

Severe Storm Spotter Training



**National Weather Service
Lincoln, IL**





Spotter Training Outline



- **Role of the Spotter**
- **T-storm Basics**
- **T-storm Types**
- **Tornadoes**

- **Severe Wind, Hail, and Flash Floods**
- **Spotter Challenges**
- **Spotter Resources, Reports & Safety**



NWS CENTRAL ILLINOIS



ROLE OF THE STORM SPOTTER





What we are dealing with...

**More tornadoes,
severe storms &
flash floods occur
in the U.S. than
ANY other country
in the world!**

A Typical Year Brings:



6 Hurricanes



1,270 Tornadoes



5,000 Floods



10,000 Violent
Thunderstorms



Drought
Conditions



500 Deaths
5,000 Injuries
\$14 B in Losses

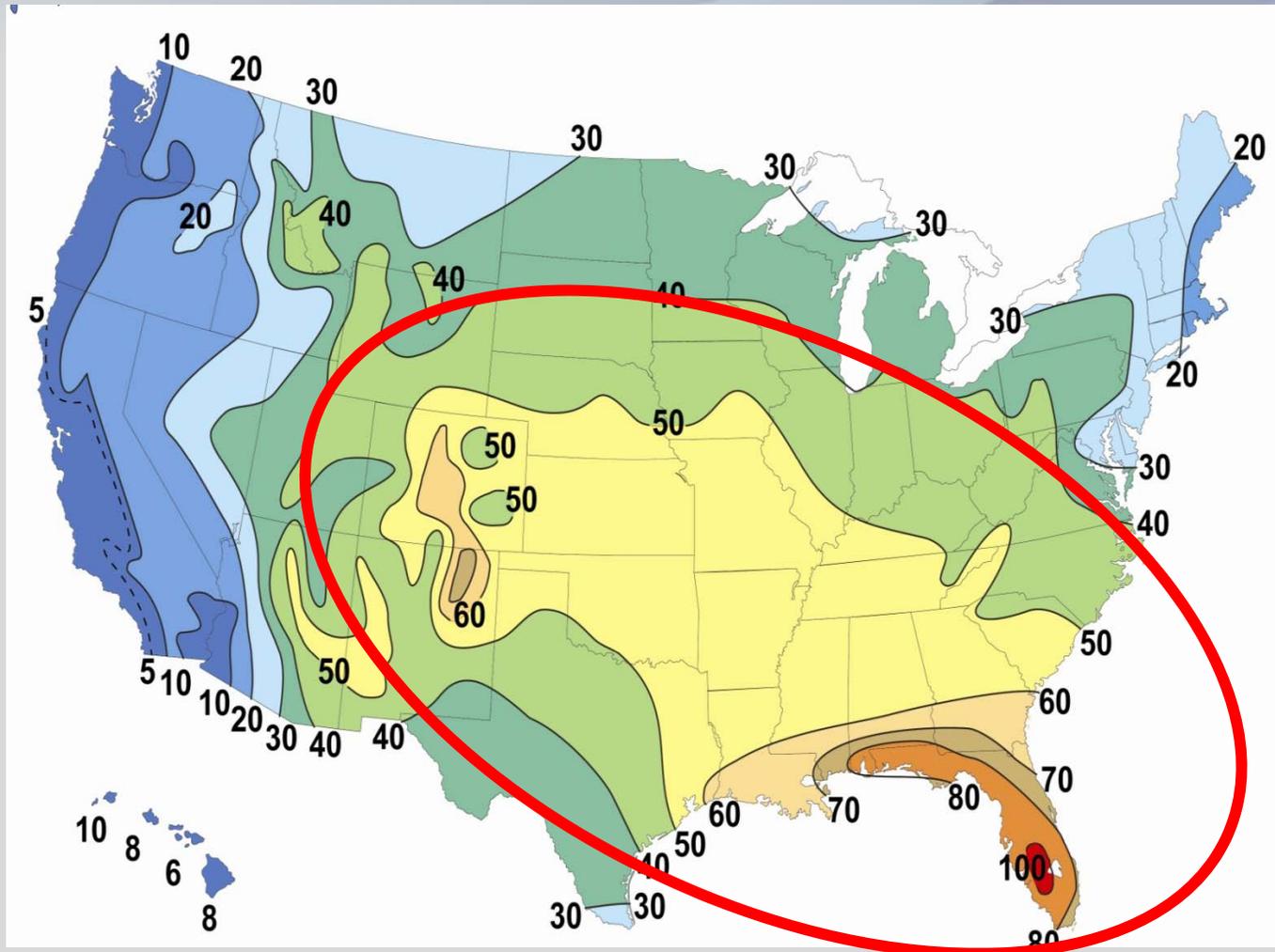


The Threat Area...

Top 5 States for tornadoes

1. Florida
2. Oklahoma
3. Kansas
4. Iowa
5. Illinois

of tornadoes per square mile



Map: Average Annual T-storm Days



Illinois Severe Weather

A Typical Year:

- 46 Tornadoes
- 550 Severe T-storm Reports
- 165 Reports of Flash Flooding



Photo by
Harmony & Matt Goodrum



Jodi Irvin
Near Morrisonville
July 12, 2011



Jacksonville
June 18, 2011



How Often Are Spotters Needed?

Illinois Severe Weather Frequency

Cent / SE Illinois

**Yearly # of
Days With:**

Tornado – 8

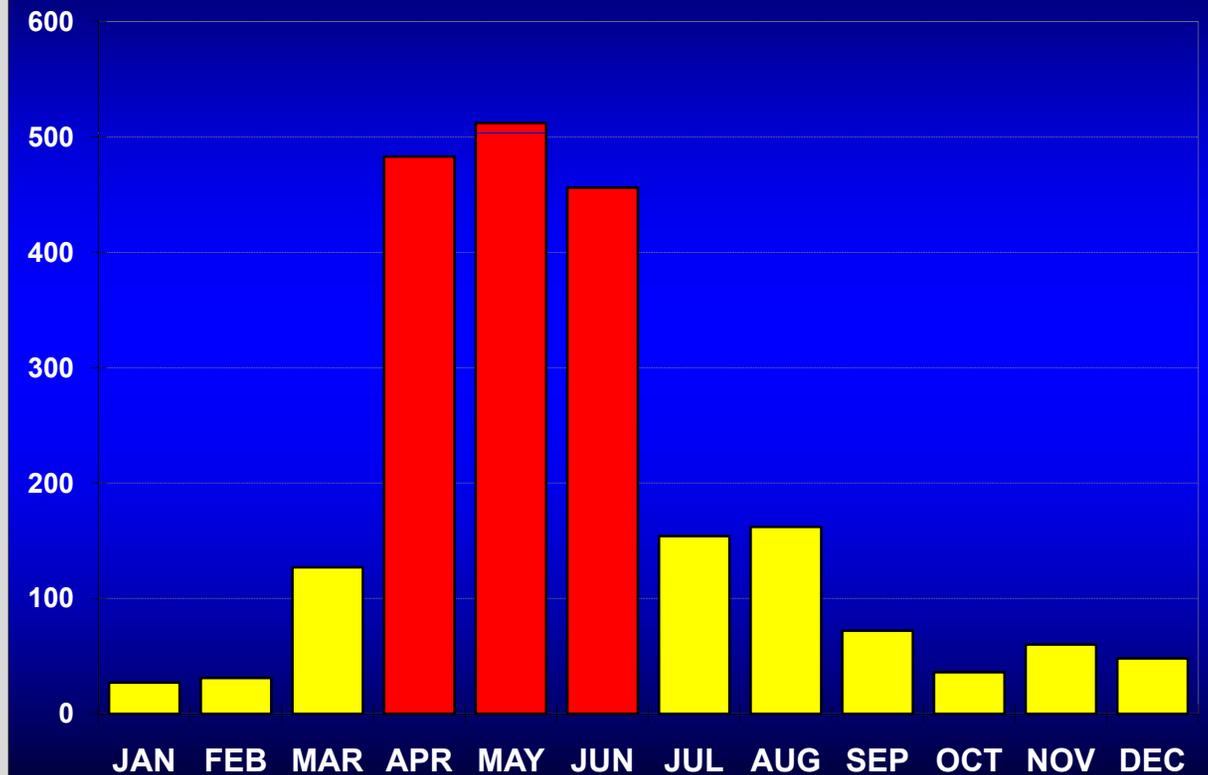
All Severe – 36

Flash Flood – 22

**Highest incidence
of severe storms:**

**last week of May &
first week of June**

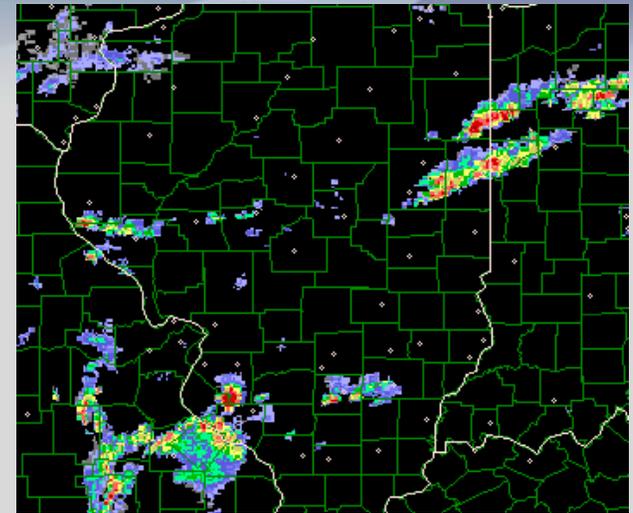
Illinois Tornadoes (1950-2011)





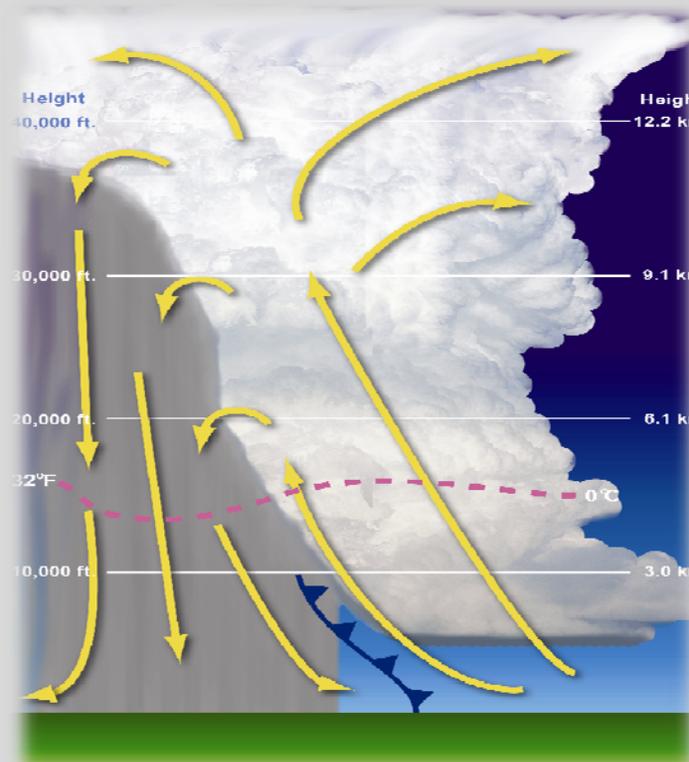
Why we are here...

- Radar only tells “part of the story”
- Spotter reports fill the gaps when & where our tools can not detect
 - “Ground truth” info helps with warning decisions
 - The public responds better when warnings & updates include spotter reports





THUNDERSTORM BASICS



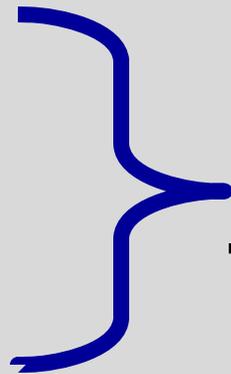


Important Ingredients

1. Lift

2. Moisture

3. Instability



**ALL
T-storms**

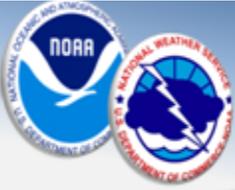


4. Wind Shear



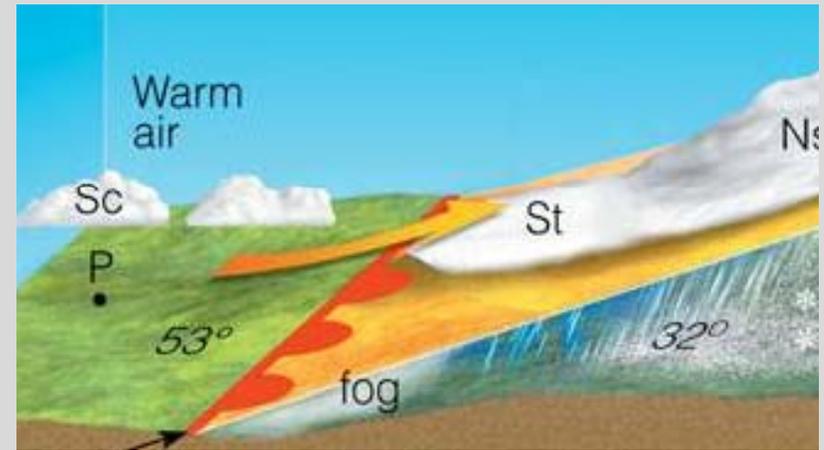
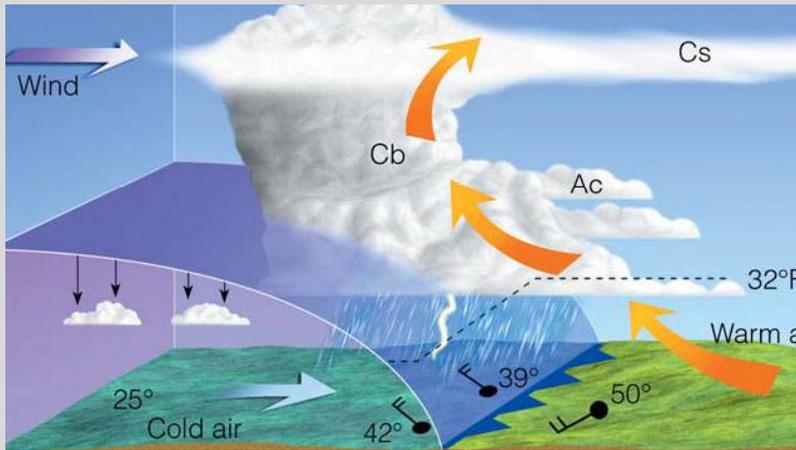
**Strong or
Severe
T-storms**





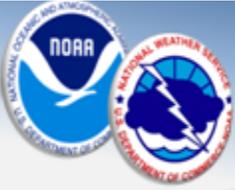
Lifting the Air...

1) Low Pressure, Cold & Warm Fronts



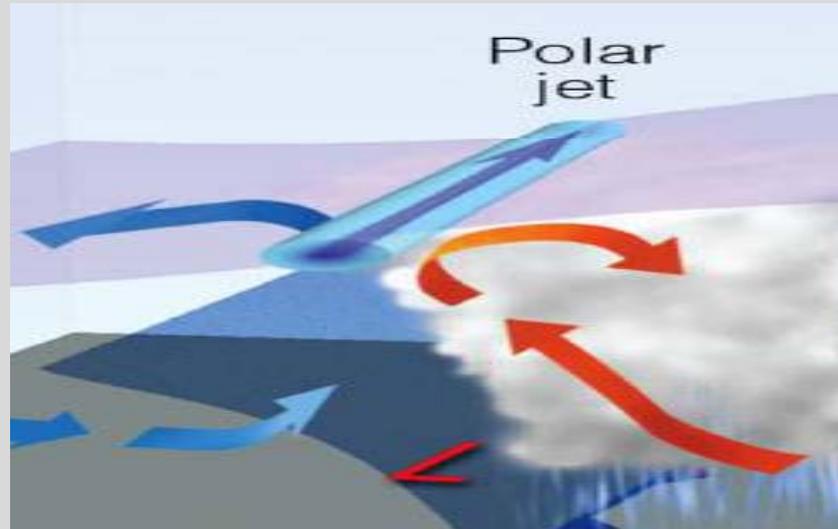
2) Heating the Ground



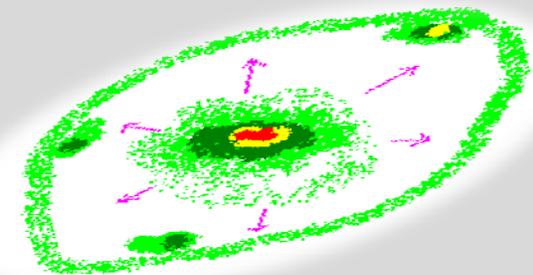


Lifting the Air...

3) Jet Stream / Upper Air Disturbance



4) Other Thunderstorms





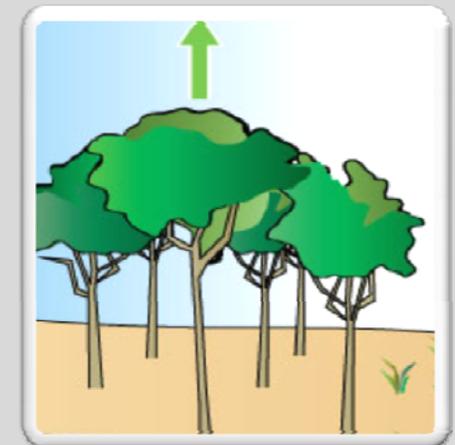
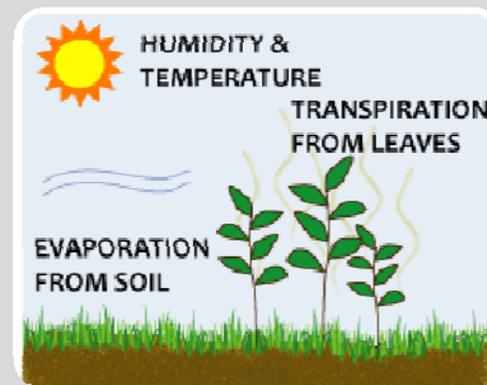
The air needs to be moist...

Sources

1) Gulf of Mexico



2) Local Vegetation





The air needs to keep rising...

Instability

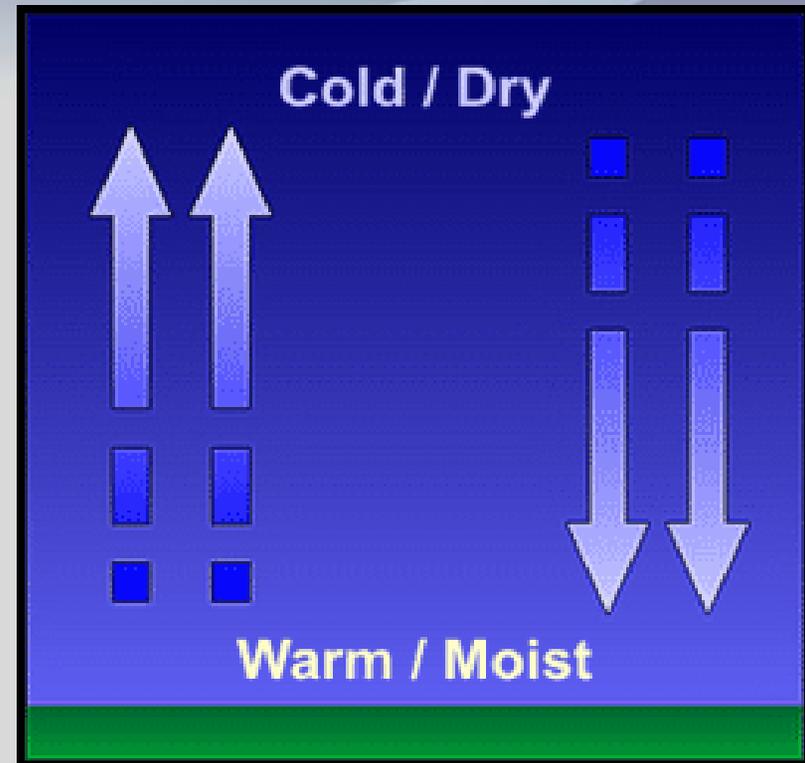
**Warm, moist air
below**

+

cold, dry air aloft



Instability



Air forced up (UPDRAFTS)
will continue to rise.

Air forced down (DOWNDRAFTS)
will continue to sink.



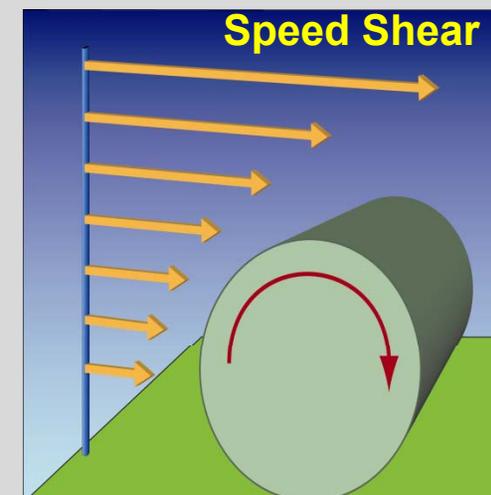
The wind can make a difference...

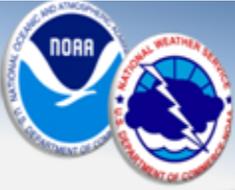
Wind Shear is:

1) Wind direction changing vertically
(Directional Shear)

AND / OR

2) Wind speed changing vertically
(Speed Shear)

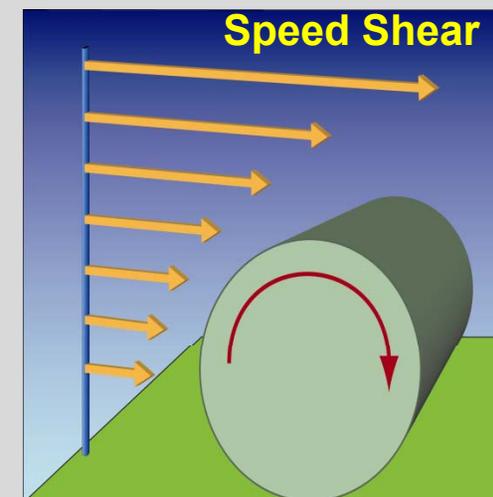


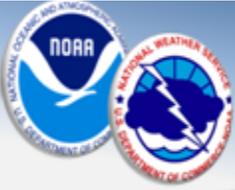


The wind can make a difference...

