



NATIONAL WEATHER SERVICE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

STORM COURIER

Charleston, SC
Weather Forecast Office

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preparedness through their social media channels and email, CEMA also organizes and hosts community events. The "Ask the Experts Telethon" was the most recent, which was a segment of the Chatham County Prepare-A-Thon. This event had representatives from several organizations, including NWS, to answer questions from the public with the overall goal of ensuring the population is prepared for all hazards that can affect the community.

2018 Ambassador of Excellence - CEMA!

by Emily McGraw - Meteorologist



The National Weather Service is transforming its operations to help America take action against extreme weather, water, and climate events. One of the strategies we are using to do this is the [Weather-Ready Nation \(WRN\) Ambassador](#) initiative. WRN Ambassadors consist of external organizations, businesses and other groups who are dedicated to helping the NWS spread weather safety and preparedness information to those within their sphere of influence.



Each year, NWS formally recognizes Ambassadors who have made significant contributions to building a Weather-Ready Nation. We'd like to congratulate Chatham Emergency Management Agency (CEMA) on being our [2018 Ambassador of Excellence!](#) CEMA continues to shine as a WRN Ambassador. Not only do they routinely promote weather safety and



Warning Coordination Meteorologist Ron Morales and CEMA personnel

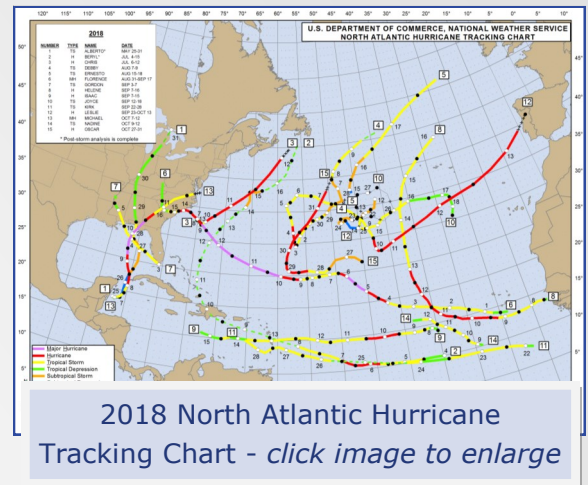


Do you want your organization, business, or community to become a WRN Ambassador? [Sign up here](#) or email [Emily McGraw](#) for more information. You can also check out our [local webpage](#) to see all of the WRN Ambassadors in the area.

Another Active Atlantic Hurricane Season Comes to an End

by Robert Bright - Meteorologist

The 2018 Atlantic hurricane season ended on November 30 after starting prior to the official start of the season on June 1. It was quite a busy year with preliminary data indicating 15 tropical storms formed, eight of which became hurricanes and two of these major hurricanes (Category 3+). This was the first season since 2008 in which four named storms existed simultaneously.

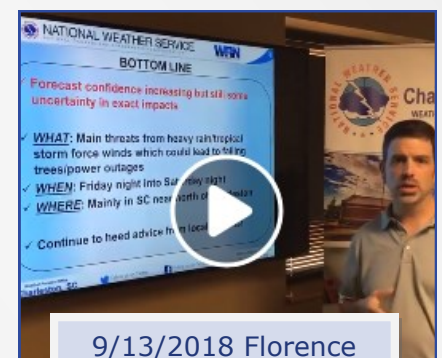


Four storms affected the U.S., with the most impacts coming from Hurricanes Florence and Michael. Hurricane Florence made landfall near Wrightsville Beach, North Carolina on September 14 after weakening to a Category 1 hurricane. Prior to landfall, Florence stalled out along the coast and drifted southwest near the northern South Carolina coast for several days. The storm resulted in over 50 deaths in the U.S. but just barely scraped the South Carolina Lowcountry.

