

# Being Prepared for Severe Weather



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Weather Forecast Office

NWS Wilmington Webpage: [weather.gov/iln](https://weather.gov/iln)



@NWSILN



/NWSWilmingtonOH

# What Will Be Covered

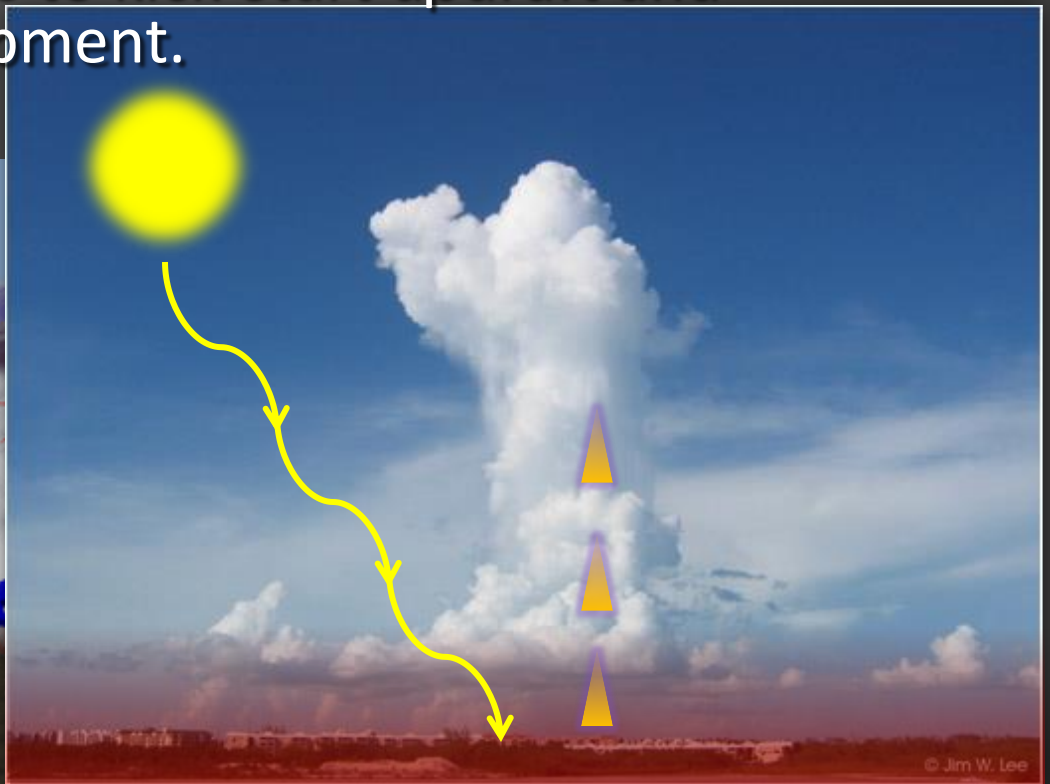
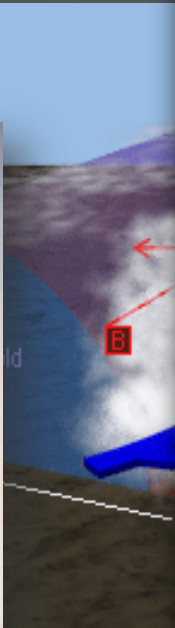
- Thunderstorm Formation
- Doppler Radar and Thunderstorms
- Types of Thunderstorms & Severe Weather
- How to Stay Safe During Severe Weather
- How to Report Severe Weather to the NWS

# Thunderstorm Formation

When air is heated, it becomes lighter and rises.

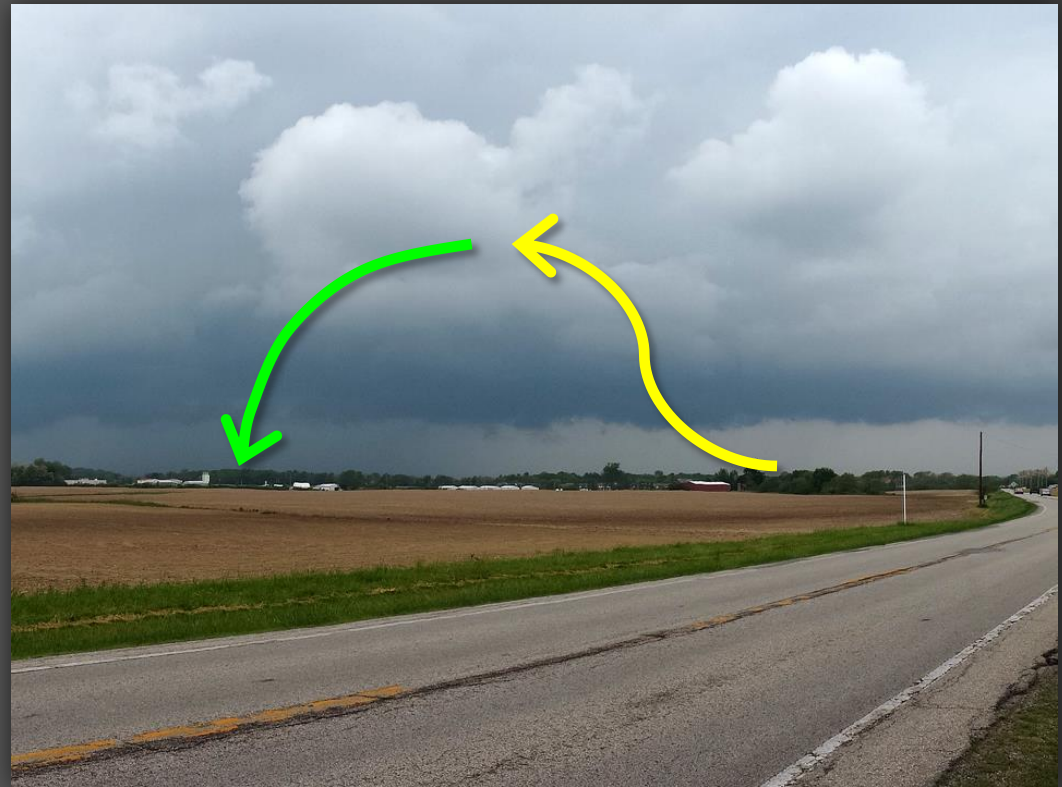
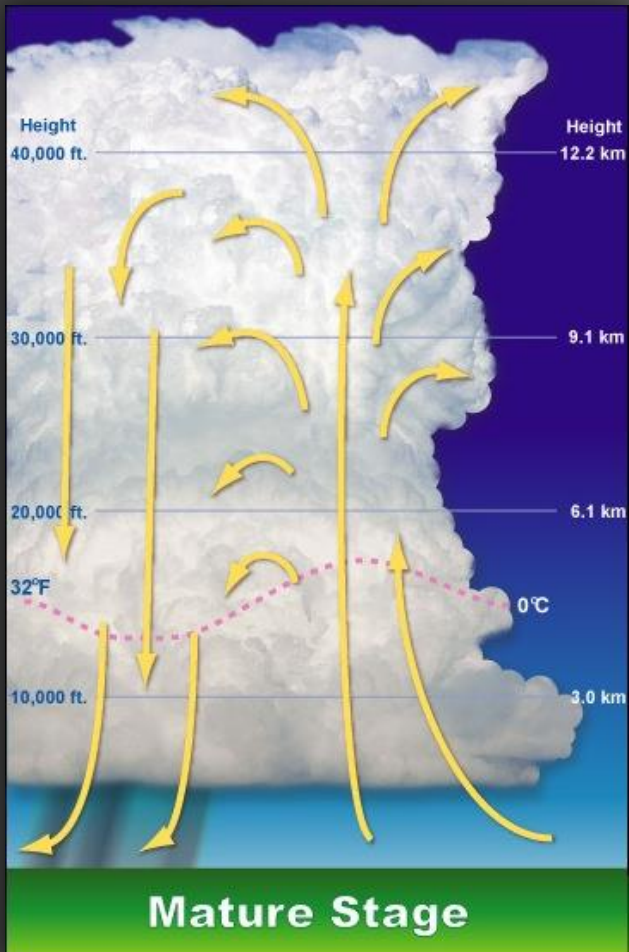
If enough moisture is present, this updraft can develop into a towering cumulus cloud.

A source of lift often acts to kick-start updraft and thunderstorm development.



# Mature Thunderstorm

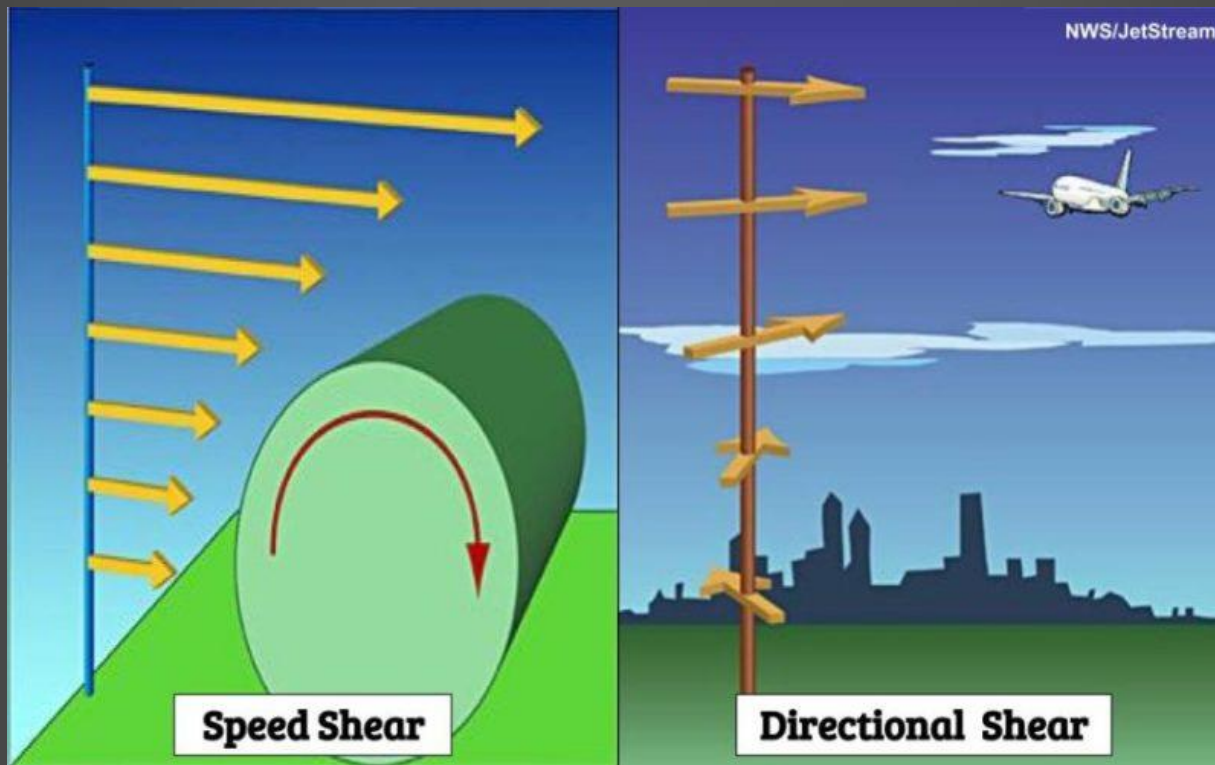
- Fully developed thunderstorm will have a distinct **updraft** and **downdraft**



