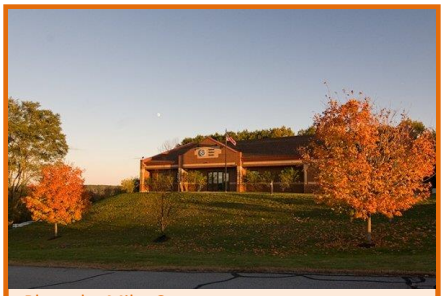

Photo by Mike Cempa

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The Coastal Front

Fall 2014

Volume V-2

Record Rains Flood Portland

By Mike Kistner, Meteorologist Intern

A slow-moving, mid-August storm system (more like something we would see in the middle of winter instead of summer) caused havoc in Detroit, Baltimore, Southern New Jersey, Long Island, and finally Portland. Numerous motorists were stranded as streets turned into rivers and manholes shot out water like geysers. Islip, New York on Long Island was hit the worst as they shattered New York's 24-hour rainfall record for the state with 13.57 inches on August 13th. The previous state record was from Tropical Storm Irene when 11.60 inches fell in Tannersville on August 27-28, 2011. The most astonishing statistic from Islip is that 9.71 inches fell in only a two hour period from 5-7 AM!

Figure 1: Flash flooding on Marginal Way in Portland. Photo by Yoon S. Byun and the Portland Press Herald

A little more than 12 hours later, the heavy rainfall axis developed again, this time over Portland, Maine. The Portland Jetport set new one-hour (2.57 inches) and two-hour (4.21 inches) record rain amounts. Overall, the 6.43 inches that fell for the day was the fifth wettest calendar day on record. The heaviest rainfall bands actually set up just to the south and east of the Jetport where radar estimates indicated that over 8 inches of rain fell in a small area south of the Jetport, 4 inches of this falling in just one hour! Multiple roads were washed out or impassable, not only in Portland, but all across Southern Maine. Some vehicles that were parked on the side of the road were floated out of parking spots and deposited in the middle of the road, blocking traffic hours later.

Record Rains (Continued)

Why did some areas get hit so hard by the heavy rain while other areas received very little precipitation? It was actually several days in advance that the potential for heavy rainfall was first recognized. Long range models showed that a frontal boundary would pass through the area. Strong forcing for upward vertical motion would occur ahead of the front as a strong east-southeasterly low-level jet transported moisture into the region. Although the models were showing these indicators, the intensity and location of heaviest precipitation was not well forecasted by models. Precipitable water values were forecasted to be as high as 2.2 inches (well above normal) indicating there would be extreme amounts of moisture available. Forecasters knew that heavy rain and flash flooding would likely occur, and a Flash Flood Watch was issued more than 36 hours before the first flash flooding occurred. However, up until a few hours before the flash flood event occurred in Portland, it was very difficult to know exactly where the heaviest precipitation axis was going to occur.

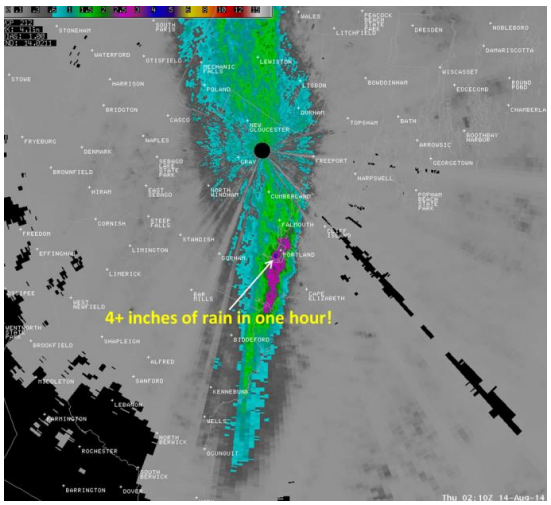

Figure 2: One hour rainfall estimates from GYX DualPol Doppler Radar. The highest amounts exceeded 4 inches in one hour near Portland.

As a line of heavy showers and thunderstorms approached Portland from the west on the evening of August 13, a coastal front was evident in the surface wind field. Portland had surface winds out the east and southeast while inland locations had a northerly wind component. This feature is more typical with a cold season extra-tropical system and often produces enhanced precipitation along and just inland from the coastline. This coastal front contributed to the heavy band of rain over Portland that evening.

