

# **RECORD HIGH RAINFALL IN MISSISSIPPI DURING THE PERIOD OF DECEMBER 1990 THROUGH MAY 1991**

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## **Introduction**

Severe weather patterns occur in Mississippi during the winter and spring months. The development of these weather patterns, which result in heavy rainfall, is largely due to the proximity of the Gulf of Mexico, a source of moisture (NOAA). However, the period of December 1990 through May 1991 was unusual in the magnitude as well as the extensive area over which these storm systems occurred. It is ironic that persistent upper level weather patterns that inundate part of the country, like the deep south, can result in drought conditions across other sections of the country.

From December 1990 through May 1991 Mississippi was devastated by severe flooding which was a result of torrential rainfall events, particularly in the northern half of the state. According to the National Oceanic Atmospheric Administration (NOAA) several rainfall reporting stations recorded record breaking rainfall amounts during this period, and several rivers and streams reached record breaking high stages causing extensive flooding.

## **Purpose and Scope**

Flooding problems continue to plague the floodplains of river basins in most areas of the state, even though numerous flood control and flood prevention measures have been installed by federal, state, and the private sector. This paper illustrates just how vulnerable Mississippi is to the unusual and persistent weather patterns that caused the widespread and extensive rainfall events in the state between December 1990 and May 1991.

### December 1990

In December of 1990 monthly rainfall totals over the southern third of the state were normal to slightly above normal, while the remainder of the state rainfall totals were much above normal. The Tennessee-Tombigbee River Basin in the Northeast portion of the state and the Yazoo River Basin in the North Central

and Northwest regions was heavily inundated with rainfall over 200% of normal (NOAA) (Figure 1).

According to NOAA, in December several rainfall reporting stations in the Tennessee-Tombigbee River Basin recorded rainfall amounts greater than any monthly totals since records began. Some of these stations are: (Figure 1)

Fulton in Itawamba County, 20.34 inches, 14.69 inches above normal.

Van Fleet in Chickasaw County, 19.59 inches, over 14 inches above normal.

Houston in Chickasaw County, 18.24 inches, almost 13 inches above normal.

Torrential rains, in association with a severe and persistent weather pattern during December 22 and 23, 1990, produced an average of almost 12 inches over the northern half of Mississippi (NOAA) (Figure 1). The rainfall during this 48 hour period accounted for approximately 60 percent of the total rainfall for the month of December 1990 in this portion of the state. Saturated ground from previous rains earlier in the month combined with this rainfall to produce near record high stages on the Tombigbee River from Fulton to Columbus. The river crested at a stage of 1.0 to 1.5 feet below the flood of record set in 1973 and according to the U. S. Army Corps Of Engineers, Mobile District, (USACE), several hundred residents were evacuated and several homes, businesses, roads, and bridges sustained major flood damages.

Most of the rivers in the Yazoo, Pearl, and Big Black River Basins also exceeded flood stages but only caused minor low land and agricultural flooding (NOAA).

### January 1991

During January 1991, the state got a reprieve from the persistent weather patterns that plagued it during December of 1990. In January the northern two thirds

of the state experienced below normal rainfall which allowed some floodwaters in the area to recede to an acceptable level (NOAA). The southern one third of Mississippi received above normal rainfall for this month (NOAA), but no major flooding occurred. Average rainfall statewide was 7 percent above normal for January (NOAA).

#### February 1991

Heavy rainfall, averaging over 10 inches, occurred again over the northern half of the state during the month of February 1991 (NOAA). Several rainfall reporting stations operated and maintained by NOAA exceeded their previous monthly totals for February (Figure 2). Some of these stations are as follows:

##### In the Yazoo River Basin

Lambert in Quitman County, 14.37 inches, 8.5 inches above normal.

University in Lafayette County, 13.24 inches, 8.5 inches above normal.

Greenville in Washington County, 13.24 inches, 8.7 inches above normal.

