

The Coastal Front

Summer 2011

Volume II-2



Photo by Mike Cempa

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April Fool's Day Snowstorm

By Chris Kimble, General Forecaster

By late March much of Southern Maine and New Hampshire were beginning to feel like spring. Temperatures were rising and the snow was almost all melted from southern and coastal areas. It was as if winter had finally given up for the year and succumbed to the inevitability of spring warmth. But while residents were starting to appreciate the arrival of spring, winter had one more trick up its sleeve.

On the morning of April 1, April Fool's Day, residents of Maine and New Hampshire woke up to one more late season nor'easter. Heavy snow fell in interior southern New England and all the way up the coast of New Hampshire and Maine with reports of 6 to 12



Residents of Portland awoke on April Fool's Day to find that winter was not quite over yet.

Photo by Mike Cempa

inches of snow common. The heaviest snow fell from interior southern Maine eastward to the Midcoast where amounts in excess of 10 inches fell. Portland received 6.0 inches, while a few miles further inland at the NWS Office in Gray 10.4 inches fell. The wet snow accumulated efficiently on trees and branches snapped from the weight of the snow. This led to sporadic power outages as tree limbs fell onto power lines.

While significant snows in April may seem unusual, it's not that uncommon. On average, Portland will see about 3 inches of snow fall in the month. Although recent years have not seen significant snow in April, more than 15 inches fell in Portland in April 2007. A significant snowfall in April generally occurs once every three years in Portland. Interior locations see late season snowfall more often and even occasionally experience accumulations in May. The latest snowfall ever in Portland was May 10-11, 1945 when 7.0 inches fell. The April Fool's Day Nor'easter was the last significant snowfall of the 2011 season for coastal Maine and New Hampshire. Portland finished the season more than 12 inches above normal, with 78.7 inches.

NWS Office Tours

By Margaret Curtis, Meteorologist Intern



Senior Forecaster Mike Cempa demonstrates some of the capabilities of our computer systems as students from the Plymouth State chapter of the American Meteorology Society look on.

It has been a busy spring around the office with over 10 tour groups making a visit. From kindergarten classes to senior citizen organizations, groups of all ages have enjoyed a visit to our facility. School groups, 4H clubs, scouts, and homeschoolers have all learned something new about weather. A highlight of the tour is the chance to see a weather balloon. Balloons, and their associated instrumentation, called a rawinsonde, are launched daily at 7am and 7pm EDT. Do you have a group that would like to take a tour? Simply call the office at 207-688-3216 to arrange a time. Our office is staffed 7 days a week, 24 hours a day, however tours are typically given during the day or evening hours. We welcome all ages, but have found that kids ages 10+ are typically able to better appreciate the variety of information we have to share.

New TAF Sites

By Chris Kimble, General Forecaster



The National Weather Service in Gray is expanding our Terminal Aerodrome Forecast (TAF) service to two airports in our area. TAFs are coded weather forecasts for specific airport terminals which provide pilots, airport staff, and other aviation users with detailed forecast information for weather elements critical to aviation. The forecasts indicate ceiling height, visibility, weather, wind, and wind shear. They help users determine when conditions will be safe for operations and plan around poor weather conditions.

The Knox County Regional Airport in Rockland, Maine (RKD) and the Mount Washington Regional Airport near Whitefield, New Hampshire (HIE) will soon be receiving these specialized aviation forecasts. Forecasts will be produced 4 times per day and updated as necessary beginning on September 1, 2011.

With the addition of these two new airports, the National Weather Service in Gray will provide TAF service for seven airport terminals in our area. The other five locations are the Portland International Jetport (PWM), Portsmouth International Airport at Pease (PSM), Augusta State Airport (AUG), Concord Municipal Airport (CON), and the Lebanon Municipal Airport (LEB).

Spring Weather Review

By Chris Kimble, General Forecaster

The cold pattern which began in December continued through much of the month of March. Portland recorded an average temperature for March of 33.4 degrees (0.3 degrees below normal), making it the third straight month of below normal temperatures. Only 3.4 inches of snow fell during the month (9.6 inches below normal), and with gradually warming temperatures the snow which had piled up over the winter finally began to melt.

