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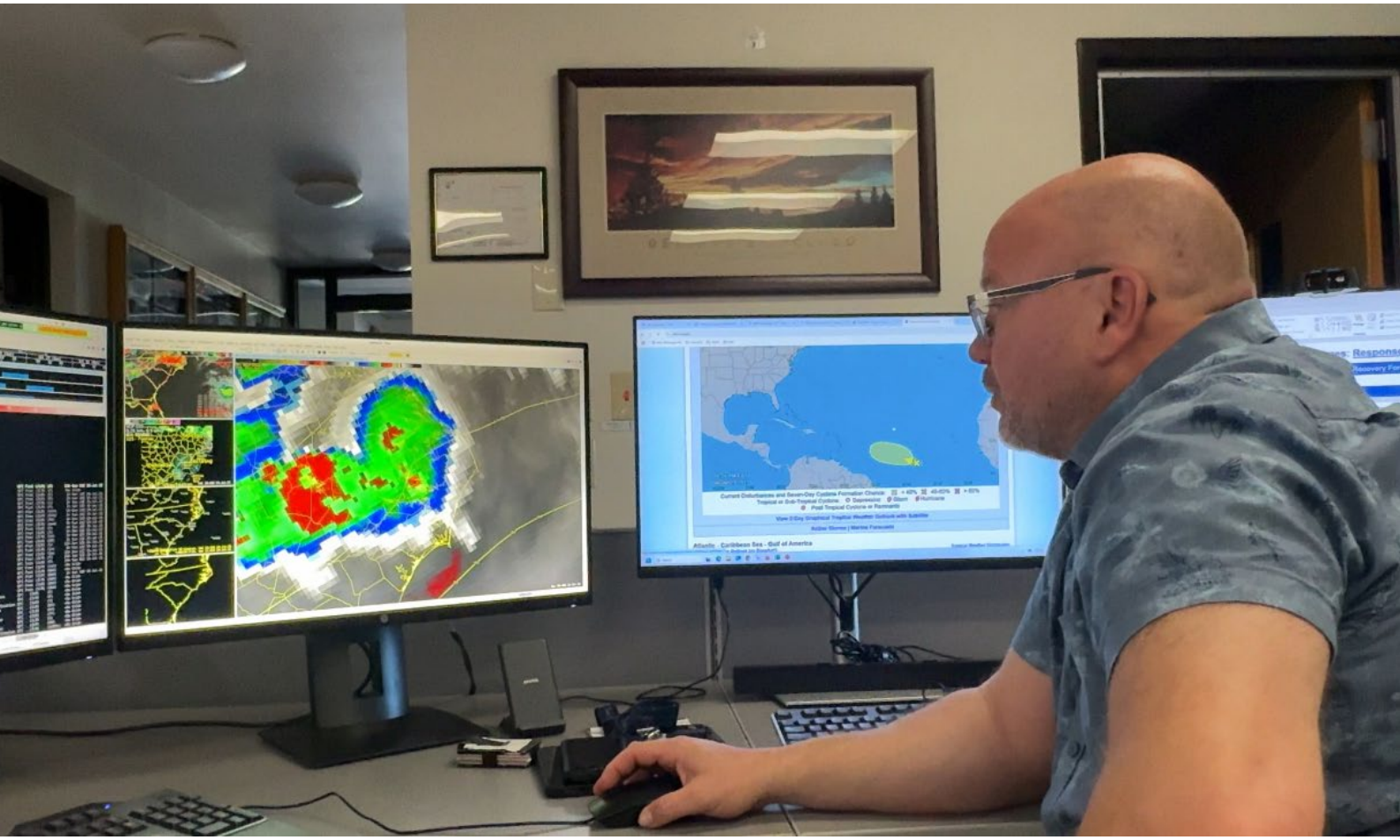
Featuring Issue

SEMILLA MAGAZINE

In the peak of heat and hurricane season,
we go inside the command center protecting our coast.

