apr. 16, 1924	13.98	50,700		July 2	18.22	66,300
	30	11.91	40,300		Sept. 2	15.26	45,500
	May 25	15.35	66,000	1933	June 18, 1933	20.22	78,000
	June 20	15.85	71,000	1934	May 20, 1934	14.76	25,600



## FLOODS IN ARIZONA

## Colorado River Main Stem

(23) Colorado River near Topock, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1935	June 24, 1935	14.83	18,600	1945	Mar. 24, 1945	27.56	<sup>e</sup> 22,300
1936	Aug. 2, 1936	13.90	11,500	1946	Feb. 2, 1946	27.38	<sup>e</sup> 20,700
1937	Aug. 24, 1937	14.28	11,300	1947	Feb. 1, 1947	27.56	<sup>e</sup> 18,700
1938	July 3, 1938	16.55	18,800	1948	Apr. 16, 1948	29.05	<sup>e</sup> 23,100
1939	Feb. 2, 1939	24.18	34,900	1949	Apr. 16, 1949	29.65	<sup>e</sup> 23,400
1940	Apr. 5, 1940	24.68	17,500	1950	Dec. 11, 1949	30.13	<sup>e</sup> 22,800
1941	June 16, 1941	24.31	<sup>e</sup> 34,500	1951	June 26, 1951	30.72	<sup>e</sup> 22,200
1942	Jan. 29, 1942	25.76	35,700	1952	June 5, 1952	21.70	26,900
1943	Oct. 10, 1942	22.14	<sup>e</sup> 22,200	1953	Oct. 1, 2, 1953	31.74	<sup>e</sup> 22,900
1944	Feb. 27, 1944	27.85	<sup>e</sup> 24,000				

<sup>b</sup> Estimated.<sup>e</sup> Maximum daily discharge.

Note. --Annual peaks only listed for years 1862, 1884, 1917, and 1935-53.

## Bill Williams River Basin

(24) Date Creek near Congress, Ariz.

Location. --Lat 34°12', long. 113°08', in NW¼SE¼ sec. 13, T. 10 N., R. 9 W., 0.6 mile upstream from Sawyer dam site, 17 miles west of Congress, and 25 miles upstream from mouth.

Drainage area. --127 sq mi.

Gage. --Recording gage after Jan. 18, 1940. Staff gage at same site and datum October 1939 to Jan. 18, 1940.

Stage-discharge relation. --Defined by current-meter measurements below 182 cfs; extended above on basis of slope-area determination at gage height 5.75 ft. Relation subject to large shifts.

Remarks. --Flood record unaffected by small minor irrigation diversions above station. Base for partial-duration series, 50 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	Sept. 3, 1940	3.50	25	1942	Dec. 11, 1941	3.75	13
1941	Feb. 25, 1941	4.48	427	1943	Jan. 24, 1943	3.98	51
	Mar. 2	4.42	388		Aug. 3	5.3	300
	5	4.06	148	1944	Feb. 24, 1944	5.26	280
	14	5.75	1,400				
	Apr. 13	5.11	878				
	July 18	4.69	568		Mar. 3	4.3	56

## GAGING-STATION RECORDS

41

Bill Williams River Basin

(25) Santa Maria River near Alamo, Ariz.

Location. --Lat 34°18', long. 113°31', in NE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 9, T. 11 N., R. 12 W., half a mile upstream from confluence with Big Sandy River and 5 $\frac{1}{4}$  miles upstream from Alamo.

Drainage area. --1,520 sq mi, approximately.

Gage. --Recording gage since December 1939. Datum of gage is 1,124.1 ft above mean sea level (from river-profile survey). Prior to Apr. 1, 1951, at site 800 ft upstream at datum 2.50 ft higher.

Stage-discharge relation. --Defined by current-meter measurements below 29,000 cfs; extended above. Relation subject to shifting.

Remarks. --Flood record unaffected by small diversions above gage. Base for partial-duration series, 200 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1939	Sept. 6, 1939	10.0	<sup>c</sup> 22,300	1945	Mar. 5, 1945	5.70	515
					16	6.14	1,220
1940	Feb. 3, 1940	3.31	256		26	6.30	1,530
	Sept. 17	3.20	262		Aug. 1	6.28	1,040
					23	6.10	680
1941	Oct. 5, 1940	4.25	2,500				
	Dec. 24	6.9	8,280	1946	Dec. 24, 1945	5.86	255
	31	4.25	3,120		July 24, 1946	6.52	1,170
	Jan. 12, 1941	3.62	262				
	25	4.65	1,890	1947	Dec. 28, 1946	5.86	234
	Feb. 8	3.91	304		Sept. 19, 1947	6.70	1,610
	21	4.40	1,730				
	24	5.70	4,440	1948	Aug. 5, 1948	6.67	1,520
	Mar. 1	7.75	11,700				
	6	4.98	2,400	1949	Jan. 14, 1949	5.80	610
	14	9.85	20,600		25	5.80	720
	Apr. 2	4.83	840		Feb. 25	6.36	1,100
	13	8.3	13,900				
	Sept. 13	7.73	11,600	1950	Oct. 18, 1949	7.09	1,570
1942	Jan. 14, 1942	4.86	91		Sept. 6, 1950	5.65	388
1943	Jan. 24, 1943	5.15	319	1951	Aug. 2, 1951	7.85	1,180
	Mar. 5	5.38	497		29	12.95	33,600
	Aug. 4	5.49	544				
				1952	Oct. 31, 1951	6.62	6,000
1944	Oct. 19, 1943	5.26	278		Dec. 31	7.45	8,020
	Feb. 24, 1944	7.05	6,000		Jan. 18, 1952	7.03	6,710
	Mar. 3	5.82	2,040		Mar. 11	7.35	7,680
	14	6.33	2,980		Apr. 29	4.88	522
	17	6.06	1,880		June 3	7.1	2,800
				1953	July 16, 1953	4.60	200
					Aug. 28	5.61	560

<sup>c</sup> Annual peak.

## FLOODS IN ARIZONA

## Bill Williams River Basin

(26) Bill Williams River near Alamo, Ariz.\*

Location. --Lat 34°14', long. 113°35', in SW $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 2, T. 10 N., R. 13 W., 1.5 miles downstream from Alamo, 2.0 miles downstream from Bullard Wash, and 6 miles downstream from confluence of Santa Maria and Big Sandy Rivers.

Drainage area. --4,730 sq mi, approximately, of which about 400 sq mi is below confluence of Santa Maria and Big Sandy Rivers.

Gage. --Recording gage since December 1939. Datum of gage is 1,002.95 ft above mean sea level, datum of 1929.

Stage-discharge relation. --Defined by current-meter measurements. Subject to shifting.

Historical data. --Flood of Sept. 6, 1939, reached a stage of 39.6 ft, from floodmarks (discharge, 86,000 cfs, from rating curve extended above 50,000 cfs on basis of slope-area determination made just below confluence of Santa Maria and Big Sandy Rivers). Floodmarks indicate a previous stage of about 46 ft which probably occurred in February 1937.

Remarks. --Flood record unaffected by small irrigation diversions above station. Base for partial-duration series, 900 cfs.

\*Published as Williams River prior to 1944.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
	Prior to 1939	<sup>a</sup> 46	-	1945	Mar. 5, 1945	7.01	1,080
					13	7.29	2,250
1939	Sept. 6, 1939	<sup>a</sup> 39.6	<sup>c</sup> 86,000		16	9.25	7,380
					26	7.98	4,340
1940	Feb. 3, 1940	6.75	2,700	1946	Dec. 24, 1945	6.75	930
1941	Oct. 5, 1940	6.1	1,340		July 25, 1946	6.28	972
	Dec. 18	5.86	1,010	1947	Dec. 28, 1946	9.22	7,290
	25	17.85	32,900		Aug. 8, 1947	7.02	2,110
	31	9.6	9,110		Sept. 19	8.12	4,650
	Jan. 12, 1941	6.95	1,000	1948	Aug. 5, 1948	7.00	2,070
	25	8.35	5,330				
	Feb. 8	6.31	1,550	1949	Jan. 14, 1949	6.40	1,190
	21	9.5	8,790		26	6.45	1,280
	25	11.2	14,100		Feb. 25	7.35	2,900
	Mar. 2	22.5	44,800	1950	July 23, 1950	6.08	958
	14	23.0	46,000		Sept. 6	6.80	1,850
	Apr. 13	17.8	32,800	1951	Aug. 3, 1951	6.48	1,340
	July 18	7.98	4,290		29	30.8	65,100
	Aug. 10	7.50	3,150	1952	Oct. 30, 1951	7.00	4,510
	Sept. 13	11.46	13,500		Dec. 31	19.65	37,600
1942	Jan. 14, 1942	6.28	407		Jan. 18, 1952	15.77	27,300
1943	Mar. 5, 1943	7.20	2,480		Mar. 11	11.20	14,300
1944	Feb. 24, 1944	10.65	11,000		June 3	7.00	2,340
	Mar. 6	9.18	5,470	1953	Aug. 28, 1953	5.35	193
	14	8.65	4,390				
	17	9.10	6,780				

<sup>a</sup> From floodmarks.

<sup>c</sup> Annual peak.

<sup>j</sup> Probably occurred February 1937.

## Bill Williams River Basin

(27) Bill Williams River at Planet, Ariz.\*

Location. --Lat 34°16', long. 113°59', in NE $\frac{1}{4}$  sec. 36, T. 11 N., R. 17 W., 1 mile west of Planet and 6 miles upstream from water line of Havasu Lake at elevation 450 ft above mean sea level.

Drainage area. --5,140 sq mi, approximately.

Gage. --Recording gage since Nov. 13, 1928. Datum of gage is 556.33 ft above mean sea level, datum of 1929.

Sept. 26, 1910 to Dec. 31, 1915, staff gages at same site and approximately same datum. October 1 to Nov. 12, 1928, staff gages at same site and datum.

Stage-discharge relation. --Defined by current-meter measurements below 51,000 cfs; extended above on basis of velocity-area study. Relation subject to large shifts.

Historical data. --Floods in 1891, 1916, and 1927 were estimated on basis of floodmarks at Striped Canyon, about 23 miles upstream.

Remarks. --Flood record not affected by small irrigation diversions above station. Base for partial-duration series, 1,500 cfs.

\*Published as Bill Williams River near Swansea, 1910-12, as Williams River near Swansea, 1913-15, and as Williams River at Planet, 1928-43.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1891	*Feb. 21, 1891	-	b200,000	1938	Mar. 2, 1938	4.77	3,150
1916	*Jan. 19, 1916	-	b175,000		4	10.7	61,000
1927	*Feb. 16, 1927	-	b125,000	1939	Sept. 7, 1939	11.7	73,000
					13	8.10	23,200
					25	5.97	8,310
1929	Sept. 2, 1929	6.00	6,270	1940	Feb. 3, 1940	5.13	2,600
	4	8.2	25,000				
1930	Mar. 18, 1930	4.36	1,860	1941	Dec. 25, 1940	8.56	37,800
	Aug. 9	4.73	1,640		Jan. 1, 1941	5.67	6,840
	Sept. 8	11.15	64,000		25	5.70	4,560
1931	Feb. 14, 1931	4.9	5,620		Feb. 8	5.19	2,100
	Aug. 5	12.3	80,000		21	6.75	10,100
	14	6.02	13,800		25	7.43	21,800
	Sept. 3	4.25	2,520		Mar. 2	9.15	42,600
1932	Dec. 29, 1931	4.66	3,150		6	5.69	5,340
	Feb. 9, 1932	9.2	51,000		14	8.57	35,400
	18	6.87	15,100		Apr. 14	7.97	26,400
1933	Mar. 4, 1933	4.91	107		Aug. 11	5.63	2,280
1934	Aug. 29, 1934	6.51	1,470	1942	Sept. 13	6.49	8,120
1935	Jan. 7, 1935	6.54	1,530		Jan. 15, 1942	5.30	300
	13	6.75	1,950	1943	Mar. 5, 1943	5.67	1,580
	16	7.50	4,030				
	Feb. 7	8.92	15,900	1944	Feb. 24, 1944	7.19	10,800
	13	7.11	6,930		Mar. 5	6.16	4,520
	Mar. 5	6.48	4,490		17	6.23	4,780
1936	July 28, 1936	5.60	1,540		Sept. 15	5.64	2,260
	30	6.11	2,270	1945	Mar. 11, 1945	5.24	2,590
	Aug. 9	6.61	2,900		16	6.08	4,520
1937	Feb. 7, 1937	13.1	92,500		26	5.78	3,050
	15	8.2	27,500	1946	July 22, 1946	4.75	328
	Mar. 17	5.34	6,420				
	Sept. 21	4.91	2,150				

\* Estimated.

\* Date approximate.



## FLOODS IN ARIZONA

## Gila River Basin

(28) Gila River below Blue Creek, near Virden, N. Mex.\*

Location. --Lat 32°38'55", long. 108°50'45", in SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 18, T. 19 S., R. 19 W., at head of canyon,  $1\frac{1}{4}$  miles downstream from Blue Creek, 10 miles east of Virden, and 16 miles upstream from state line.

Drainage area. --3,203 sq mi, excluding Animas River basin. 3,272 sq mi at site 9 miles downstream.

Gage. --Recording gage at present site since July 8, 1931. Staff gages within a few feet and readings adjusted to same datum June 1 to July 7, 1931. Altitude of gage is 3,875 ft (from river-profile map). July 1927 to May 1931, recording gage at Virden Bridge, 9 miles downstream from present site, altitude, 3,770 ft (from topographic map).

Stage-discharge relation. --Defined by current-meter measurements below 38,000 cfs. Relation for site 9 miles downstream subject to considerable shifting but was defined by current-meter measurements below 4,400 cfs and extended above.

Remarks. --Flood records unaffected by diversions above station. Base for partial-duration series, 1,900 cfs.

\*Published as "at Virden Bridge, near Duncan, Ariz.", prior to Aug. 1, 1931, and as "at Fuller's Ranch, near Duncan, Ariz.", 1931-38.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1927	July 4, 1927	5.9	1,800	1937	Feb. 8, 1937	9.55	3,820
1928	July 26, 1928	5.54	1,630		17	14.65	9,070
1929	July 30, 1929	8.85	5,700		Mar. 18	10.83	5,030
	Aug. 10	7.14	3,480		Aug. 24	8.36	2,290
	Sept. 23	5.73	1,970	1938	July 20, 1938	8.5	2,530
1930	Oct. 12, 1929	6.37	2,490		28	8.44	2,180
	July 24, 1930	5.89	2,170		Aug. 6	8.86	2,630
	27	6.52	2,780		31	12.28	6,400
	Aug. 6	6.6	3,090	1939	Sept. 16, 1939	7.71	1,630
	8	8.8	5,920	1940	Oct. 7, 1939	15.75	10,000
	11	9.43	7,400		Feb. 2, 1940	10.55	4,580
1931	July 3, 1931	6.29	3,050		Sept. 6	15.88	11,000
	Aug. 3	13.6	8,000	1941	Dec. 25, 1940	8.18	2,140
	10	8.91	3,320		31	11.05	4,410
	Sept. 6	9.16	3,570		Feb. 8, 1941	9.22	2,780
1932	Feb. 11, 1932	8.46	2,880		Mar. 16	9.53	3,510
	July 30	12.35	6,800		Apr. 28	8.00	2,150
	Aug. 10	8.3	2,750		July 20	9.33	3,260
1933	Oct. 12, 1932	10.82	5,320		Aug. 21	8.66	2,780
	Feb. 26, 1933	9.16	3,570		Sept. 1	8.58	2,620
	June 21	7.45	1,950		Sept. 29	25.78	41,700
	Aug. 29	9.4	3,810	1942	Oct. 4, 1941	7.30	2,260
	Sept. 8	11.1	5,650		Aug. 22, 1942	7.60	2,530
1934	Apr. 15, 1934	11.0	5,540		Sept. 13	8.18	3,140
	Aug. 21	8.60	3,020	1943	Sept. 27, 1943	6.87	1,600
	26	13.50	8,920	1944	Aug. 8, 1944	7.52	2,140
1935	Sept. 2, 1935	7.94	2,300		19	9.03	4,010
	27	13.3	8,600		Sept. 5	7.6	2,440
1936	June 11, 1936	9.25	3,600	1945	Aug. 11, 1945	10.0	5,370
	Sept. 11	7.91	2,240	1946	Oct. 8, 1945	13.07	10,600
	21	8.15	2,500		Aug. 14, 1946	9.47	4,670
					Sept. 5	8.0	2,850

Gila River Basin

(28) Gila River below Blue Creek, near Virden, N. Mex. --Continued

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1947	Aug. 22, 1947	8.46	3,400	1950	Sept. 24, 1950	8.05	2,190
1948	Aug. 12, 1948	8.10	2,240	1951	Aug. 28, 1951	4.40	440
1949	Dec. 28, 1948	13.09	6,040	1952	Jan. 15, 1952	9.54	3,490
	Jan. 14, 1949	17.43	15,600		19	12.06	6,100
	25	8.06	2,260		Sept. 23	10.73	4,260
	Mar. 8	12.55	6,230	1953	Aug. 21, 1953	9.55	3,330
	July 11	8.4	2,460				
	24	14.3	8,970				
	31	8.05	2,190				
	Sept. 15	9.48	3,260				

(29) Gila River near Clifton, Ariz.\*

Location. --Lat 32°57'50", long. 109°18'15", in SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 30, T. 5 S., R. 30 E., 1,100 ft upstream from bridge on former U. S. Highway 666, 6 miles upstream from San Francisco River, and 7 miles south of Clifton.

Drainage area. --4,010 sq mi (revised). For site at Guthrie, 1910-18, drainage area was 3,967 sq mi (revised).

Gage. --Recording gage since Mar. 29, 1928. Datum of gage is 3,339.3 ft above mean sea level, datum of 1929, unadjusted. Staff gage, Nov. 6, 1910, to May 15, 1914, and recording gage, May 16, 1914, to July 11, 1918, at sites about 5 $\frac{1}{2}$  miles upstream at Guthrie at different datums. March 1928 to June 1948, at site 1,100 ft downstream at datum 4.03 ft lower.

Stage-discharge relation. --Defined by current-meter measurements. Relation for site at Guthrie revised on basis of studies in 1941. Ratings at all sites subject to considerable shifting.

Historical data. --Studies by Corps of Engineers, U. S. Army, indicate that the flood of Sept. 29, 1941, was the greatest since 1891.

Remarks. --Flood records not materially affected by irrigation diversions above station. Base for partial-duration series, 2,500 cfs.

\*Published as "at Guthrie", 1910-18.

## FLOODS IN ARIZONA

## Gila River Basin

(29) Gila River near Clifton, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1911	July 25, 1911	15.0	<sup>c</sup> 16,000	1938	July 21, 1938	9.18	2,770
1912	Mar. 11, 1912	16.5	<sup>c</sup> 21,000		Aug. 6	11.80	5,930
1913	Sept. 22, 1913	8.2	<sup>c</sup> 1,200		Sept. 2	9.52	3,270
1914	Aug. 6, 1914	9.4	<sup>c</sup> 5,700	1939	July 22, 1939	9.52	3,100
1915	Dec. 20, 1914	11.4	<sup>c</sup> 12,000		Aug. 5	13.45	8,670
1916	Jan. 18, 1916	10.2	<sup>c</sup> 7,600		Sept. 16	11.16	4,680
1917	Oct. 15, 1916	14.7	<sup>c</sup> 19,500	1940	Oct. 8, 1939	12.05	6,300
					Feb. 3, 1940	9.55	3,300
1928	July 31, 1928	9.40	2,870		Sept. 6	9.32	2,920
1929	July 24, 1929	8.96	2,530	1941	Jan. 1, 1941	10.05	3,750
	27	11.08	5,600		Mar. 17	9.21	3,000
	30	14.5	13,200		July 21	9.61	3,200
	Aug. 11	10.04	3,530		Sept. 1	9.57	3,200
	13	9.43	3,030		29	20.12	28,200
	Sept. 23	11.5	6,500	1942	Aug. 6, 1942	8.82	3,280
1930	Oct. 13, 1929	9.12	2,670		Sept. 12	8.68	3,130
	July 17, 1930	10.8	5,240	1943	June 30, 1943	9.40	4,260
	19	10.27	4,510		July 25	8.41	2,830
	26	10.47	4,780		Aug. 10	10.52	6,230
	Aug. 9	10.18	4,380		Sept. 27	10.82	6,770
	11	11.5	6,300	1944	Aug. 19, 1944	8.38	2,610
1931	Aug. 3, 1931	9.74	4,080	1945	July 31, 1945	8.58	2,780
	.5	10.55	5,880		Aug. 8	9.59	4,540
	10	10.33	5,760		11	9.48	4,360
	Sept. 4	10.95	6,900	1946	Oct. 9, 1945	10.26	5,800
	7	8.98	2,630		Aug. 9, 1946	8.87	3,200
1932	July 9, 1932	11.15	4,500		16	10.45	4,270
	30	11.10	4,470	1948	Aug. 3, 1948	5.08	1,090
	Aug. 9	9.70	3,030	1949	Dec. 29, 1948	9.17	3,980
1933	Sept. 9, 1933	10.67	4,000		Jan. 15, 1949	15.3	13,900
	11	9.17	2,550		Mar. 9	9.2	5,940
	14	9.98	3,290		July 24	6.2	2,990
1934	* Aug. 26, 1934	<sup>a</sup> 16.0	<sup>c</sup> 17,000		Sept. 14	9.6	6,660
1935	Aug. 31, 1935	10.22	<sup>c</sup> 3,100	1950	July 30, 1950	4.80	1,680
1936	Aug. 28, 1936	10.95	4,300	1951	Aug. 3, 1951	7.75	4,600
1937	Feb. 18, 1937	12.72	7,450	1952	Jan. 20, 1952	7.98	4,280
	Mar. 18	9.81	3,550		Sept. 24	6.06	2,900
	Aug. 6	9.28	2,850	1953	July 30, 1953	7.38	3,700
	23	8.96	2,550				
	Sept. 10	10.0	3,600				
	22	10.16	3,820				

<sup>a</sup> From floodmark.<sup>c</sup> Annual peak.

\* Date approximate.

## GAGING-STATION RECORDS

47

## Gila River Basin

(30) San Francisco River at Clifton, Ariz.

Location. --Lat 33°03'00", long. 109°17'45", in SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 30, T. 4 S., R. 30 E., at Railroad Boulevard Bridge at Clifton, 8 $\frac{1}{2}$  miles upstream from mouth.

Drainage area. --2,766 sq mi.

Gage. --Recording gage. Since July 20, 1927, at datum 3,431.67 ft above mean sea level, datum of 1929. May 15, 1914, to Jan. 19, 1916, at site 60 ft upstream, and June 11, 1916, to July 12, 1918, 2,000 ft upstream, at different datums.

Stage-discharge relation. --Defined by current-meter measurements. Discharge for peak of Jan. 19, 1916, derived from slope-area determination computed in 1940 on basis of data compiled from 1916 records. Relation subject to moderate shifting.

Historical data. --Report by Frank H. Olmstead (Senate Document 436, dated 1919) lists flood of 1891 as second highest known (discharge not determined), that of Dec. 3, 1906 as greatest (discharge, 143,450 cfs), and that of Oct. 14, 1916, as third highest (discharge 107,870 cfs). Methods used in computation of these discharge figures are not known.

