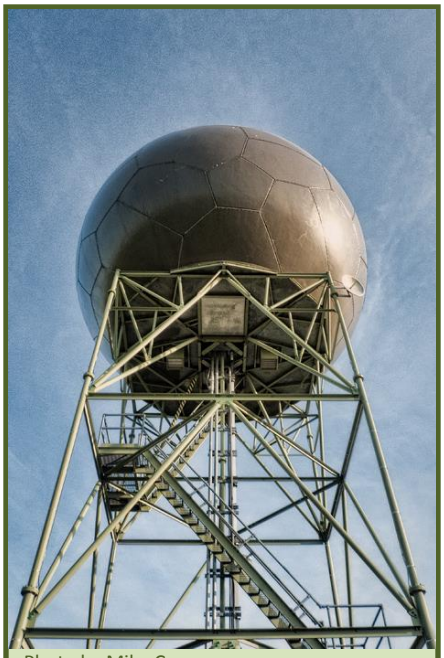

Photo by Mike Cempa

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The Coastal Front

Spring 2016

Volume VII-1

Warm Winter Weather

By Chris Kimble, Forecaster

Winter 2015-2016 was marked by a lack of persistent cold weather. It went into the record books as one of the warmest winters across much of Maine and New Hampshire. Concord experienced its warmest winter on record, while Portland came in as the second warmest.

In the fall of 2015, a stagnant jet stream pattern kept cool temperatures in the western United States and warm temperatures through much of the east. The warmth continued to build through December, peaking on Christmas Day when Portland and Concord both set record highs at 62 degrees. The first snowfall of the season did not come until December 29th, which is the second latest date of first snowfall on record. Some colder air arrived for the New Year, but most of January featured alternating periods of colder and warmer weather. The periodic warmth made it difficult to maintain a persistent snow pack.

	PORTLAND (since 1940)		CONCORD (since 1868)	
RANK	TEMP	YEAR	TEMP	YEAR
1	31.3	2001-02	**30.9**	**2015-16**
2	**31.2**	**2015-16**	30.4	1879-80
3	30.3	2011-12	29.6	2001-02
4	29.3	1997-98	29.5	1932-33
5	29.0	1990-91	29.3	1936-37

Table 1: Top 5 Warmest Winters (Dec-Feb) at Portland and Concord.

By the end of January, warm weather again began to dominate. From January 31 through February 4, the temperature topped 50 degrees 4 out of 5 days in Portland. The pattern shifted abruptly when the largest snowstorm of the season dropped 5.2 inches in Concord and 8.8 inches in Portland on February 5th. A series of cold fronts brought successively colder air, and by mid-February truly arctic air led to several days of subzero temperatures. After falling to -10 F in Portland (-12 F in Concord) on February 15th, snow changed to rain on the 16th as the temperature soared into the 50s. Warm weather continued for the rest of the month, with record highs broken again on February 29th.

40 Years Ago: Historic Penobscot Bay Flood

By John Jensenius, Warning Coordination Meteorologist

Residents along the Maine coast and in the city of Bangor may still remember what was to be a most unusual day, 40 years ago on February 2, 1976.

The weather pattern was very stormy. Low pressure had developed off the mid-Atlantic coast overnight, intensified, and moved rapidly northeastward to extreme southwestern Maine by early in the morning. As the storm approached and tracked through western Maine, very strong southerly winds developed along the Midcoast and Downeast. In Southwest Harbor, the Coast Guard recorded a wind of 115 miles per hour during the morning. The strong winds caused ocean water to pile up along the coast of Maine from Brunswick to Eastport and sent an historic storm surge up the Penobscot River and into the city of Bangor.

For residents in the city of Bangor, while the day started out stormy with high winds and heavy rain, nobody had any idea of the dramatic events that were about to unfold. Within hours the city would be hit hard by a highly unusual storm surge as it moved rapidly up the Penobscot River. Due to the funneling effects of the Penobscot River, the surge grew as it approached the unsuspecting city of Bangor.

Figure 1: Floodwaters suddenly submerge numerous cars in downtown Bangor as the storm surge raced in. Photo from the Bangor Daily News.

