

THE PEARL RIVER FLOOD
AT JACKSON, MISSISSIPPI
APRIL, 1979

PRELIMINARY REPORT

by

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1. INTRODUCTION

This report is a preliminary account of certain aspects of the Pearl River flood at Jackson MS, 12-21 April 1979. The report is based on field work conducted by the writer in Jackson during the flood, on 18-19 April, under the auspices of a grant from the National Science Foundation to the Natural Hazards Research and Applications Information Center at the University of Colorado (Boulder). This project is one of a series of "quick response" studies of natural hazard events sponsored by the Center. Co-Principal Investigator of this study is Professor Richard Francaviglia of Antioch College, Yellow Springs OH.

This study was undertaken with the specific encouragement of the Federal Disaster Assistance Administration, the Federal Insurance Administration, and the Army Corps of Engineers, Floodplain Management Services. The observations and conclusions expressed herein are strictly those of the writer and are subject to revision in light of further information. More detailed

investigation as to the history of land development in the Jackson area floodplain is currently in progress. Recommendations concerning post-disaster flood migration efforts will be offered in a final report.

Information included herein was gathered by the writer through direct observation (including a helicopter overflight of the flooded area); attendance at a press briefing by the Governor of Mississippi and his staff; conversations with federal, state and local officials in Jackson; and accounts in local newspapers.

2. GEOGRAPHIC SETTING AND FLOOD EXPERIENCE

Jackson, the state capital of Mississippi, is a city of 288,000 situated on the west side of the Pearl River about 150 miles upstream from its mouth at the Gulf of Mexico.

Above Jackson, the Pearl drains an area of 3100 square miles, consisting mostly of marginal farmlands and national forests. Runoff from upstream areas is largely uncontrolled, since proposed flood-control structures have not been built. The river is partially controlled at Jackson by the Ross Barnett Dam, built and operated by a state agency in 1962 to provide water supply and recreation to Jackson. The reservoir behind this dam is

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NATIONAL WEATHER DIGEST

maintained at a high level which precludes significant flood storage.

Below Ross Barnett Dam, the Pearl normally meanders past the City of Jackson at a sluggish pace. The floodplain at this point broadens to about three miles in width and then is "pinched" by bluffs converging from either side. This creates a natural bottleneck holding floodwaters in the vicinity of Jackson and its cross-stream neighbors - Flowood, Pearl City, and Richland.

The City of Jackson occupies a topographically diverse site bordered by the Pearl on the east and dissected by numerous tributary creeks. Older development including the State Capitol and its environs occupies upland sites, well free of the vagaries of the Pearl and its tributaries. The City received major floods in 1902, 1913, 1915, 1921, and many years thereafter. Before April 1979, its flood of record occurred on 21 December 1961, when the Pearl crested at 37 feet - 19 feet above flood stage.

Since the 1961 flood, commercial and residential development has widely encroached upon the lowlands bordering the Pearl. Several factors account for this phenomenon. First: although not intended or designed for flood control, the Ross Barnett Dam, completed in 1962, apparently created the impression that the river would no longer flood. Second: levees were completed by the Corps of Engineers on both sides of the Pearl in 1967 affording a design level of protection up to a flood stage of 40.5 feet, or three feet above the flood of record. Third: Interstate Highways 55 and 20 were built through Jackson in the late 1960's with a major intersection in the floodplain just southeast of the central business district. Fourth: the City by 1970 was running out of available space for additional urban growth within its own taxing jurisdiction. Fifth: a new jetport across the river threatened to spawn development in Flowood if Jackson could provide no further building space. For these and other reasons, massive development of the Pearl floodplain in Jackson has occurred.

3. OVERVIEW OF THE JACKSON FLOOD

During the week before Easter 1979, massive storm systems rolled across the south-central United States. Thunderstorms, hail, tornadoes, and record rainfalls battered Texas, Louisiana, Oklahoma, Arkansas, Mississippi, and Alabama. In Wichita Falls TX, a series of tornadoes levelled the city. With the media full of reports on natural disasters (including an earthquake in Yugoslavia and a volcano eruption in the Caribbean), Mississippi residents were perhaps nonchalant about their own situation. Nearly 20 inches of rain fell during the week at Louisville in the upper Pearl River watershed. Jackson received 10 inches, including 4 inches in an hour on 12 April. Flash flooding developed in many of Jackson's creeks with localized damages affecting some homes and shopping areas. By 14 April, these problems receded, and it seemed the worst was over.

