# Floods of September 1970 in Arizona, Utah, Colorado, and New Mexico

By R. H. ROESKE, M. E. COOLEY, and B. N. ALDRIDGE

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# METRIC EQUIVALENTS

Multiply English unit	By	To obtain metric unit
Inches (in.)	25.4	Millimeters (mm).
Feet (ft)	.3048	Meters (m).
Miles (mi)	1.609	Kilometers (km).
Square miles (mi <sup>2</sup> )	2.590	Square kilometers (km <sup>2</sup> ).
Cubic feet per second (ft <sup>3</sup> /s)	28.32	Liters per second $(L/s)$ .
	.02832	Cubic meters per second $(m^3/s)$ .
Cubic feet per second per square mile (ft <sup>3</sup> /s per mi <sup>2</sup> ).	.01093	Cubic meters per second per square kilometer (m <sup>3</sup> /s per km <sup>2</sup> ).
Acre-feet (acre-ft)	.001233	Cubic hectometers (hm <sup>3</sup> )
Pounds (lb)	.4536	Kilograms (kg).

[The following factors may be applied to convert the English units used in this report to metric units.]

# FLOODS OF SEPTEMBER 1970 IN ARIZONA, UTAH, COLORADO, AND NEW MEXICO

By R. H. ROESKE, M. E. COOLEY, and B. N. ALDRIDGE

#### ABSTRACT

During September 5-7, 1970, unusually large floods occurred in the mountains of central Arizona and in the Four Corners area of Arizona, Utah, Colorado, and New Mexico. Flooding also occurred in southern and northeastern Arizona. The record-high rainfall of September 5 occurred when a mass of moist tropical air from Pacific storm Norma collided with a cold front from the northwest. A new 24-hour precipitation record of 11.40 inches (290 millimeters) was established for Arizona, and new 12- and 24-hour precipitation records of 6.0 inches (152 millimeters) were established for Utah.

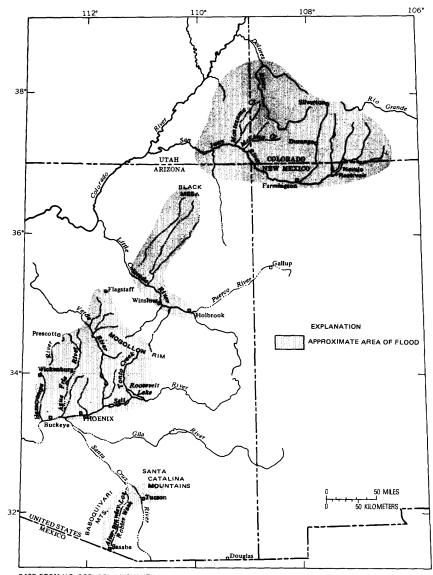
The flood took the lives of 23 persons and was reported to have caused about \$8.4 million in damage in Arizona. The main area of flooding was in the mountains in central Arizona. The flood generally was less destructive with increasing distance downstream; in the Salt and Verde River basins the reservoirs were capable of storing all the floodwater.

Flooding in the Dolores and San Juan River basins in the Four Corners area was mostly in rural areas, and two people were drowned in McElmo Creek in Utah. The flood was not as large as that of October 1911, which is the largest known flood in the area. A second storm occurred in the Four Corners area September 12-14; however, the amount of flooding generally was less than that from the previous storm. Flood damage as a result of the two storms was reported to be about \$2.9 million.

#### INTRODUCTION

During September 5-7, 1970, unusually large floods in the mountains of central Arizona and in the Four Corners area of Arizona, Utah, Colorado, and New Mexico (fig. 1) transformed the Labor Day weekend into tragedy. Rapidly rising streams claimed the lives of 23 persons in Arizona and 2 in Utah. Three other persons died in Arizona as a result of storm-related accidents; two were killed in a plane crash apparently caused by inclement weather, and one was killed when a cave entrance collapsed because of excessive ground moisture. The 23 deaths that were attributed directly to the flood in central Arizona brought the State's flood death toll to 31 for the summer of 1970; eight persons drowned in flash floods earlier in the summer. Flooding also occurred in southern Arizona on September 4 and 6 and in northeastern Arizona on September 5-7; a second flood occurred in the Four Corners area September 12-14.

More rain fell on September 5, 1970, than on any other day in Arizona's and Utah's recorded weather history. A new 24-hour precipitation record was established for Arizona, and new 12- and 24-hour precipitation records



BASE FROM U.S. GEOLOGICAL SURVEY UNITED STATES BASE MAP, 1961

FIGURE 1. - Location of flooded areas.

were established for Utah. Although rain fell over most of Arizona and the Four Corners area during September 3-6, the large amounts of rain generally were in the mountains, where the strong orographic uplift exerted great influence on the amount of precipitation.

Parts of Arizona and Colorado were declared flood disaster areas and were eligible for Federal aid. Flood damage was reported to be about \$8.4 million in Arizona, and in the Four Corners area the damage from both storms was about \$2.9 million. Most of the flooding occurred in rural areas and on national forest land; flood damage was minimized in downstream areas where the reservoirs impounded most of the floodwater.

The purpose of this report is to describe the storms that produced the floods, to give a factual account of the floods, to compare the floods with past floods, and to document some of the channel modifications caused by the floods. Although the report deals mainly with the flood of September 5-7, 1970, the flood of September 12-14 in the Four Corners area also is discussed.

#### **REPORTING OF DATA**

The U.S. Geological Survey has adopted the policy of reporting data in metric units in combination with English units as a first step in what eventually will be total conversion to the metric system. For this report, metric units are given in parentheses following English units in the text, and English and metric units are shown in the illustrations. The data in the tables are given in English units only.

#### ACKNOWLEDGMENTS

The authors wish to acknowledge the assistance given by personnel of several agencies in the preparation of this report. D. B. Thorud and P. F. Ffolliott of the University of Arizona furnished flood-damage data, and A. L. Zimmerman of the U.S. National Weather Service, formerly the U.S. Weather Bureau, furnished rainfall and meteorological data. The Rocky Mountain Forest and Range Experiment Stations of the U.S. Forest Service at Tempe and Flagstaff furnished rainfall and runoff data for small watersheds in central Arizona. Many residents in the storm-affected areas maintain nonrecording rain gages, and their data were obtained by the authors and by the National Weather Service during a "bucket survey" made immediately after the storm. Streamflow data were obtained from previously published reports and from the files of the U.S. Geological Survey offices in Arizona, Utah, Colorado, and New Mexico.

#### STORMS AND WEATHER CONDITIONS

Summer rains in the flood areas generally are the result of the movement of warm moist airmasses from the Gulf of Mexico. In late summer, however, tropical storms from the Pacific Ocean occasionally bring large amounts of precipitation into the areas, particularly those in Arizona. In a description of the climate of Arizona, Green and Sellers (1964, p. 16) stated: "In fact most of the record summer rains in the past century have been associated with deep surges of tropical air into the state from the Gulf of California and the Pacific Ocean. These storms, which occur most frequently in late August and September, usually originate as tropical hurricanes off the west coast of Mexico." The record rainfall of September 5, 1970, was the result of the collision of a mass of moist tropical air from the Pacific Ocean with a cold front from the northwest.

The flood-producing rains of September 3-6, 1970, were preceded by near-normal rainfall in August, although during the last week many climatological stations recorded no rain, and others recorded only minor amounts. In most of Arizona the first two days of September were dry, but in the Four Corners area light showers were common.

#### STORM OF SEPTEMBER 3-6, 1970

#### METEOROLOGICAL SETTING

The following meteorological description of the storm of September 3-6 is summarized mainly from the work of A. L. Zimmerman (U.S. National Oceanic and Atmospheric Administration, 1971).

On September 3, tropical storm Norma was about 300 mi (500 km) west of the southern tip of Baja California and was pushing moist tropical air northward into southern Arizona while an intense cold front that extended from northwestern Montana across Idaho and Oregon to northern California was moving southward. Thunderstorms and heavy rain from the tropical airmass began on the afternoon of September 3 in southeastern Arizona. The moist tropical air continued to spread northward, and, by the morning of September 4, clouds covered all Arizona and the Four Corners area. The ITOS (Improved Tiros Operational Satellite) 1 photograph taken at 1453 hours, m.s.t. (mountain standard time), on September 4 shows that the cloud cover had moved eastward and that the circulation around tropical storm Norma continued to feed moist tropical air into the areas (fig. 2); the clouds over northern Nevada are associated with the cold front approaching from the northwest.

Rainfall was general over Arizona and the Four Corners area on September 4 but was especially intense along the east side of the Baboquivari Mountains in southern Arizona. By early morning of September 5, the cold front extended diagonally across central Utah to the southern tip of Nevada and across southern California. As the cold front approached from the northwest, strong southerly winds developed over Arizona. The upward flow of air ahead of the cold front combined with the strong orographic uplift of moisture-laden tropical air caused extremely intense rain over central Arizona and the Four Corners area. The intense rain began to fall early on September 5 and continued throughout most of the day as the front moved steadily across Arizona and southern Utah. Rainfall activity was about at its peak over central Arizona at 1550 hours, m.s.t., on September 5 (fig. 3). The rain had stopped by late evening in most of the central

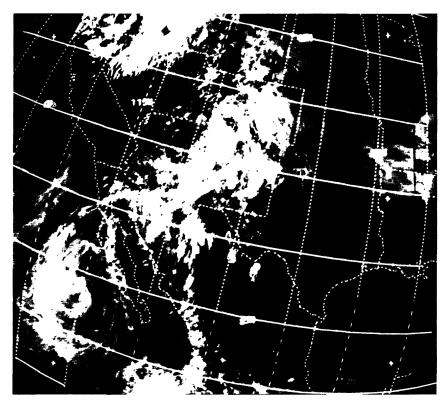


FIGURE 2.—Imagery from ITOS 1 satellite, 1453 hours, m.s.t., September 4, 1970. Orbit number 2807; picture center at lat 35° N., long 105° W. Photograph from the National Environmental Satellite Service.

mountains and the northeastern plateau of Arizona; in southwestern Colorado the rain continued to fall on September 6 as the northern part of the cold front advanced into Colorado. Although the southern part of the front had slowed and weakened, renewed storm activity continued throughout the evening of September 5 from Buckeye, Ariz., eastward. By the morning of September 6, a weak cold front—the last remnant of the storm—between Tucson and Douglas, Ariz., was causing rain in the mountains of southeastern Arizona. Rainfall was particularly heavy in the Santa Catalina Mountains near Tucson. By late on September 6, the rain had ceased, and the Labor Day weekend storm had come to an end.

#### RAINFALL

During the storm of September 3-6, at least 1 in. (25 mm) of rain fell over an area that extends northeast from the Arizona-Mexico international boundary into southwestern Colorado (pl. 1). The areas that received more

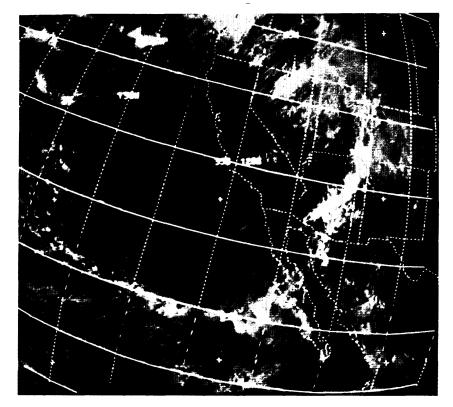


FIGURE 3.—Imagery from ITOS 1 satellite, 1550 hours, m.s.t., September 5, 1970. Orbit number 2820; picture center at lat 35° N., long 120° W. Photograph from the National Environmental Satellite Service.

than 5 in. (125 mm) of rain are mainly in the mountains of central Arizona and along the Mogollon Rim; other areas that received more than 5 in. (125 mm) of rain are the Santa Catalina Mountains and the east front of the Baboquivari Mountains in southern Arizona, the White Mountains in eastern Arizona, the headwaters of Montezuma Creek and Yellowjacket Canyon near the Utah-Colorado border, and the San Juan Mountains in southwestern Colorado. More than 10 in. (255 mm) of rain fell in small areas in the Sierra Ancha, Mazatzal Mountains, and near the Mogollon Rim in central Arizona.

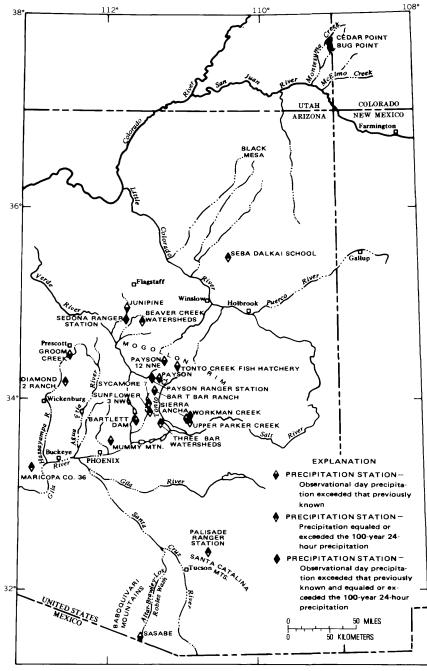
The configuration of the lines of equal rainfall shown on plate 1 for the mountains in central Arizona was improved using the information obtained from a field investigation of runoff from small drainage areas. A better definition of the 4- and 5-in. (100- and 125-mm) lines was obtained using runoff data in conjunction with rainfall data than could have been obtained using only rainfall data. In areas that received less than 3 in. (75 mm) of rain,

only small amounts of runoff occurred, and in areas that received 4 to 5 in. (100 to 125 mm) of rain, moderate amounts of runoff occurred. Large amounts of runoff were confined generally to areas that received more than 5 in. (125 mm) of rain. In many small drainage areas sharp demarcations were noted between the large amounts of runoff produced by more than 5 in. (125 mm) of rain and the small amounts produced by less than 3 in. (75 mm) of rain.

The severity of the storm in northeastern Arizona and northwestern New Mexico was not recognized immediately because of the remote nature of the area, and no attempt was made to collect rainfall data at sites other than those of the widely scattered stations of the National Weather Service network. Less than 2.5 in. (64 mm) of rain was reported at most of the stations. A notable exception was at Seba Dalkai school 37 mi (60 km) northeast of Winslow, Ariz., where 6.50 in. (165 mm) of rain was reported on September 5, and 7.00 in. (178 mm) was reported for the storm. Field inspection showed that large amounts of runoff occurred in several places; the large amounts of runoff indicate that large amounts of rain fell or that the rain was extremely intense for short periods of time. (See pl. 1.) The runoff in Dinnebito, Oraibi, and Wepo Washes indicates that the largest area of intense rainfall in northeastern Arizona was Black Mesa. The division between the areas that had no runoff and those that had small to moderate amounts is assumed to approximate the 2-in. (50-mm) line of equal rainfall (pl. 1).

During the storm of September 3-6, new observational day records were set at many precipitation stations in Arizona (fig. 4, table 1). The 6.20 in. (157 mm) measured at the Payson ranger station was the largest amount measured since the station was established in 1892. The Workman Creek 1 station in the Sierra Ancha recorded 10.99 in. (279 mm) of rain for the observational day from 2400 hours on September 4 to 2400 hours on September 5 (U.S. Environmental Data Service, 1971b). The previous record for Arizona was 6.00 in. (152 mm) in an observational day recorded December 19, 1967, at Crown King in the Bradshaw Mountains south of Prescott (U.S. Environmental Data Service, 1970a). An alltime record for 24-hour precipitation in Arizona was established at the Workman Creek 1 recording gage-11.40 in. (290 mm) between 2200 hours September 4 and 2200 hours September 5. Record rainfall also occurred in southeastern Utah, where a rancher at Bug Point measured 6.0 in. (152 mm) between 0800 hours and 1900 hours on September 5. The measurement establishes new 12- and 24-hour records for Utah (U.S. Environmental Data Service, 1970b). The previous 24-hour record was 5.08 in. (129 mm) at Deer Creek Dam northeast of Provo on February 1, 1963 (E. A. Richardson, State Climatologist, oral commun., 1972).

On September 5, rainfall intensities of more than 3 inches (75 mm) in 4 hours were recorded at several stations in central Arizona. More than 3 in. (75 mm) of rain fell in 2 hours at the Diamond R Ranch in the Bradshaw



BASE FROM U.S. GEOLOGICAL SURVEY UNITED STATES BASE MAP, 1961

FIGURE 4.—Location of stations where observational day precipitation during September 3-6, 1970, exceeded that previously known and where precipitation equaled or exceeded the 100-year 24-hour precipitation.

#### STORMS AND WEATHER CONDITIONS

Station	Septer observat	imum Iber 3-6 ional day vitation	observa	aximum ational day ripitation asly known	Station established (yr)
-	Day	Amount (in.)	Year	Amount (in.)	-
Bar T Bar Ranch	5	5.30	1955	3.96	1952
Bartlett Dam	6	4.50	1951	4.00	1939
Groom Creek	5	4.25	1966	3.85	1942
Junipine	5	5.28	1937	4.71	1935
Mummy Mountain	5	3.94	1966	2.29	1955
Payson 12 NNE	5	4.29	1967	3.53	1950
Payson Ranger Station	5	6.20	1959	4.37	1892
Payson	5	5.36	1959	3.74	1948
Sasabe	4	4.36	1969	2.75	1959
Sedona Ranger Station	5	5.50	1958	2.69	1943
Sierra Ancha	5	4.77	1951	4.58	1935
Tonto Creek Fish					
Hatchery	6	5.63	1957	4.30	1944
Workman Creek 1 <sup>1</sup>	5	10.99	1954	5.27	1941

 TABLE 1.—Comparison of maximum observational day precipitation during September 3-6, 1970, with that previously known at selected stations in Arizona [From U.S. Environmental Data Service, 1970a]

<sup>1</sup>Data from Kangieser, 1972.

Mountains; 3 in. (75 mm) of rain fell in 3 hours at Payson and at Workman Creek 1 in the Sierra Ancha (U.S. Environmental Data Service, 1971b); and more than 3 in. (75 mm) fell in 4 hours at Sycamore Creek in the Mazatzal Mountains. Maximum 15-minute rainfall intensities of more than 2.5 in. (64 mm) per hour occurred at several stations operated by the U.S. Forest Service in the Sierra Ancha, the Mazatzal Mountains, and on the plateau southeast of Flagstaff (Thorud and Ffolliott, 1973, p. 5).

A comparison of the maximum 24-hour precipitation for September 3-6 with the 100-year 24-hour precipitation is given in table 2. The 100-year 24-hour precipitation is the amount of precipitation in a 24-hour period that will be equaled or exceeded, during a long period of time, on the average of once every 100 years. The recurrence interval is a probability concept and does not indicate the amount of time between such precipitation events. In general the 100-year 24-hour precipitation is 4.6 to 6.0 in. (117 to 152 mm) in the mountains of central Arizona; in a few small areas near the crests of the mountains, however, and along the Mogollon Rim the 100-year 24-hour precipitation is 6.5 to 7.0 in. (165 to 178 mm). (See U.S. Weather Bureau, 1967a.) From an analysis of the 30-year record at the Workman Creek 1 station in the Sierra Ancha, the recurrence interval of the rainfall on September 5 is estimated as more than 500 years (Kangieser, 1972). In

#### FLOODS OF SEPT. 1970 IN ARIZ., UTAH, COLO., AND N. MEX.

addition to the areas where 24-hour precipitation is known to have exceeded the 100-year value, several areas in the Navajo and Hopi Indian Reservations in northeastern Arizona had large amounts of runoff, which indicate that the precipitation may have been in excess of the 100-year value.

#### STORM OF SEPTEMBER 12-14, 1970

A second storm hit the Four Corners area September 12-14. Rain fell in southwestern Colorado and southeastern Utah as a cold front moved southward over Colorado bringing rain behind it. In the Four Corners area the amount of rain generally was less than during the previous storm, and most climatological stations reported less than 2.5 in. (64 mm) during the period. The largest amount of rain measured during the storm was at the station 1 mi (1.6 km) east of Wolf Creek Pass in the San Juan Mountains near the divide between the San Juan River and the Rio Grande; 4.83 in. (123 mm) was reported for the 3-day storm, and the largest 24-hour precipitation was 2.84 in. (72 mm). In the Four Corners area the network of climatological stations is adequate to define only the general precipitation pattern (fig. 5). In several places, such as in the extreme northeast corner of Arizona and in the Indian Creek basin northwest of Monticello, Utah, runoff indicated that rainfall was greater than that shown in figure 5.

## **DESCRIPTION OF THE FLOODS**

The storms of September 1970 in Arizona and the Four Corners area produced record peak discharges in many places and caused channel modifications along many of the streams (table 3). The floods of September 1970 are discussed under four geographical areas in this report: (1) southern Arizona, (2) central Arizona, (3) northeastern Arizona, and (4) Four Corners area (fig. 1). The most severe floods occurred in the mountains of central Arizona and in the Four Corners area.

#### SOUTHERN ARIZONA

In southern Arizona flooding began on September 4, and the last thrust of the storm caused additional flooding on September 6. The intense rain on the Baboquivari Mountains near Sasabe induced flooding in the Los Robles Wash basin on September 4. The main stream in the Los Robles Wash basin is called Altar Wash in the upper part of the basin, Brawley Wash in the middle part, and Los Robles Wash in the lower part. Large flows entered Altar Wash from tributaries on the west, but little flow came from those on the east. Generally, the flow was confined in the deep channel in the upper part of Altar Wash. The flood destroyed the gaging station on Altar Wash at the bridge on State Highway 286 (fig. 6, No. 78) and also destroyed the steel-truss bridge, which was constructed in 1915.

The flood in Brawley Wash inundated the gaging station at the bridge on State Highway 86 near Three Points (fig. 6, No. 79); the bridge was

#### SOUTHERN ARIZONA

Station	Maximum September 3-6 24-hour precipitation		100-year 24-hour
	Day	Amount (in.)	precipitation (in.) <sup>1</sup>
	Arizona		
Seba Dalkai School	5	<sup>26,50°</sup>	3.0
Sedona Ranger Station Beaver Creek Watersheds:	5	<sup>3</sup> 5.50	4.6
No. 20	5	46.78	6.5+
No. 22	5	46.29	5.5+
No. 23	5	46.58	6.0+
No. 27	5	46.56	6.5+
No. 50	5	46.37	6.0+
Junipine	5 5 5	<sup>3</sup> 5.28	5.5
Fonto Creek Fish Hatchery	5	<sup>3</sup> 5.63	7.0
Payson Ranger Station	5	<sup>3</sup> 6.20	5.5
Bar T Bar Ranch	5	<sup>3</sup> 5.30	6.0
Sycamore Creek 7	5	<sup>5</sup> 8.91	6.5
Sunflower 3 NNW Three Bar Watersheds:	5	38.00	6.5
С	5	66.33	6.0
D	5	67.44	6.0
Workman Creek 1	5	311.40	7.0
Upper Parker Creek	5	77.80	7.0
Groom Creek	5	<sup>3</sup> 4.25	5.0
Crown King	5	34.50	6.5
Diamond 2 Ranch	5	54.85	4.8
Bartlett Dam	5 5	<sup>3</sup> 4.50	4.8
Scottsdale		<sup>3</sup> 3.57	4.0
Maricopa County No. 36	5	<sup>5</sup> 5.26	4.1
Sasabe	4	<sup>3</sup> 4.36	5.0
	Utah	i · · · · ·	
Bluff	5	82.53	2.7
Cedar Point	5	\$3.75	3.0
Bug Point	5	86.0	3.0
	Colorado		
Silverton	5	93.50	4.0
Wolf Creek Pass 1E	6	103.89	5.0

#### TABLE 2.-Comparison of maximum 24-hour precipitation during September 3-6, 1970, with the 100-year 24-hour precipitation at selected sites

From the U.S. Weather Bureau (1967a, 1967b, 1968). From the U.S. Environmental Data Service (1971a). From the U.S. Environmental Data Service (1970a).

<sup>4</sup> From the Rocky Mountain Forest and Range Experiment Station of the U.S. Forest Service (written commun., 1970) at

<sup>6</sup> From the Rocky Mountain Forest and Range Experiment Station of the U.S. Forest Service (written commun., 1971) at <sup>6</sup> From the U.S. Environmental Data Service (1971b).
 <sup>8</sup> From the U.S. Environmental Data Service (1970b).
 <sup>9</sup> From the U.S. Environmental Data Service (1970c).
 <sup>10</sup> From the U.S. Environmental Data Service (1970c).

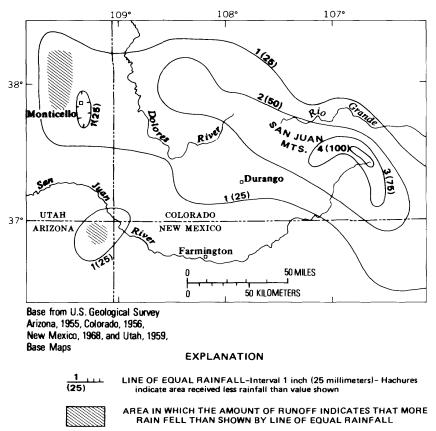


FIGURE 5.--Rainfall, September 12-14, 1970, in Arizona, Utah, Colorado, and New Mexico.

overtopped and traffic was halted for several hours. As the flood moved downstream from Three Points, wide areas of desert and farmland were inundated, and a thin layer of silt and sand was deposited over the inundated areas.

The maximum discharge in the Los Robles Wash basin probably occurred near the gaging station on Altar Wash, where the peak discharge was 22,000 ft<sup>3</sup>/s ( $623 \text{ m}^3$ /s). The peak discharge decreased to 13,700 ft<sup>3</sup>/s ( $388 \text{ m}^3$ /s) at the gaging station on Brawley Wash near Three Points and to 6,140 ft<sup>3</sup>/s ( $174 \text{ m}^3$ /s) at Mile Wide Road (fig. 6, No. 80). The peak discharge near Three Points was about equal to the peak discharge of the flood of September 1962. In 1962, however, the peak discharge increased from 13,000 ft<sup>3</sup>/s ( $368 \text{ m}^3$ /s) near Three Points to 38,000 ft<sup>3</sup>/s ( $1,080 \text{ m}^3$ /s) at Mile Wide Road.

On September 6 the intense rain in the Santa Catalina Mountains produced the highest peak discharge in 39 years of record at the gaging

# SOUTHERN ARIZONA

Drainage basin	Reach	Channel modification		
		Southern Arizona		
Los Robles Wash	Altar Wash	Moderate channel modification. In the upper reaches the channel was deepened 1 to 2 ft, and some lateral cutting and bank caving occurred. Sand and gravel bars as much as 4 ft high were formed in places, and logs were deposited in the channel. Considerable sand and gravel accumulated in the channel near the bridge on State Highway 286, which was washed out during the flood. A bar having a maximum relief of 6 ft was deposited across most of the channel a quarter of a mile upstream from the bridge; here the sediment blockage was sufficient to cause the water to overtop the 9- to 10-ft-high terrace that borders the channel. The terrace was formed prior to 1920, and this probably is the first time that it has been flooded. In the reach half a mile upstream from the bar 2 to 3 ft of sediment was deposited. In the reach from the bridge to Three Points the flood was confined in the deep narrow channel; only small amounts of sand and gravel accumulated in the channel, which was deepened about 2 ft in at least one place.		
	Brawley Wash downstream from Three Points	Generally, the channel was aggraded slightly, and only minor scouring occurred. Although only a small amount of gravel was transported into the area, a few inches of silt to silty sand was deposited on the flood plain.		
Sabino Creek	Sabino Creek	Minor to moderate channel modification; some scouring and movement of gravel.		
		Central Arizona		
Sycamore Creek	Sycamore Creek upstream from Sunflower	Major channel modification. The flow from the large tributaries deposited gravelly detritus in Sycamore Creek. This deposition and the removal of gravel resulted in alternating aggraded and degraded reaches. Downcutting was limited to about 3 ft because bedrock is at or near the surface of the channel in most of the reach. In places the shallow channel was almost filled by at least 4 ft of sediment. In general, lateral cutting was not severe except half a mile north of Sunflower, where about 50 ft of the right bank was removed.		
	Sycamore Creek downstream from Sunflower	Severe to moderate channel modification. Low terraces were eroded and vegetation was removed from the channel. About 2 ft of fill was deposited at the washed-out bridge 5 mi south of Sunflower on State Highway 87.		
East Verde River	East Verde River	Moderate channel modification. The flood cleared the channel of brush and loose rock and toppled many trees that were growing in the channel. Minor lateral cutting occurred in many places.		

 TABLE 3.—Channel modification in selected drainage basins, floods of September 1970

## FLOODS OF SEPT. 1970 IN ARIZ., UTAH, COLO., AND N. MEX.

Drainage basin	Reach	Channel modification
		Central Arizona—Continued
	Weber Creek at Camp Geronimo	Minor channel modification. Flow was not sufficient to move large boulders in the channel. Slight scouring occurred in a few places.
Oak Creek	Oak Creek	Minor channel modification. A few debris slides occurred in Oak Creek Canyon.
Beaver Creek	Wet Beaver and Dry Beaver Creeks	Most of the channel modification along Wet Beaver and Dry Beaver Creeks occurred where the streams debouch from the canyons. Scour holes several feet deep and as much as 300 flong formed in places. In general the channels were deepened; however, in places cobble and boulder bars were deposited. Only a few of the pre-flood bars and scours were recognizable after the flood. In places lateral cutting was as much as 25 ft; where present, the roots of large juniper, pinyon, and ponderosa pine trees protected the banks from more severe erosion. The flood was less turbulent downstream and caused much less channel modification. Upstream from McGuireville, Dry Beaver Creek overflowed onto the nearby terraces and deposited a layer of reddish-brown sand about 1ft thick. Downstream from McGuireville, as much as 3 ft of silty sand was deposited along the slopes and banks of the channel; many trees growing in the channel were uprooted and carried downstream.
Agua Fria River	Agua Fria River upstream from Rock Springs area	Moderate to minor channel modification.
	Agua Fria River, Rock Springs area	Major to moderate channel modification. The most severe channel modification occurred between the point where the river leaves its canyon and Rock Springs. Most of the sand and gravel transported through the canyon has been deposited in this reach and has formed a series of large bars and cut and fill terraces. The flood easily moved cobbly and bouldery gravel and severely eroded the bars and low terraces. The large gravel bars deposited upstream from Interstate Highway 17 caused the floodwater to spread over parts of the adjoining terraces.

#### TABLE 3.—Channel modification in selected drainage basins, floods of September 1970—Continued

#### SOUTHERN ARIZONA

Drainage basin	Reach	Channel modification
		Central Arizona—Continued
Agua Fria River— Continued	Agua Fria River, Rock Springs area— Continued	[Between Rock Springs and Lake Pleasant, the flow was less turbulent, and channel changes were not significant. Downstream from the confluence of the Agua Fria River and Black Canyon Wash the flood inundated the bottom land and deposited 1 to 3 ft of silty sand on a terrace that is 8 to 10 ft above the riverbed.]
	Black Canyon Wash	Major to moderate channel modification. The sudder breaching of the giant log jams in Turkey Creek probably caused the high peak discharge in Black Canyon Wash. In places the high flows severely eroded the channel and adjacent terraces and removed brush and trees.
	New River near New River	Moderate channel modification. Some scouring and minor lateral erosion occurred, gravel bars were rearranged, and the channel was cleared of vegetation.
	New River downstream from New River	Moderate to minor channel modification.
Hassayampa River	Hassayampa River and tributaries, Wagoner area	Channels and adjoining terraces were severely eroded along the Hassayampa River downstream from the mouth of Milk Creek and along Ash, Blind Indian, Cottonwood, and Spring Creeks and in Crooks Canyon. Small flows that caused only slight channel modification occurred in Fools Canyon, along Minnhaha Creek, and along the Hassayampa River upstream from Milk Creek. An average aggradation of about 2 ft occurred along the 300-ft-wide channel of Milk Creek. In places the flood in Blind Indian Creek covered an area 700 ft wide and built large bars, some of which extended from the stream channel onto the bordering low terraces. The Hassayampa River deposited a large amount of sandy material in a wide area of bottom land near Wagoner.
	Hassayampa River, Box Canyon damsite area	Channel and adjoining terraces were severely eroded and modified. Although the amount of downcutting ir Box Canyon could not be determined precisely, it probably was between 2 and 3 ft and not more than 5 ft. Downcutting did not take place immediately downstream or upstream from Box Canyon.
	Hassayampa River, Wickenburg area	Moderate channel modification. Most of the low broad terraces that adjoin the channel were inundated; the terraces are as much as a quarter of a mile wide. The flood deposited large amounts of sand in the channel and

# TABLE 3.—Channel modification in selected drainage basins, floods of September 1970—Continued

Drainage basin	Reach	Channel modification
		Central Arizona—Continued
	Hassayampa River, Wickenburg area— Continued	on the low terraces. As much as 4 ft of sand and silt was deposited in the reach between 3 and 5 mi downstream from Wickenburg. Although the newly laid deposits were scoured during the waning stage of the flood, little erosion of the pre-flood deposits occurred.
	Hassayampa River downstream from Morristown	Moderate to minor channel modification. Most of the adjoining terraces were inundated.
		Northeastern Arizona
Puerco River	Puerco River	Minor channel modification. Some bank caving and slumping. The 1970 flood caused additional deepening of the channel 2 mi east of Gallup, N. Mex.; between 1901 and 1946 the channel was deepened 14 ft (Leopold and Snyder, 1951, fig. 2), between 1946 and 1965 2 ft, between 1965 and 1969 1 ft, and between 1969 and 1971 1 ft. The Puerco River moved large amounts of sand, most of which was deposited a few miles downstream from its mouth in the Little Colorado River near Holbrook.
Polacca Wash	Wepo Wash between Piñon and Polacca	Severe channel modification. More than 5 ft of slumping and lateral cutting of the arroyo walls occurred in places. Most of the erosion was along sharp bends. The channel was cleared of vegetation.
Oraibi Wash	Oraibi Wash, Black Mesa area	Erosion was severe where Oraibi Wash is entrenched in a deep narrow arroyo. North and northwest of Piñon, large-scale slumping of the arroyo walls and as much as 40 ft of lateral cutting occurred. Vegetation was removed or bent over. As much as 3 ft of sandy silt was deposited on terraces in the protected parts of the channel. The effects of the flood were moderate where the arroyo is wide, such as at Oraibi. About 1 ft of sand and silt was deposited on a well-developed 10½-ft-high terrace that supports trees and brush; 2 to 3 ft of sediment accumulated in the channel in places. Downstream from Oraibi, large-scale lateral cutting and slumping occurred in the arroyo walls, and blocks of unconsolidated alluvium more than 50 ft long and 20 ft thick slid into the channel. In places the channel was deepened as much as 4 ft.
Dinnebito Wash	Dinnebito Wash, Black Mesa area	Channel modification in the narrow arroyo of Dinnebito Wash was less severe but similar to that in Oraibi Wash.

 TABLE 3.—Channel modification in selected drainage basins, floods of September 1970—Continued

#### SOUTHERN ARIZONA

Drainage basin	Reach	Channel modification
		Northeastern Arizona—Continued
Moenkopi Wash	Tributaries in the northern Black Mesa area	Minor channel modification. The area in which coal is being strip mined received only moderate amounts of precipitation. The strip mining has not caused any noticeable effects on erosion and deposition in the area of the mines or in downstream areas.
	Moenkopi Wash, Tuba City area	Minor to moderate channel modification. From 1 to 3 ft of cutting occurred at the falls at Moenkopi and at the falls 5 mi downstream from Moenkopi. As much as 2 ft of cutting occurred upstream from the falls at Moenkopi.
		Four Corners Area
McElmo Creek	McElmo Creek between Cortez and Yellowjacket Canyon	Slight channel modification. Low terraces and parts of a few low fields were inundated. Diversion intakes received minor damage.
	Yellowjacket Canyon upstream from its confluence with McElmo Creek	The channel was widened, deepened, and cleared of brushy vegetation, and the edges of terraces were severely eroded. As much as 1 ft of silty sand was deposited on a 4- to 5-ft-high terrace.
	McElmo Creek downstream from its confluence with Yellowjacket Canyon	The channel was deepened and widened slightly, and many fresh scars are exposed along the banks. Large amounts of silty sand were deposited on 5- to 8-ft-high terraces. At Aneth, the channel was aggraded, and a small delta was built into the San Juan River. From 2 to 3 ft of sand was deposited in the channel at the bridge on State Highway 262 west of Aneth.
Montezuma Creek	Montezuma Creek, lower reach	Near Hatch Trading Post the flood was confined largely to the wide channel; however, the terraces and vegetation that border the channel were eroded severely. At the State Highway 262 crossing near Aneth, the flood inundated most of the bottom land. The highway fill served as a dike across the channel and diverted the flow into a cutoff channel. The flow was impounded temporarily before the highway washed out; large sand bars deposited by the flow clogged the channel between the highway and the cutoff channel. One bar was nearly 18 ft high and covered a dense stand of mature saltcedar on a low terrace. The sand bars caused flood peaks that reached a height of 18 ft upstream and 16 ft downstream from the highway.

## TABLE 3.—Channel modification in selected drainage basins, floods of September 1970—Continued

Drainage basin	Reach	Channel modification
		Four Corners Area—Continued
Chinle Wash	Chinle Wash	Minor channel modification. In general the flood was confined to the channel. In the Round Rock-Rock Point area, however, the channel is shallow and is bordered by wide 5-ft-high terraces, and the flood inundated an area more than 600 ft wide and deposited several inches of sandy silt and silty sand on the terraces.

 TABLE 3.—Channel modification in selected drainage basins, floods of September 1970—Continued

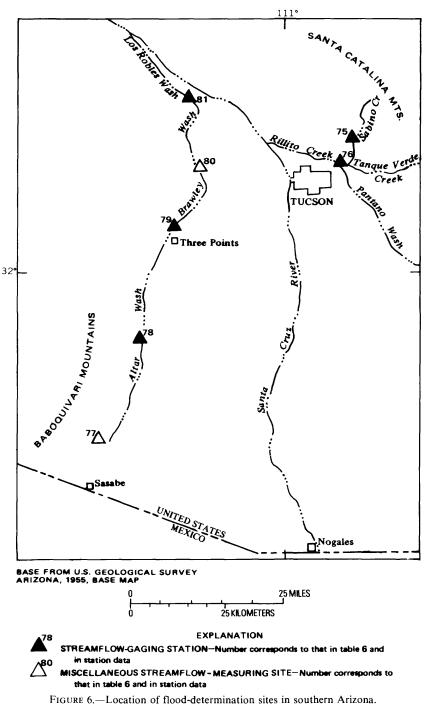
station on Sabino Creek near Tucson (fig. 6, No. 75). The flood washed out Forest Service roads and damaged recreational areas along the creek; some of the recreational areas were closed to visitors for several weeks. The drainage basins adjacent to that of Sabino Creek had very little runoff. The flow from Sabino Creek was reduced considerably after it entered the sandy channel of Rillito Creek.

#### **CENTRAL ARIZONA**

The intense rains in the mountains in central Arizona caused sudden large floods in the drainage basins of Tonto and Sycamore Creeks, East Verde River, Oak and Beaver Creeks, and Agua Fria and Hassayampa Rivers (fig. 7). The flood took the lives of 23 persons and was reported to have caused several million dollars worth of property damage. Peak discharges of several hundred cubic feet per second per square mile were measured at many gaging stations. The peak discharges at several stations probably exceeded the 100-year flood and are among the maximum known in the State (fig. 8). The flooding in the area from Buckeye to Scottsdale along the north side of the Gila and Salt Rivers was mainly sheetflow.

High flows occurred in the upper part of the Cherry Creek basin near the Mogollon Rim and in a small area on the east side of the Sierra Ancha. The flood peaks, however, are of magnitudes that occur frequently. At the south edge of the flood area, the peak flow at the gaging station on Tortilla Creek (fig. 7, No. 94) was  $5,700 \text{ ft}^3/\text{s}$  (161 m<sup>3</sup>/s), slightly less than that which occurred in 1966. The 1966 peak is the highest on this stream since 1941. Two people were killed in the 1970 flood when their vehicle was engulfed by a sharp rise of the creek as they attempted to cross the creek.

The areal distribution of high peak discharges was about the same as that of the large amounts of precipitation except in several small watersheds in the Sierra Ancha and Mazatzal Mountains where rainfall was intense but peak discharges were low (A. R. Hibbert, U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station, written commun., 1971). The high peaks in the large streams resulted when the flows from several CENTRAL ARIZONA



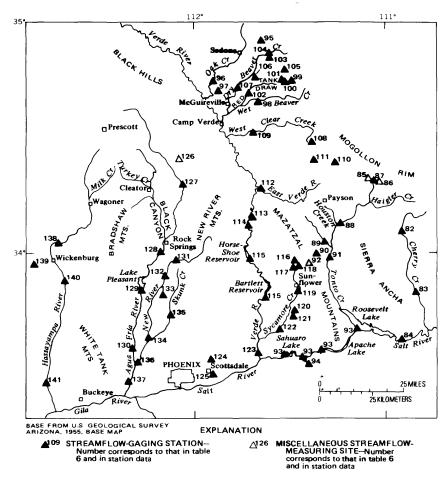


FIGURE 7.-Location of flood-determination sites in central Arizona.

small headwater tributaries reached the main channel at nearly the same time. The peaks were of sufficient magnitude to produce high flows many miles downstream; the peak discharges generally decreased in a downstream direction unless supplemented by flow from additional tributaries draining areas of high-intensity rainfall.

#### TONTO CREEK BASIN

The most destructive flood of the Labor Day weekend occurred in the Tonto Creek basin. The upper part of the basin is a popular recreational area, where pleasant streams drain the pine-covered mountains below the Mogollon Rim. Tonto Creek began rising on September 5, and Forest Rangers began assisting people in crossing the swollen stream and in moving

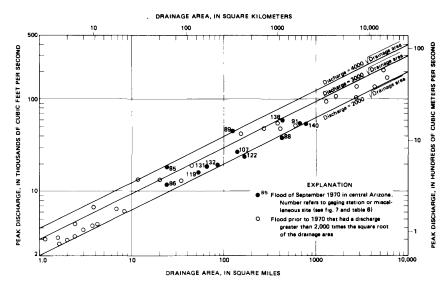


FIGURE 8.—Maximum discharges in relation to drainage areas in Arizona.

camps away from the banks. Between 1530 and 1600 hours, the creek suddenly rose several feet and became a churning mass of water, rocks, and mature pine trees. The flood took the lives of 15 persons; 14 people drowned along Tonto Creek and one along Christopher Creek when housetrailers, campers, and automobiles were swept away and cabins were washed off their foundations and destroyed. Several hundred persons were stranded in the Payson area when roads and bridges were washed out. The electricity was cut off in some areas when powerline poles were washed away.

Most of the flow in the upper part of Tonto Creek basin originated on the north and east sides of the amphitheater at the head of Tonto and Dick Williams Creeks. High-velocity flows moved 8-ft-diameter (2.4-m-diameter) boulders and large ponderosa pine trees, which formed large jams. The flood destroyed Tonto Spring on Tonto Creek and deposited debris in ponds at the State fish hatchery, which caused the loss of 70,000 lb (32,000 kg) of fish. The flood washed out a small dam near the fish hatchery, and 4-5 ft (1.2-1.5 m) of downcutting and about 100 ft (30 m) of lateral erosion occurred in about 1-1/2 hours and endangered residences at the hatchery.

The channel of Dick Williams Creek was scarred by the flood to within 600 ft (180 m) of the top of the Mogollon Rim (J. W. Smith, U.S. Geological Survey, oral commun., 1970), where log jams impounded much detritus. Torrents of water, rock, and debris were released when the jams broke. The sudden releases probably caused the severe erosion along the channel and the formation of a mudflow after the peak. In the lowermost one-fourth mi (0.4 km) of Dick Williams Creek the entire perimeter of the channel was

eroded, and trees, brush, and boulder bars were removed by the tremendous force of the water. Because the flow swirled unevenly around bends and spurs, the heights of the floodmarks on opposite banks differed by as much as 16 ft (4.9 m). The mudflow that occurred after the peak left a trail of mud, sand, and pebbles on the sides of the channel, on boulders, and on a few logs far below the floodmarks. The mudflow merged with the floodwater from Tonto Creek, and did not extend downstream from the confluence of Dick Williams and Tonto Creeks.

The flood demolished a bridge and damaged several cabins along Tonto Creek downstream from Dick Williams Creek; refrigerators and other household items were carried more than 1 mi (1.6 km) downstream. Two people were killed when a cabin was carried away by floodwater. According to evewitness reports, high-velocity flow in the center of the channel created a dome of water that was several feet higher than the water near the edges of the channel. An enormous boulder—about 7 by 9 by 4 ft (2.1 by 2.7 by 1.2 m)-was rolled by the flood and perched spectacularly on top of logs against a ponderosa pine tree growing in the middle of the channel (fig. 9). The base of the boulder was 16 ft (4.9 m) above the channel bottom, which is nearly the same height as the floodmarks on the banks. Bark was removed on the upstream side of the pine tree to a height of 24 ft (7.3 m), which indicates that the water in the middle of the channel was 8 ft (2.4 m) higher than it was near the edges of the channel. Sandstone fragments embedded in ponderosa pine logs, as if they had been shot as projectiles, illustrate the high velocity of the flow; more than 15 fragments were counted in a 12-ft (3.7-m) length of a 3-ft-diameter (0.9-m-diameter) log.

The greatest single tragedy of the flood of 1970 took place at the bridge over Tonto Creek just downstream from the confluence of Tonto and Horton Creeks during the late afternoon of September 5. According to W. L. Buckner (U.S. Forest Service Ranger, oral commun., 1970), some of the logs and trees transported by Tonto Creek accumulated upstream from the bridge abutments and caused a tremendous amount of splash over the railing of the bridge. Two cars were parked on the west approach within 50 ft (15 m) of the bridge. Suddenly, a wall of water 4-5 ft (1.2-1.5 m) high was diverted by the debris that had collected upstream from the bridge. The water washed away the cars, and the 12 occupants were drowned. The flood eventually cut a channel through the west approach to the bridge and gouged out a large section of the adjoining terrace. The peak flow covered nearly all the terrace, which is 15 ft (4.6 m) above the streambed near the bridge, and deposited a mantle of logs about 8 ft (2.4 m) deep over an area 200 by 200 ft (60 by 60 m) on the part of the terrace nearest the bridge.

In the Kohl Ranch area many houses and cabins are built on a fairly continuous terrace about 11-14 ft (3.4-4.3 m) above the bed of Tonto Creek. The flood inundated the lower part of the terrace and damaged buildings; the buildings, trailers, and roads on the slopes below the terrace were severely damaged (fig. 10).



FIGURE 9.—A flood-deposited boulder perched on top of logs in upper Tonto Creek.

According to a resident (H. P. Walker, oral commun., 1970), the flood of 1970 was the largest known in Christopher Creek—a small east tributary to Tonto Creek. At the Mountain Meadow Ranch about 1 mi (1.6 km) upstream from State Highway 160, the creek suddenly rose 3-4 ft (0.9-1.2 m) after it had been running bankfull. Large trees as much as 4 ft (1.2 m) in diameter and 100 ft (30 m) long formed log jams and covered an area about 700 ft (210 m) long upstream from the ranch. Cabins at the ranch were inundated by as much as 2 ft (0.6 m) of water; the log jams spread the flow of the creek over the entire area, which probably saved the cabins from the more severe damage that would have resulted from higher velocity flows. According to H. P. Walker (oral commun., 1970), the channel of Christopher Creek at the intake of a diversion ditch built in 1890 was downcut 4 ft (1.2 m), which was the first major downcutting since the ditch was constructed. At Christopher Ranch downstream from State Highway 160, most of the cabins



FIGURE 10.—Cabin damaged by the flood in Tonto Creek near Kohl Ranch.

are on a natural levee, which was inundated by about 1 ft (0.3 m) of water. One person was drowned when wading from the levee through the deeper water adjacent to the levee. Mr. Eddie Potter (local resident, oral commun., 1970) stated that the flow tossed boulders several feet into the air at the embankment of State Highway 160. Boulders and cobbles were strewn on the highway, and a large cottonwood tree was jammed through an unoccupied cabin by the force of the water; the cabin was damaged so severely that it was later torn down.

