THE EFFECTS OF RECORD HIGH MEAN MONTHLY STREAMFLOWS IN SELECTED STREAMS IN NORTH MISSISSIPPI IN 1989

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Introduction

Mississippi is no stranger to extremes in water-related problems. After three years of severe drought conditions in many areas of the state in 1986-87-88, in 1989 the rains came. 1989 will be remembered by Mississippi row crop producers will remember 1989 as the year that above normal rainfall washed away seed, soil, and profit.The year will also be remembered for lowering farm production value of Mississippi agriculture in excess of $100,000,000 (MCES 1989). Cotton, soybeans and food grains all suffered greatly from weather-related losses.

The year, 1989, had storm events of heavy rainfall occurring well into June and July resulting in delayed land preparation and heavy damages to crops already planted. Some fields were never planted as lands were still flooded and did not dry out until it was too late to make a crop.

Purpose and Scope

Flooding problems continue to plague the agricultural sectors in many parts of the state even though numerous flood control projects have been installed.

This paper analyzes the effects of the record high mean monthly streamflows experienced in selected streams in northern Mississippi during May through July 1989, due to the excessive rainfall occurring during this period. The streams on which the data are submitted are: Big Sunflower River ; Coldwater-Tallahatchie Rivers in the Delta area; and Big Black River.

Big Sunflower River

Big Sunflower River heads up in the northern part of the Mississippi Delta. The river flows in a southerly direction, through prime agricultural lands, to its confluence with the Yazoo River in Sharkey County in the southern part of the Delta. The drainage area of the Big Sunflower River and its tributaries is approximately 4,100 square miles and drains the western two thirds of the Delta.

Rainfall measured in the Upper Delta Region, as reported by the National Weather Service, during the period of January through July 1989, totalled over 56 inches (NOAA 1989). This was more than is normally received in this area in a years time. The rainfall received in the three month period of May through July was 16.5 inches above normal. The Clarksdale rainfall reporting station recorded actual rainfall amounts in excess of 60 inches during the period January through July, and during the period May through July, rainfall was more than 21 inches above normal. The excessive rainfall that occurred in this Region resulted in record high mean monthly streamflows in the Big Sunflower River and caused severe flooding (NOAA 1989) (Figure 1).

Streamflows in the river were monitored at the gaging station at Sunflower, MS. The mean flow for the month of June 1989 was 3,983 cubic feet per second, the second highest mean flow on record for the month of June. This streamflow compares to 810 cubic feet per second which is the normal mean flow for the month of June for the period of record. Streamflow records date back to 1935 (ACOE 1989) (Table 1).

The mean flow for the month of July 1989 on the Big Sunflower River at Sunflower, MS was 7,237 cubic feet per second, the highest mean flow ever recorded at this station, not only for July, but for any month for the period of record. The normal mean monthly flow for July is 700 cubic feet per second based on the period of record. The discharge at flood stage at Sunflower is 5,900 cubic feet per second. The record high mean monthly flow of 7,237 cubic feet per second experienced in July 1989 was more than 2 feet above flood stage (ACOE 1989) (Table 1).

During the other extreme in water-related problems in the Big Sunflower River Basin, as referred to in the Introduction, the Commission on Environmental Quality issued orders in May 1988 prohibiting farmers from withdrawing water from five streams in the Big Sunflower River Basin in the Delta for irrigation purposes because streamflows were below the established minimum due to lack of rainfall in the area. Big Sunflower River was one of those five streams where such orders were issued.

The highwaters of 1989 caused devastating damages to the agricultural community in the Big Sunflower River Basin in the Delta. An estimated 31,000 acres of cotton and 167,000 acres of soybeans were lost to production (ASCS 1989).

Yazoo-Tallahatchie-Coldwater Rivers Delta Area

The Tallahatchie and Coldwater Rivers make up the principal drainage system of the eastern part of the Mississippi Delta north of Greenwood, MS.

Four flood control dams were constructed in the 1940's and 1950's by the Army Corps of Engineers, Vicksburg District. The dams were built in the hills above the alluvial plain to control rainfall run-off and thereby provide flood protection to the Delta area. The four lakes, Arkabutla, Sardis, Enid, and Grenada lakes combine to provide 3.8 million acre-feet of floodwater storage.

According to Corps Of Engineers reports, the reservoirs have controlled run-off from the hills to the extent that the remaining uncontrolled run-off could be handled by a system of levees and channels planned by the Corps of Engineers in the several proposed projects.

The lakes were designed for and are operated to maximize flood control benefits while taking into consideration other water resources purposes such as recreation, fish, wildlife, and others but not at the expense of the primary purpose, flood control.

