

INSTRUCTIONS: HOW TO SURVIVE DURING A TORNADO

Introduction

We have all heard of the term “tornado”. According to *Atmospheric Science: An Introductory Survey* by Wallace and Hobbs, a tornado is “a rapidly rotating column of air, in contact with the ground, either hanging from or positioned beneath the base” of a thunderstorm (356). Tornadoes occur all over the world, including our very own United States. The majority of tornadoes are not deadly, and merely blow through, disrupting homes and property. However, more often than not, we hear about the big tornadoes, EF3, EF4, or even EF5 (EF stands for the “Enhanced Fujita” scale). Beginning at EF2, a tornado can pick up a car, and at EF3 a tornado can pick up and throw heavy vehicles considerable distances. Thankfully, through the years people have learned from their own experiences as well as others’ experiences about how to be safe during one of these life-threatening storms. In the instructions below, I will share with you steps you can take to protect yourself and your family from harm in the event of a tornado.

Precautions/Recommendations

The first two sections of this set of instructions involve actions taken before a tornado hits your area. The first section, “Preparation for a Tornado”, is a list of things you can do to prepare your family and your home. The second section, “During a Tornado Threat”, references the time period during a severe weather threat. The fourth section, “After the Tornado”, advises what to do after the tornado has passed.

Finally, the third section below, “During the Tornado: Where Are You?” refers to actions you should take in the event of an imminent tornado. If you are reading these instructions for the first time during a tornado warning (which means a tornado is in the area, please take cover immediately), kindly refer to this third set of instructions and take cover as soon as possible.

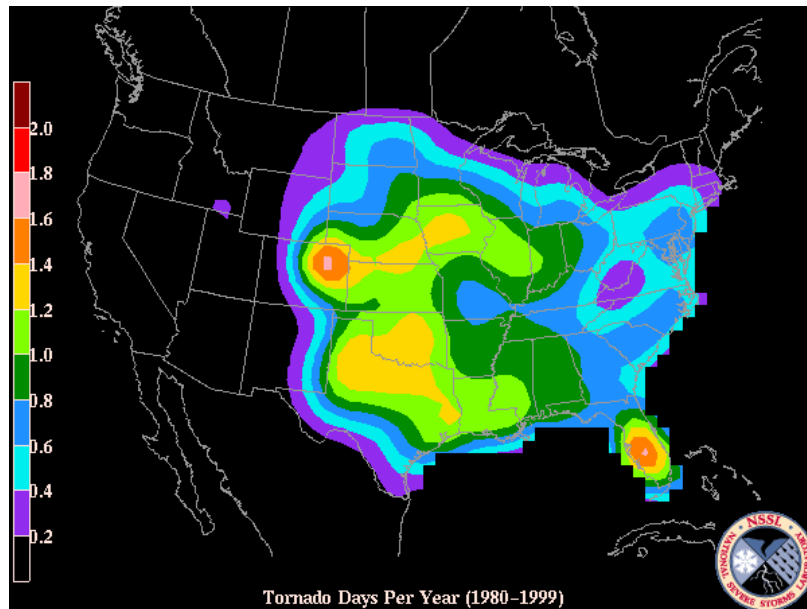
Preparation for a Tornado

In preparation for a tornado, it is important to know the history of tornadoes in your area, develop a family disaster plan, and create a survival kit.

Know your area’s history with tornadoes.

