Floods of November 1978 to March 1979 in Arizona and West-Central New Mexico

United States Geological Survey Water-Supply Paper 2241

Prepared in cooperation with the U.S. Bureau of Reclamation; U.S. Army Corps of Engineers, Los Angeles District; Arizona Department of Water Resources; Flood Control District of Maricopa County; and Salt River Valley Water Users' Association

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By B. N. ALDRIDGE and T. A. HALES

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Floods of November 1978 to March 1979 in Arizona and West-Central New Mexico

By B N Aldridge *and* T A Hales

Abstract

Severe flooding occurred in parts of the Little Colorado and Gila River basins as a result of a storm that occurred December 17-20, 1978 The central highlands received 3 to 10 inches of precipitation that was augmented by snowmelt to altitudes of 10,000 feet The storm was preceded by extremely large amounts of rainfall and runoff in November and was followed by other periods of high runoff in January and March 1979 In some areas flood peaks in November, January, or March were higher than the peak of December 1978

At Winslow, the discharge of the Little Colorado River in December 1978 was the highest since at least 1952 The discharge of the Gila River above the San Francisco River was probably the highest since at least 1891, and in the Safford Valley, the peak was the highest since 1916 The Agua Fria River below Waddell Dam had the highest discharge since 1919

The flood of December 1978 caused 12 deaths and caused damage that was probably in excess of $150 million in Arizona and west-central New Mexico Damage was estimated to be $51 8 million in Maricopa County, Arizona Floods caused extensive agricultural damage along the Gila River in Virden Valley in New Mexico and in Duncan, York, and Safford Valleys in Arizona Duncan, Arizona, was flooded with as much as 7 feet of water

The flood crest on the Gila River in December 1978 moved from Redrock, New Mexico, to Duncan, Arizona, in about 6 hours, which is more rapid than during other recent floods but is comparable to the traveltime recorded in 1941 Traveltime in the reach varies with discharge and is about 14 hours for discharges of 10,000 cubic feet per second and 5 hours for discharges of more than 40,000 cubic feet per second

Water-conservation reservoirs on the Gila, Salt, Verde, and Agua Fria Rivers and a flood-control reservoir on the Gila River had a major influence on the magnitude of floods downstream from the reservoirs All runoff from the Gila River basin upstream from Coolidge Dam, Arizona, during the floods of November 1978 to January 1979 was stored in San Carlos Reservoir, and major flooding was averted along the Gila River between Coolidge Dam and Salt River Minor flooding occurred along the Gila River downstream from San Pedro River Floods in central and western Maricopa County, Arizona, were caused by the release of water from full reservoirs on the Salt, Verde, and Agua Fria Rivers, but peak discharges and duration of the floods were much less than would have occurred if the reservoirs had not been in place Flow continued in the Salt River through Phoenix until May 1979 Floodwater was stored in the flood-control reservoir above Painted Rock Dam on the Gila River in order to prevent major damage along the Gila and Colorado Rivers Water was released from Painted Rock Dam until January 1980 The prolonged flows and reduction in ground-water pumping caused ground-water levels to rise appreciably in many areas

INTRODUCTION

Several storms and periods of high water occurred in Arizona from November 1978 to March 1979. The most widespread damage occurred in December 1978, when there was severe flooding in much of Arizona and west-central New Mexico Flooding was most severe along the Gila River upstream from San Carlos Reservoir and along the Salt, Agua Fria, and Gila Rivers near Phoenix The flood caused 12 deaths, and damage exceeded $150 million After the flood of December 1978, the President declared 10 counties in Arizona and 3 counties in New Mexico eligible for Federal disaster aid

The purpose of this report is to document the floods by bringing together hydrologic and economic data from many sources. Related purposes are to (1) analyze the floods in regard to antecedent conditions, sources of runoff, traveltimes, and damage; (2) provide detailed hydrograph data that are not readily available elsewhere; and (3) compare the floods to past events. Data presented in the section entitled "Streamflow Data at Gaging Stations and Miscellaneous Measuring Sites" can be used to develop models for flood routing and time-of-travel studies The report covers northward-flowing tributaries of the Little Colorado River and Havasu Creek in Arizona and most of the Gila River basin in Arizona and New Mexico (fig 1) Emphasis is on the floods of December 18-20 in the Gila River basin upstream from San Carlos Reservoir and near Phoenix Lesser floods in November 1978 and in January and March 1979 are also described.

The report was prepared in cooperation with the Arizona Department of Water Resources, Flood Control District of Maricopa County, Salt River Valley Water Users' Association; U S Bureau of Reclamation; and the U S. Army Corps of Engineers, Los Angeles District. The authors wish to express thanks to the personnel of these agencies who provided data and to personnel from the Arizona Department of Transportation, Arizona Emergency Services, U.S. Soil Conserva-

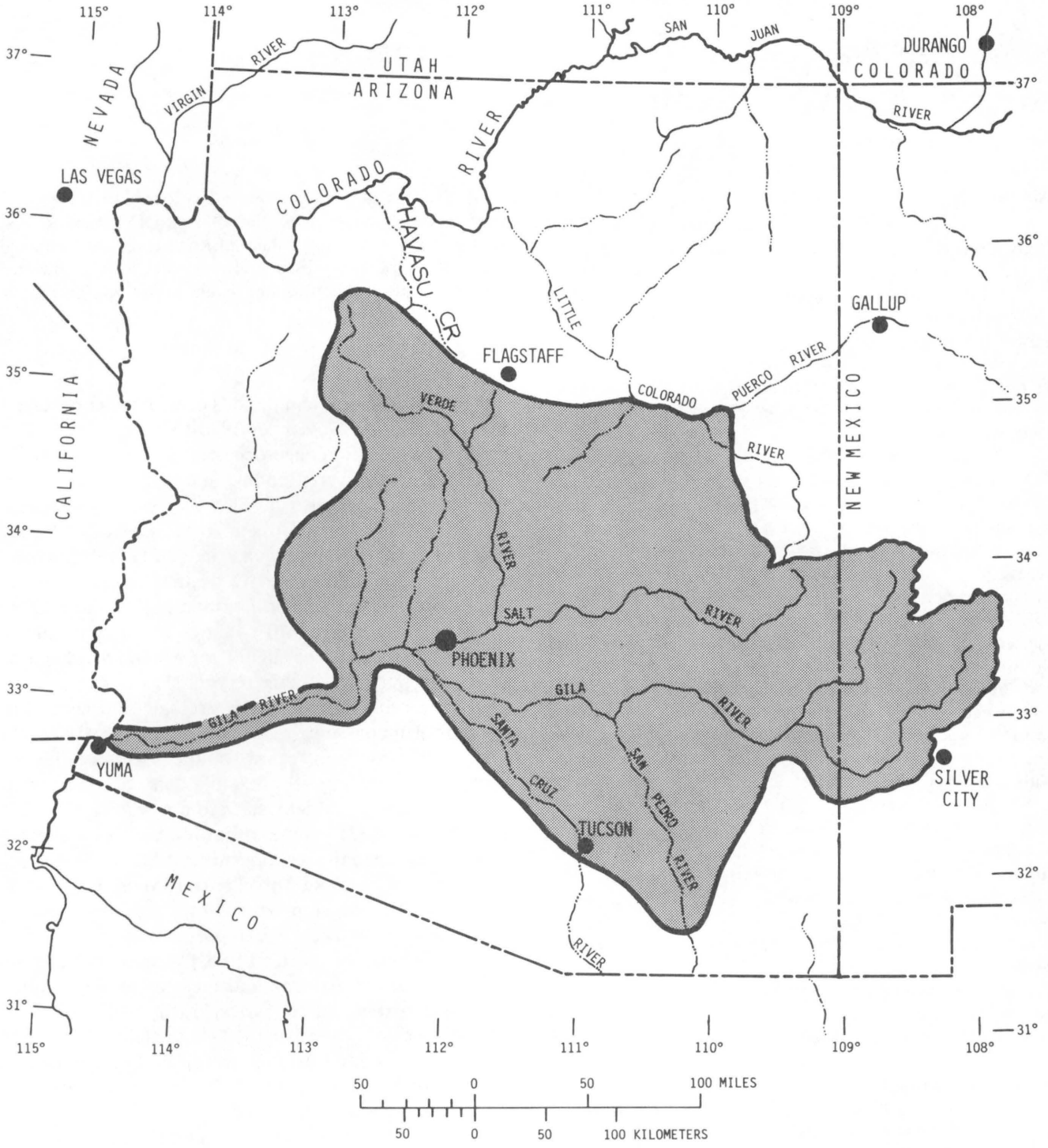

Figure 1. Area of report (shaded).

tion Service, U.S. Forest Service, U.S. Environmental Data and Information Service, Rocky Mountain Forest and Range Experiment Station, Forestry Sciences Laboratory, City of Phoenix, Maricopa County Highway Department, and Maricopa County Municipal Water Conservation District No. 1. Special thanks also are extended to U.S Geological Survey personnel who helped collect and tabulate the streamflow data, especially John P. Boland for tabulating the data from streams in New Mexico.

GEOGRAPHIC SETTING

The floods of November 1978 to March 1979 originated mainly in the mountainous area of central Arizona and west-central New Mexico and in scattered mountain ranges of southern Arizona (pl. 1). The mountainous area is drained by the Little Colorado and Gila Rivers, which flow across Arizona to the Colorado River and form the principal drainage basins in Arizona The Little Colorado River drains about 27,000 mi^2 in northwestern New Mexico and northeastern Arizona, but flooding occurred mainly in the 9 percent of the basin drained by Silver, Chevelon, and Clear Creeks in Arizona. Flooding occurred in about half of the 58,000 mi^2 drained by the Gila River Flooding also occurred in the headwaters of Havasu Creek, which heads west of Flagstaff, Ariz , and flows northward to the Colorado River.

The Gila River flows generally westward from New Mexico to the Colorado River. In New Mexico, the Gila River has a large dendritic drainage pattern that consists of three main forks—East, Middle, and West Fork Gila River—and several large tributaries. All major tributaries in New Mexico enter the Gila River upstream from the town of Cliff, N. Mex Principal tributaries to the Gila River in Arizona upstream from Coolidge Dam are the San Francisco River, Eagle Creek, Bonita Creek, and San Carlos River, which drain from the mountains along the north side of the basin, and the San Simon River, which drains from the south.

Six large tributaries—San Pedro, Santa Cruz, Salt, Agua Fria, and Hassayampa Rivers and Centennial Wash—join the Gila River between Coolidge and Gillespie Dams. Flooding occurred in parts of the San Pedro and Santa Cruz Rivers, which enter the Gila River from the south, but flow from these streams was largely dissipated upstream from the confluence of the Gila and Santa Cruz Rivers Principal sources of flooding downstream from the Santa Cruz River were the Salt and Agua Fria Rivers, which join the Gila River from the north Tributaries to the Gila River downstream from Gillespie Dam had little runoff from November 1978 to March 1979.

The Salt River, which is the principal tributary to the Gila River, heads in the White Mountains at altitudes of more than 10,000 ft above the National Geodetic Vertical Datum (NGVD) of 1929 and flows southwestward to join the Gila River west of Phoenix. Downstream from the confluence of the Black and White Rivers, five main tributaries—Carrizo, Cibecue, Canyon, Cherry, and Tonto Creeks—drain from the Mogollon Rim and enter the river within a 90-mi reach. The five main tributaries are separated by steeply sloping, sparsely vegetated mountain ranges that extend southward from the Mogollon Rim and cause orographic uplift to eastward-moving storms. The Salt River is joined by is major tributary, the Verde River, 25 mi upstream from Phoenix Drainage areas of the Salt and Verde Rivers at their confluence are 6,300 mi^2 and 6,600 mi^2, respectively Downstream from the Verde River, the Salt River flows through Phoenix and is crossed by many streets that connect the southern and northern parts of the metropolitan area.

The Agua Fria River heads near Prescott and flows southward to join the Gila River near Avondale 3 mi downstream from the Salt River. Principal tributaries are Black Canyon Creek and New River. Black Canyon Creek drains the Bradshaw Mountains and enters the Agua Fria River upstream from Lake Pleasant. New River drains the New River Mountains and enters the Agua Fria River downstream from Lake Pleasant.

Much of the Gila River is bounded by flood plains or valleys that are highly developed for agriculture. Several small valleys that border the Gila River near Gila Hot Springs, Cliff, and Redrock, N Mex., and four large valleys upstream from San Carlos Reservoir—Virden, Duncan, York, and Safford Valleys —sustained damage from the flood of December 1978 Virden Valley begins about 5 mi upstream from Virden, N. Mex At the New Mexico-Arizona State line, Virden Valley becomes Duncan Valley Duncan Valley extends about 12 mi northeast of Duncan. York Valley begins just downstream from Duncan Valley and extends about 5 mi downstream to where the Gila River enters a steep-walled rock canyon upstream from the San Francisco River. Safford Valley, which is the most extensively developed area above San Carlos Reservoir, begins where the canyon ends about 2 mi upstream from Solomon, Ariz., and extends to the upper end of San Carlos Reservoir Several towns—Pima, Thatcher, Safford, and Solomon—are located on the edge of the flood plain in Safford Valley. Narrow, sparsely developed flood plains exist between San Carlos Reservoir and Florence; wide flood plains border the Gila River between Florence and the mouth of the Gila River.

DAMS AND RESERVOIRS

Eight water-conservation reservoirs on the Gila, Salt, Verde, and Agua Fria Rivers and one large flood-control reservoir on the Gila River have a major influence on floods The operational pattern of the conservation reservoirs and the probability of various amounts of inflow and storage must be considered when applying data in this report to flood forecasting Key factors that determine the magnitude of floodflows below the reservoirs are the volume of inflow during a flood and the amount of water in storage at the start of the flood. The latter is a function of carryover storage and runoff before the flood

Principal water-conservation reservoirs are San Carlos Reservoir on the Gila River and Roosevelt Lake on the Salt River San Carlos Reservoir has a capacity of 1,070,000 acre-ft and is formed by Coolidge Dam, which was completed in 1929. Roosevelt Lake on the Salt River just below Tonto Creek is formed by Roosevelt Dam and was completed in 1910. The capacity table in use at the time of the flood showed a capacity of 1,382,000 acre-ft; however, the capacity table put in use January 1982 shows a capacity of 1,337,000 acre-ft Three smaller reservoirs on the Salt River—Apache, Canyon, and Saguaro Lakes—have a combined capacity of 373,000 acre-ft Horse Mesa, Mormon Flat, and Stewart Mountain Dams, which form the three smaller reservoirs, were built between 1924 and 1930. The Verde River reservoirs—Horseshoe and Bartlett Reservoirs —have a combined capacity of 309,600 acre-ft. Horseshoe and Bartlett Dams were completed in 1945 and 1938, respectively Releases from Stewart Mountain Dam on the Salt River and Bartlett Dam on the Verde River plus floodflows from small uncontrolled drainages constitute the floodflow of the Salt River through Phoenix.

The capacity of Lake Pleasant above Waddell Dam on the Agua Fria River is 157,600 acre-ft, Waddell Dam was completed in 1927. Painted Rock Dam on the Gila River near Gila Bend was completed in 1959 Painted Rock Reservoir, which has a capacity of about 2 5 million acre-ft, provides flood control for the lower reaches of the Gila River and for the Colorado River downstream from the Gila River.

The conservation reservoirs were built solely for storing water for future use; no storage capacity is specifically dedicated to flood control The dams have small outlets designed to carry only as much water as is needed for power generation and downstream uses. Large quantities of water cannot be released until the stage reaches the spillway, which has the sole purpose of protecting the dam The capacity of each reservoir is greater than the median annual runoff of the stream on which it is located (table 1) The reservoirs can store enough water to meet the needs during several dry years and fill to capacity only during years of high runoff Before December 1978, San Carlos Reservoir on the Gila River had not spilled, reservoirs on the Salt River had spilled eight times Reservoirs on the Verde River had spilled five times, and Lake Pleasant had spilled three times The large storage capacities and the drawn-down condition that generally precedes the high-runoff season make a large amount of flood control possible Storage provided by the reservoirs greatly reduced peak discharges and duration of previous floods Aldridge and Eychaner (1982, table 12) compared the actual discharge that occurred below Granite Reef Dam on the Salt River during 18 flood periods with discharges that would have occurred without the reservoirs Actual discharges ranged from less than 2,000 to 130,000 ft^3/s; estimates of discharges that would have occurred during the same periods without the reservoirs range from 85,000 to 260,000 ft^3/s. Severe flooding occurred downstream from the Salt River reservoirs in December 1978 and in January and March 1979; therefore, the Salt River reservoirs are used to illustrate the general operational pattern of the conservation reservoirs Past records show periods of as much as 7 consecutive years when inflow into the Salt River reservoirs was less than demand One such period is indicated by the progressive decline in reservoir contents during 1942–48 (fig 2). The importance of filling the reservoirs whenever possible is exemplified by the fact that in 9 years, the latest being 1977, the carryover storage in the reservoir system on the Salt River would not have been adequate to meet the demand during one more dry year

The reservoirs generally are at the lowest level of each year shortly before the high-runoff season, which can begin any time from November to March (fig 3). Large amounts of runoff in the spring of 1978 allowed above-average carryover storage in reservoirs on the Salt, Verde, and Agua Fria Rivers; in contrast, carryover storage in San Carlos Reservoir on the Gila River was low Minimum storage levels in the reservoirs before the high runoff began in November 1978 were 69,000 acre-ft in San Carlos Reservoir, on October 20, 1,267,000 acre-ft in the Salt River system, on November 10, 165,400 acre-ft in the Verde River system, on September 20; and 108,000 acre-ft in Lake Pleasant, October 23 to November 10

Three low-head diversion dams on the Salt and Gila Rivers serve as measuring points for streamflow Inflow to the Phoenix metropolitan area from the Salt

Table 1 Minimum, median, and maximum annual runoff and reservoir capacities, Gila, Salt, Verde, and Agua Fria Rivers
[Runoff and reservoir capacities, in acre feet Modified from Aldridge, 1981]

Capacity	Gila River	Salt River	Verde River	Agua Fria River
Annual runoff:				
Minimum.....	[1]34,800	[2]189,000	[3]137,000	[4]3,000
25th percentile..	[1]93,500	[2]317,000	[3]193,000	[4]11,000
Median.....	[1]174,000	[2]530,000	[3]240,000	[4]24,000
75th percentile..	[1]340,000	[2]822,000	[3]410,000	[4]60,000
Maximum.....	[1]1,767,000	[2]2,731,000	[3]1,238,000	[4]221,000
Reservoir capacities.....	1,070,000	1,755,000	309,600	157,600

[1]Gila River at Coolidge Dam, 1914-28; summation of Gila River near Calva and San Carlos River near Peridot, 1929-78.

[2]Summation of Salt River near Roosevelt; Tonto Creek near Roosevelt, 1914-41; and Tonto Creek above Gun Creek, near Roosevelt, 1941-78. Represents at least 95 percent of the inflow to Roosevelt Lake.

[3]Based on records from several sites between Tangle Creek and the mouth of the Verde River, 1905-78. Represents nearly all inflow to Horseshoe Reservoir.

[4]Computed inflow to Lake Pleasant, 1914-19, 1933-78.

River is measured at Granite Reef Dam, which is 3 4 mi downstream from the Verde River (pl 1) Outflow from the Phoenix area is measured at Gillespie Dam on the Gila River south of Buckeye. An intermediate measurement is made at Jointhead Dam on the Salt River in Phoenix

Several other reservoirs in the flood area had little impact on floodflows of major streams Lyman Lake on the Little Colorado River had little impact on floodflows because inflow was small Records of inflow, outflow, and lake levels are not available for most reservoirs on Show Low, Silver, Chevelon, and Clear Creeks in the Little Colorado River basin, Cataract Creek in the Havasu Creek basin, Sullivan Reservoir on the Verde River, and small reservoirs on Granite and Willow Creeks near Prescott Flood-control reservoirs on Queen Creek, Cave Creek, and several small drainages may have prevented or reduced flooding downstream from the reservoirs but had little impact on floods in the Gila and Salt Rivers These reservoirs have not been considered in subsequent analyses of the flood

METEOROLOGY

General Conditions, November 1978 to March 1979

A series of upper-level low-pressure centers developed off the southwest coast of California and the west coast of Baja California in November 1978 through January 1979 and again in March 1979 These low-pressure centers caused frequent periods of widespread precipitation in Arizona and western New Mexico November 1978, December 1978, and March 1979 each had three distinct periods of heavy precipitation Precipitation occurred almost daily in January and early February. Unusually large amounts of precipita-

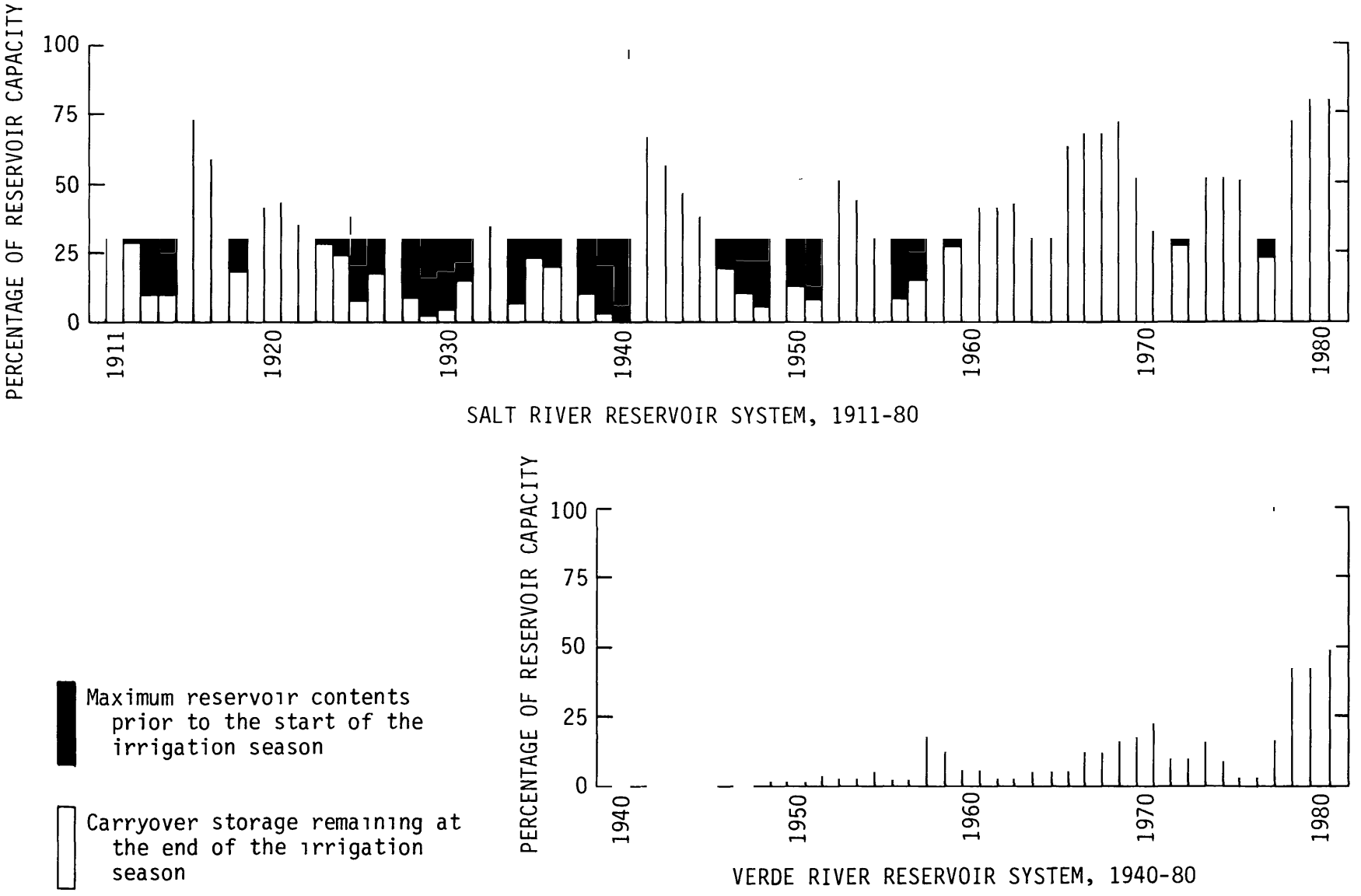

Figure 2. Maximum reservoir contents and carryover storage, Salt River reservoir system, 1911–80, and Verde River reservoir system, 1940–80 (Aldridge, 1981)

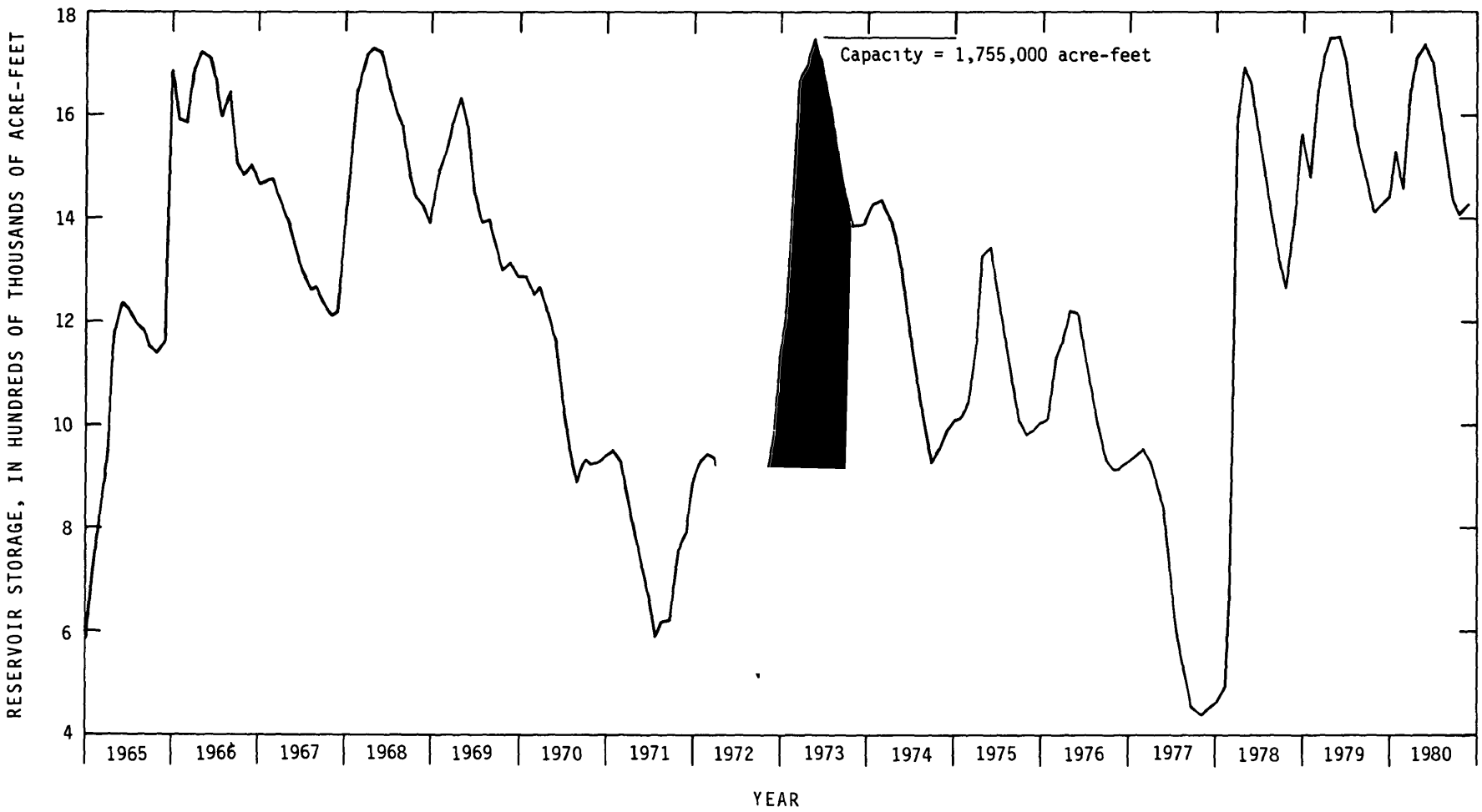

Figure 3. Monthend storage in the Salt River reservoir system, 1965–80

tion occurred on November10-12, November 23-26, December 17-20, January 17-18, and March 28-31 (U S Environmental Data and Information Service, 1978a-f; 1979a-g) Precipitation of 2 to 7 in fell over north-central Arizona during November 10-12, 1978; the Crown King station reported 8 55 in Precipitation of 1 to 5 in fell on much of eastern Arizona and western New Mexico during November 23-26, 1978; Palisades Ranger Station in the mountains near Tucson, Ariz , reported 5 62 in (U. S Environmental Data and Information Service, 1978b, 1978e). From 3 to 10 in. of precipitation fell in most of the study area during December 17-20.

Between 30 and 40 in. of precipitation fell at Hawley Lake, Sunrise Mountain, Palisades Ranger Station, Crown King, Junipine, and McNary from November 1978 through March 1979. More than 20 in. fell at 20 other locations in the central mountains of Arizona (table 2) The locations of climatological stations are shown on plate 2 The maximum precipitation was about 39 in at Hawley Lake and Sunrise Mountain (U S. Environmental Data and Information Service, 1978b, 1978c, 1979b). The total departure above normal for the period was more than 20 in at Junipine and Crown King and more than 10 in. at 20 other climatological stations for which departures are published (table 2) Departures of this magnitude probably occurred at many more stations; however, the U.S Environmental Data and Information Service publishes departures for only about 25 percent of the precipitation stations Eight stations reported departures above normal of more than 4 in. for both November and December. Departures above normal for several stations were 2 to nearly 8 in for January and 2 to 3 in for March 1979

Throughout the study period, precipitation fell partly as rain and partly as snow, and alternate periods of snowfall and snowmelt occurred In November and December, a constant snow cover existed only above an altitude of about 8,000 ft. The constant snow cover dropped to about 7,000 ft in January and below 6,000 ft in February Before the storm of December 17-20, the snow depth reached a maximum on December 7 and decreased rapidly until December 17. Little snow was reported on the ground on December 17 at National Weather Service stations below 8,000 ft, but U.S. Soil Conservation Service SNOTEL recorders showed some snow at lower altitudes Satellite photographs show that more than 75 percent of the Salt River basin had snow cover on December 7, and about 16 percent of the basin had snow on December 14. Extrapolation from these figures indicates that about 10 percent of the basin had snow cover on December 17.

The decrease in snow cover occurred despite the record low daily minimum temperatures in early December, as reported by many climatological stations At Winslow, Ariz., daily minimum temperatures during December 7-12, 1978, ranged from $-3°$ to $-11°$F, and maximum temperatures ranged from 17° to 23°F Temperatures during the first 2 weeks of December dropped as low as $-32°$F at a U S. Forest Service climatological station about 10 mi southeast of Alpine Below-zero temperatures were reported at all National Weather Service temperature stations in the study area located at altitudes of more than 5,000 ft except Jerome and Sierra Ancha stations and at five stations below 5,000 ft. After December 12, temperatures moderated Minimum temperatures in the mountains were generally in the high twenties or low thirties, and maximum temperatures ranged from the low forties to the low seventies.

The effect of precipitation, snow cover, and temperatures on soils cannot be evaluated from the data available The large amounts of precipitation followed by periods of snowmelt in November and December may have saturated soils, but significant soil drainage could have occurred between periods of wetting The snowpack in areas where extreme cold temperatures occurred may have insulated the ground from freezing, and the moderate-to-warm temperatures during December 12-17 may have allowed frozen soils to thaw.

Conditions, December 17-20, 1978

The heaviest and most extensive rainfall of the study period occurred during December 17-20 Total precipitation during this period ranged from less than 1 in in northeastern and southwestern Arizona to about 10 in in the Mazatzal Mountains northeast of Phoenix

The U S Environmental Data and Information Service (1979h) described the storm as follows

> Several days before the onset of this storm on the night of December 16, an upper low was meandering over the eastern Pacific near 27°N [latitude] and 133°W [longitude] This cutoff low developed several days previously from an eastern Pacific trough The north portion of the trough moved eastward and a strong zonal flow was established across the northeastern Pacific, much of the United States, and southern Canada The air in these westerlies [winds moving from the west] was quite dry Arizona, likewise was dry
>
> As the upper low continued to meander, moisture began to increase over the southwestern United States Satellite imagery from December 14 through 17 showed a large mass of cloudiness stretching from Baja [Mexico], southwestward The flow across the Baja Peninsula and southern California was still anticyclonic, and all cloudiness streaming into Arizona from the southwest was cirriform [high thin clouds]

Table 2. Precipitation and departures above normal at climatological stations in Arizona, November 1978 to March 1979

[Stations where precipitation exceeded 20 inches or published departures above normal exceeded 10 inches Data from U S Environmental Data and Information Service, 1978a, 1978b, 1979a, 1979b, 1979c]

Site number (See pl 2)	Station name	Altitude, in feet, above NGVD of 1929	Total precipitation, in inches, November-March	Departure above normal, in inches					
				1978		1979			Total
				November	December	January	February	March	November-March
1	Alpine	8,050	17 42	6 78	2 76	2 09	-0 26	-0 02	11 35
6	Bartlett Dam	1,650	16 33	2 28	2 42	3 42	- 73	2 97	10 36
13	Bumble Bee	2,500	21 53	-----	-----	-----	-----	-----	-----
17	Chevelon Ranger Station	7,006	16 75	4 60	2 60	2 02	- 27	1 05	10 00
18	Childs	2,650	23 63	5 11	4 87	3 80	- 66	2 66	15 78
22	Crown King	5,920	33 91	8 48	5 53	5 24	- 43	1 92	20 74
26	Flagstaff AP	7,006	21 34	4 83	3 24	3 65	26	69	12 67
29	Gisela	2,900	18 31	2 51	2 33	2 73	- 09	3 19	10 67
32	Happy Jack Ranger Station	7,840	26 32	-----	-----	-----	-----	-----	-----
33	Hawley Lake	8,180	38 86	-----	-----	-----	-----	-----	-----
35	Horseshoe Dam	2,020	20 23	-----	-----	-----	-----	-----	-----
38	Irving	3,795	22 39	5 16	2 27	4 80	- 40	1 88	13 71
39	Junipine	5,134	35 44	6 30	6 54	7 76	43	1 33	22 36
40	Kelvin	1,850	20 48	4 74	3 77	3 65	04	1 69	13 89
44	McNary	7,320	30 76	6 74	6 49	4 70	- 54	2 51	19 90
45	Miami	3,560	24 60	5 99	5 11	2 75	32	1 84	16 01
52	Palisades Ranger Station	7,945	36 75	-----	-----	-----	-----	-----	-----
54	Payson	4,913	21 16	-----	-----	-----	-----	-----	-----
56	Pinetop Fish Hatchery	7,200	23 91	-----	-----	-----	-----	-----	-----
57	Pleasant Valley Ranger Station	5,050	21 54	3 76	2 17	4 45	02	2 94	13 34
59	Punkin Center	2,350	23 11	-----	-----	-----	-----	-----	-----
65	Roosevelt 1WNW	2,205	21 79	3 87	5 51	3 44	- 17	1 72	14 37
67	San Carlos Reservoir	2,532	20 57	4 50	4 91	3 00	75	69	13 85
71	Sierra Ancha	5,100	29 61	5 57	4 16	4 32	- 03	3 20	17 22
72	Stewart Mountain	1,422	14 37	2 39	3 11	4 12	- 84	1 25	10 03
74	Sunflower 3NNW	3,720	29 92	-----	-----	-----	-----	-----	-----
76	Sunrise Mountain	9,370	38 95	-----	-----	-----	-----	-----	-----
78	Superior	2,995	21 50	4 40	4 29	3 86	- 14	2 46	14 87
79	Superior 2ENE	4,155	28 82	-----	-----	-----	-----	-----	-----
85	Tonto Creek Fish Hatchery 2	6,390	29 61	-----	-----	-----	-----	-----	-----
87	Walnut Grove	3,764	19 54	6 40	2 63	1 07	- 23	2 51	12 38
97	Jerome	5,245	20 83	5 72	1 72	4 33	- 21	2 01	13 57
98	Cordes	3,773	17 05	4 35	1 45	2 98	- 47	2 94	11 25
99	White River	5,280	16 70	3 97	2 79	2 40	- 13	1 01	10 04

By Friday, December 15, it was evident that a short-wave trough was intensifying near 170°W Within 24 hours this developed into a moderately strong trough in the Gulf of Alaska near 140°W By 00Z Sunday, December 17 [1400 hours December 16 MST], the trough had deepened, moved to 133°W, and absorbed the low-latitude low, [thus] forming a large amplitude quasi-stationary trough

The trough continued to deepen while remaining nearly stationary As the upper portion of the trough moved eastward, the lower portion remained between 120°–130°W, from Sunday morning, December 17, to Tuesday morning, December 19 At the same time, a short wave rotated out of the long-wave trough, resulting in a steady flow of nearly saturated air from the southwest into Arizona Cloudiness over Arizona thickened rapidly Saturday night as the flow backed from west-southwest of southwest Rain began over most of Arizona before dawn Sunday and gradually increased in intensity The most intense rains were Sunday night and Monday morning, decreasing slowly until they were virtually over by Wednesday morning [December 20]

As the heavy flow of moist tropical air encountered mountain ranges, such as the Bradshaw, Mazatzal, and Sierra Ancha Mountains and the Mogollon Rim, large amounts of precipitation occurred because of the orographic uplift. Rainfall intensities were moderate to high but in themselves were not responsible for the high runoff. Few, if any, extreme intensities of short duration occurred during this storm, but rates of 0 25 to 0.5 in./hr were common throughout the foothills and mountainous areas of central Arizona on December 17 and 18, 1978. The time distribution of precipitation at a few selected stations is shown in figure 4.

Total precipitation during December 17–20, 1978, is presented on plate 2, which is based on data published by the U.S. Environmental Data and Information Service (1978c, 1978f) and on unpublished data furnished by the U.S. Department of Agriculture Rocky Mountain Forest and Range Experiment Station, Flagstaff, Ariz., Forestry Sciences Laboratory, Tempe, Ariz , Soil Conservation Service, Phoenix, Ariz.; and the U.S. Geological Survey. Plate 2 presents more detailed information than does the generalized isohyetal map of the U.S. Environmental Data and Information Service (1979h). Table 3 shows daily precipitation values at 96 climatological stations reporting more than 3 in. during December 17–20.

The tropical nature of the air mass caused rain during most of the storm period to altitudes of 11,000 ft in central Arizona and western New Mexico. Near the end of the storm, the snow level dropped several thousand feet (U S. Army Corps of Engineers, 1980). In places the snow melted, and in other places, snow accumulated. At Hawley Lake, 7 in of old snow, which contained about 1 in. of water, melted on December 17–18 before snow fell again on December 19–20 (U S. Environmental Data and Information Service, 1978c) Data from U.S Soil Conservation Service SNOTEL recorders provide an inconclusive record of changes in the overall snowpack during the storm From December 15 to December 18, the amount of water in the snowpack decreased at three sites and increased at five sites, decreases ranged from 0 5 to 1.0 in

RUNOFF

The large amount of precipitation in November and early December caused above-normal runoff, which may have been an antecedent cause of later floods The runoff wet the soils and streambeds and filled channel depressions In the Salt and Agua Fria River basins, the runoff brought reservoirs to unusually high levels at the end of November In comparison with volumes of storage on November 30 during past years, the November 1978 storage ranks third highest since 1910 in the Salt River system, second highest since 1938 in the Verde River system, and second highest since 1927 in Lake Pleasant

The volume of runoff during the study period was outstanding in the San Pedro and Santa Cruz River basins and in the Gila River above San Carlos Reservoir In spite of the large volume of runoff, all inflow to San Carlos Reservoir from November 1978 to February 1979 was stored. Spill over the dam began on April 22, 1979, when the reservoir filled for the first time since storage began in 1929. Long periods of sustained, above-average runoff that occurred in the San Pedro and Santa Cruz River basins caused the runoff for each month—November 1978 through March 1979—to exceed the previous maximum for that calendar month since 1915 The mean discharge of San Pedro River near Charleston for January 1979 was 507 ft^3/s, the highest previous mean discharge for January was 278 ft^3/s in 1915 At most stations in the San Pedro and Santa Cruz River basins, the volumes of runoff in December and January are among the four highest monthly values of record.

FLOODS

Flood peaks occurred throughout most of the study area during November 24–25 and December 18–20, 1978, and January 17–18, 1979; additional peaks

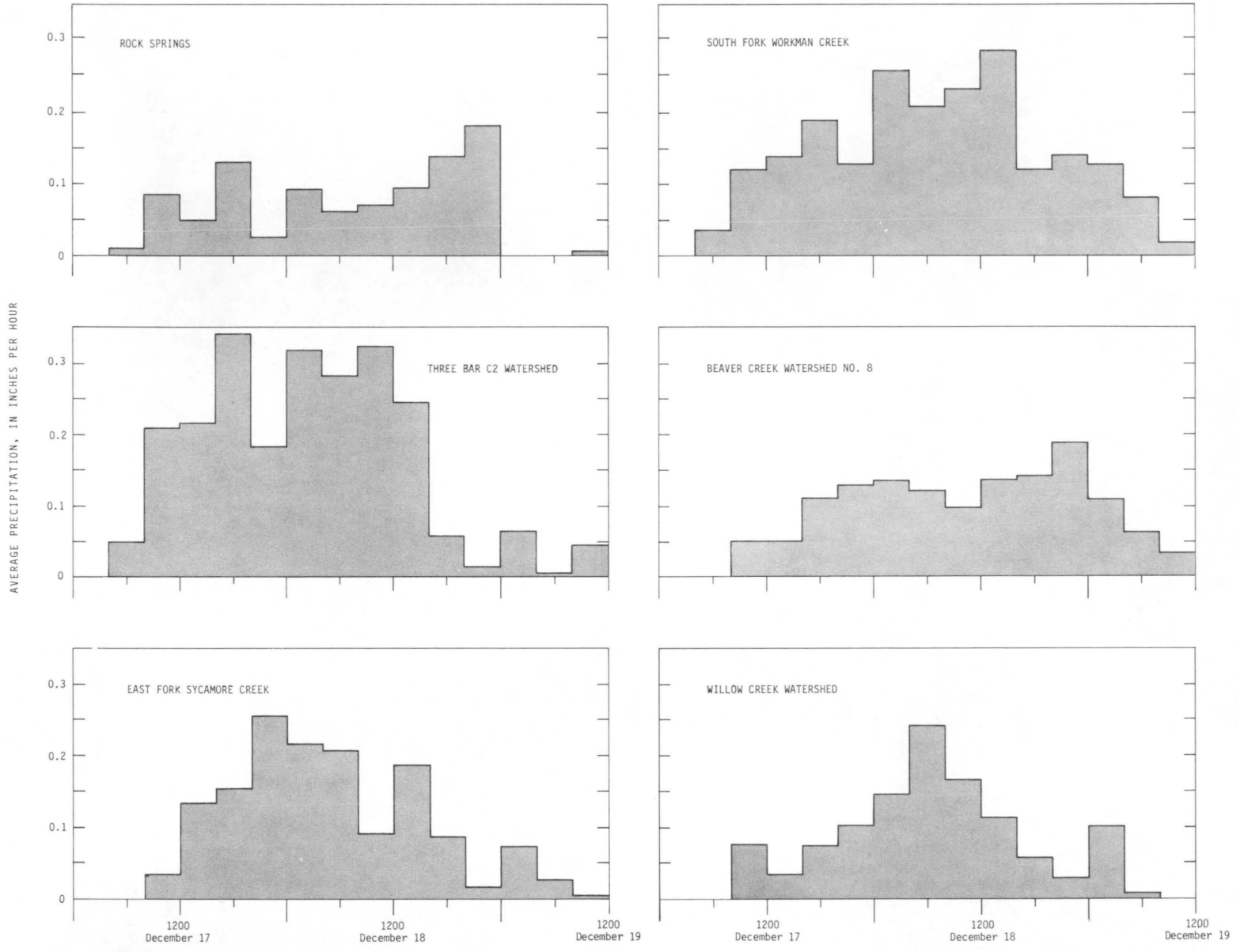

Figure 4. Time distribution of precipitation at selected stations in Arizona, December 17–19, 1978.

Table 3 Precipitation at climatological stations in central Arizona reporting at least 3 inches, December 17–20, 1978

Site number (See pl 2)	Station name	Altitude, in feet above NGVD of 1929	[1]Time of reading	Precipitation, in inches, for indicated day				Total precipitation, in inches
				17	18	19	20	
1	Alpine	8,050	1700	0 16	1 91	1 10	Trace	3 17
2	Apache Junction	1,720	1700	1 25	1 35	47	0	3 07
3	Bagdad 2	4,117	1800	1 05	2 49	23	16	3 93
4	Baker Butte	[2]7,500	----	-----	-----	-----	-----	4 6
5	Baldy (snow course)	9,125	----	-----	-----	-----	-----	3 1
6	Bartlett Dam	1,650	0800	07	3 43	0	0	3 50
7	Beaver Creek Watershed 3	5,000	2400	78	1 81	53	-----	3 12
8	Beaver Creek Watershed 4	6,240	2400	1 19	3 12	74	-----	5 05
9	Beaver Creek Watershed 8	7,400	2400	1 39	3 32	1 10	0	5 81
10	Black River pumps	6,040	2400	7	1 9	4	0	3 0
11	Blue Ridge Ranger Station	6,810	0800	0	2 50	1 85	1 00	5 35
12	Bonito River	-----	----	-----	-----	-----	-----	3 3
13	Bumble Bee	2,500	1800	1 12	3 49	1 35	0	5 96
14	Carefree	2,300	1700	-----	-----	-----	-----	3 02
15	Castle Creek	7,840	----	-----	-----	-----	-----	3 22
16	Castle Hot Springs Hotel	1,990	1700	2 20	1 43	1 27	0	4 90
17	Chevelon Ranger Station	7,006	----	05	2 76	26	0	3 07
18	Childs	2,650	0800	12	2 52	3 90	0	6 54
19	Claypool	-----	----	-----	-----	-----	-----	3 20
20	Concord	[2]5,500	----	-----	-----	-----	-----	6 25
21	Cordes Junction	3,800	----	-----	-----	-----	-----	3 33
22	Crown King	5,920	1300	([3])	4 61	3 69	05	8 35
23	Eagle Creek 2	4,870	1000	0	1 80	40	1 00	3 20
24	Fish Creek	2,550	----	-----	-----	-----	-----	6 62
25	Flagstaff (highway shop)	[2]6,900	----	-----	-----	-----	-----	4 32
26	Flagstaff WSO AP	7,006	2400	1 20	2 65	37	0	4 22
27	Flying V	-----	----	-----	-----	-----	-----	4 28
28	Fry	-----	----	-----	-----	-----	-----	3 9
29	Gisela	2,900	1800	0	2 50	1 20	03	3 73
30	Globe	3,710	0800	08	1 83	1 69	11	3 71
31	Greer	8,490	1700	23	2 15	69	Trace	3 07
32	Happy Jack Ranger Station	7,480	0800	0	1 72	2 58	44	4 74
33	Hawley Lake	8,180	0800	02	3 30	3 44	70	7 46
34	Horse Mesa Dam	2,000	----	-----	-----	-----	-----	5 67
35	Horseshoe Dam	2,020	0700	07	3 47	1 58	03	5 15
36	Humbolt Mountain	-----	----	-----	-----	-----	-----	5 00
37	Iron Spring	5,900	----	-----	-----	-----	-----	4 53
38	Irving	3,795	1000	11	1 55	1 90	0	3 56
39	Junipine	5,134	1700	93	2 68	2 30	0	5 91

See footnotes at end of table

Table 3 Precipitation at climatological stations in central Arizona reporting at least 3 inches, December 17–20, 1978—Continued

Site number (See pl 2)	Station name	Altitude, in feet above NGVD of 1929	[1]Time of reading	Precipitation, in inches, for indicated day				Total precipitation, in inches
				17	18	19	20	
40	Kelvin	1,850	1700	([3])	2 30	0 90	0	3 20
41	Lakeside	6,800	1300	0 05	1 85	1 87	1 28	5 05
42	Little Antelope	6,480	----	-----	-----	-----	-----	6 00
43	Maverick	7,800	----	-----	-----	-----	-----	4 00
44	McNary	7,320	0800	0	2 80	2 91	41	6 12
45	Miami	3,560	0800	08	3 48	2 23	11	5 90
46	Mormon Flat Dam	1,715	0800	0	3 20	94	30	4 44
47	Mormon Mountain	7,400	----	-----	-----	-----	-----	5 6
48	New River	-----	----	-----	-----	-----	-----	3 4
49	Oak Creek Rim	6,500	----	-----	-----	-----	-----	7 68
50	Oracle 2SE	4,510	0700	2 60	36	40	0	3 36
51	Orme Ranch	3,900	----	-----	-----	-----	-----	3 90
52	Palisades Ranger Station	7,945	1700	1 58	6 51	37	06	8 52
53	Parker Creek	5,000	----	-----	-----	-----	-----	5 25
54	Payson	4,913	1700	55	2 82	13	07	3 57
55	Pinedale Work Center	-----	----	0	2 38	1 98	18	4 54
56	Pinetop Fish Hatchery	7,200	1700	0	([3])	3 68	20	3 88
57	Pleasant Valley Ranger Station	5,050	1700	1 30	1 44	87	0	3 61
58	Prescott	5,510	----	-----	-----	-----	-----	3 85
59	Punkin Center	7,350	0800	0	3 86	1 15	10	5 11
60	Rattlesnake	[2]7,800	----	-----	-----	-----	-----	4 70
61	Rock Springs	-----	2400	1 20	2 56	38	0	4 14
62	Rocky Prairie	-----	2400	-----	-----	-----	-----	3 00
63	Roosevelt	-----	----	-----	-----	-----	-----	4 77
64	Roosevelt Dam	-----	----	-----	-----	-----	-----	5 16
65	Roosevelt 1 WNW	2,205	0800	03	3 88	1 36	1 00	6 27
66	San Carlos AP	2,890	1300	81	1 44	1 04	0	3 29
67	San Carlos Reservoir	2,532	0700	08	3 00	1 85	06	4 99
68	Sedona Ranger Station	4,320	2400	8	2 10	2	1	3 2
69	Show Low	6,400	----	-----	-----	-----	-----	4 00
70	Show Low City	6,440	0800	16	2 11	75	06	3 08
71	Sierra Ancha	5,100	2400	2 1	3 5	5	0	6 1
72	Stewart Mountain Dam	1,422	1700	2 74	79	10	0	3 63
73	Sugarloaf	6,120	----	-----	-----	-----	-----	3 2
74	Sunflower 3NNW	3,720	1800	1 95	1 55	2 82	0	6 32
75	Sunrise	-----	----	-----	-----	-----	-----	3 22
76	Sunrise Mountain	9,370	0800	0	3 22	1 89	58	5 69
77	Sunset Point	3,400	----	-----	-----	-----	-----	5 00
78	Superior	2,995	2400	20	2 79	2 04	17	5 20

See footnotes at end of table

Table 3. Precipitation at climatological stations in central Arizona reporting at least 3 inches, December 17–20, 1978—Continued

Site number (See pl 2)	Station name	Altitude, in feet above NGVD of 1929	[1]Time of reading	Precipitation, in inches, for indicated day				Total precipitation, in inches
				17	18	19	20	
79	Superior 2ENE	4,155	2400	2 6	3 8	0 7	0	7 1
80	Sycamore Creek, East Fork	-----	2400	2 33	3 24	55	0	6 12
81	Thomas Creek	-----	2400	1 07	2 70	26	0	4 03
82	Three Bar C-2	3,700	2400	4 00	4 46	84	0	9 30
83	Three Bar D-2	3,700	2400	5 31	3 81	71	0	9 83
84	Tonto basin	3,100	----	-----	-----	-----	-----	3 00
85	Tonto Creek Fish Hatchery	6,930	0700	04	2 35	1 83	30	4 52
86	Walnut Canyon National Monument	6,685	1700	17	2 14	1 15	0	3 46
87	Walnut Grove	3,764	1800	1 51	2 32	33	0	4 16
88	White Horse Lake	6,600	----	-----	-----	-----	-----	3 8
89	Williams (El Paso Gas)	-----	----	-----	-----	-----	-----	3 3
90	Williams (highway shop)	-----	----	-----	-----	-----	-----	5 00
91	Willow Creek	8,800	----	1 15	3 37	08	0	4 60
92	Willow Springs Ranch	3,690	0700	3 02	0	0	0	3 02
93	Workman Creek	6,970	2400	2 62	5 30	1 07	0	8 99
94	Workman Creek, South Fork	-----	2400	2 42	5 01	1 00	0	8 43
95	Workman Creek, North Fork	-----	2400	2 11	4 28	78	0	7 17
96	Young	-----	----	-----	-----	-----	-----	3 5

[1]Precipitation for the 24-hour period preceding time of reading

[2]Approximate altitude

[3]Precipitation for this date included in reading of the next day

occurred in some areas. In places the highest discharge during the study period occurred in November 1978 or in January or March 1979 In the upper part of the San Francisco River basin, the November peak was the highest. The January peak was the highest on the San Pedro River upstream from Aravaipa Creek, Tonto Creek, and Cherry Creek The March peak was the highest at New River near Rock Springs Detailed peak discharge and flood-hydrograph data are given in the section entitled "Streamflow Data of Gaging Stations and Miscellaneous Measuring Sites "

The most widespread flooding occurred during December 18-20, 1978, when peaks of record occurred at many sites Floods with recurrence intervals of more than 100 years occurred on the Gila River above the San Francisco River Flood crests occurred on small streams early December 18, reached the larger creeks and rivers late December 18, and continued down main-stem streams during December 19-22. On most streams, the runoff occurred in a single sharp crest. Two or more peaks occurred at some sites where a peak from the main stem lagged that from a large tributary by several hours. Dual peaks occurred on the Gila River downstream from San Francisco River and Santa Cruz River below Rillito Creek.

Water was released from reservoirs for periods varying from several days to 13 months The Salt River through Phoenix flowed for several weeks at a time over a 6-month period, and floodwater was released from Painted Rock Dam until January 1980.

In the following sections, streamflow and physical damage are discussed for four geographical areas One area is north of the Mogollon Rim and includes part of the Little Colorado River and Havasu Creek basins, and three areas are in the Gila River basin—Gila River basin upstream from Coolidge Dam, Gila River Basin from Coolidge Dam to the Salt River, and Gila River basin downstream from the Salt River. Coolidge Dam and the Salt River were selected as division points for the Gila River basin because (1) no water other than leakage passed Coolidge Dam from November 1978 to February 1979 and (2) peaks upstream from the Salt River were not significant to flooding farther downstream on the Gila River.

North of Mogollon Rim

Flooding north of the Mogollon Rim was slight during November. Heavy rains during December 17 – 20 on a snow-covered watershed caused high runoff in much of the Little Colorado River basin. Peaks of record occurred on Show Low Creek and in the headwaters of Chevelon and Clear Creeks

Flooding along Show Low Creek caused damage in Pinedale. In Show Low, several businesses were evacuated and the municipal water supply was damaged. Floods in Silver Creek caused damage at Taylor and Snowflake, and people were evacuated from 40 to 50 homes. Pinedale was isolated for 2 days because of road and bridge washouts. Many recreational facilities were damaged by erosion and silt deposition. Two small dams on Show Low Creek were damaged.

The most severe flood problem along the Little Colorado River occurred at Winslow, Ariz.—a community of 8,000—downstream from Chevelon and Clear Creeks. The peak discharge on Chevelon Creek was the highest since 1929. Peak discharges in Clear Creek and the Little Colorado River below Clear Creek were the highest since 1952 A slope-area measurement on the Little Colorado River near Winslow showed a peak discharge of 57,600 ft^3/s. Water spilled over and eroded one of two dikes protecting low-lying subdivisions along the Little Colorado River north of Winslow. Winslow Plaza subdivision, where homes were 5 to 10 years old and valued at about $50,000 each, received a large amount of yard damage and a small amount of interior damage. Water was as much as 5 ft deep in Ames Acres and Bushman Acres, where houses were 40 to 50 years old and valued at about $17,000 (U.S. Army Corps of Engineers, 1980). About 1,700 people were evacuated from the three subdivisions, and patients were evacuated from Winslow Hospital. A logjam at a dam on Clear Creek caused concern, but the dam held.

Floodflows in Cataract Creek, the head of Havasu Creek, caused Santa Fe Dam at Santa Fe Reservoir above the town of Williams to crack and sag. People were evacuated from businesses and 100 homes in Williams because of the crack. In the city, culverts plugged with debris, causing the creek to overflow into residential areas More than 80 homes sustained yard damage, but water entered only 2 homes (U.S. Army Corps of Engineers, 1980). Street crews breached crossings to prevent more serious damage. A 10-year-old girl was rescued in good condition after being swept away by the creek and carried three blocks through four culverts (U.S Army Corps of Engineers, 1980).

Gila River Basin Upstream from Coolidge Dam

Several periods of high water occurred in the Gila River basin upstream from Coolidge Dam between November 1978 and March 1979. The highest and most damaging floods occurred during November 24-25 and December 18-20. Peak discharges during the flood in November have a recurrence interval of 10-25 years. On the Gila River upstream from San Francisco River, the

flood in December is the highest in the 20th century; peak discharges have recurrence intervals of more than 100 years. The November flood was most outstanding in the headwaters of the Gila and San Francisco Rivers and along the Blue River, which is a tributary of the San Francisco River At Gila River near Gila, N Mex , the peak is the fifth largest in the 52-year period of record At San Francisco River near Reserve, N Mex., the peak discharge was 11,800 ft^3/s, or 100 ft^3/s less than the peak of record in October 1972 At Reserve, N Mex., 19 homes and businesses and 10 acres of farmland were damaged

Flood of December 18-20, 1978

Gila River above San Francisco River —The flood of December 18, 1978, on the Gila River upstream from the San Francisco River originated mainly in the Gila Wilderness Area of New Mexico and in the mountainous areas between the wilderness area and Cliff, N Mex. (pl. 1). Jim Williams and Marc Willcox (U S Forest Service, written commun , 1980) reported and photographed severe damage to roads, trails, and campgrounds throughout much of the Gila National Forest and Gila Wilderness Area Three forks of the Gila River—East, Middle, and West—drain 1,500 mi^2 of high, pine-covered mesas bounded by steep rock cliffs mostly in the wilderness area The mesas lie 2,000 to 3,000 ft above the valley floors and range in altitude from 6,000 to 8,000 ft, some mountain peaks rise to as much as 11,000 ft The three forks form a large dendritic drainage pattern and come together in a 6-mi reach near Gila Hot Springs, N. Mex

A hydrologic analysis for the wilderness area is difficult to develop because the few precipitation stations are in the valleys and there are stream-gaging stations in the area. The nearest gaging station is 30 mi downstream from the wilderness area The highest officially recorded daily rainfall in the wilderness area is 2.7 in , although higher amounts probably fell in the mountains One U S Soil Conservation Service remote reading recorder indicated 5 3 in. of precipitation, but the transmitting system was in a test phase, and the accuracy of the data is unknown (Ronald Jones, U S Soil Conservation Service, oral commun , 1981). The large amounts of duff in the pine forests would have greatly retarded runoff. On the basis of observations in other pine forests, it appears unlikely that the large runoff could have been caused by rainfall of less than several inches per day unless the rain melted a large amount of snow. Mr D Campbell (oral commun , 1980)—a resident of Gila Hot Springs for 60 years—reported that storms in November and early December 1978 had saturated the soil cover and left several inches of snow above 9,000 ft. The U S Army Corps of Engineers (1980) reported 10 in of snow at higher altitudes at the time of the December 18 storm

Mr Campbell gave the following information The flood crested after 2300 hours December 19, and water was 2 ft deep in a bathhouse built at Gila Hot Springs in the 1880's No other flood had reached the bathhouse; the previous high stage in 1941 had been 1 ft below the bathhouse floor Extreme runoff came from high-altitude parts of West Fork and Middle Fork, especially from the large rhyolite exposures in the Diablo and Mogollon Mountains, and from Little Creek, a tributary that enters the Gila River from the west just upstream from Gila Hot Springs The creek has caused frequent flooding since the basin was burned off in 1951. Campbell indicated that only moderate runoff came from East Fork Gila River The flood plain of West Fork was devastated by the flood. Large amounts of erosion extended to the extreme headwaters of the West and Middle Forks where many large pine trees were uprooted and carried away by the flood. Many of the trees were deposited in huge windrows paralleling the river near Gila Hot Springs The trees caught large amounts of rock debris and subsequently formed large dikes Gravel deposited on the streambed after the flood raised the streambed above adjacent farmlands S. R. Anderson (U.S. Geological Survey, oral commun , 1979) visited the area after the flood of December 1978 and estimated discharges of 15,000 to 20,000 ft^3/s in the West Fork and 8,000 to 10,000 ft^3/s in the Middle Fork.

