
# WeatherWorks

www.weatherworksinc.com

"Your Weather Experts"


# 2008-2009 WINTER FORECAST


**Edited by: Ken Elliott**

**Volume 2, Issue 10** **October 2008**


**Inside This Issue**

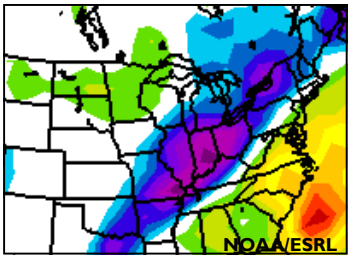


## 2007-2008 Winter Recap

La Nina strongly influenced the winter season across much of the U.S. One of the pronounced features of the season was a storm track that developed from the southern Plains thru the Mid-west into New England. In general, these areas were the ones that had a lot of precipitation, and at least normal snowfall.

South and east of the favored storm track in the Mid-Atlantic, snowfall was generally below normal with mild temperatures. Many areas in this part of the I-95 corridor received less than 50% of their normal snowfall. Particularly low snow totals were observed in Philadelphia and Washington, where 6.3 and 4.9 inches fell respectively. As usual, inland areas received more snow than the coastal plain, but even these areas away from the influences of warmer Atlantic Ocean experienced less than average snowfall.

Moving northward and closer to the favored storm track, snowfall began to increase markedly with latitude. Numerous Northern New England locations received over 100 inches of snow! As far south as New York's Hudson Valley, there were stations that had seasonal snow accumulations of at least 10 inches above normal. This overall distribution left



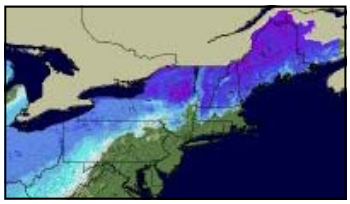

**Winter Precip Anomaly**
**Darker Colors: Above Normal**
**Lighter Colors: Below Normal**

Boston as the only big city in the megalopolis with more snow than usual. By April, Boston saw 52 inches, approximately 12 inches above average.

Aside from the geographical disparity, there was also a time based disparity. The first half of the season was quite busy with snow and ice events. But the second half of the season, especially March, was remarkably quiet. In a sample of data from last winter, nearly 77% of the region's snow fell between November and January. Amazingly, some areas near Washington, DC recorded no measurable snow after February 1st.

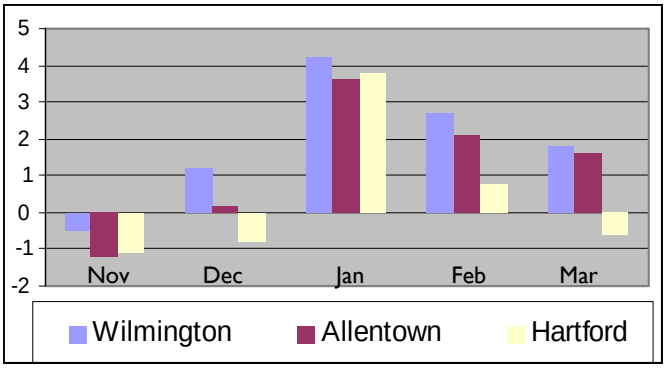
The substantial percentage of snow in the first half of the season was due in large part to temperatures that were slightly below normal in November and close to average in December. To begin December, a Clipper System brought several inches of snow, especially to southern Parts of the Mid-Atlantic. In some parts of Maryland, this turned out to be the biggest storm of the year. As temperatures warmed slightly, just over a week later a series of disturbances brought snow threats nearly every second day. Between December 13 and 21st, there were 3 significant snow storms that produced up to 2 feet of snow to parts of New England. To the south, the accumulations fell off quickly, often resulting in trace amounts in Maryland.

The rest of the winter season featured temperatures 1-4 degrees above normal. This led to diminished snow activity, though there were a few decent events for some areas. Most notably on February 22nd & 23rd, when 4-8 inches of snow fell from Central Jersey into parts of Southern New England. In some cases, this was the biggest storm in 2 seasons.



