The Coastal Front

Fall 2011

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Tornadoes Strike Maine - June 1

By Margaret Curtis, Meteorologist Intern

June 1 was an active weather day across Maine and New Hampshire as widespread severe storms broke out across the region ultimately spawning two EF1 tornadoes in Maine.

There are three requirements for thunderstorm development: warm, moist air, instability, and a trigger. All three elements were present on the morning of June 1. Warm, moist air ahead of a front brought dew points into the 60s across New Hampshire by early morning. An upper level low with cooler air aloft helped to provide instability, and a cold front approaching from the Great Lakes provided the trigger. For tornadoes, a fourth criterion must be present: rotation. On this day the wind shear, the difference between the surface level winds and the upper level winds, was very strong. This allowed the atmosphere to begin to turn over horizontally like a paddlewheel in a river. When that spinning paddlewheel of air is turned vertically by a thunderstorm updraft, a tornado may develop.

Figure 1: North Pond tornado. Courtesy of WGME 13.

The National Weather Service (NWS) issued its first Tornado Warning on a thunderstorm moving through Coos County, New Hampshire at 2:47 PM. By 3:13 PM another Tornado Warning was issued as the storm crossed into Maine. A tornado was observed at North Pond, near Bryant Pond in Oxford County, ME at approximately 3:35 PM. The funnel traveled mostly across the lake, however many broken trees and limbs were observed near the lake. A local resident was able to take a photo of the tornado as it lifted off the north side of the pond (Figure 1).

Tornadoes Strike Maine - June 1 (continued)

The NWS storm survey team determined the width of the tornado to be approximately 25 yards and tracked approximately one quarter mile on North Pond. The tornado was rated EF-1, with estimated maximum winds of 85-100 MPH.

Figure 2: This fishing camp on Sandy Pond was moved six feet off its foundation due to the tornado. The steps on the right in this image used to lead to the door on the left. Photo by NWS Gray, ME.

A second tornado went through the Embden Pond area around 6 PM. The tornado was on the ground for 8.4 miles, beginning in New Portland, ME and passing over Embden Pond, Sandy Pond, and Fahi Pond before finally lifting near the Kennebec River. The worst damage occurred along the west side of Embden pond, where a 200 yard wide damage path was observed. Wind speeds were estimated at 90-100 MPH, making it an EF-1 on the Enhanced Fugita Scale.

Thankfully, no deaths or injuries were reported from the tornadoes on June 1. The tornadoes snapped or uprooted hundreds of trees and damaged several outbuildings and at least one vehicle. On Sandy Pond in Embden a fishing camp was moved 6 feet off its foundation (Figure 2).

NWS Chat

By Stacie Hanes, Lead Forecaster

The National Weather Service office in Gray began using an instant messaging service in July already used by numerous other NWS offices across the country. The service, called NWSChat, is used for sharing critical warning decision expertise and other types of significant weather information between the NWS and key partners like emergency managers, law enforcement, and the media. NWSChat is used to enhance decision support during high impact weather events and to facilitate real-time feed-back from partners.

For instance, during a severe thunderstorm event, the media would be able to relay a report to us as soon as they receive it. This is important information for the warning forecasters at the NWS, who may need to upgrade or continue a warning based on this information. Also, an emergency manager may ask us to clarify details about an upcoming storm. This service will enhance our already strong ties with our partners, which will in turn help us make more effective and efficient warning decisions for our customers.

Interpreting the Climate Outlook

By Chris Kimble, General Forecaster

The Climate Prediction Center (CPC) issues long-term forecasts of average temperature and precipitation for the entire United States. These forecasts are intended to assist users in long-term planning, such as in the agriculture industry and others that may be greatly impacted by seasonal climate fluctuations. The CPC issues several types of forecast products, but sometimes it can be difficult for users to understand how to interpret the products.

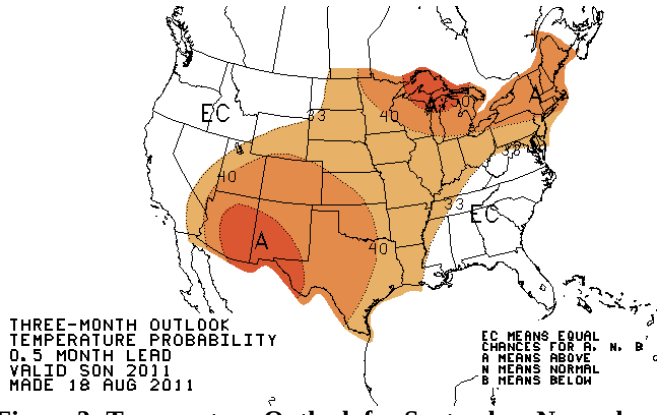

Figure 3: Temperature Outlook for September-November 2011

Average Temperature	
Value	YEAR
51.5	2005
51.3	1990
51.0	2007
51.0	2006
50.9	2010
50.8	2001
50.6	1999
50.4	1985
50.3	1983
50.0	2003
49.9	1998
49.8	2004
49.8	1994
49.8	1991
49.7	2000
49.6	2009
49.5	2008
49.5	1982
49.2	1989
49.0	2002
48.9	1988
48.9	1984
48.2	1995
48.2	1993
48.2	1987
48.0	1981
47.9	1992
47.3	1997
47.2	1996
47.2	1986

