

Severe Weather - Thunderstorms & Lightning



A thunderstorm, also known as an electrical storm, a lightning storm, thundershower or simply a storm, is a form of turbulent weather characterized by the presence of lightning and its acoustic effect on the Earth's atmosphere known as thunder. The meteorologically assigned cloud type associated with the thunderstorm is the cumulonimbus. Thunderstorms are usually accompanied by strong winds, heavy rain and sometimes snow, sleet, hail, or no precipitation at all. Those that cause hail to fall are called hailstorms. Thunderstorms may line up in a series or rainband, known as a squall line. Strong or severe thunderstorms may rotate, known as supercells. While most thunderstorms move with the mean wind flow through the layer of the troposphere that they occupy, vertical wind shear causes a deviation in their course at a right angle to the wind shear direction.

There are four types of thunderstorms: single-cell, multicell cluster, multicell lines, and supercells. Supercell thunderstorms are the strongest and the most associated with severe weather phenomena. Mesoscale convective systems formed by favorable vertical wind shear within the tropics and subtropics are responsible for the development of hurricanes. Dry thunderstorms, with no precipitation, can cause the outbreak of wildfires with the heat generated from the cloud-to-ground lightning that accompanies them. Several methods are used to study thunderstorms, such as weather radar, weather stations, and video photography. Past civilizations held various myths concerning thunderstorms and their development as late as the 18th century.

The typical thunderstorm is 15 miles in diameter and lasts an average of 30 minutes. Thunderstorms happen in every state and every thunderstorm has lightning. It is estimated that there are around 1,800 thunderstorms that occur across our planet every day.



Lightning is perhaps the most spectacular phenomenon associated with thunderstorms and every thunderstorm produces lightning, making *All Thunderstorms Dangerous*. *Lightning* is an electric current. Within a thundercloud way up in the sky, many small bits of ice (frozen raindrops) bump into each other as they move around in the air. All of those collisions create an electric charge. After a while, the whole cloud fills up with electrical charges. The positive charges or protons form at the top of the cloud and the negative charges or electrons form at the bottom of the cloud. Since opposites attract, that causes a positive charge to build up on the ground beneath the cloud. The ground's electrical charge concentrates around anything that sticks up, such as mountains, people, poles, fences or single trees. The charge coming up from these points eventually connects with a charge reaching down from the clouds and - zap - lightning strikes!

Lightning often strikes outside of heavy rain and may occur as far as 10 miles from any rainfall. Most lightning deaths and injuries occur when people are caught outdoors in the summer months during the evening or afternoon. The chances of being struck by lightning are about 1 in 600,000.

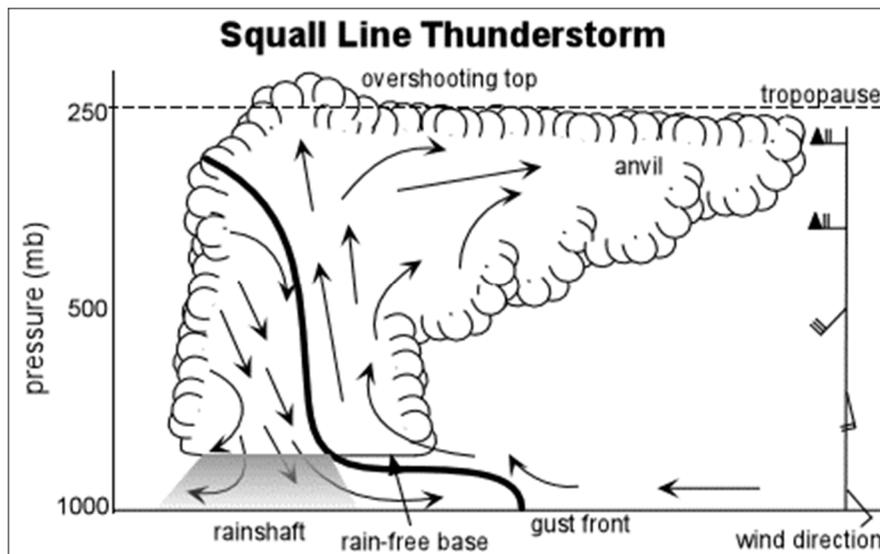


Most lightning deaths and injuries occur when people are caught outdoors, most often in the summer months and during the afternoon and early evening. In the past decade, over 15,000 lightning induced fires nationwide have resulted in several hundred million dollars a year in damage and the loss of 2 million acres of forest. The chances of being struck by lightning are estimated to be 1 in 600,000 but could be reduced by following the safety rules. Although most lightning victims survive, people struck by lightning often report a variety of long-term, debilitating symptoms.

