Prevailing Winds

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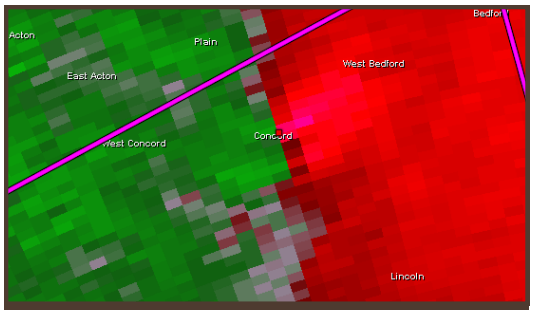
Inside this issue:

Rare Nocturnal EF-1 Tornado Strikes Concord, MA on August 22nd, 2016

by Hayden Frank, Senior Meteorologist

The spring and summer of 2016 will certainly not be remembered for its severe weather season. In fact, the main story this summer has been the very dry weather, which has put the region in a significant drought. Thunderstorms have also been quite limited, with events few and far between.



Above: WSR-88D velocity Image at the time of the Tornado.

Despite the quiet and dry weather, Mother Nature still offered up a very rare event during the early morning hours of August 22nd. A brief nocturnal tornado touched down in Concord, MA at 3:20 AM. The tornado was only on the ground for a few minutes, but was rated an EF-1 as it packed 100 mph winds. This tornado had a path length of one-half mile and a path width of 400 yards. Numerous trees were damaged and/or uprooted, blocking roads and knocking out power. Thirty-nine houses suffered minor structural damage with one house receiving significant damage. The majority of the damage was near the intersection of Lexington and Alcott roads, with the damage becoming much more sporadic to the northeast. Fortunately, there were no injuries or fatalities.

There were a couple of things that made this event quite unusual for southern New England. This was the first nocturnal tornado to have occurred in Massachusetts since July 11th, 1970 when Townsend was hit by a F-1 at 2:15 AM. Another rarity is that the tornado that occurred in Concord had no lightning associated with it.

The biggest takeaway from this event was the importance of Wireless Emergency Alerts (WEA) in helping to prevent any injuries or fatalities. These alerts are sent when the National Weather Service issues flash flood and/or tornado warnings; they are pushed to smartphones for those in the threat area. Many residents were awakened at 3:00 AM by the WEA alert generated by the tornado warning, and said they took shelter in their homes. This led to a 20 minute lead time before the tornado struck Concord. In addition, local fire and police dispatch as well as MEMA also received the advanced warning and were quickly able to mobilize the clean-up and power restoration. This amount of lead time will certainly not be possible for most southern New England type tornadoes, but now with WEA alerts, just a few minutes is sometimes enough to get people into a safe shelter.

Above: Damage in Concord, MA. Photo courtesy of NWS Taunton Amateur Radio

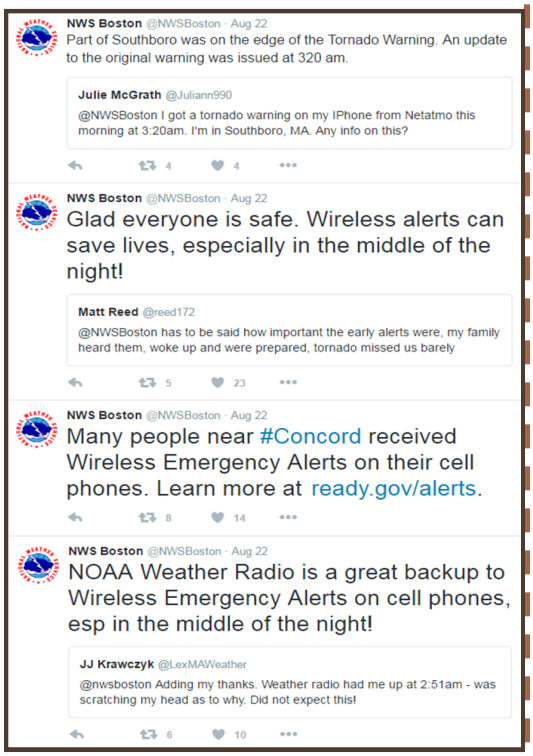
Wireless Emergency Alerts Help Save Lives!

by Joe DelliCarpini, Science and Operations Officer

"Residents in the tornado warning area received alerts through the Wireless Emergency Alerts system on their cell-phones. These warnings allowed residents to take shelter before the tornado struck."

- Kurt Schwartz, Massachusetts Emergency Management Agency Director

On August 22, 2016 a rare early morning tornado struck Concord, Massachusetts. The tornado was rated EF-1 with maximum winds of 100 mph, had a path length of one-half mile, and maximum path width of 400 yards. There was significant tree damage and some damage to homes in a small portion of the town. It was only the third tornado to have occurred in Massachusetts between midnight and 6:00 am (the last one was in July, 1970).



Despite having occurred in the middle of the night there were no fatalities or injuries, largely due to the fact that Wireless Emergency Alerts (WEAs) received on cell phones woke people up and gave them adequate time to get to safe shelter. Using the emergency alerting capabilities of your cell-phone to be informed during emergencies is an important component of emergency preparedness. Every family should have multiple methods for receiving emergency alerts, including at least one with an audible alert to wake you in the middle of the night. A programmable NOAA Weather Radio receiver is another excellent means of receiving warnings.

"The tornado that struck Concord in the overnight hours on August 22nd while residents were sleeping was a reminder of the importance of receiving emergency alerts," said Massachusetts Emergency Management Agency Director Kurt Schwartz. "Residents in the tornado warning area received alerts through the Wireless Emergency Alerts system on their cell phones. These warnings allowed residents to take shelter before the tornado struck."

WEAs are short text-like messages sent to cell phones in an affected area. WEAs are generated automatically when the National Weather Service issues warnings for the most severe weather conditions, including tornadoes, flash floods, and hurricanes. WEAs also are issued for other types of emergencies, including AMBER alerts. You do not need to subscribe to any service to receive Wireless Emergency Alerts; the alerts are sent to all WEA-enabled devices in an impacted or threatened area, and most newer cell phones are automatically enabled to receive WEAs. Check your cell phone settings to ensure that WEAs are enabled to be able to receive emergency alerts.

