National Weather Service
CHARLESTON, SC

STORM COURIER

Significant Weather Events of 2009

By Jon Jelsema - Meteorologist

The 2009 Severe Weather Season was not quite as busy as the previous year, but none the less featured a number of significant weather events and a couple rather unusual events as well. This kept forecasters at the National Weather Service (NWS) busy, issuing a plethora of watches, warnings and advisories!

Winter/Spring 2009

Following a relatively quiet late winter and early spring, Severe Weather Season began in earnest during the overnight hours of April 11th. A strong cold front moved through southern South Carolina and southeast Georgia, resulting in the development of a couple extremely intense supercell thunderstorms which produced 2 Tornadoes in Allendale County South Carolina. Damage surveys conducted by NWS personnel found the tornadoes to be of EF1 and EF2 strength. Quickly on the heels of this first system, another damaging severe weather event struck much of southeast Georgia on April 14th as an intense warm front lifted north into the local area. Numerous reports of quarter to golf ball size hail and wind damage to trees and power lines were received. In addition to the damage caused by the strong winds and large hail, an EF-1 tornado resulted in some structural damage to a church south of the Credit Hill community in McIntosh county Georgia. The remainder of the Spring Severe Weather Season featured sporadic damaging wind and hail events, leading up to an especially active pulse severe season during the summer months of June, July, and August.

Summer 2009

Pop-up afternoon thunderstorms were nearly a daily occurrence throughout the summer months, keeping NWS forecasters busy watching the radar and assessing storm severity. One of the more significant events during the summer months occurred on June 12th when a tremendous Microburst impacted Beaufort County. Numerous trees and power lines were downed across the county, several vehicles sustained damage, and a wind gust of 92 mph was measured at the

Tornado Damage that occurred in Hanahan, South Carolina on June 27th.

Hilton Head Airport. On June 22nd and 23rd, anomalously high tide levels resulted in extensive salt water flooding along the South Carolina and Georgia coast. Downtown Charleston, SC was one of the areas impacted the most by the flooding, where numerous streets were impassable due to high water, numerous cars were stranded, and several residences were flooded due to the high tide levels. The weather pattern changed abruptly after a rather busy summer pulse thunderstorm season.

Fall 2009

September 2009 went down in

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- A Quiet Atlantic Hurricane Season.
- A Wealth of Weather Information!
- NWS Charleston Meteorologists on scene support.
- An Overlooked Threat along the Coast.
- Cold and Rainy Winter so Far.
- What's Considered Severe Now?
- Report what you observe back to the NWS!

Signifcant Weather Events of 2009 continued...

Coastal Flooding around Shem Creek on June 22nd.

the record books as the second driest September at the Charleston International Airport where only 0.48 inches of rainfall was received, and the 4th driest at Waterfront Park in downtown Charleston where 0.98 inches of rain fell. A few isolated severe weather events struck the low-country of southeast Georgia and southern South Carolina during the fall months, but overall the period was fairly tranquil. There was a couple of notable events that did occur during the fall months however, one of which resulted in an EF-2 tornado and an EF-0 tornado in Liberty and Long counties in southeast Georgia on October 27th. Another event resulted in significant flooding across much of the Charleston, SC metropolitan area on December 18th, rendering many roads impassable.

Winter 2009/2010

Many residents of southern South Carolina and southeast Georgia may have noticed some unusual changes in December 2009 and January 2010 from previous years, as the effects of El Nino began to be felt across the area. Many locations across the local area received 10+ inches of rainfall during the month of December. Following the drenching December, one of the coldest periods in recent memory was observed during the first half of January 2010, when temperatures struggled to hit 50 degrees during the day and fell below the freezing mark consistently at night. These effects, both the increase in rainfall as well as the below normal temperatures are consistent with an El Nino winter. For more details on El Nino, its impacts on the local area, and what we might expect for the remainder of the Winter and Spring months, see the article entitled "El Nino's effects on the Low Country" on page X of this newsletter.

