



# ENRICHING THE MODERN DAY **STORM** SPOTTER

Through Technology & Education Enhancements

*By Joshua J. Jans & Dr. Cecil Keen*



American Meteorological Society  
92nd American Meteorological Society Annual Meeting  
January 24, 2012



Wednesday, February 22, 12



# STORM SPOTTERS

*“Volunteers who help keep communities safe by providing timely and accurate reports of severe weather”*

**STORM  
SPOTTER**

[www.StormSpotters.org](http://www.StormSpotters.org)



# STORM REPORTING

*Communities across the country have become increasingly vulnerable to severe weather events.*

551 Fatalities

7 Separate Billion  
\$ Disasters

6 EF-5  
Recorded!

**\$25.6 Billion  
Alone!**

**STORM  
SPOTTER**

[www.StormSpotters.org](http://www.StormSpotters.org)



# An Urban Year

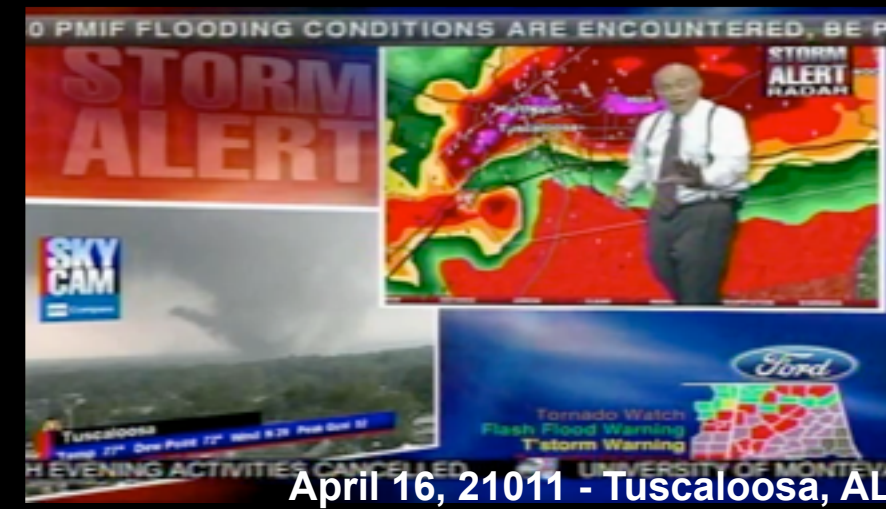
2011 will be remembered as one of the deadliest, most devastating, and costliest seasons in modern day history.



April 16, 21011 - Raleigh, NC



April 16, 21011 - Wilson, NC



April 16, 21011 - Tuscaloosa, AL



April 22, 2011 Lambert-St. Louis Intl Airport



May 22, 2011 Joplin, MO



May 22, 2011 La Crosse, WI



May 22, 2011 Minneapolis, MN



May 24, 2011 El Reno, OK



June 1, 2011 Springfield, MA



# Spotter Role

Continue to play a pivotal role in the warning process for the National Weather Service (NWS), the Emergency Management Community, and Broadcast Meteorologists



Amateur Radio



Volunteer Citizens



Storm Chaser



Emergency Management



Law Enforcement



Firefighters & Rescuers





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# Storm Reports

Over 240,00+ storm reports were transmitted via the NWS through LSRs from 2005 to 2011\*

2005 → 2006 → 2007 → 2008 → 2009 → 2010 → Today

**Tornadoes**

**Large Hail**

**Wind**



**Tornadoes**  
**1,200 +**

**Hail Reports**  
**16,000 +**

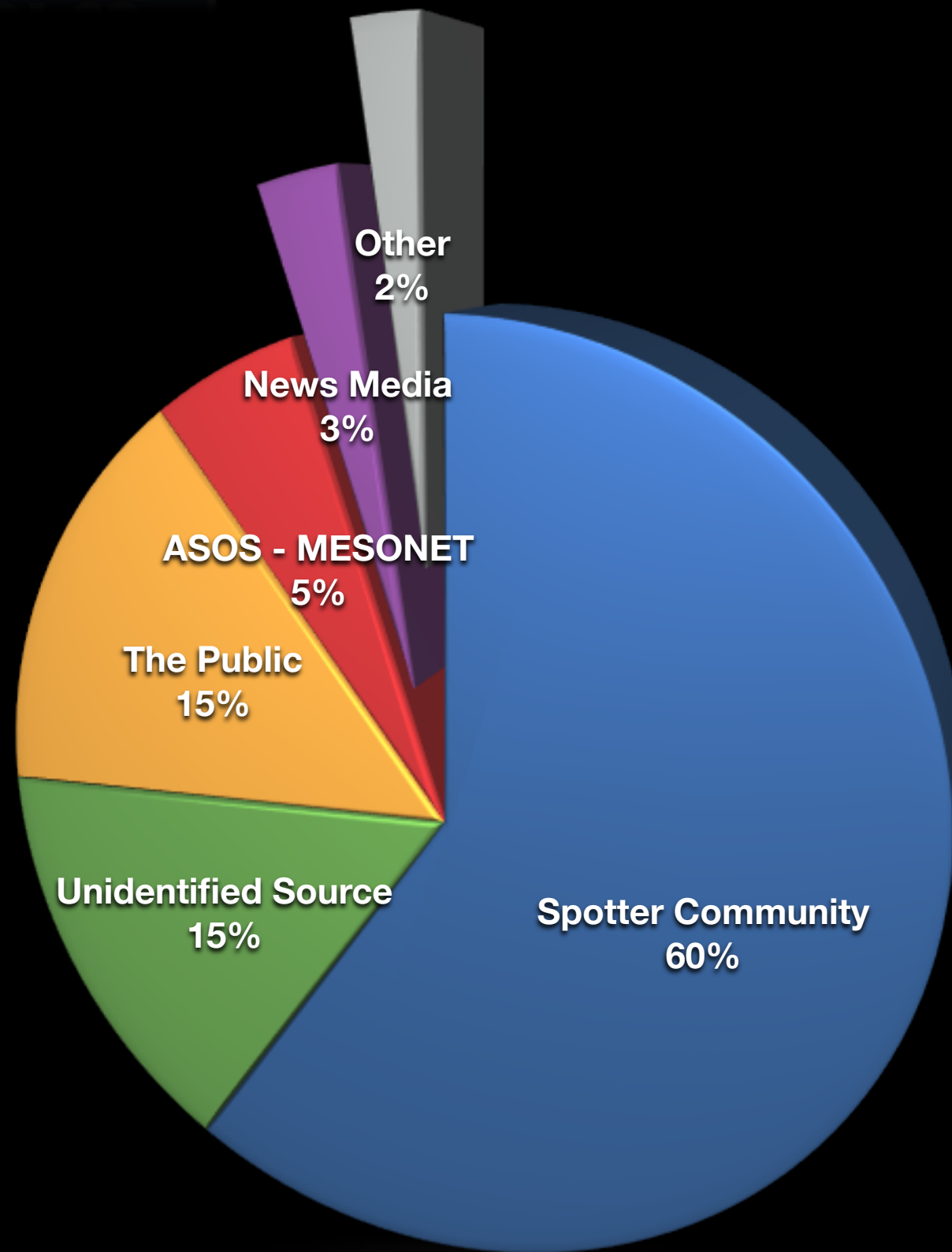
**Wind Reports**  
**8,000 +**

Note: Averages based on all LSR's transmitted by the NWS's offices.



# Storm Reports

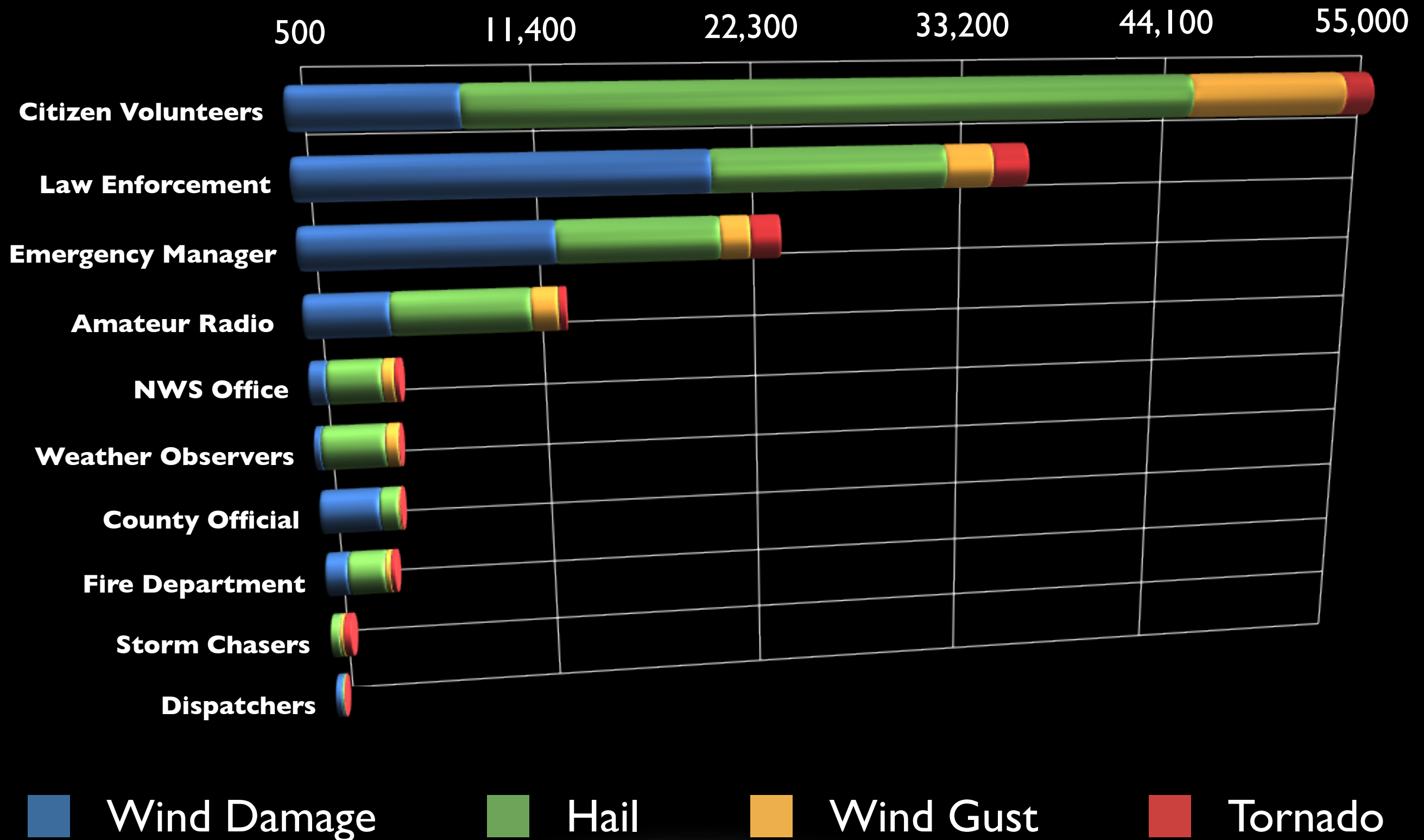
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# Storm Reports