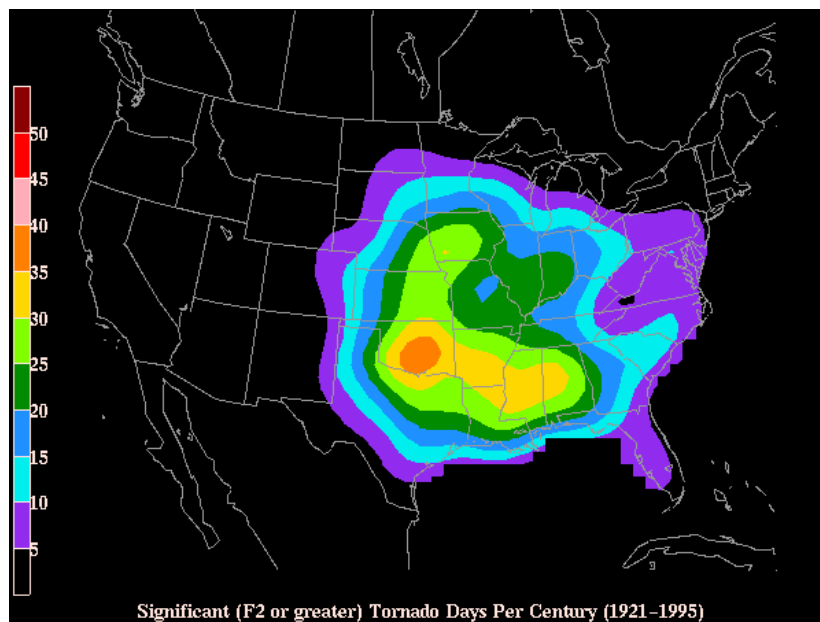
Those who have lived in an area for many years are familiar with the amount and severity of tornadoes that occur where they live. However, if you are not familiar with your area’s tornado tendencies, ask an experienced person or consult the Internet.

Tornadoes spawn from thunderstorms. As would naturally follow, the areas in the United States with most thunderstorms have the most tornadoes. Map 1 shows areas with the highest concentration of tornadoic days, or days in which a tornado occurred, per year. Note that the states with the highest concentrations are Colorado and Florida.



Map 1: Average of tornado days per year over a 20-year period.

However, when we talk about severe tornadoes the statistics change. Map 2 shows the concentration of tornadic days rated F2 or greater per century. Note that the high-risk areas now are in what is commonly known as “Tornado Alley”.



Map 2: Average of significant (F2 or greater) tornado days per century over a 74-year period.

Develop a family disaster plan

1. Choose a safe place in your home or workplace, away from exterior walls and glass windows or doors. The best hiding places are basements. If you do not have or cannot get to a basement, go to a low floor and try to stay in the center hallway or the center of the structure.

2. Be aware of your city's tornado warning system. Tornado sirens are common means of warning.
3. Keep bike or motorcycle helmets near your safe place, if possible, to protect your head.
4. If you live in a motor home, make arrangements to stay with a friend or relative in their sturdy place of residence. Mobile homes are, unfortunately, very prone to being picked up or rolled by tornadoes.

**Build a
tornado safety
kit**



1. First aid kit with essential medications
2. Canned food, a can opener, and lots of water
3. Protective clothing and bedding (sleeping bag)
4. Batteries, battery-powered radio, weather radio, flashlight(s)
5. Any other specialized survival items (for the elderly, infirm, or infants)
6. Personal identification
7. Map of the area

During a Tornadoic Threat

1. **Watch and/or listen to the weather for severe weather watches and warnings.**
2. **Keep your weather radio on.**
3. **Head for your prearranged shelter if you live in a mobile home.**
4. **Watch for distinct signs of a tornado, which include:**
 - Greenish-black sky
 - Large hail
 - Debris cloud (even if it's not connected to the storm cloud)
 - Funnel cloud
 - Roaring noise, like a train



During the Tornado: Where Are You?

At home or work



Figure 1: Proper “duck and cover” tornado safety position.

1. Go to your safe place and hide under a sturdy table or piece of furniture.
2. Don’t waste time opening windows. The tornado will open them for you.
3. Try to hold on to the furniture and protect your head and neck. Cover yourself with a heavy blanket or sleeping bag (see Figure 1 for the proper “duck and cover” position).
4. Stay away from windows as much as possible.

In a mobile home

1. You should be in your prearranged safe location.
2. If you could not make arrangements, leave the mobile home and lay in a low-lying area, ditch or ravine with your arms over your head. Be aware of the possibility of your area flooding.

Outside, near a sturdy building

1. Run for the building and head to the innermost section of the lowest floor.
2. Try to avoid places with wide-span roofs, such as auditoriums, cafeterias, shopping malls, warehouses, etc. They only have proper support around the outer walls, and are more susceptible to damage and collapse.