At the Eye of the Storm: Inside NWS Wilmington's Battle with Extreme Weather



Join us as we speak with Steven Pfaff, Meteorologist-in-Charge at NWS Wilmington, to uncover how he and his team face the challenges of extreme weather in the Carolinas.

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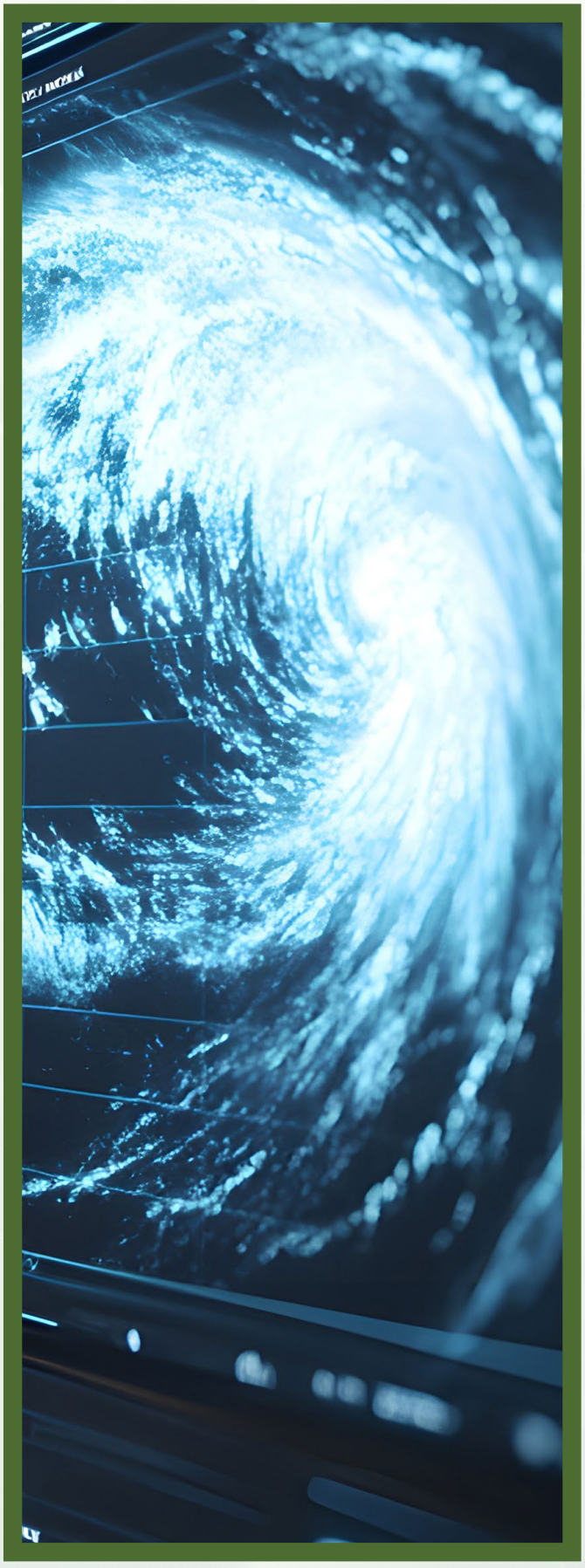
The Frontlines of Forecasting

When you step into the National Weather Service (NWS) office in Wilmington, North Carolina, the quiet hum of technology blends with the low, steady voices of professionals who quite literally stand between chaos and safety. Weather maps glow on screens, Doppler radar sweeps track storms across the Carolinas, and satellite feeds stream in from thousands of miles away.



