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The Coastal Front

Winter 2010

Volume I-3

Snow Season is Here

By Thomas Hawley, Hydrologist

The snow season is here once again, and as always the National Weather Service will depend on snowfall spotters to provide valuable ground truth information during and after winter storms. But before winter arrives in full force, it's a good idea to remind everyone how to make good snowfall observations.

The first step in taking accurate snowfall and snow depth measurements is to find a representative location for taking the observation. Snowfall and snow depth observations should be taken in an area where drifting is at a minimum. Nearby trees and other obstacles often help slow the wind and minimize drifting.

Set out your snowboard at the beginning of the snow season. The snowboard should be painted white and can be as simple as a piece of plywood. Mark the location of the snowboard with a surveyor's flag or driveway reflector. It will be difficult to find when the landscape is covered in white.

A yardstick in the snow is only part of obtaining accurate snowfall observations.

After the each snow take the measurement on the snowboard and record to the nearest tenth of an inch. After measuring the snowfall, brush off the snowboard. Now, using your ruler or yard stick, measure the total amount of snow on the ground. Measure the total snow depth in an area that is free from drifting. It is helpful to use several locations and generate an average depth. Sometimes snow melts as it falls, especially early in the season when the ground may still be relatively warm. If snow melts as it falls and there is never one tenth of an inch of snow or more on the ground then only a "trace" of snow has fallen.

In some cases, snow accumulates for a short time, melts, and then accumulates again. The total snowfall in this case is the sum of each of the individual snowfall episodes. For example, it starts snowing at 10 AM and ends at 2 PM and accumulates to 1.5 inches. The sun then comes out and the snow completely melts. Then another snow shower accumulates to 2.0 inches later in the afternoon. The total snowfall for the day is 3.5 inches, even though only 2 inches (or none at all) may be on the ground at the end of the day.

These are just a few basic rules on taking snow measurements. For a complete tutorial on taking snowfall and snow depth measurements as well as water equivalent measurements, please refer to the CoCoRaHS (Community Collaborative, Rain, Hail and Snow Network) web site at http://www.cocorahs.org/ and click on "Training Slide-Shows".

Winter Weather Safety Tips

By John Jensenius, Warning Coordination Meteorologist

For those of us who live in northern New England, winter weather is a part of our lives from November through March. Snow, sleet, freezing rain, and cold temperatures are common occurrences. While most of the time these weather elements are only a nuisance to our daily routines, they can produce hazardous or potentially life-threatening situations for those who are not prepared or don't take the proper precautions. Before the snow starts flying or the roads become icy, it's a good idea to start thinking about and preparing for winter conditions.

First, is your car ready for winter? There are some things you should do to get ready for the upcoming winter. Make sure that you have a windshield scraper and brush to keep your windows clear of snow and ice. Snow and ice on the road make winter driving particularly hazardous. Check your tires to make sure that they are properly inflated and that the tread is sufficient to provide good traction for winter driving. You may also want to consider purchasing winter tires for your vehicle. Winter also brings on cold temperatures, and those cold temperatures will affect the starting power of your car's battery. Don't get stranded on a cold morning -- be sure your battery is in good condition before the start of winter. Also, be sure that the antifreeze in your vehicle is at proper levels and of adequate strength. In addition, the National Weather Service recommends that you carry a winter storm survival kit in your car in case you do become stuck and stranded. This would include extra clothes, blankets, and/or sleeping bags for warmth; high-calorie, non-perishable food; and tools and supplies to help get you back on the road in case you do happen to get stuck.

Second, is your home ready for winter? Winter's stormy weather can leave your home without power, possibly for many days. Survival for both you and your home may depend on your ability to cope with the loss of electrical service. Many people in northern New England have generators in case the power fails. If you plan to use a generator, be sure that it is installed and functions properly. Most importantly, make sure the generator has adequate ventilation. Gas-powered generators should only be run well away a home so that the fumes don't enter into the structure. If you plan to use an alternate heat source such as a wood stove, be sure that it is installed properly and that you know how to use it safely. Be sure to have a fire extinguisher readily available in case something should go wrong. You'll also want to make sure you have an adequate supply of food and water. High energy foods such as dried fruits or nuts are good. Note that you'll need water for both drinking and sanitary purposes and you'll need containers to store that water prior to the storm. Always have a flashlight ready at night in case the power goes out. Also, have a cell phone available for communication.

