

ALBERTO: A HYDROMETEOROLOGICAL NIGHTMARE

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Abstract. The year 1994 was an enigma of sorts as far as tropical activity is concerned. While the summer season yielded only three hurricanes, several tropical systems were spawned that produced disastrous results over the southeastern part of the U.S. Tropical Storm Alberto will go down in history as a system that was considered a "weak" tropical storm. However, it was "very strong" as far as flood-producers go. More than 16 inches of rain were experienced over a large area in south Georgia. And there were small areas that received storm totals of well over 25 inches of rain (for example, Americas, Georgia recorded a storm total of nearly 27 inches). When all was said and done, one third of Georgia and about one-sixth of Alabama received over 7 inches of rain from Alberto.

The meteorological conditions surrounding Alberto were not unusual. However, as the storm approached land, minor changes in the upper atmosphere caused the system to move more slowly, and even reverse its course, before eventually moving completely out of the southeast. The path of the storm, the basins traversed, and the wetness of the area before the storm, all acted together to contribute to one of the largest floods in Georgia history. Northwest Florida and southeast Alabama also experienced similar flooding conditions. Because of the magnitude of Alberto's devastation in southeast, it will be many years before a complete analysis is done. However, this presentation should serve to provide food for thought while giving an overview of the event.

INTRODUCTION

The purpose of this presentation is to discuss the meteorological conditions surrounding tropical Storm Alberto and to review a few of the hydro- logical effects of the system. To do this, it would be appropriate to begin by discussing the "hurricane season" of 1994. However, even here, it is very difficult to classify the hurricane season of 1994. While there were fewer than normal tropical storms/hurricanes during the year, the tropical activity caused disasters in the U.S. that rivaled years with historically "strong" hurricanes. There were no hurricanes early in the season, yet several tropical systems were spawned that produced disastrous results over the southeastern part of the U.S. Additionally, the season ended with an unusual burst of activity. Two November hurricanes gravely affected the Caribbean Islands before moving into the cold Atlantic

Table 1. Hurricane Season Statistics

Name/Class	Dates	U.S. Damage (millions \$)	Deaths (Total)
Alberto (TS)*	6/30-7/7	500+	30+
Beryl (TS)	8/14-19	73	
Chris (H)*	8/16-23		
Debby (TS)	9/9-11		
Ernesto (TS)	9/21-26		
Florence (H)	11/2-8		
Gordon (H)	11/8-21	175+	1000+

*TS = Tropical Storm; *H = Hurricane.

waters. Table 1 contains a few statistics concerning the seven tropical systems that occurred in the Atlantic in 1994.

ALBERTO'S EFFECTS

The first tropical system to adversely affect the southeastern U.S. in 1994 was Tropical Storm Alberto. This tropical storm was predicted to move through the eastern Gulf of Mexico into western Georgia and slowly proceed northward into the Carolinas. Rainfall amounts were forecast to be in the 5-inch to 10-inch range, based mainly on the assumption that the storm would continue its' northward progression without delay.

Tropical Storm Alberto initially reacted as predicted and moved slowly through the eastern Gulf of Mexico during the first two days of July, 1994. The storm failed to develop its destructive wind and surf forces, and the news media called it "a wimp of a storm" as it moved inland near Fort Walton Beach, Florida. However, as it continued north into Alabama, Alberto did manage to generate numerous thunderstorms with intense rainfall that affected the Florida panhandle during the day of July 3, 1994. At this time, the track of the storm was slightly to the left of, but still parallel to, the predicted track. Therefore, on July 3, 1994, there was no cause to think that the storm would produce more than "normal flooding" usually associated with these storms. However, as the northward drift continued, the storm stalled temporarily as it moved through eastern Alabama to a point just southwest of

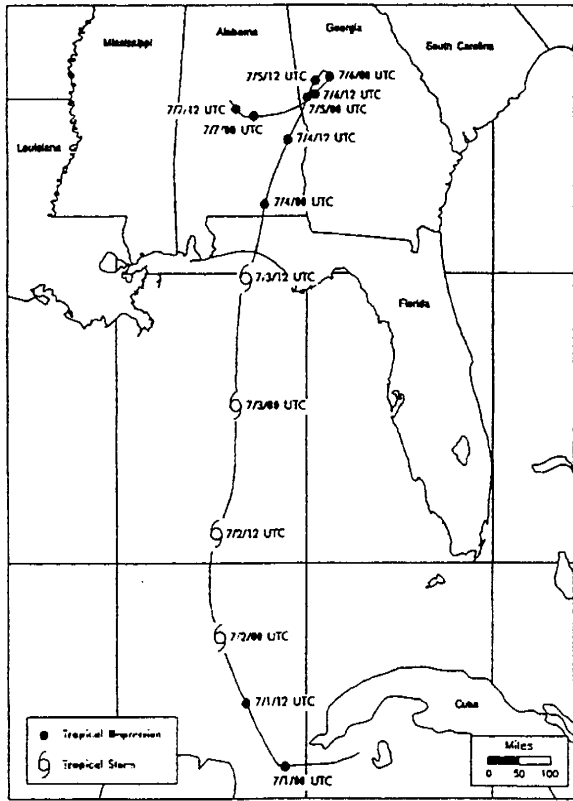


Figure 1. Track of Alberto, July 1994.

