South Carolina State Climatology Office

Report Date: October 10, 2018
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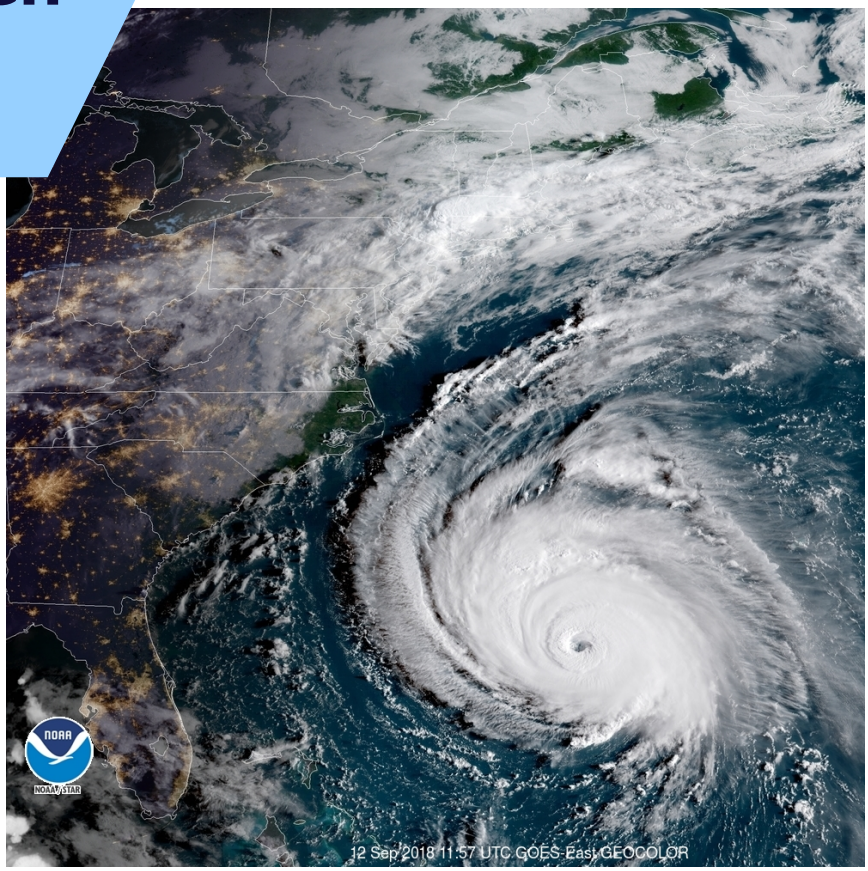
Hurricane Florence – Preliminary Open File Report



PRELIMINARY

Storm History and Impacts Report

September 14 – 17, 2018

TABLE OF CONTENTS

STORM OVERVIEW 2
RAINFALL 3
RIVER STAGES 4
STORM SURGE AND TIDES 5
TORNADOES 6
PEAK WIND GUSTS 7
STORM FACTS 8

THIS REPORT SERVES AS A PRELIMINARY DISSEMINATION OF INFORMATION. A MORE DETAILED REPORT ON THE IMPACTS OF HURRICANE FLORENCE WILL BE PROVIDED IN THE COMING WEEKS. FOR MORE DETAILED DATA, PLEASE CONTACT:

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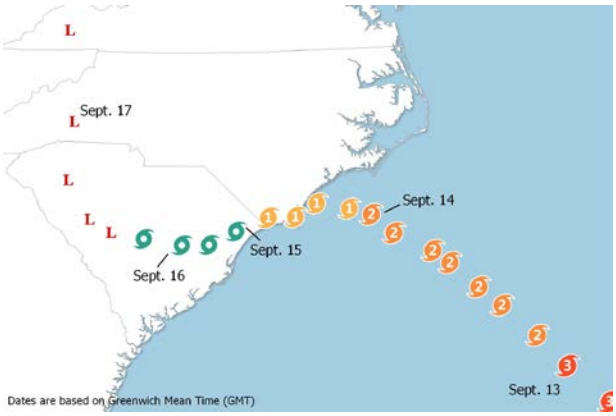
STORM OVERVIEW

Hurricane Florence

The 2018 Hurricane Season got off to a rather slow start. Florence was the sixth named storm and formed from a tropical wave off the African Coast, near the Cape Verde Islands, on August 31. The storm rapidly intensified from a Category 1 to a Category 4 Hurricane in a 24-hour period starting on September 4.