Hurricane Michael made landfall at Mexico Beach, Florida along the northern Gulf Coast on October 10 as a very strong Category 4 hurricane, the strongest to ever strike the Florida panhandle. Michael then moved through central Georgia as a hurricane and then through the Carolinas as a tropical storm. The storm resulted in at least 30 deaths and was the strongest storm to hit the U.S. since Hurricane Andrew in 1992, which was a Category 5 storm. The main impacts across southeast South Carolina/Georgia were tropical storm force wind gusts (~40-60 mph) and several inches of rain, which resulted in downed trees and power lines.

Social Media During Florence

The National Weather Service is testing the use of Facebook Live and Periscope, and NWS Charleston utilized these platforms during Hurricane Florence to provide live briefings and highlight a weather balloon launch. Our two main goals were to explain which impacts were the most concerning and to help control the "message." We conducted briefings each day from September 11 through September 14 leading up to the start of the event. There were several positives that resulted from these briefings, including comments thanking us for taking the time to explain the hazards and potential impacts. Viewers also provided useful feedback, which helped us improve subsequent briefings. We hope to provide this service for future significant weather threats.



9/13/2018 Florence Facebook Live Briefing

2018 Weather & Climate Wrap-up

by Emily McGraw - Meteorologist

click image to enlarge

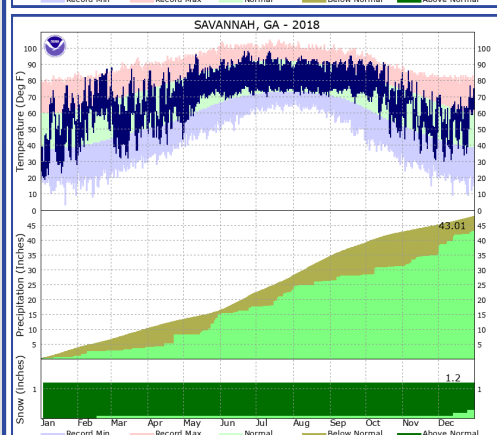
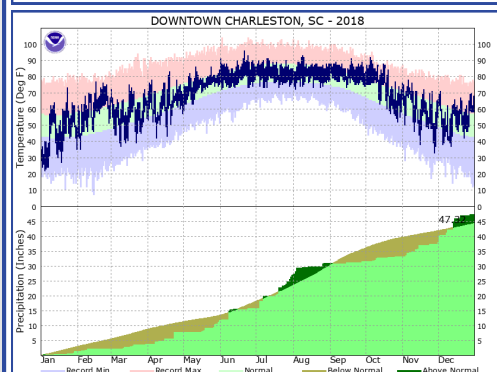
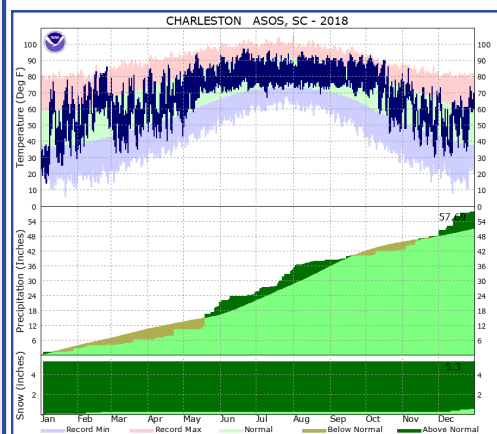
Most people will remember the start of 2018 by the rare winter storm event. Up to 7 inches of snow fell on [January 3rd](#), which ended up staying on the ground for several days due to a stretch of record/near-record cold temperatures. Once we escaped winter, we luckily experienced a relatively quiet severe weather season.



NWS Charleston issued only 70 Severe Thunderstorm Warnings - the least amount of warnings issued since

2018 Climate Plots

click graph to enlarge



2005. A couple of the more notable severe events in 2018 include the EF-1 tornado that moved over Oatland and Whitmarsh Island, Georgia on [July 27](#) and also the cluster of severe thunderstorms that produced 32 wind damage reports on [August 9](#). The tropical season on the other hand was quite active with two systems directly impacting the area - [Florence](#) and [Michael](#). For a more in-depth look at the tropical season, check out [this article](#).

