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Inside this issue:

2013 Top Weather Events for Northern Illinois and Northwest Indiana 1

Aspects of the Winter Outlook 14

Skywarn Recognition Day 29

Jim Allsopp, WFO Chicago Warning Coordination Meteorologist, Retires 30

NWS Chicago StormReady: A Busy 2013 31

2013 Top Weather Events for Northern Illinois and Northwest Indiana

by Jim Allsopp, Warning Coordination Meteorologist

Nearly Snowless December and January

Chicago didn't receive its first full inch of snow during the winter of 2012-2013 until January 25. This set a record for the latest date into the winter season without an inch of snow and also the longest number of consecutive days between 1 inch snowfalls – 335 days.

The first sub-freezing high temperature of the season for Chicago occurred January 1, which was also a record for so late in the season. The string of 310 days without a sub-freezing high was also a record.

Two Big February Snows North Suburbs

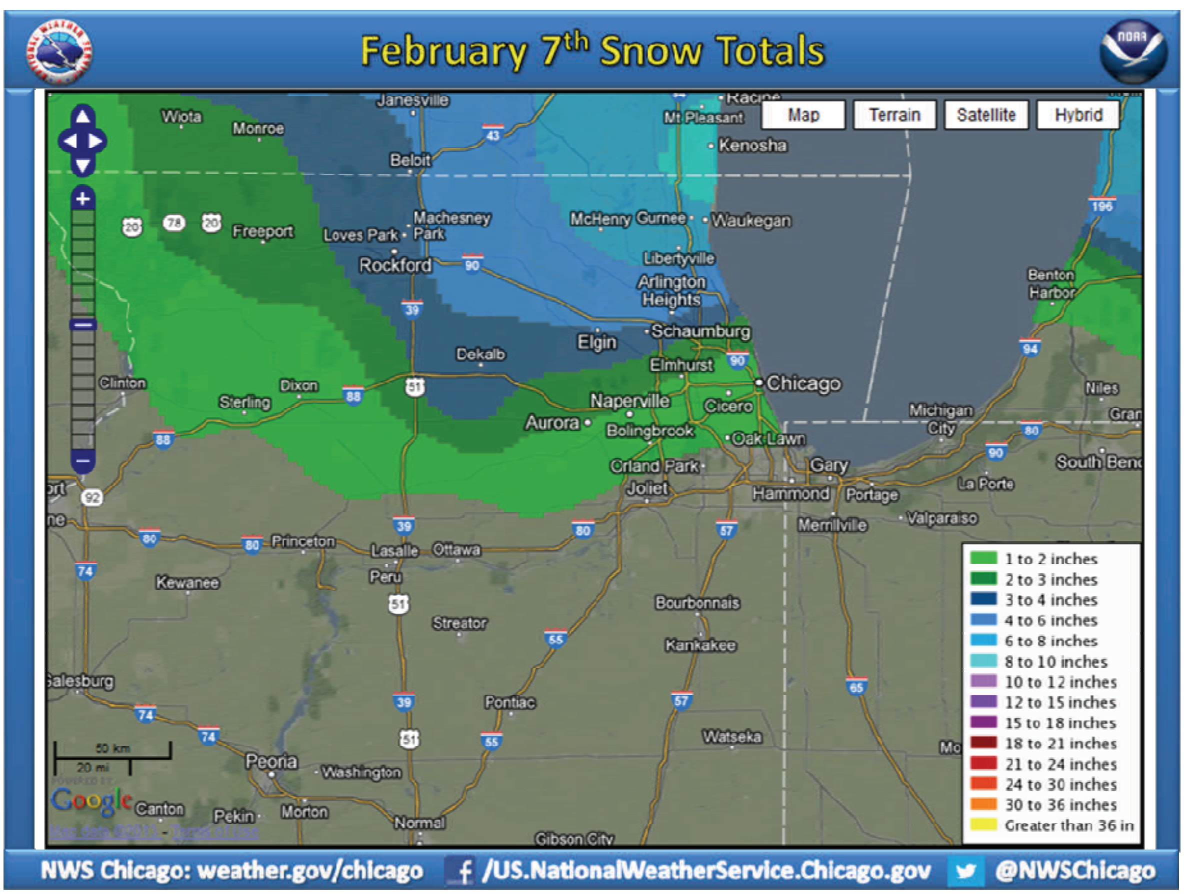
After a nearly snowless December and January, there were two bouts of heavy snow over the north suburbs in February. Six to 10 inches fell across parts of Lake and McHenry County on February 7. Another 6 to 12 inches fell on the 26th and 27th across the same area, and a bit further south into northern Cook and Kane Counties. A few spots in north central Illinois also had heavy snow.



