

# GIS Mapping the NWS Tornado Tracks and Public Health Mortality Data from the 25-28 April 2011 Tornado Outbreak

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# Presentation Overview

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# Centers for Disease Control and Prevention (CDC)

- ❑ **Geospatial Research, Analysis, and Services Program (GRASP)**
  - Provides leadership and expertise in the application of the concepts, methods, and tools of geography and geospatial information science to public health research and practice.
  
- ❑ **Environmental Hazards and Health Effects (EHHE)**
  - Disaster Epidemiology and Response Team
    - Community Assessment for Public Health Response (CASPER)
    - Identify and track (surveillance) disaster-related deaths and injuries to identify trends and determine risk factors

## External Partners

- ❑ **National Weather Service**
- ❑ **American Red Cross**
- ❑ **State Vital Statistics offices**

# April 25-28, 2011 Tornado Outbreak

- ❑ April 2011 most active tornado month on record\*
- ❑ April 25-28, 2011
  - Four days of severe weather across the Southeast
  - 376 tornadoes
    - 226 tornadoes April 27, 2011 alone
    - Alabama particularly affected
  - Substantial death toll – 355 deaths across 6 states



\* [http://www.noaanews.noaa.gov/2011\\_tornado\\_information.html](http://www.noaanews.noaa.gov/2011_tornado_information.html)

## Research Goals

- ❑ **Primary aim: To identify tornado-related fatalities and circumstances surrounding fatalities to prevent future death and injuries**
- ❑ **First step: Identify deceased, location of death/injury, and link deaths with associated tornadoes**
- ❑ **Next steps: Describe common risk factors or vulnerabilities among tornado-related deaths**

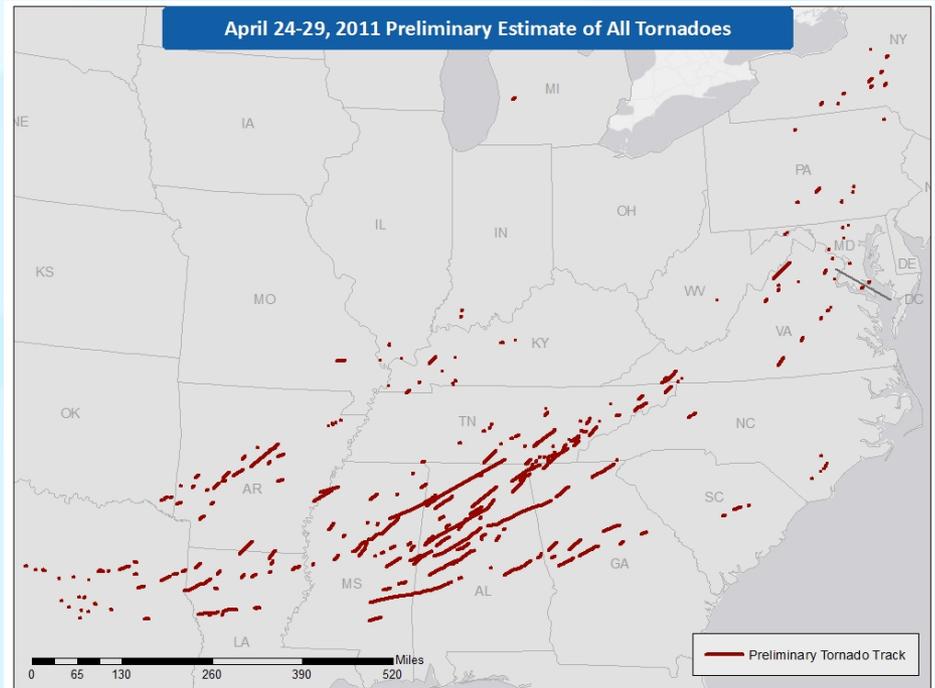
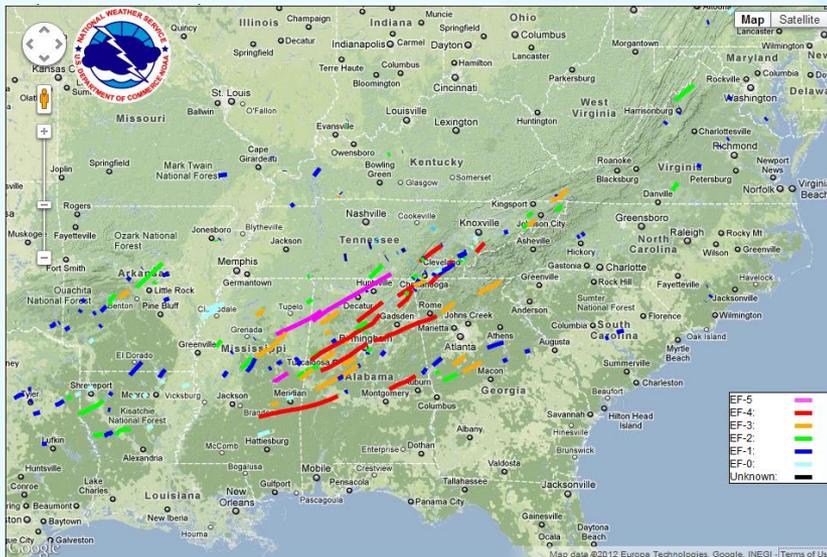
# Data Collection – Human Health

