



Tornadoes

Why talk about tornadoes?

Tornadoes have been reported in every state. They generally occur during spring and summer, although they can happen in every season. Tornadoes can strike at any time of the day or night but are most likely between 3:00 p.m. and 9:00 p.m. No areas are immune to tornadoes; they have been reported in mountains and valleys, over deserts and swamps, from the Gulf Coast into Canada, in Hawaii, and even in Alaska. Regardless of the location or time of year, if conditions are right, a tornado can develop.

More than 1,000 tornadoes are reported annually nationwide, and as our tornado detection systems improve, fewer tornadoes go undetected. Even so, tornadoes sometimes develop in areas in which no tornado watch or warning has been issued.

What are tornadoes?

A tornado is a violently rotating column of air extending from the base of a thunderstorm to the ground. Tornado intensities are classified on the Fujita Scale with ratings between 0 and 5. A storm of F0 is the weakest and F5 is the strongest. The most violent tornadoes have rotating winds of 250 miles (402 kilometers) per hour or more. They are capable of completely destroying well-made structures, uprooting trees, and hurling normally harmless objects through the air like deadly missiles. Most tornadoes are rated F0 and F1, and these usually span just a few dozen yards and touch down only briefly. Highly destructive violent tornadoes—F4 and F5—can carve out paths more than a mile (1.6 kilometers) wide and 50 miles (80 kilometers) long. Although these violent tornadoes comprise only two percent of all tornadoes, they are responsible for nearly 70 percent of tornado-related fatalities.

Waterspouts are similar to tornadoes but form over a body of water. They are most common along the Florida Gulf and Atlantic coasts and southeastern states. In the western United States, waterspouts occur in connection with storms in the late fall or winter, a time when they are least expected. Waterspouts occasionally move inland becoming tornadoes, causing damage and injuries.

How do tornadoes develop?

Tornadoes usually develop from severe thunderstorms in warm, moist, unstable air along and ahead of cold fronts. Such thunderstorms also may generate large hail and damaging winds. When intense springtime storm systems produce large, persistent areas that support tornado development, major outbreaks can occur. In the United States during the late spring, tornadic thunderstorms can develop in the southern High Plains along a "dry line," the interface between warm, moist air to the east and hot, dry air to the west. From the front range of the Rocky Mountains southward into the Texas Panhandle, a downslope

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flow of unstable air can cause tornadic thunderstorms to develop. While generally smaller and less frequent, tornadoes occurring west of the Rocky Mountains also cause damage and threaten lives annually.

Tropical storms and hurricanes that come ashore can also generate tornadoes. In 1967, Hurricane Beulah produced 141 tornadoes as it made landfall. In 1992, Hurricane Andrew produced 62 tornadoes.

How can I protect myself from a tornado?

You can protect yourself by having a safe place to go and having the time to get there. Consider building a “wind safe” room in your home. While tornadoes can be highly destructive and are potentially deadly, timely precautions can save lives and reduce property damage. During active weather, pay attention to the forecast by listening to local radio or television stations or by using a NOAA Weather Radio.

Each year, many people are killed or seriously injured by tornadoes despite advance warning. Some did not hear the warning, while others heard the warning but did not believe they were personally threatened. Timely tornado watches and warnings, combined with household preparedness, could save your life. Once you receive a warning or observe threatening skies, YOU must make the decision to take shelter before the tornado arrives. It could be the most important decision you will ever make.

What is the best source of information in a tornado situation?

Local radio or television stations or a NOAA Weather Radio are the best sources of information in a tornado situation for official weather and weather-related bulletins.

NOAA Weather Radio is the prime alerting and critical information delivery system of the National Weather Service (NWS). NOAA Weather Radio broadcasts warnings, watches, forecasts, and other hazards information 24 hours a day over more than 650 stations in the 50 states, adjacent coastal waters, Puerto Rico, the U.S. Virgin Islands, and the U.S. Pacific territories.

The NWS encourages people to buy a weather radio equipped with the Specific Area Message Encoder (SAME) feature. This feature automatically alerts you when important information about tornadoes and other hazards is issued for your area. Information on NOAA Weather Radio is available from your local NWS office or at <http://www.nws.noaa.gov/nwr>.