Over 240,00+ storm reports were transmitted via the NWS through LSRs from 2005 to 2011\*







# SKYWARN



# SKYWARN

**NWS Volunteer Program for Severe Weather Spotters**





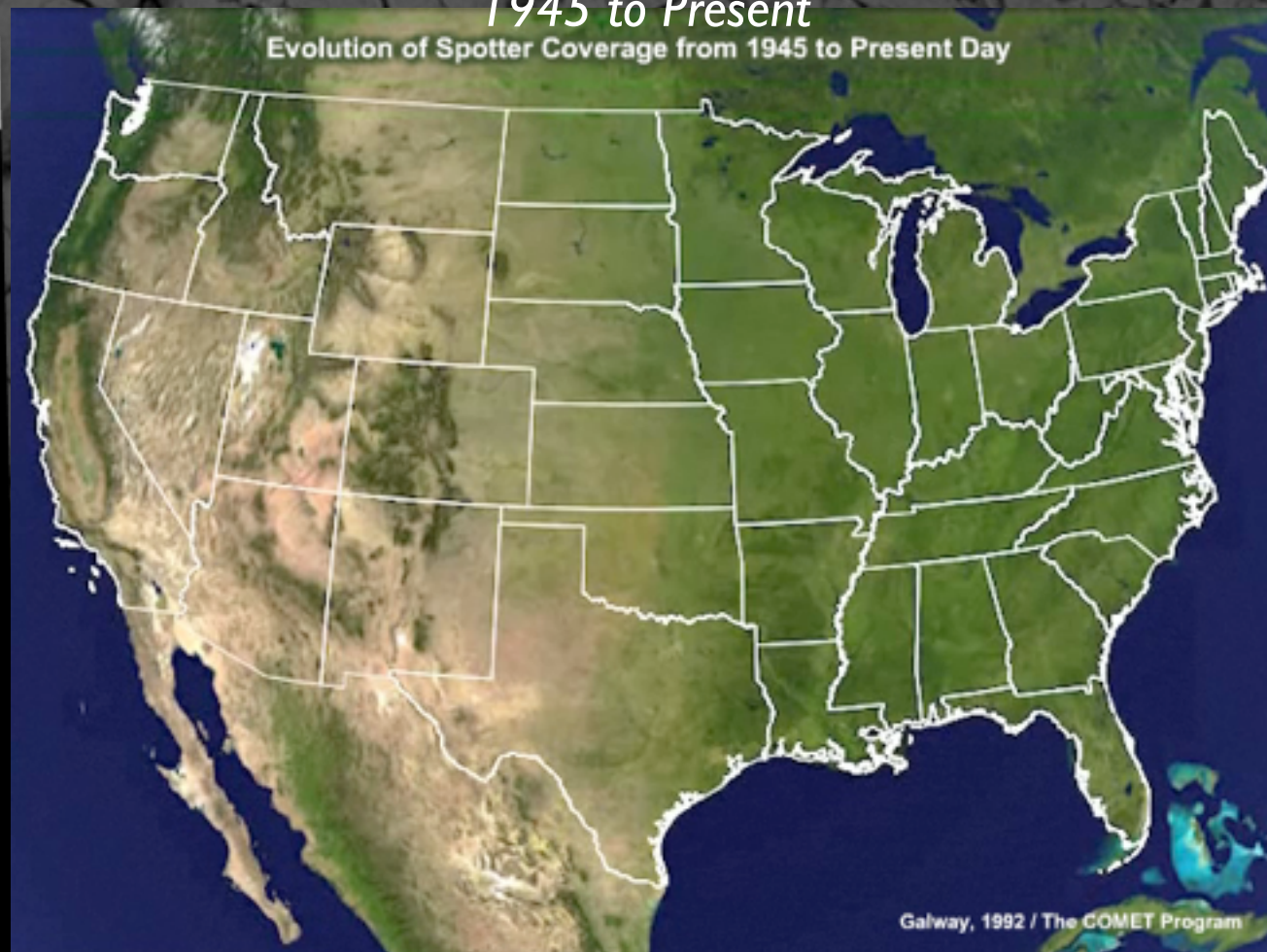
# SKYWARN

Presently operates in a fragmented manner highlighting challenges in reporting, training, and registration.

## Spotter Coverage

1945 to Present

Evolution of Spotter Coverage from 1945 to Present Day



**SKYWARN Spotters :**  
**~300,000**  
*(true number unknown)*

Online @ SKYWARN.org



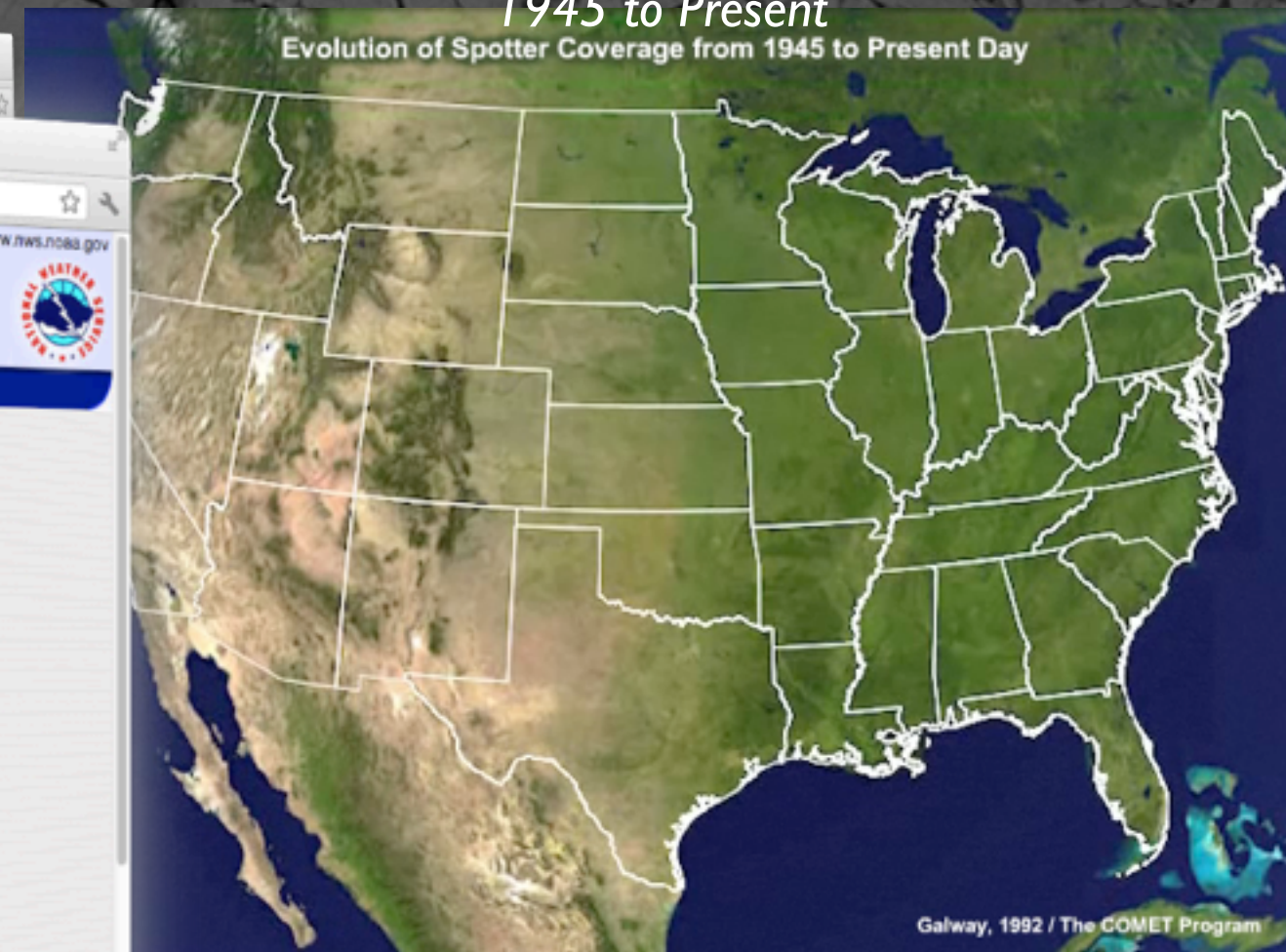




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1945 to Present



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Presently operates in a fragmented manner highlighting challenges in reporting, training, and registration.





