The Wilmington Wave

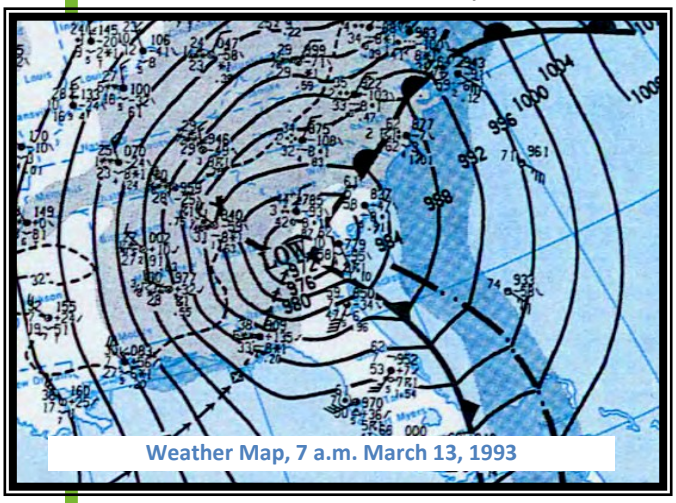
National Weather Service, Wilmington, NC

VOLUME II, ISSUE II SPRING 2013

The Superstorm of 1993: "Storm of the Century"

- Tim Armstrong

Twenty years ago one of the most powerful winter storms in U.S. history affected the nation with snow, high winds, flooding, and even tornadoes. This unprecedented weather system would become known as the Superstorm of 1993, or the Storm of the Century.



Weather Map, 7 a.m. March 13, 1993

Low pressure developed along a stalled front near the Texas Gulf coast on March 12, 1993. Over the next 24 hours the low strengthened rapidly as it moved east toward the Florida panhandle. Warm Caribbean air brought north ahead of the storm fueled a line of severe thunderstorms that produced nearly a dozen tornadoes across Florida. The low moved north through Georgia and into the eastern Carolinas during March 13th producing wind gusts of 55 to 75 mph and widespread power outages. The impact on our area was as significant as with some hurricanes. Farther inland, record amounts of snow fell from Alabama through the western Carolinas with over 18 inches reported in Asheville. Snow was accompanied by thunder in the North Carolina foothills. Five feet of snow fell on Mount Mitchell, NC, where snow would remain on the ground into the middle of April.

Location	Wind Gust (mph)
Myrtle Beach	90 mph
Holden Beach	71 mph
Wilmington	70 mph
Charleston	69 mph
Sumter, SC	63 mph
Jacksonville, NC	62 mph
Florence	58 mph
Fayetteville	55 mph
Frying Pan Shoals Tower	93 mph

Meteorologists often reference the atmospheric pressure within a storm to gauge a storm's strength. By this measure the Superstorm of 1993 was one of the strongest storm systems in the history of the Eastern United States with record low pressures recorded in Tallahassee, Columbia, Charlotte, Greensboro, and Raleigh. Hurricane Hugo just four years earlier moved directly over Columbia and Charlotte, yet the Superstorm of 1993 still broke Hugo's pressure records in these cities.

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Superstorm of 1993 - "Storm of the Century"

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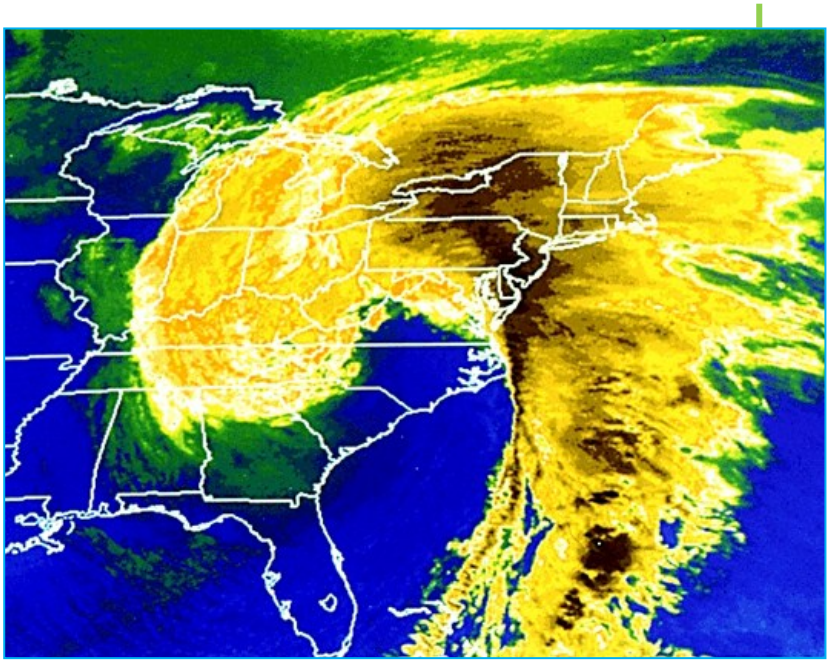
The Superstorm killed over 200 people across the Eastern United States, with additional fatalities occurring in Cuba and Eastern Canada. Around 40 percent of the population of the United States was affected by the storm, and ten million electrical customers lost power. This truly was The Storm of the Century.

