Carolina SkyWatcher

National Weather Service, Newport/Morehead City, NC

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Fall 2015 Edition

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Strong El Nino Likely to Last Into Next Year

According to an updated forecast issued by NOAA (National Oceanic and Atmospheric Administration), there is an 90 percent chance of El Nino lasting through this upcoming winter, with an 80 percent chance of El Nino holding on into the early Spring of 2016.

El Niño is an anomalous, yet periodic, warming of the central and eastern equatorial Pacific Ocean (see figure below). Precipitation and temperature impacts from a moderate-to-strong El Niño are typically most noticeable during the colder months. There's also an increasing chance this El Niño may become strong, perhaps the strongest since the 1997-1998 episode. In terms of El Nino impacts for the cool season, typical impacts include wetter conditions for the Carolinas and portions of the East Coast. Another impact of El Nino is increased wind shear in the tropical Atlantic Basin, which is one factor – along with dry air – that limits the development and strengthening of tropical cyclones. Keep in mind, even with a reduction in the number of storms, it only takes one storm to produce major impacts to our area.

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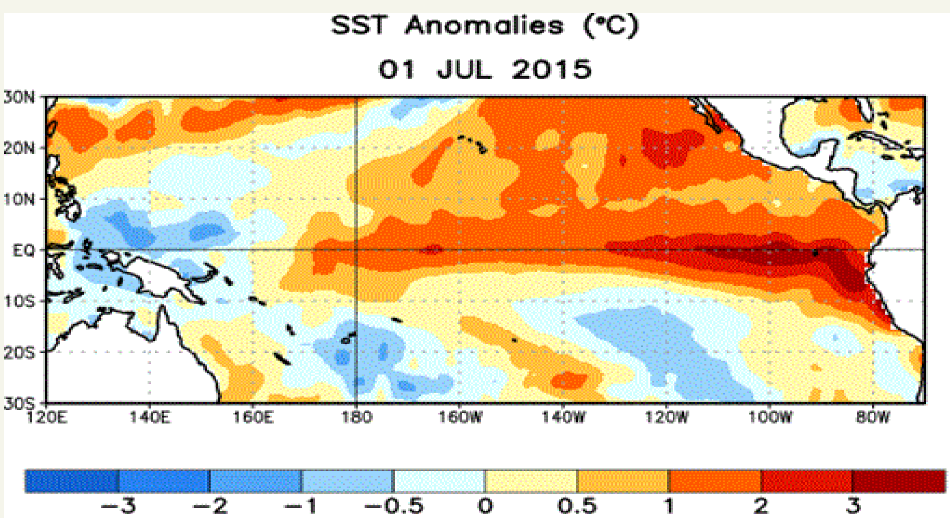


Average Sea Surface Temperature anomaly on July 1, 2015 showing much above normal water temperatures over the eastern equatorial Pacific Ocean.

Tsunami Threats on the East Coast and Tsunami-Ready

By John Cole, Meteorologist

Although the risk is extremely small, tsunamis are possible on the East Coast of the United States from a variety of sources. The most likely source for an East Coast tsunami would be an underwater landslide along the continental slope. An offshore earthquake of magnitude 4.5 or above could cause submarine landslides and create a dangerous localized tsunami. A 7.2-magnitude earthquake off the southern coast of Newfoundland in 1929 caused a large underwater landslide that created a large wave that rushed ashore killing 28 people on the island. The waves were up to 26 feet high until some reached narrow inlets, where they grew to 43 feet. While the tsunami was catastrophic for Newfoundland, it created only small waves for most of the U.S. coast and didn't cause any fatalities in the U.S. That's typical of tsunamis from submarine landslides: They tend to be large for nearby areas but quickly taper off. There are many areas along the continental slope at risk for these submarine landslides.

In the northeast Caribbean, the Puerto Rico trench has a subduction zone capable of producing a small tsunami along the east coast. Another possible source for East Coast tsunamis is the Azores-Gibraltar Transform Fault along the mid-Atlantic Ridge, off the coast of Portugal. One massive earthquake along this fault in 1755 caused a tsunami that destroyed most of Lisbon, and was felt as far away as Brazil. However, it was barely noticed on the East Coast likely dampened by underwater mountains west of Portugal slowing the waves, and disrupting their movement. The Canary Islands, off the African coast, present a possible hazard. One large volcano on the island of La Palma, called Cumbre Vieja, could erupt, collapse and create a large tsunami capable of reaching the East Coast. Likely the wave would not exceed several feet in height by the time it reached North America.

