

WaterWeb

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT



Extreme Weather and Mapping

Weather is an important part of the never-ending water cycle that exists within our environment. At times, weather conditions can be EXTREME.

In Florida, we experience some of the wildest weather in the world. Although snowy blizzards are very unlikely, we do encounter hurricanes, tornadoes, waterspouts, heavy rain showers and a lot of lightning strikes. Our humid, subtropical climate creates an ideal breeding ground for these extreme weather conditions.

Modern weather forecasting has helped the public prepare for severe weather like never before. Nearly all weather develops within a 5-mile atmospheric layer surrounding the earth, called the *troposphere*. Meteorologists, or scientists who study and predict weather, play an important role in alerting us to threatening conditions. *Meteorology* comes from the Greek word *meteoron*, which means “concerning things in the air.”

In addition to basic instruments such as thermometers, hydrographs, weather vanes, anemometers, barometers and rain gauges, meteorologists use high-powered computer systems to monitor weather patterns. High-tech tools such as satellites and Doppler radar systems are used with weather balloons, ocean buoys and other instruments. The weather updates that we receive at home on our computers, radios and TVs are

accurate and up to date because of these powerful advances in technology.

People have always been fascinated by extreme weather. Weather disasters are popular themes in movies, books and TV shows. As you learn more about extreme weather and mapping, you will realize how important it is to be a weather-wise citizen. Knowing more about extreme weather conditions may even save you or your family from harm!



Southwest Florida
Water Management District

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...Hurricanes

Most of us who live in Florida are familiar with the hurricane season, which runs each year from the beginning of June until the end of November. Unlike some other weather patterns, hurricanes can last for several days or even weeks. It's no surprise that hurricanes cause more destruction than any other type of storm on earth. But did you know that hurricanes also have a positive effect on the environment? A hurricane can provide much-needed rain to an area. It can also play an important role in transferring heat from one region to another. As a hurricane system gradually moves forward, it draws heat and energy away from the equator and pushes it toward cooler areas. Read on to learn more about one of nature's most extreme conditions.

Word History

Although hurricanes aren't really evil, the word *hurricane* gets its meaning from a dark and stormy past. In South and Central America, the ancient Mayan people believed in a storm god named *Hunraken*. In the Caribbean, the Taino people feared an evil god called *Huracan*, which is the Spanish word for "great wind." Over time, these two names combined to describe the severe weather condition known as a hurricane.

The Strongest Tropical Cyclone

Tropical cyclones are storms that spin around low air pressure systems typically formed in the tropics. Because of a force known as the

Coriolis effect, the storms spin counterclockwise in the Northern Hemisphere and clockwise in the Southern Hemisphere. Hurricanes are the most powerful type of tropical cyclone.

Growth of a Hurricane

Like all other winds, hurricane winds are caused by differences in atmospheric pressure, which is basically the pressure caused by the weight of air molecules. Hurricanes are born over the warm tropical waters of the oceans near the equator, where moisture evaporates into the atmosphere and generates the power source for a severe storm. Thunderstorms develop as winds force warm air to rise higher into the atmosphere and begin a spinning motion. Winds continue spinning faster and faster as a hurricane grows in size and strength. A hurricane can span from 200–500 miles over a body of water.

What's in a Name?

Tropical storms and hurricanes are the only weather disasters that have names. For over 50 years, tropical storms with winds of at least 39 mph have been assigned names. A storm is a hurricane when it can sustain wind speeds of 74 mph or higher. Naming storms allows everybody to communicate information about a particular storm more easily. There are six lists of alphabetical names, which are rotated each year. Names associated with deadly storms in the past, such as Donna, Hugo and Andrew, are no longer allowed on the list.

Checkup Time Mark each of the following statements as true (T) or false (F).

- 1. Hurricanes have had names for only the past 10 years.
- 2. Hurricanes can cover an area of 200–500 miles over water.
- 3. A hurricane is a type of tropical cyclone.
- 4. Hurricanes spin in a clockwise pattern in the Northern Hemisphere.