The north to south oriented line of storms along the front began to surge forward with its movement perpendicular to the east-southeast low-level jet. The low-level jet fed the thunderstorms with warm, moist air that was forced up and over the boundary, and rainfall rates nearly doubled. The line of storms continued moving east until it reached the coastal front. By 10 PM, the line became super-positioned with the coastal front and stalled. New thunderstorm cells regenerated along the southern end of the boundary, riding northward along it right through the Portland area. This caused what meteorologists call "training" as thunderstorm cells continually formed and moved over the same area, leading to heavy rainfall rates and flash flooding. At 9:44 PM, NWS meteorologists issued a Flash Flood Warning for Portland.

Although heavy rainfall also occurred inland from the coastal front, amounts were twice as high near the front. Multiple flash flood reports were received from Portland up to the Midcoast. The most notable part of this event was how the convergence at the coastal front produced record rainfall rates and gave Portland more than a month's worth of precipitation in only 2 hours.

Seasonal Weather Review

By Chris Kimble, Forecaster

Much of the past year has seen below normal temperatures at Portland. March was the 4th coldest on record in the city and the coldest March in almost half a century. The cool weather continued through April which marked the 6th straight month of below normal temperatures dating back to November 2013. Through the entire winter and spring there were 63 days that did not rise above freezing. This was 50% more than the normal of about 42 days and the 5th most freezing days on record. Snow remained on the ground through April 7, a period of 122 consecutive days with snow on the ground. This was the 7th longest stretch of consecutive days with snow on the ground in the entire 122 years of snow records at Portland and the longest since 1979. Warmer weather finally arrived in May when Portland experienced its first warmer than normal month since October 2013, although the average was less than 1 degree above normal.

	HIGH	LOW	AVE	PRECIP	SNOW	90+
March	36.2 (-5.9)	17.7 (-7.2)	27.0 (-6.5)	4.31 (+0.07)	3.7 (-9.0)	0 (0.0)
April	52.5 (-0.8)	34.1 (-0.6)	43.3 (-0.7)	2.72 (-1.60)	1.2 (-1.6)	0 (0.0)
May	64.0 (+0.5)	45.4 (+1.2)	54.7 (+0.8)	3.87 (-0.14)	T (0.0)	0 (-0.2)
June	74.2 (+1.0)	54.0 (+0.4)	64.1 (+0.7)	4.30 (+0.51)	0 (0.0)	0 (-0.7)
July	78.4 (-0.4)	61.3 (+1.9)	69.8 (+0.7)	6.12 (+2.51)	0 (0.0)	0 (-1.5)
August	76.4 (-1.3)	57.1 (-1.1)	66.7 (-1.3)	8.56 (+5.42)	0 (0.0)	0 (-1.1)

Table 1: Portland weather statistics for Spring and Summer 2014.

Although June and July were above normal, there were no periods of truly hot weather in Portland. The temperature did not rise above 85 degrees until July 23. Never before has Portland waited that long to warm up above 85 degrees. There were a few significant storm systems which brought heavy rain. More than 2 inches fell on June 13, and almost 3 inches fell from July 2 through 5 partially associated with Hurricane Arthur passing by offshore. By mid-July the weather pattern had shifted to a cooler pattern, with most of the last half of July and most of August seeing below normal conditions. It wasn't until the end of August that the cool pattern broke and some warmer air returned. The warmest day of the year was on August 27 when the temperature rose to 88 degrees. But the most significant event in August was the extreme rainfall on August 13, when more than 6 inches of rain fell during the evening and caused flash flooding. This was more than a third of the entire summer rainfall.

Overall the summer was a wet one with a noticeable absence of hot weather. The yearly maximum temperature of 88 degrees is the 3rd coolest on record (lowest was 86 in 1996). The more than 18 inches of rain that fell was the 4th wettest summer on record (wettest was 2009 with 22.31 inches). In fact, there has been a trend toward wetter summers in the last several years. Out of the top 4 wettest summers on record, 3 have occurred since 2009. Every summer since 2004 has had at least 10 inches of rain, a period of 11 years with nearly nonstop above normal rainfall. No other time in Portland's 144-year precipitation records have there been more than 4 consecutive summers with more than 10 inches of rain. As a result, summer 2014 was very wet by historical standards, but fit the trend of the last several years.