2013 Top Weather Events for Northern Illinois and Northwest Indiana (cont)

February 7 Snow

Location	County	Snowfall
Beach Park 1W	Lake	9.6
Lake Villa 1SSW	Lake	8.8
Fox Lake 2SE	Lake	8.2
Spring Grove 2N	McHenry	8.1
Woodstock 5NW	McHenry	8.0
Waukegan 2N	Lake	7.9
Gurnee 2W	Lake	7.8
Hawthorn Woods 1N	Lake	7.3
Bull Valley 2WNW	McHenry	7.1
Mundelein	Lake	7.1
Hebron	McHenry	6.7
Wonder Lake 1WNW	McHenry	6.7
Lake Zurich	Lake	6.5
Highwood 1S	Lake	6.4
Lakemoor 2SE	Lake	6.2



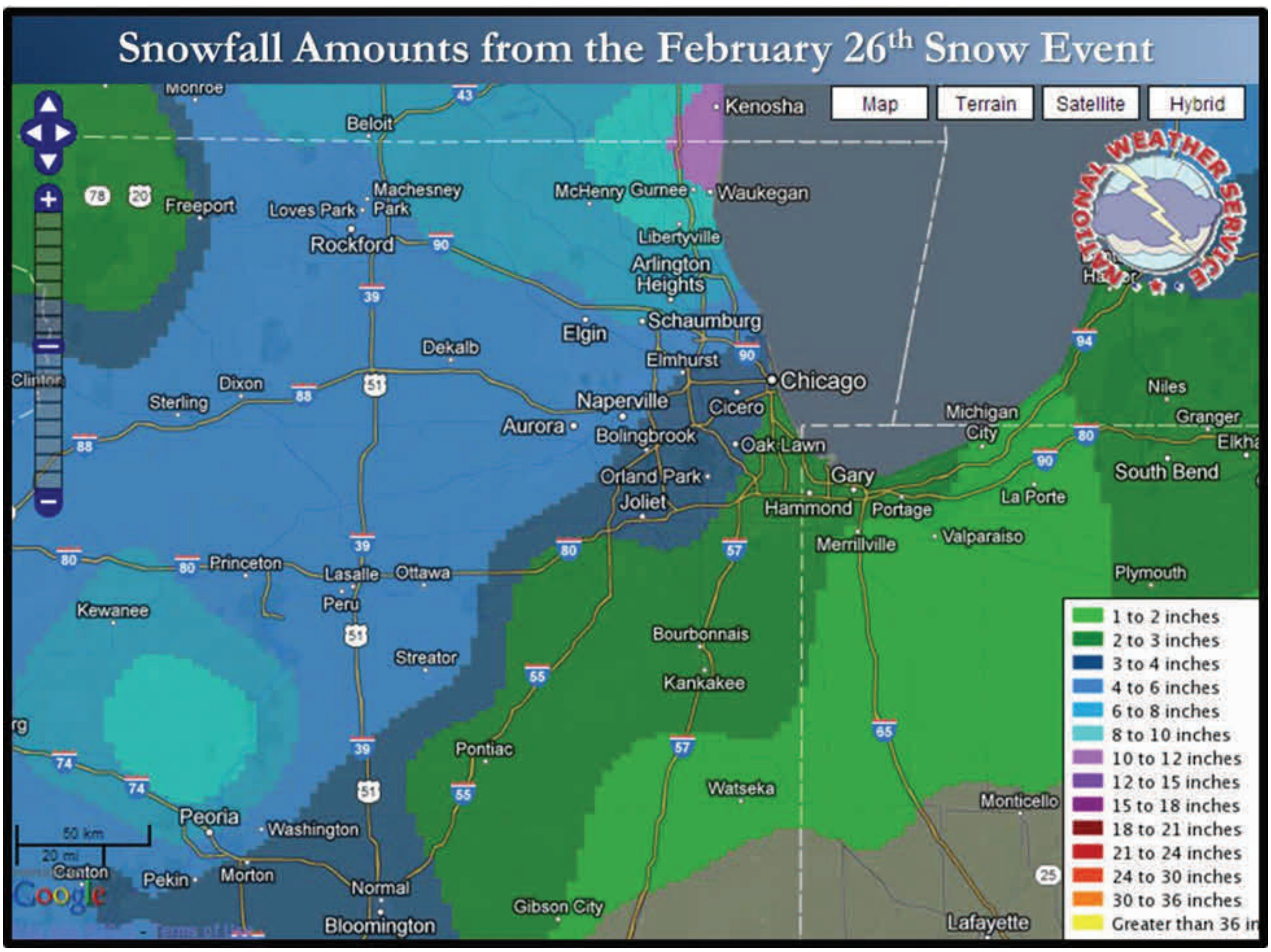
2013 Top Weather Events for Northern Illinois and Northwest Indiana (cont)

February 26 Snow

Location	County	Snowfall
Antioch 4W	Lake	12.1
Antioch 2ESE	Lake	12.0
Beach Park 1W	Lake	11.7
Gurnee 2W	Lake	10.7
Lake Villa 1SSW	Lake	10.5
Grayslake	Lake	10.2
Wonder Lake 1WNW	McHenry	9.8
Buffalo Grove 2N	Lake	9.6
Fox Lake 2SE	Lake	9.1
Waukegan 2N	Lake	8.5
Highwood 1S	Lake	8.4
Mchenry	McHenry	8.2
Sublette	Lee	8.0
Lakemoor 2SE	Lake	8.0
Spring Grove 2N	McHenry	8.0
Lincolnshire 1.3WSW	Lake	7.9
Roselle 1ESE	DuPage	7.5
Bull Valley 2WNW	McHenry	7.4
Mundelein	Lake	7.4
Hoffman Estates 5W	Cook	7.3
Mendota 1N	LaSalle	7.3
St. Charles	Kane	7.0
Lincolnshire 1N	Lake	7.0
Lake Forest 2NNE	Lake	7.0
St. Charles	Kane	7.0
Schaumburg 3WSW	Cook	6.9
Elk Grove Village 1ESE	Cook	6.8
Palatine 1E	Cook	6.7
Schaumburg 2E	Cook	6.7