At the center of it all is Steven Pfaff, Meteorologist-in-Charge (MIC) of the NWS Wilmington office. For more than 25 years, Pfaff has guided the region through hurricanes, floods, and extreme weather events. His journey to this role began at age four, living in New Jersey, when a hurricane was approaching. He remembers listening to his family discuss the storm — not fully understanding the danger but feeling compelled to act. He hopped on his bicycle and rode through the neighborhood warning,

“A hurricane is coming tomorrow!” Years later, an elementary school social studies project had him play the role of a TV meteorologist — a role that foreshadowed his life’s work and greatest passion.

The Frontlines of Forecasting

Behind Pfaff's leadership lies something deeply human — an orchestra of meteorologists, citizen scientists, amateur radio operators, emergency managers, and countless volunteers. Their tools may be weather balloons, buoys, and radar, but the goal is simple: keep people out of harm's way.

"If you don't get a starting point with observations, it's useless," the meteorologist explains. "That's why we invest, literally and figuratively , in weather balloons, satellites, radar, buoys, and volunteers. We can't have a weather station every 10 miles, so we rely on people in the field to help fill in the gaps."
– S. Pfaff

About NOAA & the NWS Wilmington, NC Office

NOAA

The National Oceanic and Atmospheric Administration (NOAA) is the parent federal agency responsible for monitoring the Earth's oceans, atmosphere, and climate. NOAA's mission spans weather forecasting, environmental research, climate change monitoring, and marine conservation.

NWS

The National Weather Service (NWS) is one of NOAA's divisions, focusing specifically on weather, water, and climate forecasts, as well as public warnings to protect life and property.

NWS Wilmington, NC

NWS Wilmington, NC is one of 122 local Weather Forecast Offices across the U.S., covering six counties in southeast North Carolina and eight counties in northeast South Carolina. The office issues severe weather warnings, coordinates with emergency managers, conducts post-storm surveys, and works closely with neighboring offices in Charleston, Columbia, and Raleigh to ensure consistent, accurate forecasts.

Climate Change: From Theory to Reality

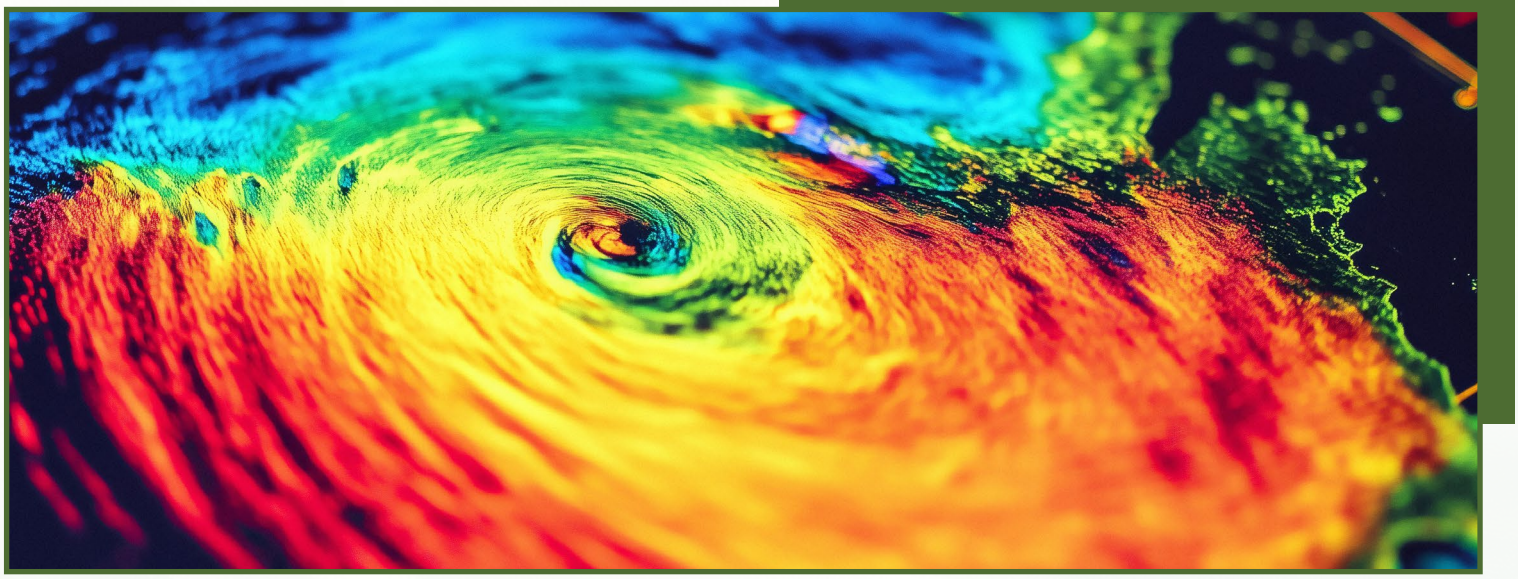
Since the late 1990s, NWS Wilmington has seen a clear shift in local weather trends. Coastal flood advisories, once issued only a few times a year, are now common — often multiple times per month. Full and new moon cycles now routinely precondition the coast with higher water levels, making it easier for even modest storms to push water inland.

