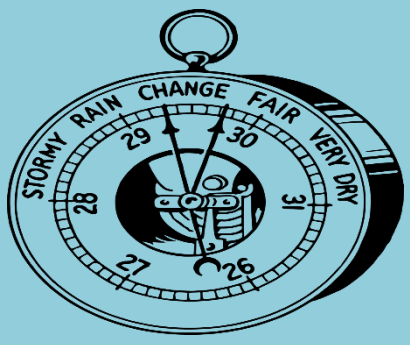


Blue Ridge Barometer

Welcome to the Fall 2020 edition of Blue Ridge Barometer, the biannual newsletter of the National Weather Service (NWS) office in Blacksburg, VA! In this issue, you will find articles of interest about the weather and climate of our County Warning Area (CWA) and the people and technologies needed to bring accurate forecasts to the public. You'll also see some new features, including a section just for kids, and an invitation for you to submit your seasonal weather photos. We hope you'll enjoy reading this as much as we enjoyed putting it together!

Inside this Issue:

Weather Highlight: Record Number of Tropical Cyclones Impact Forecast Area

Robert Beasley, Lead Forecaster

Our forecast area has experienced the effects of a record number of tropical cyclones this year. These have come in the form of remnant hurricanes or tropical storms. The tropical season started in May, earlier than the traditional start date of June 1st, and has continued well into November. The area has been impacted by one or more tropical systems every month during this period. Even as I am writing this article, yet another tropical storm is impacting the forecast area, namely Eta.

To date, we have seen nine tropical cyclones bring significant weather impacts to the area, mostly in the form of flooding rain. At least one brought tropical storm force winds resulting in extensive damage across several of the counties in our County Warning Area (CWA). Interesting to note is that the core of four of these remnant tropical cyclones tracked right across the Blacksburg area, namely Bertha, Laura, Delta, and Zeta, with the winds from Zeta prompting the Blacksburg NWS office to issue its first-ever Tropical Storm Warning on October 28, 2020. Indeed, tropical systems have clearly had an impact on the

Central Appalachians and Mid-Atlantic region this year. This article will provide a summary of each of the tropical cyclones that impacted our forecast area from May 2020 through November 15, 2020.

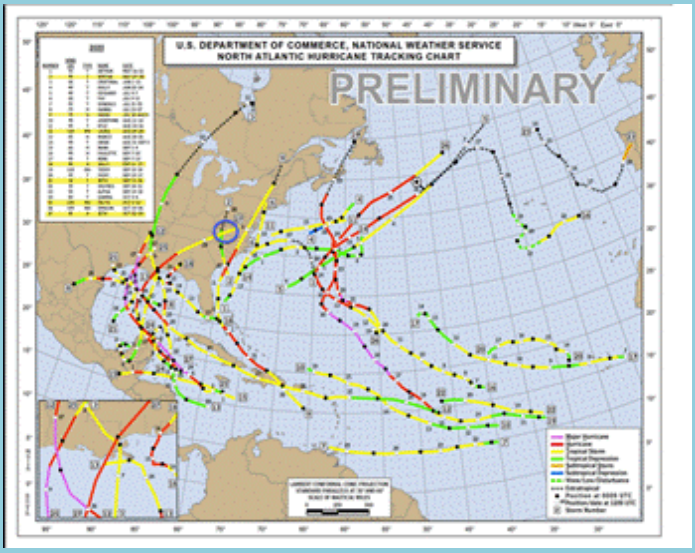


Figure 1. Tracks, intensities, and dates of named tropical cyclones during the 2020 tropical cyclone season through November 1, 2020. Note that the blue circle identifies the approximate area covered by the Blacksburg National Weather Service Forecast Office.

Hurricanes Eta, Theta, and Iota formed after the map in Figure 1 was created. Table 1 provides a written list of all the named tropical cyclones through October 31, 2020. Tropical cyclones Theta and Iota can be added to this list having formed just during the first two weeks of November.

2020 Atlantic Basin Named Tropical Cyclones

Name		Dates	Max Wind (mph)
TS	Arthur	16-19 May	60*
TS	Bertha	27-28 May	50*
TS	Cristobal	1-9 Jun	60
TS	Dolly	22-24 Jun	45
TS	Edouard	4-6 Jul	45
TS	Fay	9-11 Jul	60
TS	Gonzalo	21-25 Jul	65
H	Hanna	23-27 Jul	90
H	Isaias	30 Jul-5 Aug	85
TD	Ten	31 Jul-1 Aug	35
TS	Josephine	11-16 Aug	45
TS	Kyle	14-16 Aug	50
MH	Laura	20-28 Aug	150
H	Marco	20-25 Aug	75
H	Nana	1-4 Sep	75
TS	Omar	31 Aug-5 Sep	40
H	Paulette	7-22 Sep	105
TS	Rene	7-14 Sep	50
H	Sally	11-17 Sep	105
MH	Teddy	12-22 Sep	140
TS	Vicky	14-17 Sep	50
TS	Wilfred	18-20 Sep	40
SS	Alpha	18 Sep	50
TS	Beta	17-22 Sep	60
TS	Gamma	2-5 Oct	70
MH	Delta	4-10 Oct	145
MH	Epsilon	19-26 Oct	115
H	Zeta	24-29 Oct	110
TS	Eta	31 Oct-	40

Notes: (1) Tropical Storm Eta was ongoing at the time of this writing.
(2) Highlighted storms are ones that impacted the Blacksburg NWS County Warning Area with heavy rainfall and/or strong winds.

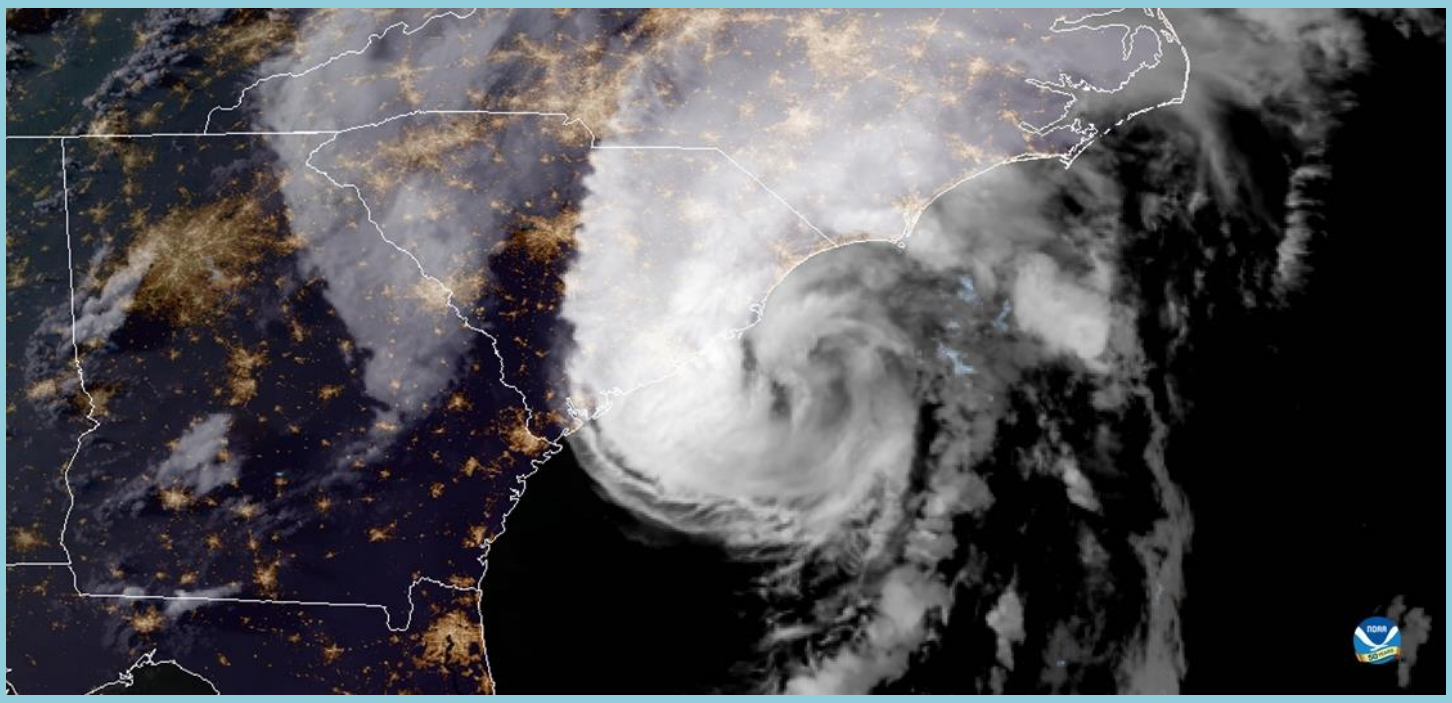
Table 1. Tropical Cyclone Status (TS=Tropical Storm, H=Hurricane, MH=Major Hurricane, SS=Subtropical Storm), Beginning and Ending Dates, and Maximum Sustained Winds.

The first tropical storm of the season, Arthur, formed on May 16, 2020 off the southeast U.S. coast. Following quickly on its heels was Tropical Storm Bertha, forming off the South Carolina coast on May 27th. Bertha then moved north-northwest directly over southwest Virginia on May 29th. This early season storm was the first of nine tropical systems to impact our forecast area in 2020 and one of thirty named tropical cyclones occurring within the Atlantic basin during 2020. Not only has this been a record tropical season for the Blacksburg NWS CWA, but it has likewise been a record season for the

entire Atlantic basin. So many named tropical cyclones occurred in 2020 that the traditional list of alphabetical names established by the World Meteorological Organization had already been exhausted by late September. Additional storms are then named according to the Greek Alphabet. The previous most active tropical season within the Atlantic basin was 2005, which lasted into early January 2006. That season the last-named storm was "Eta" or the 28th named storm. As of this writing, with the formation of Theta and Iota we have arrived at 30 named storms thus far this season. Hurricane season officially ends on November 30th, but it seems reasonable this season may linger longer than that.