Enid Dam in Yalobusha County, 12.81 inches, 8.2 inches above normal.

Batesville in Panola County, 12.61 inches, 7.8 inches above normal.

Clarksdale in Coahoma County, 12.32 inches, 7.6 inches above normal (NOAA)

Swan Lake in Tallahatchie County, 12.86 inches, 7.7 inches above normal.

Cleveland in Bolivar County, 12.98 inches, 7.7 inches above normal.

##### In the Tennessee-Tombigbee River Basin

Fulton in Itawamba County, 12.42 inches, 7.6 inches above normal

A severe weather pattern over north Mississippi during the five day period from February 17 to 22, produced rainfall amounts that accounted for 80 to 90 % of the record high rainfall in the month of February 1991 (NOAA) (Figure 2).

Major flooding occurred in the Tennessee-Tombigbee and Yazoo River Basins. Nearly every river and

stream in the basins exceeded bankfull stage and flooded during February. According to the U. S. Army Corps of Engineers (USACE), over 1.2 million acres of land were estimated to be under water, over three hundred homes were affected, and numerous roads and bridges were damaged.

Some of the worst flooding occurred in the Delta area of the Yazoo River Basin due to the flat terrain and poor drainage. The Big Sunflower River at Sunflower, Mississippi, crested at a stage of 27.97 feet on the gage on February 24 1991 (ACOE). This crest was almost 7 feet above flood stage and only 0.4 of a foot lower than the maximum stage of record, 28.37 feet which occurred on March 3, 1973 (ACOE). The Bogue Phalia, a tributary of the Big Sunflower River, also in the Delta, reached a new record high stage of 28.8 feet on the gage (USACE). This crest was almost 7 feet above flood stage and exceeded the previous record crest of 28.5 feet which occurred in 1973 (USACE).

Also, flooding in the lower Yazoo Basin was aggravated by high stages on the Mississippi River which caused a back-water effect in the Yazoo River at Vicksburg and slowed the drainage of that portion of the basin.

#### MARCH 1991

In March, after experiencing record breaking rainfall over some areas of the state in February, we got another reprieve from the severe weather patterns. According to NOAA, the rainfall in March, statewide, averaged 97% of normal.

#### APRIL 1991

The month of April 1991 was one of the wettest months on record over the entire state of Mississippi. According to rainfall data furnished by NOAA, the state as a whole had an incredible average of almost 15 inches, about 300% of the normal rainfall for the month. The actual rainfall totals ranged from 6.5 inches at Merrill in the Southeast Region to a record breaking 22.78 inches at Rolling Fork in the Delta area. The 6.5 to 10 inch totals over the southeastern portion of the state represented "the dry area." (NOAA) (Figure 3)

The excessive rainfall during April cannot be blamed on the intensity of one individual storm. Instead, the cause was the ceaseless cycle of one storm system after another (NOAA).

In April of 1991 eighteen rainfall reporting stations, mostly in the Yazoo River Basin, recorded the record high monthly totals of all-time, with records dating back to 1897 (NOAA). These record rainfall totals ranged from 15 inches at Lake Cormorant in DeSoto County (NOAA) to almost 23 inches at Rolling Fork in Sharkey County (NOAA). April rainfall totals at some of the stations include (Figure 3)(Table 1):

Arkabutla Dam in DeSoto County, 17.88 inches, 12 inches above normal

Hernando in DeSoto County, 18.02 inches, almost 13 inches above normal

Holly Springs in Marshall County, 18.13 inches, 11.6 inches above normal

Lake Cormorant in DeSoto County, 15.04 inches, almost 10 inches above normal

Lambert in Quitman County, 18.39 inches, over 12 inches above normal

Lexington in Holmes County, 15.81 inches, 10 inches above normal

Mt. Pleasant in Benton County, 16.83 inches, over 11 inches above normal

Pleasant Hill in DeSoto County, 16.61 inches, almost 10 inches above normal

Rolling Fork in Sharkey County, 22.78 inches, over 17 inches above normal

Sardis Dam in Panola County, 17.27 inches, almost 12 inches above normal

Senatobia in Tate County, 16.69 inches, over 11 inches above normal

Sledge in Quitman County, 19.06 inches, over 13 inches above normal

In addition to these eighteen stations where record high rainfall amounts were reported in April 1991, fifty-six rainfall reporting stations recorded record high totals for the month of April (NOAA). Once again, most of these stations were located in the Yazoo River Basin (Table 1).

