



# Carolina SkyWatcher



National Weather Service, Newport/Morehead City, NC

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Fall 2018 Edition



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## Historic Hurricane Florence

*By Chris Collins, Meteorologist*

Hurricane Florence was a long-lived Cape Verde hurricane and the wettest tropical cyclone on record in the Carolinas. The sixth named storm, third hurricane, and the first major hurricane of the 2018 Atlantic hurricane season, Florence originated from a strong tropical wave that emerged off the west coast of Africa on August 30, 2018. Florence became a tropical depression near Cape Verde on August 31 and progressed west-northwest, becoming a Tropical Storm on September 1. Florence strengthened rapidly on September 4–5, becoming a Category 4 storm on the Saffir-Simpson wind scale with maximum sustained winds of 130 mph. Florence weakened to a tropical storm by September 7, but the system regained hurricane strength on September 9 and major hurricane status with winds of 140 mph on September 10. However, increasing wind shear caused the storm's winds to gradually weaken over the next few days. However, the storm's wind field continued to grow. By the evening of September 13, Florence had been downgraded to a Category 1 hurricane. Hurricane Florence made landfall near Wrightsville Beach early on Saturday September 15, and weakened further as it slowly moved inland.

### CONTENTS

Hurricane Florence	1-5
Skywarn Recognition Day	6
Summer Volunteers 2018	7
July Rip Currents	8-9
Jim Merrell Retires	10-20

Florence produced extensive wind damage across eastern North Carolina. Thousands of downed trees caused widespread power outages to nearly all of eastern North Carolina. The historic legacy of Hurricane Florence will be record breaking storm surge of 9 to 13 feet and devastating rainfall of 20 to 30 inches, which produced catastrophic and life-threatening flooding. The hardest hit areas included New Bern, Newport, Belhaven, Oriental, North Topsail Beach and Jacksonville, along with Downeast Carteret County. A storm total rainfall of 34.00 inches was reported in Swansboro, while the NWS office in Newport recorded 25.20 inches. Wind gusts of 106 mph were reported at Cape Lookout with 105 mph at Fort Macon.