Weather and Fall Colors

By Stacie Hanes, Senior Forecaster

When fall arrives in New England, many people think of cooler weather, apple cider, and the beautiful colors of the changing deciduous tree leaves: red, yellow, orange, and brown. New England has some of the most vibrant fall color in the world, bringing thousands of sightseers every year. In general, the last week in September though the first few weeks of October is the peak time for fall colors in Maine and New Hampshire, with northern areas peaking first while southern and coastal areas peak last.

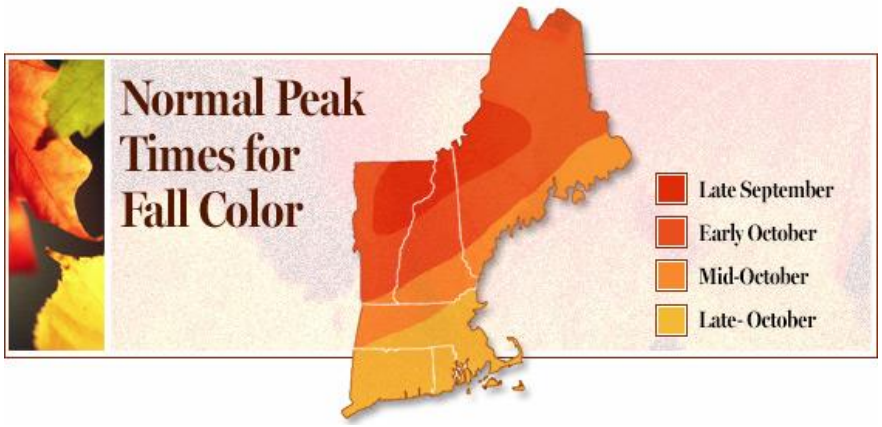

Figure 3: Normal dates of peak fall color in New England. Map available from www.boston.com

But what causes the leaves to change color? Leaves get their normal green color from an abundance of chlorophyll. Chlorophyll captures sunlight and converts it to energy, but during the fall it stops being produced in the leaves. Since the chlorophyll's green pigment is weakened, the other pigments in the leaves that have been present all along, like orange and red, become visible.

The time of best fall foliage color varies each year with environmental factors. Things like the amount of rain that has fallen recently, high and low temperatures, the number of daylight hours, and the amount of sugar in the leaves all factor into how brilliant the fall colors become. For the brightest colors, warm, sunny days and cool nights are needed. On warm days, sugar is produced in the leaves of some trees and then trapped by the cool night. As this sugar accumulates, the colors get brighter.

In general, peak foliage season begins in the higher elevations and latitudes and works southward with time. There are microclimates in valleys, near lakes and swamps, and in varied terrain that can produce pockets of fall color according to a more localized time table. Also keep in mind that a strong wind storm can rip leaves off trees before they have a chance to reach their peak colors.

For updates on the changing colors this year, use the following websites:

In Maine: http://www.maine.gov/dacf/mfs/projects/fall_foliage/index.shtml
In New Hampshire: http://www.visitnh.gov/4-seasons/fall-harvest/foliage/foliage-tracker.aspx

Winter Hazards – Stay Informed

By John Jensenius, Warning Coordination Meteorologist

As the days get shorter and the sun gets lower in the sky, we all know that winter weather is not far away. In several months, snow will be flying, the roads will become slippery and here at the National weather service we'll be issuing Watches, Warnings, and Advisories to help everyone prepare for what Mother Nature sends our way. Our mission is to keep people safe, to help prevent damage to property, and to minimize the impact on the transportation of goods and services. We want you and others to be able to get where you want to go without being surprised by hazardous winter weather.

It's important to stay informed and plan for any impending weather. Here's some basic terminology that we use to alert the public to threatening weather.

Winter Storm Watch – Conditions are favorable for a major winter storm to affect the region, usually within the next 36 to 60 hours.

Winter Storm Warning – A major winter storm is either impacting the region or expected to impact the region within the next 48 hours. Winter storm warnings are issued when an average of 6 or more inches of snow or sleet is expected across the area.