Tonto Creek is in a steep-walled canyon for several miles downstream from Christopher Creek. No serious damage was reported or observed during an aerial reconnaissance of Bear Flat, the only development in the area. Tributaries to Tonto Creek downstream from the canyon carried extremely high flows. Long reaches of bedrock were exposed along Haigler Creek, as the flood cleared everything in its path including timber and soil cover. The flood in Houston Creek filled a diversion ditch with sand and gravel—the first such occurrence since the ditch was constructed a few decades ago. A gravel bar 16 ft (4.9 m) high was deposited at the mouth of Houston Creek. The downstream end of the bar forms an escarpment that is parallel with the channel of Tonto Creek. High-water marks at the confluence were 18 ft (5.5 m) above the bed of Tonto Creek and only 2 ft (0.6 m) above the top of the bar. The gravel bar and the high-water marks indicate that the peak discharge of Houston Creek was nearly coincident with that of Tonto Creek.

Although the discharge of Rye Creek was comparable to that of Tonto Creek, only minor flood damage occurred in the Rye Creek basin. The flood near the mouth of Deer Creek, a tributary to Rye Creek, was reported by T. P. Hughes (local resident, oral commun., 1970) as being the largest since 1932. In the broad valley of Tonto Creek near Punkin Center, most of the terrace that borders the wide gravelly channel was inundated, and an area as much as one-half mi (0.8 km) wide was flooded (pl. 1).

The peak discharge of 18,400 ft<sup>3</sup>/s (521 m<sup>3</sup>/s) in Tonto Creek below Kohl Ranch (fig. 7, No. 85), 11,900 ft<sup>3</sup>/s (337 m<sup>3</sup>/s) in Christopher Creek (fig. 7, No. 86), and a large flow from Haigler Creek produced a peak discharge of 38,000 ft<sup>3</sup>/s (1,080 m<sup>3</sup>/s) in Tonto Creek near Gisela (fig. 7, No. 88). The peak discharge of 44,400 ft<sup>3</sup>/s (1,260 m<sup>3</sup>/s) in Rye Creek near Gisela (fig. 7, No. 89) entered Tonto Creek 2 hours before the peak moving downstream in Tonto Creek. The peaks were of extremely short duration, which caused two separate peaks  $2\frac{1}{2}$  hours apart 5 mi (8 km) downstream at the Tonto Creek above Gun Creek, near Roosevelt gaging station (fig. 7, No. 91). The higher of the two peaks—53,000 ft<sup>3</sup>/s (1,500 m<sup>3</sup>/s)—is the maximum discharge recorded since the station was established in 1940. Downstream from Tonto Creek above Gun Creek gaging station, records from two abandoned staff gages indicate that the flood of 1970 may have been the largest since the early 1900's.

Tonto Creek flows into Roosevelt Lake—the uppermost reservoir in the Salt River Reservoir system. On September 4, storage in the reservoir system was at a minimum for the year, and all the flow that entered Roosevelt Lake from Tonto Creek on September 5 was stored in Roosevelt Lake and the other three lakes that make up the Salt River reservoir system (fig. 7, No. 93).

#### SYCAMORE CREEK BASIN

During September 3-6, at least 7 inches (180 mm) of rain fell in the upper part of the Sycamore Creek basin, and as much as 10 inches (255 mm) was recorded at one precipitation station. Long-time residents reported that the flood of 1970 was the largest known in the area. Many stock tanks built in the last few decades were breached by runoff. Three persons were killed as a result of flooding in Sycamore Creek. An Arizona State Highway patrolman on an emergency call was killed when his patrol car plunged into Sycamore Creek at the washed-out bridge 5 mi (8 km) south of Sunflower, and two persons were drowned a short distance upstream from Sunflower (pl. 1). According to L. T. Walker (local resident, oral commun., 1970), several motorists proceeded on State Highway 87 near Sunflower as the flood began to spill over the highway; the engine of the lead car stalled, causing all to stop, and a wall of water poured across the road from the narrow upstream channel. All passengers in the stranded cars were able to reach high ground, except for an elderly couple who were swept away by the onrushing water.

During the flood of 1970, the peak discharges at the three gaging stations on East Fork and West Fork of Sycamore Creek (fig. 7, No. 116-118) were from 4 to 6 times larger than the previous maximums for 10 years of record. Downstream from the confluence of the East and West Forks, the peak discharge at the gaging station on Sycamore Creek near Sunflower (fig. 7, No. 119) was 16,100 ft<sup>3</sup>/s ( $456 \text{ m}^3$ /s), which is twice the previous maximum for 10 years of record. At the gaging station 17 mi (27 km) downstream near Fort McDowell (fig. 7, No. 122), the peak was 24,200 ft<sup>3</sup>/s ( $685 \text{ m}^3$ /s), which is 1½ times the previous maximum for 12 years or record.

#### EAST VERDE RIVER BASIN

The East Verde River drains westward from the Mogollon Rim. Beaver Valley, a community of summer homes on the river about 8 mi (13 km) north of Payson, suffered extensive damage from washouts and from the deposition of sediment and debris. Access to the community was cut off when the bridge over the East Verde River was washed out. The community swimming pool was filled with sediment, and a miniature railroad used to haul prospective buyers around a housing development was partly destroyed. Roads and recreational facilities in the national forest campgrounds along Mail and North Sycamore Creeks—tributaries of the East Verde River—were severely damaged.

#### OAK CREEK AND BEAVER CREEK BASINS

Large amounts of rain fell in the headwaters of the Oak Creek and Beaver Creek basins, and flood damage to roads, bridges, and culverts was widespread throughout the basins. Rockslides, mudslides, and pavement washouts stranded motorists and campers in Oak Creek Canyon near Sedona, and several housetrailers were severely damaged. The crest of the flood at the gaging station near Cornville (fig. 7, No. 96) was almost as high as that of the flood of March 1938, which was the highest reported since at least 1885.

The Rocky Mountain Forest and Range Experiment Station of the U.S. Forest Service at Flagstaff operates 20 streamflow-gaging stations on small watersheds in Beaver Creek basin. Several of these stations were badly damaged by the flood because the magnitude of the flow far exceeded that for which the stations were designed. The floods washed out control sections and gage shelters and deposited large amounts of gravel in the gage pools.

The peak in Wet Beaver Creek above Red Tank Draw was not unusual; where Red Tank Draw joins Wet Beaver Creek at Montezuma Well, however, the flood caused a small amount of damage to trails and partly

filled a caliche-lined irrigation ditch built by Indians nearly a thousand years ago; the ditch is rarely flooded. Measurements made by personnel of the National Park Service show that the ground-water discharge from Montezuma Well increased after the floods of September 1970—from about 1 ft<sup>3</sup>/s (28 L/s) in the summer to 1.2 ft<sup>3</sup>/s (34 L/s) immediately following the flood and to about 1.9 ft<sup>3</sup>/s (54 L/s) in November and December 1970.

Dry Beaver Creek overflowed its bordering terraces and flooded an area of farmland one-fourth mi (0.4 km) wide upstream from McGuireville. The flood caused little damage at McGuireville, where the channel is wider than it is in the upstream reach, and the terraces were not inundated. At Montezuma Castle below the confluence of Wet Beaver and Dry Beaver Creeks, the flood crest was about 5 ft (1.5 m) higher than that of any flood in the last 40 years (H. G. Egbert, Superintendent, Montezuma Castle National Monument, oral commun., 1970). As described by J. C. Knapp (National Park Service, oral commun., 1970), a sharp rise of 8-9 ft (2.4-2.7 m) formed the crest of the flood and occurred in less than 10 minutes; the flood receded immediately after the rise. Residents reported that a log jam in Beaver Creek downstream near Camp Verde caused a temporary channel blockage, which forced the creek to overtop its banks and flood a narrow strip of the adjoining 20-ft-high (6.1-m-high) terrace.

The flows from Oak and Beaver Creeks and from the East Verde River entered the Verde River and produced a peak discharge of 61,900 ft<sup>3</sup>/s (1,750 m<sup>3</sup>/s) at the gaging station 9 mi (14 km) upstream from Horseshoe Dam (fig. 7, No. 114). Although the discharge was the largest at the gaging station since 1951, all the water was stored in Horseshoe and Bartlett Reservoirs.

#### AGUA FRIA RIVER BASIN

The storm of September 3-6 in the Black Hills and Bradshaw and New River Mountains caused flooding in the Agua Fria River and its main tributary—Black Canyon Creek—above Lake Pleasant. The peak discharge of 19,800 ft<sup>3</sup>/s ( $561 \text{ m}^3/\text{s}$ ) in the Agua Fria River near Mayer (fig. 7, No. 127) was mainly from Ash Creek and Yarber Wash, which drain south from the Black Hills, and from Big Bug Creek, which drains from the east slope of the Bradshaw Mountains. The flood crest at the Agua Fria River near Mayer gaging station was the highest since the beginning of record in 1940 and was about 3 ft (0.9 m) higher than the previous maximum; however, at Rock Springs just above the confluence with Black Canyon Creek, residents reported that floods of equal magnitude had occurred several times in recent years.

The Agua Fria River leaves a narrow canyon and enters a broad alluvial valley near Rock Springs. Upstream from Interstate Highway 17, aggrading and shifting bars in the braided river channel spread the flood onto low terraces and threatened buildings and homes (table 3). Downstream from Interstate Highway 17, a dense thicket of young willow trees formed a

barrier to the flow in the channel and caused the deposition of as much as 6 ft (1.8 m) of sand. The trees diverted part of the flow over the terrace along the left bank, and minor flood damage occurred in a trailer court.

The flood of 1970, which was the largest known along Black Canyon Creek according to residents, originated principally in Turkey Creek basin. Residents reported that giant log jams occurred in the headwaters of Turkey Creek and that the sudden breaching of the jams probably caused the high peak flows near Cleator. The peaks were 10-20 ft (3.0-6.1 m) high, depending on the width of the channel. J. W. Williams and T. E. Russell of the U.S. National Forest Service (written commun., 1970) estimated that the peak discharge in Turkey Creek was about 11,000 ft<sup>3</sup>/s (310 m<sup>3</sup>/s). Undercutting of an abutment damaged a concrete bridge east of Cleator. Downstream in the narrow gorge of Black Canyon Creek, floodmarks were as much as 35 ft (10.7 m) high. The abnormally high floodmarks probably were caused by log jams.

Between Rock Springs and Lake Pleasant, the flow of the Agua Fria River augmented by that of Black Canyon Creek inundated a one-fourth-mi-wide (0.4-km-wide) area of the flood plain. The flood in the Agua Fria River near Lake Pleasant was larger than any that had occurred in recent years but did not approach the magnitude of the flood of 1909. All the floodwater from the Agua Fria River upstream from Waddell Dam was stored in Lake Pleasant.

The large amount of rain in the New River Mountains caused extremely high flows in New River—the main tributary to the Agua Fria River below Waddell Dam. The peak discharge in upper New River was the greatest since records began in 1960 but decreased rapidly with increasing distance downstream. The discharge of New River above Skunk Creek was less than the maximum of record; downstream from Skunk Creek, the discharge was about equal to the previous maximum of record but was much less than the estimated 38,000 ft<sup>3</sup>/s (1,080 m<sup>3</sup>/s) for the flood of 1943. One person was drowned in New River when his car stalled at a road crossing in the Phoenix metropolitan area.

#### HASSAYAMPA RIVER BASIN

The Hassayampa River heads on the west side of the Bradshaw Mountains south of Prescott, and Milk Creek is the uppermost tributary of the several main tributaries that join the river within about 4 mi (6 km) of Wagoner. The peak discharge of the Hassayampa River above Milk Creek was only a few hundred cubic feet per second during the flood of 1970. Downstream, however, large flows were contributed by Milk Creek and its tributaries—Ash Creek and Crooks Canyon—and Blind Indian, Arrastre, Cottonwood, and Spring Creeks. The large flow originated in a well-defined area about 6 mi (10 km) wide and 18 mi (29 km) long, which extends northeastward through Wagoner to the crest of the Bradshaw Mountains.

According to Homer Dean (local resident, oral commun., 1971), the flood in Milk Creek was the largest in the last few decades. Milk Creek overtopped

#### **CENTRAL ARIZONA**

4-ft-high (1.2-m-high) terraces one-half mi (0.8 km) upstream from its junction with Crooks Canyon and deposited a mantle of sand and gravel 300 ft (90 m) wide and as much as 1 ft (0.3 m) thick on one of the terraces; this mantle is the first coarse detritus deposited on the terrace for several decades and perhaps for a few centuries. The configuration of the gravel fan deposited by Ash Creek where it enters Milk Creek and the high-water marks along both streams indicate that the floodflows of the creeks were virtually simultaneous. The gravel bar deposited by Ash Creek had a maximum thickness of 4 ft (1.2 m), and the top of the bar was only slightly lower than the high-water marks of both streams near the confluence.

The Hassayampa River deposited a 1/2- to 1-ft-thick (0.15- to 0.3-m-thick) layer of sandy detritus in fields in the wide valley below Wagoner. In the valley the river channel is broad and shallow, and the flood inundated an area one-half mi (0.8 km) wide. According to R. F. Cooper (local resident, oral commun., 1971), the soil in the fields contained little sand before the flood; the deposition of the sandy material in the fields indicates that the flood of 1970 was a rare event. The 50-year-old Cooper ranchhouse at the confluence of Spring and Cottonwood Creeks 2 mi (3 km) southwest of Wagoner was destroyed by the flood. The house was built on a 9-ft-high (2.7-m-high) terrace and was swept away by the 14-ft-high (4.3-m-high) crest of the flood.

Fields and wooded areas were severely damaged in the reach just upstream from Box Canyon. Floodmarks in Box Canyon were 44 ft (13.4 m) above the streambed—the highest floodmarks measured for the 1970 flood. The peak discharge of 58,000 ft<sup>3</sup>/s (1,640 m<sup>3</sup>/s) at the gaging station in Box Canyon (pl. 1 and fig. 7, No. 138) is more than twice the previous maximum for the 50 years of record and is the largest flood since at least 1890, when the Walnut Grove Dam near Wagoner failed (Newell, 1891).

Although extensive flood damage occurred at Wickenburg, no lives were lost. The sewage plant was flooded, a sewerline was washed away, and raw sewage flowed into the river. Several homes and housetrailers were destroyed, and about 50 persons were left homeless. A few ranches along the river were flooded, and buildings, livestock, vehicles, and trees were swept away. Electricity was cut off in part of the area when powerline poles were washed away. In the reach between 3 and 5 mi (5 and 8 km) downstream from Wickenburg, a trailer park, a few homes, and a roadside park were inundated by 4 to 6 ft (1.2 to 1.8 m) of water. The flood crested 16 ft (4.9 m) above the channel in a wooded area, and many trees were toppled or bent over. At the Hassayampa River near Morristown gaging station (fig. 7, No. 140) 7 mi (11 km) downstream from Wickenburg, the peak discharge was 47,500 ft<sup>3</sup>/s (1,350 m<sup>3</sup>/s), and it had decreased to 39,000 ft<sup>3</sup>/s (1,100 m<sup>3</sup>/s) by the time it reached the gaging station near the mouth (fig. 7, No. 141). The flood inundated areas as much as 1 mi (1.6 km) wide in the reach between the gaging stations (pl. 1).

Large amounts of rain in the White Tank Mountains caused extensive flooding in the Buckeye area. About 3 mi (5 km) north of Buckeye, the Roosevelt Canal overflowed, and many homes and fields were flooded. Large sections of the Roosevelt and Buckeye Canals were washed away, thus allowing water to pour into Buckeye. Homes and businesses in Buckeye were flooded to depths of 3 ft (0.9 m), and many persons were evacuated. The Buckeye waterplant was flooded, and contamination of city wells was reported. A cave-in around the casing of a city well left a hole 15 ft (4.6 m) deep and large enough to contain a truck, which it did. Railroad tracks were washed out on both sides of town.

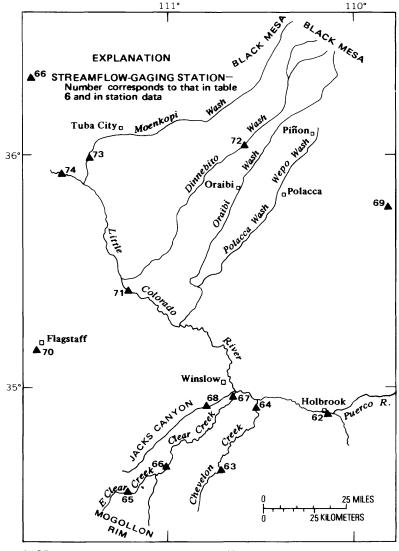
Sheetflow was widespread in Phoenix, where the water generally was carried by streets that acted as drainage systems; water was 3-4 ft (0.9-1.2 m) deep at some intersections. In places flooding occurred along the north sides of the Arizona and Grand Canals because of the ponding of water behind the embankments. Water flowing along the north side of the Arizona Canal crossed bridges on the canal and flooded areas on the south side (Attebery, 1971); water also overflowed the banks of the canal in several places.

In Scottsdale more than 250 homes were evacuated because of flooding when drainage ditches overflowed and irrigation canals were breached. The main areas of flooding were along Indian Bend Wash, which is a wasteway for excess water from Arizona Canal, and along Pima Road. A large amount of water gushed down Pima Road into adjacent homes from a break in the Arizona Canal. Many homes, trailer parks, and business establishments along Indian Bend Wash were damaged. About 2,000 ft<sup>3</sup>/s (57 m<sup>3</sup>/s) of water was released into Indian Bend Wash from Arizona Canal (Attebery, 1971), and additional inflow increased the discharge to 3,900 ft<sup>3</sup>/s (110 m<sup>3</sup>/s) at Thomas Road (fig. 7, No. 125).

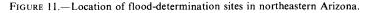
#### NORTHEASTERN ARIZONA

The flooding at Holbrook on September 6 resulted from large flows in the Puerco River, which joins the Little Colorado River 2 mi (3 km) upstream from Holbrook (fig. 11). The peak discharge of the Little Colorado River at Holbrook (fig. 11, No. 62) was 19,700 ft 3/s (558 m3/s), which was less than the peak discharge in 1968 and much less than the maximum of record—60,000 ft3/s (1,700 m3/s) in September 1923. About 40 homes were flooded when part of the dike washed out on the south bank of the river, and two sewage-treatment ponds were washed out on the north side of the river.

Runoff in Chevelon and Clear Creeks came mainly from the tributaries that head near the Mogollon Rim. In a small area on the north side of the rim, peak flows were comparable to those in the Tonto Creek basin, but rainfall and runoff diminished greatly northward. Peak flows from the upper reaches of Chevelon and Clear Creeks were reduced by storage in reservoirs,



BASE FROM U.S. GEOLOGICAL SURVEY ARIZONA, 1955, BASE MAP



and only moderate flows reached the Little Colorado River. Nevertheless, the Little Colorado River flooded a housing development 2 mi (3 km) north of Winslow to depths of 2-3 ft (0.6-0.9 m).

Dinnebito, Oraibi, and Wepo Washes, which drain into the Little Colorado River from Black Mesa, had extremely high peak discharges, which caused severe erosion in places (table 3). Wepo Wash flows through a broad flat area east and south of Piñon, and a tributary flows through a similar area on the west side of Piñon. Both streams overflowed their banks and inundated large areas on three sides of the community. The floodwater covered areas 3/4 mi (1.2 km) wide in the broad flats along Wepo Wash and about 1/2 mi (0.8 km) wide along the tributary. Downstream from Piñon, the flow from Wepo Wash removed sections of Reservation Highway 3 and damaged several earthen dams west of Polacca. The peak flow of Dinnebito Wash near Oraibi (fig. 11, No. 72) was 28,900 ft<sup>3</sup>/s (818 m<sup>3</sup>/s) from a drainage area of 261 mi<sup>2</sup> (676 km<sup>2</sup>). The flow of Oraibi Wash at the road crossing north of Piñon was of about the same magnitude as that measured in Dinnebito Wash; the drainage area of Oraibi Wash at the road crossing is 213 mi<sup>2</sup> (552 km<sup>2</sup>).

### FOUR CORNERS AREA

## FLOOD OF SEPTEMBER 5-7, 1970

Large amounts of rain in the San Juan Mountains in southwestern Colorado and along the Utah-Colorado State line caused flooding in the Dolores River and San Juan River basins during September 5-7 (fig. 12). The flood was not as large as that of October 1911, which is the largest known flood in the area. The 1911 flood peaks were not only of greater magnitude but were of longer duration. Although some high flows occurred in the upper reaches of the Rio Grande basin on the east slopes of the San Juan Mountains, the flows were not of unusual magnitudes.

## DOLORES RIVER BASIN

In the Dolores River basin in Colorado the flood of 1970 was considerably smaller than that of 1911, and flood damages were minor except in a few places. The U.S. Army Corps of Engineers (1970) reported that roads, bridges, irrigation facilities, and farmland were damaged near Rico and Dolores and along Disappointment Creek. The community water supply for Dove Creek was cut off when high flows in Big Canyon Creek—a small tributary of the Dolores River—washed out large sections of the waterline between Dove Creek and the Dolores River. At Naturita, the water-supply system was damaged by the flood in the San Miguel River. Large flows in Dry and Tabeguache Creeks, tributaries to the San Miguel River above Uravan, contributed to the flooding at Uravan, where levees and several homes were damaged.

### SAN JUAN RIVER BASIN

Floods that greatly exceed the annual peak discharge from snowmelt are rare events in the upper part of the San Juan River basin. Two such floods have occurred since the early 1880's; the first was in September 1909, and the second was in October 1911. Although actual peak discharges for the flood of 1909 are unknown, precipitation records and newspaper accounts

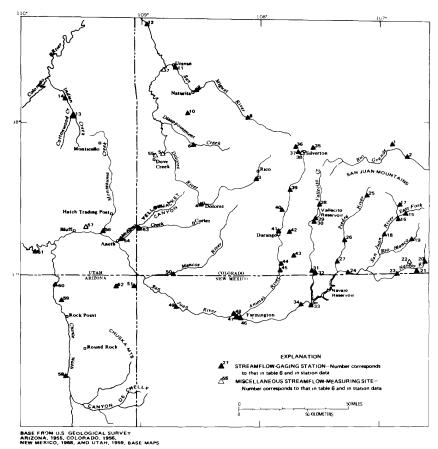


FIGURE 12.—Location of flood-determination sites in the Four Corners area.

indicate that it was a major flood. In June 1927 a third large flood occurred as a result of rain on melting snow (Follansbee and Sawyer, 1948, p. 133).

At the gaging station on the San Juan River at Pagosa Springs, Colo. (fig. 12, No. 18), the peak discharge for the flood of 1911 was 25,000 ft<sup>3</sup>/s (710 m<sup>3</sup>/s), the peak for the flood of 1927 was 16,000 ft<sup>3</sup>/s (450 m<sup>3</sup>/s), and the peak for the flood of September 6, 1970, was 6,580 ft<sup>3</sup>/s (186 m<sup>3</sup>/s). The peak on September 6 is the largest since at least 1935 but is only slightly larger than the largest peak caused by snowmelt during the same period. At the gaging stations on the Rio Blanco near Pagosa Springs, Colo., and the Piedra River near Piedra, Colo., the peak discharges of September 6 were the largest since records began in 1935 and 1938, respectively. Secondary roads, irrigation facilities, and farmlands were damaged along the streams. Upstream from Vallecito Reservoir along Vallecito Creek and its tributaries, several vacation homes were destroyed or damaged. A longtime resident stated that the flood of 1970 was no greater than the flood in the summer of 1957;

however, there were no homes in the area in 1957, and the floodwater covered only meadows and woods. The contents of Vallecito Reservoir increased by about 11,000 acre-ft (13.6 hm<sup>3</sup>) on September 6 and by 17,500 acre-ft (21.6 hm<sup>3</sup>) during September 5-7. The contents of the Navajo Reservoir on the San Juan River increased by 44,900 acre-ft (55.4 hm<sup>3</sup>) during September 5-7. The contents of the reservoirs are used mainly for irrigation. Because the flood of September 5-7 occurred immediately after the irrigation season when reservoir storage was low, the reservoirs were capable of storing most of the floodwater (U.S. Army Corps of Engineers, 1970, p. 23).

The flood in the Animas River, which enters the San Juan River at Farmington, N. Mex., began late on September 5 near Silverton, Colo. Large flows in Mineral Creek—a tributary to the Animas River west of Silverton—and Bear Creek severed the waterline between Bear Creek and Silverton, and the water supply for Silverton was cut off. Dikes around the sewage ponds at Silverton were destroyed, which allowed sewage to flow into Mineral Creek. Between Silverton and Durango, Colo., U.S. Highway 550 was closed at times owing to high water and mudslides. In the Animas River canyon downstream from Silverton more than 2 mi (3 km) of the Denver and Rio Grande Western narrow gage railroad was washed out (fig. 13), and the railroad was closed for the rest of the season.

Upstream from Durango, the Animas River flooded a broad valley, which acts as a natural reservoir for flows that overtop the channel. Some longtime residents stated that the area inundated was larger than that of the floods of 1911 or 1927. The floods of 1911 and 1927 were of long duration, the valley was flooded before the peaks arrived, and the peak flows passed through the valley with little attenuation. In 1970 the peak was extremely sharp and was reduced by storage in the valley. At Durango, the peak discharge was 25,000 ft<sup>3</sup>/s (708 m<sup>3</sup>/s) in 1911, 20,000 ft<sup>3</sup>/s (566 m<sup>3</sup>/s) in 1927, and 11,600 ft<sup>3</sup>/s (328 m<sup>3</sup>/s) in 1970.

The flood in the lower part of the San Juan River basin mainly was the result of large flows from McElmo and Montezuma Creeks. Most of the flow from McElmo Creek was contributed by Yellowjacket Canyon. A graded road and a steel culvert were washed out in Yellowjacket Canyon, and one section of the culvert was washed three-eighths of a mi (0.6 km) downstream. Two persons were drowned when a bridge approach washed out near Aneth, Utah, and their vehicle plunged into McElmo Creek. Montezuma Creek washed out about 600 ft (180 m) of Utah State Highway 262, which was built on fill across the natural channel. The flood tended to bypass a new cutoff channel, which was too small to accommodate the flow. The peak discharge of 40,500 ft<sup>3</sup>/s (1,150 m<sup>3</sup>/s) at the highway crossing (fig. 12, No. 56) was the highest since records began in 1959 and was 27 times greater than the previous maximum.



FIGURE 13.—The Denver and Rio Grande Western narrow gage railroad in the Animas River canyon near Silverton after the flood of September 5-7, 1970. Photograph by Durango Herald.

On September 7, the flow in Chinle Wash near Mexican Water, Ariz. (fig. 12, No. 60), reached a peak of 9,880 ft<sup>3</sup>/s (280 m<sup>3</sup>/s), which is the highest discharge in at least 20 years and is nearly three times the previous maximum for the period of record. Most of the flow originated in a small area south of Canyon de Chelly; small flows entered Chinle Wash from the Chuska Mountains.

The failure of a levee along the San Juan River near Bluff, Utah, resulted in damage to fields and irrigation facilities. The peak discharge of 52,000  $ft^3/s(1,470 m^3/s)$  at the gaging station near Bluff, Utah (fig. 12, No. 61), was the highest since August 1929; however, the flood of October 1911 probably was the maximum at the station.

## FLOOD OF SEPTEMBER 12-14, 1970

During the flood of September 12-14, peak discharges were generally lower than those during the flood of September 5-7; however, higher peaks did occur at several places in the upper San Juan River basin in Colorado and in the Indian Creek basin in Utah. Damages from the flood of September 12-14 were minor because most of the flooding occurred in remote areas.

At the East Fork San Juan River near Pagosa Springs, Colo., gaging station (fig. 12, No. 16), the peak discharge was the highest since the beginning of record in 1935, and at the Navajo River at Banded Peak Ranch, Colo., gaging station (fig. 12, No. 20), the peak discharge was the highest since the beginning of record in 1936. The flood of October 1911 is the maximum known flood at the stations. At the Cottonwood Creek near Monticello, Utah, gaging station (fig. 12, No. 13), the peak discharge was the highest since the beginning of record in 1949. Cottonwood Creek is a tributary to Indian Creek.

## **FLOOD FREQUENCY**

Patterson and Somers (1966) defined regional flood-frequency relations for the Colorado River basin, and B. N. Aldridge and Alberto Condes de la Torre (written commun., 1970) developed additional relations for drainage areas of less than 100 mi<sup>2</sup> (260 km<sup>2</sup>) in Arizona. The recurrence interval of a flood—the average number of years, during a long period of time, in which a given discharge will be equaled or exceeded—is a measure of the magnitude of a flood and does not indicate the amount of time between such floods. The floods of September 1970 probably exceeded the 50-year flood and may have exceeded the 100-year flood in many places. The recurrence interval was determined from the station record if the record was of long enough duration or from a regional flood-frequency analysis. (See table 6.)

In southern Arizona the recurrence interval for the peak discharge of the flood of 1970 in Sabino Creek is 40 years. Peak flows in the headwaters of Altar Wash exceeded the 50-year flood. In central Arizona peak discharges in the headwaters of Tonto, Beaver, and Sycamore Creeks undoubtedly exceeded the 50-year and possibly the 100-year floods. The recurrence intervals are difficult to determine because of the short periods of record at most of the gaging stations. The only gaging stations having 25 or more years of record in central Arizona are on streams that drain areas of several hundred square miles. All the gaging stations on streams having drainage areas of less than 100 mi<sup>2</sup> (260 km<sup>2</sup>) have less than 15 years of record and most have less than 9 years of record. The records are not of long enough duration for the development of individual frequency curves or for an average frequency curve for central Arizona. In northeastern Arizona and in the Dolores River basin in Colorado the recurrence intervals for floods generally were not large. In the San Juan River basin the peak discharges in several streams that drain the San Juan Mountains exceeded the 50-year flood.

## STREAMFLOW DATA

## **FLOOD DAMAGE**

The flood on the Labor Day weekend in 1970 has been described as the greatest natural disaster in the history of Arizona (U.S. National Oceanic and Atmospheric Administration, 1971, p. 1). Rapidly rising streams claimed the lives of 23 persons in Arizona and 2 in Utah. The governors of Arizona and Colorado sought Federal assistance under the Federal Disaster Relief Act, and on September 22, 1970, President Nixon declared a "major disaster" for Arizona and Colorado. The Office of Emergency Preparedness determined that 6 counties in Arizona and 16 in southwestern Colorado were eligible for assistance.

Thorud and Ffolliott (1973) have compiled data on expenditures made in connection with flood damage in Arizona (table 4); included in the expenditures is an estimated \$750,000 that the State is required to spend on flood work in the 12-month period prior to any request for Federal assistance. In October 1970 the U.S. Army Corps of Engineers (1970, table 3) conducted a flood-damage survey of the Four Corners area and estimated flood damages during September 5-14 to be \$2.9 million in the San Juan River and Dolores River basins (table 5). Losses to the traveling public as a result of damaged highways and bridges are included in the public-facilities category.

# 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 in figures 6, 7, 11, and 12. The permanent station numbers for the gaging stations correspond to those in the annual reports. Records of stage and discharge at 123 gaging stations, contents of 4 reservoirs and 2 reservoir systems, and peak discharges at 12 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 6. The numbers in the first column correspond to those in figures 6, 7, 11, and 12.

The first column under "maximum previously known" shows the period of known floods prior to September 1970. 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.

TABLE 4.—Summary of flood dam	age, in thousands	s of dollars, in	Arizona,	September	1970
[Adapted	from Thorud and	Ffolliott, 197	3]		

Office of Emergency Preparedness, financial assistance	@1.00 <i>E</i>
approved as of June 30, 1972	
Pre-flood obligation	750
American Red Cross, Maricopa County Chapter	77
Small Business Administration:	
171 home loans	571
28 business loans	468
U.S. Army Corps of Engineers, channel restoration	713
U.S. Department of Interior:	
Bureau of Land Management	64
Geological Survey	48
U.S. Department of Agriculture:	
Farmers Home Administration, 6 loans	64
Soil Conservation Service	11
Agricultural Stabilization and Conservation Service	465
Forest Service:	
Tonto National Forest	1.978
Coconino National Forest	108
Sitgreaves National Forest	391
Prescott National Forest	49
Coronado National Forest	280
Emergency Relief Fund projects, administered through	200
	1 255
the Arizona Highway Department	1,233
Total	\$8,377

 TABLE 5.—Summary of flood damage, in thousands of dollars, in Dolores River and San Juan
 River basins, September 1970

Drainage basin	Agri- cul- tural	Resi- den- tial	Com- mer- cial	Indus- trial and utilities	Public facil- ities	Total
Dolores River basin:						
Dolores River	20	0	1	26	169	216
San Miguel River	4	68	20	15	33	140
Disappointment Creek	1	0	0	0	48	49
- Subtotal	25	68	21	41	250	405
= San Juan River basin:	5					
Above Navajo Reservoir Navajo Reservoir to	250	1	2	9	123	385
Lake Powell	82	0	0	105	224	411
Piedra River	24	0	12	0	59	95
Los Pinos (Pine) River	2	500	20	6	106	634
Animas River	140	20	79	314	170	723
LaPlata River	1	0	0	3	28	32
McElmo Creek	25	0	0	2	51	78
Montezuma Creek	67	0	2	2	29	100
Miscellaneous areas	18	0	0	0	14	32
- Subtotal	609	521	115	441	804	2,490
= Total	634	589	136	482	1,054	2,895

[Adapted from U.S. Army Corps of Engineers, 1970]

Site				May	kimum pı	Maximum previously known	uwor		Maximum S	Maximum September 1970	20
No.	Permanent		Drainage						,	Discharge	arøe
fire f	station	Stream and nlace of determination	area	4	1	Gage	Discharge	,	Gage		
7, 11, 7, 11, and 12)			(mi <sup>2</sup> )	Period	Year	height (ft)	(ft <sup>3/s)</sup>	Date	height (ft)	Cubic feet per second	Recurrence interval (years)
			Rio Grande basin	e basin							
-	08216500	Willow Creek at Creede, Colo	35.3	1951-70	1957	,	430	9	3.37	235	
2	08217500	Rio Grande at Wagonwheel Gap, Colo.	a780	1951-70	1958 1957	4.16 5.38	- 4,870	9	5.84	4, 660	,
			Dolores River basin	/er basin							
3	09165000	Dolores River below Rico, Colo	105	1951-70	1952	6.15	b2, 120	9	5.88	1, 930	
4	09166500	Dolores River at Dolores, Colo	556	1895-1970	1911	c10.2	10,000	9	9.04	5, 190	5
S	•	Big Canyon near Dove Creek, Colo	10.7	1	,	1	1	5	,	2,400	
9	09168100	Disappointment Creek near Dove Creek, Colo	145	1957-70	1965	13.54	4, 360	ŝ	11.65	2, 720	S
2	•	Dolores River below West Paradox Creek, near	2, 100			,		9	•	5, 710	ı
c	001262100	Beuruck, Cutu,	000	er 0001	0001		000 015	0	202	000 1	u
0	00021100	Dall INTERED TINGE REAL TRACE ATTLE, COLO	200	1930-34,	0001		000 010	>		1	5
				1942-70							
6	09175500	San Miguel River at Naturita, Colo	1,080	1917-29,	1942	9.80	7, 100	13	5.63	2,620	2
				1940-70							
0	0069/160	Dry Creek near Naturita, Colo	82.9	1966-70	1.961	4. 64		<u>م</u>	8, 31	5, 660	,
= :	000/./160	San Miguel River at Uravan, Colo	1, 550	1954-62	1958	c11.75	6, 690	<u>ہ</u>	12.6	8,910	
2	00987.180	Dolores Kiver at Gateway, Colo	4, 330	1930-54		11.33		•	1.1	b, 33U	
			Tributaries between Dolores		Green River	tiver					
13	09187000		115	1949-70	1959	1	2,210	12	•	3, 500	
14	09187500	Indian Creek above Harts Draw, near Monticello, Utah.	258	1949-57	1957	9.21	3, 120	12	ı	4, 400	I
			San Juan River basın	ver basın							
15	006339900		64.1	1956-70	1957	6.32	b1,210	14	6.75	2,260	30
		near Pagosa Springs, Colo.									
16	09340000	East Fork San Juan River near Pagosa	86.9	1935-70	1941	4.84	b2, 070	9	5.08	2, 060	
		Springs, Colo.						14	4.85	2,460	
17	09341200	Wolf Creek near Pagosa Springs, Colo.	14.0	1968-70	1969	2.28		9	2.80	585	
18	09342500	San Juan River at Pagosa Springs, Colo	298	1910-70	1911	17.8	~	9	9. 02	6, 580	
19	09343000	Rio Blanco near Pagosa Springs, Colo	58.0	1935-70	1949	4.12		9	3.70	2,500	e1.2
					1957	,	b1,600				
20	09344000	Navajo River at Banded Peak Ranch, near	69.8	1936-70	1941	7. 02	b1, 340	14	4, 50	1, 350	30
ć	00011000		00	02 201	1001	2			06 05		36
17	08344300	Navajo Kiver above Curomo, Colo	30. <b>4</b>	01 -0061	1061	0.10	h1 340	<u> </u>	10. 20	1 400	
5		I ittle Manuale Diversion Channel Cale	10 6		n in in		010 10	. u		120	
77	00346000	Marris Diver at Edith Colo	179	1935-70	1949	С. С.	h2 840	. 4	5 54	1 370	. uf
3	DODDECCO			0 0001				:			

TABLE 6.—Summary of flood stages and discharges

See footnotes at end of table.

SUMMARY OF FLOOD STAGES AND DISCHARGES

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disc
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stages
f flood
5
9
Summary
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F

Permanent station number										
с н		Urainage			Gage	Discharge		Gage	Discharge	arge
ł	Stream and place of determination	area (mi <sup>2</sup> )	Period	Year	height (ft)	(ft <sup>3/s)</sup>	Date	height (ft)	Cubic feet per second	Recurrence interval (years)
	San J	San Juan River basin-Continued	usin-Continu	ned						
09346400	San Juan River near Carracas, Colo	1,230	1961-70	1965	6.85	b6, 120	9	8.34	9, 730	,
09347200	Middle Fork Piedra River near Pagosa	32.2	1969-70	1970	•	300	5	4.39	2, 520	•
09349500	Springs, Colo. Diedra River near Diedra Colo	371	1938-70	1957	8, 60	b6, 870	9	7, 92	7, 980	40
00307500		629	1962-70	1965	5.20	h4, 000	ç	6.38	8.370	
09352900		72.1	1962 - 70	1965	3.43	1, 530	9	6.51	7, 050	,
09353000	Vallecito Reservoir near Bavfield. Colo.		1941-70	1957	7, 665. 72	g 128, 200	16	7, 656.64	g104,200	,
09353500	Los Pinos River near Bayfield, Colo,	a270	1927-70	1957	12.2	h13, 800	16, 17	3.33	1,430	•
09354500	Los Pinos River at La Boca, Colo.	a510	1950-70	1957	8.95	b6, 400	9	7, 68	4, 160	
09355000	Spring Creek at La Boca, Colo	58	1950-70	1960	5, 98	•	9	4.62	1, 980	e3.0
				1969	2.90	595				
09355100	Navajo Reservoir near Archuleta, N. Mex	3,230	1962 - 70	1969	6, 044, 99	g1, 164, 000	21-24	6,053.77	g1, 266, 000	
09355500	San Juan River near Archuleta, N. Mex	a3,260	1954-70	1957	c11.00	18, 900	12	4.10	i1,400	, .
09357500	Animas River at Howardsville, Colo	55.9	1935-70	1949	4.36	b1, 980	9	3.65	1, 170	4
09358900	Mineral Creek above Silverton, Colo	11.0	1968-70	1970	ı	190	ŝ	4.50	750	
00359000	Mineral Creek near Silverton, Colo,	44.3	1935-49	1938	4.69	b1, 700	ŝ	8.5	1	,
	Mineral Creek at Silverton, Colo	51.7	ı	1	,	1	5	•	3, 070	
09359500	Animas River above Tacoma, Colo	348	1945-56	1949	8.86	b9, 5 <b>0</b> 0	9	10.05	12,500	ı
09361000	Hermosa Creek near Hermosa, Colo	172	1912-14,	1927	c8.50		9	4.20	1, 700	5
			1919-28,	1941	ı	2,980				
			1939-70							3
09361500	Animas River at Durango, Colo	692	1895-1970	1911	11	25,000	9	8.83	11, 600	15
09363050	Florida River below Florida Farmers ditch,	a108	1967-70	1970	4.64	598	14	3. 52	236	1
09363100	Salt Creek hear Oxford, Colo	16.7	1956-63,	1957	c5.18	713	9	4.45	477	ı
			1967-70							
09353200	Florida River at Bondad, Colo	a221	1956-63,	1958	c4.35	1, 430	3	5.11	760	ı
00363600	Animate Briter manual Coden B41 N Man	1 000	1933-70	1949	11 45	h13 100	y	11.30	12.140	25
3	Anunas Miver near Cedar Fill, N. MEA	1, 000				1.1	r	36.0	10 010	α
09364500	Animas kiver at Farmington, N. MeX	1, 300	- 1904	1911	10. 0 78. 5	25,000	-			<b>`</b>
00385000	San Juan Bruer at Farmington N Mex	a7.240	1909.	1909	c 12.3	(q)	7	6.78	11, 500	2
2			1912-70	1927	c10.2	b68, 000				
09367500	I.a Plata River near Farmington, N. Mex.	583	1938-70	1939	6.03	(K)	9	5.76	2, 550	
09368000	San Juan River at Shiprock, N. Mex	a 12, 900	1911,	1911	c22	(i)	2	7.39	13, 900	2
2			1927-70	1929	5.7	30, 000				
00371000	Mancos River near Towaoc, Colo	550	1920-43,	1941	7.30	5, 300	9	8.50	4,530	25

# SUMMARY OF FLOOD STAGES AND DISCHARGES

1	1		0.4
	5 O O	12 - 3 - 10 - 32 - 1 2 - 3 - 10 - 32	40 40 40 40 40 40 40 40 40 40 40 40 40 4
$\begin{array}{c} 1,\ 400\\ 2,\ 100\\ 13,\ 100\\ 13,\ 100\\ 40,\ 500\\ 1,\ 220\\ 1,\ 226\\ 52,\ 000\\ 52,\ 000\end{array}$	19, 700 11, 100 8, 020	28,000 15,800 9,650 360 11,401 11,401 28,990 4,990 12,600	7, 730 7, 340 12, 900 13, 700 13, 700 13, 700 13, 700 13, 700 13, 700 13, 400 11, 300 11, 3000
9, 44 9, 68 8, 13 8, 13 6, 72 5, 70 5, 70 5, 70 5, 70	13.92 13.58 17.54	20.65 11.10 3.56 8.23 8.23 19.3 19.3 11.38 11.38	10.21 6.57 6.57 13.85 15.8 9.27 9.25 9.84 
e - 1	ه ی و	٦ مەمەمەمە مەر	ແຜ <del>4444</del> 4ພິນແຜດນທູນດູດທູ
750 603 3,040 1,140 1,500 1,560 1,560 3,280 57 3,280 570,000	60, 000 24, 200 19, 800 25, 300	R16,000 16,400 50,6000 No Поw 383 120,000 5,890 10,000 24,900 24,900	6,400 12,200 12,200 13,000 33,800 32,000 3,400 6,520 117,000 5,400 6,54 1,370 1,370 8,130 8,130
7, 14 4, 38 7, 58 7, 58 10, 88 16, 70 8, 14 8, 14 8, 14 8, 14 3, 3, 84	- 12, 55 18, 2 19, 8	21.5 21.5 8.28 4.64 5.20 7 20.7	9.65 9.65 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.2,75 1.
1967 1968 1968 1967 1964 - 1964 1968 1964 1964	1923 1968 1952 1952	1965 1952 1952 1964 1923 1923 1952 1952	1966 1966 1966 1962 1962 1965 1965 1965 1965 1965 1965 1965 1965
1967-70 1968-70 1958-70 1959-70 1959-70 1963-70 1963-70 1964-70 1954-70 1954-70 1954-70 1954-70		neesseeseese.	r basin 1932-70 1965-70 1965-70 1965-70 1965-70 1965-70 1965-70 1965-70 1965-70 1965-70 1965-70 1965-70 1965-70 1965-70
16.0 324.5 324.5 324.5 720 8.45 203 8.0 203 80.7 203 80.7 23,000 23,000	a11, 300 a275 a994	71.1 a321 607 280 280 381,280 a21,200 a2,500 a2,500 a2,500	Gila River 35, 5 36, 4 36, 4 460, 4 460, 4 1, 176 1, 177 1, 176 1, 177 1, 176 1, 177 1, 176 1, 177 1, 176 1, 177 1, 176 1, 177 1, 177 1, 177 1, 176 1, 177 1, 177 1
Teec Nos Pos Wash near Teec Nos Pos, Ariz. Tsitab wash near Teec Nos Pos, Ariz. McElmo Creek near Colorado-Utab Sitate line McElmo Creek near Ruff, Utah. Monte Creek at Dove Creek, Colo. Dove Creek, Colo. Monte Creek near Ruff, Utah. Recapture Creek near Ruff, Utah. Recapture Creek near Ruff, Utah. Recapture Creek near Ruff, Utah. Recapture Creek near Ruff, Utah. Chinle Wash tributary near Rock Pont, Ariz Chinle Wash near Mexican Water, Ariz Chinle Wash near Mexican Water, Ariz Chinle Wash near Mexican Water, Ariz	Little Colorado River at Holbrook, Ariz Chevelon Creek below Wildcat Canyon, near Winalow, Ariz. Chevelon Creek near Winslow, Ariz		Sabuno Creek near Tucson, Ariz.         Tanque Verde Creek at Tucson, Ariz.         Tanque Verde Creek at Tucson, Ariz.         Tanque Vash near Three Points, Ariz.         Altar Wash near Three Points, Ariz.         Brawley Wash near Three Points, Ariz.         Brawley Wash near Three Points, Ariz.         De Robles Wash near Three Points, Ariz.         Los Robles Wash near Marana, Ariz.         Los Robles Wash near Marana, Ariz.         Los Robles Wash near Robsevelt, Ariz.         Los Robles Wash near Robsevelt, Ariz.         Los Robles Wash near Robsevelt, Ariz.         Cherry Creek near Gobe, Ariz.         Conto Creek hear Koung, Ariz.         Conto Creek hear Kouls Ranch, Ariz.         Christopher Creek near Robis Ranch, Ariz.         Christopher Creek near Gisela, Ariz.         Rye Creek near Gisela, Ariz.         Rye Creek near Gisela, Ariz.         Rye Creek near Payson, Ariz.         Cold Creek near Payson, Ariz.
09371100 09371200 09372200 09372200 09378650 09378650 09378650 093799080 093799080 093799080 093799080 093799080 093799080 093799080 093799080 093799080	09397500	09398300 09399500 09399500 09399000 09400240 09400650 09401100 09401400 09401400 09401400 09401400 09401400 09401000 09401000	09484000 09485500 09485600 09487500 0948750 09487250 09487250 09497290 09497290 09498700 09498800 09498800 09498800 09498800 09498800 09498800 09498800 09498800
51 52 55 55 56 50 50 61	62 64	65 66 68 68 73 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	75 77 77 77 77 77 77 77 77 77 77 88 88 88

See footnotes at end of table.