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MIC Musings - Coastal Flood Program

by Robert Thompson, Meteorologist-in-Charge

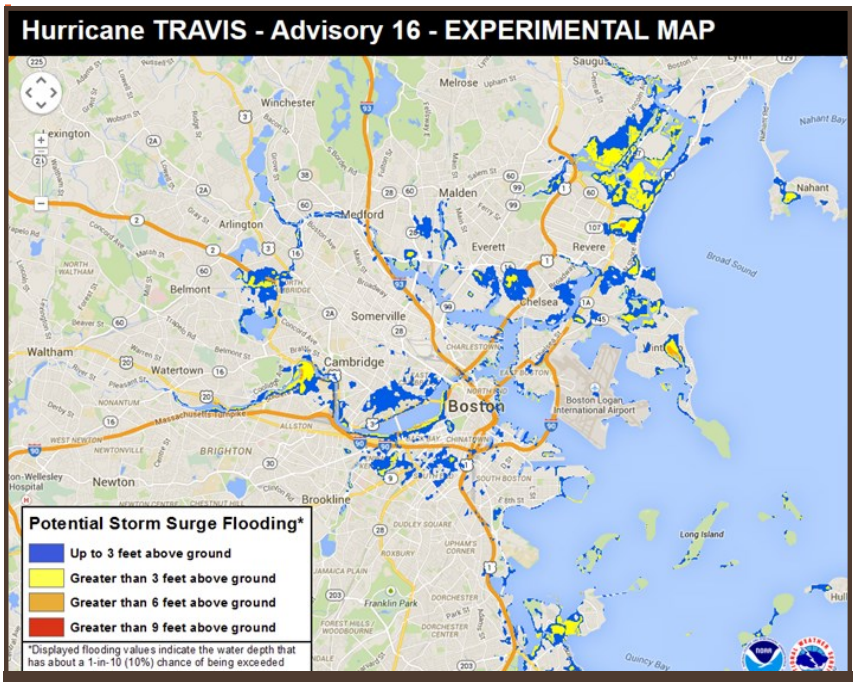
Introduction

The forecast products and services produced by the Taunton Weather Forecast Office (WFO) may be more wide-ranging than one might initially surmise. This MIC Musings article takes a look at services connected with the coastal flood program, a responsibility that many in the general population may not realize this office has. Although damaging wind often grabs headlines, history reveals that water constitutes the greater threat to life over the long haul. And more people have lost their lives (nationally and in New England) from coastal flooding than from any other hurricane hazard. Southern New England is vulnerable to serious coastal flooding from both tropical (e.g. hurricanes) and extratropical (e.g. nor'easters) cyclones. Besides the inundation from the storm surge (the additional water above the astronomical tide being pushed on shore), wave battery and erosion constitute potential impacts from coastal storms. Consequently, the Taunton WFO has invested considerable time and energy in forecasting techniques, information delivery, and preparedness for coastal flood events. Nationally, interest in coastal flooding has recently surged. This article will look at recent changes in the tropical and extratropical coastal forecast/warning program as well as how the program is evolving.

For various reasons, the National Weather Service (NWS) coastal flood program consists of two parallel tracks, one for tropical systems under the auspices of the National Hurricane Center and the other managed by local Weather Forecast Offices for extratropical systems. Recognizing that people impacted by coastal flooding don't necessarily care whether or not the cause is from a hurricane or nor'easter, the NWS has started an initiative to bring these two tracks in closer alignment. We'll take a look first at coastal flooding from hurricanes and then at coastal impacts from nor'easters.

Coastal Flooding from Tropical Systems

Hurricanes have produced extreme storm surges along the southern New England coastline. Although a storm like Sandy (but making landfall farther north) could do great harm to the Massachusetts east coast, it is the south coast of Massachusetts and/or Rhode Island that's more likely to be under the gun from a New England-bound hurricane. In particular, the constriction of the water surface at the upper reaches of Narragansett and Buzzards Bays can set the stage for catastrophic flooding. Accounts from the 1635 Colonial Hurricane reference a 20 foot storm surge at the upper end of Buzzards Bay. Running a storm surge model called SLOSH (Sea Lake and Overland Surge from Hurricanes) on hypothetical fast moving Category 3 hurricanes (like the 1938 but on a track 40 to 50 miles farther east) reveals the sobering potential of 25+ feet of storm surge along the upper part of Buzzards Bay. The 1938 Hurricane and Carol in 1954 brought a 14 foot devastating storm surge to the upper portion of Buzzards Bay but still barely half of what would be a worst case scenario. Hence, when it comes to hurricanes, Buzzards Bay, especially the upper portion, is our potential "ground zero."



Above: Prototype hurricane plausible worst case scenario inundation map.

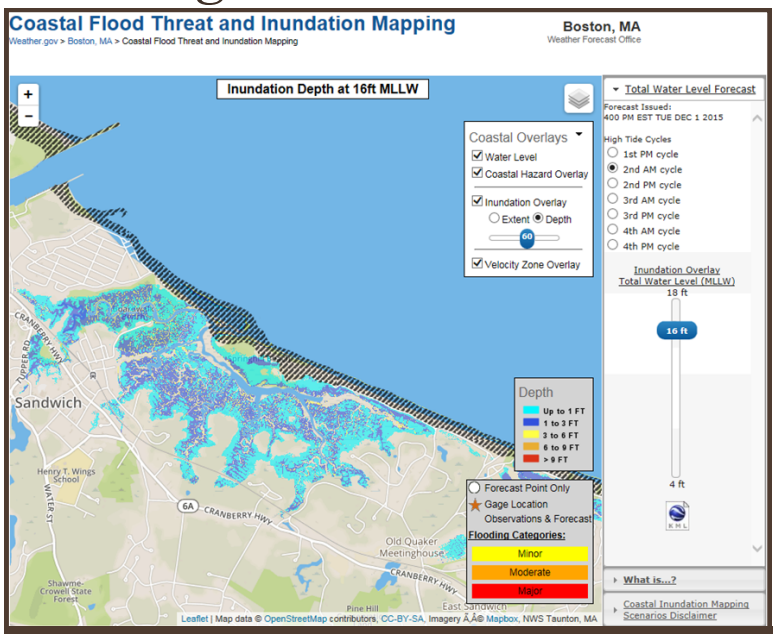
Two new initiatives should help the hurricane warning program. When a life-threatening storm surge threat emerges, a Storm Surge Watch or Warning will be issued for the coastline at risk. And when a hurricane threatens our coastline, the National Hurricane Center will issue a map of plausible worst case inundation. The map will in essence highlight where the coastal flood risk is high enough to warrant protective actions including evacuation. It may only be a one in ten chance that the depicted life-threatening flooding materializes, but then does anyone in his/her right mind want to gamble with his/her life or those of would be rescuers? Hurricanes are low frequency but high impact storms. Although we get hit infrequently, the impact (especially the coastal flooding) from a major hurricane can be extreme.