**Snow Depth 3/9/08**
**(NCDC/NOAA)**

Despite a lack of snow in March and April, there was no definitive pattern shift to bring about early Spring weather. This allowed for a handful of snow and ice threats mainly in March. But temperatures were usually a bit too warm or the precipitation a little too light to cause any accumulations, except for in some interior areas with higher elevations.

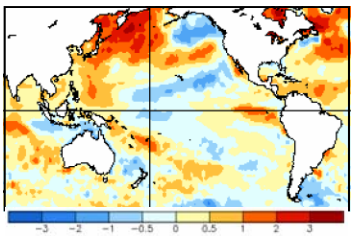



**Avg. Monthly Temp. Departure From Normal (Deg F)**

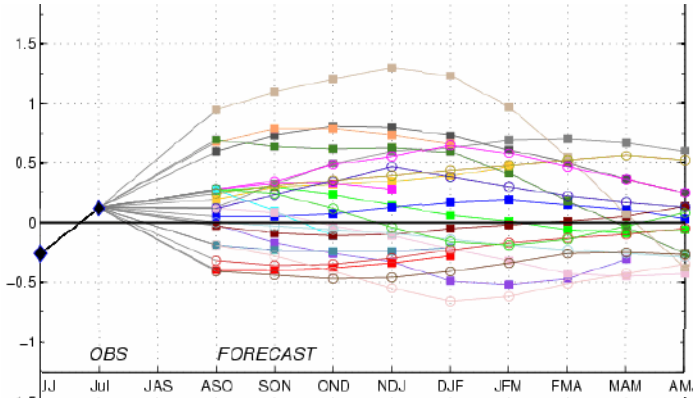
## El Nino/La Nina Forecast

One of the most widely used parameters for long term forecasting is definitely the cycles of El Nino and La Nina in the Equatorial Pacific Ocean. Last winter, a moderate to strong La Nina was in place, which was largely responsible for the large scale patterns observed.

Since the winter ended, ocean temperatures in the Equatorial Pacific have warmed considerably and now are relatively close to normal, with pockets of above normal temperatures off the coast of South America.



**Sea Surface Temperature Anomalies as of 9-16-08 (NOAA/CPC)**




**Model El Nino/La Nina Forecasts as of 9-11-08 (NOAA/CPC)**

This indicates a return to neutral El Nino/La Nina conditions.

The graph above shows current computer forecast models for El Nino/La Nina into the summer of 2009. As to be expected, there is a fair amount of spread amongst the various statistical and dynamical models. Close examination of the model data (which has performed well in recent months) suggests that ocean temperatures in the Equatorial Pacific Ocean will be ever so slightly above normal this winter. This trend is already being seen in the current observations. But the anticipated amount above normal by the models does not appear to be significant. Thus, the upcoming winter looks to feature a continuation of the ongoing neutral pattern.

## Anticipated Impacts of El Nino on Winter 2008-2009

While it may seem that there is always an El Nino or La Nina present, that is not the case. In fact, nearly 40% of all winters since the winter of 1949-1950 (when El Nino data first started to be collected) actually fall into this category. As discussed in the article above, that is expected to be the case for 2008-2009. Local variations and subclimates aside, in a lot of the eastern United States, this type of pattern translates into a fairly typical winter season. Jokingly, a meteorologist at the National Weather Service refers to the neutral El Nino state as the "La Nada" pattern, as it usually provides for ordinary winters.

The table below supports the general trend of normal winters given a neutral El Nino, especially in the Philadelphia area. Further north, there is a tendency for an occasional big snow season mixed in, as evidenced by 2 seasons in New York and Boston where snowfall totals were close to or greater than double the average. Interestingly, these did not occur in the same two winters.

Particularly encouraging for higher snowfall this season compared to the last few years is the winter of 2005-2006. Temperatures that winter were above normal. Specifically, January, often the snowiest month of the year, was unusually warm. Temperatures across the area were some 7 to 9 degrees above normal! Impressively despite that warmth, snowfalls totals were either close to or above the 30 year averages.