Major flooding occurred in all of the river basins in the state due to the record high rainfall in April. The Yazoo River Basin, in particular, was affected. According to the U. S. Army Corps of Engineers,

Vicksburg District (USACE), the record high rainfall produced nineteen (19) new maximum record stages in the Yazoo, Tallahatchie, Coldwater, and Big Sunflower Rivers. These stages of record exceeded the old records established during the floods of 1973 and 1982-1983.

All of the large flood control reservoirs constructed by the Corps of Engineers in the Yazoo River Basin (Arkabutla, Sardis, Enid, and Grenada) had discharge through the emergency spillways during the month of April. This is only the second time in the history of their operation that all four lakes had emergency spillway flow during the same period (USACE). The first time this occurred was during the flood of 1973. Three of the reservoirs, Arkabutla, Enid, and Grenada, set new record high levels in the lakes (USACE) and also record high discharges. The duration of continuous emergency spillway flow at the four reservoirs lasted for a record 72 to 77 consecutive days during April, May, June, and July 1991 (USACE).

The flooding in the Yazoo and Big Sunflower Basins lasted through the month of June. The Yazoo River at Greenwood, Mississippi, remained above flood stage for forty-eight days, and the Big Sunflower River at Hollandale, Mississippi, exceeded its flood stage for forty-three days during April and May (USACE). According to the U.S. Army Corps of Engineers, Vicksburg District, at the height of the flooding there were about 1.8 million acres of land flooded in the Delta.

#### May 1991

The month of May 1991 was also one of the wettest months of all times in Mississippi. Normal rainfall for May ranges from 3.8 to 5.8 inches over the state (NOAA). However, in May of 1991 the entire state had actual rainfall totals averaging over 10 inches (NOAA). The actual rainfall ranged from 5.88 inches at Clarksdale in the Yazoo Basin to a record shattering 23.36 inches at Guntown in the Tennessee-Tombigbee River Basin. The rainfall over the northeast region averaged over 17 inches. The 6 to 9 inch totals received over the western third of the state represented the "dry area" (NOAA). Five rainfall reporting stations recorded record high totals, mostly in the Tennessee-Tombigbee River Basin in the northeast portion of the state, and include (NOAA) (Figure 4)(Table 3):

Guntown in Lee County, 23.36 inches, over 18 inches above normal

Booneville in Prentiss County, 22.34 inches, over 17 inches above normal

Corinth in Alcorn County, 18.39 inches, almost 14 inches above normal

Fulton in Itawamba County, 21.35 inches, over 16 inches above normal

Merrill in Stone County, 20.38 inches, over 15 inches above normal

In addition to these five record breaking stations, twenty-two rainfall reporting stations set new record high totals for the month of May (NOAA) (Table 3).

According to NOAA, the weather pattern for May was similar to April, with persistent low-level southerly winds providing abundant moisture from the Gulf of Mexico. As in April, it was not necessarily the intensity of any individual storm system but the ceaseless cycle of storm systems. However, a strong storm system did occur between May 25-27. During this 48 hour period, 8 to 12 inches of rainfall fell over the Tennessee-Tombigbee River Basin in the northeast portion of the state (Figure 4). This event caused major flooding in the Tombigbee River from Fulton to Columbus where near record stages were reached on the river at several gages (USACE)

While the heaviest rainfall in May occurred over the northeast portion of the state, where an incredible average of over 17 inches fell in the Tennessee-Tombigbee River Basin, about 8 inches fell in the northwest and north central regions of the state, in the Yazoo River Basin. With rivers in the Yazoo Basin above flood stage and with record high discharges through the emergency spillways at three of the four Corps lakes and near record high discharge from the other Corps lakes, the storm system, that dropped almost 17 inches of rainfall in the Tennessee-Tombigbee Basin, would have caused catastrophic results if it had been centered 60 to 70 miles to the west in the upper Yazoo Basin.

