INTRODUCTION

This atlas presents hydrologic information on the frequency, water-surface elevations, and areal extent of flooding along a 30-mile reach of the Pearl River from the Ross Barnett Reservoir (Madison and Rankin Counties) downstream to Byram, Hinds County, Mississippi. The principal city in the area is Jackson, Hinds County. This atlas provides a permanent record of the flood of April 1979 which is the greatest flood since at least 1874. This information provides a technical basis on which to make flood-plain management decisions.

The areal extent of flooding was determined from aerial photographs made April 17, 1979 very near the time of the flood crest, supplemented by aerial photographs made a day earlier at a stage 0.4 ft lower. Flood profiles were defined from field surveys of a number of points that have been monitored since about 1969 after each flood equal to or greater than 45,000 ft³/s, supplemented by many additional floodmarks left by the 1979 flood.

FLOOD HISTORY

The streamflow gaging station on the Pearl River at Jackson is the primary source of flood data in the area. From 1901 to 1975 it was located at or near the site of Woodrow Wilson Bridge on the Old Brandon Road. In 1975 the gage was moved 0.6 mile downstream to its present location at U.S. Highway 80. The datum was lowered by 1.20 ft, the approximate amount of the high-water surface elevation differential between the two locations, so that gage heights of floods at both sites are generally comparable.

Streamflow stations have been operated on tributary streams in the Jackson area for various periods. Streamflow records on Hanging Moss, Eubanks, Town, and Lynch Creeks provided backwater flood data for the great flood of April 1979. Records for these and other nearby stations are published annually in the U.S. Geological Survey's report "Water Resources Data for Mississippi."

According to information by local residents and newspaper accounts, a Pearl River flood on April 25, 1874, reached a stage of 37 ft and a flood on December 5, 1880, reached a stage of 36.5 ft in the vicinity of the gage used prior to 1976. A flood on April 21, 1900, reached a stage of 36.7 ft in the same vicinity, according to bridge plans of the Alabama and Vicksburg Railroad.

The flood of April 1979 reached a stage on the Pearl River gage at U.S. Highway 80 of 43.28 ft. (elevation 276.98 ft NGVD). Peak discharge at this gage was 128,000 ft³/s.

Cultural changes made on the flood plain over the years coupled with both man-made and natural changes in the river channel have caused the stage to vary about 2 ft at Old Brandon Road for a discharge of 50,000 ft³/s. Natural river processes of scour and fill of the channel cause the variations to extend throughout the range of flow. The most notable flood-plain changes were the construction of the Flowood levee in 1935–40 and the East Jackson and Jackson Fairgrounds levees in 1963–65. The East Jackson levee project incorporated part of the Flowood levee and superseded it.

The construction of the Ross Barnett Reservoir in 1959–63 did not significantly affect flood stages and discharges prior to 1979 because of its relatively small capacity (450,000 acre-feet at extreme highwater surface elevation of 300 ft) and operation prior to 1979 at a near constant pool elevation of 297 ft (capacity 340,000 acre-feet).

Annual flood discharges of record are shown in figure 1. Peak gage heights for floods above 15 ft are shown in figure 2.

FLOOD FREQUENCY

Frequency of flooding on the Pearl River was determined from the records for the Pearl River at Jackson. Analysis was made by the log Pearson type III method (Water Resources Council, 1977). Adjustment in discharge for the April 1979 flood was made for change in storage in Ross Barnett Reservoir. The relationship between flood-peak discharge and exceedance probability is shown in figure 3. As applied to flood events, exceedance probability is the likelihood, expressed in percent chance of occurrence, that a given flood will be exceeded as the maximum in any one year. Exceedance probability is sometimes expressed in terms of recurrence interval, which is the average number of years in a very long period within which a given flood will be exceeded once. For exceedance probabilities of 10 percent or less, the recurrence interval is virtually equal to the reciprocal of the percent exceedance probability times 100. Thus, a flood with an exceedance probability of one percent may be said to be the 100-year flood, and a flood with and exceedance probability of two percent may be said to be the 50-year flood. It is emphasized that the occurrence of an extreme event, such as the flood of April 1979 does not alter the probability of its recurrence that year or in successive years.

A peak discharge of 145,000 ft³/s in the vicinity of Jackson, representing natural flow of Pearl River without the effects of storage in Ross Barnett Reservoir, was estimated on the basis of reservoir inflow and discharge measurements made at State Highway 43 and at the gage at U.S. Highway 80. The estimated maximum reservoir inflow, based on the combined flow of the principal tributaries, Pearl River, Yockanookany River, and Tuscalometa Creek, was 162,000 ft³/s. A discharge measurement of 143,000 ft³/s was made near the crest on April 16 at the State Highway 43 crossing of Ross Barnett Reservoir. The peak flow at the streamflow measuring station at U.S. Highway 80, based on a series of discharge measurements, was 128,000 ft³/s, April 17, 1979.

