National Oceanic and Atmospheric Administration (NOAA)
National Weather Service (NWS)

Presents

Severe Weather Observer and Safety Training 2005

Severe Weather Spotter Line
1-888-668-3344

Spotter Reports E-mail:
www.crh.noaa.gov/espotter

Homepage Address:
www.crh.noaa.gov/iwx
Goals of the Training

You will learn:

• Definitions of important weather terms and severe weather criteria

• How thunderstorms develop and why some become severe

• How to correctly identify cloud features that may or may not be associated with severe weather

• What information the observer is to report and how to report it

• Ways to receive weather information before and during severe weather events

• Observer Safety!
WFO Northern Indiana (WFO IWX)
County Warning and Forecast Area (CWFA)

Work with public, state and local officials

Dedicated team of highly trained professionals

24 hours a day/7 days a week

Prepare forecasts and warnings for 2.3 million people in 37 counties
SKYWARN (Severe Weather) Observers

Why Are You Critical to NWS Operations?

- Help overcome Doppler Radar limitations
- Provide ground truth which can be correlated with radar signatures *prior to, during, and after* severe weather
- Ground truth reports in warnings heighten public awareness and allow us to have confidence in our warning decisions
SKYWARN (Severe Weather) Observers

Why Are You Critical to NWS Operations?

• The NWS receives hundreds of reports of “False” or “Mis-Identified” funnel clouds and tornadoes each year.

• We strongly rely on the “2 out of 3” Rule before issuing a warning. Of the following, we like to have 2 out of 3 present before sending out a warning.
  
  – Atmospheric conditions that support severe weather
  
  – Radar signature/Indication
  
  – Reports from Trained Severe Weather Observers
**Fundamental Definitions**

- **Warning** - Issued when a particular severe weather hazard is either imminent or is occurring. Take immediate action to protect life and property.

- **Watch** - Issued when conditions are favorable for a particular severe weather hazard to occur in the next several hours. Plan, prepare, and be aware.
Tornado

A violent rotating column of air in contact with the ground, either pendant or underneath a cumuliform cloud.
Funnel Cloud

A violently rotating column of air that does not reach the ground. No circulation is seen on the surface.
Rotating Wall Cloud

An isolated lowering from a cumulonimbus cloud base. May resemble a pedestal.

- **Must be rotating** *(If it doesn’t spin, don’t call it in!)*
- **Often precede funnel cloud and tornado formation**
Shelf or Roll Clouds
Low level, *horizontal*, wedge shaped cloud occurring on leading edge of a thunderstorm. Wind, rain and hail may follow, but may not be severe.
Scud Clouds

Ragged edge clouds that *do not* rotate and are located below the main cloud base. May move “up and into” cloud below an updraft.
“Cold Air” Funnel Clouds

Funnel clouds that often form without the presence of a thunderstorm or rain. Usually do not reach the ground, but if they do, are brief and weak. F0 type damage.
What Makes a Thunderstorm Severe?

- Tornado
- Winds at least 58 mph or reports of damage
- Hail at least ¾ inch in diameter
- Flash Flooding

North Webster, IN
October 24, 2001

Peru, IN July 15, 2003

Aurora, NE
June 22, 2003
Reporting Criteria
1-888-668-3344 or crh.noaa.gov/espottter

• Tornado

• Funnel Clouds and Wall Clouds

• Flooding or Rapidly Rising Water
  – Water unusually high or flowing faster than normal
  – Water approaching bankfull or nearing roads/structures
  – Inch or more of rainfall observed in a “short duration”

• Strong or Damaging Winds

• Hail (any size)

Spotter Tip: Don’t assume that the NWS already knows it’s happening!
Anytime you experience weather on this list, report it immediately!
When You Report  
(4 W’s - Who What When Where)

- Identify yourself as a trained spotter
- Describe **severe weather** feature
- Provide exact time weather feature was spotted.  
  - This may or may not be the current time of your call.
- Be as specific as possible with location  
  - Reference *distance and direction from nearest city*
  - *Use major highways/roads (intersection of...)*

**Continue to monitor and report!**
When You Report
(3 C’s – Clear, Calm and Concise)

Spotter Tip: Stay calm, speak clearly and be concise with a report
Brief Review…

• Which of the following does *not* meet severe criteria?

