

Summary of Floods in the United States During 1958

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FLOODS OF 1958

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1660-B

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State, and local agencies*



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FLOODS OF 1958

SUMMARY OF FLOODS IN THE UNITED STATES DURING 1958

ABSTRACT

This report describes the most outstanding floods that occurred in the United States during 1958.

A series of storms from January 23 to February 16 brought large amounts of precipitation to northern California and produced damaging floods, particularly in the Lower Sacramento Valley where losses totaled about \$12 million.

Major floods, notable because of the large area affected, occurred on many small streams in central and south Texas, following heavy general rains in late February. Extensive flooding occurred along the Gulf Coastal plain on the lower reaches of the major streams from the Brazos River to the Nueces River. Two lives were lost, and property damage exceeded \$1 million.

Damaging floods of April 1-7 followed one of the wettest winters in California history. Swollen streams overflowed their banks throughout the central part of the State, and discharge peaks on many streams exceeded those of the floods of December 1955. Most severely flooded was the San Francisco Bay area. Total flood damage was estimated at \$23 million.

The storms and floods of April-May in Louisiana and adjacent States outranked all other floods in the United States during 1958 with respect to intensity of rain over a large area, number of streams having maximum discharge of record, rare occurrence of peaks, and great amount (\$21 million) of resultant damage.

Heavy rains on June 8-15 caused one of the greatest summer floods of record in central Indiana. Peak discharges were high and of rare occurrences. Failure of numerous levees along the Wabash River caused great damage. Crop damage alone was estimated at \$48 million.

Intense rains of July 1-2 caused record-breaking floods in southwestern Iowa. Rapid rises and the great magnitude of the floods on small streams resulted in 18 deaths and many injuries. Six towns and cities along the East Nishnabotna River and its tributaries were particularly hard hit; rural damage was also high. Total damage was estimated at \$15 million.

Heavy rains (as much as 40 inches during the last 2 weeks in September) from the middle of September to the middle of October caused destructive floods along the Rio Grande in Texas and Mexico. Many communities were isolated by the flood waters, and damage to crops was great.

In addition to the 7 floods mentioned above, 21 others of lesser magnitude are reported in this annual summary.

INTRODUCTION

The purpose of this summary chapter in the series "Floods of 1958" is to assemble information into a single volume relating to all known severe floods in the United States during 1958. The floods de-

scribed in this summary chapter were selected as unusual hydrologic events in which large areas were affected, great amounts of damage resulted, or extreme discharges or stages occurred.

The areas in the conterminous United States for which flood reports have been prepared for 1958 are shown in figure 1. The area covered by a special flood report is indicated by a solid pattern; those for the other areas reported on in this summary chapter are crosshatched. The months in which the floods occurred are shown, thereby giving the location and the time distribution of floods during the year.

Of the 28 flood reports given in this summary, 15 are, in whole or in part, for floods in the 2 months of July and September; 20 are, in whole or in part, for floods in the 4-month period, June–September; only 4 are for floods outside the 6-month period, April–September; and none are for floods in January, November, or December.

Most of the floods during the year were in the southeastern part of the Interior Plains and the western part of the Coastal Plains province. In general, the June and July floods were concentrated in the southern and eastern parts of the Interior Plains.

The severity and prevalence of floods depends not so much on the absolute values of contributing factors, but rather to the values of these factors as related to normal conditions.

When the locations of the floods of 1958 are compared to the annual precipitation pattern for 1958 (fig. 2), it shows that the locations in which the floods occurred do not necessarily correspond with the areas of high total annual precipitation. The areas with the highest annual precipitation (the western part of Washington and Oregon, with total precipitation at least as great as 80 inches, and the southeastern Coastal Plains province, with total precipitation at least as great as 64 inches) did not have significant floods during the year. A large number of the floods in the Interior Plains and the flood in central California were in areas where the annual precipitation ranged from 16 inches to 32 inches.

Figure 3 shows the 1958 annual precipitation in the conterminous United States as percentage of the normal annual precipitation. The lined areas on the map delineate those areas having more than 100 percent of the normal annual precipitation. When the locations of the 1958 floods are compared to this map, it shows that the major floods of the year occurred in areas where the 1958 annual precipitation was above normal, and also that the prevalence of the floods generally varied directly with the percentage by which the 1958 annual precipitation exceeded the normal annual precipitation.

Total loss from floods in the United States during 1958 was estimated by the U.S. Weather Bureau at about \$218 million and was the tenth greatest flood loss in 56 years of record. It was one-third less

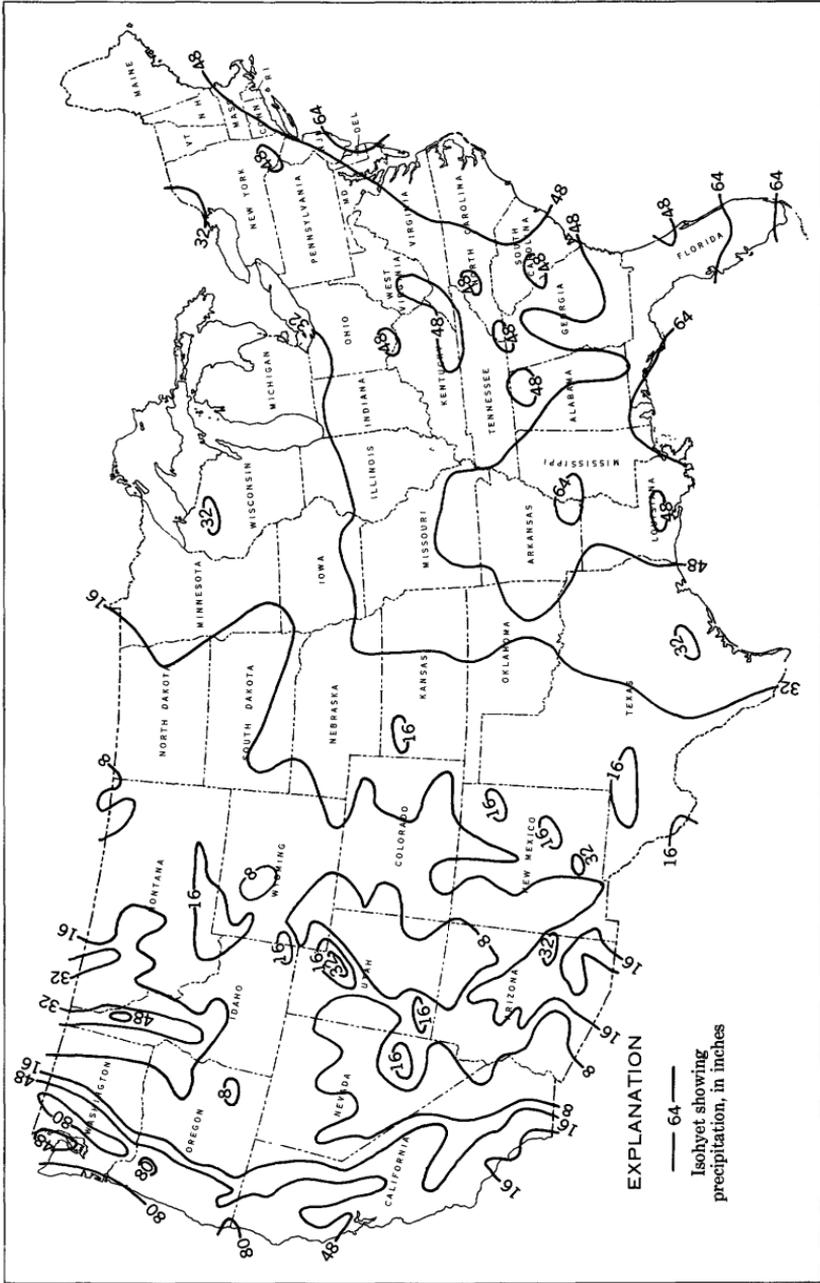


FIGURE 2.—Map of the conterminous United States showing total precipitation for the year 1958. From U.S. Weather Bureau.

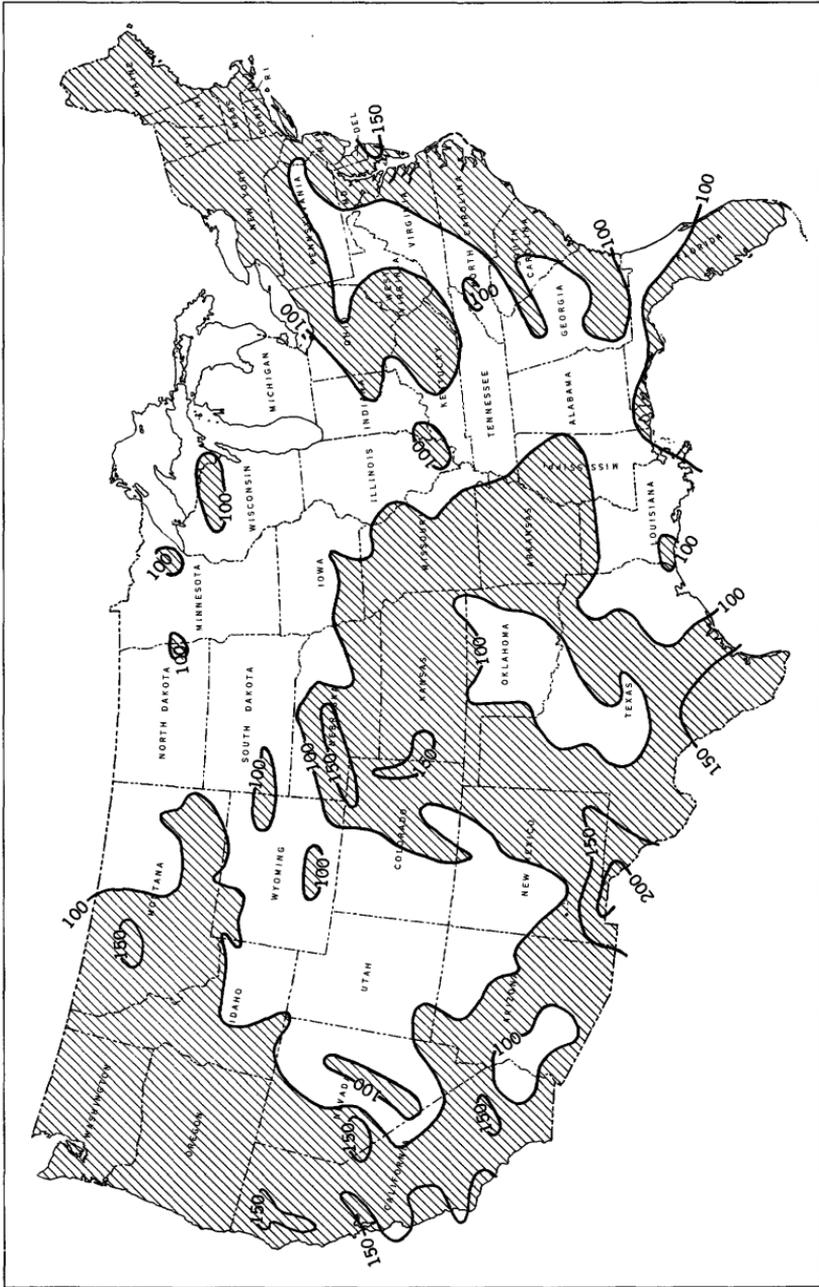


FIGURE 3.—Map of the conterminous United States showing annual precipitation in 1958 as percentage of the normal annual precipitation. Line pattern indicates areas of more than 100 percent. From U.S. Weather Bureau.

than the national annual average of \$350 million, based on the 10-year period 1949-58 (adjusted to the 1958 price index). The total loss of life due to floods during 1958 in the United States was 47, considerably less than the national annual average of 85 lives lost during the previous 34 years. Loss of life was 82 in 1957, 42 in 1956, and 302 in 1955.

The greatest damage to result from a single flood in 1958 was caused by the floods of June in the Wabash and White River basin in Indiana. The principal damage, that to crops of about \$48 million, was probably the greatest of all times in this section of the United States. The flood that caused the greatest loss of life during 1958 was the flash-flood on the East Nishnabotna River in Iowa that claimed 19 lives. This, the most tragic flood in Iowa history, resulted from a series of thunderstorms that dumped about 12 inches of rain in a 3-hour period.

The continuing investigation of surface-water resources in the areas covered by this report is performed by the Geological Survey in cooperation with State agencies, the U.S. Army Corps of Engineers, the Bureau of Reclamation, and other Federal or local agencies. Some data in this report were obtained from U.S. Weather Bureau publications.

Collection of data, computations, and some of the preparation of text were done in the district offices of the Surface Water Branch in whose district the floods occurred. Assistance in preparation of the data for the report was given by the Flood Specialists in their respective areas.

The report was assembled and prepared in the Floods Section, Tate Dalrymple, chief.

DETERMINATION OF FLOOD STAGES AND DISCHARGES

The data in this summary concerning peak stages and discharges at gaging stations and at miscellaneous sites are those which are obtained and compiled in the regular procedure of surface-water investigation by the Geological Survey.

The usual method of determining stream discharges at gaging stations is by the application of a stage-discharge relation to its associated stage. The relationship is usually defined by current-meter measurements through the maximum range of stage at a station. The peak discharge at a station may be above the range of the stage-discharge relation, to which short extensions may be made by logarithmic extrapolation, by velocity-area studies, or by use of other measurable hydraulic factors.

Peak discharge (at gaging stations) that are greatly above the range of the stage-discharge relation, and peak discharges at mis-

cellaneous sites, are generally determined by various methods of indirect measurement at the sites. A general description of these indirect methods is given in Water Supply Paper 888. Water-Supply Papers 773-E, 796-G, and 816 contain more detailed descriptions and illustrated examples.

During major floods, adverse conditions often make it impossible to obtain current-meter measurements at some sites. In these events peak discharges are measured by indirect methods based on detailed surveys of selected channel reaches.

EXPLANATION OF DATA

The floods described herein are given in chronological order. Because of the different characteristics of the floods, and because of the various amounts of information available, no consistent form is used in reporting each event.

The data include descriptions of the storm, the flood, and the flood damage; a map of the flood area showing the location of flood-determination points and, at times, the location of precipitation stations, or isohyets; rainfall data; and flood-peak stages and discharges of the streams affected.

In general, some rainfall amounts are included in the description of the flood. When considerable rainfall data are available, they are presented in tabular form and may show daily or storm totals. When sufficient data are available to determine the pattern and distribution of rainfall, an isohyetal map may be shown.

A tabular summary of peak stages and discharges is given for each flood unless the number of stations in the report is small, in which case the information is included in the text description.

In the summary table, the first column under maximum floods shows the period of known floods prior to the 1958 floods. This period does not necessarily correspond to that in which continuous records of discharge were obtained, but in many cases it extends back to an earlier date. More than one period of known floods are shown for some stations, because periods are shown whenever maximum stages can be associated with them, even though the corresponding discharge may not be known—a second period of known floods is then given in which maximums of both discharge and stage are known.

The second column under maximum floods shows the year, within the period of record, in which the maximum stage or discharge occurred. The third column gives the date of the maximum stage or discharge during the 1958 flood.

$Q_{2.33}$ in the last column refers to the theoretical flood that has a recurrence interval of 2.33 years and, by definition, is the graphical interpretation of the mean annual flood.

SUMMARY OF FLOODS OF 1958

FLOODS OF FEBRUARY 17 AND 25 IN SOUTHERN IDAHO

Localized flooding occurred in the widely scattered areas of Portneuf River, Goose Creek, and Weiser River basins (fig. 4) in February. A combination of moderately heavy rainfall on snow and of temperatures considerably above average for February produced the high flows.

Pine Creek, near Cambridge, reached a discharge on February 25 that was 65 percent greater than any other in more than 20 years. Streams adjacent to Pine Creek also flowed at high rates (table 1) owing to runoff from low and intermediate elevations. This was the third successive year in which peak discharges exceeded or approached the maximum of record in some part of the Weiser River basin.

The flood in Goose Creek has been exceeded only four times in 44 years of record.

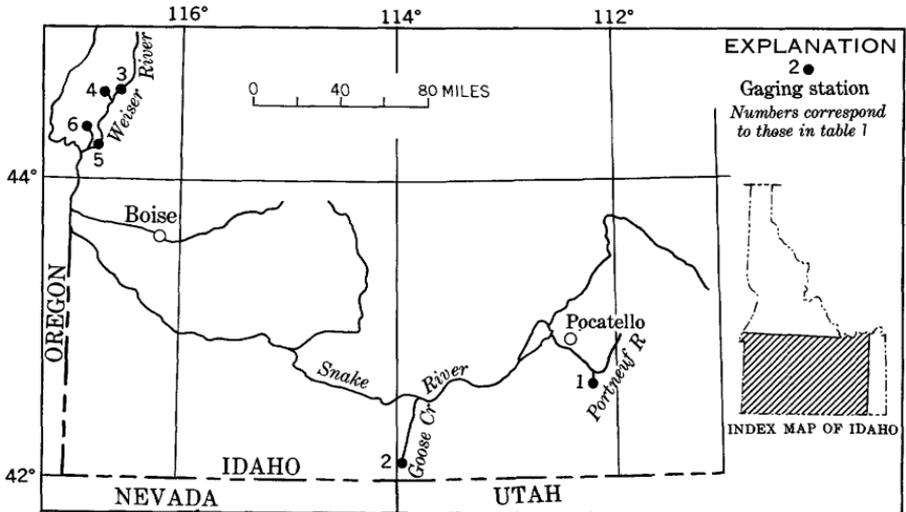


FIGURE 4.—Map of flood area showing location of flood-determination points. Floods of February 17 and 25 in southern Idaho.

TABLE 1.—Flood stages and discharges, Feb. 17 and 25, in southern Idaho

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to February 1958		February 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
PORTNEUF RIVER BASIN								
1	Marsh Creek near McCammon.	355	1954-58.....	1957	----- 25	5.53 6.72	282 342	4.2
GOOSE CREEK BASIN								
2	Goose Creek above Trapper Creek near Oakley.	633	1911-16, 1919-58...	1943	----- 17	7.6 4.87	1,670 557	2.2
WEISER RIVER BASIN								
3	Weiser River near Cambridge.	605	1939-58.....	1955	----- 25	9.36 4.17	10,100 7,260	1.7
4	Pine Creek near Cambridge.	54	1938-58.....	1957	----- 25	4.5 11.06	1,510 850	2.7
5	Weiser River near Weiser...	1,460	1890-91, 1894-1904, 1910-14, 1952-58.	1955	----- 25	10.36	17,300	1.9
6	Mann Creek near Weiser...	56	1911-13, 1920, 1937-58.	1940	----- 25	3.73	1,540 679	1.5

¹ May have been more in 1948 when gage was overtopped.

FLOODS OF FEBRUARY 19-27 IN NORTHERN CALIFORNIA

A series of cold-front storms from the North Pacific during January 23-February 16 brought large amounts of precipitation to northern California. Streams approached flood stages several times, runoff was sustained at high levels, and flood potential was exceptionally high.

Heavy rains occurred over the area on February 18-19 and on February 23-24. The latter storm was the more intense—many precipitation stations recorded maximum daily amounts ranging from 3 to 5 inches. The freezing level rose to about 8,000 feet, so most of the precipitation fell as rain. Precipitation during February 17-26 ranged from 6 to 15 inches over most of Northern California. (See figure 5.)

The most damaging floods were in the lower Sacramento Valley, where 387,000 acres of agricultural land was flooded, and some flooding occurred on practically all tributaries to the Sacramento River. Peak discharges at many selected gaging stations are given in table 2.

Rainfall was generally more intense on the northern and western parts of Sacramento Valley, and maximum discharges occurred on two western tributaries, Stony and Cache Creeks.

The Sacramento River Flood Control Project, a system of dams, levees, and floodways, operated efficiently during the flood. Shasta Reservoir, 10 miles upstream from Keswick, reduced the peak discharge near Red Bluff from an estimated natural flow of 193,000 cfs

to an actual flow of 130,000 cfs on February 25. Farther downstream, overflow occurred at all relief weirs, and floodways carried flows that otherwise would have caused greater damage in the valley.

A levee on Sacramento River at Wilson Landing broke and inundated one-half mile of State Highway 32 east of Hamilton City and flooded 8,700 acres of agricultural land. Another levee north of Tehama broke, and floodwater poured through Tehama and flooded

TABLE 2.—Flood stages and discharges, February 19–27, in northern California

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to February 1958		February 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
SACRAMENTO RIVER BASIN								
1	Sacramento River at Delta.	427	1944-58.....	1955	24	19.50 17.92	37,000 32,200	
2	Pit River near Montgomery Creek.	5,170	1944-58.....	1955	25	14.12 10.52	¹ 37,100 ¹ 23,000	
3	Sacramento River at Keswick.	6,710	1938-58.....	1940	21	47.2 31.55	¹ 186,000 ¹ 78,800	
4	Cottonwood Creek near Cottonwood.	945	1940-58.....	1941	19	15.4 15.2	52,300 48,600	
5	Battle Creek near Cottonwood.	362	1937.....	1937		15.8	35,000	
			1940-58.....	1942	24	11.85 10.27	12,800 8,430	
6	Sacramento River near Red Bluff.	9,300	1878-1958.....	1940	19	38.9 24.98	291,000 ¹ 139,000	
7	Stony Creek near Hamilton City.	764	1941-58.....	1941		(?)	¹ 37,500	
8	Butte Creek near Chico.....	148	1930-58.....	1955	25	18.31 13.35	¹ 39,900 18,700	
9	Sacramento River at Knights Landing.		1940-58.....	1942	24	9.52 40.87	9,140 ¹ 27,900	
10	Feather River at Bidwell Bar.	1,353	1862.....	1862	21	40.57 32.1	¹ 29,600 ² 1	
			1911-58.....	1955	24	25.50 16.88	104,000 39,300	
11	North Fork Feather River at Big Bar.	1,945	1911-58.....	1955	24	30.60 20.00	¹ 72,400 ¹ 34,000	
12	Feather River near Oroville.	3,611	1901-58.....	1907		(?)	230,000	
13	Yuba River at Englebright Dam.	1,104	1941-58.....	1955	24	57.15 17.73	¹ 102,000 ¹ 148,000	
14	Bear River near Wheatland.	295	1928-58.....	1955	25	(?) 19.30	¹ 50,900 ¹ 33,000	
15	Feather River at Nicolaus.		1921-58.....	1955	25	8.80	¹ 7,240	
						³ 51.60	357,000	
					26		⁴ 100,000	
16	Sacramento River at Verona.		1926-58.....	1940	26	46.13 41.20	79,000 ¹ 79,200	
17	Sacramento weir near Sacramento.		1926-58.....	1928	26	38.47	¹ 69,200	
18	Middle Fork American River near Auburn.	619	1911-58.....	1955	27		¹ 118,000	
19	American River at Fair Oaks.	1,889	1911-58.....	1955	25	33.9 18.92	¹ 3,630 79,000	
20	Sacramento River at Sacramento.		1904-58.....	1950	20	31.85 9.07	24,500 ¹ 19,300	
21	North Fork Cache Creek near Lower Lake.	198	1948-58.....	1950	27	30.14 27.21	¹ 104,000 ¹ 87,500	
22	Cache Creek near Capay.....	1,052	1930-58.....	1937	24	13.98 11.75	20,300 13,500	
			1942-58.....	1943	24	17.54	¹ 35,000	
23	Yolo bypass near Woodland.		1940-58.....	1942	24	20.90	¹ 51,600	
24	Putah Creek near Guenoc...	112	1904-06, 1930-58.....	1937	27	32.00 30.05	¹ 272,000 ¹ 180,000	
25	Putah Creek near Winters.	557	1930-58.....	1940	24	22.7 19.20	32,000 22,200	
					18	30.5 9.14	81,000 ¹ 1,240	

See footnotes at end of table.

TABLE 2.—Flood stages and discharges, February 19–27, in northern California—Continued

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods				Discharge	
			Prior to February 1958		February 1958 (day)	Gage height (ft)	Cfs	Ratio to Q _{2.33}
			Period	Year				
COASTAL BASINS								
26	Napa River near St. Helena.	81.3	1929–32, 1939–58	1955	24	15.17	12,600	-----
27	Russian River near Guerneville.	1,342	1939–58	1955	25	13.43	9,640	-----
28	Navarro River near Navarro.	304	1937	1937	-----	49.7	90,100	-----
			1950–58	1955	-----	42.95	68,700	-----
			-----	-----	-----	38.2	(²)	-----
29	Mattole River near Petrolia.	242	1911–13, 1950–58	1955	24	40.60	64,500	-----
			-----	-----	-----	34.61	34,100	-----
30	Eel River at Alderpoint.	2,079	1955–58	1955	24	29.60	90,400	-----
			-----	-----	-----	17.82	27,000	-----
31	South Fork Eel River near Miranda.	537	1940–58	1955	24	72.5	376,000	-----
32	Eel River at Scotia.	3,113	1910–58	1955	24	43.60	134,000	-----
			-----	-----	-----	42.7	173,000	-----
33	Van Duzen River near Bridgeville.	214	1950–58	1955	24	18.30	35,600	-----
			-----	-----	-----	61.90	541,000	-----
34	Mad River near Arcata.	485	1910–13, 1950–58	1955	25	40.35	202,000	-----
			-----	-----	-----	21.3	43,500	-----
35	Redwood Creek at Orick.	278	1911–13, 1953–58	1955	24	14.52	20,000	-----
			-----	-----	-----	27.30	77,800	-----
36	Klamath River below Fall Creek near Copco.	4,370	1923–58	1955	24	14.96	30,300	-----
			-----	-----	-----	23.95	50,000	-----
37	Shasta River near Yreka.	796	1933–41, 1944–58	1955	25	14.04	10,300	-----
			-----	-----	-----	8.15	¹ 12,000	-----
38	Scott River near Fort Jones.	662	1941–58	1955	25	7.15	¹ 9,280	-----
			-----	-----	-----	9.43	¹ 6,090	-----
39	Klamath River near Seiad Valley.	6,980	1912–25, 1951–58	1955	25	7.39	¹ 3,200	-----
			-----	-----	-----	21.40	38,500	-----
40	Salmon River at Somesbar.	746	1911–15, 1927–58	1955	25	13.43	14,000	-----
			-----	-----	-----	29.2	¹ 122,000	-----
41	Trinity River at Lewiston.	727	1911–58	1955	24	16.92	¹ 38,800	-----
			-----	-----	-----	28.80	84,000	-----
42	Trinity River near Hoopa.	2,846	1911–58	1955	24	12.48	23,900	-----
			-----	-----	-----	27.3	71,600	-----
43	Klamath River near Klamath.	12,100	1910–26, 1950–58	1955	24	20.56	37,500	-----
			-----	-----	-----	36.90	190,000	-----
			-----	-----	-----	19	125,000	-----
			-----	-----	-----	49.7	425,000	-----
			-----	-----	-----	33.80	236,000	-----

¹ Affected by storage and (or) diversion.² Not determined.³ Levee break downstream.⁴ Daily mean discharge.

about 2,800 acres of farm land.

Extensive flooding also occurred along the west-side tributaries to the Sacramento River.

Putah Creek was completely controlled by Monticello Dam (table 2)—no release was made from the reservoir, which received a peak inflow of 85,300 cfs.

In north coastal California the principal flooding was on the Eel, Russian, and Napa Rivers.

In the Eel River canyon, landslides along 100 miles of track of the Northwestern Pacific Railroad halted traffic for about a month. On the delta area of the Eel River, rich farm land, highways, and industrial sites were flooded.

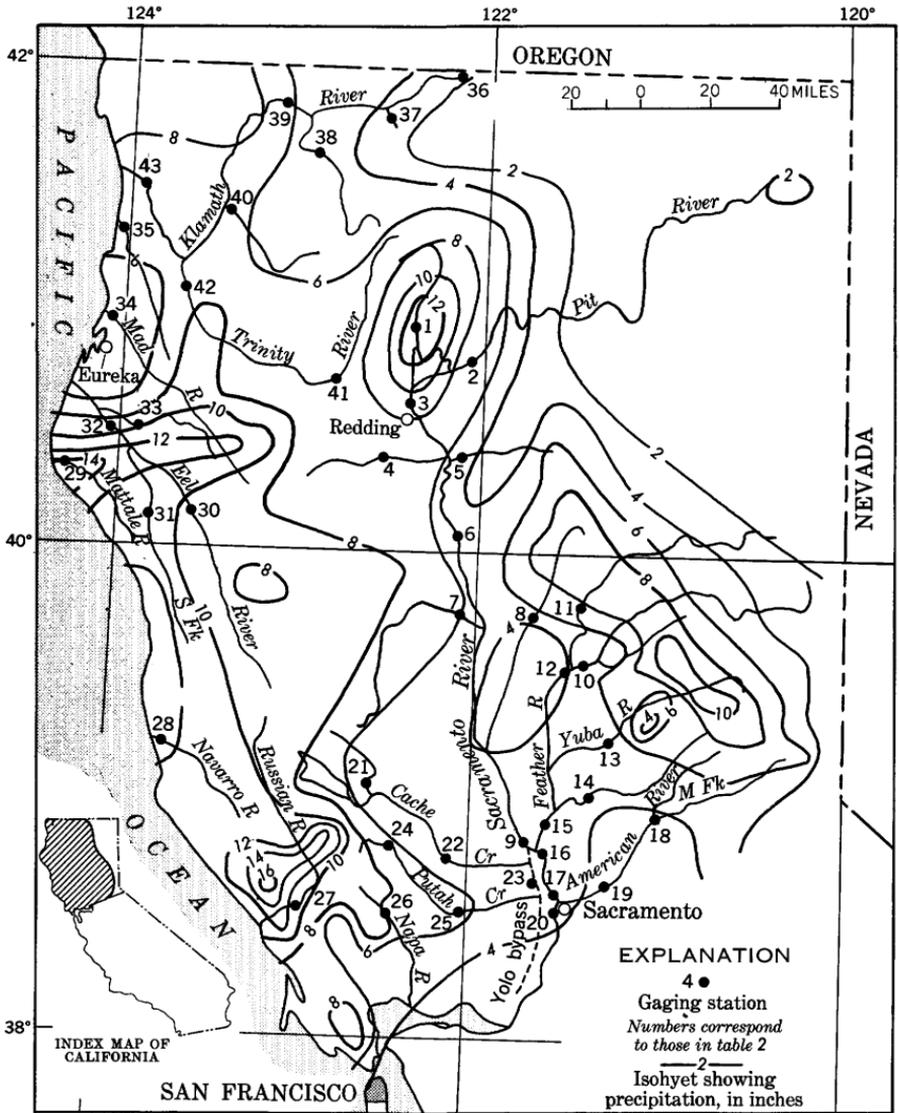


FIGURE 5.—Map of flood area showing location of flood-determination points and precipitation for February 17-26. Floods of February 19-27 in northern California.

Most of the damage along the Russian River occurred in the lower reaches, in the Guerneville-Rio Nido and Healdsburg areas. About 300 homes and business establishments were flooded, agricultural land suffered inundation damage, and considerable bank erosion occurred.

More than 6,500 acres of agricultural land in the Napa River basin was inundated, roads and bridges were damaged, and about 100 city blocks on the outskirts of Napa were flooded, causing the evacuation of many families.

Direct damage during the flood was estimated at \$12 million, of which about \$10 million was in the Sacramento River basin.

FLOODS OF FEBRUARY 21-26 IN SOUTH-CENTRAL TEXAS

Major floods on many small streams in central and south Texas resulted from heavy general rains on February 20-22. Extensive flooding occurred along the Gulf Coastal Plain on the lower reaches of the major streams from the Brazos River to the Nueces River (fig. 6). Two lives were lost; and damage to city, farm, and ranch property, and to roads, bridges and railroads was estimated by the U.S. Weather Bureau to have been more than \$1 million.

The floods were significant not because of outstanding peak discharges, but because of the large area involved. No peak flows were maximums; although at several gaging stations they were the greatest in more than 20 years.

In the Brazos River basin, up to 6 inches of rain fell on the basins of the Lampasas and San Gabriel Rivers and Brushy Creek, causing flash floods on these streams and on the Little River. Moderate flooding occurred on lowlands along the Brazos River below the mouth of Little River.

The isohyetal lines on figure 6 were drawn from U.S. Weather Bureau data.

In the Colorado River basin, flooding was generally confined to the narrow portion of the basin below Austin. Rainfall at and below Austin caused a rise above flood stage in the river from Smithville to the Gulf of Mexico. The peak discharge at Smithville of 104,000 cfs was the greatest since 1938, and that at Columbus of 77,900 cfs was the greatest since 1941. (See table 3.) During the flood period, no water was released from the reservoirs above Austin.

Only moderate floods occurred on the Lavaca and Navidad Rivers.

Major flooding occurred in the Guadalupe River basin downstream from New Braunfels. The peak stage at Victoria was the second highest since at least 1833, exceeded only by the tremendous flood of July 1936. Victoria was the only city in the basin in which flooding of any consequence was experienced. Approximately 26 blocks of the city was flooded, and the evacuation of about 350 persons was required. Two deaths were directly attributed to floods in the Guadalupe River, and both were caused when cars were swept off flooded roads.