**Snow Totals in Winters with Neutral El Nino/La Nina Conditions**

| City | 2005-2006 | 1993-1994 | 1992-1993 | 30 Yr. Avg. |
|---|---|---|---|---|
| Boston, MA | 38.3 | 96.3 | 83.9 | 39.4 |
| New York (C. Park) | 40.0 | 53.4 | 24.5 | 22.4 |
| Philadelphia, PA | 19.4 | 23.1 | 24.3 | 19.3 |
| Washington, DC | 13.6 | 13.2 | 11.7 | 15.2 |

## El Nino/La Nina By the Numbers (Since 1949-1950)

**23** Neutral Winters

**19** La Nina Winters

**17** El Nino Winters

**7th** Strongest La Nina, 2007-08

**97-98** Strongest El Nino

**88-89** Strongest La Nina

## Featured Website

http://www.elnino.noaa.gov


*NOAA's dedicated El Nino Page is a one stop source for everything you wanted to know about El Nino. In addition to providing a general overview of El Nino, there are weekly status updates, and plenty of other information including ongoing research, model ensemble forecasts and much more.*

## NAO By the Numbers (Since 1949-1950)

**20** Neutral Winters

**22** Positive Winters

**17** Neg. Winters

**14th** Strongest Positive, 2007-08

**83-84** Strongest Pos. Phase

**62-63** Strongest Neg. Phase

## Differences Between Watches, Warnings & Advisories

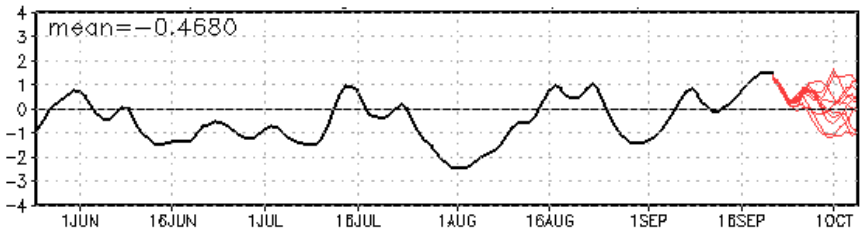
**Watches:**
Issued at least 24-36 hours before the onset of a winter hazard that is forecast to cause a high public impact.

**Warnings:**
Issued when wintry threats either are occurring or are fairly imminent and are expected to pose significant public impacts.

**Advisories:**
Issued when winter weather threatens the area, yet expected conditions do not rise to the warning criteria. Often, the largest impacts are on travelers.

# More Forecast Predictors: The NAO

The North Atlantic Oscillation, or NAO, is another very useful indicator used for forecasts beyond the short term. Unfortunately, unlike El Nino for instance, the NAO is subject to variability within a season or even a month, which is not easily forecast a few months out. This results in some inherent uncertainties for an entire season, but it remains a useful tool.

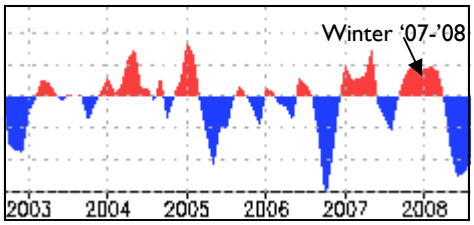



**Observed & Forecasted NAO May 25 - Oct. 4, 2008 (NOAA/CPC)**

Therefore, underlying trends are important. Currently the NAO is positive, and model guidance for the next month brings the NAO to a neutral state. That does imply that approximately half of the model guidance suggests the NAO could turn slightly negative with time. For snow lovers, a trend towards the negative would be welcomed news. Typically, a negative NAO means cooler temperatures and lower pressures across the Eastern U.S.

### RESEARCH UPDATE

In last year's edition of the WeatherWorks Winter Forecast, ongoing research into the NAO was discussed. The emerging theory was that more so than the actual positive or negative phase of the NAO, the period of time when the phase is changing is most critical to strong storm development in the Eastern U.S. As the graph below shows, the NAO was positive last winter, with no long lasting or abrupt shift of phase, so the theory was unable to be tested last year. WeatherWorks will continue to watch for this, and hopefully use it in forecasts.




