Summary of Floods in the United States During 1954

Prepared under the direction of J. V. B. WELLS, *Chief, Surface Water Branch*

FLOODS OF 1954

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PREFACE

This report on the summary of floods in the United States during 1954 was prepared by the Geological Survey, Water Resources Division, L. B. Leopold, chief hydraulic engineer, under the direction of J. V. B. Wells, chief, Surface Water Branch.

The continuing investigation of surface-water resources in the areas covered by this report is being made by the Geological Survey in cooperation with State agencies, the Corps of Engineers, the Bureau of Reclamation, and other Federal or local agencies. The U.S. Weather Bureau furnished some data and information included in this report.

The basic data and information were collected by the district offices of the Surface Water Branch, in whose districts the floods occurred.

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[Plates are in pocket]

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ABSTRACT

The most destructive floods in the United States during 1954 occurred in Iowa, Texas, Colorado, New Mexico, in the Chicago area, and in the Eastern States.

In Iowa after a series of heavy rains, most streams reached their peak stages between June 19 and 24. This was the greatest flood known in about the upper half of the Iowa River, on the Des Moines River below Fort Dodge, and in the Rock and Little Sioux Rivers.

Between June 27 and July 1 in the Rio Grande basin in Texas, up to 35 inches of rainfall produced record-breaking floods. The International Boundary and Water Commission computed a discharge of 948,000 cfs at their gaging station on the Pecos River near Comstock, Tex.—more than 8 times the previous known maximum. More than 200 lives were lost in one town alone—Piedras Negras, Mexico.

On July 22 and 23 in the Purgatoire River basin in Colorado, the high tributary inflow to the Purgatoire River near Alfalfa produced a discharge of 37,800 cfs, which was probably the greatest flood at that point since 1904.

During September 11 to 14 from New Jersey to Maine, heavy rains following hurricane Edna produced floods which caused damage that was estimated at $24 millions.

On October 6 to 8 relatively heavy rains fell in the Pecos River basin in New Mexico from Acme to Carlsbad. Thirteen lives were lost and damage was estimated at $1.8 million.

The floods of October 9 to 11 in the Chicago area caused damage estimated at $25 millions.

Between October 15 and 17 in the Eastern States, floods which followed hurricane Hazel were severe in a band about a hundred miles wide extending from North Carolina through western New York and eastern Ohio. At least 93 lives were lost and damages were estimated to have been $250 million.

This summary also describes 22 minor floods which occurred in scattered areas throughout the United States.

INTRODUCTION

The purpose of this summary chapter in the series, "Floods of 1954," is to assemble into a single volume information relating to all known severe floods in the United States, whether local or of wide areal extent. The two previous chapters of Water-Supply

Paper 1370 describe in detail the floods of June 1954 in Iowa (1370–A); and the floods of October 1954 in the Chicago area, Illinois and Indiana (1370–B). The flood areas described in these reports are shown in figure 41.

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

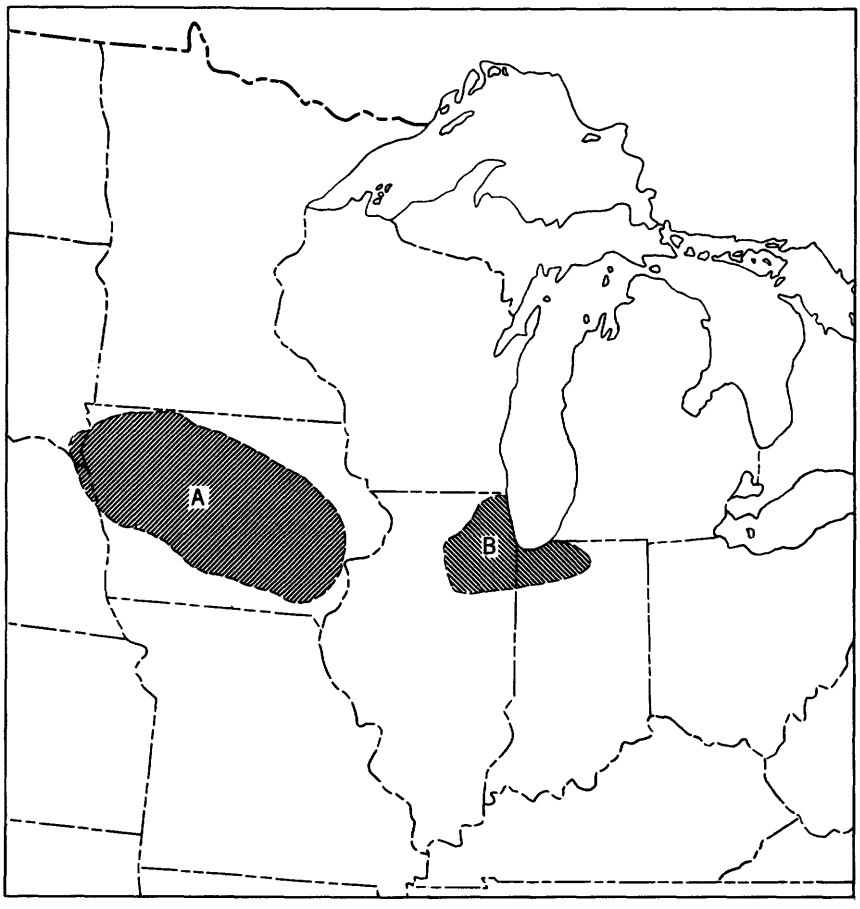

FIGURE 41.—Map of part of the United States, showing outline of areas for which reports were prepared, 1954.

DETERMINATION OF FLOOD STAGES AND DISCHARGES

The peak stages and discharges, at gaging stations and at miscellaneous sites, given in this chapter are from data which are regularly obtained and compiled in the ordinary 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 rating to the recorded stage. The rating is usually defined by current-meter measurements through as much of the range of stage as possible. At times it is impossible to make current-meter measurements at high stages because of impassable roads, washed-out bridges, large amounts of drift in the water, swift or turbulent flows, and rapidly changing stage.

The peak discharge at a gaging station may be above the range of the stage-discharge rating. Short extensions of the rating may be made by logarithmic extrapolation, by velocity-area studies, or by use of other measurable hydraulic factors. Peak discharges at gaging stations which are greatly above the range of the rating and peak-discharges at miscellaneous sites are generally determined by various methods of indirect measurements at the site.

EXPLANATION OF DATA

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

The data presented include a short description of the flood; a map of the flood area showing the location of flood-determination points and, at times, the location of precipitation stations; rainfall data; and maxima stages and discharges of the streams affected.

In general, rainfall figures are given in the description of the flood. When considerable rainfall data are available, they are presented in tabular form showing daily or storm totals; or totals may be shown directly on the map. In a few places, where sufficient data are available to determine the pattern and distribution of rainfall, an isohyetal map is shown.

A tabular summary of stages and discharges is given for each flood, unless the number of stations affected is small, in which case the information is incorporated into the description.

SUMMARY OF FLOODS OF 1954

FLOODS OF JANUARY 21–27 IN NORTH CAROLINA, TENNESSEE, AND ALABAMA

Heavy general rains fell over most of North Carolina, northeast and south-central Tennessee, and northern Alabama on January 21–23 (table 1). Flooding occurred in several basins in North Carolina, principally in the Pamlico and Neuse River basins, and in the Tennessee River basin in the States of Tennessee and Alabama (fig. 42).

The South Yadkin River near Mocksville, N.C., reached the highest stage since its record was begun in 1938. On the French Broad

TABLE 1.—*Rainfall, in inches, at Weather Bureau stations, Jan. 20–23, 1954, in North Carolina, Tennessee, and Alabama*

Station	Total rainfall (inches)	Station	Total rainfall (inches)
NORTH CAROLINA		NORTH CAROLINA—continued	
Gatesville	3.90	Mt. Pisgah	4.81
Elizabeth City	2.34	Pink beds	5.52
Weldon No. 2	4.05	Blue Ridge P.O.	5.10
Franklinton	4.30	Cedar Mtn	7.80
Burlington	2.93	Quebec	5.98
Greensboro	3.56	Bryson City	6.16
Carthage (near)	3.07	Laurel Mtn	5.25
Pope Field	2.65	Wayah Bald	7.41
Raleigh-Durham AP	3.93	Raven Mtn	6.56
Raleigh	4.49	Haywood Gap	5.45
Mt. Olive	1.68	Clingmans Dome	6.30
Wilson (near)	4.24	TENNESSEE	
Beauty Spot	4.90	Belvidere	6.57
Roan High Knob	4.55	Butler	3.30
Camp Creek Bald	4.67	Lick Creek	3.41
Coxecombe Mtn	4.60	ALABAMA	
Little Switzerland	5.49	New Market	7.38
Mt. Mitchell	9.04	Toney	7.82
Max Patch Mtn	5.48	Paint Rock	5.72
North Fork	5.39	Guntersville	3.62
Asheville	4.10	Boaz	2.20
Chambers Mtn	4.87		
Spruce Mtn	6.49		

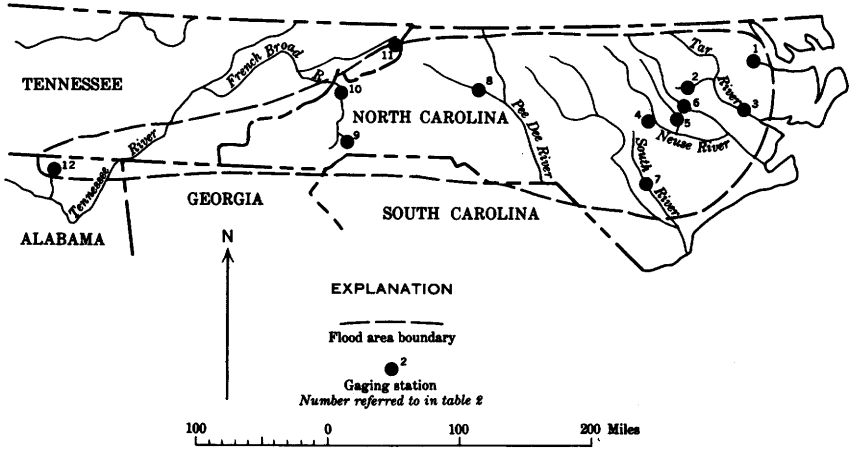

FIGURE 42.—Map of flood area showing location of flood-determination points. Floods of January 21–27 in North Carolina, Tennessee, and Alabama.

River and tributaries below Marshall, N.C., the crest stages were the highest since 1947. Cane Creek at Fletcher, N.C., was slightly higher than it was in 1949 and the highest since 1942. The Tar River at Tarboro had the greatest discharge since 1945 and the third highest during the period of record (table 2). Estimates of flood damage in North Carolina totaled $360,000.

In eastern Tennessee the flood was most noteworthy on streams in the Watauga River basin where the stage of Roan Creek at Neva was the highest since the beginning of its record in 1942.

TABLE 2.—*Summary of flood stages and discharges, January 21–27 in North Carolina, Tennessee, and Alabama*

[Each station in this table has two or three entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of record; the third pertains to the maximum flood known outside the period of record]

No. on fig. 42	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	CHOWAN RIVER BASIN						
1	Ahoskie Creek at Ahoskie, N.C.	64.3	1950–54	Jan. 24, 1954	7.89	1,100	17.1
				Feb. 29, 1952	7.47	904	14.0
				Aug. 1940	11.1		
	PAMLICO RIVER BASIN						
2	Sapony Creek near Nashville, N.C.	64.8	1950–54	Jan. 24, 1954	14.34	2,200	33.9
				Aug. 25, 1950	12.30	1,630	25.2
3	Tar River at Tarboro, N.C.	2,140	1896–1900, 1931–54	Jan. 27, 1954	[1] 27.43	23,600	11.0
				Aug. 20, 1940	31.77	37,200	17.4
				July 27, 1919	34.0	52,800	24.6
	NEUSE RIVER BASIN						
4	Middle Creek near Clayton, N.C.	80.7	1939–54	Jan. 23, 1954	11.34	3,070	38.0
				Sept. 1, 1952	12.31	4,100	50.8
5	Little River near Princeton, N.C.	229	1930–54	Jan. 24, 1954	12.79	4,770	20.8
				Dec. 2, 1934	12.68	4,470	19.5
				Sept. 1924	14.9		
6	Contentnea Creek near Wilson, N.C.	236	1930–54	Jan. 24, 1954	13.68	4,940	20.9
				Aug. 17, 1940	13.80	4,830	20.5
				Sept. 1924	22.2		
	CAPE FEAR RIVER BASIN						
7	South River near Parkersburg, N.C.	382	1951–54	Jan. 31, 1954	60.74	1,730	4.53
				Mar. 8, 1952	60.37	1,480	3.87
	PEE DEE RIVER BASIN						
8	South Yadkin River near Mocksville, N.C.	313	1938–54	Jan. 23, 1954	16.73	9,240	29.5
				Sept. 19, 1945	16.02	8,000	25.6
				Oct. 3, 1929	22.6		
	TENNESSEE RIVER BASIN						
9	Cane Creek at Fletcher, N.C.	63.1	1942–54	Jan. 22, 1954	8.52	2,900	45.9
				Aug. 28, 1949	8.45	2,770	43.8
				July 1916	14.8		
10	French Broad River at Marshall, N.C.	1,332	1942–54	Jan. 22, 1954	8.48	23,200	19.1
				Jan. 7, 1946	9.18	29,600	22.2
				July 1916	18.5		
11	Roan Creek near Neva, Tenn.	102	1942–54	Jan. 22, 1954	6.35	3,340	32.8
				Jan. 20, 1947	5.62	3,230	31.7
12	Flint River near Chase, Ala.	342	1930–54	Jan. 21, 1954	25.00	42,000	12.3
				Jan. 5, 1949	23.61	37,700	11.0
				Sept. 1929	25.0	42,000	12.3

[1] Occurred Jan. 28, 1954.

In northern Alabama there was much flooding of lowlands from tributaries of the Tennessee River, and a number of people had to be evacuated from their homes in the vicinity of Huntsville. The peak discharge in the Flint River near Chase was the greatest in the period of record which began in 1930 and equaled that of the flood of September 1929.

FLOODS OF FEBRUARY 16–17 IN SOUTHEASTERN MICHIGAN

Rain and snow fell February 16 and 17, on southern Lake Huron and on Lake St. Clair tributaries in southeastern Michigan; and owing to ice jams in a small area, minor floods were caused (fig. 43). The Weather Bureau reported precipitation measurements of 3.02 inches near Burnside, 2.45 inches at Lapeer State Hospital, 1.45 inches at Harbor Beach, and 1.42 inches at Sebewaring. Several thousand dollars of flood damage was reported at Frankenmuth from the overflowing Cass River when ice jams that broke loose upstream formed again downstream, and caused inundation of a part of the downtown area. The discharge during the 1954 flood was relatively small; it was less than one-half of that during the 1942 flood; however, the stage of 22.44 feet exceeded that of 1942 by 1.56 feet. The discharge of the Flint River near Fosters was not outstanding, but its stage almost equaled that of April 1947, the high-

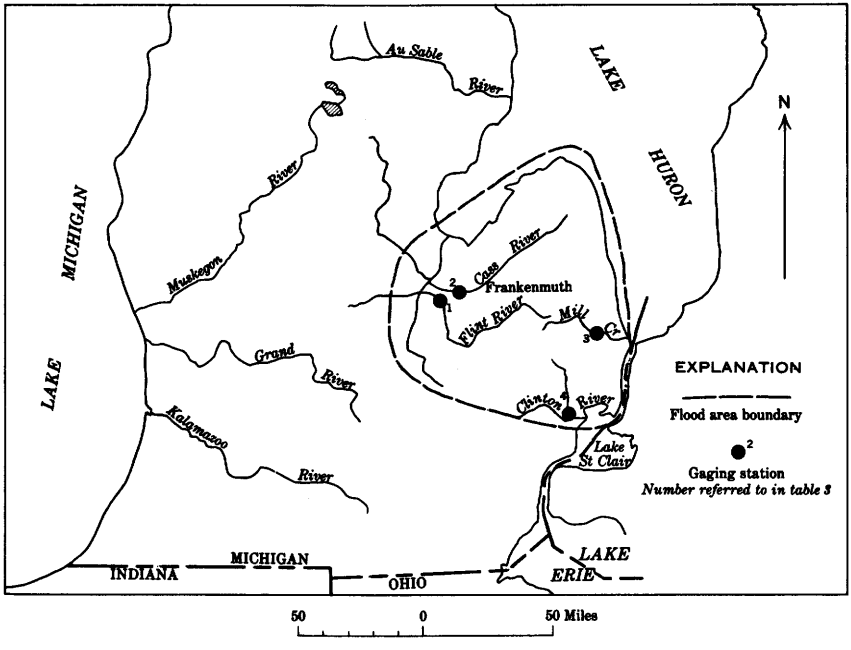

FIGURE 43.—Map of flood area showing location of flood-determination points. Floods of February 16–17 in southeastern Michigan.

est during the period of record, and was only 0.7 foot lower than the maximum stage known which occurred in 1904 (table 3).

Severe ice jamming was reported in the lower St. Clair River, and considerable damage was caused to boats and to river docks.

TABLE 3.—*Summary of flood stages and discharges, February 16–17 in southeastern Michigan*

[Each station in this table has two or three entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of record; the third pertains to the maximum flood known outside the period of record]

No. in fig. 43	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	STREAMS TRIBUTARY TO LAKE HURON						
1	Flint River near Fosters	1,120	1940–54	Feb. 17, 1954	17.7	6,080	5.43
				Apr. 7, 1947	[1] 17.97	19,000	17.0
				March 1904	[2] 18.4		
2	Cass River at Frankenmuth	848	1908–9	Feb. 17, 1954	[3] 22.44	7,500	8.85
			1935–36				
			1939–54	Mar. 18, 1942	20.88	17,700	20.9
	STREAMS TRIBUTARY TO ST CLAIR RIVER						
3	Mill Creek near Abbottsford	138	1947–54	Feb. 16, 1954	9.7	2,500	18.1
				Mar. 20, 1948	9.2	3,050	22.1
				Jan. 3, 1951	[3] [4] 10.81		
	STREAMS TRIBUTARY TO LAKE ST CLAIR						
4	North Branch Clinton River near Mount Clemens	185	1947–54	Feb. 17, 1954	15.52	3,900	21.1
				Apr. 4, 1950	[5] 17.5	[6] 4,500	24.3

[1] Occurred April 6.
[2] Maximum known.
[3] Affected by ice jam.
[4] Observed.
[5] Affected by backwater from Clinton River, occurred April 4 or 5.
[6] Daily discharge.

FLOODS OF APRIL 4–6 IN NORTHEASTERN MONTANA

Rapid snowmelt occurred April 4–7 and was responsible for localized flooding of several northern tributaries of the Milk and Missouri Rivers (fig. 44) which began April 4 or 5. Highway travel was interrupted in some areas, farm lands were flooded, and about 60 families in Nashua and Poplar were forced from their homes. The Corps of Engineers estimated the damage at $250,000.

Thirty Mile Creek flooded parts of Harlem on April 6, and Porcupine Creek did considerable damage to an outlying section of Nashua. Wolf Creek near Wolf Point exceeded the maximum peak stage of 1952 by 3.65 feet. Peak stages on all branches of the Poplar River near the international boundary exceeded maximums of 1952 and earlier known floods. Further downstream near Poplar the stages exceeded those of 1952 and were within a few tenths of a foot of

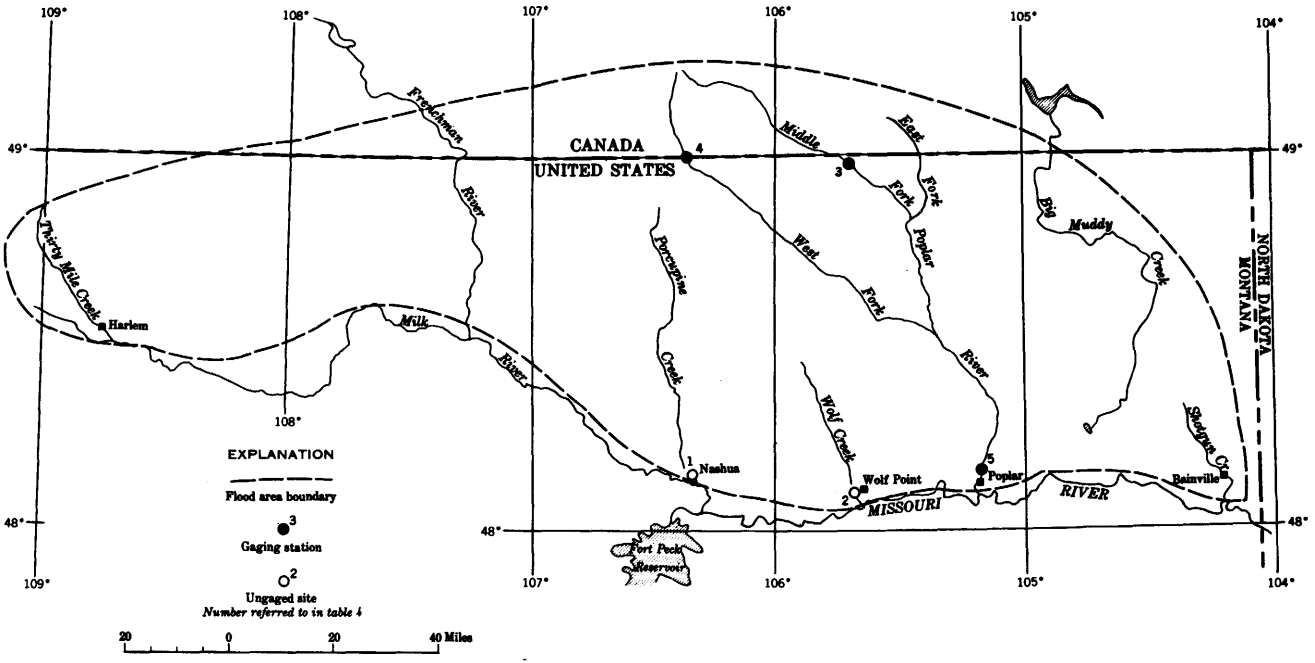

FIGURE 44.—Map of flood area showing location of flood-determination points. Floods of April 4–6 in northeastern Montana.

the rain-caused flood peaks of 1946. Big Muddy Creek caused flooding along its length, but flooding was generally less than in 1952 (table 4). Shotgun Creek flooded a part of Bainville for a short time.

