Prevailing Winds

Volume 5, Issue 2 October 28, 2015

Inside this issue:

Two Rare Significant Weather Events on August 4th 2015

by Hayden Frank, Senior Meteorologist

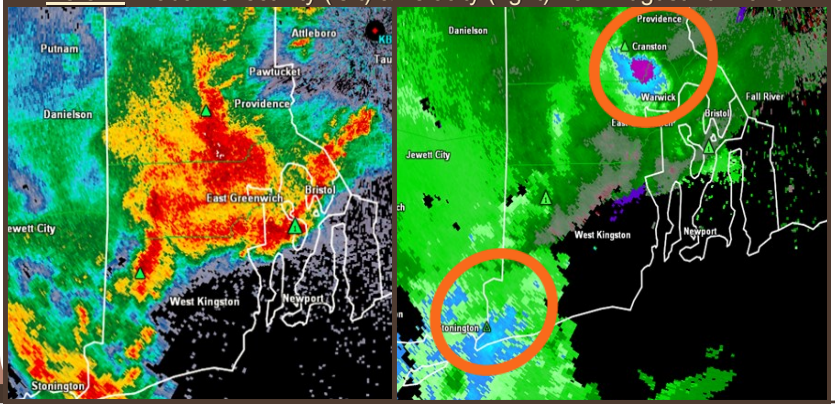
August 4th, 2015 is a day that meteorologists in southern New England will remember and study for a long time. This day was composed of not just one, but two significant severe weather events, a rarity in this region. In fact, one of these events occurred in the early morning hours, impacting the Providence, RI morning commute. It is not unheard of for southern New England to have early morning severe weather events. One recent example is the Revere, MA tornado that occurred just last year. There were no tornadoes reported on August 4th, however widespread damage did occur.

Above: Wind Damage in Barrington, RI. Photo courtesy of Barrington Police Department

As mentioned before, there were 2 events that occurred on this date. The first one impacted Rhode Island as well as portions of southeastern Massachusetts between the hours of 6 and 8:30 am. A line of severe thunderstorms developed across Long Island, NY and raced toward Rhode Island. These storms caused significant wind damage across Rhode Island resulting in widespread power outages, knocking down a significant amount of trees, and causing massive traffic delays. Wind gusts were estimated to be between 60 to 80 mph, with T.F. Green Airport reporting a wind gust of 66 mph. In fact, these storms caused more power outages then Hurricane Sandy! Some of the hardest hit areas were Cranston and Charlestown, RI. An anemometer recorded a wind gust of 83 mph in Charlestown, where there were 10 minor injuries that occurred on a campground. The storm that impacted Charlestown, RI grew in strength and rushed across southern Rhode Island bringing down trees in its wake all the way to the Cape.

After a brief lull in activity, a second severe weather event occurred north of the Massachusetts Pike between noon and 5 pm. This severe weather was triggered by an approaching cold front from the west. The hard hit areas of Rhode Island and southeast Massachusetts were not affected by this second round of storms. As these storms developed across western Massachusetts, they began to produce wind gusts of 50 to 60 mph.

Below: Radar reflectivity (left) & velocity (right) from August 4th 2015



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Cont'd from pg 1…August 4th Event

Above: Hail Pictures from Brighton, MA. Picture courtesy of Rachel Rumely

As they continued to move eastward, unusually large hail was the main story as several locations, including Boston, had hail the size of golf balls (2 inches in diameter)! In fact, the 2 inch hail that occurred in Boston is the largest to ever occur in Suffolk County since records began in 1950. Although damage was not as significant as the morning convection, there were still downed trees and power outages from these storms.

One of the biggest challenges for the National Weather Service is being able to communicate "run of the mill" severe weather events from the high end events like the ones that occurred on August 4th. During these two events, special wording was used in the warnings and statements to convey the unusually high impact and widespread damage that occurred. This helped emergency managers and the media to convey the severity of these storms to the public.

Winter Weather Preparedness Week: November 2nd — 6th

Winter Safety Tips

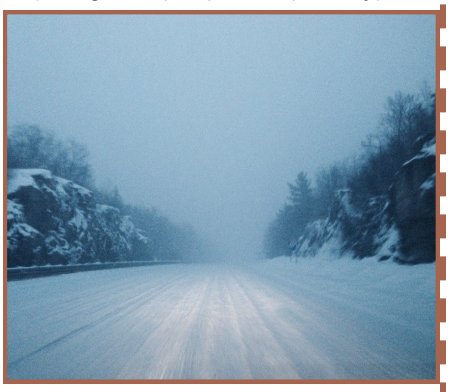
by Alan Dunham, Observation Program Leader

The heat and humidity of summer is rapidly fading into memory, the leaves are showing their vibrant fall colors, there is a nip in the air and soon the white flakes of winter will be falling. Now is the time to begin planning and making preparations to stay safe this winter.

Living in New England, we can be reasonably assured that there is a possibility that we will see at least one, if not several, good size snowstorms that could leave you without power for a few hours to a few days. Now is the time to make your home winter-ready as well as prepare an emergency kit.

To make your home winter-ready you should make sure you have fresh batteries for your smoke and carbon monoxide detectors. If you use a wood or pellet stove make sure you have your chimney cleaned before you start firing it up regularly. Also, you may want to have your stove inspected to make sure it is in good working order and that there are no leaks which will allow carbon monoxide to seep into your home. You should also make sure all your gutters are cleaned to lessen the chances of having any ice dams form as the snow on your roof melts.

As for an emergency kit, your kit should include the following: flashlights with extra batteries, a battery operated portable radio as well as a battery operated NOAA Weather Radio, a first aid kit, a 3 day supply of water (one gallon per person per day), as well as fully charged fire extinguishers.