For a more thorough review of several of the more significant weather events which impacted the low country in 2009, visit the following web page : http://www.erh.noaa.gov/chs/events.shtml.

Throughout 2009, a total of 305 Severe Thunderstorm Warnings, 27 Tornado Warnings, 178 Special Marine Warnings, 20 Flash Flood Warnings,

"It was the first time in 3 years in which no hurricanes hit the United States."

The 2009 Atlantic Hurricane Season

By Robert Bright - Meteorologist

Satellite Imagery of Hurricane Bill on August 21st.

The 2009 Atlantic hurricane season, which officially began on June 1st, came to a quiet close on November 30th. In fact, most of the season was rather benign with only 9 named storms, 3 of which were hurricanes. Only 2 of these 3 hurricanes were major (Category 3 or higher). This is the fewest number of tropical storms and hurricanes since 1997. A normal season has 11 tropical storms, six hurricanes, and two major hurricanes. As expected by the National Oceanic and Atmospheric Administration, El Nino played a role in helping to minimize tropical cyclone development across the Atlantic basin (which includes the Caribbean Sea and the Gulf of Mexico) by producing unfavorably strong west-to-east winds high in the atmosphere.

Only 2 systems made landfall in the United States, Tropical Storms Claudette and Ida. It was the first time in 3 years in which no hurricanes hit the United States. Although no storms directly affected southern South Carolina and southeast Georgia, strong Hurricane Bill produced dangerous rip currents, beach erosion and minor coastal flooding along the coast.

For more information on the 2009 Atlantic hurricane season as well as an opportunity to comment on the proposed changes to the National Hurricane Center's Public Advisory product, check out their website at

http://www.nhc.noaa.gov

For a local tropical cyclone climatology, check out:

http://weather.gov/chs/tropical/hurrstats_web.shtml

Our Website: A Wealth of Weather Information

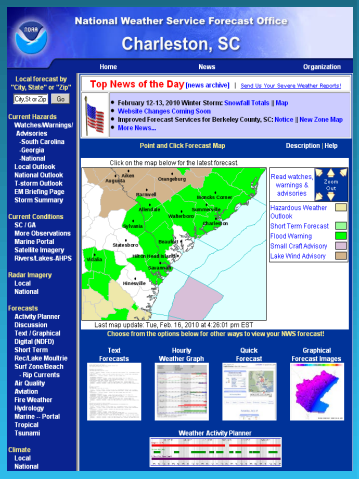
By Robert Bright - Meteorologist

Our website, weather.gov/chs, contains a lot of good information; it may just be a bit overwhelming to navigate! Let's begin on the homepage. The map shows you any advisories, watches, warnings and statements that are currently in effect. You can also click on the map to access a "point" forecast for that location. The forecast comes from our National Digital Forecast Database (NDFD). From the links at the bottom right side of the point forecast pages you can access numerous other ways of displaying the forecast. These include the Tabular Forecast, Hourly Weather Graph, Quick Forecast, and Interactive Forecast Map. You may have to select each of these to see which one best suits your needs.

Back on our homepage under the map, you can obtain "Graphical Forecast Images", which display the forecast of various weather parameters in graphical format. You can also access the "Weather Activity Planner", which allows you to customize forecast parameters for your activity. For example, if you are looking for a sunny day with temperatures above 80 degrees, relative humidity less than 50%, and rain chances less than 20% in order to complete a job outdoors, the tool will tell you during which time period(s) we are forecasting such conditions. Current radar and satellite imagery is also available on the homepage, as well as the new climate plots for Charleston, SC and Savannah, GA.

The left-hand menu contains links to current conditions/hazards, forecasts, climate data, weather safety (including our SKYWARN spotter page), local research, and our office information, among other things. In addition, many of our office programs have their own webpages, which are listed under the "Forecasts" subheader. These include Aviation Weather, Fire Weather, Hydrology, Marine Weather, and Tropical Weather. One of the most popular sections of our website is the climate webpage, which can be accessed by clicking on "Local" under the "Climate" subheader on the left menu bar. From this page you can access a bunch of climate information, including daily and monthly climate reports for our official observing sites (Charleston, SC and Savannah, GA). Also, by clicking on the "NOWData" tab, you can obtain climate data for other locations in the area beside Charleston and Savannah.