The flood waters rose rapidly as they reached downtown Bangor shortly after 11 am, flooding sections of the downtown area to a depth of 12 feet within 15 minutes. With water rising at a rate of about 10 inches per minute, residents could do little to escape the frigid waters. Many residents became trapped in their cars and in buildings. Several workers who saw the rapidly rising water tried to rescue their vehicles from parking lots in the area, only to become trapped as their cars began to float. Eventually, the cars began to sink and the occupants were forced to climb onto rooftops to await help. In one case, a lady was forced to hop from car-rooftop to rooftop as successive cars sunk in the icy-cold waters. Many people watched as within 30 minutes, about 200 cars fell victim to the surge and disappeared into the rising flood waters. Fortunately, thanks to the heroic actions of some of the residents in the area, no one died in the storm. However, the surge ruined cars and flooded the basements and lower floors of numerous buildings in the area, damaging bank vaults and electrical equipment and causing several fires.

Penobscot Bay Flood (continued)

Along the Maine coast from Brunswick to Eastport, a storm surge of 3 to 5 feet combined with high winds and large waves to cause numerous problems. In Searsport, a large Japanese freighter which had been anchored offshore awaiting a load of french fries, dragged its anchor and washed aground (Figure 2). The freighter spent weeks awaiting a sufficiently high tide before it could be freed to return to the ocean.


Still aground at Searsport

The Musashiharu, a Japanese freighter that was driven aground by high winds Monday, has still stuck Tuesday despite efforts to pull the vessel free at high tide. The plan now is to wait until the next full moon and highest tides, which won't occur until later this month. The 362-foot ship is empty and had been waiting for a cargo of french fries when heavy seas caused her to drag anchor and go aground. (Parsons Photo)

Figure 2: A Japanese freighter was grounded in Searsport, ME for weeks as a result of the storm surge. Photo from the Bangor Daily News.

The coastal flood was the result of several factors which happened to coincide on that date. First, the sun, moon, and earth were generally in alignment, causing a very high astronomical tide. Second, the extremely intense low pressure center that tracked across western Maine caused the very strong southerly winds to develop along the Maine coast east of Portland. Third, the wind driven storm surge occurred near the time of high tide. In addition, the heavy rain from the storm also likely contributed to the flood waters.

While there is nothing that could prevent this extremely rare event from happening again, much more is known about storm surges than was known 40 years ago. In fact, National Weather Service forecasters now have access to storm surge models to help predict the extent of flooding from coastal storms, making it possible for forecasters to provide advance warning of such rare events in the future.

SKYWARN

Storm Spotters Needed

The NWS Gray relies on volunteers across New England to be our eyes and ears during inclement and hazardous weather. The ground truth these storm spotters provide allows us to more accurately understand and study the weather. These reports help improve warning accuracy and are often used to warn neighbors downstream of what's headed their way!

Every year, the National Weather Service in Gray offers Skywarn Storm Spotter Training sessions across New Hampshire and Maine to train these volunteer spotters on techniques of monitoring severe storms and how to relay their reports. If you are interested in becoming a storm spotter, check out our Skywarn webpage for a list of upcoming free training sessions.
http://www.weather.gov/gyx/skywarn_skywarn.htm

Fire Weather in Northern New England

By Stacie Hanes, Lead Meteorologist

New England is no stranger to wildfires. Wildfires in New England can occur any time of the year as long as the ground is not covered with snow. However, there are two months out of the year when fires are more likely: April and May. During this time the sun's rays are becoming more direct and the amount of time the sun is out continues to increase. At the beginning of spring the air is still relatively dry. Cold, dry air from winter is warmed by the stronger spring sun. Trees, twigs, and leaves that were dried throughout the winter become available for burning. The peak time for wildfires during this season is usually a week or two after the snow has melted. This usually begins in late March to early April, and then tapers off during 'green up', a period of time when foliage returns. Green up usually happens around mid-May. There is a secondary peak in wildfire activity in early fall when leaves have dried and fallen off trees, leaving plenty of fuel for fires.

Historically, significant fires occur when very dry air masses come down from Canada. The spring sunshine will warm the air mass while the humidity remains very low. Add strong winds to the mix and the combination can result in vegetation drying out quickly, fostering the ignition and spread of wildfires. Every year numerous small and moderately-sized fires are started by lightning, campfires, carelessly tossed cigarettes, sparks from trains, or other causes. By far the worst offense is burning of trash and debris. The Great Fires of 1947, the largest wildfire event in Maine, lasted 10 days and killed 16 people. Over 200,000 acres were burned including much of York County and even part of Mount Desert Island.

