



"A Wild Weather Day" Historic April 27th 2011 Super Tornado Outbreak: Impact, Damages and Tornado Tracks Over Northern Alabama and Southern Middle Tennessee



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ABSTRACT

Many large-scale natural disasters have occurred over the Southern United States region, but not many have been as impressive in scale or intensity as the April 27th, 2011 Super Tornado Outbreak. 292 tornadoes reports over 16 states caused an estimated of 317 fatalities, damages exceeding \$10 billion and thousands of injured. This severe weather system left catastrophic destruction in its wake, especially across the state of Alabama. This research focuses on the impacts and damage, and to develop a better depiction of tornado tracks in Geographic Information System (ArcGIS©) form. The specific dataset used include the 40 tornadoes, from the historic April 27th Super Outbreak, that impacted 10 counties from Northern Alabama and 3 counties from Southern Middle Tennessee. 104 fatalities, 879 injured, damages exceeding \$52 million, a total of 515.22 miles of affected area, were the results of two massive EF5, four violent EF4, eight EF2, twenty-one EF1 and five EF0 tornadoes in a period of less than 24 hours across the Huntsville Forecast Area. All 40 tornado tracks were plotted and at least 26 tornado tracks were used to indicate specific damage swaths within the tornado track using ArcGIS© and Paint© programs. This was done to detail the impacts and damages caused by the 40 tornadoes. Undoubtedly, the April 27, 2011 Super Tornado Outbreak will rewrite Alabama history, being closely compared to the April 3rd, 1974 Super Tornado Outbreak. This research opens the doors to future studies and analysis of the impacts of this violent weather system that affected Northern Alabama and Southern Middle Tennessee.

INTRODUCTION

During April 25-28, 2011 a large portion of United States was affected by a violent Tornado Outbreak, with April 27th being the worst day. Roughly 292 tornado reports over 16 states occurred on this day with Alabama being worst hit. All total, 317 people lost their lives with thousands injured. On an economic level, total damages exceeded \$10 billion. This powerful weather system had a strong cold front with several areas of low pressure that moved from Texas Hill Country to the lower Ohio Valley. Significant low level moisture emanating off the Gulf of Mexico combined with a potent upper level system to produce the widespread severe weather. The cold front was the focal point of numerous supercells that caused the touchdown of at least 23 - EF3, 11 - EF4 and 4 - EF5 tornadoes across the Southeast Region.

TORNADO OUTBREAK IMPACT AND DAMAGES

How Many Tornadoes Impacted
Huntsville, AL NWS Forecast Area?

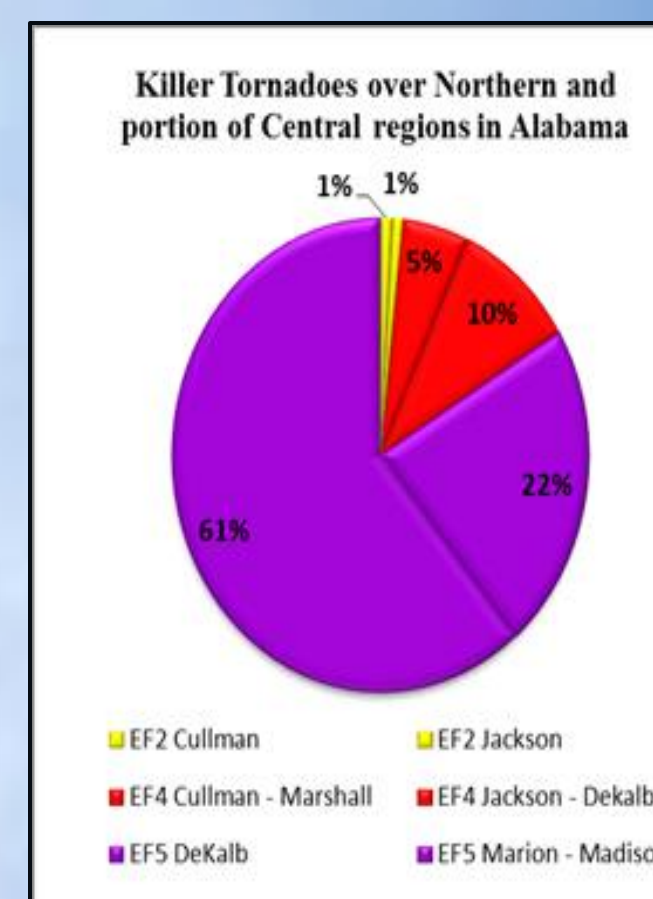
EF	Sum	Path Length
0	5	17.6 miles
1	21	157.32 miles
2	8	98.1 miles
3	0	0 miles
4	4	101.5 miles
5	2	140.7 miles
Total	40	515.22 miles

