

Weather Spotter Training



Basic Level



Weather Spotter Training

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Basic Level



Outline

- Who is the National Weather Service?
- Why are Storm Spotters Important?
- Weather Hazards and Safety
- Severe Weather Reporting Procedure
- Monitoring Severe Weather



Outline

- **Who is the National Weather Service?**
- Why are Storm Spotters Important?
- Weather Hazards and Safety
- Severe Weather Reporting Procedure
- Monitoring Severe Weather



The Organization

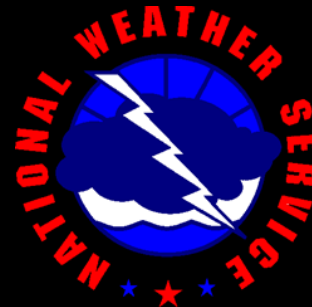
DOC



NOAA



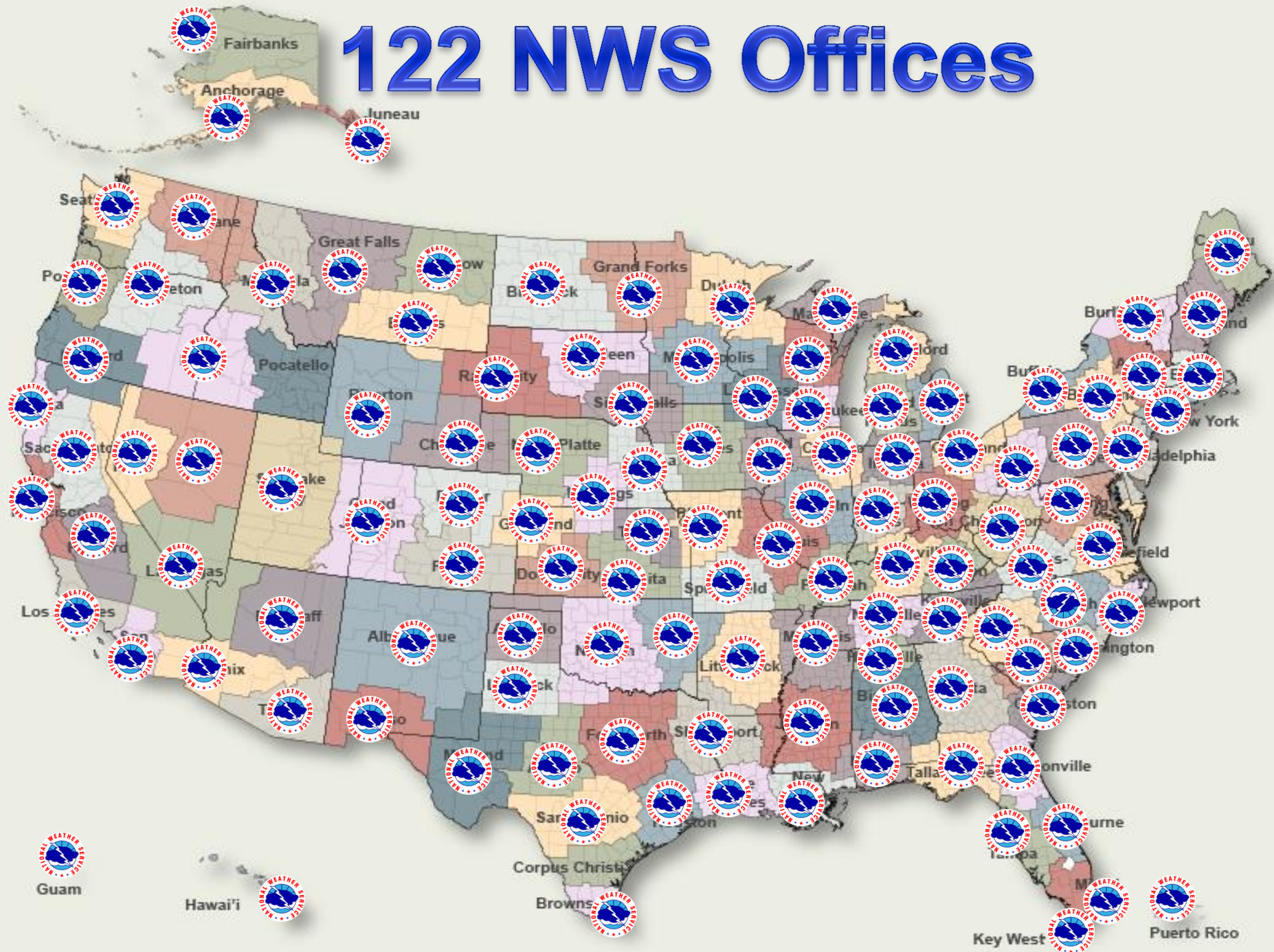
NWS



Mission and Service

- **Mission – Protection of Life and Property** and enhancement of the national economy
- **Staffed 365 days/year**
- **Work Rotating Shifts. We are ALWAYS Here!**

122 NWS Offices

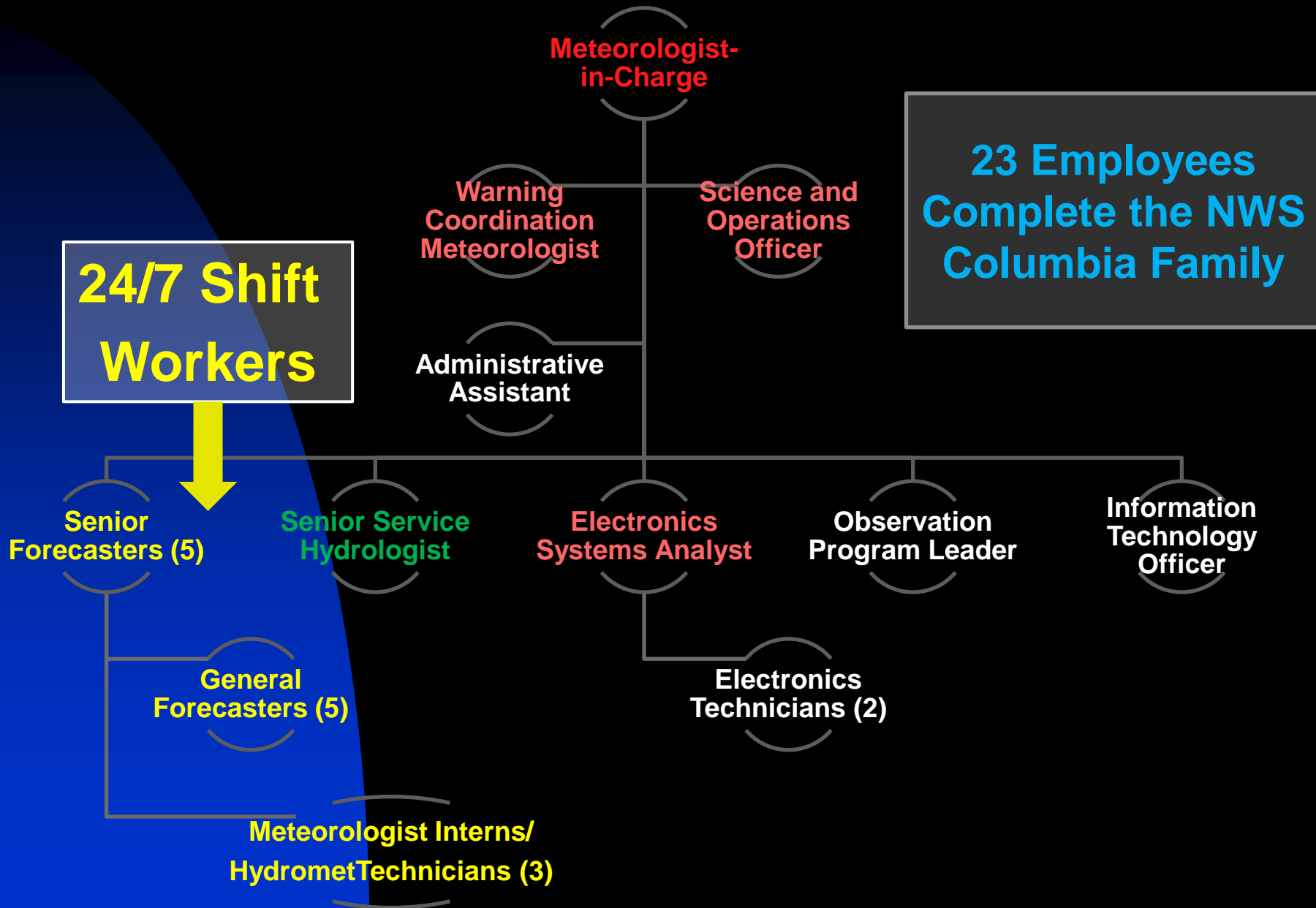


NWS Columbia Area of Responsibility



- Population (2015 est.): 1,796,361
- 23 Counties (18 in SC, 5 in GA)
- 2 Commercial Airports (CAE & AGS)

Meet the Columbia Staff



National Weather Service

Columbia Office Responsibilities



Highest Priority:
Severe Weather
Watches, Warnings, &
Advisories



7 Day Public Forecasts



Aviation Forecasts



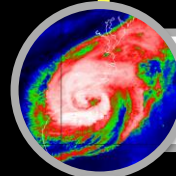
Fire Weather Forecasts



River Flood Warnings



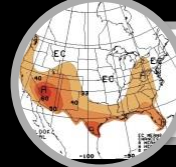
Lake Forecasts



Tropical Support



Collect Weather Data



Climate Reports



Decision Support Services



Education/Outreach &
Preparedness



Collaboration w/ Federal,
State, Media, etc.



Local Research, Attend
Scientific Conferences

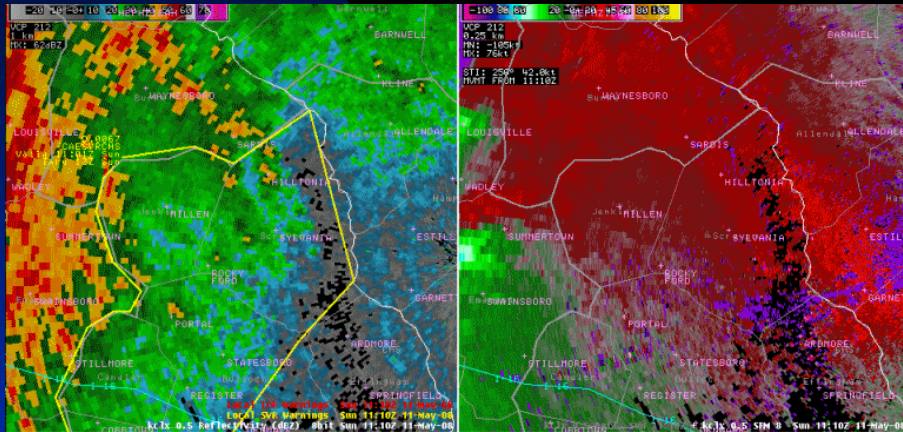
Outline

- Who is the National Weather Service?
- **Why are Storm Spotters Important?**
- Weather Hazards and Safety
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The Importance of Spotter Reports in the NWS Warning Process

Is the Storm Severe, or Tornadoic?



Should a Warning Be Issued?



The Importance of Spotter Reports in the NWS Warning Process

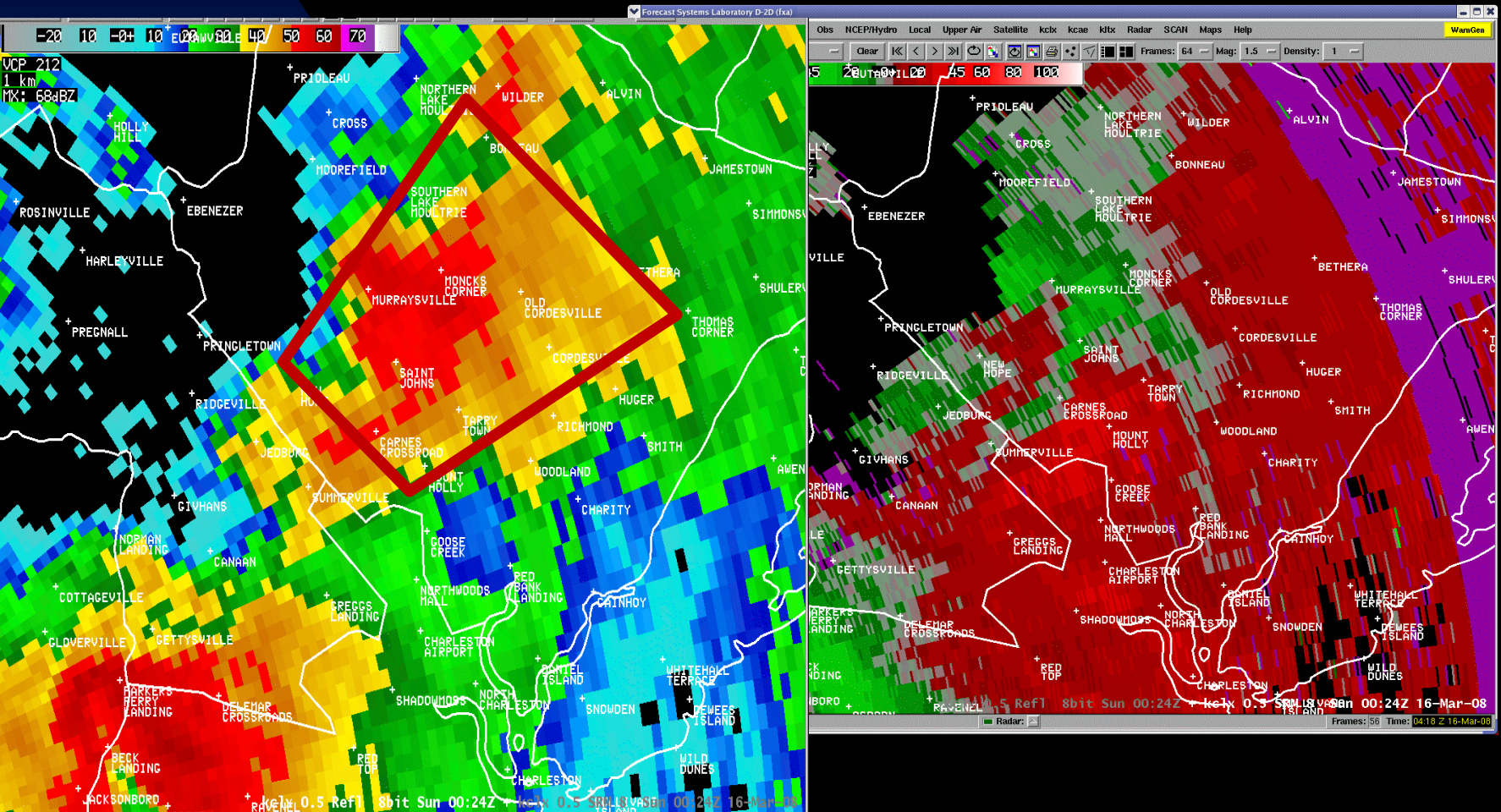
Storm Has Good Rotation, BUT No Reports!



Based on Radar,
Tornado Warning Issued!

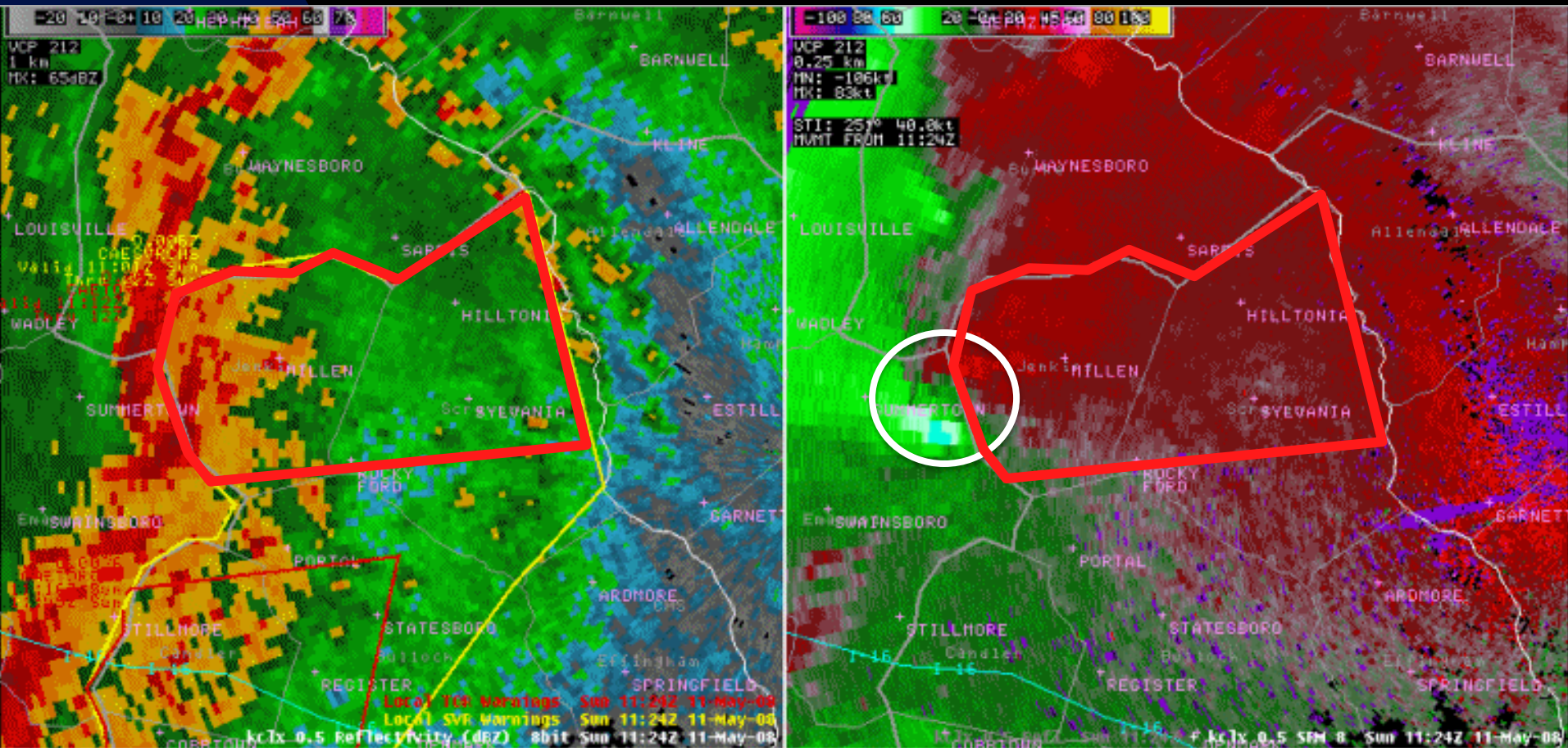
The Importance of Spotter Reports in the NWS Warning Process

A Tornado Warning Issued!