## Historic Hurricane Florence (Continued)

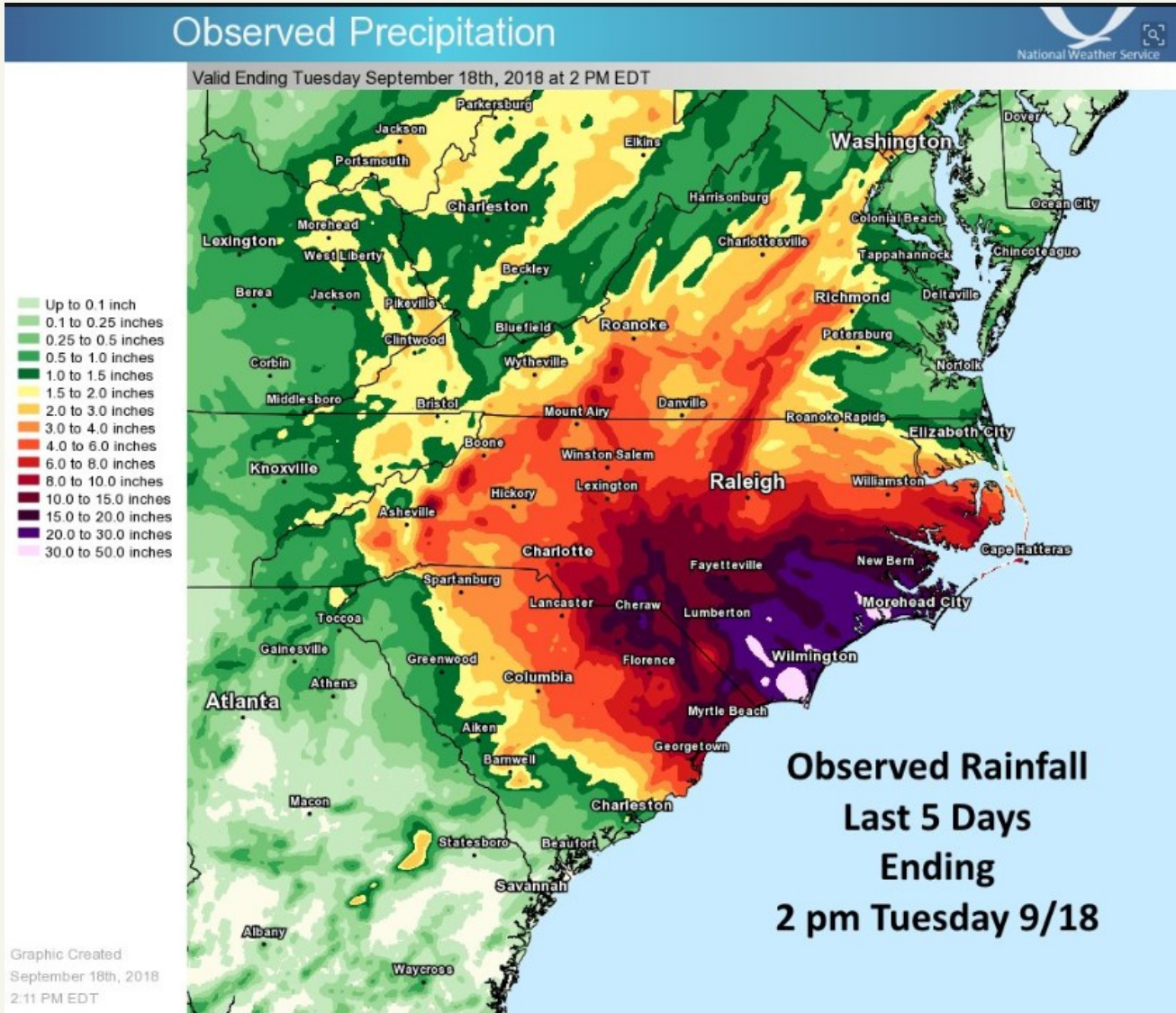


### Hurricane Florence Preliminary Rainfall Reports North Carolina - As of 2 pm September 17, 2018



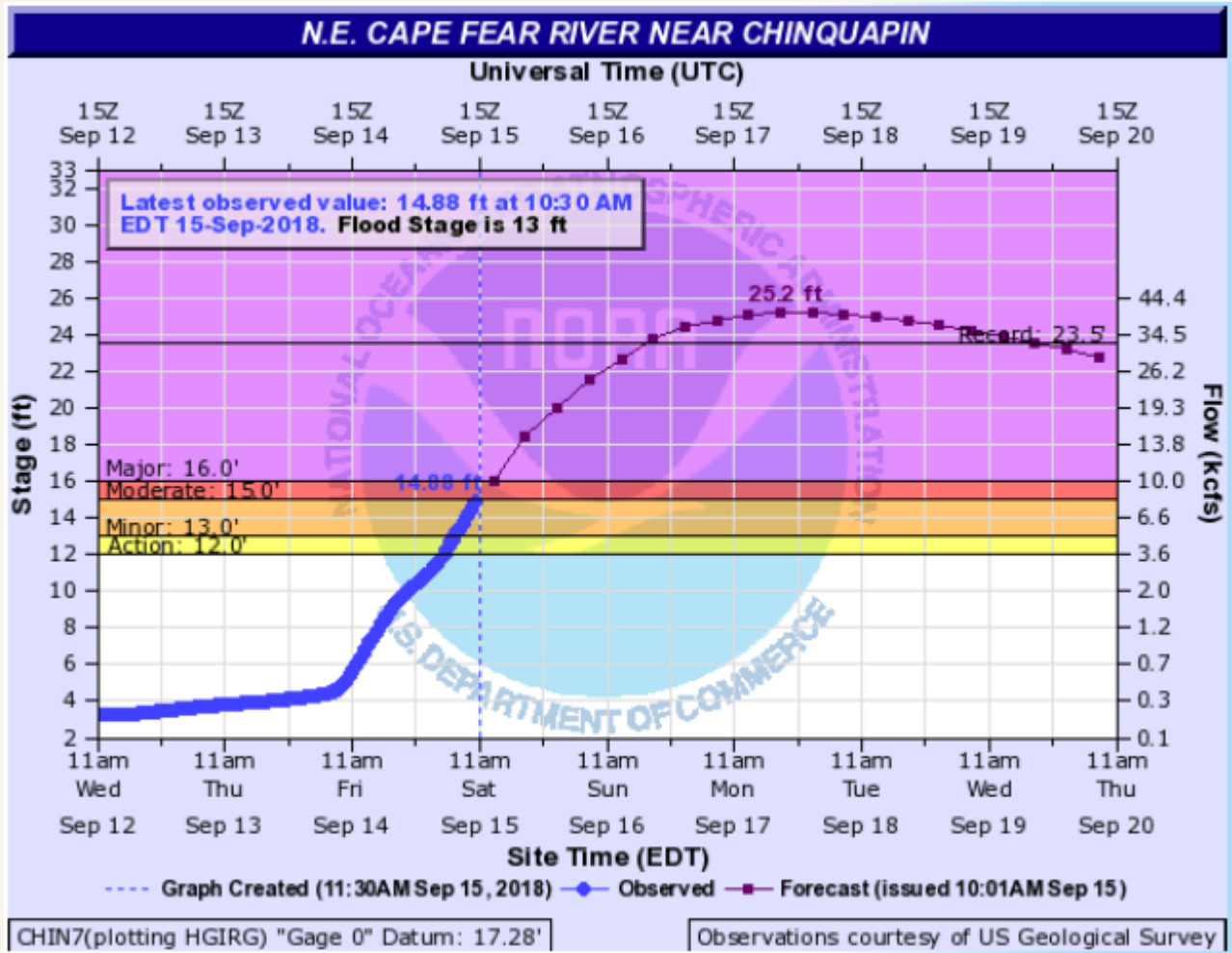
Rainfall Total		Rainfall Total		Rainfall Total	
Elizabethtown NC	35.93"	Pink Hill NC	18.31"	Chapel Hill NC	9.18"
Swansboro NC	34.00"	Chadbourn NC	18.23"	Wilson NC	8.75"
Gurganus NC	30.38"	Wallace NC	18.08"	Clayton NC	8.57"
Hoffman Forest NC	29.62"	Clinton NC	17.85"	Fairview NC	7.86"
Hampstead NC	29.52"	Trent Woods NC	17.28"	Concord NC	7.62"
Sunny Point NC	27.44"	New Bern NC	16.65"	Aho NC	7.29"
Oak Island NC	26.98"	Stedman NC	16.38"	Garner NC	7.12"
Wilmington NC	26.58"	Cameron NC	16.36"	Greensboro NC	6.99"
Whiteville NC	25.91"	Pine Knoll Shores NC	16.32"	Raleigh NC	6.98"
Jacksonville NC	25.28"	Fayetteville NC	15.27"	Williamston NC	6.93"
Newport NC (NWS Office)	25.20"	Roseboro NC	15.15"	Washington NC	6.71"
Mount Olive NC	25.04"	Linden NC	15.11"	Rocky Mount NC	6.33"
Bolivia NC	23.33"	Goldsboro NC	14.39"	Charlotte NC	6.13"
Wilmington ((ILM) NC	23.02"	Rockingham NC	14.37"	Boone NC	6.07"
Emerald Isle NC	23.66"	Raeford NC	14.32"	Gastonia NC	6.06"
Maysville NC	23.14"	Grantsboro NC	14.11"	Rocky Mount NC	6.33"
Lumberton NC	22.76"	Burgaw NC	13.60"	Lawsonville NC	5.70"
Yaupon Beach NC	22.07"	Fort Bragg NC	13.29"	Cape Hatteras NC	5.59"
Supply NC	21.92"	Greenville NC	11.66"	Tarboro NC	5.16"
Cedar Point NC	21.96"	Snow Hill NC	11.50"	North Wilkesboro NC	5.00"
Croatan NC	21.70"	Pittsboro NC	11.40"	Winston-Salem NC	4.85"
Morehead City NC	21.20"	Burnsville NC	11.26"	Yadkinville NC	4.59"
Back Island NC	20.87"	Ashboro NC	10.67"	Edenton NC	4.49"
Hope Mills NC	20.54"	Sparta NC	10.20"	Yanceyville NC	4.15"
Dunn NC	20.41"	Barrett NC	9.97"	Roanoke Rapids NC	3.92"
Sandy Run NC	19.92"	Durham NC	9.58"	Hickory NC	3.72"
Kinston NC	18.88"	Apex NC	9.52"	Asheville NC	3.29"
		Ocracoke NC	9.29"	Elizabeth City NC	2.01"

# Historic Hurricane Florence (Continued)



Map of Rainfall Totals from Hurricane Florence (Courtesy Weather Prediction Center)

## Historic Hurricane Florence (Continued)



Hydrograph from September 12, 2018 showing the predicted record crest for the Cape Fear River at Chinquapin.

## Rainfall Flooding



Morehead City



Pollockville

## Historic Hurricane Florence (Continued)

### Storm Surge



New Bern



North Topsail Beach

### Wind Damage



Morehead City



Newport

## Skywarn Recognition Day 2018

*By Hal Austin, Meteorologist*

The 20th Annual Skywarn Recognition Day (SRD) Special Event will take place from 7pm Friday, November 30th, to 7pm Saturday, December 1, 2018 here at National Weather Service Newport.