# Reporting Headaches

**Dude, where do I  
send my report?**



**Local NWS  
Phone**

**Local NWS  
Email**

**Local NWS  
Web Form**

**eSpotter**

**Amateur  
Radio**

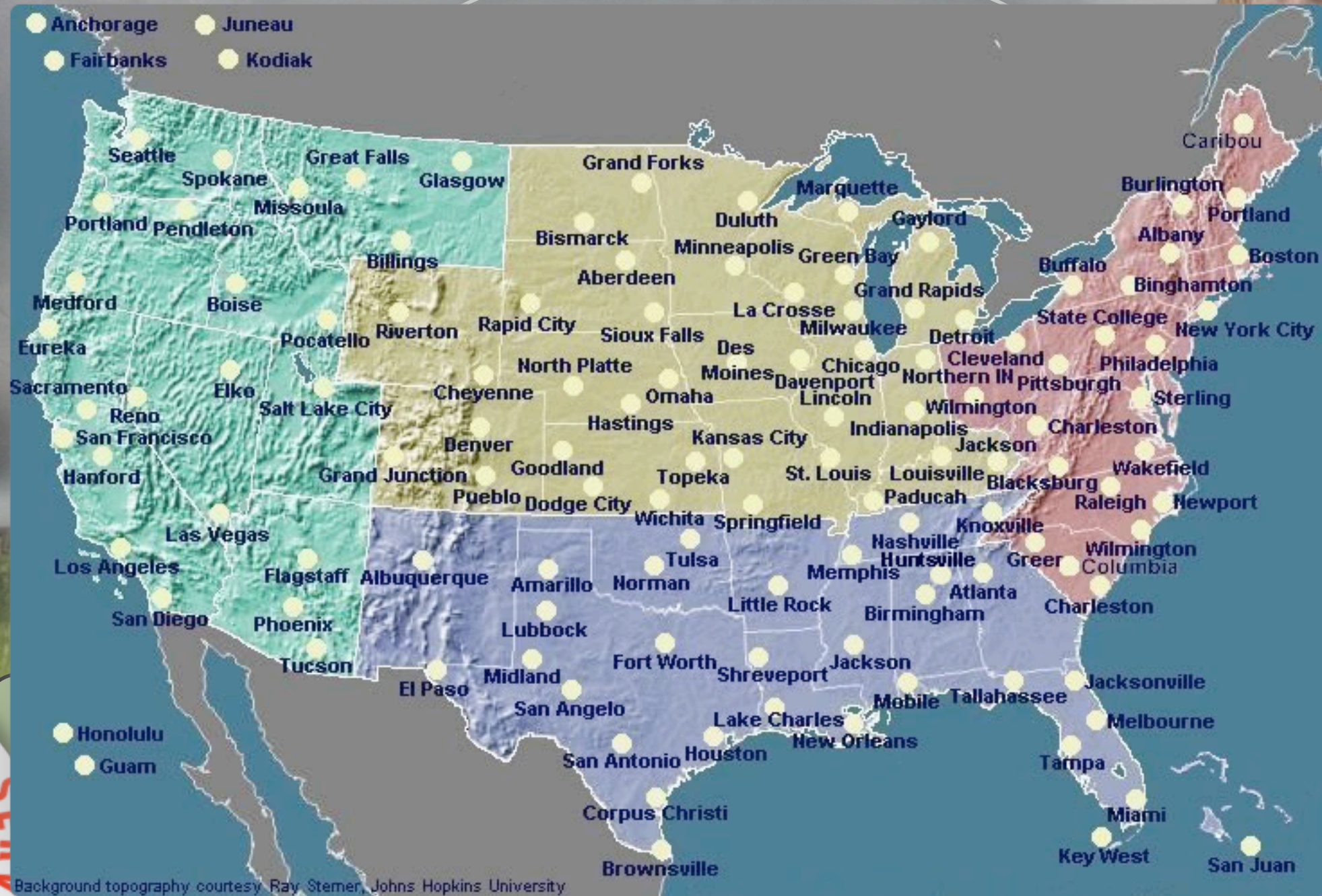
**CoCoRaHS**  
Community Collaborative  
Rain, Hail and Snow

**NPOP**  
National Public  
Observation Program

**Twitter**



# Reporting Headaches



Radio

Community Collaborative  
Rain, Hail and Snow

National Public  
Observation Program

Twitter

RADIO

Rain, Hail and Snow

Observation Program

otter



# Reporting Headaches

Dude, where do I  
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Local NWS  
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eSpotter

Amateur  
Radio

CoCoRaHS  
Community Collaborative

NPOP  
National Public  
Observation Program

Twitter

**SPOTTER**  
NETWORK





# SKYWARN

Modernization efforts have been in progress since 2008.

BASIC SPOTTERS' FIELD GUIDE  
BASIC SPOTTERS' FIELD GUIDE  
BASIC SPOTTERS' FIELD GUIDE  
BASIC SPOTTERS' FIELD GUIDE



ADVANCED SPOTTERS' FIELD GUIDE  
ADVANCED SPOTTERS' FIELD GUIDE  
ADVANCED SPOTTERS' FIELD GUIDE  
ADVANCED SPOTTERS' FIELD GUIDE



Cover Photo - Alan Moller





# SKYWARN

Modernization efforts have been in progress since 2008.

## Weather Spotter's Field Guide



© Roger Edwards



## A Guide to Being a SKYWARN

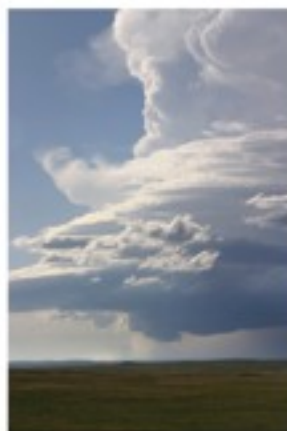
U.S. DEPARTMENT OF COMMERCE  
National Oceanic and Atmospheric Administration  
National Weather Service  
June 2011

### Spotter's Field Guide

#### SEVERE LOCAL STORMS

**Wall Cloud:** A wall cloud is an isolated lower cloud attached to the free base and below the main storm tower. Wall clouds often are on the trailing side of a storm. For example, with a storm that is moving north or northeast, the wall cloud typically is on the south or southwest side of the storm. With some storms, the wall cloud area may be obscured by precipitation. Wall clouds associated with potentially severe storms

- Usually persist for 10 minutes or more
- Often, but not always, rotate visibly
- Sometimes are accompanied by obvious rising or sinking motion of cloud piece



Wall cloud and rain free base.  
Photo by Brian Morganti.



Wall cloud with the rain free base and hail behind the wall cloud. Photo by Roger Hill.



The flanking line of a thunderstorm.  
Photo by Matt Ziebell.

**Flanking Line:** A flanking line is a row of towering cumulus clouds stair-stepping up to the main storm tower. New storm cells can develop from the flanking line, which usually extends south or southwest of a thunderstorm.

### Severe Hail and Winds

**Hail:** NWS issues a severe thunderstorm warning for hail 1/4 inch or larger. When reporting hail, it is best to measure it. If you are not equipped with a ruler or other measuring device, hail size can be related loosely to coins or athletic balls.

BB	Less than 1/8 inch
Pea	1/4 inch
Dime	7/16 inch
Penny	3/4 inch
Nickel	7/8 inch
Quarter	1 inch
Half Dollar	1 1/2 inches
Walnut or Ping-Pong Ball	1 3/4 inches
Golf Ball	1 3/4 inches
Lime	2 inches
Tennis Ball	2 1/2 inches
Baseball	2 3/4 inches
Large Apple	3 inches
Softball	4 inches
Grapefruit	4 1/2 inches



Hail storm. Photo from NOAA.

### Thunderstorm Basics

#### Section 2

### Spotter's Field Guide

#### SEVERE LOCAL STORMS



A severe squall line, known as a derecho, in northwest Ohio, May 21, 2004.

Large, organized, long-lived bow echoes can develop and move across several states producing long swaths of wind damage. This type of convective system is often referred to as a derecho.

In a severe thunderstorm, large water-coated hail stones suspended aloft reflect the radar energy in a complex way. This effects causes a narrow spike of reflectivity to protrude from the intense reflectivity core on the image. This feature is referred to as a three-body scatter spike. The spike is along a radial, the radar beam at that particular azimuth. In basic terms, this is caused by the radar beam hitting the large water-coated hail, scattering the energy to the ground below, then scattering the energy back upward, and finally scattering the energy once again by the hail aloft.

The three scatterings illustrate the triple reflection or Three Body Scatter Spike (TBSS). The presence of a hail spike is a reliable indicator that severe hail, greater than 1 inch in diameter, exists in the storm.





# SKYWARN

Modernization efforts have been in progress since 2008.

## Weather Spotter's Field Guide



© Roger Edwards



## A Guide to Being a SKYWARN

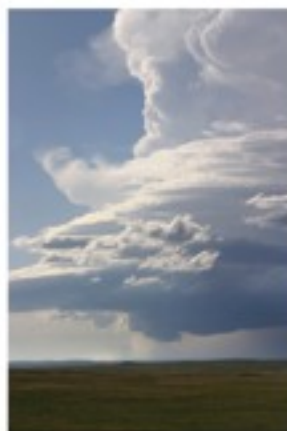
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The flanking line of a thunderstorm.  
Photo by Matt Ziebell.

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BB  
Pea  
Dime  
Penny  
Nickel  
Quarter  
Half Dollar  
Walnut or Ping-Pong Ball  
Golf Ball  
Lime  
Tennis Ball  
Baseball  
Large Apple  
Softball  
Grapefruit



Hail storm. Photo from NOAA.

