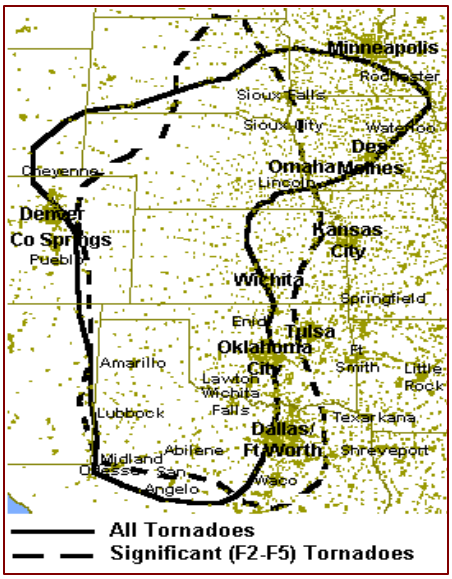
United States
Tornado History

The United States has the highest occurrence of tornadoes of any nation in the world. During an average year, over 1,000 tornadoes occur across the continental United States. Nearly a third of these tornadoes occur in the states of Texas, Oklahoma, Kansas, and Nebraska, an area known as "Tornado Alley". This is the area where conditions combine during the springtime and early summer for the formation of supercell thunderstorms and tornadoes. Over 55% of a year's tornadoes occur between the months of April and June, when cool dry air from Canada clashes with warm moist air from the Gulf of Mexico. These ingredients, when combined with a storm system, generate strong to severe thunderstorms and, in some cases, tornadoes.

This paper details historical statistics on tornadoes in the United States, gives details and damage amounts when available on past major tornadoes, and provides some tornado safety tips.



HISTORICAL TORNADO STATISTICS

- The most tornadoes in one year occurred in 2003, when 1,376 tornadoes were reported. 2003 also brought the highest number of tornadoes in a ten-day period (May 1st through May 10th): 412. May 2003 also tripled the average number of tornadoes for the month with a total of 543 tornadoes, compared to an average May total of 180.

- The Tri-State Tornado of March 18, 1925 claimed the most lives of any single tornado, killing 689 people in 3½ hours on its 219-mile long track. This tornado also was the third-fastest tornado on record, traveling at nearly 60 miles per hour.

- The most tornado deaths in one year following the inception of official severe weather forecasting by Air Force officials in 1951 occurred in 1953, when 519 people died from 422 tornadoes. Three of most deadly tornadoes of all time occurred in this year in three different places: Flint, MI; Waco, TX; and Worchester, MA.

- The costliest tornado in history occurred on May 3rd, 1999, when an F5 tornado devastated the Oklahoma City, OK suburb of Moore. This tornado caused more than $1 billion dollars in damage.

- The most tornadoes occurring over a period of time occurred on April 3rd and 4th, 1974. This tornado outbreak, known as the "Super Outbreak", produced 148 tornadoes in less than 24 hours from Michigan to Alabama. Several cities in this outbreak were hit twice from separate tornadoes, including Harvest, AL, which experienced an F5 tornado at 7:15 pm and an F4 tornado at 7:45 pm.

The next page shows the Fujita-Pearson Scale, a scale devised to determine estimated wind speeds from a tornado's damage.

Fujita-Pearson Number	Estimated Wind Speed*	Path Width*	Path Length*	Description Of Destruction
0 (Gale)	40-72 mph	6-17 yards	0.3-0.9 miles	Light damage, some damage to chimneys, braches broken, sign boards damaged, shallow-rooted trees blown over.
1 (Moderate)	73-112 mph	18-55 yards	1.0-3.1 miles	Moderate damage, roof surfaces peeled off, mobile homes pushed off foundations, attached garages damaged.
2 (Significant)	113-157 mph	56-175 yards	3.2-9.9 miles	Considerable damage, entire roofs torn from frame houses, mobile homes demolished, boxcars pushed over, large trees snapped or uprooted.
3 (Severe)	158-206 mph	176-566 yards	10-31 miles	Severe damage, walls torn from well-constructed houses, trains overturned, most trees in forests uprooted, heavy cars thrown about.
4 (Devastating)	207-260 mph	0.3-0.9 miles	32-99 miles	Complete damage, well-constructed houses leveled, structures with weak foundations blown off for some distance, large missiles generated.
5 (Incredible)	261-318 mph	1.0-3.1 miles	100-315 miles	Foundations swept clean, automobiles become missiles and thrown for 100 yards or more, steel-reinforced concrete structures badly damaged.