So we hope your experience on our website is a pleasant one! If you have any comments or questions while surfing, feel free to let us know by sending an email to chs.webmaster@noaa.gov and we will respond as soon as possible. You can also fill out a short survey which can be accessed near the bottom of the left menu on our website.



"You can also access the "Weather Activity Planner", which allows you to customize forecast parameters for your activity."

NWS Charleston Wildland Fire Suppression Support

Every year wildfires affect many locations across the United States, some of which are so large that they require Incident Management Teams to oversee the fire suppression efforts. Weather is a key factor in determining fire behavior along with what methods and time will be the most advantageous to suppress the fire.

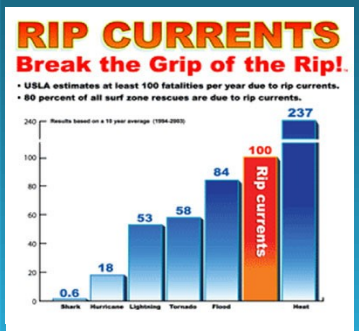
The National Weather Service plays a key role in wildfire suppression efforts each year by deploying Incident Meteorologists to provide critical weather information to key decision makers at the wildfire incident. Incident Meteorologists are specially trained to forecast for wildfires, oil spills, hazardous materials incidents, and other incidents of National significance.

This year the National Weather Service in Charleston was requested to support wildfires on two incidents. John Quagliariello helped support a wildfire in the Great Smoky Mountains National Park in Western North Carolina in June by providing weather information to the Incident Management Team. On another incident, meteorologist Jon Jelsema provided weather information to an Incident Management Team for a wildfire in the Kenai National Wildlife Refuge in Soldotna, Alaska in July.

NWS Charleston Meteorologist Jon Jelsema briefing the fire crews in Soldotna, Alaska.

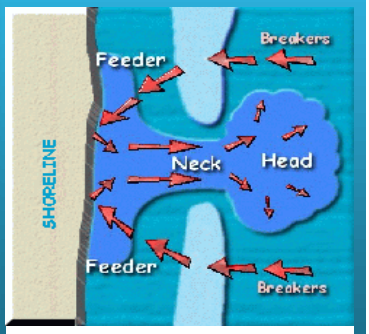
Science Corner: Rip Currents

By Pete Mohlin - Meteorologist



On average 100 fatalities occur every year due to rip currents.

"During the past 4 years at the local beaches there have been over 500 reports of rip currents."



The Rip Current Life Cycle.

Many of us are familiar with beach hazards such as lightning, jellyfish, stingrays or even the rare occurrence of a shark. There is another hazard that can be just as dangerous and causes an estimated 100 deaths or more each year at the beach. This number is more than that from floods, tornadoes, lightning and hurricanes, and is far more common than a shark attack. The hazard we are referring to is Rip Currents.

Rip currents are only dangerous if you don't know what they are or if you are not a good swimmer. They can carry you a few hundred feet offshore in less than a minute. For someone who does not understand what they are or cannot swim, that can be deadly. However, surfers who understand the rip current will use them to their advantage, to help them swim out through the surf quickly.

What are Rip Currents?

Rip Currents are powerful, channels of water flowing quickly away from shore. They typically extend from the shoreline, through the surf zone, and past the line of breaking waves. Rip currents can occur at any beach with breaking waves, including the Great Lakes. During the past 4 years at the local beaches there have been over 500 reports of rip currents. While unfortunately there have been 3 drownings due to rip currents, thankfully there have also been dozens of rescues.

How do Rip Currents Form?