While the most significant impact to our forecast area from the tropical systems has been heavy rain and flooding, a couple of these systems have also brought strong and gusty winds which caused wind damage. Isaias in late July/early August, passed well to our east, yet brought strong gusty winds to the Virginia and North Carolina Piedmont. However, Hurricane Zeta in late October was one system that remained at tropical storm strength (Figure 1) as it passed directly over the CWA. Extensive wind damage was reported across portions of Southside Virginia as well as immediate adjacent areas of the Virginia and North Carolina Piedmont.

Now let us examine the impact that each of the named storms had either directly or indirectly on the forecast region.



Hurricane Isaias nearing the southeast U.S. coast on August 3, 2020 (Source: NOAA).

Tropical Storm Bertha (5/27 – 5/28)

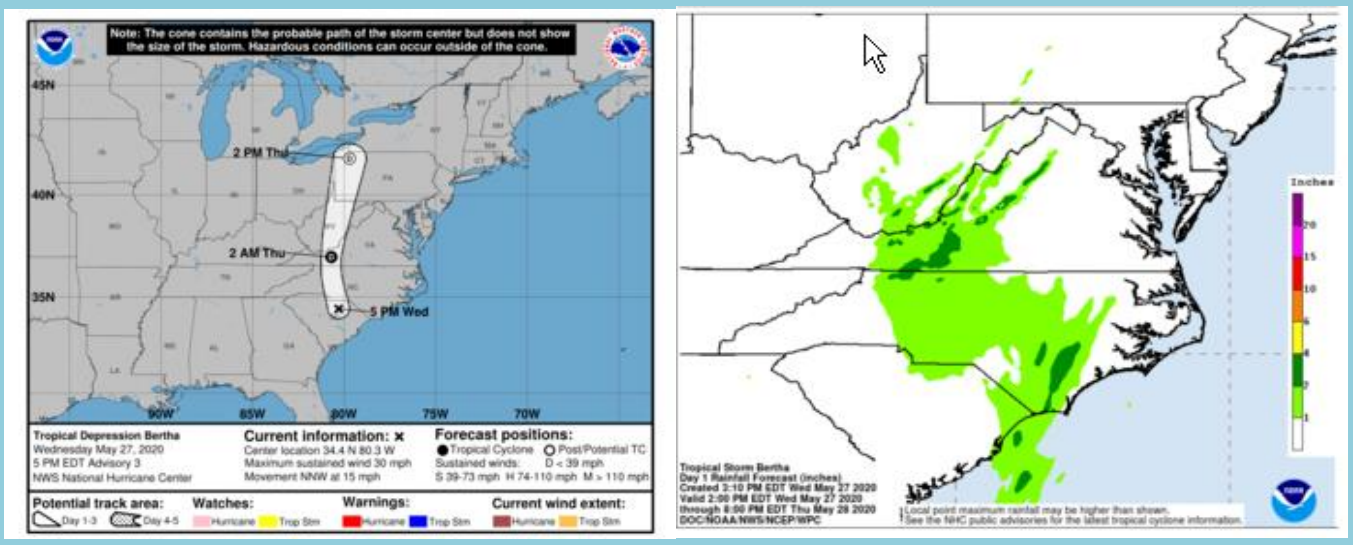


Figure 2. Path and projected rainfall associated with Tropical Storm Bertha.

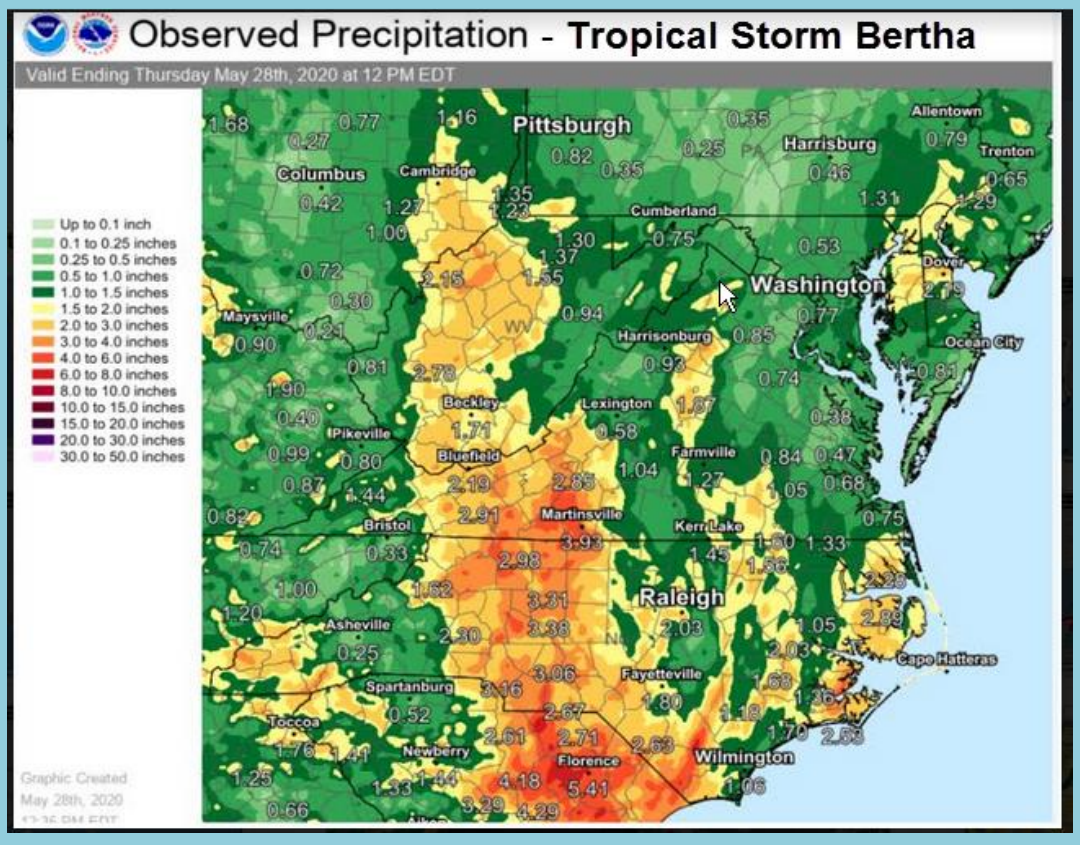


Figure 3. Rainfall associated with Tropical Storm Bertha.

Tropical Storm Cristobal (6/1/20 – 6/9/20)

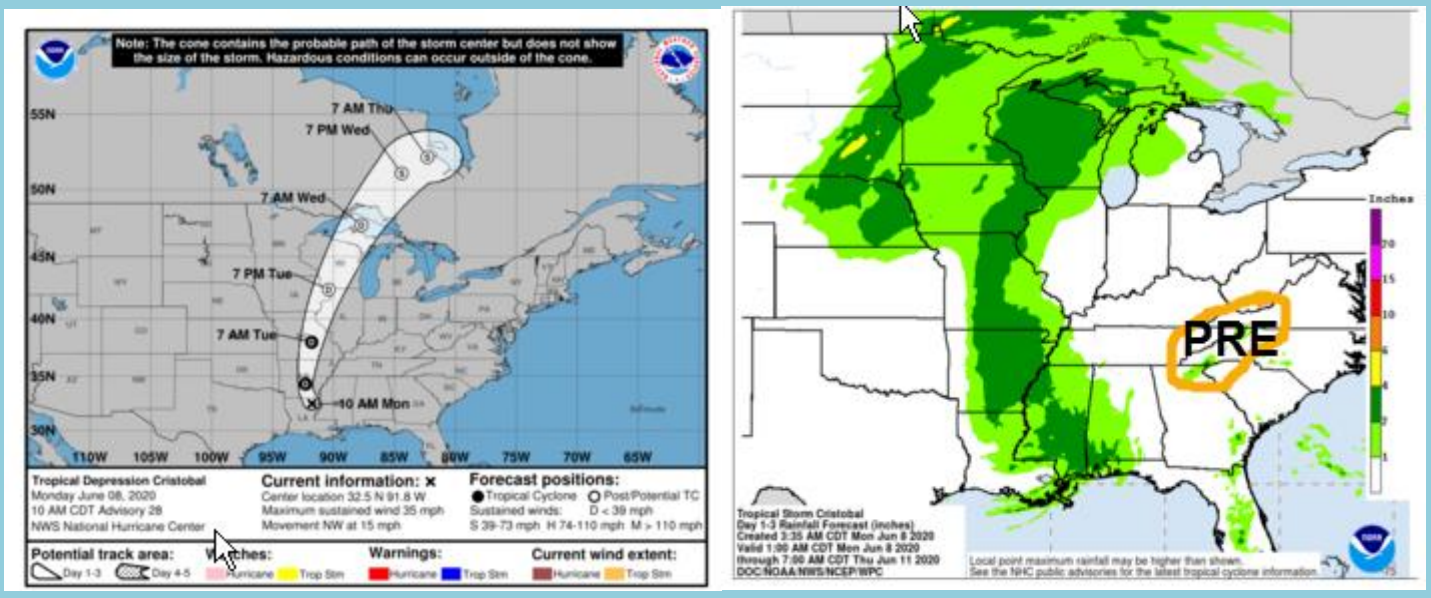


Figure 4. Path and projected rinfall from Tropical Storm Cristobal. While the path did not directly move across the Blacksburg NWS forecast area, a Predecessor Rain Event (PRE) devloped resulting in heavy rainfall especially near the Blue Ridge.