Rainfall in the Upper Delta and North Central Regions was so excessive during the period, January through July 1989, that the eastern portion of the Delta area, north of Greenwood, suffered extensive damages due to flooding. Rainfall in the North Central Region, which is the drainage basin for the four Corps dams, recorded more than 16 inches above normal during the period of May through July (NOAA 1989). The rainfall reporting station at Lambert, MS which is in the Coldwater - Tallahatchie Rivers Basin in the Delta, recorded more than 26 inches above normal for the three month period of May through July (NOAA 1989) (Figure 2)

To help relieve flooding in the Delta, the gates of the 4 reservoirs were closed to store all of the run-off from rainfall over the drainage area above the reservoirs. At times, the gates remained closed for as long as 20 or more consecutive days. The flood storage capacity of the reservoirs were practically exhausted as the water levels came to within one half an inch of activating the emergency spillways in 3 of the 4 reservoirs. At the northern most structure, Arkabutla reservoir, at the northern most structure, had water flowing over the emergency spillway for 30 consecutive days, July 3 to August 3, at its peak water flowing 2.7 feet deep in the emergency spillway and discharging 4,000 cubic feet per second into the Coldwater River (ACOE 1989)

Even with the 4 Corps of Engineers reservoirs operating at maximum flood control conditions, according to estimates made by the Agricultural Stabilization Conservation Service, the crops lost due to flooding in 1989 included 9,600 acres of cotton, 300 acres of rice, and over 200,000 acres of soybeans.

Big Black River

The Big Black River heads up in the central part of Mississippi and flows in a southwesterly direction to its confluence with the Mississippi River below Vicksburg, MS.

Rainfall in the Central Region of the National Weather Service's statewide network of rainfall reporting stations was excessive during the period January through July 1989. During the 3 month period of May through July, over 11 inches above normal rainfall were reported in the drainage basin of the Big Black River (NOAA 1989) (Figure 3).

Streamflows were monitored at the streamflow gaging station at West, MS. The gage is operated and maintained by the United States Geological Survey with records dating back to 1935. The run-off from the excessive rainfall resulted in record high mean monthly streamflows. In May 1989, the mean flow for the month was 2,940 cubic feet per second, which was the third highest mean flow for the month of May on record. The normal mean flow in May is 1,100 cubic feet per second, based on the period of record (USGS 1989) (Figure 3).

The mean monthly flow for June 1989 was 5,310 cubic feet per second. This set a new record high mean flow for the month of June. The normal streamflow in June, based on the period of record, is 510 cubic feet per second (USGS 1989) (Table 2).

Based on flows for the period of record, the normal mean flow for the month of July is 235 cubic feet per second. In July 1989, the mean monthly flow was 3,220 cubic feet per second, which is also a new record high mean flow for this month (USGS 1989) (Table 2).

The flooding of agricultural lands, as a result of the run-off from excessive rainfall over the drainage basin, caused delays in land preparation and, in many locations, the loss of crops and fields having to be replanted. According to the Agricultural Stabilization Conservation Service, over 300 acres of cotton in Attala County alone were lost due to flooding.

The cool weather we had in April and May over the entire state only added more misery and problems for the farmer. Planting was delayed, temperatures were running 8-10 degrees below normal during this time with the soils saturated from flooding. Cotton seeds and young cotton plants in the ground can stand below normal temperatures only if the soil is dry or wet soils if the temperatures are above normal. But cold weather and wet soils spell disaster to a cotton crop. The early freeze in mid-October only compounded the troubles of the farmer causing untold damage to immature cotton bolls, drastically reducing anticipated yields.

Summary and Conclusions

Mississippi suffered devastating damages and crop losses over the entire state in 1989 due to flooding caused by sustained high streamflows as a result of excessive rainfall amounts. The damages were not confined to the agricultural community. State and county roads and bridges sustained extensive damages. Many homes were also inundated to the extent they were unlivable for varying durations with untold damages.

It would not be practical to attempt to design and construct channels and levee systems to flood-proof floodplains for major storm events as experienced in 1989. The cooperation of Federal and State agencies along with the private sector in coordinating and implementing the State Water Management Plan, mandated by the existing state statues, could possibly lessen the impact of major floods as occurred in 1989.