Table 1: Sep-Nov Average Temperature Rankings for Portland, 1981-2010

All temperature and precipitation outlook products follow the same basic design. The 30-year climatological normal period (now 1981-2010) is divided into three equal groups consisting of the warmest third, the coldest third, and the middle third. These categories can be thought of as "well-above-normal," (top ten warmest) "well-below-normal," (top ten coldest) and "near-normal." This concept is illustrated in Table 1 using the observed values for average temperature in Portland for the September-November periods of 1981-2010. The CPC issues a probabilistic forecast for each of the three categories, indicating the percent chance that the actual average temperature will fall in each of these categories (example: 40% chance above normal).

The temperature and precipitation outlook products are available as 6-10 day outlooks, 8-14 day outlooks, one month outlooks, and three month outlooks. The three month temperature outlook is one of the most commonly-used products issued by the CPC.

The three month temperature outlook for September-November 2011 (Figure 3) depicts a large area of orange across the Great Lakes and Northeastern United States, which indicates where the CPC expects a higher likelihood of above-normal temperatures. This does not mean that the average temperature is forecast to be above-normal for this period, but it means that the CPC has assigned the greatest probability to the above-normal category. There is still a smaller probability assigned to the below- and near-normal categories. An area of grey on a map indicates an area where the CPC has assigned the highest probability to the "near-normal" category, while blue areas indicate the highest probability is "below-normal." Areas in white and marked "EC" are places where the CPC has assigned equal chances to all three categories (33% each). In these locations there is not enough confidence to favor one category over the others, and all three categories are just as likely to occur.

Interpreting the Climate Outlook (continued)

Another type of product that the CPC issues is the Local 3-Month Temperature Outlook (L3MTO). This product is designed to give an even more specific forecast for several individual climate stations. An example of the L3MTO product for Portland for September-November 2011 is shown in Figure 4. The breakdown of the probabilities for each of the three categories gives a clear illustration of why a high probability for above-normal (44%) does not mean zero probability for below-normal (actually 24%). The L3MTO is available for hundreds of sites nationwide.

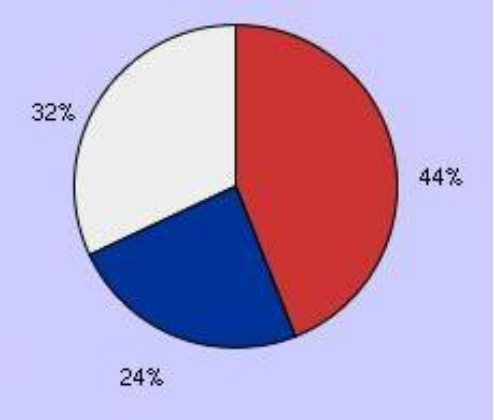

Figure 4: L3MTO for Portland, Maine September-November 2011

It is important to note that CPC forecasts are for average temperature and precipitation over a long period of time. Even in an above-normal climate period there can still be very cold days. The outlook indicates into which category the average temperature for the entire period is most likely to fall. CPC Products are available at http://www.cpc.ncep.noaa.gov/ and are also on the NWS Gray website under the local climate section: http://www.weather.gov/climate/climate_prediction.php?wfo=gyx.

New 30-year Climate Normals Implemented

By Steve Capriola, Lead Forecaster

	1971-2000	1981-2010
Temperature	45.7	46.5
Precipitation	45.83	47.25
Snowfall	66.4	61.8

Table 2: New normals for Portland, ME based on 1981-2010 data (compared to former 1971-2000 data).

On July 1 of this year the new 30-year normals were published for all National Weather Service (NWS) observation sites. This covers over 9000 stations across the U.S. including Portland, Gray, Augusta, and Concord in our area. These normals are computed for temperatures, precipitation, snowfall, snow depth, and heating and cooling degree days.

The new 30-year normals are based on the period from 1981 through 2010 and replace the previous set of 30-year normals that went from 1971 through 2000. Thus the 1970s were dropped from the normals and replaced by the 2000s. The 2000s were a warmer decade and as a result many daily, monthly and annual normals will show this trend (at Portland, 11 out of 12 months had an increase). Snowfall for Portland decreased significantly between these two decades and the new normals reflect this as well as an increase in total precipitation.