The Importance of Spotter Reports in the NWS Warning Process

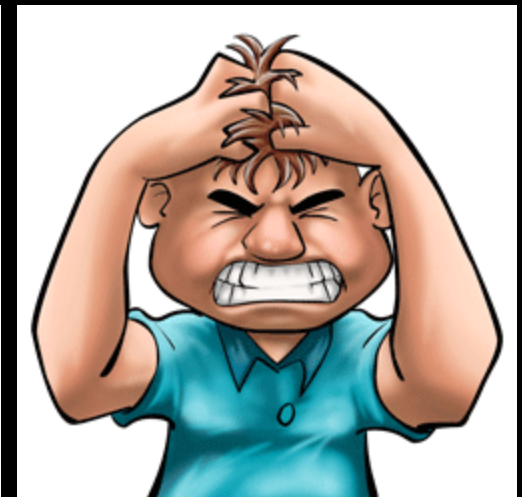
A Tornado Warning Issued!



The Importance of Spotter Reports in the NWS Warning Process

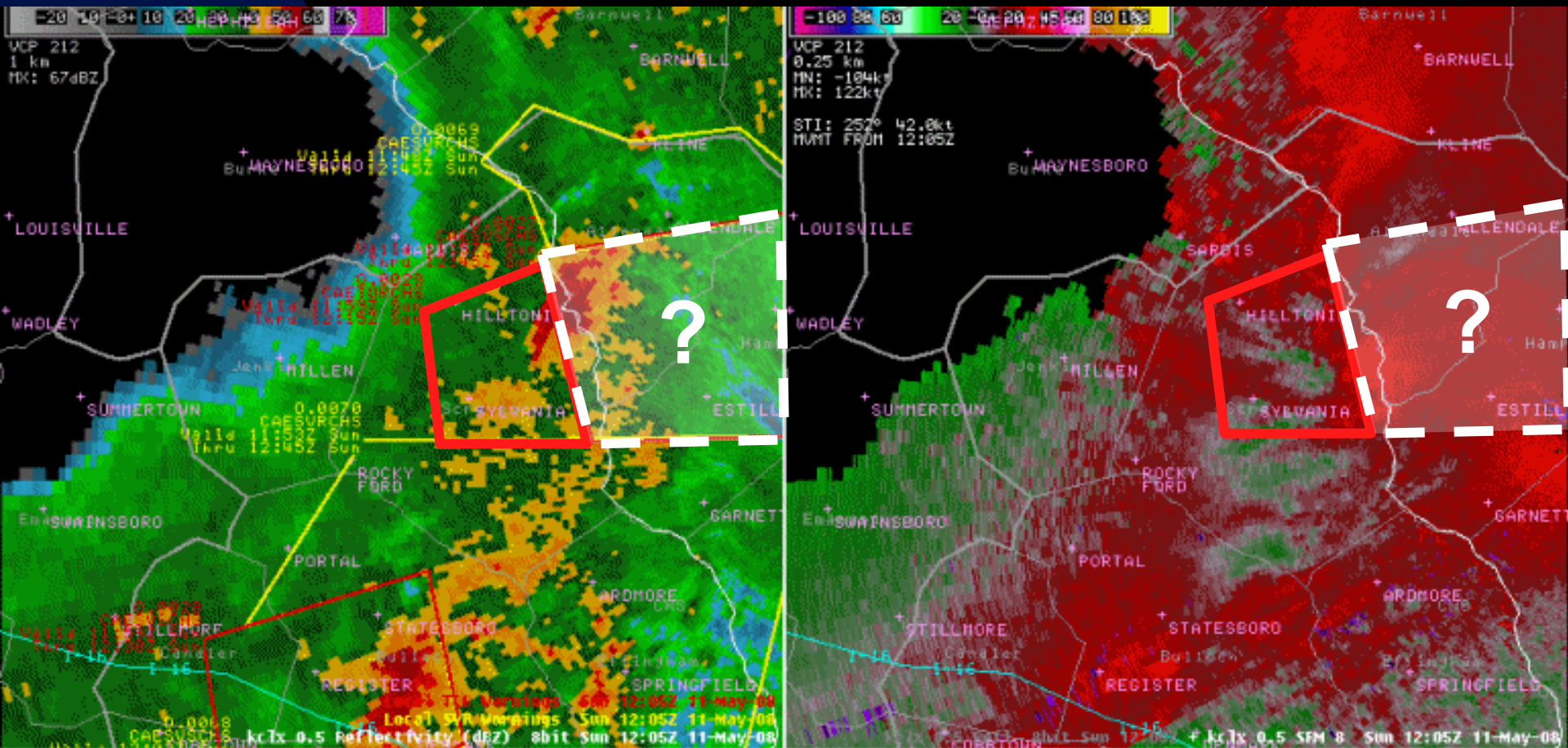
20 Minutes Later

- Warning About to Expire
- Storm Weaker, BUT Still Looks Strong
- ***Still NO reports!***



The Importance of Spotter Reports in the NWS Warning Process

Should Warning Continue???



The Importance of Spotter Reports in the NWS Warning Process

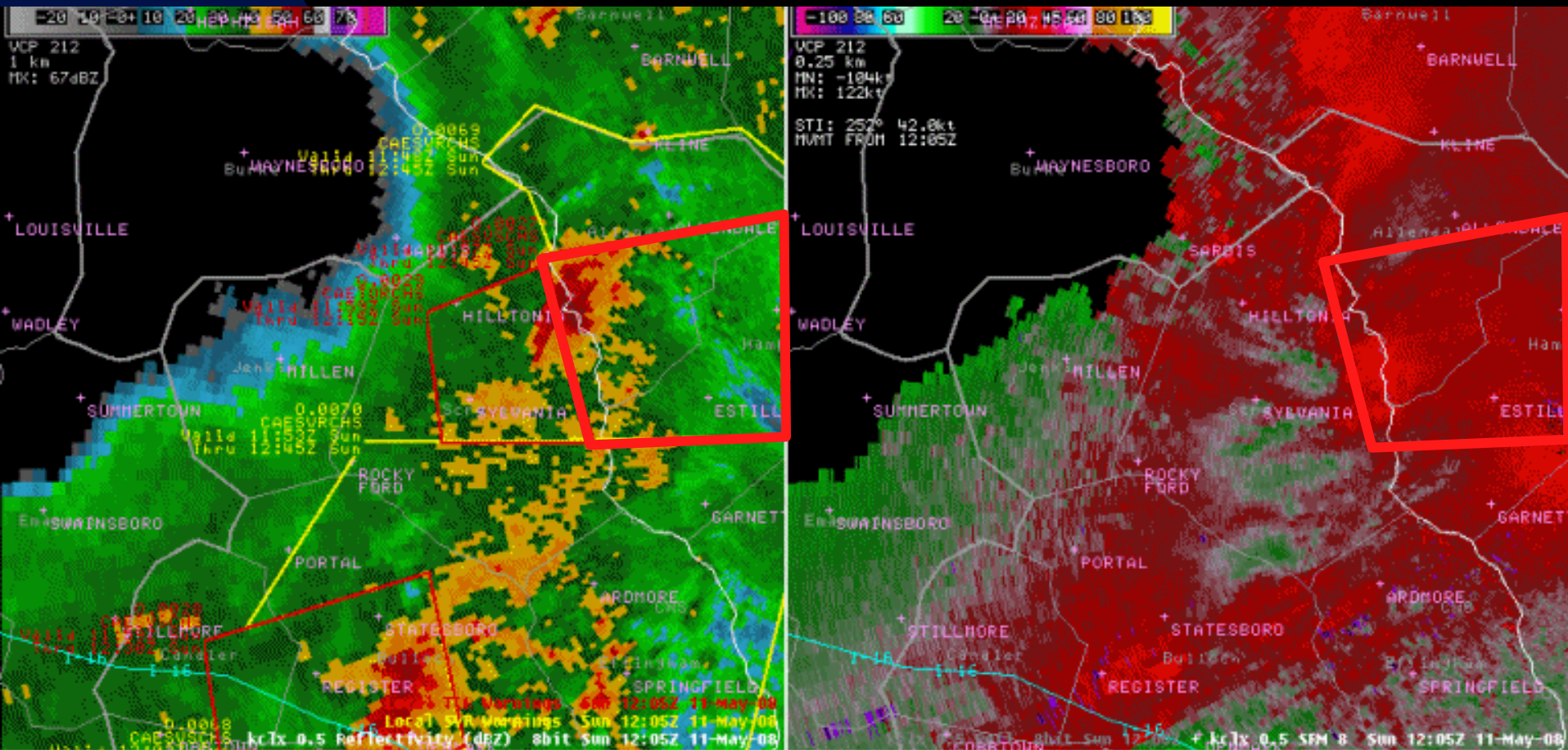
**Spotter Reports Tornado on the Ground with
Mobile Homes Damaged and Trees Down!!**

Thanks for
the Report!



The Importance of Spotter Reports in the NWS Warning Process

Tornado Warning Reissued, Supported by Spotter Report!



The Importance of Spotter Reports

Summary



TORNADO
WARNING

- Warning Text **Without Spotter Report**

“National Weather Service Doppler Radar Indicated a Severe Thunderstorm Capable of Producing a Tornado....”

- Warning Text **With Spotter Report**

“National Weather Service Storm Spotter Reported a Tornado Moving NE Toward City/Town X...”

The Importance of Spotter Reports Summary



- **Helps NWS Fulfill Mission of *Protecting Life and Property!***
- **Gives Confidence to the Warning Forecaster**
- **Adds Critical Details to the Warning, Which Heightens Impacts & Response**
- **Can Provide Downstream Communities a More Timely Warning. (*minutes make a difference!*)**

Outline

- Who is the National Weather Service?
- Why are Storm Spotters Important?
- **Weather Hazards and Safety**
- Severe Weather Reporting Procedures
- Monitoring Severe Weather



Weather Hazards and Safety





Building a Weather-Ready Nation

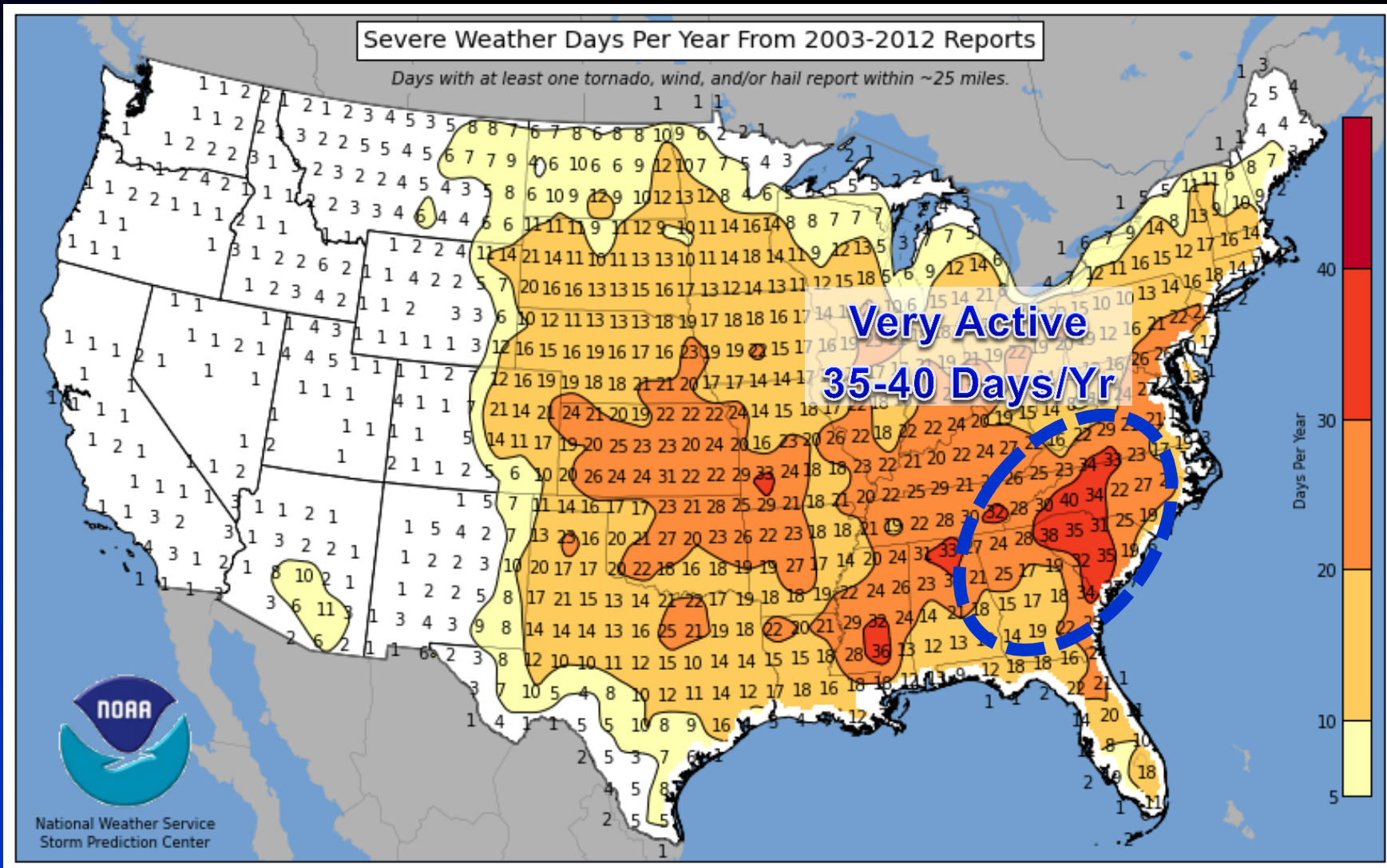


Vision

A Weather-Ready Nation: Society is Prepared for and Responds to Weather-Dependent Events