  A. Wind gust of 58 mph
  B. Frequent lightning…striking buildings
  C. Hail ¾ of an inch in diameter
  D. A and C

Answer

  B. While lightning is deadly, it occurs with all thunderstorms and is not defined as “severe”.
• What size hail should be reported by weather observers?

A. Any size
B. 1/2" diameter size
C. 3/4" diameter size
D. Only the big ones

Answer
A. Any size
Thousands of funnel cloud reports are received each year, but we only average 9 tornadoes per year!

We may not issue warnings on all funnel cloud reports!
April 11, 1965 Palm Sunday Outbreak – 40 Years Later

51 Tornadoes 256 Deaths
In IWX current CWA

* 10 Tornadoes 133 Deaths *
Palm Sunday 1965

U.S. 33 Near Dunlap in Elkhart County, Indiana
Tornado Percentages by Fujita Scale Classification

Percent of All Tornadoes by Fujita Scale Classification

- 88% Weak (F0-F1)
- 11% Strong (F2-F3)
- <1% Violent (F4-F5)

Percent of Tornado Related Deaths by Fujita Scale Classification

- 70% Weak (F0-F1)
- 30% Strong (F2-F3)
- <5% Violent (F4-F5)

Weak - <110 mph winds
Strong - 110-205 mph winds
Violent - >205 mph winds
Thunderstorm Development and Storm Types
Clues to Thunderstorm Development

• **Moisture**
  - Hazy, humid days, monitor dew points (60s and 70s)
  - Low clouds in the morning

• **Instability** (Will the air rise)
  - Once cumulus clouds show up...look for rapid growth/development

• **Trigger or focusing mechanism**
  - Fronts, lake breezes, Outflow Boundaries from other thunderstorms
  - Afternoon heating

• **Shear**
  - Wind shifts/Strong winds
  - Clouds at different levels moving different directions

**Spotter Tip:** Monitor conditions during the day. Many times, a combination of dew points in the 70s, temperatures above 80, strong south or southwest winds and an approaching front will lead to severe weather.
Simple Thunderstorm Life Cycle
*Weak shear, limited moisture*

**Developing Stage**
- Tall Cumulus from Clear Skies
- Little or no rain initially
- Lightning begins as ice develops

**Mature Stage**
- Hail, heavy rain, frequent lightning, strong winds, and isolated tornadoes

**Dissipating Stage**
- Rainfall decreases in intensity
- Downburst of strong winds
- Lightning remains a danger
Simple Thunderstorm Life Cycle

Weak shear, limited moisture

Nearly Vertical
Updraft/Downdraft
Multiple Cell Storms - Linear (Squall Line)

**Radar Schematic**
Multiple Cell Storms - Linear (Squall Line)
Strong speed shear, little directional shear, abundant moisture

Damaging Winds on Leading Edge

Storm-Relative Wind Vectors

Strong/Severe winds, heavy rain, hail and isolated tornadoes
Arcus/Roll/Shelf Cloud
Moves out ahead of storm. Leading edge of squall line.  
Strong winds, rain and hail immediately behind. 
Does not always indicate severe weather
Favorable area for tornadoes are near the leading edge of the “bookend”
Actual Tornado Tracks from 10/24/01 Squall Line

October 24, 2001

F0: 0
F1: 5
F2: 3
F3: 2
F4: 0
Unknown: 0
Total: 10
Downburst Life Cycle

FORMATION - Evaporation and precip. drag forms downdraft

IMPACT - Downdraft quickly accelerates and strikes ground

DISSIPATION - Downburst moves away from point of impact
Multiple Cell Storms - Linear (Squall Line)