August brings that reality into a sharper focus. The month sits in the heart of hurricane season for the Atlantic Basin, historically producing some of the most powerful and destructive storms to impact the Carolinas. At the same time, it is one of the hottest months of the year, with high heat and humidity acting as fuel for intense thunderstorms and tropical systems. For meteorologists, August is a constant balancing act — tracking heat-driven afternoon storms while scanning the tropics for the next potential hurricane threat.

"Ten inches over two days is one thing," the meteorologist says. "Ten inches in six hours is life-threatening." -S. Pfaff

Warmer atmospheric conditions deepen the troposphere, the lowest layer of the atmosphere, allowing it to hold more moisture. This extra capacity means summer thunderstorms can drop six to ten inches of rain in just hours, overwhelming storm drains and triggering flash flooding. Urban growth compounds the problem: more concrete means less absorption and more dangerous runoff.

The Human Factor

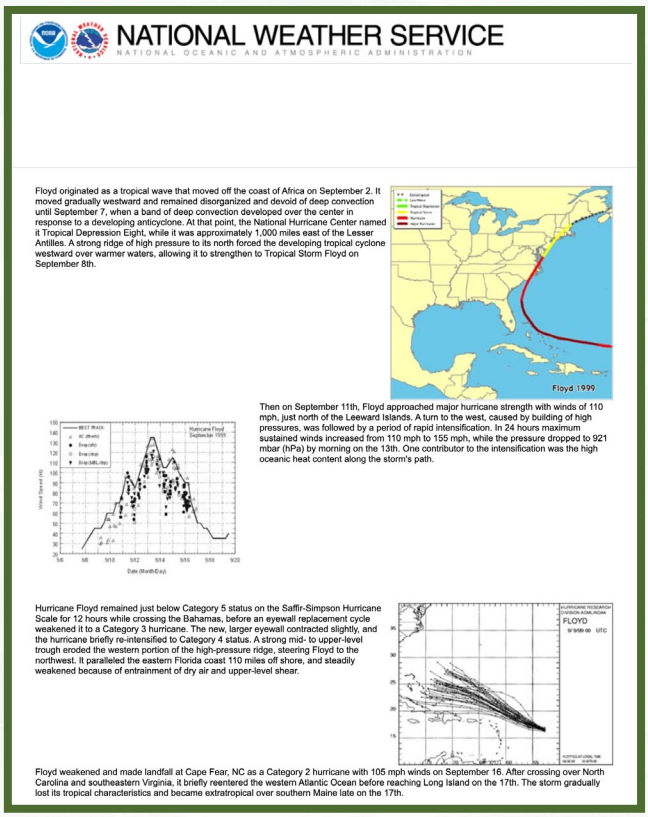


Technology delivers the warnings, but human behavior determines their impact. People who have lived through severe hurricanes or tornadoes tend to take action quickly. Others, especially newcomers, may hesitate, waiting for visible proof of danger. That hesitation can be fatal.