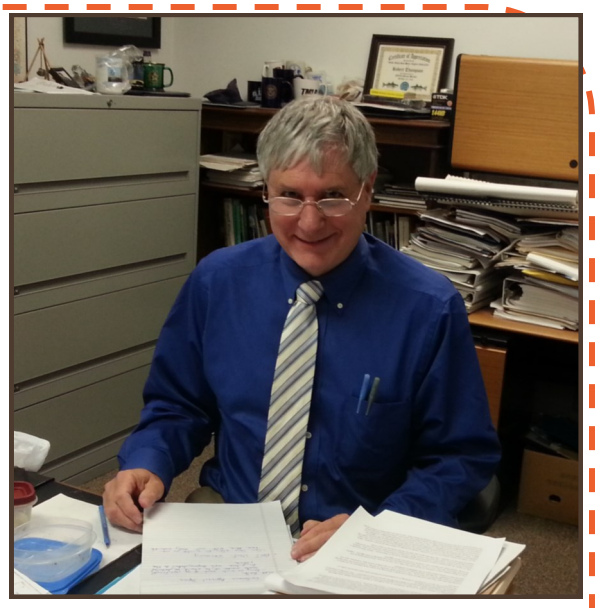
Should you lose power during a storm, there are certain "dos and don'ts" to follow. Do use battery powered lanterns. Avoid using candles or oil based lanterns as these pose an increased risk of fire. If you have a gas stove DO NOT use the stove to try to heat your house. Using your gas stove/oven as a source of heat greatly increases the chance of fire AND carbon monoxide poisoning. If you have a portable generator make sure that you run the generator outside well away from the windows. DO NOT run your generator in your garage as it is a potential fire hazard. Also, if you have a garage that is attached to your house, deadly carbon monoxide WILL seep into your home.

For other ideas to make your home winter storm ready you can contact your local American Red Cross chapter or your local emergency management office for ways to get your home ready for winter.

It is also possible that you may be stuck in a vehicle during a particularly severe winter storm, so it does not hurt to have an emergency kit for your car as well. Your kit should contain: a container of kitty litter, blanket or sleeping bag, small folding shovel, road flares, a small candle, windshield scraper, small first aid kit, jumper cables, as well as candy or energy bars and water in case you get stuck in your vehicle.

MIC Musings

by Robert Thompson, Meteorologist-in-Charge



Behind the Scenes

If the weather has been active, people will comment to me that I must be very busy. Conversely, if the weather has been quiet for a while, people will offer their insight that work must not be so hectic with the quiet weather. Well, there is of course some truth to the fact that we do get busier when there is a significant weather threat. And it doesn't need to actually materialize. There are layers of extra coordination and sometimes extra products when Mother Nature simply *threatens* us with a big storm. Joaquin was such an example. For a time, it did pose a risk to our area, and that alone prompted daily or twice daily emergency management briefings, media interviews, higher level of social media activity, and so on. But the converse isn't quite so true. Our mission to protect lives and property as well as enhance the economy depends not only upon the issuance of timely and accurate forecasts and warnings in real time but also on a plethora of day to day activities that involve such tasks as systems maintenance, science/technology integration, and preparedness initiatives.

Timely and accurate forecasts depend upon reliable observations, radar and satellite remote sensing, and computer/communications technology for starters. This office maintains 24 automated surface observation systems (ASOSs). We average at least one electronic technician on the road every day to conduct ASOS corrective or preventative maintenance. Our operational Advanced Weather Interactive Processing System (AWIPS) needs to be secure and optimally functional 24x7, if forecast information is going to be produced and disseminated reliably.

It is too easy to take these systems for granted. The Taunton Weather Forecast Office issued Tornado Warnings for a devastating EF-3 tornado on June 1, 2011. Most people know about the tornado and the warnings. But here's the rest of the story. Several days before that event on Friday afternoon May 27, the office's electronic technicians were wrapping up an exhausting week long rack consolidation project when the radar went down. As tired as the electronic technicians were, they climbed into the radar dome, crawled into the pedestal, and peered bleary-eyed into the guts of the Radar Data Acquisition computer to troubleshoot the problem. They worked late into the night Friday and came back on Saturday after a few hours of sleep to complete the diagnosis and order needed parts. By Tuesday May 31 all the parts had arrived, and our dedicated electronic technicians went back to the radar to complete the repair. Literally the day before the most violent tornado since the Worcester Tornado of June 9, 1953 struck Massachusetts, the electronic technicians got the radar humming again – the piece of remote sensing equipment that played the greatest role in identifying and warning for that deadly tornado.

This office prides itself on a top notch forecast and warning program. But we will have no such pride in the future if we don't proactively integrate new science and technology into our operations. Our world doesn't stand still, and we will no longer be relevant if we are not aggressively raising our level of service via new science and technology. We do this via many ways. Forecasters will conduct event reviews to understand signals that may be clues to a future event. Science training is conducted via frequent group meetings and quarterly individual assignments.

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Cont'd from pg 3…MIC Musing

We have joined forces with academia to help bring research to operations. We have beta tested numerous new systems/ upgrades to get on the ground floor of emerging technology that will help us in the future. For example, we are presently testing and evaluating a new Nearshore Wave Prediction System to enhance the value of our marine and coastal forecast information. In early October 2015 we upgraded our online coastal inundation maps to provide higher resolution and depth information. This was the culmination of many months of effort by a dedicated Geographic Information System (GIS) student volunteer and our Information Technology Officer.

Finally, this office engages in a myriad of preparedness activities. These include Skywarn training, hurricane seminars and workshops (e.g. this office helped the Massachusetts Emergency Management Agency plan a two day hurricane conference), StormReady designations, dozens of presentations to emergency managers, other public officials with a public safety role, educators and students, pilots, mariners, etc. We even helped plan and lead a table top exercise this summer for a hypothetical Sandy-like storm that brings a devastating storm surge into Boston Harbor to evaluate the coordinated response capability of city, state, and federal response agencies. Activities like these complement our internal training efforts by raising the capabilities of public safety decision-makers to respond effectively to NWS forecast/warning information.

This article has just scratched the surface but hopefully gives a glimpse of what we do to be ready for when the next hazardous weather event looms. Indeed, our adrenaline pumps faster when a storm threatens (after all we didn't sign up for this job to predict fair weather day after day!). Nevertheless, it is the day to day work accomplished behind the scenes during the more benign periods that determines our ability to accomplish our mission of saving lives and property when Mother Nature hurls her fury at us.

Microburst? Straight-line Wind? What's the Differences?

by Ryan Hanrahan, NBC Connecticut Meteorologist

It was clear that the destructive thunderstorm on August 4, 2015 wasn't a tornado – but what exactly was it? At the storm's peak over Cranston and Warwick, RI Doppler Radar from Taunton, MA (KBOX) showed exceptionally strong inbound velocities only about 1,300 feet above the ground. A maximum inbound velocity of 78 knots was sampled in the southern portion of Cranston right near I-95.