Schools, playgrounds, hospitals, factories and homes are often built in areas vulnerable to tsunamis. The TsunamiReady Program, developed by the National Weather Service, is designed to help cities, towns, counties, universities and other large sites in coastal areas reduce the potential for disastrous tsunami related consequences. TsunamiReady helps community leaders and emergency managers strengthen their local operations, so that these communities are better prepared to save lives through better planning, education and awareness. Communities have fewer fatalities and property damage if they plan before a tsunami arrives. No community is tsunami proof, but TsunamiReady can help minimize loss to communities.

Tsunami Threats (Continued)

We currently have one TsunamiReady county in our 15 County Warning Area in eastern North Carolina. Onslow County was the first TsunamiReady county in the state of North Carolina, and Camp Lejeune the very first TsunamiReady military installation in the country, both designated in 2006.

The National Tsunami Warning Center in Palmer, Alaska monitors the Atlantic for seismic events and issues tsunami warning, advisory, and watch information statement, and cancellation products for the southern and eastern United States. The WC/ATWC issues tsunami warnings, advisories, and watches for earthquakes with magnitudes greater than 6.4 If a Tsunami Watch, Warning, or Advisory were to be issued, by the National Tsunami Warning Center for our area, NWS Newport/Morehead City would immediately activate the Emergency Alert System (EAS), tone alert NOAA Weather Radio coastal transmitters, and broadcast the pertinent tsunami information. Following EAS activation we would issue special weather statements on a regular basis, during the event, containing pertinent follow-up local information relayed by the National Tsunami Warning Center.

See the following link for additional information on the Tsunamis and the NWS TsunamiReady program.