Outside 1945 Wilmington, OH

# Importance of Wind Shear

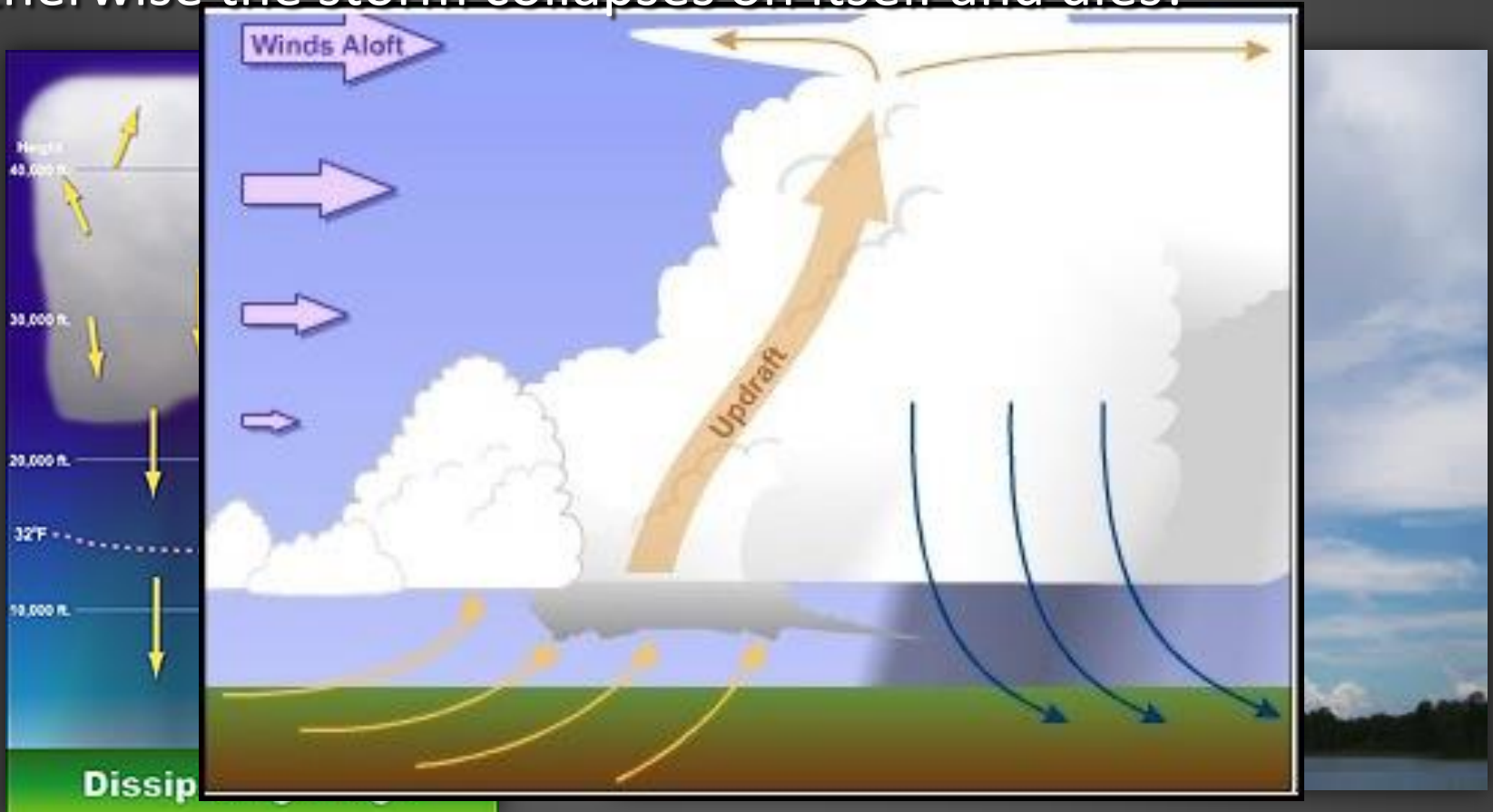
- For a thunderstorm to survive, wind shear is needed to keep the updraft and downdraft separate
- Can be described in terms of speed and direction



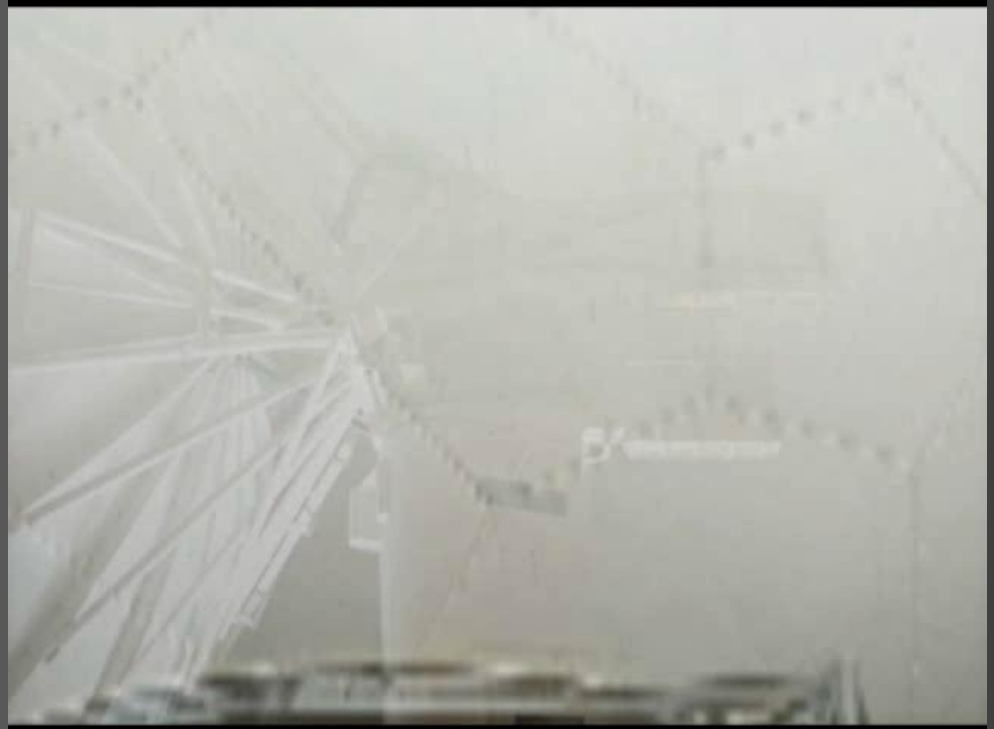


# Importance of Wind Shear

- For a thunderstorm to survive, wind shear is needed to keep the updraft and downdraft separate.
- Otherwise the storm collapses on itself and dies!