*Primary Hazard - Straight-line Winds*

- Straight-line winds - Winds that *do not* indicate rotation or exhibit a large scale rotational pattern in damaged areas
  - *Small scale “twisting” can occur when trees or poles are blown over*
  - *Winds can be in excess of 100 mph*
  - *Damage can be more substantial than that of weak tornadoes*
Multiple Cell Storms - Linear (Squall Line)

Primary Hazard - Straight-line Winds

Photo courtesy Kim Hart, Berne Tri-Weekly News.
Wind Reporting Criteria

Reference handout on estimating wind speed

• 25-31 MPH - Large branches moving. Whistling heard in wires.
• 32-38 MPH - Whole trees moving. Difficult walking against wind.
• 39-46 MPH - Small branches (twigs) break. Impedes walking.

REPORT THE FOLLOWING IMMEDIATELY!

• 47-54 MPH - Slight structural damage. Large branches may break.
• 55-63 MPH - Moderate structural and tree damage.
• 64 MPH and higher - Heavy to severe structural and tree damage.

Spotter Tip: Measure wind speeds when possible. Difficult to estimate correctly! Hand held anemometer is better than “guessing”. Severe winds will bring down trees and power lines.
Wind Safety Tips

- Stay away from windows and go to lowest floor
  - *Straight-line winds can exceed 100 mph and be more deadly than a weak tornado!*

- Keep a firm grip on your vehicle’s steering wheel
  - *Wind speed and direction can change rapidly in a microburst*

- Turn your vehicle so you face the wind
  - *Vehicles are streamlined and designed for strong headwinds*

- Be prepared for sudden changes in visibility
  - *Heavy rain, blowing dust or debris may accompany downbursts*
Multiple Cell Storms - Linear (Squall Line)

Summary

- Roll or shelf cloud near updraft/downdraft interface and will usually *precede* severe weather
- Heavy rain, wind and hail will immediately follow
- Tornadoes may occur on leading edge, especially near the northern “bookend vortex”
- Downburst winds possible with the heavy rain
Supercell Thunderstorms
Cumulonimbus (Cb) with Strong wind shear and rotation
Strong Tilted Updraft in Our Area
With Mammatus – May not necessarily be severe

Wind Speed/Direction Example

40,000 ft
Northwest Wind 100 mph

20,000 ft
West Wind 80 mph

10,000 ft
Southwest Wind 60 mph

5,000 ft
South Wind 50 mph

Surface
Southeast Wind 20 mph

Mammatus
Classic Supercell
A thunderstorm with a persistent and rotating updraft

Top View - Schematic
Location with respect to storm is important!
Position #1 – Looking South

Several miles away
Position #1a – Looking South

Within a few miles

Spotter Tip: Rain and hail will likely cause poor visibility. Never “punch the core”, you may find yourself right in the path of a tornado!
Position #2 – Looking Northeast
Spotter Tip: Supercells with tornadoes often move to the right of their original path. Position 3 is one of the most dangerous locations!
Position #4 – Inside “The Bear’s Cage”
Avoid this location. It is the most dangerous!

Fort Wayne Indiana, May 26th, 2001
Supercell Thunderstorms

Top View – Radar Perspective – KIWX WSR-88D

April 9th, 2001 – Softball size hail but no Tornadoes!
Observing Upper Level Storm Clues

Viewed 30-40 miles from the storm

• Overshooting Top
  – *Dome-like bubble of cloud extending above anvil and persisting for >10 minutes*
  – *Indicates strong updraft*

• Anvil Characteristics
  – *Thick, cumuliform anvil with sharp, well-defined edges*
  – “Bubbling” look
Spotter Tip: Typically, the larger the overshooting top, the higher the probability for severe weather. You might report that a distant Cb has a pronounced overshooting top.
Anvil – Overshooting Top
Cumuliform Texture

Developing Overshooting Top

Updraft

Indiana Cb with developing overshooting top.
Anvil – Thin/Fuzzy/Glaciated
*(Decaying storm or weak updraft)*
Observing Mid Level Storm Clues

