FLOODS IN CENTRAL AND SOUTHWESTERN GEORGIA IN JULY 1994

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ABSTRACT

Parts of central and most of southwestern Georgia were devastated by floods resulting from rainfall produced by Tropical Storm Alberto in July 1994. Whole communities were inundated by floodwaters as numerous streams reached peak stages and discharges far beyond previously known floods. As tributary floodwaters combined and moved downstream in the Flint and Ocmulgee Rivers, peak discharges exceeded the 100-year flood discharges along most stream reaches. Severe flooding resulted in 31 human deaths in towns and small communities along or near the swollen streams. A total of 55 counties in central and southwestern Georgia were declared Federal disaster areas by President Clinton. Several municipal, industrial, and private water systems were inundated and rendered unusable for three or more weeks.

Highway travel was disrupted as roadway bridges and culverts were overtopped and, in many cases, washed out. Roughly, 1,000 bridges were closed during the flooding, and about 500 bridges remained closed for several days while the bridges were temporarily repaired. About 140 bridges remained closed for several weeks for extended repairs, and 125 were closed for replacement. Estimates of road and bridge damage in Georgia were in excess of $130 million dollars.

U.S. Geological Survey (USGS) personnel monitored and reported flood information to other Federal, State, and local agencies from the onset of the storm until floodwaters finally receded. Stage and discharge data from many streams were collected and reported to the U.S. Army Corps of Engineers (COE), the National Weather Service, the Federal Emergency Management Agency, the Federal Highway Administration, various State natural resource and highway departments, electrical power companies, and numerous county and city officials as these groups worked to minimize loss of life and property. Flooding was so severe and widespread that 15 USGS gaging stations were severely damaged or destroyed, requiring much of the data to be collected manually and reported by cellular telephone. At the height of the flooding, almost 40 USGS personnel were working in the field to collect and provide hydrologic information vital to protecting life and property.

FLOOD OVERVIEW

In July 1994, parts of central and most of southwestern Georgia were devastated by floods resulting from rainfall produced by Tropical Storm Alberto. Whole communities were inundated by floodwaters as numerous streams reached peak stages and discharges far beyond previously known floods in the Flint and Ocmulgee River basins (fig. 1). The towns of Montezuma and Newton, Ga., were almost entirely encompassed by floodwaters from the Flint River. The severe flooding resulted in 31 human deaths in towns and small communities along or near the swollen streams. A total of 55 counties in central and southwestern Georgia were declared Federal disaster areas by President Clinton. Several municipal, industrial, and private water systems were inundated and rendered unusable for three or more weeks. In Macon, the municipal water-system operations were flooded, leaving about 150,000 people without a water supply for three weeks. During the height of the flooding, there were about 500,000 people without drinking water located within the two river basins (Georgia Emergency Management Agency, written commun., August, 1994).

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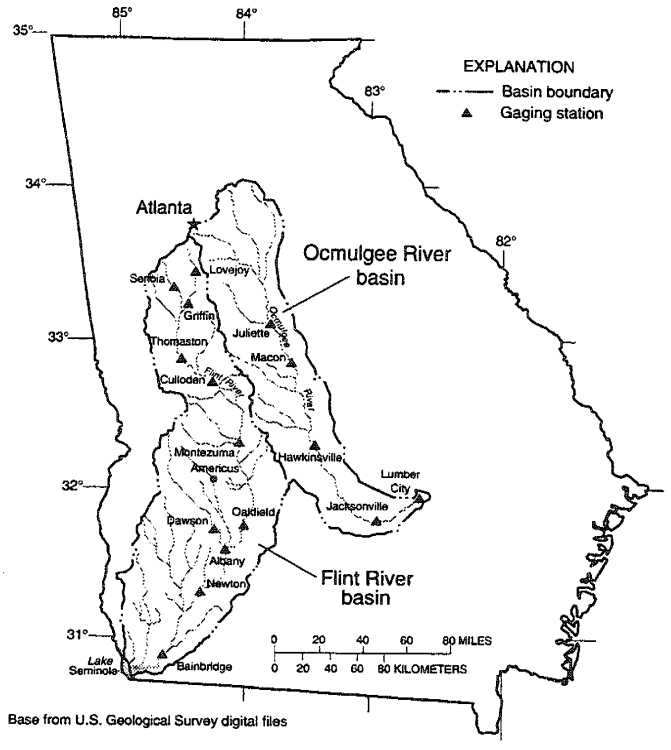

