Photo by John Jensenius

The Coastal Front

Winter 2012

Volume III-4

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Sandy Strikes New England

By Michael Kistner, Meteorologist Intern

For the second year in a row, Maine and New Hampshire saw significant impacts from a tropical system. Hurricanes Irene (2011) and Sandy (2012) both had devastating effects across parts of the Northeast. However, unlike Irene, Hurricane Sandy did something that has never been observed before. Not only was Sandy much more damaging for coastal communities across the Northeast, but its track separates it from any other hurricane to hit the region in the last 150 years.

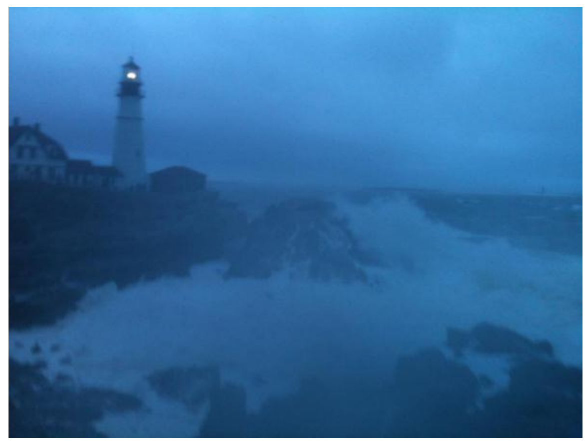

Figure 1: Portland Head Light during Sandy. October 29, 2012. Photo by Chris Kimble.

Storms that have struck the Northeast in the past have made landfall from the south, then continued north or northeastward. The coastal surge from past storms spared New Jersey and New York City because previous storms tracked to their east, leaving them on the left side of the storm. The highest surge in a hurricane occurs in the right front quadrant, where winds spiraling counterclockwise around the storm center receive an extra boost from the storm's forward motion. Water gets pushed forward on the right side, and as the system makes landfall it piles the water up on the coast. On the left side of the storm the winds are carrying the water away from the coast, so the surge is much less.

Sandy took a hard left turn and plowed into Southern New Jersey with a storm track that was nearly perpendicular to the coastline, the worst case scenario for that area. There were two key factors that caused Sandy to take that unusual left turn instead of heading out to sea. The first feature was a strong blocking ridge of high pressure

Sandy Strikes New England (Continued)

that was centered over Greenland. This ridge of high pressure was approximately 3 standard deviations stronger than normal. The second ingredient that eventually pulled Sandy ashore was a trough of low pressure that traversed across the United States throughout the week. As this trough moved closer to the Eastern U.S. it slowed down because it couldn't push through the blocking high pressure. This caused the trough to become tilted from northwest to southeast, forming what meteorologists call a negatively-tilted trough. Now, instead of the jet stream winds on the east side of the trough moving in the usual south to north direction, they were moving from the southeast to northwest. As Sandy moved northward it got caught by this negatively tilted trough and sucked right into the New Jersey Coast. The track was the worst case scenario, yet the storm was only a category 1 hurricane, so how could it cause such a high storm surge and such devastation?

Hurricane Katrina in 2005 and Hurricane Ike in 2008 completely changed our thinking on how strong a storm has to be to create a significant storm surge. Hurricane Katrina was a category 3 and Ike was a category 2 hurricane when they made landfall, yet they had storm surges higher than past category 4 and 5 storms. The reason for this is simply due to the size of the storm's wind field rotating about its center. Sandy, like Katrina and Ike, was a very large storm with sustained tropical storm force winds (58-73 mph) extending out 500 miles from its center. With this large wind field, a much larger volume of water was set into motion than would occur with a stronger storm with a smaller wind field. When the storm reached the coast there was nowhere for the water to go and it is forced inland. For more details on how this occurs you can visit the following website http://www.wunderground.com/hurricane/surge_details.asp.

Maine and New Hampshire had relatively minor impacts from Hurricane Sandy. However, even though Sandy made landfall in Southern New Jersey, we still endured wind gusts in excess of 60 mph across southern coastal areas. The highest wind gust recorded was 76 mph in Bath, ME, while the Portland Jetport recorded a 63 mph peak wind and Portsmouth, NH topped out at 60 mph. There were over 200,000 power outages reported in the two state region, with a number of trees reported on power lines and across roads. Thankfully, there was only minor inland flooding with Sandy. A few road washouts were reported in Northern New Hampshire and the Saco and Pemigewasset Rivers had some minor flooding. Along the coast, the storm surge topped out at about 3.5 feet, causing only minor beach erosion and coastal flooding.