Lightning Facts to Know:

- **NO PLACE** outside is safe when thunderstorms are in the area!!
- **When Thunder Roars, Go Indoors!**
- Safe shelter is a substantial building or inside an enclosed, metal-topped vehicle.
- Stay in safe shelter at least 30 minutes after you hear the last clap of thunder.
- Lightning often strikes outside the area of heavy rain and may strike as far as 10 miles from any rainfall.
- Many lightning deaths occur ahead of storms or after storms have seemingly passed.

Thunder is caused by lightning. When a lightning bolt travels from the cloud to the ground it actually opens up a little hole in the air, called a channel. Once then light is gone the air collapses back in and creates a sound wave that we hear as thunder. The reason we see lightning before we hear thunder is because light travels faster than sound!



A *gust front* or *squall line* is the leading edge of the downdraft from a thunderstorm. It is usually marked by gusty cool winds, and sometimes blowing dust. You will feel the wind from the gust front before it starts to rain.



Hail is created when small water droplets are caught in the updraft of a thunderstorm. These water droplets are lifted higher and higher into the sky until they freeze into ice. Once they become heavy, they will start to fall. If the smaller hailstones get caught in the updraft again, they will get more water on them and get lifted higher in the sky and get bigger. Once they get lifted again, they freeze and fall. This happens over and over again until the hailstone is too heavy and then falls to the ground.

Hail causes nearly \$1 billion in damage to property and crops annually. Large hailstones can fall at speeds faster than 100 mph. The costliest US hailstorm occurred in Denver, CO in July 1990. Total damage was \$625 million.



Other associated dangers of thunderstorms include *tornadoes*, *strong winds*, *hail* and *flash flooding*. Flash flooding is responsible for more fatalities – more than 140 annually – than any other thunderstorm-associated hazard. Dry thunderstorms that do not produce rain that reaches the ground are most prevalent in the western United States. Falling raindrops evaporate, but lightning can still reach the ground and can start wildfires.

Approximately 10% of thunderstorms are considered severe, which means they produce hail at least three-quarters of an inch in diameter, have winds of at least 58 miles per hour, or produce a tornado. The National Weather Service considers a thunderstorm severe if it produces hail at least $\frac{3}{4}$ inch in diameter, wind 50 mph or higher or tornadoes. The five main offspring of thunderstorms are: lightning, floods, straight-line winds, large hail and tornadoes.

NOAA/NWS Warnings:

SEVERE THUNDERSTORM WATCH - A severe thunderstorm (damaging winds of 58 miles per hour or more, or 1" hail in diameter or greater) is likely to develop in your area.

SEVERE THUNDERSTORM WARNING - A severe thunderstorm (damaging winds of 58 miles per hour or more, or hail three-fourths of an inch in diameter or greater) is taking place in your area.

DOWNDRAFT - A sudden descent of cool or cold air to the ground, usually with precipitation, and associated with a thunderstorm or shower.

UPDRAFT - A warm column of air that rises within a cloud. If the air is sufficiently moist, then the moisture condenses to become a cumulus cloud.



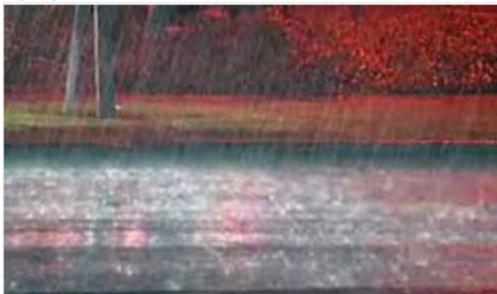
What you can do Before a thunderstorm

- Learn about your local community's emergency warning system for severe thunderstorms.
- Have an emergency preparedness kit handy in your home, vehicle and on your person.
- Get trained in first aid and learn how to respond to emergencies.
- Discuss thunderstorm safety with all members of your household so everyone knows the danger and what to do.
- Pick a safe place in your home for household members to gather during a thunderstorm. This should be away from windows, skylights and glass doors that could be broken by strong winds or hail.
- Protect your animals by ensuring that any outside buildings that house them are protected in the same way as your home.
- Make a list of items to bring inside in the event of a severe thunderstorm.
- Stay informed—Check weather forecasts before leaving for extended periods outdoors and listen to a NOAA weather radio to check local forecasts and news reports regularly.
- Keep a battery-powered or hand-cranked radio along with extra batteries.
- Buy ground fault protectors for key electrical equipment.
- Make trees and shrubbery more wind resistant by keeping them trimmed and removing damaged branches. Remove dead or rotting trees and branches that could fall.
- Consult your local fire department if you are considering installing lightning rods.
- If a thunderstorm is likely in your area, postpone outdoor activities. Many people struck by lightning are not in the area where rain is occurring.