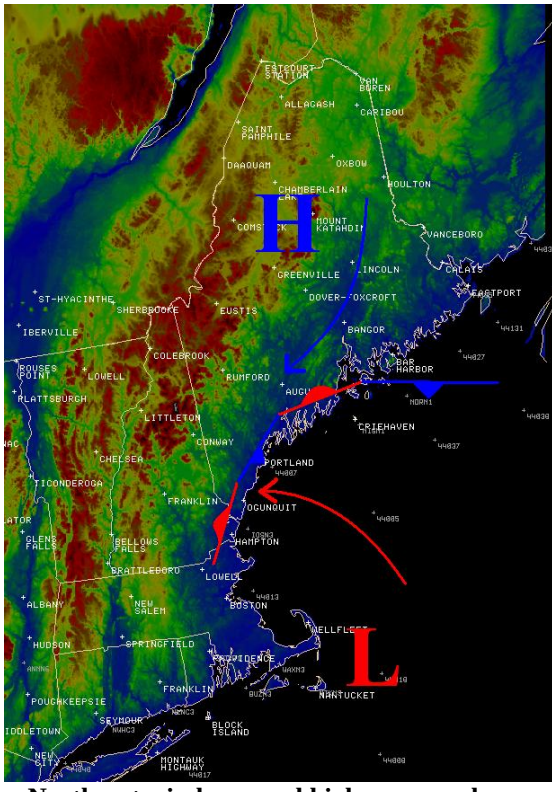
Last and most importantly, make sure you are mentally prepared for winter conditions. Many fatalities, injuries, and damage are often the result of a bad decision and/or poor judgment. Before making decisions concerning winter weather, consider the consequences if something goes wrong. Plan your schedule so that you avoid driving in bad conditions. If you are going to drive in a storm, always allow plenty of extra time so that you can drive slowly. Although snow and ice can cause slippery conditions, vehicle speed is responsible for deaths and serious injuries. Remember, speed kills, not snow or ice. Always dress appropriately (or have the clothes with you) for the outside conditions even though you do not plan to be outside during your travels. Finally, don't take chances – better to be safe than sorry!

Forecasting the Coastal Front

By Mike Cempa, Senior Forecaster

There are many challenges to forecasting winter weather in northern New England, and these can include forecasting the movement and timing of the larger scale features, such as low and high pressure, as well as the fronts that move through the area and interact with each other to produce winter precipitation. However, even more challenging are the smaller scale features that can define where precipitation falls as rain, snow, or nastier types like freezing rain and sleet.

One of the biggest issues when forecasting coastal storms during the winter is forecasting the location of the coastal front. The coastal front is the boundary between the colder and drier air that generally streams in from the north or northeast, from either Quebec or interior New Brunswick, and the warmer and the more moist maritime air that is influenced by the Gulf of Maine. This boundary is often the point at which precipitation changes, usually from snow to rain or freezing rain. It is typical for this boundary to shift as a coastal low moves northward, bringing the warmer maritime influenced air with it.



Northeast winds around high pressure keep cold air over much of Maine. Southeast winds around low pressure bring warm and moist air into the area. The coastal front provides extra lift where these air masses meet.