Figure 1. Location of Flint and Ocmulgee River basins and selected gaging stations affected by flooding, July 1994.

Numerous small earthen dams failed after being overtopped and water from small recreational lakes and farm ponds quickly emptied into local streams. Sinkholes formed in the Albany area, that are underlain by cavernous limestone formations. Many homes located on or near these sinkholes were destroyed or condemned for occupancy by local agencies.

Summer crops were severely damaged or destroyed by relentless rainfall and floodwaters. About 471,000 acres of cropland in Georgia were impacted by floodwaters, resulting in estimated damages of about $100 million dollars. Total flood damages to commercial and private property were estimated at $1 billion dollars (Federal Emergency Management Agency, written commun., July 1994). Death and suffering caused by this storm serves to emphasize the high cost imposed upon life and property by flood disasters; and thus, the importance of preparing for, monitoring, and documenting such occurrences.

TROPICAL STORM ALBERTO

Tropical Storm Alberto will be described briefly to set the stage for a description of the devastating floods that the storm produced. Alberto grew from a tropical depression which formed in the Gulf of Mexico on June 30, 1994. Alberto first came over land on the morning of July 3, rapidly lost energy, and was downgraded to a tropical depression by mid-afternoon on the same day. Remnants of Alberto drifted north to just southwest of Atlanta early on July 5, changed course, and moved in a southwesterly direction before dissipating about two days later. Slow movement of the storm and available abundant tropical moisture combined to help produce historic rainfalls.

Storm-rainfall totals of over 13 inches (in.) commonly were recorded in the areas of the heaviest rainfall throughout central and southwestern Georgia (fig. 2). The highest total rainfall of 27.6 in. (July 3-7) and the highest 24-hour rainfall of 21.1 in. (24-hour period ending at 7 a.m. on July 6) were recorded in Americus. The rainfall for Americus was about 60 percent of the area's mean annual rainfall and the 24-hour rainfall was nearly 2.5 times greater than the area's estimated 100-year recurrence interval for 24-hour rainfall (National Weather Service, written commun., November 1994).

STREAM FLOODING

Stream flooding resulting from Tropical Storm Alberto was just as remarkable as the rainfall that caused the flooding. The most significant flooding in Georgia occurred along the Flint and Ocmulgee Rivers and their tributaries (fig. 1).

Tributary Flooding. Damaging flash floods occurred from the southern suburbs of Atlanta to Macon on the night of July 4 and morning of July 5. The Line Creek near Senoia gaging station recorded a peak discharge of about 28,400 ft^3/s, which was about 2.4 times the 100-year flood discharge. The maximum stage at the Senoia gaging station was about 5.2 ft higher than any other recorded flood during 30 years of operation.

As the heaviest rains continued south of Atlanta, more destructive flash flooding occurred in the Americus area on the night of July 5 and morning of July 6. Muckalee Creek at Americus, likely affected by undetermined amounts of water released from numerous local dam failures, peaked on July 6 at a discharge of about 33,500 ft^3/s, which is about 4.0 times greater than the 100-year flood discharge.

About 20 miles south of Americus, at the gaging station on the Kinchafoonee Creek near Dawson, a peak discharge of about 24,000 ft^3/s, was recorded on July 7, which is 1.4 times greater than the 100-year flood discharge and floodwaters were greater than the 100-year flood discharge for about 48 hours.