Incoming waves break on the sand bars before they break in the channel area. These breaking waves cause an increase in water level over the sand bars relative to the channel level. This increase in water level is known as a set-up. As a result of the higher water level over the sand bars, a pressure gradient is created. This pressure gradient drives incoming feeder currents and waves. As these waves approach the shoreline, they usually break at an angle, generating a long shore current. This current flows parallel to or along the beach, sometimes converging with other currents, until there is too much of a water buildup. This buildup of water needs to find a way to go back seaward, and typically occurs through a break in the sandbar, where water is channelized into a narrow current known as a rip current. Other times rip currents can result from a wave's natural variability or when a current traveling along the shoreline encounters a structure such as a pier, a groin (rock pile) or jetty and is forced offshore.

Where do Rip Currents Form?

Rip currents usually form at low spots or breaks in sandbars, and also near structures such as groins, jetties and piers. Rip currents can be very narrow or hundreds of yards wide. The seaward pull of rip currents can vary: sometimes the rip current ends just beyond the line of breaking waves, but sometimes rip currents continue to push hundreds of yards offshore. Recent research even indicates that in a few cases the rip current can come back into the surf zone from offshore.

When do Rip Currents Form?

While rip currents can be found on surf beaches every day, if there are certain wave, tide, and beach profile conditions, the amount and intensity of rip currents can quickly increase. Research has shown that there is an increased risk of rip currents when the following factors occur:

- An onshore wind, especially with higher wind speeds.
- An onshore swell, especially with higher heights and a longer period, and with a component that is more directly onshore (the most important factor)
- At or near the new moon or full moon (known as a syzygy).
- At or near the perigee (the moon's closest approach to the earth)
- Rip currents from previous days (with cuts already in the sandbar)

Science Corner: Rip Currents continued…

In general, rip currents are most likely to be dangerous during high surf conditions as the wave height and wave period increase, as more wave energy impacts the surf.

How You Can Identify Rip Currents

Rip currents can sometimes be identified if you like for some of these familiar signs:

- A channel of churning or choppy water
- A line of foam, seaweed or debris moving steadily seaward
- Area having a noticeable difference in water channel (almost looking like a river in the ocean)
- A break in the incoming wave

How You Can Avoid Rip Currents

- Be cautious at all times, and never swim at an unguarded beach.
- Obey all instruction and advice from the lifeguards and posted signs.
- If in doubt, never go in to the water.
- Stay at least 100 feet away from groins (or rock piles), piers and jetties. Permanent rip currents often exist near these structures.
- Learn how to identify rip currents and know that factors that lead to their formation.
- Remember that the rip current is the **worst place to swim**, not the best.
- Heed the advice from the National Weather Service Rip Current Forecast before deciding to go to the beach (see below for additional information).

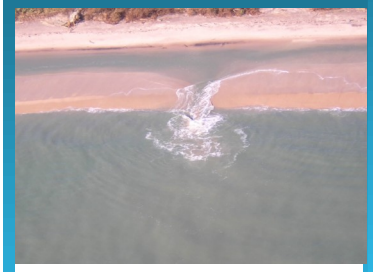
How to Survive and Escape Rip Currents

- Learn how to swim
- If caught in a rip current, remain calm to conserve energy and think clearly.
- Never fight against the current. Swim out of the current in a direction following the shoreline. When out of the current, swim towards shore.
- If you are unable to swim out of the rip current, float or calmly tread water. When out of the current, swim towards shore.
- If you are still unable to reach shore, draw attention to yourself. Face the shore, wave your arms, and yell for help.
- If you see someone in trouble, get help from a lifeguard or call 9-1-1. Throw the rip current victim something that floats and yell instructions on how to escape. **Many people drown while trying to save someone else from a rip current. Do not attempt to save the person caught unless you know how escape a rip current.**