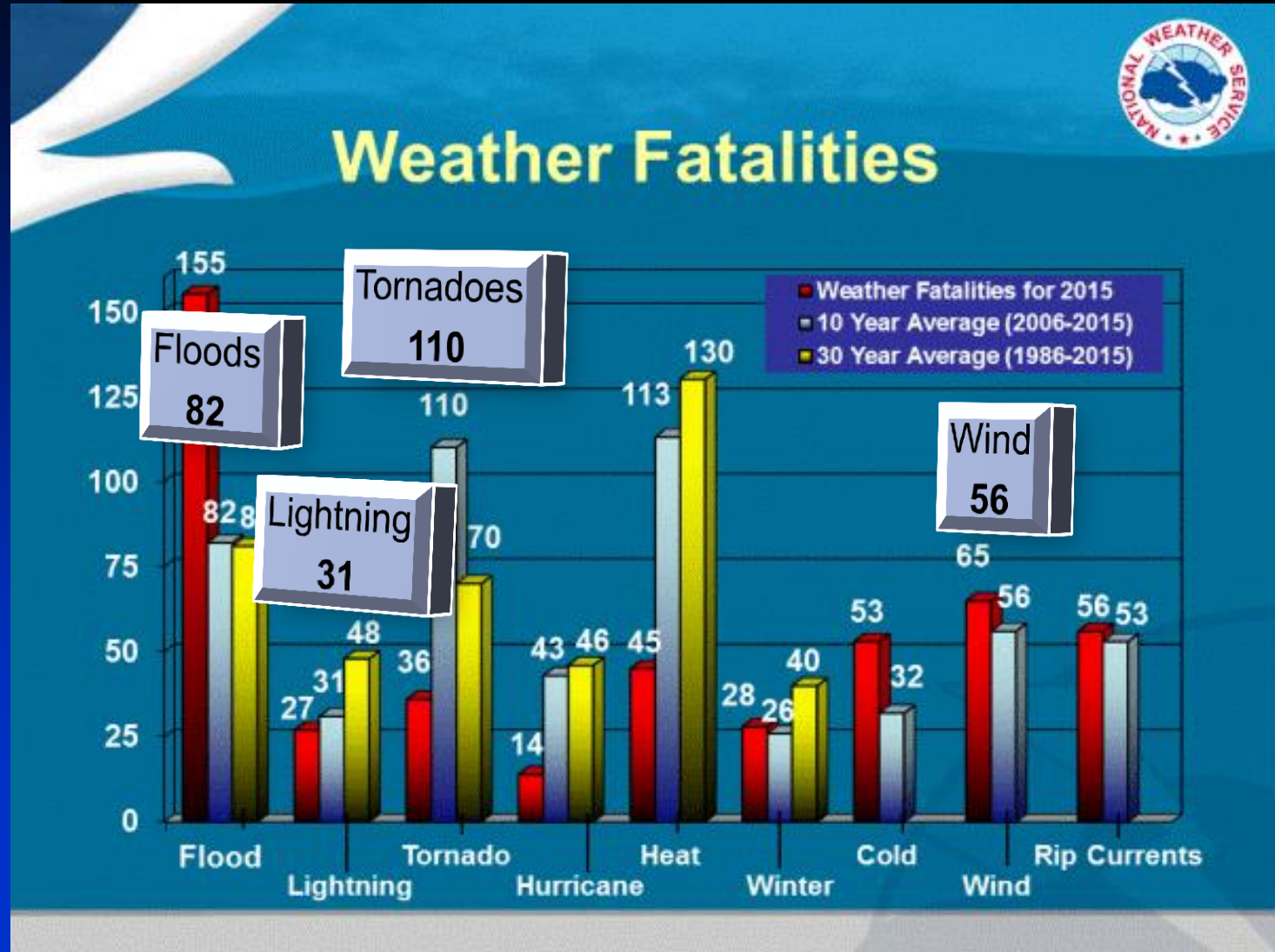


Severe Weather Days/Year



Weather Hazards and Safety

Let's Look at 10 Year Averages

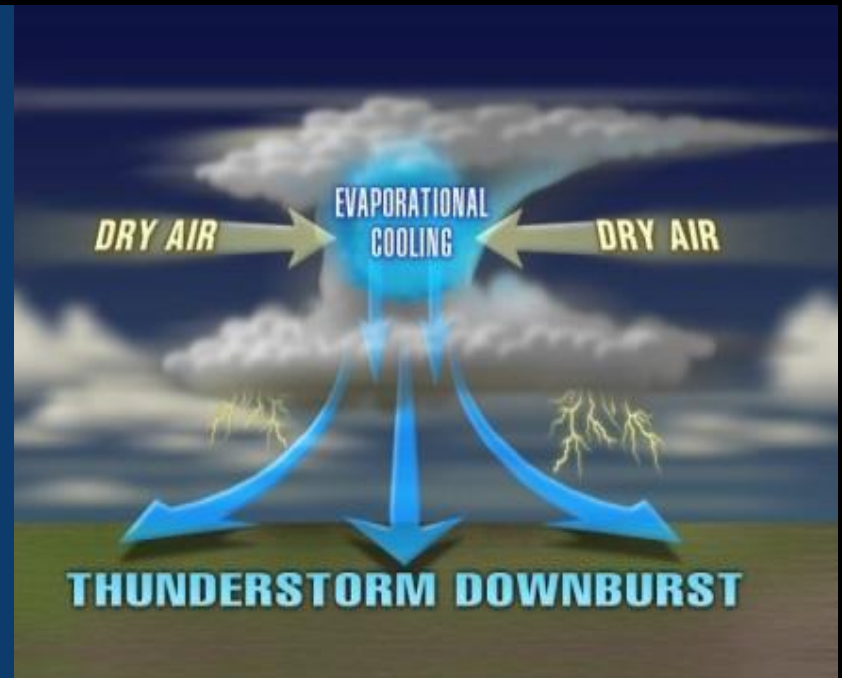
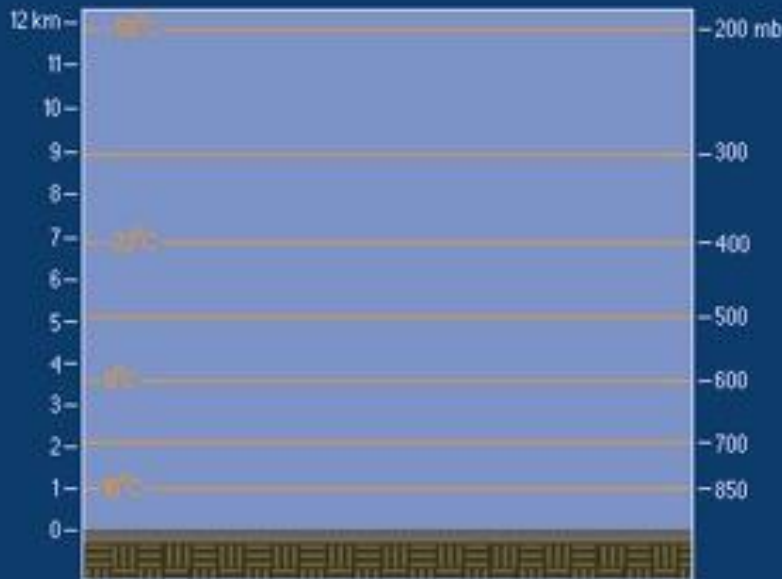


Severe Thunderstorm Winds



Thunderstorm Downburst Formation

- Clouds/Storms Form from Rising Air
- Precipitation Forms → Falls and “Drags” Air Back Down to Ground
- Drier Air Helps to Create Stronger Downward Motion, Sometimes Strong (i.e., Downburst)
- Wind Speeds of 60+ mph Start to Cause Damage



Microburst Example



Tucson Wet Microburst | August 8th, 2015

from **Bryan Snider Photography** PHOTO 2 days ago via **Dropbox** ALL RIGHTS RESERVED

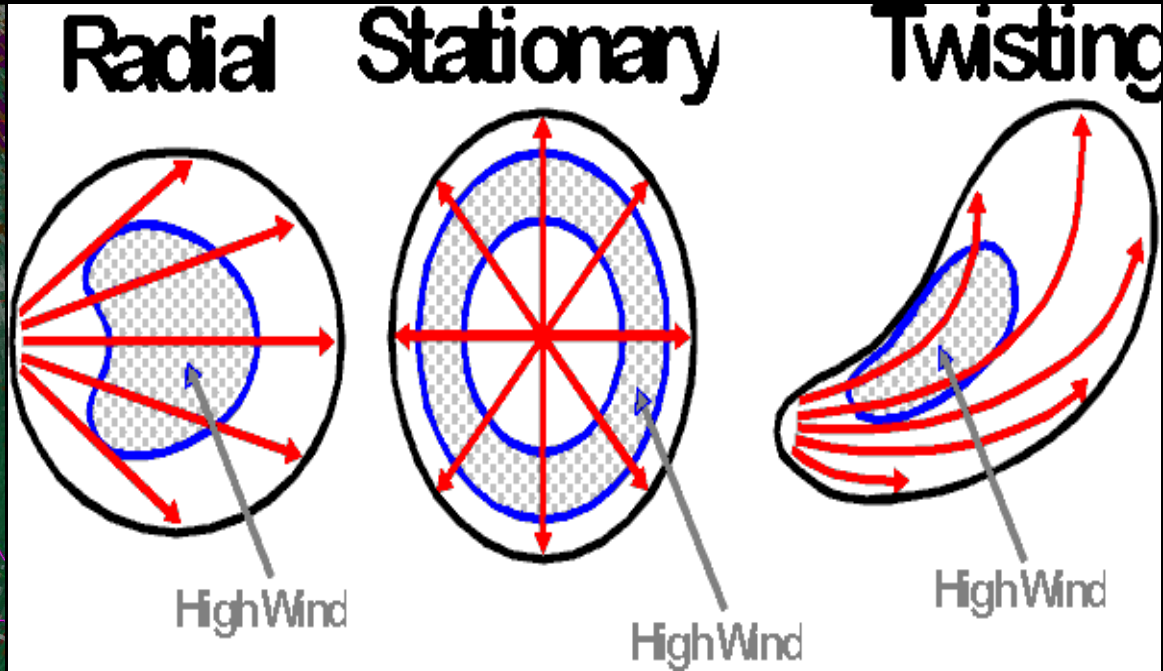
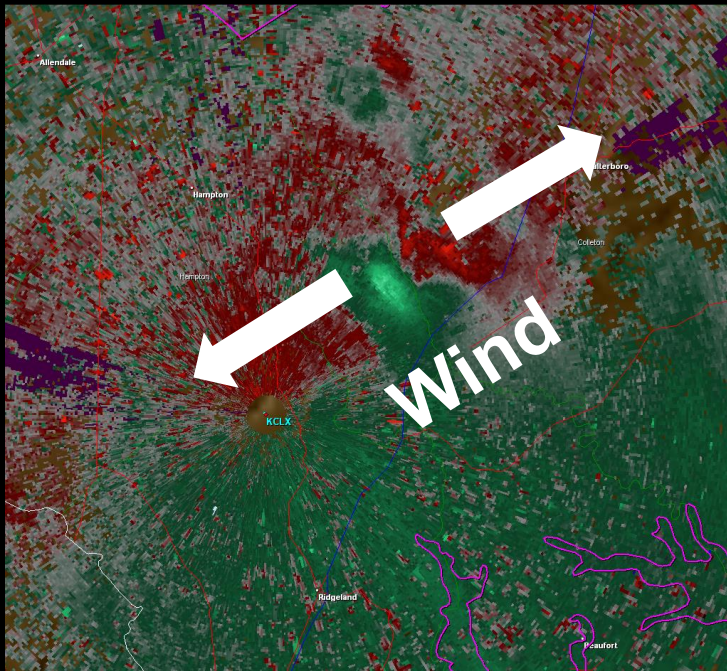
A time lapse of a strong thunderstorm that dropped a couple of wet microburst. One in particular was captured really well in the time lapse thanks to the sun peaking out to the west. Notice how the ball of rain falls from the sky and starts separating before hitting the ground. Once it hits the ground you can see the power of microburst as it expands similar to the ripple you would see when you drop a stone in water.

Downburst – Straight Line Winds

What do They Look Like?

On Radar – Difficult to Detect AND Warn For!

Damage Patterns on the Ground





Southeast of Norman, Ok (Bill Bunting)





Southeast of Norman, Ok (Bill Bunting)

Straight Line Winds - Derechos



Wind Signatures – Shelf Cloud

- Leading Edge of:
Strong Winds, Heavy Rainfall,
Hail
- Slope Down and Away from Rain
- Moves Away from Storm



Strong/Severe Wind Damage



Safety

- Go Into a Sturdy Shelter
- Lowest Level, Interior Room, Away from Windows
- Protect Your Head





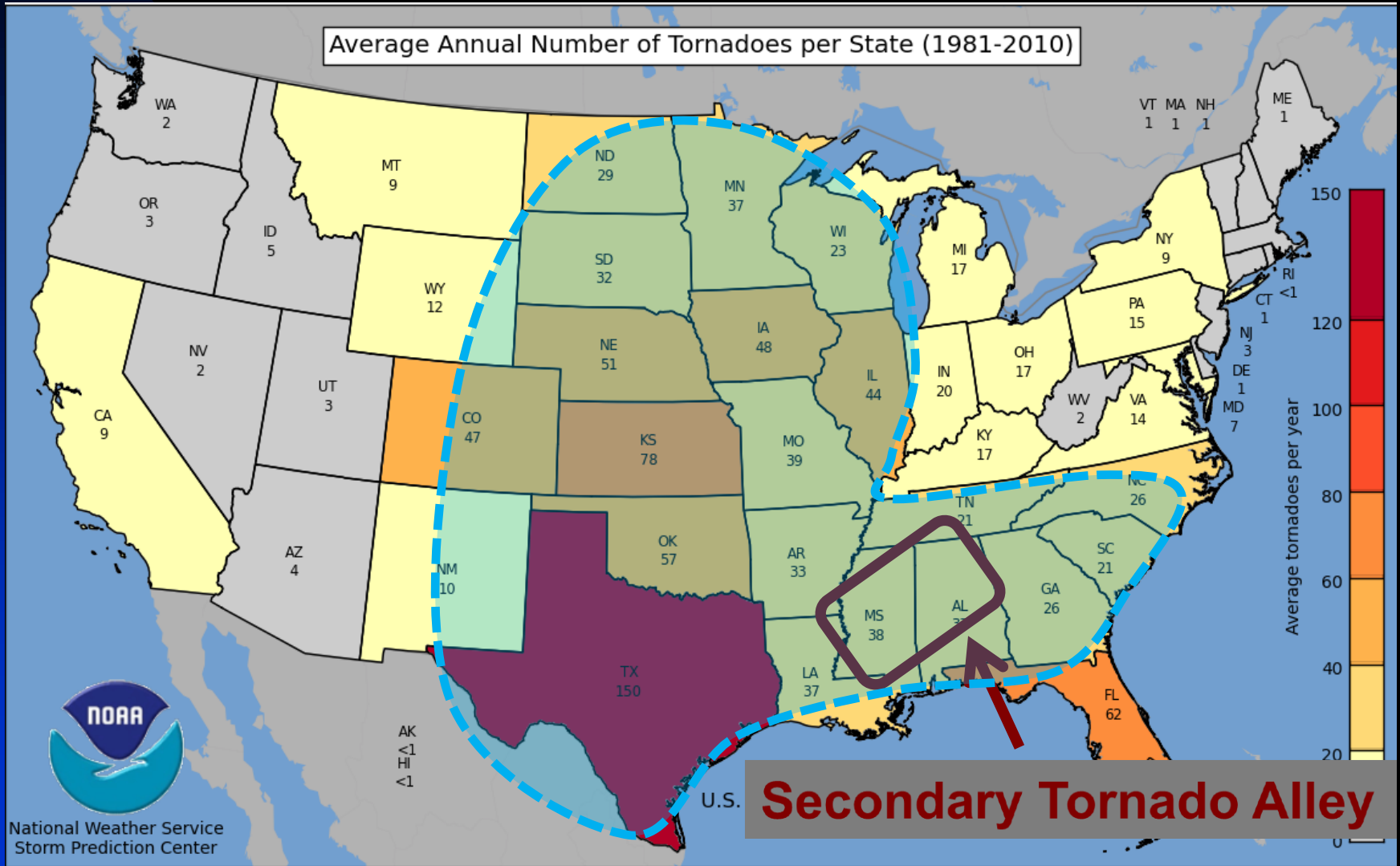
Leave Mobile Homes in Severe Weather!
Can Roll in 80+ mph Winds

Tornadoes and Waterspouts



National Tornado Distribution

30 Year Avg. 1981-2010



FUNNEL CLOUD – Rotating Column of Air from Base of Cloud- ***NO Contact with Ground***



Funnel cloud

National Weather Service Forecast Office, San Antonio, TX

NOAA Central Library

TORNADO – Violently Rotating Column of Air from a Thunderstorm and In Contact with the Ground. *Funnel* May Not be Visible!