Although little information is available about the floodflows between Gila Hot Springs and the Gila River near Gila, N. Mex , gaging station, fairly large contributions apparently came from Sapillo and Turkey Creeks, the two largest tributaries. The hydrograph for Gila River near Gila shows one sharp crest and no evidence of any secondary crest (fig.5). Large amounts of runoff came from Mogollon, Duck, and Mangas Creeks and probably Bear Creek, which enter the Gila River between Gila and Redrock, N Mex. Evidence from an aerial inspection indicated that although some flow occurred in most of the tributaries between the Redrock gage and Blue Creek, none of the tributaries had an outstanding flow. Low flood terraces along Blue Creek were not inundated. A ground inspection showed minimal contributions from the tributaries between Blue Creek and the San Francisco River

As the floodwave moved from Gila River near Gila, N. Mex., to Gila River below Blue Creek, near Virden, N. Mex., the peak discharge increased and the duration of the crest became shorter The U S. Environmental Data and Information Service (1979h) attributed the large discharge near Redrock to the for-

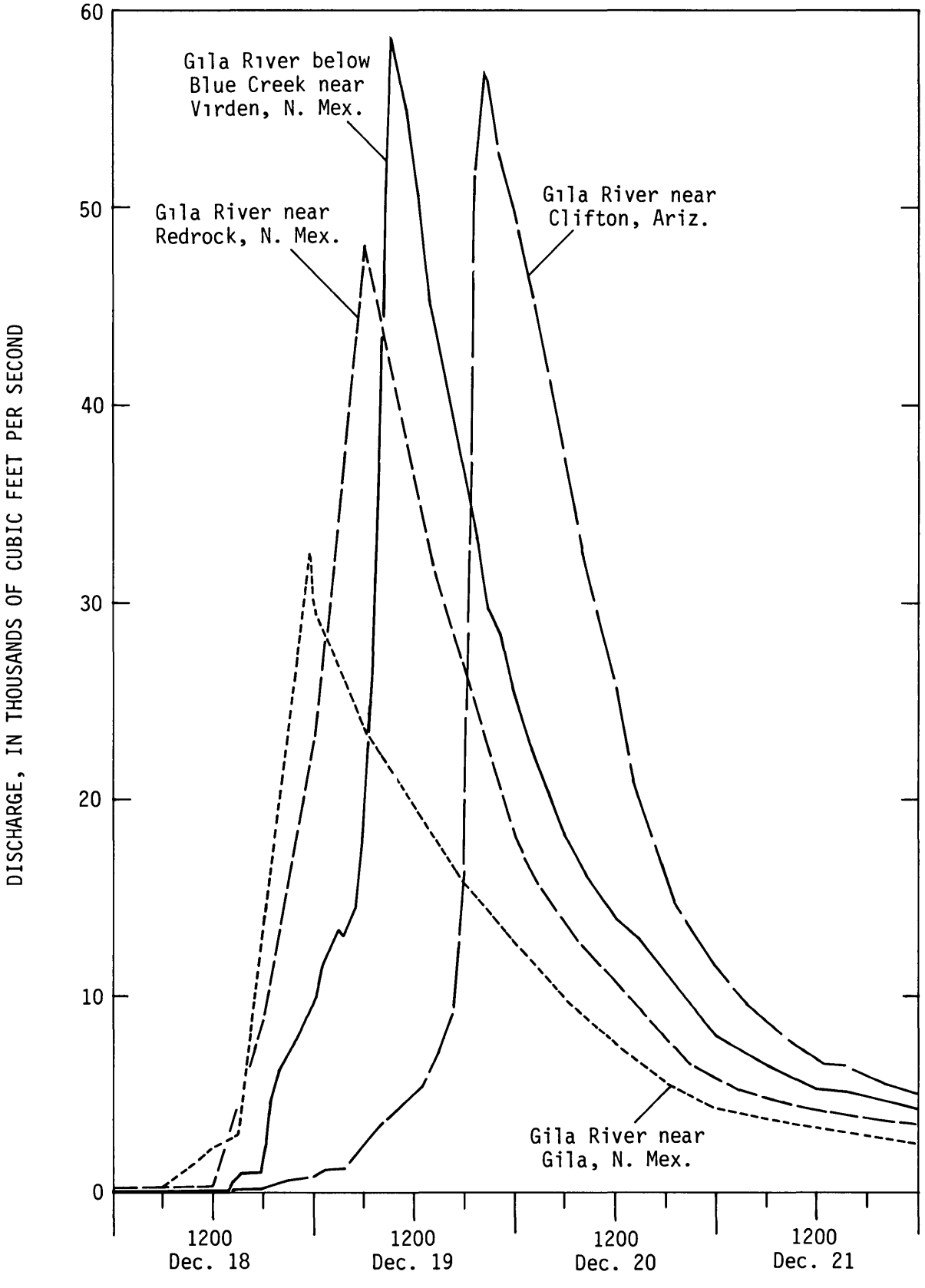

Figure 5 Discharge of the Gila River at gaging stations upstream from the San Francisco River in Arizona and New Mexico, December 18–21,1978

mation and destruction of a debris dam in Gila Middle Box, which is an extremely narrow canyon between Gila and Redrock where the river channel is less than 20 ft wide in places. Flood debris was found about 150 ft above the channel bottom Neither the debris dam nor its effect can be completely discounted; however, strong evidence indicates that, if such a debris dam did form, it only had a minor effect on the peak discharge Several items of data tend to discredit the theory of a debris dam. Although the discharge at Redrock was much greater than at any previous time in the past 90 years, it is not unreasonable for the size of drainage area. At points upstream from Gila Middle Box, the discharge also was much greater than at any other time in the past 90 years. The unit discharge of the peak at Redrock, in cubic feet per second per square mile, was no greater than that at Gila, although considerable inflow from several large tributaries occurred in the reach.

All the hydrographs for gaging stations near Gila (upstream from Gila Middle Box), Redrock, and below Blue Creek (downstream from Gila Middle Box) are similar in shape (fig. 5). At each station, a steep rise occurred; however, no sharp spike occurred, as would be expected if a debris dam had broken, and the recession appeared to have a natural shape. The crest moved from the Redrock gaging station to Duncan in about 6 hours, which is several hours faster than during most floods; however, the traveltime is comparable to the 1941 flood. (See "Traveltime of Floods.") The extreme narrowness of the Gila Middle Box could have caused depths of 150 ft without a debris dam

Floodwaters from the Gila River spilled over a 2-mile-long dike along the east side of Duncan, Ariz Large holes developed in the dike and allowed a wall of silt and water to rush through the community, destroying or damaging homes, businesses, and most public buildings and facilities. Water averaged about 2.5 ft deep but was as much as 7 ft deep in places. About 75 homes were destroyed (U.S. Army Corps of Engineers, 1980), and approximately 400 persons received emergency food and (or) shelter. Seventy-two families were living in temporary housing 6 months after the flood, and businesses were closed for 3 to 6 weeks All transportation routes into and out of Duncan were closed for 1 day. Although residents had about 18 hours warning, many failed to move household contents and personal property to higher ground (U.S. Army Corps of Engineers, 1980)

Overflow and erosion occurred at many places in the valleys near Gila, Cliff, Redrock, and Virden, N. Mex , and in the Duncan and York Valleys of Arizona. About 1,500 acres of grain and pastureland near Cliff and Gila, 1,200 acres—mostly in cotton—in the Virden Valley, and about 4,100 acres in the Duncan and York Valleys were damaged. Many fences, irrigation ditches, dikes, and other property improvements were destroyed, and thousands of acres of farmland were eroded

San Francisco River, Eagle Creek, and Bonita Creek —San Francisco River, the main tributary of the Gila River above San Carlos Reservoir, heads at altitudes above 9,000 ft near Alpine, Ariz., and flows eastward into New Mexico, southward to Glenwood, N. Mex., and then westward into Arizona The flood of December 18, 1978, was outstanding only in the lower part of the basin. Near Reserve, N. Mex., the December peak was only 3,390 ft^3/s, whereas the November peak was 11,800 ft^3/s. The December flood was the second highest since about 1917 at Alma, N Mex , and at downstream points and was exceeded only by the flood of October 20, 1972. The December flood on Eagle Creek, which heads in the mountains west of the San Francisco River, is the highest during the period of record that began in 1944 and may be the highest since at least 1916. Bonita Creek was extremely high, but the discharge was not measured.

Overflow and minor flood damage occurred along the San Francisco River near Alma, Pleasanton, and Glenwood, N. Mex , where levees, irrigation ditches, and fences were damaged Some fields near the community of Blue, Ariz , were silted over to a depth of 3 ft Roads were damaged along the San Francisco and Blue Rivers. Residents of Blue were isolated for 5 days (Gerald K. Colmer, Apache-Sitgreaves National Forest, written commun , 1979)

Most of the damage occurred in Clifton, Ariz., which occupies a narrow flood plain between steep cliffs along the San Francisco River. About 20 homes in Patterson Addition on the north side of Clifton and 22 businesses in downtown Clifton were flooded Roads, sewer lines, utilities, and the railroad were damaged. About 1,500 of the 5,100 residents were evacuated The peak stage in December 1978 was lower than that in October 1972 Stages of the two floods differed by 0.8 ft in Patterson Addition and 1.0 ft at the stream-gaging station at the south end of town. The 1978 stage on the shoreward side of floodwalls in north Clifton was 3.5 ft lower than in 1972 Floodwall heights were increased after the 1972 flood, and this was a significant factor in reducing the stage in north Clifton in 1978. Water, however, did reach the area behind the walls through drains and other small openings.

The flood caused little change in the channel of the San Francisco River Discharge measurements made at the stream-gaging station on the highway bridge near the south edge of Clifton show a scour of a few tenths of a foot, which was not enough to greatly affect the stage of the December flood. The cross section of the river

channel near the bridge in central Clifton has been measured several times. The bed of the channel changed little between 1917 and 1973 (B N Aldridge and Otto Moosburner, U.S. Geological Survey, written commun., 1973), and it is unlikely that a major change occurred in 1978.

Safford Valley —The crests of December 18 from San Francisco River, Eagle Creek, and Bonita Creek reached the Gila River almost simultaneously and combined to produce a peak discharge of about 100,000 ft^3/s (fig 6) The peak discharge at the head of Safford Valley was the highest since 1916 The crest at the head of Safford Valley occurred about 2.5 hours after the crest on the San Francisco River at Clifton Twenty hours later the peak from the headwaters of the Gila River became superimposed on the recession of the earlier peak; the discharge at the head of Safford Valley during the second crest was 88,000 ft^3/s. Each crest inundated large parts of the valley near Safford (U.S Army Corps of Engineers, 1980; pl. 6). Little Hollywood, a small community of 51 families that borders the Gila River 2 mi east of Safford, was damaged severely The 30-year-old community had been severely damaged in 1965, 1967, and 1972 (Aldridge, 1970; Condes de la Torre, 1972; Courier Publishing Company, 1972; U.S. Army Corps of Engineers, 1973; and Burkham, 1976). As much as 6 ft of floodwater swirled through Little Hollywood, lifted houses from their foundations, and carried away personal belongings that were later found scattered throughout the area Highway bridges at Solomon, Safford, Pima, Thatcher, Cork, and Bylas were destroyed or damaged leaving 400 families on the north side of the river isolated and without phone service or electricity Major agricultural damage occurred throughout the valley as the flooding river eroded massive areas of farmland and destroyed fences, irrigation ditches, crops, and cattle Deposits of as much as 7 ft of silt were left in places Although the flood occurred late in the normal harvest season, about 25 percent of the cotton crop was still in the fields because wet ground after the November storms had delayed the harvest All unharvested crops in the overflow areas were lost.

During the flood of December 1978, peak discharges of 2,000 to 5,000 ft^3/s occurred on small streams that drain the eastern and northern slopes of the Pinaleno Mountains south of Safford, whereas previous maximum discharges had been a few hundred cubic feet per second. Peak discharges of Deadman and Marijilda Creeks near Safford were more than 500 $(ft^3/s)/mi^2$, the highest measured in the area covered by this report Late on December 18, water began leaking through an 18-foot-long crack in the earthen dam on Graveyard Wash 2 mi south of Safford. Fear that the dam might give way led to the evacuation of 2,000 people Another leak was found on December 19; both leaks were repaired, and the dam held. Local sources expressed the opinion that the entire community of Safford would have been engulfed by 6 ft of water if the dam had failed (U.S. Army Corps of Engineers, 1980)

Comparison of the December flood to past floods —From gaging-station data, newspaper articles, historical documents, photographs, and local interviews, Aldridge and Moosburner (U.S Geological Survey, written commun., 1973) developed a record of the highest floods on the San Francisco River at Clifton, Ariz , since the town was settled in 1870 From that record, it can be established that the flood of December 1978 on the San Francisco River at Clifton is the seventh highest since 1870; the highest flood was in December 1906.

The comparison of the floods of December 1978 to other floods cannot be so well established on the Gila River. Lippincott (1900, p. 34) stated: "The greatest rise so far recorded on the Gila River [near Florence] occurred on the 22d of February 1891. Considerable evidence was obtained that no such flood has occurred since a date many years before the advent of the white man [about 1870]. Irrigating ditches supposed to be extremely old were overflowed and destroyed Lands were overflowed that had retained no evidence of any previous inundation." Lippincott also stated that the peak discharge near Florence during the 1891 flood was computed to be 102,566 ft^3/s All subsequent studies indicate this to be a reasonable value. Some authors have attempted to transfer the data from Florence to the Safford Valley, but the long travel distance—more than 130 mi—and a large intervening drainage area of about 10,000 mi^2 make such a transfer questionable

The U S Army Corps of Engineers (1914) stated: "Since*** [Lippincott, 1900] one greater flood is known to have occurred, that of 1905***. During the present investigation, lodged driftwood was found at San Carlos several hundred feet upstream from the proposed dam site at an elevation 26 ft about low water in the river alongside, which indicates a flow of possibly as much as 150,000 ft^3/s at the point " The quotation is assumed to refer to the flood of November 1905, although Murphy and others (1906) briefly describe the destructive nature of the floods in January and February 1905 but fail to mention the November flood. Other evidence indicates that the discharge in November was considerably greater than that in January and February. Burkham (1970) explained that the November flood did less damage than the earlier floods because the channel had been widened and deepened by the earlier floods. Although the estimate of 150,000 ft^3/s for the flood of November 1905 has been carried through

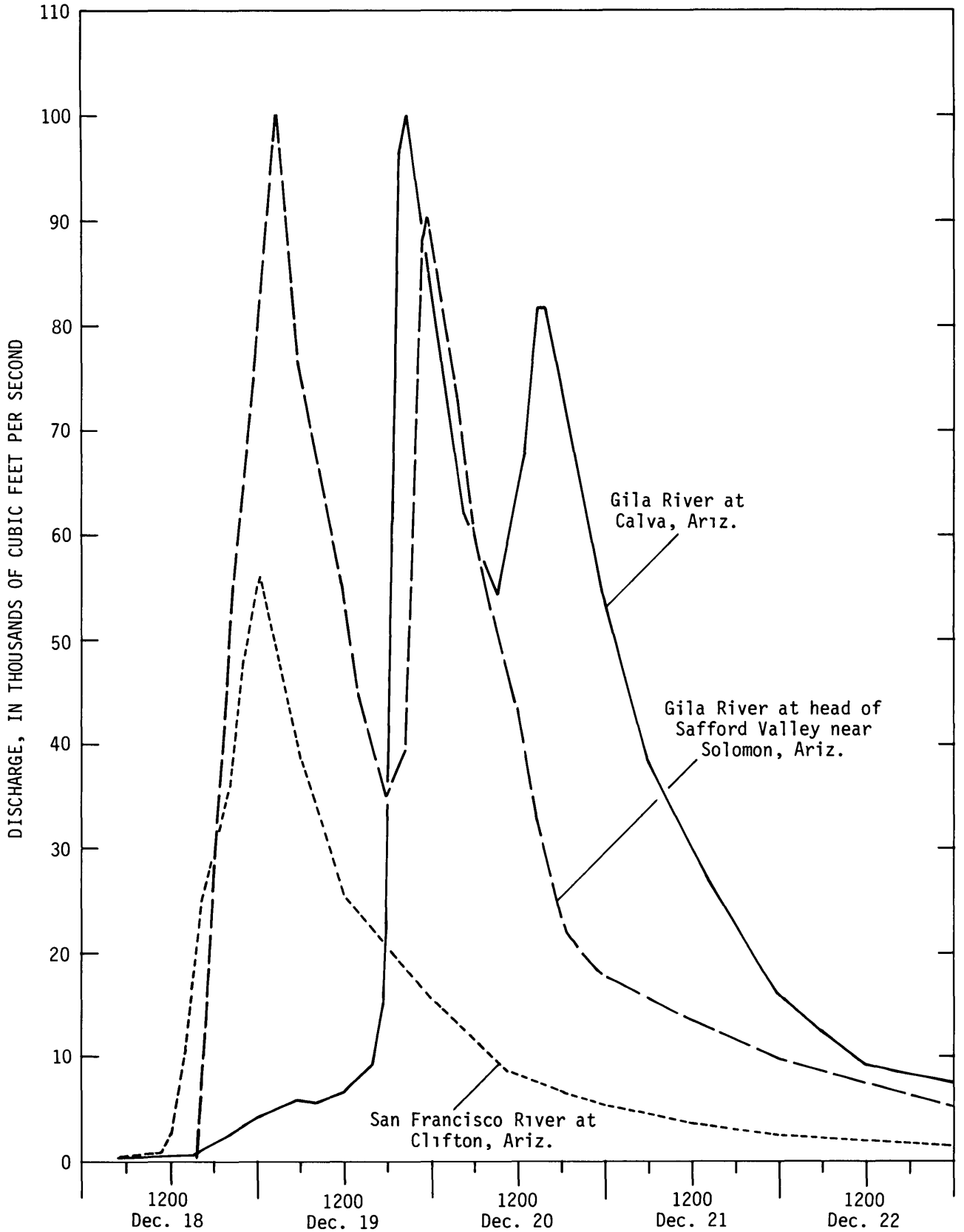

Figure 6 Discharge of the San Francisco River at Clifton and the Gila River at gaging stations between the San Francisco River and San Carlos Reservoir, December 18–22, 1978

literature, the U S Army Corps of Engineers (1945, p 55) questioned the value and stated that it was probably high Present knowledge indicates that the discharge may have been closer to 100,000 ft^3/s

Olmstead (1919) mentioned the floods of 1833, 1869, 1884, and 1916 Sources of information for the 1833 and 1869 floods were a tribal calendar of the Pima Indians and an elderly Indian who observed the floods near Sacaton The Indian described the 1833 flood as the greatest he had seen If the Indian's comparison of the 1833 flood with other floods was accurate and if his statement was made in 1917, as inferred by Olmstead, then the 1833 flood is still the maximum known near Sacaton Nothing is known about the 1833 and 1869 floods in the Safford Valley or at sites farther upstream The highest known flood on the San Francisco River at Clifton, which occurred in December 1906, probably caused a high flood in Safford Valley, but neither the U S Army Corps of Engineers (1914) nor Olmstead (1919) mentioned it, however, that flood was discussed in a later report (U S Army Corps of Engineers, 1945)

The U S Army Corps of Engineers (1945, p 52) discussed other Gila River basin floods that occurred in 1862 and 1880 and stated that the 1884 flood was equal to those of 1891, 1905, 1906, and 1916 In the same report (appendix 5, p 60), a subsequent ranking of floods on the Gila River near Solomonsville (now Solomon) placed the 1884 flood below the flood of October 1916 and seventh in the list of peaks from 1884 to 1945 The six highest peaks, in descending order of magnitude, occurred in February 1891, November 1905, December 1906, January 1916, February 1905, and October 1916 The ranking contradicts the statement by the U S Army Corps of Engineers (1914) that the 1905 flood exceeded the 1891 flood The flood shown for February 1905 probably occurred in January 1905, because in most of the Gila River basin the January flood was higher than the February flood Otherwise, the ranking appears to be the most reasonable of any postulated.

In a later report, the U.S. Army Corps of Engineers (1962) stated that the five major floods up to that time—1884, 1891, 1905, 1906, and 1916—were equal, but did not state where the peaks were compared Although the 1884 flood was large on the Salt River and may have been comparable to the large floods in parts of the Gila River basin, there is considerable doubt about whether it was among the highest floods in the Safford Valley The source of that flood cannot be identified Burkham (1970) added the floods of 1889, 1895, and 1896 to the list of outstanding historic floods but infers that these floods were less severe than the floods of 1891, 1905, 1906, and 1916 Although actual discharges for early floods on the Gila River are unknown, the peak discharges during at least four floods since 1861—February 1891, November 1905, December 1906, January 1916—probably were either approximately equal to, or greater than, the peak of December 1978 at the head of Safford Valley

The flood history for the Gila River upstream from the San Francisco River is documented by gaging-station records since 1911 Little is known about floods before 1911 except that large floods reportedly occurred on the Gila River at Gila, N Mex , in November 1905 and December 1906 (U S Geological Survey, 1980a) and at Gila Hot Springs, N Mex., in the spring of 1907 (D. Campbell, resident, oral commun., 1980). The three highest floods measured at Gila River near Clifton since 1911, in descending order of magnitude, occurred in December 1978, October 1972, and September 1941. Before 1972, the 1941 flood was reported to be the highest since either 1891 (Patterson and Somers, 1966) or 1881 (U S Geological Survey, 1954) Throughout most of the reach from Gila Hot Springs to the San Francisco River, the December 1978 flood was several feet higher than the 1941 and 1972 floods. The 1978 flood, therefore, is the highest since at least 1891 at the gaging station near Clifton and is probably the highest in that period at all points between Gila Hot Springs and the San Francisco River A strong possibility exists that the flood in December 1978 is the highest in a much longer time span

Data are not available for the flood in February 1891 upstream from the San Francisco River Mr Campbell states that the first major flood after development of Gila Hot Springs in the mid-1880's occurred in the spring of 1907, which indicates that the floods of 1891, 1905, and 1906 did not extend that far east. Campbell stated that the storm of December 1906 deposited snow but did not cause flooding at Gila Hot Springs The 1907 flood is not mentioned in accounts of flooding in the downstream valleys, although Campbell said that the 1907 flood was almost as high as the 1941 flood at Gila Hot Springs

Olmstead (1919) estimated a peak discharge of 110,000 ft^3/s for the flood on September 5, 1897, in Bear Creek, a large tributary that enters the Gila River near Cliff, N. Mex , but did not discuss the effect of this flood on the Gila River No other documentation of that flood was found If the flood did occur, it must have diminished in magnitude before reaching the valleys near Virden, N. Mex , and Duncan, Ariz

Traveltime of Floods

Traveltime must be considered in developing mathematical models for flood-warning systems Upstream from the San Francisco River, the flood of

December 1978 moved down the Gila River faster than did the smaller flood of November 1978. In November, the flood crests at Gila River near Clifton, Ariz., occurred 17 hours after the corresponding crest at Gila River below Blue Creek, near Virden, N. Mex., and 30 hours after the crest near Gila, N. Mex. The corresponding times during the December flood are 11 and 21 hours, respectively. The rapid movement of the December flood prompted a study of traveltimes during past floods. Recorder charts for the highest floods from 1940 to 1980 were examined. Most flood events have complex hydrographs that show several crests; the number and magnitude of crests depend on the sources of flood runoff. Frequently, crests originate between gaging stations, and crests that pass an upstream site are obscured by tributary inflow before reaching downstream sites. The complex hydrographs dictate that traveltime be computed from a study of individual crests (tables 4 and 5). Traveltime cannot be computed from the time of occurrence for peaks above a designated base, such as those published annually by the Geological Survey. The published time is for the highest in a series of crests. Seldom is the same crest the highest at all gaging stations Tables 4 and 5 include all crests for each storm period during which a discharge exceeded one of the following: (1) 10,000 ft^3/s at Gila River near Clifton, Ariz.; (2) 15,000 ft^3/s at San Francisco River at Clifton, Ariz ; or (3) 20,000 ft^3/s at Gila River at the head of Safford Valley near Solomon, Ariz. Flood crests that originated in the Gila River upstream from San Francisco River are shown in table 4, and peaks that originated in San Francisco River, Eagle Creek, or Bonita Creek are shown in table 5. Each crest was traced downstream on the Gila River or the San Francisco River from the originating point until the crest could no longer be identified on the hydrograph as an individual peak

On the Gila River upstream from the San Francisco River, traveltime is a function of the discharge (fig. 7). Traveltime from the Redrock gaging station to Duncan averages about 5 hours for discharges of 40,000 to 50,000 ft^3/s and about 14 hours for discharges of about 10,000 ft^3/s

The first peak through Safford Valley generally is the result of a peak from San Francisco River, Eagle Creek, or Bonita Creek. Traveltime from San Francisco River at Clifton to Safford is about 8 to 10 hours, but a crest that includes a large inflow from Eagle and Bonita Creeks may occur at Safford in as little as 5 hours after the crest at Clifton. Crests from Eagle and Bonita Creeks generally reach the Gila River about 3 hours earlier than those from the San Francisco River. The traveltime from Clifton to Safford is approximately the same for all discharges. The traveltime from Clifton to Safford is equally divided between the reach upstream from the head of Safford Valley and the reach downstream and is 4 to 5 hours in each reach.

Crests on the San Francisco River at Clifton, Ariz., generally result from crests originating in the Blue River and occur 2 to 4 hours after the crest on the Blue River near Clifton. The peaks at Clifton generally occur before the peaks on the San Francisco River at Glenwood, N. Mex. Peaks that pass Glenwood either cause a secondary crest at Clifton or are lost in the recession from the earlier crest. The two-crest pattern occurred on the San Francisco River at Clifton during the floods of November 24–25, 1978, and January 17–18, 1979. During each event, one crest originated in the Blue River and a later one originated upstream from the Blue River. The first crest occurred 2 to 4 hours after the crest at the gaging station on the Blue River near Clifton, Ariz. The second crest occurred 7 to 8 hours after the crest on the San Francisco River at Alma, N. Mex., and about 4 hours after the crest on the San Francisco River at Glenwood, N. Mex. The single-crest pattern occurred December 18 as crests from the Blue River and the San Francisco River combined.

Gila River Basin from Coolidge Dam to Salt River

Four peaks that occurred at the Gila River near Kelvin gaging station from November 1978 to January 1979 originated in the San Pedro River and in small streams that are tributary to the Gila River downstream from Coolidge Dam. No water, except leakage, was released from Coolidge Dam until February 1979 Flood peaks occurred in the San Pedro and Santa Cruz River basins during November 24–25 and December 18–22, 1978, and January 17–18 and January 25–26, 1979. An additional peak occurred on December 31, 1978, in the Santa Cruz River basin Peak discharges during November 1978 to March 1979 on the San Pedro River upstream from Aravaipa Creek and on the Santa Cruz River upstream from Rillito Creek were large for winter floods but were much smaller than past summer floods caused by tropical or convective storms.

On Aravaipa Creek and Rillito Creek, 20- to 40-year floods occurred on December 18, 1978. On each tributary of the San Pedro River and Rillito Creek, runoff occurred as a single sharp crest that followed intense rain on the morning of December 18. In places, the entry points of the tributaries to the main streams are separated by several miles. The traveltime between the tributaries and downstream locations caused multiple crests to develop on the major streams. The multiple crests were especially evident in the record for the San Pedro River near Redington.

Table 4 Time and discharge of selected flood peaks—Gila River near Gila, N Mex., to Gila River near Calva, Ariz., 1941–79

[Crests are traced downstream from the first gaging station where the crest began to the point where the crest was lost in the recession of an earlier crest or two or more crests merged to form a single crest]

Date	09430500 Gila River near Gila N Mex., river mile 572 5			09431500 Gila River near Redrock, N Mex., river mile 539 2			09432000 Gila River below Blue Creek, near Virden, N Mex., river mile 523			09432500 Gila River at Arizona-New Mexico State line, river mile 507 7			09442000 Gila River near Clifton, Ariz., river mile 471			09448500 Gila River at head of Safford Valley Ariz., river mile 448			09458000 Gila River at Safford, Ariz., river mile 433 3			09466500 Gila River at Calva, Ariz., river mile 383		
	Day	Hour	Discharge, in cubic feet per second	Day	Hour	Discharge, in cubic feet per second	Day	Hour	Discharge, in cubic feet per second	Day	Hour	Discharge, in cubic feet per second	Day	Hour	Discharge, in cubic feet per second	Day	Hour	Discharge, in cubic feet per second	Day	Hour	Discharge, in cubic feet per second	Day	Hour	Discharge, in cubic feet per second
Sept 1941	----------			28	[1]2000	[1]17,000	29	0200	17,700	29	0800	17,000	----------			----------			----------			----------		
Do	----------			29	0900	[1]40 000	29	1100	41,700	29	1400	39 500	29	2330	28,200	30	0320	69,900	30	[1]0700	33,000	Oct 1	0330	27,900
Do	29	1300[4]	25,400	29	[1]2000	[1]26,000	30	0010	26,800	30	0400	23,300	30	1200	22 000	30	1520	22,200	----------			----------		
Jan 1949	13	1130	15,000	14	0630	18,200	14	1300	15,600	14	1530	14,800	15	0300	13 900	----------			----------			----------		
Jan 1952	19	0640	4,870	19	1700	9,100	19	2330	6,100		([2])		20	1400	4,280	----------			----------			----------		
Oct 1955	----------			----------			----------				([2])		3	0130	10,800	3	0530	6,380		([2])		3	2330	3,720
Do	----------			----------			----------				([2])		4	0400	12 700	4	1230	13 300		([2])		5	1230	4,240
Dec 1965	----------			23	0200	16,800	23	1000	11,000		([2])		24	0900	10 700	24	1400	17,300	24	1900	17,500	26	1600	8,400
Do	31	0800	3,560	31	1300	6,520	31	2000	4,420		([2])		Jan 1	1600	2 230	Jan 1	1900	7,500		([2])		Jan 3	0600	8 700
Aug 1967[3]	----------			----------			12	0500	11 500		([2])		12	2000	4,000	12	2400	15,000	----------			----------		
Do	----------			12	1145	6,860	12	2030	5,040		([2])		13	1200	3,500	----------			----------			----------		
Do	----------			----------			13	1000	5,810		([2])		14	0230	3,900	----------			----------			----------		
Do	13	0530	5,810	13	[1]1500	[1]6,000	13	2300	5,000		([2])		14	1100	3,700	----------			----------			----------		
Do	----------			----------			----------				([2])		14	2300	7 730	15	0200	8 420		([2])		16	0200	7,800
Do	----------			----------			15	0600	3,930		([2])		15	1700	2,500	16	0200	4,000		([2])		----------		
Oct 1972	20	Unknown	12,500	20	1615	26,200	20	2330	27,200		([2])		21	1330	33,000	21	1800	41 900		([2])		----------		
Sept 1975	----------			----------			8	0230	7,720		([2])		8	2330	4,200	----------			----------			----------		
Mar 1978	[4]2	Unknown	4 790	[4]2	2330	12,700	3	0300	7,800		([2])		4	0800	8 420	4	1500	13 500		([2])		----------		
Nov 1978	25	1215	9 430	25	Unknown	24,700	26	0200	13,400		([2])		26	1830	11,000	26	2330	15,100		([2])		27	0900	13,600
Dec 1978	18	2330	32,400	18	0600	48,800	18	0930	58 700		([2])		18	2030	57 000	18	2330	88,000		([2])		19	1530	81,600
Jan 1979	18	1045	5,600		([2])		18	1500	10 000		([2])		19	0100	7,200	19	0200	18,000		([2])		20	0800	22,100

[1]Estimated

[2]Station not in operation

[3]Several crests of August 1967 that are identifiable at only one gaging station are not included

[4]Revised

Table 5 Time and discharge of selected flood peaks—San Francisco River near Alma, N Mex, to Gila River near Calva, Ariz, 1941–79

[Crests are traced from the first gaging station where the crest began to the point where the crest was lost in the recession of an earlier crest or two or more crests merged to form a single crest]

Date	09443000 San Francisco River near Alma, N Mex, river mile 523			09444400 San Francisco River at Glenwood, N Mex, river mile 511 5			09444500 San Francisco River at Clifton, Ariz, river mile 476 0			09448500 Gila River at head of Safford Valley, Ariz, river mile 448			09458000 Gila River at Safford, Ariz, river mile 433 3			09466500 Gila River at Calva, Ariz, river mile 383		
	Day	Hour	Discharge, in cubic feet per second	Day	Hour	Discharge, in cubic feet per second	Day	Hour	Discharge, in cubic feet per second	Day	Hour	Discharge, in cubic feet per second	Day	Hour	Discharge, in cubic feet per second	Day	Hour	Discharge, in cubic feet per second
Sept 1941	----------			----------			28	2330	6,520	29	0230	10,900	29	[1]0600	8,320	----------		
Jan 1949		(2)		13	1400	7,800	13	2000	24,100	14	0200	25,200	14	0600	23,900	15	1300	19,400
Jan 1952		(2)		19	Unknown	5,410	19	0500	15,800	19	1130	19,700	19	[1]1500	15,700	20	2130	13,200
Oct 1955		(2)		4	0330	2,400	4	0730	5,820	----------								
Dec 1965	----------									22	2400	43,000	23	0600	42,000	24	1900	39,000
Do	----------						23	1000	30,500	23	1500	36,200	23	1800	36,500	----------		
Do	23	0830	5,900	23	1100	6,860	23	1900	19,000	23	2400	20,000	----------					
Do	----------						30	1900	17,300	30	2300	22,300	31	[1]0400	[1]22,000	Jan 1	0530	20,000
Do	30	1900	7,500	30	2230	8,200	31	0700	16,000	31	1000	15,000	31	1400	8,500	----------		
Aug 1967	----------						12	0600	34,700	12	0930	34,800		(2)		13	0800	40,100
Do	12	1300	6,230	12	[1]1500	8,000	12	2200	23,300	13	0300	14,200		(2)		14	0900	14,000
Oct 1972	----------						20	0300	64,000	20	0800	82,400		(2)		20	2400	80,000
Do	20	0530	30,600	20	0630	34,100	----------											
Sept 1975	----------						9	0030	30,000	9	0330	35,000		(2)		10	1500	15,800
Do	9	0045	15,600	9	0300	10,300	----------											
Mar 1978	----------						2	1800	8,350	2	1900	21,600		(2)		4	0100	17,800
Do	2	1500	4,390	2	1600	3,750	----------											
Do	----------						3	1130	9,500	3	1500	19,600		(2)		4	1830	19,000
Nov 1978	----------						25	0200	31,000	25	0630	41,000		(2)		26	1400	22,400
Do	25	0130	19,400	25	0430	12,600	25	0830	28,500	25	1330	28,000		(2)		26	1800	21,000
Dec 1978	----------						19	0030	56,000	19	0330	100,000		(2)		19	2100	100,000
Do	18	2100	24,500	18	[1]2300	20,500	----------											
Jan 1979	----------						17	2400	22,000	18	0700	39,200		(2)		18	2300	27,900
Do	17	2330	13,500	18	0200	10,900	18	0800	27,200	----------								

[1]Estimated

[2]Station not in operation

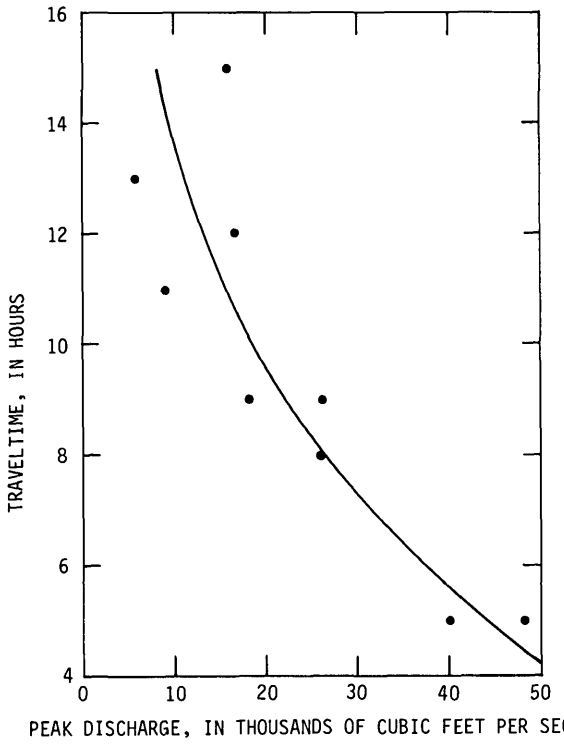

Figure 7 Relation between peak discharge at the Gila River near Redrock, N Mex, and traveltime to Duncan, Ariz

On Aravaipa Creek 6 mi above the mouth, the flood of December 1978 is the highest in the period of record that began in 1965 and probably is the second highest in the 20th century The highest flood occurred in 1920. Residents living near the mouth of Aravaipa Creek disagreed as to whether the 1967 flood or the 1978 flood was higher at that point (Ray Jordan, Arizona Department of Transportation, written commun., 1980)

The flows of the San Pedro River and Aravaipa Creek joined to cause two crests of long duration on the San Pedro River downstream from the confluence The peak discharge at the mouth of the San Pedro is the highest since 1940 The long-duration flow below Aravaipa Creek caused severe erosional damage. Large sections of flood plain were washed away, and several new channels developed

At Gila River near Kelvin, 17 mi downstream from the San Pedro River, the peak discharge of 27,000 ft^3/s in December 1978 is about equal to peak discharges in December 1965 and December 1967. In places, the stage was much higher than those for the earlier floods because the river channel was constricted by vegetation that grew after 1967 Riverside, Ariz , which is on the Gila River 16 mi downstream from the San Pedro River, was flooded with several feet of water

On the Santa Cruz River upstream from Rillito Creek, the flood of December 18, 1978, was the third highest winter flood in a period of record that began in 1905 and was exceeded only by the peaks of December 1914 and December 1967 The flood of December 18 was not exceptional, however, in relation to the overall peak record. The peak was exceeded by several peaks that occurred in August, September, and October of past years. The highest peaks in at least 25 years on tributaries that drain to Rillito Creek from the Santa Catalina and Rincon Mountains occurred on December 18, 1978 Records are not adequate, however, to define the exact period Sabino Creek reached the highest stage in a period of record that began in 1933 Rillito Creek, which had the highest peak discharge since 1929, eroded large sections of bank near Tucson and flooded at least one subdivision Flow from Rillito Creek combined with flows from a few minor tributaries to produce a peak of 18,800 ft^3/s on the Santa Cruz River at Cortaro The only higher peak during the period of record that began in 1940 was in October 1977 (Aldridge and Eychaner, 1982) A second crest of 18,200 ft^3/s occurred on the Santa Cruz River at Cortaro when the peak that passed the gaging station at Tucson was superimposed on the recession of the peak from Rillito Creek High flows continued for most of the day on December 18 The 1-day mean discharge of the Santa Cruz River at Cortaro was 14,500 ft^3/s, which exceeded the previous maximum 1-day mean discharge of 12,600 ft^3/s in October 1977

As the floods of December 1978 moved downstream along the Gila and Santa Cruz Rivers, the peak discharges were greatly reduced through attenuation and infiltration Peak discharges were delayed by the long traveltime from the source of the flooding to the confluence of the Gila and Santa Cruz Rivers Neither stream contributed significantly to flooding below the Salt River Peak discharges above the confluence near Laveen were 9,720 ft^3/s in the Gila River and 4,120 ft^3/s in the Santa Cruz River. The Santa Cruz River inundated hundreds of acres near Red Rock and Chuichu. Water was high enough to flow out into the channel the Santa Cruz River had followed before it was diverted into Greene Canal about 1900. Feedlots between Stanfield and Casa Grande were flooded, and erosional damage occurred near Casa Grande and Maricopa

Another large peak occurred on the San Pedro and Santa Cruz Rivers on January 17-18, 1979. On the San Pedro River upstream from Aravaipa Creek, the January flood was the highest winter peak since at least 1916. High flows continued on the Santa Cruz River

and Rillito Creek through March 1979 After several weeks of flow, riverbanks became saturated and extensive bank scour occurred, especially near Marana, where a large section of flood plain was eroded by the Santa Cruz River. Erosion was stopped when hundreds of car bodies were anchored along the bank

Salt River Basin and Gila River Basin Downstream from Salt River

The sources of flooding in the lower reaches of the Gila River are the Salt and Agua Fria Rivers In the Salt River basin above Roosevelt Lake, the number of peaks between November 1978 and March 1979 depended on the altitude of the basin. Only the peak of December 18 occurred in basins above 7,500 ft; the number of peaks was greater at lower altitudes In the Verde and Agua Fria River basins, the number of peaks was a function of both altitude and location. Peaks occurred at one or more stations in the Salt, Verde, or Agua Fria River basins at the following times: November 11-12 and 24-25; December 18-19 and 31, 1978; January 17-18, February 11 and 15, March 8-9, 20-21, and 28-29, 1979 The highest peaks occurred November 24-25 and December 18-19, 1978, and January 17-18, and March 28-29, 1979 Peaks of record occurred on January 17-18, 1979, on Cherry and Tonto Creeks.

Severe flooding occurred in Phoenix and suburban areas on December 18, 1978, and on January 17 and March 29, 1979, when inflow to reservoirs exceeded unfilled storage capacities. More than half of the monetary damage that resulted from the flood of December 1978 occurred along the Salt and Agua Fria Rivers The effects of floods on the Salt and Agua Fria Rivers extended to the mouth of the Gila River

Upstream from Reservoirs, December 18-20, 1978

The large amount of precipitation on a moderate snow cover on December 18, 1978, was accentuated in the Salt River basin because of the large amount of high-altitude drainage that contributes to the Salt River. About 16 percent of the Salt River basin above Roosevelt Lake is above 8,000 ft (Schumann, 1982). The warm rain that fell to altitudes of 11,000 ft on December 18 melted an unknown amount of snow that had been deposited by earlier storms.

Peaks of record occurred on Black River, Big Bonito Creek, and White River in the Salt River basin and on West Clear Creek in the Verde River basin. The length of record at these stations, however, is less than 25 years, and the probability is high that larger floods occurred in the early part of the 20th century. At long-term gaging stations, four or five higher discharges have occurred since 1890.

An unusual aspect of the December flood was the uniform distribution of runoff from the Salt River basin above the reservoir system. Discharges of 15 to 45 $(ft^3/s)/mi^2$ were recorded at gaging stations throughout the Salt River basin upstream from Roosevelt Dam, whereas, during other floods in the past 25 years, runoff came from only part of the basin. For example, in March 1978, runoff came almost entirely from altitudes of 5,000 to 7,000 ft In the Verde River, runoff during the flood of December 1978 was distributed less uniformly Low peak discharges occurred in the Verde River basin upstream from Oak Creek. High peak discharges occurred in Oak, Wet Beaver, and West Clear Creeks Moderate peak discharges occurred in the East Verde River and in tributaries to the Verde River downstream from the East Verde River Unit discharges in the Verde River basin ranged from less than 1 $(ft^3/s)/mi^2$ on Volunteer Canyon to more than 250 $(ft^3/s)/mi^2$ on small watersheds in the Beaver Creek watershed.

The maximum rate of ungaged inflow to Roosevelt Lake during the December flood was estimated as 35,000 ft^3/s. The peak rate of inflow to the lake was 152,000 ft^3/s (U S Army Corps of Engineers, 1980), which is probably the second highest since storage began in 1910 and was exceeded in March 1978.

A high volume of runoff occurred during the flood. The 1-day volume is the second highest since at least 1905 at Verde River below Tangle Creek, near Horseshoe Dam and third highest since at least 1913 at Salt River near Roosevelt and Tonto Creek above Gun Creek, near Roosevelt The 3-day volumes were third highest on Tonto Creek, fourth highest on the Salt River, and fifth highest on the Verde River. The total volume of inflow to the reservoirs, gaged plus ungaged, during the 3 highest days of the flood was about 425,000 acre-ft into the Salt River system and 250,000 acre-ft into the Verde River system The unfilled capacities preceding the flood were 330,000 acre-ft and 67,000 acre-ft, respectively These volumes of inflow in December could have been retained in the reservoirs during about 8 out of 9 years on the Salt River and 2 out of 3 years on the Verde River.

The flood hydrographs for stations along the Black River upstream from the pumping station near Point of Pines exhibit a typical downstream progression of the floodwave (fig. 8) The crest at Black River above pumping plant, near Morenci occurred about 11 hours after the crest at Black River near Maverick. Downstream from the pumping plant, the crest occurred more or less concurrently at all stations on the Black and Salt Rivers. In some reaches of the channel, the

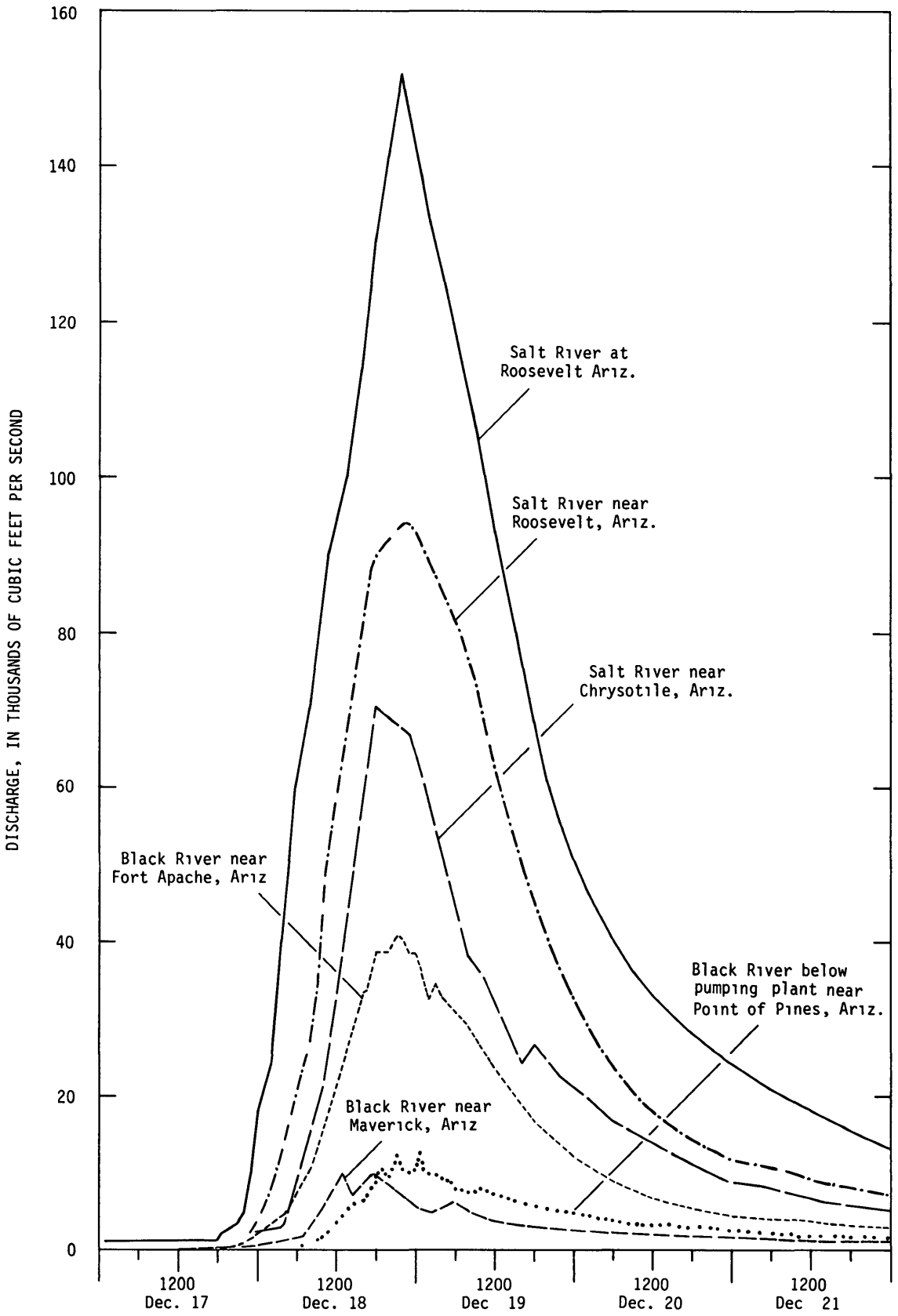

Figure 8 Discharge at gaging stations on the Black and Salt Rivers upstream from Roosevelt Lake, Ariz., December 17–21, 1978

crest occurred at a downstream station earlier than at an upstream station. This pattern is typical of floods in the Salt River because large amounts of tributary inflow enter the river between each pair of gaging stations

In contrast, the peak on the Verde River occurred progressively later as the floodwave moved downstream from the gaging station near Clarkdale to the gaging station below Tangle Creek (fig 9) The time between peaks at various stations probably equals the traveltime between the stations Traveltimes along the Verde River from the station near Clarkdale are 7 hours to Camp Verde, 12 hours to East Verde River, and 13 hours to Tangle Creek. Peak discharge at Verde River near Paulden occurred 7 hours after the peak at Verde River near Clarkdale because water that reached the Paulden station was delayed by a circuitous route from source areas and by storage in Sullivan Lake

The peak discharge at Agua Fria River near Mayer was about 35 percent greater than the previous maximum during the period of record that occurred during the Labor Day flood of 1970 (Roeske and others, 1978) The largest amount of runoff came from the Bradshaw Mountains, where rainfall of 8 3 in. was reported at Crown King The Black Hills, which are along the east side of the basin, contributed a small amount of runoff. Three small U S Forest Service research watersheds (Mingus A, B, and C) in this area, each of which drain less than 0 1 mi^2, had peak unit discharges of only a few cubic feet per second per square mile A large part of the Agua Fria River basin between the Bradshaw Mountains and the Black Hills received less than 3 in of rain during the storm period and probably did not contribute much runoff. Downstream from the Mayer gaging station, large amounts of runoff came from Black Canyon Creek and from tributaries to Lake Pleasant A local resident stated that the peak stage of Black Canyon Creek, about 1 mi above the mouth, was the second highest since he moved there in 1958 and was 0.8 ft lower than the stage in 1970. Five people drowned in the Agua Fria River when the bridge on Interstate Highway 17 at Black Canyon City was destroyed by floodwaters.

Downstream from Reservoirs, December 18–23, 1978

Severe flooding occurred during December 18–19 along the Salt and Agua Fria Rivers through Phoenix and neighboring cities when water was released from Stewart Mountain Dam on the Salt River, Bartlett Dam on the Verde River, and Waddell Dam on the Agua Fria River at rates of 51,000, 75,800, and 59,900 ft^3/s, respectively Releases from the Salt and Verde River reservoirs and tributary inflow produced a peak discharge of 126,000 ft^3/s on the Salt River at Jointhead Dam in Phoenix, an amount about equal to that in March 1978 Peak discharges in March 1978 and December 1978 were the highest since 1920. Higher discharges that have occurred on the Salt River at Jointhead Dam are listed below·

Date	*Discharge, in ft^3/s*
February 19, 1891	267,000
February 23–24, 1891	300,000
November 27, 1905	>200,000
February 16, 1980	170,000

Without the storage provided by upstream reservoirs, the peak discharge in December 1978 would have been about 234,000 ft^3/s

Less than 800 ft^3/s was released from either Bartlett Dam or Stewart Mountain Dam until about 0800 hours December 18 (fig 10) The main release of water began about 1000 hours at Bartlett Dam and 1200 hours at Stewart Mountain Dam The main release of water reached Jointhead Dam at Phoenix at 1800 hours December 18 and Gillespie Dam at 0200 hours December 20. The crest passed Granite Reef Dam about 1500 hours December 19, Jointhead Dam at 2300 hours, and Gillespie Dam at 1400 hours December 20

The peak discharge of 59,900 ft^3/s released from Waddell Dam on the Agua Fria River was nearly four times the previous maximum of 16,300 ft^3/s released in March 1978. The peak discharge of December 1978 remained nearly constant as the flow moved downstream to the gaging station at El Mirage, where a slope-area measurement indicated a discharge of 58,200 ft^3/s The discharge decreased to 29,300 ft^3/s at the gaging station near Avondale, which is 3 mi upstream from the mouth Larger floods occurred on the Agua Fria River in 1891, 1916, 1917, 1919, and 1980 The highest discharge on the Agua Fria River at Waddell Dam was about 105,000 ft^3/s in January 1916 and November 1919 The peak discharge at Gila River below Gillespie Dam on December 20, 1978, was 125,000 ft^3/s, which at the time was the highest since recordkeeping began in 1921 Larger floods occurred at this site in February 1891, November 1905, January 1916, and February 1980

During the flood, the Salt River was as much as 6,000 ft wide, and the Gila River downstream from the Salt River was as much as 14,000 ft wide. The two rivers cut all but three of the north-south streets in Phoenix and its suburbs. The bridges that were destroyed had just been rebuilt after the March 1978 flood The area that was inundated by the December flood was mapped by the U S Army Crops of Engineers (1979) and was about the same area inundated by the flood of March 1978 The Salt River destroyed sanitary landfills and

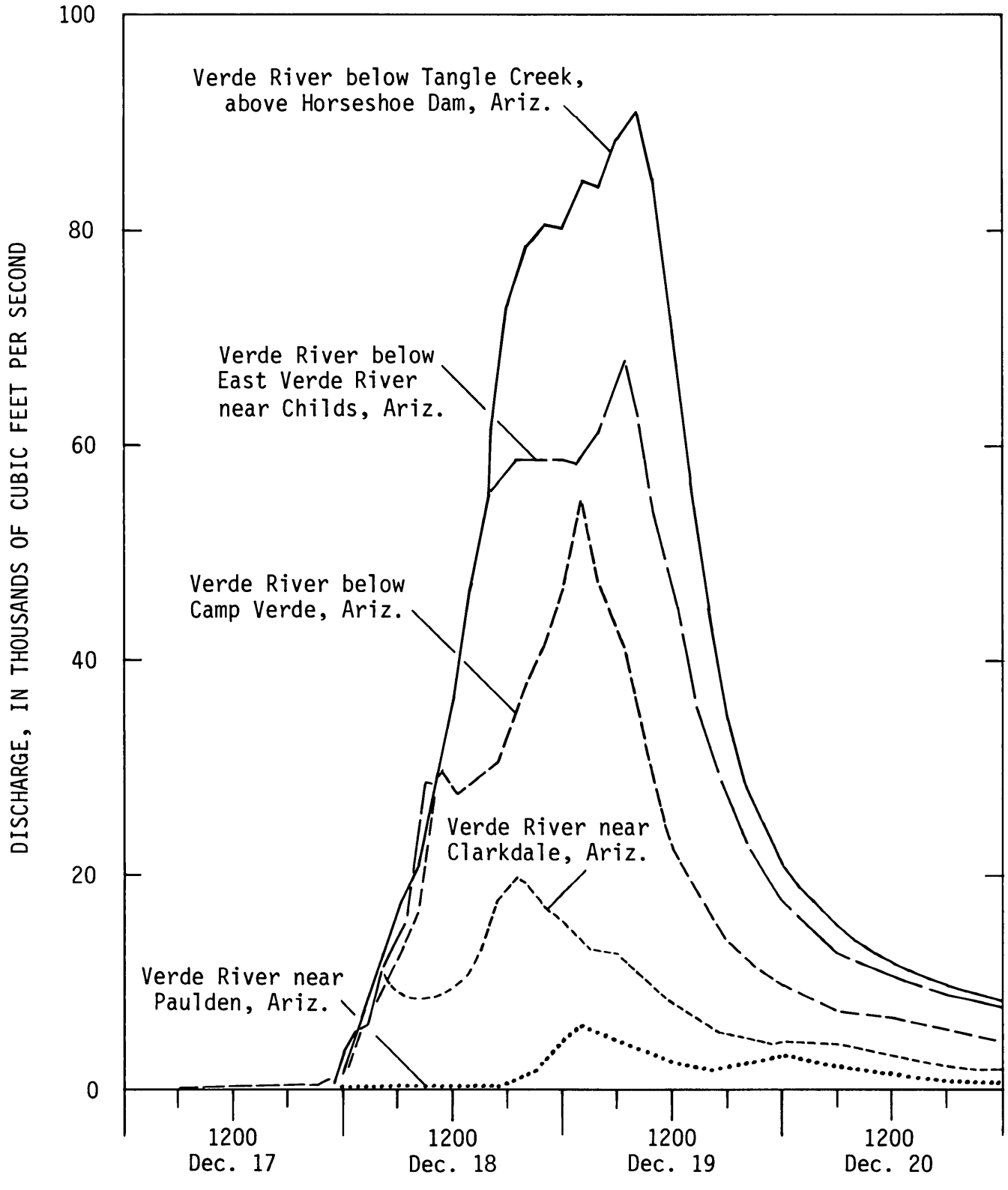

Figure 9 Discharge at gaging stations on the Verde River upstream from Horseshoe Reservoir, Ariz , December 17–20, 1978

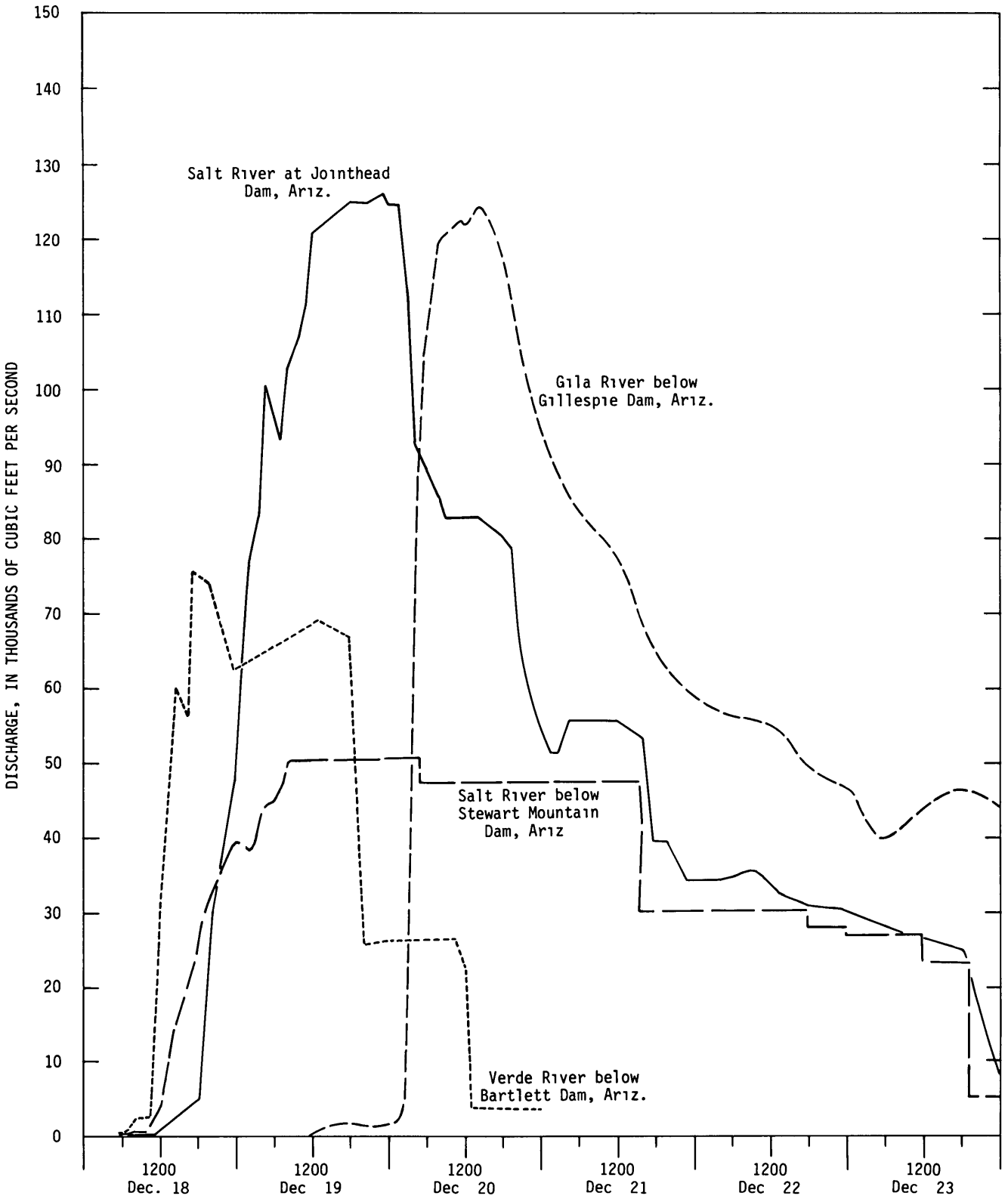

Figure 10 Regulated discharge of the Salt, Verde, and Gila Rivers, December 18–23, 1978

sewage-interceptor lines. Several hundred feet of runway at the Phoenix Sky Harbor Airport was washed out, but operations continued at a near-normal rate. Three persons drowned in the Salt River

The Agua Fria River damaged two small unplatted subdivisions in the rural area northwest of Phoenix and enlarged its channel throughout most of its length. The area inundated by the Agua Fria River was approximately equal to that inundated in 1980 and mapped by Thomsen (1980). Although the discharge was larger in 1980 than in 1978, the inundation was less in some places in 1980 because the channel was enlarged and cleaned by flows in January and March 1979.

