

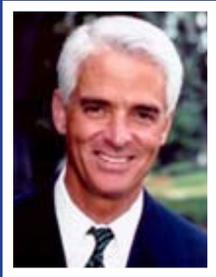
# Florida's 2010 Severe Weather Awareness Guide

Are  
You  
Ready?



Florida Division of Emergency Management

## A Message From Governor Charlie Crist



Each day, more than 18 million people call the Sunshine State their home. Florida is a great place to live, work and play. But with this beautiful place comes a personal responsibility for each of us to be prepared for the hazards that affect our state. In Florida, natural hazards like thunderstorms and lightning are common. The key to your family's safety is being aware of possible hazardous weather conditions and

knowing how to prepare for them. I urge you to read the 2010 Severe Weather Awareness Guide carefully and share this valuable information with your family. This Guide will help us all make better decisions about personal safety year-round.

## Message From The Interim Director of the Florida Division of Emergency Management

The Florida Division of Emergency Management works with local governments to respond to all types of disasters. In the last three years alone, the state of Florida has received 15 federal disaster declarations, ranging from wildfires and hurricanes to tornadoes and flooding. This year, we want to continue promoting a culture of preparedness across our great state. Every citizen can do their part by taking the time to learn about the different hazards Floridians face. Now is the perfect time to get a plan, restock emergency supplies, purchase an all-hazards weather radio, and be ready to act when threatening weather approaches your community. Please read and share this informative guidebook with your family, friends and coworkers. The time spent now can be a lifesaver later.



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# Severe Weather Awareness Week in Florida

## January 24 – 30, 2010

Sunday, January 24 through Saturday, January 30, 2010, has been proclaimed Severe Weather Awareness Week in Florida by Governor Charlie Crist. During this special week, Floridians are encouraged to learn and review the proper safety

precautions necessary for protecting their lives during severe weather. Each day will focus on a specific topic. The topics assigned to each weekday are:

<p><b>Monday</b></p>  <p><b>Lightning</b></p>	<p><b>Tuesday</b></p>  <p><b>Marine Hazards and Rip Currents</b></p>	<p><b>Wednesday</b></p>  <p><b>Tornadoes and Thunderstorms</b></p>	<p><b>Thursday</b></p>  <p><b>Hurricanes and Flooding</b></p>	<p><b>Friday</b></p>  <p><b>Temperature Extremes and Wildfires</b></p>
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## Practice makes perfect: Statewide tornado drill Jan. 27

If a tornado were to strike tomorrow, would you be prepared? Would you know what actions to take? In Florida, tornadoes strike all too often. Planning and practice are keys to tornado safety. Whether at home, school or business, everyone should have a plan in place for severe weather. The tornado drill gives Floridians a chance to test their plans and determine whether or not they are prepared. This is especially true in schools.

A very important part of Florida Severe Weather Awareness Week is the statewide tornado drill on Wednesday, January 27. On the morning of the drill, all participants should consider themselves under a Tornado Watch. A watch means you should monitor the weather and be prepared to go a safe place in the event of a warning. At approximately 10:10 a.m., the National Weather Service will issue a practice tornado warning. The warning will be broadcast on NOAA Alert Radio as a weekly test message.

By 10:30 a.m., an "all-clear" message will be issued. Public and commercial broadcasters are encouraged to participate by broadcasting these messages immediately. For the Florida Panhandle counties within the Central time zone, all drill activities will be repeated one hour earlier (9:10 a.m. Central Standard Time).

In real life, you must listen for the watch and warning messages and determine the threat to your area. Then you should decide which protective actions to take. Important: When in doubt, take immediate protective action! Plans may vary depending on the number of adults present, how vulnerable your location is, communications and a host of other factors. All Floridians should use the tornado drill to develop and practice their plans. Being prepared saves lives! If actual severe weather threatens Florida on January 27, the drill will be postponed until Friday, January 29.

## Statewide Tornado Drill Timeline

School districts, private schools, preschools and daycare centers are urged to participate in the drill.

### Weeks before the drill

#### Prepare

- Inform staff, students, parents.
- Review and refine a tornado plan.

### January 27: The day of the drill

#### After 8:00 a.m.

#### Consider a tornado watch to be in effect

- Announce watch to staff, students.
- Designate authority (coordinator).
- Evacuate tornado vulnerable areas.

#### 10:10 a.m.

#### Tornado warning

- Receive message.
- Coordinator determines threat.

#### 10:20 a.m.

- Upon determination of immediate threat, give "take shelter" or "duck and cover" command (depending on space available at location).

#### 10:30 a.m.

#### Termination of Watch and Warning

- Give instructions to return to normal activities. (You will not receive notification. Terminate the drill as you see fit.)

#### After the Drill Wrap up

- Following the drill, assess and revise plan as needed. The tornado warning will be broadcast on NOAA Alert Radio and will be encoded as a weekly test for this drill.

# NOAA Alert Radio can be your family's best companion



It's 3 a.m., and it's raining hard. You lie in bed awake, even though the rest of your family is asleep. Lightning lights up your bedroom, and you hear the rumble of distant thunder. It happens to be late March, the height of Florida's dangerous tornado season. You have a new NOAA Alert Radio by your bed, and you know it is correctly programmed because you get the weekly test and all the warnings for your county.

"Waaaaaah, waaaaaah waaaaaah," the radio alarms. You turn it on and hear a tornado warning for your county, and it lists your town in the tornado threat area.



You spring into action, waking your family and ushering them into the downstairs bathroom, the one with no windows.

Since your radio is battery-powered, you grab it and take it with you. In the bathroom, you can hear the rain getting harder and the thunder getting louder. You hear a severe weather statement over the radio telling you the tornado is four miles west of your town and moving east at 35 miles per hour.

A bad situation? Yes, but you are ready.

Your chances of surviving uninjured are excellent. However, most people face a tornado without the lifesaving information that can be provided by a NOAA Alert Radio.

The alerts are broadcast from the local National Weather Service (NWS) office serving your area. The NWS meteorologists are watching the weather 24 hours a day, every day. Sophisticated Doppler radars and other technology help the meteorologists decide when to issue watches and warnings. When the decision is made and the message is broadcast, your weather radio can alert you to the danger.

NOAA Alert Radio was designated the sole government-operated radio system to provide warning information directly to the American people for both natural and other hazards. Now, there are more than 900 stations around the nation, including 31 in Florida.

It's not just a "weather" radio. It's an "alert" radio. NOAA's National Weather Service works very closely with Emergency Management agencies to provide you with other emergency messages, such as alerts for a wildfire or a chemical spill threatening your area. Emergency management agencies may produce evacuation messages for broadcast on NOAA Alert Radio.

Weather radios are manufactured by

several companies and sold in many stores and on the Web. We recommend you buy a weather radio with the Public Alert™ designation. This means the radio can be programmed to receive only the alerts that are important to you. This is also known as SAME (specific area message encoding) technology. You should set the weather radio to ignore warnings for counties far away from your location. This way, you will get only the alerts that you need.

Many weather radios can be attached to personal computer strobe lights or other devices to make sure you are alerted.

Pay attention when your weather radio alerts you. Listen to the watch or warning message. Check out your newspaper's online news site, local TV or radio stations that serve your area. These constantly updated sources may be able to tell you much more about what is happening. Also, get the big picture on NWS Web sites. They can show you the latest warnings, overlaid on Doppler radar loop images.

During other times, when the weather is quiet, you may listen to the routine NOAA Alert Radio program. It gives you your current conditions, local forecasts, marine forecasts, tropical weather outlooks and other information.

We cannot warn you before your home is about to catch fire ... that's your smoke detector's job. For many other life-threatening events, get a NOAA Alert Radio. It just might make the difference. Oh, and don't forget the spare batteries.

**By Dennis Decker,  
National Weather Service,  
Melbourne**

*Heavy sleeper?*

*Hard of hearing?*

A disability accessory kit is now available through HomeSafe Incorporated. This accessory kit includes a pillow shaker and strobe light which plugs into your NOAA Weather Radio. There is no programming necessary, the accessory kit will automatically alert you if a warning is issued for your area.



# Hurricanes

In Florida, most of the time between June 1st and November 30th is spent dealing with sunny weather, with thunderstorms in the summer and then cool fronts coming through in October and November. However, this time period is also the season in which tropical low pressure systems, called hurricanes, become intense with maximum winds over 73 mph and can threaten Floridians.

One common misconception is that there are parts of our state that do not get hurricanes. In the last 150 years,

all of Florida's coastlines have been impacted by at least one hurricane. The south coast, including the Florida Keys, is the most vulnerable, with a hurricane striking the every 3 to 5 years on average. The western Panhandle is next most vulnerable, with a strike every 7 to 8 years. Other parts of Florida, including the Tampa Bay and Jacksonville areas, do not have as high of a risk, but folks in these areas should always be ready for a hurricane strike. This fact is especially true now since the Atlantic Basin as a whole has been in a very active period

since 1995. Even though a hurricane has not made landfall in the state since Hurricane Wilma in 2005, many hurricanes have threatened to impact the state over the past few years. Despite the inactivity in the state, people need only to look back at the 1992 hurricane season. Only six named storms developed that year, but the only major hurricane to form produced widespread devastation across South Florida. This is why residents and visitors need to always be prepared for hurricanes, even if below normal hurricane activity is forecast.

## Hunting hurricanes

Researchers use various aircraft to fly in and around hurricanes, including a WP-3D Orion propeller plane and a \$43 million Gulfstream-IV jet. This graphic shows how the WP-3D Orion studies the storms.

### The plane

#### The WP-3D Orion

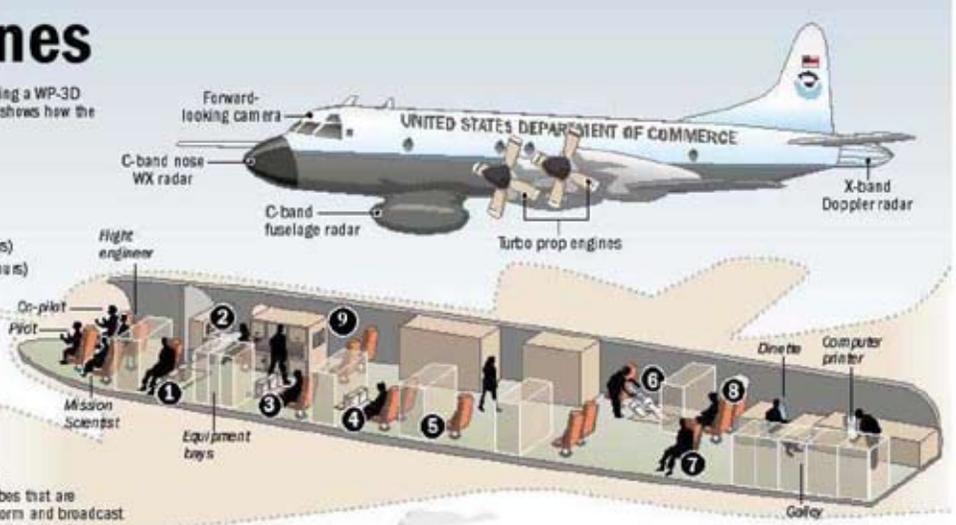
**Length:** 111 feet, 2 inches  
**Wing span:** 99 feet, 7 inches  
**Height:** 33 feet, 8 inches  
**Maximum altitude:** 32,000 feet

**Range:** About 10 hours  
**Low altitude:** 2,560 miles (9.5 hours)  
**High altitude:** 3,797 miles (11.5 hours)

### The crew

Two pilots, flight engineer, navigator, flight director (meteorologist), 2 or 3 engineering/electronic specialists, radio/avionics specialist and up to 12 scientists.

- 1 Flight director**  
Monitors all science stations during mission.
- 2 Navigation station**  
Navigator plots the aircraft's flight path.
- 3 Cloud physics station**  
Investigates all aspects of cloud systems with an emphasis on determining the physical processes leading to severe summer and winter storms.
- 4 Radar monitor station**  
Weather avoidance and Doppler radar data is examined.
- 5 Data station**
- 6 Dropsonde station**  
Data collecting probes that are dropped into the storm and broadcast information back to the aircraft.
- 7 Aft observer station**
- 8 Visiting scientist station**
- 9 Data station**



Graphic: Copyright 2004, The Palm Beach Post  
 Photographs from the National Oceanic and Atmospheric Administration (NOAA) Hurricane Research Division.