Cont'd on page 4

Cont'd from pg 3…MIC Musing

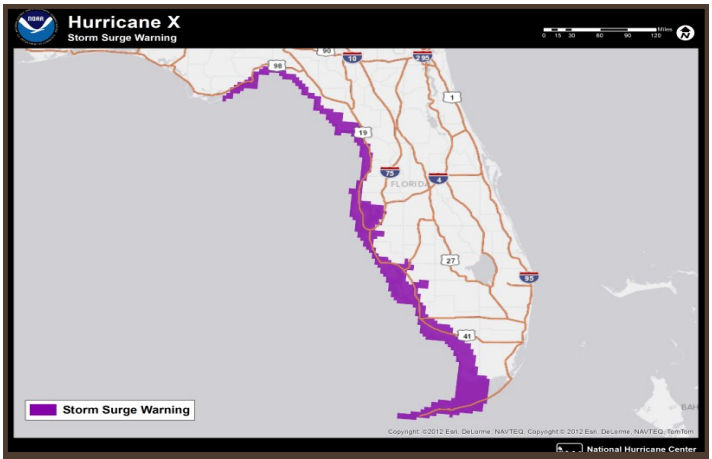
Coastal Flooding from Extratropical Systems

Nor'easters (and the associated coastal flooding) are more prolific than hurricanes in this part of the world. Infrequently, the results can be devastating as experienced with the Blizzard of 1978 and the "Perfect Storm" in October 1991. Usually, nor'easters pound the Massachusetts east facing coastline. Over recent years, this office has spent time and energy to enhance the forecast process and quality of information disseminated to the affected population. The Taunton WFO forecaster routinely produces storm surge grids and adds those to the gridded astronomical tide to derive the expected total water level (or storm tide) along the Massachusetts and Rhode Island coastline. During significant events (especially when a headline may need to be issued), the forecaster usually is compelled to make significant modifications to the storm surge guidance. Total Water Level forecasts are available to the public via the web, including a link to the Advanced Hydrologic Prediction Service (AHPS). Users can access time series forecasts, coastal flood statements (when applicable), and locally produced inundation maps in the coastal flood portal on our webpage: http://www.weather.gov/box/coastal



Above: Example of inundation map on WFO Taunton coastal flood webpage. This example depicts inundation depth for a 16 foot above Mean Lower Low Water (MLLW) storm tide at Sandwich, MA.

As with hurricanes, nor'easters can produce life threatening inundation. A lot of the damage sustained from nor'easters, however, results from waves smashing against coastal structures or severe erosion. Waves can scour out material to undermine buildings and roads as well as deposit large amounts of sand and/or cobble, requiring heavy equipment to remove it. Thus, our office considers both total water level and wave action when forecasting coastal impact from a storm. In addition, our office has joined with other offices and the North Atlantic Regional Team to implement an experimental wave run-up technique. The empirical technique (based upon research conducted by Dr. Hillary Stockdon from the U.S. Geological Survey) considers total water level, wave amplitude, and shoreline attributes (e.g. beach slope, dune, sea wall, or other barrier height) to predict the potential for erosion, splashover, or major overwash/inundation. We continue to evaluate this technique at various "hot spots" along our coastline.



Above: Prototype Storm Surge Warning from the Hurricane Center

Future

Population growth along shorelines coupled with sea level rise raises the potential for more frequent and severe coastal flooding in the future. As now exists for hurricane threats, we expect to see probabilistic storm surge guidance for nor'easters in the not too distant future. A plausible worst case scenario inundation map for nor'easters (patterned after the product for hurricanes) will likely become available within a couple of years or so. A means to depict the influence of wave run-up should also become available in another few years. The complex interaction between the atmosphere and ocean ensures much work ahead in the coastal flood program arena.

2016 Southern New England Weather Conference

By: Matt Doody, General Forecaster

Do you constantly find yourself looking at the weather? You are in luck! Every fall The Southern New England Weather Conference brings together great national and local speakers on a wide array of topics.

The Southern New England Weather Conference started in 2000, and is a non-profit venture that is sponsored by the Blue Hill Observatory, near Boston, the National Weather Service in Taunton, Massachusetts and the University of Massachusetts-Lowell Student Chapter of the American Meteorological Society. It provides a place for weather enthusiasts and professionals to gather and share their knowledge and expertise regarding topics such as winter weather forecasting, severe weather, hurricanes, and advances in the science of meteorology, emergency preparedness, etc. A small fee provides attendees with a full day of educational and entertaining talks from both meteorological and non-meteorological professions along with breakfast and lunch, as well as snacks through the day.

This year the conference will be held on October 29 at the TF Green Radisson, in Warwick, RI. This is the first time it's ever been held in Rhode Island!

2016 has been the year of anniversaries for Southern New England weather. The conference will reflect this, with interesting discussions of Hurricane Bob, the last tropical system to make landfall in New England as a Hurricane, as well as the Perfect Storm. In fact, the conference will feature John Spillane, a Pararescue jumper forced to survive at sea when his rescue helicopter was forced to ditch in the middle of a rescue during the storm.

It does not stop there. There will be discussions of tornado signatures in New England tornadoes, El Nino, and even how Canada handles its watches and warnings!

There is still a short time to register, but onsite registration is still possible. If you are unable to attend this year, we hope to see you in 2017!

"This year the conference will be held on October 29 at the TF Green Radisson, in Warwick, RI. This is the first time it's ever been held in Rhode Island!"

Learn more about the Southern New England Weather Conference: http://www.sneweatherconf.org

For the latest weather information, check out:

www.weather.gov/boston

Remembering Irene in Southern New England 5 Years Later

by Nicole Belk, Service Hydrologist

Hurricane Irene, which weakened to a tropical storm as it reached New England, brought strong winds and torrential rainfall to the region on August 27 and 28, 2011 resulting in widespread wind damage and record flooding. Irene tracked from southeastern New York into western Connecticut, western Massachusetts, and southern Vermont. As with most tropical systems in New England, damaging winds were confined to the east of the center, mainly across Rhode Island and southeast Massachusetts, while the heaviest rains were focused along and to the west across much of interior New England.

"Freshwater flooding from Irene affected much of the Northeast. Several river gauges maintained by the USGS set new records, including the Deerfield River which crested 6 feet higher than its previous flood of record."

Wind gusts of 50 to 60 mph were reported from southern and eastern Connecticut across Rhode Island and into much of central and eastern Massachusetts. This resulted in widespread tree damage and power outages to roughly two million customers, some of whom did not get their power restored until a week later.

Rain bands ahead of Irene on Saturday, August 27th produced a quick 2 to 4 inches of rainfall across parts of eastern Massachusetts. More substantial rains reached the area during the overnight hours on Saturday into the morning of Sunday, August 28th. The heaviest rainfall was focused on western Massachusetts and western and central Connecticut, where as much as 6 to 10 inches of rain was reported. Farther to the east, somewhat lesser amounts of 3 to 6 inches were reported in much of southwest New Hampshire, central Massachusetts, and northeast Connecticut and totals of 1 to 3 inches were observed across Rhode Island and eastern Massachusetts.

Freshwater flooding from Irene affected much of the Northeast. In southern New England, the hardest hit areas included the east slopes of the Berkshires into the Connecticut Valley. Several river gauges maintained by the USGS set new records, including the Deerfield River which crested 6 feet higher than its previous flood of record.