TABLE 4.—*Summary of flood stages and discharges, April 4–6 in northeastern Montana*

[Each station in this table has one, two or three entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of record; the third pertains to the maximum flood known outside the period of record]

No. in fig. 44	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	MILK RIVER BASIN						
1	Porcupine Creek at Nashua.	800	1908–24	April 1954		15,300	19.1
				Apr. 11, 1916			
				Mar. 24, 1939		35,500	44.4
	WOLF CREEK BASIN						
2	Wolf Creek near Wolf Point.	245	1909–14	Apr. 4 or 5, 1954	12.9	9,780	39.9
			1950–53	Apr. 7, 1952	9.25	7,050	28.8
	POPLAR RIVER BASIN						
3	Middle Fork Poplar River at international boundary.	381	1931–54	Apr. 6, 1954	10.25	12,700	33.3
				Mar. 21, 1939	8.78	5,600	
4	West Fork Poplar River at international boundary.	141	1931–52	April 1954	5.22	5,870	41.7
				Apr. 14, 1952	5.15	5,450	38.7
5	Poplar River near Poplar.	3,100	1908–24	Apr. 6, 1954	17.86	37,400	12.1
			1947–54	Apr. 7, 1952	16.98	27,800	8.97
				July 10, 1946	18.1	[1] 40,000	

[1] Slope-area determination at site 20 miles upstream.

FLOODS OF APRIL 12–13 IN BULL CREEK BASIN, TEXAS

As much as 5.1 inches of rain fell April 10–13 on the drainage basin of Bull Creek which is tributary to the headwaters of the Colorado River (fig. 45). The only Weather Bureau precipitation station in the area is at the southwest edge at Gail, where 2.78 inches of rain was reported for April 11–14 of which 2.48 inches fell April 11. Supplemental records furnished by the Colorado River municipal water district of Big Springs show that the flood-producing rains which fell near Gail varied from 2.5 inches 4 miles west, 3.4 inches 8 miles east, 4.5 inches 15 miles northeast and 5.1 inches 10 miles northwest of Gail. Points at which supplemental measurements of rainfall were made are shown in figure 45.

The principal damage attributable to this flood was the breeching of Bull Creek diversion dam, an earth structure which diverted flood flow from 363 square miles in Bull Creek basin to Lake J. B. Thomas through a 2-mile canal. The peak discharge, which occurred in the canal April 12, was computed by slope-area measure-

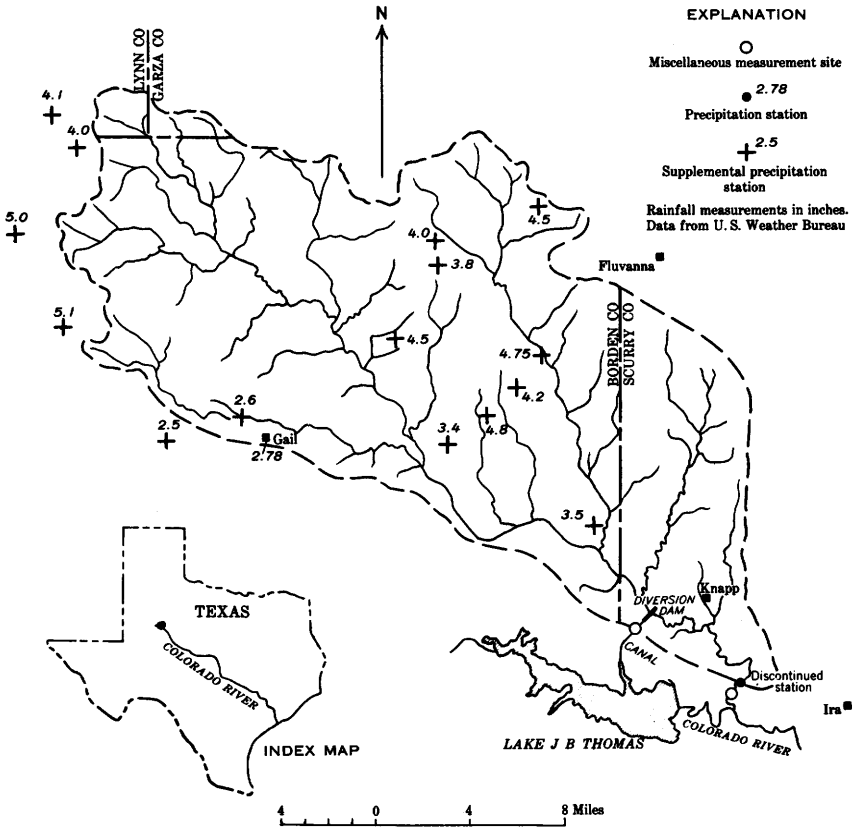

FIGURE 45.—Map of flood area showing location of flood-determination points and rainfall totals April 10–13. Floods of April 12–13 in Bull Creek Basin, Texas.

ment as 6,240 cfs. The maximum stage at the diversion dam was spillway level, and the peak discharge in the canal probably occurred at the time of the dam failure.

A gaging station was established on Bull Creek near Ira in 1947 and was discontinued September 1953. The maximum discharge during the period of record was 4,940 cfs July 6, 1948, and October 4, 1953, whereas the peak of the April 13, 1954, flood was determined to be 22,400 cfs (gage height 21.1 ft) by a slope-area measurement of a reach about 3,500 feet below the site of the discontinued station. The peak stage of this flood was exceeded by the flood of September 7, 1932 which reached a stage of 23.0 feet and by that of June 1939 which probably reached a stage 1.0 foot higher than that of September 7, 1932.

A more detailed report of this flood was prepared by the Austin, Tex., district office of the U.S. Geological Survey and released to the open files in July 1954.

FLOODS OF APRIL 15 IN WEST-CENTRAL WISCONSIN

A flash flood occurred on the Eau Galle River on April 15, 1954, as a result of heavy thunderstorms in that area (fig. 46). The peak discharge at Spring Valley, determined by slope-area measurement, was 7,000 cfs (gage height 9.5 ft) from a drainage area of 64.8 square miles. The previous maximum during the period of record (1944–54) was 3,900 cfs (gage height 8.0 ft) March 15, 1945. The maximum stage known since at least 1894 was 16.98 feet (discharge 33,000 cfs) and occurred Sept. 18, 1942. This discharge was estimated by the Corps of Engineers on the basis of a slope-area measurement by the Geological Survey of peak discharge of 39,000 cfs at Elmwood, drainage area, 91.9 square miles.

Damages in the town of Spring Valley were estimated by the Weather Bureau at $20,000. Several ungaged tributaries in the vicinity were reported at highest stages ever known. A dam at

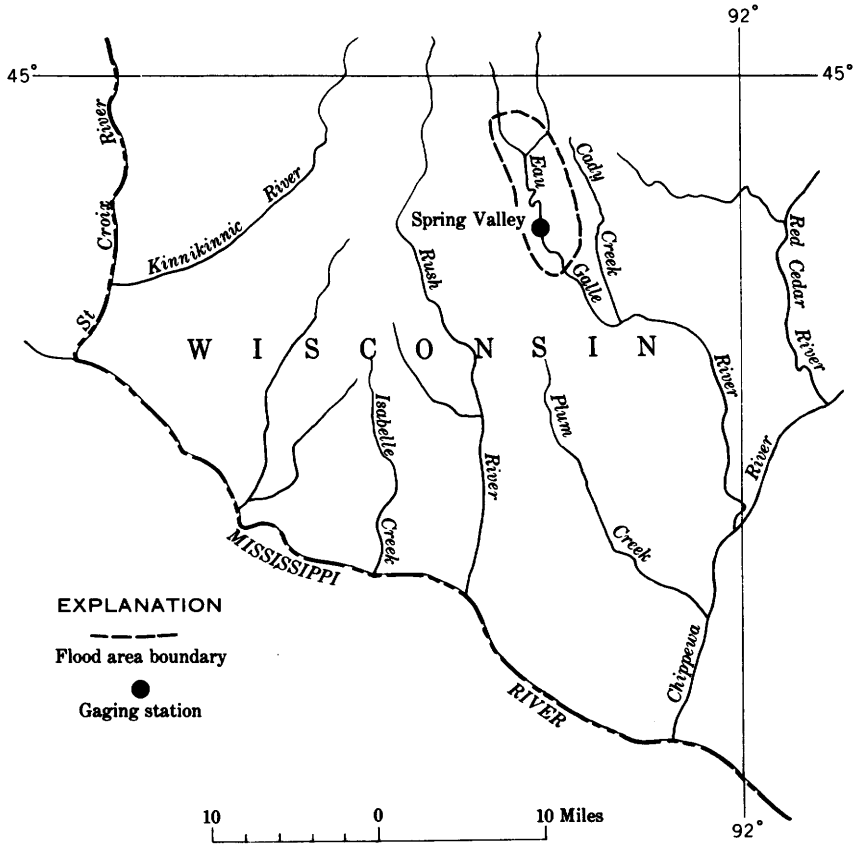

FIGURE 46.—Map of flood area showing location of flood-determination point. Floods of April 15 in west-central Wisconsin.

Lake Eau Galle, in place since 1934, on the Eau Galle River about 20 miles below Spring Valley, was washed out. Northern streams were unusually high at the end of the month because of heavy general rains, but no flood damages were reported.

FLOODS OF APRIL 29–30 IN WEST-CENTRAL OKLAHOMA

Flash floods occurred in the upper Washita River basin and in Meridian Creek near Sweetwater at the western edge of Oklahoma (fig. 47) during the night of April 29–30. These floods followed rains of more than 12 inches over the drainage area above the mainstem stream-gaging station near Cheyenne. The isohyetal lines on figure 47 were drawn from Weather Bureau data and from unofficial rainfall measurements collected by the U.S. Geological Survey, Oklahoma City. Runoff in the Sandstone Creek basin was from a different storm center, and a maximum rainfall of 3.71 inches was reported in the basin.

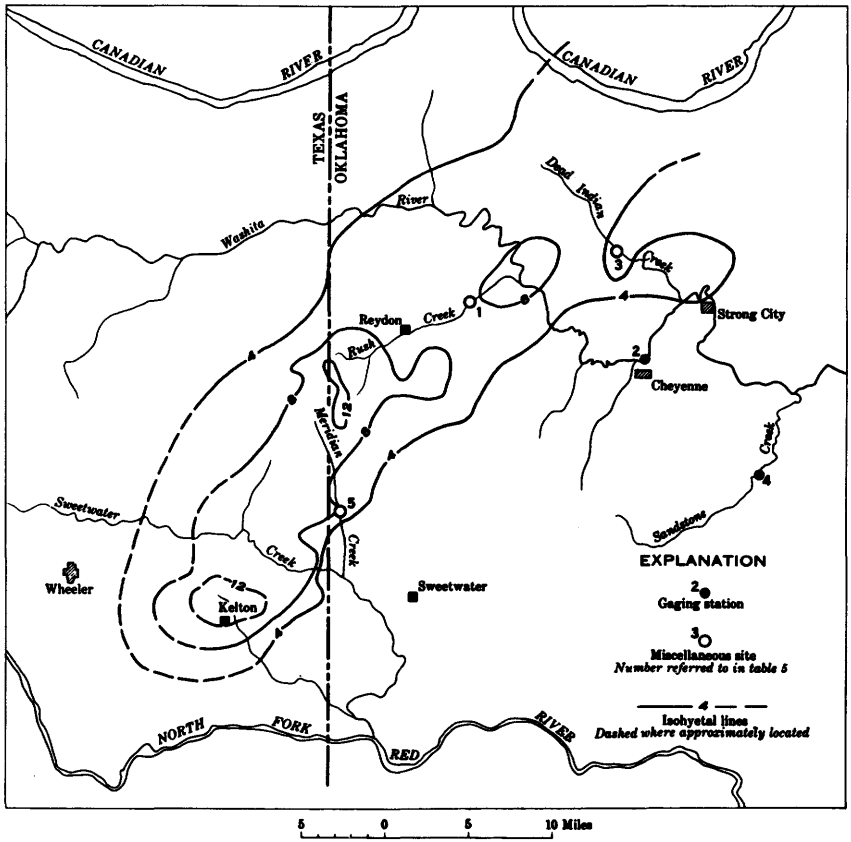

FIGURE 47.—Map of flood area showing location of flood-determination points and isohyetal lines for April 29–30. Floods of April 29–30 in west-central Oklahoma.

The peak discharge on Washita River near Cheyenne was determined by contraction method to be 69,800 cfs from a drainage area of 794 square miles which was almost 30,000 cfs greater than the previous maximum discharge for the period of record that began in 1937. The peak stage was 1.7 feet higher than any during the period of record and 1.0 foot higher than that during the great flood of April 1934. The peak discharge at an ungaged site on Rush Creek near Reydon, a tributary of the Washita River above the Cheyenne gage, was determined by slope-area measurement to be 53,700 cfs from a drainage area of 69.6 square miles or 772 cfs per square mile (table 5). Three miles downstream from Rush Creek, the Washita River was reported to be 4 feet higher than the previous maximum. Downstream from Cheyenne at Strong City and at Hammon it was 2 or 3 feet lower than the previous maximum, which occurred in 1934. The flood crest flattened rapidly further downstream creating only a minor flood at Clinton.

Damage to county roads and bridges was extensive. Winter wheat suffered considerably from the torrential rain and high winds. There were no fatalities.

FLOODS OF APRIL 30–MAY 3 IN MINNESOTA AND WISCONSIN

The heavy rainfall of April 26–27 and 30 coupled with additional heavy rains May 1–3 caused flooding in the Mississippi River along the Wisconsin-Minnesota boundary, in the Chippewa River basin

TABLE 5.—*Summary of flood stages and discharges, April 29–30 in west-central Oklahoma*

[Each station in this table has one, two or three entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of record; the third pertains to the maximum flood known outside the period of record]

No. in fig. 47	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	WASHITA RIVER BASIN						
1	Rush Creek near Reydon.	69.6	----------	Apr. 29, 1954	----------	53,700	772
2	Washita River near Cheyenne.	794	1937–54	Apr. 29, 1954	15.24	69,800	87.9
				May 23, 1941	13.5	40,000	50.4
				Apr. 3, 1934	(1)	----------	--------
3	Dead Indian Creek near Roll.	33.8	----------	Apr. 29, 1954	----------	8,410	249
4	Sandstone Creek near Cheyenne.	87.1	1952–54	Apr. 30, 1954	13.64	6,360	--------
				June 6, 1953	6.40	1,020	--------
	RED RIVER BASIN						
5	Meridian Creek near Sweetwater.	14.0	----------	Apr. 29, 1954	----------	1,210	86.4

[1] Reached a stage 1.0 ft lower than that of 1954, at site on upstream side of highway fill.

in Wisconsin, and in the Menominee River near McAllister, Wis. (See pl. 2.) The focal point of the heavy rains occurred in the Chippewa River drainage with one center in central Chippewa Valley and the other in the lower part of the drainage basin. Amounts of precipitation at Weather Bureau stations in the flood area during the storm period (April 25–May 3) are shown on plate 2.

The Chippewa River had just receded from a bankful rise during the last part of April, and the reservoirs on the river were full. The rains of May 1 and 3, 1954, produced a crest stage at Durand of 15.40 feet which almost equaled that of the 1941 flood; however, the peak discharge of 101,000 cfs exceeded that of 1941 and was the highest recorded during the period of record which began in 1928 (table 6). The Wisconsin River basin did not receive so much rainfall, and its reservoirs took up the excess runoff without much spilling. The flood was unique for this area in that it resulted entirely from rain rather than the usual combination of rainfall and snowmelt.

The greatest amount of flood damage occurred in Durand, in Trempealeau County, and in Cochran, Wis., which was estimated at about $500,000. Damage at and near LaCrosse and at Prairie du Chien, Wis., amounted to about $120,000. Along the Mississippi River in Minnesota, damage of about $150,000 occurred at Red Wing, Wabasha, and Winona.

TABLE 6.—*Summary of flood stages and discharges, April 30–May 3 in Minnesota and Wisconsin*

[Each station in this table has two or three entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of continuous record; the third pertains to the maximum flood known outside the period of continuous record]

No. in plate 2	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	CHIPPEWA RIVER BASIN						
1	Chippewa River at Eau Claire, Wis.	6,630	1902–9 1944–54	May 2, 1954 June 7, 1905	22.00 ----------	80,000 [1] 70,000	12.1 10.6
2	Chippewa River at Durand, Wis.	9,010	1928–54	May 3, 1954 Sept. 2, 1941 Sept. 12, 1884	15.40 15.43 [2] 18.4	101,000 93,600 ----------	11.2 10.4 --------
	STREAMS TRIBUTARY TO LAKE MICHIGAN						
3	Menominee River near McAllister, Wis.	4,020	1945–54	Apr. 30, 1954 Apr. 15, 1951	16.77 17.83	21,900 25,700	5.45 6.39

[1] Observed.
[2] Maximum stage known.

FLOODS OF MAY 18–23 IN THE KOOTENAI AND THE FLATHEAD RIVER BASINS, MONTANA AND IDAHO

Below normal temperatures prevailed in northwestern Montana and northern Idaho during much of the spring which kept streams at a relatively low rate of discharge. Unseasonably warm weather May 16–20 in combination with a record snowpack in the Kootenai and the Flathead River basins (fig. 48) caused floods on May 18–23 whose peak discharges approached or exceeded those of 1948.

The greatest flood damage was caused in the Kootenai Flats area near Bonners Ferry, Idaho, and a moderate amount was caused in the Kootenai basin near Libby, Mont. The peak discharge of the 1954 flood at Bonners Ferry did not quite equal the peak discharge of the 1948 flood although the stage was slightly higher (table 7). About 8,000 acres of fertile farmland were flooded to a depth of 10 to 15 feet, whereas about 30,000 acres was flooded in this area in 1948. Dikes kept the floodwaters out of Bonners Ferry, but a small residential district across the river was inundated. The lesser damage in the 1954 flood is attributed to the dike system which withstood flood action better than it did in 1948. Losses from the flood in Idaho have been estimated at $1,250,000.

The 1954 peak discharge of 86,600 cfs in the Kootenai River at Libby, Mont., was the third highest in the period of record which was begun in 1910 and was exceeded only in the floods of 1916 and 1948. Considerable farm land was inundated at and near Libby, Mont., where 18 families were forced from their homes, a number of small bridges were destroyed, and U.S. Highway 2 was closed for 2 days. The Great Northern Railway discontinued service over their lines for several days because of soggy roadbeds. Damage was fairly widespread in this part of Montana but was not severe in any locality.

FLOODS OF MAY 27–28 IN PANOLA AND LAFAYETTE COUNTIES, MISSISSIPPI

Record-breaking floods occurred May 27–28 on small streams in Panola and Lafayette Counties, Miss. They were caused by heavy rains of cloudburst intensity during the late afternoon and night of May 27. The heaviest rainfall occurred in the headwaters of Long Creek in Panola County where up to 10 inches fell in a 3-hour period. Rainfall records are available at six Weather Bureau stations which are located at the edge of the intense rainfall area. Miscellaneous rainfall measurements were obtained at 37 points within the area to supplement those of the official stations. These data were used to draw the isohyetal map, figure 49, which shows

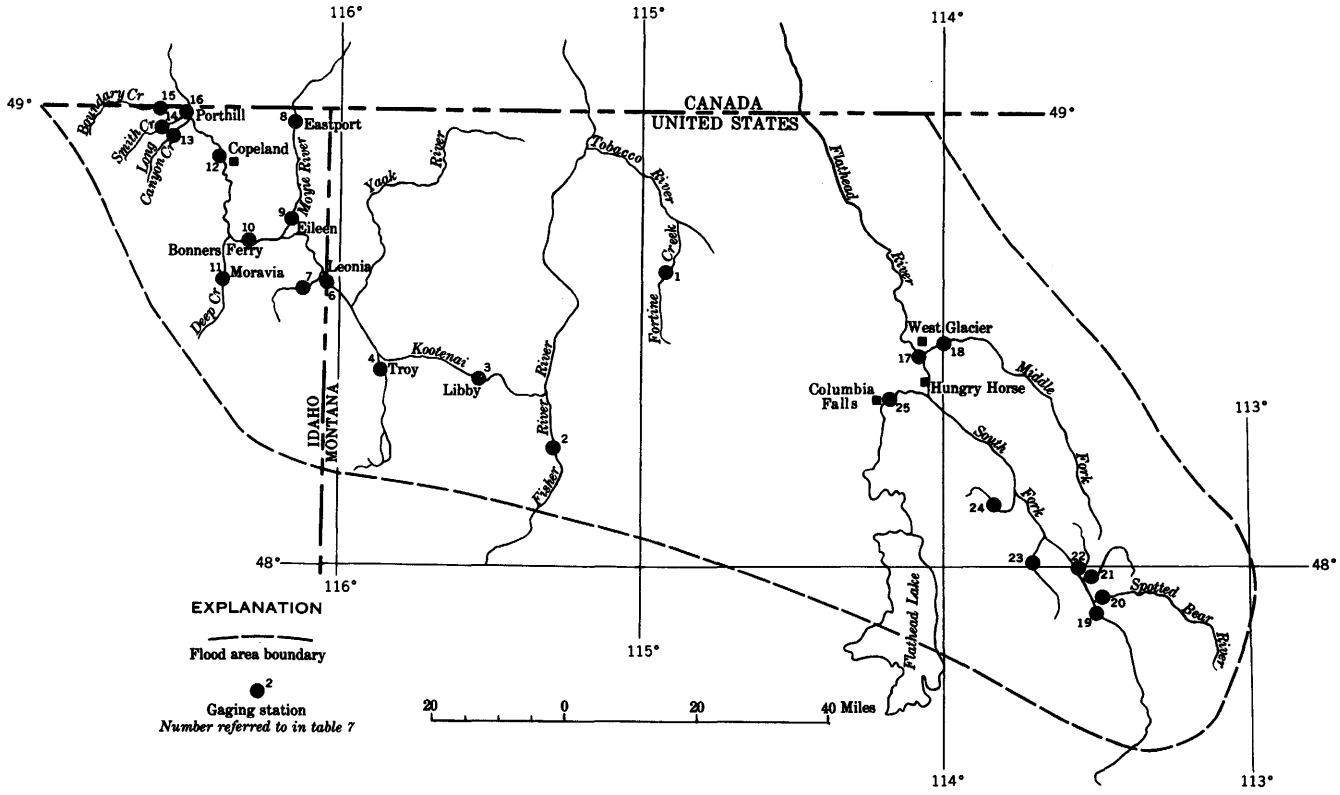

Figure 48.—Map of flood area showing location of flood-determination points. Floods of May 18–23 in the Kootenai and the Flathead River basins, Montana and Idaho.