**NAO Status Sept. 2002– Aug. 2008 (Blue Negative/Red Positive) (NOAA/CPC)**

# Upcoming Changes to NWS Winter Watches & Warnings

Effective this winter, The National Weather Service (NWS) has decided to make some changes to their suite of watches, warnings and advisories issued for winter weather. While none of the criteria used for their alerts will change, it is important to know that the names of some of the products have been consolidated.

The changes outlined in the chart to the right were made with the goal of keeping watches and warnings more consistent across an area as well as between individual NWS offices. However, users of these products will notice a loss of specificity in the name, with the more pertinent details often in the actual text of the product. Unfortunately, this change heavily impacts mixed precip events. Particularly omitted from the new naming system is sleet, which has certainly caused its fair share of problems in recent winters. From now on, sleet events will no longer be singled out in the name of a watch or warning.

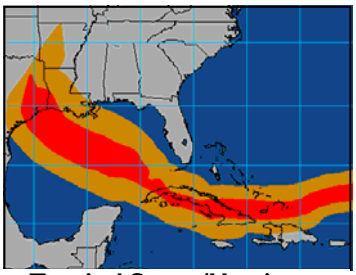
An effort was made to minimize changes to threats with hard hitting and unique public impacts. This particularly applies to blizzards and ice storms/freezing rain which will continue to be highlighted by name in NWS alert products.

**Old vs. New NWS Advisories**

| Old | New |
|---|---|
| *Advisories* | |
| Freezing Rain | Freezing Rain |
| Wind Chill | Wind Chill |
| Winter Weather | Winter Weather |
| Snow | |
| Blowing Snow | |
| Sleet | |
| *Watches/Warnings* | |
| Blizzard | Blizzard |
| Ice Storm | Ice Storm |
| Wind Chill | Wind Chill |
| Winter Storm | Winter Storm |
| Heavy Snow | |
| Sleet | |

## Looking Towards the Tropics For Winter Guidance

One of the bigger weather features in the summer months is certainly tropical storm and hurricane activity in the Atlantic Basin. As of September 24th, the amount and distribution of Tropical Storms, Hurricanes and Major Hurricanes has approximately equaled the average levels for an entire normal season. So as was widely anticipated, the tropics will likely wind up being busier than usual.



**Tropical Storm/Hurricane Wind Field From Ike (NHC/NOAA)**

**Snow Totals in Winters with Similar Atlantic Hurricane Seasons**

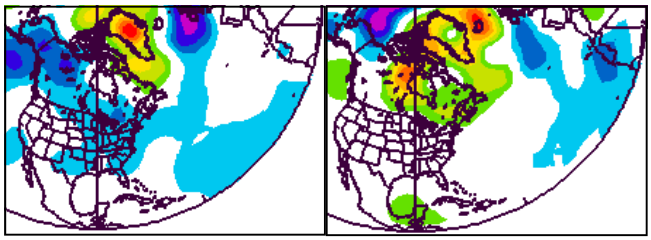
| City | 2006-2007 | 2002-2003 | 1981-1982 | Avg. |
|---|---|---|---|---|
| Hartford, CT | 23.1 | 85.9 | 61.8 | 41.2 |
| Newark, NJ | 16.0 | 50.9 | 30.8 | 27.9 |
| Baltimore, MD | 11.0 | 58.1 | 25.5 | 18.2 |

Comparing this season (so far) to others in the last several decades with similar amounts and distributions of activity suggests a decent likelihood of at least a normal snow season.

Even though there is some variability amongst the ensuing winter seasons with comparable tropical activity, there seems to be a tendency for there to be one or two good sized storms in these seasons. In fact, to cap off the winter of 1981-1982, there was a rare late season significant snowfall for much of the northeastern United States on April 6th. As much as a foot of snow fell in the New York City and Boston areas. Even Philadelphia saw an accumulation of several inches from this system. This occurrence lends some credence to the notion held by numerous meteorologists and other weather enthusiasts that there is an above average risk of a strong coastal storm capable of producing significant snow this winter.

## Bermuda Highs & Snowfall

Closer to home, the Bermuda High has a rather large influence on weather patterns. As many people in the region realized, there was a notable lack of intense and long lasting heat this past summer. One of the biggest reasons for this was the weakness, or in many cases the outright absence of a Bermuda High, which tends to force hot air northward. There were several indicators of this including the general tendency for the NAO to be negative for a good part of the summer. Not surprisingly, with weak high pressure over the Atlantic, the pressure at the surface was in fact below average.