Major flooding occurred in northwest Massachusetts where there were numerous evacuations and a number of homes that were flooded and others condemned. One building in Shelburne Falls was moved quite a distance downstream of its foundation. Another home was reported to have been washed away in Leyden on the Green River. Many highways and main roadways were affected by flooding including Interstate 91 and Routes 2, 5, 20, and 112. Large swaths of farmland were inundated along the Deerfield River. On the Greenfield River in Greenfield, the Eunice Williams covered bridge was dislodged from its abutments and river scouring was so severe the river diverted itself around the bridge.

Flooding also occurred in Hampshire and Hampden Counties in western Massachusetts along the Westfield River as well as along its uncontrolled tributaries. Hartford County in Connecticut was also affected by significant flooding. In Bristol, the Pequabuck River overflowed its banks onto Main Street. Two people went canoeing in the flood waters before their canoe was overturned. **One person drowned and the other person was rescued.** In Burlington, Bunnell Brook reached its 3rd worst flood on record (dating back to the 1930s).

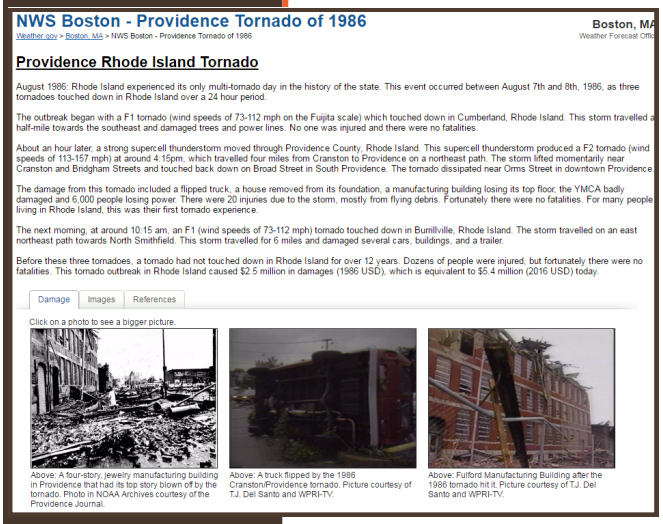
Above: Damage to Eunice Williams Covered Bridge on the Green River at Greenfield, MA.

Since heavy rain fell throughout the entire Connecticut River Basin, significant flooding affected all of the middle and lower reaches of the river. Gauges at Montague, Northampton, Holyoke, Thompsonville, Hartford, and Middletown all experienced their highest crests since the 1980s. In North Walpole, NH the river crested at its highest level since 1938.

Irene was a strong reminder that impacts from tropical storms and hurricanes are not limited to the coastline. These systems can produce damaging winds and torrential rainfall far inland, creating devastating flooding.

My Summer Student Experience

By: Alexandra Klufas, Student at Wellesley College



NWS Boston - Providence Tornado of 1986

Boston, MA

Providence Rhode Island Tornado

August 1986: Rhode Island experienced its only multi-tornado day in the history of the state. This event occurred between August 7th and 8th, 1986, as three tornadoes touched down in Rhode Island over a 24 hour period.

The outbreak began with a F1 tornado (wind speeds of 73-112 mph on the Fujita scale) which touched down in Cumberland, Rhode Island. This storm travelled a half-mile towards the southeast and damaged trees and power lines. No one was injured and there were no fatalities.

About an hour later, a strong supercell thunderstorm moved through Providence County, Rhode Island. This supercell thunderstorm produced a F2 tornado (wind speeds of 113-157 mph) at around 4:15pm, which travelled four miles from Cranston to Providence on a northeast path. The storm lifted momentarily near Cranston and Bridgham Streets and touched back down on Broad Street in South Providence. The tornado dissipated near Orms Street in downtown Providence.

The damage from this tornado included a flipped truck, a house removed from its foundation, a manufacturing building losing its top floor, the YMCA badly damaged and 6,000 people losing power. There were 20 injuries due to the storm, mostly from flying debris. Fortunately there were no fatalities. For many people living in Rhode Island, this was their first tornado experience.

The next morning, at around 10:15 am, an F1 (wind speeds of 73-112 mph) tornado touched down in Burrillville, Rhode Island. The storm travelled on an east northeast path towards North Smithfield. This storm travelled for 6 miles and damaged several cars, buildings, and a trailer.

Before these three tornadoes, a tornado had not touched down in Rhode Island for over 12 years. Dozens of people were injured, but fortunately there were no fatalities. This tornado outbreak in Rhode Island caused $2.5 million in damages (1986 USD), which is equivalent to $5.4 million (2016 USD) today.

Damage | Images | References

Click on a photo to see a bigger picture.

Above: A four-story, jewelry manufacturing building in Providence that had its top story blown off by the tornado. Photo in NOAA Archives courtesy of the Providence Journal.

Above: A truck flipped by the 1986 Cranston/Providence tornado. Picture courtesy of TJ. Del Santo and WPRI-TV.

Above: Fulford Manufacturing Building after the 1986 tornado hit it. Picture courtesy of TJ. Del Santo and WPRI-TV.

Above: Alexandra's web page on the Providence Tornado of 1986.

This summer, I had the opportunity to be a part of the Outreach Department of the National Weather Service (NWS) in Taunton, Massachusetts. Throughout the summer, I spent my time working on a presentation for the deaf and hard of hearing community, writing about significant weather events in New England history and shadowing meteorologists.

My presentation focused on providing the deaf and hard of hearing community with resources about weather safety and preparedness. I covered the main weather hazards in southern New England and how to create an emergency preparedness kit. Many of my photographs and information were drawn from previous SKYWARN presentations and ready.gov.

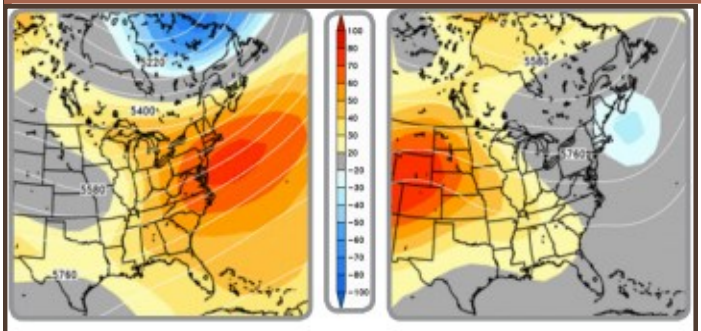
My other project focused on creating web pages for the anniversaries of weather events in New England history. My writings covered events as early as the Great Colonial Hurricane of 1635 and the Great September Gale of 1815. My first web page was published on the anniversary of the Providence Tornado of 1986.

I also had the opportunity to shadow different forecasting desks at the National Weather Service. Most of the weather this summer was dry and clear, so I was only able to observe just one severe weather day. I also watched as meteorologists at the office created forecasts based on both the models and their personal experience. During my final week at the NWS, there was a lot of attention being put towards Tropical Storm Hermine. It was really interesting hearing the National Hurricane Center call updates throughout the day.