TABLE 7.—*Summary of flood stages and discharges, May 18–23 in the Kootenai and the Flathead River basins, Montana and Idaho*

[Each station in this table has one, two, or three entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of record; the third pertains to the maximum flood known outside the period of record]

No. in fig. 48	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	KOOTENAI RIVER BASIN						
1	Fortine Creek near Trego, Mont.	112	1946–53	May 20, 1954	11.8	1,810	16.2
				May 16, 1950	11.8	1,810	16.2
2	Fisher River near Jennings, Mont.	780	1950–54	May 20, 1954	7.39	5,710	7.32
				Apr. 27, 1952	6.03	3,680	4.72
				May 22, 1948		[1] 6,560	
3	Kootenai River at Libby, Mont.	10,240	1910–54	May 21, 1954	17.33	86,600	8.46
				June 21, 1916	20.7	121,000	11.8
4	Lake Creek at Troy, Mont.	210	1945–54	May 20, 1954	7.17	3,080	14.7
				May 30, 1948	8.28	3,250	15.5
5	Yaak River near Troy, Mont.	766	1910–16	May 22, 1954	11.4	13,400	17.5
				May 1948	11.0	12,500	16.3
6	Kootenai River at Leonia, Idaho.	11,740	1928–54	May 21, 1954	120.81	104,000	8.86
				May 28, 1948	123.40	123,000	10.5
				June 1894	[2] 124.6		
7	Boulder Creek near Leonia, Idaho.	53	1928–54	May 19, 1954	6.31	2,040	38.5
				Oct. 19, 1947	7.85	2,700	51.0
8	Moyie River at Eastport, Idaho.	570	1929–54	May 20, 1954	10.55	9,400	16.5
				May 24, 1948	10.25	8,030	14.1
9	Moyie River at Eileen, Idaho.	755	1925–54	May 20, 1954	6.99	11,000	14.6
				May 26, 1948	6.51	9,650	12.8
10	Kootenai River at Bonners Ferry, Idaho.	13,000	1927–54	May 21, 1954	35.55	132,000	10.2
				May 27, 1948	[3] 35.32	139,000	10.7
11	Deep Creek at Moravia, Idaho.	133	1928–54	May 18, 1954	7.40	1,670	12.6
				May 15, 1950	[4] 6.98	1,500	11.3
12	Kootenai River near Copeland, Idaho.	13,400	1929–54	May 23, 1954	70.47	[5] 99,900	7.46
				May 30, 1948	[6] 70.1	[5] 124,000	9.25
13	Long Canyon Creek near Porthill, Idaho.	29	1928–54	May 19, 1954		827	28.5
				May 27, 1948		1,300	44.8
14	Smith Creek near Porthill, Idaho.	70	1928–54	May 19, 1954	6.40	2,570	36.7
				May 17, 1941	[7] 7.37	3,150	45.0
15	Boundary Creek near Porthill, Idaho.	97	1928–54	May 19, 1954	5.16	2,350	24.2
				May 28, 1948	5.34	2,530	26.1
16	Kootenai River at Porthill, Idaho.	13,700	1928–54	May 22, 23, 1954	[8] 65.17	[5] 102,000	7.45
				June 1, 1948	[9] 66.16	125,000	9.12
	PEND OREILLE RIVER BASIN						
17	Flathead River near Columbia Falls, Mont.	1,553	1910–17, 1929–54	May 21, 1954	12.25	31,500	20.3
				June 20, 1916	9.9	30,100	19.4
18	Middle Fork Flathead River near West Glacier, Mont.	1,128	1939–54	May 20, 1954	13.01	34,500	30.6
				May 23, 1948	12.40	32,600	28.9
19	South Fork Flathead River at Spotted Bear Ranger Station, near Hungry Horse, Mont.	958	1948–54	May 20, 1954	12.75	21,000	21.9
				June 13, 1953	11.45	17,700	18.5
				May 22, 1948	14.00	22,000	23.0
20	Spotted Bear River near Hungry Horse, Mont.	184	1948–54	May 20, 1954	7.4	5,480	29.8
				June 6, 1950	6.42	3,860	20.9
				May 22, 1948	7.24	4,010	21.8
21	Twin Creek near Hungry Horse, Mont.	47	1948–54	May 19, 1954	8.33	2,790	59.4
				May 14, 1950	7.51	1,550	33.0
				May 22, 1948	8.1	2,410	51.3
22	Lower Twin Creek near Hungry Horse, Mont.	224	1948–54	May 20, 1954	4.01	868	38.8
				June 5, 1950	3.86	565	25.2
				May 22, 1948	5.25	1,200	53.6
23	Sullivan Creek near Hungry Horse, Mont.	71.3	1948–54	May 19, 1954	5.29	2,750	38.6
				May 12, 1949	4.73	1,700	23.9
				May 22, 1948		2,280	32.0
24	Graves Creek near Hungry Horse, Mont.	27	1948–54	May 19, 1954	4.82	1,300	48.1
				June 22, 1950	5.70	[10] 1,520	46.1
				May 1948	5.33	[10] 1,440	43.6
25	Flathead River at Columbia Falls, Mont.	4,464	1922–23, 1928–54	May 20, 1954	15.57	69,600	15.6
				May 23, 1948	19.08	102,000	22.8
				June 1894	22.7	135,000	30.2

[1] At site 7½ miles downstream. [2] From information by Great Northern Railway Co.
[3] Occurred May 28, 1948. [4] Occurred April 27, 1952. [5] Daily discharge.
[6] Occurred May 31, 1948. [7] Occurred May 27, 1948. [8] Occurred May 23, 24, 1954.
[9] Occurred May 31, 1948. [10] At former site 2½ miles downstream, drainage area 33 sq mi.

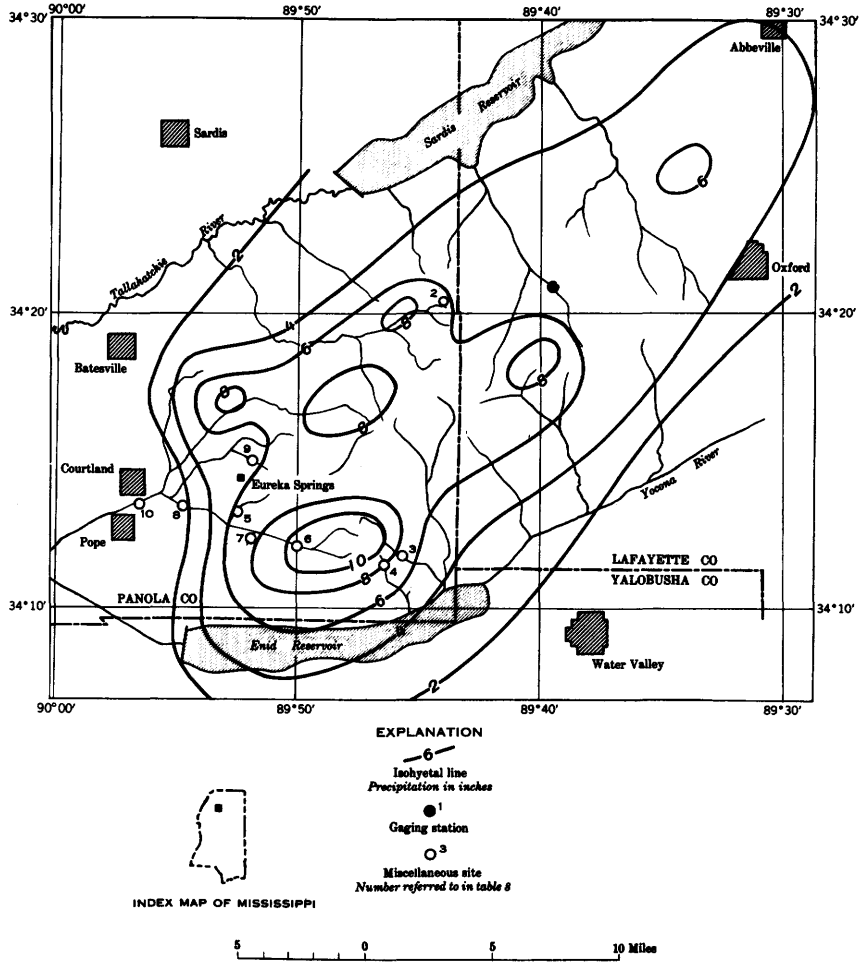

FIGURE 49.—Map of flood area showing location of flood-determination points and isohyetal lines for May 27. Floods of May 27–28 in Panola and Lafayette Counties, Miss.

rainfall for the flood area. Information from local residents indicates that most of the rainfall occurred between 7 p. m. and midnight. Recording rain gages at Sardis Dam and Enid Dam showed that most of the rainfall there occurred between 6:30 and 10 p. m.

No local resident could remember witnessing or hearing of any other flood greater than this one. The peak discharge on Clear Creek near Oxford, the only gaging station in the area, was 2,960 cfs (gage height 11.04 ft) on May 27, 1954. The previous maximum during the periods of record (1939–41, 1950–54) at this station occurred on February 20, 1953, with a peak discharge of 2,480 cfs

(gage height, 9.46 ft in the gage well and 9.9 ft from high-water marks). Indirect measurements of peak discharge for this flood were obtained at nine other sites in the area (table 8). The maximum unit discharge was 3,030 cfs per square mile from an area of 4.85 square miles. Owing to the high intensity of rainfall and the steep slopes of the drainage basins, rises were very rapid as illustrated by a discharge hydrograph of Clear Creek near Oxford (fig. 50).

All flooding was in rural areas and no loss of life resulted. The Agriculture Stabilization Committees at Sardis and at Oxford estimated the crop and soil losses in Panola County at $400,000 and in Lafayette County at $25,000. The total damage to county roads and State highways was estimated to be in excess of $25,000.

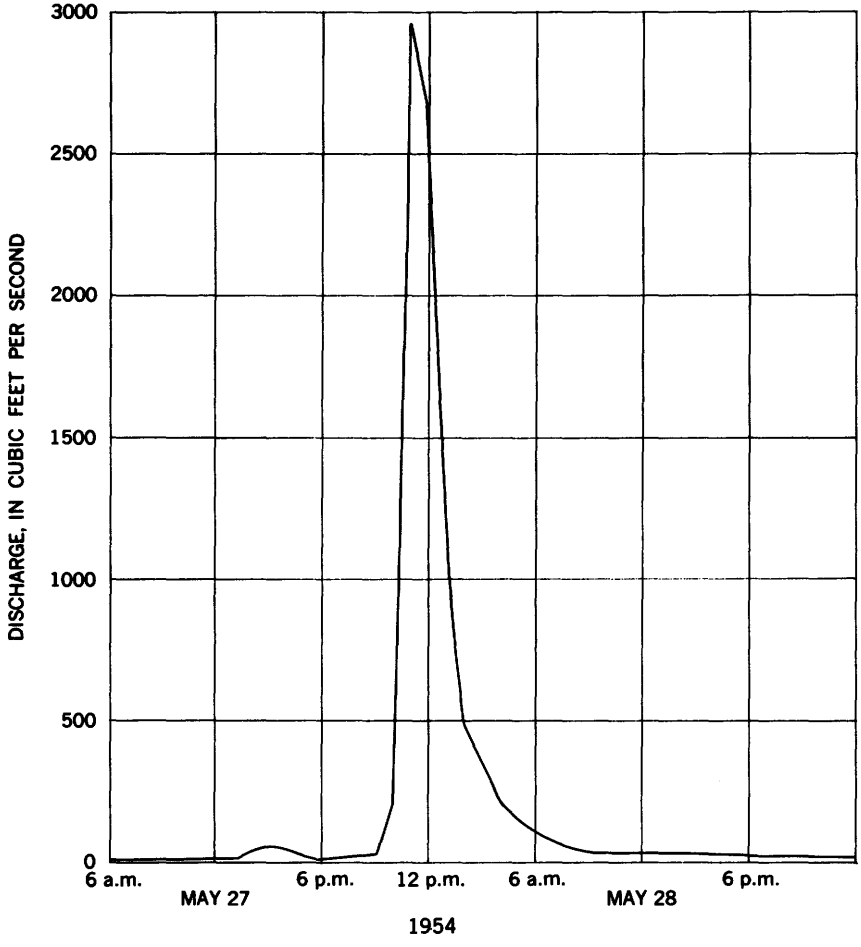

FIGURE 50.—Discharge hydrograph, Clear Creek near Oxford, Miss., May 1954.

A more detailed report of this flood was prepared by the Jackson (Mississippi) district office of the U.S. Geological Survey and released to the open files in March 1955.

TABLE 8.—*Summary of flood discharges, May 27–28 in Panola and Lafayette Counties, Miss.*

No. in fig. 49	Stream and place of determination	Drainage area (sq mi)	Discharge	
			Cfs	Cfs per sq mi
	YAZOO RIVER BASIN			
1	Clear Creek near Oxford	9.3	2,960	318
2	Dry Traywick Branch near Oxford	.27	403	1,490
3	Flowers Creek near Eureka Springs	2.59	3,280	1,270
4	Rowsey Creek near Eureka Springs	1.00	1,390	1,390
5	Long Creek near Eureka Springs	12.8	19,500	1,520
6	Caney Creek near Eureka Springs	4.85	14,700	3,030
7	Anthony Ditch near Eureka Springs	.27	500	1,850
8	Long Creek near Pope	30.8	31,900	1,040
9	Woodruff Creek at Eureka Springs	.79	800	1,010
10	Long Creek at Courtland	65.0	38,300	590

FLOODS OF JUNE 8 IN THE LITTLE MIAMI AND THE MIAMI RIVER BASINS, OHIO

Local flooding occurred in the vicinity of Yellow Springs, Greene County, Ohio, (fig. 51) following an intense thunderstorm on June 8. Rainfall, totaling 4.81 inches in less than 2 hours, was measured at the Weather Bureau rain gage at Yellow Springs. The storm centered just northeast of Yellow Springs. Highways and bridges in the area were damaged. The floodwaters rose to door levels in the Yellow Springs business district, and the public water supply was interrupted for about 6 hours.

Indirect measurements of peak discharge were made on three small tributary streams, and of these Birch Creek at Yellow Springs had a unit peak discharge of 1,160 cfs per square mile from a drainage area of 4.67 square miles. In the vicinity the only stream-gaging station which showed an appreciable rise was that on the Little Miami River near Oldtown, with a peak discharge of 4,720 cfs from a drainage area of 129 square miles. (See table 9.)

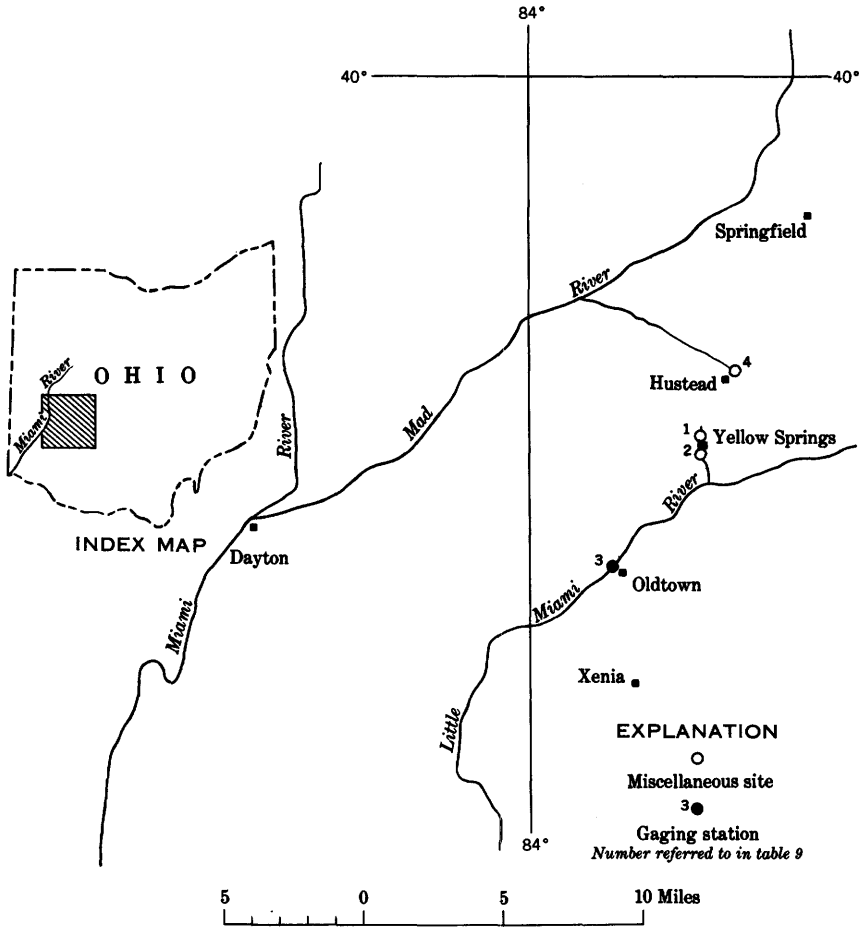

FIGURE 51.—Map of flood area showing location of flood-determination points. Floods of June 8 in the Little Miami and the Miami River basins, Ohio.

FLOODS OF JUNE 9–10 IN THE RED RIVER BASIN, TEXAS

Floods occurred on June 9 and 10 in the upper Red River basin. Up to 2.78 inches of rain in the Salt Fork Red River basin caused the maximum peak discharge for the short period of record at Salt Fork Red River near Wellington (table 10). Selected Weather Bureau precipitation stations and the amounts of rainfall for June 8–11 and location of gaging stations most affected are shown on figure 52.

Several highway structures were destroyed in the vicinity of Wellington.

TABLE 9.—*Summary of flood stages and discharges, June 8 in the Little Miami and the Miami River basins, Ohio*

[Each station in this table has one or two entries under maximum floods; the first pertains to the flood being reported on, and the second pertains to the maximum flood previously known during the period of record]

No. in fig. 51	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	LITTLE MIAMI RIVER BASIN						
1	Yellow Springs Creek at Yellow Springs.	4.30	----------	June 8, 1954	----------	2,130	495.0
2	Birch Creek in Glen Helen at Yellow Springs.	4.67	----------	June 8, 1954	----------	5,400	1,160
3	Little Miami River near Oldtown.	129	1952–54	June 8, 1954 Mar. 12, 1953	10.2 4.28	4,720 625	36.6 4.8
	MIAMI RIVER BASIN						
4	East Fork Mud Run at Hustead.	1.55	----------	June 8, 1954	----------	814	525

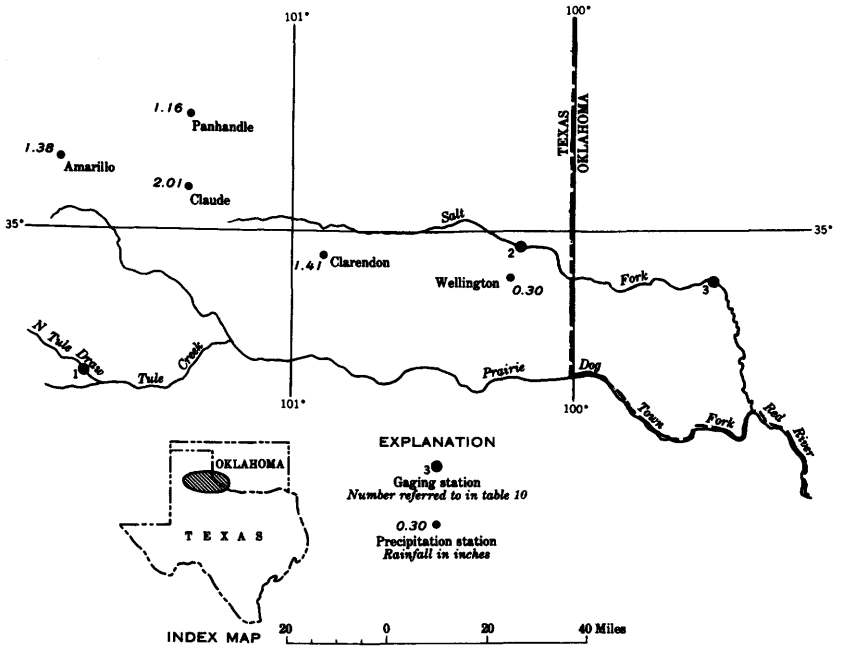

FIGURE 52.—Map of flood area showing location of flood-determination points and precipitation stations. Floods of June 9–10 in the Red River basin, Texas.

TABLE 10.—*Summary of flood stages and discharges, June 9–10 in the Red River basin, Texas*

[Each station in this table has two entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of record]

No. in fig 52	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	RED RIVER BASIN						
1	North Tule Draw at reservoir, near Tulia, Tex.	[1] 189	1940–54	June 9, 1954 May 15, 1951	97.35 [2] 96.76	4,680 5,430	--- 83.5
2	Salt Fork Red River near Wellington, Tex.	[3] 1,222	1952–54	June 10, 1954 July 19, 1953	16.00 13.90	95,900 63,400	--- 62.5
3	Salt Fork Red River at Mangum, Okla.	[3] 1,566	1937–54	June 10, 1954 June 16, 1938	13.30 14.70	38,100 60,000	--- 44.2

[1] 124 sq mi is probably noncontributing.
[2] Occurred May 16, 1951.
[3] 209 sq mi is probably noncontributing.

FLOODS OF JUNE 11 IN THE BAD RIVER BASIN, SOUTH DAKOTA

A flash flood occurred in the Bad River near Fort Pierre (fig. 53) during the morning of June 11. Weather Bureau records of rainfall were sparse in the area—0.69 inch at Hopewell, 1.42 inches at Hayes, 2.20 inches at Midland, and 2.45 inches at Pierre. The Bad River rose 19 feet in about 5 hours and reached a stage of 23.35 feet (discharge 16,600 cfs) (fig. 54). This was one of the most rapid rises which has occurred during the 26 years since the station was established although the peak was well below the maximum of record. A peak of 27.8 feet was reached May 1, 1942, another of 34.89 feet (discharge, 50,000 cfs) was reached in April 1927, and a peak in July 1905 exceeded that of April 1927 by about 2 feet.

FLOODS OF JUNE 1954 IN IOWA

Rainfall during the latter part of May and the first half of June 1954, culminated in a series of heavy rains June 15–22 and caused streams in north-central and northwest Iowa to rise to record heights in many places. Affected in Iowa were streams in the basins of the Iowa, Cedar, Skunk, Des Moines, Big Sioux, Floyd, Little Sioux, and Soldier Rivers and Perry Creek. Omaha Creek in Nebraska also was flooded.

