Blue Ridge Thunder

Newsletter of the NWS Blacksburg, VA

Welcome to the Fall 2014 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 to the public.

Inside this Issue:

Weather Highlight:

A Rare SE WV Tornado: October 7, 2014

Will Perry, Senior Forecaster

A rare tornado struck parts of western Mercer County, WV during the late evening hours of October 7, 2014. An NWS survey team from the Blacksburg office rated the tornado EF-1 on the Enhanced Fujita Scale with winds gusting into the range of 86 to 110 mph. There were two minor injuries and damage mainly to trees and a few small structures, including one mobile home in the mainly rural area of western Mercer County just to the west of Spanishburg. The tornado was on the ground from 11:39 to 11:49 PM with a track of 5.5 miles and a damage swath up to 180 yards wide with a forward speed estimated at 50 mph! According to available records this was only the second tornado to strike Mercer County since 1950, the other being an F2 (the Fujita scale then in use) on April 12, 1965.

Mobile home damage from the tornado in Mercer County, WV

The weather map during the evening of October 7th featured a weak warm frontal boundary stretching from southern Ohio/northern Kentucky southeast into the southern Appalachians. Severe storms and some supercells had stayed mainly west over western Kentucky and western West Virginia earlier in the evening. The airmass in our region was characterized by both high wind shear and high low level turning motions especially in WV and far southwest VA, while cooler temperatures kept instability in the low levels practically nil. However, the 00z (7 PM) RNK sounding showed better instability above 850 millibars (approx. 5,000 ft). With plenty of shear and turning along with elevated instability, some of the storms brought damaging winds and an isolated tornado into the mountains of WV and southwest VA. Figure 1 below shows the reflectivity and velocity just minutes after the tornado touched down northeast of Matoaka. Figure 2 shows the northwest to southeast track of the storm through western Mercer County.

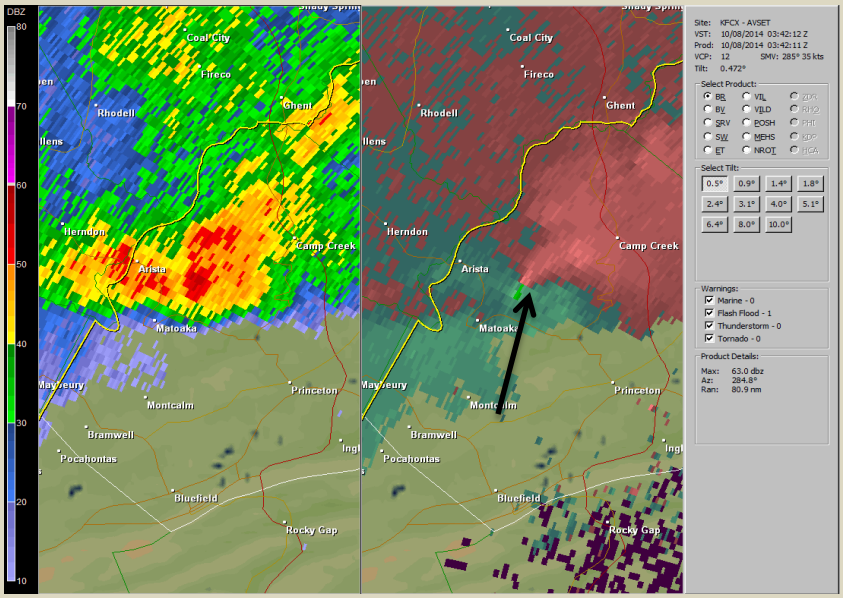


Figure 1. Reflectivity (left) and velocity (right) from KRNK WSR-88D: 11:42 PM, October 7, 2014