Outside, not near a sturdy building

1. Get out of your car, if you are in one. In addition to mobile homes, tornadoes like to pick up cars.
2. You cannot outrun a tornado. They move surprisingly fast sometimes, and can and do change direction very rapidly.
3. DO NOT hide under an overpass. Overpasses act as wind tunnels, making it stronger than outside the overpass. Unfortunately, this means that large objects, such as cars, trucks, or other large, destructive things can fly through overpasses.
4. Lay down in a low-lying area, ditch, or ravine. Cover your head and neck. Be aware of the possibility of your area flooding.

After the Tornado

1. Continue to listen to the weather radio for updates on the weather situation.
2. If you see that you can safely emerge from your hiding spot, do so. If not, stay and wait for help to come.

Emergency personnel will come quickly.

3. Avoid disaster areas.
4. As much as is safe, assist the injured or trapped, as well as the elderly or infirm.
5. Do not light matches or candles, as they may cause an explosion if there is a gas leak.
6. Look out for fallen power lines or other electrical hazards

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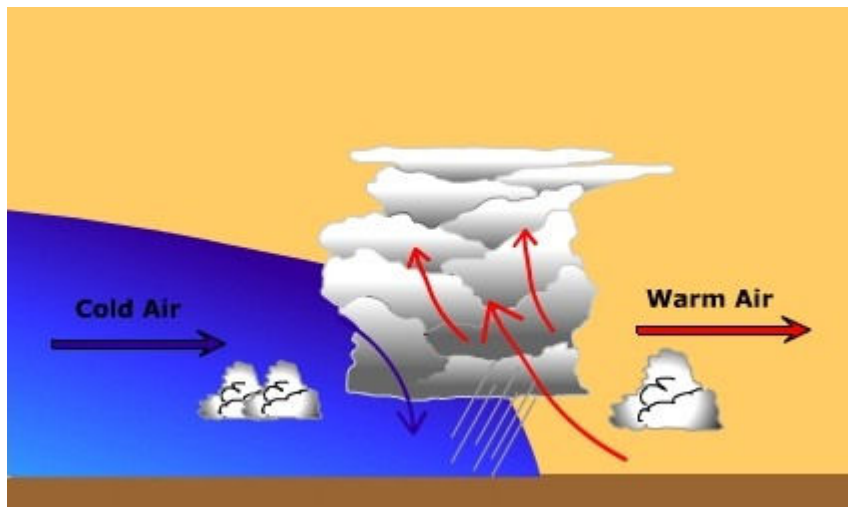
TECHNICAL DESCRIPTION OF FRONTAL ZONES

A *frontal zone*, more commonly called a front, is an important concept in meteorology. A front is “the interface or transition zone between two air masses of different density” (National Snow and Ice Data Center). An air mass is a large pool of air originating over a continent or ocean, with consistent moisture and temperature characteristics across its horizontal area (Ritter). Air masses take on the distinctive humidity and temperature of the place where they originate. For example, an air mass that originates over a northern continent in the winter is typically cold and dry. On the contrary, an air mass that originates over the ocean around the equator would be warm and humid. Different types of fronts and the changes in weather that they cause are the main concerns of meteorologists.