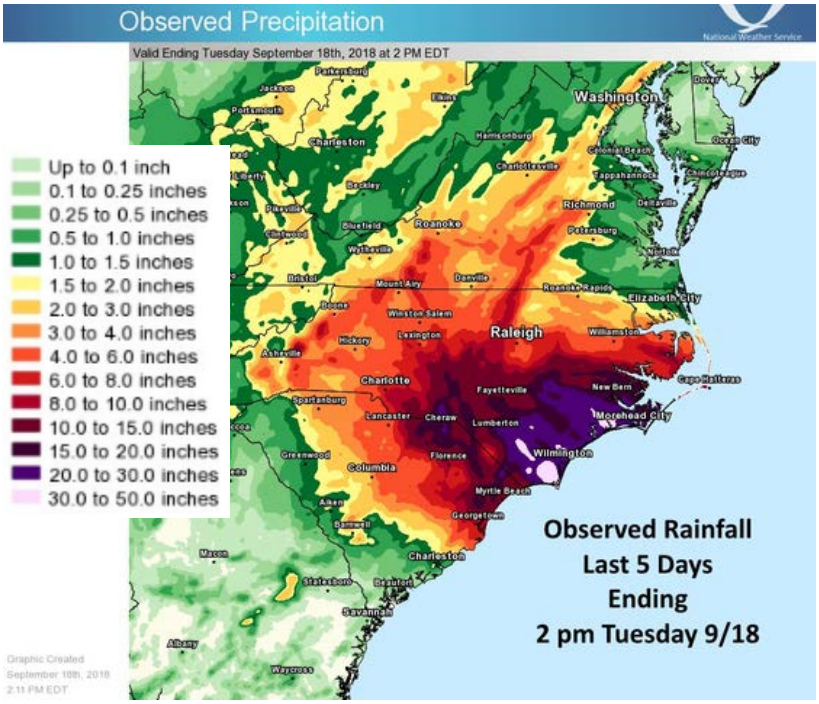


The forecast models had trouble initially with Florence's track, with some models having the storm turn out to sea, while others brought the storm closer to the United States. The track of the storm was unique, as past tropical cyclones that originated in the same area turned to the north and remained out to sea. The uncertainty was based on the strength and placement of an upper-level ridge and how it would essentially direct the storm. Once the models had a better understanding of the atmospheric steering currents, it was obvious that the hurricane would make landfall somewhere along the Southeast Coast.

As it moved across the Atlantic, the storm went through a process of weakening and was downgraded to a tropical storm before re-strengthening back to a Category 4 hurricane. Before landfall, the storm encountered wind shear, dry air and interacted with the continental shelf along the Carolina coast, causing it to weaken. Florence was a Category 1 Hurricane when it made landfall near Wrightsville Beach, North Carolina on the morning on September 14. It proceeded to stall and remain nearly stationary for an entire day before it began a slow turn to the southwest, which is not a typical movement for tropical cyclones, and traveled across South Carolina at a speed of 2-3 mph. The storm continued to weaken during the 15th and the remnant circulation recurved and accelerated to the north-northeast and out of the state on September 16th.