Skywarn Recognition Day was developed in 1999 by the National Weather Service (NWS) and the American Radio Relay League (ARRL). It celebrates the contributions that volunteer Skywarn amateur radio operators make to the NWS. On SRD, Skywarn amateur radio operators visit NWS offices and contact other radio operators across the nation and around the world. In the past, NWS offices have contacted all 50 states and more than 40 countries during the 24 hour event.

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.

Here at NWS Newport, in previous years for SRD, operators from ham radio clubs in Carteret County, New Bern, Jacksonville, Oriental, Greenville and Kinston have participated. Some even bring their own equipment and set up a “special event” station and operate from our office! We typically operate on the 2 meter, 440 mHz, 20 meter, 40 meter, and 80 meter bands as well as PSK 31. Our callsign is WX4MHX. The amateur radio station here at NWS Newport has radios that operate on all these frequencies (except PSK 31).

On any given day, we have a pool of radio operators we can call on to come to our office and operate our radios to help gather reports during a weather event. They have been a big help to us in gathering reports during severe thunderstorm outbreaks, as well as “high impact” events like Hurricane Irene and the large tornado outbreak in April 2011. We very much appreciate them giving of their time to help us and the citizens here in central eastern North Carolina!

To learn more about SRD, go to <http://hamradio.noaa.gov>

## Student Volunteers 2018

*By Casey Dail, Meteorologist*

This summer our staff had the privilege of getting to know and working with two college students: Samantha Wright and Brandon Black.

Samm is a graduate student at East Carolina University. She worked on improving our Skywarn Spotter program, by updating our database and utilizing her GIS skills. Her work will help to improve our local program as well as severe weather verification across Eastern North Carolina. Brandon is a graduate student at North Carolina State University. He worked on a Total Water Level Verification study and also utilized GIS to improve our flood impact statements at gauges across Eastern North Carolina.

Each volunteer's research will be used to enhance the NOAA/NWS mission. 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 participated in surveys and outreach events across Eastern North Carolina.

Both Samm and Brandon have recently accepted positions in the National Weather Service starting September 2018. We would like to thank Samm and Brandon for their hard work this summer and we wish them all the best as they begin their careers with the National Weather Service!

For additional information on or our volunteer program, please visit our webpage, <https://www.weather.gov/mhx/StudentInterns> or contact [Casey.Dail@noaa.gov](mailto:Casey.Dail@noaa.gov)



Student Volunteers Samantha Wright and Brandon Black

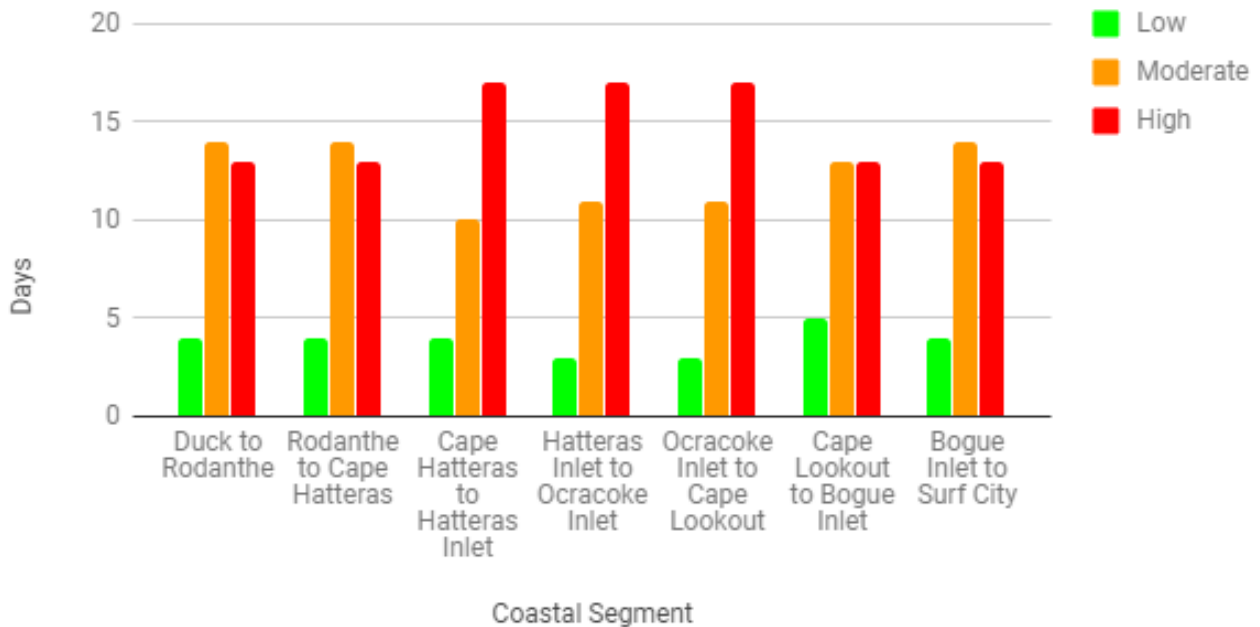
## July Was A Rippin' Month

*By Mack Simms, Meteorologist*

July 2018 was a dangerous month for rip currents along the beaches of North Carolina. Two distinct periods of high rip current risk occurred. The first, from July 7 to July 15, was associated with swell from a meandering Hurricane Chris off the North Carolina coast. The second, from July 22 to July 31, was associated with persistent unsettled weather that was also responsible for extremely heavy rain in the Outer Banks. Beaches from Cape Hatteras to Cape Lookout saw a high risk of rip currents for the majority of the month.