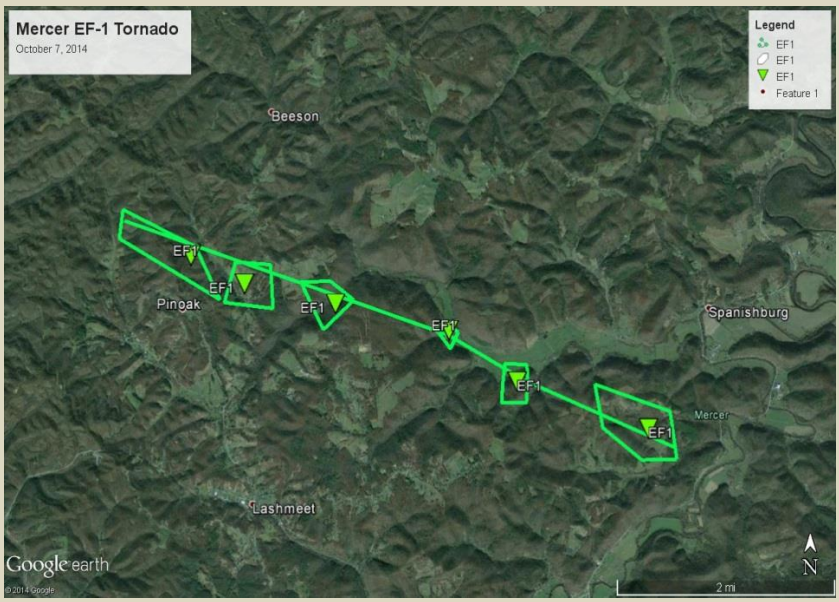


Figure 2. Track of the Mercer County tornado

Summer 2014 Climate Summary

Chris Fisher, Meteorologist Intern

The summer of 2014 was one of contrasts across the Blacksburg forecast area. The first half of the summer was warm and dry, while the second half was cooler and wetter than normal as multiple cold air damming wedge scenarios set up across the region. Let's take a look at how temperatures and precipitation compared to normal.

Summer 2014 Mean Temperatures (F)

City	June 2014	June Normal	July 2014	July Normal	Aug 2014	Aug Normal	Summer 2014	Summer Normal	Depart from Normal
Blacksburg VA	70.2	67.7	70.3	71.2	68.7	70.0	69.8	69.7	0.1
Roanoke VA	74.7	72.9	74.6	76.7	71.9	75.4	73.7	75.0	-1.3
Lynchburg VA	73.2	71.6	74.1	75.3	71.1	74.1	72.8	73.7	-0.9
Danville VA	76.3	74.8	77.1	78.3	74.5	77.0	75.9	76.7	-0.8
Bluefield WV	72.1	69.8	70.7	73.0	70.2	72.3	71.0	71.7	-0.7

With the exception of Blacksburg, who ended up with a normal summer, the remainder of climate stations experienced a slightly cooler than normal summer, despite the much warmer than normal June. There were no 90 degree days at Blacksburg or Bluefield. The highest summer temperature in Blacksburg was 89°F on July 2nd. Bluefield made it to a high of 87°F on June 18th and July 12th. Lynchburg, Roanoke and Danville didn't even flirt with 100°F this summer. The warmest days at these locations were 95°F in Lynchburg on June 18th, 96°F in Roanoke and 97°F in Danville, both on July 2nd.

Summer 2014 Precipitation (inches)

City	June 2014	June Normal	July 2014	July Normal	Aug 2014	Aug Normal	Summer 2014	Summer Normal	Depart from Normal
Blacksburg VA	3.07	4.00	1.92	4.26	5.95	3.59	10.94	11.85	-0.91
Roanoke VA	3.05	3.83	3.40	4.04	6.53	3.56	12.98	11.43	1.55
Lynchburg VA	2.40	3.62	5.79	4.36	4.78	3.26	12.97	11.24	1.73
Danville VA	1.23	3.85	3.73	4.59	6.23	3.97	11.19	12.41	-1.22
Bluefield WV	3.60	4.14	2.95	4.17	6.41	3.26	12.96	11.57	1.39