Sandy could have been much worse for our area if it took a similar left turn, but only further north. Early computer models had Sandy making landfall much further north near Portland, which would have decimated communities along Coastal Maine. This scenario was thought to be nearly impossible in the past, but Sandy has proven that a tropical system tracking directly into the Maine or New Hampshire Coast is not out of the question.

Ice Storm of 1998: 15 Years Later

By John Jensenius, Warning Coordination Meteorologist

Although it doesn't seem that long ago, it's now been 15 years since the severe ice storm of 1998 hit sections New Hampshire and Maine. The storm knocked out power to about 1 million people in the two states, some for more than two weeks. In Maine, more than 80% of the state's population lost electrical service during the storm. Due to the severity of the storm, weather-related problems continued to plague the States for weeks after the initial storm ended. In fact, a second and less severe ice storm hit southern and coastal sections of Maine and New Hampshire just two weeks after the first storm ended and caused 200,000 people to lose power. Following the storms, both Maine and New Hampshire were declared federal disaster areas for the period from January 5th through 25th.

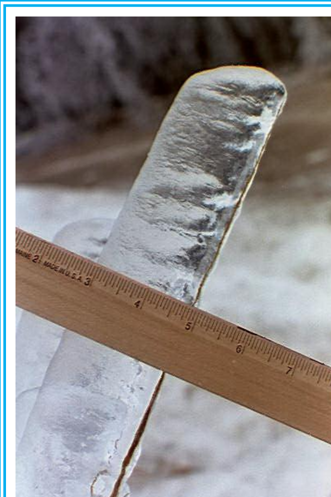

Figure 2: Ice builds to more than 2 inches in diameter. Photo by John Jensenius

The initial stages of the storm began Monday, January 5th when intermittent light freezing rain and freezing drizzle developed over parts of Maine and New Hampshire. The light mix of precipitation continued through the day Wednesday, January 7th. While temperatures warmed above freezing in most of New Hampshire and some parts of southern Maine, areas of central interior Maine remained below freezing. By Wednesday morning, ice accretions were reported to be between 1/8 and 1/4 inch in central Maine with as much as 1/2 inch in several isolated areas. Northern Maine had light snow during this period.

Steadier and heavier freezing rain developed over New Hampshire and central and southern Maine during Wednesday afternoon and evening, January 7, and continued through Friday, January 9. During that time, a stationary front was positioned south of the region. To the north of the front, a wedge of cold air remained entrenched near the ground as warm moist air moved northward from the Mid-Atlantic States over the top of the cold air. The most severe icing occurred in elevated areas of New Hampshire and most of central and interior southern Maine.

By Saturday morning, January 10, the precipitation had ended. Ice accretions ranged from about 1 to 3 inches across the region. This ice not only provided additional weight to the objects it coated, it also provided additional support. As temperatures warmed above freezing Saturday in southern sections, this additional support melted away which caused numerous trees and branches, and at least five radio or communication towers to fall. Despite sunshine, the falling ice created an imminent danger to anyone venturing outside. In fact, several towns declared States of Emergency Saturday morning to keep residents from venturing outside. The danger of falling ice, branches, and trees continued in southern and central Maine Sunday.

Ice Storm of 1998: 15 Years Later (Continued)

Auto accidents were responsible for deaths and injuries during the event. In addition, carbon monoxide poisoning, falling debris, hypothermia, and structural failures also contributed to the death toll. At least two people in Maine and one from New Hampshire died from carbon monoxide poisoning. Many more were treated at hospitals for the poisoning. One person in Maine died after being struck by falling debris and a utility worker in New Hampshire was partially paralyzed when he was struck by a falling tree. In Maine, three people died from hypothermia. They apparently were unable to return to their home safely due to the icy conditions. Finally, in Maine, one person was killed when the roof over a gas station island collapsed under the weight of snow and ice.

Hopefully, for those who experienced the ice storm, the lessons learned about personal preparedness during the ice storm have not been forgotten.

Fall Weather Review

By Chris Kimble, General Forecaster

The fall of 2012 was overall dry and slightly warmer than normal in Portland. This season will be most remembered for post-tropical storm Sandy which hit just before Halloween.

