Photo by Mike Cempa

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The Coastal Front

Fall 2013

Volume IV-3

Flash Flooding in New England

By Mike Kistner, Meteorologist Intern

The summer season of 2013 has been an active season for flash flooding across New Hampshire and Maine. The NWS office in Gray, ME has already issued 34 Flash Flood Warnings, which is more than twice the annual average issued by the office (Figure 1).

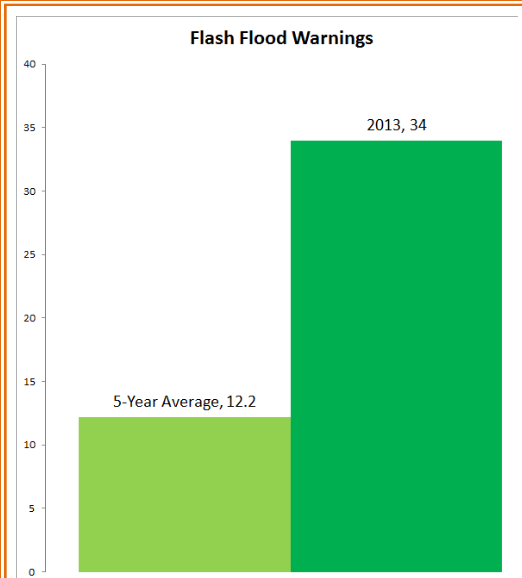

Figure 1: On average, 12 Flash Flood Warnings are issued per year. In 2013, 34 have been issued.

For much of June and July the Bermuda High was almost two standard deviations stronger than normal. As a result, the Northeast U.S. remained under a maritime tropical air mass transported north on the southerly flow over the east coast. With all the added moisture in the air, any thunderstorms that developed produced extremely heavy rainfall rates. When combined with slow storm motion, localized heavy rainfall of 4 to 5 inches per hour can fall.

While the weather pattern favored more flash floods this summer, part of the increase may have also been due to the Dual Pol upgrade to the Doppler radar. This upgrade allows for far superior rainfall estimates, allowing the warning forecaster to become much more aware of heavy rain areas that could produce flash flooding. With the increased awareness prompted by the warnings, more flash flood reports were also received. This is partly due to calls made by the NWS to local officials and spotters to follow up on flash flood warnings. There has also been an increase in reports coming from social media sources like Facebook and Twitter.

PING Helps Solve the Precipitation Type Mystery

By Chris Kimble, Forecaster

One of the biggest problems during winter precipitation events is identifying what precipitation type to expect. Will it be snow? Sleet? Freezing rain? Or just plain old rain? Even when the precipitation is occurring it can be hard for forecasters to tell exactly what's going on at your house. It is true that with the new DualPol radar forecasters are able to better identify what type of precipitation is falling, but nothing replaces the ground truth: a report from ground level.

Now you can help forecasters by telling them what's going on in your backyard! The National Severe Storms Laboratory has begun a project called Meteorological Phenomena Identification Near the Ground (mPING) which allows you to report the weather anytime, anywhere right from your smart phone. The reports that you submit will allow forecasters to get a more clear picture of things like the rain/snow line or pockets of sleet or freezing rain. It will also aid researchers in further understanding precipitation patterns and fine tuning the radar algorithms to provide a better view of precipitation type. For more information on the mPING project, go to http://www.nssl.noaa.gov/projects/ping/ or download the free app available on iPhone and Android devices.

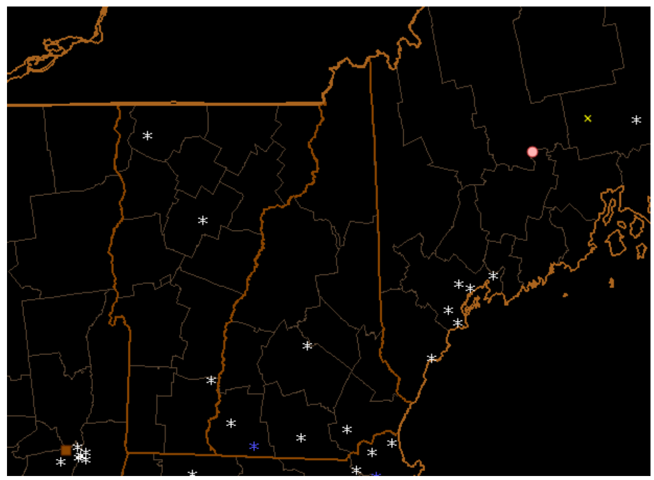

Figure 2: Reports from February 8, 2013 showed mostly snow across our area, but there was a report of ice pellets in Somerset County.