The exceedance probability of a peak discharge of 145,000 ft³/s, estimated from a frequency relation (fig. 3) based on the period of known floods, 1874–1980, is about 0.2 percent—equivalent to an average recurrence interval of about 500 years.

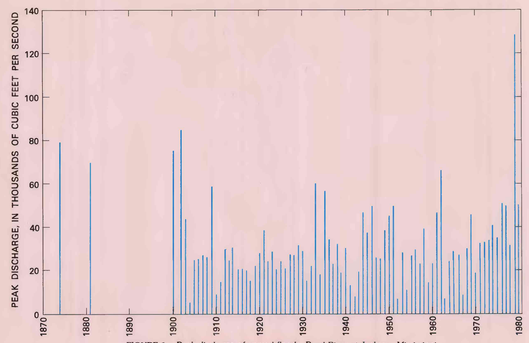


FIGURE 1.—*Peak discharge of annual floods, Pearl River at Jackson, Mississippi, 1874, 1881, 1900–80.*

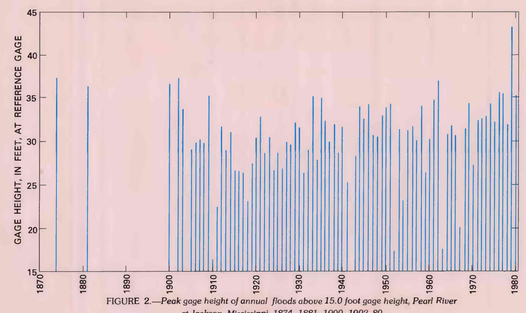


FIGURE 2.—*Peak gage height of annual floods above 15.0 foot gage height, Pearl River at Jackson, Mississippi, 1874, 1881, 1900, 1902–80.*

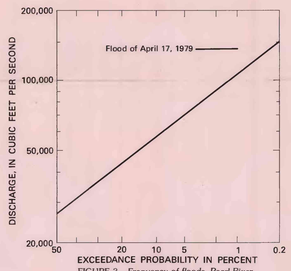


FIGURE 3.—*Frequency of floods, Pearl River at Jackson, Mississippi.*

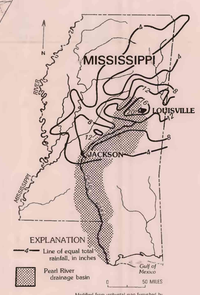


FIGURE 4.—*Isohyetal map of total rainfall April 12–14, 1979.*

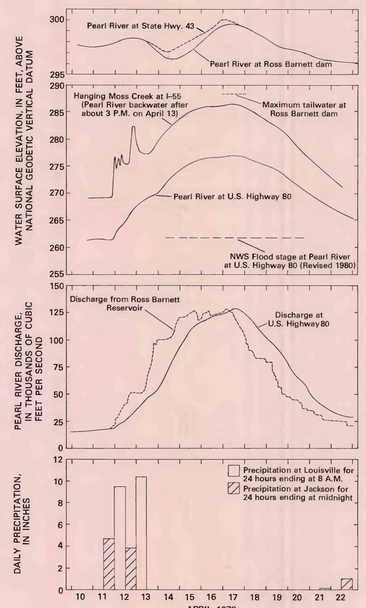


FIGURE 5.—*Water surface elevations, discharge, and precipitation at selected locations.*