Alabama Statewide Tornado Count: 62

Fatalities and Injured

County	Fatalities
Cullman	2
DeKalb	35
Franklin (AL)	26
Franklin (TN)	1
Jackson	8
Lawrence	14
Limestone	4
Madison	9
Marshall	5
Total	104

Provided by AEMA and SPC Annual US Killer Tornado Statistics



METHODOLOGY

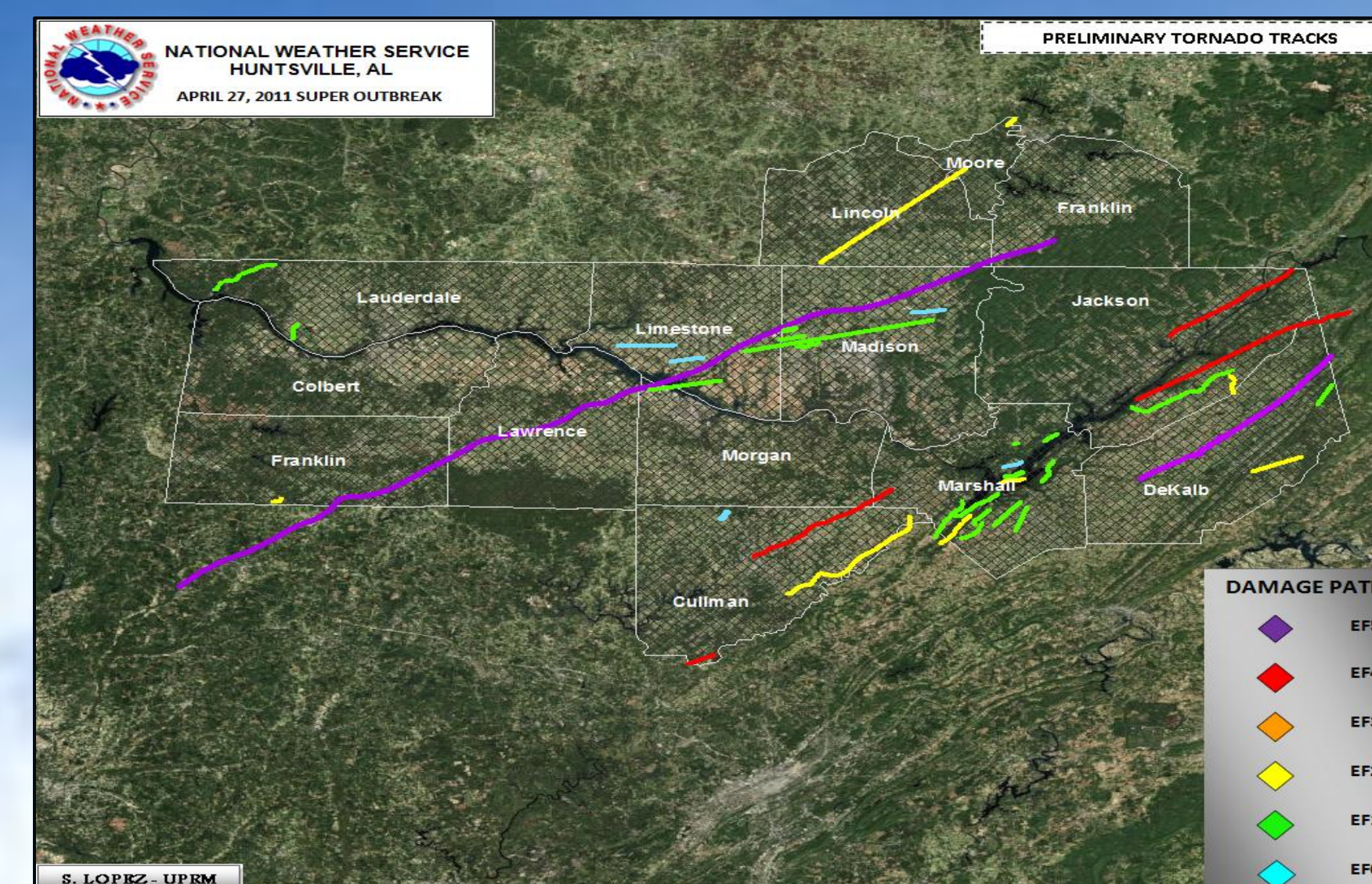


After the event, affected areas were surveyed to determine important damage information such as, tornado intensity, path length, maximum path width, etc.

How meteorologists made a tornado survey?

Damage photographs were taken with the exact coordinates of where pictures were taken. The obtained data was processed using Google Earth and a locally developed software program. In the picture above, of an actual tornado track, each point represents a picture taken of specific damage. Damage photographs were analyzed and rated using the Tornado Enhanced Fujita Intensity Scale (EF-scale). Intensities of each damage picture along with specific coordinates were entered into an excel spreadsheet and saved as a comma-delimited file. Excel data were added into a topographic map using the ArcGIS© program. Displayed X and Y coordinate data were differentiated assigning different colors to each point according to damage intensity.

The next step was to trace an estimated track using reference points where the most intense damage occurred. Different groups of damage points were circled and linked by colors depending on the intensity using the Paint Program. These steps were followed for each tornado track across North Alabama and Southern Middle Tennessee And a Bing Aerial Map including all 40 tornado tracks was completed using ArcGIS©.