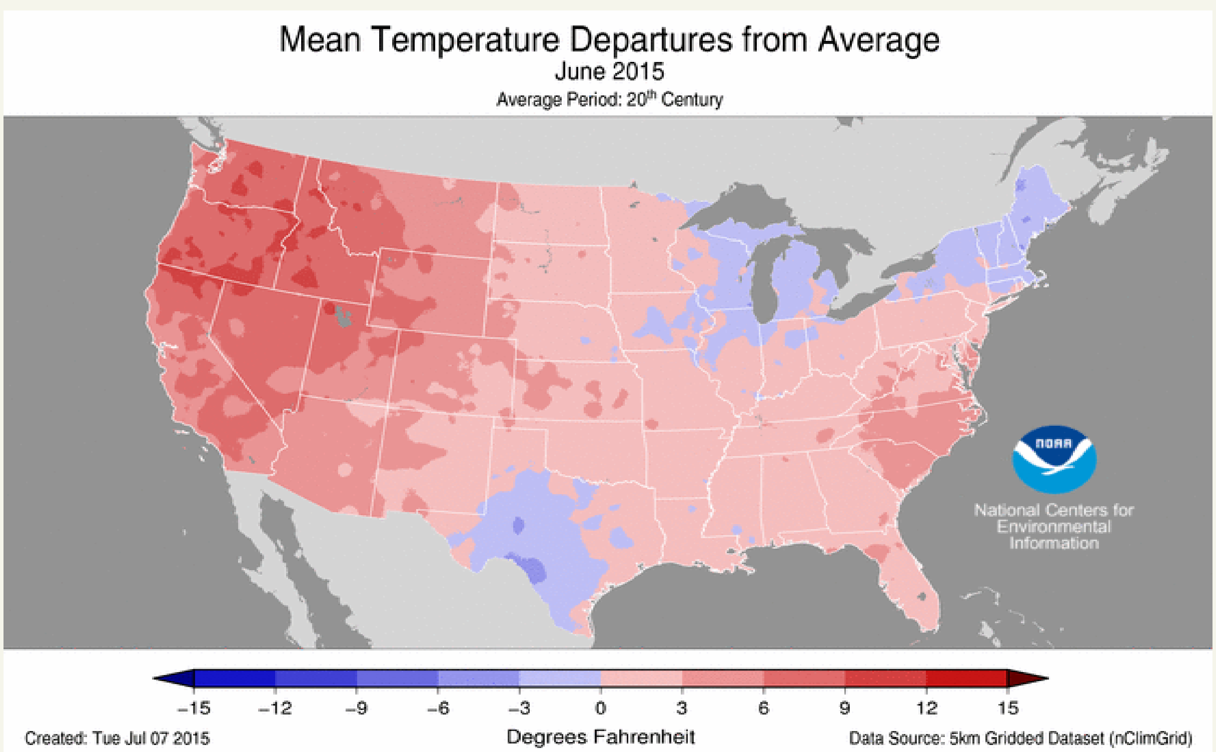
http://www.tsunami.gov

June 2015, One of the Warmest on Record

By Chris Collins, Meteorologist

A strong subtropical ridge of high pressure dominated the Carolina coast for much of the final two-thirds of the month of June 2015, resulting in persistent heat and humidity across eastern North Carolina. The result was the third warmest June over the past 20 years here at the National Weather Service Newport/Morehead City with a mean temperature of 78.5 degrees, only June 1998 and June 2010 were warmer. Numerous record highs were established across eastern North Carolina during the month. Some of the highest temperatures included 100° at New Bern, Greenville and Richlands and 98° at Newport, all on June 16th. After issuing no Heat Advisories during the summers of 2013 and 2014, numerous Heat Advisories were issued by the Newport NWS office in June 2015.

Nationally, the June 2015 contiguous U.S. maximum temperature was 83.6°, which was 2.2° above normal and the 14th warmest on record. The heat was not limited to the eastern United States in June. Several western cities set new all-time June temperatures records due to an intense heat wave in the second half of June, including Boise, Idaho where the temperature soared to 110° on June 28th.



Temperature Departures from Average for June 2015, showing above normal temperatures for much of the Carolinas. (Graphic courtesy National Centers for Environmental Information)

New Radar Technology Field-Tested at NWS Newport

By Hal Austin, Meteorologist

The Doppler radar here at Newport is one of 13 National Weather Service radars in the nation field testing software to further improve its ability to detect severe weather. It's called Multiple Elevation Scan Option for SAILS, or MESO-SAILS. MESO-SAILS takes an existing technology and makes it even better!

In 2014, Supplementary Adaptive Intra-volume Low-level Scan or SAILS software was installed in all NWS radars. When storms are occurring, the radar scans the atmosphere at 14 different elevations every 4 minutes, beginning at 0.5° and ending at 19.5°. SAILS inserts one additional 0.5° scan in the middle of each volume scan, improving low-level resolution.

MESO-SAILS allows the radar operator to choose 1, 2 or 3 additional 0.5° scans! When the 3-scan option is chosen, 0.5° scans will be available, on average, every 75 to 90 seconds. This further improves low-level resolution vital to detecting severe weather, such as tornadoes, damaging downburst winds and tropical systems, and further enhances forecast and warning support.

The field test began in mid-July and is expected to last up to one year, before being installed in all NWS radars in 2016.

Skywarn Recognition Day 2015

By Hal Austin, Meteorologist

Skywarn Recognition Day 2015 will be held from 7 pm Friday, December 4th to 7 pm Saturday, December 5th. Skywarn Recognition Day is an annual event started in 1999 by the National Weather Service (NWS) and the American Radio Relay League (ARRL). It celebrates the contributions that volunteer Skywarn radio operators make to the National Weather Service. During the 24-hour event, ham radio operators come out to NWS offices and try to make as many contacts as possible with other NWS offices as well as other hams in general. All amateur radio bands are used.

The NWS and the ARRL both recognize the importance that amateur radio provides during severe weather. Many NWS offices acquire real time weather information from amateur radio operators in the field. These operators, for example, may report the position of a tornado, the height of flood waters, or damaging wind speeds during hurricanes. All of this information is critical to the mission of the NWS which is to preserve life and property. The special event celebrates this special contribution by amateur radio operators.

