The Coastal Front

Winter 2011

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NWS Gray on Facebook

By Stacie Hanes, Senior Forecaster

National Weather Service (NWS) data and products form a national information database that is becoming more widely used online. To communicate better with our users, the NWS in Gray launched a Facebook page this fall. The office is using Facebook as a supplemental way to experimentally disseminate information and promote weather awareness activities including outreach and educational efforts. In the United States alone, there are over 150 million active user accounts on Facebook, making it the most visited site on the web. With such unprecedented reach, it poses an opportunity for the NWS in Gray to expand our community presence, and perhaps reach out to people who may use social media (such as Facebook and Twitter) as a primary means of communication.

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Figure 1: The National Weather Service in Gray now has a page on Facebook. "Like" us and receive occasional posts and weather updates from us in your news feed.

Among other things, the NWS uses its Facebook accounts to communicate upcoming hazardous weather events, gather storm information and damage photos, and announce upcoming spotter training sessions. The office regularly posts interesting weather facts such as rainfall records and other climate information. If you are a member of Facebook, please enter "US National Weather Service Gray ME" in the Search bar and "Like" us! Once you do this you will be able to see our News Feed and post on our homepage.

Hurricane Irene Causes Extreme Flooding

By John Cannon, Senior Forecaster

Northern New England experienced many significant impacts from Hurricane Irene. The storm knocked out power to hundreds of thousands of customers and brought flooding rainfall throughout the region. Vermont was particularly hard hit, where about a foot of rain fell over the entire state, destroying four to six of the iconic covered bridges, and washing out or damaging over 260 roads. The Governor proclaimed this the worst flooding in the history of Vermont.

Portions of western Maine and central New Hampshire dealt with similar issues, as flash flooding took its toll on riverfront properties. In general, three to six inches of rain fell across this region in about an 18 hour period. The Northeast River Forecast Center had suggested that this amount of rain would produce flooding in the region, and indeed, small rivers and streams overtopped their banks during the midday hours on August 29th as bands of tropical rains swept across the region.

However, the ragged remains of Irene were not giving up just yet. As the system slowly tracked across western New Hampshire during the early afternoon hours, dry air aloft began to feed in behind the system. This effectively shut off much of the precipitation across southern New Hampshire. However, as the inner core of now-Tropical Storm Irene approached the higher summits of central New Hampshire and far western Maine, rainfall rates became extreme.

Winds then switched to the southeast with the close proximity of Irene's low-level circulation, forcing tropical air to ride up the higher terrain of the White Mountains. When a moist airmass such as this is lifted, it cools and condenses to form rain. This mesoscale phenomenon is called "upsloping". In this case, the tropical airmass essentially had its moisture squeezed out like a wet sponge. The ensuing tropical downpours were estimated by doppler radar to reach a rate up to four inches per hour over the mountains between 2 and 3 pm (storm total precipitation map shown in Figure 2).

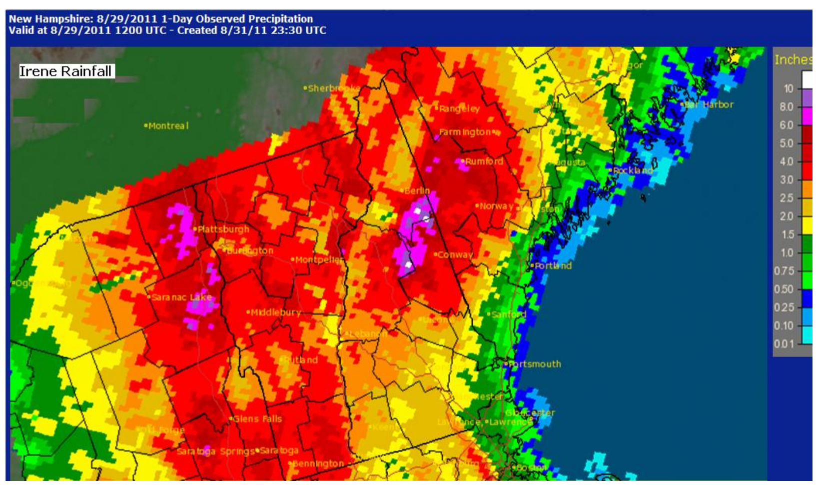

Figure 2: Radar estimated rainfall for Tropical Storm Irene. Note a few pixels in white, representing radar estimated rainfall in excess of 10 inches across the high terrain.