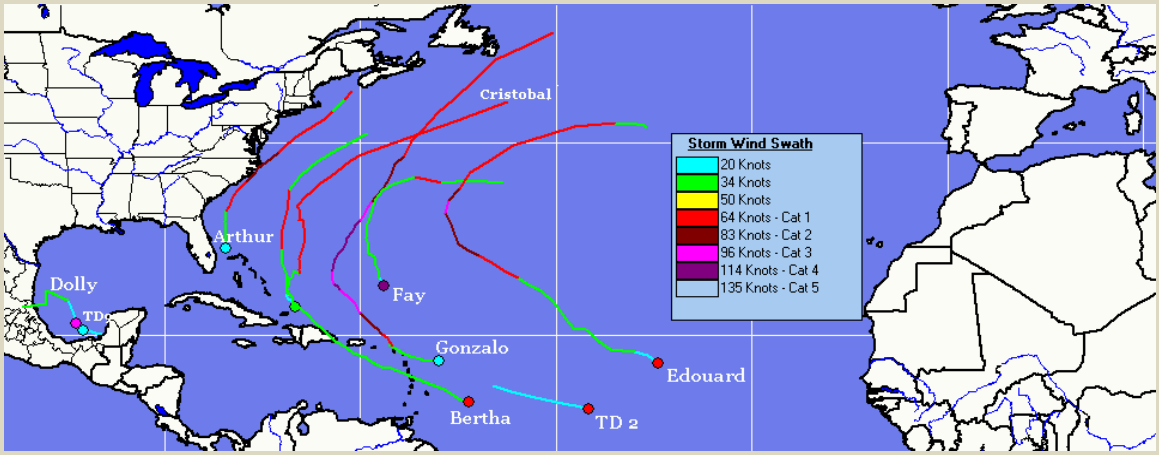
After a drier than normal June and July, August quickly made up the deficit. The 1.23 inches of rain at Danville in June was its 3rd driest June on record. July was below normal at all locations except Lynchburg. The 5.79 inches for the month at Lynchburg is a bit deceiving because 3.88 inches of that fell in just a few hours during a slow moving thunderstorm on July 24th. August was wetter than normal at all climate locations. The 6.41 inches at Bluefield was its wettest August on record, while the 5.95 inches at Blacksburg was the 4th wettest August. Despite the extremes, the summary for the entire summer shows that all the climate sites came within a couple of inches of normal rainfall.

2014 Tropical Season Wrap-Up: Sluggish For the Mainland U.S.

Jim Hudgins, Senior Forecaster

After an early spring outlook that provided a consensus of perhaps seeing anywhere from 8 to 14 named storms, the tropical Atlantic has been even less active to date (November 6th) with 7 named storms and 2 additional tropical depressions so far (Fig 1). This pattern seemed to correlate well with strong high pressure over the eastern Atlantic for most of the summer which promoted below normal ocean sea surface temperatures off western Africa, while helping push dry, dust-filled air westward across the Atlantic basin. In addition, fewer tropical waves were seen for much of the season, and those that made it across the Atlantic were mostly suppressed, ending up over the Eastern Pacific before developing.

As of the date of writing, of the 7 named storms, 6 have been hurricanes with two reaching major criteria of Category 3 or stronger. Edouard was the first major hurricane in the Atlantic since Sandy back in October of 2012. This system remained over the open waters of the Atlantic, and never affected any landmass. The strongest storm of the season was Gonzalo which reached Category 4 status before making a direct hit on Bermuda on October 17th as a strong Category 2 system. Of more local consequence was Category 2 hurricane Arthur that moved across coastal Eastern North Carolina and affected the Outer Banks with heavy rain, hurricane force winds and sound-side flooding around July 4th. Despite its strength and closer proximity, the small size of the Arthur kept most of its rainfall and winds to the east of our area with minimal impacts locally. So far there have been 18 fatalities attributed either directly or indirectly to tropical storms this season. Damages totaling over $232 million have been attributed mainly to Gonzalo in Bermuda as well as Arthur along the East Coast, and Tropical Storm Dolly that impacted the eastern coast of Mexico in early September. The 2014 tropical Atlantic hurricane season officially ends on November 30th.

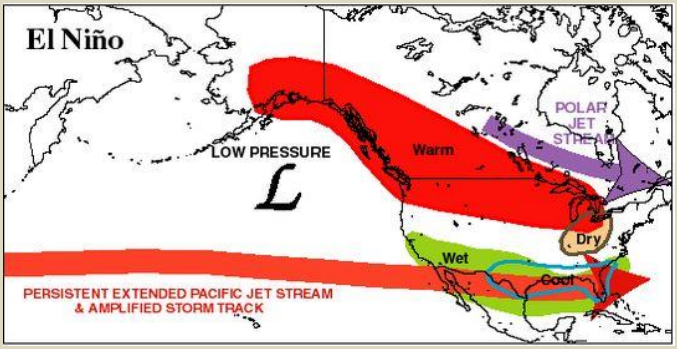


Hurricane/Tropical Storm Tracks in 2014.