## Conclusion

In conclusion, the six month period between December 1990 and May 1991 will probably be remembered a long time. Record high rainfall amounts that fell over several areas of the state resulted in record high stages on several rivers causing major flooding. The rainfall reporting stations at Fulton and Houston in the Tennessee-Tombigbee River Basin recorded a total almost 79 inches and 73 inches, respectively, during the six month period. These totals were 45 and 40 inches above normal for that period (NOAA). In the Yazoo River Basin, the rainfall reporting stations at Arkabutla Dam and Clarksdale recorded about 55 inches during the six month period. These rainfall totals were 25 to 28 inches above normal.

Flood control and flood prevention measures installed by federal and state agencies and the private sector over the state have prevented untold millions of dollars in damages to commercial, residential, agriculture, roads, and bridges. However, it would not be feasible to design and construct the structural measures necessary to provide for complete protection from flood damages that occurred in Mississippi from the record breaking rainfall storm events experienced during the six month period from December 1990 through May 1991.

## References

- U. S. Department of Commerce, National Oceanic and Atmospheric Administration, 1990-1991. Monthly precipitation data, William Thompson.
- U. S. Army Corps of Engineers, Vicksburg District. Stages and discharges. Open File, unpublished.
- U. S. Army Corps of Engineers, Vicksburg District. After Action Report, Flood Of April-June 1991, Ouachita/Black Rivers and Red River and Yazoo River Basins.
- U. S. Army Corps of Engineers, Mobile District. Stages and discharges. Open File, unpublished.

# Tables

TABLE 1. PRECIPITATION DATA FOR APRIL 1991

## All-Time Record Monthly Rainfall

| Location      | Rainfall (Inches) | Location       | Rainfall (inches) |
|---------------|-------------------|----------------|-------------------|
| Arkabutla Dam | 17.88             | Forest         | 15.91             |
| Hernando      | 18.02             | Holly Springs  | 18.13             |
| Kosciusko     | 18.34             | Lake Cormorant | 15.04             |
| Lambert       | 18.39             | Lexington      | 15.81             |
| Mt. Pleasant  | 16.83             | Newton         | 15.38             |
| Oakley        | 17.54             | Port Gibson    | 17.30             |
| Pleasant Hill | 16.61             | Rockport       | 18.54             |
| Rolling Fork  | 22.78             | Sardis Dam     | 17.27             |
| Senatobia     | 16.69             | Sledge         | 19.06             |

## Record High Rainfall For The Month Of April

| Location           | Rainfall (Inches) | Location        | Rainfall (Inches) |
|--------------------|-------------------|-----------------|-------------------|
| Abbeville          | 15.40             | Aberdeen L&D    | 16.82             |
| Ashland            | 14.47             | Batesville      | 16.23             |
| Belzoni            | 15.71             | Brookhaven      | 18.31             |
| Bruce              | 18.55             | Calhoun City    | 18.74             |
| Carrollton         | 16.84             | Charleston      | 18.39             |
| Clarksdale         | 17.94             | Cleveland       | 16.93             |
| Coffeeville        | 16.69             | D'Lo            | 15.46             |
| Edinburg           | 15.49             | Elliot          | 16.22             |
| Enid Dam           | 18.04             | Eupora          | 14.55             |
| Fulton             | 14.40             | Grenada         | 16.75             |
| Hickory Flat       | 13.29             | Houston         | 16.16             |
| Jackson            | 15.95             | Lafayette Sprgs | 16.18             |
| Moorhead           | 17.37             | New Albany      | 13.98             |
| Ofahoma            | 15.72             | Philadelphia    | 15.42             |
| Pontotoc           | 15.68             | Sarah           | 18.55             |
| Swan Lake          | 17.58             | University      | 18.46             |
| Vaiden             | 15.58             | Van Fleet       | 13.80             |
| Vicksburg Mil Park | 14.56             | Walnut Grove    | 15.88             |
| Water Valley       | 16.21             | White Oak       | 14.22             |