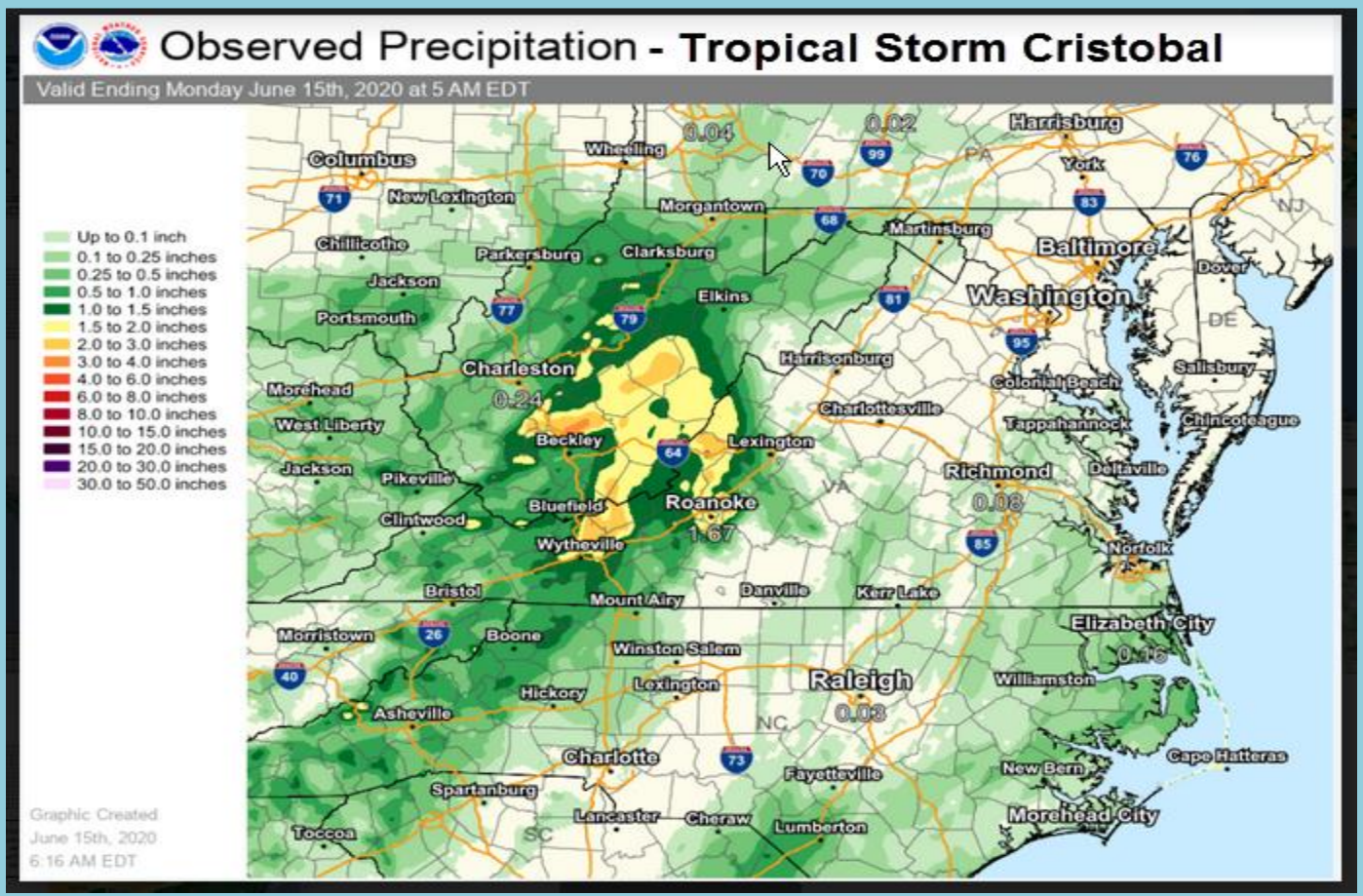


Figure 5. Rainfall associated with Tropical Storm Cristobal.

Tropical Storm Isaias (7/30/20 – 8/5/20)

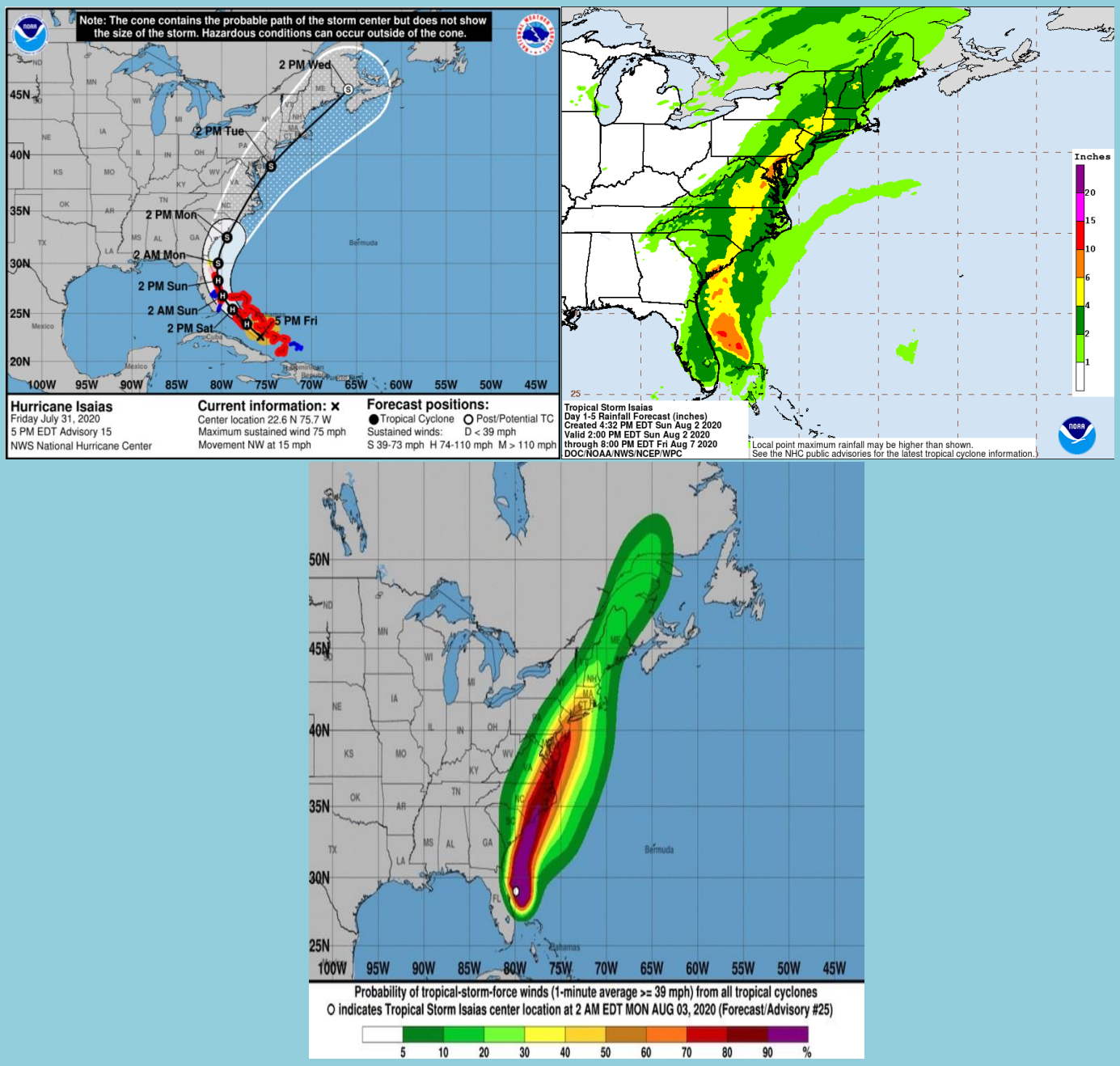


Figure 6. Path, projected rainfall, and probability of tropical storm force winds with Hurricane Isaias. Isaias was one of two storms to not only bring significant rainfall to parts of the forecast area, especially along the eastern slopes of the Blue Ridge, but also strong and gusty winds to the Virginia and North Carolina Piedmont.

Hurricane Laura (8/20/20 – 8/28/20)

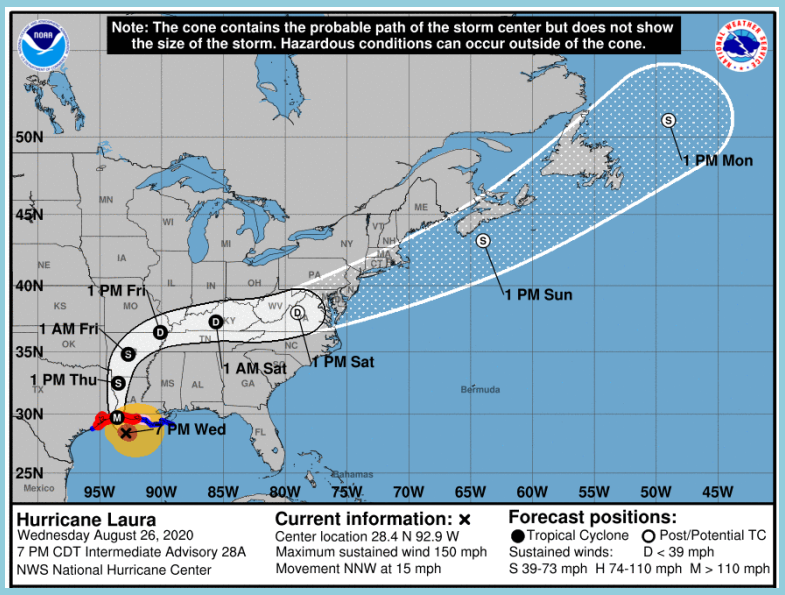


Figure 7. Path of Major Hurricane Laura. Major Hurricane Laura made landfall along the southwest Louisiana coast as a Category 4 hurricane and then tracked northeast as a Tropical Depression across the Blacksburg CWA. Laura was one of the most devastating hurricanes of the season to make landfall in the U.S. resulting in major damage along the Louisiana coast and across southern and western Louisiana with significant flooding rainfall far inland to Arkansas, Tennessee, and Kentucky. The storm had weakened considerably by the time it moved across our region some three to four days after landfall.

