VAN WERT COUNTY WEATHER PLAN

STORM READY

HISTORY

In previous years, disaster preparedness was fragmented among different agencies at the federal level as well at the local level. While Civil Defense was administered at the Federal level by the Defense Department's Defense Civil Preparedness Agency, in Ohio local programs reported to the "Adjutant General's Department, Civil Defense Corps.

In 1979 President Carter's executive order merged many separate disaster related responsibilities at the Federal level into a new "Federal Emergency Management Agency" (FEMA). In Ohio, Chapter 5502 of the Ohio Revised Code established the Ohio Emergency Management Agency, and it interfaces with local and federal counterparts. It is also part of Ohio's Homeland Security program. The program has been moved from the "Adjutant General's Department" to the "Ohio Department of Public Safety."

In the beginning the main focus was on defense of the country from an attack by an enemy of the country. While the current program is also part of "Homeland Security" and still focus's on these concerns, it has also taken on the tasks of responding to, planning for, and recovering from and mitigating against disasters and emergencies whether natural or man made.

On September 16, 1950 (journal 27, Page 452) the Board of County Commissioners did in cooperation with the City of Van Wert appoint E. Howard Hughes and E.A. Dull as Civil Defense Directors of Van Wert County.

On January 20, 1954 (journal 28, Page 447) the City of Van Wert and the County of Van Wert entered into agreements that established a Van Wert County-Wide Civil Defense Organization and the Director A. Fredrick Redrup was appointed by the Mayor of Van Wert and the Van Wert County Commissioners. The office was established at the Park Hotel located at 223 South Washington Street Van Wert.

May 1955 (RACES) Radio Amateur Civil Emergency Service established in Van Wert County as provided for in the FCC rules and regulations. RACES and Amateur radio communications has been and continues to be a primary function of Civil Defense, Disaster Services, Emergency Management and Homeland Security at the Local, State and National level.

In 1956, the office was moved to the steel building located at 134/144 Brooks Avenue, known as the "Waterworks Park" The building was owned by the City of Van Wert and formerly used for veteran's housing. The office later moved to the "Good Building" located at 301 North Washington Street in Van Wert. In 1990 it moved again to its current location at 1220 Lincoln Highway on the Campus of the Marsh foundation.

On June 26, 1958 (journal 29, Page 578), Capt. Robert E. Shell of the Van Wert Fire Dept. was named as Director until his resignation on March 21, 1961.

On March 21, 1961 (journal 30, Page 564), Kenneth E. Kunze was appointed as Director. Upon his resignation, Mr. L.E. Eichar was appointed as Director until his resignation on February 28, 1963

On February 28, 1963 (journal 31, Page 297), Mr. Wilmur L. Clay was appointed Director until his resignation on March 28, 1963.

On April 1, 1963 (journal 31, Page 318), Isable Able was named to temporarily fill the vacancy of the Director's position. On Jan. 1, 1964 (journal 31, Page 492), Able was appointed as permanent Director until her resignation on March 10, 1978.

On June 27, 1967 (Journal 33, Page 48A), the County Wide Civil Defense Organization was Founded.

On May 13, 1975 (Journal 35, Page 539), the name was changed to the "Van Wert County Civil Defense/Disaster Services."

On April 4, 1978 (Journal 36, Page 564), Ronald C. Treon was named as Director until his resignation on October 2, 1978.

On October 16, 1978 (journal 37, Page 98), Paul Wyandt was named Director until his resignation on November 16, 1978.

On January 1, 1979 Ronald C. Treon was renamed Director until his resignation on October 31, 1980 to take over as Van Wert Police Chief.

On December 22, 1980 Dale Lautzenheiser was appointed Director until his retirement on October 26, 1990.

On November 15, 1988, the name of the organization was changed to "Van Wert County Emergency Management/Disaster Services Agency).

On October 3, 1989 revised County Resolution per House Bill 131 effective 06/29/88 stating local agency is governed by a 7 member Board of Directors instead of the previous 5 members per Ohio Revised Code 5915.06. The Agency shall be called the "Van Wert County Emergency Management Agency.

On October 15, 1990, Rick W. McCoy was appointed as Director.

On January 10, 2002, Van Wert County Certified as a " Storm Ready County".

On June 26, 2003 Van Wert County Commissioner Resolution changing the name of the agency to Van Wert County Office of Homeland Security & Emergency Management.

Weather has been an important part of the Disaster Service/Emergency Management program over the years. The general public is very weather oriented and the County has been affected by a number of notable events.

Initial weather statistics for Van Wert County began in 1892 and were reported to the U.S. Department of Agriculture, Weather Bureau. Then on September 1, 1924, a local weather enthusiast from Van Wert, Jack Weaver began recording weather data. His official records were recorded and filed with the US Weather Bureau and later the Ohio Weather COOP Program. The data also was recorded with the National Climatic Data Center. Mr. Weaver kept extensive recorded until December 31, 1983. These records are on file at the Van Wert County Office of Homeland Security and Emergency Management. On January 1, 1984 the Van Wert City Water Department took over data collection reporting it to the Ohio Weather Coop Program and the National Climatic Data Center. On May 1, 1991 EMA Director Rick McCoy began collecting weather data for the county and it is reported to the Ohio Weather Observer Network. AWS Weather stations and Davis Weather Stations have also been added to the Van Wert County program for the collection of data.

Storm Spotting has been critical in getting valuable weather information to the EMA Office, Media, National Weather Service and the general public. Spotter classes are held annually within the County. The Van Wert County Amateur Radio Club has been the backbone of EMA and weather spotting for many years. Local Fire, EMS and Law Enforcement also make up a large force of the area spotters. During severe weather events, these individuals are activated by the EMA office for real-time reporting.

Van Wert County ranks as the number 1 County in the State of Ohio and surrounding states for the number of tornadoes since 1990. There is speculation within the National Weather Service that when storms are generated, the combination of airmasses of warm, gulf air from the South and a cold front moving in from the west collides with wind currents coming down off of lake Michigan in the vicinity of Van Wert County which is fueling the storms to be severe and produce tornadoes.

National Events effecting Van Wert County include the "Flood of 1913", "Palm Sunday Tornado outbreak 1965", "Blizzard of 1978", "Veteran's Day Tornado outbreak 2002".

ACTIVATION

***The EMA Office and EOC have the Primary responsibility for the Warning system in Van Wert County.**
*** The Van Wert City Police Department has served as the 24 hour Warning Point for Van Wert County since 1978 to present.**

The following guidelines shall be followed upon receipt of any severe weather watches or warnings for Van Wert County.

WATCHES

1) The Van Wert County EMA shall determine if statements are needed and if activation is necessary for Winter Storms and Flooding.

2) Upon receipt of a Severe Thunderstorm or Tornado Watch issued by the Storm Prediction Center in Norman, Oklahoma:

a) The Van Wert City Police Dispatcher will activate the Van Wert County EMA informer system and pagers and broadcast the weather statement.

b) The Van Wert City Police Dispatcher will contact the EMA Director and confirm that he has received the Watch information so the EOC can be manned. In the event the Director is not available, the Dispatcher will call the next EMA official on the call list.

3) When the EOC is manned:

a) EMA shall issue a special weather statement over EMA Informers & Pagers, the County Fire frequency and Van Wert Amateur Radio frequency.

b) EMA shall coordinate with the National Weather Service in Northern Indiana and area Indiana & Ohio Emergency Management Agencies in tracking developing storms via telephone, amateur radio, EMA Frequency or MARCS.

c) EMA shall issue updated statements every hour regarding Watch information.

d) EMA will determine when spotters are needed and activate the spotter network. This includes ham (amateur radio operators), local fire departments and law enforcement that are currently on patrol.

SEVERE THUNDERSTORM WARNINGS

1) The National Weather Service in North Webster, Indiana shall issue a Severe Thunderstorm Warning when a storm is capable of producing hail one inch or larger in diameter and/or winds which equal or exceed 58 mph. Severe Thunderstorms can result in the loss of life and/or property.

2) In the event that the EOC is unmanned:

a) The Van Wert City Police Dispatch will activate the EMA Informers and Pagers and issue the Warning statement. Dispatch will then transmit the Warning Statement over the Van Wert County Fire frequency.

b) Van Wert City Police Dispatch will then contact the EMA Director and advise of the Warning so the EOC can be activated and further statements issued.

3) If EOC is manned:

a) EMA will issue the Warning statement over EMA Informers and Pagers, the County Fire frequency and Amateur Radio frequency.

b) EMA will coordinate with area spotters and relay statements as necessary to the National Weather Service, Media and Public.

c) EMA will coordinate with the National Weather Service and area Emergency Management offices on progression of the storms.

d) EMA will issue statements as necessary until an "All Clear" is given.

4) Van Wert County Sheriff Department, Van Wert City Police Department, Village Police Departments, Ohio State Highway Patrol Post 81, all County Fire Departments and Amateur Radio personnel will report any damage to the Van Wert County EMA as soon as practical for relay to the National Weather Service through established communication channels.

This shall include:
- **a. Life threatening hazards**
- **b. Down Power lines**
- **c. Flooded roadways**
- **d. Down Trees/Large branches (measure diameter if possible)**
- **e. Damage to Structures**
- **f. Any other damage of worthy mention**

TORNADO WARNINGS

1) A Tornado Warning is issued by the National Weather Service office in North Webster, Indiana when a tornado or funnel cloud has been sighted by a trained spotter or detected by radar. A warning is not issued County-wide but only for the effected area using a polygon track.

2) In the event the EOC is unmanned:

a) **The Van Wert City Police Dispatch will activate the warning sirens for the effected area.**

b) **Dispatch will then activate the EMA Informers and Pagers and transmit the Warning statement.**

c) **Dispatch will then activate all County Fire Department Pagers and transmit the Warning statement.**

3) If EOC is manned:

a) **EMA will activate sirens for the effected area.**

b) **EMA will activate the EMA Informers and Pagers and transmit the Warning statement.**

c) **EMA will activate the County Fire Department Pagers and transmit the Warning statement.**

d) **EMA will transmit Warning statement over the Van Wert Amateur Radio Frequency.**

e) **EMA will communicate with National Weather Service and area Emergency Management Agencies on track of tornado and damage reported.**

f) **EMA will activate the EAS (Emergency Alert System) if necessary which will broadcast over local radio stations.**

4) Sirens and PA systems can be utilized by Emergency Response vehicles if necessary.

5) Upon expiration of the Tornado Warning, an all clear shall be given over EMA, Fire and Amateur Radio Frequencies.

6) All Departments and Agencies will report Tornado Damage to the Van Wert County Emergency Management for relay to the National Weather Service through established communications channels and also for damage assessment.

EMERGENCY MANAGEMENT NOTIFICATION

EMA Personnel

Rick McCoy

Craig Staley

Steve Kouts

Duane Poling

Hugh Saunier

Jack Snyder

George Ropp

Mike Long

Ralph Shields

SPECIAL MONITORS

Van Wert Police Department
WERT Radio Station
Delphos Fire Department

EMA EMERGENCY WARNING SYSTEM

All informers & Pagers
Van Wert City Sirens (Tornado Warning)
Van Wert City Sirens (Enemy Attack or Hazmat Evacuation)
Van Wert City Sirens (Cancel)
Convoy FD Siren
Middle Point Siren
Ohio City FD Siren
Scott FD Siren
Venedocia Siren
Willshire FD Siren
Wren FD Siren
Dixon Siren
Elgin Siren
Huggy Bear Campground Siren
Delphos Sirens

TORNADO OR SEVERE THUNDERSTORM WATCH

DATE:_____

Note: Upon receipt of a tornado or severe thunderstorm Watch for Van Wert County, notify the local EMA office at 419-238-1300 and advise of the Watch information.

The following procedure is to be followed if the EMA is not manned.

_____ (1) Activate monitors:

Depress frequency switch to "EMA" on radio console.

Depress XXXX on the encoder, wait for beep, or the Number flashing, then give the following message:

"This is the Van Wert County Emergency Management Agency Network, the Storm Prediction Center in Norman, Oklahoma has issued a _____ Watch for an area including Van Wert County. The Watch is in effect until _____AM/PM, Local Time. Authority National Weather Service."

(2) On console, depress Fire Frequency, then transmit the same weather statement listed in (1)

(3) Contact EMA Director Rick McCoy by calling his cell phone.

(4) If no contact is made with the EMA Director, Contact EMA personnel from call-down list.

(5) Repeat step 1 every hour until EOC is manned or the Watch expires or is cancelled.

SEVERE THUNDERSTORM WARNING

Note: Upon receipt of a Severe Thunderstorm Warning for Van Wert County, notify the local EMA Office at 419-238-1300 and advise of the Warning information.

The following procedure is to be followed if the EMA is not manned.

_____ (1) Activate monitors:

Depress frequency switch to "EMA" on the radio console.

Depress XXXX on the encoder, wait for beep, or number Flashing, then give the following message:

"THIS IS THE VAN WERT COUNTY EMERGENCY MANAGEMENT AGENCY NETWORK, THE NATIONAL WEATHER SERVICE IN NORTHERN INDIANA HAS ISSUED A SEVERE THUNDERSTORM WARNING FOR AN AREA INCLUDING VAN WERT COUNTY. THESE STORM ARE CAPABLE OF PRODUCING DAMAGING WINDS OF _____MPH, LARGE HAIL AND DANGEROUS LIGHTNING. STAY INSIDE AND MOVE AWAY WINDOWS AS THIS STORM PASSES. THE SEVERE THUNDERSTORM WARNING IS IN EFFECT UNTIL _____AM/PM LOCAL TIME. AUTHORITY NATIONAL WEATHER SERVICE, NORTHERN INDIANA.

(2) Depress Fire frequency on the radio console and transmit the same weather statement from number 1.

(3 Contact EMA Director Rick McCoy by calling his cell phone.

(4) If no contact is made with the EMA Director, call EMA personnel from the contact list.

(5) Repeat Warning statement every 15 minutes until EOC is manned or the Warning expires or is cancelled.

TORNADO WARNING

Upon receipt of a Tornado Warning, notify the local EMA office at 419-238-1300 and advise of the Warning information.

The following procedure is to be followed if the EMA is not manned.

_____ 1. Activate Warning Sirens for the effected area.

A. For City of Van Wert, depress frequency to EMA.
(1) Depress XXXX on encoder (Sirens will sound for 3 Minutes and shut off. Continue to reactivate every 3 minutes until Tornado Threat has passed.
(2) Notify Van Wert Fire Department over Emergency P.A. system so they can take trucks from the station.

B. If Venedocia is affected, depress frequency to EMA.
(1) Depress Venedocia Siren button on encoder and repeat every 3 minutes until the tornado threat has passed.

C. If MiddlePoint is affected, depress frequency to EMA.
(1) Depress MiddlePoint Siren button on encoder and repeat every 3 min. until tornado threat has passed.

D. If Elgin is affected, depress frequency to EMA.
(1) Depress Elgin Siren button on encoder and repeat every 3 minutes until tornado threat has passed.

E. If Dixon is affected, depress frequency to EMA.
(1) Depress Dixon Siren button on encoder and repeat Every 3 minutes until tornado threat has passed.

F. If other villages are affected, depress Fire Frequency.
(1) Depress individual Siren buttons for affected villages.
(2) Depress pagers for affected villages and give statement

_____2. Activate Monitors, Informers and EMA Pagers:

Depress frequency switch to "EMA" on the radio console. Depress XXXX on the encoder, wait for beep, or number flashing, then give the following message:

THIS IS THE VAN WERT CO. EMERGENCY MANAGEMENT WARNING NETWORK. THE NATIONAL WEATHER SERVICE AT NORTHERN, IND. ISSUED A TORNADO WARNING FOR PORTIONS OF VAN WERT COUNTY (Trained Spotters)_____ or (Radar) _____ IS INDICATING A TORNADO AT _____moving _____ AT _____MPH. AREAS AFFECTED INCLUDE:_____MOVE TO A PLACE OF SAFETY NOW.