### Thunderstorm Basics

## Role of the SKYWARN® Spotter

Produced by The COMET® Program



### Begin »

MetEd Home  
COMET Home

Print Version  
Download Version  
Module Quiz

## SKYWARN® Spotter Convective Basics

Produced by The COMET® Program



### Begin »

MetEd Home  
COMET Home

Print Version  
Download Version  
Module Quiz  
User Survey  
Takeaways  
Contributors  
Tech Notes

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# SPOTTER NETWORK

## Core Features

Standardize  
Training

National  
Registry

Reporting &  
Tracking

Spotter *T*rainning, *T*racking and *R*eporting System  
***STTARS***



**“BRINGS STORM SPOTTERS, STORM CHASERS, COORDINATORS AND PUBLIC SERVANTS TOGETHER IN A SEAMLESS NETWORK OF INFORMATION”**

## Quick Rundown

Founded 2006

Required Training 2008

• 20,200 Members

• 5,500 Trained



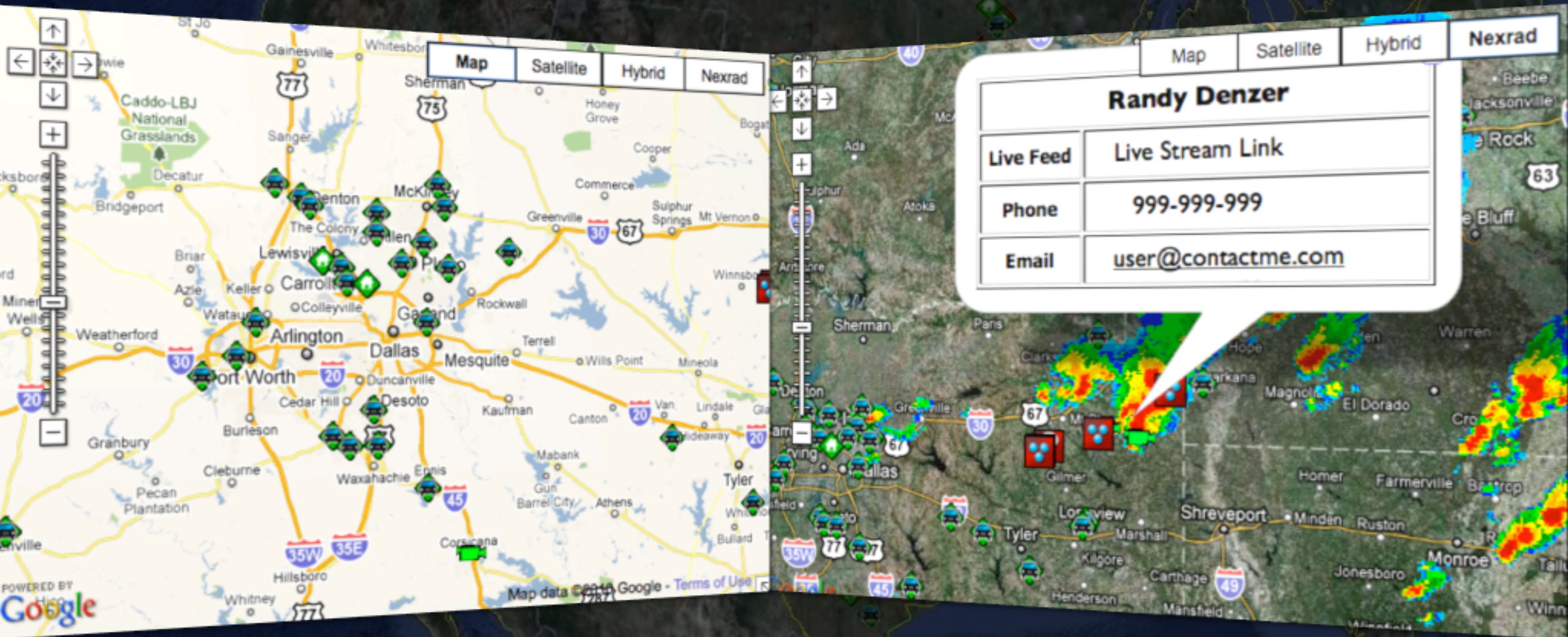
*Online @ SpotterNetwork.org*





**“BRINGS STORM SPOTTERS, STORM CHASERS, COORDINATORS AND PUBLIC SERVANTS TOGETHER IN A SEAMLESS NETWORK OF INFORMATION”**

**Shows What's Going on REAL TIME, RIGHT NOW**



*Online @ SpotterNetwork.org*







# A Quick Tour...

Spotter Network

www.spotternetwork.org

[Get Involved](#) [Training](#) [Login](#) [Support](#) [About](#)

Activity Menu

Current Activity

Alternative Feeds

--- Gibson Ridge

--- StormLab

--- Other

Reporting Guidelines

Report Quality Review

Your Account

Register

Login

Other

Windows Client

iPhone Client

Welcome to the Spotter Network!

The SpotterNetwork brings storm spotters, storm chasers, coordinators and public servants together in a seamless network of information. It provides accurate position data of spotters and chasers for coordination/reporting and provides ground truth to public servants engaged in the protection of life and property.

A collage of six images showing various storm spotting activities: a person using a laptop with a weather map, a person with a camera, a car with emergency lights, a person on a radio, a car with a weather station, and a person on a phone.

Images for montage graciously provided by [Tony Laubach](#) or in the public domain





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Windows Client

iPhone Client

Active members in past 6 hours

Updates Every 120 Seconds

NON-COMMERCIAL USE ONLY

Map

Satellite

Hybrid

Nexrad

Severe Studios Live Video

John Brown

ChaserTV Live Video

None

iMap Tracker Live Video

Bryan Kilgore

StormChaseLive Live Video

None

Spotter Network Reports (Red Icons sorted by Date order, last 3 hours)

Event	Date	Nearest City	Narrative
Hail	2012-01-23 05:58:00 UTC	1 miles E of Kelly, KY	small limbs and penny to dime size hail 5
Wind	2012-01-23 05:55:00 UTC	1 miles E of Kelly, KY	heavy rainfall with wind gust of 45 to 50
Other	2012-01-23 05:53:00 UTC	2 miles NE of Shoreham, MN	Light wind creating blowing snow. Comp
Wind	2012-01-23 05:34:00 UTC	0 miles NNE of Saint Philip, TN	60MPH winds in Boone County, TN (St. P





# A Quick Tour...

Weather Report		
<input checked="" type="checkbox"/> Try and submit to NWS if possible		
<input type="radio"/> Tornado		
<input type="radio"/> Funnel Cloud		
<input type="radio"/> Wall Cloud	* Must Supply Narrative Below	<input type="radio"/> Is Rotating <input checked="" type="radio"/> Is not Rotating
<input type="radio"/> Hail	Size: <input type="text"/>	
<input type="radio"/> High Wind	Do <b>not</b> report less than 50MPH winds Wind Speed: <input type="text"/> Wind Type: <input type="text"/>	<input type="radio"/> Measured <input checked="" type="radio"/> Estimated
<input type="radio"/> Flood	* Must Supply Narrative Below	
<input type="radio"/> Flash Flood	* Must Supply Narrative Below	
<input type="radio"/> Other	* Must Supply Narrative Below	

**NOTICE:**

- First hand reports only. **NO** relay reports
- Do **NOT** submit estimated rain measurements. Measured **ONLY!**
- Wall cloud report? Make sure you checked rotating or not rotating above





# A Quick Tour...

Current Activity

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---

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# A Quick Tour...

## Live Chase Cams

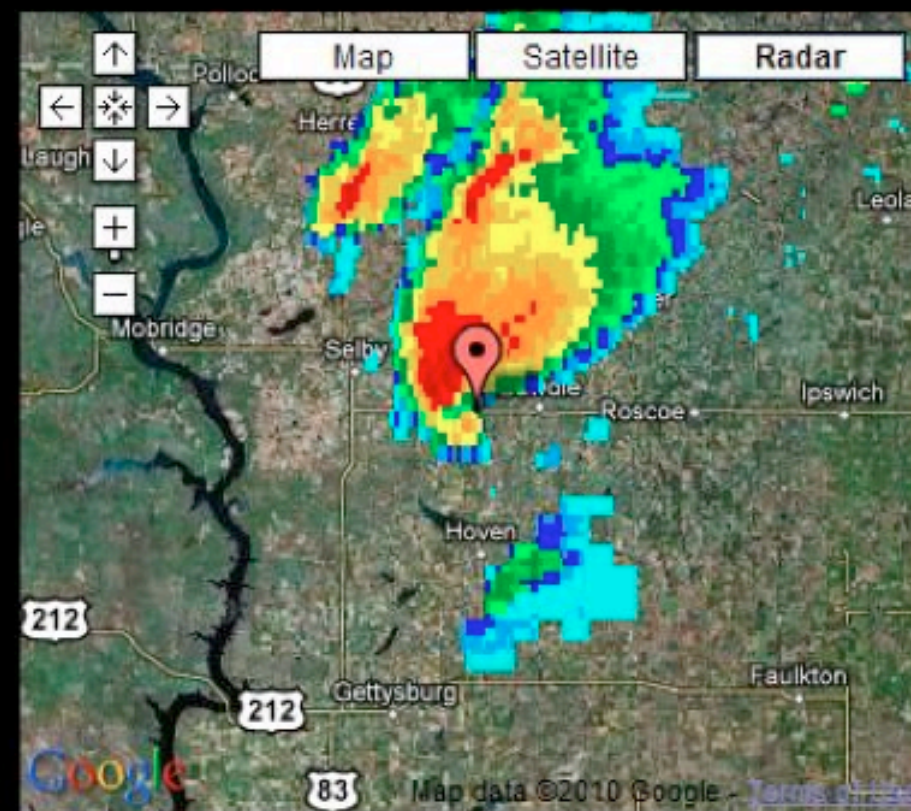
Wide spread availability of 3G Network

LIVE ChaseCam



Not for rebroadcast without prior written permission

GPS Tracking  
by







# A Quick Tour...

Training

training.spotternetwork.org

You are not logged in. (Login)

**SPOTTER NETWORK TRAINING CENTER**

Donate

MasterCard VISA American Express Discover BANK

Home Get Involved Training Support

**Get Connected**

Twitter Facebook

**Navigation**

Home  
▶ Courses

**Welcome to Our New Training Portal!**

On this site, you will find a growing number of online courses that bring focus upon weather events that have the potential for causing disasters. These courses were originally targeted towards first responders including fire fighters, emergency management, law enforcement, dispatchers, public works, and search and rescue personnel, but have since been recalibrated to fit the needs of the storm spotter and storm chasing community. The objective of our courses is to help demystify the 'science' of weather-vocabulary and present the participant with simplified processes by which hazardous weather events come about. These courses are offered in a visually rich manner in hopes that the participants will emerge with a practical knowledge of weather phenomena and appropriate methods to communicate severe weather reports.