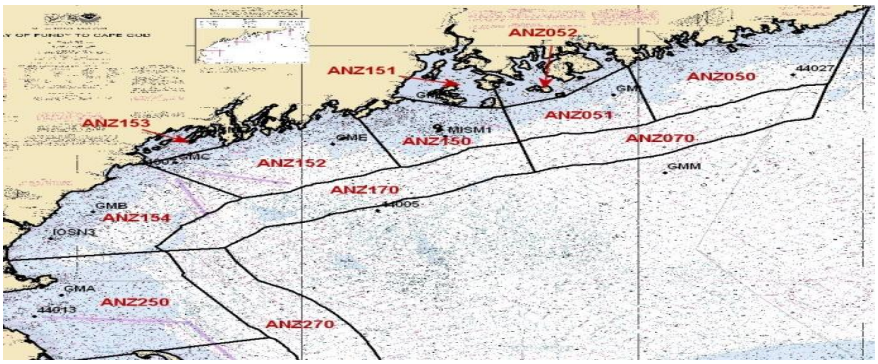
Strong high pressure, called a "blocking high" will often set up to the north of Maine. If this blocking high is in place, the coastal storm will usually slow, or shift to the east in response to a blocking high. The blocking high is a source of cold air, and the flow around low pressure rotates counter-clockwise. This means that as the low approaches from the south, intensifies, and begins to shift east, a north to northeast wind develops at the surface to the north and/or west of the coastal front, blowing parallel to the front. This wind channels in the colder and more dense air from the north. Essentially, the dense air is a block to the warm, moist maritime air and can slow or stall the coastal front from moving inland. In cases where the coastal low is intensifying rapidly as it moves up the coast, there can be such a rapid surge of that cold and more dense air just on the inland side of the coastal front that it can actually push it back to the south and east. This occurred in Rockingham and York counties during the ice storm of December 2008, where precipitation in coastal areas changed to rain as the coastal front moved west. Precipitation then turned back to freezing rain as the coastal low intensified, allowing colder air to surge southward on the inland side of the coastal front, effectively pushing it back east.

Temperature differences on each side of the coastal front can be 10 degrees or more. On several occasions, northern and western sections of Portland, Maine have had temperatures in the low 20s with snow, while the airport, which straddles Portland and South Portland 5 miles to the south, had temperatures around 33 or 34 degrees with rain. Determining the location of the coastal is front is just one of the many challenges relating to forecasting winter weather in northern New England.

Marine Weather Forecasts

By John Cannon, Senior Forecaster

The National Weather Service in Gray offers marine forecasts for Penobscot and Casco Bays, as well as several other "zones" along our coastal waters. Maps depicting all marine areas along the coast of Maine and New Hampshire are below.



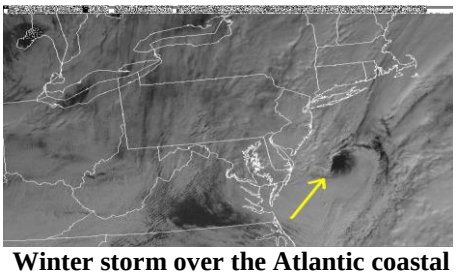
Map of the separate "zones" for which the NWS produces marine forecasts.

The buoy network, which collects wind and wave information, is extremely critical to the forecast process. Our marine forecast staff uses this real-time buoy collective and local expertise in tandem with high resolution and mesoscale models to predict wind speed and direction, waves, weather, visibility and freezing spray up to five days in advance.

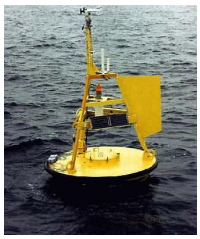
As recreational and commercial mariners have told us at user feedback events, such as the annual Maine Fishermen's Forum in Rockport, Maine, "There is no place to pull over" when out on the waters. The elements can be extreme in the Gulf of Maine, especially during the winter. Nor'easters are often accompanied by blinding rain and snow, storm force winds, large battering waves and freezing spray, prompting the National Weather Service to issue warnings over the coastal waters.

Below is a list of the more common advisories, watches and warnings we issue. The U.S. Coast Guard subsequently raises "flags" for these inclement weather events.

Small Craft Advisory: Sustained winds or frequent gusts 25 knots - 33 knots, and/or waves of at least 5 feet
Gale Warning: Sustained winds or frequent gusts 34 - 47 knots
Storm Warning: Sustained winds or frequent gusts 48- 63 knots
Hurricane Force Wind Warning: Sustained winds or frequent gusts > 63 knots



Winter storm over the Atlantic coastal waters depicting a tropical "eye-like" feature



NOAA 3 meter discuss buoy in Casco Bay

Freezing spray accumulation on a fishing boat in Portland Harbor in January 2003.