For more on the Superstorm of 1993: http://www.erh.noaa.gov/ilm/archive/Superstorm93

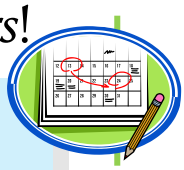


Infrared Satellite Image, 1 p.m. March 13, 1993

StormFest 2013

Fascinated by the weather? Want to learn more about severe weather? Come out and meet the area's meteorologists, emergency managers and responders to inform you about the impact severe weather can have on the lives of North and South Carolina residents. Activities, prizes and more!

Mark Your Calendars!



Myrtle Beach, SC

Saturday, April 13th, 2013

Wilmington, NC

Saturday, June 1st, 2013

Stay tuned to our website and facebook pages in the coming weeks for more information about both StormFest events!

Wilmington StormFest 2012

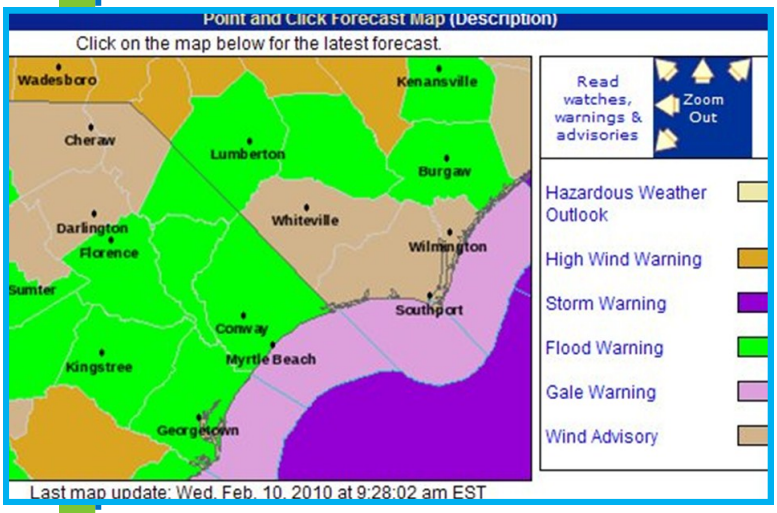
Myrtle Beach, SC StormFest 2012

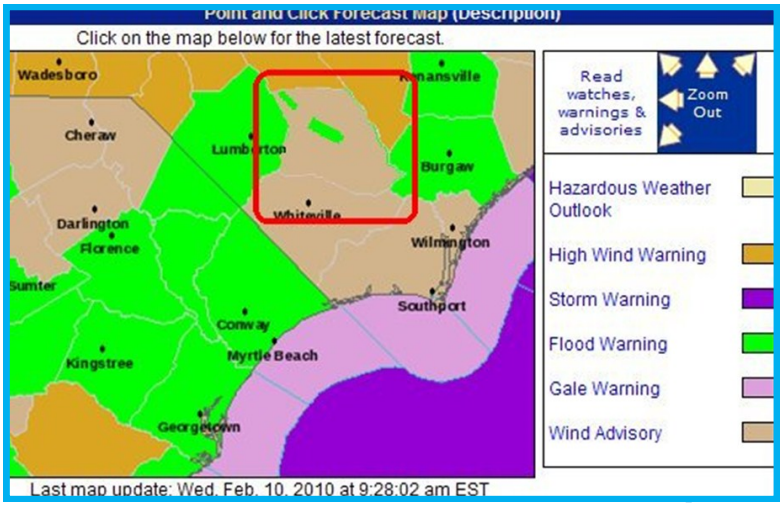
River Flood Warning Polygons

- Rick Neuherz

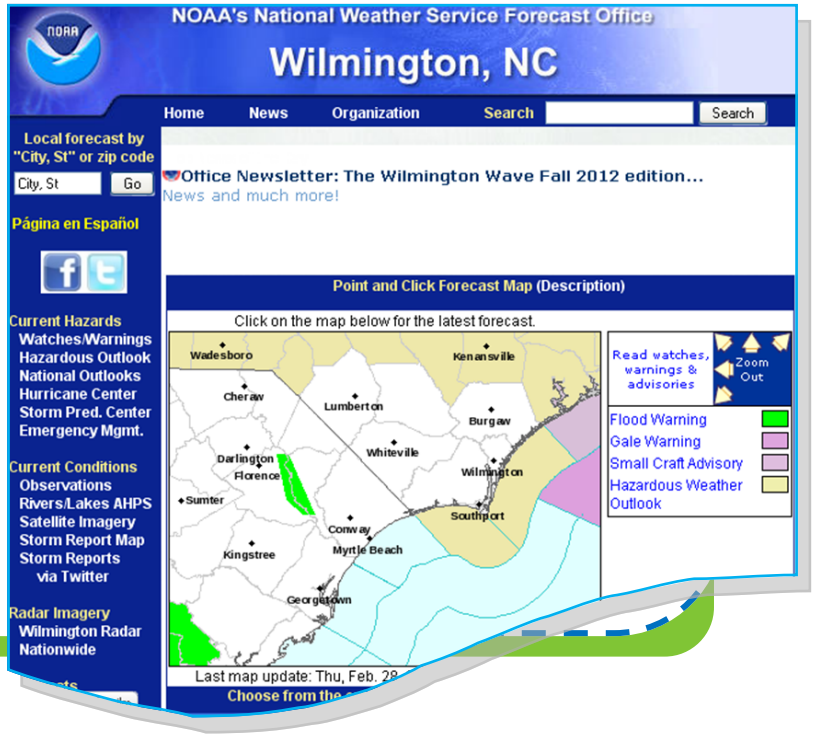
In the past, the National Weather Service issued Flood Warnings for points along rivers and creeks (River Flood Warning) with coding for the affected counties. The result was that entire counties on our forecast maps on the office internet page would be colored in green to show that there was a flood warning in effect. On the map below, you can see several counties that are colored in green due to multiple River Flood Warnings being in effect for the area. The counties colored in beige are indicating a Wind Advisory. The Wind Advisory was actually in effect for the entire area but it was masked by the River Flood Warnings in effect for our other counties.

