

## What is Severe Weather?

Severe weather is defined by the Storm Prediction Center (SPC) as any of the following:

- Winds greater than 58 mph
- Hail with a diameter greater than one inch
- A Tornado

Additionally, the SPC classifies certain weather events as significantly severe.

- Winds greater than 75 mph
- Hail with a diameter greater than two inches
- An EF-2 or stronger tornado on the Enhanced Fujita Scale

A severe thunderstorm is a thunderstorm that has one or more types of severe weather in it.

While they can cause significant damage; flooding, storm surge, snow, freezing rain, and lightning are not considered severe weather. Although, flooding and lightning often occur with many severe thunderstorms and non-severe thunderstorms alike.

There are variety of weather systems that cause severe thunderstorms, such as: mesoscale convective systems (MCSs), Squall Lines, ordinary cells, multicellular systems and Supercells.

## Severe Weather Safety & Precautions

- If a Severe Thunder Storm Warning is issued for your area, even if you do not see lightning or hear thunder, go indoors immediately. Remember, **WHEN THUNDER ROARS, GO INDOORS!**
- If you are unable to get to shelter and the threat is primarily hail and lightning, it is okay to go to a vehicle that is covered. However, if there is a threat of strong straight line winds or a tornado, **DO NOT** go into a vehicle.
- When indoors, stay away from windows or doors. Strong winds or hail could break the windows or knock down doors, possibly injuring you.
- Unplug any sensitive electronics in case power is lost. Keep your refrigerator and freezer closed and on the coldest temperature and do not open them! This will allow food to stay cold if power is lost.
- Stay off the telephone and communicate via text message only. This will keep the phone lines open for emergency personnel.

To learn more about severe weather and thunderstorm safety go to:

<http://www.nws.noaa.gov/om/severeweather/>

Cover Photo Credit: NWS

Pamphlet created by Nick Grondin  
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## Severe Weather



What is severe weather?  
What causes severe weather?  
How does hail form?  
Where does severe weather occur?

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StormReady in a Box  
Supplemental Information Pamphlet  
NWS Twin Cities  
Chanhassen, MN

## Conditions Favorable for Severe Weather

Severe thunderstorms can only occur with **convection**, the vertical motion of air associated with instability in the atmosphere. Convection is only possible with the following necessary conditions: a sub-synoptic scale lifting mechanism (a trigger), moisture, and rising air. The following are some qualities of the atmosphere that allow convection and therefore severe thunderstorm development to occur.

### High Values of CAPE

CAPE is acronym for Convective Available Potential Energy, which represents the amount of energy available for convection. Higher values of CAPE (above 1800 J/kg) are typically indicative of an environment capable of producing severe weather.

### High Levels of Low Level Moisture

Moisture is key condition for convection to occur. Convection is the reason why hot, clear, humid days can turn cloudy and stormy quickly. The high moisture levels allow foster cloud development with convection, developing thunderstorms.

### Vertical Wind Shear

Vertical Wind Shear is the change with wind direction with increasing height. A veering wind profile of vertical wind shear (i.e. wind direction turning clockwise with height) is most conducive to convection and therefore severe weather.

When the Storm Prediction Center sees these conditions (and others) over an area, they will issue a **Severe Thunderstorm Watch**. If thunderstorms begin to produce strong winds and/or large hail, local weather forecast offices will issue a **Severe Thunderstorm Warning**.

## Hail

**Hail** is a type of precipitation that falls as irregularly sized balls of ice that forms via supercooled liquid within cumulonimbus clouds. Hail stones vary in size from the size of a pea to the size of a grapefruit or larger.

Hail sometimes falls in nearly circularly pieces of ice. Other times, it falls in spikey, irregularly fragments of ice. The latter is particularly common in larger hail.



This nearly spherical hail fell in Burlington, VT area on July 1, 2004.  
Photo Credit: NWS Burlington



This large hail stone with a diameter of over 5 inches fell in Harper, KS in 2014.  
Photo Credit; Wikipedia

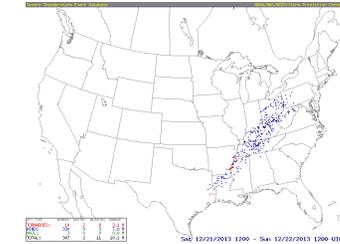
An environment conducive for hail development will have the qualities listed under conditions favorable for severe weather but also usually will have a freezing level (i.e. level in the atmosphere where the temperature drops below freezing and no where above it does the temperature go over freezing) around 10,000 feet. There also should be a strong enough updraft that allows the hail to form from the supercooled liquid above the freezing level. If the updraft is weaker, the size development of the hail will be limited.

## Severe Thunderstorm Climatology

Severe thunderstorms can occur anywhere in the continental United States. They most frequently occur across the Great Plains and the Southeastern U.S.

Severe weather season varies depending on location. In the Deep South, severe weather season begins in early March and lasts through the summer. In the Great Plains, it begins in April and lasts through early September. Outside the South, it is rare for severe thunderstorms to occur between late September and March, mainly due to lower amounts in daytime heating throughout the fall and winter. The climatological peak of severe weather season for the country is in late April through late May, such as the April 27, 2011 outbreak across the Deep South.

However, significant severe weather events have been know to occur other times during the year. Two recent examples are the 2012 Christmas Day outbreak across the Gulf Coast region and the December 21, 2013 Mesoscale Convective System that produced strong winds and wind gusts extending from Pennsylvania to Texas.



Graphic: NOAA SPC SeverePlot 3.0

Most severe weather occurs in the late afternoon hours. This is because daytime heating throughout the day helps fuel convection in the atmosphere.