Remarks. --No significant regulation or diversion above station. Base for partial-duration series, 2,000 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1891	- 1891	-	<sup>m</sup>	1933	Feb. 26, 1933	8.10	2,920
					July 23	9.1	3,800
1907	Dec. 3, 1906	-	<sup>m</sup> 143,450		Sept. 9	7.92	2,550
					14	7.67	2,360
1916	Jan. 19, 1916	<sup>n</sup> 16.8	<sup>b</sup> 90,000	1934	Aug. 26, 1934	12.5	<sup>c</sup> 11,700
1917	Oct. 14, 1916	19.7	<sup>m</sup> 107,870	1935	Sept. 1, 1935	8.37	<sup>c</sup> 2,450
1927	Aug. 9, 1927	7.1	2,090	1936	Feb. 17, 1936	8.98	3,700
	Sept. 12	9.4	4,060		July 25	6.95	2,050
1928	July 15, 1928	8.7	3,380		Sept. 11	8.30	3,080
	26	7.74	2,600				
	31	7.97	2,790	1937	Feb. 8, 1937	12.7	12,400
	Aug. 14	7.69	2,560		16	11.46	8,600
	28	7.67	2,930		Mar. 18	7.20	2,190
1929	Aug. 2, 1929	7.55	2,450		Sept. 22	7.81	2,740
	8	8.78	3,450	1938	Mar. 4, 1938	9.80	4,540
	11	7.80	2,650		June 29	8.70	3,480
	13	9.09	3,740	1939	Apr. 6, 1939	5.81	1,230
	Sept. 23	10.1	5,200	1940	Oct. 8, 1939	8.66	3,480
1930	Oct. 16, 1929	7.44	2,360		Feb. 2, 1940	8.23	2,920
	July 18, 1930	8.05	2,860		July 26	7.24	2,260
	Aug. 8	7.61	2,500		Aug. 14	9.23	3,850
	11	8.75	3,420		Sept. 1	7.32	2,250
1931	Feb. 15, 1931	8.53	3,270		6	11.6	8,700
	July 4	7.97	2,830	1941	Dec. 13, 1940	7.28	2,250
	Aug. 9	8.24	3,030		25	10.70	6,070
	30	7.77	2,680		31	11.55	8,700
	Sept. 17	7.53	2,520		Jan. 28, 1941	9.75	4,670
	19	8.09	2,910		Feb. 8	8.25	2,970
	29	8.6	3,330		Mar. 15	11.17	7,600
	30	8.58	3,310		Apr. 27	8.49	3,210
1932	Feb. 10, 1932	12.0	10,000		May 2	8.40	3,130
	Mar. 1	8.47	3,220		Aug. 17	8.48	3,210
	July 30	7.24	2,260		Sept. 29	11.16	7,300
	Aug. 9	11.5	8,640				



## FLOODS IN ARIZONA

## Gila River Basin

(30) San Francisco River at Clifton, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1942	Dec. 11, 1941	11.37	7,930	1950	July 27, 1950	5.55	825
1943	Mar. 5, 1943	6.40	1,580	1951	Aug. 29, 1951	5.31	735
1944	Sept. 26, 1944	9.15	3,800	1952	Jan. 14, 1952	12.00	11,300
1945	Aug. 17, 1945	7.73	2,500		19	12.65	15,800
	22	8.07	2,820	1953	July 15, 1953	7.50	2,510
1946	Sept. 5, 1946	6.15	1,380		Aug. 1	7.27	2,290
					18	9.85	6,090
1947	Aug. 23, 1947	10.56	5,860				
1948	June 1, 1948	10.3	5,850				
1949	Dec. 28, 1948	7.8	2,890				
	Jan. 13, 1949	15.4	24,100				
	24	9.6	3,940				
	Mar. 8	9.7	4,520				
	July 1	10.5	6,010				
	Aug. 8	10.1	4,680				

<sup>b</sup> Estimated.<sup>c</sup> Annual peak.<sup>m</sup> Senate Document No. 436 classes flood of 1891 as second highest known and is source of discharge figures shown for Dec. 3, 1906, and Oct. 14, 1916, floods.<sup>n</sup> Gage height 17.0 feet, present datum.

(31) Willow Creek near Point of Pines, near Morenci, Ariz.

Location. --Lat 33°22'45", long. 109°39'00", in NW $\frac{1}{4}$  sec. 2, T. 1 S., R. 26 E., unsurveyed, in San Carlos Indian Reservation, at head of box canyon, 4 miles east of Point of Pines, 10 miles west of Double Circle Ranch, and 23 miles northwest of Morenci.

Drainage area. --102 sq mi.

Gage. --Recording gage and concrete control since Aug. 18, 1944. Altitude of gage is 5,804 ft (by barometer).

Stage-discharge relation. --Defined by current-meter measurements below 60 cfs; extended on basis of slope-area determinations at gage heights 7.96, 8.72, and 10.1 ft. Relation is stable.

Remarks. --Peak discharges have been reduced to natural flow by adjustment for flow (not greater than 20 cfs) pumped from Black River, consequently these figures may differ from those previously published. Base for partial-duration series, 60 cfs.

## GAGING-STATION RECORDS

49

Gila River Basin

(31) Willow Creek near Point of Pines, near Morenci, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1945	Mar. 26, 1945	3.95	168	1950	July 1, 1950	2.86	23
	July 28	3.99	157	1951	Aug. 1, 1951	3.72	119
	Aug. 3	3.45	84		5	6.75	861
1946	July 10, 1946	7.96	1,370		27	3.46	91
	Sept. 11	3.67	110	1952	Oct. 25, 1951	5.18	395
					Dec. 31	6.86	919
1947	July 22, 1947	6.25	687		Jan. 13, 1952	10.1	2,590
	Aug. 12	6.90	917		18	8.72	1,770
	22	4.92	333		Mar. 6	3.46	102
	28	4.27	204		18	3.64	124
	30	4.56	258	1953	July 8, 1953	5.04	365
	Sept. 8	3.36	72				
1948	July 24, 1948	3.38	75				
	Aug. 20	5.25	410				
1949	Jan. 11, 1949	3.67	128				
	13	6.37	744				
	23	4.51	266				
	Feb. 24	3.12	64				
	July 24	4.53	270				

## FLOODS IN ARIZONA

## Gila River Basin

(32) Willow Creek near Double Circle Ranch, near Morenci, Ariz.

Location. --Lat 33°21'15", long. 109°31'30", in NE $\frac{1}{4}$  sec. 13, T. 1 S., R. 27 E., unsurveyed, in San Carlos Indian Reservation 2 $\frac{1}{4}$  miles northwest of Double Circle Ranch, 2 $\frac{1}{2}$  miles upstream from mouth, and 19 miles northwest of Morenci.

Drainage area. --149 sq mi.

Gage. --Recording gage since Aug. 26, 1944. Altitude of gage is 4,969 ft (by barometer).

Stage-discharge relation. --Defined by current-meter measurements below 70 cfs and extended by logarithmic plotting and slope-area measurements. Relation subject to large shifts.

Remarks. --Peak discharges have been reduced to natural flow by adjustment for flow (not greater than 20 cfs) pumped from Black River; consequently these figures differ in some instances from those previously published. Base for partial-duration series, 60 cfs.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1944	Sept. 11, 1944	<sup>b</sup> 4.4	209	1950	Dec. 11, 1949	3.56	24
	24	4.10	145	1951	Aug. 1, 1951	5.72	359
	26	5.32	594		5	7.1	1,350
	28	5.90	<sup>c</sup> 1,100		28	4.95	302
1945	Mar. 27, 1945	4.20	134	1952	Oct. 26, 1951	4.87	278
	July 29	3.92	70		Dec. 31	6.33	900
1946	July 10, 1946	6.03	1,220		Jan. 13, 1952	7.62	4,230
	Sept. 12	3.92	69		18	7.61	2,620
1947	July 22, 1947	5.37	612		Mar. 7	4.34	95
	Aug. 8	5.09	438		19	4.74	159
	12	4.91	348		31	4.12	61
	22	4.92	354		Aug. 15	6.12	674
	30	4.42	171		23	5.72	442
				1953	July 8, 1953	4.95	191
1948	Aug. 20, 1948	4.33	147				
1949	Jan. 13, 1949	6.49	2,010				
	23	4.94	315				
	July 10	4.87	178				
	13	4.87	176				
	19	6.60	563				
	24	5.95	425				

<sup>b</sup> Estimated.

<sup>c</sup> Annual peak; peaks prior to Aug. 26, 1944 not known.

Gila River Basin

(33) Eagle Creek near Double Circle Ranch, near Morenci, Ariz.

Location. --Lat 33°18'00", long. 109°29'30", in SE $\frac{1}{4}$  sec 32, T. 1 S., R. 28 E., unsurveyed, 2  $\frac{3}{4}$  miles downstream from Willow Creek, 3  $\frac{1}{4}$  miles downstream from Double Circle Ranch, and 17 miles northwest of Morenci.

Drainage area. --377 sq mi.

Gage. --Recording gage since Aug. 26, 1944. Altitude of gage is 4,722 ft (from barometer). Prior to Jan. 13, 1952, at datum 2.01 ft higher.

Stage-discharge relation. --Defined by current-meter measurements below 270 cfs and extended above on basis of slope-area determinations at gage heights 6.81 and 8.51 ft, present datum. Relation subject to considerable shifting.

Remarks. --Peak discharges have been reduced to natural flow by adjustment for flow (not greater than 20 cfs) pumped from Black River; consequently these figures differ in some instances from those previously published. Base for partial-duration series, 150 cfs.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1944	Sept. 11, 1944	4.80	2,400	1950	July 28, 1950	3.68	863
	25	4.35	1,880		30	2.81	339
	26	3.07	741		Aug. 4	2.40	176
	28	3.70	1,240		Sept. 17	3.19	328
1945	Aug. 3, 1945	3.10	746	1951	July 22, 1951	3.00	227
	6	3.25	782		29	3.60	587
	31	3.15	717		Aug. 1	3.98	979
1946	July 10, 1946	3.78	1,140	1952	25	3.94	1,070
	31	2.53	315		28	3.06	440
	Sept. 19	2.61	222		Oct. 26, 1951	2.84	457
1947	July 22, 1947	3.24	616	1953	Jan. 13, 1952	8.51	7,000
	Aug. 8	3.25	664		19	6.78	3,780
	13	2.77	384		Mar. 19	2.81	193
	15	3.51	1,070		Aug. 15	4.42	468
	22	3.82	985		12	3.76	210
	25	4.76	2,060		18	3.54	160
	31	2.29	184		19	4.25	386
	Sept. 17	2.45	226		23	3.84	232
1948	Aug. 21, 1948	2.26	118				
1949	Jan. 13, 1949	4.80	2,400	July 25, 1953	4.30	304	
	23	2.77	478	28	4.50	387	
	Mar. 8	2.16	190	29	4.08	201	
	July 10	2.19	209	Aug. 1	4.68	446	
	19	3.78	983				
	24	2.82	488				
	Aug. 8	3.24	735				

° Annual peak; peaks prior to Aug. 26, 1944 not known.



## FLOODS IN ARIZONA

## Gila River Basin

(34) Gila River at Head of Safford Valley, near Solomon, Ariz.\*

Location. --Lat 32°52'10", long. 109°30'40", on SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 31, T. 6 S., R. 28 E., 0.6 mile downstream from intake of Brown Canal, 8 miles northeast of Solomon, and 13 miles downstream from San Francisco River.

Drainage area. --7,896 sq mi. At site in use October 1932 to December 1940, 7,856 sq mi.

Gage. --Recording gage. Datum of gage is 3,065.09 ft above mean sea level, datum of 1929 since Jan. 1, 1941.

April 31, 1914, to Sept. 13, 1917, datum 1.89 ft higher, and Sept. 13, 1917, to Sept. 30, 1932, at datum 0.89 ft higher. October 1, 1932, to Dec. 31, 1940, at site 3 miles upstream and three-eighths of a mile below Bonita Creek at different datum.

Stage-discharge relation. --Defined by current-meter measurements below 26,000 cfs and extended on basis of slope-area determinations. Relation subject to considerable shifting.

Remarks. --Flood record not materially affected by irrigation diversions above station. Base for partial-duration series, 4,000 cfs.

Bank-full stage. --13 ft.

\*Published as "near Solomonsville" 1914 to September 1932, 1941-49, and as "below Bonita Creek near Solomonsville" October 1932 to September 1940.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1914	Aug. 21, 1914	4.15	9,000	1923	July 22, 1923	5.22	7,050
					26	4.32	4,700
1915	Oct. 4, 1914	6.0	24,000		31	3.95	4,080
	Nov. 12	3.7	8,000		Aug. 4	4.08	4,360
	Dec. 20	8.75	50,000		9	6.00	9,720
	Jan. 30, 1915	8.6	48,000		12	6.8	12,600
	Feb. 12	2.86	4,060		15	5.35	7,630
	21	4.1	10,500		20	4.27	5,280
	Mar. 28	3.9	9,000		26	5.0	6,210
	Apr. 7	3.76	7,600		Sept. 6	4.46	4,930
	July 26	5.5	20,000				
1916	Jan. 19, 1916	14.0	100,000	1924	Nov. 11, 1923	4.22	4,260
	29	6.0	28,000		Dec. 28	6.5	10,600
	Feb. 13	2.40	4,910	1925	June 24, 1925	4.4	5,140
	Mar. 1	2.5	4,900		July 31	5.50	7,630
	25	2.46	4,400		Sept. 3	8.1	15,900
1917	Oct. 14, 1916	10.7	67,900	1926	Mar. 30, 1926	4.07	4,300
1918	July 1, 1918	3.1	2,700		Apr. 7	4.58	5,660
1919	July 14, 1919	5.75	10,600	1927	Feb. 17, 1927	4.25	4,630
	Aug. 3	6.60	15,000		July 6	4.15	4,500
					Sept. 13	6.08	9,320
1920	Dec. 5, 1919	5.2	7,620	1928	Aug. 1, 1928	3.64	3,230
	Feb. 10, 1920	5.0	7,020				
	23	4.6	5,820	1929	July 27, 1929	5.04	6,350
1921	July 26, 1921	4.6	5,820		30	7.15	12,700
	31	-	9,000		Aug. 8	4.90	5,940
	Aug. 4	-	9,500		10	5.53	7,630
	19	6.1	10,500		14	5.42	7,340
	21	7.55	15,700		Sept. 23	5.65	7,920
1922	Aug. 15, 1922	3.6	3,780	1930	July 26, 1930	5.2	6,770
					Aug. 4	4.75	5,540
					8	6.30	10,000
					11	6.32	10,100

Gila River Basin

(34) Gila River at Head of Safford Valley, near Solomon, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1931	Feb. 15, 1931	6.45	10,500	1942	Dec. 12, 1941	6.33	7,730
	Aug. 3	5.76	8,010		Sept. 13, 1942	5.55	5,520
	10	5.05	6,420	1943	Mar. 6, 1943	5.38	4,260
	Sept. 4	4.47	4,910		Aug. 10	5.72	6,100
	19	4.36	5,220		Sept. 27	5.87	6,680
	29	4.45	5,120				
1932	Feb. 10, 1932	11.05	24,000	1944	Sept. 25, 1944	9.00	15,800
	Mar. 1	4.59	4,420	1945	Aug. 11, 1945	5.7	4,820
	July 30	5.25	6,570		Oct. 9, 1945	5.83	5,100
	Aug. 10	5.5	6,450	1946	Oct. 9, 1945	5.83	5,100
1933	Feb. 27, 1933	12.15	4,780	1947	Aug. 23, 1947	6.86	6,100
	Aug. 31	13.1	6,200		30	7.30	9,250
	Sept. 9	15.4	9,600	1948	June 1, 1948	5.56	2,540
	14	14.1	6,670		Dec. 29, 1948	6.69	4,170
1934	Aug. 27, 1934	<sup>a</sup> 19.4	<sup>c</sup> 23,000	1949	Jan. 14, 1949	11.5	25,200
1935	Sept. 1, 1935	13.5	<sup>c</sup> 5,550		24	6.71	5,210
1936	Feb. 17, 1936	13.94	8,000		Mar. 9	7.81	8,050
1937	Feb. 8, 1937	19.1	23,700	1950	July 30, 1950	5.30	1,240
	17	15.6	12,700		Aug. 3, 1951	6.98	4,240
	Mar. 18	13.19	6,430	1951	Aug. 3, 1951	6.98	4,240
1938	Mar. 4, 1938	12.85	4,690	1952	Jan. 14, 1952	10.30	18,600
1939	Aug. 6, 1939	14.20	7,370		19	10.50	19,700
1940	Oct. 8, 1939	14.75	8,070	1953	July 30, 1953	6.42	3,040
	Feb. 3, 1940	13.07	4,930				
	Sept. 6	15.24	9,840				
1941	Dec. 25, 1940	16.35	12,000				
	31	18.4	17,600				
	Jan. 28, 1941	7.05	8,140				
	Feb. 8	5.82	5,490				
	Mar. 15	8.64	12,300				
	Apr. 27	5.24	4,180				
	May 2	5.22	4,610				
	Sept. 30	13.43	31,900				

<sup>a</sup> From floodmarks.<sup>b</sup> Estimated.<sup>c</sup> Annual peak.

## FLOODS IN ARIZONA

## Gila River Basin

(35) Cave Creek near Paradise, Ariz.

Location. --Lat 31°54', long. 109°10', in SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 34, T. 17 S., R. 31 E., at Portal ranger station 4 $\frac{1}{4}$  miles southeast of Paradise.

Drainage area. --39 sq mi.

Gage. --Staff gage Aug. 5, 1919 to September 1925. Altitude of gage is 4,950 ft (from topographic map).

Stage-discharge relation. --Defined by current-meter measurements below 350 cfs and extended above. Relation probably subject to shifts.

Remarks. --Flood record not affected by small diversions above station. Records furnished by University of Arizona, Agricultural Engineering Department. Only annual peaks are available, and these are in most years maximum observed values which may possibly have been exceeded.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1920	Nov. 21, 1919	5	3,000	1923	Aug. 31, 1923	4.00	1,780
1921	Aug. 7, 1921	5.30	3,360	1924	Dec. 27, 1923	2.70	395
1922	Aug. 16, 1922	1.80	110	1925	July 31, 1925	1.95	*60

\* Maximum daily discharge.

## GAGING-STATION RECORDS

55

Gila River Basin

(36) San Simon Creek near San Simon, Ariz.

Location. --Lat 32°13'30", long. 109°10'30", in SW $\frac{1}{4}$  sec. 10, T. 14 S., R. 31 E., at bridge on San Simon-Paradise highway, 4 $\frac{1}{2}$  miles southeast of San Simon.

Drainage area. --814 sq mi at site 1931-41; 893 sq mi at site 1919-25.

Gage. --Recording gage since June 1931. Altitude of gage is 3,630 ft (from topographic map). August 1, 1919, to Sept. 30, 1925, staff gage 3 $\frac{1}{2}$  miles downstream. Altitude of gage is 3,580 ft (from topographic map).

Stage-discharge relation. --Defined by current-meter measurements to 2,300 cfs and extended above on basis of slope-area determination at gage height 10.9 ft at site 1931-41. Defined by current-meter measurements at site 1919-25. Relation subject to shifting.

Remarks. --Flood record unaffected by small diversions for irrigation above station. Records after 1931 are not closely comparable with earlier records because of probable large inflow during summer floods between the two stations. Records for 1919-25 furnished by University of Arizona, Agricultural Engineering Department. Base for partial-duration series, 650 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1923	July 21, 1923	14.0	<sup>c</sup> 5,350	1937	Aug. 9, 1937	5.80	548
1931	Aug. 1, 1931	7.50	1,400	1938	June 29, 1938	8.50	2,280
	4	8.78	2,400		Aug. 4	6.15	699
	10	11.15	4,500	1939	July 24, 1939	6.70	1,000
1932	July 25, 1932	7.3	1,250		27	6.28	773
1933	Aug. 4, 1933	7.71	1,550		31	8.58	2,360
1934	Oct. 9, 1933	6.67	822		Aug. 5	7.90	1,840
	<sup>c</sup> Aug. - 1934	<sup>a</sup> 11.2	<sup>p</sup> 4,550		11	6.61	940
1935	Aug. 5, 1935	8.5	2,280		13	9.25	2,840
	7	7.09	1,250	1940	June 29, 1940	10.9	4,280
	12	6.87	1,090		July 24	8.10	2,170
	25	7.7	1,680		Aug. 3	6.54	1,060
	28	11.7	<sup>q</sup> 5,020		7	6.89	1,300
	Sept. 23	7.17	1,280	1940	Aug. 14, 1940	6.23	868
1936	July 25, 1936	6.50	880		Sept. 21	8.47	2,480
	Aug. 18	10.85	4,190	1941	July 15, 1941	6.13	808
	28	6.45	852		18	5.94	689
	Sept. 20	6.82	1,060		Aug. 15	7.7	1,870
	26	7.00	1,180		21	6.40	961
					Sept. 29	6.57	1,060

<sup>a</sup> From floodmarks

<sup>c</sup> Annual peak.

<sup>d</sup> Date not known; probably in August 1934

<sup>p</sup> Annual peak; other peaks November 1933 to September 1934 not known.

<sup>q</sup> Annual peak; peaks October 1934 to June 1935 not known.



## FLOODS IN ARIZONA

## Gila River Basin

(37) San Simon Creek near Solomon, Ariz. \*

Location. --Lat 32°48'06", long. 109°38'19", in NW¼NE¼ sec. 25, T. 7 S., R. 26 E., 1 mile southwest of Solomon and 2½ miles upstream from mouth.

Drainage area. --2,192 sq mi.

Gage. --Recording gage since June 1931, and concrete control since 1948. Datum of gage is 2,960.15 ft above mean sea level, datum of 1929.

Stage-discharge relation. --Defined by current-meter measurements below 7,000 cfs; extended above by slope-area determination at gage height 19.0 ft. Relation subject to minor shifting.

Remarks. --Flood record unaffected by small irrigation diversions above station prior to May 27, 1953. Some regulation of flood flow after this date by flood control detention reservoir having 1,400 sq mi of drainage area, located 35 miles upstream. Storage capacity is 3,370 acre-ft at emergency spillway level. Base for partial-duration series, 2,500 cfs.

Bank-full stage. --16 ft.

\*Published as "near Solomonsville" prior to 1950.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1931	Aug. 4, 1931	10.7	4,830	1941	Apr. 25, 1941	7.75	2,860
	9	19.0	27,500		Aug. 17	17.55	13,000
	24	7.8	2,640		Sept. 28	9.59	4,370
	30	15.4	9,680	1942	Aug. 6, 1942	7.45	2,780
	Sept. 18	11.35	5,840		8	7.40	2,660
	28	9.13	4,080		Sept. 11	10.05	5,000
1932	Oct. 1, 1931	14.47	8,780		20	7.51	2,750
	July 9, 1932	8.34	3,120	1943	July 25, 1943	7.92	3,110
	25	8.26	3,060		Aug. 2	10.75	5,750
	28	8.81	3,520		5	7.58	2,940
	30	14.5	8,800		10	10.85	5,850
	Aug. 8	12.6	7,000		15	11.43	6,430
1933	July 16, 1933	9.45	4,000		24	9.94	4,960
1934	Aug. - 1934	15.7	11,500	1944	Aug. 16, 1944	8.54	3,740
1935	Aug. 1, 1935	16.35	12,000		18	10.36	5,400
	6	7.56	2,700		Sept. 5	7.30	2,590
	19	8.8	3,790		25	10.88	5,900
	29	8.5	3,500	1945	July 31, 1945	8.86	4,010
1936	July 25, 1936	12.05	7,450		Aug. 3	9.6	4,640
	Aug. 8	7.85	3,400		10	12.35	7,350
	19	8.8	4,400	1946	Oct. 9, 1945	8.09	3,180
	28	6.8	2,530		Aug. 30, 1946	9.91	4,820
	Sept. 10	15.0	10,600	1947	June 18, 1947	7.34	2,700
	21	6.88	2,610		Aug. 8	7.1	2,540
1937	Aug. 21, 1937	7.20	2,370		23	7.17	2,620
1938	July 12, 1938	8.90	4,500	1948	Aug. 6, 1948	10.95	5,880
	Aug. 5	9.0	4,000		21	7.70	2,880
1939	Aug. 14, 1939	6.90	2,140	1949	July 9, 1949	13.3	6,310
1940	Aug. 4, 1940	7.52	2,610		23	8.05	2,860
	22	7.28	2,450		Aug. 8	15.55	8,100
	Sept. 5	11.0	6,080	1950	Sept. 18, 1950	7.42	2,060

## Gila River Basin

(37) San Simon Creek near Solomon, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1951	July 27, 1951	9.2	3,260	1953	July 7, 1953	10.70	3,970
	Aug. 2	14.15	7,390		31	8.42	2,630
	3	8.54	2,800				
1952	Aug. 15, 1952	10.8	4,030				
	17	12.4	5,100				
	Sept. 22	9.30	3,130				

a From floodmarks.

c Annual peak.

o Date not known; probably in August 1934.

(38) Gila River at Safford, Ariz.

Location. --Lat 32°50'50", long. 109° 42'55", in SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 5, T. 7 S., R. 26 E., at highway bridge 1 mile north of Safford and 4 $\frac{1}{4}$  miles downstream from San Simon Creek.

Drainage area. --10,459 sq mi (revised).

Gage. --Recording gage at present site since July 1, 1942. Datum of gage is 2,880.07 ft above mean sea level, datum of 1929. June 1940 to June 1942 recording gage at site 1,400 ft upstream at datum 6.91 ft higher.

Stage-discharge relation. --Defined by current-meter measurements. Subject to shifting.

Remarks. --Flood record unaffected by irrigation diversions above gage, but affected to some extent after May 27, 1953 by flood control reservoir on San Simon Creek (capacity 3,370 acre-feet at emergency spillway level). Base for partial-duration series, 4,000 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	Sept. 6, 1940	5.06	c 8,600	1945	Aug. 3, 1945	7.9	5,320
1941	Dec. 25, 1940	5.44	9,920	1946	Oct. 9, 1945	8.00	6,340
	31	6.9	15,200		Aug. 30, 1946	7.2	4,390
	Jan. 28, 1941	5.05	8,560	1947	Aug. 23, 1947	7.18	4,350
	Feb. 8	4.05	4,980		31	7.3	4,600
	Mar. 16	6.28	12,400				
	Apr. 28	3.59	4,030	1948	Aug. 7, 1948	9.34	6,090
	May 2	3.65	4,140				
	Aug. 17	5.4	9,180	1949	Dec. 30, 1948	7.65	4,320
	Sept. 28	5.15	8,320		Jan. 14, 1949	13.1	23,900
	30	13.0	33,000		24	7.35	5,000
1942	Dec. 12, 1941	5.00	7,800		Mar. 9	8.45	7,790
	Sept. 14, 1942	7.45	6,620		July 9	7.5	5,300
1943	Mar. 6, 1943	6.58	4,270		Aug. 9	8.85	8,400
	Aug. 2	6.8	4,870	1950	July 30, 1950	5.50	1,860
	10	6.60	4,140				
	15	6.65	4,260	1951	Aug. 3, 1951	8.75	6,390
	24	7.35	5,380				
	Sept. 27	7.15	5,780	1952	Jan. 14, 1952	11.24	14,900
1944	Aug. 18, 1944	7.5	6,730		19	11.42	15,700
	Sept. 5	7.45	6,590		Aug. 17	7.83	4,630
	26	10.4	13,600	1953	July 7, 1953	6.56	2,670

c Annual peak; peaks October to June not known.