**Available Courses**

**Thunderstorms - An Introduction**

Use Spotter Network Account Login

Username

Password

Login

Lost password?

© Copyright 2006-2011 Spotter Network Inc. (NFP) - Not Associated with the NWS or NOAA





# A Quick Tour...

A screenshot of a web browser displaying the Spotter Network Training Center page. The browser's address bar shows the URL: `training.spotternetwork.org/mod/page/view.php?id=51`. The page header includes the Spotter Network logo, a "Donate" button with payment icons (MasterCard, Visa, American Express, Discover, Bank of America), and a login status: "You are logged in as Joshua Jans (Logout)". A navigation menu contains links for Home, Get Involved, Training, and Support. A breadcrumb trail reads: Home ► My Courses ► Awareness ► Weather Defined ► Water & Weather.

The main content area features a large circular image of a water droplet hitting a surface, creating ripples. To the right of this image is the text "Water & Weather" in a large, stylized font, with "Water" in blue and "Weather" in black.

Below this, a paragraph of text states: "Water acts as THE carrier of heat energy in atmospheric processes. Weather *really* happens when water is involved, not to say that temperature differences are also important in weather formations."

The section titled "Three States of Water" follows, with three sub-images illustrating the states: "Water" (a droplet), "Ice" (icicles), and "Steam" (mist over a lake).




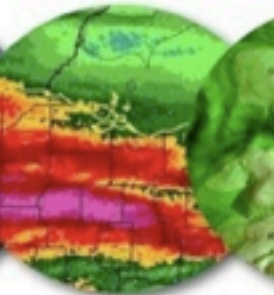





# A Quick Tour...

A screenshot of a web browser window displaying a training module titled "Awareness: Flash Flood". The browser's address bar shows the URL: [training.spotternetwork.org/mod/page/view.php?id=64](http://training.spotternetwork.org/mod/page/view.php?id=64).

## Flash Flood Factors




**Rainfall Intensity**

**Rainfall Duration**

**Land Topography**

**Soil Condition**

**Ground Cover**




*Training Thunderstorms are commonly associated with flash flooding events.*

Most flash floods are the result of stalled or slow moving thunderstorms, or thunderstorms that move repeatedly over the same area (*also known as Training Thunderstorms*). Clearly where heavy rains are a result from tropical storms and hurricanes flash floods can also result. Once again these floods can develop within minutes or over hours depending on the conditions listed below:

- Rainfall Intensity
- Rainfall Duration
- Topography
- Soil Conditions
- Ground Cover

Cities located along rivers, streams, creeks, or beneath dams are especially vulnerable if the amount of water generated during a flash flood overwhelms any protective barriers.







# A Quick Tour...

A screenshot of a web browser window displaying a page titled "Hail Damage Impact". The browser's address bar shows the URL [training.spotternetwork.org/mod/page/view.php?id=60](http://training.spotternetwork.org/mod/page/view.php?id=60). The page contains four photographs illustrating the effects of hail:

- Top Left:** A photograph of a man's bare back, showing numerous dark, circular impact marks from hail. A tattoo is visible on his left arm.   
Caption: Courtesy Denis Balibouse, Reuters
- Top Right:** A photograph of a man in a red shirt standing in a cornfield, where many corn stalks have been snapped or bent over by hail.   
Caption: Courtesy John Cross, Mankato Free Press
- Bottom Left:** A photograph of a white house with significant hail damage to its siding, with many pieces missing and the underlying structure exposed.   
Caption: Courtesy NWS-Louisville
- Bottom Right:** A photograph of a red car with a severely cracked and shattered windshield.   
Caption: Courtesy NWS-Green Bay





# A Quick Tour...

A screenshot of a web browser window displaying a training page from the Spotter Network. The browser's address bar shows the URL: [training.spotternetwork.org/mod/page/view.php?id=61](http://training.spotternetwork.org/mod/page/view.php?id=61). The page title is "Awareness: Damaging Winds".

The main content area features a large image titled "Downburst in Progress" showing a massive, dark, and turbulent cloud formation over a green field. Below this image is a diagram illustrating the mechanics of a downburst. The diagram shows air sinking from the cloud, hitting the ground, and then rushing outward. A green box indicates "70 MPH Wind Reported". A yellow arrow points to the right, labeled "Rushes Outward". The text "Hits Surface" is at the bottom of the sinking air column. The diagram is labeled "Sinking Air" with arrows pointing down.

Photo of Downburst Winds

CLOSE X

Video Examples of Downbursts in Action

nd becomes too heavy to be held aloft in  
ent rush of air descending out of the cloud  
mobile homes, uproot trees, blow vehicles  
of the wind can pick up debris which in itself  
ches, lumber planks, cement blocks, and  
f 120 mph are not that uncommon in  
outh Dakota, downburst winds were





# A Quick Tour...



Courtesy of YouTube - User Unknown



Courtesy of YouTube - Sportscaster17



Courtesy of YouTube - CastleofAnim



Courtesy of YouTube - paulknightley





# A Quick Tour...

## Implications for Storm Spotters



- ✓ While rarely lethal, hailstones can cause considerable damage and injuries.
- ✓ Wear protective head and eye gear to avoid injuries from large hail and glass fragments.
- ✓ Hail covered roads can be unexpectedly slippery.





A Quick Tour...