Flooding along the Pearl in Jackson was delayed by two factors. First: several days were required for the major runoff from the storm in the upper watershed to reach Ross Barnett Reservoir. Second: the Pearl River Valley Water Supply District, which operates the dam, did not immediately begin emptying the reservoir to accommodate approaching floodwaters. By Easter Sunday (15 April), inflows to the reservoir far exceeded outflows. The latter were hastily increased and the Jackson Flood was underway. By Tuesday (17 April), the flood crested at 43.2 feet, a level 25 feet above flood stage and 6 feet above the 1961 flood of record. This was approximately the level of the "standard project flood" estimated by the Corps of Engineers in its 1972 Flood Information Report for the Pearl River. In terms of probable return period, it was somewhat greater than the 500-year flood indicated in the Flood Insurance Rate Map for the city prepared by the Federal Insurance Administration.

The most visible and costly flood damage was inflicted upon new development surrounding the intersection of Interstates 55 and 20. Up to fourteen feet of water inundated major public and private

investments in this area - the Mississippi Coliseum (also a casualty in 1961), Ramada Inn, Motel Six, the State Fairgrounds, the Trailways Bus Station, and many other highway-oriented businesses. The highways themselves were closed by a considerable expanse of flooding. Cultural facilities were damaged, including the Mississippi Art Museum, a new planetarium, and the Natural History Museum. Even businesses long established on higher ground such as the Jackson "Daily News" received serious basement flooding.

Residential flooding was concentrated in northeastern Jackson where some of the City's most expensive homes are located. Floodplain encroachment by luxury homes and apartment developments has occurred here despite inundation of much of the area in Jackson's flood of record 21 December 1961.

Additional residential flooding occurred in southeastern Jackson and in tributary ravines throughout the City. The latter received flood waters from two sources. First they experienced flash flooding from heavy rainfall on 11-12 April. Later they received backwatering from the rising waters of the Pearl on 15-18 April. In addition to property damage, tributary flooding substantially impaired communications throughout the City due to blockage of local streets and arteries.

A great potential threat to Jackson's health and safety was the near collapse of its vital public services: electrical, water supply, sewage treatment, gas and telephone. All of these services were gravely affected by rising floodwaters. The sewage treatment plant was entirely disabled and discharged raw sewage into the floodwaters for several days. The water treatment plant was narrowly saved by an improvised dike. Three electrical substations were flooded out. The loss of two others which would have caused a major blackout was averted through heroic sandbagging efforts. Gas and telephone services were understandably disrupted in flood areas but maintained for the rest of the City.

Altogether 20 per cent of the land

VOLUME 5, NUMBER 1, FEBRUARY 1980

area of Jackson was flooded, some of it for more than a week. Two children lost their lives. Seventeen thousand persons were evacuated from their homes. About 2,000 dwellings were damaged by flooding, 800 of them substantially. Preliminary damage estimates for Jackson placed total damage to public and private property at \$500 million. This does not account for the costs of emergency services such as sandbagging, the psychic costs incurred by flood victims, or the loss of income to local businesses. Nor does it include further losses outside Jackson caused by the same flood. Only a minute portion of these losses will be compensated by flood insurance. The City of Jackson has been in the "emergency phase" of the National Flood Insurance Program for three years and is due to qualify for the "regular phase" in January 1980. One thousand four hundred policies have been purchased by Jackson property owners but these are at the low levels of coverage allowed in the "emergency phase".

4. PRELIMINARY FINDINGS AND OBSERVATIONS

It is of course premature to state definite findings and recommendations. These will be made in the final report following further field work and data assembly in Jackson. However, the writer as eyewitness to the Jackson Flood formed some strong impressions during the event itself. These are briefly noted below.

5. UNRELIABILITY OF ROSS BARNETT DAM

It is probable that much of the floodplain development that has occurred in Jackson since 1965 has been predicated upon the existence of the Ross Barnett Dam completed in that year. This dam however may have exacerbated rather than relieved the flood situation in April, 1979. Furthermore, if the dam had failed, as happened in Rapid City, SD in 1972, a massive wall of water would have been released upon Jackson and other downstream communities.