While rain gage coverage is limited in this area, small rivers and streams reacted violently, giving credence to the radar rainfall estimations. The upper reaches of the Pemigewasset and Saco river basins reacted first, sending river gages to their all-time record heights at Lincoln, Woodstock, and Conway (an example of the extreme runoff in Glen, New Hampshire is shown here *http://www.youtube.com/watch?v=Vc9QQpcnfeM&feature=related*). National Weather Service follow-up surveys confirmed that water surging through these communities crested even higher than our historic 1987 floods.

Figure 3: A section of a bridge was washed away on route 302 in Bartlett, New Hampshire (left), while tree trunks mark the high water line on a bridge along route 175 near Woodstock (right). Photos by John Cannon.

The intense rainfall and runoff caused mudslides and debris to be shunted downstream. Whole trees slammed against bridges, roads were washed away, and earthen levees eroded causing flash floods downstream (Figure 3). Millions of cobblestones were tossed downstream, effectively raising the bottom of the riverbed where they landed. This geological change may have created a new hazard along some rivers. With the river bottom raised, less water is required to cause river flooding. For example, river flooding began on the Saco River when the Conway river gage reached 7.5 feet one month later. Normally, there is little impact in this region until the river reaches its 9 foot flood stage.

The hydrological response to Irene's rains was truly historic in several communities. Impacts involving the intertwined disciplines of meteorology, hydrology and geology remain very complex. It will take several more river surveys, ongoing debates with experts, and future flood events to fully understand the long term effects from Irene on our local rivers.

Figure 4: Large piles of cobblestones are noted during a survey of the Saco River in Bartlett after the passage of Irene. This effectively raises the river bottom and creates new flood potential. Photo by John Cannon.

Large Scale Circulations Drive Global Weather

By Michael Kistner, Meteorologist Intern

Atmospheric circulations create the weather that we observe at any particular time and location. These circulations are nothing more than a large-scale movement of air caused by unequal heating of the Earth's surface, and they transfer heat from lower latitudes to higher latitudes. At the equator, where the Earth receives its most intense energy from the sun, warm air is forced upward. The warm air rises until it reaches the tropopause (a stable layer high above the Earth's surface), where it then diverges towards the poles. Eventually, this air cools and a portion of it sinks when it reaches about 30°N/S latitude. As this air nears the surface, it spreads northward and southward. Finally, when you add the Coriolis Force caused by the rotation of the Earth, the southward moving air deflects to the right (in the Northern Hemisphere) and becomes the northeast trade winds. This circulation is called the Hadley cell and it is the strongest of the three atmospheric cells that circulate air around the planet.

