Photo by Stacie Hanes

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The Coastal Front

2018

Volume IX

NWS Director Visits Maine

By Nikki Becker, Observing Program Leader

In early May, the Director of the National Weather Service, Dr. Louis Uccellini, visited the Weather Forecast Office (WFO) in Gray. The morning started out with the NWS Director, Dr. Uccellini, and a member of his team helping to launch the morning weather balloon, something NWS Gray performs at least twice daily. Afterwards, Dr. Uccellini met with WFO Gray's staff and listened to presentations on local programs, projects, and events in which NWS Gray is involved.

WFO Gray Warning Coordination Meteorologist John Jensenius was presented with the Sherman's Lagoon award for his relentless dedication to lightning safety, which was instrumental to help reduce lightning deaths in the United States. The Sherman's Lagoon award is a special award the Director can choose to give out to a NWS employee.

Figure 1: NWS Director Louis Uccellini presents WFO Gray Warning Coordination Meteorologist, John Jensenius, with the Sherman's Lagoon award for his relentless dedication to lightning safety in the United States.

The staff of WFO Gray was able to listen to the Director's presentation on how the NWS is evolving to ensure we are giving Impact-based Decision Support Services to our core partners and general public as we continue to help build a Weather Ready Nation. WFO Gray management staff was able to show the Director how northern New England forecast offices partner with the United States Coast Guard (USCG) Sector of Northern New England with the Cold Water initiative.

The Cold Water initiative is using the USCG's knowledge of people habits and the impacts of cold water along with NWS knowledge of weather and ability to issue statements and advisories to help inform people of the hazard of how cold water can kill. Paddle crafts, which are especially dangerous in cold water, include stand up paddleboards, kayaks, and canoes. This is a common issue when the water temperature is below 60 degrees and the air temperature is 10 or more degrees warmer than the water, causing some to underestimate the threat from the cold water.

The USCG took NWS Director and WFO Gray management staff out on a USCG Cutter in Casco Bay. On that day, the air temperature was 85 degrees with a water temperature of 45 degrees. Due to it being the first warm day of the spring season, people were out in the water in paddle crafts even with a water temperature of 45 degrees that can kill someone within minutes if they capsize. You can learn more about the effects of cold water on people through this NWS website on the topic: https://www.weather.gov/safety/coldwater

Figure 2: NWS Director Louis Uccellini helps release a weather balloon (top) and meets with the US Coast Guard on one of their cutters in Casco Bay (bottom).

Air Quality Issues: Ozone

By Martha Webster, Maine Department of Environmental Protection

This is the last of a couple of articles regarding air quality issues in Maine. This article will focus on Ozone. If you are not familiar with air quality forecasting in Maine, please review the article in the previous edition of this newsletter called: "Air Quality Forecasting" and: http://www.maine.gov/dep/air/ozone/index.html.

What is Ozone?

Ozone is a colorless gas made up of three molecules of oxygen. In the upper atmosphere (stratosphere) the ozone layer protects us from the sun's strong ultra-violet rays that cause skin cancers. At ground level, ozone becomes a pollutant that affects our health. Hence the saying -- "Ozone: good up high; bad nearby."

Where does Ozone come from?

Ozone in the outside air is not usually emitted directly. It is a 'photochemical pollutant' meaning it forms in the presence of sunlight from pollutants given off by the burning of fuels and other sources. These pollutants are called ozone precursors. The most dominant of the precursors are nitrogen oxides (NOx) and volatile organic compounds (VOCs). These precursors 'cook' in strong sunshine and the result of this complex chemical reaction is ozone.

Why is Ozone a problem?

