Blue Ridge Thunder

Newsletter of the NWS Blacksburg, VA

Welcome to the Spring 2016 edition of 'Blue Ridge Thunder' the biannual newsletter of the National Weather Service (NWS) office in Blacksburg, VA. In this issue you will find articles of interest on the weather and climate of our region and the people and technologies needed to bring accurate forecasts and warnings to the public.

Inside this Issue:

Weather Highlight:

February 24 Tornadoes

Steve Keighton, Science and Operations Officer
Mike Sporer, Meteorologist

February 24th 2016 produced two rare tornadoes in the Blacksburg NWS County Warning Area (CWA), including one rated EF3 on the enhanced Fujita tornado scale in Appomattox County, VA which resulted in one death and seven injuries. This was the first February EF3 documented in the month of February in our CWA, and the first ever in Appomattox County. The last time our CWA experienced a tornado of this magnitude was on March 20, 1998 (Stoneville, NC), and that one resulted in two deaths and 27 injuries. The second tornado in our CWA was an EF1 just east of the Blue Ridge in western Patrick County. There were a total of seven tornadoes in Virginia on February 24th, and several in North Carolina and South Carolina.

Appomattox County tornado near Evergreen, VA

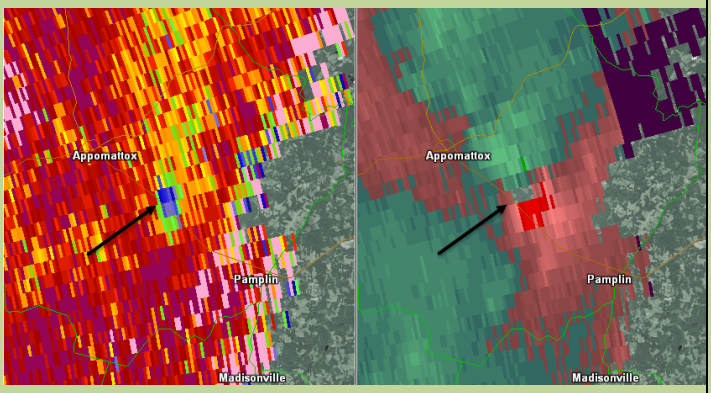
Photo courtesy of Jason Smith

The weather pattern which produced the tornadoes was a very classic one for our area, and featured a strong cold front heading in from the west and a retreating (northward-moving) warm front across the Piedmont as strong cold air damming weakened. Moisture and instability was significant (especially for February) south of the boundary, while vertical wind shear (conducive for supercell storms and tornadoes) was very strong across the entire region. Both tornadoes formed very near the retreating warm-frontal boundary, which is believed to have provided favorable shear conditions on a local scale.

Damage to a home in the Evergreen area

In addition to the relatively rare occurrence of this magnitude tornado in the region and the conditions that came together to produce it, there were two "firsts" associated with this tornado that we want to highlight in this article.

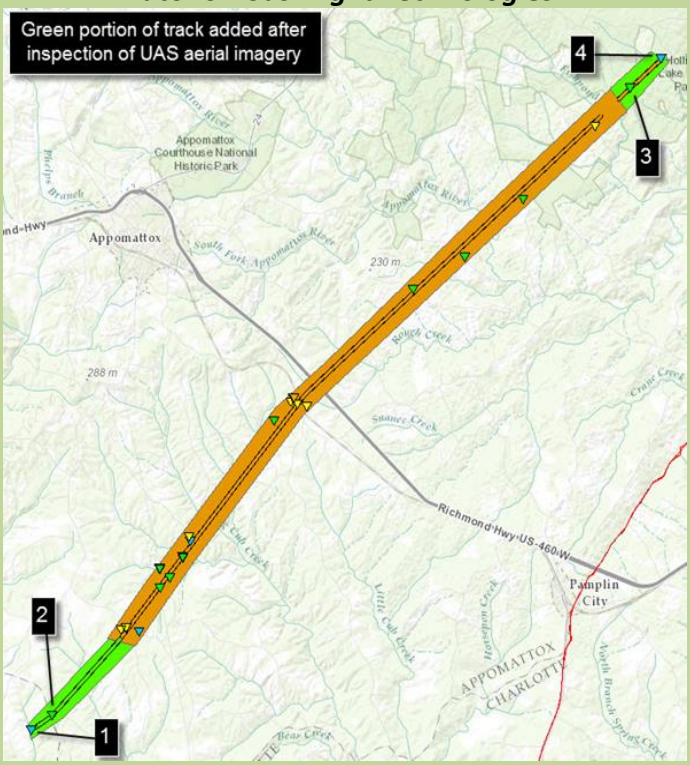
One is the observation of a Tornado Debris Signature (TDS) seen in the relatively new dual-polarization radar products from the WSR-88D radar in Floyd County VA, which is over 70 miles away from the tornado location (this signature was also seen from the radar in Wakefield VA which is even farther away). The "dual-pol" technology (installed at the radar site in late 2012) allows improved detection of the variety of particles being detected and results in unique signatures for non-meteorological targets such as debris from buildings and trees thrown high into the air by tornadoes. These are typically only observed in association with strong tornadoes or those within a few miles of the radar. The signature highlighted in the image below was observed at a height of about 10,000 ft. above the ground, meaning tornado debris was being lofted at least this high. The observation of this radar signature can provide confirmation to forecasters that indeed a tornado has touched down.