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Summar
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TABLE 6

			May	sumum pr	Maximum previously known	uwor		Maximum	Maximum September 1970	20
		Drainage			Gage			Gage	Disc	Discharge
Stream and	Stream and place of determination	area (mi <sup>2</sup> )	Period	Year	height (ft)	Ulscharge (ft <sup>3</sup> /s)	Date	height (ft)	Cubic feet per second	Recurrence interval (years)
	0	Gila River basın-Continued	un-Continue	q						
late Creek near Su	Slate Creek near Sunflower, Ariz	8.80 6.211	- 1010-70	- 1041		- 	<u>ہ</u> ہ		4,480	
Roosevelt Dam, Ariz.	ITIZ.	117 0	DI-DIET	1101		R1, 104, 000	2		gao+, 000	I
Tortulla Creek at Tortilla Flat, Arız.	rtilla Flat, Arız	24.3	1942-70	1966	9.3	6, 660	5	11.4	5, 700	ı
Aunds Canyon tribut	Munds Canyon tributary near Sedona, Ariz	1.19	1963-70	1965	6.91	222		11.1	705	• •
Uak Ureek near Uoi	Creek near Cornville, Ariz	357	1885-1970 1939-70	1938	15.18		ი 	16.48	24, 700	25
	:			1906	14.68	19, 200				
Oak Creek tributar Wet Beaver Creek	Creek tributary near Cornville, Ariz	111.05	1963-70	1969	6,51	53 6 150	ۍ د.	6.02	7 870	
locky Gulch (U.S.	Rocky Gulch (U.S. Forest Service Beaver Creek	1.42	1963-70	1967	3.50	363	0.0	4.91	1, 550	ı
Watershed No. 13).	13).									
tocky Gulch tributary (U. S. Creek Watershed No. 10)	Rocky Gulch tributary (U.S. Forest Service Beaver Creek Watershed No. 10).	. 89	1963-70	1965	2.42	122	2	4.32	980	
oster Canyon (U. Watershed No.	Foster Canyon (U. S. Forest Service Beaver Creek Watersched No. 7)	3.18	1963-70	1965	3. 50	363	2	6.8	2,260	ı
ed Tank Draw ne	Red Tank Draw near Rimrock. Ariz	49.4	1957-70	1965	7.62	2.010	5	12.69	10.500	,
Toods Canyon ne	Woods Canyon near Sedona, Ariz	16.7	1962-70	1969	5.71	2, 710	о ю	7, 93	3,990	,
lar M Canyon ne	Bar M Canyon near Sedona, Ariz	25.7	1962-70	1966	,	2,770	5	9.35	4,100	,
outh Fork Rattle	South Fork Rattlesnake Canyon (U.S. Forest Service	2.82	1963-70	1965	3. 70	437	5	4.99	1,200	•
Beaver Creek	Watershed No. 8).									
attlesnake Can	Rattlesnake Canyon near Rımrock, Arız	24.6	1957-70	1969	9.52	2, 160	5	11.50	3, 590	•
<b>Dry Beaver Cre</b>	Beaver Creek near Rimrock, Arız	142	1960-70	1969	9.98	10, 600	2	14:35	26, 600	•
	Dirty Neck Canyon near Clints Well, Ariz	3.42	1964-70	1965	5.59	115	2	7.65	210	•
	Clear Creek near Camp Verde, Ariz	241	1964-70	1965	8.3	6,510	2	5.42	1,050	•
East Verde Rive	Verde River near Pine, Ariz	6.65	1961-70	1967	3.82	1, 350	5	6.4	2,820	•
Vebber Creek a	Webber Creek above West Fork Webber Creek,	4.92	1959-70	1961	3. 13	399	2	4.36	1, 220	
near Fine, Ariz.	.12.									
ast Verde Rive	East Verde River near Childs, Arız	328	1961-70	1965	1	17,000	ŝ	19.2	23, 500	,
Vet Bottom Cre	Wet Bottom Creek near Childs, Arız	37	1967-70	1967	11.00	5, 990	5	14.18	5, 600	
erde River bel	Verde River below Tangle Creek, above Horseshoe	a5,872	1925-70	1938	19.0	m 100, 000	9	18.85	61,900	10
Dam, Ariz.										
Reservoir system on Ver Horeschae Dam Ariz	rvoir system on Verde River at and below meeshae Dam Aniz	6, 185	1939-70	1968		g315, 300	14	•	g215, 500	I
West Fork Sycan	Fork Svcamore Creek above McFarland Canvon.	4.58	1965-70	1965	4.45	430	5	5.50	1.700	
near Sunflower, Ariz.	, Ariz.	;			:		,			
West Fork Sycam	Fork Sycamore Creek near Sunflower, Ariz	9.8	1961-70	1965	6.75	698	ۍ	9.50	3,480	·
ast Fork Sycam	East Fork Sycamore Creek near Sunflower, Ariz	4.49	1961-70	1965	5.07	330	5	9.50		,
ycamore Creek r	lear Sunflower, Ariz	53.4	1961-70	1967	8.61	7, 650	5	22.0		'

42

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g Contents in acre-feet. h Maximum flood known prior to construction of Vallecito Reservoir occurred in 1911. Contents in acre-feet.

39,000

8.40

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6.500

c 6. 05

1964

1,470

a Includes some noncontributing area, or discharge is materially affected by b The maximum flood known occurred in 1911; stage and discharge at this

storage or regulation in reservoirs above station.

09517000 Hassayampa River near Arlington, Ariz.

141

7.00 19.0

2,600 9,230

8.05 11.6

1967

1963-70 1939-47, 1954-56, 1964-70 1961-70

57

5.5

Hassayampa River near Morristown, Ariz . . . . . . .

Hassayampa River at Box damsite, near Wickenburg,

Ariz.

09515800 09516500

09513970 09515500

135 137 139

1951

417

a2,013

Daily discharge.

Maximum flood known; discharge not determined.

Not determined; major floods occurred 1909, 1911.

Peak stage at upstream side of bridge, gage is located on downstream side

Peak of 1891 probably exceeded 150,000 ft<sup>3</sup>/s. Ξ

> Ratio to 50-year flood. e

Result of failure of Trout and Middle Reservoir Dams.

c Site and datum then in use.

σ

site are unknown.

Backwater from diversion dam 4.

SUMMARY OF FLOOD STAGES AND DISCHARGES

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11.21 34.6

9,650 19,200 20, 600 58, 000 1,600 47,500

12.24 9.1

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11, 500 38, 000 19, 800 20, 000 27, 000

10.48 6.7 12.70 18.3

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1964 1943 1967

64.6<sup>1</sup> 323

Skunk Creek near Phoemx, Arız..... Agua Fria River at Avondale, Ariz . . . . . . . . . . . . Hartman Wash near Wickenburg, Ariz.....

1961-70

1960-70 1921-70

11,900

9.98 5.58 11.03

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3,200 10,600 12,600 1,850 14,600

170.28 4.05 9.12 7.0 13.5

02-0961 1965-70

67. 3 85. 7 11.1 187

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136 1,540 24,200 14,500 2,000 3,900

2.55 6.35 19.7 11.32 2.35 3.72

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391 1,900 15,800 31,300 2,000 1,500

1959 1965 1967 1967

> 1961-70 1961-70 1961-70

2.6 15 165 600 142

a6,

Indian Bend Wash near Scottsdale, Ariz.....

Indian Bend Wash at Thomas Road, at Scottsdale, Ash Creek at Interstate Highway 17 near Cordes

Camp Creek near Sunflower, Arız. . .<sup>j</sup>. . . . . . . . . . . . . Rock Creek near Sunflower, Ariz . . . . . . . . . . . . . Sycamore Creek near Fort McDowell, Ariz ..... Verde River near Scottsdale, Ariz .....

> 09510180 09510200 09511300 09512150

09512100

20 21 22 123 124 124 125

09510170

4.96 6.80 15.0 12.75 3.12 3.0

1965

1963-70 1963-70 1959-70

1963

i. <del>0</del> . .

9,000

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19, 800

14.90

13,000

12.00

194 I 1955 1941

940-70

Agua Fria River near Mayer, Ariz . . . . . . . . . Agua Fria River near Rock Springs, Ariz. . . . . . . . Lake Pleasant at Waddell Dam, Arız.... New River near Rock Springs, Ariz. ..... Deadman Wash near New River, Ariz New River at Bell Road, near Peoria, Ariz ..... New River near Glendale, Ariz. . . . . . . . . . . . . . . .

Junction, Ariz.

09512500

126 127 128

09512800 09513500

09513780 09513820 09513835 09513860 016513910

[31] [31] [32] [33] [34]

09513650 09513800

Ariz.

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1939-70

1, 130 1, <del>4</del>59 a 1, 637

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118 583 5,000 18,600 1, 630

4.60 13.5

19, 500

40, 100 g80, 100

21.48 143.04

g178, 500

996 1967 1967 1959 1967

> 1963-70 1962-70 1959-70 1960-70 1943-70 1963.

Agua Fria River at El Mirage, Ariz . . . . . . . . . . .

### DATA FOR INDIVIDUAL SITES

The data for each site where flood maxima were determined may include a station description, a table of daily mean discharges for the flood periods, and 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 of September 1970 and for previous floods are given. The tables of stages and discharges at indicated times contain sufficient data to define stage and discharge hydrographs.

## STATION DATA

### RIO GRANDE BASIN

(1) 08216500. Willow Creek at Creede, Colo.

Location. --Lat 37°51'20'', long 106°55'40'', in SE<sup>1</sup>/<sub>4</sub> sec. 25, T. 42 N., R. 1 W., Mineral County, on left bank at north city limits of Creede, 8 ft (2 m) upstream from entrance to paved channel just downstream from Windy Gulch, 0.5 mi (0.8 km) downstream from confluence of East and West Willow Creeks, and 2.5 mi (4.0 km) upstream from mouth.

Drainage area. --35.3 mi<sup>2</sup> (91.4 km<sup>2</sup>).

- <u>Gage-height record.</u> --Water-stage recorder graph. Altitude of gage is 8,880 ft (2,707 m), from topographic map.
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 250 ft<sup>3</sup>/s (7. 1 m<sup>3</sup>/s).

Maxima. --Sept. 4-18, 1970: Discharge, 235 ft<sup>3</sup>/s (6.66 m<sup>3</sup>/s) 0600 hours Sept. 6 (gage height, 3.37 ft or 1.027 m).

1951 to August 1970: Discharge, 430 ft<sup>3</sup>/s (12.2 m<sup>3</sup>/s) June 5, 1957 (gage height, 4. 14 ft or 1. 262 m); gage height, 4. 16 ft (1. 268 m) May 23, 1958.

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5		Sept. 9.	· · · 85 · · · 75	Sept. 14 . 15 .	
6	179	11 .	65	16.	86
7 8		12.		17.	

Mean discharge, in cubic feet per second, 1970

	Gage height, in	ı feet, and di	scharge, in d	cubic feet pe	r second, at	indicated time, 1970
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Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 4			Sept. 7-	-Con.		Sept. 13	3-Con.	
2400	1.85	35	1800	2.59	112	2130	2.58	111
Sept. 5			2400	2.57	1 10	2400	2.51	103
1200	1.83	34	Sept. 11			Sept. 14	<b>1</b> *	
1500	1.91	40	2400	2.11	61	0400	2.45	95
2000	2.26	73	Sept. 12	*		0730	2.58	110
2400	2.93	156	1200	2.10	60	1000	2.55	106

#### Willow Creek at Creede, Colo.-Continued

Gage h	eight, in	feet, and dis	scharge,	in cubic	feet per sec	ond, at i	ndicated	time, 1970
Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 6			1600	2,13	63	1700	2.65	118
0300	3.34	227	2000	2.34	84	2400	2.57	109
0600	3.37	235	2400	2.23	73	Sept. 1	5*	
0700	3.36	233	Sept. 13			1200	2.48	98
1200	2.98	166	0200	2.21	71	2400	2.40	89
2400	2.77	135	0700	2.35	85			
Sept. 7			1 1 0 0	2.84	146	ļ		
0600	2.73	130	1230	2.87	150			
1200	2.66	121	1800	2.60	114			

\*Daily means computed from data in addition to figures shown.

(2) 08217500. Rio Grande at Wagonwheel Gap, Colo.

Location. --Lat 37°46'00", long 106°49'50", in NE<sup>1</sup>/<sub>4</sub> sec. 35, T. 41 N., R. 1 E., Mineral County, on right bank 250 ft (76 m) upstream from private bridge, 0.2 mi (0.3 km) upstream from Goose Creek, and 0.3 mi (0.5 km) west of town of Wagonwheel Gap.

Drainage area. -- 780 mi<sup>2</sup> (2,020 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph. Datum of gage is 8,431.26 ft (2,569.848 m) above mean sea level.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 3,000  ${\rm ft}^3/{\rm s}$  (85 m<sup>3</sup>/s) and by slope-area measurement at 4,660  ${\rm ft}^3/{\rm s}$  (132 m<sup>3</sup>/s).

<u>Maxima</u>. --Sept. 4-18, 1970: Discharge, 4,660  $ft^3/s$  (132 m<sup>3</sup>/s) 1030 hours Sept. 6 (gage height, 5.84 ft or 1.780 m).

1951 to August 1970: Discharge, 4,870 ft<sup>3</sup>/s (138 m<sup>3</sup>/s) July 26, 1957 (gage height, 5.38 ft or 1.640 m).

Remarks. --Flow regulated by Santa Maria, Rio Grande, and Continental Reservoirs (total capacity, 121, 400 acre-ft or 150 hm<sup>3</sup>).

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6 7 8	547 3,210 1,640	11 12		16 17	2,150 1,770 1,280 1,020 858

Mean discharge, in cubic feet per second, 1970

Gage height, in	feet, and disc	harge, in cubic	feet per secor	id, at indicated time	, 1970
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Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 4			Sept.	7		Sept. 13	3*-Con.	
2400	2.00	415	0600	3.67	1,840	1930	4.07	2,280
Sept. 5*			1200	3.45	1,600	2400	3.91	2,100
0300	2.14	494	1800	3.27	1,420	Sept. 14	1	
0700	2.22	542	2400	3.12	1,270	0600	3.75	1,920
1200	2.15	500	Sept.	8*		1000	3.77	1,950
1800	2.15	500	1200	2,91	1,080	1500	4.10	2,320
2100	2.29	584	2400	2.73	917	1800	4.19	2,430
2400	2.99	1,150	Sept. 1	12		2400	4.01	2,210

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Gage he	Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970										
Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge			
Sept. 6			2400	2.30	590	Sept. 1	5				
0200	3.85	2,040	Sept. 13	3*		0600	3.76	1,940			
0500	5.00	3,480	0600	2.37	639	1200	3.56	1, 720			
1030	5.84	4,660	1100	2.64	842	1800	3.42	1,570			
1530	5.00	3,480	1500	3.30	1,450	2400	3.32	1,470			
2000	4.28	2,540	1630	3.49	1,640						
2400	3.96	2,160	1730	3.86	2,050						

Rio Grande at Wagonwheel Gap, Colo.-Continued **1** ·

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\*Daily means computed from data in addition to figures shown.

#### DOLORES RIVER BASIN

(3) 09165000. Dolores River below Rico, Colo.

Location. --Lat 37°38'20", long 108°03'35", in SW<sup>1</sup>/<sub>4</sub> sec. 15, T. 39 N., R. 11 W., Dolores County, on left bank at upstream side of bridge, at Dolores-Montezuma County line, 0.5 mi (0.8 km) upstream from Ryman Creek, and 4 mi (6 km) southwest of Rico.

Drainage area.  $--105 \text{ mi}^2 (272 \text{ km}^2)$ .

Case height in fact and dischard

Gage-height record. --Water-stage recorder graph. Datum of gage is 8, 422.23 ft (2, 567.096 m) above mean sea level.

Discharge record. -- Stage-discharge relation defined by current-meter measurements below 1,600 ft<sup>3</sup>/s (45 m<sup>3</sup>/s) and by slope-area measurement at 1,930 ft<sup>3</sup>/s (54.7 m<sup>3</sup>/s).

Maxima. --Sept. 4-18, 1970: Discharge, 1,930 ft<sup>3</sup>/s (54.7 m<sup>3</sup>/s) 0130 hours Sept. 6 (gage height, 5.88 ft or 1.792 m).

1951 to August 1970: Discharge, 2, 120 ft<sup>3</sup>/s (60.0 m<sup>3</sup>/s) June 10, 1952 (gage height, 6. 15 ft or 1. 875 m).

Maximum flood known occurred Oct. 5, 1911.

Da	у	Discharge	Day	Discharge	Day	Discharge
Sept.	4	83	Sept. 9.	240	Sept. 14	368
<b>F</b> · ·	5		10.		15	254
	6	1,210	11.	180	16	208
	7	455	12.	241	17	177
	8	296	13.	490	18	158

Mean discharge, in cubic feet per second, 1970

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 3			Sept. 6*	Con.		Sept. 1	2*-Con.	
2400	2.36	56	0330	5.72	1,820	2400	3.64	358
Sept. 4*			0600	5.37	1,540	Sept. 1	3*	
1200	2.39	60	0900	5.00	1,250	0200	3.52	303
1930	2.70	109	1200	4.72	1,020	0400	3.55	314
2100	2.92	155	1600	4.50	867	0830	4.00	520
2400	2.91	153	2400	4.10	606	1000	4.22	648
Sept. 5*			Sept. 7			1200	4.12	588
0400	2.75	119	0600	3.92	505	1300	4.15	606
0800	2.71	111	1200	3.81	450	1500	4.06	546
1200	2.82	133	1800	3.68	386	1800	4.05	535
1500	3.35	260	2400	3.60	354	1930	4.10	564
1600	3.83	455	Sept. 1	L		2400	3.90	455

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
1700	3,90	490	2400	2.96	166	Sept. 14		
1830	3.81	445	Sept. 12	<b>*</b>		0400	3.80	405
2000	3.91	495	1200	2.96	166	1200	3.73	370
2400	5.33	1,500	1730	3.27	240	1600	3.71	358
Sept. 6*			1930	3.85	465	1800	3.65	330
0130	5.88	1,930	2100	3.90	485	2400	3.56	296

\*Daily means computed from data in addition to figures shown.

(4) 09166500. Dolores River at Dolores, Colo.

Location. --Lat 37°28'15", long 108°30'15", in NE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec. 16, T. 37 N., R. 15 W., Montezuma County, on left bank 70 ft (21 m) downstream from bridge on State Highway 184 in Dolores and 0.2 mi (0.3 km) upstream from Lost Canyon Creek.

Drainage area.  $--556 \text{ mi}^2$  (1, 440 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph. Datum of gage is 6,918.74 ft (2,108.832 m) above mean sea level.

 $<sup>\</sup>frac{Maxima. --Sept. 4-18, 1970: Discharge, 5, 190 ft^3/s (147 m^3/s) 0800 hours Sept. 6}{(gage height, 9, 04 ft or 2.755 m, in gage well; 9.19 ft or 2.801 m, from floodmark). 1895 to August 1970: Discharge, 10,000 ft^3/s (283 m^3/s) Oct. 5, 1911 (gage height, 10.2 ft (3.11 m), at site 70 ft (21 m) upstream at different datum), from rating curve extended above 2,800 ft^3/s (79 m^3/s).$ 

Day		Discharge Day Dischar		Discharg	ge Day	Discharge	
Sept. 4		235	Sept. 9.	563	Sept. 14 .	980	
5	· · · •	462	10 .	465	15 .	663	
6		3,040	11 .	388	16 .	528	
7		1,230	12 .	380	17 .	465	
8		760	13.	949	18 .	400	

Mean discharge, in cubic feet per second, 1970

Gage height, in feet,	and discharge,	in cubic feet per	second,	at indicated time,	1970
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Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	6Con.		Sept. 13	3*	
2400		5.50	260	2400	7.11	1,640	0200	6.36	840
Sept.	5*			Sept.	7		0330	6.43	900
0200		5.51	265	0400	6.97	1,470	0900	6.21	720
0700		5.74	394	0800	6.83	1,300	1400	6.45	920
1000		5.76	406	1700	6.63	1,100	1600	6.75	1,220
1300		5.74	394	2400	6.43	900	1900	6.74	1,210
2000		5.80	430	Sept. 8	3*		2400	6.73	1,200
2400		6.98	1,500	1200	6.26	760	Sept. 14	1	
Sept.	6			2400	6.10	633	0130	6.75	1,220
0330		7.90	2,900	Sept. 1	1		0600	6.60	1,070
0600		8.55	4,140	2400	5.69	358	1200	6.49	960
0800		9.04	5,190	Sept. 12	2*		1800	6.40	872
1100		8.67	4,360	1100	5.65	334	2400	6.29	784
1230		8.23	3,480	1400	5.68	352	Sept. 15	5*	
1430		7.90	2,880	1900	5.76	400	1200	6.13	656
2000		7.35	1,980	2400	6.00	563	2400	6.02	577

\*Daily means computed from data in addition to figures shown.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 3, 200 ft<sup>3</sup>/s (91 m<sup>3</sup>/s) and by slope-area measurement at 5, 190 ft<sup>3</sup>/s (147 m<sup>3</sup>/s).

(5) Big Canyon near Dove Creek, Colo.

#### (Miscellaneous site)

Location. --Lat 37°47'42", long 108°50'26", in  $SE_4^1SW_4^1$  sec. 22, T. 41 N., R. 18 W., 0.8 mi (1.3 km) upstream from mouth and 4 mi (6 km) northeast of Dove Creek.

Drainage area. -- 10. 7 mi<sup>2</sup> (27. 7 km<sup>2</sup>).

Maximum. --Sept. 4-18, 1970: Discharge, 2, 400 ft<sup>3</sup>/s (68.0 m<sup>3</sup>/s) 1800 hours Sept. 5, by indirect measurement of peak flow.

(6) 09168100. Disappointment Creek near Dove Creek, Colo.

Location. --Lat 37°52'35", long 108°34'55", in SE<sup>1</sup>/<sub>4</sub> sec. 25, T. 42 N., R. 16 W., Dolores County, 0.2 mi (0.3 km) downstream from ford, 6.5 mi (10.5 km) southeast of Cedar, and 19 mi (31 km) northeast of town of Dove Creek.

Drainage area.  $--145 \text{ mi}^2$  (376 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph. Altitude of gage is 6,420 ft (1,957 m), from topographic map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below  $250 \text{ ft}^3/\text{s}$  (7. 1 m<sup>3</sup>/s) and by slope-area measurements at 824, 1, 770, 2, 240, and 4, 360 ft<sup>3</sup>/s (23. 3, 50. 1, 63. 4, and 123 m<sup>3</sup>/s).

Maxima. --Sept. 4-18, 1970: Discharge, 2, 720 ft<sup>3</sup>/s (77.0 m<sup>3</sup>/s) 1930 hours Sept. 5 (gage height, 11.65 ft or 3.551 m).

1957 to August 1970: Discharge, 4, 360 ft<sup>3</sup>/s (123 m<sup>3</sup>/s) July 13, 1965 (gage height, 13.54 ft or 4, 127 m), from rating curve extended above 250 ft<sup>3</sup>/s (7.1 m<sup>3</sup>/s) on basis of slope-area measurements at gage heights 7.18, 9.86, 10.95, and 13.54 ft (2.188, 3.005, 3.338, and 4.127 m).

Day		Discharge	Day l	Discharge	Day D	Discharge	
Sept.	4	2.9	Sept. 9	5.6	Sept. 14	19	
	5	492	10	4.2	15	8.2	
	6	89	11	3.9	16	7.6	
	7	11	12	346	17	6.8	
	8	7.6	13	77	18	6.0	

Mean discharge, in cubic feet per second, 1970 Discharge Day Discharge Day

Sept. 4 2400 Sept. 5 1430 1500 1530 1600 1630 1700 1730	1.24 1.55 1.80 4.20 4.43	3.0 8.6 16 260	2400 Sept. 11	Con. 1.65 1.11	15	Sept. 13 0030	6.35	630
Sept. 5 1430 1500 1530 1600 1630 1700	1.55 1.80 4.20	8.6 16	Sept. 11 2400		15			630
1430 1500 1530 1600 1630 1700	1.80 4.20	16	2400			0100		
1500 1530 1600 1630 1700	1.80 4.20	16		1.11		0100	4.90	<b>36</b> 5
1530 1600 1630 1700	4.20		Sont 12		3.9	0130	4.15	252
1600 1630 1700		260	10cpt. 14	*		0230	3.53	1 <b>6</b> 8
1630 1700	4.43		1230	1.15	4.6	0400	2.90	95
1700		294	1300	5.00	380	0600	2.20	42
	3.55	162	1330	6.45	650	1200	1.43	9.0
1730	3.18	109	1400	7.20	810	1700	1.17	3.9
	7.00	760	1430	5.90	542	1730	1.76	20
1800	9.00	1,330	1530	7.20	810	1900	1.63	15
1930	11.65	2,720	1730	9,60	1,550	1930	2.65	78
2130	11.00	2,270	1800	5.15	407	2400	2.10	38
2200	9.00	1,330	1830	6.10	580	Sept. 14	*	
2330	6.00	5 <b>60</b>	1930	6.00	560	0600	1.77	21
2400	5.45	461	2000	6.25	610	0900	1.67	17
Sept. 6			2130	4.40	290	1030	1.76	20
0400	3.24	131	2200	5.70	506	1800	1.54	12
0800	2.65	<b>6</b> 5	2330	8.10	1,040	2400	1.47	9.8
1400	2.15	35	2400	8.00	1,010			

\*Daily means computed from data in addition to figures shown.

#### (Miscellaneous site)

Location. --Lat 38°21'29'', long 108°49'52'', in SW<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec. 2, T. 47 N., R. 18 W., Montrose County, 2.5 mi (4.0 km) downstream from West Paradox Creek and 4.4 mi (7.1 km) northeast of Bedrock.

Drainage area. --2, 100 mi<sup>2</sup> (5, 440 km<sup>2</sup>), approximately.

Maximum. --Sept. 4-18, 1970: Discharge, 5, 710 ft<sup>3</sup>/s (162 m<sup>3</sup>/s) Sept. 6, by slopearea measurement of peak flow.

(8) 09172500. San Miguel River near Placerville, Colo.

Location. --Lat 38°02'05", long 108°07'15", in NW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec. 30, T. 44 N., R. 11 W., San Miguel County, on right bank 0.7 mi (1.1 km) downstream from Specie Creek and 4 mi (6 km) northwest of Placerville.

Drainage area.  $-308 \text{ mi}^2$  (798 km<sup>2</sup>).

 $\frac{\text{Gage-height record.}}{(2, 150, 608 \text{ m}) \text{ above mean sea level (Bureau of Reclamation bench mark)}}.$ 

Discharge record. --Stage-discharge relation defined by current-meter measurements below 1, 900 ft3/s (54 m3/s).

Maxima. --Sept. 4-18, 1970: Discharge, 1,880 ft<sup>3</sup>/s (53.2 m<sup>3</sup>/s) 0500 hours Sept. 6 (gage height, 5.56 ft or 1.695 m).

1909-12, 1930-34, 1942 to August 1970: Discharge, 10,000 ft<sup>3</sup>/s (283 m<sup>3</sup>/s) Sept. 5, 1909 (result of failure of Trout and Middle Reservoir Dams).

Dag	у	Discharge	Day	Discharge	Day	Discharge
Sept.	4	208	Sept. 9.	379	Sept. 14	. 669
	5	325	10 .	326	15	. 450
	6	1,270	11 .	274	16	. 370
	7	624	12 .	334	17	. 323
	8	460	13 .	766	18	. 292

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of San Miguel River near Placerville, Colo.

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 4			Sept.	7*	-	Sept. 1	2-Con.	
2400	3.51	250	0300	4.45	736	2400	4.25	594
Sept. 5	<b>i</b>		0800	4.36	671	Sept. 1	3*	
0700	3.42	228	1230	4.26	601	0200	4.19	556
1300	3.44	232	1800	4.14	526	0600	4.24	587
1600	3.52	252	2400	4.12	514	1130	4.52	792
1930	4.16	514	Sept. 1	1		1500	4.62	872
2000	4.08	470	2400	3.49	255	1800	4.56	824
2300	4.34	636	Sept. 1	2		2030	4.61	864
2400	4.68	907	0130	3.55	271	2130	4.76	997
Sept. 6	i		1200	3.54	268	2400	4.68	925
0400	5.54	1,840	1330	3.43	240	Sept. 1	4*	
0500	5.56	1,880	1500	3.59	283	0200	4.66	898
1000	5.13	1,370	1530	3.50	258	0500	4.43	713
1400	4.94	1,170	1800	3.60	286	1200	4.32	622
1800	4.80	1,030	1900	3.99	445	1600	4.43	699

Gage height,	in feet,	and discharge,	in cubic	feet per	second,	at indicated time,	1970,
	c	of San Miguel Ri	iver near	Placerv	ille, Col	ο.	

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
2100	4.64	889	2000	3,94	420	1900	4.25	562
2400	4.59	848	2300	4.45	736	2400	4.16	509

\*Daily means computed from data in addition to figures shown.

(9) 09175500. San Miguel River at Naturita, Colo.

Location. --Lat 38°13'05'', long 108°33'55'', in NE<sup>1</sup>4NW<sup>1</sup>4 sec. 30, T. 46 N., R. 15 W., Montrose County, on left bank 20 ft (6 m) downstream from bridge on State Highway 97 in Naturita and 1.2 mi (1.9 km) downstream from Naturita Creek.

Drainage area. --1,080 mi<sup>2</sup> (2,800 km<sup>2</sup>), approximately.

Gage-height record. --Water-stage recorder graph. Datum of gage is 5, 392. 85 ft (1, 643. 741 m) above mean sea level.

<u>Discharge record.</u> --Stage-discharge relation defined by current-meter measurements below 3, 800 ft<sup>3</sup>/s (110 m<sup>3</sup>/s).

Maxima. --Sept. 4-18, 1970: Discharge, 2, 620 ft<sup>3</sup>/s (74. 2 m<sup>3</sup>/s) 0630 hours Sept. 13 (gage height, 5. 63 ft or 1. 716 m).

1917-29, 1940 to August 1970: Discharge, 7, 100 ft<sup>3</sup>/s (201 m<sup>3</sup>/s) Apr. 15, 1942 (gage height, 9.80 ft or 2.987 m), from rating curve extended above 3,800 ft<sup>3</sup>/s (110 m<sup>3</sup>/s).

_ Day		Discharge	Day	D	ischarge	Day	Discharge
Sept. 4.		125	Sept. 9.		402	Sept. 14	985
5.		671	10.		327	15	655
6.		1,610	11.		248	16	519
7.		848	12.		336	17	442
8.	· · ·	514	13.		1,420	18	388

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of San Miguel River at Naturita, Colo.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept. 7			Sept. 1	3*-Con.	· · · · · · · · · · · · · · · · · · ·
2400		1.58	123	0600	3.72	996	0630	5.63	2,620
Sept.	5			1400	3.36	800	0800	4.90	1,870
0300		1.61	128	1500	3.38	8 10	1100	4.33	1,410
0500		1.74	153	1630	3.32	780	1300	4.06	1,230
0730		1.82	169	1730	3.07	655	1600	3.97	1, 180
0830		1.80	165	2400	2.83	542	2100	4.03	1,210
1430		2.13	245	Sept. 11			2400	3.86	1, 110
1600		3.16	690	2400	2.04	225	Sept. 14	4*	
1900		4.58	1,550	Sept. 12	*		0200	3.82	1,090
2000		4.54	1,520	0130	2.10	242	0330	4.07	1,240
2300		5.46	2,380	0600	2.08	236	0800	3.88	1, 120
2400		5.10	2,020	1100	2.01	218	1200	3.57	938
Sept.	6			1900	2.15	257	2130	3.31	800
0200		4.40	1,430	1930	2.95	596	2230	3.45	872
0500		4.00	1, 160	2100	2.80	528	2400	3.40	845
0630		4.65	1,610	2300	3.84	1,070	Sept. 1	5*	
1030		5.34	2,260	2400	3.23	735	1200	3.00	645

### STATION DATA—DOLORES RIVER BASIN

#### San Miguel River at Naturita, Colo.-Continued

Gage height, in feet,		•	cond, at indicated time,	1970,
	of San Miguel	River at Naturita, C	2010.	
Gage		Gage	Gade	

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
1600	4.60	1,570	Sept. 13	}*		2400	2.83	564
2000	4.29	1,350	0200	2.91	578			
2400	4.05	1,190	0400	5.16	2,100			

\*Daily means computed from data in addition to figures shown.

(10) 09175900. Dry Creek near Naturita, Colo.

 Location. --Lat 38°05'32'', long 108°37'17'', in NE<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec. 10, T. 44 N., R. 16 W., San Miguel County, on right bank 50 ft (15 m) upstream from ford, 0.3 mi (0.5 km) upstream from unnamed tributary, 1.2 mi (1.9 km) downstream from Dead Horse Creek, 5 mi (8 km) northwest of Basin, and 14 mi (23 km) south of Naturita.

Drainage area. --85.9 mi<sup>2</sup> (222.5 km<sup>2</sup>).

<u>Gage-height record.</u> --Water-stage recorder graph. Altitude of gage is 6,270 ft (1,911 m), from topographic map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 140 ft3/s (4.0 m3/s) and by slope-area measurements at 494 and 5, 660 ft3/s (14.0 and 160 m3/s).

<u>Maxima.</u> --Sept. 4-18, 1970: Discharge, 5,660 ft<sup>3</sup>/s (160 m<sup>3</sup>/s) 2130 hours Sept. 5 (gage height, 8.31 ft or 2.533 m).

1966 to August 1970: Discharge, 506 ft<sup>3</sup>/s (14.3 m<sup>3</sup>/s) Aug. 7, 1967 (gage height, 4.64 ft or 1.414 m), from rating curve extended above 140 ft<sup>3</sup>/s (4.0 m<sup>3</sup>/s) on basis of slope-area measurement at gage height 4.57 ft (1.393 m).

Day	Discharge	Day	Discharge	Day	Discharge
Sept.         4            5          6            7          8	. 1,030 . 106 . 2.8	Sept. 9 10 11 12 13	28 16 . 90	Sept. 14 15 16 17 18	2.4 .52 .28

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of Dry Creek near Naturita, Colo.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	6*-Con.		Sept. 13	3	
2400		0.77	0.1	0400	3.05	231	0030	5.00	590
Sept.	5			0700	2.21	86	0200	7.17	3,240
0900		. 77	. 1	1100	1.73	29	0300	6.78	2,560
1100		. 87	. 3	1600	1.43	12	0430	5.00	590
1230		1.76	26	2100	1.36	9.2	0600	3.65	328
1400		2.86	186	2400	1.23	5.6	0830	2.35	98
1500		4.05	400	Sept. 1	1		1030	1.98	47
1600		5.00	590	2400	. 75	. 1	1600	1.57	16
1700		6.05	1,420	Sept. 1	2*		1630	1,60	17
1800		6.76	2,520	1300	. 75	. 1	1700	1.56	15
1900		7.26	3,420	1400	. 80	. 3	2400	1.54	14
1930		7.10	3,100	1600	. 81	. 3	Sept. 14	1	
2130		8.31	5,660	1700	5.06	605	0600	1.49	12
2230		7.00	3,030	1800	3,90	373	1200	1.41	9.6
2400		5.65	934	1900	3.19	245	1800	1.33	7.2

of Dry Creek near Naturita, Colo.											
Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge		
Sept.	6*			1930	3.27	260	2400	1.25	5.1		
0030		5.00	605	2030	3.27	260					
0130		4.08	416	2400	2.33	95					

# Dry Creek near Naturita, Colo.-Continued Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970.

\*Daily means computed from data in addition to figures shown.

(11) 09177000. San Miguel River at Uravan, Colo.

(Gaging station, discontinued 1962)

Location. --Lat 38°21'25'', long 108°42'40'', in SW<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec. 2, T. 47 N., R. 17 W., on right bank 20 ft (6 m) downstream from bridge on State Highway 141, 300 ft (90 m) downstream from Tabeguache Creek, and 1.2 mi (1.9 km) southeast of Uravan.

Drainage area. --1, 550 mi<sup>2</sup> (4,010 km<sup>2</sup>), approximately.

Gage-height record. --Floodmarks only. Altitude of gage is 5,000 ft (1,520 m), from topographic map.

Maxima, --Sept. 4-18, 1970: Discharge, 8,910 ft<sup>3</sup>/s (252 m<sup>3</sup>/s) 0230 hours Sept. 6 (gage height, 11.2 ft or 3.41 m, from floodmarks in gage well; 12.6 ft or 3.84 m, from floodmarks outside gage well), by slope-area measurement at site 5.5 mi (8.8 km) downstream.

1954-62: Discharge, 6,690 ft<sup>3</sup>/s (189 m<sup>3</sup>/s) Apr. 19, 1958 (gage height, 11.75 ft or 3.581 m, site and datum then in use). Peak of Apr. 20, 1965, was probably higher.

(12) 09179500. Dolores River at Gateway, Colo.

(Gaging station, discontinued 1954)

Location. --Lat 38°40'55'', long 108°58'50'', in SW $\frac{1}{4}$  sec. 15, T. 51 N., R. 19 W., on right bank 500 ft (150 m) downstream from bridge on State Highway 141, 0.3 mi (0.5 km) northwest of Gateway.

Drainage area. --4, 350 mi<sup>2</sup> (11, 270 km<sup>2</sup>), approximately.

Gage-height record. --Floodmarks only. Datum of gage is 4,547.76 ft (1,386.157 m) above mean sea level, datum of 1929.

 Maxima, --Sept. 4-18, 1970: Discharge, 6, 350 ft<sup>3</sup>/s (180 m<sup>3</sup>/s) Sept. 6 (gage height, 7.7 ft or 2.35 m, from profile), by slope-area measurement of peak flow. 1936-54: Discharge, 15, 400 ft<sup>3</sup>/s (436 m<sup>3</sup>/s) May 14, 1941 (gage height, 11.33 ft or 3, 453 m).

### STATION DATA—DOLORES RIVER BASIN

#### TRIBUTARIES BETWEEN DOLORES RIVER AND GREEN RIVER

(13) 09187000. Cottonwood Creek near Monticello, Utah

#### (Crest-stage station)

Location. --Lat 38°03', long 109°34', in NE<sup>4</sup>/<sub>4</sub> sec. 36, T. 31 S., R. 21 E., San Juan County, 1 mi (2 km) above mouth and 18 mi (29 km) northwest of Monticello.

Drainage area.  $--115 \text{ mi}^2$  (298 km<sup>2</sup>).

Gage-height record. --Crest stages only. Altitude of gage is 5, 340 ft (1, 628 m), from topographic map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 100 ft<sup>3</sup>/s (2.8 m<sup>3</sup>/s) and by slope-area measurements at the following discharges: 1,520, 1,680, 2,210, and 6,100 ft<sup>3</sup>/s (43.0, 47.6, 62.6, and 173 m<sup>3</sup>/s).

Maxima. --Sept. 4-18, 1970: Discharge, 3,500 ft<sup>3</sup>/s (99.1 m<sup>3</sup>/s) Sept. 12 (inside gage height, 7.88 ft or 2.402 m; outside gage height, 12.78 ft or 3.895 m).
 1950-57, 1959 to August 1970: Discharge, 2,210 ft<sup>3</sup>/s (62.6 m<sup>3</sup>/s) Aug. 5, 1959; inside gage height, 6.82 ft (2.079 m) Aug. 18, 1963.

(14) 09187500. Indian Creek above Harts Draw, near Monticello, Utah

#### (Gaging station, discontinued 1957)

Location. --Lat 38°08'25", long 109°37'25", in NW<sup>1</sup>/<sub>4</sub> sec. 33, T. 30 S., R. 21 E., San Juan County, 5 mi (8 km) upstream from Harts Draw and 24 mi (39 km) northwest of Monticello.

Drainage area.  $-258 \text{ mi}^2$  (668 km<sup>2</sup>).

- Gage-height record. --Floodmarks only. Altitude of gage is 4,920 ft (1,500 m), by barometer.
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 200 ft<sup>3</sup>/s (5. 7 m<sup>3</sup>/s) and by slope-area measurements at the following discharges: 620, 820, 2,240, and 2,850 ft<sup>3</sup>/s (17. 6, 23. 2, 63. 4, and 80. 7 m<sup>3</sup>/s).

Maxima. --Sept. 4-18, 1970: Discharge, 4,400 ft<sup>3</sup>/s (125 m<sup>3</sup>/s) Sept. 12 (gage height, 9,80 ft or 2.987 m).

1949-57: Discharge, 3, 120 ft<sup>3</sup>/s (88.4 m<sup>3</sup>/s) Aug. 30, 1957 (gage height, 9.21 ft or 2.807 m, from floodmark).

#### SAN JUAN RIVER BASIN

(15) 09339900. East Fork San Juan River above Sand Creek, near Pagosa Springs, Colo.

Location. --Lat 37°23'25", long 106°50'25", in NE<sup>1</sup>/<sub>4</sub> sec. 4, T. 36 N., R. 1 E., Archuleta County, on right bank 0.3 mi (0.5 km) upstream from Sand Creek, 4 mi (6 km) upstream from West Fork San Juan River, and 13 mi (21 km) northeast of Pagosa Springs.

Drainage area, --64. 1 mi<sup>2</sup> (166. 0 km<sup>2</sup>).

- Gage-height record. --Water-stage recorder graph. Altitude of gage is 8,900 ft (2,710 m), from topographic map.
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 460 ft<sup>3</sup>/s (13 m<sup>3</sup>/s) and extended above on basis of slope-area measurement at 1, 710 ft<sup>3</sup>/s (48.4 m<sup>3</sup>/s).
- <u>Maxima.</u> --Sept. 4-18, 1970: Discharge, 2,260 ft<sup>3</sup>/s (64.0 m<sup>3</sup>/s) 0930 hours Sept. 14 (gage height, 6.75 ft or 2.057 m).
  - 1956 to August 1970: Discharge, 1,210 ft<sup>3</sup>/s (34.3 m<sup>3</sup>/s) June 6, 1957 (gage height, 6.32 ft or 1.926 m).

Flood of Oct. 5, 1911, exceeded all other known floods at this location.

Mean discharge, in cubic feet per second, 1970

Day		Discharge	Day	Discharge	Day	Discharge	
Sept.	4	31	Sept. 9.	117	Sept. 14	1, 150	
-	5	205	10 .	95	15	535	
	6	844	11 .	80	16	390	
	7	275	12 .	101	17	294	
	8	158	13.	466	18	226	

Gage height, in feet,	and discharge,	in cubic feet per seco	nd, at indicated time, 1970	
Gage		Gage	Gage	-

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept. 7	7		Sept. 1	3*-Con.	
2400		2.98	49	0600	4.07	320	2000	5.30	1,040
Sept.	5*			1200	3.96	270	2230	4.80	722
0700		2.83	38	1800	3.84	218	2400	4.97	835
1100		2.81	36	2400	3.78	194	Sept. 1	4*	
1500		3.15	65	Sept. 11	L		0100	5.10	933
1600		3.80	202	2400	3.22	74	0200	4.97	849
1830		4.59	584	Sept. 12	*		0300	5.65	1,330
1930		4.66	632	1200	3.22	74	0400	5.03	891
2030		4.61	608	1500	3.26	79	0600	5.20	1,010
2100		4.66	644	1900	3.50	120	0730	5.57	1,270
2300		4.45	530	2000	3.64	152	0830	6.00	1,610
2400		4.70	680	2130	3.92	250	0930	6.75	2,260
Sept.	6*			2400	3.62	148	1100	5.96	1,550
0100		4.60	620	Sept. 13	*		1300	5.50	1,250
0330		5.43	1,170	0200	3.53	126	2000	4.94	884
0600		6.13	1,710	0500	3.59	140	2400	4.85	828
0700		5.90	1,530	0730	3.82	210	Sept. 1	5*	
0900		5.38	1,140	1030	3.73	178	0200	4.78	782
1100		5.06	905	1400	4.92	776	0500	4.48	602
1400		4.72	680	1600	4.72	656	1500	4.20	455
2400		4.20	390	1800	4.80	704	2400	4.15	430

\*Daily means computed from data in addition to figures shown.

### STATION DATA—SAN JUAN RIVER BASIN

(16) 09340000. East Fork San Juan River near Pagosa Springs, Colo.

Location. --Lat 37°22'10", long 106°53'30", in NW<sup>1</sup>4SW<sup>1</sup>4 sec. 7, T. 36 N., R. 1 E., Archuleta County, on right bank 0.2 mi (0.3 km) upstream from private highway bridge, 0.5 mi (0.8 km) upstream from West Fork, and 9.5 mi (15.3 km) northeast of Pagosa Springs.

Drainage area. --86.9 mi<sup>2</sup> (225. 1 km<sup>2</sup>).

Flood of Oct. 5, 1911, exceeded all other known floods at this location.

Mean discharge, in cubic feet per second, 1970

Day	7	Discharge	Day	Discharge	Day	Discharge
Sept.	4	48	Sept. 9.	177	Sept. 14	. 1,500
	5	312	10 .	138	15	. 665
	6	1,060	11.	115	16	. 455
	7	354	12 .	152	17	. 364
	8	234	13.	674	18	. 284

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	3			Sept.	6*-Con.		Sept. 13	3*-Con.	
2400		1.53	32	2400	2.77	455	2200	3.63	1,100
Sept.	4*			Sept.	7*		2400	3.52	1,030
1300		1.57	36	0600	2.63	392	Sept. 14	4*	
1700		1.67	47	1200	2.52	344	0030	3.52	1,030
1800		1.86	74	2400	2.38	288	0200	4.06	1,480
2400		1.98	96	Sept. :	11		0300	3.82	1,250
Sept.	5*			2400	1.75	104	0330	4.13	1,550
0500		1.83	69	Sept.	12*		0430	3.91	1,330
0600		1.93	86	1200	1.74	102	0530	4.12	1,540
1100		1.78	62	1800	1.93	146	0600	3.90	1,320
1 <b>330</b>		1.95	90	1900	2.12	198	0800	4.72	2,280
1400		2.50	234	2000	2.47	340	0900	4.85	2,460
1600		2.74	324	2130	2.32	280	1000	4.83	2,290
1730		3.40	640	2200	2.45	332	1200	4.64	1,790
1930		3.74	844	2400	2.25	256	1400	4.55	1,580
2100		3.81	886	Sept.			1700	4.13	1,190
2400		3.86	916	0300	2.07	195	2000	3.85	970
Sept.	6*			0630	2.32	288	2100	4.04	1,080
0300		4.45	1,350	1100	2.41	348	2400	3.87	958
0600		5.08	2,060	1200	3.10	705	Sept. 15		
0800		4.62	1,620	1600	3.55	1,050	0400	3.55	760
0900		4.50	1,600	1630	3.44	976	0500	3.63	802
1100		3.84	1,060	1700	3.70	1,160	1200	3.36	630
1500		3.30	727	1900	3.94	1,360	1830	3.25	560
1700		3.25	700	2030	3.95	1,370	2400	3.06	450

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

\*Daily means computed from data in addition to figures shown.

Gage-height record. --Water-stage recorder graph. Datum of gage is 7,597.63 ft (2,315.758 m) above mean sea level.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 1, 500 ft<sup>3</sup>/s (42 m<sup>3</sup>/s).

 $<sup>\</sup>frac{\text{Maxima. --Sept. 4-18, 1970: Discharge, 2,460 ft^3/s (69.7 m^3/s) 0900 hours Sept. 14}{(gage height, 4.85 ft or 1.478 m); gage height, 5.08 ft (1.548 m) 0600 hours Sept. 6.$  $1935 to August 1970: Discharge, 2,070 ft^3/s (58.6 m^3/s) May 12, 1941 (gage height, 4.84 ft or 1.475 m).$ 

(17) 09341200. Wolf Creek near Pagosa Springs, Colo.

Location. --Lat 37°26'47", long 106°53'00", Mineral County, on right bank 0.3 mi (0.5 km) upstream from Fall Creek and 14 mi (23 km) northeast of Pagosa Springs.

Drainage area. --14.0 mi<sup>2</sup> (36.3 km<sup>2</sup>).

<u>Gage-height record.</u> --Water-stage recorder graph. Altitude of gage is 7,900 ft (2,410 m), from topographic map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below  $170 \text{ ft}^3/\text{s}$  (4.8 m<sup>3</sup>/s) and by slope-area measurement at 585 ft<sup>3</sup>/s (16.6 m<sup>3</sup>/s).

Maxima. --Sept. 4-18, 1970: Discharge, 585 ft<sup>3</sup>/s (16.6 m<sup>3</sup>/s) 0430 hours Sept. 6 (gage height, 2.80 ft or 0.853 m).

1968 to August 1970: Discharge, 360 ft<sup>3</sup>/s (10.2 m<sup>3</sup>/s) May 28, 1969 (gage height, 2.28 ft or 0.695 m), from rating curve extended above 70 ft<sup>3</sup>/s (2.0 m<sup>3</sup>/s).