Recently, a change was made to our main computer system to allow for the inclusion of latitude and longitude pairs to "warning polygons" for our River Flood Warnings. The effect of this is that the affected counties are no longer colored entirely in one color. This will allow users of our internet page to see other significant weather advisories and warnings for an area when a River Flood Warning is in effect. An example of this is shown below with Bladen County, North Carolina (red box) modified to show this change. You can see in the image that the beige color for the Wind Advisory is also visible.





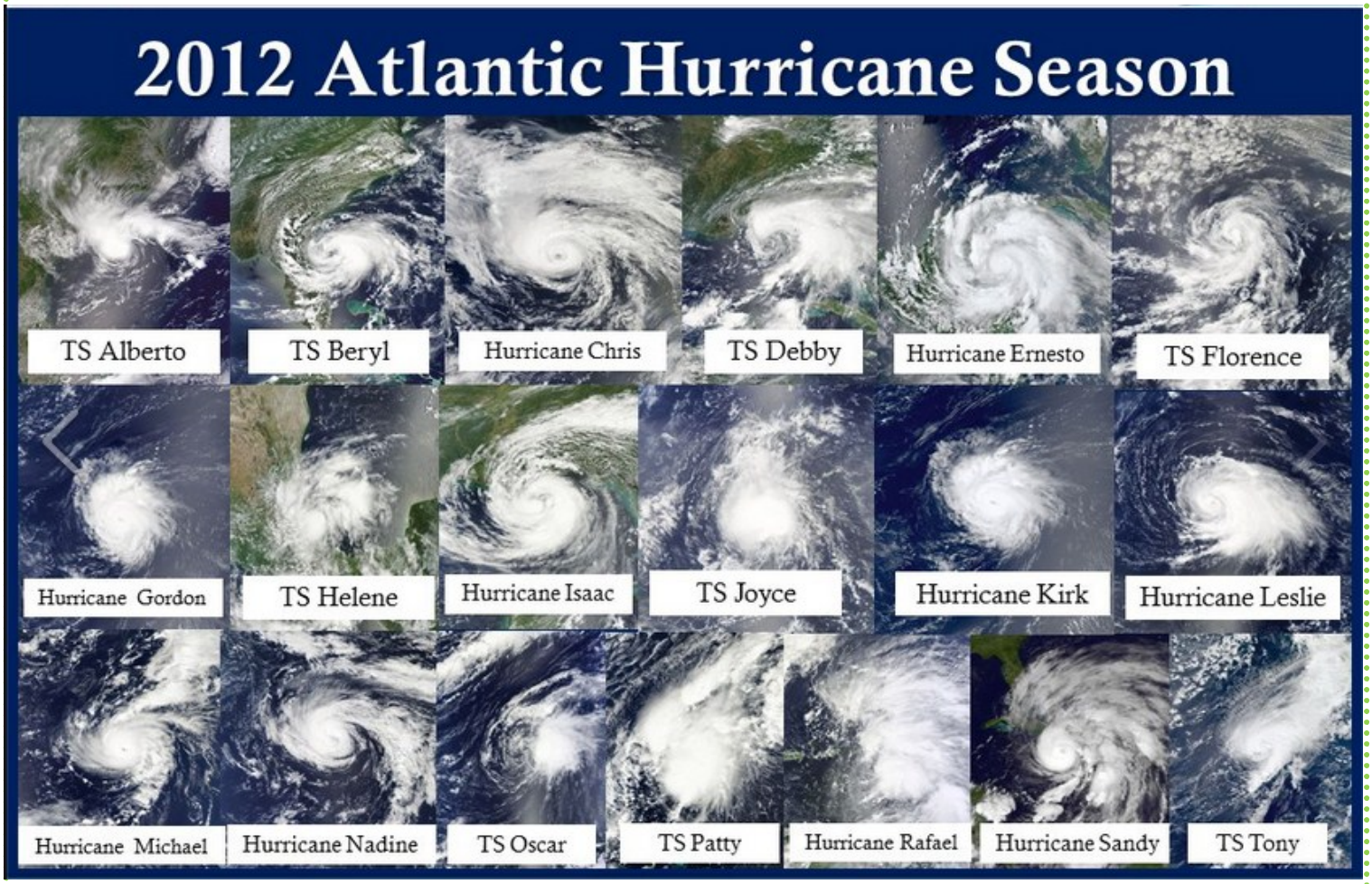
Below is a recent example of a Flood Warning issued for the Pee Dee River at Pee Dee, South Carolina as shown on our internet site. The mapped polygon covers parts of Florence and Marion Counties without covering the entirety of both counties. If other advisories or warnings were in effect, they would have been visible. It is important to note that the polygons DO NOT represent flood inundation or even exactly where the river is located. The polygon is there to reduce the footprint of the warning while encompassing affected areas but polygons for river flooding will always be larger than the area where the flood actually is occurring using our current software.