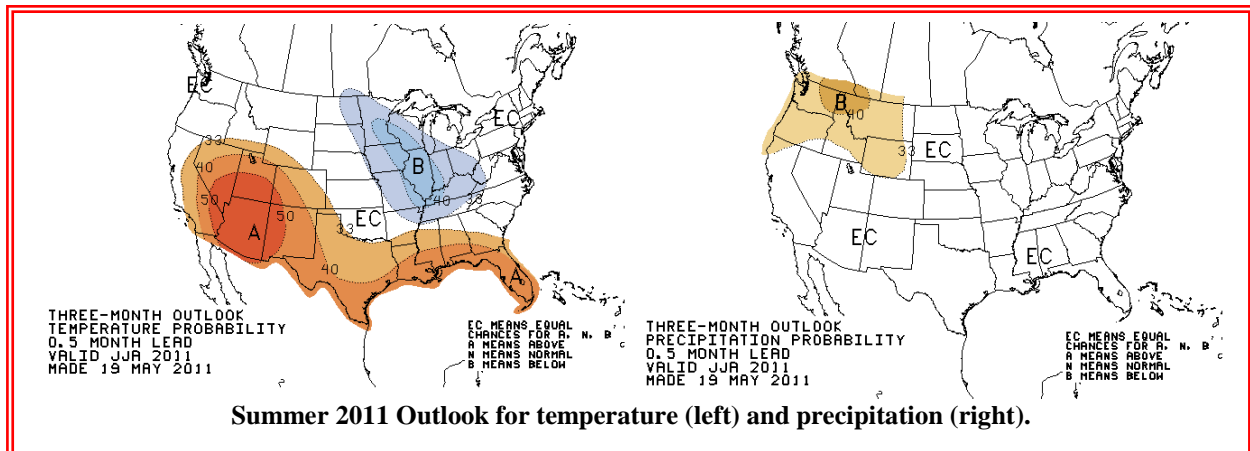
By the beginning of April, many residents across Southern Maine were feeling like spring had arrived with warming temperatures and very little snow remaining. But Mother Nature played a cruel trick this year with an April Fool's Day Nor'easter dropping 6 to 12 inches of snow across all of New Hampshire and Western Maine including 6 inches in Portland. This was the last significant snowfall of the season as the rest of the month saw a warming trend and a return to more spring-like weather.

After a quiet start to the month of May, the weather turned colder and wetter. Most of the middle of the month was dominated by a stagnant weather pattern consisting of constant clouds and rain being pushed inland off the cold Gulf of Maine waters. But the cool and wet weather finally ended, bringing a warm end to the month. Portland hit 73 degrees on May 24, the first time Portland had seen 70 degrees since October 8 of last year. This was the second longest stretch (227 days) of temperatures below 70 degrees ever recorded in Portland. The longest stretch was 229 days in 1977-78. But once temperatures began to warm, it didn't take long to hit our first 80 degree temperature of the year either. Portland climbed to 86 degrees on Memorial Day, May 30.

Summer Weather Outlook

By Chris Kimble, General Forecaster

The [Climate Prediction Center \(CPC\)](#) produces three-month temperature and precipitation outlooks for the United States. The current forecast for this summer (June, July, and August) is below. The forecast indicates equal chances for above, near, or below normal temperatures and precipitation over New England. This means there are no major climatic signals which provide a good indication as to whether this spring will be colder/warmer or wetter/drier than usual in this part of the country. Summer in New England varies depending on the distance from the coastline. Interior areas frequently see temperatures rise into the 80s and occasionally 90s, while locations near the coast are cooled by a sea breeze from the cold Gulf of Maine waters. Humidity gradually increases through the late summer, and occasional bouts with severe weather are also common. Normally precipitation during the summer months totals 9 or 10 inches, with a significant portion of this coming from thunderstorms.



Tropical Cyclones in New England

By Michael Kistner, Meteorologist Intern

Hurricanes are actually more common in the state than many would believe. Although a major hurricane (category 3 or higher) has never made a direct strike in Maine or New Hampshire, the area has been affected by numerous storms. Most hurricanes normally strike somewhere in southern New England and then weaken as they travel north toward Maine. In fact, southern New England has been struck by four major hurricanes, 10 hurricanes category 2 or lower, and 28 other tropical systems in the last 150 years. Although these storms weaken before arriving in Maine and New Hampshire, several have still caused substantial amounts of damage, with even a few fatalities.

On average, the center of a category one hurricane will pass within 75 miles of Maine every 30 years with a 3% chance of occurrence in any given year. Most storms usually get pushed out to sea by the prevailing westerly jet stream. However, occasionally when these westerly winds are weak or cut-off, storms have a chance to trek into the Northeast. Also, tropical systems are cyclic, meaning Maine can go decades without seeing any tropical activity and then may see several storms within the same decade. The most common time of year for Maine to be hit by a storm is generally at the peak of the Hurricane Season from mid August through mid September.