I really enjoyed my time at the National Weather Service in Taunton and I appreciated the opportunity to learn about being a meteorologist in Southern New England.

Northeast Drought

by Ellen Mecray, NOAA Eastern Region Climate Services Director



Maps of monthly average upper-level (500 mb) circulation patterns and anomalies (in meters). Ridging occurred over the eastern U.S. in March (top left), while a trough was present over the Northeast in June (top right). Credit: NOAA.

Weather Patterns & Drought Monitor

In March, a stronger–than–normal Bermuda High weakened low pressure systems as they moved through the eastern U.S., contributing to drier-than-normal conditions. A combination of dry Canadian air masses and upper-level-ridges led to below-normal precipitation in April and May. Dry conditions continued in June. The weather pattern featured an upper-level trough much of the month, which helped keep the drought from becoming worse. However, low relative humidity, windy conditions, and warm temperatures contributed to greater evaporation. July was also well below normal with many sites receiving near normal precipitation in August. In fact, twelve states were drier than normal with four ranking this summer among their top 20 driest.

The US Drought Monitor released on September 22nd showed 37% of the Northeast was in a drought, with 5% of the Northeast in an extreme drought. It was the first time some counties had experienced extreme drought since at least 2000. Drought advisories, watches and warnings were in place for several states. The drought intensity categories are based on five key indicators, numerous secondary indicators, and local reports from expert observers. Droughts in the Northeast tend to be seasonal, lasting less than 6 months. The current drought is expected to be seasonal. Seasonal droughts are more common than the severe drought of the mid-1960's, which persisted for several years.

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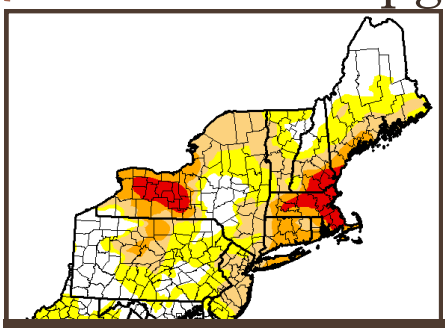
Cont'd from pg 7…Northeast Drought.

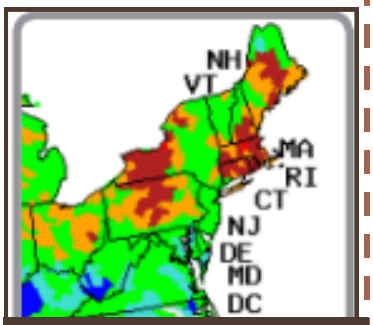


Above: Drought Monitor issued on September 13th 2016.

The current drought is focused in three main areas. Drought conditions have occurred in Essex County, MA seven of the past 17 years, with a drought every year since 2012. Tompkins County, NY, is experiencing an extreme drought for the first time since the U.S. Drought Monitor began in 2000. Bergen County, NJ has experienced drought conditions nine of the past 17 years, with extreme drought in 2002.

Drought Impacts

Stream flow and groundwater were at near to record low levels in New England and New York during the summer. Reservoir levels were also below normal. Due to water shortages, more than 290 water systems in New Hampshire and Massachusetts had water restrictions in early September. A few reports indicated low water levels led to fish deaths in some rivers and that it could impact river ecology for several years.



Above: Monthly streamflow compared to historical streamflow for July 2016

Many farmers irrigated, but some water sources dried up. Crops such as corn and soybeans were stressed and stunted, with yields and quality expected to be lower than usual. Slow growth of pastures forced some farmers to supplement with winter feed. Crop losses in Massachusetts for producers participating in USDA Farm Service Agency programs exceeded $13 million as of late August. Over 50% of hay crops were lost. Increased irrigation and labor costs also impacted the agriculture economy. Farmers in many of the drought areas became eligible for federal aid.

A fungus that kills gypsy moth caterpillars needs springtime moisture to grow. Without adequate rainfall, the caterpillar population thrived and in turn decimated tree foliage in Massachusetts, Rhode Island and Connecticut. The defoliated trees also heightened fire danger because more sun is able to reach the forest floor, creating drier conditions that contribute to the rapid spread of fire.

There was an increased in fire risk and activity. In late July, Massachusetts had more lightning strike fires than usual and moisture in dead vegetation was historically low, meaning fires could start easily and spread rapidly. The drought made fighting fires more labor intensive.

My Summer Student Experience

By: Lucy Bergemann, Meteorology Student at SUNY Oswego

This summer I had the opportunity to intern with the NWS Taunton team, specifically working on the CoCoRaHS (Community Collaborative Rain, Hail & Snow) network initiative! I communicated with current observers and worked to grow the network in New England. I found that CoCoRaHS is extremely important in showing hyperlocal weather effects that can result in flash floods or damage (see the latest CoCoRaHS newsletter for details)!

This summer I worked to increase the number of reporters in the smallest state in the country, Rhode Island. There are only about eight consistent observers who report every day in the state; combine that with only three airports that report precipitation, which is less than a dozen reports per day! Comparatively, there are more than a dozen automated stations in MA alone at airports across the state. It is apparent there is a need for rain, snow and hail data in Rhode Island.

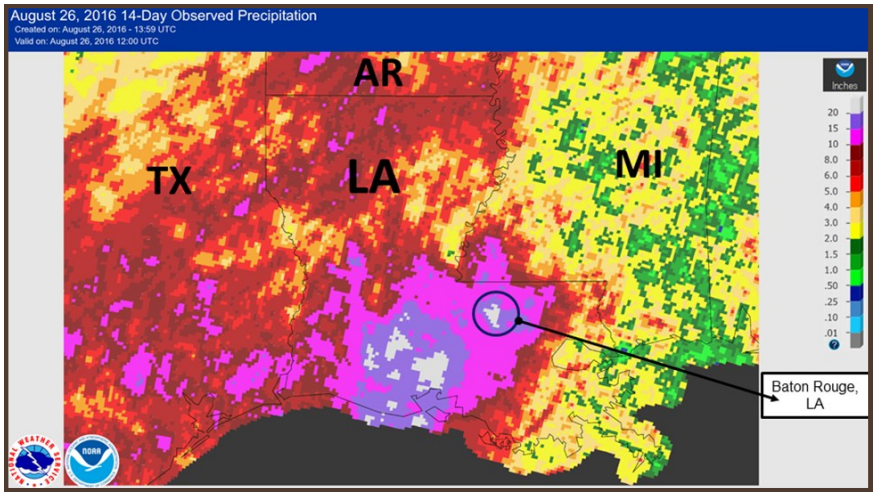
In order to increase observers in the Rhode Island area, I contacted those who had signed up for CoCoRaHS but had not reported in a while or begun! We received many positive responses from observers who are excited to begin daily reports again! Another push is to involve CoCoRaHS in elementary schools, where weather may already be a part of the curriculum.