Notable high rates of discharge produced by the extremely heavy rains include 108 cfs per square mile from 2.14 square miles of drainage area on the East Fork Iowa River above Hayfield, Iowa, and 242 cfs per square mile from a drainage area of 7.07 square

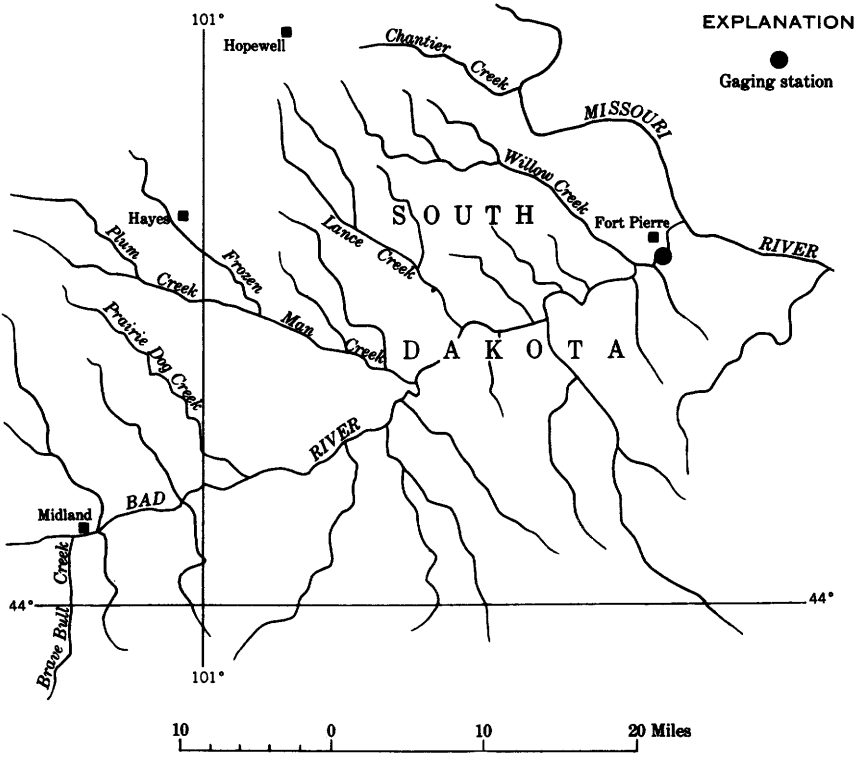

FIGURE 53.—Map of flood area showing location of flood-determination point. Floods of June 11 in the Bad River basin, South Dakota.

miles on a small Otter Creek tributary. The greatest unit peak discharge was 1,110 cfs per square mile measured from an area of 0.056 square mile on a small tributary of Boone River near Britt, Iowa. The unit discharge of 83.4 cfs per square mile on the Skunk River near Randall, Iowa, was unusual considering its much larger drainage area of 163 square miles.

The floods of June 1954 were the greatest known on the Iowa River above Eldora, on the Des Moines River below Fort Dodge to Des Moines, and on the Rock and the Little Sioux Rivers. Near-record floods occurred on the Des Moines River at and upstream from Fort Dodge, and on the Cedar River and tributaries upstream from Waterloo.

Flood damage amounted to nearly $28 million. Much urban damage occurred; however, the above total consisted mainly of agricultural damage with an estimated 725,000 acres of cropland in 26 northern counties of Iowa under water during the first 3 weeks in June.

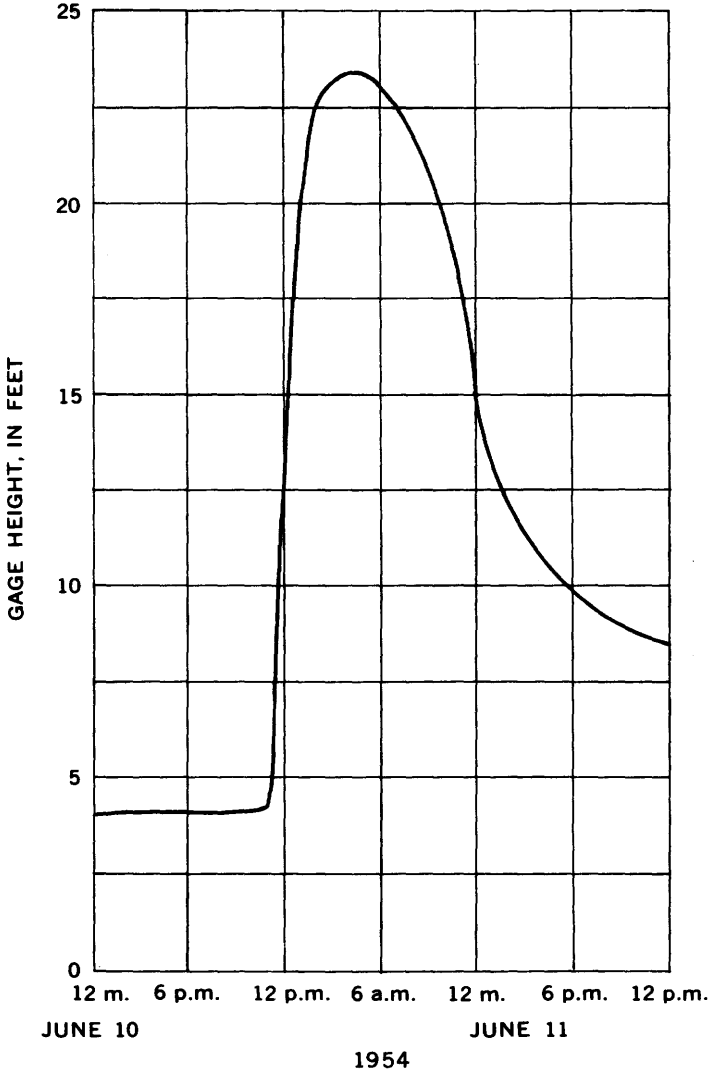

FIGURE 54.—Stage hydrograph, Bad River near Fort Pierre, S. Dak., June 1954.

A more comprehensive report on this flood is contained in Water-Supply Paper 1370–A.

FLOODS OF JUNE 17 IN NEBRASKA

Heavy rainfall occurred in the Nemaha River basin in southeastern Nebraska and in the Loup River basin in east-central Nebraska (fig. 55) during the early hours of June 17.

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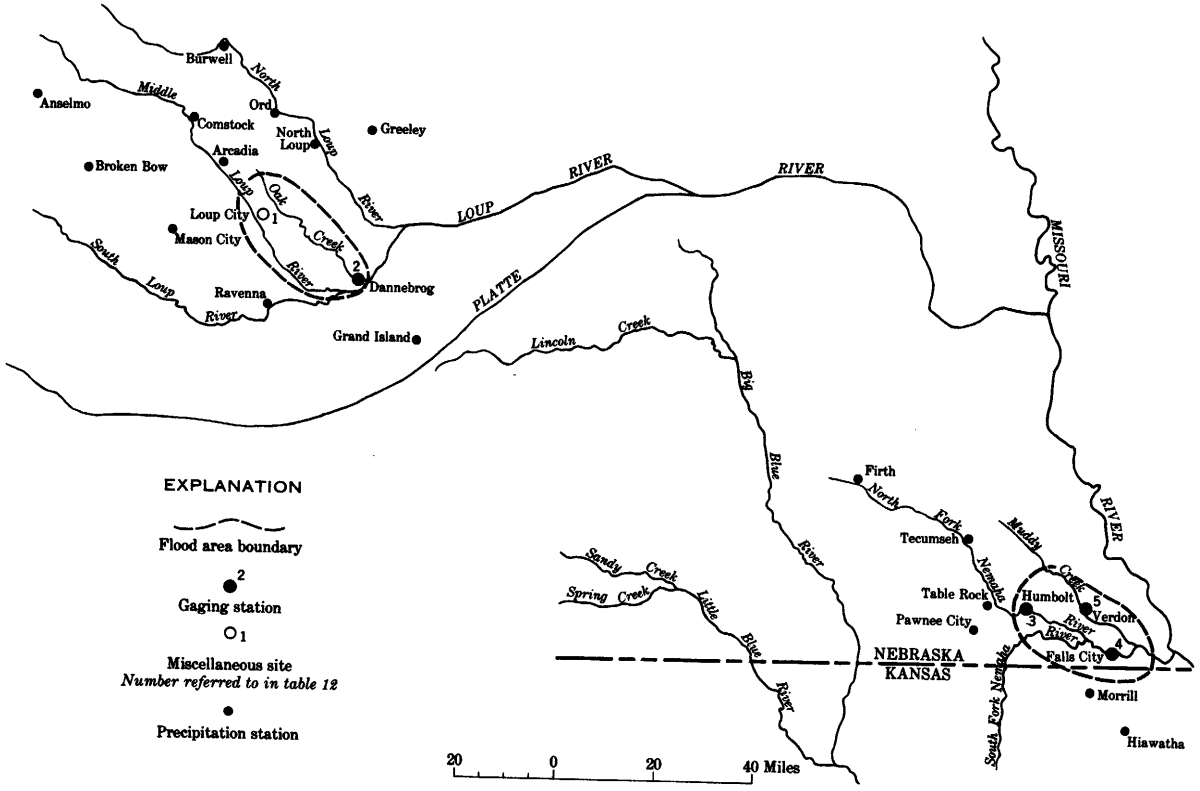

FIGURE 55.—Map of flood area showing location of flood-determination points and precipitation stations. Floods of June 17 in Nebraska.

In the Nemaha River basin, rainfall averaged about 3 inches over most of the drainage area and tapered off sharply outside of it, and in the Loup River basin localized rainfall of 4 to 5 inches occurred in the vicinity of Loup City (table 11).

There was considerable crop damage on the Nemaha River flood plain near Falls City, and local flooding occurred in the vicinity of Loup City.

A maximum unit discharge of 389 cfs per square mile from an area of 6.2 square miles was obtained in the Loup City area (table 12).

TABLE 11.—*Rainfall, in inches, at Weather Bureau stations, June 15–17, 1954, in Nebraska*

Station	Total rainfall (inches)	Station	Total rainfall (inches)
NEBRASKA		NEBRASKA—continued	
Loup City	5.05	Burwell	0.09
Arcadia	.47	Pawnee City	3.49
North Loup	.26	Falls City	4.10
Comstock	.97	Table Rock	3.97
Broken Bow	.41	Tecumseh	3.60
Ord	.43	Firth	2.59
Anselmo	.92		
Mason City	2.61	KANSAS	
Ravenna	3.01		
Grand Island AP	2.34	Morrill	4.50
Greeley	.50	Hiawatha	5.10

TABLE 12.—*Summary of flood stages and discharges, June 17 in Nebraska*

[Each station in this table has 1 or 2 entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of record]

No. in fig. 55	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	PLATTE RIVER BASIN						
1	Dead Horse Creek at Loup City.	6.2	----------	June 17, 1954	----------	2,410	389
2	Oak Creek near Dannebrog.	122	1949–54	June 17, 1954	17.23	1,880	15.4
				July 9, 1950	17.00	1,780	14.6
	NEMAHA RIVER BASIN						
3	North Fork Nemaha River at Humboldt.	531	1952–54	June 17, 1954	28.48	43,300	81.5
				Aug. 6, 1953	9.15	2,180	4.1
4	Nemaha River at Falls City.	1,340	1944–54	June 17, 1954	27.44	51,400	38.4
				June 2, 1949	28.8	34,200	26,0
5	Muddy Creek at Verdon.	188	1952–54	June 17, 1954	22.97	17,100	91.0
				Nov. 16, 1952	11.87	4,040	21.5

FLOODS OF JUNE 27–JULY 1 IN THE RIO GRANDE BASIN, TEXAS

Record-breaking floods, caused by an intense tropical storm moving inland from the Gulf of Mexico, occurred June 27–29 in the Devils River and the Pecos River basins and on the Rio Grande. Other streams in the United States and in Mexico also yielded large flows. During June 24–29, rainfall totaling 35 inches fell in some areas (fig. 56).

Uncounted lives were lost, mostly in Mexico, and damage to man-made structures was extensive. Several bridges were destroyed and hundreds of buildings were washed away or damaged beyond repair. In Mexico many adobe homes collapsed after being partly submerged in water for a few hours. In the town of Piedras Negras (population 35,000), half of the buildings were destroyed and more than 200 people died. Falcon Reservoir on the Rio Grande below Laredo, Tex., was nearly empty when the flood flow arrived and consequently contained the flow without spilling. This saved the agricultural area downstream from flooding.

The maximum discharge during the flood, reported by the International Boundary and Water Commission, United States and Mexico, was 1,158,000 cfs on June 28 below Diablo Dam site on the Rio Grande (table 13). The Commission's gaging station on the Pecos River near Comstock, Tex., in continuous operation since 1900, had a peak discharge of 948,000 cfs, that was more than 8 times the previously known maximum. The peak stage, 96.24 feet, was nearly 58 feet higher than the previous maximum. Devils River near Juno, Tex., reached a peak stage of 35.0 feet and had a discharge of 393,000 cfs, reported to be the highest flow since at least 1882.

More detailed information on a part of the flood area is contained in open file release No. 49, August 1954, "Floods in the Devils and Pecos River Basins of Texas, June 27–28, 1954," which was prepared by the Austin district office in cooperation with the Texas State Board of Water Engineers. Information is also contained in Water Bulletin No. 24, "Flow of the Rio Grande and related data," published by the International Boundary and Water Commission, United States and Mexico.

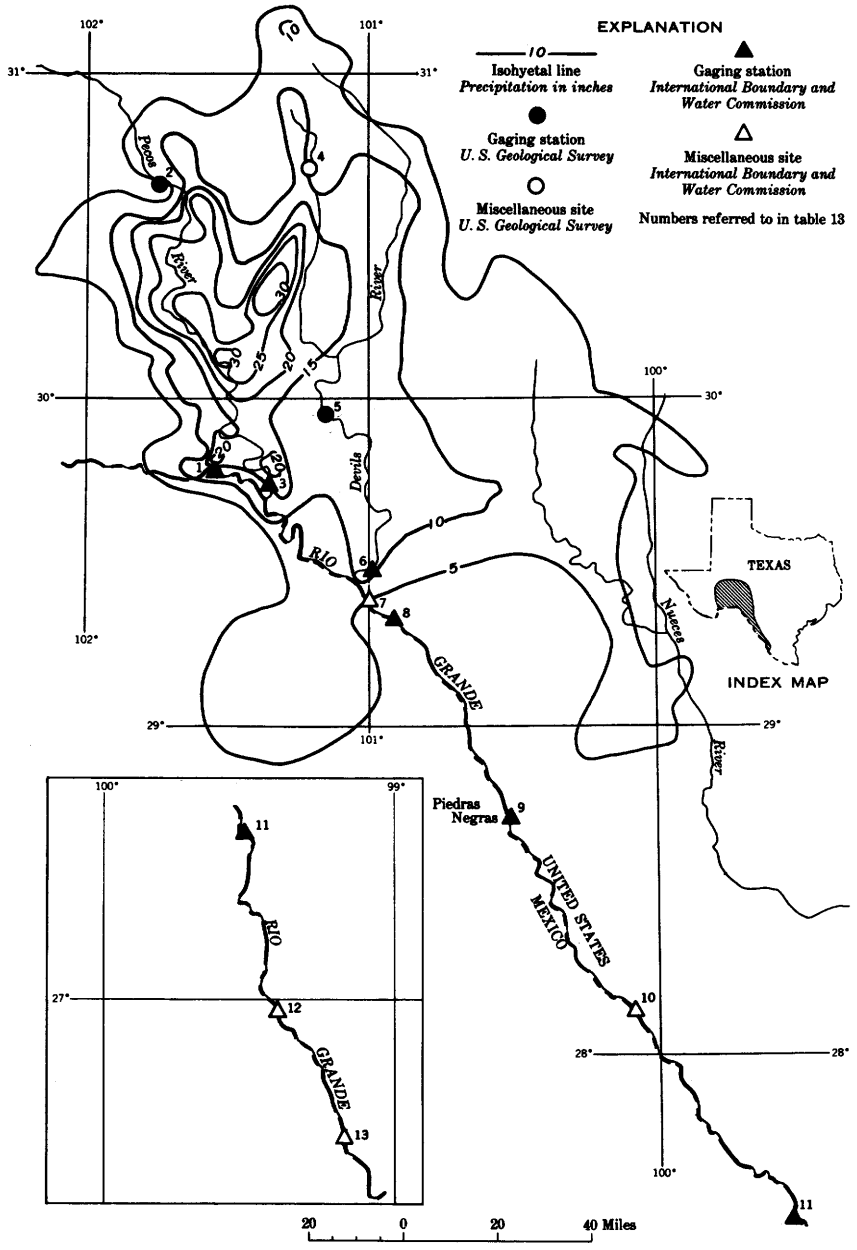

FIGURE 56.—Map of flood area showing location of flood-determination points and isohyetal lines for June 24–29. Floods of June 27–July 1 in the Rio Grande basin, Texas.

TABLE 13.—*Summary of flood stages and discharges, June 27–July 1 in the Rio Grande basin, Texas*

[Each station in this table has 1, 2, or 3 entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of record; the third pertains to the maximum flood of which knowledge is available outside the period of record]

No. in fig. 56	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	RIO GRANDE BASIN						
1	Rio Grande at Langtry [1]	79,375	1900–14, 1919–20, 1924–54	June 27, 1954 Sept. 4, 1935 June 17, 1922	49.87 46.70 56.9	169,000 149,000 204,000	2.1 1.9 2.6
2	Pecos River near Sheffield	31,660	1921–25, 1939–49	June 27, 1954 Oct. 8, 1941	17.72 16.75	17,000 13,800	.54 .44
3	Pecos River near Comstock.[1]	35,293	1900–54	June 28, 1954 Sept. 1, 1932	96.24 38.25	948,000 116,000	26.9 3.3
4	Johnson Draw at Ozona	120		June 28, 1954		72,700	606.0
5	Devils River near Juno	2,733	1925–49	June 28, 1954 Sept. 1, 1932	35.0 33.8	[2] 393,000 370,000	144.0 135.0
6	Devils River near Del Rio [1]	4,185	1900–14, 1923–54	June 28, 1954 Sept. 1, 1932	34.76 36.60	585,000 597,000	140.0 143.0
7	Rio Grande below Diablo Dam site.[1]			June 28, 1954	55.72	1,158,000	
8	Rio Grande near Del Rio [1]	121,925	1900–15, 1919–20, 1923–54	June 28, 1954 Sept. 1, 1932	38.25 34.5	1,140,000 605,000	9.4 5.0
9	Rio Grande at Eagle Pass [1]	125,502	1900–14, 1924–54	June 29, 1954 Sept. 2, 1932	53.51 49.00	964,000 569,000	7.7 4.5
10	Rio Grande at San Antonio Crossing.[1]	127,245		June 29, 1954	42.70	912,000	7.2
11	Rio Grande at Laredo [1]	130,859	1900–13, 1923–54	June 30, 1954 Sept. 3, 1932 June 1865	61.35 52.20 62.5	716,900 335,000 950,000	5.5 2.6
12	Rio Grande at Head of Falcon Reservoir.[1]			June 30, 1954		640,000	
13	Rio Grande at Falcon Dam.[1]			July 1, 1954		528,000	

[1] Data furnished by International Boundary and Water Commission, United States and Mexico.
[2] Greatest since at least 1882.

FLOODS OF JULY 19 IN WEST VIRGINIA

Heavy rains on July 19 produced a severe flash flood on the Cherry River causing damages estimated at $2 million. Other streams in the area, however, were not comparatively high, although the storm covered most of the Gauley River basin, of which the Cherry River is a part (fig. 57).

Relatively high amounts of precipitation fell over most of the Gauley River basin. Camden on Gauley had 3.53 inches, Webster Springs had 2.98 inches, Richwood had 3.60 inches, and Summersville had 2.93 inches. As a result of these heavy rains and resulting floods, the town of Richwood and vicinity was declared an emergency area.

FIGURE 57.—Map of flood area showing location of flood-determination points and precipitation stations. Floods of July 19 in West Virginia.

The discharge on Cherry River at Fenwick was almost 10,000 cfs higher than the previous maximum of record (table 14).

FLOODS OF JULY 20 IN MIAMI, ARIZONA

A thunderstorm on July 20 produced 1.70 inches of rain at Miami, 1.20 inches at Superior, 0.61 inch at Pinal Ranch, and 0.48 inch at Globe during the evening of July 20 and caused a flash flood in Bloody Tanks Wash in Miami (fig. 58). Water topped the concrete walls of the channel, flooded the main streets, and demolished many

TABLE 14.—*Summary of flood stages and discharges, July 19 in West Virginia*

[Each station in this table has two entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of record]

No. in fig. 57	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	KANAWHA RIVER BASIN						
1	Gauley River at Camden on Gauley	236	1908–16, 1929–54	July 19, 1954	19.42	19,800	83.9
				July 4, 1932	27.38	42,500	180
2	Cherry River at Fenwick.	150	1929–54	July 19, 1954	19.8	37,000	246
				June 1940	15.2	27,300	182
3	Gauley River near Summersville.	680	1908–16, 1928–54	July 19, 1954	25.87	66,100	97.3
				July 4, 1932	28.75	77,700	114
4	Gauley River above Belva.	1,315	1928–54	July 19, 1954	24.80	67,500	51.3
				July 5, 1932	28.6	105,000	79.8

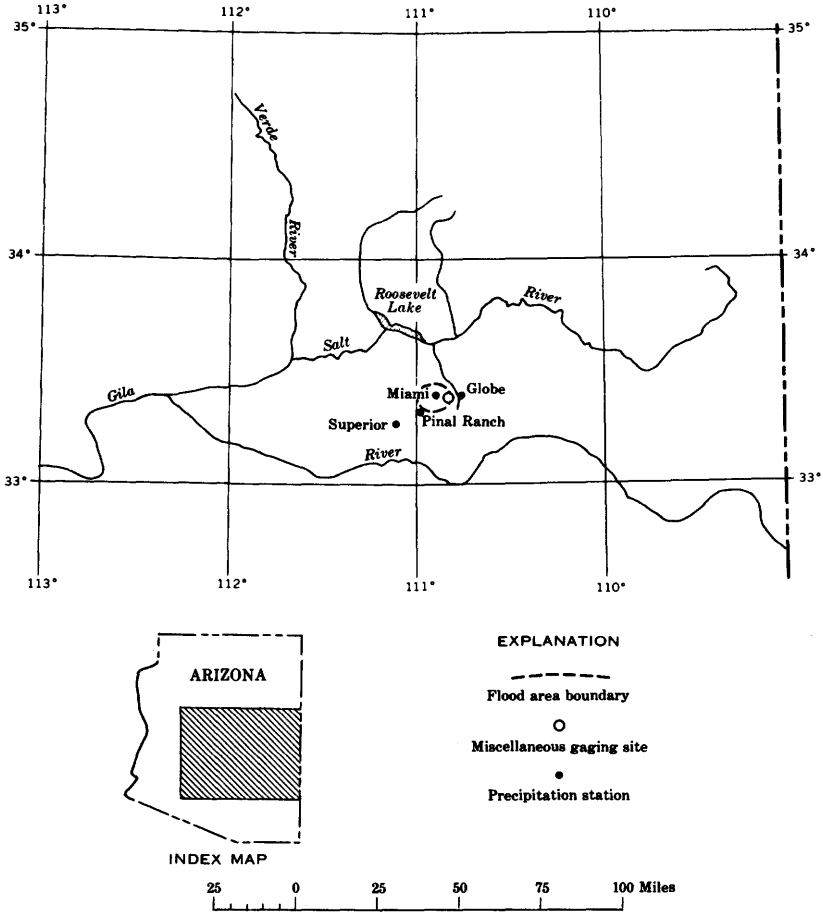

FIGURE 58.—Map of flood area showing location of flood-determination point and precipitation stations. Floods of July 20 in Miami, Arizona.

automobiles. Floodwater carrying mud and debris did considerable damage to business establishments. Total damage was estimated at $150,000.

A slope-area measurement in NW¼SE¼NE¼ sec. 30, T. 1 N., R. 15 E., below bridge on U.S. Highways 60 and 70 east of Miami determined the peak discharge to be 2,720 cfs from 18.2 square miles.