Look for Debris

**KEEP YOUR EYE on THE SKY...
AND the GROUND!**



SevereStudios.com
Andy Gabrielson

NWS/Traning Use Only - NOT FOR BROADCAST

Categories of Tornadoes



- **Intensity of Tornadoes**
 - ◆ **Based on the Damage**
 - ◆ Winds NOT Directly Measured
- **Rated From EF0-EF5**
(Enhanced Fugita Scale)
- **Size May Not \neq Strength**

Weak Tornadoes



- **EF0 and EF1** on the Enhanced Fujita Scale (65-110 mph)
- **88% + of All Tornadoes**
- **< 5% of all Tornado Deaths**
- **Brief Touchdowns, or Paths < Few Miles Long**



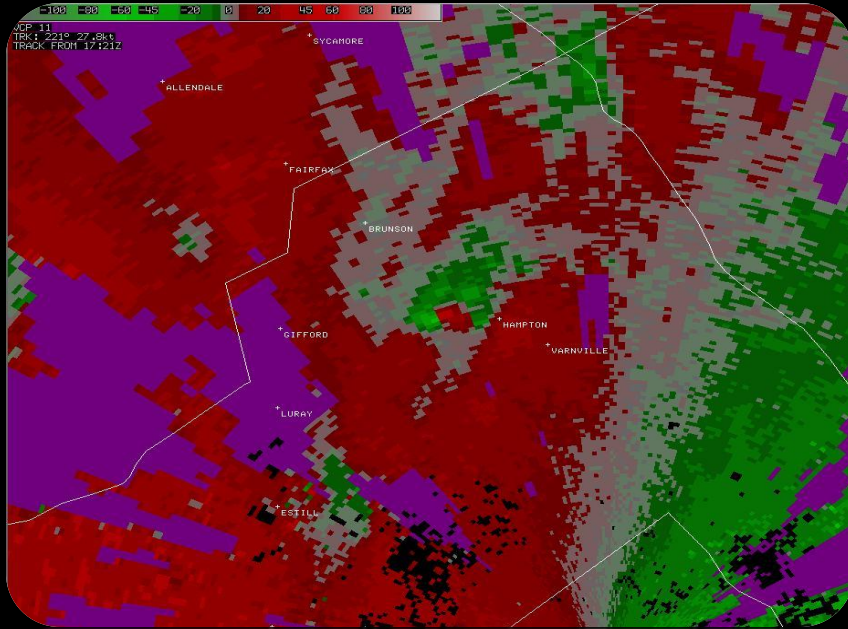
EF0 Damage



EF1 Damage



EF1 Damage



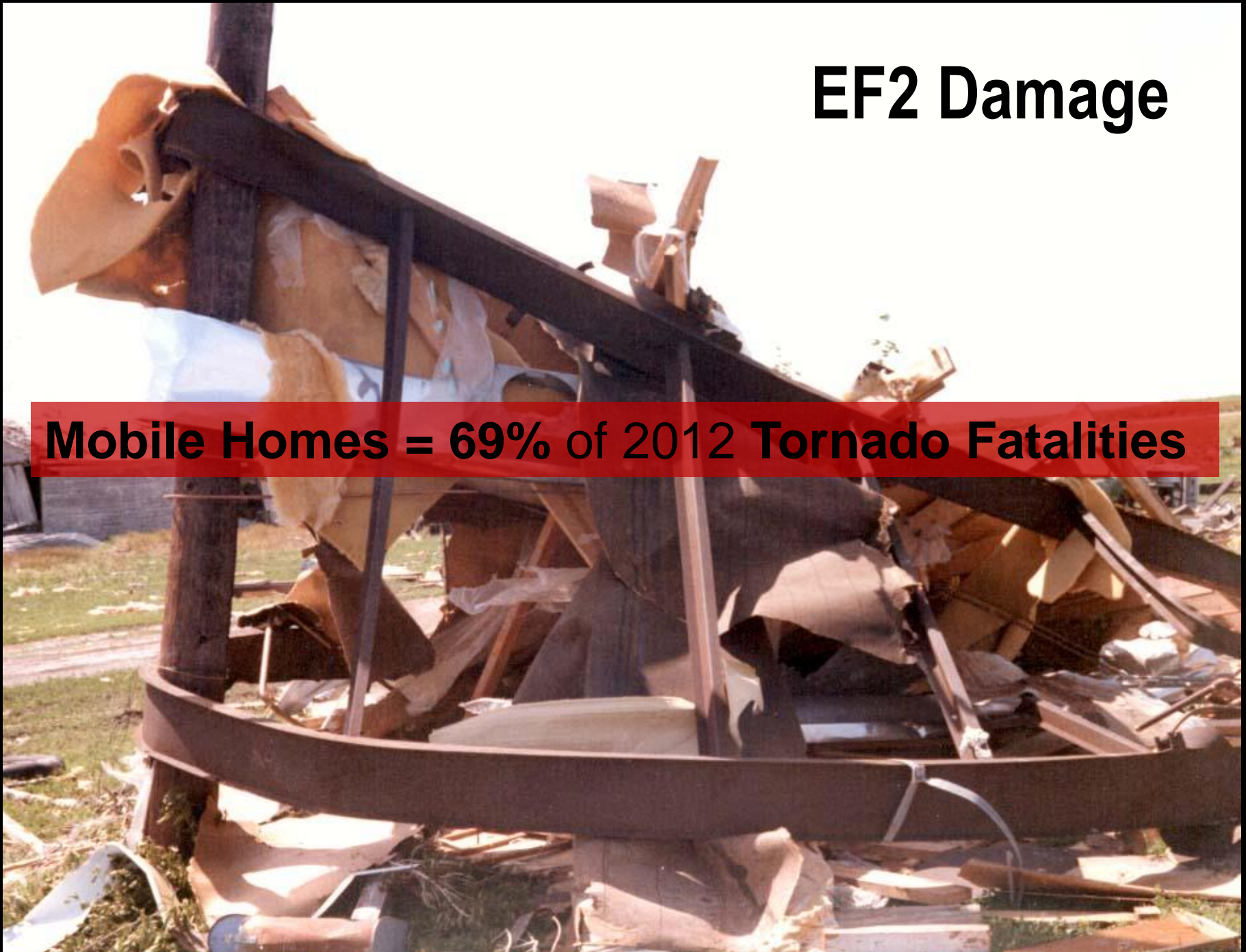
Strong Tornadoes



- **EF2 and EF3** (111-165 mph)
- **11% of All Tornadoes**
- **Up to 30% of Tornado Deaths**
- **Paths as Long as 10 - 15 Miles Long**

EF2 Damage

Mobile Homes = 69% of 2012 Tornado Fatalities



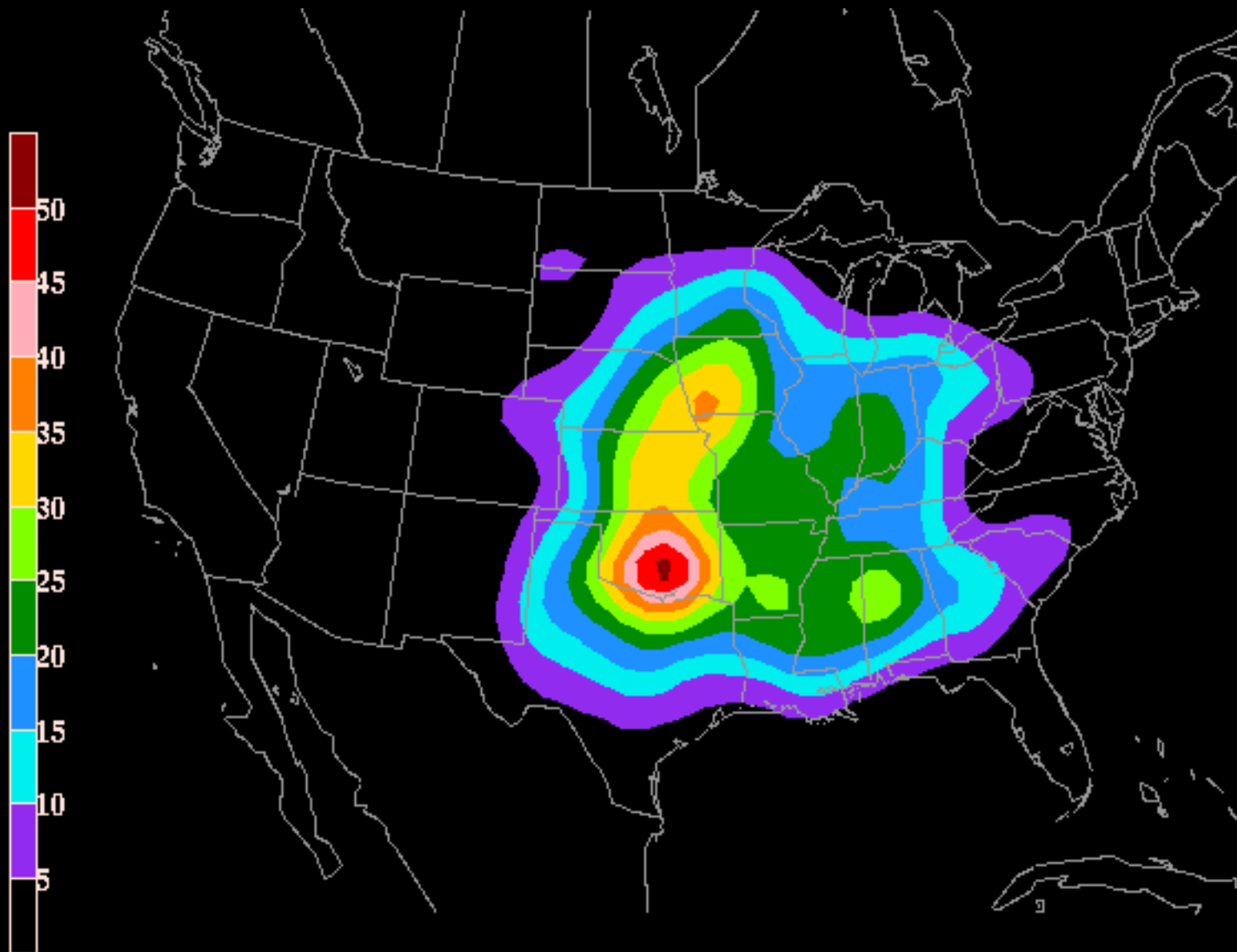
Violent Tornadoes



Photo by Doug Berry

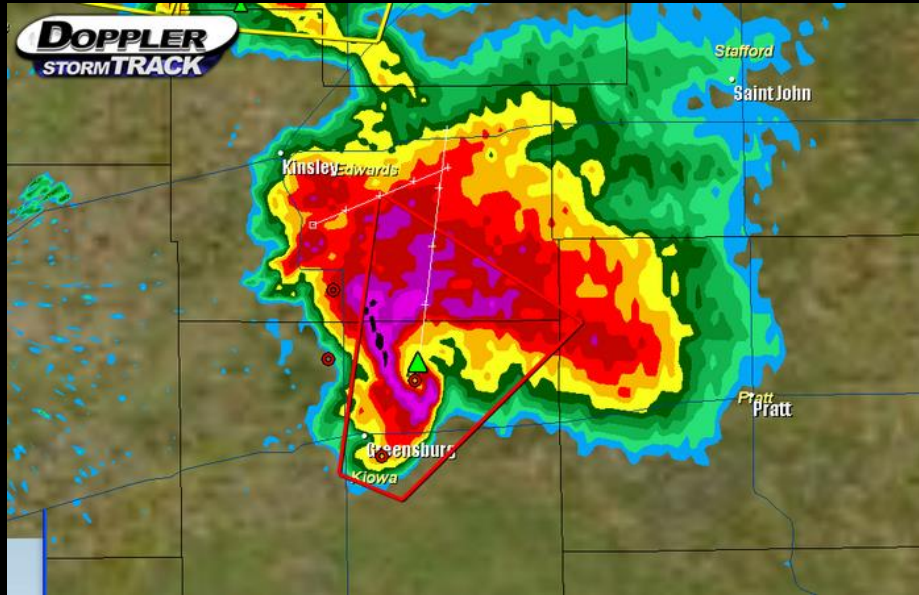
- **EF4 and EF5** (166-200+ mph)
- **1% or Less of All Tornadoes**
- **~70% of all Fatalities**
- **Paths May Be > 70 miles Long, up to 1 mile Wide**

Violent Tornado (EF4 +) Days



Violent (F4 or greater) Tornado Days Per Millenium (1921-1995)

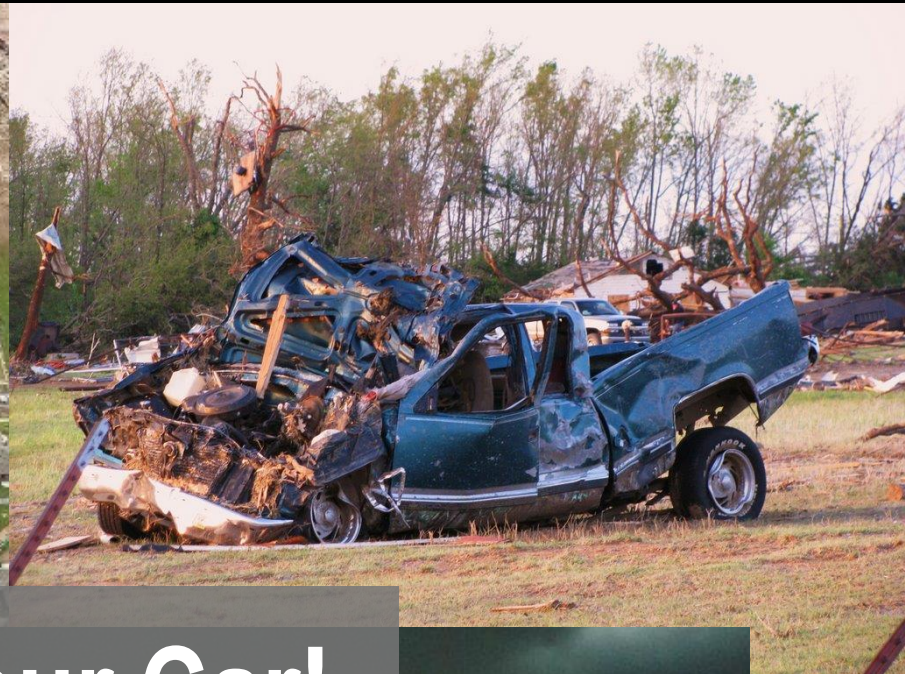
EF5 Damage



Asphalt Stripped Off Highway



EF5 Damage



Leave Your Car!

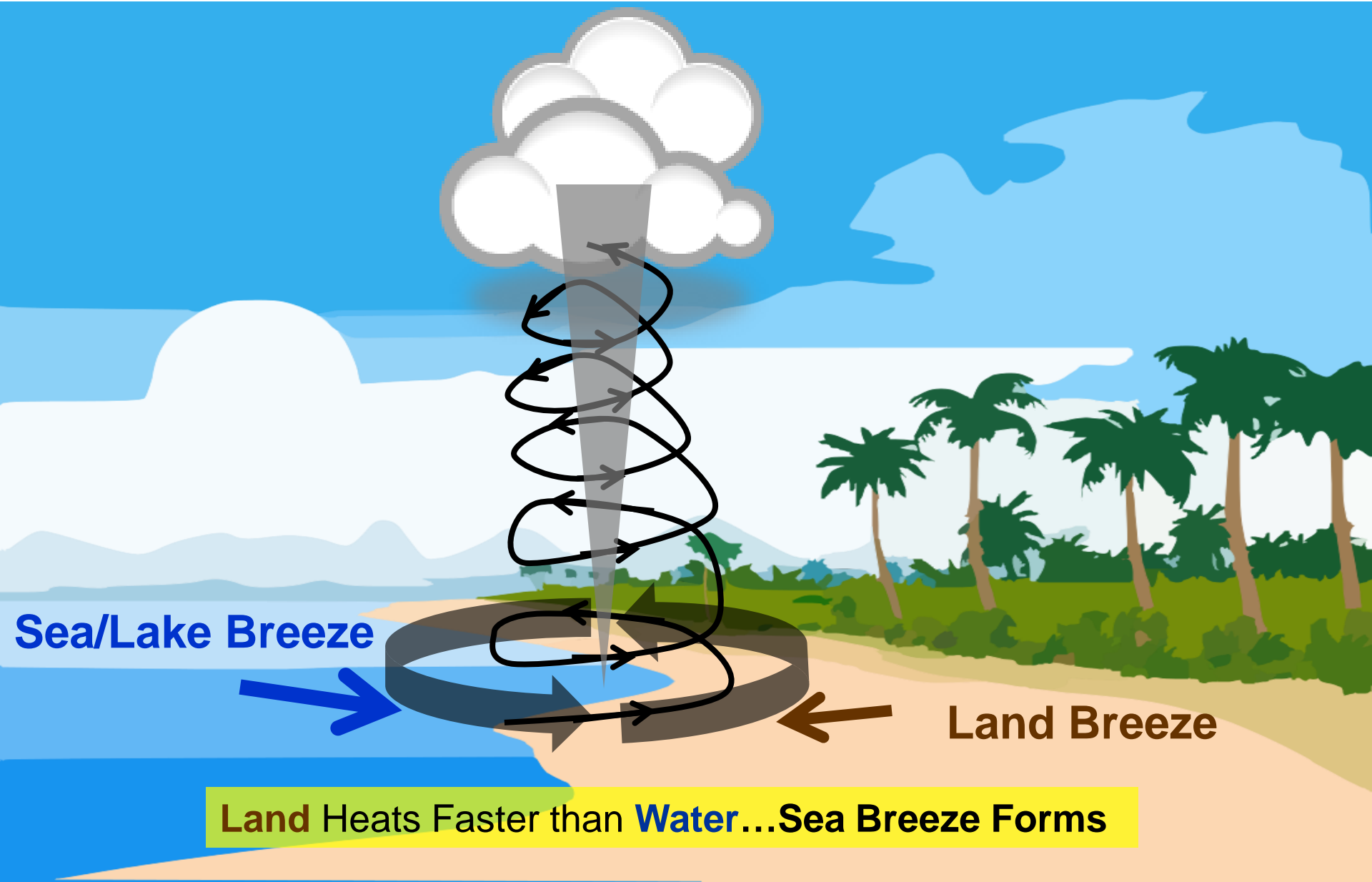


Landspouts / Waterspouts

- Form From Lower Levels up to the Cloud
- Land Version -> **“Landspout”**
- Water version -> **“Waterspout”**
 - ◆ Typically Weak (EF0, EF1)
 - ◆ Slow to Little Motion



Water/Land Spout Formation



Beaufort Waterspout – July 13, 2005



Picture courtesy of
Beaufort Gazette



Video courtesy of Beaufort Emergency Management

Tornado Safety

- Seek Sturdy Shelter
- Interior Room, on Lowest Level
- Away From Windows
- Protect Your Head



Tornado Safety



**All Survived in Interior
Rooms or Closets!**

Tornado Safety – *Use a Helmet??*

CBS42 Promotes Helmet Safety wi..