2018 as a whole was well above normal with regards to temperature. The Charleston International Airport (CHS) climate site even came in as 4th warmest year on record. Although the Savannah International Airport (SAV) did not quite crack the top 5 warmest years on record, they did make the top 10. Not surprisingly, this has been the trend the past several years - 2018 joins 2015, 2016, and 2017 in the top 10 warmest years on record at both sites. Temperatures for 2018 in Downtown Charleston (CXM) fell just shy of the top 10 list. Annual average temperatures ran around 2 degrees above normal. Rainfall totals for the year also came in above normal for our Charleston sites, but below normal for Savannah. CHS had both May and December come in as wettest and third wettest on record for their respective months, helping to push the annual total to 57.69 inches. About 10 miles down the road at CXM, 47.32 inches of rain fell; meanwhile SAV only received 43.01 inches.

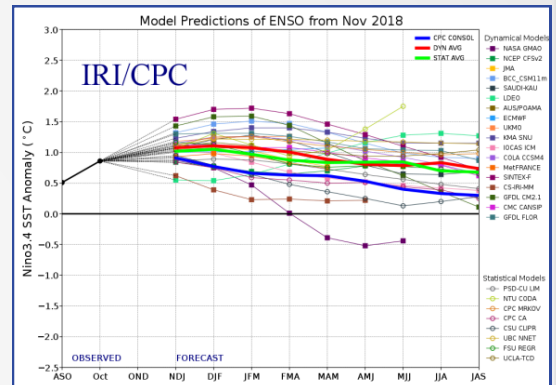
Full annual climate summaries can be found [here](#). Records date back to 1938 at CHS; 1871 at SAV; 1870 at CXM.

What is El Niño - Will it Impact Our Region this Winter?

by Ron Morales - Warning Coordination Meteorologist

El Niño refers to the condition when the sea surface temperatures (SSTs) are at least 1.5 to 2.5 degrees Celsius above normal in the eastern equatorial Pacific waters. El Niño conditions typically form between March and June, and peak in intensity from December to April. Once it forms, it will typically persist for 9 to 12 months. When a moderate to strong El Niño forms, it usually has significant impacts on the weather pattern across a large portion of the western northern hemisphere, including the continental U.S. The National Oceanic and Atmospheric Administration’s (NOAA) [Climate Prediction Center](#) (CPC) is forecasting at least a weak El Niño to be in place during this [2018/2019 winter season](#), with above normal precipitation expected over the southeastern U.S. In fact, as of December 2018, much of our area has already experienced above normal rainfall. Given the relatively weak magnitude of the event, the temperature forecast is a little more uncertain, with equal chances for above/below/near normal temperatures. Finally, another potential impact during an El Niño event, especially the stronger ones, is an increased chance for severe weather. Therefore, our region may continue to receive above normal precipitation, and possibly severe storms/tornadoes, but the final impact will greatly depend on the strength of the El Niño episode this winter.

The majority of the latest model predictions for El Niño show El Niño conditions peaking later this winter and into early spring.



click chart to see publication from CPC

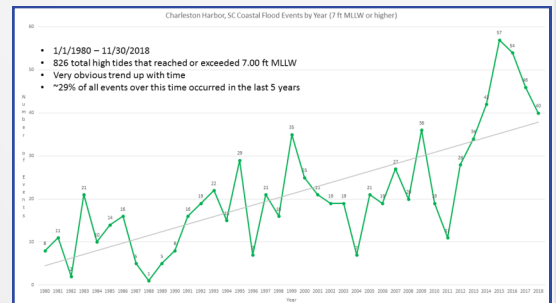
NWS Charleston Focus on Coastal Flooding

by Steve Rowley - Science and Operations Officer

Your National Weather Service office in Charleston, SC devotes significant time and resources forecasting salt water flooding caused by elevated high tides. These high tides can flood low-lying roads and damage coastal properties. Because these elevated high tides inhibit coastal drainage, heavy rain at high tide can greatly exacerbate flooding.