The Carolinas are no strangers to major storms like Fran, Hazel, and Hugo, but many new coastal residents have never experienced the “wind monster” of a Category 3 or 4 landfall.

And sometimes, even the technology is vulnerable. In September 2017, Hurricane Irma damaged the Doppler radar at NWS San Juan in Puerto Rico. Just 13 days later, Hurricane Maria made direct landfall with the radar still offline, forcing meteorologists to rely on satellite data, offshore radars, and surface reports — a reminder of how quickly storms can overwhelm infrastructure.

Florence, Floyd, & the Unthinkable



NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Floyd originated as a tropical wave that moved off the coast of Africa on September 2. It moved gradually westward and remained disorganized and devoid of deep convection until September 7, when a band of deep convection developed over the center in response to a developing anticyclone. At that point, the National Hurricane Center named it Tropical Depression Eight, while it was approximately 1,000 miles east of the Lesser Antilles. A strong ridge of high pressure to its north forced the developing tropical cyclone westward over warmer waters, allowing it to strengthen to Tropical Storm Floyd on September 8th.

Floyd 1999

Then on September 11th, Floyd approached major hurricane strength with winds of 110 mph, just north of the Leeward Islands. A turn to the west, caused by building of high pressures, was followed by a period of rapid intensification. In 24 hours maximum sustained winds increased from 110 mph to 155 mph, while the pressure dropped to 921 mbar (hPa) by morning on the 13th. One contributor to the intensification was the high oceanic heat content along the storm's path.

Hurricane Floyd remained just below Category 5 status on the Saffir-Simpson Hurricane Scale for 12 hours while crossing the Bahamas, before an eyewall replacement cycle weakened it to a Category 3 hurricane. The new, larger eyewall contracted slightly, and the hurricane briefly re-intensified to Category 4 status. A strong mid- to upper-level trough eroded the western portion of the high-pressure ridge, steering Floyd to the northwest. It paralleled the eastern Florida coast 110 miles off shore, and steadily weakened because of entrainment of dry air and upper-level shear.

FLOYD

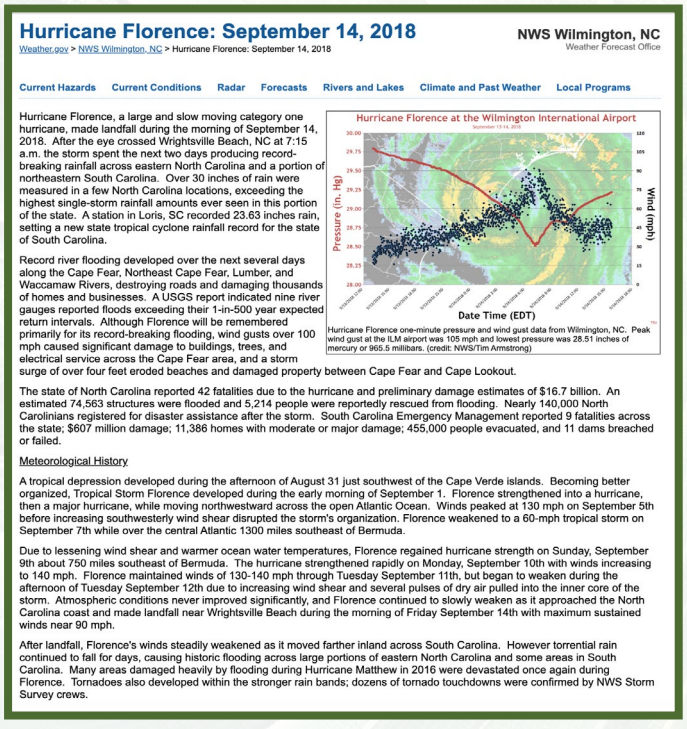
Floyd weakened and made landfall at Cape Fear, NC as a Category 2 hurricane with 105 mph winds on September 16. After crossing over North Carolina and southeastern Virginia, it briefly reentered the western Atlantic Ocean before reaching Long Island on the 17th. The storm gradually lost its tropical characteristics and became extratropical over southern Maine late on the 17th.