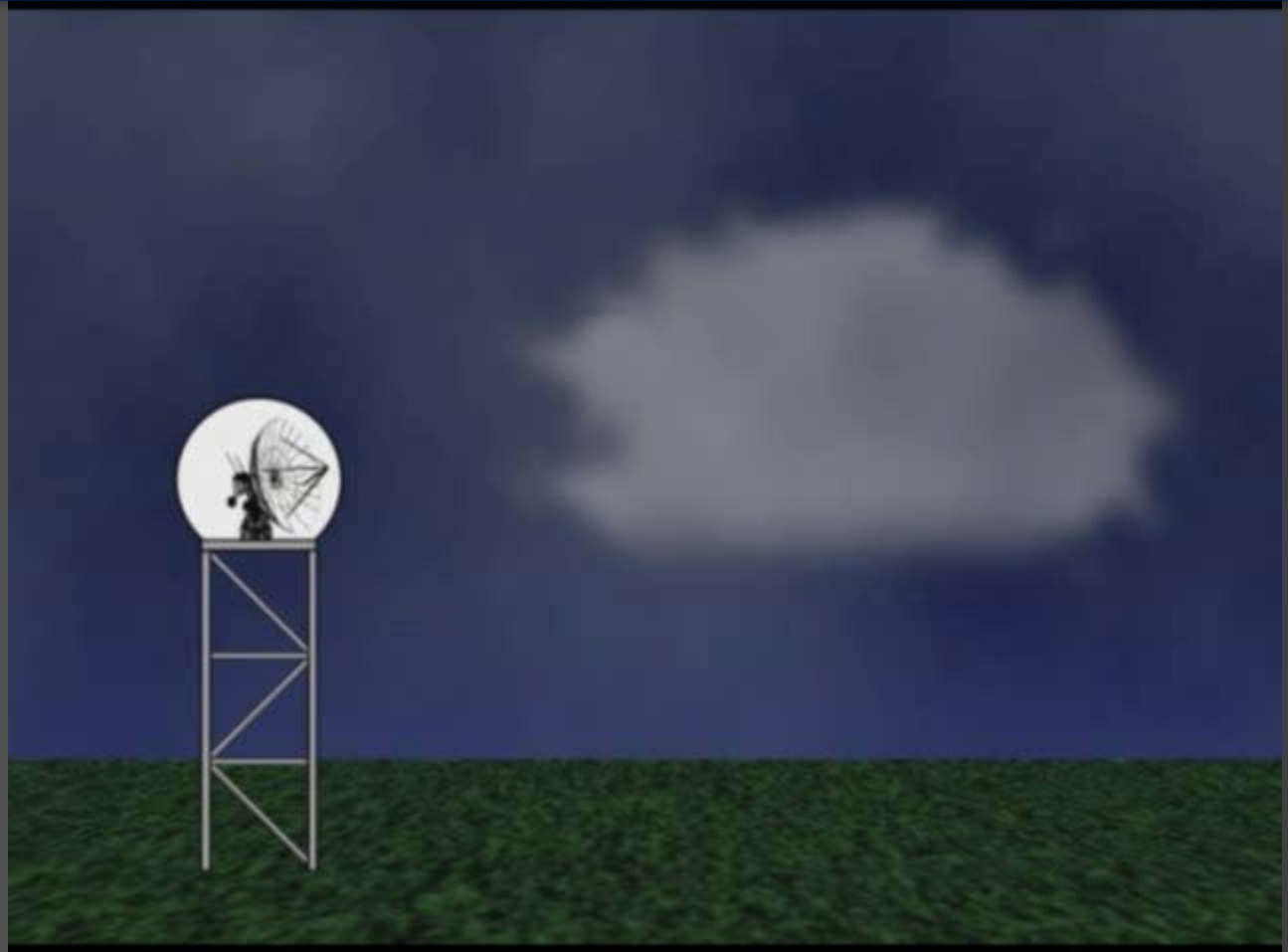
# NWS Radar Operations



- National Weather Service WSR-88D Radar

# NWS Radar Operations

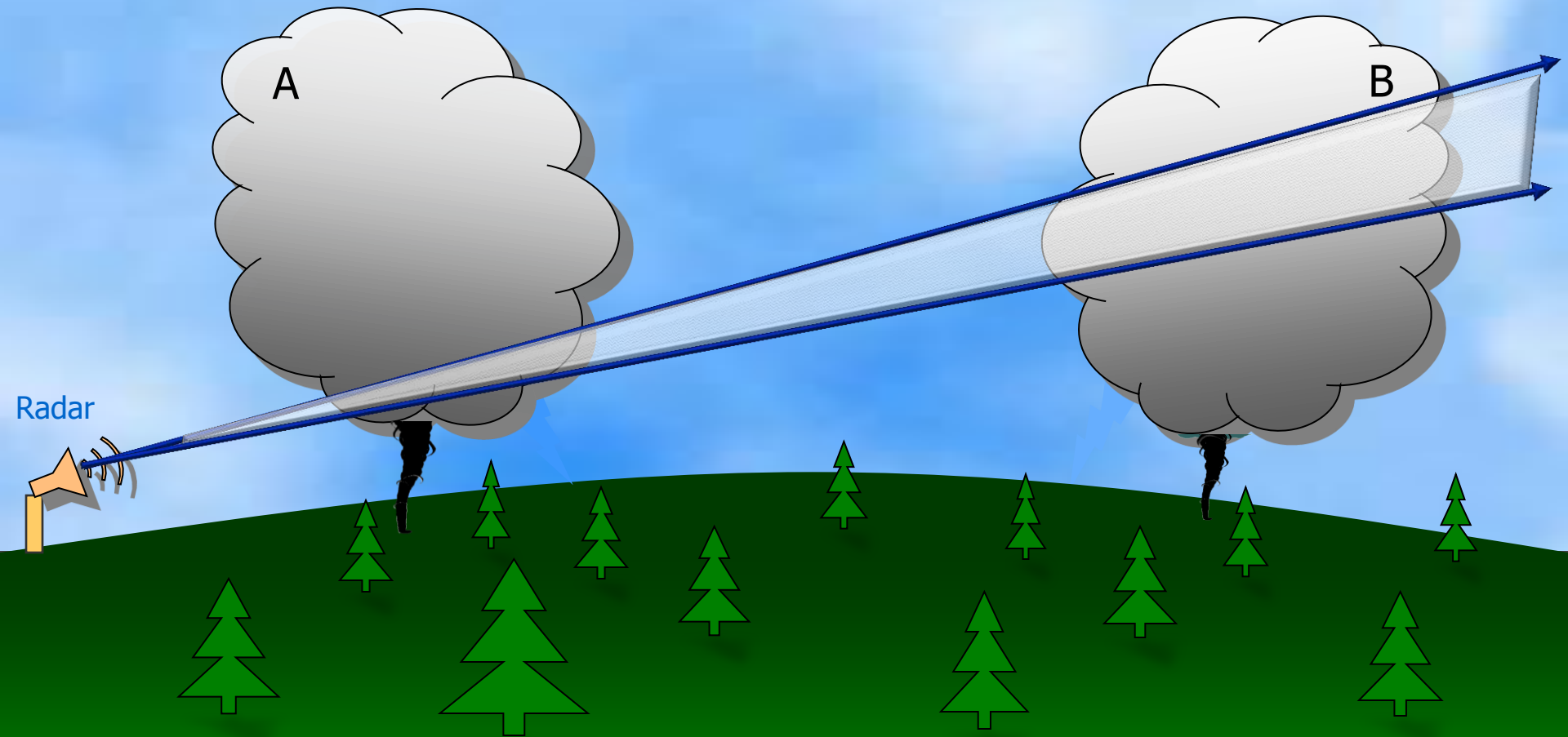
- NWS Doppler radar enables us to estimate:
- Reflectivity (amount or strength of the signal)
- Velocity (direction in which the air is moving)



However, there are some significant limitations...



# NWS Radar Limitations



Radar beam cannot see the lower portion of storm B.  
Resolution is poor at distances far from the radar.

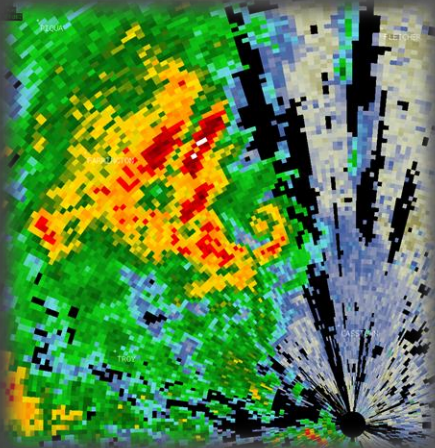
# NWS Storm Spotters



- Volunteers who relay real-time severe weather reports to NWS
- NWS relies on spotter information to issue warnings
- Spotters keep our communities safe during hazardous weather!

# Why Spotters Are Needed

What we see:

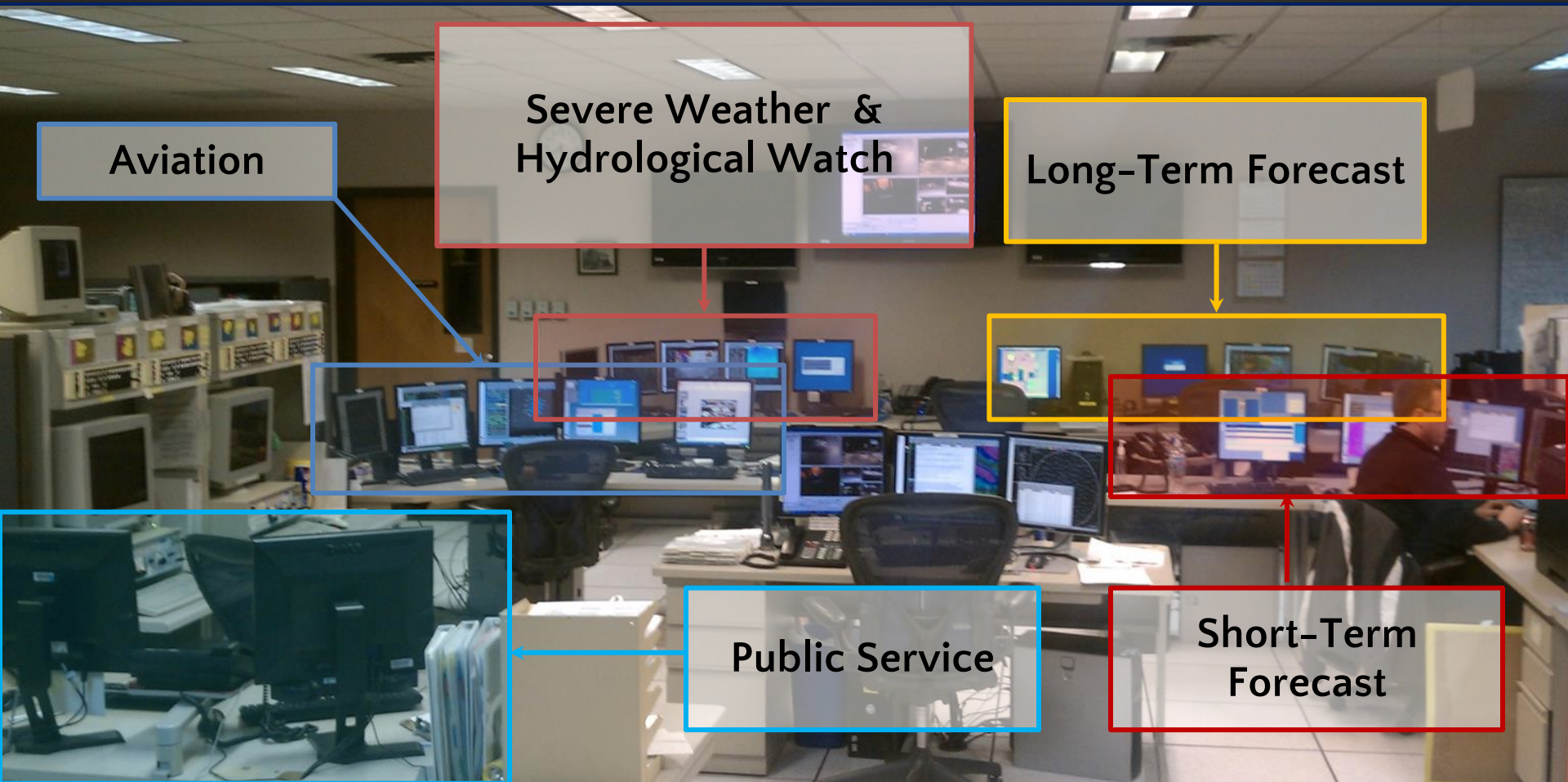


What you see:



- The ONLY way for us to know ground truth is from spotter reports!
- Real-time verification adds credibility, enhances public response, and improves warning accuracy.

# NWS Operations



Always staffed by at least 2 meteorologists, but as many as 10 can be in the operations area during particularly hazardous weather.



# Types of Thunderstorms



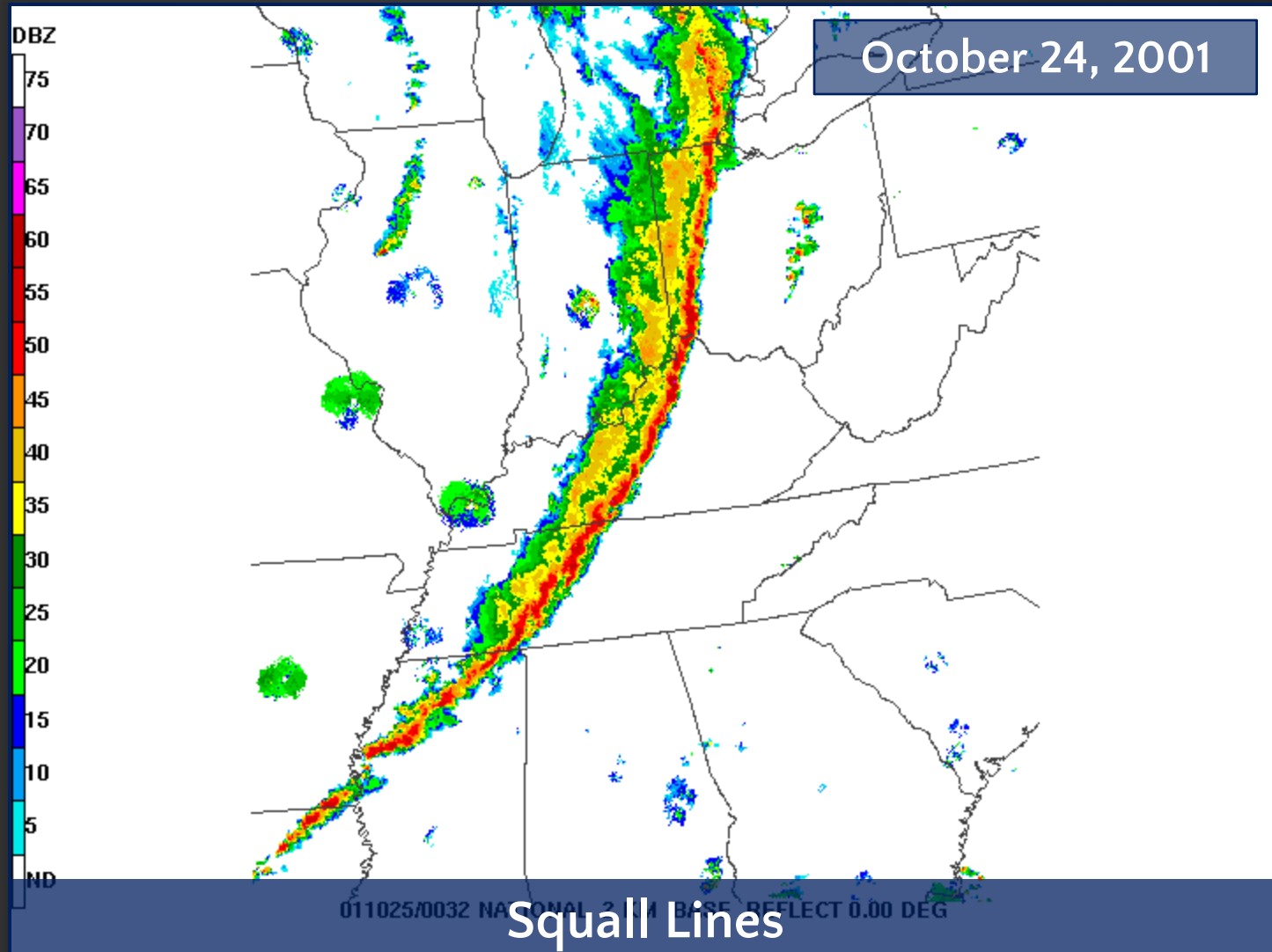


# Types of Thunderstorms

## Squall Lines

The highest threat with squall lines (or any thunderstorm complex which in linear or nearly-linear in nature) is...

...strong wind!