What are the causes of tidal flooding?

Over the long term, rising sea levels have translated to more frequent coastal flood events, as shown by the chart prepared by Senior Forecasters Blair Holloway and Pete Mohlin.



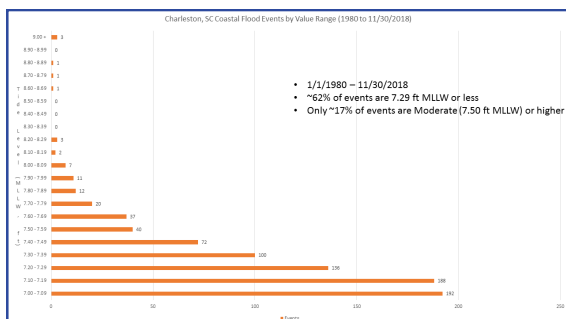
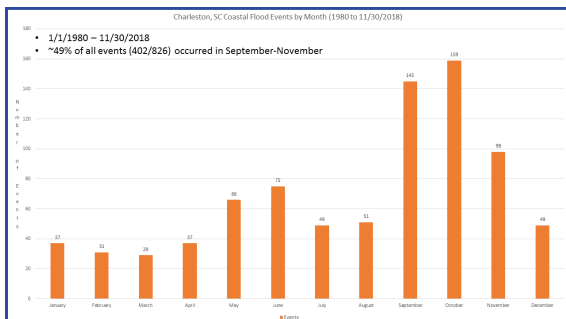
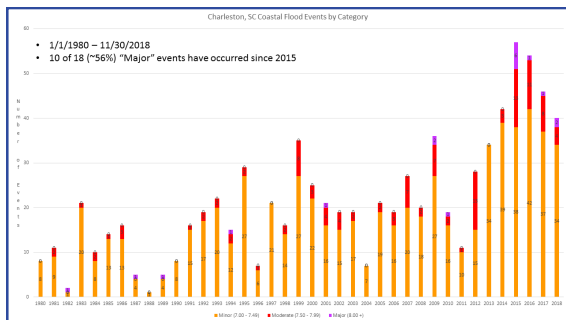
click chart to enlarge

Focus on Coastal Flooding - Continued

In the shorter term, the position of the Moon during its orbit about the Earth is well understood and plays a huge role in global tides. Indeed, you have probably noticed that tides are higher when the Moon phase is full or new. Meteorologists must also consider other, more variable processes such as wind direction, wind speed and atmospheric pressure. Recent research also suggests that changes in the Gulf Stream could impact tides levels along our coastline, but these processes are still poorly understood. From a societal standpoint, growing coastal population greatly increases the odds that salt water flooding will impact lives and property.

Charleston Harbor Coastal Flood Events

click chart to enlarge



Charts prepared by Senior Forecasters Blair Holloway & Pete Mohlin

Your National Weather Service office produces forecasts of specific water level which account for all these factors. You can view these forecasts anytime for [Charleston](#) and [Fort Pulaski](#). Most commonly, when the high tide level is expected to produce nuisance flooding, the Charleston National Weather Service will issue a Coastal Flood Advisory valid for an hour or two before and after the time of the high tide. On rare occasions, when salt water is expected to produce serious coastal flooding which could endanger lives and property, your National Weather Service office will issue Coastal Flood Watches and Warnings. During these situations, you should protect coastal property from high water and avoid driving through flood-prone areas. The charts to the left offer more information about the frequency of coastal flood events since 1980.

And, of course, during tropical cyclones we often issue Storm Surge Watches and Warnings in advance of dangerous salt water inundation. We urge you to remain alert for coastal flooding by checking for these Watches, Warnings and Advisories on our web site.

Finally, during coastal flood events, we greatly appreciate your real-time or delayed reports of salt water flooding of any location within the tide zone.

You can pass along reports 24 hours a day at 888-383-2024, or you can drop us an e-mail at nws.charlestonSC@noaa.gov. Your reports will help us to more accurately assess the impacts of ongoing flooding and to calibrate our services for future events.