2014-2015 Winter Outlook

Robert Beasley, Senior Forecaster

As we approach the winter of 2014-2015 there is always plenty of interest in what kind of winter it will be. Much of the current winter outlook is predicated on the return of an El Niño episode for the winter season. The most recent monthly ENSO bulletin from the NWS Climate Prediction Center (CPC) as of November 6, 2014 maintained an El Niño Watch with a 58 percent chance of an El Niño event developing late this fall or winter. However, this represents a slight decrease from the 60 to 65 percent probabilities issued earlier this fall. El Niño, an ocean-atmospheric phenomenon in the Tropical Pacific whereby the waters of the eastern Pacific are warmer than normal, affects global weather patterns by relocating the jet stream and associated storm track further south than normal. The strongest correlation between El Niño and the resultant weather pattern generally exists across the southern United States (see Fig. below).



U.S. weather patterns during a typical El Niño

A moderate or strong El Niño will often lead to wetter than normal conditions across the southern states, including many current drought stricken states such as California and Texas. By the same token, when the jet stream and storm track are located further south, this leads to cooler than normal temperatures across the south because of more clouds and precipitation. It can also yield some big winter storms, especially ice storms across the south central and southeast states. The strong southern jet stream associated with El Niño, especially when it persists into the early spring, can yield more frequent bouts of severe weather across the southern states as the stronger winds aloft result in greater shear and pulling of deep Gulf Moisture into the region. Across the northern states an El Niño pattern, with the jet stream often relocated to the southern states, results in a drier and warmer winter than normal. With the jet primarily anchored across the southern states it is more difficult for Canadian and Arctic intrusions to penetrate southward. Our region, being located somewhat between the warmer and drier regions to the north and the cooler and wetter areas to the south, is thus located in the transition zone. Consequently, the official outlook for our region this winter is for equal chances of above/below normal temperatures and above/below.

Winter 2014 Temperature/Precipitation Outlook

It is important to note that a moderate to strong El Nino is not expected this winter and again the El Nino has failed to even develop at this point, so it could well be that we may once again find ourselves overall in a neutral pattern with respect

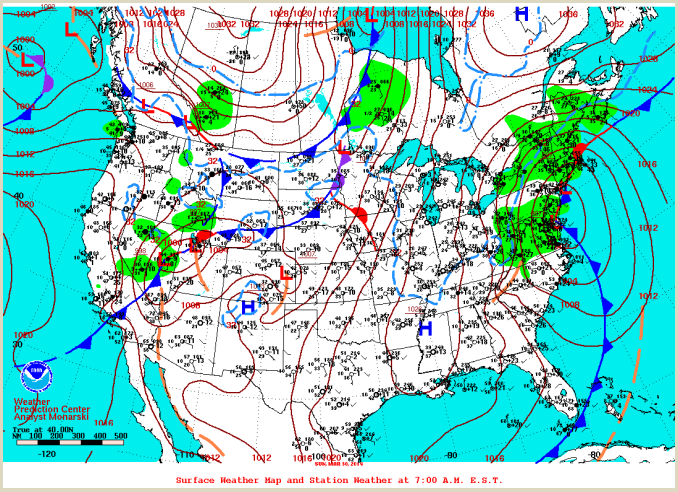
to El Nino/La Nina this winter, of which there are inconsistent signals as to what to expect. Furthermore, there are numerous other factors that impact the overall winter season, many of which change multiple times throughout the season. Some of these include the Arctic Oscillation, the North American Oscillation, the Pacific-North American Teleconnection, and the Madden-Julian Oscillation. All of these factors, combined with the El Nino/La Nino Southern Oscillation interact with each other, are much more difficult to predict in advance with any certainty, and could result in considerable variability from week-to-week or month-to-month throughout the winter season. With only a weak El Nino expected at best, we could well end up with a colder, snowier winter than normal, or we could end up with a drier, warmer winter than normal. One thing that can be said for sure with a weak El Nino, weak La Nina or essentially near neutral pattern is overall the predictability level of any specific climate pattern for the winter is low and you should expect high variability throughout the winter season. Thus, there will be periods of below to much below normal temperatures and greater than normal precipitation, hence snow, and there will also be periods of above to much above normal temperatures and less than normal precipitation. This is essentially what an outlook of equal chances means!