FLOODS OF JULY 21 IN PAINT CREEK BASIN, OHIO

Heavy local rains fell in the vicinity of Hillsboro and New Vienna, Ohio (fig. 59), during the night of July 20–21. Totals of 5.72 inches (official) at Hillsboro and 7.5 inches (unofficial) at New Vienna were recorded. The 5.72 inches at Hillsboro occurred in about 8 hours and was the record 24-hour rainfall for the station. Roads, bridges, and some private property were damaged by the excessive runoff from this storm.

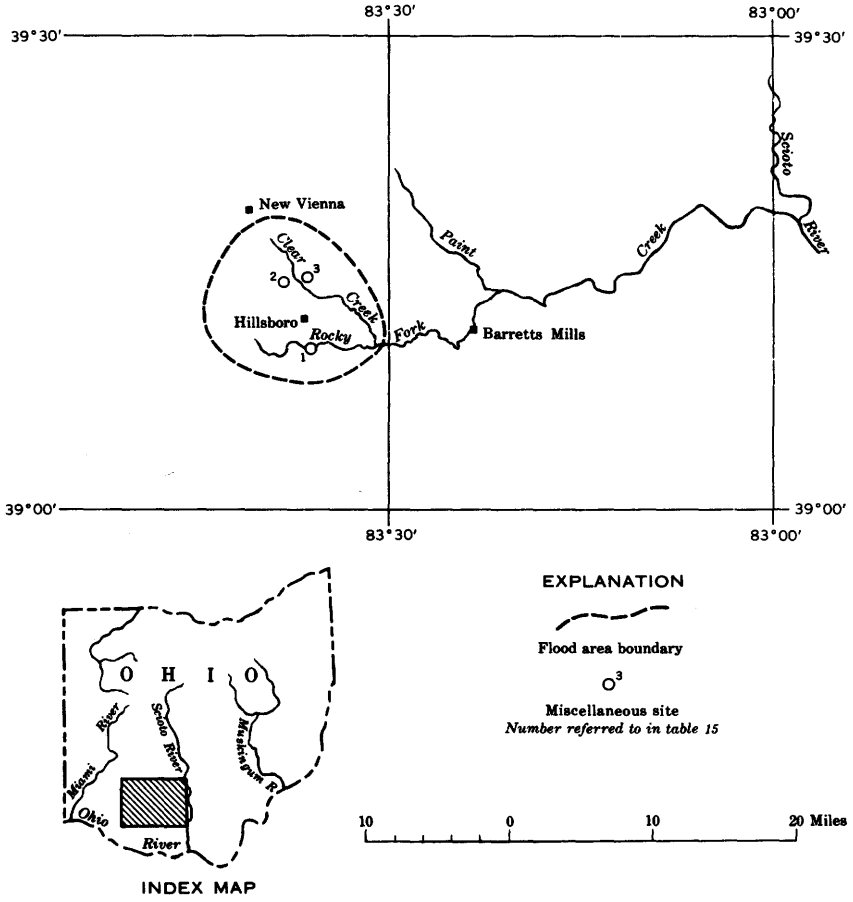

FIGURE 59.—Map of flood area showing location of flood-determination points and precipitation stations. Floods of July 21 in Paint Creek basin, Ohio.

Three peak-flow determinations, on areas of 0.74, 3.60, and 16.1 square miles were made, with a maximum unit discharge of 700 cfs per square mile on the 3.60 square mile drainage area (table 15). The storm covered about 200 square miles and centered over the ridge separating the Little Miami River and the Paint Creek basins rather than concentrating over one basin. At the gaging station on Rocky Fork near Barretts a peak discharge of 6,150 cfs from 141 square miles was not extreme for this site, because the peak discharge had been exceeded several times since 1939.

TABLE 15.—*Summary of flood stages and discharges, July 21 in Paint Creek basin, Ohio*

No. in fig. 59	Stream and place of determination	Drainage area (sq mi)	Date	Discharge	
				Cfs	Cfs per sq mi
	PAINT CREEK BASIN				
1	Rocky Fork near Hillsboro	16.1	July 21, 1954	6,520	405
2	Clear Creek tributary No. 1 near Hillsboro	.74	July 21, 1954	485	655
3	Clear Creek tributary No. 2 near Hillsboro	3.60	July 21, 1954	2,520	700

FLOODS OF JULY 22–23 IN THE PURGATOIRE RIVER BASIN, COLORADO

Floods of outstanding magnitude occurred in the Purgatoire River basin in Colorado (fig. 60) as a result of heavy rains on July 22–23. The area which received the heaviest rainfall is sparsely inhabited and has few official precipitation stations. Information on the distribution of the rainfall is limited to unofficial measurements of total storm precipitation made by residents of the area, to visual inspections of the streams contributing high discharge, and to a few records collected at official weather stations on the fringe of the area. On July 22 the Walsenburg, Colo., recording precipitation gage recorded 0.52 inch of rain between 11 a. m., and 12 m., 0.43 inch between noon and 1 p. m., and decreasing hourly amounts until 7 p. m., with a total catch of 2.00 inches. On July 22 at John Martin Dam, precipitation occurred between 2 and 3 p. m., but the largest hourly amount was 0.89 inch between 3 and 4 p. m. Light precipitation continued until 7 a. m., July 23, when a total of 2.44 inches were recorded.

According to residents of Trinchera, a cloudburst occurred there during the afternoon of July 22; the heavy rain, estimated at more than 5 inches in less than 1 hour, fell on the relatively flat land north of Raton Mesa. Judging by all known evidence, the storm causing the floods of July 22–23 in the Purgatoire River basin was

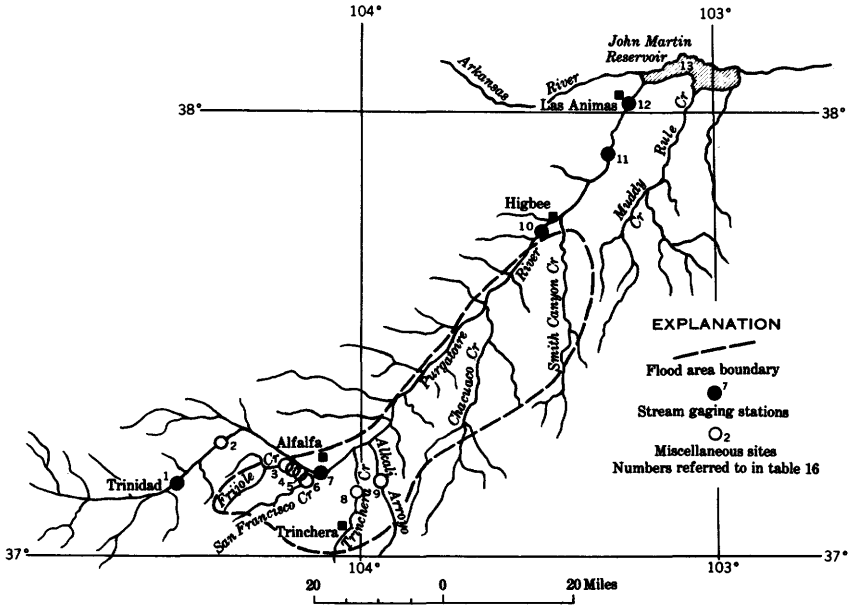

FIGURE 60.—Map of flood area showing location of flood-determination points. Floods of July 22–23 in the Purgatoire River basin, Colorado.

relatively widespread with one or more cores of intense precipitation extending generally parallel to the Purgatoire River between Raton Mesa and Higbee. Unofficial measurements of total storm rainfall collected by the Corps of Engineers showed a few amounts of 7 inches. The descriptions of the storm, as furnished by residents, indicate an extremely intense initial downpour followed by several hours of light rain.

Runoff from the heavy precipitation was extremely flashy. Following the flood, determinations of the peak discharges at regular gaging stations and at miscellaneous ungaged sites were made by the Geological Survey (table 16). The investigations at miscellaneous sites were limited by the scarcity of roads in the flood area.

Moderate runoff occurred from almost all small tributaries of the Purgatoire River upstream from Trinidad early in the afternoon of July 22. The Purgatoire River at Trinidad reached a peak stage of 6.7 feet about 2:40 p. m., on July 22. The right-bank tributaries of the Purgatoire River (Frijole, San Francisco, Trinchera, and Terminton Creeks) reached peak stages and discharges at U.S. Highway 160 about 4 p. m., on July 22, as a result of the cloudburst just north of Raton Mesa. The Geological Survey recording-gage structure on the Purgatoire River near Alfalfa was overtopped by about 6 feet with the floods from Frijole and San Francisco Creeks that

caused the main stream to reach peak stage at about 5 p. m. Floods from Chacuaco and Smith Canyon Creeks entered the main stem before the flood from upstream reached the mouths of these creeks. The recorder trace at Ninemile Dam near Higbee, shows a small flood peak at 7:40 p. m., July 22, and at 12:15 a. m., July 23, presumably from local inflow and Chacuaco Creek, and then a major peak at 6:30 a. m., July 23, when the upstream flood passed. The recorder trace at Highland Dam, 11 miles southwest of Animas, shows a first small flood peak at 2 a. m., July 23, presumably from Smith Canyon Creek and then a major peak at 3 p. m., July 23, when the upstream flood passed. Contributions to flooding by tributaries downstream from Smith Canyon Creek were minor. (See fig. 61.) Precipitation above Muddy Creek reservoir did not fill the reservoir. The Purgatoire floodwater passed into empty John Martin Reservoir and was stored for beneficial use. Inflow to John Martin Reservoir from the Purgatoire and the Arkansas Rivers was 39,100 acre-feet during the 3 days July 22–24. Comparative data on previous floods on the small tributaries which were affected by the 1954 flood are lacking. Comparison with previous mainstem floods along the Purgatoire River indicates that the July 22–23,

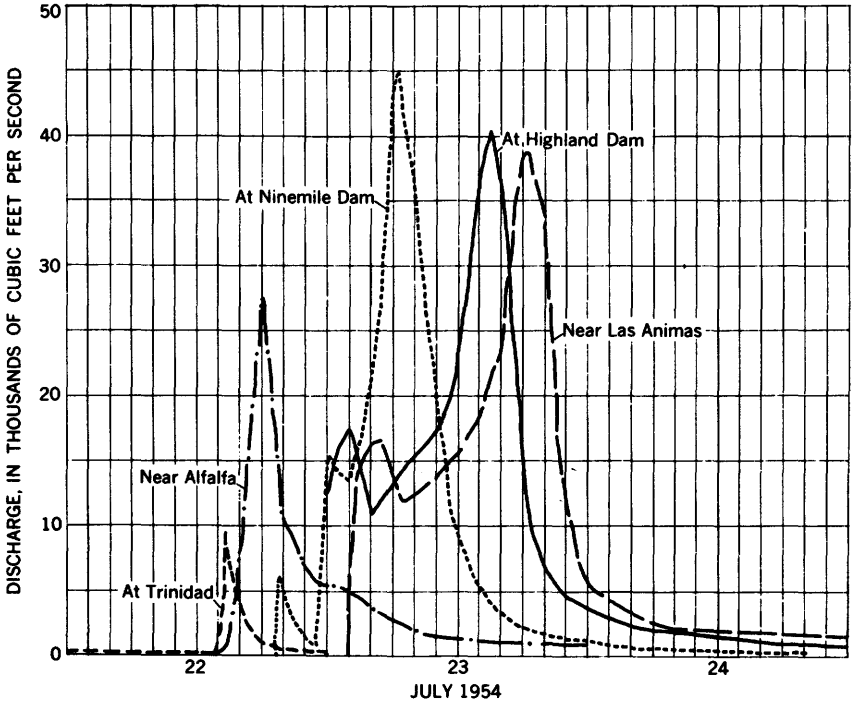

FIGURE 61.—Hydrograph of discharge in Purgatoire River July 22–24.

1954 flood was among minor floods at Trinidad, probably the largest flood since 1904 at Alfalfa, about equal to the 1934 and 1942 floods at Ninemile Dam, and well below the 1942 flood at Highland Dam and at Las Animas.

The floods caused damage to highways, railways, small farm ponds, and irrigated farms in the valleys. At the village of Trinchera many homes were flooded, the Colorado Railway embankment across Trinchera Creek was overtopped and seriously eroded, and State Route 55 was washed out in many places. Two automobiles were lost or destroyed. U.S. Highway 160 was overtopped at the time of flood crest at the crossings of Frijole, San Francisco, and Trinchera Creeks and many intervening small draws. The overtopping washed away minor amounts of the road fill, but traffic was restored as soon as the flood receded below the pavement. Many

TABLE 16.—*Summary of flood stages and discharges, July 22–23 in the Purgatoire River basin, Colorado*

[Each station in this table has one, two, or three entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of record; the third pertains to the maximum flood known outside the period of record]

No. in fig. 60	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	PURGATOIRE RIVER BASIN						
1	Purgatoire River at Trinidad.	795	1896–99, 1905	July 22, 1954	6.7	9,300	11.7
			1906–12,	Apr. 23, 1942	12.70	35,000	44.0
			1916–54.	Sept. 30, 1904	[1] 13.6	45,400	57.1
2	Purgatoire River at Hoehne Dam.	857	----------	July 22, 1954	----------	5,920	6.91
3	Frijole Creek at U.S. Highway 160.	80	----------	July 22, 1954	----------	13,500	169
4	Draw No. 1 at U.S. Highway 160.	0.843	----------	July 22, 1954	----------	447	530
5	Draw No. 2 at U.S. Highway 160.	1.49	----------	July 22, 1954	----------	1,130	758
6	San Francisco Creek at U.S. Highway 160.	160	----------	July 22, 1954	----------	26,300	164
7	Purgatoire River near Alfalfa.	1,320	1905–7,	July 22, 1954	27.6	37,800	28.6
			1924–28,	Aug. 7, 1927	[2] 18.0	19,100	14.5
			1951–54.				
8	Trinchera Creek at U.S. Highway 160.	129	----------	July 22, 1954	----------	25,100	195
9	Alkali Arroyo at U.S. Highway 160.	34.5	----------	July 22, 1954	----------	15,500	449
10	Purgatoire River at Ninemile Dam near Higbee.	2,900	1924–54	July 23, 1954	14.30	45,000	15.5
				Sept. 15, 1934	14.3	45,000	15.5
11	Purgatoire River at Highland Dam near Las Animas.	3,376	1931–54	July 23, 1954	14.05	40,300	11.9
				Apr. 24, 1942	16.8	60,000	17.8
12	Purgatoire River near Las Animas.	3,503	1889, 1909,	July 23, 1954	11.55	38,800	11.1
			1922–31,	July 21, 1927	[3] 8.80	49,000	14.0
			1948–54.	Oct. 1, 1904	([4])	([4])	--------
13	John Martin Reservoir at Caddoa.	18,917	1943–54	July 24, 1954	[5] 3,794.64	[6] 25,230	--------
				July 3, 1948	[5] 3,835.70	[6] 244,700	--------

[1] Greatest known since at least 1859.
[2] Site and datum then in use.
[3] Datum then in use.
[4] Greatest flood known, stage and discharge undetermined.
[5] Elevation, in feet, above mean sea level.
[6] Contents, in acre-feet.

small farm ponds were damaged or destroyed when flood runoff eroded the impounding earth dam. Below Ninemile Dam the Purgatoire River overflowed several irrigated farms causing some damage.

FLOODS OF JULY 29 IN PINAL CREEK, ARIZONA

Heavy rains south of Globe and 1.1 inches in Globe caused a flash flood in Pinal Creek near Globe (fig. 62) on the evening of July 29. The creek which flows through the lower part of the business district overflowed its banks and water rose to a depth of several feet in some of the buildings. The Weather Bureau reported 25 business establishments in 2 city blocks severaly damaged and 126 families suffered losses. Total damages were estimated at $1 million.

A slope-area measurement in N½SE¼NW¼SE¼ sec. 23, T. 1 N., R. 15 E., 1¼ miles northwest of the courthouse in Globe showed a peak discharge of 8,130 cfs from 34.4 square miles.

A greater flood occurred August 17, 1904. Computation of a simple slope-area measurement showed the discharge to have been 13,200 cfs from a drainage area of 33.4 square miles.

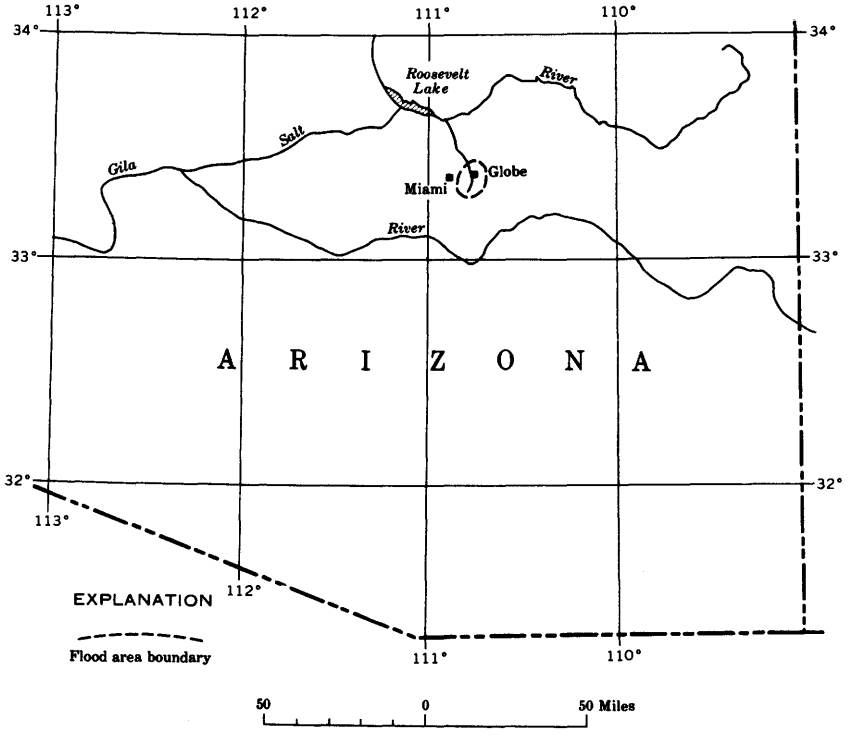

FIGURE 62.—Map showing location of flood area. Floods of July 29 in Pinal Creek, Arizona.

FLOODS OF AUGUST 4–5 IN THE SANTA CRUZ RIVER BASIN, ARIZONA

Heavy thundershowers occurred August 4 and 5 in the Santa Rita Mountains and extended west to the Santa Cruz River where severe flooding was caused in the reach between Amado and Sahuarita (fig. 63). A few Weather Bureau precipitation stations are in the area and are listed in table 17, which shows total amounts of rainfall recorded for August 3–5, 1954. A peak discharge of 14,600 cfs (gage height 10.1 ft) from a drainage area of 1,662 square miles occurred in the Santa Cruz River at Continental. The previous maximum during the period 1940–54 was 12,100 cfs (gage height 8.85 ft) which occurred August 14, 1940. Damage to railroad right-of-way, highways, bridges, irrigation canals, and power and communication facilities were estimated at $50,000 by the Weather Bureau. Crop damage, mainly to cotton, was estimated at $50,000.

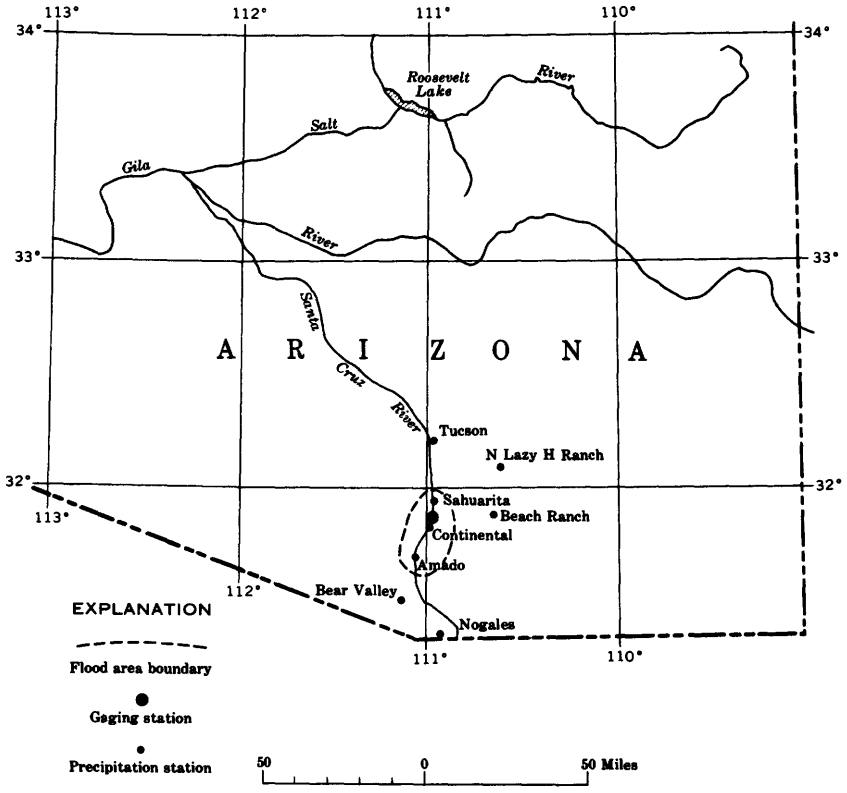

FIGURE 63.—Map of flood area showing location of flood-determination point and precipitation stations. Floods of August 4–5 in the Santa Cruz River basin, Arizona.