# STORM

SPOTTER & CHASER SAFETY

AWARENESS

COMMUNICATION

ESCAPE ROUTES

SAFETY ZONES



ACES





## THE BOARD

Tyler Allison

Paul Sirvatka

Gilbert Sebenste

Joshua Jans

## ADVISORY COMMITTEE

### NWS Operations

**Albert Pietrycha**

NWS Goodland, KS

**Rick Smith**

NWS Norman, OK

**Tanja Fransen**

NWS Glasgow, MT

**Gary Woodall**

NWS Phoenix, AZ

**Evan Bookbinder**

NWS Springfield, MO

**Scott Blair**

NWS Topeka, KS

### Emergency Operations

**Rob Dale**

Meteorologist WLNS Channel 6  
Lansing/Jackson, MI

**Chris Novy**

Severe Weather Trainer  
Emergency Management  
Oklahoma City, OK

**Randy Denzer**

Fire Fighter  
Emergency Response Trainer  
Austin, TX

**Laura Hedien**

Fire Fighter & EMT  
Greater Chicago Area

**John Wetter**

NWS Chanhassen, MN  
SKYWARN Operations Coordinator

### Meteorology & Training

**Greg Stumpf**

Research Meteorologist  
University of Oklahoma

**Joshua Jans**

Private Meteorologist,  
Instructional Designer  
Austin, TX

**Andrew Revering**

Private Meteorologist,  
Software Developer  
Minneapolis, MN

### Storm Chasers

**Ben Holcomb**

Storm Chaser  
Norman, OK

**Craig Curlee**

Storm Chaser  
DeCordova, TX

**Brett Adair**

Storm Chaser  
Birmingham, AL

**Steve Miller**

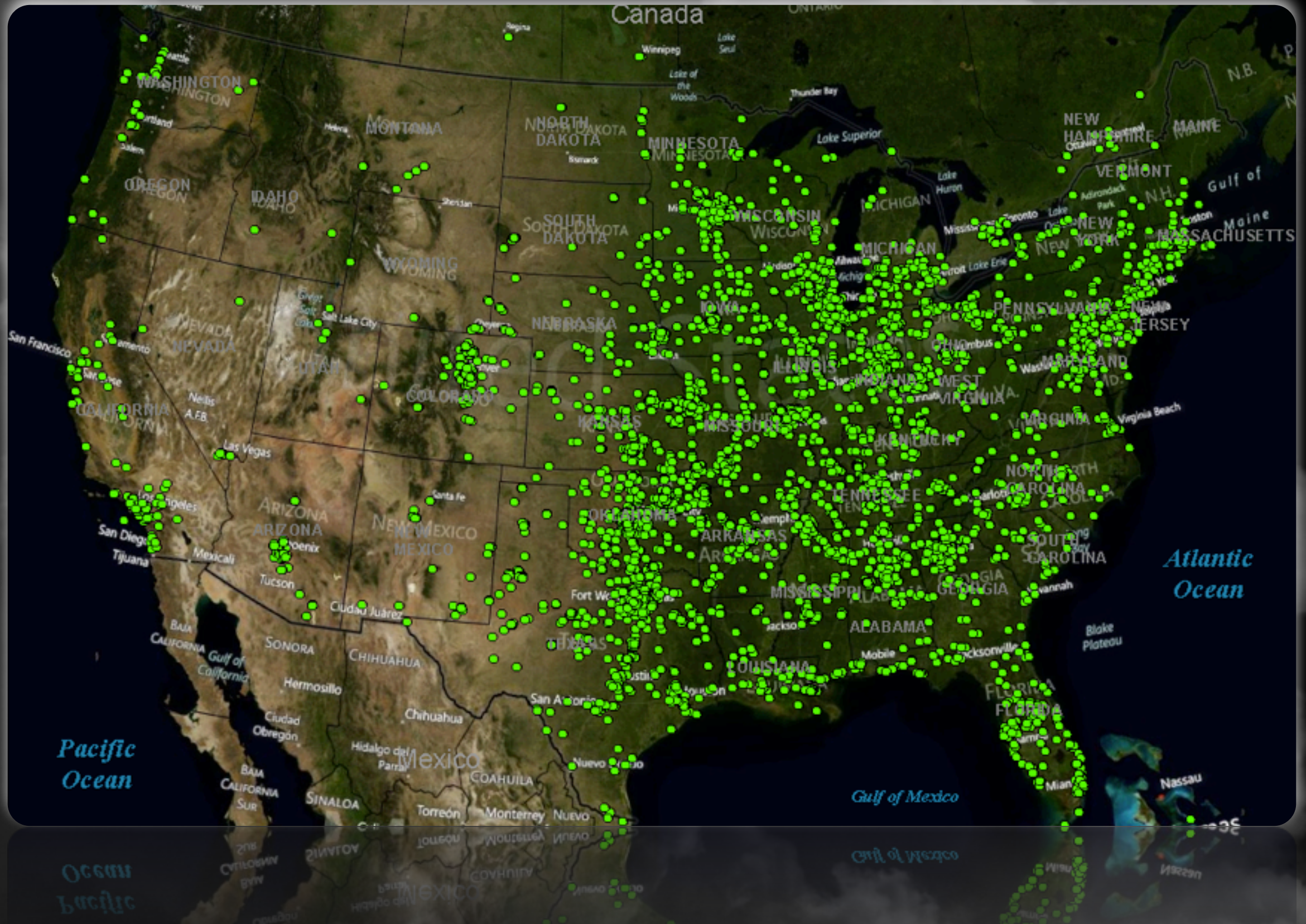
Storm Chaser  
Amarillo, TX

*“Run as an organization of like minded individuals taking input from the various communities that it serves and making the output available to any and all who are interested in severe weather”*





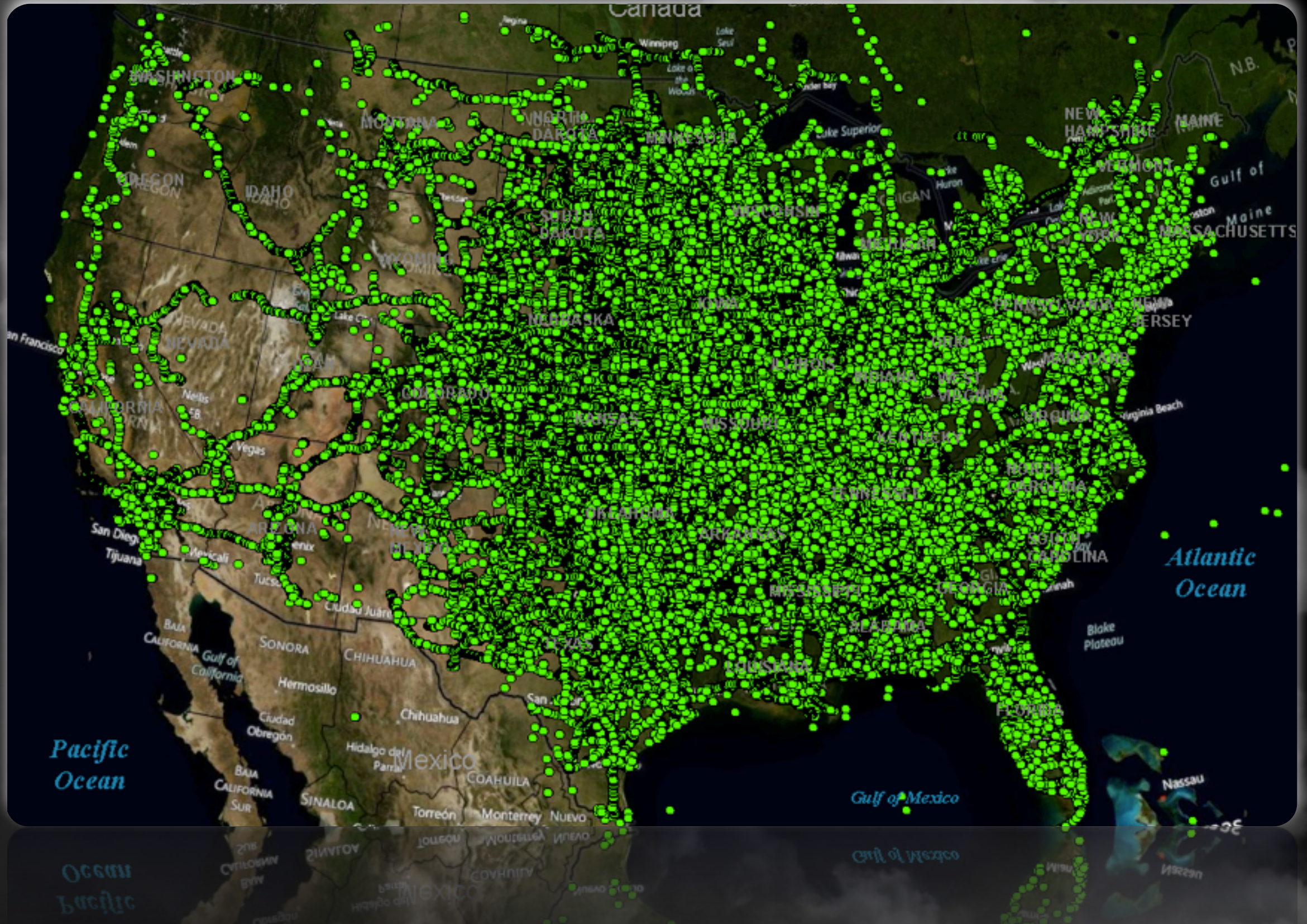
# Tracking It Down in 2011







# Tracking It Down in 2011









# Accessing Data

Timely, accurate, and frequent storm reports continue to play a critical role in protecting life, property, and more!

From Real-Time Mission Critical

Storm Spotter

NWS Local  
Office

Broadcast  
Media Outlets

Emergency  
Management

First Responders  
& Rescuers

Commercial  
Weather Vendors

Science Research  
Applications

Legal  
Professionals

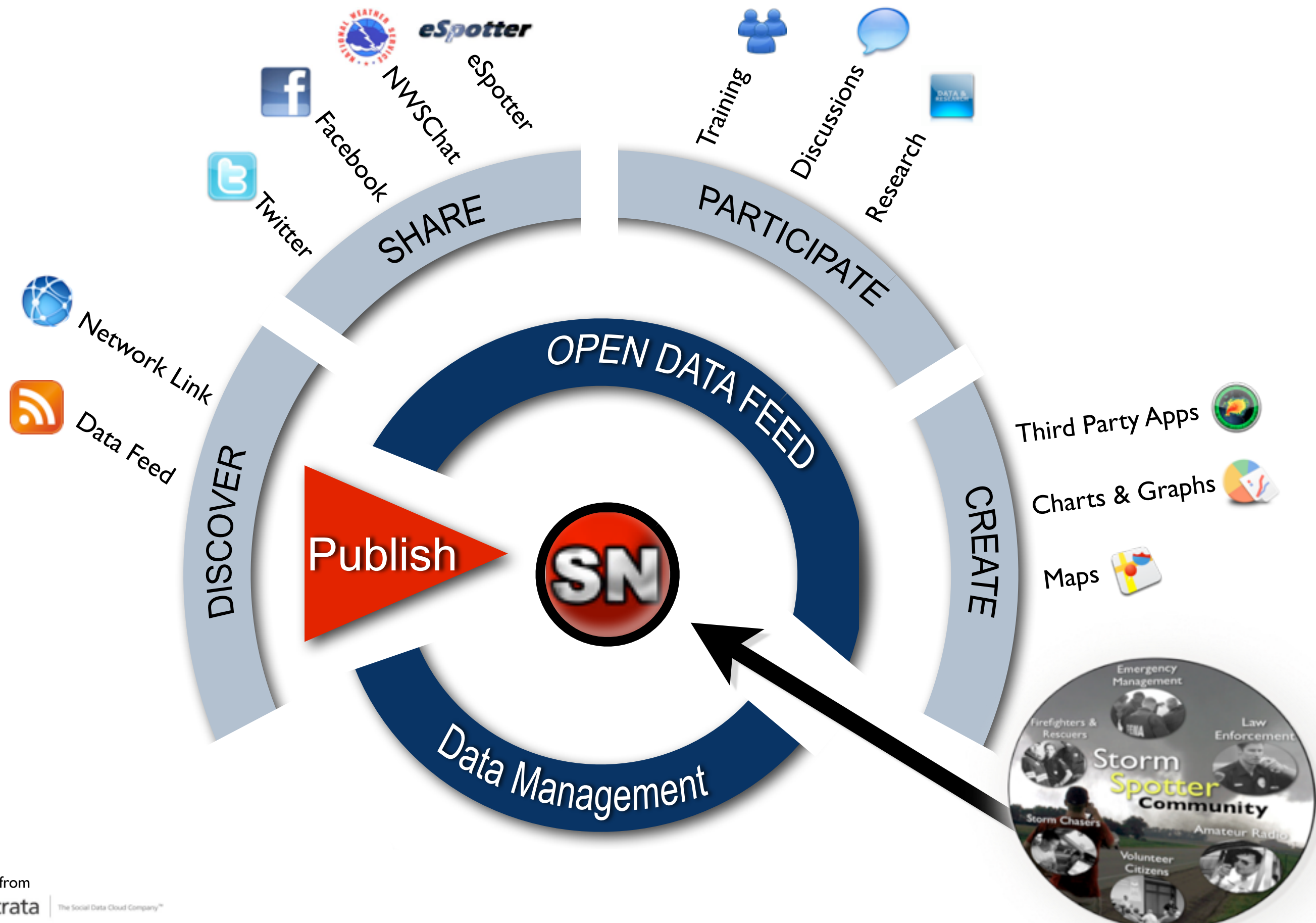
Insurance &  
Claims Adjustors

Structural  
Engineers

to Post Storm Clean Up



# Open Data Spotter Reporting & Tracking





# Modern Day Spotter

It's easier than Facebook!