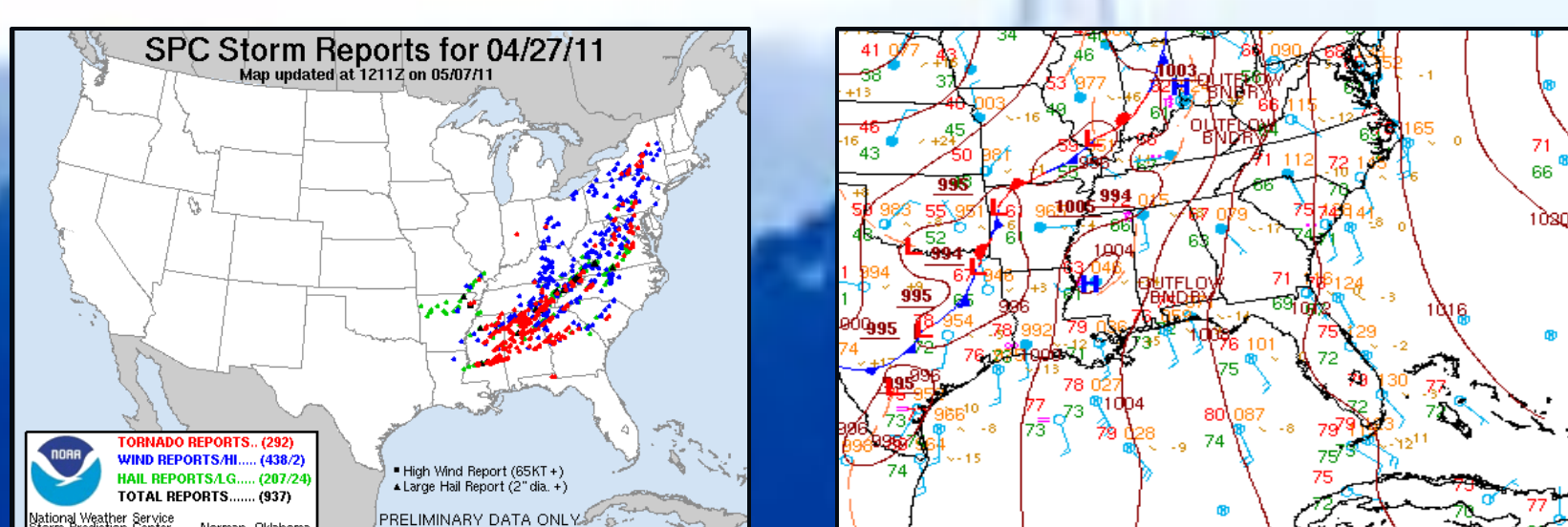
CONCLUSION

By detailing the impacts and damage caused by the 40 tornadoes across North Alabama and Southern Middle Tennessee, results will prove useful to Alabama citizens, researchers and meteorologists, and also other first response agencies such as, AEMA, AFC, among others. Alabama has experienced violent tornado outbreaks in the past, like the Super Outbreak of 3 April 1974 that left 86 dead, at least 949 injured, with economic losses of around \$50 million. However, the 27 April 2011 Super Tornado Outbreak in North Alabama alone, will go down as one of the worst weather-related disasters to ever hit the state of Alabama. The 27 April 2011 Super Tornado Outbreak left 104 dead, at least 879 injured, with economic losses exceeding \$52 million after 40 tornadoes ripped across the area. Weather never rests and meteorologists and emergency managers must continue to work together to have a better understanding of these weather events and also to develop plans that will mitigate loss of life and property.