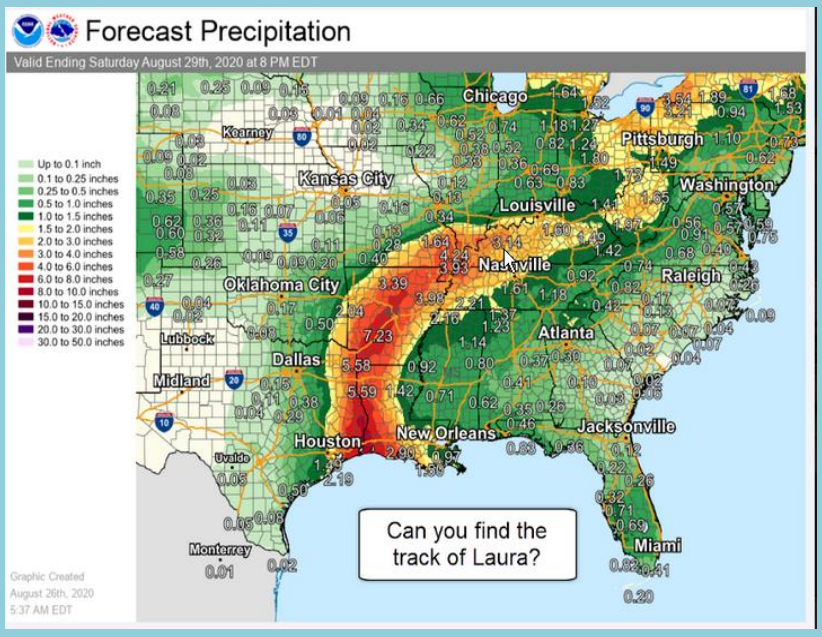


Figure 8. Rainfall associated with Major Hurricane Laura. With this particular storm, once Laura moved several hundred miles inland, the heaviest rainfall focused along a weak nearly stationary frontal system that extended across the Tennessee and Ohio Valleys, thus sparing our region from much more than one to two inches in the far western sections. While there appeared to be a more significant tornado threat for our area with this system compared to most of the others from this season, it fortunately failed to materialize largely due to the long period of time and track before the storm reached our forecast area.

Hurricane Sally (9/11/20 – 9/17/20)

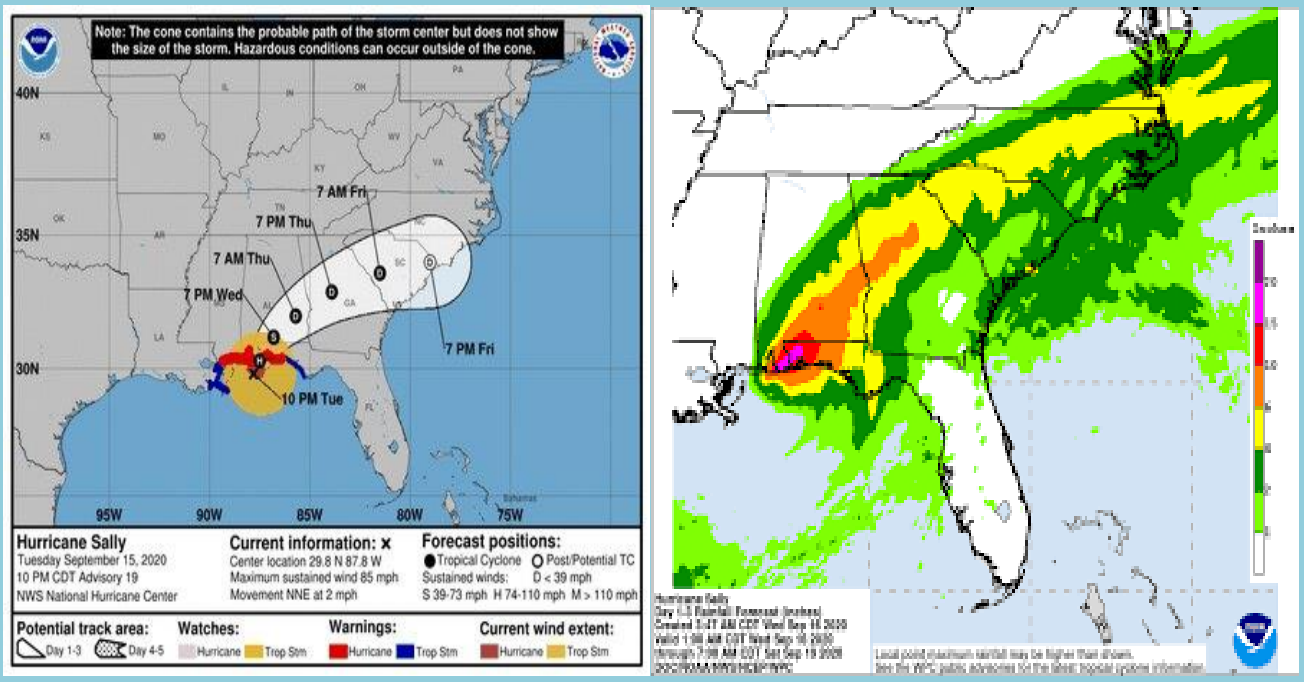


Figure 9. Path and projected rainfall associated with Hurricane Sally.

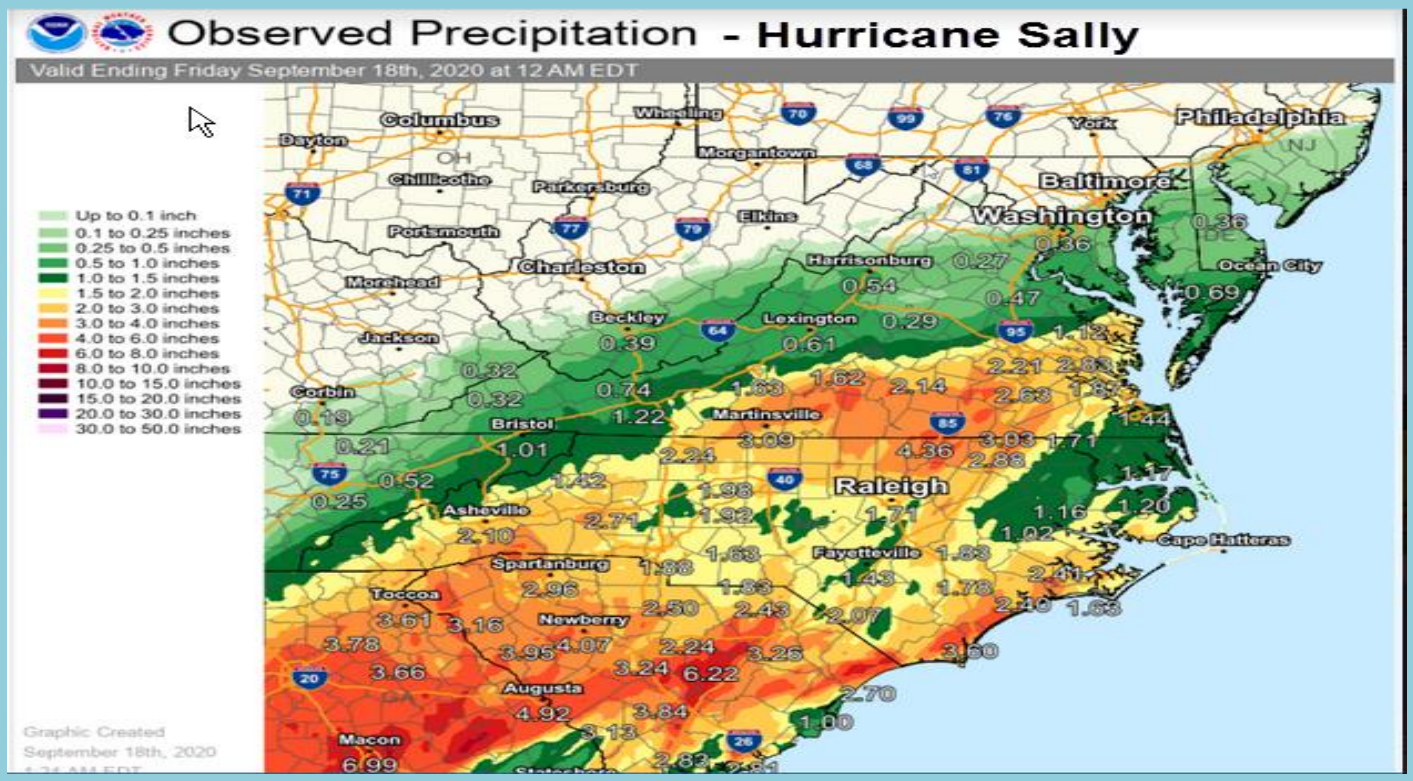


Figure 10. Actual observed precipitation resulting from Hurricane Sally. Upslope southeasterly flow associated with the hurricane brought significant flooding rainfall to the Virginia and North Carolina Piedmont. This was much more than originally anticiapted as the core of Sally tracked well to the southeast of the forecast area.

Tropical Storm Beta (9/17/20 – 9/22/20)

Figure 11. Projected path of Tropical Storm Beta which stalled along the Texas coast (somewhat reminiscent of Hurricane Harvey in 2017), then moved northeast across the southeast states bringing significant rainfall and some thunderstorms to the southeast U.S., including our forecast area.