In years past, many members of the Carteret County Amateur Radio Society as well as other amateur radio clubs in the area have come out to our office and took turns operating the NWS radios (callsign WX4MHX). At the same time, hams also operated their own radios from our conference room, as well as from a mobile station in a portable trailer parked outside next to the office and even their own personal vehicles. It has always been a busy but very fun day, and this year will be no different! For the latest information including operating procedures, participating NWS offices, as well as stats, pictures and news stories from past events, go to hamradio.noaa.gov.

My Time at the Weather Prediction Center

By Rich Bandy, Meteorologist-in-Charge

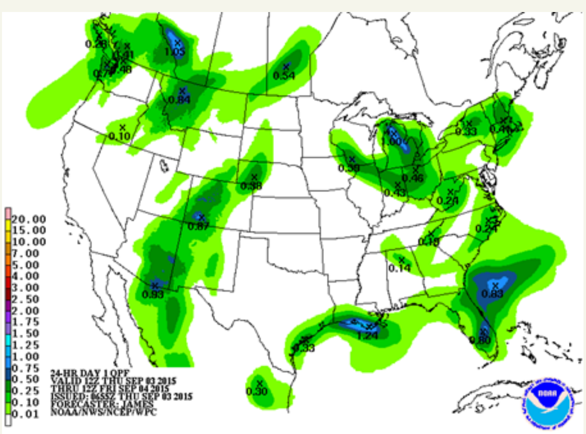
While my routine job is serving as the Meteorologist-in-Charge at the National Weather Service here in Newport, NC, I recently had the pleasure to temporarily assume the duties of the Forecast Operations Branch Chief at the Weather Prediction Center (WPC), in College Park, MD from March through June of 2015. WPC is one of several centers that are part of the National Centers for Environmental Prediction (NCEP). Other centers that you may be familiar with include the Storm Prediction Center and National Hurricane Center. I was lucky enough to start my career with the National Weather service with the WPC group that was named the Hydrometeorological Prediction Center at the time.

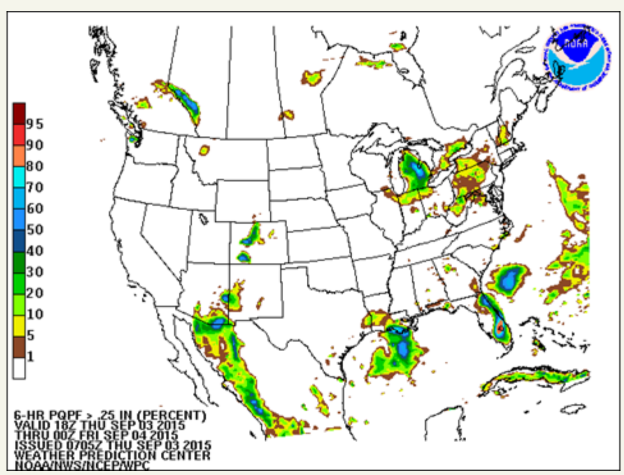
WPC produces forecasts that cover the entire nation. They perform routine surface analysis and forecasts of general weather and precipitation through 7 days. Their expertise as a national center lies in what we call medium range forecasting, which is in the Day 3 to 7 time period, heavy precipitation forecasting, and winter weather precipitation forecasting.

Above is the exterior of the NOAA Center for Weather and Climate Prediction (NCWCP) in College Park Maryland. NCWPC is home to WPC. It is also the home of NCEP Leadership, The Ocean Prediction Center, The Climate Prediction Center, and the Environmental Modeling Center among other tenants.

My Time at the Weather Prediction Center (Continued)