TABLE 17.—*Rainfall, in inches, at Weather Bureau stations, August 3–5, 1954, in the Santa Cruz River basin, Arizona*

Station	Total rainfall (inches)	Station	Total rainfall (inches)
Casa Grande 3 SE	0.74	Beach Ranch	1.34
Tucson AP	.90	Amado	3.06
Univ. of Ariz	.77	Bear Valley	3.12
N Lazy H Ranch	1.40	Nogales	1.26
Tucson Magnetic Obs	.16	San Rafael Ranch	1.13
Sabino Canyon	.76		

FLOODS OF AUGUST 19 IN UPPER QUEEN CREEK BASIN, ARIZONA

Heavy rains of from 4 to 6 inches fell in a few hours over the Upper Queen Creek basin on the morning of August 19. Weather Bureau rain gages at Superior and at Superstition Mountain recorded 2.47 inches and 4.93 inches, respectively, for August 19. A flash flood of 42,900 cfs from an area of 144 square miles occurred at 10 a. m., at the gaging station at Whitlow Dam site, near Superior (fig. 64). The previous maximum during the period of record

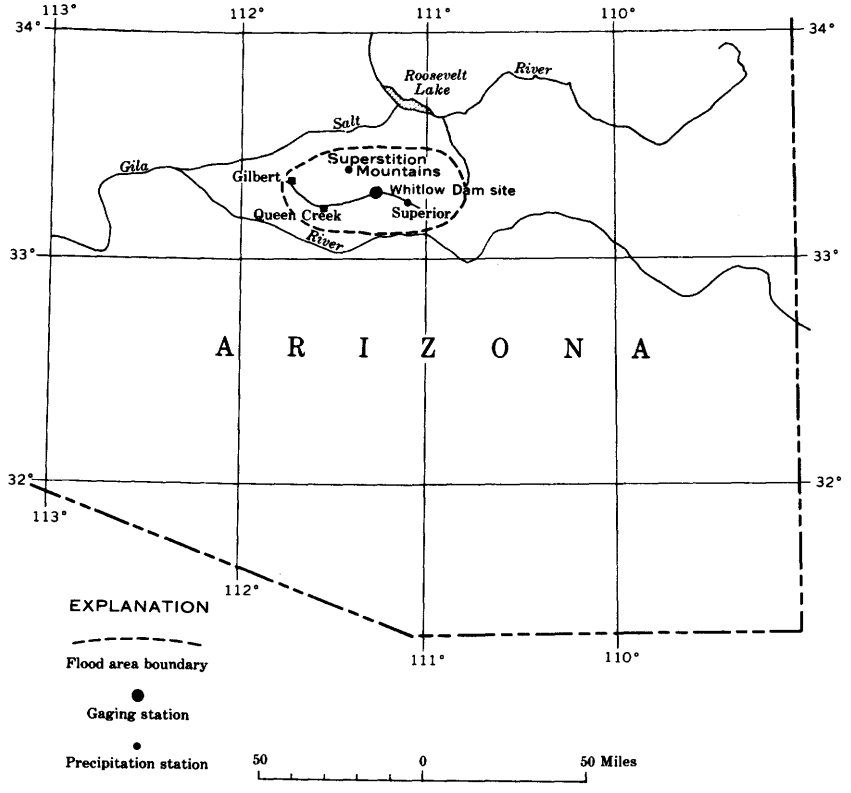

FIGURE 64.—Map of flood area showing location of flood-determination point and precipitation stations. Floods of August 19 in Upper Queen Creek basin, Arizona.

(1915–20, 1948–54) was 10,000 cfs August 1, 1919. The previous maximum outside the period of record was 13,200 cfs August 6, 1939.

The gage was destroyed by the flood. Most of the flood damage occurred in or near the communities of Gilbert and Queen Creek, where homes were flooded, maturing cotton was destroyed, and canal banks were washed out. A railroad bridge 4 miles west of Superior was destroyed. The Weather Bureau reported property damage of $445,700 and damage to crops, mainly cotton, of $1.4 million.

FLOODS OF AUGUST 19 AND 24 IN EASTERN WASHINGTON

On August 19 two cloudbursts occurred—1 about 15 miles north of Davenport and 1 near Lamont—and on August 24 a cloudburst occurred in Clayton Gulch near Clarkston. Figure 65 shows approximate location of the storms. Farmlands were eroded; and roads, culverts, and bridges were damaged by the resulting floods. Determinations of peak runoff were made on 4 small areas ranging from 0.33 to 7.04 square miles. The largest unit peak discharge was 1,410 cfs per square mile from an area of 0.33 square mile (table 18). No gaging stations were affected by these local storms.

TABLE 18.—*Summary of flood stages and discharges, August 19 and 24 in eastern Washington*

Stream and place of determination	Drainage area (sq mi)	Date	Discharge	
			Cfs	Cfs per sq mi
PALOUSE RIVER BASIN				
Mud Lake Tributary near Lamont	----------	Aug. 19, 1954	1,140	----------
SNOOK CANYON BASIN				
Snook Canyon near Davenport	0.45	Aug. 19, 1954	519	1,150
Snook Canyon tributary	.33	Aug. 19, 1954	467	1,410
ALPOWA CREEK BASIN				
Clayton Gulch near Clarkston	7.04	Aug. 24, 1954	1,600	227

FLOODS OF SEPTEMBER 5 IN LITTLE BEAVER CREEK BASIN, MONTANA

A cloudburst centered over an unnamed tributary of Little Beaver Creek, 7.5 miles southeast of Baker (fig. 66) at about 5:45 p. m., on September 5. Residents, within 5 miles of the area, reported rainfall intensities ranging from 2.5 inches in 30 minutes to 4.5 inches in 45 minutes. An indirect measurement of peak flow showed a discharge of 1,680 cfs from a drainage area of 0.5 square mile which is equivalent to a unit peak discharge of 3,360 cfs per square mile.

A Chicago, Milwaukee, St. Paul, and Pacific train carrying 160 passengers was derailed and two cars overturned at the culvert

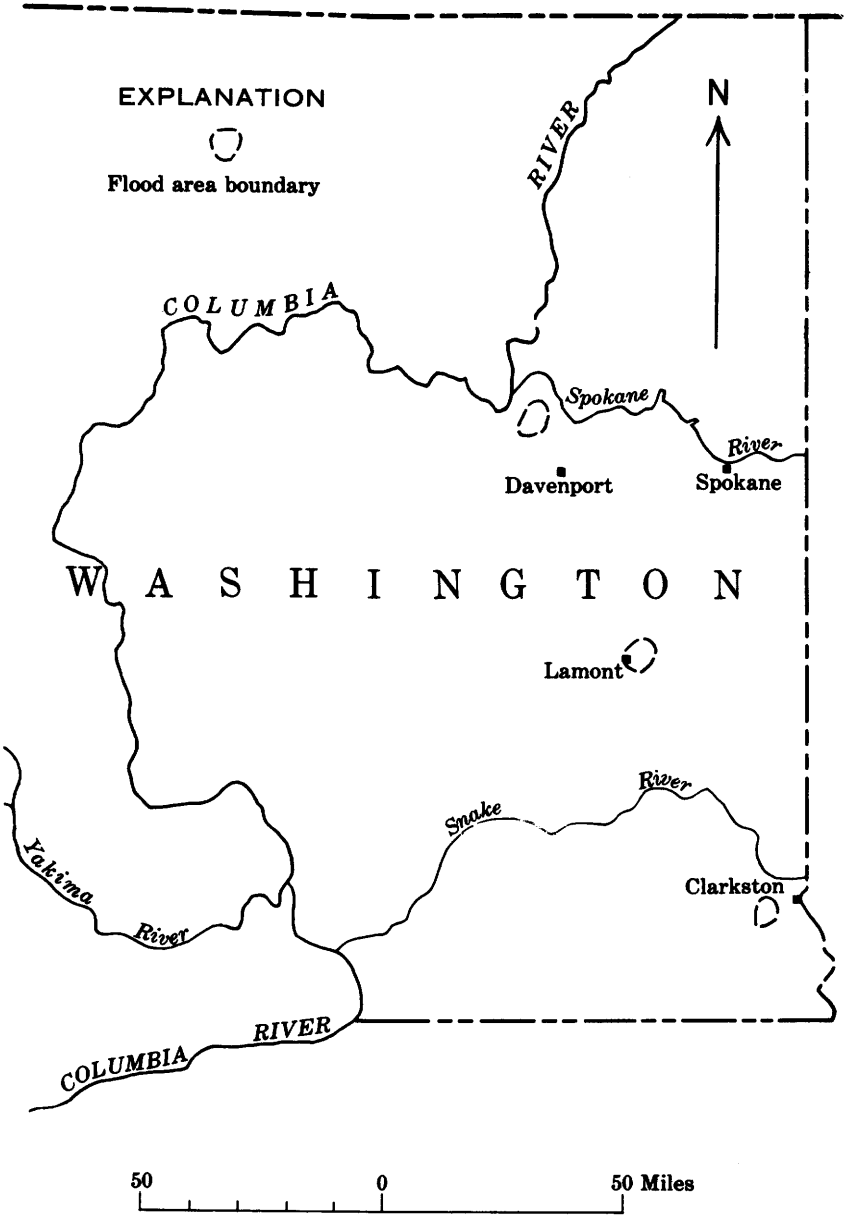

FIGURE 65.—Map showing location of flood areas. Floods of August 19 and 24 in eastern Washington.

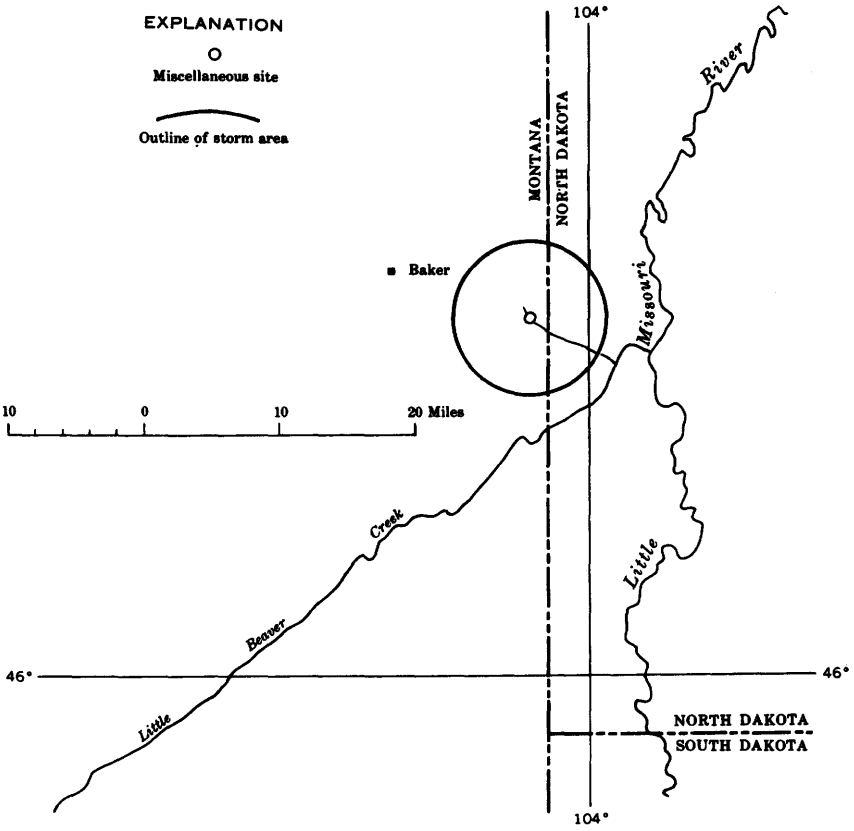

FIGURE 66.—Map of flood area showing location of flood-determination point. Floods of September 5 in Little Beaver Creek basin, Montana.

washout on the Little Beaver Creek tributary. No lives were reported lost. The railway company estimated damage at $75,000. No other significant damage was reported.

FLOODS OF SEPTEMBER 11–14, NEW JERSEY TO MAINE

The Weather Bureau described the storm which produced the floods of September 11–14 as follows:

Hurricane Edna, the second such storm to visit the east coast within 11 days, struck New England a glancing blow on September 11, 1954. Smashing into Martha's Vineyard shortly after 1 p.m., it crossed Cape Cod Bay, following a slightly curving northeasterly course offshore; it headed toward extreme eastern Maine and passed close to Eastport, Maine into New Brunswick shortly after 7:30 p.m.; thus, nearly all of New England, except Cape Cod and the islands to the south, were on the west or north side of the storm, and were spared the full brunt of the wind force. Highest gust velocities in these areas came with the storm's backlash and reached to above 90 mph. Gusts above 100 mph were recorded on Martha's Vineyard and outer Cape Cod. However, despite this great wind force, major damage was produced by the very intensive rainfall preceding and attending the storm's onslaught. This rainfall was

of excessive and near-record intensity for a number of hours and amounts of 4 to 8 inches were general along coastal areas, southeastern New England, and eastern Maine. Local floods and washouts were widespread. Southern and eastern Maine were especially hard hit, with 8 deaths by drowning; highways and railroad right-of-ways honeycombed with treacherous washouts; many trees felled, taking electric and telephone lines down with them; more than 40,000 phones knocked out and many communities deprived of electric power; and substantial losses to Aroostook County grain crops. Major losses in other parts of the affected areas were of similar nature—road washouts, serious local floods, electric and telephone lines downed by felled trees.

Over New England as a whole, 16 deaths, mostly drownings, were attributed to the storm, with about 150 reported injured; 250,000 phones were knocked out; hundreds of communities were blacked out; all Maine and New Hampshire roads were temporarily closed; many thousands of persons in river valleys and coastal areas were forced to flee their homes.

Preliminary estimates of damage, by states, were as follows: Maine, $7,000,000; New Hampshire, $5,500,000; Vermont, $100,000; Massachusetts, $7,500,000; Rhode Island, $2,000,000; Connecticut, $1,500,000; total for section, $23,600,000. These estimates include crop as well as property damage.

Amounts of rainfall as reported by Weather Bureau stations September 11 and 12 are shown in plate 3.

In Maine, peak stages on major rivers were high but had been exceeded by other floods during the past 35 years. However, maximum floods of record occurred on some smaller streams. Eight fatalities resulted from the flood. Many small bridges failed, and log booms were broken on the Kennebec River.

In east-central Massachusetts, streams were the highest since the hurricane flood of 1938. In the coastal areas of Massachusetts, in New Hampshire, and in the White Mountain region, peak discharges were high but generally did not reach the maximum for period of record.

In Rhode Island the peaks approached or exceeded those of March 1936.

Peaks on Connecticut streams were generally moderate, except in the eastern part where they approached or exceeded previous maximums for the period of record. The monthly discharge for September on Quinebaug River at Jewett City was the second highest September discharge in the 37 years of record; it was exceeded only in 1938.

Several small streams in New York reached peak stage and discharges that exceeded any others during the period of record.

Elizabeth River at Elizabeth, N.J., reached a stage about 2 feet higher than any previous peak during 33 years of record, although the peak discharge was slightly less than that of July 1938.

A summary of flood stages and discharges for the streams most affected by this flood is shown in table 19. The numbers of these stations correspond to those on the location map (pl. 3).

TABLE 19.—*Summary of flood stages and discharges, September 11–14, New Jersey to Maine*

[Each station in this table has two or three entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of record; the third pertains to the maximum flood of which knowledge is available outside the period of record]

No. in plate 3	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	ST. JOHN RIVER BASIN						
1	Meduxnekeag River near Houlton, Maine.	175	1940–54	Sept. 12, 1954	9.28	6,590	37.6
				May 5, 1947	[1] 8.56	5,440	31.0
	KENOBSCOT RIVER BASIN						
2	Piscataquis River near Dover-Foxcroft, Maine.	297	1902–54	Sept. 12, 1954	12.93	13,200	44.5
				Apr. 29, 1923	17.67	21,500	72.4
	KENNEBEC RIVER BASIN						
3	Kennebec River at Moosehead, Maine.	1,240	1919–54	Sept. 14, 1954	9.38	13,600	11.0
				May 8, 1947	9.94	15,600	12.6
4	Dead River near Dead River, Maine.	520	1939–54	Sept. 12, 1954	11.50	18,000	34.6
				May 5, 1940	9.66	10,400	20.0
	ROYAL RIVER BASIN						
5	Royal River at Yarmouth, Maine.	142	1949–54	Sept. 12, 1954	7.12	7,960	56.0
				Mar. 27, 1953	5.57	4,650	32.7
	MOUSAM RIVER BASIN						
6	Mousam River near West Kennebunk, Maine.	105	1939–54	Sept. 12, 1954	5.69	2,830	26.9
				Apr. 6, 1952	5.04	2,350	22.4
	PISCATAQUA RIVER BASIN						
7	Oyster River near Durham, N.H.	12.1	1934–54	Sept. 11, 1954	5.47	862	71.2
				Mar. 19, 1936	7.45	548	45.3
	MERRIMACK RIVER BASIN						
8	Clark Brook at Auburn, N.H.	27.8	1938–54	Sept. 12, 1954	2.55	602	21.7
				Mar. 16, 1953	2.37	494	17.8
9	Rocky Brook near Sterling, Mass.	2.28	1946–54	Sept. 11, 1954	4.58	395	173
				Mar. 20, 1948	3.54	73	32.0
10	Assabet River at Maynard, Mass.	116	1941–54	Sept. 13, 1954	6.47	2,040	17.6
				Mar. 21, 1948	5.75	1,460	12.6
	MYSTIC RIVER BASIN						
11	Aberjona River at Winchester, Mass.	[2] 23.3	1939–54	Sept. 12, 1954	13.66	482	--------
				Mar. 20, 1948	12.44	358	--------
	WESTPORT RIVER BASIN						
12	Adamsville Brook at Adamsville, R.I.	8.6	1940–54	Sept. 12, 1954	5.80	269	31.3
				Aug. 8, 1946	5.72	241	28.0
	PROVIDENCE RIVER BASIN						
13	Quinsigamond River at North Grafton, Mass.	25.5	1939–54	Sept. 12, 1954	3.50	340	13.3
				Mar. 16, 1953	3.48	336	13.2
14	Blackstone River at Northbridge, Mass.	139	1939–54	Sept. 12, 1954	11.36	4,510	32.4
				Feb. 8, 1951	9.04	2,270	16.3
				Mar. 19, 1936	13.7	7,510	54.0
15	Woonasquatucket River at Centerdale, R.I.	38.3	1941–54	Sept. 11, 1954	7.03	1,100	28.7
				Mar. 16, 1953	5.35	728	19.0
				March 1936	----------	1,000	26.1
	PAWTUXET RIVER BASIN						
16	South Branch Pawtuxet River at Washington, R.I.	63.8	1940–54	Sept. 12, 1954	4.11	1,320	20.7
				June 1, 1948	[3] 3.01	959	15.0
				March 1936	----------	1,810	28.4

[1] A stage of 10.83 ft occurred Mar. 27, 1953 (backwater from ice).
[2] Excludes 1.4 sq mi drained by Winchester reservoir.
[3] Occurred Mar. 17. 1953.

TABLE 19.—*Summary of flood stages and discharges, September 11–14, New Jersey to Maine*—Continued

No. in plate 3	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	POTOWOMUT RIVER BASIN						
17	Potowomut River near East Greenwich, R.I.	23.0	1940–54	Sept. 12, 1954	2.63	450	19.6
				Aug. 8, 1946	[4] 6.78	392	17.0
				Sept. 21, 1938	[5] 8.5		
	PAWCATUCK RIVER BASIN						
18	Wood River at Hope Valley, R.I.	72.4	1941–54	Sept. 12, 1954	7.45	1,470	20.3
				Mar. 16, 1953	7.10	1,260	17.4
				March 1936		1,540	21.3
	POQUONOCK RIVER BASIN						
19	Great Brook at Poquonock Bridge, Conn.	14.3	1946–54	Sept. 12, 1954	5.1	464	32.4
	THAMES RIVER BASIN						
20	Safford Brook near Woodstock Valley, Conn.	4.08	1950–54	Sept. 11, 1954	5.89	570	132
				Feb. 7, 1951	5.31	390	95.6
21	Mount Hope River near Warrenville, Conn.	29.1	1940–54	Sept. 11, 1954	9.20	3,250	112
				Feb. 7, 1951	7.79	1,610	55.3
22	Little River near Hanover, Conn.	29.8	1951–54	Sept. 12, 1954	5.31	935	31.4
				Dec. 21, 1951	5.08	865	29.0
23	Little River at Buffumville, Mass.	27.7	1939–54	Sept. 12, 1954	7.33	1,220	44.0
				Feb. 8, 1951	5.37	520	18.8
	CONNECTICUT RIVER BASIN						
24	Eightmile River at North Plain, Conn.	18.6	1937–54	Sept. 11, 1954	6.56	1,240	66.7
				Sept. 21, 1938		1,810	97.3
	MENUNKETESUCK RIVER BASIN						
25	Menunketesuck River near Clinton, Conn.	11.6	1941–54	Sept. 11, 1954	8.51	1,600	138
				Nov. 12, 1947	6.72	870	75.0
	HOUSATONIC RIVER BASIN						
26	Blackberry River at Canaan, Conn.	48.2	1949–54	Sept. 11, 1954	8.50	1,910	39.6
				Nov. 26, 1950	9.37	2,550	52.9
	BRONX RIVER BASIN						
27	Bronx River at Bronxville, N.Y.	[6] 26.6	1943–54	Sept. 11, 1954	4.81	737	27.7
				Sept. 15, 1944	6.37	876	32.9
	STREAMS ON LONG ISLAND						
28	Mill Neck Creek at Mill Neck, N.Y.	11.5	1937–54	Sept. 11, 1954	1.09	67.8	5.90
				Sept. 15, 1944	[7] 4.85	104	9.04
29	Cold Spring Brook at Cold Spring Harbor, N.Y.	7.3	1950–54	Sept. 11, 1954	1.33	108	14.8
				Aug. 23, 1952	[8] 5.34	36.9	5.06
30	Nissequogue River near Smithtown, N.Y.	27	1943–54	Sept. 11, 1954	1.20	131	4.85
				Sept. 14, 1944	1.32	147	5.45
31	Carmans River at Yaphank, N.Y.	71	1942–54	Sept. 11, 1954	1.25	83.2	1.17
				Aug. 7, 1946	1.19	76.3	1.08
32	Swan River at East Patchogue, N.Y.	8.8	1946–54	Sept. 11, 1954	1.80	46	5.23
				July 21, 1953	.95	37	4.21
33	Patchogue Creek at Patchogue, N.Y.	13.5	1945–54	Sept. 12, 1954		[9] 51.6	3.82
				Sept. 11, 1950		[9] 60	4.44
34	Champlin Creek at Islip, N.Y.	6.5	1948–54	Sept. 11, 1954	1.12	75	11.5
				July 23, 1953	.78	35.1	5.40

[4] Occurred Aug. 31, 1954 (hurricane wave).
[5] Backwater from hurricane wave.
[6] Does not include 18.0 sq mi, from which entire flow is diverted for municipal water supply.
[7] Occurred Sept. 21, 1938 (hurricane wave).
[8] Occurred Aug. 31, 1954 (hurricane wave).
[9] Daily.

TABLE 19.—*Summary of flood stages and discharges, September 11–14, New Jersey to Maine*—Continued

No. in plate 3	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	STREAMS ON LONG ISLAND—continued						
35	Penataquit Creek at Bay Shore, N.Y.	5	1945–54	Sept. 11, 1954	1.08	40	8.00
				July 15, 1947	1.02	36	7.20
36	Sampawams Creek at Babylon, N.Y.	23	1944–54	Sept. 11, 1954	1.44	83.6	3.63
				Mar. 13, 1953	1.08	50.8	2.21
37	Carlls River at Babylon, N.Y.	35	1944–54	Sept. 11, 1954	1.50	106	3.03
				July 15, 1947	1.44	100	2.86
38	Santapogue River at Lindenhurst, N.Y.	7	1947–54	Sept. 11, 1954	.91	42.2	6.01
				July 14, 1948	1.15	22.6	3.23
39	East Meadow Brook at Freeport, N.Y.	31	1903, 1937–54	Sept. 11, 1954	3.08	270	8.71
				Feb. 15, 1944	2.19	297	9.58
40	Pines Brook at Malverne, N.Y.	10	1936–54	Sept. 11, 1954	2.56	146	14.6
				July 13, 1948	2.27	110	11.0
	PASSAIC RIVER BASIN						
41	Weasel Brook at Clifton, N.J.	4.45	1937–54	Sept. 11, 1954	3.33	426	95.7
				Mar. 13, 1953	3.35	450	101
42	Second River at Belleville, N.J.	11.6	1937–54	Sept. 11, 1954	5.74	2,140	185
				July 23, 1938	7.05	3,300	284
	ELIZABETH RIVER BASIN						
43	Elizabeth River at Elizabeth, N.J.	18.0	1921–54	Sept. 11, 1954	15.02	2,600	144
				Sept. 14, 1944			
				July 23, 1938	[10] 13.05	2,720	151

[10] Occurred July 23, 1938.