When asked which storms most defined his career, the meteorologist Steven Pfaaf doesn't hesitate to say: "Florence."

Hurricane Floyd (1999) dropped 18–20 inches of rain on already saturated ground, causing record flooding.

Hurricane Florence (2018) delivered an estimated 35–40 inches over Brunswick, Columbus, and Bladen Counties. Some towns, like Fair Bluff, lost their historic centers entirely, and seven years later, families in Pender County remain displaced.

The Saffir-Simpson scale (which categorizes hurricanes by wind speed) doesn't measure flooding. "Imagine Florence with full rivers, 30–40 inches of rain, and coming ashore as a Category 3 or 4," he says. "That's something we haven't seen — yet."



Hurricane Florence: September 14, 2018

NWS Wilmington, NC
Weather Forecast Office

Weather.gov > NWS Wilmington, NC > Hurricane Florence: September 14, 2018

Current Hazards | Current Conditions | Radar | Forecasts | Rivers and Lakes | Climate and Past Weather | Local Programs

Hurricane Florence, a large and slow moving category one hurricane, made landfall during the morning of September 14, 2018. After the eye crossed Wrightsville Beach, NC at 7:15 a.m. the storm spent the next two days producing record-breaking rainfall across eastern North Carolina and a portion of northeastern South Carolina. Over 30 inches of rain were measured in a few North Carolina locations, exceeding the highest single-storm rainfall amounts ever seen in this portion of the state. A station in Loris, SC recorded 23.63 inches rain, setting a new state tropical cyclone rainfall record for the state of South Carolina.

Hurricane Florence at the Wilmington International Airport

Pressure (in. Hg)

Wind (mph)

Date Time (EDT)

Hurricane Florence one-minute pressure and wind gust data from Wilmington, NC. Peak wind gust at the ILM airport was 105 mph and lowest pressure was 28.51 inches of mercury or 965.5 millibars. (credit: NWS/Tim Armstrong)

Record river flooding developed over the next several days along the Cape Fear, Northeast Cape Fear, Lumber, and Waccamaw Rivers, destroying roads and damaging thousands of homes and businesses. A USGS report indicated nine river gauges reported floods exceeding their 1-in-500 year expected return intervals. Although Florence will be remembered primarily for its record-breaking flooding, wind gusts over 100 mph caused significant damage to buildings, trees, and electrical service across the Cape Fear area, and a storm surge of over four feet eroded beaches and damaged property between Cape Fear and Cape Lookout.

The state of North Carolina reported 42 fatalities due to the hurricane and preliminary damage estimates of $16.7 billion. An estimated 74,563 structures were flooded and 5,214 people were reportedly rescued from flooding. Nearly 140,000 North Carolinians registered for disaster assistance after the storm. South Carolina Emergency Management reported 9 fatalities across the state; $607 million damage; 11,386 homes with moderate or major damage; 455,000 people evacuated, and 11 dams breached or failed.

Meteorological History

A tropical depression developed during the afternoon of August 31 just southwest of the Cape Verde islands. Becoming better organized, Tropical Storm Florence developed during the early morning of September 1. Florence strengthened into a hurricane, then a major hurricane, while moving northwestward across the open Atlantic Ocean. Winds peaked at 130 mph on September 5th before increasing southwesterly wind shear disrupted the storm's organization. Florence weakened to a 60-mph tropical storm on September 7th while over the central Atlantic 1300 miles southeast of Bermuda.