2012 Atlantic Hurricane Season Recap

- Michael Caropolo

The 2012 Hurricane season came to an end on November 30th, 2012, the season will go down tied as the third most active season on record with 19 named storms, 10 of which become hurricanes, and 2 major hurricanes. This was the third consecutive year with 19 named storms and the fifth time we recorded 19 named storms (also occurred in 1887 & 2003 in addition to 2010, 2011 and 2012). The long term average in the Atlantic basin which includes the Caribbean are 12 named storms, 6 hurricanes and 3 major hurricanes. According to the National Hurricane Center 2012 was classified as an above normal season when combining the number of storms, intensity and duration of all tropical systems. NOAA's prediction in May called for a near-normal season with 9-15 named storms, 4-8 hurricanes and 1-3 major hurricanes. After a very active August NOAA's updated predictions projected 12-17 named storms, which was still a little short of what occurred.



Some interesting facts about the 2012 season include; for only the third time in recorded history we had two tropical systems form before the official start of the hurricane season, June 1st, Alberto which formed on May 19th and Beryl which formed on May 26th. The last time this occurred was back in 1908. We also had 8 named storms formed in August, this tied 2004 for the busiest August on record. There were two major hurricane formed this season, Hurricane Michael, a Category 3 storm that formed on September 2nd, luckily it remained out over the ocean and never made landfall and Hurricane Sandy which was upgraded to a Category 3 storm when it crossed over Cuba . Sandy will also go down in the record books as the second most costly storm with near $50 billion in damages since 1900[1]. Sandy also attributed to 147 deaths across the Atlantic basin with 72 of these fatalities occurring in the mid-Atlantic and northeastern United States. This is the greatest number of U.S. direct fatalities related to a tropical cyclone outside of the southern states since Hurricane Agnes in 1972[2]. Sandy also had the distinction of producing the largest wind swath ever recorded with tropical storm force winds extending out more than 900 miles from the center.

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Locally the Wilmington and surrounding area only two threats came from Tropical Storm Beryl in late May which brushed the area as a tropical depression and Sandy which had only minor impacts on the region. Beryl did produce 3.69 inches of rain at the NWS office in Wilmington on May 30th which was a record for that day.

Only two storms developed in June and none formed in July. August produced a record tying 8 named storms, with 2 storms in September and 5 additional storms in October. The season came to an early end when tropical storm Tony dissipated on October 25th.

Numerous storms that developed this season remained out over the open ocean and were weak in intensity as well short in duration. A look at the upper levels of the atmosphere showed that a favorable jet stream across the southeast into the gulf helped to steer most of the activity away from the United States.

2012 Atlantic Basin Tropical Cyclones[3]

Type/ Cat	Name	Dates	Max Wind (mph)	Min Press (mb)	Deaths	U.S. Damage
TS	Alberto	19 – 22 May	60	995		
TS	Beryl	26 – 30 May	70	992	1	
H1	Chris	18 – 22 June	85	974		
TS	Debby	23 – 27 June	65	990	5	$210M
H2	Ernesto	1 – 10 Aug	100	973	7	
TS	Florence	3 – 6 Aug	60	1002		
H2	Gordon	15 – 20 Aug	110	965		
TS	Helene	9 – 18 Aug	45	1004		
H1	Isaac	21 Aug – 1 Sep	80	965	34	$2.35B
TS	Joyce	22 – 24 Aug	40	1006		
H2	Kirk	28 Aug – 2 Sep	105	970		
H1	Leslie	30 Aug – 11 Sep	80	968		
H3	Michael	3 – 11 Sept	115	964		
H1	Nadine	10 Sept – 3 Oct	90	978		
TS	Oscar	3 – 5 Oct	50	994		
TS	Patty	11 – 13 Oct	45	1005		
H1	Rafael	12 – 17 Oct	90	969		
H3	Sandy	22 – 29 Oct	115	940	147	$50B
TS	Tony	22 – 25 Oct	50	1000		