Ice Storm Warning – Freezing rain is expected to produce a half inch or more of ice accretion to trees and wires. Widespread power outages can be expected.

Winter Weather Advisory – A winter storm will impact the area, but its impacts should be minimal provided that people take the appropriate precautions.

Freezing Rain Advisory – Freezing rain is expected to create dangerous driving or walking conditions on untreated surfaces.

Wind Chill Warning – Wind chill temperatures of -30 F or colder are expected.

Wind Chill Advisory – Wind chill temperatures of -20 to -29 F are expected.

A good way to monitor the current forecast and any watches, warnings or advisories is on our web site. Specifically, last year we added a web page for Emergency Managers (http://www.weather.gov/gyx//EMhome), but it can be used by anyone. From our main web page, mouse over current hazards, then click on briefing page on the drop-down menu. The briefing page will point out any potential hazards and direct you to one of the links below for additional information.

Winter Spotters: What's Their Role?

By Chris Kimble, General Forecaster

Storm spotters are an integral part of the weather forecast and warning process. They provide valuable ground truth as to what's going on with the weather that forecasters may not otherwise have access to. In Maine and New Hampshire, wintertime reports from storm spotters are especially important. Winter forecasting can be very tricky, with many different types of wintry precipitation possible. Accumulations of wintry precipitation can be especially hazardous.

With all the advancements in technology over the past few decades, weather observing and forecasting has improved dramatically. Satellite technology has allowed us to track storms and their development. Radar has provided in depth observations of the intensity and motion of precipitation. Recent Dual Polarization radar upgrades provide greater insights into precipitation type. But nothing has replaced the storm spotters and the crucial role they play.

As a reminder to all of our valuable storm spotters, here are some of the contributions that are most helpful to us at the National Weather Service:

1) **Precipitation type** – Knowing where rain, sleet, freezing rain, or snow is falling is important in the forecast and warning process. When precipitation type changes from one type to another, it's a good idea to give us a call.

2) **Snow Amount** – Measure the new snowfall using a snow board or other hard surface that has been cleared off since the last snow. Make sure your snowboard or measuring area is located in a spot where drifting is minimized and a measurement that is representative of the general area can be obtained. Take several measurements and average them to come up with the snowfall. Most spotters report this to us as a cumulative storm total, even if multiple measurements are taken during the storm.

3) **Snowfall Rate** – If snowfall is especially heavy, we want to know. Rates of 1 inch per hour or more are significant enough to give us a call. Rates this heavy can make it difficult for snow removal crews to keep up and can cause a busted snowfall forecast very quickly!

4) **Ice Accumulation** – When freezing rain accumulates it can be one of the most dangerous winter weather conditions. When measuring ice accretion, we are looking for the total depth of ice which has formed on exposed surfaces. One common way to measure is by breaking off a small twig and measuring the ice on the twig. When doing this it is important to measure from the outside of the twig to the edge of the ice and not the total diameter of the ice-covered twig!

5) **Damage/Impacts** – High winds during winter storms can occasionally cause damage, as can significant accumulations of ice. If you see damage or have any unusual impacts from the storm, let us know.

Routine snowfall reports can be reported via the CoCoRaHS website at http://cocorahs.org. Important, time-sensitive information should be reported directly to the National Weather Service in Gray at 1-800-482-0913 or by submitting a storm report from our website.

COOP Observers Recognized

By Nichole Becker, Observing Program Leader

The NWS Weather Forecast Office in Gray, Maine, gives Length of Service Awards to individuals and institutions involved in the Cooperative Observing Program. Length of Service Awards given this year range from 10 to 75 years of service and are designed to recognize observers for their continued service. We are very lucky and proud of each Cooperative Weather Observer who volunteers their time to report daily precipitation and temperatures. Their dedicated service is important to the NWS daily forecasting mission and our national climate records. The following locations will receive Length of Service Awards in 2014:

75 Years: Pittsburg (NH)
40 Years: New Sharon (ME), Greenland (NH)
30 Years: Bridgton (ME)
25 Years: Port Clyde (ME), Kennebunkport (ME)
20 Years: Eliot (ME)
15 Years: Tamworth (NH), Cape Neddick (ME), and Harmony (ME)
10 Years: Epping (NH)

The NWS Gray is also able to honor some observers with prestigious awards for their exceptional quality of observations. There are three John Campanius Holm Awards that will be given to observers in New Sharon, ME; Bridgton, ME; and Epping, NH. In order to be eligible for the Holm Award, the observer has to have at least 20 years of service. There are only up to 25 Holm Awards given out in the entire country each year.