References

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Table 1: MEAN DAILY DISCHARGE, IN CFS, IN SELECTED STREAMS FOR THE WETTEST YEARS OF RECORD DURING MAY, JUNE AND JULY

NORMAL AND RANKING OF WETTEST YEARS FOR PERIOD OF RECORD	MAY			JUNE			JULY		
	Mean Daily Disch.	Year of Occur.	Inches of Runoff	Mean Daily Disch.	Year of Occur.	Inches of Runoff	Mean Daily Disch.	Year of Occur.	Inches of Runoff
BIG SUNFLOWER RIVER AT SUNFLOWER, MS. (Discharge at Flood Stage = 5,900 CFS)									
Normal Flow For Period of Record	1,230	-	1.85	810	-	1.18	700	-	1.05
Wettest Year For Period of Record	6,078	1958	9.14	5,781	1974	8.41	7,237	1989	10.88
Second Wettest Year of Record	4,901	1953	7.37	3,983	1989	5.79	2,076	1958	3.12
Third Wettest Year of Record	3,340	1978	5.02	1,867	1949	2.72	1,932	1980	2.90

Source: Army Corps of Engineers, Vicksburg District

Table 2: MEAN DAILY DISCHARGE, IN CFS, IN SELECTED STREAMS FOR THE WETTEST YEARS OF RECORD DURING MAY, JUNE AND JULY

NORMAL AND RANKING OF WETTEST YEARS FOR PERIOD OF RECORD	MAY			JUNE			JULY		
	Mean Daily Disch.	Year of Occur.	Inches of Runoff	Mean Daily Disch.	Year of Occur.	Inches of Runoff	Mean Daily Disch.	Year of Occur.	Inches of Runoff
BIG BLACK RIVER AT WEST, MS. (Discharge at Flood Stage = 1,760 CFS)									
Normal Flow For Period of Record	1,100	-	1.29	510	-	0.58	235	-	0.28
Wettest Year For Period of Record	9,720	1983	11.38	5,310	1989	6.02	3,220	1989	3.77
Second Wettest Year of Record	4,890	1978	5.72	2,480	1979	2.81	1,884	1979	2.21
Third Wettest Year of Record	2,940	1989	3.44	1,228	1983	1.39	486	1983	0.57

Source: U. S. Geological Survey

Rainfall Data in North Central Region

January through July, 1989.