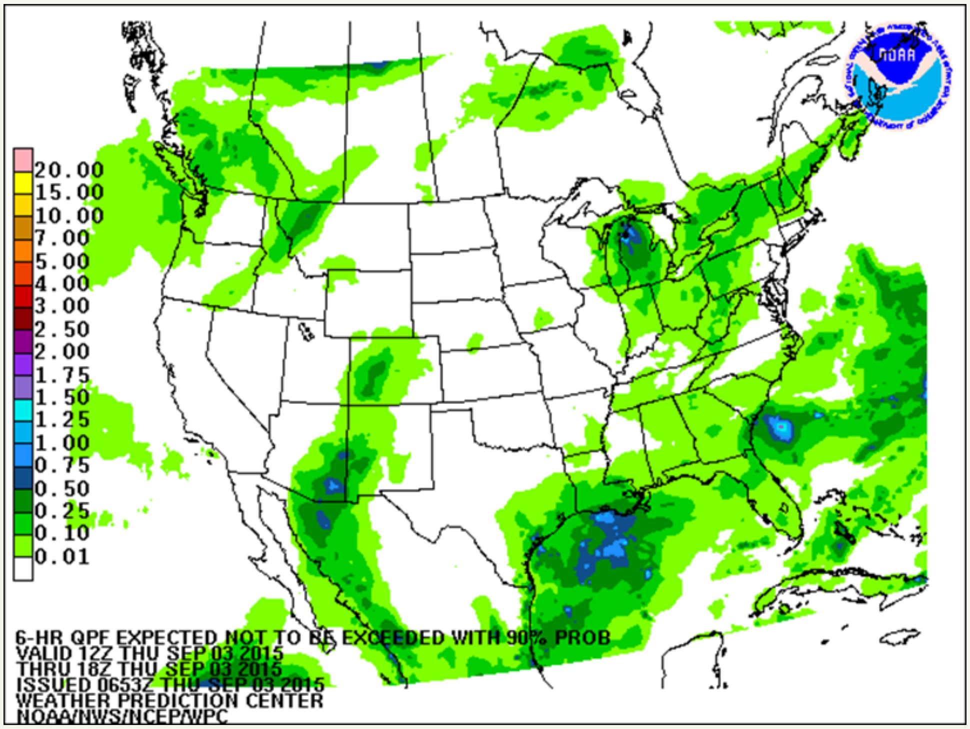
In the medium range, WPC forecasters specialize in analyzing weather trends across the entire Northern Hemisphere, then applying that analysis to a plethora of ensemble computer forecasts produced by models run by the United States, United Kingdom, Europe, and Canada. They devote all their time to understanding how these models perform to provide the best forecast possible, and provide the information to the public as well as forecasters in local National Weather Forecast Offices (WFOs) who can take their forecast and apply local knowledge to refine it. Just like SPC focuses on severe thunderstorms and NHC on hurricanes, WPC has a focus on heavy rainfall forecasts, as well as winter weather forecasts of ice and snow accumulations. As with the medium range, they have forecasters who focus on just these specialties to produce the best forecast possible. They share this expertise publicly and with local WFOs. They focus on the day one through three time period for very detailed forecasts of rainfall amounts, and highlight areas where flash flooding is possible. They produce what we call "deterministic" forecasts of exact rainfall amounts, as well as probabilistic forecasts that a certain amount of rainfall is possible. That helps to highlight areas at risk, as much like in forecasting an exact hurricane track, there is a great deal of uncertainty in exactly where convective heavy rains will fall. They also highlight areas at risk within the next several hours to flash flood producing rains through their Mesoscale Precipitation Discussions and their associated graphics.





Above is an image of the deterministic quantitative precipitation forecast (QPF) on the left, versus the probabilistic QPF forecast for more than a quarter inch of rain. WPC produces probabilistic QPF forecasts in intervals up to 3 or greater.

My Time at the Weather Prediction Center (Continued)



Similar to a storm surge exceedance forecast, WPC also produces probabilistic percentile QPF forecasts. Above is a 90th percentile forecast, showing the amount of precipitation that it would be unlikely to exceed 90% of the time. This could be considered a reasonable worst case forecast.

Uncertainties apply to winter weather also, which has many more variables involved in the forecast. The probabilistic forecasts are very important to assist decision makers in understanding their potential threat. WPC forecasters work closely with local NWS WFOs to collaborate on snowfall forecasts and they produce probabilistic forecasts of ice and snow as well. This past season they did a record amount of collaboration with local offices for several high impact snowstorms.