Summer Weather Review

By Chris Kimble, Forecaster

Summer 2013 started off generally cool and wet before a pattern shift in mid-June. From mid-June through mid-July, a very warm, moist tropical air mass invaded New England. This allowed several rounds of thunderstorms to form, some of them severe, and several incidents of flash flooding. The hot and humid pattern finally shifted again for the last week of July. A shift to a cool, dry flow out of Canada allowed for a break from the humidity through late August. The cooler air was most noticeable in low temperatures which frequently dropped into the 50s and occasionally the 40s. Portland also went more than two weeks without measurable precipitation from August 10 thru August 25. A shift to a warmer and wetter pattern began by the end of August. The summer as a whole was slightly warmer and wetter than normal.

	HIGH	LOW	AVE	PRECIP	90+
June	73.7 (+0.5)	56.0 (+2.4)	64.9 (+1.5)	7.32 (+3.53)	3 (+2.3)
July	79.7 (+0.9)	63.4 (+4.0)	71.6 (+2.5)	3.36 (-0.25)	5 (+3.5)
August	78.1 (+0.4)	57.3 (-0.9)	67.7 (-0.3)	1.74 (-1.40)	0 (-1.1)
Summer 2012	77.2 (+0.6)	58.9 (+1.8)	68.1 (+1.2)	12.42 (+1.88)	8 (+4.7)

Table 1: Summer 2013 climate statistics for Portland.

Summer Student Completes Research

By Manda Chasteen, Hollings Scholar

Through NOAA's Hollings Scholarship program I was granted the opportunity to leave the cornfields of rural Illinois behind and move somewhere in the United States to conduct an internship through the National Weather Service. I chose the Gray, Maine office as my destination for two important reasons: the project was relevant to future work I hope to do in graduate school, and because Maine was far from Illinois and somewhere I had never visited.

As a rising senior at the University of Illinois, I had high expectations for my summer in Gray. Severe thunderstorms have always been my primary interest in the weather field, so an internship that brought together this research with operational meteorology was particularly appealing to me. I spent most of my time working on my project, "Comparative Dynamic and Thermodynamic Characteristics of Nontornadic New England Thunderstorms", with the Science and Operations Officer, Dan St. Jean. The purpose of this project was to continue research done by previous Hollings scholars Sarah Trojniak (2010) and Kyle Mattingly (2011) in order to determine if certain forecast parameters distinguished between tornadic and nontornadic environments. After the project was completed, I presented my research to the staff at NWS Gray. I then went to Washington D.C. to present to my fellow Hollings scholars at NOAA headquarters in Silver Spring, Maryland.

When not working on my project, I had the valuable opportunity to shadow forecasters, help out during severe weather events, and launch the 00Z radiosondes. This opportunity was very rewarding as I had the chance to observe operational meteorology firsthand. I also got to ride to the top of Mount Washington with a NWS employee and tour the observatory at the summit.

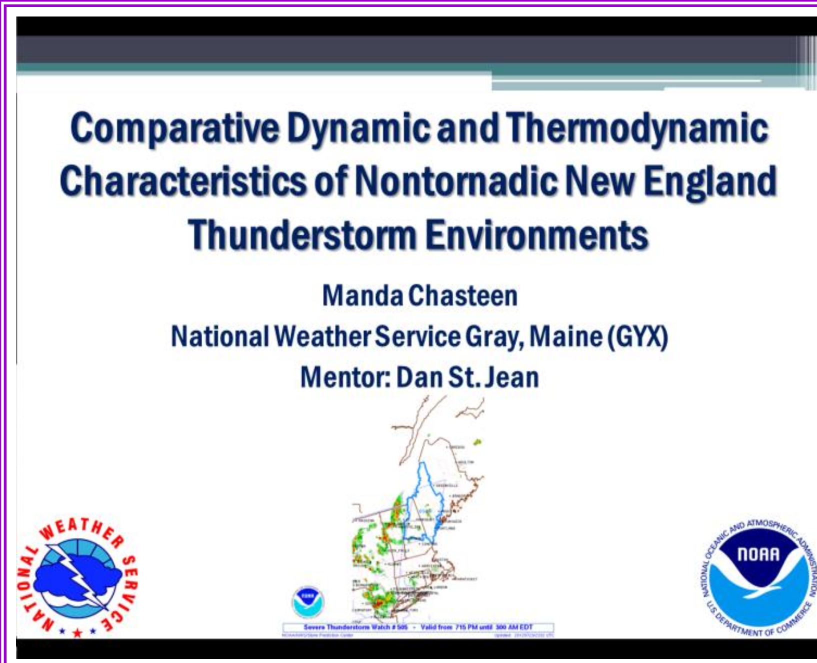

Figure 3: Manda Chasteen presented the findings of her study to the staff at NWS Gray.