Ozone primarily impacts the lungs, but it can have other impacts on people's health. The most prevalent health impacts of ozone are:

- Irritation of the respiratory system as evidenced by: coughing, throat irritation or an uncomfortable sensation in your chest
- Reduced lung function
- Inflamed and Damaged lining of the lungs: much like a sunburn on your skin
- Aggravated Asthma
- Aggravated emphysema and chronic bronchitis

Those who are more likely to be affected by ozone include children, the elderly and those with an existing lung disease. Once ozone levels reach or exceed the 'Unhealthy for Sensitive Groups' category on the Air Quality Index (AQI) scale even healthy adults who exert themselves are considered a sensitive group because exertion increases the amount of air one is breathing which increases the pollution exposure. One can learn more about the health effects by going to:
http://www.maine.gov/dep/air/ozone/airqualityindexandhealth.html
https://www.airnow.gov/index.cfm?action=ozone_health.index

Ozone in Maine

Maine DEP has been monitoring ozone for many years at sites such as the one in the photo. Much has been learned during that time. A few monitors run year-round but most are 'seasonal' running from sometime in March through early October. The data is available in near-real time. These monitors measure ozone, and every hour that data is gathered and sent to Maine DEP's web site (http://www.maine.gov/dep/air/ozone/hourly_data.html) as well as EPA's AirNow web site (https://airnow.gov/) for public display.

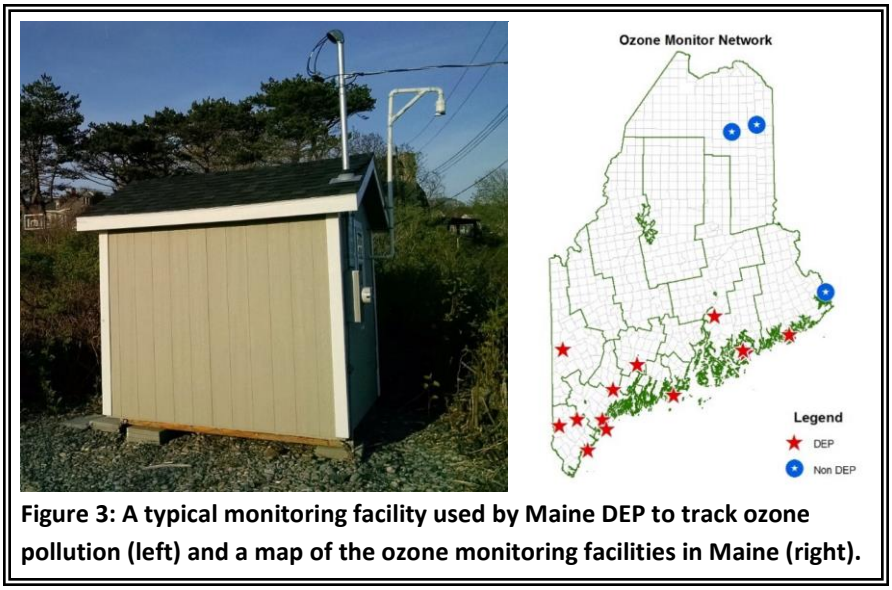

Figure 3: A typical monitoring facility used by Maine DEP to track ozone pollution (left) and a map of the ozone monitoring facilities in Maine (right).

Since ozone is a photochemical pollutant, requiring strong sunlight to form, ozone values are low during the colder months. This is because the sun is lower in the sky and the days are shorter. In Maine, background levels of ozone begin to rise in February and levels can be of concern to sensitive groups on some days in March. Maine's official ozone season, as designated by the Environmental Protection Agency (EPA), is April 1st through September 30th.

Forecasting Ozone

Maine DEP's Air Quality Meteorologists enjoy a great working relationship with the local National Weather Service (NWS) offices and use NWS products to forecast air quality in Maine. For predicting ozone levels, the following information can be critical on some days: the timing of frontal passage, timing and thickness of cloud cover, timing of rain as well as how far inland the sea breeze front is likely to travel. Time of year is also a consideration. From an air quality forecasting perspective ozone exhibits two personalities: Spring Ozone and Summer Ozone.