Viewed 10-20 miles from the storm

• Main Storm Tower - Updraft
  – Solid appearance with cauliflower texture
  – May be tilted, indicating strong shear

• Flanking Line
  – Row of towering cumulus stair-stepping up to main storm tower

• Surrounding Clouds Dissipating
  – Nearby clouds and other storms may dissipate while main storm dominates
  – All available energy will go to main storm tower
Mid Level Storm Clues
Strong Updraft Tower and Flanking Line
Mid Level Storm Clues
Strong Updraft Tower 10-20 miles away
Weak Updraft Towers
Observing Low Level Storm Clues

Viewed within 10 miles of storm

- **Wind Clues** – We have already discussed these
  - *Shelf Cloud (a.k.a. Roll Cloud or Arcus Cloud)*
  - *Downburst*
- **Hail Clues**
  - *White hail shaft*
  - *Greenish tint to sky*
- **Tornadoes**
  - *Rain-Free Base (Low, flat cloud base with little visible precipitation falling and updraft towers above)*
  - *Wall Cloud (Isolated lowering of rain-free base, rotating, and usually near the north side of the updraft)*
Clues to Identifying Hail Producing Storms

Severe hail is ¾” diameter or larger

- Look for
  - White hail shaft
  - Greenish tint to sky
Clues to Identifying Hail Producing Storms

*Bright White “Columns” are a good Indication of Hail*

Looking north around 6:00 pm during mid-summer
This thunderstorm produced half inch diameter hail
Softball Size Hail
Whitley and Steuben Counties - 1998

The stronger the updraft, the larger the hailstones can grow.
Do Not Report

“Marble Size Hail”
or
“Dime Size Hail”
Measure the hail if possible…

Spotter Tip: Measure the diameter of the largest stone... not the circumference
Hail Safety Tips

• Remain in your vehicle whenever possible, it will provide some protection from hail smaller than golf ball size

• Get under a substantial structure but remember…

• Underpasses provide no protection from tornadoes!

**Spotter Tip:** Be careful if you do try to measure the hail! Remember, Dime size hail is just under 3/4 of an inch while Penny size hail is just over 3/4 of an inch.
Let’s take a closer look at tornadoes, funnel clouds and wall clouds.
Shelf Clouds vs. Wall Clouds

What Is The Difference?

**Shelf Clouds**

- Suggest downdraft/outflow
- Move away from precipitation areas and usually on the leading edge of a thunderstorm
- Horizontally orientated and can extend for miles. May “roll” like a rolling pin.

**Wall Clouds**

- Suggest updraft/inflow
- Maintain position with respect to precipitation, often on back side
- Isolated, vertically orientated, and rotating, like a spinning skater
Rain-Free Base – Wall Cloud Formation

Flanking line of towering cumulus

Rotating Updraft

Downdraft/Rain
Rain-Free Base – Wall Cloud Formation

Rotating/Tilted Updraft

Downdraft/Rain
Our Encounter with an F4
Van Wert County Tornado Video
Richey and Zook roads, just southwest of the city of Van Wert.

Permission granted by Randy Baker
Van Wert County Tornado Video

Video speed has been increased to see rotation

Spotter Tip: If you are videotaping a cloud feature and are unsure if there is rotation, quickly stop taping, rewind, then watch your video as you fast forward!
Van Wert F4 Tornado
Van Wert Cinemas

Photos courtesy Paul Van Dyke
Van Wert F4 Tornado

Intersection of Zook and Dull-Robinson

Photos courtesy Paul Van Dyke
Video of F4 Van Wert Tornado Showing Transformers and Power Lines Being Destroyed

Permission granted by Randy Baker
Tornado Safety Tips

Cars Do Not Provide Protection

Photo courtesy Department of Natural Resources

Department of Natural Resources Vehicle
9/20/02 Monroe City, Knox County, IN Tornado

Photo courtesy Department of Natural Resources
Tornado Safety Tips

Underpasses **do not** provide protection from tornadoes. This event was an exception!! People have been killed beneath overpasses!
Tornado Safety Tips

• If in an open area, drive away from the approaching tornado if possible
  – THIS DOES NOT APPLY TO URBAN SPOTTERS, SPOTTERS IN LOW VISIBILITY AREAS, AND THE GENERAL PUBLIC!