It is also important to note that the seasonal outlooks do not project where and when snowstorms may hit or provide total seasonal snowfall accumulations. Snow forecasts are dependent upon the strength and track of individual winter storms, which are generally not predictable more than a week in advance. Bottom line, be prepared for a myriad of conditions throughout this winter from bouts of extreme cold and perhaps some big snows to spells of abnormally warm temperatures. An outbreak of severe weather and flooding at some point during the winter season can also not be ruled out.

Weather Focus - Snowbands East of the Blue Ridge

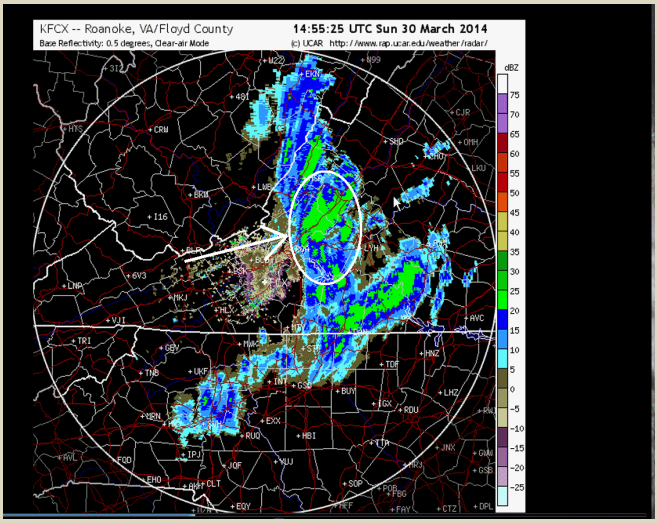
Jim Hudgins, Senior Forecaster

About once every winter season, ingredients come together to produce small scale but intense bands of snow that mainly affect areas along the eastern slopes of the Blue Ridge, and eastward into the Piedmont. These isolated snowbands have been observed to usually occur in the wake of a passing cold front and an associated storm system near the coast (Figure below).



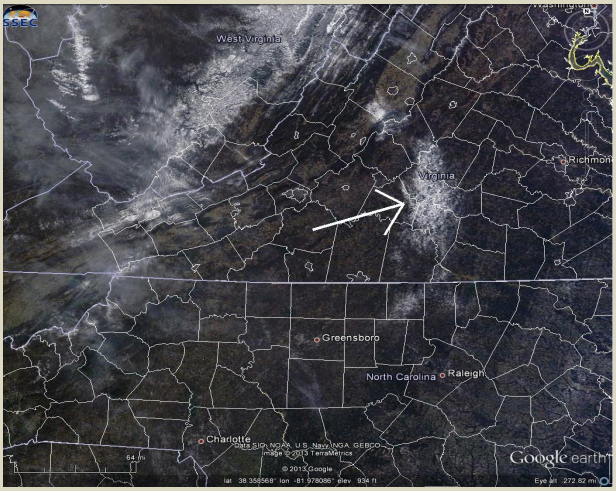
Surface Weather Map, March 30, 2014

These unique events are different than the typical "upslope" snow showers across the Appalachians, which are primarily driven by moisture moving up and over the higher terrain by low level northwest winds. These eastern bands of snow are usually supported by winds and energy aloft on the back of a departing low pressure system where a more northerly trajectory can also transport moisture south from the Great Lakes. This allows for more north-south oriented bands that tend to wrap around on the back edge of the deeper moisture where aided by arrival of much colder air near the surface. In most instances, the typical downslope northwest winds off the Blue Ridge are enough to hinder their development as colder and drier air rushes in.



KFCX Radar, March 30, 2014

Occasionally, this flow will tend to lag back over the mountains allowing for features to line up resulting in heavy and very persistent ribbons of snow. Development and timing of these snowbands can be difficult to forecast given their very small-scale nature and rare frequency. In the past couple of years two notable events have occurred across the Blacksburg county warning area with one during the evening of February 16, 2013, and the other on March 30, 2014. The February event affected areas across Buckingham and Appomattox counties in Virginia where localized totals of up to 7 inches occurred in a couple hours, with lesser amounts of 1 to 2 inches into Charlotte and Halifax counties.