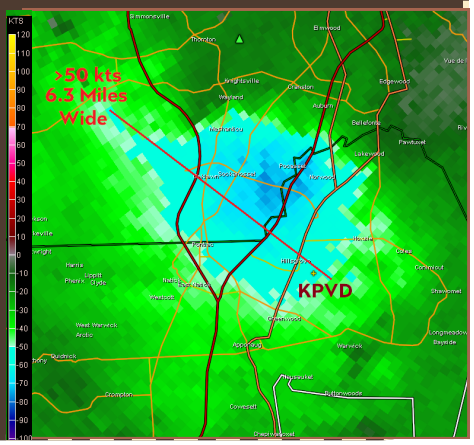
Not surprisingly, the damage was significant. More than 100,000 customers were left without power in Rhode Island after the storm moved through and the cleanup lasted days.

In order to determine how to classify the thunderstorm wind damage it's necessary to look at the horizontal scale of the damage. The definition of a microburst (Fujita and Wakimoto, 1980) is a small downburst with its horizontal dimensions <4km. This is not necessarily an easy thing to do. In this case the large number of damage reports, and the fact that this storm was so well sampled by Doppler Radar, makes the case a relatively easy one.

When the 58 knot gust was reported at an observation site at TF Green Airport, the radar was sampling an inbound velocity of 53 knots just above the airport. This gives us a fairly good idea that the velocities sampled by KBOX were fairly representative, if not a bit low, of the winds observed at 10 meters in metropolitan Providence. Using the 0.5 degree elevation base velocity from KBOX we see 50 knot winds being observed in a wide swath – 6.3 miles (10.1km) wide when the storm was over Cranston and Warwick. Damage also occurred outside of the 50 knot isotach on base velocity making the true size of damaging wind even larger than 6.3 miles. This would not meet the Fujita and Wakimoto definition of a microburst.

A microburst is a type of straight-line wind damage. There are many causes of straight-line wind damage from thunderstorms. Intense downdrafts or lesser downdrafts that carry momentum from aloft (descending rear inflow jets) can cause damaging straight-line winds (Markowski and Richardson, 2010). Cold pools created by precipitation cooled downdrafts can result in strong horizontal pressure gradients causing damaging wind at the surface. Not all straight-line wind damage is the result of a microburst but all microbursts are types of straight-line wind damage.

As a broadcaster one of the things I struggle with is how to communicate the danger associated straight-line winds from high-end severe weather events. While TV station newsrooms and the public react strongly to the word tornado – a severe thunderstorm doesn't necessarily get that same reaction. In a situation like the August 4, 2015 event making sure we're communicating the threat with the right tone is critical.



WEA Alerts for High-End Severe Thunderstorms: Coming in Spring 2016

by Glenn Field, Warning Coordination Meteorologist

Wireless Emergency Alerts (WEA) are emergency messages sent by authorized government alerting authorities through your mobile carrier. Government partners include local and state public safety agencies, FEMA, the FCC, the Department of Homeland Security, and the National Weather Service (NWS). The NWS began participation in the WEA system in June, 2012. The system is automatically activated on WEA-enabled smart phones when a Tornado Warning, Flash Flood Warning, Hurricane Warning, Extreme Wind Warning (such as hurricane eye wall), Dust Storm Warning, or Tsunami Warning is issued. More information about WEA can be found at http://www.weather.gov/wirelessalerts .

We have seen how useful these can be. On July 1, 2013, a Tornado Warning from NWS-Taunton triggered a Wireless Emergency Alert (WEA) which saved as many as 34 lives in East Windsor, CT. Five adults and 29 children were in the Sports World Complex soccer dome when the manager received the WEA on her iPhone. She immediately evacuated everyone to an adjoining building. Within two minutes of receiving the WEA, a tornado hit the dome, sending it flying across I-91. The children and adults were safe. For other success stories, checkout this link: http://www.nws.noaa.gov/com/weatherreadynation/news/130313_wea_stories.html%23.VhQfpzZdGUk

But tornadoes, flash floods, and hurricanes aren't the *only* damage producers – what about severe thunderstorms that cause damaging winds and large hail, including derechos, strong microbursts, etc.? On August 4, 2015, much of southeastern New England was awakened by continuous lightning/thunder at 6 AM to 8 AM…not the usual time for that type of activity. But in a swath from Cranston, RI eastward to Cape Cod, a damaging macroburst occurred, with wind gusts exceeding 80 mph. Trees were downed onto cars and many roads were impassable. At that time of the morning, many people were caught off guard by the severity. Ten campers were injured in Charlestown, RI by a separate microburst which had measured wind gusts to 83 mph.

"...from Cranston, RI eastward to Cape Cod, a damaging macroburst occurred, with wind gusts exceeding 80 mph...At that time of the morning, many people were caught off guard by the severity."

Severe Thunderstorm Warnings (SVR) currently are not part of the WEA system. That's because a severe thunderstorm, by definition, has wind gusts of at least 58 mph and/or hail that is at least 1" in diameter. More than a million SVRs have been issued across the country since 2006. It would de-sensitize people to the WEA Alert if it went off so frequently.

Well, there's a solution coming in the near future! NWS Headquarters has been working on getting the local forecast offices, like Taunton, the ability to trigger the WEA system for high-end severe thunderstorms. The thresholds for such notifications are still being discussed, but will likely be something on the order of 80+ mph wind gusts and 3" diameter hailstones. This new capability -- for NWS to trigger WEA alerts for ultra-severe thunderstorms -- is expected to occur as early as Spring, 2016. Just another facet to helping establish a more Weather Ready Nation.

Learn more about the NWS's effort to become a Weather Ready Nation: http://www.nwsnoaa.gov/com/weatherreadynation/

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Getting to know your NWS Team:

Nicole Belk, Senior Service Hydrologist

Above: Nicole Belk, Senior Service Hydrologist for the National Weather Service Office in Taunton, MA.