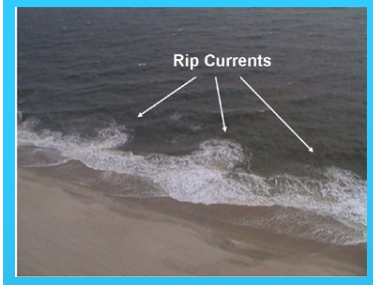
Rip Current Misconceptions

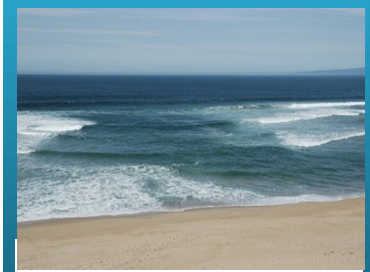
Many people believe that rip currents will pull you under water. This is not true! **Rip currents will pull you away from shore, but not pull you under water.** Drownings occur when people pulled offshore are unable to keep themselves afloat and swim back to shore. This may be due to any combination of fear, panic, exhaustion, or lack of swimming skills. Remember, the rip current will eventually dissipate, even if this is far from shore, so there is no use fighting against the current. Let it carry you out until its seaward flow stops, or attempt to swim sideways and out of the current. Think of the rip current like you are on a treadmill that cannot be turned off. You need to get off the treadmill, or in this case out of the rip current, to no longer fight the effects of the opposing force.

In some regions rip currents are referred to by other, incorrect terms such as rip tides and undertow. These terms may confuse people and negatively impact public education efforts.



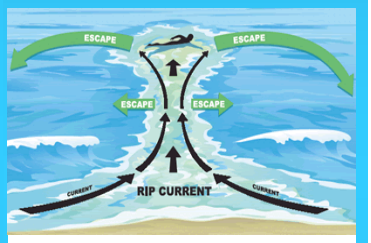
A Rip Current forms as water breaks through a sand bar.





A large Rip Current flowing out to sea.

Science Corner: Rip Currents continued…



How to Escape From a Rip Current.
"Break the Grip of the Rip"

Rip Current Characteristics

- Rip currents can occur at any time, but generally their velocity increases as water levels decrease.
- Rip current velocities also typically increase as wave heights increase. Rip currents are very unsteady and may increase in strength within a few minutes, catching unwary beachgoers and swimmers off-guard.
- The average velocity of the rip current is 1 to 2 feet per second, but many can reach up to 8 feet per second - this is faster than an Olympic swimmer can sprint!
- Rip currents are usually 20 to 100 feet wide and may extend hundreds of feet offshore.

Different Types of Rip Currents

Permanent or Topographic Rip Currents -

Rip currents which move little and are caused by structures such as jetties, piers, drainage outflows, groins and rock piles. They can persist for months or years.

Fixed Rip Currents -

Rip Currents which form in an area of water that is deeper than the surrounding water. They are strongly influenced by wave action, the shape of the coast and also the shape of the sandbar. Most times they will form in an area of water or cusp between two higher points on the beach. They may last for several hours to as much as several months.

Traveling Rip Currents–

Rip Currents which occur when there is a long shore current or current that is parallel to the beach. The long shore current will sometimes be strong enough to pull a rip current away from its original location to another. This process can be repeated provided the long shore current persists.

Flash Rip Currents –

Rip Currents which are usually of short duration (lasting no more than 15 or 30 minutes). They can appear suddenly and can be extremely dangerous because they form so rapidly and can occur over a large and varying area.

Swash Rip Currents -

These Rip Currents are smaller, usually occur on steep beaches and are associated with strong backwash from the beach face due to larger waves. They do not extend very far from the shore

Mega Rip Currents –

These Rip Currents are the largest rip currents and occur during extreme wave events (usually 10 feet or higher). More common in Australia.

The National Weather Service Rip Current Program

The beach forecast with the rip current outlook is issued at least twice a day each beach season (approximately from mid-March through the end of October). The rip current outlook will be one of the three-tiered qualifiers; Low, Moderate or High. You can obtain the rip current outlook at http://www.weather.gov/chs/rips.shtml, or by listening to NOAA Weather Radio, All Hazards.