Several commercial enterprises along the Salt, Agua Fria, and Gila Rivers, including an auto-wrecking yard and a tire-recycling plant, were damaged Seventeen sand- and gravel-processing facilities along the Salt River, nine along the Agua Fria River, and one along the Gila River were damaged Downstream from the Salt River, large areas of farmland along the Gila River were inundated, and several dairies and feedlots were damaged The flood damaged land that had not been damaged in March 1978 and cut an extensive number of new channels through the farmland Irrigation ditches, fences, equipment, wells, pumps, and crops were damaged throughout the reach from the Salt River to Painted Rock Dam. The subdivisions of Allenville and Holly Acres, which were being rebuilt after being devastated in March 1978, were devastated again by flow from the Gila River

Postflood Reservoir Storage and Releases and Streamflow Depletion

A few thousand cubic feet per second were released from both Stewart Mountain Dam on the Salt River and Bartlett Dam on the Verde River through December 29, when the release at each dam was reduced to a few hundred cubic feet per second. On December 29, the unfilled storage was about 200,000 and 39,000 acre-ft in the Salt and Verde River reservoir systems, respectively. Between December 29, 1978, and January 16, 1979, daily mean discharges of as much as 5,780 and 2,920 ft^3/s were released from Stewart Mountain and Bartlett Dams, respectively Storage in the reservoirs was held nearly constant during the first half of January The maximum variation in contents of either system during that time was about 10,000 acre-ft

Floodflows from Tonto Creek and a localized area upstream from Roosevelt Lake on January 16–17, 1979, rapidly increased the amount stored in the reservoir system on the Salt River The unfilled storage capacity of 200,000 acre-ft that had been established before January 16 was insufficient to contain the 380,000 acre-ft of inflow that occurred on January 17, 1979, and water was again released to the Salt River. The peak discharge of 65,000 ft^3/s of Salt River below Stewart Mountain Dam was the maximum since the dam was constructed in 1930 The peak discharge on January 17 may have been exceeded in 1916, when a daily mean discharge of 50,000 ft^3/s was released from Roosevelt Dam. The release from Bartlett Dam during the peak of January 1979 was 26,400 ft^3/s. The peak discharge of the Salt River at Jointhead Dam in Phoenix was 85,100 ft^3/s. The January flood on the Salt River washed out temporary repairs that had been made after the flood of December 1978 and caused a pier of the Interstate 10 bridge to settle. The bridge was one of three bridges that remained in use after the December flood.

Preflood storage levels were re-established within a few days after the January flood. Reservoirs were drawn down during late January and early February by continuous release of a few thousand cubic feet per second. Gradual filling occurred during late February and most of March as the flood potential decreased, and reservoirs reached a nearly full condition—1,708,000 acre-ft in the Salt River system and 302,000 acre-ft in the Verde River system—just before the March 28 storm. The unfilled capacities were 47,000 acre-ft in the Salt River system and 7,000 acre-ft in the Verde River system Peak discharges of March 28 on the Salt River and Tonto Creek combined to cause a peak inflow to Roosevelt Lake of about 55,000 ft^3/s. The maximum release from Stewart Mountain Dam of 48,600 ft^3/s, in combination with the release from Bartlett Dam, produced a peak of 67,400 ft^3/s in Phoenix

Following the March storm, the Salt River and Verde River reservoirs were again drawn down, for a period of 1 week on the Verde River system and slightly more than 2 weeks on the Salt River system, after which the reservoirs were allowed to fill The Verde River system reached its maximum storage level on April 15, and the Salt River system reached a maximum level on May 30. Water flowed over Granite Reef Dam on most days from December 18, 1978, through June 1979. Reservoir storage dropped gradually during the remainder of the water-use season

Lake Pleasant above Waddell Dam on the Agua Fria River filled during the December flood and remained essentially full through March 1979. The maximum unfilled capacity from December 18, 1978, through April 30, 1979, was 6,000 acre-ft. Lake Pleasant was full when the floods of January 17 and March 28 occurred. These floods passed through the reservoir without being reduced. Although water spilled over the diversion dam

below Waddell Dam almost continuously from December 18, 1978, through April 30, 1979, water reached the mouth of the Agua Fria River only during December 18–22, January 16–21, and March 29–31 A peak of 24,600 ft^3/s reached the mouth of the Agua Fria River on January 17, 1979.

The volume of water released from Stewart Mountain and Bartlett Dams from December 1978 through June 1979 was 3,108,700 acre-ft About 672,000 acre-ft were diverted upstream from Granite Reef Dam, and more than 2 4 million acre-ft were wasted to the Salt River below Granite Reef Dam Gaged inflow from other sources between Granite Reef and Gillespie Dams was 424,900 acre-ft (table 6), and the unmeasured inflow may have been on the order of several tens of thousands of acre-feet The volume of water reaching Gillespie Dam was 2,764,100 acre-ft.

The flood runoff was stored in Painted Rock Reservoir for controlled release, which began on December 22, 1978 Water reached the Gila River near Mohawk gaging station on January 2, 1979, and reached the mouth of the Gila River on January 18, 1979 Storage in Painted Rock Reservoir increased more than 1 million acre-ft in December 1978 and January 1979 and reached a maximum of about 1 85 million acre-ft in April 1979 Outflow from the reservoir began to exceed inflow in May 1979, and the reservoir was gradually drawn down until January 28, 1980 The maximum release rate from painted Rock Dam was 3,340 ft^3/s The volume of water released from Painted Rock Dam from November 1978 to January 1980 was 2,226,500 acre-ft; about 774,600 acre-ft, or nearly 35 percent was lost to evaporation and infiltration The volumes of streamflow for Gila River below Painted Rock Dam to the mouth of the Gila River are shown in table 7

MONETARY DAMAGE

A complete tabulation of damage caused by the floods of November 1978 through March 1979 has not been compiled Detailed damage analyses for the flood of December 1978 were prepared only for parts of the flood-affected area Damage from the floods of November 1978 and January and March 1979 has not been identified separately

Emergency expenditures and loans made as a result of the flood of December 1978 in Arizona were tabulated by the Arizona Emergency Services (written commun , 1980) and the U.S Army Corps of Engineers (1979) The two tabulations show totals of $134 million and $132 million, respectively, but differ drastically in categories used and in dollar values assigned to common categories Some duplication is possible, and damage was not assessed in some areas The true amount of damage will never be known, but it is probably between $150 million and $200 million

The U S Army Corps of Engineers (1979, 1980) tabulated damage caused by the December flood in Maricopa County and selected outlying areas that include Winslow on the Little Colorado River, Williams on Cataract Creek, the Gila River basin above San Carlos Reservoir, and along the Gila River near Gila Bend, Ariz (table 8) The tabulations show $51 8 million in damage in Maricopa County, of which $20.5 million or 40 percent was damage to roads and bridges or losses due to traffic delay caused by the damage

The outlying areas assessed by the U.S Army Corps of Engineers (1979, 1980) sustained $39 8 million in damage Sixty-three percent, or $25 2 million, was to agricultural lands, crops, and equipment The authors were able to obtain information on damage in a few other localities. The U.S Soil Conservation Service (written commun , 1980) estimated $2.8 million damage along the Santa Cruz River and its distributaries downstream from the community of Redrock, Ariz. Damage in the Wellton-Mohawk Irrigation and Drainage District was estimated at $3 4 million (Arizona Water Commission, 1980) The damage primarily involved losses to crops, farmland, and improvements, bridge repairs, and increased transportation costs An expense of $505,000 was incurred by the Yuma County Highway Department for maintenance of Gila River crossings from July 1979 to February 1980 (Mr. Fortney, Yuma County Highway Department, oral commun , 1980) About $250,000 was spent by the U S Bureau of Reclamation for riprap along the Gila River from Dome to its confluence with the Colorado River (Harold Pritchart, U S Bureau of Reclamation, oral commun., 1980) Large areas where damage has not been assessed include the San Pedro River basin, the Gila River between Winkelman, and the Salt River; the Santa Cruz River basin upstream from Redrock; and all the mountain drainages in the Little Colorado and Gila River basins in Arizona.

EFFECTS OF THE FLOODS ON GROUND-WATER LEVELS

In some areas, the rise in ground-water level that accompanied the flood was a benefit In the Wellton-Mohawk and South Gila Valleys, however, rises in water levels damaged irrigation projects along the Gila River More than 2,600 acres of cropland were taken out of production because of waterlogging In those areas where waterlogging occurred, water was pumped to keep water levels low enough for growing crops.

Table 6 Measured inflow and outflow to the reach from Stewart Mountain Dam on the Salt River to Gillespie Dam on the Gila River, December 1978 to June 1979

Station number	Station name	Measured inflow and outflow, in acre-feet
	INFLOW	
09479500	Gila River near Laveen.....	134,800
09489000	Santa Cruz River near Laveen.....	45,700
09502000	Salt River below Stewart Mountain Dam...	2,139,000
09510000	Verde River below Bartlett Dam.....	969,700
09510200	Sycamore Creek near Fort McDowell.....	78,400
09513970	Agua Fria River at Avondale.....	72,400
09517000	Hassayampa River near Arlington.....	6,400
09517500	Centennial Wash near Arlington.....	400
--------	City of Phoenix sewage effuent.....	86,800
	Total	3,533,600
	OUTFLOW	
---------	City of Phoenix diversions.....	19,400
---------	Canals at Granite Reef Dam.....	653,000
---------	Buckeye Irrigation Canal.....	39,300
---------	Canals at Gillespie Dam.....	32,700
09519500	Gila River below Gillespie Dam.....	2,731,400
	Total	3,475,800

For purposes of publishing ground-water data, the U.S Geological Survey divided Arizona into separate ground-water areas (U.S. Geological Survey, 1980b). Selected wells in each area are measured annually In wells along major flood plains where flooding occurred, the ground-water level rose substantially between 1978 and 1980 (table 9) Table 9 shows net rises between annual measurements and does not account for intervening declines. The measurements in 1978 were made before the flood of March 1978; measurements in 1979 were made after the flood of December 1978 but before the end of the high-water period in March 1979. Only annual measurements made by the U.S. Geological Survey are shown in table 9. In some irrigation districts, water levels in many additional wells were measured Water levels rose an average of 22 ft between January 1978 and April 1979 in 183 wells near Phoenix Much of the rise was due to below-average pumping during periods of surplus surface water Only part of the rise was due to recharge. Records from water-level recorders in wells along the Salt River showed rises of as much as 80 ft from December 1978 to June 1979 (fig 11). Ground-water levels rose 6 ft under about 200 acres downstream from Dome and 2 ft or more under about 4,000 acres in valleys near the mouth of the Gila River

STREAMFLOW DATA AT GAGING STATIONS AND MISCELLANEOUS MEASURING SITES

Explanation of Data

The detailed flood information given in this report for gaging stations and miscellaneous sites is in addition to that published in the regular annual reports of the Geological Survey The sites are numbered consecutively in downstream order, and the numbers identify the locations on plate 1 The permanent station numbers for the gaging stations correspond to those used and explained in the annual report "Water Resources Data for

Table 7 Streamflow at gaging stations and inflow, diversions, and losses between gaging stations, Painted Rock Dam to mouth of the Gila River, November 1978 to January 1980
[Volume, in acre-feet]

Station number	Station name	Streamflow	Inflow	Diversion	Loss
09519800	Gila River below Painted Rock Dam.....	2,226,500	-------	-------	-------
09520360	Gila River near Mohawk.....	1,795,300	-------	-------	431,200
09520500	Gila River near Dome.....	1,579,000	-------	[1]77,600	138,700
09520700	Gila River near mouth.....	1,436,300	[2]62,000	-------	204,700
	Total loss.....				774,600

[1]At Norton Siphon 1 mi downstream from station 09520360.

[2]Return flow from Colorado River diversions.

Arizona" (U.S. Geological Survey, 1980a). Records of stage and discharge at gaging stations, contents of reservoirs and reservoir systems, and peak discharges at miscellaneous sites are given.

Summary of Flood Stages and Discharges

Maximum stages and discharges at continuous-recording stations, crest-stage stations, and miscellaneous sites are summarized in table 10 The first column under "maximum previously known" shows the period of known floods prior to November 1978. The period does not necessarily correspond to that in which continuous records of discharge were obtained; where available, records of historical floods are included, and overlapping time periods may be shown. The next three columns give data for the maximum known discharge and gage height Separate listings are given for stations where maximum discharge and gage height did not occur concurrently. Separate listings also are given for periods that have different degrees of regulation. The last four columns present data for the maximum discharge, November 1978 to March 1979.

Data for Individual Sites

The data for each site include a station description and may include a table of gage heights and discharges at indicated times during the rise and recession of the flood peak. The station description contains information on location, drainage area, and type and datum of gage. The method used to determine the gage height during the flood period and the definition of the stage-discharge relation are explained. The maximum stage and (or) discharge for the floods in November 1978 to March 1979 and for the highest previous flood known at each station are given. The tables of stages and discharges at indicated times contain sufficient data to define stage and discharge hydrographs, but they are less complete than the data used to compute daily mean discharges.

Table 8. Summary of property damage and other costs associated with the flood of December 1978 in Maricopa County, Ariz., and selected outlying areas
[Data from U S Army Corps of Engineers, 1979, 1980]

Type of property	Property damage	Income losses	Emergency costs	Total
Maricopa County[1]				
Agricultural.....	$3,829,000	$1,808,000	$56,000	$5,693,000
Commercial.....	1,396,000	703,000	26,000	2,125,000
Industrial:				
Sand and gravel....	3,098,000	1,930,000	215,000	5,243,000
Other.....	797,000	359,000	10,000	1,166,000
Public:				
Roads and bridges..	8,009,000	12,016,000	485,000	20,510,000
Other.....	12,519,000	1,056,000	847,000	14,422,000
Residential.....	2,486,000	81,000	30,000	2,597,000
Total.....	$32,134,000	$17,953,000	$1,669,000	$51,756,000
Outlying areas in Arizona and west-central New Mexico[2]				
Agricultural.....	$24,750,000	$447,000	--------	$25,197,000
Commercial.....	2,037,000	137,000	$1,000	2,175,000
Industrial.....	10,000	--------	--------	10,000
Public:				
Roads and bridges..	6,737,000	--------	387,000	7,124,000
Other.....	2,636,000	25,000	95,000	2,756,000
Residential.....	2,584,000	--------	4,000	2,588,000
Total.....	$38,754,000	$609,000	$487,000	$39,850,000

[1]Damage in Maricopa County downstream from reservoirs on Salt, Verde, and Agua Fria Rivers.

[2]Damage in Gila River basin above San Carlos Reservoir in eastern Arizona and west-central New Mexico; Winslow and Williams in northern Arizona; and Gila Bend in southwestern Arizona.

Table 9 Rises in ground-water levels in the Gila River basin in Arizona, 1978-80
[Includes only annual measurements by U S Geological Survey]

Ground-water area	Number of wells		Maximum rise, in feet	
	Measured	In which water level rose	1978-79	1979-80
Duncan basin.....	6	4	1.6	----
Safford basin.....	24	22	[1]27.4	----
San Carlos Reservoir to Kelvin.....	3	2	3.6	----
Upper San Pedro River basin.....	23	10	4.3	----
Lower San Pedro River basin.....	24	21	81.5	----
Upper Santa Cruz River basin.....	37	19	27.5	----
Lower Santa Cruz River basin[2].....	76	44	72.7	----
Upper Verde River.....	6	5	10.6	----
Agua Fria basin.....	2	1	5.2	----
Salt River Valley:				
Tempe.....	13	7	56.6	----
	13	8	----	38.9
Buckeye.....	7	5	19.5	----
	7	6	----	16.6
Queen Creek.....	19	11	48.4	----
	23	17	----	62.2
Phoenix.....	18	17	36.6	----
	12	6	----	12.0
Beardsley.....	11	8	21.9	----
	10	5	----	9.5
Gila Bend basin[3].....	14	9	28.7	----
	12	12	----	32.0
Gila River Drainage:				
Painted Rock to Texas Hill.....	5	2	7.4	----
	4	4	----	15.3
Texas Hill to Dome.....	5	3	.9	----
	5	5	----	9.7

[1]Anomalous rise; most rises less than 12 feet.

[2]Includes Gila River below Kelvin excluding Queen Creek.

[3]Rises of 1978-79 include effect of March 1978 flood. Measurements of 1980 made prior to February 1980 flood.

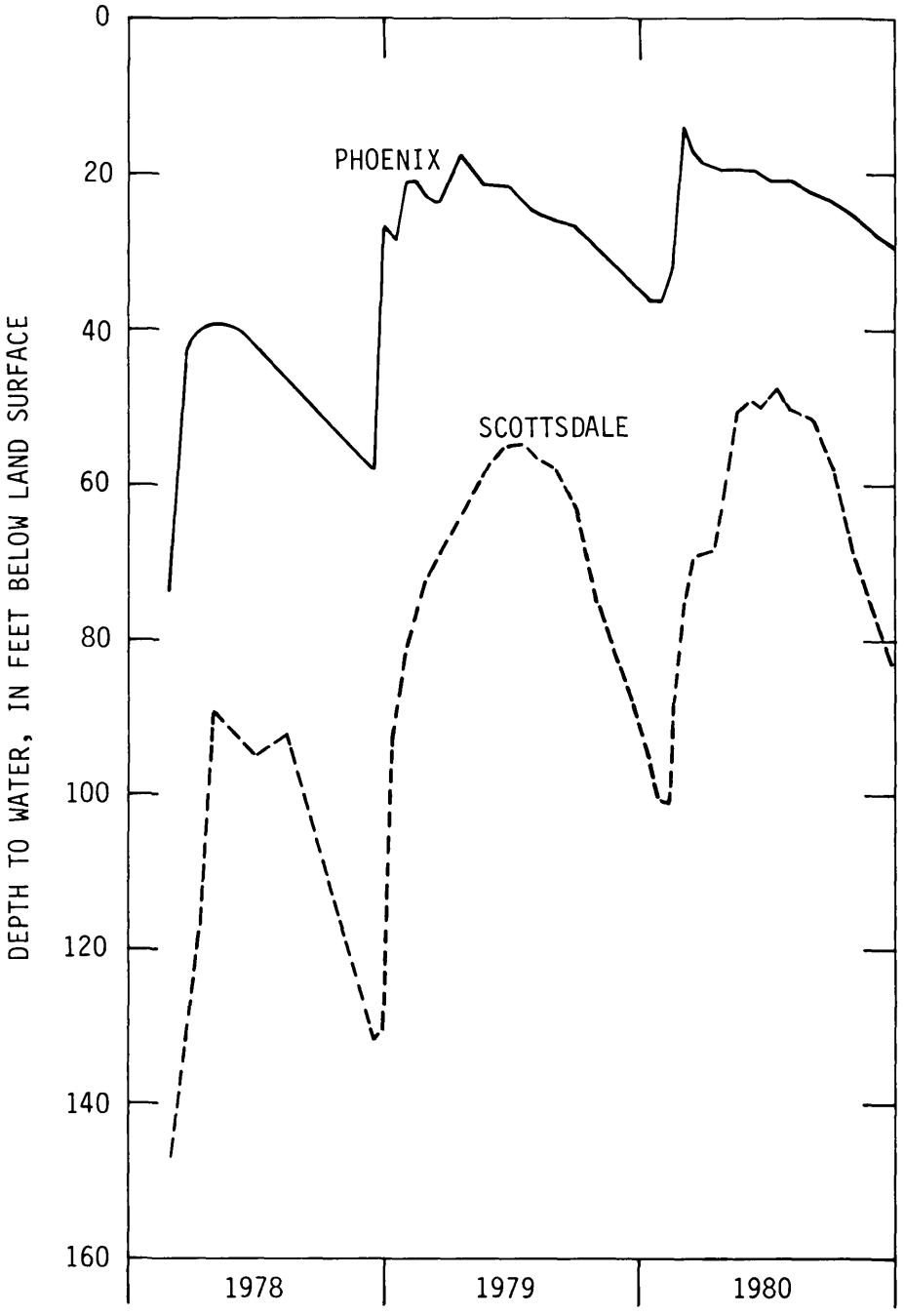

Figure 11 Depth to water recorded in wells near the Salt River at Phoenix and Scottsdale, Ariz., 1978–80

Table 10 Summary of flood stages and discharges

Location number shown on plate 1	Station number	Stream and place of determination	Drainage area (mi^2)	Maximum previously known				Maximum November 1978 to March 1979			
				Period	Year	Gage height (ft)	Discharge (ft^3/s)	Date	Gage height (ft)	Discharge (ft^3/s)	Recurrence interval (years)
1	09390500	Show Low Creek near Lakeside, Ariz	68.6	[illegible]-78	1971	9.53	5,450	12-18-78	9.16	5,550	18
2	09392000	Show Low Creek below Jaques Dam, near Show Low, Ariz	73.0	[illegible]41-53	1952	[2]9.9	6,250	12-18-78	--------	[3]4,410	20
				[4][illegible]-78	1971	--------	2,500				
3	09393500	Silver Creek near Snowflake, Ariz	886	[illegible]-78	1940	[2]12.37	11,000	12-19-78	15.33	7,700	8
4	09394500	Little Colorado River at Woodruff, Ariz	[5]8,100	[illegible]-19	1916	[2]12.7	([6])	12-19-78	22.9	9,320	9
				[7][illegible]-78	1940	[2]13.45	13,000				
5	09396100	Puerco River near Chambers, Ariz	2,160	[illegible]-78	1971	9.65	17,800	12-18-78	[3]7.99	[3]13,800	4
6	09397000	Little Colorado River at Holbrook, Ariz	[5]11,300	[illegible]-1978	1923	--------	60,000	12-19-78	12.40	([8])	-------
7	09397300	Little Colorado River near Joseph City, Ariz	[5]12,200	[illegible]-78	1974	6.90	20,600	12-19-78	7.64	25,400	14
8	09397500	Chevelon Creek below Wildcat Canyon, near Winslow, Ariz	275	[illegible]-78	1952	18.2	19,800	12-18-78	18.25	[9]19,900	20
9	09398000	Chevelon Creek near Winslow, Ariz	794	1915-19	1952	19.8	25,300	12-19-78	24.46	[9]33,600	70
				1929-78							
10	09398500	Clear Creek below Willow Creek, near Winslow, Ariz	321	1947-78	1952	21.5	16,400	12-18-78	22.32	[9]19,700	18
11	09399000	Clear Creek near Winslow, Ariz	607	1929-78	1929	18.1	50,000	12-19-78	16.67	[9]36,300	55
12	09399400	Jacks Canyon Creek near Winslow, Ariz	280	1970-75	1972	13.50	2,600	12-18-78	16.98	4,600	-------
13	09400000	Little Colorado River near Winslow, Ariz	[5]16,600	1978	----	--------	----------	12-20-78	--------	57,600	90
14	09402000	Little Colorado River near Cameron, Ariz	[5]26,500	1870-1978	1923	--------	120,000	12-23-78	17.36	17,800	25
15	09430500	Gila River near Gila, N Mex	1,864	1927-78	1941	17.2	25,400	12-18-78	12.5	32,400	>100
16	09430600	Mogollon Creek near Cliff, N Mex	69.0	1967-78	1967	13.7	10,800	12-18-78	12.4	10,100	16
17	09430900	Duck Creek at Cliff, N Mex	228	1957-78	1967	11.09	6,900	12-18-78	9.36	5,800	6
18	09431500	Gila River near Redrock, N Mex	2,829	1912-78	1941	31	40,000	12-19-78	34.1	48,800	>100
19	09432000	Gila River below Blue Creek, near Virden, N Mex	3,203	1892-1978	1941	25.78	41,700	12-19-78	29.0	58,700	>100
20	09437200	Mexican Canyon at Virden, N Mex	3.40	1968-78	----	--------	----------	---------	--------	([10])	-------
21	09442000	Gila River near Clifton, Ariz	4,010	1892-78	1972	18.7	33,000	12-19-78	23.80	57,000	>100
22	09442630	Mail Hollow near Luna, N Mex	4.20	1970-78	1972	3.90	([11])	11-24-78	3.05	66	3
23	09442660	Trout Creek at Luna, N Mex	31.9	1954-78	1972	4.47	2,250	11-24-78	3.07	720	10
24	09442680	San Francisco River near Reserve, N Mex	350	1959-78	1972	[2]7.47	11,900	11-25-78	9.40	11,800	>100
25	09442695	Negro Canyon at Aragon, N Mex	9.62	1958-78	1959	11.60	5,200	11-24-78	1.48	230	3
26	09442740	Tularosa River near Reserve, N Mex	426	1956-78	1956	--------	2,280	11-24-78	6.22	850	7
27	09443000	San Francisco River near Alma, N Mex	1,546	1904-14	1972	18.16	30,600	12-18-78	15.84	24,500	16
				1927-78							
28	09444000	San Francisco River near Glenwood, N Mex	1,653	1927-78	1972	16.61	24,000	12-18-78	15.60	20,500	24
29	09444100	Campbell Blue Creek near Alpine, Ariz [12]	11.6	1958-78	1972	5.50	341	12-18-78	4.92	255	10
30	09444200	Blue River near Clifton, Ariz	506	1870-1978	1972	22.56	30,000	11-24-78	17.1	14,700	12
31	09444400	Chase Creek near Clifton, Ariz	1.37	1963-78	1964	13.9	600	([13])	7.59	72	4
32	09444500	San Francisco River at Clifton, Ariz	2,766	1870-1978	1906	--------	[3]70,000	12-19-78	16.0	56,000	33
33	09447000	Eagle Creek above pumping plant, near Morenci, Ariz	613	1932-78	1965	12.8	21,000	12-18-78	12.5	24,500	50
34	09448500	Gila River at head of Safford Valley, near Solomon, Ariz	7,896	1906-78	1916	[2]15.89	100,000	12-19-78	14.40	100,000	90
35	09457000	San Simon River near Solomon, Ariz	2,192	1880-1978	1931	19.0	27,500	1-17-79	7.20	727	1
36	09458050	Marijilda Wash near Safford, Ariz	10.9	1971-78	1977	5.10	883	12-18-78	6.8	5,770	-------
37	09458200	Deadman Creek near Safford, Ariz	4.78	1966-76	1972	3.45	119	12-18-78	--------	2,760	-------
38	09466500	Gila River at Calva, Ariz	11,470	1906-78	1916	--------	100,000	12-19-78	15.20	100,000	90
39	09467120	Salt Creek near Peridot, Ariz	35.2	1964-78	1972	19.56	3,200	12-18-78	18.17	2,200	7
40	09468300	Sevenmile Wash Tributary near Globe, Ariz	.83	1933-78	----	--------	526	12-18-78	9.47	640	25
41	09468500	San Carlos River near Peridot, Ariz	1,027	1929-78	1941	11.4	40,600	11-25-78	13.07	----------	-------
								12-18-78	--------	22,500	11
42	09469000	San Carlos Reservoir at Coolidge Dam, Ariz	12,886	1928-78	1973	2,704.67	[14]843,300	3-31-79	2,717.16	[14]1,030,000	-------
43	09469500	Gila River below Coolidge Dam, Ariz	12,886	1914-28	1916	--------	130,000	3-29-79	4.84	1,460	-------
				[4]1928-78	1952	4.64	1,350				
44	09470000	Gila River at Winkelman, Ariz	[15]13,268	1932-78	1944	18.4	55,000	12-18-78	14.30	9,520	5
45	09472000	San Pedro River near Redington, Ariz	2,939	1906-78	1926	29.0	90,000	1-18-79	15.21	10,800	3

See footnotes at end of table

Table 10. Summary of flood stages and discharges—Continued

Location number shown on plate 1	Station number	Stream and place of determination	Drainage area (mi^2)	Maximum previously known				Maximum November 1978 to March 1979			
				Period	Year	Gage height (ft)	Discharge (ft^3/s)	Date	Gage height (ft)	Discharge (ft^3/s)	Recurrence interval (years)
46	09472100	Peck Canyon Tributary near Redington, Ariz	8.02	1967-78	1972	9.25	4,340	12-19-78	7.07	46	1
47	09473000	Aravaipa Creek near Mammoth, Ariz	541	1931-78	1967	14.25	15,300	12-18-78	14.4	16,200	25
48	09473500	San Pedro River at Winkelman, Ariz	4,471	1906-78	1926	--------	[16]85,000	12-18-78	14.41	18,000	8
49	09473600	Tam O'Shanter Wash near Hayden, Ariz	4.37	1963-78	1974	14.28	1,570	12-18-78	8.07	230	1
50	09474000	Gila River at Kelvin, Ariz	[15]18,011	1911-28	1916	19.5	132,000	12-19-78	25.30	27,000	8
				[4]1928-78	1930	12.6	42,800				
51	09478600	Queen Creek Tributary 3 at Whitlow Dam, Ariz	0.37	1966-78	1966	7.55	280	12-18-78	3.70	50	1
52	09479500	Gila River near Laveen, Ariz	[15]20,615	1940-78	1941	--------	11,900	12-21-78	10.20	9,720	25
					1965	10.08	----------				
53	09482000	Santa Cruz River at Continental, Ariz	1,662	1936-78	1977	16.7	26,500	12-18-78	10.0	16,000	20
54	09482500	Santa Cruz River at Tucson, Ariz	2,222	1892-78	1977	21.8	23,700	12-19-78	14.1	13,500	16
55	09483000	Tucson Arroyo at Vine Avenue, Tucson, Ariz	8.2	1940-78	1961	10.35	5,000	12-18-78	5.35	334	1
56	09483100	Tanque Verde Creek near Tucson, Ariz	43.0	1959-78	1967	5.14	3,080	12-18-78	5.71	4,100	12
57	--------	Agua Caliente Wash near Tucson, Ariz	39.0	1978	----	--------	----------	12-18-78	--------	3,440	10
58	09484000	Sabino Creek near Tucson, Ariz	35.5	1932-78	1970	10.21	7,730	12-18-78	11.76	7,400	37
59	09484200	Bear Creek near Tucson, Ariz	16.3	1959-78	1965	4.90	1,150	12-18-78	5.40	1,400	11
60	09484500	Tanque Verde Creek at Tucson, Ariz	219	1940-45, 1966-78	1965	7.89	12,200	12-18-78	7.33	12,700	75
61	09484510	Ventana Canyon Wash near Tucson, Ariz	6.46	1965-78	1965	11.34	260	12-18-78	14.55	234	6
62	09485450	Pantano Wash (at Broadway Blvd) at Tucson, Ariz	599	[17]1930-78	1958	[2]7.50	20,000	12-18-78	--------	1,530	2
63	09486000	Rillito Creek near Tucson, Ariz	918	1907-78	1929	24.0	24,000	12-18-78	--------	16,400	22
64	09486300	Canada del Oro near Tucson, Ariz	250	[17]1950-78	1959	--------	17,000	11-25-78	3.90	1,380	1
65	09486500	Santa Cruz River at Cortaro, Ariz	3,503	1936-78	1977	15.6	23,000	12-18-78	14.42	18,800	20
66	09489000	Santa Cruz River near Laveen, Ariz	8,581	1940-78	1962	17.50	9,200	12-22-78	16.11	4,120	10
67	09489075	East Fork Black River near Alpine, Ariz	111	1968-78	1972	[2]8.04	3,720	12-18-78	4.98	2,270	-------
68	09489076	Burro Mountain Weir near Springerville, Ariz	1.14	1960-78	1972	1.78	18	12-18-78	1.23	7.4	6
69	09489078	West Fork Black River near Alpine, Ariz	54.1	1968-78	1972	5.90	2,050	12-18-78	4.58	1,150	-------
70	09489086	Beaver Creek near Alpine, Ariz	59.1	1968-78	1972	--------	2,490	12-18-78	5.36	1,750	-------
71	09489089	Heifer Branch near Alpine, Ariz	3.8	1967-78	1972	--------	158	12-18-78	6.75	67.5	-------
72	09489100	Black River near Maverick, Ariz	315	1962-78	1972	8.99	11,100	12-18-78	8.74	10,300	50
73	09489200	Pacheta Creek at Maverick, Ariz	14.8	1957-78	1973	4.36	323	12-18-78	4.23	224	9
74	09489500	Black River below pumping plant, near Point of Pines, Ariz	560	1953-78	1972	18.0	17,900	12-19-78	14.8	12,400	25
75	09489700	Big Bonito Creek near Fort Apache, Ariz	119	1957-78	1978	[18]9.09	----------	12-18-78	9.04	4,510	75
					1978	--------	2,870				
76	09490500	Black River near Fort Apache, Ariz	1,232	1912-78	1916	--------	[19]50,000	12-18-78	24.05	40,200	22
77	09491000	North Fork White River near McNary, Ariz	66	1945-78	1946	5.36	1,290	12-18-78	4.82	1,060	14
78	09492400	East Fork White River near Fort Apache, Ariz	38.8	1957-78	1967	3.63	758	12-18-78	3.62	751	20
79	09494000	White River near Fort Apache, Ariz	632	1957-78	1971	13.8	8,670	12-18-78	15.71	14,600	>100
80	09496500	Carrizo Creek near Show Low, Ariz	439	1951-78	1965	[2]13.0	23,000	12-18-78	15.1	19,400	20
81	09497500	Salt River near Chrysotile, Ariz	2,849	1906-78	1916	18	74,000	12-18-78	17.35	70,400	45
82	09497800	Cibecue Creek near Chrysotile, Ariz	295	1959-78	1977	17.3	22,200	12-18-78	10.20	7,740	5
83	09497850	Canyon Creek near Globe, Ariz	316	1975-78	1978	18.8	21,100	12-18-78	[3]19.4	[3]22,700	-------
84	09497980	Cherry Creek near Globe, Ariz	200	1965-78	1972	14.0	8,300	1-17-79	15.2	15,700	29
85	09498500	Salt River near Roosevelt, Ariz	4,306	1906-78	1941	--------	117,000	12-19-78	29.35	95,800	25
					1978	28.55	----------				
86	09498508	Upper Parker Creek Watershed near Roosevelt, Ariz [12]	1.09	1934-78	1945	5.91	270	1-17-79	3.63	64	7
87	09498550	Workman Creek near Roosevelt, Ariz [12]	1.70	1938-78	1972	6.64	289	12-18-78	5.78	204	15
88	09498870	Rye Creek near Gisela, Ariz	122	1963-78	1970	14.1	44,400	1-17-79	6.15	5,230	3
89	09498900	Gold Creek near Payson, Ariz	6.44	1963-78	1970	11.94	2,800	Unknown	6.72	1,120	8
90	09499000	Tonto Creek above Gun Creek, near Roosevelt, Ariz	675	1940-78	1970	18.2	53,000	1-17-79	17.0	61,400	20

See footnotes at end of table

Table 10 Summary of flood stages and discharges—Continued

Location number shown on plate 1	Station number	Stream and place of determination	Drainage area (mi^2)	Maximum previously known				Maximum November 1978 to March 1979			
				Period	Year	Gage height (ft)	Discharge (ft^3/s)	Date	Gage height (ft)	Discharge (ft^3/s)	Recurrence interval (years)
91	09500100	Three Bar D Watershed near Roosevelt, Ariz [12]	0 13	1963-78	1959	4 33	99	12-18-78	1 16	3 71	2
92	09500500	Salt River at Roosevelt, Ariz	5,824	1888-1978	1978	--------	[20]155,000	12-19-78	--------	[21]152,000	-------
93	09501000	Reservoir system on Salt River, at and below Roosevelt Dam, Ariz	6,211	1910-78	1941	--------	[14]1,764,000	3-29-79	--------	[14]1,710,000	-------
94	--------	Fish Creek above Lewis and Pranty Creek, near Tortilla Flat, Ariz	32 2	1978	----	--------	----------	12-18-78	--------	2,650	10
95	--------	Lewis and Pranty Creek near Tortilla Flat, Ariz	13 4	1967	1967	--------	3,310	12-18-78	--------	1,210	8
96	09501300	Tortilla Creek at Tortilla Flat, Ariz	24 3	1942-78	1971	13 23	7,500	12-18-78	10 07	4,400	5
97	09502000	Salt River below Stewart Mountain Dam, Ariz	6,232	[4]1930-78	1966	22 4	51,600	1-18-79	23 3	65,000	-------
98	09502800	Williamson Valley Wash near Paulden, Ariz	255	1965-78	1978	8 22	7,490	12-18-78	7 28	4,890	8
99	09503700	Verde River near Paulden, Ariz	2,530	1963-78	1978	9 66	8,080	12-19-78	8 78	5,700	6
100	09503720	Hell Canyon near Williams, Ariz	14 9	1965-78	1965 1978	4 78	1,080	12-18-78	2 68	220	2
101	09503750	Limestone Canyon near Paulden, Ariz	14 5	1969-78	1971	16 51	4,100	12-18-78	3 62	200	2
102	09503800	Volunteer Wash near Bellemont, Ariz	131	1966-78	1978	6 55	2,300	12-18-78	3 00	100	1
103	09504000	Verde River near Clarkdale, Ariz	3,520	1915-21, 1965-78	1920	[2]19 1	50,600	12-18-78	14 89	19,900	14
104	09504400	Munds Canyon Tributary near Sedona, Ariz	1 19	1963-78	1970	11 10	705	12-18-78	7 17	275	7
105	09504500	Oak Creek near Cornville, Ariz	357	1885-1978 1940-78	1938 1970	[2]23 16 48	---------- 24,700	12-19-78	16 00	25,100	20
106	09505200	Wet Beaver Creek near Rimrock, Ariz	111	1961-78	1970	12 41	7,670	12-18-78	12 38	7,560	6
107	09505220	Rocky Gulch near Rimrock, Ariz [12]	1 40	1959-78	1970	4 91	1,550	12-18-78	2 75	166	5
108	09505255	Woods Canyon near Munds Park, Ariz	18 9	1961-78	1970	7 9	3,990	12-18-78	7 00	3,200	-------
109	09505260	Bar M Canyon near Munds Park, Ariz	25 6	1961-78	1970	9 35	4,100	12-18-78	8 86	4,210	-------
110	09505326	Beaver Creek Watershed No 15 near Munds Park, Ariz [12]	25	1962-78	1970	--------	84	12-18-78	1 85	62	-------
111	09505300	Rattlesnake Canyon near Rimrock, Ariz	24 6	1957-78	1970	11 50	3,590	12-18-78	10 94	2,850	10
112	09505350	Dry Beaver Creek near Rimrock, Ariz	142	1960-78	1970	14 35	26,600	12-18-78	12 20	17,300	10
113	09505550	Verde River below Camp Verde, Ariz	4,670	1970-78	1970	19 5	43,000	12-19-78	21 27	55,000	20
114	09505800	West Clear Creek near Camp Verde, Ariz	241	1964-78	1978	10 15	13,800	12-18-78	11 6	22,400	20
115	09507980	East Verde River near Childs, Ariz	328	1961-78	1970	[2]19 2	23,500	1-17-79	13 45	11,600	5
116	09508000	Verde River below East Verde River, near Pine, Ariz	5,623	1924-78	1938	24 7	110,000	12-19-78	26 07	79,400	-------
117	09508300	Wet Bottom Creek near Childs, Ariz	36 4	1967-78	1978	15 66	6,660	12-18-78	15 72	6,680	6
118	09508500	Verde River below Tangle Creek, above Horseshoe Dam, Ariz	5,872	1924-78	1938	19 0	100,000	12-19-78	21 36	94,000	22
119	--------	Deadman Creek near Horseshoe Dam, Ariz	36 3	1978	1978	--------	6,620	12-18-78	--------	3,900	16
120	--------	Lime Creek near Horseshoe Dam, near Carefree, Ariz	41 9	1978	1978	--------	5,180	12-18-78	--------	1,540	4
121	--------	Davenport Creek near Horseshoe Dam, Ariz	25 5	1978	1978	--------	5,500	12-18-78	--------	3,600	12
122	--------	Sheep Creek near Horseshoe Dam, Ariz	34 2	1978	1978	--------	6,660	12-18-78	--------	2,500	12
123	09509500	Reservoir system on Verde River at and below Horseshoe Dam, Ariz	6,185	1939-78	1973	--------	[14]318,000	3-26-79	--------	[14]302,100	-------
124	09510000	Verde River below Bartlett Dam, Ariz	6,185	1888-1939 [4]1939-78	1891 1978	-------- 25 9	[22]150,000 101,000	12-18-78	22 60	75,800	-------
125	09510080	West Fork Sycamore Creek near Sunflower, Ariz	9 8	1959-78	1970	9 50	3,480	1-17-79	5 60	463	5
126	09510100	East Fork Sycamore Creek near Sunflower, Ariz	4 49	1959-78	1970	9 50	1,940	12-18-80	4 80	298	6
127	09510170	Camp Creek near Sunflower, Ariz	2 6	1963-78	1978	5 05	402	12-18-78	2 52	134	2
128	09510200	Sycamore Creek near Fort McDowell, Ariz	164	1959-78	1970	19 7	24,200	12-18-78	10 84	9,520	5
129	09511300	Verde River near Scottsdale, Ariz	6,600	1939-78	1978	18 3	96,000	12-18-78	--------	64,000	-------
130	09512100	Indian Bend Wash at Scottsdale, Ariz	62	1922-78	1972	4 90	21,000	1-17-79	1 62	252	1

See footnotes at end of table

Table 10 Summary of flood stages and discharges—Continued

Location number shown on plate 1	Station number	Stream and place of determination	Drainage area (mi^2)	Maximum previously known				Maximum November 1978 to March 1979			
				Period	Year	Gage height (ft)	Discharge (ft^3/s)	Date	Gage height (ft)	Discharge (ft^3/s)	Recurrence interval (years)
131	09512170	Salt River at Jointhead Dam, at Phoenix, Ariz	13,500	1870-1939	1891	--------	[23]300,000	12-19-78	10 05	126,000	18
				[4]1939-78	1978	12 50	122,000				
132	09512300	Cave Creek near Cave Creek, Ariz	121	1958-78	1967	8 62	12,400	12-18-78	7 34	6,900	8
133	09512410	Mingus C Watershed near Prescott, Ariz [12]	07	1958-78	1961	1 74	17	3-13-79	1 06	5 1	16
134	09512500	Agua Fria River near Mayer, Ariz	588	1940-78	1970	14 90	19,800	12-18-78	14 3	[4]26,700	50
135	--------	Agua Fria River at Black Canyon City, Ariz	845	1978	------	--------	----------	12-18-78	--------	32,100	--------
136	--------	Black Canyon Creek near Black Canyon City, Ariz	238	1957-78	1970	([24])	----------	12-18-78	--------	22,300	--------
137	09512700	Agua Fria River Tributary No 2 near Rock Springs, Ariz	1 11	1963-78	1964	19 54	1,200	12-18-78	4 92	265	2
138	09512800	Agua Fria River near Rock Springs, Ariz	1,130	1970-78	1970	25 3	40,100	12-18-78	27 2	52,800	20
139	--------	Castle Creek near Castle Hot Springs, Ariz	72 0	1978	1978	([25])	----------	12-18-78	--------	5,780	--------
140a	09513000	Agua Fria River at (above) Waddell Dam, Ariz	1,459	1891-1978	1916	[2]30	105,000	12-18-78	--------	79,500	--------
					1919	[2]33 0	([26])				
141	09513500	Lake Pleasant at Waddell Dam, Ariz	1,459	1927-78	1941	--------	[14]178,500	3-28-79	170 92	[14]161,000	--------
					1978	170 52	----------				
140b	09513000	Agua Fria River at (below) Waddell Dam, Ariz	1,459	[4]1927-78	1978	--------	16,300	12-19-78	--------	59,900	--------
142	09513650	Agua Fria River at El Mirage, Ariz	1,637	1963-78	1978	7 95	9,870	12-19-78	11 70	58,400	--------
143	09513780	New River near Rock Springs, Ariz	67 3	1960-78	1970	13 5	18,600	3-28-79	7 09	6,530	4
144	09513800	New River at New River, Ariz	83 3	1960-78	1970	[29] 98	19,500	12-18-78	7 88	5,560	3
				1972-78	1978	12 34	----------				
145	09513820	Deadman Wash near New River, Ariz	11 1	1959-78	1959	7 0	1,850	11-11-78	2 77	88	1
146	09513835	New River at Bell Road, near Peoria, Ariz	187	1960-78	1967	13 5	14,600	12-19-78	7 61	[3]8,410	6
147	09513860	Skunk Creek near Phoenix, Ariz	64 6	1959-78	1964	--------	11,500	1-18-79	6 80	600	2
					1970	12 24	----------				
148	09513970	Agua Fria River at Avondale, Ariz	2,013	1959-78	1970	11 21	20,600	12-19-78	6 48	29,300	30
149	09514400	Whitespar A Watershed near Prescott, Ariz [12]	47	1957-78	1978	2 00	24	12-18-78	1 58	13 6	2
150	09515500	Hassayampa River at Box damsite, near Wickenburg, Ariz	417	1891-1978	1970	34 6	58,000	3-28-79	11 50	9,640	6
151	09516500	Hassayampa River near Morristown, Ariz	774	1921-78	1970	19 0	47,500	12-18-78	11 67	9,600	6
152	09517000	Hassayampa River near Arlington, Ariz	1,470	1961-78	1970	8 40	39,000	11-11-78	2 83	3,300	2
153	09517500	Centennial Wash near Arlington, Ariz	1,810	1961-78	1961	4 70	14,500	1-17-79	3 53	818	1
154	09519500	Gila River below Gillespie Dam, Ariz	[15]49,650	1891-1910	1891	--------	250,000	12-20-78	17 06	125,000	20
				[27]1921-78	1966	16 1	----------				
					1978	--------	92,900				
155	--------	Painted Rock Reservoir at Painted Rock Dam, Ariz	[15]50,910	1959-78	1973	601 25	[14]439,860	4-17-79	642 35	[14]1,849,000	--------
156	09519800	Gila River below Painted Rock Dam, Ariz	[15]50,910	[3]1959-78	1973	10 29	2,860	2- 9-79	10 57	3,340	--------
157	09520360	Gila River near Mohawk, Ariz	[15]55,430	1973-78	1973	7 44	1,730	3-21-79	--------	[28]2,430	--------
158	09520500	Gila River near Dome, Ariz	[15]57,850	1892-1958	1916	--------	[29]200,000	3-25-79	--------	[28]2,360	--------
				[27]1959-78	1963	16 20	[30]4,820				
159	09520700	Gila River near mouth, near Yuma, Ariz	[15]57,950	1975-78	1977	--------	757	3-25-79	--------	[28]2,040	--------

[1]At Show Low, drainage area is 87 mi^2
[2]Site and datum then in use
[3]Revised
[4]Regulated
[5]Includes approximately 2,100 mi^2 that is noncontributing of which 790 mi^2 is above Lyman Lake
[6]Discharge not determined but is known to be greater than the 25,000 ft^3/s that occurred in 1919
[7]Flow of the Little Colorado River partially regulated by Lyman Reservoir since 1920
[8]Discharge approximately equal to that at Joseph City
[9]Flow partially regulated
[10]No evidence of flow during flood period
[11]Discharge not determined
[12]Part of a U S Forest Service watershed project Several nearby stations are not included
[13]Date uncertain, probably December 18, 1978
[14]Contents in acre-feet
[15]An area of 12,886 mi^2 above Coolidge Dam did not contribute to flooding downstream from the dam
[16]Estimated on basis of records for San Pedro at Mammoth and Gila River near Kelvin
[17]Most likely period
[18]Result of backwater from washed-out bridge
[19]Estimated on basis of records for Salt River near Chrysotile
[20]Estimated on basis of flood routing
[21]Estimated inflow to Roosevelt Lake
[22]Estimated on basis of records for Salt River above and below Verde River
[23]At former station near Granite Reef Dam published as Salt River near McDowell
[24]Peak was 0 8 ft higher than peak of December 1978
[25]Stage in March 1978 was approximately equal to that of December 1978
[26]Probably exceeded 1916
[27]See "Station Data" for regulation
[28]Maximum daily, higher discharges occurred later in the calendar year
[29]Maximum daily
[30]From inflow below Painted Rock Dam Maximum due to release from dam is 1,380 ft^3/s in 1973

(1) 09390500 Show Low Creek near Lakeside, Ariz.

Location --Lat 34°10'46", long 109°59'14", in SW¼NW¼ sec.14, T 9 N., R 22 E., Navajo County, Hydrologic Unit 15020005, on left bank 1 mi (2 km) upstream from pumping plant on Show Low Lake 1 9 mi (3.1 km) northwest of Lakeside, 2.2 mi (3 5 km) upstream from Jaques Dam, and 6 mi (10 km) southeast of Show Low.

Drainage area --68 6 mi² (177.7 km²).

Gage-height record.--Digital water-stage recorder tape. Altitude of gage is 6,610 ft (2,015 m), from topographic map.

Discharge record.--Stage-discharge relation for concrete control with V-notch sharp-crested weir extended above 2,500 ft³/s or 70.8 m³/s on basis of slope-area measurement at gage height 9 53 ft (2 905 m)

Maxima.--November 1978 to March 1979 Discharge, 5,550 ft³/s (157 m³/s) 1615 hours Dec. 18, gage height, 9 16 ft (2.792 m).
1953 to October 1978: Discharge, 5,450 ft³/s (154 m³/s) December 26, 1971, gage height, 9 53 ft (2.905 m).

Remarks --Record shows inflow to Show Low Lake Flow partly regulated by several small reservoirs, largest of which are Rainbow Lake and Scott Reservoir, combined capacity, 2,400 acre-ft (2.96 hm³).

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec 18—Con			Dec 19—Con.		
1500	2 27	19	1500	8 99	5,320	0800	6 57	2,480
1600	2.53	27	1615	9 16	5,550	1200	5.64	1,630
2200	3 43	226	1700	9 04	5,390	1800	4 64	884
2400	3 93	458	1800	8 98	5,310	2400	3 94	475
Dec 18			2400	6 52	2,430			
0200	4 55	828	Dec 19			Dec 20		
0400	5 45	1,480	0200	6 07	2,010	0400	3 69	351
0800	7 95	4,000	0400	6 18	2,110	1200	3 36	212
1100	9 00	5,340	0500	6 17	2,100	1900	3 41	233
1400	9 08	5,440	0730	6 60	2,510	2400	3 24	167

(2) 09392000 Show Low Creek below Jaques Dam, near Show Low, Ariz

Location --Lat 34°11'47", long 110°00'13", in NW¼ sec 10, T.9 S , R.22 E , Navajo County, Hydrologic Unit 15020005, at Jaques Dam, 3.5 mi (5.6 km) northwest of Lakeside, and 4 5 mi (7 2 km) southeast of Show Low.

Drainage area --73 0 mi² (189 km²).

Gage-height record.--Crest stage only. Datum of lake gage is National Geodetic Vertical Datum of 1929

Discharge record.--Stage-discharge relation for concrete spillway extended above 270 ft³/s on basis of weir computations.

(2) 09392000 Show Low Creek below Jaques Dam, near Show Low, Ariz.—Continued

Maxima --November 1978-March 1979 Discharge, 4,410 ft^3/s (125 m^3/s) revised, over spillway; lake level 6,573.7 from floodmark.
1953 to 1978: Discharge, about 2,500 ft^3/s (70.8 m/s), Dec. 26, 1971.
1941 to 1953 Discharge, 6,250 ft^3/s (177 m^3/s) Jan 18, 1952, at site 5 mi downstream at Show Low

Remarks --Record shows release from Show Low Lake. Flow regulated by several reservoirs, largest of which are Show Low Lake, completed in 1953; Rainbow Lake, completed prior to 1941, and Scott Reservoir, completed in 1946 (combined capacity, 8,800 acre-ft or 10.9 hm^3).
Total capacity of Show Low Lake to spillway, 6,176 acre-ft (7.62 hm^3) consisting of 1,070 acre-ft (1.32 hm^3), dead storage below elevation, 6,535.0 ft (1,991.87 m), sill of outlet structure, and 5,106 acre-ft (6.30 hm^3) usable storage between elevation 6,535.0 and 6,570 0 ft (1,991.87 and 2,002 54 m), sill of overflow spillway.

(3) 09393500 Silver Creek near Snowflake, Ariz

Location --Lat 34°40'00", long 110°02'30", in SW¼NW¼ sec 29, T.15 N., R.22 E , Navajo County, Hydrologic Unit 15020005, on left bank 6 mi (10 km) upstream from mouth and 11 mi (18 km) north of Snowflake

Drainage area.--886 mi^2 (2,295 km^2).

Gage-height record --Crest stage only during flood period Datum of gage is 5,204.1 ft (1,586.21 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation extended above 4,400 ft^3/s (125 m^3/s) on basis of peak discharge for former station near Woodruff

Maxima --November 1978 to March 1979· Discharge, 7,700 ft^3/s (218 m^3/s) Dec 19, gage height, 15 33 (4.660 m) from high-water mark in gage well
July 1929 to October 1978: Discharge, 11,000 ft^3/s (286 m^3/s) July 26, 1940, gage height, 12 37 ft (3.760 m) at former station near Woodruff

Remarks --Flow regulated by several reservoirs including Lone Pine Reservoir and Show Low Lake

(4) 09394500 Little Colorado River at Woodruff, Ariz.

Location --Lat 34°46'58", long 110°02'37", in NE¼SW¼ sec 17, T.16 N., R.22 E., Navajo County, Hydrologic Unit 15020002, on left bank at abandoned county road bridge in Woodruff, 3.7 mi (6 0 km) downstream from Silver Creek.

Drainage area --8,100 mi^2 (21,000 km^2), approximately Includes approximately 2,100 mi^2 that is noncontributing of which 790 mi^2 is above Lyman Lake.

Gage-height record --Crest stage only during flood period. Datum of gage is 5,130 3 ft (1,563 72 m) National Geodetic Vertical Datum of 1929

(4) 09394500 Little Colorado River at Woodruff, Ariz —Continued

Maxima.--November 1978 to March 1979 Discharge, 9,320 ft^3/s (264 m^3/s) Dec 19 from slope-area measurement of peak flow Gage height, 22.9 ft (6.98 m) from high-water mark in gage well.

1916 to 1919: Discharge (not determined) occurred Jan 19, 1916, maximum discharge recorded, 25,000 ft^3/s (708 m^3/s) Dec 5, 1919.

July 1929 to October 1978. Discharge, 13,000 ft^3/s (368 m^3/s) July 26, 1940, gage height, 13.45 ft (4.010 m) site and datum then in use.

September 1949 to October 1978 Gage height at present site and datum, 22 50 ft (6 858 m) Sept 30, 1971, from floodmark.

Outside period of record: Large floods may have occurred in September 1923, when the maximum flood since 1879 occurred on Little Colorado River at Holbrook, and April 1929 when large floods occurred at Chevelon and Clear Creeks near Winslow

Remarks --Flow partially regulated by many reservoirs

(5) 09396100 Puerco River near Chambers, Ariz

Location.--Lat 35°10'42", long 109°27'15", in SW¼NW¼ sec 35, T.21 N., R.27 E., Apache County, Hydrologic Unit 15020007, on upstream side of right abutment of Atchison, Topeka, and Santa Fe Railway Co bridge, 1.5 mi (2.4 km) southwest of Chambers.

Drainage area.--2,160 mi^2 (5,600 km^2), approximately

Gage-height record.--Water-stage recorder tape 2000 hours Dec 17 to 0300 hours Dec. 20; record estimated Dec. 21-22. Altitude of gage is 5,705 ft (1,738.9 m), from topographic map

Discharge record.--Stage-discharge relation for concrete control extended above 8,000 ft^3/s (227 m^3/s) on basis of critical depth computations.

Maxima --November 1978 to March 1979· Discharge, 13,800 ft^3/s (391 m^3/s) revised, 2300 hours Dec. 18, gage height, 7.99 ft (2 44 m) revised.

1971 to 1978· Discharge, 17,800 ft^3/s (504 m^3/s) Sept 30, 1971, gage height, 9.65 ft (2 941 m).

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec 18—Con			Dec 20		
2000	1 05	565	2400	7 20	12,000	0300	2 00	1,900
2400	1 13	669				1200	1.64	1,370
Dec 18			Dec. 19			2400	1 38	1,000
0300	1 13	669	0400	5 25	7,840			
0700	1 44	1,100	0600	4 20	5,700	Dec 21		
1600	1 44	1,100	1200	3 00	3,510	1200	1.21	773
1900	2 70	3,000	1700	2 20	2,200	2400	1.10	630
2100	5.00	7,300	1800	2 40	2,520	Dec 22		
2200	7.00	11,600	2200	2.38	2,490	1200	1.07	591
2300	7 99	13,800	2400	2 24	2,260	2400	1 01	513

(6) 09397000 Little Colorado River at Holbrook, Ariz.