Sea Fog Forecasting and Local Research

by Pete Mohlin - Meteorologist

The cooler months of the year often bring our area periodic sea fog. This can be particularly hazardous for mariners, pilots and even motorists if it moves onshore.

There are many challenges associated with forecasting sea fog. Since sea fog is not restricted to light wind regimes, it can affect an area far from where it originated, and it can persist for an extended period of time.

To aid forecasters in the prediction of sea fog, a local research team comprised of Dr. Bernard Lindner from the College of Charleston, Peter Mohlin from NWS Charleston, and College of Charleston students Clay Caulder and Aaron Neuhauser conducted a study of 648 coastal fog events from 1998-2014. The researchers looked for correlations between these events and relevant oceanic and atmospheric parameters.

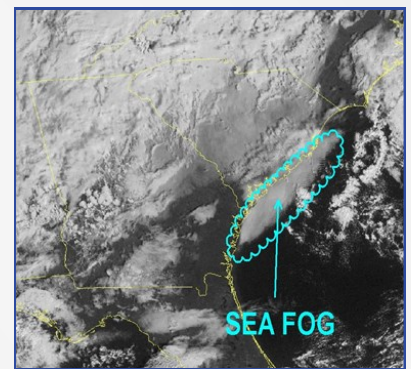
Parameters that were examined included sea surface, air, and dew point temperatures, wind speed and direction, and inversion strength and height. Some parameters were more important than others, but all were utilized in creating a [sea fog decision tree](#). This decision tree was tested during the 2016-2017 "sea fog season" and was determined to be highly successful, predicting sea fog 94% of the time that it occurred and predicting the lack of sea fog during the 97% of the time it did not occur.

[Click here for a more in-depth look into this sea fog study.](#)

In general, forecasters look for the following when assessing sea fog potential:

- Waters "cooler" than the overriding "warmer" air during the cooler months
- Stable air with a strong inversion in place
- High relative humidity (or a small difference between the air temperature and the dew point)
- Air and dew point temperatures over the ocean greater than or similar to the water temperature
- A long fetch that is either parallel to the coast or onshore
- Wind speeds mostly 11 kt or less

The Charleston Harbor and the Port of Savannah will be closed to navigation when visibility drops to 1 mile or less, and our office will issue a Dense Fog Advisory for mariners when visibility falls to ½ mile or less (with the option of issuing the advisory for visibility 1 mile or less). If the sea fog moves onshore, forecasters will issue a Dense Fog Advisory when visibility is ¼ mile or less.



click image to enlarge

To assist us with the forecasting of sea fog, please call (888-383-2024) or email (nws.charlestonSC@noaa.gov) any sea fog reports with an estimate of the visibility and where it is occurring. In addition, let us know when conditions have improved.

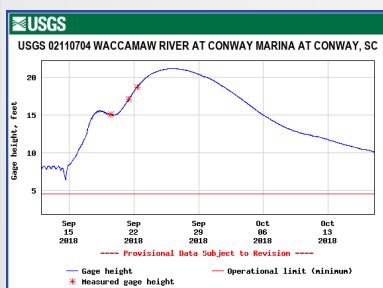
NWS Charleston Assists NWS Wilmington with Hurricane Florence Flood Surveys

by Blair Holloway - Meteorologist

Hurricane Florence made landfall near Wrightsville Beach, NC at 7:15 am EDT on Friday, September 14th as a Category 1 hurricane and brought a wide array of impacts to much of eastern North and South Carolina. Florence produced maximum storm total rainfall amounts of nearly 36 inches, and the result was record flooding along several rivers. Fortunately for the NWS Charleston forecast area, Florence and its most significant impacts remained just to the north. One of the most heavily impacted regions was that served by the NWS Wilmington, NC office. In the days and weeks following Florence, NWS Wilmington needed to survey the impacted areas to document the full scope and significance of the flooding. To assist, two forecasters from NWS Charleston traveled to the region to join the survey effort.