30-year normals are updated every 10 years by the NWS in order to include newer stations that report daily weather data. One of these stations is the NWS forecast office site in Gray, Maine. Weather records were started in October of 1995 at the Gray site. Even though weather data is only available for half of the 30-year normal period, through the use of statistical analyses 30-year normals can still be computed.

The National Climatic Data Center (NCDC) in Asheville, NC is responsible for keeping all climatic weather data for the NWS and has a summary of the new normals at:
http://www.ncdc.noaa.gov/oa/climate/normals/newnormals.html

Summer Student Conducts Tornado Research

By Kyle Mattingly, Student Intern

At the beginning of the summer, I left my home in Owensboro, Kentucky and made the long trek to Maine to complete a nine week internship at the National Weather Service Gray office. This opportunity was made available to me through NOAA's Hollings Scholarship program, which I was awarded as a sophomore at Western Kentucky University.

The majority of my time at the NWS Gray office was spent working on a tornado research project in coordination with Dan St. Jean, the office's Science and Operations Officer and my NOAA mentor. The purpose of my project, titled "Sounding-Derived Parameters Associated with New England Tornadoes", was to determine whether certain parameters that can be computed from atmospheric soundings show significant differences when grouped by tornado intensity, or by the mid level flow direction on days when tornadoes occurred in New England. After this research was completed, I presented a summary of my findings to the office and traveled to Washington, D.C. to meet with other Hollings Scholars and present a poster on my summer project.

When I was not busy with my research project, I shadowed NWS employees, learning about their duties and helping out whenever I could. I learned how to launch the weather balloons that the office releases twice daily and issued a few of the numerous public products that the NWS puts out. I also helped during severe weather events, including the June 1 severe weather outbreak. I accompanied a storm survey team from the office as they looked at the damage left behind by the storms to determine whether tornadoes had occurred.

Overall, my brief time working for the NWS Gray office was very enjoyable and rewarding. I got to experience life as a meteorologist firsthand and spending the summer in Maine was a welcome break from the heat I would have had to deal with down south. Thanks to all the staff for a great summer!

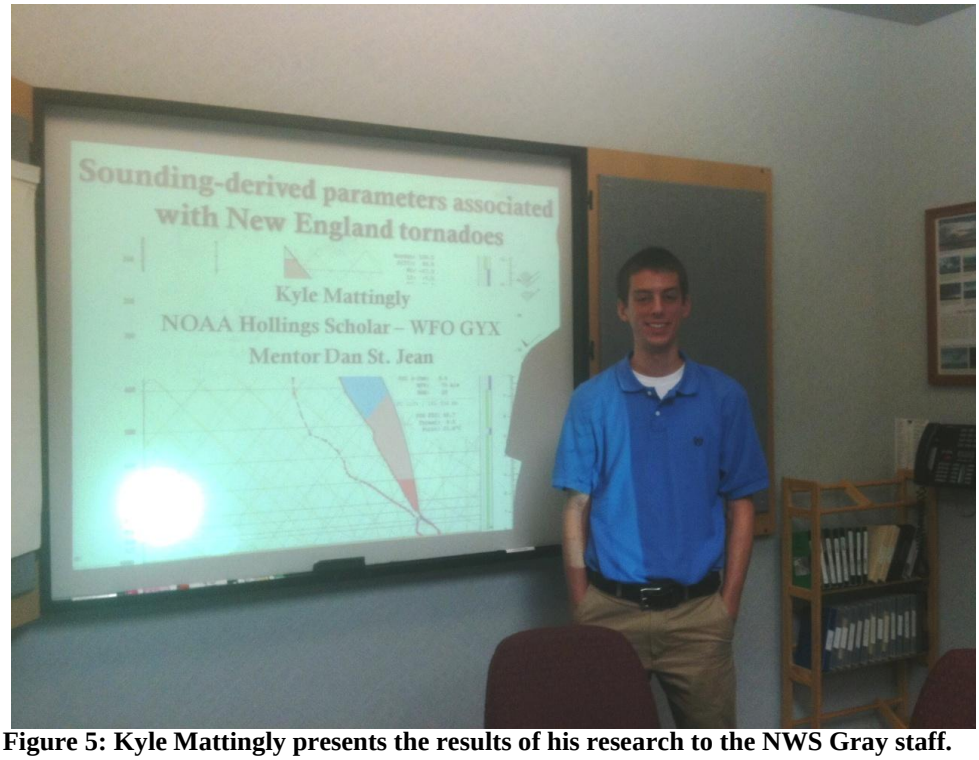

Figure 5: Kyle Mattingly presents the results of his research to the NWS Gray staff.