For Nicole, working at the NWS Taunton office is working on home turf, since she grew up in Fitchburg, MA. Nicole had a keen interest in weather going back as early as the 5th grade. After completing a science project on the weather, she declared she wanted to become a meteorologist. Nicole's interest in the weather was influenced even more by several significant weather events, starting with Hurricane Gloria in 1985. In April 1987, back-to-back heavy rain events resulted in significant flooding across parts of southern New England. In Fitchburg, the heavy rains, along with a dam failure resulted in swift rushing water along the North Nashua River, and the Bemis Road Bridge was destroyed.

Nicole fulfilled her childhood aspiration, attending Penn State University and acquiring a Bachelor of Science Degree in Meteorology in 1994. While in college, Nicole had the opportunity to intern with Bob Copeland at WCVB TV. Nicole started her career with the National Weather Service (NWS) at the Weather Service Office in South Bend, Indiana. In 1996, Nicole went on to the NWS Weather Forecast Office in Charleston, West Virginia, where she was promoted to General Forecaster. Nicole became heavily involved in the Charleston office's Hydrology Program.

Nicole was promoted to Senior Service Hydrologist at NWS Taunton in 2001, and has been here ever since. As Senior Service Hydrologist, Nicole is responsible for leading efforts at NWS Taunton to manage and provide water-related data, forecasts, and NWS flood warning services across much of southern New England. Her day-to-day work addresses threats ranging from too much water (floods), to too little water (drought). Nicole has been a Certified Floodplain Manager (CFM) since April 2007. With a background in meteorology and forecasting, Nicole also routinely works operational shifts, forecasting for a wide variety of weather and water hazards.

Those of you that read our last Prevailing Winds newsletter may be doing a double-take. 'Wasn't there someone named Belk in the last newsletter?' Why yes there was - Matthew and Nicole Belk celebrated their 20th wedding anniversary this year! They have a 'fur family' of 3 dogs and 2 cats. Nicole enjoys hanging out with her nephews and nieces, including a recent addition to the family this year! Nicole is an avid outdoor runner. In fact, she ran 3 half marathons in 2014, which included the Surftown Half in Westerly, and the Narragansett Bay Half in East Providence. This year Nicole ran the Tufts 10K in Boston, and will participate in the Spartan Sprint (an obstacle course race) at Fenway Park in November.

Tuesday August 4th 2015 Ham Radio Operations

By: Robert Macedo, Amateur Radio Coordinator

Above: Wind Damage to the Mardi Gras in Cranston, RI. Picture by John Buco.

On Tuesday August 4th, 2015, the most widespread severe weather event of the Summer of 2015 occurred across Southern New England. It was the equivalent of two separate severe weather outbreaks that occurred on the same day but affected different parts of the National Weather Service (NWS) Taunton coverage area.

On Monday August 3rd, NWS Taunton office highlighted the potential for severe weather for Tuesday August 4th. The forecasters mentioned that there was the potential for a round of morning strong to severe thunderstorms and if there was enough clearing, another round of strong to severe thunderstorms for the afternoon hours. Having a severe weather event during the daybreak hours is fairly unusual in Southern New England. However with strong wind fields aloft coupled with very high instability would set the stage for a significant severe weather event.

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Cont'd from pg 6…August 4th 2015

Above: Wind Damage in Warwick, RI on Aug 4th. Photo by WA1RVH Ferrante.

Shortly after 6 AM Tuesday August 4th, thunderstorms rapidly organized in eastern Connecticut and south off of eastern Long Island, New York. SKYWARN Self-Activation handled the morning portion of this outbreak, since the extent of the morning severe weather outbreak wasn't as clear cut as the severe weather potential for the afternoon. The storms rapidly became severe over Rhode Island causing wide spread damage. Many wind damage, hail and flooding reports were received in the hardest hit areas of Cranston, Providence, Coventry, West Warwick and Warwick RI. Wind gusts as high as 68 mph were recorded at Conimicut Light in Warwick RI.

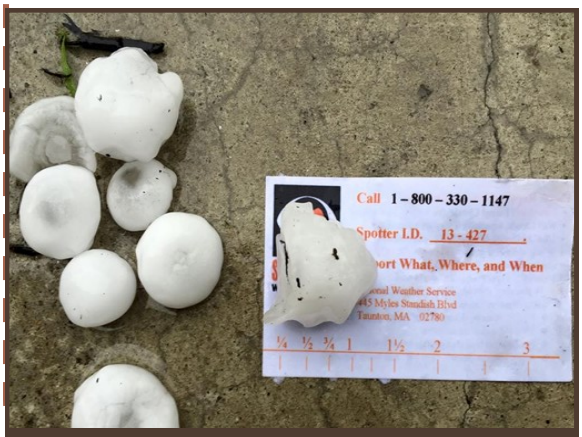
Also, hard hit in the state of Rhode Island was the Charlestown RI area. A measured wind gust of 84 mph was recorded with significant tree damage in the Burlingame State Park. Ten people suffered minor injuries as the severe thunderstorm swept through the area. Over 180,000 were without power in the state of Rhode Island, which it took several days to restore.

The RI storms moved eastward and swept through southeastern Massachusetts with many reports of tree and wire damage. Hardest hit areas included Seekonk, Swansea, Fall River and New Bedford and portions of Cape Cod. Several measured wind gusts greater than 50 mph were recorded including a 63 mph wind gust at Otis Air Force Base in Falmouth. After the storms moved through, approximately 14,000 were without power in Massachusetts.

Numerous damage photos were received from across the hardest hit areas of Rhode Island and Southeast Massachusetts Receiving these photos was helpful in understanding the extent of the damage as well as for the historical record regarding the morning portion of the severe weather outbreak.

After these storms moved offshore, a lull in activity occurred as the atmosphere began to destabilize ahead of an approaching cold front. Shortly after noon, thunderstorms quickly became strong to severe over portions of northwest and north-central Massachusetts. Amateur Radio Operations at WX1BOX were started just after the first couple of strong to severe thunderstorms organized in Massachusetts. In western Massachusetts, strong to severe thunderstorms caused wind damage and large hail in communities such as Huntington, Cummington and Worthington, MA. As these storms moved eastward reports of large hail and wind damage were received out of several locations including Littleton, Chelmsford and Acton, MA. Hail was as large as 2" in diameter in Littleton, MA. Additional reports of large hail up to golf ball sized were received as well.