ACKNOWLEDGEMENTS

I appreciated the help and support from the staff at the National Weather Service Weather Forecast Office in Huntsville AL. Thanks to Brian Carcione (Science & Operations Officer) who helped me further understand and comprehend the ArcGIS © Program and thanks to David Nadler (Warning Coordination Meteorologist) and Chris Darden (Meteorologist-in-Charge) who supervised the development of this interesting and important research. I was very happy and fortunate toward the staff of NWS Huntsville for making me feel part of the office during the Summer of 2011.

MAIN REFERENCE: NWS WFO Huntsville, AL. (22 September 2011) April 27th, 2011 Tornado Outbreak: http://www.srh.noaa.gov/hun/?n=hunsur_2011-04-27_main



BRIEF SEVERE WEATHER OVERVIEW

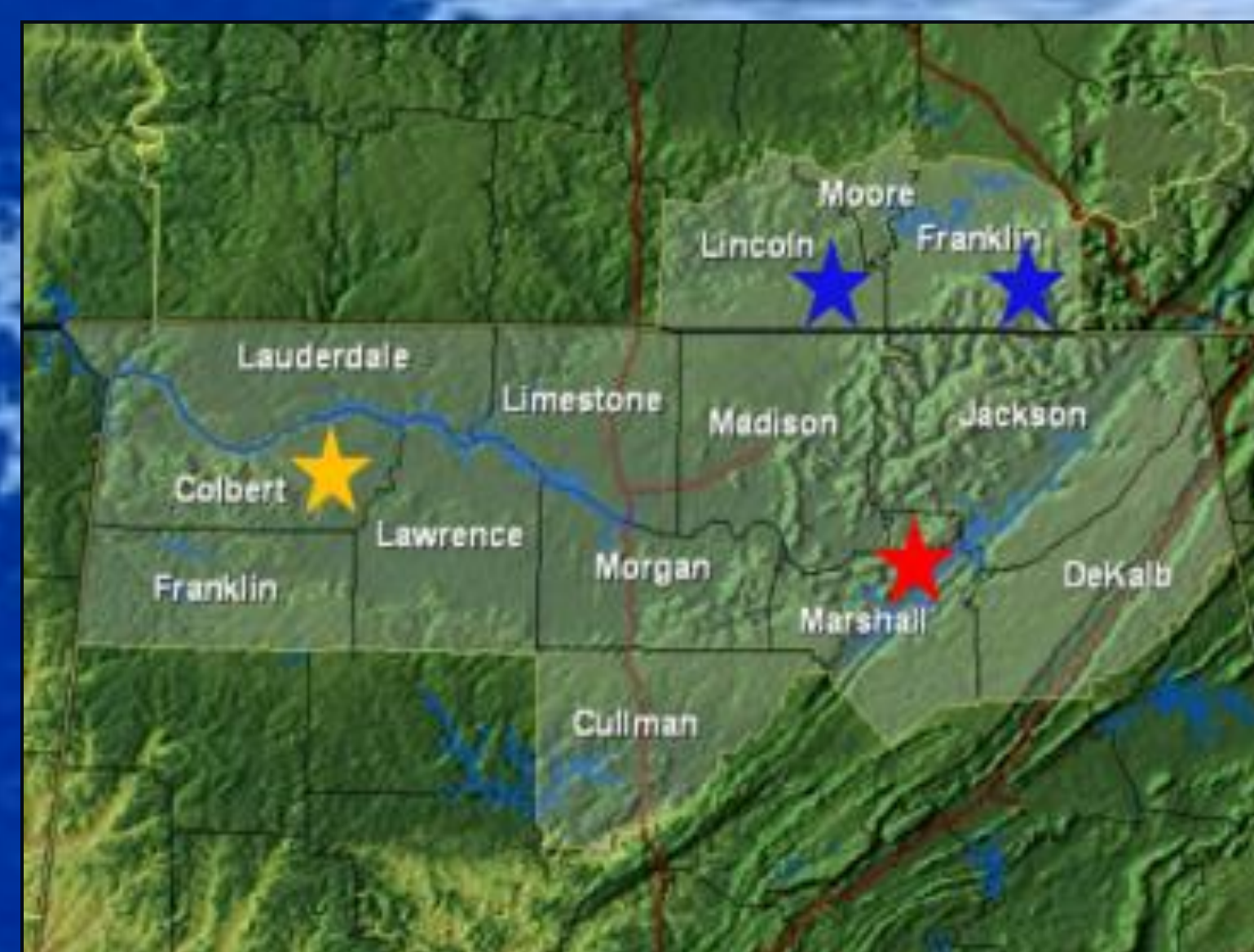
The Huntsville County Warning Forecast Area (CWFA) was affected by three separate waves of severe weather in an ~18 hour time period.