• If you cannot avoid an oncoming tornado, seek shelter in a sturdy structure, away from windows, on lowest floor

• If a structure is not available, seek shelter in a ditch or other low lying area, possibly in a drainage pipe
  – Be aware of flooding or rising water
Remember, many clouds may look like tornadoes, funnel clouds and wall clouds...

Virga - Rain falls from clouds but evaporates before reaching ground. No rotation.
Remember, many clouds may look like tornadoes, funnel clouds and wall clouds...

Rain Shafts – Heavy rain several miles away that takes on a “funnel” or “wedge” appearance. No rotation.
Remember, many clouds may look like tornadoes, funnel clouds and wall clouds...

Smoke – Smoke plumes from fires and factories have been mistaken for tornadoes. *No rotation!*
Remember, many clouds may look like tornadoes, funnel clouds and wall clouds...

It may be difficult to determine sometimes! **No** rotation here!
To see more, visit the Non-Tornado Homepage at [www.spc.noaa.gov](http://www.spc.noaa.gov)
Trained Spotter Exam

You Make the Call!

You are looking northeast
Clouds are moving northeast
Rain is just beginning
Other Severe Weather Elements and Safety Tips
Flood/Flash Flooding
#1 Weather Related Killer in U.S.
140 fatalities annually

People do not respect the power of water!
Be especially cautious at night!
What is Flash Flooding?

- A rapid rise of water, usually near a stream, ditch or low lying area, caused by heavy rain from slow moving or “training” thunderstorms, dam failure or rapid snowmelt.

Flash Flooding may be observed as...

- Six inches or more of flowing water over roadways
- Roads/bridges washed out
- Forced evacuation of homes, businesses and autos
- Widespread flooding of structures with damage (This does not include usual basement flooding)
- When rushing water puts people’s lives in immediate danger
Flood/Flash Flooding

July, 2003 - Decatur IN and Willshire OH
Flood/Flash Flooding
How to Observe and Report

- Watch for extended periods of heavy rainfall from slow moving thunderstorms or thunderstorms “training” over the same locations.

- 1 to 3 hours of heavy rainfall during a thunderstorm may result in flash flooding.

- Heavy rainfall usually when 1 or more inches of rain occur in less than an hour.

- Be alert for rapidly rising water, water flowing across roads and water beginning to affect buildings.

Report water as it begins to rise and before it starts to impact people’s lives!
Flood/Flash Flood Safety

Never Drive into Flooded Areas,
It may be deeper than you think!!
Flash Flood Safety Tips

- Do not drive across any low-water crossing
- If your vehicle stalls in high water, leave it and seek higher ground immediately
- Be especially careful at night when flash flooding is more difficult to recognize
Flash Flooding Question

- Which of the following meet flash flood criteria?
  - A. Six inches or more of flowing water over roadways
  - B. Floating Sheds
  - C. Widespread flooding of structures with damage
  - D. A and C

Answer
D. A and C
Lightning Kills!

But it does not make a thunderstorm “Severe”
Lightning Safety Tips

Lightning tends to strike the tallest object in an area… make sure it’s not you!

• Remain in your vehicle whenever possible
• If you must go outside, crouch down to make yourself a poor lightning target and stay away from trees, telephone poles, and other tall objects
• Avoid contact with telephones, radios, or other electrical appliances when possible
• Additional safety tips on NWS lightning safety website at http://www.lightningsafety.noaa.gov
How to Be Prepared Before Severe Weather Begins
Spotter Awareness/Activation

What to look and listen for

• Hazardous Weather Outlook
  – *Issued 5:00 – 6:00 A.M. EST daily, updated as necessary*
  – *Today and tonight hazards. Day 2 through day 7 potential hazards*
    – “Spotter information statement” with details of when spotter activation may be needed.