With Strong Wind Shear:

- Storms are more organized
- Storms are longer lived
- Rotation can develop in a storm





Updrafts and Downdrafts:

- It is **IMPORTANT** to identify the Updraft and Downdraft
 - **Updraft / Inflow**
 - Warm, moist air feeds storm
 - Usually where **most** tornadoes form
 - **Downdraft / Outflow**
 - Cool, rainy air spreads out
 - High wind gusts
 - Heavy rain / Hail





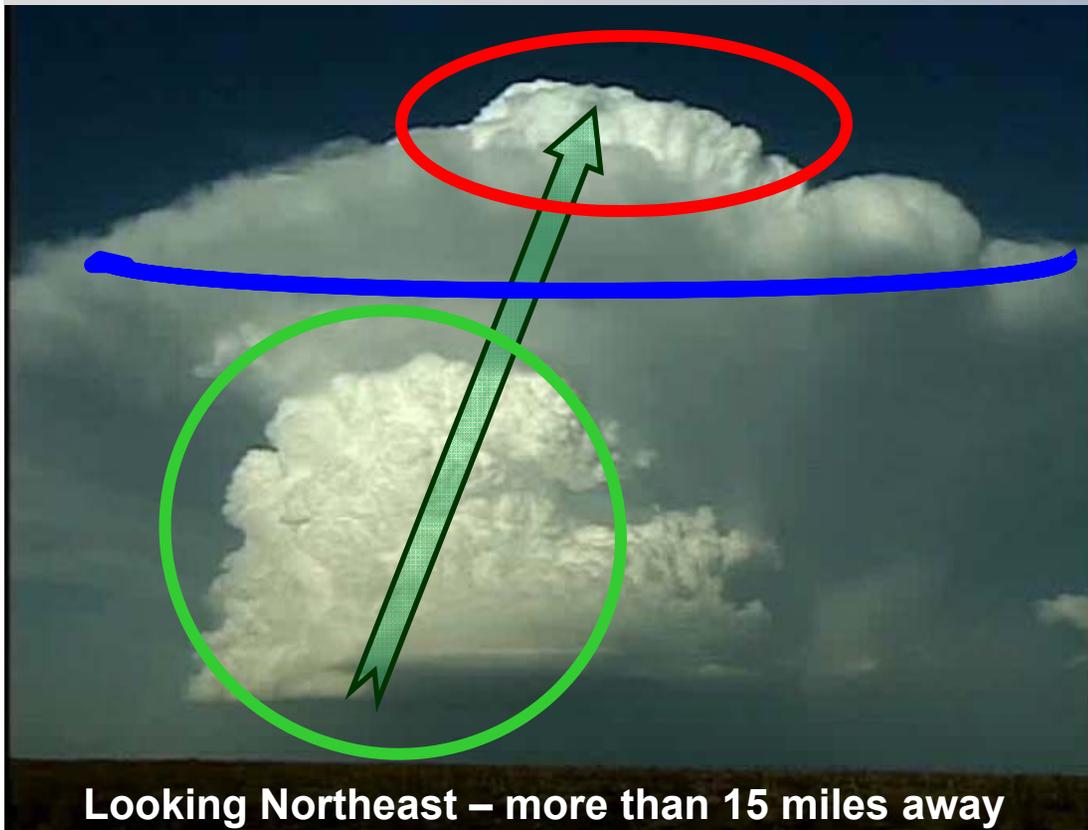
SEVERE STORM FEATURES





Severe Storm Features

Seen at long distances from the storm \approx 15-30 miles or more



OVERSHOOTING TOP:

- VERY strong updraft
- If the top persists, the storm is strengthening
- If it collapses, severe weather is imminent

ANVIL:

- Solid, sharp edges, spreading back toward the west

STORM TOWER:

Sharp, bulging edges & tilted updraft because of wind shear



Severe Storm Features

Seen at distances of \approx 10 to 20 miles

*Photo by Matt Ziebell
Looking North – more than 10 miles away
Flanking line on western side of storm*



Flanking Line: Indicates the storm will intensify, or sustain itself for quite some time



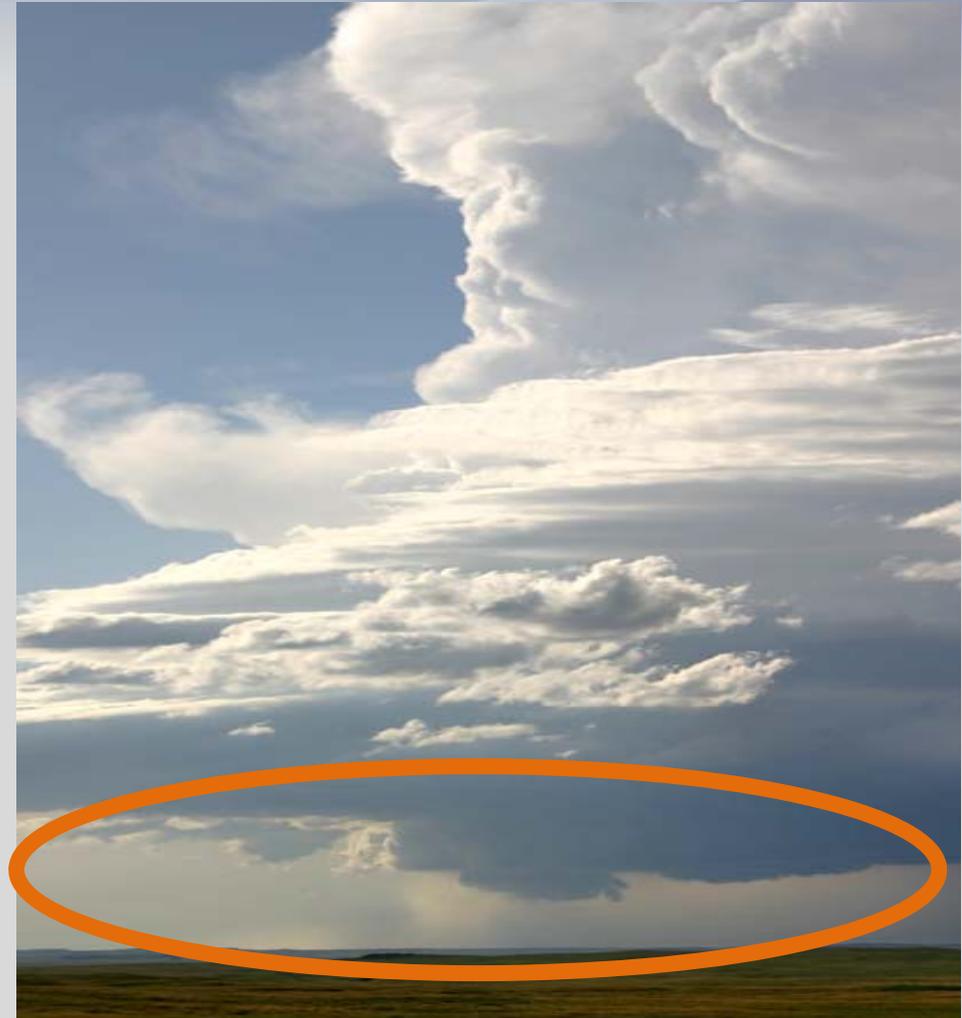
Severe Storm Features

Seen at close distances from the storm \approx 5 miles or less

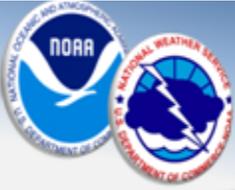
Rain-Free Base and Wall Cloud:

Indicates a strong updraft – heavy rain can not penetrate it.

There is a higher potential for a tornado with a rotating wall cloud



*Photo by Brian Morganti
Looking northwest – less than 5 miles away*



Severe Storm Features

Seen at close distances from the storm \approx 5 miles or less



Heavy
Rain

Downburst
wind gusts

Photo by Barb Janke

Strong Downdraft

- Very heavy rain
- Strong outflow, or downburst with high winds
- Caused by rain cooled air rapidly descending



Comparison: Severe Storm vs. Weak Storm



- **Anvil and overshooting top**
- **Strong, tilted updraft**
 - Stronger wind shear
- **Sharp edges in tower**

- **No anvil**
- **Weak, straight updraft**
 - Weaker wind shear
- **Fuzzy edges in tower**



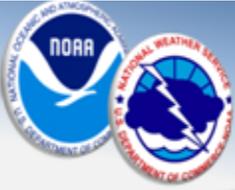
THUNDERSTORM TYPES

Single
Cell

Multicell
Cluster

Multicell
Line

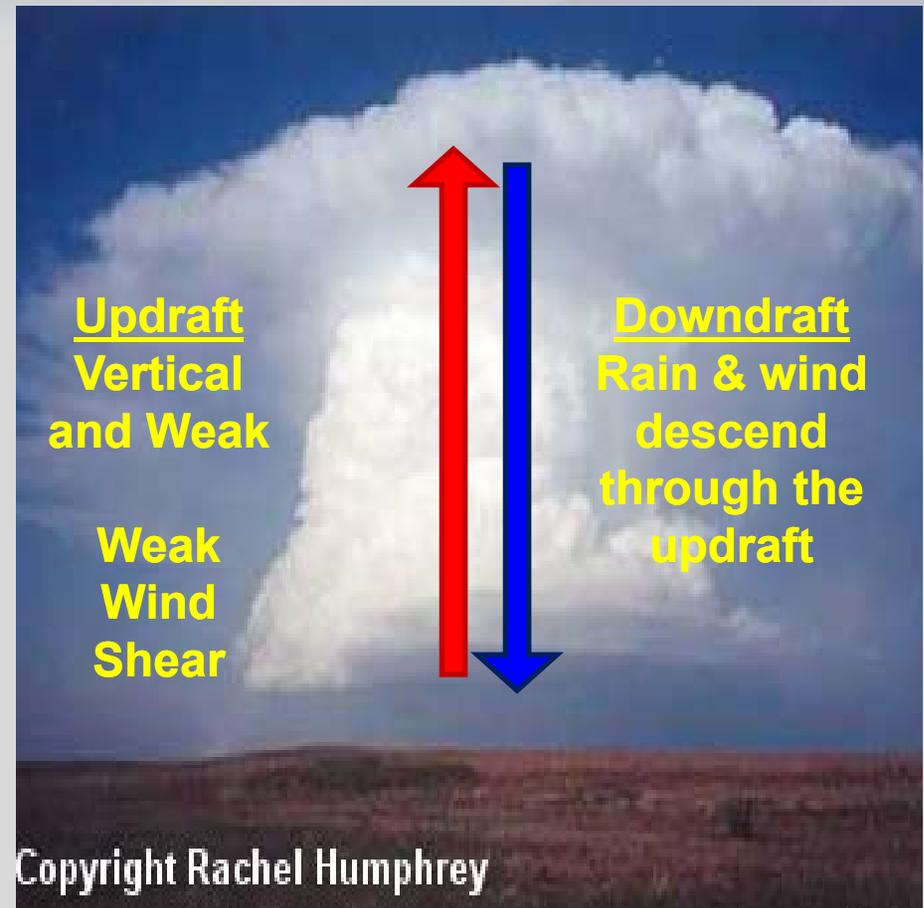
Supercell



Single Cell Storms

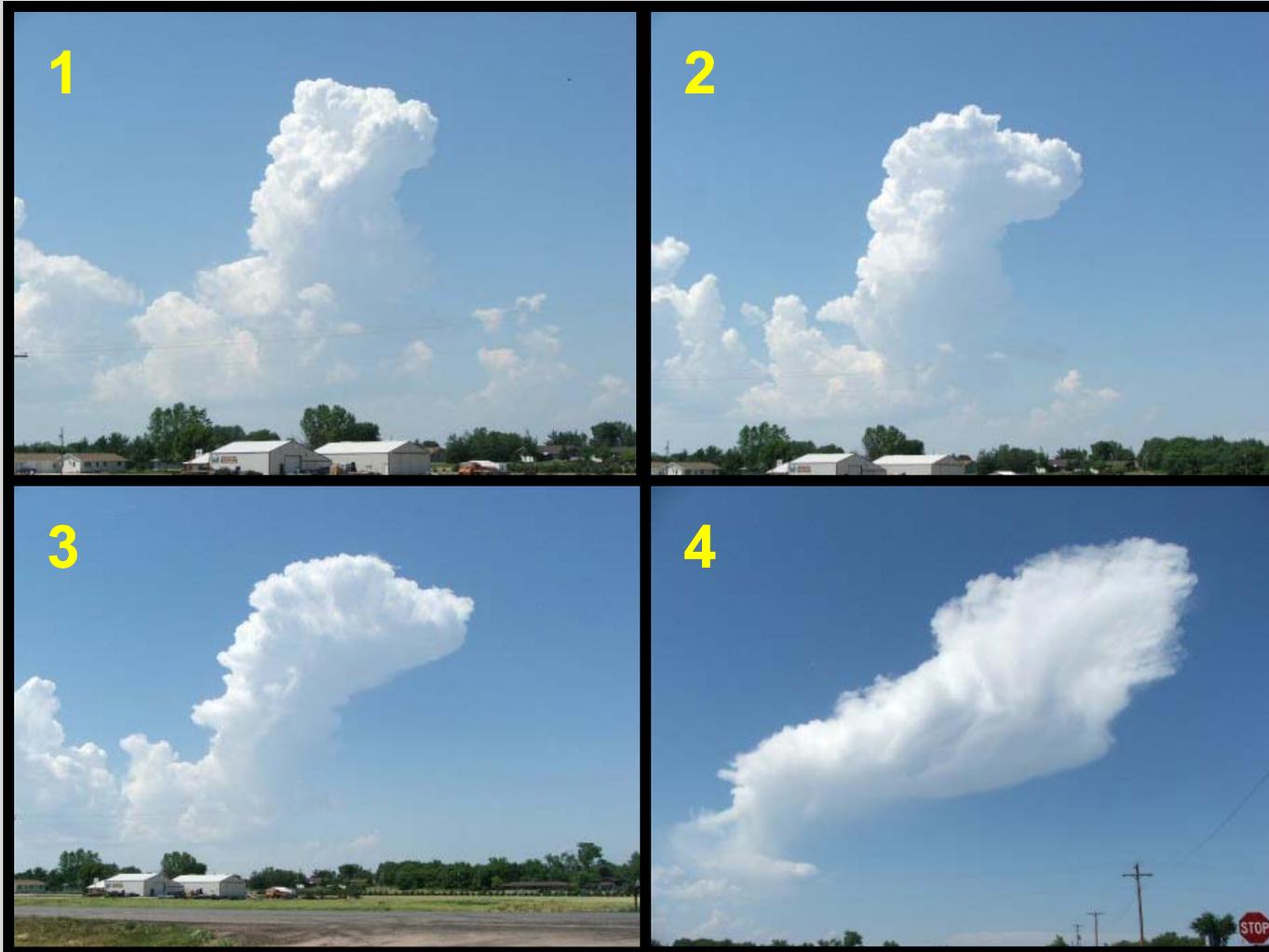
Visual Clues and Characteristics

- **Most common in IL during summer**
- **Short lived:
Less than 1 hour**
- **Expected Weather:**
 - **Small Hail**
 - **Downpours**
 - **Gusty Wind**
(usually < 40-50 mph)





Single Cell Storms



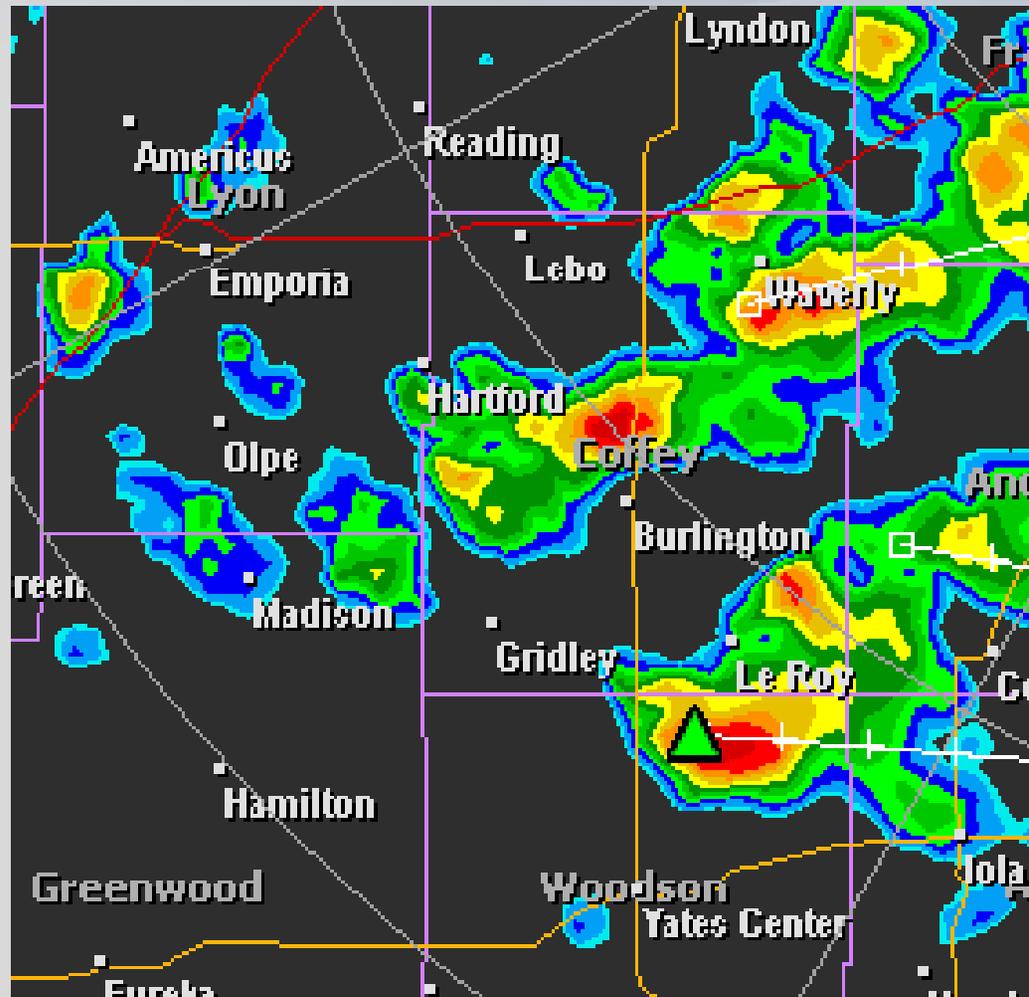
Single Cell Storm Life Cycle

Photos are about 5 minutes apart



Single Cell Storms

Radar View





Multicell Cluster Storms

Characteristics

- **Most common type of thunderstorm in Illinois**
- **Form near fronts & boundaries from nearby storms**
- **Severe weather:**
 - **Heavy Rain / Hail**
 - **Downburst Winds**
 - **Weak Tornadoes**



Looking NORTH

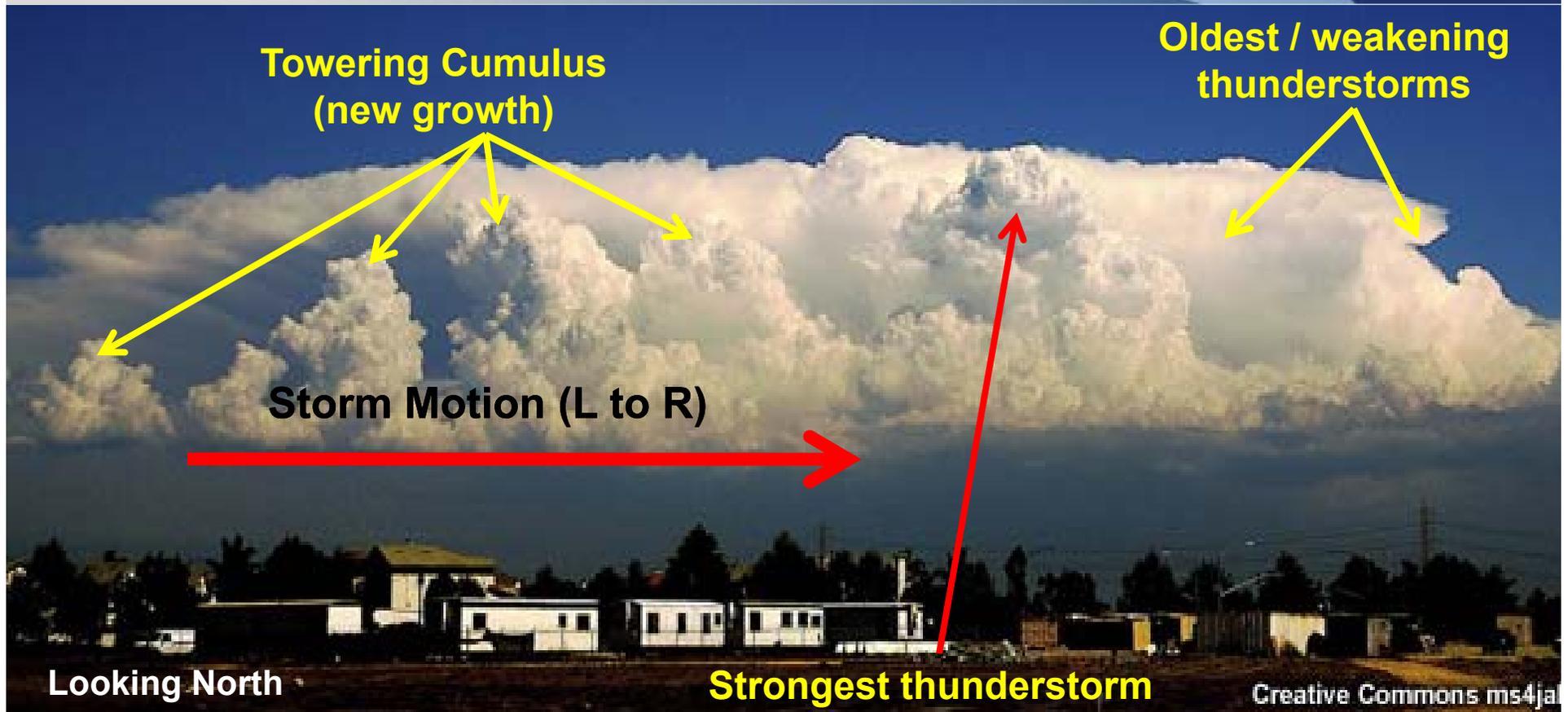
Photo by Gary Woodall

Moderate to Strong Updrafts
Weak to Moderate Wind Shear



Multicell Cluster Storms

Visual Clues

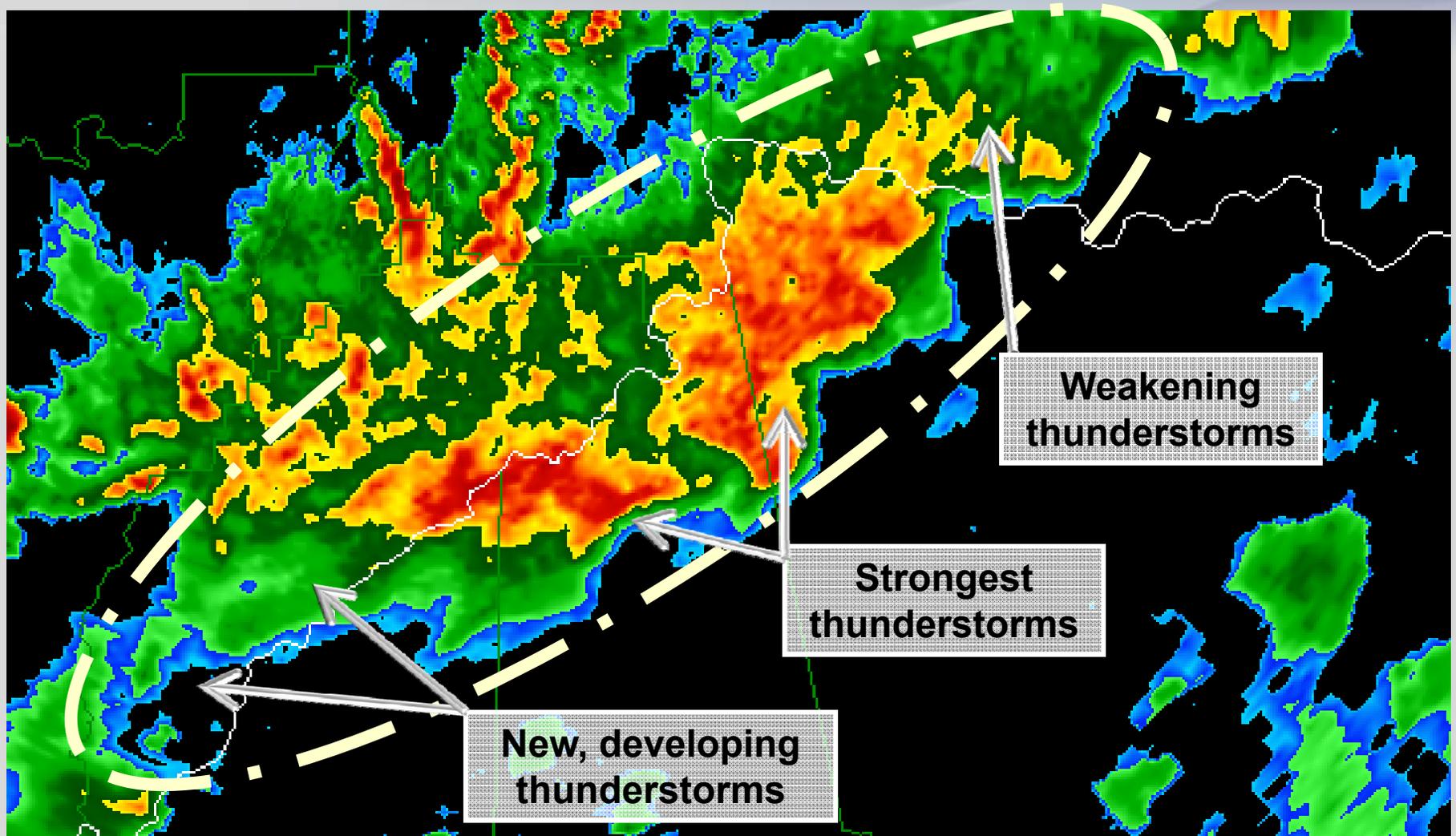


- New storms form on the W or SW side of the cluster
- Dissipating storms weaken on E or NE side of the cluster
- Clusters, usually last an hour or two



Multicell Cluster Storms

Radar View

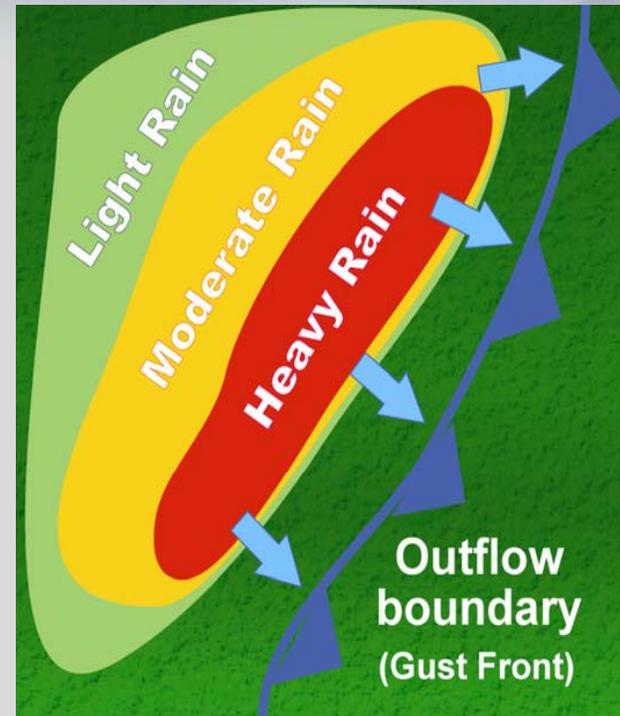




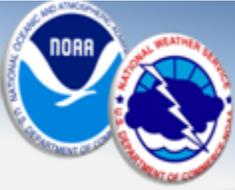
Squall Lines

Characteristics

- Long line of separate storms
 - Usually develop ahead of a cold front
- Squall lines are usually oriented in a N-S or NE-SW direction
- Downdrafts of separate storms merge to produce a “Gust Front”