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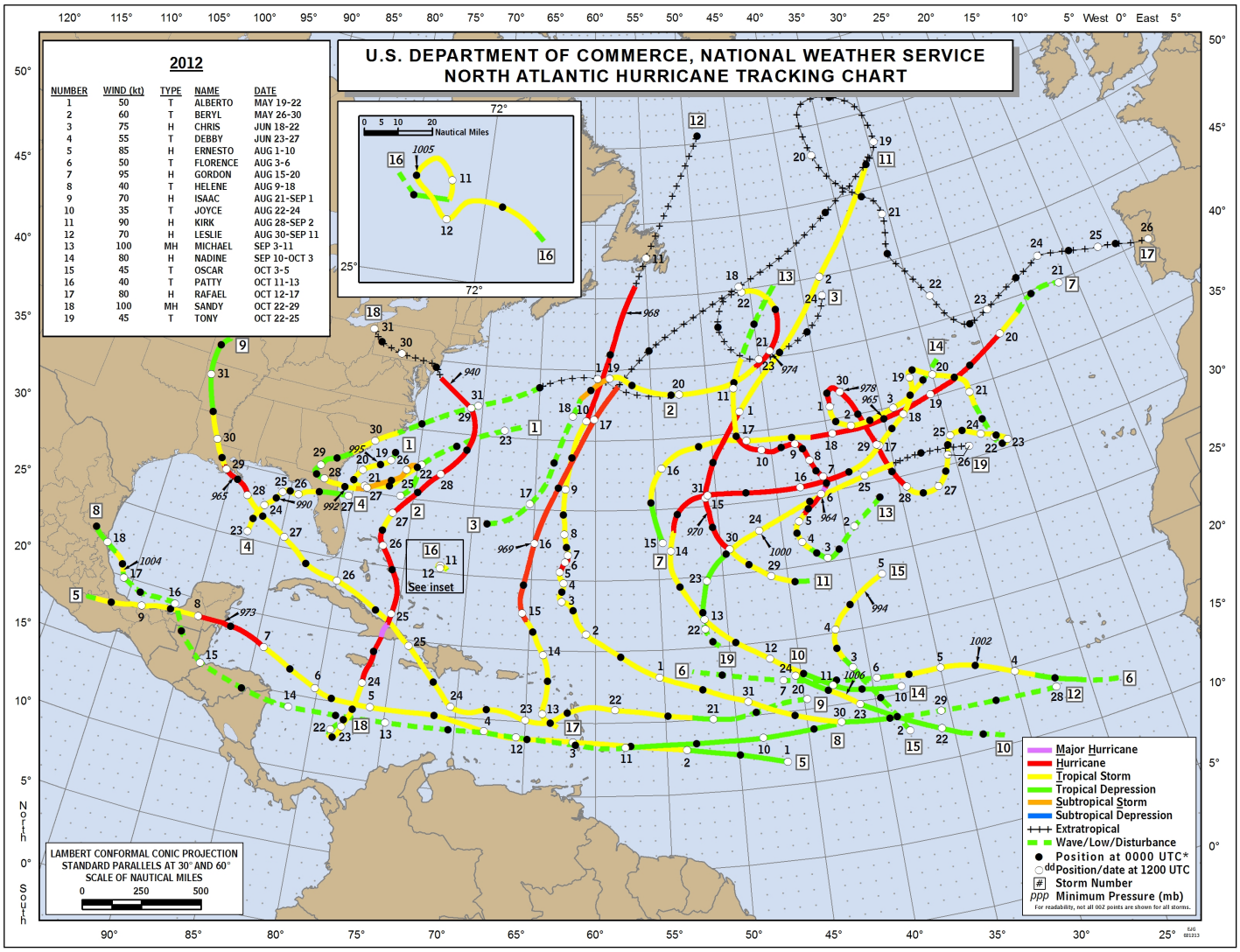
One of the most asked questions we received during the season was "Why the increased activity, especially since the seasonal outlook was calling for a quieter season?" The main reason for this was that the development of "El Nino" did not develop as the long term climatic models predicted. The summer months into the fall season we remained under the influence of a more neutral state – between El Nino and La Nina. Historically the Atlantic basin is very active when we are in this neutral state. The Atlantic basin has been in a period of above average activity than began back in the mid 1990s, these periods of above average activity usually last on the order of 25-40 years, so historically we should see another 8-23 years of above normal activity on average. This is not to say that every year will be above average but the odds favor increased activity continuing in the future. But like we always say, it only takes one hurricane to make a season bad!



Sources:

1. When not adjusted for inflation, population and wealth normalization. Sandy ranks sixth when accounting for those factors (records of costliest cyclones began in 1900).

2.Tropical Cyclone Report Hurricane Sandy. Eric S. Blake, Todd B. Kimberlain, Robert J. Berg, John P. Cangialosi and John L. Beven II, National Hurricane Center , 12 February 2013

3. From the NHC web site

When Thunder Roars, Go Indoors!

- Brad Reinhart

The warmer temperatures of springtime mean people will be returning to the outdoors for sports and recreation. The transition to the warm season also corresponds to an increased chance of thunderstorms. Although Lightning Safety Awareness Week is not until late June, now is a great time to discuss the dangers of lightning and review lightning safety.

Lightning is a serious, and often overlooked, weather hazard that poses a great risk to people in our area. From 1959-2011, 193 lightning fatalities occurred in North Carolina – third most in the U.S. behind only Florida and Texas. South Carolina reported 99 lightning fatalities during the same time period. Over 80% of all people killed by lightning are male, many between the ages of 15-40. The variety of outdoor activities available in this area – including golf, boating, and swimming at the beach – make us especially vulnerable to the dangers of lightning.

Lightning Science

What is lightning, and how does it form? Simply put, lightning is an abrupt discharge of electricity in the atmosphere. Lightning formation requires strong updrafts of air in a growing storm that carry water and ice particles aloft. Colliding ice particles within the cloud acquire positive and negative charges. The lighter, positively charged ice crystals are transported upward by the storm's updrafts. The heavier, negatively charged ice particles fall into the lower portions of the storm, and a buildup of positive charge develops on the surface below the storm (Fig. 1). When the charge differences become large, the stage is set for a lightning strike.