If you are interested in providing feedback, the next Fisherman's Forum will be held March 3rd-5th, 2011. More information is available at http://www.mainefishermensforum.org/.

Summer Weather Review and Winter Outlook

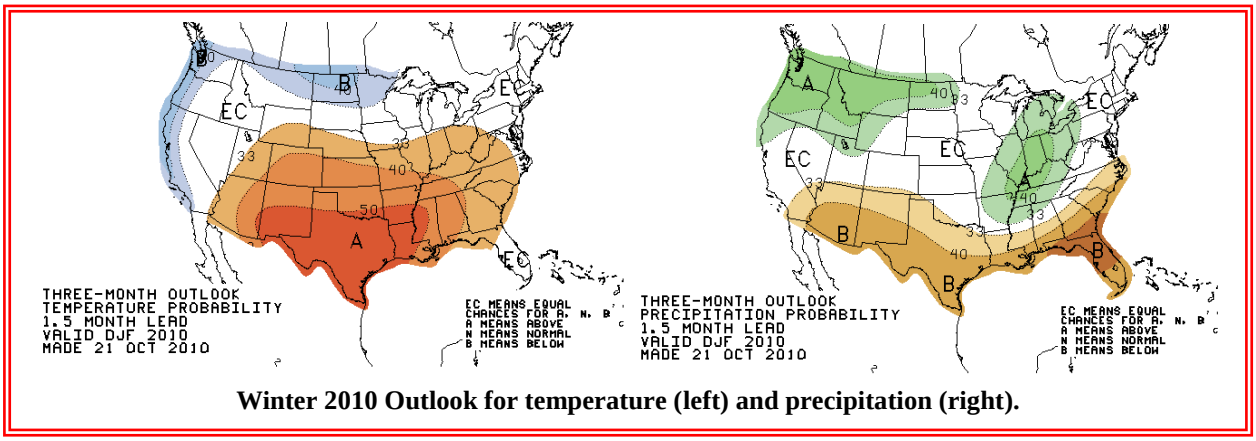
By Steve Capriola, Senior Forecaster and
Chris Kimble, General Forecaster

After enjoying the warmest spring on record, Portland followed with a record-tying warmest summer. The summer of 2010 in Portland tied 1988 as the warmest summer at the Portland Jetport with an average temperature of 68.7 degrees. This summer was 2.4 degrees above normal and contrasts to last year when Portland had a very cool and wet summer. This summer averaged 3.1 degrees warmer than last summer. All three summer months (June, July and August) were above normal. In fact, Portland has now had ten consecutive months of above normal temperatures. This streak began in November of 2009. The month of July 2010 was the second warmest month ever at the Portland Jetport.

Portland had a string of five consecutive days with highs of 90 or warmer from August 28th through September 2nd. The five day heat wave ties three other heat waves as the longest on record at the Portland Jetport (the last occurred in July 1993). It is also the first time such a string of 90 degree days extended into the month of September. Temperature records at the Portland Jetport began in November of 1941.

Last year, Portland's summer was the wettest on record with 22.31 inches of rain. This year Portland recorded less than half that amount with just 10.48 inches of rain over the three month period. But the ten and a half inches of rain was still above normal by nearly an inch (0.83 inches). Nearly half of the total summer rainfall occurred in just two days. Portland had a record setting 2.26 inches of rain on July 14th and another record setting 2.64 inches on August 25th. The combined 4.90 inches of rain from these two rain events accounted for 47 percent of the total summer rainfall.

The Climate Prediction Center (CPC) produces three-month temperature and precipitation outlooks for the United States. The current forecast for this winter (December, January, and February) is below. The forecast indicates equal chances for above, near, and 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 winter will be colder/warmer or wetter/drier than usual in this part of the country. This period is the coldest time of year with high temperatures normally near freezing, and low temperatures in the teens. Normally precipitation during the fall months totals 8 to 10 inches, with generally 40 to 50 inches of snowfall. Snow normally remains on the ground from after the first significant snowfall through the end of the season.