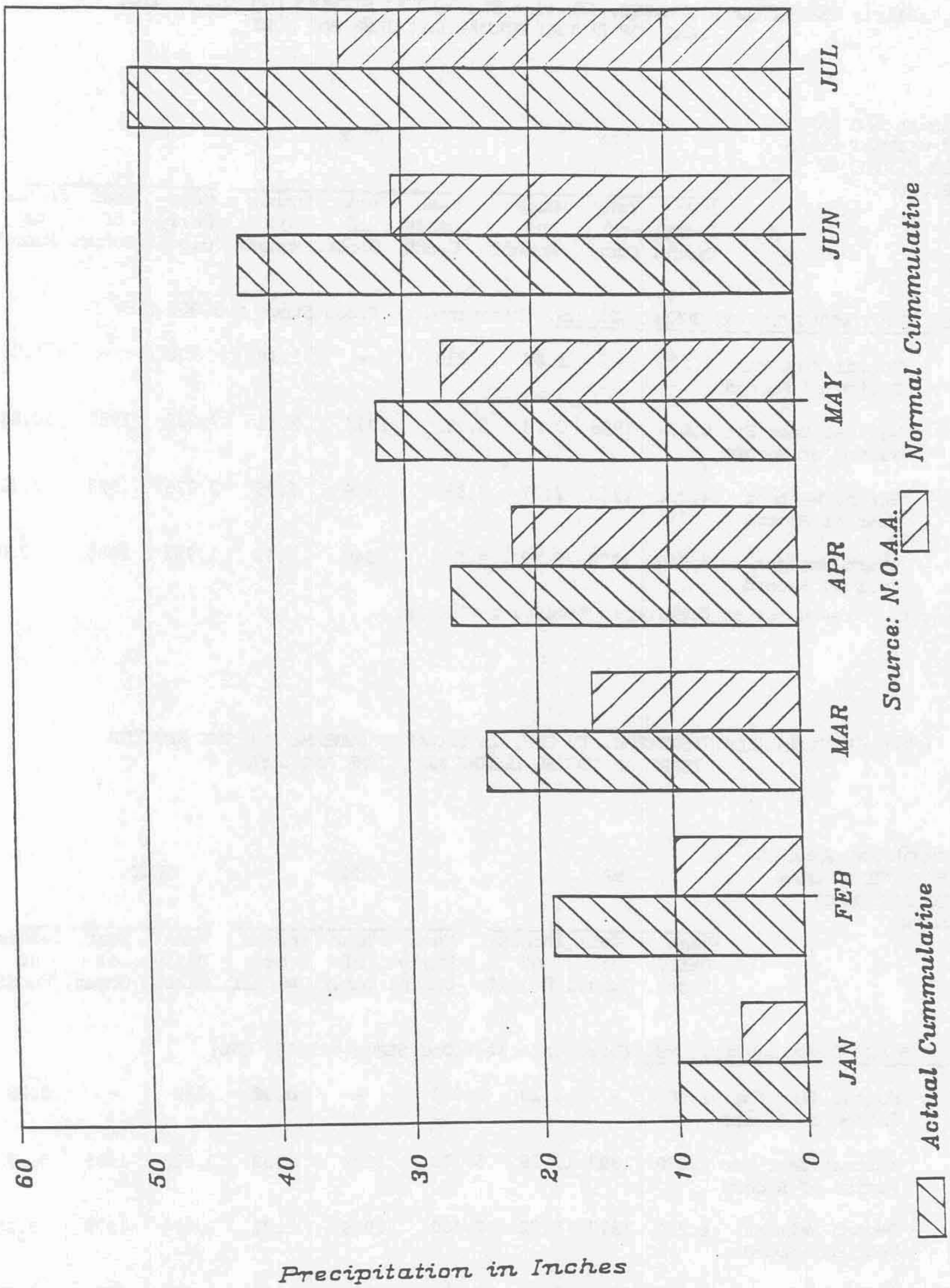


Figure 1

Rainfall Data in the Central Region

January through July, 1989.