The National Weather Service issues several products in partnership with forest services in order to assist firefighters as they attack wildfires and plan for prescribed burns. In addition, the NWS helps to keep the public aware of the danger of wildfires. The Fire Weather Forecast is a summary of the general weather trends and how they may affect fire behavior. This product helps the forest services and firefighters make decisions related to pre-suppression and other planning or resource land management activities. Spot forecasts are localized forecasts provided for firefighting personnel while they are already fighting a fire. In many cases these forecast requests come from the site of the fire.

A Fire Weather Watch or Red Flag Warning is issued when conditions are dry and winds are strong enough to potentially cause dangerous fire behavior. NWS Gray issues these only after coordinating with the Maine Forest Service or the New Hampshire Division of Forests and Lands. The forest services will know how dry the vegetation is, and will have an opinion as to whether a watch or warning is needed. Any Fire Weather Watches and Red Flag Warnings that we issue will be posted on our website to inform the general public of the potentially dangerous fire weather conditions.

Climate Outlooks: What do they mean?

By Chris Kimble, Forecaster

The Climate Prediction Center (CPC) issues long-term outlooks of average temperature and precipitation for the entire United States. These forecasts are particularly useful for users in industries which are impacted by seasonal climate fluctuations, but they can be difficult to interpret.

All temperature and precipitation outlooks issued by the CPC follow the same basic design. The 30-year climatological normal period (currently 1981-2010) is ranked and then divided into three equal groups. The top third is considered "above normal," the bottom third is considered "below normal" and the middle third is considered "near normal." The CPC then issues a forecast indicating the probability that the average temperature will fall into each of these three categories. Table 2 (at right) provides an example of this system using temperature data from Portland, Maine.

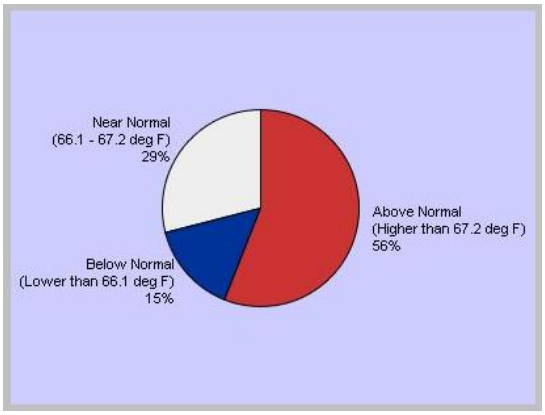

Figure 3: The Local Three-Month Temperature Outlook for the Portland Jetport valid for summer (June-August) 2016. The forecast calls for a 56% chance of above normal temperatures.

One of the easiest ways to understand the outlook forecast is to use the Local Three-Month Temperature Outlook product (Figure 3). This shows the breakdown in the forecast by category. A look at this summer's forecast indicates a 56% chance of the temperature falling into the "above normal" category. This is not specifically a forecast of above normal temperatures, however, it does show that the CPC has assigned the greatest probability to the "above normal" category. There are still probabilities assigned to the "below normal" and "near normal" categories as well. The Local Three-Month Temperature Outlook is available for 40 unique locations across New Hampshire and western Maine.

Average Temperature (June-July-August)	
68.7	1988
68.7	2010
68.6	1999
68.5	1991
68.3	1994
68.1	2005
68.0	2006
67.9	1993
67.7	2001
67.5	1984
67.5	1990
67.2	1995
67.1	1989
67.1	2008
67.0	1983
67.0	2002
67.0	2003
66.6	1998
66.5	1997
66.5	2007
66.2	1981
66.0	1985
66.0	1987
65.8	2000
65.6	1996
65.6	2009
65.3	1992
65.1	2004
64.5	1986
64.0	1982

Table 2: Average temperatures in Portland, Maine for the June-July-August period from 1981-2010. The shaded colors indicate into which category each observed value falls.

