INTRODUCTION

Heavy and intense rainfall of April 12-13, 1979, caused major flooding along the Black Warrior River and flooding to a lesser degree along small streams in Tuscaloosa and Northport. The purpose of this report is to document distribution and the amount of rainfall, flood peak elevations along streams, and discharge for gaging stations in the Tuscaloosa and Northport areas. These documented data for a known flood event may be used to verify flood studies, and provide a basis for formulating effective flood-plain management to minimize existing and future flood problems.

This report is a product of the cooperative efforts of the U.S. Geological Survey, U.S. Army Corps of Engineers, and the Geological Survey of Alabama.

Acknowledgment is made to individuals and agencies for their contributions to the report: Mr. Harold Doyal, U.S. Army Corps of Engineers, furnished locations and elevations of high water marks; Mr. Richard M. Pierce, Tuscaloosa County Civil Defense, furnished flood damage estimates; and Messrs. John F. Miller and Burt Reeves, National Weather Service, furnished rainfall records.

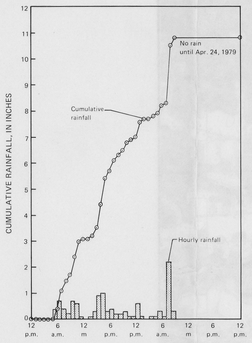

Figure 2.--Hourly and cumulative rainfall, in inches, at Oliver Lock and Dam at Tuscaloosa, April 12-13, 1979.

STORM RUNOFF

Runoff from the storm of April 12 and 13 resulted in extreme flooding along the Black Warrior River at Tuscaloosa and Northport, and downstream. The flood peak elevation at the U.S. Geological Survey gaging station at Northport is the second highest of record exceeded only by the April 18, 1900, flood peak. However, the peak discharge of April 13 (272,000 ft^3/s) is the maximum known and exceeded the peak discharge of the April 1900 flood (215,000 ft^3/s) but at a lower elevation (0.85 ft lower) because of changes in the flood plain.

The flood peak on North River at the U.S.G.S. gaging station near Samantha was the fourth highest since 1916. The peak discharge was between the 50- and 100-year flood frequency discharge. Drainage area of the basin upstream from the gaging station is 219 square miles (mi^2) and runoff caused by the rainfall distribution of the five periods of intense rainfall combined to produce a single flood peak for this size drainage area.

Streams in Tuscaloosa and Northport having small drainage areas responded to the short duration high intensity rainfall by producing five peaks in rapid succession. The highest peaks were the result of the 2.2 inches of rainfall between 7:00 and 8:00 a.m. on April 13.

FLOOD ELEVATIONS AND HYDROGRAPHS

The rate of discharge of a stream is the volume of water that passes a particular location in a specific period of time. The discharge rates used in this report are expressed in cubic feet per second (ft^3/s).

The height of the water surface is usually stated in terms of gage height or stage, which is the elevation of the water surface above a selected datum plane. For this report, all stages are reported in feet above National Geodetic Vertical Datum of 1929 (NGVD).

Flood peak elevations were determined by field surveys of high-water marks located along streams. Elevations for all recorded high-water marks and their locations are given on the accompanying topographic map.

Hydrographs of water-surface elevation and discharge for: Black Warrior River at Northport, drainage area 4,828 sq mi (figs. 3 and 4); North River near Samantha, drainage area 218 sq mi (figs. 5 and 6); Cribbs Mill Creek at Kauloosa Ave. in Tuscaloosa, drainage area 10.7 sq mi (figs. 7 and 8); and Cribbs Mill Creek at Second Ave. in Tuscaloosa, drainage area 2.75 sq mi (figs. 9 and 10) are shown to illustrate the floods that resulted from the April 12-13 storm.

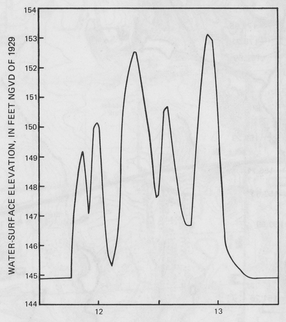

Figure 7.--Water-surface elevations for April 12-13, 1979, for Cribbs Mill Creek at Kaloosa Avenue in Tuscaloosa.