### Days of Rip Current Risk (July)

Highest Risk Forecasted



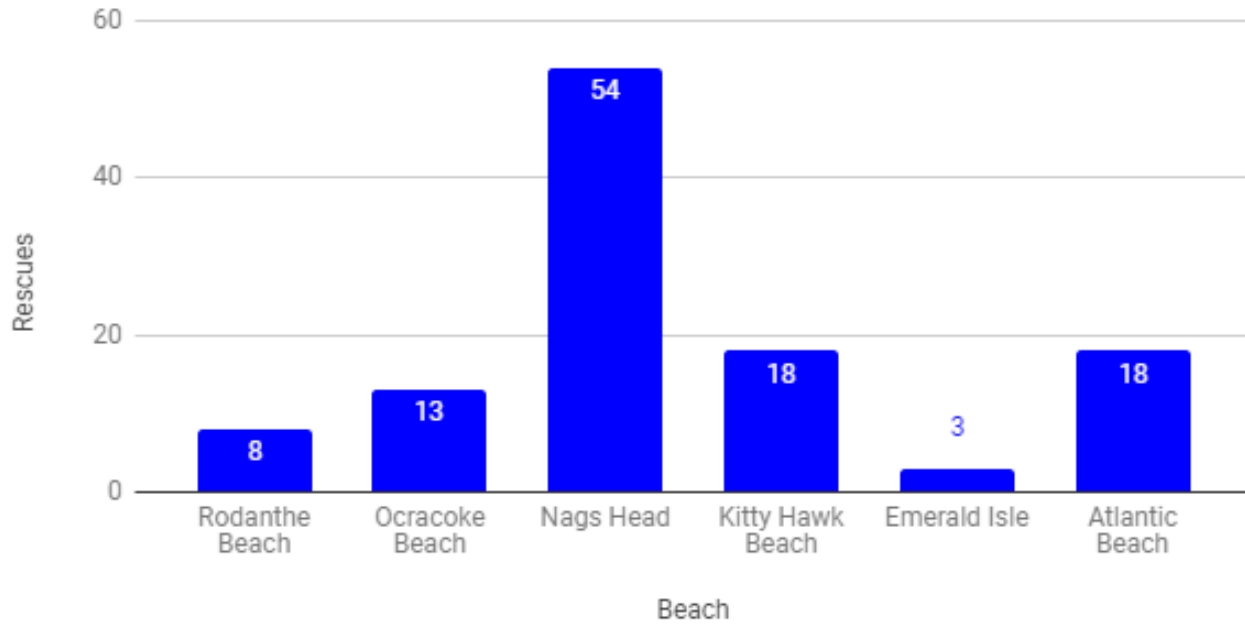
A total of 114 rip current rescues were reported to the National Weather Service Newport in July. The highest amount of rescues all occurred while Hurricane Chris was offshore, while conditions on the beaches were relatively calm. Nags Head beach reported 31 rescues on July 11 alone; Kitty Hawk Beach had 11. Additionally, there were 2 rip current fatalities along the Outer Banks. In total, there were 7 surf zone fatalities in North Carolina in July bringing the year-to-date total deaths to 13.



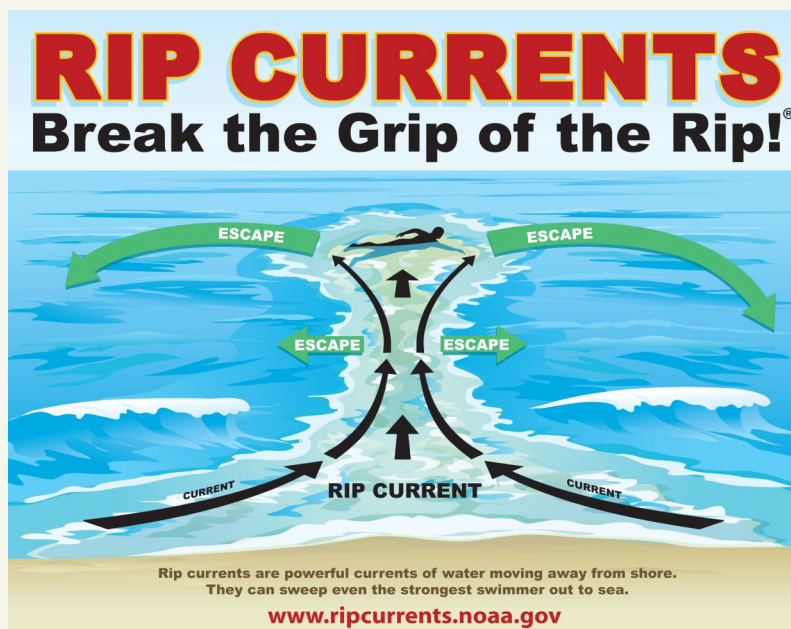
## July Was A Rippin' Month (Continued)

### Reported Rip Current Rescues (July)

Reported By Lifeguards



If you are caught in a rip current, do not swim directly to shore. Instead, swim parallel to shore until you are outside the current's influence, and then swim towards shore at an angle away from the current. If you can't make it to shore, relax and call or gesture for help. If possible, only swim at guarded beaches. If you do choose to swim at an un-guarded beach, never swim alone.



## Reflections On The Last 20 Years at WFO MHX

*By Jim Merrell, Meteorologist*

Lead forecaster Jim Merrell retired from NWS Newport/Morehead City on August 31<sup>st</sup> after 36 years of Federal service – 35 with the NWS. Jim was the lone member of the staff that was a Carteret County native as he grew up near Beaufort and graduated from East Carteret High School in 1978. After receiving his B.S. in Meteorology at NC State in 1982, he entered the NWS at Jackson, KY in 1983 and slowly worked his way back home starting in 1985 with a brief stint at the National Climatic Data Center in Asheville, followed by 13 years at the NWS Raleigh forecast office. Jim came to WFO Newport/Morehead City in August 1998 as one of the original 5 Lead Forecasters at the office.

Here are Jim's reflections on his past 20 years at the office:

“I have had the unique privilege of serving my home area doing a job that is interesting, challenging and at times stressful, but all with the knowledge that people are depending on our forecasts and warnings for the protection of life and property. One thing that most folks may not think about too often is that sometimes the weather impacts the forecasters as well, and I have had a few “up close and personal” events. Along that line, here are my Top 6 events at MHX from the past 20 years.

### **Hurricane Bonnie – August 24-27 1998**

“I had just started at MHX as a lead forecaster at beginning of month and my family was staying in temporary quarters in Atlantic Beach condo. A Hurricane Warning was issued on the morning of first day of school so what a way to kick it off for wife and our 5 and 9 year-old sons. A Mandatory evacuation was ordered for Bogue Banks so we had to go stay with family near Beaufort for rest of week.”