RESPONSIBILITY

SIREN ACTIVATION:

1. Ohio Revised Code 5502.21 Section (D) (1) (d) authorizes Civil defense (Emergency Management) to take control and use of emergency communications, lighting, and WARNING EQUIPMENT and SYSTEMS during any hazard that effects the civilian population.

a. The Van Wert County Office of Homeland Security and Emergency Management shall therefore have responsibility to activate all Warning Sirens located within Van Wert County and shall authorize the 24 hour Warning Point (Van Wert City Police Department) to activate the system whenever necessary.

b. Sirens may be activated independently under the Authority of the Fire Chiefs in their respective Jurisdictions.

c. The Van Wert County Sheriff Department has the Authority to activate the sirens currently in use in the Villages.

2. EOC and Warning Point personnel shall have the authority to activate the Sirens under the following circumstances:

a. National Weather Service Tornado Warning
b. Law Enforcement sighting
c. Fire Department sighting
d. Emergency Management sighting
e. Trained Amateur Radio Operator sighting.

3. Sightings include:

a. Tornado on the ground.
b. Funnel aloft for an extended period of time.

4. Sirens may also be activated for a Microburst with winds of 80 to 120 MPH causing damage just as extensive as a tornado. The microburst can also be just as deadly. This includes a Derecho with destructive winds.

AUTHORITY

_____ EMA DIRECTOR

_____ VAN WERT POLICE CHIEF

TESTING OF COUNTY SIRENS, PAGERS & MONITORS

Two individual tests are conducted in Van Wert County each week. One on Saturday at 12:30pm and one on Monday at 10:00pm The breakdown of testing is as follows:

****** The County Fire and Pager Test is done every Saturday at 12:30pm. The 9-1-1 dispatch centers at the Van Wert County Sheriff Dept. and Van Wert City Police Dept. rotate every week in conducting the test. The Van Wert County Emergency Management and Van Wert Fire Dept. conducts the test twice a year.**

"This is KDR762, testing all stations. Standby for individual test:"

Sirens and Pagers are then activated individually for: Delphos, Middle Point, Ohio City, Willshire, Wren, Convoy, Scott, Brickners.

"All stations standby for group test" is then conducted of all pagers and sirens. Upon completion, A pager test is done of all "Van Wert Fire Pagers".

****** The Emergency Management test is conducted in Van Wert County every Monday at 10:00am. In the event that the EOC is not manned, the Van Wert City Police Dispatch conducts the test.**

Elgin Siren
Venedocia Siren
Middle Point Siren
Dixon Siren
Van Wert Sirens
Huggy Bear Campground Siren

Informers and EMA pagers are tested: " This is the Monday morning test of the Van Wert County Emergency Management Warning Network and Storm Monitors System. Please reset your pagers and monitors at this time…..KNM906".

EMA then conducts a radio check on the MARCS 800MHz system with:

Post 81, Van Wert Co. Health Dept., Van Wert County Sheriff Dept., Van Wert City Police Dept., Van Wert County Hospital, Wilmington Weather Service, North Webster Weather Service.

SNOW EMERGENCIES

Ohio and Indiana Counties vary on the process of calling Snow Emergencies within their respective counties. Listed are the procedures for counties neighboring Van Wert County.

In Ohio: Pursuant to Ohio Attorney General Opinion 86-023 the County Sheriff may declare a Snow Emergency and temporarily close county and township roads within the Sheriff's jurisdiction for the preservation of public safety and public peace. (ORC 311.07)

Ohio Attorney General Opinion 97-015 allows the County Sheriff to declare a snow emergency and temporarily close State and Municipal roads within his jurisdiction.

In Van Wert County, a Snow Emergency means:

All roadways are closed to non-emergency personnel. No one should be out on the roadways during the snow emergency due to conditions being life threatening. Anyone traveling on roadways during a snow emergency is subject to arrest.

A Van Wert County Snow Emergency is a Level 3 snow emergency as used by some Ohio counties that use the snow level system. Van Wert County does not use the "Snow Level System" for snow emergencies due to the public confusion it creates.

A) The Sheriff's from Allen, Mercer, Paulding & Putnam County use levels.

1. **Level 1 Roadways are snow or ice covered with possible drifting. Driving conditions are hazardous. Extreme caution is advised.**

2. **Level 2 Roadways are extremely dangerous due to heavy, drifted or blowing snow. Only those who feel it is necessary to drive should be out on the roadways. Contact your local employer to see if you should report to work.**

3. **Level 3 All roadways are closed to non-emergency personnel. No one should be out during these conditions unless it is absolutely necessary to travel. All employees should contact their employer to see if they should report to work. Those traveling on the roadways may subject themselves to arrest.**

4) Emergency Management Directors in the Northwest Ohio Counties shall determine if Emergency situations exist of such magnitude during ice or snow storms that additional emergency measures are needed. In these situations, Directors shall request that their respective County Commissioners issue : "An Emergency Declaration".

SNOW EMERGENCIES

Indiana

SCHOOL PROCEDURES

All school buildings in Van Wert County have been equipped with NOAA Weather All Hazards Radios and Emergency Management Informers. School personnel shall monitor the radios for watches and warnings and act accordingly to their adopted guidelines when activated.

A. Tornado Watch, Severe Thunderstorm Watch, Severe Thunderstorm Warning

1. **NOAA Radios and Informers activated.**
2. **A weather spotter (custodian) should be monitoring conditions and should notify the office if severe weather conditions are observed.**

B. Tornado Warning

1. **NOAA Radios and Informers will be activated**
2. **School officials will make notification of the warning by using the public address system, air horn, portable bull horn, or a runner.**
3. **Students and staff shall move to lowest hallways and pre-designated areas.**
   a. **No one should be in rooms with windows, in the gymnasium, cafeteria, portable classrooms or outside.**
4. **Teachers should take class rosters with them to account for students and close the door when exiting the rooms.**
5. **Leave all windows closed!**
6. **Everyone should assume a position with head down against the wall in a kneeling position with hands and a hard-covered textbook covering their head.**
7. **Custodians should shut off gas, if possible.**
8. **If damage or injury is sustained, use 9-1-1 to notify authorities to get help.**
9. **If the building needs to be evacuated after a tornado strike, use caution for downed power lines.**
10. **The (ALL-CLEAR) will be verbal or P.A. announcement by the principal.**

C. Use of School Radios.

All School Superintendents, Principles, Custodians and School Buses are equipped with an 800 MHz radio trunking system. The Van Wert County Emergency Management, Van Wert County Sheriff dispatch and Van Wert City Police Dispatch also has the school radio frequencies.

1. **During winter weather events, the Van Wert County Emergency Management shall update the School Superintendents on threatening conditions such as Freezing rain, Ice Accumulations, snow, or whiteout conditions from blowing snow.**
2. **During flooding events, the Van Wert County Emergency Management shall update School Superintendents of road closing due to high water.**
3. **During Thunderstorm and Tornado events, the Van Wert County Emergency Management shall notify School Superintendents of threatening conditions.**
4. **The Van Wert County Emergency Management shall advise the School Superintendents anytime the Director feels that school needs to be delayed, Cancelled or dismissed early or late due to weather conditions. The School Superintendents will make the final decision based on the Director's advise.**

TELEPHONE TREE-CALL DOWN LIST-EMERGENCY

COMMISSIONERS

CLERK OF COURTS

COMMON PLEAS COURT

CHILD SUPPORT

TREASURERS OFFICE

AUDITORS OFFICE

RECORDERS OFFICE

TAX MAP OFFICE

MICROGRAPHICS

JUVENILE COURT

YOUTH BUREAU

VETERANS SERVICES

EXTENSION SERVICE

JOBS AND FAMILY SERVICES

ASCS

HEALTH DEPARTMENT

BRUMBACH LIBRARY

COUNCIL ON AGING

ELECTION BOARD

TRANSFER STATION

FAIR BOARD OFFICE

Weather Related Reference Guide

For Emergency Personnel

This guide was put together to provide Emergency Managers, Dispatchers, Police and Sheriff Officers, Fire Fighters, and other county and state officials with weather information that is critical to both your local agency and the National Weather Service (NWS). Timely information freely shared between your agency and the NWS can literally mean the difference between life and death.

Critical weather information is broken down into categories for easy reference below. When providing a report please provide the following information

1. Who you are
2. Location and time of event
3. What was seen and/or damage witnessed.

Tornados	Flooding	Winter Weather

• Tornado
• Funnel Cloud
• RotatingWall Cloud
	• Flooding that results in evacuations
	• High water rescues from roofs or trees
	• Water:
	  ○ rapidly rising
	  ○ entering homes, not just basements
	• Roads:
	  ○ closed due to high water
	  ○ impassable due to high water
	• Small Streams overflowing their banks.
	• ≥ 1" of rain measured, in an hour
		• Any Freezing Rain or Drizzle
		• Thunder associated with Snow, Sleet, or Freezing Rain
		• ≥ 1" of Snow accumulation.

Severe Thunderstorms • Any size Hail- Severe Hail is 1 inch. • Wind damage to trees, power lines, or any structure.		

Hail Estimates (inches)

- Pea 0.25
- **Penny 0.75**
- Quarter 1.00
- Half-Dollar 1.25
- Walnut 1.50
- Golf Ball 1.75
- Tennis Ball 2.50
- Baseball 2.75
- Grapefruit 4.00

Wind Speed Estimates (mph)

- 39-54 Small limbs break off trees
- **55-72 Downed shallow rooted trees, minor structural damage**
- 73-112 Minor to major structural damage, Trailers overturned
- 113+ Major structural damage, Trailers destroyed

Information You Can Use:

Web Site – http://www.crh.noaa.gov/iwx

Twitter - #wx4iwx

Headline Definitions:

- **Hazardous Weather Outlook** – Potential for significant weather for the next 7 days.
- **Watch** – Conditions are favorable for weather event in or near the watch area. Watches may be issued for weather events listed under Warnings.
- **Warning** – Weather Event is imminent or occurring in warned area.
  - **Tornado** – A violently rotating column of air extending from a thunderstorm and in contact with the ground.
  - **Severe Thunderstorm** – Thunderstorm that produces hail ≥ 1" and/or wind gusts ≥ 58 mph.
  - **Flash Flood** – Rapid rise of water resulting in:
    1. Rushing water over roads,
    2. Water entering main level of homes and businesses, and/or
    3. A dam break.
  - **Flood** – Rise of water that results in water covering roads or spilling out of stream banks. Not as rapid or extreme as flash flooding.
  - **Winter Weather** –
    - **Blizzard** –
      1. Sustained wind or frequent gusts ≥ 35 mph accompanied by falling and/or
      2. Blowing snow, frequently reducing visibilities ≤ ¼ mile for 3 or more hours.
    - **Snow** – 6" in 12 hours or 8" in 24 hours.
    - **Ice** - ≥1/4" in 24 hours
    - **Wind Chill** - ≤ -30E F with wind > 10 mph.
  - **Heat** –
    - Heat Index 110 for 3 hours or more
  - **High Wind** – Sustained wind blowing at 40 mph and/or gust to 58 mph.
- **Advisory**
  - **Winter Weather** –
    - **Snow** – 3" to 5" in 12 hours.
    - **Ice** - <1/4" in 24 hours
    - **Snow and Blowing Snow** – Sustained wind or frequent gust of 25 to 34 mph and falling and blowing snow, which occasionally reduces visibility to ≤ 1 mile for at least an hour.
    - **Blowing Snow** – Widespread or localized blowing snow reducing visibilities to ≤ 1 mile for at least an hour and winds 25 to 34 mph.
    - **Wind Chill** – -20 to -29E F with wind > 10 mph.
  - **Heat** –
    - Heat index of 100-109 for 3 hours or more
  - **Wind** – Sustained wind blowing 31 to 39 mph for an hour or more and/or gust 46 to 57 mph.
  - **Dense Fog** – Widespread Visibilities ≤ ¼ mile.

Beaufort Wind Scale (Estimated wind speeds)

Beaufort number	Wind speed			Mean wind speed (kt / km/h / mph)	Description	Land conditions
	kt	km/h	Mph			
0	0	0	0	0 / 0 / 0	Calm	Calm. Smoke rises vertically.
1	1-3	1-6	1-3	2 / 4 / 2	Light air	Wind motion visible in smoke.
2	4-6	7-11	4-7	5 / 9 / 6	Light breeze	Wind felt on exposed skin. Leaves rustle.
3	7-10	12-19	8-12	9 / 17 / 11	Gentle breeze	Leaves and smaller twigs in constant motion.
4	11-15	20-29	13-18	13 / 24 / 15	Moderate breeze	Dust and loose paper is raised. Small branches begin to move.
5	16-21	30-39	19-24	19 / 35 / 22	Fresh breeze	Smaller trees sway.
6	22-27	40-50	25-31	24 / 44 / 27	Strong breeze	Large branches in motion. Whistling heard in overhead wires. Umbrella use becomes difficult.
7	28-33	51-62	32-38	30 / 56 / 35	Near gale	Whole trees in motion. Effort needed to walk against the wind.
8	34-40	63-75	39-46	37 / 68 / 42	Gale	Twigs broken from trees. Cars veer on road.
9	41-47	76-87	47-54	44 / 81 / 50	Severe gale	Light structure damage.
10	48-55	88-102	55-63	52 / 96 / 60	Storm	Trees uprooted. Considerable structural damage.
11	56-63	103-119	64-73	60 / 112 / 70	Violent storm	Widespread structural damage.
12	64-80	120	74-95	73 / 148 / 90	Hurricane	Considerable and widespread damage to structures.