YouTube

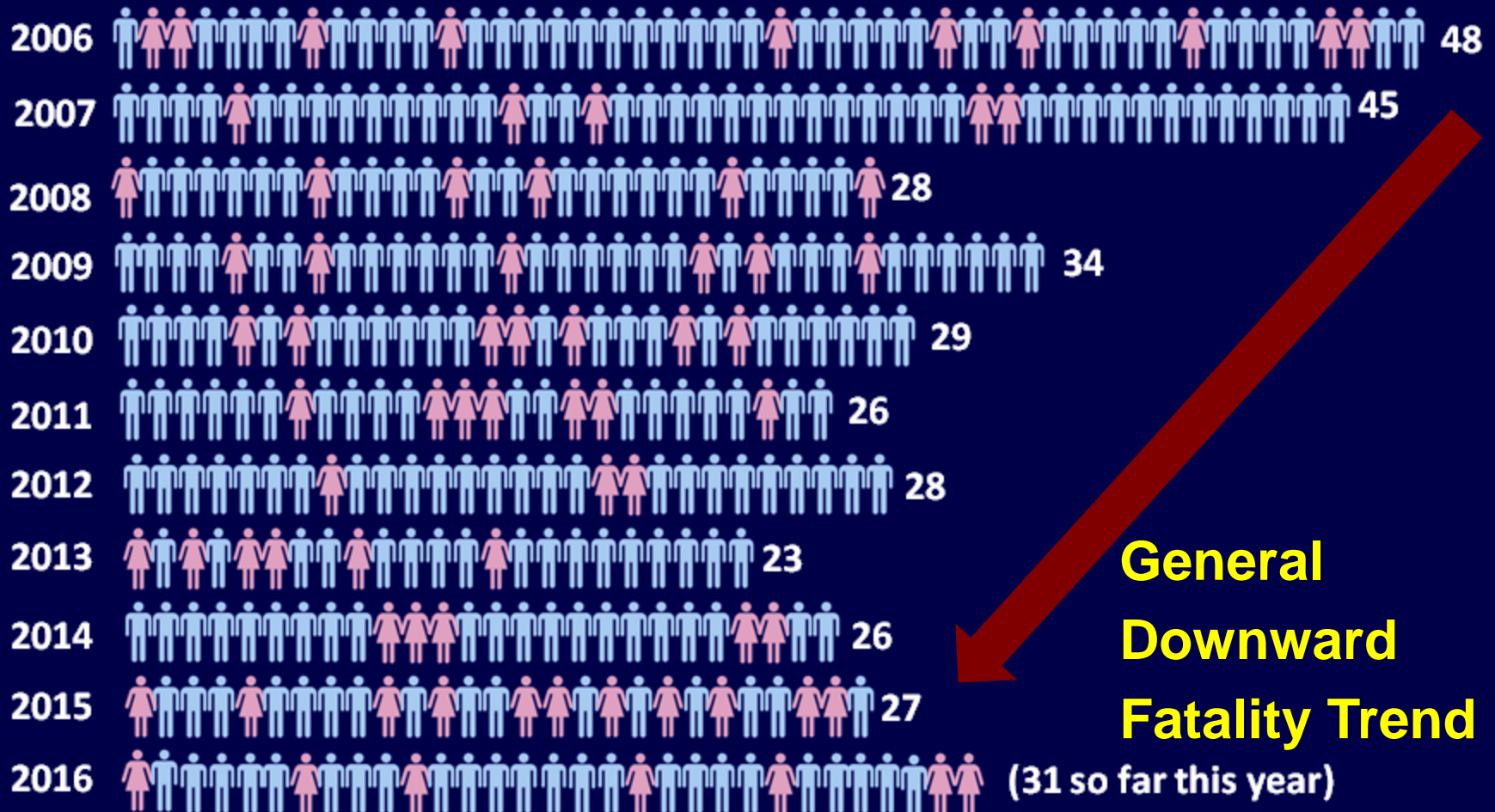


Lightning





U.S. Lightning Fatalities 2006-2016



♂ -272 ♀ -73

For more information:

<http://www.lightningsafety.noaa.gov/victims.htm>

Lightning Facts



Photo by Doug Berry

- Bolt Can Heat the Air to 50,000 ° F
- Causes an Average of 30-60 U.S. Deaths/Year
(70-80% male)
- After Thunder...
5 sec ~ 1 mile

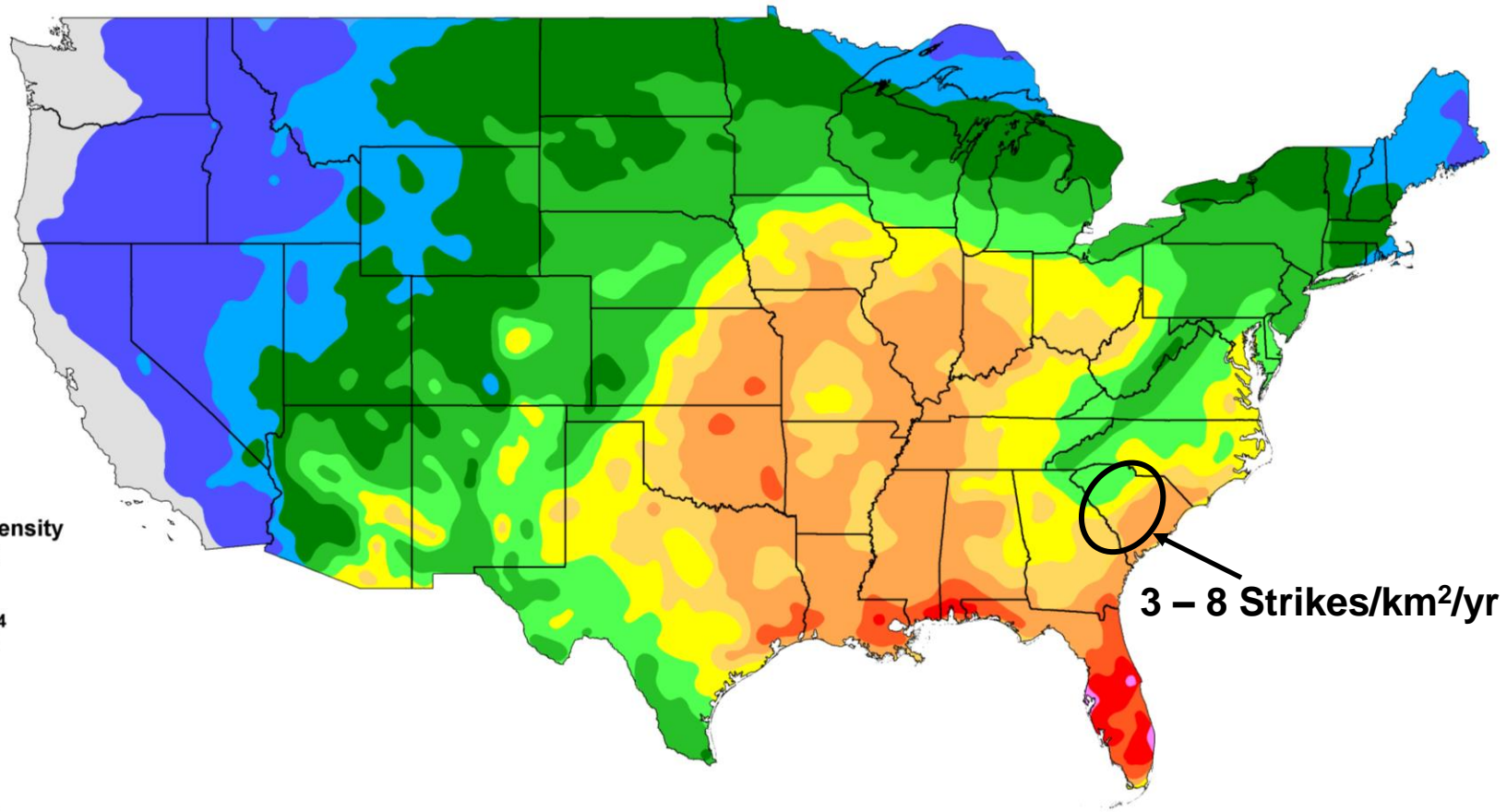




**Lightning Can Strike “Out of the Blue”,
Miles Away From the Thunderstorm!**

Average CG Lightning Strikes (km²/yr)

Cloud-to-Ground Lightning Incidence in the Continental U.S. (1997 - 2010)

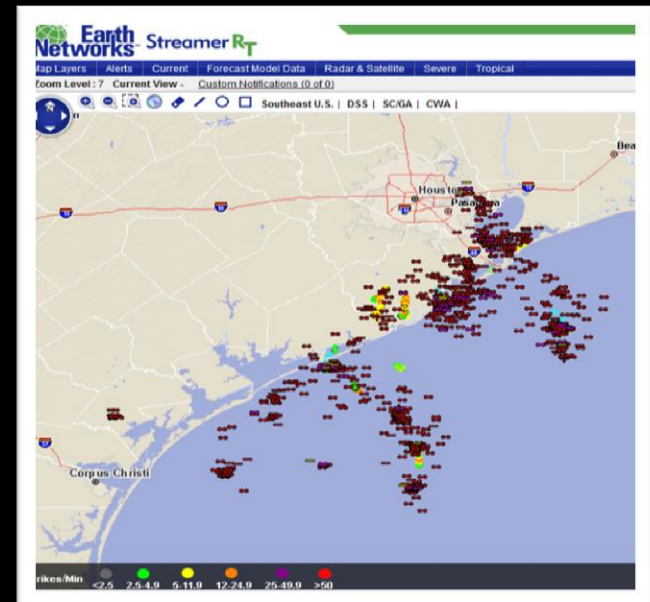


VAISALA

NO NWS Warnings for Lightning!



- Big Danger to Spotters
- Hard to Predict When/Where a CG Strike Will Occur
- Future – Lightning Warnings?



Some Signs of a Strike



BEFORE Strike

- Hair stands on end
- May hear a buzzing or crackling sound

AFTER Strike

- Bark Striped off Tree
- Marks/Burns on Body
- Clothes/Shoes Burned
- Blown Electrical Outlets/Bulbs/Appliances



Lightning Safety Tips

Strike Timing and Location is Unpredictable!!

- Avoid Being the Tallest Object
- Stay Away From Water and Metal
- Seek Protection in a Sturdy Structure
- Stay off Phones, Get Away from Windows & Appliances



Flooding



Flash Flooding

**One of the Biggest
Weather-Related Killers!**

**Don't Drive Through
Low Water Crossings!**

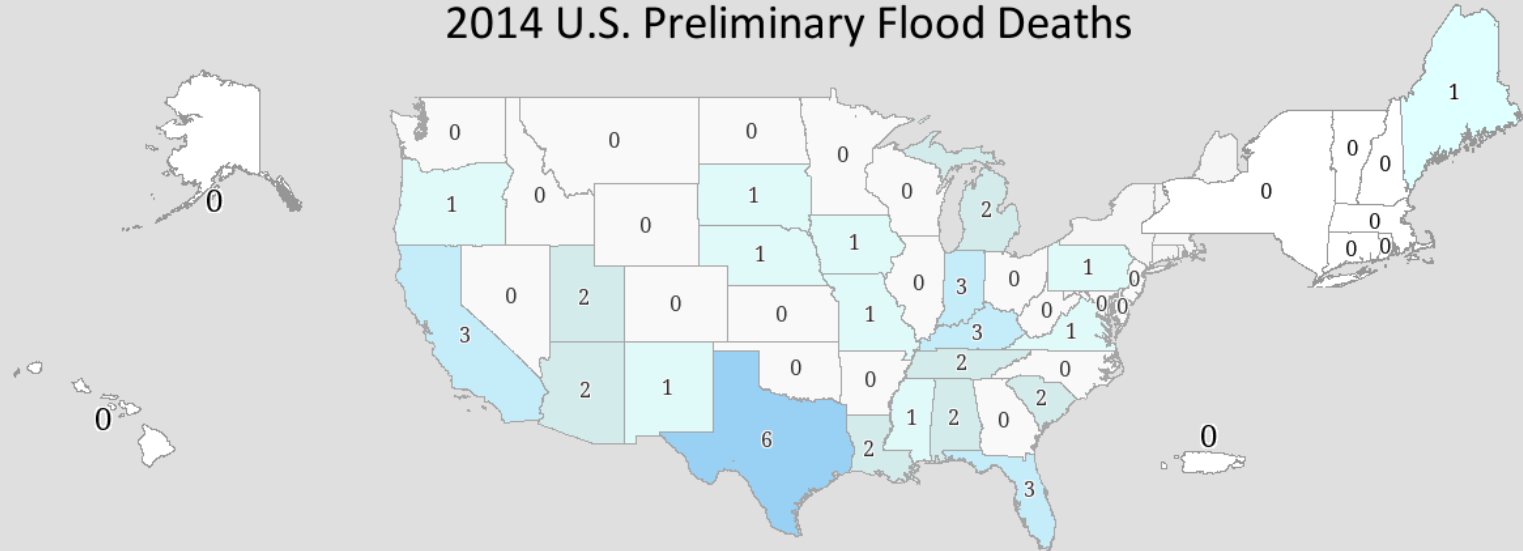


**Nearly 1/2 of All
Flash Flood-Related
Deaths Involve
Automobiles**

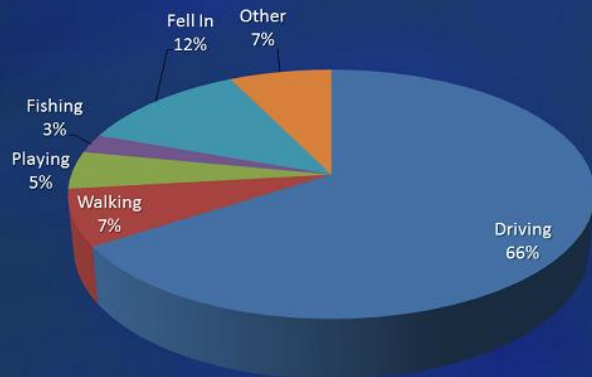


Flood Fatalities - # Varies Year to Year

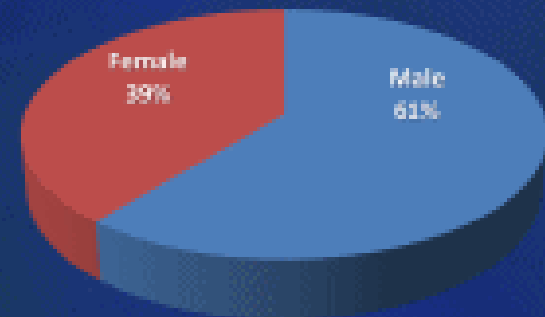
2014 U.S. Preliminary Flood Deaths



2014 U.S. Flood Fatalities
Activity of Victims



2014 U.S. Flood Fatalities
Gender of Victims



Flash Flooding...Hidden Dangers



- Hazardous Chemicals
- Snakes...
- Alligators...
- Drainage pipes...
- Glass...
- Sharp Objects...



Flash Flood – Turn Around Don't Drown



Flash Flood – Don't Do This!!

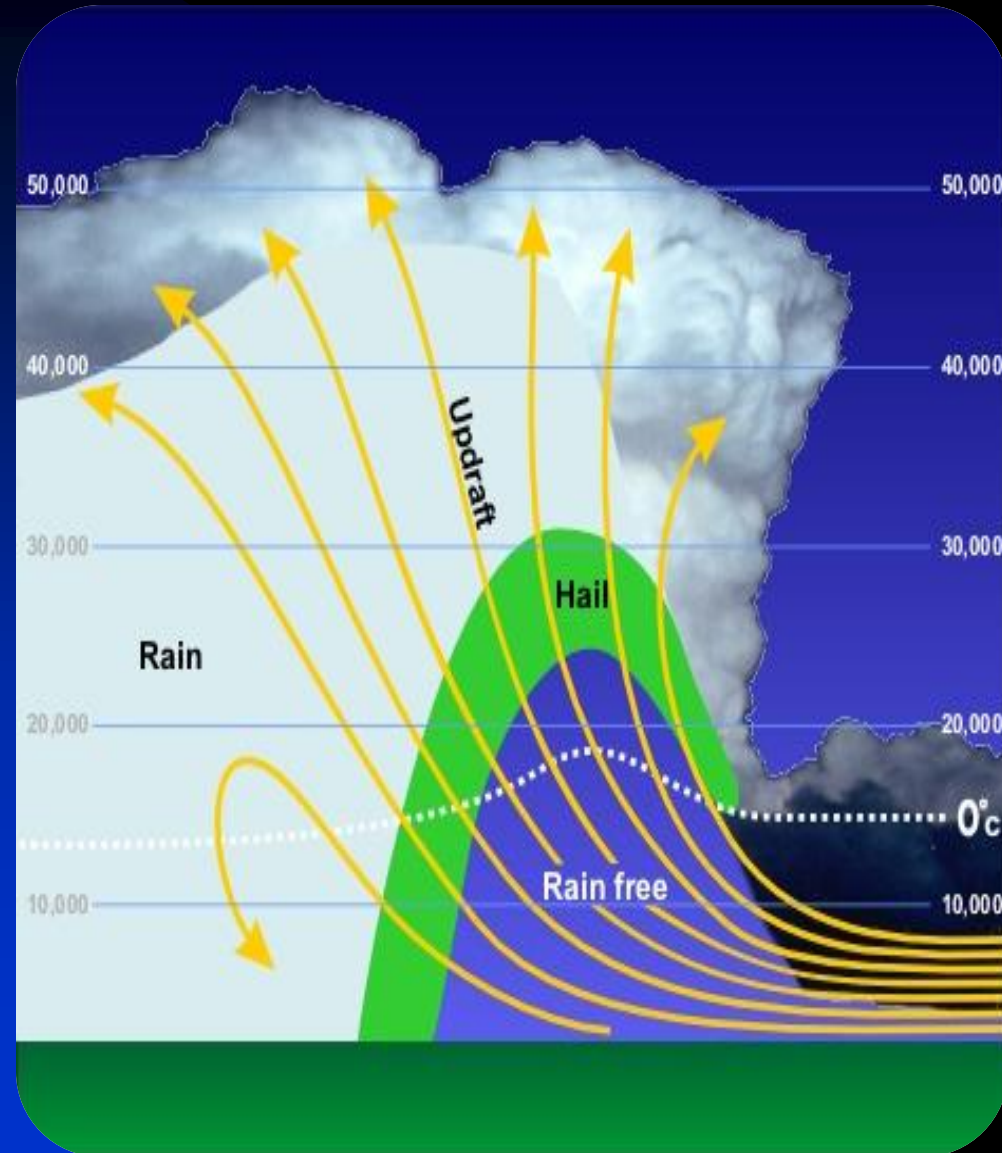


Flash Flood – Don't Do This!!

