

N.C. Standard Course of Study and Grade Level Competencies

Grade 7 – Competency Goal 3

The learner will make observations and build an understanding of weather concepts.

Objectives

3.05 Examine evidence that atmospheric properties can be studied to predict

atmospheric conditions and weather hazards:

- Humidity.
- Temperature.
- Wind speed and direction.
- Air pressure.
- Precipitation.
- Tornadoes.
- Hurricanes.
- Floods.
- Storms.

Objectives

3.06 Assess the use of technology in studying atmospheric phenomena and

weather hazards:

- Satellites.
- Weather maps.

Other Resources

Want to know more? Check out the following web sites for further formation on tornadoes:

<http://www.spc.noaa.gov/faq/tornado>

<http://www.tornadoproject.com>

<http://www.cln.org/themes/tornadoes.html>

<http://www.spc.noaa.gov>

<http://www.nssl.noaa.gov/edu/tornado>

<http://www.nssl.noaa.gov/NWSTornado>

<http://www.stormtrack.org>

<http://www.sirlinksalot.net/tornado.html>

<http://www.ncdc.noaa.gov/oa/climate/severeweather/extremes.html>

Tornado!



TORNADOES

Interesting Facts about Tornadoes

- Although tornadoes do occur throughout the world, the United States experiences the most intense and devastating tornadoes.
- In the United States, tornadoes are more prevalent from April through July, with May and June being the peak months.
- Like thunderstorms, tornadoes can form any time of year. They can and do occur in every state in the country.
- Tornadoes can be nearly invisible, marked only by swirling debris at the base of the funnel. Some are composed almost entirely of wind-blown dust and still others are composed of several mini-funnels.
- On average the United States experiences 100,000 thunderstorms each year.
- Approximately 1,000 tornadoes develop from these storms.
- Tornadoes produce the most violent winds on earth. Tornado winds can approach speeds as high as 300 miles per hour and travel distances over 100 miles.
- May 3rd 1999, 76 tornadoes struck 5 midwestern states, resulting in 40 lives lost and damages reaching \$12 billion.
- According to the National Weather Service, about 42 people are killed because of tornadoes each year.

Fujita Tornado Scale The Fujita Tornado Scale, usually referred to as the F-Scale, classifies tornadoes based on the damage caused. It was developed by Dr. Theodore Fujita.

F-Scale	Winds	Type of Damage
F0	40 - 72 mph	Minimal Damage: Some damage to chimneys, TV antennas, roof shingles, tree branches, and windows.
F1	73 - 112 mph	Moderate Damage: Automobiles overturned, carports destroyed, trees uprooted.

Waterspout

- Waterspouts are weak tornadoes that form over warm water.
- Waterspouts are most common along the Gulf Coast and southeastern states. In the western United States, they occur with cold late fall or late winter storms. Waterspouts occur most frequently in northern Michigan during the months of August, September, and October, when the waters of the Great Lakes are warm.
- Waterspouts occasionally move inland becoming tornadoes causing damage and injuries.



The Worst Tornado Outbreak

- Super Outbreak
- April 3-4, 1974
- 148 tornadoes
- 330 deaths
- 5,484 injuries

The Most Deadliest U.S. Tornado

- Tri-State Outbreak
- March 18, 1925
- 7 tornadoes
- 695 deaths
- 2,027 injuries

Longest U.S. Tornado Track

Tornado soared through the states of Missouri, Illinois, and Indiana on 219 miles in March 18, 1925.



Storm Chasers

Storm Chasing is chase teams, hobbyists, and forecasters in the field since 1977. Storm Chasing is risk life and helps to increase knowledge about storms. People who chase storms have to be very knowledgeable on the subject of severe weather, both for their own safety, and so that severe weather phenomena can be reported properly. Storm Chasers must learn meteorology to be successful and may bring picture and video cameras, too.



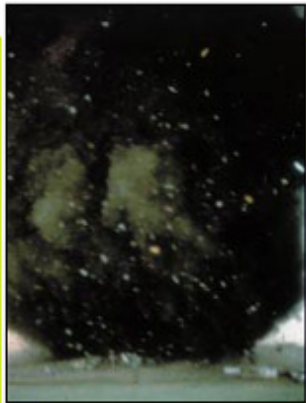
Storm Chaser took video camera.