[WATCH THIS YOUTUBE VIDEO FOR MORE ON JIM'S RETIREMENT!](#)

## Reflections On The Last 20 Years at WFO MHX (Continued)



Hurricane Bonnie making landfall near Wilmington, NC late on August 26, 1998. (NWS NHC )

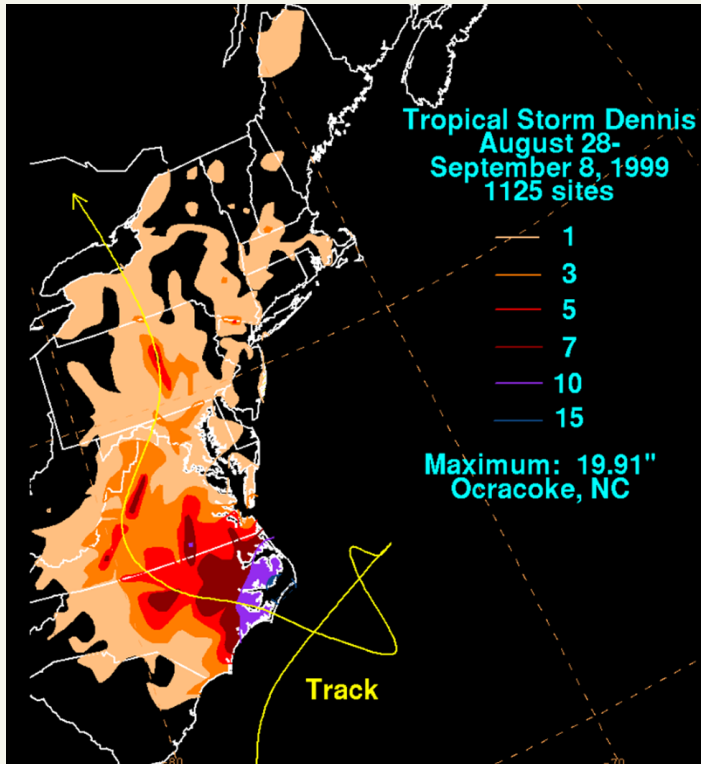
### **Dennis and Floyd – August-September 1999**

“We had 2 bouts of Dennis about 10 days apart with total rainfall near 11 inches which flooded our yard. (Pics of boys trying to surf on ski). Floyd hit about 2 weeks later with wind and tornados near coast but the heaviest rainfall was inland over already water-logged areas which resulted in devastating flooding.”

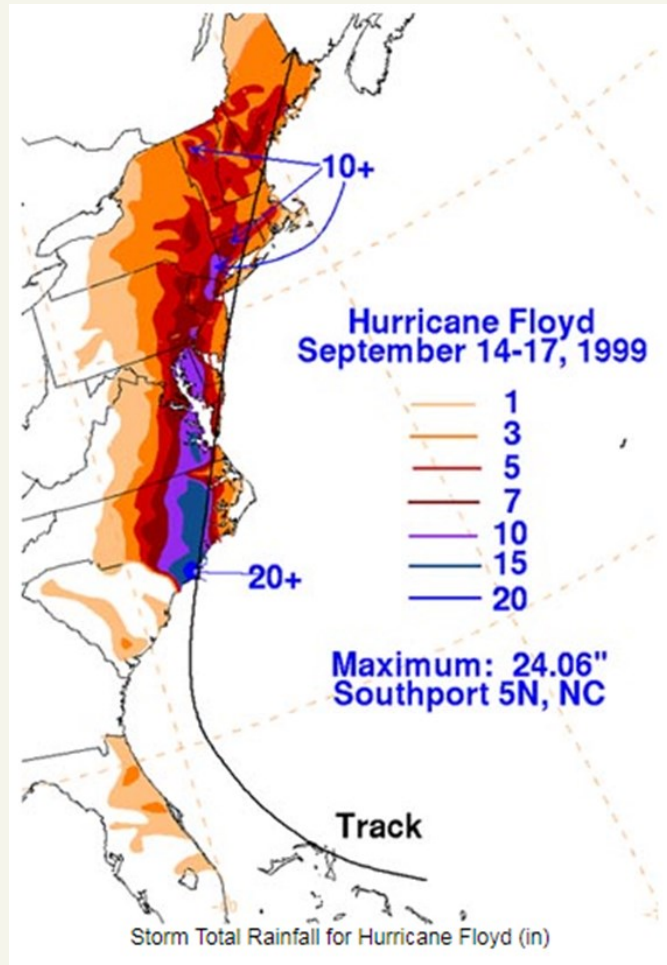
# Reflections On The Last 20 Years at WFO MHX (Continued)



Flooding at Merrell home from Hurricane Dennis. (Merrell personal photos).



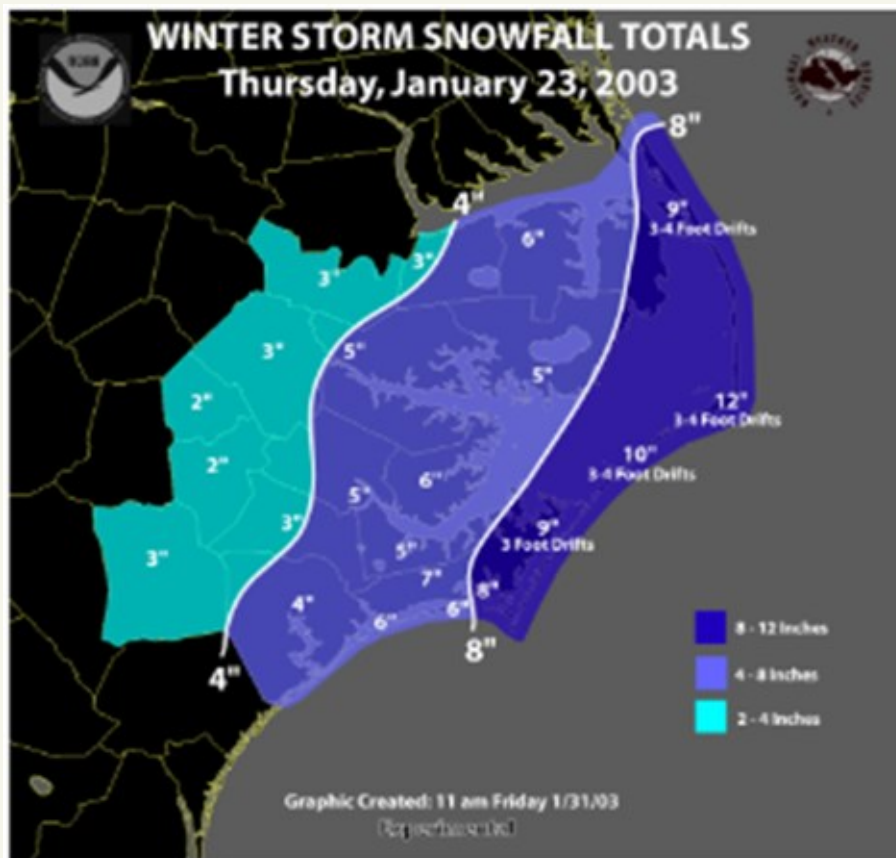
## Reflections On The Last 20 Years at WFO MHX (Continued)



### January 23, 2003 Coastal Snowstorm

“Many may not recall this one, but it was one of the most well-forecast events by computer models I ever experienced. Both main models (NAM/GFS) indicated 6-12 inches of snow over coastal sections several days in advance which verified with 6-9 inches over Carteret County and 8-12 inches on Outer Banks. I have 2 distinct memories: 1) The Meteorologist-In-Charge shaking his head in disbelief when I did the morning briefing and stated that a Winter Storm Watch had been issued for 6-12 inches on coast. 2) My brother (amateur forecaster) told me later that he still had doubts about my forecast early in the morning of the event when there was no sign of precipitation on radar. He read my forecast discussion around that time that indicated forecast was on track with snow expected to blossom over area in next 3-6 hours. He was quite impressed when the forecast verified later that day.”