# Types of Thunderstorms

*Scenario: While working outside, you notice this type of cloud advancing toward you. What could this mean and what action might you take?*



July 19, 2015

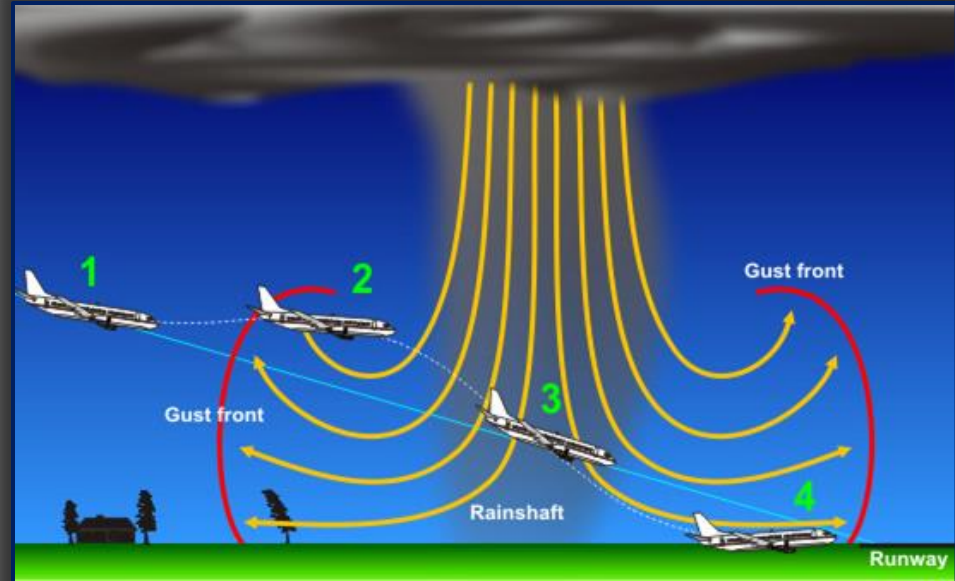


# Straight-Line Wind



# Straight-Line Wind

- Straight-line wind just merely refers to wind that is NOT directly associated with a tornadic circulation.
- The term “straight-line” doesn’t mind the wind went in an exact straight line.
- Straight-line wind often results from the outflow from a thunderstorm due to:
  - Downbursts
  - Squall Lines
  - Gust Fronts



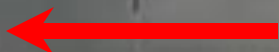




# Straight-Line Wind



The trees over here were blown down to the west...



...While the trees over here were blown down to the east.



**Frequent Conclusion... It must have been a tornado! The damage is going in different directions!**

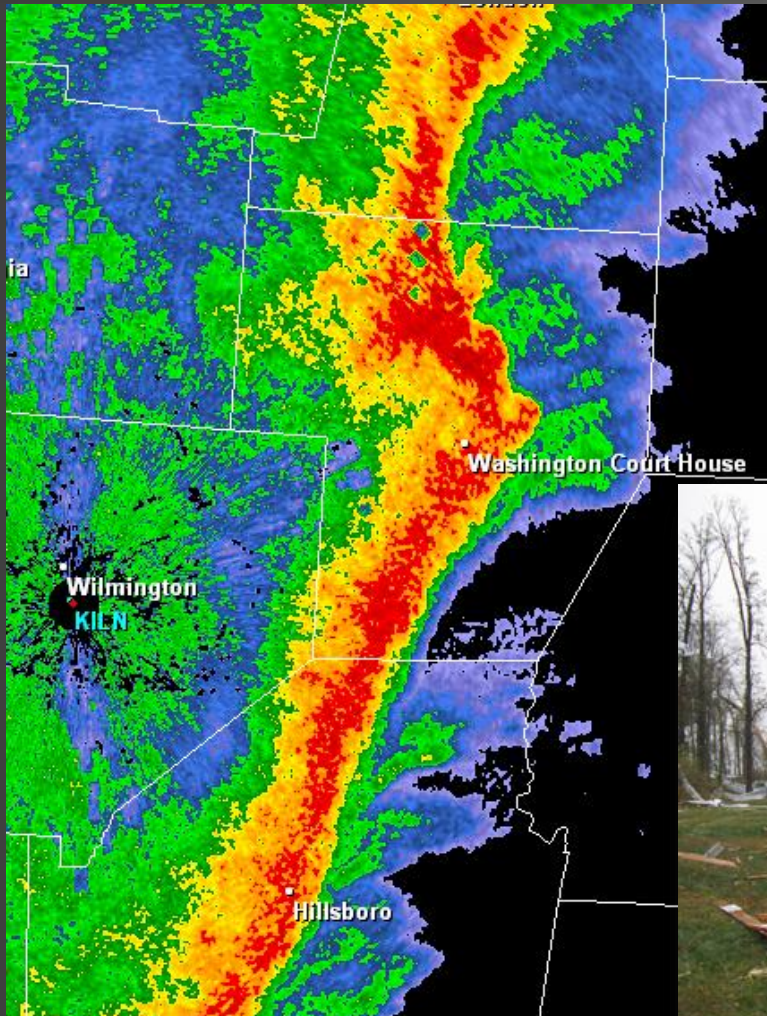


# Straight-Line Wind



Video courtesy NBC4 SkyCam  
Columbus, Ohio

# Squall Lines and Tornadoes



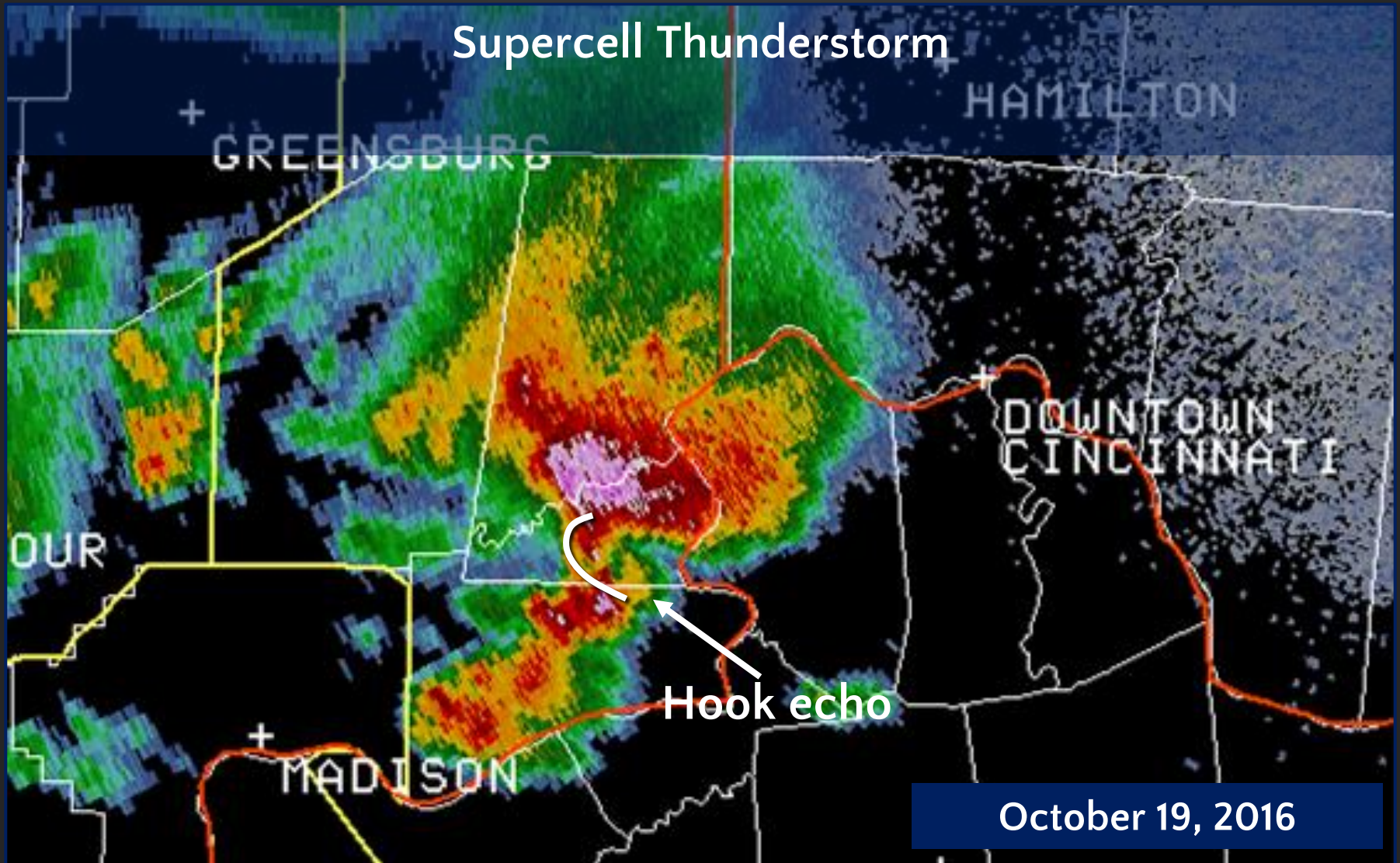
- Squall line tornadoes are usually weak and short-lived, but in rare cases can be EF2-EF3.
- These tornadoes move very quickly, and are frequently rain-wrapped. Because of this, they are virtually impossible to spot.





# Types of Thunderstorms

Supercell Thunderstorm

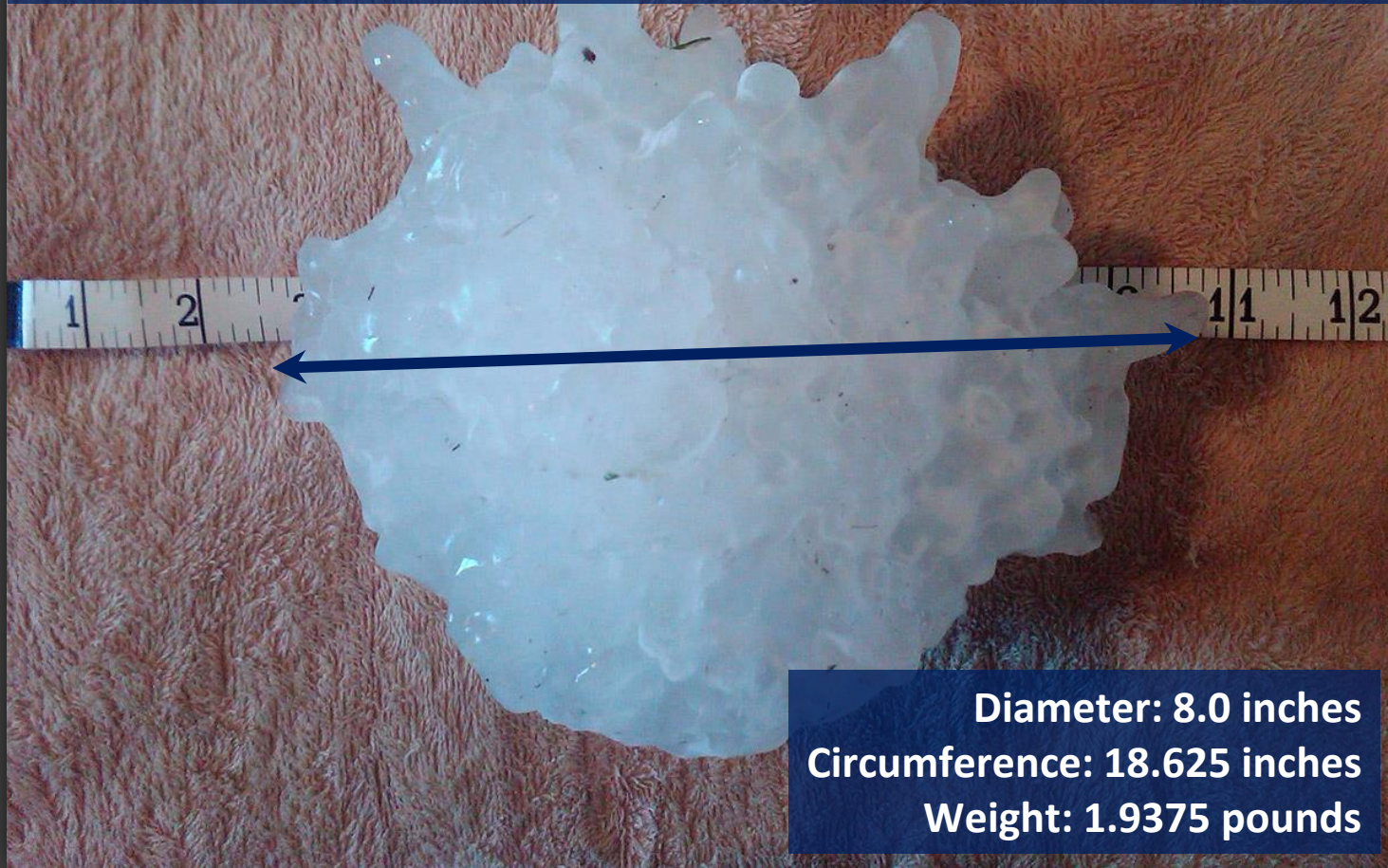


October 19, 2016



# Supercells Can Produce Very Large Hail

Vivian, SD  
July 23, 2010





# Hail Identification



**Pea**

Diameter: 0.25"