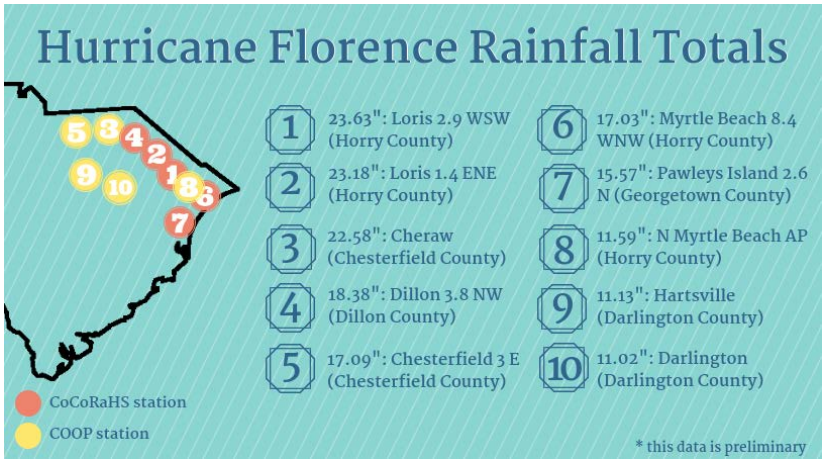
RAINFALL

Excessive Rainfall Across The Carolinas



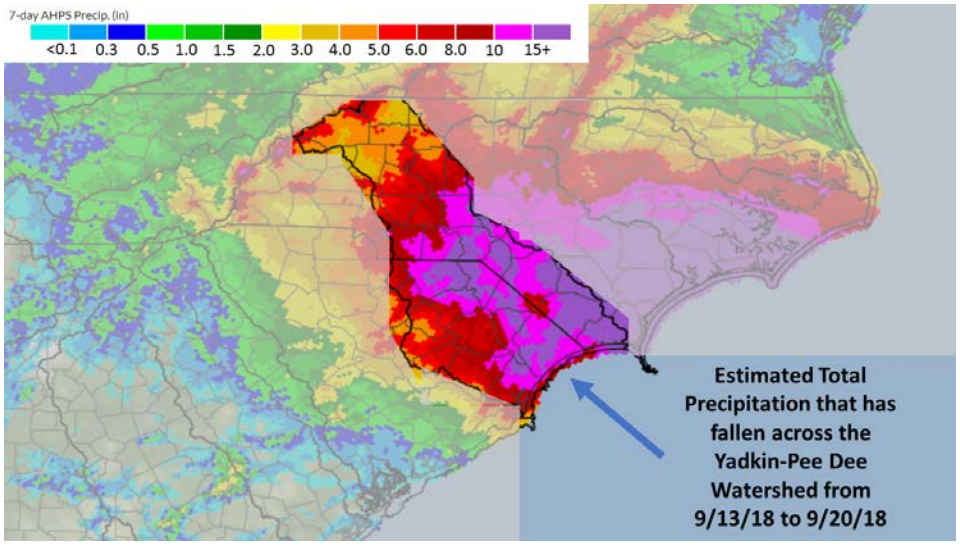
Before the landfall of Hurricane Florence, the United States Drought Monitor indicated areas of dry (D0) and moderate drought conditions (D1) in much of the Pee Dee region, including Lancaster County and parts of Chester, Chesterfield, Fairfield and Kershaw counties. Streamflow values across the same region were below normal, and rivers such as the Little Pee Dee at Galivants and the Lynches at Bishopville were near record low flows. A statewide drought call scheduled for Thursday, September 13th was canceled due to preparations for Florence. The magnitude of the event would have been worse, had there been wet antecedent conditions in the region. The slow-moving system dropped more 30 inches of rain across portions of eastern North Carolina, and over 20 inches of rain in Chesterfield and Horry counties.

The 4-day total of 23.63 inches, from the CoCoRaHS station at Loris 2.9 WSW, is listed as the highest rainfall total in South Carolina caused by a tropical cyclone and its remnants, replacing the previous total of 17.45 inches caused by Tropical Storm Beryl in 1994. This total is the second highest 4-day total behind the 26.88 inches reported by the CoCoRaHS station at Mount Pleasant 6.4 NE during the October 2015 Flood (which was not considered coming from a tropical event because of the interaction between the front and Hurricane Joaquin).