Sheet flooding over Lee County after Tropical Storm Fay in 2008, after the area received over a foot of rain (photo taken by Lee County emergency management).

## Hurricane Impacts

When most of us think of a hurricane, we think of strong winds. However, a hurricane brings other major hazards to life and property, including storm surge and associated coastal flooding, inland flooding, and tornadoes.

The storm surge is the term used to describe the wall of water that is pushed toward the shoreline as a hurricane moves onshore. A major hurricane can produce a surge of 15 feet or more.

Those living in coastal and near-coastal communities should know the evacuation zone that they live in. When local officials declare an evacuation for your zone,

move to the nearest possible evacuation destination outside of the danger zone. Your family can choose to stay with friends or relatives, or you may choose a hotel or motel.

The next deadly hazard associated with hurricanes is inland flooding. Slow moving hurricanes and tropical storms often produce large amounts of rain. A typical rule of thumb used for estimating the maximum rainfall totals (in inches) possible from a storm is to take 100 and divide it by the storm's forward motion. For example, Tropical Storm Fay drifted across the Peninsula a couple of times at forward motions of around 5 mph. Using the rule of thumb gives an estimate of 20 inches for the maximum rainfall totals,

not too far off from the highest observation near Melbourne with a total of 27.65 inches!

For those outside of coastal communities, winds associated with the eyewall of a hurricane are a major concern. Hurricane force winds can easily damage or destroy mobile homes and other items such as lanai's, roofing materials, trees and power lines. Though a hurricane's winds typically weaken rapidly following landfall, Florida's flat terrain allows the stronger winds to survive longer inland than in other parts of the country. With Hurricane Wilma in 2005, winds gusted to over 100 mph in these areas, causing damage to several structures, including downtown high rises.

**GET A  
PLAN!**  
FloridaDisaster.org

**START THE SEASON WITH A  
FAMILY DISASTER PLAN**

# The Flight of the Hurricane Hunter

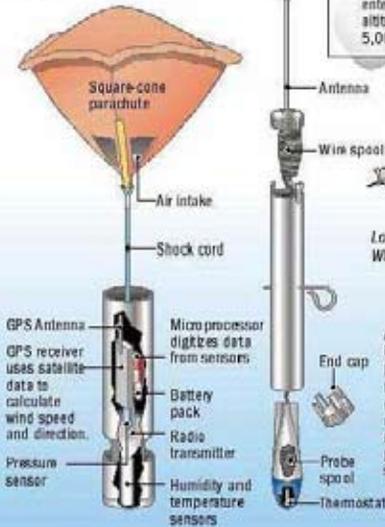
## The hunt

The National Oceanic and Atmospheric Association (NOAA) has conducted research inside the fast-moving, cloud walls of hurricanes since the late 1970s. Here is how they hunt for information to learn more about one of nature's most destructive forces.

## The instruments

### GPS Dropsonde

Measures air temperature, dewpoint, atmospheric pressure, and uses GPS positioning to detect horizontal and vertical winds. These data are measured and transmitted twice per second while the probe is in the air.



Source: Jim McPherson, Aircraft Operations Control, National Oceanic and Atmospheric Administration, NOAA

**1 Through the wall:** The aircraft's nose and fuselage radars measure rainfall density in the on-coming cloud wall, which indicates the intensity of turbulence. The aircraft usually enters the cloud at altitudes between 5,000 to 23,000 feet.

**2 In the whirlwind:** The tail Doppler radar rotates, giving scientists wind speeds within the storm from an altitude of 500 to 35,000 feet.

**3 The drop zone:** The GPS Dropsonde Probe is released from a tube at an altitude of 10,000 feet. Collects data as it descends. Transmits it back to the aircraft where it's compiled. The information is then transmitted by satellite to the National Hurricane Center in Miami.

**4 From the depths below:** The Aircraft Expendable Bathythermograph measures water temperature as it sinks to a maximum depth of around 1,500 feet. Since hurricanes derive their strength from the energy stored in warm seas, temperature readings help scientists predict a storm's strength and duration.

**5 'Round and round' she goes:** The aircraft continues its *nominal* four flight path, shifting 45 degrees with each new pass, mapping the entire structure of the hurricane.

**Aircraft Expendable Bathythermograph**  
Measures water temperatures as it descends into the ocean. Temperature readings help scientists predict a storm's strength and duration.

Ocean

Probe

Source: LOPEZ/S&P/ARND

The final hazard associated with tropical cyclones is tornadoes. These tornadoes typically form in the right-front quadrant of a hurricane, when looking in the direction the hurricane is moving. These tornadoes are typically smaller than those produced by severe thunderstorms. However, ALL tornadoes have the potential to be deadly and produce extensive damage. Tornadoes developing from a hurricane can form in the outer rain bands of the storm, well away from the center, and usually move quickly.

Again, increasing your awareness of hurricane hazards and developing a safety plan before hurricane season will provide you and your family with added benefits

throughout the year. The National Hurricane Center along with your local National Weather Service forecast offices will issue Tropical Storm and Hurricane Watches and Warnings in plenty of time to prepare for a storm. The trained professionals coordinate with local emergency managers as well as county, state, and federal officials so that evacuation decisions and other considerations are made with plenty of time for action and response. The job you and your family have to do is critical--be prepared before the season starts with a Family Disaster Plan as well as an emergency supply kit.

**By Ryan Sharp, National Weather Service, Tampa Bay Area-Ruskin, FL**

Saffir-Simpson Hurricane Scale		
Category	Wind Speed	
	mph	knots
5	≥156	≥135
4	131-155	114-134
3	111-130	96-113
2	96-110	84-95
1	74-95	65-83
Non-Hurricane Classifications		
Tropical Storm	39-73	34-64
Tropical Depression	0-38	0-33

**National Hurricane Preparedness Week**  
**May 23-29, 2010**

# Now is the Time to Prepare For All of Florida's Weather!

Preparing for severe weather is the theme of Severe Weather Awareness Week, so how do we go about it? Preparedness plans come in all sizes as dictated by individual and collective needs.

**Do you know the basic safety rules?**

**Would your children know what to do if home alone?**

**Are plans ready to move elderly or disabled people to shelter quickly?**

## Being Ready for An Emergency is As Easy As . . .

### EMERGENCY KIT

**1** In an emergency you need to be ready to make it on your own. What should you have in your disaster supply kit?

- ◆ 1 gallon of water for each person per day. You should have enough water for at least 3 days. If you have 4 people in your family, you should store 1 gallon of water X4 people X3 days = 12 gallons of water.
- ◆ Canned and dried food – food that is easy to prepare and doesn't need refrigeration
- ◆ Manual can opener
- ◆ Sleeping bags or cots
- ◆ Flashlight or lantern with batteries
- ◆ First-Aid kit
- ◆ Bathroom supplies
- ◆ Medicines
- ◆ Emergency Contact list
- ◆ Soap and hand sanitizer
- ◆ Face masks
- ◆ NOAA alert radio or battery powered radio
- ◆ Games
- ◆ Credit cards and cash
- ◆ Duct tape
- ◆ Heavy garbage bags or tarps
- ◆ Important documents
- ◆ Waterproof container
- ◆ Fire extinguisher
- ◆ Whistle or airhorn
- ◆ Tools
- ◆ Special needs:
  - baby formula, diapers, bottles, and other infant supplies
  - extra eyeglasses/hearing aid batteries
  - special equipment for physically challenged
  - diabetic supplies
  - serial numbers of medical devices such as pacemakers
  - pet supplies such as a cage, leash, food and vaccination papers

Have 2 kits:

1. A large one with 3 days of supplies.
2. A smaller kit to take with you if you must evacuate

## MAKE A PLAN

# 2

Think ahead and have a plan:

- ◆ Plan how you will get together in different situations
  - ◆ Talk about the plans with your family
  - ◆ Have a contact list
  - ◆ If phones are down, pick 2 meeting places:
    1. Near your home
    2. Somewhere outside the neighborhood
  - ◆ Discuss what to do if you must evacuate
- ◆ Test smoke/carbon monoxide detectors monthly
  - ◆ Learn how to turn off gas, electric, water and heater systems at main breaker switches
  - ◆ Learn First-Aid and CPR
  - ◆ Discuss basic safety rules
  - ◆ Make sure children know what to do if home alone
  - ◆ Plan for elderly or disabled family members or neighbors

## BE INFORMED

You can be ready for an emergency by:

- ◆ Having a supply kit
  - ◆ Talking it over with your family
  - ◆ Learning about the different threats
    - Severe Weather
    - Fire
    - Hazardous Materials (biological, chemical, explosive or radiological)
    - Nuclear
- ◆ Watch TV or listen to the radio for information
  - ◆ Stay calm, have plans ready, and listen for instructions.
  - ◆ If you have questions, call your county emergency management office.
  - ◆ Go to [www.FloridaDisaster.org](http://www.FloridaDisaster.org)
  - ◆ Kids' activities and information available at [www.kidsgetaplan.com](http://www.kidsgetaplan.com)

# 3



**GET  
READY  
NOW!**

# Flooding

**W**e've all seen those photos in the newspaper: After heavy rain, someone in a canoe or kayak paddles down what is usually the middle of a street. It may look like fun, but it is dangerous. Flooding can happen in Florida and any of the other 49 states. Even relatively dry states in the desert southwest have serious floods from time to time. Each year, more deaths in the U.S. occur due to flooding than from any other thunderstorm-related hazard. The main reason is that people underestimate the force and power of water. Flood effects can be local, impacting a neighborhood or community, or very large, affecting entire river basins and multiple states. In Florida, flooding occurs frequently, but often the floods are minor. Nonetheless, Floridians must be careful because even minor floods can result in a loss of life. Once in a while, Florida can experience major floods that can cause many deaths and destruction of property. We must be prepared.

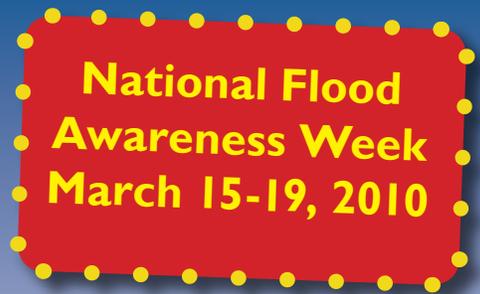
What makes a flood happen? Rain, right? Yes, but flooding is more than just how

much rain falls. It is also how fast it falls and what happens to the rain after it hits the ground. All of Florida is vulnerable to flooding at any time of the year. Since Florida is surrounded on most sides by the Atlantic Ocean and Gulf of Mexico, the state has an abundant supply of moisture available that feeds developing thunderstorms which produce heavy rains in a fairly short period of time.

Meteorologists try to predict accurately when, where and how much rain will fall. The total amount of rain and how fast it falls (the rainfall rate) affect how much water will collect in places. The more water that runs down into streams or lower areas, the worse the flooding can be.

## Hurricanes and flooding

While hurricanes are known and feared for their ferocious winds, historically it is the water that causes most of the deaths in hurricanes. About 90% of all hurricane fatalities occur from drowning in either storm surge or freshwater flooding. The Florida record for the most rainfall dur-



ing a 24-hour period occurred during Hurricane Easy in September of 1950. During that storm, 38.7 inches of rain fell at Yankeetown, along the Gulf Coast in Levy County. This heavy rainfall caused extensive flooding near Yankeetown and south of Ocala. More recently, the widespread flooding caused by Tropical Storm Fay serves as a reminder that tropical storms can cause as much or greater devastation than hurricanes with freshwater flooding. Tropical systems flood neighborhoods and towns but may also result in flooding of streams and rivers as all of the rainwater flows into the basin.

Meteorologists at the National Hurricane Center, the Southeast River Forecast Center and local Florida National Weather Service offices all watch tropical systems very closely to try to forecast how much rainfall it may produce and how much flooding may occur. These meteorologists use satellite pictures, Doppler radar and computer models to try to warn people well in advance of the flooding, so they can save lives and property. (See story on hurricanes, Page 5.)



## Flooding Safety Actions

- Never play in flooded areas where hidden sharp objects, electrocution and pollution are serious hazards.
- In highly flood-prone areas, keep materials such as sandbags, plywood, plastic sheeting, plastic garbage bags, lumber and shovels on hand.
- Be aware of streams, canals and areas that are known to flood so you or your evacuation routes are not cut off.