September was marked by very few extremes, with near normal temperatures during the month. Although the first half of the month was generally dry, the last 3 days brought a change to wetter conditions, with the month finishing slightly cooler and wetter than normal. The wet conditions continued through the first half of October when the weather pattern became much drier and warmer. Sandy brought 63 mph winds and 1.10 inches of rain to Portland on the 29-30. Despite 17 days with measureable rainfall in October, the month still finished more than an inch below normal and the 3rd warmest on record.

	HIGH	LOW	AVE	PRECIP	Snow
September	**69.0 (-1.0)**	**50.8 (+0.5)**	**59.9 (-0.2)**	**3.80 (+0.11)**	**0**
October	**61.3 (+2.6)**	**44.4 (+5.5)**	**52.9 (+4.1)**	**3.64 (-1.23)**	**0**
November	**46.7 (-1.3)**	**29.3 (-1.6)**	**38.0 (-1.4)**	**1.02 (-3.91)**	**2.9 (+1.0)**
Fall 2012	**59.0 (+0.1)**	**41.5 (+1.5)**	**50.3 (+0.9)**	**8.46 (-5.03)**	**2.9 (+1.0)**

Table 1: Fall 2012 climate statistics for Portland.

The pattern began to shift toward cooler, drier weather after the remnants of Sandy left the region. The first snowfall of the season occurred on the November 7-8, when 2.8 inches fell. But no measureable precipitation fell the last 16 days of the month, leading to the 7th driest November on record. November 2012 also ended a streak of 19 straight months with above normal low temperatures.

CoCoRaHS Corner – Snowfall Measurement

By Tom Hawley, Hydrologist

Measuring snowfall accurately is very important. The climate of a location not only includes temperatures and rainfall, but also snowfall and snow depth.

Measuring snowfall can be a tricky proposition especially if conditions are windy. To measure snowfall you will need a yard stick and a snow board. The snow board can be a ½ or ¾ inch piece of plywood about 2 feet by 1.5 feet in size. The snow board should be painted white to reduce the effect of solar insolation. Another useful item that is not absolutely necessary but may make your life easier is a surveyor's flag or driveway reflector. Putting one of these next to the snow board will make finding it much easier when the landscape is completely white from newly fallen snow (Figure 3).

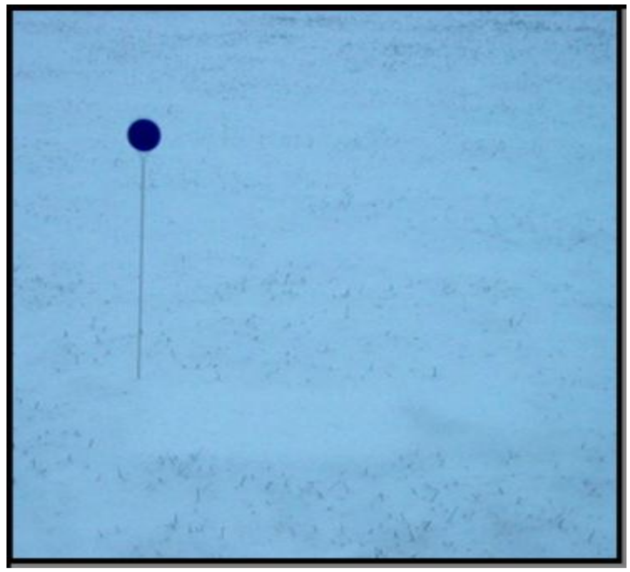

Figure 3: Placing a flag or other marker near your snowboard will make it easier to find once the landscape becomes blanketed in white!

The snow board should be put out in the yard before the winter season begins. It should set in a location that is not prone to drifting. Install the driveway reflector at this time too.

At observation time take the measurement of the newly fallen snow on the snow board. This will be the amount of snow that has fallen in the last 24 hours. Measure the newly fallen snow to the nearest tenth of an inch. After you take the measurement brush the snow board off and replace it on top of the snow on the ground to be ready for the next day's measurement. It is important to note that you must report all the snowfall that accumulated at any point during the previous 24 hours. Suppose it starts snowing at 10 AM and by 2 PM there is 4 inches of new snow on the snow board. The snow then changes to rain, and by observation time the next morning there is only 1 inch of snow left on the snow board. The amount of new snow that is reported should be 4 inches because that is what fell before the snow changed to rain.