Hail



Hail Formation



- Chunks of Ice Falling From a Thunderstorm
- Size of Hail Indicates Storm Severity
- If Driving, Pull Over to Minimize Window Damage

Hail – Many Shapes and Sizes

Record

Vivian, SD Jul 23, 2010

Diameter: 8"
Weight: 1.94 lbs
Circumference: 18.62,
biggest 18.75 (Right)



Typical Size Spectrum
Pea to Baseball



Warning Criteria for Hail

Severe Hail is 1" Diameter (Quarter Size) or Larger

Note: Report Hail of ANY Size!



Hail Damage

Car



Roof



Plants



Airplanes



Siding on Home



Hail Damage – Trees/Shrubs



Hail Injury and Safety



Move into a **Sturdy**
Structure:

Car, House, Building



Jogger Injured by 1.5"
Hail in Des Moines, IA
April 2010

Photo courtesy
KCCI 8 – Des Moines

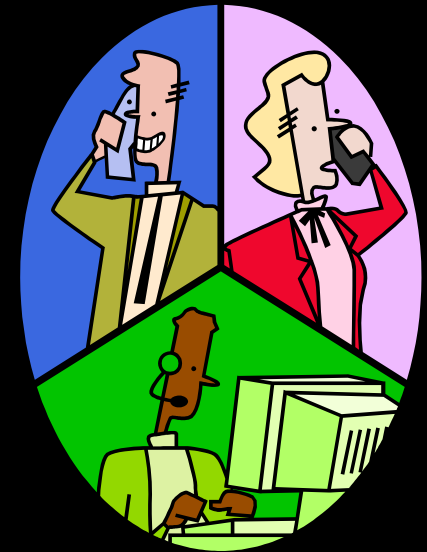
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What To Report

- **Measured or Estimated Winds 50+ MPH, 40 + mph over/near Water**
- **Wind Damage** (downed trees/tree limbs, powerlines, cars, etc)
- **Tornadoes/Waterspouts**
- **Funnel Clouds**
- **Significant Flooding**
(Roads Impassable/Closed, Water into homes)
- **Hail (any size)** Report Largest Piece



Use TEL Method for Your Report

Time – When Did it Happen?

Event – What Did You Observe?

Location – Where Did it Occur?

Note: *Lat/Lon and/or Nearest Intersection for
Damage VERY Helpful!*

Reporting Wind Damage

Some Examples:

- If Possible, Measured Wind Gusts of 50 mph+
- Can Estimate Strong Winds Using Beaufort Wind Scale
- Downed Power Lines, Trees or Limbs (include diameter of tree or limbs)
- Any Structural Damage, Including the Type of Structure



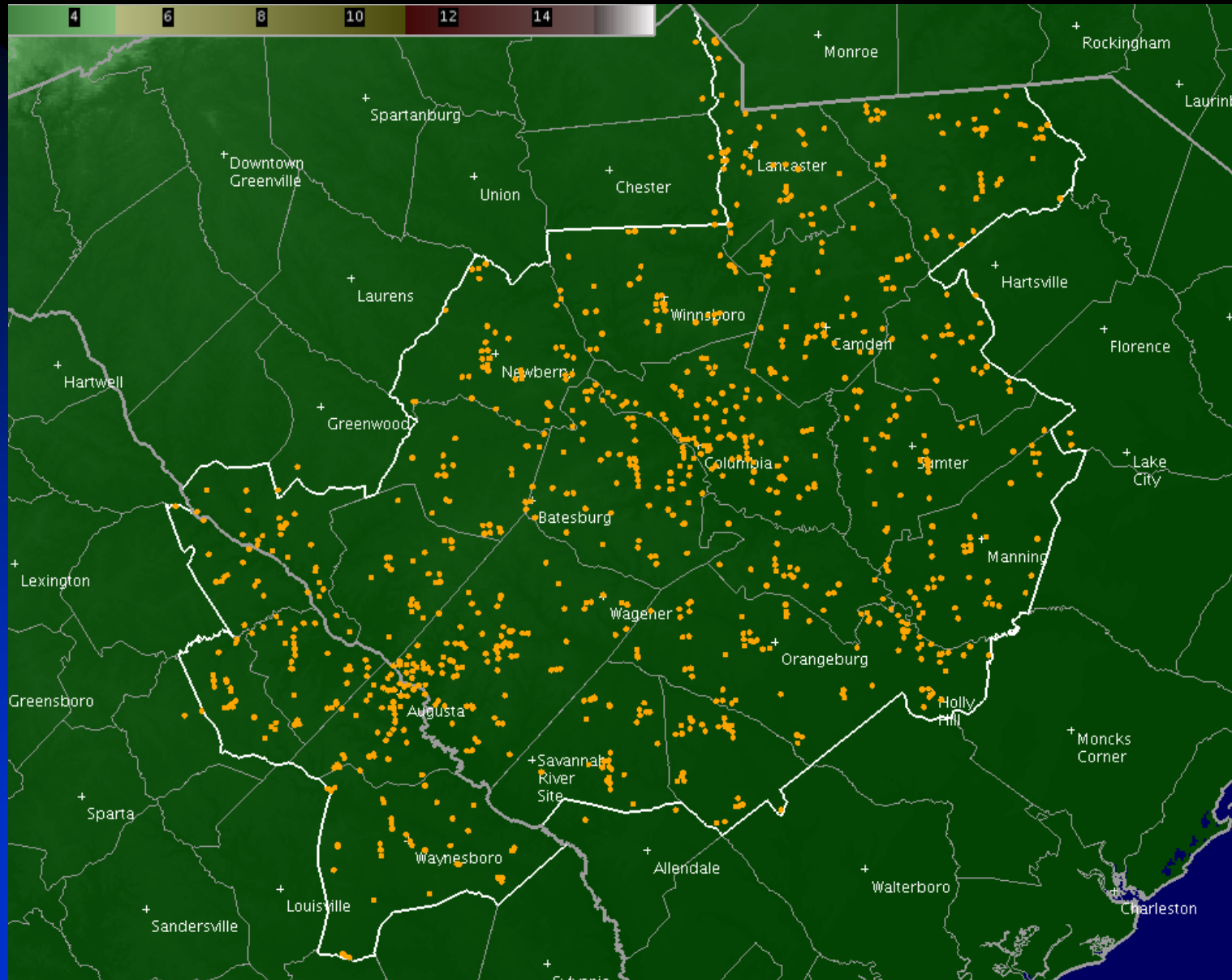
Reporting Hail



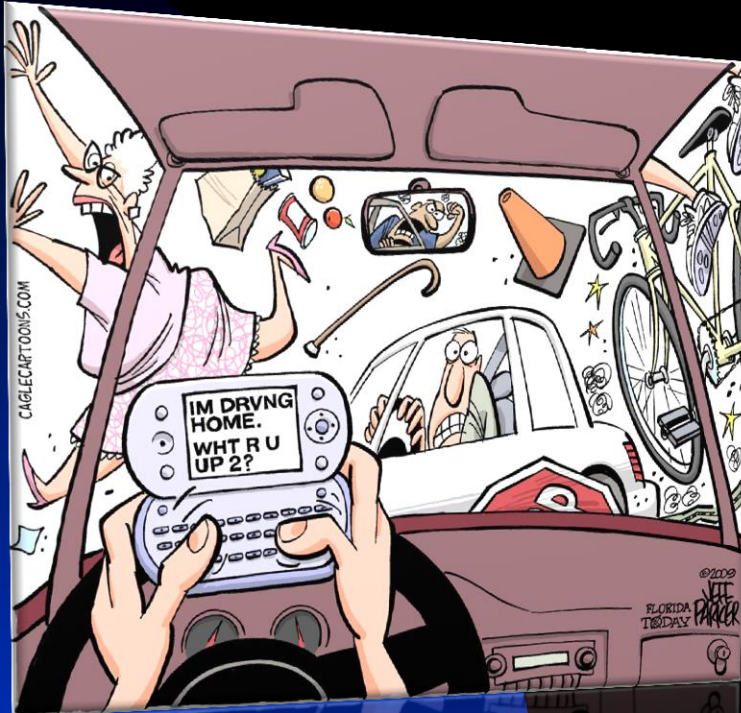
$\frac{1}{4}$ inch	Pea
$\frac{3}{4}$	Penny
0.88	Nickel
1	Quarter
$1 \frac{3}{4}$	Golf ball
$2 \frac{1}{2}$	Tennis ball
$2 \frac{3}{4}$	Baseball
4	Grapefruit



Where are our Spotters?



Remember, Spotters are MOBILE!!



- Report Severe Weather and/or Damage From Any Location!
(Home, Shopping, Work, Vacation, etc.)
- Don't Chase the Weather!
- Remember Safety First!
- If in Car – Pull Over Before Sending Report
- We Will Relay Your Report to Proper NWS Office if Needed

How To Report



Phone (unlisted):



E-Storm Report
Submit at weather.gov/cae



E-mail:
caewx@noaa.gov



Facebook:
NWSColumbia



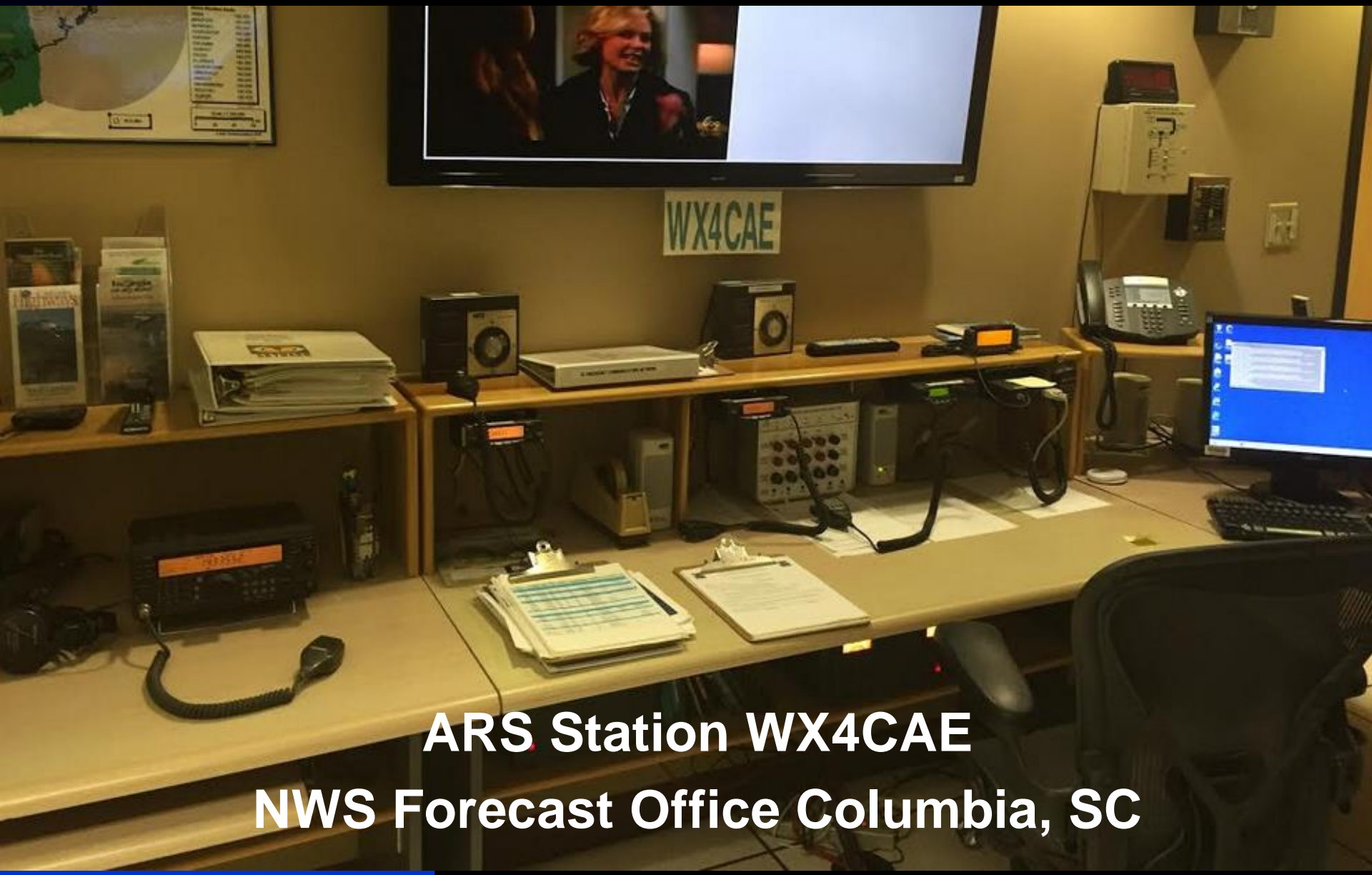
Twitter:
@NWSColumbia

How To Report

And of course... *Amateur Radio!*

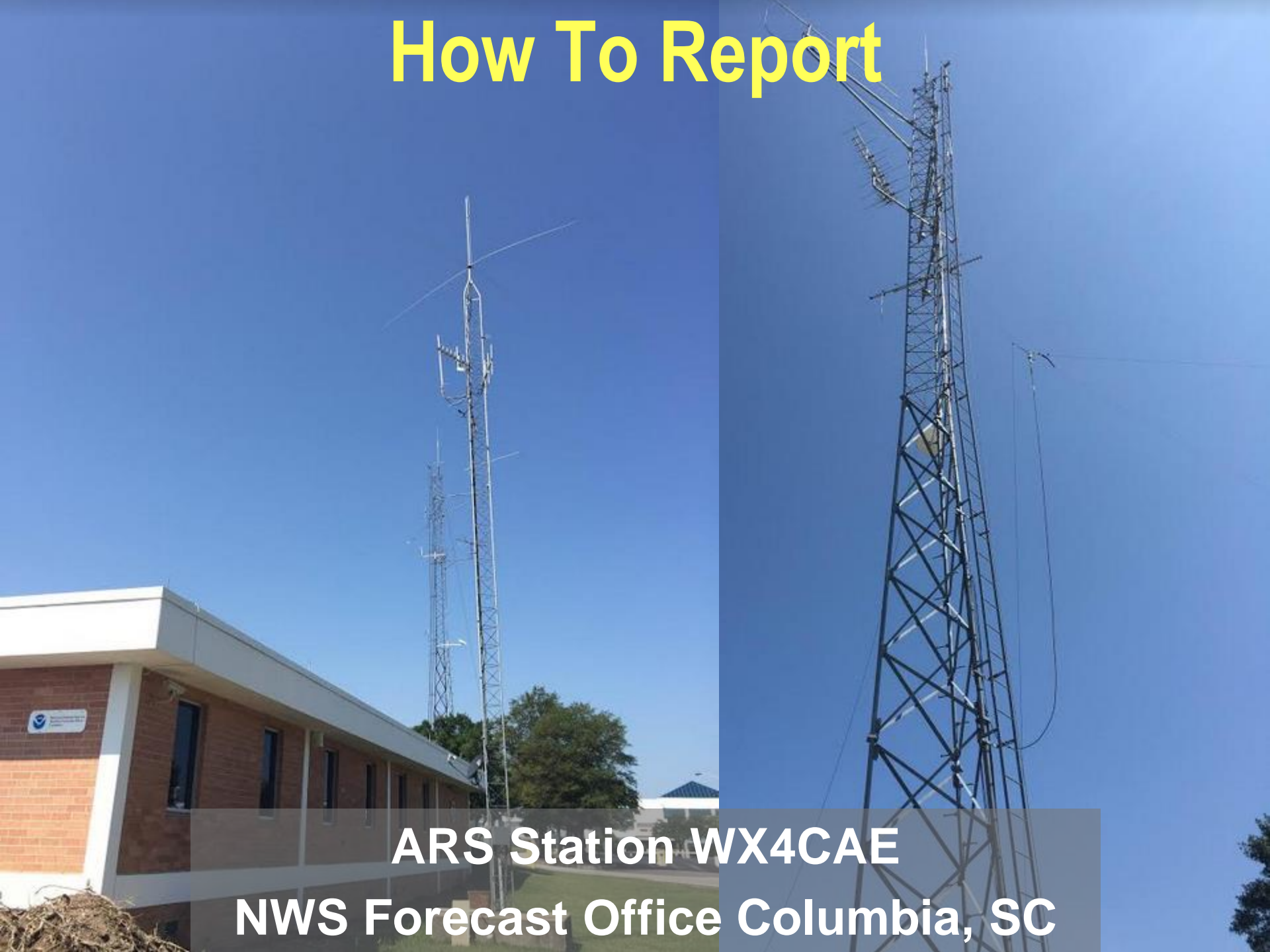


How To Report



ARS Station WX4CAE
NWS Forecast Office Columbia, SC

How To Report



ARS Station WX4CAE
NWS Forecast Office Columbia, SC

Other Ways to Help – CoCoRaHS

- **C**ommunity **C**ollaborative **R**ain, **H**ail & **S**now Network
- National Network of Volunteers
- All You Need is a Simple Rain Gauge to Get Started
- Report Daily Observations via Interactive Web Site