The tornado debris signature associated with the Appomattox EF3, seen in the left image (indicated by the black arrow) which is at the center of the circulation seen in the right panel.

The other "first" for our office was the use of an unmanned aerial system (UAS), or drone, to assist with the survey of the damage track. This was done in partnership with Autonomous Flight Technologies (from Salem, VA) who assisted the NWS in survey efforts two days after the tornado after gusty winds settled down. The drone not only captured high quality aerial images confirming the damage was indeed produced by a tornado (based on patterns that are most evident from the an overhead view), but also was able to fly over more remote locations where the ground crew could not easily reach and determine that the damage track began and ended beyond what was originally thought. This resulted in extending the path length of the damage from 13 miles as determined from the ground survey, to a total of 17 miles.

Aerial view from UAS (drone) showing the end of the track where the tornado lifted up. Courtesy of Autonomous Flight Technologies



Tornado damage track determined by NWS ground survey in orange, and the extensions to the track based on aerial views from UAS shown in green.

The success in this event and future potential of UAS technology to improve damage surveys was recently shared nationally by NWS Blacksburg forecaster Mike Sporer in an interview with The Weather Channel.

Severe Weather Watches vs. Warnings: What's the Difference?

How do I know if I am under a warning?

Phil Hysell, Warning Coordination Meteorologist

Severe Thunderstorm and Tornado Watches and Warnings have existed for decades. In fact, the first Tornado Warning was issued way back in March 1948. Yet even today many people still do not understand the difference between a watch and a warning. Severe Thunderstorm and Tornado Watches are issued usually 3 to 6 hours in advance of the expected bad weather by the Storm Prediction Center (SPC) in Norman, OK. A WATCH means BE PREPARED to take action. If a watch is issued pay close attention to the weather and be ready to act, because severe weather is possible.

A WARNING is issued by the local NWS office and means to actually TAKE ACTION to ensure safety. If a warning is issued, find shelter immediately, and move to an interior room on the lowest floor of a sturdy building. Take Action! This YouTube video explains the differences between watches and warnings in more detail.

It is critical to **always** have a means to receive weather watches and warnings. Think about how you can receive this life-saving information when you are at home, traveling, at work or school, or outdoors. There are thousands of apps you can download for your smartphone. NOAA All-Hazards Weather Radio (NWR) can automatically sound a tone alert when a warning is issued for your county. Wireless Emergency Alerts (WEA) will automatically deliver Tornado Warnings and Flash Flood Warnings (not severe thunderstorm warnings) automatically to most smart phones. But, there are limitations with these dissemination systems.

Let's consider the tornado warning issued by the National Weather Service in Blacksburg on Feb 24, 2016:

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BULLETIN - EAS ACTIVATION REQUESTED
TORNADO WARNING
NATIONAL WEATHER SERVICE BLACKSBURG VA
315 PM EST WED FEB 24 2016

THE NATIONAL WEATHER SERVICE IN BLACKSBURG HAS ISSU

* TORNADO WARNING FOR...
  WEST CENTRAL CHARLOTTE COUNTY IN SOUTH CENTRAL VI
  EAST CENTRAL PITTSYLVANIA COUNTY IN SOUTH CENTRAL
  SOUTHEASTERN CAMPBELL COUNTY IN CENTRAL VIRGINIA.
  NORTHWESTERN HALIFAX COUNTY IN SOUTH CENTRAL VIRG