- ❑ **American Red Cross Mortality Form 2077A**
  - Completed by Disaster Health Services (DHS) volunteer during “condolence” visits with families of decedant
  - CDC staff deployed to AL to assist in data collection
  - Other states - completed forms sent to Red Cross HQ then CDC
  
- ❑ **Official death certificates**
  - Obtained for majority of deaths from Vital Statistics
  - Reviewed with 2077A for accuracy and completeness
  
- ❑ **Six states experienced fatalities: Alabama, Arkansas, Georgia, Tennessee, Mississippi, and Virginia**

# Data Collection – Tornado Tracks step 1

## ❑ Searched National Weather Service website

- Overall preliminary shapefile of event by Southern Region Operation Center (SR ROC)—Last update May 20, 2011
- State specific tornado information
  - 8 separate Weather Forecasting Offices (WFO) across 6 states



<http://www.srh.noaa.gov/srh/ssd/mapping/>

# Data Collection – Tornado Tracks step 2

## ❑ Obtained available NWS post-storm survey data

- Tornado names and characteristics – various reporting conventions
- WFOs' Science and Operations Officers—provide clarification

### NWS Tornado Name

Halifax tornado  
 E Cleveland EF1  
 Camp Creek EF3  
 Hamilton/Bradley Ooltewah-Cleveland EF1  
 Meriwether, Spalding, Henry  
 Pike, Lamar, Monroe, Butts  
 Catoosa  
 Lumpkin, White  
 Calhoun, Chickasaw, Monroe, MS  
 Monroe, Itawamba, MS  
 Washington tornado

### Jackson, MS

<b>Rating:</b> <i>(Click for EF Scale)</i>	EF-2
<b>Estimated Maximum Wind:</b>	125 mph
<b>Fatalities/Injuries:</b>	1 fatality
<b>Damage Path Length:</b>	14.5 miles
<b>Maximum Path Width:</b>	3/4 miles
<b>Approximate Start Point/Time:</b>	2.5 S Eupora 2:37am
<b>Approximate End Point/Time:</b>	5.5 N Maben 2:49am

### Little Rock, AR

TORNADO NUMBER 1...

THE TORNADO TRAVELED FROM 2.8 MILES NORTH-NORTHWEST OF PEARCY TO 5 MILES NORTHWEST OF ROCKWELL. THE PATH LENGTH WAS 6 MILES AND THE PATH WIDTH WAS 200 YARDS.

THE TORNADO WAS RATED AS EF2 ON THE ENHANCED FUJITA SCALE.

THE TORNADO KNOCKED DOWN OR SNAPPED OFF HUNDREDS OF TREES AND POWER LINES WITH THE HEAVIEST DAMAGE ON OLD DALLAS ROAD...TIMBERLAKE ROAD AND IN THE SMALL COMMUNITY OF SUNSHINE. SEVERAL WELL CONSTRUCTED HOUSES WERE DESTROYED WITH MANY OTHER EXPERIENCING ROOF DAMAGE FROM TORNADO WINDS OR FROM BEING HIT BY FALLING TREES. NUMEROUS OUTBUILDINGS WERE DESTROYED. A TRAVEL TRAILER WAS PUSHED ONTO A CAR. ONLY MINOR INJURIES WERE REPORTED.