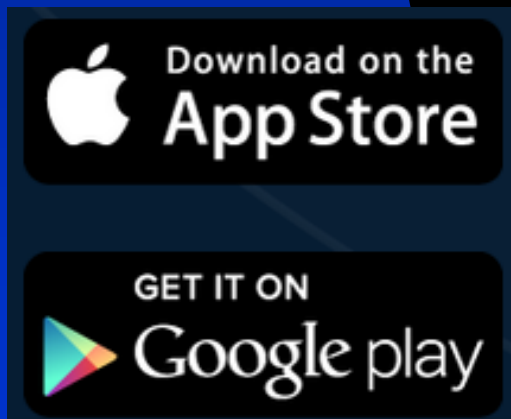


Other Ways to Help – mPING



Display of mPING reports over a 2-hour period centered on 1900 UTC for 13 February 2014. The legend is in the lower left-hand corner.

<http://mping.nssl.noaa.gov/>



- mobile Precipitation Identification Near the Ground
- Real-time reporting of precipitation type!
- **All You Need is the mPING App**
- Very helpful to us during winter weather & thunderstorm hail events
- *Helps us improve forecasts and developing new radar algorithms*

**You make
the call**



What Would You Report?



Example of Severe Weather Report:

- I am a trained spotter located 2 miles N of Aiken.
- I see a Tornado 2 miles North, moving to the NE.
- We also had Golfball size hail here at the house.
(Give lat/lon and/or nearest intersection of damage if possible)
- It began at 635 pm and lasted for 5 minutes.
- Highest wind gust at my location was around 20 mph.
- You can call 803-555-1234 if you have any questions.
My name is John Doe.

Time – Event – Location

What Would You Report?

Tornado, Downburst,
Rain Shaft...?



What Would You Report - Tornado or Updraft ?



Updraft! Look for Rotation. If NOT Rotating → NOT a Tornado.

What Would You Report?



Rainshaft. You would notice NO rotation!

What Would You Report?

© 2000 Tim Marshall



What Would You Report?



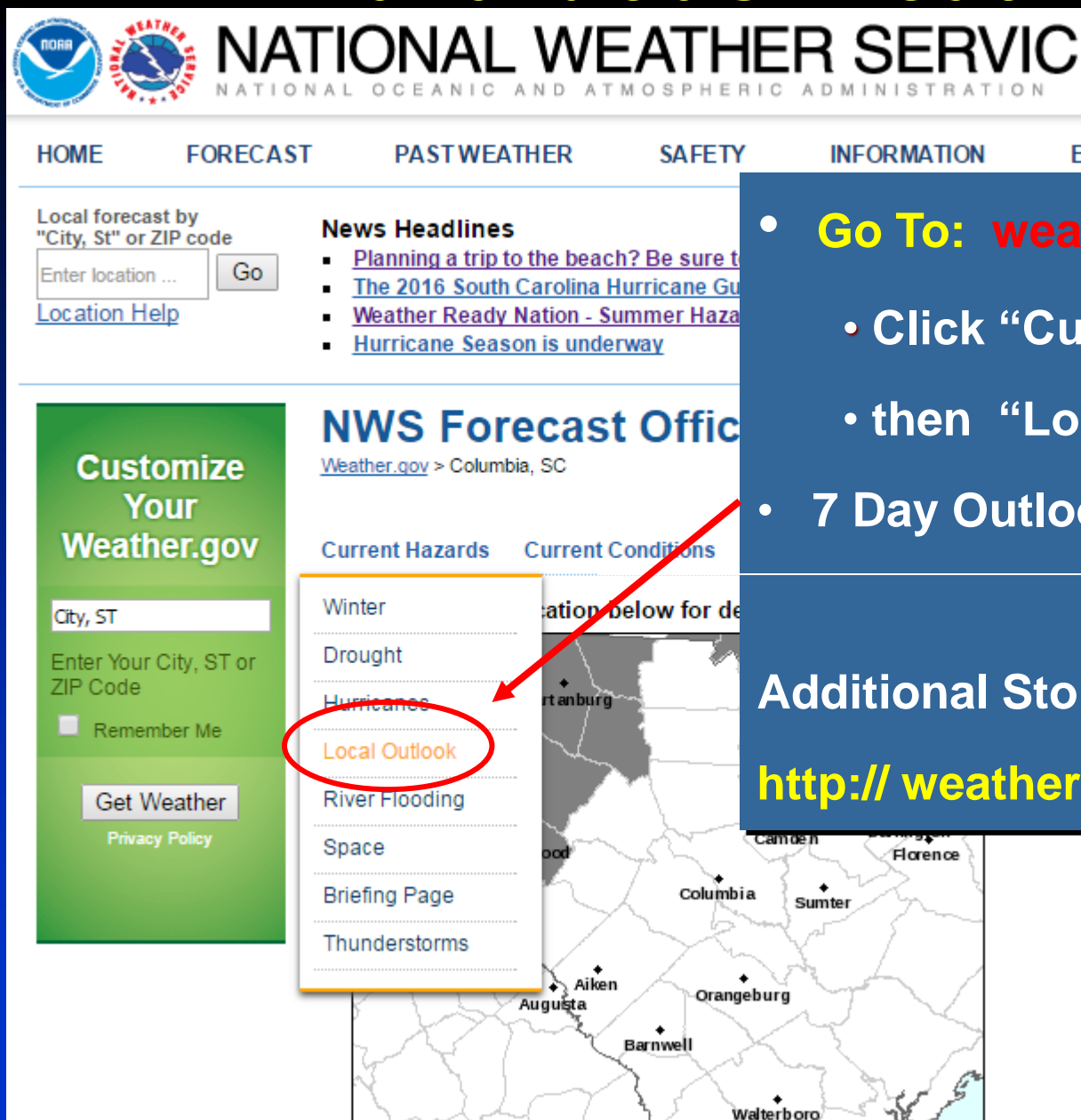
Tornado! The funnel is embedded in very heavy precipitation, but is a tornado. The observer noticed strong rotation and power flashes in the circled area, and reported the tornado.

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Hazardous Weather Outlook



The screenshot shows the National Weather Service website. At the top, the NWS logo and name are displayed. Below the navigation bar, there is a section for "Local forecast by 'City, St' or ZIP code" with a search box and a "Go" button. To the right, "News Headlines" are listed. The main content area is titled "NWS Forecast Office" and shows a dropdown menu for "Current Hazards". The "Local Outlook" option is highlighted with a red circle and a red arrow pointing to it. Below the dropdown, a map of the Columbia, SC area is visible.

NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HOME FORECAST PAST WEATHER SAFETY INFORMATION

Local forecast by "City, St" or ZIP code
Enter location ... Go
[Location Help](#)

News Headlines

- Planning a trip to the beach? Be sure to...
- The 2016 South Carolina Hurricane Gu...
- Weather Ready Nation - Summer Haza...
- Hurricane Season is underway

NWS Forecast Office
[Weather.gov](#) > Columbia, SC

Current Hazards Current Conditions

Winter
Drought
Hurricanes
Local Outlook
River Flooding
Space
Briefing Page
Thunderstorms

City, ST
Enter Your City, ST or ZIP Code
☐ Remember Me
Get Weather
[Privacy Policy](#)

Map labels: Columbia, Sumter, Florence, Camden, Orangeburg, Barnwell, Walterboro, Augusta, Aiken.

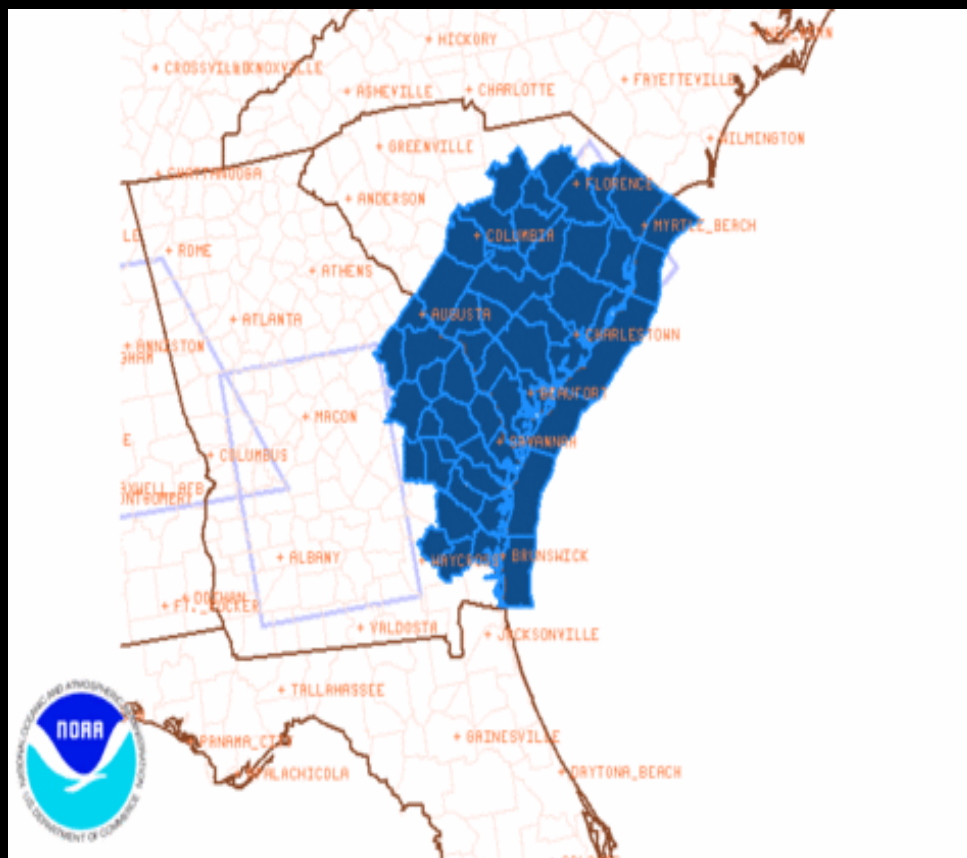
- **Go To:** weather.gov/cae
 - Click "Current Hazards",
 - then "Local Outlook"
- 7 Day Outlook for Hazardous Weather

Additional Storm Spotter Program Info:

[http:// weather.gov/cae/skywarn.html](http://weather.gov/cae/skywarn.html)

Watch: Conditions Favorable for Severe Weather **Be Prepared to Take Action**

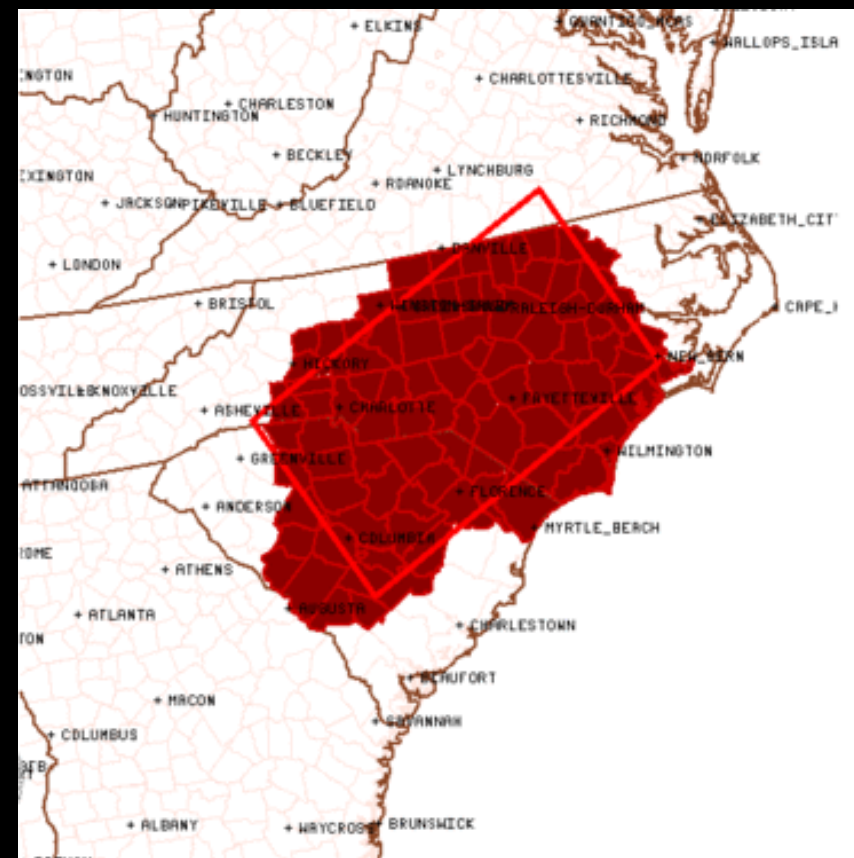
Issued by the Storm Prediction Center (SPC)
Usually Large Areas for 4-6 hours



Severe Thunderstorm Watch # 548 - Valid from 300 PM until 1000 PM EDT

AA/NWS/Storm Prediction Center

Updated: 20070720/19



Tornado Watch # 26 - Valid from 1115 AM until 700 PM EST

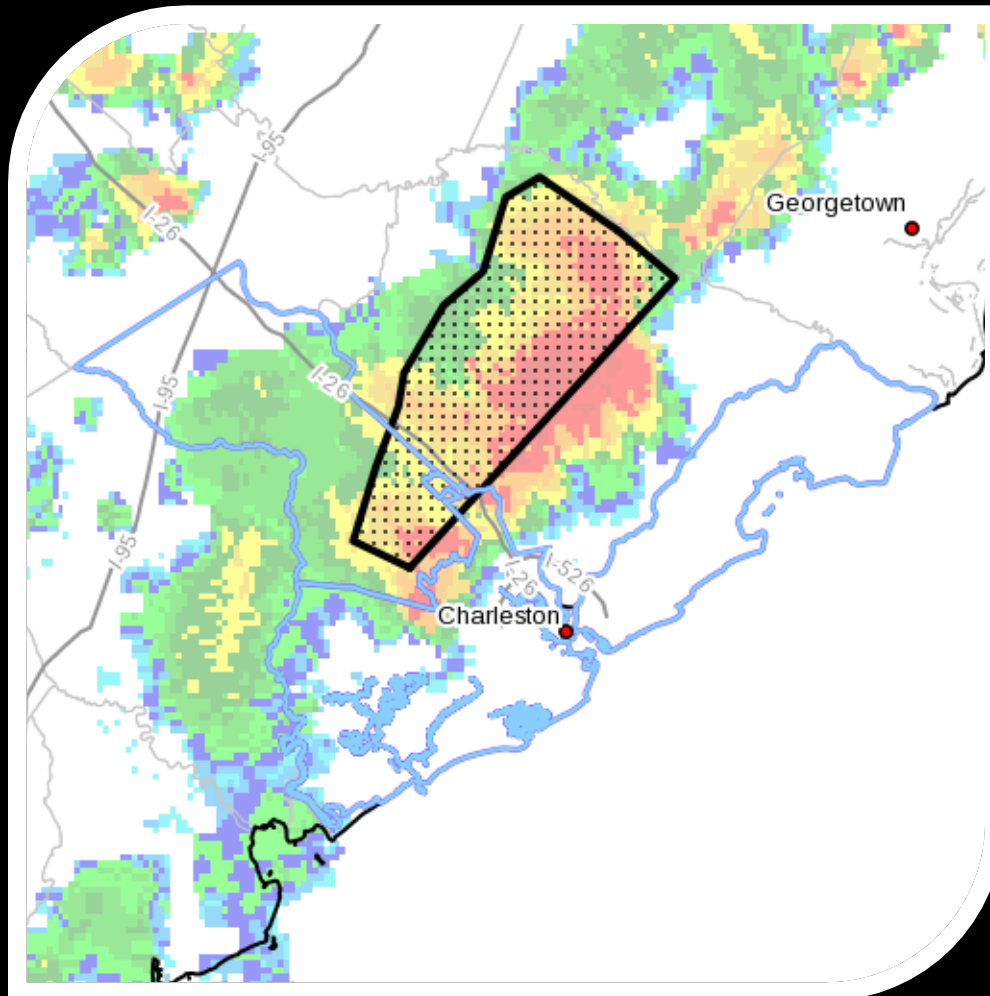
ediction Center

Updated: 2

Warning: Severe Weather Imminent or Occurring

Seek Shelter Now!