2013 Top Weather Events for Northern Illinois and Northwest Indiana (cont)

Location	County	Snowfall
Elk Grove Village 2WSW	Cook	6.6
Schaumburg	Cook	6.6
Hebron	McHenry	6.5
Cary 2NE	McHenry	6.5
Woodstock 2WSW	McHenry	6.5
Woodstock	McHenry	6.5
Lake Bluff 1W	Lake	6.3
Cary	McHenry	6.2
Winnetka 1S	Cook	6.1
Barrington	Lake	6.0
Lily lake 2E	Kane	6.0
Marengo	McHenry	6.0



2013 Top Weather Events for Northern Illinois and Northwest Indiana (cont)

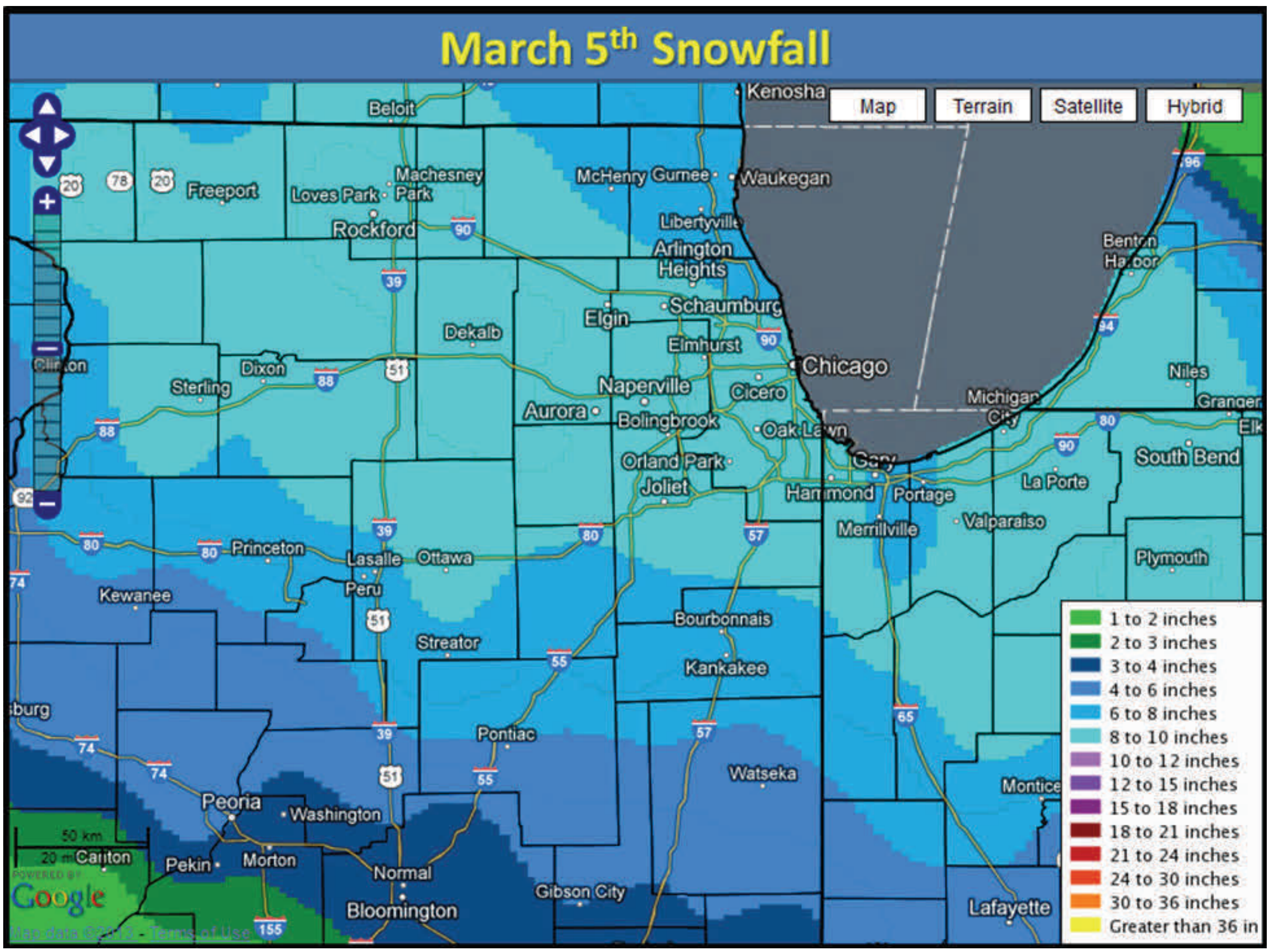
March 5 - Biggest Snowstorm of Season for Most

Chicago - A total of 9.2 inches was measured at Chicago O'Hare International Airport from the start of the event Tuesday morning through Tuesday night. This was the largest snowfall during the entire season and the first 6 inch snowfall in Chicago since the February 1-2, 2011 blizzard. Some other statistics:

- 4th largest March single day snowfall in Chicago history
- First 9 inch March calendar day snowfall since 11.5 inches fell on March 2, 1954
- Biggest March calendar day snow since 8.5 inches fell on March 21, 1992