The most common impacts Maine will see from tropical systems are in the marine environment. However, in the last 150 years, there have been 12 storms that have caused either significant damages or fatalities on land. In 1991, Hurricane Bob killed three people and injured two others, while also causing over \$212 million dollars in damage to the state. Bob was a powerful and destructive storm and reminded us that hurricanes are a real hazard for the state. Before Bob, it had been 40 years since Maine had seen such devastation from a storm, and we haven't seen anything like it since. Hurricanes Carol and Edna occurred within 10 days of each other in 1954 and both caused extensive damage to the state including 11 fatalities.

Two other major hurricanes that impacted New England and caused extensive damage across Maine were the New England Hurricane of 1938 and the Great Atlantic Hurricane of 1944. The New England Hurricane of 1938 uprooted thousands of trees and caused staggering amounts of damage to several homes and businesses in Maine and New Hampshire. In the 1944 storm, damage was less extensive across the area, but two deaths were attributed to the storm. Most of the damage in this storm was mainly to apple trees, as Androscoggin County lost 40% of its apple crop from the storm.

Residents should look at where they live and list the possible impacts they could see from a major hurricane. They can use this information to aid in the development of an emergency plan and to be prepared when that storm arrives. If you live on the coast, you should pay attention to the tropics during hurricane season and be ready to evacuate if needed. Coastal flooding is the most dangerous hazard that occurs from a hurricane, but even if you are away from the coast, you are not impervious to hurricane threats. Hurricanes can often cause extensive inland flooding from heavy rain, and may cause more damage and injuries than is experienced along the coast.

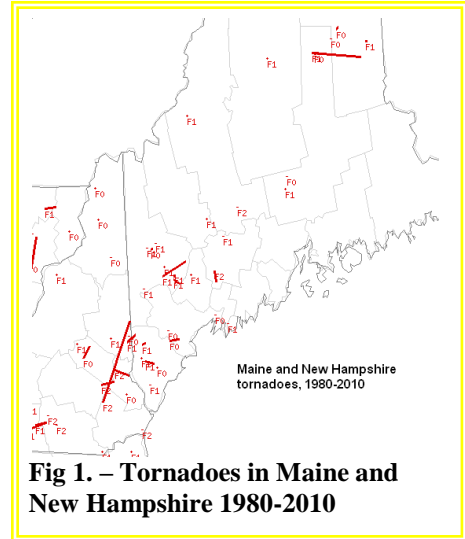
The 2011 hurricane season is now underway and residents in New England should be aware of the possible threats we face. Last year Hurricane Earl gave us quite a scare before being pushed out to sea. This year we may not be as lucky. Are you prepared?

Much appreciation is extended to our weather spotter in Poland, Wayne Cotterly. His report on *Hurricanes and Tropical Storms and Their Impact on Maine and Androscoggin County* was used extensively to gather information for this story.

Severe Weather in New England

By Michael Ekster, Senior Forecaster

While tornadic thunderstorms are relatively rare in Maine and New Hampshire as compared to the Great Plains, they do occur almost every warm season. In the last 30 years, around 80 tornadoes have been reported in Maine and New Hampshire (Fig. 1). A high percentage of them are spawned from supercell thunderstorms. These storms are different from ordinary thunderstorms in that they have a single, rotating updraft that is formed when the right combination of wind shear (changing wind speeds aloft) and instability exists in the atmosphere. This rotating updraft allows for the parent storm to last longer than most other types of thunderstorms, and also aids in the production of damaging winds, as well as hail frequently larger than golf balls. However, tornadoes are usually the most feared threat from supercell thunderstorms.



One such thunderstorm occurred in New Hampshire and Maine during the late afternoon hours of June 5th 2010. The thunderstorm formed near a warm front in Vermont and developed supercell characteristics as it moved eastward across northern New Hampshire and southern Maine. The storm produced damaging winds, large hail, and at least three tornadoes during its lifespan, which lasted over three hours and at least one hundred miles. The supercell produced its last reported tornado near South Paris, Maine which is only about 20 miles NNW of the Gray, Maine Doppler radar. This gave forecasters a good look at the structure of the tornadic storm. Fig. 2 is a radar reflectivity snapshot around the time of the tornado near South Paris. The darker red and pink colors indicate where the heaviest rain and largest hail are falling. Just to the south of the heavy rain and hail area, one can see a classic “hook echo”. This is where the low level portion of the supercell’s strong rotating updraft resides, and subsequently, the tornado.