Learn More About It Hurricane Categories

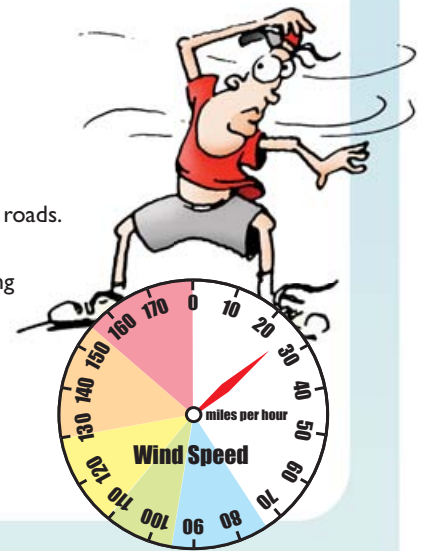
A tropical storm that has become powerful enough to be given a name may also eventually reach the status of a fully developed hurricane. However, not all hurricanes are alike. They vary in atmospheric pressure, wind speed and potential damage caused by storm surges. Storm surges are sudden rises in water levels that occur when the winds from hurricanes or other severe storms push ocean waters onto land. Florida is a state largely surrounded by ocean waters, so we are particularly vulnerable to coastal

flooding caused by storm surges. The potential destructiveness of a storm surge often depends on the severity of the hurricane that causes it.

Numbered categories are used to describe the power of a hurricane. If a hurricane reaches the status of a category 5, people are unlikely to forget its destructive impact. Use the information below to gain a better understanding of the destructive forces of hurricanes.

The Saffir-Simpson Hurricane Scale

Category	Wind Speed (Miles Per Hour)	Damaging Effects
1	74–95	Slight damage to trees, bushes and unanchored mobile homes.
2	96–110	Some trees and mobile homes may be blown over. Some roofing, door and window damage to small buildings and homes. Flooding of coastal roads.
3	111–130	Structural damage to small buildings and homes. Mobile homes are destroyed. Flooding and floating debris causes damage to structures.
4	131–155	Extensive damage to buildings and homes. Major erosion of beach areas. Inland areas flooded.
5	greater than 155	Complete destruction of roofs on homes and buildings. Major flooding. Buildings may be completely destroyed. Massive evacuation of an area may be necessary.



Deadly Effects *Most deaths from violent hurricanes are caused by the storm surge rather than damaging winds. Why do you think this is so?*

I Was Wondering...



Photo courtesy NOAA

The largest hailstone ever recovered in the United States fell in Aurora, Nebraska, in 2003 with a record 7-inch diameter and a circumference of 18.75 inches.

Question:

I know that hailstones can ding our cars and cause severe damage to the roofs of our homes. How is hail formed?

Answer:

Hailstones are balls of ice that fall from cumulonimbus clouds. Hail begins as frozen rain droplets. Inside a storm, vertical winds called updrafts keep the droplets from falling. The updraft causes the droplets to freeze together, becoming bigger and heavier balls of ice. These chunks fall to the earth's surface when their weight can no longer be sustained or when the updraft weakens.

Twisters

There may be no sight more frightening than a very dark, funnel-shaped cloud racing in your direction! Although tornadoes, also known as twisters, don't last long, they can uproot trees, level buildings and even destroy entire towns. Sometimes tornadoes travel in clusters and a single storm can spawn multiple tornadoes.

In some years, Florida has more tornadoes than any other state. Tornadoes most commonly exist in areas where a layer of cold, dry air flows over the top of a layer of warm, wet air. As air rises, it carries water upward with it and a low-pressure area is created. Then air comes rushing in from all sides to replace the air rising in the low-pressure area. The spinning winds form a vertical funnel, which extends below a thundercloud. A tornado's terror is fast and furious. In fact, most of the tornadoes in Florida last less than 10 minutes.