Rockford - A total of 9.6 inches was measured at Chicago-Rockford International Airport from the start of the event early Tuesday morning through Tuesday night. This was the largest snowfall of the entire winter and the first 6 inch snowfall in Rockford since the February 1-2, 2011 blizzard. Some other statistics:

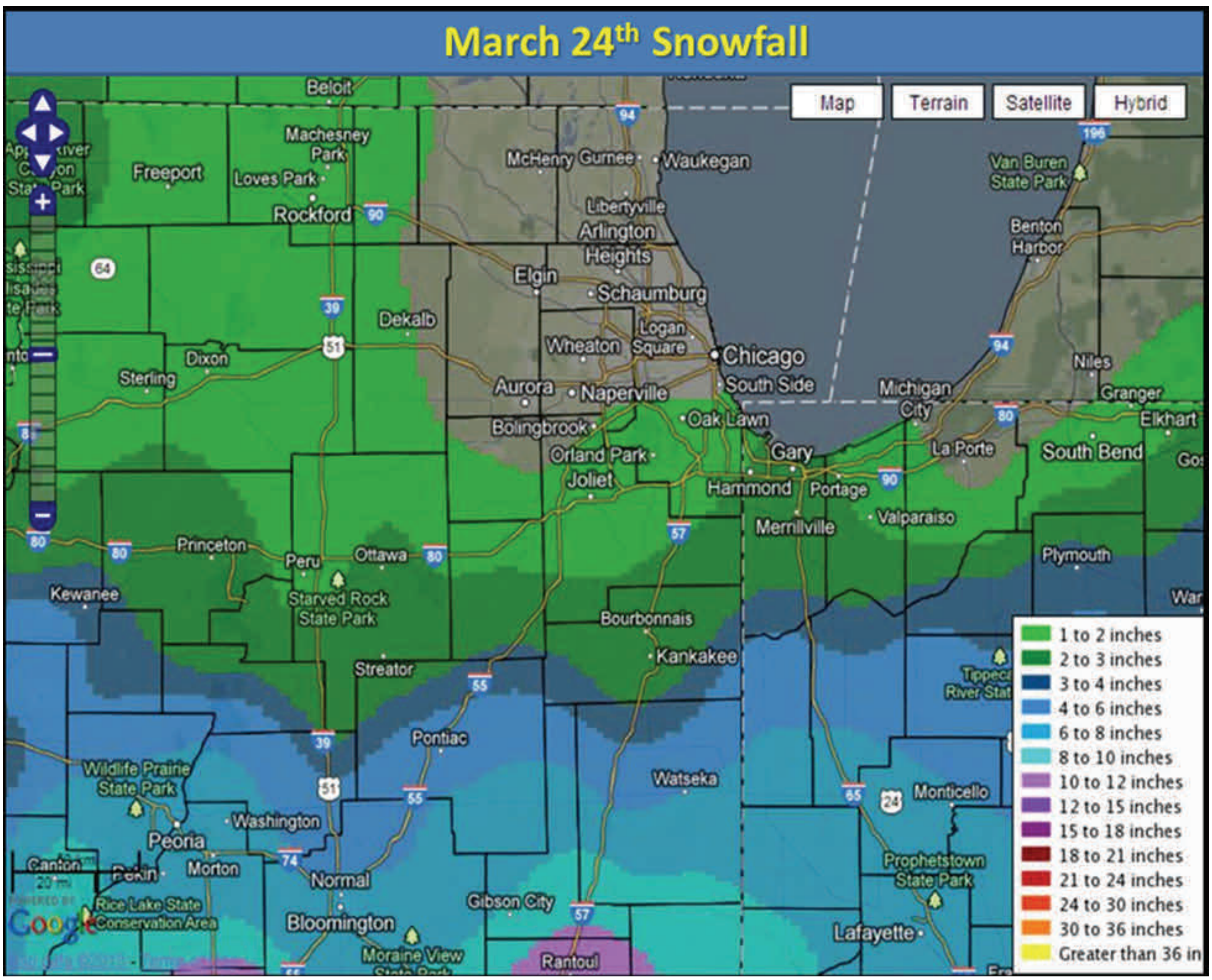
- 6th largest March single day snowfall in Rockford history
- Largest March calendar day snowfall since 10.4 inches fell on March 29, 1972



2013 Top Weather Events for Northern Illinois and Northwest Indiana (cont)

March 24 Heavy Snow South

Location	County	Snowfall
Paxton	Ford	10.0
Milford	Iroquois	8.9
Chatsworth	Livingston	7.0
Watseka	Iroquois	7.0
Remington	Jasper IN	7.8
Rensselaer	Jasper IN	7.2
Mount Ayr 2NNE	Newton IN	6.3
Kentland 1NNW	Newton IN	6.0
Brook 4W	Newton IN	6.0
Morocco	Newton IN	6.0



2013 Top Weather Events for Northern Illinois and Northwest Indiana (cont)

April 17-18 Heavy Rain and Flooding
Spring snowmelt and more than 2 inches of rain that fell in the first half of the month saturated soils and increased flow on area rivers. Heavy rain fell on April 17 and 18 resulting in widespread flash flooding and all-time record crests on some rivers. Two day rainfall totals were 3 to more than 7 inches across much of northern Illinois, with lesser amounts over northwest Indiana and central Illinois. The heaviest amounts were in DuPage County southwestward into LaSalle County. Some of the heavier amounts included 7.34 inches near Naperville, 7.26 inches at Elmhurst, 7.21 inches near Aurora, and 7.01 inches in Lisle. O'Hare Airport reported 5.55 inches and Rockford had 4.68 inches.