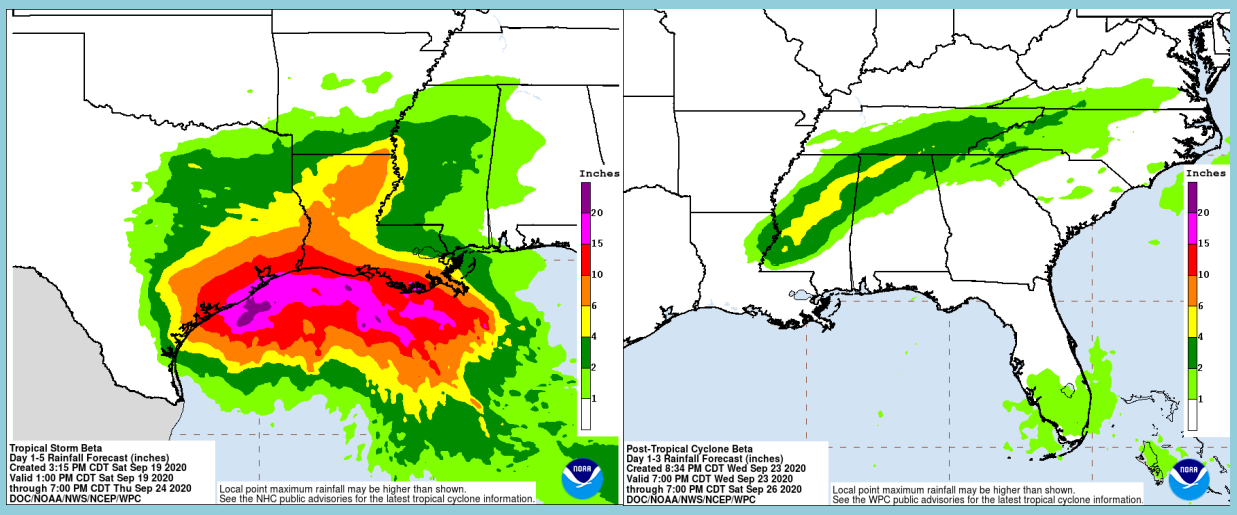


Figure 12. Rainfall projected along the Texas coast and across the southeast U.S. in association with Tropical Storm Beta. Rainfall across our region ended up being a bit more than forecast here, mostly in the two to three-inch range.

Major Hurricane Delta (10/4/20 – 10/10/20)

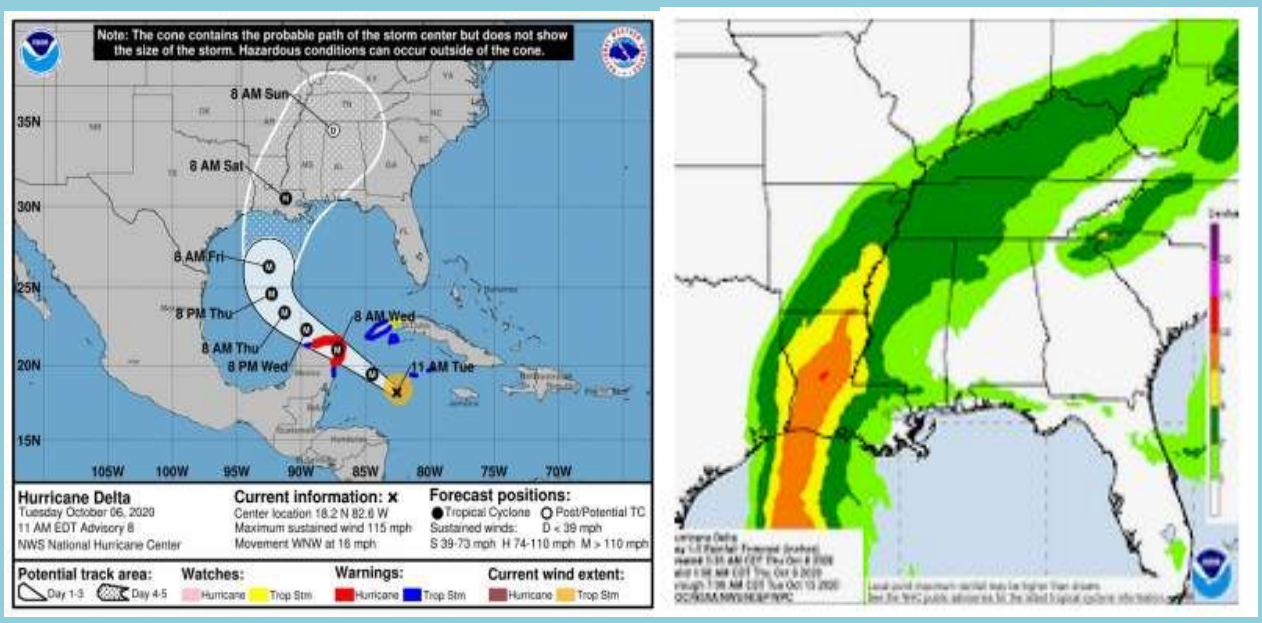


Figure 13. Projected path and rainfall associated with Major (Category 3) Hurricane Delta.

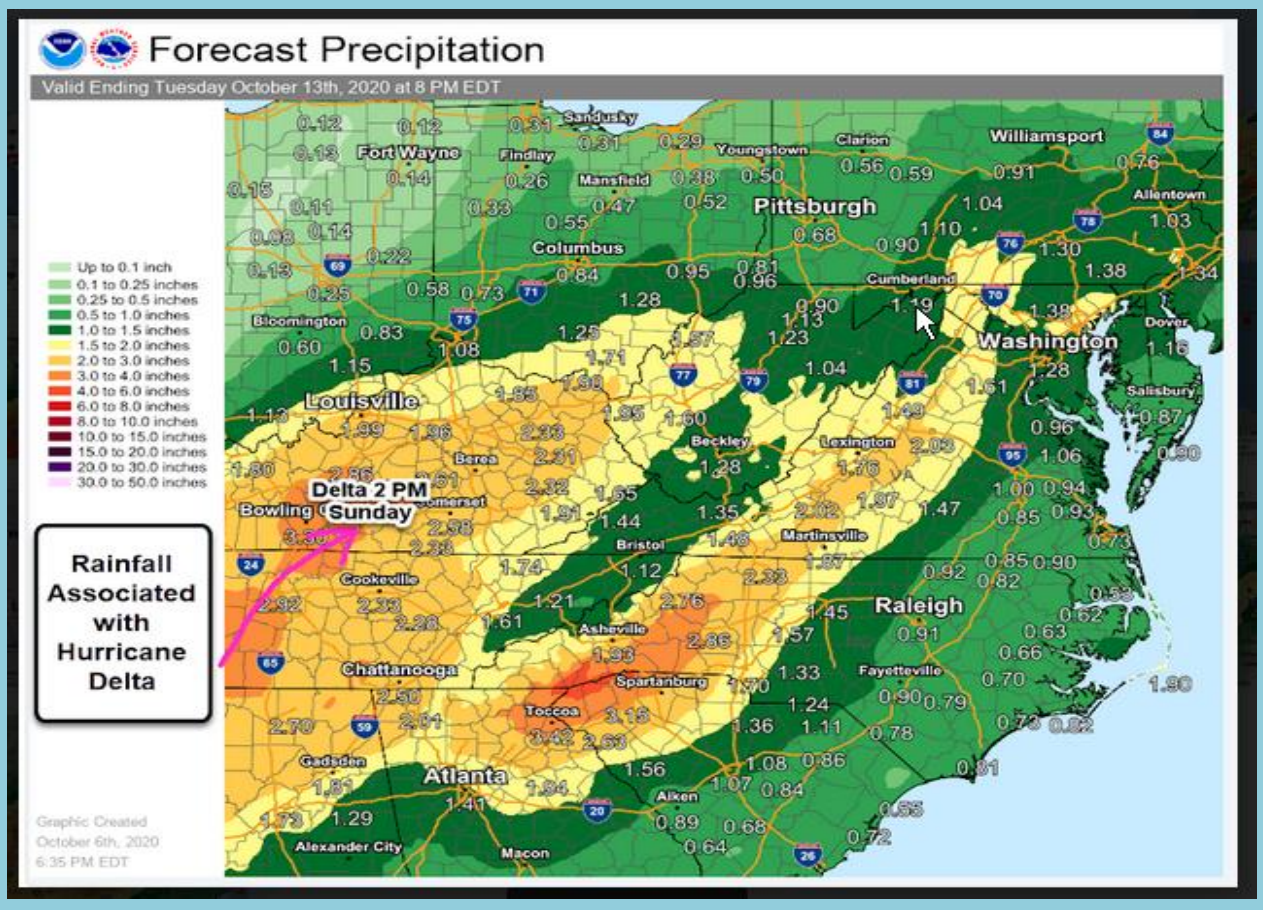


Figure 14. A closer look at the rainfall associated with the remnants of Major Hurricane Delta, as yet another tropical cyclone moved directly across the Blacksburg CWA.

Hurricane Zeta (10/24/20 – 10/29/20)

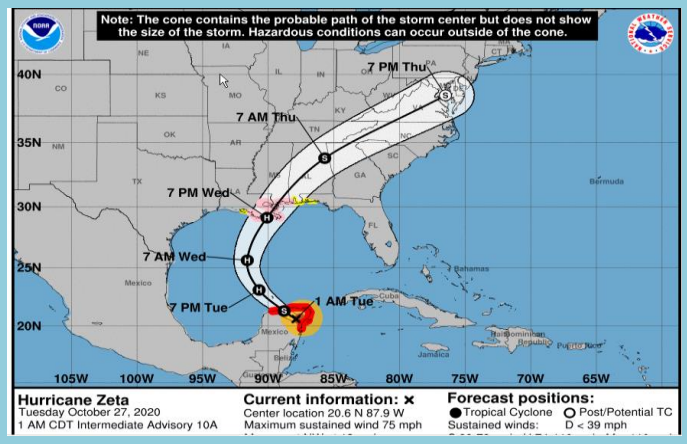


Figure 15: Projected path of Hurricane Zeta. Zeta triggered the first ever Tropical Storm Warning issued by the Blacksburg National Weather Service Office with the projection of tropical storm force winds and flooding rainfall. Wind gusts more than 50 mph were observed across the Virginia and North Carolina Piedmont resulting in extensive damage to trees, power lines, and some property, especially near Reidsville, NC and Danville, VA.