Issued by Local NWS Office



Tornado

Tornado Developing or in Progress

Severe Thunderstorm :

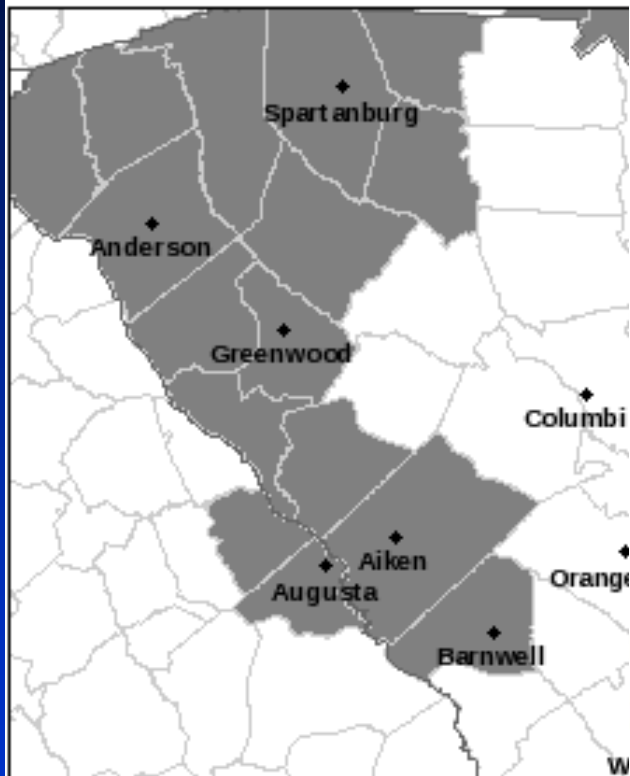
1 inch Hail, Wind Gusts 58 mph or Greater.


♦ ***Lightning is not a criteria!***

Forecasts on the Web

weather.gov/cae

Click a location below for de



**NATIONAL WEATHER SERVICE**
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HOME FORECAST PAST WEATHER SAFETY INFORMATION EDUCATION NEWS SEARCH ABOUT


[View Location Examples](#)
Your local forecast office is **Columbia, SC**

[En Español](#) [Share](#) [f](#) [t](#) [g+](#) [v](#) [p](#)

News Headlines

- Planning a trip to the beach? Be sure to keep up with what's going on in the Tropics.
- The 2016 South Carolina Hurricane Guide
- Weather Ready Nation - Summer Hazards: Stay Safe
- Hurricane Season is underway

Current conditions at
Columbia, Jim Hamilton L.B. Owens Downtown Airport (KCUB)
Lat: 33.57°N Lon: 80.99°W Elev: 210ft










**Fair**
85°F
29°C

Humidity 43%
Wind Speed Calm
Barometer 29.99 in (1015.2 mb)
Dewpoint 60°F (16°C)
Visibility 10.00 mi
Heat Index 85°F (29°C)
Last update 5 Jun 7:53 pm EDT

More Information:

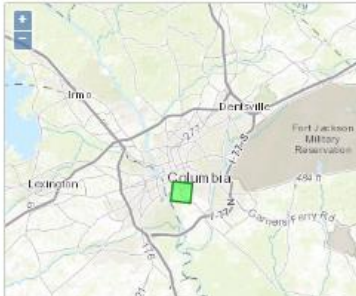
- [Local Forecast Office](#)
- [More Local Wx](#)
- [3 Day History](#)
- [Mobile Weather](#)
- [Hourly Weather Forecast](#)

Extended Forecast for
Jim Hamilton L.B. Owens Airport SC

Tonight	Friday	Friday Night	Saturday	Saturday Night	Sunday	Sunday Night	Monday	Monday Night
								
Mostly Clear	Sunny	Mostly Clear	Mostly Sunny	Mostly Clear	Hot	Mostly Clear	Sunny	Partly Cloudy
Low: 66 °F	High: 91 °F	Low: 71 °F	High: 96 °F	Low: 73 °F	High: 100 °F	Low: 75 °F	High: 95 °F	Low: 72 °F

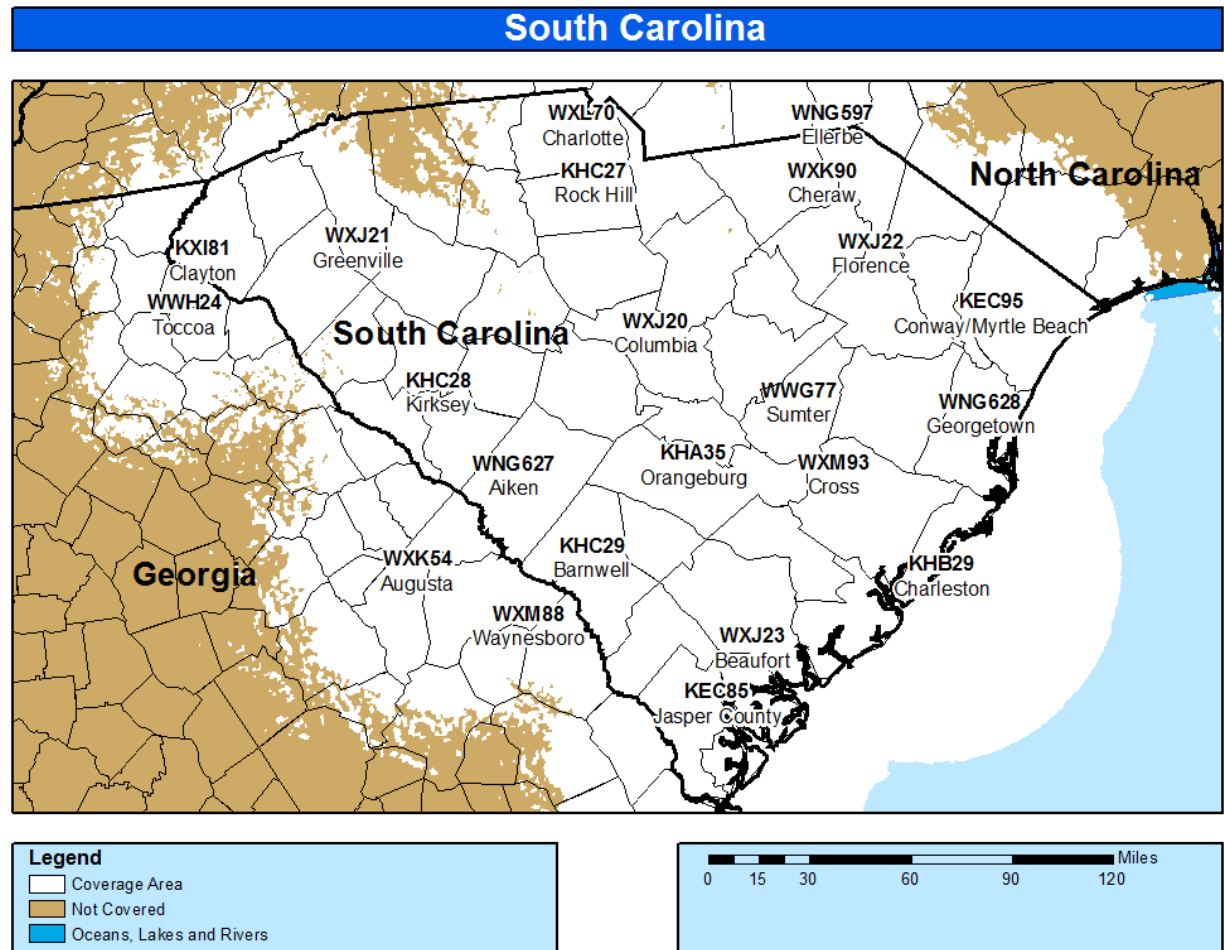
Detailed Forecast

Tonight	Mostly clear, with a low around 66. Calm wind.
Friday	Sunny, with a high near 91. Light and variable wind.
Friday Night	Mostly clear, with a low around 71. South wind 3 to 5 mph.
Saturday	Mostly sunny, with a high near 95. Heat index values as high as 100. Calm wind becoming southwest 5 to 7 mph in the morning.
Saturday Night	Mostly clear, with a low around 73. South wind around 8 mph.
Sunday	Sunny and hot, with a high near 100.
Sunday Night	Mostly clear, with a low around 75.
Monday	Sunny, with a high near 95.
Monday Night	Partly cloudy, with a low around 72.
Tuesday	Mostly sunny, with a high near 95.

Click Map For Forecast



- “All Hazards” 24-hr Radio (Warnings, Statements, Civil Emergencies, etc)
- Requires Special Radio Receiver or Scanner



162.400, 162.425, 162.450, 162.475, 162.500, 162.525, 162.550 Mhz



Other Ways to Monitor Severe WX

TV/Cable/Satellite

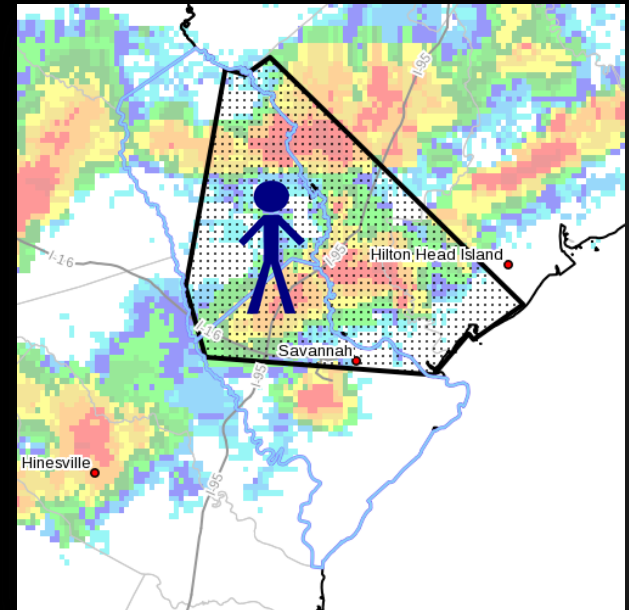
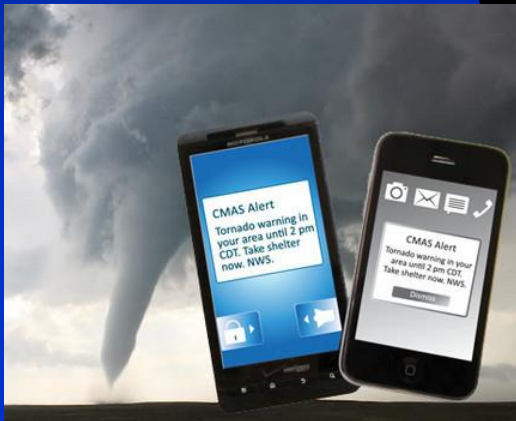


Cell/Smart Phones

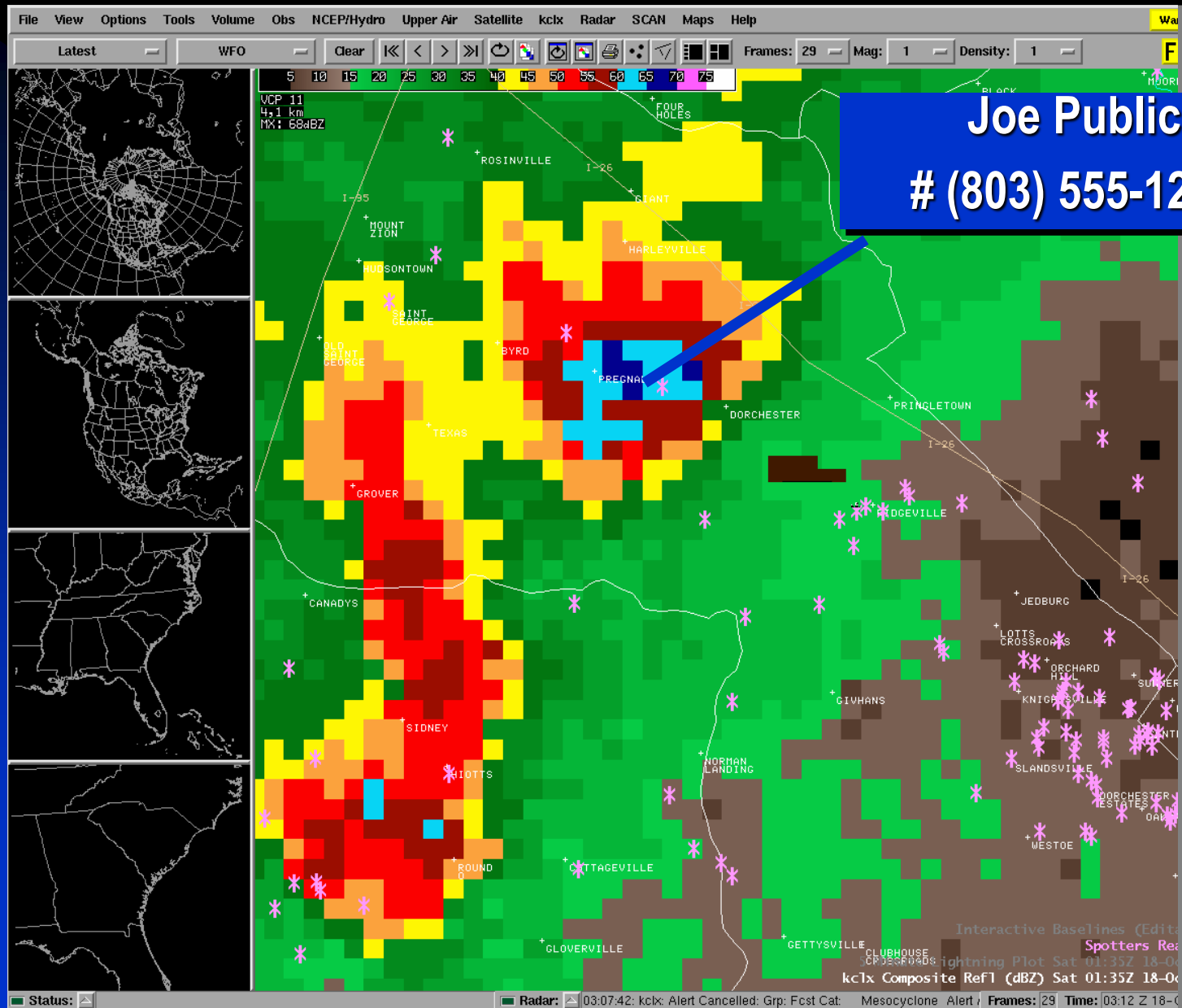


Warnings to Your Cell Phone!

- Wireless Emergency Alerts (WEA)
- All Major Cell Phone Companies Participate
- GPS Based! If in Warning Area → You Get the Alert
- **You Receive:** Severe Weather, Amber, and Presidential Alerts
- Customer Can Opt **In/Out** of Service

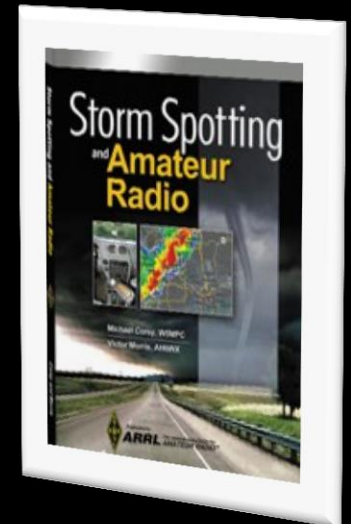


Spotter Info on NWS Computer



Some References

- **Weather Spotter's Field Guide** **NEW**
<http://www.weather.gov/os/brochures/SGJune6-11.pdf>
- **“Storm Spotting and Amateur Radio”**
M. Corey, V. Morris
<http://www.arrl.org/shop/Storm-Spotting-and-Amateur-Radio/?page=1>
- **Spotter Training from COMET**
<http://www.meted.ucar.edu>



You Are Invited!

- Every first Saturday in December
 - ◆ Planning for this year's event on Dec 3, 2016
 - ◆ Times & schedule dependent on weather
 - ◆ Event to recognize our SKYWARN Spotters & Cooperative Weather Observers
- Plans now being made...any interest in a WX4CAE special event station?
 - ◆ <http://www.wrh.noaa.gov/mtr/hamradio/index.php>
- Want to help with event planning? Let me know!



National Weather Service

SKYWARN Recognition Day





Thank You!

National Weather Service - Columbia

<http://weather.gov/cae>