If it is very windy and the reading on the snow board does not seem representative of what actually fell, it will then be necessary to take several measurements around the area and average these to come up with a more representative snowfall reading. The important thing to remember is to use your best judgment.

Winter Weather Awareness

By John Jensenius, Warning Coordination Meteorologist

Many of us look forward to winter and the variety of outdoor winter activities that the season brings. However, winter also brings hazardous driving conditions, dangerously cold temperatures and wind chills, and the possibility of extended power outages due to ice and heavy wet snow. As we look ahead toward the winter season, we should make sure we are prepared for the upcoming season.

Figure 4: Ice storms can cause severe damage to trees and structures, as well as make roads very slippery. This photo was taken by John Jensenius during the 1998 ice storm.

Most weather-related deaths, injuries, and damages in the winter are a result of automobile accidents. The early winter storms often produce unique challenges and hazards. New drivers are experiencing winter driving conditions for the first time, and more seasoned drivers are re-adjusting to winter driving. The combination of wet snow and pavement temperatures near freezing can create very slippery road surfaces. There is a tendency by many to continue to drive at speeds which are safe for normal road surfaces, but much too fast for snowy or slushy surfaces. Remember to slow down anytime snow or ice start to accumulate on road surfaces.

As in the past, the National Weather Service issues Watches, Warnings, and Advisories for hazardous winter conditions. A Watch indicates that the hazard is possible; a Warning indicates that the hazard is likely or occurring. Watches and Warnings are issued for an average of 6 or more inches of snow, or a half inch of ice. Advisories are issued for an average of 4 inches of snow, or any accretion of ice less than one half inch. While Watches, Warnings, and Advisories are issued to alert the public to the more significant events, any amount of snow or ice can be dangerous. In fact, most of the more serious automobile accidents occur with only a small amount of snow on the roadway because people have not reduced their speed.

Cooperative Observers Awarded for Service

By Nikki Becker, Observing Program Leader

NWS Gray is thankful for every observation we get form our Cooperative Observers across Maine and New Hampshire. This summer and fall, the National Weather Service (NWS) Gray has had the pleasure to present 22 Length of Service Awards ranging from 10 to 50 years across Maine and New Hampshire.

Figure 5: Betty Wing (left), cooperative observer in Eustis, Maine receives the Golden Jubilee for 50 years of observing. Hendricus Lulofs (right), Meteorologist-In-Charge, presents the award.

50 Years:
Eustis (ME)
45 Years:
Farmington (ME), Newcastle (ME)
40 Years:
Livermore Falls (ME)
35 Years:
Lakeport (NH)
25 Years:
Brassua Dam (ME), Bridgton (ME), Bethel (ME), Hannover 2 (NH), Jefferson (NH), Warren (NH)
20 Years:
Bath (ME), Bethlehem (NH), Benton (NH), Colebrook (NH), Lancaster (NH)
15 Years:
Hartford (ME), Moosehead (ME), Poland (ME), Alexandria (NH)
10 Years:
North Sebago (ME), Phillips (ME), Westport Island (ME)

NWS Gray was also able to honor some observers with prestigious awards for their exceptional quality of observations, which are the highest Cooperative Observer awards given in the Nation. There are around 11,000 Cooperative Observers across the United States. There were four John Campanius Holm Awards given to observers in Eustis, ME; Framington, ME; Greenland, NH; and Livermore Falls, ME. In order to be eligible for the Holm Award the observer has to have at least 20 years of service and there are only 25 given out in a year. There was one Thomas Jefferson Award given to the observer in Newcastle, ME, which is the highest award given to Cooperative Observers. To be eligible for the Jefferson Award, the observer has to have at least been awarded the Holm Award and have 25 years of service. Only 5 Jefferson Awards are given out each year. The Golden Jubilee award for 50 years of service was given to the Eustis, ME observers.

All Cooperative Awards pictures have been submitted to the National Cooperative Observer newsletter and can be found at: http://www.nws.noaa.gov/om/coop/

Figure 6: Meteorologist-in-charge Hendricus Lulofs presents awards to observers. Holm Awards were presented to Dennis Pike (top left) of Farmington, Kenneth Fernald (top right) of Greenland, and Harold Souther (bottom left) of Livermore Falls. Arlene Cole (bottom right) of Newcastle receives the Thomas Jefferson award.

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

Photo by John Jensenius