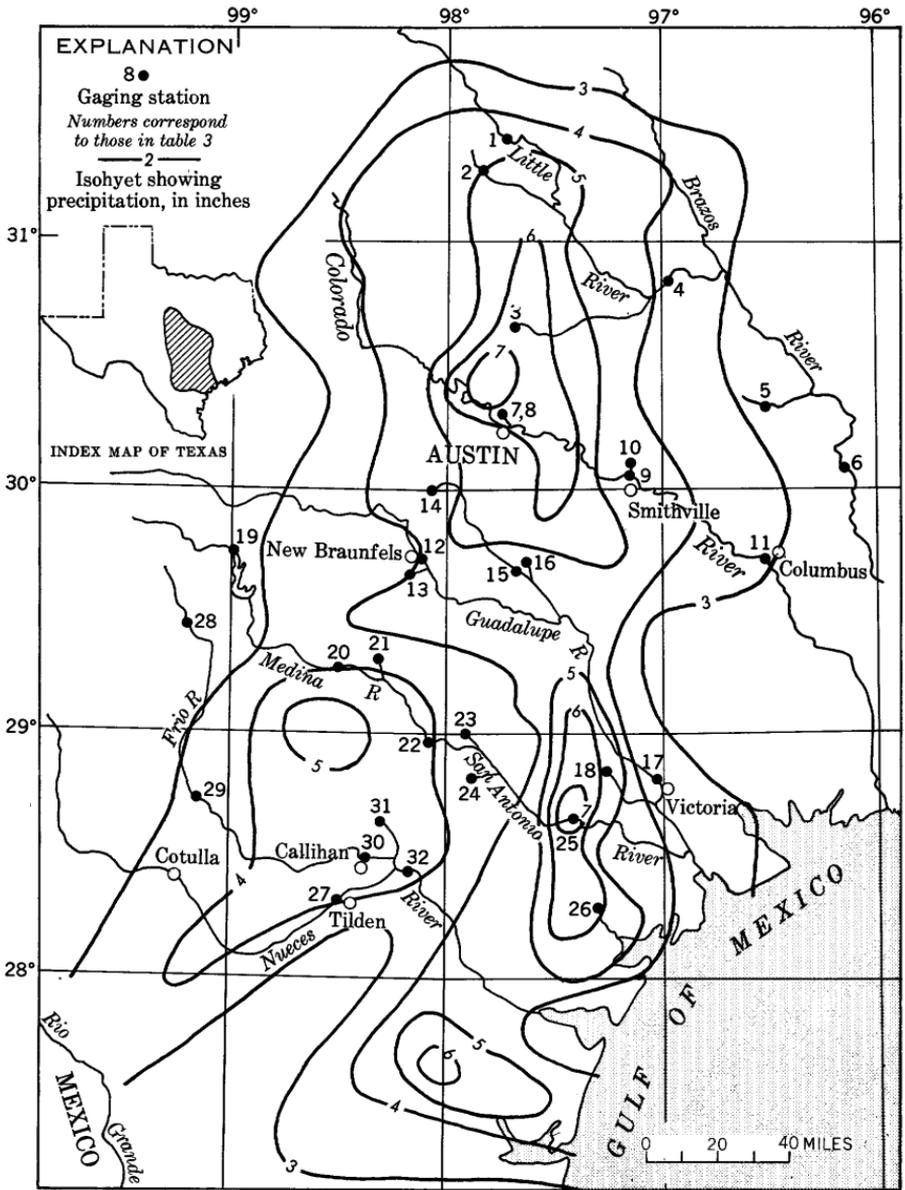


FIGURE 6.—Map of flood area showing location of flood-determination points and precipitation for February 20-22. Floods of February 21-26 in south-central Texas.

Flash flooding occurred on the upper Nueces River, and major flooding was experienced on the Nueces River and tributaries below Cotulla. While this flood did not exceed all-time records, it is classed as one of the largest floods in the basin. The peak discharge at the stream-gaging stations on the Nueces River near Tilden, and on the Frio River at Calliham, were the greatest since 1946; and on the Nueces River at Three Rivers the peak flow was the greatest since 1935.

TABLE 3.—Flood stages and discharges, February 21–26, in south-central Texas—Continued

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to February 1958		February 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
	GUADALUPE RIVER BASIN—continued							
24	Escondido Creek at Kenedy.	82.2	1887–1958..... 1954–58.....	1946 1955	----- ----- 22	24.2 19.82 16.30	(1) 3,370 1,060	----- ----- -----
25	San Antonio River at Goliad.	3,918	1924–29, 1939–58.....	1942	----- ----- 25	44.9 33,800 16,000	----- ----- -----	
	MISSION RIVER BASIN							
26	Mission River at Refugio...	643	1899–1958.....	1942	----- ----- 23	33.3 30.14	41,700 22,000	----- -----
	NUECES RIVER BASIN							
27	Nueces River near Tilden...	8,192	1902–58.....	1946	----- ----- 24	26.46 24.80 25.8	70,000 50,600 (1)	----- ----- -----
28	Hondo Creek near Hondo...	132	1910–58..... 1952–58.....	1919 1957	----- ----- 21	13.5 3.04 29.60	1,020 1,300 230,000	----- ----- -----
29	Frio River near Derby.....	3,493	1860–1958.....	1932	----- ----- 24	4.38 39.2 29.95	1,300 70,000 16,000	----- ----- -----
30	Frio River at Calliham.....	5,491	1870–1958.....	1932	----- ----- 23	39.2 29.95 38.3	70,000 16,000 39,300	----- ----- -----
31	Atascosa River at Whitsett.	1,171	1881–1958..... 1922–58.....	1919 1942	----- ----- 23	41 38.3 32.52	(1) 39,300 17,500	----- ----- -----
32	Nueces River near Three Rivers.	15,600	1875–1958.....	1919	----- ----- 25	46.0 85,000 42.99	85,000 56,500	----- -----

¹ Unknown.² Of which 9,240 sq mi is probably noncontributing.³ Of which 11,900 sq mi is probably noncontributing.⁴ At site 0.5 mile downstream.⁵ At site 0.7 mile downstream.⁶ Occurred prior to construction of Medina Dam in 1913.⁷ Backwater from San Antonio River.⁸ Floods of 1913 and 1935 reached about same stage as 1942 flood.

FLOODS OF MARCH 5 IN HONOLULU, HAWAII

The peak discharges of the floods of March 5 on the island of Oahu were not extremely high, but the rainfall of March 5-6 that produced them was of unusual nature. Total rainfall over the island during a 24-hour period beginning 8 a.m. March 5 was the maximum since 1905.

The southeast end of the island received the heaviest rainfall (fig. 7). The precipitation station at Lunalilo Home reported 24.00 inches of rainfall during the storm, of which 19.70 inches fell in 24 hours. The average annual rainfall at the station is 25.5 inches. (See table 4.)

Streamflow, although of flood proportion (table 5), was not particularly damaging. Damage was estimated by the Corps of Engineers

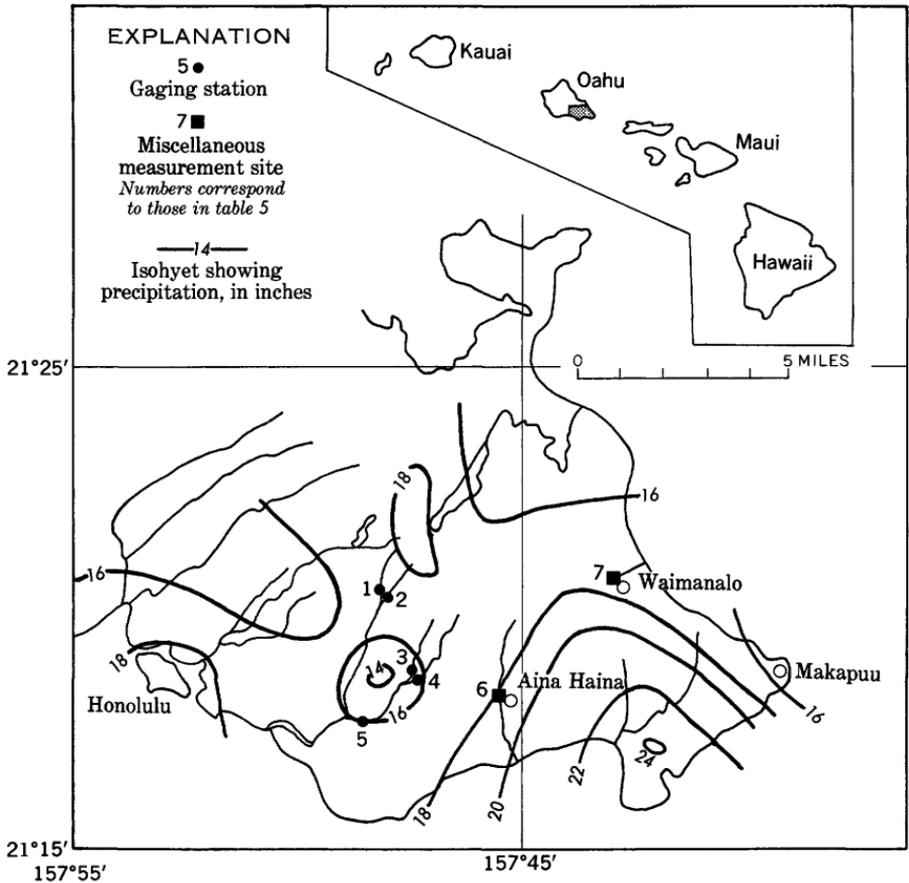


FIGURE 7.—Map of flood area showing location of flood-determination points and precipitation for March 5-6. Floods of March 5 in Honolulu, Hawaii.

TABLE 4.—*Rainfall, in inches, March 5-6 At U.S. Weather Bureau stations in southeast Oahu, Hawaii*

Station	8 a.m. March 5 to 8 a.m. March 6	March 5-6	Average annual
Waimanalo.....	13. 76	18. 63	43. 58
Makapuu.....	13. 30	15. 84	25
Aina Haina.....	12. 16	18. 27	25. 5
Lunailo Home.....	19. 70	24. 00	25. 5
Honolulu Airport.....	14. 55	17. 80	21. 70
Federal Building.....	17. 41	18. 15	23. 92

to have been \$400,000 in Honolulu and \$10,000 in rural Oahu, principally from mud flows and dislodged boulders which damaged lawns, retaining walls, paved areas, and public utilities. Many automobiles were damaged, and about 50 families were evacuated from an area that was inundated to a depth of 4 feet.

TABLE 5.—*Flood stages and discharges, March 5, in Honolulu, Hawaii*

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to March 1958		March 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{1.33}
MANOA STREAM BASIN								
1	East Branch Manoa Stream near Honolulu.	1. 06	1913-21, 1925-58..	1921	----- 5	10. 4 4. 67	3, 070 1, 010	----- -----
2	West Branch Manoa Stream near Honolulu.	1. 14	1913-21, 1925-58..	1921	----- 5	10. 4 4. 35	3, 250 743	----- -----
3	Pukele Stream near Honolulu.	1. 18	1912-13, 1926-58..	1930	----- 5	7. 75 5. 89	2, 600 1, 010	----- -----
4	Waiomao Stream above Pukele Stream near Honolulu.	1. 04	1911-12, 1926-58..	1933	----- 5	5. 43 5. 32	931 851	----- -----
5	Palolo Stream near Honolulu.	3. 63	1952-58.....	1954	----- 5	4. 52 5. 38	2, 410 3, 250	----- -----
6	Wailupe Stream at Aina Haina.	2. 35	-----	-----	----- 5	5. 87	1, 920	-----
7	Pacific Ocean tributary at Waimanalo.	1. 21	-----	-----	----- 5	4. 37	594	-----

FLOODS OF APRIL 1-7 IN CENTRAL CALIFORNIA

Unusual features of the April floods were the lateness in the season and the location so far south. Rain swollen streams overflowed throughout central California, and the peak of many of the small streams exceeded those of the floods of December 1955. High tides contributed to the high stages on many of the coastal streams. The low freezing level during the major storm period moderated runoff from high elevations.

A series of storms moved southeastward across California and caused almost continuous precipitation over most of the State from April 29 to May 7, with the greatest concentration in the central part of the State. Precipitation totals of more than 10 inches were not uncommon (fig. 8), and several stations recorded daily amounts of more than 5 inches.

The most intense rainfalls were associated with the frontal passage of April 2-3. In San Francisco, 0.96 inch of rain fell in an hour, the greatest hourly intensity recorded there since the maximum of 1.07 inches in 1912.

Temperatures were below normal, and heavy snowfall occurred in the Sierra above 4,000 feet, and in places as low as 1,500 feet, above mean sea level. The snow line remained at about 3,000 feet. Norden, at elevation 7,000 feet, received 10 feet of snow in 5 days and reported 270 inches of snow on the ground on April 4. This explains a peculiar relationship of runoff to precipitation during the storm in which the heaviest precipitation totals occurred outside the area of heaviest floods.

The storms of March 29-April 7 were preceded by one of the wettest winters in California history. Conditions were favorable for heavy runoff. Ground water and soil-moisture levels were high, storage reservoirs were nearly full, and streams were running high. By April 2, streams began to overflow their banks, and evacuation of homes began. About 5,000 persons in the San Francisco Bay area and 2,000 in the San Joaquin delta area near Stockton left their homes.

The areas most severely flooded were the San Francisco Bay area and the Carmel River area in Monterey County. In the town of Alviso, at the extreme southern end of San Francisco Bay, almost the entire population of 1,000 persons was evacuated when protecting levees were breached. The high stages on the Guadalupe River, in

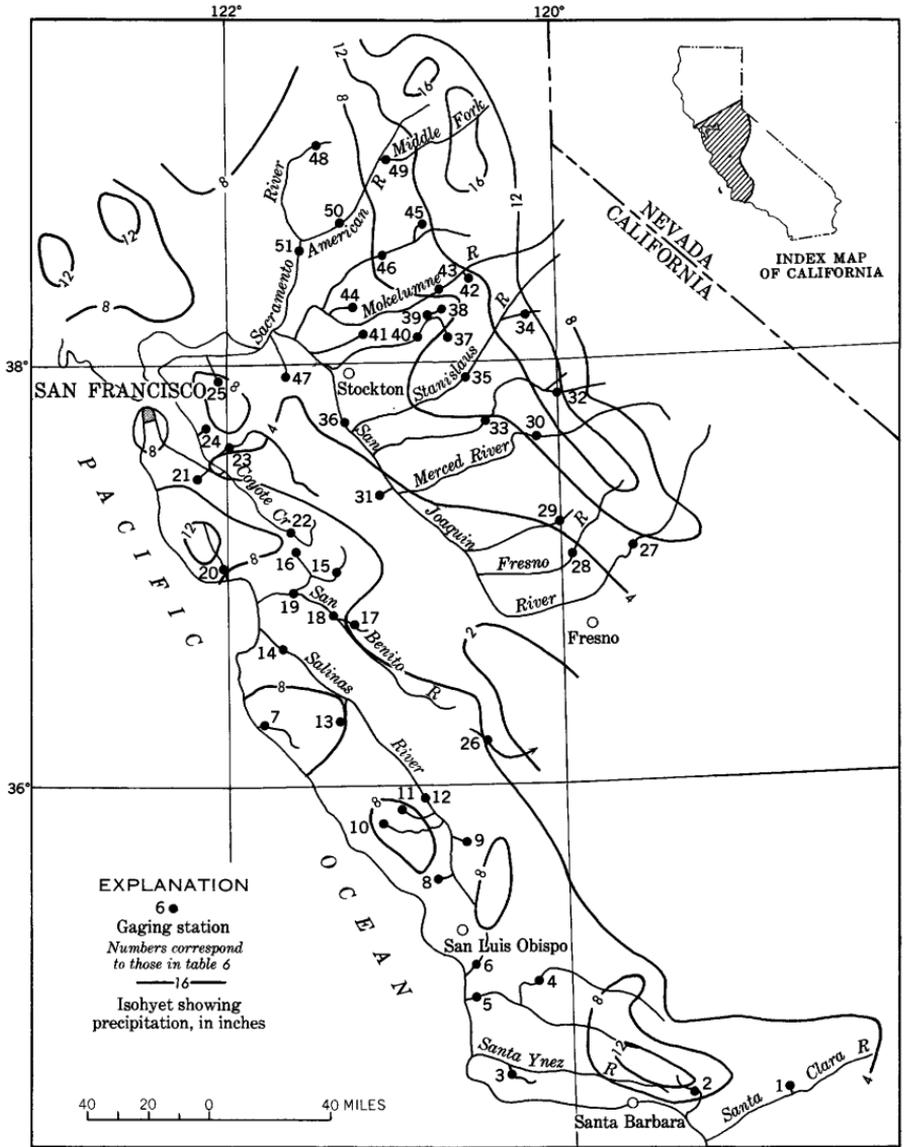


FIGURE 8.—Map of flood area showing location of flood-determination points and precipitation for March 29–April 7. Floods of April 1–7 in central California.

conjunction with high tides on San Francisco Bay, caused inundation of the town to a depth of more than 4 feet.

More than 100,000 acres of farmland was flooded in the San Joaquin Valley. The greatest damage occurred in the San Joaquin delta area near Stockton and in the urban area near Walnut Creek. Extensive flooding along the San Joaquin Valley resulted from breaks in the water-softened levees between Stockton and the mouth of the Merced River.

Hogan Reservoir on the Calaveras River near Stockton and Shasta Reservoir on the Sacramento River made maximum releases of record, and there was almost continuous flow over the Sacramento River by-pass weirs.

In southern California, streets were flooded in many low-lying areas, and highways were severely damaged. Overflow occurred on Santa Maria River and Carbon Canyon Creek, and the lower reaches of Mojave River had surface flow for the first time since 1943.

Total flood damage in the area was estimated at \$23 million, of which \$3 million was caused by streams around San Francisco Bay, \$5 million by coastal streams south of San Francisco Bay, and \$15 million by Central Valley streams, including Walnut Creek.

Peak discharges at selected gaging stations in the flood areas are shown in table 6.

TABLE 6.—Flood stages and discharges, April 1–7, in central California

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to April 1958		April 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
1	SANTA CLARA RIVER BASIN	254	1911–13, 1927–58	1938	3	16.15	56,000	
	Sespe Creek near Fillmore						28,400	
2	VENTURA RIVER BASIN	187	1911–14, 1929–58	1938	3	19.2 17.25	39,200	
	Ventura River near Ventura						18,700	
3	SANTA YNEZ RIVER BASIN	47.0	1941–58	1952	7	20.8 8.03	11,400	
	Salsipuedes Creek near Lompoc						2,820	
4	SANTA MARIA RIVER BASIN	912	1929–58	1938	4	16.6 7.70	17,300	
	Cuyama River near Santa Maria						7,200	
5	SANTA MARIA RIVER at Guadalupe	1,763	1941–58	1952	3	8.18 7.30	32,800	
							20,300	
6	ARROYO GRANDE BASIN	106	1939–58	1952	1	11.97 10.13	5,370	
	Arroyo Grande at Arroyo Grande						4,030	
7	SUR RIVER BASIN	46.9	1950–58	1950	2	(2) 11.56	7,000	
	Sur River at Big Sur						5,680	
8	SALINAS RIVER BASIN	25.4	1949–58	1956	3	9.56 8.00	5,040	
	Jack Creek near Templeton						2,900	
9		922	1954–58	1956	6	3.92 7.20	1,310	
	Estrella Creek near Estrella						8,850	
10		140	1955–58	1955	3	24.63 20.96	30,300	
	Nacimiento River near Bryson						23,100	
11		282	1922, 1929–58	1955	3	5.84 6.44	14,500	
	San Antonio River at Pleyto						19,100	
12		2,522	1948–58	1952	3	12.35 12.53	26,800	
	Salinas River near Bradley						28,400	

See footnotes at end of table.

TABLE 6.—Flood stages and discharges, April 1-7, in central California—Continued

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to February 1958		April 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
	SALINAS RIVER BASIN—CON.							
13	Arroyo Seco near Soledad...	241	1901-58.....	1955	-----	14.30	27,700	-----
					3	14.40	28,300	-----
14	Salinas River near Spreckels.	4,231	1900-01, 1929-58..	1938	-----	26.85	75,000	-----
				1952	-----	23.15	³ 35,600	-----
	PAJARO RIVER BASIN							
15	Pacheco Creek near Dunneville.	146	1940-58.....	1955	-----	18.6	³ 12,600	-----
					3	14.00	³ 7,700	-----
16	Llagas Creek near Morgan Hill.	19.6	1951-58.....	1952	-----	8.18	2,760	-----
					2	8.45	³ 3,190	-----
17	Tres Pinos Creek near Tres Pinos.	209	1938.....	1938	-----	9.0	(²)	-----
			1940-58.....	1941	-----	7.75	8,060	-----
					3	7.41	5,490	-----
18	San Benito River near Hollister.	586	1949-58.....	1955	-----	12.55	7,460	-----
19	Pajaro River at Chittenden.	1,188	1939-58.....	1955	-----	16.30	11,600	-----
					3	32.46	24,000	-----
						33.11	23,500	-----
	SAN LORENZO RIVER BASIN							
20	San Lorenzo River at Big Trees.	110	1937-58.....	1955	-----	22.55	30,400	-----
					2	17.76	17,200	-----
	SAN FRANCISQUITO CREEK BASIN							
21	San Francisquito Creek at Stanford University.	37.7	1931-41, 1950-58..	1955	-----	13.60	5,560	-----
					2	11.04	4,460	-----
	COYOTE CREEK BASIN							
22	Coyote Creek near Madrone.	194	1902-12, 1916-58..	1911	-----	(²)	25,000	-----
					3	9.65	³ 5,750	-----
	COOS CREEK BASIN							
23	Alameda Creek near Niles...	633	1916-58.....	1955	-----	14.9	³ 29,000	-----
					3	14.17	³ 25,500	-----
	SAN LORENZO CREEK BASIN							
24	San Lorenzo Creek at Hayward.	38.0	1940, 1946-58.....	1955	-----	20.82	4,790	-----
					2	17.45	5,100	-----
	PACHECO CREEK BASIN							
25	Walnut Creek at Walnut Creek.	78.1	1952-58.....	1955	-----	23.22	11,000	-----
					2	20.2	12,200	-----
	TULARE LAKE BASIN							
26	Los Gatos Creek above Nunez Canyon near Coalinga.	95.5	1949-58.....	1952	-----	3.70	1,250	-----
					3	6.51	2,560	-----

See footnotes at end of table.

TABLE 6.—Flood stages and discharges, April 1-7, in central California—Continued

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					Discharge	
			Prior to February 1958		April 1958 (day)	Gage height (ft)	Cfs	Ratio to Q _{2.33}	
			Period	Year					
SAN JOAQUIN RIVER BASIN									
27	San Joaquin River below Kerckhoff powerhouse.	1,480	1910-14, 1936-37, 1942-58.	1955	-----	51.0	³ 92,200	-----	
28	Fresno River near Daulton.	259	1941-58.	1955	3	24.35	³ 13,800	-----	
29	Chowchilla River at Buchanan dam site.	238	1921-23, 1930-58.	1955	3	11.64	17,500	-----	
30	Merced River at Bagby.	912	1922-58.	1955	3	9.18	10,400	-----	
31	Orestimba Creek near Newman.	135	1932-58.	1943	2	16.50	30,000	-----	
32	South Fork Tuolumne River near Oakland Recreation Camp.	87.6	1923-58.	1955	3	13.02	14,000	-----	
33	Tuolumne River above La Grange Dam, near La Grange.	1,540	1895-1958.	1950	6	26.80	92,500	-----	
34	Middle Fork Stanislaus River at Sand Bar Flat, near Avery.	318	1905-58.	1955	2	12.33	25,000	-----	
35	Stanislaus River below Melones powerhouse.	898	1931-58.	1955	3	5.95	6,450	-----	
36	San Joaquin River near Vernalis.	14,010	1922-58.	1950	5	6.57	10,200	-----	
37	South Fork Calaveras River near San Andreas.	118	1950-58.	1955	2	10.9	11,900	-----	
38	North Fork Calaveras River near San Andreas.	85.7	1950-58.	1955	2	7.10	2,380	-----	
39	Cosgrove Creek near Valley Springs.	20.6	1929-58.	1955	2	43.8	³ 61,000	-----	
40	Calaveras River at Jenny Lind.	395	1907-58.	1911	3	13.7	³ 7,790	-----	
41	Bear Creek near Lockeford.	48.4	1930-33, 1943-58.	1945	3	20.2	26,000	-----	
42	Middle Fork Mokelumne River at West Point.	67.2	1911-58.	1955	2	6.10	940	-----	
43	Mokelumne River near Mokelumne Hill.	538	1927-58.	1950	2	29.0	³ 62,800	-----	
44	Dry Creek near Galt.	325	1926-33, 1944-58.	1955	3	13.94	³ 13,400	-----	
45	North Fork Cosumnes River near El Dorado.	202	1911-41, 1948-58.	1955	3	27.75	³ 79,000	-----	
46	Cosumnes River at Michigan Bar.	537	1907-58.	1955	3	26.60	41,400	-----	
47	Marsh Creek near Byron.	42.5	1953-58.	1955	2	10.29	17,600	-----	
SACRAMENTO RIVER BASIN									
48	Bear River near Wheatland.	295	1928-58.	1955	2	8.79	12,000	-----	
49	Middle Fork American River near Auburn.	619	1911-58.	1955	2	12.52	6,230	-----	
50	American River at Fair Oaks.	1,889	1904-58.	1950	7	8.96	3,240	-----	
51	Sacramento River at Sacramento.	-----	1921, 1948-58.	1950	7	8.07	2,540	-----	
						21.0	50,000	-----	
						13.7	³ 12,200	-----	
						14.45	2,260	-----	
						15.13	2,930	-----	
						8.98	2,300	-----	
						6.13	1,720	-----	
						18.5	³ 33,700	-----	
						10.10	³ 9,400	-----	
						15.28	17,000	-----	
						14.8	15,800	-----	
						10.81	7,160	-----	
						14.59	42,000	-----	
						12.18	29,300	-----	
						12.98	3,800	-----	
						10.90	3,380	-----	
						19.30	³ 33,000	-----	
						12.93	³ 16,000	-----	
						33.9	79,000	-----	
						15.05	13,400	-----	
						31.85	180,000	-----	
						12.20	³ 36,200	-----	
						30.14	³ 104,000	-----	
						27.62	³ 88,900	-----	

¹ At site 200 ft upstream, at datum 1.31 ft higher.² Not determined.³ Affected by storage and (or) diversion.

FLOODS OF APRIL 23-26 IN NORTHERN MAINE

High flood discharges occurred April 23-26 in streams in the St. John River basin and, to a lesser degree, in the Penobscot River basin in northern Maine (fig. 9). These floods were the result of heavy general rains on April 22-23 (table 7), a considerable accumulation of snow in heavily wooded areas, and high temperatures (table 8).

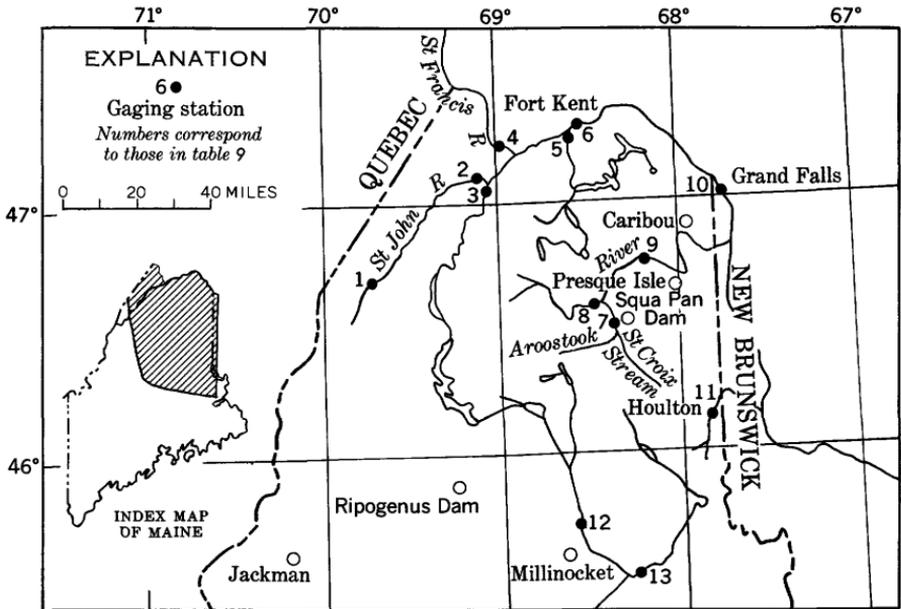


FIGURE 9.—Map of flood area showing location of flood-determination points. Floods of April 23-26 in northern Maine.

TABLE 7.—Rainfall, in inches, at precipitation stations, April 21-24, in northern Maine and New Brunswick

Location	April 21	April 22	April 23	April 24	Total
Fort Kent Maine.....	0.04	0.20	1.38	0.02	1.64
Grand Falls, N.B.....	.04	.16	1.58	.38	2.16
Caribou, Maine.....	.10	1.01	1.31	.01	2.43
Presque Isle, Maine.....	0	.53	.53	0	1.06
Squapan Dam, Maine.....	0	.66	1.01	.17	1.84
Houlton, Maine.....	0	1.35	.11	0	1.46
Ripogenus Dam, Maine.....	0	.35	.70	.07	1.12
Millinocket, Maine.....	.02	.03	1.28	.22	1.55
Jackman, Maine.....	0	.42	.51	.04	.97

TABLE 8.—*Maximum and minimum daily temperatures, in degrees Fahrenheit, April 20–26, in northern Maine and New Brunswick*

Location	April 20	April 21	April 22	April 23	April 24	April 25	April 26
Fort Kent, Maine:							
Maximum.....	60	50	69	53	60	66	55
Minimum.....	28	37	36	39	44	47	32
Grand Falls, N.B.:							
Maximum.....	51	65	48	58	62	55	41
Minimum.....	28	43	39	40	41	47	33
Caribou, Maine:							
Maximum.....	52	62	47	58	63	57	38
Minimum.....	31	41	38	45	47	36	32
Presque Isle, Maine:							
Maximum.....	53	65	61	59	64	61	44
Minimum.....	27	41	38	44	47	44	31
Squapan Dam, Maine:							
Maximum.....	54	63	55	57	63	57	41
Minimum.....	25	41	35	42	46	46	31
Houlton, Maine:							
Maximum.....	55	70	48	59	65	56	43
Minimum.....	29	42	42	44	49	40	32
Ripogenus Dam, Maine:							
Maximum.....	56	53	62	52	55	63	51
Minimum.....	22	44	40	42	39	43	34
Millinocket, Maine:							
Maximum.....	60	58	66	54	57	66	57
Minimum.....	28	38	31	42	47	48	34
Jackman, Maine:							
Maximum.....	54	53	50	48	61	52	41
Minimum.....	24	30	40	42	33	35	30

Peak discharges (table 9) were, in general, the greatest since 1933 in the St. John River basin, and that of one tributary, Fish River, exceeded the 1933 discharge by 9 percent.

At many points, maximum stage did not accompany maximum discharge, because maximum stages that occurred in some past floods were affected by ice jams.

The area of greatest flood intensity was largely uninhabited woodland. Damage was sustained principally in Fort Kent, where water was about 18 inches deep on some sections of the main business street. Highways and culverts were damaged throughout northern Maine, and minor flooding occurred in towns along the Aroostook River.

TABLE 9.—*Flood stages and discharges, Apr. 23–26, in northern Maine, and New Brunswick*

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to April 1958		April 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
ST. JOHN RIVER BASIN								
1	St. John River at Ninemile Bridge, Maine.	1,290	1950-58	1954 1957	----- ----- 25	9.81 14.26 10.97	27,800 ----- 34,200	-----
2	St. John River at Dickey, Maine.	2,700	1946-58	1947 1953	----- ----- 25	16.30 19.88 16.58	68,700 ----- 71,200	-----
3	Allagash River near Allagash, Maine.	1,250	1931-58	1933 1939	----- ----- 25	11.32 13.14 10.25	23,400 ----- 19,000	-----
4	St. Francis River at outlet of Glazier Lake near Connors, N.B. ²	520	1951-58	1955	----- ----- 26	11.53 13.21	8,770 10,800	-----
5	Fish River near Fort Kent, Maine.	871	1903-8, 1929-58	1933, 1947	----- ----- 26	10.50 10.81 25.1	11,000 12,000 121,000	-----
6	St. John River below Fish River, at Fort Kent, Maine.	5,690	1926-58	1933	----- ----- 26	25.1 24.55	118,000 -----	-----
7	Aroostook River near Marsdis, Maine.	888	1957-58	1957	----- ----- 25	16.44 16.30 11.94	----- 21,500 16,600	-----
8	Mac'ias River near Ashland, Maine.	330	1951-58	1954	----- ----- 25	7.75 13.80 15.78	8,180 37,800 -----	-----
9	Aroostook, River at Washburn, Maine.	1,652	1930-58	1936 1951	----- ----- 25	12.40 29.00 27.55	35,400 160,000 148,000	-----
10	St. John River at Grand Falls, N.B.	8,450	1930-58	1936	----- ----- 26	10.83 9.28 9.30	----- 6,590 6,620	-----
PENOBSCOT RIVER BASIN								
12	East Branch Penobscot River at Grindstone, Maine.	1,070	1902-58	1923	----- ----- 24	16.9 13.49	37,000 24,800	-----
13	Mattawamkeag River near Mattawamkeag, Maine.	1,418	1934-58	1936	----- ----- 26	15.34 13.90	29,200 25,400	-----

¹ Affected by backwater from ice.² Data from Canada Dept. of Northern Affairs and National Resources, Water Resources Div.³ Affected by dam failure.