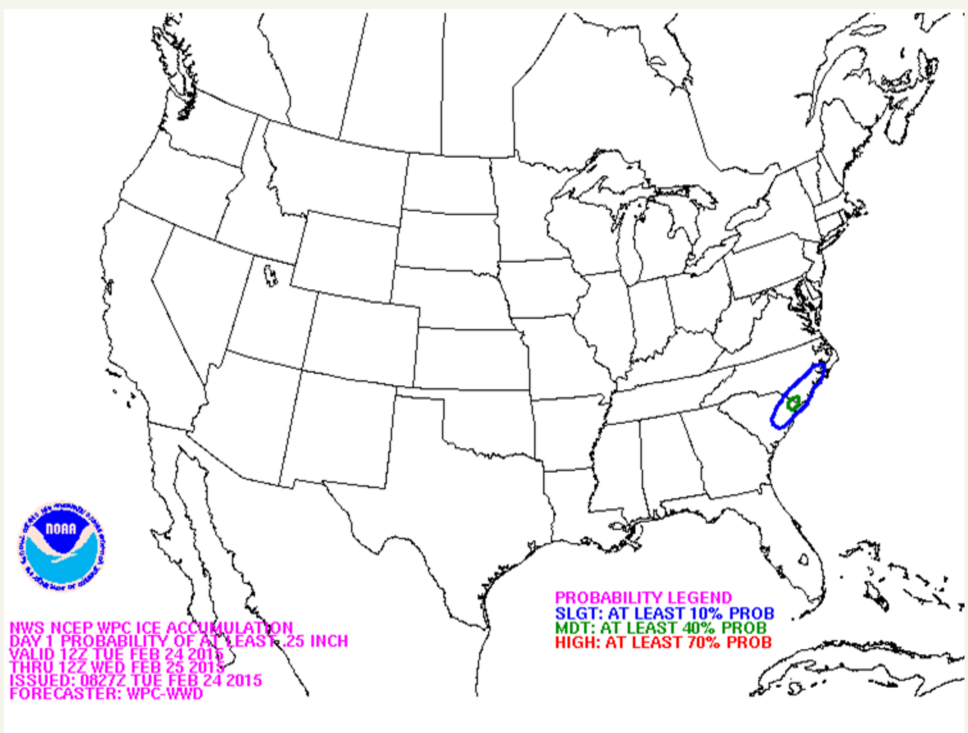
WPC's Forecast Operations Branch is made up of more than 30 very dedicated operational forecasters who work around the clock just like we do in the local NWS WFOs. In addition to those routine duties I described, they also maintain a presence on social media, and perform special briefings to national media, FEMA, and the US Army Corps of Engineers and River Forecast Centers.

My Time at the Weather Prediction Center (Continued)

WPC also has a group of dedicated developers who are on the leading edge of creating new modeling and forecasting techniques that can be applied at WPC and in the local WFOs. Each year they host visiting forecasters to take part in experimental heavy rainfall and winter weather forecast experiments, which results in new tools and forecast methods. WPC also hosts visiting forecasters from South America and the Caribbean to both train and exchange information.

I was honored to get a change to work with the amazing WPC forecasters and their Director Dr. David Novak for a few months. I encourage anyone interested in the weather to check out their website and become familiar with their wide range of useful products.

Weather Prediction Center website: http://www.wpc.ncep.noaa.gov/



Above is a probabilistic forecast of greater than a quarter inch of Ice from this past February. During the winter weather season, higher resolution probabilistic snow and ice accumulation graphics are available on the WPC website.

Student Volunteers Summer 2015

By Casey Dail, Meteorologist

This summer our staff had the privilege of getting to know and work with three college students: Caitlin Amos, Samantha Connolly, and Sarah Schulte. Caitlin is a senior at North Carolina State University. She worked on a collaborative research project with the NOAA Lab in Beaufort, NC. She looked at synoptic and mesoscale weather patterns that resulted in low flow days at the Pivers Island Bridge, which impacted their sampling of ichthyoplankton. They were interested in specific weather conditions that contributed to the low flow events. Her research will be used by the scientists at the NOAA Lab with their future plankton studies.

Samantha is a senior at Millersville University in Pennsylvania. We were lucky enough to have Sam with us last summer as well. This summer she continued her work on outreach related projects for the office. She created a video on how to navigate the new NWS website, as well as a presentation on weather for elementary schools. She also created a new office tour for our website.