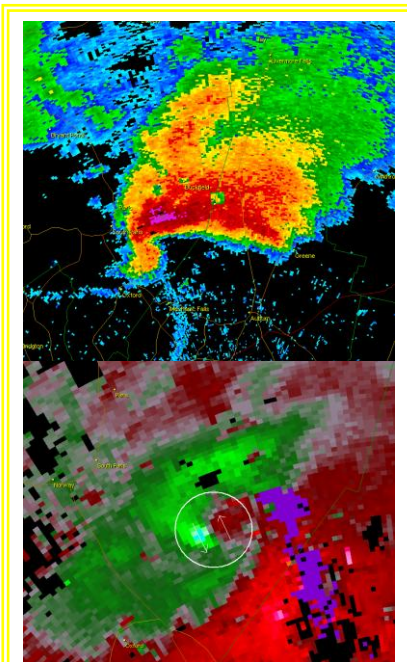


Fig 2 and 3 – Radar imagery from the South Paris tornadic storm. Above: Radar reflectivity. Below: Radar velocity.

One advantage to Doppler radar is the ability to see what the winds are doing inside the storm. Fig. 3 is the radar storm relative velocity map in the area of the reflectivity hook echo shown in Fig. 2. The green colors indicate winds blowing toward the radar (which is to the southeast of the storm). The red colors indicate winds blowing away from the radar. These two colors meet in the circled area, which is called a “velocity couplet”. This indicates that strong rotation is occurring in the area, and that a tornado is possible. In this case, an EF1 tornado did occur in this area around 5:20 pm EDT causing damage in South Paris, Oxford, and Hebron.

In summary, while supercell thunderstorms and tornadoes are more common in the central portion of the United States, they do occur in Maine and New Hampshire on occasion. One such scenario did occur on June 5th 2010 relatively close to the Doppler radar in Gray, which gave forecasters a relatively rare look into a classic tornadic supercell storm in Maine.

Staying Safe While Enjoying the Great Outdoors

By Stacie Hanes, Senior Forecaster

Summer in northern New England is a perfect time to enjoy the many outdoor activities that the area is known for, such as boating, hiking, or biking. But whether you plan to kayak around Casco Bay or camp in Baxter State Park, there are certain guidelines you should remember regarding the weather.

Thunderstorms can develop quickly during the summer months, turning a trip to the beach into a scary ordeal. In particular, lightning poses a great risk to those enjoying outdoor activities. If you are caught outside as a storm approaches, you can substantially reduce your risk of getting struck by lightning by quickly finding shelter in a building or a car. The safest buildings include completely enclosed rooms. Car ports, covered patios, and tents are not safe. If you are caught out in the open, do not take shelter near trees. If there is no safe building or vehicle nearby, avoid open fields and the tops of ridges, and stay away from water.



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Once in a safe building or vehicle, stay put for at least 30 minutes after you hear the last clap of thunder. A lightning flash can travel over 10 miles from the parent thunderstorm, so it is important to keep abreast of changing weather situations. If a thunderstorm poses a tornado, damaging wind, or large hail threat, a Severe Thunderstorm Warning or Tornado Warning will be issued by your local NWS office. A great way to stay up to date on life-saving warnings and weather information is to invest in a portable NOAA Weather Radio. These are very helpful for getting weather information in remote locations where cell phone service may not be available.

Other favorite summer pastimes in New Hampshire and Maine include boating and kayaking. Unfortunately, a large number of injuries and deaths due to lightning occur near water. If thunderstorms are in the forecast, postpone the trip for another day. If you are out on the water and skies become threatening, get back to shore as soon as possible.

Sometimes small boats such as kayaks can be capsized by a sudden increase in winds and waves. This is particularly dangerous off the New England coast where air temperatures may be warm but ocean temperatures remain frigid, even in the summer months. If the boater is not dressed properly, hypothermia can occur very quickly. Sadly this has happened time and time again off the coast of northern New England. The loss of body heat results in a loss of dexterity, consciousness, and eventually loss of life. Again, the best way to avoid this situation is to remain abreast of changing weather conditions. If you do go kayaking, make sure you have a PFD (personal flotation device) and someone knows where you are and when you are expected back.