Day		Discharge	Day	Discharge		Day	Discharge	
Sept. 4		13	Sept. 9.		29	Sept. 14	300	
5		85	10.		21	15	115	
6		229	11.		18	16	80	
7		74	12.		21	17	60	
8		43	13.		231	18	47	

Mean discharge, in cubic feet per second, 1970

Gage height, in feet,	and discharge,	in cubic feet per	r second,	at indicated time,	1970
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Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	3			Sept.	6*-Con.		Sept. 1	3*—Con.	
2400		0.88	6.7		2.57	404	- 0930	1.85	115
Sept.	4*			0430	2.80	585	1130	2.47	390
1230		.89	6.9	0530	2.37	280	1230	2.40	355
1600		1.12	13	0630	2.50	349	1300	2.53	465
1730		1.34	24	1000	2.32	245	1500	2.35	390
2100		1.39	28	1300	2.10	161	1530	2.08	245
2400		1.35	25	1800	1.96	120	1800	2.38	425
Sept.	5*			2400	1.92	108	2400	2.30	369
0400		1.29	20	Sept.	7*		Sept. 1	4*	
1100		1.24	18	1200	1.78	76	0600	2.30	369
1300		1.42	31	2400	1.65	54	0800	2.53	545
1500		1.85	102	Sept.	11		1000	2.30	<b>36</b> 9
1700		2.13	180	2400	1.27	17	1200	2.20	301
2000		2.13	180	Sept.	12*		1230	2.28	343
2200		2.16	191	1500	1.27	17	1400	2.15	265
2230		2.33	260	1700	1.31	19	1500	2.08	229
2330		2.25	225	2000	1.55	40	2400	1.91	167
2400		2.29	241	2400	1.37	23	Sept. 1	5*	
Sept.	6*			Sept.	13*		1200	1.70	110
0130		2.57	404	0200	1.40	25	2400	1.64	95
0200		2.37	280	0500	1.80	88			
0330		2.78	5 <b>6</b> 9	0700	1.95	132			

\*Daily means computed from data in addition to figures shown.

(18) 09342500. San Juan River at Pagosa Springs, Colo.

 Location. --Lat 37°15'58'', long 107°00'37'', in NE<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec. 13, T. 35 N., R. 2 W., Archuleta County, on right bank of former bridge site in Pagosa Springs, 0.2 mi (0.3 km) upstream from McCabe Creek, 0.6 mi (1.0 km) downstream from bridge on U.S. Highway 160, and 2 mi (3 km) upstream from Mill Creek.

Drainage area.  $--298 \text{ mi}^2$  (772 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph. Datum of gage is 7,052.04 ft (2,149.462 m) above mean sea level.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 4, 400 ft<sup>3</sup>/s (125 m<sup>3</sup>/s) and by slope-area measurement at 6, 580 ft<sup>3</sup>/s (186 m<sup>3</sup>/s).

 $\frac{\text{Maxima.} - \text{Sept. 4-18, 1970: Discharge, 6,580 ft}^{3}/\text{s}(186 m^{3}/\text{s}) 0700 \text{ hours Sept. 6}}{(\text{gage height, 9.02 ft or 2.749 m}), \text{ from rating curve extended above 4,400 ft}^{3}/\text{s}(125 m^{3}/\text{s}) \text{ on basis of slope-area measurement of peak flow.}}$ 

1910 to August 1970: Discharge, about 25,000  $ft^3/s$  (710 m<sup>3</sup>/s) Oct. 5, 1911 (gage height, 17.8 ft or 5.43 m, from floodmarks), from velocity-area study. Maximum stage known, that of Oct. 5, 1911. Flood of June 29, 1927, reached a stage of 13.5 ft or 4.11 m (discharge, about 16,000 ft<sup>3</sup>/s or 450 m<sup>3</sup>/s), from information by local residents.

Day		Discharge	Day	D	ischarge	Day	Discharge
Sept.	4	108	Sept. 9.		999	Sept. 14	. 3,170
	5	928	10.		887	15	. 2,000
	6	4,100	11.		815	16	. 1,190
	7	1,560	12 .		810	17	. 943
	8	1,160	13.		1,660	18	. 756

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	3			Sept.	6-Con.		Sept. 13	3*—Con.	
2400		1.87	81	0900	8.42	5,720	0900	4.60	1,320
Sept.	4*			1200	7.33	4,270	1200	4.56	1,290
0600		1.86	80	1500	6.63	3,410	1600	5.76	2,430
1200		1.88	83	1800	6.12	2,820	19 <b>0</b> 0	5.68	2,340
1600		2.08	120	2100	5.72	2,380	2000	5.88	2,560
2200		2.22	151	2400	5.43	2,080	2200	5.91	2,590
2400		2.66	281	Sept.	7		2400	5.58	2,230
Sept.	5*			0700	5.00	1,670	Sept. 14	4*	
0300		2.77	323	1200	4.78	1,470	0200	5.62	2,270
0800		2.61	264	1800	4.65	1,360	0500	6.23	2,940
1200		2.61	264	2400	4.54	1,270	0700	6.30	3,020
1500		3.01	435	Sept. 1	1		1000	7.10	3,980
1700		3.99	1,010	2400	3.84	770	1200	7.08	3,930
2000		5.53	2,360	Sept. 1	2*		1800	6.61	3,320
2100		5.95	2,800	1200	3.84	770	2400	6.18	2,800
2300		5.95	2,800	1700	3,86	782	Sept. 15	5	
2400		6.33	3, 190	2100	4.09	936	0600	5.75	2,300
Sept.	6			2400	4,24	1,040	1200	5.43	1,960
0300		8.00	5,230	Sept, 13	3*		1800	5.18	1,650
0400		8.08	5,290	0400	4.11	950	2400	4.98	1,410
0700		9.02	6,580	0700	4.12	957			

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

\*Daily means computed from data in addition to figures shown.

(19) 09343000. Rio Blanco near Pagosa Springs, Colo.

Location. --Lat 37°12'46", long 106°47'38", in center of sec. 1, T. 34 N., R. 1 E., Archuleta County, on right bank 40 ft (12 m) downstream from highway bridge, 0.4 mi (0.6 km) upstream from Leche Creek, 1.5 mi (2.4 km) downstream from Fish Creek, and 12.5 mi (20.1 km) southeast of Pagosa Springs.

Drainage area. --58.0 mi<sup>2</sup> (150.2 km<sup>2</sup>).

- <u>Gage-height record.</u> --Water-stage recorder graph. Altitude of gage is 7,950 ft (2, 423 m), from topographic map.
- <u>Discharge record.</u> --Stage-discharge relation defined by current-meter measurements below  $490 \text{ ft}^3/\text{s}$  (14 m<sup>3</sup>/s), by float-area measurement at 706 ft<sup>3</sup>/s (20.0 m<sup>3</sup>/s), and by flow over dam computation at 2,500 ft<sup>3</sup>/s (70.8 m<sup>3</sup>/s).
- Maxima. --Sept. 4-18, 1970: Discharge, 2,500 ft<sup>3</sup>/s (70.8 m<sup>3</sup>/s) 0330 hours Sept. 6 (gage height, 3,70 ft or 1,128 m).

1935 to August 1970: Discharge, about 1,600 ft<sup>3</sup>/s ( $45 \text{ m}^3$ /s) July 26 or 27, 1957; gage height, 4. 12 ft (1.256 m) June 18, 1949.

Maximum flood known prior to September 1970 occurred on Oct. 5, 1911.

Day		Discharge	Day	Discharge	Day	Discharge
Sept.	4	42	Sept. 9.	108	Sept. 14	. 852
	5	521	10.	78	15	. 516
	6	1,070	11.	60	16	. 326
	7	270	12 .	133	17	. 228
	8	149	13 .	765	18	. 188

Mean discharge, in cubic feet per second, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	3			Sept.	6*-Con.		Sept. 1	3*—Con.	
2400		0.78	26	1030	2.70	790	1130	2.85	1,240
Sept.	4*			1300	2,85	880	1230	2.95	1,360
1300		. 79	27	1600	2.68	660	1430	2.44	790
1700		. 90	37	2030	2.68	636	1600	2.62	970
1830		1.11	62	2400	2,53	448	1730	2.85	1,240
2030		1.11	62	Sept.	7		1930	2.95	1,360
2130		1.32	105	0600	2.34	320	2200	2.52	870
2400		1.30	100	1200	2.23	245	2330	2.87	1,260
Sept.	5*			2100	2.11	185	2400	2.79	1,170
0400		1.05	54	2400	2.10	173	Sept. 14	4*	
0800		.98	45	Sept.	11		0100	3.05	1,500
1100		1.00	48	2400	1.24	54	0230	2.67	1,020
1300		1.35	112	Sept.	12*		0500	2.50	850
1400		2.23	540	1130	1.23	53	0630	2.52	870
1500		2.43	730	1400	1.30	62	0800	2.97	1,390
1630		2.28	604	1700	1.50	102	1000	2.52	870
1730		3.10	1,500	1900	2.02	295	1430	2.22	596
1830		3.28	1,770	1930	2.42	572	1630	2.33	684
2100		2.80	1,120	2100	2.15	400	2400	2.20	580
2200		2.28	604	2200	1.87	270	Sept. 1	5*	
2400		2.33	644	2400	1.66	200	0600	2.12	508
Sept.	6*			Sept.	13*		1000	2.17	540
0100		2.52	820	0130	1.81	280	1830	2.12	492
0230		3.61	2,340	0330	1.63	212	2400	2.02	418
0330		3.70	2,500	0600	2.15	516	Sept. 1	6*	
0700		3.35	1,640	0730	1.93	376	0600	1.94	364
0800		2.90	1,220	0930	1.87	346	1200	1.88	325
							2400	1.76	265

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

\*Daily means computed from data in addition to figures shown.

(20) 09344000. Navajo River at Banded Peak Ranch, near Chromo, Colo.

Location. --Lat 37°05'07'', long 106°41'20'', in NW<sup>1</sup>/<sub>4</sub> sec. 24, T. 33 N., R. 2 E., Archuleta County, on left bank at downstream side of private bridge on Banded Peak Ranch, 0.5 mi (0.8 km) downstream from Aspen Creek, 4 mi (6 km) downstream from East Fork, and 9 mi (14 km) northeast of Chromo.

Drainage area. --69.8 mi<sup>2</sup> (180.8 km<sup>2</sup>).

<u>Maxima</u>. --Sept. 4-18, 1970: Discharge, 1, 350  $ft^3/s$  (38.2 m<sup>3</sup>/s) 1000 hours Sept. 14 (gage height, 4.50 ft or 1.372 m).

1936 to August 1970: Discharge, 1, 340 ft<sup>3</sup>/s  $(37.9 \text{ m}^3/\text{s})$  May 13, 1941 (gage height, 7.02 ft or 2.140 m, present datum).

Maximum flood known occurred Oct. 5, 1911.

Da	у	Discharge	Day	Discharge	Day	Discharge
Sept.	4	52	Sept. 9.	105	Sept. 14	. 1,030
	5	247	10.	83	15	. 436
	6	610	11.	75	16	. 268
	7	202	12 .	103	17	. 201
	8	142	13.	642	18	. 162

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time,	r second, at indicated time, 1970	ed time,	at indicated	ond, a	second,	; per	feet	in cubic	discharge,	and	in feet,	Gage height,
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Hour	Ga hei		Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	3			Sept.	6*-Con.		Sept. 1	3*—Con.	
2400		95	44	2100	2.97	364	1700	3.90	805
Sept.	4			2400	2.88	300	1800	4.35	1,130
0600	1.	96	45	Sept.	7		1830	4.08	926
1200	1.	97	46	0600	2.67	222	1930	4.28	1,070
1800	2.	06	55	1200	2.55	186	2230	4.07	919
2400	2.	24	76	1800	2.50	171	2245	4.25	1,050
Sept.	5*			2400	2.46	160	2400	4.17	989
0600	2.	11	61	Sept.	11		Sept. 1	4	
1330	2.	33	89	2400	2.02	70	0200	4.25	1,070
1500	2.	70	180	Sept.	12*		0300	4.20	1,040
1630	3.	73	624	1200	2.03	72	0500	4.33	1,160
1730	3.	63	575	1600	2.06	75	0700	4.31	1,160
1900	3.	88	733	1900	2.40	140	1000	4.50	1,350
2130	3.	58	575	2000	2.40	140	1300	4.33	1,200
2400		95	288	2100	2.90	300	1700	4.16	912
Sept.	6*			2400	2.48	160	1900	4.17	787
0100	2.	9 <b>0</b>	268	Sept.	13*		2400	4.09	624
0200	3.	14	384	0130	2.41	142	Sept. 1		
0400	3.	96	857	0500	2.60	195	0300	4.07	560
0700	4.	30	1, 160	0700	3.15	402	1300	4.03	440
0900	4.	13	1,030	0900	2.98	332	1800	3.93	352
1100	3.	62	691	1130	3.85	775	2400	3.90	320
1500	3.	21	475	1430	4.20	1,010			

\*Daily means computed from data in addition to figures shown.

Gage-height record. --Water-stage recorder graph. Datum of gage is 7,940.6 ft (2,420.29 m) above mean sea level (river-profile survey).

Discharge record. --Stage-discharge relation defined by current-meter measurements below 840 ft<sup>3</sup>/s (24 m<sup>3</sup>/s).

#### FLOODS OF SEPT. 1970 IN ARIZ., UTAH, COLO., AND N. MEX.

(21) 09344300. Navajo River above Chromo, Colo.

Location. --Lat 37°01'55'', long 106°43'56'', in NE<sup>1</sup>/<sub>4</sub> sec. 9, T. 32 N., R. 2 E., Archuleta County, on right bank 6 mi (10 km) east of Chromo and 7 mi (11 km) upstream from Little Navajo River.

Drainage area. --96. 4 mi<sup>2</sup> (249. 7 km<sup>2</sup>).

 $\frac{\text{Discharge record.} -\text{Stage-discharge relation defined by current-meter measurements}}{\text{below 1,000 ft}^3/\text{s}(28 \text{ m}^3/\text{s})} \text{ and by float-area measurement at 1, 320 ft}^3/\text{s}(37.4 \text{ m}^3/\text{s}). \text{ Discharge 1000 to 1700 hours Sept. 6, 1500 hours Sept. 13 to 2400 hours Sept. 14, estimated on basis of records for Navajo River at Banded Peak Ranch, near Chromo.}$ 

Maxima. --Sept. 4-18, 1970: Discharge, 1, 400 ft<sup>3</sup>/s or 40 m<sup>3</sup>/s (estimated) 1230 hours Sept. 14; gage height, 8.20 ft (2, 499 m) 0830 hours Sept. 14 (backwater from diversion dam).

1956 to August 1970: Discharge, 1, 340 ft<sup>3</sup>/s  $(37.9 \text{ m}^3/\text{s})$  June 7, 1957 (gage height, 5. 95 ft or 1. 814 m); gage height, 6. 13 ft (1. 868 m) during period Feb. 1-8, 1957 (ice jam).

Maximum flood known prior to September 1970 occurred on Oct. 5, 1911.

Mean discharge, in cubic feet per second, 1970

Da	У	Discharge	Day	Discharge	Day	Discharge
Sept.	4	53	Sept. 9.	108	Sept. 14	. 1,100
	5	223	10.	90	15	. 461
	6	584	11.	80	16	. 260
	7	221	12 .	91	17	. 204
	8	144	13.	640	18	. 168

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	6—Con.		Sept. 1	3*—Con.	
2400		3.65	65	0900	5.61	1,090	0700	4.09	180
Sept.	5			0930	5,75	1,200	0800	4.40	320
0200		3.70	73	1000	5.67	1, 140	1200	4.47	362
0900		3.62	62	1200	-	735	1400	5.03	679
1300		3.65	65	1700	4.61	440	1500	5.12	742
1500		3.80	88	2000	4.50	380	Sept. 1	4*	
1600		3.98	137	2400	4.36	300	1230	-	1,400
1700		4.52	392	Sept. 1	1		2400	5.45	9 <b>60</b>
1800		4.93	616	2400	3.72	73	Sept. 1	5	
1900		4.85	567	Sept. 12	2		0500	5.02	644
2300		4.90	602	1600	3.75	78	0600	4.82	512
2400		4.61	440	2100	3.90	113	0800	4.64	404
Sept.	6			2300	4.27	260	1100	4.56	356
0200		4.43	338	2400	4.21	230	1300	4.60	380
0300		4.61	440	Sept. 1	3*		1800	4.52	332
0700		5.17	770	0300	4.04	160	2400	4.46	300

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

\*Daily means computed from data in addition to figures shown.

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

#### (Miscellaneous site)

Location. --Lat 37°04'40'', long 106°48'34'', in Archuleta County, about 1,000 ft (300 m) upstream from Bureau of Reclamation diversion dam and 4 mi (6 km) northeast of Chromo.

Drainage area. -- 13. 6 mi<sup>2</sup> (35. 2 km<sup>2</sup>).

Maximum. --Sept. 4-18, 1970: Discharge, 132 ft<sup>3</sup>/s (3.74 m<sup>3</sup>/s) Sept. 6, 1970, by slopearea measurement of peak flow.

(23) 09346000. Navajo River at Edith, Colo.

Location. --Lat 37°00'10", long 106°54'25", in NW<sup>1</sup>/<sub>4</sub> sec. 24, T. 32 N., R. 1 W., Archuleta County, on right bank 290 ft (88 m) downstream from highway bridge, 0.2 mi (0.3 km) southeast of Edith, 0.5 mi (0.8 km) upstream from Colorado-New Mexico State line, and 1.3 mi (2.1 km) upstream from Coyote Creek.

Drainage area.  $-172 \text{ mi}^2$  (445 km<sup>2</sup>).

- Gage-height record. --Water-stage recorder graph. Datum of gage is 7,033.00 ft (2,143.658 m) above mean sea level (Bureau of Reclamation bench mark).
- <u>Discharge record.</u> --Stage-discharge relation defined by current-meter measurements below  $650 \text{ ft}^3/\text{s}$  (18 m<sup>3</sup>/s) and extended above on basis of float measurement at gage height 5.39 ft (1.643 m).
- <u>Maxima</u>. --Sept. 4-18, 1970: Discharge, 1, 370  $ft^3/s$  (38.8  $m^3/s$ ) 1030 hours Sept. 14 (gage height, 5.54 ft or 1.689 m, in gage well; 5.91 ft or 1.801 m, from floodmarks), from rating curve extended above 650  $ft^3/s$  (18  $m^3/s$ ) on basis of float measurement at 1, 190  $ft^3/s$  (33.7  $m^3/s$ ).
  - 1935 to August 1970: Discharge, 2,840 ft<sup>3</sup>/s (80.4 m<sup>3</sup>/s) Apr. 23, 1942 (gage height, 6.55 ft or 1.996 m), from rating curve extended above 1,100 ft<sup>3</sup>/s ( $31 \text{ m}^3$ /s). Maximum flood known occurred Oct. 5, 1911.

Da	у	Discharge	Day	Discharge	Day	Discharge
Sept.	4°	52	Sept. 9.	128	Sept. 14	. 1,060
-	5	208	10.	104	15	. 509
	6	636	11 .	92	16	. 298
	7	276	12 .	92	17	. 226
	8	173	13 .	526	18	. 185

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of Navajo River at Edith, Colo.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	6*-Con.		Sept. 1	3*-Con.	
<b>240</b> 0		3.24	61	2400	4.23	350	1800	4.82	686
Sept.	5*			Sept.	7		1900	5.35	1,180
0600		3.38	82	0300	4.13	310	2200	5.02	858
1400		3.38	82	1000	4.08	290	2400	5.19	1,020
1630		3.47	97	1600	4.00	258	Sept. 1	4*	
1800		3.81	182	2400	3.87	212	0700	5.25	1,080
2000		4.75	635	Sept. 1	1		0900	5.46	1,290
2100		4.83	710	2400	3.36	84	0930	5.10	930
2200		4.70	614	Sept. 1	2*		1030	5.54	1,370
2230		4.92	786	1700	3.40	90	1300	5.24	1,100
2400		4.87	742	2200	3.49	106	1400	5.44	1,320

Navajo	River at	Edith,	ColoContinued
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Gage height, in feet,	and discharge,	in cubic	feet per	second,	at indicated time,	1970,
	of Navajo	River at	Edith, C	olo.		

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	6*			2400	3.72	161	1700	5.19	1,070
0200		4.80	686	Sept. 13	}*		2400	4.91	804
0430		4.53	500	0100	4.15	310	Sept. 15	5*	
0630		4.92	786	0600	3.79	182	1200	4.45	470
1030		5.10	950	0830	3.80	185	1800	4.35	420
1200		5.02	876	1030	4.45	445	2400	4.19	346
1330		4.37	415	1230	4.35	395	Sept. 16	5*	
1500		4.89	759	1500	4,85	710	1200	4.07	298
1600		4.74	642	1700	5.02	858	2400	3.94	246

\*Daily means computed from data in addition to figures shown.

(24) 09346400. San Juan River near Carracas, Colo.

<u>Location.</u> --Lat  $37^{\circ}00'43''$ , long  $107^{\circ}18'34''$ , in SE $\frac{1}{4}SW_{\frac{1}{4}}$  sec. 17, T. 32 N., R. 4 W., Archuleta County, on right bank just upstream from flow line of Navajo Reservoir, 3 mi (5 km) northwest of Carracas, 7.2 mi (11.6 km) upstream from Piedra River, and at mile 178.8 (287.7 km).

Drainage area. --1, 230 mi<sup>2</sup> (3, 190 km<sup>2</sup>), approximately.

Gage-height record. --Digital recorder tape punched at 30-minute intervals. Altitude of gage is 6,090 ft (1,856 m), from river-profile map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 5, 700 ft<sup>3</sup>/s (160 m<sup>3</sup>/s) and extended above on basis of slope-area measurement of peak flow.

Maxima. --Sept. 4-18, 1970: Discharge, 9,730 ft<sup>3</sup>/s (276 m<sup>3</sup>/s) 1500 hours Sept. 6 (gage height, 8.34 ft or 2.542 m).

1961 to August 1970: Discharge, 6,120 ft<sup>3</sup>/s (173 m<sup>3</sup>/s) May 22, 1965 (gage height, 6.85 ft or 2.088 m).

Maximum flood known occurred Oct. 5, 1911. Major floods occurred Sept. 5 or 6, 1909 and June 29, 1927.

Day		Discharge	Day		Discharge	Day	Discharge
Sept.	4	200	Sept.	9	1,120	Sept. 14	6,120
-	5	876	1	0	844	15	4,030
	6	6,450	1	1	668	16	2,380
	7	2,870	1	2	662	17	1,690
	8	1,620	1	3	2,330	18	1,330

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of San Juan River near Carracas, Colo.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 0200	5*	2.02	2 10	Sept. 2000	6*-Con. 6.68	6,060	2400	3*-Con. 6. 22	5,200
1000 1400		$2.20 \\ 3.28$	274 892	2400 Sept.	5.85 7*	4,420	Sept. 1- 0400	4* 6.46	6,010
2000 2400		3.87	1,440	0600 1200	5.14 4.80	3,240	0800	6.18	5,420
Sept.	6*	5.16	3,180	1800	4.56	2,700 2,360	1600	6.67 6.78	6,480 6,720
0400 0600 0800		6.50 6.44 6.61	5,640 5,520 5,880	2400 Sept. 0200	4.35 13* 3.30	2,070 948	1800 2000 2400	6.86 6.72 6.13	6,890 6,590 5,320

### STATION DATA—SAN JUAN RIVER BASIN

#### San Juan River near Carracas, Colo.-Continued

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
1200	7.64	8,150	0600	3.98	1,610	Sept. 1	5*	
f400	8.08	9,130	1000	4.00	1,630	0600	5.50	4,440
1500	8.34	9,730	1400	3.91	1,530	1200	5.16	3,830
1600	8.09	9,160	1800	4.71	2,560	2400	4.66	3,000
1800	7.52	7,880	2000	5.66	4,120			

Gage height, in feet, and discharge, in cubic feet per second, at indicated time. 1970

\*Daily means computed from data in addition to figures shown.

(25) 09347200. Middle Fork Piedra River near Pagosa Springs, Colo.

Location. --Lat 37°29'12'', long 107°09'46'', in  $SW_{\frac{1}{4}}NW_{\frac{1}{4}}$  sec. 35, T. 38 N., R. 3 W., Hinsdale County, on right bank 0.6 mi (1.0 km) upstream from Toner-Taylor ditch, 4.1 mi (6.6 km) northeast of Piedra guard station, and 17 mi (27 km) northwest of Pagosa Springs.

Drainage area. -- 32. 2 mi<sup>2</sup> (83. 4 km<sup>2</sup>).

Gage-height record. --Water-stage recorder tape (hourly punches). Altitude of gage is 8,210 ft (2,502 m), from topographic map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 200 ft<sup>3</sup>/s (5.7 m<sup>3</sup>/s) and by slope-area measurement of 2,520 ft<sup>3</sup>/s (71.4 m<sup>3</sup>/s).

Maxima. --Sept. 5-18, 1970: Discharge, 2,520 ft<sup>3</sup>/s (71.4 m<sup>3</sup>/s) 2330 hours Sept. 5 (gage height, 4.39 ft or 1.338 m, from floodmarks).

October 1969 to August 1970: Discharge, 300 ft<sup>3</sup>/s or 8.5 m<sup>3</sup>/s (estimated) May 17, 1970.

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 5	279	Sept. 10		Sept. 15	. 530
6		11	68	16	. 356
7	332	12	63	17	. 252
8	184	13	447	18	. 176
9	117	14	774		

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of Middle Fork Piedra River near Pagosa Springs, Colo.

Hour		Gage height	Discharge	Hour	. Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	6*-Con.		Sept. 1	3Con.	
2400		1.50	72	1300	2.78	944	1300	2.58	766
Sept.	5*			1800	2,60	787	1400	2.40	605
1200		1.36	53	2400	2.26	492	2000	2.45	651
1400		1.67	110	Sept.	7*		2400	2.41	612
1600		1.98	226	0600	2.19	429	Sept. 14	1*	
1800		2.09	284	1200	1.99	302	0600	2.44	651
2000		2.29	408	2400	1.88	240	0800	2.70	872
2100		2.51	568	Sept.	12		1200	2.79	953
2200		2.90	890	2400	1.47	78	1400	2,68	854
2300		3.41	1,390	Sept.	13		1800	2.63	809
2330		4.39	2,520	0300	1.47	78	2400	2.52	715
2400		3.42	1,400	0600	1.90	246	Sept. 1	5*	
Sept.	6*			0800	1.95	274	1200	2.29	522
0100		3.06	1,160	0900	2.27	500	2400	2.18	443
0200		2.78	944	1200	2.26	492			

\*Daily means computed from data in addition to figures shown.

(26) 09349500. Piedra River near Piedra, Colo.

<u>Location.</u> --Lat 37°13'20'', long 107°20'32'', in  $NW_4^1NW_4^1$  sec. 17, T. 34 N., R. 4 W., Archuleta County, on right bank 0.1 mi (0.2 km) downstream from bridge on U.S. Highway 160, 0.4 mi (0.6 km) upstream from Yellow Jacket Creek, and 1.5 mi (2.4 km) northwest of Piedra.

Drainage area. --371 mi<sup>2</sup> (961 km<sup>2</sup>).

- Discharge record. --Stage-discharge relation defined by current-meter measurements below 2, 300 ft<sup>3</sup>/s (65 m<sup>3</sup>/s) and by slope-area measurement at 7, 980 ft<sup>3</sup>/s (226 m<sup>3</sup>/s).
- <u>Maxima.</u> --Sept. 4-18, 1970: Discharge, 7,980 ft<sup>3</sup>/s (226 m<sup>3</sup>/s) 0700 hours Sept. 6 (gage height, 7.92 ft or 2.414 m in gage well; 9.40 ft or 2.865 m, from floodmarks), from rating curve extended above 2,300 ft<sup>3</sup>/s (65 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow.

1938 to August 1970: Discharge, 6,870 ft<sup>3</sup>/s (195 m<sup>3</sup>/s) July 26, 1957 (gage height, 8.60 ft or 2.621 m, site and datum then in use), from rating curve extended above 2,800 ft<sup>3</sup>/s (79 m<sup>3</sup>/s).

Maximum flood known occurred Oct. 5, 1911 (discharge not determined). Another major flood occurred June 29, 1927.

Day	Discharge	Day	D	ischarge	Day	7	Discharge
Sept. 4	 135	Sept. 9.		782	Sept.	14	3,080
5	 737	10 .		575		15	2,280
6	 5,180	11.		446		16	1,480
7	 1,940	12 .	• • •	391		17	1,060
8	 1,070	13 .		1,380		18	788

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of Piedra River near Piedra, Colo.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	3			Sept.	7*		Sept. 13	3*—Con.	
2400		1.67	130	0200	4.89	2,670	2100	4.89	2,670
Sept.	4*			0700	4.43	2,130	2400	4.65	2,380
1200		1.63	121	1200	4.23	1,930	Sept. 14	4*	
2100		1.75	150	2400	3.56	1,300	0500	4.36	2,060
2400		2.35	330	Sept.	8*		0800	4.50	2,200
Sept.	5*			0600	3.39	1,160	1000	5.00	2,800
0200		2.50	406	1200	3.29	1,080	1300	5.60	3,660
0400		2.60	446	2400	3.00	870	1500	6.00	4,300
1100		2.41	372	Sept. 1	1		1800	5.70	3,820
1800		2.65	466	2400	2.12	398	2400	5.25	3,150
2000		3.95	1,380	Sept. 1	2		Sept. 1	5*	
2400		5.60	3,660	0600	2.07	380	0400	5.00	2,800
Sept.	6*			1200	2.05	372	1100	4.58	2,300
0200		6.90	5,9 <b>00</b>	1800	2.08	383	1800	4.21	1,910
0700		7.92	7,980	2400	2.28	462	2400	4.05	1,750
1200		6.70	5,540	Sept. 1	3*		Sept. 10	5*	
1500		6.05	4,380	0400	2.48	560	0600	3.90	1,610
1700		5.56	3,600	0900	2.68	668	1200	3.76	1,480
2 <b>200</b>		5.27	3,180	1200	3.39	1,160	1800	3.62	1,360
2400		4.95	2,740	1600	4.23	1,930	2400	3.46	1,220

\*Daily means computed from data in addition to figures shown.

Gage-height record. --Water-stage recorder graph. Altitude of gage is 6,510 ft (1,984 m), from topographic map.

(27) 09349800. Piedra River near Arboles, Colo.

Location. --Lat 37°05'18", long 107°23'50", in NE<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec. 21, T. 33 N., R. 5 W., Archuleta County, on left bank 3 mi (5 km) downstream from Ignacio Creek, 5.2 mi (8.4 km) northeast of Arboles Post Office, and 8 mi (13 km) upstream from mouth.

Drainage area.  $--629 \text{ mi}^2$  (1, 629 km<sup>2</sup>).

- Gage-height record. --Digital recorder tape punched at 30-minute intervals. Altitude of gage is 6, 147.52 ft (1, 873.764 m), from Colorado State Highway Department bench mark.
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 3, 100 ft<sup>3</sup>/s (88 m<sup>3</sup>/s) and extended above on basis of slope-area measurement of peak flow.
- Maxima, --Sept. 4-18, 1970: Discharge, 8, 370 ft<sup>3</sup>/s (237 m<sup>3</sup>/s) 1130 hours Sept. 6 (gage height, 6.38 ft or 1.945 m recorded; 7.55 ft or 2.301 m, from floodmarks). 1962 to August 1970: Discharge, 4,000 ft<sup>3</sup>/s (113 m<sup>3</sup>/s) Apr. 23, 1965 (gage height, 5.20 ft or 1.585 m).

Other major floods occurred Sept. 5 or 6, 1909 and Oct. 5, 1911.

Mean discharge, in cubic feet per second, 1970

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4	134	Sept. 9.	878	Sept. 14	. 3,370
5	508	10.	652	15	. 2,650
6	5,360	11 .	532	16	. 1,630
7	2,340	12 .	440	17	. 1,160
8	1,290	13.	1,090	18	. 926

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of Piedra River near Arboles, Colo.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	5*			Sept.	6*Con.		Sept. 1	3*-Con.	
0200		1.48	146	2400	4.69	3,670	2400	4.14	2,660
0600		2.07	370	Sept.	7*		Sept. 1	4*	
1200		2.15	412	0600	4.15	2,640	0400	4.05	2,520
2000		2.21	448	1200	3.87	2,220	0800	4.35	3,010
2200		3.31	1,340	1400	3.81	2,120	1200	4.45	3,200
2400		3.98	2,150	1600	3.73	2,010	1400	4.77	3,820
Sept.	6*			1800	3.63	1,890	1600	4.87	4,050
0400		4.81	3,930	2000	3.55	1,800	1800	4.91	4,140
0600		5.76	6,330	2200	3.48	1,710	2000	4.86	4,030
0800		6.02	7,090	2400	3.39	1,610	2200	4.69	3,660
1000		5.98	7,000	Sept.	13*		2400	4.60	3,480
1130		6.38	8,370	0200	1.98	465	Sept. 1	5*	
1200		6.18	7,280	1200	2.29	646	0600	4.26	2,990
1600		5.77	6,360	1600	3.01	1,230	1200	3.96	2,500
2000		5.14	4,690	2000	3.77	2,110	2400	3.60	1,980

\*Daily means computed from data in addition to figures shown.

(28) 09352900. Vallecito Creek near Eayfield, Colo.

### (Hydrologic bench-mark station)

<u>Location.</u> --Lat  $37^{2}28'39''$ , long  $107^{\circ}32'35''$ , in NW<sup>1</sup>/<sub>4</sub> sec. 16, T. 37 N., R. 6 W., La Plata County, on right bank 60 ft (13 m) upstream from Fall Creek, 0.8 mi (1.3 km) down-stream from Bear Creek, 6.7 mi (10.8 km) north of Vallecito Dam, and 18 mi (29 km) north of Bayfield.

Drainage area. --72. 1 mi<sup>2</sup> (186. 7 km<sup>2</sup>).

- Gage-height record. --Water-stage recorder graph. Datum of gage is 7,906.08 ft (2,409.773 m) above mean sea level.
- $\frac{\text{Discharge record.} --\text{Stage-discharge relation defined by current-meter measurements}}{\text{below 1, 400 ft}^3/\text{s (40 m}^3/\text{s) and by slope-area measurement at 7,050 ft}^3/\text{s (200 m}^3/\text{s).}}$
- <u>Maxima</u>. --Sept. 4-18, 1970: Discharge, 7,050 ft<sup>3</sup>/s (200 m<sup>3</sup>/s) 0200 hours Sept. 6 (gage height, 6.51 ft or 1.984 m, from water-stage recorder; 6.76 ft or 2.060 m, from floodmarks).

1962 to August 1970: Discharge, 1,530 ft $^3$ /s (43.3 m $^3$ /s) June 19, 1965 (gage height, 3.43 ft or 1.045 m).

Major floods occurred in October 1911 and June 1927.

Mean discharge, in cubic feet per second, 1970

Day	Discharge	Day	Discharge	Day	Discharge	
Sept. 4 5 6 7 8	1,690 3,020 735	11.12.	308            245            212            247            1,730	Sept. 14 15 16 17 18	. 698 . 445 . 320	

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of Vallecito Creek near Bayfield, Colo.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	3			Sept.	6*-Con.		Sept. 13	3∗	
2400		1.27	82	0600	5.19	4,260	0300	2.06	386
Sept,	4∗			0730	4.40	2,880	0600	3.00	1,150
1200		1.27	82	0800	4.50	3,040	0800	3.70	1,920
1500		1.40	110	1100	4.05	2,370	1100	4.35	2,800
1700		1.90	308	1130	4.67	3,320	1200	4.10	2,440
1900		2.23	528	1400	3.60	1,800	1230	4.61	3,220
2100		2.23	528	1800	3.48	1,570	1300	4.10	2,440
2400		2.13	452	2400	3.00	1,150	1500	3,85	2,100
Sept.	5*			Sept.	7		1300	3.80	2,040
0300		2.02	380	0300	2.83	997	2400	3,35	1,520
0600		2.02	380	0600	2.65	840	Sept. 14	4*	
1200		1.97	350	1200	2.46	688	0400	3.20	1,350
1400		2.61	832	1800	2.32	576	0730	3.26	1,420
1700		4.28	2,740	2400	2.25	520	1300	3.10	1,250
1800		4.32	2,800	Sept.	11		1800	2.99	1,140
2000		4.75	3,520	2400	1.68	192	2400	2.79	961
2200		5.94	5,800	Sept.	12*		Sept. 1	5*	
2300		5.70	5,300	1200	1.65	180	1200	2.46	680
2400		6.04	6,000	1600	1.64	176	2400	2.27	528
Sept.	6*			1800	1.79	236			
0200		6.51	7,050	2030	2.25	520			
0400		5.71	5,300	2400	2.08	398			

\*Daily means computed from data in addition to figures shown.

# STATION DATA—SAN JUAN RIVER BASIN

(29) 09353000. Vallecito Reservoir near Bayfield, Colo.

Location. --Lat 37°23'00", long 107°34'30", in SW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec. 18, T. 36 N., R. 6 W., in gatehouse above outlet gates at Vallecito Dam on Los Pinos (Pine) River, 300 ft (90 m) left of spillway, 0.2 mi (0.3 km) upstream from Little Red Creek, and 11 mi (18 km) northeast of Bayfield.

Gage-height record. --Water-stage recorder graph. Datum of gage 1s 7, 530 ft (2, 310 m) above mean sea level (Bureau of Reclamation bench mark): gage readings have been reduced to elevations above mean sea level.

Maxima. --Sept. 4-13, 1970: Contents, 104, 200 acre-ft (128 hm<sup>3</sup>) 0100 to 0900 hours Sept. 16 (elevation, 7, 656.64 ft or 2, 333.744 m). 1941 to August 1970: Contents, 128, 200 acre-ft (158 hm<sup>3</sup>) July 27, 1957

(elevation, 7,665.72 ft or 2,336.511 m).

Cooperation. --Gage-height record furnished by Bureau of Reclamation.

Date	5	Hour	Elevation	Contents	Date	Hour	Elevation	Contents
Sept.	3	2400	7,643.87	73,540	Sept. 13	0600	7,652.38	93,560
						0900	7,652.55	93,980
Sept.	4	1200	7,643.70	73,160		1200	7,652.96	94,990
•		1800	7,643.68	73, 120		2400	7,654.53	98,900
		2400	7,643.70	73, 160				
					Sept. 14	1200	7,655.53	101,400
Sept,	5	1000	7,643.75	73,270		2400	7,656.17	103,000
•		1400	7,643.32	73,430				
		1800	7,644.03	73,900	Sept. 15	1200	7,656,50	103,900
		2400	7,645,30	76,770		1800	7,656,61	104,200
				-		2400	7,656,63	104,200
Sept.	6	1200	7,648,60	84, 440				-
		2400	7,649.93	87,610	Sept. 16	0300	7,656.64	104,200
						1200	7,656,60	104, 100
Sept.	7	1200	7,650.63	,89,300		2400	7,656,52	103,900
•		2400	7,651.20	90,680				
					Sept. 17	1200	7,656,35	103,500
Sept.	8	1200	7,651.65	91,780		2400	7,656,17	103,000
•		2400	7,651.94	92,480				
				-	Sept. 18	1200	7,655.95	102,500
Sept.	12	2400	7,652.32	93,420	•	2400	7,655.69	101,800

Elevation, in feet, and contents, in acre-feet, at indicated time, 1970, of Vallecito Reservoir near Bayfield, Colo.

(30) 09353500. Los Pinos River near Bayfield, Colo.

### (Locally known as Pine River)

Location. --Lat  $37^{\circ}22'58''$ , long  $107^{\circ}34'37''$ , in SW<sup>1</sup>/<sub>4</sub> sec. 13, T. 36 N., R. 6 W., La Plata County, on left side of outlet flume from Vallecito Reservoir, 0.2 mi (0.3 km) upstream from Little Red Creek, 2 mi (3 km) upstream from Red Creek, and 11 mi (18 km) north of Bayfield.

Drainage area. --270 m1<sup>2</sup> (700 km<sup>2</sup>), approximately.

Gage-height record, --Water-stage recorder graph. Datum of gage 15 7, 582.54 ft (2, 311, 158 m) above mean sea level (Bureau of Reclamation bench mark).

Discharge record. --Stage-discharge relation defined by current-meter measurements below 1, 400 ft3/s (40 m3/s).

### Los Pinos River near Bayfield, Colo.-Continued

Maxima. --Sept. 4-18, 1970: Discharge, 1,430 ft<sup>3</sup>/s (40.5 m<sup>3</sup>/s) Sept. 16, 17 (gage height, 3.33 ft or 1.015 m).

1927 to August 1970: Discharge, 13,800 ft<sup>3</sup>/s ( $391 \text{ m}^3$ /s) July 27, 1957 (gage height, 12.2 ft or 3,72 m, from floodmarks at supplementary gage), from rating curve extended above 2,500 ft<sup>3</sup>/s ( $71 \text{ m}^3$ /s) on basis of slope-area measurement of peak flow (result of automatic spillway gates releasing from Vallecito Reservoir). Maximum flood known prior to construction of Vallecito Reservoir occurred Oct. 5, 1911.

Remarks. --Floodflow regulated by Vallecito Reservoir (see station 09353000).

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4	570	Sept. 9 .	399	Sept. 14	1,050
5	457	10 .	514	15	1,250
6		11 .	625	16	. 1,430
7		12 .	664	17	. 1,430
8	268	13.	744	18	. 1,420

Mean discharge, in cubic feet per second, 1970

(31	) 09354500.	Los Pinos	<b>River</b> at	La	Boca	Colo

Location. --Lat 37°00'37'', long 107°35'49'', in S<sup>1</sup>/<sub>2</sub> sec. 15, T. 32 N., R. 7 W., La Plata County, on downstream end of right abutment of the Denver and Rio Grande Western Railroad Co. bridge, at southeast edge of La Boca, 0.1 mi (0.2 km) upstream from Spring Creek, and 13 mi (21 km) upstream from mouth.

Drainage area.  $-510 \text{ mi}^2$  (1, 320 km<sup>2</sup>), approximately.

Gage-height record. --Digital recorder tape punched at 15-minute intervals. Datum of gage is 6, 143, 58 ft (1, 872, 563 m) above mean sea level.

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

Maxima. --Sept. 4-18, 1970: Discharge, 4,160 ft<sup>3</sup>/s (118 m<sup>3</sup>/s) 0645 hours Sept. 6 (gage height, 7.68 ft or 2.341 m).

1950 to August 1970: Discharge, 6,400 ft<sup>3</sup>/s (181 m<sup>3</sup>/s) July 27, 1957 (gage height, 8.95 ft or 2.728 m), from rating curve extended above 5,100 ft<sup>3</sup>/s (140 m<sup>3</sup>/s). A major flood occurred Oct. 5, 1911, at this location.

Remarks. --Floodflow regulated by Vallecito Reservoir since 1941 (see station 09353000).

Day	7	Discharge	Day	Discharge	Day	Discharge
Sept.	4	178	Sept. 9.		Sept. 14	
	5	$572 \\ 1,640$		263 339	15 16	•
	7			441	17	. 1,430
	8	167	13 .	579	18	. 1,400

Mean discharge, in cubic feet per second, 1970

## STATION DATA-SAN JUAN RIVER BASIN

(32) 09355000. Spring Creek at La Boca, Colo.

Location. --Lat 37°00'46", long 107°35'42", in S<sup>1</sup>/<sub>2</sub> sec. 15, T. 32 N., R. 7 W., La Plata County, on right bank in an excavated channel, 0.2 mi (0.3 km) upstream from mouth, and 0.2 mi (0.3 km) east of La Boca.

Drainage area. -- 58 mi<sup>2</sup> (150 km<sup>2</sup>), approximately.

Gage-height record. --Digital recorder tape punched at 15-minute intervals. Altitude of gage is 6,160 ft (1,878 m), from topographic map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 160 ft<sup>3</sup>/s (4. 5 m<sup>3</sup>/s) and by field estimate at 1,980 ft<sup>3</sup>/s (56. 1 m<sup>3</sup>/s).

Maxima. --Sept. 4-18, 1970: Discharge, 1,980 ft<sup>3</sup>/s (56.1 m<sup>3</sup>/s) 0415 hours, Sept. 6 (gage height, 4.62 ft or 1.408 m).

1950 to August 1970: Discharge, 595 ft<sup>3</sup>/s (16.9 m<sup>3</sup>/s) Mar. 22, 1969 (gage height, 2.90 ft or 0.884 m), from rating curve extended above 100 ft<sup>3</sup>/s (2.8 m<sup>3</sup>/s); gage height, 5.98 ft (1.823 m) Mar. 9, 1960 (ice jam).

Day	7	Discharge	Day	Discha	rge Day	Discharge
Sept.	4	68	Sept. 9.	4	6 Sept. 14	220
	5	303	10.	5	7 15	44
	6	7 <b>7</b> 8	11 .	6	2 16	31
	7	64	12 .	7	2 17	27
	8	49	13,	8	4 18	31

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of Spring Creek at La Boca, Colo.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	5*			Sept.	6*-Con.		Sept. 13	3*-Con.	
0200		1.60	100	0600	4.11	1,540	2000	1.25	90
1000		1.65	110	0800	3.82	1,310	2400	1.31	102
1400		1.86	160	1200	2,63	522	Sept. 14	4*	
1800		2.80	560	1400	2.04	292	0400	1.24	86
2000		3.11	746	1800	1.58	156	0600	1.96	265
2200		3.04	704	2400	1.29	98	0800	1.84	229
2400		3.45	1,000	Sept.	7*		1000	2.63	518
Sept.	6*			1200	1.11	66	1200	2.37	414
0200		3.89	1,360	2400	1,04	54	1600	1.61	160
0400		4.48	1,830	Sept.	13*		2000	1.21	80
0415		4.62	1,980	1400	1.13	66	2400	1, 10	58

(33) 09355100. Navajo Reservoir near Archuleta, N. Mex.

Location. --Lat 36°48'28", long 107°36'31", in SW<sup>1</sup><sub>4</sub>SE<sup>1</sup><sub>4</sub> sec. 18, T. 30 N., R. 7 W., San Juan County, in gage shaft of outlet works structure near right abutment of Navajo Dam on San Juan River at river mile 145.0 (233.3 km), 5.5 mi (8.8 km) east of Archuleta and 33 mi (53 km) east of Farmington.

Drainage area. --3,230 mi<sup>2</sup> (8,370 km<sup>2</sup>), approximately.

Gage-height record. --Water-stage recorder graph. Datum of gage is at mean sea level.

Maxima, --September 1970: Contents, 1,266,000 acre-ft (1,560 hm<sup>3</sup>) Sept. 21, 22, 23, 24 (elevation, 6,053.77 ft or 1,845.189 m).

<u>Remarks.</u> --Reservoir is formed by earth-rock-fill dam, completed in June 1963; storage began June 27, 1962. Capacity, 1, 708, 600 acre-ft (2, 110 hm<sup>3</sup>) between elevations 5, 720 ft or 1, 743 m (upstream toe of dam) and 6,085 ft or 1, 855 m (crest of spillway). Usable capacity 1, 696, 000 acre-ft (2, 090 hm<sup>3</sup>) above elevation 5, 774. 9 ft or 1, 760, 19 m (minimum operating level). Dead storage below elevation 5, 774. 9 ft (1, 760, 19 m) is 12,600 acre-ft (15.5 hm<sup>3</sup>). Figures given herein are usable contents.

Cooperation. -- Records furnished by Bureau of Reclamation.

Elevation, in feet, and contents, in thousands of acre-feet, at 2400 hours of indicated day, September 1970

		- 1			
Day	Elevation	Contents	Day	Elevation	Contents
1	. 6,043.69	1, 150	16	. 6,052.37	1,250
2	. 6,043.66	1,149	17	. 6,052.82	1,255
3	. 6,043.64	1, 149	18	. 6,053.16	1,259
4	. 6,043.63	1,149	19	. 6,053.43	1,262
5	. 6,044.15	1,155	20	. 6,053.65	1,265
6	. 6,046.71	1, 184	21	. 6,053.72	1,266
7	. 6,047.62	1,194	22	. 6,053.76	1,266
8	. 6,048.05	1,199	23	. 6,053.77	1,266
9	. 6,048.27	1,201	24	. 6,053.73	1,266
10	6,048.38	1,203	25	. 6,053.68	1,265
11	. 6,048.42	1,203	26	. 6,053.65	1,265
12	. 6,048.57	1,205	27	. 6,053.56	1,264
13	. 6,049.06	1,210	28	. 6,053.50	1,263
14	. 6,050.70	1,230	29	6,053.43	1,262
15	. 6,051.77	1,242	30	6,053.34	1,261

(34) 09355500. San Juan River near Archuleta, N. Mex.