Sarah is a senior at the Georgia Institute of Technology. Sarah looked at past snowfall events to establish a benchmark for significant snowfall events across the area. She also looked at model temperatures biases during winter weather events. Her research will be used to improve synoptic pattern recognition and winter weather forecasts in Eastern North Carolina.

In addition to completing their individual research projects, each student spent many hours shadowing the forecast staff in operations: from launching weather balloons to assisting with forecast updates. They also assisted with surveys and outreach events across Eastern North Carolina. These experiences have reaffirmed each's desire to pursue meteorology and possibly work for the National Weather Service. We would like to thank these three again for their hard work and wish them best of luck with their future endeavors!

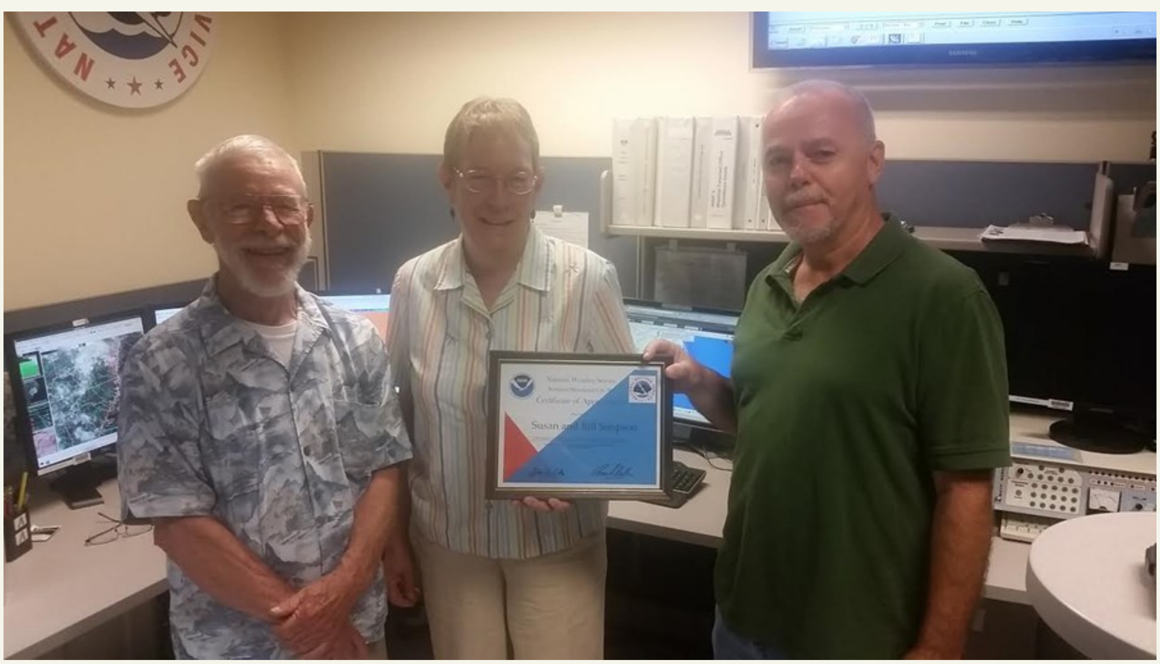
L to R: Caitlin Amos, Sarah Schulte, Samantha Connolly

Certificate of Appreciation for Volunteer Water Level Observers

By Brian Cullen, Meteorologist

In June 2015, Susan and Bill Simpson were presented with a Certificate of Appreciation at the National Weather Service office in Newport/Morehead City NC. The Simpsons have been volunteer water level observers for the NWS office in Newport since the program's inception in 2008. The volunteer water level observer program has enlisted both public and private organizations, and in some cases, individual citizens to observe and record water levels at specific locations. The water level readings are an invaluable source of information when storms of both tropical and non-tropical origin affect the North Carolina coast. The data is used to analyze how water level rise and storm surge impact locations along the coast, and also to verify watches, warnings, and advisories that are issued by the NWS office in Newport during tropical and non-tropical storms.