Visible Satellite of Feb.16, 2013 snowfall

The March snowfall was more of a prolonged scenario during the evening hours resulting in a narrow strip of snowfall totaling around 8 inches in northern Rockbridge County while much of the rest of the county saw 2 to 3 inches or less.

Snowfall in Buena Vista, VA Mar. 30, 2014

Winter Weather Terminology

Heavy Snow - Snow accumulating 4" more in 12 hours or less, or 5" or more in 12-24 hours for locations east of the Blue Ridge. For those areas in the Blue Ridge and west, heavy snow is defined as 5" or more in 12 hours or less, or 6" or more in 12-24 hours.

Blizzard - Sustained winds or frequent gusts of 35 mph or greater and considerable falling and/or blowing snow frequently reducing the visibility to less than 1/4 of a mile. Conditions must last for a period of at least 3 hours for the storm to be classified as a blizzard.

Winter Storm Watch - Issued for the possibility of a combination of any of the following events: blizzard conditions, heavy snow, or significant and damaging accumulations of freezing rain or sleet. A watch usually gives 12-36 hours advance notice of the onset of winter weather conditions.

Winter Storm Warning - Issued when a mixture of heavy snow, freezing rain, freezing drizzle or sleet is occurring, is imminent, or is very likely. A Winter Storm Warning is issued with the goal of providing at least 20 hours of lead time.

Changes to the Storm Prediction Center's Day 1-3 Outlooks

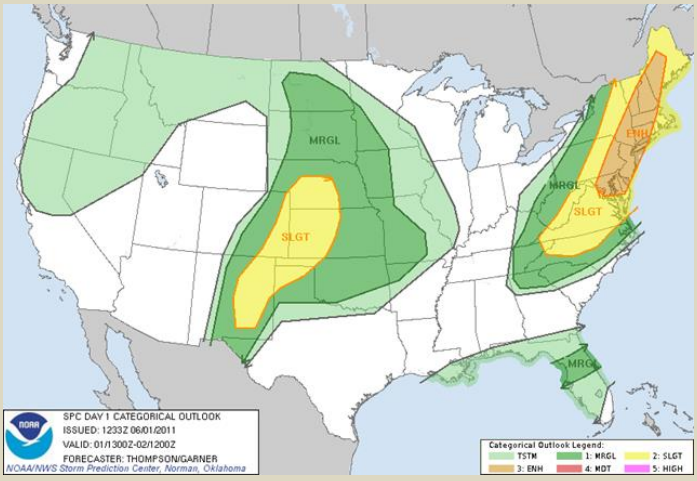
Will Perry, Senior Forecaster

Starting October 22nd, 2014, the Storm Prediction Center (SPC) made changes to the way they graphically denote their severe thunderstorm outlooks for Days 1 through 3.

A survey of the public was conducted for 2 months this past April through June that showed more in favor of the change to a 5 tiered risk wording from 4, with some wording changes. The general thunderstorm threat, which is for non-severe or near severe will also remain in the graphics.

The primary goal of this change is to better communicate the severe weather threat for days 1 through 3. With the addition of "marginal" and "enhanced" wording the outlook maps can have up to 6 contours. More information on the exact details of the wording can be found at the Storm Prediction Center's page on this change.

Example 1. New format of the map for SPC outlook



Building a Weather-Ready Nation with Help from Ambassadors

Phil Hysell, Warning Coordination Meteorologist

Do you know what to do in a severe weather emergency? Each year, people in this country are killed or seriously injured by all types of extreme weather, despite advance warning. NOAA's Weather-Ready Nation (WRN) initiative is about helping our nation become more resilient to increasing extreme weather, water and climate events. The NWS is working to keep these threats from becoming disasters with greater accuracy in forecasts and warnings, evolving services to decision makers, and better ways to communicate risk to stakeholders and the public.