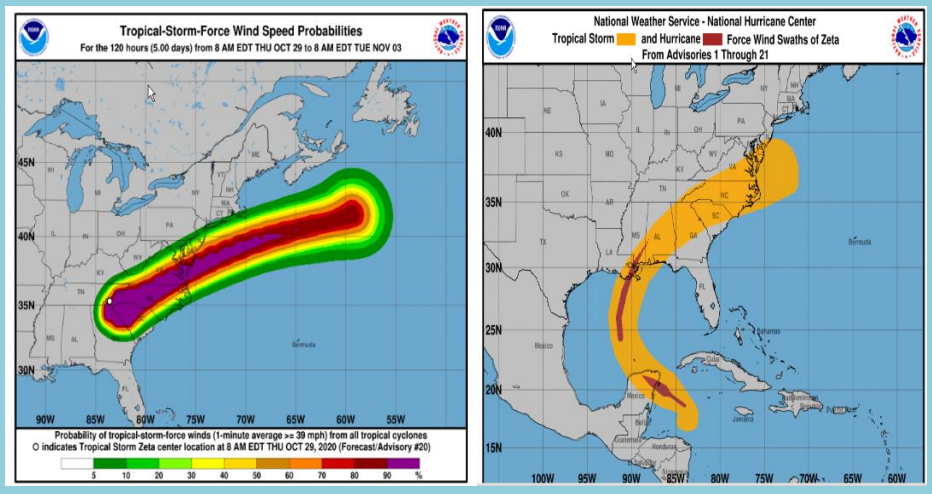


Figure 16. Probabilities of 80-90% of sustained tropical storm force winds associated with the remnants of Hurricane Zeta.

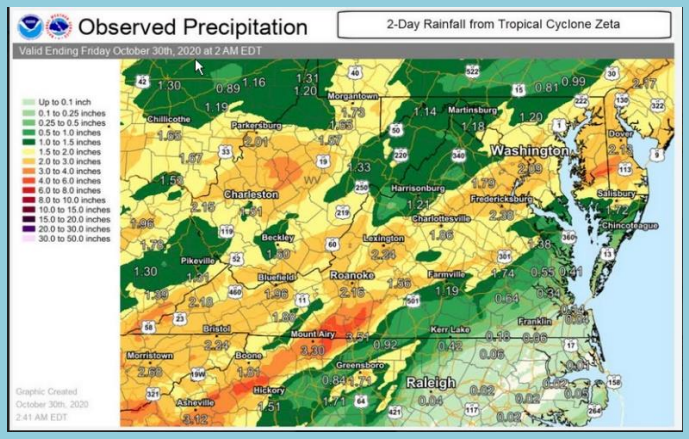


Figure 17. Rainfall associated with the remnants of Hurricane Zeta which tracked across the Blacksburg NWS Forecast Office county warning area as a Tropical Storm.

Tropical Storm Eta (10/31/20 – 11/14/20)

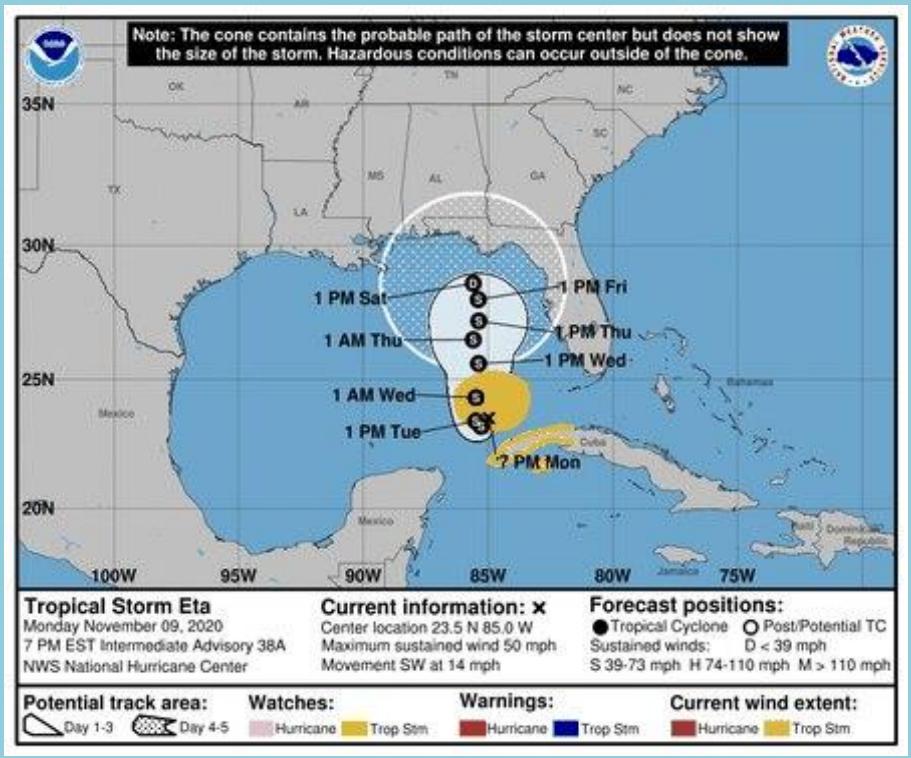


Figure 18. Very slow moving track of Tropical Storm Eta. This storm eventually moved across Florida and out into the Atlantic. However, a slow, northward path through the eastern Gulf resulted in a deep tropical moisture feed along a slow moving frontal system just to the west of our forecast area. Widespread four to six inches of rainfall resulted in extensive flooding across the region, especially in western North Carolina.

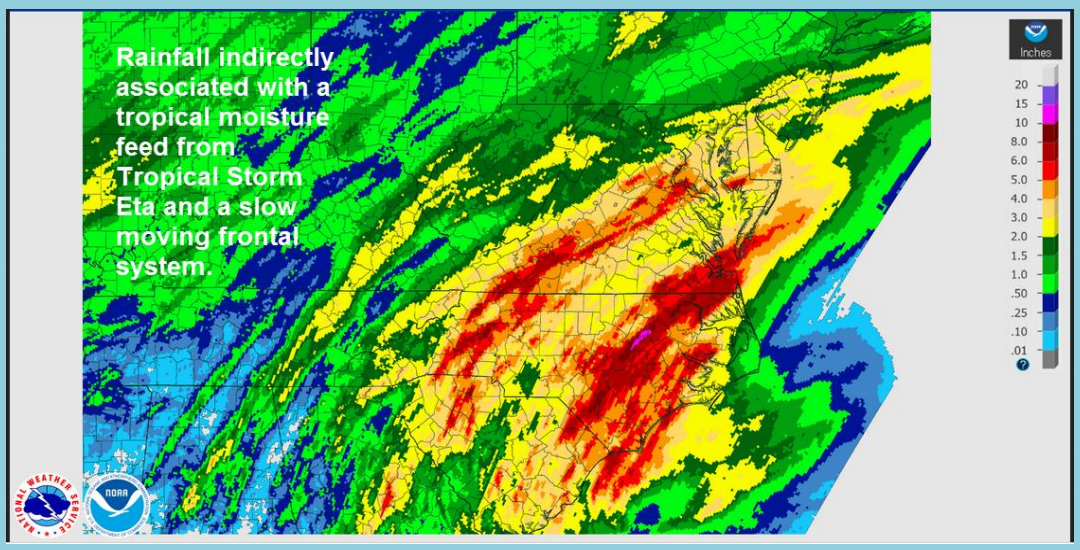


Figure 19. Rainfall associated with a deep tropical moisture feed from Tropical Storm Eta.