Mobile Doppler Radar

- F2** 113 - 157 mph **Major Damage:** Roofs blown off homes, sheds and out-buildings demolished, mobile homes overturned.
- F3** 158 - 206 mph **Severe Damage:** Exterior walls and roofs blown off homes. Metal buildings collapsed or are severely damaged. Forests and farmland flattened.
- F4** 207 - 260 mph **Devastating Damage:** Few walls, if any, standing in well-built homes. Large steel and concrete missiles thrown far distances.
- F5** 261 - 318 mph **Incredible Damage:** Homes leveled with all debris removed. Schools, motels, and other large structures have considerable damaged with exterior walls and roof gone. Top stories demolished.

Shapes and Sizes



Weak Tornadoes

- 69% of all tornadoes
- Less than 5% deaths
- Lifetime 1-10+ minutes

Fujita Scale Class
Weak F0-F1

Strong Tornadoes

- 29% of all tornadoes
- Nearly 30% deaths
- May last 20 minutes or longer

Fujita Scale Class
Strong F2-F3

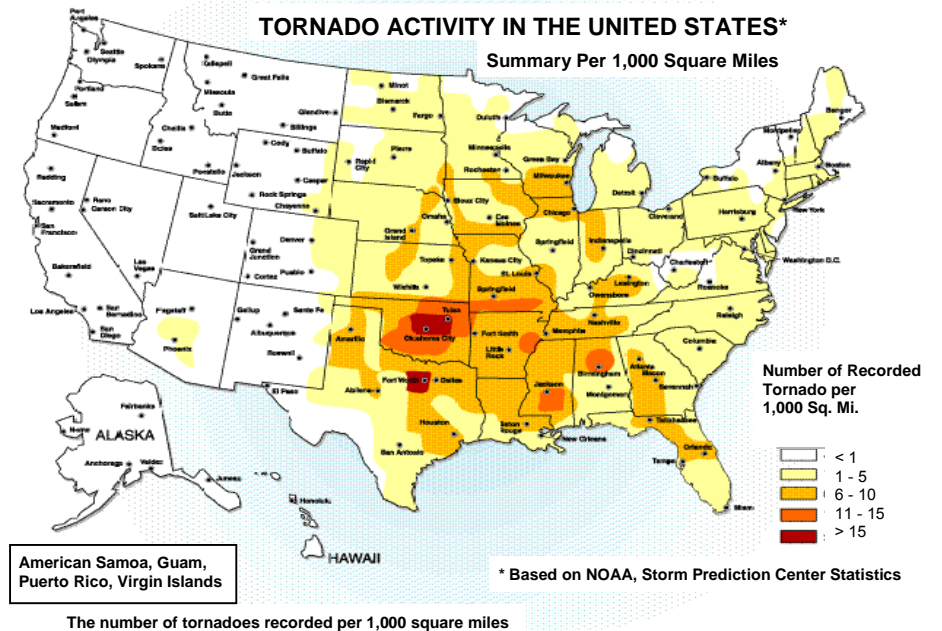
Violent Tornadoes

- 2% of all tornadoes
- 70% deaths
- Lifetime can exceed 1 hour

Fujita Scale Class
Violent F4-F5

Analysis Questions for Fujita Scales

1. Describe the level of destruction if an F2 tornado moved through a mobile home community.
2. Describe the level of destruction if a tornado hit and had winds of 250 miles per hour.



Analyzing Tornado Data:

AVERAGE NUMBER OF TORNADOES PER YEAR 1953 - 2003

Alabama	24
Alaska	0
Arizona	3
Arkansas	25
California	5
Colorado	30
Connecticut	1
Delaware	1
District of Columbia	0
Florida	52
Georgia	21
Hawaii	0
Idaho	3
Illinois	33
Indiana	20
Iowa	35
Kansas	52
Kentucky	11
Louisiana	26
Maine	1
Maryland	4
Massachusetts	2
Michigan	16
Minnesota	24
Mississippi	26
Missouri	29
Montana	6

Nebraska	42
Nevada	1
New Hampshire	1
New Jersey	2
New Mexico	8
New York	6
North Carolina	16
North Dakota	21
Ohio	15
Oklahoma	56
Oregon	1
Pennsylvania	11
Puerto Rico	0
Rhode Island	0
South Carolina	12
South Dakota	28
Tennessee	14
Texas	135
Utah	2
Vermont	0
Virginia	8
Virgin Islands	0
Washington	1
West Virginia	2
Wisconsin	19
Wyoming	10
Pacific Islands	0

Tornado Outbreak

On 3rd and 4th of April 1974 in 16 hours there were measured 148 tornadoes in 13 states. The tornadoes were varying from F0 to F5 and some of them traveled 60 kilometers. This was the biggest breakout ever. There were 330 people killed and 5,484 people injured. Such a strike of nature is rare, but the scientist can assure us that it will come back. We know one thing for sure: there won't be so many people killed or injured, because of the better warning system.