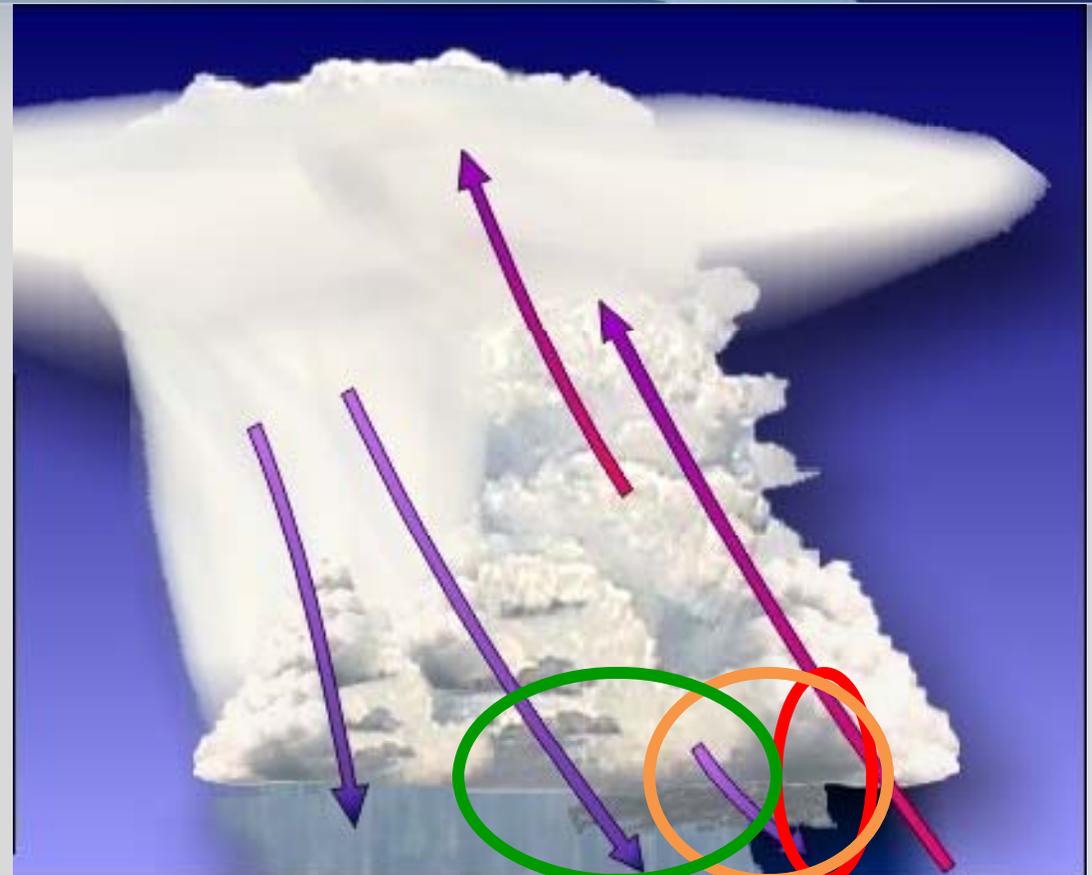
Moderate to Strong Updrafts
Moderate to Strong Wind Shear



Squall Lines

Characteristics

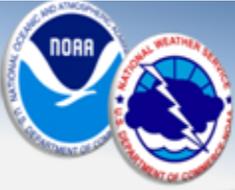
- **Severe Weather:**
 - Potential for high winds / damage
 - Occasional Tornadoes
 - Heavy Rain
 - Hail
(up to golf ball sized)



Heavy Rain
and Hail

Wind
Damage

Tornado



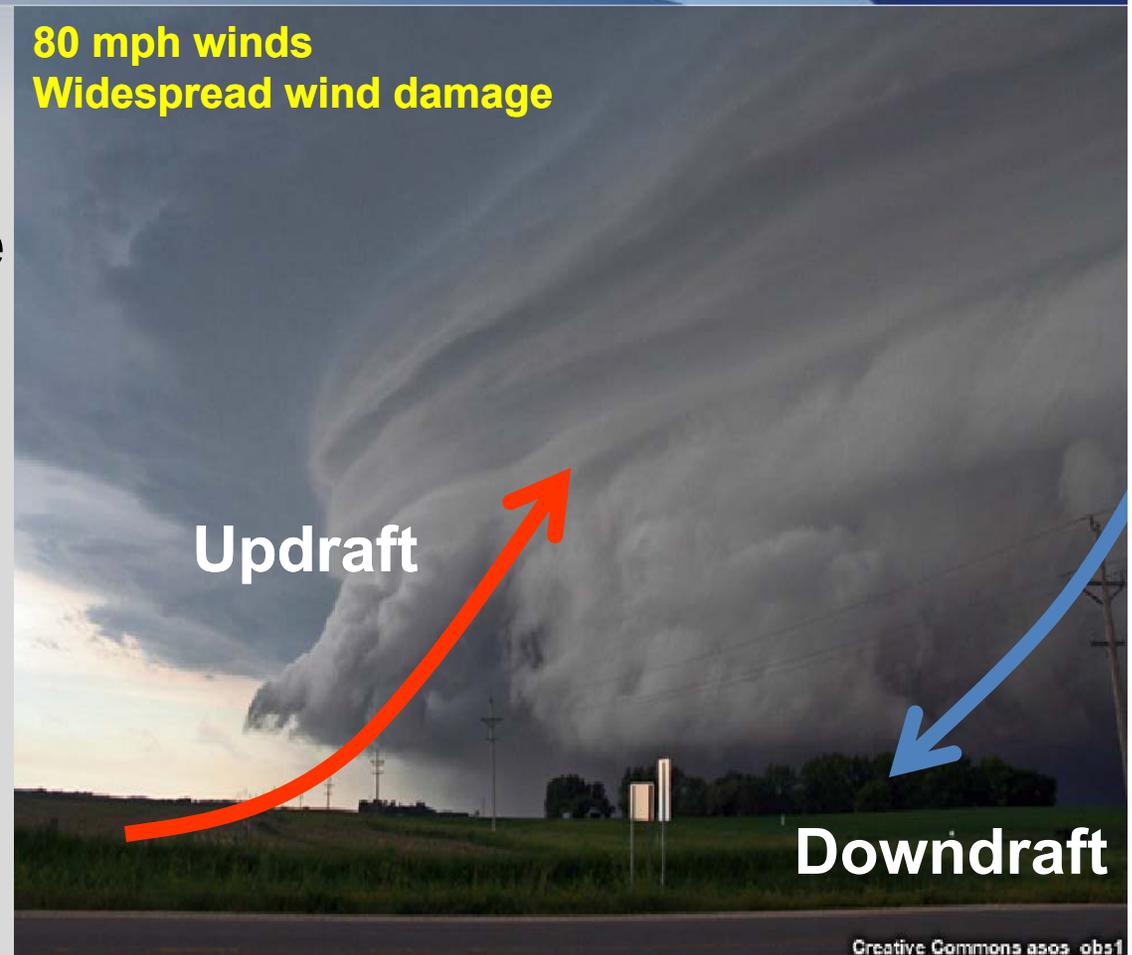
Squall Lines

Visual Clues

Shelf Cloud

- Long cloud at the front of the squall line
 - Where the **Warm Updraft** and **Cool Downdraft** meet
 - Shelf clouds that are low hanging with a “wavy” look aloft, often produce the highest winds

80 mph winds
Widespread wind damage



Creative Commons asos_obs1

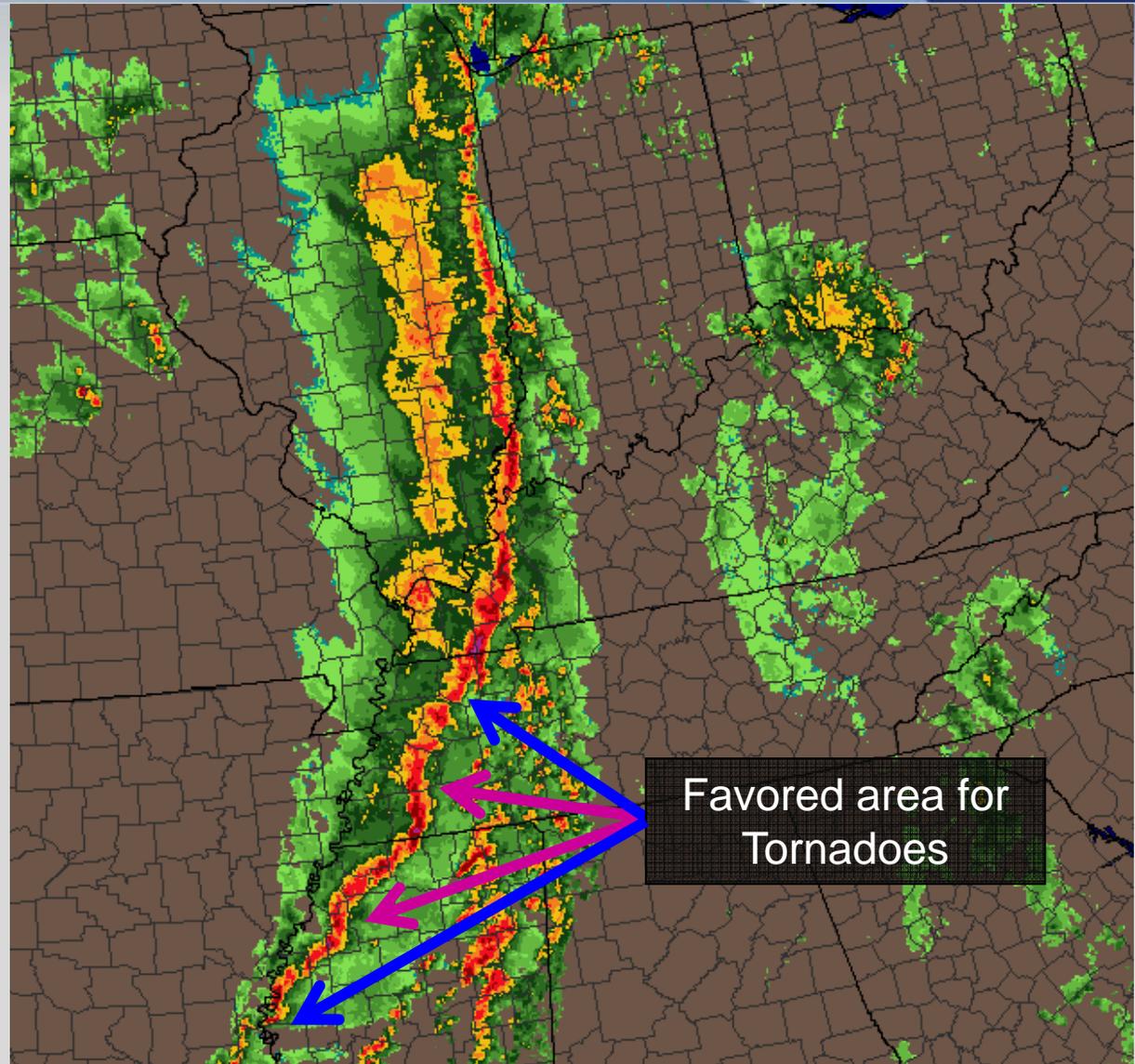
A dark grey or greenish color indicates heavy rain / hail



Squall Lines

Radar View

- **Tornadoes favored at the front of the line**
 - Look for kinks in the line
 - End or break in the line
- **High Wind**
 - Anywhere along the leading edge of the line





Supercells

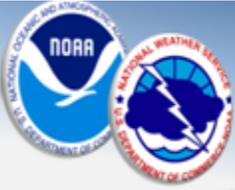
Characteristics

- Highly organized storms
- Pose a HIGH threat to life & property
- Updrafts rotate
 - Rotating “Updraft” is called a “MESOCYCLONE” or “MESO” ...this only occurs in supercells
 - Rotation caused by “wind shear” in the atmosphere



*Photo by Kyndi Hanson
near Peoria, 6/5/10
Looking NNW*

**Strong Updrafts
Strong Wind Shear
(Directional & Speed Shear)**



Supercells

Characteristics

- **Severe Weather:**

- **Tornadoes**

- Higher potential for strong or violent tornadoes



- **High winds / wind damage**

- Two downdrafts – one near heavy rain, other in rear of the storm
 - Wind up to 100 mph possible



- **Large Hail & Heavy Rain:
updraft / downdraft interface**

- Hail bigger than a golf ball
 - Flash Flooding





Supercells

Visual Clues

Rotating Updraft (Mesocyclone)



- 1. Wind shear in the vertical** (change in direction and wind speed) **causes a “rolling” motion**
- 2. A strong updraft pulls this upward, resulting in a rotating, tilted updraft**



Supercells

Visual Clues

1. Rotating Updraft (Mesocyclone)

Photo by Don Bell
Peoria, IL 6/5/10



Classic Supercell



HP Supercell

Spiral bands and striations in updraft tower are clues that the updraft is rotating



Supercells

Visual Clues

2. Wall Cloud



Richard Lewis
West of Tuscola
April 5, 2010

- Persistent lowering near the updraft (the rain-free base)
- Usually long lived – the key is rotation
- Upward motion often present
- May contain a “tail cloud” which points toward the downdraft



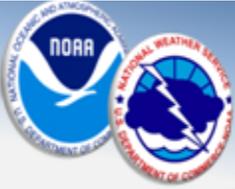
Supercells

Visual Clues

2. Wall Cloud - Images



Photo by David Cashion



Supercells

Visual Clues

2. Wall Cloud - Images



Heather Hall
Macon/Moultrie County Line
April 5, 2010



Supercells

Visual Clues

2. Wall Cloud - Images





Supercells

Visual Clues

2. Wall Cloud - Images





Supercells

Visual Clues

3. Inflow Cloud Bands



- Smooth, nearly flat, low level clouds
- Feeds into the updraft of the storm, usually from an easterly direction (E or SE)
- May see dust / dirt being lifted into the updraft from the ground
- NOT a necessary feature for every supercell



Supercells

Visual Clues

3. Inflow Cloud & Dust Bands - Photos



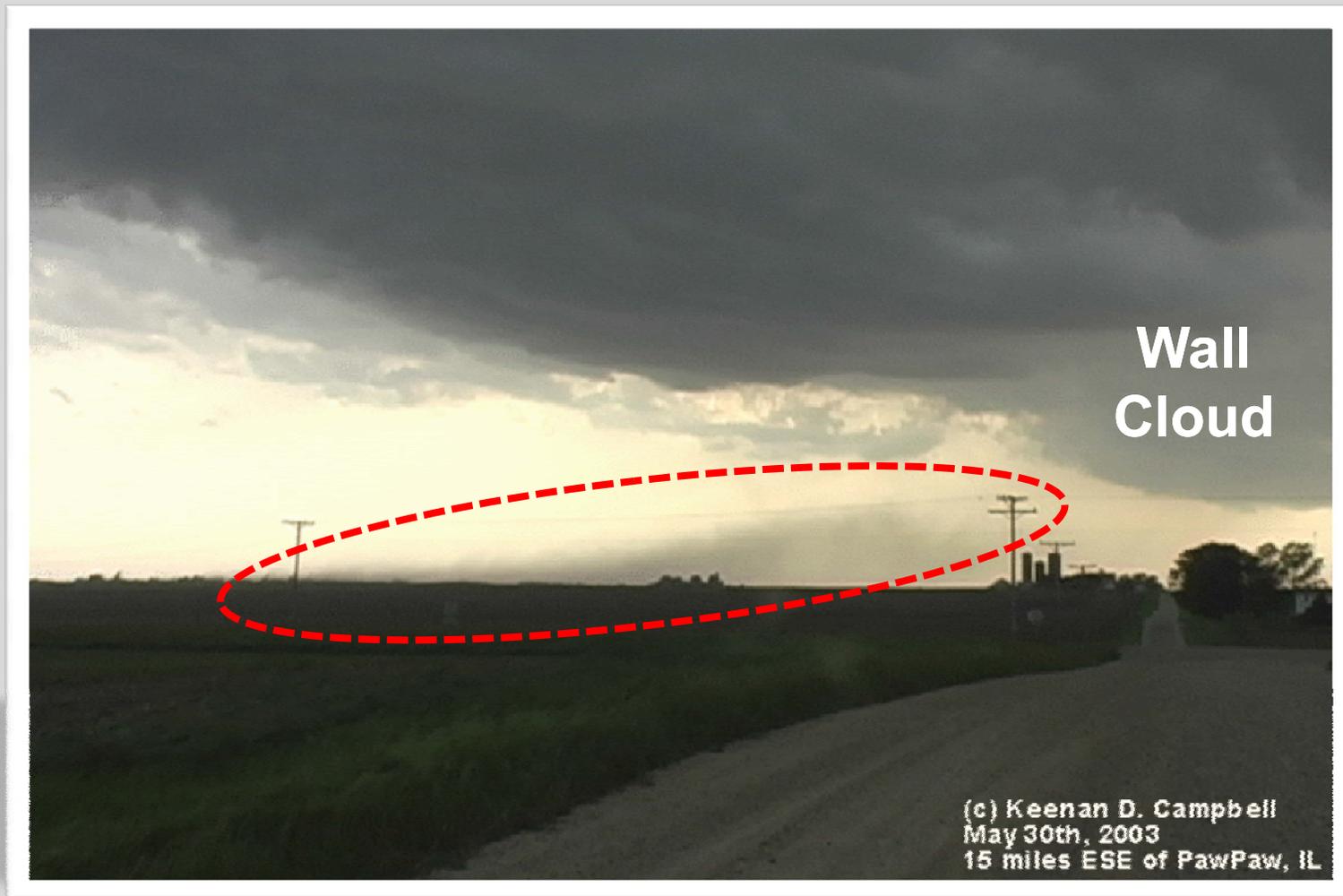
Photo by Michael Thompson



Supercells

Visual Clues

3. Inflow Cloud & Dust Bands - Photos



Wall
Cloud

(c) Keenan D. Campbell
May 30th, 2003
15 miles ESE of PawPaw, IL

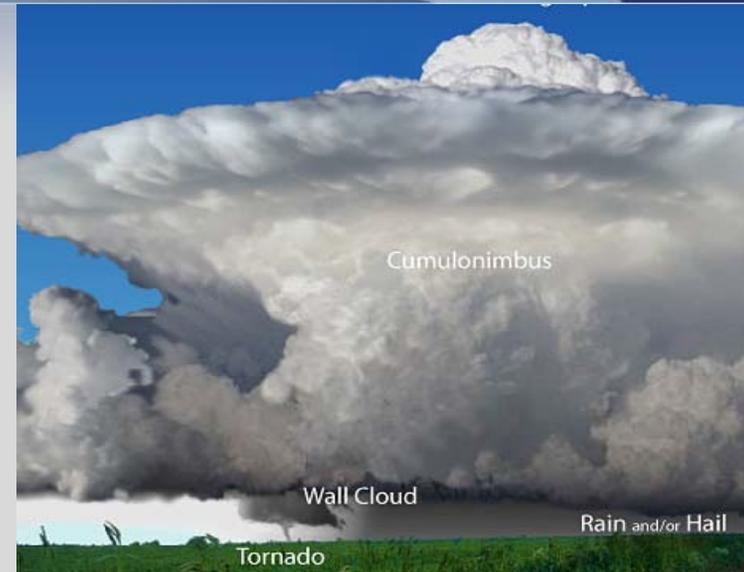


Supercells

- Supercell Variations:

- Classic

- Many are in this category
 - Potential for long-track tornadoes



- High Precipitation (HP)

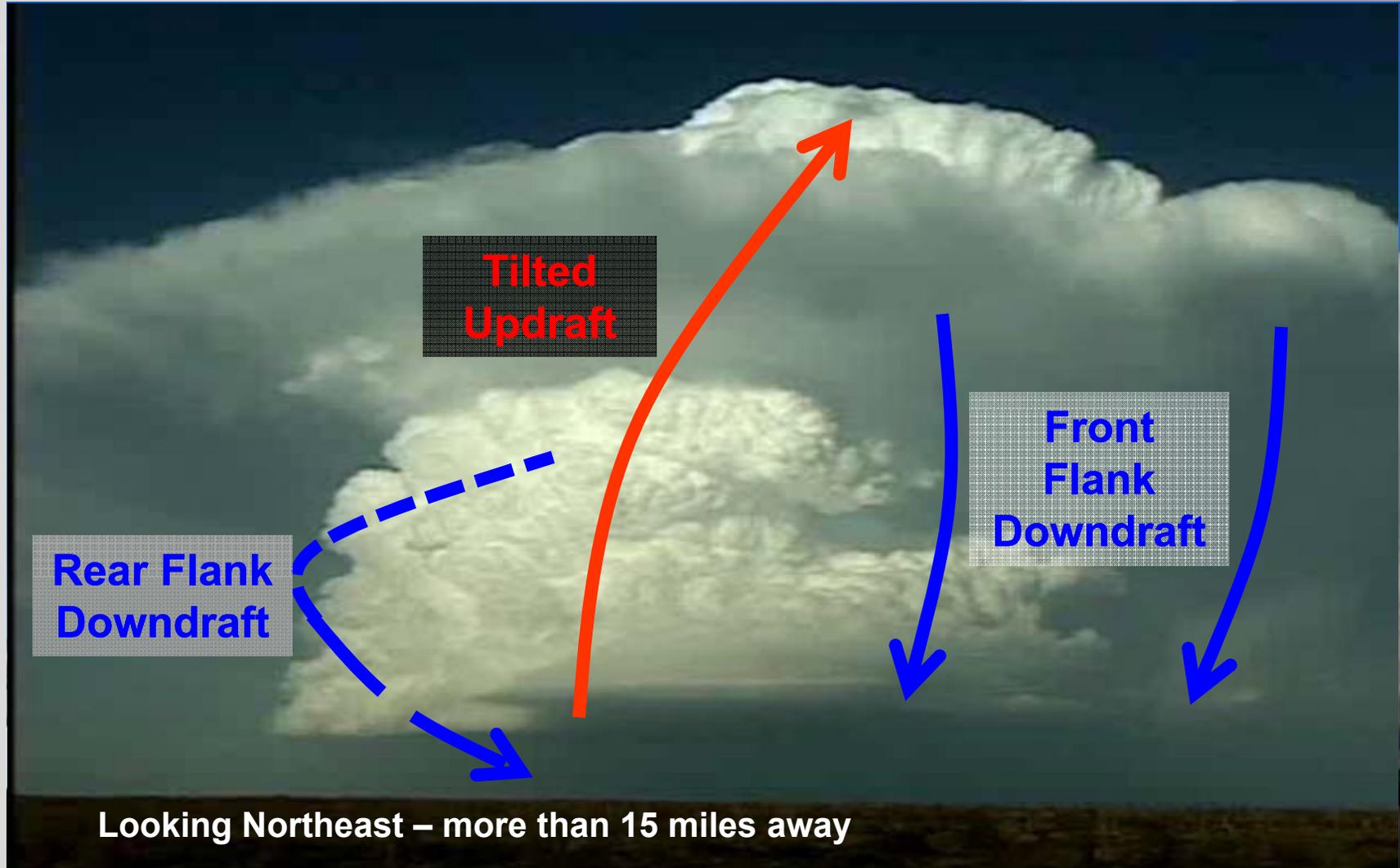
- Rain and hail often surrounds the updraft
 - Rotation is usually hidden by the heavy precipitation
 - Very DANGEROUS to spot