In addition to working on the CoCoRaHS project I had the opportunity to observe forecasters on the floor of NWS Boston, learning what tools they use to forecast long and short term weather. I was able to see how there is plenty of collaboration between forecasters in providing the best forecast they can for the public and other meteorologists. Furthermore, I was in the office for several severe weather days and I was able to see how the team jumps into action. There was communication between the forecasters and double checks on the intensity of storms systems. It was really cool to see how a storm goes from an afternoon pop-up to severe criteria.

My summer volunteer experience at NWS Taunton was a great experience for understanding how the office works. My future plans are to pursue a career in broadcast meteorology, and my summer at NWS helped give me a different perspective of forecasting the weather! I am grateful for the NWS Taunton team for providing me with an awesome opportunity!

The Louisiana Flood of 2016

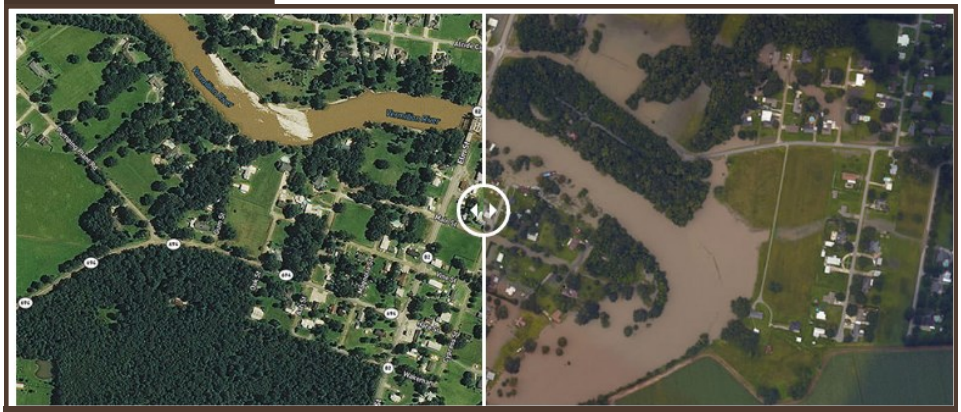
by Lenore Correia, Meteorologist Intern



The Louisiana flood of August 2016 is debatably the worst natural disaster America has seen since Hurricane Sandy in 2012. This event set new rainfall records for Baton Rouge with new daily, monthly, and 72-hour rainfall records. Baton Rouge, the hardest hit city, saw more than two feet of water within 72 hours. The system that brought so much rain was a weak low pressure system associated with an outflow boundary. The low was located over Mississippi causing a wind shift to the northeast. Southwesterly winds transported moisture from the Gulf of Mexico onto the Louisiana coast. This outflow boundary remained over the southern Louisiana coast for several days and finally dissipated as a high pressure system moved over northwestern Louisiana. The time period of rainfall started on the evening of August 12 and continued until the morning on August 14. During this time, the state of Louisiana issued a State of Emergency as 30,000 were displaced from their homes and 13 citizens died. The Red Cross estimates the recovery will cost at least $30 million. President Obama signed a Louisiana disaster declaration on Aug. 14, making federal disaster funding available.

"Baton Rouge, the hardest hit city, saw more than two feet of water within 72 hours."

Over the next few days, the floods set three new records for Baton Rouge, Louisiana. Despite records dating back to 1892, Baton Rouge had its wettest August on record. August 2016 rainfall total of 30.04 inches was close to double the previous wettest August, which was 1926 when 16.27 inches of rain fell. In fact, August 11-13, 2016 had 17.15 inches, which alone would have broken the previous wettest August. August 2016 is now the wettest month of any month on record. The previous wettest month of any month was May 1907, when 23.73 inches of rain fell. August 2016 had 5 times as much rainfall as a typical August, which is 5.82 inches. The greatest 24 hour rainfall in August 2016 was 12.07 inches falling on the 12th and 13th. This 24 hour total doubles the typical August rainfall total.



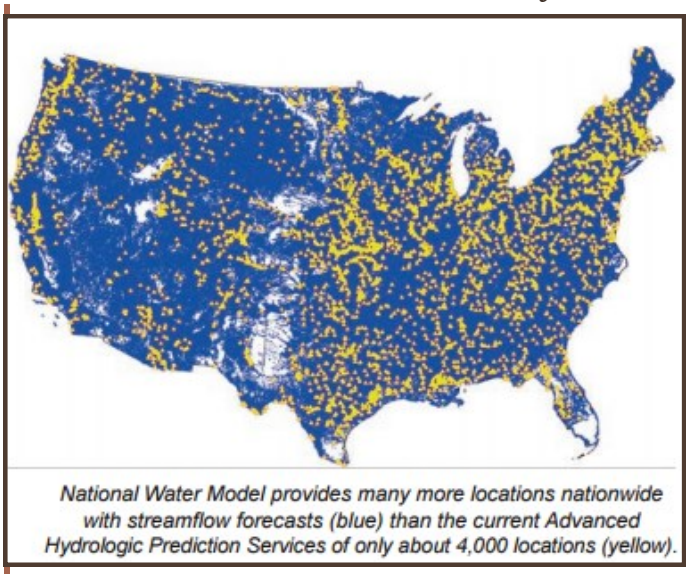
Above: Before and After the August Flood of Abbeville, LA. Photo taken by NOAA National Geodetic Survey

The one record that the floods did not break was the most precipitation recorded in a day. With 11.24 inches on 12 August, Baton Rouge fell short just 0.75 inches from the record flooding of April 1967.

In a recent study by NOAA, forecasters and climatologists have estimated that the Louisiana Flood was a 1-in-550 year event for the region. Because of the perfect meteorological setup, this 1-in-550 year event happened during our lifetime and has since become an historical phenomenon.

NOAA Launches America's First National Water Forecast Model

By: NOAA Public Affairs



National Water Model provides many more locations nationwide with streamflow forecasts (blue) than the current Advanced Hydrologic Prediction Services of only about 4,000 locations (yellow).

NOAA and its partners have developed a new forecasting tool to simulate how water moves throughout the nation's rivers and streams, paving the way for the biggest improvement in flood forecasting the country has ever seen.

Launched on August 16th and running on NOAA's powerful new Cray XC40 supercomputer, the National Water Model uses data from more than 8,000 U.S. Geological Survey gauges to simulate conditions for 2.7 million locations in the contiguous United States. The model generates hourly forecasts for the entire river network. Previously, NOAA was only able to forecast streamflow for 4,000 locations every few hours.

The model also improves NOAA's ability to meet the needs of its stakeholders - such as emergency managers, reservoir operators, first responders, recreationists, farmers, barge operators, and ecosystem and floodplain managers - with more accurate, detailed, frequent and expanded water information.