**Dime**

Diameter: 0.50"



**Penny**

Diameter: 0.75"



**Quarter**

Diameter: 1.00"



**Half-Dollar**

Diameter: 1.25"



**Ping Pong**

Diameter: 1.50"



**Golfball**

Diameter: 1.75"



**Tennis Ball**

Diameter: 2.50"



**Baseball**

Diameter: 2.75"



**Grapefruit**

Diameter: 4.50"

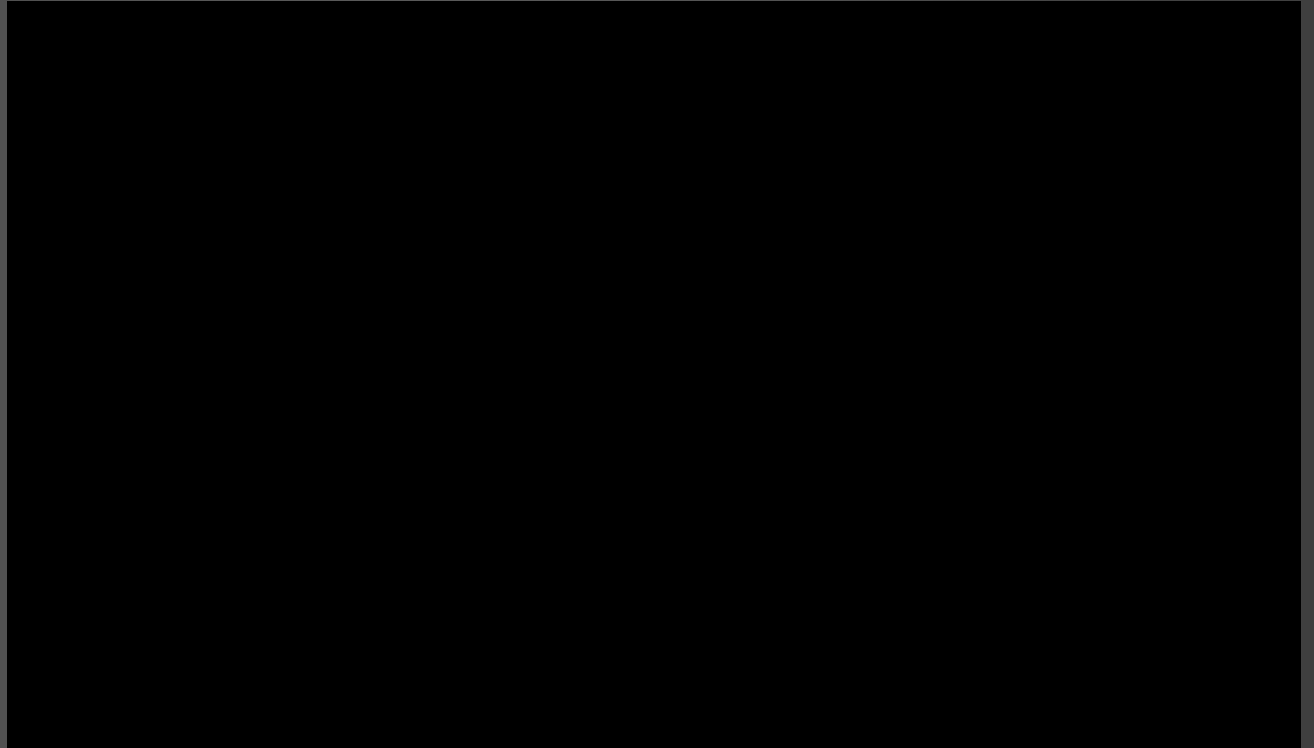


**Always report the largest stone size you see!**



# Tornado

- Rapidly rotating column of air in contact with cloud base and ground
- Not all have visible funnel clouds; look for dirt/debris swirling near ground
- Always exhibit rapid rotation if spotted from up close





# Flooding vs. Flash Flooding

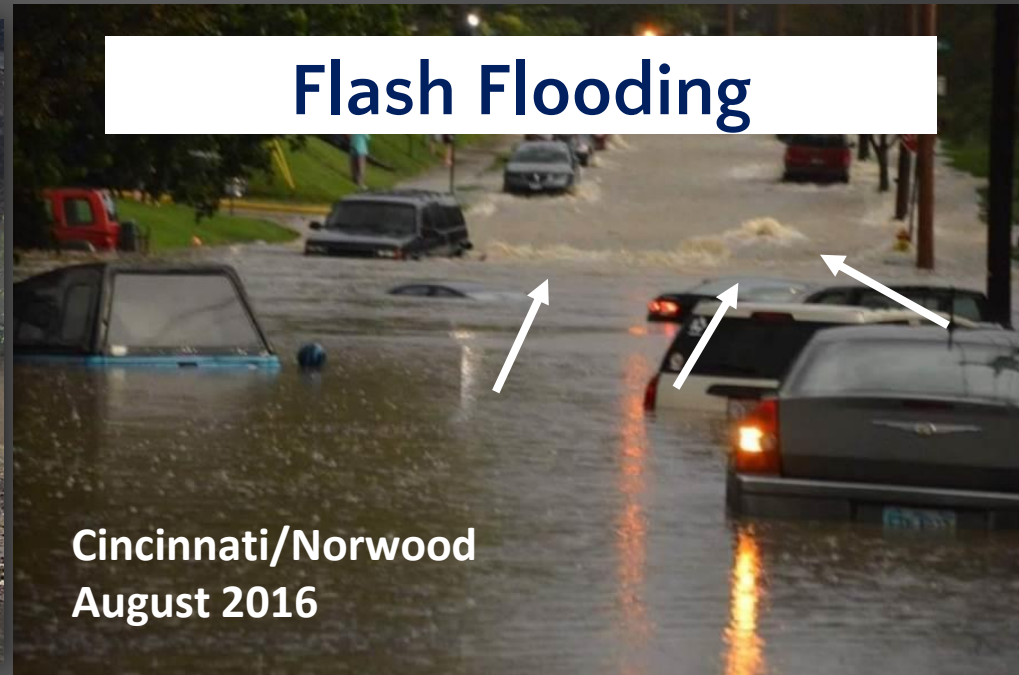


## Flooding



- Usually “standing” water on roads or streams slightly out of their banks.
- ‘Typical flooding’ that occurs under underpasses or in flood-prone areas.
- Is not usually life-threatening

## Flash Flooding



Cincinnati/Norwood  
August 2016

- “Flash” flooding refers to rapid rises of water onto dry areas or “rushing” water over the roads. This type of flooding can occur in a “flash.”
- Typically flash flooding results in water entering main levels of homes and businesses and has enough power to sweep away vehicles.

# Staying Weather-Aware

- Always keep up with the latest forecasts, statements, and warnings...
- For safety.
- For awareness.
- For others.

[www.weather.gov/iln](http://www.weather.gov/iln)

The screenshot shows the National Weather Service website for the Wilmington, OH forecast office. The header includes the NWS logo and navigation links: HOME, FORECAST, PAST WEATHER, WEATHER SAFETY, INFORMATION CENTER, NEWS, SEARCH, and ABOUT. Below the header, there is a section for 'Local forecast by "City, ST" or ZIP code' with a search bar and a 'Go' button. To the right, there are 'News Headlines' with links to 'Frost/Freeze Program', 'We Need Your Feedback...Take Our Short Weather Survey!', 'Changes Coming This Fall to Storm Prediction Center's Severe Weather Outlooks', and 'Hocking County Spotter Talk September 23'. Below the search bar, there is a 'Customize Your Weather.gov' section with a 'City, ST' input field, a 'Remember Me' checkbox, and a 'Get Weather' button. To the right of this section, there is a 'NWS Forecast Office Wilmington, OH' section with a link to 'Weather.gov > Wilmington, OH'. Below this, there are links for 'Current Hazards', 'Current Conditions', 'Radar', 'Forecasts', 'Rivers and Lakes', 'Climate and Past Weather', and 'Local Programs'. The main content area features a map of the region with a 'Click on the map below to zoom in.' prompt. A 'Zoom Out' button is visible. To the right of the map, there are links for 'Watches, Warnings & Advisories' and 'Hazardous Weather Outlook'. Below the map, there are four icons: 'Radar', 'Current Weather', 'Hour by Hour Forecast', and 'Detailed Forecast'.

# Staying Weather-Aware

## Hazardous Weather Outlook

- Discusses potential for hazardous weather within the next week (especially the first 24 hours)
- Issued at least once a day before 6 AM
- Updated more frequently during significant weather

INZ075-080-KYZ089>100-OHZ063>065-071>074-077>082-088-182115-  
OHIO-SWITZERLAND-CARROLL-GALLATIN-BOONE-KENTON-CAMPBELL-OWEN-GRANT-  
PENDLETON-BRACKEN-ROBERTSON-MASON-LEWIS-FAYETTE OH-PICKAWAY-  
FAIRFIELD-WARREN-CLINTON-ROSS-HOCKING-HAMILTON-CLERMONT-BROWN-  
HIGHLAND-ADAMS-PIKE-SCIOTO-  
411 PM EST SAT DEC 17 2016

THIS HAZARDOUS WEATHER OUTLOOK IS FOR SOUTHEAST INDIANA...NORTHEAST KENTUCKY...NORTHERN KENTUCKY...CENTRAL OHIO AND SOUTHWEST OHIO.

.DAY ONE...TONIGHT.

SHOWERS AND THUNDERSTORMS WILL BRING THE POTENTIAL FOR LOCALLY HEAVY DOWNPOURS ON COLD...SATURATED GROUND. RAINFALL AMOUNTS FROM 1 TO 2 INCHES ARE POSSIBLE IN THE HEAVIEST ACTIVITY...AND THIS AMOUNT OF RAIN COULD LEAD TO LOCALIZED FLOODING.

A STRONG THUNDERSTORM OR TWO WITH SMALL HAIL OR GUSTY WINDS IS POSSIBLE MAINLY SOUTH OF THE OHIO RIVER THIS EVENING.

A LIGHT WINTRY MIX WILL REDEVELOP BACK ACROSS THE AREA LATER TONIGHT. RAIN WILL TRANSITION TO FREEZING RAIN AND END AS SNOW...WITH A GLAZE OF ICE AND DUSTING OF SNOW POSSIBLE. ROAD CONDITIONS MAY DETERIORATE LATER OVERNIGHT.

.DAYS TWO THROUGH SEVEN...SUNDAY THROUGH FRIDAY.

NO HAZARDOUS WEATHER IS EXPECTED AT THIS TIME.

.SPOTTER INFORMATION STATEMENT...

SPOTTER ACTIVATION IS NOT EXPECTED AT THIS TIME.