* UNTIL 345 PM EST
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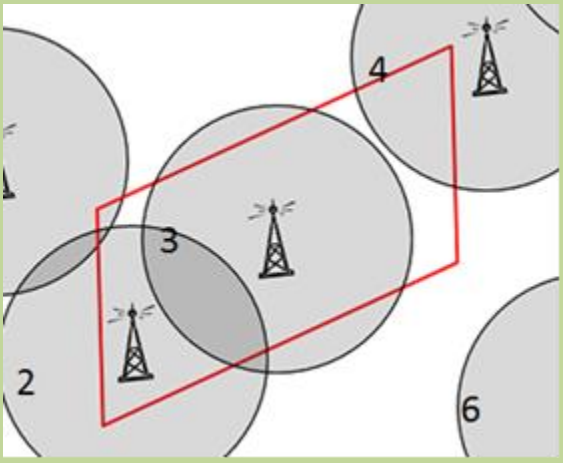
Text of Tornado Warning on February 24, 2016

If you were located in Gladys (Campbell County) would you be under this warning? The Tornado Warning would alert on NWR. What about WEA? Cell phone providers will activate phone towers physically located within an NWS warning. The broadcast area of the tower may extent past the actual warning area, as shown in the image below:



(The red box illustrates the warning area, the circles illustrate the broadcast areas for cell phone towers. Note the broadcast area for towers 2 and 3, located in the warning, extend beyond the warning polygon)

In our tornado warning example, WEA **might** alert in Gladys for this warning. To know for certain if a warning falls under your location, make sure you have a means to view the warning graphically on a map. Warnings are plotted on our website or on a mobile phone at www.mobile.weather.gov.

Other sites that display polygon warnings on maps include:
http://www.srh.noaa.gov/ridge2/
http://nowcoast.noaa.gov/
preview.weather.gov/edd (select 'hazards' from the left-hand menu).

As you can see below, Gladys was NOT included in the tornado warning issued at 3:15 PM on 2/24/16, despite NWR alerting and perhaps WEA alerting.

Tornado Warning area for warning issued at 3:15 PM on 2/24/16

For locations where a large number of people gather (schools, churches, businesses, public areas, etc.), desginate a 'weather-watcher' to monitor conditions and notify everyone when warnings are issued, so your hazardous weather plan can be activated.

Report Severe Weather!

Trained Spotters/Public call 1-866-215-4323 or via Social Media (Twitter/Facebook):

- **Tornadoes or funnel clouds**
- **Wind damage**
- **Wind gusts > 58 MPH**
- **Hail (any size)**
- **Flooding; very heavy rain**

Spring into Weather Safety

Will Perry, Senior Meteorologist

Spring and summer in southeast West Virginia, southwest Virginia, and northwest North Carolina, is no stranger to a wide variety of weather. Therefore, it is important to keep abreast of the latest weather forecasts, and always have a plan of action when bad weather threatens. The following are guidelines for our most common weather threats during the warm season.

- **Flooding**: Each year, more deaths occur due to flooding than from any other thunderstorm related hazard. The Centers for Disease Control and Prevention report that over half of all flood-related drownings occur when a vehicle is driven into hazardous flood water. It takes just **12 inches** of rushing water to carry away a small car, while **2 feet** of rushing water can carry away most vehicles. It is NEVER safe to drive into flood waters. TURN AROUND, DON'T DROWN.

- **Lightning:** There is no safe place outside when thunderstorms are in the area. If you hear thunder, you are likely within striking distance of the storm. Just remember, *When Thunder Roars, Go Indoors.* Too many people wait far too long to get to a safe place when thunderstorms approach. Unfortunately, these delayed actions lead to many of the lightning deaths and injuries in the United States.

- **Severe Thunderstorm Winds and Tornadoes**: A thunderstorm is considered severe if it produces hail at least 1 inch in diameter or has wind gusts of at least 58 miles per hour. High winds can damage homes and blow down trees and utility poles, causing widespread power outages. Every year people are killed or seriously injured because they did not heed severe thunderstorm warnings. Tornadoes in our area are not as common as in the Plains/Midwest or Gulf Coast states, but they can occur. Always have a plan of action when severe thunderstorm or tornado warnings are issued.