Classic Supercells

Side View



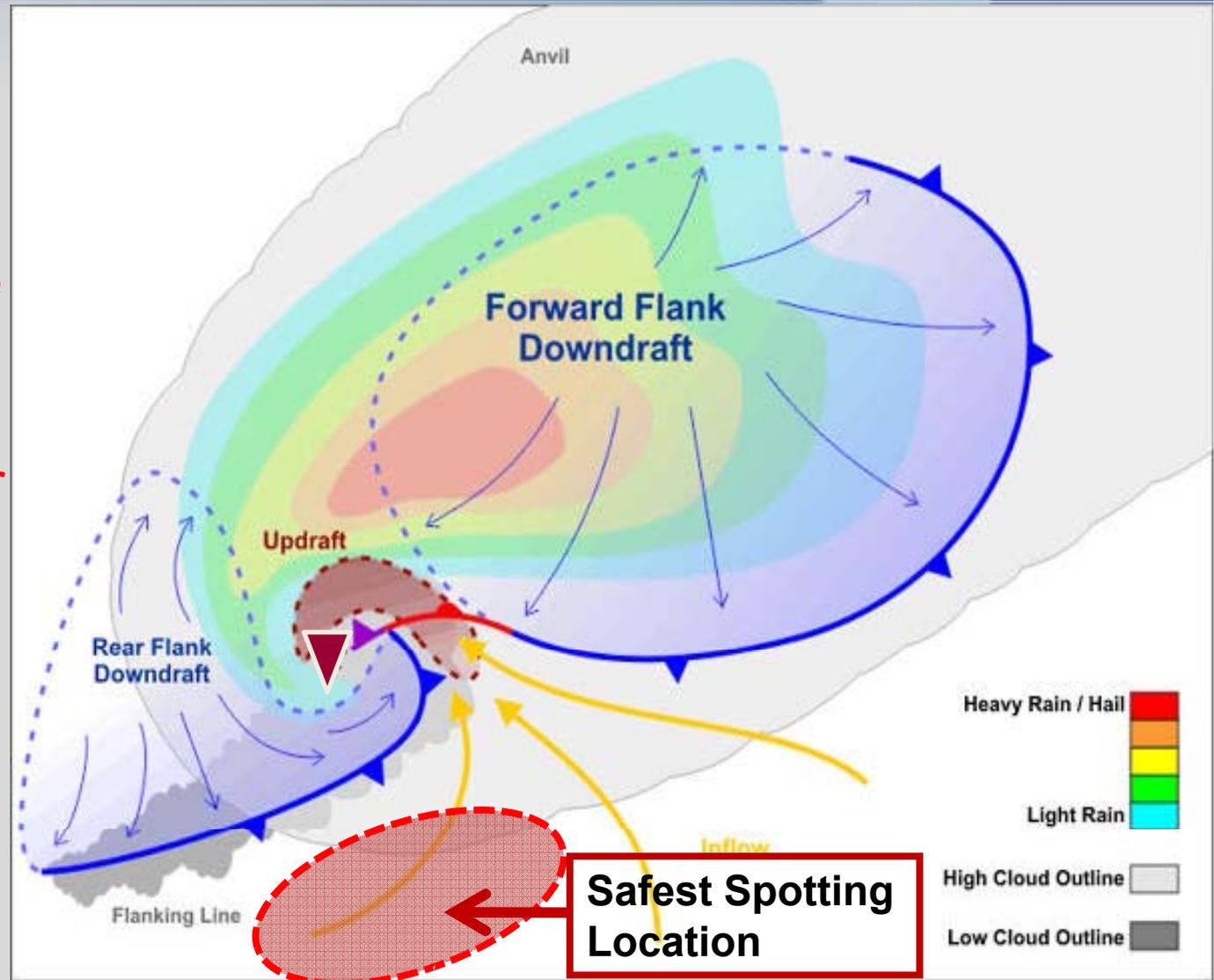


Classic Supercells

Top View

Important Points

- Safest spotting position is on the southern flank of the storm, with the inflow at your back
- RFD can create VERY high winds





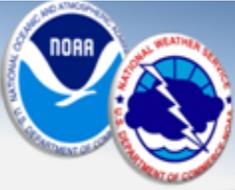
Classic Supercells

Radar View

Important Points

- The Hook Echo is the meso – not necessarily a tornado
- The precipitation shield “leans” in the direction of the storm movement

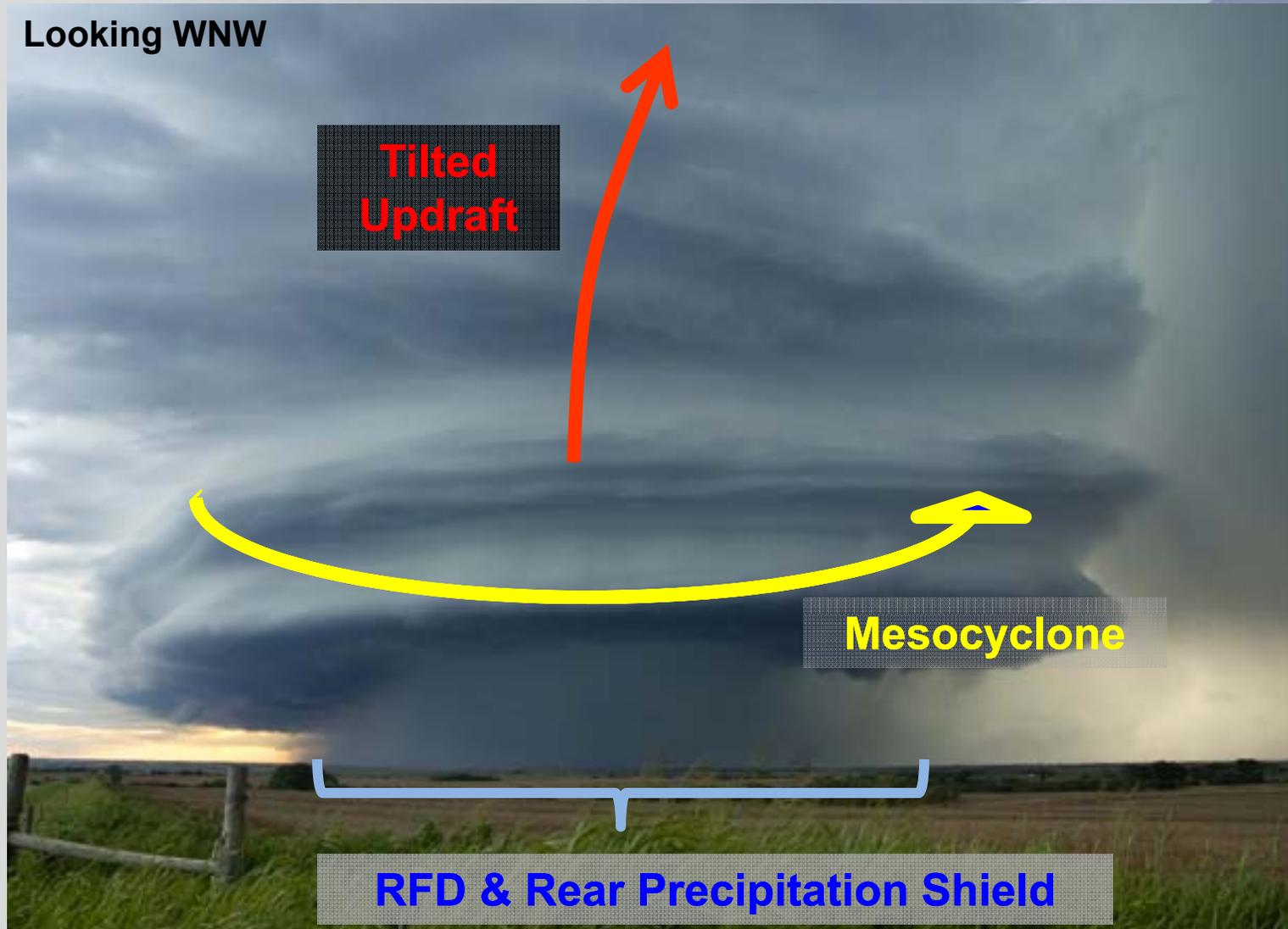




HP Supercells

Side View

Looking WNW



Tilted
Updraft

Mesocyclone

RFD & Rear Precipitation Shield

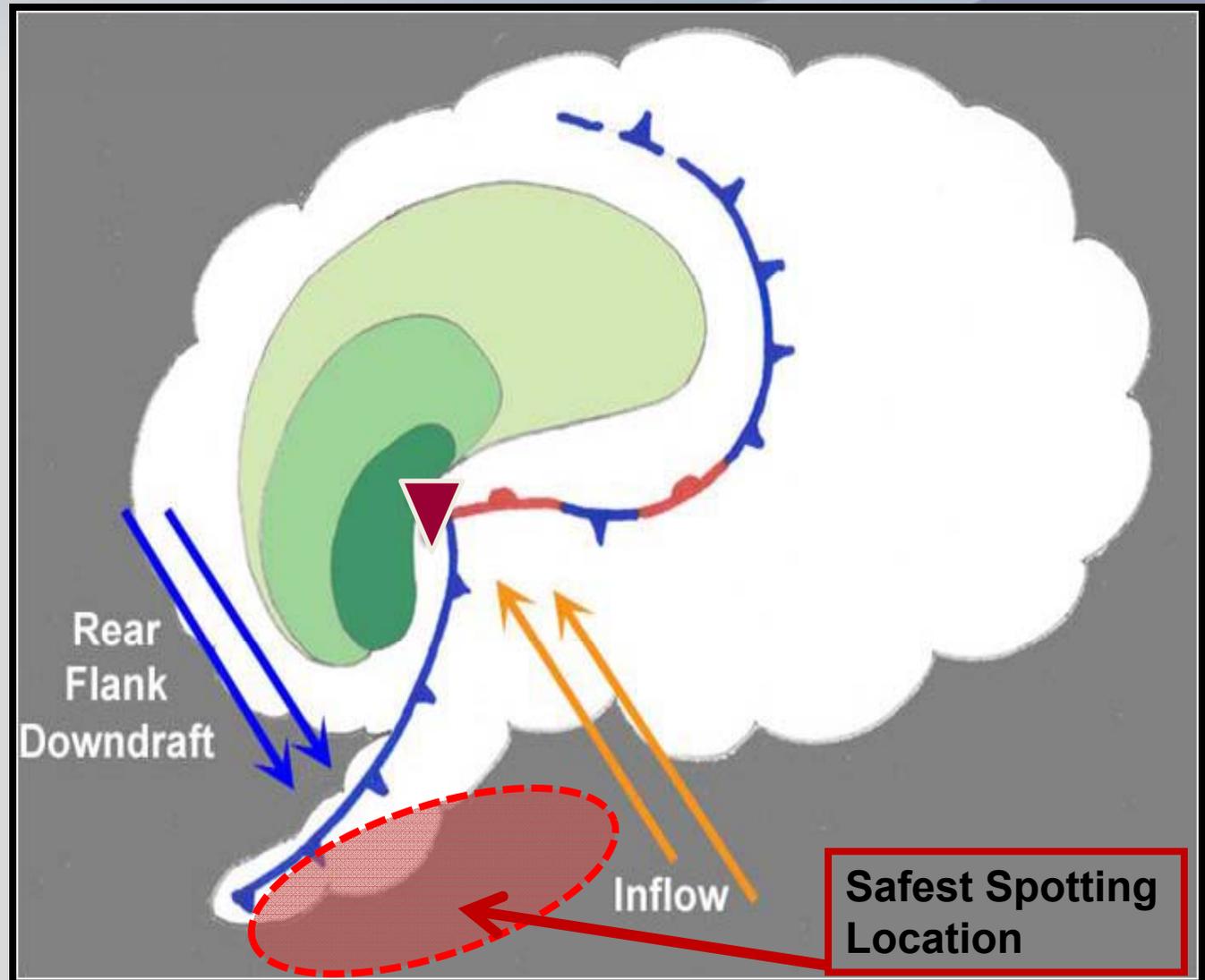


HP Supercells

Top View

Important Points

- Wall cloud and tornado are often obscured by rain
- Often has a “kidney bean” shape early on
- Safest place to spot is on the south flank





TORNADOES & OTHER ROTATIONS



Photo by Jacob Guenther



Tornado Formation

Supercells

Tornado: A violently rotating column of air attached to a thunderstorm, and in contact with the ground.

Visual Clues of Tornado Formation:

1. Large, rounded rain-free base





Tornado Formation

Supercells

Tornado: A violently rotating column of air attached to a thunderstorm, and in contact with the ground.

Visual Clues of Tornado Formation:

1. Large, rounded rain-free base
2. Persistent wall cloud, with increasing rotation





Tornado Formation

Supercells

Visual Clues of Tornado Formation:

3. Development of a funnel cloud, in or near the wall cloud





Tornado Formation

Supercells

Visual Clues of Tornado Formation:

3. **Development of a funnel cloud, in or near the wall cloud**
4. **A clearing sky working into the rain-free base**
(The RFD wrapping around the meso, called a "Clear Slot")



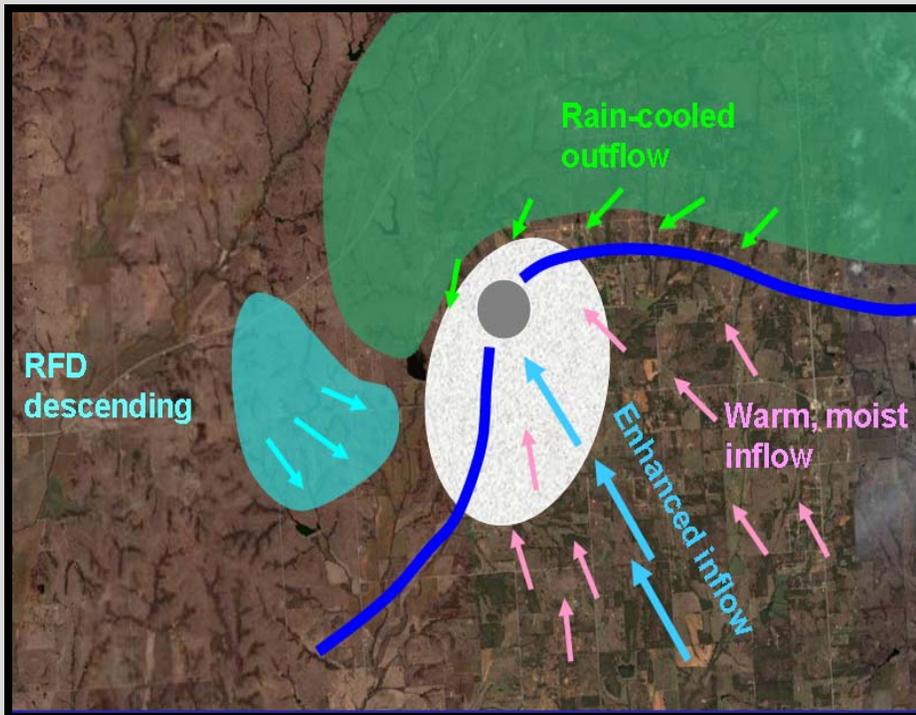
Photo by John Farley

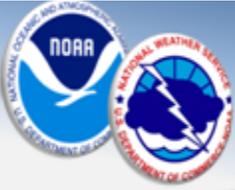


Tornado Life Cycle

Supercells

1. Developing Stage

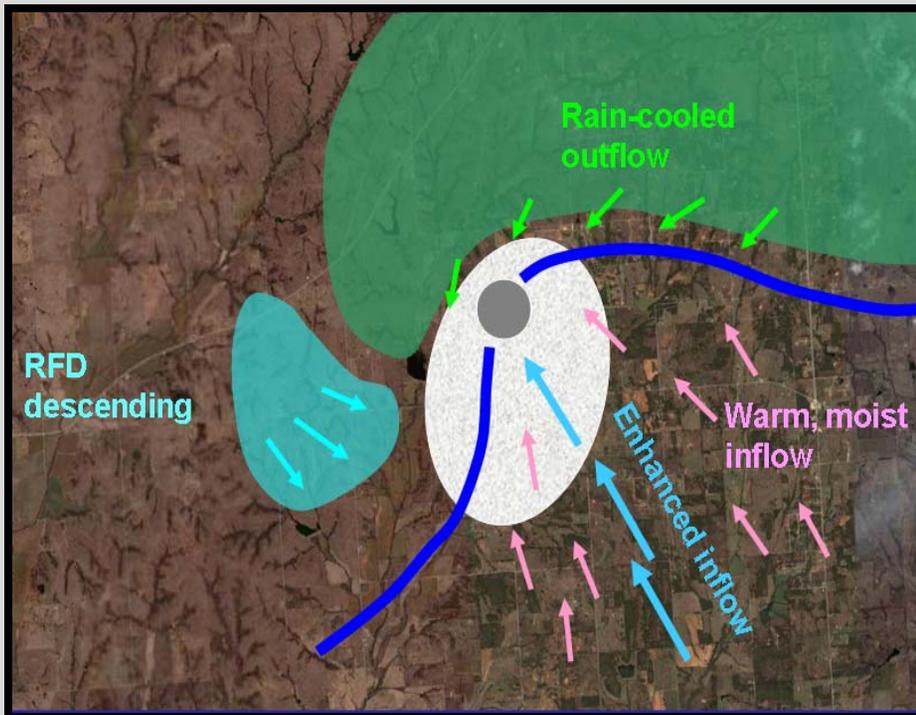




Tornado Life Cycle

Supercells

1. Developing Stage

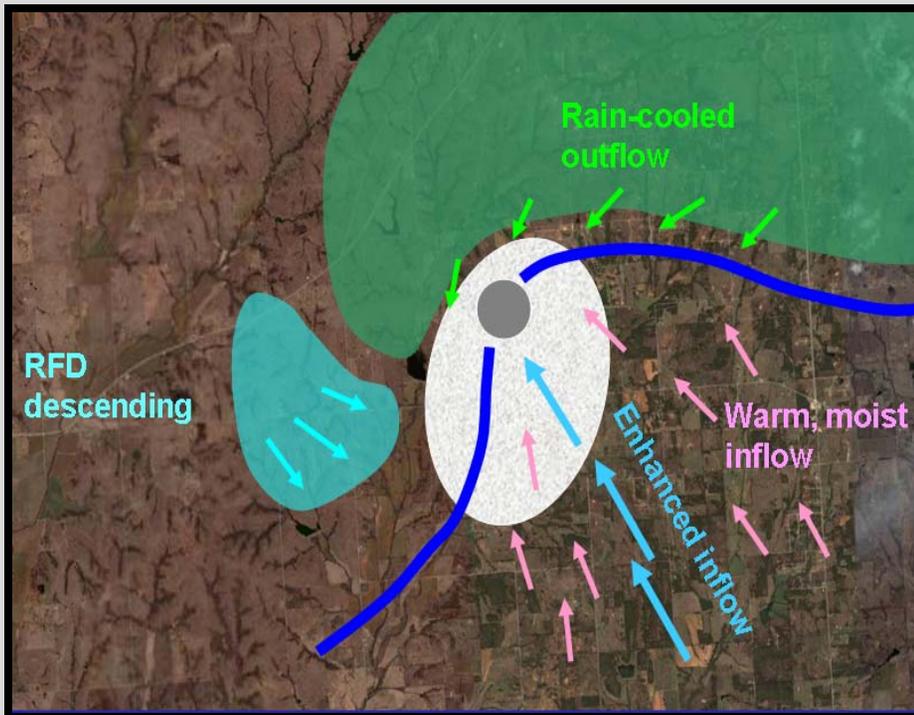




Tornado Life Cycle

Supercells

1. Developing Stage



Watch for: Rotation and dust whirl at the ground & a connection to wall cloud or funnel



Tornado Life Cycle

Supercells

2. Mature Stage – Potentially the most dangerous stage of a tornado

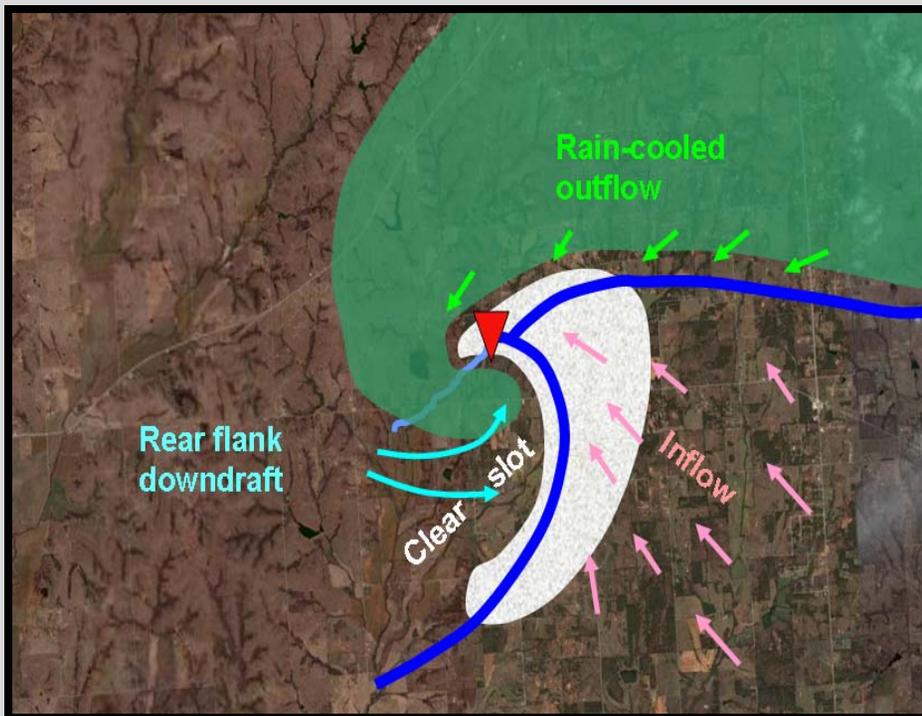


Photo by Mike Umsheid

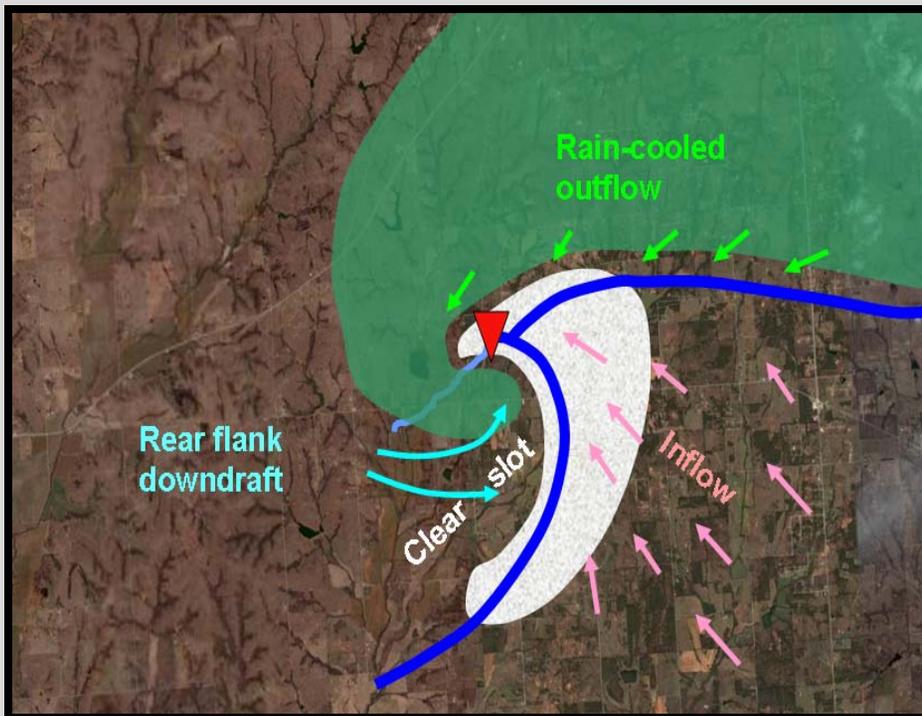
Watch for: Debris with tornado may mask that it is still in contact with the ground.



Tornado Life Cycle

Supercells

2. Mature Stage – Potentially the most dangerous stage of a tornado



Watch for: Debris with tornado may mask that it is still in contact with the ground.