## FLOODS IN ARIZONA

## Gila River Basin

(39) Gila River at Calva, Ariz.

Location. --Lat 33°11'10", long. 110°13'10", in SW $\frac{1}{4}$  sec. 8, T. 3 S., R. 21 E., unsurveyed, at railroad bridge, on San Carlos Indian Reservation, at head of San Carlos Reservoir, 1 $\frac{1}{2}$  miles northwest of Calva.

Drainage area. --11,470 sq mi.

Gage. --Recording gage at present site since Nov. 6, 1929. Datum of gage is 2,514.77 ft above mean sea level, datum of 1929. October 4 to Nov. 1, 1929, staff gage at same site and datum.

Stage-discharge relation. --Defined by current-meter measurements.

Historical data. --The greatest known flood, that of Jan. 20, 1916, was estimated as 100,000 cfs or greater on basis of records at Solomon and at Kelvin.

Remarks. --Flood record not materially affected by irrigation diversions above station. Base for partial-duration series, 3,000 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1916	Jan. 20, 1916	-	<sup>b</sup> 100,000	1937	Feb. 9, 1937	9.37	12,800
1930	Oct. 14, 1929	5.45	3,390		18	8.06	8,960
	July 10, 1930	5.43	3,810		Mar. 19	7.25	7,260
	29	7.40	9,600	1938	Mar. 5, 1938	6.08	4,310
	Aug. 8	6.43	6,860				
	13	6.37	7,120	1939	Aug. 7, 1939	6.49	4,260
	Sept. 8	5.63	3,420		Sept. 17	6.60	4,130
1931	Feb. 16, 1931	6.80	8,850	1940	Oct. 9, 1939	7.15	5,620
	Aug. 6	6.55	7,940		Feb. 4, 1940	6.67	4,820
	11	7.12	9,900		Aug. 14	6.69	5,180
	24	5.23	3,130		Sept. 7	6.69	4,600
	30	6.35	6,770				
	Sept. 19	6.14	5,920	1941	Dec. 27, 1940	7.67	6,200
1932	29	6.17	5,470		Jan. 2, 1941	9.44	14,300
	Oct. 1, 1931	6.65	6,520		29	7.52	7,260
	Feb. 12, 1932	9.7	21,500		Feb. 8	6.61	5,180
	Mar. 2	6.20	5,580		26	5.60	3,420
	July 30	6.82	7,900		Mar. 17	9.06	13,000
					Apr. 28	6.15	3,990
1933	Feb. 27, 1933	5.84	5,250		May 3	6.16	3,990
	Sept. 9	6.23	6,560		Aug. 17	6.17	4,700
	14	5.46	4,050		Sept. 28	6.80	5,180
1934	July 20, 1934	6.40	6,100	1942	Oct. 1, 1941	11.82	27,900
	Aug. 22	5.76	4,150		Dec. 12	6.81	5,760
	28	9.35	18,000		Sept. 14, 1942	5.58	3,320
	Sept. 23	5.87	4,540	1943	Mar. 6, 1943	5.60	3,590
1935	Jan. 6, 1935	5.54	3,560		Aug. 24	5.39	3,090
	July 31	6.24	4,470		Sept. 28	5.76	3,710
	Aug. 2	6.00	3,750	1944	Aug. 18, 1944	5.82	3,260
	31	6.01	4,320		Sept. 27	9.48	12,800
	Sept. 2	5.68	3,450				
1936	Feb. 18, 1936	6.56	5,640	1945	Aug. 3, 1945	6.00	3,390
	July 26	5.60	3,200		12	6.02	3,050
	Aug. 20	5.61	3,780	1946	Oct. 10, 1945	6.40	4,680
	Sept. 11	6.22	6,000				
	26	6.04	4,880	1947	Aug. 24, 1947	6.20	3,200

GAGING-STATION RECORDS  
Gila River Basin

59

(39) Gila River at Calva, Ariz. --Continued

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1948	Aug. 7, 1948	6.06	2,570	1951	Aug. 4, 1951	5.97	2,970
1949	Dec. 30, 1948	6.38	3,030	1952	Jan. 16, 1952	9.00	7,880
	Jan. 15, 1949	11.47	19,400		20	11.45	13,200
	25	6.98	5,230		Aug. 17	6.08	3,350
	Mar. 10	7.91	6,290	1953	July 30, 1953	4.93	2,040
	Aug. 9	6.24	4,400				
1950	July 30, 1950	5.30	3,210				

6 Estimated.

(40) San Carlos River near Peridot, Ariz.\*

Location. --Lat 33°19'20", long. 110°26'50", in NW¼ sec. 30, T. 1 S., R. 19 E., unsurveyed, in San Carlos Indian Reservation, at highway bridge 2 miles downstream from San Carlos and 2 miles upstream from Peridot.

Drainage area. --1,058 sq mi 1929 to January 1942, and 1,027 sq mi thereafter.

Gage. --Recording gage at present site since February 1942. Datum of gage is 2,582.71 ft above mean sea level, datum of 1929. Staff gage Oct. 4 to Nov. 8, 1929, and recording gage Nov. 14, 1929, to Jan. 31, 1942, at railroad bridge 2 miles downstream from Peridot at datum 2,506.6 ft above mean sea level (Southern Pacific Railway benchmark).

Stage-discharge relation. --Defined by current-meter measurements below 23,000 cfs; extended above on basis of rate of change of storage in San Carlos Reservoir. Relation subject to shifting.

Historical data. --Flood of January 1916 was estimated on the ground by W. E. Dickinson, then working for the Interstate Commerce Commission.

Remarks. --Flood record unaffected by small irrigation diversions above station. Base for partial-duration series, 2,200 cfs.

Bank-full stage. --11 ft.

\*Published as "at San Carlos" prior to 1929. (Former village of San Carlos, which was located at mouth of San Carlos River 10 miles south of present village, was abandoned in 1929 when San Carlos Reservoir formed.) Drainage area at this location was 1,068 sq mi.



## FLOODS IN ARIZONA

## Gila River Basin

(40) San Carlos River near Peridot, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1916	Jan. 18 or 19, 1916	-	<sup>b</sup> 25,000	1940	Feb. 2, 1940	5.79	2,840
1930	Mar. 17, 1930	6.85	5,700		July 16	5.74	2,720
	July 12	6.45	4,870		Aug. 3	6.70	6,000
	Aug. 8	6.66	5,270		23	6.39	4,780
	11	6.60	5,590		Sept. 29	5.55	2,480
1931	Feb. 15, 1931	6.69	5,800	1941	Dec. 25, 1940	9.05	14,600
	July 11	6.68	5,750		30	9.1	18,100
	16	6.10	3,630		Jan. 12, 1941	5.92	3,910
	29	6.50	5,100		25	5.83	3,770
	Aug. 7	7.02	7,000		28	6.40	5,380
	30	7.01	6,950		Feb. 7	6.6	5,990
	Sept. 28	6.38	4,680		25	6.43	5,530
1932	Nov. 21, 1931	5.93	3,080		Mar. 14	11.4	40,600
	Dec. 10	6.20	4,000		Sept. 28	7.12	7,670
	Feb. 10, 1932	8.3	12,000	1942	Dec. 12, 1941	5.35	2,520
	20	6.04	3,460	1943	Jan. 24, 1943	4.45	3,580
	July 7	5.88	2,910		28	4.20	2,940
	Aug. 6	6.34	4,480		Mar. 5	4.62	3,450
1933	Sept. 3, 1933	7.08	7,150		Aug. 15	4.08	2,320
	8	8.04	11,000		Sept. 26	5.16	5,060
1934	Aug. 18, 1934	7.35	8,200	1944	Sept. 27, 1944	3.88	795
	22	6.80	6,110	1945	Aug. 9, 1945	5.50	3,200
	30	5.70	2,320	1946	July 27, 1946	7.00	4,530
	Sept. 7	6.84	6,260		Sept. 18	6.20	2,900
1935	Jan. 6, 1935	7.46	8,630	1947	Aug. 8, 1947	11.1	15,000
	Feb. 7	8.45	13,800		Sept. 6	6.28	2,330
	11	6.21	4,920	1948	Aug. 2, 1948	6.65	2,850
	Apr. 9	7.11	7,230	1949	Jan. 9, 1949	6.88	3,260
	July 17	7.94	10,600		Aug. 9	6.26	2,260
	Aug. 1	8.05	11,100	1950	July 21, 1950	6.68	2,150
	8	6.02	3,120	1951	July 27, 1951	6.81	2,420
	12	7.12	7,270		Aug. 27	6.70	2,280
	24	8.27	12,000		29	7.13	2,940
	29	5.80	2,340	1952	Dec. 31, 1951	9.82	9,390
	Sept. 4	6.14	2,760		Jan. 13, 1952	12.54	39,200
1936	Feb. 13, 1936	6.89	6,370		18	10.2	23,900
	17	8.8	14,400		Aug. 5	6.41	3,040
	20	5.89	2,580		11	7.70	6,400
	July 25	5.98	2,520		15	6.54	3,300
1937	Feb. 7, 1937	10.7	29,400		19	6.24	2,720
1938	Mar. 4, 1938	7.35	8,640	1953	Aug. 27, 1953	5.48	860
1939	Apr. 5, 1939	5.72	3,160				
	July 3	5.50	2,520				
	Aug. 3	7.96	10,200				
	5	6.28	4,640				
	7	6.26	4,060				

<sup>b</sup> Estimated.

## Gila River Basin

(41) Gila River below Coolidge Dam, Ariz.\*

Location. --Lat 33°10'15", long. 110°31'45", in SW $\frac{1}{4}$  sec. 17, T. 3 S., R. 18 E., unsurveyed, 2,200 ft downstream from Coolidge Dam.

Drainage. --12,886 sq mi.

Gage. --Recording gage and 30-ft concrete Parshall flume since Mar. 9, 1937. Datum of gage is 2,309.33 ft above mean sea level, datum of 1929. April 29, 1914, to Mar. 8, 1937, recording gage at various sites and datums, within 1 mile upstream.

Stage-discharge relation. --For sites in use prior to Mar. 9, 1937, relation defined by current-meter measurements below 7,000 cfs and extended above by logarithmic plotting and comparison with flood records for stations near Solomon and at Kelvin. Relations subject to shifting. Stage-discharge relation for Parshall flume defined by current-meter measurements and conforms closely to theoretical rating.

Historical data. --Notable floods occurred in 1891 and 1905. Flood of 1891 was considered highest in preceding 25-30 years at site near Florence (80 miles downstream). Flood of Nov. 28, 1905 exceeded the 1891 flood at this point. On this basis flood of Nov. 28, 1905 (estimated discharge 150,000 cfs) can be considered greatest since about 1861. Discussion and estimates on these floods is found in WSP 33 and House Doc. No. 791.

Remarks. --Flood record not significantly affected by irrigation diversions above station. Completely regulated at Coolidge Dam after Nov. 15, 1928. Base for partial-duration series, 3,500 cfs (for period prior to Nov. 15, 1928).

\*Published as "near San Carlos", 1914-26, and as "at Coolidge Dam", 1927-38.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1906	Nov. 28, 1905	-	<sup>b</sup> 150,000	1922	Aug. 21, 1922	5.65	2,800
1914	Aug. 24, 1914	8.25	<sup>c</sup> 7,400	1923	July 22, 1923	-	<sup>b</sup> 9,000
1915	Dec. 20, 1914	16.4	<sup>c</sup> 42,000		Aug. 10	10.3	13,500
1916	Jan. 20, 1916	25.5	130,000		12	-	<sup>b</sup> 9,000
	29	-	<sup>b</sup> 30,000		20	7.15	5,200
	Mar. 2	-	<sup>b</sup> 5,500	1924	Dec. 28, 1923	11.0	15,100
	25	<sup>b</sup> 7.7	6,400	1925	Aug. 1, 1925	10.3	5,550
	Aug. 26	6.46	4,000		Sept. 4	14.1	14,400
	Sept. 10	7.3	5,600		17	9.68	4,380
					19	10.57	5,960
1917	Oct. 14, 1916	20.4	74,000				
	Jan. 22, 1917	<sup>b</sup> 13	23,000	1926	Mar. 30, 1926	9.5	4,650
1918	Aug. 6, 1918	8.84	8,630		Apr. 6	11.9	9,960
1919	July 2, 1919	7.7	6,400	1927	Feb. 15, 1927	11.22	7,080
	6	8.55	8,400		17	11.9	9,100
	15	9.85	11,800		Sept. 12	8.65	4,300
	19	7.65	6,300	1928	Aug. 25, 1928	9.4	6,500
	Aug. 3	11.3	16,000		28	9.75	7,200
	Sept. 27	6.48	4,100	1929	Sept. 26, 1929	4.57	241
1920	Dec. 5, 1919	11.8	18,000	1930	Sept. 6, 1930	5.70	954
	Feb. 11, 1920	9.2	9,700	1931	July 20, 1931	5.95	1,020
	21	13.0	23,000	1932	July 24, 1932	5.94	980
	23	8.42	7,600	1933	July 11, 1933	5.98	1,040
1921	July 10, 1921	7.2	5,200	1934	Apr. 28, 1934	5.30	535
	21	6.46	3,950				
	27	7.57	6,200				
	31	9.9	12,800				
	Aug. 4	8.28	7,500				
	22	-	<sup>b</sup> 14,000				

## FLOODS IN ARIZONA

Gila River Basin

(41) Gila River below Coolidge Dam, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1935	June 16, 1935	5.54	767	1945	July 16, 1945	2.88	616
1936	Apr. 24, 1936	5.80	980	1946	Aug. 29, 1946	1.98	345
1937	July 31, 1937	4.35	1,240	1947	Mar. 7, 1947	2.65	551
1938	June 19, 1938	2.92	620	1948	Apr. 12, 1948	2.09	362
1939	Apr. 16, 1939	2.94	620	1949	July 18, 1949	4.07	1,090
1940	Aug. 17, 1940	2.94	634	1950	Apr. 30, 1950	3.15	726
1941	July 22, 1941	4.17	1,110	1951	Sept. 13, 1951	1.90	321
1942	Aug. 26, 1942	4.07	1,130	1952	July 28, 1952	4.64	1,350
1943	July 17, 1943	3.92	1,040	1953	Dec. 16, 1952	2.13	373
1944	Aug. 7, 1944	3.52	861				

<sup>b</sup> Estimated<sup>c</sup> Annual peak.

Note. --Annual peaks only listed after 1928.

## Gila River Basin

(42) Gila River at Winkelman, Ariz.

Location. --Lat 30°00'10", long. 110°45'55", in NW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 13, T. 5 S., R. 15 E., 1 $\frac{1}{4}$  miles north of Winkelman, 2 miles upstream from San Pedro River, and 29 miles downstream from Coolidge Dam.

Drainage area. --13,268 sq mi (includes 382 sq mi below Coolidge Dam).

Gage. --Recording gage since Sept. 11, 1941. Datum of gage is 1,920.95 ft above mean sea level, datum of 1929, supplementary adjustment of 1949.

Stage-discharge relation. --Defined by current-meter measurements below 2,900 cfs; extended above on basis of slope-area determination at gage height 18.40 ft. Relation subject to minor shifting.

Remarks. --Runoff from area above Coolidge Dam is completely regulated. Peak discharges are adjusted by amount of released water to show natural flow from 382 sq mi drainage area below Coolidge Dam, and differ in some instances from previously published figures. Base for partial duration series, 1,000 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1942	Aug. 8, 1942	7.95	3,950	1947	Aug. 8, 1947	13.68	24,300
					12	5.54	1,920
1943	Mar. 5, 1943	5.37	1,550		Sept. 19	6.10	2,420
	July 30	5.45	1,010				
	Aug. 3	6.28	2,120	1948	July 26, 1948	4.89	1,220
	Sept. 26	8.70	5,470				
1944	Oct. 19, 1943	5.60	1,570	1949	June 18, 1949	5.85	1,630
	Aug. 7, 1944	6.15	1,830		July 30	5.38	1,100
	9	18.40	54,500		Sept. 13	6.70	2,880
1945	Aug. 1, 1945	4.70	1,040	1950	July 7, 1950	5.13	1,330
	9	5.37	1,650		21	6.97	3,550
	21	5.59	1,640		30	7.90	4,960
1946	Oct. 7, 1945	5.03	1,100	1951	Aug. 2, 1951	15.15	26,100
	Jan. 5, 1946	4.85	1,210		27	6.90	2,810
	Aug. 15	5.05	1,400	1952	Dec. 31, 1951	5.63	1,670
	20	10.70	12,500		Jan. 13, 1952	6.25	2,239
	30	6.10	2,320				
	Sept. 10	4.85	1,160	1953	Aug. 25, 1953	4.38	640
	19	7.72	5,010				
	27	6.5	3,100				



## FLOODS IN ARIZONA

## Gila River Basin

(43) San Pedro River at Palominas, Ariz.

Location. --Lat 31°22'50", long. 110°06'45", in SE $\frac{1}{4}$  sec. 33, T. 23 S., R. 22 E., at highway bridge 0.7 mile east of Palominas, 2  $\frac{3}{4}$  miles upstream from Greenbush Creek, 4 $\frac{1}{2}$  miles downstream from international boundary, and 13 miles southwest of Bisbee.

Drainage area. --741 sq mi, of which 649 sq mi is in Mexico.

Gage. --Recording gage since June 1930. Altitude of gage is 4,200 ft (from topographic map). Prior to Oct. 18, 1936, at datum 3.71 ft higher; Oct. 18, 1936, to Oct. 10, 1939, at datum 3.91 ft higher; Oct. 11, 1939, to July 16, 1941, at datum 0.29 ft lower.

Stage-discharge relation. --Defined by current-meter measurements below 5,600 cfs; extended above on basis of slope-area determination at gage height 16.16 ft, present datum.

Historical data. --Flood of Sept. 28, 1926, reached a stage of about 23.9 ft, present datum, from floodmarks (discharge not determined).

Remarks. --Flood record unaffected by small irrigation diversions above station. Base for partial-duration series, 2,400 cfs.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1926	Sept. 28, 1926	<sup>a</sup> 23.9	-	1938	July 28, 1938	5.77	3,040
					Aug. 7	7.55	6,300
1930	July 22, 1930	7.96	4,040	1939	July 17, 1939	5.18	3,140
	28	7.69	3,500		22	6.30	4,230
	Aug. 7	9.75	9,400		Aug. 3	6.77	4,960
1931	Aug. 1, 1931	7.72	3,380		6	8.05	7,500
	6	7.50	3,460	1940	July 25	10.12	3,820
	8	9.6	8,900		Aug. 4	9.54	3,150
	30	7.61	3,780		14	16.45	22,000
	Sept. 1	7.71	3,940	1941	Jan. 28, 1941	11.50	<sup>r</sup> 5,900
1932	Oct. 1, 1931	7.46	3,490	1950	July 5, 1950	<sup>a</sup> 8.5	6,270
	July 29, 1932	8.3	5,180		21	7.67	5,150
	Aug. 9	8.0	6,000		30	6.51	3,610
1933	July 13, 1933	7.75	4,020	1951	July 2, 1951	8.10	5,710
	Sept. 19	8.1	4,700		Aug. 26	5.80	2,760
1935	Aug. 14, 1935	6.74	3,000	1952	Aug. 5, 1952	6.05	3,000
1936	July 1, 1936	6.40	2,420		8	7.54	4,890
	Aug. 19	6.83	3,200		16	9.15	7,400
	Sept. 10	10.15	13,500	1953	July 6, 1953	6.85	3,990
1937	July 18, 1937	5.75	2,650		7	11.68	11,900
	Aug. 17	6.55	4,060		13	7.20	4,500
	20	8.31	8,090		17	7.10	4,380
	23	6.90	4,860		18	6.60	3,740
	26	6.78	4,730				
	Sept. 7	5.64	2,860				

<sup>a</sup> From floodmarks.

<sup>r</sup> Flood record complete to July 16, 1941; annual peak not determined, probably occurred Aug. 16.

## Gila River Basin

(44) San Pedro River at Charleston, Ariz.\*

Location. --Lat 31°37'40", long. 110°10'30", in NE¼NE¼ sec. 11, T. 21'S., R. 21 E., in Spanish land grant of San Juan de las Boquillas & Nogales, at highway bridge a quarter of a mile south of Charleston, 1½ miles upstream from Charleston dam site, 8½ miles upstream from Babocomari River, and 29 miles upstream from Benson.

Drainage area. --1,219 sq mi for site used since December 1942; 1,253 sq mi for sites used 1904 to November 1911 and 1928 to November 1942; 1,300 sq mi, approximately, for sites used November 1911 to September 1926. All areas include about 696 sq mi in Mexico.

Gage. --Recording gage and concrete control at present site since Dec. 1, 1942. Datum of gage is 3,954.26 ft above mean sea level, datum of 1929. November 15, 1911, to Oct. 28, 1924, staff gages at various sites and datums from 5½ to 6½ miles downstream. October 29, 1924, to Sept. 27, 1926, recording gage about 6 miles downstream. September 28, 1926, to May 11, 1928, no gage; estimates of discharge based on record for station at Fairbank, below Babocomari River. June 17, 1928, to Dec. 21, 1933, and May 1, 1935, to Nov. 30, 1942, recording gage 1½ miles downstream at datum 24.01 ft lower. Staff gage nearby May 12 to June 16, 1928, at same datum. December 22, 1933, to Apr. 30, 1935, no gage; estimates of discharge based on record for station near Mammoth.

Stage-discharge relations. --Defined by current-meter measurements below 4,400 cfs; extended above on basis of slope-area determination of 1926 flood. Relation prior to Nov. 30, 1942, subject to considerable shifting.

Historical data. --Flood of Sept. 28, 1926, is the greatest known since 1906 or earlier.

Remarks. --Flood record unaffected by irrigation diversions above station. Base for partial-duration series, 3,000 cfs.

\*Published as "near Fairbank", 1911-26.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1916	Aug. 11, 1916	3.9	3,100	1922	Aug. 10, 1922	13.35	3,630
	16	5.7	7,700		Sept. 9	13.4	3,720
	Sept. 7	4.0	3,300	1923	July 14, 1923	14.0	4,820
1917	Oct. 13, 1916	4.5	b 4,400		Aug. 12	14.2	5,200
	July 14, 1917	-	4,000	1924	July 24, 1924	12.2	1,900
	18	6.0	8,600				
	24	4.8	5,150	1925	June 24, 1925	10.3	7,340
	Aug. 2	5.0	5,700		July 27	7.95	3,940
	9	4.0	3,300		Aug. 6	12.1	11,900
	12	7.3	13,000		9	7.5	3,450
	Sept. 8	4.0	3,300		Sept. 3	8.2	4,260
1918	June 20, 1918	4.15	3,610	1926	Sept. 26, 1926	11.85	10,500
	July 1	-	b 4,000		28	21.9	98,000
1919	July 3, 1919	6.0	8,600	1927	Oct. 9, 1926	8.5	b 5,100
	5	7.6	14,100		July 8, 1927	8.0	b 3,600
	7	8.4	17,200		Aug. 7	8.5	b 4,260
	14	6.8	11,300	1928	July 15, 1928	6.02	3,800
	28	4.5	4,400				
	31	4.6	4,640	1929	Oct. 11, 1928	6.95	5,720
	Aug. 2	4.0	3,300		July 17, 1929	6.58	4,910
	16	10.3	25,100		27	6.56	4,870
1920	Aug. 1, 1920	3.30	3,300		29	8.74	10,400
	Sept. 5	3.9	4,500		Aug. 2	6.15	4,030
1921	July 3, 1921	16.5	10,200		8	5.85	3,460
	19	20.2	19,000	1930	July 19, 1930	6.0	3,740
	27	14.0	5,000		22	6.50	4,740
	31	16.9	11,200		28	6.05	3,840
	Aug. 4	14.6	6,200		Aug. 7	8.5	9,740
	6	14.3	5,400		10	5.95	3,640
	8	14.5	5,800				
	19	13.6	4,100				

## FLOODS IN ARIZONA

## Gila River Basin

(44) San Pedro River at Charleston, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1931	Aug. 2, 1931	5.95	3,640	1942	July 24, 1942	4.95	2,870
	6	6.20	4,090				
	9	12.0	24,500	1943	June 29, 1943	8.22	8,380
	27	6.5	4,740		Aug. 6	8.22	8,380
	30	6.3	4,330		9	8.20	8,650
	Sept. 18	6.0	3,740		18	8.07	7,860
1932	Oct. 1, 1931	6.2	4,130	1944	Aug. 18, 1944	6.87	3,430
	July 30, 1932	6.4	4,530				
	Aug. 9	7.5	7,000	1945	Aug. 7, 1945	7.65	6,600
1933	July 13, 1933	6.2	4,130		9	7.95	7,670
	22	8.45	9,600		21	6.90	4,180
	Sept. 17	7.3	6,550	1946	July 17, 1946	7.90	7,490
	20	6.85	5,500		29	6.78	3,900
1934	-	-	b <sup>c</sup> 5,000		Aug. 4	9.10	12,000
1935	Aug. 2, 1935	5.9	3,780	1947	Aug. 9, 1947	8.60	10,100
	14	5.95	3,870		12	6.64	3,760
	28	8.1	8,600		15	7.05	4,620
	31	5.96	3,890		22	7.20	5,080
1936	July 25, 1936	7.55	7,210		28	6.57	3,120
	Aug. 19	6.0	3,250	1948	July 24, 1948	7.25	5,400
	Sept. 11	9.5	13,000		Aug. 3	8.0	7,850
1937	Aug. 9, 1937	6.4	4,720		12	7.85	7,310
	18	6.02	4,000		Sept. 18	6.80	3,900
	20	8.5	9,430		26	7.6	5,080
	23	6.7	4,920	1949	July 19, 1949	7.15	5,160
	26	6.85	5,030		22	7.10	5,010
	Sept. 8	5.80	3,150		24	7.65	6,720
1938	July 28, 1938	7.06	5,700		Aug. 8	6.9	4,460
	Aug. 2	7.25	6,180	1950	July 6, 1950	7.48	6,070
	7	7.74	7,450		21	7.15	4,920
1939	July 22, 1939	6.50	4,360		30	6.72	3,630
	Aug. 3	7.40	6,480	1951	July 2, 1951	7.4	5,730
	7	8.45	9,370		Aug. 26	6.9	4,180
	Sept. 7	6.85	5,370	1952	Aug. 9, 1952	6.45	3,120
1940	July 16, 1940	8.8	10,700		10	7.7	6,770
	Aug. 13	13.1	31,000		17	8.0	7,850
1941	Jan. 28, 1941	7.00	6,700		19	7.05	4,680
	Aug. 9	7.0	6,700	1953	July 7, 1953	8.2	8,590
	16	8.53	10,800		13	6.43	3,120
					17	6.70	3,720
					25	6.50	3,230

b Estimated

c Annual peak.