\$\$



# Staying Weather-Aware

## Graphical Hazardous Weather Outlook

Experimental Enhanced Hazardous Weather Outlook

Product Suite Last Updated: **Tuesday August 28, 2018 09:56 AM**

Click links to switch between Graphical and Text: [Graphical HWO](#) | [HWO Text](#)

### Severe Thunderstorm Risk

Today/Tonight

Current Time - 7 AM

#### Severe Thunderstorms Risk

Valid: 08/28/2018 09:00 AM - 08/29/2018 08:00 AM EDT



National Weather Service  
Wilmington Ohio  
08/28/2018 09:45 AM EDT

Follow Us: [f](#) [t](#) [v](#)  
weather.gov/lin

24 Hr. Hazards	Day 1	Wed	Thu	Fri	Sat	Sun	Mon
Tornado							
Hail							
Thunderstorm Wind Gust							
Severe Thunderstorms							
Lightning							
Flooding							
Fire Weather							
Grassland Fire Weather Index							
Fog							
Non Thunderstorm Winds							
Excessive Heat							
Snow & Sleet							
Ice Accumulation							
Frost & Freeze							
Excessive Cold							



# Staying Weather-Aware

## Graphical Hazardous Weather Outlook

Experimental Enhanced Hazardous Weather Outlook

Product Suite Last Updated: Tuesday August 28, 2018 09:56 AM

Click links to switch between Graphical and Text: [Graphical HWO](#) | [HWO Text](#)

### Severe Thunderstorm Legend

### Severe Thunderstorm Safety Tips

Definition Severe Thunderstorm Risk Day 2 to 7	
Risk Level	
None	No risk of severe thunderstorms.
Limited	<b>Risk for severe thunderstorms with the</b> <i>Probability of severe thunderstorms* within 25 miles of a point: Less than 15%</i> Review weather safety tips and emergency kit.
Elevated	<i>Probability of severe thunderstorms* within 25 miles of a point: Equal to or greater than 15%</i> Review weather safety tips and emergency kit. Identify closest safe shelter.
Significant	<i>Probability of severe thunderstorms* within 25 miles of a point: Equal to or greater than 45%</i> Review weather safety tips and emergency kit. Identify closest safe shelter.
Extreme	<i>Probability of severe thunderstorms* within 25 miles of a point: Equal to or greater than 60%</i> Review weather safety tips and emergency kit. Identify closest safe shelter.

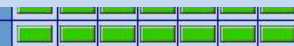


National Weather Service  
Wilmington Ohio  
08/28/2018 09:45 AM EDT

Follow Us: [f](#) [t](#) [v](#)  
weather.gov/iln

Frost & Freeze

Excessive Cold





# Staying Weather-Aware

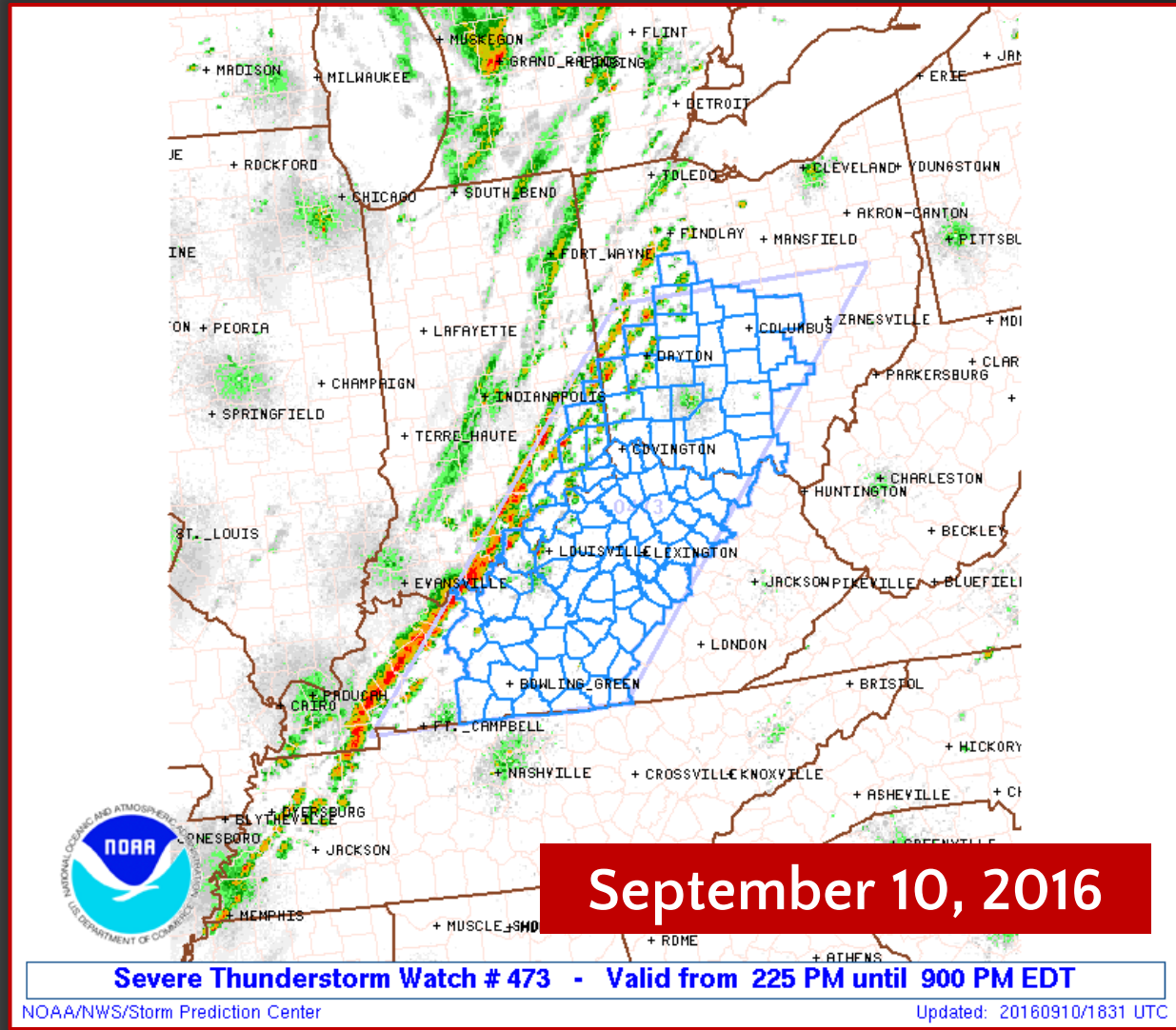


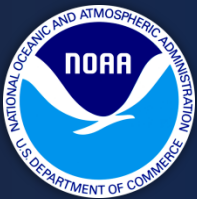
## Watch

A watch means that conditions are favorable for hazardous weather to develop in and near the watch area.

- Winter Storm Watch
- High Wind Watch
- \*Severe Thunderstorm Watch
- \*Tornado Watch

\*These watches are issued by the Storm Prediction Center (SPC) in Norman, Oklahoma in collaboration with local NWS offices.





# Staying Weather-Aware

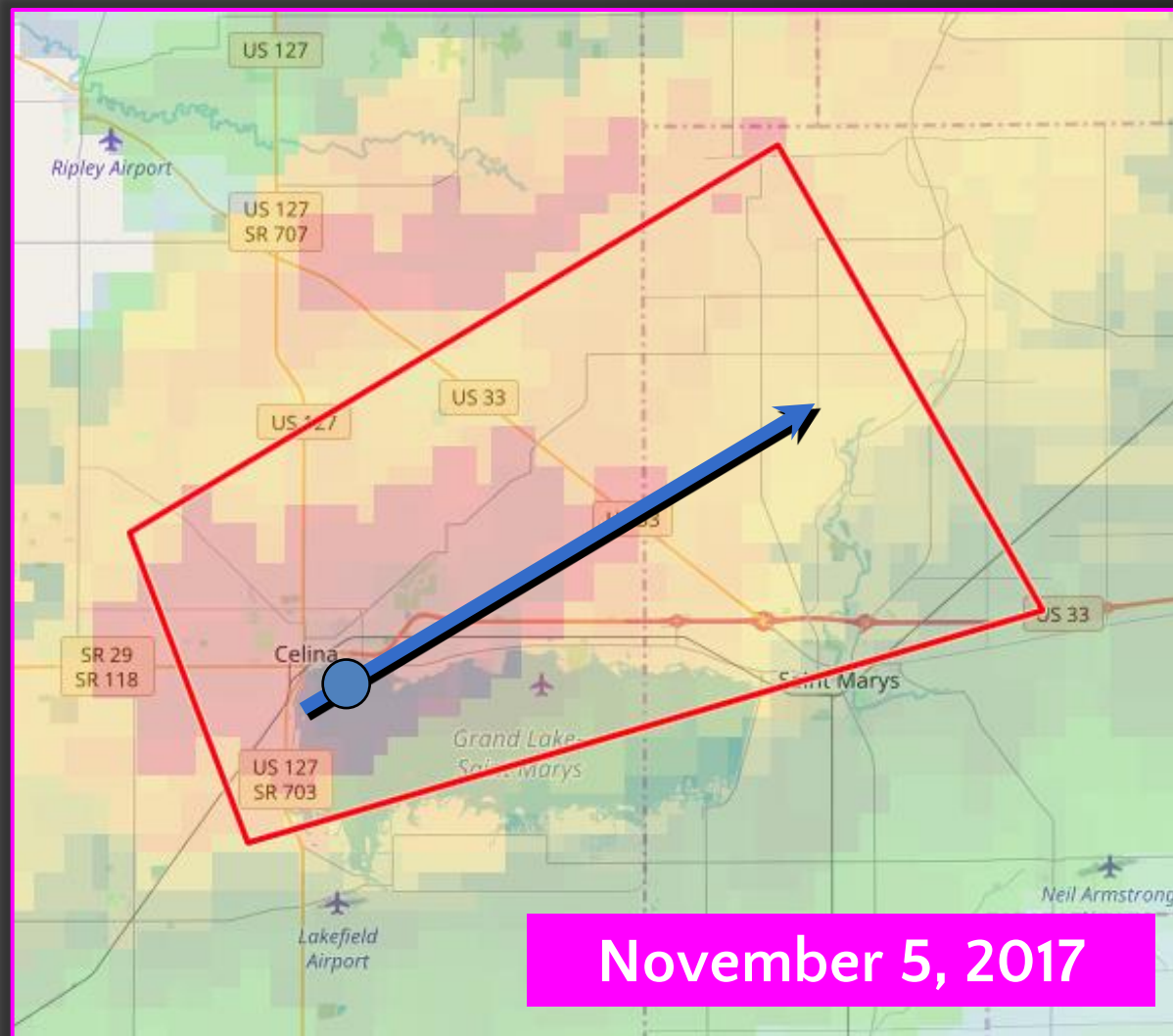


## Warning

The expected hazard is imminent or already occurring.

- Winter Storm Warning
- Blizzard Warning
- Severe Thunderstorm Warning
- Flash Flood Warning
- Tornado Warning

In extremely rare cases, a **Flash Flood Emergency** or **Tornado Emergency** may be issued.





# When A Watch Is Issued



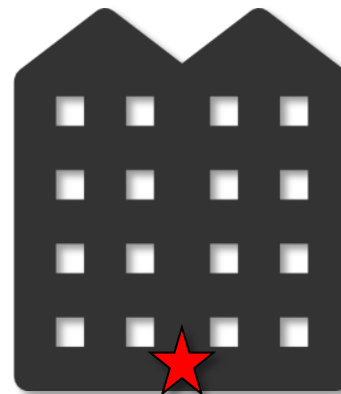
Scenario: While at work, you hear that a **tornado watch** has been issued for central Ohio, including Delaware County.

Check the radio, local media, or our website for clarifying details on the watch. Know that watches may be issued hours before a storm may arrive in your area.



If your NOAA All-Hazards Radio was not already turned on, definitely make sure it's on and the batteries are working. The radio will alert you if a warning is issued, so it is vital to have it on and working correctly.

If you don't own a NOAA Weather Radio, you should check our website or tune in to the media (either television or radio) to stay updated on the situation.



Know where to go and what actions to take should a severe thunderstorm or tornado warning be issued for your area.





# Scenario



Before you go to work, you hear there is a chance for severe thunderstorms in the afternoon. What can you do to make sure you are prepared?