NOAA REPORTS RECORD NUMBER OF TORNADOES IN 2004

Every year, an average of 1,200 tornadoes kill about 55 Americans, injure 1,500 people and cause more than \$400 million in damage. Considered nature's most violent storms, tornadoes can occur any month of the year with peak activity from the months of March through July.

In 2004, "the number of tornadoes associated with tropical storms and hurricanes was extraordinary and can be partially blamed for the high number of overall tornado reports," Tropical Storm Bonnie and five land-falling hurricanes - Charley, Frances, Gaston, Ivan and Jeanne - affected the mid-Atlantic and Southeast states during August and September. Tornadoes frequently occur in the northeast quadrant of northward advancing tropical systems or their remnants.

Hurricane Frances produced the most tornadoes for a tropical system with a preliminarily number of 117 reports. Frances tops Hurricane Beulah, which spawned 115 tornadoes in September 1967. Hurricane Ivan was close with 104 tornado reports, and a total of 16 tornadoes were reported in association with Hurricane Jeanne.



On July 13, 2004, tornado struck Parsons Manufacturing near Roanoke, Illinois and destroyed the automobiles.



Doppler Radar

These odd-looking domes have become more common sights across the United States in the past fifteen years, as the National Weather Service has beefed up its storm-warning capabilities with more than one hundred Doppler radars. The radar lies inside the fiberglass dome. It bounces microwaves off tiny cloud particles dozens of miles away, to create a sort x-ray of a turbulent thunderstorm. Doppler radar sometimes glimpses intense winds, side by side, moving in opposite directions: an indication of a storm that is rotating, and that may be producing a tornado on the ground at that very moment.



TOTO

TOTO, or Totable Tornado Observatory, was a barrel full of atmospheric sensors. The device was said to weigh about 400 lbs. (recently its weight was estimated by one of its handlers at considerably less, maybe 200 lbs. or so). In the early 1980s, storm chasers raced around with TOTO, trying to plant it right in the path of a tornado. It was a difficult endeavor, like trying to thread the eye of a moving needle. A tornado never struck the device, but it nevertheless won a small measure of fame when a TATO-like imitation called “Dorothy” appeared in the movie Twister.

Questions

1. In which general region of the U.S. do most tornadoes appear to form?
2. Which region appears to have the least number of tornadoes?
3. Which state has the highest number of tornadoes?
4. Which state has the lowest number of tornadoes?
5. List the five states that have the highest number of tornadoes in order from greatest to least.
6. What do you think is the cause of the low number of tornadoes in the northeastern part of the country?
7. Why do you think that states like Texas and Florida have so many tornadoes?

Your Twister IQ - True or False?

True or False: Questions:

1. Tornadoes are always visible from a great distance away.
2. Tornadoes cause houses to explode from changes in air pressure.
3. By opening the windows, you can balance the pressure inside and outside your home so a tornado will not do damage.
4. The best place to be during a tornado is generally in the southwest corner of the house.
5. Tornadoes cannot cross water.
6. Tornadoes are often preceded by large hail and heavy rain.
7. Downward-bulging clouds mean tornadoes are on the way.

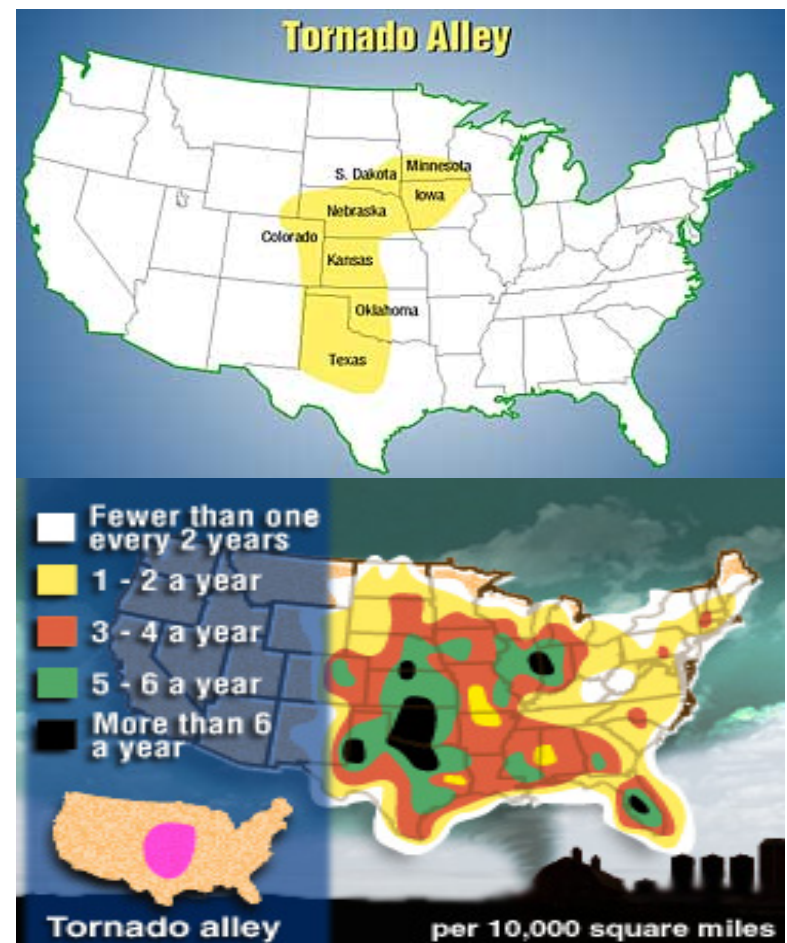
True or False: Answers:

1. False! They can be hidden in heavy rainfall.
2. False! Homes are damaged primarily by strong winds and airborne Debris, not by air pressure changes.

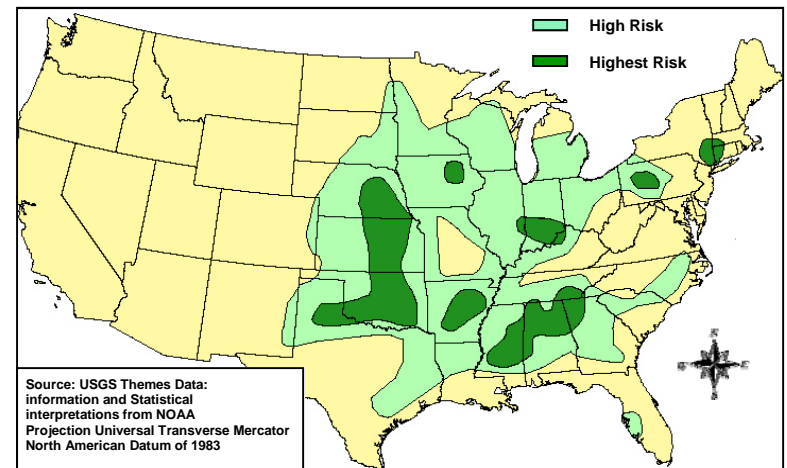
3. False! The force of a tornado can rip through a structure, whether the windows are open or not. One should not waste time opening the windows when a tornado is threatening as this could actually make the situation much worse.
4. False! This used to be a safety rule based on the idea that debris would usually not be deposited in the southwest corner, but this has now been rethought. The current best advice is to move to a protected interior room on the lowest floor of the building, as far as possible from exterior walls and windows. Basements underground are the very best locations.
5. False! A waterspout is a type of tornado that actually forms on water, and tornadoes that form on land can cross bodies of water, such as rivers and lakes. Tornadoes, especially the more violent ones, can also travel up and down hillsides. Therefore, a belief that your location is protected by a river or ridge could prove to be a dangerously invalid one.
6. True! Especially in the early stages of tornado development. The largest hailstones and heaviest rain often occur just ahead of the tornado.
7. Not Necessarily! This may be the case, especially with those that show evidence of a rotating motion in the rear of the storm, but many of these clouds are not associated with tornadoes and may be completely harmless.

Tornado Alley

The places in North America where tornado's happen most often is called Tornado Alley. It covers the middle part of the continent. It covers the Great Plains which is between the Rocky Mountains and the Appalachian Mountains. It includes all or half of the 13 mid-west states. About 1,214 tornadoes happen in the United States each year. Canada has about 100 tornadoes every year. Ninety percent of tornadoes happen in association with thunderstorms. They happen a lot in places where people don't live. Only several dozen that cause death and destruction are reported. Tornadoes can occur everywhere in the world and have been reported from other countries of Brazil, South Africa, Spain, Australia, Bangladesh, Japan, New Zealand, Wales, and several countries of Europe. But, tornadoes occur in the mid-west of the United States and Canada in larger numbers than any other place on earth! Kansas, Nebraska, Oklahoma, and Texas have tornadoes most frequently than any other state. Tornadoes are rare in Alaska.



Two maps showing Tornado Alley.



Map showing **Tornado Risk Areas** in the Conterminous United States, also known as "Tornado Alley".