AMBASSADOR™
WRN
WEATHER-READY NATION

As part of the WRN initiative, the NWS partners with emergency management officials, businesses, and the media to help communities to prepare for potential weather disasters. Building a WRN requires the participation and commitment of a vast nationwide network of "Ambassadors" – organizations contributing in the best ways they can. In 2014, the NWS launched the Weather-Ready Nation (WRN) Ambassador™ initiative to formally recognize partners who are improving the nation's readiness, responsiveness, and overall resilience against extreme weather events. As a WRN Ambassador, partners commit to working with the NWS to strengthen national resilience

against extreme weather. In effect, the WRN Ambassador initiative helps unify the efforts across government, non-profits, academia, and private industry toward making the nation more ready, responsive, and resilient against extreme environmental hazards.

To be officially recognized as a WRN Ambassador, an organization must commit to:

- Promoting Weather-Ready Nation messages and themes to their stakeholders;
- Engaging with NOAA personnel on potential collaboration opportunities;
- Sharing their success stories of preparedness and resiliency;
- Serving as an example by educating employees on workplace preparedness

Any organization across all levels of government, businesses large and small, non-profit and non-governmental organizations, and academia can become a WRN Ambassador. In the NWS Blacksburg forecast region, Stokes County Public Health; Halifax Regional Hospital; and WataugaRoads.com have already been recognized as WRN Ambassadors. To learn more about the Weather-Ready Nation initiative or becoming a WRN Ambassador, visit the WRN website at www.noaa.gov/wrn

Recent WFO Staff Changes

Patricia Douglass (Administrative Assistant)

In September the WFO welcomed a new Administrative Assistant, Patricia Douglass (ASA) to Blacksburg! Patricia has been with the federal government for 30 years, starting right out of high school at NASA Langley Research Center in Hampton, Virginia as a Co-op student. During her 10 years at NASA Langley Research Center, she worked in two research branches (aeronautical and electronics), the Director's and Chief Scientist's offices. She also worked for several other agencies in Texas before moving to upstate New York in 2001 with her family, where she worked with the Department of Defense as a procurement technician working on a variety of government contracts. In 2007, she was excited to become an addition to the National Weather Service's WFO Binghamton team as their new ASA. Patricia was in the first graduating class of the ERLDP, and in 2010, a recipient of the National Isaac Cline Award for Support Services. Equally, she is excited to return to her home state of Virginia and join the WFO Blacksburg team. Patricia is married with three grown children.

Justin York (Electronics Technician)

Justin was hired as an Electronics Technician at WFO Blacksburg in July of this year. Justin grew up in a small town in Alaska called Tok. During summer work in Alaska for the U.S Forest Service, he was given the opportunity to work as a Communications Technician which helped steer him into a career in electronics. In September, 1997, he joined the U.S. Air Force, where he studied Ground Radio Communications in Biloxi MS. He was later assigned to F. E. Warren AFB in Cheyenne, WY – where became a Non Commissioned Officer in the Missile Communications Work Center. In 2001, he separated from active duty and took a position in the Wyoming Air National Guard until 2005, when he accepted a Civil Service position as an Electronics Instructor and Equipment Specialist for the USAF in addition to several other positions In November, 2011, he accepted a position as an Electronics Technician with the National Weather Service at WFO Cheyenne.