Multiple Tropical Systems Simultaneously

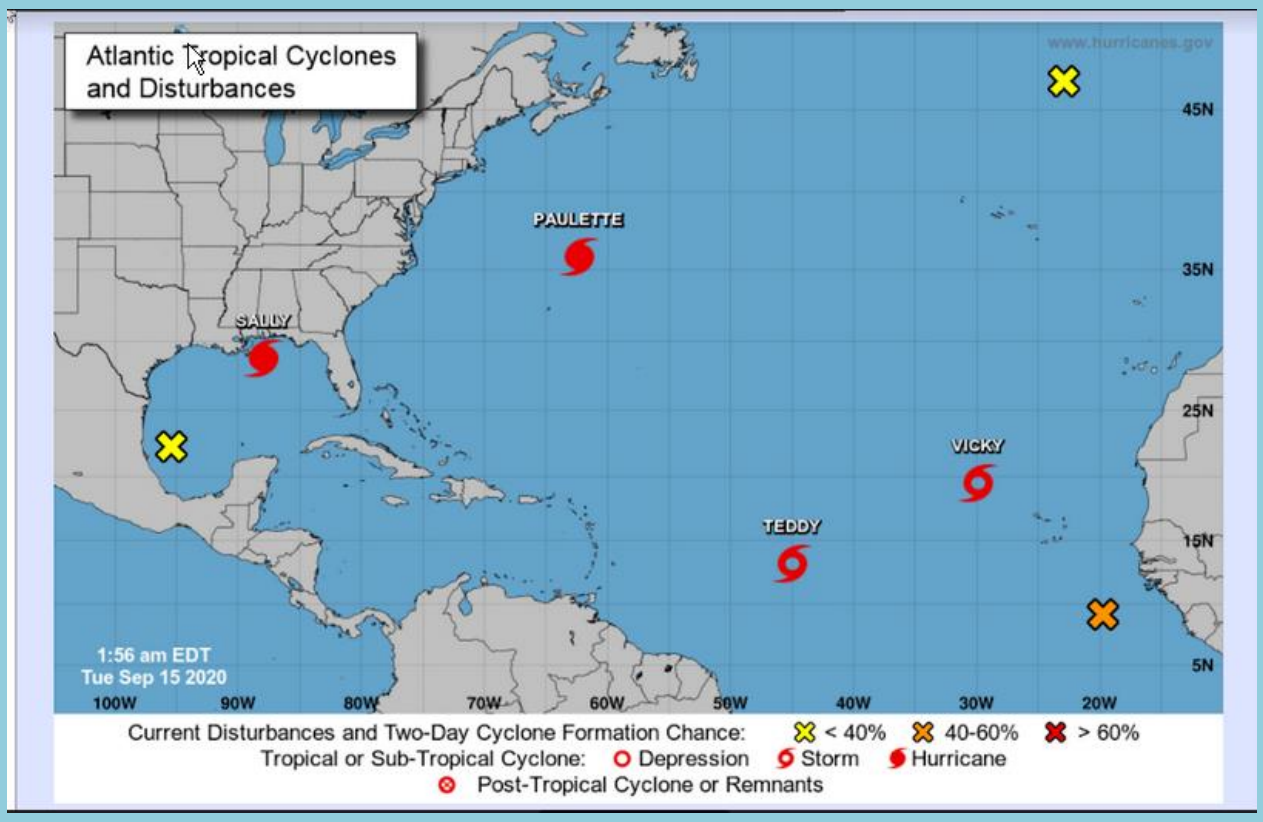


Figure 20. The peak of tropical cyclone activity is typically in early to mid-September. The tropical Season of 2020 fit right to form. This image shows that no less than seven tropical weather systems were simultaneously active during mid-September 2020.

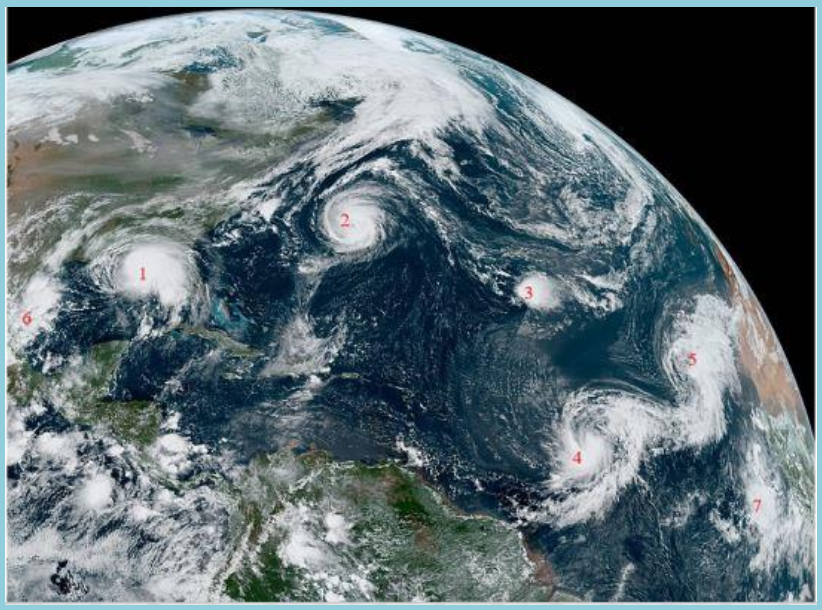
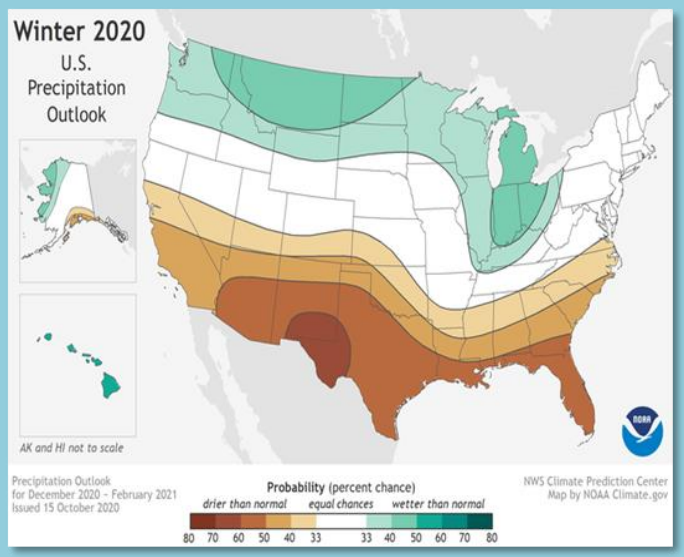


Figure 21. Visible satellite image of seven tropical systems on September 14, 2020 in the Atlantic basin: 1. Sally, 2. Paulette, 3. Rene, 4. Teddy, 5. Vicki, 6. Wave that became Beta, 7. Wave that became Wilfred. (Source NOAA)

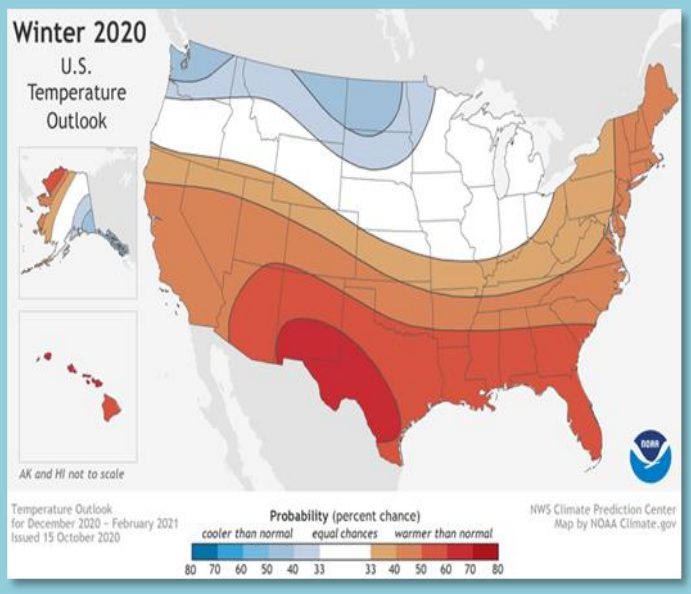
Winter 2020-2021 Outlook

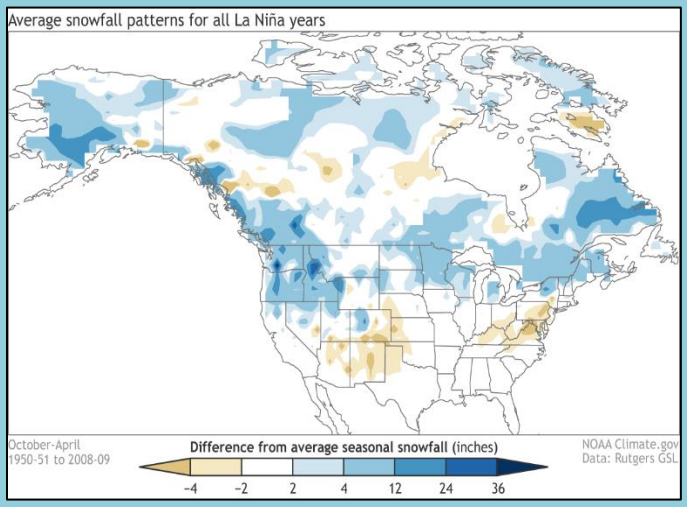
Phil Hysell, Warning Coordination Meteorologist

With La Niña well-established and forecast to persist through the winter, we anticipate temperatures to be above normal for the meteorological winter of December 2020 through February 2021. Signals for near normal, above normal, or below normal precipitation amounts through this period are less apparent, but the likelihood of below normal precipitation increases as one travels south across the Mid-Atlantic region. Here are the official NOAA outlook graphics for temps and precipitation this winter. You can find a full summary at the following site: https://www.noaa.gov/media-release/us-winter-outlook-cooler-north-warmer-south-with-ongoing-la-nina



What about the chances for a snowy winter? Average seasonal snowfall totals for all La Niña winters since 1950 have generally been near to below average in our region, with more below normal snowfall seasons during stronger La Niña winters. This year, a weak to moderate La Niña winter is forecast, which lowers the confidence for a long-range snowfall forecast.





Recent La Niña winters in our region have produced widely varied snowfall totals. For example, the winter of 1995-96 was a La Niña winter, with Roanoke recording its second highest seasonal snow total on record (56 inches). 2000-2001 and 2011-2012 were also La Niña winters that produced well below average totals (4.1" and 6.1" respectively at Roanoke). Since it only takes one major winter weather event to create a disaster, it's important we prepare now.

At home or work, loss of heat, power, telephone service and a shortage of supplies are the primary concerns, so make sure you have a disaster preparedness kit at home and in your vehicle. Here is what your kit should include: http://ready.gov/kit

Before traveling on a long trip this winter, make certain all fluid levels are full, and ensure that the lights, heater, and windshield wipers are in proper condition. Keep your gas tank near full to avoid ice in the tank and fuel lines. Avoid traveling alone. Let someone know your timetable and primary routes. Finally, always check the forecast at the following site: www.weather.gov.

What's New For You: Anticipating Impacts From An Approaching Winter Storm

Phil Hysell, Warning Coordination Meteorologist

The National Weather Service has implemented a new tool that attempts to convey the complexities and hazards associated with winter storms as they relate to potential societal impacts. This tool is called the "Winter Storm Severity Index" or WSSI. The purpose of WSSI is to convey the expected severity of potential societal impacts due to expected winter hazards and their distribution.

Winter weather events that produce similar snowfall amounts may have vastly different impacts. For example, four inches of heavy, or wet, snow may lead to power outages, while four inches of 'fluffier" snow with strong winds will have greater impacts to travel due to reduced visibility.