TABLE 2. PRECIPITATION DATA FOR MAY 1991

## All-Time Record Monthly Rainfall

| Location   | Rainfall (inches) | Location | Rainfall (Inches) |
|------------|-------------------|----------|-------------------|
| Booneville | 22.34             | Corinth  | 18.39             |
| Fulton     | 21.35             | Guntown  | 23.36             |
| Merrill    | 20.38             |          |                   |

## Record High Rainfall For The Month Of May

| Location     | Rainfall (Inches) | Location        | Rainfall (Inches) |
|--------------|-------------------|-----------------|-------------------|
| Buckatunna   | 15.88             | Collins         | 11.76             |
| Columbia     | 13.31             | Crandall        | 14.15             |
| D'Lo         | 11.62             | Eupora          | 14.67             |
| Gholson      | 8.80              | Guntown         | 23.36             |
| Hattiesburg  | 11.24             | Houston         | 16.84             |
| Kipling      | 10.96             | Lafayette Sprgs | 12.90             |
| Laurel       | 11.38             | Ofahoma         | 8.44              |
| Philadelphia | 13.87             | Pontotoc        | 18.99             |
| Van Fleet    | 16.02             | Walnut Grove    | 11.75             |

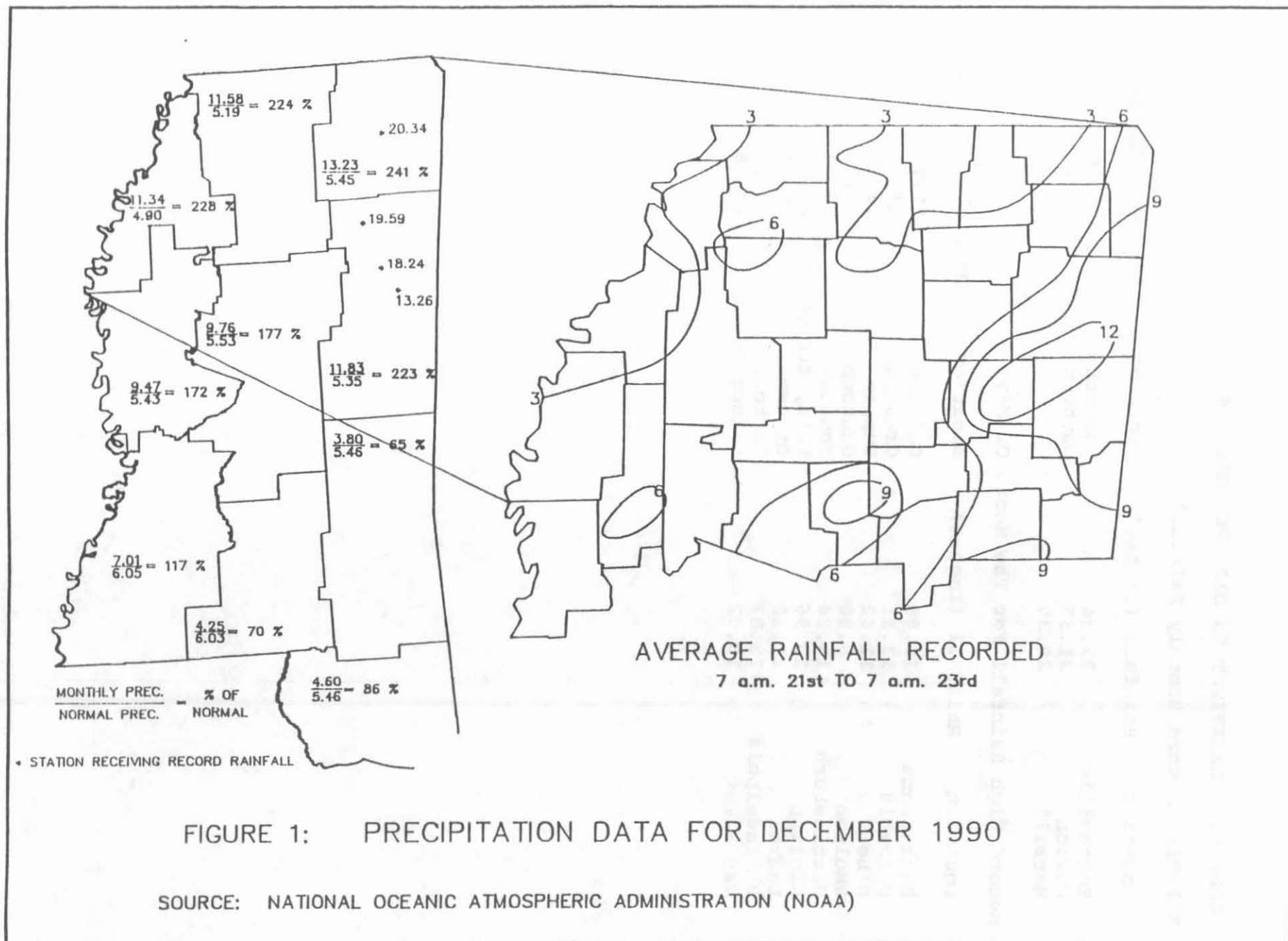


FIGURE 1: PRECIPITATION DATA FOR DECEMBER 1990

SOURCE: NATIONAL OCEANIC ATMOSPHERIC ADMINISTRATION (NOAA)