RIVER STAGES

Record Crests On South Carolina Rivers



Unprecedented flooding occurred in Florence's wake, as a portion of the excessive amount of rainfall measured in North Carolina fell in the Yadkin-Pee Dee River watershed. This watershed drains to the Atlantic Ocean by passing through much of South Carolina and emptying out through Winyah Bay. For weeks after the initial landfall, flooding plagued most of the Pee Dee Region, with the significant impacts along the Pee Dee, Little Pee Dee, Lumber, Lynches and Waccamaw rivers and their tributaries.

Many of these river gauges reached crest values that fell within the top five highest measured crests at their locations, while a number of the rivers set new record crest values. The Pee Dee River at Pee Dee reached a height of 31.83 ft. during the flooding, which was 1.5 ft. lower than the historic crest of 33.3 ft. during 1945. Gauges along Waccamaw exceed previous record crests by 3 or more feet during this event.

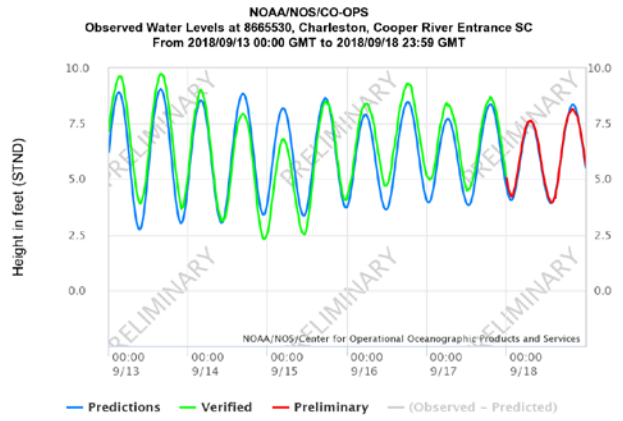
SC River Crest Records

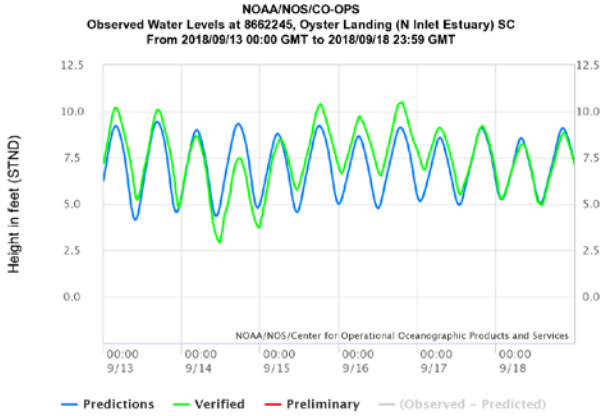
River Gauge	Florence Crest (ft.)	Previous Crest (ft.)	Previous Crest Date/Event
Waccamaw at Longs	20.22	17.94	9/22/1999 - Hurricane Floyd
Waccamaw above Conway	19.82	15.77	10/16/2016 - Hurricane Matthew
Waccamaw at Conway	21.16	17.87	10/18/2016 - Hurricane Matthew
Pee Dee at Bennettsville	94.25	89.94	04/12/2003 - No Name Event
Black Creek near Quinby	17.37	16.81	10/05/2015 - October Flood
Pee Dee below Pee Dee	36.93	34.00	Not listed
Little Pee Dee near Galivants Ferry	17.21	17.10	10/12/2016 - Hurricane Matthew