The nation has experienced a number of disastrous floods in recent years, including the ongoing flooding last month in Louisiana, accentuating the importance of more detailed water forecasts to help people prepare.

"With a changing climate, we're experiencing more prolonged droughts and a greater frequency of record-breaking floods across the country, underscoring the nation's need for expanded water information," said Louis Uccellini, Ph.D., director of the National Weather Service. "The National Water Model will improve resiliency to water extremes in American communities. And as our forecasts get better, so will our planning and protection of life and property when there's either too much water, too little, or poor water quality."

Last Month's announcement fulfills a commitment President Obama made to the American public on World Water Day in March. In a White House statement, he called for "cross-cutting, creative solutions to solving the water problems of today, as well as innovative strategies that will catalyze change in how we use, conserve, protect and think about water in the years to come."

"Flash floods, punishing droughts, rising sea levels and harmful algal outbreaks are just a few of the problems we expect to worsen as the climate changes and high-impact weather events become more frequent. Strengthening our nation's water prediction and information services is a critical component for addressing that threat." - NOAA Administrator Dr. Kathryn Sullivan

Initially, the model will benefit flash flood forecasts in headwater areas and provide water forecast information for many areas that currently aren't covered. As the model evolves, it will provide "zoomed-in," street-level forecasts and inundation maps to improve flood warnings, and will expand to include water quality forecasts.

"Through our partnership with the research, academic and federal water community, NOAA is bringing the state-of-the-science in water forecasting and prediction to bear operationally," said Thomas Graziano, Ph.D., director of NOAA's new Office of Water Prediction at the National Weather Service. "Over the past 50 years, our capabilities have been limited to forecasting river flow at a relatively limited number of locations. This model expands our forecast locations 700 times and generates several additional water variables, such as soil moisture, runoff, stream velocity, and other parameters to produce a more comprehensive picture of water behavior across the country."

The underlying technology for the model was developed by the National Center for Atmospheric Research (NCAR). NOAA developed and implemented the model along with NCAR, the Consortium of Universities for the Advancement of Hydrologic Sciences, the National Science Foundation, and federal Integrated Water Resources Science and Services Consortium partners. Continuing to leverage partnerships with the research community will prepare NOAA for new collaborations and even greater innovation in the future.

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

Getting to know your NWS Team:
William Simpson, Hydrometeorological Technician

Originally from Tewksbury, Massachusetts, Bill Simpson began his weather career in 1975 in the United States Air Force. He then spent 9 years in the Air Force stationed in Alaska, California, Arizona and Portsmouth, NH. Afterwards, Bill joined the NWS in 1986. He had worked at the Weather Service Meteorological Observatory (WSMO) in Chatham, MA working on the 74-S band radar and launching upper air weather balloons. In 1990, the National Weather Service underwent a reorganization and consolidated the southern New England office. So Bill moved from Chatham, MA to the Taunton Weather Forecast Office (WFO) and has been with us ever since.

Bill's current position at the NWS Taunton office is a Hydrometeorological Technician (HMT). HMTs act as forecaster aids to the meteorologists on duty. Typically the HMTs handle public service requests and perform data collection and data quality control duties.

Bill is also the office snow water equivalent (SWE) hunter. While in the Air Force out in California, Bill would spend some of his free time back country skiing and snowshoeing in the Sierra Nevada mountains. On one of his trips, he came across a team of geologists analyzing the snowpack and inquired if he could assist. This is where he learned about the National Snow Analyses page (www.nohrsc.noaa.gov) and kept abreast of the evolving snow pack. He also discovered that the algorithms of the snow melt process, within the analyses page, needed to be verified with ground truth surveys. Nowadays, Bill often heads out to the higher elevation of southern New England hills to measure the snow depth and the water content. By doing this he not only provides ground truth for the Snow Analyses page, but also determines how much water is within the snowpack. Winter accumulating snowpack can become a concern for spring flooding potential. For example, a warm spring rain event with a significant snowpack can cause significant river flooding.

Bill lives on the Cape and is an avid tennis player, mountain biker, skier and loves spending time with his four grandkids.

Winter Weather Preparedness Week: Oct 31st — Nov 4th

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COOP Awards

by Kimberly Buttrick, Cooperative Program Manager

Above: John J Bagdon Jr receiving his 40 year Length of Service Award

The National Weather Service (NWS) Cooperative Observer Program (COOP) is truly the Nation's weather and climate observing network of, by, and for the people. More than 11,000 volunteers across our Nation take weather observations on farms, in urban and suburban areas, National Parks, U.S. Army Corps of Engineer Projects, water plants, seashores and mountaintops. The weather data collected is representative of where people live, work and play. Here are a few notable COOP observers in our area.

40 year Length of Service Award

John J. Bagdon, Jr. of Sunderland, MA received a 40 year Length of Service Award. John is a farmer on a family farm in Sunderland that started in 1917 by his grandfather. John raises tomatoes, yellow/green squash, Napa Cabbage, Bok Choi and Baby Bok Choi. The produce is sold through the Pioneer Valley Growers' Association and then from there ends up at major local markets such as Market Basket, Shaw's and Hannaford Brothers. A note about John is that before he became a full time farmer, he was drafted in the United States Army in October 1968 and served a tour in Viet Nam at Bien Hoa with the 1st of the 7th Cavalry. We thank John for serving our Nation on many fronts: our country while patrolling as a uniformed soldier overseas; our community by farming delectable home grown produce; and our climate record by recording daily weather observations!

Above: Ray Whitley receiving his 30 year Length of Service Award

30 year Length of Service Award

Ray Whitley of Newburyport, MA received a 30 year Length of Service Award and this recognition came right on time as Ray plans to retire from weather observing. Sadly, his last observation will be September 30, 2016. We thank Ray for his 30 years of volunteer service to our Nation by contributing to the climate record of Newburyport, MA.

Summer 2016 Season Review

by Robert Macedo, Amateur Radio Coordinator

Above: Tree on home in Wellesley, MA. Photo by KB1NCG– Marek Kozubal.

Despite the drought that has significantly impacted southern New England throughout the course of the 2016 summer season, there were still some notable severe weather events that impacted the region. WX1BOX, the amateur radio station at the National Weather Service (NWS) Taunton Forecast Office, was active for many of these events.

Monday July 18th, severe thunderstorms caused widespread pockets of wind damage in Franklin County into northern Worcester County in Massachusetts. Another severe thunderstorm caused microburst damage from the Haverhill to Merrimac region. Many of these reports were received by SKYWARN spotters and amateur radio operators across these areas. Another area of severe thunderstorms caused a series of straight-line wind damage reports from Wellesley all the way to Hingham, Massachusetts where dry docked boats were blown off of their pedestals.