The heavy rain caused rapid flooding of roads, low lying areas, basements, creeks and small streams. Cars were stranded in flood waters, and homes, apartments and buildings were damaged by flood water. A levee was breached in Lincolnshire resulting in evacuation of nearly 50 homes. In Marseilles, 1500 people were evacuated when a levee was compromised. Around 500 homes and buildings were flooded. Several barges broke loose damaging 5 of 8 locks on the Illinois River. In Morris, patients were evacuated when the lower floor of the hospital was inundated. Several area rivers experienced record flooding, including the Des Plaines River at Des Plaines and Riverside, and the Illinois River at Morris, Ottawa, and LaSalle.

River	Location	April 2013 Crest	Date	Previous Record	Date
Des Plaines River	Des Plaines, IL	10.92	4/19	10.88	10/1/1986
Des Plaines River	Riverside, IL	11.42	4/19	9.90	8/15/1987
Vermilion River	Leonore, IL	30.31	4/18	27.13	12/4/1982
N Branch Chicago River	Chicago Albany Ave	8.57	4/18	7.86	9/14/2008
E Branch Du Page River	Bolingbrook, IL	25.85	4/18	24.04	9/14/2008
Fox River	McHenry, IL Tailwater	7.49	4/22	7.20	10/2/1986
Illinois River	Morris, IL	24.91	4/19	24.84	9/16/2008
Illinois River	Ottawa, IL	473.72	4/19	472.21	9/16/2008
Illinois River	La Salle, IL	34.44	4/20	33.79	9/16/2008

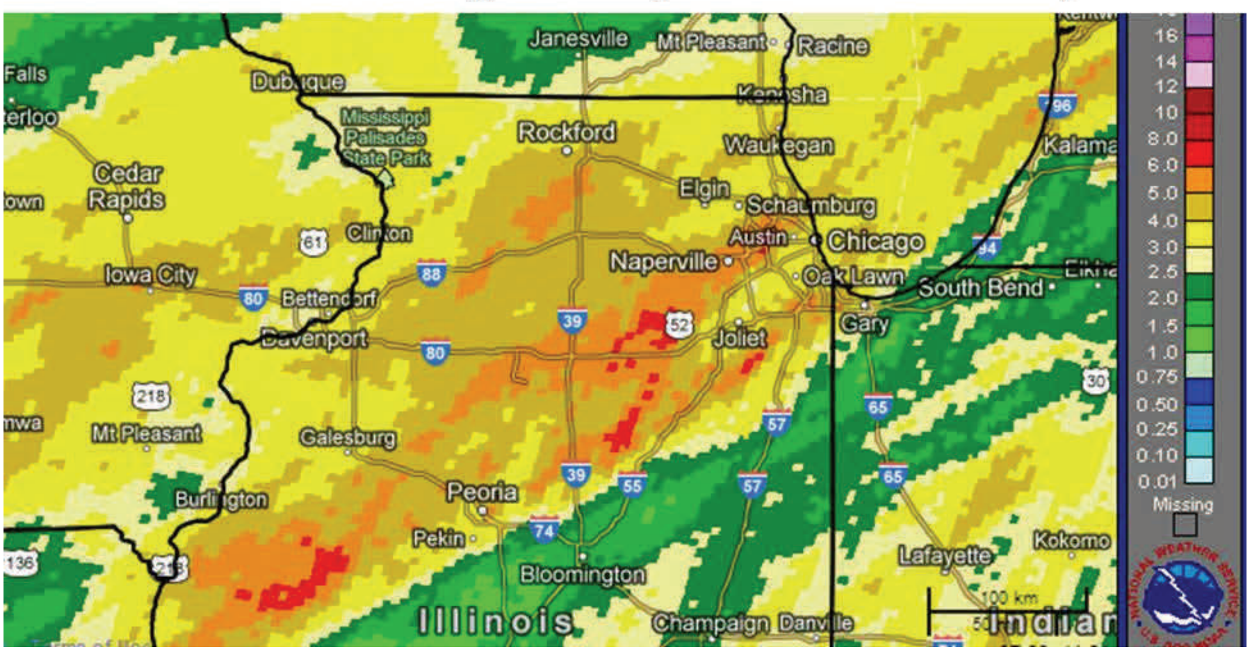
2013 Top Weather Events for Northern Illinois and Northwest Indiana (cont)