* The above guidelines are based on conceptual wind speeds, path widths, and path lengths. Most tornadoes do not follow these guidelines, however. Some of the most intense tornadoes have traveled less than 100 miles. An example of this would be the April 26th, 1991 Andover, KS F5 tornado. This tornado only traveled 45 miles and had a path width of 500 yards. Another example would be the famous Xenia, OH tornado of April 3rd, 1974. This F5 tornado only traveled 32 miles and had a path width of 500 yards. On the other hand, an F2 tornado on April 24, 1990 in Shattuck, OK produced a path width up to 250 yards and a path length of 19 miles, which does not follow the above guidelines.

TORNADO RECORDS

- Highest Recorded Wind: 318 mph, Bridge Creek/Moore, OK, May 3, 1999. **
- Widest Observed Path: 2.5 miles, Hallam, NE, May 22nd, 2004.+
- Longest Observed Path: 219 miles, Tri State Tornado, March 18, 1925.

**Unofficial; Measured above the earth's surface, NOT at ground level; DOW movement may have added/subtracted from wind speed estimation

+Preliminary estimate made by the Omaha NWS on May 24th, 2004; may be revised in later statements

UNITED STATES' MOST DESTRUCTIVE TORNADOES

1840 May 7: Natchez, MS
A tornado ravaged the heart of the city, killing 317 and injuring over 1,000. The northern and central portions of the city were destroyed. 269 people perished on riverboats on the Mississippi River.

1896 May 27: St. Louis, MO
A tornado moved into St. Louis and East St. Louis, killing 255 people and injuring over 1,000. Damage estimates were around $10 million from this tornado. The tornado and accompanying microburst winds spanned a mile wide.

1899 June 12: New Richmond, WI
A tornado struck around 4:30 pm while people were attending an outdoor circus. 114 people were killed, but due to the high visibility of the tornado, most were able to take shelter. Over 300 buildings were destroyed in the town.

1908 April 24: Purvis, MS
The majority of the town of Purvis, MS was leveled as a tornado moved from Amite, LA into Purvis. 55 people died as a result of this tornado in Purvis alone. People reported that the tornado was "2 miles wide" at times.

1925 March 18: Ellington, MO to Princeton, IN
The "Tri-State Tornado" is the most deadly single tornado in history. Murphysboro, Illinois was the hardest hit by the tornado, where 234 lives were claimed. Several cities in the tornado's path were obliterated, including: Annapolis, MO; Gorham, IL; Parrish, IL; and Griffin, IN.

1936 April 6: Gainesville, GA
A pair of tornadoes converged inside the city on the morning of April 6th, 1936. 203 people were killed and most of the city's buildings lay in ruins. Damage estimates from the tornado were around $12.5 million.

1947 April 9: Woodward, OK
An F5 tornado moved through the northern portions of Woodward, OK. Over 100 city blocks were demolished from the tornado and over 1,000 homes were damaged or destroyed. 107 people were killed, 1,000 people were injured, and over $6 million in damage occurred.

1953 May 11: Waco, TX
114 people died when an F5 tornado moved through downtown Waco, TX. A six-story brick furniture store was destroyed. The main street was filled with bricks from the building, in some instances nearly five feet deep. Some people were buried under brick for nearly 14 hours.

1953 June 8: Flint, MI
Over $19 million in damage occurred as an F5 tornado moved through the northern sections of Flint, MI. 115 people were killed and 844 were injured. This tornado was the last single tornado through March 2002 to cause more than 100 deaths.

1955 May 25: Udall, KS
An F5 tornado moved into the small community of Udall, KS. 80 people were killed and 270 injured. Over half the population of Udall was killed or injured by this tornado. Over $2 million in damage occurred in Udall. A large portion of the town was completely destroyed.