## Reflections On The Last 20 Years at WFO MHX (Continued)

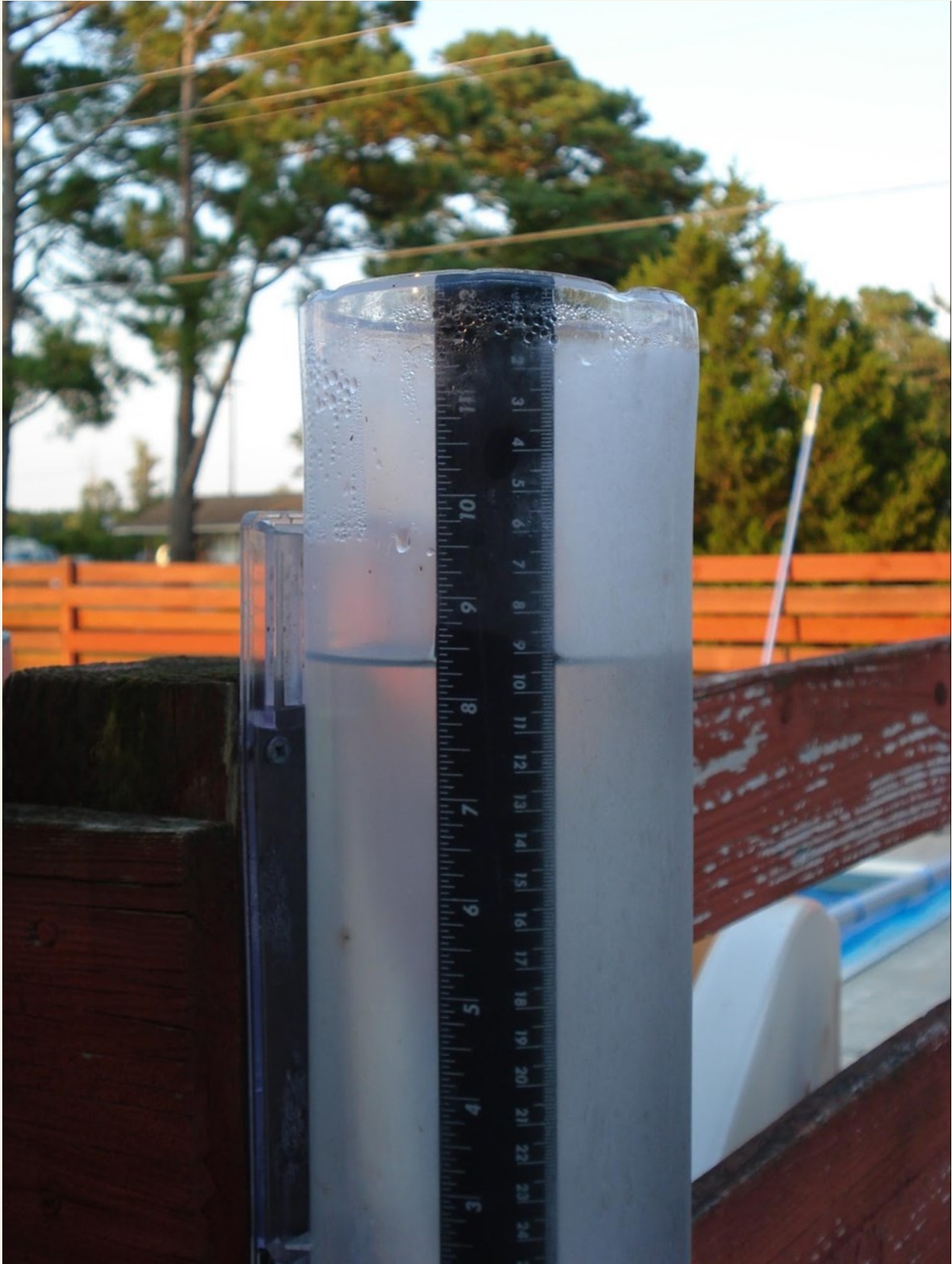


Storm total Snowfall January 23, 2003. (NWS MHX)