Winter 2015-2016 Climate Summary

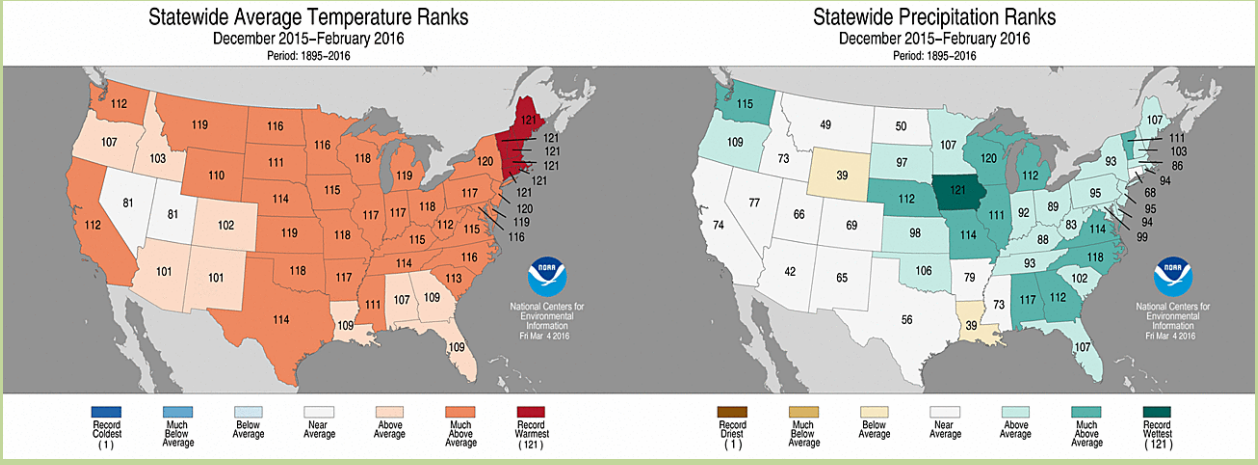
Peter Corrigan, Senior Service Hydrologist

For most of the region the winter (December 1 – February 29) of 2015-2016 had well above normal temperatures and precipitation. The season began with record warmth, as December 2015 shattered weather records at every official climate site in our CWA (and across nearly the entire eastern half of the U.S.). Monthly averages at local climate stations were 10 to 14 degrees above the long-term (1981-2010) normals. The warm and wet pattern was generally attributed to a very strong El Niño that was in place the entire winter and reached strengths comparable to the historically strongest El Niño events in 1982-83 and 1997-98. The rest of the winter saw temperatures much closer to average with both January February within a few degrees of normal, but the influence of the incredibly warm December put several of the climate sites in the top 10 of warmest winters (exceptions at Lynchburg and Roanoke with longer periods of record).

Climatological Statistics for Winter 2015-2016 (Dec-Feb).

Climate Site	Average Temperature (Anomaly)	Rank (as warmest)	Period of Record	Total Precipitation (Anomaly)	Total Snowfall (Normal)
Bluefield	39.2 (+3.0)	2nd	1959-2016	8.65 (+0.08)	32.2 (25.3)
Blacksburg	36.7 (+3.6)	7th	1952-2016	12.16 (+3.32)	24.0 (16.2)
Roanoke	40.6 (+2.3)	22nd	1912-2016	12.78 (+4.03)	22.0 (14.2)
Lynchburg	39.9 (+3.0)	35th	1893-2016	12.26 (+2.95)	15.6 (10.2)
Danville	43.4 (+3.9)	4th	1948-2016	12.41 (+2.71)	11.1 (9.3)

The two figures below show winter statewide ranking for temperature (left) and precipitation (right) since 1895 across the lower 48 states for the winter period. The New England states were the warmest in 121 years of records with the rest of the East not far behind. Winter precipitation in the CWA was generally well above average by about 1 to 3 inches due mainly to an extremely wet February. Seasonal snowfall was near normal across most of the region as January and February snowfall made up for the complete lack of snow in December.



U.S. Temperature and Precipitation Rankings for Winter (Dec-Feb) 2015-16

Summer 2016 Outlook: Strong El Niño Weakens – Transition to La Niña Expected by Fall

Robert Beasley, Senior Meteorologist

It's official now! The current El Niño the first since 2010 and the strongest since 1998 is weakening. The El Niño Southern Oscillation Pattern (ENSO), which refers to the temperature characteristics across the Pacific Ocean, is now expected to transition to an ENSO neutral state by summer and then to a fairly strong La Niña pattern by the end of 2016 (see figure below).