Location --Lat 34°53'52", long 110°09'45", in SW¼SW¼ sec 6, T 17 S , R 21 E , Navajo County, Hydrologic Unit 15020007, near right bank on downstream side of bridge on U S Highway 180 at Holbrook, 2 3 mi (3 7 km) downstream from Puerco River.

Drainage area.--11,300 mi² (29,300 km²), approximately. Includes approximately 2,100 mi² that is noncontributing of which 790 mi² is above Lyman Lake

Gage-height record --Water-stage recorder graph Datum of gage is 5,062 87 ft (1,543.163 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation during flood undefined.

Maxima.--November 1978 to March 1979 Gage height, 12.40 ft (3 780 m) 0900 hours Dec 19. 1905-6, 1949 to October 1978 Discharge, 24,200 ft³/s (685 m³/s) Oct. 4, 1968, gage height, 15 2 ft (4.633 m) Oct. 20, 1972

Outside period of record. A discharge of 60,000 ft³/s (17,00 m³/s) was determined for the peak of Sept 19, 1923 U.S. Army Corps of Engineers studies indicate this is the greatest flood since at least 1870.

Remarks --Some regulation by reservoirs above station (combined capacity about 73,000 acre-ft)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Hour	Gage height	Hour	Gage height
Dec 18		Dec. 19		Dec.20—Con.	
0430	8 60	0400	10 60	2400	7.65
0800	8 57	0700	12 16	Dec 21	
1030	9 10	0900	12.40	0700	7.45
1130	9 70	1300	11 65	1200	7 18
1400	9 57	1800	10.75	1800	6 80
1700	10 30	2400	10.15	2400	6.68
1830	10 90	Dec 20		Dec. 22	
2100	11 00	0300	10.40	0600	6 68
2400	10 70	0600	10 10	1200	6 65
Dec 19		1000	10 07	1800	6 22
0230	10 95	1800	8.30	2400	6 15

(7) 09397300 Little Colorado River near Joseph City, Ariz

Location --Lat 34°54'04", long 110°15'17", in NE¼SE¼ sec 6, T 17 N , R.20 E , Navajo County, Hydrologic Unit 15020008, on right bank just upstream from diversion dam, 5 4 mi (8 7 km) west of Holbroook, 5 7 mi (9 2 km) southeast of Joseph City, and 8 5 mi (13 7 km) downstream from Puerco River.

Drainage area --12,200 mi² (31,600 km²), approximately. Includes approximately 2,100 mi² that is noncontributing of which 790 mi² is above Lyman Lake

Gage-height record --Water-stage recorder graph except 2400 hours Dec. 18 to 1100 hours Dec 20. Missing record reconstructed on basis of peak indicator reading and record for Little Colorado River at Holbrook. Datum of gage is 5,031.10 ft (1,533.479 m) National Geodetic Vertical Datum of 1929

(7) 09397300 Little Colorado River near Joseph City, Ariz.—Continued

Discharge record --Stage-discharge relation extended above 7,400 ft³/s (210 m³/s) on basis of slope-area measurement at gage height 6.82 ft (2.079 m).

Maxima --November 1978 to March 1979: Discharge, 25,400 ft³/s (719 m³/s) 1130 hours Dec. 19, gage height, 7 64 ft (2 329 m)
1971 to October 1978: Discharge, 20,600 ft³/s (583 m³/s) Oct. 29, 1974, gage height, 6 90 ft (2 103 m).
Probably 1870 to October 1978· A discharge of 60,000 ft³/s (1,700 m³/s) was determined at Holbrook for peak of Sept. 19, 1923.

Remarks --Some regulation by reservoirs above station (combined capacity about 73,000 acre-ft

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18			Dec 19—Con.			Dec 20—Con.		
0530	-----	0	0800	7 15	22,100	0400	5 00	9,900
0730	3 25	2,850	0930	7.00	21,200	1100	4 88	9,300
1030	3.14	2,300	1130	7 64	25,400	1330	4 65	8,400
1530	4 20	6,860	1400	6.30	17,000	1930	3.76	5,360
1830	5 18	12,200	1600	6 60	18,800	2400	3 25	2,850
1930	5 12	12,000	1900	5 80	14,000			
2230	6 15	16,100	2400	5.95	14,900	Dec. 21		
2400	6 10	15,800				0530	3.32	3,200
Dec 19			Dec 20			1200	2 85	1,180
0500	5 80	14,000	0100	4.80	8,900	2400	2 65	1,050

(8) 09397500 Chevelon Creek below Wildcat Canyon, near Winslow, Ariz.
(Discontinued station)

Location --Lat 34°38'11", long 110°42'49", in SW¼ sec 36, T.15 N., R.15 E., Navajo County, Hydrologic Unit 15020010, on right bank 0.4 mi (0.6 km) downstream from Wildcat Canyon and 25 mi (40 km) south of Winslow

Drainage area --275 mi² (712 km²).

Gage-height record --Crest stage only. Datum of gage is 5,905 16 ft (1,799 893 m) National Geodetic Vertical Datum of 1929 (Bureau of Reclamation bench mark).

Discharge record.--Stage-discharge relation extended above 6,300 ft³/s (180 m³/s) on basis of slope-area measurement at 19,800 ft³/s (561 m³/s).

Maxima --November 1978 to March 1979: Discharge, 19,900 ft³/s (564 m³/s) Dec. 18, gage height, 18.25 ft (5.563 m) from high-water mark in gage well
Probably 1929 to October 1978: Discharge, 19,800 ft³/s (561 m³/s) Jan. 18, 1952, gage height, 18.2 ft (5 55 m).

Remarks --Discharge partially regulated by several small reservoirs in the headwaters of the basin.

(9) 09398000 Chevelon Creek near Winslow, Ariz
(Discontinued station)

Location --Lat 34°55'35", long 110°31'51", in SE¼SW¼ sec 27, T 18 N., R 17 E., Navajo County, Hydrologic Unit 15020010, on right bank 3 mi (5 km) upstream from mouth and 12 mi (19 km) southeast of Winslow

Drainage area --794 mi² (2,056 km²), excludes 200 mi² (518 km²), which is noncontributing

Gage-height record.--Crest stage only Datum of gage is 4,899 5 ft (1,493 367 m) National Geodetic Vertical Datum of 1929

Maxima --November 1978 to March 1979 Discharge, 33,600 ft³/s (952 m³/s) Dec. 19, gage height, 24 46 ft (7.455 m) from slope-area measurement of peak flow
1915-19, 1929 to October 1978 Discharge, 25,300 ft³/s (716 m³/s) Jan 1952, gage height, 19 8 ft (6 04 m) from slope-area measurement of peak

Remarks --Discharge partially regulated by several small reservoirs in the headwaters of the basin

(10) 09398500 Clear Creek below Willow Creek near Winslow, Ariz.

Location --Lat 34°40'03", long 111°00'25", in SW¼SE¼ sec 19, T 15 N , R.13 E , Coconino County, Hydrologic Unit 15020008, in Sitgreaves National Forest, on right bank 2 mi (3 km) downstream from Willow Creek and 30 mi (48 km) southwest of Winslow

Drainage area --321 mi² (831 km²)

Gage-height record --Water-stage recorder except for periods of skipped punches, which were estimated from adjoining good record Altitude of gage is 5,957 ft (1,815.7), from Topographic Division by photogrammetry

Discharge record --Stage-discharge relation extended above 6,000 ft³/s (170 m³/s).

Maxima --November 1978 to March 1979. Discharge, 19,700 ft³/s (558 m³/s) 2115 hours Dec 18, gage height, 22.32 ft (6 803 m)
1947 to October 1978· Discharge, 16,400 ft³/s (464 m³/s) Jan. 18, 1952, gage height, 21.5 ft (6 55 m)

Remarks --Discharge partially regulated by Blue Ridge Reservoir (capacity, 19,500 acre-ft or 24 0 hm³), which was completed in 1964.

(10) 09398500 Clear Creek below Willow Creek near Winslow, Ariz —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1977

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18			Dec 19			Dec 20—Con		
0800	4 02	52	0100	19 80	14,200	2400	8 51	1,200
0900	12 65	4,100	0300	18.94	14,400	Dec 21		
1000	16 02	8,190	0500	18 71	12,500	0600	7.82	898
1100	17 75	10,900	0800	16.49	8,890	1200	7 47	758
1200	19.00	13,000	1200	14 15	5,740	1800	7 30	695
1600	20 63	15,700	1800	12.18	3,710	2400	7 40	731
1730	20 67	15,800	2400	10 90	2,660			
1900	20 75	16,000				Dec 22		
2030	21 96	18,300	Dec 20			0600	6 97	582
2115	22 37	19,700	0600	10 06	2,070	1200	6 60	471
2300	21 67	17,700	1300	9.20	1,550	1800	6 40	417
2400	20 84	16,100	1800	8.51	1,200	2400	6 51	446

(11) 09399000 Clear Creek near Winslow, Ariz

Location --Lat 34°58'10", long 110°38'40", in SE¼SE¼ sec.9, T 18 N , R 16 E., Navajo County, Hydrologic Unit 15020008, on right bank 10 ft (3.0 m) downstream from bridge on State Highway 99, 1 5 mi (2.4 km) upstream from mouth, and 5 mi (8 km) southeast of Winslow.

Drainage area --607 mi² (1,572 km²)

Gage-height record.--Digital water-stage recorder tape Datum of gage is 4,861 32 ft (1,481 730 m) National Geodetic Vertical Datum of 1929.

Discharge record --Stage-discharge relation for concrete diversion dam extended above 13,500 ft³/s (582 m³/s on basis of velocity area studies and verified by slope-area measurement at gage height, 13.4 ft (4 08 m).

Maxima --November 1978 to March 1979. Discharge, 36,300 ft³/s (1,030 m³/s) 0430 hours Dec 19, gage height, 16 67 ft (5 081 m)

March 1929 to October 1978: Discharge, 50,000 ft³/s (1,420 m³/s) Apr 4, 1929, gage height, 18 1 ft (5.52 m), present datum

Prior to March 1929. Floodmarks 3 ft (0.9 m) higher than stage of flood of Apr 4, 1929, were found 1,850 ft (564 m) downstream from gage in 1929

Remarks --Discharge partially regulated by Blue Ridge Reservoir (capacity, 19,500 acre-ft or 24 0 hm³), which was completed in 1964. Discharge during December 1978 may have been affected by storage above large debris dam a short distance upstream from gage.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18			Dec. 19—Con			Dec 20—Con.		
2000	5 91	34	0600	16.02	32,300	1800	8 29	2,670

(11) 09399000 Clear Creek near Winslow, Ariz —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1977

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18—Con			Dec 19—Con.			Dec 20—Con.		
2100	13 58	19,300	1000	14 30	22,800	2400	7 95	2,110
2200	14 88	25,900	1200	14 10	21,800	Dec 21		
2300	15 15	27,300	2100	11 01	9,390	0600	7 68	1,710
2400	15 88	29,800	2400	10 35	7,410	1200	7.49	1,450
Dec 19			Dec 20			2400	7.12	1,020
0100	15 73	30,600	0300	9 85	6,100	Dec. 22		
0200	16 33	34,200	0600	9 40	4,980	1200	6.88	772
0430	16 67	36,300	1200	8 79	3,610	2400	6 82	716

(12) 09399400 Jacks Canyon Creek near Winslow, Ariz.
(Discontinued station)

Location --Lat 34°55'17", long 110°47'49", in NW¼NW¼ sec 31, T 18 N , R 15 E., Coconino County, on left bank 9 mi (14 km) northeast of Sunset Pass and 9 5 mi (15 3 km) southwest of Winslow

Drainage area --280 mi² (725 km²)

Gage-height record --Crest stage only from high-water mark in well Altitude of gage is 5,220 ft (1 591 m) from topographic map

Discharge record --Stage-discharge relation extended above 140 ft³/s (3.96 m³/s) on basis of culvert and road-overflow measurement at 12 0 ft (3.66 m)

Maxima --November 1978 to March 1979 Discharge, 4,600 ft³/s (130 m³/s) Dec. 18, gage height, 16 98 ft (5 176 m)
1970 to 1975 Discharge, 2,600 ft³/s (73 6 m³/s), Nov 20, 1972, gage height, 13 50 ft (4 115 m)

(13) 09400000 Little Colorado River near Winslow, Ariz
(Miscellaneous site)

Location --Lat 35°00'00", long 110°39'00", in SE¼NW¼ sec 33, T 19 S., R.16 E., Navajo County, Hydrologic Unit 15020008, at U S Highway 66, 2 mi (3 2 km) downstream from Clear Creek 1,500 ft (460 m) downstream from Jacks Canyon and 2 75 mi (4 4 km) southeast of Winslow.

Drainage area --16,100 mi² (41,700 km²) Includes approximately 2,100 mi² (5,349 km²) that is noncontributing of which 790 mi² (2,046 km³) is above Lyman Lake

Maxima --November 1978 to March 1979 Discharge, 57,600 ft³/s (1,630 m³/s) Dec 20, 1978, from slope-area measurement of peak flow.

Remarks.--Low-water station operated at site 700 ft (210 m) upstream 1954-56 Discharge partially regulated by many reservoirs on the Little Colorado River and tributaries.

(14) 09402000 Little Colorado River near Cameron, Ariz.

Location --Lat 35°55'35", long 111°34'00", in NW¼ sec.5, T.29 N , R 8 E. (unsurveyed), Coconino County, Hydrologic Unit 15020016, in Navajo Indian Reservation, on left bank 3 mi (5 km) downstream from Coconino damsite, 9 5 mi (15 3 km) downstream from Moenkopi Wash, 9 5 mi (15.3 km) northwest of Cameron, and 45 mi (72 km) upstream from mouth

Drainage area --26,500 mi² (68,600 km²), approximately Includes approximately 2,100 mi² (5,349 km²) that is noncontributing of which 790 mi² (2,046 km²) is above Lyman Lake

Gage-height record --Water-stage recorder graph Datum of gage is 3,979 2 ft (1,212 86 m) National Geodetic Vertical Datum of 1929.

Discharge record --Stage-discharge relation defined by current-meter measurements.

Maxima --November 1978 to March 1979. Discharge, 17,800 ft³/s (504 m³/s) 0200 hours Dec 23, gage height, 17 36 ft (5.291 m).
1947 to October 1978: Discharge, 24,900 ft³/s (705 m³/s) Jan 21, 1952, gage height, 20 7 ft (6 31 m).
Probably 1870 to October 1978 A discharge of about 120,000 ft³/s (3,400 m³/s) occurred on Sept 19 or 20, 1923, based on discharge at Grand Falls

Remarks --Discharge partially regulated by many reservoirs on the Little Colorado River and tributaries

(15) 09430500 Gila River near Gila, N. Mex

Location --Lat 33°03'40", long 108°32'12", in NE¼NW¼ sec 30, T 14 S , R 16 W., Grant County, Hydrologic Unit 15040001, on left bank at Hooker damsite, 1 6 mi (2 6 km) upstream from Mogollon Creek, and 7 mi (11 km) northeast of Gila, at mile 572 5

Drainage area --1,864 mi² (4,828 km²)

Gage-height record --Digital water-stage recorder tape except 0200 hours Dec 19 to 1200 hours Dec 20, which was reconstructed. Datum of gage is 4,655 8 ft (1,419 09 m) National Geodetic Vertical Datum of 1929 (river-profile survey)

Discharge record --Stage-discharge relation extended above 7,000 ft³/s (200 m³/s) on basis of slope-area measurement of peak flow.

Maxima --November 1978 to March 1979. Discharge, 32,400 ft³/s (918 m³/s) 2330 hours Dec 18, gage height, 12.5 ft (3 810 m) from floodmark
1927 to October 1978 Discharge, 25,400 ft³/s (719 m³/s) Sept 29, 1941, gage height, 17 2 ft (5 24 m) from floodmark from rating curve extended above 3,900 ft³/s (110 m³/s) on basis of velocity-area studies.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 23			Nov 28			Dec 22		
2400	2 19	114	0600	3 10	1,040	1200	3 39	2,160
Nov 24			1200	3 04	998	2400	3 10	1,830
0600	2 23	124	2400	2 81	837	Jan. 17		
1200	2 83	365	Dec 17			0600	1.40	480
1800	3 26	648	2400	1 53	166	1200	1 45	510

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 24—Con			Dec 18			Jan 17—Con		
2100	4 75	2,200	0600	1 66	214	1800	1 57	582
2400	6 22	3,990	1000	3 27	1,420	2400	2 53	1,270
Nov 25			1200	3 82	2,120	Jan 18		
0300	7 32	5,630	1500	4.41	2,990	0300	3.96	2,570
0700	9 21	8,590	1800	8 87	14,300	0600	4 52	3,520
0800	9 07	8,360	2100	10 97	23,800	0900	5 41	5,370
1215	9 74	9,430	2330	12 5	32,400	1045	5 51	5,600
1300	9 21	8,590	2400	12 06	30,000	1200	5.35	5,240
1400	9 29	8,710				1800	4 85	4,160
1800	8 47	7,400	Dec 19			2400	4 46	3,410
2400	7 09	5,280	0600	10.85	23,600	Jan. 19		
			1200	9 95	19,400	0600	4.32	3,200
Nov 26			1800	9.08	15,700	1200	3 84	2,430
0600	5 94	3,920	2400	8 20	12,600	1800	3.67	2,190
1200	5 42	3,360	Dec 20			2400	3 35	1,780
1800	4 84	2,670	0600	7.32	9,810	Jan. 20		
2400	4 49	2,290	1200	6.46	7,530	0600	3.26	1,680
Nov 27			1800	5 56	5,520	1200	3 05	1,420
0600	4 15	1,950	2400	4 90	4,310	2400	2 74	1,130
1200	3 84	1,640	Dec 21			Jan 21		
1800	3 56	1,410	1200	4 35	3,420	1200	2.55	969
2400	3 26	1,170	2400	3 81	2,660	2400	2 30	792

(16) 09430600 Mogollon Creek near Cliff, N Mex

Location --Lat 33°10'01", long 108°38'58", in SE¼SE¼ sec 13, T 13 S., R.18 W., Grant County, Hydrologic Unit 15040001, on right bank 0 3 mi (0 5 km) downstream from Gila Wilderness Boundary, 12 mi (19 km) upstream from mouth, and 14 mi (23 km) north of Cliff.

Drainage area.--69 mi² (179 km²).

Gage-height record --Water-stage recorder except 1030 hours Dec 18 to 0500 hours Dec 20 Altitude of gage is 5,440 ft (1,658 m), from topographic map

Discharge record.--Stage-discharge relation extended above 270 ft³/s (7 65 m³/s) on basis of slope-area measurement of peak flow at 13.7 ft (4 18 m)

Maxima --November 1978 to March 1979 Discharge, 10,100 ft³/s (286 m³/s) Dec 18, gage height, 12 4 ft (3 78 m) from high-water mark in well
1967 to October 1978 Discharge, 10,800 ft³/s (306 m³/s) Aug 12, 1967, gage height, 13 7 ft (4 18 m) from floodmarks.

(16) 09430600 Mogollon Creek near Cliff, N Mex —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 24			Nov. 24—Con.			Nov. 25—Con.		
0100	2 16	14	2300	9 42	4,770	1900	5.34	1,020
0300	2 30	22	2400	8.71	3,950	2100	4.87	755
0400	3 17	143	Nov. 25			2400	4 71	675
0500	3 88	335	0100	9 38	4,730			
0600	4 46	552	0200	9.34	4,680	Nov. 26		
0700	4 94	785	0500	8 17	3,360	0500	4.19	448
0900	6 26	1,640	0600	8 42	3,640	0600	4.27	480
1100	6.92	2,160	0800	7.00	2,230	0900	4 06	396
1300	6 49	1,820	0900	7.31	2,510	1200	3.86	332
1700	6 35	1,710	1000	7.37	2,560	1800	3 62	260
1800	6 68	1,990	1200	6.45	1,790	2400	3.41	198
1900	6.76	2,030	1400	5.95	1,420			
2000	7 72	2,890	1500	5.90	1,390	Nov. 27		
2100	8.06	3,230	1700	5 40	1,060	1200	3.09	130
2215	9.80	5,220	1800	5.47	1,100	2400	3.06	123

(17) 09430900 Duck Creek at Cliff, N Mex.

Location --Lat 32°58'03", long 108°36'36", in SW¼SW¼ sec.28, T.15 S., R.17 W , Grant County, Hydrologic Unit 15040002, on right bank at Cliff 300 ft (91 4) downstream from State Highway 211, and 0.6 mi (0.9 km) above mouth

Drainage area --228 mi^2 (591 km^2)

Gage-height record --Crest stage only Altitude of gage is 4,500 ft (1,372 m)

Discharge record --Stage-discharge relation extended above 1,200 ft^3/s (34 0 m^3/s) on basis of slope-area measurements at gage heights 5 90 ft (1 798 m), 8.60 ft (2.621 m), 9.50 ft (2 896 m) and 10 24 ft (3 121 m)

Maxima --November 1978 to March 1979 Discharge, 5,800 ft^3/s (164 m^3/s) Dec 18, gage height, 9 36 ft (2 853 m)

1957 to October 1978. Discharge, 6,900 ft^3/s (195 m^3/s) Aug. 4, 1967, gage height, 11 09 ft (3.380 m)

Outside period of record· Olmstead (1919, facing page 71, site 2) gives a discharge of 10,600 ft^3/s (300 m^3/s) for the flood of Oct. 16, 1916 and 41,800 ft^3/s (1,180 m^3/s) for an earlier flood Accuracy of estimates is unknown.

(18) 09431500 Gila River near Redrock, N. Mex

Location --Lat 32°43'37", long 108°40'30", in W½ sec 23, T 18 S , R.18 W , Grant County Hydrologic Unit 15040002, on left bank 0.2 mi (0 3 km) downstream from Copper Canyon, 0 2 mi (0 3 km) upstream from lower end of box canyon, 4.7 mi (7.6 km) northeast of Redrock, and 14 mi (23 km) downstream from Mangas Creek, at mile 539.2.

Drainage area --2,829 mi^2 (7,327 km^2).

(18) 09431500 Gila River near Redrock, N Mex.—Continued

Gage-height record.--Digital water-stage recorder tape except Dec. 19. Altitude of gage is 4,090 ft (1,247 m) from plane-table survey.

Discharge record --Stage-discharge relation extended above 9,500 ft^3/s (269 m^3/s) and on basis of slope-area measurement of peak flow Discharge for Dec. 19-20 estimated from reconstructed gage-height record, discharge measurements, and hydrographic comparison with stations on the Gila River near Gila and below Blue Creek, near Virden, N. Mex.

Maxima --November 1978 to March 1979. Discharge, 48,800 ft^3/s (1,380 m^3/s) at 0600 hours, Dec 19, gage height, 29 8 ft (9 08 m) in gage well, outside stage, 34 1 ft (10.4 m) from floodmarks

1912 to October 1978· Discharge, 40,000 ft^3/s (1,130 m^3/s) Sept. 29, 1941, gage height, 31 ft (9.4 m) from floodmarks computed on basis of peak flow of Gila River below Blue Creek, near Virden, N. Mex.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 27			Dec 18			Dec 19—Con		
1600	9 01	1,980	0600	6 32	198	1800	-----	27,000
2400	8 97	1,930	1200	6 52	279	2400	-----	18,000
Nov. 28			1800	12 46	8,720	Dec. 20		
1200	8 59	1,460	2400	18 87	23,000	0600	-----	14,000
2400	8 41	1,270	Dec. 19			1200	-----	11,000
Dec. 17			0600	29 8	48,000	1800	-----	8,000
2400	6 29	186	1200	-----	36,000	2400	-----	6,000

(19) 09432000 Gila River below Blue Creek, near Virden, N Mex.

Location --Lat 32°38'53", long 108°50'43", in SE¼SW¼ sec 18, T 19 S , R 19 W , Grant County, Hydrologic Unit 15040002, on left bank at head of canyon, 1 4 mi (2.3 km) downstream from Blue Creek, 10 mi (16 km) east of Virden, and 16 mi (26 km) upstream from Mexico-Arizona State line at mile 523.

Drainage area --3,203 mi^2 (8,296 km^2), excluding Animas River basin.

Gage-height record --Water-stage recorder graph Altitude of gage is 3,875 ft (1,181 1 m), from river-profile map.

Discharge record.--Stage-discharge relation prior to peak of Dec 19 extended above 14,000 ft^3/s (396 m^3/s) on basis and slope-area measurement of peak flow. Large positive shift adjustments following the peak are based on current-meter measurements below 13,000 ft^3/s (368 m^3/s)

Maxima --November 1978 to March 1979 Discharge, 58,700 ft^3/s (1,660 m^3/s) 0930 hours Dec 19, 1978, gage height, 29.00 ft (8.839 m).

Probably 1892 to October 1978: Discharge, 41,700 ft^3/s (1,180 m^3/s) Sept 29, 1941, gage height, 25.78 ft (7 858 m).

(19) 09432000 Gila River below Blue Creek, near Virden, N Mex —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 24			Dec. 18—Con.			Dec 20—Con.		
2400	5.71	172	1530	8.50	900	0600	16 00	18,200
Nov 25			1730	8 60	980	0830	15 00	16,000
0100	6 78	611	1830	10 10	2,500	1200	14 00	14,000
0200	7 45	925	1900	11 75	4,550	1500	13.14	13,000
0600	8 55	1,560	2000	13.20	6,280	2400	12 05	8,100
0630	9 30	2,140	2200	14 28	7,848	Dec. 21		
0730	10.30	3,100	2400	15 30	9,640	0600	11 40	6,640
0900	11.16	3,960	Dec. 19			1200	10.65	5,290
1100	11 85	4,650	0100	16.25	11,500	1530	10 60	5,210
1500	13 00	6,000	0300	17.15	13,300	2400	10.10	4,480
1800	14 00	7,400	0330	17 05	13,100	Dec 22		
2030	15 00	9,100	0500	17 65	14,450	1200	9.73	3,950
2200	16.10	11,200	0600	18.90	18,200	2400	9.16	3,190
2400	16 95	12,900	0700	21 60	26,300	Jan. 18		
Nov 26			0800	26.80	43,000	0030	6 48	795
0200	17 20	13,400	0830	27.60	51,000	0100	8.40	2,180
0430	16.80	12,600	0930	29.00	58,700	0200	9.55	3,700
0600	16 00	11,000	1100	28.20	54,900	0330	10.25	4,600
0700	15.25	9,550	1230	27 00	50,600	0630	9.72	2,170
0900	14 15	7,640	1400	25 85	45,300	0800	11 70	7,120
1100	13.45	6,630	1600	24 70	40,700	1000	13 35	10,700
1730	12 10	4,920	1800	23.40	36,200	1300	13 30	10,600
2400	11 00	3,800	1930	22.14	33,500	1400	12.90	9,520
Nov. 27			2100	21 10	29,700	1500	13.00	10,000
0800	10.20	2,700	2230	20 50	28,300	1800	12.95	9,730
2400	9 75	2,100	2400	19.20	25,300	2400	11 95	6,350
Dec 18			Dec. 20			Jan 19		
1400	6.86	205	0200	18.10	22,800	1200	10.75	3,550
1430	7 82	542	0400	17.00	20,300	2400	9.78	1,960

(20) 09437200 Mexican Canyon at Virden, N. Mex.
(Crest-stage station)

Location.--Lat 32°41'03", long 108°59'00", in SE¼NW¼ sec 2, T 19 S , R.21 W, Hidalgo County, Hydrologic Unit 15040002, upstream from dip in State Road 82, and about 0.8 mi (1.3 km) east of Virden

Drainage area --3 40 mi² (8.8 km²).

Gage-height record.--Crest stage only Altitude of gage is 3,760 ft (1,146 m) from topographic map

Maxima --November 1978 to March 1979. No evidence of flow.

(21) 09442000 Gila River near Clifton, Ariz

Location --Lat 32°1'57'57", long 109°18'35", in NE¼SE¼ sec.25, T.5 S., R.29 E , Greenlee County, Hydrologic Unit 15040002, on right bank 500 ft (150 m) downstream from bridge on county road, 6 mi (10 km) upstream from San Francisco River, and 6 mi (10 km) south of Clifton at mile 471

Drainage area --4,010 mi² (10,386 km²).

Gage-height record.--Water-stage recorder graph. Datum of gage is 3,336.82 ft (1,017.063 m) National Geodetic Vertical Datum of 1929 (adjusted).

Discharge record.--Base stage-discharge relation defined by current-meter measurements below 25,000 ft³/s (708 m³/s). Large positive shift adjustments required after the peak of Dec. 19 are based on discharge measurements below 28,000 ft³/s (793 m³/s).

Maxima --November 1978 to March 1979· Discharge, 57,000 ft³/s (1,610 m³/s) 2030 hours, Dec 19, 1978, gage height, 23 80 ft (7.254 m).
Probably 1892 to November 1978· Discharge, 33,000 ft³/s (935 m³/s) Oct. 21, 1972, gage height, 18 7 ft (5.70 m), from high-water mark in gage well.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 24			Dec. 18—Con.			Dec 21—Con.		
2400	1 20	70	2100	3.40	615	2400	6.45	5,010
Nov 25			2300	3.45	645	Dec. 22		
0200	1 18	66	2400	3.83	877	1200	5.70	3,980
0330	2 28	308	Dec 19			2400	5.25	3,440
0800	1.60	130	0100	4.16	1,130	Jan 17		
1100	1.50	108	0330	4.26	1,210	1800	1.95	603
1300	1 58	126	0430	4.70	1,640	2400	3.10	1,290
1515	1 50	108	0800	6 10	3,400	Jan. 18		
1530	3.00	645	1300	7.55	5,440	0200	3 80	1,850
1600	4 15	1,460	1500	8.55	7,070	0300	4.10	2,120
1700	4.80	2,040	1700	10.0	9,680	0700	3.52	1,620
2400	5 85	3,200	1800	13.0	16,200	0830	3.65	1,720
Nov. 26			1900	21.0	42,200	1000	3.50	1,600
0600	6.20	3,620	1930	23 0	52,200	1200	4.40	2,420
1200	7.50	5,360	2030	23.8	57,000	1400	4.62	2,660
1500	8.75	7,430	2200	23.0	53,400	1430	4 58	2,620
1830	10 70	11,000	2400	21 70	49,800	1700	5.35	3,540
2200	9.55	8,870	Dec.20			1830	6.20	4,620
2400	8 65	7,250	0200	20 60	46,200	1930	7 00	5,790
Nov 27			0430	18.90	40,600	2130	7.62	6,870
0600	7.04	4,720	0800	16.85	32,800	2400	7.70	7,050
1200	6 26	3,630	1200	14.50	25,800	Jan 19		
1800	5 55	2,660	1400	13.10	21,000	0100	7.78	7,200
2400	5 20	2,190	1630	12.0	17,800	0230	7.56	6,750
Nov 28			1900	11.05	14,900	0300	7.64	6,830
1200	4 68	1,640	2400	9.75	11,400	0930	6.85	5,580
2400	4 60	1,520	Dec. 21			1100	6.85	5,580
Dec. 17			0400	8 90	9,500	1500	6.32	4,910
2400	2 20	119	0800	8.10	7,880	2400	5.54	3,970
Dec. 18			1300	7 45	6,560	Jan. 20		
1200	2 20	119	1530	7.40	6,480	1200	4.69	3,080
1830	2 40	170	1900	6.90	5,680	2400	4.08	2,380

(22) 09442630 Mail Hollow near Luna, N. Mex
(Crest-stage station)

Location --Lat 33°47'38", long 108°56'59", in NW¼SW¼ sec.7, T.6 S., R.20 W., Catron County, Hydrologic Unit 15040004, 450 ft (137.2 m) upstream from U.S. Highway 180, and 2 3 mi (3 7 km) south of Luna.

Drainage area --4 20 mi² (10.9 km²)

Gage-height record --Crest stage only. Altitude of gage is 7,100 ft (2,164 1 m) from topographic map

Discharge record --Stage-discharge relation extended above 6.0 ft³/s (0 17 m³/s) on basis of slope-area measurement at gage height 3.30 ft (1.006 m).

Maxima --November 1978 to March 1979 Discharge, 66 ft³/s (1.87 m³/s) Nov. 24, gage height, 3 05 ft (0.930 m)
1970 to October 1978 Discharge not determined, gage height, 3.90 ft (1.189 m) Oct. 20, 1972

(23) 09442660 Trout Creek at Luna, N. Mex
(Crest-stage station)

Location --Lat 33°50'50", long 108°59'38", in NE¼NW¼ sec.29, T 5 S , R 20 W., Catron County, Hydrologic Unit 15040004, 500 ft downstream from Luna-Red Hill Road and 2.6 mi (4 2 km) north of Luna.

Drainage area --31.9 mi² (82.9 km²).

Gage-height record --Crest stage only Altitude of gage is 7,300 ft (2,225 0 m) from topographic map.

Discharge record --Stage-discharge relation extended above 70 ft³/s (1.98 m³/s) on basis of slope-area measurements at gage heights 1.82 ft (0 555 m), 2 00 ft (0.610 m) and 4.20 ft (1 280 m).

Maxima --November 1978 to March 1979: Discharge, 720 ft³/s (20.4 m³/s) Nov 24, gage height, 3 07 ft (0.936 m)
1954 to October 1978. Discharge, 2,250 ft³/s (63 7 m³/s) Oct. 19, 1972, gage height, 4 47 ft (1 362 m)

(24) 09442680 San Francisco River near Reserve, N. Mex.

Location.--Lat 33°44'12", long 108°46'14", in NE¼NW¼SE¼ sec 35, T 6 S , R.19 W , Catron County, Hydrologic Unit 15040004, on left bank 1,300 ft (400 m) downstream from Rainbow Bridge Canyon, 1 7 mi (2.7 km) northwest of Reserve, and at mile 563 1 (906 0 km)

Drainage area --350 mi² (907 km²), approximately.

Gage-height record --Digital water-stage recorder tape except Nov 25 Altitude of gage, 5,820 ft (1,774 m), from topographic map.

Discharge record.--Stage-discharge relation extended above 1,400 ft³/s (39 6 m³/s)

Maxima --November 1978 to March 1979: Discharge, 11,800 ft³/s (334 m³/s) Nov. 25, gage height, 9.40 ft (2.865 m) from high-water mark in well
1959 to October 1978 Discharge, 11,900 ft³/s (337 m³/s) Oct. 20, 1972, gage height, 7 47 ft (2 277 m) in gage well; 8.05 ft (2.454 m) from outside floodmarks site and datum then in use, and from rating curve extended above 9,000 ft³/s (255 m³/s) on basis of velocity-area study
Outside period of record: Stage, about 15 ft (4.6 m), as determined in 1962 from old floodmarks

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18			Dec. 19—Con			Dec. 20		
0100	1 28	38	0400	5.28	2,590	0600	3.25	620
0900	1 60	74	0630	5.85	3,390	1200	2.88	440
1200	2 67	330	0800	4 51	1,650	1800	2.63	340
1800	4 64	1,640	1200	3 25	655	2400	2.63	340
2400	5.51	2,710	1400	4 21	1,350	Dec 21		
Dec 19			1800	4 01	1,180	1200	2.20	185
0300	5 47	2,850	2400	3 60	864	2400	2.27	202

(25) 09442695 Negro Canyon at Aragon, N Mex
(Crest-stage station)

Location --Lat 33°52'47", long 108°33'08", in NW¼NW¼ sec 18, T.5 S., R.16 W., Catron County, Hydrologic Unit 15040004, above culvert on State Highway 12, at west edge of Aragon

Drainage area --9.62 mi² (24 9 km²).

Gage-height record.--Crest stage only. Altitude of gage is 6,880 ft (2,097 0 m)

Discharge record --Stage-discharge relation defined by computation of flow through culvert.

Maxima --November 1978 to March 1979 Discharge, 230 ft³/s (6.51 m³/s) Nov. 24, gage height, 1 48 ft (0 451 m).
1958 to October 1978. Discharge, 5,200 ft³/s (147 m³/s) July 28, 1959, gage height, 11.60 ft (3 536 m)

(26) 09442740 Tularosa River near Reserve, N Mex
(Crest-stage station)

Location.--Lat 33°44'00", long 108°42'10", in SE¼ sec.33, T.6 S , R.18 W., Catron County, Hydrologic Unit 15040004, 150 ft (46 m) west of Eagle Peak Lookout Road and 3.3 mi (5 3 km) northeast of Reserve.

Drainage area --426 mi² (1,103 km²).

Gage-height record.--Crest stage only. Altitude of gage is 5,950 ft (1,813.6 m)

Discharge record --Stage-discharge relation extended above 16 ft³/s (0.45 m³/s) on basis of slope-area measurement at gage heights 4 35 ft (1.326 m) and 5.76 ft (1.756 m).

(26) 09442740 Tularosa River near Reserve, N. Mex.—Continued

Maxima --November 1978 to March 1979: Discharge, 850 ft³/s (24.1 m³/s) Nov. 24, gage height, 6 22 ft (1.896 m).

1956 to October 1978. Discharge, 2,280 ft³/s (64 6 m³/s) July 28, 1956.

Outside period of record Olmstead (1919, facing p 64, site 45) shows a discharge of 16,420 ft³/s (465 m³/s) at site 2 mi (3.2 km) downstream for flood of Oct. 16, 1916 and indicates that it was the maximum known prior to 1919. Accuracy of estimate is unknown

(27) 09443000 San Francisco River near Alma, N Mex

Location --Lat 33°22'05", long 108°54'35", in SW¼SE¼ sec 4, T 11 S , R.20 E., Catron County, Hydrologic Unit 15040004, on right bank 1 2 mi (1 9 km) downstream from Alma, 4 mi (6 km) northwest of Glenwood, and 6 mi (10 km) upstream from Whitewater Creek, at at mile 523.5

Drainage area --1,546 mi² (4,004 km²)

Gage-height record.--Water-stage recorder graph. Altitude of gage is 4,842 ft (1,476 m) from topographic map

Discharge record.--Stage-discharge relation extended above 8,700 ft³/s (246 m³/s) on basis of slope-area measurment at gage height 18 16 ft (5.535 m)

Maxima --November 1978 to March 1979 Discharge, 24,500 ft³/s (694 m³/s) 2100 hours, Dec 18, 1978, gage height, 15.84 ft (4.828 m)

1904-14, 1927 to October 1978: Discharge, 30,600 ft³/s (867 m³/s) Oct. 20, 1972, gage height, 18 16 ft (5 535 m) present datum, from floodmarks in well, and from rating curve extended above 3,500 ft³/s (99.1 m³/s) on basis of slope-area measurement of peak flow.

Outside period of record: Olmstead (1919, facing page 64, site 27) gives a peak discharge of 31,800 ft³/s (901 m³/s) for the flood of October 16, 1916, and 49,400 ft³/s (1,400 m³/s) for an earlier flood (probably 1891). Accuracy of data is unknown.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 24			Dec. 18—Con			Jan. 17		
0100	3 18	67	0400	3.46	58	0100	3.48	204
0800	3.30	79	0600	3.79	130	0600	3.50	212
1200	5.70	1,010	0900	5 80	2,060	0900	3.80	338
1400	7 45	3,030	1200	8 50	6,400	1200	3.93	404
1500	6.80	2,160	1500	12.30	15,200	1500	4.20	562
1800	9.20	6,120	1800	14.50	20,800	1800	5.00	1,140
2100	10 50	9,000	2100	15.84	24,500	2100	9.40	8,620
2400	12 30	13,700	2400	15 25	22,800	2330	11.10	13,500
Nov 25			Dec 19			2400	10.50	11,600
0130	14 38	19,400	0300	13,90	19,200	Jan. 18		
0300	12 35	13,800	0600	13 00	17,000	0300	9.05	7,750
0600	11 35	11,100	0900	11 80	14,000	0600	8 35	6,180
0900	10 50	9,000	1200	10 60	11,000	0900	7.20	3,990
1200	9 60	6,960	1500	9 90	9,280	1200	6.35	2,690
1500	8 25	4,350	1800	9 10	7,600	1500	6.00	2,150
1800	7.15	2,610	2100	8 10	5,680	1800	5 75	1,800

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1977

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 25—Con			Dec 19—Con.			Jan 18—Con		
2100	6 50	1,800	2400	7.60	4,780	2100	5.55	1,520
2400	6 00	1,300	Dec 20			2400	5 37	1,350
Nov 26			0600	6 70	3,640	Jan 19		
0600	5 55	1,050	1200	6 00	2,860	0600	5.12	1,030
1200	5 35	890	1800	5 35	1,820	1200	5 00	938
1800	5 20	780	2400	5.15	1,520	1800	4 95	862
2400	5 00	660				2400	4.89	816
Nov 27			Dec 21			Jan. 20		
0600	4 86	578	0600	5 20	1,470	0600	4 83	733
1200	4,64	572	1200	5.20	1,470	1200	4.75	680
1800	4 53	515	1800	5.05	1,320	1800	4.66	627
2400	4 38	446	2400	4.85	1,140	2400	4.44	498
Nov. 28			Dec. 22			Jan 21		
1200	4 24	346	0600	4.65	919	0600	4.40	444
2400	4 05	282	1200	4 50	798	1200	4.30	388
Dec. 18			1800	4.34	680	1800	4 25	360
0100	3 44	54	2400	4 30	652	2400	4.22	346

(28) 09444000 San Francisco River near Glenwood, N. Mex.

Location --Lat 33°14'48", long 108°52'47", in NE¼NW¼ sec 23, T 12 S., R 20 W , Catron County, Hydrologic Unit 15040004, on left bank 0.2 mi (0 3 km) upstream from hot springs, 5 mi (8 km) south of Glenwood, and 6 mi (10 km) downstream from Whitewater Creek, at mile 511 5.

Drainage area --1,653 mi² (4,281 km²)

Gage-height record.--Water-stage recorder graph except 2000 hours Dec 18 to 1200 hours Dec 20, which was reconstructed Altitude of gage is 4,560 ft (1,290 m) from topographic map

Discharge record.--Stage-discharge relation extended above 6,500 ft³/s (184 m³/s) on basis of slope-area measurement at gage heights 10 74 ft (3 274 m) and 15 6 ft (4 75 m).

Maxima --November 1978 to March 1979 Discharge, 20,500 ft³/s (581 m³/s) Dec 18, gage height, 15 60 ft (4.755 m).
1927 to October 1978. Discharge, 24,000 ft³/s (680 m³/s) Oct 20, 1972, gage height, 16 61 ft (5 063 m).

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov. 24			Nov. 28			Jan 17—Con		
0100	1 39	24	0600	3.67	500	1200	2 76	342
0600	1.56	32	1200	3.52	448	1500	3 16	541
0900	2 59	137	1800	3 37	400	1800	3.47	720

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1977

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 24—Con			Nov 28—Con			Jan. 17—Con		
1200	4.45	614	2400	3.27	370	2100	4 89	1,010
1500	6 37	1,630	Dec. 18			2400	10 01	9,260
1800	8.18	3,210	0600	1 92	83	Jan. 18		
2100	9 41	4,640	0900	2 92	249	0200	10 92	10,900
2400	11 36	7,800	1200	5 67	1,430	0600	8.50	6,760
Nov 25			1500	11 20	8,640	0900	8 22	6,370
0300	13.41	11,700	1800	14.20	16,000	1200	6 72	4,080
0430	13.80	12,600	2000	15.16	19,000	1500	5 68	2,750
0600	13 29	11,400	----	15 6	20,500	1800	6.16	3,330
0900	12 66	9,980	Dec 20			2100	5.94	3,060
1200	11 90	8,310	1200	6 96	3,640	2400	5 76	2,840
1500	10 89	6,470	1800	6 16	2,770	Jan. 19		
1800	9 60	4,450	2400	5.51	2,140	0600	4 98	1,960
2100	8 93	3,650	Dec. 21			1200	4.59	1,570
2400	8 38	3,120	0600	5.13	1,790	1800	4 24	1,270
Nov 26			1200	4.84	1,560	2400	4.03	1,100
0600	7.26	3,110	1800	4.52	1,330	Jan 20		
1200	6 31	2,190	2400	4.32	1,210	0600	3.82	941
1800	5 49	1,540	Dec 22			1200	3 61	790
2400	4 87	1,170	0600	4.21	1,190	1800	3.38	657
			1200	4 07	1,110	2400	3.31	616
Nov 27			1800	3.97	1,050	Jan. 21		
0600	4.60	860	2400	3 81	954	0600	3 20	564
1200	4 30	714	Jan 17			1200	3.15	535
1800	4 05	614	0100	2.39	218	1800	3 06	485
2400	3 84	535	0600	2 49	250	2400	2.99	450

(29) 09444100 Campbell Blue Creek near Alpine, Ariz.
(U S. Forest Service station)

Location --Lat 33°44'46", long 109°12'17", in SE¼SE¼ sec 26, T 4 N., R 30 E , Greenlee County Hydrologic Unit 15040004, Apache National Forest, 2 5 mi (4 0 km) upstream from Coleman Creek, and 8 mi (13 km) southwest of Alpine

Drainage area.--11.6 mi² (30 1 km²).

Gage-height record.--Water-stage recorder tape. Altitude of gage is 7,700 ft (2,350 m) from topographic map

Discharge record --Stage-discharge relation for Villemonte weir defined by model studies.

Maxima --November 1978 to March 1979 Discharge, 255 ft³/s (7 22 m³/s) 1625 hours Dec 18, gage height, 4 92 ft (1 500 m)
1958 to October 1978. Discharge, 341 ft³/s (9 66 m³/s) Oct 20, 1972, gage height, 5 50 ft (1 676 m)

Remarks --Discharges furnished by U S. Forest Service, Rocky Mountain Forest and Range Experiment Station and rounded to U.S Geological Survey standards. Watershed is one of several small watersheds in this area.

(29) 09444100 Campbell Blue Creek near Alpine, Ariz —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec 18—Con			Dec. 20—Con.		
2400	0 58	1.38	2400	2.95	67	1125	2 42	40
Dec 17						2400	2 06	26
2125	90	3 5	Dec 19			Dec. 21		
2400	1.02	4.6	0335	2.76	56	0815	1 95	22
			0730	2 98	68	1300	2 13	28
Dec 18			1030	2.88	62	1620	2.18	30
0325	1 52	12	1335	3 06	73	1955	2 07	26
0500	1 72	16	1558	2.83	60	2400	1.93	22
1245	3 00	70	1630	2 86	62	Dec 22		
1500	4 20	169	1930	2.66	51	0900	1.78	18
1625	4 92	255	2400	2.45	42	1155	2.00	24
1700	4 58	211	Dec 20			1300	2 06	26
1800	3 60	112	0900	2 23	32	2400	1 78	18

(30) 09444200 Blue River near Clifton, Ariz.

Location --Lat 33°17'27", long 109°11'44", in sec 6, T.2 S , R 31 E (unsurveyed), Greenlee County, Hydrologic Unit 15040004, in Apache National Forest, on right bank 0 1 mi (0.2 km) downstream from county road crossing, 0 9 mi (1 4 km) upstream from Clear Creek, 8 mi (13 km) upstream from mouth, and 17 mi (27 km) northeast of Clifton.

Drainage area --506 mi^2 (1,311 km^2)

Gage-height record --Digital water-stage recorder tape except 1000 hours Nov 25 to 1200 hours Nov 26, 1300 hours Dec 18 to 1500 hours Dec 22, and 2200 hours Jan. 17 to 1200 hours Jan 20 when recorder float rested on a plug of trash in the gage well during recessions. Gage-height record estimated for missing periods Altitude of gage is 4,160 ft (1,268 m), from topographic map

Discharge record --Stage-discharge relation extended above 1,900 ft^3/s (53.8 m^3/s) on basis of slope-area measurement at gage height 22 56 ft (6 876 m).

Maxima.--November 1978 to March 1979· Discharge, 14,700 ft^3/s (416 m^3/s) 2400 hours Nov 24, gage height, 17 1 ft (5.21 m)
1965 to October 1978: Discharge, 30,000 ft^3/s (850 m^3/s) Oct. 10, 1972, gage height, 22 56 ft (6 876 m) Flood of Oct 20, 1972 appears to be the highest since at least 1885.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 23			Dec. 18—Con.			Jan. 16—Con		
2400	4 68	34	0400	5.93	260	1800	6.09	473
Nov 24			0600	6.89	609	2400	6 18	503
0300	5 51	150	0800	7 65	995	Jan 17		
0600	6.68	518	1000	9.84	2,810	0200	6.18	516
0900	8 12	1,320	1200	12.36	5,990	0600	6 21	633

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1977

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 24—Con			Dec 18—Con			Jan 17—Con		
1200	9.32	2,290	1300	15.66	11,800	1300	7.18	948
1500	10.93	4,050	1400	16.3	13,100	1600	7 80	1,300
1700	11 63	4,900	2000	13 7	8,000	1700	8.83	1,470
1800	13 44	7,600	2400	12 5	6,200	1800	10 08	3,050
2000	14 34	9,200	Dec 19			1900	12 28	5,870
2100	14 45	9,400	0600	11.4	4,600	2015	13.6	7,850
2200	15.20	10,900	1200	10 5	3,500	2200	12 9	6,800
2400	17 1	14,700	1800	9 9	2,900	2400	12 0	5,450
Nov 25			2400	9.4	2,400	Jan 18		
0600	14 0	8,500	Dec. 20			0600	10.1	3,200
1200	10 8	3,600	1200	8.5	1,700	1200	9.0	2,200
1800	8 8	1,500	2400	8.0	1,400	1800	8.4	1,800
2400	8 0	900	Dec. 21			2400	7.9	1,400
Nov 26			1200	7.5	1,100			
0600	7 6	700	2400	7 2	900	Jan 19		
1200	7 53	628	Jan. 15			1200	7 1	1,100
1800	7 43	604	2400	5.61	345	2400	6.5	800
2400	7 35	580	Jan. 16			Jan 20		
Dec 18			0800	5 76	381	1300	6.18	724
0200	5.53	179	1200	6.08	469	2400	6.09	681

(31) 09444400 Chase Creek near Clifton, Ariz
(Crest-stage station)

Location --Lat 33°10'20", long 109°22'10", in NW¼ sec.16, T.3 S., R.29 E , Greenlee County, Hydrologic Unit 15040004, at U S. Highway 666, 9 mi (14 4 km) northwest of Clifton

Drainage area.--1.37 mi² (3 55 km²)

Gage-height record.--Crest stages only. Altitude of gage is 6,050 ft from topographic map.

Discharge record.--Stage-discharge relation defined by computations of flow through culvert.

Maxima --November 1978 to March 1979. Discharge, 72 ft³/s (2.03 m³/s) probably Dec 18, gage height, 7 59 ft (2.313 m).
1963 to October 1978· Discharge, 600 ft³/s (17.0 m³/s) July 25, 1964, gage height, 13 9 ft (4 24 m), from computation of flow through culvert and over roadway

(32) 09444500 San Francisco River at Clifton, Ariz.

Location --Lat 33°02'58", long 109°17'43", in SW¼SE¼ sec 30, T 4 S., R 30 E., Greenlee County, Hydrologic Unit 15040004, on downstream side of right pier at Railroad Boulevard Bridge (U S Highway 666), at Clifton, 9.9 mi (15.9 km) upstream from mouth

Drainage area.--2,766 mi² (7,164 km²).

Gage-height record --Water-stage recorder except 2000 hours Dec 19 to 1030 hours Dec 20 when recorder was underwater Gage-height record reconstructed on basis of high-water mark and stage measurements by Clifton Police Department. Datum of gage is 3,436 16 ft (1,047,342 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation extended above 26,000 ft^3/s (736 m^3/s) on basis of slope-area measurment at gage height 17.0 ft (5 18 m).

Maxima --November 1978 to March 1979 Discharge, 56,000 ft^3/s (1,590 m^3/s) about 0030 hours Dec 19, 1978, gage height, 16.0 ft (4 88 m) from high-water mark in gage house adjusted for surge.
1870 to October 1978 Discharge, 70,000 ft^3/s or 1980 m^3/s (revised) Dec. 3, 1906

Remarks --Discharges for the 1906 peak and several other historic peaks are either previously unpublished or were published in error Discharges below are from Aldridge and Moosburner (written commun , 1978) and superseded those published by Olmstead (1919) and several subsequent authors

Date	Approximate discharge	
	Cubic feet per second	Cubic meters per second
February 21, 1981	65,000	1,840
January 10, 1905	60,000	1,700
February 17, 1905	50,000	1,420
November 27, 1905	65,000	1,840
January 16, 1916	[1]59,000 (revised)	1,670
October 13, 1916	60,000 (revised)	17,00

[1]From slope-area computation of peak flow

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 24			Dec. 18			Jan. 16		
0600	3 50	340	0600	2 56	202	1200	3 80	443
0930	4 60	1,220	1000	3.10	320	1600	3.95	556
1330	5 90	3,750	1200	5 32	2,940	1800	4.15	687
1830	6.70	6,200	1400	8 00	10,700	2400	4.31	782
2000	8 00	10,700	1500	9.52	17,600	Jan. 17		
2100	9 00	15,000	1600	10 85	24,200	1200	4 48	919
2130	9 75	18,350	2000	13.10	35,600	1800	4.78	1,220
2400	11 40	27,000	2200	15.0	48,000	2000	5.72	2,740
			2400	15.9	55,200	2100	7.30	6,740
Nov. 25			Dec 19			2200	8 90	12,700
0200	12 20	31,000	0030	16 0	56,000	2400	10 54	22,000
0530	11 40	27,000	0600	13.6	38,600	Jan. 18		
0830	11 70	28,500	1200	11.1	25,500	0200	9 60	18,000
1030	11 60	28,000	1800	10 1	20,500	0500	11 05	25,200
1200	10.20	21,000	2400	9.1	15,500	0800	11.30	26,500
1600	9 10	15,500	Dec. 20			0830	11.25	26,200
2000	8 15	11,300	0500	8.2	12,300	1100	10.40	22,000

(32) 09444500 San Francisco River at Clifton, Ariz —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov. 25—Con			Dec. 20—Con			Jan. 18—Con		
2400	7 25	7,850	1030	7.20	8,820	1300	9 40	16,000
			1800	6 50	6,500	1800	8 20	11,500
Nov 26			2400	6 10	5,280	2400	6 90	7,800
0600	6 60	5,900	Dec. 21			Jan 19		
1200	6 10	4,600	1200	5.60	3,650	1200	6.20	4,850
2400	5 50	3,300	2400	5 15	2,680	2400	5.60	3,400

(33) 09447000 Eagle Creek above Pumping Plant, near Morenci, Ariz.

Location --Lat 33°04'12", long 109°27'05", in SE¼NE¼ sec 22, T 4 S , R 28 E., Greenlee County, Hydrologic Unit 15040005, 3 mi (5 km) upstream from Phelps Dodge Corp. pumping plant, 5 mi (8 km) west of Morenci, and 13 mi (21 km) upstream from mouth

Drainage area --613 mi^2 (1,588 km^2)

Gage-height record --Water-stage recorder graphs from main gage at flume and from supplemental gage 90 ft (27 m) upstream Datum of gage is 3,695 ft (1,126 m) unadjusted.

Discharge record --Discharges of less than 700 ft^3/s (19 8 m^3/s) are from stage-discharge relation for flume, which is defined by current-meter measurements, larger discharges are from stage-discharge relation for supplemental gage, which was extended above 3,500 ft^3/s (99 1 m^3/s) on basis of slope-area measurement of peak flow

Maxima --November 1978 to March 1979. Discharge, 24,500 ft^3/s (694 m^3/s) 2200 hours Dec 18, gage height, 12.5 ft (3.81 m) at supplemental gage
1944 to October 1978 Discharge, 21,000 ft^3/s (595 m^3/s) Dec. 30, 1965, gage height, 12 8 ft (3 90 m) at supplemental gage
Peak of December 18, 1978, is probably the highest since at least 1916

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18			Dec 20			Jan. 17—Con.		
0800	2 25	751	1400	4 57	3,080	1730	7 35	12,900
0930	2 32	188	2400	4.23	1,950	1800	7.20	12,400
1400	3 45	1,550	Jan. 16			1830	9.15	20,400
1430	6 50	6,150	1200	3 80	374	2000	6.30	9,600
1500	6 70	6,650	1530	4 1	405	2030	7.10	12,000
1700	9 20	12,700	1700	5 15	510	2100	7.55	14,800
1930	11.66	21,460	1900	5 40	567	2300	9.20	20,600
2200	12 5	24,500	2400	5 80	665	2400	9 15	20,400
2400	11 56	21,000				Jan 18		
			Jan 17			0200	7.65	14,000
Dec 19			0500	5 93	8,220	1200	4.85	5,200
0300	10 45	17,100	0800	5 65	7,520	1530	4 67	4,800
0400	8 85	11,700	0900	5 70	7,650	2000	5.14	6,000

(33) 09447000 Eagle Creek above Pumping Plant, near Morenci, Ariz.—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1977

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 19—Con			Jan. 17—Con			Jan 18—Con		
0500	7 20	7,400	1130	5.53	7,220	2400	4 83	6,160
0730	6 50	6,150	1300	5 60	7,400	Jan 19		
1400	5 85	5,000	1430	5.56	7,300	0600	4.10	3,600
2000	5 20	3,900	1600	5 96	8,300	1200	3.75	2,130
2400	5 00	3,600	1700	6 80	11,100	2400	3.64	2,000

(34) 09448500 Gila River at head of Safford Valley, near Solomon, Ariz.