Winter 2010 Outlook for temperature (left) and precipitation (right).

Late Season Heat Wave

By Chris Kimble, Meteorologist

Summer 2010 was a hot one for much of northern New England. In fact, the summer months (June, July, and August) were tied with 1988 as the warmest on record in Portland. While extreme heat was rare (only 1 day reached 95 degrees), abnormally warm temperatures were persistent throughout the summer. Portland reached 70 degrees 119 times in 2010, the third most ever (record is 126 days in 1941). The temperature also reached 80 degrees 60 times, second only to 1993 (63 days). While the total number of 90 degree days (10 days) was not a record, it was the most Portland has endured in 22 years (1988). The unusually warm summer ended with the longest (and latest in the season) heat wave on record in Portland.

Table 1: Temperature statistics for Portland

Portland, Maine 2010				
CRITERIA	2010 VALUE	RANK*	NORMAL	RECORD*
90+ Days	10	5th (tied)	4.7	16 (1955)
80+ Days	60	2nd	39.1	63 (1993)
70+ Days	119	3rd	103.3	126 (1941)
Consecutive 90+ Days	5 (Aug 29-Sep 2)	1st (tied)	1.8	5 (1993, 1948, 1944)
Jun-Aug Temperature	68.7	1st (tied)	66.5	68.7 (1988)

* Records are from the Portland Jetport 1940-present.

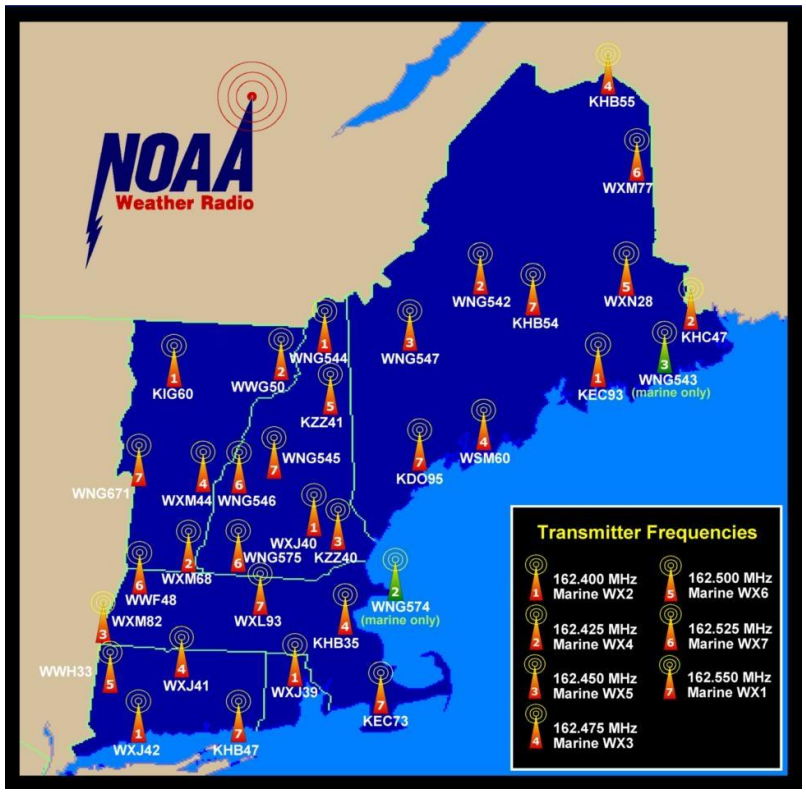
At the end of August, a large ridge of high pressure in the upper atmosphere developed over the central United States and moved into the Northeast. These large ridges are often associated with very warm temperatures and dry weather and frequently build and develop over central North America during summertime. When they move into the Northeast they bring unusually hot weather to a region of the country that does not normally experience such hot temperatures. Occasionally, these large high pressure ridges can become nearly stationary over the same region for days or weeks, leading to exceptionally long periods of heat and drought. This was what happened at the end of August and the beginning of September of this year in New England. Beginning on August 29, very warm temperatures began affecting Maine and New Hampshire with many areas rising above 90 degrees. As the ridge of high pressure moved very slowly to the east, the hot weather continued for several days. The clockwise circulation around the high brought an offshore breeze to the area. This helped delay or prevent the sea breeze from developing which normally cools coastal areas each afternoon in the summer. As the calendar turned to September, the hot weather continued. A very intense Hurricane Earl began moving up the East Coast at the beginning of September. With intense hurricanes such as Earl, the strong rising motions in the atmosphere associated with the hurricane are compensated by downward motions in the atmosphere well away from the storm's center. It is this downward motion, or subsidence, which causes the air to get even hotter, and helped extend the heat wave in northern New England through September 2. As Hurricane Earl passed by to the east, temperatures finally began to cool to more seasonable levels, but not after tying the record for the longest stretch of 90 degree heat ever in Portland at 5 days (also occurred in 1993, 1948, and 1944).