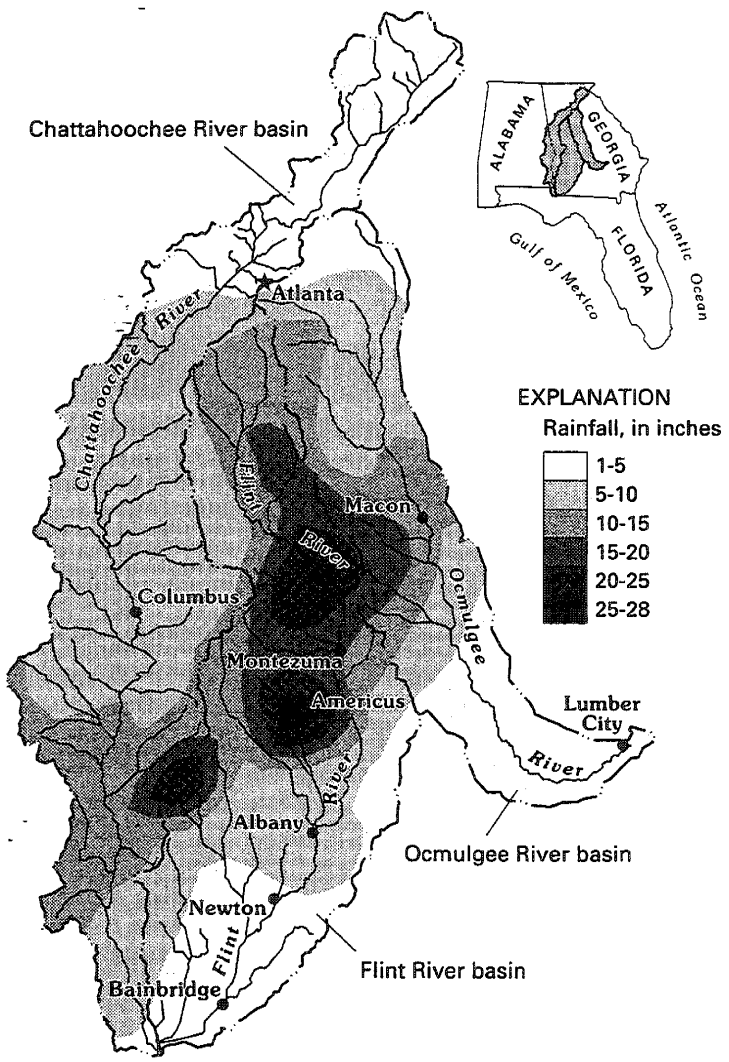

Figure 2. Storm-rainfall totals from Tropical Storm Alberto, July 3-7, 1994.

Flint and Ocmulgee Mainstem Flooding. Tributary floodwaters combined and moved downstream in the Flint and Ocmulgee Rivers. Flood discharges on the mainstem of the Flint and Ocmulgee Rivers exceeded the 100-year flood discharges along most stream reaches.

Peak discharges greater than the 100-year flood discharge were recorded at Flint River gaging stations from Lovejoy, about 20 miles south of Atlanta to Bainbridge, to about 29 miles upstream of its confluence with the Chattahoochee River near the southwestern corner of the State (fig. 3). At Montezuma, the Flint River peaked on July 8 at a stage about 6.7 ft higher than the 1929 flood, which previously was the largest flood of this century at this gaging station. At Albany, the Flint River peaked on July 11 at a stage of about 43 ft, about 5 ft higher than the 1925 flood, which was the previous maximum flood. The stage hydrograph (fig. 4) for the July 1994 flood for the Flint River at Albany shows that floodwaters exceeded the 100-year stage from about 1300 hours on July 7 to 0600 hours on July 14.

A comparison of the July 1994 and the estimated 100-year flood stages (Stamey and Hess, 1993) for selected sites on the Flint River are shown in figure 5. At Montezuma, the July 1994 flood exceeded the estimated 100-year flood stage by about 3.7 ft and at Albany, by about 5.9 ft.