Severe thunderstorms entered the North Shore of Massachusetts with wind damage being the primary severe weather mode with several reports of trees and wires down in Lynnfield, Danvers, Peabody, and Beverly, MA. True dedication was shown by Amateur Radio SKYWARN Spotter, W1FBI-Ed Gustat, He was severely impacted when a large tree fell on to his home and car causing severe damage to his properties. Despite the major personal impact, Ed provided reports of the damage into SKYWARN and the National Weather Service.



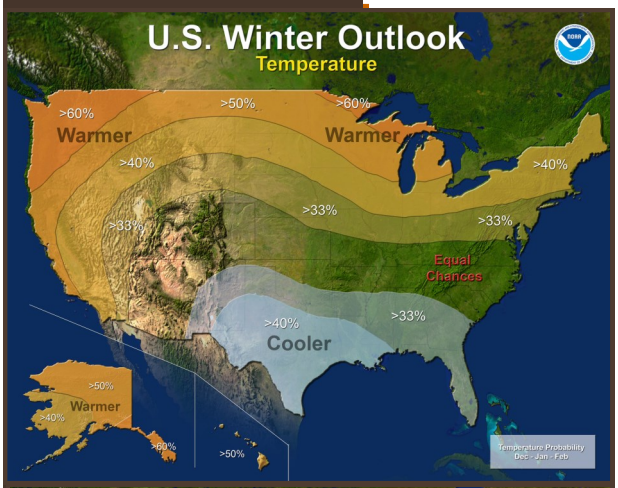
Above: Large Hail in Wayland, MA. Photo taken by Kathryn Grey.

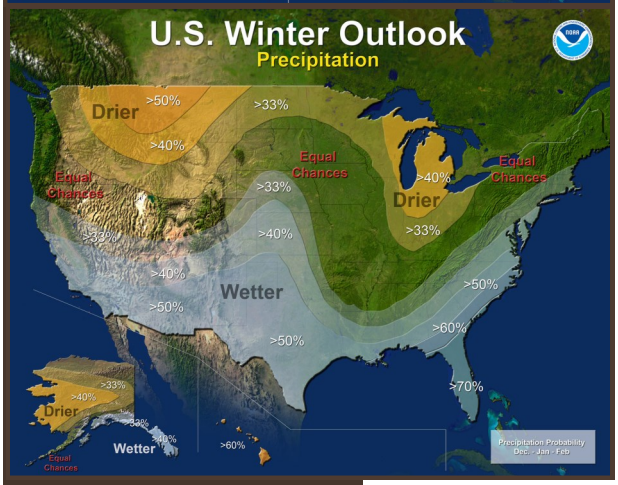
As the severe thunderstorms moved into the metro west area and into Boston, strong wind gusts and hail of between 3/4" and 2" in diameter were reported. Pockets of tree and wire damage were also noted in several metro west communities. In Boston Harbor, a waterspout was reported by KB1MSJ-Bill Collins as seen by a vessel captain and reported into the United States Coast Guard.

The amount of severe criteria reports received on Tuesday August 4th in the morning outbreak and the afternoon outbreak was the equivalent of two sizeable New England Severe Weather Outbreaks in just one day. The response from the SKYWARN Spotter and Amateur Radio community on this day was superb and provided timely severe weather reporting into the National Weather Service, other Emergency Management Agencies and the media in a very timely fashion which helped save lives and property. Thanks to all SKYWARN spotters and we look forward to this upcoming winter.

Strong El Niño sets the stage for 2015-2016 Winter Weather

by NOAA Public Affairs





Above: NOAA's Winter Weather Outlook for the 2015-2016 Winter Season.

Forecasters at the National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Center issued the U.S. Winter Outlook last week favoring cooler and wetter weather in Southern Tier states with above-average temperatures most likely in the West and across the Northern Tier. This year's El Niño, among the strongest on record, is expected to influence weather and climate patterns this winter by impacting the position of the Pacific jet stream.

"A strong El Niño is in place and should exert a strong influence over our weather this winter," said Mike Halpert, deputy director, NOAA's Climate Prediction Center. "While temperature and precipitation impacts associated with El Niño are favored, El Niño is not the only player. Cold-air outbreaks and snow storms will likely occur at times this winter. However, the frequency, number and intensity of these events cannot be predicted on a seasonal timescale."

Other factors that often play a role in the winter weather include the Arctic Oscillation, which influences the number of arctic air masses that penetrate into the South and nor'easters on the East Coast, and the Madden-Julian Oscillation, which can impact the number of heavy rain storms in the Pacific Northwest.

The 2015 U.S. Winter Outlook (December through February):

Precipitation Outlook:

Wetter-than-average conditions most likely in the Southern Tier of the United States, from central and southern California, across Texas, to Florida, and up the East Coast to southern New England. Above-average precipitation is also favored in southeastern Alaska.

Drier-than-average conditions most likely for Hawaii, central and western Alaska, parts of the Pacific Northwest and northern Rockies, and for areas near the Great Lakes and Ohio Valley.

Temperature Outlook:

Above-average temperatures are favored across much of the West and the northern half of the contiguous United States. Temperatures are also favored to be above-average in Alaska and much of Hawaii. Below-average temperatures are most likely in the southern Plains and Southeast.

Drought Outlook:

The U.S. Drought Outlook shows some improvement is likely in central and southern California by the end of January, but not drought removal. Additional statewide relief is possible during February and March. Drought removal is likely across large parts of the Southwest, while improvement or removal is also likely in the southern Plains. However, drought is likely to persist in the Pacific Northwest and northern Rockies, with drought development likely in Hawaii, parts of the northern Plains and in the northern Great Lakes region.

My Summer Student Experience

By: Tim Cady, Meteorology Student at Saint Louis University

My participation in the National Weather Service (NWS) office in Boston Student Volunteer program this summer gave me some amazing practical experience that could not be replicated in any classroom. Between my projects with the Outreach Team, the opportunities I was given to learn the ins and outs of the forecasting process, and getting the chance to know everyone in the office, my time at NWS Boston was both pleasant and informative. In addition to this, this summer really ingrained in me the desire to seek a career within National Oceanic and Atmospheric Administration (NOAA) once I finish my educational process.