One of the most common ways of viewing the CPC forecast is through the national map of the Three-Month Temperature or

Climate Outlooks (continued)

Precipitation outlooks. These maps provide a simplified view showing which category the CPC thinks has the greatest likelihood of occurring across the country. From the latest forecast for the summer period (Figure 4), the most likely category is above normal across the entire United States, with the greatest likelihood of above normal temperatures across southern Alaska, the Pacific Northwest, the eastern Great Lakes, and the Northeast. Occasionally the CPC outlook will show an area of "EC" which stands for "Equal Chances." This category means that there are not enough climate indicators available to give confidence in which of the three categories would be the most likely to occur. It is not meant to imply "normal" conditions but that all three categories are equally likely to occur.

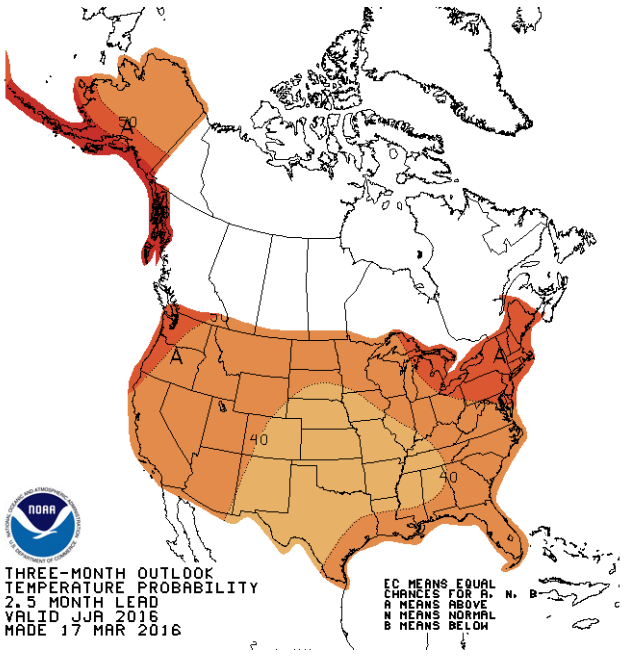

Figure 4: The Three-Month Temperature Outlook for the valid for summer (June-August) 2016. The greatest probability of above normal temperatures exists across southern Alaska, the Pacific Northwest, and the Northeast.

It is important to note that the CPC outlooks are for the average temperature and precipitation over a long period of time. Even in a climate period which is considered "above normal" there can still be very cold days. This past winter is a great example. Although the average temperature for the winter was at or near record warm levels at both Portland and Concord, there was still a period in mid-February that saw extremely cold temperatures which approached daily record values across the region. There are no outlooks for snowfall as snowfall requires a unique combination of temperature and precipitation to occur. It's hard enough for daily weather forecasters to get the snow forecast right, and it's even more difficult to predict in a longer term outlook!

The temperature and precipitation outlook products are available in many different formats. Some include 6-10 day outlooks, 8-14 day outlooks, one-month outlooks, and three-month outlooks. The Local Three-Month Temperature Outlook product is available from our local climate webpage using the "Climate Prediction" tab:
http://w2.weather.gov/climate/climate_prediction.php?wfo=gyx

More forecasts from the CPC are available at their website: http://www.cpc.ncep.noaa.gov/

NWS Staff Profile

By Margaret Curtis, Meteorologist Intern

The staff profile column introduces you to a new NWS staff member every issue. This issue we introduce you to Science and Operations Officer Justin Arnott.

What is your role at the office? As Science and Operations Officer, I oversee the forecast operations at WFO Gray, in addition to developing forecaster training and conducting scientific research projects aimed at improving our products and services.

How long have you worked for the National Weather Service in Gray? I arrived in May of 2015.

Figure 5: Science and Operations Officer Justin Arnott is this issue's staff profile.

Where else have you worked? I started in the NWS as an intern and general forecaster in Fairbanks, Alaska. I then moved back to the lower 48, working as a general forecaster in Binghamton, NY for about two years. I then spent just over one year as a lead forecaster at the Northern Indiana forecast office before becoming the Science and Operations Officer at the forecast office in Gaylord, Michigan, where I spent five years before moving to Gray.

Where did you grow up? I was born and raised in Clinton, Massachusetts. My family now resides in Mont Vernon, a small town in Hillsborough County, New Hampshire.