Overall, I thoroughly enjoyed my summer in Gray. I had the opportunity to work with a great staff, learn valuable tools to aid me in my future studies and career in the meteorology field, and visit parts of New England and Canada that I would not have otherwise visited. I am very grateful for the hospitality I was shown this summer by all of the staff!

Hurricanes: Where and Why Do They Form?

By Margaret Curtis, Meteorologist Intern

In the past few years Irene and Sandy have made quite an impact on New England. Since the climate of New England isn't tropical why do tropical storms still impact our area? The answer will take us through the origins of tropical cyclones and the weather patterns that drive them.

Hurricanes are one of nature's ways maintaining balance. At tropical latitudes, there is an excess amount of heat built up by the more direct heating from the sun compared to higher latitudes. Tropical cyclones feed off this heat and humidity over the tropical oceans and transport it generally toward the polar regions.

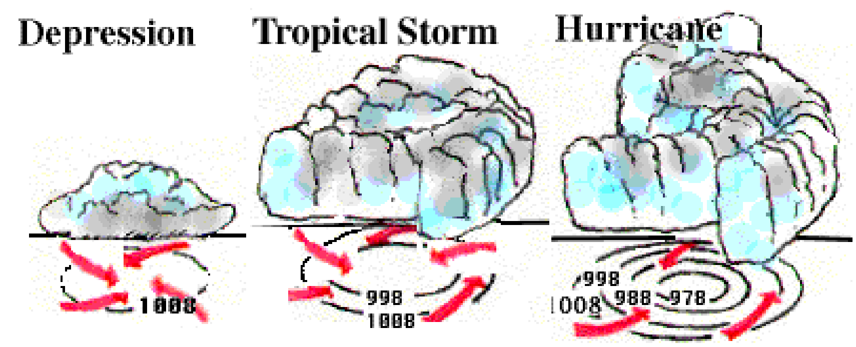

Figure 4: Formation stages of a tropical cyclone from tropical depression to hurricane. (Source: Earth Science Australia)

For a tropical storm to form, several ingredients must come together. First, there must be warm ocean water to serve as fuel. Sea temperatures of 80F (26.5C) or are usually needed, and it is this heat and humidity from the ocean that fuels the storm. Second, there must be a trigger for thunderstorms to form. This can come in the form of a weak wave of low pressure which can bring with it just enough instability and lift to generate thunderstorms. In the Atlantic Ocean, the trigger for tropical cyclones often comes from waves of low pressure moving off the African coast westward into the tropical Atlantic waters. Third, there must be very little wind shear. If strong winds exist in the upper atmosphere, then any thunderstorms which form will get blown apart before they get a chance to organize into a tropical storm. Finally, the storms must be allowed to rotate. If they form too close to the equator there is not enough rotation due to the Earth's spinning to allow the storms to rotate. Tropical storms usually form between the latitudes of 5 and 15 degrees north or south of the Equator. When all these ingredients come together, thunderstorms begin to form. The rising motion created by the updrafts of these storms causes low pressure to develop. The storms begin to coalesce and rotate, feeding off the warm, humid air over the ocean. As the low pressure becomes stronger and wind speeds increase, the cyclone becomes a tropical storm and then a hurricane.

In the Atlantic Ocean, September is the most frequent month for hurricane formation. Figure 5 (next page) shows the formation location and typical tracks for hurricanes and tropical storms in September. As you can see, formation is most likely in the Leeward Islands of the eastern Caribbean, as well as through the Gulf of Mexico. Storms may track into the northeastern United States.

Hurricanes (Continued)

Throughout the life of a tropical storm, the large scale wind pattern is responsible for the storm's motion. As you can see from the prevailing tracks shown in Fig 3, in the tropics the trade winds cause storms to move from east to west. As the storms begin to move north they are impacted by mid-latitude systems such as the Bermuda high, a large ridge of high pressure typically seen over Bermuda in early fall. The clockwise flow around high pressure over Bermuda causes the storms to turn to the right and track up the eastern seaboard of the United States. That same motion often causes the storms to move into the North Atlantic before they are able to impact Northern New England.