<http://www.srh.noaa.gov/lzk/?n=pns042711txt.htm>

[http://www.srh.noaa.gov/jan/?n=2011\\_04\\_25\\_27\\_svr\\_webster\\_choctaw](http://www.srh.noaa.gov/jan/?n=2011_04_25_27_svr_webster_choctaw)

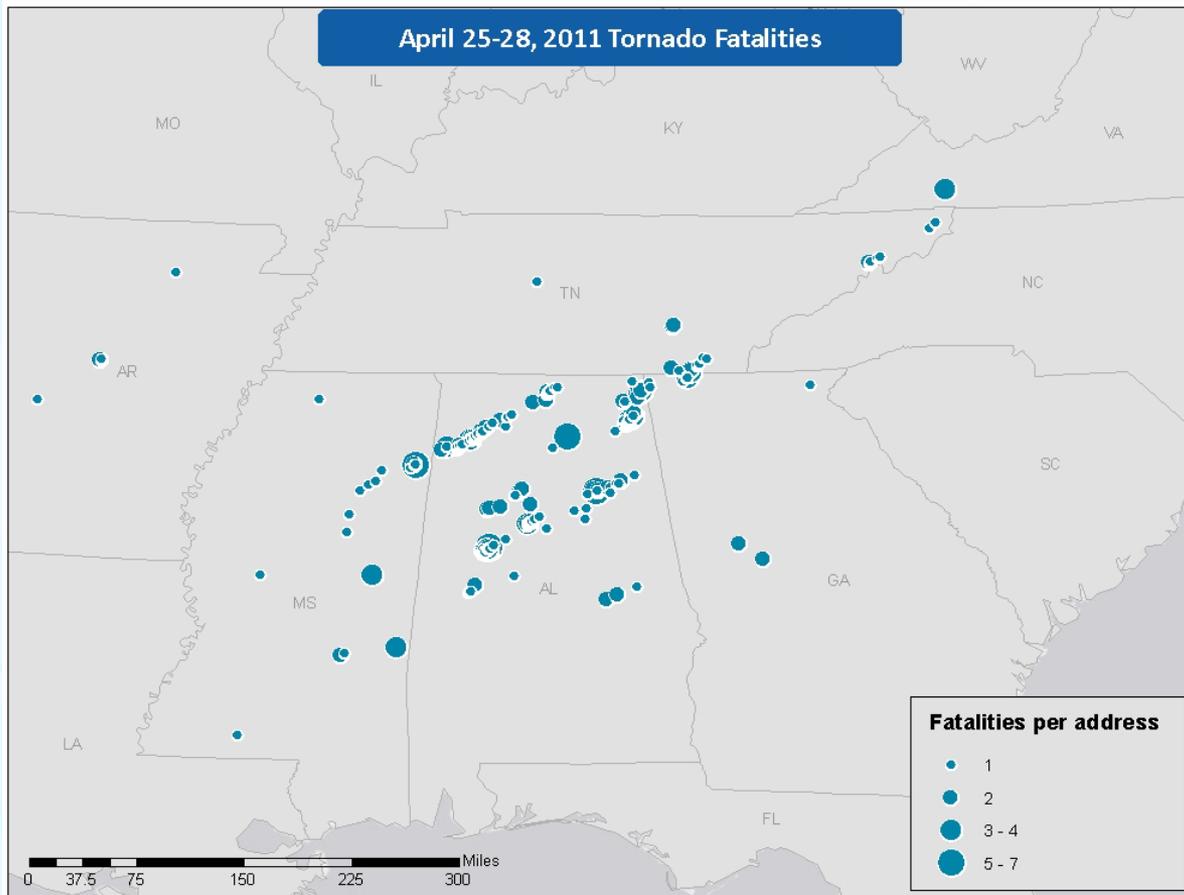
## **Data Collection – Tornado Tracks step 3**

- ❑ **Compiled tornado paths**
  - Converted all available track data into one shapefile
  - Linked 40 tornadoes to associated track characteristics
  - Variability of GIS data generated by 8 weather offices
  