- Stay away from downed power lines and never drive into moving water.
- Drive carefully when water covers the road. If you cannot see the roadway beneath the water, do not drive through it!! The water may be deeper than it appears and the road may already be washed away.
- Heed water contamination advisories. Do not use food that has come in contact with floodwaters.

## Flooding Facts

- Six inches of water will reach the bottom of most passenger cars causing loss of control and possible stalling.

- A foot of water will float many vehicles.
- Two feet of rushing water can carry away most vehicles including sport utility vehicles (SUV's) and pick-ups.
- Most flood-related deaths occur at night and are vehicular.
- Urban and small-stream flash floods often occur in less than one hour.
- Tropical cyclones pose significant risks well inland due to freshwater flooding.
- Flood damages are not covered under homeowners' insurance policies. Consider purchasing flood insurance.

## Go with the flow – predicting water’s movement

When rain hits the ground, it can behave many different ways. The study of the movement of water along and under the ground is called hydrology. Hydrologists look at all the aspects of water’s behavior and make predictions. Why would one river or small creek flood when another does not, even with the same amount of rainfall? To answer this, hydrologists look at the size and shape of the stream’s basin. Another factor that hydrologists look at is the condition of the soil around the river and the earth beneath. Is it sandy? If so, the water can soak in rather than flow away into a stream. Is it already wet? If so, there is less room for new water and there will be more water runoff into rivers. Are there sinkholes and lakes and underground caverns that can hold the new water? If so, there will be less potential for flooding.

A flood results when water flows over the stream’s banks into normally dry areas. Imagine a wide riverbank. The river may spill over and flood a large area, but the flood will be fairly shallow. A steeper riverbank may result in some areas experiencing deeper flooding along the shores. Either way, people along rivers and streams need to be ready for such floods.

### River forecasts online

At the National Weather Service (NWS), hydrologists team up with meteorologists to produce the best river and flood forecasts and warnings possible. These river forecasts are available on the internet and shows maps of river forecast points which are color coded for certain river level heights. Specific site forecasts are displayable in graphs. These hydrographs show past, current and forecast river stage levels along with flood potential information. River flood forecasts are now available on the easy-to-use Advanced Hydrologic Prediction Service website at: [www.weather.gov/ahps](http://www.weather.gov/ahps). If you live along or near a river, you should pay attention to the forecast, especially in times of significant rain. It takes time to prepare for river flooding, so get a head start by being alert to the forecasts.



### Flash Flood

Flash flooding occurs when the ground becomes saturated with water that has fallen too quickly to be absorbed. Flash floods can also occur due to a dam or levee failure. These floods occur within an hour and can destroy structures, down trees and wash out roads. You may not always have warning of these sudden and deadly floods.



### Urban Flood

Flooding can be magnified in urban areas as paved areas lose its ability to absorb rainfall. Urbanization increases water runoff as much as 2 to 6 times over what would occur on natural terrain. These floods make driving very dangerous.



### River Flood

River floods occur in Florida on a yearly basis, but can cause extensive damage. Many river basins stream into northern Florida from Georgia and Alabama, but other rivers are located further south near Lake Okeechobee. As water runoff collects in rivers and streams, the excess water can be too much to handle and may overflow the banks.



### Areal Flooding

Areal flooding is usually not life-threatening, but results in standing water in low-lying areas and open fields. Agricultural losses can occur with these floods. In addition, stagnant water can serve as a breeding ground for insects and disease.

## Flooding—it’s not just for rivers anymore

We also see our share of urban flooding. As our state’s population increases, buildings and pavement replace the natural land. This creates more water runoff and can increase flood problems in urban areas, which can be especially dangerous and costly in these developed areas where we live and drive. Most deaths due to flooding in the United States are due to people driving their cars into flooded areas. It may only take 12 to 16 inches of water to cause a car to float. Once a vehicle begins to float, the situation for the driver and passengers becomes danger-

ous and often deadly. So, remember the advice: Turn around. Don’t drown!

Florida has over 2,200 miles of tidal shoreline. Because of this, many areas of Florida are also prone to coastal flooding. This may come from storm surge associated with tropical cyclones or from other causes such as strong onshore winds or higher than normal tides due to lunar effects. The National Weather Service will issue coastal flood advisories, watches and warnings similar to inland flood statements.

**By Bob Goree, National Weather Service, Tallahassee**

# Lightning

**F**lorida is the lightning capital of the country. Why our state? Geography is the main reason. Many elements that make our home state such a great place to live and play, such as warm annual temperatures and close proximity to large bodies of water, play key roles in generating thunderstorms that produce dangerous lightning. These thunderstorm ingredients frequently come together during the warm season when lightning is often a daily occurrence within the state. July is the deadliest month for weather related fatalities, both due to the frequency of storms and because many people are outside enjoying outdoor activities, which make them more vulnerable to lightning strikes.

Florida is bound on the east by the Atlantic Ocean and the Gulf of Mexico to the west. It is also located farther south than most of the nation. This geography allows the sun to strongly heat the ground each summer afternoon. As a result, daytime heating of the ground over inland areas causes warm air near the ground to rise. In addition, wind flow creates small frontal boundaries along the Florida coasts, called sea breezes, which form on both east and west coasts. As the sea breezes begin to progress inland, a warm and unstable atmosphere allows thunderstorms to develop along the leading edge of these sea breeze fronts.

Lightning is not just confined to thunder-

storms, as it can even be generated by the ash cloud from an erupting volcano. Lightning is also not just confined to the Earth; lightning has been observed in the clouds of Jupiter and possibly Venus.

## What are Thunder and Lightning?

**EVERY THUNDERSTORM** contains lightning. Lightning develops from friction and static electricity as cloud particles collide with one another. The electrical charge of a lightning strike searches for the path of least resistance to complete the channel from the cloud. It might strike you, a tree, or an object in the air. Thunder is a result of lightning. When a lightning

## Lightning Facts

Lightning heats the air up to 50,000 degrees Fahrenheit. This rapid heating of the air produces the shock wave that results in thunder.

A ground stroke of lightning can produce between 100 million and 1 billion volts of electricity.

The length of an average cloud-to-ground lightning channel can range from 2 to 10 miles.

You can tell how far away lightning is by counting the seconds between seeing the lightning flash and hearing thunder. For every 5 seconds you count, lightning is one mile away.

Contrary to belief, lightning **CAN** strike the same place twice and rubber shoes or tires do not protect you from lightning strikes.

## Lightning Safety Actions

Avoid open ground and isolated large trees.

Avoid water. This includes swimming pools, lakes, rivers, beaches and boats.

Seek shelter inside a building or automobile, but not a convertible car or golf cart.

Stay away from doors, windows and metal objects such as pipes and faucets.

Stay off corded telephones and away from electrical devices.

## Lightning Safety Week

June 20 – 26, 2010

[www.lightningsafety.noaa.gov](http://www.lightningsafety.noaa.gov)





## Bolt from the Blue

It was a beautiful Saturday afternoon on the 4th of July, 2009, in Lakeland, Florida. A group of about 100 people were celebrating the holiday at a local field, playing soccer and volleyball, when a lightning bolt or series of strikes hit nearby, seemingly out of nowhere. In less than a few seconds, one of the group members was killed and 27 others were injured.

Those at the gathering witnessed just a few clouds in the area just north of the celebration, but it was not enough to suggest severe weather. Then all of a sudden, they saw two strikes of lightning and a flash on the field. Many of the people playing soccer were knocked off their feet. Meteorologists suggest that the lightning strike came from a stronger thunderstorm well south of the area

According to the National Weather Service, about 1.5 million lightning strikes occur every year in Florida. The summer months of June, July and August are also the deadliest time of year for lightning strike victims in Florida.

bolt travels through the atmosphere, it heats the air around it quickly. This rapid heating creates expansion of the air around the lightning bolt at speeds faster than the speed of sound. The speeding air breaks the sound barrier resulting in the explosive sound we know as thunder. Thunder is really just another form of a sonic boom.

Because lightning travels at the speed of light, it is possible to see lightning far off in the distance and never hear the thunder it produces. Heat lightning is seen from a very far distance, but so far away that thunder is not heard.

A “Bolt from the Blue” lightning strike is a flash which travels a relatively large distance in clear air away from the parent thunderstorm and then strikes the ground. These lightning flashes have been documented more than 25 miles away from the thunderstorm cloud. These events can be especially dangerous as they appear to come from “clear blue sky.”

### Lightning Dangers

Lightning has been called “the underrated killer” since it usually does not get as much headline attention compared to other dangerous weather phenomena.

On average, lightning strikes kill about 100 Americans each year, more than hurricanes or tornadoes. In our state, lightning results in an average of 10 deaths and 40 injuries every year.

Most people who are struck by lightning are not killed, but they are left badly bruised and burned. It is important to realize that people struck by lightning carry no electrical charge and emergency medical services can be immediately performed safely to help resuscitate the person.

### Lightning Safety

Because of our active Florida lifestyles and busy schedules, lightning plays a very important role in our daily lives. How many times each summer have you been at the beach or engaging in some outdoor activity, and have seen a thunderstorm approaching? Many of us assume that the storm is too far away to pose any danger, and many believe that if the storm is not producing rain at their location, then they are not at risk of being impacted by the storm. Many of us “roll the dice” when we try to speed-up doing yard work or have just a few more things to bring inside from the car. The fact still remains, if you are close enough to the storm to

hear thunder, then you are close enough to be struck by lightning.

A darkening cloud is often the first sign that lightning may strike. As soon as you see lightning or hear thunder, you are at risk. Go immediately inside a house or other enclosed structure to stay safe, and when inside, do not touch metal or use corded electrical devices. If lightning strikes an object nearby, the electrical current can travel into your safe place through wiring or cables.

If you are caught outside when lightning is occurring, the most dangerous place to be is an open area, such as a sports field. Outdoor water activities such as swimming, boating and fishing are also very dangerous during lightning because you are often the tallest, most vulnerable object in the area closest the storm. When a substantial building is not available and lightning is occurring or imminent, get into a vehicle with a hard-topped roof.

The best course of action for lightning safety is to monitor the weather forecast and sky conditions if you are participating in an outdoor activity. The safest lightning safety rule is this: If thunder roars, go indoors.

**NWS Jacksonville, Sandrik/Enyedi**

# Rip Currents:

## Don't Fight. Swim Left or Right!

### What is a rip current?

A rip current is a channel of water flowing away from the shore at beaches. Most rip currents develop along the beach at breaks in the offshore sandbar, but they can also form near structures such as jetties and piers. Rip currents form when water, piled against the shore, begins to return to deeper water. Typically, onshore winds and waves push water over the offshore sandbar, allowing excess water to collect between the bar and the beach. Eventually, this excess water starts to return seaward through low spots in the sandbar, "ripping" an opening. Near the beach, rip currents are usually narrow, increasing in width as they extend farther offshore. Some rip currents last only a few minutes to a few hours, while others may last a few days. Weather or ocean conditions can cause rip currents to be stronger and more frequent on some days than on others.

### Telltale signs of rip currents

You can sometimes see the signs that show a rip current is present. A visible

channel of churning, choppy water; a narrow channel where there is a difference in water color; a line of seaward moving foam; an offshore area of murky water are all indicators of possible rip currents.

### Why are rip currents dangerous?

Rip currents are dangerous because they can pull unprepared swimmers away from shore and into deeper waters. Rip currents do NOT pull a swimmer under water, but do become dangerous when swimmers panic and struggle against the current while being pulled farther and farther away from the beach. Rip currents can move at speeds of up to 5 miles per hour, which is faster than an Olympic swimmer! At these speeds, the force of a rip current is too strong for even the best swimmers, and attempts to swim directly back toward shore against the current can be fatal, especially for the panicked or tired swimmer. In fact, rip currents claim more lives in Florida each year than hurricanes, tornadoes and lightning.