Fujita Tornado Intensity Scale (F-scale)

The intensity of a tornado can be categorized according to levels represented on what is commonly called the F-scale. The scale numbers range from F0 to F5. The scale originally included ratings higher than F5, but storms of this magnitude have never been recorded and do not seem to exist. Fortunately for us, most tornadoes in Florida are F0 or F1 tornadoes, with damage ranging from light to moderate.

Waterspouts

Waterspouts are more frequent and damaging in Tampa Bay than almost anywhere else in

the world. Waterspouts are water columns that rotate over bodies of water, such as the Gulf of Mexico. They come in two forms: tornadic and fair-weather. Tornadic waterspouts typically begin as tornadoes over land, eventually moving to open water. Fair-weather waterspouts usually form over the water and are small, weak types of funnels. They are much less dangerous than the tornadic form. Waterspouts occur most often during the month of June.

Warning System

Weather forecasters often use Doppler radar to monitor severe weather systems. Radar stands for radio detecting and ranging. Doppler radar is a large instrument used to determine the location, speed and direction of wind movement. This information is especially important for alerting the public of approaching tornadoes. In fact, Doppler radar can provide up to a 30-minute warning. A network of Doppler radar systems exists across the continental United States.



Analyze It

Explain why early detection and warning of a severe weather system is especially important in a heavily populated area.

Opposite Extremes — Floods & Droughts

Visitors to Florida are often impressed with our tropical, humid temperatures and lush landscapes. Our 54 inches of average annual precipitation contribute to these naturally green surroundings. However, excessive rainfalls from extreme weather conditions can cause rivers to overflow and inland areas to become covered with water. At the other extreme, severe dry conditions can cause our normally green environment to become faded and parched. Let's learn more about what happens when it rains too much or too little.



Extremely Dry (Droughts)

Drought conditions exist when precipitation is far below normal for a long period of time. Florida typically receives a significant amount of rain, so extremely dry conditions have dramatic effects on our environment.

Wildlife must search for enough water to survive and agricultural activities suffer without adequate water supplies. Vegetation becomes dry and parched, allowing wildfires to trigger easily and spread quickly. In response to a drought, strict water conservation efforts may be required. Sometimes droughts can last for months or even years.

Extremely Wet (Floods)

Flooding occurs when a land area that is normally dry becomes covered by water. Floods cause more damage and threaten more lives than any other extreme weather condition. Heavy rains make the water level in a body of water rise so fast that it overflows onto nearby areas. Florida is comprised of relatively low-lying land and a large number of water bodies, making it fairly susceptible to flooding.

Venn Weather Diagram

Use the information you learned about floods and droughts to complete the Venn diagram below. Write the features that are unique to floods and droughts on the correct side. Then list the features in the overlapping area that may be common to both extreme weather conditions.



You Can Make It!

Weather Maps

Weather maps are used to show a variety of data about atmospheric conditions, such as temperature, precipitation, pressure systems and fronts. In this activity, you will design your own weather map. You can collect weather information from newspapers, TV and radio broadcasts, web sites and other sources. If you are feeling really ambitious, develop a new map for each day of the week!