## Gila River Basin

(45) San Pedro River near Redington, Ariz.

Location. --Lat 32°22'50", long. 110°26'40", in NE¼NW¼ sec. 19, T. 12 S., R. 19 E., half a mile upstream from Cochise-Pima County line, 4½ miles upstream from Redington, and 30 miles downstream from Benson.

Drainage area. --2,939 sq mi (includes 696 sq mi in Mexico).

Gage. --Recording gage at present site and datum since July 1950. Datum of gage is 2,940.51 ft above mean sea level, datum of 1929. Prior to July 1950, at site 400 ft downstream at datum 2.98 ft lower.

Stage-discharge relation. --Defined by current-meter measurements below 8,400 cfs; extended above on basis of slope-area determination of 1951 peak flow and records for adjacent stations. Relation subject to shifting.

Historical data. --The greatest known flood was that of Sept. 28, 1926, (gage height, 21.5 ft, former datum, from floodmark), discharge estimated as 90,000 cfs on basis of records for stations at Charleston and Gila River at Kelvin.

Remarks. --Flood record unaffected by irrigation diversions above station. Base for partial-duration series, 3,000 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1926	Sept. 28, 1926	<sup>a</sup> 21.5	90,000	1948	Sept. 26, 1948	<sup>a</sup> 9.1	<sup>c</sup> 11,500
1943	June 29, 1943	6.03	4,590	1949	"	<sup>a</sup> 8.4	<sup>c</sup> 10,000
	Aug. 6	5.92	3,910				
	9	7.40	7,090	1950	July 7, 1950	8.48	3,720
1944	Aug. 9, 1944	8.2	9,240		20	11.4	7,830
	18	5.10	3,090		23	9.1	4,470
	Sept. 24	11.05	19,000		30	12.0	8,800
1945	Aug. 7, 1945	5.45	3,900	1951	Aug. 2, 1951	18.0	28,600
	10	9.90	14,600	1952	July 28, 1952	9.2	3,910
	21	6.52	5,720		29	9.4	4,330
1946	Oct. 5, 1945	5.11	3,080		Aug. 16	9.5	4,470
	Aug. 4, 1946	8.25	9,000	1953	July 7, 1953	11.0	7,290
1947	Aug. 8, 1947	12.0	23,000				
	9	8.12	9,280				
	15	4.90	3,000				

<sup>a</sup> From floodmark.

<sup>c</sup> Annual peak.

<sup>d</sup> Date not known, probably occurred in summer of 1949.



Gila River Basin

(46) San Pedro River near Mammoth, Ariz.

Location. --Lat 32°44'35", long. 110°38'50", in NE¼NW¼ sec. 18, T. 8 S., R. 17 E., at bridge on Mammoth-Winkelman highway 1½ miles north of Mammoth.

Drainage area. --3,599 sq mi.

Gage. --Recording gage May 1931 to June 1941. Datum of gage is 2,306.98 ft above mean sea level, datum of 1929, supplementary adjustment of 1949.

Stage-discharge relation. --Defined by current-meter measurements below 5,300 cfs; extended above on basis of 4 float-area measurements between 20,000 and 41,000 cfs. Relation is subject to large shifts.

Historical data. --Greatest known flood was that of Sept. 28, 1926, (gage height unknown), discharge about 90,000 cfs, estimated on basis of records for stations at Charleston and Gila River at Kelvin.

Remarks. --Flood record unaffected by irrigation diversions above station. Base for partial-duration series, 4,500 cfs.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1926	Sept. 28, 1926	-	<sup>b</sup> 90,000	1937	Aug. 20, 1937	9.40	12,800
1931	Aug. 5, 1931	8.4	5,210		22	9.5	14,000
	7	8.58	5,550		27	8.55	7,960
	10	10.9	18,000		30	9.6	14,100
	14	8.4	4,740		Sept. 5	8.47	7,530
	24	9.3	8,270		7	8.22	6,760
	30	9.2	8,270	1938	June 28, 1938	9.15	4,580
	Sept. 19	8.9	4,970		July 29	9.74	6,000
1932	Oct. 2, 1931	11.1	19,400		Aug. 3	9.3	5,090
	Aug. 10, 1932	8.8	7,250		5	10.5	7,800
1933	July 23, 1933	9.8	13,500		8	10.00	6,600
	Sept. 10	8.6	5,440	1939	July 19, 1939	9.35	8,660
1934	Aug. 4, 1934	8.40	7,400		Aug. 2	9.65	9,920
					6	9.85	9,710
1935	Aug. 14, 1935	9.13	5,300		Sept. 11	9.52	9,290
	24	10.65	16,300		17	8.7	6,010
	28	10.3	14,000	1940	Aug. 14, 1940	12.7	50,000
	Sept. 1	8.55	4,600		24	8.4	6,570
1936	July 26, 1936	8.40	7,960	1941	Dec. 31, 1940	9.4	8,870
	Aug. 9	8.2	8,220		Jan. 29, 1941	9.7	*10,100
	Sept. 11	8.9	10,400				

<sup>b</sup> Estimated

\* Maximum observed; peaks July to September 1941 not known.

## Gila River Basin

(47) Aravaipa Creek near Feldman, Ariz.\*

Location. --Lat 32°50', long. 110°38', in NW $\frac{1}{4}$  sec. 9, T. 7 S., R. 17 E., 6 miles upstream from mouth and 6 miles east of Feldman (now PZ Ranch), and 8 $\frac{1}{2}$  miles north of Mammoth.

Drainage area. --542 sq mi; 562 sq mi at site used 1919-21.

Gage. --Staff gage after Jan. 8, 1941. Altitude of gage is 2,345 ft (from topographic map). April 21, 1919, to Sept. 30, 1921, staff gage painted on depth markers at ford 5  $\frac{3}{4}$  miles downstream and a quarter of a mile upstream from mouth, at different datum. May 23, 1931, to Jan. 1, 1941, recording gage 100 ft downstream at datum 0.32 ft lower, staff gage at same site and datum May 1-22, 1931.

Stage-discharge relation. --Defined by current-meter measurements 1919-21 below 5,100 cfs; 1931-41 below 3,000 cfs, and extended above on basis of velocity-area studies.

Remarks. --Flood record unaffected by upstream irrigation diversions. Base for partial-duration series, 2,500 cfs.

\*Former town of Feldman now known as PZ Ranch.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1919	Aug. 2, 1919	<sup>a</sup> 6.3	<sup>c</sup> 20,000	1936	Feb. 15, 1936	7.57	3,800
1920	Jan. 5, 1920	<sup>a</sup> 4.03	<sup>c</sup> 7,400		July 22	7.2	3,220
1921	July 31, 1921	<sup>a</sup> 5.0	<sup>c</sup> 12,600		25	9.1	6,500
					Aug. 9	7.55	3,770
					Sept. 7	7.1	3,070
1931	Aug. 20, 1931	8.11	4,700	1937	Feb. 7, 1937	7.30	3,380
1932	Oct. 1, 1931	9.0	6,300	1938	Mar. 4, 1938	7.56	3,600
	Dec. 10	6.92	2,800	1939	Aug. 5, 1939	9.1	6,450
	Feb. 10, 1932	7.75	4,090		7	7.4	3,340
	Aug. 9	6.79	2,610		Sept. 8	7.3	3,170
1933	July 16, 1933	7.1	3,070		11	8.25	4,830
	23	10.5	9,340	1940	Oct. 7, 1939	8.35	4,920
1934	July 20, 1934	7.12	3,100		Feb. 23, 1940	7.20	3,080
	Aug. 30	6.85	2,700		June 23	6.97	2,600
1935	Jan. 6, 1935	7.75	4,090		26	7.22	2,950
	Feb. 7	8.0	4,500		Aug. 4	7.15	2,840
	Aug. 2	7.35	3,460		Sept. 21	8.6	5,480
	13	6.79	2,610	1941	Nov. 19, 1940	8.4	4,450
	15	10.9	10,200		Dec. 31	10.88	<sup>a</sup> 9,600
	24	10.3	8,900		Feb. 7, 1941	7.7	5,400
	29	10.2	8,690		Mar. 16	7.7	5,400

<sup>a</sup> From floodmarks.

<sup>c</sup> Annual peak.

<sup>s</sup> Probably annual peak; peaks July to September 1941 not known.

## FLOODS IN ARIZONA

## Gila River Basin

(48) Gila River at Kelvin, Ariz.

Location. --Lat 33°10", long. 110°58'45", in NW¼NW¼ sec. 12, T. 4 S., R. 13 E., at Kelvin, 1,000 ft downstream from Mineral Creek, 17 miles downstream from San Pedro River, and 19½ miles upstream from Ashurst-Hayden Dam.

Drainage area. --18,011 sq mi of which 5,125 sq mi is below Coolidge Dam.

Gage. --Recording gage at present site June 15 to Nov. 30, 1914, and since Sept. 1, 1915. Datum of gage is 1,743.22 ft above mean sea level, datum of 1929, supplementary adjustment of 1949. January 26, 1911, to June 14, 1914, staff gages at several sites within three-quarters of a mile downstream at different datums. December 1, 1914, to Aug. 31, 1915, staff gages and tape gage at several sites from 1 3/4 miles upstream to half a mile downstream except for March 1915 at Florence; all gage-height readings reduced to present datum.

Stage-discharge relation. --Defined by current-meter measurements below 38,000 cfs; extended above on basis of slope-area measurement at 82,000 cfs. Relation subject to minor shifts.

Historical data. --A peak discharge of 102,000 cfs, Feb. 22, 1891, by slope-area determination, was observed at station at the Buttes (15½ miles downstream). This flood was considered highest in at least the preceding 25-30 years. Flood of Nov. 28, 1905, was estimated as 190,000 cfs. Discussion of these floods and basis for estimates can be found in WSP 33 and House Document No. 791.

Remarks. --Early flood records unaffected by irrigation diversions above station. Since Nov. 15, 1928, flow from area above Coolidge Dam has been completely regulated, and flood records represent natural runoff from drainage area below the dam which is affected only to a minor extent by releases at the dam. Base for partial-duration series, 6,000 cfs prior to Nov. 15, 1928, 4,000 cfs thereafter.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1891	Feb. 22, 1891	-	<sup>t</sup> 102,000	1918	Aug. 6, 1918	7.9	15,100
1906	Nov. 28, 1905	-	<sup>b</sup> 190,000	1919	July 3, 1919	5.1	6,420
1912	Mar. 12, 1912	16.0	35,000		6	5.54	7,800
	July 25	<sup>b</sup> 10	12,500		16	7.55	14,200
	30	8.4	7,300		28	5.63	7,100
	Aug. 31	8.5	7,600		Aug. 3	9.2	20,800
					27	5.65	7,000
1913	Feb. 25, 1913	6.5	4,400	1920	Dec. 5, 1919	10.25	25,800
1914	Aug. 19, 1914	7.55	16,700		Feb. 11, 1920	6.4	9,200
	Sept. 15	4.68	6,700		21	7.3	13,000
	21	8.26	18,000	1921	July 11, 1921	5.5	6,000
1915	Oct. 6, 1914	5.6	8,500		28	6.25	8,500
	Dec. 21	14.0	55,000		31	9.8	24,000
	24	15.1	67,300		Aug. 9	-	<sup>b</sup> 7,000
	Jan. 1, 1915	7.1	12,800		22	<sup>b</sup> 8.1	16,000
	30	15.0	66,000	1922	Aug. 22, 1922	4.25	2,800
	Feb. 21	8.6	18,600	1923	July 14, 1923	6.9	11,700
	Mar. 27	<sup>b</sup> 4.9	6,000		23	6.2	8,500
	Apr. 1	<sup>b</sup> 5.0	6,400		Aug. 11	<sup>b</sup> 6.4	9,700
	8	<sup>b</sup> 5.4	7,800		13	6.6	10,500
	July 26	<sup>b</sup> 7.3	13,200		16	6.35	9,500
1916	Jan. 20, 1916	19.5	132,000		Sept. 12	5.5	6,450
	29	10.35	27,000	1924	Dec. 29, 1923	6.9	11,700
	Mar. 24	5.50	6,400	1925	Aug. 6, 1925	5.50	6,420
	Sept. 9	7.0	11,600		30	5.4	6,100
1917	Oct. 15, 1916	14.0	55,000		Sept. 4	6.9	11,200
	Jan. 23, 1917	-	<sup>b</sup> 20,000		18	5.77	7,250

## GAGING-STATION RECORDS

71

## Gila River Basin

(48) Gila River at Kelvin, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1926	Apr. 7, 1926	5.95	8,000	1938	Aug. 5, 1938	6.55	5,660
	Sept. 28	16.2	82,000		8	6.45	5,360
1927	Feb. 18, 1927	6.15	8,570	1939	Aug. 3, 1939	6.55	5,470
	Sept. 12	5.76	6,870		7	7.63	9,320
1928	Aug. 2, 1928	7.05	12,000	1940	Aug. 14, 1940	12.06	38,200
	28	6.25	8,640		Sept. 12	6.0	4,040
1929	July 30, 1929	5.68	6,500	1941	Dec. 24, 1940	7.10	7,170
	Aug. 1	6.00	7,330		31	10.06	23,300
	8	5.32	5,120		Feb. 7, 1941	6.07	4,160
	Sept. 24	7.22	11,600		Mar. 15	8.85	11,600
1930	Mar. 18, 1930	4.90	4,020		July 23	7.77	6,270
	July 8	5.69	5,690		Aug. 9	6.82	4,450
	10	5.76	6,310		17	6.70	4,170
	20	6.02	7,500		Sept. 28	7.09	5,410
	Aug. 8	12.6	42,800	1942	Aug. 9, 1942	6.35	3,300
	Sept. 7	5.05	4,360	1943	Jan. 23, 1943	7.26	5,960
1931	Feb. 16, 1931	5.97	6,030		Mar. 5	6.64	4,040
	Aug. 3	5.02	4,020		Aug. 10	7.0	5,300
	10	7.65	11,800		Sept. 26	7.30	6,290
	30	10.6	28,600	1944	Aug. 9, 1944	10.95	28,000
	Sept. 19	5.18	4,020		Sept. 25	6.8	4,710
1932	Oct. 2, 1931	7.5	12,800	1945	Aug. 10, 1945	9.10	9,200
	Dec. 10	5.50	4,850	1946	Aug. 5, 1946	7.92	6,440
	Feb. 10, 1932	6.0	6,060		21	6.87	4,320
	July 1	5.31	4,850		Sept. 19	7.35	5,300
	Aug. 10	5.34	4,950	1947	Aug. 8, 1947	8.67	10,000
1933	July 24, 1933	6.45	8,800		Sept. 8	6.98	4,730
	Aug. 20	5.27	4,390		20	7.05	4,860
1934	July 20, 1934	5.26	4,590	1948	Aug. 3, 1948	7.70	5,850
	Aug. 23	5.82	6,750	1949	July 31, 1949	6.91	4,740
	Sept. 23	5.47	5,140		Aug. 8	7.07	5,230
1935	Jan. 6, 1935	5.25	4,390		Sept. 13	6.68	4,500
	Feb. 7	5.90	6,670		15	7.12	5,610
	Aug. 2	6.10	7,400	1950	July 21, 1950	6.88	4,330
	10	5.02	4,060		30	7.91	6,920
	15	6.44	9,030	1951	Aug. 3, 1951	9.99	13,200
	24	8.4	12,200	1952	Jan. 14, 1952	7.57	5,430
	29	9.30	21,000	1953	July 7, 1953	7.1	4,210
	Sept. 1	5.50	7,400		30	6.7	4,140
1936	July 26, 1936	5.30	4,780				
	Aug. 9	6.38	8,310				
	Sept. 11	7.45	12,600				
1937	Feb. 7, 1937	6.60	8,740				
	Aug. 21	6.94	10,200				

b Estimated

t Maximum peak discharge during period Aug. 26, 1889, to September 1899.

Note. --Contributing drainage area reduced to 5,125 sq mi. since Nov. 15, 1928.



## Gila River Basin

(49) Queen Creek at Whitlow dam site, near Superior, Ariz.\*

Location. --Lat 33°17'55", long. 111°16'25", in NW¼SE¼ sec. 36, T. 1 S., R. 10 E., at Whitlow dam site, 2½ miles upstream from Whitlow Canyon, 4 miles northeast of Florence Junction, and 10 miles west of Superior.

Drainage area. --144 sq mi.

Gage. --Recording gage and concrete control since May 1, 1948. Datum of gage is 2,048.96 ft above mean sea level, datum of 1929, supplementary adjustment of 1949. January 25, 1896, to Sept. 30, 1920, staff gages at various sites and datums within 1 mile downstream.

Stage-discharge relation. --At present site, defined by current-meter measurements below 1,600 cfs and extended above on basis of slope-area measurement at gage height 8.40 ft. Relation at former site poorly defined, extended above 90 cfs on basis of slope-area measurement at 600 cfs.

Remarks. --Flood records not affected by small diversions above gage. No flood records available prior to 1917. Base for partial-duration series, 500 cfs.

\*Published as "near Superior", 1915-20.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1917	May 20, 1917	<sup>a</sup> 6.0	<sup>c</sup> 2,800	1950	July 18, 1950	8.40	5,100
1918	Aug. 5, 1918	<sup>a</sup> 8.0	<sup>c</sup> 5,000		22	6.65	2,690
1919	Aug. 1, 1919	<sup>a</sup> 11.0	<sup>c</sup> 10,000		Aug. 5	5.80	1,790
1920	Feb. 20, 1920	<sup>a</sup> 4.5	<sup>c</sup> 750	1951	Jan. 30, 1951	4.70	840
1939	Aug. 6, 1939	-	<sup>c</sup> 13,200		July 27	4.59	664
1948	July 21, 1948	4.46	676		Aug. 3	5.51	1,510
1949	Dec. 27, 1948	4.28	568		3	4.41	646
	July 20, 1949	4.75	670		Aug. 26	5.30	1,320
	22	6.60	2,630	1952	Dec. 31, 1951	4.85	1,130
	23	4.70	805		Jan. 13, 1952	4.20	640
	Aug. 6	4.65	805		18	5.12	1,170
	8	5.72	1,710		Mar. 17	4.65	624
				1953	Feb. 28, 1953	4.64	632
					Mar. 2	5.10	1,020
					July 29	5.86	1,780

<sup>a</sup> From floodmarks.

<sup>c</sup> Annual peak.

<sup>u</sup> By slope-area determination. Floodmarks indicate a previous stage 1½ ft higher.

## GAGING-STATION RECORDS

73

Gila River Basin

(50) Gila River near Laveen, Ariz.

Location. --Lat 33°15', long, 112°10', in SW¼NW¼ sec. 16, T. 2 S., R. 2E., on Gila River Indian Reservation, at highway bridge 1½ miles south of Komatke, 8 miles south of Laveen, and 8 miles upstream from Santa Cruz River.

Drainage area. --20,615 sq mi of which 7,729 sq mi is below Coolidge Dam.

Gage. --Recording gage above concrete diversion dam on main channel since Jan. 1, 1940, and auxiliary recorder on overflow channel at highway bridge a quarter of a mile south since Mar. 18, 1942. Datum of principal gage is 1,018.90 ft above mean sea level, datum of 1929, supplementary adjustment of 1949, and datum of auxiliary gage is 0.23 ft lower. Staff gage at site of auxiliary gage Oct. 16, 1940, to Mar. 17, 1942.

Stage-discharge relation. --Defined by current-meter measurements. Relation is complex owing to operational procedures at the dam and is subject to large shifts during flood periods.

Remarks. --Flood records represent runoff from drainage area below Coolidge Dam and may be slightly affected by irrigation diversions above station. Base for partial-duration series, 700 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	Aug. 17, 1940	9.21	8,740	1946	Oct. 6, 1945	5.63	1,250
1941	Nov. 20, 1940	5.75	1,610		Aug. 6, 1946	5.76	1,180
	Dec. 26	5.49	1,440		Sept. 20	6.26	1,260
	Jan. 2, 1941	9.33	11,900				
	13	5.08	1,040	1948	July 26, 1948	5.70	1,280
	30	5.72	1,720		Aug. 5	6.09	1,430
	Feb. 9	6.19	1,830				
	26	5.21	1,600	1949	July 25, 1949	6.22	880
	Mar. 17	7.80	4,710		Aug. 1	5.90	755
	July 24	5.00	1,420		10	6.64	1,250
	Aug. 11	5.42	1,730		Sept. 14	5.96	776
	18	5.43	1,750		17	6.68	1,210
1942	Sept. 19	5.14	1,560	1950	July 9, 1950	5.72	706
	29	5.62	1,800		19	6.08	777
					23	6.80	1,040
	Dec. 12, 1941	4.90	1,170		Aug. 2	7.22	1,500
					6	7.02	1,160
1943	Jan. 25, 1943	4.68	714	1951	Aug. 5, 1951	6.93	1,100
	Mar. 6	5.13	1,550		29	7.29	1,210
	Aug. 4	4.70	702	1952	Jan. 15, 1952	6.70	871
	11	5.41	1,470		20	7.03	1,070
	15	4.70	730	1953	July 31, 1953	6.76	565
1944	Sept. 27	5.78	1,570				
	Aug. 11, 1944	5.83	1,330				
1945	Aug. 13, 1945	7.42	2,800				

## FLOODS IN ARIZONA

Gila River Basin

## (51) Santa Cruz River near Lochiel, Ariz.

Location. --Lat 31°21'20", long. 110°35'25", in SW $\frac{1}{4}$  sec. 11, T. 24 S., R. 17 E., unsurveyed, at bridge on county road on southern border of Spanish land grant of San Rafael,  $1\frac{1}{2}$  miles upstream from international boundary, and  $2\frac{1}{2}$  miles northeast of Lochiel.

Drainage area. --82.2 sq mi.

Gage. --Recording gage since January 1949. Altitude of gage is 4,620 ft (from topographic map).

Stage-discharge relation. --Defined by current-meter measurements below 1,400 cfs; extended above on basis of slope-area determination at gage height 6.75 ft. Relation subject to minor shifts.

Remarks. --Flood record unaffected by small irrigation diversions above station. Base for partial-duration series, 1,000 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1949	Aug. 8, 1949	5.70	1,600	1951	Aug. 2, 1951	5.65	2,560
	Sept. 13	5.75	1,650				
1950				1952	Aug. 16, 1952	3.71	550
	July 8, 1950	6.65	4,300	1953	July 7, 1953	4.80	1,730
	20	5.43	2,240		13	5.20	2,180
	22	6.38	3,790		14	6.05	3,320
	30	6.75	4,520		15	4.57	1,500
	Aug. 5	6.74	4,490		30	4.55	1,480

## (52) Santa Cruz River near Nogales, Ariz.

Location. --Lat 31°20'40", long. 110°51'05", in NW $\frac{1}{4}$  sec. 18, T. 24 S., R. 15 E., unsurveyed, in Spanish land grant of Buena Vista, three-quarters of a mile downstream from international boundary,  $5\frac{1}{4}$  miles upstream from Yerba Buena dam site, and  $5\frac{1}{2}$  miles east of Nogales.

Drainage area. --532 sq mi, (includes about 348 sq mi in Mexico).

Gage. --Staff gage May 5 to June 2, 1930, and recording gage thereafter. Datum of gage is 3,702.54 ft above mean sea level, datum of 1929 (levels by International Boundary and Water Commission).

Stage-discharge relation. --Defined by current-meter measurements below 2,300 cfs; extended above on basis of slope-area determinations at gage height 9.5 ft, 10.9 ft, and 12.03 ft. Relation subject to extreme shifting.