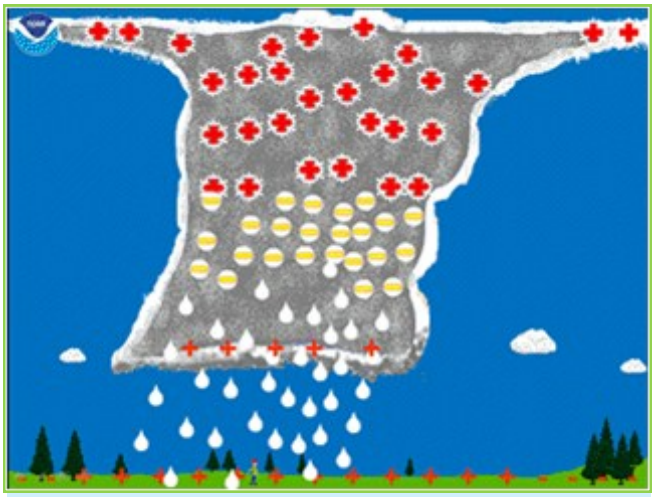


Fig. 1. The negative charge (yellow) builds up in the lower half of the storm with positive charge (red) aloft and at the surface.

Typical cloud-to-ground lightning strikes begin with a downward flow of negative charge from the storm towards the ground, known as a stepped leader. As the stepped leader approaches the surface, the air above tall objects becomes positively charged.

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When the negative stepped leader makes contact with a positive channel of air (or "upward streamer") near the surface (Fig. 2), electrical charge rapidly flows from the thunderstorm to the ground and a bright flash occurs – which is what we know as lightning (Fig. 3)!

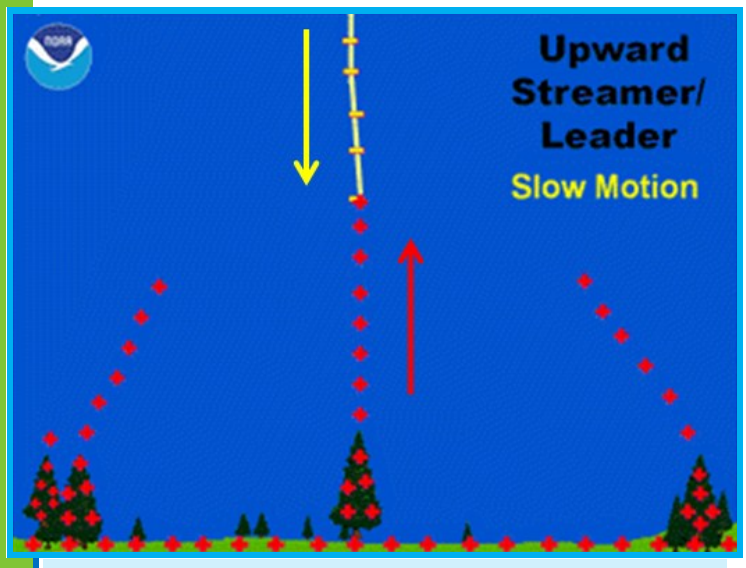


Fig. 2. The negative stepped leader (yellow) makes contact with a positive upward streamer (red), completing the lightning channel.

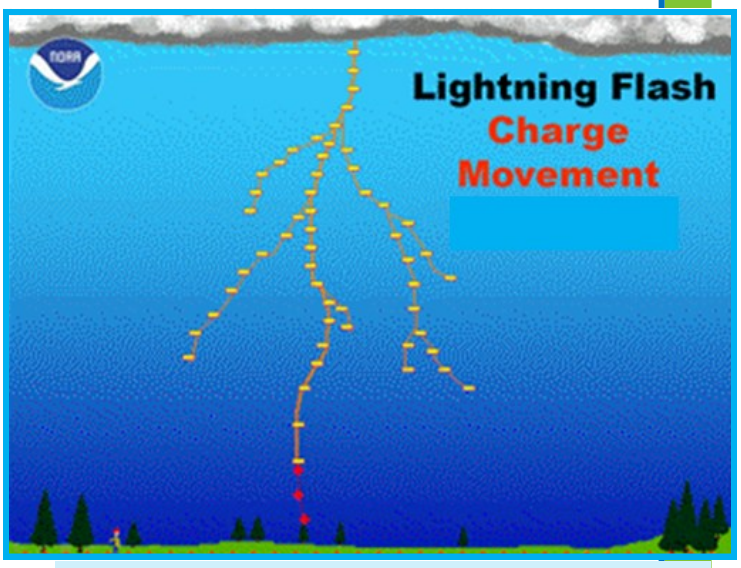


Fig. 3. The lightning flash occurs as negative charge is rapidly transported to the ground.

Lightning Safety

The most important rule of lightning safety is that NO place outside is safe during a thunderstorm. If you can hear thunder, it means that the storm is close enough for you to be potentially struck by lightning. The storm does not have to be overhead to be dangerous – in fact, lightning can strike many miles away from the parent thunderstorm. Once you hear thunder, you should immediately seek shelter in an enclosed building and remain there until 30 minutes after the last rumble of thunder. While indoors, stay away from windows and avoid contact with running water and corded appliances. If you are caught outside, avoid tall objects and open areas – but continue to seek shelter in an enclosed space. If you can't reach an enclosed building, a hard-topped vehicle is a safe alternative, as the metal frame conducts electricity into the ground.