The chance to be able to observe the real-time forecasting process on a daily basis was extremely valuable to me. Not only was I able to learn key tools used in the NWS like the AWIPS II Package, BUFKIT sounding program, and Gibson Ridge Analyst, but I was also able to shadow different forecasting shifts and learn the method of writing a clear and accurate forecast discussion. In addition to this, I was also around for some of the major severe weather events that we experienced this summer, so being able to see the teamwork and coordination involved in keeping the public informed during these situations was an opportunity that only an experience like this could provide. I can definitely say that I have significantly improved both my short and long-term forecasting skills throughout the duration of the summer, in great part due to the help of many people in the office and their willingness to work with me when I had questions. Hopefully, this will help me significantly as I continue to work towards my degree and later in my career. Aside from forecasting, I was also granted the chance to learn about the many other programs that are present within the office, especially the increasing presence of Decision Support Services within local forecast offices. As a whole, I think that this summer provided an extremely valuable educational experience that will help me for years to come.

The projects I worked on this summer were also vital in my development as a future meteorologist. I was very glad to be able to develop videos for the office's YouTube channel, as it had previously been inactive and I definitely think the publishing of informational and safety videos through that platform can reach a very wide audience. In total, I produced nine videos for the channel covering a variety of topics. Look for these videos to become public in the coming months! In addition to working on the videos, I was also involved in the planning for the Hurricane Preparedness Workshops that we hosted in coordination with local emergency managers and utilities this summer. Even though we had many issues with venues and speakers switching around at the last minute, it was great to be able to be part of an event that coordinated with several agencies that work very closely with the NWS. The events also gave me very good experience working on the outreach side of things, which is something I had not had a lot of experience with before.

As a whole I loved being with NWS Boston office this summer. I'd like to thank everyone for making it such a welcoming environment for me and for answering my many questions. Hopefully I will cross paths with all of you again in my future career!

"I can definitely say that I have significantly improved both my short and long-term forecasting skills throughout the duration of the summer, in great part due to the help of many people in the office and their willingness to work with me when I had questions."

You Tube

Be sure to find

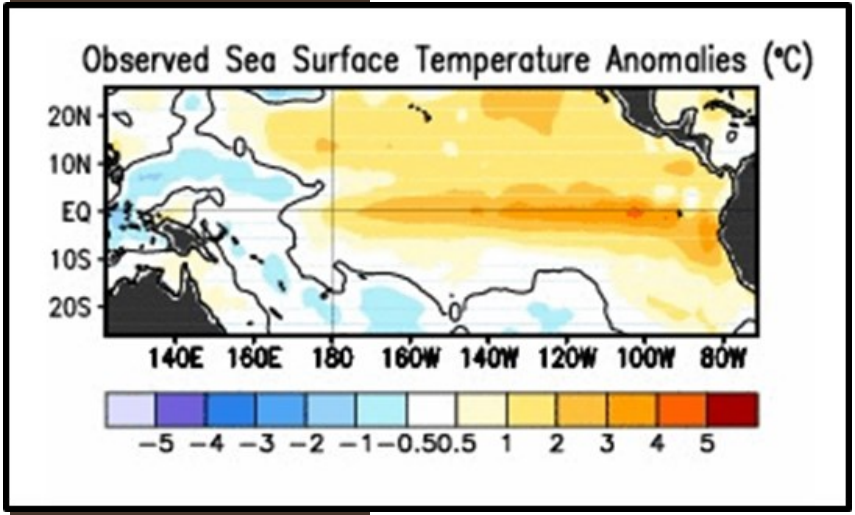
NWS Boston

on YouTube

http://www.youtube.com/NWSBoston

Will El Niño Have an Effect on Winter in Southern New England?

by Joe DelliCarpini, Science and Operations Officer



Above: Map showing El Niño conditions in the equatorial Pacific (orange and red shading).

By now, you've probably heard about El Niño but you may not know exactly what it is or how it affects our weather here in southern New England. El Niño refers to the warming of the ocean waters over the equatorial Pacific, which occurs periodically as a result of interactions between the ocean and atmosphere. Its opposite is La Niña, which is a cooling of the ocean waters in the same region.

During an El Niño, the changes in Pacific Ocean temperatures affect the patterns of tropical rainfall from Indonesia to the west coast of South America, a distance covering approximately one-half way around the world. These changes in tropical rainfall affect weather patterns throughout the world, including parts of the United States. In fact, there is a strong correlation between increased rainfall along the West Coast and Gulf Coast in El Niño years.

In southern New England, there is less of a connection between El Niño and our weather patterns, but in strong El Niño years such as this, there is somewhat of a relationship. When looking through past climate data, our winters tend to be mild with below average snowfall. Winters tend to start off dry before the pattern turns wet in January and especially as we head into spring, when the potential for river and stream flooding increases. However, the effects of El Niño can be "washed out" by other global weather patterns, so it's not always a lock to expect a mild and relatively snowless winter! Some recent examples of strong El Niño winters include 1997-98, 1982-83, and 1972-73. Keep in mind it's always possible to experience a blizzard or significant winter storm during any winter – I'm sure many of you remember the Presidents' Day Storm of 1983!

You can monitor El Niño conditions on the Climate Prediction Center's web site, which are updated weekly: http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml. There is also a wealth of information, including a FAQ section.

"During an El Niño, the changes in Pacific Ocean temperatures affect the patterns of tropical rainfall from Indonesia to the west coast of South America, a distance covering approximately one-half way around the world."