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Watch, Warning

- A Tornado WATCH means that tornadoes are possible in and near the watch area. People in a watch area should review their tornado plans (Family Disaster Plan, Disaster Supplies Kit, tornado safe room), and be ready to act if a warning is issued or they suspect a tornado is approaching.
- A Tornado WARNING means that a tornado has been sighted or indicated by weather radar. Tornado warnings indicate imminent danger to life and property. People in a warning area should go immediately to their safe room. If they are in a vehicle, they should get out of the vehicle and go to shelter in a nearby sturdy building or lie flat in a low spot away from the vehicle. Watches and warnings for tornadoes are issued by the National Weather Service (NWS) and broadcast on NOAA Weather Radio and on local radio and television stations.

Be Prepared for a Tornado

For general preparedness, every household should create and practice a Family Disaster Plan and assemble and maintain a Disaster Supplies Kit. In addition, every household should take tornado-specific precautions and plan for and practice what to do in a tornado situation.

Protect Yourself

You should:

- Pick a safe place in your home where family members, including pets, could gather during a tornado. The safest place to be is underground, or as low to the ground as possible, and away from all windows. If you have a basement or storm cellar, make it your safe place. If you do not have a basement or storm cellar, consider an interior bathroom, closet, or hallway on the lowest floor. Putting as many walls as you can between you and the outside will provide additional protection. Less than two percent of all tornadoes are powerful enough to completely destroy a sturdy building. Make sure there are no windows or glass doors in your safe place and keep this place uncluttered.
- Consider having your tornado safe place reinforced. Additional reinforcement will add more protection from the damaging effects of tornado winds.
- If you are in a high-rise building, pick a place in a hallway in the center of the building. You may not have enough time to go to the lowest floor. Center hallways are often the most structurally reinforced part of a building.
- If you live in a mobile home, choose a safe place in a nearby sturdy building. A sturdy

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building provides greater protection. If your mobile home park has a designated shelter, make it your safe place. Mobile homes are much more vulnerable to strong winds than site-built structures. Prior to 1994, most mobile homes were not designed to withstand even moderate winds.

- Learn about your community's warning system. Different communities have different ways of providing warnings. Many communities have sirens intended for outdoor warning purposes. Use a NOAA Weather Radio to keep aware of watches and warnings while you are indoors.
- Make sure all family members know the name of the county or parish where you live or are traveling, because tornado watches and warnings are issued for a county or parish by name.
- Conduct periodic tornado drills, so everyone remembers what to do if a tornado approaches. Practice having everyone in the household go to your designated safe place. Have everyone get under a sturdy piece of furniture, hold on with one hand, and protect his or her head and neck with the other. Practicing your plan makes the appropriate response more of a reaction, requiring less thinking time during an actual emergency situation.
- Check at your workplace and your children's schools and day care centers to learn about their tornado emergency plans. Every building has different safe places. It is important to know where they are and how to get there in an emergency.
- Discuss tornadoes with your family. Everyone should know what to do in case all family members are not together. Discussing disaster preparedness ahead of time helps reduce fear and lets everyone know what to do in a tornado situation.

Protect Your Property

- Make a list of items to bring inside in the event of a storm. Having a list will help you remember things that may be broken or blown away in strong winds.
- Keep trees and shrubbery trimmed. Make trees more wind resistant by removing diseased or damaged limbs, then strategically remove branches so that wind can blow through. Strong winds frequently break weak limbs and hurl them at great speed, causing damage or injury when they hit. Debris collection services may not be operating just before a storm, so it is best to do this well in advance of approaching storms.
- Remove any debris or loose items in your yard. Branches and firewood may become missiles in strong winds.
- Consider installing permanent shutters to cover windows. Shutters can be closed quickly and provide the safest protection for windows.
- Strengthen garage doors. Garage doors are often damaged or destroyed by flying debris, allowing strong winds to enter. As winds apply pressure to the walls, the roof can be lifted off, and the rest of the house can easily follow.

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What to Do Before a Tornado

When the season, conditions, or forecast indicate the potential for tornadoes to form, you should:

- Use a NOAA Weather Radio to keep informed of watches and warnings issued in your area. If you do not have a NOAA Weather Radio, keep up with local forecasts and conditions via a local radio or television station.
- If planning a trip or extended period of time outdoors, listen to the latest forecasts and take necessary action if threatening weather is possible. Knowing what the weather could be helps you to be prepared. Have a raincoat, umbrella, and Disaster Supplies Kit handy so you can deal with severe weather if it occurs.
- Watch for tornado danger signs. Tornadoes may strike so quickly that warnings cannot be issued long in advance. Pay attention to weather clues around you that warn of imminent danger:
 - Dark, often greenish clouds. Sometimes one or more of the clouds turns greenish (a phenomenon caused by hail) indicating a tornado may develop.
 - Wall cloud, an isolated lowering of the base of a thunderstorm. The wall cloud is particularly threatening if it is rotating.
 - Large hail. Tornadoes are spawned from powerful thunderstorms, which are capable of producing large hail. Tornadoes frequently emerge from near the hail-producing portion of the storm.
 - Cloud of debris. An approaching cloud of debris can mark the location of a tornado, even if a funnel is not visible.
 - Funnel cloud. A visible rotating extension of the cloud base is a sign that a tornado may develop.
 - Roaring noise. The high winds of a tornado can cause a roar that is often compared with the sound of a freight train.