**Surface Pressure Anomaly Maps June-August 2008 (Left), 1982 (Right)**
**Blue: Below Normal, Red: Above Normal (NOAA/ESRL)**

Comparing this map to others in past summers, there were a few that showed similar patterns, most notably in 1982. While 1982 was not as pronounced as this year, pressures over the Atlantic (especially the eastern half) were lower than normal. Looking ahead into the following winter, there seems to be a correlation with near to slightly above normal snowfall. This relationship seems to be strongest in northern and central parts of the Mid-Atlantic into New England.

**Snow Totals in Winters with Weak Bermuda Highs**

| City | 2000-2001 | 1992-1993 | 1982-1983 | 30 Yr. Avg. |
|---|---|---|---|---|
| Providence, RI | 35.9 | 39.7 | 32.4 | 39.2 |
| New York, NY | 35.0 | 24.5 | 27.2 | 22.4 |
| Philadelphia, PA | 26.1 | 24.3 | 35.9 | 19.3 |
| Washington, DC | 7.4 | 11.7 | 27.6 | 15.2 |

## Tropical Storm & Hurricane Activity (Season thru Sept. 24)

| Year | Named Storms | Hurricanes |
|---|---|---|
| 2008 | 10 | 5 |
| 2006 | 10 | 5 |
| 2002 | 12 | 4 |
| 1981 | 9 | 6 |
| Normal | 7 | 4 |

## Recent Snowfall Totals/Departures From Normal MD,VA & DC

| Location | 06-07 | 07-08 |
|---|---|---|
| Aberdeen, MD | 9.9 (-7.2) | 9.0 (-8.1) |
| Annapolis, MD | 10.0 (-8.1) | 9.6 (-8.5) |
| Baltimore, MD | 12.6 (-5.9) | 8.5 (-10.0) |
| Dulles, VA | 14.7 (-6.4) | 6.5 (-14.6) |
| Frederick, MD | 29.5 (+3.6) | 13.5 (-12.1) |
| Hagerstown, MD | 29.5 (+1.3) | 13.6 (-14.6) |
| Laurel, MD | 13.7 (-7.7) | 8.8 (-12.6) |
| Washington, DC | 14.2 (-1.2) | 4.9 (-10.5) |
| Westminster, MD | 18.7 (13.1) | 16.2 (-15.6) |

## 2008-2009 Winter Season Calendar

| | |
|---|---|
| Dec. 1 | Meteorological Winter Begins |
| Dec. 21 | Astronomical Winter Begins |
| Jan. 18-23 | Avg. Temperatures Begin Rising |
| Feb. 2 | Ground Hog Day |
| Feb. 16 | President's Day |
| Feb. 28 | Meteorological Winter Ends |
| Mar. 20 | Astronomical Winter Ends |

## Recent Snowfall Totals/Departures From Normal PA & DE

| Location | 06-07 | 07-08 |
|---|---|---|
| Allentown, PA | 22.6 (-10.8) | 21.2 (-12.2) |
| Doylestown, PA | 13.5 (-14.3) | 10.9 (-16.9) |
| Exton, PA | 16.2 (-10.8) | 10.0 (-17.0) |
| Harrisburg, PA | 23.5 (-11.5) | 14.0 (-21.0) |
| Philadelphia, PA | 13.8 (-7.4) | 6.3 (-14.9) |
| Scranton, PA | 43.5 (+12.8) | 38.3 (+7.6) |
| Wilmington, DE | 13.1 (-8.0) | 9.2 (-11.9) |
| York, PA | 26.5 (+6.2) | 17.6 (-2.7) |

# Winter Forecast 2008-2009 Overview

The main theme of the winter season ahead should be a snowier winter than the last few seasons. While some areas have had above normal snowfall recently, this season and likely the season to follow should feature near to above normal snowfall for nearly the entire area. In addition to the various predictors and trends that have already been discussed in previous pages, a statistical analysis also suggests near to perhaps above normal snowfall.