Learning Goals

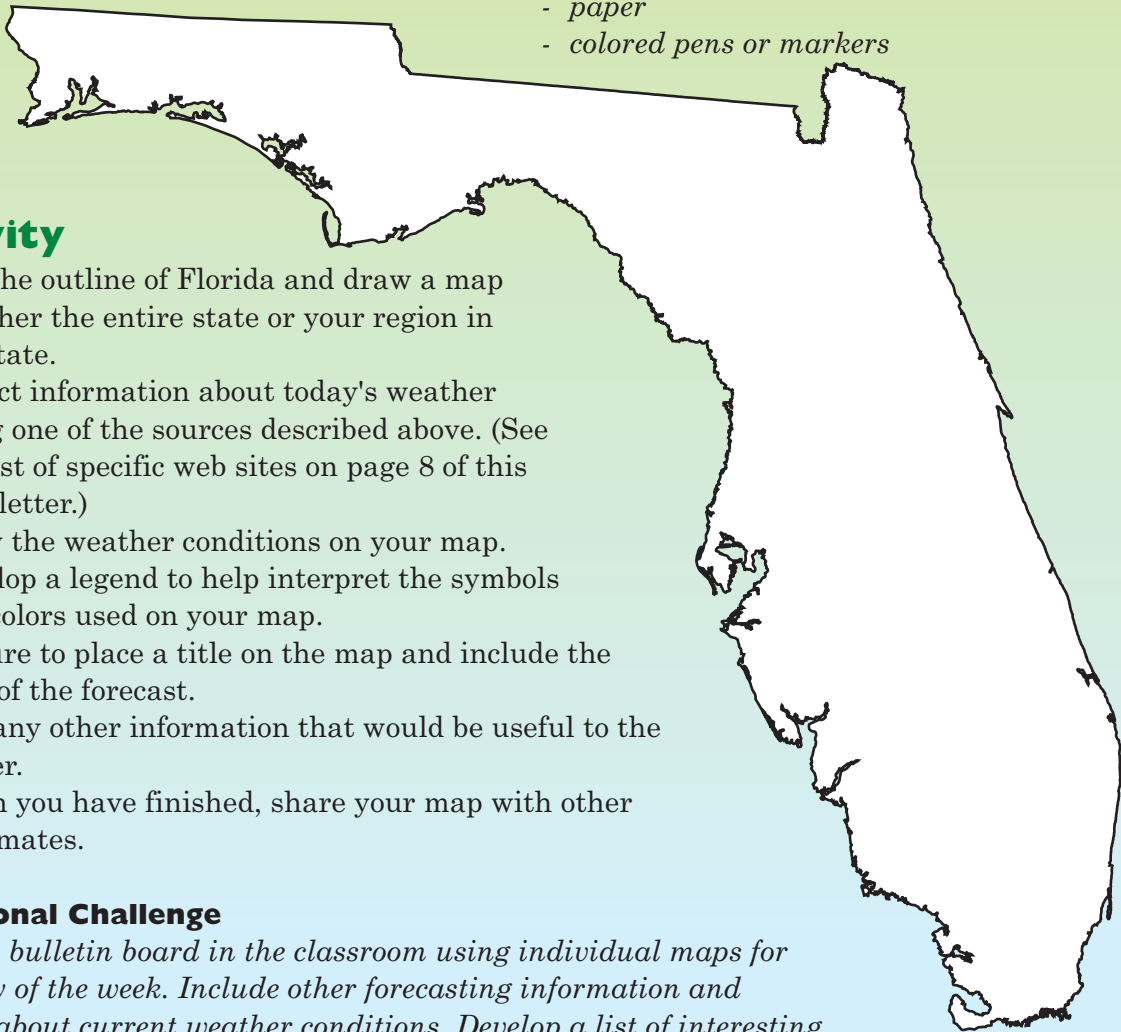
- *To engage in a hands-on activity about weather mapping*
- *To develop an awareness of the importance of weather forecasting*

Subjects

- *Science*
- *Mathematics*
- *Language Arts*

Materials

- *outline of Florida or your region*
- *paper*
- *colored pens or markers*



Activity

1. Use the outline of Florida and draw a map of either the entire state or your region in the state.
2. Collect information about today's weather using one of the sources described above. (See the list of specific web sites on page 8 of this newsletter.)
3. Draw the weather conditions on your map.
4. Develop a legend to help interpret the symbols and colors used on your map.
5. Be sure to place a title on the map and include the date of the forecast.
6. Add any other information that would be useful to the reader.
7. When you have finished, share your map with other classmates.

Additional Challenge

Create a bulletin board in the classroom using individual maps for each day of the week. Include other forecasting information and articles about current weather conditions. Develop a list of interesting web sites about the study of weather.