Tornado Life Cycle

Supercells

3. Dissipating (Rope) Stage

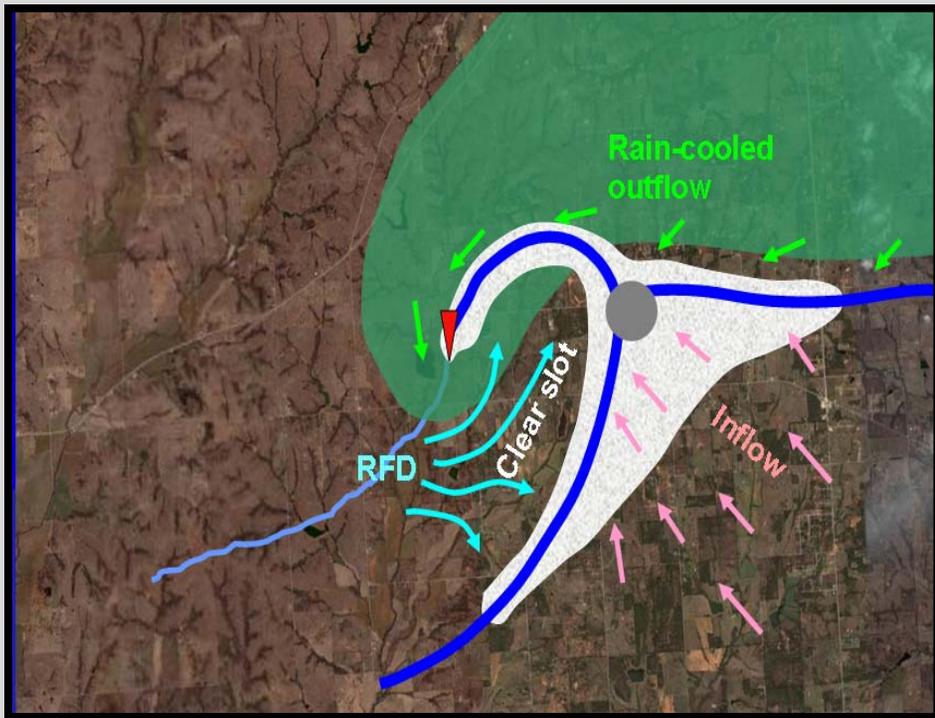


Photo by Mike Umsheid



Tornado Life Cycle

Supercells

3. Dissipating (Rope) Stage

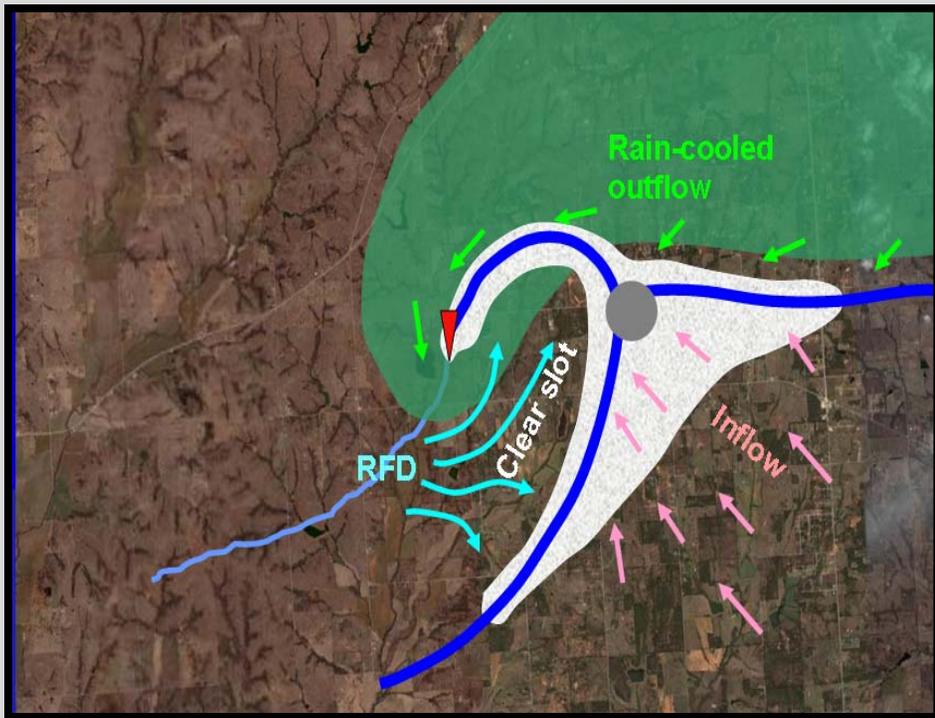
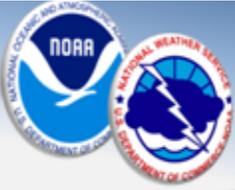


Photo by KCBD-TV

Watch for: Another tornado to develop a few miles or so to the E / SE of the dissipating one



Tornado Life Cycle

“Cyclic” Supercells

- **Favored area:
E to SE of a
dissipating tornado**
- **The new wall cloud
and funnel cloud
will be the dominant
part of the storm**
- **Watch this area very carefully for a
NEW tornado to develop**





NWS CENTRAL ILLINOIS



Tornado Life Cycle

"Cyclic" Supercells



Looking Northeast

Patrick Skinner



NWS CENTRAL ILLINOIS



Tornado Life Cycle

"Cyclic" Supercells



Looking Northeast

Patrick Skinner



Tornado Life Cycle

"Cyclic" Supercells

Old tornado

**New tornado
forming**

Looking Northeast

Patrick Skinner





Non-Supercell Tornadoes

“Landspouts”

- No “organized” large scale rotation
 - No wall cloud
 - No rotation on radar
- Often curved and nearly transparent
- Often form near an E-W front OR on the southwest end of multicell clusters





Other Rotations

Gustnado

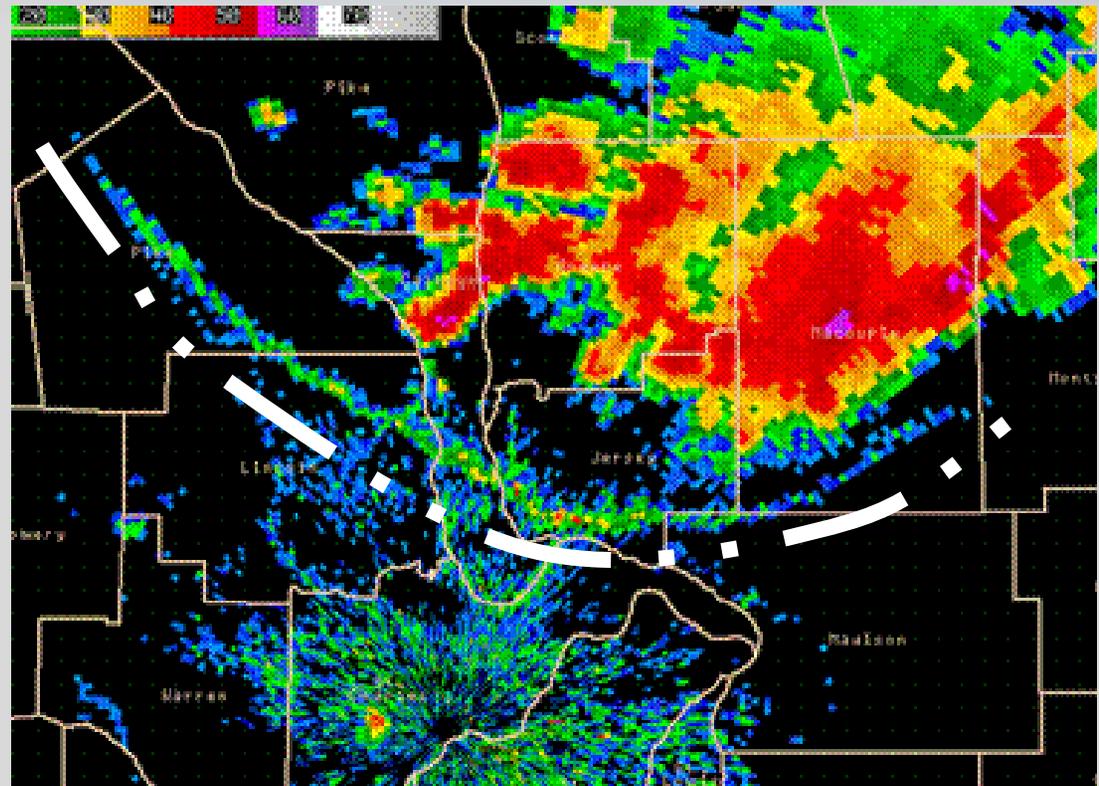
- Small short-lived rotations along a gust front
- Does not reach up to cloud, no rotation in cloud OR on radar
- Look for rotation at the ground not just dust
- Can cause minor damage, mainly from the wind gust
- Report a "Gustnado" not a tornado, when you see them





Other Rotations Gust Front on Radar

**Gustnadoes
could form
anywhere
along OR just
ahead of the
gust front**





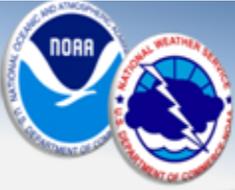
Other Rotations

Dust Devils

- A small, short-lived rotation that swirls dirt and debris to great heights
- Form on warm and sunny days, usually over open fields when the ground heats up
- No clouds or storms are present



Photos by Roger Look



Other Rotations

Cold Air Funnels



Photo by Pete Mantell



Photo by Dorothy Bullard

- Occur in vertically developed clouds, usually with no thunder
- **Most common in late spring / early summer, and in autumn**
- **Rarely reach the ground**
- **Almost always occur in the afternoon and early evening**



SEVERE WIND, HAIL AND FLASH FLOODING



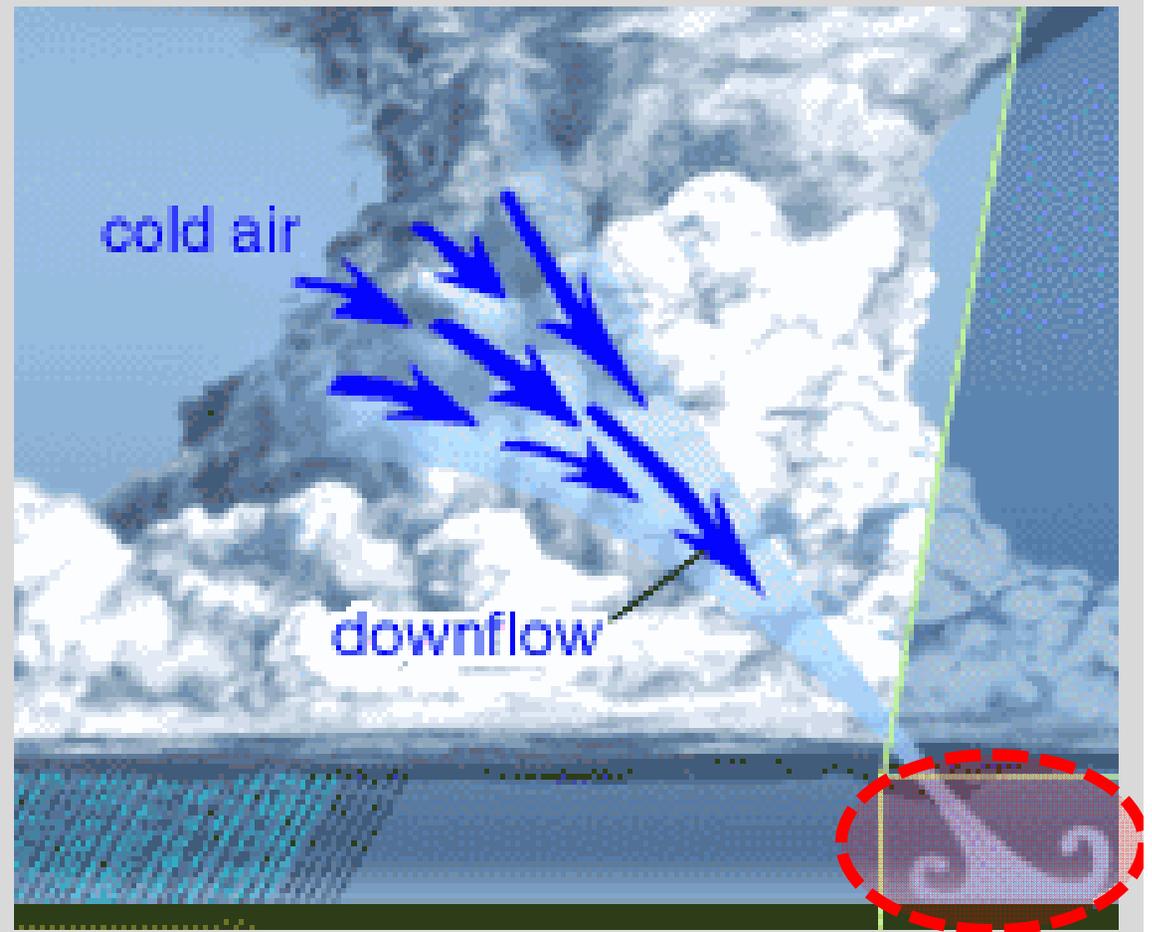
Steve Hardesty
Near Birds
May 21, 2010



Downburst

What is it?

- **A severe downdraft**
- **Rain-cooled air rapidly descends in a t-storm**
- **Most in IL are “Wet”**
(with heavy rain)
- **Can last several minutes, and be a mile or more wide**



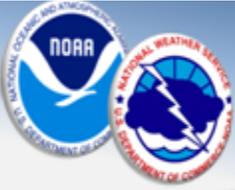


Downbursts

Visual Identification

- **Rain-foot indicates strongest winds**
- **Wind speeds:**
 - Can reach > 100 mph
 - Damage will be the **SAME** as what a weak, or even a strong tornado produces





Downbursts

Visual Identification

- **Rain-foot indicates strongest winds**
- **Wind speeds:**
 - Can reach > 100 mph
 - Damage will be the **SAME** as what a weak, or even a strong tornado produces





Downbursts

Visual Identification

- **Rain-foot indicates strongest winds**
- **Wind speeds:**
 - Can reach > 100 mph
 - Damage will be the **SAME** as what a weak, or even a strong tornado produces





Downbursts

What storm types produce them?

- **Multicell Clusters**
 - Many downbursts are from this type
- **Squall Lines**
 - At the front with strongest updrafts
 - In the heavy rain area
- **Supercells**
 - In / near the heaviest rain
 - With the RFD





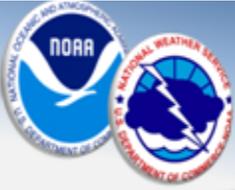
Straight-line Wind

What is it?

- **The strong or severe downdraft from a line of thunderstorms**
- **The wind blows outward, nearly horizontal to the ground, usually from one direction**
 - Keep in mind that wind blowing around structures can curve or change direction



Photo by Jim Gray
Springfield, IL 7/19/10



Straight-line Wind

Visual Identification

- **Shelf cloud on the approaching side**
 - **Look for:**
 - **Low, dark clouds on front edge with some vertical depth to them**
 - **Wavy, smooth clouds higher up**

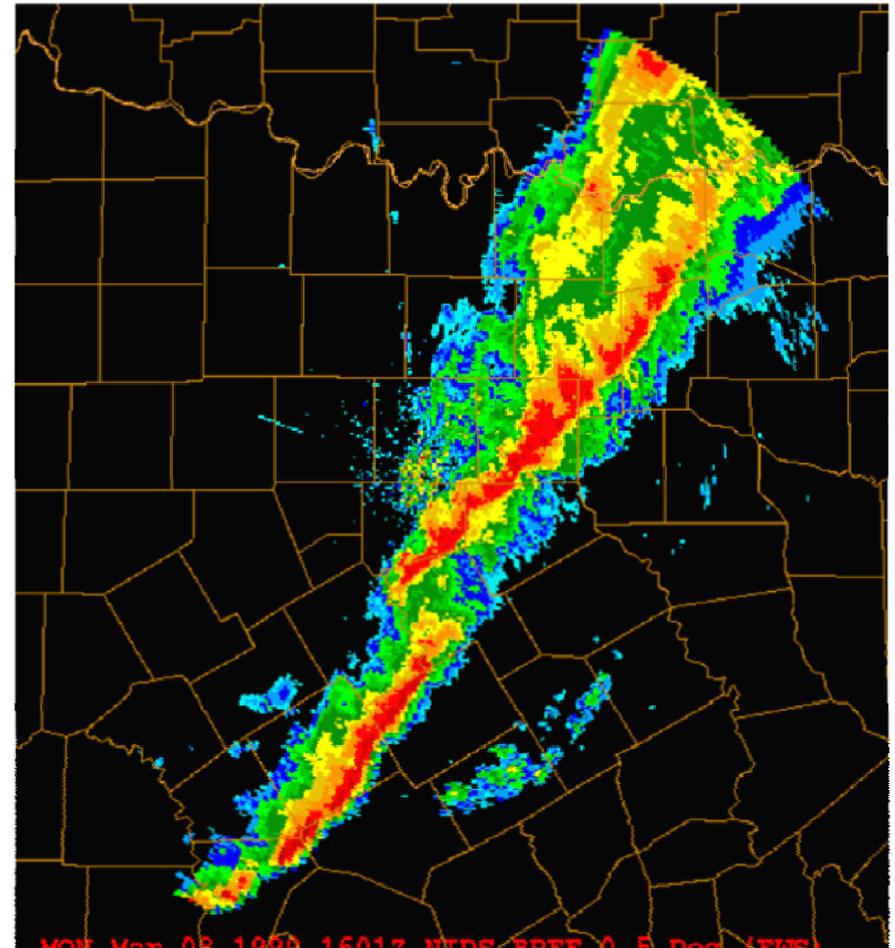


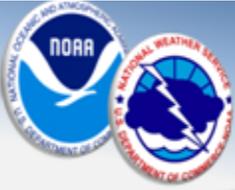


Straight-line Wind

What storm types produce this?

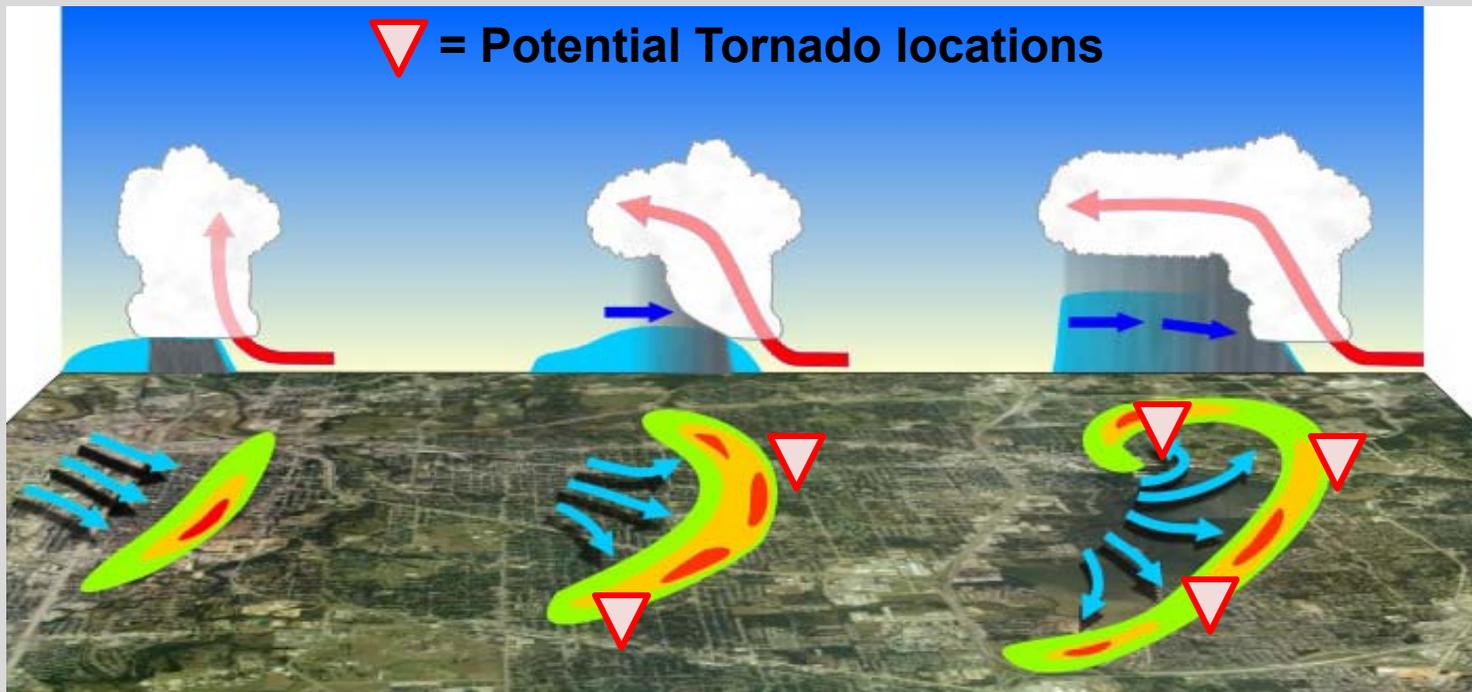
- **Squall Lines**
 - The areal coverage of a squall line is best seen on radar
 - Keep in mind:
 - The wind speeds will vary along the line
 - Some locations may have intense wind speeds, while others nearby have much less wind





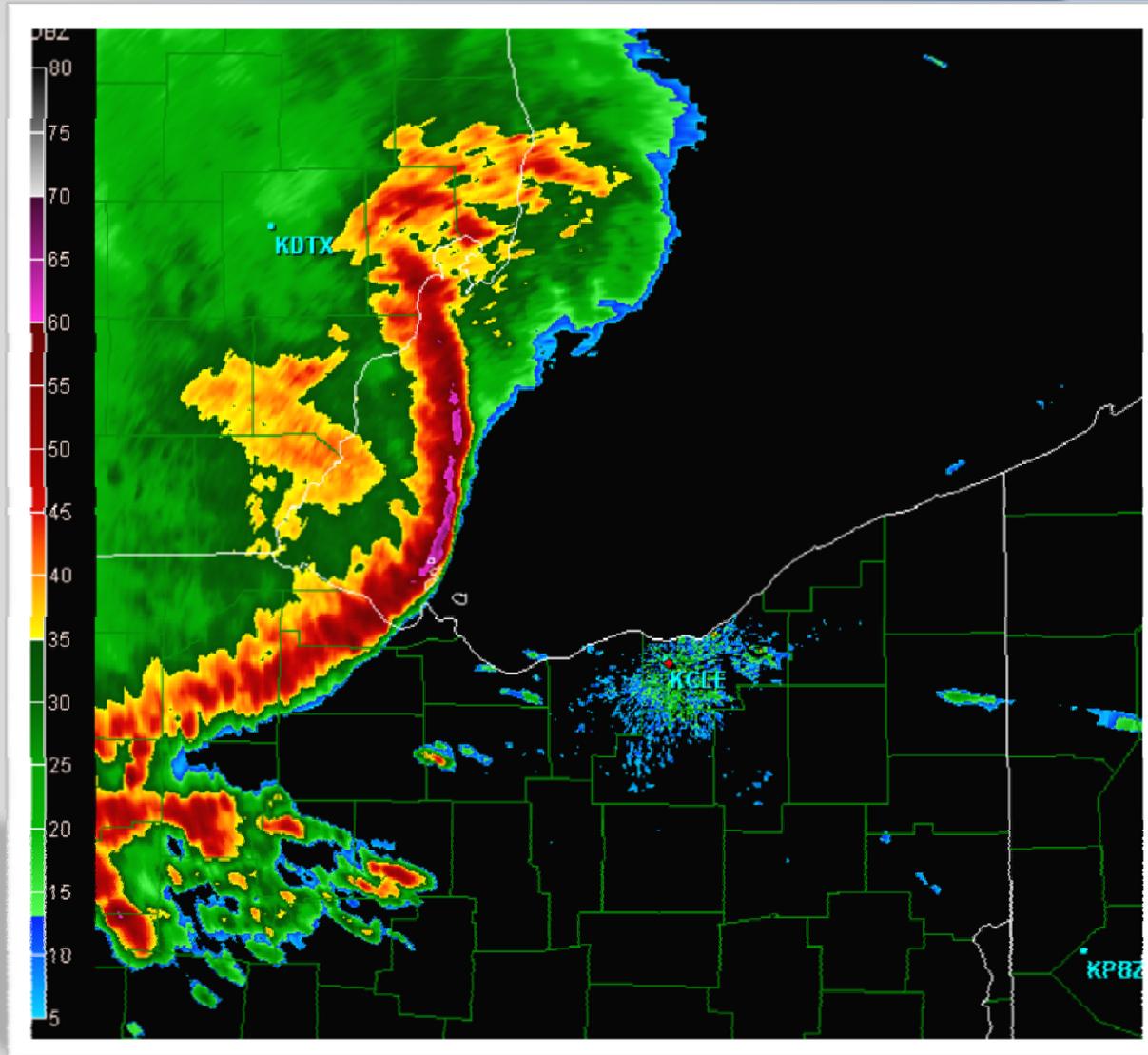
Bow Echo

- An extreme Squall Line
- A “bow shaped” line of radar returns often associated with swaths of straight-line wind damage and occasionally tornadoes