FLOODS OF OCTOBER 6–8 IN THE PECOS RIVER BASIN, NEW MEXICO

On October 5–7 relatively heavy rains fell in the Pecos River basin in the area from Alamogordo Reservoir to Carlsbad. From Roswell and south the rains occurred mostly west of the river. Rainfall was relatively light above Alamogordo Reservoir, and discharge into the reservoir was small (19,100 cfs) compared to previous floods (48,600 cfs on Sept. 1, 1942). The mean daily discharge flowing out of the reservoir was less than 10 cfs.

A heavy concentration of rainfall occurred south of the reservoir with almost 10 inches at Canton. This produced a peak discharge of 29,000 cfs in the Pecos River near Acme.

Heavy rains fell also in an arc-shaped area from west of Roswell to Artesia with more than 7 inches at Hondo and near Artesia, and somewhat smaller amounts between these two points. Plate 4, an isohyetal map, shows the amounts and distribution of rainfall of the October 5–7 storm and the points at which peak discharges were determined.

Tributaries of the Pecos River near Roswell contributed appreciable discharges into the Pecos River. The peak discharge of Eightmile Draw was 10,200 cfs, and that of Berrendo Creek was 19,400 cfs. See table 20.

Tributaries at the upper end of the Rio Hondo were at the western edge of the storm, and the peak discharge of the Rio Ruidoso at Hondo was only 765 cfs from a drainage area of 307 square miles, and the discharge from a drainage area of 306 square miles in Rio Bonito at Hondo was negligible. Downstream from the heavy rain at Diamond A Ranch, the peak discharge on the Rio Hondo was 23,000 cfs, which was subsequently spread over a wide overflow channel and sharply reduced to 7,250 cfs at the dam site a few miles downstream. Rocky Arroyo near Roswell produced a peak discharge of 6,620 cfs from 71 square miles. The Rio Felix contributed 74,000 cfs at its crest, which was the maximum during the period of record which began in 1932; the previous maximum peak of 26,500 cfs occurred in 1937. The peak flattened to 26,700 cfs in the Pecos River near Lake Arthur.

The peak discharge of the Rio Penasco at Dayton was 25,900 cfs, and that of Four Mile Draw near Lakewood was 7,650 cfs. Most of the flow from these points was confined in McMillan Reservoir, whose peak outflow of 16,100 cfs occurred 4 days later.

The peak discharge of Rocky Arroyo near Carlsbad was 63,300 cfs from 254 square miles. The peak discharge of the Pecos River above Avalon reservoir was 53,000 cfs, which was reduced to 41,000 cfs below the reservoir.

Typical hydrographs for a tributary stream in a steep drainage basin (the Hondo River at Diamond A Ranch near Roswell) and for a main-stem station (the Pecos River near Artesia) are shown in figure 67.

Major damage occurred along the main stem of the Pecos River from Roswell to Lake McMillan and along the principal tributaries in this reach. Thirteen lives were lost in the flood—2 in Berrendo Creek and 11 in the Rio Felix. Total direct damages from the flood have been estimated by the Corps of Engineers at about $1.8 million.

The greatest damages were to crops and agricultural property. Of 17,000 acres of cultivated crops which were inundated, about 10,000 acres was in cotton, about 5,000 acres was in alfalfa, and the remainder was in feed crops. More than 40,000 acres of uncultivated land was flooded along the main stem of the Pecos River. Erosion caused substantial amounts of damage to farm structures and farmlands.

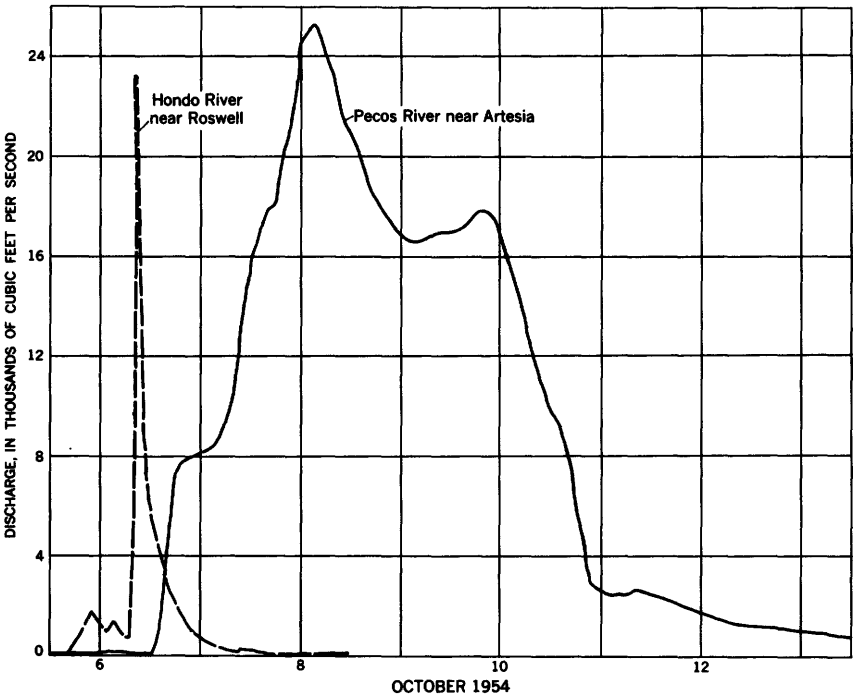

FIGURE 67.—Discharge hydrographs for the Hondo River at Diamond A Ranch near Roswell and the Pecos River near Artesia.

The greatest urban damage resulted in Roswell and Artesia from floods in Rio Hondo and in Eagle Creek respectively. A large part of this damage was to residences and the remainder to businesses, streets, bridges, sewers, and schools.

Damage to highways, bridges, and approaches was relatively light. A small bridge on Yeso Arroyo south of Fort Sumner and a timber bridge on Eagle Creek west of Artesia were damaged. On Rio Penasco a timber bridge at Lower Penasco and a truss bridge south of Hope were destroyed.

Owing to track damage along the Rio Felix, traffic was suspended for 4 days on the Atchison, Topeka and Santa Fe Railway.

FLOODS OF OCTOBER 1954 IN THE CHICAGO AREA, ILLINOIS AND INDIANA

The floods of October 9–11, in the Chicago area of Illinois and in Indiana were the greatest in the history of the region. The 24-hour rainfall of 5.63 inches on October 9–10 and the 48-hour total rainfall of 6.72 inches on October 9–11 were the greatest recorded at the Chicago Weather Bureau station in 69 and in 84 years respectively. Unofficial measurements in the southern suburbs of the city indicate that nearly 11 inches of rain fell in 48 hours.

TABLE 20.—*Summary of flood stages and discharges, October 6–8 in Pecos River basin, New Mexico*

[Each station in this table has one, two, or three entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of continuous record; the third pertains to the maximum flood known outside the period of continuous record]

No. in plate 4	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	RIO GRANDE BASIN						
1	Pecos River near Pecos	189	1930–54	Oct. 7, 1954		[1] 57	
				May 14, 1941	4.57	1,960	10.4
				Sept. 22, 1929		[2] 2,000	
2	Pecos River near Anton Chico.	1,050	1912–54	Oct. 6, 1954	11.24	8,470	8.07
				June 1, 1937		40,300	38.4
3	Gallinas River near Montezuma.	84	1930–54	Oct. 7, 1954		[1] 15	
				Sept. 23, 1941	7.78	3,310	39.4
4	Gallinas River at Montezuma.	87	1930–54	Oct. 6, 1954		[1] 9.4	
				Sept. 3, 1942	7.75	[2] 6,020	69.2
				Sept. 29–30, 1904		[3]	
5	Gallinas River near Lourdes.	313	1951–54	Oct. 6, 1954	7.35	3,440	11.0
				Sept. 10, 1954	7.20	[4] 3,230	10.3
6	Gallinas River near Colonias.	610	1951–54	Oct. 7, 1954	10.6	2,800	4.59
				Sept. 26, 1954	12.1	3,720	6.1
				June 1, 1937	27.0	[5] 23,000	37.7
7	Pecos River at Santa Rosa.	2,650	1930–54	Oct. 7, 1954	14.58	17,800	6.72
				June 2, 1937	25.7	55,200	20.8
8	Pecos River near Puerto de Luna.	3,970	1938–54	Oct. 7, 1954	9.69	19,100	4.81
				Sept. 1, 1942	17.0	48,600	12.2
9	Pecos River below Alamogordo Dam.	4,390	1930–54	Oct. 7, 1954		[1] 8.8	
				Sept. 1, 1942	[6] 13.58	42,800	9.75
10	Pecos River near Acme	11,380	1937–54	Oct. 7, 1954	14.89	29,000	2.55
				Sept. 23, 1941	13.71	45,000	3.96
				May 28, 1937		53,000	4.66
11	Eightmile Draw near Roswell.	397	1954	Oct. 6, 1954	5.33	10,200	25.7
				fall 1941	7.2	22,200	55.9
12	South Berrendo Creek at Roswell.	438		Oct. 6, 1954		19,400	44.3
				May 17, 1954		23,000	
				June 1, 1937		37,700	86.0
13	Rio Ruidoso at Hollywood.	120	1953–54	Oct. 6, 1954		[1] 17	
				July 8, 1954	2.90	154	1.28
14	Rio Ruidoso at Hondo	307	1930–54	Oct. 8, 1954	5.63	765	2.49
				Sept. 29, 1941	21.13	12,500	40.4
15	Rio Bonito at Hondo	306	1930–54	Oct. 6, 1954		[1] 14	
				Sept. 28 or 29, 1941.	20.92	11,000	36.0
16	Rio Hondo at Diamond A Ranch near Roswell.	960	1939–54	Oct. 6, 1954	27.12	23,000	24.0
				Sept. 22, 1941	28.78	27,000	28.1
17	Rio Hondo at dam site near Roswell.	976		Oct. 6 or 7, 1954		7,250	7.43
18	Rocky Arroyo at Lambert Well near Roswell.	71		Oct. 6 or 7, 1954		6,620	93.2
				1941		9,400	132
19	Rio Felix at old highway bridge near Hagerman.	932	1939–54	Oct. 7, 1954	27.50	74,000	79.4
				Sept. 22, 1941	23.0	20,000	21.4
				May 29, 1937		26,500	28.4
20	Pecos River near Lake Arthur.	14,760	1938–54	Oct. 7, 1954	20.6	26,700	1.81
				Sept. 24, 1941	21.9	49,600	3.36
				May 30, 1937	21.77	[7] 51,500	3.49
21	Cottonwood Creek near Lake Arthur.	199	1932–54	Oct. 7, 1954	[8] 11.04	185	.93
				June 13, 1935	[8 9] 12.0	1,100	5.53
22	Eagle Creek near Artesia.	166		Oct. 6, 1954		12,500	75.3
23	Pecos River near Artesia	15,300	1905–54	Oct. 8, 1954	13.76	25,200	1.65
				May 30, 1937	14.7	51,500	3.37
24	Rio Penasco near Lower Penasco at Trails End.	574	1953–54	Oct. 6 or 7, 1954	12.9	36,300	63.2
				fall 1953	5.9		
25	Rio Penasco at Dayton	1,070	1951–54	Oct. 7, 1954	6.82	25,900	24.2
				Aug. 24, 1954	2.7	3,650	3.41

[1] Mean daily discharge.
[2] About.
[3] Discharge unknown, probably exceeded that of the flood of 1942.
[4] Major floods occurred in 1904 and on June 1, 1937.
[5] Flood of about same magnitude occurred in 1904.
[6] Occurred September 22, 1941.
[7] May have been exceeded in 1904 and 1919.
[8] Backwater from Pecos River.
[9] Occurred May 30, 1937.

TABLE 20.—*Summary of flood stages and discharges, October 6–8 in Pecos River basin, New Mexico*—Continued

No. in plate 4	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	RIO GRANDE BASIN—con.						
26	Four Mile Draw near Lakewood.	265	1951–54	Oct. 7, 1954	13.3	7,650	28.8
				July 13, 1953	9.61	1,470	5.55
27	Pecos River below McMillan Dam.	16,990	1939–40, 1946–54	Oct. 11, 1954	7.09	16,100	0.95
				Sept. 16, 1949	7.47	3,210	.19
				Oct. 2, 1904		[10] 82,000	4.83
28	Rocky Arroyo near Carlsbad.	254	1953–54	Oct. 7, 1954		63,300	249
				July 12, 1953	9.43	18,200	71.7
29	Pecos River at dam site 3 near Carlsbad.	17,620	1939–40, 1944–54	Oct. 7, 1954	18.53	53,000	3.0
				May 31, 1948	12.3	18,200	1.03
30	Pecos River below Avalon Dam.	18,080	1951–54	Oct. 7, 1954	23.3	41,000	2.27
				May 24, 1954	5.08	150	
31	Pecos River at Carlsbad.	18,100	1903–8, 1914–54	Oct. 7, 1954	18.12	39,500	2.18
				Aug. 7, 1916	21.0	[11] 85,700	4.74
32	Black River above Malaga.	343	1946–54	Oct. 7, 1954	10.66	10,900	31.8
				Apr. 24, 1954	12.6	15,200	44.3
				Sept. 1941	19.0	33,000	96.2
33	Pecos River near Malaga	19,190	1920–54	Oct. 7, 1954	28.31	43,100	2.25
				Sept. 21, 1941	[12] 35.1	63,700	3.32
34	Pecos River at Pierce Canyon Crossing, near Malaga.	19,260	1938–41, 1951–54	Oct. 8, 1954	24.35		
				May 22, 1941	24.8		
35	Pecos River at Red Bluff.	19,540	1937–54	Oct. 8, 1954	23.28	26,600	1.36
				May 24, 1941	28.3	52,600	2.69
36	Delaware River near Red Bluff.	689	1912–13, 1914–15, 1937–54	Oct. 7, 1954	10.1	8,480	12.3
				June 27, 1938	18.0	34,600	50.2

[10] Estimated by Chief Engineer of Pecos Irrigation Co.
[11] Greatest since 1893.
[12] Occurred May 22, 1941.

These intense rainfalls on the flat areas of the Little Calumet, Kankakee, and Chicago Rivers caused the streams to overflow their banks and flood the heavily industrialized and densely populated parts of the city. Slow drainage of floodwaters in large areas along these rivers resulted in a prolonged period of inundation. On the Kankakee River at Shelby, Ind., the crest of the flood occurred 17 days after the rain.

The flow of the South Branch Chicago River has been diverted by locks into the Des Plaines River since 1900. The elevation at the mouth of the South Branch is usually held about 3 feet below the lake level. During this flood the river rose to a stage 3.4 feet higher than lake level at the time. To relieve flooding, the lock gates were opened on October 10, 1954, to allow the river to discharge into Lake Michigan for the first time in 54 years.

Notable rates of discharge occurred in the Des Plaines River basin, where Long Run had a unit peak discharge of 152 cfs per square mile from a drainage area of 20.8 square miles, and Flag Creek had a unit peak discharge of 80.2 cfs per square mile from a drainage area of 16.2 square miles.

Flood damages in Chicago and its suburbs were estimated by the U.S. Weather Bureau to be about $25 million.

A more comprehensive report on this flood is contained in Water-Supply Paper 1370–B.

FLOODS OF OCTOBER IN THE EASTERN STATES

On October 15, 1954, the West Indian Hurricane, officially named "Hazel," hit the eastern seaboard and delivered a devastating blow. The center of the hurricane entered North Carolina at a point near the South Carolina line and traveled generally northward over North Carolina, Virginia, Maryland, Pennsylvania, and western New York into Canada in little more than 12 hours.

Drenching rains accompanied "Hazel" with some record-breaking amounts being recorded. Pittsburgh had a new October rainfall record for 24 hours of 3.56 inches and an all-time record 12-hour amount of 3.41 inches on the 15th. Winston-Salem, N.C., had a record 6.24-inch amount in 24 hours on the 15th; and Carthage, N.C., received 9.72 inches on the 15th and 16th. Greatest rainfall totals for the storm were recorded in the Carolinas and Virginia. A rain gage not operated by the USWB but of approved design is operated by Standard Minerals Company, Inc., of Robbins, N.C., at which station 11.25 inches was reported. In Virginia 10.71 inches at Big Meadows and 10.60 inches at Natural Bridge were measured. Although some large amounts of rainfall occurred in Virginia, the runoff was not comparatively high. This was due to the extreme drought which left the ground in a condition to absorb a great amount of water. If ground-water levels had been more nearly normal, a more intense flooding would have occurred in all sections in the path of the storm. A map of the area covered by the storm, showing total precipitation, in inches, and the path of the hurricane, is shown in figure 68.

The heavy rainfall accompanying "Hazel" produced record-breaking or near record-breaking floods over much of the area (table 21). The area of most severe flooding is shown in plate 5. In western Maryland some of the peaks were exceeded only by the 1924 flood. Two gaging stations were destroyed by the flood—one at Kitzmiller and the other at Bloomington. In the Youghiogheny River basin in Pennsylvania some of the peak discharges exceeded those of the 1936 flood. In Ohio a few stages were only slightly below the record highs since 1926, while some were the highest since 1921.

Extensive damage occurred directly from the hurricane and from the floods produced by the accompanying rains. Probably more damage can be attributed to the hurricane itself, but a considerable amount was caused by the floods. West Newton, Pa., reported that its business district was covered with 5 feet of water; this was 2 feet more than in 1936. Property and crop losses, although never

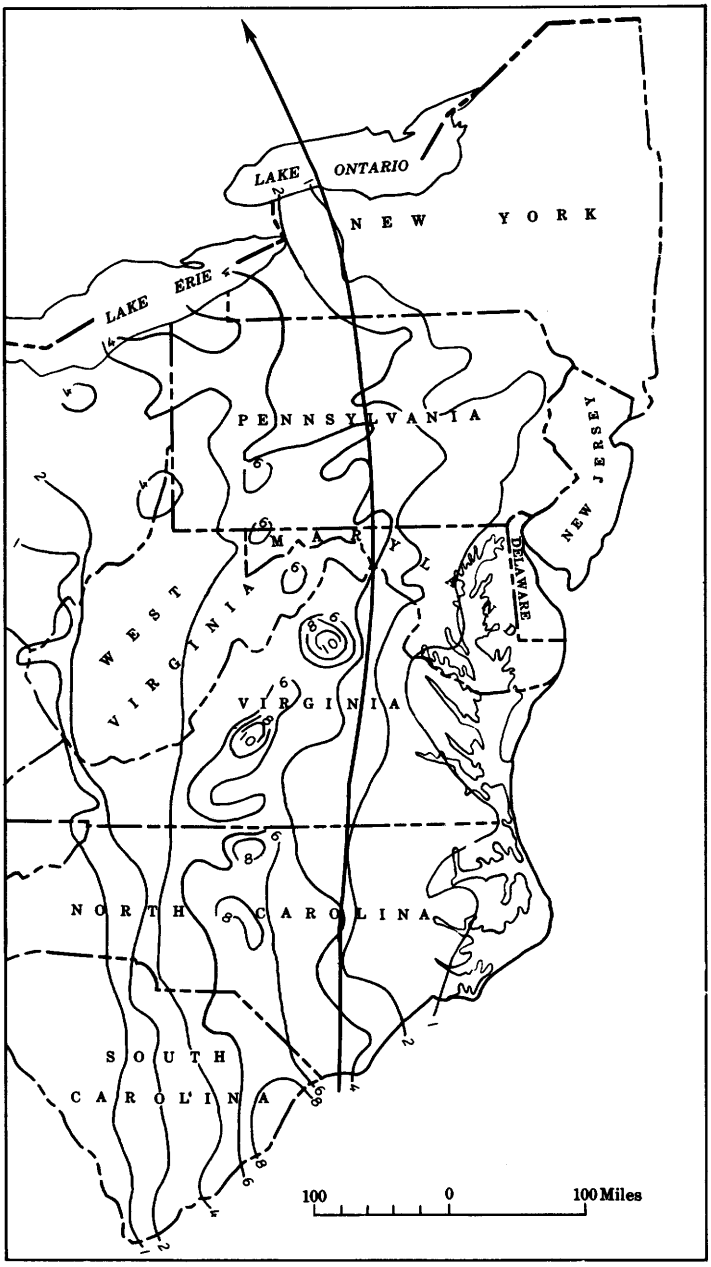

FIGURE 68.—Map showing total precipitation, in inches, October 15–16; and path of hurricane Hazel. The floods of October in Eastern States.

fully evaluated in many sections, particularly rural areas, totaled more than $250 million.

At least 93 persons lost their lives and several hundred were injured, as a result of the hurricane.