Location --Lat 32°52'06", long 109°30'38", in SE¼NE¼ sec 31, T 6 S , R.28 E , Graham County, Hydrologic Unit 15040005, on left bank 0.6 mi (1 0 km) downstream from intake of Brown Canal, 8 mi (13 km) northeast of Solomon, and 17 mi (27 km) downstream from San Francisco River

Drainage area --7,896 mi² (20,451 km²)

Gage-height record.--Water-stage recorder graph Datum of gage is 3,064.88 ft (934 175 m) National Geodetic Vertical Datum of 1929

Discharge record --Base stage-discharge relation extended above 35,000 ft³/s (990 m³/s) on basis of slope-area measurement at 15.6 ft, and area-velocity study at 15 89 ft (4 842 m) Large positive shift adjustments required during the flood period were estimated on basis of current-meter measurements below 52,000 ft³/s and a slope-area measurement of the peak flow

Maxima --November 1978 to March 1979. Discharge, 100,000 ft³/s (2,830 m³/s) 0300 hours Dec 19, gage height, 14.40 ft (4,389 m)
1914 to October 1978: Discharge about 100,000 ft³/s (2,830 m³/s) Jan. 19, 1916, gage height, 15 89 ft or 4 843 present datum

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 24			Dec. 18—Con.			Dec 21		
0600	4 02	229	1600	5 80	3,100	1200	7 20	13,250
1600	4 20	343	1630	7.30	7,700	2400	6 50	19,700
1630	5 56	1,910	1700	8 30	12,300	Dec. 22		
2000	6 70	5,050	1830	10 70	30,000	1200	6.00	7,380
2030	6 53	4,650	2000	12 00	45,200	2400	5.55	5,550
2300	7 29	7,660	2100	12 70	55,800	Jan. 17		
2400	8 21	12,100	2400	13.65	76,800	0100	4.05	1,660
			Dec. 19			2000	4.40	2,380
Nov. 25			0300	14.40	100,000	2400	5.65	5,950
0200	9 40	19,580	0600	13 50	76,800			
0430	10 70	30,000	1100	12 50	58,300	Jan. 18		
0630	11 75	41,000	1400	11.40	45,200	0100	7 30	14,000
0830	11 20	35,000	1700	10.75	38,000	0200	8 65	23,600

(34) 09448500 Gila River at head of Safford Valley, near Solomon, Ariz.—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 25—Con			Dec. 19—Con.			Jan 18—Con		
1130	9 80	22,400	1800	10 40	35,000	0300	9 40	31,000
1330	10 05	28,000	2030	10 85	39,200	0500	10 00	38,000
1800	9 32	18,900	2130	12.00	51,400	0600	9.80	35,000
2400	8 59	14,300	2330	13.90	88,000	0700	10 10	39,200
Nov.26			2400	13.80	85,200	1000	9 70	34,000
1300	7 86	10,300				1200	9 20	26,400
2230	8 72	15,100	Dec. 20			1400	8.50	19,600
2400	8 60	14,400	0400	13 00	73,000	1700	8 15	16,300
Nov 27			0600	12 10	61,000	2000	8 00	15,200
0600	7 76	9,780	0900	11.00	52,200	2400	8 30	17,500
1100	7 35	7,660	1200	10 40	43,400			
1800	6 70	5,300	1500	9 60	33,000	Jan. 19		
2400	6 30	4,100	1900	8.50	22,000	0200	8.40	18,000
Dec 18			2000	8 00	18,400	1200	7.80	13,500
1530	4.10	468	2400	7.95	17,800	2400	7.05	9,100

(35) 09457000 San Simon River near Solomon, Ariz.

Location --Lat 32°48'06", long 109°38'19", in NW¼NE¼ sec.25, T.7 S , R.26 E , Graham County, Hydrologic Unit 15040006, 1 0 mi (1 6 km) southwest of Solomon and 2 2 mi (3 5 km) upstream from mouth

Drainage area --2,192 mi^2 (5,677 km^2).

Gage-height record.--Water-stage recorder graph Datum of gage is 2,960 15 ft (902 25 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation defined by current-meter measurements.

Maxima --November 1978 to March 1979· Discharge, 727 ft^3/s (21.2 m^3/s) 1800 hours Jan 17, gage height, 7.20 ft (2 195 m). Maximum during December flood is 56 ft^3/s or 1.6 m^3/s
1931 to October 1978: Discharge, 27,500 ft^3/s (779 m^3/s) Aug 9, 1931, from slope-area measurement of peak flow, gage height, 19.0 ft (5 79 m).
Flood of Aug 9, 1931, is the maximum since at least the early 1880's. Olmstead (1919) gives a peak discharge of 11,960 ft^3/s (338 m^3/s) for the maximum flood known prior to 1919 Date of flood unknown.

(36) 09458050 Marijilda Wash near Safford, Ariz.
(Discontinued station)

Location --Lat 32°41'43", long 109°47'"28, in NE¼ sec.33, T.8 S., R 25 E. (unsurveyed), Graham County, Hydrologic Unit 15040005, on right bank, in Coronado National Forest, 10 mi (16 km) southwest of Safford

Drainage area.--10 9 mi^2 (28 2 km^2)

Gage-height record --Crest stage only Altitude of gage is 4,500 ft (1,370 m) from topographic map

Maxima.--November 1978 to March 1979 Discharge, 5,770 ft^3/s (163 4 m^3/s) Dec 18 from slope-area measurement of peak flow, gage height, 6.8 ft (2 07 m) from floodmarks at gage.
1971 to October 1978 Discharge, 883 ft^3/s (25 0 m^3/s) Sept 13, 1977, gage height, 5 10 ft (1 554 m) from rating curve extended above 668 ft^3/s (18 9 m^3/s)

(37) 09458200 Deadman Creek near Safford, Ariz.
(Discontinued station)

Location --Lat 32°43'59", long 109°48'57", in SW¼ sec.17, T 8 S., R 25 E. (unsurveyed), Graham County, Hydrologic Unit 15040005, in Coronado National Forest, on left bank, 9 mi (14 km) southwest of Safford

Drainage area --4 78 mi² (12.38 km²).

Gage-height record --None. Altitude of gage is 4,950 ft (1,509 m) from topographic map

Maxima --November 1978 to March 1979· Discharge, 2,760 ft³/s (78.2 m³/s) from slope-area measurement of peak flow.
1966 to September 1976· Discharge, 119 ft³/s (3.37 m³/s) Oct 19, 1972, gage height, 3 45 ft (1 052 m) from rating curve extended above 18 ft³/s (0 51 m³/s) on basis of computation of flow over weir at gage height 3.25 ft (0.991 m).

(38) 09466500 Gila River at Calva, Ariz

Location --Lat 33°11'08", long 110°13'10", in SW¼ sec 8, T.3 S , R 21 E (unsurveyed), Graham County, Hydrologic Unit 15040005, in San Carlos Indian Reservation, on right upstream abutment of Southern Pacific Railroad bridge at head of San Carlos Reservoir, 2.0 mi (3 2 km) west of Calva. Supplemental gage at downstream side of bridge.

Drainage area --11,470 mi² (29,710 km²)

Gage-height record.--Water-stage recorder graph Datum of gage is 2,517 29 ft (767 270 m) National Geodetic Vertical Datum of 1929.

Discharge record --Stage-discharge relation defined by current-meter measurements Large positive shift adjustments required after the peak of December 20 were estimated on basis of current-meter measurements below 29,000 ft³/s (820 m³/s)

Maxima --November 1978 to March 1979 Discharge, 100,000 ft³/s (2,830 m³/s) 2130 hours Dec. 19, gage height, 15 20 ft (4,633 m)
1929 to October 1978 Discharge, 80,000 ft³/s (2,270 m³/s) Oct 20, 1972, gage height, 15 88 ft (4 840 m) at supplemental gage, from rating curve extended above 44,000 ft³/s (1,250 m³/s)
Floods of February 1891, November 1905, and January 1916 probably exceeded 100,000 ft³/s (2,830 m³/s).

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 24			Dec. 18			Dec. 22—Con.		
1700	1 51	102	0500	1.80	294	1200	5.95	9,100
2400	2 65	406	0900	2.10	399	1600	5 75	8,500
Nov 25			1030	2.81	692	1700	5.95	9,100
0300	3 40	770	1100	2 76	674	2400	5.40	7,480
0900	4 55	1,760	1200	2.85	722	Dec. 23		
1500	5 65	3,380	1500	2.50	555	1000	4.75	5,940

(38) 09466500 Gila River at Calva, Ariz.—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1977

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 25—Con.			Dec 18—Con.			Dec 23—Con		
2100	6.43	4,810	1700	3.66	1,270	2400	4.40	5,040
2400	6 75	5,340	2000	4 66	2,170	Jan 17		
Nov 26			2200	5.45	3,100	2400	3 17	2,470
0300	7 08	6,030	2400	6 25	4,020	Jan 18		
0700	7 68	7,410	Dec 19			0600	3.90	3,820
0830	8 55	9,580	0530	7.40	5,940	1200	4.80	6,240
0930	9 49	12,100	0800	7.30	5,640	1400	6.20	12,500
1100	10 92	17,600	1200	7.75	6,840	1600	7 70	18,800
1400	12 00	22,400	1600	8 62	9,380	1800	8 90	23,200
1800	11.70	21,000	1730	9 80	15,200	2000	9 75	26,900
2100	11 20	18,500	1800	11.00	22,400	2200	9 85	27,400
2400	10 65	16,100	1900	14 00	61,900	2300	9 90	27,900
Nov 27			2000	15 10	96,200	2400	9 80	26,900
0600	9 75	12,600	2100	15 20	100,000	Jan 19		
0900	9 25	13,600	2400	14 60	85,100	0300	9 25	26,000
1200	9 05	11,200	Dec 20			0600	8 15	23,600
1500	9 05	11,200	0500	13.50	61,900	0800	7 45	22,100
1800	9.10	11,400	0930	12 80	54,300	1400	6.95	21,200
2200	9 30	12,100	1300	13.75	67,850	1900	6 25	19,400
2400	9 30	12,100	1500	14 40	81,600	2400	5 30	15,800
Nov 28			1600	14 40	81,600	Jan. 20		
0400	8 75	10,200	2400	12 85	54,300	0300	4 76	14,400
1100	7 50	6,930	Dec 21			0700	4.22	13,100
1800	6.38	4,570	0600	11 35	38,100	1700	3 80	8,900
2400	5.75	3,490	1400	9.90	27,400	2400	3 60	6,840
Nov 29			2400	7 80	16,100	Jan 21		
1200	5 30	2,890	Dec 22			1200	3 65	6,690
2400	4 80	2,330	0600	6 95	12,500	2400	3.50	5,940

(39) 09467120 Salt Creek near Peridot, Ariz.
(Crest-stage station)

Location --Lat 33°16'15", long 110°18'15", Graham County, Hydrologic Unit 15040005, at U S Highway 70, 4 mi (6.4 km) above mouth, and 9.5 mi (15.3 km) southeast of Peridot.

Drainage area --35 2 mi² (91 2 km²) Contributing drainage area 30.3 mi² (48 6 km²)

Gage-height record --Crest stage only. Altitude of gage is 2,800 ft (853 m) from topographic map

Discharge record.--Stage-discharge relation defined on basis of culvert computations.

Maxima --November 1978 to March 1979· Discharge, 2,200 ft³/s (62 3 m³/s) Dec. 18, gage height, 18.17 ft (5.538 m).
1964 to October 1978: Discharge, 3,200 ft³/s (90.6 m³/s) Oct. 19, 1972, gage height, 19 56 ft (5.962 m).

(40) 09468300 Sevenmile Wash Tributary near Globe, Ariz.
(Crest-stage station)

Location --Lat 33°35'10", long 110°39'00", Gila County, Hydrologic Unit 15040007, at U S. Highway 60, 0 2 mi (0.32 km) south of Sevenmile Wash and 15 mi (24 km) northwest of Globe

Drainage area --0 83 mi^2 (2.15 km^2)

Gage-height record --Crest stage only Altitude of gage is 4,072 ft (1,241.15 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation defined on basis of culvert computations.

Maxima --November 1978 to March 1979 Discharge, 640 ft^3/s (18 1 m^3/s) Dec. 18, gage height, 9 47 ft (2 886 m)
1933 to October 1978 Discharge, 526 ft^3/s (14 9 m^3/s) from slope-area measurement in culvert. Date and gage height unknown

(41) 09468500 San Carlos River near Peridot, Ariz

Location --Lat 33°19'16", long 110°26'54", in NW¼ sec. 30, T 1 S , R.19 E (unsurveyed), Gila County, Hydrologic Unit 15040007, in San Carlos Indian Reservation, on right bank 750 ft (229 m) downstream from highway crossing, 0 8 mi (1.3 km) north of Peridot, and 2 4 mi (3 9 km) south of San Carlos. Gage moved 1 8 mi (2 9 km) downstream to U S Highway 70 on Jan 31, 1979.

Drainage area --1,027 mi^2 (2,660 km^2).

Gage-height record.--Water-stage recorder graph except during short periods on Jan 16 and 18, which were reconsturcted Datum of gage is 2,578 90 ft (786 049 m) National Geodetic Vertical Datum of 1929

Discharge record --Base rating extended above 2,200 ft^3/s (62 3 m^3/s) on basis of contracted-opening measurement of peak flow of Dec. 22, 1965 at gage height 14.8 ft (3 99 m). Large negative shift adjustments prior to development of a new channel during flood of Dec 18 were estimated from current-meter measurements below 340 ft^3/s (9 63 m^3/s) during the flood period and from measurements to 17,000 ft^3/s (637 m^3/s) made in March 1978. Large positive shifts, after development of the channel, estimated from current-meter measurements below 11,000 ft^3/s (312 m^3/s) and contracted opening measurement of peak flow. Records poor.

Maxima --November 1978 to March 1979. Discharge, 22,500 ft^3/s (637 m^3/s) 1130 hours Dec 18, from contracted opening measurement of peak flow at site 4 mi (6.4 km^2) downstream Gage height, 13 07 ft (3.973 m) 0100 hours Nov 25, result of failure of partially completed dam forming Talkalai Reservoir (discharge 22,400 ft^3/s or 634 m^3/s).
1928 to October 1978: Discharge, 40,600 ft^3/s (1,150 m^3/s) Mar. 14, 1941, gage height, 11 4 ft (3 47 m) site and datum then in use from rating curve extended above 23,000 ft^3/s (650 m^3/s) on basis of rate of change in storage in San Carlos Reservoir

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 24			Nov. 26—Con			Dec 19—Con.		
1030	1.20	20 0	1200	1.66	326	0600	6.38	11,900
1300	1 58	58 5	2400	1.40	218	0730	5.69	10,600
1400	1 46	44.0	Dec 17			1000	5.12	7,740
1430	2 90	485	2330	80	38	1600	4.34	3,400
1600	4 00	1,440	2400	3 36	2,160	2400	3.75	1,260
1630	5 00	2,540	Dec 18			Dec. 20		
1730	6 50	4,900	0100	3 00	1,580	1200	3 66	1,100
2100	5.16	2,640	0130	4 00	3,310	2400	3 48	805
2130	6 40	4,700	0200	5.29	6,060	Jan 16		
2200	8 70	8,900	0330	6.40	8,700	1830	3.38	475
2300	9.84	11,500	0500	7.76	12,700	2000	3 58	583
2400	9 34	10,200	0600	7 60	12,200	2400	3 61	814
Nov 25			0730	7.90	13,200	Jan. 17		
0030	10 34	12,700	1000	9 40	19,800	1000	3.62	822
0045	11.94	17,800	1130	10.00	22,500	1100	3.80	1,560
0100	13.07	22,400	1330	9.48	20,200	1230	6.50	12,300
0130	11.34	15,600	1500	9.90	21,800	1500	7.20	14,100
0200	8.40	8,150	1730	9.50	20,600	1630	8.15	16,400
0215	6 70	5,200	1900	9 70	21,400	1900	7.20	10,900
0315	5.30	3,260	2100	8.70	17,800	2230	6.33	6,760
0730	3.80	1,560	2200	7.59	14,600	2400	6.74	8,500
0930	3 80	1,560	2400	6.49	12,200	Jan 18		
1400	2 84	693				0600	5.66	4,080
2400	2 20	435	Dec. 19			1000	5.19	2,370
			0130	5.74	10,700	1100	5 24	2,440
Nov 26			0300	5.72	10,600	1800	4.98	1,790
0600	1 80	400	0400	6.59	12,300	2400	4 70	890

(42) 09469000 San Carlos Reservoir at Coolidge Dam, Ariz.

Location --Lat 33°10'32", long 110°31'38", in NW¼ sec.17, T 3 S., R.18 E (unsurveyed), Gila County, Hydrologic Unit 15040005, in San Carlos Indian Reservation, at right intake tower of Coolidge Dam on Gila River

Drainage area.--12,886 mi² (33,375 km²).

Gage-height record.--Water-stage recorder graph Datum of gage is National Geodetic Vertical Datum of 1929

Contents --Contents computed from capacity tables developed by San Carlos Irrigation District.

Maxima --November 1978 to March 1979. Contents, 1,030,000 acre-ft (1,270 hm³) 2400 hours Mar 31, elevation, 2,717.16 ft (767 230 m)
1928 to October 1978. Contents, 843,300 acre-ft (1,040 hm³) June 1, 1973, elevation, 2,704 67 ft (763.423 m).

Remarks --Reservoir is formed by concrete multiple-dome dam completed Oct 25, 1928; storage began Nov. 15, 1928. Usable capacity, 1,070,000 acre-ft (1,320 hm³), from table put in use Jan 1, 1979, between elevations 2,382 63 ft (726.226 m)—sill of lowest outlet gate—and 2,519.0 ft (767.79 m)—crest of spillway. Reservoir is used to store water for irrigation of San Carlos project and for power development. Contents reached 1,070,000 acre-ft (1,320 hm³) April 22, 1979; flow over spillway from Apr. 22, 1979, to about May 5, 1979.

(43) 09469500 Gila River below Coolidge Dam, Ariz.

Location.--Lat 33°10'10", long 110°31'50", in SW¼ sec.17, T.3 S., R.18 E (unsurveyed), Pinal County, Hydrologic Unit 15050100, on left bank 2,200 ft (670 m) downstream from Coolidge Dam

Drainage area --12,886 mi² (33,375 km²)

Gage-height record.--Water-stage recorder chart. Datum of gage is 2,309.33 ft (703.884 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation for concrete flume defined by discharge measurements

Maxima.--November 1978 to March 1979 Daily discharge 1,460 ft³/s (41.3 m³/s) Mar. 29, gage height, 4 84 ft (1.475 m) Maximum during December flood period, 64 ft³/s (1.81 m³/s)
1928 to October 1978: Discharge, 1,350 ft³/s (38.2 m³/s) July 28, 1952, gage height, 4 64 ft (1 414 m).
1914 to 1928 Discharge, 130,000 ft³/s (3,680 m³/s) Jan. 20, 1916, estimated on basis of peak discharge near Solomon and at Kelvin.

Remarks --Flow regulated by San Carlos Reservoir since Nov 15, 1928 (See sta 09469000.) Record includes flow of Warm Springs, which enters between dam and gage.

(44) 09470000 Gila River at Winkelman, Ariz.

Location --Lat 33°00'06", long 110°45'55", in NW¼NE¼ sec.13, T.5 S., R.15 E., Gila County, Hydrologic Unit 15050100, on right bank 1 mi (1.6 km) north of Winkelman, 2.2 mi (3.5 km) upstream from San Pedro River, and 29 mi (47 km) downstream from Coolidge Dam.

Drainage area --13,268 mi² (34,364 km²), of which 382 mi² (989 km²) is below Coolidge Dam

Gage-height record --Digital water-stage recorder tape. Datum of gage is 1,921.76 ft (585 752 m) National Geodetic Vertical Datum of 1929.

Discharge record --Stage-discharge relation defined by current-meter measurements

Maxima --November 1978 to March 1979. Discharge, 9,520 ft³/s (270 m³/s) 1430 hours Dec. 18, gage height, 14 30 ft (4,359 m)
1941 to October 1978. Discharge, 55,000 ft³/s (1,560 m³/s) Aug. 9, 1944, gage height, 18 40 ft (5.608 m) from rating curve extended above 2,900 ft³/s (82 m³/s) on basis of slope-area measurement of peak flow.
Peak discharge, Aug. 9, 1944, is probably the highest to originate downstream from Coolidge Dam since at least 1913, but it could have been exceeded on Aug. 4, 1930, or Aug 30, 1931

Remarks --Flow regulated by San Carlos Reservoir since 1928 Records of peak flow show discharge from drainage area below Coolidge Dam

(44) 09470000 Gila River at Winkelman, Ariz.—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18			Dec 18—Con			Dec. 19—Con.		
0100	2 05	97	1430	14.30	9,520	0600	12.16	6,110
0300	3 53	574	1500	14.10	8,920	0800	11.63	5,532
0500	4 15	862	1600	13.84	8,470	1200	9.29	3,770
0700	5 61	1,570	2100	13.55	8,030	1800	5.83	1,680
0900	7.67	2,750	2400	13.28	7,630	2400	4 91	1,220
1100	10 22	4,410						
1200	11 76	5,640	Dec 19			Dec 20		
1300	13 40	7,810	0200	13.11	7,390	0400	4.93	1,230
1400	14 10	8,920	0400	12.69	6,810	----	3 53	581

(45) 09472000 San Pedro River near Redington, Ariz

Location.--Lat 32°22'50", long 110°26'45", in NE¼NW¼ sec.19, T 12 S , R.19 E., Cochise County, Hydrologic Unit 15050203, on left bank 0.3 mi (0.5 km) upstream from Cochise-Pima County line, 4 3 mi (6.9 km) southeast of Redington, and 30 mi (48 km) north of Benson

Drainage area --2,939 mi² (7,612 km²), of which 696 mi² (1,803 km²) is in Mexico.

Gage-height record.--Water-stage recorder graph Datum of gage is 2,930.04 ft (893.076 m) National Geodetic Vertical Datum of 1929.

Discharge record.--Stage-discharge relation extended above 3,300 ft³/s (93 m³/s) on the basis of slope-area measurement at 15 21 ft (6.523 m).

Maxima --November 1978 to March 1979. Discharge, 10,800 ft³/s (306 m³/s) 2000 hours Jan 18, gage height, 15.21 ft (4 636 m).
1906 to October 1978: Discharge, about 90,000 ft³/s (2,550 m³/s) Sept 28, 1926, gage height, 29.0 ft (8.84 m) present site and datum from floodmark. Discharge computed on basis of peak discharges of San Pedro River at Charleston and Gila River at Kelvin.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec 19—Con.			Jan. 17—Con.		
2400	6.2	10	2400	14.57	9,670	2300	10 35	3,190
Dec. 18			Dec. 20			2400	11.55	5,210
0400	6 2	10	0200	14.92	10,200	Jan. 18		
0600	7 85	163	0600	14.0	8,900	0500	10.38	3,220
0800	8 25	348	0800	12.85	7,270	0700	9.97	2,370
1000	8 80	760	0900	12 0	6,020	1300	9 47	1,530
1300	9 85	2,190	1100	11.25	4,790	1400	12.3	6,500
1500	11.00	4,300	1300	10 75	3,880	1600	14 36	9,020
1800	13 2	7,720	1500	10 55	3,520	2000	15 21	10,800

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1977

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18—Con			Dec. 20—Con			Jan. 18—Con.		
2000	14 4	9,100	1900	10 00	2,390	2400	13.25	7,810
2200	12 8	7,180	2400	9.75	2,030	Jan. 19		
2400	11 5	5,140	Dec 21			0200	12 0	6,020
Dec 19			1200	9 30	1,300	0400	11 00	4,300
2000	14.4	9,100	1900	10 00	2,390	2400	13 25	7,810
2200	12 8	7,180	2400	9.75	2,030	Jan 19		
2400	11 5	5,140	Dec 21			0200	12 0	6,020
Dec 19			1200	9.30	1,300	0400	11 00	4,300
0200	10.0	2,480	2400	8 85	620	0800	10 43	3,270
0400	9 65	1,800	Jan 16			1000	10 60	3,700
0700	9.12	1,090	2400	-----	40	1200	9.95	2,190
1000	9 19	1,120	Jan 17			1400	9 75	1,800
1200	9.10	1,030	1700	-----	40	1800	10 05	2,440
1300	10 45	3,400	1800	7 83	160	2000	9 80	1,910
1400	11 30	4,860	1900	8.16	275	2400	9 55	1,450
1600	12 1	6,180	2000	8.30	385	Jan 20		
1800	13.0	7,540	2100	9.15	1,100	1200	9.25	1,030
2100	14.37	9,340	2200	9.72	1,930	2400	9.10	840

(46) 09472100 Peck Canyon Tributary near Redington, Ariz.
(Crest-stage station)

Location --Lat 32°29'12", long 110°30'00", in SW¼SW¼ sec.10, T.11 S., R 18 E., Pima County, Hydrologic Unit 15050203, on left bank 0.2 mi (0 32 km) upstream from mouth and 4 mi (6 4 km) north of Redington.

Drainage area --8.02 mi^2 (20.8 km^2).

Gage-height record --Crest stage only Altitude of gage is 2,850 ft (869 m) from topographic map

Discharge record.--Stage-discharge relation defined by step-backwater analysis

Maxima --November 1978 to March 1979. Discharge, 46 ft^3/s (1 30 m^3/s) Dec 19, 1978, gage height, 7 07 ft (2 15 m) from high-water mark in well of former gaging station.
1967 to October 1978· Discharge, 4,340 ft^3/s (123 m^3/s) Aug. 12, 1972, gage height, 9 25 ft (2 819 m) from inside high-water mark and 10.9 ft (3.322 m) from outside high-water mark from slope-area measurement of peak flow

(47) 09473000 Aravaipa Creek near Mammoth, Ariz

Location --Lat 32°50'37", long 110°37'07", in NW¼NW¼ sec.9, T 7 S , R 17 E , Pinal County, Hydrologic Unit 15050203, on right bank 6 mi (10 km) upstream from mouth, and 9 mi (14 km) north of Mammoth

(47) 09473000 Aravaipa Creek near Mammoth, Ariz.—Continued

Drainage area --541 mi² (1,401 km²).

Gage-height record.--Crest stages only during flood periods because well was damaged. Altitude of gage is 2,350 ft (716 m), from topographic map.

Discharge record --Stage-discharge relation extended above 1,300 ft³/s (36.8 m³/s) on basis of step-backwater computations and slope-area measurements at 8 09 and 13.71 ft (2 465 and 4 179 m).

Maxima.--November 1978 to March 1979. Discharge, 16,200 ft³/s (459 m³/s) about 1200 hours Dec 8, gage height, 13.71 ft (4.179 m) from profile of outside floodmarks
1931 to October 1978: Discharge, 15,300 ft³/s (433 m³/s) revised Dec. 19, 1967, gage height, 11 86 ft (3.615 m) in gage well, and 14 25 ft (4.343 m) from profile past gage.
Outside period of record· A discharge of 20,000 ft³/s (566 m³/s) occurred Aug. 2, 1919, at former gaging station 6 mi (10 km) downstream, from rating curve extended above 5,100 ft³/s (140 m³/s) on basis of velocity-area study.

(48) 09473500 San Pedro River at Winkelman, Ariz

Location --Lat 32°58'38", long 110°46'11", in SE¼SW¼ sec 24, T.5 S., R 15 E., Pinal County, Hydrologic Unit 15050203, on right bank 0.7 mi (1.1 km) south of Winkelman, and 1 0 mi (1 6 km) upstream from mouth

Drainage area.--4,471 mi² (11,580 km²), of which 696 mi² (1,803 km²) is in Mexico.

Gage-height record.--Water-stage recorder graph from manometer gage. Altitude of gage is 1,925 ft (587 m), from topographic map.

Discharge record.--Stage-discharge relation extended above 4,200 ft³/s (119 m³/s) on basis of slope-area measurement for flood of Dec. 22-23, 1965, at site 3 5 mi (5.6 km) upstream, discharge, 16,800 ft³/s (476 m³/s). Stage-discharge relation for the recession estimated because a secondary channel, which bypassed gage, was formed during the flood.

Maxima --November 1978 to March 1979: Discharge, 18,000 ft³/s (510 m³/s) about 2045 hours Dec 18, gage height, 14.41 ft (4.392 m)
1906 to October 1978. Discharge, about 85,000 ft³/s (2,410 m³/s) Sept. 28, 1926, on basis of interpolation between discharges of San Pedro River at Mammoth and Gila River near Kelvin

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec. 17			Dec. 18—Con.			Dec. 20		
2400	5 93	48	2400	14.22	17,100	0200	10.77	5,260
Dec 18			Dec 19			0500	11.63	7,360
1000	6 06	82	0200	14 28	17,400	0730	12 04	8,510
1030	7.32	651	0415	14 37	17,900	1200	11.84	7,940
1100	7.54	772	0515	14 26	17,300	1500	10.44	4,570
1400	11 45	6,880	0700	12 94	11,600	1800	10.06	3,840
1700	12 91	11,500	1000	11 53	7,090	2200	9 14	2,520
1900	13 52	14,000	1500	10.61	4,910	2400	9.34	2,720
2000	14 08	16,500	1800	10 11	3,930			
2045	14.41	18,000	2000	9 48	2,880	Dec 21		
2130	14 30	17,500	2200	9 93	3,600	1200	7 88	1,390
2200	14 31	17,600	2400	10 98	5,730	2400	7.14	903

(49) 09473600 Tam O'Shanter Wash near Hayden, Ariz.
(Discontinued crest-stage station)

Location --Lat 33°01'46", long 110°52'22", in SE¼NW¼ sec.1, T 5 S., R.14 E., Pinal County, Hydrologic Unit 15050100, at State Highway 177, 6 mi (9 6 km) west of Hayden

Drainage area --4 37 mi² (11.3 km²).

Gage-height record --Crest stage only Altitude of gage is 1,900 ft (519 m) from topographic map

Discharge record.--Stage-discharge relation defined by computations of flow through culvert.

Maxima --November 1978 to March 1979. Discharge, 230 ft³/s (6 51 m³/s) Dec 18, gage height, 8 07 ft (2 460 m)
1963 to October 1978· Discharge, 1,570 ft³/s (44.5 m³/s) Aug. 2, 1974, gage height, 14 28 ft (4 353 m).

(50) 09474000 Gila River at Kelvin, Ariz.

Location --Lat 33°06'10", long 110°58'33", in NE¼NW¼ sec.12, T 4 S., R 13 E., Pinal County, Hydrologic Unit 15050100, on left bank at Kelvin, 500 ft (152 m) downstream from Mineral Creek, 18 mi (29 km) downstream from San Pedro River, and 19 mi (31 km) upstream from Ashurst-Hayden Dam

Drainage area --18,011 mi² (46,648 km²), of which 5,125 mi² (13,274 km²) is below Coolidge Dam

Gage-height record --Water-stage recorder graph except 0600 hours Dec 19 to 0940 hours Dec 20, which was estimated on basis of high-water mark and information from local residents, and 2400 hours Dec 20 to 0930 hours Dec 21, which was estimated on basis of adjacent good record. Datum of gage is 1,745 02 ft (531 882 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation extended above 12,000 ft³/s (3,400 m³/s) on basis of step-backwater study and high-water mark at Hayden, 17 mi upstream.

Maxima --November 1978 to March 1979· Discharge, 27,000 ft³/s (765 m³/s) 1500 hours Dec 19, gage height, 25 30 ft (7.711 m)
1928 to October 1978. Discharge, 42,800 ft³/s (1,210 m³/s) Aug 8, 1930, gage height, 12.6 ft (3 84 m).
1911 to October 1978: Discharge, about 132,000 ft³/s (3,740 m³/s) Jan. 20, 1916, gage height, 19 5 ft (5 94 m) from rating curve extended above slope-area measurement of peak discharge of Sept 28, 1926, at gage height 16.2 ft (4.94 m)

Remarks --Flow partially regulated by San Carlos Reservoir 49 mi (79 km) upstream since Nov 15, 1928. Records of peak flow show discharge from drainage area below Coolidge Dam

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec 21—Con			Jan 18		
0330	4 93	90	1200	11 75	5,370	0230	11 27	4,970
1030	5.09	108	1700	9 25	2,650	0430	11.11	4,810

(50) 09474000 Gila River at Kelvin, Ariz —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec. 17—Con			Dec 21—Con.			Jan. 18—Con		
1700	5 33	139	2400	8.70	2,100	0800	11.45	5,150
2200	5 53	168				1000	11 58	5,280
2400	5 62	182	Dec 22			1300	12.29	5,990
Dec 18			0300	8 50	1,920	1600	13 98	7,940
0200	6.69	470	0900	8.20	1,650	1800	15 22	9,420
0400	8 37	1,803	1500	7.97	1,470	2030	15.86	10,200
0630	9.37	2,770	2100	7.75	1,300	2400	15.54	9,920
1000	11 05	4,450	2400	7.60	1,190			
1500	13 16	6,592	Dec 23			Jan 19		
2400	13 60	7,120	0600	7 45	1,080	0200	14.96	9,220
Dec 19			1800	7.18	918	0530	13.99	8,060
0200	14 00	7,600				0900	13 25	7,170
0500	20 05	16,900	Jan 16			1000	13.28	7,200
0700	24 40	25,200	0430	5 80	350	1130	13 99	8,060
0900	25 20	26,800	1230	5 93	390	1400	14 79	9,020
1500	25.30	27,000	1930	6.12	458	1700	15 34	9,680
1900	22 00	20,300	2400	6.20	530	2400	14 14	8,250
2400	18.50	14,500				Jan 20		
			Jan. 17			0100	13.96	8,030
Dec 20			0700	6 20	615	0500	12.55	6,350
0200	16 0	11,000	0930	6 41	790	0900	11 40	5,200
0900	14 0	8,550	1130	6 81	836	1300	9.92	3,720
1300	13 44	7,770	1200	7.53	1,280	1630	9.49	3,290
1700	14.30	8,860	1300	8 74	2,340	2200	9.02	2,820
1900	14 75	9,460	1430	9.30	2,900	Jan. 21		
2200	15 06	9,830	1730	10 07	3,670	0300	8 86	2,680
2400	15.08	9,860	2000	10 89	4,490	1000	8.50	2,320
Dec 21			2300	11.08	4,680	1700	8.18	2,010
0800	13.0	7,000	2400	11.08	4,780	2200	8.00	1,850

(51) 09478600 Queen Creek Tributary No 3 at Whitlow Dam, Ariz.
(Crest-stage station)

Location --Lat 33°17'30", long 111°16'50", in N½ sec.1, T.2 S , R.10 E., Pinal County, Hydrologic Unit 15050100, 0.5 mi (0.8 km) south of Whitlow Dam, and 4.5 mi (7.2 mi) northeast of Florence Junction.

Drainage area --0 37 mi² (0.958 km²).

Gage-height record --Crest stages only. Altitude of gage is 2,110 ft (643 m) from topographic map.

Discharge record.--Stage-discharge relation defined by culvert computations.

Maxima.--November 1978 to March 1979. Discharge, 5.0 ft³/s (0.14 m³/s) probably Dec. 18, gage height, 3 70 ft (1.13 m).
1966 to October 1978. Discharge, 280 ft³/s (7.93 m³/s) Sept 13, 1966, gage height, 7.55 ft (2.30 m).

(52) 09479500 Gila River near Laveen, Ariz.

Location --Lat 33°15'25", long 112°09'59", in SW¼NW¼ sec.16, T 2 S., R.2 E , Pinal County, Hydrologic Unit 15050100, in Gila River Indian Reservation, on left abutment of highway bridge, 2 1 mi (3 4 km) upstream from Santa Cruz River, 2.6 mi (4.2 km) south of Komatke, and 7.3 mi (11.7 km) south of Laveen Supplementary water-stage recorder on overflow channel at highway bridge 0.2 mi (0.3 km) south.

Drainage area --20,615 mi² (53,393 km²), of which 696 mi² (1,803 km²) is in Mexico and 7,729 mi² (20,018 km²) is below Coolidge Dam.

Gage-height record --From two water-stage recorders. Datum of both gages is 1,018 90 ft (310 561 m) National Geodetic Vertical Datum of 1929. Gage heights given are for base gage

Discharge record.--Both stage-discharge relations defined by current-meter measurements. Records include flow in main and overflow channels

Maxima --November 1978 to March 1979. Discharge, 9,720 ft³/s (275 m³/s) 1900 hours Dec 21, gage height, 10 20 ft (3.109 m) at base gage
1940 to October 1978 Discharge, 11,900 ft³/s (337 m³/s) Jan 2, 1941, gage height, 10 08 ft (3 072 m) Dec. 26, 1965, result of backwater.

Remarks --Flow partly regulated by storage in San Carlos Reservoir since 1928; discharge represents runoff from area below the reservoir

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	[1]Gage height	[2]Discharge	Hour	[1]Gage height	[2]Discharge	Hour	[1]Gage height	[1]Discharge
Dec 20			Dec. 23—Con.			Jan. 20—Con.		
0400	3 90	5.8	2400	8.43	2,530	2200	8.74	3,870
0500	3.98	21	Dec. 24			2400	8.80	3,990
0600	4 16	110	2400	7.79	1,000	Jan 21		
0900	6 18	336	Dec 25			0530	9 41	6,170
1200	6 85	381	1500	7.63	760	0700	9.48	6,520
2400	7 15	453	2000	7 52	623	1100	9.50	6,560
Dec 21			2400	6 91	493	1730	9.43	6,330
1600	7 28	494	Dec. 26			2400	9.57	6,750
1700	8.62	2,520	0200	6.21	338	Jan. 22		
1800	9 96	8,480	0400	5.73	314	0045	9.59	6,780
1900	10 20	9,720	1200	6.22	338	0200	9.56	6,710
2400	9 99	8,610	2400	5.60	305	0800	9.27	5,610
Dec 22			Jan. 19			1400	8.85	4,150
0600	9 45	6,900	0600	-----	------	2000	8.54	3,100
1200	9 10	5,840	1200	-----	------	2400	8 42	2,650
1800	8.91	5,130	1800	-----	------	Jan. 23		
2400	8 84	4,670	2400	7 97	1,400	1200	8.16	1,870
Dec 23			Jan. 20			2400	8 02	1,540
0600	8 94	4,680	0700	8.29	2,300	Jan 24		
1200	8 89	4,170	1300	8 56	3,200	1200	7 89	1,250
1800	8 64	3,280	1900	8.66	3,630	2400	7 80	1,040

[1]At main channel gage
[2]Total of two channels.

(53) 09482000 Santa Cruz River at Continental, Ariz.

Location.--Lat 31°51'12", long 110°58'40", in NE¼NE¼ sec.23, T 18 S , R.13 E. (unsurveyed), Pima County, Hydrologic Unit 15050301, in Spanish land grant of San Ignacio de la Canoa, near left bank on downstream side of pier of highway bridge at Continental.

Drainage area.--1,662 mi² (4,305 km²), of which 395 mi² (1,023 km²) is in Mexico.

Gage-height record.--Water-stage recorder graph except 1800 hours Dec. 18 to 1500 hours Dec. 19. Datum of gage is 2,832.28 ft (863.279 m) National Geodetic Vertical Datum of 1929.

Discharge record.--Average stage-discharge curve defined below 7,000 ft³/s (198 m³/s) by current-meter measurements.

Maxima.--November 1978 to March 1979: Discharge, 16,000 ft³/s (453 m³/s), about 2300 hours Dec 18, gage height, 10.0 ft (3.05 m) from high-water mark in well.
1936 to October 1978: Discharge, 26,500 ft³/s (750 m³/s) Oct. 10, 1977, gage height, 16.70 ft (5.090 m), from rating curve extended above 16,000 ft³/s (453 m³/s) on basis of flood-routing studies.

(54) 09482500 Santa Cruz River at Tucson, Ariz.

Location --Lat 32°13'16", long 110°58'52", in NE¼NE¼ sec.14, T.14 S., R 13 E , Pima County, Hydrologic Unit 15050301, on downstream side of center pier of Congress Street Bridge in Tucson

Drainage area.--2,222 mi² (5,755 km²), of which 395 mi² (1,023 km²) is in Mexico.

Gage-height record.--Water-stage recorder graph except Dec 19-23 Record affected by drawdown on manometer orifice. Datum of gage is 2,317.82 ft (706 472 m) National Geodetic Vertical Datum of 1929.

Discharge record --Discharge estimated on basis of flood-routing studies.

Maxima --November 1978 to March 1979: Discharge, 13,500 ft³/s (382 m³/s) about 1000 hours Dec 19, gage height, recorded, 9.50 ft (2.896 m), outside, 14 1 ft (4 30 m) from floodmark on bank.
1892 to October 1978 Discharge, 23,700 ft³/s (671 m³/s) Oct. 10, 1977, from slope-area measurement of peak flow, gage height, 21.8 ft (6.64 m) from floodmark on the bank.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18			Dec 19—Con.			Dec. 20—Con		
0900	3 4	0	0900	9.0	11,000	1800	-----	1,680
1000	4 37	108	1000	9 50	13,500	2400	-----	1,450
1200	4 17	61	1200	9 25	12,200	Dec 21		
1400	4 70	238	1500	9.35	12,700	0800	-----	1,180

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18—Con			Dec 19—Con			Dec 21—Con.		
1500	4 32	97	1600	-----	12,000	1600	-----	940
1600	4 65	216	1800	-----	11,200	2400	-----	800
2000	3 93	26	2000	-----	9,800			
2200	7 4	4,880	2200	-----	7,000	Dec. 22		
2400	7.9	6,530	2400	-----	5,800	1200	-----	570
Dec 19			Dec 20			2400	-----	415
0200	8 1	7,230	0400	-----	3,700	Dec. 23		
0400	8 3	8,030	0800	-----	2,750	1200	-----	300
0700	8 7	9,730	1200	-----	2,150	2400	-----	220

(55) 09483000 Tucson Arroyo at Vine Avenue, Tucson, Ariz

Location --Lat 32°13'00", long 110°56'54", in SW¼NE¼ sec 18, T.14 S., R.14 E., Pima County, Hydrologic Unit 15050301, on right bank at Vine Avenue in Tucson, 0 2 mi (0.3 km) downstream from confluence of Railroad Wash and Arroyo Chico.

Drainage area.--8.2 mi² (21.2 km²) since June 1956

Gage-height record.--Water-stage recorder tape. Datum of gage is 2,411.9 ft (735 15 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation for concrete control extended above 2,100 ft³/s (60 m³/s) on basis of slope-area measurements at gage heights 10 13 and 10 35 ft (3.088 and 3 155 m)

Maxima --November 1978-March 1979· Discharge, 334 ft³/s (9.46 m³/s) 1315 hours Dec. 18, gage height, 5.35 ft (1.631 m).
1940 to October 1978· Discharge, 5,000 ft³/s (142 m³/s) Aug 22, 1961, gage height, 10, 35 ft (3.155 m).

(56) 09483100 Tanque Verde Creek near Tucson, Ariz.
(Crest-stage station)

Location.--Lat 32°14'48", long 110°40'46", in NE¼NW¼ sec.2, T.14 S., R.16 E., Pima County, Hydrologic Unit 15050302, 4 4 mi (7 1 km) east of Tanque Verde School, 7.4 mi (11 9 km) upstream from Agua Caliente Wash, and 17.5 mi (28.2 km) east of Tucson city hall.

Drainage area.--43 0 mi² (111 km²).

Gage-height record --Crest stage only. Altitude of gage is 2,720 ft (829 m) from topographic map.

Discharge record --Stage-discharge relation extended above 600 ft³/s (17.0 m³/s) on basis of slope-area measurements at 3.85, 4.86, and 5.14 ft (1.173, 1.481, and 1 566 m).

Maxima --November 1978 to March 1979. Discharge, 4,100 ft³/s (116 m³/s) Dec. 18, gage height, 5 71 ft (1.74 m)
1959 to October 1978: Discharge, 3,080 ft³/s (87 2 m³/s) Dec. 20, 1967, gage height, 5 14 ft (1.566 m)

(57) Agua Caliente Wash near Tucson, Ariz.
(Miscellaneous site)

Location.--Lat 32°15'30", long 110°45'34", in SW¼NE¼ sec.36, T.13 S , R.15 E., Pima County, Hydrologic Unit 15050302, atGlenn Street, 0.7 mi (1.1 km) upstream from Tanque Verde Road and 13 5 mi (21 7 km) northeast of Tucson city hall.

Drainage area.--39.0 mi² (101 km²).

Maxima --November 1978 to March 1979. Discharge, 3,440 ft³/s (97 4 m³/s) Dec. 18, 1978, from slope-area measurement of peak discharge. Record poor.

Remarks --Tributary to Tanque Verde Creek.

(58) 09484000 Sabino Creek near Tucson, Ariz
(Crest-stage station)

Location --Lat 32°19'00", long 110°48'35", in SE¼NE¼ sec 9, T 13 S., R.15 E , Pima County, Hydrologic Unit 15050302, 1,000 ft (304.8 m) upstream from Lower Sabino Dam, 0.5 mi (0 8 km) north of Coronado National Forest boundary, and 12 mi (19.3 km) northeast of Tucson city hall

Drainage area --35.5 mi² (92 km²).

Gage-height record.--Crest stage only. Altitude of gage is 2,720 ft (829 m) from topographic map

Maxima --November 1978 to March 1979 Discharge, 7,400 ft³/s (210 m³/s) Dec 18, gage height, 11 76 ft (3 584 m) from computation of flow over dam.
1932 to October 1978· Discharge, 7,730 ft³/s (219 m³/s) Sept. 6, 1970, gage height, 10.21 ft (3.112 m) from rating extended above 3,000 ft³/s (85 0 m³/s) on basis of slope-area measurement at gage height 9.65 ft (2 941 m)

(59) 09484200 Bear Creek near Tucson, Ariz
(Discontinued station)

Location --Lat 32°18'20", long 110°48'03", in NW¼ sec.15, T.13 S., R.15 E., Pima County, Hydrologic Unit 15050302, on left bank 0.8 mi (1 3 km) upstream from mouth, and 12 5 mi (20 1 km) northeast of Tucson city hall..

Drainage area --16 3 mi² (42.2 km²).

Gage-height record --Crest stage only. Altitude of gage is 2,670 ft (8 13 m) from topographic map.

Discharge record --Stage-discharge relation extended above 300 ft³/s (8.50 m³/s) on basis of computation of peak flow over dam at 4.90 ft (1 493 m).

Maxima --November 1978 to March 1979. Discharge, 1,400 ft³/s (39 6 m³/s) Dec. 18, gage height, 5.40 ft (1.650 m) from crest-stage gage.
1959 to October 1978: Discharge, 1,150 ft³/s (32 6 m³/s) Dec 22, 1965, gage height recorded 4 1 ft (1 25 m) affected by drawdown, 4 90 ft (1.493 m) outside from floodmark.

(60) 09484500 Tanque Verde Creek at Tucson, Ariz
(Crest-stage station)

Location.--Lat 32°15'57", long 110°50'27", in SE¼SE¼ sec.30, T.13 S , R 15 E., Pima County, Hydrologic Unit 15050302, at Sabino Canyon Road, 1.0 mi (1 609 km) downstream from Sabino Creek and 8.25 mi (13.3 km) northeast of Tucson city hall

Drainage area.--219 mi² (567 km²).

Gage-height record --Crest-stage gage only. Datum of gage is 2,464 33 ft (751.128 m) National Geodetic Vertical Datum of 1929.

Maxima --November 1978 to March 1979: Discharge, 12,700 ft³/s (360 m³/s) Dec. 18, gage height, 7 33 ft (2.234 m) from slope-area measurement of peak flow.
Probably 1940 to October 1978. Discharge, 12,200 ft³/s (346 m³/s) Dec. 22, 1965, gage height, 7.89 ft (2 405 m) from rating curve defined by current-meter measurement

(61) 09484510 Ventana Canyon Wash near Tucson, Ariz.
(Crest-stage station)

Location --Lat 32°18'33", long 110°50'20", in SW¼SW¼ sec.8, T 13 S., R.15 E., Pima County, Hydrologic Unit 15050302, at Sunrise Drive, 0 5 mi (0.8 km) upstream from Esperero Wash, and 4 mi (6 4 km) northeast of Tucson city limits and 12 mi (19 3 km) northeast of Tucson city hall.

Drainage area --6 46 mi² (16 7 km²)

Gage-height record.--Crest stages only. Altitude of gage is 2,720 ft (829 m) from topographic map

Discharge record --Stage-discharge relation defined by computations of flow through culvert and over roadway.

Maxima --November 1978 to March 1979. Discharge, 234 ft³/s (6 63 m³/s) Dec. 18, gage height, 14 55 ft (4.43 m).
1965 to October 1978 Discharge, 260 ft³/s (7.36 m³/s) Dec. 22, 1965, gage height, 11 34 ft (3.456 m)

(62) 09485450 Pantano Wash (at Broadway Blvd.) at Tucson, Ariz

Location --Lat 32°13'14", long 110°49'44", in NW¼NE¼ sec 17, T 14 S., R 15 E , Pima County, Hydrologic Unit 15050302, near right bank at bridge on Broadway Blvd., 4.6 mi (7.4 km) upstream from mouth, and 8.5 mi (13 7 km) east of Tucson city hall

Drainage area --599 mi² (1,550 km²)

Maxima --November 1978 to March 1979 Discharge, 1,530 ft³/s (43.3 m³/s) Dec 18, from slope-area measurement of peak flow
Probably 1930 to October 1978: Discharge, 20,000 ft³/s (566 m³/s) Aug 12, 1958, from slope-area measurement of peak flow at site 1 mi (1 6 km) downstream at Speedway Blvd.

(63) 09486000 Rillito Creek near Tucson, Ariz.
(Flood-hydrograph station)

Location.--Lat 32°17'41", long 110°59'00", in SW¼SE¼ sec.14, T.13 S., R.13 E., Pima County, Hydrologic Unit 15050302, on right bank 600 ft (183 m) downstream from Pima Wash, 1,800 ft (549 m) downstream from U.S. Highway 89, 5 mi (8 km) above mouth, and 5.4 mi (8 6 km) north of Tucson city hall.

Drainage area --918 mi² (2,378 km²).

Gage-height record --Water-stage recorder graph prior to 1000 hours Dec. 18 when station was washed out Datum of gage is 2,280.16 ft (694 993 m) National Geodetic Vertical Datum of 1929, supplementary adjustment of 1954

Discharge record --Stage-discharge relation for period of gage-height record defined by current-meter measurements. Discharge during period of missing gage-height record estimated by subtracting Santa Cruz River at Tucson and minor tributaries from Santa Cruz River at Cortaro.

Maxima --November to March 1979: Discharge, 16,400 ft³/s (464 m³/s) about 1300 hours Dec 18, from slope-area measurement of peak flow at site 5 mi (8.1 km) upstream at Swan Road

1908 to October 1978· Discharge, 24,000 ft³/s (680 m³/s) Sept 23, 1929, gage height, 24 ft (7 31 m) from floodmarks at site 800 ft (244 m) upstream at different datum from rating extended above 12,000 ft³/s (339 km³/s) on basis of velocity-area studies.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec. 18—Con			Dec. 18—Con.		
2330	1 03	-----	0700	5.90	-----	2400	-----	6,000
2400	4 15	-----	0800	5 93	-----	Dec. 19		
Dec 18			0900	7 20	-----	0600	-----	4,000
0200	4 73	-----	1000	8 34	7,170	0900	-----	6,000
0300	4 75	-----	1200	-----	14,000	1400	-----	4,000
0330	5.50	-----	1400	-----	16,400	1800	-----	1,000
0530	6 65	-----	1800	-----	12,000	2400	-----	500

(64) 09486300 Canada del Oro near Tucson, Ariz
(Crest-stage station)

Location.--Lat 32°22'27", long 111°00'31", in SW¼NW¼ sec 22, T.12 S , R.13 E., Pima County, Hydrologic Unit 15050301, on right bank at upstream side of Overton Road, 4 7 mi (7.6 km) upstream from mouth, and 10.5 mi (16 9 km) north of Tucson city hall.

Drainage area.--250 mi² (648 km²).

Gage-height record.--Water-stage recorder chart. Datum of gage is 2,374 39 ft (723.714 m) National Geodetic Vertical Datum of 1929 from project bench mark

Discharge record --Stage-discharge relation extended above 600 ft³/s (17 m³/s) on basis of slope-area measurements at gage heights 4.5 and 7.5 ft (1 37 and 2 29 m)

Maxima --November 1978 to March 1979 Discharge, 1,380 ft^3/s (39.1 m^3/s) 0030 hours Nov 25, gage height, 3 90 ft (1.19 m).
About 1955 to October 1978: Discharge, 17,000 ft^3/s (481 m^3/s) July 21, 1959, from slope-area measurement at Tangerine Road, 4 mi (6 4 km) upstream.

(65) 09486500 Santa Cruz River at Cortaro, Ariz

Location --Lat 32°21'04", long 111°05'38", in NW¼NW¼ sec.35, T.12 S , R.12 E., Pima County, Hydrologic Unit 15050302, on downstream side of right bridge pier 0 5 mi (0 8 km) southwest of Cortaro, 2.6 mi (4 2 km) downstream from Canada del Oro, and 3.7 mi (6 0 km) downstream from Rillito Creek

Drainage area --3,503 mi^2 (9,073 km^2), of which 395 mi^2 (1,023 km^2) is in Mexico.

Gage-height record --Water-stage recorder graph from 0600 hours, Dec. 18 to 2000 hours, Dec 20 Gage height for Dec 21 estimated Datum of gage is 2,133.13 ft (650.178 m) National Geodetic Vertical Datum of 1929 (State Highway Department bench mark)

Discharge record.--Stage-discharge relation defined by current-meter measurements.

Maxima --November 1978-March 1979 Discharge, 18,800 ft^3/s (532 m^3/s) 1930 hours, Dec. 18, gage height, 14.42 ft (4,395 m).
1936 to October 1978 Discharge, 23,000 ft^3/s (651 m^3/s) Oct. 10, 1977, gage height, 15 6 ft (4 75 m).

Remarks --Flow of less than about 50 ft^3/s (1 4 m^3/s) is waste water from sewage-disposal plant. Rapid drop in discharge from 0500 hours to 0600 hours is not due to natural causes The most likely cause of the drop is overflow into a large gravel pit upstream from station.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec. 17			Dec. 18—Con.			Dec. 20		
2400	5 0	33	2400	13.89	16,000	0200	9.65	4,910
Dec. 18			Dec. 19			0400	9 25	4,110
0400	5.3	70	0500	13 22	13,700	0800	9 00	3,680
0530	6 0	200	0530	12 04	11,000	1000	8.79	3,340
0600	7 36	900	0630	9 73	5,090	1200	8.58	2,850
0800	8.43	1,800	0700	12.04	12,000	1400	8.45	2,670
0930	8.28	1,700	0800	13.07	16,400	1500	8.52	2,770
1100	9 92	4,000	1100	13.23	17,400	1700	8.49	2,730
1200	11 41	7,500	1200	13.20	17,400	1800	8.30	2,460
1400	13 60	15,400	1330	13 38	18,200	2200	8.1	2,000
1600	13.99	17,000	1700	12.89	16,100	2400	8.0	1,940
1930	14.42	18,800	1930	12 40	14,000	Dec. 21		
2130	13 71	16,000	2100	11.45	10,350	1200	7.5	1,310
2300	13.99	17,000	2400	10.16	6,550	2400	7 2	970

(66) 09489000 Santa Cruz River near Laveen, Ariz

Location --Lat 33°13'56", long 112°10'08", in NE¼NE¼ sec.29, T 2 S , R 2 E., Pinal County, Hydrologic Unit 15050303, in Gila River Indian Reservation, on downstream side of highway bridge, 3 4 mi (5 5 km) upstream from mouth, 4 3 mi (6.9 km) south of Komatke, and 9 mi (14 km) south of Laveen.

Drainage area --8,581 mi² (22,225 km²)

Gage-height record --Digital water-stage recorder tape Datum of gage is 1,020 86 ft (311 158 m) National Geodetic Vertical Datum of 1929.

Discharge record --Stage-discharge relation defined by current-meter measurements

Maxima --November 1978 to March 1979 Discharge, 4,120 ft³/s (117 m³/s) 1045 hours Dec 22, gage height, 16 11 ft (4 910 m)
1940 to October 1978 Discharge, 9,200 ft³/s (261 m³/s) Sept 29, 1962, gage height, 17 50 ft (5 334 m)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 20			Dec. 21—Con			Dec 22—Con.		
1200	7 58	5.8	1800	13 87	1,530	2400	15.82	3,570
1800	7 45	3.9	2400	14.64	2,050	Dec.23		
2400	11.14	460				1200	14.70	2,060
			Dec. 22			2400	12 83	984
Dec 21			0300	15 08	2,480	Dec. 24		
0600	12.47	888	0700	15 99	3,880	1200	11 01	428
1200	13 15	1,160	1045	16.11	4,120	2400	9 77	174

(67) 09489075 East Fork Black River near Alpine, Ariz.
(U.S. Forest Service station)

Location --Lat 33°45'33", long 109°21'26", in SE¼NW¼ sec.12, T.4 S., R.28 E , Greenlee County, Hydrologic Unit 15060101162, on left bank 0.5 mi (0.8 km) upstream from confluence with West Fork Black River, 28 mi (45 km) southwest of Alpine, Ariz.

Drainage area --111 mi² (288 0 km²).

Gage-height record --Water-stage recorder tape and chart Altitude of gage is 7,515 ft (2,291 m) from topographic map.

Discharge record.--Stage-discharge relation for modified Woods Canyon flume defined by discharge measurements.

Maxima --November 1978 to March 1979· Discharge, 2,270 ft³/s (64.3 m³/s) 1140 hours Dec 18, gage height, 4.98 ft (1.518 m)
1968 to October 1978 Discharge, 3,720 ft³/s (105 m³/s) Oct. 20, 1972, gage height 8 04 ft (2 451 m) at site and datum then in use from slope-area measurement of peak discharge

Remarks.--Gage-height record and stage-discharge relation furnished by U.S. Forest Service, Apache-Sitgreaves National Forest

(67) 09489075 East Fork Black River near Alpine, Ariz —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec 18—Con			Dec 20—Con.		
2400	0.62	31 3	1945	4 30	1,680	1900	2 70	641
Dec 17			2200	4.00	1,440	2400	2.42	514
1045	.63	32.2	2400	3.90	1,370	Dec. 21		
1915	.78	50 0	Dec 19			1045	2.16	408
2215	1 00	83.3	0200	3.80	1,300	1245	2 22	430
2400	1 12	104	0500	3 94	1,400	1600	2.44	520
Dec 18			0900	3.50	1,100	1800	2 44	522
0315	1 74	259	1300	3 60	1,160	2400	2.26	444
0610	3.00	799	1545	3.56	1,140	Dec. 22		
0730	3.70	1,230	2400	3.10	855	0845	2 00	347
0945	4 30	1,680	Dec. 20			1045	2 04	361
1140	4.98	2,270	0815	2 55	572	1345	1.96	333
1400	4 56	1,890	1215	2 52	560	1630	1.83	288
1700	4.80	2,100	1730	2 70	643	2400	2.00	347

(68) 09489076 Burro Mountain Weir near Springerville, Ariz.
(U.S. Forest Service station)

Location --Lat 33°53'55", long 109°28'35", in SE¼ sec 22, T.6 N , R.27 E., Apache County, Hydrologic Unit 15060101, Apache National Forest, 1 mi (1.6 km) upstream from mouth, and 19 mi (31 km) southwest of Springerville

Drainage area.--1.14 mi² (2.95 km²).

Gage-height record.--Water-stage recorder tape and chart. Altitude of gage is 9,000 ft (2,743 m) from topographic map

Discharge record --Stage-discharge relation defined by computations of discharge over 120° v-notch weir

Maxima --November 1978 to March 1979 Discharge, 7.4 ft³/s (0 210 m³/s) 1515 hours Dec. 18, gage height, 1.23 ft (0.375 m)
1960 to October 1978: Discharge, 18.1 ft³/s (0 51 m³/s) Oct. 19, 1972, gage height, 1.78 ft (0.543 m)

Remarks --Gage-height record and stage-discharge relation furnished by U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station. Data for other small research watersheds in the area are available from the experiment station

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec. 18—Con.			Dec. 20		
0900	0 26	0 2	1800	1 19	6 8	0900	0 79	2 5
1800	29	.2	2000	1 15	6 2	1200	.78	2.4

(68) 09489076 Burro Mountain Weir near Springerville, Ariz.—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1977

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17—Con			Dec 18—Con			Dec. 20—Con		
2400	0 58	1 2	2400	1.11	5 7	2400	0 71	1 9
Dec 18			Dec 19					
0300	87	3 2	0600	1 04	4.9	Dec. 21		
0500	99	4 3	0700	1.04	4 9	0800	.67	1 7
0600	1 09	5.5	0800	1 01	4 5	2400	.61	1 3
0800	1 19	6 8	1200	97	4 1			
1000	1 21	7 1	1400	.95	3.9	Dec. 22		
1200	1 21	7 1	1500	.97	4.1	0800	59	1 2
1300	1 20	6 9	2000	90	3 4	2300	58	1 2
1515	1 23	7.4	2400	85	3.0	2400	52	.9

(69) 09489078 West Fork Black River near Alpine, Ariz.
(U S. Forest Service station)

Location --Lat 33°45'36", long 109°22'30", in SE¼NW¼ sec 11, T 4 N , R 28 E., Apache County, Hydrologic Unit 15060101162, on right bank, 1 mi (1.6 km) upstream from confluence with East Fork Black River, and 15 mi (24 km) southwest of Alpine

Drainage area --54 1 mi² (140 1 km²).