NWS Windchill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times — 30 minutes — 10 minutes — 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

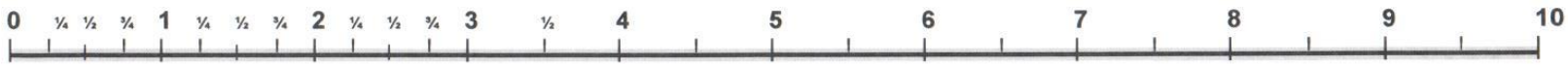
Where, T= Air Temperature (°F) V= Wind Speed (mph)

Effective 11/01/01

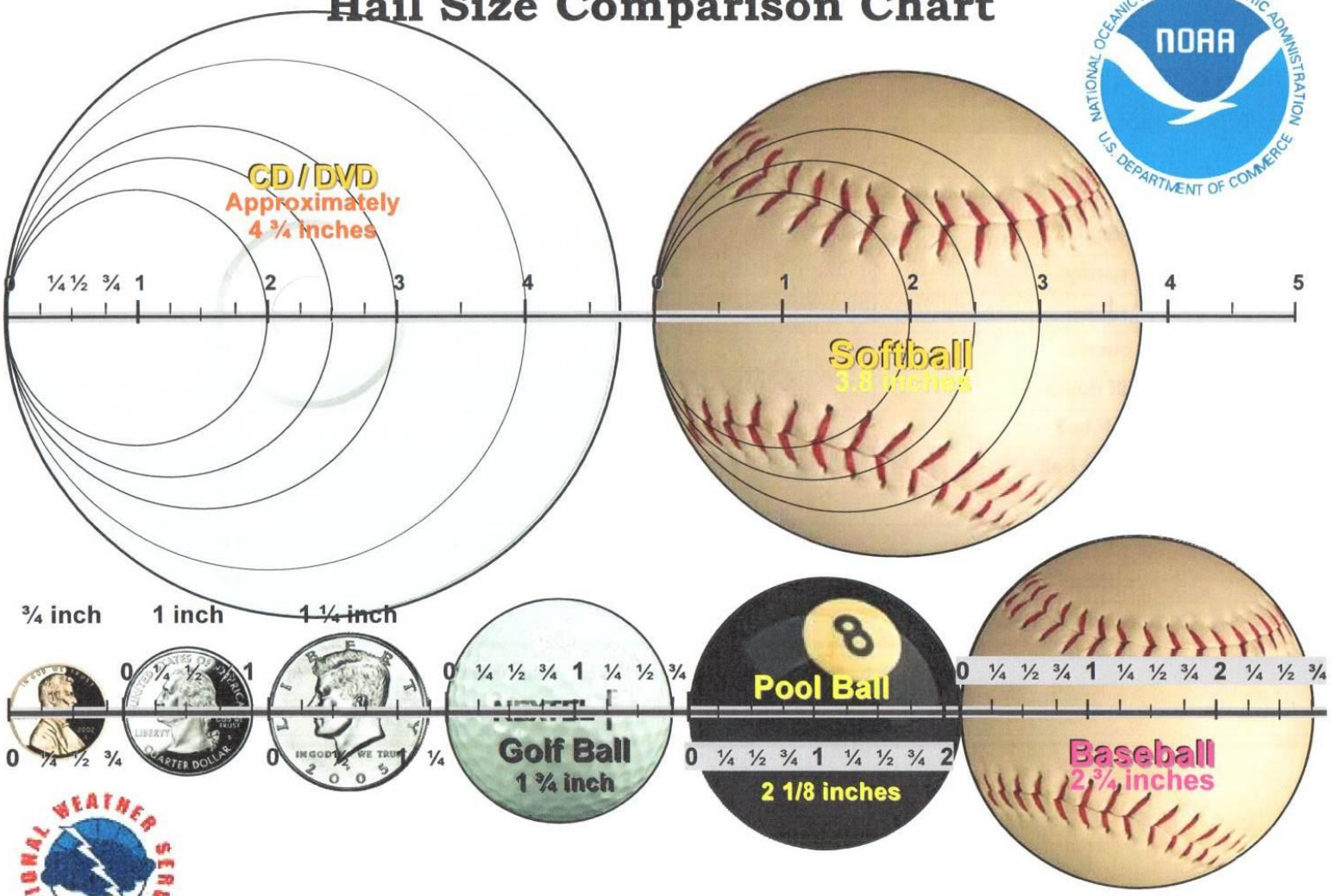
Hail Size Description Chart

Hailstone size	Measurement	
	in.	cm.
bb	< 1/4	< 0.64
pea	1/4	0.64
dime	7/10	1.8
penny	3/4	1.9
nickel	7/8	2.2
quarter	1	2.5
half dollar	1 1/4	3.2
golf ball	1 3/4	4.4
billiard ball	2 1/8	5.4
tennis ball	2 1/2	6.4
baseball	2 3/4	7.0
softball	3.8	9.7
Compact disc / DVD	4 3/4	12.1

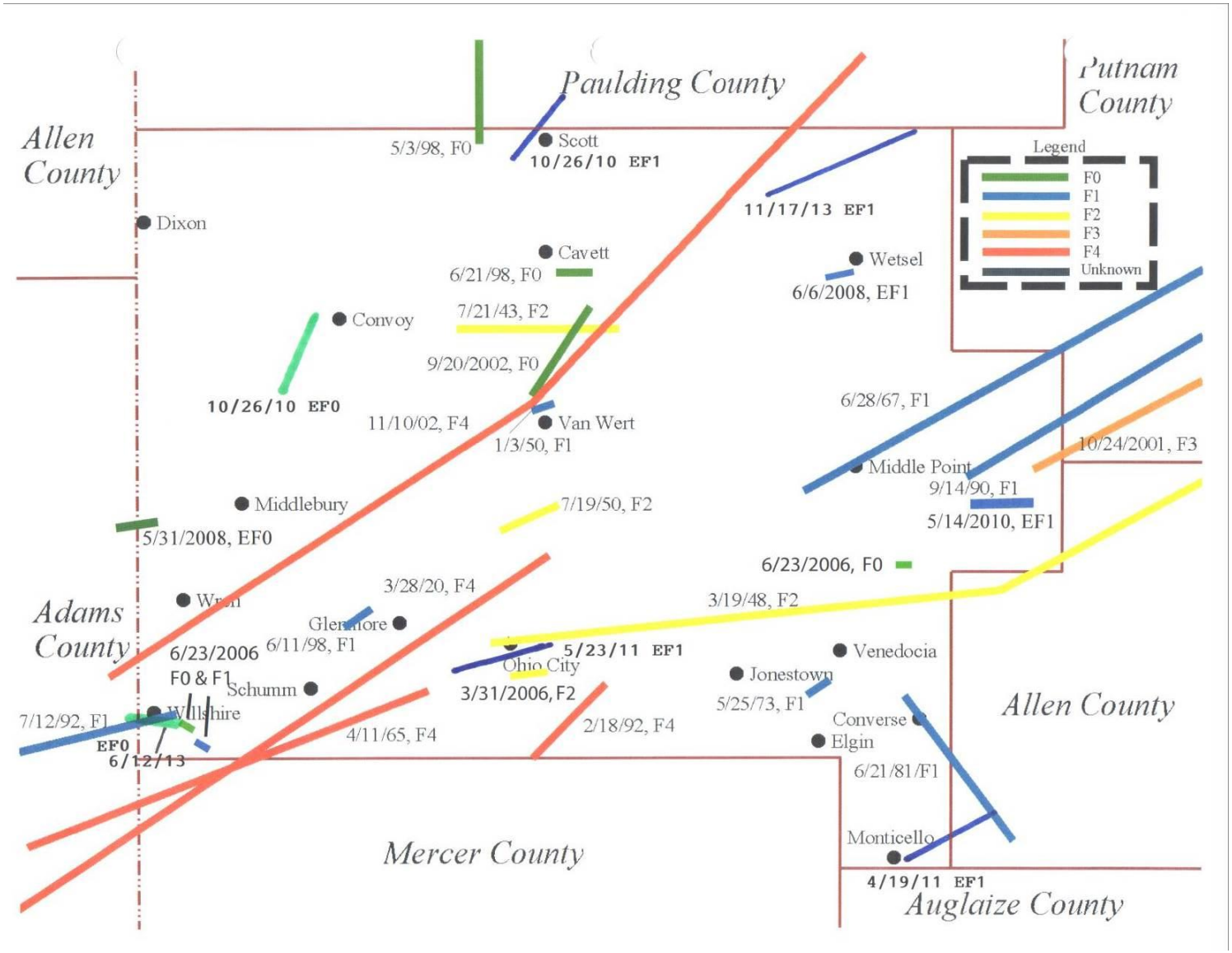
Note: Hail size refers to the **diameter** of the hailstone.



Hail Size Comparison Chart



Produced by Michael S. Lewis, NOAA, National Weather Service, Northern Indiana


Paulding County
Putnam County
Allen County
Adams County
Mercer County
Allen County
Auglaize County
Legend
F0
F1
F2
F3
F4
Unknown
5/3/98, F0
Scott
10/26/10 EF1
11/17/13 EF1
Dixon
Cavett
6/21/98, F0
Wetsel
6/6/2008, EF1
Convoy
7/21/43, F2
9/20/2002, F0
10/26/10 EF0
11/10/02, F4
Van Wert
1/3/50, F1
6/28/67, F1
10/24/2001, F3
Middle Point
9/14/90, F1
5/14/2010, EF1
Middlebury
5/31/2008, EF0
7/19/50, F2
6/23/2006, F0
3/28/20, F4
3/19/48, F2
Wren
Glenmore
6/11/98, F1
6/23/2006
F0 & F1
5/23/11 EF1
Venedocia
Ohio City
3/31/2006, F2
Jonestown
5/25/73, F1
Schumm
7/12/92, F1
Willshire
EF0
6/12/13
4/11/65, F4
2/18/92, F4
Converse
Elgin
6/21/81/F1
Monticello
4/19/11 EF1

NOAA WEATHER RADIOS

Serial #	Agency	Address
30701394	WeeCare/Day Care	10485 Van Wert Decatur Rd Van Wert
50519011	1st United Methodist Preschool	113 W. Central Van Wert
	Lincolnview Supt.	15945 MiddlePoint Rd Van Wert
	Lincolnview High School	15945 MiddlePoint Rd Van Wert
30701417	MiddlePoint Town Hall	103 N. Adams St. MiddlePoint
30701421	Venedocia Post Office	15155 Main St. Venedocia
30703025	Elgin Post Office	18100 Main St. Elgin
8120060502	Ohio City Post Office	118 S. Main St. Ohio City
50519016	Convoy Post Office	116 W. Tully St Convoy
31248076	Wren Post Office	119 St. Rt 49 Wren
31248078	Willshire Post Office	110 Walcott St Willshire
30700459	MiddlePoint Post Office	206 E. Jackson St. MiddlePoint
30703400	Van Wert Post Office	314 E. Main St Van Wert
31242398	Scott Post Office	12436 Blaine St. Scott
30703022	Brumbach Library	215 W. Main St Van Wert
	Crestview Supt.	531 E. Tully St Convoy
	Crestview High School	531 E. Tully St Convoy
30703031	US Bank	112-118 S Main St Convoy
30703032	Co. Engineer Maintenance	1196 Grill Rd Van Wert
8030105865	HuggyBear Campground I	9065 Ringwald Rd MiddlePoint
30700457	Timber Woods Campground	10856A Liberty Union Rd Van Wert
50517212	FairBoard Office	1055 S Washington St. Van Wert
30700454	Extension Office	1055 S. Washington St. Van Wert
8080136339	Ohio City Village Hall	105 S. Main St. Ohio City
60234383	Wellness Center/VWCH	140 Fox Rd. Van Wert
30703405	Kim Hohman Dance Works	11199 Van Wert Decatur Rd Van Wert
30703411	Calvary Preschool	10686 Van Wert Decatur Rd Van Wert
30703408	St Marys Religious Ed Office	611 Jennings Rd. Van Wert
30703412	St. Marys School	611 Jennings Rd. Van Wert
30703410	Election Board	120 E. Main St. Van Wert
	Jefferson Elementary	1120 Buckeye Dr. Van Wert
	Washington School	839 Prospect Ave. Van Wert
	Van Wert High School	205 W. Crawford St. Van Wert
8011115274	Hearth & Home	1118 Westwood Dr. Van Wert
50519010	Van Wert Cinemas	10721 Lincoln Highway Van Wert
31242613	Dedicated Fleet Logistics	1181 Grill Rd. Van Wert
31242424	Elgin Grain	18110 Sands Rd. Elgin
31242422	Unverferth/Kill Brothers	24325 St Rt 697 Delphos
	Jonestown Elevator	15970 Jonestown Rd. Venedocia
31242436	Starr Commonwealth	15145 Lincoln Highway Van Wert
31242437	Rambler's Roost Truck Stop	18191A Lincoln Highway MiddlePoint
31242434	E&R Trailer Sales	20186 Lincoln Highway MiddlePoint
31242421	Pure Line Food Elevator	101 N. Mason St. MiddlePoint
31242427	Mercer Landmark	402 W. Veach Rd. MiddlePoint

50519589	Marsh Foundation School	1229 Lincoln Highway Van Wert
1212101836	County Auditor's Office	121 East Main St. Van Wert
30701422	Commissioner's Annex	114 East Main St. Van Wert
31242400	Warehouse on Wheels	6973 US Rt 127 Van Wert
31242399	Cooper Foods	6793 US Rt 127 Van Wert
31242397	Pond Seed Co.	12462 Blaine St. Scott
31242390	Mercer Landmark-Elevator	207 S. Main St. Convoy
31242391	Mercer Landmark-Agronomy	5703 Convoy Rd. Convoy
31242386	Barb's Party Shop	143 West Tully St. Convoy
31242388	Kulwicki/Hilton Insurance	106 West Tully St. Convoy
31242389	Convoy Town Hall	123 South Main St. Convoy
31242394	Hall Do It Best Lumber	122 South Main St. Convoy
1212108372	Chuffers Express Mart	511 West Carmean St. Ohio City
31242382	Mercer Landmark-Elevator	114 East Carmean St. Ohio City
31242381	Brumback Library branch	101 West Carmean St. Ohio City
50519013	El Monte Plastics	103 South Shane St. Ohio City
31242380	El Monte Plastics	103 South Shane St. Ohio City
31242395	Mercer Landmark/Glenmore	15052 Glenmore Rd. Ohio City
8030018286	Farmers Grain & Feed	1257 US Rt 33 Willshire
31242396	Willshire Town Hall	323 State St. Willshire
31242393	J&J Butler's	200 State St. Willshire
31248077	Becky's Village Restraunt	301 State St. Willshire
31248079	Painters Place	402 State St. Willshire
31248071	TJs Grocerette	603 Rockford Rd. Willshire
60235268	Willshire Drive Inn	306 Walcot St. Willshire
31248070	Photo Star	307 State St. Willshire
31248072	Wren Tavern	102 State Rt 49 Wren
30703387	Wren Town Hall	107 State Rt 49 Wren
31248075	Convoy Tavern	110 West Tully St. Convoy
31248073	Remedys Tavern	104 North Main St. Convoy
31248074	Convoy Preschool	207 North Main St. Convoy
31242263	Rager's Food Service & Vending	1042 Westwood Dr. Van Wert
31242265	Merkle Insurance	105 Fisher Ave. Van Wert
30703026	V.W. License Bureau	1198 Westwood Dr. Van Wert
	Scott Equity Exchange	12529 Blaine St. Scott
31242260	Vantage Superintendent	818 N. Franklin St. Van Wert
31242262	Van Wert SWMD	1135 North Washington St. Van Wert
31242264	Lassus BP	885 North Washington St. Van Wert
31242261	Pak A Sak #16	800 North Washington St. Van Wert
31242269	VW Party Mart	1060 South Washington St. Van Wert
31248765	Pak A Sak #17	1052 South Shannon St. Van Wert
31248771	Hires BP	1053 South Shannon St. Van Wert
31248749	Brookside	1300 West Main St. Van Wert
60710813	ShortStop	714 East Main St. Van Wert
31248768	CitiFinancial	134 East Main St. Van Wert
31248770	Community First	102 East Main St. Van Wert
31248760	US Bank	818 South Shannon St. Van Wert
31248759	Van Wert Federal	976 South Shannon St. Van Wert