Location. --Lat 36°48'05", long 107°41'51", in N<sup>1</sup>/<sub>2</sub> sec. 20, T. 30 N., R.8 W., in San Juan County, on left bank at river mile 136.8 (220.1 km), 0.5 mi (0.8 km) upstream from Gobernador Canyon, 0.8 mi (1.3 km) northeast of Archuleta, and 7.2 mi (11.6 km) downstream from Navajo Dam.

Drainage area. --3, 260 mi<sup>2</sup> (8, 440 km<sup>2</sup>), approximately.

Gage-height record. --Water-stage recorder graph. Altitude of gage is 5,655 ft (1,723.6 m), from river-profile survey.

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

Maxima. --Sept. 4-18, 1970: Discharge, 1,400 ft<sup>3</sup>/s (39.6 m<sup>3</sup>/s) Sept. 12 (gage height, 4.10 ft or 1.250 m).

1954 to August 1970: Discharge, 18,900 ft<sup>3</sup>/s (535 m<sup>3</sup>/s) July 27, 1957 (gage height, 11.00 ft or 3.353 m, site and datum then in use).

June 1962 to August 1970: Discharge, 6,500  $ft^3/s$  (184  $m^3/s$ ) June 20, 1965 (gage height, 4.57 ft or 1.393 m).

Remarks. -- Flow regulated by Navajo Reservoir since June 1962.

<sup>1962</sup> to August 1970: Contents, 1, 164,000 acre-ft (1, 440 hm<sup>3</sup>) Aug. 5, 6, 1969 (elevation, 6, 044.99 ft or 1, 842.513 m).

# STATION DATA—SAN JUAN RIVER BASIN

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6 7 8	. 799 . 790 . 510	10 . 11 . 12 .	772           1,180           1,370           1,400           1,380	Sept. 14 15 16 17 18	1,390 1,390 1,380

## San Juan River near Archuleta, N. Mex.-Continued Mean discharge, in cubic feet per second, 1970

(35) 09357500. Animas River at Howardsville, Colo.

Location. --Lat 37°50'00", long 107°35'55", in sec. 12, T. 41 N., R. 7 W., San Juan County, on right bank 1,000 ft (300 m) downstream from bridge on State Highway 110, 0.3 mi (0.5 km) southwest of Howardsville, and 0.4 mi (0.6 km) downstream from Cunningham Creek.

Drainage area.  $--55.9 \text{ mi}^2$  (144.8 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph. Datum of gage is 9,616.98 ft (2,931.256 m) above mean sea level.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 950 ft3/s (27 m3/s).

Maxima. --Sept. 4-18, 1970: Discharge, 1, 170 ft<sup>3</sup>/s (33.1 m<sup>3</sup>/s) 0130 hours Sept. 6 (gage height, 3.65 ft or 1.113 m).

1935 to August 1970: Discharge, 1,980 ft<sup>3</sup>/s (56.1 m<sup>3</sup>/s) June 18, 1949 (gage height, 4.36 ft or 1.329 m), from rating curve extended above 950 ft<sup>3</sup>/s (27 m<sup>3</sup>/s); gage height, 5.24 ft (1.597 m) Feb. 18, 1958 (backwater from snowslide). Maximum flood known occurred Oct. 5, 1911.

Day	Ŷ	Discharge	Day	J	Discharge	Day	Discharge
Sept.	4	90	Sept. 9.		250	Sept. 14	429
	5	252	10.		217	15	329
	6	634	11.		188	16	257
	7	332	12 .		223	17	217
	8	285	13.		475	18	188

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of Animas River at Howardsville, Colo.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	3			Sept. 6	6—Con.		Sept. 1	3*-Con.	
2400		1.45	69	1200	2.80	528	1000	2.91	594
Sept.	4			2400	2.50	378	1800	2.80	528
1000		1.45	69	Sept. '	7		2400	2.71	465
1400		1.52	81	1300	2.31	301	Sept. 14	4	
1700		1.80	134	1800	2.40	337	0300	2.67	445
1800		1.80	134	1900	2.40	337	0530	2.75	485
2400		1.66	106	2400	2.34	313	0600	2.64	420
Sept.	5			Sept. 1	1		1200	2.65	420
1100		1.61	97	2400	1.91	175	1600	2.70	440
1300		1.78	130	Sept. 12	2		2400	2.60	388
1700		2.47	349	1200	1.89	170			
2100		2.71	465	1900	2.42	345			
2400		3.43	965	2400	2.21	264			
Sept.	6			Sept. 13	3*				
0130		3.65	1,170	0100	2.20	260			
0600		3.15	756	0500	2.36	321			

## FLOODS OF SEPT. 1970 IN ARIZ., UTAH, COLO., AND N. MEX.

(36) 09358900. Mineral Creek above Silverton, Colo.

Location. --Lat 37°51'04'', long 107°43'31'', San Juan County, on right bank 200 ft (60 m) upstream from bridge, 0.6 mi (1.0 km) upstream from Middle Fork, and 4.3 mi (6.9 km) northwest of Silverton.

Drainage area. --11.0 mi<sup>2</sup> (28.5 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph except 1900 hours Sept. 5 to 1315 hours Sept. 9 and 0400 hours to 2300 hours Sept. 13. Peak stage determined from high-water mark near gage well. Altitude of gage is 9,980 ft (3,042 m), from topographic map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 52 ft3/s (1.47 m<sup>3</sup>/s). Discharge, 1900 hours Sept. 5 to 1315 hours Sept. 9 and 0400 hours to 2300 hours Sept. 13, estimated on basis of peak discharge, two discharge measurements, and records for nearby stations.

Maxima. --Sept. 4-18, 1970: Discharge, 750 ft<sup>3</sup>/s (21.2 m<sup>3</sup>/s) Sept. 5 (gage height, 4.50 ft or 1.372 m, from floodmark), by slope-area measurement of peak flow.
 1968 to August 1970: Discharge, 190 ft<sup>3</sup>/s or 5.38 m<sup>3</sup>/s (estimated) May 17, 1970 (gage height not determined).

	Discharge	Day	Discharg	e Day	Discharge
4	15	Sept. 9.	33	Sept. 14	. 46
5	400	10.	30	15	. 33
6	210	11.	27	16	. 30
7	100	12.	32	17	. 25
8	60	13.	80	18	. 22
	4 5 6 7	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of Mineral Creek above Silverton, Colo.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept. 11	[		Sept. 13	3*-Con.	
2400		1.18	18	2400	1.30	25	2400	1.70	60
Sept.	5			Sept. 12	*		Sept. 14	4*	
1000		1.16	17	0600	1.30	25	1200	1.59	46
1200		1.40	30	1330	1.28	24	2400	1.52	38
1400		1.65	54	1800	1.65	59			
1600		1.75	70	1930	1.55	46			
1700		1.50	38	2200	1.48	38			
1800		1.65	54	2400	1.49	39			
1900		2.20	180	Sept. 13	}*				
Sept.	9			0200	1,60	52			
1315		1.44	35	0400	1.60	52			
2400		1.41	32	2300	1.70	60			

\*Daily means computed from data in addition to figures shown.

(37) 09359000. Mineral Creek near Silverton, Colo.

(Gaging station, discontinued 1949)

Location. --Lat 37°48'50", long 107°41'45", in sec. 13, T. 41 N., R. 8 W., 50 ft (15 m) from U. S. Highway 550, 300 ft (90 m) upstream from Bear Creek, and 2 mi (3 km) west of Silverton.

Drainage area. --44.3 mi<sup>2</sup> or 114.7 km<sup>2</sup> (revised).

Gage-height record. --Floodmarks only. Datum of gage is 9,399.04 ft (2,864.827 m) above mean sea level, datum of 1929.

Maxima. --Sept. 5-14, 1970: Discharge, not determined 0900 hours Sept. 5 (gage height, 8.5 ft or 2.59 m, from floodmarks).

1935-49: Discharge, 1,700  $ft^3/s$  (48.1 m<sup>3</sup>/s) June 29, 1938 (gage height, 4.69 ft or 1.430 m), from rating curve extended above 750  $ft^3/s$  (21.2 m<sup>3</sup>/s). Maximum flood previously known occurred Oct. 5, 1911.

## STATION DATA—SAN JUAN RIVER BASIN

(38) Mineral Creek at Silverton, Colo.

(Miscellaneous site)

Location. --Lat 37°48'27'', long 107°40'39'' (unsurveyed), San Juan County, 0.5 mi (0.8 km) west of Silverton and 0.7 mi (1.1 km) upstream from mouth.

Drainage area. --51. 7 mi<sup>2</sup> (133. 9 km<sup>2</sup>).

Maximum. --Sept. 4-18, 1970: Discharge, 3,070 ft<sup>3</sup>/s (86.9 m<sup>3</sup>/s) 0900 hours Sept. 5, by slope-area measurement of peak flow.

(39) 09359500. Animas River above Tacoma, Colo.

(Gaging station, discontinued 1956)

Location. --Lat 37°34'10", long 107°46'40", in sec. 8, T. 38 N., R. 18 W., on left bank 0.8 mi (1.3 km) upstream from Tank Creek, 2.4 mi (3.9 km) downstream from Cascade Creek, and 3.3 mi (5.3 km) north of Tacoma.

Drainage area.  $--348 \text{ mi}^2$  (901 km<sup>2</sup>).

Gage-height record. --Floodmark only. Altitude of gage is 7,520 ft (2,292 m), from topographic map.

 $\frac{\text{Maxima. --Sept. 4-18, 1970: Discharge, about 12,500 ft}^{3/s} (354 m^{3/s}) \text{ Sept. 6 (gage height, 10.05 ft or 3.063 m), from rating curve extended above 5,700 ft}^{3/s} (160 m^{3/s}).$ 

1945-56: Maximum discharge, 9,500 ft<sup>3</sup>/s (269 m<sup>3</sup>/s) June 18, 1949 (gage height, 8.86 ft or 2.701 m), from rating curve extended above 5,700 ft<sup>3</sup>/s (160 m<sup>3</sup>/s).

Maximum flood previously known occurred Oct. 5, 1911.

(40) 09361000. Hermosa Creek near Hermosa, Colo.

Location. --Lat 37°25'20", long 107°50'40", in NW<sup>1</sup>/<sub>4</sub> sec. 3, T. 36 N., R. 9 W., La Plata County, on right bank 20 ft (6 m) downstream from private bridge, 1 mi (2 km) northwest of Hermosa, and 2 mi (3 km) upstream from mouth.

Drainage area. -- 172 mi<sup>2</sup> (445 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph. Datum of gage is 6, 705.88 ft (2, 043.952 m) above mean sea level.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 1, 800 ft<sup>3</sup>/s (51 m<sup>3</sup>/s).

Maxima. --Sept. 4-18, 1970: Discharge, 1, 700 ft<sup>3</sup>/s (48.1 m<sup>3</sup>/s) 0130 hours Sept. 6 (gage height, 4.20 ft or 1.280 m).

1912-14, 1919-28, 1939 to August 1970: Discharge, 2,980 ft<sup>3</sup>/s (84.4 m<sup>3</sup>/s) May 12, 1941 (gage height, 6.02 ft or 1.835 m); gage height, 8.50 ft (2.591 m) Sept. 12, 1927, from floodmarks, at site within 0.5 mi (0.8 km) at different datum.

Da	У	Discharge	Day	Discharge	Day	Discharge
Sept.	4	48	Sept. 9	171	Sept. 14	380
-	5	299	10	139	15	300
	6	980	11	115	16	228
	7	352	12	138	17	189
	8	220	13	337	18	159

Mean discharge, in cubic feet per second, 1970

ouge		<b>B</b> <sup>111</sup> , 111		<u> </u>		Hermosa, Co		uncated in	me, 1070,
Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	3			Sept.	6-Con.		Sept. 1	3*-Con.	
2400		0.78	38	1200	3.09	900	1000	1.75	238
Sept.	4*			1800	2.61	615	1100	1.94	308
0800		. 77	38	2400	2.35	481	1200	2.16	396
1800		. 89	49	Sept.	7*		1330	2.20	414
2030		1.03	66	1200	2.03	344	1400	2.34	476
2400		1.12	80	2400	1.83	266	1730	2.28	450
Sept.	5×			Sept. 1	11		2400	2.17	400
0200		1.16	87	2400	1.30	105	Sept. 14	4*	
1000		1.18	91	Sept.	12		1200	2.14	388
1400		1.42	150	0600	1.29	103	2400	2.02	340
1600		1.88	304	1300	1.29	103			
1800		2.41	535	1800	1.44	142			
2030		2.46	560	2230	1.87	280			
2400		3.81	1,400	2400	1.82	262			
Sept.	6			Sept.	13*				
0130		4.20	1,700	0200	1.70	220			
0600		3.67	1,300	0700	1.66	207			

Hermosa Creek near Hermosa, Colo.-Continued Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970.

\*Daily means computed from data in addition to figures shown.

(41) 09361500. Animas River at Durango, Colo.

Location. --Lat 37°16'45'', long 107°52'47'', in SW<sup>1</sup>/<sub>4</sub> sec. 20, T. 35 N., R.9 W., La Plata County, on left bank at Western Colorado Power Co.'s plant at Durango, 0.8 mi (1.3 km) upstream from Lightner Creek.

Drainage area. --692 mi<sup>2</sup> (1, 792 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph. Datum of gage is 6, 501. 57 ft (1, 981, 678 m) above mean sea level.

 $\frac{\text{Discharge record.} - \text{Stage-discharge relation defined by current-meter measurements}}{\text{below 11, 400 ft}^3/\text{s (323 m}^3/\text{s)}}.$ 

Maxima. --Sept. 4-18, 1970: Discharge, 11,600 ft<sup>3</sup>/s (329 m<sup>3</sup>/s) 1400 hours Sept. 6 (gage height, 8.83 ft or 2.691 m).

1895 to August 1970: Discharge, 25,000 ft<sup>3</sup>/s (708 m<sup>3</sup>/s) Oct. 5, 1911 (gage height, 11 ft or 3.4 m, present site and datum), from rating curve extended above 13,000 ft<sup>3</sup>/s (368 m<sup>3</sup>/s).

Maximum flood known, that of Oct. 5, 1911.

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6 7 8	. 1,070 . 7,740 . 5,330	10 . 11 . 12 .	1,900 1,490 1,260 1,130 1,130	Sept. 14 15 16 17 18	3,480 2,330 1,760

Mean discharge, in cubic fee	t per second,	1970
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Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of Animas River at Durango, Colo.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	6*-Con.		Sept. 13		
2400		2.82	522	1800	8.40	10,600	1400	4.60	2,880
Sept.	5*			2100	7.80	9,160	1700	5.40	4,210

# STATION DATA-SAN JUAN RIVER BASIN

Gage	height, in f	eet, and disc of Ai			eet per seco rango, Colo		dicated ti	me, 1970,
Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
0500	2.99	664	2400	7.35	8,120	2000	5.75	4,880
1100	3.31	980	Sept. 7			2400	5.88	5,140
1300	3.31	980	0200	7.06	7,530	Sept. 14	1*	
1700	3.45	1,140	0700	6.49	6,320	0200	5.95	5,280
2000	3.71	1,450	1300	5.75	4,780	0500	6.03	5,460
2300	4.27	2,180	1400	5.45	4,240	0800	6.00	5,390
2400	4.80	2,920	1830	4.97	3,420	1000	5.95	5,280
Sept.	6*		2400	4.80	3,140	1800	5.68	4,740
0100	5.34	3,790	Sept. 8			2400	5.50	4,390
0300	5.88	4,800	0600	4,61	2,850	Sept. 18	5*	
0600	6.05	5,140	1200	4.44	2,610	1200	4.97	3,430
0800	6.05	5,140	1800	4.30	2,420	2400	4.52	2,710
1000	6.40	5,900	2400	4.13	2,180	Sept. 16	5*	
1100	7.40	8,100	Sept. 12			1200	4.23	2,300
1200	8.15	9,900	2400	3.31	1,180	2400	4.02	2,010
1300	8.55	10,900	Sept. 13					
1400	8.83	11,600	0500	3.90	1,900			
1500	8.78	11,400	1100	4.07	2,140			

# Animas River at Durango, Colo.-Continued

\*Daily means computed from data in addition to figures shown.

(42) 09363050. Florida River below Florida Farmers ditch, near Durango, Colo.

Location. --Lat 37°17'42", long 107°47'28", in SW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec. 18, T. 35 N., R. 8 W., La Plata County, on right bank 30 ft (9 m) downstream from diversion dam for Florida Farmers ditch and 4.0 mi (6 km) east of Riverview School in Durango.

Drainage area.  $--108 \text{ mi}^2$  (280 km<sup>2</sup>).

 $\frac{\text{Gage-height record.} --\text{Water-stage recorder graph.} \text{ Datum of gage is 7,065.35 ft}}{(2,153.519 \text{ m}) \text{ above mean sea level (levels by Bureau of Reclamation).}}$ 

Discharge record. --Stage-discharge relation defined by current-meter measurements below 460 ft $^{3}/s$  (13 m $^{3}/s$ ).

Maxima. --Sept. 4-18, 1970: Discharge, 236 ft<sup>3</sup>/s (6.68 m<sup>3</sup>/s) 0500 hours Sept. 14 (gage height, 3.52 ft or 1.073 m).

1967 to August 1970: Discharge, 598 ft<sup>3</sup>/s (16.9 m<sup>3</sup>/s) May 18, 1970 (gage height, 4.64 ft or 1.414 m).

Remarks. --Flow regulated by Lemon Reservoir (capacity, 40, 100 acre-ft or 49.4 hm<sup>3</sup>). Records do not represent storm runoff but inflow to flood area.

Da	у	Discharge	Day	Discharge	Day	Discharge
Sept.	4	5, 0	Sept. 9	61	Sept. 14	216
	5	19	10	58	15	214
	6	83	11	56	16	206
	7	70	12	56	17	. 204
	8	66	13	75	18	. 202

Mean discharge, in cubic feet per second, 1970

(43) 09363100. Salt Creek near Oxford, Colo.

Location. --Lat 37°08'20", long 107°45'10", in NE<sup>1</sup>/<sub>4</sub> sec. 6, T. 33 N., R. 8 W., La Plata County, on right bank 2.2 mi (3.5 km) upstream from mouth, 3 mi (5 km) southwest of Oxford, and 11 mi (18 km) southeast of Durango.

Drainage area. --16. 7 mi<sup>2</sup> (43. 3 km<sup>2</sup>).

Discharge

Gage-height record. --Water-stage recorder graph. Altitude of gage 1s 6,470 ft (1,972 m), from topographic map.

 $\frac{\text{Discharge record.} - \text{Stage-discharge relation defined by current-meter measurements}}{\text{below 200 ft}^3/\text{s}} (5.7 \text{ m}^3/\text{s}).$ 

Maxima. --Sept. 4-18, 1970: Discharge, 477 ft<sup>3</sup>/s (13.5 m<sup>3</sup>/s) 0430 hours Sept. 6 (gage height, 4.45 ft or 1.356 m).

1956-63, 1967 to August 1970: Discharge, 713 ft $^3$ /s (20.2 m $^3$ /s) Aug. 6, 1957 (gage height, 5.18 ft or 1.579 m, at site 0.2 mi or 0.3 km upstream at different datum).

Sept.	4	35	Sept. 9		18	Sept. 1	4	65
	5	95	10	)	22	1	5	21
	6	214	11		24	1	6	19
	7	22	12		32	1	7	19
	8	16	13		37	13	8	16
Gage	e height, in	feet, and dis	charge, i	in cubic	feet per seco	nd, at ir	ndicated t	ime, 1970
Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge

Mean discharge, in cubic feet per second, 1970

Discharge

Day

Discharge

Day

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	3			Sept.	6-Con.		Sept. 1	3—Con.	
2400		2.20	24	1600	3.18	101	2400	2.34	20
Sept.	4*			2000	2.84	59	Sept. 1	4	
1200		2.30	29	2400	2.59	35	0130	2.31	19
2000		2.59	55	Sept.	7*		0500	2.31	19
2400		2.66	61	0500	2.40	24	0530	3.07	93
Sept.	5*			1500	2.35	21	0600	2.80	57
0130		2.73	67	2400	2.24	16	0630	3.00	83
0400		2.70	63	Sept. 1	. 1		0700	2.80	57
0800		2.83	80	2400	2.33	22	0800	2.95	76
1030		2.72	66	Sept. 1	2*		0900	2.91	71
1600		2.91	86	1530	2.48	28	1100	3.11	105
2000		3.22	135	1600	2.95	76	1500	2.88	73
2100		3.38	169	1700	2.62	38	1700	3.07	105
2400		3.62	225	1930	2.65	41	2100	2.75	62
Sept.	6			2400	2.72	48	2400	2.45	33
0200		4.00	341	Sept. 1	3		Sept. 1	5*	
0300		4.10	369	0500	2.65	41	0600	2.21	21
0430		4.45	477	1700	2.61	37	1200	2.14	19
0900		4.00	324	2000	2.55	33	2400	2.07	18
1300		3.55	186	2200	2.36	22			

\*Daily means computed from data in addition to figures shown.

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Day

(44) 09363200. Florida River at Bondad, Colo.

Drainage area.  $-221 \text{ mi}^2$  (572 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph. Altitude of gage is 6,000 ft (1,829 m), from topographic map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below  $430 \text{ ft}^{3}/\text{s}$  (12. 2 m<sup>3</sup>/s).

Maxima. --Sept. 4-18, 1970: Discharge, 760 ft<sup>3</sup>/s (21.5 m<sup>3</sup>/s) 2100 hours Sept. 5 (gage height, 5.11 ft or 1.558 m).

1956-63, 1967 to August 1970: Discharge, 1,430 ft<sup>3</sup>/s (40.5 m<sup>3</sup>/s) June 7, 1958 (gage height, 4.35 ft or 1.326 m, at site 300 ft or 90 m upstream at datum 2.39 ft or 0.728 m higher), but may have been higher on July 26, 1957.

Remarks. --Flow regulated by Lemon Reservoir (capacity, 40, 100 acre-ft or 49.4 hm<sup>3</sup>) since November 1963.

Mean discharge, in cubic feet per second, 1970

Da	у	Discharge	Day	Discharge	Day	Discharge
Sept.	4	49	Sept. 9.	118	Sept. 14	. 274
	5	190	10 .	114	15	. 253
	6	480	11 .	112	16	. 238
	7	162	12 .	122	17	. 238
	8	132	13 .	144	18	. 229

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	3			Sept.	5*Con.		Sept. 1	3*—Con.	
2400		2.87	40	2400	4.50	466	2000	3.58	164
Sept.	4*			Sept.	6		2400	3.58	164
1100		2.90	43	0100	4.62	515	Sept. 1	4	
1800		3.04	58	0200	4.31	390	0300	3.48	144
2400		3.17	76	0400	4.67	540	0400	3.48	144
Sept.	5*			1000	5.04	725	0600	4.08	308
0200		3.37	110	1730	4.18	340	0800	3.71	198
0300		3.29	96	2400	3.85	232	1000	4.10	315
1000		3.32	101	Sept.	7*		1100	4.08	308
1300		3.43	122	0600	3.62	172	1500	4.20	354
1530		3.47	130	1200	3.52	152	2000	4.06	304
1900		3.55	146	2400	3.44	136	2200	4.07	308
2000		3.93	247	Sept.	2		2400	4.01	287
2100		5.11	760	2400	3.44	136	Sept. 1	5*	
2130		4.72	565	Sept.	3*		1200	3.89	250
2200		4.93	670	1200	3.43	134	2400	3.86	241
2330		4.40	426	1800	3.45	138			

(45) 09363500. Animas River near Cedar Hill, N. Mex.

Location. --Lat 37°02'17'', long 107°52'25'', in sec. 7, T. 32 N., R. 9 W., La Plata County, Colorado, on right bank 0.8 mi (1.3 km) downstream from Florida River, 2.5 mi (4.0 km) upstream from Colorado-New Mexico State line, and 8.5 mi (13, 7 km) north of Cedar Hill.

Drainage area. --1,090 mi<sup>2</sup> (2,820 km<sup>2</sup>), approximately.

Gage-height record. --Digital recorder tape punched at 30-minute intervals. Altitude of gage is 5,960 ft (1,817 m), from topographic map.

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

Maxima. --Sept. 4-18, 1970: Discharge, 12,140 ft<sup>3</sup>/s (344 m<sup>3</sup>/s) 1800 hours Sept. 6 (gage height, 11.30 ft or 3.444 m).

1933 to August 1970: Discharge, 13,100 ft $^3$ /s (371 m $^3$ /s) June 19, 1949 (gage height, 11.45 ft or 3.490 m).

A flood in October 1911 exceeded all other known floods at this location.

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6 7 8	. 1,290 . 8,220 . 6,200	10. 11. 12.	2,110            1,800            1,590            1,480            2,590	16 17	3,970 2,740

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Mean discharge, in cubic feet per second, 1970

-	-		-		•			
Hour	Gage heigh		Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	5*		Sept.	6*—Con.		Sept.	13*—Con.	
0200	4.24	606	2200	10.83	10,960	2400	7.50	4,690
0600	4.35	672	2400	10.39	9,870	Sept.	14*	
1200	4.80	996	Sept.	7*		0400	7.64	4,980
1800	5.42	1,570	0400	9.70	8,350	0600	8.14	5,910
2400	6.28	2,480	0800	9.08	7,040	0800	7.96	5,570
Sept.	6*		1200	8.53	5,990	1000	8.00	5,650
0200	7.01	3,450	1800	7.73	4,560	1200	8.01	5,670
0600	8.10	5,170	2400	7.03	3,480	1800	7.80	5,270
0800	8.42	5,780	Sept.	13*		2400	7.59	4,900
1000	8.54	6,010	0200	5.10	1,560	Sept.	15*	
1200	8,54	6,010	0600	5.17	1,630	0600	7.37	4,430
1400	9.29	7,450	1000	5.74	2,200	1200	7.06	3,940
1600	10.98	11,340	1400	5.93	2,430	2400	6.56	3,210
1800	11.30	12,140	1800	6.55	3,250			
2000	11.05	11,510	2000	7.05	3,970			
			1			1		

## STATION DATA—SAN JUAN RIVER BASIN

(46) 09364500. Animas River at Farmington, N. Mex.

Location. --Lat 36°43'12'', long 108°12'08'', in SE<sup>1</sup>/<sub>4</sub> sec. 16, T. 29 N., R. 13 W., San Juan County, on left bank at bridge on former State Highway 17, 0.6 mi (1.0 km) downstream from bridge on State Highway 17, and 1.3 (2.1 km) upstream from mouth.

Drainage area. --1, 360 mi<sup>2</sup> (3, 520 km<sup>2</sup>), approximately.

Gage-height record. --Water-stage recorder graph. Altitude of gage is 5,278 ft (1,608.7 m), from bridge-profile plans.

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

Maxima. --Sept. 4-18, 1970: Discharge, 10,940 ft<sup>3</sup>/s (310 m<sup>3</sup>/s) 0500 hours Sept. 7 (gage height, 8.25 ft or 2.515 m).

1904 to August 1970: Discharge, about 25,000  $ft^3/s$  (710  $m^3/s$ ) June 29, 1927 (gage height, 8.5 ft or 2.59 m, site and datum then in use), from rating curve extended above 10,000  $ft^3/s$  (280  $m^3/s$ ).

Maximum flood known occurred Oct. 6, 1911, when a stage of about 16.5 ft (5.03 m) was reached (present site and datum).

Da	у	Discharge	Day	Discharge	Day	Discharge
Sept.	4	2 70	Sept. 9 .	2,330	Sept. 14	. 5,130
	5	781	10 .	1,770	15	. 4,640
	6	5,650	11.	1,430	16	. 3,300
	7	7,690	12 .	1,350	17	. 2,580
	8	3,420	13 .	1,720	18	. 2,160

Mean discharge, in cubic feet per second, 1970

Gage height, in fee	t, and discharge,	in cubic feet per second	, at indicated time, 1970
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Hour		Gage height	Discharge	Hour	Gage he <b>ig</b> ht	Discharge	Hour	Gage height	Discharge
Sept.	5*			Sept.	6*-Con.		Sept. 13	B-Con.	
0200		3.12	324	2400	7.40	8,170	2400	5.05	2,890
1000		3.22	393	Sept.	7*		Sept. 14	ł	
1400		3.56	664	0200	7.75	9,230	0200	5.40	3,650
1800		3.90	963	0400	8.00	10,090	0400	5.70	4,260
2200		4.40	1,540	0500	8.25	10,940	0600	5.85	4,570
2400		5.60	3,490	0600	8.10	10,430	1200	6.40	5,900
Sept.	6*			1000	7.50	8,590	1400	6.30	5,660
0200		6.23	4,990	1400	7.00	7,190	1800	6.20	5,590
0400		6.66	6,000	1800	6.58	6,120	2400	5.98	5,190
0600		6.30	5,170	2400	5.88	4,550	Sept. 15	5	
0800		6.10	4,750	Sept. 3	13		0200	5.95	5,240
1200		6.30	5,220	0200	4.05	1,210	1200	5.66	4,590
1400		6.50	5,710	1200	4.10	1,270	2400	4.90	3,080
1800		6.70	6,220	1800	4.57	2,020			
2200		6.95	6,890	2200	5.20	3,130			

(47) 09365000. San Juan River at Farmington, N. Mex.

Location. --Lat 36°43'22'', long 108°13'30'', in SE $\frac{1}{4}$  sec. 17, T. 29 N., R. 13 W., San Juan County, on left bank at river mile 97.4 (156.7 km), 360 ft (110 m) downstream from highway bridge, 4,000 ft (1,200 m) downstream from Animas River, and 1 mi (2 km) west of Farmington.

Drainage area. --7,240 mi<sup>2</sup> (18,750 km<sup>2</sup>), approximately.

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Gage-height record. --Digital recorder tape punched at 15-minute intervals. Datum of gage is 5, 230. 37 ft (1, 594, 217 m) above mean sea level.

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

<u>Maxima</u>. --Sept. 4-18, 1970: Discharge, 11,500  $ft^3/s$  (326 m<sup>3</sup>/s) 0500 hours Sept. 7 (gage height, 6.78 ft or 2.067 m).

1912 to August 1970: Discharge, about  $68,000 \text{ ft}^3/\text{s} (1,900 \text{ m}^3/\text{s})$  June 29, 1927 (gage height, 10.2 ft or 3, 11 m, site and datum then in use), from rating curve extended above 37,000 ft $^3/\text{s} (1,000 \text{ m}^3/\text{s})$ . Flood of Sept. 6, 1909, reached a stage of about 12.3 ft (3.75 m), site and datum then in use. Maximum flood known occurred Oct. 6, 1911.

Remarks. --Flow partly regulated by Navajo Reservoir since June 1962 (see station 09355100).

Da	У	Discharge	Day	Discharge	Day	Discharge
Sept.	4	664	Sept. 9.	3,110	Sept. 14	7,190
	5	1,270	10.	2,760	15	6,350
	6	8,190	11.	2,680	16	4,780
	7	9,140	12 .	2,850	17	4,000
	8	4,350	13.	4,170	18	3,580

Mean discharge, in cubic feet per second, 1970

Gage height, in feet,	and discharge,	in cubic feet per second	, at indicated time,	1970

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Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	5			Sept.	6-Con.		Sept. 1	3*—Con.	
0200		1.69	710	2400	6.09	9,090	1800	3.68	4,140
1200		1.84	860	Sept.	7*		2000	3.70	4,180
1400		1.99	1,020	0200	6.41	10,360	2200	3.75	4,270
1600		2.03	1,070	0400	6.66	11,110	2400	3.70	4,180
1800		2.99	2,480	0500	6.78	11,500	Sept. 1	4*	
2000		2.38	1,540	0600	6.77	11,440	0200	4.60	6,280
2200		2.84	2,240	0800	6.68	11,170	0400	4.72	6,570
2400		4.45	5,060	1000	6.47	10,540	0800	4.93	7,080
Sept.	6			1400	5.87	8,530	1000	5.22	7,830
0200		5.84	8,390	1800	5.44	7,620	1200	5.16	7,670
0400		6.20	9,400	2000	5.17	6,930	1400	5.25	7,920
0600		6.27	9,600	2400	4.63	5,640	1600	5.28	8, <b>00</b> 0
0800		5.82	8,340	Sept. 1	3*		1800	5.16	7,670
1000		5.70	8,000	0200	4.62	6,120	2400	5.00	7,260
1200		5.67	7,920	0400	4.21	5,170	Sept. 1	5*	
1400		5.48	7,410	0600	4.20	5,140	0400	4.92	7,000
1600		5.69	7,970	0800	3.53	3,880	0800	4.77	6,640
1800		5.69	7,970	1200	3.23	3,380	1200	4.66	6,380
2000		5.62	7,780	1400	3.13	3,200	2400	4.25	5,410
<b>2</b> 200		5.77	8,200	1600	3.23	3,380			

\*Daily means computed from data in addition to figures shown.

### STATION DATA---SAN JUAN RIVER BASIN

(48) 09367500. La Plata River near Farmington, N. Mex.

Location. --Lat 36°44'23'', long 108°14'51'', in SW<sup>1</sup>/<sub>4</sub> sec. 7, T. 29 N., R. 13 W., San Juan County, on right bank 1, 300 ft (400 m) upstream from bridge on U.S. Highway 550, 1, 800 ft (550 m) upstream from mouth, and 2.5 mi (4.0 km) northwest of Farmington.

Drainage area.  $-583 \text{ mi}^2$  (1, 510 km<sup>2</sup>).

1938 to August 1970: Discharge, not determined Sept. 10, 1939 (gage height, 6.03 ft or 1.838 m).

Major floods occurred Sept. 5 or 6, 1909, and Oct. 5 or 6, 1911.

Mean discharge, in cubic feet per second, 1970

Day	/	Discharge	Day	Discharge	Day	Discharge
Sept.	4	1.3	Sept. 9.	33	Sept. 14	249
-	5	246	10.	30	15	110
	6	917	11.	23	16	31
	7	222	12 .	23	17	16
	8	242	13 .	99	18	14

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	5			Sept.	6Con.		Sept. 13	3—Con.	
0200		2.30	6.30	1600	3.72	295	2200	3.65	275
0600		2.12	2.05	1800	3.95	422	2400	3.45	194
0800		3.90	464	2400	4.20	560	Sept. 14	1	
1000		3.02	82	Sept.	7		0200	3.25	123
1200		3.35	178	0200	4.13	518	0400	3.10	85
1600		2.85	44	0400	3.75	295	0600	3.50	214
1800		3.55	254	0600	3.67	258	1000	4.10	536
2000		4.00	500	1200	3.56	214	1200	3.85	386
2200		4.25	672	1800	3.45	170	1400	3.68	290
2400		4.65	1,080	2400	3.35	135	1800	3.54	230
Sept.	6			Sept.	13		2400	3.43	186
0200		4.50	900	0200	2.77	27	Sept. 15	5	
0600		4.80	1,230	0400	2.78	28	0200	3.39	162
0700		5.76	2,550	0600	3.08	80	0600	a3.32	138
0800		5.40	2,040	1200	2.97	56	1200	a3.21	108
1000		5.00	1,470	1800	2.90	44	1800	a3.13	88
1200		3.95	434	200 <b>0</b>	4.02	488	2400	a3.03	64

a Estimated gage-height record.

Gage-height record. --Water-stage recorder graph. Altitude of gage is 5,215 ft (1,589.5), from river-profile map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 450 ft<sup>3</sup>/s (13 m<sup>3</sup>/s) and extended above on basis of slope-area measurement at 2, 710 ft<sup>3</sup>/s (76. 7 m<sup>3</sup>/s).

Maxima. --Sept. 4-18, 1970: Discharge, 2,550 ft<sup>3</sup>/s (72.2 m<sup>3</sup>/s) 0700 hours Sept. 6 (gage height, 5.76 ft or 1.756 m).

(49) 09368000. San Juan River at Shiprock, N. Mex.

Location. --Lat 36°47'52", long 108°43'52", in SW<sup>1</sup>/<sub>4</sub> sec. 22, T. 30 N., R. 18 W., San Juan County, on left bank, 3 mi (5 km) west of Shiprock and 6 mi (10 km) downstream from Chaco River, and at mile 61.0 (98.1 km).

Drainage area. -- 12,900 mi<sup>2</sup> (33,400 km<sup>2</sup>), approximately.

Gage-height record. --Water-stage recorder graph Sept. 4 to 0900 hours Sept. 8. Digital recorder tape punched at 15-minute intervals 0900 hours Sept. 8 to 2400 hours Sept. 18. Datum of gage is 4,848.68 ft (1,477.878 m) above mean sea level (riverprofile survey).

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

Maxima. --Sept. 4-18, 1970: Discharge, 13,900 ft<sup>3</sup>/s (394 m<sup>3</sup>/s) 1400 hours Sept. 7 (gage height, 7.39 ft or 2.252 m); maximum gage height, 7.75 ft (2.362 m) 1230 hours Sept. 6.

1927 to August 1970: Discharge, about 80,000 ft<sup>3</sup>/s (2,300 m<sup>3</sup>/s) Aug. 11, 1929 (gage height, 5.7 ft or 1.74 m, site and datum then in use).

Maximum flood known occurred Oct. 6, 1911, and reached a stage of 22 ft (6.7 m), site and datum then in use.

Remarks. -- Flow partly regulated by Navajo Reservoir since June 1962 (see station 09355100).

Mean discharge, in cubic feet per second, 197	Mean discharge,	in cubic	feet per	second,	1970
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Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6 7 8	. 1,650 . 8,470 . 11,300	10 . 11 . 12 .	3, 140 2, 670 2, 620 2, 740 3, 930	Sept. 14 15 16 17 18	6,120 4,510 3,630

Gage height, in feet,	and discharge,	in cubic feet per s	second, at indicated time, 1970
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Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	5			Sept.	6—Con.		Sept. 13	—Con.	
0200		4.40	1,120	2400	6.95	10,210	1800	4.67	3,710
0400		4.93	1,970	Sept.	7		2000	4.52	3,330
0600		4.40	1,200	0200	7.14	11,350	2200	4.57	3,430
0800		4.19	1,020	0400	7.44	13,330	2400	4.97	4,610
1000		4.27	1,130	0600	7.14	11,770	Sept. 14		
1400		4.40	1,390	0800	7.14	11,770	0200	5.05	4,910
1600		4.67	1,840	1000	7.09	11,770	0400	4.96	4,580
1800		4.70	1,950	1200	6.80	10,330	0600	5.04	4,820
2000		4.63	1,860	1400	7.39	13,930	0800	5.66	6,850
2200		5.15	2,970	1600	7.35	13,870	1000	5.63	6,730
2400		5.35	3,410	1800	7.10	12,190	1200	5.77	7,290
Sept.	6			2000	6.50	9,570	1400	5.93	7,930
0200		5.37	3,500	2200	6.33	9,010	1600	6.02	8,290
0400		6.10	5,780	2400	6.09	8,130	1800	6.03	8,330
0600		7.20	10,170	Sept. 3	13		2000	5.85	7,610
0800		7.15	10,130	0200	4.25	2,790	2200	5.91	7,850
1000		7.65	13,030	0400	4.28	2,850	2400	5.74	7,170
1200		7.70	13,510	0600	4.57	3,430	Sept. 15	*	
1400		7.60	12,970	0800	5.46	6,080	0600	5.58	6,530
1600		7.25	11,110	1000	5.09	4,970	1200	5.46	6,080
1800		6.90	9,690	1200	5.24	5,420	1800	5.32	5,660
2000		6.85	9,570	1400	4.83	4,190	2400	5.14	5,120
2200		6.80	9,450	1600	4.64	3,620			

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## STATION DATA—SAN JUAN RIVER BASIN

(50) 09371000. Mancos River near Towaoc, Colo.

Location. --Lat 37°01'39", long 108°44'27", in NW<sup>1</sup>/<sub>4</sub> sec. 18, T. 32 N., R. 17 W., Montezuma County, on left bank 750 ft (230 m) upstream from bridge on U.S. Highway 666, 6 mi (10 km) upstream from Aztec Creek, and 12 mi (19 km) south of Towaoc.

Drainage area. -- 550 mi<sup>2</sup> (1, 420 km<sup>2</sup>), approximately.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 280 ft $^{3}$ /s (7.9 m<sup>3</sup>/s) and by slope-area measurement at 4,530 ft<sup>3</sup>/s (128 m<sup>3</sup>/s).

Maxima. --Sept. 4-18, 1970: Discharge, 4,530 ft<sup>3</sup>/s (128 m<sup>3</sup>/s) 0500 hours Sept. 6 (gage height, 8.50 ft or 2.591 m,in gage well; 8.72 ft or 2.658 m, from floodmark), from rating curve extended above 280 ft<sup>3</sup>/s (7.9 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow.

1920-43, 1951 to August 1970: Discharge, 5,300 ft<sup>3</sup>/s (150 m<sup>3</sup>/s) Oct. 14, 1941 (gage height, 7.30 ft or 2.225 m, present site and datum), from rating curve extended above 200 ft<sup>3</sup>/s (5.7 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow.

Mean discharge, in cubic feet per second, 1970

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6 7 8	406	Sept. 9. 10. 11. 12. 13.	37 28 262	Sept. 14 15 16 17 18	67 39 32

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept. 7			Sept. 13	3-Con.	
2400		1.47	4.1	0600	3.70	300	0600	3.84	352
Sept.	5*			0800	3.61	246	0700	3.98	430
0830		1.44	3.5	0900	3.59	222	1200	3.50	195
0900		1.85	16	1200	3.43	158	1900	3.24	120
1 <b>0</b> 30		2.51	86	1800	3.27	122	193 <b>0</b>	3,48	160
1200		2.40	71	2400	3.19	107	2300	3.29	100
1590		2.07	31	Sept. 11			2400	3.32	97
153 <b>0</b>		3.41	340	2400	2.53	24	Sept. 14	1*	
1800		2.99	189	Sept. 12			0400	3.24	85
1900		4.29	844	0800	2.52	23	0600	3.32	97
2030		5.60	1,900	1530	2.55	25	0900	3.49	128
2300		5.64	1,930	1700	3.53	207	0930	4.50	505
2400		5.12	1,520	1730	3.39	158	1200	3.65	165
Sept.	6			1800	3.93	400	1730	3.17	75
0100		4.89	1,330	1830	3.35	148	1800	3.57	145
0230		4.89	1,330	1900	4.49	773	2130	3.32	97
0330		4.95	1,380	2000	4.52	804	2200	3.42	115
0500		8.5 <b>0</b>	4,530	2030	4.90	1,140	2400	3.37	106
0800		7.00	3,020	2400	4.83	1,080	Sept. 15	5	
0900		5.77	1,960	Sept. 13			0600	3.18	76
1300		5.43	1,640	0030	5.00	1,230	1200	3.08	62
2000		5.41	1,590	0100	5.37	1,550	1800	3.00	52
2100		4.85	1,100	0230	6.98	2,970	2400	2.96	47
2400		4.20	59 <b>0</b>	0430	5.02	1,240			

\*Daily means computed from data in addition to figures shown.

Gage-height record. --Water-stage recorder graph. Datum of gage is 5,055.98 ft (1,541.063 m) above mean sea level.

(51) 09371100. Teec Nos Pos Wash near Teec Nos Pos, Ariz.

#### (Crest-stage station)

Location. --Lat 36°55'58'', long 109°06'35'', in NE<sup>1</sup>/<sub>4</sub> sec. 27, T. 41 N., R. 30 E. (unsurveyed), Apache County, at U.S. Highway 164, 1.5 mi (2.4 km) northwest of Teec Nos Pos Trading Post.

Drainage area. --16.0 mi<sup>2</sup> (41.4 km<sup>2</sup>).

- Gage-height record. --Crest stages only. Altitude of gage is 5,040 ft (1,536 m), from topographic map.
- Discharge record. --Stage-discharge relation defined by computations of flow through culvert.

Maxima. --Sept. 4-18, 1970: Discharge, 1,350 ft<sup>3</sup>/s (38.2 m<sup>3</sup>/s) Sept. 12 (gage height, 9, 44 ft or 2, 877 m, from gage; 9, 72 ft or 2,963 m, from high-water profile). 1967 to August 1970: Discharge, 750 ft<sup>3</sup>/s (21.2 m<sup>3</sup>/s) July or August 1967 (gage height, 7, 14 ft or 2, 176 m).

(52) 09371200. Tsitah Wash near Teec Nos Pos, Ariz.

#### (Crest-stage station)

Location. --Lat 36°56'40'', long 109°15'51'', in  $NE\frac{1}{4}SE\frac{1}{4}$  sec. 19, T. 41 N., R. 29 E., Apache County, on U.S. Route 164, 19.2 mi (30.9 km) east of Mexican Water Trading Post.

Drainage area. --24.5 mi<sup>2</sup> (63.5 km<sup>2</sup>).

- Gage-height record. --Crest stages only. Altitude of gage is 5, 340 ft (1, 628 m), from topographic map.
- Discharge record. --Stage-discharge relation defined by computations of flow through culvert.
- Maxima. --Sept. 4-18, 1970: Discharge, 2, 120 ft<sup>3</sup>/s (60.0 m<sup>3</sup>/s) Sept. 12 (gage height, 9.68 ft or 2.950 m, from high-water profile).

1968 to August 1970: Discharge, 603 ft $^3$ /s (17.1 m $^3$ /s) Summer 1968 (gage height, 4.38 ft or 1.335 m).

- (53) 09372000. McElmo Creek near Colorado-Utah State line
- Location. --Lat 37°19'27", long 109°00'54", in NE¼ sec. 2, T. 35 N., R. 20 W., Montezuma County, on right bank 1.5 mi (2.4 km) upstream from Colorado-Utah State line, 2 mi (3 km) upstream from Yellowjacket Creek, and 2 mi (3 km) west of former town of McElmo.

Drainage area. -- 350 mi<sup>2</sup> (910 km<sup>2</sup>), approximately.

- Gage-height record. --Water-stage recorder graph except 1600 hours Sept. 5 to 0715 hours Sept. 9. Peak stage determined from high-water mark in gage well. Altitude of gage is 4, 890 ft (1, 490 m), from topographic map.
- <u>Discharge record.</u> --Stage-discharge relation defined by current-meter measurements below 2, 100 ft<sup>3</sup>/s (59 m<sup>3</sup>/s) and by slope-area measurement at 2, 880 ft<sup>3</sup>/s (81. 6 m<sup>3</sup>/s). Discharge 1600 hours Sept. 5 to 0715 hours Sept. 9 estimated on basis of slope-area measurement at 2, 880 ft<sup>3</sup>/s (81. 6 m<sup>3</sup>/s), two discharge measurements, weather records, and records for nearby stations.
- $\frac{\text{Maxima. --Sept. 4-18, 1970: Discharge, 2,880 ft^3/s (81.6 m^3/s) Sept. 6 (gage height, 8.13 ft or 2.478 m, from floodmark in gage well).}$

1951 to August 1970: Discharge, 3,040 ft<sup>3</sup>/s (86.1 m<sup>3</sup>/s) Aug. 7, 1967 (gage height, 7.58 ft or 2.310 m, from floodmark in gage well), from rating curve extended above 2,100 ft<sup>3</sup>/s (59 m<sup>3</sup>/s).