### What you need to know

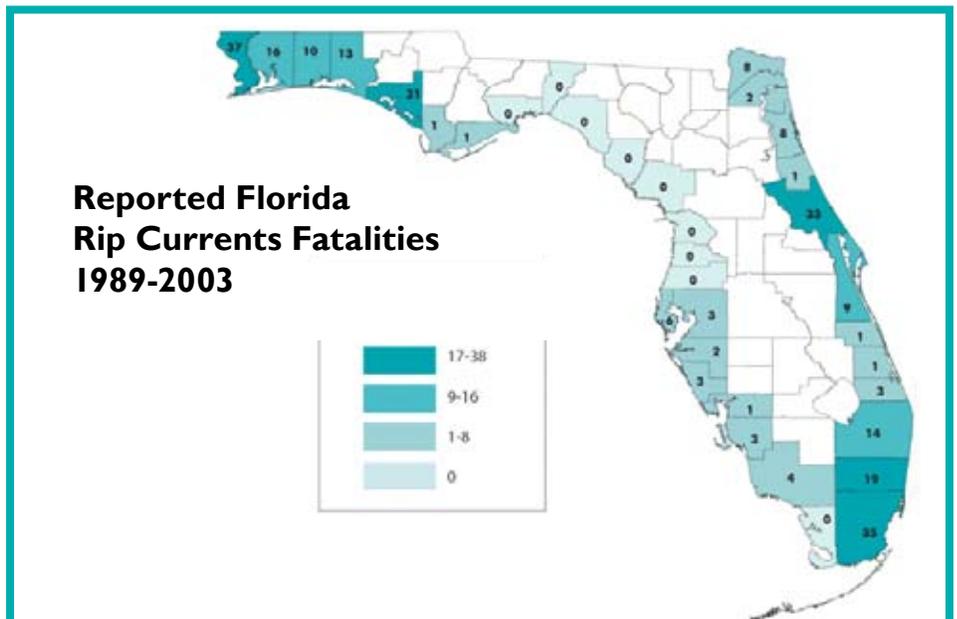
When you take a trip to the beach, there are a few things that you can do to protect yourself from the dangers of rip currents. You should swim at beaches with lifeguards, if possible. When you arrive at the beach, ask the lifeguard about the current rip current danger. Also note any flag warning system that may be present.

If you find yourself caught in a rip current, DON'T panic and DON'T swim against

### BEACH WARNING FLAGS

- Water Closed to Public
- High Hazard  
High Surf and/or Strong Currents
- Medium Hazard  
Moderate Surf and/or Currents
- Low Hazard  
Calm Conditions, Exercise Caution
- Dangerous Marine Life

Absence of Flags Does Not Assure Safe Waters



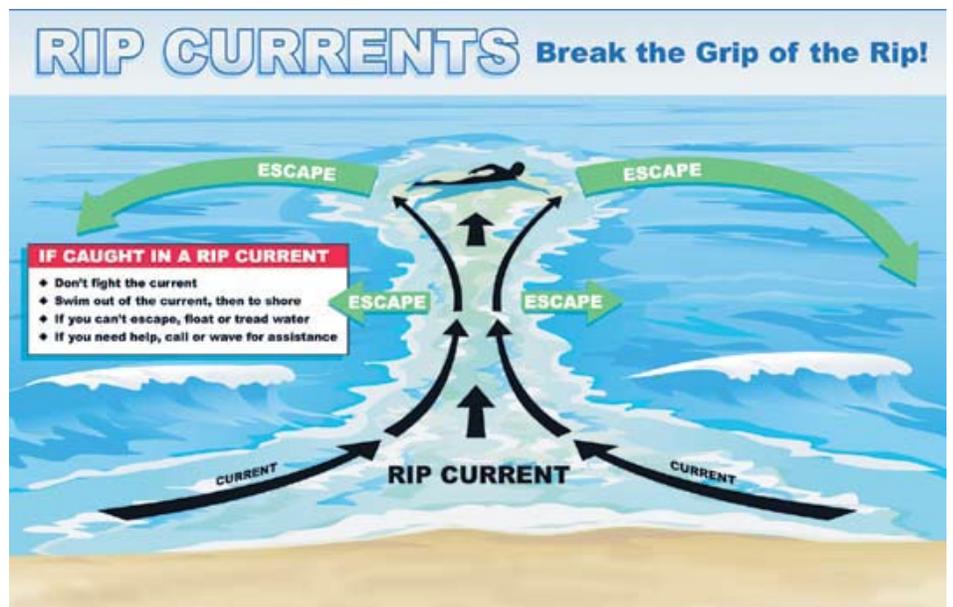


## National Rip Current Awareness Week June 6-12, 2010

the outgoing current. Doing either of these could cost you your life. Since most rip currents are relatively narrow, you should swim in a direction parallel to the shoreline to escape the outgoing current. More simply, if caught in a rip current and facing back toward the beach, swim either toward your left or right to escape the current. Just remembering the simple phrase “Don’t fight...Swim left or right” could save your life. Once free of the outgoing current, swim at an angle back to the beach.

*By Don Shepherd, National Weather Service, Mobile*

For more rip current information, visit [www.ripcurrents.noaa.gov](http://www.ripcurrents.noaa.gov)



### Learn how to swim!

- Do not overestimate your ability to swim in ocean waters and strong currents.
- If possible, always swim at beaches staffed by lifeguards or beach patrols, and heed their advice.
- If caught in a rip current, try to remain calm and signal for help in the direction of the beach patrol.
- If caught in a rip current, do not try to swim directly back to shore! Instead, turn and face sideways to the shore and wade or swim until you are out of the rip current. Then move back toward shore at an angle away from the rush of water.
- An alternate method of escape from a rip current, for those who are good floaters and swimmers, is to let the rush of water take you offshore until it slows, then swim back to the beach at an angle away from the rip current.
- Do not get caught in a rip current while trying to save someone else. Throw the person a flotation device and get help from the beach patrol.

# Tornadoes

## What is a Tornado?

A tornado is a violent column of rapidly spinning or rotating air that comes down from a thunderstorm to reach the ground. Tornadoes usually last only a few minutes, but often cause severe damage. Some tornadoes skip along a path or stay on the ground for many miles. Tornadoes are quite small compared to its larger cousin, the hurricane, with most tornadoes spanning no wider than one half of a mile. Because of this, the damage area of a tornado is quite narrow, but in its direct path, winds can be as strong as a strong hurricane. Tornadoes are typically funnel-shaped, but vary in width and even color. Some tornadoes look dark gray or even black, while others appear light gray or white. The strength of a tornado's winds cannot be determined by its color and shape.



A tornado moves through downtown Miami after touching down on the southwest edge of the city.

## Florida Tornadoes

Florida is not typically noted for tornadoes, but statistics show that tornadoes are much more common in the Sunshine State than most people realize. Since 1950, only three states (Texas, Kansas and Oklahoma) have reported more tornadoes than Florida. Our state also ranks fourth in the amount of damage caused by tornadoes.

Most tornadoes in Florida occur during the summer months of June, July and August. Stronger and more devastating tornadoes can occur in Florida in the late winter and spring months when strong cold fronts move through the state and provide the necessary conditions for tornadoes to form. Tornadoes have occurred in every month in Florida, even on Christmas Day, as was the case in 2006, when tornadoes struck Central Florida. Tornadoes can also occur during hurricane season, especially in the spiral rain bands of tropical storms and hurricanes. During the hurricane season of 2008, Hurricane Gustav and Tropical Storm Fay produced damaging tornadoes in Florida.

Tornadoes can also strike at any time. The deadly tornado outbreak on Groundhog Day 2007 occurred in Central Florida after midnight.

## Where Do Tornadoes Come From?

Tornadoes normally develop when rising air currents in a storm begin to rotate or move around in a circular nature. If the rotation is strong enough, a funnel cloud can drop from the clouds and touch ground. It is important to know that a tornado is a rotating column of air that is touching the ground. If a funnel cloud is not touching the ground, it is NOT a tornado. A special type of thunderstorm called a supercell has the greatest potential to produce large and damaging tornadoes. Smaller tornadoes can also develop when cold air rushing out from underneath one thunderstorm collides with cold air rushing out from another thunderstorm. As these winds merge from different directions, rotation takes place, and that rotation sometimes

produces a tornado. The spiral bands of tropical storms and hurricanes can also produce small, but sometimes intense, tornadoes.

## How Do We Know the Strength of Tornadoes?

National Weather Service meteorologists use the Enhanced Fujita Scale, or EF Scale, estimate the strength of the tornado's winds. The scale is used when meteorologists investigate the damage caused by tornadoes. The EF scale rates tornadoes on a scale from 0 to 5, with 0 being the weakest and 5 being the strongest.

Meteorologists first look at the tornado damage, either from the ground or the air. Next, they compare the damage for a single type of home, business or other structure to the EF Scale. Last, they estimate the wind speed needed to cause the damage. The EF Scale shows that major damage can occur in winds as low as 90 to 100 mph, equivalent to an EF1

## How does the Enhanced Fujita Scale work?

The Enhanced Fujita Scale (EF Scale) uses actual damage to estimate a tornado's wind speed. Tornadoes are classified according to the damage they cause, on the Fujita Scale. This scale was named after its creator, Dr. Theodore Fujita. The EF Scale is to be used with caution. Tornado wind speeds are still largely unknown, and the wind speeds on the EF Scale never have been scientifically tested and proven. Winds of different speeds may cause the same damage depending on how well-built a structure is, wind direction, wind duration, battering by flying debris and various other factors.

### EF 0 Gale Tornado: 65-85 miles per hour (mph)

Some damage to chimneys. Tree branches broken off. Shallow-rooted trees uprooted.

### EF 1 Moderate Tornado: 86-110 mph

Roof surfaces peeled off. Mobile homes overturned. Moving autos pushed off roads.

### EF 2 Significant Tornado: 111-135 mph

Considerable damage. Roofs torn off frame houses. Large trees snapped or uprooted. Light object projectiles generated.

### EF 3 Severe Tornado: 136-165 mph

Severe damage. Roofs and some walls torn off well-constructed homes. Most trees in forests uprooted. Heavy cars lifted off ground.

### EF 4 Devastating Tornado: 166-200 mph

Well-constructed houses leveled. Structures blown off weak foundations. Cars thrown and large projectiles generated.

### EF 5 Incredible Tornado: 200+ mph

Strong frame houses lifted off foundations and disintegrated. Automobile-sized projectiles fly through the air in excess of 100 mph. Trees debarked.

## Tornado Safety Actions

### Homes

- When a tornado watch is issued, be prepared to take action.
- When a tornado warning is issued or a tornado is imminent, go to the innermost room on the lowest level away from windows. Interior closets, halls and bathrooms are good places to go.
- If you do not have time to get to the lowest level, get under a bed. If you are at school, get under your desk.
- Consider constructing a tornado-safe room in or adjacent to your home.

### Open Country

- Seek a nearby shelter, if time permits.
- If not, lie flat in the nearest depression, ditch or culvert. Cover your head with your arms.

### Vehicles

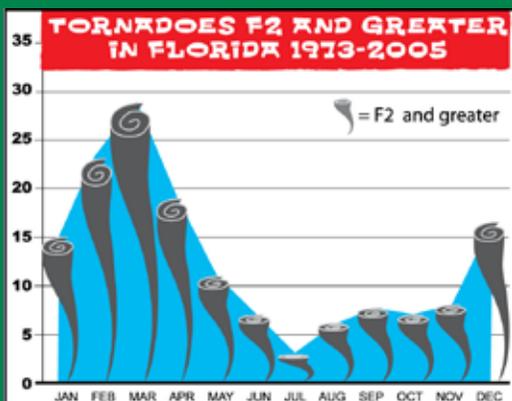
- Abandon your vehicle and seek refuge in a building or, as a last resort, a ditch.
- Do not try to outrun a tornado.

### Offices, Hotels and Condos

- When action is required, take shelter in an interior hallway on the lowest floor, or in a closet or small room.
- As a last resort, get under heavy furniture, away from windows.