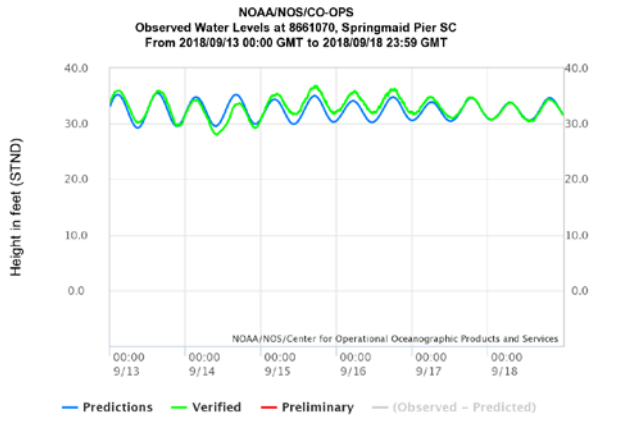
STORM SURGE AND TIDES

Minor Beach Erosion Along The Coast

Hurricane Florence's landfall and southwesterly tracks placed most of the South Carolina Coast on the southerly side of the circulation. On this side of the storm, prevailing wind direction is offshore, and because of the slow movement of the storm, the winds persisted for hours and caused the water to retreat from the coastline. Tidal gauges along the coast measured low-tidal water levels from September 13 to September 15. As the storm moved across the state, the wind direction changed (onshore flow) and the water returned to normal levels before increasing as the wind continued to push more water toward the coast. A storm surge of less than 2.5 ft. combined with local tides, thus only minor erosion was reported in Horry and Georgetown counties.







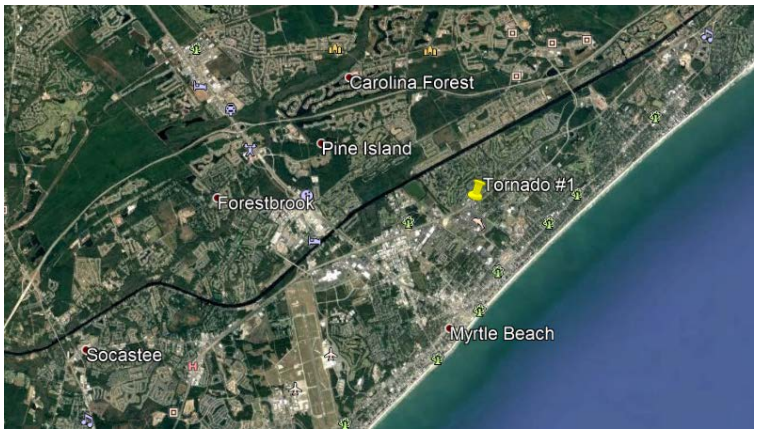
TORNADOES

Weak Tornadoes

Unlike other tropical cyclones to impact the state, Hurricane Florence only spawned two weak tornadoes, both within Horry County.

Tornado #1 – 2 NNE Myrtle Beach (Horry County)

- Rating: EF0
- Date: 2018-09-16
- Narrative: The tornado was shown live by a local television station as viewed from their sky camera. It caused minor damage to the tops of pine trees, breaking numerous limbs before it crossed highway 17 moving west. Additional minor tree damage occurred on the west side of Highway 17 before the fast-moving tornado lifted. Path width was 30 yards; the path length was 0.5 miles, maximum winds 70 mph, no injuries or fatalities.