- ❑ **Time consuming process!**

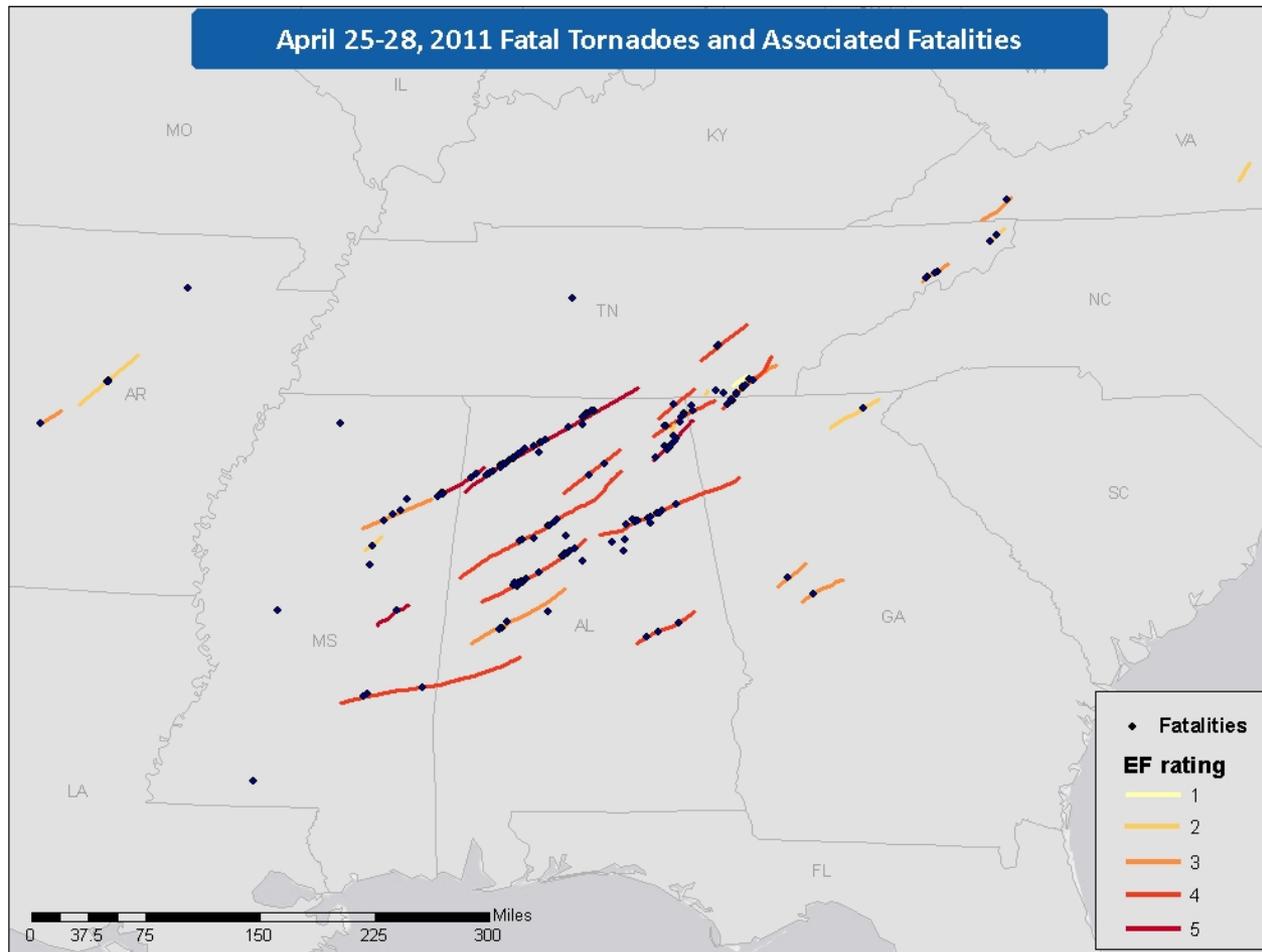
# Mapping Fatalities

## □ Fatalities were reported in six states

- In Alabama—location of injury, not death, was geocoded
- For all other states, residential address was geocoded