1965 April 11-12: WI, IL, IA, MI, IN, OH
Known as the "Palm Sunday Outbreak", 51 tornadoes occurred in the Midwest, killing 258 people and injuring more than 3,100. 19 tornadoes in this outbreak were of F4 or F5 intensity, with the strongest tornadoes occurring in Elkhart, IN and Strongsville, OH. Damage estimates were over $200 million for the event.

1974 April 3-4: MI, IL, IN, OH, KY, TN, AL, GA, WV, NC, SC
The "Super Outbreak" of 1974 produced the most tornadoes in a 24-hour period in history (148). The most famous tornado from this outbreak was an F5 tornado that moved through Xenia, Ohio. Damages in Xenia alone totaled over $100 million. Total damages from the outbreak exceeded $600 million.

1979 April 10: Wichita Falls, TX
$400 million in damage occurred when an F4 tornado moved through Wichita Falls. Nearly 3,100 homes were destroyed and about 20,000 people were left homeless. 42 people were killed and 1,740 were injured.

1984 June 8: Barneveld, WI
An F5 tornado struck around 1 a.m. in the small community of Barneveld, WI. Nine people were killed, 197 were injured, and 90% of the community was destroyed. Over $40 million in damage was caused from this tornado.

1991 April 26: Wichita/Andover, KS
An F5 tornado tore through portions of south Wichita, KS. It then moved into Andover, an eastern suburb of Wichita. The tornado killed 13 people in the Golden Spur Mobile Home Park. The tornado came within 1,000 FT of a fleet of parked B-1 bombers, 2 of which were loaded with nuclear warheads. Total damage was $262 million.

1997 May 27: Jarrell, TX
29 people died and $20 million in damage occurred when an F5 tornado moved through the small Texas community of Jarrell. The tornado hit at 3:45 pm and was so strong that it ripped pavement from roadways.

1999 January 21: Little Rock, AR
A rare tornado outbreak in January brought more than 30 tornadoes to Arkansas. One of the tornadoes, an F3 on the Fujita Scale, moved into the northern portions of Little Rock. One person was killed. Damage estimates from the tornado outbreak were at $1.3 billion.

1999 May 3: Bridge Creek/Moore, OK
The strongest tornado ever recorded moved through the Oklahoma City suburbs of Bridge Creek and Moore in the late afternoon hours. This tornado killed 38 people and injured hundreds. A total of 69 tornadoes occurred from this outbreak. The tornado's path was judged to be more than a mile wide at times. A Doppler radar On Wheels (DOW) team measured a 318 mph wind speed in this tornado, the highest measured wind speed ever recorded within a tornado. The National Weather Service was able to give Moore residents 35 minutes warning lead time on this tornado. Total damages exceeded $1.1 billion.

1999 May 3: Haysville/Wichita, KS
An F4 tornado moved into the southern suburbs of Wichita, KS in the evening. 6 people died, 150 were injured, and over $150 million of damage occurred. South Wichita residents were given 30 minutes warning lead time on this tornado. This tornado was part of the outbreak that produced the Moore, OK tornado.

2001 April 21: Hoisington, KS
An F4 tornado moved into the Kansas community of Hoisington. One person was killed, 28 injured, and nearly $43 million in damage was done from this tornado. There was no tornado warning issued for this community when the tornado struck. Most people were home watching local TV stations and were told to take cover, even though a tornado warning had not been issued.

2002 April 28: La Plata, MD
An F4 tornado moved through La Plata, MD and killed one person. The tornado also wiped six homes completely off their foundations. Damage estimates from this tornado were around $100 million. Other tornadoes from this storm system occurred in Nebraska, Kansas, Missouri, Illinois, Kentucky, Tennessee, Virginia, New York, Iowa, and Ohio.

2002 November 10: Van Wert, OH
An F4 tornado moved through Van Wert, Ohio around 3:30 PM local time, destroying the entire northwest corner of the city. This tornado was part of one of the largest November tornado outbreaks in history, with 70 tornadoes occurring within two days. Total damages from the outbreak totaled $490 million.