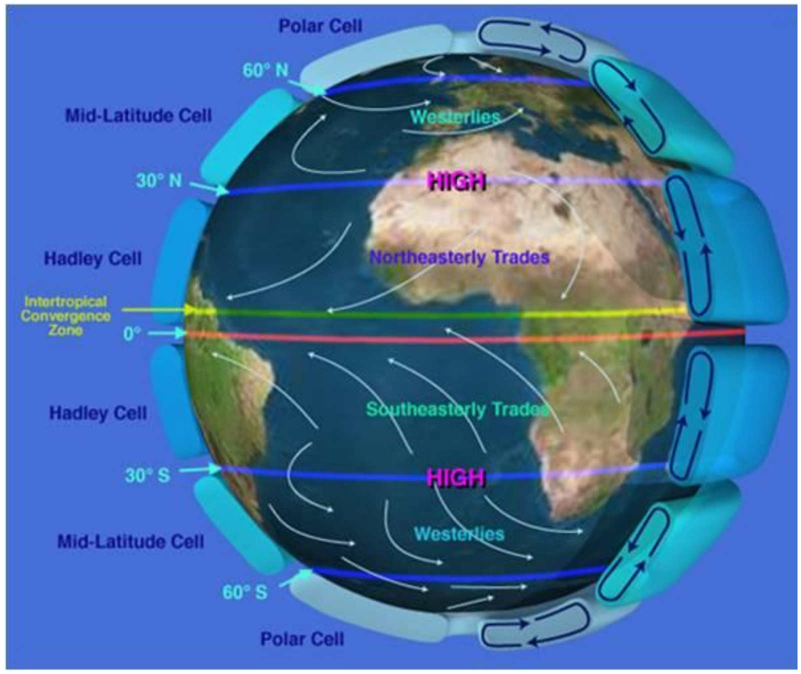

Figure 5: This diagram shows the three atmospheric "cells" at work. Warm air rises at the equator, sinks at 30° N/S, rises again at 60° N/S, and sinks at the polls. This rising and sinking motion drives major weather patterns. Notice the belt of deserts at 30° N/S where this sinking dries the air out. Rain forests are common along the equator where the rising motion occurs, and other large forests are common within the westerlies. Image created by NASA.

The Hadley cell is responsible for most of the weather features in the tropics. The Northern and Southern Hemisphere trade winds meet at the Inter-tropical Convergence Zone (ITCZ). The ITCZ is located in the area of the Hadley cell where air is rising, creating a low pressure belt. Most of the Earth's rainforests are found within the vicinity of the ITCZ (including the Amazon Rainforest, West Africa, and Indonesia). The other pressure belt created by the Hadley cell is a high pressure belt. The high pressure belt is located where the air descends at 30°N/S latitude. This is the location of the subtropical high pressure systems, such as the Bermuda High. The sinking air creates a very dry atmosphere and the Earth's largest deserts are found along this high pressure belt (including the Saharah Desert, the Middle East, and the Mexican Deserts).

The other two atmospheric circulation cells are the Polar and Ferrel cells. The average location of the Polar cell is between 60°N/S latitude and the poles. High pressure at the poles is created by very dense and cold air subsiding to the surface. Just like with the Hadley cell at 30°N/S latitude, the air spreads out when it interacts with the surface. With the Coriolis force being the strongest at the poles, this air turns very abruptly to the right in the Northern Hemisphere, creating the surface polar easterlies. Finally, when this air reaches around 60°N latitude, it collides with the northwesterly surface flow that created from the spreading air at 30°N. When these two flows collide it pushes air upwards, creating another belt of low pressure near 60°N.

The Ferrel cell is the mid-latitude circulation cell between the Hadley and Polar cell. The Ferrel cell is not as well defined as the other two and it is actually induced by the Hadley and Polar cells. The strong subsidence and surface divergence at 30°N/S coupled with surface convergence and rising air at 60°N/S is what generates the circulation of the Ferrel cell. However, the Ferrel cell's circulation pattern is disrupted by the advection of cold polar air southward and warm tropical air southward. This is the main reason why the mid-latitude regions experience the greatest variety of weather types, which is the case for the diversity of our weather in New England. The Ferrel cell is not a closed loop like the Hadley and Polar cells and this can be noticed by looking at the prevailing "Westerlies." Although upper level winds are basically westerly, the surface winds change abruptly in direction. This is done by low and high pressure systems that can change the prevailing "Westerlies" for several days at a time.

Fall Weather Review

By Chris Kimble, General Forecaster

This fall continued to be a warm one across much of New England. Portland registered record warm temperatures for the months of September, October, and November. Although on the whole the weather was warm for the region, there were a few notable exceptions.

	HIGH	LOW	AVE	PRECIP	SNOW
September	71.6 (+1.6)	54.0 (+3.7)	62.8 (+2.7)	3.30 (-0.39)	0
October	59.7 (+1.0)	43.1 (+4.2)	51.4 (+2.6)	6.64 (+1.77)	5.2 (+5.2)
November	55.0 (+7.0)	34.3 (+3.4)	44.7 (+5.3)	2.86 (-2.07)	1.0 (-0.9)
Fall 2011	62.1 (+3.2)	43.8 (+3.8)	53.0 (+3.6)	12.80 (-0.69)	6.2 (+4.3)

Table 1: Fall 2011 climate statistics for Portland.