Sadly, many lightning fatalities occur with the first or last lightning strike of a storm. So, situational awareness is crucial to ensuring your safety. Check the weather forecast each day, and know the chances for thunderstorm development before you go boating or drive to the beach. Pay close attention if you see the skies darkening in the distance, and plan ahead in case you need to quickly seek shelter. By following these simple tips, you can enjoy the outdoors and protect yourself from dangerous thunderstorms.

For more information on lightning safety, visit: http://www.lightningsafety.noaa.gov/

CoCoRaHS Needs You!

- Josh Weiss

Have you ever wondered how much rainfall you received from a thunderstorm? How about snowfall during a winter storm? Would you like to help your community by reporting your rain and snow to the National Weather Service? If so, then the Community Collaborative Rain, Hail, and Snow network, or CoCoRaHS, wants (and needs) you! CoCoRaHS is a national program, and is a collaborative effort between the National Weather Service and many other partners to increase the density of weather spotters across the country. Volunteers are being recruited during the month of March to become spotters, or the "eyes and ears" of the National Weather Service, and all are welcome to join.

CoCoRaHS came about as a result of a devastating flash flood that hit Fort Collins, Colorado in July 1997. The ensuing flood caught many by surprise and caused $200 million in damages. CoCoRaHS was born in 1998 with the intent of improving both the mapping and reporting of intense rain, snow, and hail, and has now reached all 50 states. As more volunteers participated, rain, hail, and snow maps were produced for every storm, illustrating fascinating local patterns that were of great interest to scientists and the public.

North Carolina became the 21st state to establish a CoCoRaHS network by joining the program in 2007, and won the national award for most new volunteers both in 2011 and 2012! South Carolina was the 29th state to establish a CoCoRaHS network by joining the program in 2008, and in that same year won the national award for most new volunteers. In 2012, South Carolina finished 5th in the recruiting contest.

Each day, eight to ten thousand volunteers across the country report their rain, hail, and snow observations to the CoCoRaHS website. The process takes only five minutes per day, but the impact to the community is tremendous. By providing high quality, accurate measurements, observers are able to supplement existing networks and provide important data to the National Weather Service, as well as other scientists, resource managers, and decision makers.

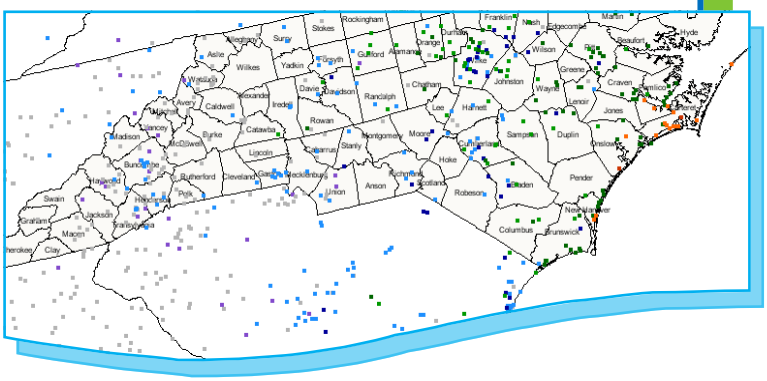
"An additional benefit of the program to the National Weather Service is the ability to receive accurate reports of significant weather. Timely reports of hail or localized flooding from volunteers can assist forecasters in issuing and verifying warnings for severe thunderstorms," says David Glenn, a meteorologist with the National Weather Service in Newport/Morehead City and the North Carolina CoCoRaHS state coordinator.

CoCoRaHS volunteers may attend a training class when offered, or take simple online training, and purchase an official rain gauge through the CoCoRaHS website. Once becoming an official volunteer, users will enter their data through the website each morning and see their rainfall plotted on a national map along with all other reports. It can be very exciting to compare reports across a small region, especially here in the Carolinas when tropical systems produce extreme amounts of rainfall.

"We don't offer a paycheck," says Dr. Hope Mizzell, South Carolina State Coordinator from SCDNR, "but by participating in the CoCoRaHS network you will make an important contribution. Providing your daily precipitation data will assist in filling in a piece of the climate puzzle that affects all South Carolinians."

If you are interested in joining the program, please visit www.cocorahs.org, or contact Josh Weiss, meteorologist at the National Weather Service in Wilmington and CoCoRaHS regional coordinator at 910-762-4289.

Weiss commented, "We are in need of new observers across the Carolinas, and the more dense our spotter network, the more prepared we can be for severe weather. Our mission is to protect life and property, and we can do a better job of that with the help of our volunteers."