FLOODS OF APRIL-MAY IN LOUISIANA AND ADJACENT STATES

Northern Louisiana and southern Arkansas received extremely heavy rains in late April and early May. The rains extended into southeastern Oklahoma, northeastern Texas, and west-central Mississippi and produced high stages on streams in these areas.

Rainfall in the region was far below normal in February, and from near normal to above normal during March. Storms on April 8-9, 13-14, and 19-20 brought light rains. Total antecedent rainfall was about normal through these periods.

The two periods of heaviest rainfall were April 24-26 and April 28-May 1. The greatest rainfall recorded during April 24 to May 1 was 19.58 inches at Haynesville, La. A 24-hour rainfall of 10.65 inches occurred at El Dorado, Ark., on April 26. The heaviest precipitation in each of the storms fell on a strip about 50 miles wide that extends from Mt. Pleasant, Texas, to the Mississippi River. (See figures 10 and 11.)

Smaller amounts of rain on May 9, 18-20, 25, and 27-28 had no effect on crest stages but they did prolong the flood period.

Although there were two distinct storm periods, they were so close together that the runoff pattern for most streams was similar to that for a single storm. Maximum discharges of record occurred on many large streams (table 10), as the second storm came while the streams were still rising from the first storm.

The extent of the flood area is shown in figure 10. Floods in the Sabine River basin and on most tributaries to the Red River in Texas were not outstanding except at a few places where maximum peak discharges occurred. The peak discharge on Boggy Creek at Daingerfield, Tex., was 28,900 cfs at a stage of 0.3 ft higher than any other known since 1900.

The 12-day increase in contents of Lake O' the Pines of 492,000 acre-feet, plus 70,000 acre-feet released from storage, exceeded the previous maximum 12-day runoff of 1945 by 142,000 acre-feet.

The maximum hourly rate of inflow to the reservoir was 83,900 cfs on April 29. The previous maximum (at the gaging station in operation at this location from 1924 until storage began in 1957) was 57,100 cfs in 1945, the greatest since 1853.

Lake Texoma, on the Red River, stored 336,000 acre-feet in the flood-control pool during May 2-7.

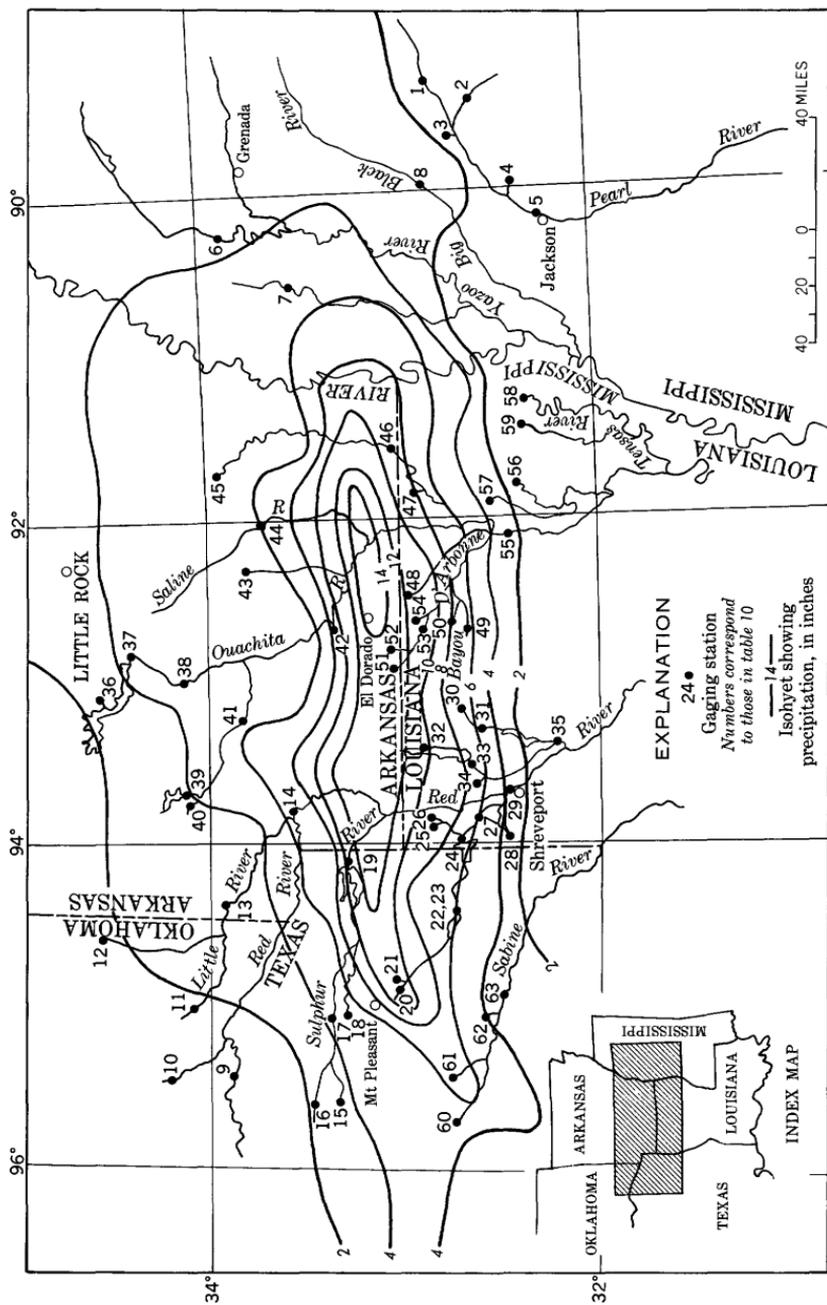


FIGURE 10.—Map of flood area showing location of flood-determination points and precipitation for April-May in Louisiana and adjacent States.

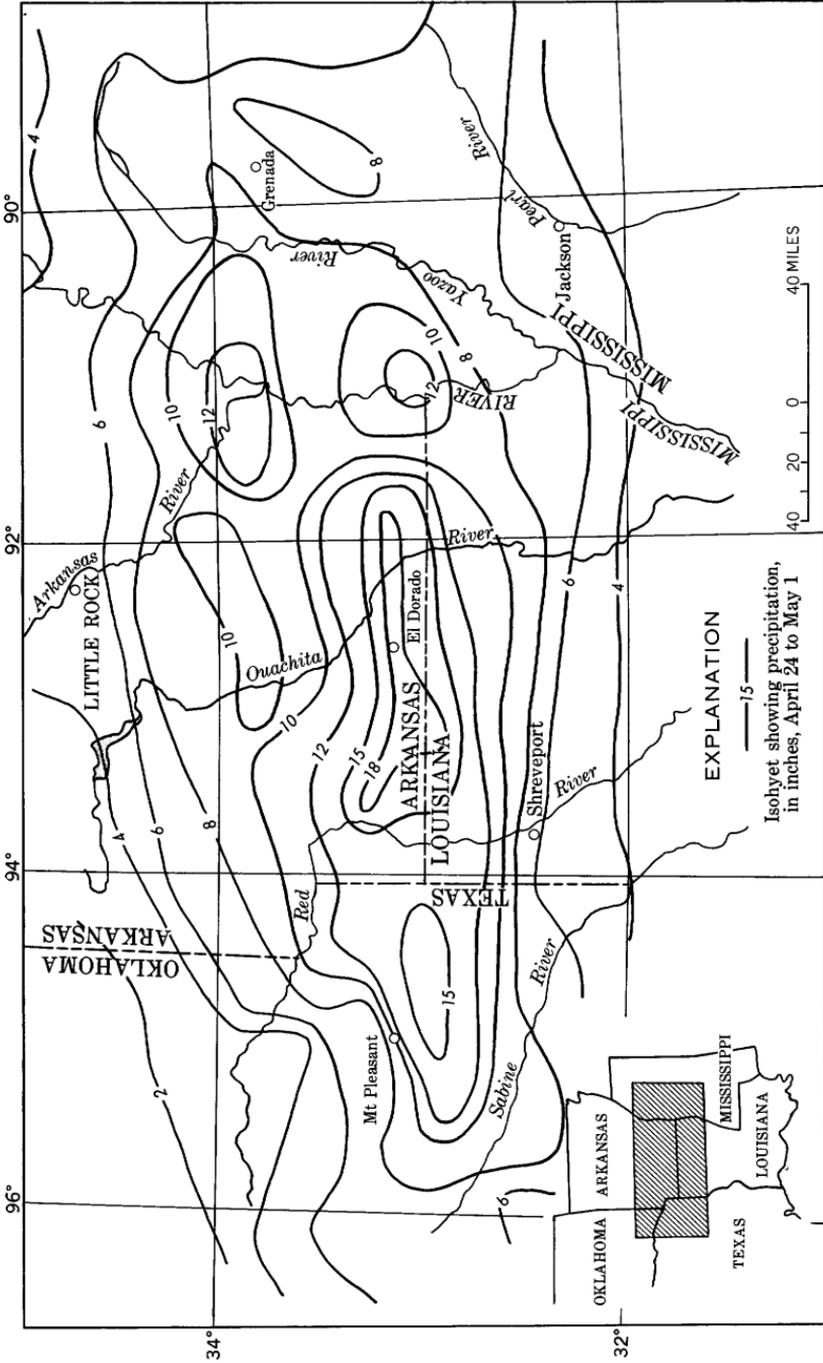


FIGURE 11.—Map of flood area showing precipitation for April 24-May 1. Floods of April-May 1. Floods of April-May 1. Floods of April-May 1.

TABLE 10.—Flood stages and discharges, April–May, in Louisiana and adjacent States—Continued

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to April 1958		April–May 1958	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
RED RIVER BASIN—con.								
22	Lake O' the Pines near Jefferson, Tex.	850			May 7	4239.71	515.8	
23	Cypress Creek near Jefferson, Tex.	850	1853–1958	1945		212.48	(⁶)	
			1924–58	1945	Apr. 29	212.48	57,100	
24	Caddo Lake near Mooringsport, La.	2,744	1921–58	1945	Apr. 29	201.30	5,190	0.5
25	Kelly Bayou near Houston, La.	116	1944–58	1945	May 5	181.8	745.5	
				1957		182.59	783.3	
						17.23	1,800	
					Apr. 28		4,460	2.6
26	Black Bayou near Gilliam, La.	364	1942–58	1945	Apr. 29	22.72		
				1947		25.73	8,200	
27	Twelvemile Bayou near Dixie, La.	3,137	1942–58	1945	Apr. 29	27.51	17,700	4.9
						35.65	34,900	
					May 5		38,400	2.7
					do	35.65		
28	Paw Paw Bayou near Greenwood, La.	78	1955–58	1957		11.24	3,750	
29	Red River at Shreveport, La.	60,613	1849	1849	Apr. 27	13.84	7,310	2.4
			1928–58	1945		45.9	(¹)	
				1945		38.4	303,000	
30	Flat Lick Bayou near Leton, La.	66.9	1956–58	1957	May 8	33.70	249,000	1.9
						9.92	2,340	
31	Bayou Dorcheat near Minden, La.	1,097	1928–31, 1936–58	1930	Apr. 26	12.95	10,200	5.1
						22.95	40,000	
32	Bodcau Bayou near Sarrepta, La.	546	1905	1905	May 1	24.90	44,800	3.7
			1938–58	1940		(⁶)	(¹)	
					May 2	22.16	12,600	
33	Bodcau Bayou Reservoir near Shreveport, La.	683	1949–58	1953	May 2	25.14	18,600	2.4
						187.01	157.2	
34	Cypress Bayou near Benton, La.	133	1956–58	1957	May 11	196.67	301.0	
35	Loggy Bayou near Ninoch, La.	2,628	1948–58	1953	Apr. 27	15.08	8,130	
				1957		15.18	8,350	2.7
						47.08	20,000	
					May 4		32,600	
36	Lake Ouachita near Hot Springs, Ark.	1,105	1952–58	1957	May 8	47.83		
						584.01	2,402.1	
37	Ouachita River near Malvern, Ark.	1,562	1903–5, 1922–58	1923	May 6	583.57	2,383.1	
						30.3	140,000	
38	Ouachita River at Arkadelphia, Ark.	2,311	1929–58	1945	May 2	21.16	55,200	
						30.3	170,000	
39	Lake Greason near Murfreesboro, Ark.	237	1949–58	1953	May 3	27.65	119,000	
					May 6	557.84	359.3	
40	Muddy Fork Creek near Murfreesboro, Ark.	121	1940–58	1945	May 2	29.7	359.1	
						26.28	47,100	
41	Little Missouri River near Boughton, Ark.	1,068	1937–58	1945	May 2	27.2	35,100	2.8
						24.22	111,000	
42	Smackover Creek near Smackover, Ark.	377	1938–58	1945	May 3	24.22	66,000	2.1
						19.8	16,500	
43	Moro Creek near Fordyce, Ark.	216	1938	1938	Apr. 27	21.21	25,000	4.1
			1951–58	1957		15.1	15,800	
						14.35	11,100	
44	Saline River near Rye, Ark.	2,062	1927	1927	May 2	16.47	26,800	4.2
			1937–58	1949		30.5	73,000	
						29.19	57,400	
45	Bayou Bartholomew near Star City, Ark.	215	1941–58	1953	May 3	30.31	70,500	2.0
						23.97	2,860	
46	Bayou Bartholomew at Wilmot, Ark.	1,170	1925–58	1932	May 2	26.29	4,000	2.4
						26.3	7,100	
47	Chemin a Haut Bayou near Beekman, La.	271	1955–58	1956	May 23	26.16	8,000	1.4
				1957			3,890	
						12.78		
					Apr. 26		29,500	
					Apr. 27	18.71		

See footnotes at end of table.

TABLE 10.—Flood stages and discharges, April–May, in Louisiana and adjacent States—Continued

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to April 1958		April–May 1958	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
RED RIVER BASIN—CON.								
48	Bayou de Loutre near Laran, La.	141	1956–58.....	1957	Apr. 27	11.10	2,700	7.0
49	Bayou D'Arbonne near Dubach, La.	355	1940–58.....	1945	Apr. 28	20.90	23,400	1.6
50	Middle Fork Bayou D'Arbonne near Bernice, La.	178	1940–58.....	1945	Apr. 27	11.45	10,500	7.4
51	Cornie Bayou near Three Creeks, Ark.	180	1956–58.....	1957	Apr. 27	12.00	6,400	9.5
52	Three Creek near Three Creeks, Ark.	46	1956–58.....	1957	Apr. 26	11 15.50	35,800	7.2
53	Corney Bayou near Lillie, La.	462	1940–58.....	1945	Apr. 27	11 9.35	11,300	6.6
54	Little Corney Bayou near Lillie, La.	208	1956–58.....	1957	Apr. 28	18.20	17,200	5.2
55	Ouachita River at Monroe, La.	15,298	1932–58.....	1932		9.19	4,660	
				1945		16.52	21,400	
						50.42	101,000	
					May 22		9 97,200	1.8
					May 23	50.45		
56	Boeuf River near Girard, La.	1,226	1927	1927		29.5	(1)	
			1938–58.....	1947		18.80	2,970	
					May 2		3,070	
57	Bayou LaFourche near Crew Lake, La.	361	1938–58.....	1955	May 6	19.31		
					May 2	25.28	20,800	
					May 6	27.50	26,800	
58	Tensas River at Tendal, La.	309	1927	1927		34.02	(1)	
			1935–58.....	1948			4,610	
				1948		24.78		
					May 1		3,900	
					May 2	23.07		
59	Bayou Macon near Delhi, La.	782	1882	1882		37.5	(1)	
			1935–58.....	1947			5,460	
				1953		25.58		
					May 1		4,760	1.1
					May 6, 7	26.00		
SABINE RIVER BASIN								
60	Sabine River near Emory, Tex.	965	1900–58.....	1943		25.7	(1)	
			1952–58.....	1957		25.06	74,000	
					Apr. 28	20.27	35,400	
61	Lake Fork, Sabine River, Quitman, Tex.	586	1895–1958.....	1945		29.85	(6)	
			1924–26, 1939–58.....	1945		29.85	75,600	
					Apr. 28	24.38	39,400	
62	Big Sandy Creek near Big Sandy, Tex.	236	1905–58.....	1945		24.1	(6)	
			1939–58.....	1945		24.1	38,000	
					Apr. 28	21.30	12,900	
63	Sabine River near Glade-water, Tex.	2,846	1914–58.....	1945		44.16	(6)	
			1932–58.....	1945		44.16	138,000	
					May 3	39.90	53,500	

¹ Not determined.² Observed.³ 5,936 sq mi above Denison Dam is noncontributing.⁴ Elevation in feet.⁵ Contents in thousands of acre-feet.⁶ Peak discharge of this flood not necessarily maximum of this period.⁷ Elevation, in ft, at site 1,500 ft upstream.⁸ May have reached 27 ft.⁹ Daily mean discharge.¹⁰ Regulated since 1925.¹¹ Maximum stage known since at least 1880.

Maximum floods occurred in the area north of Shreveport, La. The peak stage on Black Bayou near Gilliam, La., exceeded the previous maximum in 16 years of record by about 1.8 ft, and that on Bayou Dorcheat near Minden, La., exceeded the previous maximum in 25 years by almost 2 ft.

Regulation of Lake Ouachita reduced the maximum 24-hour inflow rate of 46,700 cfs to daily discharges of 55 cfs on May 2 and 25 cfs on May 3. Below the dam, the peak discharge at Malvern, Ark., was 55,200 cfs from 120 square miles, and that at Arkadelphia, Ark., was 119,000 cfs from 1,206 square miles.

The crest on Bayou de Loutre near DeLoutre, La., exceeded the previous maximum stage by almost 8 ft.

Stages on Cornie Bayou and Three Creek near Three Creeks, Ark., were the highest since 1880.

Four flood-control reservoirs—Sardis, Enid, Arkabutla, and Grenada—were instrumental in keeping stages and discharges in most of the Yazoo River basin well below previous maximums. Releases after April 26 were reduced to zero for 8 to 29 days until flood runoff in the lower reaches had subsided.

Extensive damage was wrought along the Red River and Ouachita River in Arkansas and Louisiana, in the Boeuf River-Tensas River basin in Louisiana, in the Sulphur River basin in Texas, and in the Yazoo and Big Black River basins in Mississippi. Three lives were lost in Louisiana.

Almost every highway in Louisiana north of U.S. Highway 80 and west of U.S. Highway 165 was closed at some point. Roads were overtopped by as much as 10 feet of water for distances of several thousand feet. Damage was estimated by the Louisiana Department of Highways to be \$92,000.

Agricultural damage was high also. Lowlands were under water for several days, and much newly plowed land was seriously eroded. The U.S. Army Corps of Engineers estimated that almost 2½ million acres of land was flooded in the Ouachita River basin.

Table 11, as adapted from Weather Bureau data, shows the great amount of damage inflicted by the floods.

The recurrence intervals, in years, of the peak discharges at the selected gaging stations listed in table 12 shows that they were of rare occurrence.

TABLE 11.—*Flood damage, in dollars, by basins, floods of April-May in Louisiana and adjacent States*

Ouachita River and tributaries (southern Arkansas).....	\$2, 080, 000
Black and Ouachita Rivers and Red River below Alexandria (Louisiana).....	2, 950, 000
Little Sulphur and Sabine Rivers, Cypress Creek and Red River above Alexandria, La. (Arkansas, Texas, and Louisiana).....	8, 380, 000
Pearl River basin (Mississippi).....	1, 590, 000
Big Sunflower River and tributaries (Mississippi).....	3, 950, 000
Yazoo and Big Black River basins (Mississippi).....	2, 190, 000
Total	\$21, 140, 000

TABLE 12.—*Outstanding flood discharges, April-May, in Louisiana and adjacent States*

Stream and location	Recurrence interval (years)
Boggy Creek near Daingerfield, Tex.....	>> 50
Kelly Bayou near Hosston, La.....	25
Black Bayou near Gilliam, La.....	>> 50
Twelvemile Bayou near Dixie, La.....	31
Muddy Fork Creek near Murfreesboro, Ark.....	>> 50
Antoine Creek at Antoine, Ark.....	34
Moro Creek near Fordyce, Ark.....	>> 50
Sabine River near Rye, Ark.....	23

This flood is described in more detail in Water-Supply Paper 1660-A, "Floods of April-May [1958] in Louisiana and Adjacent States."

FLOODS OF MAY-JUNE IN SOUTH-CENTRAL IDAHO

Flooding occurred in several river basins in south-central Idaho (fig. 12) during May and June. Water content in the accumulated snow was far above average on May 1 as a result of cool weather and heavy precipitation in April. Many snow courses at high elevations showed larger water contents on May 1 than on April 1, which is unusual for most snowfields in Idaho. Precipitation in May was below normal, but temperatures, particularly for the last half of the month, were far above normal and thereby accelerated the rate of snowmelt. Streams on which discharges exceeded previous maximum peaks include Big Lost River near Arco, Warm Springs Creek near Ketchum, and Big Wood River and Slough combination at Hailey. The peaks on several other streams were near the highest of record, as shown in table 13. Of greater interest than record-breaking peak discharges were the exceptionally large volumes of runoff in the flooding basins. Monthly mean discharges for May 1958 were the maximum of any month during the periods of record at Big Wood River near Ketchum, Warm Springs Creek near Ketchum, Big Wood River and Slough

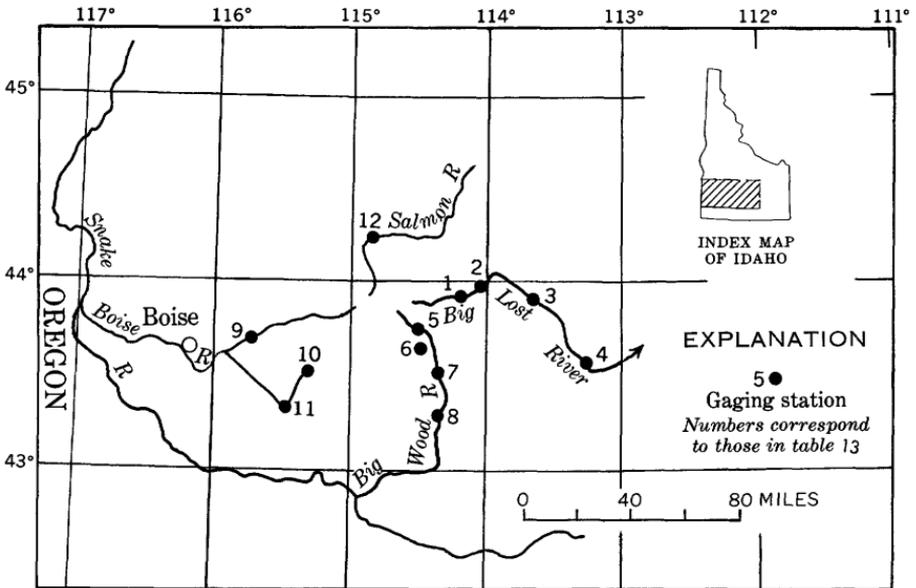


FIGURE 12.—Map of flood area showing location of flood-determination points. Floods of May-June in south-central Idaho.

TABLE 13.—*Flood stages and discharges, May-June, in south-central Idaho*

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to May 1958		May-June 1958	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
MUD LAKE-LOST RIVER BASINS								
1	Big Lost River at Wild Horse near Chilly.	114	1944-58.....	1956	----- May 22	6.18 5.84	1,270 1,200	----- 2.0
2	Big Lost River at Howell Ranch, near Chilly.	450	1904-14, 1920-58..	1954	----- May 24	6.00 5.36	3,960 3,280	----- 1.6
3	Big Lost River below Mackay Reservoir near Mackay.	813	1903-6, 1912-15, 1919-58.	1921	----- May 26	5.79 5.65	2,990 2,520	----- -----
4	Big Lost River near Arco...	1,410	1946-58.....	1956	----- June 1	6.32 6.59	1,050 1,190	----- -----
BIG WOOD RIVER BASIN								
5	Big Wood River near Ketchum.	137	1948-58.....	1956	----- May 21	6.44 6.08	1,620 1,540	----- 1.6
6	Warm Springs Creek near Ketchum.	96	1940-58.....	1956	----- May 21	4.02 4.18	883 961	----- 1.9
7	Big Wood River and Slough at Hailey.	640	1915-58.....	1956	----- May 24	----- 6.00	4,730 4,840	----- 2.0
8	Big Wood River near Bellevue.	823	1911-58.....	1956	----- May 25	6.00 6.43	4,130 3,870	----- 1.4
BOISE RIVER BASIN								
9	Boise River near Twin Springs.	830	1911-58.....	1956	----- May 21	8.76 8.40	11,200 10,700	----- 1.5
10	South Fork Boise River near Featherville.	635	1945-58.....	1956	----- May 22	8.62 7.85	7,580 7,560	----- 1.9
11	South Fork Boise River at Anderson Ranch Dam.	982	1943-58.....	1956	----- May 20	10.56 9.13	9,850 7,510	----- -----
SALMON RIVER BASIN								
12	Salmon River below Valley Creek, at Stanley.	501	1925-58.....	1956	----- May 28	4.62 4.20	5,070 4,360	----- 1.4

combination at Hailey, Boise River near Twin Springs, and South Fork Boise River near Featherville; that for June 1958 was maximum at Big Lost River near Arco. Monthly mean flows at other nearby gaging stations were near maximums of record, as shown in table 14.

Most of these high flows occurred above reservoirs, and storage was controlled to avert serious flooding downstream. Damage from the floods was slight, but it could have been serious without regulation by the reservoirs.

TABLE 14.—*Maximum monthly mean discharges, in south-central Idaho*

No.	Stream and place of determination	Drainage area (sq mi)	Monthly mean discharge				
			Maximum prior to May 1958			May-June 1958	
			Period	Month	(cfs)	Month	(cfs)
1	Big Lost River at Wild Horse near Chilly.	114	1944-58.....	June 1956	589	May	584
2	Big Lost River at Howell Ranch near Chilly.	450	1904-14, 1920-58..	June 1911	2,390	May	1,700
3	Big Lost River below Mackay Reservoir near Mackay.	813	1903-6, 1912-15, 1919-58.	June 1921	¹ 1,765	June..	¹ 1,265
4	Big Lost River near Arco.....	1,410	1946-58.....	June 1956	485	June..	675
5	Big Wood River near Ketchum...	137	1948-58.....	May 1956	818	May..	916
6	Warm Springs Creek near Ketchum.	96	1940-58.....	May 1952	487	May..	524
7	Big Wood River and Slough at Hailey.	640	1915-58.....	June 1938	2,837	May..	2,926
8	Big Wood River near Bellevue....	823	1911-58.....	May 1952	2,366	May..	2,088
9	Boise River near Twin Springs....	830	1911-58.....	May 1928	6,530	May..	6,737
10	South Fork Boise River near Featherville.	635	1945-58.....	May 1952	4,407	May..	4,875
11	South Fork Boise River at Anderson Ranch Dam.	982	1943-58.....	..do.....	² 6,370	May..	² 6,340
12	Salmon River below Valley Creek at Stanley.	501	1925-58.....	June 1956	3,405	May..	2,504

¹ Adjusted for storage in Mackay Reservoir.² Adjusted for storage in Anderson Ranch Reservoir.

FLOODS OF MAY 31 IN CLAYTON COUNTY, IOWA

A torrential rainstorm struck part of northeastern Iowa about noon on May 31. The intense rainfall occurred in the vicinity of Garber and in a small area to the south. The Weather Bureau recording gage at Strawberry Point, 14 miles southwest of Garber, was the nearest recording gage to the area of intense precipitation and recorded a total rainfall of 4.38 inches during the 3 hour period from 12 m. to 3 p.m. Residents of the Wayman Creek area, near the town of Garber, estimated that about 6 inches of rain fell between 11 a.m. and 2 p.m. on May 31. Estimates of similar amounts of rainfall, time, and duration of the storm were made by residents of Littleport, a town in the Honey Creek drainage basin about 6 miles west of Garber. The only precipitation gage within 10 miles of Garber was a nonrecording gage at Guttenberg, and it measured a daily total of 0.54 inch for May 31.

Major flooding occurred on two relatively small streams in the Littleport-Garber area (fig. 13). Wayman Creek, a tributary entering the Turkey River about one half mile south of Garber, had a peak flow exceeding that of any other flood of record in Iowa for a stream

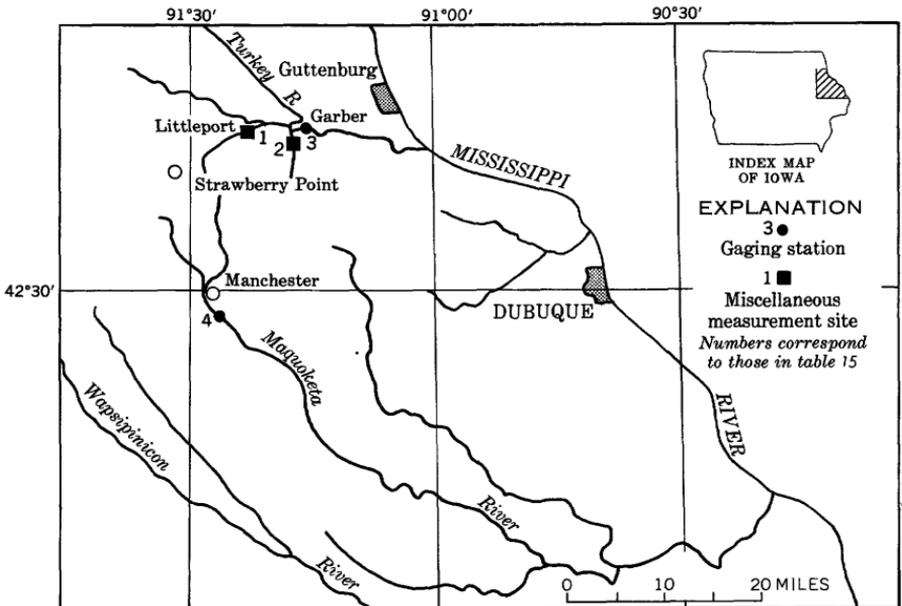


FIGURE 13.—Map of flood area showing location of flood-determination points. Floods of May 31 in Clayton County, Iowa.

of comparable size. The peak discharge of 15,500 cfs from a drainage area of 6.98 square miles was measured at a contracted opening at a county road bridge near the mouth of the creek. A local resident stated that the peak occurred about 2 p.m. on May 31. Honey Creek, another small tributary, enters Turkey River near the town of Littleport, and it also produced an outstanding peak discharge. An estimate computed from surveys at a county road bridge at the south edge of the town indicated a peak discharge of about 12,000 cfs from a 13.0-square mile drainage area. A local resident stated that the peak occurred about 2:30 p.m. on May 31 and was the highest stage reached at that point in at least 33 years.

Other small streams in the area were also high, but their peak discharges are unknown. Because of the small storm area, the major streams did not have outstanding floods. The moderate peak discharges at two gages maintained by the U.S. Geological Survey are shown in table 15.

Although limited to small areas, damage to rural property was high throughout the valleys of Honey and Wayman Creeks. The American National Red Cross reported that 11 families suffered losses, and 4 families required Red Cross assistance. They also reported that 2 homes received major damage and 7, minor damage; 7 farm buildings were destroyed, 7 received major damage and 10 received minor damage. Red Cross assistance was limited to those requiring emergency relief and totaled almost \$2,000. No deaths or injuries occurred, possibly because the floods struck during daylight hours.

TABLE 15.—*Flood stages and discharges, in Clayton County, Iowa*

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to May 1958		May-June 1958	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
TURKEY RIVER BASIN								
1	Honey Creek at Littleport...	13.0	1926-58.....		May 31		¹ 12,000	-----
2	Wayman Creek at Garber...	6.98			May 31		15,500	-----
3	Turkey River at Garber....	1,545	1913-16, 1919-27, 1932-58	1922 1947		² 28.06	29,000	-----
					May 31	17.61	12,100	-----
MAQUOKETA RIVER BASIN								
4	Maquoketa River near Manchester.	305	1925.....	1925		(³)	25,400	-----
			1933-58.....	1947		21.36	20,000	-----
					June 1	8.87	2,620	-----

¹ Estimated.

² Maximum since about 1890.

³ Unknown.

FLOODS OF JUNE AND JULY IN NORTHWESTERN WISCONSIN

The occurrence of two heavy general rains in adjacent areas of northwestern Wisconsin in a month was a rare event.