Spring Ozone is like a wild beast and doesn't follow the "rules." It can pop up with little or no notice. Part of the issue is that background levels of ozone are highest prior to leaf out. So, it doesn't take as much 'cooking' to reach the moderate level. Spring Ozone can reach the moderate range of the AQI on a cloudy day with scattered showers if transport is just right from an upwind area that had moderate ozone the day before. Spring Ozone can reach the moderate range if there is a sunny day with temperatures in the 40's right after a snowstorm. This is because the fresh white snow will reflect sunlight thus increasing the amount of 'cooking' that occurs. Spring Ozone doesn't follow typical transport patterns so even northwest (NW) or northeast (NE) winds, which are usually clean winds, won't prevent levels from reaching the

moderate range. Every once in a while, Spring Ozone can even reach the 'Unhealthy for Sensitive Groups' range before the official start of ozone season. Nearly all air quality forecasting models tend to under predict ozone levels in the spring. Maine DEP's primary Air Quality Meteorologist has been heard to mutter: "I hate Spring Ozone!" For areas of Maine away from the coast, ozone levels are often actually highest in the Spring. That is unless a major, regional, multi-day event engulfs the state of Maine during the summer.

Summer Ozone on the other hand is a bit more predictable. Once the trees are fully leafed out there are typical transport patterns that come into play. Usually, winds from the NW to east E bring clean air. Thick clouds, especially just upwind and into Maine, can greatly reduce the amount of sunlight available to 'cook' the ozone and therefore can prevent ozone levels from rising too high in Maine. Summer Ozone levels are usually highest along the coast. This is because when an air mass is transported over the Gulf of Maine the cool waters cause the air mass to form layers which concentrates ozone and other pollutants. The dynamics of the change from land to water also turn the winds and the Maine coast is in perfect alignment to receive those winds. As the air mass moves inland, leaves and other vegetation remove ozone from the air and ozone levels are reduced.

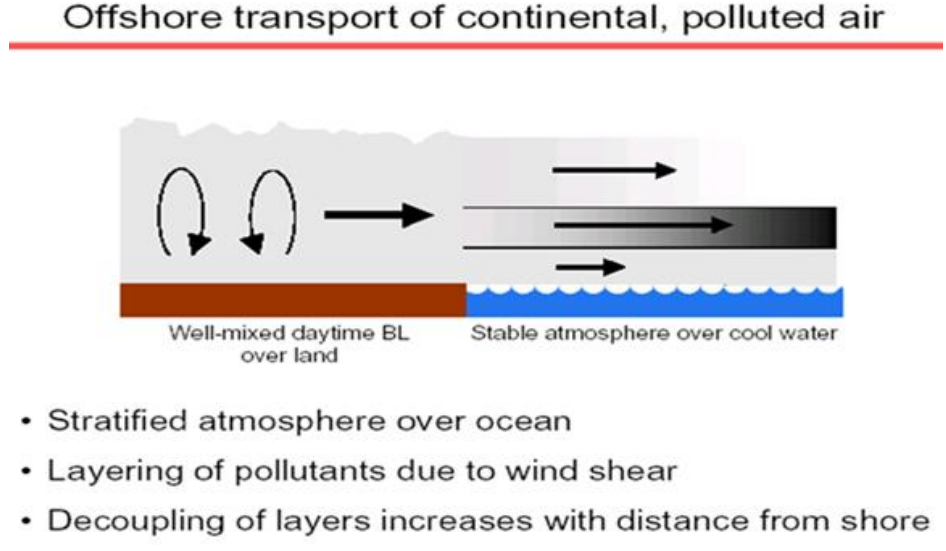

Figure 4: An idealized representation of meteorological conditions which affect ozone formation and transport. BL refers to the "boundary layer."

Maine DEP's Air Quality Meteorologists are continuously honing their air quality forecasting skills. It seems that every year there are new developments in the 'art and science' of forecasting ozone, especially 'Spring Ozone'. In addition to what has been stated above, some of the confounders are: the national standards change periodically (which results in revised AQI category ranges used in the forecast); emission levels are always changing; and it can be difficult to determine the height above ground that the wildfire smoke is being transported (when it is lower in elevation the chemical makeup can enhance ozone formation at the surface). In the end, the goal is to weigh all the evidence and provide an air quality forecast that is as accurate as possible so people know when to take actions to protect their health.