# STATION DATA—SAN JUAN RIVER BASIN

## McElmo Creek near Colo.-Utah State line-Continued

Dag	у	Discharge	Day	Discharge	Day	Discharge
Sept.	4	42	Sept. 9.	158	Sept. 14	155
	5	300	10.	140	15	121
	6	1,200	11.	112	16	104
	7	300	12 .	290	17	100
	8	200	13 .	253	18	99

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 4			Sept. 12	2*Con.		Sept. 13		
2400	3.10	64	1500	3.38	94	0600	4.37	282
Sept. 5			1600	4.00	200	1100	4.39	288
0300	3.29	94	1630	6.00	927	1500	4.20	242
0600	3.42	116	1800	6.80	1,650	2000	4.06	214
1200	3.41	114	1830	6.25	1,110	2400	3.94	193
1600	3.45	121	1900	6.25	1,110	Sept. 14		
Sept. 11			2000	4.80	406	0600	3.80	168
2400	3.44	104	2100	4.36	280	1200	3.69	150
Sept. 12*			2230	4.36	280	1800	3.62	138
1200	3.35	89	2400	4.29	262	2400	3.59	133

\*Daily means computed from data in addition to figures shown.

(54) 09372200. McElmo Creek near Bluff, Utah

### (Crest-stage station)

Location. --Lat 37°13', long 109°11', in  $SW_4^1$  sec. 16, T. 41 S., R. 25 E., San Juan County, about 0.2 mi (0.3 km) north of Aneth Trading Post, 1 mi (2 km) above mouth, and 21 mi (34 km) southeast of Bluff.

Drainage area. --720 mi<sup>2</sup> (1,860 km<sup>2</sup>), approximately.

Gage-height record. --Crest stages only. Altitude of gage is 4,600 ft (1,400 m), from topographic map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 500 ft<sup>3</sup>/s (14 m<sup>3</sup>/s) and by slope-area measurement at 13, 100 ft<sup>3</sup>/s (371 m<sup>3</sup>/s).

Maxima, --Sept. 4-18, 1970: Discharge, 13, 100 ft<sup>3</sup>/s (371 m<sup>3</sup>/s) Sept. 6 (gage height, 14, 90 ft or 4, 542 m).

1959 to August 1970: Discharge, 1,140  $\rm ft^3/s$  (32.3  $\rm m^3/s)$  Oct. 18, 1962 (gage height, 10.88 ft or 3.316 m).

### (55) Dove Creek at Dove Creek, Colo.

### (Miscellaneous site)

 $\frac{\text{Location.} --\text{Lat 37°45'44'', long 108°54'03'', in NE}_4^1 \text{ sec. 1, T. 40 N., R. 19 W., Dolores}{\text{County, at bridge on U.S. Highway 160 at Dove Creek.}}$ 

Drainage area, --8, 45 mi<sup>2</sup> (21, 89 km<sup>2</sup>).

Maximum. --Sept. 4-18, 1970: Discharge, 830 ft<sup>3</sup>/s (23.5 m<sup>3</sup>/s) Sept. 5, by slope-area measurement of peak flow.

(56) 09378600. Montezuma Creek near Bluff, Utah

#### (Crest-stage station)

Location. --Lat 38°18'30'', long 109°17'35'', in  $NW_4^1SW_4^1$  sec. 16, T. 40 S., R. 24 E., San Juan County, about 100 ft (30 m) above bridge on State Highway 262, 3.4 mi or 5.5 km (5.8 mi or 9.3 km by creek) above mouth, and 14 mi (23 km) southeast of Bluff.

Drainage area. --1,200 mi<sup>2</sup> (3,100 km<sup>2</sup>), approximately.

- Gage-height record. --Crest stages only. Altitude of gage prior to September 1970 peak discharge was 4, 490 ft (1, 369 m), from topographic map.
- Discharge record. --Stage-discharge relation prior to the flood of Sept. 6, 1970, has no relation to rating conditions during or subsequent to that flood. The maximum was determined by slope-area measurement of peak flow.
- Maxima, --Sept. 4-18, 1970: Discharge, 40,500 ft<sup>3</sup>/s (1,150 m<sup>3</sup>/s) Sept. 6 (gage height, undetermined).

1959 to August 1970: Discharge, 1,500 ft $^3$ /s (42.5 m $^3$ /s) Aug. 2, 1964 (gage height, 16.70 ft or 5.090 m).

<u>Remarks.</u> --The crest-stage station and all points at datum control were destroyed during the flood.

(57) 09378650. Recapture Creek near Bluff, Utah

#### (Miscellaneous site)

Location. --Lat 37°18'45", long 109°27'15", in  $W_{\frac{1}{2}}W_{\frac{1}{2}}$  sec. 13, T. 40 S., R. 22 E., San Juan County, 2 mi (3 km) above mouth and 5 mi (8 km) east of Bluff.

Drainage area. -- 203 mi<sup>2</sup> (526 km<sup>2</sup>), approximately.

Maximum. --Sept. 4-18, 1970: Discharge, 4,240 ft<sup>3</sup>/s (120 m<sup>3</sup>/s) Sept. 5, by slopearea measurement of peak flow.

(58) 09379030. Black Mountain Wash near Chinle, Ariz.

### (Crest-stage station)

Location. --Lat 36°20'00'', long 109°37'25'', Apache County, at Navajo Highway 8, 1 mi (2 km) south of Many Farms and 13 mi (21 km) north of Chinle.

Drainage area. --80. 7 mi<sup>2</sup> (209.0 km<sup>2</sup>).

- <u>Gage-height record.</u> --Crest stages only. Altitude of gage is 5,200 ft (1,585 m), from topographic map.
- <u>Discharge record.</u> --Stage-discharge relation defined by theoretical rating developed on the digital computer above 700  $ft^3/s$  (20 m<sup>3</sup>/s) and by estimates and computations of flow through culverts below 700  $ft^3/s$  (20 m<sup>3</sup>/s).
- Maxima. --Sept. 4-18, 1970: Discharge, 640 ft<sup>3</sup>/s (18.1 m<sup>3</sup>/s) Sept. 5 (gage height, 5.46 ft or 1.664 m, from gage; 5.65 ft or 1.722 m, from high-water profile).
   1963 to August 1970: Discharge, 1,560 ft<sup>3</sup>/s (44.2 m<sup>3</sup>/s) Aug. 1, 1968 (gage height, 8.14 ft or 2.481 m).

## STATION DATA-SAN JUAN RIVER BASIN

(59) 09379080. Chinle Wash tributary near Rock Point, Ariz.

### (Crest-stage station)

Location. --Lat 36°47', long 110°40', Apache County, a. Navajo Reservation Road No. 12, 4.5 mi (7.2 km) north of Rock Point.

Drainage area.  $-2.5 \text{ mi}^2$  (6.5 km<sup>2</sup>).

- Gage-height record. --Crest stages only. Altitude of gage is 5,000 ft (1,520 m), from topographic map.
- Discharge record. --Stage-discharge relation defined by theoretical rating developed on the digital computer.

Maxima. --Sept. 4-18, 1970: Discharge, 216 ft<sup>3</sup>/s (6.12 m<sup>3</sup>/s) Sept. 5 (gage height, 5.69 ft or 1.734 m, from gage; 5.68 ft or 1.731 m, from high-water profile).
 1964 to August 1970: Discharge, 25 ft<sup>3</sup>/s or 0.71 m<sup>3</sup>/s (estimated) 1965 (gage height, 3.84 ft or 1.170 m).

(60) 09379200. Chinle Wash near Mexican Water, Ariz.

- Location. --Lat 36°56'38", long 109°42'36", in sec. 19, T. 41 N., R. 25 E. (unsurveyed), Apache County, in Navajo Indian Reservation, in midstream 150 ft (46 km) upstream from bridge on U.S. Highway 164, 3 mi (5 km) upstream from Walker Creek, 4 mi (6 km) west of Mexican Water, 5 mi (8 km) downstream from Laguna Creek, and 6 mi (10 km) upstream from Arizona-Utah State line.
- Drainage area. --3, 660 mi<sup>2</sup> (9, 480 km<sup>2</sup>), approximately, of which 360 mi<sup>2</sup> (930 km<sup>2</sup>) is noncontributing.

Gage-height record. --Water-stage recorder graph except Sept. 10-13, 17, 18. Altitude of gage is 4, 720 ft (1, 439 m), from topographic map.

- Discharge record. --Stage-discharge relation defined by current-meter measurements below 500 ft<sup>3</sup>/s (14 m<sup>3</sup>/s) and by slope-area measurements at 2,070 and 3,280 ft<sup>3</sup>/s, (58.6 and 92.9 m<sup>3</sup>/s). Discharge Sept. 10-13, 17, 18 estimated on basis of normal recession.
- $\frac{Maxima. --Sept. 4-18, 1970: Discharge, 9,880 ft^3/s (280 m^3/s) 0230 hours Sept. 7}{(gage height, 7.55 ft or 2.301 m).}$

1950 to August 1970: Discharge,  $3,280 \text{ ft}^3/\text{s}$  (92.9 m<sup>3</sup>/s) Aug. 1, 1964 (gage height, 6.32 ft (1.926 m), from floodmark).

Da	У	Discharge	Day	Di	scharge	Day	Discharge
Sept.	4	3.0	Sept. 9.		42	Sept. 14 .	 68
	5	433	10 .	• • •	30	15.	 290
	6	435	11 .		20	16.	 74
	7	4,070	12 .		10	17.	 30
	8	231	13.		5.0	18.	 15

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour		Gage neight	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	6*-Con.		Sept.	8*—Con.	
2400		2.03	3	2100	3.88	483	0800	3.00	175
Sept.	5*			2300	4.02	569	1200	2,85	108
0700		2.04	3	2400	4.40	850	1600	2.73	70
0900		2.15	8	Sept.	7*		2000	2.68	62
1000		2.52	43	0100	6.45	4,780	2400	2.67	59
1100		4.20	695	0200	7.45	9,050	Sept.	14*	
1200		3.93	513	0230	7.55	9,880	0400	2.92	140
1300		4.95	1,420	0400	7,50	9,300	1200	2.72	68
1500		4.55	975	0600	7.14	7,500	2400	2,55	40
1600		4.66	1,080	0800	6.78	6,020	Sept.	15*	

Gage	height, in f	eet, and dis	charge,	in cubic	feet per seco	ond, at ir	ndicated t	ime, 1970
Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
1800	4.36	818	1000	6.43	4,700	0400	2.55	40
2000	3.94	519	1200	6.10	3,700	0600	2.92	140
2200	3.79	430	1400	5.70	2,700	0900	3.16	279
2400	3.87	477	1600	5.33	1,980	1200	3.34	415
Sept.	6*		1800	4.95	1,420	1630	3.54	597
0230	3.97	537	2000	4.67	1,090	1800	3.51	576
0600	3.84	459	2200	4.43	874	2100	3.17	275
0900	3.73	400	2400	4.13	914	2400	2.92	140
1200	3.60	335	Sept.	8*		Sept. 16	5×	
1400	3.61	340	0200	3.77	710	1200	2.74	71
1600	3.70	385	0400	3.45	513	2400	2.54	39
1830	3.94	519	0600	3.15	275			

Chinle Wash near Mexican Water, Ariz.-Continued

\*Daily means computed from data in addition to figures shown.

(61) 09379500. San Juan River near Bluff, Utah

Location. --Lat 37°08'49'', long 109°51'51'', in  $SE_4^1NE_4^1NW_4^1$  sec. 7, T. 42 S., R. 19 E., San Juan County, on left bank 1,600 ft (490 m) downstream from Gypsum Creek, 1,800 ft (550 m) upstream from highway bridge, 20 mi (32 km) southwest of Bluff, at mile 113.5 (182.6 km).

Drainage area. --23,000 mi<sup>2</sup> (60,000 km<sup>2</sup>), approximately.

Gage-height record. --Water-stage recorder graph. Altitude of gage is 4,048 ft (1,233.8 m), levels by Topographic Division.

 $\frac{\text{Discharge record.} --\text{Stage-discharge relation defined by current-meter measurements}}{\text{below 31,000 ft}^3/\text{s}} (880 \text{ m}^3/\text{s}) \text{ and a slope-area measurement at 52,000 ft}^3/\text{s}} (1,470 \text{ m}^3/\text{s}).$ 

Maxima. --Sept. 4-18, 1970: Discharge, 52,000 ft<sup>3</sup>/s (1,470 m<sup>3</sup>/s) 1000 hours Sept. 6 (gage height, 26.62 ft or 8,114 m).

1914 to August 1970: Discharge, 70,000 ft $^3$ /s (1,980 m $^3$ /s) Sept. 10, 1927 (gage height, 32.0 ft or 9.75 m).

Flood of Oct. 6, 1911, probably exceeded that of Sept. 10, 1927, but stage was not accurately determined.

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6 7 8	. 6,240 . 34,700	10 . 11 . 12 .	4,960 3,780 3,250 3,770 10,200	Sept. 14 15 16 17 18	. 7,460 . 6,230 . 4,500

Mean discharge, in cubic feet per second, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 2400	4	3, 92	634	Sept. 1800	6*-Con. 19.56	31,300	Sept. 1 0500	13*—Con. 12.91	14.500
Sept.	5*		034	2000	16.76	23,800	0600	12.91	14,500
0700		4.31	914	2400	14.89	19,300	0900	10.77	10,100
0900		4.77	1,350	Sept.	7*		1200	11.32	11,200
1500		4.72	1,300	0600	14,01	17,200	1600	9.88	8,420
1700		10.63	10,200	1200	13.22	15,400	2400	10.55	9,660
2000		13.72	16,700	2400	12.14	13,100	Sept. 3	14*	
2400		15.53	20,900	Sept.	11*		0600	8.59	6,230

San Juan River near Bluff, Utah-Continued

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	6*		2400	6.50	3,190	1000	7.58	4,680
0200	16.61	23,500	Sept. 1	2*		1600	7.16	4,090
0400	18.33	27,900	1300	6.48	3,170	2400	8.79	6,550
0600	21.56	37,000	1400	8.77	6,540	Sept. 1	5*	
0800	24.66	46,100	1700	6.98	3,850	0600	9.44	7,640
0900	25.88	49,700	1900	7.21	4,170	1200	9.67	8,040
1000	26.62	52,000	2300	6.92	3,760	2400	8.89	6,710
1100	26.52	51,700	2400	8.02	5,360			
1200	25.88	49,700	Sept. 1	3*				
1400	23.67	43,100	0100	8.10	5,460			
1600	20.73	34,600	0300	11.54	11,600			

\*Daily means computed from data in addition to figures shown.

### LITTLE COLORADO RIVER BASIN

(62) 09397000. Little Colorado River at Holbrook, Ariz.

Location. --Lat 34°53′52′′, long 110°09′45′′, in SW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec. 6, T. 17 N., R. 21 E., Navaio County, 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 mi<sup>2</sup> (29, 300 km<sup>2</sup>), approximately.

<u>Gage-height record.</u> --Water-stage recorder graph except Sept. 5. Gage-height record reconstructed from normal recession and adjoining good record. Datum of gage is 5,062.87 ft (1,543.163 m) above mean sea level, datum of 1929.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 13,000 ft<sup>3</sup>/s (370 m<sup>3</sup>/s).

Maxima. --Sept. 4-18, 1970: Discharge, 19,700 ft<sup>3</sup>/s (558 m<sup>3</sup>/s) 0900 hours Sept. 6 (gage height, 13.92 ft or 4.243 m).

1370 to August 1970: Discharge, 60,000 ft<sup>3</sup>/s (1,700  $m^3/s$ ) Sept. 19, 1923 (gage height, unknown), from cross section and slope of water surface by Corps of Engineers.

Day		Discharge	Day	Discharge	Day	Discharge
Sept.	4	10	Sept. 9	 38	Sept. 14	. 214
	5	1,800	10	 16	15	. 119
	6	13,600	11	 93	16	. 35
	7	1,700	12	 8.6	17	. 20
	8	255	13	 281	18	. 20

Mean discharge, in cubic feet per second, 1970

Cage height, in feet, and	d discharge,	in cubic fe	eet per second.	at indicated time.	1970
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Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4		Sept.	6*-Con.		Sept.	7*-Con.	
2400	(a)	20	0800	13.85	18,200	0400	11.15	2,910
Sept.	5*		0900	13.92	19,700	0600	10.80	2,250
1515	(a)	20	1000	13.90	19,600	0900	10.38	1,560
1530	11.20	3,680	1100	13.80	19, <b>00</b> 0	1000	10.35	1,510
1600	10.75	2,570	1200	13.40	16,400	1200	10.08	1,170
1730	10.65	2,360	1400	12.85	13,600	1500	9.77	834
1900	11.33	4,050	1500	12.70	13,000	1800	9.62	722
2130	11.43	4,350	1600	12.55	12,200	2100	9.52	620
2200	12.40	8,120	1700	12.55	12,200	2400	9.45	600

Gage	height, in f	eet, and dis	charge,	in cubic :	feet per seco	nd, at i	ndicated t	ime, 1970
Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
2230	12,62	9,370	1800	12, 75	9,510	Sept.	8*	
2330	12.60	9,270	1900	12.98	9,180	0600	9.12	371
2400	12.80	10,200	2130	13.20	9,560	1200	8.85	217
Sept.	6*		2230	12,98	8,520	1800	8.67	147
0200	13.10	12,100	2400	12.50	6,670	2400	8.45	78
0400	13.31	13,700	Sept.	7*		1		
0530	13,60	15,800	0100	12.00	5,060			
0630	13.50	15,100	0200	11.65	4,110			

Little Colorado River at Holbrook, Ariz.-Continued

a Estimated.

\*Daily means computed from data in addition to figures shown.

(63) 09397500. Chevelon Creek below Wildcat Canyon, near Winslow, Ariz.

Location. --Lat 34°38'11", long 110°42'49", in SW<sup>1</sup>/<sub>4</sub> sec. 36, T. 15 N., R. 15 E., Navajo County, on right bank 0.4 mi (0.6 km) downstream from Wildcat Canyon and 25 mi (40 km) south of Winslow.

Drainage area,  $-275 \text{ mi}^2$  (712 km<sup>2</sup>).

Gage-height record. --Digital recorder tape except 1530 hours Sept. 6 to Sept. 10. Gage-height record reconstructed from normal recession and adjoining record. Datum of gage is 5,905.16 ft (1,799.893 m) above mean sea level, datum of 1929 (Bureau of Reclamation bench mark).

Discharge record. --Stage-discharge relation defined by current-meter measurements below 6, 300 ft<sup>3</sup>/s (180 m<sup>3</sup>/s) and by slope-area measurement at 19, 800 ft<sup>3</sup>/s (561 m<sup>3</sup>/s).

Maxima. --Sept. 4-10, 1970: Discharge, 11,100 ft<sup>3</sup>/s (314 m<sup>3</sup>/s) 2300 hours Sept. 5 (gage height, 13.58 ft or 4.139 m).

1947 to August 1970: Discharge, 19,800 ft $^3$ /s (561 m $^3$ /s) Jan. 18, 1952 (gage height, 18.2 ft or 5.55 m).

Day	Discharge	Day	I	Discharge	Day		Discharge
Sept. 4 5 6	534	Sept.	7 8	750 300	-	9	100 45

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	6*		Sept.	6*-Con.	
2400		0.81	0	0030	12.25	8,840	1200	8.52	3,490
Sept.	5*			0100	11.57	7,760	1500	7.60	2,500
1200		. 81	0	0130	10.81	6,620	1800	6.9	1,860
2000		.81	0	0200	12.57	9,350	2400	6.2	1,320
2100		. 81	0	0230	13.47	1 <b>0,</b> 9 <b>0</b> 0	Sept.	7*	
2200		. 81	0	0300	13.28	10,500	0600	5.6	955
2230		. 81	0	0400	12.73	9,610	1200	5.2	750
2245		13.35	10,700	0500	11.96	8,380	1800	4.8	572
2300		13.58	11,100	0600	11.46	7,590	2400	4.5	457
2330		12.14	8,660	0800	1 <b>0.1</b> 9	5,710			
<b>2</b> 400		10.99	6,890	1000	9.23	4,380			

# STATION DATA-LITTLE COLO. RIVER BASIN

(64) 09398000. Chevelon Creek near Winslow, Ariz.

- Location. --Lat 34°55'35'', long 110°31'51'', in  $SE_4^1SW_4^1$  sec. 27, T. 18 N., R. 17 E., Navajo County, on right bank 3 mi (5 km) upstream from mouth and 12 mi (19 km) southeast of Winslow.
- $\frac{\text{Drainage area.}}{\text{tributing.}}$  --794 mi<sup>2</sup> (2,056 km<sup>2</sup>), excludes 200 mi<sup>2</sup> (518 km<sup>2</sup>) which is noncon-
- Gage-height record. --Digital recorder tape. Datum of gage is 4,899.5 ft (1,493.367 m) above mean sea level, datum of 1929.
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 2, 700 ft<sup>3</sup>/s (76 m<sup>3</sup>/s) and extended above on basis of slope-area measurement of peak flow.

Maxima. --Sept. 4-10, 1970: Discharge, 8,020 ft<sup>3</sup>/s (227 m<sup>3</sup>/s) 1300 hours Sept. 6 (gage height, 17.54 ft or 5.346 m).

1916 to August 1970: Discharge, 25,300 ft<sup>3</sup>/s (716 m<sup>3</sup>/s) Jan. 19, 1952 (gage height, 19.8 ft or 6.04 m).

Day	Discharge	Day		Discharge	Day		Discharge
Sept. 4 5 6	18	Sept.	7 8	1,510 442	Sept.	9 0	189 80

Mean discharge,	in cubic feet per	second, 1970
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Gage he	eight, in f	eet, and dis	charge,	in cubic	feet per secc	ond, at i	ndicated t	ime, 1970
Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 4			Sept.	6—Con.		Sept.	6-Con.	
2400	2.36	1.8	1330	17.45	7,870	1915	14.94	4,750
Sept. 5			1345	17.38	7,760	1930	14.80	4,640
0600	2.38	2.3	1400	17.30	7,630	1945	1 <b>4.6</b> 8	4,540
1200	2.38	2.3	1415	17.25	7,550	2000	14.54	4,430
1800	2.44	3.8	1430	17.19	7,450	2030	14.29	4,230
2100	3.50	58	1445	17.06	7,250	2100	14.05	4,060
2400	3.83	85	1500	17.04	7,210	2130	13.80	3,830
Sept. 6			1515	16.91	7,020	2200	13.57	3,720
0100	3.80.	154	153 <b>0</b>	16.79	6,840	2230	13.3 <b>6</b>	3,570
0300	3.55	126	1545	16.71	6,720	2300	13.14	3,420
0500	3.36	106	1600	1 <b>6.</b> 59	6,540	2330	12.89	3,250
0700	3.21	91	1615	16.50	6,400	2400	12.71	3,150
0900	3.07	79	1630	16.39	6,250	Sept.	7	
1100	2.96	70	1645	16.16	5,940	0300	11.65	2,520
1115	8.39	1,150	1700	16.10	5,870	0600	10.71	2,050
1130	13.06	3,360	1715	16.00	5,760	0900	9.82	1,680
1145	15.46	5,210	1730	15.89	5,640	1200	9.05	1,380
1200	16.47	6,360	1745	15.74	5,490	1500	8.41	1,160
1215	17.03	7,200	1800	15.57	5,320	1800	7.86	993
1230	17.32	7,660	1815	15.47	5,220	2100	7.38	849
1245	17.44	7,850	1830	15.29	5,060	2400	<b>6.</b> 95	738
1300	17.54	8,020	1845	15.21	4,990			
1315	17.49	7,930	1900	15.05	4,840			

(65) 09398300. Blue Ridge Reservoir near Pine, Ariz.

Location. --Lat 34°33'19", long 111°11'00", in NE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec. 33, T. 14 N., R. 11 E., Coconino County, in Coconino National Forest, on upstream side of left end of spillway structure of Blue Ridge Dam on East Clear Creek, at mouth of General Springs Canyon, 7.3 mi (11.7 km) east of Clints Well, and 20 mi (32 km) northeast of Pine.

Drainage area. --71.1 mi<sup>2</sup> (184.1 km<sup>2</sup>).

- Gage-height record. --Water-stage recorder graph except 2000 hours Sept. 5 to 2400 hours Sept. 9 and 1700 hours Sept. 14 to 2400 hours Sept. 15. Datum of gage is 6,620 ft (2,018 m) above mean sea level; gage readings have been reduced to elevations above mean sea level.
- Maxima. --Sept. 5-15, 1970: Contents, not determined, probably occurred Sept. 12. 1965 to August 1970: Contents, 16,000 acre-ft (19.7 hm<sup>3</sup>) Dec. 30, 1965, based on outflow studies and weather records.
- Remarks. --Dam completed and storage began in December 1964. Total capacity is 19,500 acre-ft (24.0 hm<sup>3</sup>) at elevation 6, 735 ft (2,053 m), of which 15,000 acre-ft (18.5 hm<sup>3</sup>) is usable storage below 6, 720 ft (2,048 m)—crest of spillway.

Date		Hour	Elevation	Contents	Date	Hour	Elevation	Contents
Sept.	5	2000	6,684.38	7,280	Sept. 8	3 0600	6,704.73	11,260
		2200	6,688.70	8,050	-	1200	6,705.00	11,320
		2400	6,692.30	8,720		1800	6,704.88	11,290
						2400	6,705.00	11,320
Sept.	6	0200	6,694.80	9,220				
		0400	6,696.50	9,560	Sept. 9	0600	6,705.18	11,360
		0600	6,697.84	9,830	-	1200	6,705.53	11,440
		0900	6,699.32	10, 120		1800	6,705.26	11, 380
		1200	6,700.38	10,340		2400	6,705.52	11,430
		1600	6,701.38	10,540				
		2200	6,702.30	10,730	Sept. 14	1700	6,705.98	11,540
					-	2400	6,705.97	11,530
Sept.	7	0400	6,703.17	10,920				
-		1000	6,703.78	11,050	Sept. 15	5 1200	6,705.94	11,530
		1200	6,704.00	11,100	-	2400	6,705,91	11, 520
		2400	6, 704, 44	11,200				

Elevation, in feet, and contents, in acre-feet, at indicated time, 1970

(66) 09398500. Clear Creek below Willow Creek, near Winslow, Ariz.

Location. --Lat 34°40'00", long 111°00'25", in NW<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec. 30, T. 15 N., R. 13 E., Coconino County, 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 mi<sup>2</sup> (831 km<sup>2</sup>).

- <u>Gage-height record.</u> --Floodmarks only. Gage not operating. Altitude of gage is 6,000 ft (1,800 m), from Forest Service map.
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 6,000 ft<sup>3</sup>/s (170 m<sup>3</sup>/s) and extended to 16,400 ft<sup>3</sup>/s (464 m<sup>3</sup>/s). Discharge estimated from hydrographic comparison with downstream station and Chevelon Creek below Wildcat Canyon near Winslow.

Maxima. --Sept. 4-10, 1970: Discharge, 15, 800 ft<sup>3</sup>/s (447 m<sup>3</sup>/s), time unknown, Sept. 5 (gage height, 20.65 ft or 6.294 m, from floodmarks).
 1947 to August 1970: Discharge, 16, 400 ft<sup>3</sup>/s (464 m<sup>3</sup>/s) Jan. 18, 1952 (gage height, 21.5 ft or 6.55 m).

# STATION DATA-LITTLE COLO. RIVER BASIN

### Clear Creek below Willow Creek, near Winslow, Ariz.-Continued

Da	у	Discharge	Day	I	Discharge			Discharge
Sept.	4 5 6	0 100 5,000	Sept.	7 8	800 300		) )	150 70

Mean discharge, in cubic feet per second, 1970 of Clear Creek below Willow Creek, near Winslow, Ariz.

(67) 09399000. Clear Creek near Winslow, Ariz.

Location. --Lat 34°58'10", long 110°38'40", in SE<sup>1</sup>/<sub>4</sub> sec. 9, T. 18 N., R. 16 E., Navajo County, on right bank 1.5 mi (2.4 km) upstream from mouth and 5 mi (8 km) southeast of Winslow.

Drainage area.  $--607 \text{ mi}^2$  (1, 572 km<sup>2</sup>).

Gage-height record. --Digital recorder tape. Datum of gage is 4,861.32 ft (1,481.730 m) above mean sea level.

Maxima. --Sept. 4-12, 1970: Discharge, 9,650 ft<sup>3</sup>/s (273 m<sup>3</sup>/s) 1300 hours Sept. 6 (gage height, 11.10 ft or 3.383 m).

1929 to August 1970: Discharge, 50,000  $ft^3/s$  (1,420 m<sup>3</sup>/s) Apr. 4, 1929 (gage height, 18.1 ft or 5.52 m).

An earlier flood reached a stage 3 ft (0.9 m) higher than that of Apr. 4, 1929, at a site 1,850 ft (564 m) downstream.

Day	Discharge	Day	Discharge	Day	Discharge
	0            2,960            1,570	1	548 304 145	Sept. 11 12	

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and disch	narge, in cubic feet per second,	at indicated time.	1970
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Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	5			Sept.	6*-Con.		Sept.	7*-Con.	
2400		4.35	0	1500	10,41	7,580	1200	7.45	1,410
Sept.	6*			1600	10.06	6,650	1600	7.23	1,140
0600		4.36	0	1800	9.58	5,450	2000	7.05	945
1130		4.36	0	2000	9.16	4,400	2400	6.90	790
1145		7.85	1,960	2200	8.83	3,700	Sept.	8*	
1200		9.94	6,350	2400	8.53	3,100	0600	6.73	636
1230		10.98	9,290	Sept.	7*		1200	6.60	530
1300		11.10	9,650	0400	8.06	2,280	1800	6.49	448
1400		10.76	8,630	0800	7.72	1,770	2400	6.42	399

Discharge record. --Stage-discharge relation defined by current-meter measurements below 10, 500 ft<sup>3</sup>/s (297 m<sup>3</sup>/s) and by slope-area measurement at 18, 700 ft<sup>3</sup>/s (530 m<sup>3</sup>/s) and velocity-area measurement at 44, 200 ft<sup>3</sup>/s (1, 250 m<sup>3</sup>/s).

(68) 09399400. Jacks Canyon Creek near Winslow Ariz.

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.  $-280 \text{ mi}^2$  (725 km<sup>2</sup>).

Gage-height record. --Water-stage recorder. Altitude of gage is 5,220 ft (1,591 m), from topographic map.

Discharge record. --Discharge based on estimate of the peak flow.

Maximum. --Sept. 4-10, 1970: Discharge, 1.1 ft<sup>3</sup>/s (0.031 m<sup>3</sup>/s) Sept. 5 (gage height, 3.56 ft or 1.085 m).

(69) 09400200. Steamboat Wash tributary near Ganado, Ariz.

#### (Crest-stage station)

Location. --Lat 35°45'50", long 109°48'00", Apache County, at State Highway 264, 15 mi (24 km) west of Ganado.

Drainage area. --0.5 mi<sup>2</sup> (1.3 km<sup>2</sup>), approximately.

- <u>Gage-height record.</u> --Crest stages only. Altitude of gage is 6, 700 ft (2, 040 m), from topographic map.
- Discharge record. --Stage-discharge relation defined by theoretical rating developed on the digital computer.
- Maxima. --Sept. 4-10, 1970: Discharge, 360 ft<sup>3</sup>/s (10.2 m<sup>3</sup>/s) Sept. 5 (gage height, 8.23 ft or 2.509 m, from gage; 8.24 ft or 2.512 m, from high-water profile). 1963 to August 1970: Discharge, 383 ft<sup>3</sup>/s (10.8 m<sup>3</sup>/s) Aug. 13, 1964 (gage height, 8.28 ft or 2.524 m).

(70) 09400650. Sinclair Wash at Flagstaff, Ariz.

### (Crest-stage station)

Location. --Lat 35°09'50'', long 111°40'48'', in NW<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec. 32, T. 21 N., R. 7 E., Coconino County, at Holmes Avenue in Palmerville at Flagstaff.

Drainage area. --8. 16 mi<sup>2</sup> (21. 13 km<sup>2</sup>).

Gage-height record. --Crest stages only. Altitude of gage is 6,900 ft (2,100 m), from topographic map.

Discharge record. --Stage-discharge relation defined by theoretical rating developed on the digital computer.

<u>Maximum.</u> --Sept. 4-10, 1970: Discharge, 401  $\text{ft}^3/\text{s}$  (11.4 m<sup>3</sup>/s) Sept. 5 (gage height, 19.21 ft or 5.855 m, from gage; 19.3 ft or 5.88 m, from high-water profile).

## STATION DATA-LITTLE COLO. RIVER BASIN

### (71) 09401000. Little Colorado River at Grand Falls, Ariz.

### (Gaging station, discontinued 1960)

Location. --Lat 35°26', long 111°12', in T. 24 N., R. 11 E. (unsurveyed), 1,000 ft (300 m) downstream from Grand Falls on Navajo Indian Reservation, 4.5 mi (7.2 km) upstream from Dinnebito Wash, 30 mi (48 km) northeast of Flagstaff, and 96 mi (154 km) upstream from mouth.

Drainage area,  $-21,200 \text{ mi}^2$  (54,900 km<sup>2</sup>), approximately.

Gage-height record. -- Crest stage only, from high-water mark in well. Datum of gage is 4,438.9 ft (1,352.98 m) above mean sea level, datum of 1929.

Discharge record. --Discharge obtained from rating curve in use prior to discontinuance of station in 1960; stage-discharge relation defined by current-meter measurements.

Maxima. --Sept. 4-10, 1970: Discharge, 11,400 ft<sup>3</sup>/s (323 m<sup>3</sup>/s) Sept. 6 (gage height, 15.6 ft or 4.75 m, from high-water mark in well). 1923 to August 1970: Discharge, 120,000 ft<sup>3</sup>/s (3,400 m<sup>3</sup>/s) Sept. 19, 1923

(gage height, 47.0 ft or 14.33 m, from floodmarks).

(72) 09401100. Dinnebito Wash near Oraibi, Ariz.

(Crest-stage station)

Location. --Lat 36°03'10'', long 110°35'06'', in NW<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec. 35, T. 31 N., R. 16 E., Navajo County, 3,500 ft (1,070 m) east of Dinnebito Trading Post, 43 mi (69 km) east of Tuba City, and 8.4 mi (13.5 km) north of Rocky Ridge Trading Post.

Drainage area.  $-261 \text{ m}^2$  (676 km<sup>2</sup>).

- Gage-height record. --Crest stages only. Altitude of gage is 5,900 ft (1,800 m), from topographic map.
- Discharge record. --Stage-discharge relation defined by current-meter measurement at 40 ft<sup>3</sup>/s (1.1 m<sup>3</sup>/s) and slope-area measurements at 5,890 ft<sup>3</sup>/s (167 m<sup>3</sup>/s) and at peak flow.
- Maxima. --Sept. 4-10, 1970: Discharge, 28,900 ft<sup>3</sup>/s (818 m<sup>3</sup>/s) Sept. 5 (gage height, 10 ft or 3.0 m, from high-water profile).

1968 to August 1970: Discharge, 5,890 ft<sup>3</sup>/s (167 m<sup>3</sup>/s) Aug. 28, 1969 (gage height, 4,78 ft or 1,457 m).

(73) 09401400. Moenkopi Wash near Tuba City, Ariz.

- Location. --Lat 36°01'25'', long 111°23'48'', in sec. 35, T. 31 N., R.9 E. (unsurveyed), Coconino County, on Navajo Indian Reservation, on downstream side of bridge on U.S. Highway 89, 3,500 ft (1,070 m) downstream from Hamblin Wash, 11 mi (18 km) upstream from mouth, and 12 mi (19 km) southwest of Tuba City.
- Drainage\_area. --2, 500 mi $^2$  (6, 500 km $^2$ ), approximately, of which about 1, 200 mi $^2$  $(3, 100 \text{ km}^2)$  is partly or entirely noncontributing.
- Gage-height record. --Water-stage recorder graph. Datum of gage is 4, 309 ft (1, 313.4 m) above mean sea level.
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 1, 300 ft<sup>3</sup>/s ( $37 \text{ m}^3$ /s) and extended above on basis of slope-area measurements at gage height 8.84 ft (2.694 m) and of peak flow.

Maxima. --Sept. 4-10, 1970: Discharge, 4,990 ft<sup>3</sup>/s (141 m<sup>3</sup>/s) 0730 hours Sept. 6 (gage height, 11.38 ft or 3.469 m).

1941 to August 1970: Discharge, 10,000 ft<sup>3</sup>/s (283 m<sup>3</sup>/s) Sept. 21, 1952 (gage height, 12.3 ft or 3.75 m, site and datum then in use), from rating curve extended above 500 ft<sup>3</sup>/s (14 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow.

1926-41 at site 8 mi (13 km) upstream: Discharge, 15,100 ft<sup>3</sup>/s (428 m<sup>3</sup>/s) Aug. 4, 1929, from rating curve extended above 200 ft<sup>3</sup>/s (5, 7 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow.

### Moenkopi Wash near Tuba City, Ariz.-Continued

Day	Discharge	Day	Di	ischarge	Da	Υ.	Discharge
Sept. 4 5 6	. 14	Sept. 7 8	••••	78 23	Sept.	9 10	9.0 3.3

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	6		Sept.	6—Con.	
2400		1.21	0.56	0100	4.00	570	1400	4.40	708
Sept.	5			0300	10.15	3,860	1800	3.63	444
1200		1.20	. 52	0600	10.90	4,420	2400	2.94	252
1800		1.20	. 52	0730	11.38	4,990	Sept.	7	
1830		2.41	121	0900	7.20	1,950	1200	2.02	57.5
2400		1.67	21.1	1100	5.30	1,050	2400	1.80	32.5

(74) 09402000. Little Colorado River near Cameron, Ariz.

Location. --Lat 35°55'35'', long 111°34'00'', in NW<sup>1</sup>/<sub>4</sub> sec. 5, T. 29 N., R. 8 E. (unsurveyed), Coconino County, 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, 0.5 mi (15.3 km) northwest of Cameron, and 45 mi (72 km) upstream from mouth.

Drainage area, --26, 500 mi<sup>2</sup> (68, 600 km<sup>2</sup>), approximately.

Gage-height record. --Water-stage recorder graph. Datum of gage is 3, 979.2 ft (1,212.86 m) above mean sea level, datum of 1929.

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

Maxima. --Sept. 4-15, 1970: Discharge, 12,600 ft<sup>3</sup>/s (357 m<sup>3</sup>/s) 0130 hours Sept. 7 (gage height, 14.54 ft or 4.432 m).

1947 to August 1970: Discharge, 24,900 ft<sup>3</sup>/s (705 m<sup>3</sup>/s) Jan. 21, 1952 (gage height, 20.7 ft or 6.31 m).

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4	0.3	Sept. 8 .	3, 320	Sept. 12	385
5		9.	4,560	13	180
6	3,860	10.	6,130	14	192
7	3,880	11.	1,200	15	260

Mean discharge, in cubic feet per second, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	7*		Sept.	9*	
2400		2.36	0.2	0130	14.54	12,600	0600	8.62	4,060
Sept.	5*			0200	14.30	12,200	1700	9.40	4,980
2000		2.33	. 1	0400	10.90	6,940	1900	9.47	5,060
2100		5.10	860	0500	9.00	4,500	2400	10.12	5,880
2400		4.25	385	0700	7.45	2,800	Sept.	10*	
Sept.	6*			1100	5.96	1,490	0600	10.80	6,800
0100		3.88	223	1400	5.32	1,000	1400	11.28	7,470
0400		4.34	430	1500	5.56	1,170	1800	10.85	6,870
0600		4.80	680	1800	7.45	2,800	2200	8.66	4,110
0700		8.30	3,710	2100	7.41	2,760	2400	7.82	3,180
0900		9.22	4,760	2400	7.70	3,050	Sept.	11*	

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

## STATION DATA-GILA RIVER BASIN

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
1215	9.72	5,360	Sept.	8*		0400	6.70	2,090
1400	9.40	4,980	0400	7.92	3,290	0800	5.97	1,500
1700	8.00	3,380	1000	7.94	3,310	1400	5.33	1,010
2000	7.85	3,220	1600	7.92	3,290	1800	5.11	866
2200	11.60	7,920	2400	8.38	3,800	2400	4.78	668
2400	13.95	11,600						

### Little Colorado River near Cameron, Ariz.-Continued

\*Daily means computed from data in addition to figures shown.

### GILA RIVER BASIN

(75) 09484000. Sabino Creek near Tucson, Ariz.

Location. --Lat 32°19'01'', long 110°48'36'', in SE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec. 9, T. 13 S., R. 15 E., Pima County, on right bank 0.5 mi (0.8 km) north of Coronado National Forest boundary and 12 mi (19 km) northeast of city hall in Tucson.

Drainage area. --35.5 mi<sup>2</sup> (91.9 km<sup>2</sup>).

<u>Gage-height record.</u> --Digital recorder tape. Altitude of gage is 2, 720 ft (829 m), from topographic map.

Discharge record. - Stage-discharge relation defined by current-meter measurements below 3,000 ft<sup>3</sup>/s (85 m<sup>3</sup>/s) and extended above on basis of slope-area measurement of peak flow.

Maxima. --Sept. 3-10, 1970: Discharge, 7, 730 ft<sup>3</sup>/s (219 m<sup>3</sup>/s) 0315 hours Sept. 6 (gage height, 10.21 ft or 3.112 m).

1932 to August 1970: Discharge, 6,400 ft<sup>3</sup>/s (181 m<sup>3</sup>/s) Aug. 10, 1966 (gage height, 9.65 ft or 2.941 m), from rating curve extended above 3,000 ft<sup>3</sup>/s (85 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow.

Mean discharge, in cubic feet per second, 1970

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 3 4 5	9.1 126 154	Sept. 6 7 8	2,130 347 151	Sept. 9 10	

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 4			Sept.	3		Sept.	7	
2400	4.49	187	0200	8.44	1,140	0200	5.30	450
Sept. 5			0315	10.21	7,730	0400	5.11	378
0200	4.32	147	0400	9.26	5,120	0600	5.09	371
0400	4.23	128	0600	8.57	3,770	0800	4.97	330
0600	4.12	108	0800	8.40	3,480	1000	4.87	344
0800	4.07	100	1000	7.41	2,090	1200	4.80	272
1000	4.19	120	1200	6.88	1,500	1400	4.71	246
1200	4.81	275	1400	6.54	1,200	1600	4.63	223
1400	4.55	203	1600	6.13	891	1800	4.58	206
1600	4.38	160	1800	5.80	690	2000	4.51	193
1800	4.27	136	2000	5.73	655	2200	4.43	172
2000	4.17	117	2200	5.60	590	2400	4.36	156
2200	4.09	103	2400	5.46	520			
2400	4.06	98						

(76) 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, at Sabino Canyon Road, 1.0 mi (1.6 km) downstream from Sabino Creek, and 1.25 mi (2.0 km) northeast of Tucson city limits.

Drainage area.  $--221 \text{ mi}^2$  (572 km<sup>2</sup>).

Gage-height record. --Crest stages only. Datum of gage is 2, 464. 33 ft (751. 128 m) above mean sea level (from Pima County bench mark).

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

Maxima. --Sept. 4-10, 1970: Discharge, 7,340 ft<sup>3</sup>/s (208 m<sup>3</sup>/s) Sept. 6 (gage height, 6.57 ft or 2.003 m, from gage; 6.52 ft or 1.987 m, from high-water profile).
 1940 to August 1970: Discharge, 12,200 ft<sup>3</sup>/s (346 m<sup>3</sup>/s) Dec. 22, 1965 (gage height, 7.89 ft or 2.405 m).

(77) Bailey Wash near Sasabe, Ariz.

(Miscellaneous site)

Location. --Lat 31°36'10'', long 111°31'23'', in SE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec. 16, T. 21 S., R. 8 E., Pima County, just upstream from State Highway 286, 8 mi (13 km) north of Sasabe.

Drainage area. --30. 4 mi<sup>2</sup> (78. 7 km<sup>2</sup>).

Maximum. --Sept. 4-10, 1970: Discharge, 12,900 ft<sup>3</sup>/s (365 m<sup>3</sup>/s) Sept. 4, from slope-area measurement of peak flow.

(78) 09486800. Altar Wash near Three Points, Ariz.

Location. --Lat 31°50'10", long 111°24'11", in SE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec. 27, T. 18 S., R. 9 E., Pima County, on downstream side of right abutment of bridge on State Highway 286, 0.1 mi (0.2 km) downstream from Chiltipines Wash, and 18 mi (29 km) south of Three Points.

Drainage area. --463 mi<sup>2</sup> (1, 199 km<sup>2</sup>).

- Gage-height record. --Water-stage recorder graph except Sept. 4-30. Gage-height record reconstructed on basis of normal recession. Altitude of gage is 2,980 ft (908 m), from topographic map.
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 11,000 ft<sup>3</sup>/s (310 m<sup>3</sup>/s) and extended above on basis of velocity-area determination of peak flow.
- Maxima, --Sept. 2-10, 1970: Discharge, 22,000 ft<sup>3</sup>/s (623 m<sup>3</sup>/s) 1230 hours Sept. 4 (gage height, 13.85 ft or 4.221 m).

<sup>1966</sup> to August 1970: Discharge, 10,700 ft<sup>3</sup>/s (303 m<sup>3</sup>/s) Aug. 10, 1966 (gage height, 10.40 ft or 3.170 m), from rating curve extended above 1,700 ft<sup>3</sup>/s (48 m<sup>3</sup>/s).

Da	у	Discharge	Day		Discharge	Day		Discharge
Sept.	2	0	Sept.	5	130	Sept.	8	200
	3	426		6	15		9	50
	4	5,460		7	0		10	10

Mean discharge, in cubic feet per second, 1970

# STATION DATA-GILA RIVER BASIN

(79) 09487000. Brawley Wash near Three Points, Ariz.

#### (Crest-stage station)

Location. --Lat 32°04'32'', long 111°20'15'', in SE<sup>1</sup>/<sub>4</sub> sec. 32, T. 15 S., R. 10 E., Pima County, at State Highway 86, 1.5 mi (2.4 km) west of Three Points (Robles Junction), and 23 mi (37 km) west of Tucson.

Drainage area,  $-776 \text{ mi}^2$  (2,010 km<sup>2</sup>).

- Gage-height record. --Crest stages only. Datum of gage is 2,532.85 ft (772.013 m) above mean sea level (levels by U.S. Coast and Geodetic Survey).
- Discharge record. --Stage-discharge relation undefined except for slope-area measurement of peak flow.
- Maxima. --Sept. 4-10, 1970: Discharge, 13,200  $ft^3/s$  (374 m<sup>3</sup>/s) Sept. 4 (gage height, 15.8 ft or 4.82 m, from high-water profile).

1962 to August 1970: Discharge, 13,000  $ft^3/s$  (368  $m^3/s$ ) Sept. 26, 1962 (gage height, 12.75 ft or 3.886 m).

(80) Brawley Wash at Mile Wide Road near Tucson, Ariz.

#### (Miscellaneous site)

Location. --Lat 32°15', long 111°15', in sec. 32, T. 13 S., R. 11 E., Pima County, 2,000 ft (610 m) downstream from Mile Wide Road, and 17 mi (27 km) west of Tucson.

Drainage area. --1, 077 mi<sup>2</sup> (2, 789 km<sup>2</sup>).

Maxima. --Sept. 4-10, 1970: Discharge, 6, 140 ft<sup>3</sup>/s (174 m<sup>3</sup>/s) Sept. 4, from slopearea measurement of peak flow.

1962 to August 1970: Discharge, 38,800 ft<sup>3</sup>/s (1,100 m<sup>3</sup>/s) Sept. 26, 1962, slope-area measurement.

(81) 09487250. Los Robles Wash near Marana, Ariz.

#### (Crest-stage station)

Location. --Lat 32°26'16'', long 111°18'13'', in SE<sup>1</sup><sub>4</sub>SE<sup>1</sup><sub>4</sub> sec. 27, T. 11 S., R. 10 E., Pima County, at Trico Road 0. 75 mi (1.2 km) downstream from confluence of Brawley Wash and China Draw, 3 mi (5 km) upstream from Blanco Wash, and 5 mi (8 km) southwest of Marana.

Drainage area. --1, 170 mi<sup>2</sup> (3, 030 km<sup>2</sup>).

Gage-height record. --Flood hydrograph recorder graph. Datum of gage is 1,907.76 ft (581.485 m) above mean sea level (levels by U.S. Coast and Geodetic Survey).

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

Maxima. --Sept. 4-10, 1970: Discharge, 4,490 ft<sup>3</sup>/s (127 m<sup>3</sup>/s) Sept. 5 (gage height, 9.27 ft or 2.825 m, at gage).