Remarks. --Flood records unaffected by irrigation diversions above station. Records were obtained for period 1913-22 at Yerba Buena dam site,  $5\frac{1}{4}$  miles downstream, but did not adequately define peak flow periods and are not included here. Base for partial-duration series, 2,000 cfs.

## GAGING-STATION RECORDS

75

## Gila River Basin

(52) Santa Cruz River near Nogales, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)	
1930	July 22, 1930	6.20	2,400	1942	July 8, 1942	10.9	8,200	
	26	6.45	2,700		14	7.4	2,400	
	Aug. 7	8.55	5,400		24	7.7	2,900	
1931	Aug. 7			Aug. 7	9.26	5,100		
	July 30, 1931	6.75	2,900	9	10.0	6,410		
	Aug. 4	7.45	4,150	1943	July 19, 1943	7.15	2,120	
	6	6.8	3,000		30	9.45	5,300	
	9	6.52	2,600		Aug. 2	7.3	2,270	
Sept. 14	6.1	2,050	13		7.7	2,720		
1932	Jan. 14, 1932	7.0	3,500		1944	Aug. 15, 1944	9.15	4,700
	July 8	9.5	6,400	1945		July 30, 1945	8.35	3,290
	29	6.7	3,100		1946	July 26, 1946	12.03	7,200
	Aug. 9	7.9	4,500			29	7.55	3,110
	26	5.82	2,270	Aug. 3		9.75	5,440	
1933	Sept. 19, 1933	5.5	1,900	11	7.75	3,300		
1934	Aug. - 1934	9.0	5,900	19	9.65	5,320		
				Sept. 9	9.30	4,910		
1935	July 31, 1935	6.0	2,740	1947	Aug. 8, 1947	6.90	2,460	
	Aug. 12	6.2	3,000		29	7.05	2,550	
	14	6.05	2,800	1948	Aug. 1, 1948	7.9	3,410	
	23	8.25	5,000		6	7.5	3,010	
	28	5.65	2,310		11	7.35	2,730	
	31	12.3	12,000	15	7.95	2,930		
1936	June 26, 1936	6.51	3,200	1949	July 3, 1949	7.6	2,750	
	July 25	6.70	3,400		17	7.1	2,300	
	Aug. 4	5.95	2,600		20	9.9	5,350	
1937	Aug. 9	7.34	4,050	29	7.8	3,310		
	Aug. 16, 1937	6.80	2,400	Aug. 8	7.7	2,840		
	22	7.10	2,300	Sept. 14	10.5	6,350		
	28	6.90	2,100	1950	July 7, 1950	6.95	2,210	
1938	July 28, 1938	7.45	2,200		17	10.32	5,890	
	1939	July 18, 1939	7.05		2,020	20	11.16	7,210
21		7.95	3,020		22	9.36	4,670	
Aug. 2		7.5	2,490		31	8.90	4,060	
6		8.67	4,030	1951	July 28, 1951	7.85	2,840	
13		10.3	7,010		Aug. 3	7.95	3,040	
28	7.5	2,490	1952		July 29, 1952	7.02	2,330	
1940	Aug. 4, 1940	6.80		1,800	Aug. 16	7.00	2,000	
1941	July 21, 1941	7.0	1,980	1953	July 14, 1953	8.25	3,500	

<sup>v</sup> Annual peak; peaks October 1929 to April 1930 not known.<sup>w</sup> Annual peak; other peaks January to September 1934 not known.



## FLOODS IN ARIZONA

## Gila River Basin

(53) Sonoita Creek near Patagonia, Ariz.

Location. --Lat 31°30'00", long. 110°49'00", in SE $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 21, T. 22 S., R. 15 E., at site of former railroad bridge at Circle Z Ranch, 5 miles downstream from Patagonia.

Drainage area. --209 sq mi.

Gage. --Recording gage at present site since Apr. 1, 1940. Datum of gage is 3,818.61 ft above mean sea level, datum of 1929. June 21, 1930, to Mar. 5, 1940, recording gage 2,700 ft downstream at datum 18.00 ft lower. June 11-21, 1930, and Mar. 6-31, 1940, staff gages at same site and datum.

Stage-discharge relation. --Defined by current-meter measurements below 3,400 cfs; extended above on basis of slope-area determination at gage height 13.0 ft.

Remarks. --Flood record not affected by small diversions for irrigation and mining above station. Base for partial-duration series, 1,200 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1930	June 22, 1930	6.25	1,540	1940	July 17, 1940	7.28	1,480
	July 8	6.75	2,030		24	7.12	1,340
	20	6.3	1,590		Aug. 13	8.42	2,580
	26	5.9	1,220	1941	Aug. 9, 1941	8.02	2,150
	Aug. 7	7.3	2,600				
1931	Feb. 12, 1931	6.29	1,270	1942	Sept. 12, 1942	6.7	1,000
	15	6.5	1,450	1943	July 6, 1943	7.0	1,260
	July 28	6.95	1,900		14	7.67	1,820
1932	July 26, 1932	6.75	1,700		19	7.12	1,340
					Aug. 2	7.80	2,050
1933	July 15, 1933	6.0	1,050		5	7.65	1,900
1934	Aug. - 1934	15.2	11,000	28	9.95	4,530	
				1944	Aug. 9, 1944	6.22	669
1935	July 18, 1935	9.1	3,900	1945	July 18, 1945	7.05	1,580
	Aug. 1	7.25	2,160		31	7.85	2,260
	23	9.8	4,700		Aug. 1	7.5	1,990
	28	7.25	2,160		4	6.91	1,450
	31	9.55	4,400		6	8.70	3,140
	Sept. 23	8.10	3,000	10	7.25	1,810	
1936	July 7, 1936	7.45	2,540	1946	Sept. 8	6.70	1,270
	9	6.07	1,210		Oct. 8, 1945	7.08	1,470
	20	6.06	1,210		July 3, 1946	7.65	2,100
	Aug. 7	7.1	2,170		Aug. 20	7.65	2,100
	9	8.36	3,600		Sept. 10	8.25	2,900
1937	July 27, 1937	6.94	2,020	30	13.0	14,000	
	Aug. 20	6.70	1,770	1947	July 20, 1947	7.45	1,860
	Sept. 6	8.70	3,600		Aug. 12	7.60	2,360
1938	Sept. 9, 1938	8.2	3,400	1948	Aug. 1, 1948	7.25	2,020
1939	July 30, 1939	7.80	2,700		5	7.92	2,880
	Aug. 2	7.90	2,800		9	6.57	1,300
	4	6.60	1,550		11	7.70	2,580
	8	8.45	3,300		15	9.1	4,750
	11	7.4	2,300				
	24	6.2	1,200				
	Sept. 3	7.10	2,000				

## GAGING-STATION RECORDS

77

## Gila River Basin

(53) Sonoita Creek near Patagonia, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1949	July 6, 1949	6.7	1,330	1951	Aug. 2, 1951	8.65	5,030
	23	7.7	2,450		14	6.40	1,290
	Aug. 8	9.4	5,790		Sept. 6	6.97	2,200
	Sept. 9	7.20	1,580	1952	Aug. 14, 1952	7.78	3,630
	13	8.20	3,130		26	7.00	2,280
1950	July 17, 1950	7.22	1,800	1953	July 6, 1953	7.35	2,780
	20	7.10	1,740		14	7.4	2,870
	22	7.13	2,520		30	7.20	2,510
	30	9.80	7,300				
	Aug. 10	6.46	1,400				

<sup>a</sup> From floodmark.<sup>c</sup> Annual peak.<sup>v</sup> Annual peak; peaks prior to June 21 not known.

(54) Santa Cruz River at Continental, Ariz.

Location. --Lat 31°51'10", long. 110°58'40", in NE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 23, T. 18 S., R. 13 E., unsurveyed, in Spanish land grant of San Ignacio de la Canoa, on bridge on U. S. Highway 89 at Continental.

Drainage area. --1,662 sq mi (includes about 395 sq mi in Mexico.)

Gage. --Recording gage May 1940 to December 1946, and since October 1951. Datum of gage is 2,836.74 ft above mean sea level, datum of 1929, adjustment of 1952.

Stage-discharge relation. --Defined by current-meter measurements below 5,200 cfs; extended above on basis of float-area determination at gage height 8.85 ft. Relation subject to shifting.

Remarks. --Flood record unaffected by irrigation diversions above station. Base for partial-duration series, 2,000 cfs.

## FLOODS IN ARIZONA

Gila River Basin

(54) Santa Cruz River at Continental, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	Aug. 14, 1940	8.85	12,100	1946	Oct. 8, 1945	5.50	3,670
1941	July 23, 1941	5.18	3,190		July 18	5.48	2,800
	Aug. 9	5.4	3,670		27	6.00	3,860
1942	July 28, 1942	4.95	2,700		Aug. 2	5.78	3,490
	Aug. 9	4.70	2,200		4	5.40	2,590
1943	Aug. 1, 1943	5.55	4,000		20	5.30	2,390
	4	4.99	2,810		Sept. 9	5.94	4,120
	23	5.14	3,120		27	5.17	2,150
	25	4.60	2,010	1947	Oct. 1, 1946	6.40	5,330
	28	5.07	3,020	1952	Aug. 15, 1952	4.20	1,820
1944	Aug. 8, 1944	5.55	3,860	1953	July 14, 1953	6.15	4,910
	12	5.80	4,440		15	5.0	2,920
	16	5.30	3,200		16	6.20	4,910
1945	Oct. 27, 1944	4.91	2,510				
	July 4, 1945	4.80	2,390				
	28	6.40	5,910				
	29	5.41	3,670				
	31	5.13	3,120				
	Aug. 1	5.90	4,770				
	5	5.42	3,670				
	7	4.85	2,500				
	9	7.25	7,820				
	20	5.82	4,550				
	Sept. 8	4.90	2,600				

## GAGING-STATION RECORDS

79

Gila River Basin

(55) Santa Cruz River at Tucson, Ariz.

Location. --Lat 32°13'15", long. 110°58'50", in NE¼NE¼ sec. 14, T. 14 S., R. 13 E., at Congress Street Bridge in Tucson.

Drainage area. --2,207 sq mi (includes about 395 sq mi in Mexico).

Gage. --Recording gage since Nov. 27, 1929. Datum of gage is 2,327.16 ft above mean sea level, datum of 1929. October 1905 to Nov. 27, 1929, non-recording gages at same site but various datums.

Stage-discharge relation. --Defined by current-meter measurements below 9,000 cfs and extended above. Relation subject to large shifts.

Historical data. --Flood of Dec. 23, 1914, was reported to be the greatest since 1905 (from University of Arizona Technical Bulletin No. 95 and earlier publications).

Remarks. --Flood records unaffected by various small diversions above station. Records prior to December 1925 furnished by University of Arizona, Agricultural Engineering Department. Flood data not available for period prior to water year 1915.

Base for partial-duration series, 1,700 cfs.

Bank-full stage. --15 ft.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1915	Dec. 23, 1914	-	15,000	1932	July 9, 1932	9.26	4,160
1916	Jan. 20, 1916	-	5,000		30	9.27	4,200
1917	Sept. 8, 1917	-	7,500		Aug. 9	8.70	3,070
1918	Aug. 7, 1918	-	4,900	1933	July 24, 1933	8.66	3,000
1919	Aug. 2, 1919	-	4,700		Aug. 21	10.1	6,100
1920	Aug. 9, 1920	-	1,950		Sept. 10	8.84	3,330
1921	Aug. 1, 1921	-	4,000		17	9.35	4,340
1922	July 20, 1922	-	2,000	1934	Aug. 3, 1934	8.02	1,960
1923	Aug. 17, 1923	-	1,900		23	10.07	6,000
1924	Nov. 17, 1923	-	2,050		27	8.21	2,250
1925	Sept. 18, 1925	7.5	3,400	1935	July 17, 1935	7.76	1,730
1926	Sept. 28, 1926	19.5	11,400		18	7.90	1,900
1927	Sept. 7, 1927	15.5	1,950		Aug. 24	9.42	4,130
1928	Aug. 1, 1928	14.6	1,600		Sept. 1	12.25	10,300
1929	Sept. 24, 1929	19.2	10,400	1936	July 26, 1936	10.00	5,400
1930	Aug. 7, 1930	8.00	1,770		Aug. 8	8.00	1,740
1931	Feb. 16, 1931	7.67	2,060	1937	July 10, 1937	9.10	3,280
	July 30	8.92	3,480		Aug. 20	7.75	1,900
	Aug. 6	7.92	2,170		24	8.08	1,920
	10	11.3	9,200	1938	July 25, 1938	7.98	1,920
	21	8.87	2,840		Aug. 5	11.70	9,000
					13	8.95	3,080
				1939	July 4, 1939	7.9	1,800
					Aug. 3	12.32	8,000
					5	10.72	5,300
					7	11.5	6,650
					14	9.83	3,560
					29	9.92	3,730



## FLOODS IN ARIZONA

## Gila River Basin

(55) Santa Cruz River at Tucson, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	July 17, 1940	7.76	1,890	1947	Oct. 1, 1946	7.20	2,960
	Aug. 14	13.05	11,300	1948	Aug. 8, 1948	6.05	2,820
1941	July 23, 1941	7.68	1,740		16	6.9	3,860
	Aug. 5	7.76	1,840		Sept. 27	5.15	1,940
	14	8.48	2,490	1949	July 23, 1949	5.05	2,010
1942	Aug. 9, 1942	7.19	1,670		Aug. 5	5.60	2,670
1943	Aug. 2, 1943	9.85	4,510		8	6.63	3,800
	15	7.45	1,800		Sept. 10	5.00	1,960
	Sept. 24	7.55	1,900		14	5.25	2,210
					15	5.55	2,540
1944	Aug. 8, 1944	7.28	2,100	1950	July 8, 1950	5.15	1,800
	13	7.66	2,450		18	6.30	4,570
	16	10.40	6,530		22	8.10	7,990
	Sept. 15	8.10	3,070		30	8.8	9,490
1945	July 28, 1945	8.30	3,740		Aug. 11	6.0	3,770
	30	9.60	5,360		12	5.0	2,340
	Aug. 2	7.60	2,450	1951	July 16, 1951	5.20	2,300
	10	12.70	10,800		27	4.70	1,900
	21	7.60	2,270		Aug. 2	6.51	5,020
1946	July 18, 1946	6.15	2,120	1952	Aug. 12, 1952	3.90	1,780
	28	5.90	1,890		16	5.10	3,820
	Aug. 4	8.05	4,260		Sept. 20	4.22	2,260
	20	6.28	2,230		21	4.17	2,180
	31	7.15	3,180	1953	July 15, 1953	6.80	5,900
	Sept. 10	6.75	2,530		16	5.7	3,950
	27	6.02	1,790		29	4.24	2,000

° Annual peak.

Gila River Basin

(56) Tucson Arroyo at Vine Avenue, Tucson, Ariz.

Location. --Lat 32°13'00", long. 110°57'00", in SW $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 18, T. 14 S., R. 14 E., at Vine Avenue, a quarter of a mile downstream from Arroyo Chico, and 2 $\frac{1}{2}$  miles upstream from mouth.

Drainage area. --27.0 sq mi before August 1945 and 23.4 sq mi thereafter.

Gage. --Recording gage and concrete control since June 1944. Datum of gage is 2,411.9 ft above mean sea level (city of Tucson benchmark).

Stage-discharge relation. --Defined by current-meter measurements below 1,800 cfs; extended above on basis of conveyance-extension determination of peak flow at gage height 9.9 ft.

Remarks. --Runoff characteristics of this drainage area have been modified to some extent by cultural development within the period of record.

Base for partial-duration series, 150 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	Aug. 13, 1940	<sup>a</sup> 9.2	<sup>c</sup> 2,700	1948	July 24, 1948	9.9	4,100
1943	Sept. 24, 1943	<sup>a</sup> 9.2	<sup>c</sup> 2,700		Aug. 4	5.13	300
					Sept. 18	4.64	190
1944	July 22, 1944	6.43	676	1949	Aug. 8, 1949	5.02	198
	Aug. 9	4.47	156		Sept. 13	4.87	212
	16	5.82	486		28	5.56	364
	Sept. 15	6.39	663	1950	July 22, 1950	5.18	312
1945	July 28, 1945	6.98	877		30	7.40	1,160
	Aug. 9	6.82	816		Aug. 12	4.56	174
	17	5.64	434		Sept. 7	5.13	300
	21	6.56	719	1951	Apr. 19, 1951	4.68	198
1946	July 17, 1946	6.45	682		Aug. 2	6.43	676
	Aug. 3	6.90	850	1952	Oct. 30, 1951	4.98	263
	5	4.95	252		Aug. 14, 1952	6.55	716
	Sept. 30	5.93	519		15	8.04	1,780
1947	Nov. 24, 1946	4.42	149	1953	July 12, 1953	4.60	182
					14	9.40	3,240
					26	5.56	413

<sup>a</sup> From floodmark.

<sup>c</sup> Annual peak.

## FLOODS IN ARIZONA

Gila River Basin

(57) Sabino Creek near Mount Lemmon, Ariz.

Location. --Lat 32°25'20", long. 110°45'05" in SE $\frac{1}{4}$ NW $\frac{1}{4}$  sec. 6, T. 12 S., R. 16 E., 250 ft below Bear Wallow Creek, 1 $\frac{1}{2}$  miles south of Mount Lemmon post office, and 18 miles northeast of Tucson.

Drainage area. --3.19 sq mi.

Gage. --Recording gage since May 1951. Altitude of gage is 7,250 ft (from topographic map).

Stage-discharge relation. --Defined by current-meter measurements below 50 cfs; extended above on basis of slope-area determination in 1954 at gage height 11.3 ft. Relation is stable.

Remarks. --No regulation and only small diversions for domestic use above station.

Base for partial-duration series, 50 cfs.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1951	July 23, 1951	8.5	180	1953	July 8, 1953	8.96	210
	Aug. 2	7.65	126		12	8.94	208
	27	6.4	50		16	9.12	219
1952	Nov. 11, 1951	6.56	59		17	7.00	85
	Dec. 31	8.0	148		24	7.09	91
	Jan. 13, 1952	9.8	262				
	18	7.25	100				

Gila River Basin

(58) Sabino Creek near Tucson, Ariz.

Location. --Lat 32°19'00", long. 110°48'35", in SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 9, T. 13 S., R. 15 E., half a mile north of Coronado National Forest boundary, 1 3/4 miles upstream from Bear Canyon, and 12 miles northeast of business center of Tucson.

Drainage area. --35.5 sq mi.

Gage. --Recording gage and concrete control since June 27, 1932. Altitude of gage is 2,630 ft (from topographic map by Forest Service).

Stage-discharge relation. --Defined by current-meter measurements. Relation subject to shifting in higher range.

Remarks. --Flood record unaffected by several small dams above station.

Base for partial-duration series, 150 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1932	July 15, 1932	5.45	706	1941	Nov. 19, 1940	4.62	483
	26	5.00	582		Dec. 12	4.38	398
	30	4.82	530		17	3.38	187
	Aug. 9	3.30	199		24	5.70	1,180
	25	3.04	158		30	7.13	3,180
1933	Sept. 8, 1933	3.40	215	1942	Jan. 28, 1941	3.27	172
	10	4.73	510		Feb. 7	3.41	192
					23	3.21	165
1934	Aug. 12, 1934	3.13	176		Mar. 15	4.67	525
	Sept. 22	4.59	472		July 24	4.38	516
1935					Sept. 28	3.68	282
	Jan. 6, 1935	4.46	439	1943	Nov. 13, 1941	4.19	398
	Feb. 6	4.85	540		Dec. 11	3.87	291
	Aug. 1	3.26	184		Feb. 28, 1942	4.23	414
	24	3.15	166		Sept. 10	4.34	449
	Sept. 2	3.63	252	1944	Mar. 5, 1943	4.56	567
1936	Jan. 29, 1936	4.69	500		Aug. 4	3.40	212
	July 30	3.90	318		6	3.25	182
	Aug. 9	3.57	254		14	3.14	163
	Sept. 11	3.95	328				
1937	Feb. 7, 1937	6.51	2,020	1945	July 8, 1944	3.31	175
	16	3.53	233		Aug. 9	3.28	170
	Mar. 16	4.50	451	1946	July 29, 1945	4.37	484
1938	Feb. 27, 1938	3.54	255		30	5.15	916
	Mar. 3	7.13	3,200		Aug. 9	3.30	192
	Aug. 7	3.30	220	1947	Sept. 8	4.04	375
	31	3.52	250		Oct. 9, 1945	3.43	219
1939	Aug. 2, 1939	2.95	152		Aug. 23, 1946	6.30	2,000
	6	3.96	385	1948	31	3.46	225
1940	Feb. 2, 1940	3.99	396		Dec. 26, 1946	3.47	227
	23	4.98	904		Aug. 6, 1948	4.06	380
	June 21	4.48	431		11	3.30	192



Gila River Basin

(58) Sabino Creek near Tucson, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1949	Dec. 27, 1948	5.15	916	1952	Oct. 30, 1951	4.96	675
	Jan. 9, 1949	3.88	277		Nov. 11	5.90	1,290
	13	4.41	461		Dec. 31	6.05	1,410
	July 30	3.57	250		Jan. 13, 1952	6.25	1,640
	Aug. 8	5.78	1,430		18	4.93	675
	Sept. 13	4.22	430		Mar. 18	3.32	161
1950	July 7, 1950	6.50	2,260	1953	Aug. 24	3.38	169
	Aug. 23	4.25	440		July 16, 1953	5.31	861
					24	3.19	157
1951	July 23, 1951	4.1	340				
	Aug. 2	5.11	750				
	27	4.12	346				

<sup>v</sup> Peaks prior to June 27, 1932 not known.

(59) Rillito Creek near Wrightstown, Ariz.

Location. --Lat 32°15'55", long. 110°50'25", in NE¼NE¼ sec. 31, T. 13 S., R. 15 E., at highway bridge 1 mile downstream from Sabino Creek, 2 miles upstream from Pantano Wash, and 3½ miles northwest of Tucson.

Drainage area. --221 sq mi.

Gage. --Recording gage since June 21, 1940. Altitude of gage is 2,460 ft (from topographic map).

Stage-discharge relation. --Defined by current-meter measurements. Relation subject to shifting.

Remarks. --No significant regulation or diversion above station.

Base for partial-duration series, 400 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	Feb. 23, 1940	-	<sup>b</sup> 700	1942	Dec. 12, 1941	4.09	536
	Aug. 13	7.8	6,400		Feb. 28, 1942	4.12	639
1941	Dec. 12, 1940	4.25	995	1943	Mar. 5, 1943	4.59	1,090
	25	5.33	2,140		Aug. 15	4.53	1,070
	30	7.85	9,000	1944	July 22, 1944	3.94	547
	Jan. 28, 1941	4.60	906		Aug. 9	4.20	825
	Feb. 7	5.24	1,800	1945	July 29, 1945	3.76	411
	23	4.11	507		Aug. 9	3.97	573
	Mar. 15	4.84	1,540				
	July 23	4.67	1,020				

<sup>b</sup> Estimated.

Gila River Basin

(60) Rillito Creek near Tucson, Ariz.

Location. --Lat 32°17'40", long. 110°59'05", in SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 14, T. 13S., R. 13 E., 1,100 ft downstream from Pima Canyon, 2,300 ft downstream from bridge on U. S. Highway 89, 4  $\frac{3}{4}$  miles upstream from mouth, and 5 miles north of Tucson.

Drainage area. --918 sq mi; prior to July 1945, 904 sq mi.

Gage. --Recording gage at present site since July 19, 1945. Datum of gage is 2,288.23 ft above mean sea level, datum of 1929, supplementary adjustment of 1949. October 1908 to July 19, 1945, recording gage (after July 25, 1930), or staff gages at site of former highway bridge 1,800 ft upstream at various datums.

Stage-discharge relation. --Defined by current-meter measurements below 12,000 cfs, and extended above on basis of area-velocity studies. Relation subject to large shifts.

Historical data. --Flood of Dec. 23, 1914 was the greatest known in period 1908-15.

Remarks. --Flood record not affected by small irrigation diversions above station. Records prior to 1926 were furnished by University of Arizona, Agricultural Engineering Department, and reviewed by U.S.G.S.

Base for partial-duration series, 1,000 cfs.