Ross Barnett Dam is an earthen structure three miles long and fifty feet high, at the northeastern edge

NATIONAL WEATHER DIGEST

of the City of Jackson. It was designed, constructed and has since been operated by the Pearl River Valley Supply District, a state-created instrumentality. No federal money or supervision has been involved in its construction or maintenance.

Ross Barnett was not designed to provide flood control although that is a purpose stated in its authorizing legislation. It was designed primarily to afford a dependable water supply to Jackson and to create recreational opportunities. Its 75-mile shoreline is extensively developed with year-round and seasonal homes and water-orientated commercial activities. To accommodate these uses, the pool is maintained at a constant level of 295 feet above mean sea level (a depth of about 45 feet).

Since the spillway elevation of the dam is 300 feet mean sea level, this leaves only five feet to accommodate excess runoff. The level of the reservoir on April 15 reached 299.79 feet, which required rapid discharge (up to 130,000 cubic feet per second as compared with a normal rate of 9,200 cubic feet per second) to prevent overtopping. The question naturally arises as to whether the District took timely action to lower the level of the pool reservoir to accommodate approaching floodwaters. If the 350,000 acre-feet normally stored in the pool could have been substantially discharged before the upstream floodwaters arrived on April 15, flooding in Jackson would have occurred earlier but would not have reached the record level of 43.2 feet.

An even more dire question concerns the potential failure of the dam itself. This would not necessarily have resulted from overtopping since the dam is designed for emergency drawdown of pool elevation by ten feet (which did not in fact occur). However at least one "boil" or leak was discovered on the downstream side of the dam during the flood. This was quickly plugged but it indicated that the stress limits of the dam were being approached. The Chief of the Corps of Engineers Mobile District Office denied publicly that this leak signified an imminent failure of the dam.

Ironically, a rapid reduction in water levels against the dam and levees could itself have caused them to collapse. According to Eugene Thomas, consultant to the Water Supply District, a sudden withdrawal of hydrostatic pressure against a saturated earthen structure could produce such a failure. The District therefore had to time its releases so as to balance the threat of overtopping the dam and levees against the threat of too-rapid reduction of water levels. This could cause the dam and levees to dissolve (Jackson Daily News, 16 April 1979).

It is recommended that an official investigation review the condition and performance of Ross Barnett Dam before and during the flood of April 1979. The dam is located virtually on top of an urban area of a half million people; its integrity is obviously imperative. Furthermore, the operation of the dam with regard to the timing and rate of discharge should be carefully examined. The experience of Jackson should serve as a warning to communities elsewhere not to rely on structures of this kind (i.e. earthen dams) for flood protection.

6. WERE THE LEVEES NEEDED?

Experience with the Pearl River levees raises some additional questions. These structures extend two miles on the Jackson side, and 13 miles on the Flowood-Pearl City side. They were constructed by the Army Corps of Engineers to accommodate a flood stage of 40.5 feet, with a three-foot freeboard. Since their completion in 1967, they have been operated and maintained by the Rankin-Hinds Flood Drainage Control District.

But what of the property they were intended to protect? Areas behind the levee in Jackson were flooded as though the levee never existed. This resulted from inflow through a low point where the levee meets Interstate 55. On the opposite side, the Flowood-Pearl City levee was more successful in protecting landward areas from flooding. But much of this land was sparsely developed.

The river was denied access to 4,500 acres of natural floodplain, so the crest elevation and therefore the level of damage on the west (Jackson) side was increased. This presents an example of intergovernmental conflict, because the Pearl river is an inter-jurisdictional boundary.

Finally, it is possible that the manpower and resources devoted to the expensive and dangerous campaign to save the levees might have been better used elsewhere; e.g. in evacuating buildings and removing property from the reach of flood waters. It would appear that the levees became part of the problem rather than of the solution.

7. FLOOD WARNING: A CONVENIENT SCAPEGOAT?

With the gradual subsidence of floodwaters following the crest on 16 April, the media expressed a general outcry that the public had been inadequately warned about the height, timing, and duration of flood levels. For instance, Jackson Mayor Dale Danks was quoted in the New York Times on 19 April as criticizing the National Weather Service and the Army Corps of Engineers for failure to provide enough warning to permit people to remove belongings from homes and businesses.