31248767	Community First Financial	1163 South Shannon St. Van Wert
8010183236	Citizens National Bank	1191 Westwood Drive Van Wert
30703390	First Federal Savings & Loan	679 Fox Rd. Van Wert
31248766	Wells Fargo Bank	115 Hospital Drive Van Wert
30703382	Willow Bend Golf Club	179 Fox Rd. Van Wert
30700456	The Woods Golf Club	12087 US Rt 127 Van Wert
31248769	Marsh Supermarket	1107 South Shannon St. Van Wert
30700790	Tractor Supply Co.	1122 South Shannon St. Van Wert
50517214	Big Lots	1155 South Shannon St. Van Wert
50519018	Walmart	811 Fox Rd. Van Wert
30700789	E. Conrad Trucking	1285 Industrial Drive Van Wert
30700793	Tecumseh Box	1275 Industrial Drive Van Wert
30700792	Teleflex Inc.	1265 Industrial Drive Van Wert
30700788	Budd Company	1276 Industrial Drive Van Wert
60235270	Greve Chrysler	756 West Ervin Road Van Wert
30700785	Kinstle's	650 West Ervin Road Van Wert
1212093208	Alexander & Bebout	10098 Lincoln Highway Van Wert
8030140917	Statewide Ford	1108 West Main St. Van Wert
30701248	Stahl Stoller Meyer Ins.	117 South Main St. Convoy
30701246	The Gathering Place	121 South Main St. Ohio City
30701247	Braun Industries	1170 Production drive Van Wert
30701249	Store & Haul Inc.	1165 Grill Road Van Wert
30701251	ELMCO ENGR.	1171 Grill Road Van Wert
30701250	Kam Mfg. Inc.	1197 Grill Road Van Wert
30701243	Scott Equity/Van Wert	506 Bonnewitz Ave. Van Wert
30701236	Van Wert Propane	10763 US RT 127 S. Van Wert
30702996	Federal Mogal Corp.	150 Fisher Ave. Van Wert
30702991	Wells Motor Sales	119 Sibley St. Van Wert
60234388	Flat Lands Supply	1220 E Jackson St. Van Wert
30702998	Van Wert Civic Theatre	118 S. Race St. Van Wert
30702999	Van Del Drive Inn	19986 Lincoln Highway MiddlePoint
30703000	Kennedy Kuhn	1042 S. Washington St. Van Wert
30703388	Taylor Auto Sales Inc.	231 S. Walnut St. Van Wert
30702994	Ag Plus	15010 State Line Road Dixon
60234382	Adult Day Care	1151 Westwood Drive Van Wert
30703001	Western Buckeye ESC	813A North Franklin St Van Wert
31242384	Laurie's Naturescapes	12368 St Rt 118 Van Wert
31242612	Elgin Service Center	18018 St Rt 81 Elgin
50519015	Thomas Edison Head Start	813 N. Franklin St. Van Wert
50517216	McDonald's	101 Christopher Crossing Van Wert
50517217	McDonald's	1162 S. Shannon St. Van Wert
50517211	GKN	1202 Industrial Drive Van Wert
60234381	Community Health Profess.	1159 Westwood Drive Van Wert
50517213	Help Me Grow/WIC	1119 Westwood Dr. Suite A Van Wert
50517218	Midwest Rehab	1119 Westwood Dr. Suite C Van Wert
50517215	Elks Lodge #1197	1197 Elks Drive Van Wert
50518342	Van Del Drive Inn	19986 Lincoln Highway Van Wert
50518348	PR Tech 2	7600 US 127 North Van Wert

50518349	Subway	319 Towne Center Blvd Van Wert
50518350	First Choice H/C	Towne Center Van Wert
50518347	First American Cash Advance	345 Towne Center Blvd Van Wert
50518343	Petland	309 Towne Center Blvd Van Wert
50518345	I Don't Care Grill	1103 S. Shannon St Van Wert
50518344	Fashion Bug	745 Fox Rd. Van Wert
60234386	Subway	807 Fox Rd. Van Wert
60234390	James Rhoades Ins.	100 W. Main Street Van Wert
8080136719	Pizza Hut	735 W. Ervin Street Van Wert
60235266	Roger Okuley DDS	707 Fox Rd #200 Van Wert
60235267	Derry Drugs	1191 Westwood Drive Van Wert
60235261	Lori Frey DDS	1142 Westwood Drive Van Wert
50519020	Quality Sorting	1145 W Main Street Van Wert
30700061	Student Learning Center	620 Cherry Street Van Wert
30700057	Transfer Station	7780 US 127 Van Wert
8050048658	Holiday Inn Express	840 N Washington St. Van Wert
60235264	Guest Keeper Inn	875 N. Washington St Van Wert
60235265	Certified Oil	210 N. Washington St Van Wert
60234385	Gamestop	317 Towne Center Blvd Van Wert
50516713	Sonic	109 Towne Center Blvd Van Wert
50516717	Hong Kong Buffet	349 Towne Center Blvd Van Wert
50516716	First Bank of Berne	102 Christopher Crossing Van Wert
50519590	Willshire Home Furnishings	318 State Street. Willshire
50519585	Wendys	1234 S. Shannon Street Van Wert
70600369	Van Wert Co. Historical Soc	602 N. Washington Street Van Wert
70608061	Elegant Nails	343 Towne Center Van Wert
60234385	AT&T	303 Towne Center Van Wert
70600362	Kennedy Kuhn	10305 Liberty Union Rd Van Wert
70600361	Window Creation LLC	21438 US 224 Ft Jennings
70600363	Maurices	325 Town Center Van Wert
70600367	Taco bell	1280 S. Shannon St Van Wert
70600364	CVS	703 W. Ervin Rd Van Wert
70600370	Sleep Aphneia Center	Wellness Center Fox Rd Van Wert
70600365	Van Wert Chamber	118 W. Main St. Van Wert
30700455	Robert P. Mone Plant	4406 Mentzer Rd. Convoy
1212100813	Sears Optical 1384	323 Towne center Blvd Van Wert
8060032421	Van Wert Bedrooms	706 W. Ervin Rd. Van Wert
	Goedde Building-VW Schools	205 W. Crawford St. Van Wert
8030140909	Thomas Edison Store	115 W. Main St. Van Wert
8030140907	VW Inpatient Hospice	1155 Westwood Dr Van Wert
30703031	Murphy USA Gas	201 Towne Center Blvd. Van Wert
8050048596	Foster family Chiropractic	10963 Van Wert Decatur Rd VanWert
8050046413	Holiday Inn Express	860 N. Washington St. Van Wert
8050048620	Wild Willys	209 N. Washington St. Van Wert
307700058	Raabe Ford L M	11260 Elida Rd. Delphos
50519582	VW License Bureau	777 Fox Rd. Van Wert
8050046436	Rural king	811 Fox Rd. Van Wert
8050046610	Aaron's Sales & Lease	205 Towne Center Blvd Van Wert

8080127793	Secret Garden Floral	109 W. Tully St. Convoy
30703386	Thomas Edison Group Home	516 S. Market St. Van Wert
8080136724	VW Manor	160 Fox Rd. Van Wert
8080127962	Westwood Car Wash	1190 Westwood Dr. Van Wert
8030013677	Leland Smith Ins	1175 Westwood Dr. Van Wert
8010008286	Straightline Body & Paint	8619 John Brown Rd. Van Wert
8080136409	Comprehensive Health Care	1052 S. Washington St. Van Wert
8080136415	Family Health Care	140 Fox Rd. Van Wert
8080136321	Life Star Rescue	1171 Production Dr Van Wert
808131874	First Financial Branch Bank	113 East Central Ave Van Wert
8010183394	Hearth & Home	1118 Westwood Drive Van Wert
8080119541	Van Crest of Convoy	510 E Tully Street Convoy
8010183381	Stoneco, Inc.	2364 Richey Rd. Convoy
8120060248	Fastenal	529 Bonnewitz Ave. Van Wert
8060031132	Hickory Sticks Golf Club	12083 St Rt 127 Van Wert
8060331134	Remedys	100 Main St Convoy
8060031120	Straley Realty	419 E Ervin Rd Van Wert
8060031123	Northwest St. C. College	793 Fox Rd Van Wert
8060031133	Frickers	735 Fox Rd. Van Wert
8060031130	Custom Audio	1196 Westwood Dr. Van Wert
8060071129	Orchard Tree	1058 West Main St Van Wert
8060031121	B&K Drive In	836 West Main St Van Wert
8120060516	Best Little Hairhouse	600 West Main St Van Wert
8080130153	JJ Nails	1130 S. Shannon St. Van Wert
8010178965	El Mexicano	1198 Westwood Dr. Van Wert
8080136717	Gibbys Photo	103 West Main Street Van Wert
8010187485	Scruples	1198 Westwood Dr. Van Wert
8080136276	Delphos Granate Works	1198 West Wood Dr. A Van Wert
8030000148	The Marsh Foundation	1229 Lincoln Highway Van Wert
8080136416	Thrivent Financial Lutherans	10730 Lincoln Highway Van Wert
8010178973	Star Rental	1294 W. Main St Van Wert
8080136418	K&L Ready Mix	900 John Brown Road Van Wert
8030008441	Ridgeview Hospital	17872 Lincoln Highway Van Wert
8030013841	Hair to Stay	506 Wise St Ohio City
8010178979	Council on Aging	220 Fox Rd Van Wert
8080015859	Continental Structural Plastics	1276 Industrial Dr Van Wert
8080133499	Van Wert Massotherapy	149 East Central Ave Van Wert
8010183198	One Hour Cleaners	114 N Washington St Van Wert
1212125894	Quick Change	1111 Westwood Dr Van Wert
1212108300	Great Clips	343 Town Center Van Wert
1212108302	The Bridge	706B West Ervin Rd Van Wert
1212108301	Shoe Sensation	1138 S. Shannon St Van Wert
1212108446	Van Wert Police Dispatch	515 E. Main St Van Wert
1212108449	Tavern	110 W. Tully St Convoy
1212108370	TEEM Wholesale Inc	W Skinner St Ohio City
1212108854	Hemker Grain Inc	15970 Jonestown Rd Venedocia
1212108856	Village of Ohio City	103 S, Main St Ohio City
1212108855	Jubilee Park	Gleason Ave Van Wert

1212108853	**Camp Clay**	**9196 Liberty Union Rd Van Wert**
1212100656	**Shear Magic**	**117 W. Tully St Convoy**
1212101837	**Ridgeview Hospital**	**17872 Lincoln Hwy Middle Point**
50517220	**Dog Warden**	**Bonnewitz Ave Van Wert**
1212101867	**Label Shopper**	**1159 Shannon St Van Wert**

INFORMERS, PAGERS, PORTABLES or SCANNERS

Van Wert County Commissioners	**Portable Radio**
Van Wert County Board of Elections	**Portable Radio**
Van Wert County Auditor	**I**
Van Wert County Common Pleas	**I**
OSU Extension Service	**I**
Van Wert County Engineer	**I**
Van Wert Fairgrounds	**I**
Van Wert County Health Department	**I**
Van Wert County Court House Custodian	**I**
Van Wert City Mayors Office	**I**
Van Wert City Police Department	**Pager**
Van Wert City Fire Department	**I**
Delphos Police Department	**I**
Van Wert Chapter American Red Cross	**Portable Radio**
Brumbach Library	**I**
Van Wert County Hospital	**Pager**
Van Wert Job & Family Services	**I**
Van Wert Behavioral Health	**Portable Radio**
Tri-County ADAMHS	**Portable Radio**
Van Wert YWCA	**I**
Van Wert YMCA	**I**
Hearth & Home	**I**
Van Crest Convoy Care Center	**I**
Van Crest Sara Jane Nursing Home	**Pager**
Van Crest Health Care Center	**Pager**
Van Crest Health Care center	**Pager**
Van Crest Health Care Center	**I**
Van Crest Health Care Center Admin	**Pager**
Van Wert Manor	**I**
Crestview School Superintendent	**I**
Crestview High School	**I**
Crestview School Elementary	**I**
Delphos School Superintendent	**I**
Delphos High School	**I**
Delphos School Elementary	**I**
Delphos St Johns High School	**I**
Lincolnview School Superintendent	**I**
Lincolnview High School	**Pager**
Lincolnview School Elementary	**Pager**
Marsh School	**I**
St. Marys Catholic School	**I**
Student Learning Center	**I**
Thomas Edison Center	**Pager**
Thomas Edison School	**I**
Vantage Career center	**Pager**
Vantage Superintendent	**Pager**

Van Wert City School Superintendent	**Pager**
Van Wert High School	**Pager**
Van Wert School Elementary	**Pager**
Van Wert School Elementary Principal	**Pager**
Van Wert Goedde School Building	**I**
Jefferson School Elementary Early Childhood	**Pager**
Western Buckeye ESC	**I**
Wee Care Day Care	**Pager**
WERT Radio-Van Wert	**I**
WDOH Radio-Delphos	**Pager**
Camp Clay	**Scanner**
Ohio City Town Hall	**I**
Eaton	**I**
Teleflex	**I**
Central Insurance	**I**
Braun Ambulance	**I**
Life Star	**I**
Budd company	**I**
Cooper Foods	**I**
Federal Mogul	**I**
KAM Manufacturing	**I**
Kill Brothers	**I**
Van Wert Cinemas	**I**
Walmart	**Pager**
Neiswonger Performing Arts Center	**Pager**
Ridgeview Hospital	**Pager**

Denotes: I-Informer

Tornado Safety

If a tornado was approaching, would you know what to do?

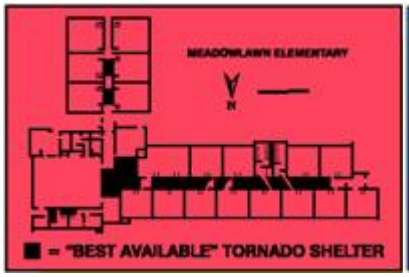
Tornadoes are the most violent atmospheric phenomenon on the planet. Winds of 200-300 mph can occur with the most violent tornadoes. The following are instructions on what to do when a tornado warning has been issued for your area or whenever a tornado threatens:

- **IN HOMES OR SMALL BUILDINGS:**

- Go to the basement (if available) or to an interior room on the lowest floor, such as a closet or bathroom. Wrap yourself in overcoats or blankets to protect yourself from flying debris.

- **IN SCHOOLS, HOSPITALS, FACTORIES, OR SHOPPING CENTERS:**

- Go to interior rooms and halls on the lowest floor. Stay away from glass enclosed places or areas with wide-span roofs such as auditoriums and warehouses. See the left figure for an example of where to go in a school. Crouch down and cover your head as shown in the right figure.



- **IN HIGH-RISE BUILDINGS:**

- Go to interior small rooms or halls. Stay away from exterior walls or glassy areas.

Photo courtesy of the Institute for Disaster Research

- **IN CARS OR MOBILE HOMES:**

- *ABANDON THEM IMMEDIATELY!!* Most deaths occur in cars and mobile homes. If you are in either of those locations, leave them and go to a substantial structure or designated tornado shelter. If the tornado is several miles away amd there is adequate time, drive quickly away from it at a right angle.

- **IF NO SUITABLE STRUCTURE IS NEARBY:**

- Lie flat in the nearest ditch or depression and use your hands to cover your head.

Flash Flood Safety

Photo courtesy of NOAA (photographer unknown)

Do you know what to do if you see water crossing over a roadway?

Flash floods and floods are the #1 weather - related killer with around 140 deaths recorded in the U.S. each year. In the picture above, the man and his child were swept away in their truck by water flowing over a roadway, before being rescued at the last minute.

Flash flood safety rules:

- **WHEN INSIDE**:

- If ordered to evacuate or if rising water is threatening, leave immediately and get to higher ground!

- **IF CAUGHT OUTDOORS**:

- Go to higher ground immediately! Avoid small rivers or streams, low spots, canyons, dry riverbeds, etc.
- Do not try to walk through flowing water more than ankle deep!
- Do not allow children to play around streams, drainage ditches or viaducts, storm drains, or other flooded areas!

- **IF IN A VEHICLE**:

- *DO NOT DRIVE THROUGH FLOODED AREAS!* Even if it looks shallow enough to cross. The large majority of deaths due to flash flooding are due to people driving through flooded areas. Water only one foot deep can displace 1500

lbs! Two feet of water can EASILY carry most automobiles! Roadways concealed by floodwaters may not be intact, as the picture below shows the aftermath of a flood.