Bank full stage. --6 ft, present site and datum.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1915	Dec. 23, 1914	7.75	17,000	1931	Feb. 16, 1931	6.6	1,840
1916	Jan. 19, 1916	6.5	7,620		Aug. 6	7.16	3,110
					8	8.17	6,120
1917	Aug. 11, 1917	-	10,000		10	8.45	7,200
1918	Mar. 1, 1918	-	5,300		14	6.35	1,090
					20	6.9	2,080
1919	July 27, 1919	-	9,250	1932	Nov. 22, 1931	7.10	2,550
1920	Feb. 21, 1920	-	7,800		Feb. 10, 1932	6.86	1,970
1921	July 31, 1921	-	16,000		July 8	6.90	2,060
1922	Aug. 9, 1922	7.0	3,250		29	8.7	7,200
1923	Aug. 26, 1923	-	4,000	1933	Oct. 12, 1932	7.13	2,630
1924	Dec. 26, 1923	6.3	1,980		Sept. 10, 1933	7.65	4,400
1925	Sept. 17, 1925	-	3,500	1934	July 17, 1934	7.25	3,000
1926	Sept. 27, 1926	17.7	1,750		Aug. 23	7.2	2,820
1927	Sept. 12, 1927	18.2	2,200	1935	Jan. 6, 1935	7.4	2,420
1928	Aug. 1, 1928	19.0	4,500		Feb. 8	6.69	1,050
1929	Sept. 23, 1929	24.0	24,000		July 31	7.58	2,640
1930	Mar. 17, 1930	17.0	1,920		Aug. 24	8.45	4,850
	July 9	17.0	1,310		31	10.18	13,400
	13	17.0	1,030	1936	Jan. 30, 1936	6.71	1,130
	20	7.4	4,540		July 26	6.97	1,270
	22	6.35	1,670		Aug. 9	8.0	3,210
	25	6.9	2,910		17	8.25	4,500
	Aug. 8	7.76	4,600	1937	Feb. 7, 1937	7.53	2,280
	Sept. 7	7.14	2,660		Aug. 17	7.85	2,980
				1938	Mar. 4, 1938	7.54	3,000
				1939	July 2, 1939	8.75	6,100
					Aug. 3	9.45	9,710
					14	7.5	1,310

## FLOODS IN ARIZONA

Gila River Basin

(60) Rillito Creek near Tucson, Ariz. --Continued  
Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	June 23, 1940	7.8	2,810	1947	Aug. 8, 1947	6.10	5,740
	Aug. 13	10.30	13,200		12	4.80	3,530
	Sept. 12	7.83	1,760		15	9.92	7,660
1941	Dec. 25, 1940	7.63	1,300	1948	Sept. 26, 1948	2.75	779
	31	9.70	9,900				
	Feb. 7, 1941	7.74	1,540	1949	Sept. 13, 1949	3.00	1,300
	Mar. 15	7.67	1,320		15	3.23	1,640
	Aug. 7	9.15	1,040	1950	June 23, 1950	3.70	1,510
	Sept. 18	7.38	1,640		July 19	3.25	1,110
1942	Sept. 14, 1942	7.6	1,600		21	3.85	1,710
					23	4.85	3,480
1943	Aug. 2, 1943	7.47	1,340		30	6.90	9,490
	4	7.27	1,070				
	15	8.45	3,850	1951	July 25, 1951	6.93	9,500
	25	7.81	1,710		Aug. 2	4.55	4,200
1944	July 23, 1944	7.73	1,670		13	3.40	2,280
	Aug. 9	8.51	4,100	1952	Nov. 11, 1951	2.97	1,630
1945	Aug. 10, 1945	5.95	7,000	1953	July 14, 1953	2.80	1,300
	22	3.0	1,010		16	5.20	5,470
1946	Aug. 4, 1946	3.75	1,560				
	23	3.85	2,000				
	29	3.42	1,300				
	31	5.03	4,160				

† Maximum for period 1908-15.

Note. --Annual peaks only for water years 1915 to 1929.

Gila River Basin

(61) Santa Cruz River at Cortaro, Ariz. \*

Location. --Lat 32°21'10", long. 111°05'45", in SW $\frac{1}{4}$ SW $\frac{1}{4}$  sec. 26, T. 12 S., R. 12 E., half a mile southwest of Cortaro, 3 miles downstream from Canada del Oro, and 4 miles downstream from Rillito Creek.

Drainage area. --3,503 sq mi; 53 sq mi greater at site in use October 1939 to June 1947.

Gage. --Recording gage at present site since July 8, 1950. Datum of gage is 2,137.13 ft above mean sea level (Arizona Highway Department benchmark).

Prior to Mar. 13, 1941, recording gage and auxiliary staff gages 4 3/4 miles downstream. Datum of gage is 2,053.43 ft above mean sea level, datum of 1929.

Mar. 14, 1941, to June 30, 1947, recording gage 4 3/4 miles downstream (850 ft upstream from preceding gage) at datum 1.10 ft lower.

Stage-discharge relation. --Defined by current-meter measurements below 14,000 cfs at site in use prior to July 8, 1950. Relation at present site defined by current-meter measurements below 7,200 cfs, and extended above by logarithmic plotting. Relations at both sites subject to shifting.

Remarks. --Flood record not affected by municipal and irrigation diversions above station.

Base for partial-duration series, 2,700 cfs.

Bank-full stage. --10 ft, present site and datum.

\*Published as "at Rillito", 1940-47.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	Aug. 14, 1940	9.9	17,000	1946	Aug. 4, 1946	10.85	4,440
1941	Dec. 31, 1940	8.52	7,800		31	10.6	3,600
	Aug. 8, 1941	12.1	6,000		Sept. 10	10.34	2,790
	9	10.7	2,720	1947	Aug. 15, 1947	11.8	7,500
	14	11.0	2,740		June 22, 1950	-	64,000
1942	Aug. 9, 1942	10.90	1,550		July 19	5.90	4,040
1943	Aug. 2, 1943	11.3	4,080		21	6.3	5,920
	14	11.16	4,110		22	7.60	8,280
	15	11.33	4,670		24	6.8	6,130
	23	10.9	3,220		30	9.1	12,900
	Sept. 24	11.75	5,500		Aug. 12	4.9	3,640
	26	10.48	2,710	1951	July 17, 1951	4.82	2,700
1944	July 22, 1944	11.0	3,270		25	6.50	6,820
	Aug. 8	11.35	4,890		Aug. 2	5.48	4,560
	16	11.60	5,650	1952	Aug. 14, 1952	6.2	6,100
	Sept. 16	11.15	4,310		16	5.2	3,810
1945	July 28, 1945	11.3	4,740	1953	July 14, 1953	8.10	10,800
	30	11.1	4,600		16	6.1	5,900
	Aug. 2	10.7	3,360				
	10	13.25	14,000				
	21	10.1	2,850				

♢ Estimated.



## Gila River Basin

(62) Santa Cruz River near Laveen, Ariz.

Location. --Lat  $33^{\circ}14'$ , long.  $112^{\circ}10'$ , in  $NE\frac{1}{4}NE\frac{1}{4}$  sec. 29, T. 2 S., R. 2 E., on Gila River Indian Reservation, at highway bridge 3 miles south of Komatke, 9 miles upstream from mouth, and  $9\frac{1}{2}$  miles south of Laveen.

Drainage area. --8,581 sq mi.

Gage. --Recording gage since Feb. 11, 1940. Datum of gage is 1,020.86 fr above mean sea level, datum of 1929, Phoenix-Picacho supplementary adjustment of 1949.

Stage-discharge relation. --Main channel relation defined by current-meter measurements. High stage flow in bypass channel is estimated. Relation subject to shifts.

Remarks. --Flood record affected by spreading operations and diversions above station for irrigation.

Base for partial-duration series, 380 cfs.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	Aug. 17, 1940	7.68	743	1946	Oct. 5, 1945	6.87	390
	Sept. 18	9.30	1,200		July 18, 1946	9.50	840
1941	Nov. 20, 1940	6.87	536		Sept. 21	16.70	5,020
	Jan. 2, 1941	9.08	1,230	1948	Aug. 7, 1948	11.85	<sup>c</sup> 1,200
	Mar. 2	6.12	384	1949	Aug. 6, 1949	12.58	1,400
	6	7.05	548		Sept. 11	9.56	565
	15	10.03	1,580		15	12.59	1,280
	Apr. 13	8.05	908		17	13.61	1,780
	July 25	8.32	950	1950	Aug. 3, 1950	8.36	428
	Aug. 7	7.50	720		11	10.20	685
	30	5.97	384	1951	July 28, 1951	9.50	502
1942	Dec. 11, 1941	6.11	413		Aug. 4	13.83	1,510
	Jan. 2, 1942	5.97	384		7	15.73	2,810
	July 15	11.61	1,890		15	9.70	527
	Aug. 5	7.19	551		28	17.00	5,060
1943	Aug. 1, 1943	6.42	390	1952	July 28, 1952	11.57	805
	18	7.02	480		Aug. 15	14.38	1,860
	Sept. 25	7.46	563	1953	Nov. 16, 1952	9.54	425
	28	10.01	1,200		18	10.46	538
1944	Feb. 25, 1944	5.10	217		July 17, 1953	9.05	380
1945	July 31, 1945	7.61	488		17	10.43	555
	Aug. 3	8.28	592				
	11	10.79	1,200				

<sup>c</sup> Annual peak.

Gila River Basin

(63) White River near McNary, Ariz.

Location. --Lat 34°02'45", long. 109°44'15", in E½ sec. 31, T. 8 N., R. 25 E., unsurveyed, on Fort Apache Indian Reservation, 2 miles downstream from Paradise Creek, 6 3/4 miles southeast of McNary, and 47½ miles upstream from confluence with Black River.

Drainage area. --66 sq mi, approximately.

Gage. --Recording gage since June 1945. Altitude of gage is 7,750 ft (from Indian Irrigation Service river-profile map).

Stage-discharge relation. --Defined by current-meter measurements below 550 cfs and extended above by logarithmic plotting. Relation stable.

Remarks. --No storage above station. One small canal diverting about 5 miles upstream has no effect on flood records.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1946	Sept. 19, 1946	5.36	1,290	1951	Aug. 28, 1951	2.13	167
1948	Apr. 16, 1948	5.02	*1,120	1952	Apr. 6, 1952	4.10	748
1949	Apr. 15, 1949	3.70	656	1953	Mar. 29, 1953	2.03	152
1950	°	*2.23	188				

° From floodmark.

° March or April 1950

\* Maximum observed, may have been exceeded about Apr. 12.

Note. --Only annual peaks listed because of incomplete records in 1947-1950.

(64) Salt River near Chrysotile, Ariz.

Location. --Lat. 33°48', long. 110°30' in sec. 25, T. 5 N., R. 17 E., unsurveyed, on San Carlos Indian Reservation, 1,200 ft upstream from bridge on U. S. Highway 60, 5½ miles northeast of Chrysotile, 8 miles upstream from Cibecue Creek, and 33 miles downstream from confluence at Black and White Rivers.

Drainage area. --2,850 sq mi, approximately.

Gage. --Staff gage Sept. 18 to Oct. 1, 1924, and recording gage thereafter. Datum of gage is 3,354.57 ft above mean sea level, datum of 1929.

Stage-discharge relation. --Defined by current-meter measurements below 52,000 cfs, and extended above by logarithmic plotting.

Historical data. --Flood peak of 74,000 cfs (gage height, 18 ft, from floodmark) is believed to be flood of Jan. 19, 1916.

Remarks. --Flood record not materially affected by regulation and diversions above station.

Base for partial-duration series 3,500 cfs.

## Gila River Basin

(64) Salt River near Chrysotile, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1916	Jan. 19, 1916	<sup>a</sup> 18	74,000	1938	Mar. 4, 1938	9.68	19,000
1925	Mar. 8, 1925	6.5	6,930		Aug. 5	5.51	4,400
	Sept. 3	5.38	4,400		13	6.55	6,700
1926	Mar. 30, 1926	5.15	4,000	1939	Apr. 5, 1939	7.10	8,530
	Apr. 6	8.5	13,600	1940	Aug. 15, 1940	6.40	6,300
	20	5.28	4,230		Sept. 29	5.08	3,730
	29	5.82	5,270	1941	Dec. 13, 1940	6.98	8,340
	May 6	5.62	4,810		25	10.36	22,500
	July 11	7.51	9,930		31	8.52	13,600
	Sept. 26	5.10	3,920		Jan. 12, 1941	8.76	14,900
1927	Feb. 17, 1927	9.9	19,900		29	6.85	7,750
	Mar. 15	5.33	4,240		Feb. 8	5.92	5,490
	Sept. 17	6.78	7,750		26	6.68	7,470
1928	July 21, 1928	3.58	1,670		Mar. 3	5.01	3,710
1929	Apr. 5, 1929	7.93	11,400		14	15.08	52,200
	July 29	5.96	5,420		Apr. 3	6.45	6,670
	Aug. 8	4.98	3,730		14	6.17	6,060
	12	6.28	6,370		May 6	7.12	8,640
	Sept. 23	7.95	11,500		Aug. 10	6.19	6,180
1930	Mar. 17, 1930	7.47	9,930		Sept. 29	6.33	6,420
	July 9	6.04	5,820	1942	Dec. 13, 1941	5.16	3,980
	Aug. 11	8.0	11,700		Jan. 13, 1942	5.89	5,380
1931	Feb. 15, 1931	6.67	7,400		Apr. 6	5.25	4,070
	Aug. 7	5.90	5,550	1943	Jan. 24, 1934	8.2	12,400
	Sept. 19	5.92	5,590		Mar. 5	8.32	12,800
1932	Oct. 2, 1931	6.25	6,240		Sept. 26	5.54	4,750
	Feb. 10, 1932	13.3	40,000	1944	Oct. 19, 1943	4.14	2,380
	20	6.7	7,460	1945	Mar. 27, 1945	5.41	4,450
	Mar. 2	5.50	4,620		Apr. 23	5.36	4,360
	20	4.88	3,550	1946	Oct. 8, 1945	5.48	4,650
	Apr. 5	5.58	4,770		Sept. 19, 1946	7.44	9,600
	July 25	5.24	4,150	1947	Sept. 18, 1947	6.97	8,160
	30	5.0	3,740	1948	Oct. 14, 1947	5.24	3,970
1933	Feb. 28, 1933	4.40	2,880		Apr. 12, 1948	6.04	5,730
1934	Aug. 4, 1934	6.08	3,760	1949	Jan. 14, 1949	8.65	14,200
	20	6.20	3,850		Mar. 8	5.50	4,510
1935	Jan. 12, 1935	6.52	5,340		Apr. 16	5.40	4,310
	16	6.05	4,140		24	5.23	3,990
	Feb. 7	8.60	14,000		July 23	5.64	4,790
	11	6.50	5,870		Aug. 8	5.66	4,840
	15	5.58	3,760	1950	July 21, 1950	4.28	2,500
	Mar. 15	5.90	4,200	1951	Aug. 29, 1951	5.79	5,150
	Apr. 9	9.00	15,700	1952	Dec. 31, 1951	12.3	33,600
	Aug. 29	5.70	4,020		Jan. 14, 1952	15.0	51,500
1936	Feb. 17, 1936	8.40	13,200		18	14.9	50,800
	Mar. 24	5.57	4,040		Mar. 19	5.01	3,680
	Apr. 15	5.82	4,570		Apr. 8	6.25	6,100
1937	Feb. 7, 1937	15.18	52,900		17	5.79	5,200
	17	5.86	5,050		28	7.00	8,270
	Mar. 14	6.45	6,430	1953	July 30, 1953	5.01	3,680
	17	7.41	9,700				
	Apr. 16	6.14	5,700				

<sup>a</sup> From floodmark.

## GAGING-STATION RECORDS

91

## Gila River Basin

(65) Salt River near Roosevelt, Ariz.

Location. --Lat 33°37', long. 110°55', in NE¼ sec. 9, T. 3 N., R. 14 E., unsurveyed, 100 ft downstream from bridge on Globe-Young highway, a quarter of a mile downstream from Pinal Creek, 1 mile upstream from diversion dam for power canal, 14 miles east of village of Roosevelt, and 17 miles upstream from Roosevelt Dam.

Drainage area. --4,310 sq mi, approximately.

Gage. --Staff gage prior to Jan. 17, 1935. Recording gage thereafter. Datum of gage is 2,177.14 ft above mean sea level, datum of 1929.

Stage-discharge relation. --Defined by current-meter measurements below 55,000 cfs and extended above on basis of velocity-area studies and float-area measurements at 66,000 cfs and 102,000 cfs. Relation subject to moderate shifting.

Historical data. --Flood of Jan. 19, 1916, about 100,000 cfs by computation of flow past Roosevelt Dam, was the greatest known since 1906, and has been exceeded only in 1941 and 1952.

Remarks. --Flood record not significantly affected by regulation and diversions above station.

Base for partial-duration series 4,000 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1916	Jan. 19, 1916	-	100,000	1938	Mar. 4, 1938	16.38	24,100
					Aug. 5	12.19	8,300
1925	Mar. 9, 1925	7.2	9,000		14	10.95	5,700
1926	Apr. 7, 1926	13.0	21,000	1939	Apr. 5, 1939	12.35	9,050
1927	Feb. 18, 1927	16.5	40,000	1940	July 16, 1940	10.80	4,610
1928	Feb. 5, 1928	6.5	2,600	1941	Dec. 13, 1940	13.75	11,600
1929	Sept. 23, 1929	13.0	15,000		25	17.93	31,600
1930	Mar. 17, 1930	11.5	8,300		31	16.79	24,900
1931	Feb. 15, 1931	14.0	22,000		Jan. 11, 1941	17.44	31,600
1932	Feb. 10, 1932	22	57,000		29	12.82	8,620
1933	Feb. 28, 1933	7.8	4,200		Feb. 8	12.10	6,290
1934	Aug. 4, 1934	9.0	5,500		26	12.99	8,350
1935	Jan. 13, 1935	9.87	6,180		Mar. 2	12.42	6,540
	16	9.13	4,850		14	24.4	117,000
	Feb. 7	13.43	15,100		Apr. 3	13.26	8,350
	15	8.30	4,340		14	12.81	7,300
	Mar. 3	8.96	5,870		May 8	13.78	9,520
	15	8.96	5,530		Aug. 10	12.11	6,540
	Apr. 9	12.94	15,200		Sept. 29	12.36	6,290
	Aug. 1	8.25	4,420	1942	Jan. 13, 1942	11.80	5,140
1936	Feb. 17, 1936	12.60	13,800	1943	Jan. 24, 1943	14.75	14,700
	Mar. 24	8.48	4,660		Mar. 5	15.75	16,500
	Apr. 16	8.70	4,820		Sept. 26	11.38	4,770
1937	Feb. 7, 1937	23.4	88,000	1944	Sept. 26, 1944	10.60	4,560
	17	12.53	6,470	1945	Mar. 27, 1945	11.30	5,450
	Mar. 14	14.09	11,200		Apr. 24	10.94	4,860
	17	15.64	19,700	1946	Sept. 19, 1946	15.62	15,100
	Apr. 17	11.43	5,890	1947	Sept. 19, 1947	12.88	6,170
				1948	Apr. 13, 1948	12.16	5,960



## FLOODS IN ARIZONA

## Gila River Basin

(65) Salt River near Roosevelt, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1949	Jan. 10, 1949	12.51	6,340	1952	Dec. 31, 1951	20.03	42,300
	14	16.45	15,500		Jan. 14, 1952	22.80	74,100
	Mar. 8	12.42	5,000		18	25.3	111,000
	Apr. 17	11.98	4,260		Mar. 16	13.20	4,790
	July 24	11.65	4,120		Apr. 9	13.93	6,980
1950	Aug. 9	12.29	4,740		21	13.72	6,370
	July 21, 1950	12.47	5,930		28	14.47	9,050
	Aug. 2, 1951	13.40	7,070	1953	Mar. 9, 1953	12.25	4,320
	28	18.10	27,600				
1951							

° Annual peak.

(66) Tonto Creek above Gun Creek, near Roosevelt, Ariz.

Location. --Lat 33°59', long. 111°18', in NE¼SW¼ sec. 2, T. 7 N., R. 10 E., in Tonto National Forest, 600 ft upstream from Gun Creek, and 23½ miles northwest of village of Roosevelt Dam.

Drainage area. --675 sq mi.

Gage. --Recording gage since Jan. 29, 1941. Datum of gage is 2,523.14 ft above mean sea level, datum of 1929. Dec. 21, 1940 to Jan. 28, 1941, staff gage 30 ft upstream.

Stage-discharge relation. --Defined by current-meter measurements below 7,700 cfs and extended on basis of slope-area determination of 1941 peak for period prior to 1951. Validity of relations used confirmed by slope of rating developed in 1951 defined by current-meter measurements below 27,000 cfs and extended by logarithmic plotting. Relation subject to large shifts.

Remarks. --Flood record unaffected by small diversions above station.

Base for partial-duration series, 1,700 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1941	Dec. 18, 1940	*4.75	2,010	1947	Nov. 15, 1946	6.52	1,930
	25	<sup>a</sup> 14.0	26,700		Dec. 28	8.78	7,130
	30	11.2	14,200		Aug. 16, 1947	7.10	2,800
	Feb. 7, 1941	7.02	2,840		21	6.39	1,780
	25	6.72	2,530	1948	July 26, 1948	7.32	3,240
	Mar. 2	8.87	6,610				
	5	6.91	2,680	1949	Dec. 23, 1948	6.95	2,540
	14	15.1	32,000		28	6.45	1,770
	Apr. 3	6.95	2,600		Jan. 13, 1949	9.60	9,890
	13	9.14	7,530		25	6.76	2,140
1942	May 2	10.18	10,600	1950	July 7, 1950	<sup>b</sup> 7.0	2,500
	Dec. 11, 1941	5.86	1,250		16	8.25	5,500
1943	Jan. 24, 1943	8.52	5,730	1951	Aug. 28, 1951	14.10	31,100
	Mar. 5	11.6	15,800				
1944	Feb. 24, 1944	7.29	2,990	1952	Dec. 31, 1951	14.4	33,900
	Mar. 2	6.75	1,990		Jan. 14, 1952	7.30	3,560
	14	6.78	1,880		18	16.55	45,400
1945	Mar. 10, 1945	6.70	1,750		Mar. 2	6.35	3,360
	16	7.29	2,760		15	6.15	2,900
	25	7.01	2,280		Apr. 20	6.50	2,540
	Aug. 11	8.5	5,320		29	6.24	2,100
	17	7.18	2,780				
				1953	July 30, 1953	6.79	2,620
1946	Aug. 24, 1946	7.49	3,000				
	26	6.78	1,880				
	Sept. 18	9.60	10,200				

<sup>a</sup> From floodmarks.<sup>b</sup> Estimated.<sup>\*</sup> Computed from staff gage record at site 10 miles downstream from Gun Creek.

## Gila River Basin

(67) Granite Creek near Prescott, Ariz.

Location. --Lat 34°34', long. 112°27', in SW $\frac{1}{4}$  sec. 26, T. 14 N., R. 2 W., unsurveyed, at bridge on U. S. Highway 89, 2 miles north of Prescott, 3 miles upstream from dam forming Watson Lake, and 4 $\frac{1}{2}$  miles upstream from Willow Creek.

Drainage area. --39.6 sq mi.

Gage. --Recording gage since July 21, 1932. Datum of gage is 5,207.3 ft above mean sea level (Arizona Highway Department benchmark).

Stage-discharge relation. --Defined by current-meter measurements below 1,400 cfs; extended above. Relation subject to large shifts.

Remarks. --Records for period July 1941 to February 1945 furnished by Bureau of Reclamation.

Flood record unaffected by small diversions above station for municipal use.

Base for partial-duration series, 200 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1932	Aug. 25, 1932	6.0	* 250	1940	Sept. 29, 1940	4.36	83
1933	Sept. 7, 1933	5.89	230	1941	Oct. 5, 1940	5.55	530
1934	Aug. 4, 1934	6.61	390		Dec. 24	5.71	616
	17	6.8	413		Feb. 21, 1941	5.50	487
	30	7.15	450		Mar. 1	7.00	1,530
1935	Feb. 7, 1935	7.96	* 500		14	5.65	579
	Aug. 25	6.6	290		Apr. 13	5.52	499
	30	7.75	600		Sept. 13	5.55	411
1936	July 31, 1936	6.4	247	1942	July 14, 1942	6.55	1,080
	Sept. 11	7.41	500		Aug. 4	5.9	610
1937	Feb. 7, 1937	9.20	2,900		17	6.95	1,110
	14	7.56	1,420	1943	Jan. 23, 1943	6.25	750
	Mar. 17	7.19	1,290		Mar. 5	5.65	500
	Aug. 14	7.95	1,670		Aug. 7	6.30	780
1938	Mar. 3, 1938	8.70	2,400		28	7.3	1,780
	12	5.68	370	1944	Mar. 14, 1944	5.34	297
	Aug. 4	6.40	646	1945	Mar. 15, 1945	7.18	1,670
	Sept. 16	6.0	227		July 30	6.29	828
1939	Aug. 4, 1939	6.45	638		Aug. 10	8.20	2,200
	14	6.12	462	1946	Dec. 23, 1945	6.21	455
	Sept. 6	5.47	220		July 20, 1946	6.88	899
	9	5.73	322		Aug. 10	5.58	202
					20	6.87	891
					24	6.09	397
				1947	July 21, 1947	5.72	251

<sup>b</sup> Estimated.

<sup>s</sup> Incomplete year; peaks prior to July 1 unknown.

## FLOODS IN ARIZONA

Gila River Basin

(68) Oak Creek near Cornville, Ariz.

Location. --Lat 34°46', long. 111°53', in SE¼ sec. 14, T. 16 N., R. 4 E., at county highway bridge 0.2 mile upstream from Page Springs, 4 miles northeast of Cornville, and 15 miles upstream from mouth.

Drainage area. --357 sq mi.

Gage. --Recording gage since July 1940. Altitude of gage is 3,470 ft (from topographic map).

Stage-discharge relation. --Defined by current-meter measurements. Relation subject to shifting.

Historical data. --The highest stage known is that of Mar. 3, 1938, gage height 23 ft (from floodmarks), discharge unknown.

Remarks. --Flood record unaffected by irrigation diversions above station.