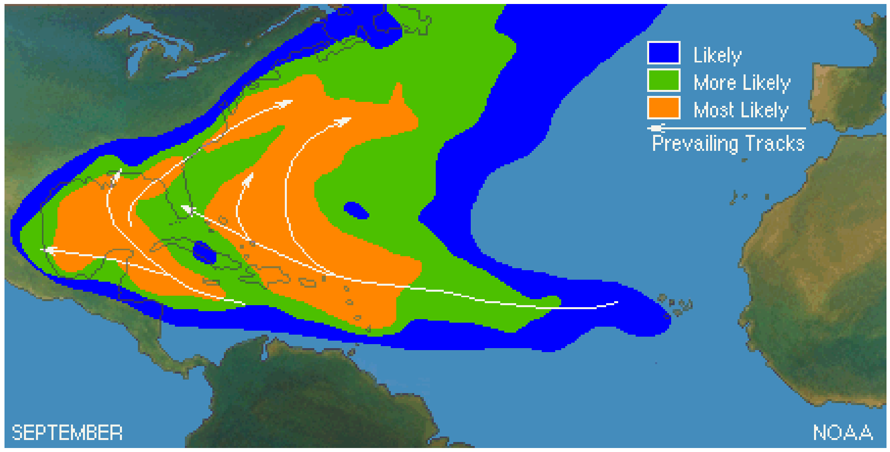

Figure 5: Formation regions and prevailing tracks of Tropical Storms during the month of September. (Source: NOAA/NHC)

Because of the high latitude, cold offshore waters, and the shape of the coastline, New Hampshire and Western Maine rarely see full scale hurricane conditions. The high latitude brings strong westerly winds which act to tear apart hurricanes. The cold waters off the New England coast rob hurricanes of the energy that creates and sustains the storm. The geography of the coastline itself also acts as a barrier which acts to disrupt hurricanes and absorb some of the worst impacts. Because storms almost always track toward the north or northeast, any storm which crosses into New Hampshire or Western Maine must track through southern New England or Cape Cod. The worst impacts from hurricanes in the Northeast are often felt in these areas, sheltering northern New England from the worst conditions. Due to all of these factors, most tropical systems that impact northern New England have weakened before they can bring hurricane conditions.

Although hurricane conditions are rarely observed in New Hampshire and Western Maine, they have been known to occur. On average, hurricane force winds (74 mph or greater) are seen in Portland, ME once every 43 years and in Portsmouth, NH once every 30 years.

Hourly Weather Graphs for Your Backyard

By Stacie Hanes, Lead Forecaster

The "point and click" forecast available from our webpage is a very popular feature. But not as many people know about the hourly weather graphs that are also available for each point. These hourly weather graphs provide line and bar graph representations of the hourly forecast temperature, dew point, wind chill/heat index, wind, relative humidity, chance of precipitation, and several other features. Just select as many or as few elements as you want and new graphs will be generated. To aid in reading any specific hour, just click on that hour then read each forecast value at the bottom of the graph.

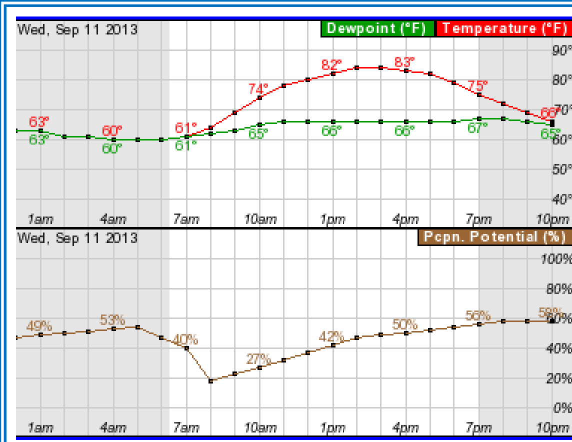

Figure 6: An example Hourly Weather Graph showing Temperature and Dew point (top) and chance of precipitation (bottom).

The Hourly Weather Graph is found on the front of our homepage or through a link from the point and click forecast.
http://www.erh.noaa.gov/gyx/gridpoint.php

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For questions, comments, or suggestions contact us at

GYX-Newsletter@noaa.gov

Photo by John Jensenius