Due to lessening wind shear and warmer ocean water temperatures, Florence regained hurricane strength on Sunday, September 9th about 750 miles southeast of Bermuda. The hurricane strengthened rapidly on Monday, September 10th with winds increasing to 140 mph. Florence maintained winds of 130-140 mph through Tuesday September 11th, but began to weaken during the afternoon of Tuesday September 12th due to increasing wind shear and several pulses of dry air pulled into the inner core of the storm. Atmospheric conditions never improved significantly, and Florence continued to slowly weaken as it approached the North Carolina coast and made landfall near Wrightsville Beach during the morning of Friday September 14th with maximum sustained winds near 90 mph.

After landfall, Florence's winds steadily weakened as it moved farther inland across South Carolina. However torrential rain continued to fall for days, causing historic flooding across large portions of eastern North Carolina and some areas in South Carolina. Many areas damaged heavily by flooding during Hurricane Matthew in 2016 were devastated once again during Florence. Tornadoes also developed within the stronger rain bands; dozens of tornado touchdowns were confirmed by NWS Storm Survey crews.

An Orchestra of Collaboration

Daily, National Weather Service (NWS) Wilmington works with surrounding offices in Charleston, Columbia, and Raleigh to ensure forecast consistency. Meteorologists compare graphics, adjust models, and smooth out land-to-sea temperature gradients so the public gets one clear message.

When hazards loom, this collaboration intensifies. A one-page PDF briefing grows into multi-slide presentations and then into live calls with emergency managers. Historical comparisons, model projections, and risk assessments are shared openly so communities can prepare.

During Florence, the Wilmington team expanded its schedule: one forecaster on winds, another on radar, another on public briefings. Every role was essential in keeping the orchestra in sync.

Patterns and the Long View

The meteorologist S. Pfaff, explains the Atlantic Multidecadal Oscillation (AMO) — a decades-long cycle of ocean temperature changes that influences hurricane activity. Since 1995, the Atlantic has been in a “warm phase,” producing more frequent and intense storms. This cycle may end in the coming years, but climate change complicates predictions. NASA projects a 20% increase in the intensity of the strongest hurricanes in the future.

For forecasters, August is the month when the AMO’s warm phase, climate change’s amplifying effects, and the peak of hurricane season often collide. It’s when ocean waters are at their warmest and the atmosphere is primed for rapid storm development conditions that demand constant vigilance.

The Weight of Warnings

When asked what it feels like to issue a life-threatening hurricane warning, the meteorologist’s answer was heavy:

“Sometimes you know people are going to be killed because you can’t reach everyone. Some live off the grid, some just don’t believe it. We’ve used phrases like ‘life-threatening flood situation’ and ‘catastrophic flooding,’ but not everyone is on social media or owns a weather radio. Communication gaps, especially socioeconomic ones, are always a challenge.” - Steven Pfaff

To the Guardians of the Coast...

For Steven Pfaff, the science of meteorology isn't just about charts, satellites, and forecasts — it's about people. And he believes the next generation has a vital role to play in shaping the future of weather readiness.

His advice to young people is simple but powerful: start connecting.
"Reach out to your local news stations," he says. "Introduce yourself to meteorologists, ask questions, and learn about how they serve your community. Contact your local National Weather Service office — we're always looking for volunteers, storm spotters, and citizen scientists. If you're passionate about weather, there's a place for you in this network."