Where did you get your education? I received bachelor's degrees in Meteorology and Mathematics from Lyndon State College in Vermont, and then a Master's degree in Meteorology from Penn State University.

How did you first get interested in weather? Hurricane Gloria, in 1985, was the weather event that first got me interested in meteorology. The eye passed directly over where I lived and I remember going outside and seeing the sun briefly before the storm resumed. The damage caused by the storm also left a big impression on me.

What is the most interesting part of your job? The rapid advances in science and technology, and how to bring them into operational use are particularly interesting parts of my job. This not only involves scientific research, but also keeping up to date with the latest tools being developed for operational forecasters from other research centers across the country.

NWS Staff Profile (continued)

What is the most challenging aspect of your job? I find that developing training that fits the diverse learning styles of operational forecasters is a challenge in this position. To make training that is effective, we have used a variety of different delivery mechanisms, including written assignments, online modules, and short "how to" videos.

What is the most memorable weather event that you have worked? The December 1, 2006 severe weather event is one that sticks out in my memory. This event featured the first December tornadoes in Pennsylvania in over 50 years and the first F2 tornado in December in Pennsylvania in recorded history. The event was well-anticipated and it is the first time I remember schools being closed early in expectation of severe weather in the afternoon. I remember there being more forecasters than workstations at the office that day, but we all were kept very busy in what turned out to be an impressive out-of-season severe weather event. I went on one of the storm surveys after this event, and recalled just how cold it can be behind a departing storm system in December!

Lightning – Summer's Underrated Threat

By John Jensenius, Warning Coordination Meteorologist

During the summer, a common weather threat is lightning. For the past 15 years, The National Weather Service has been leading an effort to reduce lightning deaths and injuries in the U.S. Since the campaign began, lightning deaths have decreased significantly across the U.S., as seen in Figure 6. While the downward trend in fatalities is very good, there are still too many people being killed by lightning.

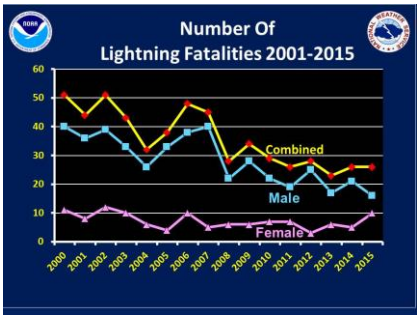

Figure 6: Lightning deaths in the United States 2000-2015.

Studies of fatal lightning incidents have shown that most victims were involved in outdoor leisure activities prior to being struck. While Maine and New Hampshire may not have as much lightning as many other areas of the U.S., both States have a wealth of outdoor activities that put people at risk during the summer. They include water-related activities, sports, camping, walking or hiking, or gatherings outside with friends. Leading causes of fatal lightning incidents are from water-related activities like fishing, boating, and beach activities.

Be safe this summer! If you hear thunder, get inside a substantial building or hard-topped vehicle immediately, and remain there until 30 minutes after the last lightning strike. If you are headed out onto the water or into the woods, check the forecast before leaving, be sure to watch for any signs of a developing storm, and make sure you can get to a safe place quickly.

Lightning Safety Awareness Week is June 19-25. For more information on lightning or lightning safety, please visit: http://www.lightningsafety.noaa.gov/

NWS Comings and Goings

By Hendricus Lulofs, Meteorologist-in-Charge

In January our office saw Meteorologist Intern Michael Kistner depart as he accepted a promotion to General Forecaster at the Weather Forecast Office in Charleston, West Virginia. After serving the country as an officer in the Air Force, Mike started his National Weather Service (NWS) career as an intern at the NWS Forecast Office here in Gray in December 2010. As an intern Mike completed numerous training assignments and quickly took on focal point responsibilities that contributed to various office programs. For example, Mike's GIS knowledge resulted in the development of a Flash Flood Potential Index (FFPI) and enhanced snowfall mapping. While at Gray he also finished up his master's degree in Meteorology.

While Mike thought he was leaving the cold and snow behind for the warmth and year around golf of West Virginia, we had to laugh when during Mike's first week at his new office a blizzard dumped 19 inches of snow on the Charleston area! Mike is very much deserving of this promotion and we wish him and his family the best as they embark on this new chapter of his career.

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For questions, comments, or suggestions contact us at

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Photo by Bob Marine