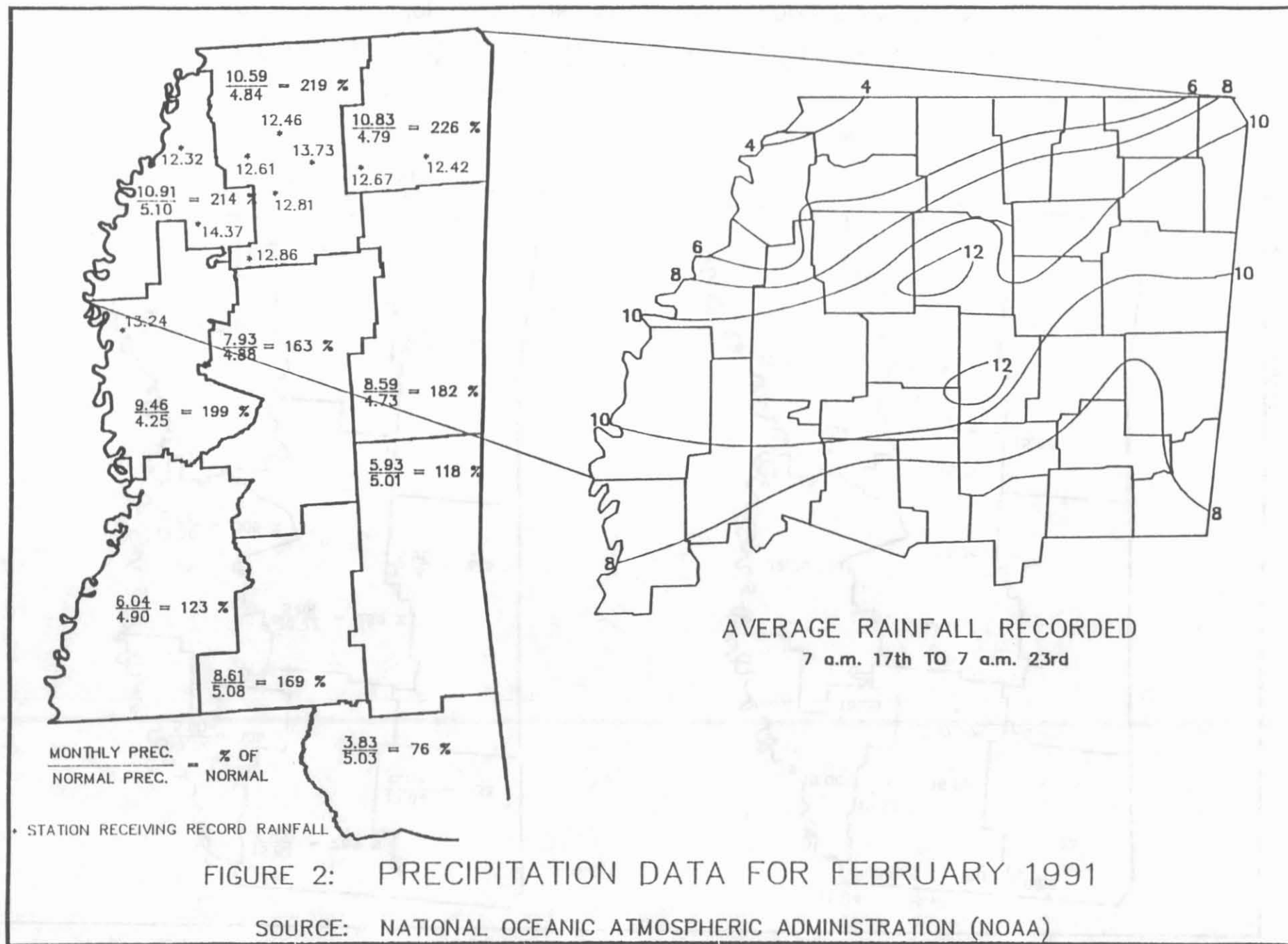


FIGURE 2: PRECIPITATION DATA FOR FEBRUARY 1991

SOURCE: NATIONAL OCEANIC ATMOSPHERIC ADMINISTRATION (NOAA)