Lightning Safety

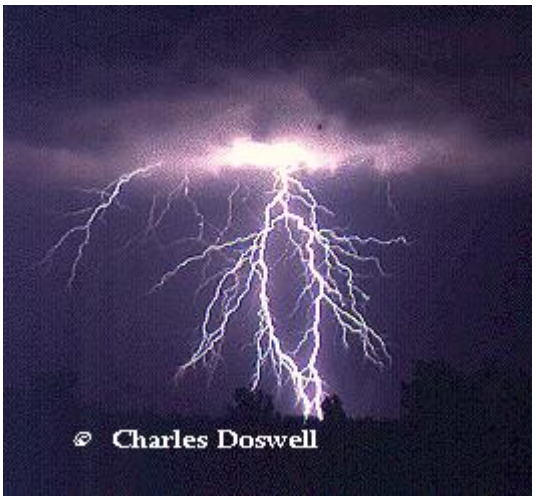


Photo courtesy and (c) Charles Doswell

Lightning causes around 100 deaths in the U.S. annually (more than hurricanes and tornadoes combined). In the picture above, the young woman and her friends were severely injured by lightning just a few seconds after this picture was taken. Notice that no rain was falling, clearly illustrating that lightning can strike up to several miles away from the thunderstorm.

General lightning safety rules:

WHEN INSIDE:

- Avoid using the telephone (except for emergencies) or other electrical appliances.
- Do not take a bath or shower.

- **IF CAUGHT OUTDOORS**:

- Go to a safe shelter immediately! such as inside a sturdy building. A hard top automobile with the windows up can also offer fair protection.
- If you are boating or swimming, get out of the water immediately and move to a safe shelter away from the water!
- If you are in a wooded area, seek shelter under a thick growth of relatively small trees.
- If you feel your hair standing on end, squat as shown in the diagram below with your head between your knees.**Do not lie flat!**
- ***Avoid:*** isolated trees or other tall objects, bodies of water, sheds, fences, convertible automobiles, tractors, and motorcycles.

Winter Storm/Blizzard Preparedness and Safety

Winter storms occasionally strike the area, especially in northwest Oklahoma. Do you know what to do if you are trapped in the middle of a blizzard?

If a **Winter Storm Watch** has been issued for your area, that means that hazardous winter weather conditions (such as snow greater than 6 inches in 24 hours, winds gusting over 35 mph, or visibilities less 1/4 mile) are expected in the next 12 to 36 hours. You should prepare for the worst now:

- **AT HOME OR WORK MAKE SURE YOU HAVE:**

- a working flashlight
- battery powered NWS weather radio , radio, or TV
- extra food, water, medicine, and baby items
- first aid supplies
- heating fuel (propane, kerosene, fuel oil, etc...)
- emergency heating source
- fire extinguisher and smoke detector

- **IN CARS AND TRUCKS:**

- fully check and winterize your vehicle
- keep your gas tank near full
- try not to travel alone
- let a friend or relative know your timetable for travel
- carry a **WINTER STORM SURVIVAL KIT** which contains:
    - blankets/sleeping bags
    - flashlight with extra batteries
    - knife
    - high calorie, non-perishable food

    - a smaller can and water-proof matches to melt snow for drinking water
    - sand or cat litter
    - shovel
    - windshield scraper
    - tool kit
    - tow rope
    - jumper cables
    - water container
    - compass and road maps

- **ON THE FARM:**

- Move animals to sheltered areas, haul extra feed to nearby feeding areas and have a water supply available (most animal deaths in winter storms are from dehydration)

If a **Winter Storm Warning** has been issued for your area, that means that hazardous winter weather conditions (such as snow greater than 6 inches in 24 hours, winds gusting over 35 mph, or visibilities less 1/4 mile) are expected within the next 12 hours or are already occurring.

- **IF CAUGHT OUTSIDE:**

- Find a dry shelter. Cover all exposed parts of the body.
- If shelter is not available:
    - Prepare a lean-to, wind break, or snow-cave for protection from the wind.
    - Build a fire for heat and to attract attention. Place rocks around the fire to absorb and reflect heat.
    - Do not eat snow. It will lower your body temperature. Melt it first.

- **IF STRANDED IN A CAR OR TRUCK:**

- ***Stay in your car or truck!***
- Run the motor about ten minutes each hour. Open the windows a little for fresh air to avoid carbon monoxide poisoning. Make sure the exhaust pipe is not blocked.
- Make yourself visible to rescuers:
    - Turn on the dome light at night when running the engine
    - Tie a colored cloth to your antenna or door
    - Raise the hood after the snow stops falling
- Exercise to keep blood circulating and to keep warm

- **AT HOME OR IN A BUILDING:**

- ***Stay inside!***
- If there is no heat:
    - Close off unneeded rooms
    - Stuff towels or rags in cracks under doors

- Cover windows at night
- Eat and drink. Food provides the body with energy and heat. Fluids prevent dehydration.
- Wear layers of loose-fitting, light-weight, warm clothing.
- **Winter Storm Warning:** Issued when hazardous winter weather in the form of heavy snow, heavy freezing rain, or heavy sleet is imminent or occurring. Winter Storm Warnings are usually issued 12 to 24 hours before the event is expected to begin.

Winter Storm Watch: Alerts the public to the possibility of a blizzard, heavy snow, heavy freezing rain, or heavy sleet. Winter Storm Watches are usually issued 12 to 48 hours before the beginning of a Winter Storm.

Winter Storm Outlook: Issued prior to a Winter Storm Watch. The Outlook is given when forecasters believe winter storm conditions are possible and are usually issued 3 to 5 days in advance of a winter storm.

Blizzard Warning: Issued for sustained or gusty winds of 35 mph or more, and falling or blowing snow creating visibilities at or below ¼ mile; these conditions should persist for at least three hours.

Wind Chill Warning: Issued when wind chill temperatures are expected to be hazardous to life within several minutes of exposure.

Wind Chill Advisory: Issued when wind chill temperatures are expected to be a significant inconvenience to life with prolonged exposure, and, if caution is not exercised, could lead to hazardous exposure.

Winter Weather Advisories: Issued for accumulations of snow, freezing rain, freezing drizzle, and sleet which will cause significant inconveniences and, if caution is not exercised, could lead to life-threatening situations.

Dense Fog Advisory: Issued when fog will reduce visibility to ¼ mile or less over a widespread area.

Snow Flurries: Light snow falling for short durations. No accumulation or light dusting is all that is expected.

Snow Showers: Snow falling at varying intensities for brief periods of time. Some accumulation is possible.

Snow Squalls: Brief, intense snow showers accompanied by strong, gusty winds. Accumulation may be significant. Snow squalls are best known in the Great Lakes region.

Blowing Snow: Wind-driven snow that reduces visibility and causes significant drifting. Blowing snow may be snow that is falling and/or loose snow on the ground picked up by the wind.

Sleet: Rain drops that freeze into ice pellets before reaching the ground. Sleet usually bounces when hitting a surface and does not stick to objects. However, it can accumulate like snow and cause a hazard to motorists.

Freezing Rain: Rain that falls onto a surface with a temperature below freezing. This causes it to freeze to surfaces, such as trees, cars, and roads, forming a coating or glaze of ice. Even small accumulations of ice can cause a significant hazard.

GLOSSARY

Accessory Cloud - A cloud which is dependent on a larger cloud system for development and continuance. Roll clouds, shelf clouds, and wall clouds are examples of accessory clouds.

Anvil - The flat, spreading top of a Cb (cumulonimbus), often shaped like an anvil. Thunderstorm anvils may spread hundreds of miles downwind from the thunderstorm itself, and sometimes may spread upwind (see back-sheared anvil).

Back-building Thunderstorm - A thunderstorm in which new development takes place on the upwind side (usually the west or southwest side), such that the storm seems to remain stationary or propagate in a backward direction.

Bear's Cage - [Slang], a region of storm-scale rotation, in a thunderstorm, which is wrapped in heavy precipitation. This area often coincides with a radar hook echo and/or mesocyclone, especially one associated with an HP storm.

Beaver('s) Tail - [Slang], a particular type of inflow band with a relatively broad, flat appearance suggestive of a beaver's tail. It is attached to a supercell's general updraft and is oriented roughly parallel to the pseudo-warm front, i.e., usually east to west or southeast to northwest. As with any inflow band, cloud elements move toward the updraft, i.e., toward the west or northwest. Its size and shape change as the strength of the inflow changes. See also inflow stinger.

Spotters should note the distinction between a beaver tail and a tail cloud. A "true" tail cloud typically is attached to the wall cloud and has a cloud base at about the same level as the wall cloud itself. A beaver tail, on the other hand, is not attached to the wall cloud and has a cloud base at about the same height as the updraft base (which by definition is higher than the wall cloud). Unlike the beaver tail, the tail cloud forms from air that is flowing from the storm's main precipitation cascade region (or outflow region). Thus, it can be oriented at a large angle to the pseudo-warm front.

Bow Echo - A radar echo which is linear but bent outward in a bow shape (Fig. 1). Damaging straight-line winds often occur near the "crest" or center of a bow echo. Areas of circulation also can develop at either end of a bow echo, which sometimes can lead to tornado formation - especially in the left (usually northern) end, where the circulation exhibits cyclonic rotation.

CA - **C**loud-to-**A**ir lightning.

Cap (or Capping Inversion) - A layer of relatively warm air aloft (usually several thousand feet above the ground) which suppresses or delays the development of thunderstorms. Air parcels rising into this layer become cooler than the surrounding air,

which inhibits their ability to rise further. As such, the cap often prevents or delays thunderstorm development even in the presence of extreme instability. However if the cap is removed or weakened, then explosive thunderstorm development can occur.

The cap is an important ingredient in most severe thunderstorm episodes, as it serves to separate warm, moist air below and cooler, drier air above. With the cap in place, air below it can continue to warm and/or moisten, thus increasing the amount of potential instability. Or, air above it can cool, which also increases potential instability. But without a cap, either process (warming/moistening at low levels or cooling aloft) results in a faster release of available instability - often before instability levels become large enough to support severe weather development.

***Cb** - **C**umulonim**b**us cloud, characterized by strong vertical development in the form of mountains or huge towers topped at least partially by a smooth, flat, often fibrous anvil. Also known colloquially as a "thunderhead."

CC - **C**loud-to-**C**loud lightning.

***CG** - **C**loud-to-**G**round lightning flash.

Cirrus - High-level clouds (16,000 feet or more), composed of ice crystals and appearing in the form of white, delicate filaments or white or mostly white patches or narrow bands. Cirrus clouds typically have a fibrous or hairlike appearance, and often are semi-transparent. Thunderstorm anvils are a form of cirrus cloud, but most cirrus clouds are not associated with thunderstorms.

Clear Slot - A local region of clearing skies or reduced cloud cover, indicating an intrusion of drier air; often seen as a bright area with higher cloud bases on the west or southwest side of a wall cloud. A clear slot is believed to be a visual indication of a rear flank downdraft.

Cold-air Funnel - A funnel cloud or (rarely) a small, relatively weak tornado that can develop from a small shower or thunderstorm when the air aloft is unusually cold (hence the name). They are much less violent than other types of tornadoes.

Condensation Funnel - A funnel-shaped cloud associated with rotation and consisting of condensed water droplets (as opposed to smoke, dust, debris, etc

Convection - Generally, transport of heat and moisture by the movement of a fluid. In meteorology, the term is used specifically to describe vertical transport of heat and moisture, especially by updrafts and downdrafts in an unstable atmosphere. The terms "convection" and "thunderstorms" often are used interchangeably, although thunderstorms are only one form of convection. Cbs, towering cumulus clouds, and ACCAS clouds all are visible forms of convection. However, convection is not always made visible by clouds. Convection which occurs without cloud formation is called dry convection, while the visible convection processes referred to above are forms of moist convection.

Cumulus - Detached clouds, generally dense and with sharp outlines, showing vertical development in the form of domes, mounds, or towers. Tops normally are rounded while bases are more horizontal.

dBZ - Nondimensional "unit" of radar reflectivity which represents a logarithmic power ratio (in decibels, or dB) with respect to radar reflectivity factor, Z.

The value of Z is a function of the amount of radar beam energy that is backscattered by a target and detected as a signal (or echo). Higher values of Z (and dBZ) thus indicate more energy being backscattered by a target. The amount of backscattered energy *generally* is related to precipitation intensity, such that higher values of dBZ that are detected from precipitation areas generally indicate higher precipitation rates. However, other factors can affect reflectivity, such as width of the radar beam, precipitation type, drop size, or the presence of ground clutter or AP. WSR-88D radars can detect reflectivities as low as -32 dBZ near the radar site, but significant (measurable) precipitation generally is indicated by reflectivities of around 15 dBZ or more. Values of 50 dBZ or more normally are associated with heavy thunderstorms, perhaps with hail, but as with most other quantities, there are no reliable threshold values to confirm the presence of hail or severe weather in a given situation

***Debris Cloud** - A rotating "cloud" of dust or debris, near or on the ground, often appearing beneath a condensation funnel and surrounding the base of a tornado.

This term is similar to dust whirl, although the latter typically refers to a circulation which contains dust but not necessarily any debris. A dust plume, on the other hand, does not rotate. Note that a debris cloud appearing beneath a thunderstorm will confirm the presence of a tornado, even in the absence of a condensation funnel.

Dew Point (or Dew-point Temperature) - A measure of atmospheric moisture. It is the temperature to which air must be cooled in order to reach saturation (assuming air pressure and moisture content are constant).

Doppler Radar - Radar that can measure radial velocity, the instantaneous component of motion parallel to the radar beam (i.e., toward or away from the radar antenna).

***Downburst** - A strong downdraft resulting in an outward burst of damaging winds on or near the ground. Downburst winds can produce damage similar to a strong tornado. Although usually associated with thunderstorms, downbursts can occur with showers too weak to produce thunder. See dry and wet microburst.

Downdraft - A small-scale column of air that rapidly sinks toward the ground, usually accompanied by precipitation as in a shower or thunderstorm. A downburst is the result of a strong downdraft.

Dry Slot - A zone of dry (and relatively cloud-free) air which wraps east- or northeastward into the southern and eastern parts of a synoptic scale or mesoscale low pressure system. A dry slot generally is seen best on satellite photographs.

Dust Devil - A small atmospheric vortex not associated with a thunderstorm, which is made visible by a rotating cloud of dust or debris (dust whirl). Dust devils form in response to surface heating during fair, hot weather; they are most frequent in arid or semi-arid regions.

***Dust Whirl** - A rotating column of air rendered visible by dust. Similar to debris cloud; see also dust devil, gustnado, tornado.

Front - A boundary or transition zone between two air masses of different density, and thus (usually) of different temperature. A moving front is named according to the advancing air mass, e.g., cold front if colder air is advancing.

Fujita Scale (or F Scale) - A scale of wind *damage* intensity in which wind speeds are inferred from an analysis of wind damage:

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F0 (weak):      40- 72 mph, light damage.
F1 (weak):      73-112 mph, moderate damage.
F2 (strong):  113-157 mph, considerable damage.
F3 (strong):  158-206 mph, severe damage.
F4 (violent): 207-260 mph, devastating damage.
F5 (violent): 261-318 mph, (rare) incredible damage.
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All tornadoes, and most other severe local windstorms, are assigned a single number from this scale according to the most intense damage caused by the storm.

***Funnel Cloud** - A condensation funnel extending from the base of a towering cumulus or Cb, associated with a rotating column of air that is *not* in contact with the ground (and hence different from a tornado). A condensation funnel is a tornado, *not* a funnel cloud, if either a) it is in contact with the ground or b) a debris cloud or dust whirl is visible beneath it.

Ground Clutter - A pattern of radar echoes from fixed ground targets (buildings, hills, etc.) near the radar. Ground clutter may hide or confuse precipitation echoes near the radar antenna.

Gust Front - The leading edge of gusty surface winds from thunderstorm downdrafts; sometimes associated with a shelf cloud or roll cloud. See also downburst, gustnado, outflow boundary.

Gustnado (or Gustinado) - [Slang], gust front tornado. A small tornado, usually weak and short-lived, that occurs along the gust front of a thunderstorm. Often it is visible only as a debris cloud or dust whirl near the ground. Gustnadoes are not associated with storm-scale rotation (i.e. mesocyclones); they are more likely to be associated visually with a shelf cloud than with a wall cloud.