Marseilles dam damaged by barges. Photo by Kris Habermehl

2013 Top Weather Events for Northern Illinois and Northwest Indiana (cont)

Marseilles flooded. Photo by Kris Habermehl

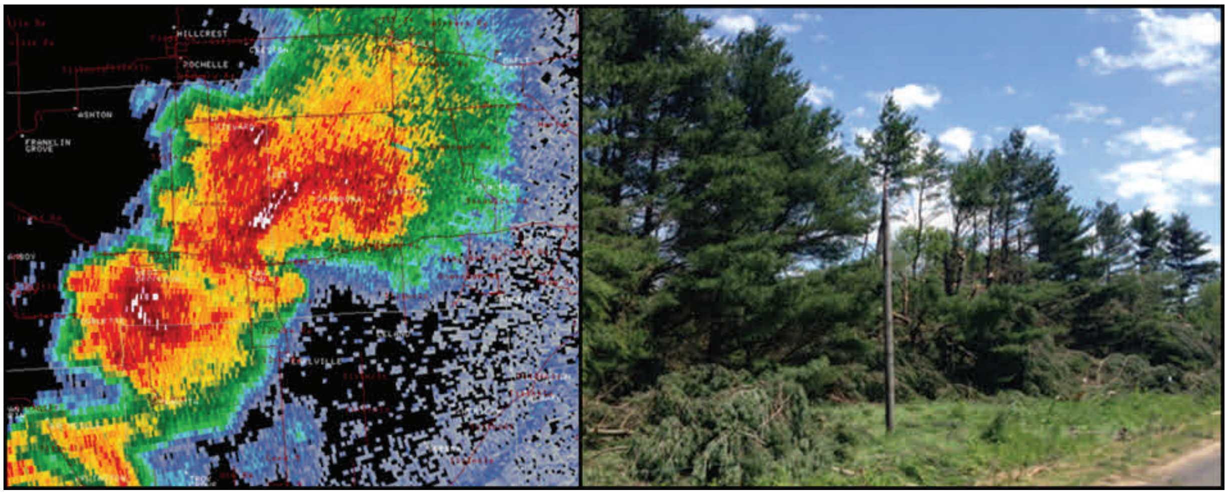
48 Hour Rainfall Through 7 am April 19th as Estimated by Radar



2013 Top Weather Events for Northern Illinois and Northwest Indiana (cont)

June 12 Severe Storms

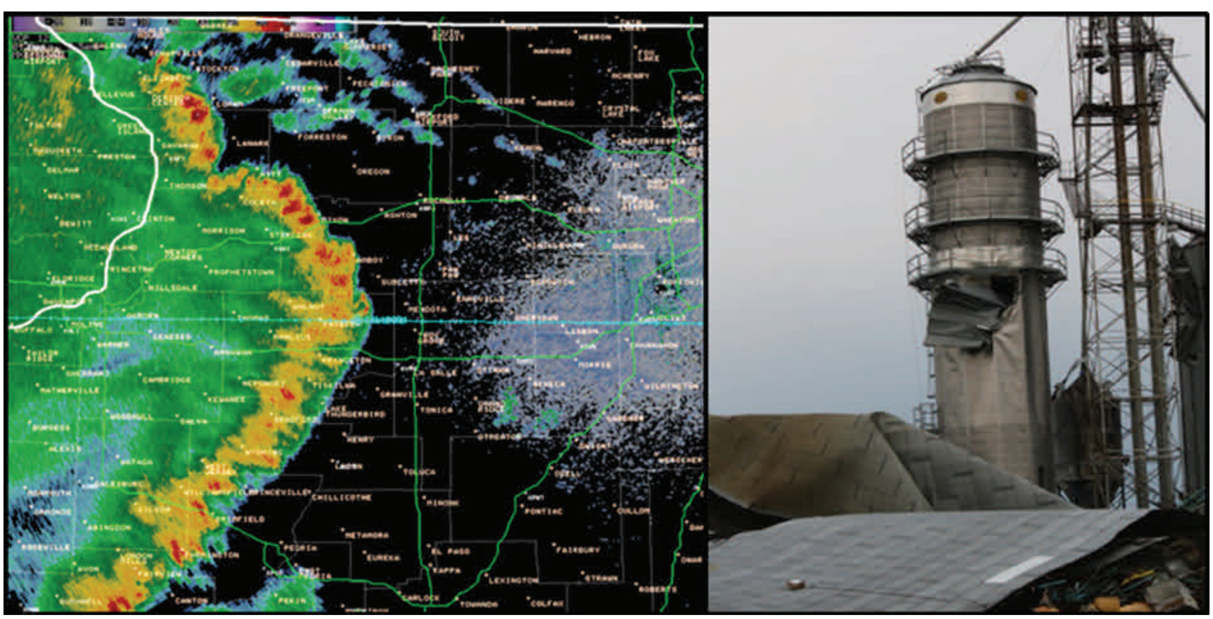
The June 12th event began with discrete rotating storms, or supercells, in northwest and north central Illinois, as seen in the below radar image. The supercells brought multiple funnels as well as one tornado near Shabbona Lake State Park. The storms also produced hail to the size of golf balls in Rockford, near Shabbona, near Oswego, Naperville, Crete, Sauk Village and Kankakee. These storms generally phased into a progressive arc of storms producing concentrated wind damage into the southwestern and southern Chicago metro area and into northwest Indiana. Thunderstorm winds damaged trees, power lines and farm buildings. There was one more embedded tornado near the border of Will and Kankakee Counties.



Radar image of “hook echo” and picture of tree damage near Shabbona Lake State Park

June 24 Derecho

The early afternoon into the mid-evening of June 24th brought a long-lived severe wind complex, or derecho, originating in eastern Iowa and moving through northern Illinois. This event overlapped some of the same area from the June 12th event, mainly along the U.S. Highway 30 and 34 corridors. Some of the most severe wind damage occurred in Lee County to grain storage bins and farmsteads. There also was an embedded tornado in Lee County. Semis were blown over on I-80 and on I-39 in LaSalle County, and on I-80 near Morris in Grundy County. Numerous trees and limbs were blown down across northern Illinois and northwest Indiana.