Forecasters Blair Holloway and Jonathan Lamb spent nearly 4 days assessing storm surge and river flooding damage across an area from Georgetown, SC to Southport, NC, and as far inland as Conway, SC. The bulk of their time, and the location of most significant flooding damage, was spent in and around Conway, SC along the Waccamaw River.

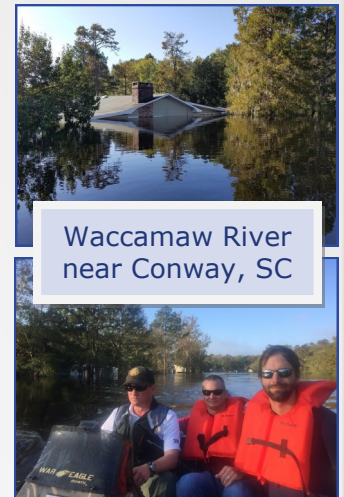
click chart to enlarge



A USGS river gage located on [US-501 in Conway](#) provided stage height measurements during the event. At the gage location, the Waccamaw River spent nearly a month above its Major flood stage (14 feet), and crested at a new record of 21.16 feet on September 26th. This crest exceeded the previous record of 17.87 feet which was associated with Hurricane Matthew from October of 2016. The

degree of damage from the flooding along the Waccamaw River certainly matched the magnitude and duration of its crest. It is estimated that thousands of homes were inundated with flood waters, not only along the Waccamaw River but also along and near many small swamps and tributaries that feed into the main portion of the river. Also, extensive flooding occurred along the Intracoastal Waterway near Conway and Socastee, likely due to backwater effects extending from the Waccamaw River. Flood waters extended up to 5 miles away from the main channel of the river in some areas. Furthermore, in many locations, flood waters were deep enough to reach the roofs of homes and produced significant damage to infrastructure, including washed out roads and bridges.

Survey efforts were aided by excellent guidance from NWS Wilmington staff and by support from state/local emergency management and law enforcement officials. NWS Charleston was proud to help out our neighboring office in a time of major need!



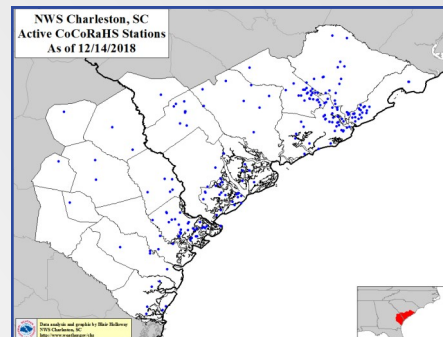
Waccamaw River near Conway, SC

Join the CoCoRaHS Network!

by Julie Packett - Administrative Support Assistant

Have you ever wondered how much rain fell in your backyard after a downpour or curious to know if Mother Nature provided enough weekly rainfall for your garden? If so, consider becoming a volunteer for with the Community Collaborative Rain, Hail and Snow Network, better known as [CoCoRaHS](#).

CoCoRaHS is a non-profit, community-based network of volunteers of all ages and backgrounds working together to measure and map precipitation. Volunteers take daily rain, snow, and hail measurements in their backyard and report their observations online. As of 2019, CoCoRaHS is in all fifty states and has grown to 20,000 active volunteers. In the NWS Charleston forecast area, over 200 active CoCoRaHS observers contribute to the daily weather puzzle!



click map to enlarge



CoCoRaHS March Madness

Each March, CoCoRaHS hosts a friendly recruiting contest between all 50 states to see who can recruit the most new volunteers during the 31 days. South Carolina took home the CoCoRaHS March Madness Cup in 2018 with 178 new volunteers! Georgia made a great showing with 55 new observers, placing 8th in the traditional category.

For more information about CoCoRaHS and how to become a volunteer observer, Check out our [local webpage](#)!