Base for partial-duration series, 1,300 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1938	Mar. 3, 1938	<sup>a</sup> 23	-	1946	<sup>o</sup>	<sup>a</sup> 5.25	1,200
1941	Oct. 5, 1940	6.8	4,100	1947	-	-	-
	Dec. 17	5.74	2,180	1948	July 26, 1948	4.71	605
	25	6.42	3,300	1949	Mar. 20, 1949	6.18	1,470
	Feb. 21, 1941	6.57	3,410		Apr. 9	6.70	1,840
	24	6.29	2,870		Sept. 9	7.15	2,260
	Mar. 1	6.8	3,980	1950	Oct. 19, 1949	10.5	6,400
	14	7.36	5,280		Feb. 7, 1950	6.11	1,670
	Apr. 5	5.31	1,420		27	5.77	1,390
	16	6.75	3,860	1951	Aug. 29, 1951	8.12	3,440
1942	Oct. 13, 1941	6.17	2,580	1952	Dec. 30, 1951	14.5	17,200
	Nov. 18	5.77	1,940		Jan. 18, 1952	9.35	7,240
	Apr. 5, 1942	5.76	1,940		Apr. 7	6.15	1,920
	Aug. 10	5.64	1,810		Aug. 20	5.60	1,360
1943	Mar. 4, 1943	6.29	2,530	1953	July 14 and	5.10	858
	10	6.72	3,640		Aug. 28, 1953		
1944	Apr. 6, 1944	6.15	2,180				
	14	5.79	1,630				
1945	Mar. 16, 1945	6.30	1,500				
	Apr. 2	5.89	1,620				
	9	5.75	1,440				
	19	6.42	2,370				
	July 30	7.80	6,020				
	Aug. 9	7.75	5,850				

<sup>a</sup> From floodmark.

<sup>o</sup> Date unknown but is believed to be highest peak in water years 1946 and 1947.

Gila River Basin

(69) Verde River near Camp Verde, Ariz.

Location. --Lat 34°27', long. 111°47', in sec. 1, T. 12 N., R. 5 E., unsurveyed, 750 ft upstream from Chasm Creek, 800 ft downstream from Camp Verde dam site, and 9 miles southeast of Camp Verde.

Drainage area. --5,024 sq mi ( includes 373 sq mi in Aubrey Valley Playa, a closed basin).

Gage. --Recording gage since Apr. 1, 1934. Datum of gage is 2,874.1 ft above mean sea level, datum of 1929.

Stage-discharge relation. --Defined by current-meter measurements below 32,000 cfs; extended above on basis of slope-area determination at gage height 26.1 ft, and comparison with other stations on Verde River. Relation subject to shifting.

Remarks. --Flood record unaffected by irrigation diversions above station.

Base for partial-duration series, 4,000 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1934	July 17, 1934	10.82	5,500	1941	Oct. 5, 1940	11.8	11,100
					Dec. 12	8.94	4,540
1935	Feb. 7, 1935	11.70	6,990		25	12.15	11,900
	Mar. 15	11.92	7,040		Jan. 1, 1941	8.71	4,070
	Apr. 9	13.43	11,500		Feb. 12	8.73	4,160
	Aug. 30	11.27	5,100		16	9.57	5,860
	Sept. 27	11.38	5,320		21	13.14	14,600
					25	10.73	8,370
1936	Feb. 24, 1936	12.17	6,820		Mar. 2	14.47	19,000
					14	16.85	30,000
1937	Feb. 7, 1937	19.9	41,700		Apr. 3	9.24	5,030
	15	16.5	25,700		16	13.2	14,100
	Mar. 14	12.02	10,100				
	17	15.2	19,100	1942	Oct. 13, 1941	9.68	6,080
1938	Feb. 28, 1938	13.08	12,300		Mar. 5, 1942	12.25	11,600
	Mar. 3	26.1	97,000	1943	Mar. 11, 1943	10.40	6,740
	13	9.84	7,230				
	Aug. 13	11.00	10,200	1944	Mar. 14, 1944	9.73	5,160
					26	9.55	4,860
1939	Aug. 4, 1939	10.88	9,720		Apr. 14	9.29	4,400
	Sept. 7	11.22	10,700				
	13	13.04	16,100	1945	Mar. 16, 1945	11.18	8,380
1940	Feb. 27, 1940	9.40	6,040				
	Aug. 4	10.2	7,560				

(70) Verde River below East Verde River, near Pine, Ariz.

Location. --Lat 34°16', long 111°41', in sec. 30, T. 11 N., R. 7 E., unsurveyed, 2½ miles downstream from East Verde River and 15 miles southwest of Pine.

Drainage area. --5,623 sq mi.

Gage. --Recording since July 4, 1934. Datum of gage is 2,401.6 ft above mean sea level, datum of 1929.

Stage-discharge relation. --Defined by current-meter measurements below 27,000 cfs; extended above on basis of slope-area determination at gage height 24.7 ft. Relation subject to shifting.

Remarks. --Flood record unaffected by irrigation diversions or power plant above station.

Base for partial-duration series, 5,000 cfs.



## FLOODS IN ARIZONA

Gila River Basin

(70) Verde River below East Verde River, near Pine, Ariz.--Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1934	July 17, 1934	9.45	3,400	1939	Sept. 7, 1939	11.98	10,700
1935	Feb. 7, 1935	11.60	10,400		13	13.90	19,300
	Mar. 15	10.80	7,460	1940	Feb. 27, 1940	10.42	5,290
	Apr. 9	11.76	10,500		Aug. 4	10.83	6,630
1936	Feb. 24, 1936	11.74	11,000	1941	Oct. 5, 1940	12.27	11,900
1937	Feb. 7, 1937	20.6	68,600		Dec. 12	10.46	5,570
	15	15.25	29,600		25	13.54	18,900
	Mar. 14	11.71	11,500		31	10.63	6,670
	16	15.32	30,000		Feb. 16, 1941	10.30	5,630
1938	Feb. 28, 1938	12.26	13,700		21	13.30	17,900
	Mar. 3	24.7	110,000		25	11.50	9,700
	13	11.01	7,110		Mar. 2	14.04	21,600
	Aug. 13	11.24	7,950		14	18.2	49,700
					Apr. 2	10.83	7,840
					13	13.12	17,400
					16	13.32	18,400

(71) Verde River below Tangle Creek, above Horseshoe Dam, Ariz.\*

Location. --Lat 34°04'25", long. 111°42'50", in sec. 35, T. 9 N., R. 6 E., unsurveyed, in Tonto National Forest, 1 1/4 miles downstream from Tangle Creek, and 9 miles upstream from Horseshoe Dam.

Drainage area. --6,650 sq mi, approximately, prior to 1925; 6,210 sq mi 1925-38; 6,065 sq mi 1939-45; 5,872 sq mi 1946-53 (all areas include 373 sq mi in Aubrey Valley Playa, a closed basin).

Gage. --This is a combined record from the following gages:

Prior to 1925: Non-recording gages at several sites from 0.7 to 1.4 miles above mouth.

1925-38: Recording gages at two different sites, 500 ft and half a mile, respectively, above Camp Creek, at different datums.

1939-45: Recording gage, 4.5 miles downstream from Horseshoe Dam. Datum of gage is 1,829.5 ft above mean sea level, datum of 1929.

1946-53: Recording gage at present site, 9 miles upstream from Horseshoe Dam. Datum of gage is 2,029.0 ft above mean sea level, datum of 1929.

Stage-discharge relation. --

1925-38: Defined by current-meter measurements below 45,000 cfs, and estimated above on basis of basin wide runoff studies and slope-area determination at gage height 21.9 ft.

1939-45: Defined by current-meter measurements.

1946-53: Defined by current-meter measurements below 42,000 cfs and extended above by logarithmic plotting. Relation subject to shifting at all locations.

Historical data. --Flood of Feb. 24, 1891, is greatest known since 1888; record furnished by Arizona Canal Company.

Remarks. --Computation of peaks 1905, 1925-33 was made from records furnished by Salt River Valley Water Users' Association.

Flood record unaffected by irrigation diversions above station.

Base for partial-duration series, 4,000 cfs.

\*Published as "above Camp Creek, near McDowell" 1925-38 and as "above Bartlett Reservoir, near Cave Creek" 1939-45.

## GAGING-STATION RECORDS

97

## Gila River Basin

(71) Verde River below Tangle Creek, above Horseshoe Dam, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1891	Feb. 24, 1891	-	<i>y</i>	1941	Oct. 6, 1940	12.36	11,800
1906	Nov. 27, 1905	-	96,000	Dec. 13	9.23	5,900	
1925	Sept. 17, 1925	-	<i>b</i> c20,000	18	7.93	4,210	
1926	Apr. 6, 1926	10.2	<i>c</i> 32,000	25	14.34	19,600	
1927	Feb. 17, 1927	<i>b</i> 17.0	<i>c</i> 70,000	31	11.13	10,400	
1928	Feb. 5, 1928	7.37	<i>c</i> 14,000	Feb. 22, 1941	13.23	16,000	
1929	Apr. 5, 1929	<i>b</i> 12.5	<i>c</i> 26,000	Mar. 2	14.47	23,400	
1930	Aug. 9, 1930	7.8	<i>c</i> 8,100	14	17.85	43,800	
1931	Feb. 14, 1931	10.65	<i>c</i> 34,000	Apr. 3	10.28	8,460	
1932	Feb. 9, 1932	15.0	<i>c</i> 53,000	13	14.14	22,300	
1933	Mar. 13, 1933	4.0	<i>c</i> 1,660	May 4	8.17	4,180	
1934	Aug. 25, 1934	7.30	3,300	1942	Oct. 14, 1941	8.00	3,510
1935	Jan. 12, 1935	9.32	7,380	1943	Mar. 5, 1943	12.44	13,100
	16	8.40	4,790	11	9.56	6,520	
	Feb. 7	11.56	14,300	Aug. 14	12.98	16,600	
	15	8.40	5,030	1944	Feb. 25, 1944	8.47	4,670
	Mar. 3	8.60	5,130	Mar. 14	10.33	7,530	
	15	9.88	7,680	26	8.82	5,030	
	Apr. 9	10.81	11,800	Apr. 3	8.10	4,120	
	Aug. 15	9.09	5,870	14	8.43	4,720	
1936	Feb. 24, 1936	10.89	12,000	1945	Mar. 16, 1945	11.12	9,710
1937	Feb. 7, 1937	18.8	63,000	Apr. 3	8.02	4,060	
	15	14.66	30,400	1946	Apr. 8, 1946	9.90	8,660
	Mar. 14	11.27	12,400	1947	Dec. 28, 1946	8.62	6,110
	17	15.03	32,300	Sept. 19, 1947	11.47	11,500	
1938	Mar. 4, 1938	21.9	95,000	1948	Mar. 25, 1948	6.45	2,560
	13	9.81	5,940	1949	Jan. 13, 1949	11.24	11,000
1939	Sept. 7, 1939	11.42	9,500	Feb. 25	7.82	4,140	
	14	13.92	17,700	Mar. 8	8.37	4,900	
1940	Feb. 3, 1940	8.36	4,740	20	8.65	5,260	
	27	8.62	5,020	Apr. 9	8.07	4,480	
				Sept. 19	7.77	4,040	
				1950	Oct. 19, 1949	10.50	9,330
				Feb. 8, 1950	8.96	5,620	
				1951	Aug. 30, 1951	12.40	16,400
				1952	Dec. 31, 1951	17.62	81,600
				Jan. 18, 1952	13.86	27,800	
				Apr. 1	10.33	7,960	
				Aug. 15	8.87	5,550	
				1953	Aug. 29, 1953	10.00	6,390

<sup>b</sup> Estimated<sup>c</sup> Annual peak.<sup>y</sup> Probably exceeded 150,000 cfs.

## FLOODS IN ARIZONA

## Gila River Basin

(72) Agua Fria River near Mayer, Ariz.

Location. --Lat 34°19', long. 112°04', in NW¼SE¼ sec. 20, T. 11 N., R. 3 E., at Sycamore Dam Site, 700 ft downstream from Bigbug Creek, and 12 miles southeast of Mayer.

Drainage area. --588 sq mi.

Gage. --Recording gage since Feb. 15, 1940, and staff gage Jan. 24 to Feb. 14, 1940. Altitude of gage is 3,434 ft (levels by Maricopa County Municipal Water Conservation District No. 1).

Stage-discharge relation. --Defined by current-meter measurements below 5,600 cfs; extended above on basis of slope-area determinations at gage heights 9.3, 9.44, and 11.97 ft. Relation subject to minor shifting.

Remarks. --Flood record unaffected by small diversions for mining and irrigation above station.

Base for partial-duration series, 1,300 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	Feb. 2, 1940	5.7	1,820	1946	July 22, 1946	8.2	4,930
	June 26	8.80	5,920		Aug. 10	5.53	1,570
	Aug. 18	7.27	3,620		14	6.26	2,350
	Sept. 2	8.55	5,500		15	5.76	1,800
1941					30	7.0	3,230
	Oct. 5, 1940	5.78	1,900	1947	Aug. 16, 1947	5.57	1,610
	Dec. 24	9.30	6,830		31	5.38	1,430
	30	5.59	1,710	1948	Aug. 4, 1948	9.30	6,830
	Mar. 1, 1941	11.97	13,000		6	7.15	3,490
	14	9.43	7,080	1949	Jan. 13, 1949	6.37	2,460
	Apr. 13	7.92	4,510		Oct. 18, 1949	5.66	1,690
	July 18	5.85	2,010	1950	July 17, 1950	6.10	2,170
1942	24	5.08	1,380		30	5.88	1,950
	Aug. 8	5.39	1,650	1951	July 31, 1951	6.86	3,040
	Sept. 17	5.14	6,430		Aug. 19	9.23	6,230
					28	9.70	8,180
1943	Oct. 20, 1941	6.00	2,190		29	9.65	8,010
	July 25, 1942	5.08	1,380		Sept. 7	7.16	4,380
	Aug. 4	6.37	2,560	1952	Oct. 1, 1951	5.70	2,770
	6	9.0	6,280		30	7.38	5,260
1944	Aug. 9, 1943	4.79	1,340		Dec. 30	5.20	2,140
	15	4.78	1,330		Jan. 18, 1952	8.85	7,500
	Sept. 25	6.70	3,500		Mar. 11	5.78	2,900
1945	Feb. 24, 1944	6.11	2,320		Aug. 16	5.35	2,320
	Aug. 19	5.92	2,280		24	5.50	2,510
	Sept. 14	5.78	2,140	1953	July 8, 1953	7.23	5,510
	16	7.3	3,810		26	5.37	2,510
1946	26	5.08	1,500		Aug. 28	5.02	1,880
	July 27, 1945	6.26	2,620				
	Aug. 10	6.10	2,460				

Gila River Basin

(73) Hassayampa River near Wagoner, Ariz.

Location. --Lat 34°18', long. 112°34', in NE¼SE¼ sec. 9, T. 11 N., R. 3 W., at bridge on Kirkland Junction-Wagoner road, 5½ miles upstream from Milk Creek, and 7½ miles upstream from Wagoner.

Drainage area. --78.7 sq mi.

Gage. --Recording gage since Jan. 20, 1940. Datum of gage is 3,741.51 ft above mean sea level, unadjusted.

Stage-discharge relation. --Defined by current-meter measurements below 500 cfs and extended above. Relation subject to very large shifts and of questionable accuracy.

Historical data. --Failure of the Walnut Grove Dam, 9 miles downstream, on February 22, 1890 resulted in a catastrophic flood in which 76 persons lost their lives. This dam failure followed a period of high runoff due to melting snow. Flood discharge is not known. (See Thirteenth Annual Report of the Geological Survey 1891-92 Part III Irrigation for detailed discussion of this flood.)

Remarks. --Flood record unaffected by small irrigation diversions above station.

Base for partial-duration series, 160 cfs.

Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	Sept. 6, 1940	3.4	171	1943	Aug. 3, 1943	4.55	945
					9	5.10	1,470
1941	Oct. 5, 1940	2.97	214				
	Feb. 21, 1941	2.9	850	1944	Sept. 27, 1944	3.43	138
	24	3.5	1,250				
	Mar. 2	5.11	1,250	1945	Mar. 16, 1945	3.54	291
	8	4.33	343		Aug. 9	5.12	1,480
	14	4.37	498		11	4.82	1,160
	Apr. 16	3.1	1,700		23	4.42	782
	24	3.93	221				
	Aug. 9	3.68	162	1946	Aug. 10, 1946	4.35	648
	29	3.78	297		Sept. 27	3.70	259
1942	July 17, 1942	3.81	323				
	Aug. 15	5.00	1,250				

(74) Hassayampa River at Box dam site, near Wickenburg, Ariz.

Location. --Lat 34°02'35", long. 112°42'35", in SE¼ sec. 7, T. 8 N., R. 4 W., unsurveyed, at Box dam site, 7½ miles upstream from Wickenburg.

Drainage area. --417 sq mi.

Gage. --Recording gage at present site since May 1946. Datum of gage is 2,236.12 ft above mean sea level, datum of 1929. May 1, 1946, to Nov. 17, 1949, at datum 2.16 ft higher. January to June 1938 at site 1 mile downstream at datum 23.76 ft lower.

All gage heights referenced to present site and datum.

Stage-discharge relation. --Defined by current-meter measurements below 2,000 cfs; extended above on basis of slope-area determinations at gage height 9.16 ft and 18.3 ft.

Historical data. --Records obtained by W. A. Farish, engineer for Joseph Wittman, show high magnitude floods on Sept. 19, 1925 (25,500 cfs), Feb. 16, 1927 (27,100 cfs), and Feb. 7, 1937 (22,000 cfs). Basis for these discharge figures is not known, and they are not included in the listing below.

Remarks. --Flood record unaffected by small diversions for mining and irrigation above station.

Base for partial-duration series, 500 cfs.



## FLOODS IN ARIZONA

## Gila River Basin

(74) Hassayampa River at Box dam site, near Wickenburg, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1938	Mar. 3, 1938	<sup>a</sup> 10.65	<sup>c</sup> 10,000	1950	Oct. 18, 1949	9.01	5,500
1946	July 22, 1946	5.88	664	1951	Aug. 3, 1951	6.05	2,130
	Aug. 11	7.0	1,710		20	4.80	750
	14	6.41	1,110		26	7.7	4,910
					29	18.3	27,000
1947	Aug. 8, 1947	7.41	2,300	1952	Oct. 30, 1951	3.70	885
1948	Aug. 5, 1948	9.16	5,600		Dec. 30	4.50	1,590
1949	Jan. 13, 1949	5.26	651		Jan. 18, 1952	3.50	590
	25	5.36	708		Mar. 11	5.35	1,410
	July 4	7.40	2,510		17	4.90	910
	Sept. 11	6.21	1,310		Aug. 14	6.05	775
	14	5.76	970		Sept. 20	5.70	580
	26	7.71	2,910	1953	July 18, 1953	5.95	865

<sup>a</sup> From floodmark.<sup>c</sup> Annual peak; peaks October to December 1937 and July to September 1938 not known.

(75) Hassayampa River near Morrystown, Ariz.

Location. --Lat 33°53'. long. 112°39', in SE¼ sec. 3, T. 6 N., R. 4 W., 600 ft downstream from San Domingo Wash, 900 ft upstream from railroad bridge, and 3.0 miles northeast of Morrystown.

Drainage area. --774 sq mi.

Gage. --Recording gage Nov. 17, 1938, to July 15, 1947. Datum of gage is 1,831.16 ft above mean sea level, datum of 1929.

Stage-discharge relation. --Defined by current-meter measurements below 1,600 cfs; extended above on basis of slope-area determination at gage height 8.36 ft. Relation subject to shifting.

Remarks. --Flood record unaffected by small diversions for mining and irrigation above gage.

Base for partial-duration series, 1,100 cfs.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1939	Dec. 20, 1938	7.30	2,700	1942	Aug. (o), 1942	<sup>a</sup> 5.7	<sup>b</sup> 100
	Sept. 4, 1939	6.6	1,240				
	6	8.7	6,200	1943	Aug. 3, 1943	9.9	7,700
	12	6.55	1,600		14	8.52	3,800
					Sept. 26	6.80	1,200
1940	Feb. 1, 1940	5.9	160	1944	Oct. 18, 1943	7.68	2,420
1941	Oct. 5, 1940	7.18	2,460		Feb. 24, 1944	7.22	1,510
	Dec. 24	7.30	3,350		Aug. 9	8.10	3,520
	Feb. 25, 1941	6.96	2,600	1945	Aug. 2, 1945	7.55	2,200
	Mar. 2	8.36	6,100		10	6.98	1,110
	5	6.66	2,040				
	14	7.90	4,060	1946	July 22, 1946	7.38	1,510
	Apr. 11	7.57	3,020		Aug. 11	7.50	2,090
	15	7.05	1,320		Sept. 17	7.60	2,310
	July 24	7.50	2,110				
	Aug. 9	7.73	3,460	1947	Aug. 8, 1947	<sup>a</sup> 8.95	6,000
	29	7.27	2,050				

<sup>a</sup> From floodmark.<sup>b</sup> Estimated.<sup>c</sup> Probably Aug. 5.

## Gila River Basin

(76) Gila River below Gillespie Dam, Ariz. \*

Location. --Lat 33°13'45", long. 112°46'00", in SE $\frac{1}{4}$ NE $\frac{1}{4}$  sec. 28, T. 2 S., R. 5 W., at Gillespie Dam, 8 miles downstream from Hassayampa River. Gila Bend Canal diverts at left side and Enterprise Canal at right side of Gillespie Dam.

Drainage area. --49,620 sq mi; contributing area, smaller because of construction of Roosevelt, Lake Pleasant, Stewart Mountain, Coolidge, and Bartlett Dams, was as follows: 1921-27, 43,730 sq mi; 1928, 42,270 sq mi; 1929, 29,380 sq mi; 1930-38, 23,170 sq mi; 1939-53, 16,990 sq mi.

Gage. --Recording gage since July 28, 1924. Datum of gage is 5.00 ft below average elevation of dam crest; crest is 753.46 ft above mean sea level, datum of 1929. Prior to July 23, 1932, datum of gage was at average elevation of dam crest. Aug. 4, 1921, to Nov. 10, 1924, depth of water over crest of dam read at left end of dam.

Stage-discharge relation. --Defined by current-meter measurements below 56,000 cfs; extended above on basis of computation of peak flow over dam. Relation affected by operation of sluice and diversion gates at dam.

Historical data. --Greatest known flood occurred in February 1891 (estimated, 250,000 cfs).

Remarks. --Flood record shown is that for uncontrolled areas below major dams as listed above except for flood of March 5, 1938, originating from upper Verde River, and those occurring during period of spill over Bartlett, Lake Pleasant, and Stewart Mountain dams January to June 1941.

Base for partial-duration series, 2,000 cfs 1925-38, 1,000 cfs 1939-53.

\*Published as "at Gillespie Dam", prior to 1939.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1891	February 1891	-	<sup>b</sup> 250,000	1930	Mar. 19, 1930	0.82	3,160
					Aug. 10	2.19	13,900
1921	Aug. 22, 1921	3.25	<sup>c</sup> 26,800	1931	Feb. 16, 1931	2.50	17,500
1922	Jan. 4, 1922	3.67	<sup>c</sup> 32,700		Aug. 6	1.20	5,470
1923	Sept. 20, 1923	2.00	<sup>c</sup> 13,100		Aug. 12	1.45	7,530
					31	1.41	6,930
1924	Dec. 28, 1923	6.00	<sup>c</sup> 85,000	1932	Oct. 3, 1931	.73	2,360
					Dec. 11	1.00	3,690
1925	Sept. 2, 1925	.68	2,500		Feb. 11, 1932	4.47	44,500
	6	1.73	9,570		20	1.78	9,670
	20	2.23	15,200		Mar. 3	1.65	8,260
					12	.67	2,090
1926	Oct. 6, 1925	1.28	6,160		22	.92	3,270
	Dec. 4	.72	2,700	1933	Oct. 9, 1932	5.70	2,180
	Mar. 31, 1926	.88	4,060	1934	Aug. 30, 1934	5.88	3,100
	Apr. 8	3.15	26,700	1935	Feb. 10, 1935	6.60	7,470
	21	1.02	4,760		17	5.73	2,240
	July 27	.87	3,520		Mar. 17	6.06	3,890
	Sept. 9	1.05	4,620		Aug. 25	5.84	2,380
	30	3.95	38,300		Sept. 1	5.71	2,140
1927	Dec. 8, 1926	1.84	10,600	1936	July 29, 1936	5.90	3,240
	15	.68	2,500	1937	Feb. 9, 1937	8.48	45,800
	Feb. 18, 1927	5.45	67,300		17	7.67	18,400
	Mar. 12	1.04	4,560		Mar. 16	6.00	4,520
	17	.81	3,160		19	7.77	21,300
	Sept. 13	3.71	34,900	1938	Mar. 5, 1938	9.95	60,000
1928	Feb. 6, 1928	1.70	9,220	1939	Aug. 10, 1939	5.70	2,200
	Aug. 3	1.26	5,600		Sept. 5	2.43	2,500
	29	.70	2,350		13	5.97	3,240
1929	Apr. 6, 1929	2.74	20,700				
	Aug. 18	.60	2,050				
	Sept. 5	.88	3,680				
	26	1.15	5,210				

## FLOODS IN ARIZONA

Gila River Basin

(76) Gila River below Gillespie Dam, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1940	Aug. 19, 1940	5.87	2,620	1945	Aug. 14, 1945	5.53	1,350
1941	Jan. 4, 1941	6.16	5,850	1946	Sept. 19, 1946	5.85	4,290
	Feb. 10	5.68	1,910		24	5.92	2,880
	16	5.44	1,040	1947	Aug. 9, 1947	5.63	4,390
	19	5.65	1,800		Aug. 9, 1948	5.23	330
	24	6.57	7,180	1949	Aug. 7, 1949	5.42	976
	28	6.70	7,250		Oct. 19, 1949	5.56	1,460
	Mar. 5	7.07	10,800	1951	July 28, 1951	-	2,340
	16	9.45	45,800		Aug. 4	5.96	2,880
	Apr. 5	5.95	3,060		28	7.55	16,600
	18	8.08	25,300	1952	Jan. 22, 1952	5.23	430
	May 5	7.05	10,600		Nov. 20, 1952	5.10	115
	Aug. 12	5.43	1,010				
1942	Dec. 13, 1941	5.30	580				
1943	Aug. 5, 1943	5.75	2,200				
1944	Feb. 25, 1944	5.29	580				

<sup>b</sup> Estimated.<sup>c</sup> Annual peak.