### Manufactured and Mobile Homes

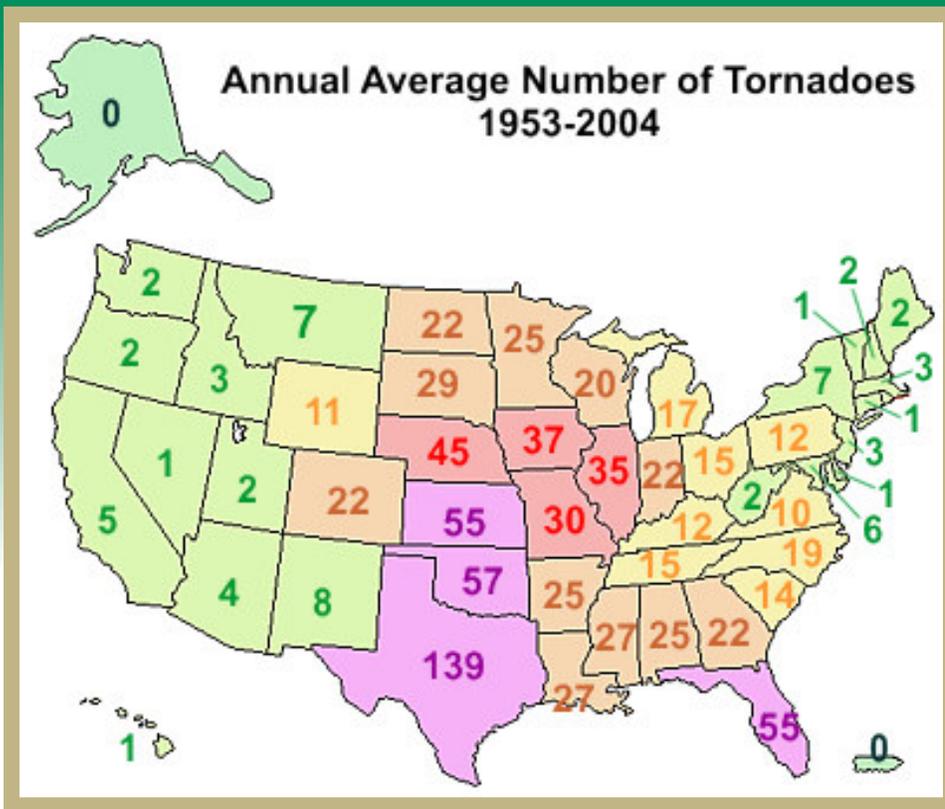
- Have a plan of where to go during a tornado threat—a nearby pre-identified safe structure within walking distance.
- Abandon mobile homes and go to a firmly built shelter.



## What's the # 1 wind safety rule?

The # 1 wind safety rule is to get as many walls between you and the outside world as possible so the debris in the wind cannot reach you. It is not the wind that kills and injures people; it is the debris in the wind.

For example, you can drive on the highway at 70 mph and stick your hand out the window and not be harmed. However, you would suffer serious injury if your hand hit a brick or branch while the car is speeding down the road. If you can keep the debris in the wind from reaching your location, you will survive the wind event—whether it is a tornado, hurricane or thunderstorm downburst wind.



detect possible tornadoes. Doppler radars are able to see the rotation inside of a thunderstorm that could be the beginning of a tornado. However, an actual tornado is typically too small for the Doppler radar to detect. Therefore, meteorologists depend on volunteer storm spotters who report funnel clouds, tornadoes and other severe weather to the National Weather Service. The SKYWARN program is the National Weather Service's network of volunteer storm spotters. Timely reports from SKYWARN spotters can lead to early warnings that can save lives.

The National Weather Service will issue a tornado warning when a tornado has been either seen by a severe weather spotter or when Doppler radar shows strong rotation inside of a thunderstorm. In the event a tornado warning is issued for your area, you and your family need to seek shelter and take cover right away. NOAA Weather Radio is the best way to stay informed about tornadoes. The NOAA Weather Radio will turn on and alert you of dangerous weather.

**By Robert Molleda,  
National Weather Service, Miami**

on the Enhanced Fujita scale and to category 1 or 2 on the Saffir-Simpson scale for hurricanes.

During the Groundhog Day tornado outbreak of February 2, 2007, three tornadoes moved through Central Florida during the overnight hours. Two of the tornadoes were rated EF-3, with winds estimated as high as 150 mph. These tornadoes heavily damaged hundreds of homes and killed 21 people. In 2009, 28 tornadoes were confirmed by the National Weather Service, with the strongest tornadoes rated at EF-1.

### Waterspouts

A waterspout is a tornado that touches down over water. The Florida Keys is considered to be the waterspout capital of the United States. Dr. Joseph Golden studied waterspouts in Florida for more than 35 years. He estimated more than 300 waterspouts occurred each year near the Florida coast. Most of these are weak, but boaters are urged to move directly away from a waterspout since they can easily flip over a vessel. A few waterspouts do manage to move onshore and cause damage. A waterspout that touches land is then called a tornado.

### Predicting Tornadoes: Warnings and Safety

The National Weather Service uses powerful tools such as Doppler radar to de-



A waterspout approaches the Fuller Warren Bridge over the St. Johns River in Jacksonville on July 26th, 2009. AP Photo/The Florida Times-Union, Will Dickey

# WANTED:

## Weather Observers in Florida

# CoCoRaHS

## Community Collaborative Rain, Hail & Snow Network

**C**oCoRaHS is a unique, non-profit, community base network of volunteers of all ages and backgrounds working together to measure and map precipitation (rain, hail, and snow). By using low-cost measurement tools, stressing training and education, and utilizing an interactive

web site, this project's aim is to provide the highest quality data for natural resource, education and research applications. We currently operate in many states across the country, including Florida.

This is a community project. Everyone can help, from the young to the old. This web-base program requires an enthusiasm for watching and reporting weather conditions, and a desire to learn more about how weather can affect and impact everyone's lives.

### What will Volunteers be Doing?

Each time a rain, hail or snow storm crosses your area, volunteers take mea-



surements of precipitation from their locations. These precipitations reports are then recorded on the Web at [www.cocorahs.org](http://www.cocorahs.org). The data is then displayed and organized for many of our customers to analyze and apply to daily situations, ranging from water resource analysis and severe storm warnings to neighbors comparing how much rain fell in their backyards.

### What are the Benefits of Volunteering?

One of the neat things participating in this network is coming away with the feeling that you have made an important contribution that help others. By providing your daily observations, you help to fill in a piece of the weather puzzle that affects many across your area in one way or another. You will also have the chance to make new friends as you make a significant contribution and learn some new things along the way. In some areas, activities are organized for network participants including training sessions, field trips, special speakers, picnics, potluck dinners, and photography contests, just to name a few.

### CONTACT:

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Florida CoCoRaHS  
State Coordinator  
Email: [griffing@coaps.fsu.edu](mailto:griffing@coaps.fsu.edu)  
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**Dr. Pat Welsh,**  
Florida CoCoRaHS  
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Phone: 904.620.2756

## We need you! To sign up, just visit our web site

[www.cocorahs.org](http://www.cocorahs.org)  
and click on Florida. From the Florida page, click on the Join CoCoRaHS link

# Marine Hazards

## Small Boat Safety

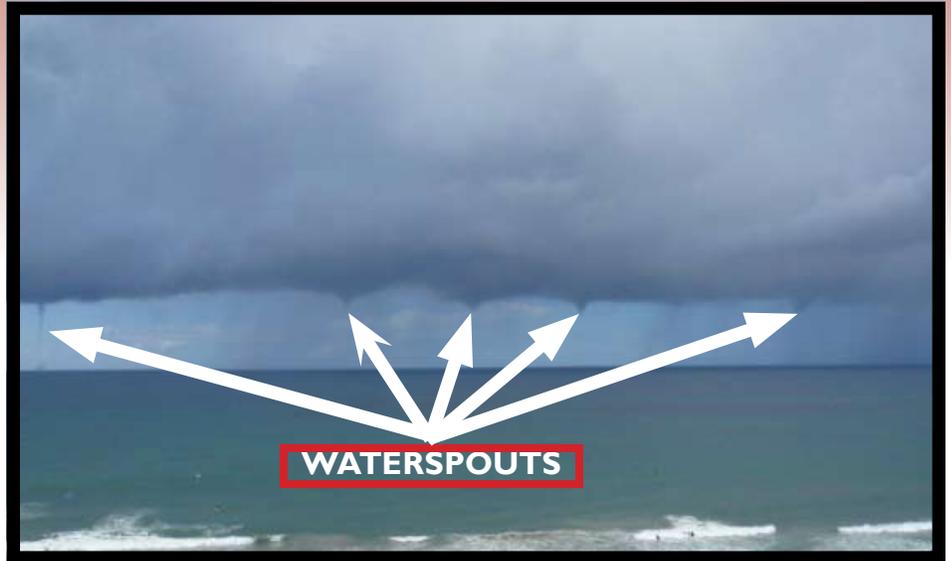
It is no surprise that Florida ranks as the top boating state with almost one million registered boats. The state's beautiful waterways, water-sport opportunities and great weather all add up to a lot of time spent on the water by residents and visitors alike. However, before venturing out on the water, it is imperative for boaters—particularly small boat operators—to check the weather. What may seem like a tranquil and beautiful start to the day's weather can quickly turn violent with hazards such as severe thunderstorms, strong winds, rough seas, lightning and waterspouts. Larger scale weather systems such as tropical cyclones, squall lines along cold fronts, gusty winds behind cold fronts and cool season low-pressure systems also present dangers to small boaters.

### Marine Hazards

*Thunderstorms, Lightning, and Waterspouts*

A mariner is never safe from thunderstorms. Brief wind gusts to gale force are possible, producing locally rough seas in a matter of moments. These conditions make maneuvering a small boat difficult, and in the worst case the rough seas can overturn small boats. In addition, torrential rains can reduce visibility to near zero, and hail is also possible. The most dangerous thunderstorm events are from eastward-moving squall lines during the winter, spring, or fall, and slow-moving thunderstorms in the summer associated with the sea breeze.

Cloud to water lightning is the most common hazard with marine thunderstorms and can occur far away from the parent thunderstorm. Florida has more lightning strikes than any other state and also often leads the nation in lightning-related fatalities and injuries. Many of these deaths and injuries occur on the water. If you hear thunder, you potentially can be struck by lightning.



Waterspouts are analogous to tornadoes over water. Waterspouts can easily overturn boats and create locally hazardous seas. In general, there are two types of waterspouts: fair weather and tornadic. Fair weather waterspouts are normally not associated with thunderstorms. They form along the dark bases of developing cumulus clouds and tend to develop from the surface up. Tornadic waterspouts are similar in structure to tornadoes over land. They are associated with super cellular thunderstorms ahead of squall lines during the cool season and sea breeze thunderstorms during the warm season. When waterspouts and thunderstorms approach, have an escape plan prepared. Never let thunderstorms cut off your route back to land. If a thunderstorm or waterspout threatens, it is best to seek safe harbor immediately. If you are unable to get back to the dock, be sure everyone aboard is wearing a life jacket, as gusty thunderstorm winds or waterspouts can quickly overturn small boats. If caught near a waterspout, your best course of evasive action is to move at a 90 degree angle from its apparent movement, then seek safe harbor, if possible. Since lightning presents a danger to boaters even well away from its parent

thunderstorm, boaters should seek safe shelter anytime thunder is heard. If unable to reach safe shelter, go below deck and stay away from masts or ungrounded metal objects.

Always have a NOAA Weather Radio or VHF marine radio on board and listen to them for warning information. The U.S. Coast Guard also re-broadcasts some of these warnings, advisories and statements across the marine radio emergency channel.

### Preparation and Awareness

Staying safe during a boating adventure requires knowing the expected weather. Before leaving home, be sure to check the current marine conditions and the day's forecast by going online to [weather.gov](http://weather.gov) or listening to NOAA Weather Radio. The National Weather Service issues Coastal Waters Forecasts that are updated four times daily and if conditions rapidly change. The Coastal Waters Forecast includes a five-day forecast of wind direction, wind speed, wave height and precipitation. This forecast should be one of your primary tools for planning a safe day on the water. Once on the wa-

ter, be vigilant that weather conditions can rapidly change, so periodically listen to NOAA Weather Radio on your VHF marine band radio. Additionally, turn on the alert feature of your NOAA Weather Radio or VHF marine radio, if equipped. This feature will sound an alarm on your radio anytime the National Weather Service issues a Special Marine Warning. These warnings are issued to provide advanced notice to mariners of short-duration (up to 2 hours) hazardous weather conditions including sustained marine thunderstorm winds or associated gusts of 34 knots or greater, hail 3/4 inch or more in diameter or waterspouts

You can also stay aware of short-term weather conditions and forecasts while on the water by using your internet capable cell phone or PDA. Simply point your HTTP-enabled device (PDA) to [mobile.srh.weather.gov](http://mobile.srh.weather.gov) or your WAP enabled device (internet capable cell phone) to [www.srh.noaa.gov/wml](http://www.srh.noaa.gov/wml). These sites will allow you to check the current marine conditions and updated forecasts and allow you to view the latest local radar and satellite images.