1

Visit our website ([weather.gov/iln](https://weather.gov/iln)) to review the hazardous weather outlook



2

If you have a severe weather safety kit and/or NOAA All-Hazards Radio, you should make sure that everything has fresh batteries that work. You should check your radio, flashlight, etc. because they may become necessary later in the day. Make sure your cell phone is fully charged in case you lose power.



3

If you have a severe weather safety plan, you should review it. Make sure everyone in your family knows what to do in certain situations. Know where everyone will be during the day and make it clear what to do if severe weather impacts your location. Know where to seek shelter beforehand!



4

Whether it be via local television, our webpage, an app on your mobile device, AM/FM radio, the Internet, NOAA All-Hazards Radio, etc., continue to monitor weather information during the day for any changes in the situation. Set up a routine (i.e. check the weather information every hour on the hour).



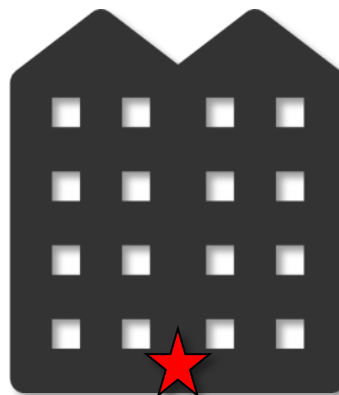
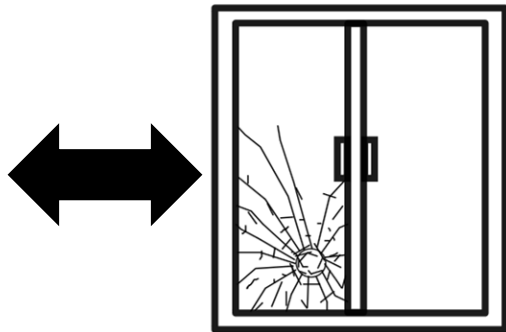


# When A Warning Is Issued



Scenario: While at work, you receive a notification on your cell phone that a **tornado warning** has been issued for your area.

Move indoors and away from windows. Even straight-line winds or large hail from a severe thunderstorm can cause damage. Be aware of the situation around you.



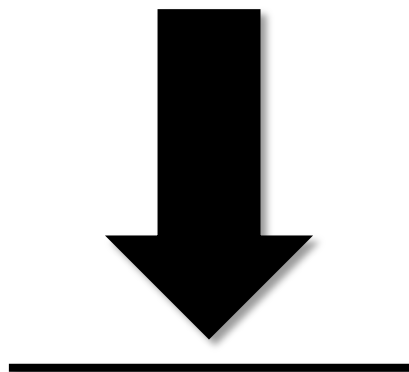
Put your severe weather safety plan into action. Notify other coworkers of the threat so that everyone can take the necessary actions to stay safe until the storm has passed.

Tornado warnings contain info that list cities in the path of the storm. While the NWS strives to provide detailed info, every city may not be directly listed in a warning. Because of radar limitations, time and locations listed in warnings are subject to minor errors. Allow yourself plenty of time to get to your safe place.

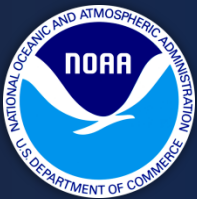
THE NATIONAL WEATHER SERVICE  
IN WILMINGTON HAS ISSUED A

\* TORNADO WARNING FOR...  
FRANKLIN COUNTY IN CENTRAL  
OHIO...

\* LOCATIONS IMPACTED INCLUDE...  
COLUMBUS...GAHANNA AND OBETZ.



Stay in your tornado shelter or interior room until the storm has passed or the tornado warning has been cancelled or expired.



# Have A Plan of Action



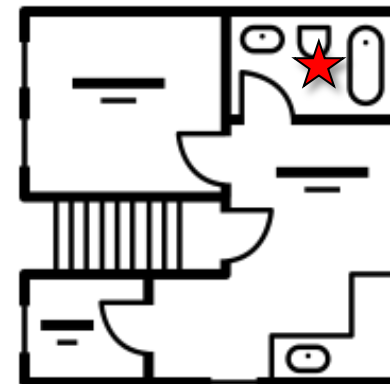
## DISASTER KIT

Have a disaster supply kit in your office where everyone knows its location!



## SAFE PLACE MARKER

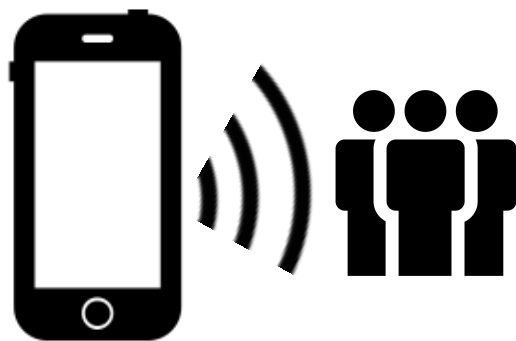
Have a clearly-defined and well-known safe place in your office. Have this displayed in your office.



★ Office Tornado Shelter

## COMMUNICATION PLAN

Notify your coworkers of the weather situation as quickly as possible! Practice tornado drills on a routine basis.



If on the road on a routine basis, know your location in relation to the nearest sturdy structure!



**ALWAYS HAVE AT LEAST 3 WAYS TO RECEIVE CRUCIAL WARNING INFORMATION!**

Remember – some communities and agencies have systems which allow you to sign up for notifications.





# Have A Plan of Action



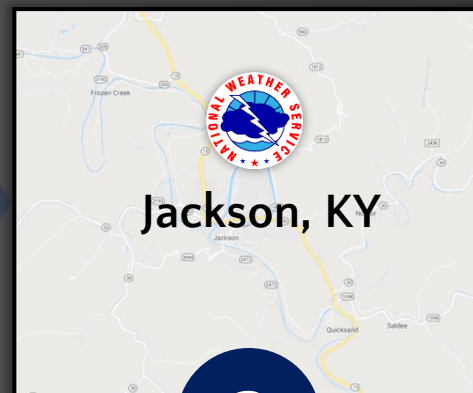
What happens if the National Weather Service in Wilmington, OH issues a tornado warning that includes the very office in which the warning was issued from?



1



2



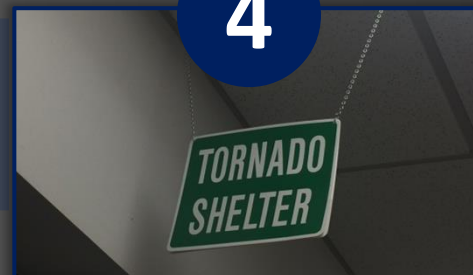
3



5



4





# Preparedness. Saves. Lives.



## Lessons From March 2, 2012

1:05 PM EST

SPC Issues A Tornado Watch

3:04 PM EST

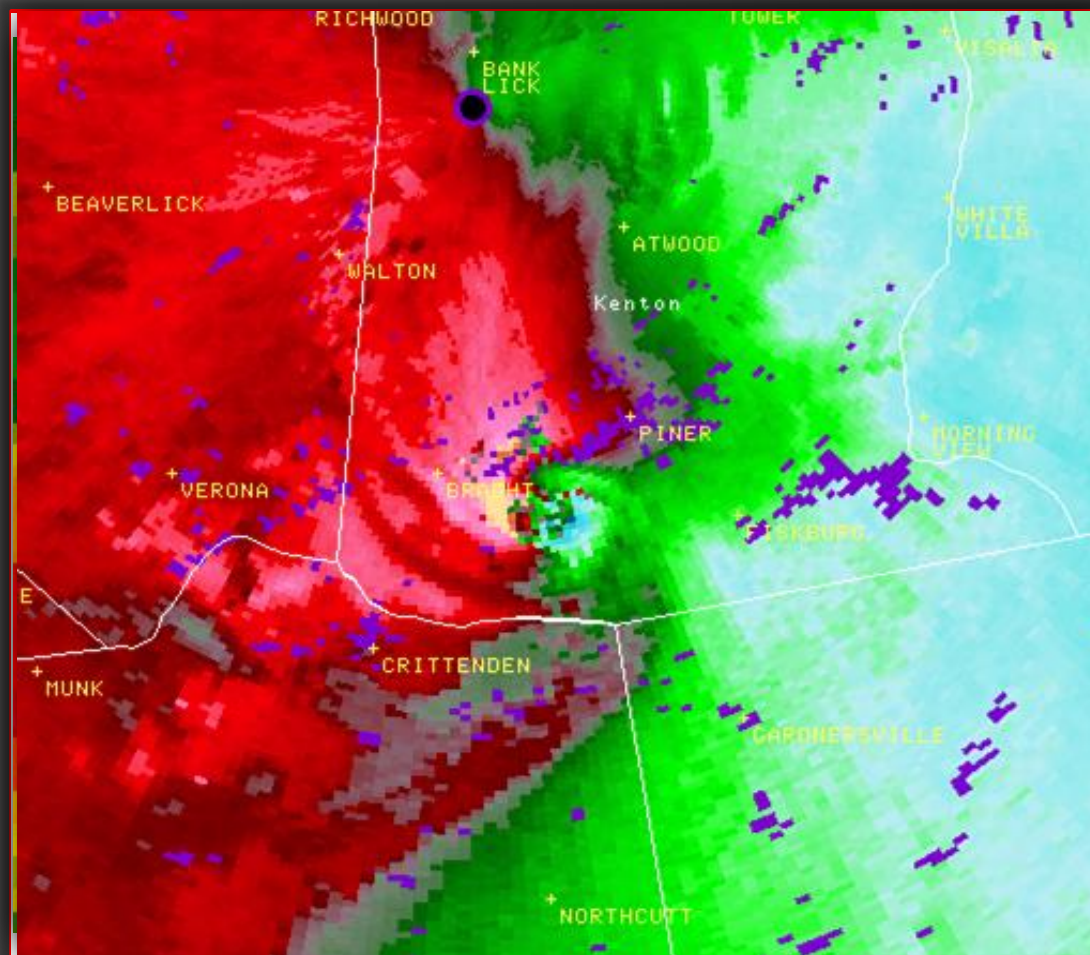
NWS Wilmington, OH issues a  
Special Weather Statement

4:03 PM EST

NWS Wilmington, OH issues a  
Tornado Warning for Piner and  
North Crittenden for northern  
Kentucky.

4:30 PM EST

A tornado touches down near  
I-75



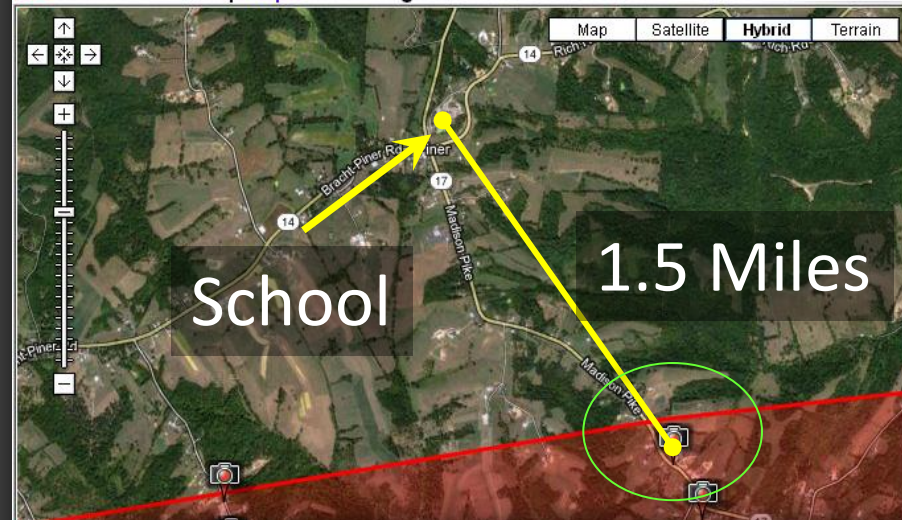


# Preparedness. Saves. Lives.



**Tornado Track Map - Plotted Tracks are Preliminary and Approximate**

Red -- Tornado Track | Purple -- EF4 Segment of Track



Officials at Piner Elementary maintained their weather-awareness during the afternoon hours.