NOAA Weather Radio

By Eric Schwibs, General Forecaster

NOAA All Hazards Weather Radio is a nationwide network of radio stations broadcasting continuous weather information directly from a nearby National Weather Service forecast office. NWR broadcasts National Weather Service watches, warnings, forecasts and other hazard information 24 hours a day. Known as the "Voice of the National Weather Service," NOAA Weather Radio is provided as a public service by the Department of Commerce's National Oceanic and Atmospheric Administration, and covers the 50 states, District of Columbia, Puerto Rico, U.S. Virgin Islands, and U.S. Pacific Territories.

NOAA Weather Radio broadcasts emergency and post-event information for all types of hazards -- both natural (such as severe weather, flooding, earthquakes and volcanic activity) and man-made (such as chemical releases or oil spills). Working with other Federal agencies and compatible with the Federal Communication Commission's new Emergency Alert System (EAS), NOAA Weather Radio is an all hazards radio network, making it the single source for the most comprehensive weather and emergency information available to the public.



Locations and frequencies of NWR stations in New England.

About 10 years ago, the NWS upgraded Weather Radio with the installation of the Console Replacement System (CRS). This is a personal computer-based broadcasting console that automatically translates and schedules written National Weather Service forecasts and warnings into synthesized-voice broadcasts over NOAA Weather Radio.

The automated broadcast programs for NOAA Weather Radio allow NWS staff to spend more time on critical warning and forecasting duties. This automated system provides faster broadcasts of severe weather watches, warnings and emergency information over NOAA Weather Radio because multiple warnings can be both recorded and transmitted at once. This capability dramatically speeds up the broadcast of warnings during severe weather events.

Weather Radios may be purchased at most electronics stores and can be an invaluable tool during inclement weather.

WFO Gray Intern Receives Promotion

By Albert Wheeler, Meteorologist in Charge

WFO Gray Meteorologist Intern David Glenn was promoted to a General Forecaster position at WFO Morehead City, NC on September 26, 2010. David began his internship at WFO Gray in November 2008. Many people have met or talked with David through his participation in the Community Cooperative Rain, Hail, and Snow program (CoCoRaHS). David's energy and enthusiasm helped launch the CoCoRaHS program in New Hampshire and Maine. While at WFO Gray, David also contributed to a number of office programs, including our upper air observation program (our twice a day weather balloon launches), our Amateur Radio storm report program, our Diversity program, our climate records program, our forecast verification program, and our Graphic Information System (GIS) mapping program. All of this was in addition to David's primary job of working Hydro-Meteorological Technician shifts, forecaster training shifts, and completing a rigorous training program to prepare for becoming a General Forecaster. Prior to moving to their native North Carolina, David and his wife Melissa became proud parents of their first child, William David, on September 5, 2010. Needless to say, September was an eventful month for David and his family! His enthusiasm is certainly missed here at WFO Gray, and we wish him all the best in his new assignment at WFO Morehead City.

NWS Meteorologist David Glenn with his son

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

Photo by John Jensenius