The Weather Bureau reported that tornadoes consisting of one to three funnel clouds touched down at five different localities between 5:30 p.m., and 7:30 p.m., on the evening of June 4. Rainfall accompanying the tornadoes was most severe in the Stanley-Owen area. Maximum recorded rainfall at Weather Bureau stations is listed in table 16. Some residents of Thorp and Owen reported rainfall of from 4 to 6 inches in a period of 1½ to 2 hours. Technical Paper No. 25 of the U.S. Weather Bureau shows that the return period for a 3-inch rainfall in 2 hours would be approximately 50 years in this area. Figure 14 shows the amount and distribution of rainfall for June 1-5.

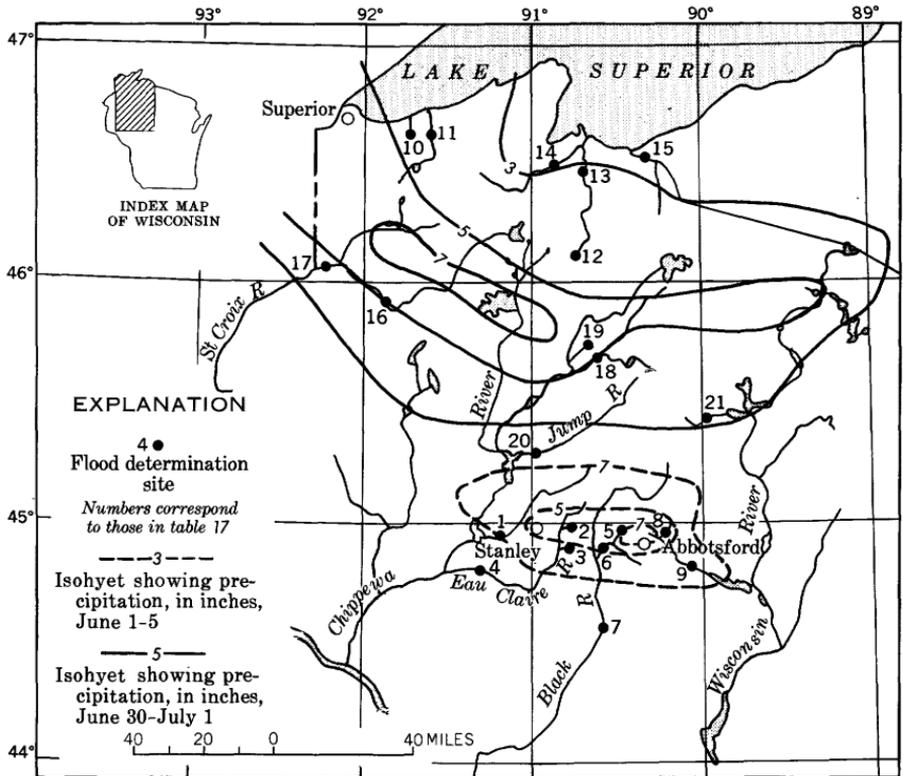


FIGURE 14.—Map of flood area showing location of flood-determination points and precipitation, June 1-5 and June 30-July 1. Floods of June and July in northwestern Wisconsin.

TABLE 16.—*Rainfall, in inches, at U.S. Weather Bureau stations, June 1-5, in northwestern Wisconsin*

<i>Station</i>	<i>Total rainfall</i>	<i>Station</i>	<i>Total rainfall</i>
Cedar Falls Hydro.....	2. 45	Rib Falls.....	2. 88
Eau Claire Airport.....	1. 41	Medford.....	4. 08
Bloomer.....	3. 04	Eau Pleine Reservoir.....	2. 55
Holcombe.....	3. 87	Goodrich.....	3. 29
Jump River.....	2. 00	Marshfield.....	2. 24
Curtiss.....	7. 04	Neillsville.....	1. 78
Stratford.....	3. 90	Weyerhauser.....	1. 82
Owen.....	6. 02	Ridgeland.....	2. 01
Stanley.....	6. 02	Fairchild.....	1. 98
Wausau.....	2. 21	Rosholt Collins.....	1. 83

Only four drainage structures on State Highway 29 between Abbotsford and Stanley were able to carry the flow. One of these structures was on the North Fork Poplar River near Owen, where the discharge was 5,730 cfs from 56 square miles of drainage area (table 17). A resident of the area for about 45 years said that the stage on Goggle-eye Creek at State Highway 73, 1.3 miles north of State Highway 29 in Thorp, was the highest he had ever observed. At a site on a tributary to the Eau Claire River 2 miles south of Thorp, 1 mile north of the path of one of the tornado funnels, the peak discharge was 453 cfs from a drainage area of 0.68 square mile.

On June 30 and July 1, generally heavy rains fell in most of northwestern Wisconsin (fig. 14, table 18). Damage was not great from this storm because of its long duration, its relatively low intensity, and because much of the soil in this area is sandy and there are numerous swamps and lakes. In many of the swampy areas, town and county roads were flooded for several days. Road shoulders were damaged in some areas but, in general, damage was light. Discharges at various sites in the area are listed in table 17.

Several culverts were washed out on State Highway 13 between Superior and Port Wing. In this area a peak discharge of 1,190 cfs from 4.55 square miles occurred on Pearson Creek north of Maple. At the same time, in another area, which is generally sandy and swampy and that received about equal rainfall totals for the storm period, peak discharges were only 250 cfs in Price Creek near Phillips from 14.7 square miles and 157 cfs in Spilieberg Creek near Cayuga from 6.6 square miles.

Fairly high runoff occurred in the large basins of the Bad River near Odanah and the South Fork Flambeau River near Phillips. Two vacationers lost their lives on the South Fork Flambeau River when the small boat in which they were riding was drawn through the open gates of a recreation dam.

TABLE 17.—Flood stages and discharges, June and July, in northwestern Wisconsin

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to June 1958		June-July 1958	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
CHIPPEWA RIVER BASIN								
1	Yellow River at Cadott....	351	1942-58.....	1943	-----	12.15	15,600	-----
2	Goggle-eye Creek near Thorp.	7.04	-----	-----	June 5	9.85	10,000	1.9
3	Tributary to North Fork Eau Claire River near Thorp.	.68	-----	-----	do.	20.99	2,610	-----
4	Eau Claire River near Fall Creek.	747	1943-55, 1957-58	1955	-----	16.11	17,200	-----
			-----	-----	June 6	11.33	8,590	.8
BLACK RIVER BASIN								
5	North Fork Poplar River near Owen.	56	-----	-----	June 5	45.54	5,830	-----
6	Poplar River near Owen....	159	-----	-----	do.	20.18	7,160	-----
7	Black River at Neillsville.	756	1905-09, 1913-58.	1938	-----	23.8	48,800	-----
8	Tributary to Randall Creek near Abbotsford.	.50	-----	-----	June 5	14.18	15,500	1.1
			-----	-----	June 4	11.94	133	-----
WISCONSIN RIVER BASIN								
9	Big Eau Pleine River near Stratford.	224	1914-25, 1937-58.	1938	-----	24.5	41,000	-----
			-----	-----	June 5	15.52	8,890	1.1
STREAMS TRIBUTARY TO LAKE SUPERIOR								
10	Pearson Creek near Maple..	4.55	1957-58.....	1957	-----	22.65	1,030	-----
11	Boise Brule River at Brule.	113	1943-58.....	1944	July 1	25.71	1,190	-----
12	Spillieberg Creek near Cayuga.	6.6	-----	-----	July 1	5.2	1,520	-----
			-----	-----	July 2	3.8	832	.8
13	Bad River near Odanah....	611	1946.....	1946	-----	22.2	(1)	-----
			1914-22, 1948-58.	1949	-----	17.3	16,500	-----
14	White River near Ashland..	269	1948-58.....	1953	July 2	10.00	6,410	.5
			-----	-----	July 1	7.90	6,270	-----
15	Montreal River near Saxon.	281	1938-58.....	1942	July 1	3.2	1,430	.4
			-----	-----	July 3	6.93	5,700	-----
			-----	-----	July 3	3.35	850	-----
ST. CROIX RIVER BASIN								
16	Namekagon River near Trego.	503	1927-58.....	1941	-----	-----	² 5,200	-----
17	St. Croix River near Danbury.	1,588	1914-58.....	1950	July 3, 4	-----	² 2,380	2.0
			-----	-----	July 2	8.22	10,200	-----
			-----	-----	July 2	7.11	8,500	1.7
CHIPPEWA RIVER BASIN								
18	South Fork Flambeau River near Phillips.	615	1929-58.....	1943	-----	14.32	10,200	-----
19	Price Creek near Phillips....	14.7	-----	-----	July 3	11.20	5,070	1.0
20	Jump River at Sheldon.....	574	1915-58.....	1941	July 2	13.79	235	-----
			-----	-----	July 2	18.8	46,000	-----
			-----	-----	July 2	9.35	5,830	.7
WISCONSIN RIVER BASIN								
21	Spirit River at Spirit Falls..	82	1942-58.....	1942	-----	10.00	4,180	-----
			-----	-----	July 5	4.53	710	-----

¹ Not determined.² Mean daily discharge.

TABLE 18.—*Rainfall, in inches, at U.S. Weather Bureau stations, June 30–July 1 in northwestern Wisconsin*

<i>Station</i>	<i>Total rainfall</i>	<i>Station</i>	<i>Total rainfall</i>
Superior.....	6. 33	Grantsburg.....	1. 86
Port Wing.....	3. 47	Spooner Experiment Farm.....	3. 50
Bayfield.....	2. 88	Gouderay.....	4. 90
Brule Ranger Station.....	4. 66	Federic.....	1. 40
Ashland Experiment Farm.....	2. 92	Cumberland.....	1. 66
Solon Springs.....	6. 81	Rice Lake.....	2. 51
Madeline Island.....	1. 82	Ladysmith.....	2. 15
Mellen.....	4. 53	Holcombe.....	2. 16
Gurney.....	2. 33	Jump River.....	1. 61
Gordon.....	7. 88	Prentice.....	4. 47
Stanley.....	. 23	Medford.....	1. 49
Hayward Ranger Station.....	6. 36	Willow Reservoir.....	3. 76
Winter.....	7. 54	Rainbow Reservoir.....	3. 90
Park Falls.....	4. 73	North Pelican.....	2. 40
Flambeau Reservoir.....	5. 13	Phelps Deerskin Farm.....	4. 49
Eagle River.....	5. 10	Rice Reservoir.....	3. 08
Rest Lake.....	4. 12	Merrill.....	2. 07

FLOODS OF JUNE - SEPTEMBER IN NEW MEXICO

Intense local thunderstorms can be expected throughout New Mexico from late June to mid-September.

During 1958, at least four noteworthy small-area floods were caused by thunderstorms, three in the northeast corner and one in the southwestern part of the State. Two general storms on September 10-13 and 22-28 caused widespread flooding in the southwest corner of the State. Figure 15 shows the location of the flood areas and points at which peak discharges were determined.

Floods of June 5-6 near Cimarron were caused by heavy rains during the night of June 5-6 in a line extending northeastward from Black Lake to Cimarron. The largest daily rainfalls recorded were 4.51 inches at Black Lake and 3.44 inches at Cimarron on June 6.

The peak discharge on Cimarron Creek at Springer was the greatest since the station was established in 1930 (table 19) but was probably exceeded by floods in 1904 and 1913. A very small drainage area of 0.05 square mile of a tributary to Cimarron Creek yielded a peak discharge of 337 cfs.

An intense thunderstorm on July 6 caused local flooding in the northeastern part of New Mexico, near Kenton, Okla. A total rainfall of 3.33 inches was recorded at the Weather Bureau gage at Rutledge Ranch, 8 miles northwest of Kenton.

The peak stage on Cimarron River near Kenton, Okla., was 3 feet higher than the previous maximum since 1950; and the peak discharge in Carrizozo Creek near Kenton was about 70 percent greater than that of the previous maximum since 1953.

The deck and center pilings were washed out on a bridge over Carrizozo Creek at the New Mexico-Oklahoma State line.

Heavy rains fell in the east-central part of the State near Ragland and Quay on July 16. Rainfall totals of 3.50 inches and 1.37 inches were recorded at Weather Bureau gages at Ragland and Quay, respectively.

The flood was not an outstanding event, as it was confined to small-area drainages of several tributaries to Plaza Larga Creek, and the small amount of damage was erosion downstream from a large box culvert near Quay. However, the storm that caused the flood was of interest because of its intensity and because of the small area in which rain fell.

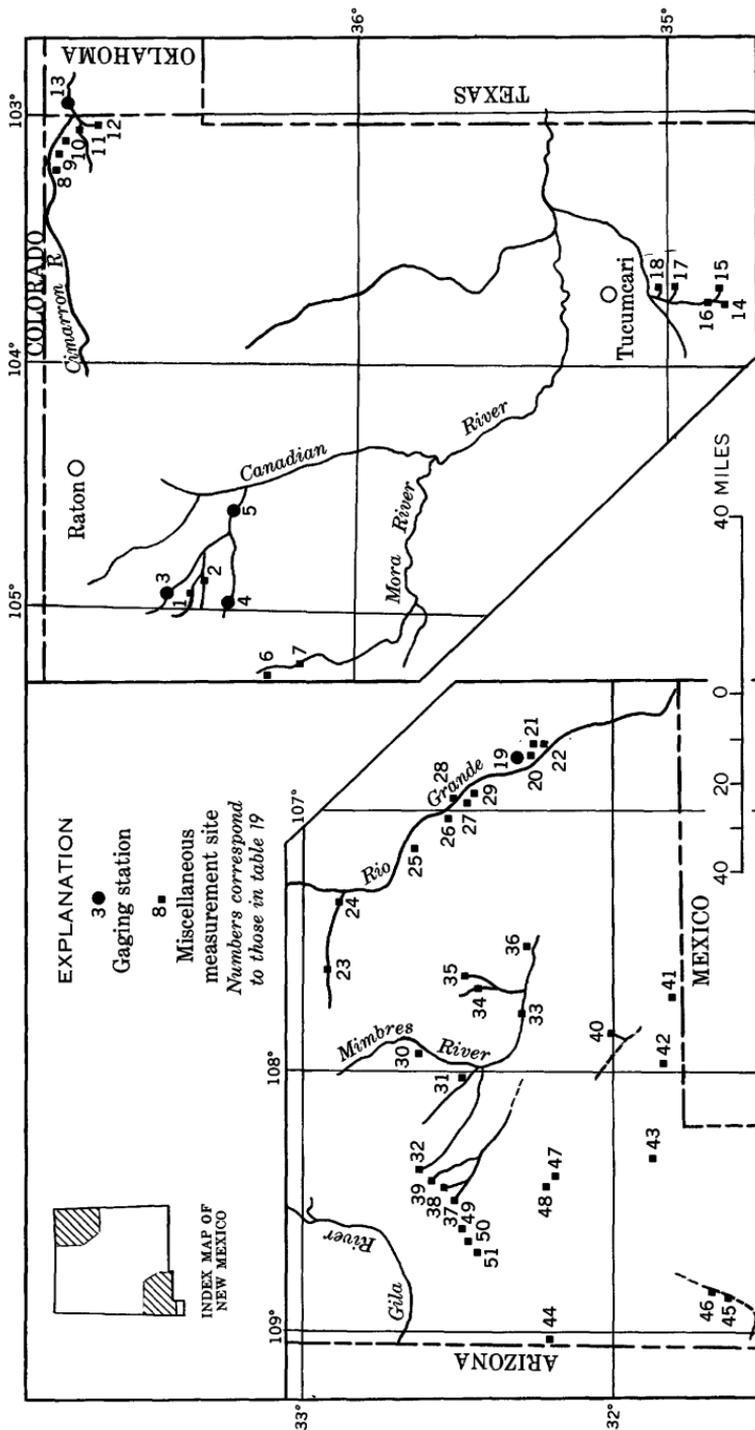


FIGURE 15.—Map of flood area showing location of flood-determination points. Floods of June-September in New Mexico.

TABLE 19.—Flood stages and discharges, June–September, in New Mexico and Oklahoma

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to June 1958		June–Sept. 1958	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q ₅₀
ARKANSAS RIVER BASIN								
1	Cimarron Creek tributary near Cimarron, N. Mex.	0.05			June 5		337	
2	Cimarron Creek tributary at Cimarron, N. Mex.	1.44			June 6		1,870	
3	Ponil Creek near Cimarron, N. Mex.	171	1915–58 1948–58	1929 1948		(1) 7	5,200 1,900	
4	Rayado Creek at Sauble Ranch near Cimarron, N. Mex.	65	1904 1909–58	1904 1913 1942	June 5	4.55	540	0.4
5	Cimarron Creek at Springer, N. Mex.	1,032	1904–58 1930–58	1904 1942	June 6	4.94 3.87	850 320	1.6
6	Coyote Creek below Black Lake, N. Mex.	48	1953–58	1957 1957	June 6	10.11 10.55	5,000 6,250	4.3
7	Coyote Creek above Guadalupe, N. Mex.	71	1956–58	1957	June 6	3.10 4.70 3.03	76 913 130	4.1
8	Cimarron River tributary No. 1 near Kenton, Okla.	37			June 6	6.08	1,390	4.1
9	Cimarron River tributary No. 2 near Kenton, Okla.	7.5			do		4,280	
10	Cimarron River tributary No. 3 near Kenton, Okla.	4.9			do		1,930	
11	Carrizozo Creek near Kenton, Okla.	111	1953–58	1953	do		2,410	
12	Carrizozo Creek tributary near Moses, N. Mex.	.15			July 6	12.22	9,160	9.6
13	Cimarron River near Kenton, Okla.	41,106	1950–58	1954	do		307	
14	Plaza Larga Creek tributary at Ragland, N. Mex.				July 6	10.67	(1)	
15	Plaza Larga Creek tributary near Ragland, N. Mex.	.5	1952–58	1957	July 16	13.67	26,300	3.8
16	Plaza Larga Creek tributary No. 2 near Ragland, N. Mex.	5			do		1,150	
17	Plaza Larga Creek tributary near Quay, N. Mex.	9.2	1954–58	1956	do		4,730	
18	Plaza Larga Creek tributary No. 2 near Quay, N. Mex.	5.8			July 16	7.70 12.70	320 1,170	
RIO GRANDE BASIN								
19	Los Cruces Arroyo at Las Cruces, N. Mex.	13.5			Aug. 23	2.72	643	
20	Tortugas Arroyo at Tortugas, N. Mex.	21.7			Aug. 22		5,880	
21	Fillmore Arroyo near Tortugas, N. Mex.	19.5			do		4,100	
22	Mesquite Drainage Ditch tributary near Mesquite, N. Mex.	2.9			do		809	
23	Percha Creek near Hillsboro, N. Mex.	35.4	1957–58	1957		6.25	(1)	
24	Percha Creek at Caballo Dam near Arrey, N. Mex.	119	1953–58	1955	Sept. 13	4.66	1,570	1.5
25	Placitas Arroyo at Hatch, N. Mex.	27			Sept. 13	2.97	(1)	
26	Broad Canyon near Radium Springs, N. Mex.	68.1			do	4.31	7,260	3.8
27	Rio Grande tributary near Radium Springs, N. Mex.	.40	1955–58	1958	do		3,360	3.7
28	Rio Grande tributary at Radium Springs, N. Mex.	2.12			Sept. 13	7.17	260	
29	Faulkner Canyon at Radium Springs, N. Mex.	30.3			do	7.48	280	
					do		1,190	
					do		4,640	

See footnotes at end of table.

TABLE 19.—Flood stages and discharges, June–September, in New Mexico and Oklahoma—Continued

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to June 1958		June–Sept. 1958	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
MIMBRES RIVER BASIN								
30	Mimbres River tributary near Dwyer, N. Mex.	6.34	-----	-----	September	-----	2,790	6.5
31	Mimbres River tributary near Spalding, N. Mex.	-----	-----	-----	Sept. 12	-----	1,910	-----
32	Cherry Creek near White Signal, N. Mex.	3.8	-----	-----	September	-----	565	1.7
33	Mimbres River at Deming, N. Mex.	1,370	1954–58	1954	-----	4.40	2,000	-----
34	Mimbres Basin Arroyo No. 1 near Florida, N. Mex.	.6	-----	-----	Sept. 13	2.21	746	1.5
35	Mimbres Basin Arroyo No. 2 near Florida, N. Mex.	-----	-----	-----	do.	-----	695	-----
36	Mimbres Basin Arroyo near Akela, N. Mex.	40	-----	-----	do.	-----	2,270	-----
37	Walkin? X Canyon tributary near White Signal, N. Mex.	1.19	-----	-----	September	-----	770	4.2
38	Keese Canyon near White Signal, N. Mex.	1.24	-----	-----	do.	-----	954	5.0
39	Keese Canyon tributary near White Signal, N. Mex.	.19	-----	-----	do.	-----	320	4.4
40	Palomas Arroyo tributary near Waterloo, N. Mex.	1.5	-----	-----	Sept. 11	-----	474	-----
BASINS IN MEXICO								
41	State Highway 9 Arroyo near Mimbres, N. Mex.	3.5	-----	-----	September	-----	467	-----
42	Hermanas Draw near Hermanas, N. Mex.	24.5	-----	-----	do.	-----	618	-----
43	Granite Pass Arroyo near Hachita, N. Mex.	4	-----	-----	do.	-----	1,200	-----
GILA RIVER BASIN								
44	Steins Creek tributary near Steins, N. Mex.	-----	-----	-----	do.	-----	380	-----
ANIMAS BASIN								
45	Animas Creek near Rodeo, N. Mex.	248	-----	-----	Sept. 13	-----	1,030	.4
46	Animas Creek tributary near Rodeo, N. Mex.	4.78	-----	(1)	-----	-----	450	-----
47	Lordsburg Draw tributary No. 1 near Separ, N. Mex.	47.6	-----	-----	Sept. 13	-----	375	-----
48	Lordsburg Draw tributary No. 2 near Separ, N. Mex.	43.3	-----	-----	September	-----	7,310	-----
49	Wood Canyon tributary near Lordsburg, N. Mex.	-----	-----	-----	do.	-----	432	-----
50	Peterson Canyon near Lordsburg, N. Mex.	-----	-----	-----	do.	-----	603	-----
51	Peterson Canyon tributary near Lordsburg, N. Mex.	-----	-----	-----	do.	-----	518	-----

¹ Not determined.² Affected by backwater.³ Probably exceeded 10,000 cfs.⁴ Of which 68 square miles is probably noncontributing.⁵ Flow regulated by small flood-control dams.

Peak discharges were high at five sites that have small drainage areas; three of these were near the base of a high caprock formation north of Ragland (table 19). On a drainage area of 0.5 square mile, the peak stage was 5 feet higher and the peak discharge was $3\frac{1}{2}$ times the previous maximum since at least 1952.

An intense rainstorm occurred on August 22 south of Las Cruces. A total rainfall of 2.20 inches was recorded at the Weather Bureau gage in Las Cruces; more than 2 inches of rain fell at several places nearby; and 3.1 inches fell at Mesilla Dam, 5 miles southwest of Las Cruces.

The highest runoff from the storm was in the arroyos that drain the west side of the Organ Mountains, and the peak discharge data are given for four of these arroyos in table 19. Severe damage was done to irrigation and drainage ditches south of Las Cruces, and several cotton fields were flooded.

General rains covered a large area in the southwestern part of the State during 2 periods, September 10–13 and 22–28. The rainfall was irregular, with the daily maximums occurring on different days at different places. U.S. Weather Bureau gages recorded 2.00 inches of rainfall at Lordsburg on September 12, and 2.33 inches at Florida, 2.05 inches at Hatch, and 1.95 inches at Deming on September 13. The greatest recorded total for September 10–13 was 4.68 inches at Deming.

Peak discharges were determined for the 2 series of floods at 29 sites (table 19) by indirect measurements. The exact dates in September for the floods of the later period are unknown.

The floods of September 13 caused sever damage to cotton fields in the Rio Grande Valley near Hatch and Radium Springs and in the Mimbres River basin near Deming. U.S. Highway 85 near Hatch and Radium Springs and U.S. Highways 70 and 80 east of Deming were closed on September 13. The damage caused by the floods of September 22–28 was minor and occurred mostly near Lordsburg.

Ratios of the peak discharges to mean annual floods are shown in table 19 wherever data are available for their computation. A ratio of 4.8 for stations in the northeastern part of the State and of 4.2 for stations in the southwestern part of the State indicate a flood with a recurrence interval of 50 years.

FLOODS OF JUNE 8-15 IN INDIANA

Heavy rains fell in central Indiana during the period June 8-15 and caused one of the greatest summer floods of record. At Medaryville, 3.60 inches of rain fell from 5:40 p.m. to 9:10 p.m. on June 8. Accumulations from June 8 to 10 ranged from 6 to 9 inches across the central part of the state.

The U.S. Weather Bureau, in their weather summary for June 1958 in Indiana, described the rains and floods as follows:

On June 8 several 3 and 4 inch rainfall amounts were reported. Heavier amounts on the following day presaged the greatest summertime flood of record, from the standpoint of crop destruction and gave rise to the highest stages since 1913 in one or two instances.

The greatest single 24-hour rainfall amount was 5.65 inches reported at Marion on the 9th, although Monticello and Kokomo were not far behind with 5.54 and 4.72 inches respectively, on the same date. Rainfall for the period of the 8th to the 17th averaged about 7 or 8 inches over the Wabash, and totals for the period ranged from about 3.5 inches at Hutsonville to more than 12 inches at Kokomo.

Rainfall data from selected stations for the period June 8-11 are shown in table 20, and the total precipitation distribution for June 8-10 is indicated by isohyetal lines on figure 16 (from U.S. Weather Bureau).

After the flood, determinations of peak discharges at gaging stations and at miscellaneous ungaged sites (fig. 16) were made by the Geological Survey (table 21). Moderate runoff occurred on the larger streams, the Wabash and White Rivers. At all gaging stations on these two streams, the June flood lacked several feet of being as high as the 1913 flood, which was the largest known along the Wabash and White Rivers.

TABLE 20.—Rainfall, in inches, at selected precipitation stations, June 8-11, in Indiana

Station	June 8	June 9	June 10	June 11	Total
Collegeville, St. Joseph's College	1. 14	3. 85	2. 10	0. 14	7. 23
Covington	0	2. 02	4. 63	. 57	7. 22
Delphi	2. 82	2. 85	1. 55	. 02	7. 24
Kentland	3. 30	1. 00	2. 84	. 05	7. 19
Logansport, Cicoft Street Branch	0	4. 08	1. 94	. 32	6. 34
Marion, 2N	0	5. 65	2. 75	1. 00	9. 40
Monticello	0	5. 54	3. 00	. 38	8. 92
Muncie Sewage Plant	. 92	3. 47	2. 62	1. 32	8. 33
Richmond Airport	3. 72	3. 37	1. 22	0	8. 31
Kokomo	-----	4. 72	-----	-----	-----

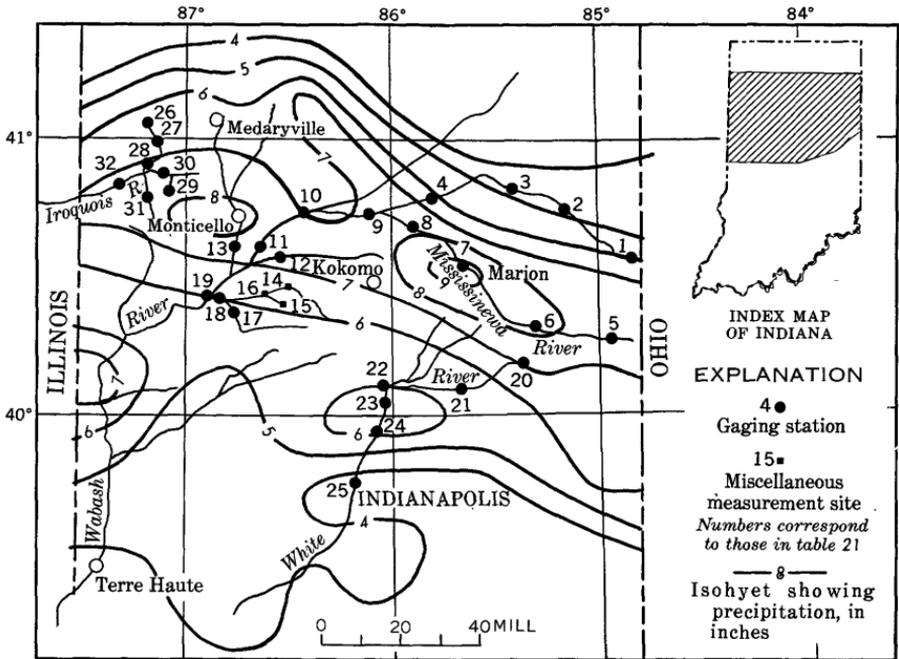


FIGURE 16.—Map of flood area showing location of flood-determination points and precipitation for June 8-10. Floods of June 8-15 in Indiana.

On many Wabash River tributary streams with drainage areas of from 100 to 1,900 square miles, and on the Iroquois River and Carpenter Creek, the ratios of the peak discharges of June 1958 to the mean annual floods (table 21) were high and indicate floods of extremely rare recurrence intervals. On the Tippecanoe River and in the Illinois River basin, a ratio of 1.5 indicates a 10-year flood, and a ratio of 2.0 indicates a 50-year flood. In the remainder of the flood area, a ratio of 1.7 indicates a 10-year flood, and a ratio of 2.5 indicates a 50-year flood.

Although no outstanding stages or discharges occurred on the Wabash River, much damage was inflicted when numerous levees failed to contain the flood waters. The giant Niblack Levee collapsed and flooded 11,600 acres. In West Terra Haute, the break in Sugar Creek Levee forced evacuation of about 1,500 persons and closed U.S. Highway 40. About 80 homes in an area about 3 blocks square in the northern part of Clinton were evacuated.

A statement by the Red Cross indicated that 2,630 homes were damaged by flood waters, but this did not include homes having flooded basements only. Fourteen homes were reported to have been completely destroyed, 54 others received major damage, and 2,745 families suffered flood losses other than crop losses. A newspaper estimate indicated that about 1 million acres of crops was flooded. The total crop damage was estimated at \$48 million by the U.S. Weather Bureau.

TABLE 21.—Flood stages and discharges, June 8-15, in Indiana

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to June 1958		June 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q ₅₀
WABASH RIVER BASIN								
1	Wabash River near New Corydon.	250	1951-58	1957	19.27	6,390	-----	
2	Wabash River at Bluffton.	506	1837-1958	1913	21.0	5,850	1.3	
3	Wabash River at Huntington.	710	1913-58	1913	13	25,000	-----	
			1951-58	1957	14.20	7,890	1.4	
4	Wabash River at Wabash.	1,733	1894-1958	1913	22.7	(2)	-----	
					18.29	9,880	-----	
					13	11,400	1.5	
5	Mississinewa River near Ridgeville.	130	1946-58	1957	28.7	190,000	-----	
6	Mississinewa River near Eaton.	304	1952-58	1957	13	22.46	36,300	1.5
7	Mississinewa River at Marion.	677	1913-58	1913	14.57	8,830	-----	
			1923-58	1927	10	16.25	13,900	3.6
8	Mississinewa River at Peoria.	809	1943-58	1943	17.6	14,800	-----	
			1952-58	1957	10	18.53	19,400	2.9
9	Wabash River at Peru.	2,655	1884-1958	1913	11	19.2	(2)	-----
					11	17.4	25,000	-----
					11	16.88	24,300	2:1
10	Wabash River at Logansport.	3,751	1884-1958	1913	12	17.4	(2)	-----
					12	19.26	19,300	-----
					12	28.0	28,000	2.2
11	Wabash River at Delphi.	4,032	1913-58	1913	12	22.65	53,100	1.9
12	Deer Creek near Delphi.	278	1943-58	1943	12	22.65	53,100	1.9
13	Tippecanoe River near Delphi.	1,857	1903-6, 1939-58	1957	12	25.3	140,000	-----
14	Middle Fork Wildcat Creek near Edna Mills.	52.0			12	17.80	52,500	1.3
15	Camy bells Creek at Rossville.	16.9			14	28.4	145,000	-----
16	Middle Fork Wildcat Creek at Edna Mills.	84.1			14	25.54	61,500	1.7
17	South Fork Wildcat Creek near Lafayette.	246	1943-58	1943	10	19.8	18,000	-----
18	Wildcat Creek near Lafayette.	791	1954-58	1957	10	18.26	14,400	4.4
19	Wabash River at Lafayette.	7,247	1858-1958	1913	10	14.08	18,800	-----
20	White River at Muncie.	242	1904-58	1913	8	14.72	21,400	2.4
21	White River at Anderson.	401	1904-58	1913	8	(2)	3,700	2.7
22	White River near Noblesville.	814	1915-58	1927	8	(2)	-----	
23	White River at Noblesville.	837	1913-58	1913	8	(2)	-----	
			1946-58	1957	8	(2)	-----	
24	White River near Nora.	1,200	1913-58	1913	8	(2)	11,000	6.0
25	White River at Indianapolis.	1,627	1904-58	1913	10	16.8	17,900	-----
					10	15.28	12,600	-----
					10	14.06	9,110	-----
					10	21.52	25,000	-----
					10	32.9	190,000	-----
					14	26.28	99,000	-----
					14	19.6	20,000	-----
					14	11.85	10,000	-----
					14	23.6	128,000	-----
					14	19.96	14,000	-----
					14	16.3	27,200	-----
					14	16.35	26,500	-----
					15	23.8	(2)	-----
					15	19.94	21,100	-----
					15	20.55	24,000	-----
					15	22.4	58,500	-----
					15	17.96	27,000	-----
					15	690.0	70,000	-----
					15	678.87	30,500	-----
ILLINOIS RIVER BASIN								
26	Iroquois River at Rosebud.	30.3	1948-58	1950	8.3	422	-----	
27	Iroquois River near North Marion.	134	1948-58	1957	10	8.45	308	-----
28	Iroquois River at Rensselaer.	194	1948-58	1950	10	13.72	1,230	-----
29	Bice ditch near South Marion.	22.6	1948-58	1951	10	15.09	2,040	-----
30	Big Slough Creek near Collegeville.	84.1	1948-51, 1952-58	1951	10	13.37	1,620	-----
				1956	10	16.54	2,550	-----
				1957	13	11.43	610	-----
					13	12.02	780	-----
					13	13.22	1,470	-----
31	Carpenters Creek at Egypt.	48.1	1948-51, 1952-58	1951	10	13.7	2,030	-----
					10	10.92	1,790	-----
32	Iroquois River near Foreman.	452	1948-58	1950	10	11.66	3,720	-----
				1951	14	18.9	3,250	-----
					14	24.42	5,930	-----

¹ Not necessarily maximum discharge for the period.