When a thunderstorm approaches

- Draw blinds and shades over windows. If windows break due to objects blown by the wind, the shades will help prevent glass from shattering into your home.
- Shutter windows and secure outside doors and objects that could blow away. Keep away from windows.
- Unplug appliances and other electrical items, such as computers, and turn off air conditioners. If you are unable to unplug them, turn them off.
- If thunder roars, go indoors! If you can hear thunder, you are close enough to the storm to be struck by lightning. Go to a safe shelter immediately.
- Move to a sturdy building or car. DO NOT take shelter in small sheds, under the tallest or isolated trees or in convertible automobiles.
- Get out of boats and stay away from water.
- Avoid using a landline telephone or any other electrical appliances.
- Turn off air conditioners.
- Do not take a bath/shower or wash dishes. Plumbing conducts electricity.
- Watch for signs of a storm, like darkening skies, lightning flashes or increasing wind.
- If a severe thunderstorm warning is issued, take shelter in a substantial building or in a vehicle with the windows closed. Get out of mobile homes that can blow over in high winds.
- If you are in the woods, take shelter under the shorter trees.
- If you are boating or swimming, get to land and find shelter immediately.



During a Thunderstorm

Follow The 30/30 rule:

Step 1: When you see lightning, count the seconds until you hear thunder.

Step 2: If this time is 30 seconds or less, the thunderstorm is within 6 miles and is dangerous: quickly go inside your metal-topped vehicle, close the windows, and don't touch the metal frame. If you're at an improved campground that has a substantial central recreation building, go inside that building.

Step 3: Wait at least 30 minutes after seeing the last lightning or hearing the last thunder before going back outside.

When Inside

- Do not take a bath, shower or use plumbing.
- Avoid electrical equipment and telephones. Use battery-powered TVs and radios instead.
- Stay off corded phones, computers, and other electronic equipment that put you in direct contact with electricity or plumbing. Cordless phones and cell phones are safe to use.



If Outside

- If you can hear thunder, you are within striking distance for lightning. Seek safe shelter immediately.
- Stop outdoor activities at the first clap of thunder and get inside a large building or an enclosed vehicle. Wait 30 minutes after the thunder to go back outside.
- If you are outside and cannot reach a safe building, avoid high ground; tall, isolated trees; and metal objects such as fences or bleachers. Picnic shelters, dugouts and sheds are NOT safe.
- Find a low spot away from trees, fences and poles. Make sure the place is not subject to flooding.
- If you are in the woods, take shelter under shorter trees or bushes.
- If you are driving, try to safely exit the roadway and park. Stay in the vehicle and turn on the emergency flashers until the heavy rain ends. Avoid touching metal or other surfaces that conduct electricity in and outside the vehicle.
- If you are in open water, go to land and seek shelter immediately.
- If you can't and you feel your hair stand on end, indicating that lightning is about to strike, squat low to the ground on the balls of your feet. Place your hands over your ears and your head between your knees. Make yourself the smallest target possible and minimize your contact with the ground. Do not lie flat on the ground as this will make you a larger target.

Last Resort Outdoor Risk Reduction Tips

- **NO PLACE** outside is safe when lightning is in the area, but if you are caught outside **with no safe shelter anywhere nearby** the following actions *may* reduce your risk:
 - Immediately get off elevated areas such as hills, mountain ridges or peaks
 - NEVER lie flat on the ground
 - NEVER use a tree for shelter
 - NEVER use a cliff or rocky overhang for shelter
 - Immediately get out and away from ponds, lakes and other bodies of water
 - Stay away from objects that conduct electricity (barbed wire fences, power lines, windmills, etc.)

- UNDER NO CIRCUMSTANCES should ANY of the above actions be taken if a building or an all-metal vehicle is nearby



If someone is struck by lightning

- ✓ Lightning strike victims carry no electrical charge and can be handled safely; attend to them immediately. Check their breathing, heartbeat, and pulse.
- ✓ If a person is struck by lightning, call 9-1-1 and get medical care immediately.
- ✓ Give first aid. If breathing has stopped, begin rescue breathing. If the heart has stopped beating, someone trained in CPR should begin chest compressions. If the person has a pulse and is breathing, look and care for other possible injuries.
- ✓ The injured person may be burned, both where they were struck and where the electricity left their body. Check for burns in both places. Being struck by lightning can also cause nervous system damage, broken bones, and loss of hearing or eyesight.



After the storm

- Continue to listen to a NOAA Weather Radio or to local radio and television stations for updated information or instructions, as access to roads or some parts of the community may be blocked.
- Never drive through a flooded roadway. Turn around, don't drown!
- Stay away from storm-damaged areas to keep from putting yourself at risk from the effects of severe thunderstorms.
- Help people who may require special assistance, such as infants, children and the elderly or disabled.
- Stay away from downed power lines and report them immediately.
- Watch your animals closely. Keep them under your direct control.