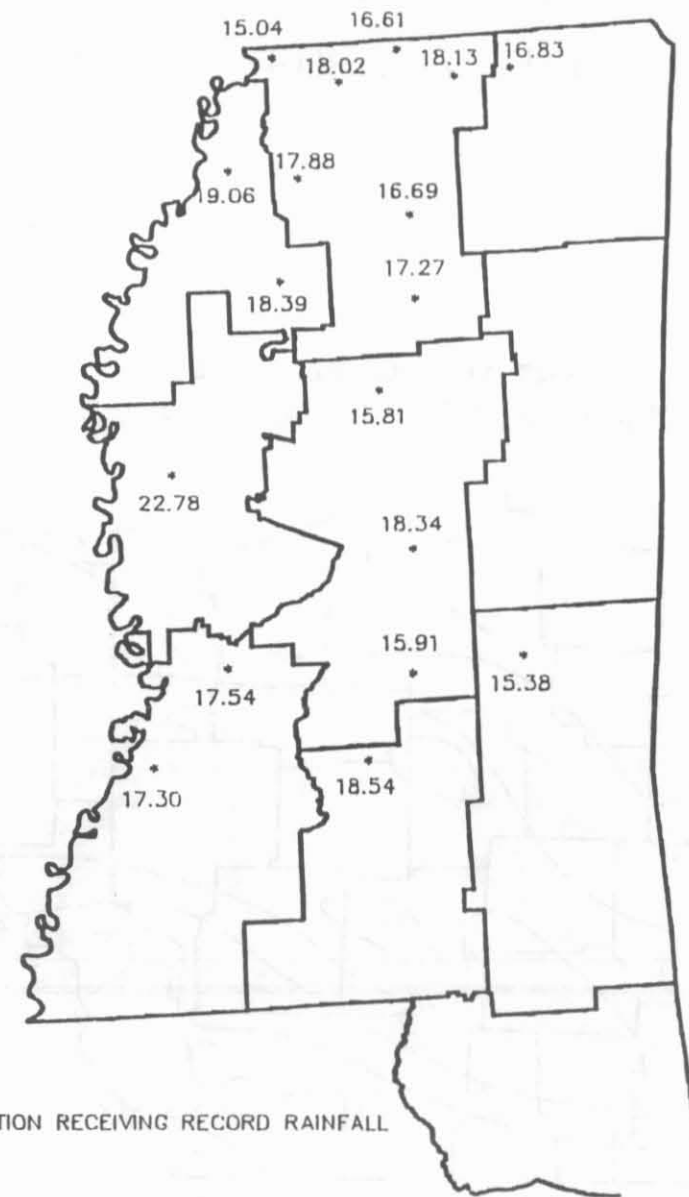
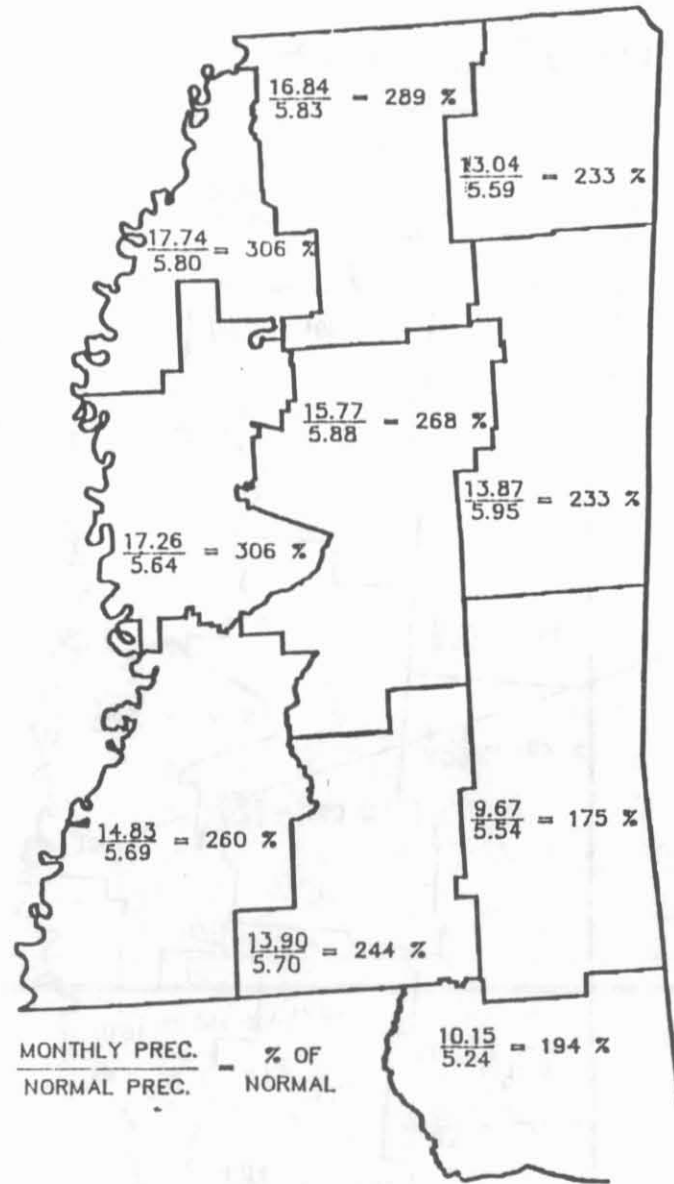


FIGURE 3: PRECIPITATION DATA FOR APRIL 1991

SOURCE: NATIONAL OCEANIC ATMOSPHERIC ADMINISTRATION (NOAA)