1962 to August 1970: Discharge,  $32,000 \text{ ft}^3/\text{s}$  (906 m<sup>3</sup>/s) Sept. 26, 1962, from slope-area sites upstream and downstream from this site.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	3			Sept.	5-Con.		Sept.	6-Con.	
2400		3.80	50	1400	9.10	4,150	1300	7.00	1,210
Sept.	4			1600	8.60	3,190	1400	7.05	1,250
1200		3.00	14	1800	8.10	2,400	1500	7.00	1,210
1800		3.70	44	2000	7.60	1,750	1600	6.85	1,095
2400		4.60	135	2200	7.10	1,290	1800	6.60	920
Sept.	5			2400	6.60	920	2000	6.35	760
0200		4.60	135	Sept.	6		2200	6.10	610
0530		4.60	135	0200	6.35	760	2400	5,75	450
0600		5.20	260	0330	6.60	920	Sept.	7	
0700		7.60	1,750	0400	6.70	990	0200	5.10	235
0800		8.85	3,650	0500	6.60	920	0530	4.60	135
0900		8.90	3,750	0630	6.70	990	0700	5.35	305
0930		8.85	3,650	0700	6.60	920	0800	4.10	74
1000		8.95	3,850	0900	6.50	850	1200	3.85	53
1100		9.10	4,150	1030	6.50	850	1800	3.10	17
1200		9.15	4,250	1130	6.60	920	2400	2.60	7
1230		9.27	4,490	1230	6.85	1,095			

Los Robles Wash near Marana, Ariz.-Continued

(82) 09497900. Cherry Creek near Young, Ariz.

Location. --Lat 34°04'58'', long 110°55'25'', in SE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec. 32, T. 9 N., R. 14 E., Gila County, on left bank 0.3 mi (0.5 km) downstream from Deadman Canyon and 2 mi (3 km) southeast of Young.

Drainage area. --62. 1 mi<sup>2</sup> (160. 8 km<sup>2</sup>).

Gage-height record. --Floodmarks only. Gage not operating. Altitude of gage is 4,950 ft (1,509 m), from topographic map.

Discharge record. --Discharge estimated on basis of hydrographic comparison with downstream station.

Maxima. --Sept. 4-10, 1970: Discharge, 3, 100 ft<sup>3</sup>/s (87.8 m<sup>3</sup>/s) time unknown Sept. 5 (gage height, 6.3 ft or 1.92 m, from floodmark).

1963 to August 1970: Discharge, 3,400  $\rm ft^3/s$  (96.3  $\rm m^3/s)$  Dec. 22, 1965 (gage height, 6.6 ft or 2.01 m).

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6		Sept. 7 8	150 100	Sept. 9 10	

Mean discharge, in cubic feet per second, 1970

(83) 09497980. Cherry Creek near Globe, Ariz.

Location. --Lat 33°49'40'', long 110°51'20'', in  $SW_4^1$  sec. 30, T. 6 N., R. 15 E. (unsurveyed), Gila County, 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.  $-200 \text{ mi}^2$  (518 km<sup>2</sup>).

Gage-height record. --Digital recorder tape except Sept. 8-10. Gage-height record reconstructed on basis of normal recession and hydrographic comparison with other stations in adjacent watersheds. Altitude of gage is 3,200 ft (975 m), from topographic map.

### Cherry Creek near Globe, Ariz.-Continued

Discharge record. --Stage-discharge relation defined by current-meter measurements below 130 ft<sup>3</sup>/s (3.68 m<sup>3</sup>/s) and extended above on basis of slope-area measurements of peak flow.

Maxima. --Sept. 4-10, 1970: Discharge, 4, 300 ft<sup>3</sup>/s (122 m<sup>3</sup>/s) 0145 hours Sept. 6 (gage height, 9.62 ft or 2.932 m).

1965 to August 1970: Discharge, 6,620 ft $^3$ /s (187 m $^3$ /s) Dec. 22, 1965 (gage height, 12.3 ft or 3.75 m, in gage well).

Day	D	ischarge	Day		Di	scharge	Day	4	Discharge
Sept. 4. 5. 6.	•••	8.8 764 1,830	Sept.	7 8		802 470	Sept.	9 10	

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 2400 Sept. 0200	4 5	0. 78	9	Sept. 1800 2000 2200	5Con. 3.62 4.67 9.13	748 1,200 3,900	Sept. 1000 1200 1400	6Con. 5.47 5.00 4.84	1,590 1,350 1,270
0400		. 78 . 78 . 83	9 12	2400	8.56 6	3,490	1600	4.65	1, 210 1, 190 1, 210
0800		. 83 . 82 1. 29	11 64	0145	9.62 9.34	4,300 4,070	2000	4.69 4.50	1,210 1,210 1,120
1200 1400 1600		2.83 3.00 2.96	444 515 501	0400 0600 0800	7.55 6.39 5.90	2,790 2,090 1,800	2400	4.34	1,050

(84) 09498500. Salt River near Roosevelt, Ariz.

Location. --Lat 33°37'10'', long 110°55'15'', in SE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec. 9, T. 3 N., R. 14 E. (unsurveyed), Gila County, in Tonto National Forest, on left bank 100 ft (30 m) downstream from bridge on State Highway 288, 0.3 mi (0.5 km) downstream from Pinal Creek, 1 mi (1.6 km) upstream from diversion dam for power canal, 14 mi (23 km) east of village of Roosevelt, and 17 mi (27 km) upstream from Roosevelt Dam.

Drainage area. --4, 306 mi<sup>2</sup> (11, 153 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph. Datum of gage is 2, 177. 14 ft (663. 592 m) above mean sea level.

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

Maxima. --Sept. 4-10, 1970: Discharge, 17, 300 ft<sup>3</sup>/s (489.9 m<sup>3</sup>/s) 0600 hours Sept. 6 (gage height, 17.2 ft or 5.24 m).

1906 to August 1970: Discharge, 117,000  $ft^3/s$  (3,310  $m^3/s$ ) Mar. 14, 1941 (gage height, 24.4 ft or 7.44 m), 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 and 102,000  $ft^3/s$  (1,870 and 2,890  $m^3/s$ ).

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6	421		3,430 2,020	Sept. 9 10	

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970									
Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	6*		Sept.	6*-Con.	
2400		7.57	176	0200	13.90	8,100	1300	14.08	8,500
Sept.	5*			0245	13.90	8,100	1700	13.10	6,500
1100		7.61	186	0345	14.70	10,500	2100	12.40	5,100
1300		7.86	247	0445	16.63	15,400	2400	12,28	4,880
1800		7.90	259	0600	17.20	17,300	Sept.	7	
1830		8.90	739	0800	15.60	12,300	1200	11.30	3,300
2300		9.50	1,160	0900	14.70	10,500	2230	10.60	2,340
2400		10.65	2,420	1100	13.55	7,400	2400	10,70	2,480

## Salt River near Roosevelt, Ariz.-Continued

\*Daily means computed from data in addition to figures shown.

(85) Tonto Creek below Kohl's Ranch, Ariz.

#### (Miscellaneous site)

Location. --Lat  $34^{\circ}19'15''$ , long  $111^{\circ}05'30''$ , in SE<sup>1</sup>/<sub>4</sub> sec. 21, T. 11 N., R. 12 E., Gila County, 0.6 mi (1.0 km) downstream from bridge on State Highway 160 at Kohl's Ranch.

Drainage area. --24.0 mi<sup>2</sup> (62.2 km<sup>2</sup>).

Maximum. --Sept. 4-10, 1970: Discharge, 18,400 ft<sup>3</sup>/s (521 m<sup>3</sup>/s) Sept. 5, from slope-area measurement of peak flow.

(86) Christopher Creek near Kohl's Ranch, Ariz.

(Miscellaneous site)

Location. --Lat 34°18'25", long 111°02'45", in SE<sup>1</sup>/<sub>4</sub> sec. 25, T. 11 N., R. 12 E., Gila County, at Christopher Creek campground, 0.25 mi (0.40 km) downstream from Hunter Creek and 3.5 mi (5.6 km) southeast of Kohl's Ranch.

Drainage area, --24, 4 mi<sup>2</sup> (63, 2 km<sup>2</sup>).

Maximum. --Sept. 4-10, 1970: Discharge, 11,900 ft<sup>3</sup>/s (337 m<sup>3</sup>/s) Sept. 5, from slope-area measurement of peak flow.

(87) 09498600. Christopher Creek tributary near Kohl's Ranch, Ariz.

### (Crest-stage station)

Location. --Lat 34°19'20'', long 111°04'00'', in NE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec. 22, T. 11 N., R. 12 E., Gila County, at State Highway 160, 1.8 mi (2.9 km) east of Kohl's Ranch, and 15.5 mi (24.9 km) northeast of Payson.

Drainage area. --0. 66 mi<sup>2</sup> (1. 71 km<sup>2</sup>).

<u>Gage-height record.</u> --Crest stages only. Altitude of gage is 5,500 ft (1,680 m), from topographic map.

Discharge record. --Stage-discharge relation defined by theoretical rating based on computations of flow through the culvert.

Maxima. --Sept. 4-10, 1970: Discharge, 265  $ft^3/s$  (7.50 m<sup>3</sup>/s) Sept. 5 (gage height, 9.84 ft or 2.999 m, from floodmarks).

1965 to August 1970: Discharge, 54 ft $^3$ /s (1.53 m $^3$ /s) Dec. 22, 1965 (gage height, 4.65 ft or 1.417 m).

(88) 09498800. Tonto Creek near Gisela, Ariz.

Location. --Lat 34°07'44'', long 111°15'17'', in NE<sup>1</sup>/<sub>4</sub> sec. 18, T. 9 N., R. 11 E., Gila County, in Tonto National Forest, on left bank 0.2 mi (0.3 km) upstream from Houston Creek, and 1.5 mi (2.4 km) northeast of Gisela.

Drainage area. --430 mi<sup>2</sup> (1, 114 km<sup>2</sup>).

Maxima, --Sept. 4-10, 1970: Discharge, 38,000 ft<sup>3</sup>/s (1,080 m<sup>3</sup>/s) about 1800 hours Sept. 5 (gage height, 29.2 ft or 8.90 m, from profile past gage), from slope-area measurement of peak flow.

1964 to August 1970: Discharge, 30,000 ft<sup>3</sup>/s ( $850 \text{ m}^3$ /s) Dec. 22, 1965 (gage height, 19.0 ft or 5,79 m, from floodmark), from rating curve extended above 14,000 ft<sup>3</sup>/s ( $400 \text{ m}^3$ /s) on basis of slope-area measurement of peak flow.

Mean discharge, in cubic feet per second, 1970

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6	12 8,000 5,000	Sept. 7 8	350 200	Sept. 9 10	13 <b>0</b> 80

(89) 09498870. Rye Creek near Gisela, Ariz.

Location. --Lat 34°02'00'', long 111°17'30'', in SW<sup>1</sup>/<sub>4</sub> sec. 13, T. 8 N., R. 10 E., Gila County, in Tonto National Forest, on right bank 0.2 mi (0.3 km) upstream from mouth, 0.6 mi (1.0 km) downstream from bridge on county road, and 6 mi (10 km) south of Gisela.

Drainage area. --122 mi<sup>2</sup> (316 km<sup>2</sup>).

- Gage-height record. --Water-stage recorder graph. Altitude of gage is 2,730 ft (832 m), from topographic map.
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 600 ft<sup>3</sup>/s (17 m<sup>3</sup>/s) and extended on basis of slope-area measurement of peak flow.

<u>Maxima.</u> --Sept. 4-10, 1970: Discharge, 44,400 ft<sup>3</sup>/s (1,260 m<sup>3</sup>/s) 1730 hours Sept. 5 (gage height, 14.1 ft or 4.30 m).

1965 to August 1970: Discharge, 8,130 ft $^3$ /s (230 m $^3$ /s) Dec. 22, 1965 (gage height, 9.0 ft or 2.74 m).

Flood of Aug. 22, 1963, reached a discharge of 14,300  $ft^3/s$  (405  $m^3/s$ ) at site 7.4 mi (11.9 km) upstream.

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6	1.1 2,680 91	Sept. 7 8	. 29 . 16	Sept. 9. 10.	

Mean discharge, in cubic feet per second, 1970

Gage-height record. -- No record. Gage destroyed by flood. Altitude of gage is 2,940 ft (896 m), from topographic map.

Discharge record. --Discharge estimated on basis of hydrographic comparison with downstream station and slope-area measurement of peak flow.

Gage	he	ight, in i	feet, and dis	charge,	in cubic	feet per seco	ond, at is	ndicated t	ime, 1970
Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
2400	4	1.53 1.69 2.35 1.99 2.75 2.74 3.81 4.21 4.21	1.7 7.4 87 32 190 188 595 826 826	Sept. 1645 1745 1800 1830 1845 1930 2030 2100 2200 2300	5-Con. 10.00 12.00 14.10 11.00 10.00 7.26 5.86 5.06 4.46 4.01	12,000 24,400 44,400 17,400 12,000 3,420 1,410 706 384 223	0400 0650 0950 1250 2050 2400	6 3.66 3.38 3.41 3.38 3.16 3.06 7 2.74 2.69	137 87 92 87 56 46 21.9 18.2
1600		5.00	1,400	2400	3.82	170			

#### Rye Creek near Gisela, Ariz.-Continued

(90) 09498900. Cold Creek near Payson, Ariz.

(Crest-stage station)

Location. --Lat 34°00'10'', long 111°21'30'', in SW $\frac{1}{4}$  sec. 29, T. 8 N., R. 10 E., Gila County, at State Highway 87, 16 mi (26 km) south of Payson.

Drainage area.  $-6.52 \text{ mi}^2$  (16.89 km<sup>2</sup>).

Gage-height record. --Crest stages only. Datum of gage is 3,470.58 ft (1,057.833 m), levels by Arizona Highway Department.

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

Maxima. --Sept. 4-10, 1970: Discharge, 2,800 ft<sup>3</sup>/s (79.3 m<sup>3</sup>/s) Sept. 5 (gage height, 11.94 ft or 3.639 m, from high-water profile).
 1963 to August 1970: Discharge, 1,370 ft<sup>3</sup>/s (38.8 m<sup>3</sup>/s) Aug. 22, 1963 (gage height, 7.75 ft or 2.362 m).

(91) 09499000. Tonto Creek above Gun Creek, near Roosevelt, Ariz.

Location. --Lat 33°58'48", long 111°18'10", in SW<sup>1</sup>4NE<sup>1</sup>4 sec. 2, T. 7 N., R. 10 E., Gila County, in Tonto National Forest, on left bank 600 ft (180 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 mi<sup>2</sup> (1, 748 km<sup>2</sup>).

 $\frac{\text{Gage-height record. --Water-stage recorder graph except Sept. 5-8. Datum of gage is}{2,523.14 \text{ ft (769.053 m) above mean sea level.}}$ 

Discharge record. --Stage-discharge relation defined below 27,000 ft<sup>3</sup>/s (760 m<sup>3</sup>/s) and extended above on basis of slope-area measurement of peak flow. Discharge Sept. 5-9 estimated on basis of adjoining good record and on basis of normal recession.

Maxima. --Sept. 4-10, 1970: Discharge, 53,000 ft<sup>3</sup>/s (1,500 m<sup>3</sup>/s) 2100 hours Sept. 5 (gage height, 18.2 ft or 5.55 m).

1940 to August 1970: Discharge, 45,400 ft<sup>3</sup>/s (1,290 m<sup>3</sup>/s) Jan. 18, 1952 (gage height, 16.55 ft or 5.044 m), from rating curve extended above 2,000 ft<sup>3</sup>/s (60 m<sup>3</sup>/s) on basis of previous rating curve defined to 27,000 ft<sup>3</sup>/s or 760 m<sup>3</sup>/s.

## Tonto Creek above Gun Creek, near Roosevelt, Ariz.-Continued

Mean discharge, in cubic feet per second, 1970

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6	11,100	Sept. 7 8		Sept. 9 10	

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour	_	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	5*-Con.		Sept.	6	
2400		3.78	6.6	1830	17.8	50,300	0600	8.9	8,850
Sept.	5*			1900	13.6	27,700	0900	7.0	3,700
1200		4.51	110	1915	15.7	38,200	1200	5.4	1,240
1230		6.52	2,100	1945	13.7	28,200	1800	4.6	570
1300		6.20	1,580	2000	15.0	34,400	2400	4.4	460
1530		6.15	1,510	2100	18.2	53,000	Sept.	7	
1630		6.70	2,430	2200	16.65	43,400	1200	4.25	385
1700		11.0	16,800	2300	15.1	34,900	2400	4.1	315
1730		12.0	20,800	2400	13.5	27,200			
1800		14.5	31,900						

\*Daily means computed from data in addition to figures shown.

# (92) Slate Creek near Sunflower, Ariz.(Miscellaneous site)

Location. --Lat 33°57'20", long 111°24'31" (unsurveyed), Gila County, at culvert on State Highway 87, 3.5 mi (5.6 km) north of Mt. Ord, and 7.2 mi (11.6 km) northeast of Sunflower.

Drainage area: --8.80 mi<sup>2</sup> (22.79 km<sup>2</sup>).

Maximum. --Sept. 4-10, 1970: Discharge, 4,480 ft<sup>3</sup>/s (127 m<sup>3</sup>/s) Sept. 5, by indirect measurement of peak flow.

(93) 09501000. Reservoir system on Salt River at and below Roosevelt Dam, Ariz.

Location. --This system comprises 4 storage reservoirs created by 4 separate dams on Salt River: Roosevelt Lake, formed by Roosevelt Dam, in sec. 20, T. 4 N., R. 12 E. (unsurveyed), on State Highway 88; 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. Contents given herein are combined contents of the 4 reservoirs.

Drainage area. -- 6, 211 mi<sup>2</sup> (16, 086 km<sup>2</sup>), at Stewart Mountain Dam.

- Maxima. --Sept. 1-15, 1970: Contents, 964,000 acre-ft (1,190 hm<sup>3</sup>) 2400 hours Sept. 10. 1910 to August 1970: Contents, 1,764,000 acre-ft (2,180 hm<sup>3</sup>) May 22, 1941.
- Remarks. --Total capacity of the 4 reservoirs is 1, 755, 000 acre-ft (2, 160 hm<sup>3</sup>), divided as follows: Roosevelt Lake, 1, 382, 000 acre-ft (1, 700 hm<sup>3</sup>); Apache Lake, 245, 000 acre-ft (302 hm<sup>3</sup>); Canyon Lake, 58, 000 acre-ft (71.5 hm<sup>3</sup>); and Saguaro Lake, 70, 000 acre-ft (86.3 hm<sup>3</sup>). Dead storage negligible. Dams forming these reservoirs were built as follows: Roosevelt, 1905-11; Horse Mesa, 1924-27; Mormon Flat, 1923-26; and Stewart Mountain, 1928-30. Since 1910, spill over Roosevelt Dam because of capacity or near-capacity storage has occurred only during the following periods: Apr. 15 to June 21, 1915; Jan. 19 to May 30, 1916; Apr. 21 to June 7, 1917; Feb. 17 to June 3, 1920; Apr. 13 to July 24, 1941; Dec. 30, 1965 to Jan. 10, 1966; and Feb. 16 to Apr. 26, 1968. Records given herein represent usable contents.

## FLOODS OF SEPT. 1970 IN ARIZ., UTAH, COLO., AND N. MEX.

Reservoir System on Salt River at and below Roosevelt Dam, Ariz.-Continued

Cooperation. -- Records furnished by Salt River Valley Water Users' Association.

Day	,	Contents	Day	Contents	Day	Contents
Sept.	1	897	Sept. 6	951	Sept. 11	963
	2	893	7	7 957	12	963
	3	890	8	3 961	13	963
	4	888	9	963	14	962
	5	916	10	964	15	961

Contents, in thousands of acre-feet, at 2400 hours of indicated day, 1970

(94) 09501300. Tortilla Creek at Tortilla Flat, Ariz.

#### (Crest-stage station)

Location. --Lat 33°31'38", long 111°23'13", in NW<sup>1</sup>/<sub>4</sub> sec. 13, T. 2 N., R. 9 E. (unsurveyed), Maricopa County, 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 mi<sup>2</sup> (62. 9 km<sup>2</sup>).

- Gage-height record. --Crest stages 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 the weir.
- <u>Maxima</u>. --Sept. 4-10, 1972: Discharge, 5,700 ft<sup>3</sup>/s (161 m<sup>3</sup>/s) Sept. 5 (gage height,  $\frac{11.4}{11.4}$  ft or 3.47 m, from floodmarks).
  - 1942 to August 1970: Discharge, 6,660  $\rm ft^3/s$  (189  $\rm m^3/s)$  Sept. 13, 1966 (gage height, 12.3 ft or 3.75 m).

(95) 09504400. Munds Canyon tributary near Sedona, Ariz.

#### (Crest-stage station)

<u>Location</u>. --Lat 34°55'20'', long 111°38'40'', in SW $\frac{1}{4}$  sec. 22, T. 18 N., R. 7 E., Coconino County, at State Highway 70, 7 mi (11 km) northeast of Sedona.

Drainage area, --1, 10 mi<sup>2</sup> (2.85 km<sup>2</sup>).

- Gage-height record. --Crest stages only. Datum of gage is 6, 485. 72 ft (1, 976. 847 m), levels by Arizona Highway Department.
- $\frac{\text{Discharge record.}-\text{Stage-discharge relation defined by theoretical rating developed on the digital computer.}$
- <u>Maxima.</u>--Sept. 4-10, 1970: Discharge, 705 ft<sup>3</sup>/s (20.0 m<sup>3</sup>/s) Sept. 5 (gage height, 11.10 ft or 3.383 m, from high-water profile).
  - 1963 to August 1970: Discharge, 222 ft $^3$ /s (6.29 m $^3$ /s) Sept. 3 and Nov. 25, 1965 (gage height, 6.91 ft or 2.106 m).

(96) 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, 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 mi<sup>2</sup> (925 km<sup>2</sup>).

### Oak Creek near Cornville, Ariz.-Continued

Gage-height record. --Digital recorder tape except parts of Sept. 5-7. Missing gageheight record reconstructed from normal rise or recession and adjoining good record. Altitude of gage is 3, 470 ft (1, 058 m), from topographic map.

 $\frac{Discharge\ record.\ --Stage-discharge\ relation\ defined\ by\ current-meter\ measurements}{below\ 16,\,000\ ft^3/s\ (450\ m^3/s)\ and\ extended\ above\ by\ logarithmic\ plotting.}$ 

Maxima. --Sept. 4-10, 1970: Discharge, 24,700 ft<sup>3</sup>/s (700 m<sup>3</sup>/s) 1600 hours Sept. 5 (gage height, 16.48 ft or 5.023 m).

1885 to August 1970: Discharge, 19,200 ft<sup>3</sup>/s ( $544 \text{ m}^3$ /s) Dec. 6, 1966 (gage height, 14.68 ft or 4.474 m); maximum gage height, 15.18 ft (4.627 m) Nov. 25, 1965.

Maximum flood known since at least 1885 occurred in March 1938 (stage at upstream side of bridge, 23 ft or 7.0 m, from floodmarks).

Day		Discharge	Day		Discharge	Day	Discharge
× ·	4     5     6	27 7,340 2,490	Sept.	7 8	320 145	Sept. 9. 10.	94 67

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of Oak Creek near Cornville, Ariz.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	5*—Con.		Sept.	6*-Con.	
2400		2.17	43	1700	15.78	22,500	0600	7.44	3,560
Sept.	5*			1800	13.30	15,200	0900	6.52	2,520
0100		2.15	41	1900	12.20	12,500	1200	5.92	1,920
0400		2.25	52	2000	11.30	10,300	1500	5.45	1,510
0700		2.68	121	2100	10.85	9,300	1800	4.82	1,030
0900		3.73	447	2200	9.90	7,420	2100	4.39	774
1000		6.56	2,570	2300	9.56	6,810	2400	4.05	595
1100		8.03	4,350	2400	9.36	6,480	Sept.	7	
1200		9.62	6,920	Sept.	6*		0600	3.42	327
1300		10.99	9,580	0100	9.08	6,030	1200	3.08	219
1400		14.13	17,600	0200	8.70	5.420	1800	2.85	157
1500		15.12	20,600	0300	8.40	4,940	2400	2,80	145
1600		16.48	24,700	0400	8.15	4,540			

\*Daily means computed from data in addition to figures shown.

(97) 09504800. Oak Creek tributary near Cornville, Ariz.

#### (Crest-stage station)

Location. --Lat 34°42'45", long 111°52'50", in NW<sup>1</sup>/<sub>4</sub> sec. 12, T. 15 N., R. 4 E., Yavapai County, at county road, 2.5 mi (4.0 km) east of Cornville.

Drainage area. --0, 048 mi<sup>2</sup> (0, 124 km<sup>2</sup>).

Gage-height record. --Crest stages only. Altitude of gage is 3,500 ft (1,070 m), from topographic map.

<u>Discharge record.</u>--Stage-discharge relation defined by theoretical rating developed on the digital computer.

Maxima. --Sept. 4-10, 1970: Discharge, 47 ft<sup>3</sup>/s (1.33 m<sup>3</sup>/s) Sept. 5 (gage height, 6.02 ft or 1.835 m).

1963 to August 1970: Discharge, 53 ft<sup>3</sup>/s (1.50 m<sup>3</sup>/s) Aug. 8, 1969 (gage height, 6.51 ft or 1.984 m).

## FLOODS OF SEPT. 1970 IN ARIZ., UTAH, COLO., AND N. MEX.

(98) 09505200. Wet Beaver Creek near Rimrock, Ariz.

Location. --Lat 34°40'29'', long 111°40'17'', in NW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec. 24, T. 15 N., R. 6 E., Yavapai County, in Coconino National Forest, on right bank 4.5 mi (7.2 km) northeast of Rimrock and 5.7 mi (9.2 m) upstream from Red Tank Draw.

Drainage area. --111 mi<sup>2</sup> (287 km<sup>2</sup>).

Gage-height record. --Digital recorder tape. Altitude of gage is 4,020 ft (1,225 m), from topographic map.

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

Maxima. --Sept. 4-10, 1970: Discharge, 7,670 ft<sup>3</sup>/s (217 m<sup>3</sup>/s) 1945 hours Sept. 5 (gage height, 12.41 ft or 3.783 m).

1961 to August 1970: Discharge, 6,150 ft<sup>3</sup>/s (174 m<sup>3</sup>/s) Nov. 25, 1965 (gage height, 11.62 ft or 3.542 m).

Day		Discharge	Day		Discharge	Day	Discharge
	4 5 6	7.9 1,760 462	Sept.	7		Sept. 9 . 10 .	

Mean discharge, in cubic feet per second, 1970 of Wet Beaver Creek near Rimrock, Ariz.

Gage height, in feet,	and discharge,	in cubic feet p	er second,	at indicated time,	1970
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$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	-Con. 9.13 2,780 8.61 2,280 8.07 1,830 7.61 1,470 6.72 892 5.59 392 4.98 220 4.44 117 4.14 78

\*Daily means computed from data in addition to figures shown.

#### (99) Rocky Gulch

(U.S. Forest Service Beaver Creek Watershed No. 13)

Location. --Lat 34°44'50'', long 111°29'39'', in SE<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec. 27, T. 16 N., R. 8 E., Coconino County, 1,000 ft (300 m) downstream from Forest Service gage, 16 mi (26 km) northeast of Rimrock.

Drainage area. --1. 42 mi<sup>2</sup> (3. 68 km<sup>2</sup>).

<u>Maximum</u>, --Sept. 4-10, 1970: Discharge, 1,550 ft<sup>3</sup>/s (43.9 m<sup>3</sup>/s) 1425 hours Sept. 5 (gage height, 4.53 ft or 1.381 m, at gage; 6.4 ft or 1.95 m, from high-water profile), from slope-area measurement of peak flow.

Remarks. -- Continuous gaging station operated by the U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station.

#### (100) Rocky Gulch tributary

(U.S. Forest Service Beaver Creek Watershed No. 10)

Location. --Lat 34°44'55'', long 111°31'19'', in SW<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec. 29, T. 16 N., R. 8 E., Coconino County, 100 ft (30 m) downstream from Forest Service gage, 16 mi (26 km) northeast of Rimrock.

Drainage area. --0. 892 mi<sup>2</sup> (2. 310 km<sup>2</sup>).

Maximum. --Sept. 4-10, 1970: Discharge, 980 ft<sup>3</sup>/s (27.8 m<sup>3</sup>/s) 1445 hours Sept. 5 (gage height, 4.32 ft or 1.317 m, at gage; 5.5 ft or 1.68 m, from high-water profile), from slope-area measurement of peak flow.

Remarks. -- Continuous gaging station operated by the U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station.

#### (101) Foster Canyon

(U.S. Forest Service Beaver Creek Watershed No. 7)

Location. --Lat 34°45'27", long 111°30'58", in NW4SW4 sec. 21, T. 16 N., R. 8 E., Coconino County, 200 ft (60 m) downstream from Forest Service gage, 16 mi (26 km) northeast of Rimrock.

Drainage area.  $-3.18 \text{ mi}^2$  (8.24 km<sup>2</sup>).

Maximum. --Sept. 4-10, 1970: Discharge, 2,260 ft<sup>3</sup>/s (64.0 m<sup>3</sup>/s) 1440 hours Sept. 5 (gage height, 4.99 ft or 1.521 m, at gage; 6.0 ft or 1.83 m, from high-water marks), from slope-area measurement of peak flow.

Remarks. -- Continuous gaging station operated by the U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station.

(102) 09505250. Red Tank Draw near Rimrock, Ariz.

Location. --Lat 34°41'43'', long 111°42'49'', in SE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec. 16, T. 15 N., R. 6 E., Yavapai County, in Coconino National Forest, on left bank 2.5 mi (4.0 km) downstream from confluence of Rarick and Mullican Canyons, and 3.5 mi (5.6 km) northeast of Rimrock.

Drainage area. --49.4 mi<sup>2</sup> (127.9 km<sup>2</sup>).

Gage-height record. --Digital recorder tape. Altitude of gage is 3, 920 ft (1, 195 m), from topographic map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 480 ft<sup>3</sup>/s (13.6 m<sup>3</sup>/s) and extended above on basis of slope-area measurement of peak flow.

Maxima. --Sept. 4-11, 1970: Discharge, 10,500 ft<sup>3</sup>/s (297 m<sup>3</sup>/s) 1630 hours Sept. 5 (gage height, 12.69 ft or 3.868 m).

1957 to August 1970: Discharge, 2,010 ft<sup>3</sup>/s (56.9 m<sup>3</sup>/s) Nov. 25, 1965 (gage height, 7.62 ft or 2.323 m), from rating curve extended above 480 ft<sup>3</sup>/s (13.6 m<sup>3</sup>/s) on basis of slope-area measurement at gage height 7.55 ft (2.301 m).

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6		Sept. 7. 8. 9.	5.5	Sept. 10 11	

Mean discharge, in cubic feet per second, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	5*-Con.		Sept.	5*-Con.	
2400		0.58	0	1530	11.02	5,940	2230	7.50	1,690
Sept.	5*			1600	11.37	6,740	2400	6.82	1,210
0830		. 58	0	1630	12.69	10,500	Sept.	6*	
0845		2.45	22	1700	10.80	6,200	0400	5.77	828
1015		2.23	9.4	1800	10.57	5,740	0800	4.92	346
1030		2.85	5 <b>6</b>	1900	9.14	3,480	1200	4.27	174
1330		2,53	27	2000	9,20	3,560	1800	3.69	75.8
1400		3.42	139	2100	8.50	2,710	2400	3.36	39.0
1500		8.05	1.870	2200	6.86	1,240			

Red Tank Draw near Rimrock, Ariz.-Continued

\*Daily means computed from data in addition to figures shown.

(103) Woods Canyon near Sedona, Ariz.

(U.S. Forest Service)

Location. --Lat 34°51'14", long 111°36'06", in SE<sup>1</sup>/<sub>4</sub> sec. 13, T. 17 N., R. 7 E., Coconino County, 300 ft (90 m) downstream from Forest Service gage 11 mi (18 km) east of Sedona.

Drainage area. --16. 7 mi<sup>2</sup> (43. 3 km<sup>2</sup>).

- <u>Maximum.</u> --Sept. 4-10, 1970: Discharge, 3,990 ft<sup>3</sup>/s (113 m<sup>3</sup>/s) 1650 hours Sept. 5 (gage height, 7.93 ft or 2.417 m, at gage; 8.4 ft or 2.56 m, from high-water profile), from slope-area measurement of peak flow.
- Remarks. --Continuous gaging station operated by the U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station.

(104) Bar M Canyon near Sedona, Ariz.

(U.S. Forest Service)

Location. --Lat 34°51'42", long 111°36'18", in  $SE_4^1SW_4^1$  sec. 12, T. 17 N., R. 7 E., Coconino County, at Forest Service gage 10 mi (16 km) east of Sedona.

Drainage area. -- 25. 7 mi<sup>2</sup> (66. 6 km<sup>2</sup>).

Maximum. --Sept. 4-10, 1970: Discharge, 4, 100 ft<sup>3</sup>/s (116 m<sup>3</sup>/s) 1500 hours Sept. 5 (gage height, 9.35 ft or 2.850 m, at gage; 10.0 ft or 3.05 m, from high-water profile), from slope-area measurement of peak flow.

Remarks. -- Continuous gaging station operated by the U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station.

#### (105) South Fork Rattlesnake Canyon

(U.S. Forest Service Beaver Creek Watershed No. 8)

Location. --Lat 34°47'38", long 111°31'30", in NW4SE4 sec. 5, T. 16 N., R. 8 E., Coconino County, 700 ft (200 m) upstream from Forest Service gage, 15 mi (24 km) northwest of Rimrock.

Drainage area. --2. 82 mi<sup>2</sup> (7. 30 km<sup>2</sup>).

Maximum. --Sept. 4-10, 1970: Discharge, 1,200 ft<sup>3</sup>/s (34.0 m<sup>3</sup>/s) 1535 hours Sept. 5 (gage height, 4.99 ft or 1.521 m, at gage; 6.0 ft or 1.83 m, from outside profile), from slope-area measurement of peak flow.

Remarks. -- Continuous gaging station operated by the U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station.

(106) 09505300. Rattlesnake Canyon near Rimrock, Ariz.

Location. --Lat 34°46'01'', long 111°40'23'', in NW<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec. 24, T. 16 N., R. 6 E., Yavapai County, 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 mi<sup>2</sup> (63.7 km<sup>2</sup>).

- Gage-height record. --Digital recorder tape except Sept. 6-30. Gage-height record reconstructed from normal recession and hydrographic comparison with stations in adjacent drainage basin. Altitude of gage is 4,870 ft (1,484 m), from topographic map.
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 1, 100 ft<sup>3</sup>/s (31. 2 m<sup>3</sup>/s) and extended above on basis of computation of flow over weir at gage height 8.50 ft (2.591 m).

Maxima. --Sept. 4-10, 1970: Discharge, 3,590 ft<sup>3</sup>/s (102 m<sup>3</sup>/s) 1530 hours Sept. 5 (gage height, 11.50 ft or 3.505 m).

1957 to August 1970: Discharge, 2,160 ft $^3$ /s (61.2 m $^3$ /s) Jan. 25, 1969 (gage height, 9.52 ft or 2.902 m).

Day	 Discharge	Day		 Disch	arge	Da	у	Discharge
Sept. 4.	 0	Sept.	7		10	Sept.	9	0.50
5.	 800		8		2.0		10	.10
6.	 50							

Mean discharge, in cubic feet per second, 1970

Gage height, in feet.	and discharge.	in cubic feet per second	. at indicated time.	19 <b>70</b>

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	5*-Con.		Sept.	5*—Con.	
2400		1.62	0	1330	3.61	67	1700	10.63	2,750
Sept.	5*			1400	7.76	1,050	1730	11.47	3,560
0600		2.01	. 12	1430	10.42	2,500	1800	1 <b>0.</b> 19	2,380
0700		5.96	438	1500	9.30	1,830	2000	8.05	1,180
0800		7.09	786	1530	11.50	3,59 <b>0</b>	2200	6.46	588
1200		4.18	125	1600	11.12	3,200	2400	4.97	236

\*Daily mean computed from data in addition to figures shown.

(107) 09505350. Dry Beaver Creek near Rimrock, Ariz.

Location. --Lat 34°43'43'', long 111°46'30'', in NE<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec. 1, T. 15 N., R. 5 E., Yavapai County, in Coconino National Forest, on left abutment on upstream side of abandoned highway bridge, 400 ft (120 m) upstream from present County Highway 179, and 5.5 mi (8.8 km) north of Rimrock.

Drainage area.  $--142 \text{ mi}^2$  (368 km<sup>2</sup>).

- Gage-height record. --Digital recorder tape except Sept. 9-13. Gage-height record reconstructed from normal recession and adjoining good record. Datum of gage is 3, 694. 38 ft (1, 126, 047 m) above mean sea level.
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 6,000 ft<sup>3</sup>/s (170 m<sup>3</sup>/s) and extended above on basis of computations of peak flow over weir at gage heights 9.07 and 9.69 ft (2.765 and 2.954 m) and slope-area measurement at gage height 14.35 ft (4.374 m).
- Maxima. --Sept. 4-10, 1970: Discharge, 26,600 ft<sup>3</sup>/s (753 m<sup>3</sup>/s) 1530 hours Sept. 5 (gage height, 14.35 ft or 4.374 m).

1960 to August 1970: Discharge, 10,600 ft $^3$ /s (300 m $^3$ /s) Jan. 25, 1969 (gage height, 9.98 ft or 3.042 m).

Mean discharge,	in cubic	feet per	second,	1970
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Day	7	Discharge	Day		Discharge	Day	Discharge
Sept.	4 5	0 5,930	Sept.	7 8	81 23	Sept. 9 10	
	6	669					

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	5*Con.		Sept.	5*-Con.	
2400		1.43	0	1000	7.03	3,850	1730	12.26	19,500
Sept.	5*			1100	7.77	5,220	1900	9.79	10,300
0230		2.75	21	1200	9.33	8,620	2100	7.81	5,300
0330		2.40	2.7	1300	8.33	6,390	2400	6.11	2,420
0400		2.73	19	1400	8,47	6,690	Sept.	6*	
0630		2.58	7.4	1500	9.90	10,000	0400	5.05	1,200
0700		4.18	499	1530	14.35	26,600	1200	4.11	457
0800		5.52	1,690	1600	13.21	21,300	2400	3.44	161
0900		4.68	864	1630	14.08	25,500			

\*Daily means computed from data in addition to figures shown.

(108) 09505600. Dirty Neck Canyon near Clints Well, Ariz.

#### (Crest-stage station)

Location. --Lat 34°30'45'', long 111°21'30'', in N<sup>1</sup>/<sub>2</sub> sec. 23, T. 13 N., R. 9 E., Coconino County, at county road, 4 mi (6 km) southwest of Clints Well and 18 mi (29 km) north of Payson.

Drainage area. --3. 42 mi<sup>2</sup> (8. 86 km<sup>2</sup>).

- <u>Gage-height record.</u> --Crest stages only. Altitude of gage is 6,800 ft (2,070 m), from topographic map.
- Discharge record. --Stage-discharge relation defined by computations of flow through culvert.

Maxima. --Sept. 4-10, 1970: Discharge, 210 ft<sup>3</sup>/s (5.95 m<sup>3</sup>/s) Sept. 5 (gage height, 7.88 ft or 2.402 m, from floodmarks).

1964 to August 1970: Discharge, 115 ft<sup>3</sup>/s (3.26 m<sup>3</sup>/s) Dec. 30, 1965 (gage height, 5.59 ft or 1.704 m).

(109) 09505800. West Clear Creek near Camp Verde, Ariz.

Location. --Lat 34°32'19", long 111°41'36", in NW<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec. 11, T. 13 N., R. 6 E., Yavapai County, 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.  $-241 \text{ mi}^2$  (624 km<sup>2</sup>).

Discharge record. --Stage-discharge relation defined by current-meter measurements below 2, 100 ft<sup>3</sup>/s (59.5 m<sup>3</sup>/s) and extended above on the basis of slope-area measurements of peak flow.

 $\frac{\text{Maxima.} --\text{Sept. 4-10, 1970: Discharge, 1,050 ft^3/s (29.7 m^3/s) 2345 hours Sept. 5}{(gage height, 5,42 ft or 1.652 m).}$ 

1964 to August 1970: Discharge, 6,510 ft $^3$ /s (184 m $^3$ /s) Jan. 6, 1965 (gage height, 8.3 ft or 2.53 m, from floodmark).

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6	. 236	Sept. 7 8	108 42	Sept. 9 10	

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	5*-Con.		Sept.	6*-Con.	
2400		3.16	17.8	1600	3.76	111	0800	4.63	456
Sept.	5*			1800	4.85	59 <b>0</b>	1200	4.33	308
0200		3.16	17.8	2200	4.93	654	2000	4.01	184
0400		3.24	25.0	2345	5.42	1,050	2400	4.12	222
0800		3.57	71.9	2400	5.37	1,010	Sept.	7*	
1000		3.40	44.0	Sept.	6*		0800	3.80	120
1400		3.53	65.1	0600	4.40	340	2400	3.50	60.0

\*Daily means computed from data in addition to figures shown.

(110) 09507600. East Verde River near Pine, Ariz.

Location. --Lat 34°23'30", long 111°16'05", in SE<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec. 26, T. 12 N., R. 10 E. (unsurveyed), Gila County, on right bank 0.8 mi (1.3 km) upstream from Dude Creek, 2.7 mi (4.3 km) south of Washington Park, and 10 mi (16 km) east of Pine.

Drainage area. --6. 65 mi<sup>2</sup> (17. 22 km<sup>2</sup>).

Gage-height record. --Digital recorder tape. Altitude of gage is 5,400 ft (1,650 m), from topographic map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 40 ft<sup>3</sup>/s (1.13 m<sup>3</sup>/s) and extended above on basis of slope-area measurements at gage heights 3.05, 3.67, and 6.4 ft (0.930, 1.119, and 1.95 m).

Maxima, --Sept. 4-10, 1970: Discharge, 2,820 ft<sup>3</sup>/s (79.9 m<sup>3</sup>/s) 1600 hours Sept. 5 (gage height, 6.4 ft or 1.95 m).

1961 to August 1970: Discharge, 1,350 ft<sup>3</sup>/s (38.2 m<sup>3</sup>/s) July 31, 1967 (gage height, 3.82 ft or 1.164 m), from rating curve extended above 40 ft<sup>3</sup>/s (1.13 m<sup>3</sup>/s) on basis of slope-area measurements at gage heights 3.05 and 3.67 ft (0.930 and 1.119 m).

Gage-height record. --Digital recorder tape. Altitude of gage is 3,630 ft (1,106 m), from topographic map.

#### East Verde River near Pine, Ariz.-Continued

Day		Discharge	Day		Discharge	Day	<i>t</i>	Discharge
Sept.	4 5 6		Sept.	7 8		-	9 10	18 2.4

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 2400 Sept. 0600 1400	4 5*	1.43 1.80 2.13	1.0 20 56	Sept. 1500 1530 1600 1630	5*-Con. 3.04 3.30 6.4 4.83	270 351 2,820 1,230	Sept. 1700 2000 2400	5*-Con. 3.30 2.43 2.09	354 117 56

\*Daily mean computed from data in addition to figures shown.

(111) 09507700. Webber Creek above West Fork Webber Creek, near Pine, Ariz.

Location. --Lat 34°24'40", long 111°22'20", in SW<sup>1</sup>/<sub>4</sub> sec. 23, T. 12 N., R. 9 E. (unsurveyed), Gila County, in Tonto National Forest on left bank 0.2 mi (0.3 km) upstream from West Fork and 4.9 mi (7.9 km) northeast of Pine.

Drainage area. --4. 92 mi<sup>2</sup> (12. 74 km<sup>2</sup>).

Gage-height record. --Digital recorder tape. Altitude of gage is 5, 530 ft (1, 686 m), from topographic map.

<u>Discharge record.</u> --Stage-discharge relation defined by current-meter measurements below 33 ft $^3$ /s (0.93 m $^3$ /s) and extended above on basis of slope-area measurement of peak flow.

Maxima. --Sept. 4-10, 1970: Discharge, 1,220 ft<sup>3</sup>/s (34.6 m<sup>3</sup>/s) 1530 hours Sept. 5 (gage height, 4.36 ft or 1.329 m).

1959 to August 1970: Discharge,  $399 \text{ ft}^3/\text{s}$  (11.3 m<sup>3</sup>/s) Sept. 13, 1961 (gage height, 3.13 ft or 0.954 m), from rating curve extended above 33 ft<sup>3</sup>/s (0.93 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow.

Mean discharge, in cubic feet per second, 1970

Day		Discharge	Day	- I	Discharge	Day		Discharge
Sept.	4 5 6	0.44 181 30	Sept.	7 8	10 7.0	Sept. 9 10	· · · · ·	4.0 3.2

Hour		Gage he1ght	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 2400	4	0.95	0.60	Sept. 1300	5*-Con. 2.26	124	Sept. 1700	5*—Con. 3.13	398
Sept.	5*			1400	2.75	256	1800	2.81	276
0400		1.11	2.9	1500	4.21	1,090	2000	2.47	173
$0800 \\ 1000$		$\begin{array}{c} 1.51\\ 2.24 \end{array}$	$\frac{21}{119}$	1530 1600	4.36 4.27	1,220 1,140	2400	1.98	72

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

\*Daily mean computed from data in addition to figures shown.

(112) 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, 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 mi<sup>2</sup> (850 km<sup>2</sup>).

Gage-height record. --Digital recorder tape except Sept. 5-10. Altitude of gage 1s 2,500 ft (760 m), from topographic map.

Discharge record, --Stage-discharge relation defined by current-meter measurements below 800 ft3/s (22.7 m<sup>3</sup>/s) and extended above on basis of slope-area measurement of peak flow. Discharge for Sept. 5-10 estimated on basis of streamflow records for Verde River below Tangle Creek and East Verde River near Pine, precipitation records, and recession characteristics.

 $\frac{\text{Maxima. --Sept. 4-10, 1970: Discharge, 23,500 ft^3/s (666 m^3/s) 1800 hours Sept. 5}{(gage height, 19.2 ft or 5.85 m, from profile past gage).}$ 

1961 to August 1970: Discharge, 17,000 ft3/s (481 m3/s) Dec. 22 or 30, 1965 (gage height, unknown), by slope-area measurement of peak flow.

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6	. 5,000	Sept. 7. 8.		Sept. 9 10	

Mean discharge, in cubic feet per second, 1970

(113) 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, in Tonto National Forest, on right bank 1.4 mi (2.2 km) upstream from mouth and 13 mi (21 km) south of Childs.

Drainage area. -- 36. 4 mi<sup>2</sup> (94. 3 km<sup>2</sup>).

Gage-height record, --No record; gage not operating. Altitude of gage is 2,320 ft (707 m), from topographic map.

Discharge record. --Discharge estimated on the basis of slope-area measurement of peak flow and comparison with surrounding stations of the relation of unit peak discharge to total unit discharge for Sept. 5-10.

Maxima. --Sept. 4-10, 1970: Discharge, 5,600 ft<sup>3</sup>/s (159 m<sup>3</sup>/s), time unknown, Sept. 5 (gage height, 14.18 ft or 4.322 m).

1967 to August 1970: Discharge, 5,220 ft<sup>3</sup>/s (148 m<sup>3</sup>/s) Dec. 19, 1967 (gage height, 11.00 ft or 3.353 m), from rating curve extended above 300 ft<sup>3</sup>/s (8.50 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow.