High Risk (of severe thunderstorms) - Severe weather is expected to affect more than 10 percent of the area. A high risk is rare, and implies an unusually dangerous situation and usually the possibility of a major severe weather outbreak. (See slight risk, moderate risk, convective outlook.)

Hook (or Hook Echo) - A radar reflectivity pattern characterized by a hook-shaped extension of a thunderstorm echo, usually in the right-rear part of the storm (relative to its direction of motion). A hook often is associated with a mesocyclone, and indicates favorable conditions for tornado development. See Fig. 2, BWER, and Fig. 7, supercell.

HP Storm or HP Supercell - High-Precipitation storm (or High-Precipitation supercell). A supercell thunderstorm in which heavy precipitation (often including hail) falls on the trailing side of the mesocyclone (Fig. 3). Precipitation often totally envelops the region of rotation, making visual identification of any embedded tornadoes difficult and very dangerous. Unlike most classic supercells, the region of rotation in many HP storms develops in the front-flank region of the storm (i.e., usually in the eastern portion). HP storms often produce extreme and prolonged downburst events, serious flash flooding, and very large damaging hail events.

Mobile storm spotters are strongly advised to maintain a safe distance from any storm that has been identified as an HP storm; close observations (e.g., core punching) can be extremely dangerous. See bear's cage.

Humidity - Generally, a measure of the water vapor content of the air. Popularly, it is used synonymously with relative humidity.

Inversion - Generally, a departure from the usual increase or decrease in an atmospheric property with altitude. Specifically it almost always refers to a temperature inversion, i.e., an increase in temperature with height, or to the layer within which such an increase occurs. An inversion is present in the lower part of a cap.

Isobar - A line connecting points of equal pressure.

Jet Stream - Relatively strong winds concentrated in a narrow stream in the atmosphere, normally referring to horizontal, high-altitude winds. The position and orientation of jet streams vary from day to day. General weather patterns (hot/cold, wet/dry) are related closely to the position, strength and orientation of the jet stream (or jet streams). A jet stream at low levels is known as a low-level jet.

Landspout - [Slang], a tornado that does not arise from organized storm-scale rotation and therefore is not associated with a wall cloud (visually) or a mesocyclone (on radar). Landspouts typically are observed beneath Cbs or towering cumulus clouds (often as no more than a dust whirl), and essentially are the land-based equivalents of waterspouts.

Low-level Jet (abbrev. LLJ) - A region of relatively strong winds in the lower part of the atmosphere. Specifically, it often refers to a southerly wind maximum in the boundary layer, common over the Plains states at night during the warm season (spring and summer).

LP Storm (or LP Supercell) - **L**ow-**P**recipitation storm (or **L**ow-**P**recipitation supercell). A supercell thunderstorm characterized by a relative lack of visible precipitation. Visually similar to a classic supercell, except without the heavy precipitation core (Fig. 5). LP storms often exhibit a striking visual appearance; the main tower often is bell-

shaped, with a corkscrew appearance suggesting rotation. They are capable of producing tornadoes and very large hail. Radar identification often is difficult relative to other types of supercells, so visual reports are very important. LP storms almost always occur on or near the dry line, and thus are sometimes referred to as dry line storms.

LSR - Local **S**torm **R**eport. A product issued by local NWS offices to inform users of reports of severe and/or significant weather-related events.

Mammatus Clouds - Rounded, smooth, sack-like protrusions hanging from the underside of a cloud (usually a thunderstorm anvil). Mammatus clouds often accompany severe thunderstorms, but do not produce severe weather; they may accompany non-severe storms as well. See Figs. 3 (HP storm), 5 (LP storm), and 7 (supercell).

***Mesocyclone** - A storm-scale region of rotation, typically around 2-6 miles in diameter and often found in the right rear flank of a supercell (or often on the eastern, or front, flank of an HP storm). The circulation of a mesocyclone covers an area much larger than the tornado that may develop within it.

Properly used, mesocyclone is a radar term; it is defined as a rotation signature appearing on Doppler radar that meets specific criteria for magnitude, vertical depth, and duration. Therefore, a mesocyclone should not be considered a visually-observable phenomenon (although visual evidence of rotation, such as curved inflow bands, may imply the presence of a mesocyclone).

***Microburst** - A small, concentrated downburst affecting an area less than 4 kilometers (about 2.5 miles) across. Most microbursts are rather short-lived (5 minutes or so), but on rare occasions they have been known to last up to 6 times that long.

Moderate Risk (of severe thunderstorms) - Severe thunderstorms are expected to affect between 5 and 10 percent of the area. A moderate risk indicates the possibility of a significant severe weather episode

***Multiple-vortex (or Multi-vortex) Tornado** - a tornado in which two or more condensation funnels or debris clouds are present at the same time, often rotating about a common center or about each other. Multiple-vortex tornadoes can be especially damaging.

NEXRAD - NEXt-Generation Weather **RAD**ar. Technologically-advanced weather radar being deployed to replace WSR-57 and WSR-74 units. NEXRAD is a high-resolution Doppler radar with increased emphasis on automation, including use of algorithms and automated volume scans. NEXRAD units are known as WSR-88D.

NOAA - National **O**ceanographic and **A**tmospheric **A**dministration.

Nowcast - A short-term weather forecast, generally out to six hours or less.

Outflow Boundary - A storm-scale or mesoscale boundary separating thunderstorm-cooled air (outflow) from the surrounding air; similar in effect to a cold front, with

passage marked by a wind shift and usually a drop in temperature. Outflow boundaries may persist for 24 hours or more after the thunderstorms that generated them dissipate, and may travel hundreds of miles from their area of origin. New thunderstorms often develop along outflow boundaries, especially near the point of intersection with another boundary (cold front, dry line, another outflow boundary, etc.

*Overshooting Top **(or Penetrating Top) - A dome-like protrusion above a thunderstorm anvil, representing a very strong updraft and hence a higher potential for severe weather with that storm. A persistent and/or large overshooting top (anvil dome) often is present on a supercell. A short-lived overshooting top, or one that forms and dissipates in cycles, may indicate the presence of a pulse storm or a cyclic storm**

PDS Watch - [Slang], a tornado watch with enhanced wording (**P**articularly **D**angerous

Pulse Storm - A thunderstorm within which a brief period (pulse) of strong updraft occurs, during and immediately after which the storm produces a short episode of severe weather. These storms generally are not tornado producers, but often produce large hail and/or damaging winds. See overshooting top, cyclic storm.

Radial Velocity - Component of motion toward or away from a given location. As "seen" by Doppler radar, it is the component of motion parallel to the radar beam. (The component of motion *perpendicular* to the beam cannot be seen by the radar. Therefore, strong winds blowing strictly from left to right or from right to left, relative to the radar, can *not* be detected.)

Rain Foot - [Slang], a horizontal bulging near the surface in a precipitation shaft, forming a foot-shaped prominence. It is a visual indication of a wet microburst.

***Rain-free Base** - A dark, horizontal cloud base with no visible precipitation beneath it. It typically marks the location of the thunderstorm updraft. Tornadoes may develop from wall clouds attached to the rain-free base, or from the rain-free base itself - especially when the rain-free base is on the south or southwest side of the main precipitation area.

Note that the rain-free base may not actually be rain free; hail or large rain drops may be falling. For this reason, updraft base is more accurate.

Rear Flank Downdraft (or RFD) - A region of dry air subsiding on the back side of, and wrapping around, a mesocyclone. It often is visible as a clear slot wrapping around the wall cloud. Scattered large precipitation particles (rain and hail) at the interface between the clear slot and wall cloud may show up on radar as a hook or pendant; thus the presence of a hook or pendant may indicate the presence of an RFD. See Fig. 7, supercell.

Reflectivity - Radar term referring to the ability of a radar target to return energy; used to derive echo intensity, and to estimate precipitation intensity and rainfall rates.

Relative Humidity - A dimensionless ratio, expressed in percent, of the amount of atmospheric moisture present relative to the amount that would be present if the air were saturated. Since the latter amount is dependent on temperature, relative humidity is a function of both moisture content and temperature. As such, relative humidity by itself does not directly indicate the actual amount of atmospheric moisture present. See dew point.

***Roll Cloud** - A low, horizontal tube-shaped arcus cloud associated with a thunderstorm gust front (or sometimes with a cold front). Roll clouds are relatively rare; they are completely detached from the thunderstorm base or other cloud features, thus differentiating them from the more familiar shelf clouds. Roll clouds usually appear to be "rolling" about a horizontal axis, but should not be confused with funnel clouds.

Rope Stage - The dissipating stage of a tornado, characterized by thinning and shrinking of the condensation funnel into a rope (or rope funnel). Damage still is possible during this stage.

***Scud** (or Fractus) - Small, ragged, low cloud fragments that are unattached to a larger cloud base and often seen with and behind cold fronts and thunderstorm gust fronts. Such clouds generally are associated with cool moist air, such as thunderstorm outflow.

***Severe Thunderstorm** - A thunderstorm which produces tornadoes, hail 0.75 inches or more in diameter, or winds of 50 knots (58 mph) or more. Structural wind damage may imply the occurrence of a severe thunderstorm.

Shear - Variation in wind speed (speed shear) and/or direction (directional shear) over a short distance. Shear usually refers to vertical wind shear, i.e., the change in wind with height, but the term also is used in Doppler radar to describe changes in radial velocity over short horizontal distances.

***Shelf Cloud** - A low, horizontal wedge-shaped arcus cloud, associated with a thunderstorm gust front (or occasionally with a cold front, even in the absence of thunderstorms). Unlike the roll cloud, the shelf cloud is attached to the base of the parent cloud above it (usually a thunderstorm). Rising cloud motion often can be seen in the leading (outer) part of the shelf cloud, while the underside often appears turbulent, boiling, and wind-torn.

Slight Risk (of severe thunderstorms) - Severe thunderstorms are expected to affect between 2 and 5 percent of the area. A slight risk generally implies that severe weather events are expected to be isolated.

SPC - Storm Prediction Center. A national forecast center in Norman, Oklahoma, which is part of NCEP. The SPC is responsible for providing short-term forecast guidance for severe convection, excessive rainfall (flash flooding) and severe winter weather over the contiguous United States.

Splitting Storm - A thunderstorm which splits into two storms which follow diverging paths (a left mover and a right mover). The left mover typically moves faster than the

original storm, the right mover, slower. Of the two, the left mover is most likely to weaken and dissipate (but on rare occasions can become a very severe anticyclonic-rotating storm), while the right mover is the one most likely to reach supercell status.

***Squall Line** - A solid or nearly solid line or band of active thunderstorms.

***Straight-line Winds** - Generally, any wind that is not associated with rotation, used mainly to differentiate them from tornadic winds.

Stratiform - Having extensive horizontal development, as opposed to the more vertical development characteristic of convection. Stratiform clouds cover large areas but show relatively little vertical development. Stratiform precipitation, in general, is relatively continuous and uniform in intensity (i.e., steady rain versus rain showers).

Stratocumulus - Low-level clouds, existing in a relatively flat layer but having individual elements. Elements often are arranged in rows, bands, or waves. Stratocumulus often reveals the depth of the moist air at low levels, while the speed of the cloud elements can reveal the strength of the low-level jet.

Stratus - A low, generally gray cloud layer with a fairly uniform base. Stratus may appear in the form of ragged patches, but otherwise does not exhibit individual cloud elements as do cumulus and stratocumulus clouds. Fog usually is a surface-based form of stratus.

Suction Vortex (sometimes Suction Spot) - A small but very intense vortex within a tornado circulation. Several suction vortices typically are present in a multiple-vortex tornado. Much of the extreme damage associated with violent tornadoes (F4 and F5 on the Fujita scale) is attributed to suction vortices.

***Supercell** - A thunderstorm with a persistent rotating updraft. Supercells are rare, but are responsible for a remarkably high percentage of severe weather events - especially tornadoes, extremely large hail and damaging straight-line winds. They frequently travel to the right of the main environmental winds (i.e., they are right movers). Radar characteristics often (but not always) include a hook or pendant, bounded weak echo region (BWER), V-notch, mesocyclone, and sometimes a TVS. Visual characteristics often include a rain-free base (with or without a wall cloud), tail cloud, flanking line, overshooting top, and back-sheared anvil, all of which normally are observed in or near the right rear or southwest part of the storm (Fig. 7). Storms exhibiting these characteristics often are called classic supercells; however HP storms and LP storms also are supercell varieties.

***Tail Cloud** - A horizontal, tail-shaped cloud (not a funnel cloud) at low levels extending from the precipitation cascade region of a supercell toward the wall cloud (i.e., it usually is observed extending from the wall cloud toward the north or northeast). The base of the tail cloud is about the same as that of the wall cloud. Cloud motion in the tail cloud is away from the precipitation and toward the wall cloud, with rapid upward motion often observed near the junction of the tail and wall clouds. Compare with beaver tail, which is

a form of inflow band that normally attaches to the storm's main updraft (not to the wall cloud) and has a base at about the same level as the updraft base (not the wall cloud).

Tilted Storm or Tilted Updraft - A thunderstorm or cloud tower which is not purely vertical but instead exhibits a slanted or tilted character. It is a sign of vertical wind shear, a favorable condition for severe storm development.

***Tornado** - A violently rotating column of air in contact with the ground and extending from the base of a thunderstorm. A condensation funnel *does not need to reach to the ground* for a tornado to be present; a debris cloud beneath a thunderstorm is all that is needed to confirm the presence of a tornado, even in the total absence of a condensation funnel.

Tornado Family - A series of tornadoes produced by a single supercell, resulting in damage path segments along the same general line.

Towering Cumulus –A large cumulus cloud with great vertical development, usually with a cauliflower-like appearance, but lacking the characteristic anvil of a Cb.

TVS - **T**ornadic **V**ortex **S**ignature. Doppler radar signature in the radial velocity field indicating intense, concentrated rotation - more so than a mesocyclone. Like the mesocyclone, specific criteria involving strength, vertical depth, and time continuity must be met in order for a signature to become a TVS. Existence of a TVS strongly increases the probability of tornado occurrence, but does *not* guarantee it. A TVS is not a visually observable feature.

Updraft - A small-scale current of rising air. If the air is sufficiently moist, then the moisture condenses to become a cumulus cloud or an individual tower of a

VIL - **V**ertically-**I**ntegrated **L**iquid water. A property computed by RADAP II and WSR-88D units that takes into account the three-dimensional reflectivity of an echo. The maximum VIL of a storm is useful in determining its potential severity, especially in terms of maximum hail size.

VIP - **V**ideo **I**ntegrator and **P**rocessor, which contours radar reflectivity into 6 levels:

- VIP 1 (Level 1, 18-30 dBZ) - Light precipitation
- VIP 2 (Level 2, 30-38 dBZ) - Light to moderate rain.
- VIP 3 (Level 3, 38-44 dBZ) - Moderate to heavy rain.
- VIP 4 (Level 4, 44-50 dBZ) - Heavy rain
- VIP 5 (Level 5, 50-57 dBZ) - Very heavy rain; hail possible.
- VIP 6 (Level 6, >57 dBZ) - Very heavy rain and hail; large hail possible.

***Virga** - Streaks or wisps of precipitation falling from a cloud but evaporating before reaching the ground. In certain cases, shafts of virga may precede a microburst; see dry microburst.

***Wall Cloud** - A localized, persistent, often abrupt lowering from a rain-free base. Wall clouds can range from a fraction of a mile up to nearly five miles in diameter, and normally are found on the south or southwest (inflow) side of the thunderstorm. When seen from within several miles, many wall clouds exhibit rapid upward motion and cyclonic rotation. However, not all wall clouds rotate. Rotating wall clouds usually develop before strong or violent tornadoes, by anywhere from a few minutes up to nearly an hour. Wall clouds should be monitored visually for signs of *persistent, sustained* rotation and/or rapid vertical motion.