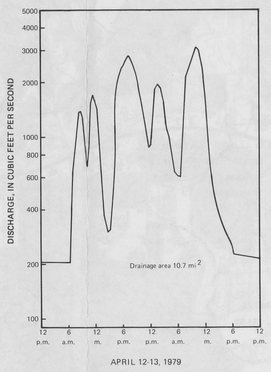

Figure 8.--Hydrograph of discharge for Apirl 12-13, 1979, for Cribbs Mill Creek at Kaloosa Avenue in Tuscaloosa.

MAGNITUDE AND FREQUENCY OF FLOODS

The relation of flood-peak magnitude to the probability of occurrence, or recurrence interval, is generally referred to as a flood-frequency relation. The probability of occurrence is the percent chance of a given flood magnitude being exceeded in any one year. The recurrence interval, which is the reciprocal of the probability of occurrence multiplied by 100, is the average number of years between exceedances. It is emphasized that the recurrence interval is an average interval and that the occurrence of floods is assumed to be random in time; no schedule of regularity is implied. The occurrence of a flood having a 50-year recurrence interval (2-percent chance of occurrence) is no guarantee, therefore, that a flood of equal or greater magnitude will not occur the following year, or even the following week (Water Resources Council, 1977).

The magnitude or peak discharge of the 100-year flood for the Black Warrior River gaging station at Northport is 234,000 cubic feet second (ft^3/s) based on streamflow records from 1889 to 1979. The peak discharge for April 13, 1979 was 272,000 ft^3/s. The 100-year flood frequency discharge for North River near Samantha is 21,300 ft^3/s and the April 13 flood peak discharge was 19,400 ft^3/s.

The April 13 flood-peak discharge on small streams was approximately the 10-year flood discharge.

Flood-peak magnitude for selected recurrence intervals for three stations are given in table 2.

Table 2.--Magnitude and frequency of floods at selected gaging stations.

Station identification	Years of Record	Drainage Area (mi^2)	Recurrence interval, in years 2	5	10	25	50	100
02464000 North River near Samantha	1939-79	219	7,970	11,000	13,200	16,200	18,700	21,300
02456500 Black Warrior River at Northport	1889-1905 1928-79	4,828	113,000	149,000	171,000	197,000	215,000	234,000
02465286 Cribbs Mill Creek at 2nd Ave East at Tuscaloosa	1977-79	2.75	568	948	1,250	1,680	2,040	2,440

FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM OF METRIC UNITS (SI)

For the convenience of readers who may want to use International System of Units (SI), the data may be converted by using the following factors:

Multiply inch-pound unit	By	To obtain SI unit
inches (in)	25.4	millimeters (mm)
inches per hour (in/h)	25.4	millimeters per hour (mm/h)
	2.54	centimeters per hour (cm/h)
feet (ft)	0.3048	meters (m)
feet per mile (ft/mi)	0.1894	meters per kilometer (m/km)
miles (mi)	1.609	kilometers (km)
square miles (mi^2)	2.590	square kilometers (km^2)
gallons per minute (gal/min)	0.06309	liters per second (L/s)
million gallons per day (mgal/d)	0.04381	cubic meters per second (m^3/s)
	3785.	cubic meters per day (m^3/d)
cubic feet per second (ft^3/s)	0.02832	cubic meters per second (m^3/s)
cubic feet per second per square mile [$(ft^3/s)/mi^2$]	0.01093	cubic meters per second per square kilometer [$(m^3/s)/km^2$]

STORM RAINFALL

During the first two months of 1979, temperatures were below normal and precipitation was above normal over Alabama. Thus, at the beginning of March the soil was saturated or nearly so from the preceding weather conditions. During March and April a series of storms occurred with the largest in mid-April. These storms and some intervening rain periods produced record breaking floods in the Coosa, Tallapoosa, and Tombigbee River basins. Of these rainfall periods March 3-4, March 23-24, April 8-9, and April 12-13 were the most significant. Rainfalls of lesser amounts occurred on March 11, March 14-15, and March 21.