Figure 4: A typical Cooperative Observer location includes a temperature sensor and a rain gage, often located in someone's backyard. Observations are recorded daily and sent to the National Weather Service to serve as part of the national climatic record and to aid in forecasting.

We are grateful to all of our observers and we look forward to giving out the next round of awards in 2015!

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 Warning Coordination Meteorologist John Jensenius.

What is your role at the office? My job entails a variety of duties. The National Weather Service's mission is to save lives, protect property, and promote the economic well-being of this country. My primary function is to work with various groups and organizations to make sure critical weather information is properly communicated and understood. In particular, I coordinate closely with emergency management officials before, during and after significant weather events to accomplish our mission. I'm also responsible for documenting significant weather events and, if necessary, conducting storm damage surveys. In addition, I'm in charge of the office's education and outreach, and spotter programs. I also support the office's mission by filling in on the forecast desk, filling in as acting Meteorologist-In-Charge, or helping out with administrative work.

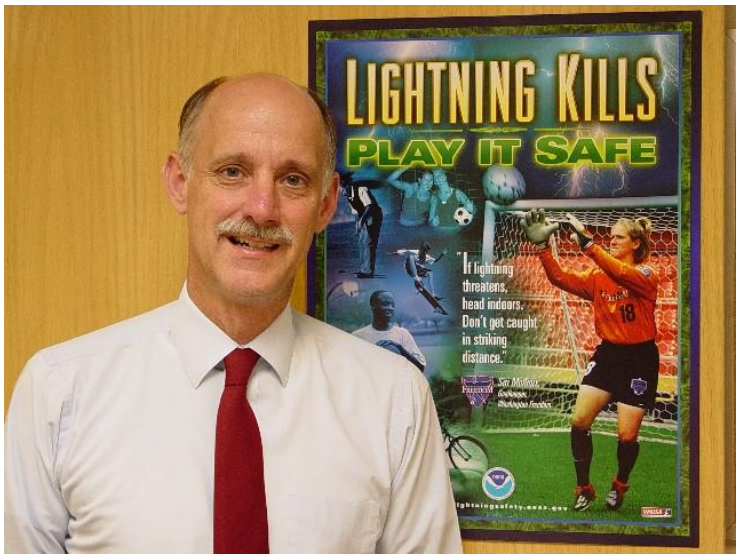

Figure 5: John Jensenius, Warning Coordination Meteorologist at NWS Gray

How long have you worked for the NWS in Gray? I officially started in November of 1994 when I was sent to Oklahoma for radar training. I arrived on station in early January 1995.

Where else have you worked? After graduate school, I taught meteorology for a year at the State University of New York at Oneonta. From there, I began my NWS career in 1977 working for the Techniques Development Laboratory (TDL) at the World Weather Building near Washington, D.C. There, I developed statistical equations to forecast various weather elements based on the output of computer models. These statistical forecasts were sent out to meteorologists around the country to help predict the weather. Eventually, I became Chief of TDL's Computer Systems Section and was responsible for several hundred operational computer programs that ran daily.

Where did you grow up? I grew up in a rural area near York, Pennsylvania. There, I developed a love of nature and the outdoors.

Staff Profile (Continued)

Where did you get your education? I started college as a biology major at Millersville University, but after two years I switched my major to Earth Science with an emphasis on meteorology. After graduation from Millersville, I went to Penn State where I earned a Master's degree in meteorology

How did you first get interested in weather? Like most meteorologists, I became interested in weather early in life. As a child, I had a small weather station that I used to track temperatures and could monitor other weather elements. Every morning at 7:15, I also listened to a broadcast of the upcoming weather from the NWS office in Harrisburg, PA, which was carried on local radio stations. And, above all, I loved snow storms!