Just for Fun

These activities are not only for fun — they'll help you improve your problem-solving skills too!

Lightning Puzzler

We live in an area that is often called the lightning capital of the world. Lightning can trigger forest fires, destroy buildings or even kill animals and people. But lightning also helps to maintain a balance of electricity between the earth and sky. When collisions of storm clouds cause electrical charges to separate, lightning works to restore stability in the atmosphere. Lightning can also be used to estimate how far you are from an approaching storm. By counting the seconds between a lightning flash and the first clap of thunder, you can determine the approximate distance between you and the storm. Knowing how close a storm is can serve as a warning to find safe shelter immediately!

Practice computing the distance of a storm. Perform the necessary computations and complete the chart. The following hints will help you.

Hints:

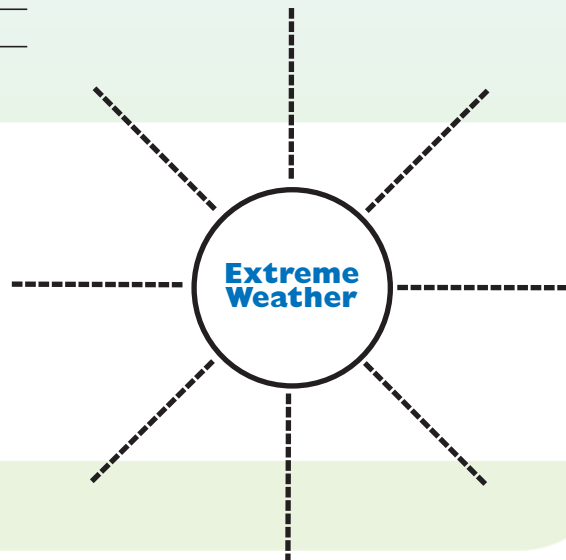
- To find out how many miles you are from a storm, divide the time between flash and thunder by 5.
- To find out the number of kilometers, divide the time between flash and thunder by 3.
- Time is given in hours: minutes: seconds.

Flash Time	Thunder Time	Distance in Miles	Distance in Kilometers
3:10:01	3:10:26	_____	_____
5:15:06	5:15:17	_____	_____
2:30:30	2:31:00	_____	_____



Weather Extremes Concept Map

A concept map can be used to diagram information. Make a list of eight facts you learned about extreme weather patterns. Write the facts on the lines surrounding the extreme weather circle. Compare your concept map with others.



Surfing for More Info

If you are interested in learning more about topics covered in this newsletter, check out these web sites on the Internet.

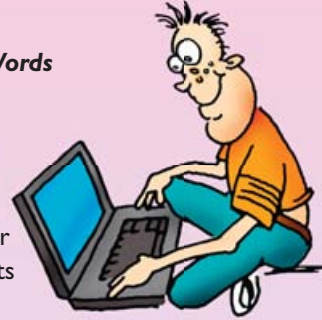
National Oceanic and Atmospheric Administration
www.noaa.gov

Tampa Bay Online (select weather)
www.tbo.com

USA Today Weather
asp.usatoday.com/weather/weatherfront.aspx

Key Weather Words and Phrases:

hurricanes
weather maps
tornadoes
extreme weather
weather forecasts
thunderstorms



Tell Us What You Think!

Have you or someone in your family ever experienced an extreme weather situation? Maybe you have witnessed some awesome lightning or thunder. Or maybe you had a tornado pass by your community. Possibly you experienced the flooding effects of a hurricane. We want your tale of a severe weather experience.

Even if you don't know anyone who has had such an experience, try to imagine what it would have been like and write a story about it. Please be sure to let us know whether your story is based on a real-life experience or your own imagination.

Mail your story to us and we will send you a prize!

Is this story based on real life? ____ Or your imagination? ____

Name _____

Address _____

City _____ State _____ ZIP Code _____

County _____ School _____

Grade _____ Teacher _____

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