On Friday July 22nd, more severe weather affected Southern New England. The towns of Westboro and Southboro were significantly impacted by a microburst with many downed trees, wires and utility poles. Additional severe thunderstorms impacted portions of northern Connecticut, Rhode Island and southeast Massachusetts.

On Saturday July 23rd, another round of strong to severe thunderstorms affected Southern New England. These thunderstorms started in New Hampshire and dived south into the North Shore of Massachusetts. These storms eventually moved across much of eastern Massachusetts and Rhode Island. These storms produced hail and strong to damaging winds. Power outages in Massachusetts were scattered in the region and numbered approximately 21,000 at the height of the event.

Cont'd on page 13

Cont'd from pg 12…Summer Review

Above: Tornado damage in Concord, MA. Photo by Anne Umphrey - SKYWARN spotter.

Another active severe weather time frame occurred from Friday August 12th into Saturday August 13th. On Friday August 12th, severe thunderstorms produced flash flooding with water as high as 4"-6" in just a 90 to 120 minute period occurred across northeast Connecticut and northwest Rhode Island. Trees and wires were also knocked down in Pomfret, Putnam and Killingly, Connecticut. The worst of the flooding occurred near Interstate 395 close to Killingly. Across western Providence County, RI downed trees and wires and flooding occurred in the Foster area.

During the late afternoon on August 13th, marginally severe thunderstorms affected the south-central Massachusetts area with pockets of wind damage and flash flooding impacting parts of Dudley, Oxford and Douglas. A second round of severe thunderstorms occurred after 8 PM which produced a more widespread round of severe weather with pockets of tree and wire damage affecting western and central Massachusetts. Leominster, Massachusetts was hard hit with flash flooding in urbanized area of the city. This round of severe weather lasted through midnight with a last round of severe thunderstorms occurring in Connecticut through Rhode Island and Southeast Massachusetts between 12 to 4 AM. Pockets of wind damage, flooding and even small hail occurred with these severe thunderstorms.

In the early morning hours of Monday August 22nd, areas of thunderstorms with heavy rainfall and strong wind gusts moved through southern New England. The environment on this night was also conducive for an isolated tornado. A severe thunderstorm cell organized over eastern Worcester County and moved into Middlesex County. Isolated pockets of wind damage were reported in Marlborough and Sudbury. As the severe thunderstorm moved into Concord, the storm signature intensified with strong rotation. A concentrated area of wind damage was identified in Concord. The parent severe thunderstorm produced a tornado in the town, which was the first nocturnal tornado in 46 years. SKYWARN spotters and amateur radio operators were critical in relaying the first damage reports and documenting the area of damage to allow for a NWS Taunton storm survey to take place.

On Labor Day, Monday, September 5th, Post Tropical Cyclone Hermine brought tropical storm force wind gusts to portions of southeast New England and sustained tropical storm force conditions to Nantucket and Martha's Vineyard. Hermine caused isolated to scattered pockets of tree and wire damage and isolated power outages in the region. While some beneficial rainfall occurred, it was not as much as hoped with most rainfall amounts less than an inch. Nantucket Island was lucky as they received close to 1.50 inches of rainfall. Low astronomical tides prevented a more significant coastal flood episode but some minor beach erosion and some impacts to boats were noted along the coast especially out on Nantucket Island.

Above: Tree on home in Westboro, MA. Photo by NIKFV– Bob Tripi.

On Sunday September 11th, a cold front swept through southern New England ushering in the first Fall-like weather of the season. The front had a line of strong to severe thunderstorms causing scattered pockets of tree and wire damage and power outages across interior Massachusetts with isolated wind damage in northwest Connecticut. A measured wind gust of 67 MPH was recorded in West Brookfield, Massachusetts. Multiple wind gusts between 40 and 60 MPH occurred as this line of severe thunderstorms moved through the area. Over 17,000 were without power in Massachusetts at the height of the event with the more concentrated power outages in parts of Worcester and Middlesex Counties of Massachusetts.

Over the course of these various events across the summer 2016 season, SKYWARN spotter and amateur radio SKYWARN spotter reports have been critical in understanding the conditions that are happening at the surface. The service provided this year was exemplary and a huge thank you to all who have supported the SKYWARN program during this past summer severe weather season. If interested in joining the SKYWARN Announcement email list sign-up (you don't have to be an amateur radio operator to join): contact Rob Macedo-KD1CY: rmacedo@rcn.com

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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.

Visit our Website:
www.weather.gov/boston

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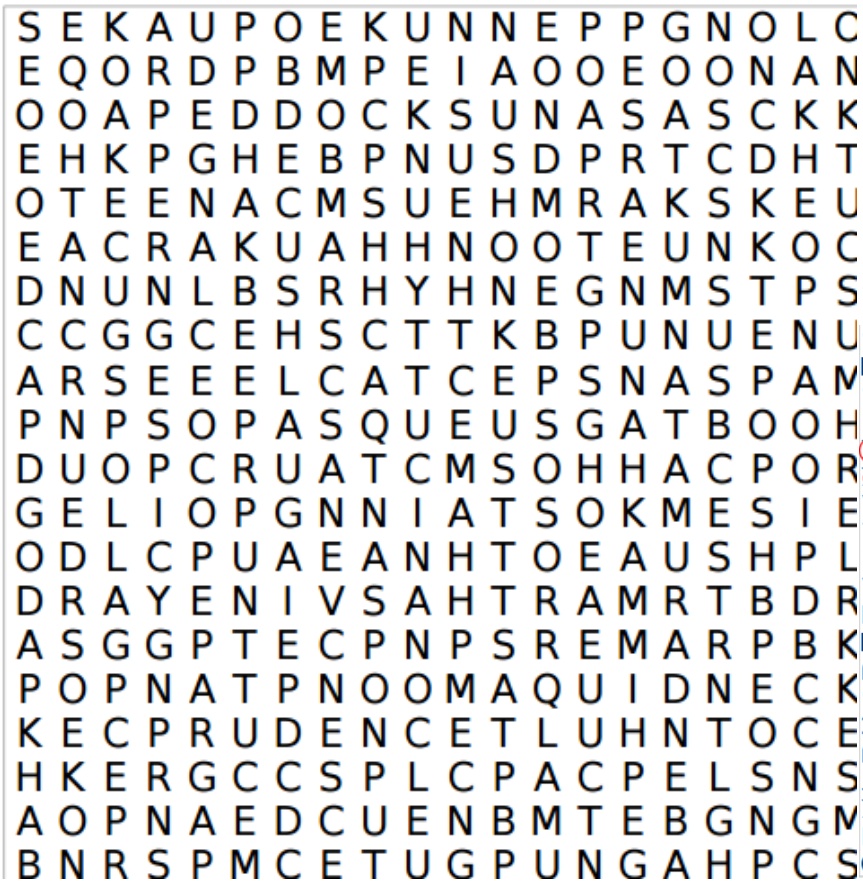
Southern New England Islands



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