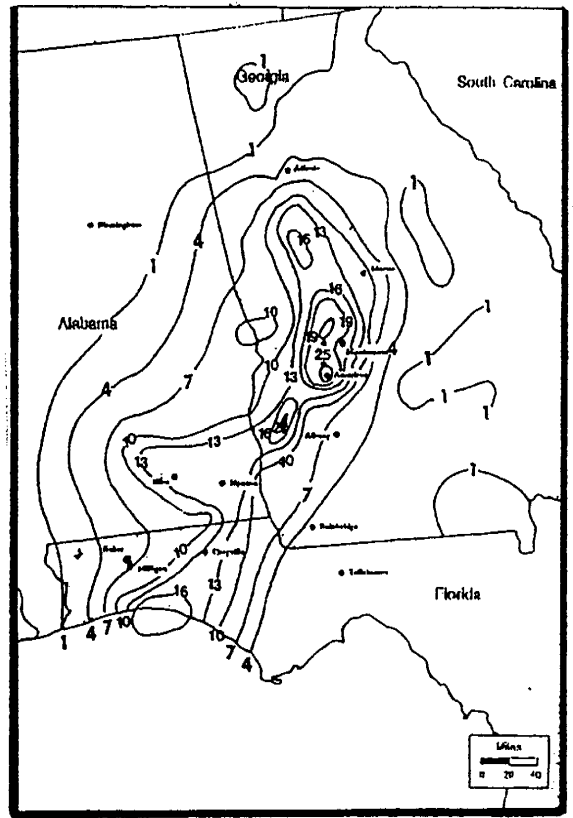


Figure 2. Five Day Storm Total Precipitation for Flood Area, 8 a.m. EDT 7/2/94 to 8 a.m. EDT 7/7/94.

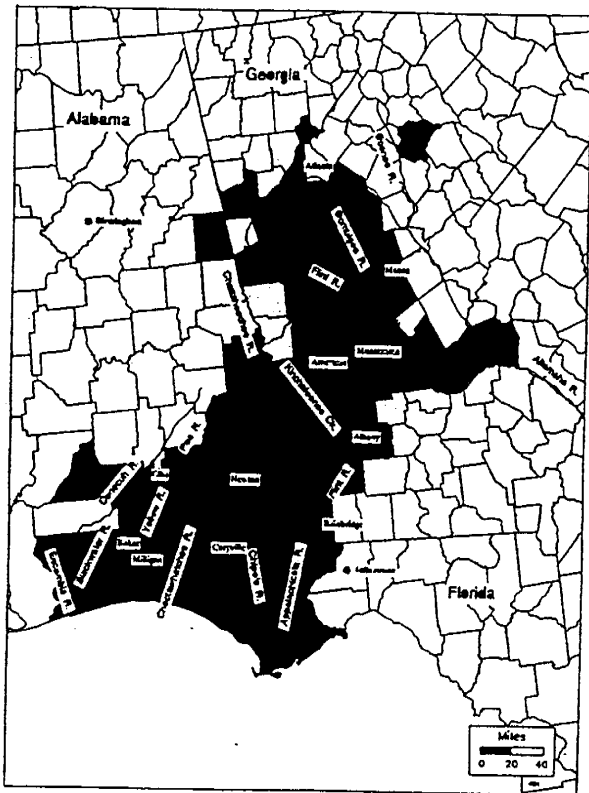


Figure 3. Disaster Declarations, July 1994.