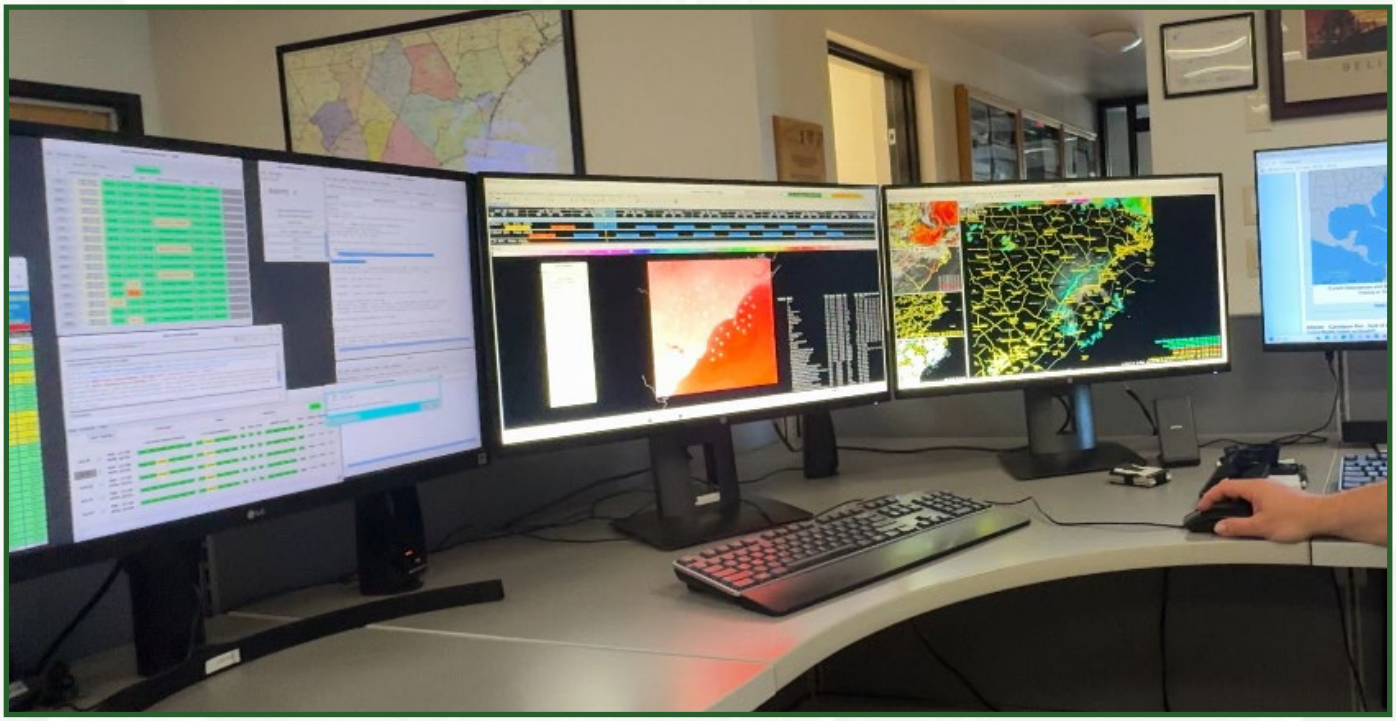
Pfaff encourages attending conferences, workshops, and public safety events. "That's where you meet the people you'll one day be working alongside — emergency managers, broadcasters, researchers. You start building relationships, and those connections will carry you far."

To the Guardians of the Coast...

The path, begins with curiosity and action. “It’s like preparing for a storm,” he smiles. “You don’t wait until it’s here — you start now.”

The team at Semilla Magazine extends heartfelt thanks to the National Weather Service Wilmington office for opening their doors to us and sharing an inside look at their vital work. We deeply appreciate the dedication, expertise, and collaboration they bring to protecting our communities from extreme weather — especially in August, when heat waves and hurricane threats can arrive in quick succession, putting preparation and resilience to the test.

We encourage our readers to follow the National Weather Service Wilmington on social media and visit their official website to stay informed and prepared year-round. And don’t forget to follow Semilla Magazine across all our platforms — links to all our socials are included ahead.



Thank You for Reading!

We appreciate you joining us for this special feature of Semilla Magazine, highlighting the dedication of the National Weather Service Wilmington team. Follow us for more inspiring stories, exclusive interviews, and resources that keep our communities informed and prepared.

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