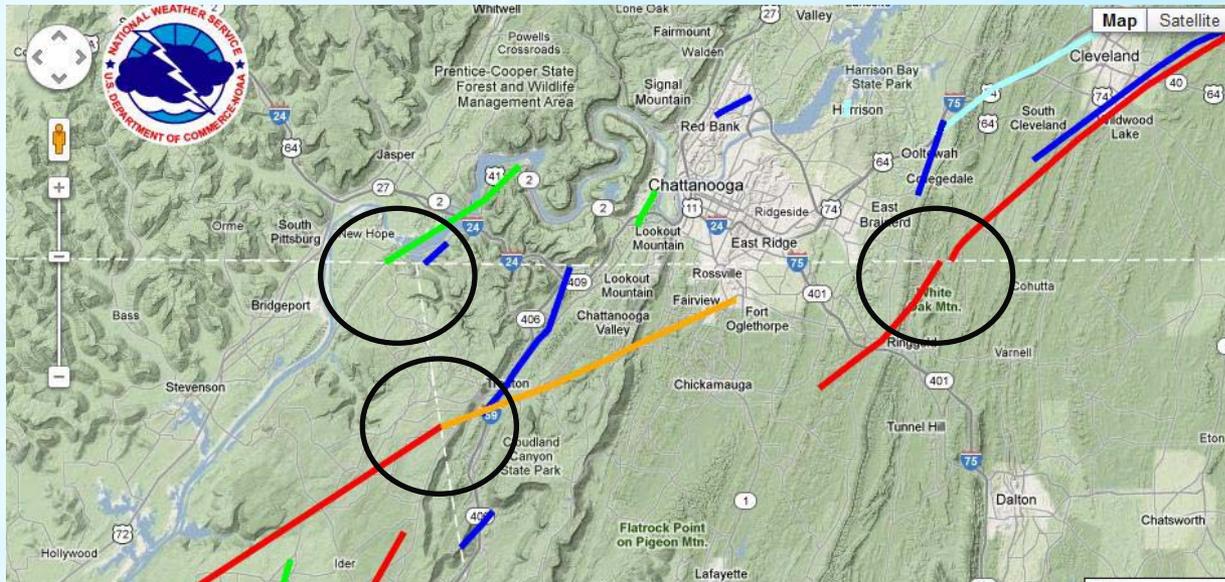
# Integrating Location of Deaths and Tornado Tracks



EF	1	2	3	4	5	Total
# Tornadoes	0	5 (17.85)	9 (32.14)	10 (35.71)	4 (14.29)	<b>28</b>
Fatalities (%)	0	10 (3.16)	25 (7.19)	162 (51.27)	119 (37.66)	<b>316</b>

# Challenges

- ❑ Inconsistencies and variability of storm survey data
- ❑ Discrepancies of tornado track and characteristics across jurisdictional borders
- ❑ Ambiguity of “final” dataset – ongoing data updates (tornadoes details and number of deaths)



## Recommendations

- ❑ **Standardized format of reporting storm survey information**
  - Naming convention, date and time convention
  
- ❑ **Consistent method of mapping tornadoes that cross WFO boundaries**
  
- ❑ **Increased collaboration with local and national (response and/or public health) agencies to increase accuracy and data sharing**

## Next Steps

- ❑ **Identify common risk factors or vulnerabilities among tornado-related deaths**
  - Social vulnerabilities
  - Housing types
  - Proximity of community shelters
  - Timing of tornado occurrence, proximity to tornado path, strength of tornado

# References

- ❑ **The Historic Tornadoes of April 2011, NOAA Service Assessment, December 2011**
  - [http://www.nws.noaa.gov/om/assessments/pdfs/historic\\_tornadoes.pdf](http://www.nws.noaa.gov/om/assessments/pdfs/historic_tornadoes.pdf)
  
- ❑ **Storm Prediction Center**
  - <http://www.spc.noaa.gov/>
  
- ❑ **WFO websites for this event**
  - Peachtree City, GA;
  - Birmingham, AL
  - Huntsville, AL
  - Memphis, TN
  - Morristown, TN
  - Jackson, MS
  - Little Rock, AR
  - Blacksburg, VA

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## NWS

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# Questions?

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