² Not determined.

FLOODS OF JUNE 16-20 IN SOUTHWESTERN TEXAS

Major floods occurred June 16-20 in southwestern Texas (fig. 17). Movement of moist tropical air northward produced torrential rains as it ascended the southern slopes of the Edwards Plateau. Floods resulted in the Devils River basin, on the headwaters of the Nueces and Guadalupe Rivers, and on some tributaries to the Colorado River above Lake Travis.

In the period of heaviest rainfall, June 16-18, most amounts reported ranged from 6 to 10 inches; however, there were a few unofficial reports of rainfalls up to 16 and 20 inches in the storm area. Fig-

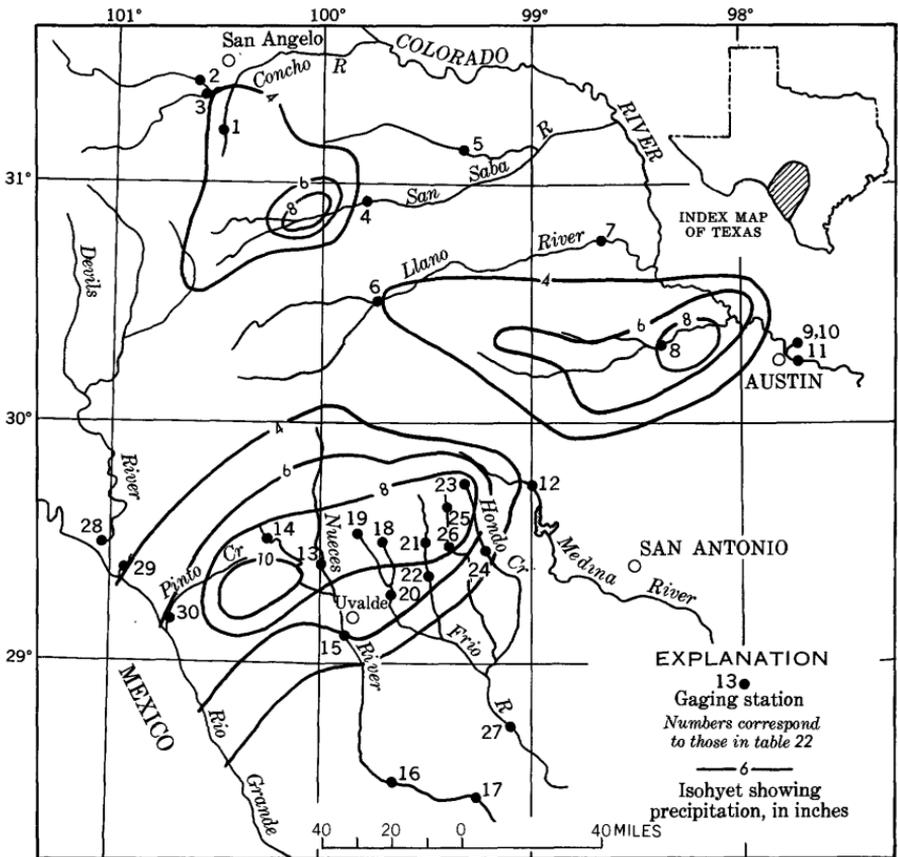


FIGURE 17.—Map of flood area showing location of flood-determination points and precipitation for June 16-18. Floods of June 16-20 in southwestern Texas.

ure 17 shows the pattern of rainfall as recorded at U.S. Weather Bureau stations during the period June 16-18.

The storm area was bounded by Devils River on the west, tributaries to the Concho River on the northwest, and tributaries to Lake Travis on the Colorado River on the northeast. The U.S. Weather Bureau reported a peak stage of 19.8 feet (7.8 feet above flood stage) at the site of the discontinued gaging station on the Devils River near Juno. Small creeks that drain directly into Lake Travis carried heavy flood runoff, and in 1 hour on June 17, the storage in Lake Travis was increasing at the rate of 160,000 cfs. Flood water began flowing over the spillway of Medina Lake near San Antonio on June 18—the first spill since 1936.

Maximum or near-maximum peak flows occurred in the upper Nueces River basin. The following table gives the relationship of the June 1958 floods to outstanding floods in the past.

<i>Stream and place of determination</i>	<i>Peak gage height, June flood (feet)</i>	<i>Remarks</i>
West Nueces River near Brackettville.	25. 15	Fourth highest since 1879.
Nueces River below Uvalde.....	21. 4	Fourth highest since at least 1913.
Nueces River near Asherton.....	30. 23	Highest since 1944. Third highest since at least 1913.
Frio River below Dry Frio River near Uvalde.	19. 7	Highest since 1932. Third highest since 1894.
Sabinal River near Sabinal.....	24. 6	Highest since 1932. Second highest since at least 1919.
Sabinal River at Sabinal.....	33. 3	Highest since 1919. Second highest since 1858.
Hondo Creek near Tarpley.....	28. 2	Highest since at least 1907.
Hondo Creek near Hondo.....	23. 4	Highest since 1919. Second highest since 1910.
Seco Creek near Utopia.....	21. 4	Highest since at least 1935.
Seco Creek near D'Hanis.....	20. 8	Highest since 1935. Second highest since at least 1866.

A summary of flood stages and discharges for this flood period is shown in table 22.

TABLE 22.—Flood stages and discharges, June 16–20, in southwestern Texas

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to June 1958		June 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
COLORADO RIVER BASIN								
1	South Concho River at Christoval.	434	1882–1958	1906	23	(1)		
			1930–58	1938	21.95	100,000		
					17	10,73	12,000	
2	Middle Concho River near Tankersly.	1,280	1900–58	1922	27.2	(1)		
			1930–58	1946	24.30	27,500		
					16	0		
3	Spring Creek near Tankersly.	734	1853–1958	1882	26	(1)		
			1930–58	1957	21.35	29,400		
					16	11,900		
4	San Saba River at Menard.	1,151	1880–1958	1899	23.3	(3)		
			1915–58	1938	22.2	130,000		
					17	31,900		
5	Brady Creek at Brady	575	1882–58	1938	29.1	386,000		
					17	2		
6	Llano River near Junction.	1,874	1888–1958	1935	41.4	319,000		
					17	8,290		
7	Llano River at Llano	4,233	1879–1958	1935	41.5	380,000		
					18	7,900		
8	Pedernales River near Johnson City.	947	1859–1958	1952	42.5	441,000		
					17	41,600		
9	Waller Creek at 38th Street, Austin.	2.31	1955–58	1957	5.75	596		
					17	315		
10	Waller Creek at 23d Street, Austin.	4.13	1885–1958	1915	(4)	(1)		
			1954–58	1957	5.85	2,050		
					17	804		
11	Colorado River at Austin.	38,400	1833–1958	1869	46.0	(1)		
			1898–1958	1935	45.0	481,000		
					17	33,300		
GUADALUPE RIVER BASIN								
12	Medina River near Pipe Creek.	457	1880–1958	1919	43	(1)		
			1922–34, 1952–58	1932	33.8	64,000		
					17	37,100		
NUECES RIVER BASIN								
13	Nueces River at Laguna.	764	1854–1958	1955	29.95	307,000		
					17	45,100		
14	West Nueces River near Brackettville.	700	1879–1958	1935	40	(7)		
			1939–58	1955	27.1	150,000		
					17	104,000		
15	Nueces River below Uvalde.	1,947	1836–1958	1935	25.15	104,000		
					17	616,000		
16	Nueces River near Asherton.	4,082	1900–58	1935	21.4	146,000		
			1939–58	1944	33	(1)		
					20	24,000		
17	Nueces River at Cotulla.	5,260	1879–1958	1935	30.23	21,800		
					24	82,600		
18	Frio River at Concan.	405	1869–1958	1932	19.70	13,700		
					17	162,000		
19	Dry Frio River near Reagan Wells.	117	1935–58	1935	12.51	18,800		
					17	64,700		
20	Frio River below Dry Frio River, near Uvalde.	661	1887–1958	1894	26.0	8,000		
			1952–58	1954	35	(1)		
					17	24,400		
21	Sabinal River near Sabinal.	206	1932	1932	19.7	53,000		
			1942–58	1954	29	(1)		
					17	14,18	15,800	
					17	24.6	55,200	

See footnotes at end of table.

TABLE 22.—Flood stages and discharges, June 16–20, in southwestern Texas—Con.

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to June 1958		June 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
NUECES RIVER BASIN—continued								
22	Sabinal River at Sabinal.	247	1890–1958.....	1919	-----	40	(¹)	-----
			1952–58.....	1954	-----	19.56	15,900	-----
					-----	17	33.3	73,300
23	Hondo Creek near Tarp-ley.	86.2	1907–58.....	1932	-----	26.0	(¹)	-----
			1952–58.....	1957	-----	17.8	25,300	-----
					-----	28.2	69,800	-----
24	Hondo Creek near Hondo.	132	1910–58.....	1919	-----	25.8	(¹)	-----
			1952–58.....	1957	-----	13.5	20,500	-----
					-----	23.4	71,700	-----
25	Seco Creek near Utopia...	53.2	1935.....	1935	-----	19	(¹)	-----
			1952–58.....	1957	-----	11.63	12,100	-----
					-----	17	52,600	-----
26	Seco Creek near D'Hanis.	87.4	1866–1958.....	1935	-----	26.2	(¹)	-----
			1952–58.....	1957	-----	11.18	12,400	-----
					-----	17	72,000	-----
27	Frio River near Derby...	3,493	1860–1958.....	1932	-----	29.60	230,000	-----
					-----	20	14.84	22,200
RIO GRANDE BASIN								
28	Devils River at Devils River. ¹¹	4,305	1900–58.....	1932	-----	36.60	¹² 597,000	-----
					-----	17	19.10	82,000
29	San Felipe Creek near Del Rio. ¹¹	46	1931–58.....	1935	-----	26.89	(¹³)	45,000
				1954	-----	18	5.80	1,540
					-----	32.0	186,000	-----
30	Pinto Creek near Del Rio. ¹¹	249	1928–58.....	1948	-----	17	11.00	20,100
					-----			-----

¹ Unknown.² Of which 152 sq mi is probably noncontributing.³ At site 5 miles downstream.⁴ Stream was 30 to 40 ft deep, probably at mouth of creek, from information by U.S. Weather Bureau.⁵ Of which 11,900 sq mi is probably noncontributing.⁶ Peak in well; 32.7 ft from floodmarks.⁷ At site 33 miles upstream, 580,000 cfs; at site 24 miles downstream, 536,000 cfs.⁸ At site 4.5 miles upstream.⁹ Peak in gage well; 21.8 ft from floodmarks.¹⁰ At site 2.6 miles upstream.¹¹ Data from International Boundary and Water Commission.¹² At site 3.7 miles upstream.¹³ Affected by backwater from the Rio Grande.

FLOODS OF JULY 2-7 IN SOUTHWESTERN IOWA

A tremendous downpour of rain on the night of July 1-2 caused record-breaking floods in several counties in southwestern Iowa. The heaviest rains fell in Audubon and Guthrie Counties and parts of the adjoining counties. The maximum precipitation was at and to the east of the town of Audubon. The U.S. Weather Bureau rain gage at Audubon measured 12.53 inches for the 24-hour period ending at 6 p.m. on July 2. However, the total may have been greater because the gage was out of service for a time during the storm. The U.S. Weather Bureau observer estimated that the maximum 24-hour total may have been 13.23 inches. The greatest official 24-hour rainfall previously reported for Iowa was 12.99 inches at Larrabee in June 1891.

Nearly one quarter of the area of the State is included within the 2-inch isohyet shown on figure 18, compiled from published U.S. Weather Bureau reports. Within this large area were several sub-areas that experienced heavy precipitation— notably the area around Audubon and an area southeast of Des Moines in which the maximum depth of rainfall exceeded 9 inches in 24 hours.

Most of the precipitation occurred in a period of 6 hours or less, as shown by the mass rainfall curves on figure 19. The heavy precipitation in most areas began at 10-11 p.m. on July 1 and ended at 3-4 a.m. on July 2.

As a result of the downpour, streams in the area rose rapidly to peak stages and discharges, which, in many cases, exceeded previous maximum peaks. The rapid rise on small streams came late at night, and this was responsible for the great loss of life, the injuries, and the heavy damage to property. After the floods had progressed from the tributaries to the main rivers, warnings of the impending floods averted further loss of life and permitted the removal of some property. Nevertheless, damage was great along the flood plains of the main rivers.

The streams that were affected most by the storm were the East Nishnabotna River above Shenandoah and its tributaries above Atlantic, the south Raccoon River, the Middle Raccoon River below the confluence with the South Raccoon, and Cedar Creek, a tributary of the Des Moines River about 50 miles southeast of Des Moines. On all these streams, peak stages and discharges were at or above

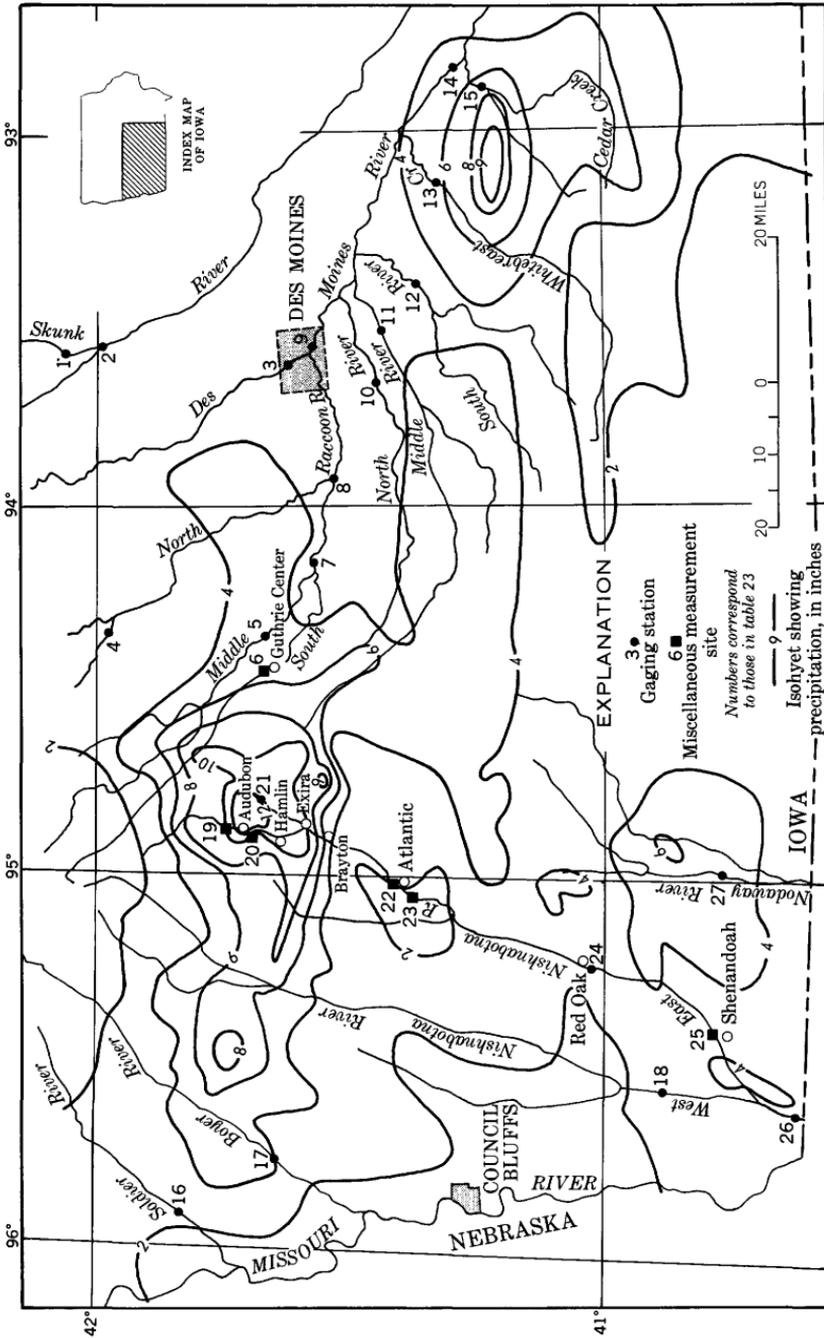


FIGURE 18.—Map of flood area showing location of flood-determination points and precipitation for July 1-2. Floods of July 2-7 in southwestern Iowa.

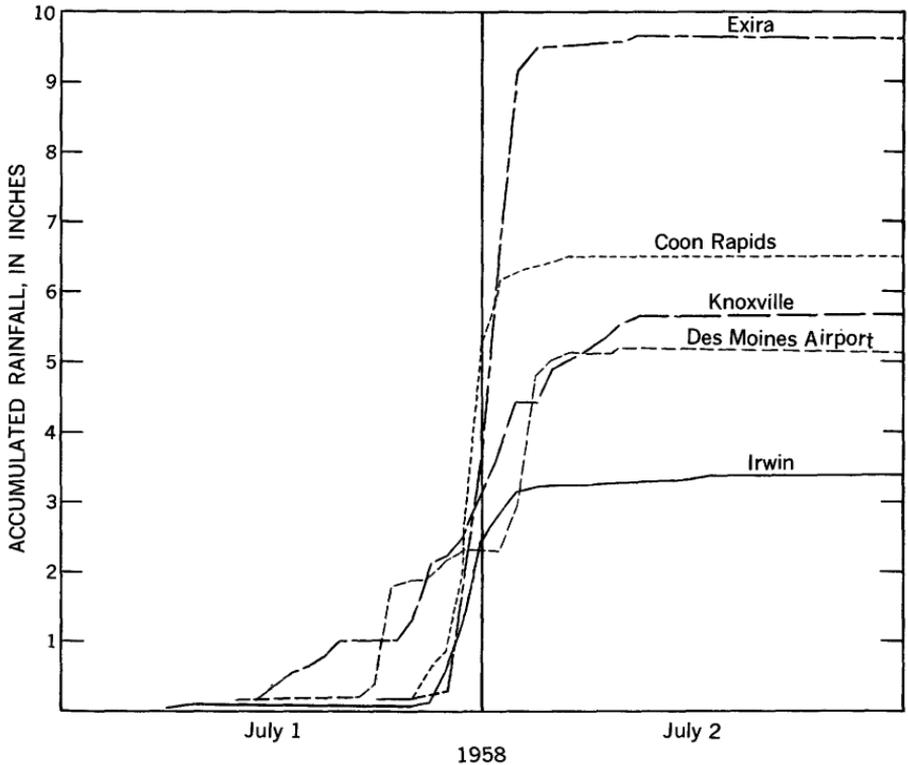


FIGURE 19.—Accumulated rainfall at selected U.S. Weather Bureau stations, July 1-2, in southwestern Iowa.

former maximum peaks at gaging stations and, as reported by residents of the area, exceeded all floods previously known on ungaged streams; but on the lower parts of the rivers, peak stages and discharges were far below past maximums.

Peak stages and discharges at gaging stations and miscellaneous sites are summarized in table 23. The relation of peak discharges, in cubic feet per second per square mile, to drainage area, in square miles, is shown on figure 20. The figure also shows the relation of the mean annual flood and the 10-year and 50-year recurrence interval floods to drainage areas¹ at several discharge stations. The curves show relations for drainage areas of 200 square miles or greater, and they have been extended as straight lines to smaller drainage areas for reference purposes only. Numbering of stations on this graph conforms to that shown on figure 18 and in table 23.

The suddenness of the great rise in stage on the smaller tributaries and the record size of the floods resulted in 18 deaths and many injuries. Total damage as the result of the flood has been estimated

¹ Schwob, H. H., 1953, Iowa floods; magnitude and frequency: Iowa State Highway Comm. Bull. 1.

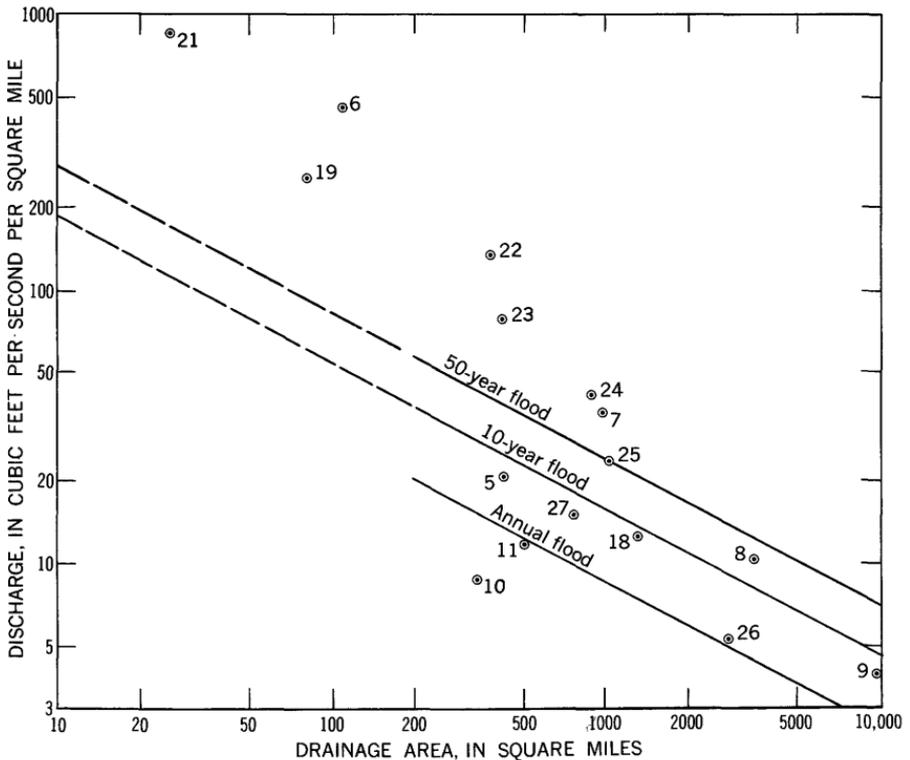


FIGURE 20.—Relation of peak-discharge, July 2-7, to floods of selected recurrence intervals in southwestern Iowa.

at \$15 million. Six towns and cities along the East Nishnabotna River and its tributaries were particularly hard hit; these were: Audubon, Hamlin, Exira, Brayton, Atlantic and Red Oak. Along the Raccoon River and its tributaries, the town of Guthrie Center and parts of Des Moines were damaged by the floods.

Rural damage was also great and consisted mostly of crop damages because the flood occurred well into the growing season, and damage to homes, fences, live stock, stored grain, and other items connected with agriculture was moderately heavy.

Damage to transportation facilities and utilities was large. Many bridges and road fills were washed out or damaged extensively. Utilities in cities and towns that were all or partly within the flood plains of the streams were affected.

A summary of damage and the amounts spent for emergency relief are shown in tables 24 and 25. The statistics were compiled from reports of various agencies, who collected the information, and are believed to be reasonably good estimates of the damage sustained. However, many types of damages were not known or were not easily assessed in dollars, and the estimate of \$15 million is an overall figure that may be a good measure of the total cost of the storm.

TABLE 23.—Flood stages and discharges, July 2-7, in southwestern Iowa

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to July 1958		July 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
SKUNK RIVER BASIN								
1	Skunk River near Ames.....	315	1920-27, 1933-5 8	1954	-----	13.66	9,240	-----
					-----	7.85	3,150	1.1
2	Skunk River below Squaw Creek near Ames.	556	1944.....	1944	-----	13	10,000	-----
			1952-58.....	1954	-----	12.36	8,700	-----
					-----	4	8,550	1.9
DES MOINES RIVER BASIN								
3	Des Moines River at Des Moines.	6,245	1893-1958.....	1954	-----	30.16	60,200	-----
					-----	4	8,000	.6
4	North Raccoon River near Jefferson.	1,619	1940-58.....	1947	-----	22.3	29,100	-----
5	Middle Raccoon River at Panora.	440	1953.....	1953	-----	8.95	2,520	.4
					-----	2	(1)	-----
6	South Raccoon River and Bear Grove Creek at Guthrie Center.	111			-----	11.87	9,150	1.5
					-----	2	52,000	(2)
7	South Raccoon River at Redfield.	988	1940-58.....	1947	-----	24.3	23,800	-----
					-----	2	29,04	4.2
8	Raccoon River at Van Meter.	3,441	1915-58.....	1947	-----	21.6	41,200	-----
					-----	3	35,200	2
9	Des Moines River below Raccoon River at Des Moines.	9,879	1893-1958.....	1947	-----	21.7	37,000	-----
					-----	4	39,000	1.6
10	North River near Norwalk.	349	1940-58.....	1947	-----	25.3	32,000	-----
					-----	6	3,180	.6
11	Middle River near Indianola.	506	1940-58.....	1947	-----	26.40	34,000	-----
					-----	2	6,090	1.0
12	South River near Ackworth.	474	1940-58.....	1947	-----	24.60	34,000	-----
					-----	2	6,040	.7
13	Whitebreast Creek near Knowville.	380	1945-58.....	1947	-----	19.6	14,000	-----
					-----	2	7,300	.9
14	Des Moines River near Tracy.	12,479	1852-1958.....	1947	-----	26.5	155,000	-----
					-----	7	33,100	.9
15	Cedar Creek near Bussey...	374	1946.....	1946	-----	28.05	31,500	-----
			1948-58.....	1950	-----	27.50	29,300	-----
					-----	2	29,000	3.7
MISSOURI RIVER BASIN								
16	Soldier River at Pisgah.....	407	1940-58.....	1950	-----	28.17	22,500	-----
					-----	2	5,280	.7
17	Boyer River at Logan.....	871	1918-25, 1937-58.....	1957	-----	22.67	23,600	-----
					-----	2	17,400	1.5
NISHNABOTNA RIVER BASIN								
18	West Nishnabotna River at Randolph.	1,326	1947-58.....	1949	-----	24.8	29,600	-----
				1950	-----	3	16,500	1.7
					-----	2	20,500	(2)
19	East Nishnabotna River near Audubon.	81.8			-----			-----
20	Blue Grass Creek tributary No. 1 near Audubon.	.057			-----	2	143	-----
21	Dauids Creek near Hamlin.	26.0	1952-58.....	1957	-----	14.80	1,160	-----
					-----	2	19,35	(2)
22	East Nishnabotna River at Atlantic.	382			-----	2	51,000	9.3
23	East Nishnabotna River near Atlantic.	437			-----	2	34,200	5.7
24	East Nishnabotna River at Red Oak.	894	1918-25, 1936-58.....	1947	-----	23.23	36,200	-----
					-----	3	35,600	4.5
25	East Nishnabotna River at Shenandoah.	1,019			-----	4	24,400	2.9
26	Nishnabotna River above Hamburg.	2,806	1922-23, 1928-58.....	1947	-----	26.03	55,500	-----
					-----	6	14,600	1.1
27	Nodaway River at Clarinda.	762	1903.....	1903	-----	25.4	(1)	-----
			1918-25, 1936-58.....	1947	-----	25.3	31,100	-----
					-----	3	19,000	-----

¹ Not determined.² Greater than 5.³ Not necessarily maximum discharge for period.⁴ Affected by ice jam.

TABLE 24.—*Damage resulting from July 1-2 storm*

[Losses rounded to \$1,000. Urban and rural losses from U.S. Army Corps of Engineers report; transportation losses from Iowa Highway Commission and U.S. Army Corps of Engineers (Railroad Damage) reports]

<i>Type of damage</i>	<i>Losses</i>
Urban.....	\$2, 720, 000
Rural.....	7, 097, 000
Transportation.....	2, 267, 000
Total.....	12, 084, 000

TABLE 25.—*Casualties, losses, and cost of relief and services for July 1958 flood*

Reported by American Red Cross:	
Human casualties and losses:	
Dead.....	18
Missing.....	1
Injured.....	78
Families suffering loss.....	1, 075
Families requiring assistance.....	344
Relief costs:	
Emergency mass care.....	\$5, 144
Individual family care.....	\$211, 958
Total.....	\$217, 102
Iowa National Guard expenditures for services.....	\$24, 640
Total cost.....	\$241, 742

FLOODS OF JULY AND AUGUST IN KANSAS

Maximum total monthly rainfall for the month of July occurred at several U.S. Weather Bureau stations in the eastern and southwestern parts of Kansas. In the northeastern part of the State, July 1958 was the wettest July since 1887, and precipitation exceeded that of the previous wettest July (1950) by 2.95 inches. In the west-central and south-central parts it was the second wettest July in the same 72-year period. Precipitation was recorded in measurable amounts on at least 10 days during the month in practically all sections of the State. Figure 21 shows the total precipitation for July in central and eastern Kansas. The average precipitation for the month of July is about 4 inches for this part of the State.

Many noteworthy floods occurred during the month, mainly in eastern Kansas (fig. 22). The U.S. Weather Bureau estimated that the storm damage in Kansas during July, 1958 surpassed the damage

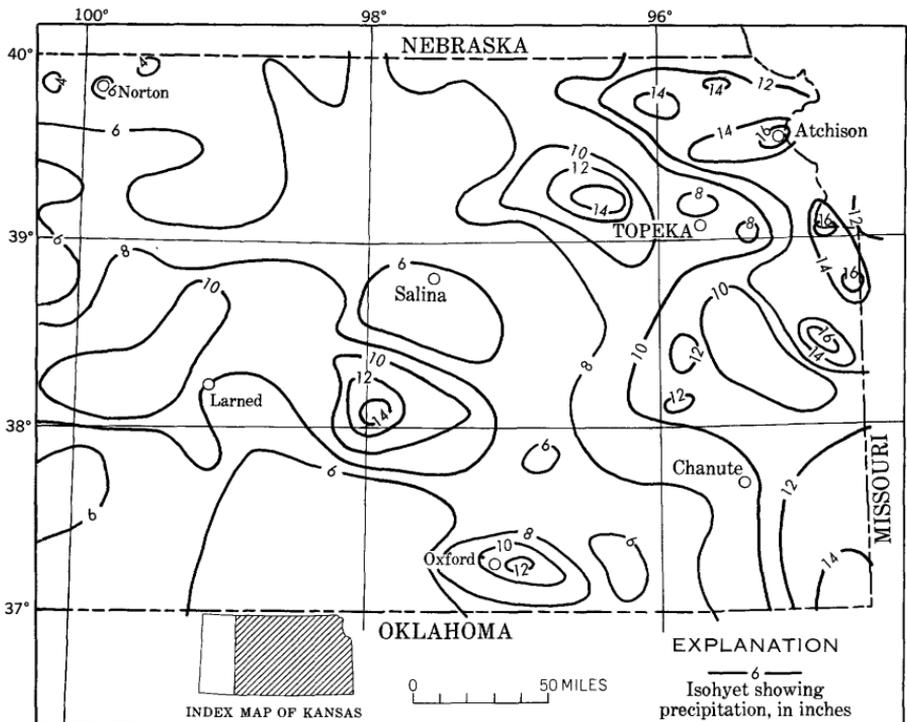


FIGURE 21.—Total precipitation for July in central and eastern Kansas.