Gage-height record.--Water-stage recorder tape and chart Altitude of gage is 7,550 ft (2,300 m) from topographic map

Discharge record --Stage-discharge relation for modified Woods Canyon flume defined by discharge measurements.

Maxima --November 1978 to March 1979 Discharge, 1,150 ft³/s (32 6 m³/s) 1730 hours Dec 18, gage height, 4 58 ft (1.396 m)
1968 to October 1978 Discharge, 2,050 ft³/s (58 1 m³/s) Oct 20, 1972, gage height 5 90 ft (1 798 m), from slope-area measurement of peak flow

Remarks --Gage-height record and stage-discharge relation furnished by U S Forest Service, Apache-Sitgreaves National Forest

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec 18—Con.			Dec. 20		
0915	0 98	15.7	1345	4 31	976	0630	2 80	293
1045	1 01	17.1	1515	4 32	982	0900	2.62	244
1630	1 40	42.5	1730	4.58	1,150	1000	2 70	265
1750	1 45	46.9	1810	4 41	1,040	1230	2 66	254
2315	1 83	89.7	1945	4.11	855	1815	2.77	285
2400	2 00	115	2400	3 92	749	2400	2 39	189
Dec 18			Dec. 19			Dec 21		
0100	1 95	107	0045	3.95	744	0400	2.33	176
0345	2 21	152	0245	4 01	798	1215	2.36	182

(69) 09489078 West Fork Black River near Alpine, Ariz —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18—Con			Dec 19—Con			Dec 21—Con		
0500	2 41	193	0400	4.12	861	1630	2 55	226
0605	2 61	241	0815	3.81	692	2400	2 33	176
0830	3 21	429	1145	3.61	596	Dec 22		
1000	3 71	643	1504	3 46	529	1230	1 93	104
1245	4 21	914	2400	3 02	362	2400	1 92	103

(70) 09489086 Beaver Creek near Alpine, Ariz

Location --Lat 33°44'17", long 109°20'28", in SW¼SW¼ sec 34, T.4½ N , R 29 E., Greenlee County, Hydrologic Unit 15060101162, on right bank, on Forest Road 565, 1 mi (1 6 km) upstream from mouth, and 25 mi (40 km) southwest of Alpine

Drainage area --59 1 mi² (153 km²)

Gage-height record.--Water-stage recorder tape and chart Altitude of gage is 7,500 ft (2,290 m) from topographic map

Discharge record --Stage-discharge relation for modified Woods Canyon flume defined by discharge measurement

Maxima --November 1978 to March 1979· Discharge, 1,750 ft³/s (49 3 m³/s) 1800 hours Dec 18, gage height, 5 36 ft (1 634 m)
1968 to October 1978: Discharge, 2,490 ft³/s (70 5 m³/s) Oct 20, 1972, from computation of peak flow through culvert

Remarks --Gage-height record and stage-discharge relation furnished by U.S. Forest Service, Apache-Sitgreaves National Forest

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec 18—Con			Dec. 20—Con.		
2400	0 83	9 4	1130	3 99	762	1045	2.50	206
Dec 17			1800	5 36	1,750	1230	2.50	206
1030	77	7 6	2400	4 21	886	2400	2 11	128
1230	80	8 5	Dec 19			Dec. 21		
1600	1 32	34	0500	4 15	851	0630	2 02	114
1800	1 53	52	1220	3.66	599	1600	2.10	126
2145	1.56	55	1500	3.49	524	2100	2 00	110
2400	1 73	74	1630	3.53	541	2400	1 92	98
			1745	3 50	528	Dec. 22		
Dec 18			2400	3.00	343	0730	1.80	82
0400	1 96	104	Dec 20			1800	1.85	89
0800	2 98	337	0445	2.66	245	2400	1.75	76

(71) 09489089 Heifer Branch near Alpine, Ariz
(U.S Forest Service station)

Location --Lat 33°44'21", long 109°20'30", in SW¼NW¼ sec.34, T 4½ N., R.29 E , Greenlee County, Hydrologic Unit 15060101162, on left bank at mouth, and 25 mi (40 km) southwest of Alpine

Drainage area.--3 8 mi² (9 8 km²).

Gage-height record.--Water-stage recorder tape and chart except 2100 hours, Dec 20 to 1100 hours Dec 21, which was estimated. Altitude of gage is 7,550 ft (2,300 m) from topographic map.

Discharge record --Computed from formula for flow over 120° v-notch weir.

Maxima.--November 1978 to March 1979 Discharge, 67.5 ft³/s (1 91 m³/s) 1800 hours Dec. 18, gage height, 3.04 ft (0.927 m)
1967 to October 1978. Discharge, 158 ft³/s (4.47 m³/s) Oct. 20, 1972.

Remarks.--Gage-height record and discharge formula furnished by U S. Forest Service, Apache-Sitgreaves National Forest.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec. 17			Dec. 19			Dec. 21		
1030	0 35	0.3	0215	2 70	50.4	0300	1.30	8 4
1715	.73	2 0	0415	2.80	55 1	0600	1.32	8.7
2400	1 02	4 6	0545	2.78	54.2	1500	1 59	13 8
Dec 18			1630	2.34	35 5	1900	1.42	10.5
0830	1 66	15.3	2300	2.00	24.2	2400	1 31	8.6
1245	2.43	39 0	2400	1.96	23 0	Dec. 22		
1430	2.52	42.6				0800	1.13	6.0
1600	2 79	54.7	Dec. 20			1115	1.29	8.3
1800	3.04	67.5	0930	1.90	21.3	1215	1.29	8 3
1945	2 66	48 6	1245	1.78	18 2	1515	1.34	9 1
2330	2 77	53 7	1615	1 73	17 0	2115	1 19	6 8
2400	2.76	53.2	2400	1.38	9 8	2400	1.11	5.7

(72) 09489100 Black River near Maverick, Ariz

Location --Lat 33°42'27", long 109°26'48", in SW¼ sec.30, T 4 N , R.28 E., Apache County, Hydrologic Unit 15060101, in Apache National Forest, on right bank 1 0 mi (1.6 km) downstream from Fish Creek, 1 1 mi (1 8 km) upstream from Conklin Creek, and 6 mi (10 km) southeast of Maverick.

Drainage area.--315 mi² (816 km²).

Gage-height record.--Digital water-stage recorder tape Altitude of gage is 6,850 ft (2,088 m), from topographic map.

Discharge record.--Stage-discharge relation extended above 2,100 ft³/s (59 m³/s) on basis of slope-area measurement at gage height, 8 99 ft (2 740 m)

(72) 09489100 Black River near Maverick, Ariz —Continued

Maxima --November 1978 to March 1979: Discharge, 10,300 ft³/s (292 m³/s) 1315 hours Dec 18, gage height, 8.74 ft (2.664 m).
1962 to October 1978· Discharge, 11,100 ft³/s (314 m³/s) Oct. 20, 1972, gage height, 8 99 ft (2.740 m) present datum.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec 18—Con.			Dec 19—Con.		
1200	1.68	115	1400	8.32	9,060	1000	6 49	4,740
1800	1.99	186	1500	8.05	8,390	1400	6 08	3,990
2400	2.82	496	1600	8 27	8,920	1600	6.00	3,860
Dec 18			1800	8.63	9,960	2000	5.57	3,170
0200	3.08	635	1900	8 31	9,030	2400	5.08	2,480
0400	3 51	912	2000	7.89	7,890	Dec. 20		
0600	4 23	1,520	2100	7.57	7,080	0600	4 62	1,940
0700	4 58	1,890	2200	7.43	6,750	1200	4.31	1,600
0800	5 28	2,750	2400	7.26	6,350	1800	4.24	1,530
0900	6 03	3,910	Dec. 19			2400	4 02	1,330
1000	6 99	5,750	0200	7 05	5,880	Dec. 21		
1200	8 22	8,780	0400	7 26	6,350	1200	3.50	905
1300	8.67	10,100	0530	7.37	6,610	1900	3 76	1,100
1315	8.74	10,300	0600	7.30	6,440	2400	3 58	963

(73) 09489200 Pacheta Creek at Maverick, Ariz.

Location.--Lat 33°44'23", long 109°32'24", at corner of secs.28, 29, 32, 33, T 4½ N., R 27 E. (unsurveyed), Apache County, Hydrologic Unit 15060101, in Fort Apache Indian Reservation, on left bank 0 5 mi (0.8 km) southeast of Maverick.

Drainage area --14 8 mi² (38.3 km²)

Gage-height record --Digital water-stage recorder tape Altitude of gage is 7,850 ft (2,393 m), by barometer

Discharge record.--Stage-discharge relation for concrete control extended above 98 ft³/s (2.78 m³/s)

Maxima --November 1978 to March 1979. Discharge, 224 ft³/s (6.34 m³/s) 1545 hours Dec 18, gage height, 4.23 ft (1.289 m).
1957 to October 1978 Discharge, 323 ft³/s (9 15 m³/s) May 13, 1973, gage height, 4 36 ft (1 329 m)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec. 18—Con.			Dec. 19		
0900	2 62	2 8	1100	3.91	152	0400	3.93	156
1200	2 68	4.1	1300	4 07	192	1200	3 75	119
1800	2 90	12	1545	4.23	224	2400	3.49	76
2400	3 13	27	1700	4.11	203			
Dec. 18			2000	3.83	134	Dec 20		
0600	3 61	86	2200	3.80	128	1500	3 67	104
0900	3 94	147	2400	3 84	136	2400	3 50	78

(74) 09489500 Black River below pumping plant, near Point of Pines, Ariz

Location --Lat 33°28'36", long 109°45'48", in W½ sec 32, T 2 N , R.25 E. (unsurveyed), Graham County, Hydrologic Unit 15060101, in San Carlos Indian Reservation on left bank 0 9 mi (1 4 km) downstream from Phelps Dodge Corp. pumping plant, 1.3 mi (2.1 km) downstream from Freezeout Creek, 8 mi (13 km) northwest of Point of Pines.

Drainage area --560 mi² (1,450 km²)

Gage-height record --Digital water-stage recorder tape , record partially reconstructed because of erroneous punches. Altitude of gage is 5,725 ft (1,745 0 m), from topographic map

Discharge record.--Stage-discharge relation extended above 4,000 ft³/s (113 m³/s) on basis of a slope-area measurement at 9 5 ft (2 895 m)

Maxima --November 1978 to March 1979 Discharge, 12,400 ft³/s (351 m³/s) 0015 hours Dec 19, gage height, 14.8 ft (4.51 m).
1953 to January 1978 Discharge, 17,900 ft³/s (507 m³/s) Oct 19, 1972, gage height, 18 0 ft (5.49 m), from floodmarks

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec. 18—Con.			Dec. 19—Con		
2400	2 72	75	1400	9 50	5,170	0400	12 7	9,140
Dec. 17			1600	10 40	6,100	0600	11 7	7,740
0900	2 72	75	1800	12 90	9,420	0800	11 3	7,220
1200	2 87	107	1900	13 6	10,500	1100	11 7	7,740
2000	2 89	112	2000	13 0	9,560	1500	10.6	6,340
2400	2 94	124	2100	14 7	12,200	2400	9 2	4,730
Dec 18			2200	13 4	10,100	Dec 20		
0700	3 77	423	2400	13 7	10,600	1200	7 7	3,210
0900	4 93	1,060	Dec 19			2400	6.8	2,400
1000	5 60	1,480	0015	14 8	12,400	Dec 21		
1100	6 50	2,160	0100	13 5	10,300	1200	6.2	1,920
1200	7 95	3,460	0200	13 3	9,980	2400	5 9	1,690

(75) 09489700 Big Bonito Creek near Fort Apache, Ariz.

Location --Lat 33°40'02", long 109°50'46", in NE¼ sec.28, T.4 N , R.24 E. (unsurveyed), Apache County, Hydrologic Unit 15060101, in Fort Apache Indian Reservation, at downstream side of bridge, 1.9 mi (3 1 km) upstream from Tonto Creek, 3.7 mi (6 0 km) southeast of Chino Springs, and 12 mi (19 km) southeast of Fort Apache

Drainage area --119 mi² (308 km²)

Gage-height record.--Digital water-stage recorder tape Altitude of gage is 5,910 ft (1,801 m), by barometer

Discharge record --Stage-discharge relation extended above 600 ft³/s (17.0 m³/s) on basis of slope-area measurements at gage heights 7 11 and 7 77 ft (2 167 and 2.368 m)

Maxima --November 1978 to March 1979· Discharge, 4,510 ft³/s (128 m³/s) 1915 hours Dec 18, gage height, 9.04 ft (2 755 m).
1957 to January 1978 Discharge, 2,870 ft³/s (81.3 m³/s) Mar 3, 1978. Gage height, 9.09 ft (2.77 m) Mar. 1, 1978, result of backwater

(75) 09489700 Big Bonito Creek near Fort Apache, Ariz.—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Nov 24			Nov. 26			Dec. 18—Con.		
0700	2 16	37 9	1200	3.18	166	1800	8.64	3,910
0900	2 31	50	2400	2.96	129	1900	8 62	3,880
1200	3.01	137	Dec. 17			1915	9 04	4,510
1700	4 64	585	1200	2 01	34	2000	8.78	4,120
1800	4 62	577	2400	2 56	80	2200	8 23	3,390
2200	5 27	876				2300	7 65	2,740
2400	5 85	1,210	Dec. 18			2400	7 63	2,720
			0200	2 96	129	Dec. 19		
Nov 25			0400	3.84	315	0400	6.80	1,920
0015	5 95	1,280	0600	4.94	714	0500	7 14	2,230
0100	5 81	1,190	0800	5 94	1,270	0900	6.81	1,930
0600	5 09	785	1100	7.79	2,890	1200	6.40	1,600
1500	4.16	411	1200	7 65	2,740	1800	6 13	1,400
2400	3 67	271	1700	8 30	3,470	2400	5.70	1,120

(76) 09490500 Black River near Fort Apache, Ariz

Location.--Lat 33°42'46", long 110°12'40", in NW¼ sec 12, T 4 N , R 20 E (unsurveyed), Gila County, Hydrologic Unit 15060101, on downstream side of bridge, 5 mi (8 km) upstream from confluence with White River, and 14 mi (23 km) west of Fort Apache

Drainage area --1,232 mi² (3,191 km²)

Gage-height record --Digital water-stage recorder tape, except 0700 hours Dec 19 to 1100 hours Dec 20, which were reconstructed Altitude of gage is 4,345 ft (1,324.4 m), from river-profile map.

Discharge record --Stage-discharge relation extended above 8,900 ft³/s (250 m³/s) on basis of slope-area measurements at gage heights 14.70 and 22.33 ft (4.481 and 6.806 m).

Maxima --November 1978 to March 1979 Discharge, 40,200 ft³/s (1,140 m³/s) 2200 hours, Dec. 18, gage height, 24.05 ft (7.330 m).
1957 to October 1978. Discharge, 33,200 ft³/s (940 m³/s) Mar 2, 1978, gage height, 22 33 ft (6.896 m)
1912 to October 1978. Discharge, probably in excess of 50,000 ft³/s (1,420 m³/s) Jan 19, 1916, from correlation with Salt River near Chrysotile

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec. 19—Con.			Jan. 17—Con.		
1800	2 50	172	1200	19 40	23,300	1900	13.01	9,200
2000	2 76	226	1800	16.80	16,500	2100	15.48	13,600
2200	4 38	754	2400	14.60	11,900	2200	15 83	14,400
2400	6 54	1,960	Dec. 20			2400	15.56	13,800
Dec. 18			0600	12.7	8,720	Jan 18		
0400	9 36	4,460	1200	11 28	6,740	0300	14 23	11,200

(76) 09490500 Black River near Fort Apache, Ariz —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1977

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18—Con			Dec. 20—Con.			Jan 18—Con.		
0800	13 82	10,500	1800	10.16	5,360	0400	13.38	9,780
1200	18 80	21,600	2400	9 42	4,520	0600	11.83	7,470
1600	22 30	33,100	Jan 16			0800	10 83	6,170
1800	23 60	38,300	0700	3 02	316	1200	9.87	5,020
2000	23 62	38,400	1200	3 86	592	1800	9 23	4,320
2100	24 02	40,100	1800	4.91	1,050	2000	9 90	5,060
2200	24 05	40,200	2400	5.05	1,320	2200	10.43	5,680
2300	23 60	38,300				2400	10.05	5,230
2400	23.60	38,300	Jan. 17			Jan 19		
			0200	6.11	1,890	0500	8.99	4,080
Dec 19			0800	5.81	1,700	1300	7 40	2,620
0100	23 06	36,100	1200	6.01	1,820	1900	6.51	1,940
0200	22 10	32,400	1500	12.23	8,030	2400	6.20	1,740
0300	22 60	34,300	1600	13 47	9,930	Jan 20		
0400	22 10	32,400	1700	13.49	9,960	1200	5.45	1,280
0800	21.20	29,100	1800	13.19	9,480	2400	4.82	950

(77) 09491000 North Fork White River near McNary, Ariz

Location --Lat 34°02'47", long 109°44'02", in E½ sec.31, T.8 N., R 25 E. (unsurveyed), Apache County, Hydrologic Unit 15060102, in Fort Apache Indian Reservation, on left bank 1.9 mi (3 1 km) downstream from Paradise Creek and 7 mi (11 km) southeast of McNary.

Drainage area --66 mi² (171 km²), approximately

Gage-height record.--Digital water-stage recorder tape to 0630 hours Dec. 18. Datum of gage is 7,723 ft (2,354 0 m) National Geodetic Vertical Datum of 1929.

Discharge record --Stage-discharge relation extended above 470 ft³/s (13.3 m³/s).

Maxima --November 1978 to March 1979 Discharge, 1,060 ft³/s (30 0 m³/s) 0630 hours Dec. 18, gage height, 4 82 ft (1.469 m).
1945 to October 1978. Discharge, 1,290 ft³/s (36 5 m³/s) Sept. 19, 1946, gage height, 5 36 ft (1 634 m), from rating curve extended above 350 ft³/s (9 9 m³/s).

(78) 09492400 East Fork White River near Fort Apache, Ariz.

Location --Lat 33°49'20", long 109°48'50", in SE¼ sec.16, T 5 N , R 24 E. (unsurveyed), Apache County, Hydrologic Unit 15060102, in Fort Apache Indian Reservation, on left bank 600 ft (180 m) downstream from highway bridge, 0.1 mi (0.2 km) upstream from Rock Creek, and 10 mi (16 km) east of Fort Apache.

Drainage area --38.8 mi² (100 5 km²)

Gage-height record.--Crest stage only during flood period. Altitude of gage is 6,050 ft (1,844 m), by barometer.

(78) 09492400 East Fork White River near Fort Apache, Ariz —Continued

Discharge record --Stage-discharge relation extended above 290 ft³/s (8 21 m³/s)

Maxima --November 1978 to March 1979: Discharge, 751 ft³/s (21 3 m³/s) Dec. 18, 1978, gage height, 3.62 ft (1.103 m) from high-water mark in well.
1957 to October 1978: Discharge, 758 ft³/s (21.5 m³/s), revised, Aug. 3, 1967, gage height, 3.63 ft (1 106 m), revised, in well and about 5.0 ft outside.

(79) 09494000 White River near Fort Apache, Ariz

Location --Lat 33°44'11", long 110°09'58", in SE¼ sec.32, T.4½ N , R.21 E (unsurveyed), Gila County, Hydrologic Unit 15060102, in Fort Apache Indian Reservation, on right bank 2,200 ft (670 m) downstream from bridge, 4 5 mi (7.2 km) upstream from confluence with Black River, and 11 mi (18 km) west of Fort Apache.

Drainage area.--632 mi² (1,637 km²).

Gage-height record --Digital water-stage recorder tape except 1000 hours Dec. 19 to 1600 hours Dec 20, when gage-height graph was reconstructed Datum of gage is 4,365 99 ft (1,330 754 m) National Geodetic Vertical Datum of 1929.

Discharge record.--Stage-discharge relation extended above 4,100 ft³/s (120 m³/s) on basis of slope-area measurements at gage heights 9 8 and 15 71 ft (2 80 and 4.788 m)

Maxima --November 1978 to March 1979 Discharge, 14,600 ft³/s (413 m³/s) 2130 hours Dec 18, gage height, 15 71 ft (4 788 m) from high-water mark in well.
1957 to January 1978. Discharge, 8,670 ft³/s (246 m³/s) Aug. 12, 1971, from slope-area measurement of peak flow, gage height, 13 8 ft (4 21 m)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec. 18—Con			Dec 20		
1200	3 74	126	2400	12 96	9,510	0600	6 34	1,990
2200	3 74	126	Dec. 19			1200	6.04	1,790
2400	4 01	145	0100	12.25	8,420	2000	5.83	1,660
Dec 18			0300	11.10	6,800	2100	6 09	1,820
0500	4 76	458	0400	11.02	6,700	2400	5.90	1,710
0600	6 23	1,570	0500	10.00	5,420	Dec 21		
0700	6 96	2,220	0600	11 30	7,070	1200	5.08	1,230
1000	9 65	5,020	0630	11.50	7,340	1900	4.90	1,140
1400	13 97	11,200	0800	10 70	6,280	2400	4.95	1,160
1600	14 19	11,600	0900	10 82	6,440			
1800	14 95	12,900	1200	9 80	5,190	Dec 22		
2130	15 71	14,600	1800	7 65	3,010	1200	4.45	914
2300	14 10	11,400	2400	6.75	2,280	2400	4 39	851

(80) 09496500 Carrizo Creek near Show Low, Ariz.

Location.--Lat 33°59'09", long 110°16'52", in sec.24, T.7 N , R.19 E. (unsurveyed), Gila County, Hydrologic Unit 15060104, in Fort Apache Indian Reservation, on right bank 500 ft (152 m) upstream from U.S. Highway 60, 1 mi (2 km) downstream from Corduroy Creek, 23 mi (37 km) southwest of Show Low, and 24 mi (39 km) upstream from mouth.

Drainage area.--439 mi² (1,137 km²).

Gage-height record.--Fragmentary record from water-stage recorder and floodmarks, record estimated 0900 Dec. 18 to 2400 Dec. 20. Datum of gage is 4,750.53 ft (1,447.98 m) National Geodetic Vertical Datum of 1929.

Discharge record --Stage-discharge relation extended above 160 ft³/s (4.53 m³/s) on basis of current-meter measurements at 4,300 and 5,800 ft³/s (122 and 164 m³/s) and slope-area measurement at gage height 12.07 ft (3.679 m). Above 160 ft³/s (4 53 m³/s) rating is shaped through measurements by step-backwater analysis.

Maxima --November 1978 to March 1979: Discharge, 19,400 ft³/s (549 m³/s) 1600 hours Dec. 18, gage height, 15.1 ft (4.60 m) from floodmark.
1951 to October 1978: Discharge, about 23,000 ft³/s (650 m³/s) Dec. 30, 1965, gage height, 13.0 ft (3.96 m), from high water in well at site and datum then in use, from rating curve extended above 2,000 ft³/s (57 m³/s) on basis of slope-area measurement at gage height, 12.08 ft (3 682 m).

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec 18—Con.			Dec. 19—Con		
0600	2 07	57	0500	7 60	4,360	1200	10.0	8,120
1500	2.15	69	0900	9 5	7,300	1800	5.9	2,450
2200	2 35	106	1500	13.4	15,000	2400	4 85	1,540
2400	3 00	314	1600	15.1	19,400	Dec. 20		
			2000	14.85	18,800	0600	4.5	1,260
Dec 18			2400	13 5	15,300	1200	4 2	1,050
0200	5 46	2,050	Dec. 19			1800	4.0	918
0300	7 00	3,580	0600	11 5	10,900	2400	3.8	765

(81) 09497500 Salt River near Chrysotile, Ariz.

Location.--Lat 33°47'53", long 110°29'57", in sec.25, T 5 N., R.17 E. (unsurveyed), Gila County, Hydrologic Unit 15060103, in San Carlos Indian Reservation, on left bank 1,200 ft (366 m) upstream from U.S Highway 60, 5.7 mi (9.2 km) northeast of Chrysotile, 8 mi (13 km) upstream from Cibecue Creek, and 33 mi (53 km) downstream from confluence of Black and White Rivers.

Drainage area --2,849 mi² (7,379 km²).

Gage-height record.--Digital water-stage recorder tape. Datum of gage is 3,354.57 ft (1,022 473 m) National Geodetic Vertical Datum of 1929.

Discharge record --Stage-discharge relation defined by current-meter measurements

(81) 09497500 Salt River near Chrysotile, Ariz —Continued

Maxima --November 1978 to March 1979 Discharge, 70,400 ft³/s (1,990 m³/s) 1800 hours Dec. 18, gage height, 17.35 ft (5,288 m).
1906 to October 1978: Discharge, 74,000 ft³/s (2,100 m³/s), gage height, 18 ft (5.5 m) from floodmarks, from rating curve extended above 52,000 ft³/s (1,500 m³/s), occurred prior to 1924 probably on Jan 19, 1916.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec 19—Con			Jan. 17—Con		
0600	2 03	392	1800	11 49	26,300	0800	5.75	4,780
1200	2.00	375	2200	10 73	22,200	1000	7.45	9,150
2100	2 02	387	2400	10.48	21,000	1200	9 06	14,700
2200	2 06	410	Dec 20			1400	9.31	15,700
2300	2 88	969	0200	10 21	19,700	1600	10.01	18,800
2400	4 22	2,370	0600	9.51	16,600	1800	12.30	30,900
Dec 18			1200	8 80	13,700	2000	12.76	33,700
0400	4 66	2,970	1800	8 01	10,900	2115	12 99	35,100
0800	9 17	15,100	2400	7.31	8,730	2400	12.25	30,600
1000	10 49	21,100	Dec 21					
1200	12 50	32,100	0500	7.06	8,020	Jan. 18		
1400	14 51	45,700	1500	6 35	6,180	0200	12.09	29,700
1600	16.09	58,500	2400	5.89	5,050	0600	11 15	24,500
1700	16.57	62,900	Jan. 15			1200	8.97	14,300
1800	17.35	70,400	2400	2.55	727	2400	7.59	9,570
2300	16 98	66,700	Jan. 16			Jan. 19		
2400	16 78	64,800	1200	3 41	1,450	1200	6 86	7,480
Dec 19			2400	4 30	2,470	2400	5.67	4,640
0800	13 41	37,800	Jan. 17			Jan 20		
1000	13 12	35,900	0200	4.29	2,460	1200	4 94	3,390
1600	11.09	24,100	0600	4 66	2,970	2400	4.24	2,390

(82) 09497800 Cibecue Creek near Chrysotile, Ariz

Location --Lat 33°50'35", long 110°33'25", in E½ sec 8, T 5 N., R.17 E. (unsurveyed), Gila County, Hydrologic Unit 15060103, in Fort Apache Indian Reservation, on right bank 0 5 mi (0 8 km) upstream from mouth, and 7 mi (11 km) north of Chrysotile.

Drainage area.--295 mi² (764 km²).

Gage-height record --Digital water-stage recorder tape except on recession from peak of Dec 18, which was estimated. Altitude of gage is 3,200 ft (975 m), from topographic map.

Discharge record --Stage-discharge relation extended above 2,200 ft³/s (62 m³/s) on basis of slope-area measurements at gage heights 7.70, 10 50, and 17.3 ft (2.35, 3.20, and 5.27 m).

Maxima --November 1978 to March 1979 Discharge, 7,740 ft³/s (219 m³/s) 0900 hours Dec. 18, gage height, 10 20 ft (3 109 m)
1959 to October 1978 Discharge, 22,200 ft³/s (629 m³/s) Sept. 2, 1977, gage height, 17 3 ft (5 27 m)

(82) 09497800 Cibecue Creek near Chrysotile, Ariz.—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec 19			Jan. 16—Con.		
1400	2.18	38	0600	5 2	1,850	1800	3.86	661
1600	2 26	49	1200	4 8	1,360	2400	3.53	481
1800	3 01	232	1800	4.4	1,010			
2000	3 59	495	2400	4 1	789	Jan. 17		
2200	3 77	605				0500	3.42	430
2400	3 73	578	Jan. 16			0900	3 94	708
Dec 18			0000	2 12	48	1200	5.20	1,800
0200	4 07	795	0200	2 19	58	1400	9.42	6,740
0400	5 18	1,770	0400	2 50	115	1800	7.15	3,780
0600	6.81	3,530	0600	3 26	356	2200	5 48	1,970
0800	9 71	7,100	0700	3 90	684	2400	5.08	1,580
0900	10.20	7,740	0800	3 87	667	Jan 18		
1000	9 6	6,960	1000	3.70	572	0600	4.50	1,060
1200	8 6	5,690	1200	3 65	541	1200	4.14	780
1800	6.9	3,640	1400	4.06	789	1800	3.87	602
2400	5.9	2,560	1600	4.07	795	2400	3 66	481

(83) 09497850 Canyon Creek near Globe, Ariz

Location --Lat 33°49'47", long 110°39'50", in sec.17, T 6 N., R.16 E (unsurveyed), Gila County, Hydrologic Unit 15060103, on left bank 1.9 mi (3 1 km) upstream from mouth, 10 mi (16 km) northwest of Seneca, and 31 mi (50 km) north of Globe

Drainage area --316 mi^2 (818 km^2).

Gage-height record --Digital water-stage recorder tape from recorder driven by manometer Altitude of gage is 3,080 ft (940 m), from topographic map Record affected by drawdown from 0900 hours to 1800 hours Dec 18

Discharge record --Stage-discharge relation extended above 4,200 ft^3/s (119 m^3/s) on basis of slope-area measurement at 18.8 ft (5 73 m), outside stage. Discharge estimated during period of drawdown

Maxima --November 1978 to March 1979 Discharge, 22,700 ft^3/s (643 m^3/s) (revised) about 1715 hours Dec 18, gage height, 19.4 ft (5.913 m) from floodmark
1975 to October 1978 Discharge, 21,100 ft^3/s (598 m^3/s) Mar 1, 1978, gage height, 18 8 ft (5 73 m), from floodmark

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec 18—Con			Dec 20—Con		
1000	2 90	40	0400	10 55	5,440	0300	6 20	1,220
1800	3 06	60	0500	12 32	7,920	0400	6 36	1,320
1900	3 12	69	0600	13 56	9,950	0600	6 07	1,130
2000	3 59	156	0900	19 4	22,700	0700	6.13	1,170
2100	4 37	300	1200	-----	19,000	1200	5.79	952

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1977

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17—Con			Dec. 18—Con.			Dec. 20—Con.		
2200	6 25	1,250	1500	-----	14,000	2400	5 36	728
2300	7 81	2,480	1800	13.88	10,500	Dec. 21		
2330	9 50	4,180	2000	12 93	8,890	1200	4 95	531
2400	8.83	3,420	2200	11 48	6,680	2400	4 74	404
Dec. 18			2400	10 23	5,040	Dec. 22		
0100	9.49	4,170	Dec 20			1200	4.59	345
0200	9 32	3,990	0100	6.61	1,490	2400	4.38	298

(84) 09497980 Cherry Creek near Globe, Ariz.

Location --Lat 33°49'40", long 110°51'20", in SW¼ sec 30, T 6 N., R.15 E (unsurveyed), Gila County, Hydrologic Unit 15060103, in Tonto National Forest, on left bank 0 2 mi (0 3 km) upstream from Devils Chasm, 13 mi (21 km) upstream from mouth, and 30 mi (48 km) north of Globe

Drainage area --200 mi^2 (518 km^2).

Gage-height record --Crest stage only during flood periods. Recording station destroyed by flood of Jan 17, 1979. Altitude of gage is 3,200 ft (980 m), from topographic map

Maxima --November 1978 to March 1979 Discharge, 15,700 ft^3/s (445 m^3/s) Jan 17, from slope-area measurement of peak flow, gage height, 15 2 ft (4 63 m) from profile past gage site

1965 to October 1978· Discharge, 8,300 ft^3/s (235 m^3/s) Oct 19, 1972, gage height, 14 0 ft (4 27 m), from floodmarks, from rating curve extended above 330 ft^3/s (9.35 m^3/s) on basis of slope-area measurements at gage heights 5 85, 6 70, 8 70 and 12 3 ft (1.783, 2 042, 2.652, and 3.75 m)

(85) 09498500 Salt River near Roosevelt, Ariz

Location --Lat 33°37'10", long 110°55'15", in SE¼NE¼ sec 9, T.3 N , R 14 E (unsurveyed), Gila County, Hydrologic Unit 15060103, in Tonto National Forest on left bank 100 ft (30 m) downstream from State Highway 288, 0 3 mi (0 5 km) downstream from Pinal Creek, 14 mi (23 km) east of village of Roosevelt, and 17 mi (27 km) upstream from Roosevelt Dam.

Drainage area --4,306 mi^2 (11,153 km^2)

Gage-height record --Water-stage recorder graph. Datum of gage is 2,177 14 ft (663 592 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation defined by current-meter measurements

Maxima --November 1978 to March 1979 Discharge, 95,800 ft^3/s (2,710 m^3/s) 0130 hours Dec 19, gage height, 29 35 ft (8 946 m)

1906 to October 1978 Discharge, 117,000 ft^3/s (3,310 m^3/s) Mar 14, 1941 from rating curve extended above 55,000 ft^3/s (1,600 m^3/s) on basis of velocity-area studies and float-area measurements at 66,000 ft^3/s (1,870 m^3/s) and 102,000 ft^3/s (2,890 m^3/s). Gage height, 25.8 ft (7.86 m) Dec. 23, 1965

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec. 21			Jan. 17—Con.		
2400	10 40	3,470	0600	14 15	10,800	2100	21.40	41,700
Dec 18			1200	13 50	9,080	2400	22.20	46,100
0200	11 21	5,120	1800	13 12	8,070			
0330	13.74	11,400	2400	12 73	7,070	Jan. 18		
0500	15 58	16,700				0100	22.40	47,000
0730	18 24	26,600	Jan. 15			0500	20.65	37,800
0900	20 07	34,900	2400	8.56	908	1300	18.00	25,600
1000	21 34	41,400	Jan 16			1700	16.00	18,100
1200	24.20	58,100	0800	8 53	820	2000	15.30	15,800
1700	28 25	87,000	1200	8 65	908	2400	14.50	13,400
2100	29 08	93,600	1400	9 00	1,260	Jan. 19		
2230	29 20	94,600	1500	10 15	2,730	0400	14.00	11,900
2400	29.05	93,400	1600	10.68	3,580	0730	13.60	10,800
Dec 19			2200	11 06	4,330	1030	14.00	11,900
0130	29 35	95,800	2400	11 80	6,040	1130	14.10	12,200
0600	27 80	83,200				1230	14.00	11,900
1200	24 98	62,200	Jan 17			1600	13 25	9,840
1800	22 24	44,700	0600	11 50	5,400	2400	12.43	7,580
2400	19 74	31,800	0830	12 00	6,500			
Dec 20			1030	13.50	10,500	Jan 20		
0600	17 83	23,400	1200	15 80	17,400	0200	12 37	7,530
1200	16.24	17,400	1400	18.80	29,000	0700	11.97	6,550
1800	15 18	14,000	1500	20.90	39,100	1500	11 45	5,460
2400	14.44	11,700	1700	22 70	48,900	2200	11.00	4,470

(86) 09498508 Upper Parker Creek Watershed near Roosevelt, Ariz.
(U.S. Forest Service station)

Location --Lat 33°47'50", long 110°57'35", in NE¼NW¼ sec.7, T.5 N., R.14 E., Gila County, Hydrologic Unit 15060103, Tonto National Forest, 1.5 mi (2 41 km) upstream from confluence with Pocket Creek, and 12 mi (19 km) northeast of Roosevelt

Drainage area --1 09 mi² (2.82 km²).

Gage-height record.--Water-stage recorder tape and chart Altitude of gage is 5,440 ft (1,658 m)

Discharge record --Stage-discharge relation for 90° v-notch and Cippoletti weirs defined by model studies furnished by U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station

Maxima.--November 1978 to March 1979: Discharge, 64 ft³/s (1 81 m³/s) 1045 hours Jan. 17, gage height, 3.63 ft (1.106 m).
1934 to October 1978. Discharge, 270 ft³/s (7.65 m³/s) Dec. 23, 1945, gage height 5 91 ft (1 801 m)

Remarks --Data for other small research watersheds in this area are available from the experiment station.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec. 19			Jan 17—Con		
0915	0.72	1 1	0530	2.54	26	0630	2.62	28
1200	1 32	5 1	0930	1.86	12	0820	3.23	48
1400	2.38	22	1400	1.43	6.2	1045	3.63	64
1825	3 15	45	2400	1 32	5.1	1600	2 82	34
2100	3 36	53				2030	2 42	33
2200	3 00	40	Dec. 20			2400	2.18	19
2400	2 83	34	1200	1 42	6.1	Jan. 18		
			2400	1.28	4 7	1000	1.76	10
Dec 18			Jan 15			2400	1 53	7 4
0200	3 44	56	2400	67	9	Jan 19		
0245	3 45	56	Jan. 16			2400	1.28	4 7
0330	3 30	50	1800	1.02	2 7	Jan 20		
1000	2 84	35	2400	1.36	5 5	1000	1.20	4.0
1440	3 03	41	Jan. 17			1500	1 21	4.1
2400	2 71	31	0300	1 97	14	2400	1.18	3 9

(87) 09498550 Workman Creek near Roosevelt, Ariz.
(U.S. Forest Service station)

Location --Lat 33°49', long 110°56', in SW¼ sec.33, T.6 N , R 14 E., Gila County, Hydrologic Unit 15060103, 16 mi (26 km) northeast of Roosevelt

Drainage area.--1 70 mi² (4.40 km²).

Gage-height record.--Water-stage recorder Altitude of gage is 6,600 ft (2,012 m), from topographic map.

Discharge record.--Stage-discharge relation defined by model studies for Cippoletti weir Discharges furnished by U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station

Maxima --November 1978 to March 1979. Discharge, 204 ft³/s (5.78 m³/s) 1400 hours Dec. 18, gage height, 5 78 ft (1.762 m).
1938 to October 1978: Discharge, 289 ft³/s (8.184 m³/s) Oct 19, 1972, gage height, 6.64 ft (2 023 m).

Remarks --Data for other small research watersheds in this area are available from the experiment station.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec. 17			Dec. 18—Con.			Dec. 20—Con		
0345	0 56	0 6	1110	5 15	154	1200	1.45	6.4
0800	.64	8	1230	5 40	172	2400	1 17	3 8
1025	88	1 9	1300	5.41	174	Jan. 16		
1215	95	2 3	1400	5.78	204	2100	.65	.9

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec. 17—Con.			Dec. 18—Con.			Jan 16—Con.		
1500	1 51	8 3	1525	5 09	148	2400	.91	2 0
1655	2 13	17	1635	4.51	110	Jan. 17		
1815	2 51	28	1715	4 24	94	0300	.99	2 5
1945	2 93	37	1730	4 33	99	0700	1 90	13
2000	3.28	50	2030	3.65	55	0825	2.63	28
2140	3 55	50	2115	3.68	66	0905	3.31	51
2230	3 53	59	2325	3 24	48	1015	4.06	85
2400	3 45	56	2400	3.34	52	1100	4 21	93
			Dec. 19			1300	3.70	67
Dec 18			0100	3 65	65	1600	3 31	51
0100	3.55	65	0300	4 34	100	1900	2 94	38
0150	4 89	134	0400	3.97	80	2230	2.63	28
0230	5 09	148	0440	3.80	71	2400	2 48	24
0320	5 36	169	0510	3.84	73	Jan. 18		
0415	5 26	161	0900	3.21	47	0425	2.18	18 0
0500	5 24	159	1200	2.77	33	0900	1.95	13
0535	5 04	145	1700	2.39	22	1600	1 70	9.6
0625	5.21	158	2400	1.97	14	2400	1 51	7.1
0700	5 05	146				Jan. 19		
0835	4 66	119	Dec. 20			0910	1.38	5.6
0920	4 66	119	0400	1 76	10	2400	1.21	4.0

(88) 09498870 Rye Creek near Gisela, Ariz.

Location --Lat 34°01'57", long 111°17'26", in SW¼ sec.13, T.8 N., R.10 E., Gila County, Hydrologic Unit 15060105, in Tonto National Forest, on right bank, 0 5 mi (0 8 km) upstream from mouth, 0 8 mi (1.3 km) downstream from county road, and 4.8 mi (7.7 km) south of Gisela

Drainage area --122 mi^2 (316 km^2).

Gage-height record --Water-stage recorder graph in December, crest stage only in January. Altitude of gage is 2,730 ft (832 m) from topographic map

Discharge record --Stage-discharge relation extended above 1,100 ft^3/s (31 m^3/s) on basis of slope-area measurements at gage heights 9 0 and 14.1 ft (2 74 and 4.30 m), present datum

Maxima.--November 1978 to March 1979. Discharge, 5,230 ft^3/s (148 m^3/s) Jan. 17, gage height, 6 15 ft (1.875 m) from high-water mark in gage well
1963 to October 1978. Discharge, 44,400 ft^3/s (1,260 m^3/s) Sept. 5, 1970, gage height, 14 1 ft (4 30 m) in gage well and 18 7 ft (5.70 m) from profile past gage

(88) 09498870 Rye Creek near Gisela, Ariz.—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec 18—Con.			Dec 19—Con		
2000	0 61	6 0	1100	4 90	3,270	1030	3.01	1,180
2000?	80	55	1400	4.85	3,200	1200	2 96	1,150
2030	93	110	1500	4.95	3,340	1800	2.56	864
2130	1 31	128	1700	4 50	2,750	2400	2.28	692
2200	2 18	675	2000	3 70	1,860			
2400	3 06	1,280	2200	3.40	1,570	Dec. 20		
Dec 18			2400	3.52	1,680	1200	1.77	433
0200	4 90	3,270	Dec 19			1800	1.58	354
0300	4.75	3,070	0230	3.95	2,040	2400	1 44	301
0400	5 25	3,770	0300	3.65	1,740	Dec. 21		
0600	4.80	3,140	0830	3 11	1,260	1200	1 17	207
0900	4 80	3,140	0930	3 10	1,260	2400	1.02	159

(89) 09498900 Gold Creek near Payson, Ariz.
(Discontinued crest-stage station)

Location --Lat 33°00'10", long 111°21'30", in SW¼ sec.29, T.8 N., R 10 E., Gila County, Hydrologic Unit 15060105, on left bank at State Highway 87, 16 mi (26 km) south of Payson.

Drainage area --6 44 mi² (16.7 km²)

Gage-height record --Crest stage only Datum of gage is 3,470.58 ft (1,057.833 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation defined by computations of discharge through culvert

Maxima --November 1978 to March 1979. Discharge, 1,120 ft³/s (31 7 m³/s) Dec 18 or Jan 17, gage height, 6 72 ft (2 048 m)
1963 to October 1978 Discharge, 2,800 ft³/s (79 3 m³/s), gage height 11.94 ft (3.639 m) from profile of floodmarks

(90) 09499000 Tonto Creek above Gun Creek, near Roosevelt, Ariz

Location.--Lat 33°58'48", long 111°18'10", in SW¼NE¼ sec 2, T 7 N., R 10 E , Gila County, Hydrologic Unit 15060105, in Tonto National Forest, on left bank 600 ft (183 m) upstream from Gun Creek, 17 mi (27 km) upstream from high-water line of Roosevelt Lake, and 24 mi (39 km) northwest of Roosevelt.

Drainage area --675 mi² (1,750 km²)

Gage-height record.--Water-stage recorder graph. Datum of gage is 2,523 14 ft (769 053 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation defined by current-meter measurements.

(90) 09499000 Tonto Creek above Gun Creek, near Roosevelt, Ariz.—Continued

Maxima.--November 1978 to March 1979: Discharge, 61,400 ft³/s (1,580 m³/s), revised, 1100 hours Jan. 17, gage height, 17.0 ft (5 18 m), from high-water mark in gage well
1940 to October 1978: Discharge, 57,200 ft³/s (1,620 m³/s), revised, Mar. 2, 1978, gage height, 16 5 ft (5.029 m), from rating curve extended above 27,000 ft³/s (765 m³/s) on basis of slope-area measurement of peak flow.
Peak of January 1979 is probably the highest since at least 1905.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec 20			Jan 17—Con		
2400	3 50	55	0400	6.10	3,280	0400	6.4	4,980
Dec. 17			0800	5 85	2,810	0600	8.0	10,500
0600	3 52	59	1600	5 53	2,240	0700	10.0	18,600
1400	3 61	79	2400	5.33	1,920	0900	14.0	37,600
2000	3 80	141	Dec. 21			1000	16.0	49,100
2200	4 80	770	0800	5 10	1,600	1100	17 0	61,400
2400	5.90	2,300	1600	4.80	1,230	1200	16.9	55,100
			2400	4 68	1,110	1300	16.1	49,700
Dec 18			Dec. 22			1400	15.0	43,200
0100	7 00	4,710	1200	4.45	868	1500	13 5	34,900
0200	9 00	11,900	2400	4.25	724	1600	12 3	29,200
0400	10.45	18,800	Jan. 15			1800	11 2	24,200
0600	12.00	26,800	2400	3 17	144	2000	9.5	16,800
0900	14 20	38,700	Jan. 16			2100	8.9	14,300
1200	13 70	35,400	0600	3.20	155	2200	8 7	13,500
1600	13 40	33,900	1100	3.34	212	2300	8.2	11,600
2000	13.80	36,000	1400	3 66	400	2400	7 9	10,500
2200	11 00	21,800	1500	4 50	1,200	Jan.18		
2400	9.80	15,600	1600	5 35	2,610	0500	7.25	8,100
Dec. 19			1900	6.05	4,100	1200	6 65	6,100
0200	8.80	11,000	2100	7.2	7,530	1500	6.50	5,650
0900	8 80	11,000	2400	6.7	5,830	1700	6.10	4,200
1600	7.55	6,600	Jan. 17			1900	6.20	4,580
2400	6 50	4,040	0200	6 5	5,250	2400	6 10	4,200

(91) 09500100 Three Bar D Watershed near Roosevelt, Ariz
(U S. Forest Service station)

Location --Lat 33°42'55", long 111°18'15", in SE¼SE¼ sec.3, T 4 N., R.10 E., Gila County, Hydrologic Unit 15060105, 1 mi (1.6 km) upstream from confluence of Rock Creek and Fox Gulch, and 11 mi (18 km) northwest of Roosevelt.

Drainage area.--0 13 mi² (0.34 km²).

Gage-height record.--Water-stage recorder tape. Altitude of gage is 3,695 ft (1,126 m) from topographic map

Discharge record.--Stage-discharge relation for 90° v-notch weir defined by model studies. Discharge furnished by U.S Forest Service, Rocky Mountain Forest and Range Experiment Station

(91) 09500100 Three Bar D Watershed near Roosevelt, Ariz.—Continued

Maxima --November 1978 to March 1979· Discharge, 3 7 ft³/s (0 105 m³/s) 0035 hours Dec 18, gage height, 1.16 ft (0.354 m).
1963 to October 1978: Discharge, 99 ft³/s (2 80 m³/s) July 26, 1964.

Remarks.--Data for other small research watersheds in the area are available from the experiment station

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec. 18—Con			Jan. 17		
2400	0 15	0.02	0515	0.95	2.25	0600	0.94	2.15
Dec 17			0645	.89	1.88	0655	1.07	3.03
0605	15	.02	0835	1.04	2.82	0720	.96	2.28
1000	26	.09	1215	1 11	3 30	0745	1.09	3.14
1200	.43	.32	1355	1.07	3.00	0805	1.05	2 86
1400	53	.51	1805	.81	1.50	0820	1.13	3.44
1535	67	94	2100	78	1 34	0900	1.04	2 84
1740	.92	2.05	2400	.72	1.12	1200	.84	1.62
1810	87	1.80				1800	.70	1.03
1850	1 06	2 95	Dec. 19			2400	.65	.87
1905	1.08	3.06	0130	.84	1.63	Jan 18		
2020	.91	2.03	1205	.70	1.05	0205	.77	1.33
2200	88	1.86	2400	.55	.58	0500	.65	.88
2350	70	1 06				0700	.69	1 00
2400	74	1.19	Dec. 20			0800	67	.95
Dec 18			2400	45	.34	1025	.69	1.02
0030	1 04	2 84	Jan 15			1805	.64	.83
0035	1 16	3 71	2400	.30	.13	2050	.76	1.30
0125	92	2 08	Jan. 16			2400	.68	.99
0145	99	2 46	0405	36	.20	Jan 19		
0220	97	2 35	1200	.49	42	1200	61	.75
0305	1.13	3.45	2400	.58	.64	2400	.59	.68

(92) 09500500 Salt River at Roosevelt, Ariz.
(Former gaging station)

Location --Lat 33°40'30", long 111°09'30", in sec.20, T.4 N., R.12 E. (unsurveyed), Gila County, Hydrologic Unit 15060103, at Roosevelt Dam, about 0 5 mi (0 8 km) downstream from Tonto Creek, and 1 mi (1 6 km) west of Roosevelt.

Drainage area.--5,824 mi² (15,100 km²)

Discharge record.--Computed by U S Army Corps of Engineers, Los Angeles District on basis of change in contents of and outflow from Roosevelt Lake.

Maxima --November to March 1979: Discharge, 152,000 ft³/s (4,300 m³/s) about 2200 hours Dec 18.
1888 to October 1978. Discharge, known to be about 155,000 ft³/s (4,390 m³/s) Mar 1, 1978; computed on the basis of flood-routing studies

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec. 18—Con.			Dec 19—Con.		
0400	-----	1,000	1600	-----	114,000	2400	-----	50,300
0800	-----	1,000	1800	-----	131,000	Dec 20		
1200	-----	1,000	2000	-----	142,000	0600	-----	40,000
1600	-----	1,000	2200	-----	152,000	1200	-----	33,000
2000	-----	2,200	2400	-----	142,500	1800	-----	28,000
2400	-----	18,000	Dec. 19			2400	-----	24,000
			0400	-----	126,000	Dec. 21		
Dec 18			0800	-----	111,000	0600	-----	20,800
0400	-----	42,000	1200	-----	93,300	1200	-----	18,000
0800	-----	69,500	1600	-----	76,100	1800	-----	15,200
1200	-----	96,500	2000	-----	61,200	2400	-----	13,100

(93) 09501000 Reservoir system on Salt River at and below Roosevelt Dam, Ariz

Location --This system comprises four storage reservoirs created by four separate dams on Salt River. Roosevelt Lake, formed by Roosevelt Dam, in sec.20, T.4 N , R 12 E. (unsurveyed), Apache Lake, formed by Horse Mesa Dam, 17 mi (27 km) downstream from Roosevelt Dam, Canyon Lake, formed by Mormon Flat Dam, 27 mi (43 km) downstream from Roosevelt Dam, and Saguaro Lake, formed by Stewart Mountain Dam, 37 mi (60 km) downstream from Roosevelt Dam Hydrologic Unit 15060106.

Drainage area --6,211 mi^2 (16,086 km^2), at Stewart Mountain Dam

Gage-height record --Nonrecording gages read at intervals varying from once daily at 0800 hours during periods of low inflow to hourly during periods of high inflow

Cooperation --Records furnished by Salt River Valley Water Users' Association

Maxima --November 1978 to March 1979 Combined contents, 1,710,000 acre-ft (2,110 hm^3) 0300 hours to 0900 hours Mar. 29
1910 to January 1978 Combined contents, 1,764,000 acre-ft (2,180 hm^3) May 22, 1941.

Remarks --Total capacity of the four reservoirs to top of spillway gates is 1,755,000 acre-ft (2,160 hm^3), divided as follows Roosevelt Lake, 1,382,000 acre-ft (1,700 hm^3), Apache Lake, 245,000 acre-ft (302 hm^3); Canyon Lake, 58,000 acre-ft (71 5 hm^3), and Saguaro Lake, 70,000 acre-ft (86 3 hm^3) Dead storage negligible. Dams forming these reservoirs were completed as follows: Roosevelt, 1911 (enlarged 1924), Horse Mesa, 1927, Mormon Flat, 1926, and Stewart Mountain, 1930 Since 1910, spill over Roosevelt Dam because of capacity or near-capacity storage has occurred in 1915, 1916, 1917, 1920, 1941, 1965, 1966, 1968, 1973, 1979, and 1980 water years Reservoir contents reached 1,748,000 acre-ft in May 1979.

(94) Fish Creek above Lewis and Pranty Creek, near Tortilla Flat, Ariz.
(Miscellaneous site)

Location --Lat 33°31', long 111°18'30", (unsurveyed), Maricopa County, Hydrologic Unit 15060106, about 4 mi (6.4 km) southeast of Horse Mesa Dam, and 4 mi (6.4 km) northeast of Tortilla Flat

Drainage area --32.2 mi² (83.4 km²).

Maxima.--November 1978 to March 1979: Discharge, 2,650 ft³/s (75.0 m³/s) Dec. 18, from slope-area measurement of peak flow

Remarks --Tributary to Salt River downstream from Horse Mesa Dam

(95) Lewis and Pranty Creek near Tortilla Flat, Ariz
(Miscellaneous site)

Location --Lat 33°32'22", long 111°16'13", in Maricopa County, Hydrologic Unit 15060106, 150 ft (46 m) downstream from Arizona Highway Department maintenance yard, 2 4 mi (6 3 km) above mouth and 4 mi (6 4 km) northeast of Tortilla Flat

Drainage area --13 4 mi² (34 7 km²).

Maxima --November 1978 to March 1979 Discharge, 1,210 ft³/s (34 3 m³/s) probably Dec 18, from slope-area measurement
Peak of Aug 18, 1967 Discharge, 3,310 ft³/s (93 7 m³/s), from slope-area measurement of peak flow is probably the highest since at least 1960.

Remarks --Tributary to Fish Creek.

(96) 09501300 Tortilla Creek at Tortilla Flat, Ariz.
(Crest-stage station)

Location --Lat 33°31'38", long 111°23'13", in NW¼ sec.13, T 2 N , R.9 E. (unsurveyed), Maricopa County, Hydrologic Unit 15060106, 600 ft (180 m) upstream from State Highway 88 and Tortilla Flat store, and 3.7 mi (6 0 km) southeast of Mormon Flat Dam.

Drainage area --24 3 mi² (62 9 km²).

Gage-height record --Crest stage only Altitude of gage is 1,755 ft (535 m), from topographic map

Discharge record --Stage-discharge relation defined by computations of peak flow over weir

Maxima --November 1978 to March 1979 Discharge, 4,400 ft³/s (125 m³/s) Dec 18, gage height, 10 07 ft (3.069 m)
1942 to October 1978 Discharge, 7,500 ft³/s (213 m³/s) Sept. 1, 1971, gage height, 13 23 ft (4 033 m).

(97) 09502000 Salt River below Stewart Mountain Dam, Ariz

Location --Lat 33°33'10", long 111°34'33", in NW¼NW¼ sec.6, T 2 N., R 8 E (unsurveyed), Maricopa County, Hydrologic Unit 15060106, on left bank 3.5 mi (5.6 km) downstream from Stewart Mountain Dam, and 6 mi (10 km) upstream from Verde River

Drainage area --6,232 mi² (16,141 km²), of which 21 mi² (54 km²) is below Stewart Mountain Dam

Gage-height record --Water-stage recorder graph Supplemented by water-stage recorder tape. Operation was sporadic during flood period, and record is missing Dec 22-26 Altitude of gage is 1,370 ft (418 m), from topographic map

Discharge record --Stage-discharge relation in December extended above 14,900 ft³/s (422 m³/s) on basis of computation of flow over dam at gage height 22 4 ft (6.83 m). Stage-discharge relation in January and March extended above 11,000 ft³/s (312 m³/s) on basis of data furnished by Salt River Valley Water Users' Association on releases from Stewart Mountain Dam Discharges from 2400 hours Dec 19 to 0900 hours Dec 27 and during periods of no gage-height record in January are from release data in January

Maxima.--November 1978 to March 1979· Discharge, 65,000 ft³/s (1,840 m³/s) 1900-2200 hours Jan 18, gage height, 23 3 ft (7.10 m) from high-water mark in well.
1930 to January 1978 Discharge, 51,600 ft³/s (1,460 m³/s) Jan. 1, 1966, gage height, 22 4 ft (6.83 m), from floodmarks.
Outside period of record Peak discharge in January 1916 when a mean daily discharge of 50,000 ft³/s (1,420 m³/s) was released from Roosevelt Dam, may have exceeded the peak discharge of Jan 1, 1966

Remarks --Flow regulated by four reservoirs above station. (See sta 09501000).