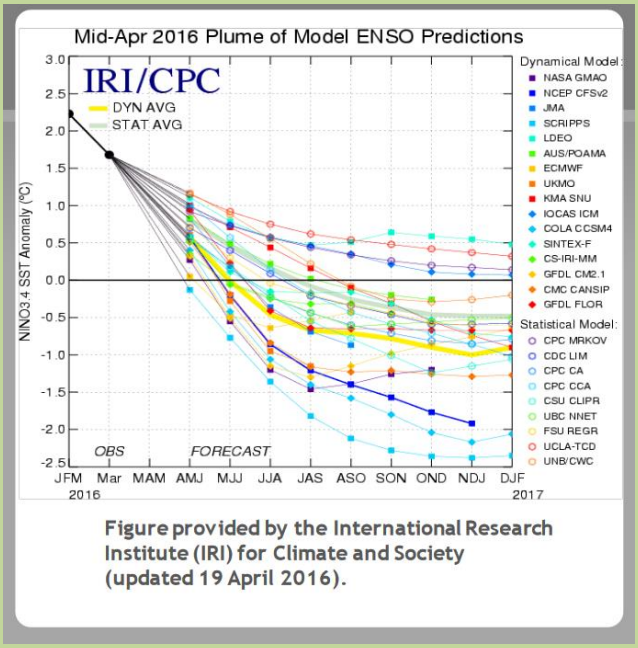
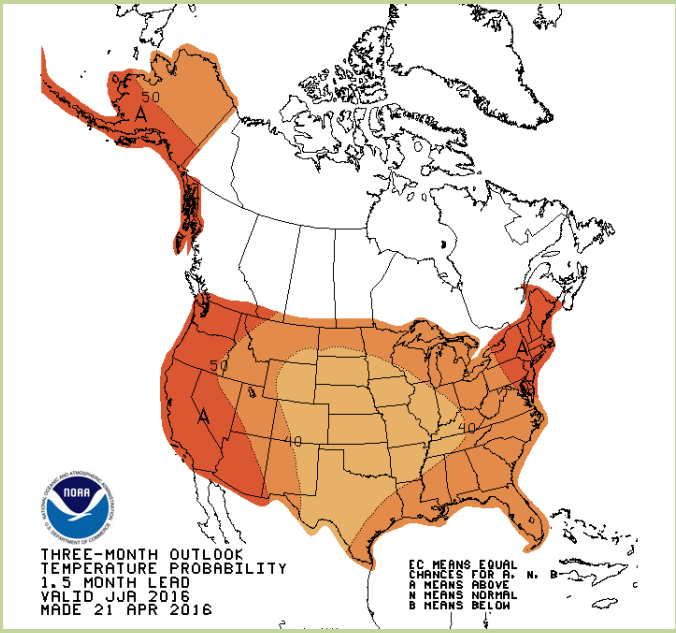


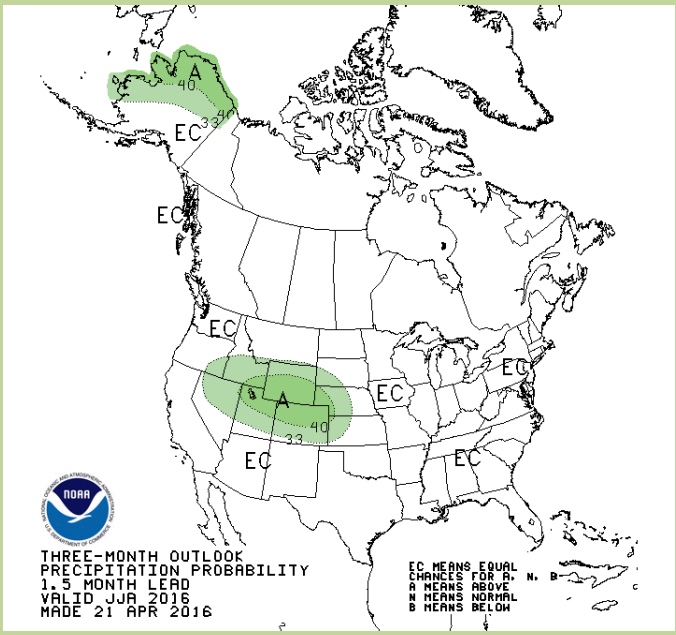
Figure provided by the International Research Institute (IRI) for Climate and Society (updated 19 April 2016).