2003 May 4 – May 11: Plains Into The Southeast
A deadly outbreak of severe weather occurred between May 4th and May 11th, producing hundreds of tornadoes and widespread reports of large hail and damaging winds across eight states. Tornadoes affected the metropolitan areas of Kansas City and Oklahoma City, producing F3 and F4 damage. Other cities including Pierce City, Missouri and Jackson, Tennessee sustained heavy damage and loss of life. At least 38 people were killed from the outbreak in Kansas, Missouri and Tennessee. In Oklahoma City, damaging tornadoes occurred on both the 8th and 9th. May 1st through the 11th had more reported tornadoes (412) than any other ten-day period since records began in 1950. The estimated total damages from this historical outbreak totaled more than $3.2 billion.

TORNADO SAFETY RULES

As shown in Hoisington, KS, tornadoes can occur at anytime and without warning. However, there are several precautions that can be taken to be prepared in the event that a tornado strikes.

1. BE ALERT: Know what is going on with the weather. Stay tuned to local media outlets such as television or radio. If neither of these will be accessible, take a portable NOAA weather radio. Know what to look and listen for if threatening weather approaches, such as:

- a greenish-black tint to the sky
- rapidly-rotating clouds converging on a single point
- a strange quiet followed by a sound like a waterfall or rushing air.
- a sound like a railroad train or jet engine
- debris dropping from the sky
- a low-hanging cloud that looks to be rotating
- objects such as branches and leaves being pulled upwards

Be sure to inform the blind or deaf about the weather conditions. Alert the elderly and ill about the impending weather situation as well.

2. BE OBSERVANT OF YOUR SURROUNDINGS: There are several places that should NOT be considered as safe when a tornado is approaching. Seek shelter in another area if time allows if you are in a (an):

- mobile home
- car or truck
- auditorium
- open field
- high-rise building

The safest place to be in a tornado is a basement or underground tornado-proof shelter. If neither of these are accessible, the inner-most and lowest room of a building, such as a closet or bathroom, provides some shelter. Keep as many walls as possible between you and the tornado. Cover yourself with blankets or sofa cushions to protect you from flying debris. If you cannot find shelter indoors, get to a ditch or ravine, crouch into a fetal position, and cover your head. Abandon your vehicle immediately!

3. PREPARE A DISASTER KIT: Having a disaster kit BEFORE a tornado strikes may mean the difference between life and death. The Red Cross recommends the following in a kit:

- a first aid kit with essential medications along with common items
- a battery-powered radio, flashlight, and extra batteries
- a hand-operated can opener along with canned and non-perishable food
- bottled water
- sturdy shoes and work gloves
- written instructions on how to turn off your house's utilities
- extra cash or credit cards
- a camera for taking insurance pictures

4. KNOW THE WEATHER TERMINOLOGY: Meteorologists use several different terms when describing a storm or a day's severe weather potential:

- Tornado Watch: a "tornado watch" is issued when meteorologists believe that conditions are favorable for the formation of severe weather and tornadoes. At this time, you should be going over your tornado safety rules and keeping abreast to the weather conditions via television, radio, or NOAA weather radio.

- Tornado Warning: a "tornado warning" is issued when a tornado has been spotted or radar indicates a developing tornado. When a tornado warning is issued, head to a tornado-safe place, such as a basement or interior room.

5. KNOW WHAT TO DO AFTER A TORNADO STRIKES: After a tornado has moved through:

- help injured or trapped people
- give first aid when appropriate
- don't try to move seriously injured people unless further danger is imminent
- call for help
- turn on the radio or television for the latest emergency information
- use the telephone only for emergencies
- clean up spilled medicines, bleach, and flammable liquids immediately
- leave the area if gas or burning fumes are present
- stay out of damaged buildings
- take pictures of the both the house and contents for insurance purposes

For more information on tornado safety tips, please visit FEMA's website on tornado safety at http://www.fema.gov/library/tornadof.htm

If additional information or assistance is requested, please contact Impact Forecasting by phone at (312) 381-5919, by email at ifsupport@aon.com, or by the worldwide web at www.impactforecasting.com.