First Round: During early morning hours between 2 am-8 am. A very pronounced quasi-linear convective system (QLCS) with damaging winds (> 70 MPH) and isolated tornadoes ripped across portions of northeast Alabama. Tornado and Severe Thunderstorm warnings were issued in Northern Alabama.

Second Round: During late morning to early afternoon. Another QLCS produced significant wind damage along with several tornadoes across northwest and north central Alabama.

Third Round: "The march of the supercells". The most violent wave occurred during the afternoon/early evening hours, beginning around 2:30 PM and lasting until 9 PM CDT. Supercells began to line up to the southwest of northern Alabama. A "Particularly Dangerous Situation" Tornado Watch was in effect for the Huntsville CWFA. Numerous supercell thunderstorms produced strong to violent tornadoes, including 4 EF4 and 2 EF5 tornadoes. Severe weather finally diminished by the late evening hours as the cold front pushed east of northern Alabama.

County	0	1	2	3	4	5
Colbert, AL	0	0	0	0	0	0
Cullman, AL	1	1	1	0	2	0
DeKalb, AL	0	1	3	0	1	1
Franklin, AL	0	0	1	0	0	1
Franklin, TN	0	0	0	0	0	1
Jackson, AL	0	1	1	0	2	0
Lauderdale, AL	0	2	0	0	0	0
Lawrence, AL	0	0	0	0	0	1
Limestone, AL	2	4	0	0	0	1
Lincoln, TN	0	1	0	0	0	0
Madison, AL	1	5	0	0	0	1
Marshall, AL	1	11	2	0	1	0
Moore, TN	0	0	2	0	0	0
Morgan, AL	0	1	0	0	1	0