The rainfall of April 12-13 was heavy across the northern half of Alabama (fig. 1). The areas receiving the largest amounts were in northeastern Mississippi and just north and west of Tuscaloosa, Alabama. The heavy rainfall (14 inches in 28 hours) to the north of Tuscaloosa was in the lower North River basin.

The National Weather Service's rainfall station at Oliver lock and dam at Tuscaloosa recorded 10.8 inches of rainfall during 28 hours between 5:00 a.m. April 12 and 9:00 a.m. April 13 (fig. 2). The maximum 24-hour intensity at Tuscaloosa was 9.0 inches from 8:00 a.m. April 12 to 8:00 a.m. April 13. This exceeded the 24-hour 100-year rainfall frequency for Tuscaloosa. The maximum intensity for a one-hour period was 2.2 inches between 7:00 and 8:00 a.m. April 13 (fig. 2).

Table 1 gives rainfall-frequency intensities for Tuscaloosa for various increments of time.

Table 1.--Summary of rainfall-frequency intensities for Tuscaloosa.

Duration in hours	RAINFALL INTENSITIES IN INCHES Frequency (recurrence interval) 1 yr	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
1	1.6	1.9	2.3	2.6	2.9	3.2	3.5
2	2.0	2.3	2.8	3.2	3.6	4.0	4.5
3	2.2	2.5	3.2	3.5	4.0	4.5	5.0
6	2.5	3.0	3.8	4.3	5.0	5.5	6.0
12	3.0	3.7	4.6	5.2	6.0	6.8	7.5
24	3.5	4.2	5.4	6.1	7.0	7.9	8.8

Probable maximum 6-hour precipitation for 10 sq mi = 30 inches.
This is five times the 100-year 6-hour rainfall.

From: U.S. Department of Commerce, Weather Bureau, 1961, Rainfall Frequency Atlas of the United States, Technical Paper No. 40, 115 p.

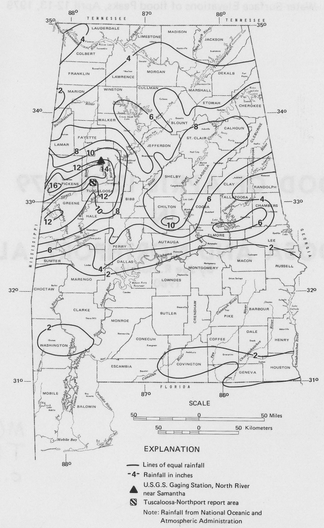

Figure 1.--Total storm rainfall for April 12-13, 1979.

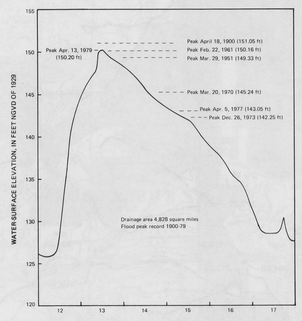

Figure 3.--Water surface elevations for April 12-17, 1979, for Black Warrior River at Northport.

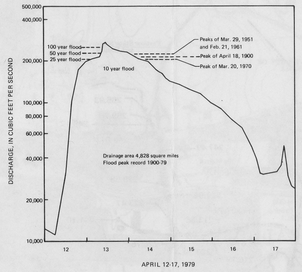

Figure 4.--Hydrograph of discharge for April 12-17, 1979, for Black Warrior River at Northport.

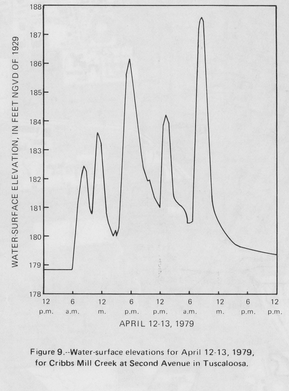

Figure 9.--Water-surface elevations for April 12-13, 1979, for Cribbs Mill Creek at Second Avenue in Tuscaloosa.