For the latest weather information, check out:

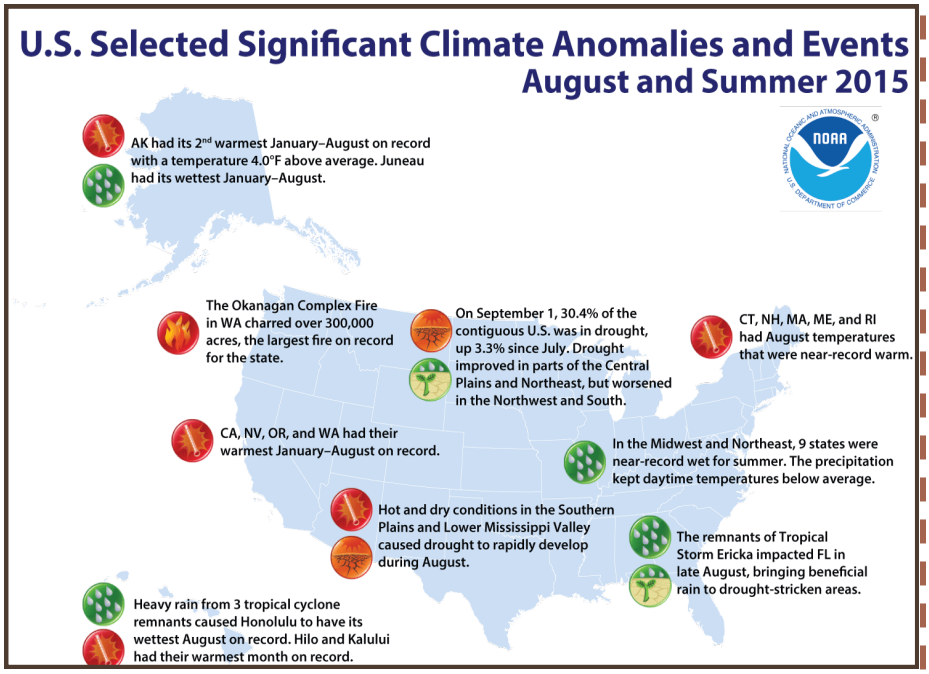
www.weather.gov/boston

Quarterly Climate Outlook

by Ellen Mecray, NOAA Eastern Region Climate Services Director

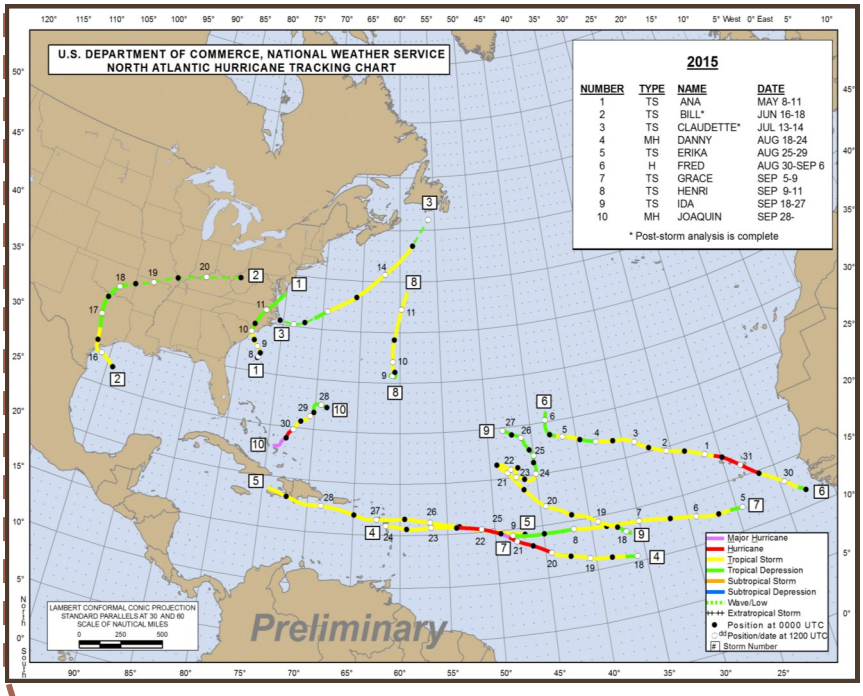
Highlights for the East

Ohio had a record-wet June and another 9 states ranked this June among their top 10 wettest. Baltimore, MD, also had a record-wet June, while several sites set or tied records for greatest number of June days with measurable precipitation. The heavy rain caused flooding and impacted crops in Ohio, but it helped keep drought conditions from worsening in the Northeast. However, increasing dryness in the Carolinas lead to the development of severe drought in late July. In August, Woodstock, VA was record-dry and Bridgeport, CT has its greatest number of days without measurable precipitation. With spotty rainfall during August and into September, dry conditions expanded in the region.



The highs of 49F on June 2 and 3 were the coolest highs recorded on any June day in Boston, MA. Conversely, Raleigh, NC, had 12 consecutive days in June with a high of at least 95F, which is the site's longest and earliest streak on record. From July 10 to September 9, Central Park, NY had its longest stretch of consecutive days with a high of at least 80F. August was a near record-warm month for Maine, Connecticut, Massachusetts, Rhode Island and New Hampshire.

Severe storms produced large hail, damaging winds, and over 30 weak tornadoes in the region during the summer. Heavy rain caused flooding, including a flash flood emergency in Charleston, SC on August 18th.



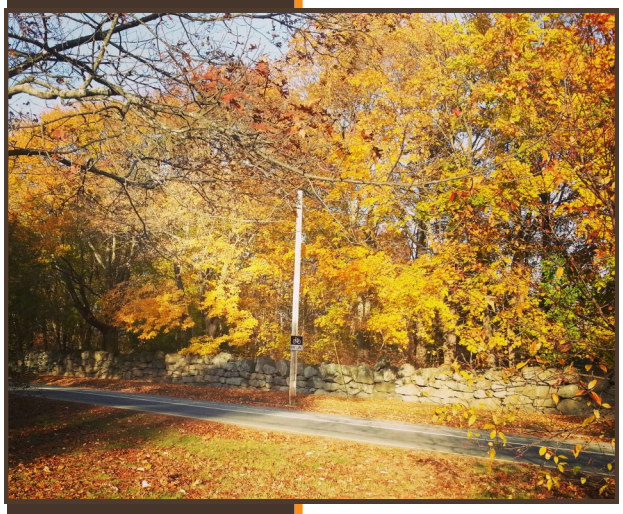
Above: Current Hurricane Tracks for the 2015 season. (Credit: National Hurricane Center)

Updated 2015 Atlantic Hurricane Season Outlook

According to the Climate Prediction Center's updated outlook, there is now a 90% chance of a below-normal 2015 Atlantic hurricane season. Including eight named storms to date, the forecast calls for 6-10 named storms, with 1-4 of those becoming hurricanes, and 0-1 becoming major hurricanes. May's outlook, which had a 70% chance of a below normal season, predicted 6-11 name storms, with 3-6 if those becoming hurricanes, and 0-2 becoming major hurricanes. In comparison, a normal hurricane season averages 12 named storms, 6 hurricanes, and 3 major hurricanes. The increased confidence level, the highest since hurricane outlooks began in 1998, is based on a strengthening El Niño and cooler-than-average tropical Atlantic sea-surface temperatures. So far there have only been ten named storms in the Atlantic: Ana, Bill, Claudette, Danny, Erika, Fred, Grace, Henri, Ida and Joaquin.