The table to the right shows average snowfall by decade since the 1890's for Philadelphia. From a statistical standpoint, it would appear the next two winter seasons will feature above normal snowfall to make up for a lack of snow so far this decade. It would take some 57.8 inches of snow over the next two snow seasons to bring Philadelphia up to normal levels. This means that just two normal snowfall seasons to close out the decade would still yield a below normal ten year total snowfall. Given the recent below normal snowfall seasons, and the deficit so far this decade, there is an increased likelihood for snowier upcoming winters particularly in the Mid-Atlantic and adjoining regions.

| Philadelphia Snowfall By Decade 1890-Present | |
|---|---|
| Years | Total Snowfall |
| 2000/2001 - 2007/2008 | 163.7 |
| 1990/1991 - 1999/2000 | 187.3 |
| 1980/1981 - 1989/1990 | 200.1 |
| 1970/1971 - 1979/1980 | 217.1 |
| 1960/1961 - 1969/1970 | 289.5 |
| 1950/1951 - 1959/1960 | 171.9 |
| 1940/1941 - 1949/1950 | 194.1 |
| 1930/1931 - 1939/1940 | 195.3 |
| 1920/1921 - 1929/1930 | 176.7 |
| 1910/1911 - 1919/1920 | 280.4 |
| 1900/1901 - 1909/1910 | 272.4 |
| 1890/1891 - 1899/1900 | 251.4 |
| Decade Average (excluding 2000s) | 221.5 |

# Month by Month Forecasts

### NOVEMBER 2008

| | |
|---|---|
| Temps | Near Normal |
| Snow | Near Normal |

While it can be rather difficult for snow to accumulate in coastal areas in November, it is certainly very possible for inland locations with elevation. These areas can expect 1 to 2, perhaps more minor snow events by month's end where rain at least mixes with snow.

This would be most likely should a particularly strong cold front cross the area. If cooler air and precipitation match up, it would not be surprising at all for parts of the Interstate 95 corridor to see some snow as the month draws to a close.

### DECEMBER 2008

Look for near normal temperature and precipitation patterns to continue into December, the first month of meteorological winter. This means there should be a noticeable drop in temperatures and a significantly increased threat for snow all the way to the coast.

| | |
|---|---|
| Temps | Near/Slightly Below Normal |
| Snow | Near to Above Normal |

While December is not climatologically the snowiest month, last December there were a lot of snow and ice threats, and that could very well be the case again this season. Long range models suggest a trend towards a ridge of high pressure establishing itself in the Great Plains. This suggests an above normal chance for troughs of low pressure setting up along the eastern seaboard. Typically given this type of pattern, temperatures would be near or slightly under the average, with potentially above normal snowfall.

### JANUARY 2009

The arrival of the new year will more than likely feature a continuation of the ridge over the heartland. Given that average temperatures in January are plenty cold for snow, and a trough should be in place for a good part of the month, January may be the snowiest month of the year for just about all of the area.

## Winter Forecast Continued

| | |
|---|---|
| Temps | Slightly Above Normal |
| Snow | Near to Above Normal |

As always, the precise location of the trough will ultimately determine the subtleties of temperature, precipitation and snowfall distributions. However, it does appear that the trough will be most persistent in New England. This suggests that northern parts of the area have an enhanced possibility for seeing above normal amounts of snow for the month.

### FEBRUARY 2009

As the second half of the winter begins, dynamical and statistical guidance indicate an eastward shift in the central U.S. ridge. How far east the ridge moves will have a direct impact on both temperatures and precipitation amounts for the area. It does appear that best chance for cooler than normal temperatures and above normal snowfall will be across northern parts of New England into Canada. Given the uncertainty with the ridge placement, and the propensity for strong nor'easters to develop during the month of February, all signs point to a near normal month of snow and ice.