Warning - A product issued by NWS local offices indicating that a particular weather hazard is either imminent or has been reported. A warning indicates the need to take action to protect life and property. The type of hazard is reflected in the type of warning (e.g., tornado warning, blizzard warning). See short-fuse warning.

Watch - An NWS product indicating that a particular hazard is possible, i.e., that conditions are more favorable than usual for its occurrence. A watch is a recommendation for planning, preparation, and increased awareness (i.e., to be alert for changing weather, listen for further information, and think about what to do if the danger materializes).

Waterspout - In general, a tornado occurring over water. Specifically, it normally refers to a small, relatively weak rotating column of air over water beneath a Cb or towering cumulus cloud. Waterspouts are most common over tropical or subtropical waters.

The exact definition of waterspout is debatable. In most cases the term is reserved for small vortices over water that are not associated with storm-scale rotation (i.e., they are the water-based equivalent of landspouts). But there is sufficient justification for calling virtually any rotating column of air a waterspout if it is in contact with a water surface.

Wedge (or Wedge Tornado) - [Slang], a large tornado with a condensation funnel that is at least as wide (horizontally) at the ground as it is tall (vertically) from the ground to cloud base.

The term "wedge" often is used somewhat loosely to describe any large tornado. However, not every large tornado is a wedge. A true wedge tornado, with a funnel at least as wide at the ground as it is tall, is very rare.

Wedges often appear with violent tornadoes (F4 or F5 on the Fujita Scale), but many documented wedges have been rated lower. And some violent tornadoes may not appear as wedges (e.g., Xenia, OH on 3 April 1974, which was rated F5 but appeared only as a series of suction vortices without a central condensation funnel). Whether or not a tornado achieves "wedge" status depends on several factors other than intensity - in particular, the height of the environmental cloud base and the availability of moisture below cloud base. Therefore, spotters should *not* estimate wind speeds or F-scale ratings based on visual appearance alone. However, it generally is safe to assume that most (if not all) wedges have the potential to produce strong (F2/F3) or violent (F4/F5) damage. The Van Wert, Ohio Tornado on November 10, 2002 which was rated as an F-4 one half mile wedge tornado with multiple vortices.

Zonal Flow - Large-scale atmospheric flow in which the east-west component (i.e., latitudinal) is dominant. The accompanying meridional (north-south) component often is weaker than normal. Compare with meridional flow.

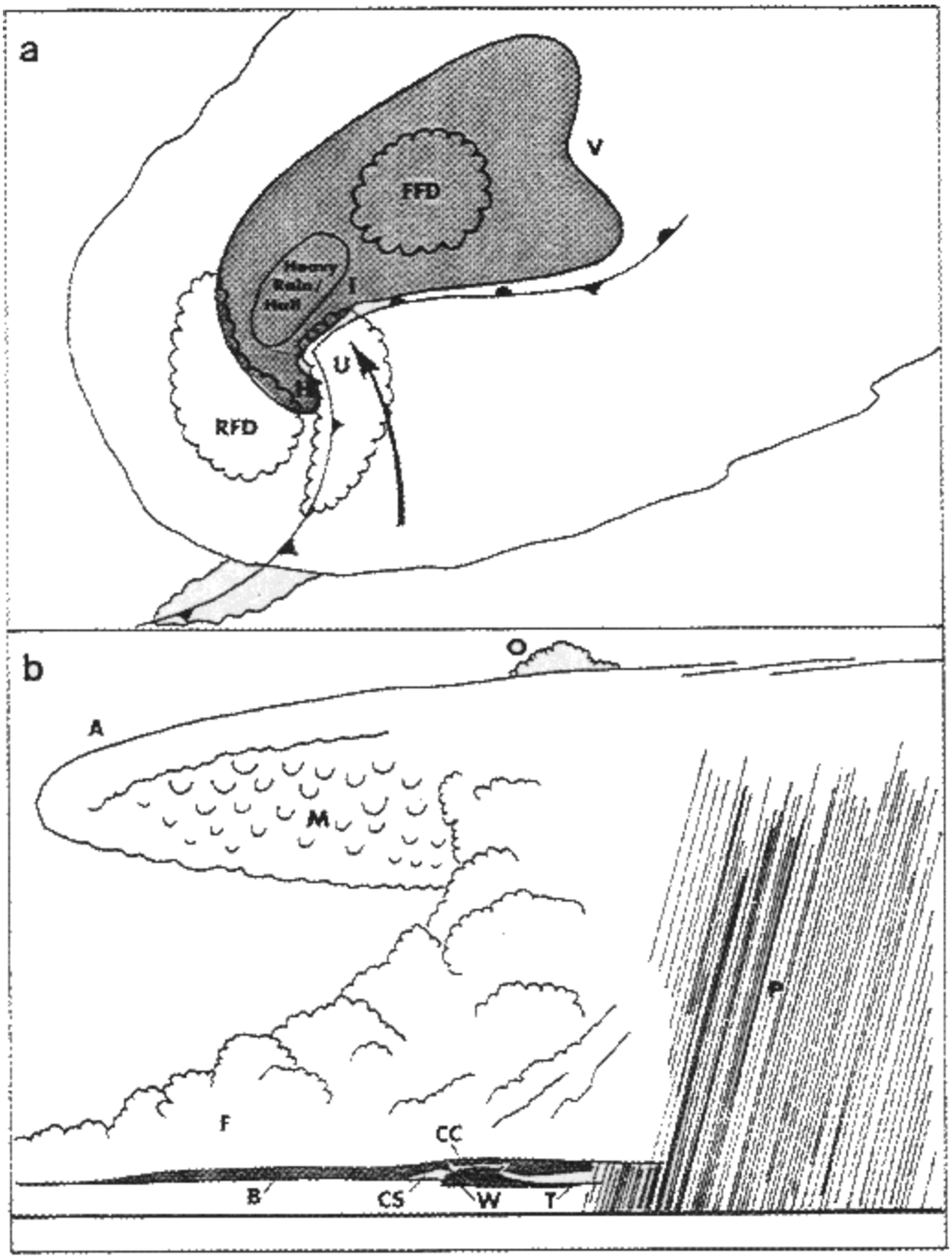


Figure 7.
Supercell. Schematic view of a classic supercell (a), and visual characteristics of the same storm as might be seen from the east or southeast (b). In (a), the region of radar reflectivity is shaded; note V-notch (V), inflow notch (I), and hook echo (H). Scalloped lines enclose region of main updraft (U), forward flank downdraft (FFD) and rear flank downdraft (RFD). Surface inflow is indicated by arrow. Frontal symbols indicate location of gust front. Features in (b) include overshooting top (O), backsheared anvil (A), mammatus (M), flanking line (F), rain-free base (B), clear slot (CS), collar cloud (CC), wall cloud (W), tail cloud (T) and area of heavy precipitation (P). Compare with Figs. 3 and 5.

Figure 1 - Bow Echo

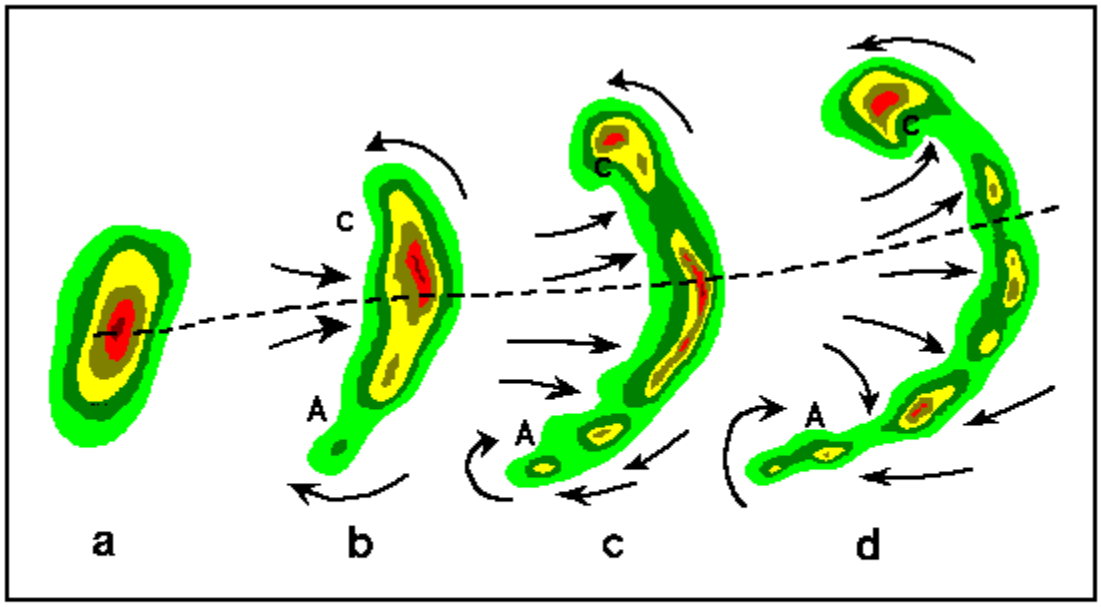


Fig. 1. Bow Echo. Typical evolution of a thunderstorm radar echo (a) into a bow echo (b,c) and into a comma echo (d). Dashed line indicates axis of greatest potential for downbursts. Arrows indicate wind flow relative to the storm. Note regions of cyclonic rotation (C) and anticyclonic rotation (A); both regions, especially C, are capable of supporting tornado development in some cases.

TORNADOES AND FUNNEL CLOUDS

A tornado is a tightly spinning column of air in contact with the ground beneath a thunderstorm cloud. It may be visible as a **condensation funnel** or as a swirl of dirt (debris cloud) on the ground. By comparison, a funnel cloud spins in mid-air and is not touching the ground.

Funnel clouds and tornadoes are relatively rare but there's no reason to assume one cannot happen with a severe storm. Of the 1,000 average annual tornado sightings in the United States, most are first seen and reported by spotters or the public, and they may occur without being previously forecast. The search for this complex,unusual event offers you a most exciting and rewarding challenge. For the sake of reporting and because of the potential threat to people, tornadoes and funnel clouds are grouped together.

How and why they form

It takes an exact set of conditions for a storm to become tornadic. Key storm characteristics are an intense, sustained updraft, a rightward turning of winds with height (e.g. SE at the surface and SW aloft), and strong winds at cloud-top height. The storm's own circulation interacts with the environmental flow to create a structure that can lead to a tightly rotating vortex within the cloud.

Spotting tornadoes at a distance is harder than it looks. Even without haze, showers, or low cloud bases, any distant object in the sky quickly becomes tiny beyond about 10 km. You will have to depend on knowing exactly where to look for it in the storm structure. Here, a tornado (light column, bottom centre) is barely visible on the left side of a low wall cloud. The flanking line (darker axis, centre) trails away from a large mesocyclone (note striations, right half) and the RFD has cleared a slot of bright sky behind the storm (left).

There are two main tornado types - weak and strong. Weak ones are brief events causing only limited damage. They are formed primarily by the tightening-up of a rotating updraft as the storm intensifies to a maximum,and will be found right under the updraft core,sometimes without a significant lowering. They are more common on the Prairies or with mid-summer storms. This form of "simple "rotation accounts for several tornado variations (see below)and most funnel sightings, including all cold-air funnels.

There is a much stronger variety that occurs with supercells.The updraft becomes a mesocyclone, or rotating column,within the cloud which you see at the bottom as a rotating wall cloud. The mesocyclone derives its rotation from a

complex process in which two forces combine. First, positive **vorticity** is transferred from inflow air to the updraft column. Vorticity refers to the ability of a fluid (air) to rotate about an axis. The initially horizontal inflow is sheared forward and rightward (higher parts move faster and more to the right), causing a "rolling-pin" motion in the flow.When the air turns vertical in the updraft, the rollers angle upward too. This causes the column to rotate slowly as a mesocyclone with a diameter of about 2-5 km. The potential for rotation is highest when the air entering the storm turns sharply to the right with height (undergoes directional wind shear). That's why storms moving from the W-SW with a SE-E inflow are more likely to rotate than those with inflow that is aligned with the flow aloft.

92 W/NE, 93 N/NE, 94-95 NW/NE Four classic supercell tornadoes in a moist region. All four examples show an F2-F3 tornado at the back end of the storm, under the flanking line a few kilometres from the precipitation. In 92 and 95, the flank is advancing as a weak gust front, pushed along by outflow behind the line. In a moist region, the wall cloud will be low, soft and appear larger (95), resulting in a shorter visible tornado (93). There are often scud tags attached to it, and the tornado's position and structure may be harder to see because of rain, low cloud and a mix of debris and condensation in the vortex. 95 is a more distant view of 94 and a few minutes later.

The much tighter tornadic circulation is still largely a mystery. It is known that the column's spin increases as the updraft narrows (the "ice-skater effect") and stretches due to the upward acceleration of air induced by wind shear. Once the storm is fully formed, it acts as a barrier to the flow, enhancing the rotation. A final influence comes when a severe phase leads to an intense downdraft that interacts with the adjacent updraft to create a much smaller vortex within the mesocyclone. (This last "trigger "can be seen from a distance as a burst phase and overshooting top that then collapses). At the same time, the flow at the back of the storm is deflected toward the ground (as the rear-flank downdraft) where it begins to push the flanking line forward and wrap around the mesocyclone,

further tightening the rotation. This last step can take from 10-20 minutes after a major updraft dome has flattened again, and will be seen as a speeding-up of wall cloud rotation followed by the emergence of a funnel that may lengthen downward and widen.

This all sounds complicated - and it is!! There are many more questions than answers, and the things you see and relate in your report will greatly help in recognizing these severe processes. Most weak tornadoes occur with an intense phase of a multicell type storm. Supercells, too, can produce brief, weak ones but they are also responsible for almost all strong, large, or long-lasting tornadoes. Tornadoes are rated on the Fujita-scale, from F0 (weak) to F5 (devastating), based on damage assessment. Most tornadoes in the United States are F0-F1.

No two are alike

There is no such thing as a typical-looking tornado because so many things contribute to the shape and appearance. Humid conditions cause larger wall clouds, lower cloud bases (short, fat tornado), while drier weather leads to higher bases and relatively thinner, taller tornadoes. The storm severity affects their diameter; terrain determines the type and thickness of debris visible from a distance; and low-level winds and moisture affect shape and the presence or absence of a traditional condensation funnel cloud. It can be said that most weak tornadoes are the slender type while strong ones are generally wider and messier overall.The really big supercell types can be over a kilometre in diameter, with winds reaching 200-300km/hr in the separate vortices swirling around the perimeter of a rotating wall cloud that has descended right to the ground!

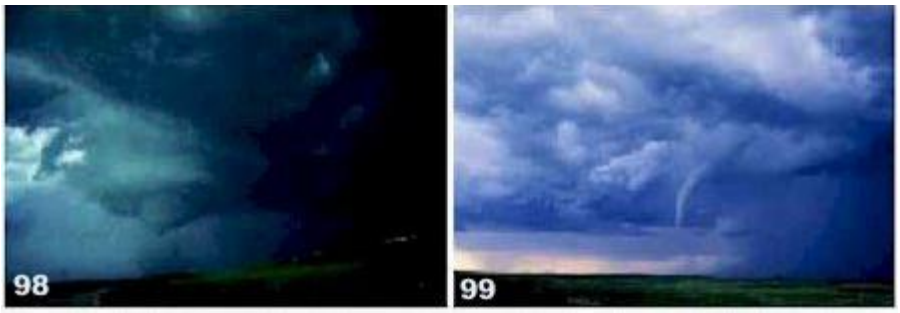
A significant distinction must be made between a tornado as a visible funnel extending to the ground and the associated violently rotating column of air. When we see a tornado we are usually looking at its condensation funnel, a cloud condensed in the very low pressure within the vortex. However, many tornadoes have short or incomplete condensation funnels and some none at all. This can fool us into thinking the tornado hasn't reached the surface. A tornado can be doing major damage (often made visible by the debris cloud at the ground) with few visible signs of its presence in the sky above.