### Tropical Storm Gabrielle—September 2007

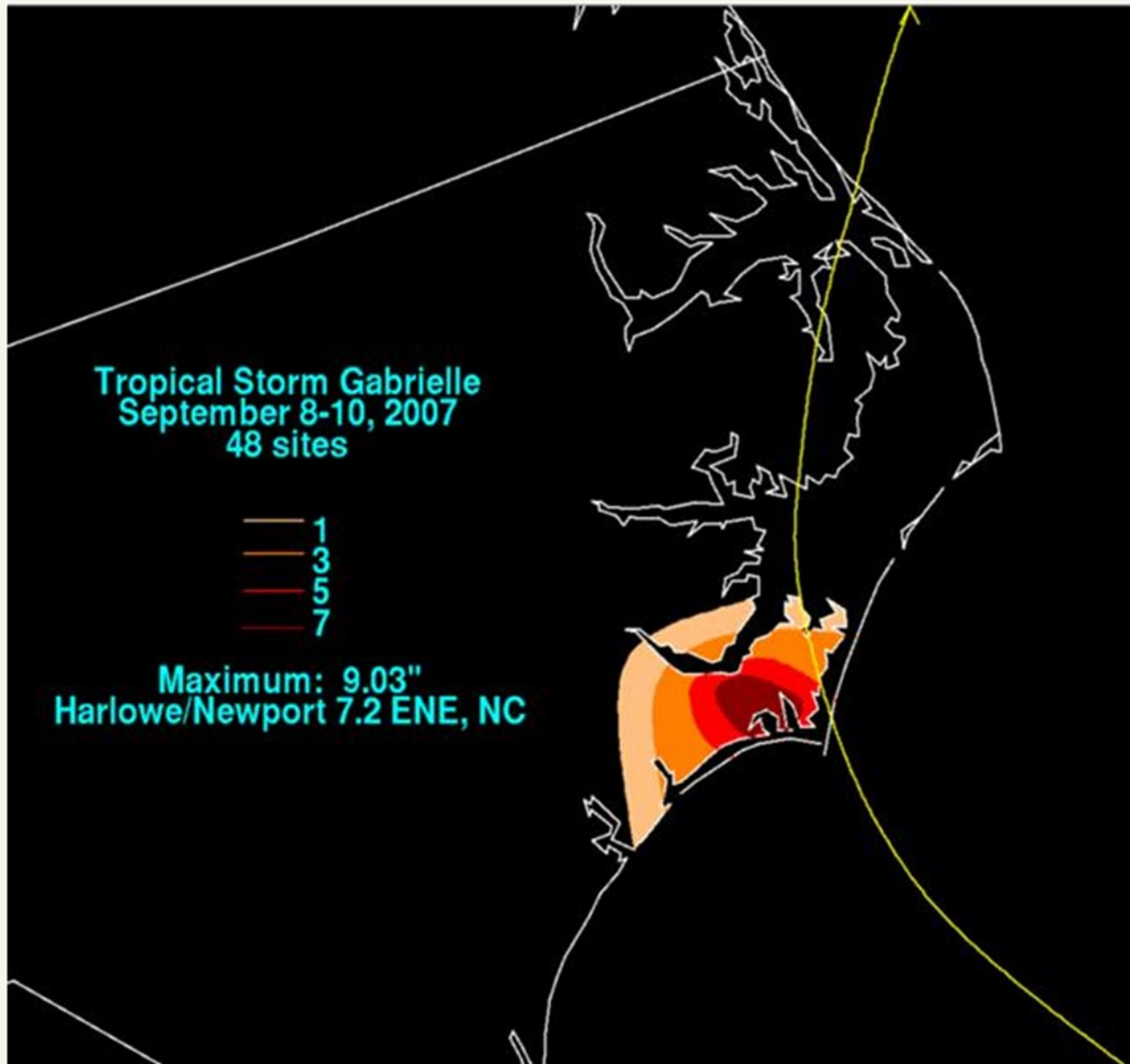
“A fairly benign Tropical Storm except that training rain bands set up from Harlowe to Beaufort and produce 8.3 inches of rain at my house in 6 hours. This occurred near high tide and produced flooding into our garage and storage building for the only time in the 56 year history of residence.”

## Reflections On The Last 20 Years at WFO MHX (Continued)



Rainfall at Merrell home September 10, 2007. (Merrell personal photos).

## Reflections On The Last 20 Years at WFO MHX (Continued)



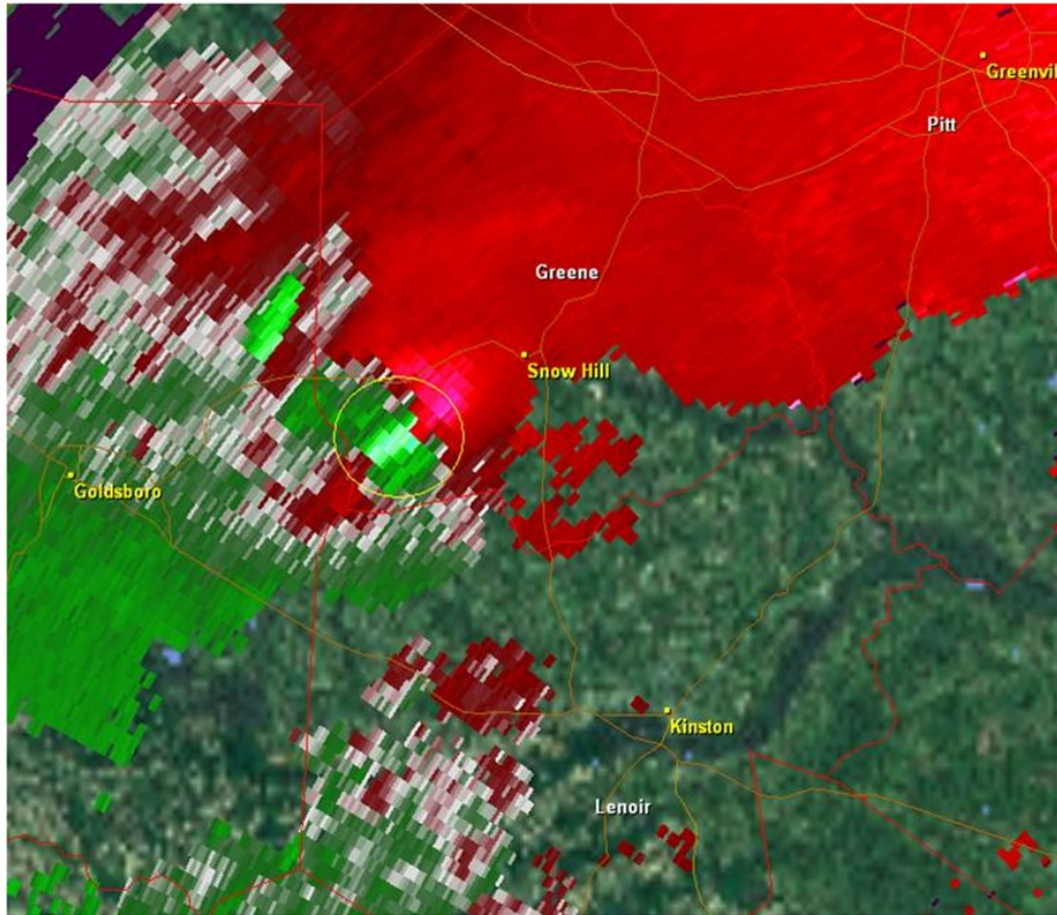
Rainfall Totals from Tropical Storm Gabrielle, September 8-10, 2007. (NWS MHX)

### April 16 2011 Major Tornado outbreak

“I worked the day shift and told the forecasters and extra staff coming in for the evening shift “if it’s rotating, put out a Tornado warning”. There was no doubt it was going to be a bad day – never thought I would see multiple rotating supercells moving across NC like in Tornado Alley.”



## Reflections On The Last 20 Years at WFO MHX (Continued)

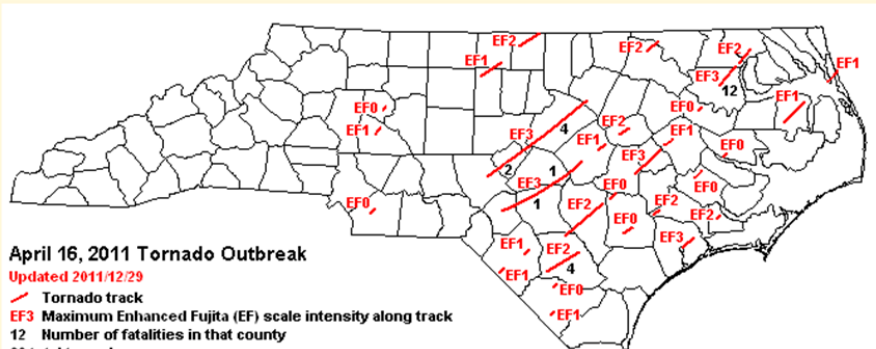


Velocity image showing strong rotational couplet (yellow circle) near Snow Hill around 545 pm April 16, 2011. An EF-3 tornado was on the ground at this time.