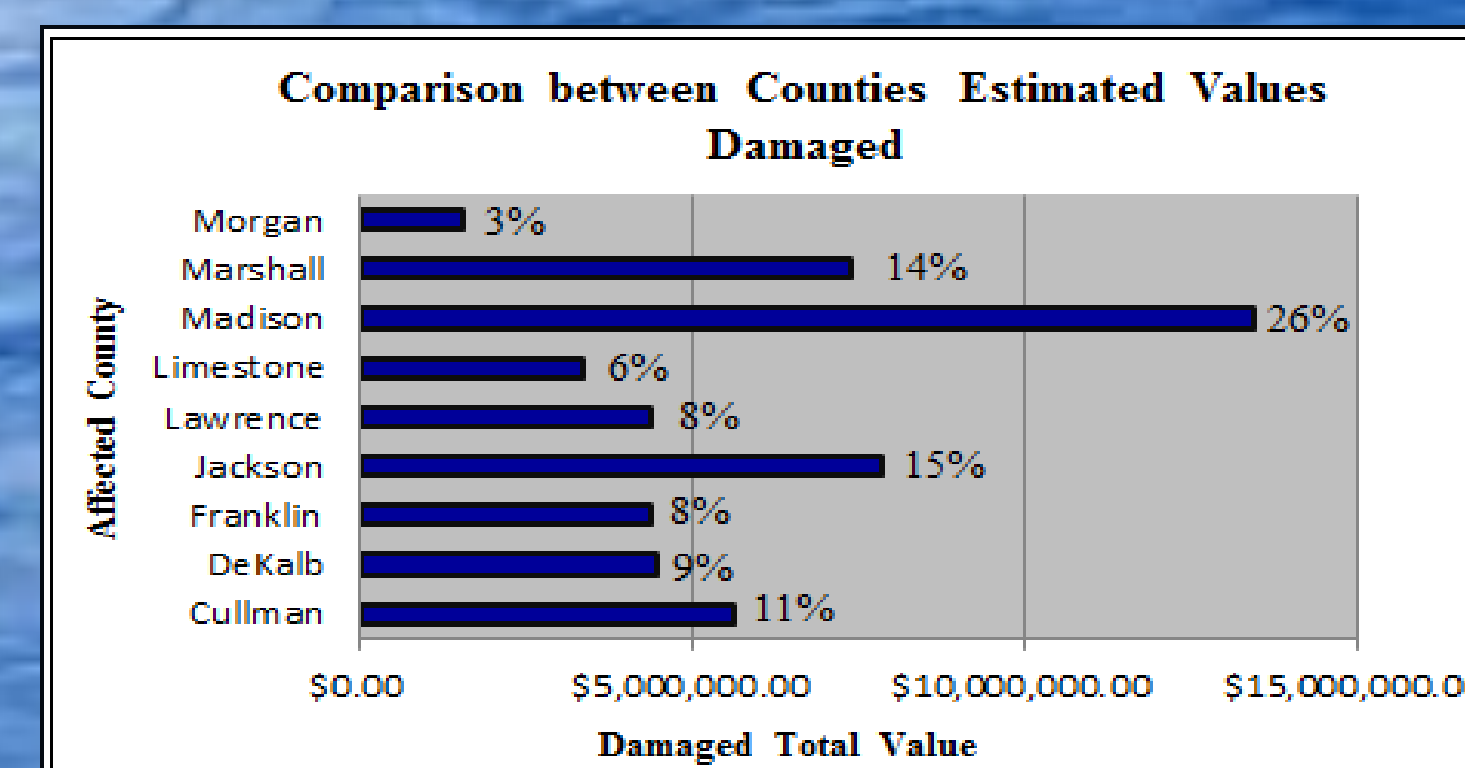
Huntsville, AL NWS Forecast Area
Tornado Activity:

★ N/A ★ Less ★ More

Economic Impact over Northern Alabama

County	Total Damaged Acres	Forested Damaged Acres	Damaged Total Value
Cullman	11,275	4,623	\$5,617,351.79
DeKalb	11,505	3,861	\$4,479,091.96
Franklin	6,801	4,438	\$4,367,811.54
Jackson	7,730	5,553	\$7,839,379.07
Lawrence	10,814	3,199	\$4,393,500.07
Limestone	8,980	2,068	\$3,366,993.29
Madison	14,041	7,674	\$13,473,818.38
Marshall	5,052	4,514	\$7,391,441.77
Morgan	2,777	916	\$1,540,441.48
Total	78,975	36,846	\$52,469,829.35

Estimated Timber Values provided by the AFC



According to the Alabama Forestry Commission (A total damage value of **\$228,360,575.75** resulted in the Alabama State and **\$52,469,829.35** in the Northern region.

RESULTS

The Worst Tornado to Date:

Rating: EF5 – Affected Counties: Marion, Franklin, AL, Lawrence, Limestone, Madison and Franklin, TN. / Path Length: 106.9 miles / Max Width: 1.25 mile / Peak Wind: 210 mph / Starting Time: 3:28 pm / Ending Time: 5:20 pm / Killer Tornado: 71 fatalities