TABLE 21.—*Summary of flood stages and discharges, October in the Eastern States*

[Each station in this table has two or three entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of record; the third pertains to the maximum flood of which knowledge is available outside the period of record]

No. in plate 5	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	POTOMAC RIVER BASIN						
1	North Branch Potomac River at Kitzmiller, Md.	225	1949–54	Oct. 15, 1954	16.5	[1] 33,400	148
				Mar. 1, 9154	9.02	9,280	41.2
				Dec. 7, 1950	8.71	8,510	37.8
2	Savage River near Barton, Md.	49.1	1948–54	Oct. 15, 1954	8.45	7,510	153
				Sept. 21, 1950	5.00	2,630	53.6
3	Crabtree Creek near Swanton, Md.	16.7	1948–54	Oct. 15, 1954	4.90	2,290	137
				July 12, 1949	5.01	3,260	195
4	Savage River below Savage River Dam near Bloomington, Md.	106	1948–54	Oct. 16, 1954	7.70	6,530	61.6
				Jan. 8, 1952	6.78	4,910	46.3
5	North Branch Potomac River at Luke, Md.	404	1949–54	Oct. 15, 1954	17.15	39,400	97.5
				June 13, 1951	10.28	11,200	27.7
6	Georges Creek at Franklin, Md.	72.4	1929–54	Oct. 15, 1954	10.84	4,340	59.9
				Mar. 17, 1936		8,500	117
7	North Branch Potomac River at Pinto, Md.	596	1938–54	Oct. 16, 1954	23.23	37,000	62.1
				Oct. 16, 1942	22.87	35,200	59.1
				Mar. 29, 1924	24.0	55,000	92.3
8	Wells Creek below Hyndman, Pa.	146	1951–54	Oct. 15, 1954	11.02	11,600	79.5
				May 31, 1953	8.98	7,680	52.6
9	North Branch Potomac River near Cumberland, Md.	875	1929–54	Oct. 16, 1954	23.85	38,500	44.0
				Mar. 17, 1936	29.1	88,200	101
				June 1, 1889	29.2	89,000	102
10	Sawpit Run near Oldtown, Md.	5.0	1947–54	Oct. 15, 1954	4.72	770	154
				Mar. 1, 1954	4.30	590	118
11	Little Tonoloway Creek near Hancock, Md.	16.9	1947–54	Oct. 15, 1954	7.10	1,470	87.0
				Nov. 21, 1952	7.01	1,180	69.8
12	Bell Creek at St. Pauls Chapel, near Staunton, Va.	.61	1948–54	Oct. 15, 1954	2.12	306	500
				Apr. 13, 1949	1.86	193	316
	JAMES RIVER BASIN						
13	Back Creek near Mountain Grove, Va.	131	1951–54	Oct. 15, 1954	9.35	8,750	66.8
				Feb. 21, 1953	9.05	7,800	59.5
14	South River near Riverside, Va.	111	1949–54	Oct. 15, 1954	9.44	4,890	44 0
				Mar. 1, 1954	8.78	4,000	36.0
				March 1936	13.7		
	ROANOKE RIVER BASIN						
15	Goose Creek near Huddleston, Va.	187	1930–54	Oct. 15, 1954	23.14	16,000	85.6
				Oct. 19, 1937	25 75	20,300	108.5
16	Dan River at Paces, Va.	2,550	1950–54	Oct. 17, 1954	25.40	34,000	13.3
				Mar. 26, 1952	22.12	25,700	10.5
				Aug. 16, 1940	32.3		
17	Georges Creek near Gretna, Va.	9.2	1949–54	Oct. 15, 1954	6.23	932	103.5
				Jan. 22, 1954	4.93	460	50.0
	CAPE FEAR RIVER BASIN						
18	South Buffalo Creek near Greensboro, N.C.	33.6	1928–54	Oct. 15, 1954	9.76	4,700	140.0
				July 15, 1949	11.54	10,000	298.0
19	North Buffalo Creek near Greensboro, N.C.	37.0	1928–54	Oct. 15, 1954	15.54	5,580	151.0
				Sept. 25, 1947	15.96	6,000	162.0
20	Stony Creek near Burlington, N.C.	44.2	1952–54	Oct. 16, 1954	15 26		
				Feb. 15, 1953	9.08	1,670	37.8
21	West Fork Deep River near High Point, N.C.	32.1	1923–26, 1928–54	Oct. 15, 1954	13.9	3,120	97.1
				Sept. 24, 1947	19.92	8,450	263.0
22	East Fork Deep River near High Point, N.C.	14.7	1928–54	Oct. 15, 1954	6.77	3,410	232.0
				Sept. 24, 1947	10 87	6,300	428
23	Deep River near Randleman, N.C.	124	1928–54	Oct. 15, 1954	23 48	7,900	63.7
				Sept. 25, 1947	32.2	20,000	161
24	Deep River at Ramseur, N.C.	346	1922–54	Oct. 15, 1954	30.47	34.000	98.5
				Sept. 18, 1945	34.04	43,000	124

See footnotes at end of table.

TABLE 21.—*Summary of flood stages and discharges, October in the Eastern States*—Continued

No. on plate 5	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	TIONESTA CREED BASIN						
25	Tionesta Creek at Lynch, Pa.	233	1938–54	Oct. 16, 1954	10.06	9,120	39.2
				May 28, 1946	10.26	9,520	41
	OIL CREEK BASIN						
26	Oil Creek at Rouseville, Pa.	300	1932–54	Oct. 16, 1954	11.55	18,600	62
				Mar. 22, 1948	11.29	16,800	56
	FRENCH CREEK BASIN						
27	French Creek at Utica, Pa.	1,028	1932–54	Oct. 17, 1954	11.05	16,400	15.9
				Mar. 23, 24, 1948.	12.32	20,700	20.1
				March 1913	[2] 15.7	35,600	34.6
28	Sugar Creek at Sugarcreek, Pa.	166	1932–54	Oct. 16, 1954	9.20	9,480	57
				May 28, 1946	10.49	10,000	60.2
	MAHONING CREEK BASIN						
29	Little Mahoning Creek at McCormick, Pa.	87.4	1939–54	Oct. 16, 1954	11.3	5,180	59.4
				Jan. 27, 1952	11.42	5,300	60.7
	CROOKED CREEK BASIN						
30	Crooked Creek at Idaho, Pa.	191	1938–54	Oct. 16, 1954	15.12	12,400	65
				Jan. 27, 1952	12.66	8,030	42.1
				March 1936	[2] 18.6	19,400	102
	KISKIMINETAS RIVER BASIN						
31	Stony Creek at Ferndale, Pa.	451	1938–54	Oct. 15, 1954	16.23	34,800	77.2
				Mar. 31, 1940	13.3	23,900	53.0
				Mar. 17, 1936	----------	[2] 58,600	130
32	Little Conemaugh River at East Conemaugh, Pa.	183	1939–54	Oct. 16, 1954	8 86	12,300	67.2
				Mar. 30, 1940	8.80	11,800	64.5
				Mar. 17, 18, 1936	----------	[2] 28,800	157
33	Conemaugh River at Seward, Pa.	715	1938–54	Oct. 16, 1954	19.2	54,000	75.5
				Mar. 31, 1940	15.22	35,000	49
				Mar. 18, 1936	26.4	90,000	126
34	Blacklick Creek at Josephine, Pa.	192	1952–54	Oct. 15, 1954	11.35	11,900	62
				Jan. 27, 1952, May 31, 1953.	11.3	7,510	39.1
35	Two Lick Creek at Graceton, Pa.	171	1951–54	Oct. 16, 1954	12.71	12,900	75.5
				Jan. 27, 1952	10.42	6,600	38.6
36	Loyalhanna Creek at Kingston, Pa.	172	1939–54	Oct. 15, 1954	14.8	29,700	173
				June 28, 1951	10.73	10,500	61
				Mar. 17 or 18, 1936.	14.5	21,000	122
37	Loyalhanna Creek at Loyalhanna Creek Dam, Pa.	292	1940–54	Oct. 18, 1954	6.90	4,780	16.4
				June 5, 1941	10.3	11,700	40.1
	BUFFALO CREEK BASIN						
38	Buffalo Creek near Freeport, Pa.	137	1940–54	Oct. 15, 1954	13.6	14,000	102
				Jan. 27, 1952	9.3	7,170	52.3
	MONONGAHELA RIVER BASIN						
39	Tygart River near Dailey, W. Va.	187	1915–54	Oct. 16, 1954	13.62	10,400	55.6
				Feb. 4, 1932	17.2	13,100	70.1
40	Tygart River near Elkins, W. Va.	272	1944–54	Oct. 16, 1954	14.45	10,700	39.3
				Feb. 14, 1948	14.13	8,810	32.4
41	Tygart River at Belington, W. Va.	408	1907–54	Oct. 16, 1954	17.66	15,000	36.8
				July 25, 1912	20.3	18,400	45.1
				July 1888	[2] 21.7	21,200	52.0
42	Middle Fork River at Audora, W. Va.	149	1942–54	Oct. 16, 1954	13.02	9,780	65.6
				Feb. 14, 1948	11.26	7,740	51.9
43	Sand Run near Buckhannon, W. Va.	14.5	1953–54	Oct. 15, 1954	6.26	2,580	178
				Jan. 16, 1954	3.08	273	18.8
				Mar. 24, 1948	[3] 5.39	1,510	104

See footnotes at end of table.

TABLE 21.—*Summary of flood stages and discharges, October in the Eastern States*—Continued

No. on plate 5	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	MONONGAHELA RIVER BASIN—continued						
44	Buckhannon River at Hall, W. Va.	277	1915–54	Oct. 16, 1954	11.8	8,700	31.4
				Mar. 14, 1918, Oct. 29, 1937.	14.7	12,200	44.0
45	Tygart River at Philippi, W. Va.	916	1940–54	Oct. 16, 1954	24.1	33,600	36.7
				Feb. 14, 1948	22.72	30,900	33.7
				July 25, 1912	[2] 26.0	37,000	40.4
46	Tygert River at Colfax, W. Va.	1,366	1939–54	Oct. 16, 1954	14.46	15,700	11.5
				Feb. 14, 1948	16.86	22,500	16.5
47	Dry Fork at Hendricks, W. Va.	345	1940–54	Oct. 15, 1954	15.23	47,000	136
				Feb. 22, 1944, Feb. 14, 1948.		18,100	52.5
				Feb. 22, 1944	9.82		
48	Shavers Fork at Parsons, W. Va.	214	1910–26, 1940–54	Oct. 16, 1954	12.34	12,500	58.4
				May 12, 1924	10.60	[4] 14,800	69.2
				July 10, 1888, July 17, 1907.		25,000	117
				Oct. 15, 1954	19.08	52,100	72.6
49	Cheat River near Parsons, W. Va.	718	1913–54	Mar. 12, 1917	19.05	62.400	86.9
				July 1888	[2] [5] 20.5	51,300	71.4
				Oct. 16, 1954	15.67	66,300	68.2
50	Cheat River at Rowlesburg, W. Va.	972	1923–54	Feb. 4, 1932	12.66	65,200	67
				July 6, 1844	[2] 16.7	125,000	129
				Oct. 15, 1954	15.68	15,800	79.0
51	Big Sandy Creek at Rockville, W. Va.	200	1909–18, 1921–54	July 24, 1912	18.0	21,300	106
				July 10, 1888	[6] 20.5	[7] 30,000	150
				Oct. 16, 1954	30.1	127,000	93.8
52	Cheat River near Pisgah, W. Va.	1,354	1927–54	Oct. 28, 1937, Feb. 3, 1939.	24.28	74,700	55.2
				Oct. 16, 1954	28.93	140,000	31.8
53	Monongahela River at Greensboro, Pa.	4,407	1939–54	Feb. 14, 1948	26.6	124,000	27.8
				July 1888	[2] [8] 36.0		
				Oct. 15, 1954	11.83	4,400	59.7
54	Redstone Creek at Waltersburg, Pa.	73.7	1942–54	June 2, 1946	7.84	2,750	37.3
				Oct. 16, 1954	21.07	140,000	26.9
55	Monongahela River at Charleroi, Pa.	5,213	1886–1905, 1933–54	July 11, 1888	26.1	156,000	30.0
				Oct. 16, 1954	12.16	11,800	88.1
56	Youghiogheny River near Oakland, Md.	134	1941–54	Dec. 16, 1948	9.77	7,800	58.2
				March 1936	15.3		
				Oct. 16, 1954	8.99	13,000	44.1
57	Youghiogheny River at Friendsville, Md.	295	1898–1904, 1940–54	Mar. 29, 1924	10.2	[8] 15,600	52.9
				Oct. 15, 1954	10.70	8,400	134
58	Casselman River at Grantsville, Md.	62.5	1947–54	July 4, 1948	8.13	5,110	81.8
				Oct. 15, 1954	8.56	6,850	280
59	Big Piney Run near Salisbury, Pa.	24.5	1932–54	Apr. 26, 1937	7.6	4,300	175
				Oct. 15, 1954	14.06	[9] 50,000	131
60	Casselman River at Markelton, Pa.	382	1920–54	Mar. 17, 1936		35,800	94
				Oct. 15, 1954	10.63	10,900	90
61	Laurel Hill Creek at Ursina, Pa.	121	1916–54	Mar. 17, 1936	10.28	10,300	85
				Oct. 15, 1954	19.92	69,500	67.5
62	Youghiogheny River below Confluence, Pa.	1,029	1940–54	June 4, 1941	16.42	43,800	42.5
				Mar. 17 or 18, 1936.	[2] 21.6	85,000	82.6
				Oct. 16, 1954	21.96	103,000	77.7
63	Youghiogheny River at Connellsville, Pa.	1,326	1908–54	Mar. 18, 1936	20.28	92,500	69.7
				Oct. 15, 1954	5.06	860	280
64	Green Lick Run at Green Lick Reservoir, Pa.	3.07	1941–54	Aug. 13, 1943	5.1	1,400	457
				Oct. 16, 1954	32.5	108,000	63
65	Youghiogheny River at Sutersville, Pa.	1,715	1915–29, 1931–36 1938–54	Mar. 18, 1936	30.65	100,000	58.3
				Oct. 15, 1954	6.68	950	216
66	Abers Creek near Murrysville, Pa.	4.39	1948–54	July 5, 1950	7.72	1,600	365
				Oct. 16, 1954	30.63	200,000	27.3
67	Monongahela River at Braddock, Pa.	7,337	1939–54	June 5, 1941	31.2	201,000	27.4
				Mar. 18, 1936	[2] 38.8	210,000	28.6

See footnotes at end of table.

TABLE 21.—*Summary of flood stages and discharges, October in the Eastern States*—Continued

No. on plate 5	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge	
						Cfs	Cfs per sq mi
	BEAVER RIVER BASIN						
68	Sugar Run at Pymatuning Dam, Pa.	9.34	1934–54	Oct. 15, 1954	5.84	1,980	212
				Sept. 4, 1937	6.80	1,460	156
69	Shenango River at Pymatuning Dam, Pa.	167	1934–54	Oct. 15, 1954	8.75	1,430	8.55
				Sept. 4, 1937	9.2	1,540	9.24
70	Little Shenango River at Greenville, Pa.	104	1919–23, 1925–54	Oct. 16, 1954	12.73	6,620	63.6
				May 28, 1946	12.26	6,200	59.6
71	Pymatuning Creek near Orangeville, Pa.	169	1914–23, 1925–54	Oct. 16, 1954	10.73	3,650	21.6
				Feb. 3, 1915	9.1	6,200	36.7
72	Shenango River at Sharpsville, Pa.	588	1938–54	Oct. 16, 1954	12.64	13,900	23.6
				Jan. 27, 1952	12.04	12,800	21.8
				Mar. 26, 1913	[2] 19.3		
73	Beaver River at Wampum, Pa.	2,235	1914, 1932–24	Oct. 16, 1954		41,400	18.5
				Jan. 25, 1937	21.44	48,000	21.5
				Mar. 26, 1913	[2] 29.9	87,000	39.0
74	Connoquenessing Creek at Hazen, Pa.	356	1919–54	Oct. 16, 1954	15.51	18,200	51.2
				June 29, 1924	16.66	23,000	64.6
75	Slippery Rock Creek at Wurtemburg, Pa.	398	1912–54	Oct. 16, 1954	10.23	15,700	39.5
				Jan. 25, 1937	12.05	19,000	47.7
76	Beaver River at Beaver Falls, Pa.	3,106	1935–54	Oct. 16, 1954	13.33	58,500	18.9
				Jan. 25, 1937	13.8	64,500	20.8
				Mar. 27, 1913	[2] 17.4	103,000	33.2
	RACCOON CREEK BASIN						
77	Raccoon Creek at Moffatts Mill, Pa.	178	1941–54	Oct. 16, 1954	8.42	6,250	35
				Jan. 27, 1952	9.71	8,590	48.3
				Apr. 15, 1922	9.80	10,000	56.2
	KANAWHA RIVERA BASIN						
78	Greenbrier River at Durbin, W. Va.	134	1943–54	Oct. 15, 1954	8.38	9,900	73.9
				Feb. 23, 1944		5,110	38.1
				Feb. 14, 1948	[10] 8.86		
79	Elk River at Sutton, W. Va.	543	1939–54	Oct. 16, 1954	29.42	32,300	59.5
				Apr. 16, 1939	27.8	27,700	51.0
	STREAMS TRIBUTARY TO LAKE ERIE						
80	Cuyahoga River at Hiram Rapids, Ohio.	147	1927–35, 1944–54	Oct. 17, 1954	6.35	1,980	13.5
				Mar. 23, 1948	7.00	2,760	18.8
81	Cuyahoga River at Old Portage, Ohio.	405	1921–35, 1939–54	Oct. 20, 1954	6.94	2,180	5.38
				Jan. 26, 1952	10.42	4,540	11.2
82	Cuyahoga River at Independence, Ohio.	709	1921–23, 1927–35 1940–54	Oct. 16, 1954	20.04	14,200	20
				Jan. 27, 1952	18.47	11,200	15.8
83	Phelps Creek near Windsor, Ohio.	26.4	1942–54	Oct. 15, 1954	8.29	2,220	84.1
				Mar. 22, 1948	8.97	2,700	102
84	Ashtabula River near Ashtabula, Ohio.	118	1924–35, 1939–47, 1950–54	Oct. 16, 1954	9.32	8,880	75.3
				May 16, 1942	9.67	10,800	91.5
85	Conneaut Creek at Amboy, Ohio.	178	1922–35, 1950–54	Oct. 16, 1954	10.74	12,900	72.1
				Dec. 4, 1950	9.00	8,830	49.6

[1] Probably was exceeded by flood of March 29, 1924.
[2] Maximum known.
[3] Maximum previously known.
[4] Observed.
[5] At site 1,600 ft upstream at datum 1.13 ft higher.
[6] Maximum known; 20.0 to 20.5 ft.
[7] Maximum known; 28,000 to 30,000 cfs.
[8] About.
[9] Estimated.
[10] Ice jam.

FLOODS OF NOVEMBER 18–19 IN WESTERN WASHINGTON

Floods occurred on the Olympic Peninsula in western Washington (fig. 69) on November 18 and 19 following rains of up to 17 inches during the 6-day period November 14–19. The greatest amount of any one day was about 5.5 inches at Cushman Dam (table 22). There was very little damage because the streams are generally confined to canyons or fairly deep channels. Most of the peaks in the area were not excessive, but at gaging stations on 4 streams the peak for the period of record was established, and at another the discharge was the second highest during the periods 1923–32, and 1946–54. (See table 23.)

The Wynoochee River had the highest unit peak discharge of 294 cfs per square mile from 69.5 square miles. This was the maximum peak discharge at this station during the 30-year period of record.

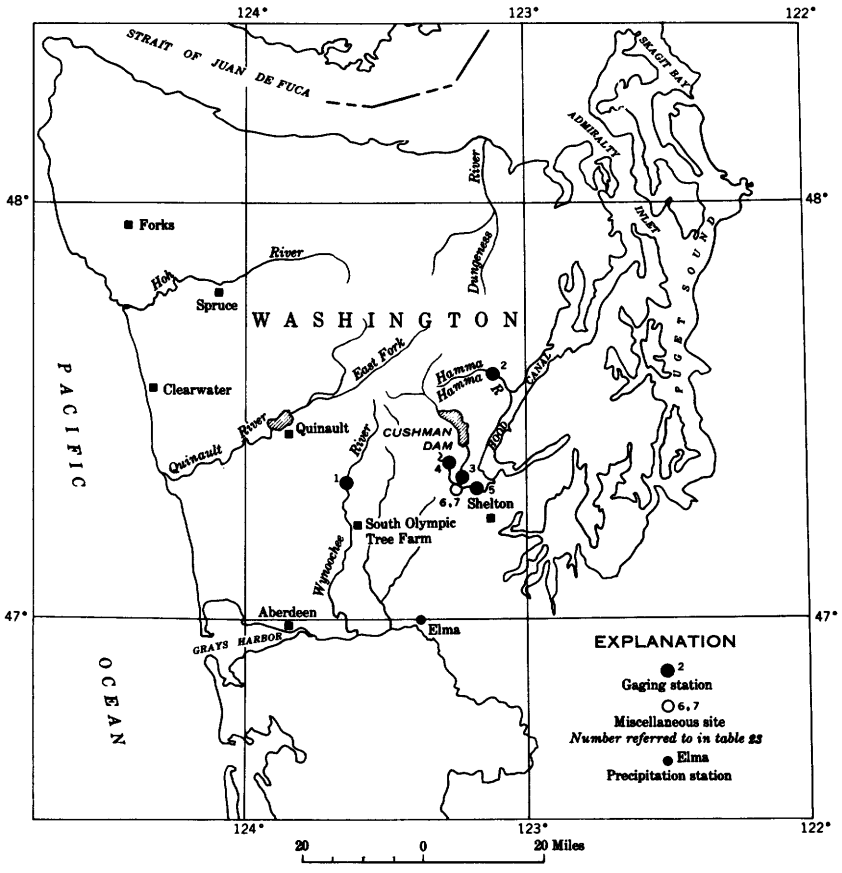

FIGURE 69.—Map of flood area showing location of flood-determination points and precipitation stations. Floods of November 18–19 in western Washington.

TABLE 22.—*Rainfall, in inches, at Weather Bureau stations, November 14–19, 1954, in western Washington*

Station	November						Total
	14	15	16	17	18	19	
Elma	0.30	0.40	0.56	0.97	1.44	1.08	4.75
S. Olympic Tree Farm	1.57	1.20	1.80	2.77	4.65	2.00	13.99
Quinault RS	------	4.84	1.53	1.35	4.18	1.35	13.25
Spruce	2.37	.86	2.28	3.05	4.21	2.38	15.15
Cushman Dam	3.20	1.00	1.91	2.37	5.55	3.25	17.28
Shelton	.48	.60	.51	2.10	2.37	.51	6.57
Aberdeen	1.13	.76	.57	1.27	1.82	1.83	7.38
Clearwater	2.18	.94	1.77	1.88	2.85	3.95	13.57
Forks IE	2.17	.50	2.30	2.52	5.10	3.25	15.84

TABLE 23.—*Summary of flood stages and discharges, November 18–19 in western Washington*

[Each station in this table has two entries listed under maximum floods; the first pertains to the flood being reported on; the second pertains to the maximum flood previously known during the period of record]

No. in fig. 69	Stream and place of determination	Drainage area (sq mi)	Period of record	Maximum floods			
				Date	Gage height (ft)	Discharge (Cfs)	Discharge (Cfs per sq mi)
	CHEHALIS RIVER BASIN						
1	Wynoochee River above Save Creek, near Aberdeen, Wash.	69.5	1925–54	Nov. 18, 1954 Jan. 22, 1935	15.83 ----------	20,400 18,000	294 259
	HAMMA HAMMA RIVER BASIN						
2	Hamma Hamma River near Eldon.	51.3	1951–54	Nov. 19, 1954 Jan. 9, 1953	6.53 5.25	4,280 2,780	83.4 54.2
	SKOKOMISH RIVER BASIN						
3	North Fork Skokomish River near Potlatch, Wash.	117	1944–54	Nov. 19, 1954 Nov. 27, 1949	9.99 9.66	[1] 6,100 [1] 4,800	-------- --------
4	South Fork Skokomish River near Potlatch, Wash.	65.6	1923–32, 1946–54	Nov. 18, 1954 Nov. 26, 1949	14.96 17.75	14,800 19,300	226 294
5	Skokomish River near Potlatch, Wash.	230	1943–54	Nov. 18, 1954 Nov. 27, 1949, Feb. 10, 1951	12.21 [2] 14.51	[1] 20,000 [1] 19,200	-------- --------
6	Fir Creek tributary near Potlatch, Wash.	.76	----------	Nov. 18, 1954	----------	216	284
7	Fir Creek near Potlatch, Wash.	1.86	----------	Nov. 18, 1954	----------	460	247

[1] Affected by storage.
[2] For flood of Nov. 27, 1949.

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