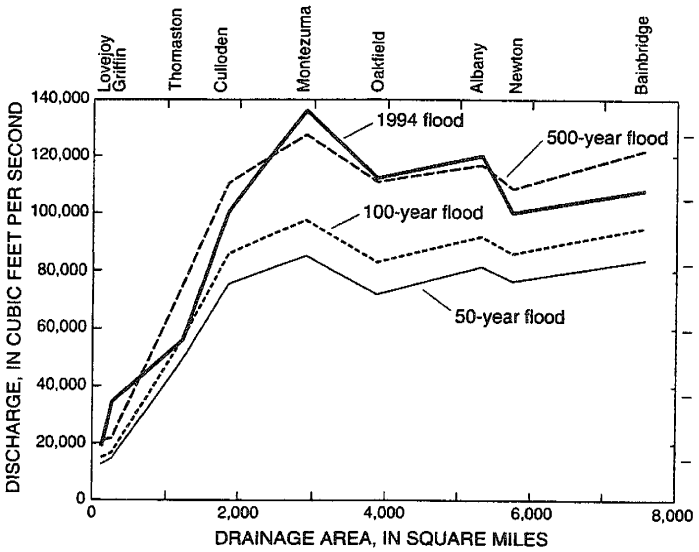

Figure 3. Selected recurrence-interval discharges for selected gaging stations in the Flint River basin.

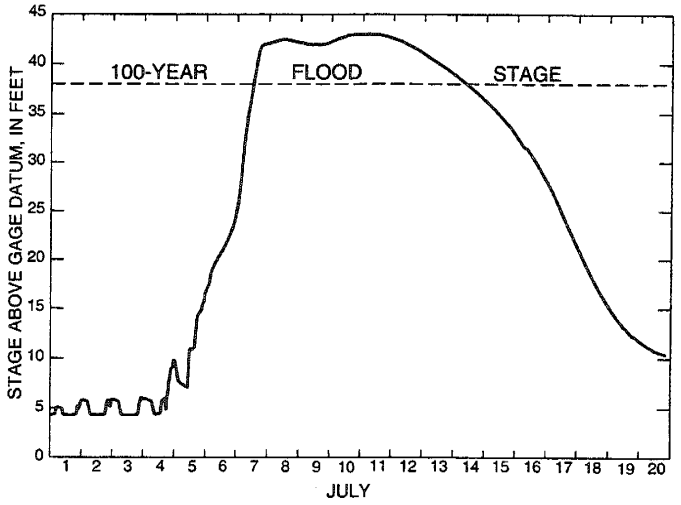

Figure 4. Stage hydrograph for Flint River at Albany, July 1994.

Peak discharges on the Ocmulgee River exceeded the 100-year flood discharge from near Juliette, about 25 miles north of Macon to Jacksonville, Ga. (fig. 1), to about 40 miles upstream from the confluence with the Oconee River (fig. 6). At Macon, the Ocmulgee River peaked on July 6 at a stage of about 35.4 ft, which was about 5.4 ft higher than the 1990 flood, and the highest stage since 1887. The highest peak discharge previously recorded at Macon was 83,500 ft^3/s, which occurred during the 1948 flood. The 1994 peak discharge of about 107,000 ft^3/s is the highest of record at Macon. Numerous changes in the floodplain and to the downstream river channel since 1948 have caused changes in the stage-discharge relation which resulted in the stage being higher for the 1990 flood than that of 1948, although the 1990 peak discharge was less than the peak discharge in 1948. The stage hydrograph (fig. 7) for Ocmulgee River at Macon shows that flood stages for the July 1994 flood exceeded the 100-year flood stage from about 1200 on July 6 to about 1200 on July 7.