### Low Pressure and Frontal System Winds

Strong or developing fronts can cause tranquil or favorable coastal waters to become raging seas in a matter of hours prior to or after a strong frontal passage. Waves can quickly build in excess of 6 feet with the onset of 20-knot winds. Winds approaching or exceeding gale force can build seas to 12 feet or more

## Safety Actions

*A safe and enjoyable Florida boating experience is up to you. Always plan ahead and remember the follow safe boating practices:*

- ♦ Check forecasts well ahead of time.
- ♦ File a float plan at your marina.
- ♦ Have an escape plan in mind. Thunderstorms and weather related hazards form quickly. Never let these storms cut off your route back to land.
- ♦ If a thunderstorm threatens, be sure everyone aboard is wearing a life jacket as a small boat can be overturned quickly by gusty winds.
- ♦ If caught in a thunderstorm, go below deck if possible, and stay away from masts or ungrounded metal objects.
- ♦ Have a VHF Marine Band Radio on board.
- ♦ Listen to NOAA Weather Radio for warning information.
- ♦ Know the limitations of your boat. If small craft advisories or gale warnings are issued, you should postpone travel.
- ♦ Always apply sunscreen before leaving the dock.

in exposed coastal or offshore waters. Winds and seas can remain high for extended periods behind a strong front.

Tropical cyclones and cool season non-tropical, low-pressure systems pose an extreme threat to marine conditions. Tropical storms with winds between 34 and 63 knots typically result in seas building to 12 feet or more. A tropical storm becomes a hurricane when the winds reach 64 knots. Cool season or non-tropical low pressure systems can easily reach winds speeds of gale force (34-49 knots) or even storm force (50 knots or higher). During these times, boaters should remain off the water and secure their boats (if docked on the water) for potentially damaging winds and high water levels.

Frontal system winds or tropical and non-tropical low-pressure systems are usually predicted in advance. As such, be sure to check forecasts well ahead of time. Know the limitations of your boat, and if small craft advisories, gale warnings or tropical cyclone advisories are issued, postpone your boating plans and wait until conditions improve before resuming activities.

### Solar Radiation and Excessive Heat

Even in good weather, there are potential marine hazards that many people overlook. Strong solar radiation from exposure to the sun can cause sun burn and potentially long-term skin effects. During the warm season, the combination of hot temperatures, light winds and high humidity can combine to create a situation in which heat illnesses and even heat stroke are possible.

For protection against sun burn and excessive heat, always apply sunscreen with a Sun Protection Factor (SPF) of 15 or greater before leaving the dock and reapply while out on the water, drink plenty of water to stay hydrated and utilize on-board sun shades if available.

*By Nick Petro, National Weather Service, Tampa Bay Area*

**RAIN OR SHINE,  
THE KEY TO SMOOTH SAILING  
IS BOATING SAFETY  
National Safe Boating Week  
March 22-28, 2010**



# Thunderstorms



**T**hunderstorms occur frequently across Florida. In fact, the Florida peninsula has the greatest number of thunderstorms in the United States. Florida's tropical atmosphere and sea breezes provide the perfect recipe for the making of thunderstorms. Three ingredients are needed – moisture, an unstable atmosphere and lift. Thunderstorms are part of life in Florida. They are nature's way of providing badly needed rainfall. When they

become strong, a thunderstorm can have strong winds, hail, lightning, heavy rainfall and even tornadoes.

## Hail

Although hail forms in every thunderstorm, it only reaches the ground if atmospheric conditions are favorable. Hail typically has the best chance of falling to the ground in winter and springtime thunderstorms when the atmosphere is colder. Hail may take on many different sizes and shapes, such as a thin flat penny or a baseball.

Large hails can be dangerous. Penny-sized hail or larger can cause damage to objects, such as vehicles and buildings, by breaking windows and damaging roofs. Large hail can also down trees. Bodily injuries, or even death, can result in people are caught outdoors when large hail occurs.

## Strong winds

All thunderstorms can produce gusty winds. Severe thunderstorms produce even stronger winds, called downbursts, that can cause significant damage to

homes, trees, road signs, and vehicles. Downburst winds can cause damage similar to that of a strong tornado and cause loss of life or significant bodily injury from wind-blown debris and toppled structures.

## WATCH vs. WARNING

Although radar, satellite, and computer systems continue to improve, if you do not know what to do or where to go, warnings are not effective! Remember, severe weather can develop rapidly and advance warning time may only be a few minutes. Everyone needs the knowledge to react quickly and execute a plan of action when severe weather materializes.

**A WATCH** means that conditions are favorable for severe thunderstorm, tornado, or flash flood development. This is the time to be weather-aware. You should keep alert by listening to a radio, television, or weather radio for the latest weather information. Know where your children are. Be aware of where you will go and what you will do if a severe thunderstorm, tornado, or flash flood threatens.

**A WARNING** means a severe thunderstorm, tornado, or flash flood has been sighted or indicated by radar. People in the path of the storm should take immediate life-savings actions.



Sunday June 1, 2008  
Jacksonville, FL

See page 12 for information on lightning, page 10 for flooding and page 16 for tornadoes.

## How long do thunderstorms last?

It's not easy to say how long a thunderstorm will last. Thunderstorms come in different forms, which will determine how long they might survive. Sometimes a storm has only one thunderstorm cloud and will last for 20 to 30 minutes. Meteorologists call these of storms single cell thunderstorms because each cloud is known as a cell.

Sometimes thunderstorms have a family of clouds, or cells, associated with them and the thunderstorm cell dies, inside the storm another develops, keeping the parent thunderstorm alive. These families of thunderstorms are called multi cell thunderstorms. Finally, sometimes a thunder storm cell can become huge and cover an area as large as some of our biggest counties, such as Marion County or Palm Beach County. When this happens, they are called super cell thunderstorms, and all super cell thunderstorms rotate. Super cell thunderstorms are very dangerous because the often can produce tornadoes. Meteorologists track these types of thunderstorms very closely!

## Tracking Thunderstorms

Meteorologists use many tools to forecast and keep close watch on thunderstorms. Weather balloons and weather

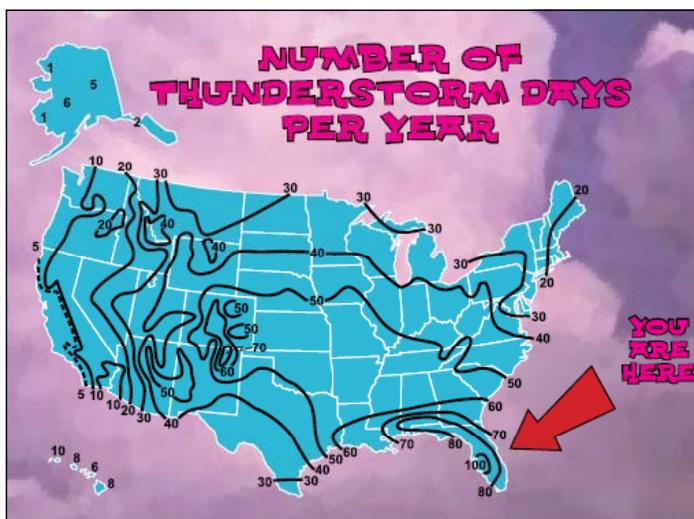
## THUNDERSTORM SAFETY ACTIONS

- ♦ Monitor NOAA Alert Radio. Listen for severe thunderstorm watches and warnings.
- ♦ Avoid windows, metal objects and electrical equipment.
- ♦ When severe thunder storms threaten, go to a small interior room on the lowest floor of your home, school or business.
- ♦ Before a severe thunderstorm, move vehicles into garages or carports to help prevent damage, time permitting.
- ♦ Postpone outdoor activities if thunderstorms are imminent.
- ♦ Avoid tall structures such as trees and powerlines.

instruments detect the moisture and unstable air needed for thunderstorms to form. Doppler radar is used to see inside thunderstorms. It can see heavy rains, hail and strong winds. Your local National Weather Service office has meteorologists and technicians working every hour

of the day and every day of the year. They issue warnings when thunderstorms may become severe. Warnings give people time to move to places of safety.

**By Al Sandrik, National Weather Service, Jacksonville**



## What makes a Thunderstorm Severe?

Any one of these:

- ✓ Tornadoes
- ✓ Wind at or above 58 mph
- ✓ Quarter-size hail (1 inch in diameter) or larger

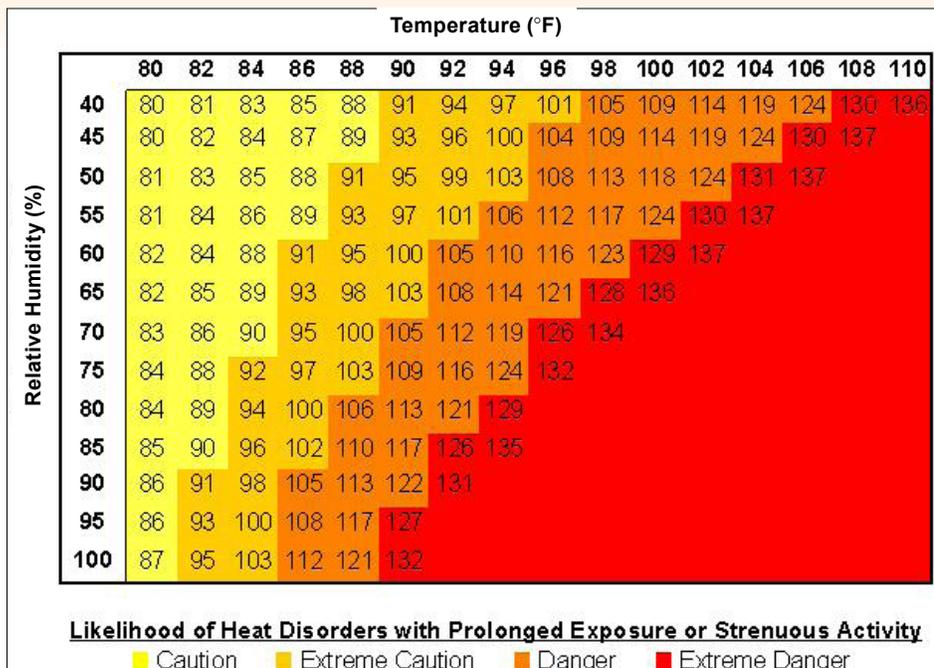


# Temperatures

## It's Not the Heat, It's the Humidity.

**A**lthough the desert Southwest is technically the sunniest place in the continental United States, Florida's deserving of its recognition as the "Sunshine State."

are combined with high temperatures, it makes our bodies think it's hotter than it actually is the reality. This is called the heat index. The increased moisture in the air limits our body's ability to cool off



\*Provided by the National Weather Service

There are good reasons why Florida is known as the "Sunshine State". Each summer, tourists come travel from all over the world to enjoy Florida's warm weather and sunny beaches; however, most are unaware of just how hot it can get here. Surrounded by the Atlantic Ocean and the Gulf of Mexico, Florida is continually influenced by tropical moisture, especially in the summer. The humidity is a measures of how much the level of water vapor is present in the air, and these percentages can be very high during the summer months

In order for our bodies to keep cool, we sweat to get rid of excess body heat. As the sweat evaporates/runs off our bodies, it pulls the heat from our bodies and cools us. However, when high humidity values

by not allowing the sweat to evaporate. When the heat index reaches over more than 105°F, conditions become dangerous for the general population. A person can experience sunstroke, heat cramps, heat exhaustion and even heatstroke if they are exposed to these conditions for a period of time.

The National Weather Service (NWS) will issue heat advisories and warnings when the combination of heat and humidity causes the heat index to reach the extreme caution level.

In addition to the heat, people forget the dangers of ultraviolet (UV) radiation and often get sunburn. Sunburn can occur within 15 minutes of exposure, depending on the level of UV radiation and skin

**WITH PROLONGED EXPOSURE AND/OR PHYSICAL ACTIVITY**

**EXTREME DANGER**

Heat stroke or sunstroke highly likely

**DANGER**

Sunstroke, muscle cramps, and/or heat exhaustion likely

**EXTREME CAUTION**

Sunstroke, muscle cramps, and/or heat exhaustion possible

**CAUTION**

Fatigue

type. Even on cloudy days, the sun's UV radiation can do damage to skin. Over time, with prolonged exposure, this UV radiation can cause cancer and blindness.