| | |
|---|---|
| Temps | Near Normal |
| Snow | Near Normal |

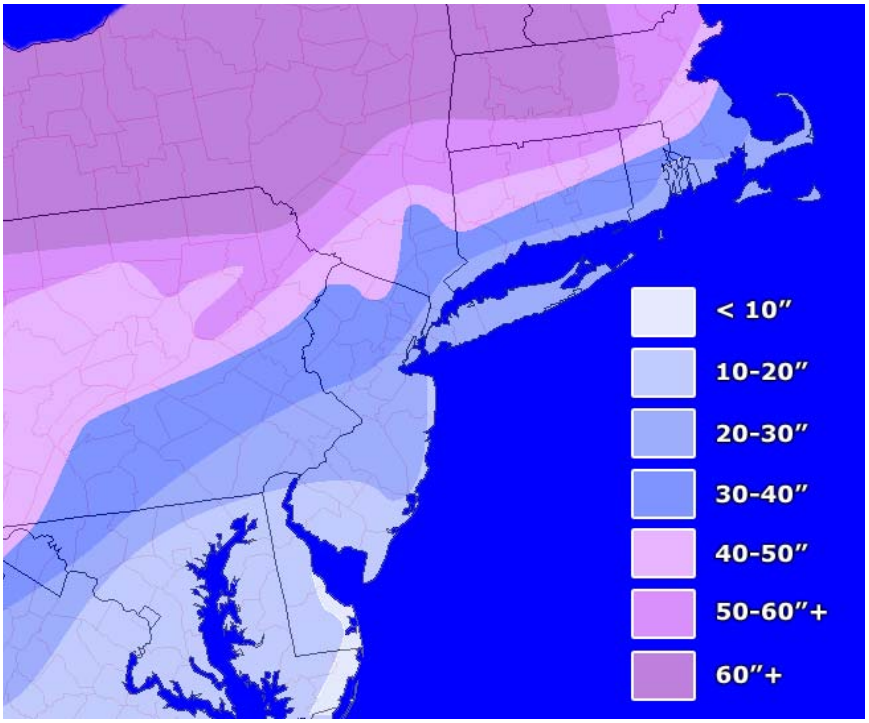
### MARCH/APRIL 2009

Even though Spring may be in the air in March, it is certainly not too late for snow. As would be expected, the threat is diminished somewhat, especially for southern and coastal areas, but it is still a distinct threat. Despite mild temperatures to end last winter, there were a few "near misses" for snow events which could have provided several more inches of snow.

Since there are a lack of strong indicators suggesting any unusual large scale weather patterns in March or April, these months should average out normal. This means many places should see at least a few inches of snow, especially in typically favored areas.

| | |
|---|---|
| Temps | Near Normal |
| Snow | Near Normal |

## Long Term Average Regional Snowfall




## Recent Snowfall Totals/Departures From Normal NY & NJ

| Location | 06-07 | 07-08 |
|---|---|---|
| Atlantic City, NJ | 6.5 (-10.6) | 8.8 (-8.3) |
| Islip, NY | 8.3 (-13.4) | 8.0 (-13.1) |
| Middletown, NY | 32.6 (-4.5) | 50.1 (+13.0) |
| Mt. Holly, NJ | 10.6 (-9.4) | 7.2 (-12.8) |
| New Brunswick, NJ | 12.2 (-14.6) | 13.6 (-13.2) |
| Hackensack, NJ | 15.2 (-12.4) | 16.7 (-10.9) |
| Queens, NY (LGA) | 14.4 (-9.6) | 11.8 (-12.2) |
| Trenton, NJ | 12.9 (-12.6) | 10.5 (-15.0) |
| Vernon, NJ | 31.0 (-10.0) | 49.8 (+8.8) |
| White Plains, NY | 20.9 (-13.8) | 26.5 (-8.2) |

## Recent Snowfall Totals/Departures From Normal CT, MA & RI

| Location | 06-07 | 07-08 |
|---|---|---|
| Boston, MA | 17.1 (-22.3) | 52.0 (+12.6) |
| Bridgeport, CT | 13.7 (-12.0) | 20.2 (-5.5) |
| Framingham, MA | 29.0 (-20.9) | 64.2 (+14.3) |
| Hartford, CT | 23.1 (-18.1) | 39.1 (-2.1) |
| Providence, RI | 18.2 (-13.1) | 29.5 (-1.8) |
| Worcester, MA | 50.9 (-10.5) | 69.7 (+8.3) |