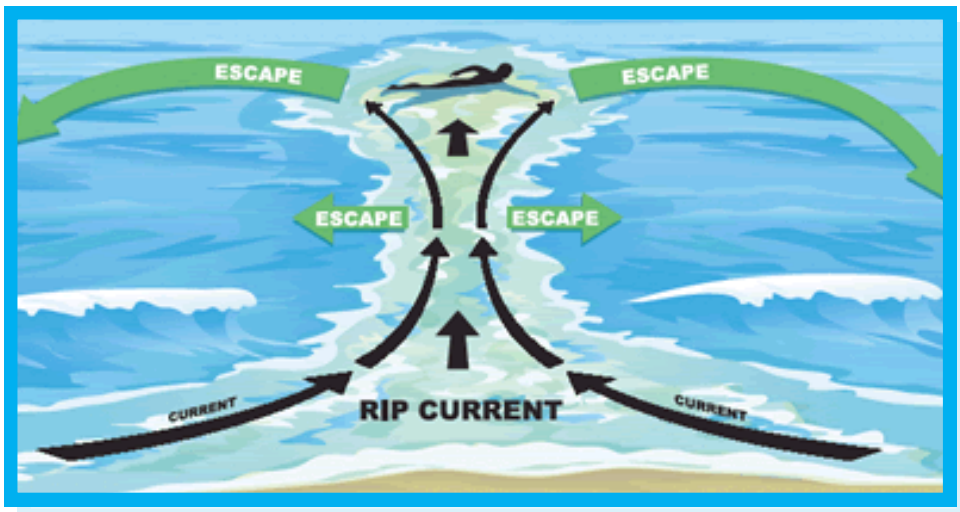
Measurements each day are plotted on a map!

Rip Currents: Break the Grip of the Rip!

- Brad Reinhart

The Carolina beaches are a popular destination for locals and tourists to cool off when the temperatures rise. As beach season quickly approaches, it is important to remember the dangers that rip currents pose to swimmers of all ages and skill levels.

Rip currents form as breaking waves create a build-up of water near the shoreline. The excess water must go somewhere, and sometimes it returns to the sea as a narrow, rapid current of water flowing away from shore. This feature is known as a rip current. These currents are fairly common at our local beaches. Rip currents vary in strength, and sometimes they are too weak to pose a significant hazard. However, strong rip currents can travel at speeds over 5 mph – which is even faster than Olympian Michael Phelps can swim!



Safest way to escape if you are caught in a rip current.

From the shore, rip currents may look like discolored areas of churning water, possibly carrying seaweed or debris out to sea. However, they are not always this easy to spot. Strong onshore winds provide a favorable environment for rip current formation. Dangerous rip currents become more likely as larger, longer period waves move towards the coast. Stronger rips are also more prevalent around low tide and near jetties and piers.

When visiting the beach, remember to NEVER swim alone. Always try to swim in areas monitored by a lifeguard. If you get caught in a rip current, do NOT try to swim against it. This will only wear you out and make you more susceptible to drowning. Instead, swim parallel to the shore in order to move yourself outside of the narrow current. Once you are outside of the rip, swim back to shore at an angle away from the current. If you can't break the rip or become too tired, tread water and get the attention of people onshore by waving and yelling.

NWS Wilmington provides daily surf zone and rip current forecasts for our local beaches in North and South Carolina beginning in the spring. This includes a daily assessment of the rip current risk as "low", "moderate", or "high." A low risk means that wind and wave conditions are not expected to support rip current formation (although infrequent rips may still occur). A high risk indicates that conditions support dangerous, life-threatening rip currents. All beachgoers should understand the daily risk of rip currents before they get into the water. For more information, please visit our website http://www.erh.noaa.gov/ilm/ and click on the rip current forecast link on the left side of the page.

NWS Wilmington NC Attends 2013 Cape Fear Wildlife Expo

- Stephen Keebler and Brad Reinhart

The National Weather Service in Wilmington, North Carolina attended the 2013 Cape Fear Wildlife Expo on Friday, March 15 and Saturday, March 16. The NWS booth was manned by Meteorologist Intern Brad Reinhart and General Forecaster Stephen Keebler both days. The office's tornado simulator drew many outdoor enthusiasts and students to the booth, where they learned about lightning and tornado safety.

On Friday, approximately three hundred fourth to eighth grade school children, teachers, and other adults visited the display. The students walked away with mini-tornadoes, which were provided by the office after the students completed a brief quiz on tornado or lightning safety. Special emphasis was placed on distinguishing between a tornado watch and warning. Lightning safety was heavily promoted as well, especially since North Carolina has the 3rd most lightning fatalities of any state since 1959.

Saturday was likely the busiest day of the event, and many families flocked to the NWS booth. Another three to four hundred children and adults stopped by the display. Many came by to view the tornado simulator and earn a mini-tornado, while others offered compliments or made inquiries about topics including NOAA weather radio and the upcoming hurricane season.

"It was one of the most successful outreach events I have worked," explained Stephen Keebler. Brad Reinhart echoed those sentiments, "It felt good to discuss weather safety with so many people who are at risk because they spend lots of time outdoors."

NWS meteorologists Brad Reinhart (left) and Stephen Keebler (right) visit with attendees of the 2013 Cape Fear Wildlife Expo.

Severe Weather Terminology

With severe weather right around the corner, it's time to make sure your prepared! This includes knowing important terminology!

What is the Difference between a funnel cloud and a tornado?

*A **funnel cloud** is a rotating column of air that extends from the base of a storm cloud that does not make contact with the ground.*

*A **tornado** is a violently rotating column of air that extends from the base of a storm cloud and makes contact with the ground.*

For more helpful severe weather information, check out our 2013 Severe Weather Awareness Page!

http://www.weather.gov/ilm/swaw

We're now on Twitter!!

Be sure to follow us!

@NWSWilmingtonNC

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The Wilmington Wave
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