Model forecasts of ENSO through late 2016. Positive values indicate El Niño status while negative values indicate La Niña status

What does this mean for us and how is it expected to impact our weather later this summer? While there are certain general weather patterns expected with these important global oceanic phenomena, there are many other global and local climate factors that can influence the weather we will ultimately see. You can learn more about ENSO and obtain weekly expert discussions at the NWS Climate Prediction Center (CPC) web page. El Niño and La Niña have less influence on weather patterns across the hemisphere during the summer season, outside of an increase in hurricane activity. Current forecasts for summer 2016 (Jun-Aug) are partly based on the transition to an ENSO neutral state during this period and suggest that above normal temperatures are more likely and equal chances of above or below normal precipitation are in order for our region. CPC forecast summer conditions across the U.S. are depicted below.



Summer Temperature Outlook (Jun-Aug)

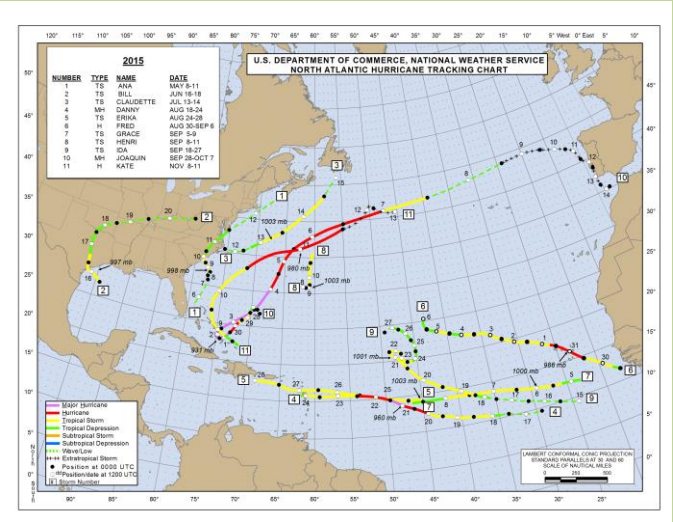


Summer Precipitation Outlook (June-Aug)

Will the Tropics Become More Active in 2016?

Jim Hudgins, Senior Meteorologist

It was another rather uneventful tropical season in 2015 with 11 named storms and four hurricanes (Figure below) but little to no impact on the local area as most systems stayed off from the U.S. east coast. Only early season Tropical Storm Ana (May 8-11, 2015) that passed through southeast Virginia provided appreciable rainfall to the CWA.



Tracks of 2015 Atlantic Tropical Cyclones

The early season outlook for 2016 provided by Colorado State University suggests that a near average storm scenario may play out with a forecast of around 12 named storms, of which five are expected to become hurricanes, and two reaching major hurricane status. This in part is supported by the demise of the current ongoing El Niño to a more neutral phase or even La Niña state by the end of summer 2016. This transition however, may take until late in the tropical season to fully evolve. An interesting note is that only seven hurricanes have made landfall in the U.S. since 2006 which is a record low for any 10 year period dating back to 1850. Also, all of these systems were below major Category 3 levels and only Irene (2011) and Arthur (2014) having any direct impact to North Carolina and Virginia.

The 2016 season will already include a rare January named system, Alex, which reached hurricane status while affecting the Azores back in mid-January. The remainder of the names for this season include: Bonnie, Colin, Danielle, Earl, Fiona, Gaston, Hermine, Ian, Julia, Karl, Lisa, Matthew, Nicole, Otto, Paula, Richard, Shary, Tobias, Virginie, and Walter. The 2016 season officially begins on June 1st and ends on November 30th.

Dry Spring leads to Drought Concerns

Peter Corrigan, Senior Service Hydrologist

After a wetter than normal winter, March and April turned very dry across portions of the Blacksburg NWS forecast area. At the Roanoke Airport observing site (with data back to 1912) it was the 7th driest March-April on record with only 3.38" of precipitation, less than 50 percent of the normal amount of 6.83". At several Cooperative network sites the dry numbers were even more dramatic: W. Kerr Scott Reservoir in Wilkes County, NC had its driest (since 1965) such period with 3.19" of rain. North Wilkesboro had 3.15" for its driest since records began back in 1921. The once per week U.S. Drought Monitor for May 5th 2016 had the lowest drought category (D0) depicted over the much of the CWA with a small pockets of D1 (Moderate Drought) in southeast West Virginia and far northwest North Carolina. Fortunately however, the first few days of May have seen a turn to much wetter conditions as numerous thunderstorms rolled across the area erasing D0 in portions of the Dan and lower Roanoke River basins. Even 'bad' weather can be very beneficial!