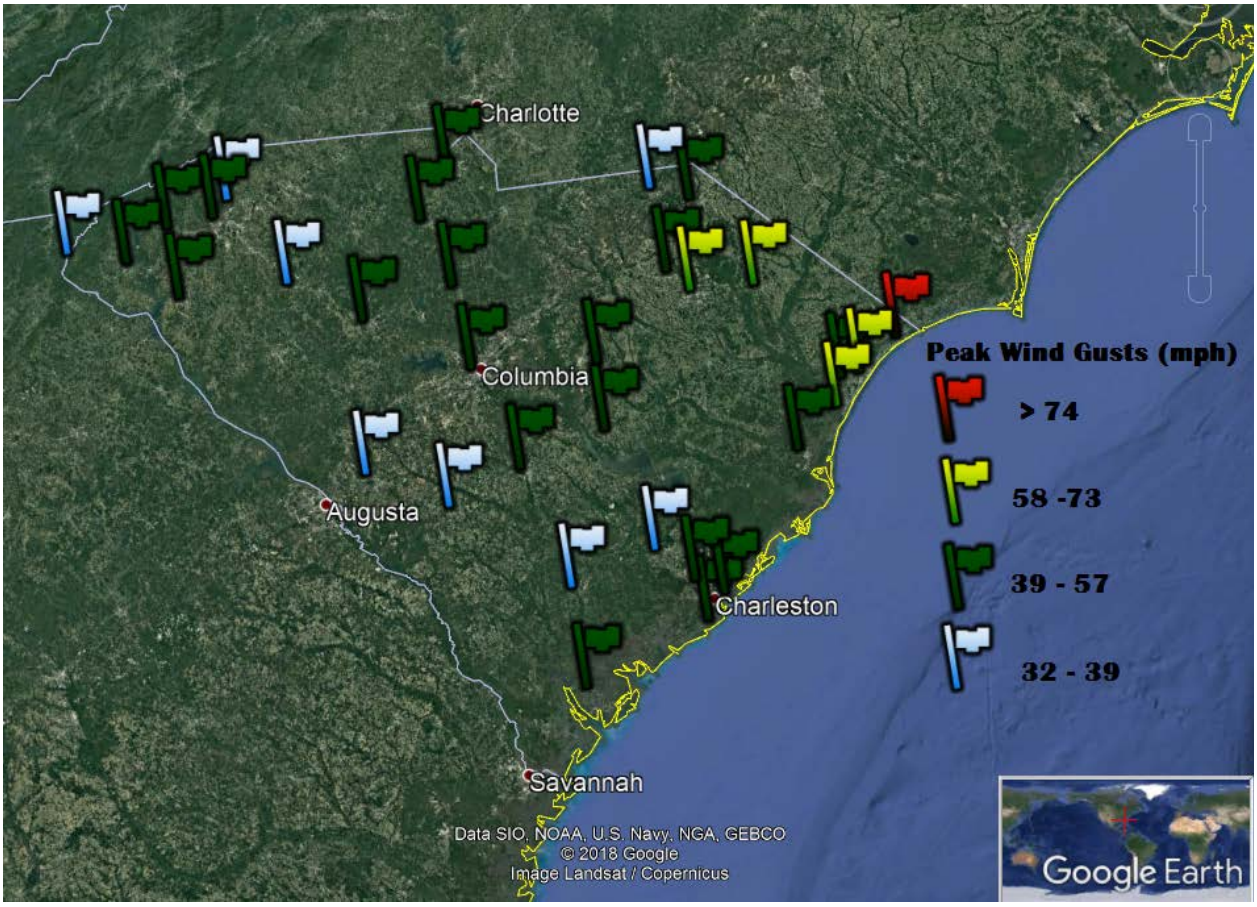
Tornado #2 – 4 ESE Gorgetown (Horry County)

- Rating: EF0
- Date: 2018-09-16
- Narrative: Tornado touched down six miles north-northwest of Longs, causing spotty damage to pine trees and damage to a roof.

There were also multiple reports of funnel clouds on September 16th across Horry County, especially near the areas of Myrtle Beach and Loris.

PEAK WIND GUSTS

Limited Wind Damage



Hurricane Florence had a large diameter wind field, with hurricane force (sustained winds over 74 mph) extending 80 miles from the center of the storm, and tropical storm-force winds were felt up to 200 miles away from the center.

Shortly before landfall on the morning of Friday, September 14, the National Weather Service station at the Wilmington Airport in New Hanover County, North Carolina reported a wind gust of 105 mph. The highest observed wind gust associated with the storm in South Carolina was 77 mph measured at the Cherry Grove Beach Pier on September 14. Many stations across the Lowcountry, Midlands, and Pee Dee region experienced peak wind gusts of 39 mph or higher. Even after Florence was downgraded to a tropical depression on Sunday, strong thunderstorm cells embedded within its rain bands caused high winds.

Despite the windy weather and saturated ground, utility companies reported less than 200,000 outages across the state, with most of those concentrated in Dillon, Horry, and Marion counties.

STORM FACTS

By The Numbers

As of October 5, three weeks after the initial landfall, many across South Carolina are still dealing with the impacts of Hurricane Florence. Floodwaters are beginning to recede across the Pee Dee Watershed and now begins one of the hardest parts of any Natural Disaster – Recovery.

Aerial view of flooding along the Waccamaw River in Longs, SC