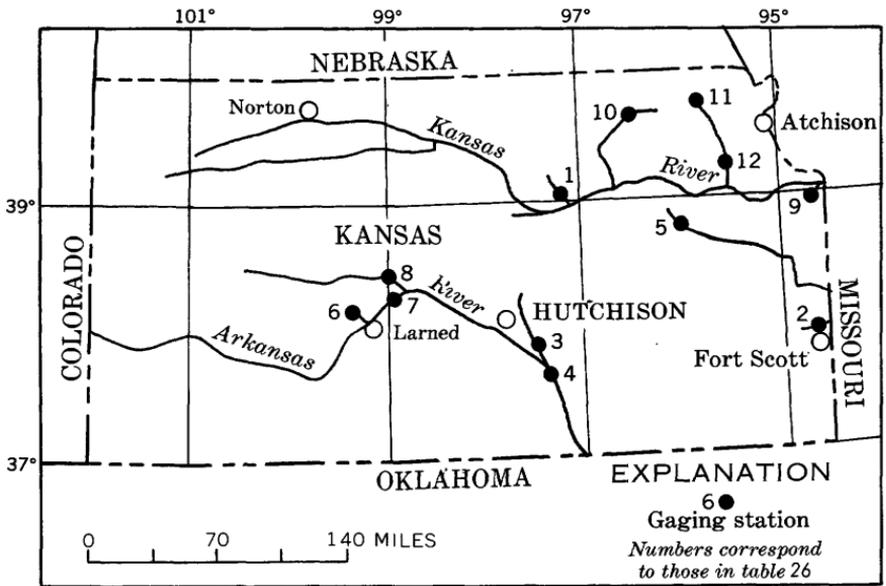


FIGURE 22.—Map of flood area showing location of flood-determination points. Floods of July and August in Kansas.

of June 1951 by \$5 million; however, the amount of damage attributable to flood waters is unknown.

During the preceding low-water years, many stream channels in Kansas became partially blocked by trees and brush, so, in July 1958, some streams reached record high stages with substantially less discharge than previously recorded.

At 8 a.m. on July 3, 4.17 inches of rain had been recorded at Wakefield and 3.30 inches at Longford, and as much as 9 inches of rainfall were estimated to have fallen east of Industry. Chapman Creek near Chapman peaked at 12,200 cfs on July 3. This flood discharge was almost 4.5 times greater, and the stage was 4.0 feet higher (table 26), than the previous maximum in a 5-year record. However, the flood in July 1951 was much greater. Damage estimates for the July 1958 flood totaled \$162,000.

Intense rains in the Wakeeney-Ellis area on July 4 produced a high rate of runoff, 667 cfs per square mile, on a small tributary of Big Creek near Ogallah. The rain gage 10 miles south of Ellis recorded 1.40 inches between 7 and 8 p.m., 0.45 inch in the next hour, and 2.36 inches total on July 4.

Rains of 5.07 inches in 45 minutes on July 11 at Atchison resulted in floods that severely damaged the business district; three persons were drowned. Part of the damage occurred when White Clay Creek overflowed a big storm sewer that runs under the business area and

TABLE 26.—*Flood stages and discharges, July and August, in Kansas*

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to July 1958		July-August 1958	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
1	KANSAS RIVER BASIN Chapman Creek near Chapman.	300	1951.....	1951.....	July 3	25.5	46,700	-----
			1953-58.....	1954.....		19.65	2,780	-----
			-----	-----		23.65	12,200	3.5
2	OSAGE RIVER BASIN Marmaton River near Fort Scott.	411	1915.....	1915.....	July 16	42.34	(¹)	-----
			1921-25, 1929-58.....	1935.....		37.30	37,400	-----
			-----	-----		37.40	27,200	2.5
3	ARKANSAS RIVER BASIN Little Arkansas River at Valley Center.	1,327	1922-58.....	1945.....	July 17	22.05	32,000	-----
			-----	-----		11.84	11,300	-----
			-----	-----		(¹)	30,700	1.5
4	OSAGE RIVER BASIN Arkansas River at Wichita.	40,420	1934-58.....	1957.....	July 17	10.81	18,200	1.7
			-----	-----		-----	-----	-----
			-----	-----		-----	-----	-----
5	ARKANSAS RIVER BASIN Switzler Creek at Burlingame.	26.3	1903-58.....	1945.....	July 20	22.3	(¹)	-----
			1954-58.....	1957.....		13.98	966	-----
			-----	-----		18.65	4,800	-----
6	ARKANSAS RIVER BASIN Pawnee River near Larned.	2,148	1924-58.....	1935.....	July 28	² 31.96	14,000	-----
			-----	-----		28.22	16,300	-----
			-----	-----		10.34	20,200	-----
7	ARKANSAS RIVER at Great Bend.	34,356	1940-58.....	1942.....	July 30	11.47	15,800	2.4
			-----	-----		-----	-----	-----
			-----	-----		-----	-----	-----
8	OSAGE RIVER BASIN Walnut Creek at Albert.	³ 1,410	1908-58.....	1927.....	July 30	⁴ 21.3	(¹)	-----
			-----	-----		25.19	4,560	1.3
			-----	-----		-----	-----	-----
9	KANSAS RIVER BASIN Turkey Creek at Mill Street, Kansas City, Kans.	21	-----	-----	July 31	-----	10,000	-----
			-----	-----		-----	-----	-----
			-----	-----		-----	-----	-----
10	OSAGE RIVER BASIN Black Vermillion River near Frankfort.	412	1948.....	1948.....	July 31	30.2	(¹)	-----
			1951.....	1951.....		28.6	30,400	-----
			1953-58.....	1954.....		24.31	4,210	-----
11	OSAGE RIVER BASIN Little Delaware River near Horton.	19	1951.....	1951.....	July 31	28.25	12,800	2.1
			1954-58.....	1955.....		18	(¹)	-----
			-----	-----		12.36	673	-----
12	KANSAS RIVER BASIN Delaware River at Valley Falls.	922	1865-1958.....	1951.....	Aug. 1	14.63	893	-----
			-----	-----		32.08	⁵ 94,600	-----
			-----	-----		29.14	41,500	4.0

¹ Not determined.² At different site and datum.³ Of which 104 square miles is probably noncontributing.⁴ Before levees were built in 1934.⁵ Not necessarily maximum discharge for the period.

sent torrents of water rushing down the streets. Climatological Data, Kansas, July 1958, contains the following description:

At least 200 cars were estimated to have been washed off the streets or ruined by being submerged in low places. Basements and business houses were flooded with loss of stocks and machinery. A number of buildings were caved in by the water or its effect. Surrounding farm lands were seriously eroded, bridges and culverts torn out, highways and railroad embankments impaired, and many crops ruined. Atchison suffered a second flash flood on the 30th when 3 inches of rain fell in 2 hours affecting much the same area as on the 11th. A number of business houses were again flooded just after reopening with new stocks, fixtures, and machinery.

The damage in Atchison was due to excessive rainfall and a local drainage problem. No major streams were involved.

Following light to moderate rains on July 14 and 15, heavy rains occurred early on July 16 at Fort Scott and vicinity. Rainfall at Fort Scott totaled 5.22 inches in the 24 hours ending at 8 a.m. July 16. Between 2.5 and 3 inches fell at Iola, Moran, and Walnut. The Marmaton River crest near Fort Scott on July 16 exceeded the May 28, 1935, rise by 0.1 foot, but the discharge was substantially less even though it almost equaled that of the disastrous floods of 1951. Thirty-one dwellings and 3,600 acres were flooded with damages amounting to \$17,000.

Moderate rains on July 15 were followed by intense rains early on July 16 in an area northwest of Wichita (fig. 22). Rainfall at Burrton during the first seven hours of July 16 totaled 3.08 inches, with 1.35 inches of that amount falling between 2 and 3 a.m. Rainfall at Hutchinson, Mount Hope, and Ripley were 3.47, 2.80, and 3.06 inches, respectively, for the 24 hours ending at 8 a.m. July 16.

The resulting peak discharges of Little Arkansas River at Valley Center and of Arkansas River at Wichita on July 17 (table 26) were only about one-third the previous maximum discharges on record, but the flows were sufficient to require the Big Slough-Cowskin floodway to operate.

Starting after 8 p.m. on July 19, heavy, intense rain fell near Burlingame. One rain gage recorded 2.29 inches in the hour ending at 9 p.m. July 19, and another recorded 0.99 inch in the same hour and 1.25 inches in the next hour. Seven gages in the area recorded 24-hour amounts ranging from 2.68 inches to 3.11 inches.

The resulting runoff caused a peak on Switzler Creek at Burlingame of 4,800 cfs, or 183 cfs per square mile, on July 20. This peak discharge exceeded the previous maximum of a 4-year period of record by 400 percent and was at a stage 4.67 feet higher, but it was almost 4 feet lower than the flood of June 30, 1945.

Heavy rains north of Dodge City on July 26 and 27 caused the Pawnee River near Larned to surpass the previous maximum discharge in a 34-year period of record. During these two days 5.43 inches of rain fell at Jetmore and 4.22 inches fell near Burdett.

The flood on the Pawnee River plus intermediate inflow produced a peak discharge of 15,800 cfs on July 30 on Arkansas River at Great Bend. Although the discharge was only 78 percent of the maximum during 18 years of record, the stage was 1.13 ft higher.

Farther north, on July 26, 1.43 inches of rain fell between 7 and 8 p.m. and 1.14 inches between 8 and 9 p.m., 13 miles south-southwest of Bazine. The total precipitation for that date was 4.10 inches. This intense rainfall caused a peak discharge on Walnut Creek at Albert of

4,560 cfs on July 30. The stage of this flood was 3.9 feet higher than the historical flood of August 1927.

Turkey Creek at Mill Street, Kansas City (fig. 22), had a peak discharge of 10,000 cfs, or 476 cfs per square mile, on July 31. This resulted from a storm that produced an average of about 5.3 inches of rainfall over the basin in a 4-hour period. U.S. Weather Bureau records show rainfall for the 24 hours ending at 7 a.m. July 31 of 6.15 inches at Bonner Springs and 4.51 inches at Olathe. At Morse, 4.33 inches fell between 8 p.m. July 30 and 4 a.m. July 31.

Rainfall centered near Centralia on July 30-31 produced a stage on Black Vermillion River near Frankfort that was only 0.3 foot lower than that of June 1951, although the peak discharge was much less. The rain gage at Centralia recorded 5.65 inches in 24 hours, but most of this probably fell within a 4- to 6-hour period before midnight on July 30. Four feet of water inundated the business district of Frankfort.

During the last six hours of July 30, rain totaled about 4 inches near Horton and about 3 inches at Valley Falls. The Little Delaware River near Horton crested on July 31 at the highest stage in the 4-year period of record (table 26). The crest on the Delaware River at Valley Falls did not occur until August 1. It was high but about 3 feet lower than the stage on June 21, 1951, and it had less than half the discharge. The U.S. Weather Bureau estimated damage from the flood at \$388,000.

FLOODS OF JULY 7-AUGUST 2 IN MISSOURI

Rainfall in Missouri during July was above normal and at many places was maximum for July records. Figure 23, an isohyetal map, shows the total amounts and distribution of rainfall for the month of July and the points of flood determinations.

The rains kept all streams above normal, with the greatest runoff occurring in the Salt River basin. Successive rises during the month reached a climax between July 31 and August 2, when peak stages and discharges in the Salt River basin generally exceeded the previous

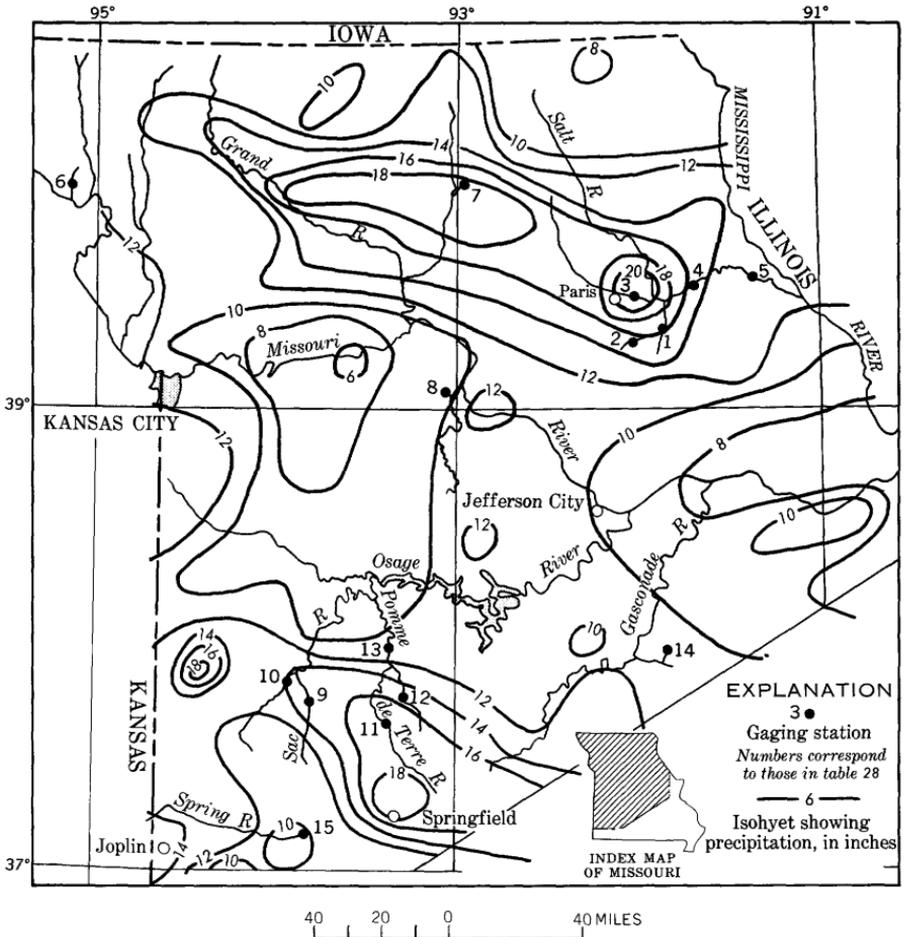


FIGURE 23.—Map of flood area showing location of flood-determination points and precipitation for July. Floods of July 7-August 2 in Missouri.

maximums in periods of record from 20 to almost 30 years long. Table 27 shows the total rainfall for the period July 30–August 2 in the northeastern part of Missouri, as reported by the U.S. Weather Bureau.

The previous maximum discharge of record in Middle Fork Salt River at Paris was exceeded by the floods of both July 21 and August 1. The stage on July 31 at a former gaging station, Elk Fork Salt River near Paris, was 23.30 ft, which was the highest stage since at least 1875. The previously known maximum stage was 20.22 ft on June 27, 1942 (discharge, 20,600 cfs).

TABLE 27.— Total rainfall at U.S. Weather Bureau stations, July 30–August 2, in northeast Missouri

Location	Rainfall (inches)	Location	Rainfall (inches)
Milan.....	2.45	Martinsburg.....	4.23
Kirksville.....	1.81	Middletown.....	4.12
Macon.....	6.71	Monroe City.....	3.58
Moberly.....	2.92	Palmyra.....	1.68
Madison.....	4.85	Hannibal.....	2.16
Shelbyville.....	4.02	Vandalia.....	4.14
Shelbina.....	5.18	Bowling Green.....	4.32
Paris.....	7.62	Louisiana.....	5.08
Mexico.....	3.77	Elsberry.....	2.78

Many of the flood peaks listed in table 28 have high recurrence intervals. In the Salt River basin, ratios of the flood peak to $Q_{2.33}$ (mean annual flood) of 1.94 and 2.30 signify recurrence intervals of 20 and 50 years, respectively; whereas in the Osage River basin the ratios of 2.94 and 3.83 signify recurrence intervals of 20 and 50 years, respectively. The ratio for Mill Creek is about 2 times that for a 50-year flood. The major flooding was in the northeastern part of Missouri. Crops and farmland were extensively damaged. Several county bridges were destroyed, and the historic covered bridge at Paris was washed from its foundation in late July. Water flooded the lower residential area in Paris and necessitated the evacuation of several families.

TABLE 28.—Flood stages and discharges, July 7–August 2, in Missouri

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods						
			Prior to July 1958		July-August 1958	Gage height (ft)	Discharge		
			Period	Year			Cfs	Ratio to Q _{2.33}	
SALT RIVER BASIN									
1	South Fork Salt River at Santa Fe.	298	1939-58.....	1944	-----	21.10	13,100	-----	
2	Youngs Creek near Mexico.	67.4	1930-58.....	(¹)	July 31	20.62	12,300	1.2	
			-----	1942	-----	15.1	(¹)	-----	
3	Middle Fork Salt River at Paris.	356	1939-58.....	1942	July 31	12.19	6,140	1.6	
			-----	-----	-----	12.52	6,530	-----	
4	Salt River near Monroe City.	2,230	1928.....	1928	July 21	21.76	10,500	1.0	
			1939-58.....	1944	Aug. 1	23.48	10,800	1.0	
5	Salt River near New London.	2,480	1922-58.....	1928	Aug. 1	29.94	23,100	2.1	
			-----	-----	-----	36	(¹)	-----	
MILL CREEK BASIN									
6	Mill Creek at Oregon.....	4.90	1950-58.....	1951	-----	4.75	840	-----	
						July 30	7.0	2,640	5.9
GRAND RIVER BASIN									
7	Hamilton Branch near New Boston.	2.51	1955-58.....	1956	-----	6.81	612	-----	
						July 15	7.45	693	-----
LAMINE RIVER BASIN									
8	Shiloh Branch near Marshall.	2.87	1952-58.....	1955	-----	6.92	871	-----	
						July 15	7.04	880	-----
OSAGE RIVER BASIN									
9	Sac River near Stockton....	1,160	1921-58.....	1943	-----	31.8	120,000	-----	
10	Cedar Creek near Pleasant View.	420	1909.....	1909	July 17	25.3	45,000	1.5	
			1923-26, 1948-58..	1951	-----	27.7	(¹)	-----	
11	Pomme de Terre River near Bolivar.	225	1950-58.....	1957	July 17	25.56	24,300	3.1	
			-----	-----	-----	27.35	33,900	-----	
12	Lindley Creek near Polk...	112	1914.....	1914	July 16	15.88	12,900	-----	
			1957-58.....	1957	-----	17.30	17,600	2.5	
13	Pomme de Terre River at Hermitage.	655	1921-58.....	1927	July 16	25.2	(¹)	-----	
			-----	-----	-----	15.5	4,320	-----	
GASCONADE RIVER BASIN									
14	Little Beaver Creek near Rolla.	6.41	1948-58.....	1957	-----	7.57	5,040	-----	
						July 17	8.57	7,420	6.8
ARKANSAS RIVER BASIN									
15	Stahl Creek near Miller....	3.86	1950-58.....	1951	-----	6.18	904	-----	
						July 7	6.40	1,010	-----

¹ Unknown.² Maximum stage since 1881 or 1882.

FLOODS OF JULY 10 ON SOLDIERS CREEK, NEBRASKA

A highly localized storm over Soldiers Creek near Crawford (fig. 24) caused a flash flood on July 10. Because of the scarcity of rain gages in this area, the heavy flood-producing rainfall was not measured. The maximum rainfall reported was 1.67 inches in the 24 hours ending at 8 a.m. July 10 at Fort Robinson.

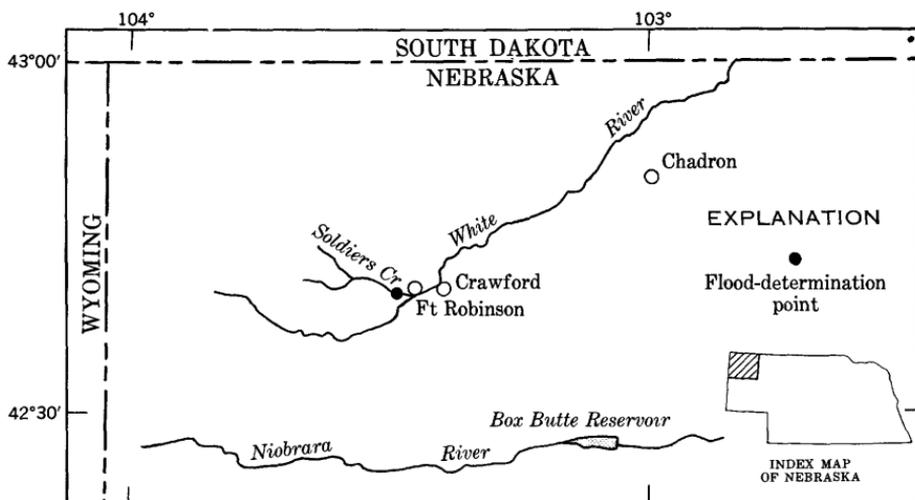


FIGURE 24.—Map of flood area showing location of flood-determination point. Flood of July 10 on Soldiers Creek, Nebraska.

The peak discharge in Soldiers Creek near Crawford was 3,970 cfs from 52.6 square miles of drainage area. This flood peak cannot be adequately compared with the past maximum because the 4-year period of record is too short. Although flood-frequency relationships for drainage areas of less than 75 square miles in Nebraska are not well defined, data indicate that the peak discharge had a recurrence interval of more than 50 years, and possibly more than 100 years.

FLOODS OF JULY 10 AND SEPTEMBER 4 IN SOUTHEASTERN NEBRASKA

Intense storms occurred July 9–11 and September 3–6 in almost the same areas in the southeast corner of Nebraska (fig. 25) and caused flooding in the Little Nemaha and the Nemaha River basins. Although rainfall was recorded on 4 days, September 3–6, at some weather stations, that on September 3 was recorded only at gages that were observed in the evening or at midnight. Therefore, the September storm was of a duration about equal to that of July 9–11.

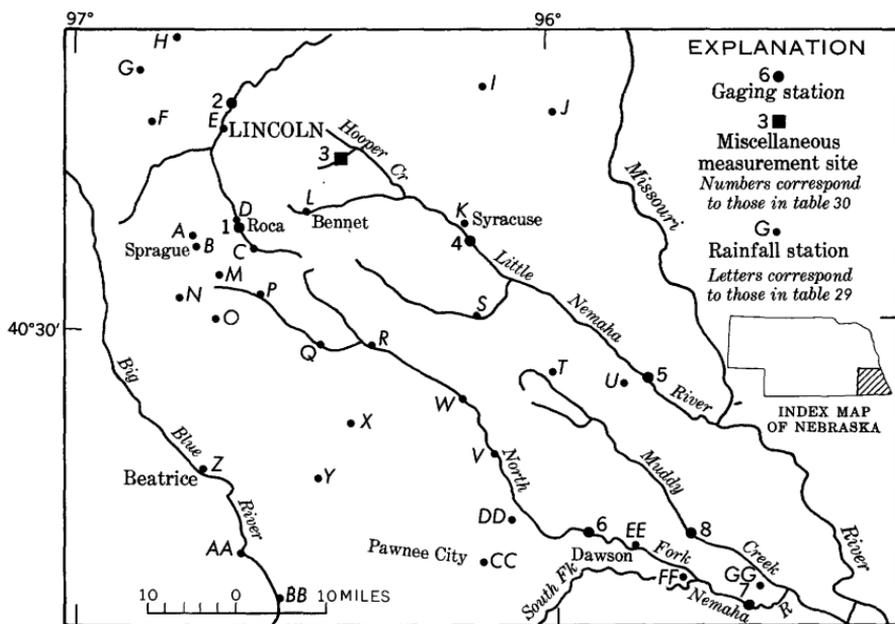


FIGURE 25.—Map of flood area showing location of flood-determination points and rainfall stations. Floods of July 10 and September 4 in southeastern Nebraska.

The rains in July were considerably heavier than those in September from Sprague northeastward to Syracuse (table 29). The maximum total rainfall during the period was 8.36 inches at Bennet.

The rains in September were much heavier than those in July from Beatrice to Pawnee City. The maximum during the September storm was 12.21 inches near Pawnee City, and 8.20 inches was recorded on September 4 at Pawnee City.

The intensity of the rainfall was great. Daily rainfall amounts that would be expected on the average of once in 25 years fell near Roca, Bennet, Syracuse, and Dawson on July 10 and near Pawnee City and Dawson on September 4. Thus, Dawson twice received daily rainfalls of 25-year recurrence intervals within a period of 2 months.

Severe flooding occurred in the Little Nemaha and Nemaha River basins following the intense July rains. Peak discharges at gaging stations in operation since 1952 were maximum for the period of record (table 30); but at stations established before 1952, the peak discharges were the second or third highest since 1944. Floods occurred in the same basins in September, but the peak discharges were mostly considerably less except in the lower reaches of the Nemaha River where the concentration of rain near Pawnee City caused peaks almost equal to those in July.

The July floods damaged or destroyed thousands of acres of crops; and many State and county highways, culverts, and bridges were

TABLE 29.—Rainfall, in inches, at U.S. Weather Bureau stations, and at miscellaneous sites, July 9–11 and September 3–6, in southeastern Nebraska

Site	Station	July				September				
		9	10	11	9-11	3	4	5	6	3-6
A	Martel.....					0	1.10	0	1.70	2.80
	5W.....	0.07	3.28	0.10	3.45					
B	2NNW.....	.52	3.02	1.62	5.16					
	Sprague.....	.58	2.29	1.24	4.11					
C	1ESE.....	.74	2.43	1.41	4.58					
	Hickman.....	.64	4.00	2.05	6.69	0	1.52	.46	1.46	3.44
D	1N.....	.62	3.32	1.52	5.46	0	1.10	.58	1.18	2.86
	2WSW.....	.66	2.73	1.78	5.17	0	1.58	.53	1.15	3.26
E	Roca.....	.62	4.40	1.55	6.57	0	(1)	1.50	.60	2.10
	2SE.....	.90	3.93	1.28	6.11					
F	2S.....	.60	3.22	1.37	5.19	0	1.14	.51	1.26	2.91
	1NE.....	.56	5.03	1.37	6.96	0	1.30	.78	1.35	3.43
G	6NE.....	.49	6.25	1.46	8.20	0	2.60	.70	1.49	4.79
	Lincoln Weather Bureau.....	1.76	2.40	.12	4.28					
H	College View.....	4.20	.60	0	4.80					
	Agricultural Farm.....	.26	5.15	.15	5.56					
I	Emerald.....	.56	1.75	.33	2.64					
	Malcolm.....	.47	5.04	.20	5.71					
J	Raymond.....	.35	.22	4.10	4.67					
	Weeping Water.....	.37	1.91	.38	2.66					
K	6NW.....	1.24	.90	.34	2.48	1.60	.15	1.56	0	3.31
	Nehawka.....					2.08	.39	1.18	0	3.65
L	4S.....					0	3.38	.57	.71	4.66
	Syracuse.....	.27	5.75	.60	6.62	0	2.80	.40	.83	4.03
M	4NE.....	.27	3.40	.70	4.37					
	3NE.....	1.73	2.52	.58	4.83					
N	Bennet.....	.54	6.51	1.31	8.36					
	4SW.....	.55	5.33	1.28	7.16					
O	Princeton.....					0	2.10	1.43	0	3.53
	2NW.....	.12	3.27	.18	3.57	0	2.01	1.49	.04	4.08
P	2N.....	.72	2.30	1.30	4.32	0	1.88	.42	1.18	3.48
	3N.....	.98	2.61	1.45	5.04	0	1.76	.52	1.28	3.56
Q	3NW 2.....					0	3.00	0	1.00	4.00
	Hallam.....									
R	3W.....	.55	1.80	1.46	3.81	0	.41	.60	1.25	2.26
	2NNE.....	.59	1.79	1.56	3.94	0	2.28	.50	1.20	3.98
S	3NW 2.....					0	3.00	.50	1.50	5.00
	Cortland.....									
T	2E 2.....					0	3.75	0	1.50	5.25
	Firth.....	2.37	1.38	0	3.75	0	2.33	.63	1.20	4.16
U	4NE 2.....					0	3.10	.75	1.50	5.35
	Adams.....									
V	3W 2.....					0	3.10	1.30	2.10	6.50
	5SW 2.....					0	4.00	.80	1.80	6.60
W	1E 2.....					0	3.70	0	.40	4.10
	5S 2.....					0	3.75	1.75	1.50	7.00
X	3N 2.....					0	2.40	.77	1.30	4.57
	2SW 2.....					0	2.50	4.00	0	6.40
Y	Sterling.....	.32	3.32	.86	4.50	0	2.63	1.15	1.15	4.93
	6NE 2.....					0	3.50	.10	.90	4.50
Z	Cook.....					0	3.29	.99	.98	5.26
	3S 2.....									
AA	Johnson.....					0	5.00	1.00	1.00	7.00
	2SSW 2.....					0	4.33	.89	1.06	6.28
BB	Auburn.....					0	2.00	1.00	1.00	4.00
	Elk Creek.....					0	4.00	1.15	.90	6.05
CC	2WSW 2.....					0	2.30	.86	.80	5.18
	5ENE 2.....					0	2.75	1.75	.25	4.75
AA	Tecumseh.....	.25	5.16	.57	5.98	1.22	3.00	.80	1.10	4.90
	7SW 2.....					0	4.75	1.00	1.00	6.75
BB	5W 2.....					0	3.00	1.90	1.20	6.10
	6ENE 2.....					0	3.40	1.00	1.50	5.90
CC	5N 2.....					0	4.20	.81	1.50	6.51
	Virginia.....	.13	1.75	1.16	3.04	0	3.77	2.10	0	6.17
AA	Beatrice No. 1.....	0	1.45	1.54	2.99	0	3.50	1.56	1.54	6.60
	Beatrice No. 2.....	0	2.50	.60	3.10	0	3.50	1.56	1.54	6.60
BB	Wymore.....					0	4.22	1.05	1.28	6.55
	2N.....	0	1.54	3.27	4.81	0	8.20	1.04	1.46	10.70
CC	Barneston.....	.02	1.21	2.20	3.43	0	10.73	1.40	.08	12.21
	Pawnee City.....	.03	4.16	2.00	6.19	0	3.10	.75	1.50	5.35
CC	5E.....	.07	3.74	1.16	4.97	(1)				
	6N 2.....					0				

See footnotes at end of table.

TABLE 29.—Rainfall, in inches, at U.S. Weather Bureau stations, and at miscellaneous sites, July 9-11 and September 3-6, in southeastern Nebraska—Continued

Site	Station	July				September				
		9	10	11	9-11	3	4	5	6	3-6
DD	Table Rock									
	5N	.12	3.93	.98	5.03	1.50	3.04	1.08	1.10	6.72
EE	2E ²					0	3.30	0	1.70	5.00
	Dawson	.12	5.61	.92	6.65					
FF	3N W ²					0	4.80	1.40	1.20	7.40
	6SW ²					0	6.30	0	1.05	7.35
GG	Salem									
	3N ²					0	2.50	.90	1.00	4.40
	Falls City	.07	3.17	1.63	4.87	0	3.30	.50	1.25	5.05

¹ Amount included in observation for next day.² Unofficial data collected from residents by Corps of Engineers.

washed out or badly damaged. Damage also occurred to railroad fills and bridges.

The September floods caused less damage than those of July, but again there was some damage to roads, bridges, and crops.

TABLE 30.—Flood stages and discharges, July 10 and September 4, in southeastern Nebraska

No.	Stream and place of determination	Drainage area (sq. mi.)	Maximum floods					
			Prior to July 1958		July, September 1958	Gage height (ft.)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
PLATTE RIVER BASIN								
1	Salt Creek at Roca	174	1950-58	1950	July 10	26.0 22.70	67,000 16,700	----- 7.5
2	Salt Creek at Lincoln	710	1949-58	1951	July 10	26.15 23.00	28,200 21,700	----- 3.4
LITTLE NEMAHA RIVER BASIN								
3	Hooper Creek tributary near Palmyra	7.81	1950-58	1951	July 10	16.55 15.65	3,090 1,630	-----
4	Little Nemaha River near Syracuse	218	1950-58	1950	July 10	36.7 28.75	225,000 25,300	----- 7.7
5	Little Nemaha River at Auburn	801	1949-58	1950	July 10	27.65 24.28	164,000 49,200	----- 5.1
NEMAHA RIVER BASIN								
6	North Fork Nemaha River at Humboldt	531	1952-58	1954	July 10	28.48 31.70	43,300 51,000	----- 7.4
7	Nemaha River at Falls City	1,340	1944-58	1954	July 10	27.44 26.13	51,400 35,100	----- 2.3
8	Muddy Creek at Verdon	188	1952-58	1954	July 10	22.97 31.50	17,100 31,900	----- 8.5
LITTLE NEMAHA RIVER BASIN								
5	Little Nemaha River at Auburn	801	1949-58	1950	Sept. 4	27.65 17.40	164,000 10,300	----- 1.1
NEMAHA RIVER BASIN								
6	North Fork Nemaha River at Humboldt	531	1952-58	1954	Sept. 4	28.48 19.50	43,300 22,700	----- 3.3
7	Nemaha River at Falls City	1,340	1944-58	1954	Sept. 4	27.44 25.85	51,400 34,200	----- 2.2

FLOODS OF JULY 14-15 IN UPPER ILLINOIS RIVER BASIN, ILLINOIS

The most severe rainstorm in Illinois during 1958 was centered near Ottawa in the north-central part of the State. Here, on July 14, 12-hour rainfall amounts of more than 8 inches and 6-hour amounts of more than 7 inches were recorded. Flash floods caused extensive damage in the Ottawa area early on July 14.