NWS Blacksburg Opens Doors for Virginia Tech Meteorology Students

Jordan Pegram, VT Meteorology Class of 2016

Getting experience outside of the classroom to gain skills in the field of a potential career is crucial for college students. Juniors and seniors pursuing a degree in Meteorology at Virginia Tech have the opportunity to work as student volunteers at the National Weather Service (NWS) office in Blacksburg. Most students are familiar with jobs in fields such as broadcast or academia, but this program provides them with an in-depth look at the operational forecasting sector of meteorology. I was selected to serve as a student volunteer for the fall semester of my senior year. As a volunteer, I worked with the Interns in the office to help complete daily tasks during my shifts. These included writing and issuing routine products, assisting with check lists to maintain equipment, and taking observations and entering them into the database. Another important role of the volunteer is to interact with the public by answering phone calls and posting updates on the NWS Blacksburg's social media accounts. My favorite part of the position, along with most other volunteers, was preparing and launching the weather balloons.

VT Meteorology Volunteers and RNK staff

Blacksburg is one of 92 locations across the country that launches weather balloons twice each day to obtain observations and create a profile of the atmosphere.

For my last semester as an undergraduate at Virginia Tech, I was chosen to be one of two Capstone students. This program is one step above being a volunteer as it is a more hands-on, detailed insight into the forecasting process at the NWS. Each student is paired up with a forecaster who will serve as their mentor throughout the class. As a Capstone student, I was able to issue my own TAFs (aviation forecasts), edit and update the forecast grids, write part of the Area Forecast Discussion, practice issuing weather warnings on an event simulator, and create and record a briefing for decision support services. Getting practice and gaining skills with these products is essential to anyone interested in making a career within in the NWS. For our last lesson, Capstone students are invited to take a trip with the electrical technicians to visit our radar in Floyd County. I am very grateful for these opportunities as the folks at the Blacksburg office have taught me invaluable lessons and skills, not only in meteorology, but also in everyday life. I have established both personal friendships and professional connections within the National Weather Service. All of the meteorologists in the office have equipped me with exceptional knowledge and a level of skill that will help open doors to even greater opportunities down the road. Lastly, I cannot thank my mentor Robert Stonefield enough for being so patient and supportive throughout the Capstone class and for running such an incredible program. Thank you to every one of the staff at the Blacksburg NWS office for being so gracious to share their time and expertise with all of us students. You all have helped make our weather-filled dreams come true.

Recent WFO Staff Changes

Chris Fisher (Meteorologist Intern)

Meteorologist Intern Chris Fisher (once rumored to be heading to the deserts of Nevada) will be soon be exchanging the mountains of southwest Virginia for the tropical breezes and 'Café Cubanos' of South Florida. Chris has accepted the position of Observing Program Leader (OPL) at WFO Miami and will depart our area in early June. Chris has been at WFO Blacksburg since January 2012 during which time he proved to be an invaluable addition to the office. He was a social media innovator and his work in the NWS Cooperative (COOP) program was outstanding. He also displayed a willingness to fill in shifts on short notice and for extended periods, thus earning the moniker 'Ironman Chris'.

Nick Fillo (Meteorologist to OPL)

Nick Fillo, who has been a general forecaster at WFO Blacksburg since arriving in 2011 from Shreveport, LA, recently accepted the position of Observing Program Leader (OPL) at our office. This is a position that has been unfilled since early 2013. In his new role Nick will be responsible for managing the important NWS Cooperative Observer (COOP) program. The COOP program nationwide consists of roughly 8700 observing sites taking daily precipitation and temperature readings and sending the data to the NWS via the internet or by phone. This data is critical for daily weather and hydrologic operations and plays a critical role in defining the climate of the United States and to help measure long-term climate changes. Currently, NWS Blacksburg has about 60 COOP sites covering every County in the forecast area.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National Weather Service
1750 Forecast Dr.
Blacksburg, VA 24060
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