Cool Autumn Weather Reveals Nature's True Hues

By: NOAA Public Affairs



Above: Fall Foliage across in Providence, RI. (NOAA)

A favorite American pastime in fall is to pack a picnic basket and set off with loved ones on a Sunday drive along one of the nation's many scenic byways. It's a time of year when people enjoy crisp cool weather and marvel at the transforming landscape as tree leaves turn from lush green to gorgeous shades of yellow, orange, red, purple and brown.

While we relish the opportunity to frolic in a big pile of freshly raked leaves, we don't often think about the science behind why leaves change color and eventually fall from their branches. The answer may surprise you!

Recipe for fabulous foliage? Cool nights and sunny days

Weather factors such as temperature, sunlight, precipitation and soil moisture influence fall color arrival, duration and vibrancy. According to United States National Arboretum, a wet growing season followed by a dry autumn filled with sunny days and cool, frostless nights results in the brightest palette of fall colors. Changes in weather can speed up, slow down or change the arrival time of fall's colorful foliage. For example:

- Drought conditions during late summer and early fall can trigger an early "shutdown" of trees as they prepare for winter. This causes leaves to fall early from trees without reaching their full color potential
- Freezing temperatures and hard frosts can kill the processes within a leaf and lead to poor fall color and an early separation from a tree.

"Weather factors such as temperature, sunlight, precipitation and soil moisture influence fall color arrival, duration and vibrancy."

True colors come from inside

Trees actually begin to show their true colors in autumn, and here's why.

The four primary pigments that produce color within a leaf are: chlorophyll (green); xanthophylls (yellow); carotenoids (orange); and anthocyanins (reds and purples). During the warmer growing seasons, leaves produce chlorophyll to help plants create energy from light. The green pigment becomes dominant and masks the other pigments.

Trees must replenish the chlorophyll because sunlight causes it to fade over time. As days get shorter and nights become longer, trees prepare for winter and the next growing season by blocking off flow to and from a leaf's stem. This process stops green chlorophyll from being replenished and causes the leaf's green color to fade.

The fading green allows a leaf's true colors to emerge, producing the dazzling array of orange, yellow, red and purple pigments we refer to as fall foliage.

Following the feast of fall colors

Fall's color "parade" varies from region to region and year to year, depending on weather conditions. For areas under calm and dry high pressure, cool nights and sunny days can lengthen fall color displays. Cold or warm fronts can produce strong winds and heavy rain that cause leaves to fall off trees more rapidly.

Above: Fall Foliage (NOAA)

Visit to a Remote Sensor: Chatham Upper Air

by Michael Esip, Electronic System Analysis

Above: Chatham Upper Air Facility.

This is the fourth in a series of articles that will take you to various remote sensors assigned to the Weather Service Forecast office (WFO) in Taunton, Massachusetts. Each article will take you to a different sensor or equipment group within the WFO county warning area (CWA). In this article you will visit the Upper Air facility on Cape Cod, in Chatham, Massachusetts.

On any map of Massachusetts, if you placed your finger on what you thought was the "elbow of Cape Cod"; most likely it would be resting on the location of the Chatham Upper Air site. Located on the National Wildlife Refuge on Morris Island in Chatham, the Upper Air facility is on US Government property which is run by the Department of Interior. The Upper Air Inflation building is a two story garage with tracking equipment mounted on its roof. Another smaller office building housing the computers necessary to track balloons launched from the site are both physically located several yards from a bluff overlooking the Atlantic Ocean. The site attracts tourists from all over the world who witness not only the technology of the National Weather Service (NWS) Upper Air system, but also the natural wonders and wildlife of the beautiful outer Cape. During the 1980s, the site, primarily due to its location was referred to in a Cape Cod Times news article as "the country club of the National Weather Service." Currently the area has become noted for its attraction to great white sharks that feed on a seal population surrounding Monomoy Island. The island is only several hundred yards from the NWS facility.

The site originally was located on Nantucket Island. In the early 1970's, the NWS moved its Upper Air facility and equipment to Chatham. At that time the NWS also built a small "Cape" style house which housed the Weather Service Meteorological Observatory (WSMO) from 1973 to 1996. During those years, in addition to launching weather balloons, the site also provided network radar data from its WSR74S radar located at the site. In the early to mid 90's the NWS shut down the WSMO and removed the radar, leaving only the Upper Air equipment. The Dept. of Interior took over the WSMO building and turned it into a visitor reception center.

The WBRT (Weather Bureau Radiotheodolite) Upper Air system which was moved from Nantucket was upgraded in the 80s and became known as an ART-2R (Automatic Radio-Theodolite). Finally, around 2007 the WBRT and ART-2R was replaced with completely new equipment now known as the RRS (Radiosonde Replacement System) and continues to track manually launched weather balloons twice a day, seven days of the week.

The Chatham Upper Air site is one of the 102 radiosonde stations in North America and the Pacific Islands and Caribbean. Radiosondes attached to the balloons released from Chatham and other similar sites around the world provide Upper Air data essential for weather forecasts and research. The released balloons reach heights of 60,000 feet above the earth's surface within about 60 minutes. As the balloon rises, it expands due to the thin atmosphere and decreased outside pressure. Within about two hours of the launch, the balloon will break at elevations of 80,000 to 120,000 feet. The radiosonde which is attached to the balloon will then parachute back to earth after having measured temperature, relative humidity, and pressure during its approximate two hour flight. The data will be processed along with the data from hundreds of other worldwide sites giving meteorologists a three-dimensional snapshot of the earth's atmospheric conditions. Once the radiosonde returns to earth, if it is found or recovered, it has a self-addressed postage-paid envelope attached so that it can be returned to the National Reconditioning Center in Kansas City, MO for repair and later reuse.

Above: Upper Air Balloon Release with ESA Mike Esip & contractor Mike Ryder.

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The National Weather Service provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community.

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Southern New England Islands

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