### Play it safe: Hot Temperatures

- ◆ Make sure to wear lightweight and light-colored clothing. Lighter colors help reflect heat and sunlight, while the loose light-weight clothing will help your body maintain its normal temperature.
- ◆ Slow down and limit your outdoor activities. Try to avoid participating in or scheduling outdoor events during the hottest part of the day (usually 10am until 4pm). Remain in air-conditioned places to reduce your exposure to the heat.
- ◆ Drink plenty of water or other non-alcoholic beverages. Your body needs





# NWS Windchill Chart



		Temperature (°F)																	
		40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
Wind (mph)	Calm	36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
	5	34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
	10	32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
	15	30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
	20	29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
	25	28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
	30	28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
	35	27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
	40	26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
	45	26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
	50	25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
55	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98	
60	25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98	

Frostbite Times: 30 minutes (light blue), 10 minutes (medium blue), 5 minutes (dark blue)

Wind Chill (°F) = 35.74 + 0.6215T - 35.75(V<sup>0.16</sup>) + 0.4275T(V<sup>0.16</sup>)  
Where, T= Air Temperature (°F) V= Wind Speed (mph) Effective 11/01/01

\*Provided by the National Weather Service

water to keep cool. And drink water even if you don't feel thirsty, since people can become dehydrated without realizing it.

- ◆ Check on the elderly, young children and animals during periods of prolonged heat.
- ◆ Apply sunscreen before exposure to the sun. Reapply sunscreen if you are taking part in activities that could 'wash off' the product. Make sure to use a sunscreen with a Sun Protection Factor of at least 15. Also, wear sunglasses, a hat or carry an umbrella to further protect yourself.

## Interesting Heat Facts

- ◆ The hottest temperature ever recorded in Florida was 109°F on June 29, 1931, in Monticello, FL.
- ◆ Heat waves in Florida are unusual, and typically occur only during periods of drought, low humidity and mostly clear skies. In early June 1985, a particularly severe heat wave hit the state, with temperatures of 106°F in Ocala and 105°F reported in Lakeland.
- ◆ The hottest temperature recorded in the continental U.S. was 134°F on

July 10, 1913, in Greenland Ranch, CA (located in Death Valley).

- ◆ The hottest temperature recorded on Earth was 136°F at Al' Aziziyah, Libya on September 13, 1922.

## "Baby, It's Cold Outside"

Although many people head south to escape the cold temperatures in the winter, it isn't always warmer in Florida. Over the past 150 years, there have been numerous severe cold outbreaks that have affected the state. These cold weather outbreaks can produce below freezing temperatures and are usually accompanied by strong winds that produce bitterly cold wind chills. Increased wind speeds at cold temperatures accelerate the heat loss from exposed skin and the wind chill is a measure of this effect. Basically, these conditions make a person or animal feel colder than the actual temperature. The NWS will issue wind chill advisories/watches/warnings, freeze watches/warnings, hard freeze watches/warnings, and frost advisories if cold weather will threaten an area.

## Interesting Cold Facts

- ◆ The coldest temperature recorded in Florida was -2°F in Tallahassee



Ice clings to an orange tree on a farm near Plant City, January 22, 2009

on February 13, 1899. At the same time, snow up to three inches deep was reported by several cities in the Panhandle.

- ◆ Snow has been reported numerous times throughout the state. On January 19, 1977, snow fell on Miami, FL and was seen in Homestead, FL (which is 22 miles south of Miami). Unfortunately, it melted when it hit the ground.
- ◆ The deepest snowfall ever measured in Florida (four inches), occurred in Milton on March 6, 1954.
- ◆ The coldest temperature recorded in the lower 48 states was -70°F at Roger's Pass, MT, on January 20, 1954.
- ◆ The coldest temperature recorded on Earth was -129°F at Vostock II, Antarctica, on July 21, 1983.

## Play It Safe: Cold Temperatures

- ◆ Stay indoors and use a safe heating source. Do not use fuel-burning devices indoors. They release carbon monoxide, which is a deadly gas. Also, make sure to use space heaters according to their instructions and be attentive to open flames.
- ◆ Don't overexert yourself when outdoors. Your heart is already working overtime to keep you warm.
- ◆ If you must go outside, dress in layers and wear a hat and gloves. Try to stay dry and out of the wind.

By *Melissa Griffin*,  
Florida Climate Center

# In Florida, it can be hot, hot, hot, but also chilly.



# Wildfires

From January through October of 2009, more than 2,800 wildfires across Florida burned over 136,000 acres of state and federal lands. Though this may seem like a lot of fires, 2009 was a fairly inactive wildfire season compared to recent years.

turned during the winter months of early 2009, Lake Okeechobee levels were falling, and it looked like Florida was in for a rough year. From January through March of 2009, over 1,000 wildfires burned nearly 25,000 acres. That's more than double the 508 fires that burned over

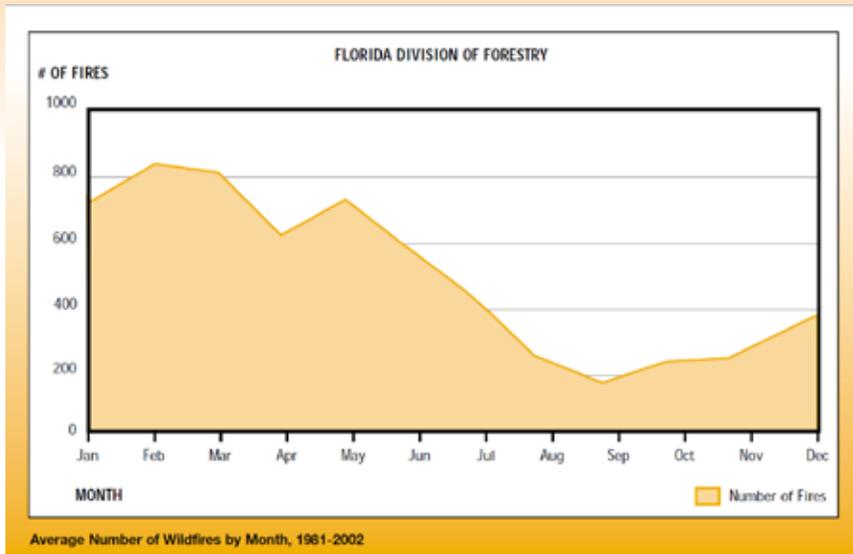
## What do El Niño and La Niña mean for Wildfires?

Part of the reason for the inactive wildfire season this past year was the development of El Niño in the Pacific Ocean during the early summer months. El Niño conditions occur when abnormally warm water forms across the central and eastern Pacific Ocean. These warm waters create a change in the atmospheric weather patterns that result in wetter and cooler than normal conditions across the Southeastern United States.

In 2003, only 27,000 acres burned in 2,071 fires due to El Niño weather patterns keeping plenty of moisture in the soils and waterways. With these same conditions in the forecast, there is the potential for an inactive fire season in the early part of 2010.

When the waters in the central Pacific Ocean are cooler than normal, it is referred to as La Niña. La Niña conditions usually bring drier than normal winters and increase wildfire activity through the spring. Because of the influence of El Niño and La Niña, it is possible to anticipate upcoming fire activity of the next three to six months based on forecasts of weather and climate. As more research is done, more accurate forecasts and better planning and preparation can be made for upcoming wildfire seasons across Florida.

*By Amy Godsey, Florida Division of Emergency Management*



Though high pressure near the state kept most of the tropical systems away, Tropical Storm Fay in August of 2008 was able to affect just about every part of the state by slowly weaving its way northward across the Peninsula and then westward along the Florida Panhandle. However, drought conditions quickly re-

turned during the winter months of early 2009, Lake Okeechobee levels were falling, and it looked like Florida was in for a rough year. From January through March of 2009, over 1,000 wildfires burned nearly 25,000 acres. That's more than double the 508 fires that burned over

## WILDFIRE SAFETY ACTIONS

Cause	Percentage
Incendiary (Arson)	26%
Lightning	16%
Debris Burning	19%
Miscellaneous	10%
Unknown	12%
Children	5%
Campfires	2%
Smoking	4%
Equipment	4%
Railroad	2%

- ♦ Create a defensible or safe space of at least 30 feet around your home that is lean, clean and green.
- ♦ To help emergency vehicles gain access, make sure driveway are at least 12 feet wide with at least 15 feet of overhead clearance and are easily identifiable.
- ♦ Keep gutters, eaves and yards clear of debris, sticks, pine needles and leaves.
- ♦ Trim all the branches that hang over the house or are lower than 6 to 10 feet from the ground.
- ♦ Plant fire-resistant plants such as dogwood, sycamore, magnolia, oaks, red maple, wild azalea, sweet gum, black cherry and ferns instead of pines and palmettos.
- ♦ Use fire-resistant construction materials where possible and fire-resistant barriers when attaching flammable materials, such as wood decks or fences, to the house.
- ♦ Follow local regulations for the burning or disposal of yard waste and other materials.
- ♦ Develop a personal disaster plan, including a plan for evacuating your home. Be sure to identify at least two routes out of your neighborhood or subdivision.

# 2009 – Florida Weather Year in Review



Daytona Speedway on May 22, 2009

## The Numbers

Warnings Issued for Florida Counties  
by the National Weather Service;  
January 1st to December 1st

Tornado Warnings 121  
Severe Thunderstorms Warnings 740  
Flash Flood Warnings 50



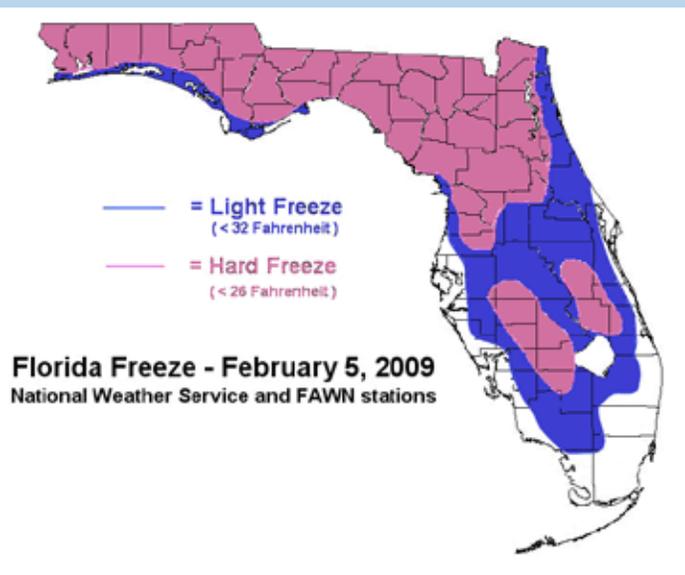
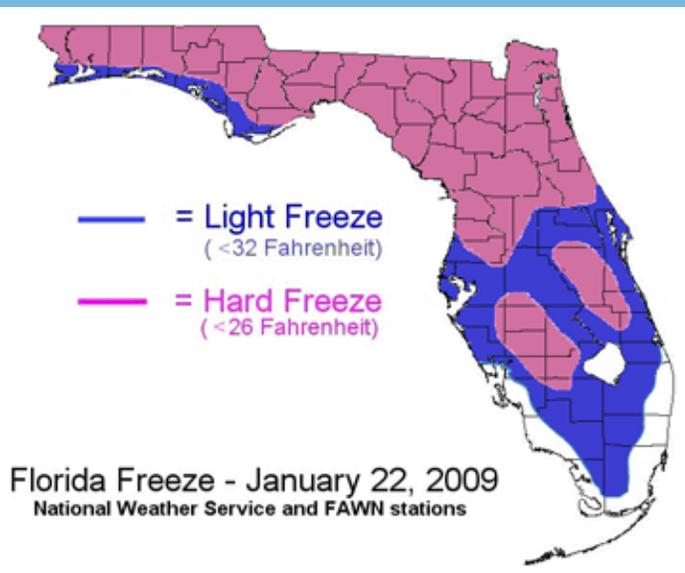
Port Orange, July 24, 2009

## OTHER SIGNIFICANT WEATHER

**T**he National Weather Service does not issue special warnings or statements for lightning because all thunderstorms contain dangerous lightning. In 2009, 5 people were killed and over 50 people were injured from lightning strikes in Florida. Four of these fatalities occurred within 1 month of each other. In June, a Broward County man was killed while cutting the grass in his yard. Three days later, a Highlands County man was killed while standing underneath a tree on a golf course. In Polk County, a man was killed and 27 others were injured when lightning struck an open soccer field where a group was having a 4th of July picnic. A man was killed by lightning while at the beach in Brevard County and a man fishing near Soldier Key in Miami-Dade County was struck on his boat.

An unusually strong winter freeze appeared twice within one month across Florida. The first widespread freeze occurred on the morning of January 22nd, where freezing temperatures extended down into the Everglades and hard freezes were experienced across many areas north of the I-4 corridor. Two weeks later, another strong cold front produced a second round of widespread freezes across the state. In total, these freezes caused millions of dollars in crop damage and resulted in 2 deaths.