• Tornado/Severe Thunderstorm Watch
• Tornado/Severe Thunderstorm Warning
• Utilize NWR, Internet, and local Media sources to stay informed
• [www.crh.noaa.gov/iwx](http://www.crh.noaa.gov/iwx) or [weather.gov](http://www.weather.gov)
**NWS on the Internet**

*weather.gov*

- Digital Weather Grids, Warning Maps, Radar and Satellite
  - *Detailed forecasts out to 7 days, includes hourly data*
  - *See what time we think thunderstorms will develop and end*
  - *Map of our area with current watches and warnings*
NOAA All-Hazards Weather Radio
Protecting You Day and Night!

• Voice of the National Weather Service, Homeland Security and Emergency Management

• All-Hazards Weather Radio can be heard by about 97% of the U.S. population

• 24/7 Broadcasts of Routine and Emergency information:
  – NWS Warnings/Watches/Forecasts/Observations
  – Terror Alerts and Warnings from Homeland Security
  – Emergency Messages/Evacuation information from local Emergency Management Agencies

• For more information, visit the NOAA All-Hazards Weather Radio Web Site at weather.gov
NOAA All-Hazards Radio Coverage Areas

Visit weather.gov for radio locations in your area

Fort Wayne
WXJ-58, 162.550 Mhz

Marion
WXM-98, 162.450 Mhz

South Bend
WXJ-57, 162.400 Mhz

Angola
WXI-94, 162.425 Mhz

North Webster
WWG-45, 162.500 Mhz

Oshtemo
WWF-34, 162.475 Mhz

Onondaga
WXK-81, 162.400 Mhz

Toledo
WXL-51, 162.550 Mhz

Lima
WXJ-93, 162.400 Mhz

Monticello
WXK-74, 162.475 Mhz
Remember…
We Want To Hear From You When…

• Tornado, Funnel Cloud or Wall Cloud is observed
  – *Must be Rotating*

• Flooding or Rapidly Rising Water
  – *Water unusually high or flowing faster than normal*
  – *Water approaching bankfull or nearing roads/structures*
  – *Inch or more of rainfall observed in a “short duration”*
  – *Any flooding is observed!*

• Strong or Damaging Winds

• Hail (any size)

*Don’t Assume that we already know it’s Happening!*
Observing Rules to Remember…

“Investigative Spotting Rules Handout”

- Be prepared ahead of time
- Always begin observing and spotting with the assumption you will not see severe weather.
- Go through checklist on handout. Know this procedure.
- Utilize the 4 W’s and 3 C’s when reporting
- Continue to monitor and report
- Report early, often and to the end
Final Exam...

What cloud feature are you observing and what hazard would you expect

A. Wall Cloud – Potential Tornado
B. Scud Cloud - No hazard
C. Shelf Cloud - Wind
D. Funnel Cloud – Potential Tornado
What cloud feature are you observing and what hazard would you expect?

A. Wall Cloud – Potential Tornado
B. Scud Cloud - No hazard
C. Shelf Cloud - Wind
D. Funnel Cloud – Potential Tornado

Answer
B. Scud Cloud - No hazard
Call for Video and Photos

If you are in a SAFE location and have the chance to shoot video, please share it with us for inclusion in future presentations.

WFO IWX Contacts

Steve Eddy - Warning Coordination Meteorologist
Steven.Eddy@noaa.gov
574-834-1104 x726

Patrick Murphy - Amateur Radio Coordinator
Patrick.Murphy@noaa.gov
Congratulations!

You’re now a trained NWS Spotter. (Almost as smart as Homer!)
National Weather Service
Weather Observer Tips and Important Web Sites

Tips to Remember

Don’t assume the NWS already knows severe weather is happening! Anytime you experience severe weather, report it immediately and protect yourself!

Stay calm, speak clearly and be concise when reporting.

Monitor conditions during the day. Many times, a combination of dew points in the 70s, temperatures above 80, strong south or southwest winds and an approaching front will lead to severe weather.