Types of Fronts

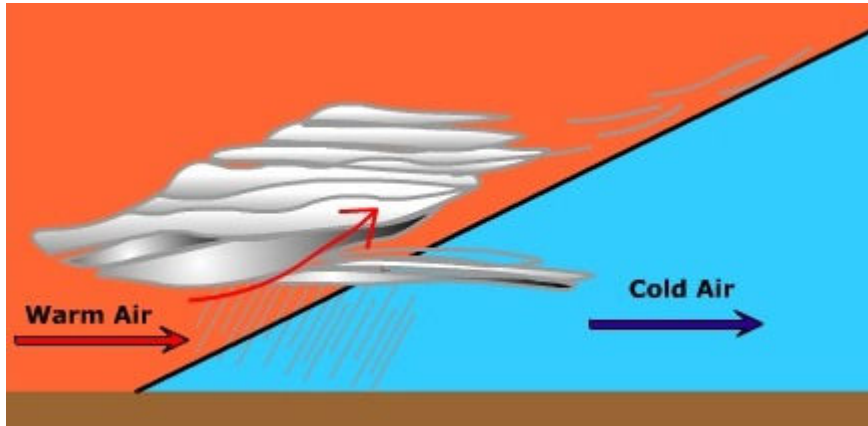
Depending on the characteristics of air masses, the formation of fronts (also known as *frontogenesis*) differs. Four main types of fronts form with the movement of air masses: cold fronts, warm fronts, stationary fronts, and occluded fronts.

- *Cold fronts* form when cold air masses replace warm air masses. Generally, cold fronts move from the northwest to the southeast. Cold fronts bring colder, dryer air with them, and a significant and sudden temperature drop characterizes the front. Veering winds also indicate a cold front, as the winds change from south to west-northwest. Weather maps show cold fronts as blue lines with blue triangles indicating the direction of the front. Below is a profile of a cold front. Note the sharp vertical boundary between the cold and warm air; this often causes instability in the air, which leads to severe storms.



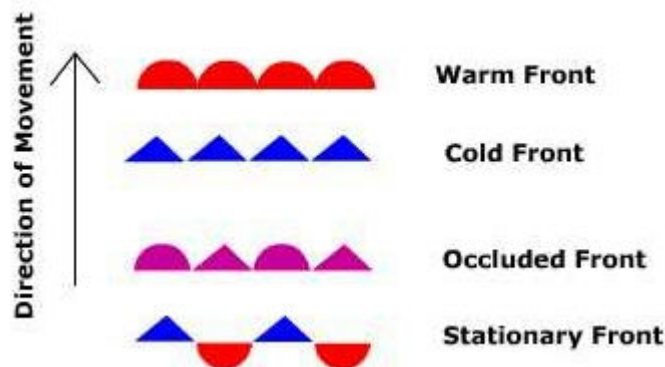
- *Warm fronts* form when warm air masses replace cold air masses, the opposite of a cold front. Warm fronts typically move from southwest to northeast, and typically bring air that is warm and moist. This is because warmer air can hold more moisture than colder air. As with a cold front, there is a significant change in temperature as a warm front passes by, except here the temperatures become warmer. The winds associated with warm fronts are variable during the passage of the front. Weather maps depict warm fronts as red lines with red hemispheres pointing in the direction of the front's movement. Below is a profile of a warm front. As opposed to the cold front case, the boundary

between cold and warm air as the warm air moves in is much less steep. Severe weather is not associated with warm fronts.



- *Stationary fronts* occur when warm or cold fronts exhibit little movement. On one side of the front is warm air, and on the other side the air is cold. On a weather map, the red hemispheres point towards the warm air and blue triangles point towards the cold air. *Cyclones*, or areas of low atmospheric pressure, that move along stationary fronts often deposit large amounts of precipitation on the ground or water beneath them. Clouds and prolonged precipitation are generally associated with stationary fronts.
- *Occluded fronts* form when a rapid cold front catches up with a warm front. Behind the warm front is a developing cyclone. The cold front wraps around the cyclone to catch the warm front, and an occluded front forms. Weather maps depict occluded fronts as purple lines with alternating hemispheres and triangles.

The picture below shows symbols of the different fronts as seen on a weather map.



Weather Caused by Fronts

Each type of front brings with it new and different weather as it moves across an area. Because of the sharply vertical boundary that forms when a cold front moves in, the air becomes unstable and brews severe weather. Warm fronts bring steady precipitation and cloud cover. Stationary fronts might not move for several days, and therefore are usually associated with long periods of precipitation. Occluded fronts appear when a low pressure system, or cyclone, develops. These cyclones can bring about strong winds and severe weather that sustains as the cyclones move across an area. In the United States, weather generally moves from west to east.



Above: thunderstorm in its mature stage, identified by the anvil shape

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