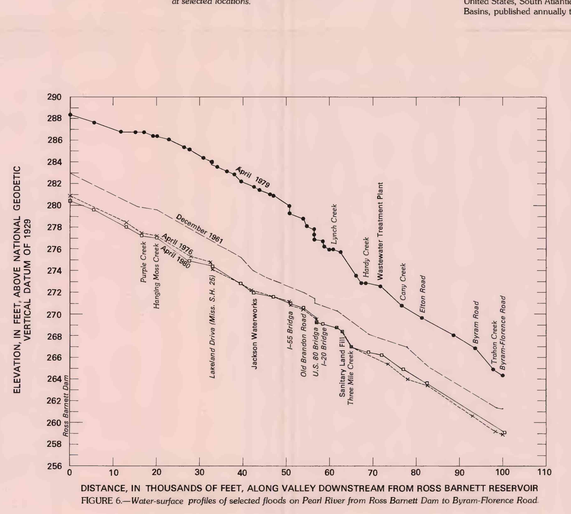
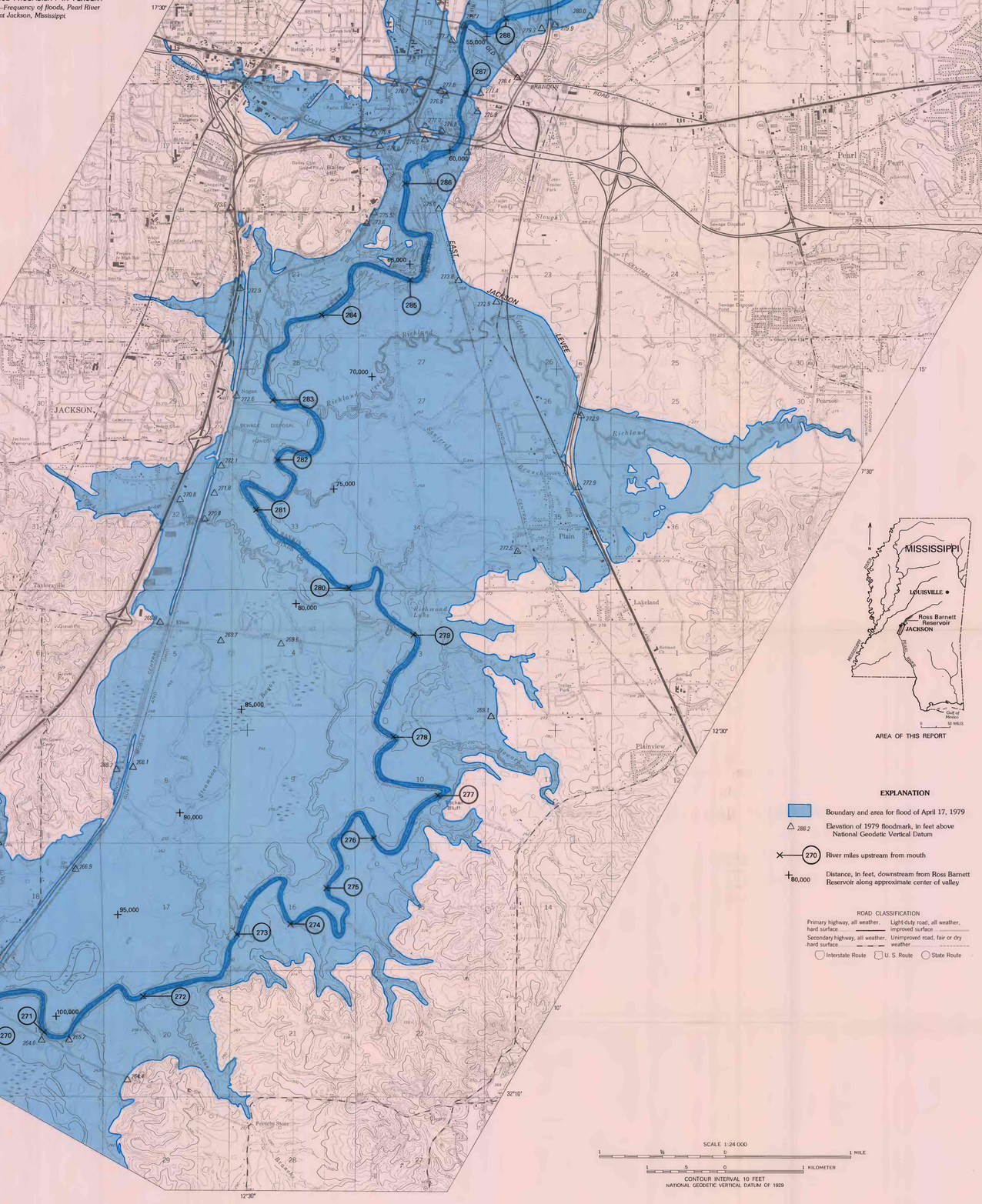


FIGURE 6.—*Water-surface profiles of selected floods on Pearl River from Ross Barnett Dam to Byram-Florence Road.*



Base from U.S. Geological Survey
Florence, 1:24,000, 1971; Jackson, 1:24,000, 1963, interim revision of 1971; Jackson SE, 1:24,000, 1963, interim revision of 1971; Madison, 1:24,000, 1963, interim revision of 1971; New Byram, 1:24,000, 1971; Ridgeland, 1:24,000, 1963, interim revision of 1971.

DESCRIPTION OF FLOOD

The great flood of April 17, 1979, on the Pearl River resulted from rains of 4.5 to more than 20 inches which fell in the upper Pearl River basin from late in the day on April 11, 1979, to the morning of April 13. An isohyetal map of total storm rainfall in the Pearl River basin and adjoining basins is shown in figure 4.