Officials decided to shelter students rather than release them on buses and allow them to leave the school.

This decision helped keep children and drivers out of harm's way.

**Their preparedness saved lives.**







# On The Road...



***Scenario:** While outside or on the road as part of your workplace duties, you hear that there is a threat for severe storms in your area.*

## TRUTH

- Never seek shelter in an uncovered vehicle.
- Fortunately being caught unprotected by hazardous weather can be avoided most of the time by being **ALERT** to the possibility of severe storms and tornadoes.
- **All types of vehicles** can be blown over, rolled, crushed, lifted or otherwise destroyed by even a weak tornado.

Consider delaying your trip if severe thunderstorms are in the area or along your path of travel

1

Monitor radio, NOAA weather radio, and internet from a mobile device for storm location information.

2

Be familiar with the area where you're traveling. Keep a map handy, one that includes the county names and boundaries. NWS severe weather warnings are issued based on counties. If you do not know what county you're in you could miss life-saving information!

3

If you're in your car, find a station broadcasting weather info. Some stations will interrupt programming to broadcast warnings. Search for a station with local weather info and listen for details.

4

If the tornado is far enough away and road options and traffic allow, you should try to find a substantial building for shelter. Follow the basic tornado safety guidelines (get in - get down - cover up). Motorists have found truck stops, convenience stores, restaurants, etc. to be adequate shelters in a tornado situation.

5



# In The Great Outdoors...



Scenario: While outside at a park or on-the-job, you hear thunder in the distance and notice darker clouds moving towards you.

## TRUTH:

Outdoor open-walled structures such as gazebos, tents, or picnic structures offer **NO** protection from lightning!

Additionally, **NEVER** hide under a tree during a thunderstorm. Lightning tends to strike the tallest objects. If a tree is struck, the electric current can travel through the nearby ground, putting you in harm's way.

1

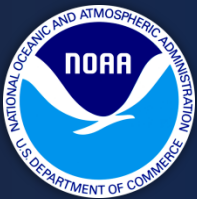
Always find a hard-topped, enclosed metal vehicle as quickly as possible. Golf carts, bicycles and motorcycles offer no protection from lightning! Know where the closest sturdy structure is located!

2

If your job takes you outdoors as part of your regular duties, make sure you have a plan in place to take shelter at the first sign of an impending storm. Knowing where to go and how to get there quickly may save your life!

3

Stay inside a sturdy structure for at least 30 minutes after the last clap of thunder. Lightning can strike many miles away from the thunderstorm core! Just because it isn't raining doesn't mean lightning can't strike.



# In The Great Outdoors...



It's important to remember that the National Weather Service does NOT issue watches or warnings for lightning...



**When Thunder Roars, Go Indoors!**

**STOP all activities.**

Seek shelter in a substantial building or hard-topped vehicle.

Wait 30 minutes after the storm to resume activities.

 [www.lightningsafety.noaa.gov](http://www.lightningsafety.noaa.gov) 

Lightning is one of the leading causes of hazardous weather related deaths in the U.S.

The safest place place is a home/business (due to plumbing and electrical structure)

An automobile is next safest place!

**You have little to no protection if outdoors!**





# True or False



**FALSE**

If in the path of a tornado, you can outrun it in your vehicle.

You may, in some situations, be able to get out of the tornado's way by driving out of its path, or simply stopping and allowing the tornado to pass. Again, this can be extremely dangerous unless traffic, time of day and road options allow you to see the tornado, determine which way it's moving (and how fast), find a road option that will take you out of its path (while avoiding other storms) and to safe shelter.

**TRUE**

If in the path of a tornado, leaving your car and taking cover in a ditch or culvert can be used as a “last resort” option.

The worst-case scenario for motorists would be to be trapped in your vehicle on the road with no escape possible. This scenario could occur in more densely populated areas, in metropolitan areas at rush-hour or in high traffic situations, or on limited access roadways, such as interstates or turnpikes, where it might not be possible to quickly exit and find safe shelter. It is in these situations when it may become necessary to leave your vehicle and seek shelter in a ditch, culvert or low spot.

**FALSE**

If water covers a roadway and the water is not moving rapidly, it is likely passable.

Just because the water isn't moving rapidly doesn't mean your vehicle cannot become stranded. You may not know how deep the water is. Traveling through standing or even gently-moving water may result in your car being lifted (due to floating). Even a small current in the water can then carry your vehicle, leaving you without control of the situation. Remember – turn around, don't drown!

**FALSE**

If encountering large hail, strong winds, or torrential rain, take cover under an underpass to stay safe.

Highway underpasses offer NO protection from flying debris. Additionally, you may be promoting a traffic jam and/or crash by stopping suddenly on the highway. Winds channeling through a constrained area (such as underneath an underpass) can actually go faster. Additionally, runoff from heavy rain may collect in low-lying areas such as those under an underpass. Do not get caught under an underpass!



# Situation Quiz

## (1)



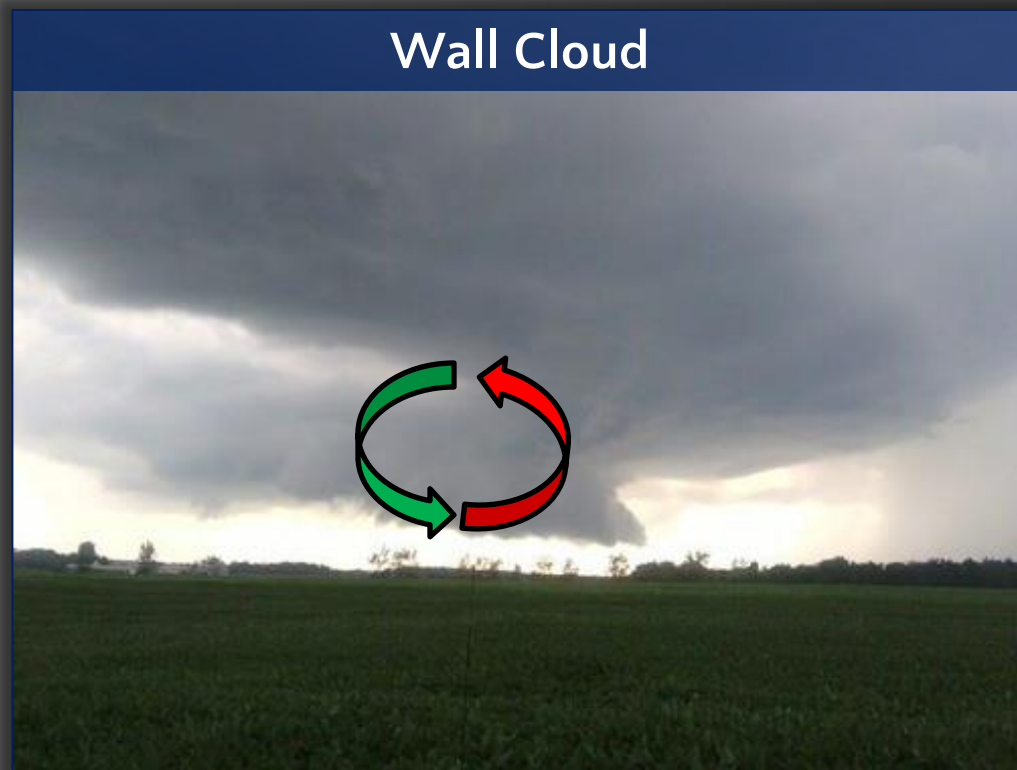
You are working outside and you see this type of cloud nearby and notice that it is rotating. What is the best course of action?

**A** Drive as far away from it as possible and seek shelter in a sturdy building until the storm passes.

**B** Stay in your car but wait in place for the storm to move away from you.

**C** Call the NWS and report that you see rotation in a cloud.

**D** Try to get closer to take better pictures.



Best answers: **A** and **C**.



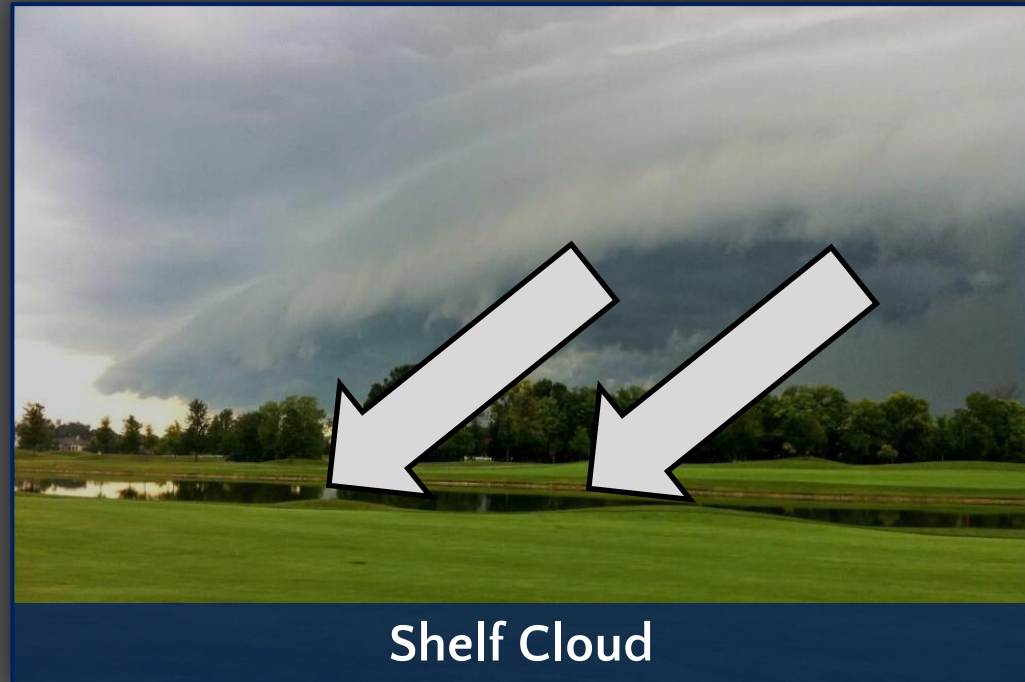
# Situation Quiz

## (2)



You are working outside and you see this type of cloud nearby and notice it is moving toward you. What is the best course of action?

- A** Seek shelter in a vehicle or sturdy building.
- B** Try to get closer to get a better picture.
- C** Call the NWS and report a “funny looking cloud.”
- D** Try to get as low as possible, either in a nearby ditch or under a car.



Shelf Cloud

Best answer: **A**



# Situation Quiz

## (3)



You are in a warehouse with large open spaces (like a gymnasium). The warehouse has no windows and is itself a sturdy structure. A severe thunderstorm (with possible tornado) is moving through your area. What should you do?

**A**

Move toward the middle of the open space and away from the walls.

**B**

Continue about your business as if no storm was moving through.

**C**

Seek shelter in a nearby bathroom or small room.

**D**

Crouch down and shield your head with your hands until the storm has passed.



Best answer: **C**





# Situation Quiz

## (4)



You are in your safe place during a severe thunderstorm. The power is out and it appears the storm has ended. What should you do?

- A** Wait for the all-clear from NOAA Weather Radio. Keep listening to stay updated about storms.
- B** Contact your family and loved ones to let them know you're okay.
- C** Try to assess for any potential damage, being mindful of potential hazards like downed powerlines or broken glass.
- D** Help the people around you if they have been affected by the storm.



Best answer: **All of the Above**



# Reporting Damage Back To The NWS



★ Phone – 1-800-899-2748

★ Amateur Radio

Social Media –



Email – [spotreport.iln@noaa.gov](mailto:spotreport.iln@noaa.gov)

- Use social media/email for pictures of damage, cloud features

**Urgent reports should always be communicated via  
first two methods!**

# Thank You For Attending!

## Any Questions?



NOAA / NWS Wilmington, Ohio  
Weather Forecast Office

Remember that being prepared may save a life.  
And that life may be yours.