The first freeze of the season in Portland occurred on October 7, but was soon followed by 3 straight days with highs in the 80s from October 8-10. But the month ended on a much colder note. Although the first snowflakes of the season fell on October 27, a record-smashing 5.2 inches fell on October 29-30 producing a White Halloween. Many places just inland from the coast saw 12-24 inches. November was the warmest ever recorded in Portland, and included a record 26 days of 50 degrees or more (old record was only 20 days in 1975). But this, too, would lead to another snowstorm. On November 23, pre-Thanksgiving travel was hampered by 6-12 inches of snow across the central part of the area. Although Portland only recorded 1 inch, it was enough to make for a White Thanksgiving.

Winter Driving Tips

By John Jensenius, Warning Coordination Meteorologist

New England's winter weather presents challenges and risks to those out driving on the roadways. Weather-related vehicle accidents are responsible for numerous deaths and injuries throughout the winter and result in many millions of dollars in damage. In addition, hypothermia can be a threat to anyone stranded along the roadway by an accident or stalled vehicle.

Make sure you and your car are ready for winter.

The first step in preparing for winter driving is to make sure that you and your car are ready for winter conditions. Before winter arrives, have your vehicle checked to make sure that it is in good working condition, and that the tires, battery, and wipers are in good condition. Have a scraper and brush to deal with frost, snow, and ice; and a shovel, flashlight, extra clothes, and blankets or sleeping bags in case you get stranded. During winter, keep your gas tank at least half full.

Listen to the forecast and anticipate driving conditions.

Listen to the weather forecast so that you can anticipate changing road conditions and try to avoid travel in particularly dangerous conditions. Even an inch of snow on a well-traveled road can result in a hidden glaze of ice on the road surface. A heavy burst of snow from a snow shower or squall can turn a highway into a nightmare in minutes. Snow falling when road surfaces are near freezing can be especially slippery. Strong winds and blowing snow can reduce visibilities and cause icy conditions, even after the storm has ended. Also, be aware of instances when rain is forecast, but road and/or surface temperatures are below freezing. Keep in mind that road surfaces in sheltered locations or north-facing slopes tend to be colder than road surfaces in exposed areas or south-facing slopes. Note that after a rain, a wet roadway can quickly turn to ice on a winter night if skies start to clear. This is especially true if rains have washed salt and sand from the roadway. Also, remember that melting snow during the day can lead to icy conditions at night. Finally, if a storm is forecast, consider canceling or adjusting your travel plans. If you are traveling a long distance, be sure to check the forecast for the entire route and plan accordingly. Safety should be your highest priority.

Prepare for the cold.

Make sure that you have adequate clothing for the outside conditions. If you get stranded, you'll want those extra clothes. Also consider taking some high calorie, non-perishable food with you. Let someone know your travel plans and when you expect to arrive. Check your vehicle to be certain that it is ready for the anticipated driving conditions. Make sure all your windows and mirrors are clear of snow and ice before you start driving and remain clear while on your trip. If you need to stop to clear your windows, do so in a parking lot, side street, or rest area. Leave plenty of extra time for your travels. Snow and ice contribute to accidents. Excessive speed kills. In ice and snow, take it slow! Finally, if you do get stranded, stay with your vehicle until help arrives.

Goodbye and Hello

By Hendricus Lulofs, Meteorologist-in-Charge

When people think of professions at the National Weather Service they often think of meteorologists. While the majority of our employees are meteorologists there are other positions that work in support of the mission of the National Weather Service. The most common position that we have turnover in are within the Meteorological Intern and Forecast staff. A position that we don't often see much turnover in is the Administrative Support Assistant (ASA) position. Each Weather Forecast Office has only one ASA. This job is important in supporting several key areas within the forecast office. These include assisting with budgeting, travel, supplies, contracting, property, time keeping, accounts payable, as well as several other functions. Over the summer, Jean Sellers, ASA at the Gray office, resigned her position. Jean was able to get part time employment locally which allows her to spend more time with her family. Jean's hard work and can do approach to things will be missed and we wish her the best in her new job.

Bob Bernier was recently selected as the new ASA. Bob comes to us from the Department of Veterans Affairs office in Augusta. Bob has a strong background in the skills required for the ASA position especially when it comes to budgeting. In addition Bob has strong IT skills which will be very useful. Bob joined our staff this fall.

For questions, comments, or suggestions contact us at

GYX-Newsletter@noaa.gov

Photo by John Jensenius