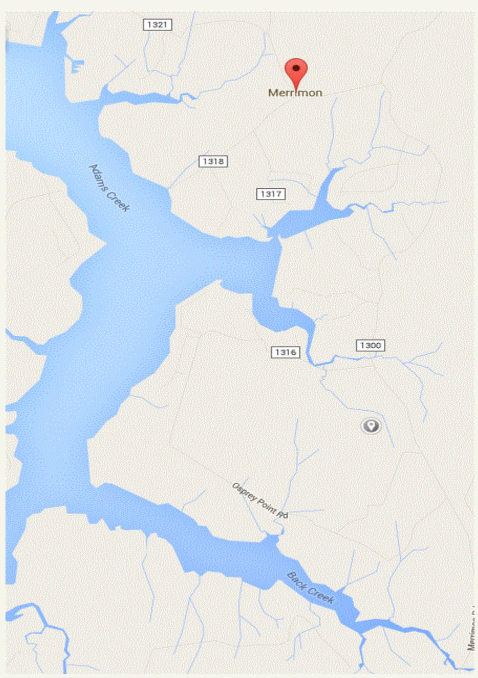
Susan and Bill live on Back Creek near Merrimon NC. They were provided a staff gage that has been placed in the creek near their home, and they monitor the gage and call the NWS office with their readings. The Simpsons have observed water levels estimated to be as high as 9 feet above the normal water level at the creek which occurred during Hurricane Irene in August of 2011. A picture of the gage in Back Creek is included below, the red line above the staff gage representing the highest water level during Hurricane Irene. Thanks to Susan and Bill for their years of dedication in providing the NWS in Newport with reliable, ground truth water level readings!



Brian Cullen presents Susan and Bill Simpson with Certification of Appreciation

Volunteer Water Level Observers (Continued)

Water level staff gage on Back Creek at the Simpson residence. The red line above the gage is the highest water level during Hurricane Irene in 2011.



Location of Back Creek, south of Merrimon, NC

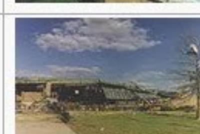
The Enhanced Fujita Scale

By Chris Collins, Meteorologist

The Enhanced Fujita scale (EF-Scale) rates the strength of tornadoes in the United States and Canada based on the damage they cause. The original Fujita scale was introduced in 1971 by Tetsuya Theodore Fujita, before being replaced by the Enhanced Fujita scale in February, 2007.

The scale has the same basic design as the original Fujita scale—six categories from zero to five, representing increasing degrees of damage. It was revised to reflect better examinations of tornado damage surveys, so as to align wind speeds more closely with associated storm damage. It also adds more types of structures and vegetation, expands degrees of damage, and better accounts for variables such as differences in construction quality. As with the Fujita scale, the Enhanced Fujita scale remains a damage scale and only a proxy for actual wind speeds.

Here is a graphic describing the Enhanced Fujita or EF-scale.

Scale	Wind speed		Relative frequency	Potential damage	
	mph	km/h			
EF0	65–85	105–137	53.5%	Minor damage. Peels surface off some roofs; some damage to gutters or siding; branches broken off trees; shallow-rooted trees pushed over. Confirmed tornadoes with no reported damage (i.e., those that remain in open fields) are always rated EF0.	
EF1	86–110	138–178	31.6%	Moderate damage. Roofs severely stripped; mobile homes overturned or badly damaged; loss of exterior doors; windows and other glass broken.	
EF2	111–135	179–218	10.7%	Considerable damage. Roofs torn off well-constructed houses; foundations of frame homes shifted; mobile homes completely destroyed; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.	
EF3	136–165	219–266	3.4%	Severe damage. Entire stories of well-constructed houses destroyed; severe damage to large buildings such as shopping malls; trains overturned; trees debarked; heavy cars lifted off the ground and thrown; structures with weak foundations blown away some distance.	
EF4	166–200	267–322	0.7%	Extreme damage to near-total destruction. Well-constructed houses and whole frame houses completely leveled; cars thrown and small missiles generated.	
EF5	>200	>322	<0.1%	Massive Damage. Strong frame houses leveled off foundations and swept away; steel-reinforced concrete structures critically damaged; high-rise buildings have severe structural deformation. Incredible phenomena will occur.	

National Weather Service

530 Roberts Road
Newport, NC 28570

Phone: 252-223-5122
Fax: 252-223-3673
Website: http://weather.gov/Newport
Twitter: @NWSMoreheadCity
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