For additional information here are some other web sites that might be of interest to you:

The National Weather Service Rip Current Program at :

http://www.ripcurrents.noaa.gov/

The United States Lifesaving Association at : http://www.usla.org/ripcurrents/

NOAA Watch at:

http://www.noaawatch.gov/themes/rip.php

National Ocean Service at http://oceanservice.noaa.gov/education/kits/currents/03coastal3.html

El Nino is Expected to Continue into the Northern Hemisphere Spring 2010

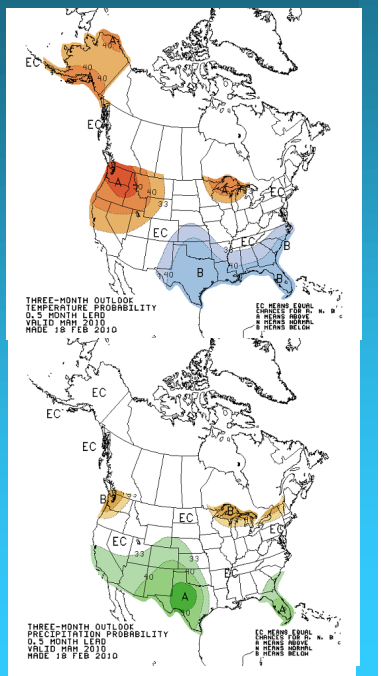
By Joe Calderone - Meteorologist

As you have likely noticed, this winter has been much colder than normal while and we have seen several heavy rainfall events. This pattern falls right in line with the types of weather expected from a bona fide El Nino pattern. The Climate Prediction Center, part of the National Weather Service, has an ongoing El Nino Advisory, which is issued when El Nino conditions are observed and expected to continue. El Nino conditions are determined by observing sea surface temperatures in a pre-defined portion of the Pacific Ocean near the equator. Should sea surface temperatures remain above normal by at least 0.5 degrees Celsius in this particular portion of the Pacific Ocean for several months, the CPC declares that an El Nino is occurring. For this winter, the temperature difference has been over 1.5 degrees Celsius above normal, indicating that a moderate to strong El Nino is occurring. Going forward for the rest of the winter and into the spring, most models indicate that the sea surface temperature differences will remain elevated in the equatorial Pacific, meaning that the El Nino pattern is expected to persist through at least this spring.

In terms of weather impacts for the United States, El Nino impacts typically include above average precipitation for the southern tier of the country while below-normal temperatures are favored for the south-central and southeastern states. This is because of a change in the location of the jet stream. During a pronounced El Nino, the jet stream extends west-to-east across the Pacific Ocean, bringing enhanced storm systems and moisture into and across the southern United States. These systems then obtain additional moisture from the Gulf of Mexico, producing more overcast and precipitation-laden days while not allowing for much warming for the southeastern states.

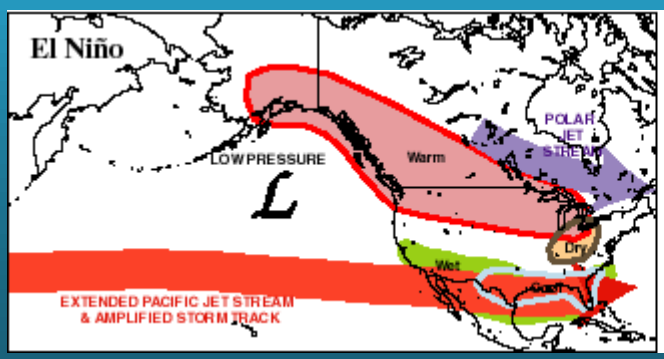
For southeast South Carolina and southeast Georgia, high temperatures can be expected to be well below normal while minimum temperatures are expected to be slightly below normal; this means that overall average temperatures will be below normal. This is reflected on having overall cooler air brought into the region, along with additional cloud cover which holds down temperatures quite well during the day and not allowing much to escape into the atmosphere at night. In addition, precipitation is expected to be well above normal due to the increased frequency of storms and the additional moisture that storms will accrue as they traverse the Pacific and the Gulf of Mexico. One other important commonality during moderate to strong El Nino events, particularly during late winter and early spring, is the increase in storms that contain hail due to stronger jet stream winds and colder air aloft which are key factors in hail-producing storms.