The greatest rainfall reported for July 14 was 8.93 inches at Ottawa, of which 8.77 inches fell in 11 hours. Rainfall was reported from other U.S. Weather Bureau stations as follows: Marseilles Lock, 7.28 inches; Streator, 5.99 inches; LaSalle-Peru, 5.51 inches; and Pontiac, 5.25 inches. The Illinois State Water Survey Division made an extensive field survey, collected and analyzed rainfall data, and prepared an isohyetal map for the storm area. Figure 26 was drawn from this map.

The storm caused the maximum discharge during 27 years of record at Vermilion River at Lowell (table 31). The only higher stage known there was caused by an ice jam of unknown date. Data in the

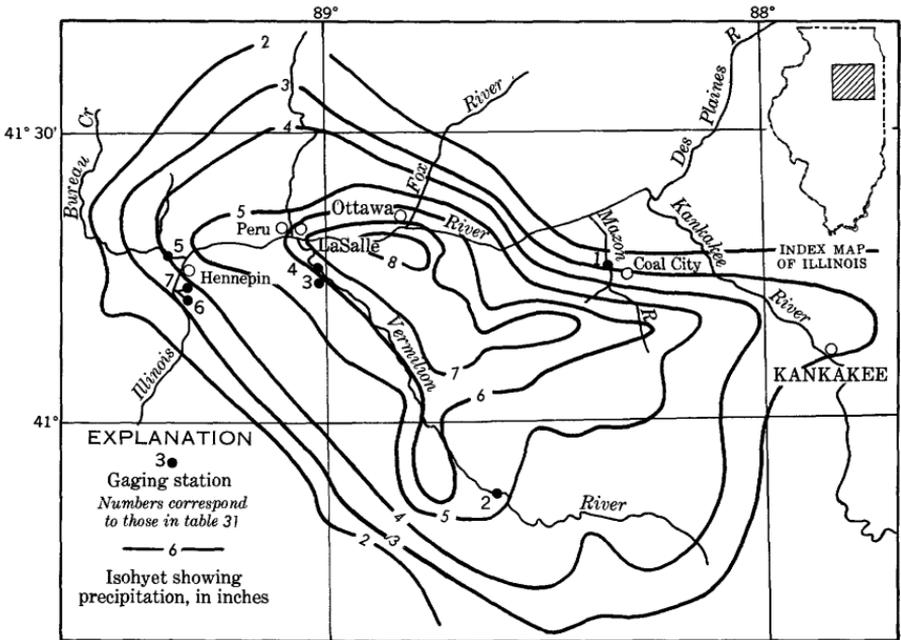


FIGURE 26.—Map of flood area showing location of flood-determination points and precipitation for July 14. Floods of July 14-15 in upper Illinois River basin, Illinois.

TABLE 31.—Flood stages and discharges, July 14–15, in upper Illinois River basin, Illinois

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					Discharge	
			Prior to July 1958		July 1958 (day)	Gage height (ft)	Cfs	Ratio to $Q_{2.33}$	
			Period	Year					
1	Mazon River near Coal City.	470	1924–58.....	1924.....	-----	21	(1)	-----	
			1939–58.....	1950.....		18.50	17,300	-----	
2	Vermilion River at Pontiac.	568	-----	-----	-----	15	19.70	17,600	
			1911–58.....	1951.....		17.90	13,600	2.0	
3	Vermilion River tributary at Lowell.	.13	-----	-----	-----	15	15.84	8,670	
			1956–58.....	1956.....		11.68	22.7	-----	
4	Vermilion River at Lowell.	1,230	-----	(1)	-----	14	16.30	176	
			-----	-----		² 16	(1)	-----	
5	East Bureau Creek near Bureau.	101	-----	-----	-----	³ 12.70	27,700	-----	
			1931–58.....	1951.....		15	15.30	33,500	3.2
6	Coffee Creek tributary near Florida.	.034	-----	-----	-----	14	17.39	6,200	
			1936–58.....	1938.....		11.50	1,910	.6	
7	Coffee Creek tributary near Hennepin.	.23	-----	-----	-----	14	13.42	(1)	
			1956–58.....	1957.....		16.53	122	-----	
			-----	-----	-----	14	19.16	71.4	
			-----	-----	-----	14	27.54	373	

¹ Not determined.² At site 500 feet downstream; ice jam.³ At site 500 feet downstream.

State flood-frequency report ² indicate that the recurrence interval for the flood at Lowell is in excess of 50 years. At Mazon River near Coal City the flood was the maximum in 19 years of record and the highest known stage in 34 years.

² Mitchell, W. D., 1954, Floods in Illinois—Magnitude and frequency: Illinois Department of Public Works and Buildings, Division of Waterways, Springfield, Ill.

FLOODS OF JULY 15-16 IN WESTERN PENNSYLVANIA

During the night of July 14-15, thunderstorms were accompanied by heavy rainfall in several areas in the western part of the State (table 32). The heaviest concentrations were in a narrow belt that runs from Greenville, near the Ohio State line, eastward to Franklin, and in the Stump Creek basin northeast of Punxsutawney (fig. 27).

Flood stages occurred in the Shenango River basin, in the Sandy Creek and Chubb Run basins near Franklin, and in the Mahoning Creek basin near Punxsutawney. These stages are summarized in table 33 together with discharges in comparison with previous maximums. The peak stage and the discharge on Little Shenango River at Greenville in 1958 were maximum since at least 1913.

Flood damages were estimated at \$3.5 million by the U.S. Weather Bureau. The business district of Sharon was flooded to a depth of a foot or more. Industrial areas in Greenville and railroad property were severely damaged. Many roads and bridges over tributaries of the Shenango River were destroyed or badly impaired.

One life was lost during the flood at Raymilton in the Sandy Creek basin during attempted evacuation. A total of 764 dwellings and 4,440 acres of agricultural land were flooded in the major damage area. The most seriously damaged towns were Sharon, with a loss of \$2.5 million; Wheatland, with \$125,000; Greenville, with \$57,000; Farrell, with \$20,000; and New Castle, with \$10,000.

TABLE 32.—*Rainfall at selected U.S. Weather Bureau stations, July 13-16, in western Pennsylvania*

[Period of record, 7 a.m. July 13 to 7 a.m. July 16. Data furnished by U.S. Weather Bureau, Pittsburgh, Pa.]

<i>Station</i>	<i>Location</i>	<i>Total rainfall (inches)</i>
A.....	Farrell-Sharon.....	2. 03
B.....	Franklin.....	3. 28
C.....	Greenville.....	5. 72
D.....	Jamestown.....	2. 12
E.....	Meadville.....	1. 43
F.....	Mercer.....	2. 02
G.....	Utica.....	4. 25
H.....	Brookville.....	3. 37
I.....	DuBois.....	2. 82
J.....	Mahaffey.....	1. 87
K.....	Marion Center.....	1. 89
L.....	Punxsutawney.....	4. 13
M.....	Putneyville.....	2. 17
N.....	Sagamore.....	. 92
O.....	Stump Creek.....	5. 01

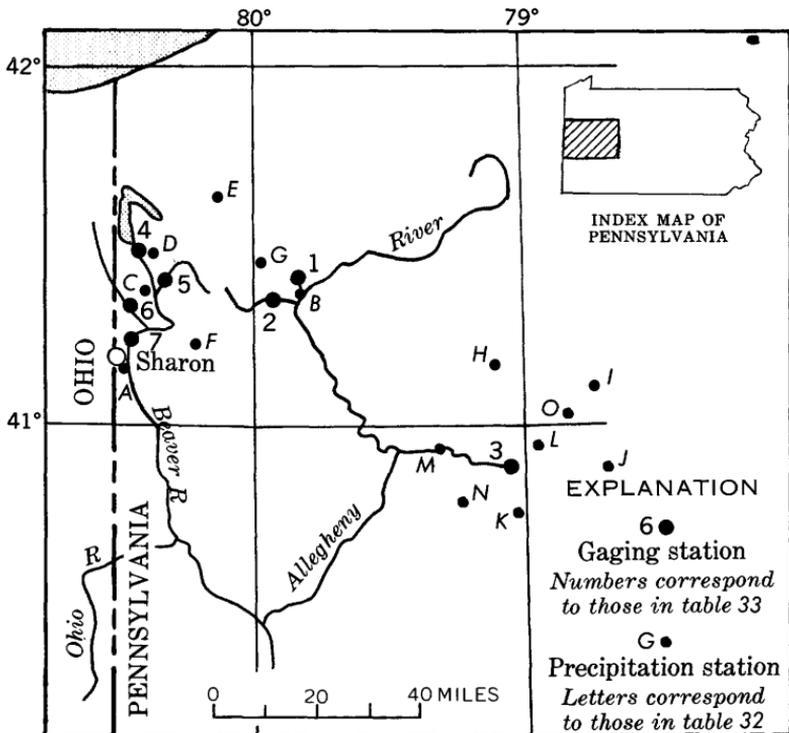


FIGURE 27.—Map of flood area showing location of flood-determination points and precipitation stations. Floods of July 15-16 in western Pennsylvania.

TABLE 33.—Flood stages and discharges, July 15-16, in western Pennsylvania

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to July 1958		July 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
1	FRENCH CREEK BASIN Chubb Run at Franklin.....	0.75			15		258	
	SANDY CREEK BASIN Little Sandy Creek at Polk.....		17.8			15		4,330
3	MAHONING CREEK BASIN Mahoning Creek at Punxsutawney.....	158		1936.....	1936		¹ 15.60	12,500
			1938-58.....	1952		10.12	6,490	
						15	10.89	7,370
4	BEAVER RIVER BASIN Shenango River at Pymatuning Dam.....	167	1934-58.....	1937		9.2	1,540	
					15	8.88	² 1,460	
5	Little Shenango River at Greenville.....	104	1913-58.....	1954		12.73	6,620	
						16	13.50	7,600
6	Pymatuning Creek near Orangeville.....	169	1913-58.....	1915		¹ 9.1	6,200	
						15	11.90	5,200
7	Shenango River at Sharpsville.....	588	1913.....	1913		19.3	⁽³⁾	
			1938-58.....	1954		12.64	13,900	
						16	13.97	12,900

¹ At different site or datum. ² Regulated by reservoir. ³ Not determined.

FLOOD OF JULY 18 AT RYEGATE, MONT.

Heavy thunderstorms, which started about 4:30 p.m. July 18, centered over the town of Ryegate, Mont. (fig. 28), and caused a flash flood of rare occurrence in a small stream in the northwest corner of Ryegate. At Ryegate, about 2½ inches of rain in half an hour was measured in a small-diameter rain gage by a resident. Another resident estimated that about 3 inches of rain fell. Only 0.6 inch of rain in a 2-hour period was reported 2½ miles north of Ryegate, and very little rain was reported 1½ miles west of Ryegate. A survey south and east of town indicated the amount of precipitation was considerably less than that which fell in town. There is no rainfall recurrence data for Ryegate, but at Miles City (160 miles east) and at Havre (160 miles north), a rainfall intensity of 2½ inches in half an hour has a recurrence interval of more than 100 years.

A Musselshell River tributary in SE¼NE¼ Sec. 6, T. 6 N., R. 20 E., about 100 feet upstream from the mouth, and half a mile north of State Highway 6 at Ryegate (fig. 28), had a peak discharge of 352 cfs from 0.082 square mile, a rate of 4,290 cfs per square mile. The peak of the July 18, 1958, flood was the maximum known since at least 1928.

The unnamed creek that flows through Ryegate, to which the above small stream is tributary, had an estimated peak discharge of more than 1,000 cfs from about 0.8 square mile of drainage area. The resultant flood in Ryegate was the most severe of 4 to occur in 30 years—the last flood previous to the one of 1958 occurred in 1942. In the latest inundation, many basements in town were flooded, but only minor damage resulted.

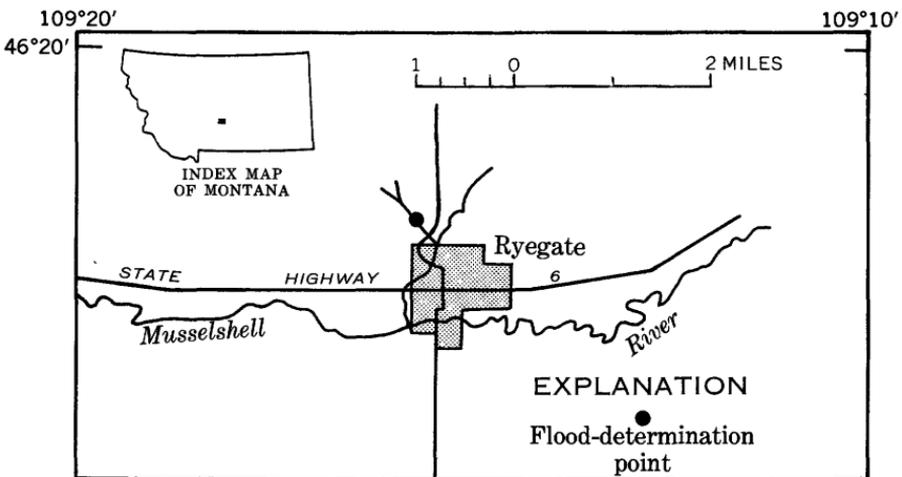


FIGURE 28.—Map of flood area showing location of flood-determination point. Flood of July 18 at Ryegate, Mont.

FLOODS OF JULY 30 AND AUGUST 16 IN NORTH-CENTRAL UTAH

Two severe small-area storms occurred about 50 miles apart in north-central Utah, near Great Salt Lake, within a period of 18 days.

The first storm, on July 30, produced heavy rain over an area of approximately 36 square miles in the vicinity of Beaver Dam and Collinston and caused high rates of runoff and considerable flood damage.

Bucket surveys indicated that from 1.5 to 2.5 inches of rain fell in 40 to 60 minutes. One indirect measurement of peak discharge was obtained on a small tributary to Bear River and gives some indication of the high rate of runoff from the storm. The peak discharge of 1,180 cfs from the small drainage area of 0.475 square mile, 2,480 cfs

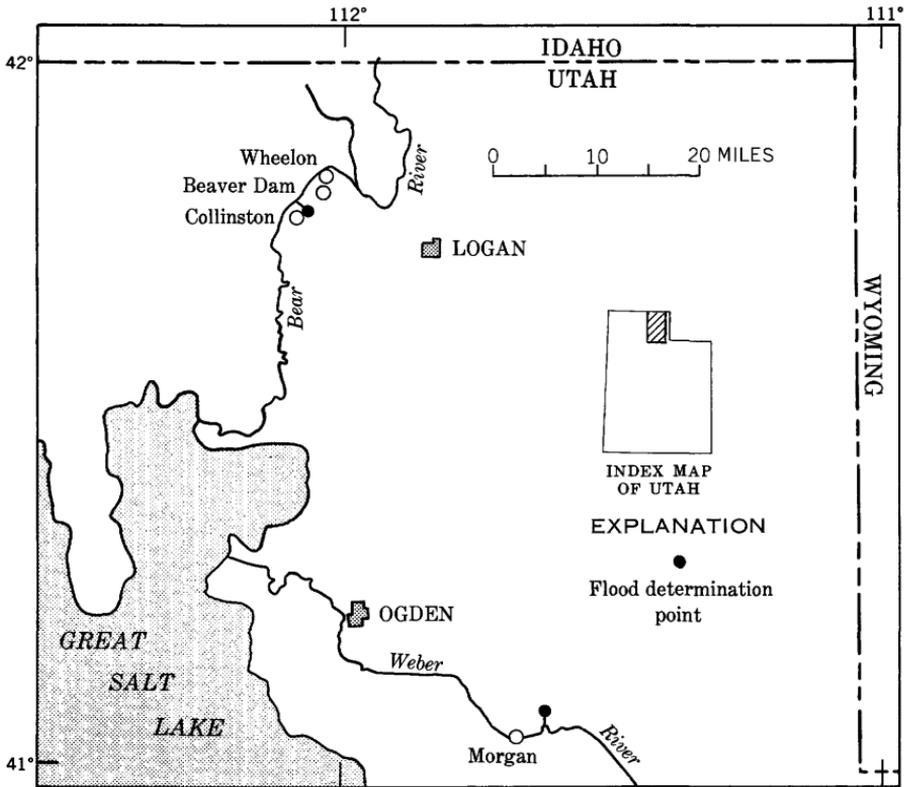


FIGURE 29.—Map of flood area showing location of flood-determination points. Floods of July 30 and August 16 in north-central Utah.

per square mile, in Sleepy Hollow near Collinston (fig. 29), was the maximum known since at least 1918.

The area seriously affected by the storm is predominantly farmland, and damage from erosion varied depending upon the farming methods used. Principal damage to highways and roads consisted of destruction of one bridge crossing Beaver Creek between Beaver Dam and Wheelon and loss of road fill and culverts in some sections of State Highway 69.

Residents in the area indicated that the storm was the most severe known in the past 40 years.

The second storm, a heavy thunderstorm on August 16, caused extremely high rates of runoff and considerable flood damage in an area of about 8 square miles east of Morgan (fig. 29). Precipitation data from a bucket survey showed high concentrations of rainfall—from 4 to 6 inches of rain fell in less than an hour. The area covered by the storm is mainly steep pasture land with a little grass and sagebrush cover. The bottom land near the Weber River supports hay crops and was subject to considerable damage from deposits of sediment and debris. U.S. Highway 30 South was blocked for about 3 days owing to water and debris.

A high peak discharge, determined by indirect measurement on one of the small tributaries to the Weber River, draining an area of 0.177 square mile, was 454 cfs, or 3,880 cfs per square mile.

**FLOODS OF AUGUST 25-26 IN EASTERN MARYLAND AND
DELAWARE**

Heavy rains on August 24-26 (table 34) caused flooding from small drainage areas in the Nanticoke and Choptank River basins in eastern Maryland and Delaware. Eight inches or more of rain fell in the area enclosed by lines extending from Milford to Georgetown to Easton (fig. 30), and more than 9 inches fell at some points.

Peak discharges (table 35) at four gaging stations were the maximum during their periods of operation. The peak discharges on

TABLE 34.—*Rainfall at U.S. Weather Bureau stations, August 24-26, in eastern Maryland and Delaware.*

MARYLAND		
Station	Location	Total rainfall (inches)
A-----	Coleman-----	4. 51
B-----	Millington-----	4. 37
C-----	Chestertown-----	5. 21
D-----	Rock Hall-----	2. 74
E-----	Centreville-----	5. 24
F-----	Denton-----	7. 95
G-----	Easton-----	7. 95
H-----	Easton Pol. Brks-----	8. 27
I-----	Preston-----	7. 85
J-----	Cambridge-----	7. 15
K-----	Salisbury-----	4. 64
DELAWARE		
L-----	Dover-----	6. 45
M-----	Milford-----	9. 02
N-----	Bridgeville-----	9. 05
O-----	Lewes-----	9. 01
P-----	Georgetown-----	8. 89

Marshy Hope Creek, near Adamsville, Del., and on Nanticoke River, near Bridgeville, Del., were respectively 1.5 times and 2.8 times the previous maximum since 1943.

Ratios of the peak discharge to the mean annual flood at the three gaging stations in Maryland indicate a recurrence interval much greater than 50 years. The recurrence intervals of the floods at the two gaging stations in Delaware are undoubtedly also very high, but no frequency data are available for them.

Flood damage in Federalsburg, Md., was estimated at \$250,000. High water forced the evacuation of more than 100 residents and some merchants from their homes and business establishments.

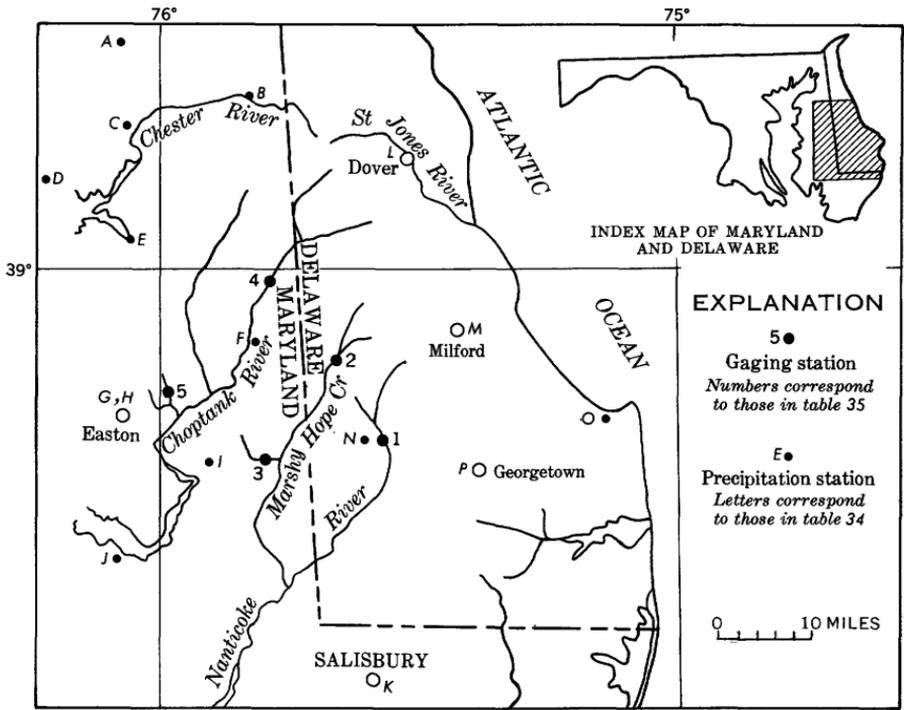


FIGURE 30.—Map of flood area showing location of flood-determination points and precipitation stations. Floods of August 25-26 in eastern Maryland and Delaware.

TABLE 35.—Flood stages and discharges, August 25-26, in eastern Maryland and Delaware

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to August 1958		August 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
NANTICOKE RIVER BASIN								
1	Nanticoke River near Bridgeville, Del.	75.4	1935.....	1935	-----	11.0	(¹)	-----
			1943-58.....	1948	-----	6.40	830	-----
					26	8.84	2,300	-----
2	Marshy Hope Creek near Adamsville, Del.	44.8	1935.....	1935	-----	14.5	(¹)	-----
			1943-58.....	1956	-----	10.42	1,440	-----
					26	11.55	2,270	-----
3	Faulkner Branch at Federalsburg, Md.	7.10	1950-58.....	1955	-----	4.10	433	-----
					25	4.12	440	3.5
CHOPTANK RIVER BASIN								
4	Choptank River near Greensboro, Md.	113	1948-58.....	1956	-----	11.47	4,140	-----
					26	11.74	4,380	3.4
5	Beaverdam Branch at Matthews, Md.	5.85	1950-58.....	1958	-----	7.24	1,050	-----
					25	5.94	660	2.9

¹ Not determined.

FLOODS OF SEPTEMBER 3-9 IN SOUTHWESTERN IOWA

A period of scattered heavy thundershowers in southern Iowa began on September 3 and was climaxed by a downpour on September 5 that exceeded 12 inches in a period of 7 hours in the vicinity of Casey. Small streams in the Marengo-Grinnell area in eastern Iowa had high peak discharges on September 4 as a result of the local heavy storms, but the peaks were lower again on the 5th. The upper end of the Middle River and tributaries to the Nishnabotna River were affected by the extreme precipitation in the Casey area and produced high peaks. The rainfall distribution for the storm of September 5 is shown on figure 31 in the form of isohyets compiled from published U.S. Weather Bureau data.

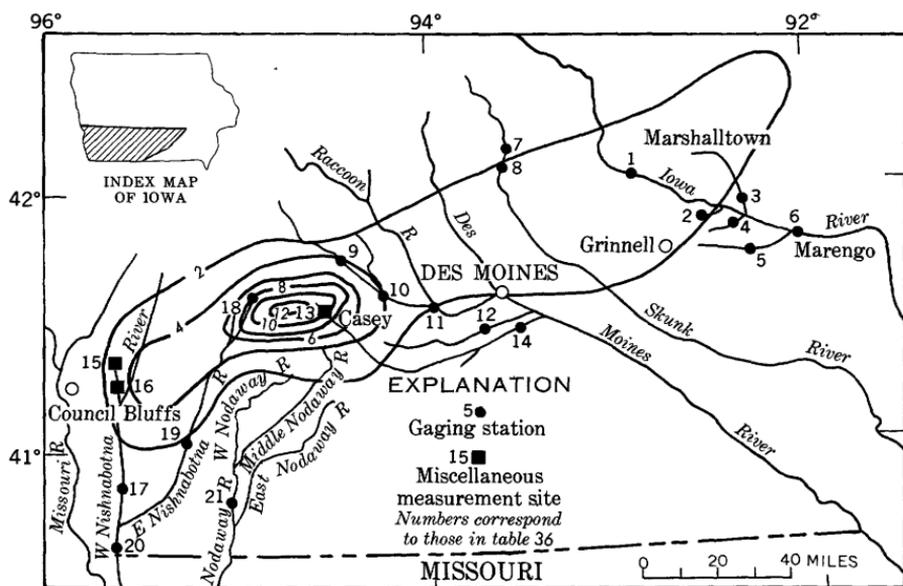


FIGURE 31.—Map of flood area showing location of flood-determination points and precipitation for September 5. Floods of September 3-9 in southwestern Iowa.

As a result of the downpour which occurred generally from 3 p.m. to 10 p.m. on September 5 in the Casey area, streams rose very rapidly, flooding large areas and causing heavy destruction and damage.

Peak discharges at several gaging stations and miscellaneous sites are shown in table 36.

TABLE 36.—Flood stages and discharges, September 3-9, in southwestern Iowa

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to September 1958		September 1958 (day)	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{2.33}
IOWA RIVER BASIN								
1	Iowa River at Marshalltown.	1,532	1915-27, 1933-58.	1918	-----	17.74	42,000	-----
2	Richland Creek near Haven.	56.1	1918	1918	-----	9.77	1,160	0.1
			1949-58.	1950	-----	14.3	(¹)	-----
3	Salt Creek near Elberon.	201	1944-58.	1944	-----	10.92	2,320	-----
				1947	-----	9.18	1,090	-----
4	Walnut Creek near Hartwick.	70.9	1947	1947	-----	19.9	35,000	-----
			1949-58.	1950	-----	6	1,770	.8
5	Bear Creek at Ladora.	189	1945-58.	1946	-----	13.44	(¹)	-----
6	Iowa River at Marengo.	2,794	1957-58.		-----	17.7	3,600	-----
					-----	3	4,930	-----
					-----	4	9,050	-----
					-----	4	5,290	2.6
					-----	4	11,000	.8
SKUNK RIVER BASIN								
7	Skunk River near Ames.	315	1920-27, 1933-58.	1944	-----	13.90	9,240	-----
				1954	-----	2.80	105	-----
8	Skunk River below Squaw Creek, near Ames.	556	1944	1944	-----	13	10,000	-----
			1952-58.	1954	-----	12.36	8,700	-----
					-----	5	186	-----
DES MOINES RIVER BASIN								
9	Middle Raccoon River at Panora.	440	1953	1953	-----	14.3	(¹)	-----
			1958.	1958	-----	11.87	9,150	-----
10	South Raccoon River at Redfield.	988	1940-58.	1958	-----	6.42	1,330	.2
11	Raccoon River at Van Meter.	3,441	1915-58.	1947	-----	29.04	35,000	-----
				1958	-----	6	25,500	3.0
12	North River near Norwalk.	349	1940-58.	1947	-----	21.77	41,200	-----
					-----	6	20,900	1.4
13	South Fork Middle River at Casey.	35.5	1940-58.	1947	-----	17.76	32,000	-----
14	Middle River near Indianola.	506	1940-58.	1947	-----	9	1,530	.3
					-----	5,6	23,900	-----
NISHNABOTNA RIVER BASIN								
15	Middle Silver Creek near Oakland.	25.7	1952-58.		-----	5,6	12.28	1,450
16	Middle Silver Creek at Treynor.	42.7	1952-58.		-----	5,6	16.0	2,600
17	West Nishnabotna River at Randolph.	1,326	1948-58.	1949	-----	² 24.8	29,600	-----
				1950	-----	21.93	17,900	1.9
18	Davids Creek near Hamlin.	26.0	1952-58.	1958	-----	6	19.35	22,700
					-----	5	11.08	425
19	East Nishnabotna River at Red Oak.	894	1918-25, 1936-58.	1947	-----	7	23.23	36,200
20	Nishnabotna River above Hamburg.	2,806	1922-23, 1928-58.	1947	-----	7	18.58	19,900
					-----	6	26.03	55,500
					-----	6	20.55	10,300
NODAWAY RIVER BASIN								
21	Nodaway River at Clarinda.	762	1903	1903	-----	25.4	(¹)	-----
			1918-25, 1936-58.	1947	-----	25.3	31,100	-----
					-----	7	10.26	6,810

¹ Not determined.² Affected by ice jam.

Damage over an area of several counties was very heavy—incomplete damage figures indicate totals of almost \$2 million (table 37). Damage in eastern Iowa as a result of the floods was relatively light. Casualty and relief expenditure data are shown in table 38.

TABLE 37.—*Damage resulting from floods of September 3-9 in southwestern Iowa*

[Data incomplete; from the U.S. Army Corps of Engineers. Transportation losses are for Nishnabotna River basin. Mississippi drainage transportation damages, to the extent known, are an unidentifiable part of rural damages]

<i>Type of damage</i>	<i>Losses</i>
Urban.....	\$184, 000
Rural.....	1, 599, 000
Transportation.....	83, 000
Total.....	1, 866, 000

TABLE 38.—*Casualties, losses, and cost of relief and services, floods of September 3-9 in southwestern Iowa*

Reported by American Red Cross:	
Casualties and losses:	
Dead or injured.....	0
Families suffering loss.....	78
Families requiring assistance.....	58
Dwellings:	
Destroyed.....	2
Damaged.....	39
Buildings:	
Destroyed.....	35
Damaged.....	25
Relief costs:	
Emergency mass care.....	\$254
Individual family care.....	\$19, 423
Total.....	\$19, 677
Iowa National Guard expenditures for services.....	\$1, 508
Total cost.....	\$21, 185

FLOODS OF SEPTEMBER 5 ON TRIBUTARIES TO THE BIG BLUE AND REPUBLICAN RIVERS IN NORTHEASTERN KANSAS

After intermittent showers on the morning of September 4, heavy downpours late in the day produced rainfall totaling 6.60 inches at Clifton and 6.85 inches at Fact (fig. 32). The resulting peak discharge, 19,600 cfs, on Fancy Creek at Winkler was about 15 times the previous maximum during a 5-year discharge record, and the peak stage was the second highest since at least 1915. This discharge was almost 6 times as large as the mean annual flood and had a recurrence interval greater than 50 years.

Rainfall of 4 to 7 inches fell in other parts of the Republican River basin on September 4-5 and caused severe flash floods on small streams in the area; the amounts of discharge were not determined. Belleville, on the headwaters of Salt Creek, received 7.03 inches of rain on September 5, and flood waters caused some damage at Hollis. Heavy rains, reportedly totaling about 14 inches, fell at Agenda, and the overflow from Elk Creek flooded Clyde with water from 1½ to 5 feet deep. Six houses were destroyed, and other damage was sustained by 300 residents of Clyde. The U.S. Weather Bureau estimated the damage in this area from this flood at \$1.4 million.

The unusual magnitude of the storm is apparent when the amount of rainfall is compared to data on recurrence intervals—in this flood area, a 24-hour rainfall of from 6.0 to 6.5 inches has an expected recurrence interval of about 50 years.

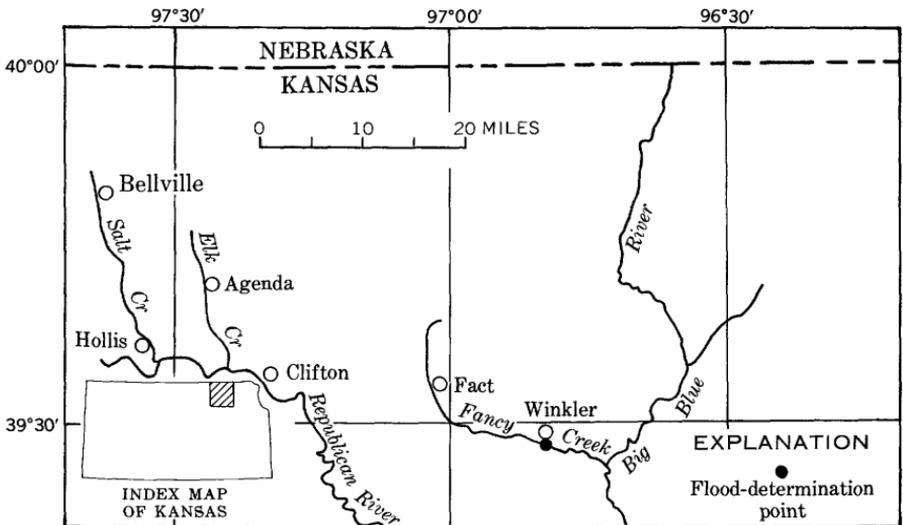


FIGURE 32.—Map of flood area showing location of flood-determination point. Floods of September 5 in northeastern Kansas.