Daily precipitation at Jackson and at Louisville, near the center of the upper Pearl River basin, are shown in figure 5. Also shown are the resulting stream flow and water-surface elevation changes at several points. The water-surface elevation of Hanging Moss Creek at Interstate 55 represents backwater and thus the stage of the Pearl River after local runoff declined on April 13.

The water-surface elevation graphs (figure 5) show the release of stored water from the Ross Barnett Reservoir on April 13 in anticipation of the runoff from the upstream rains. From about midday on April 14 until about midday of the 17th the reservoir storage increased indicating that inflow exceeded outflow during this period. The relatively steep water-surface profile through Ross Barnett Reservoir as the flood wave passed is shown by the elevation difference between the dam and State Highway 43, 8 miles upstream.

The duration of the Pearl River flood in Jackson is notable in that the river was above flood stage of 28 feet (261.7 ft NGVD) from April 11 to April 24. The official flood stage for Jackson was revised from 18 feet to 28 feet by the National Weather Service in January 1980.

AREA INUNDATED

The area inundated by the flood of April 1979 is shown on the aerial photo mosaic and on the topographic map. Flood elevations are given at representative locations on the map.

The left bank (East Jackson) levees around Flowood and Pearl were not overtopped and did not fail. The right bank Jackson Fairgrounds levee was not breached, but water which flowed through the Fortification Street interchange on Interstate 55, and through city sewers, filled the Fairgrounds area to the top of the downstream levee.

FLOOD PROFILES

The profile of the water surface of the April 1979 flood along the Pearl River from Ross Barnett Dam to the Byram-Florence Road is shown in figure 6. Also shown, for comparison, are the profiles of the flood of December 1961 and the more recent floods of April 1976 and April 1980. These floods were substantially above bankfull stage. The profiles are based on field surveys of maximum flood elevations made shortly after each flood. Wherever practical, floodmarks at the same locations were surveyed for each flood. The base line used for the profiles is composed of straight line segments that follow the approximate route of the centroid of the flow near the center of the flood plain. Distance, in feet downstream from Ross Barnett Reservoir, used for the profiles in figure 6 are shown on the maps. River miles above the mouth, measured along the thalweg, also shown on the maps, were not used because the overbank flow greatly exceeded that of the meandering channel upstream and downstream of the rechanneled area between the levees.

Abrupt changes in the flood profiles at some road crossings indicate differences in water surface elevations upstream and downstream from channel constrictions. Crossings of State Highway 25 (Lakeland Drive), Interstate 55, Old Brandon Road, U.S. Highway 80 and Interstate 20 show drops in water surface elevation through bridges. The railroad bridges at the Jackson Water Works and upstream from U.S. Highway 80 were overtopped, but they constricted flow to some extent. The railroad bridge downstream from Interstate 20 was overtopped to such a degree that it offered minimal resistance to flow and no break in the water surface profile was apparent. The now-abandoned Jackson sanitary land fill in a meander loop of Pearl River near the downstream limit of the East Jackson levee produced a marked steepening in the slope of the flood profile in that area.

ACKNOWLEDGMENTS

This report was prepared by the Mississippi District, U.S. Geological Survey, in cooperation with the Mississippi Department of Natural Resources, Pearl River Valley Water Supply District, the City of Jackson, and the U.S. Army Corps of Engineers.

ADDITIONAL INFORMATION

Other information on floods on the Pearl River in Mississippi may be obtained from the U.S. Geological Survey, 100 W. Capitol Street, Suite 710, Jackson, Mississippi, 39269.

SELECTED REFERENCES

Colson, B. E., and Hudson, J. W., 1976, Flood Frequency of Mississippi Streams: Mississippi State Highway Department, 34 p.

Shell, J. D., 1964, Flood on Pearl River at Jackson, Mississippi: U.S. Geological Survey Hydrologic Investigations Atlas 127.

Water Resources Council Hydrologic Committee, 1977, Guidelines for determining flood flow frequency: Washington, D. C., Water Resources Council Bulletin 17A, 25 p.

Wilson, K. V., 1973, Floods in Jackson quadrangle Mississippi: U.S. Geological Survey Open-File Atlas.

U.S. Geological Survey, 1964–1980, issued annually, Water Resources Data for Mississippi, Jackson, Miss., published for years indicated.

_____1901–1963, issued annually, Surface Water Supply of the United States, South Atlantic Slope and Eastern Gulf of Mexico Basins, published annually through 1963.

FLOOD OF APRIL 1979 ON PEARL RIVER IN JACKSON, MISSISSIPPI AND VICINITY

By

Lamar E. Carroon

1982

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA.—1982—W80042

For sale by Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, VA 22202