To investigate this allegation, the writer obtained copies of the Jackson Daily News beginning with the issue of 12 April. On that day, a front-page article stated:

"The National Weather Service said the worst is yet to come. Flooding will increase as water continues to rise above normal river levels."

And on Friday, 13 April:

"By Easter, the Pearl River is predicted to reach an all-time high, pouring water into low-lying areas of the city that haven't seen flood waters in decades.

VOLUME 5, NUMBER 1, FEBRUARY 1980

"At 11 a.m. today the river had reached a threatening level of 35 feet. Officials at Ross Barnett Reservoir say upstate rains have not even begun to filter into the Jackson portion of the river."

It is true that the level of the ultimate flood crest was underestimated by several feet, partly due to the unknown rate at which water would be released from Ross Barnett. But it would appear that the criticism of inadequate warning was unfounded. Rather, the city by 12 April was already experiencing flash floods unrelated to the eventual Pearl River crest. This confused the situation. Further, there appears to have been little preparation on the part of the city to translate warnings of "record flooding" into specific evacuation plans for affected areas of the city until the waters were actually rising. The lack of such planning is in turn related to Jackson's failure to deter new development from being located in the floodplain in the first place.

8. VITAL SERVICES: JACKSON'S ACHILLES HEEL

Once the flood was in progress, the response of the city, county, state and federal authorities in coping with the emergency was exemplary. Nowhere was this more evident than in the heroic efforts to save the city's vital public services, particularly its water supply and electrical service. These required construction of emergency dikes and round-the-clock repair activities to protect and restore affected facilities. The water treatment plant was saved although the city's total water supply was cut in half during the crisis. Five of Jackson's 42 substations were flooded out or closed down. The Jefferson Street substation, serving the downtown business district, was protected by a massive dike-building effort. The city's \$50-million sewage treatment

NATIONAL WEATHER DIGEST

plant, however, was flooded out, and discharged raw sewage directly into the floodwaters. Telephone and gas services were maintained throughout most of the non-flooded areas.

However: it is apparent that the possibility of flooding was not considered in locating many of Jackson's vital service facilities. Shutdown of water and electrical service (which was narrowly averted) would have crippled the entire city, not just the flooded areas.

9. ASSOCIATED HAZARDS

The danger of drowning, while by no means unimportant, is but one of many hazards to human safety arising in the midst of a flood. For the record, this observer noted the following sources of real danger from the rising floodwaters to the unfortunate residents of Jackson:

Contamination of public and private water supplies

Electrocution from downed power lines

Snakes and vermin

Looting of structures and vehicles

Traffic accidents due to overcrowded streets and malfunction of traffic-control equipment

Aviation accidents due to overcrowded airspace

Boating accidents

Spoilage of food in homes and stores without electrical power

Collapse of structures from water damage

Exhaustion and emotional trauma

Luckily, these did not all materialize; but most were the

subject of public warnings.

10. THE NEED FOR FLOODPLAIN MANAGEMENT

At a press briefing on 18 April, the Governor of Mississippi asked an officer of the Corps of Engineers how this kind of disaster could be prevented from occurring again. The answer was "higher levees, if economically justified." Jackson's experience, however, is a sad commentary on the effectiveness of structures to protect urban communities from flood losses. It is apparent that most of the damaged structures have been built on the floodplain since the last flood of record, in 1961. It is no coincidence that Ross Barnett Dam and the Pearl River Levees were completed just in time for the wave of building on the floodplain. The very existence of flood-control structures invites unwise development in the "protected" floodplain. When a flood exceeds the design limits of the structures, catastrophic losses occur which may exceed the total of minor losses that would otherwise have happened in an unprotected but less developed floodplain. Preliminary observation suggests that this is exactly the case in Jackson.

The Jackson experience thus underscores the necessity of floodplain management, with or without flood control structures. Floodplain management involves a range of adjustments: floodplain zoning, building restrictions, land acquisition and relocation, and emergency evacuation planning. Section 406 of the Federal Disaster Relief Act of 1974, and the National Flood Insurance Act of 1968 as amended, require these and related measures to be applied by communities receiving federal disaster assistance and flood insurance. The implementation of this policy should be first priority in the planning of post-flood recovery in Jackson, Mississippi.

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