Stages in tornado development

Most tornadoes and funnel clouds will be preceded by a rotating wall cloud. You can see the rotation by watching the bits of cloud along the edge of the lowering moving slowly around it. The motion is usually clockwise when looking up.

If the entire wall cloud rotates faster and lowers further,a large,wide tornado can form without a typical funnel. However, most cases will have a funnel cloud form under the wall cloud, usually between the centre and south edge of it. The funnel will be smooth-edged and tapered to a point. Some larger funnel clouds may appear as a rounded bulb or diffuse V-shaped cone.

If the funnel is wide or close to the ground it is likely already a tornado and you should check carefully for debris. Thinner funnel clouds may hang in the air for several minutes, then disappear again. If they lengthen downward it will only be a minute or two before ground contact is made. But it must be stressed that a tornado can exist without a long funnel or any signs of rotation in the air. Indeed, often the first visible sign of a tornado touchdown is a cloud of debris at the ground.



98-99 NW/E The SW back end of this classic supercell has a small, circular wall cloud and F2 tornado. The funnel is a mere rounded bulbous extension, but the vortex is obvious from the large debris cloud being stirred up. After 5 minutes (99), the tornado has lifted (no more debris visible) even though the condensation funnel is now much longer.

100 NW/SE, 101-106 W/SE Sequence showing classic supercell F2 tornado life cycle. The wall cloud - which precedes most tornadoes - is seen here (100) as a rotating, light-grey brushy lower cloud attached to the SW end of a dark storm base. The storm it belongs to is mainly to the right; a separate storm and flanking line axis are visible in the background. A short while later, in (101), a debris cloud appears suddenly to indicate a tornado touchdown. Note how uniform and symmetrical the swirl of dirt is. In a minute (102), dirt begins to form a column as it rises up the vortex (mostly on the outside). There is a short condensation funnel visible below the cloud base. The tornado soon reaches full strength (103) and now has a dense debris cloud extending about halfway up, plus a funnel about halfway down. Peak F2 damaging winds are now occurring and the vortex column is at its widest. In 104, the mature tornado continues but has become more elongated because outflow from the right and back (from the rain core) has pushed SW and is "leaning" against the vortex.

This begins to weaken the tornado and the weakening circulation is beginning to loosen its grip on the dirt column. Tornadoes usually weaken when the vortex up inside the cloud decreased (the storm weakens) but it can also be caused or assisted by a surge of outflow that under-cuts the vortex near the ground. The funnel is now most of the way down, but is thinner, twisted and kinked by the impinging outflow. This is the waning, rope stage.

After another minute or so the tornado had almost lifted. The ropey funnel is still shrinking in the air but contact at the ground is much weaker and will end shortly. Without a strong, controlling influence, the dust cloud drifts apart and will dissipate in a few minutes. The entire event from touchdown to liftoff took about 7 minutes.

107-116 Ten tornado examples presented in order of intensity. Every tornado has a different combination of moisture (width, length), strength (extent of debris), and mesocyclone size (wall cloud) to be come a unique sight. Your viewing angle is also important. Many tornadoes (110,115) do not appear dark (backlit) but are instead white from reflected skylight. The unusual white blob in 110 was a "puff" of water where the tornado hit a water-bottling factory. In the transition from dark to light as a tornado moves across your view (93), it can briefly appear a nearly invisible grey. Some tornadoes (94,112) are multiple-vortex - having intense, smaller vortices, sometimes seen as separate, dark (condensed) bands within them. Size can be

deceiving, too. 109 may look weaker because it is slender (our size bias) but is actually a quite intense F2. There is no typical funnel in 111 but the entire wall cloud/mesocyclone has descended to the ground and is doing damage as a true tornado. By contrast, dry-region tornadoes may have no lowering at all (108).

Once formed, a tornado will reach maximum intensity fairly quickly. Weaker and stronger phases may alternate and the funnel cloud may lift briefly or change in diameter. At peak intensity, you will usually see a dark mass of debris at the base of the tornado, with the debris revolving upward in a tightly controlled fashion. Low, wide tornadoes can be spread out,with several apparent contact points or separate vortices within a broad circular region which show both debris and condensing cloud matter mixing as they ascend.

In the waning stage,the tornado lifts and becomes thinner. Debris decreases suddenly and become diffuse or spreads out horizontally. The condensation funnel shrinks upward and becomes twisted, curved, or less vertical in orientation. It continues to shrivel in this rope stage until it vanishes or retracts into the cloud base. The wall cloud also loses structure and size but may rebuild again in a while.

What it's like near a tornado

If a tornado is nearby and moving closer, forget about the sightseeing and take immediate measures to protect yourself!

Tornadoes move with the storm cloud, at the same speed and direction, typically 60-70mph/hr from the SW or W. Their motion is, therefore, reasonably slow and predictable. Two factors can exist to alter this regular movement: the wall cloud can be rebuilding (often eastward), causing the tornado, especially if it is wide, to also shift and reform forward in steps; and, strong, persistent tornadoes can move along a looping path where straight motion is replaced for short periods by a tightening-up and northward twist in the motion. Tornadoes are highly organized and quite well-behaved structures, and there are rarely any sudden changes or surprises in the direction of movement.

Contrary to popular belief, it is not windy near most tornadoes. Within a few kilometres, the air will be unusually calm since the storm's giant updraft is overhead. Although weaker tornadoes tend to begin and end abruptly, some strong tornadoes induce a steadily increasing wind outside of the destructive vortex itself. Even without strong winds, it is dangerous outside near a tornado because pieces of debris can fall from the sky without warning (most likely NW-NE of the tornado).

In any one place, the severe tornadic wind will last from several seconds to, at most, two minutes and be accompanied by a variety of sounds caused by the damage to buildings, trees, etc. Some people also hear a roar, but many tornadoes have no sound with them at all. If the sound is irregular it is likely the result of damage occurring nearby; but if it is a steady, softer sound that originates in the sky or toward the main storm cloud, it is more likely caused by large hailstones hitting the ground or colliding in mid-air.

Most tornadoes occur near the back side of a worst-last storm, near a brightening sky to the west, and without any precipitation. Heavy rain and hail may precede its arrival but once the updraft core is overhead, only a few scattered hailstones will interrupt the eerie calm. After its passage, some light rain or hail can occur briefly,along with cooler W-NW winds,before clearing takes place.

Other rotating structures

There are several other rotating structures to watch for and report which do not form under a typical wall cloud or storm updraft base. For all of these, your description of their location in the storm, associated features, and general situation will help the weather office determine the true risk and the need for further action.

Cold-air funnels

Cold-air funnels are true funnel clouds by appearance but will not lead to a damaging tornado. They are usually brief and thin, and often occur under the rain-free base of weaker storms or large cumulus during relatively cool, moist weather from spring to fall. A common situation,seen more often on the Prairies, is a spell of cool, windy, unsettled weather in summer. Large cumulus fill the sky and showers are scattered about. Some of the larger clouds will have ragged bases and bits of scud below them. If an updraft is particularly strong, the rising air can tighten into a small vortex which you see as a funnel. A brief, weak touchdown is rare, but possible. The "cold-air" refers to the situation,in which the temperatures aloft are relatively cold for the time of year.A special weather bulletin is issued for these funnels because they can look so much like a tornadic funnel.

117, 118 E/SE, 119 W/E Three examples of non-tornadic funnel clouds. 117 is a cold-air funnel dangling like a snake below a large cumulus cloud. The funnel in 118 is not connected with a lowering or updraft. Instead, it formed on the boundary between different airstreams (possibly separate outflows at the back of this storm) and is referred to as a "shear funnel". The needle or "spaghetti funnel" in 119 (see also photo 135) can appear briefly under intense updrafts (usually LP storms) but rarely touches down.

Other funnels

A funnel cloud is just a spinning vortex and you may see one that looks like the real thing but is either in the wrong location or eems unrelated to any lowering or updraft region. These mid-air funnels are very deceiving and the only way to discount their threat is to look at the surrounding clouds for clear signs of rotation Fortunately they are very short-lived and quickly decay after formation.

Landspouts

The landspout is a weak tornado type seen under small storms or large, growing cumulus clouds. It is like a cold-air funnel that has touched down, and can cause brief, minor damage. They don't always have a full condensation funnel and are sometimes only made visible by the dust they stir up.

Waterspouts

The waterspout is another weak tornado type. Like a landspout, it looks like a slender tornado but occurs only over water in the same situations as cold-air funnels. They are occasionally seen near the coasts in the late summer and fall, but are more common in early fall over the Great Lakes and other large lakes.

Cool, unstable air masses passing over the warmer waters allow vigorous updrafts to form, which can tighten up into a spinning column. The cool, moist air supports a full condensation funnel despite the weaker rotation. Waterspouts can be dangerous for boaters and shoreline locations but are no threat farther inland since they collapse as soon as they move onshore. A true waterspout forms over the water and is not accompanied by a strong storm. If a severe storm with a tornado happens to pass over a stretch of water, the tornado is sometimes called a tornadic waterspout and would be just as dangerous as if it were over land. The difference is entirely in the weather we see with the waterspout. If it's cool, cloudy, with showers around but no organized storms, then the appearance of a tornado-like funnel over water will be a regular waterspout.

Gustnadoes

The most common weak tornado type is the gustnado, a brief, intense vortex that usually forms on the leading edge of severe gust fronts. In rarer cases, gustnadoes form at the edge of a severe storm where opposing airstreams happen to converge. They will last from a few seconds to a minute and are strong enough to cause minor damage. They are distinguished from a true tornado by their location at the edge of advancing outflow, away from the main updraft. Although they look like a **dust devil** at times, they do not form in fair weather and they extend higher into the sky.

The only indicators you can spot beforehand are the dust they stir up and sometimes a ruffled, lowered part of the cloud base that shows some swirling.

The best hint is the gust front itself - if it is a strong one, there will probably also be microbursts and lifting dust. Within this forward-moving dust and wind, a gustnado will stand out as a distinct vertical column. But if the vortex is over wet ground or forest, you may not see anything at all. As it comes closer you'll hear the wind rush, too, but there will likely not be any signs of a funnel with it.

Gustnadoes occur everywhere and account for a large number of the weakest tornado reports each year. Their localized impact and damaging effects have allowed them to be counted as tornadoes (although many also go unreported each year) but most are probably not "true" tornadoes. The vortex forms along the boundary of two air masses near the ground and most of the time it doesn't reach to a convective cloud base. But because they

happen with a nearby storm they are easily mistaken for and labeled as regular tornadoes.

Dust devils

On sunny, dry spring and summer days the heated air near the ground can rise in small, spinning columns. If over dusty ground, the stronger ones become visible when the dust gathers into a whirl and rises up the column. These dust devils can look like a weak tornado at the bottom but they rarely extend higher than 100m and are only seen in fair weather. Large dust devils can toss lawn furniture around, etc. but are not a threat otherwise.

DON'T GET FOOLED!

One of the great joys of cloudwatching is the variety of ways Mother Nature presents her evidence - proving or disproving our theories and assumptions about what we see. The weather watcher is constantly challenged by new circumstances and every storm adds to your understanding and respect for the complexities of the atmosphere. What we take for granted confounds us; what we perceive as obvious hides the truth eloquently; what we see and appreciate for its simple beauty speaks quiet volumes of wisdom. As your experience grows, the context for tour understanding widens until surprises enrich rather than confuse your knowledge of the sky.

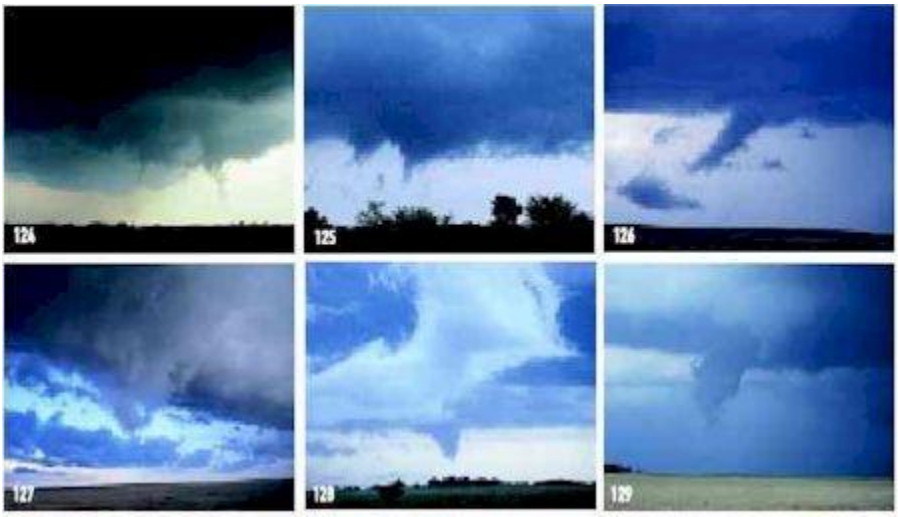
False funnels

There are several tornado/funnel look-alikes which can easily fool you at first glance. Disqualifying such "false funnels "is very important for minimizing erroneous reports as well as reducing your anxiety while storm spotting.

Scud tags and inflow tails

Whenever you have air rising rapidly at the edge of cool, moist outflow, lower cloud fragments (scud) will form in mid-air or under the base in the shape of small points, lumps, etc. protruding downward. These scud tags change shape constantly and do occasionally take the form of a tapered cloud that looks like a funnel. They are most common along the gust front, near ragged lowerings, or along any cool-warm boundary. They are best differentiated from true funnels by location, since a true wall cloud is absent or found elsewhere in the sky. However, they are also less smooth-edged, more transient, more ragged or fragmented, and rising rather than rotating.

A more organized structure that sometimes appears when a new,intense updraft forms adjacent to rain or outflow, is an **inflow tail**. This is a low, often ragged, and thick cloud extending down at an angle below the main cloud base. It is a brief event but can be quite frightening if close by. Again, location and the absence of a wall cloud will disqualify this cloud as a tornado threat. The edges of wall clouds or lowerings also assume pointed shapes briefly, but without classic, persistent funnel features. When a tail cloud forms on the rainy side of the wall cloud, however, it may indicate overall intensification and the entire structure should be watched.



124 W/NE, 125 E/E, 126 NW/NE, 127 SE/S, 128 SW/SE, 129 N/E Examples of false funnels. All of these are scud rising in updrafts that have drawn some of the moist air in from nearby outflow. In 127 and 129, the updraft is under the rain-free base and shows you where the next, strong tower may be along the axis. All examples are transient, having a funnel-like shape for only seconds before becoming less deceiving.

132-135 Four inflow tails. In 132, outflow driving a sharp gust front is lifting scud in chunks and in tails within stronger updrafts. 133 and 134 are lowerings with an inflow tail extending back towards the rain and outflow. The cloud mass in 135 is the backside of a storm. A short flanking line ends (SW side) as a tapered extension of the cloud base where the updrafts are focused to a point. As seen in 18 and 119, such LP storms can produce brief true funnels at the very back, too.

136 SW/E A collapsing heavy rain core (lower right) has sent out a burst of outflow, forming a giant cloud "claw" that lunges forward with teeth bared. Along the leading edge of this gust front, numerous small updrafts condense as fingers of scud that can briefly look very much like funnel clouds.