FLOODS OF SEPTEMBER-OCTOBER IN THE RIO GRANDE BASIN, TEXAS AND MEXICO

Heavy rains during the last half of September and the first half of October in the Rio Grande basin caused destructive floods along the Rio Grande in Texas and Mexico (fig. 33).

Torrential rainfalls were reported in the mountains near Marfa and Alpine, Tex., on September 27. As much as 40 inches of rain fell during the last two weeks in September in northern Mexico and western Texas.

The stage of the Rio Conchos near Ojinaga, Mexico, on September 28 was the highest since 1917, although the peak discharge was only about one-third that of the 1904 flood (table 39). Although a large part of its flow (1,850,000 acre-feet) was stored in Boquilla and Madero reservoirs, the peak discharge of Rio Conchos was 54,740 cfs on September 28.

More than 16,000 persons were isolated in Ojinaga, and water ran a foot deep over the International bridge at Presidio; downstream

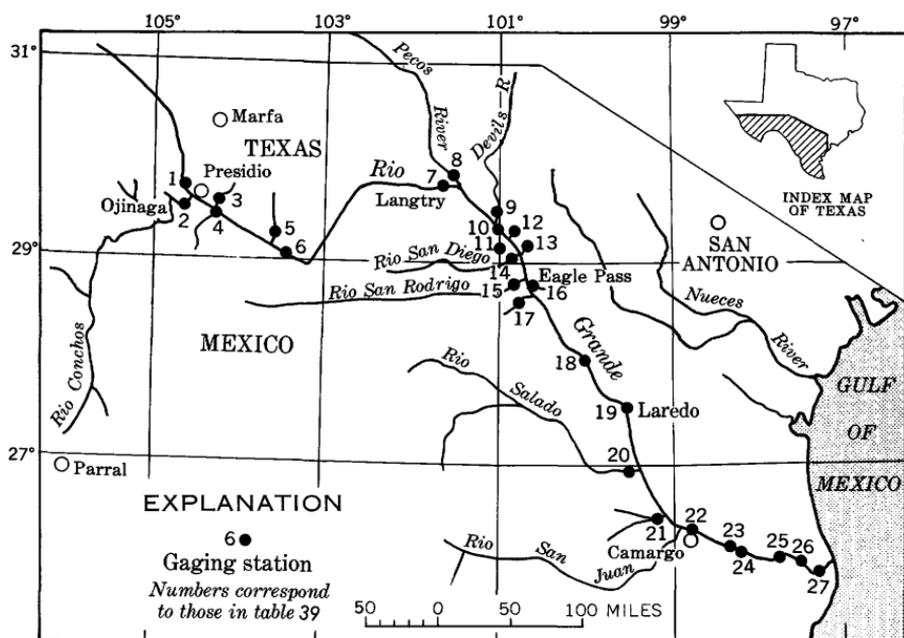


FIGURE 33.—Map of flood area showing location of flood-determination points. Floods of September-October in the Rio Grande basin, Texas and Mexico.

TABLE 39.—Flood stages and discharges, September–October, in the Rio Grande basin, Texas and Mexico

[From International Boundary and Water Commission Water Bulletins]

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to September 1958		September–October 1958	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{a.s.}
1	Rio Grande above Presidio, Tex.	34,988	1889–1958	1905	Sept. 27	13.99	14,000	-----
2	Rio Conchos near Ojinaga Chihuahua, Mex.	29,267	1896–1958	1904	Sept. 28	17.98	1,320	-----
3	Alamito Creek near Presidio, Tex.	1,504	1932–58	1955		7.33	162,000	-----
				1958		1 9.57	54,740	-----
4	Rio Grande at Lower Presidio Station, Tex.	66,203	1896–1958	1904	Sept. 26		16,400	-----
5	Terlingua Creek near Terlingua, Tex.	1,070	1932–58	1935			2 2,590	-----
6	Rio Grande at Johnson Ranch, Tex.	70,715	1932	1932	Oct. 1	20.37	3 162,000	-----
			1936–58	1938	Sept. 25	4 17.59	54,300	-----
7	Rio Grande at Langtry, Tex.	84,795	1900–58	1922		10.15	34,900	-----
8	Pecos River near Shumla, Tex.	35,162	1900–58	1954	Sept. 27	24.6	21,400	-----
9	Devils River at Devils River, Tex.	4,305	1900–58	1932	Sept. 25	24.6	97,000	-----
10	Rio Grande near Devils River, Tex.	126,423	1900–58	1954		19.75	58,800	-----
11	Arroyo Las Vacas near Ciudad Acuña, Coahuila, Mex.	358	1938–58	1954	Sept. 27	24.70	61,900	-----
12	San Felipe Creek near Del Rio, Tex.	46	1931–58	1935	Sept. 29	56.9	204,000	-----
13	Pinto Creek near Del Rio, Tex.	249	1928–58	1948		30.47	56,900	-----
14	Rio San Diego at Jimenez, Coahuila, Mex.	848	1922–58	1941	Sept. 22	121.7	5 948,000	-----
15	Rio San Rodrigo near El Moral, Coahuila, Mex.	669	1932–58	1932	Sept. 22	21.90	38,400	-----
16	Rio Grande at Eagle Pass, Tex.	130,575	1745–1958	1865	Sept. 22	36.60	6 597,000	-----
17	Rio Escondido at Villa De Fuente, Coahuila, Mex.	1,279	1932–58	1936			31,100	-----
18	Rio Grande at San Antonio Crossing near Villa Guerrero, Coahuila, Mex.	132,347	1952–58	1954	Sept. 28	18.10	1,158,000	-----
19	Rio Grande at Laredo, Tex.	135,976	1745–1958	1865	Sept. 28	16.14	73,900	-----
20	Rio Salado at Las Tortillas, Tamaulipas, Mex.	24,877	1953–58	1955	Sept. 19	5.18	25,780	-----
21	Rio Alamo at Ciudad Mier, Tamaulipas, Mex.	1,692	1923–58	1948	Sept. 19	6.71	2,140	-----
22	Rio Grande at Rio Grande City, Tex.	180,396	1932–58	1932	Sept. 20	32.0	186,000	-----
23	Rio Grande below Anzalduas Dam Site.	182,138	1952–58	1953	Sept. 20	4.33	1,130	-----
24	Rio Grande at Hidalgo, Tex.	182,173	1929–58	1932	Sept. 28	20.96	75,200	-----
25	Rio Grande at Progreso Bridge, Tex.	182,173	1952–58	1954	Sept. 28	10.14	23,550	-----
26	Rio Grande, near San Benito, Tex.	182,187	1952–58	1954	Sept. 28	16.08	81,200	-----
27	Rio Grande at Lower Brownsville Station, Tex.	182,215	1934–58	1942	Sept. 28	14.99	29,660	-----
				1945	Sept. 29	56.00	1,236,000	-----
					Sept. 29	20.08	75,570	-----
					Sept. 16	19.13	24,000	-----
					Sept. 16	10.30	8,120	-----
					Sept. 29	42.70	912,000	-----
					Sept. 29	12.26	68,900	-----
					Oct. 1	62.5	950,000	-----
					Oct. 1	20.93	59,680	-----
					Oct. 16	15.94	19,700	-----
					Oct. 16	23.79	27,720	-----
					Oct. 17	33.56	144,800	-----
					Oct. 17	14.17	22,250	-----
					Oct. 17	57.4	7 198,800	-----
					Oct. 17	57.40	104,000	-----
					Oct. 19	21.85	27,900	-----
					Oct. 19	28.87	63,920	-----
					Oct. 19	104.88	83,870	-----
					Oct. 19	102.02	37,100	-----
					Oct. 22	14.50	10,810	-----
					Oct. 22	23.69	19,900	-----
					Oct.	60.07	8,040	-----
					22–25		13,600	-----
					Oct. 23	33.24	31,700	-----
					Oct. 23	31.84	9,760	-----

1 Affected by backwater from Rio Grande.

2 Mean daily.

3 At site 7.1 miles upstream.

4 At site 0.3 mile downstream at different datum.

5 At site 13 miles downstream.

6 At site 3.7 miles upstream.

7 At site 3 miles downstream.

at Del Rio the water was within 1½ feet of the International bridge approaches. Some railroad tracks were washed out near Presidio, and cotton crops in the area were badly damaged.

The addition of flood inflow from the Pecos and Devils Rivers in Texas, from Rio San Diego and Rio San Rodrigo in Mexico, and from other tributaries below Langtry produced a peak discharge of 75,570 cfs in the Rio Grande at Eagle Pass on September 29, the greatest discharge of this flood above Falcon reservoir.

Storage in Falcon Reservoir was increased by 1.7 million acre-feet from September 4 to October 9. Flood discharge at the dam began on September 26 and continued to the end of the year.

During a period of heavy rains in the lower Rio Grande Valley, up to 4 inches of rain fell daily in scattered areas from October 14 to 16.

In Elsa, Tex., 5 inches of rain flooded streets and closed schools. Camargo, Mexico (population 8,000) was deserted except for police officials.

The stage of the river at Rio Grande City was 7 feet above flood stage on October 17; and the floodway system at Mission, Tex., began to take significant amounts of water on October 16.

The Rio Grande discharge below Falcon Dam was augmented by a peak discharge of 22,250 cfs in Rio Alamo at Ciudad Mier and by high discharge in Rio San Juan. Marte Gomez Reservoir on the San Juan River held less than 400,000 acre-feet of water on September 7, but by October 11 it was completely filled to its capacity of more than a million acre-feet. Spilling over the uncontrolled spillway began on October 11, and this spill plus discharge from intervening areas produced a peak discharge that was the maximum since 1948 on the lower Rio Grande.

Extensive flooding plagued irrigated farms and villages adjacent to the Rio Grande from the mouth of the Rio San Juan to the Gulf of Mexico. About 50,000 acres of agricultural land in Texas and about 125,000 acres of ranching and agricultural land in Mexico were inundated. Damage in Texas below Anzalduas Dam was confined within the river and interior floodway levees. In Mexico, however, interior flooding occurred at several places owing to cuts made in the river levees to relieve pressure on them.

A comparison of 1958 stages and discharges below Falcon Dam to former floods and the operation of the floodway system in Texas and Mexico was described by the International Boundary and Water Commission, United States and Mexico (Water bulletin no. 28) as follows:

In the reach of river below Falcon Dam to the Gulf of Mexico the 1958 flood forcefully demonstrated the reduction in flood-carrying capacity of the river,

probably largely due to encroachment of vegetation in the channel and in portions of the river floodways during recent years when no flood flows have occurred. Water surface elevations in the river during the 1958 flood were higher than in 1950 for the same flows by amounts ranging from two to four feet in the reach from Rio Grande City to Hidalgo Bridge, to as much as nine feet at the Lower Brownsville gaging station. In terms of maximum discharges the 1958 flood was far less than the 1932 flood. In terms of maximum water surface elevations the 1958 flood was one foot higher at Lower Brownsville, 2.6 feet lower at Penitas, and 3.0 feet lower at Rio Grande City, than the 1932 flood.

The United States and Mexican floodway systems received their greatest test since the 1932 flood. At the height of the flood, there was a peak flow of approximately 100,000 second-feet at the head of the floodway system. Diversions to the interior floodways of the United States and Mexico, and overflows through levee cuts along the Mexican bank left a residual flow of less than 11,000 second-feet flowing to the Gulf of Mexico through the Rio Grande channel. A total of 3,135,800 acre-feet were diverted through the floodway systems, 1,341,000 acre-feet through the United States and 1,794,000 acre-feet through the Mexican side.

FLOODS OF SEPTEMBER 20-22 IN WESTERN LOUISIANA AND EASTERN TEXAS

Heavy rains fell on a large portion of western Louisiana and eastern Texas (fig. 34) during the period September 19-22, causing high runoff and floods on many of the small streams in the area. Rainfall exceeded 6 inches over an area about 50 miles wide and 170 miles long. The largest amounts measured for the period September 19-22 were 19.9 inches at Vinton, La., about 22 miles west of Lake Charles, La., and 16.3 inches at Mansfield, La., about 36 miles south of Shreveport, La.

At few of the stations was the great flood of May 1953 exceeded, although the peak discharge in Bayou San Patricio near Noble exceeded the previous maximum since at least 1951 by 65 percent. Bundick Creek and Beckwith Creek, tributaries to the Calcasieu River, had peaks of more than 50 year frequencies.³

Table 40 gives the peak discharges at selected gaging stations throughout the area (fig. 34).

Damage in the area was light, although many highways were inundated, and traffic was suspended at some places for a short time.

³ Cragwall, J. S., Jr., 1952, "Floods in Louisiana, Magnitude and Frequency"; Louisiana Dept. Highways.

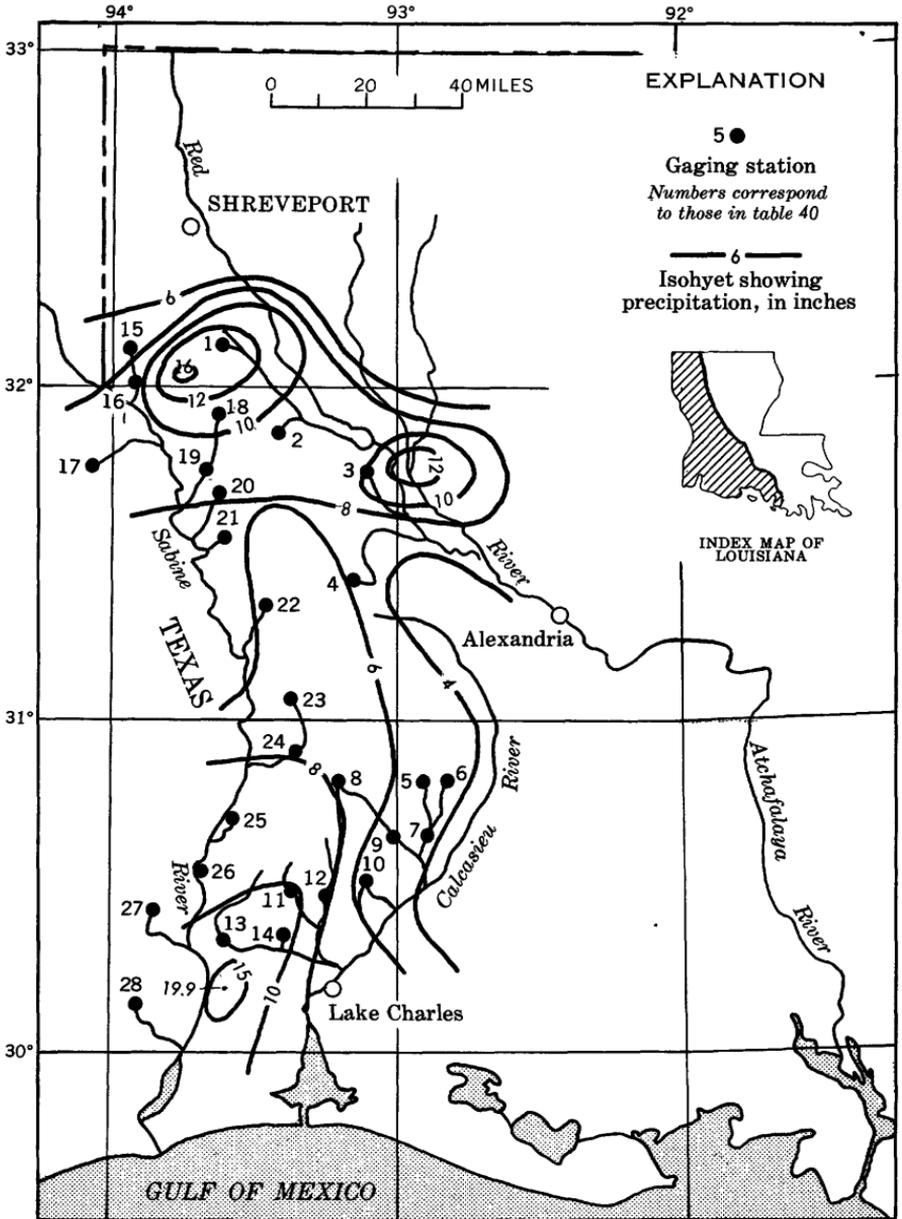


FIGURE 34.—Map of flood area showing location of flood-determination points and precipitation for September 19-22. Floods of September 20-22 in western Louisiana and eastern Texas.

TABLE 40.—Flood stages and discharges, September 20–22, in western Louisiana and eastern Texas

No.	Stream and place of determination	Drainage area (sq in)	Maximum floods						
			Prior to September 1958		September 1958 (day)	Gage height (ft)	Discharge		
			Period	Year			Cfs	Ratio to Q _{2.33}	
RED RIVER BASIN									
1	Bayou NaBonchasse near Mansfield, La.	19.5	-----	-----	21	15.75	(¹)	-----	
2	Bayou Dupont near Robeline La.	35.1	1957–58	1958	-----	9.42	2,800	-----	
3	Youngs Bayou at Natchitoches La.	40.1	-----	-----	21	8.92	1,630	0.6	
4	Little Sandy Creek at Kitchie La.	21.4	1949–58	1953	-----	14.89	1,890	.6	
			-----	-----	21	15.36	5,880	-----	
			-----	-----		9.65	2,450	1.2	
CALCASIEU RIVER BASIN									
5	Sixmile Creek near Sugartown, La.	171	1956–58	1956	-----	13.99	6,120	-----	
6	Tenmile Creek near Elizabeth, La.	91.5	1949–58	1953	-----	14.05	6,360	1.0	
7	Whiskey Chitto Creek near Oberlin, La.	510	1939–58	1953	-----	21.33	31,900	-----	
8	Bundick Creek near Deridder, La.	120	1956–58	1956	-----	13.67	2,960	.7	
9	Bundick Creek near Dry Creek, La.	238	1939–58	1953	-----	32.8	144,000	-----	
10	Barnes Creek near Reeves, La.	111	1949–58	1953	-----	22	20.65	16,000	1.3
11	Beckwith Creek near DeQuincy, La.	148	1945–58	1955	-----	18.75	4,750	-----	
12	Hickory Branch near Kernan, La.	82.2	1946–58	1955	-----	20.11	6,260	1.2	
13	Bearhead Creek near Starks, La.	177	1956–58	1956	-----	23.67	37,000	-----	
14	Coward Gully near DeQuincy, La.	15.3	1954–58	1956	-----	22	19.06	18,000	2.3
			-----	-----	20	46.20	(¹)	-----	
			-----	-----		46.10	(¹)	-----	
			-----	-----	21	24.45	13,800	-----	
			-----	-----	21	24.13	13,000	2.3	
			-----	-----	20	27.83	6,850	-----	
			-----	-----	20	27.62	6,760	1.8	
			-----	-----	22	15.86	4,880	-----	
			-----	-----	22	17.00	7,300	1.8	
			-----	-----		10.96	(¹)	-----	
			-----	-----		12.19	(¹)	-----	
SABINE RIVER BASIN									
15	Bayou Castor near Longstreet, La.	27.7	1954–58	1954	-----	14.37	(¹)	-----	
16	Bayou Castor near Logansport, La.	96.5	1955–58	1956	-----	15.17	(¹)	-----	
17	Tenaha Creek near Shelbyville, Tex.	87.0	1952–58	1953	-----	23.33	8,030	-----	
18	Bayou San Patricio near Benson, La.	81.1	1954–58	1957	-----	21	21.45	6,260	
19	Bayou San Patricio near Noble, La.	154	1951–58	1953	-----	13.85	15,200	-----	
20	Bayou San Miguel near Zwolle, La.	113	1948–58	1950	-----	20	12.70	9,180	
21	Bayou LaNana near Zwolle, La.	130	1955–58	1958	-----	16.53	3,400	-----	
22	Bayou Toro near Toro, La.	148	1955–58	1957	-----	20	20.36	(¹)	
23	Bayou Anacoco near Leesville, La.	114	1948–58	1953	-----	14.75	9,330	-----	
24	Bayou Anacoco near Rosepine, La.	366	1951–58	1953	-----	21	16.04	15,400	
25	Hoosier Creek near Merryville, La.	14.6	1955–58	1956	-----	15.75	15,000	-----	
26	Brushy Creek at Bancroft, La.	27.3	1954–58	1954	-----	21	13.07	7,060	
27	Cypress Creek near Buna, Tex.	63.4	1952–58	1955	-----	22	19.24	4,300	
28	Cow Bayou near Mauriceville, Tex.	127	1940–58	1952	-----	14.53	5,700	-----	
			1952–58	1952	-----	17.53	2,360	-----	
			-----	-----	21	15.32	3,350	-----	
			-----	-----	21	19.39	26,200	-----	
			-----	-----	21	15.32	4,640	-----	
			-----	-----	21	28.38	64,300	-----	
			-----	-----	21	22.09	14,000	-----	
			-----	-----	21	10.25	870	-----	
			-----	-----	21	10.86	1,000	-----	
			-----	-----	21	15.10	(¹)	-----	
			-----	-----	21	16.97	(¹)	-----	
			-----	-----	22	11.95	3,800	-----	
			-----	-----	22	10.95	2,420	-----	
			-----	-----	23	16.51	-----	-----	
			-----	-----	23	-----	3,380	-----	
			-----	-----	23	-----	4,300	-----	
			-----	-----	23	16.71	-----	-----	

¹ Not determined.

FLOODS OF SEPTEMBER 20-27 IN NORTHWESTERN MISSISSIPPI

Rainfall of September 1-18 in northwestern Mississippi was considerably above normal. A series of thunderstorms on September 10-17 saturated the ground with as much as 7½ inches of rainfall and caused moderate rises on many streams. Heavy rains began on the afternoon of September 19 and continued intermittently through September 23,

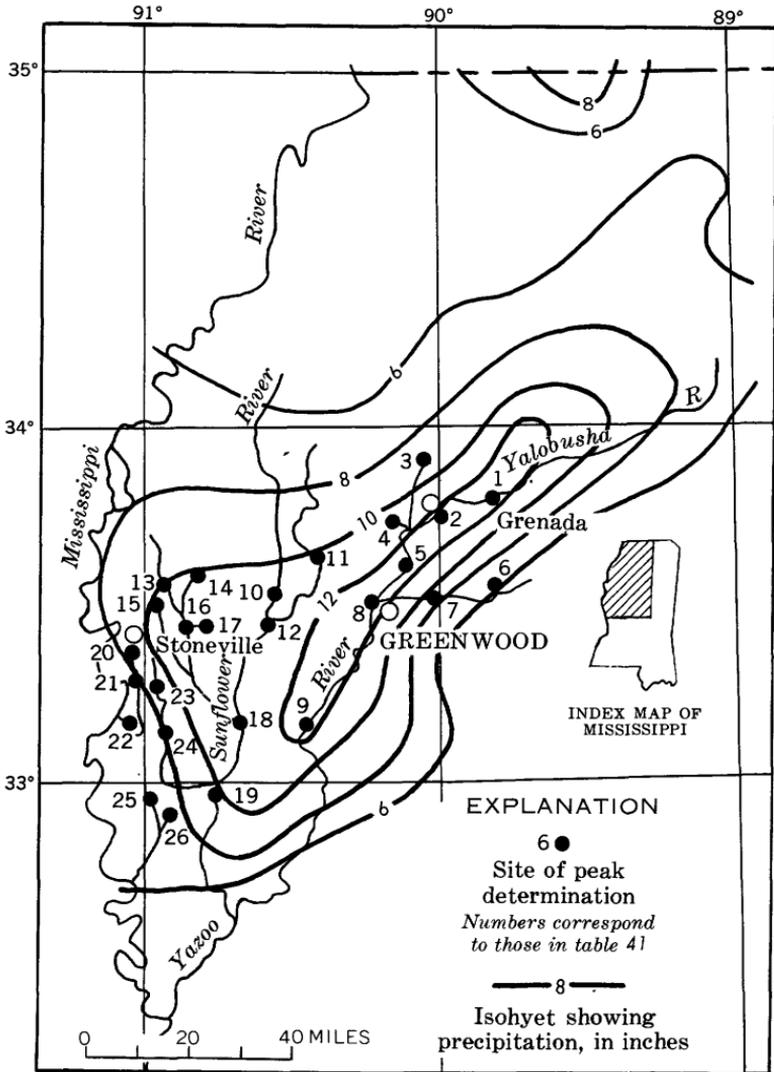


FIGURE 35.—Map of flood area showing location of flood-determination points and precipitation for September 20-22. Floods of September 20-27 in northwestern Mississippi.

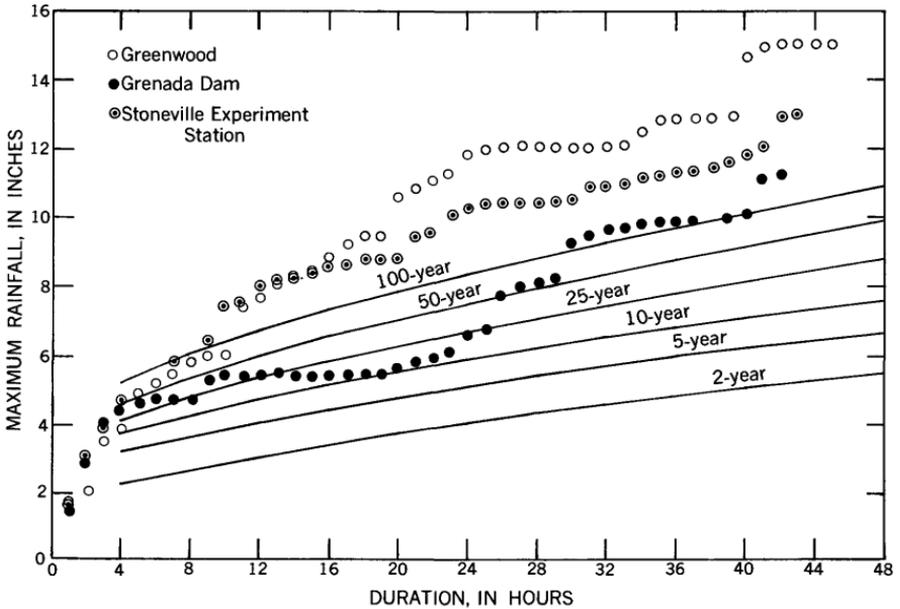


FIGURE 36.—Comparison of rainfall of September 19-21 at selected stations in northwestern Mississippi with frequency curves. Frequency curves from U.S. Weather Bureau.

and the heaviest rainfall in this period occurred September 19-21. The storm center covered an area of about 10 miles by 80 miles (fig. 35) that extends from Belzoni to Coffeeville. The relationship of maximum rainfall for selected time intervals at three stations to U.S. Weather Bureau recurrence interval curves is shown in figure 36. Intense storms in Mississippi rarely cover areas as large as this one. The maximum rainfall at two stations near the storm center for durations in excess of 10 hours exceeded a recurrence interval of 100 years. The maximum measured total rainfall for September 20-22 was 13.78 inches at Greenwood. More than 13 inches also fell at Grenada and Coffeeville.

The floods were greater than any previously known on some of the small delta streams (table 41). Stages on the middle reaches of the Sunflower River came within a foot of those of May 1958, which are the greatest known, and the peak discharge at Little Callao Landing was within 15 percent of that of May 1958, which was the greatest since 1948. The flood on Cane Creek near Holcomb was the highest known since at least 1900, according to information by local residents, although a flood in 1919 was almost as high. A recurrence interval of 50 years is indicated for this station. The peak discharges from some

TABLE 41.—Flood stages and discharges, September 20–27, Yazoo River basin, northwestern Mississippi

No.	Stream and place of determination	Drainage area (sq mi)	Maximum floods					
			Prior to September 1958		September–October 1958	Gage height (ft)	Discharge	
			Period	Year			Cfs	Ratio to Q _{1.33}
1	Yalobusha River at Grenada. ¹	1,550	1908–12, 1929–58	1948	Sept. 20	30.78	78,900	-----
2	Cane Creek near Holcomb.	25.6	-----	-----	do	21.60	² 13,000	-----
3	Ascalmore Creek near Charleston. ¹	32	1941–42, 1946–48, 1951–58.	1957	-----	159.11	16,000	2.8
4	Tippo Bayou near Phillip.	-----	1956–58	1958	Sept. 21	15.35	11,000	1.7
5	Yalobusha River at Whaley. ¹	1,960	1932	1932	Sept. 23	25.1	(³)	-----
6	Thompsons Creek at McCauley.	14.4	1938–58	1948	-----	24.7	(³)	-----
7	Big Sand Creek at Valley Hill. ¹	110	1950–58	1955	Sept. 21	27.79	72,600	-----
8	Yazoo River at Greenwood.	7,450	1946–58	1947	Sept. 21	24.2	12,000	-----
9	Yazoo River at Belzoni.....	7,830	1950–58	1955	Sept. 21	14.05	3,980	-----
10	Sunflower River at Sunflower.	767	1946–58	1947	Sept. 21	10.58	1,880	.5
11	Quiver River near Doddsville. ¹	292	1904–58	1932	Sept. 21	21.91	33,000	-----
12	Sunflower River near Moorhead. ¹	1,452	-----	-----	Sept. 21	13.86	17,000	1.0
13	Bogue Phalia near Choctaw.	220	-----	-----	Sept. 24, 25.	40.1	72,900	-----
14	Bogue Hasty Bayou near Shaw. ¹	70	1932	1932	Sept. 24, 25.	32.4	² 26,100	-----
15	Shell Bayou near Priscilla. ¹	102	1939–58	1946	Oct. 2, 3	37.9	(³)	-----
16	Bogue Phalia near Leland. ¹	484	1918–58	1958	Sept. 25	37.2	(³)	-----
17	Bogue Phalia Cutoff near Leland.	-----	-----	-----	Sept. 26, 27.	² 32.1	(³)	-----
18	Sunflower River at Little Callao Landing. ¹	2,287	1945–58	1958	Sept. 26	28.31	9,300	1.1
19	Sunflower River near Anguilla. ¹	2,525	1949–58	1958	Sept. 26	27.3	6,300	-----
20	Main Canal near Swiftwater. ¹	46	1945–58	1950	September	25.29	5,030	-----
21	Main Canal near Wayside. ¹	82	1949–58	1958	Sept. 24	24.7	3,620	1.4
22	Silver Lake (Main Canal) near Longwood.	112	1948–58	1958	Sept. 26	36.52	15,000	-----
23	Black Bayou near Arcola. ¹	79	1948–58	1950	Sept. 26	35.6	12,000	-----
24	Black Bayou and Ditch No. 13 near Percy.	168	1957–58	1958	Sept. 26	123.8	(³)	-----
25	Steele Bayou near Grace. ¹	400	1957–58	1958	Sept. 26	123.2	(³)	-----
26	Steele Bayou (East Prong) near Rolling Fork.	-----	1949–58	1958	Sept. 23	125.7	2,300	-----
			1949–58	1958	Sept. 23	125.4	2,000	-----
			1949–58	1958	Sept. 23	122.0	2,400	-----
			1945–58	1946	Sept. 23	121.5	2,200	-----
			1945–58	1946	Sept. 21, 22.	28.0	8,500	-----
			1945–58	1946	Sept. 21, 22.	26.8	7,400	1.6
			1945–58	1946	Sept. 22	27.7	(³)	-----
			1948–58	1958	Sept. 22	27.2	(³)	-----
			1949–58	1958	Sept. 24, 25.	36.87	23,000	-----
			1949–58	1958	Sept. 24, 25.	36.4	20,000	1.3
			1949–58	1958	Sept. 25, 28.	48.16	26,000	-----
			1949–58	1958	Sept. 25, 28.	47.5	22,000	1.4
			1949–58	1958	Sept. 22	117.2	900	-----
			1949–58	1958	Sept. 22	117.6	1,100	-----
			1949–58	1958	Sept. 22	112.4	2,300	-----
			1949–58	1958	Sept. 22	112.6	2,400	-----
			1949–58	1958	Sept. 23	107.5	2,500	-----
			1949–58	1958	Sept. 23	105.7	1,700	-----
			1955–58	1958	Sept. 22	109.3	2,400	-----
			1955–58	1958	Sept. 22	109.5	2,100	-----
			1955–58	1958	Sept. 22	107.2	(³)	-----
			1955–58	1958	Sept. 22	105.4	(³)	-----
			1955–58	1958	Sept. 25	28.50	4,700	-----
			1947–58	1958	Sept. 25	26.5	4,800	-----
			1947–58	1958	Sept. 27	22.56	5,400	-----
			1947–58	1958	Sept. 27	20.5	4,200	-----

¹ Records from Corps of Engineers.² Regulated by reservoir or reservoirs.³ Not determined.

of the smaller drainage areas had recurrence intervals greater than 50 years. The peak discharge on Sunflower River at Anguilla and on Quiver River at Doddsville had an indicated frequency of about 10 years, and that on Bogue Phalia near Leland was about 30 years.

This flood occurred during the crop-growing season and caused great damage in the delta area.

The material for this flood report was obtained from the open-file report, "Floods of 1958 in Mississippi," prepared by the Jackson district office, Surface-Water Branch.