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec. 29			Jan. 22—Con.		
2400	0 70	5	1100	5.60	3,340	1100	4.8	2,560
Dec 18			2300	5.62	3,370	1300	3 5	1,450
0500	2 14	218	2400	3.20	1,030	1500	3.60	1,200
0700	2 75	420	Dec. 30			1530	11.0	13,000
0900	2.60	366	0100	2 30	512	1800	12.4	16,500
1100	2.56	352	0500	1.38	163	2400	12.4	17,500
1130	4 80	1,670	1200	1.10	102	Jan 23		
1200	3 92	1,030	2400	.92	66	1400	12.3	16,200
1300	9 00	7,860				1500	11.0	13,000
1500	12 50	16,200	Jan. 15			2400	11.0	13,000
1800	15 40	24,900	2400	2.47	297	Mar. 27		
2100	18 15	34,500	Jan. 16			2400	8 78	8,600
2400	19 43	39,400	1600	2.47	297	Mar. 28		
			1730	2 05	178	0600	8 91	8,840
Dec. 19			2400	2 52	314	1030	9 07	9,130
0300	19 05	37,800				1700	9.12	9,210
0500	20 60	44,100	Jan 17			1900	9 90	10,700
0700	20 75	44,700	0300	2 55	325	2100	15 03	24,100
0900	22.2	51,000	0430	2.45	290	2400	20.53	48,600
2400	-----	50,000	0600	2 50	308	Mar. 29		
Dec. 20			1000	-----	400	0400	20 43	48,200
0500	-----	50,000	1200	-----	10,000	0500	20 10	46,500

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1977

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 20—Con			Jan 17—Con			Mar. 29—Con.		
0600	21 1	47,000	1500	-----	20,000	1100	19 80	45,000
1700	21.15	47,000	1700	16 0	28,000	1900	19.55	43,800
2400	20 94	47,000	1800	17.0	32,000	2000	17.80	35,200
Dec 21			2000	18.0	36,000	2300	17.80	35,200
0800	20 75	47,000	2100	19 5	43,500	Mar 30		
1630	20 4	47,000	2400	20.0	46,000	0100	14.95	23,800
1700	-----	30,000	Jan. 18			0800	15.02	24,100
2400	-----	30,000	0600	20 4	48,000	0900	17 80	35,200
			1200	20.8	50,000	2400	17.80	35,200
Dec. 22			1800	21 3	53,000	Mar. 31		
1800	-----	30,000	1900	23 3	65,000	0500	17.8	35,200
1800	-----	28,000	2200	-----	65,000	0545	15.0	24,000
2400	-----	28,000	2400	-----	63,000	0700	13 5	19,500
2400	-----	27,000	Jan. 19			1700	13.35	19,000
Dec 23			0200	-----	62,000	1900	12.60	17,000
1200	-----	27,000	0600	-----	60,000	2400	12.40	16,500
1200	-----	23,100	0900	21 8	56,000	Apr. 1		
1930	-----	23,100	1300	21.5	54,200	0800	12.08	15,700
1930	-----	5,000	1700	20.6	49,000	1500	11.22	13,600
Dec 24			2000	20 2	47,000	2400	10.30	11,500
2400	-----	5,000	2400	19.6	44,000	Apr. 2		
Dec 25			Jan 20			0500	9.85	10,600
1400	-----	5,000	0600	19 0	41,000	0600	8.90	8,820
1400	-----	3,500	1100	18.6	39,000	0800	8.82	8,680
2400	-----	3,500	1300	19 2	42,000	Apr. 3		
Dec. 26			1600	18.7	39,500	1200	7.40	6,120
0600	-----	3,500	2000	18.4	38,000	1300	9 90	10,700
0600	-----	3,290	2400	18.0	36,000	1400	10 20	11,300
1600	-----	3,260	Jan. 21			2400	9.85	10,600
1600	-----	2,780	0300	17 6	34,400	Apr 4		
2400	-----	2,780	0700	16.6	30,400	1100	9 50	9,900
			0800	17.0	32,000	1200	8.76	8,570
Dec. 27			1200	16.6	30,400	1600	8.81	8,660
0900	-----	2,780	1400	15.9	27,600	1800	7 38	6,090
0900	-----	2,320	1600	13 9	20,700	2400	7.75	6,750
1630	4.66	2,320	2400	14.2	21,600	Apr. 5		
1730	5 35	3,220				0500	8 06	7,310
			Jan. 22			1700	7.08	5,620
Dec 28			0900	14 4	22,200	2000	4 70	2,440
2400	5 35	3,220	1000	6 2	4,300	2400	4.66	2,390

(98) 09502800 Williamson Valley Wash near Paulden, Ariz

Location.--Lat 34°52'00", long 112°36'45", in SE¼SE¼ sec.7, T 17 N., R.3 W., Yavapai County, Hydrologic Unit 15060201, on left bank 3 6 mi (5 8 km) north of Simmons, and 8.5 mi (13 7 km) west of Paulden

(98) 09502800 Williamson Valley Wash near Paulden, Ariz.—Continued

Drainage area --255 mi² (660 km²).

Gage-height record.--Digital water-stage recorder tape Datum of gage is 4,455 ft (1,357 9 m) National Geodetic Vertical Datum of 1929.

Discharge record --Stage-discharge relation extended above 2,200 ft³/s (62 3 m³/s) on basis of slope-area measurements at gage heights 7.38, 8.22, and 8.93 ft (2.249, 2 505, and 2.722 m)

Maxima.--November 1978 to March 1979· Discharge, 4,890 ft³/s (138 m³/s) 1600 hours Dec 18, gage height, 7.28 ft (2.219 m)
1965 to October 1978. Discharge, 7,490 ft³/s (212 m³/s) Mar. 1, 1978, gage height, 8 22 ft (2 505 m)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec. 18—Con.			Dec. 19		
2400	2 43	5.8	0900	5.32	1,430	0300	5.30	1,410
			1000	5 19	1,290	0600	4 82	947
Dec. 18			1100	5.17	1,270	1200	4 23	510
0100	3 72	275	1300	5.67	1,860	1800	3 83	318
0200	3 96	373	1500	7.16	4,600	2400	3.68	261
0600	4 46	662	1600	7 28	4,890	Dec. 20		
0700	5 10	1,200	2000	7 00	4,230	1200	3.15	102
0800	5 33	1,440	2400	6 01	2,350	2400	3 00	72 8

(99) 09503700 Verde River near Paulden, Ariz

Location --Lat 34°53'40", long 112°20'32", in SW¼SW¼ sec 35, T 18 N , R 1 W , Yavapai County, Hydrologic Unit 15060201, in Prescott National Forest, on right bank 0.3 mi (0 5 km) upstream from Verde Valley Ranch, 7 mi (11 km) east of Paulden, 8 mi (13 km) upstream from Hell Canyon, 8 mi (13 km) downstream from Granite Creek, and 10 mi (16 km) downstream from Sullivan Lake.

Drainage area --2,530 mi² (6,550 km²), approximately (includes 373 mi² or 966 km² in Aubrey Valley Playa, a closed basin)

Gage-height record --Water-stage recorder tape. Altitude of gage is 4,117 ft (1,255 m), from topographic map.

Discharge record --Stage-discharge relation defined by current-meter measurements

Maxima --November 1978 to March 1979. Discharge, 5,700 ft³/s (161 m³/s) 0215 hours Dec 19, gage height, 8 78 ft (2 676 m).
1963 to January 1978: Discharge, 8,080 ft³/s (229 m³/s) Mar. 1, 1978, gage height, 9 66 ft (2 944 m)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec 19—Con			Dec. 21		
2400	2 37	29	1200	7 09	2,560	1200	4 39	403
Dec 18			1630	6 44	1,780	2400	4 02	283
1700	2 35	28	2200	7 20	2,710	Dec 22		
1800	4 59	482	2400	7 36	2,950	1200	3 61	182
2100	6 21	1,550	Dec 20			2400	3 45	151
2400	8 20	4,420	0600	6.75	2,130			
Dec 19			1200	6 02	1,380	Dec 23		
0215	8 78	5,700	1800	5 29	838	1200	3 24	117
0600	8 21	4,440	2400	4.92	633	2400	3 01	86

(100) 09503720 Hell Canyon near Williams, Ariz
(Discontinued station)

Location --Lat 35°09'40", long 112°12'33", in NW¼NW¼ sec 32, T 21 N , R 2 E , in Kaibab National Forest, on right bank, 6 mi (10 km) south of Williams

Drainage area --14 9 mi² (38 6 km²)

Gage-height record --Crest stage only from high-water mark in well of former gaging station Altitude of gage is 6,750 ft (2,057 m) from topographic map

Discharge record --Stage-discharge relation extended above 110 ft³/s (3.12 m³/s) on basis of slope-area measurement at 4.78 ft (1 457 m)

Maxima --November 1978 to March 1979. Discharge, 220 ft³/s (6 23 m³/s) probably Dec 18, gage height, 2 68 ft (0 817 m)
1966 to October 1978 Discharge, 1,080 ft³/s (30.6 m³/s) Nov. 25, 1965, and Mar.5, 1978, gage height, 4 78 ft (1 457 m)

(101) 09503750 Limestone Canyon near Paulden, Ariz
(Discontinued crest-stage station)

Location --Lat 34°58'48", long 112°24'05", in S½ sec 31, T. 19 N , R 1 W , Yavapai County, Hydrologic Unit 15060202, 1 3 mi (2 1 km) upstream from mouth, 1 5 mi (2 4 km) west of Drake, and 7 5 mi (12 0 km) northeast of Paulden

Drainage area --14 5 mi² (37 6 km²)

Gage-height record --Crest stage only Altitude of gage is 4,650 ft (1,420 m) from topographic map

Discharge record --Stage-discharge relation defined by computations of discharge through culvert

Maxima --November 1978 to March 1979 Discharge, 200 ft³/s (5 66 m³/s) Dec 18, gage height, 3 62 ft (1 103 m)
1969 to October 1978· Discharge, 4,100 ft³/s (116 m³/s), Aug 12, 1971, gage height, 1,651 ft (5 032 m)

(102) 09503800 Volunteer Wash near Bellemont, Ariz
(Discontinued station)

Location --Lat 35°09'00", long 111°53'50", in SE¼SE¼ sec.31, T 21 N , R.5 E , In Kaibab National Forest, on right bank, 7 mi (11 km) southwest of Bellemont, and 14 mi (22 km) west of Flagstaff

Drainage area --131 mi² (368 km²)

Gage-height record.--Crest stage only from high-water mark in well of former gaging station Altitude of gage is 6,820 ft (2,079 m) from topgraphic map

Discharge record --Stage-discharge relation extended above 400 ft³/s (2.27 m³/s) on basis of slope-area measurement of peak flow, at gage height 5 73 ft (1 75 m)

Maxima --November 1978 to March 1979 Discharge, 100 ft³/s (2.32 m³/s) Dec 18, gage height, 3 00 ft (0 914 m).
1965 to October 1978 Discharge, 2,300 ft³/s (65 1 m³/s), Mar 1, 1978, gage height, 6 55 ft (1 996 m)

(103) 09504000 Verde River near Clarkdale, Ariz.

Location --Lat 34°51'08", long 112°03'55", in NW¼SE¼ sec.17, T.17 N., R 3 E., Yavapai County, Hydrologic Unit 15060202, in Prescott National Forest, on left bank 1.7 mi (2 7 km) downstream from Sycamore Creek, and 5 6 mi (9 0 km) north of Clarkdale.

Drainage area.--3,520 mi² (9,120 km²), approximately (includes 373 mi² or 966 km² in Aubrey Valley Playa, a closed basin).

Gage-height record --Digital water-stage recorder tape after 1500 hours, Dec 18 Altitude of gage is 3,500 ft (1,070 m) from bench mark at gage

Discharge record --Stage-discharge relation defined by current-meter measurements Discharge during period of missing gage-height record estimated on basis of records for nearby streams

Maxima --November 1978 to March 1979. Discharge, 19,900 ft³/s (564 m³/s) 1900 hours Dec 18, gage height, 14 89 (4 538 m)
1915-21, 1965 to October 1978 Discharge, 50,600 ft³/s (1,430 m³/s) Feb 21, 1920, gage height, 19 1 ft (5 82 m), site and datum then in use, from rating curve extended above 2,500 ft³/s (71 m³/s) on basis of float-area measurement at 35,000 ft³/s (990 m³/s) Peak probably is the maximum since at least 1905

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec. 19			Dec 20—Con.		
2400	----	1,000	0300	12.03	13,000	2300	4.72	1,820
0400	----	11,000	0600	11 88	12,600	2400	4 57	1,720
0800	----	8,000	1100	10 12	8,640			
1200	----	9,000	1700	7 98	5,220	Dec 21		
Dec 18			2300	7 03	4,050	1200	3.67	1,070
1500	11 91	12,700	2400	7 18	4,230	2400	2.84	618
1700	13 87	17,500	Dec 20					
1800	14 39	18,700	0100	7 07	4,100	Dec 22		
1900	14 89	19,900	0300	7 23	4,270	0200	2 78	590

(103) 09504000 Verde River near Clarkdale, Ariz —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18—Con.			Dec. 20—Con.			Dec. 22—Con		
2000	14 60	19,200	0600	7.12	4,150	0400	2.87	633
2200	13 65	17,000	1200	6 12	3,020	0900	2.86	628
2400	13.08	15,600	2100	4.76	1,850	2400	2.33	415

(104) 09504400 Munds Canyon tributary near Sedona, Ariz
(Discontinued crest-stage station)

Location --Lat 34°55'20", long 111°38'40", in SW¼ sec.22, T.18 S., R 7 E , Coconino County, Hydrologic Unit 15060202, at Interstate Highway 17, 7 mi (11 km) northeast of Sedona.

Drainage area --1 19 mi² (2.85 km²).

Gage-height record.--Crest stage only Datum of gage is 6,485.72 ft (1,976.847 m) from Arizona Highway Department bench mark.

Discharge record --Stage-discharge relation defined by computations of discharges through culvert

Maxima --November 1978 to March 1979: Discharge, 275 ft³/s (7.79 m³/s) probably Dec. 18, gage height 7 17 ft (2 185 m)
1963 to October 1978: Discharge, 705 ft³/s (20.0 m³/s) Sept. 5, 1970, gage height, 11 10 ft (3 383 m), from high-water profile.

(105) 09504500 Oak Creek near Cornville, Ariz.

Location.--Lat 34°45'56", long 111°53'24", in NW¼SE¼ sec.23, T 16 N., R.4 E., Yavapai County, Hydrologic Unit 15060202, near left bank on downstream side of pier of county highway bridge, 0 2 mi (0 3 km) upstream from Page Springs, 4 mi (6 km) northeast of Cornville, and 15 mi (24 km) upstream from mouth.

Drainage area --357 mi² (925 km²)

Gage-height record --Water-stage recorder tape except 0800 hours to 2400 hours Dec 19 Altitude of gage is 3,470 ft (1,058 m), from topographic map

Discharge record --Stage-discharge relation extended above 11,000 ft³/s (312 m³/s) on basis of shape of previous rating. Discharges estimated for period of missing record

Maxima.--November 1978 to March 1979 Discharge, 25,100 ft³/s (711 m³/s) 0115 hours Dec. 19, gage height, 16 00 ft (4.877 m) in gage well, and 17.8 ft (5 425 m) outside from floodmarks
1940 to October 1978: Discharge, 24,700 ft³/s (700 m³/s) Sept. 5, 1970, gage height, 16.48 ft (5 023 m)
Outside period of record. Maximum stage since at least 1885, 23 ft (7.0 m) in March 1938, from floodmarks upstream from bridge

(105) 09504500 Oak Creek near Cornville, Ariz —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec 18—Con			Dec 18—Con		
0100	2 49	51	0900	12 99	14,300	2300	14 44	19,000
0700	2 48	50	1000	13 00	14,300	2400	15 45	22,900
2000	2 57	60	1200	11 25	9,690			
2100	4 74	707	1300	11 44	10,100	Dec. 19		
2200	5 81	1,380	1400	11 00	9,090	0115	16.00	25,100
2300	6 92	2,380	1500	12.00	11,600	0200	15 82	24,400
2400	7 74	3,280	1600	13 82	16,900	0400	13.39	15,600
Dec 18			1700	14 61	19,700	0600	10 43	8,000
0100	8 32	4,060	1800	14 61	19,700	0700	9.16	5,680
0200	9 68	6,340	1900	14 15	18,000	1000	-----	2,000
0400	10 50	7,980	2000	13 65	16,450	1400	-----	1,000
0600	10 80	8,630	2100	14 07	17,800	2000	-----	700
0700	11.18	9,520	2200	14 16	18,000	2400	-----	500

(106) 09505200 Wet Beaver Creek near Rimrock, Ariz

Location --Lat 34°40'29", long 111°40'17", in NW¼SW¼ sec 24, T 15 N , R 6 E , Yavapai County, Hydrologic Unit 15060202, in Coconino National Forest, on right bank 4 5 mi (7 2 km) northeast of Rimrock, and 5 7 mi (9 2 km) upstream from Red Tank Draw

Drainage area --111 mi² (287 km²)

Gage-height record --Digital water-stage recorder tape Altitude of gage is 4,020 ft (1,225 m), from topographic map

Discharge record --Stage-discharge relation for concrete control defined by current-meter measurements

Maxima --November 1978 to March 1979· Discharge, 7,560 ft³/s (214 m³/s) 1745 Dec 18, gage height, 12 38 ft (3 773 m)
1961 to October 1978 Discharge, 7,670 ft³/s (217 m³/s) Sept 5, 1970, gage height, 12 41 ft (3 783 m)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec. 18			Dec. 18—Con		
2400	3 50	21	0130	8.48	2,150	2300	11 39	5,590
Dec 17			0400	8.19	1,910	2400	11 52	5,830
0400	3 64	28	0500	8.65	2,300	Dec 19		
0500	3 81	40	0700	11.32	5,460	0100	10 94	4,920
0700	3 80	39	0900	10 69	4,580	0400	10 43	4,240
1200	3 71	33	1100	10.37	4,160	0600	9 78	3,460
1700	3 73	34	1300	10 77	4,680	1200	7 04	1,080
1900	4 16	79	1500	11 82	6,400	1400	6.65	843
2100	5 05	235	1700	12.00	6,760	1600	6.62	838
2200	5 64	405	1745	12 38	7,560	1800	6.74	894
2300	6 87	970	2000	11 44	5,680	2300	5.81	465
2400	7 76	1,570	2130	11 60	5,980	2400	5 69	423

(107) 09505220 Rocky Gulch near Rimrock, Ariz.
(U S. Forest Service Beaver Creek Watershed No 13)

Location --Lat 34°44'49", long 111°29'38", in SE¼NW¼ sec 27, T 16 N , R.8 E , Coconino County, Hydrologic Unit 150602, Forest Service 5th Code Watershed 189, Coconino National Forest, on headwaters of Rocky Gulch, and 7 mi (11 km) northeast of Rimrock

Drainage area --1 40 mi² (3 62 km²)

Gage-height record --Water-stage recorder tape Altitude of gage is 6,750 ft (2,060 m) from topographic map

Discharge record --Stage-discharge relation defined by laboratory rating for trapezoidal venturi flume Record furnished by U S Forest Service, Rocky Mountain Forest and Range Experiment Station

Maxima --November 1978 to March 1979 Discharge, 166 ft³/s (4 70 m³/s) 0415 hours Dec 18, gage height 2 75 ft (0 838 m)
1959 to October 1978. Discharge, 1,550 ft³/s (43 9 m³/s) Sept 5, 1970, gage height 4 91 ft (1 500 m) from slope-area measurement of peak flow

Remarks --Additional data for other small research watersheds in the area are available from the experiment station

(108) 09505255 Woods Canyon near Munds Park, Ariz.
(U.S Forest Service Beaver Creek Watershed No 19)

Location --Lat 34°51'14", long 111°36'07", in SW¼NE¼ sec 13, T 17 N , R 7 E., Coconino County, Hydrologic Unit 150602, 1 mi (1 6 km), upstream from confluence with Bar M Canyon, and 6 mi (9 7 km) southeast of Munds Park

Drainage area --18 9 mi² (48 9 km²)

Gage-height record --Water-stage recorder tape Altitude of gage is 6,475 ft (1,974 m) from topographic map.

Discharge record.--Stage-discharge relation for concrete flume defined by current-meter measurement and slope-area measurement at 7 9 ft (2.408 m) Record furnished by U S Forest Service, Rocky Mountain Forest and Range Experiment Station

Maxima --November 1978 to March 1979 Discharge, 3,200 ft³/s (90 6 m³/s) 2220 hours Dec 18, gage height, 7 00 ft (2 134 m)
1961 to October 1978. Discharge, 3,990 ft³/s (113 m³/s) Sept. 5, 1970, gage height 7.9 ft (2.408 m) from slope-area measurement

Remarks --Record published as "near Sedona" in WSP 2052

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec. 18—Con			Dec 19—Con		
2400	0 83	7 60	0700	5 30	1,770	1000	2 65	224
Dec 17			0900	4 91	1,480	1600	2.48	182
1040	1.05	14 3	1100	5 37	1,820	1800	2 28	141

(108) 09505255 Woods Canyon near Munds Park, Ariz —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17—Con			Dec 18—Con			Dec 19—Con		
1155	1 35	28 2	1400	5 69	2,070	2400	2 05	102
1700	2 58	206	1500	5 52	1,940	Dec 20		
2000	3 34	470	1530	5 51	1,930	0600	1 85	74 2
2200	3 85	752	2100	6 43	2,730	1200	1 82	71.6
2400	4 58	1,225	2220	7 00	3,200	1800	1.85	74 2
Dec 18			2300	6 76	3,000	2400	1 55	43 1
0100	4 67	1,290	2400	5 90	2,250	Dec 21		
0200	4 65	1,280	Dec 19			1200	1.51	40 0
0300	4 96	1,520	0100	4.97	1,530	2400	1.38	30 2
0400	5 79	2,160	0300	3.85	752	Dec. 22		
0455	6 28	2,590	0500	3 23	421	1200	1 28	2 43
0600	5 85	2,210	0800	2 81	268	2400	1.20	20 4

(109) 09505260 Bar M Canyon near Munds Park, Ariz
(U.S. Forest Service Beaver Creek Watershed No 20)

Location --Lat 34°51'42", long 111°36'18", in SE¼SW¼ sec 12, T 17 N , R 7 E , Coconino County, Hydrologic Unit 150602, 1 mi (1.6 km) upstream from confluence with Woods Canyon and 6 mi (9 7 km) southeast of Munds Park

Drainage area --25 6 mi² (66 2 km²).

Gage-height record --Water-stage recorder tape Altitude of gage is 6,380 ft (1,945 m) from topographic map

Discharge record --Stage-discharge relation for concrete flume defined by discharge measurements and slope-area measurements above 3 5 ft (1.07 m) Record furnished by U.S Forest Service Rocky Mountain Forest and Range Experiment Station.

Maxima --November 1978 to March 1979· Discharge, 4,210 ft³/s (119 m³/s) 2225 hours Dec 18, gage height, 8 77 ft (2 673 m) from slope-area measurement of peak flow.
1961 to October 1978. Discharge, 4,100 ft³/s (116 m³/s) Sept 5, 1970

Remarks --Record published as "near Sedona" in WSP 2052.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec. 18—Con.			Dec. 19—Con.		
2400	0 61	3 98	0900	5.85	2,080	0330	5 33	1,780
			1200	7.05	2,860	0600	4.38	1,270
Dec 17			1330	7.98	3,520	0900	3.65	811
1045	89	11 1	1600	7 65	3,280	1200	3.19	508
1800	2 54	232	1800	8 31	3,780	2000	2 52	226
2400	4 09	1,130	1900	8 17	3,670	2400	2.30	171

(109) 09505260 Bar M Canyon near Munds Park, Ariz —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18			Dec. 18—Con.			Dec. 20		
0300	4 71	1,440	2225	8 86	4,210	0200	2.30	171
0400	5 93	2,130	2400	7.53	3,190	1140	2 02	115
0445	6 36	2,400	Dec 19			1645	2.31	173
0700	5 57	1,910	0200	6.10	2,230	2400	2 07	124

(110) 09505326 Beaver Creek Watershed No. 15 near Munds Park, Ariz
(U.S Forest Service station)

Location.--Lat 34°54'15", long 111°36'14", in NW¼NE¼ sec 36, T 18 N , R 7 E., Coconino County, Hydrologic Unit 150602, Forest Service 5th Code Watershed 188, Coconino National Forest, 0 3 mi (0 5 km) upstream from confluence with T-Six Canyon, and 3 mi (4 8 km) southeast of Munds Park

Drainage area --0 25 mi² (0.65 km²).

Gage-height record --Water-stage recorder tape Altitude of gage is 6,720 ft (2,050 m) from topographic map

Discharge record.--Stage-discharge relation defined by laboratory rating of trapezoidal venturi flume Record furnished by U S. Forest Service, Rocky Mountain Forest and Range Experiment Station

Maxima --November 1978 to March 1979 Discharge 62 ft³/s (1 76 m³/s) 0355 hours Dec 18, gage height, 1 85 ft (0 564 m)
1962 to October 1978 Discharge, 84 ft³/s (2 38 m³/s) Sept 5, 1970

Remarks --Additional data for other small research watersheds in the area are available from the experiment station

(111) 09505300 Rattlesnake Canyon near Rimrock, Ariz.

Location --Lat 34°46'01", long 111°40'23", in NW¼SW¼ sec 24, T 16 N , R.6 E , Yavapai County, Hydrologic Unit 15060202, in Coconino National Forest, on left bank 2.6 mi (4 2 km) upstream from mouth, 7 mi (11 km) northeast of Beaver Creek Ranger Station, and 9 mi (14 km) northeast of Rimrock

Drainage area.--24 6 mi² (63 7 km²).

Gage-height record --Digital water-stage recorder tape. Altitude of gage is 4,870 ft (1,484 m), from topographic map

Discharge record.--Stage-discharge relation for concrete control extended above 1,100 ft³/s (31 m³/s) on basis of computation of peak flow over weir at gage height 8.50 ft (2 591 m) and slope-area measurement at gage height 11.50 ft (3.505 m).

(111) 09505300 Rattlesnake Canyon near Rimrock, Ariz.—Continued

Maxima --November 1978 to March 1979. Discharge, 2,850 ft³/s (80.7 m³/s) 2200 hours Dec 18, gage height, 10 94 ft (3.335 m).
1957 to October 1978: Discharge, 3,590 ft³/s (102 m³/s) Sept 5, 1970, gage height, 11 50 ft (3 505 m)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec. 16			Dec 18—Con			Dec 19		
2400	2 98	20	0500	10 20	2,250	0100	9.22	1,710
Dec 17			0515	10 17	2,230	0200	8 01	1,100
1100	2 98	20	0730	8 00	1,070	0600	6.99	733
1245	3 51	53	0845	7 61	919	1100	5.06	247
1330	4 59	168	1100	8 05	1,090	1700	4 90	224
1600	4 67	180	1245	7 82	998	2000	4 29	134
2000	6 86	677	1400	8 75	1,420	2400	4 14	116
2130	7.16	766	1700	8 91	1,510			
2230	7 58	908	2000	9.84	2,030			
2400	8.78	1,440	2100	10 10	2,190	Dec. 20		
Dec 18			2200	10 94	2,850	0600	4.00	102
0200	7 71	956	2245	10 77	2,700	1200	3 64	68
0245	7 58	908	2315	10 86	2,780	1800	3 91	93
0345	8 34	1,220	2400	10.25	2,290	2400	3 53	59

(112) 09505350 Dry Beaver Creek near Rimrock, Ariz

Location --Lat 34°43'43", long 111°46'30", in NE¼NW¼ sec 1, T 15 N., R 5 E., Yavapai County, Hydrologic Unit 15060202, in Coconino National Forest, on left upstream abutment of abandoned highway bridge, 400 ft (122 m) upstream from State Highway 179, and 5 5 mi (8 8 km) north of Rimrock.

Drainage area --142 mi² (368 km²)

Gage-height record --Digital water-stage recorder tape. Datum of gage is 3,694.38 ft (1,126 047 m) National Geodetic Vertical Datum of 1929 (Arizona Highway Department bench mark)

Discharge record --Stage-discharge relation for concrete weir in bridge opening extended above 6,000 ft³/s (170 m³/s) on basis of computations of peak flow over weir at gage heights 9 07 and 9 69 ft (2 765 and 2 954 m), slope-area measurement at gage height 14.35 ft (4 374 m), and contracted opening measurement at 12 53 ft (3 819 m).

Maxima --November 1978 to March 1979· Discharge, 17,300 ft³/s (490 m³/s) 2230 hours (revised) Dec 18, gage height, 12 20 ft (3 67 m).
1960 to October 1978 Discharge, 26,600 ft³/s (753 m³/s) Sept. 5, 1970, gage height, 14 35 ft (4 374 m)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec 18—Con			Dec 18—Con.		
2400	2 78	23	0715	9 12	8,090	2145	11 44	14,600
Dec 17			0830	8 07	5,830	2230	12 20	17,300
1500	2 94	44	1030	8 06	5,810	2300	11 95	16,400
1530	4 14	473	1230	8.74	7,230	2400	11 29	14,100
1900	5 68	1,880	1330	8 68	7,100			
2315	7 16	4,074	1445	9.33	8,600	Dec. 19		
2400	7.74	5,150	1700	9 20	8,290	0015	11.14	13,700
			1800	9 76	9,710	0030	11.1	13,600
Dec 18			1845	11 6	15,200	0115	10.0	10,400
0015	7 82	5,310	1915	11 54	15,000	0300	8.47	6,660
0100	8.04	5,760	1930	11.74	15,700	0445	7.49	4,670
0200	8 04	5,760	1945	11 76	15,700	0800	6 03	2,320
0230	7 86	5,390	2000	11.34	14,300	1000	5 29	1,440
0415	8 04	5,760	2045	11 2	13,900	1200	4.94	1,090
0600	10 12	10,700	2115	11.69	15,500	1800	4.54	747

(113) 09505550 Verde River below Camp Verde, Ariz

Location --Lat 34°33'02", long 111°51'02", in SW¼NW¼ sec 5, T.13 N , R 5 E., Yavapai County, Hydrologic Unit 15060203, on downstream side of bridge on county highway, 0.5 mi (0 8 km) southeast of Camp Verde, and 2.2 mi (3 5 km) downstream from Beaver Creek.

Drainage area --4,670 mi² (12,100 km²), approximately (includes 373 mi² or 966 km² in Aubrey Valley Playa, a closed basin).

Gage-height record --Digital water-stage recorder tape except 0030 to 0400, Dec 19, when float was against floor of recorder shelter; record reconstructed on basis of high-water mark in shelter Datum of gage is 3,045 10 ft (948 148 m) National Geodetic Vertical Datum of 1929.

Discharge record --Stage-discharge relation defined by current-meter measurements.

Maxima --November 1978 to March 1979 Discharge, 55,000 ft³/s (1,560 m³/s) about 0200 hours Dec 19, gage height, 21 27 ft (6.483 m) from high-water mark in recorder shelter
1970 to October 1978· Discharge, 43,000 ft³/s (1,220 m³/s) Sept 5-6, 1970, gage height, 19 5 ft (5 94 m) from profile past gage site.
Outside period of record A peak discharge of 97,000 ft³/s (2,750 m³/s) was recorded at former gaging station at site 8 5 mi (13 7 km) downstream (below West Cear Creek) on Mar 3, 1938, and is the highest since at least 1924

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec 18—Con			Dec 19—Con		
2400	4 48	247	1230	15.88	27,300	2400	11 29	9,710
Dec 17			1700	16.56	30,500	Dec. 20		
0600	4 44	236	2000	18 02	37,900	0600	10 34	7,270

(113) 09505550 Verde River below Camp Verde, Ariz.—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec. 17—Con			Dec. 18—Con.			Dec 20—Con		
1200	4 44	236	2200	18 67	41,200	1200	9.96	6,570
2100	4 51	258	2400	19.75	46,800	2400	8.56	4,240
2400	6 22	1,320	Dec. 19			Dec. 21		
Dec 18			0200	21.27	55,000	1200	7.79	3,130
0100	8 01	3,440	0400	19 83	47,200	2400	6.91	2,020
0200	9 24	5,320	0700	18.60	40,800	Dec. 22		
0400	10 78	8,320	0900	17.05	32,900	1200	6 59	1,670
0600	12 15	12,300	1100	15 46	25,400	2400	6 21	1,310
0800	13 38	16,600	1200	14 77	22,300	Dec 23		
1000	16 26	29,100	1800	12.62	13,900	1200	6 00	1,120
1045	16.40	29,700	2100	11 84	11,300	2400	5 67	864

(114) 09505800 West Clear Creek near Camp Verde, Ariz.

Location --Lat 34°32'19", long 111°41'36", in NW¼NW¼ sec.11, T 13 N , R.6 E , Yavapai County, Hydrologic Unit 15060203, in Coconino National Forest, on left bank at Bull Pen Ranch, 9 mi (14 km) upstream from mouth, and 9 mi (14 km) east of Camp Verde

Drainage area --241 mi² (624 km²).

Gage-height record --Digital water-stage recorder tape to 1900 hours, Dec 18 Altitude of gage is 3,630 ft (1,106 m) from topographic map

Discharge record --Stage-discharge relation extended above 2,700 ft³/s (60 m³/s) on basis of slope-area measurements at gage heights 8 3 and 10 15 ft (2 53 and 3 094 m) Discharge for period of missing gage-height record estimated on basis of records for nearby stations

Maxima --November 1978 to March 1979 Discharge, 22,400 ft³/s (634 m³/s) 1830 hours Dec 18, gage height, 11 6 ft (3.54 m) from high-water mark in well.
1964 to October 1978 Discharge, 13,800 ft³/s (391 m³/s) Mar 1, 1978, gage height, 10 15 ft (3 094 m)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec 18			Dec 18—Con		
2400	2.92	38.5	0100	6 23	2,000	1830	11.6	22,400
Dec 17			0300	6 10	1,850	2400	-----	13,100
0300	2 97	43.4	0500	7 33	3,990	Dec 19		
0700	2.93	39.7	0700	8 54	7,250	1200	-----	5,900
1300	2 93	39 7	0900	8 25	6,340	2400	-----	2,900
2000	3 51	122	1500	10 00	13,100	Dec. 20		
2100	3 64	149	1600	11.22	19,800	0700	-----	2,100
2200	4 24	328	1700	11 52	21,900	1500	-----	1,700
2400	6 04	1,770	1800	11 47	21,500	2400	-----	2,100

(115) 09507980 East Verde River near Childs, Ariz

Location --Lat 34°17'00", long 111°38'50", in sec.21, T.11 N., R.7 E. (unsurveyed), Gila County, Hydrologic Unit 15060203, in Tonto National Forest, on left bank 1.3 mi (2.1 km) upstream from mouth, and 6 mi (10 km) southeast of Childs

Drainage area --328 mi² (850 km²)

Gage-height record.--Water-stage recorder graph Altitude of gage is 2,500 ft (760 m), from topographic map

Discharge record.--Stage-discharge relation extended above 960 ft³/s (27 m³/s) on basis of slope-area measurements at gage heights 8.82 and 19.2 ft (2.688 and 5 85 m)

Maxima --November 1978 to March 1979. Discharge, 11,600 ft³/s (329 m³/s) 1330 hours Jan 17, gage height, 13 45 ft (4.100 m).
1961 to October 1978 Discharge, 23,500 ft³/s (666 m³/s) Sept 5, 1970, gage height, 19 2 ft (5 85 m), from profile past gage.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec. 19			Jan 17—Con		
2400	2 84	37	0100	7 76	4,220	1130	13 36	11,400
Dec 17			0400	7.58	4,080	1200	12 19	9,740
1700	2 89	44	0700	8 19	4,740	1330	13 45	11,600
2100	3 00	62	0900	7.31	3,800	1500	11 25	8,420
2200	5 00	968	1200	6 50	3,000	1700	9 78	6,510
2300	5 29	1,180	1800	5.71	2,280	1800	8.99	5,530
2400	5 78	1,560	2400	4 98	1,680	2000	8 09	4,500
			Dec 20			2200	7.22	3,570
Dec 18			0600	4 25	1,140	2400	6 50	2,860
0200	6 22	1,930	1200	3 90	909	Jan 18		
0300	7 93	3,540	1800	3 57	712	0800	5 73	2,160
0400	9.42	5,150	2400	3.40	639	0600	5.30	1,790
0600	10.30	6,220	Jan 15			1100	5 03	1,580
0800	12.53	9,480	2400	1 80	44	1500	5 30	1,790
0815	12 62	10,300	Jan. 16			1800	5.60	2,040
0900	12 22	9,780	1200	1.86	52	2100	6.38	2,740
1000	11 43	8,700	1600	2 41	167	2400	5 68	2,110
1400	11 53	8,830	2100	3 69	764			
1600	12 37	9,990	2400	4.15	1,050	Jan .19		
1700	11 92	9,360	Jan 17			0600	4 88	1,460
1900	11 22	8,420	0300	5.00	1,680	1200	4 37	1,080
2100	10 00	6,860	0600	7 51	3,980	1800	4 18	954
2400	8 05	4,580	0900	11.00	8,140	2400	4 03	853

(116) 09508000 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), Yavapai County, Hydrologic Unit 15060203, on right bank 2 5 mi (4 0 km) downstream from East Verde River, and 15 mi (24 km) southwest of Pine.

(116) 09508000 Verde River below East Verde River near Pine, Ariz —Continued

Drainage area --5,623 mi² (14,560 km²), approximately (includes 373 mi² or 966 km² in Aubrey Valley Playa, a closed basin)

Gage-height record.--Water-stage recorder graph. Datum of gage is 2,401 6 ft (732.0 m) National Geodetic Vertical Datum of 1929.

Discharge record --Stage-discharge relation extended above 40,000 ft³/s (1,130 m³/s)

Maxima --November 1978 to March 1979 Discharge, 79,400 ft³/s (2,250 m³/s) 0645 hours Dec 19, gage height, 26 07 ft (7 946 m).
1924 to January 1978· Discharge, 110,000 ft³/s (3,115 m³/s) Mar 3, 1938, gage height, 24 7 ft (7 52 m), from rating curve extended above 27,000 ft³/s (765 m³/s), on basis of slope-area measurement of peak flow, verified by comparison with records for other stations on Verde River

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec 20			Jan 17—Con		
2400	5 57	400	0600	12 10	12,800	1800	16 04	26,600
Dec 17			1200	11 18	10,400	2400	13 08	15,600
0700	5 57	400	1330	11 20	10,200	Jan 18		
2000	5 66	490	1800	10 65	8,860	0530	11 50	11,200
2300	5 83	639	2400	10 27	7,970	0800	11 43	11,000
2400	7 80	3,140	Dec 21			1015	11 18	10,400
Dec 18			0500	9.38	6,050	1330	11.18	10,400
0130	9 04	5,360	1400	9 13	5,530	1530	11 48	11,100
0245	9 32	5,920	2400	8 58	4,480	1730	11 18	10,400
0400	11 20	10,400	Dec 22			2100	11.58	11,400
0500	12 00	12,600	1130	8 07	3,580	2400	11.26	10,600
0700	13 22	16,000	1500	8 03	3,510			
0900	17 00	31,000	2400	7 76	3,070	Jan. 19		
1000	16 90	30,600	Jan 15			0400	11.08	10,100
1130	18 40	37,500	2400	5 72	536	0900	11.70	11,700
1330	20 80	49,500	Jan 16			1600	9.65	6,540
1600	23 52	64,300	1500	5 74	545	2400	9 33	5,880
1900	24 18	68,100	1800	5 96	739	Jan. 20		
2400	24 20	68,200	2200	7 19	2,190	0600	9.13	5,480
Dec 19			2400	7.18	2,170	1200	8.84	4,910
0130	24 10	67,600	Jan. 17			1800	8 64	4,540
0400	24 82	71,900	0045	7 35	2,420	2400	8 40	4,100
0645	26 07	79,400	0230	7 60	2,790	Jan 21		
0800	25 07	73,400	0400	8 70	4,670	0600	8 22	3,790
0900	24 20	68,200	0530	11 00	9,650	1200	8 12	3,620
1000	23 17	62,400	0700	12 80	14,800	1600	8.09	3,560
1230	21 00	50,500	1000	15 50	24,300	2400	7.88	3,220
1430	19 13	41,200	1200	15 87	25,900			
1700	17.10	31,400	1300	16 96	30,700	Jan 22		
2000	15 28	23,400	1330	17 30	32,400	1200	7.70	2,930
2400	13 66	17,400	1530	17.09	31,400	2400	7 63	2,820

(117) 09508300 Wet Bottom Creek near Childs, Ariz

Location --Lat 34°09'39", long 111°41'32", in sec 36, T 9½ N., R 6 E (unsurveyed), Gila County, Hydrologic Unit 15060203, in Tonto National Forest, on right bank 1 4 mi (2.3 km) upstream from mouth, and 13 mi (21 km) south of Childs.

Drainage area --36 4 mi² (94 3 km²)

Gage-height record --Digital water-stage recorder tape except 1000 hours Dec 18 to 1600 hours Dec 20 Altitude of gage is 2,320 ft (707 m), from topographic map

Discharge record.--Stage-discharge relation extended above 3,000 ft³/s (85.0 m³/s) on basis of slope-area measurements at gage heights 9 77, 11 00, 14 18, and 15 66 ft (2 978, 3 353, 4 322, and 4 773 m) Discharge during period of missing gage height estimated on basis of records for nearby streams

Maxima --November 1978 to March 1979 Discharge, 6,680 ft³/s (189 m³/s) about 0315 hours Dec 18, gage height, 15 72 ft (4 791 m) from high-water mark in well
1967 to October 1978· Discharge, 6,660 ft³/s (189 m³/s) Mar 2, 1978, from slope-area measurement of peak flow, gage height, 15 66 ft (4 773 m) from high-water mark in gage well

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec 18—Con			Dec 18—Con		
2400	3 77	3 3	0200	7.53	1,330	1000	8.55	2,230
Dec 17			0300	14 44	6,160	1200	-----	1,800
0800	3 77	3 3	0315	15 72	6,680	1800	-----	1,100
1800	3 93	8 8	0400	13 83	5,830	2400	-----	800
2200	4 43	36	0500	12 81	5,320	Dec 19		
2300	6 27	566	0600	9.75	3,570	0600	-----	550
2400	6 77	833	0700	8 67	2,350	1200	-----	450
Dec 18			0800	8 25	1,950	1800	-----	350
0100	6 89	898	0900	7.74	1,500	2400	-----	250

(118) 09508500 Verde River below Tangle Creek, above Horseshoe Dam, Ariz

Location --Lat 34°04'23", long 111°42'56", in sec 35, T 9 N , R 6 E (unsurveyed), Yavapai County, Hydrologic Unit 15060203, in Tonto National Forest, on right bank 1 3 mi (2 1 km) downstream from Tangle Creek, and 9 mi (14 km) upstream from Horseshoe Dam

Drainage area --5,872 mi² (15,208 km²), includes 373 mi² (966 km²) in Aubrey Valley Playa, a closed basin

Gage-height record --Water-stage recorder chart Datum of gage is 2,029.0 ft (618 44 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation defined by current-meter measurements

Maxima --November 1978 to March 1979 Discharge, 94,000 ft³/s (2,660 m³/s) 0730 hours Dec 19, gage height, 21 36 ft (6 511 m)
1924 to October 1978 Discharge, 100,000 ft³/s (2,830 m³/s) Mar 3, 1938, based on comparison with peak discharge at other stations on Verde River, gage height, 19.0 ft (5 79 m) from floodmarks
1888 to October 1978. Discharge about 150,000 ft³/s (4,250 m³/s) Feb 24, 1891, estimated from records for Salt River above and below Verde River.

(118) 09508500 Verde River below Tangle Creek, above Horseshoe Dam, Ariz.—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec 18—Con.			Dec 19—Con.		
2400	3 74	426	1600	19 1	62,200	2000	15.4	28,200
Dec 17			1800	20 0	73,700	2400	14.2	20,900
1200	3 83	458	2100	20 5	80,800	Dec 20		
2100	4 15	579	2400	20 45	80,000	0600	13.0	15,100
2200	4 39	675	Dec 19			1200	12 0	11,600
2300	5 15	1,030	0300	20.85	86,000	1800	11.35	9,730
2400	5 65	1,340	0400	20.6	82,200	2400	10.75	8,240
Dec. 18			0600	21 0	88,300	Dec. 21		
0300	11 0	8,610	0730	21.36	94,000	1200	9.75	6,140
0500	13 15	15,800	0900	21.0	88,300	2400	8 75	4,520
0800	14 05	20,100	1200	19.8	71,000			
1000	15 5	28,800	1400	18.6	56,400	Dec 22		
1200	16 48	36,100	1600	17.4	44,100	1200	7.75	3,290
1400	17 6	46,000	1800	16 2	33,900	2400	7.10	2,630

(119) Deadman Creek near Horseshoe Dam, Ariz.
(Miscellaneous site)

Location --Lat 34°01'33", long 111°39'04", Yavapai County, Hydrologic Unit 15060203, 3 9 mi (6 2 km) upstream from mouth, 4 4 mi (7.1 km) northeast of Horseshoe Dam

Drainage area --36.3 mi² (92 9 km²).

Maxima --November 1978 to March 1979· Discharge, 3,900 ft³/s (110 m³/s) Dec 18, from floodmark and rating defined by slope-area measurements of peak flows in March 1978 and February 1980.
February to October 1978 Discharge, 6,620 ft³/s (187 m³/s) probably Mar. 2 (revised), from slope-area measurement of peak flow

Remarks --Tributary to Horseshoe Reservoir from the northeast

(120) Lime Creek near Horseshoe Dam, near Carefree, Ariz.
(Miscellaneous site)

Location --Lat 33°59'11", long 111°45'03", in sec.4, T.7 N , R 6 E. (unsurveyed), Maricopa County, Hydrologic Unit 15060203, 0 5 mi (0 8 km) upstream from mouth at maximum reservoir level, 2 5 mi (4 0 km) west of Horseshoe Dam

Drainage area --41 9 mi² (109 km²).

Maxima --November 1978 to March 1979· Discharge, 1,540 ft³/s (43 6 m³/s) revised Dec 18 from slope-area measurement of peak flow
February to October 1978. Discharge, 5,180 ft³/s (147 m³/s) probably Mar 2 (revised), from slope-area measurement of peak flow

Remarks --Tributary to Horseshoe Reservoir from the northwest

(121) Davenport Creek near Horseshoe Dam, Ariz.
(Miscellaneous site)

Location --Lat 33°59'54", long 111°38'32", in sec 32, T.8 N., R 7 E. (unsurveyed), Maricopa County, Hydrologic Unit 15060203, 4.2 mi (6.7 km) upstream from mouth, 4 mi (6 4 km) east of Horseshoe Dam, and 13.7 mi (22 0 km) northwest of Sunflower.

Drainage area.--25 5 mi² (66 0 km²).

Maxima --November 1978 to March 1979. Discharge, 3,600 ft³/s (102 m³/s) Dec 18 from floodmark and rating defined by slope-area measurements at 5,500 ft³/s (156 m³/s) in March 1978 and 3,220 ft³/s (91 2 m³/s) in February 1980
February to October 1978 Discharge, 5,500 ft³/s (156 m³/s) probably Mar 2 (revised), from slope-area measurement of peak flow

Remarks --Tributary to Verde River from the northeast between Horseshoe and Bartlett Reservoirs.

(122) Sheep Creek near Horseshoe Dam, Ariz
(Miscellaneous site)

Location --Lat 33°55'24", long 111°38'12", in sec 28, T 7 N., R 7 E (unsurveyed), in Maricopa County, Hydrologic Unit 15060203, 1 mi (1 6 km) upstream from mouth at maximum reservoir level, and 6 mi (9 6 km) southeast of Horseshoe Dam

Drainage area --34 2 mi² (88 6 km²)

Maxima --November 1978 to March 1979 Discharge, 2,500 ft³/s (70 8 m³/s) revised Dec 18 from slope-area measurement of peak flows
February to October 1978 Discharge, 6,660 ft³/s (189 m³/s) probably Mar 2 (revised) from slope-area measurement of peak flow

Remarks --Tributary to Bartlett Reservoir from the northeast

(123) 09509500 Reservoir System on Verde River at and below Horseshoe Dam, Ariz

Location --This system comprises two storage reservoirs created by Horseshoe and Bartlett Dams on Verde River Gages on Horseshoe Reservoir, formed by Horseshoe Dam, lat 33°59'05", long 111°42'35", in sec 2, T 7 N., R.6 E (unsurveyed), and Bartlett Reservoir, formed by Bartlett Dam, lat 33°49'05", long 111°37'52", in sec 34, T 6 N., R.7 E (unsurveyed), Maricopa County, Hydrologic Unit 15060203.

Drainage area --6,185 mi² (16,019 km²), at Bartlett Dam.

Gage-height record.--Water-stage recorder graphs. Datum of gage on Horseshoe Reservoir is 1,900 00 ft (579.120 m) and on Bartlett Reservoir, 1,599 46 ft (487.515 m) National Geodetic Vertical Datum of 1929

Maxima --November 1978 to March 1979 Contents, 302,100 acre-ft (373 hm³) 1500 hours Mar 26
1939 to January 1978· Contents, 318,000 acre-ft (392 hm³) May 9, 1973

Cooperation --Capacity tables furnished by Salt River Valley Water Users' Association

(123) 09509500 Reservoir System on Verde River at and below Horseshoe Dam, Ariz —Continued

Remarks --Horseshoe Reservoir is formed by earthfill and rockfill dam, dam completed and storage began Nov 15, 1945. Bartlett Reservoir is formed by concrete multiple-arch dam, dam completed May 1939 and storage began Feb 5, 1939 Total capacity of the two reservoirs is 309,600 acre-ft (382 hm^3) divided as follows Horseshoe Reservoir, 131,400 acre-ft (162 hm^3) at elevation 2,026 0 ft (617.52 m)—top of spillway gates and Bartlett Reservoir, 178,200 acre-ft (220 hm^3) at elevation 1,787.46 ft (544 818 m)—top of spillway gates Capacities given here are from tables put in use October 1, 1978, and are approximately 8,100 acre-ft less than those from tables used previously Since 1939, spill has occurred in the 1941, 1965, 1966, 1973, 1978, 1979, and 1980 water years

(124) 09510000 Verde River below Bartlett Dam, Ariz

Location --Lat 33°48'30", long 111°39'09", in NW¼ sec.5, T 5 N , R 7 E (unsurveyed), Maricopa County, Hydrologic Unit 15060203, in Tonto National Forest, on right bank 2 1 mi (3 4 km) downstream from Bartlett Dam, 4 0 mi (6 4 km) upstream from Camp Creek, and 18 mi (29 km) east of town of Cave Creek

Drainage area.--6,185 mi^2 (16,019 km^2)

Gage-height record --Water-stage recorder graph Datum of gage is 1,572.34 ft (479.249 m) National Geodetic Vertical Datum of 1929. This gage was used as a supplemental gage for records published in water resources data for Arizona

Discharge record.--Stage-discharge relation defined by current-meter measurements

Maxima --November 1978 to March 1979 Discharge, 75,800 ft^3/s (2,150 m^3/s) 1700 hours Dec 18, gage height, 22 60 ft (6.888 m)

1939 to January 1978 (regulated) Discharge, 101,000 ft^3/s (2,860 m^3/s) Mar. 2, 1978, gage height 25 9 ft (7.894 m).

1888 to 1939 (unregulated). Discharge not determined, probably over 150,000 ft^3/s (4,250 m^3/s) Feb 24, 1891 Floods of Nov 27, 1905, and Mar 4, 1938, reached maximum discharges of 96,000 ft^3/s (2,720 m^3/s) and 95,000 ft^3/s (2,690 m^3/s), respectively.

Remarks --Flow regulated by Bartlett Reservoir since 1939 and by Horseshoe Reservoir since 1945 (see station 09509500)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 15			Dec 18—Con			Jan 17—Con		
2400	3 30	427	2400	20 69	62,800	0400	7.07	2,910
Dec 16			Dec 19			1000	7.07	2,910
1000	3 30	427	0600	21 13	65,800	1030	10.00	13,300
1200	3 89	713	1200	21 56	68,700	1115	12.00	19,800
1330	2 85	205	1330	21 67	69,400	1200	12.24	20,700
1800	3 78	713	2000	15 14	26,900	1445	12.25	20,700
2400	3 87	788	2100	14 78	26,100	1515	13.53	25,700
Dec 17			2400	14 86	26,400	2400	13.61	26,000
1500	3 87	788	Dec 20			Jan 18		
1700	3 35	446	1100	14 86	26,400	0830	13.70	26,400
1900	3 17	328	1200	14 11	22,900	0900	12.37	21,000

(124) 09510000 Verde River below Bartlett Dam, Ariz.—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17—Con			Dec. 20—Con			Jan. 18—Con.		
2400	3 16	321	1300	7.45	3,740	1000	12 27	20,600
			2400	7.16	3,160	1500	12.35	20,900
Dec 18			Jan 15			2400	12 15	20,100
0100	3 32	427	2400	4.45	24	Jan 19		
0700	3 20	350	Jan. 16			0100	10.70	15,000
0800	5 30	2,530	0800	4 45	24	2400	10.60	14,700
1000	5 48	2,820	1000	5 30	484	Jan 20		
1100	12.17	15,500	1600	5 32	499	1200	10.50	14,400
1200	15 85	31,700	1800	5 22	400	2400	10 40	14,100
1430	20 33	60,300	2400	5 22	400	Jan 21		
1600	19 81	56,760				0100	5 90	3,720
1700	22 60	75,800	Jan 17			0700	5.74	3,440
2000	22 33	74,000	0300	5 23	418	2400	5 74	4,440

(125) 09510080 West Fork Sycamore Creek near Sunflower, Ariz
(Discontinued station)

Location --Lat 33°56'45", long 111°29'05", in SE¼ sec 13, T 7 N , R 8 E , Maricopa County, Hydrologic Unit 15060203, in Tonto National Forest, on right bank 1.2 mi (1.9 km) upstream from confluence with East Fork, and 5 7 mi (9.2 km) north of Sunflower.

Drainage area.--9.8 mi² (25 4 km²)

Gage-height record --Crest stage only. Altitude of gage is 4,000 ft (1,200 m), from topographic map

Discharge record --Stage-discharge relation defined by current-meter measurements below 420 ft³/s (11.9 m³/s) and extended above on basis of slope-area measurements of peak flows at 6 7 and 9 50 ft (2 04 and 2 896 m).

Maxima --November 1978 to March 1979. Discharge, 463 ft³/s (13 1 m³/s) probably Jan 17, gage height, 5 60 ft (1 707 m) from high-water mark in well
1959 to October 1978: Discharge, 3,480 ft³/s (98.6 m³/s) Sept 5, 1970, gage height, 9 50 ft (2 896 m)

(126) 09510100 East Fork Sycamore Creek near Sunflower, Ariz

Location --Lat 33°56'58", long 111°27'39", in NE¼SE¼ sec 18, T 7 N , R.9 E , Maricopa County, Hydrologic Unit 15060203, in Tonto National Forest, on left bank 1 7 mi (2 7 km) upstream from confluence with West Fork, and 6.0 mi (9 7 km) north of Sunflower

Drainage area --4 49 mi² (11 6 km²).

Gage-height record --Crest stage only during flood period. Altitude of gage is 4,140 ft (1,262 m), from topographic map

(126) 09510100 East Fork Sycamore Creek near Sunflower, Ariz.—Continued

Discharge record --Stage-discharge relation extended above 130 ft^3/s (3.7 m^3/s) on basis of slope-area measurement at gage height 9.50 ft (2 896 m)

Maxima --November 1978 to March 1979 Discharge, 298 ft^3/s (8.44 m^3/s) Dec 18, gage height, 4 80 ft (1 463 m) from high-water mark in well.
1959 to October 1978 Discharge, 1,940 ft^3/s (54 9 m^3/s) Sept. 5, 1970, gage height, 9 50 ft (2 896 m) from profile past gage

(127) 09510170 Camp Creek near Sunflower, Ariz
(Crest-stage station)

Location --Lat 33°45'35", long 111°29'44", in SW¼ sec 24, T 5 N , R 8 E , Maricopa County, Hydrologic Unit 15060203, on right bank at upstream side of culvert on State Highway 87, 0 5 mi (0 8 km) upstream from mouth, and 7 mi (11 km) south of Sunflower

Drainage area --2 6 mi^2 (6 7 km^2)

Gage-height record --Water-stage recorder graph Datum of gage is 2,186.61 ft (666 479 m) Arizona State Highway datum.

Discharge record --Stage-discharge relation extended above 27 ft^3/s (0 76 m^3/s) on basis of computations of flow through culvert

Maxima --November 1978 to March 1979 Discharge, 134 ft^3/s (3 79 m^3/s) 1600 hours Dec 18, gage height, 2 52 ft (0 768 m)
1963 to October 1978 Discharge, 402 ft^3/s (11 4 m^3/s) Mar 2, 1978, gage height, 5 05 ft (1 554 m)

Remarks --Tributary to Sycamore Creek from the east

Mean discharge, in cubic feet per second, 1978

Day	Discharge	Day	Discharge	Day	Discharge
Dec 17	16	Dec 20	10	Jan 19	24
18	98	Jan. 17	39	20	9 5
19	51	18	44		

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec. 16			Dec 19—Con.			Jan 18—Con		
2400	0 09	0	1400	1 51	53	0300	1 60	60
Dec 17			1800	1 27	34	0430	1.73	70
1600	36	0	1900	1 48	50	0530	1 61	61
2200	2 15	104	2400	1.17	26	0700	1 36	41
2400	1 72	70	Jan. 16			1100	1 21	29
Dec. 18			2400	60	3	1700	1 18	26
0300	1 54	55	Jan 17			1900	1 20	28
0400	2 16	105	0200	.82	4 8	2000	1 61	61
0500	2 45	128	0400	1 10	20	2100	2 09	99

(127) 09510170 Camp Creek near Sunflower, Ariz.—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18—Con			Jan 17—Con.			Jan 18—Con.		
0600	2 51	133	0600	1.40	44	2200	1 76	73
1300	1 97	90	0700	1.94	87	2400	1 50	52
1600	2 52	134	0830	2.18	106			
2400	1 38	42	1000	1.85	80	Jan. 19		
Dec 19			1200	1 55	56	0200	1.30	36
0300	2 05	96	1500	1.32	38	0600	1 19	27
0500	1 63	62	1800	1.15	24	0930	1.17	26
1000	1 36	41	2400	1 09	19	1200	1.13	22
1100	1 52	54	Jan 18			1800	1 06	17
1300	1 46	49	0100	1.27	34	2400	1.03	15

(128) 09510200 Sycamore Creek near Fort McDowell, Ariz

Location --Lat 33°41'39", long 111°32'28", in sec 16, T 4 N , R 8 E (unsurveyed), Maricopa County, Hydrologic Unit 15060203, in Tonto National Forest, on right bank 0.7 mi (1 1 km) southwest of Sugarloaf Mountain, 9 mi (14 km) northeast of Fort McDowell, 10 mi (16 km) upstream from mouth, and 25 mi (40 km) northeast of Scottsdale

Drainage area --164 mi^2 (425 km^2)

Gage-height record --Water-stage recorder tape from recorder driven by manometer Datum of gage is 1,759 33 ft (536 244 m) National Geodetic Vertical Datum of 1929.

Discharge record.--Stage-discharge relation extended above 3,600 ft^3/s (102 m^3/s) on basis of slope-area measurements at gage heights 15 0, 16.0, and 19 7 ft (4 57, 4.88, and 6.00 m)

Maxima --November 1978 to March 1979· Discharge, 9,520 ft^3/s (270 m^3/s) 0500 hours, Dec 18, gage height, 10 84 ft (3 304 m).
1959 to October 1978 Discharge, 24,200 ft^3/s (685 m^3/s) Sept 5, 1970, gage height, 19 7 ft (6.00 m), from profile past gage

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec 19			Jan 17—Con		
2400	1 00	7 0	0300	7 37	4,900	1800	5 03	2,420
Dec 17			0600	5 82	3,180	1900	5.11	2,490
0700	1 00	7 0	0700	5.82	3,180	2200	4.71	2,130
1200	1 04	11	0800	6 15	3,520	2400	4.44	1,890
1400	1 05	12	1200	5.32	2,680	Jan 18		
1600	1 13	22	1300	4.83	2,240	0200	4 17	1,670
1700	1 23	37	1500	4 94	2,340	0500	5.22	2,590
1900	1.27	43	1800	4.37	1,830	0700	5.35	2,710
2000	1 81	205	2100	4.23	1,710	1200	4 66	2,080

(128) 09510200 Sycamore Creek near Fort McDowell, Ariz —Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17—Con			Dec 19—Con			Jan 18—Con		
2100	3 31	1,000	2400	3 69	1,280	1500	4 97	2,360
2200	6 20	3,580				1900	4 39	1,840
2300	6 28	3,670	Dec 20			2100	4 53	1,970
2400	6 23	3,610	0600	3 12	891	2230	6 05	3,420
Dec 18			1200	2 82	704	2400	5 45	2,810
0100	6 57	3,990	1800	2 58	565	Jan 19		
0200	7 05	4,520	2400	2 44	490	0300	4.46	1,900
0300	8 52	6,310	Dec 21			0400	4 46	1,900
0400	8 33	6,060	1800	2 08	320	0800	3 88	1,430
0500	10 84	9,520	2400	2 04	304	0900	3 97	1,510
0600	9 81	8,020	Jan 16			1500	3 54	1,160
0900	7 51	5,070	2400	1 77	194	1600	3 59	1,200
1000	7 51	5,070	Jan 17			2400	3 25	962
1100	7 59	5,170	0200	2 01	284	Jan 20		
1200	7 22	4,720	0500	1 97	268	0600	2 42	470
1300	7 70	5,300	0600	4 49	1,930	1400	2 31	415
1600	10 14	8,490	0700	5.05	2,440	1800	2 34	430
1700	9 22	7,220	0800	5 85	3,210	2400	2 12	329
2100	7 08	4,560	0900	7.40	4,940	Jan 21		
2400	6 19	3,570	0945	8 68	6,510	0600	2 07	308
			1100	8 49	6,270	1200	2.05	300
Dec 19			1200	7 59	5,170	1500	2 09	316
0100	5 86	3,220	1400	6 63	4,050	1800	1 99	276
0200	6 00	3,360	1600	5 69	3,050	2400	1.89	236

(129) 09511300 Verde River near Scottsdale, Ariz

Location --Lat 33°34'52", long 111°40'12", in NE¼ sec.30, T 3 N , R 7 E , Maricopa County, Hydrologic Unit 15060203, on pier near left bank on downstream side of bridge on State Highway 87, in Fort McDowell Indian Reservation, 2 5 mi (4 0 km) upstream from mouth, 3 8 mi (6 1 km) downstream from Fort McDowell, and 16 mi (26 km) northeast of Scottsdale

Drainage area --6,600 mi² (17,090 km²), approximately.