“Because every drop counts”

“I have thoroughly enjoyed checking my rain gauge each morning, and since I am also a Master Gardener, I have learned a lot in determining the watering needs of my own garden!”
March Madness recruit - SC-CR-123



“I’ve been an amateur scientist and an observer of nature since I was a child. I really appreciate the opportunity to contribute my observations to the CoCoRaHS network.”
March Madness recruit - SC-CL-20

8th Annual NWS Week of Service

by Emily McGraw - Meteorologist

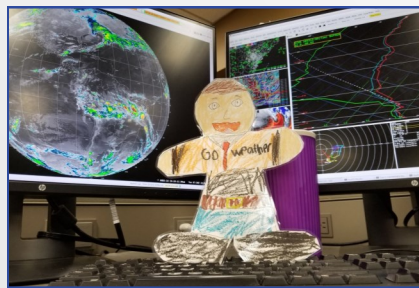
Every year in the fall, the National Weather Service (NWS) holds the National Week of Community Service. During this week, offices around the country make an effort to reach out to help those who are in need in our communities. All of these events occur outside of our normal working hours.



NWS Week of Service - Continued

For the 8th Annual NWS Week of Service, NWS Charleston, SC brought in donations to make Hygiene Kits for One80 Place. At the end of the donation period, several staff members worked together to assemble the kits. We were able to make 114 kits! Each kit contained travel size toothpaste, shampoo, deodorant, soap and a toothbrush. One80 Place provides a variety of services for homeless people in the community. Not only does the shelter offer meals and a place to sleep, they also provide comprehensive programs for guests to help stop the cycle of homelessness and promote self-sufficiency.

Check out the [2018 Week of Service](#) page to see what other NWS offices did, as well as an event summary.



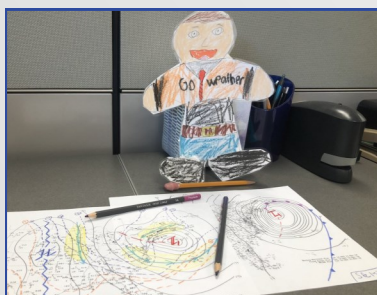
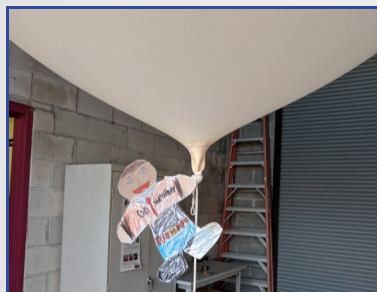
Flat Stanley Visits the NWS

by Neil Dixon - Meteorologist

Flat Stanley, by Jeff Brown, has been enjoyed by young students for 50 years. Flat Stanley has traveled around the world visiting high profile celebrities, politicians, and athletes. (It is easy to do when you can travel via the mail.)

During the spring of 2018, Flat Stanley was sent to us by Mrs. Brule’s Second Grade Class at Laurel Hill Primary. We had fun with Flat Stanley's visit and featured him in numerous posts on our social media channels. In fact, one or two of the Flat Stanley tweets were ranked among the top 25 daily tweets across the entire U.S. Government. Here is a Twitter Moment of all of Flat Stanley’s cameos discussing atmospheric

science, safety/preparedness, and climate: [Twitter Moment](#).



We would welcome another visit from Flat Stanley. If you know a student with a Flat Stanley, please let them know about our office. Just send the Flat Stanley, a letter, and the teacher/school information to:

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National Weather Service	
5777 South Aviation Avenue	
North Charleston, SC 29406	

Thank you to our NWS Charleston Weather Ready Nation Ambassadors!

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 American Red Cross of Southeast & Coastal Georgia
 Anderson Insurance Associates
 Atlantic Business Continuity Services
 Awendaw McClellanville Fire Department
 Beaufort County Sheriff's Office Emergency Management
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 Charleston Amateur Radio Society (CARS)
 Charleston County School District
 Charleston County Park and Recreation Commission
 Charleston Junior Woman's Club
 Charleston RiverDogs
 Charleston Water Taxi
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 Chucktown Wind Report
 Coastal Health District (GA Dept of Public Health)
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