Tornadoes may occur near the trailing edge of a thunderstorm and be quite visible. It is not uncommon to see clear, sunlit skies behind a tornado. Tornadoes may also be embedded in rain and not visible at all.

If you live in a single-family home in a tornado-prone area, find out how to reinforce an interior room on the lowest level of your home (such as the basement, the storm cellar, a bathroom, a closet, or a hallway) to use as a shelter.

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If a tornado watch is issued:

- Listen to NOAA Weather Radio or local radio or television stations for updated information. Tornadoes can change direction, intensity, and speed very quickly.
- Be alert to changing weather conditions. Tornadoes accompany severe thunderstorms, and weather conditions can change rapidly. Large hail, blowing debris, or the sound of an approaching tornado may alert you. Many people say approaching tornadoes sound like a freight train.
- Bring your companion animals indoors and maintain direct control of them.
- Be prepared to go to your tornado safe place.

If a tornado warning is issued:

- Listen to a battery-powered NOAA Weather Radio or a local radio or television station for updated information. If the electricity goes out, you will still be able to receive emergency information.
- If you are inside, you should:
 - Go to your safe place to protect yourself from glass and other flying objects. Take your pets with you, provided you can do so without endangering yourself. Tornadoes can change direction, intensity, and speed very quickly. The tornado may be approaching your area.
 - Get under a sturdy piece of furniture, such as a workbench or heavy table, and hold on to it with one hand. Sturdy furniture will help protect you from falling debris. If tornado wind enters the room and the object moves, holding on with one hand will help you move with it, keeping you protected.
 - Use your other arm and hand to protect your head and neck from falling or flying objects. Your head and neck are more easily injured than other parts of your body. Protect them as well as you can.
 - Stay away from windows. Opening windows allows damaging winds to enter the structure. Leave the windows alone; instead, immediately go to your safe place. It is a myth that tornadoes cause houses to explode due to changes in air pressure. Flying debris can shatter glass. Violent winds and debris slamming into buildings cause the most structural damage.
- If you are outside in a vehicle or mobile home, you should:
 - Go immediately to the basement of a nearby sturdy building. A sturdy building is the safest place to be. Tornado winds can blow large objects, including cars and mobile homes, hundreds of feet away. Tornadoes can change direction quickly and can lift up a car or truck and toss it through the air; never try to out-drive a tornado. Mobile homes are particularly vulnerable. A mobile home can

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- overturn very easily even if precautions have been taken to tie it down.
- If there is no building nearby, lie flat in a low spot and use your arms and hands to protect your head and neck. Tornadoes cause a lot of debris to be blown at very high speeds. Dangerous flying debris can be blown under overpasses and bridges, and the structures themselves could be destroyed. You will be safer lying flat in a low-lying area where the wind and debris will blow above you. Tornadoes come from severe thunderstorms, which can produce a lot of rain. If you see quickly rising water or floodwater coming toward you, move to another spot.
- Avoid places with wide-span roofs, such as auditoriums, cafeterias, large hallways, or shopping malls. Wide-span roofs are frequently damaged or destroyed in tornado winds; they provide less protection and more risk of injury than roofs over smaller rooms.

What to Do After a Tornado

You should:

- Continue listening to local radio or television stations or a NOAA Weather Radio for updated information and instructions. Access may be limited to some parts of the community or roads may be blocked.
- Check for injuries. Give first aid and get help for injured or trapped persons. Taking care of yourself first will allow you to help others safely until emergency responders arrive.
- Help people who require special assistance—infants, elderly people, those without transportation, large families who may need additional help in an emergency situation, people with disabilities, and the people who care for them.
- Watch out for fallen power lines or broken gas lines and report them to the utility company immediately. Reporting potential hazards will get the utilities turned off as quickly as possible, preventing further hazard and injury.
- Avoid damaged areas. Your presence might hamper rescue and other emergency operations and put you at further risk from the residual effects of tornadoes.
- Stay out of damaged buildings.
- If you are away from home, return only when authorities say it is safe.
- Wear long pants, a long-sleeved shirt, and sturdy shoes. The most common injury following a disaster is cut feet.
- Use battery-powered lanterns or flashlights when examining buildings. Battery-powered lighting is the safest and easiest. It protects the user, the building occupants, and the building from fire hazards. **DO NOT USE CANDLES.**
- Examine walls, floors, doors, staircases, and windows to make sure that the building is