The Bipolar Winter of 2017-18

By Chris Kimble, Climate Focal Point

The last 6 months have seen quite a wide range of weather conditions here in northern New England. After a very warm fall, including nearly a week of 80-degree heat in late September, the cold of winter seemed slow to arrive. A fairly persistent ridge of high pressure over the western Atlantic Ocean was the primary cause for the early fall warmth. While this ridge directed several hurricanes westward toward Florida, it pumped warm and humid air northward into New England. Things began to change in late October when three storm systems brought heavy rain, with the last one bringing very strong and damaging winds as well. This series of storms helped to initiate a shift in the weather pattern which had been stagnant for so long. By early November, residents in New England felt a noticeable shift toward colder weather as the weather pattern became dominated by a trough of low pressure over the eastern half of North America, allowing cold air from the Arctic to pour in on a fairly routine basis.

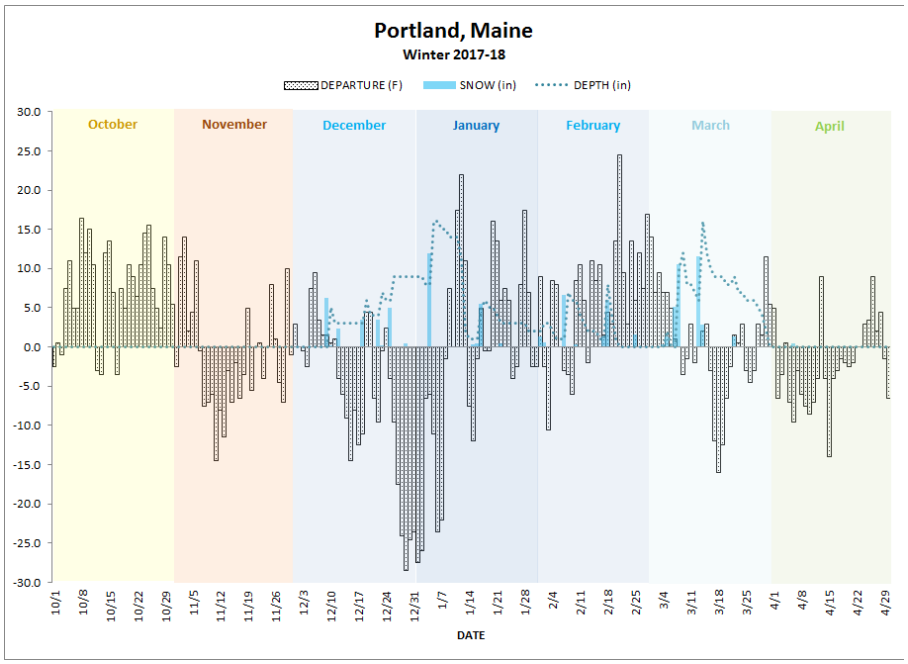

Figure 5: A graph showing average temperature (black hollow bars), snow (blue bars), and snow depth (blue dotted line) at Portland, Maine

The cold that began in November intensified through December. Several storm systems brought snow and freezing rain, with cold temperatures through most of the month. It was on Christmas when things got even more intense. A snowstorm brought a few hours of heavy snow Christmas morning, accumulating to several inches in just a short time period. Behind this storm, a brutally cold Arctic air mass was on the march. For 7 straight days, Portland did not see the temperature rise above 15 degrees, with it dropping below zero each night. This was one of the most intense and long lasting cold spells recorded at Portland, including the coldest New Year's Day on record. Just as the brutal cold briefly ended, an intense winter storm brought nearly a foot of snow and blizzard conditions on January 4. More cold air moved in behind this storm, but it was not as intense or long lasting as the previous cold spell. Soon after, the January Thaw arrived. Warm air surged northward ahead of a cold front on January 12 bringing heavy rain. This rain and snow melt caused ice jam flooding on some rivers, including the Kennebec River at Augusta.

