

Tornadoes

Cyclones



Supply list:

- 2 empty two-liter soda bottles
- Duct tape



Tornadoes generate visions of flying debris, swirling winds, and a path of destruction. These fearsome storms remind us that only God can control the weather and man is powerless to stop something like a tornado. Tornadoes are also called twisters, dust devils, whirlwinds, waterspouts, and cyclones. Tornado comes from the Spanish word *tronada* meaning thunderstorm.

Tornadoes usually form during thunderstorms. They tend to form at the edge of the storm where the warm moist updraft meets a falling downdraft of cool air. The updraft pulls air from the ground creating a low pressure area. The downdraft rushes in to fill the low pressure then gets sucked up. The falling drier air causes the updraft to begin to spiral and tighten up. This increases the speed of the spiraling air resulting in a tornado. The key to tornado formation is changing wind direction, which causes the spiraling motion. A jet stream above the thunderstorm can enhance thunderstorm growth and contribute to the tornado formation.

If a spiraling cloud does not touch the ground it is called a funnel cloud. The funnel acts like a giant vacuum cleaner, sucking up anything it comes in contact with. If the powerful twisting column of air touches the ground it is then called a tornado. Tornadoes are visible because of the swirling water droplets, dust and debris that are sucked up by the wind. Sometimes funnel clouds form over water. These storms are called waterspouts. They suck water up into the funnel. Waterspouts form mostly along the coast of the Gulf of Mexico.

The average tornado is 400-500 feet wide, 4000 feet from cloud to ground, and has winds from 73 to 112 miles per hour. Most tornadoes last only a few minutes and cover a few miles of ground. The worst tornado on record had winds up to 300 miles per hour, lasted for more than an hour, and covered 200 miles of land, leaving a path of devastation in its wake.

Tornadoes are ranked by the Fujita-Pearson Tornado Intensity Scale, or F-scale for short. The F-scale ranks tornadoes by wind speed and potential damage. The chart below shows the F-scale and the percent of tornadoes that fit into each category.

Scale	Wind Speed	Damage	% of Tornadoes
F0	40-72 mph	Light damage	30 %
F1	73-112 mph	Uproots trees and overturns cars	40 %
F2	113-157 mph	Considerable damage, lifts roofs	29%
F3	158-206 mph	Severe damage, flattens forests	0.6%
F4	207-260 mph	Extreme damage	0.3 %
F5	> 260 mph	Levels everything in its path	0.1%

Tornadoes have occurred in every state and during every season, but most tornadoes occur in the eastern 2/3 of the United States during the spring. So many tornadoes have occurred in Texas, Oklahoma, Kansas, Missouri, Nebraska, and Iowa that a path through those states has been nicknamed “Tornado Alley.” About 1000 tornadoes touch down in the United States each year. There are more tornadoes in America than in any other country.

The National Weather Service uses Doppler radar to watch thunderstorms for signs of tornado development. They try to give at least 15-20 minutes of warning to people who are in areas where tornadoes are developing. Another technology is being developed, which researchers hope will give even more advanced notice of tornadoes. This technology uses extremely low-frequency sound waves to detect the rotating column of air inside a tornado. This technique is still in development, but it shows promise. Advanced notice has saved many lives and it is believed that more lives will be saved with more notice.

You should pay attention to weather warnings. If a tornado warning is issued for your area, you should go to the basement and stay under a set of stairs, under a heavy table, or in a bathtub with cushions on top of you. This will help protect you if a tornado does come through your neighborhood. If you are in the open, you should lie down flat in a low area if there is no rain. If it is raining, you should avoid low areas that may flood out. Instead crouch down and make your self as small as possible. We should all recognize and respect the power of a tornado and not take chances.



The awesome power of a tornado is demonstrated as a 33rpm plastic record was blown into a telephone pole without breaking. (Photo compliments of NOAA.)



Tornado in a Bottle:

You can make a non-destructive tornado in a bottle. Have your child fill an empty 2-liter soda bottle about half full with water. Next, place another empty soda bottle on top of the bottle with water so that the mouths of the bottles are lined up with each other. Carefully tape the two bottles together tightly with duct tape or other strong tape.

Have your child do the following over a sink in case the bottles leak. Quickly turn the bottle of water over and swirl the top bottle in a circle for a few seconds. This should cause the water in the bottle to begin to swirl, creating a vortex near the mouth of the bottle. This vortex will suck the air from the bottom bottle into the top bottle like a tornado, thus forcing water from the top bottle into the bottom bottle.



What did we learn?

What causes a tornado to develop? (Warm updrafts suck cool downdrafts into them. The falling drier air can cause the updraft to begin to spiral. If there is enough heat and energy the spiral can tighten and speed up resulting in a tornado.)

What is the difference between a funnel cloud and a tornado? (A funnel cloud does not touch the ground.)

What is a waterspout? (A tornado that develops over the water)

When do most tornadoes occur in the United States? (In the springtime)

Taking it further

Why does the jet stream affect tornado formation? (The jet stream is a fast moving current of air at high altitudes. It can cause the air in a thunderstorm to move more quickly adding energy to the storm. This encourages tornado formation.)

Why should you take shelter during a tornado? (The greatest threat to people during a tornado is flying debris. Taking shelter can protect you from the debris.)

FUN FACT

The first tornado to be caught on film occurred in 1884.

FUN FACT

Tornadoes cause lots of damage, but sometimes they have interesting results as well. Below are some interesting tornado statistics.

- In 1990, a tornado in Illinois lifted a 20-ton tractor-trailer from the highway and dropped it 1100 feet away in a field.
- A tornado once sucked up a pond full of frogs and the frogs “rained” down on a nearby town.
- A tornado carried a 500-pound piano 1200 feet without damaging it.
- A check was carried 305 miles from its place of origin. This is the longest documented movement of debris by a tornado.
- The average property loss each year due to tornadoes is \$1 billion.
- The deadliest tornado occurred on March 18, 1925. It moved across parts of Missouri, Illinois, and Indiana covering 219 miles and lasted 3 ½ hours. 689 people were killed, 2,000 people were injured, and 10,000 people were left homeless.

The engineering committee examining a 1X5 inch board that was driven through a 2X6 inch plank somewhere along the path of the Tri-State Tornado. This was the longest-lived tornado, lasting over 3 ½ hours. It traveled over 300 miles from SE Missouri to Indiana and killed over 600 people. Photo from: Journal of the Western Society of Engineers, Vol. 30, No. 9. September, 1925.