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- not in danger of collapsing.
- Look for fire hazards. There may be broken or leaking gas lines, or damage to electrical systems. Clean up spilled medications, bleaches, gasoline, or other flammable liquids immediately. Fire is the most frequent hazard following other disasters. get everyone out quickly. Turn off the gas using the outside main valve if you can, and call the gas company from a neighbor's home. If you turn off the gas for any reason, it must be turned back on by a professional.
- Look for electrical system damage. If you see sparks or broken or frayed wires or if you smell burning insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in water to get to the fuse box or circuit breaker, call an electrician first for advice. Electrical equipment should be checked and dried before being returned to service.
- Watch for loose plaster, drywall, and ceilings that could fall.
- Take pictures of the damage, both of the building and its contents, for insurance claims.
- Use the telephone only for emergency calls. Telephone lines are frequently overwhelmed in disaster situations. They need to be clear for emergency calls to get through.
- Watch your animals closely. Keep all your animals under your direct control. Your pets may be able to escape from your home or through a broken fence. Pets may become disoriented, particularly because tornadoes and the heavy rains that accompany them will usually affect scent markers that normally allow animals to find their homes. The behavior of pets may change dramatically after any disruption, becoming aggressive or defensive, so be aware of their well-being and take measures to protect them from hazards, including displaced wild animals, and to ensure the safety of other people and animals.

Facts and Fiction

Fiction: Areas near lakes, rivers, and mountains are safe from tornadoes.

Facts: No place is safe from tornadoes. A tornado near Yellowstone National Park left a path of destruction up and down a 10,000-foot mountain.

Fiction: The low pressure associated with a tornado causes buildings to “explode” as the tornado passes overhead.

Facts: Air pressure in a tornado does not cause buildings to explode. Buildings are damaged by violent winds associated with a tornado and by the debris blown at high velocities by a tornado’s winds.

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Fiction: Windows should be opened before a tornado approaches to equalize pressure and minimize damage.

Facts: You should leave the windows alone. The most important action you can take is to go immediately to your tornado safe place. Damage happens when wind gets inside a home through a broken window, door, or damaged roof. Keep the windows closed and stay away from them. Flying debris could shatter the glass and cause injury.

Fiction: The southwest corner of a building is the safest place to be during a tornado.

Facts: In the past, some people advised going to the southwest corner of a building in case of a tornado. However, the southwest corner is no safer than any other corner. One corner on the lowest level away from windows is as safe as any other corner. If tornado winds enter the room, debris has a tendency to collect in corners. When selecting a tornado safe place, look for a place on the lowest level and away from windows—a basement or storm cellar is best. If there is no basement or storm cellar, pick a small room (closet, bathroom, hallway) in the center of the building. Small rooms are safer because their walls are closer together and provide more support to the roof than widely spaced walls. Rooms in the center of the building are safer because each wall between you and the outside provides protection.

Fiction: If you are driving and a tornado is sighted, you should turn and drive at right angles to the tornado.

Facts: Many people are injured or killed when they remain in their vehicles during a tornado. If you are in a vehicle during a tornado, the safest thing to do is go to a nearby sturdy building and go inside to an area on the lowest level without windows. If a sturdy building is not available, then get out of and move away from the vehicle, lie down in a low spot on the ground not subject to flooding, and protect your head and neck. Driving at right angles to a tornado will not protect you for many reasons, including the fact that tornadoes do not necessarily travel in straight lines; you cannot always tell where a tornado is coming from; the road may not be straight; and there may be more than one tornado.

Fiction: People caught in the open should take shelter under overpasses or bridges.

Facts: Do not take shelter under overpasses or bridges. If at all possible, take shelter in a sturdy, reinforced building. Dangerous flying debris can be blown under overpasses and bridges at an accelerated rate, and the structures themselves could be destroyed. If a building is not available, you will be safer lying flat in a low-lying area where the wind and debris will blow above you. Use your arms and hands to cover your head and neck.