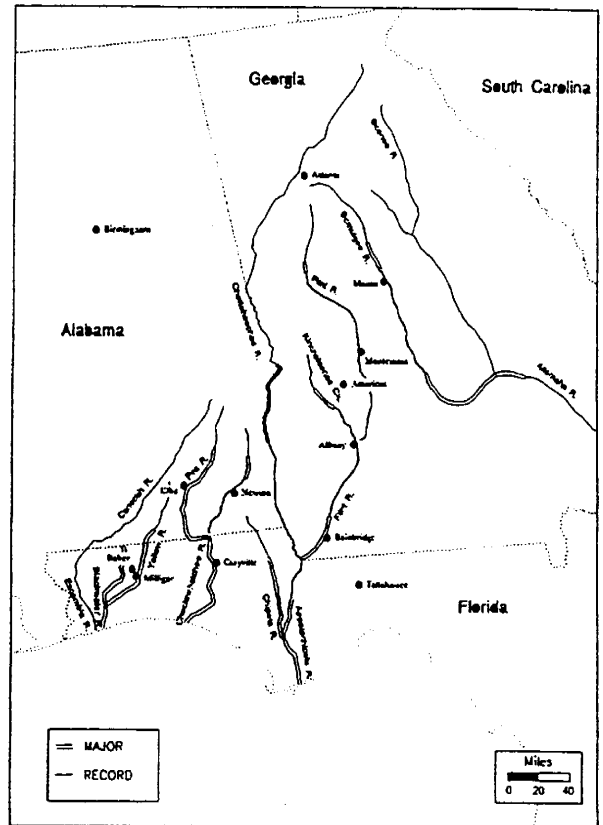


Figure 4. River Flooding, July 1994.

Columbus, GA. The center of the storm continued to move very slowly north to northeast, and on July 5th, the center was located between Fayetteville, in Fayette County, GA, and Newnan, in Coweta County, GA.

For over 24 hours, from about the evening of July 4, 1994 through the morning of July 6, 1994, Alberto stalled in an area near Peachtree City, GA. Then, contrary to what had been expected to happen, the storm moved southwest toward Alabama, almost retracing its track. The southern-most edge of the storm extended south to a point near Fort Walton, FL. Finally, Alberto began its final push into central Alabama on July 7, 1994 before moving rapidly northeastward through Georgia into North Carolina. The last rapid push through the southeast was caused by the approach of a cold front, which finally brought an end to the rains over the southeastern states. Figure 1 shows the location of the "center" of the storm between July 1 and July 7, 1994.

Alberto will go down in history as a system that was considered a "weak" tropical storm. However, as shown in Figure 2, it was a very potent flood-producer. Over 16 inches of rain were experienced over a large area in south Georgia. All in all, one third of Georgia and about one-sixth of Alabama received over 7 inches of rain from Alberto. The heavy downpours, which normally happen on the east side of tropical systems, dropped more than 24 inches of rain on parts of the western half of Georgia. There was immense damage to homes and businesses. In addition, the storm also caused widespread road and rail disruptions and forced the evacuation of thousands of people.

The meteorological conditions surrounding Alberto were not unusual. However, as the storm approached land, minor changes in the upper atmosphere caused the system to move more slowly, and even reverse its course, before eventually moving completely out of the southeast. The path of the storm, the basins traversed, and the wetness of the area before the storm, all acted together to contribute to one of the largest floods in Georgia history. Northwest Florida and southeast Alabama also experienced similar flooding conditions. Figure 3 illustrates the extent of the flooding due to Tropical Storm Alberto.

The scenario presented by this tropical storm not only matched, but exceeded any fictional one devised for any training exercise. For example, researchers normally consider three separate and distinct ways that a rain-producing system can affect a river basin such as is located in southwestern Georgia (Figure 4): One way would be to imagine a system moving perpendicular to a basin. Thus, considering the speed of the system, a flood potential can be estimated.

The other two ways consider a system as it moves parallel to the basin. In these cases, similar rainfall estimates on systems moving upstream through the basin or downstream through the basin would yield separate and distinct flooding scenarios. But what Alberto produced was a situation where the system moved upstream through the Flint River Basin, stalled at the location where the Flint River

begins, moved south through the same basin, and finally went perpendicular across the same basin, thus affecting it three distinct times.

To make matters worse, Tropical Storm Beryl followed almost at Alberto's heels. Both storms made landfall in the Florida panhandle and moved into Georgia. It was indeed fortunate, however, that Beryl moved into southwest Georgia and was moving faster than Alberto. While damage in southwest Georgia was mainly due to tornadoes and high winds, the tropical storm caused considerable damage to South Carolina and Virginia before moving off the coast into the Atlantic.

SUMMARY

Because of the magnitude of Alberto's devastation in the southeast, it will be many years before a complete analysis is done. Forecasting the movement of Alberto was difficult due to the absence of well defined steering currents aloft. Yet this seems to be the most important key in planning for disaster recovery.

At this time, it is known that there are over \$40 billion worth of damage. Over thirty people died as a result of the storm. It would be impossible in this allotted period to completely outline the total destruction caused by the storm. However, this presentation should serve to provide food for thought while giving an overview of the event.

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