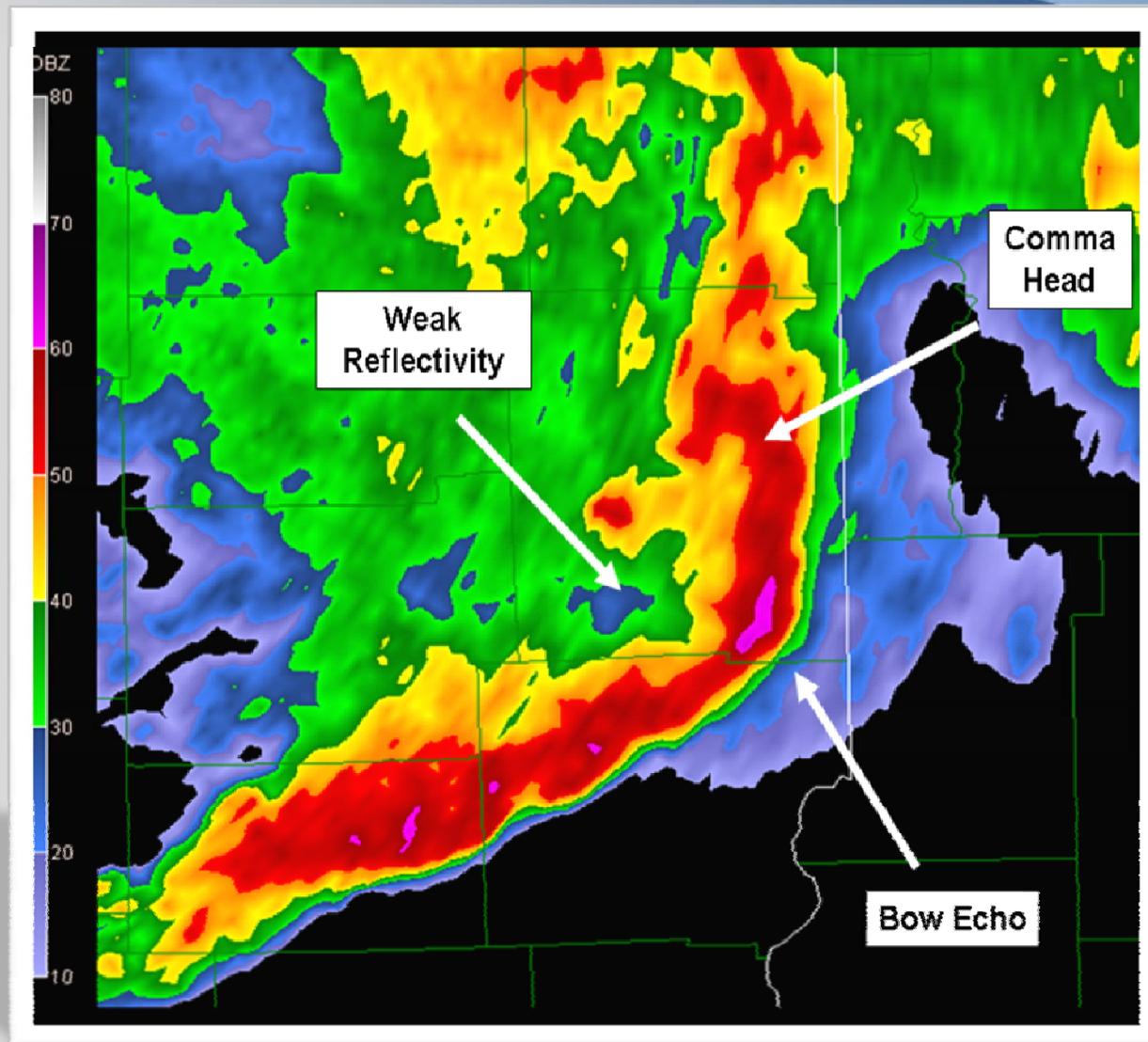


Bow Echo Radar Views





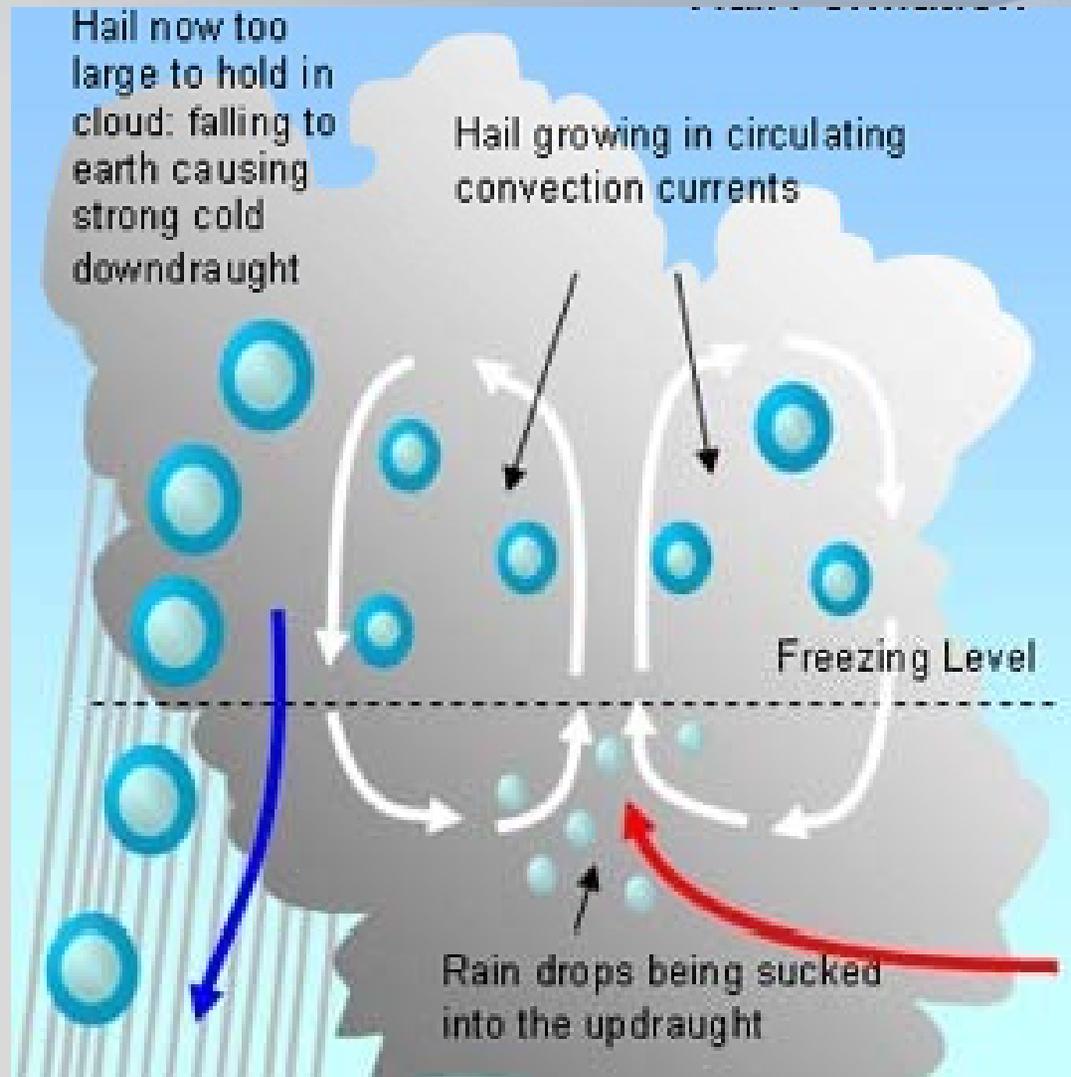
Bow Echo Radar Views





Hail

How it forms

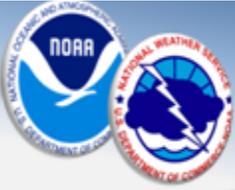




Hail Characteristics

- All types of T-storms can produce hail
 - The biggest hail is associated with the strongest updrafts
 - Sizes bigger than a golf-ball usually mean a SUPERCELL
- Sometimes you can see a “hail shaft” (white streaks) in a distant hailstorm



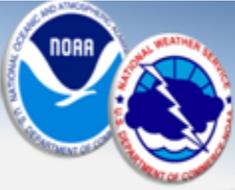


Flash Flood

- **A flood where the water rises rapidly**
 - Can occur in any area, especially if the ground is already moist
 - Usually caused by heavy rain in a short time
 - **1.00” or more per hour**
 - Can also be caused by a dam or levee failure



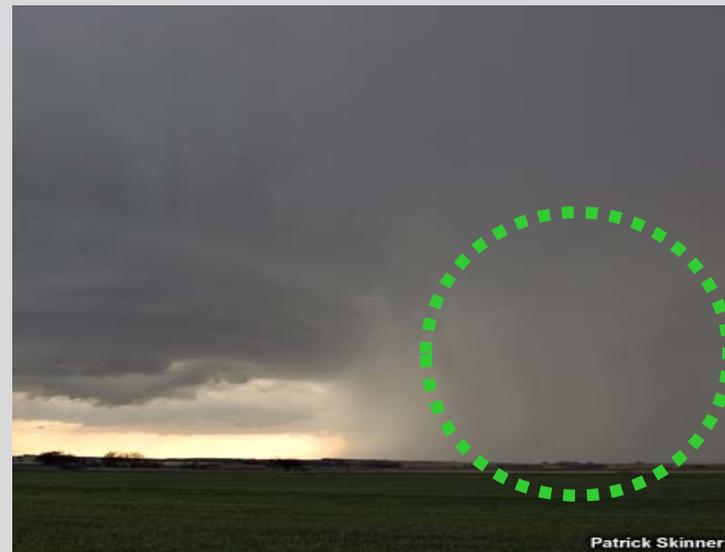
Photo from Lawrence Co., IL EMA
Wabash River Levee Failure April / May 2011



Flash Floods

What storm types produce them?

- **Single Cells**
 - **Because of slow movement**
- **Multicell Clusters**
 - **The individual storms can move over the same areas (called “training” echoes)**
- **Squall Lines**
 - **Rarely produce flash floods because of fast movement**
- **Supercells**
 - **Frequently in the “heavy precipitation” shield**





Flash Flood Characteristics

- Water flowing over roads – 6” deep or more
- Ponding of water 12” or deeper
- Water flowing over bridges
- Rapid rises in creeks or streams





CHALLENGES WHILE SPOTTING



Photo by Jim Gray



nebraska



Obstructions to View

Trees

Tornado or Funnel Cloud...?



...we really don't know because
the trees are in the way



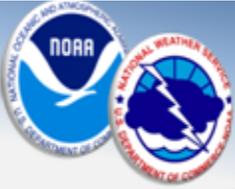
Obstructions to View

Trees & Distance (nearly overhead)

Is that a Wall Cloud,
Funnel Cloud or Tornado?



...most likely a wall cloud, but we don't know
for sure because of the obstruction



Obstructions to View

Corn Field

**Is there anything developing
under that Wall Cloud?**



**...we don't know. Move
to a better location
which is not blocked by
the corn.**

**Ethan Schisler
South of Alpha
August 20, 2011**



Obstructions to View

Hazy Conditions

Is that a Wall Cloud?



...yes this is a wall cloud, but it is very hard to see because of the hazy sky.



Tornado & Funnel Look Alikes

Scud Clouds



Photo by Paul Nelles

- **Low hanging clouds**
- **Can be attached, or detached from the cloud base**
- **Easily confused for wall clouds and funnels... especially at night**
- **Look for lack of rotation to confirm it is scud**



Tornado & Funnel Look Alikes



More Scud Clouds



Stefanie Sullivan



NWS CENTRAL ILLINOIS

Tornado & Funnel Look Alikes



More Scud Clouds





Tornado & Funnel Look Alikes



More Scud Clouds

Scud “claws” at the front of a Shelf Cloud



**Judy Lines
Shelbyville
June 27, 2010**



Tornado & Funnel Look Alikes

Rain Shafts and Hail Shafts



© Paul M. Hadfield



NWS CENTRAL ILLINOIS

Tornado & Funnel Look Alikes



Rain Shafts and Hail Shafts



Photo by Jim Gray



Tornado & Funnel Look Alikes

Rain Shafts and Hail Shafts



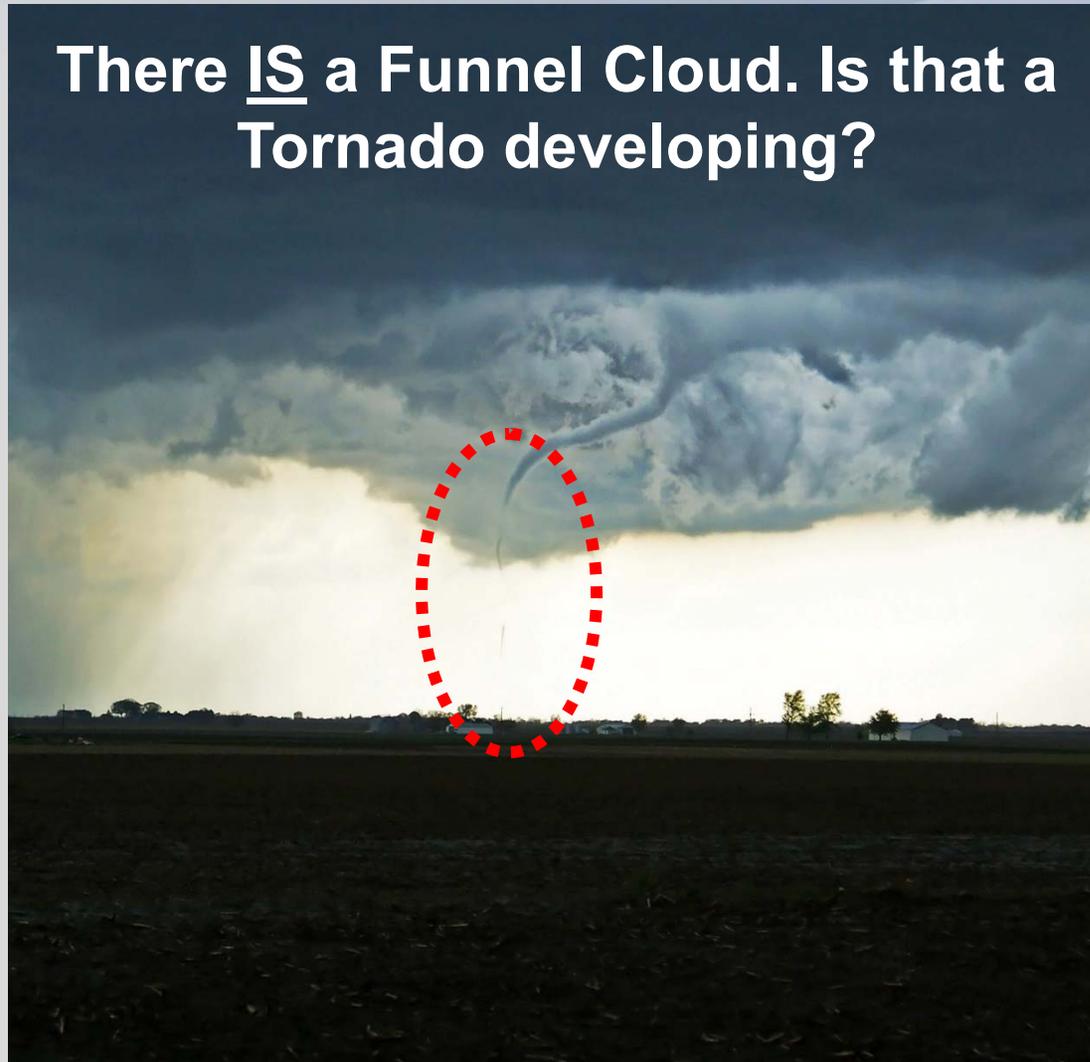


Tornado & Funnel Look Alikes



Other Items

There IS a Funnel Cloud. Is that a Tornado developing?



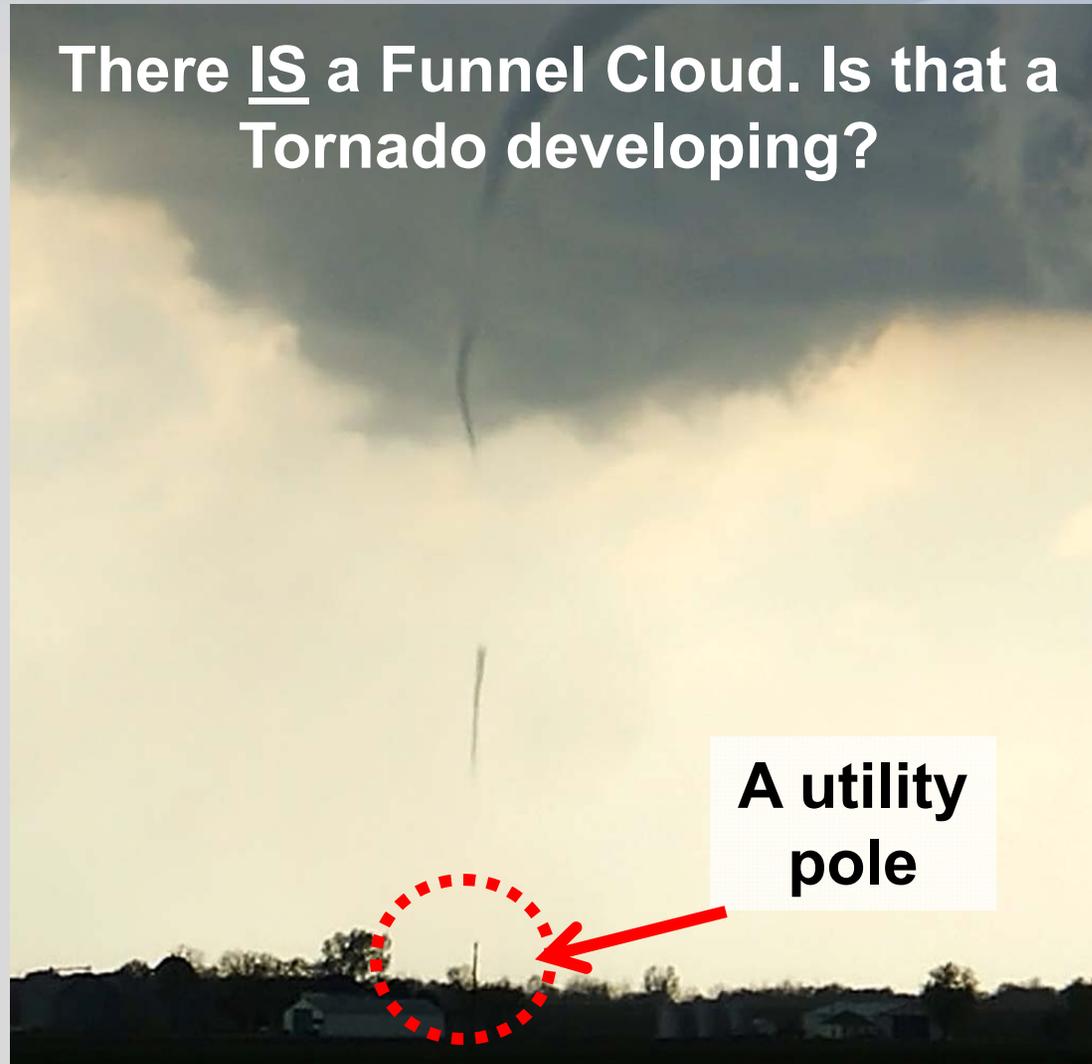
Photos by
Jess Starkey



Tornado & Funnel Look Alikes

Other Items

There IS a Funnel Cloud. Is that a Tornado developing?



A utility pole

Photos by
Jess Starkey



Distinguishing between a tornado, funnel or look alike

Ask Yourself:

- **Can I see it clearly?**
- **Is it attached to the bottom of the thunderstorm?**
- **Is it near the updraft?**
- **Is there organized rotation?**
- **Is there any debris or power line flashes?**

IMPORTANT: Report what you see, not what you THINK you see





SPOTTER RESOURCES, REPORTING & SAFETY



Photo by Jim Gray



#1 Objective – Stay Safe

- 1) **Personal safety is the main objective**
- 2) **Obey all laws and directives from public safety officials**
- 3) **Never put yourself in harm's way. This includes walking or driving over obstructions.**
- 4) **Adhere to the concept of "ACES"**



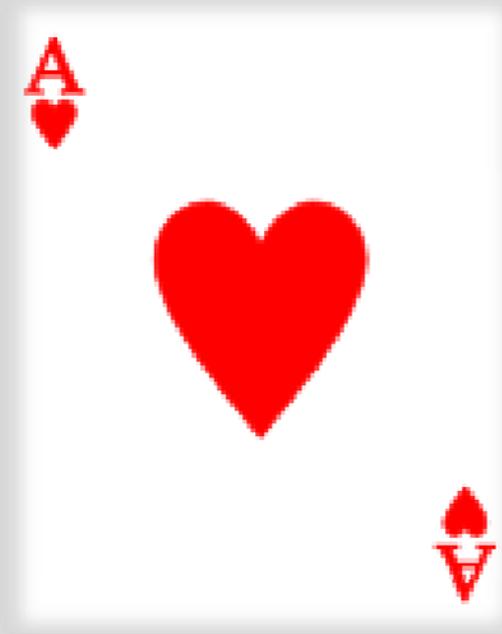
Creative Commons Pistols Drawn

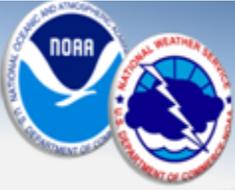
ACES

- Awareness
- Communication
- Escape Routes
- Safe Zones



ACES - Awareness





Awareness

- **Constantly monitor your surroundings, and the risks around you**
 - Know the roads and the area you are spotting in
 - Be alert for areas with damage or flooding
 - **Monitor the weather conditions at all times**





Awareness – Stay Informed

www.weather.gov/Lincoln

Top News of the Day

National Weather Service Weather Forecast Office
Central Illinois

Home Site Map News Organization

Top News of the Day

- Hot and Humid Weather Expected This Weekend
- Major Severe Weather Event on August 4
- Summer Newsletter Now Available (PDF, 1.1 MB)

Watches & Warnings Observations Forecast Graphics Rivers & Lakes Climate

Click on the map below for the latest forecast.

Read watches, warnings & advisories

- Flood Warning
- Heat Advisory
- Special Weather Statement
- Hazardous Weather Outlook
- Short Term Forecast

Current Hazards
Watches/Warnings
Outlooks



Watches/Warnings and Outlooks pages



Awareness – Stay Informed

www.weather.gov/Lincoln

- Local
- National
- Drought
- More
- Weather Safety**
- Preparedness
- Weather Radio
- StormReady
- SkyWarn
- Additional Info
- Other Useful Links
- Education Resources
- Coop Observer
- Top News Archive

Latest Conditions in **Springfield, IL** Choose Your Front Page City

Mar 31
10:52 am



A Few Clouds

69°F
(21°C)

Select A City:



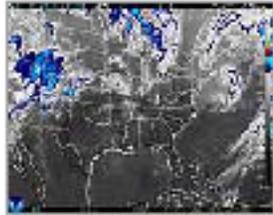
Weather Story



Radar

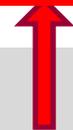


Satellite



Weather Map





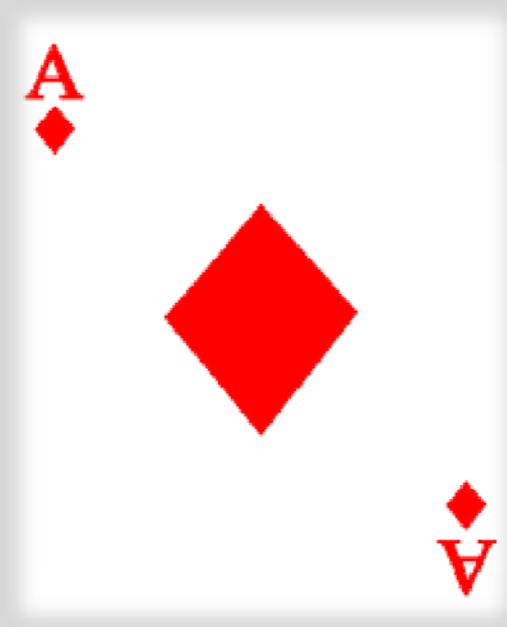
Weather Safety

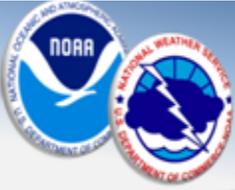
- Go to SKYWARN/Spotter Training section for additional resources & links to download
- ✓ **Severe Weather Products from the NWS** (new PDF download)

- **Daily Weather Story**
- **Graphical Short Term Forecast**
(During Severe Weather Events)



ACES - C Communications





Communications

Useful Items for Spotters

- **Communication Device**
(cell phone or radio)
- **Safe shelter nearby**
- **GPS or local maps**
- **Binoculars**
- **Weather radio**
- **Computer or Smart Phone to monitor weather conditions**
- **Camera**
(still and/or video)





Communications REPORTING

- **WHO** you are
 - **A trained spotter**
- **WHAT** you have witnessed
 - The **specific** weather event
- **WHEN** the event occurred
 - **NOT** the time you are reporting, but when the event happened
- **WHERE** the event occurred
 - Use **well known** roads, which could be found on any map, and familiar landmarks





Reporting: Tornadoes, Funnel Clouds, Wall Clouds

- **Tornado**

- Is it still in sight, or has it dissipated? How long was it there?
- Are there any injuries or damage you know of?

- **Funnel Clouds & Wall Clouds**

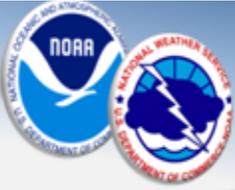
- Do you see persistent rotation?
- If so, how long has it been rotating?