Radar image of bowing line of severe storms and damage to grain bins in Lee County.

2013 Top Weather Events for Northern Illinois and Northwest Indiana (cont)

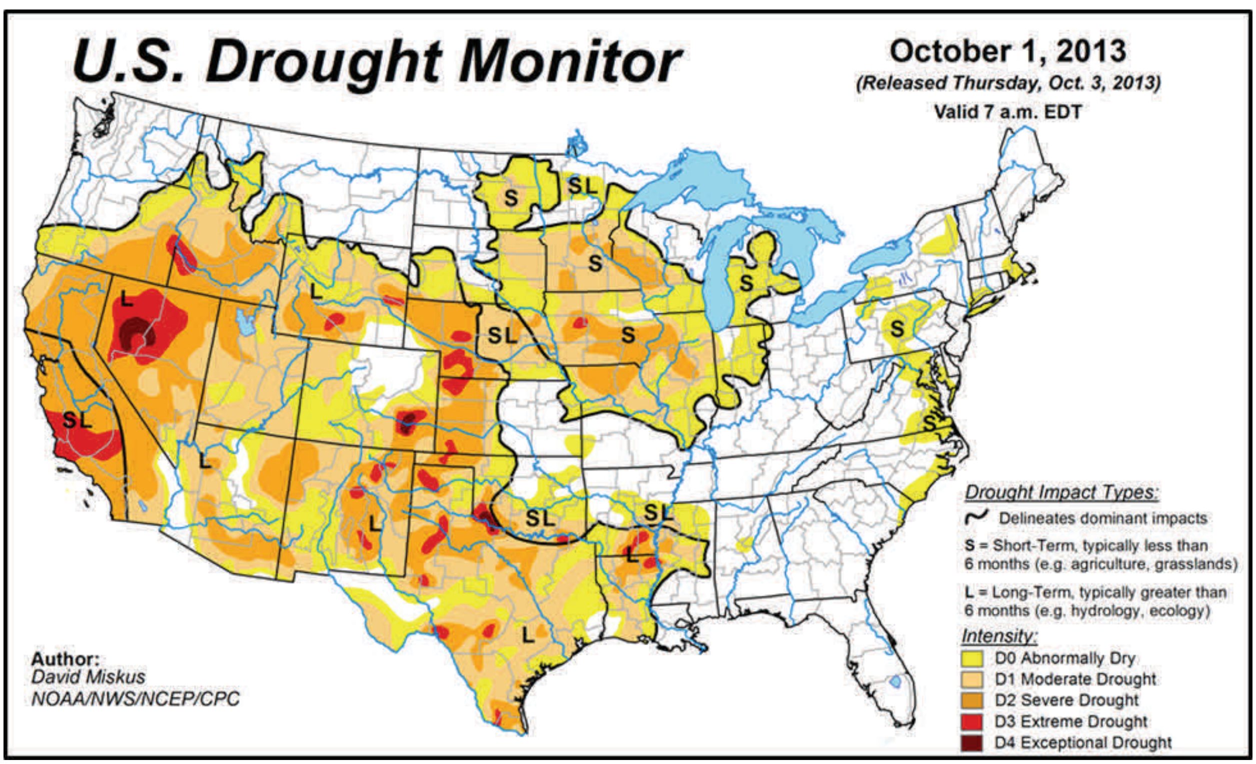
Mid July Heat Wave Followed by Record Cool Late July

The most intense period of heat and humidity of the summer of 2013 occurred in mid July. High temperatures in Chicago were 92, 94, 95 and 96, from the 16th through the 19th. The heat index was around 100 degrees each day. Six heat related fatalities were reported. Rockford had 5 straight days of 90 degree heat, peaking at 94 on the 18th.

A little over a week later, record cool weather occurred. The high temperature at both Chicago and Rockford was on 65 on July 27, a record for the coldest maximum temperature at both locations.

Wet First Six Months Followed by "Flash Drought" Late Summer

The period January through June was the wettest start to a year on record for Chicago, with 28.46 inches of precipitation. Rockford had 27.16 inches, its third wettest start to a year. After a very wet start to the year, it quickly turned very dry over much of northern Illinois and northwest Indiana from July through September. Rockford had 6.45 inches for the 3 month period, which was 5.44 inches below normal. Chicago had 6.48 inches, which was 5.33 below normal. Some areas south of Chicago had only 3 to 5 inches of rain from July through September. By early October parts of northern Illinois were suffering from moderate to severe drought.



2013 Top Weather Events for Northern Illinois and Northwest Indiana (cont)

September 12 Spoutapalooza
A family of waterspouts developed in the early afternoon on September 12 off the Kenosha shoreline and drifted southeast off Winthrop Harbor. A combination of warm lake water and a strong cold front caused the waterspout formation.