Spotter Network Client 3.0.9 © 2011 SpotterNetwork Inc. (NFP)

**SPOTTER NETWORK**

Status: **Manual** Heading: Lat: 44.222 Lon: -93.919 Elevation: You are: 3 Miles E of Benning, MN in Blue Earth County.

Contact the MPX NWS office at 800-692-2110 (emergency only)

**Submit Report** **Force Update**

**Communications Log:** Your last position update was ? minutes ago.

3:32:28 PM	Data Inserted Successfully
3:32:07 PM	Required data not provided
3:30:07 PM	Required data not provided

**Settings**

Spotter ID: Port: COM12 Manual Position Latitude: 44.2216

Baud: GPS Manual Longitude: -93.9187

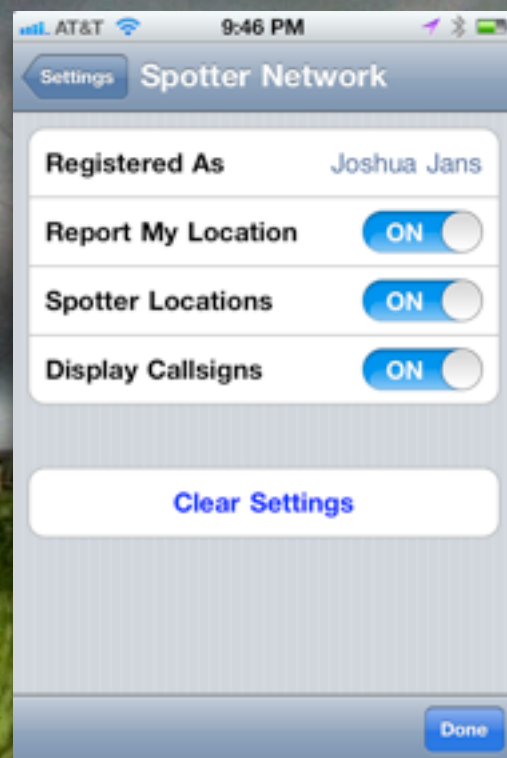
Advertisement  
Convective Development, Inc. AlertMe Pro Cat5Data F5Data F5 app F5 maps





# Modern Day Spotter

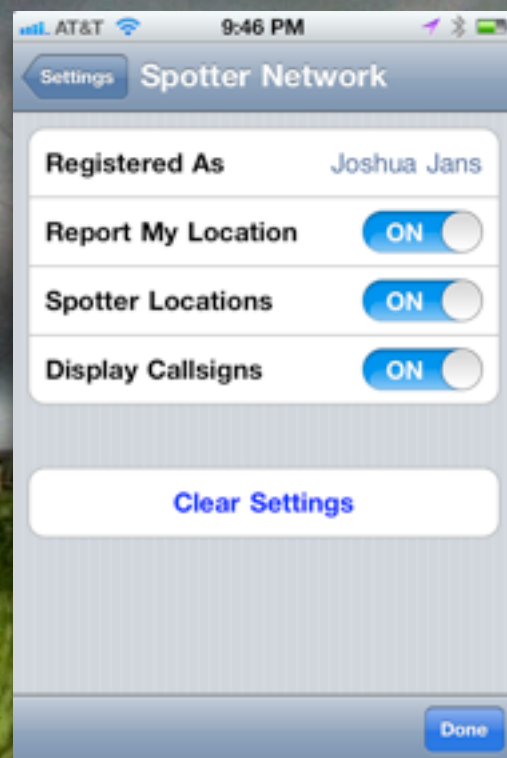
It's easier than  
Facebook!





# Modern Day Spotter

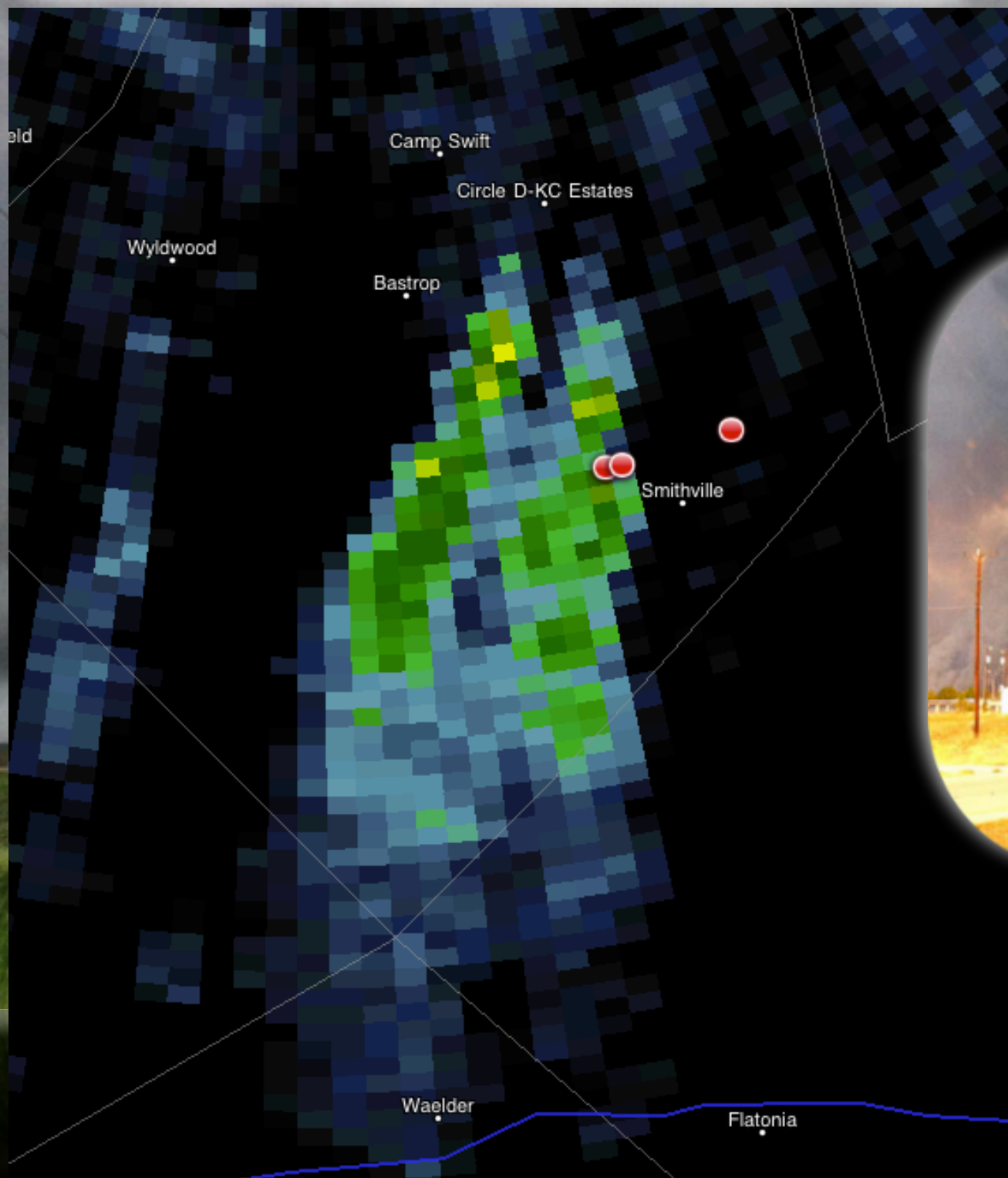
It's easier than  
Facebook!