Measure wind speeds when possible. Difficult to estimate correctly! Hand held anemometer is better than “guessing”. Severe winds will bring down trees and power lines.

Rain and hail will likely cause poor visibility. Never “punch the core”, you may find yourself right in the path of a tornado!

Supercell’s with tornadoes often move to the right of their original path. Remember, southeast of a supercell is one of the most dangerous locations!

Typically, the larger the overshooting top, the higher the probability for severe weather. You might report that a distant Cb has a pronounced overshooting top.

Measure the diameter of the largest hail stone… not the circumference.

Be careful if you do try to measure hail! Remember, Dime size hail is just under 3/4 of an inch while Penny size hail is just over 3/4 of an inch.

If you are videotaping a cloud feature and are unsure if there is rotation, quickly stop taping, rewind, then watch your video as you fast forward!

Weather observing and severe thunderstorm chasing can be dangerous. Stay out of the path of storms and do not put yourself in harms way!

Important Web Sites

http://www.noaa.gov – National Oceanic and Atmospheric Administration (NOAA)
http://www.crh.noaa.gov/iwx - Northern Indiana NOAA NWS
http://weather.gov/nwr/ - NOAA NWS All-Hazards Weather Radio
http://www.lightningsafety.noaa.gov – Lightning Information
http://www.spc.noaa.gov – Storm Prediction Center
http://www.crh.noaa.gov/spotter - Spotter Reports Email
http://www.imoskywarn.org – Indiana, Michigan, Ohio Skywarn
Fun and Interesting Weather/Science Web Sites

National Weather Service and Other Government Sites

Northern Indiana Office – http://www.crh.noaa.gov/iwx
NWS Outreach and Educational Links – http://www.weather.gov/education.html
NWS Weather Glossary - http://www.crh.noaa.gov/dtx/?page=glossary
NWS Satellite Page - http://www.goes.noaa.gov/
NWS Radar Page - http://weather.noaa.gov/radar/
Storm Prediction Center – http://www.spc.noaa.gov
Hydrometeorological Prediction Center (lots of weather maps) – http://www.hpc.ncep.noaa.gov/

Weather and Experiments for Kids

What’s the Weather - www.galaxy.net/~k12/weather/index.shtml
Web Weather for Kids - http://www.ucar.edu/40th/webweather/
New Web Weather for Kids - http://www.ucar.edu/educ_outreach/webweather/
Science Central in Fort Wayne, Indiana - http://www.sciencetentral.org/
Reeko’s Mad Scientist World - http://www.spartechsoftware.com/reeko/
For Kids Only at NASA - http://kids.earth.nasa.gov/
Exploratorium Museum of Science - http://www.exploratorium.edu/

College Sites

College of Dupage Weather Page - http://weather.cod.edu/
Ohio State University Weather Experiments - http://www.osu.edu/Weather/weatherlist.htm
Arizona State University Experiments - http://chainreaction.asu.edu/weather/trythis/
Plymouth State Weather Page - http://vortex.plymouth.edu/
Penn State Weather Pages - http://www.ems.psu.edu/wx/
Michigan University Weather - http://cirrus.spri.umich.edu/wxnet/
University of Illinois Weather - http://www.atmos.uiuc.edu/
Space Science and Engineering Wisconsin University - http://www.ssec.wisc.edu/
Valparaiso University Storm Chasing - http://www.valpo.edu/student/vusit/
Ball State University Weather - http://www.bsu.edu/geog/wx/98wxfcst.html
Indiana Climate Purdue University - http://shadow.agry.purdue.edu/sc.index.html
SEVERE THUNDERSTORM REPORTING CRITERIA

NWS Northern Indiana

Please report the following IMMEDIATELY to the NWS at:

1-888-668-3344

Tornadoes – A violently rotating column of air touching the ground
Funnel clouds – watch for rotation, usually about a vertical axis !!
Wall clouds – watch for rotation and persistence (about 5 minutes)
Flooding – water rising rapidly, flowing over roads, flooding buildings
Wind damage – large healthy limbs, structural damage, trees uprooted
Hail – all hail, any size