What is the most interesting part of your job? There are many aspects of my job that are quite interesting. Obviously, the daily changes in the weather and, in particular, storms make my job interesting. However, the most interesting part of my job is working with people. As my job title indicates, I coordinate with many people. Whether it is with the public, emergency managers, the media, the forecast or maintenance staff, or regional and national NWS employees, I find the interaction the best part of the job. Our office is here to provide the best service we can to the people we serve, and I try to do my part to make that happen.

What is the most challenging aspect of your job? The many aspects that the job entails requires multitasking, and managing both time and workload are all challenging. This is especially true during the summer when, in addition to the normal workload, I'm filling in on the forecast desk for staff on vacation, conducting storm surveys, responding to media inquiries on storms, and, at the same time, trying to enjoy some time off.

What is the most memorable weather event that you have worked? Undoubtedly, the 1998 ice storm was the most memorable event. The immediate area around the office had up to 3 inches of ice accretion. The storm left most of our staff without power to their homes and there was no commercial electrical service to the office for six days. After several days, our office's backup generator failed, creating additional problems. Although the storm offered many challenges, it demonstrated to me the resourcefulness of the people that live in northern New England and how people can work together to get through a difficult situation.

NWS Comings and Goings

By Hendricus Lulofs, Meteorologist-in-Charge

In August, our office saw a new face join our staff while at the same time we said "So long" to a longtime employee.

Lia Hoffman was selected to fill our long standing Administrative Support Assistant (ASA) vacancy. Lia comes to us from the US Coast Guard where she has over 20 years of experience working in administration. For the past 9 years she has been working as an Administrative Assistant in South Portland. Many of her job functions and responsibilities with the Coast Guard translate directly to the responsibilities for the ASA job here at the Gray office. She has experience as timekeeper, travel, budgeting, accounting, HR, supplies, and property. The office was without an ASA for over a year and a half making Lia's arrival very welcomed!

Figure 6: Steve Capriola, Senior Forecaster, retired in August 2014 after 33 years of government service. A frequent cyclist, Steve will now be free to bike whenever he wants without the hassle of shift work!

Senior Forecaster Steven Capriola retired at the end of August. Steve had over 33 years of government service, including 31 years with the National Weather Service. A graduate from Lyndon State College (LSC) in Lyndonville, VT, Steve began his National Weather Service career in Charleston, WV in December, 1982 as a general forecaster. In November, 1987 Steve was promoted to Lead Forecaster at the Portland, Maine office located in the federal building in downtown Portland. Steve was part of two office moves while at the Portland Forecast Office. The first move was to the Portland Jetport in 1988 followed by the move to the Gray Office in 1994 as part of the modernization of the NWS. While at the Gray Forecast Office Steve was the climate services focal point for nearly ten years. He was co-leader of the office spotter program for a number of years, which included giving spotter training seminars and publishing a bi-monthly newsletter. Steve also wrote or co-authored several papers while with the Weather Service.

Steve's journey through the Weather Service took him from teletype data, coloring facsimile charts, hand plotting and analyzing surface, upper air and sounding charts as well as typing forecasts by hand to the computerized age where just about everything has been automated, included forecast preparations through a Graphical Forecast Editor. We wish Steve the best in his retirement!

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For questions, comments, or suggestions contact us at

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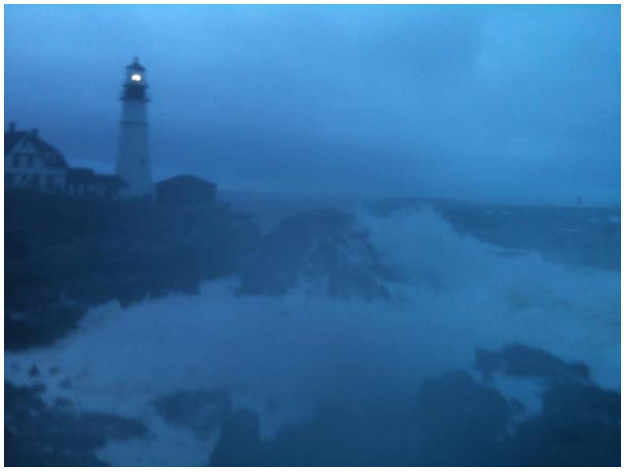

Photo by Chris Kimble