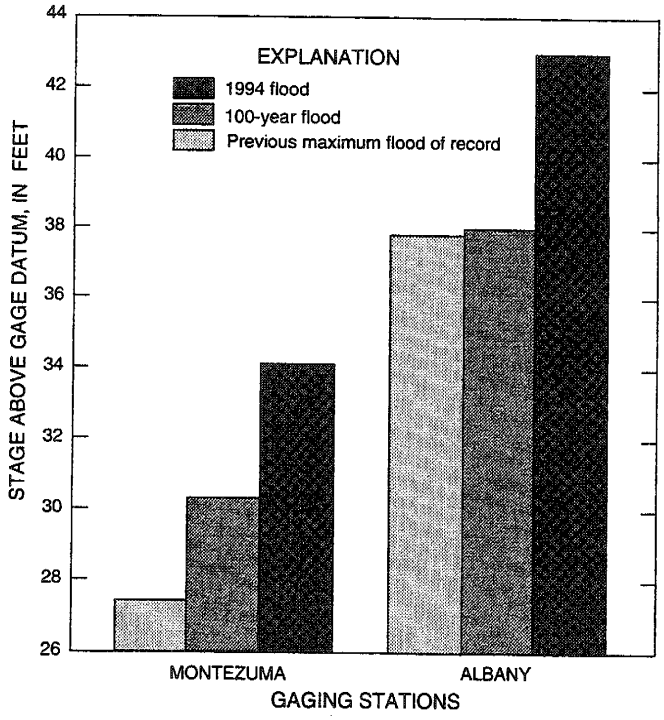

Figure 5. Flood stages for Flint River at Montezuma and Albany gaging stations.

At U.S. Highway 341 at Hawkinsville, the Ocmulgee River peaked at a stage of about 40.9 ft, which was about 4.4 ft higher than the 1925 flood and probably the highest since 1841. It should be noted that the computations of the estimated 100-year flood discharges and stages are based on a 1993 USGS flood-frequency study (Stamey and Hess, 1993) and the current discharge ratings at gaging stations. The 100-year flood discharges presented here do not include data from the July 1994 flood event. However, the stages given do reflect recent changes in the stage-discharge relations resulting from the July 1994 flood.

DATA AQUISITION

U.S. Geological Survey (USGS) personnel monitored and reported flood information to other Federal, State, and local agencies from the onset of the storm until floodwaters finally receded. Stage and discharge data from many streams were collected and reported to the U.S. Army Corps of Engineers (COE), the National Weather Service, the Federal Emergency Management Agency, the Federal Highway Administration, various State natural resource and highway departments, electrical power companies, and numerous county and city officials as these groups worked to minimize loss of life and property. Flooding was so severe and widespread that 15 USGS gaging stations were severely damaged or destroyed, requiring much of the data to be collected manually and reported by cellular telephone. At the height of the flooding, almost 40 USGS personnel were working in the field to collect and provide hydrologic information vital to protecting life and property.

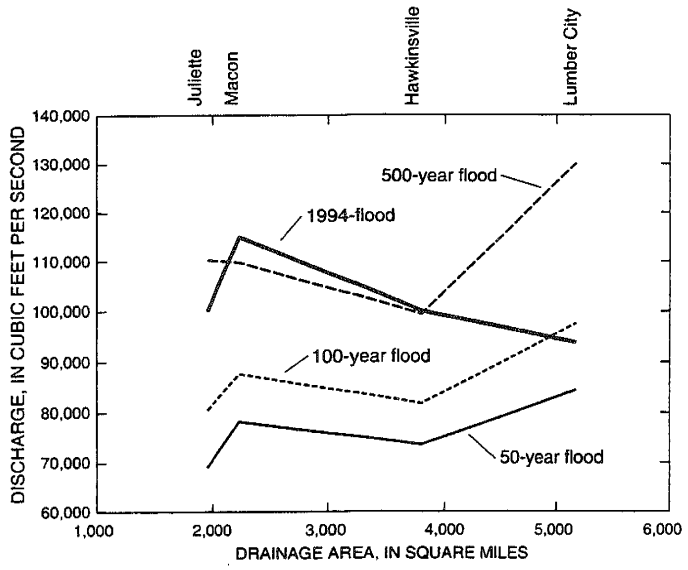

Figure 6. Selected recurrence-interval discharges at selected gaging stations in the Ocmulgee River basin.