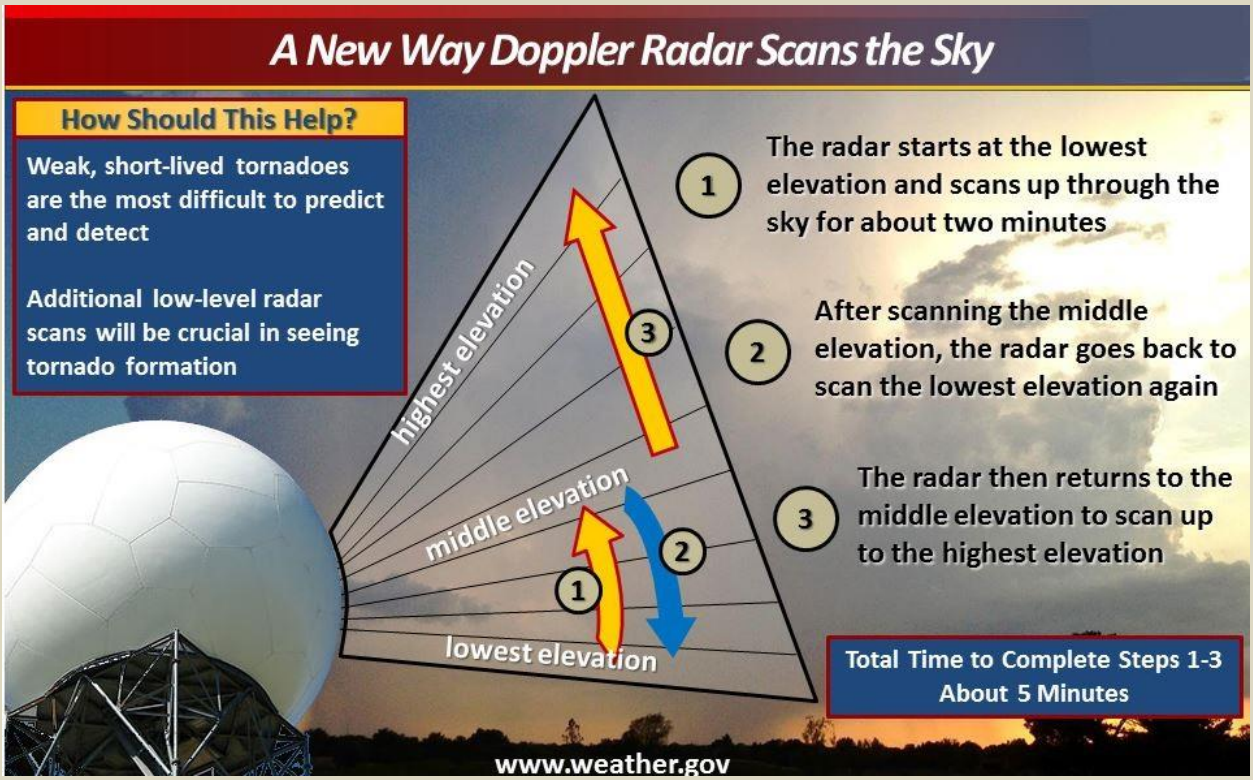
Mike Sporer (Meteorologist)

Also in September a new general forecaster was selected from among a highly competitive group of applicants. After the interviews and careful deliberation, the position was filled by our very own meteorologist intern, Mike Sporer. Mike was hired as an intern at WFO Blacksburg in April 2012 and has proven a valuable addition. He has become one of the office experts in Social Media and remains a resident authority on satellite meteorology. Mike's career pre-Blacksburg career was profiled in the Spring 2012 office newsletter.

Technology Focus - SAILS

Ken Kostura, General Forecaster

SAILS? No, we haven't started a sailing club at the WFO! But we have improved our ability to look at the winds that drives sailing (and a lot of other weather)! On August 13th, 2014, the National Weather Service in Blacksburg installed Build 14.1 on the KFCX WSR-88D which included the SAILS (Supplemental Adaptive Intra-Volume Low-Level Scans) capability. How does this new software help in warning operations? This software provides more frequent 0.5 slices which is crucial in see tornado formation especially with weak, short-lived tornados. Background information on Build 14 and SAILS can be found by visiting the Warning Decision Training Branch Build 14 web site at http://wdtb.noaa.gov/buildTraining/Build14/index.php.



The warning decision training branch has also created a short tutorial on how to view SAILs data in GR2Analyst which can be found at http://wdtb.noaa.gov/buildTraining/Build14/documents/SAILSandGR2-6-17-2014.pdf . Several other additions with Build 14 software on the WSR-88D included a calibration process to provide the best possible dual-pol base data quality, a new Storm-Based algorithm for some developing storms at long range from the KFCX radar, and adjustments to the Quantitative Precipitation Estimates (QPE) multiplier for dry snow and ice crystals based on local research to improve radar estimates. The Build 14 upgrade was the first comprehensive RDA/RPG build since the deployment of the dual-polarization upgrade.

When it comes to severe weather, frequent low-level radar scans are crucial to observe the development of tornadoes, which can form in a matter of seconds. Thus, with SAILS the NWS to be able to observe rapidly changing weather phenomenon with a greater degree of precision and issue more timely severe weather warnings.

Blue Ridge Thunder

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