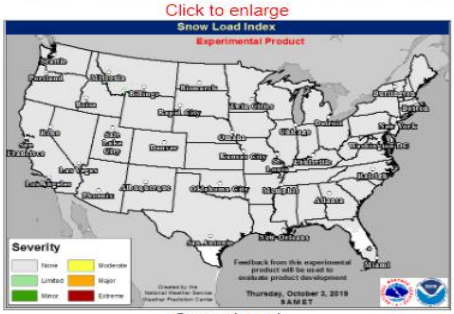
The WSSI provides a classification of the expected severity of six different winter weather characteristics: snow load, snow amount, ice accumulation, blowing snow, flash freeze and ground blizzard. The expected severity of these characteristics is displayed in WSSI using the following terminology: "None," "Limited," "Minor," "Moderate," "Major," and "Extreme."

Winter Storm Severity Index Components

Click to enlarge

Snow Amount

Click to enlarge



Snow Load

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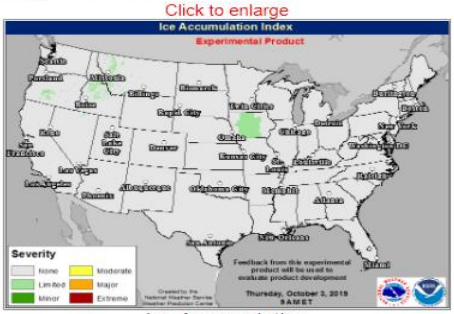

Ice Accumulation

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Flash Freeze

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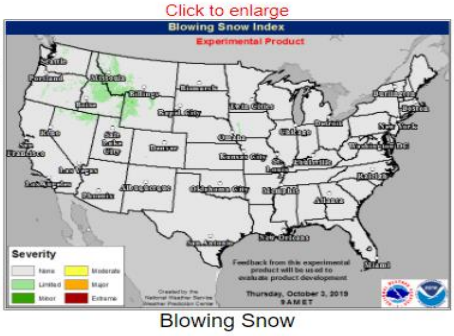


Blowing Snow

Click to enlarge

Ground Blizzard

The WSSI product is updated every two hours and can be viewed here.

More details about WSSI are provided here.

What's New at The Office: Personnel Changes

Peter Corrigan

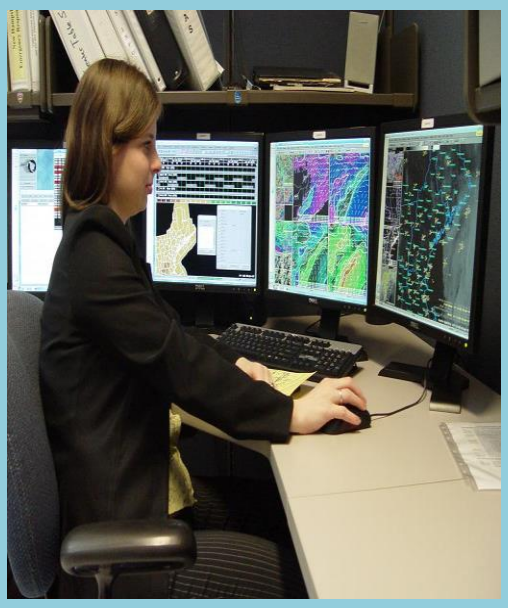
In August, we said "happy trails" to a long-time colleague and friend, Peter Corrigan, as he retired after nearly 36 years of government service. Pete had served as the Senior Service Hydrologist at WFO Blacksburg, VA, since 2005. Raised in Greenwich, CT outside NYC, he graduated with a double major in Geography (climatology) and Journalism from the University of Rhode Island in 1978 and a M.S. in Geography (Climatology) from the University of Delaware in 1982. After stints in the private sector, he began a government career in 1984 at the Defense Mapping Agency Hydrographic/Topographic Center in Brookmont, MD (now the National Geospatial Intelligence Agency) and then joined the NOAA Aeronautical Charting Division in Rockville, MD the following year. In January 1987 he was hired as meteorologist in the NWS Office of Hydrology at NWSHQ in Silver Spring, MD.

During his career, he also worked as a hydrologist at NWS offices in Fort Worth, TX, Des Moines, IA, and San Juan, PR.

Pete had a tremendous impact on the hydrology office at NWS Blacksburg in his fifteen years here, including, but not limited to, developing very important relationships with many partners, working together on improvements to river flood stages, coordinating on droughts and wet periods alike, diligently creating critical and thorough monthly reports and storm data entries for historical purposes, doing what he could to ensure the highest quality precipitation, stream, and river gauge data, and training our meteorologists on new data and software. He will be greatly missed in this office and in the agency.

Stacie Hanes

We are excited to announce that Stacie Hanes will be joining our office as a Lead Forecaster. A 20-year veteran of the NWS, she has been working as a Lead Forecaster at the Portland/Gray, ME, office for the past eleven years. Prior to that, she was employed at WFOs Dallas/Fort Worth, TX, and Peachtree City, GA, where she especially enjoyed working severe storms, and participating in outreach, decision support, and science initiatives. An Atlanta native and UGA alum, Stacie is also married, a proud dog-owner, and an avid horseback rider.



Kidz Korner

Welcome to the first installment of Kidz Korner! This section of our newsletter will highlight a weather topic that may be of interest. Future installments will also include art and writing from kids across the region, just like you! More on that later….but first, on to this edition's topic:

SNOW!

Some of you may already know that snow is frozen water in a crystal pattern. When a bunch of these crystals group together on their way from the clouds to the ground, snowflakes form. When snowflakes hit the ground, they start to pile up, or as weather folks like to say, accumulate.

A couple of factors play a role in just how much the snow accumulates. The first factor is the warmth of the ground when the snow starts falling. Maybe there have been some mild days leading up to the day with the snow. If so, then the ground may be well above 32 degrees Fahrenheit, the freezing point of water, so the falling snow melts on contact for a while. Once the snow and the arrival of colder air drops the temperature of the ground to freezing, the snow can start to accumulate. If the ground is at, or colder than, freezing when the snow starts to fall, it will begin to accumulate right away.

The second factor is the amount of moisture available in the air, and how long that moisture will fall as snow. The more moisture there is in the air, and the longer that moisture falls as snow, the greater the accumulation of snow there will be. When there is a small amount of moisture, and the time period of falling snow is short, then the accumulation will be less.

Temperature of the ground, amount of moisture, and the length of time the snow falls are the main factors we think about at the National Weather Service when we forecast a snowfall accumulation for your area. You will likely hear this forecast presented in a range of values. For example, your forecast might be two to four inches of snow. Your relative or friend who lives a few counties away might have a forecast of six to ten inches.

How do you know how much snow accumulated where you live? The most basic way is to take a ruler (or yardstick, if the snow is very deep) and insert it into the snow. This will allow you to determine the depth of the snow. Try to measure the snow in a location that is free from trees, buildings, or other structures that could alter the amount of snowfall by blocking its fall to the ground. If it looks like there is a lot of variation in the depth of the snow, take several measurements (at least five) that include what look like both the largest and smallest snow amounts in your yard. You can then compute the average of all your measurements (with the help of an adult, if needed) to determine your total snowfall.

You can be a weather person! Compare the snowfall at your location with the amounts you are hearing mentioned on TV or in the reports the National Weather Service issues during a winter event. Did you receive more or less snow than the nearest report to your location? Please share your snowfall totals with the National Weather Service (with the help of an adult, if needed) by emailing your snowfall amount, your location, and when you made your measurement to rnk.skywarn@noaa.gov. You can also submit your report at the following website:

https://inws.ncep.noaa.gov/report/index.html

Would you like to see your art or writings included in the next edition of Blue Ridge Barometer? If you are between the ages of 3 and 17, we would love to see your hand-drawn artwork, short poems, or short stories about the weather. For the next edition, we are looking for art and writings that involve the spring or summer. Our meteorologists will review the submissions and select a few to include in the newsletter. Maybe yours will be one of them!

To submit your original drawing, poem, or story, scan your artwork or writing into a .jpg computer image file (with the help of an adult, if needed). You can also write your poem or story using Word and save it as a .doc or .docx file. Please keep any written material to 500 words or less. Artwork may also be completed using drawing or painting software, submitted as a .jpg file.

When submitting your drawing, poem, or story, please include your first name and first initial of your last name, age, and the city/town where you live. All entries should be submitted no later than April 1, 2021, and be included in an email attachment sent to the editor.

From Piedmont to Mountaintop

Have a photo that you would like to share from your neighborhood? In future editions, we will be publishing your pictures from across the region – from Piedmont to mountaintop, and places in between. From now until April 1, 2021, we invite you to take some weather-related photos and share them with us. Please include with your photos your first name, the first initial of your last name, and where and when you took the picture. We will select a few photos from the total number submitted by the public for inclusion in upcoming newsletters and credit them appropriately. Also, by submitting a picture, you agree that we can also use it on one of our social media platforms (Facebook and Twitter) or in our local community outreach presentations (for example, a SKYWARN class). Photos used in these forums would also be credited appropriately. We look forward to seeing our region through your lens!

Stay Safe & Stay Involved!

The fall and winter seasons not only bring cold temperatures, but a wide range of potential weather hazards, including flooding, lightning, snow, and ice. Check out the NWS Weather Safety web page for information on all types of weather hazards. If you are interested in helping the NWS with storm spotting and verification, please consider participating in the SKYWARN program. Additionally, the NWS can always use new rain/snow observers for the CoCoRaHS network, especially in West Virginia!

To keep up to date on what's happening in our office in between newsletters, please visit our website: https://www.weather.gov/rnk or follow us on Twitter and Facebook.

For questions or comments about this newsletter, please contact the editor or via snail mail at:

Blue Ridge Barometer

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