## What If Thunderstorms Were Just the Beginning?



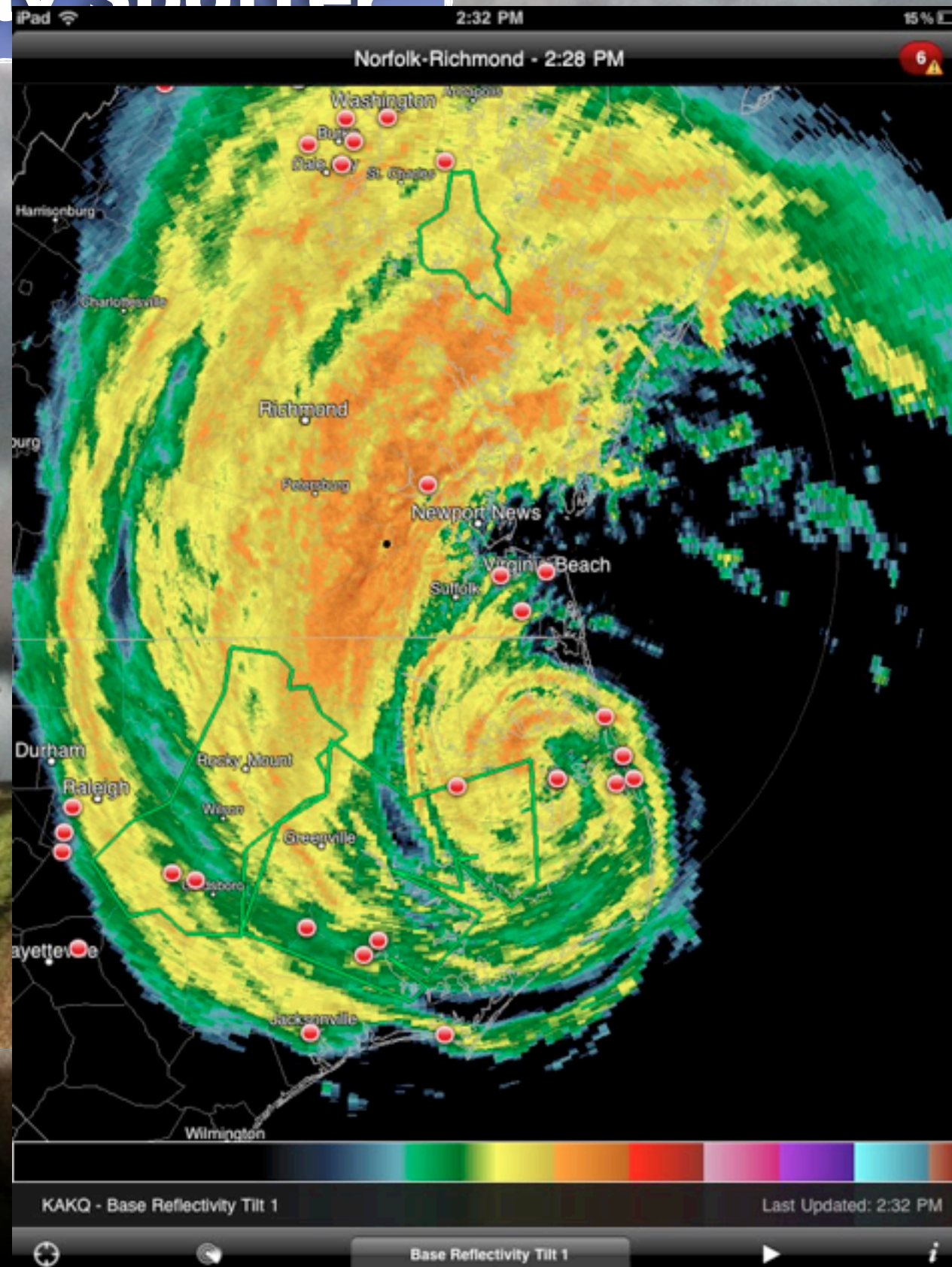
# Modern Day Spotter



Labor Day Weekend 2011



# Modern Day Spotter



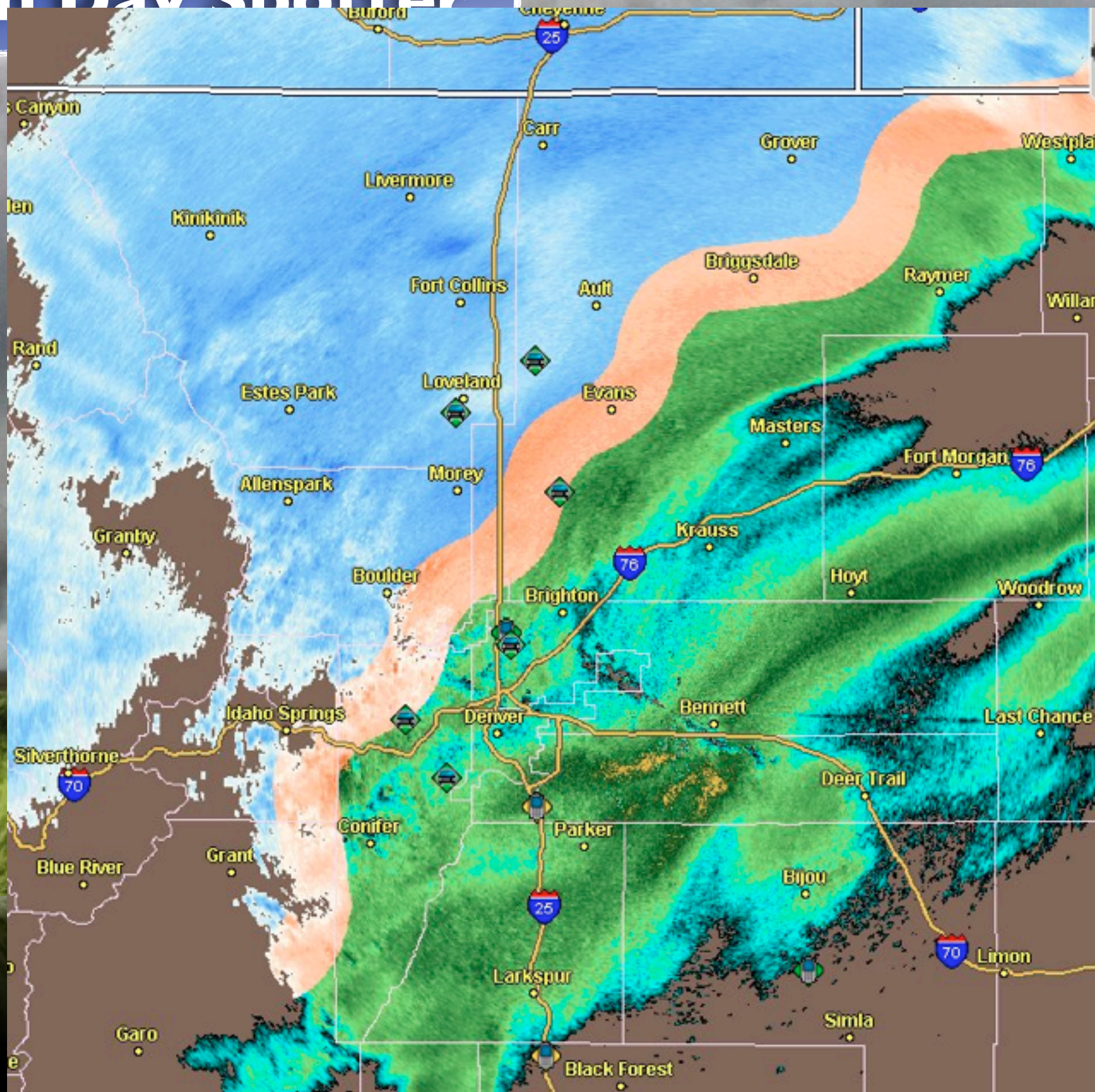


# Modern Day Spotter





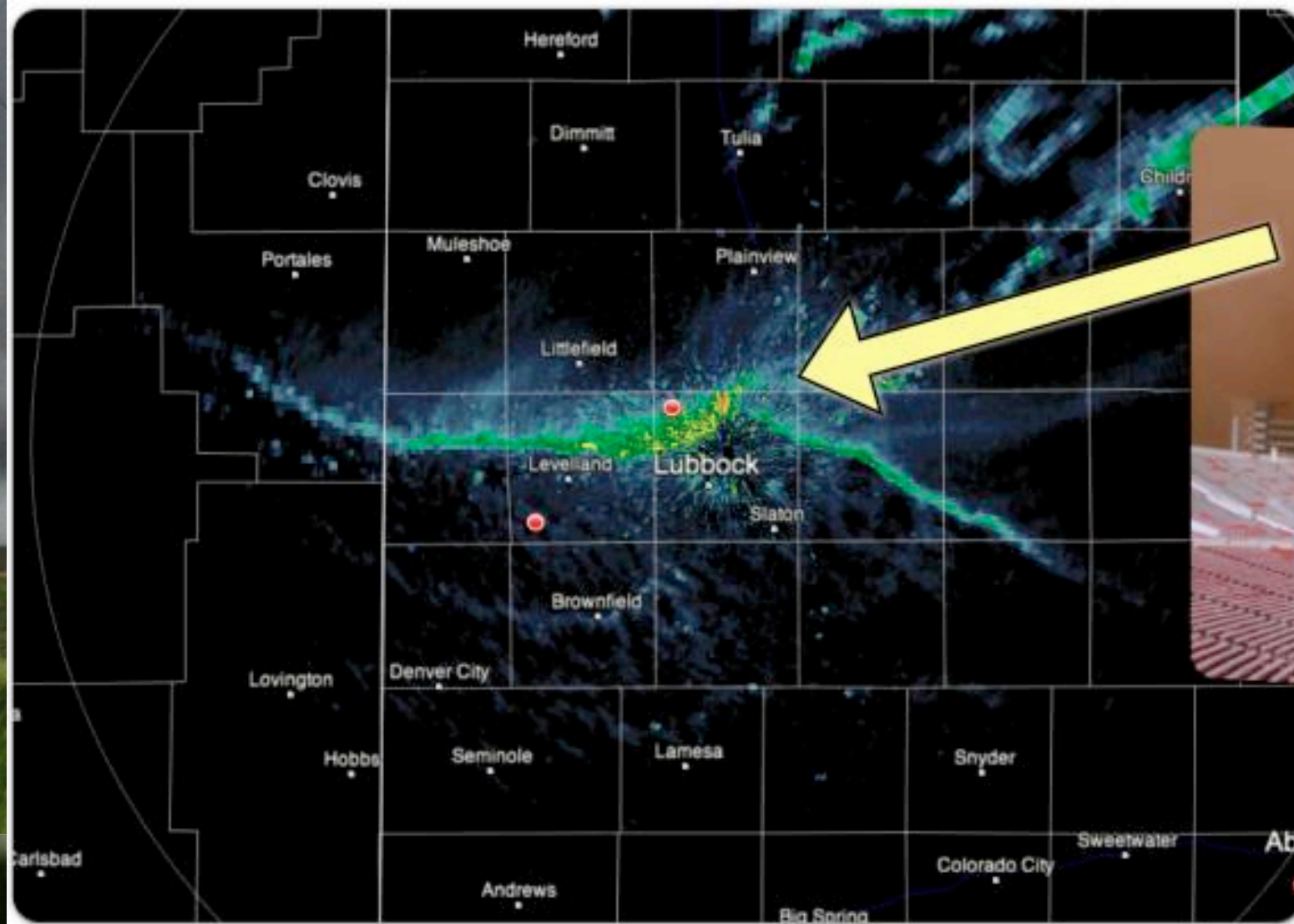
# Modern Day Spotter





# Modern Day Spotter

## *Dust Storm on Radar*



Courtesy of Texas Tech's Associate Director/Athletics Communications  
for Football Scott Lacefield



# A Push to **ALL-HAZARD** Training, Reporting, & Tracking



Training  
Opportunities

Network of Multi-Hazard  
Spotter Information

Technology  
Infusion



*Thank You.*

**Joshua Jans**

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Wednesday, February 22, 12