Lack of winter rains created moderate drought conditions across much of the state by March. Abundant rainfall finally came to the Florida Panhandle in late March and early April, creating widespread river flooding across North Florida, but left the central and southern Florida peninsula in extreme drought conditions until the end of May. Above normal rainfall was seen through the end of the year in Jacksonville, Orlando and Tampa. Tallahassee and Miami ended the year with a 8-12 inch deficit.



# El Niño Southern Oscillation

Several global-scale atmospheric patterns can impact the weather and climate over Florida during certain times of the year. Of these many patterns, one dominant pattern is called the El Niño – Southern Oscillation (ENSO or El Niño for short). As an ENSO event begins, winds across the equatorial western Pacific become altered, which in turn cause a warming of the ocean surface and an eastward movement of the warm water region to the central and eastern equatorial Pacific. When ocean temperatures over a specific portion of the eastern Pacific warm to 0.5° Celsius (0.9° Fahrenheit) or more above normal and persist for several months, scientists label this phenomenon as an El Niño. Conversely, if ocean temperatures become 0.5° Celsius (0.9° Fahrenheit) or more below normal over this area for an extended period of time, this pattern is called La Niña.



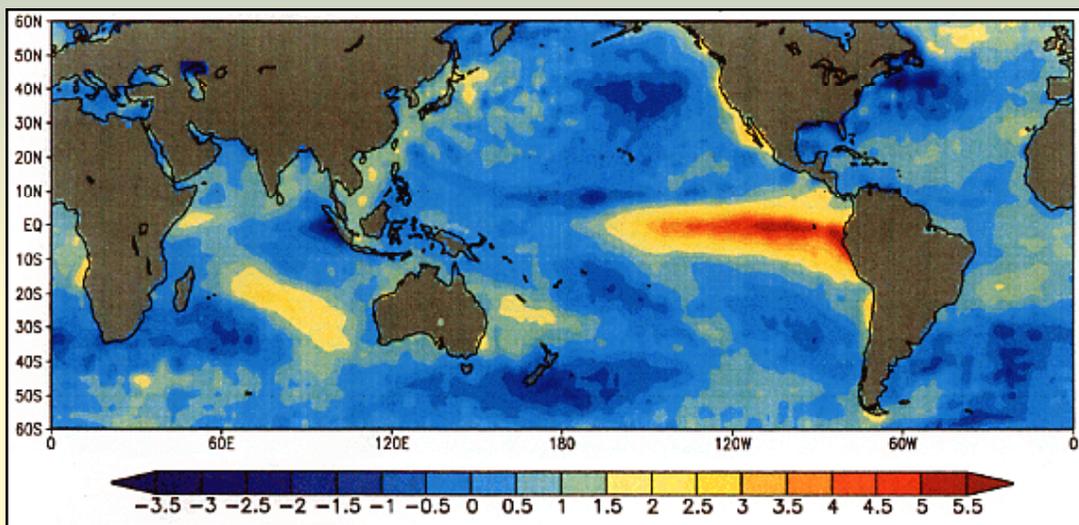
El Niño and La Niña events alter large scale circulation patterns that in turn change weather patterns over North America, including Florida, especially during the Northern Hemisphere winter season. The primary change that El Niño brings about to influence weather over Florida is an extension of the Pacific Jet

Stream over the southern United States. A jet stream is a narrow channel of fast moving air far up in the atmosphere that helps transport storm systems across the globe. This extension of the jet stream over the southern United States transports more periods of rainy and stormy

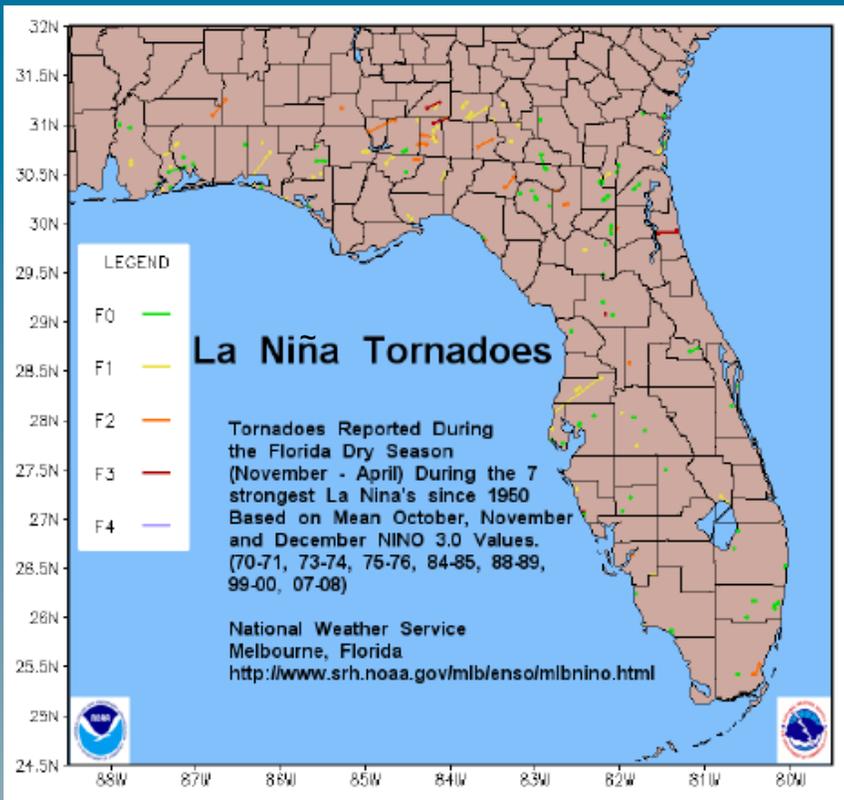
weather across Florida during the winter months compared to a typical year. This increase in storminess leads to above normal precipitation during Florida's usual dry season that runs from November to April. This increase in rainfall can be beneficial in some respects, as it can lead

to a reduced risk of wildfires across Florida, but can also be harmful by producing flooding across certain areas of the state. El Niño has also typically been found to bring below normal temperatures across Florida during the winter season; however, this relationship is usually not very strong and the amount of cooling can often be small.

The most dangerous impact that El Niño brings to Florida is an increased potential for severe weather. During El



Temperature anomalies for Pacific Ocean (Yellow and red indicates above normal sea surface temperatures)



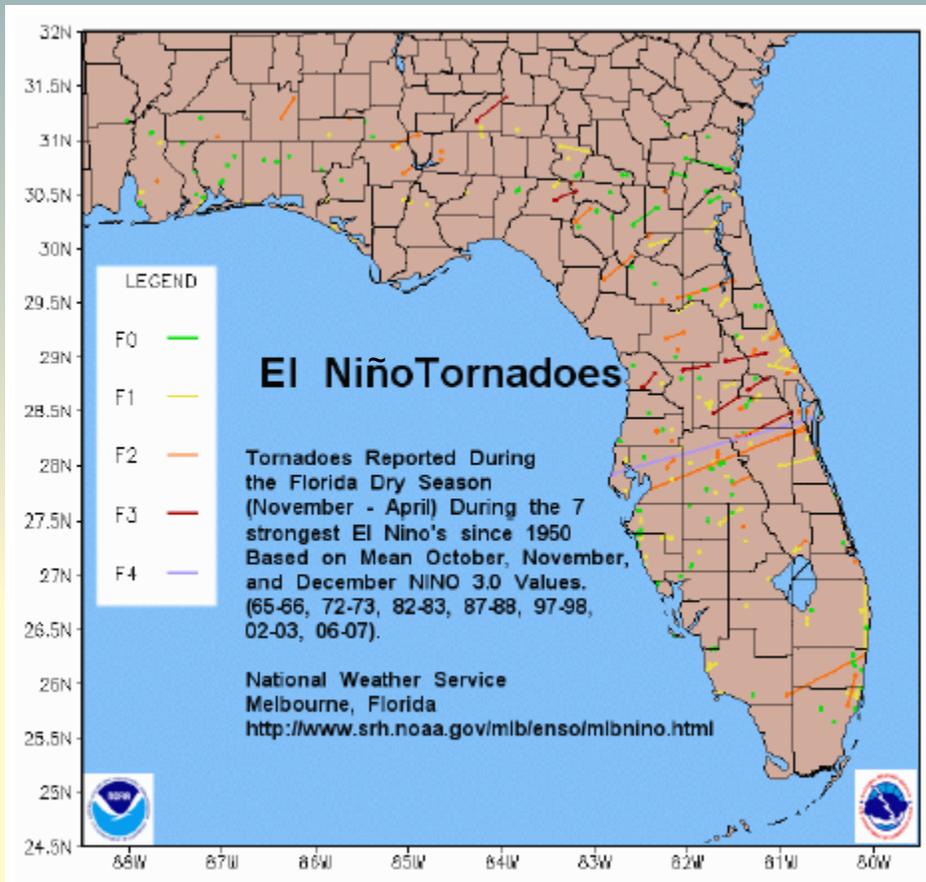
Niño events, a greater number of storm systems move across the region during the winter and early spring, bringing a larger than normal risk of thunderstorms that can produce large hail, damaging winds and tornadoes. In fact, two of the most deadly tornado events to affect Florida occurred during recent El Niño periods. During the strongest El Niño on record (1997-1998), several EF-3 tornadoes with winds up to 165 mph moved across central Florida during the night of February 22nd to 23rd, tragically killing 42 people, many in the Kissimmee area. A more recent tornado episode occurred during a much weaker El Niño (2006-2007). During this event, two EF-3 tornadoes with winds up to 165 mph pushed through Sumter, Lake, and Volusia Counties the early morning hours of February 2nd, 2007, resulting in 21 fatalities.

As illustrated by the February 2, 2007 tornadoes, it doesn't take a strong El Niño to create dangerous weather across Florida. No two El Niño events are exactly alike, which makes it difficult for forecasters to determine how much and where severe weather will occur. The best course of action is to have a pre-

paredness plan in place for you and your family, which includes knowing in advance where to shelter in the event of a severe weather in your area. Your plan should also include having a NOAA weather radio, which broadcasts National Weather Service warnings, watches, forecasts and other hazardous information 24 hours a day. The ability of the radio to trigger tone alerts can save lives, especially for overnight tornadoes when most people are sleeping. Also consider having a back-up method to receive weather alerts, such as subscribing to a text message service to have warnings sent directly to a personal cellular phone.

Remember, to remain safe, you need to know where to shelter in the event of a tornado, you must have a method to receive tornado warnings day or night, and you must react immediately by moving to your place of safety when it becomes necessary.

**Derrick Weitlich and Scott Spratt,  
National Weather Service,  
Melbourne, Florida**



# 2010 Severe Weather Awareness Guide Sponsors



## For more information, visit these websites:

Florida Division of  
Emergency Management  
[www.FloridaDisaster.org](http://www.FloridaDisaster.org)

Kids Get A Plan  
[www.kidsgetaplan.com](http://www.kidsgetaplan.com)

National Weather Service  
[www.weather.gov](http://www.weather.gov)

American Red Cross  
[www.redcross.org](http://www.redcross.org)

Florida Department of Education  
[www.fldoe.org](http://www.fldoe.org)

Just Read Florida!  
[www.justreadflorida.com](http://www.justreadflorida.com)

National Hurricane Center  
[www.nhc.noaa.gov](http://www.nhc.noaa.gov)

JetStream Online School for Weather  
[www.srh.noaa.gov/jetstream/index.htm](http://www.srh.noaa.gov/jetstream/index.htm)

Storm Prediction Center  
[www.spc.noaa.gov](http://www.spc.noaa.gov)

Federal Alliance For Safe Homes  
[www.flash.org](http://www.flash.org)

Hurricane Hunter website for  
Teachers and Students  
[www.aoc.noaa.gov/teachers\\_and\\_students.html](http://www.aoc.noaa.gov/teachers_and_students.html)

National Wildland/Urban  
Interface Fire Program  
[www.firewise.org](http://www.firewise.org)

Florida Climate Center  
[www.coaps.fsu.edu/climate\\_center/index.shtml](http://www.coaps.fsu.edu/climate_center/index.shtml)

Climate Prediction Center  
[www.cpc.ncep.noaa.gov](http://www.cpc.ncep.noaa.gov)



## Don't Forget to Get A Plan For Your Family and Business