Radar velocity image showing strong rotational couplet (yellow circle) near Snow Hill around 545 PM April 16, 2011. An EF-3 tornado was on the ground at the time. (NWS MHX).

### Map of tornado tracks and strength across North Carolina on 16 April 2011 -

The map below highlights the tornado tracks across the entire state of North Carolina with the maximum EF scale rating for each tornado shown in red. The number of fatalities for each tornado is shown in black. There were 30 total tornadoes including five EF-3 tornadoes, eight EF-2 tornadoes, and nine EF-1 tornadoes.



#### April 16, 2011 Tornado Outbreak

Updated 2011/12/29

- Tornado track
- EF3 Maximum Enhanced Fujita (EF) scale intensity along track
- 12 Number of fatalities in that county
- 30 total tornadoes
- Tornadoes by Intensity :
- EF0 - 8
- EF1 - 9
- EF2 - 8
- EF3 - 5

Data Analysis - Gail Hartfield  
 Graphic - Brandon Vincent  
 NWS Raleigh, NC  
[www.weather.gov/raleigh](http://www.weather.gov/raleigh)

April 16 2011 Tornado Map. (NWS RAH).

## Reflections On The Last 20 Years at WFO MHX (Continued)

### Hit by a Tornado! - December 26 2012 –

“I worked the overnight shift and was sleeping during the day. A rotating storm came in over Atlantic Beach and came up the Newport River and produced a small tornado in my neighborhood along Highway 101 north of Beaufort. The outskirts of the tornado knocked down one tree across our driveway and broke the tops out of 2 others. Fortunately there was no damage to the house or vehicles. I will never forget being awoken by roaring winds and my wife yelling to our sons to “Get in the hall!””.



Damage at Merrell home (Merrell family photos).

## Reflections On The Last 20 Years at WFO MHX (Continued)

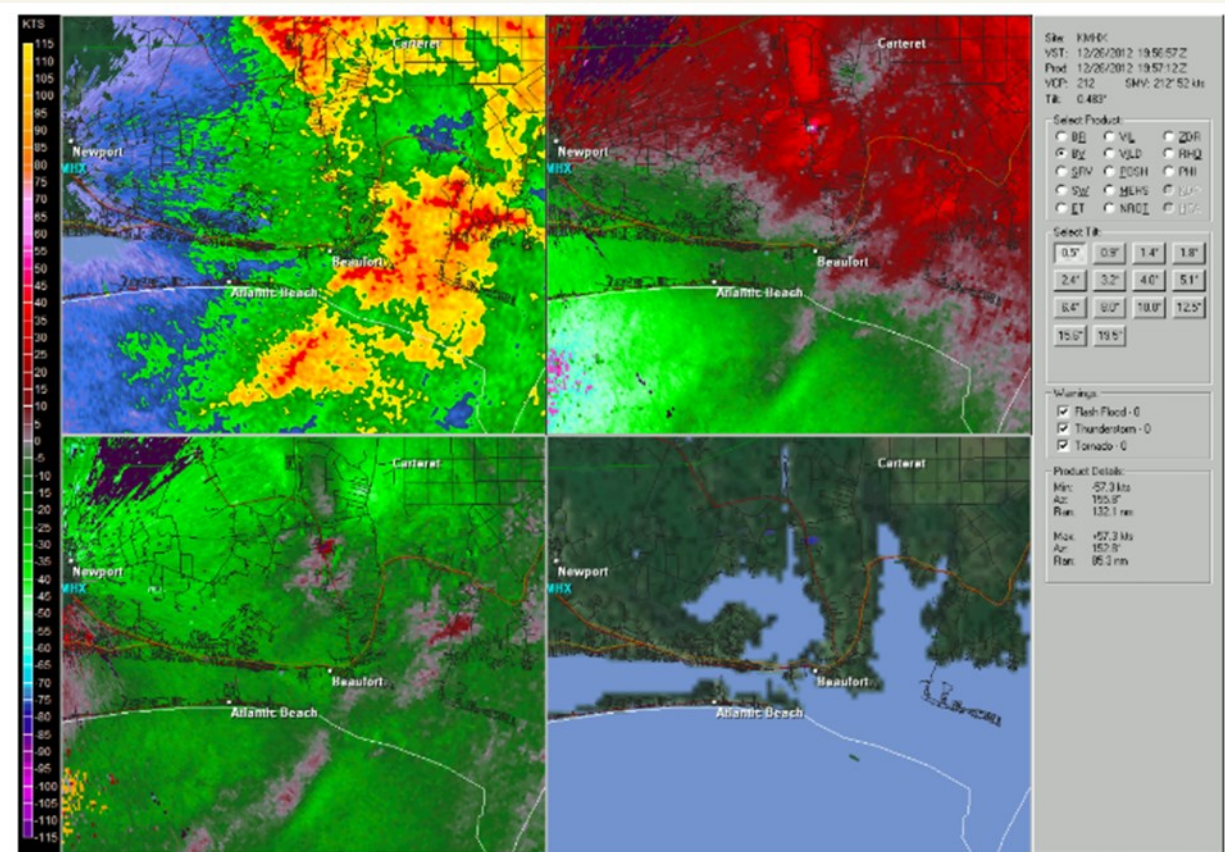


Figure 11: KMHX 0.5 degree loop of base reflectivity (top left), base velocity (top right), storm-relative velocity (bottom left), and GR2Analyst normalized rotation (NROT) product (bottom right).



Damage at Merrell home (Merrell family photos).

## Reflections On The Last 20 Years at WFO MHX (Continued)

### Bonus – a few others:

Sleet/Freezing rain events in 2015 – never thought I would see significant accumulations at the coast.

Hurricane Matthew in October 2016 – had to miss NC State game against Notre Dame – first home game not attended since 2003.

Record cold – 4 days below freezing. Longest stretch in eastern NC since December 1917-January 1918 (not 1718 as somehow got reported).

I have been very blessed to work with some great people of the past 35 years , especially the past 20 in my home community near friends and family. I will miss the day-to-day interaction with my colleagues, partners and customers, but do look forward to not having to rotate between shifts on a weekly basis and to have all weekends off. Here's hoping your future holds more "High and dry" days than "low and wet".



## National Weather Service

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