Ultimately, though, the weather pattern began to shift again with warmer temperatures becoming the new standard from the second half of January right through the month of February. There were occasional colder days, including a few snowstorms, but warm weather was the trend. In fact, most of New England saw the warmest February day on record when the temperature warmed into the 60s and 70s on February 21st. Portland set a new February record high of 68 degrees while Concord set the new record at 74 degrees. Just when it seemed the intense early winter had made an early exit, the pattern shifted again in March. More Arctic air poured into New England during the middle of the month, heralded by two more intense snowstorms. The first came on March 7th and 8th, with the second arriving a few days later on the 13th and 14th. Portland saw more than a foot of snow from each snowstorm, bringing another few weeks of renewed snow cover. Although there was a brief warm up at the end of March, the cold returned in April as a persistent trough of low pressure kept cold temperatures and occasional snow showers around for a few weeks. Even more intense cold moved in during the middle of April, and on April 15 most of northern New England stayed below freezing all day with light snow, sleet, and freezing rain falling. This was the coldest day on record for so late in the season at both Portland (33) and Concord (32). Ultimately, though, the warmth of Spring could not be held back, and warmer weather finally arrived at the end of April.

SEVERE WEATHER REVIEW

With the arrival of warmer weather comes an increased risk for severe thunderstorms. The National Weather Service is committed to providing advance warning of many weather hazards including severe thunderstorms, tornadoes, and flash flooding. In support of that mission, we issue watches and warnings to alert people of the threats. It is important to remember the difference between a watch and a warning, and know what action to take when one is issued.

PRODUCT	WHAT IT MEANS	WHAT YOU SHOULD DO
Watch	Conditions are favorable for hazardous weather to develop. Example: Severe Thunderstorm Watch	Be alert for changing weather conditions and listen for possible warnings.
Warning	Hazardous weather is occurring now or will be very shortly. Example: Severe Thunderstorm Warning	Take action now! Get inside a sturdy structure and avoid windows.

The National Weather Service uses the following definitions when issuing watches and warnings for hazardous weather:

Severe Thunderstorm — **A thunderstorm producing 58 mph winds or stronger and/or 1 inch diameter hail.**

Tornado — **A violently rotating column of air extending from the base of a thunderstorm to the ground**

Flash Flood — **A rapid rise of water onto normally dry land.**

2018 Cooperative Observer Awards

By Nikki Becker, Observing Program Leader

The NWS Weather Forecast Office in Gray, Maine, will present a total of 13 Length of Service Awards to individuals and institutions ranging from 10 to 125 years of service across Maine and New Hampshire. We are very lucky and proud to have every 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 the backbone of our national climate records. It is always amazing to present an award to an institution with over a century of weather observations.

NWS Gray will honor one observer with the Thomas Jefferson Award, a prestigious award for exceptional quality of observations. This is the highest award for exceptional service an observer can receive, which will be given to the observer in Farmington, ME. No more than 5 Thomas Jefferson Awards are given out each year out of the 8,400 observers across the nation.

Figure 6: A typical Cooperative Observer station. These are often located at the homes or businesses of volunteer observers.

2018 Awards:
10 year in Maine: Rumford and Winthrop
15 year in New Hampshire: North Stratford and West Hampstead
20 year in New Hampshire: Bradford and Wentworth
25 year in Maine: Durham and Waterville
25 year in New Hampshire: Meredith and Lakeport
30 year in New Hampshire: Laconia
45 year in New Hampshire: Epping
125 year in New Hampshire: University of New Hampshire

Final Issue of the Coastal Front

By Chris Kimble, Editor-in-Chief

After 9 seasons of issuing the Coastal Front newsletter, the NWS in Gray has decided that this will be the last issue of the newsletter. Due to the increasing popularity of social media such as Facebook and Twitter, we will be devoting more efforts to reaching out to the community through these methods. Many of the topics covered in the semi-annual newsletter are already covered in real time on social media. We will also make use of our webpage to host more in depth articles and discussions on various topics, linking to these on our social media accounts. If you don't follow us on Facebook or Twitter already, please do! We look forward to greater interaction with you there.

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For questions, comments, or suggestions contact us at

GYX-Newsletter@noaa.gov

Photo by Mike Cempa