Photo by
Jacob Guenther

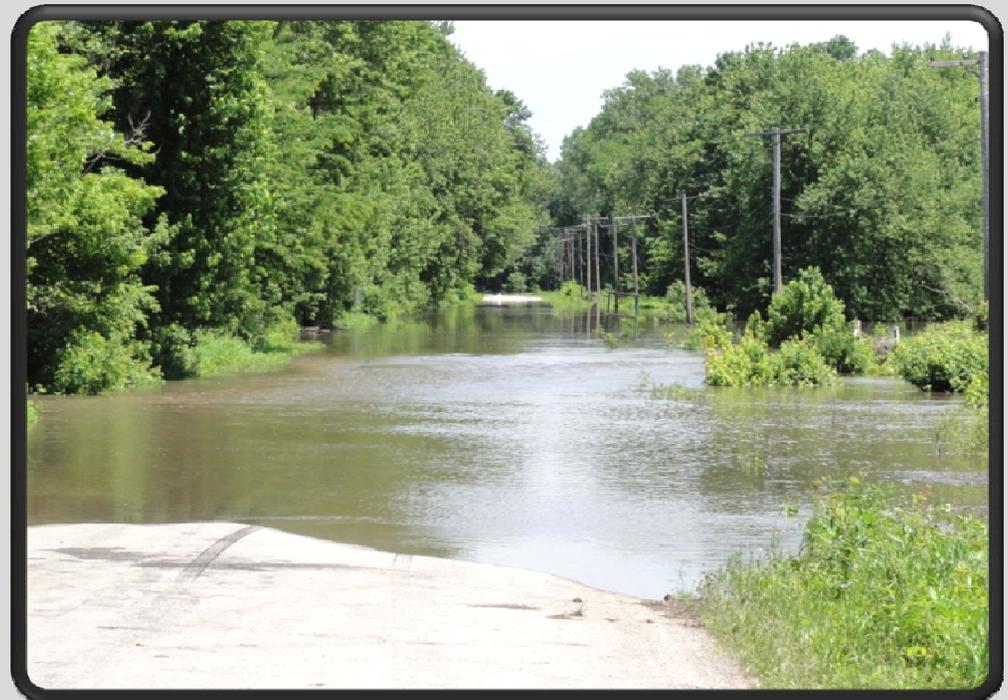


Photo by
Patrick Hohenberry



Reporting: Flash Flooding

- Which roads, creeks/streams/rivers are impacted? Have any roads been closed?
- How deep is the water? Is the water flowing or ponded?
- Is this an area prone to flooding?
- Is the water level rising, falling, or steady?





Reporting: High Wind & Wind Damage

- Report wind of 40 mph or greater
 - Is the wind speed estimated or measured?
 - Estimating is difficult. Give a description of moving objects or damage.



25 – 30 mph: Large branches moving



Reporting: High Wind & Wind Damage

- Report wind of 40 mph or greater
 - Is the wind speed estimated or measured?
 - Estimating is difficult. Give a description of moving objects or damage.



30 – 40 mph: Whole trees moving, can be difficult to walk



Reporting: High Wind & Wind Damage

- Report wind of 40 mph or greater
 - Is the wind speed estimated or measured?
 - Estimating is difficult. Give a description of moving objects or damage.



40 – 55 mph: Small tree limbs break, walking impeded



Reporting: High Wind & Wind Damage

- Report wind of 40 mph or greater
 - Is the wind speed estimated or measured?
 - Estimating is difficult. Give a description of moving objects or damage.



55 – 70 mph: Large tree limbs break, shallow rooted trees blown down.

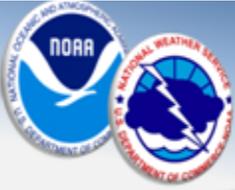


Reporting: High Wind & Wind Damage

- Report wind of 40 mph or greater
 - Is the wind speed estimated or measured?
 - Estimating is difficult. Give a description of moving objects or damage.

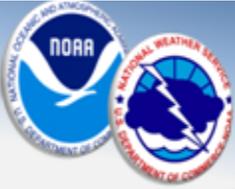


70 - 100 mph: Damage to roofs/siding, severe damage to outbuildings, trailers tipped over



Reporting: High Wind & Wind Damage

- **Report wind of 40 mph or greater**
 - Is the wind speed estimated or measured?
 - Estimating is difficult. Give a description of moving objects or damage.
- **Wind Damage**
 - Report damage to trees, tree limbs, power lines/poles, and any damage to buildings
 - Give sizes of objects
(ex: 6" limbs, large shed, single family mobile home, etc...)
 - Was object in good condition? What was the structural material of the building?
(ex: new or old structure, made of wood – brick/concrete – metal, healthy or rotted limbs, etc...)



Reporting: Hail

- **Report hail of all sizes**
(Will also help with new radar upgrade)
- **Warnings are for ≥ 1 " hail**
- **Report with respect to common objects or measure**



Descriptor	Size
Pea	1/4"
One-Half Inch	1/2"
Dime	7/10"
Penny	3/4"
Nickel	7/8"
Quarter	1"
Half Dollar	1 1/4"
Ping Pong Ball	1 1/2"
Golf Ball	1 3/4"
Tennis Ball	2 1/2"
Baseball	2 3/4"
Large Apple	3"
Softball	4"
Grapefruit	4 1/2"



Reporting: HOW?

Follow the reporting rules of your area!

**Contact the local
EMA / ESDA
or 9-1-1 dispatch
center**

URGENT





Reporting: What is done with your report?

- ALL reports sent to the NWS are acted upon
 - **Our actions will depend on the situation, including:**
 - Issuing a warning, statement, and/or local storm report
 - Relay to another NWS office, or EMA in an adjacent community
 - Request for more information from the spotter who made the report

Example: A reported funnel cloud may not result in a Tornado Warning if it is a cold air funnel – OR maybe the storm is already moving into another county



Reporting: What is done with your report?

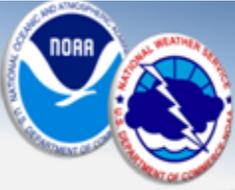
- ALL reports sent to the NWS are acted upon
 - **Our actions will depend on the situation, including:**
 - Issuing a warning, statement, and/or local storm report
 - Relay to another NWS office, or EMA in an adjacent community
 - Request for more information from the spotter who made the report

THE BOTTOM LINE: We combine ALL of the info we have at the time to make the best decisions. Don't get discouraged!! Ground-truth spotter reports are important to help us decide the BEST course of action!



ACES – Escape Routes & Safe Zones





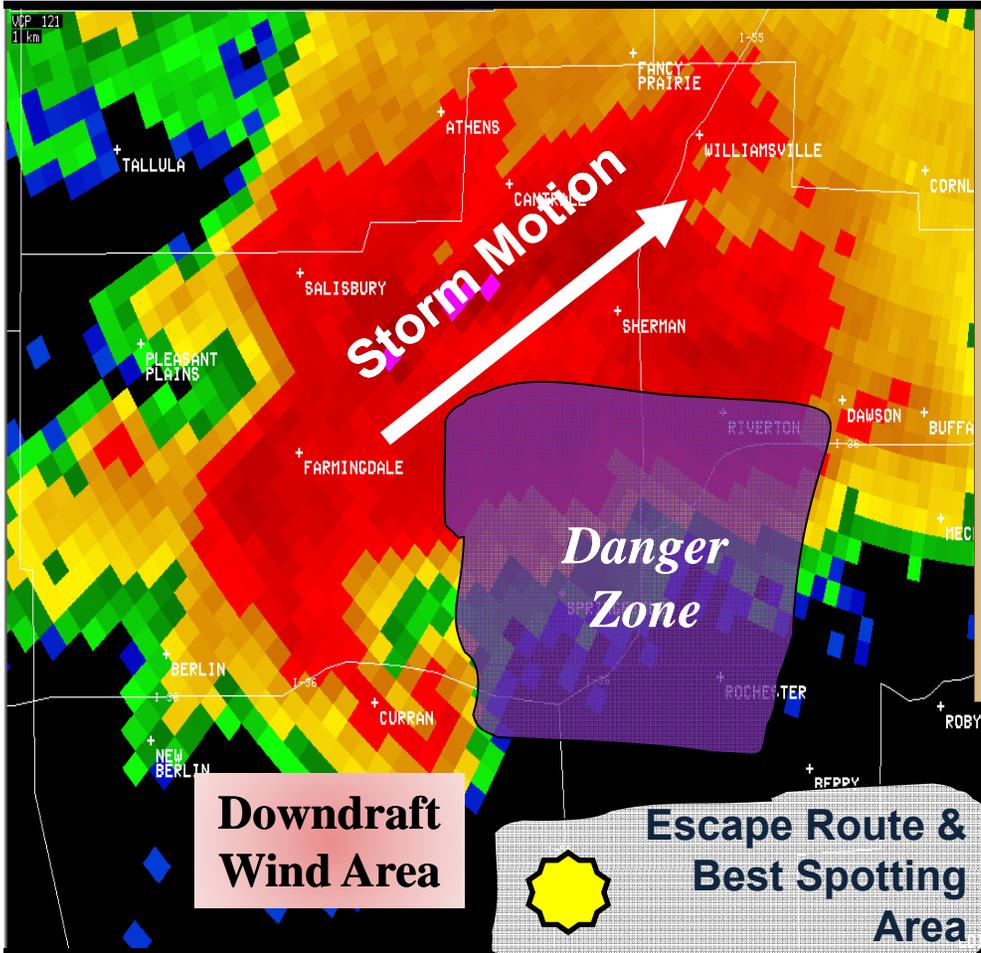
Escape Routes

- **VERY IMPORTANT** when you need to get away from danger
- They are clear paths allowing you to reach safety **BEFORE** the threat arrives
- **ALL Spotters:**
 - A secure, indoor shelter
- **Mobile spotters:**
 - Adequate roads or paths for you to move to a secure shelter





Mobile Spotter Positioning: Classic Supercell Thunderstorm

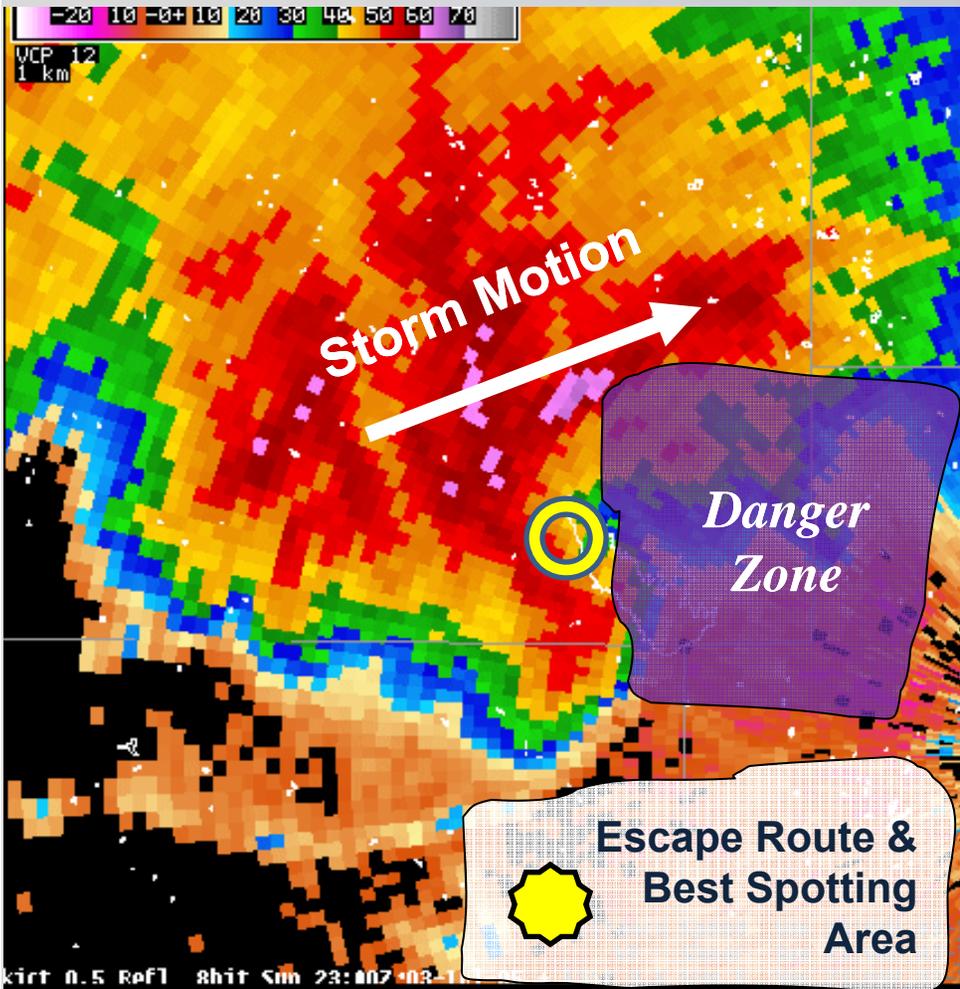


Looking North-northwest

**Stay southeast to south
of the updraft and
wall cloud**



Mobile Spotter Positioning: HP Supercell Thunderstorm



**Stay away from heavy
rain and rotating
updraft area !!**



Night Spotting...

Spotting at night is very dangerous!

This should only be done from a safe shelter.

Mobile spotters should only attempt this if they have communications with someone who knows their position and if a shelter is nearby.

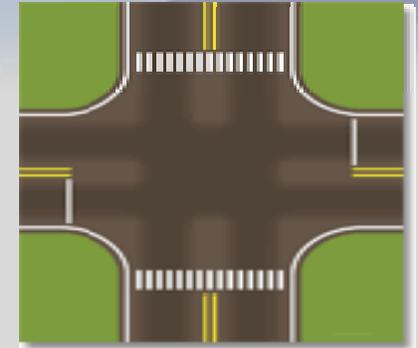




Safe Zones

Tips for Mobile Spotters

- Keep options open for escape routes; a 4-way intersection is best
- **Never spot alone**
- Know your position with respect to the storm movement
- **Never drive through the core of the storm** (Heavy rain & hail)
- Be alert for other traffic, emergency vehicles & pedestrians
- **Don't park near large trees or signs in high wind conditions**





Lightning Safety

Safe Locations

- Secure building with windows & doors closed
- A hard topped vehicle with the windows closed
 - This is safe because you are enclosed in the metal frame of the vehicle – NOT because of the tires!!



**When you see lightning
OR hear thunder – Go
to a safe location
IMMEDIATELY!!**



Lightning Safety

UN-SAFE Locations

- Anywhere outdoors – *especially* near trees or tall objects
- Buildings with large open doors – or, no walls
- An auto with open windows





NWS CENTRAL ILLINOIS

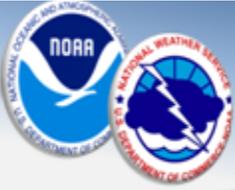


Lightning Safety



**Ironwood Golf Course
Normal, IL**

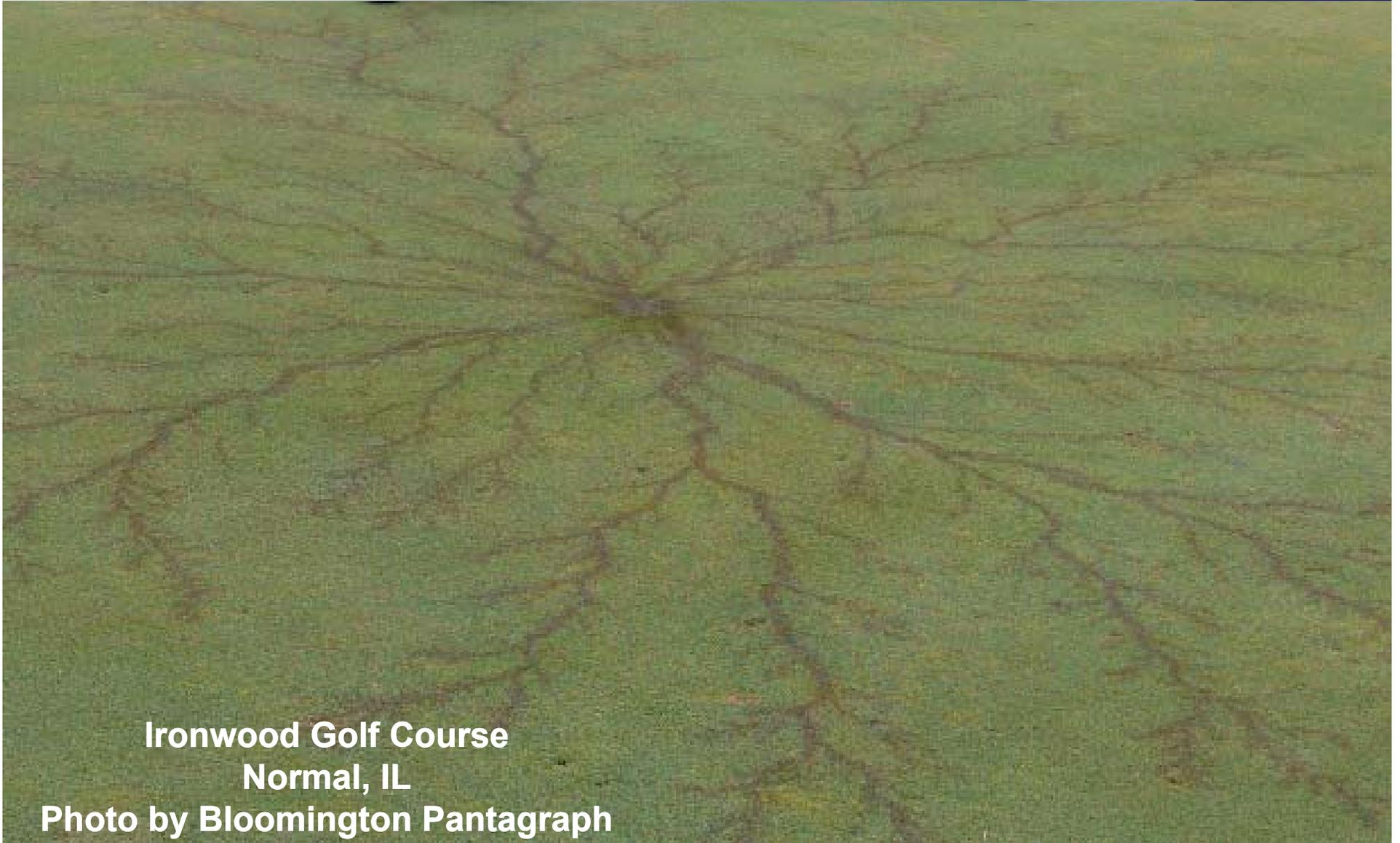
Photo by Bloomington Pantagraph



NWS CENTRAL ILLINOIS

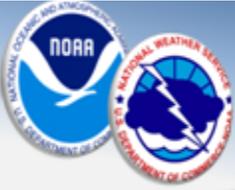


Lightning Safety



**Ironwood Golf Course
Normal, IL**

Photo by Bloomington Pantagraph



Lightning Safety

Intense lightning can occur many miles away from the storm – in areas with NO rain!

Don't return outdoors too soon! Stay in your safe shelter at least 30 minutes AFTER the last rumble of thunder.





High Wind Safety

- **Mobile Spotters**
Get indoors, if you can safely!
Slow down and find a safe place to pull off, away from trees and power lines



Photo by Ron Handke

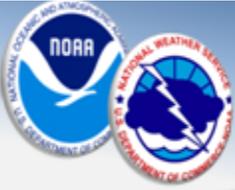


High Wind Safety

- **Mobile Spotters**
Get indoors, if you can safely!
Slow down and find a safe place to pull off, away from trees and power lines
- **Other Spotters**
Stay away from windows and doors
Be alert for falling trees or tree limbs



Photo by Steve Hardesty

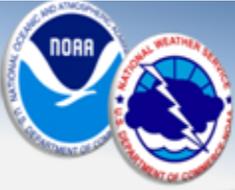


Hail Safety

- **Mobile Spotters**
Stay away from the part of the storm where large hail is occurring. (Updraft)
Golf-ball sized or bigger hail can damage car windows, and injure you.

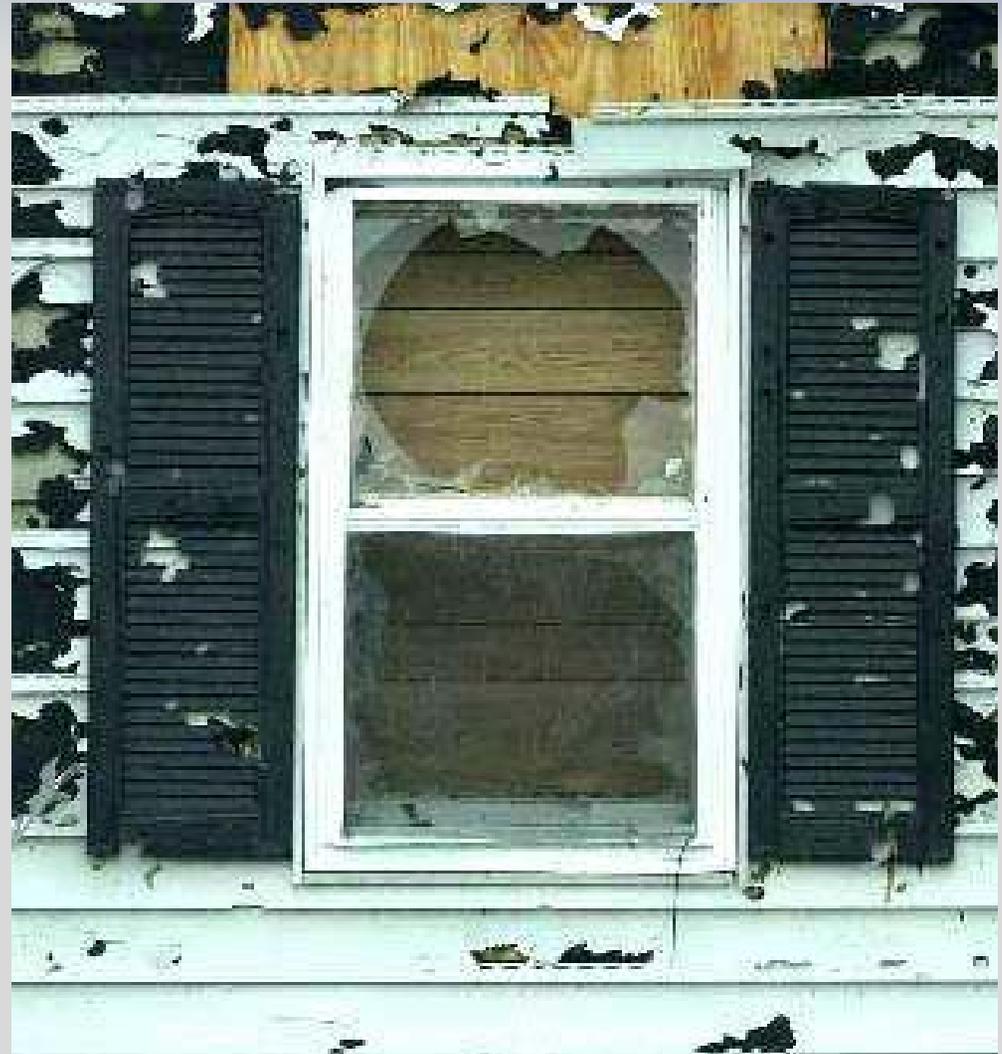


Photo by Amy Jankowski



Hail Safety

- **Mobile Spotters**
Stay away from the part of the storm where large hail is occurring. (Updraft)
Golf-ball sized or bigger hail can damage car windows, and injure you.
- **Other Spotters**
Stay away from windows





Flood Safety

- Flooded roads are dangerous for **ALL** types of vehicles
- Most deaths from flooding occur in vehicles
- Most flash floods occur at **NIGHT** in Illinois
- **Peak time is 1:00 AM**