Gage-height record --Remote readings from water-stage recorder from Dec 16 to 1600 hours Dec 18 when gage was destroyed. Water-stage recorder graph Jan. 16-21 and Mar 26-Apr 1 Datum of gage is 1,351 35 ft (411 891 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation defined by current-meter measurements below 32,000 ft³/s (906 m³/s)

Maxima --November 1978 to March 1979 Discharge, 64,000 ft³/s (1,812 m³/s) Dec 18 estimated on basis of flood routing, gage height not determined.
1939 to October 1978· Discharge, 96,000 ft³/s (2,719 m³/s) Mar 2, 1978, on basis of flood routing, gage height, 18 3 ft (5 58 m), from profile past gage

Remarks --Flow regulated by Bartlett Reservoir since 1939 and by Horseshoe Reservoir since 1945 (see sta 09509500)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1979

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Jan 16			Jan 19			Mar 28		
2100	6 15	134	0200	11 46	25,400	2000	8.45	9,400
2400	6 55	538	0400	11 21	23,600	2200	9 16	12,200
			0600	11 58	26,200	2400	9 11	12,040
Jan 17			0800	10.18	16,800	Mar 29		
0900	6 71	790	1600	10 20	16,900	0200	9 49	13,600
1200	8 60	6,310	2400	10 17	16,700	0600	8 96	11,500
1400	9 32	10,600	Jan 20			0800	8 85	11,100
1500	9 48	11,900	1200	9 97	16,100	2400	8 81	10,900
1600	10 38	18,600	2400	10 01	16,400	Mar 30		
1900	10 95	21,000	Jan 21			1200	8 74	10,600
2000	11 47	24,500	0300	9 87	15,600	1400	9.45	13,400
2200	11.65	25,000	0600	7.69	5,820	1600	9 74	14,900
2400	11 74	25,400	1000	7 20	4,980	1800	9 63	14,300
			2400	7.21	5,000	2400	9.64	14,300
Jan 18			Mar 26			Mar 31		
0300	11 87	27,000	2200	6 60	4,140	2000	9.67	14,500
0600	11 87	27,000	2400	7.31	5,730	2200	8 77	10,700
0900	12 02	27,600				2400	8 50	9,570
1100	12 05	27,800	Mar 27			Apr 1		
1200	11 99	27,500	1400	7 52	6,330	1000	8 53	9,670
1500	11 40	24,300	1600	8 31	8,840	1300	7.69	6,790
2400	11 23	23,000	2400	8 36	9,040	2400	6 38	3,610

(130) 09512100 Indian Bend Wash at Scottsdale, Ariz

Location --Lat 33°32'19", long 111°54'57", in SW¼SE¼ sec 2, T.2 N , R 4 E., Maricopa County, Hydrologic Unit 15060106, at Indian Bend Road in Scottsdale.

Drainage area --62 mi² (161 km²) excluding area upstream from Central Arizona Canal.

Gage-height record --Water-stage recorder Datum of gage is 1,280 29 ft (390 232 m) National Geodetic Vertical Datum of 1929.

Discharge record --Stage-discharge relation extended above 7,000 ft³/s (200 m³/s) on basis of partial measurement at gage height 4 2 ft (1 28 m) and slope-conveyance computation at gage height 4 90 ft (1 494 m).

Maxima --November 1978 to March 1979 Discharge, 252 ft³/s (7 14 m³/s) 1200 hours Jan 17, gage height, 1.62 ft (0.494 m)
1922 to October 1978 Discharge, 21,000 ft³/s (595 m³/s) June 22, 1972, gage height 4 90 ft (1 494 m)

(131) 09512170 Salt River at Jointhead Dam at Phoenix, Ariz

Location --Lat 33°26'25", long 111°58'22", in SW¼ sec 8, T 1 N , R 4 E , Maricopa County, Hydrologic Unit 15060106, 1,500 ft (460 m) upstream from 48th Street in Phoenix, 1.7 mi (2 7 km) downstream from Tempe bridge, and 5 8 mi (9 3 km) east of Phoenix Post Office

(131) 09512170 Salt River at Jointhead Dam at Phoenix, Ariz.—Continued

Drainage area --13,225 mi² (35,000 km²)

Gage-height record.--Frequent staff gage readings from 2400 hours Dec. 18 to 1000 hours Dec 21, and water-stage recorder graph 1000 hours Dec. 19 to 1400 hours Dec 22, and after 1800 hours Jan 17. Record furnished by the Salt River Valley Water Users' Association Altitude of gage is 1,130 ft (350 m) from topographic map.

Discharge record.--Stage-discharge relation prior to 1000 hours Dec 19 is uncertain, thereafter, the stage-discharge relation is defined by current-meter measurements Discharge during periods of no gage-height record and periods of shifting control were estimated on the basis of releases from Stewart Mountain and Bartlett Dams.

Maxima --November 1978 to March 1979. Discharge, 126,000 ft³/s (3,570 m³/s) 2300 hours Dec 19, gage height, 10 05 ft (3 064 m).
1939 to October 1978· Discharge, 122,000 ft³/s (3,455 m³/s) Mar. 2, 1978, gage height, 12 50 ft (3 81 m).
1870 to October 1939: Discharge, about 300,000 ft³/s (8,500 m³/s) Feb. 24, 1891, estimated on basis of records for former station at Arizona Dam

Remarks --Flow regulated by reservoirs on the Salt River since 1910 (see sta 09502000) and by reservoirs on the Verde River since 1939 (see sta 09509500).

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Jan 17			Mar. 27		
2400	-----	0	1200	-----	0	0800	3.65	11,500
Dec 18			1800	4 5	15,000	1800	3 74	12,400
1000	-----	0	2000	5 48	27,800	2200	4 05	15,600
1800	-----	5,000	2200	6 17	38,700	2400	4 07	15,800
2000	-----	30,000	2400	7 20	57,500	Mar 28		
2400	8 4	48,000				0400	4 10	16,200
Dec 19			Jan 18			1000	4 17	16,900
0200	9 9	77,100	0500	7 70	67,100	1200	4 22	17,600
0330	10 2	83,100	0900	7 95	72,100	2000	4 28	18,300
0450	10 4	101,000	1400	8 13	75,700	2400	4.60	22,500
0550	10 2	97,100	1800	7.98	72,700	Mar. 29		
0630	10.0	93,100	2200	8 15	76,100	0200	5 75	40,100
0700	9 9	93,100	2400	8 40	81,100	0400	6 90	61,500
0800	10 0	103,000				0800	7.18	67,400
0930	9 8	107,000	Jan 19			1800	6 92	61,900
1100	9 8	113,000	0200	8 60	85,100	2000	6 94	62,400
1200	9 85	121,000	0800	8 07	74,500	2200	6.90	61,500
1315	9 9	122,000	2000	7.64	65,900	2400	6 70	57,500
1800	10 0	125,000	2400	7.45	62,300	Mar. 30		
2030	10 0	125,000	Jan 20			0600	5.65	38,400
2300	10 05	126,000	0200	7.28	61,100	1000	5 48	35,600
2400	10 0	125,000	1600	6 96	56,700	1400	5 53	36,400
			1800	7 03	60,100	1800	6 35	50,800
Dec 20			2400	6 90	59,500	2000	6 50	53,600
0200	10 0	125,000				2200	6 55	54,600
0300	9 5	113,000	Jan. 21			2400	6.55	54,600
0400	8 5	93,100	0500	6 79	59,300	Mar. 31		
0600	8 3	89,100	1200	6 00	44,400	1000	6.55	54,600

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 20—Con			Jan 21—Con			Mar 31—Con.		
0800	8 15	86,100	1800	5 65	38,400	1200	6 30	49,900
1000	8 0	83,100	2400	4 93	27,100	1600	5 33	33,200
1420	8 0	83,100				1800	5.30	32,700
1540	7 9	82,100	Jan 22			2200	5.32	33,000
1800	7 9	81,100	0800	5 00	28,100	2400	5 22	31,500
1900	7 8	79,100	1400	4 97	27,700	Apr 1		
2000	7 5	73,100	1500	4 50	21,100	0400	4 83	25,700
2400	6 58	55,200	1600	4.08	15,900	1400	4.63	22,900
			2000	2 83	4,700	1600	4.55	21,800
Dec 21			2200	2 63	3,370	2400	3 95	14,600
0115	6 4	51,700	2400	4 15	16,700	Apr 2		
0230	6 4	51,700	Jan 23			0600	3 70	12,000
0430	6 6	51,700	0100	4.30	18,500	1000	3 65	11,600
1100	6 6	55,600	0400	4 40	19,800	1400	3 32	8,500
1600	6 5	53,600	1800	4 94	27,200	1800	3.00	5,940
1730	5 7	39,200	2200	4 16	16,800	2000	2.85	4,840
2000	5 7	39,200	2400	4 10	16,200	2400	2 85	4,840
2300	5.4	34,300				Apr. 3		
2400	5 4	34,300	Jan 24			1800	2 78	4,360
			0900	4 04	15,500	2000	2 85	4,840
Dec 22			2400	4 05	15,600	2200	3 43	9,460
0300	5 4	34,300				2400	3 48	9,920
0900	5 48	35,600	Jan 25			Apr. 4		
1330	5 30	32,700	0200	3 91	14,100	1600	3 42	9,380
1800	-----	31,000	0500	3 93	14,300	2400	2.95	5,570
2400	-----	30,000	0800	3 73	12,300	Apr 5		
			1000	3.73	12,300	0400	2.78	4,360
Dec 23			1500	3 85	13,500	1000	2 88	5,060
1800	-----	25,000	1800	3 75	12,500	2200	2 63	3,370
2400	-----	8,000	2400	3 93	14,300	2400	2.55	2,880

(132) 09512300 Cave Creek near Cave Creek, Ariz
(Crest-stage station)

Location --Lat 33°47'07", long 112°00'24", in SW¼ sec.12, T.5 N., R.3 E., Maricopa County, Hydrologic Unit 15060106, on left bank 200 ft (61 m) upstream from power transmission line, 4 75 mi (7 6 km) southwest of the town of Cave Creek, and 5 0 mi (8 0 km) upstream from Cave Creek Dam

Drainage area --121 mi² (314 km²).

Gage-height record --Crest stage only Altitude of gage is 1,800 ft (550 m), from topographic map

Discharge record --Stage-discharge relation extended above 720 ft³/s (20.4 m³/s) on basis of slope-area measurements at gage heights 6.79 and 8 62 ft (2 094 and 2.656 m)

(132) 09512300 Cave Creek near Cave Creek, Ariz —Continued

Maxima --November 1978 to March 1979 Discharge, 6,900 ft^3/s (195 m^3/s) probably Dec 18, gage height, 7 34 ft (2 237 m)
1958 to October 1978. Discharge, 12,400 ft^3/s (351 m^3/s) Dec 19, 1967, gage height, 8 62 ft (2 627 m)

Remarks --Flow stored in Cave Creek Reservoir and released slowly to prevent flooding in Phoenix

(133) 09512410 Mingus C Watershed near Prescott, Ariz
(U S Forest Service station)

Location --Lat 34°38'54", long 112°10'27", in NW¼SE¼ sec 29, T 15 N., R.2 E , Yavapai County, Hydrologic Unit 15070102, Prescott National Forest, 3 mi (5 km) upstream from the confluence of Lang Canyon with Yeager Canyon, and 19 mi (31 km) east-northeast of Prescott

Drainage area --0 07 mi^2 (0.18 km^2).

Gage-height record --Water-stage recorder chart Altitude of gage is 6,310 ft (1,923 m) from topographic map

Discharge record.--Computed from theoretical rating for 120° v-notch weir Records furnished by U S Forest Service, Rocky Mountain Forest and Range Experiment Station.

Maxima --November 1978 to March 1979· Discharge, 5 1 ft^3/s (0 144 m^3/s) 2400 hours Mar 13, gage height, 1 06 ft (0 323 m).
1958 to October 1978. Discharge, 17 3 ft^3/s (0 49 m^3/s) July 28, 1961.

Remarks --Additional data for other small research watersheds are available from the experiment station

(134) 09512500 Agua Fria River near Mayer, Ariz.

Location --Lat 34°18'55", long 112°03'48", in NW¼SE¼ sec 20, T 11 N , R 3 E , Yavapai County, Hydrologic Unit 15070102, on left bank at Sycamore damsite, 700 ft (210 m) downstream from Big Bug Creek, and 12 mi (19 km) southeast of Mayer

Drainage area --588 mi^2 (1,523 km^2)

Gage-height record --Water-stage recorder graph except 2100 hours, Dec 18 1730 hours Dec 21, which was estimated on the basis of high-water mark and adjacent good record. Datum of gage is 3,434 ft (1,046 7 m), Maricopa County Municipal Water Conservation District No 1 datum

Discharge record --Stage-discharge relation extended above 1,600 ft^3/s (45 m^3/s) on basis of slope-area measurement for peak of February 1980 at 15 76 ft (4 804 m)

Maxima --November 1978 to March 1979 Discharge, 26,700 ft^3/s (756 m^3/s) revised, 2130 hours, Dec 18, gage height, 14 3 ft (4 359 m)
1940 to October 1978 Discharge, 19,800 ft^3/s (561 m^3/s) Sept 5, 1970, gage height, 14 90 ft (4 542 m) on basis of slope-area measurement of peak flow

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec 19			Jan 17—Con.		
2400	3 18	2.8	0200	9.4	9,920	2200	5 30	1,720
Dec 17			0600	7 0	4,510	2400	4 98	1,340
1000	3 18	2 8	1000	5 7	2,330	Jan 18		
2100	3 30	7 3	2400	4 9	1,230	0600	4.75	1,050
2400	3 68	69 2	Jan 15			1200	4.58	846
			2400	3 09	6 3	1400	4 60	870
Dec 18			Jan 16			1600	4 95	1,300
0200	4 54	706	1300	3 09	6.3	1800	5 44	1,970
0500	4 70	918	2400	3 24	17	2000	6 25	3,100
0700	5 80	2,570	Jan 17			2100	7.00	4,150
0900	6 50	3,630	0200	3.30	25	2130	7 26	4,510
1200	5 65	2,260	0400	4 45	695	2300	6.34	3,230
1300	6 30	3,300	0600	8 77	8,310	2400	5.73	2,370
1400	7 10	4,690	0700	11 7	16,900	Jan 19		
1600	8 50	7,660	0730	12 5	[1]19,700	0600	4 64	918
1800	9 00	8,880	0800	12 3	19,000	1200	4.32	560
1900	10 38	12,700	0900	11 4	15,900	1800	4.18	434
2000	9 05	9,010	1200	9 98	11,500	2400	4 28	522
2100	8 22	7,020	1400	8 19	6,950	Jan 20		
2300	14 30	[1]26,700	1600	6.69	3,950	1200	4.00	300
2400	10 6	13,300	1800	5 80	2,570	2400	3 92	250

[1]Revised

(135) Agua Fria River at Black Canyon City, Ariz.
(Miscellaneous site)

Location --Lat 34°04'23", long 112°08'08", SW¼, sec.34, T 9 N , R 2 E , Yavapai County, Hydrologic Unit 15070102, 1,500 ft (457 m) upstream from Interstate Highway 17 at Black Canyon City

Drainage area --845 mi^3 (2,190 km^3)

Maxima --November 1978 to March 1979 Discharge, 32,100 ft^3/s (909 m^3/s) probably Dec 19, 1978, from slope-area measurement of peak flow

(136) Black Canyon Creek near Black Canyon City, Ariz.
(Miscellaneous site)

Location --Lat 34°05'10", long 112°09'10", in SE¼ sec 28, T 9 N , R.2 E , Yavapai County, Hydrologic Unit 15070102, 1.2 mi (1 9 km) above mouth and 1 mi (1 6 km) north of Black Canyon City, Ariz.

Drainage area --238 mi^2 (161 km^2)

(136) Black Canyon Creek near Black Canyon City, Ariz —Continued

Maxima --November 1978 to March 1979. Discharge, 22,300 ft³/s (632 m³/s) Dec 18, 1978, from slope-area measurement of peak flow

Observations by local resident at slope-area reach indicate Dec. 18 peak was 0.8 ft (0 24 m) lower than peak in September 1970 flood and 2 ft (0.61 m) above peak in March 1978 Peak in September 1978 is the highest since at least 1957

Remarks --Tributary to Agua Fria River

(137) 09512700 Agua Fria River Tributary No. 2 near Rock Springs, Ariz
(Crest-stage station)

Location --Lat 34°02'00", long 112°08'42", in SW¼ sec 15, T 8 N , R 2 E., Maricopa County, Hydrologic Unit 15070102, at State Highway 69, 1 mi (1 6 km) south of Rock Springs

Drainage area --1 11 mi² (2 87 km²)

Gage-height record --Crest-stage record only Altitude of gage is 2,010 ft (613 m), from topographic map.

Discharge record --Stage-discharge relation defined by culvert computations

Maxima --November 1978 to March 1979 Discharge, 265 ft³/s (7 50 m³/s) probably Dec 18, gage height, 4 92 ft (1 500 m)

1963 to October 1978 Discharge, 1,200 ft³/s (34 0 m³/s) Aug 2, 1964, gage height, 19 54 ft (5 956 m)

(138) 09512800 Agua Fria River near Rock Springs, Ariz

Location --Lat 34°00'56", long 112°10'02", in NW¼NW¼ sec 28, T 8 N , R 2 E , Yavapai County, Hydrologic Unit 15070102, on right bank 2 5 mi (4 0 km) southwest of Rock Springs, and 10 mi (16 km) upstream from Lake Pleasant

Drainage area --1,130 mi² (2,930 km²), approximately

Gage-height record --Crest stage only during flood periods Altitude of gage is 1,800 ft (549 m), from topographic map

Maxima --November 1978 to March 1979 Discharge, 52,800 ft³/s (1,500 m³/s) Dec 18 from slope-area measurement of peak flow, gage height, 27 2 ft (8.29 m) from profile of floodmarks

1970 to October 1978· Discharge, 40,100 ft³/s (1,140 m³/s) Sept. 5, 1970, from slope-area measurement of peak flow, gage height, 25 3 ft (7 71 m), present site and datum from profile of floodmarks.

(139) Castle Creek near Castle Hot Springs, Ariz

Location --Lat 33°59'40", long 112°22'10", in W½ sec 33, T 8 N., R.1 W , Yavapai County, Hydrologic Unit 15070102, about 1 mi (1 6 km) northwest of Castle Hot Springs, and 8 mi (13 km) upstream from mouth at Lake Pleasant

Drainage area --72 0 mi² (186 km²).

Maxima --November 1978 to March 1979 Discharge, 5,780 ft³/s (164 m³/s) probably Dec 18, 1978, from slope-area measurement of peak flow

Remarks --Tributary to Lake Pleasant on the Aqua Fria River

(140) 095313000 Agua Fria River at (above and below) Waddell Dam, Ariz

Location --Lat 33°51'20", long 112°15'58", in SW¼ sec 16, T 6 N , R.1 E , Maricopa County, Hydrologic Unit 15070102, at left upstream end of Waddell Dam, and 22 mi (35 km) northwest of Glendale

Drainage area --1,459 mi² (3,779 km²)

Gage-height record --Nonrecording gage on Lake Pleasant, read hourly or more frequently and staff gage at diversion dam below Waddell Dam Datum of gage is 1,431 2 ft (436 23 m) above National Geodetic Vertical Datum of 1929

Discharge record --Figures given herein represent flow into Lake Pleasant and release to Agua Fria River below diversion dam Inflow computed on basis of three factors as follows 1 Change in contents of Lake Pleasant and in contents of small reservoir behind diversion dam 1 5 mi (2 4 km) downstream from Lake Pleasant 2. (a) Release from Lake Pleasant, computed from readings by Calusen-Pierce weir rule in Beardsley Canal, checked by current-meter measurements by U S Geological Survey, (b) spill from Lake Pleasant measured over diversion dam based on staff-gage readings 3 Effect of rainfall and evaporation on lake; evaporation assumed as 0 85 of that measured once daily in 3-foot-square (0 9-meter-square) land pan buried 1 5 ft (0 5 m) in ground near left end of Waddell Dam Effect of bank storage and bank release in Lake Pleasant is not taken into account

Maxima --November 1978 to March 1979 Inflow, 79,500 ft³/s (2,250 m³/s) 2230 hours Dec 18, outflow, 59,900 ft³/s (1,700 m³/s) 0130 hours, Dec. 19

1927 to October 1978 Inflow, not determined Outflow, 16,300 ft³/s (460 m³/s) Mar 5, 1978

1891 to October 1978· Recorded discharge about 105,000 ft³/s (2,970 m³/s) Jan 28, 1916, gage height, 30 ft (9 1 m) datum then in use from floodmarks, from rating curve extended above 13,000 ft³/s (370 m³/s) on basis of velocity-area studies Gage height, 33 ft (10 1 m), Nov 27, 1919, to same datum as in 1916, from floodmarks, discharge believed to be greater than that of 1916

Remarks --Since 1927, outflow has been regulated at Lake Pleasant (see sta 09513500) and record has been furnished by Maricopa County Municipal Water Conservation District No 1 Spills occurred in 1941, 1966, 1968, 1978, 1979, and 1980 water years The spill that started Dec 18, 1978 continued into April 1979.

Inflow and outflow, in cubic feet per second, 1978-79

Hour	Inflow	Outflow	Hour	Inflow	Outflow	Hour	Inflow	Outflow
Dec 18			Dec 19—Con			Jan. 18—Con.		
1000	7,410	0	2400	4,960	3,600	1200	4,410	5,900
1200	8,180	0	Jan .17			1400	4,170	3,950
1400	11,600	0	0200	1,550	150	1600	5,980	4,930
1600	16,300	0	0400	1,840	150	1800	6,120	5,900
1800	23,200	0	0600	6,920	150	2000	8,440	5,900
2000	37,200	0	0800	6,350	4,200	2200	8,440	5,900
2200	53,000	0	1000	23,800	15,300	2400	10,200	5,900
2230	79,500	6,000	1200	28,800	19,800	Jan. 19		
2400	68,600	25,100	1400	24,800	25,700	0200	8,250	5,900
Dec 19			1600	19,700	25,700	0400	8,820	6,900
0130	76,300	59,900	1800	11,700	19,800	0600	6,900	6,900
0400	51,200	50,800	2000	13,500	13,900	0800	5,480	5,900
0600	28,600	31,200	2200	8,640	8,000	1000	3,590	2,950

(140) 095313000 Agua Fria River at (above and below) Waddell Dam, Ariz —Continued

Inflow and outflow, in cubic feet per second, 1978-79

Hour	Inflow	Outflow	Hour	Inflow	Outflow	Hour	Inflow	Outflow
Dec 19—Con			Jan 17—Con			Jan 19—Con		
0800	20,500	24,000	2400	6,720	8,000	1200	4,440	2,950
1000	15,100	16,800	Jan. 18			1400	2,950	2,950
1200	11,500	13,200	0200	6,280	8,000	1600	2,100	2,950
1400	10,600	7,200	0400	5,230	8,000			
1600	9,340	7,200	0600	5,020	8,000	Jan 20		
1800	6,490	7,200	0800	4,820	8,000	0800	2,470	2,950
2000	6,490	7,200	1000	4,640	5,900	1400	1,810	2,950

(141) 09513500 Lake Pleasant at Waddell Dam, Ariz

Location --Lat 33°51'20", long 112°15'58", in SW¼ sec 16, T 6 N , R 1 E , Maricopa County, Hydrologic Unit 15070102, at left upstream end of Waddell Dam on Agua Fria River

Drainage area --1,459 mi² (3,779 km²)

Gage-height record --Nonrecording gage read hourly or more frequently Datum of gage is 1,431 2 ft (436 53 m) National Geodetic Vertical Datum of 1929.

Maxima --November 1978 to March 1979 Contents, 161,000 acre-ft (198 hm³) Mar 29, gage height 170 92 ft (52 712 m)
1927 to October 1978 Contents, 178,500 acre-ft (220 hm³) Apr 19, 1941 Gage height, 170 52 ft (51 989 m) Mar 23, 1978

Remarks --Lake is formed by concrete multiple-arch dam; dam completed and storage began in 1927 Capacity, 157,600 acre-ft (194 hm³), of which 86,870 acre-ft (107 hm³) is below the crest of spillway and 70,730 acre-ft (87 2 hm³) is between the crest of the spillway and the top of spillway gates Figures given herein represent usable contents in Lake Pleasant (based on 1965 capacity table) Contents of small reservoir formed by diversion dam downstream from Waddell Dam is not included

Cooperation --Gage-height record furnished by Maricopa County Municipal Water Conservation District No 1

(142) 09513650 Agua Fria River at El Mirage, Ariz
(Crest-stage station)

Location --Lat 33°36'24", long 112°18'14", in NW¼NW¼ sec 18, T 3 N , R 1 E , Maricopa County, Hydrologic Unit 15070102, at Grand Avenue 0 75 mi (1 2 km) southeast of El Mirage

Drainage area --1,637 mi² (4,240 km²), of which 1,459 mi² (3,779 km²) is above Lake Pleasant

Gage-height record --Crest stage only Datum of gage is 1,113 00 ft (339.242 m) Arizona Highway Department datum.

Maxima --November 1978 to March 1979· Discharge, 58,400 ft³/s (1,650 m³/s) Dec. 19, from slope-area measurement of peak flow, gage height, 11 70 ft (3 566 m) from outside high-water mark
1963 to October 1978· Discharge, 9,870 ft³/s (280 m³/s) Mar 2, 1978, gage height, 7 95 ft (2 423 m)

Remarks --Flow regulated by Lake Pleasant since 1927 (see station 09513500) Excess floodwater released from McMicken Dam on Trilby Wash may enter Agua Fria River upstream from station Record poor.

(143) 09513780 New River near Rock Springs, Ariz.

Location.--Lat 33°58'27", long 112°05'54", in SW¼SW¼ sec 6, T 7 N , R.3 E , Maricopa County, Hydrologic Unit 15070102, on right bank 180 ft (55 m) upstream from road crossing, and 6 mi (10 km) southeast of Rock Springs

Drainage area --67 3 mi² (174 km²)

Gage-height record --Water-stage recorder graph. Altitude of gage is 2,310 ft (704 m), from topographic map.

Discharge record --Stage-discharge relation extended above 380 ft³/s (11 m³/s) on basis of five slope-area measurements at gage heights 3.6 to 13 5 ft (1.10 to 4 11 m).

Maxima --November 1978 to March 1979· Discharge, 6,530 ft³/s (185 m³/s) 2200 hours Mar 28, gage height, 7 09 ft (2 161 m)
1960 to October 1978· Discharge, 18,600 ft³/s (527 m³/s) Sept. 5, 1970, gage height, 13 5 ft (4 11 m), from profile past gage.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 16			Dec 18—Con			Dec. 19—Con.		
2400	1.50	2 55	0400	6.54	5,250	0800	4.54	1,770
Dec 17			0700	5 39	3,030	0830	4 54	1,770
----	1 49	2 31	0930	4 78	2,080	1200	3.97	1,160
----	1 57	4 70	1030	5.09	2,530	1700	3 58	654
----	1.66	9.30	1300	5.29	2,820	2000	3.47	538
----	5 29	2,850	1500	6 29	4,720	2200	3 49	562
----	5 21	2,730	1600	6.51	5,180	2400	3 40	476
----	5 54	3,300	1700	6 51	5,180			
----	5 24	2,770	2000	6.13	4,390	Dec 20		
----	4 97	2,450	2130	6.59	5,360	0300	3 27	375
----	4 79	2,096	2330	6.28	4,700	0900	3 10	279
----	4 54	1,770	2400	6.41	4,970	1500	2.95	206
Dec 18			Dec 19			2100	2.84	161
0030	4.46	1,680	0030	6 46	5,080	2400	2.80	147
0100	4.54	1,770	0200	5.79	3,710	Dec. 21		
0200	4 81	2,120	0330	5 51	3,250	1200	2 65	98 5
0300	6 19	4,510	0700	4.64	1,890	2400	2.57	88.5

(144) 09513800 New River at New River, Ariz.

Location.--Lat 33°54'41", long 112°08'26", in NW¼NE¼ sec.34, T 7 N , R 2 E., Maricopa County, Hydrologic Unit 15070102, near center of downstream side of bridge on east frontage road of Interstate Highway 17, 0.5 mi (0.8 km) southwest of village of New River, and 10 mi (16 km) south of Rock Springs

Drainage area --83 3 mi² (215 7 km²).

Gage-height record --Water-stage recorder graph. Datum of gage is 1,984 02 ft (604 729 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation extended above 960 ft³/s (27 m³/s) on basis of slope-area measurement at 12 34 ft (3 761 m) and step-backwater computations.

Maxima.--November 1978 to March 1979· Discharge, 5,560 ft³/s (157 m³/s) 2230 hours Dec 18, gage height, 7.88 ft (2.402 m).

1960 to October 1978 Discharge, 19,500 ft³/s (552 m³/s) Sept 5, 1970, gage height, 9 98 ft (3 042 m), at site and datum then in use, from rating curve extended above 1,300 ft³/s (37 m³/s) on basis of slope-area measurements at gage heights 5.57, 7 33, 9 12, and 9.98 ft (1 698, 2 234, 2 780, and 3.042 m)

1972 to October 1978 Gage height at present site and datum, 12 34 ft (3 761 m) Mar 2, 1978, from high-water mark in well.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18			Dec 18—Con			Dec. 19—Con		
0130	5 34	1,704	1730	7 55	4,930	0430	6 34	2,966
0300	5 47	1,854	1900	7 13	4,191	0700	5 67	2,010
0400	6 65	3,415	2030	7.08	4,106	0830	5 45	1,693
0500	7 20	4,310	2100	6 95	3,890	1000	5 38	1,605
0700	6 35	2,980	2130	7 00	3,970	1400	5 02	1,130
0900	5 80	2,250	2230	7 88	5,560	1800	4 74	804
1030	5 62	2,034	2400	7 43	4,714	2100	4 60	651
1130	5 82	2,274				2400	4.57	615
1300	5 88	2,346	Dec 19					
1430	6 05	2,565	0030	7 25	4,395	Dec 20		
1600	6 98	3,938	0130	7 48	4,804	1200	4 19	285
1700	7 51	4,858	0300	6 55	3,265	2400	4 04	204

(145) 09513820 Deadman Wash near New River, Ariz.
(Crest-stage station)

Location.--Lat 33°50'30", long 112°08'40", in NW¼ sec.27, T 6 N , R.2 E , Maricopa County, Hydrologic Unit 15070102, at State Highway 69, 4 5 mi (7.2 km) south of New River

Drainage area --11 1 mi² (28 7 km²).

Gage-height record --Crest stage only Datum of gage is 1,720 82 ft (524 506 m) National Geodetic Vertical Datum of 1929

Discharge record.--Stage-discharge relation extended above 60 ft³/s (1.7 m³/s) on basis of slope-area measurements at gage heights 5 58 and 5 92 ft (1.701 and 1 804 m) and field estimates

Maxima.--November 1978 to March 1979. Discharge, 88 ft³/s (2.5 m³/s) Nov 11, gage height, 2 77 ft (0 844 m)

1959 to October 1978· Discharge, 1,850 ft³/s (52 4 m³/s) Dec. 25, 1959, gage height, 7 0 ft (2 13 m), from floodmarks

(146) 09513835 New River at Bell Road, near Peoria, Ariz.

Location --Lat 33°38'18", long 112°14'22", in NE¼NE¼ sec 3, T 3 N , R 1 E , Maricopa County, Hydrologic Unit 15070102, on downstream side of bridge at Bell Road, 1 6 mi (2 6 km) upstream from Skunk Creek, 3 1 mi (5 0 km) north of Peoria, and 9 mi (14 km) upstream from mouth

Drainage area --187 mi² (484 km²)

Gage-height record --Water-stage recorder graph Datum of gage is 1,190 00 ft (362 712 m), Arizona State Highway Department datum

Discharge record --Stage-discharge relation extended above 1,800 ft³/s (51 m³/s) on basis of slope-area measurement at gage height 11 0 ft (3 35 m)

Maxima --November 1978 to March 1979 Discharge, 8,410 ft³/s (238 17 m³/s), revised, 0330 hours Dec 19, gage height, 7.61 ft (2 320 m)
1960 to October 1978. Discharge, 14,600 ft³/s (413 m³/s) Dec 19, 1967, gage height, 13 5 ft (4 11 m) from slope-area measurement of peak flow

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 17			Dec. 18—Con.			Dec. 19—Con		
2400	1 32	0	2000	5 67	3,770	0800	5 97	4,400
Dec 18			2100	6 02	4,510	0900	5 77	3,980
0500	1 32	0	2200	6 61	5,860	1000	5 20	2,820
0530	3 25	154	2230	6 84	6,420	1100	4 30	1,310
0600	3 87	748	2300	6 76	6,220	1300	3.92	807
0700	4.02	926	2400	6 73	6,150	1900	3.54	390
0800	4 32	1,340	Dec 19			2200	3 43	293
0830	5.07	2,570	0200	6 77	6,250	2400	3 36	237
0900	5 47	3,350	0300	7 12	7,110			
0945	5 80	4,040	0330	7 61	8,410	Dec. 20		
1100	5 57	3,560	0400	7.27	7,500	0100	3 35	228
1300	4 86	2,190	0430	6 82	6,370	0430	3 17	105
1500	4 45	1,530	0500	7.04	6,900	0830	3.08	70
1700	4 77	2,030	0600	6 72	6,130	1400	2.93	47
1900	5 12	2,670	0700	6 32	5,200	2400	2 67	31

(147) 09513860 Skunk Creek near Phoenix, Ariz

Location --Lat 33°43'44", long 112°07'12", in SE¼ sec.35, T 5 N , R.2 E , Maricopa County, Hydrologic Unit 15070102, on downstream side of right end of bridge on east frontage road of Interstate Highway 17, 3 mi (5 km) north of Adobe, and 20 mi (32 km) north of city hall in Phoenix

Drainage area --64 6 mi² (167.3 km²)

Gage-height record --Water-stage recorder graph Datum of gage is 1,459 95 ft (444 993 m) National Geodetic Vertical Datum of 1929.

Discharge record --Stage-discharge relation defined by current-meter measurements

Maxima.--November 1978 to March 1979. Discharge, 600 ft³/s (17.0 m³/s) 2200 hours Jan. 18, gage height, 6 80 ft (2 073 m)
1960 to October 1978 Discharge, 11,500 ft³/s (326 m³/s) Aug 1, 1964, from rating curve extended above 6,200 ft³/s (180 m³/s) Gage height, 12.24 ft (3.731 m) Sept. 5, 1970

(148) 09513970 Agua Fria River at Avondale, Ariz

Location --Lat 33°26'06", long 112°19'59", in NW¼ sec 14, T 1 N , R 1 W , Maricopa County, Hydrologic Unit 15070102, on downstream side of bridge on U S Highway 80, 0 5 mi (0 8 km) east of Avondale, and 3 mi (5 km) upstream from mouth

Drainage area --2,013 mi² (5,214 km²), of which 1,459 mi² (3,779 km²) is above Lake Pleasant Floodwater from drainage area of 247 mi² (640 km²) above McMicken Dam on Trilby Wash was diverted into Agua Fria River basin above station

Gage-height record --Water-stage recorder graph Datum of gage is 952 92 ft (290 450 m), Arizona Highway Department datum

Discharge record --Stage-discharge relations poorly defined by current-meter measurements below 23,500 ft³/s (666 m³/s) and extended above on basis of slope-area measurement of peak flow Record poor

Maxima --November 1978 to March 1979 Discharge, 29,300 ft³/s (830 m³/s) at 1100 hours, Dec 19, gage height, 6 48 ft (1 975 m), from profile past gage
1959 to October 1978 Discharge, 20,600 ft³/s (583 m³/s) Sept 6, 1970, gage height, 11 21 ft (3 417 m), from rating curve extended above 1,500 ft³/s (42 m³/s) on basis of slope-area measurement of peak flow

Remarks --Flow regulated by Lake Pleasant, 35 mi (56 km) upstream (See station 09513500)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 18			Dec 21			Jan 19—Con		
1300	0	0	0400	0 10	286	0300	2 53	7,700
1330	0	0	0800	10	188	0700	2 13	5,700
1400	1 90	3,500	1400	-----	80	0800	1 80	4,000
1500	1 55	2,150	2400	-----	20	1100	2 30	6,600
1830	1 20	1,100				1130	2.15	5,800
2000	1 37	1,550	Jan 17			1200	2.25	6,400
2130	1 50	1,960	0000	-----	0	1800	1 32	1,900
2300	1 93	3,650	1500	-----	0	2000	1 27	1,750
2400	2 05	4,150	1530	80	550	2300	1 38	2,150
Dec 19			1800	1 05	1,080	2400	1 35	2,050
0330	1 90	3,500	1900	96	860	Jan 20		
0550	2 34	5,550	1930	2 00	5,000	0600	1 23	1,600
0730	2 10	4,400	2000	3.34	12,500	1200	1 21	1,530
0830	3 73	12,700	2030	3 96	16,250	1800	1 17	1,430
0930	1 40	1,650	2100	4 47	19,400	2100	1 12	1,250
1100	6 48	29,300	2200	5.10	23,500	2400	.81	570
1130	5 00	22,500	2230	5 23	24,600	Jan 21		
1230	4 65	20,300	2300	4 94	22,500	1200	09	90
1300	5 50	24,500	2400	3 86	15,600	2400	60	0
1500	3 75	16,000				Mar 29		
1600	3 25	13,400	Jan 18			0000	-----	0
1630	3 85	16,400	0200	3 11	11,200	0800	-----	0
1800	2 95	11,900	0300	2 59	8,200	1000	2.60	8,400
1830	3 89	16,500	0400	2 21	6,150	1200	2 44	7,400
2000	3 18	13,000	0600	2 00	5,000	2000	1 27	1,750
2200	2 60	10,100	0830	1.78	3,950	2200	1 15	1,350

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978-79

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 19—Con			Jan 18—Con			Mar 29—Con		
2400	2 50	9,600	1200	2 00	5,000	2400	1 10	1,200
			1600	2 00	5,000	Mar. 30		
Dec 20			1700	1.80	4,000	1200	1 06	1,100
0100	2 50	9,600	1800	1 95	4,760	2400	1 00	960
0200	2 10	7,500	2000	1.90	4,500			
0600	2 00	7,000	2200	2 13	5,700	Mar. 31		
1200	1 10	2,850	2400	2 50	7,800	0600	1 00	960
1500	60	1,060				1200	40	250
1700	43	645	Jan 19			1800	15	80
2400	17	325	0130	2 33	6,800	2400	55	0

(149) 09514400 Whitespar A Watershed near Prescott, Ariz
(U S Forest Service station)

Location --Lat 34°28'51", long 112°31'06", in SE¼NE¼ sec 25, T 13 N , R 3 W , Yavapai County, Hydrologic Unit 15070103, Prescott National Forest, 2 mi (3 2 km) upstream from confluence with Little Copper Creek, and 5 5 mi (8 8 km) southwest of Prescott

Drainage area --0 47 mi² (1 22 km²)

Gage-height record --Water-stage recorder chart Altitude of gage is 6,020 ft (1,835 m) from topographic map.

Discharge record --Computed from theoretical rating for 120° v-notch weir

Maxima --November 1978 to March 1979 Discharge, 13 6 ft³/s (0 39 m³/s) 2000 hours Dec. 18, gage height, 1 58 ft (0 482 m)
1957 to October 1978 Discharge, 24 ft³/s (0 68 m³/s) Mar 2, 1978, gage height, 2 00 ft (0 61 m)

Remarks --Records furnished by U S Forest Service Rocky Mountain Forest and Range Experiment Station Additional data for other small research watersheds in this area are available from the experiment station

(150) 09515500 Hassayampa River at Box Damsite, near Wickenburg, Ariz

Location --Lat 34°02'42", long 112°42'33", in SW¼SE¼ sec 7, T 8 N , R 4 W , Yavapai County, Hydrologic Unit 15070103, on right bank at Box damsite, 5.5 mi (8.8 km) northeast of Wickenburg

Drainage area --417 mi² (1,080 km²).

Gage-height record.--Water-stage recorder graph. Datum of gage is 2,236 12 ft (681 569 m) National Geodetic Vertical Datum of 1929

(150) 09515500 Hassayampa River at Box Damsite, near Wickenburg, Ariz —Continued

Discharge record --Average rating curve defined by four slope-area measurements between gage heights of 9 0 and 34.6 ft (2 743 and 10 55 m) Shifts to average curve defined by current meter measurements below 400 ft^3/s (11 3 m^3/s) Records are poor.

Maxima --November 1978 to March 1979 Discharge, 9,640 ft^3/s (273 m^3/s) 2330 hours Mar 28, gage height, 11 50 ft (3 505 m).

At least 1891 to October 1978 Discharge, 58,000 ft^3/s (1,640 m^3/s) Sept 5, 1970, gage height, 34 6 ft (10 55 m), from profile past gage, from slope-area measurement of peak flow Relation to flood in February 1890, which was caused by failure of dam near Wagoner, is unknown

(151) 09516500 Hassayampa River near Morristown, Ariz
(Crest-stage station)

Location --Lat 33°53'06", long 112°39'41", in SW¼SE¼ sec 3, T 6 N , R 4 W , Maricopa County, Hydrologic Unit 15070103, 3 0 mi (5 0 km) northwest of Morristown, and 7 mi (11 km) southeast of Wickenburg

Drainage area --774 mi^2 (2,005 km^2)

Gage-height record --Crest stage only Datum of gage is 1,831 16 ft (558 138 m) National Geodetic Vertical Datum of 1929, supplemental adjustment of 1965

Discharge record --Stage-discharge relation based on estimated flows and slope-area measurements Record is poor

Maxima --November 1978 to March 1979 Discharge, 9,600 ft^3/s (27 2 m^3/s) Dec 18, gage height, 11 67 ft (3 557 m)

1921 to October 1978 Discharge, 47,500 ft^3/s (1,350 m^3/s) Sept 5, 1970, gage height, 19 0 ft (5 79 m), from high-water profile, from slope-area measurement of peak flow

(152) 09517000 Hassayampa River near Arlington, Ariz

Location --Lat 33°20'50", long 112°43'30", in NW¼ sec 13, T 1 S , R 5 W , Maricopa County, Hydrologic Unit 15070104, at former U S Highway 80, 1 8 mi (2 9 km) upstream from mouth, and 2 8 mi (4 5 km) northeast of Arlington.

Drainage area --1,470 mi^2 (3,810 km^2), approximately

Gage-height record --Water-stage recorder. Datum of gage is 831.87 ft (253 443 m) National Geodetic Vertical Datum of 1929

Discharge record --Determined by shifting two current-meter measurements of less than 420 ft^3/s (11 9 m^3/s) and slope-area measurement of peak flow to base rating defined by step-backwater computations Record is poor

Maxima --November 1978 to March 1979. Discharge, 3,300 ft^3/s (93 5 m^3/s) 2245 hours Nov 11, gage height, 2 83 ft (0 863 m)

1961 to October 1978· Discharge, 39,000 ft^3/s (1,100 m^3/s) Sept 5, 1970, gage height, 8 40 ft (2 560 m), result of slope-area measurement of peak flow

(153) 09517500 Centennial Wash near Arlington, Ariz

Location --Lat 33°16'12", long 112°47'50", in sec 7, T 2 S , R.5 W , Maricopa County, Hydrologic Unit 15070104, on upstream side of ford on former U S Highway 80, 3 0 mi (4 8 km) upstream from Gillespie Dam, and 4 4 mi (7 1 km) southwest of Arlington

Drainage area --1,810 mi² (4,690 km²), approximately.

Gage-height record --Water-stage recorder graph Datum of gage is 773 22 ft (235 677 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation defined by current-meter measurements

Maxima -- February to March 1978 Discharge, 818 ft³/s (23 2 m³/s) Jan. 17, gage height, 3 53 ft (1 076 m)
1961 to October 1978 Discharge, 14,500 ft³/s (411 m³/s) July 23, 1961, from rating curve extended above 5,500 ft³/s (160 m³/s) Gage height, 4 71 ft (1 436 m) Sept 5, 1970

(154) 09519500 Gila River below Gillespie Dam, Ariz

Location --Lat 33°13'45", long 112°46'00", in SE¼NE¼ sec 28, T 2 S , R 5 W , Maricopa County, Hydrologic Unit 15070101, at left end of Gillespie Dam, 8 mi (13 km) downstream from Hassayampa River

Drainage area --49,650 mi² (128,600 km²)

Gage-height record --Digital water-stage recorder tape except 0100 to 1200 hours Jan 17 Datum of gage is 743 51 ft (226 622 m) National Geodetic Vertical Datum of 1929

Discharge record --Stage-discharge relation defined by current-meter measurements.

Maxima --November 1978 to March 1979 Discharge, 125,000 ft³/s (3,540 m³/s) 1400 hours Dec 20, gage height, 17 06 ft (5 200 m)
1921 to October 1978 Discharge, 92,900 ft³/s (2,630 m³/s) Mar. 4, 1978. Gage height, 16 1 ft (4 91 m) Jan 2, 1966
1891 to October 1978 Discharge estimated as 250,000 ft³/s (7,100 m³/s) in February 1891

Remarks --Flow partially regulated by San Carlos Reservoir on the Gila River since 1928 (see sta 09469000), by a system of reservoirs on the Salt River since 1910 (see sta 09501000), by a system of reservoirs on the Verde River since 1939 (see sta 09509500), and by Lake Pleasant on the Agua Fria since 1927 (see sta 09513500)

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 19			Jan 17			Mar. 29		
1100	9 56	0	2400	10.42	1,590	1200	12 02	18,100
1200	10 12	223	Jan 18			1800	12.22	21,000
1500	10 41	1,540	1200	10 33	1,100	2000	12 57	26,200
2000	10 46	1,870	1600	10 39	1,440	2200	13.36	39,700
2400	10 41	1,540	1800	10 76	4,050	2400	13 97	51,500
Dec 20			2000	12 59	26,500	Mar 30		
0200	10 54	2,340	2200	14 01	52,300	0400	14 27	57,700

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1978

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Dec 20—Con			Jan 18—Con.			Mar 30—Con		
0300	11 34	9,650	2400	14 55	63,500	0430	14 38	59,900
0400	14 95	72,300	Jan 19			0600	14 35	59,300
0500	16 01	97,500	0200	14 91	71,500	0800	14 32	58,700
0800	16 88	120,000	0400	15 03	74,100	1200	14 24	57,100
1100	16 98	123,000	0600	15 15	76,800	1800	14 03	52,700
1300	16 93	122,000	0800	15 17	77,300	2400	13 52	42,800
1400	17 06	125,000	1200	15 27	79,600	Mar 31		
1600	16 99	123,000	1400	15 34	81,200	0400	13 33	39,200
1900	16 65	114,000	1830	15 56	86,600	0800	13 40	40,400
2400	15 90	94,800	2000	15 52	85,200	1200	13 69	45,900
Dec 21			2400	15 44	83,500	1600	13 93	50,700
0600	15 47	84,200	Jan 20			2000	13 97	51,500
1200	15 24	78,900	0600	15 18	77,500	2400	13 97	51,500
1800	14 65	65,600	1200	15 02	73,900			
2400	14 37	59,700	1800	14 74	67,500	Apr 1		
Dec 22			2400	14 57	63,900	0600	13 65	45,200
0600	14 23	56,600	Jan 21			0900	13 38	40,000
1200	14 16	55,200	1200	14 37	59,700	1200	13 18	36,400
1800	13 89	49,900	2400	14 16	55,200	1800	12 95	32,600
2400	13 48	41,900	Jan 22			2400	12 67	27,900
Dec 23			1200	13 65	45,200	Apr 2		
0500	13 36	39,700	2400	13 28	38,300	1200	12 37	23,200
1700	13 72	46,500	Jan 23			2400	11 95	17,200
2400	13 59	44,100	1200	12 80	30,000			
Dec 24			2400	12 57	26,200	Apr 3		
1200	13 35	39,600	Mar 28			1200	11 58	12,400
2400	12 78	29,500	2400	11 83	15,500	2400	11 34	9,700

(155) Painted Rock Reservoir at Painted Rock Dam, Ariz

Location --Lat 33°04'30", long 113°00'50", in SE¼ sec 18, T 4 S , R 7 W , Maricopa County, Hydrologic Unit 15070201, at Painted Rock Dam, 19 mi (31 km) northeast of Sentinel

Drainage area --50,910 mi² (131,860 km²), approximately.

Gage-height record --Water-stage recorder graph Record furnished by U S Army Corps of Engineers, Los Angeles District Datum of gage is 0 0 ft (0 0 m) National Geodetic Vertical Datum of 1929

Reservoir-contents record --Capacity table furnished by U S Army Corps of Engineers, Los Angeles District

Maxima --November 1978 to April 1979 Contents, 1,616,000 acre-ft (1,992 5 hm³) Apr 17, 1979, gage height, 642 35 ft (195 788 m)
1959 to October 1978 Contents, 439,860 acre-ft (542 hm³) May 21, 1973, gage height, 601 25 ft (183 261 m).

Remarks --Flood control reservoir is formed by earthfill dam completed in 1959, capacity 2,492,000 acre-ft (3,070 hm³) Last water from floods of November 1978 to March 1979 was released in January 1980

(156) 09519800 Gila River below Painted Rock Dam, Ariz

Location --Lat 33°04'30", long 113°00'50", in SE¼ sec 18, T 4 S , R 7 W , Maricopa County, Hydrologic Unit 15070201, on left bank 0 3 mi (0 5 km) downstream from Painted Rock Dam, and 19 mi (31 km) northeast of Sentinel

Drainage area --50,910 mi² (131,860 km²), approximately

Gage-height record --Water-stage recorder graph Datum of gage is 518 69 ft (158 097 m) National Geodetic Vertical Datum of 1929 (levels by U.S Army Corps of Engineers)

Discharge records --Stage-discharge relation defined by current-meter measurements.

Maxima --November 1978 to March 1979 Discharge, 3,340 ft³/s (94 6 m³/s) 0800 hours Feb 9, gage height, 10 57 ft (3 222 m)
1959 to October 1978 Discharge, 2,860 ft³/s (81 0 m³/s) Apr 5, 1973, gage height, 10 29 ft (3 136 m)

Remarks --Flow regulated by Painted Rock Reservoir since 1959 (capacity 2,492,000 acre-ft or 3,070 hm³) Release of water from the flood began Dec 22, 1978, and continued into January 1980 Daily discharges ranged from 1,200 to 5,020 ft³/s (34 to 142 m³/s) and were generally in the range from 2,000 to 3,000 ft³/s (57 to 85 m³/s) See U S Geological Survey Water Resources Data for Arizona, 1979 water year and 1980 water year

(157) 09520360 Gila River near Mohawk, Ariz

Location --Lat 32°47'18", long 113°45'48", on section line between secs 25 and 26, T 7 S , R 15 W , Yuma County, Hydrologic Unit 15070201, in center of channel, 70 ft (21 m) upstream from Avenue 51E, and 4 0 mi (6 4 km) north of Mohawk

Drainage area --55,430 mi² (143,560 km²)

Gage-height record --Water-stage recorder Altitude of gage is 300 ft (91 4 m), revised, from topographic map

Maxima --November 1978 to March 1979 Daily discharge, 2,430 ft³/s (68 8 m³/s) Mar 21
1973 to October 1978 Discharge, 1,730 ft³/s (49 0 m³/s) June 2, 1973, gage height, 7 44 ft (2 268 m)

Remarks --Records fair Flow regulated by Painted Rock Dam (see Remarks for sta 09519800)

(158) 09520500 Gila River near Dome, Ariz

Location --Lat 32°45'39", long 114°25'11", in SW¼ sec 4, T 8 S , R 21 W , Yuma County, Hydrologic Unit 15070201, on right bank 440 ft (134 m) upstream from McPhal bridge on old route of State Highway 95, 3 mi (5 km) west of Dome, and 12 mi (19 km) upstream from mouth

Drainage area.--57,850 mi² (149,800 km²), approximately—includes 373 mi² (966 km²) in Aubrey Valley Playa, a closed basin, but excludes all other closed basins

Gage-height record --Water-stage recorder Datum of gage is 139 18 ft (42 422 m) National Geodetic Vertical Datum of 1929

(158) 09520500 Gila River near Dome, Ariz —Continued

Maxima --November 1978 to March 1979 Daily discharge, 2,360 ft^3/s (66 8 m^3/s) Mar 25
Maximum due to releases from dam is 1,380 ft^3/s (39 1 m^3/s) in 1973
1903 to 1929 Maximum daily discharge about 200,000 ft^3/s (5,700 m^3/s) Jan 22, 1916
1929 to 1959 Maximum discharge, 20,700 ft^3/s (586 m^3/s) Feb 15, 1932, gage height, 16 75 ft (5 105)
1959 to 1981 Maximum discharge, 4,820 ft^3/s (137 m^3/s) Sept 18, 1963, gage height, 16 20 ft (4 938 m), result of tributary inflow below Painted Rock Dam

Remarks --Many diversions above station for irrigation Flow above station regulated by several reservoirs on Gila, Salt, Verde and Agua Fria Rivers (see Remarks for sta 09519500 and 09519800)

(159) 09520700 Gila River near mouth, near Yuma, Ariz

Location --Lat 32°42'38", long 114°33'06", in NW¼NE¼ sec 30, T 8 S , R 22 W , Yuma County, Hydrologic Unit 15070201, on left bank just upstream from South Gila Pump Outlet Channel No 1, 0 6 mi (1 0 km) upstream from mouth, and 4 mi (6 km) east of Yuma

Drainage area --57,950 mi^2 (150,090 km^2), approximately

Gage-height record --Water-stage recorder and weir Datum of gage is 122 01 ft (37 189 m) U S Bureau of Reclamation datum

Maxima --November 1978 to March 1979 Daily discharge, 2,040 ft^3/s (57 8 m^3/s) Mar 29
1975 to October 1978 Daily discharge, 757 ft^3/s (21 4 m^3/s) Sept 11, 1977

Remarks --Flow regulated by Painted Rock Reservoir (see sta 09519800) Record includes flow of South Gila Pump Outlet Channel No 1

SUMMARY

Severe flooding occurred during December 18–20, 1978, in central Arizona and west-central New Mexico as a result of as much as 10 in. of warm rain on a snow pack of moderate depth The December 17–20 rainfall followed a period of above-average runoff in November 1978 Lesser floods occurred in November 1978 and in January and March 1979.

In December 1978, flooding occurred at Winslow, Ariz., where the Little Colorado River was the highest in nearly 30 years The flood on the Gila River upstream from San Francisco River was the highest since at least 1891, and probably many years earlier Downstream from the San Francisco River, the peak discharge of 100,000 ft^3/s is the highest since 1916 and is about equal to four peaks that occurred between 1891 and 1916. The flood that occurred upstream from the San Francisco River in December 1978 originated mainly in the West and Middle Forks Gila River and in tributaries to the Gila River between Gila Hot Springs, N Mex., and Redrock, N Mex In New Mexico the flood was at least 3 ft above the previous known maximum stages that occurred in 1941 and 1972. The flood inundated Duncan, Ariz , to a depth of 7 ft and caused severe agricultural losses in Virden Valley of New Mexico and Duncan, York, and Safford Valleys of Arizona At Clifton, Ariz., the San Francisco River was 0.8 to 3.5 ft lower than in October 1972; however, Eagle Creek was higher than in 1972. Extreme amounts of runoff came from Marijilda and Deadman Creeks, which drain the Pinaleno Mountains south of Safford

As the peak on the Gila River moved downstream through west-central New Mexico, the peak discharge increased and the duration of the crest became shorter Although the possibility of a debris dam in Gila Middle Box cannot be completely ruled out, changes in the hydrograph appear to be due entirely to inflow and changes in channel conditions The peak moved from Redrock, N. Mex., to Duncan, Ariz., in about 6 hours. Average traveltime in this reach for other floods differs with the discharge at Redrock and is about 5 hours for discharges of 40,000 to 50,000 ft^3/s and about 14 hours for discharges of 10,000 ft^3/s Average traveltime for floodwaves moving from Clifton to Safford is 8 to 10 hours.

Flooding occurred in the Phoenix area where the discharge of the Salt River was about equal to the discharge of March 1978 Peak discharges of March and December 1978 were the highest since 1920. The Agua Fria River had the highest peak since 1919. The flooding occurred because the unusually large volume of inflow could not be contained in water-conservation reservoirs on the Salt, Verde, and Agua Fria Rivers. The reservoirs already contained above-average storage for that time of year because of a large carryover storage from the 1978 water-use season and above-average runoff in November 1978. The volume of inflow to reservoirs on the Salt, Verde, and Agua Fria Rivers was high, but in most years, unfilled storage capacity in the reservoirs would have been adequate to allow all inflow during the 3 days of maximum discharge to be retained in the reservoirs

Floodwater reached Phoenix about 8 hours after the main release began from Bartlett Dam and reached Gillespie Dam 32 hours later. The crest traveled from Granite Reef Dam to Jointhead Dam in about 8 hours.

The flood caused 12 deaths and between $150 million and $200 million in damage, of which $51.8 million occurred in Maricopa County and $40 million occurred in the Gila River basin above San Carlos Reservoir. Along most of the rivers in the flood area, ground-water levels rose several feet from spring of 1978 to spring of 1979.

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CONVERSION FACTORS

For readers who may prefer to use metric units, the conversion factors for the terms used in this report are listed below

Multiply	By	To obtain
inch (in)	25 4	millimeter (mm)
foot (ft)	0 3048	meter (m)
mile (mi)	1 609	kilometer (km)
square mile (mi^2) (mi^2)	2 590	square kilometer (km^2)
acre	0 4047	hectare (ha)
acre-foot (acre-ft) (acre-ft)	0 001233	cubic hectometer (hm^3)
cubic foot per second (ft^3/s)	0 02832	cubic meter per second (m^3/s)
cubic foot per second per square mile [(ft^3/s)/mi^2]	0 01093	cubic meter per second per square kilometer [(m^3/s)/km^2]
degree Fahrenheit (°F)	(temp °F-32)/1 8	degree Celsius (°C)

National Geodetic Vertical Datum of 1929 (NGVD of 1929) A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called mean sea level