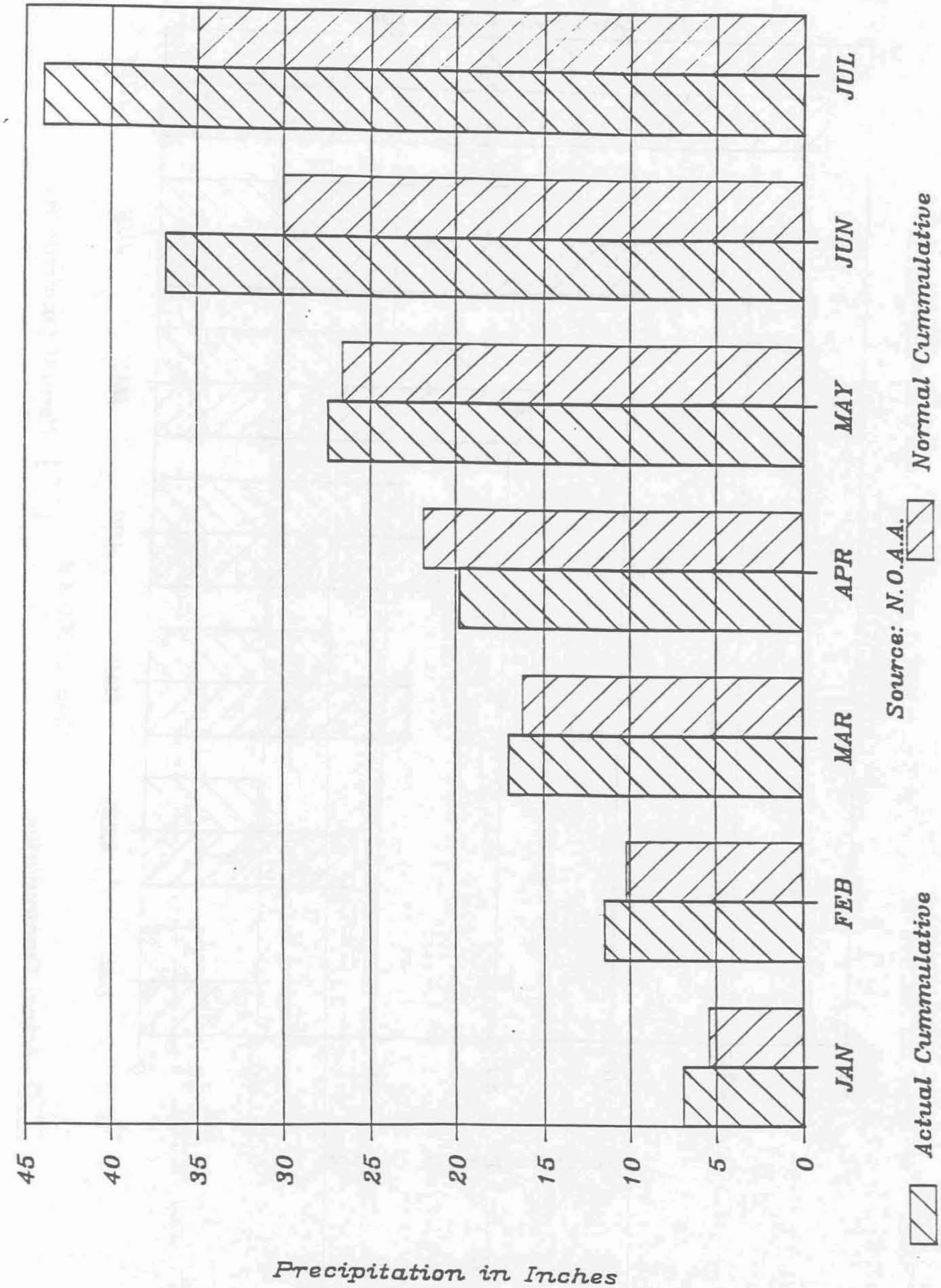
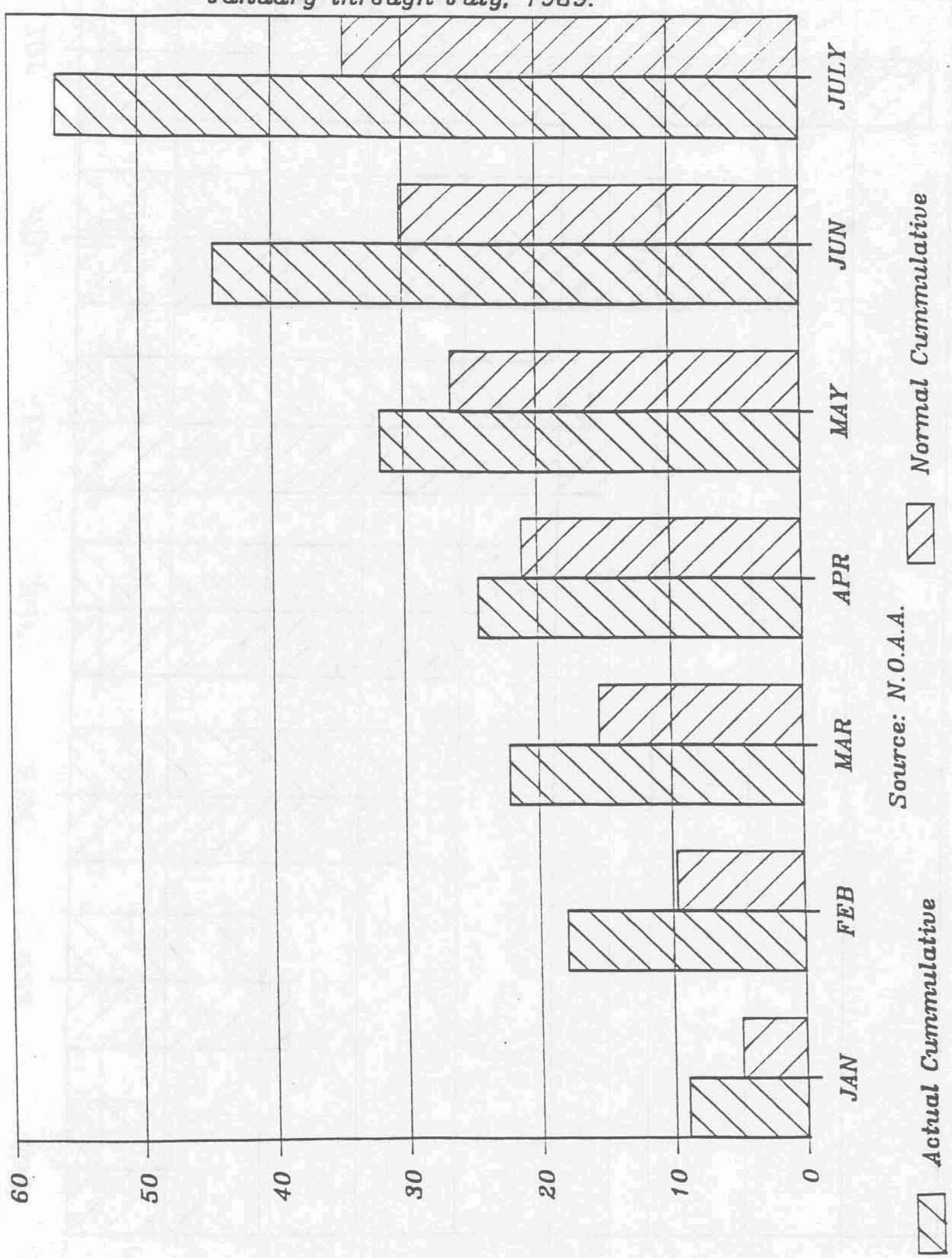


Figure 2

Rainfall Data in Upper Delta Region

January through July, 1989.



Precipitation in Inches

Figure 3