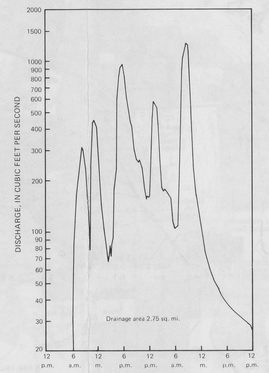

Figure 10.--Hydrograph of discharge for April 12-13, 1979, for Cribbs Mill Creek at Second Avenue in Tuscaloosa.

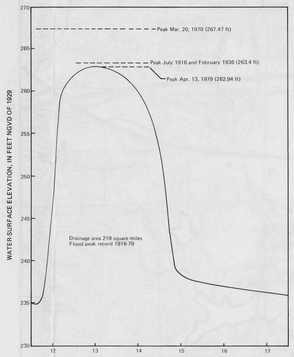

Figure 5.--Water-surface elevations for April 12-17, 1979, for North River near Samantha.

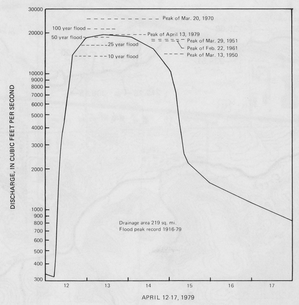

Figure 6.--Hydrograph of discharge for April 12-17, 1979, for North River near Samantha.

Figure 11.--Flooding of residential area in Northport by Black Warrior River, April 13, 1979. View facing southwest with Black Warrior River main channel in background. Flow is from left to right.

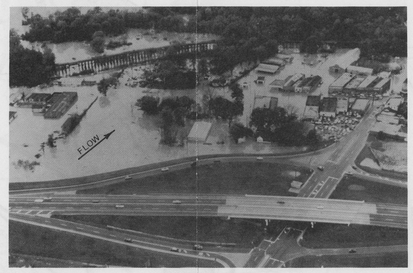

Figure 12.--Flooding of business area in Northport by Black Warrior River, April 13, 1979. View facing southwest. River, shown in upper left, flows west.

FLOOD DAMAGE

Flood damage in Tuscaloosa County was estimated at 1.75 million dollars. The majority of the damage was caused by flooding of the Black Warrior River in the Tuscaloosa-Northport area. Tuscaloosa County was declared a disaster area May 2, 1979, by Presidential declaration.

Photographs made April 13 at or near the time of the flood crest on the Black Warrior River shows some of the flooding of residential (fig. 11) and business areas in Northport (figs. 12 and 13). These areas are in the flood plain on the north side of the river. The flood plain in Tuscaloosa on the south side of the river is not as wide and most of the damage was confined to industrial property and developments adjacent to the river channel (figs. 14 and 15).

Figure 13.--Flooding of business area in Northport by Black Warrior River, April 13, 1979. View facing north with Black Warrior River main channel in foreground. Flow is from right to left.

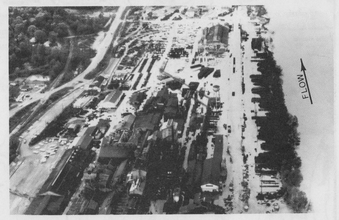

Figure 14.--Flooding of industrial area in Tuscaloosa by Black Warrior River, April 13, 1979. View facing downstream along Black Warrior River. Tree line on right is the edge of the main channel.

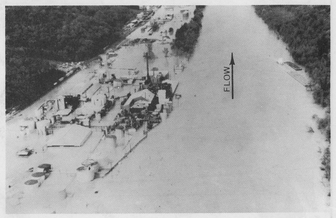

Figure 15.--Flooding of industrial area in Tuscaloosa by Black Warrior River April 13, 1979. View facing downstream along Black Warrior River. Tree lines mark the main channel.

REFERENCES

U.S. Department of Housing and Urban Development, Federal Insurance Administration, 1978a, Flood insurance study, city of Tuscaloosa, Ala., 135 p.

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FLOOD OF APRIL 12-13, 1979
IN
TUSCALOOSA AND NORTHPORT, ALABAMA

By Joe R. Harkins

1980

Prepared by the
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