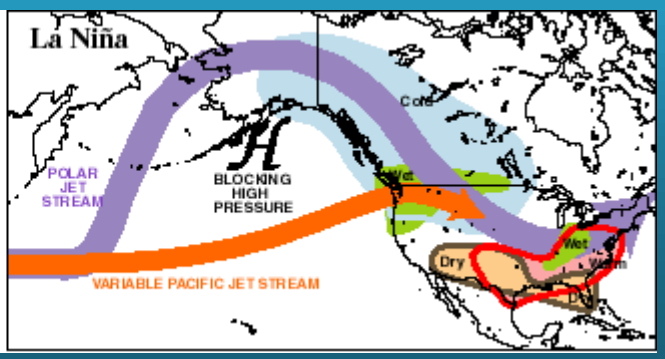
For additional information on El Nino and to see weekly and monthly outlooks, please visit the Climate Prediction Center's website at http://www.cpc.ncep.noaa.gov/index.php.



The outlook for March, April, and May calls for below normal temperatures and above normal precipitation across southern South Carolina and southeast Georgia.

"An El Nino Advisory is issued when El Nino conditions are observed and expected to continue"





Severe Thunderstorm Hail Criteria Change

By: Douglas Berry - Meteorologist

"The minimum size hail criterion for severe thunderstorms changed from 3/4 inch (penny – size) to 1 inch (quarter-size) nationwide on January 5, 2010"

New Hail Criteria Change For Severe Thunderstorms

"The minimum size hail criterion for severe thunderstorms changed from 3/4 inch (penny-size) to 1 inch (quarter-size) nationwide on January 5, 2010."

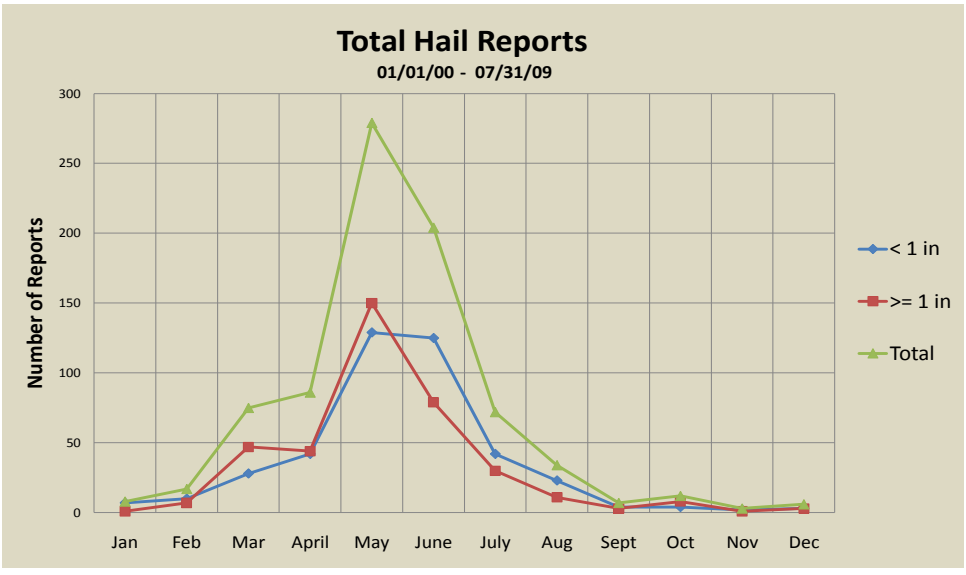
WHAT HAS CHANGED?

As of January 5, 2010 the National Weather Service implemented a change from the traditional ¾ inch diameter size hail (penny) to 1 inch diameter size hail (quarter) when determining whether a thunderstorm has reached severe status. The wind requirement or threshold for a severe thunderstorm will remain unchanged at 50 knots or 58 mph.