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6	. 700	Sept. 7. 8.		Sept. 9 10	

Mean discharge, in cubic feet per second, 1970

(114) 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, 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 mi<sup>2</sup> (15, 208 km<sup>2</sup>), includes 373 mi<sup>2</sup> (966 km<sup>2</sup>) in Aubrey Valley Playa, a closed basin.
- Gage-height record. --Water-stage recorder graph except for Sept. 8-10. Gage-height record reconstructed from normal recession and adjoining good record. Datum of gage is 2,029.0 ft (618.44 m) above mean sea level.
- $\frac{Discharge\ record.\ --Stage-discharge\ relation\ defined\ by\ current-meter\ measurements}{below\ 42,000\ ft^3/s\ (1,200\ m^3/s)\ and\ extended\ above\ by\ logarithmic\ plotting.}$
- $\frac{Maxima. --Sept. 4-11, 1970: Discharge, 61,900 ft^3/s (1,750 m^3/s) 0300 hours Sept. 6}{(gage height, 18.85 ft or 5.745 m, in gage well).}$

1925 to August 1970: Discharge, 100,000 ft $^3$ /s (2,830 m $^3$ /s) Mar. 3, 1938 (gage height, 19.0 ft or 5.79 m, from floodmarks).

Day		Discharge	Day		Discharge	Day	Discharge
	· · · · · · ·	194 5,420 26,600	Sept.	7 8 9	. 1,300	Sept. 10 11	

Mean discharge, in cubic feet per second, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 2400 Sept.	4 5	2.12	194	Sept. 2300 2400	5-Con. 14.35 15.40	22,000 30,000	Sept. 0500 1100	7 7.75 6.85	3,750 2,880
0500		2.12	194	Sept.	6		1700	6.17	2,340
0630		3.60	700	0100	17.20	46,400	2000	5.85	2,100
0800		4.90	1,440	0300	18.85	61,900	2400	5.40	1,780
1100		3.92	860	0630	17.42	48,200	Sept.	8	
1400		5.45	1,820	0900	15.50	30,900	1200	4.60	1,250
1600		7.30	3,300	1100	14.25	21,400	2400	4.10	936
1630		10.90	8,750	1700	11.62	10,600			
1930		11.70	10,800	2200	9 <b>.6</b> 5	6,120			
2100		13.00	14,800	2400	9.03	5,220			

(115) 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).

Drainage area. --6, 185 mi<sup>2</sup> (16, 019 km<sup>2</sup>), 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) above mean sea level.

Maxima. --Sept. 1-15, 1970: Contents, 215,500 acre-ft (266 hm<sup>3</sup>) Sept. 14. 1939 to August 1970: Contents, 315,800 acre-ft (389 hm<sup>3</sup>) Mar. 19, 20, 1968.

## 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 317, 700 acre-ft (392 hm<sup>3</sup>) divided as follows: Horseshoe Reservoir, 139, 200 acre-ft (172 hm<sup>3</sup>) at elevation 2, 026.0 ft (617.52 m)--top of spillway gates and Bartlett Reservoir, 178, 500 acre-ft (220 hm<sup>3</sup>) at elevation 1, 787.46 ft (544.818 m)--top of spillway gates. No dead storage. Records given herein represent usable contents.

Cooperation. -- Capacity tables furnished by Salt River Valley Water Users' Association.

Day	Contents	Day	Contents	Day	Contents
$3 \ldots $ $4 \ldots $	133,500 133,400	7.8.9.		13 14	

Contents, in acre-feet, at 2400 hours on indicated day, 1970

(116) 09510070. West Fork Sycamore Creek above McFarland Canyon near Sunflower, Ariz.

Location. --Lat 33°57'38", long 111°29'12", in SE<sup>1</sup>/<sub>4</sub>SW<sup>1</sup>/<sub>4</sub> sec. 12, T. 7 N., R. 8 E. (unsurveyed), Maricopa County, in Tonto National Forest, on left bank 0.2 mi (0.3 km) upstream from McFarland Canyon and 6.8 mi (10.9 km) north of Sunflower.

Drainage area. --4. 58 mi<sup>2</sup> (11. 86 km<sup>2</sup>).

- Gage-height record. --Water-stage recorder graph except Sept. 6-9. Gage-height record was estimated on the basis of adjacent record, normal recession, and flow at nearby stations. Altitude of gage is 4, 380 ft (1, 335 m), from topographic map.
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 28 ft3/s (0. 79 m3/s) and extended above on basis of weir and critical depth measurements of peak flow.
- Maxima, --Sept. 4-10, 1970: Discharge, 1,700 ft<sup>3</sup>/s (48.1 m<sup>3</sup>/s) 1530 hours Sept. 5 (gage height, 5.50 ft or 1.676 m).

1965 to August 1970: Discharge, 430 ft<sup>3</sup>/s (12.2 m<sup>3</sup>/s) Dec. 22, 1965 (gage height, 4.45 ft or 1.356 m), from rating curve extended above 28 ft<sup>3</sup>/s (0.79 m<sup>3</sup>/s) on basis of weir and critical depth measurements of peak flow.

Day		Discharge	Day		Discharge	Day	у	Discharge
5.	· · · · · ·	0 132 20	Sept.	7 8	5.0 2.0	Sept.	9 10	

Mean discharge, in cubic feet per second, 1970

Gage height, in feet	, and discharge,	in cubic feet	per second,	at indicated time,	1970
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Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 4 2400 Sept. 5* 0800 1400 1500	0.77 1.50 1.53 3.15	0 .12 .16 58	Sept. 1530 1600 1700 1730 1800	5*-Con. 5.50 4.95 4.15 4.95 4.20	1,700 845 295 845 315	Sept. 1830 1900 2200 2400	5*Con. 4.05 4.10 3.60 3.35	255 275 130 84

\*Daily mean computed from data in addition to figures shown.

(117) 09510080. West Fork Sycamore Creek near Sunflower, Ariz.

Location. --Lat 33°56'45", long 111°29'05", in SE<sup>1</sup>/<sub>4</sub> sec. 13, T. 7 N., R. 8 E., Maricopa County, 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. 
$$--9.8 \text{ mi}^2$$
 (25. 4 km<sup>2</sup>).

- <u>Gage-height record.</u>--Water-stage recorder graph except Sept. 6-10. 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 measurement of peak flow. Discharge for Sept. 6-10 estimated on basis of records at upstream station, field inspection, and normal recession.
- Maxima. --Sept. 4-10, 1970: Discharge, 3,480 ft<sup>3</sup>/s (98.6 m<sup>3</sup>/s) 1530 hours Sept. 5 (gage height, 9.50 ft or 2.896 m).

1961 to August 1970: Discharge, 698 ft $^3$ /s (19.8 m $^3$ /s) Dec. 22, 1965 (gage height, 6.75 ft or 2.057 m).

Day		Discharge	Day		Discharge	Day		Discharge
	4 5 6	0 257 50	Sept.	7 8	13 5.0		9 10	3.5 2.5

Mean discharge,	in cubic	feet p	er second	1970
mean discharge,	in cubic	reerp	er secona,	1010

Gage height, in feet, and discharge, in cu	ibic feet per second, at indicated time.	1970
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Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 2400	4	0.85	0	Sept. 1500	5*-Con. 2,60	110	Sept. 1900	5*-Con. 6.05	550
Sept.	5*			1530	9.50	3,480	2130	4.65	322
1000		1.14	.84	1600	8.00	1,430	2300	3.35	188
1200		1.52	8.5	1630	6.95	760	2400	2.80	133
1300		2.20	62	1700	8.35	1,780			
1400		1.99	40	1730	7.55	1,080			

\*Daily mean computed from data in addition to figures shown.

(118) 09510100. East Fork Sycamore Creek near Sunflower, Ariz.

Location. --Lat 33°56'58", long 111°27'39", in NE<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec. 18, T. 7 N., R. 9 E., Maricopa County, 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 mi<sup>2</sup> (11. 63 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph except Sept. 6-9. Altitude of gage is 4,140 ft (1,262 m), from topographic map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below 130 ft<sup>3</sup>/s (3. 7 m<sup>3</sup>/s) and extended above on basis of slope-area measurement of peak flow. Discharge Sept. 6-9 was estimated on the basis of slope-area measurement of peak flow, record of peak at nearby station, field inspection, and normal recession.

Maxima, --Sept. 4-10, 1970: Discharge, 1,940 ft<sup>3</sup>/s (54.9 m<sup>3</sup>/s) 1630 hours Sept. 5 (gage height, 9.50 ft or 2.896 m, from floodmarks).

1961 to August 1970: Discharge, 330 ft<sup>3</sup>/s (9.35 m<sup>3</sup>/s) Dec. 22, 1965 (gage height, 5.07 ft or 1.545 m).

#### East Fork Sycamore Creek near Sunflower, Ariz.-Continued

	mean dist	marge, meable	reet per secor	10, 1370	
Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6	120	Sept. 7 8		Sept. 9 10	

Mean discharge, in cubic feet per second, 1970

(119) 09510150. Sycamore Creek near Sunflower, Ariz.

Location. --Lat 33°51'05'', long 111°27'09'', in NE<sup>1</sup>/<sub>4</sub> sec. 20, T. 6 N., R. 9 E., Maricopa County, in Tonto National Forest, on right bank 1.1 mi (1.8 km) upstream from Boulder Creek, 1.2 mi (1.9 km) north of Crabtree Butte, and 1.2 mi (1.9 km) southeast of Sunflower.

Drainage area. --52. 3 mi<sup>2</sup> (135. 5 km<sup>2</sup>).

Gage-height record. --No gage-height record. Datum of gage is 3, 307.9 ft (1, 008.25 m) above mean sea level.

Discharge record. --Discharge estimated on basis of records at upstream stations, measurements, field estimates, and slope-area measurement of peak flow.

Maxima. --Sept. 4-10, 1970: Discharge, 16,100 ft<sup>3</sup>/s (456 m<sup>3</sup>/s) about 1630 hours Sept. 5 (gage height, 22.0 ft or 6.71 m, from profile past gage).

1961 to August 1970: Discharge, 7,650 ft<sup>3</sup>/s ( $217 \text{ m}^3$ /s) Dec. 19, 1967 (gage height, 8.61 ft or 2.624 m), from rating curve extended above 260 ft<sup>3</sup>/s (7.4 m<sup>3</sup>/s) on basis of slope-area measurements at 5.7 and 7.90 ft (1.74 and 2.408 m).

Mean discharge, in cubic feet per second, 1970

Day		Discharge		D	Discharge			Discharge	
Sept.	$     \begin{array}{c}       4 & \ldots & \vdots \\       5 & \ldots & \vdots \\       6 & \ldots & \vdots     \end{array} $	0.05 1,000 200	Sept. 7 8	••••	20 10	Sept.	9 0		

(120) 09510170. Camp Creek near Sunflower, Ariz. (Crest-stage station)

Location. --Lat 33°45'35'', long 111°29'44'', in SW<sup>1</sup>/<sub>4</sub> sec. 24, T. 5 N., R. 8 E., Maricopa County, 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<sup>2</sup> (6.7 km<sup>2</sup>).

Gage-height record. --Crest stages only. Datum of gage is 2, 186. 61 ft (666. 479 m) above mean sea level (Arizona State Highway levels).

Discharge record. --Stage-discharge relation defined by current-meter measurements and field estimates below 27 ft<sup>3</sup>/s (0. 76 m<sup>3</sup>/s) and above by computations of flow through culvert.

Maxima. --Sept. 4-10, 1970: Discharge, 136 ft<sup>3</sup>/s (3.85 m<sup>3</sup>/s) Sept. 5 (gage height, 2.55 ft or 0.777 m).

1963 to August 1970: Discharge, 391 ft $^3$ /s (11.1 m $^3$ /s) Aug. 16, 1963 (gage height, 4.96 ft or 1.512 m).

(121) 09510180. Rock Creek near Sunflower, Ariz.

Location. --Lat 33°43'49'', long 111°30'28'', in SE<sup>1</sup>/<sub>4</sub> sec. 35, T. 5 N., R. 8 E., Maricopa County, on left bank 300 ft (90 m) upstream from culvert on State Highway 87, 0.3 mi (0.5 km) upstream from mouth, and 10 mi (16 km) south of Sunflower.

Drainage area. --15.2 mi<sup>2</sup> (39.4 km<sup>2</sup>).

<u>Gage-height record.</u> --Digital recorder tape. Datum of gage is 2,051.59 ft (625.325 m) above mean sea level (Arizona State Highway Department bench mark).

Discharge record. --Stage-discharge relation defined by current-meter measurements below  $150 \text{ ft}^3/\text{s}$  (4.2 m<sup>3</sup>/s) and extended above on basis of slope-area measurements at gage heights 4.50, 5.40, and 6.80 ft (1.372, 1.646, and 2.073 m).

Maxima. --Sept. 4-10, 1970: Discharge, 1,540 ft<sup>3</sup>/s (43.6 m<sup>3</sup>/s) 1945 hours Sept. 5 (gage height, 6.35 ft or 1.935 m).

1963 to August 1970: Discharge, 1,900 ft<sup>3</sup>/s (53.8 m<sup>3</sup>/s) Dec. 22, 1965 (gage height, 6.80 ft or 2.073 m).

Day		Discharge	Day		Discharge	Day	Discharge
	4 5 6	0 149 75	Sept.	7 8		Sept. 9. 10.	

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 2400		2.17	0	Sept. 1900	5*—Con. 3.03	14.6	Sept. 2400	5*-Con. 4. 73	349
Sept. 1400	5*	2.18	0	1915 1930	5.01 5.98	507 1,250	Sept. 0400	6* 4.21	178
1600 1700		2.34 2.84	.01 5.3	1945 2000	6.35 6.24	1,540 1,450	0800	3.68 3.29	73.4 30.8
1715		2.04	41.8	2100	0.24 5.70	1,430	2400	3.25	21.4
1800		2.94	10.4	2200	5.26	682			

\*Daily means computed from data in addition to figures shown.

(122) 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, 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<sup>2</sup> (425 km<sup>2</sup>).

- Gage-height record. --No gage-height record. Datum of gage is 1, 759.17 ft (536.195 m) above mean sea level, datum of 1929.
- Discharge record. --Discharge estimated on basis of slope-area measurement of peak flow, relation of past peaks to daily discharges, records of upstream stations, and field estimates.
- $\frac{\text{Maxima. --Sept. 4-10, 1970: Discharge, 24,200 ft}^{3}/s (685 m^{3}/s) \text{ about 1800 hours Sept. 5}}{(\text{gage height, 19.7 ft or 6.00 m, from profile past gage).}}$

1959 to August 1970: Discharge, 15,800 ft<sup>3</sup>/s ( $447 \text{ m}^3$ /s) Dec. 25 or 26, 1959 (gage height, 15.0 ft or 4.57 m, from floodmarks), from rating curve extended above 3,600 ft<sup>3</sup>/s (100 m<sup>3</sup>/s) on basis of slope-area measurement of peak flow.

## Sycamore Creek near Fort McDowell, Ariz.-Continued

Day		Discharge	ischarge Day		Discharge			Discharge	
Sept.	4 5 6	0 2,000 700	Sept.	7 8			9 10		

Mean discharge, in cubic feet per second, 1970

(123) 09511300. Verde River near Scottsdale, Ariz.

Location. --Lat 33°34'52'', long 111°40'12'', in NE<sup>1</sup>/<sub>4</sub> sec. 30, T. 3 N., R. 7 E., Maricopa County, 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 mi<sup>2</sup> (17, 100 km<sup>2</sup>), approximately.

Gage-height record. --Digital recorder tape. Datum of gage is 1,351.35 ft (411.891 m) above mean sea level, datum of 1929.

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

Maxima. --Sept. 4-10, 1970: Discharge, 14,500 ft<sup>3</sup>/s (411 m<sup>3</sup>/s) 2230 hours Sept. 5 (gage height, 11.32 ft or 3.450 m).

1961 to August 1970: Discharge, 31,300 ft $^3$ /s (886 m $^3$ /s) Dec. 31, 1965 (gage height, 12.75 ft or 3.886 m).

Remarks. -- Flow regulated by Bartlett and Horseshoe Reservoirs (see station 09509500).

Day	1	Discharge	Day	]	Discharge		7	Discharge	
Sept.	4 5 6		Sept.	7 8	370 306	Sept.	9 10	166 91	

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of Verde River near Scottsdale, Ariz.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4*			Sept.	5*-Con.		Sept.	6*	
2400		1.95	133	2000	7.96	5,610	0200	5.84	3,010
Sept.	5*			2100	7,99	5,660	0600	3.97	1,270
0600		1.99	147	2200	10.45	10,500	1200	2.74	480
1200		2.06	174	2230	11.32	14,500	1800	2.68	450
1600		2.11	194	2300	11.07	13,100	2400	2.66	440
1800		6,73	4,020	2330	10.30	10,000			
1900		8.18	5,940	2400	9.06	7,370			

\*Daily means computed from data in addition to figures shown.

## FLOODS OF SEPT. 1970 IN ARIZ., UTAH, COLO., AND N. MEX.

(124) 09512100. Indian Bend Wash near Scottsdale, Ariz.

Location. --Lat 33°32'19", long 111°54'57", in SW<sup>1</sup><sub>4</sub>SE<sup>1</sup><sub>4</sub> sec. 2, T. 2 N., R. 4 E., Maricopa County, on upstream side of ford on Indian Bend Road, 3.5 mi (5.6 km) north of Scottsdale.

Drainage area.  $--142 \text{ mi}^2$  (368 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph. Datum of gage is 1,280.29 ft (390.232 m) above mean sea level.

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

Maxima. --Sept. 4-7, 1970: Discharge, 1, 120 ft<sup>3</sup>/s (31.7 m<sup>3</sup>/s) 2330 hours Sept. 5 (gage height, 2.35 ft or 0.716 m).

1961 to August 1970: Discharge, 2,000 ft $^3$ /s (56.6 m $^3$ /s) Dec. 19, 1967 (gage height, 3.12 ft or 0.951 m).

Day	Discharge	Day	Discharge	Day	Discharge	
Sept. 4 5	0 231	Sept. 6 .	252	Sept. 7	. 0	

Mean discharge,	in	cubic	feet r	per	second.	1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 2400	4		0	Sept. 1900	5*-Con. 2.05	830	Sept. 0330	6*Con. 1.95	670
Sept.	5*		Ū	2100	2.16	930	0530	1.65	440
1630			0	2200	2.15	920	0930	1,10	103
1640		1.00	135	2330	2.35	1,120	1200	. 78	18
1700		1.30	283	2400	2.33	1,100	1800	. 45	3.0
1730		1.60	470	Sept.	6*		2400	. 36	. 4
1830		1.92	726	0130	2.25	1,020			

\*Daily means computed from data in addition to figures shown.

(125) 09512150. Indian Bend Wash at Thomas Road, at Scottsdale, Ariz.

#### (Crest-stage station)

Location. --Lat 33°28'49", long 111°54'42", in SE<sup>1</sup>/<sub>4</sub> sec. 26, T. 2 N., R. 4 E., Maricopa County, on right bank on Thomas Road, 0.8 mi (1.3 km) east of Scottsdale Road and 1 mi (1.6 km) east of downtown Scottsdale.

Drainage area. --Undetermined.

Gage-height record. --Crest stages only. Altitude of gage is 1,225 ft (373 m), from topographic map.

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

Maxima. --Sept. 4-10, 1970: Discharge, 3,900 ft<sup>3</sup>/s (110 m<sup>3</sup>/s) Sept. 5 (gage height, 6,74 ft or 2.054 m).

1961 to August 1970: Discharge, 1,500 ft $^3$ /s (42.5 m $^3$ /s) Dec. 19, 1967 (gage height, 3.0 ft or 0.91 m).

## (126) Ash Creek at Interstate Highway 17 near Cordes Junction, Ariz.

#### (Miscellaneous site)

Location. --Lat 34°24'05'', long 112°04'25'', Yavapai County, 100 ft (30 m) downstream from Dugas Road at junction with Interstate Highway 17, 6 mi (10 km) upstream from mouth, and 6 mi (10 km) northeast of Cordes Junction.

Drainage area. --118  $mi^2$  (306  $km^2$ ).

Maximum. --Sept. 4-10, 1970: Discharge, 9,000 ft<sup>3</sup>/s (255 m<sup>3</sup>/s) Sept. 5, from slopearea measurement of peak flow.

(127) 09512500. Agua Fria River near Mayer, Ariz.

Location. --Lat 34°18'55'', long 112°03'48'', in NW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec. 20, T. 11 N., R. 3 E., Yavapai County, 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<sup>2</sup> (1, 523 km<sup>2</sup>).

- <u>Gage-height record.</u> --Water-stage recorder graph except Sept. 6-8. Gage-height record reconstructed on basis of adjoining good record, trend of recession, engineer's field notes, discharge measurements, and estimates of flow. Datum of gage is 3, 434 ft (1, 046.7 m)—levels by Maricopa County Municipal Water Conservation District No. 1.
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 1, 600 ft<sup>3</sup>/s (45 m<sup>3</sup>/s) and extended above on basis of slope-area measurement of peak flow.
- Maxima. --Sept. 4-10, 1970: Discharge, 19,800 ft<sup>3</sup>/s (561 m<sup>3</sup>/s) 1600 hours Sept. 5 (gage height, 14.90 ft or 4.542 m, from slope-area measurement).
   1940 to August 1970: Discharge, 13,000 ft<sup>3</sup>/s (368 m<sup>3</sup>/s) Mar. 1, 1941, from slope-area measurement; maximum gage height, 12.00 ft (3.658 m) Aug. 3, 1955.

Day Dis		Discharge	Discharge Day		Discharge		у	Discharge	
Sept.	4 5 6	2.6 5,240 294	Sept.	7 8	14 8. 0	Sept.	9 10	5. 1 3. 7	

Mean discharge, in cubic feet per second, 1970, of Agua Fria River near Mayer, Ariz.

Gage height, in feet,	and discharge,	in cubic feet	per second	, at indicated time, 1970
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Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 4			Sept.	5-Con.		Sept.	5—Con.	
2400	2.99	6	1100	10.65	9,700	2100	5.80	2,010
Sept. 5			1200	9.60	7,680	2200	5.20	1,370
0015	6.30	2,620	1400	8.00	5,040	2400	4.80	1,000
0100	5.00	1,180	1500	13.20	15,000	Sept.	6	
0600	4.08	447	1600	14.90	19,800	0200	4.38	656
0700	6.50	2,880	1630	13.80	16,500	0600	4,05	427
0730	6.20	2,490	1700	14.30	18,000	1200	3.70	207
0800	7.73	4,640	1800	11.00	10,400	2100	3.33	59
0900	5.90	2,130	1900	8.40	5,640	2400	3.24	30
1000	8.57	5,910	2000	6.80	3,290			

(128) 09512800. Agua Fria River near Rock Springs, Ariz.

Location. --Lat 34°00'50", long 112°10'15", in NW<sup>1</sup>/<sub>4</sub> sec. 28, T. 8 N., R. 2 E., Maricopa County, on left bank 10 mi (16 km) upstream from Lake Pleasant, 45 mi (72 km) north of Phoenix, and 2.5 mi (4.0 km) southwest of Rock Springs.

Drainage area. --1, 130 mi<sup>2</sup> (2, 930 km<sup>2</sup>), approximately.

Gage-height record. --Water-stage recorder graph except after 1830 hours Sept. 5, when the gage was destroyed.

Discharge record. --Discharge estimated on basis of current-meter measurements, slopearea measurement of peak flow, and comparison with upstream station.

 $\frac{\text{Maximum.}}{\text{Sept. 5}} - \text{Sept. 4-10, 1970: Discharge, 40,100 ft}^{3}/\text{s} (1,140 \text{ m}^{3}/\text{s}) \text{ about 1900 hours}}{\text{Sept. 5}}$ 

Remarks. -- Gage was installed January 1970.

Mean discharge, in cubic feet per second, 1970

Day		Discharge	Day		Discharge	Day		Discharge	
	4 5 6		Sept.	7 8	350 90	Sept. 9 10	 	50 20	

(129) 09513500. Lake Pleasant at Waddell Dam, Ariz.

 $\frac{\text{Location.} -\text{Lat } 33^{\circ}51'20'', \text{ long } 112^{\circ}15'58'', \text{ in } SW_4^{\frac{1}{4}} \text{ sec. 16, } T. 6 \text{ N., } R. 1 \text{ E., } Maricopa \\ \hline County, \text{ at left upstream end of Waddell Dam on Agua Fria River.}$ 

Drainage area. --1, 459 mi<sup>2</sup> (3, 779 km<sup>2</sup>).

- Gage-height record. --Nonrecording gage read once daily. Datum of gage is 1,432.2 ft (436.53 m) above mean sea level.
- Maxima. --Sept. 1-15, 1970: Contents, 80, 100 acre-ft (98.8 hm<sup>3</sup>) Sept. 10 (gage height, 143.04 ft or 43.599 m).

1928 to August 1970: Contents, 178, 500 acre-ft (220 hm<sup>3</sup>) Apr. 19, 1941.

Remarks. --Lake is formed by concrete multiple-arch dam; dam completed and storage began in 1927. Capacity, 157,600 acre-ft (194 hm<sup>3</sup>), of which 86,870 acre-ft (107 hm<sup>3</sup>) is at gage height 146.0 ft or 44.50 m (crest of spillway) and 70,730 acre-ft (87.2 hm<sup>3</sup>) between gage heights 146.0 ft or 44.50 m and 170.0 ft or 51.82 m (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 is not included.

<u>Cooperation</u>. --Gage-height record furnished by Maricopa County Municipal Water Conservation District No. 1.

Day	Contents	Day	Contents	Day	Contents
Sept. 1	56,980	Sept. 6	78,720	Sept. 11	80,080
2	56,620	7	79,700	12	80,050
3	56,240	8	79,9 <b>6</b> 0	13	80,030
4	5 <b>6,</b> 050	9	80,050	14	80,010
5	59,780	10	80,100	15	79,940

Contents, in acre-feet, at 1700 hours on indicated day, 1970

#### (130) 09513650. Agua Fria River at El Mirage, Ariz.

#### (Crest-stage station)

 $\frac{\text{Location.} --\text{Lat 33°36'24'', long 112°18'14'', in NW_4^1NW_4^1 sec. 18, T. 3 N., R. 1 E.,}{\text{Maricopa County, at Grand Avenue 0.75 mi (1.2 km) southeast of El Mirage.}}$ 

Drainage area. --1, 637 mi<sup>2</sup> (4, 240 km<sup>2</sup>), of which 1, 459 mi<sup>2</sup> (3, 779 km<sup>2</sup>) is above Lake Pleasant, which is noncontributing except during periods of spill from Waddell Dam.

Gage-height record. --Crest stages only. Datum of gage is 1,113.00 ft (339.242 m) above mean sea level (levels by Arizona Highway Department).

Discharge record. --Stage-discharge relation defined by current-meter measurements below 1, 540 ft<sup>3</sup>/s (43. 6 m<sup>3</sup>/s) and extended above by logarithmic plotting.

<u>Maxima</u>, --Sept. 4-10, 1970: Discharge, 5,000 ft<sup>3</sup>/s (142 m<sup>3</sup>/s) Sept. 5 (gage height, 4.60 ft or 1.402 m). 1963 to August 1970: Discharge, 2,520 ft<sup>3</sup>/s (71.4 m<sup>3</sup>/s) Dec. 19, 1967 (gage

1963 to August 1970: Discharge, 2,520 ft $^{\circ}$ /s (71.4 m $^{\circ}$ /s) Dec. 19, 1967 (gage height, 4.05 ft or 1.234 m).

(131) 09513780. New River near Rock Springs, Ariz.

Location. --Lat 33°58'27", long 112°05'54", in SW<sup>1</sup>/<sub>4</sub>Sec. 6, T. 7 N., R. 3 E., Maricopa County, on right bank 180 ft (55 m) upstream from road crossing and 6 mi (10 km) southeast of Rock Springs.

Drainage area. --67.3 mi<sup>2</sup> (174.3 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph except Sept. 6, 8-10. Gage-height record reconstructed from normal recession and adjoining record. Altitude of gage is 2,310 ft (704 m), from topographic map.

Discharge record. --Stage-discharge relation defined by current-meter measurements below  $380 \text{ ft}^{3}/\text{s}$  (11 m<sup>3</sup>/s) and extended above on basis of slope-area measurements at gage heights 3. 6, 4. 73, 7. 3, 10. 7, and 13. 5 ft (1. 10, 1. 442, 2. 23, 3. 26, and 4. 11 m).

Maxima. --Sept. 4-10, 1970: Discharge, 18,600 ft<sup>3</sup>/s (527 m<sup>3</sup>/s) 1600 hours Sept. 5 (gage height, 13.5 ft or 4.11 m, from profile past gage).

1962 to August 1970: Discharge, 10,600 ft<sup>3</sup>/s ( $300 \text{ m}^3$ /s) Dec. 19, 1967 (gage height, 8.3 ft or 2.53 m, in gage well; 10.7 ft or 3.26 m, from profile past gage), from rating curve extended above 380 ft<sup>3</sup>/s ( $11 \text{ m}^3$ /s) on basis of slope-area measurement of peak flow.

Day Discharge		Day	Discharge	Day	Discharge
Sept. 4 5 6	0.10 2,750 262	Sept. 7. 8.		Sept. 9 10	

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4			Sept.	5*-Con.		Sept.	5*-Con.	
2400		0.82	0	1030	3.70	800	1600	13.5	18,600
Sept.	5*			1200	5.69	2,370	1700	9.16	7,700
0530		. 82	0	1300	5.91	2,730	1830	8.41	6,500
0600		1.12	6	1330	6.41	3,410	2000	6.46	3,480
0700		1.03	5	1400	5.86	2,670	2200	5.20	1,940
0730		3.00	450	1500	8.28	6,290	2400	4.05	1,020

\*Daily mean computed from data in addition to figures shown.

#### (132) 09513800. New River at New River, Ariz.

Location. --Lat 33°54'29", long 112°08'37", in SE¼NW¼ sec. 34, T. 7 N., R. 2 E., Maricopa County, on right bank 0.3 mi (0.5 km) downstream from bridge on State Highway 69, 0.8 mi (1.3 km) southwest of village of New River, and 10 mi (16 km) south of Rock Springs.

Drainage area. --85.7 mi<sup>2</sup> (222.0 km<sup>2</sup>).

- <u>Gage-height record.</u> --Water-stage recorder graph except Sept. 6-10. Datum of gage is 1,973.16 ft (601.419 m) above mean sea level.
- Discharge record, --Stage-discharge relation defined by current-meter measurements below 1, 300 ft<sup>3</sup>/s (37 m<sup>3</sup>/s) and extended above 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). Discharge Sept. 6-10 was estimated on basis of hydrographic comparison with New River near Rock Springs and normal recession.
- <u>Maxima</u>. --Sept. 4-10, 1970: Discharge, 19,500 ft<sup>3</sup>/s ( $552 \text{ m}^3$ /s) 1700 hours Sept. 5 (gage height, 9.98 ft or 3.042 m).

1960 to August 1970: Discharge, 12,600 ft $^3$ /s (357 m $^3$ /s) Dec. 19, 1967 (gage height, 9.12 ft or 2.780 m).

Day	Discharge	Day	Discharge	Day	Discharge	
Sept. 4 5 6		Sept. 7 8		Sept. 9 10	10 5.0	

Mean discharge, in cubic feet per second, 1970

(133) 09513820. Deadman Wash near New River, Ariz.

(Crest-stage station)

Location. --Lat 33°50'30'', long 112°08'40'', in  $NW_4^1$  sec. 27, T. 6 N., R. 2 E., Maricopa County, at State Highway 69, 4.5 mi (7.2 km) south of New River.

Drainage area. --11.1 mi<sup>2</sup> (28.7 km<sup>2</sup>).

- Gage-height record. --Crest stages only. Datum of gage is 1, 720. 82 ft (524. 506 m) above mean sea level (levels by U.S. Coast and Geodetic Survey).
- Discharge record. --Stage-discharge relation defined by current-meter measurements below 60 ft<sup>3</sup>/s (1. 7 m<sup>3</sup>/s) and extended above on basis of slope-area measurements at gage heights 5, 58 and 5. 92 ft (1. 701 and 1. 804 m) and field estimates.
- <u>Maxima</u>. --Sept. 4-10, 1970: Discharge, 1, 630 ft<sup>3</sup>/s (46.2 m<sup>3</sup>/s) Sept. 5 (gage height,  $\frac{5.58}{5.58}$  ft or 1.701 m).

1959 to August 1970: Discharge, 1,850  $ft^3/s$  (52.4 m<sup>3</sup>/s) Dec. 25, 1959 (gage height, 7.0 ft or 2.13 m).

(134) 09513835. New River at Bell Road, near Peoria, Ariz.

Location. --Lat 33°38'18'', long 112°14'22'', in NE<sup>1</sup>/<sub>4</sub>NE<sup>1</sup>/<sub>4</sub> sec. 3, T. 3 N., R. 1 E., Maricopa County, 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.  $--187 \text{ mi}^2$  (484 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph except part of Sept. 5 and Sept. 6-7. Datum of gage is 1, 190. 00 ft (362, 712 m) above mean sea level.

#### New River at Bell Road, near Peoria, Ariz.-Continued

Discharge record. --Stage-discharge relation defined by current-meter measurements below 680 ft3/s (19 m<sup>3</sup>/s) and extended above on basis of slope-area measurement of peak flow. Discharge Sept. 5-7 was estimated on basis of normal recession and current-meter measurement.

Maxima. --Sept. 4-8, 1970: Discharge, 11,900 ft<sup>3</sup>/s (337 m<sup>3</sup>/s) 2200 hours Sept. 5 (gage height, 11.03 ft or 3.362 m).

1963, 1965 to August 1970: Discharge, 14,600 ft $^3$ /s (413 m $^3$ /s) Dec. 19, 1967 (gage height, 13.5 ft or 4.11 m).

Mean	discharge,	in	cubic	feet	per	second.	1970

Day	Discharge	Day	Discharge	Day	Discharge	
Sept. 4 5		Sept. 6 7	5.0	Sept. 8	. 0	

(135) 09513860. Skunk Creek near Phoenix, Ariz.

Location. --Lat 33°43'44", long 112°07'12", in SE<sup>1</sup>/<sub>4</sub> sec. 35, T. 5 N., R.2 E., Maricopa County, 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 mi<sup>2</sup> (167.3 km<sup>2</sup>).

Gage-height record. --Water-stage recorder graph except part of Sept. 6. Gage-height record reconstructed from normal recession and adjoining good record. Datum of gage is 1, 459, 95 ft (444, 993 m) above mean sea level.

Discharge record. -- Stage-discharge relation defined by current-meter measurements below 3, 600 ft<sup>3</sup>/s (100 m<sup>3</sup>/s), by slope-area measurement at gage height 11.7 ft (3.57 m), and extended above by logarithmic plotting.

Maxima. --Sept. 4-7, 1970: Discharge, 9,650 ft<sup>3</sup>/s (273 m<sup>3</sup>/s) 1900 hours Sept. 5 (gage height, 12.24 ft or 3.731 m).

1960 to August 1970: Discharge, 11,500 ft $^3$ /s (326 m $^3$ /s) Aug. 1, 1964 (gage height, 10.48 ft or 3.194 m).

Mean discharge, in cubic feet per second, 1970

Day	Discharge	Day	Discharge	Day		Discharge
Sept. 4 5		Sept. 6	115	Sept.	7	0

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970, of Skunk Creek near Phoenix, Ariz.

Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 2400	4		0	Sept. 1700	5—Con. 6, 80	104	Sept. 0100	6 8.65	730
Sept.	5			1730	10.50	3,580	0300	7.75	255
1130			0	1800	11.00	4,910	0600	6.85	53
1200		5.27	4.6	1830	12.24	9,650	0900	6.30	15
1300		5.75	16	2130	9.10	1,150	1200	5.87	2.7
1330		6.40	55	2300	10.10	2,700	1800		0
1500		5.88	22	2400	9.45	1,580			
1630		5.30	11						

(136) 09513910. New River near Glendale, Ariz.

Location. --Lat 33°32'12", long 112°16'52", in NE<sup>1</sup>/<sub>4</sub>NW<sup>1</sup>/<sub>4</sub> sec. 8, T. 2 N., R. 1 E., Maricopa County, on downstream side of bridge at Glendale Avenue, 2 mi (3 km) upstream from mouth, 4 mi (6 km) southwest of Peoria, and 6 mi (10 km) west of Glendale.

Drainage area. -- 323 mi<sup>2</sup> (837 km<sup>2</sup>).

- Gage-height record. --Water-stage recorder graph except 2100-2400 hours Sept. 5 and 1700 hours Sept. 6 to Sept. 9. Missing graph for Sept. 5, 6 reconstructed on basis of high-water mark in well, records at upstream stations, and normal recession. Datum of gage is 1,046.20 ft (318,882 m) above mean sea level.
- Discharge record, --Stage-discharge relation defined by current-meter measurements below 2, 100 ft<sup>3</sup>/s (59 m<sup>3</sup>/s) and extended above on basis of slope-area measurement of peak flow. Discharge for Sept. 7-9 estimated on basis of two current-meter measurements, an observation of no flow, and records of flow at upstream stations,
- $\frac{\text{Maxima. --Sept. 4-9, 1970: Discharge, 19,200 ft^3/s or 544 m^3/s (time unknown) Sept. 5}{(gage height, 9.1 ft or 2.77 m, in gage well).}$

1943 to August 1970: Discharge, 38,000 ft<sup>3</sup>/s (1,080 m<sup>3</sup>/s) August 1943 (gage height, unknown), from Corps of Engineers.

Day		Discharge	Day	I	Discharge	Day		Discharge
	4 5	0 2,300	Sept.	6 7	2,190 100	Sept.	8 9	10 0

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1970

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept. 4 2400 Sept. 5 1900 1910 1915 1930 2000 2100	0.15 .15 5.10 8.10 8.20 8.10 8.00	0 620 8,100 8,600 8,100 8,100	Sept. 2200 2300 2400 Sept. 0030 0100 0200 0300	5Con. 8.4 9.1 8.1 6 7.85 7.45 7.30 6.60	11,200 19,200 12,200 10,600 8,350 7,600 4,860	Sept. 0500 0700 1000 1200 1500 1600 2400	6-Con. 6.15 5.60 5.20 4.95 4.63 4.35 4.0	3,480 2,300 1,370 1,010 650 415 220

(137) 09513970. Agua Fria River at Avondale, Ariz.

- Location. --Lat 33°26'06'', long 112°19'59'', in NW<sup>1</sup>/<sub>4</sub> sec. 14, T. 1 N., R. 1 W., Maricopa County, 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 mi<sup>2</sup> (5,214 km<sup>2</sup>), of which 1,459 mi<sup>2</sup> (3,779 km<sup>2</sup>) above Lake Pleasant is noncontributing except during periods of spill from Waddell Dam. Floodwater from drainage area of 247 mi<sup>2</sup> (640 km<sup>2</sup>) above McMicken Dam may be diverted into Agua Fria River above station.
- Gage-height record. --Water-stage recorder graph except part of Sept. 7. Gage-height record reconstructed on the basis of normal recession. Datum of gage is 950.00 ft (289, 560 m) above mean sea level.
- $\frac{\text{Discharge record.} \text{Stage-discharge relation defined by current-meter measurements}}{\text{below 500 ft}^3/\text{s}} (14 \text{ m}^3/\text{s}) \text{ and extended above on basis of slope-area measurement}} of peak flow.}$
- Maxima. --Sept. 4-8, 1970: Discharge, 20,600 ft<sup>3</sup>/s (583 m<sup>3</sup>/s) 0130 hours Sept. 6 (gage height, 11.21 ft or 3.417 m). 1960 to August 1970: Discharge, 20,000 ft<sup>3</sup>/s (566 m<sup>3</sup>/s) Dec. 20, 1967 (gage
  - height, 12. 70 ft or 3. 871 m).

#### Agua Fria River at Avondale, Ariz.-Continued

charge	Dis	Day	Discharge	Ľ	Day	Discharge		Day
0	8	Sept.	-	6	Sept.	0	4	Sept.
		~~p.:	30	7		450	5	

Mean discharge, in cubic feet per second, 1970

Gage height, in feet, and discharge,	in cubic feet per second.	at indicated time.	1970
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Hour		Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Sept.	4				5—Con.		Sept.	6-Con.	
2400		5.70	0	2400	11.00	12,000	0600	8.72	3,000
Sept.	5			Sept.	6		1000	8.02	1,450
2000		5.70	0	0030	11.14	14,600	1800	7.53	676
2100		7.40	0	0130	11.21	20,600	2400	7.32	248
2145		7.45	0	0200	10.80	16,500	Sept.	7	
2200		8.75	690	0300	10.10	9,800	0600	7,00	0
2300		10.40	4,300	0400	9.50	6,200	2400	6.76	0

(138) 09515500. Hassayampa River at Box damsite, near Wickenburg, Ariz.

Location. --Lat 34°02'42'', long 112°42'23'', in SW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec. 7, T. 8 N., R. 4 W. (unsurveyed), Yavapai County, on right bank at Box damsite, 5.5 mi (8.8 km) northeast of Wickenburg.

Drainage area. --417 mi<sup>2</sup> (1,080 km<sup>2</sup>).

Gage-height record. --No gage-height record. Gage destroyed by flood. Datum of gage is 2,236.12 ft (681.569 m) above mean sea level, datum of 1929.

Discharge record. --Discharge estimated on basis of slope-area measurement of peak flow, observations of flow, weather records, and flow records at distant stations.

Maxima. --Sept. 4-10, 1970: Discharge, 58,000  $ft^3/s$  (1,640  $m^3/s$ ) about 1600 hours Sept. 5 (gage height, 34.6 ft or 10.55 m, from profile past gage).

1938 to August 1970: Discharge, 27,000  $ft^3/s$  (765  $m^3/s$ ) Aug. 29, 1951 (gage height, 18.3 ft or 5.58 m).

Day	Discharge	Day	Discharge	Day	Discharge
Sept. 4 5 6	1.5 5,000 200	Sept. 7 8		Sept. 9 10	

Mean discharge, in cubic feet per second, 1970

(139) 09515800. Hartman Wash near Wickenburg, Ariz.

(Crest-stage station)

Location. --Lat 33°57'46'', long 112°49'40'', in SE<sup>1</sup>/<sub>4</sub> sec. 12, T. 7 N., R. 6 W., Maricopa County, at U.S. Highway 60, 5.7 mi (9.2 km) west of Wickenburg.

Drainage area. -- 5. 57 mi<sup>2</sup> (14. 43 km<sup>2</sup>).

Gage-height record. --Crest stages only. Datum of gage is 2,490.00 ft (758.952 m) above mean sea level (levels by Arizona Highway Department).

Discharge record. --Stage-discharge relation defined by current-meter measurements below 4.7 ft (1, 43 m) and above by a theoretical rating based on flow through culvert.

Maxima. --Sept. 4-10, 1970: Discharge, 1,600 ft<sup>3</sup>/s (45.3 m<sup>3</sup>/s) Sept. 5 (gage height, 7.00 ft or 2.134 m, at gage; 6.13 ft or 1.868 m, from profile of high-water marks). 1963 to August 1970: Discharge, 2,600 ft<sup>3</sup>/s (73.6 m<sup>3</sup>/s) Aug. 14, 1967 (gage height, 8.05 ft or 2.454 m).

(140) 09516500. Hassayampa River near Morristown, Ariz.

(Gaging station, discontinued 1947; crest-stage station)

Location. --Lat 33°53'06", long 112°39'41", in SW<sup>1</sup>/<sub>4</sub>SE<sup>1</sup>/<sub>4</sub> sec. 3, T. 6 N., R. 4 W., Maricopa County, 3.0 mi (5.0 km) northwest of Morristown, and 7 mi (11 km) southeast of Wickenburg.

Drainage area. --774 mi<sup>2</sup> (2,005 km<sup>2</sup>).

- Gage-height record. --Crest stages only. Datum of gage is 1,831.16 ft (558.138 m) above mean sea level, datum of 1965.
- Discharge record. --Stage-discharge relation defined by rating based on estimated flow and slope-area measurements.
- Maxima. --Sept. 4-10, 1970: Discharge, 47, 500 ft<sup>3</sup>/s (1, 350 m<sup>3</sup>/s) Sept. 5 (gage height, 19.0 ft or 5.79 m, from high-water profile), from slope-area measurement of peak flow.

1939-47, 1954, 1956, 1964 to August 1970: Discharge, 9,280 ft<sup>3</sup>/s (263 m<sup>3</sup>/s) Sept. 3, 1965 (gage height, 11.6 ft or 3.54 m).

(141) 09517000. Hassayampa River near Arlington, Ariz.

#### (Crest-stage station)

- Location. --Lat 33°20'50'', long 112°43'30'', in  $NW_4^1$  sec. 13, T. 1 S., R. 5 W., Maricopa County, 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<sup>2</sup> (3, 807 km<sup>2</sup>).
- Gage-height record. --Crest-stages only. Datum of gage is 831.91 ft (253.566 m) above mean sea level (levels by Arizona Highway Department).
- Discharge record. --Stage-discharge relation poorly defined by current-meter measurements below 1, 700 ft<sup>3</sup>/s (48 m<sup>3</sup>/s) and extended above on basis of slope-area measurements.
- Maxima. --Sept. 4-10, 1970: Discharge, 39,000 ft<sup>3</sup>/s (1,100 m<sup>3</sup>/s) Sept. 5 (gage height, 8.40 ft or 2.560 m, high-water mark in gage well), from slope-area measurement of peak flow.

1961 to August 1970: Discharge, 6,500 ft $^3$ /s (184 m $^3$ /s) Aug. 14, 1964 (gage height, 6.05 ft or 1.844 m).

## **REFERENCES CITED**

- Attebery, J. E., 1971, Flood damage report, storm and flood of September 4-6, 1970: City of Phoenix Eng. Dept. Rept., 20 p.
- Follansbee, Robert, and Sawyer, L. R., 1948, Floods in Colorado: U.S. Geol. Survey Water-Supply Paper 997, 151 p.
- Green, C. R., and Sellers, W. D., eds., 1964, Arizona climate: Tucson, Arizona Univ. Press, 503 p.
- Kangieser, P. C., 1972. Unusually heavy 24-hour rainfall at Workman Creek 1. Arizona: Monthly Weather Rev., v. 100, no. 3, p. 206-207.
- Leopold, L. B., and Snyder, C. T., 1951, Alluvial fills near Gallup, New Mexico: U.S. Geol. Survey Water-Supply Paper 1110-A, 19 p.
- Newell, F. H., 1891, Hydrography of the arid regions: U.S. Geol. Survey 12th Ann. Rept., pt. 2, p. 213-361.

- Patterson, J. L., and Somers, W. P., 1966, Magnitude and frequency of floods in the United States-Part 9, Colorado River basin: U.S. Geol. Survey Water-Supply Paper 1683. 475 p.
- Thorud, D. B., and Ffolliott, P. F., 1973, A comprehensive analysis of a major storm and associated flooding in Arizona: Ariz. Univ., Agr. Expt. Sta. Tech. Bull. 202, 30 p.
- U.S. Army Corps of Engineers, 1970, Office report on the September 1970 floods, upper Colorado River basin, Four Corners area, Arizona, Colorado, New Mexico, Utah: U.S. Army Engineers District, Sacramento, 25 p.
- U.S. Environmental Data Service, 1970a, Climatological data, Arizona, September 1970: U.S. Dept. Commerce, v. 74, no. 9, p. 159-181.
  - \_\_\_\_\_1970b, Climatological data, Utah, September 1970: U.S. Dept. Commerce, v. 72, no. 9, p. 141-155.
    - 1970c, Climatological data, Colorado, September 1970: U.S. Dept. Commerce, v. 75, no. 9, p. 143-161.
    - \_\_\_\_\_1971a, Climatological data, Arizona, December 1970: U.S. Dept. Commerce, v. 74, no. 12, p. 215-233.
    - \_\_\_\_1971b, Hourly precipitation data, Arizona, September 1970: U.S. Dept. Commerce, v. 20, no. 9, 3 p.
- \_\_\_\_\_1971c, Hourly precipitation data, Colorado, September 1970: U.S. Dept. Commerce, v. 20, no. 9, 7 p.
- U.S. National Oceanic and Atmospheric Administration, 197., Arizona floods of September 5 and 6, 1970: U.S. Dept. Commerce Natural Disaster Survey Rept. 70-2, 39 p.
- U.S. Weather Bureau, 1967a, Arizona, 100-year 24-hour precipitation: U.S. Dept. Commerce map.

\_\_\_\_\_1967b, Colorado, 100-year 24-hour precipitation: U.S. Dept. Commerce map.

\_\_\_\_\_1968, Utah, 100-year 24-hour precipitation: U.S. Dept. Commerce map.

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