Gila River Basin

(77) Gila River near Dome, Ariz.

Location. --Lat 32°45'40", long. 114°25'10", in SW $\frac{1}{4}$  sec. 4, T. 8 S., R. 21 W., 440 ft upstream from bridge on Yuma-Quartzite highway, 3 miles west of Dome, and 12 miles upstream from mouth.

Drainage area. --58,080 sq mi, approximately (including 373 sq mi in Aubrey Valley Playa, a closed basin).

Gage. --Recording gage since May 1929. Datum of gage is 148.18 ft above mean sea level, datum of 1929.

Prior to Oct. 15, 1903, no gage; estimates of discharge.

Oct. 15, 1903, to Dec. 31, 1906, staff gage 4 miles upstream, with numerous supplementary staff gages following radical changes in channel in 1905 and 1906. Datum of principal gage is 158.37 ft above mean sea level, adjustment of 1912.

1907-28, no gage; estimates of discharge within the 20-mile reach upstream from mouth, between Dome and Yuma.

Stage-discharge relation. --Defined by current-meter measurements since 1929. Relation subject to large shifts.

Historical data. --Flood of Jan. 22, 1916 (estimated mean daily discharge, 200,000 cfs) was probably the greatest flood since Feb. 26, 1891, when a greater discharge may have occurred.

Remarks. --This tabulation is of annual floods only. Prior to 1929 maximum mean daily discharges are the only figures available but on the large floods they are probably close to the instantaneous maxima. Many of those figures were estimated from record of Colorado River at Yuma and scattered observations of flood flows and therefore are considered as rough estimates only. Flood record increasingly affected by diversions, and after completion of Roosevelt Dam on Salt River in 1911, by storage in major reservoirs. See record for Gila River below Gillespie Dam for details.

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1891	Feb. 26, 1891	-	(v)	1919	Aug. 6, 1919	-	3,000
1904	Aug. 30, 1904	-	4,560	1920	Feb. 25, 1920	-	95,000
1905	Mar. 20, 1905	-	95,000	1921	Aug. 24, 1921	-	25,000
1906	Nov. 29, 1905	-	95,000	1922	Jan. 6, 1922	-	36,800
1907	Mar. 7, 1907	-	50,000	1923	Sept. 21, 1923	-	8,000
1908	Feb. 7, 1908	-	37,500	1924	Dec. 30, 1923	-	46,500
1909	Dec. 19, 1908	-	62,500	1925	Sept. 22, 1925	-	6,500
1910	Jan. 5, 1910	-	45,000	1926	Apr. 11, 1926	-	20,000
1911	Jan. 15, Feb. 6, and Mar. 10, 1911	-	10,000	1927	Feb. 21, 1927	-	61,000
				1928	Feb. 9, 1928	-	1,400
1912	Mar. 15-16, 1912	-	10,000	1929	Apr. 9, 1929	-	<sup>b</sup> 1,500
1913	Mar. 16, 1913	-	2,500	1930	Aug. 14, 1930	10.50	3,600
1914	Feb. 22-27, 1914	-	8,000	1931	Feb. 19, 1931	13.78	11,400
1915	Feb. 3, 1915	-	80,000	1932	Feb. 15, 1932	16.75	20,700
1916	Jan. 22, 1916	-	<sup>a</sup> 200,000	1933	Oct. 10, 1932	3.90	770
1917	Apr. 20, 1917	-	40,000	1934	Aug. 5, 1934	3.44	200
1918	Mar. 16, 1918	-	30,900	1935	Feb. 16, 1935	5.35	757



## FLOODS IN ARIZONA

Gila River Basin

(77) Gila River near Dome, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1936	-	-	0	1944	-	-	0
1937	Mar. 24, 1937	12.68	8,530	1945	-	-	0
1938	Mar. 10, 1938	12.92	8,670	1946	-	-	0
1939	Sept. 13, 1939	7.47	905	1947	Aug. 9, 1947	5.25	380
1940	-	-	0	1948	-	-	0
1941	Apr. 22, 1941	13.93	14,000	1949	-	-	0
1942	-	-	0	1950	-	-	0
1943	-	-	0	1951	Sept. 7, 1951	7.94	1,100
				1952	Oct. 30, 1951	5.24	293

<sup>b</sup> Estimated.<sup>v</sup> May have exceeded flood of January 1916.<sup>z</sup> Instantaneous peak discharge at mouth, near Yuma was 230,000 cfs.

Note. --Peaks prior to 1929 are maximum mean daily discharges.

Colorado River Main Stem

(78) Colorado River at Yuma, Ariz.

Location. --Lat 32°43'45", long. 114°37'15", in NW¼NE¼ sec. 35, T. 16 S., R. 22 E., San Bernardino meridian, 1,800 ft downstream from highway bridge at Yuma, half a mile upstream from Yuma Main Canal wasteway, 5 miles downstream from Gila River, 7 miles upstream from boundary between California and Mexico, and 19 miles downstream from Imperial Dam.

Drainage area. --242,900 sq mi approximately.

Gage. --Recording gage at present site since July 20, 1934. Datum of gage is 102.32 ft above mean sea level, Yuma Project datum, or 102.86 ft, datum of 1929 (datum was 0.07 ft lower prior to earthquake of May 18, 1940). Since July 6, 1945, auxiliary recording gage 20 ft upstream, at same datum, used for periods of low stage or faulty record.

Prior to May 1, 1922, staff gages at several sites about 800 ft upstream on or near original railroad bridge of Southern Pacific Company, at approximately same datum. May 1, 1922, to Oct. 21, 1928, automatic sending device actuating recording gage in office of Bureau of Reclamation, and Nov. 1, 1928, to Oct. 24, 1933, recording gage, both 800 ft upstream at same datum. Oct. 25 to Nov. 10, 1933, staff gage 680 ft upstream and Nov. 11, 1933, to July 19, 1934, staff gage at present site at same datum.

Stage-discharge relation. --Defined by current-meter measurements. Relation subject to large shifts.

Historical data. --Flood of June 27, 1884, was reported by river-boat captain to have been the highest since 1867.

Remarks. --Flood records not appreciably affected by diversions and regulation on main stem prior to Feb. 1, 1935. Since that date flow has been regulated at Hoover Dam and other points. Regulation and storage in the Gila River basin prior to 1935 probably had little effect on flood records at this station.

Construction of levees to confine channel started about 1903.

Gage-height record for 1878-1902 furnished by Southern Pacific Company.

Base for partial-duration series, 40,000 cfs.

Bank-full stage. --35.5 ft (top of levee).

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1878	June 24, 1878	23.0	-	1892	July 3, 1892	25.5	-
1879	May 12, 1879	20.0	-	1893	May 28, 1893	25.2	-
1880	May 31, 1880	24.0	-	1894	June 14, 1894	23.7	-
1881	June 14, 1881	23.5	-	1895	Jan. 20, 1895	28.2	-
1882	June 18, 1882	22.6	-	1896	Sept. 30, 1896	24.5	-
1883	July 3, 1883	24.5	-	1897	June 9, 1897	26.1	-
1884	June 27, 1884	28.5	-	1898	June 27, 1898	23.6	-
1885	June 13, 1885	24.7	-	1899	July 1, 1899	27.0	-
1886	June 6, 1886	26.8	-	1900	June 10, 1900	26.0	-
1887	June 10, 1887	23.5	-	1901	May 31, 1901	27.2	-
1888	June 25, 1888	21.8	-	1902	May 26, 1902	24.5	-
1889	June 7, 1889	22.4	-	1903	June 27, 1903	27.2	673,000
1890	June 5, 1890	25.5	-	1904	June 7, 1904	26.0	651,500
1891	Feb. 26, 1891	33.2	-	1905	Mar. 20, 1905	30.3	6112,000

## FLOODS IN ARIZONA

## Colorado River Main Stem

(78) Colorado River at Yuma, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1906	Nov. 30, 1905	31.8	<sup>b</sup> 109,000	1920	Nov. 30, 1919	28.3	84,400
1907	June 30, 1907	28.6	<sup>b</sup> 116,000		Feb. 13, 1920	22.2	43,000
1908	June 26, 1908	25.45	<sup>b</sup> 62,700		25	32.0	175,000
1909	Dec. 19, 1908		<sup>b</sup> 74,000		June 8	30.7	190,000
	Apr. 1, 1909	25.0	44,900	1921	June 27, 1921	31.25	188,000
	27	24.75	47,200		Aug. 4	23.2	58,100
	June 24	-	<sup>b</sup> 150,000		29	23.8	61,800
	July 31	-	<sup>b</sup> 53,500	1922	Jan. 6, 1922	23.9	55,200
	Aug. 24	-	<sup>b</sup> 54,800		May 18	24.8	77,000
	Sept. 4	-	<sup>b</sup> 69,000		June 10	27.4	117,000
	13	-	<sup>b</sup> 94,000		21	25.4	112,000
1910	Jan. 5, 1910	23.3	72,800	1923	June 8, 1923	25.4	101,000
	Mar. 15	20.45	41,000		Sept. 24	24.3	60,100
	Apr. 1	20.4	40,300	1924	Dec. 30, 1923	25.1	69,800
	May 7	22.95	67,700		Apr. 22, 1924	22.2	44,800
	22	23.35	73,500		May 31	24.03	61,500
	June 12	23.55	71,200		June 24	24.3	66,500
1911	May 20, 1911	24.0	65,200	1925	June 8, 1925	23.45	53,200
	June 24	25.95	79,400		30	23.60	48,900
	July 30	22.85	58,100	1926	May 15, 1926	25.5	59,300
1912	Oct. 14, 1911	24.3	63,000		June 16	25.20	73,200
	June 22, 1912	29.15	146,000	1927	Feb. 21, 1927	29.4	92,400
	Aug. 2	20.8	42,200		May 14	25.45	59,900
1913	Apr. 27, 1913	21.05	41,300		June 2	27.0	76,200
	June 10	22.85	63,600		July 9	27.4	78,000
1914	June 15, 1914	29.05	141,000		Sept. 20	26.3	73,900
	July 25	20.25	52,800	1928	May 23, 1928	26.52	74,200
	Aug. 5	19.2	44,000		June 13	28.3	99,400
1915	Dec. 28, 1914	22.6	56,200	1929	June 7, 1929	27.26	91,000
	Feb. 3, 1915	26.8	102,000		Aug. 11	23.05	56,100
	Apr. 28	22.15	48,000		18	22.98	52,800
	May 8	24.2	69,800		Sept. 13	22.32	41,100
	28	22.0	53,000		28	23.16	43,300
	June 30	21.9	58,800	1930	May 3, 1930	22.71	42,400
1916	Jan. 22, 1916	34.0	250,000		June 9	25.16	54,500
	31	30.8	182,000		Aug. 16	24.48	49,400
	Mar. 26	25.35	75,300	1931	June 16, 1931	22.37	29,000
	May 24	25.1	76,800	1932	Feb. 16, 1932	26.51	58,000
	June 25	24.1	75,000		June 5	28.56	90,800
1917	Oct. 18, 1916	25.6	71,300		July 7	24.99	63,200
	Apr. 20, 1917	25.85	75,300	1933	June 23, 1933	26.10	70,700
	May 8	22.9	55,300	1934	May 20, 1934	21.02	22,900
	June 2	26.4	95,300	1935	June 26, 1935	21.46	15,600
	July 3	29.35	144,000	1936	Aug. 1, 1936	20.17	9,520
1918	Mar. 16, 1918	22.35	52,100				
	July 3	23.7	94,900				
1919	June 6, 1919	23.3	58,100				

Colorado River Main Stem

(78) Colorado River at Yuma, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1937	Feb. 10, 1937	24.22	23,200	1946	Feb. 9, 1946	17.60	16,800
1938	Mar. 6, 1938	23.26	21,700	1947	Feb. 5, 1947	16.56	14,200
1939	Sept. 7, 1939	24.57	34,900	1948	Jan. 31, 1948	18.27	21,300
1940	Jan. 16, 1940	19.48	13,800	1949	Jan 13, 1949	18.07	24,000
1941	June 5, 1941	22.66	30,400	1950	Jan. 12, 1950	16.88	22,900
1942	Feb. 7, 1942	20.49	31,800	1951	Apr. 5, 1951	15.57	16,100
1943	Dec. 14, 1942	18.67	19,000	1952	Mar. 20, 1952	17.60	23,600
1944	Feb. 24, 1944	18.89	21,200	1953	Feb. 12, 1953	16.76	24,300
1945	Mar. 5, 1945	18.90	22,900				

† Estimated on basis of published discharge measurements and daily discharge.

Whitewater Draw Basin

(79) Whitewater Draw near Douglas, Ariz.

Location. --Lat 31°21'15", long. 109°35'00", in SW $\frac{1}{4}$ SE $\frac{1}{4}$  sec. 10, T. 24 S., R. 27 E., at bridge on U. S. Highway 80, 1 $\frac{1}{2}$  miles upstream from international boundary and 2 miles west of Douglas.

Drainage area. --1,023 sq mi.

Gage. --Recording gage since June 17, 1930. Datum of gage is 3,907.10 ft above mean sea level, datum of 1929.

Prior to May 14, 1938, 0.03 ft higher. Prior to Apr. 30, 1922, staff gage at various sites within three-quarters of a mile at various datums.

Stage-discharge relation. --Defined by current-meter measurements below 2,000 cfs, extended above by logarithmic plotting. Relation is subject to shifting.

Remarks. --Flood record unaffected by irrigation diversions above station (mostly from groundwater).

Base for partial-duration series, 1,000 cfs.



## FLOODS IN ARIZONA

## Whitewater Draw Basin

(79) Whitewater Draw near Douglas, Ariz. --Continued

## Annual peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)	Water year	Date	Gage height (feet)	Discharge (cfs)
1916	July 11, 1916	9.5	<sup>c</sup> 1,600	1941	July 20, 1941	8.72	1,460
1917	Aug. 9, 1917	7.0	<sup>c</sup> 720		23	8.52	1,280
1918	July 15, 1918	8.0	<sup>c</sup> 1,050		Sept. 7	8.12	1,010
1919	July 27, 1919	14.5	<sup>h</sup> 4,050		29	10.27	2,750
1920	Nov. 23, 1919	13.3	<sup>c</sup> 3,400	1942	July 16, 1942	8.57	1,320
1930	June 21, 1930	8.14	1,240		Sept. 13	9.85	2,300
	July 23	8.73	1,490	1943	June 30, 1943	10.34	2,750
	Sept. 7	9.11	1,700		July 15	8.53	1,180
1931	Aug. 5, 1931	11.56	3,040		Aug. 2	9.75	2,140
	10	12.15	3,450		10	10.04	2,440
	30	9.56	1,710		20	9.15	1,580
	Sept. 1	8.61	1,170		24	9.29	1,710
1932	Oct. 1, 1931	8.86	1,430	1944	Aug. 16, 1944	9.78	2,190
	July 29, 1932	9.09	1,560		18	9.13	1,710
	31	9.54	1,800	1945	July 31, 1945	11.16	3,100
1933	July 16, 1933	8.36	1,180	1946	Oct. 9, 1945	9.27	1,440
	23	8.10	1,060		Aug. 5, 1946	8.89	1,180
	Sept. 20	9.36	1,730		17	8.56	1,010
1934	Aug. - 1934	11.65	<sup>v</sup> 3,100	1947	After July 8, 1947	<sup>a</sup> 9.33	<sup>w</sup> 1,580
1935	Aug. 28, 1935	10.58	2,360	1948	July 22, 1948	11.10	3,170
	Sept. 1	11.40	2,900		28	9.04	1,180
	22	8.65	1,210		Aug. 10	9.14	1,420
1936	Sept. 11, 1936	-	<sup>b</sup> 2,000		12	9.48	1,710
1937	July 20, 1937	8.27	1,260		23	8.88	1,210
	Aug. 19	10.30	2,770	1949	July 11, 1949	9.38	1,450
	21	10.15	2,650		18	9.77	1,790
	23	10.20	2,690	1950	July 9, 1950	8.88	1,070
	Sept. 6	8.48	1,420		19	12.38	3,400
1938	Dec. 4, 1937	8.09	1,170		22	9.31	1,070
	July 20, 1938	8.34	1,320	1951	Aug. 20, 1951	9.06	1,230
	Aug. 7	9.29	1,990	1952	June 2, 1952	10.48	1,670
	Sept. 9	7.88	1,020		Aug. 17	10.34	1,660
1939	July 17, 1939	8.17	1,110	1953	July 7, 1953	12.2	2,950
	Aug. 5	10.25	2,690		13	10.1	1,520
	Sept. 17	9.21	1,900		18	9.18	1,050
1940	June 24, 1940	10.26	2,750		26	9.90	1,420
	Aug. 13	9.62	2,160		31	9.90	1,420
	Sept. 19	8.54	1,360				

<sup>a</sup> From floodmarks.<sup>b</sup> Estimated.<sup>c</sup> Maximum annual peak observed; other peaks not known.<sup>h</sup> Maximum observed; higher peak may have occurred about July 15, 1919.<sup>v</sup> Annual peak; peaks January to September 1934 not known.<sup>w</sup> Annual peak; other peaks July to September 1947 not known.

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	Station no.	Page
Agua Fria River at Lake Pleasant Dam, Ariz. ....	135	6
near Mayer, Ariz. ....	72	98
Aravaipa Creek near Feldman, Ariz. ....	47	69
Arroyo Seco at mouth, 21 miles upstream from Picacho, Calif. ....	110	5
Beaver Creek at Camp Verde, Ariz. ....	132	6
Big Sandy River below Burro Creek at Signal, Ariz. ....	108	5
Bill Williams River at confluence of Big Sandy and Santa Maria Rivers, near Alamo, Ariz. ....	109	5
at Planet, Ariz. ....	27	43
near Alamo, Ariz. ....	26	42
Black Creek (tributary to Puerco River) near Houck, Ariz. ....	101	5
Black River near Fort Apache, Ariz. ....	121	6
Bright Angel Creek near Grand Canyon, Ariz. ....	20	35
Cave Creek (tributary to San Simon Creek), near Paradise, Ariz. ....	35	54
Cave Creek (tributary to Salt River), near Phoenix, Ariz. ....	134	6
Chemehuevi Wash at Needles-Vidal Highway, near Needles, Calif. ....	106	5
Chevelon Fork below Wildcat Canyon, near Winslow, Ariz. ....	12	25
near Winslow, Ariz. ....	13	26
Clear Creek below Willow Creek, near Winslow, Ariz. ....	14	27
near Winslow, Ariz. ....	15	28
Colorado River at Lees Ferry, Ariz. ....	1	14
at Yuma, Ariz. ....	78	105
near Grand Canyon, Ariz. ....	19	33
near Topock, Ariz. ....	23	39
Copper Hill Wash at Globe, Ariz. ....	126	6
Date Creek near Congress, Ariz. ....	24	40
Eagle Creek above pumping plant, near Morenci, Ariz. ....	113	5
near Double Circle Ranch, near Morenci, Ariz. ....	33	51
East Fork White River at Fort Apache, Ariz. ....	123	6
Gila River at Calva, Ariz. ....	39	58
at head of Safford Valley, near Solomon, Ariz. ....	34	52
at Kelvin, Ariz. ....	48	70
at Safford, Ariz. ....	38	57
at Winkelman, Ariz. ....	42	63
below Blue Creek, near Virden, N. Mex. ....	28	44
below Coolidge Dam, Ariz. ....	41	61
below Gillespie Dam, Ariz. ....	76	101
near Clifton, Ariz. ....	29	45
near Dome, Ariz. ....	77	103
near Laveen, Ariz. ....	50	73
near Sentinel, Ariz. ....	136	6
Granite Creek near Prescott, Ariz. ....	67	93
Hassayampa River at Box dam site, near Wickenburg, Ariz. ....	74	99
near Morristown, Ariz. ....	75	100
near Wagoner, Ariz. ....	73	99
Julian Wash at Highway 80 near Tucson, Ariz. ....	119	5
Kirkland Creek at Yava, Ariz. ....	107	5
Little Colorado River above Lyman Reservoir, near St. Johns, Ariz. ....	3	17
above Zuni River, near Hunt, Ariz. ....	4	18
at Grand Falls, Ariz. ....	16	29
at Holbrook, Ariz. ....	11	25
at Woodruff, Ariz. ....	8	22
near Cameron, Ariz. ....	18	32
near Hunt, Ariz. ....	5	19

	Station no.	Page
Moenkopi Wash near Tuba, Ariz. ....	17	31
Muddy River near Overton, Nev. ....	22	38
Nogales Wash at Nogales, Ariz. ....	116	5
Oak Creek near Cornville, Ariz. ....	68	94
Pantano Wash near Tucson, Ariz. ....	120	6
Paria River at Lees Ferry, Ariz. ....	2	15
Picacho Wash at All-American Canal, near Yuma, Ariz. ....	112	5
Pinal Creek below Copper Hill Wash at Globe, Ariz. ....	127	6
Piute Wash at Box Canyon, 8.5 miles northwest of Needles, Calif. ....	104	5
Puerco River at Gallup, N. Mex. ....	9	23
near Adamana, Ariz. ....	10	24
Queen Creek at Whitlow dam site, near Superior, Ariz. ....	49	72
near Florence Junction, Ariz. ....	115	5
Rillito Creek near Tucson, Ariz. ....	60	85
near Wrightstown, Ariz. ....	59	84
Sabino Creek near Mount Lemmon, Ariz. ....	57	82
near Tucson, Ariz. ....	58	83
Sacramento Wash at mouth, near Topock, Ariz. ....	105	5
Salt Creek near Winslow, Ariz. ....	102	5
Salt River at Arizona Dam, Ariz. ....	133	6
at Roosevelt (below Tonto Creek), Ariz. ....	128	6
near Chrysotile, Ariz. ....	64	89
near Roosevelt, Ariz. ....	65	91
San Carlos River near Peridot, Ariz. ....	40	59
San Francisco River at Clifton, Ariz. ....	30	47
San Pedro River at Charleston, Ariz. ....	44	65
at Palominas, Ariz. ....	43	64
nr. Redington, Ariz. ....	45	67
near Mammoth, Ariz. ....	46	68
San Simon Creek near San Simon, Ariz. ....	36	55
near Solomon, Ariz. ....	37	56
Santa Cruz River at Continental, Ariz. ....	54	77
at Cortaro, Ariz. ....	61	87
at Tucson, Ariz. ....	55	79
near Laveen, Ariz. ....	62	88
near Lochiel, Ariz. ....	51	74
near Nogales, Ariz. ....	52	74
Santa Maria River near Alamo, Ariz. ....	25	41
Show Low Creek at Show Low, Ariz. ....	6	20
Silver Creek near Snowflake, Ariz. ....	7	21
Sonoita Creek near Patagonia, Ariz. ....	53	76
Sopori Wash, 2 miles northwest of Amado, Ariz., and 3 miles above mouth .	117	5
Tonto Creek above Gun Creek, near Roosevelt, Ariz. ....	66	92
Truxton Canyon near Kingman, Ariz. ....	103	5
Tucson Arroyo at Vine Avenue, Tucson, Ariz. ....	56	81
Verde River at Camp Verde, Ariz. ....	131	6
below East Verde River, near Pine, Ariz. ....	70	95
below Tangle Creek, above Horseshoe Dam, Ariz. ....	71	96
near Camp Verde, Ariz. ....	69	95
near Clarkdale, Ariz. ....	130	6
Virgin River at Littlefield, Ariz. ....	21	37
Wash above Gunters Ranch, 12½ miles north of Pomerene, Ariz. ....	114	5
Wash at All-American Canal, near Yuma, Ariz. ....	111	5
Wash ¼ mile above mouth and 5 miles northeast of Amado, Ariz. ....	118	5
White River at Fort Apache, Ariz. ....	124	6
at Wanslee's Ranch, near Fort Apache, Ariz. ....	125	6
at White River, Ariz. ....	122	6
near McNary, Ariz. ....	63	89



# INDEX OF FLOOD RECORDS

113

	Station no.	Page
Whitewater Draw near Douglas, Ariz. ....	79	107
Willow Creek (tributary to Eagle Creek) near Double Circle Ranch, near Morenci, Ariz. ....	32	50
near Point of Pines, near Morenci, Ariz. ....	31	48
Willow Creek (tributary to Granite Creek in Verde River basin) near Prescott, Ariz. ....	129	6