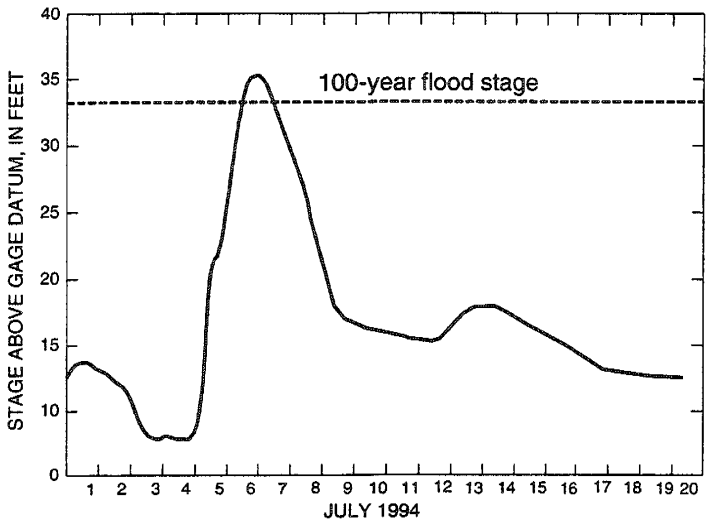

Figure 7. Stage hydrograph for Ocmulgee River at Macon, July 1994.

Despite the extraordinary effort to collect and document needed hydrological and flood information as it occurred, it was impossible to visit every site where data were needed. In some instances, bridges and roadways were inundated and floodwaters were too dangerous to risk human life by working from boats. In other cases, personnel could not travel to the point of interest before floodwaters had receded. Therefore, immediately following the flood, field crews were dispatched to flag and document highwater marks along the Flint and Ocmulgee Rivers and many of their tributaries. Data collection and documentation will serve as a basis for determining flood-elevation profiles and indirect determinations of peak discharges at several key locations. Gage reconstruction and follow-up field work continued into the Fall of 1994. By the end of September 1994, the 15 USGS gaging stations that were damaged or destroyed by floodwaters had been repaired or temporarily restored to operation, and by the end of January 1995, indirect peak-discharge measurements had been computed for 27 gaging sites.

FLOOD DOCUMENTATION

Hippe and others (1994) presented preliminary information on water quality in the Flint and Ocmulgee River basins during the July 1994 flood. The report compares the types and concentrations of selected pesticides in surface waters and presents preliminary information on the occurrence of nitrates and commonly used pesticides in shallow ground water.

Additional field-work activities are continuing to be conducted by USGS, COE, and Georgia Department of Transportation to further document information pertinent to the July 1994 flood. Flood-elevation profiles of the July 1994 flood have not been determined for the Flint and Ocmulgee Rivers and their major tributaries. When flood discharges are finalized, an update of the flood-frequency analyses will be made, which will include the July 1994 flood data. Hydrologic data collected and analyzed by the USGS is extremely valuable to agencies responsible for future land-use activities and minimizing potential flood damages. Flood-related data collected, analyzed, and documented will be available to Federal, State, local agencies, and to the general public.

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Hippe, D.J., Wangsness, D.J., Frick, E.A., and Garrett, J.W., 1994, Water Quality of the Apalachicola-Chattahoochee-Flint and Ocmulgee River Basins Related to the Flooding from Tropical Storm Alberto; Pesticides in Urban and Agricultural Watersheds; and Nitrate and Pesticides in Ground Water: U.S. Geological Survey Water-Resources Investigations Report 94-4183, 36 p.