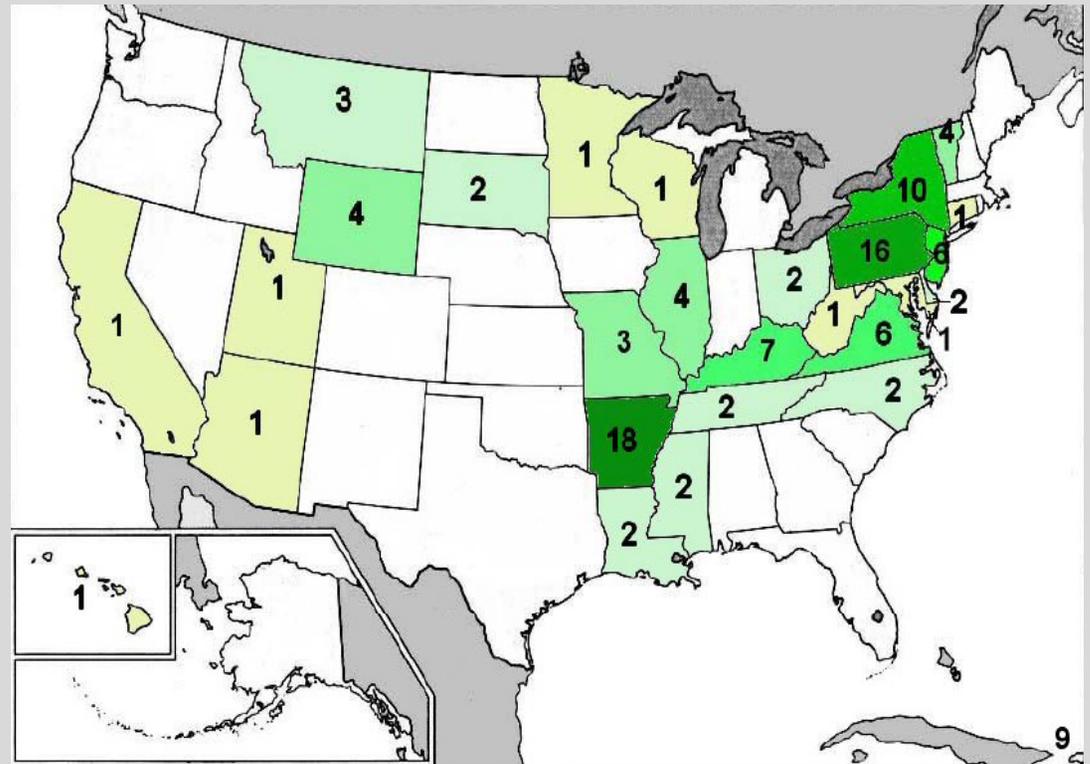


School bus on flooded road near Marion, IL



Flood Safety

- Flooded roads are dangerous for **ALL** types of vehicles
- Most deaths from flooding occur in vehicles
- Most flash floods occur at **NIGHT** in Illinois



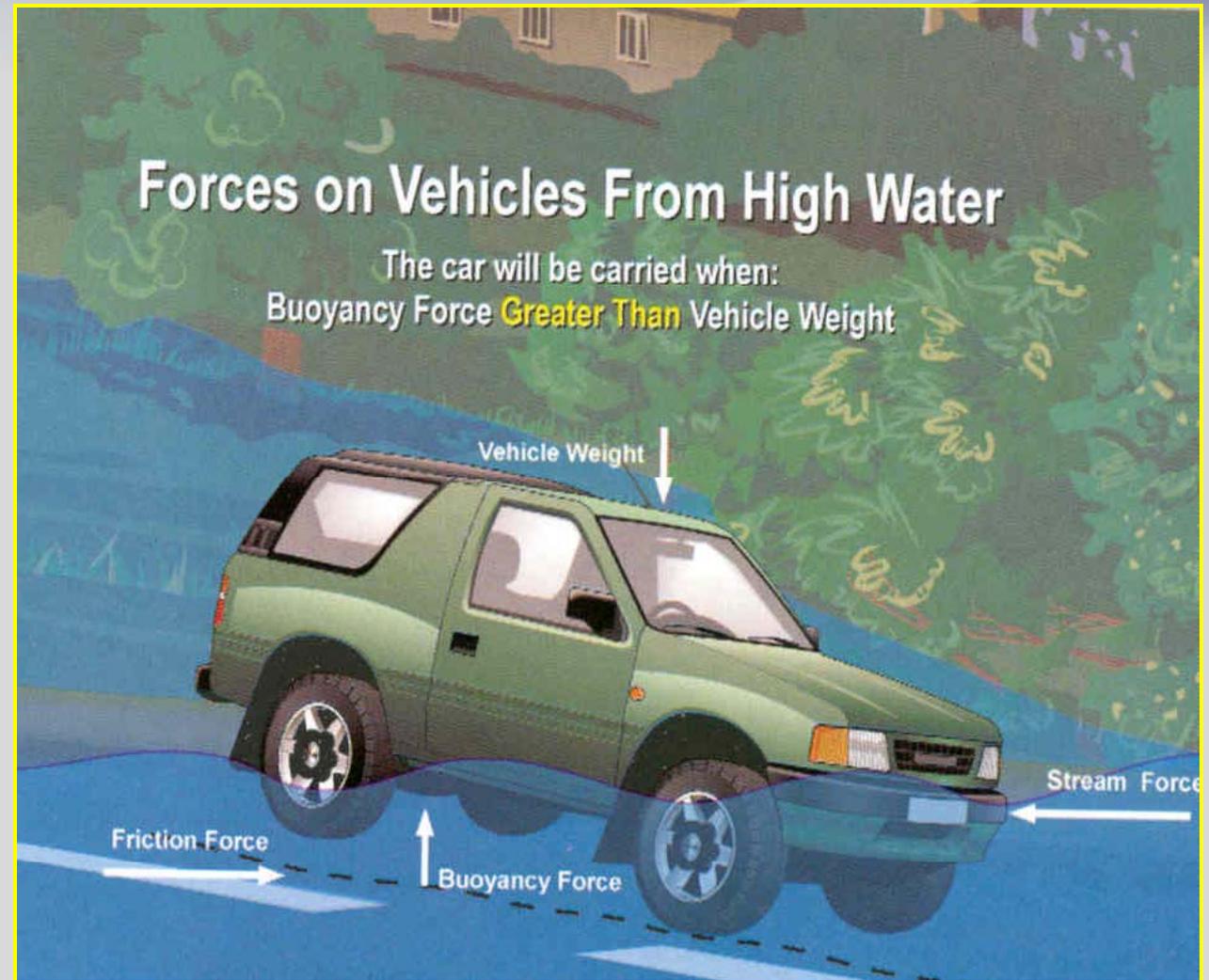
*U.S. flood deaths in 2011
About 70% were in vehicles*

- **Peak time is 1:00 AM**



Flood Safety

It only takes
18" – 24" of
water to
cause an
auto to float
or to push it
off of the
road

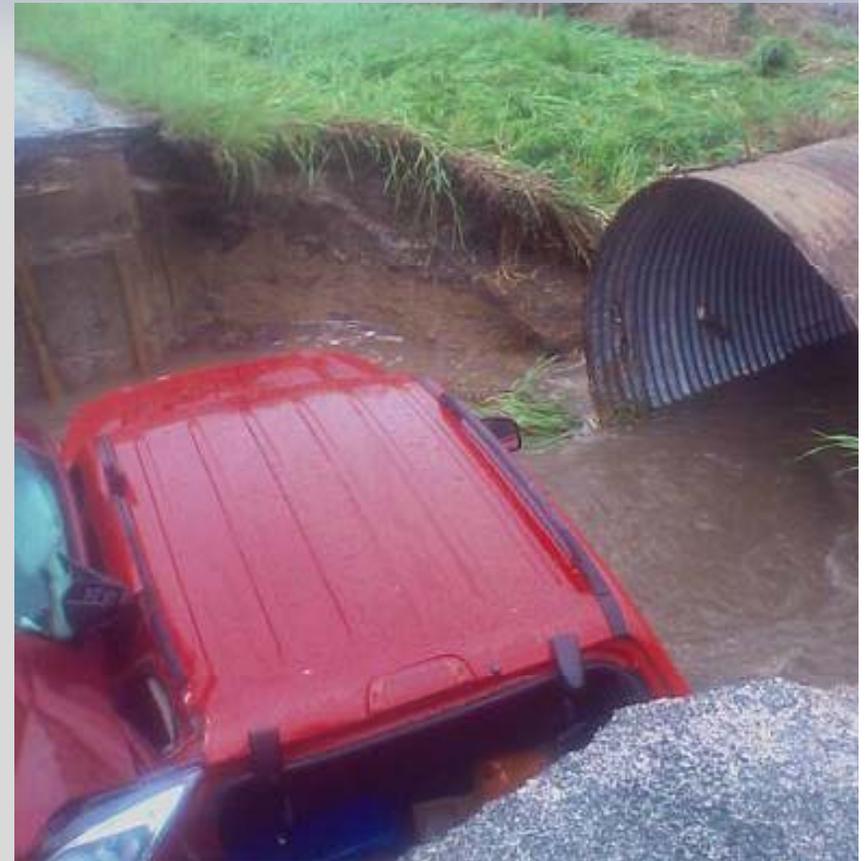




Flooding: Road Impacts



Photo by Melody Bergdahl
Near Lindsey, WI - Sept. 23, 2010



near Geneseo, IL May 13, 2010



Flood Safety

✓ **Never cross a water covered road in a vehicle**



Photo from
Morgan Co. EMA



Photo from WLDS
Jacksonville, IL 6/18/11



Flood Safety

- ✓ **Never cross a water covered road in a vehicle**
- ✓ **Do not allow kids to play in or near flooded roads, creeks or streams**
- ✓ **Never walk into a flooded area**





Flood Safety

- ✓ **Never cross a water covered road in a vehicle**
- ✓ **Do not allow kids to play in or near flooded roads, creeks or streams**
- ✓ **Never walk into a flooded area**





Tornado Safety

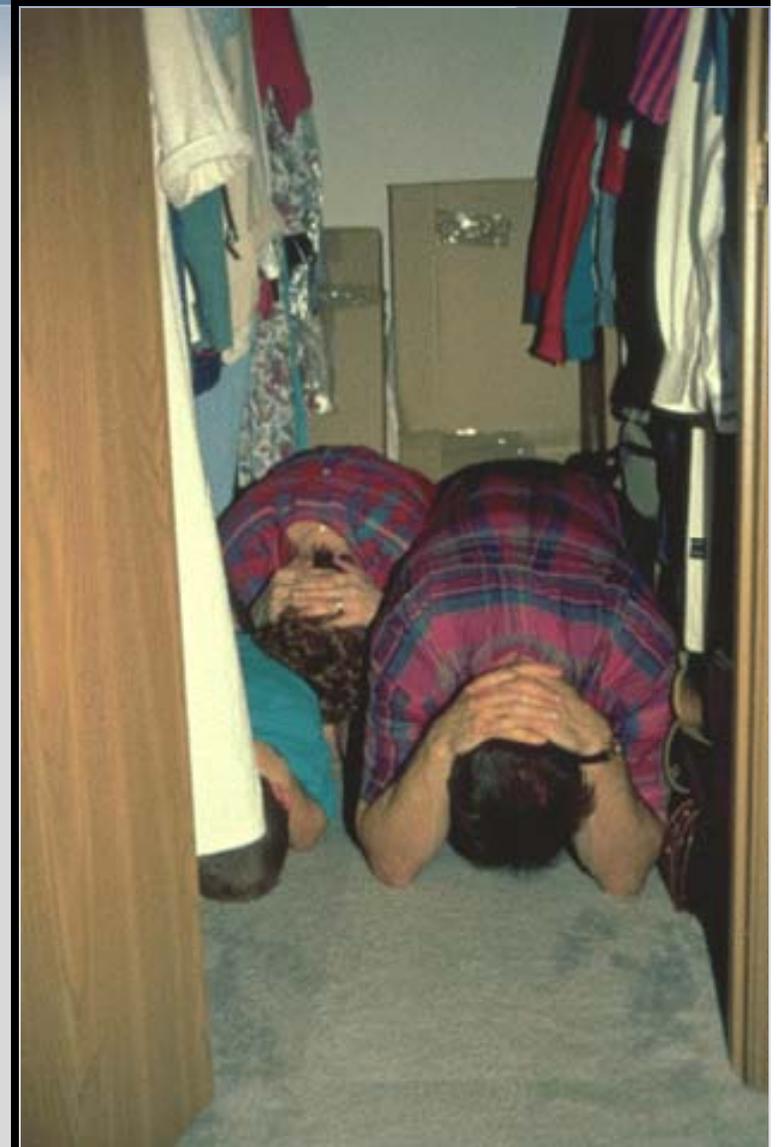
- **Whether indoors or outdoors: Flying & falling debris is the biggest hazard**





Tornado Safety

- **Get in:** A sturdy shelter
- **Get down:** A basement or underground shelter is the best. If none is available, get to the lowest level near the center of the building.
- **Cover up:** Minimizes your risk of injury from falling debris





Tornado Safety

Mobile Spotters

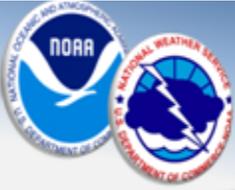
- **Never try to outrun a tornado in a vehicle, especially in heavy traffic**
 - **Park your car and get into a sturdy structure**
 - **Don't take shelter under bridges or overpasses**
- **LAST RESORT:**
If no shelter is nearby, lie flat in a ditch to protect yourself





A FEW FINAL WORDS...





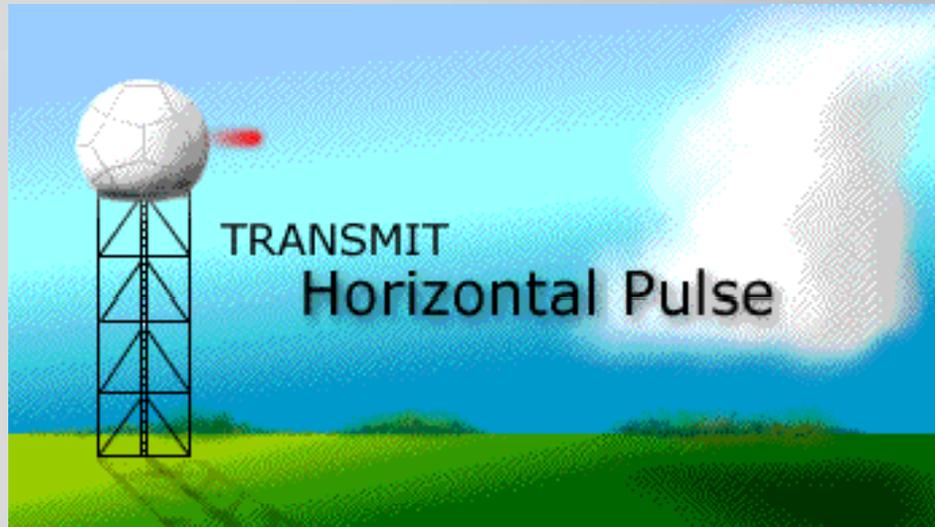
NWS Radar Upgrade...

- **Dual Polarization Doppler Radar**
 - **Already installed at NWS Chicago, Quad Cities & St. Louis**
 - **Lincoln: Oct 1-14, 2012**
 - **During installation the radar will be down for \approx 2 weeks**
 - **Use surrounding radars during outage**



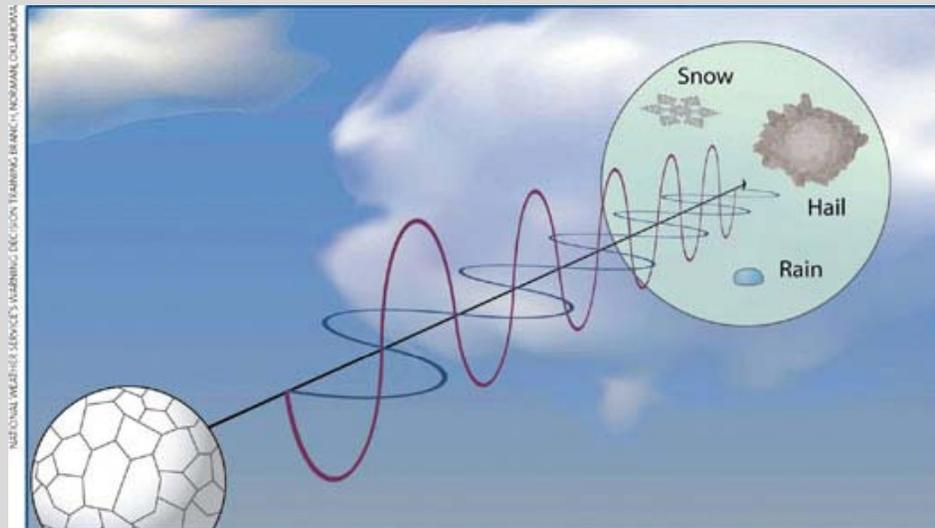


Why are we upgrading?



• Current Radar

- **Horizontal radar pulses**
- Measures only the horizontal dimension of the precipitation



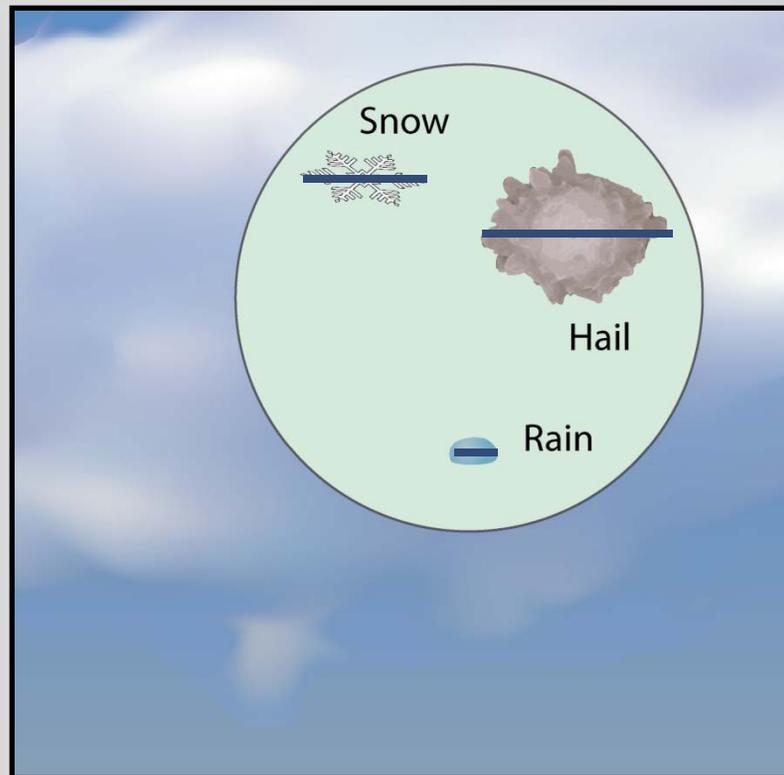
• Dual Pol Radar

- **Horizontal AND Vertical radar pulses**
- Measures the precipitation in 3 dimensions



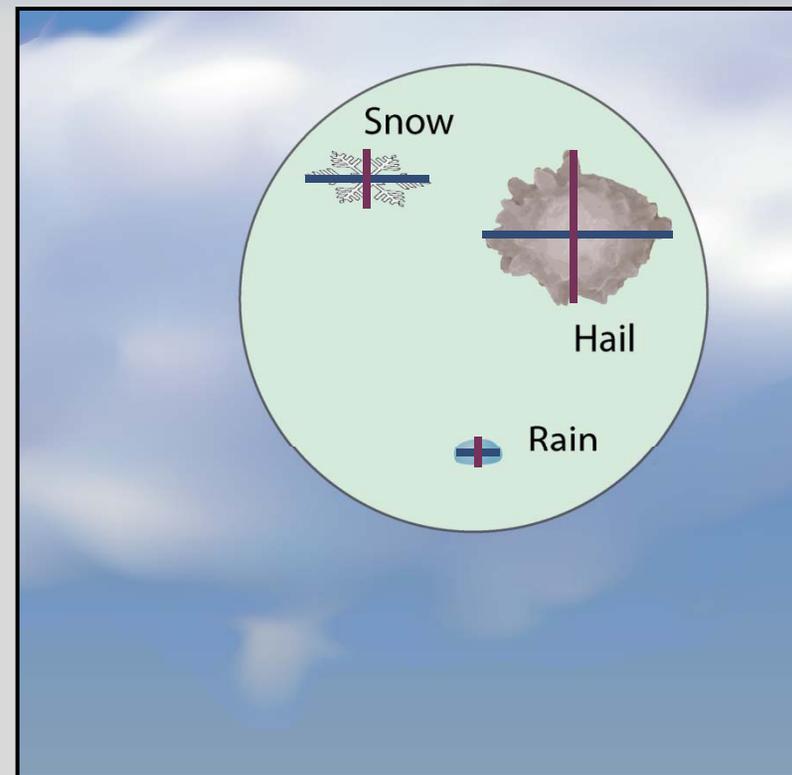
Why are we upgrading?

Current Radar



Conventional radar tells us about the size of objects

Dual-Pol Radar

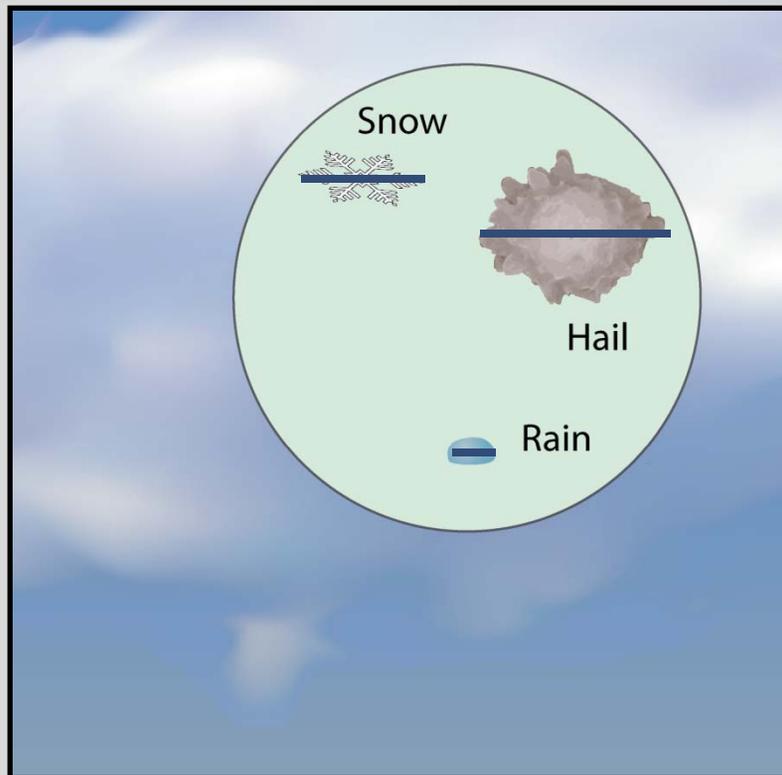


Dual-pol radar tells us about the size, shape, & variety of objects

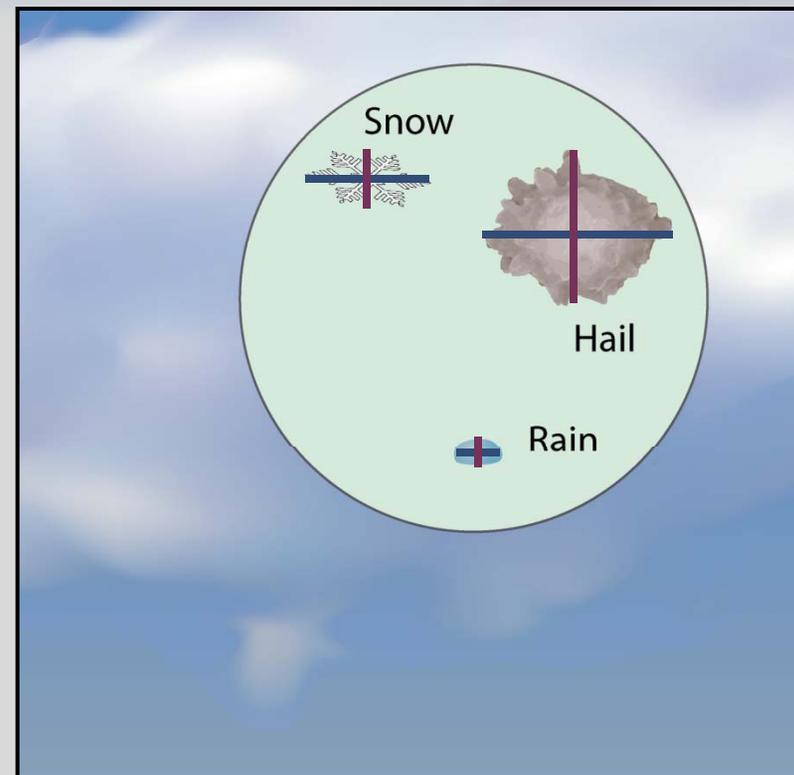


Why are we upgrading?

Current Radar



Dual-Pol Radar



The biggest improvements with Dual Pol Radar will be better accuracy with rainfall estimates AND the ability to better infer precipitation types (ex...rain vs. hail)



Why are we upgrading?

- Other benefits of dual pol radar
 - Precip vs. non-precip discrimination
 - Easier updraft identification
 - Tornadic debris signature
 - Only seen with larger tornadoes already on the ground
 - Will help confirm larger tornadoes at night, and in areas lacking spotters
 - Since we only see this with tornadoes already on the ground, it will NOT improve tornado warning lead time



NWS CENTRAL ILLINOIS



Questions ???

Thank you for your time!!



Web Page: www.weather.gov/Lincoln



Facebook: <http://www.facebook.com/US.NationalWeatherService.Centrallllinois.gov>



Twitter: [#wxreport WW](#) <your location> [WW](#) <weather>