WHY THE CHANGE?

The change in hail criteria is based on research that indicates significant damage does not occur until hail reaches 1 inch in diameter. Core partners in emergency management and the media also requested the change. Particularly in areas of the central United States, the frequency of severe thunderstorm warnings issued for penny-size and nickel-size hail might have desensitized the public to take protective action during a severe thunderstorm warning. In areas that experimented with changing to the one inch hail criterion, media partners stated their user feedback suggests warnings are now more meaningful. In addition, television networks receive fewer viewer complaints from breaking into programming for non-damaging storms. The Emergency Management community in those areas agreed that warnings carry more weight, and spotters now concentrate on the more significant events.

Monthly Hail Reports For Charleston County Warning Area



Data Provided by NCDC 2009

Severe Thunderstorm Hail Criteria Change continued…

WILL FUTURE SEVERE THUNDERSTORM WARNING ISSUANCES CHANGE?

- The graph on the previous page shows the total number of hail reports per month over the past 10 years.

- **The green line represents the total hail reports during each month over the past 10 years.**
- **The red line represents hail reports >= 1 inch diameter each month over the past 10 years.**
- **The blue line represents hail reports < 1 inch diameter each month over the past 10 years.**

Notice time frame from late May to Aug

Based on climate records of hail noted in the graph above, it appears the new warning criteria may largely affect the number of late season severe hail reports (May through

Aug) since more than 50% of total severe hail reports are less than 1 inch in diameter during this time frame. This may also affect the number of severe thunderstorm warnings the National Weather Service in Charleston, SC issues if a storm is being solely assessed for the threat of hail. Keep in mind that the wind threshold of 50 knots or 58 mph has remained unchanged; therefore storms that produce hail smaller than 1 inch may still be considered severe if the wind requirement is met. For the Southeast U.S., the hail criteria change will likely have less of an impact to the number of severe thunderstorm warnings issued when compared to other places in the United States (Great Plains for example), because a large portion of severe weather reports are a result of strong winds.

WILL THERE BE ANY CHANGE TO WHAT YOU REPORT?

Spotters should continue to report hail of any size as well as the time and duration it falls to the National Weather Service in Charleston, SC. This can help meteorologists assess the potential strength or verify the severity of a thunderstorm. Any report can also provide significant lead time of dangerous weather to the public by aiding warning meteorologists who issue future severe thunderstorm warnings. Reports of hail meeting old severe thunderstorm warning criteria will still be recorded in climate records at the Storm Prediction Center and National Data Climatic Center, but will no longer verify a severe thunderstorm warning. As always, spotters should also report damage from high winds, including trees and powerlines down.

If you would like to learn more about the new hail criteria change feel free to log onto http://www.weather.gov/oneinchhail/ for more details.

"The new warning criteria may largely affect the number of late season severe hail reports (May through August)"

Mission: "Protection of Life and Property and Enhancement of the National Economy"

NATIONAL WEATHER SERVICE
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North Charleston, SC 29406

Phone: (843) 744-0303

We're on the Web!
www.weather.gov/chs

Your Report Makes a difference!

Whenever severe weather strikes, remember, as a trained weather spotter ***we want to hear from you!***

If you measure or estimate winds of 50 mph or greater, observe trees and/or power lines down, structures damaged, hail (any size), flooding (water running across the road, ditches overflowing, creeks/streams out of their banks), tornadoes, funnel clouds or waterspouts, pick up the phone and give us a call. In addition, if you see or hear of any injuries, fatalities, or damage from lightning, give us a call.

Your valuable reports help us confirm what we're detecting on radar, and could make a life-or-death difference for the people in the next town or in the next county in the path of the severe storm that just went over your home. *When in doubt,* ***please call us!***

You can reach us by calling the toll free number which we provided to you during the spotter training session you attended.

You can also leave a report on our severe weather answering machine: 1-888-383-2024.

For Forecast and Current Conditions call: 1-843-744-0303.