NWS Warning Criteria

Tornadoes; Hail ¾ inch or larger (penny size);
Damaging winds (in excess of 57 mph); and severe Flooding

Estimating Wind Speed

25-31 mph Large tree branches moving. Wires whistle.
32-38 mph Whole trees moving. Inconvenience walk into the wind.
39-46 mph Small branches or twigs break off. Impedes walking.
47-54 mph Slight structural damage (shingles blown off). Large branches break off.
55-63 mph Structural damage (parts of roofs blown off). Trees snapped off.

NWS Northern Indiana e-mail address -
http://www.crh.noaa.gov/espotter

NWS Northern Indiana homepage address -
http://www.crh.noaa.gov/iwx
Investigative Spotting Rules

1. Be prepared! Be aware of the potential or expected weather for the time period during which you will spotting.
   Ways to do this include:
   a. Read latest Hazardous Weather Outlook (tells you what type severe weather is expected and if spotter activation is expected) (www.crh.noaa.gov/iwx/)
   b. Read SPC’s latest discussions (www.spc.noaa.gov)
   c. Read forecast discussions (gives science behind forecast)
   d. Reference various weather sources (even days in advance) for all the info you can glean...examples local weather reports, weather channel, etc.
   e. Have your equipment ready – example - batteries charged for your equipment and spares available, vehicle fueled, maps in vehicle, spotter partner lined up if planning to chase, UPS operating if at home, etc.

2. ALWAYS begin with the assumption that you will not see any formations that are reportable. When you come across a suspicious cloud formation, assume it is scud or a shelf/roll cloud until you complete the following checklist.
   REMEMBER – climatology says there will be about 1 tornado in your county every 3 years – therefore odds are you WILL NOT see one!!!! Many professional chasers have never seen a tornado even though they have been chasing for years!!

3. Checklist:
   a. Are you in a favorable location? (southwest corner of a Supercell or southeast corner of a High Precipitation (HP) Supercell)
   b. Are you in an inflow area? (wind to your back as you look north at the feature)
   c. Is the cloud feature attached to the base of the parent thunderstorm?
   d. Is the cloud feature rotating? (Spinning like a figure skater or a toy top, normally from left to right. NOT up and down like a rolling pin)
   e. Is the rotating feature persistent? (continuing for several minutes)

4. If you answered yes to all of the above questions, call in your report immediately. Follow the 4 W’s of reporting (Who, What, When & Where) and the 3 C’s (Clear, Calm & Concise)

5. Continue to monitor and report until the feature dissipates

6. Report when the feature dissipates
NATIONAL WEATHER SERVICE
NORTHERN INDIANA
SPOTTER REGISTRATION FORM
PLEASE PRINT LEGIBLY

COUNTY: ____________ STATE (circle): IN MI OH

NAME: ____________________________________________
ADDRESS: _______________________________________
   Street: _________________________________________
   City: __________________ State, ZIP: _____________
   (If outside city limits)
   Direction and distance (miles) from nearest town within your county ______
ex. 3 N Anytown, 5 SE Townville

TELEPHONE INFORMATION
   Home: ________________ Hours the NWS can call this number: _______
   Work: ________________ Hours the NWS can call this number: _______
   Other (Pager/Cell): ________________ Hours the NWS can call this number: _______
   Other (Pager/Cell): ________________ Hours the NWS can call this number: _______

E-MAIL ADDRESS: ________________________________

AMATEUR RADIO OPERATOR? (Circle) Yes No If Yes, Call Sign: ____________

WEATHER EQUIPMENT? (Circle) Rain Gage Wind Recorder Thermometer
   Snowfall Stick Other: ______________________________

PLEASE RETURN TO: THE SPOTTER TEAM
   NATIONAL WEATHER SERVICE
   7506 E 850 N
   SYRACUSE, IN 46567