Extreme Winds Strike Western Maine

By Chris Legro, General Forecaster

After a round of severe thunderstorms on Independence Day, the 5th of July was quiet across northern New Hampshire and western Maine. However, to the west thunderstorms fired in the Midwest and moved around a high pressure ridge and towards New England. By the morning of the 6th the remnants of these storms were forming a compact wave that was spinning its way along the U.S./Canada border.

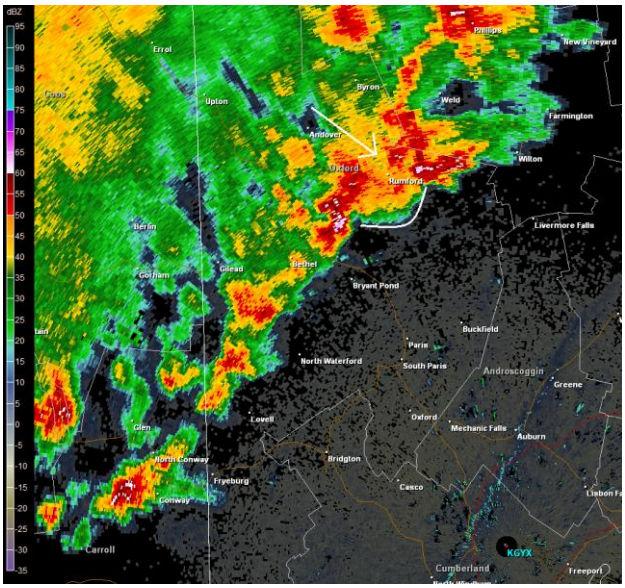

Figure 6: Severe Thunderstorms produce damaging winds in Oxford County, Maine.

Over New Hampshire and Maine skies were clear and temperatures rose well into the 80s. Winds were also out of the southwest, which kept the cool marine air away and allowed increasing amounts of moisture to surge northward. The result was hazy, hot and humid conditions around noon, providing plenty of instability for afternoon storms. Aloft winds around 10,000 feet were from the west around 40 to 45 MPH, and consistently from the west above and below that level. This suggested that strong wind gusts were a concern.

Eventually thunderstorms formed over the North Country of New York around 1:30 PM and a Severe Thunderstorm Watch was issued for parts of New York, Vermont, New Hampshire and Maine until 9 PM. About an hour later the storms were becoming stronger and were merging into a squall line, and they also began to produce damaging wind gusts in and around the Burlington area. Throughout the Champlain Valley and Northeast Kingdom there were numerous reports of trees and wires down.

By 4 PM these storms were approaching the Connecticut River Valley and the first Severe Thunderstorm Warning was issued in New Hampshire. The main squall line arrived at the Connecticut River at 4:30 PM, and for the next three hours severe thunderstorm warnings were issued for both the primary squall line and isolated severe storms ahead of it.

In the middle of all the warnings, around 5:30 PM, one of those isolated storms merged with a part of the incoming squall line northeast of Bethel, Maine. The downdraft (cool air rushing out of a thunderstorm) was enhanced as the two storms merged. This cooler, denser air rushed eastward spilling down the terrain from roughly 2,500 feet near Long and Puzzle Mountains in western Maine. As the wind rushed towards the Androscoggin River Valley it was funneled between two smaller peaks, around 1,500 feet tall, and across Howard Pond near Hanover. The result was an acceleration of the wind speeds through the narrow gap and across the smooth surface of the pond. As it blasted out the other side the ensuing gusts uprooted or snapped numerous 80 to 90 year old pine trees, known as the Hanover Pines. The magnitude of reported tree damage suggested that wind speeds approached 100 MPH in the area of that narrow gap.

While the damage in and around Hanover was the most significant of the day, numerous reports of trees and wires down were received throughout the afternoon, all across New Hampshire and Maine. Twelve severe thunderstorm warnings were issued, and all twelve contained damaging winds. As the sun began to set and daytime heating lessened, the storms began to weaken and move offshore.

New Meteorologist-in-Charge

By Chris Kimble, General Forecaster

A new Meteorologist-in-Charge has been selected for WFO Gray. Hendricus Lulofs comes to us from the NWS Office in Caribou where he was Meteorologist-in-Charge since 2005. He has been leading the Gray office since late June of this year.

Lulofs' career has included working as a broadcast meteorologist in Syracuse, NY and several private sector weather companies. In July 1991 he joined the NWS as an Intern at the NWS office in Portland (before the office moved to Gray). He was promoted to a General Forecaster at the Gray office and later served as a Senior Forecaster at NWS Marquette, MI. He has also served as Warning Coordination Meteorologist at WFO Caribou, ME and WFO Blacksburg, VA.

Lulofs said: "I am thrilled to be back at the office where I began my Weather Service career 20 years ago. I look forward to getting reacquainted with our many customers and partners. This is an exciting time to be in Meteorology and I look forward to leading our office of highly talented people to meet the ever changing needs the area."

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