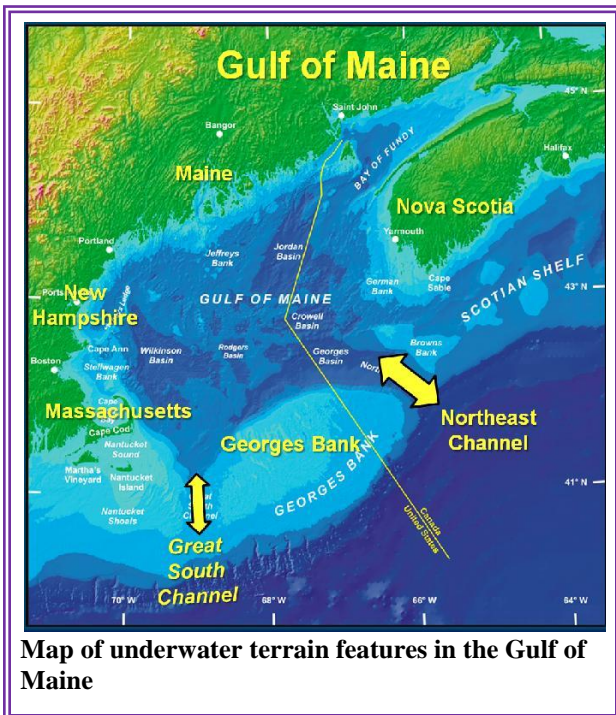


Enjoy the great outdoors this summer, but always remember to check the forecast and take your NOAA Weather Radio on any outings. With proper planning, many weather hazards can be anticipated and avoided.

Tsunamis in New England

By John Jensenius, Warning Coordination Meteorologist

Shortly after the devastating tsunami in the Indian Ocean in 2004, National Weather Service Offices began working with the West Coast/Alaska Tsunami Warning Center to determine the tsunami threat along the East Coast. For our office, one of the more interesting aspects of this effort was in determining how a tsunami would behave once it entered the Gulf of Maine.



Map of underwater terrain features in the Gulf of Maine

Major tsunamis are initiated along subduction zones on the ocean floor. In these areas, the continental and oceanic plates are in compression. When the two plates slip an earthquake is generated, and possibly a tsunami. For the Gulf of Maine, the most threatening subduction zone is along the Puerto Rican Trench. Studies show that an earthquake there could send a tsunami wave north toward the Gulf of Maine. Fortunately, the Georges Bank would reflect much of the tsunami energy back out to sea. However, some of the energy would enter the Gulf and impact much of the coastline.

Simulations show that most of the tsunami wave energy entering the Gulf of Maine would pass through either the Northeast Channel or the Great South Channel. From there, it would gradually spread throughout the Gulf. Since ocean depth determines the tsunami wave speed, the shallower waters of the

Georges Bank and the Gulf of Maine would slow the tsunami. Within the Gulf, wave movement would continue to be greatly influenced by water depth. Although a wave initiated near Puerto Rico would be moving from south to north, the first areas affected by the tsunami wave in the Gulf would be the Downeast coast of Maine. From there, the wave would impact areas both to the east and west.

Water depth also affects the concentration of wave energy. Energy is dispersed when a tsunami wave is traveling along a submarine valley and is concentrated when it is traveling along a submarine ridge. In addition, wave energy also can be concentrated on the backsides of islands. The overall results of the simulations show that tsunami waves of 3 to 4 feet above tides levels are possible, but the results also showed highly variable water levels all along the coast. In addition, the simulations showed very rapid tidal fluctuations along the coast of 3 to 6 feet. These rapid fluctuations would create very dangerous and potentially damaging currents throughout the Gulf.

The West Coast/Alaska Tsunami Warning Center is responsible for issuing watches, warnings, and advisories for the East Coast. A Watch is issued for a tsunami if major inundation is possible; a Warning is issued if major inundation is likely. An advisory is issued when dangerous and damaging currents could threaten coastal interests, but when major inundation is not expected. During an event, the National Weather Service in Gray would issue Special Weather Statements giving information on the impact along the New Hampshire and Western Maine coastlines.

NWS in Your Neighborhood



The National Weather Service will be promoting Lightning Safety Awareness Week during the week of June 20-24, 2011. Come join the staff of NWS Gray on Wednesday June 23, 2011 at the Portland Sea Dogs Baseball Game to help promote awareness of the hazards associated with lightning. The NWS will be handing out brochures for families and stickers for the children. There will also be a limited number (about 100) of lightning visors for children 12 years of age and under. Although we hope there won't be any natural fireworks that night, the 6 pm game will be followed by some man-made fireworks for everyone to enjoy.

The National Weather Service in Gray has tentatively scheduled a public open house for Saturday, September 17. Come see the office in action. Watch the NWS Gray homepage in late August for more detailed information on this very popular event. We look forward to seeing you then.



***For questions, comments, or suggestions contact us at
GYX-Newsletter@noaa.gov***