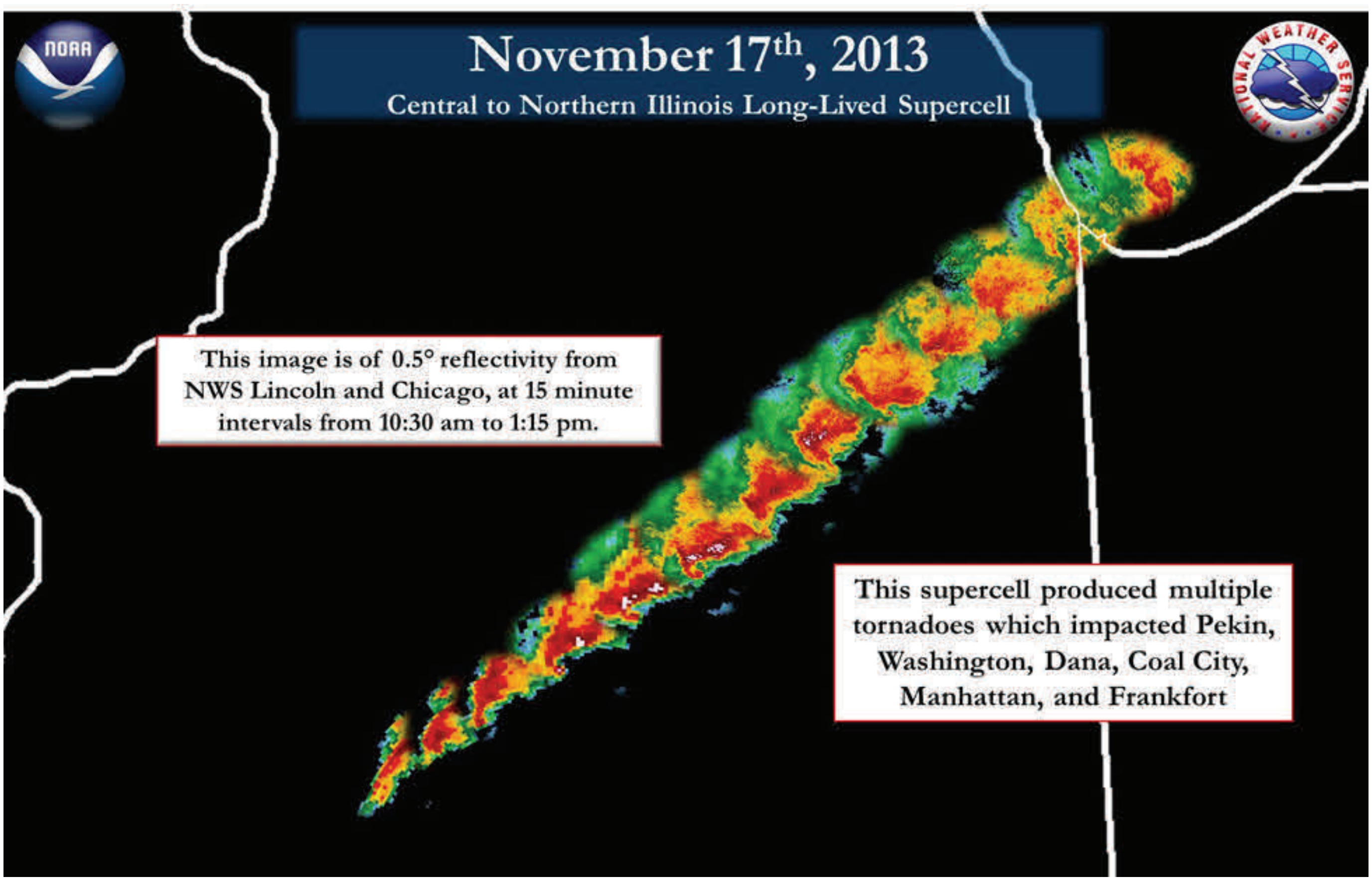
Photo from Shanon Molina

Photo from Kenosha Police Department

2013 Top Weather Events for Northern Illinois and Northwest Indiana (cont)

November 17 Tornado Outbreak

A powerful fall storm system brought unseasonably mild and humid air northward into the Ohio Valley and Great Lakes region on Sunday November 17. This produced once of the largest November tornado outbreaks on record. Around 75 tornadoes, damaging winds, and large hail affected parts of 7 states. Illinois was hard hit with 25 tornadoes including 2 EF4s. Seven people were killed by tornadoes in Illinois. In the NWS Chicago warning and forecast area of north central and northeast Illinois and northwest Indiana, there were 10 tornadoes. The supercell storm that spawned the EF4 tornado that struck Washington, just east of Peoria, continued into far southern LaSalle County and northwest Livingston Counties. This tornado mostly impacted rural areas causing EF2 damage around Dana and Long Point. There was a brief weak satellite tornado just south of the main tornado path near Dana. The same cyclic storm produced another EF2 tornado from near Coal City and Diamond northeastward to near Wilmington. The storm produced its last tornado of this family from near Manhattan to Frankfort. The storm eventually dissipated over Lake Michigan. Other weaker tornadoes spun up in far eastern Will and Kankakee Counties, Iroquois County in Illinois, as well as Newton, Jasper and Benton Counties in northwest Indiana. Elsewhere across northern Illinois and northwest Indiana, high winds damaged trees, power lines, power poles, and outbuildings.



Path of tornadic supercell storm as seen on Doppler radar.

Aspects of the Winter Outlook
by Kevin Birk and Richard Castro, NWS Chicago-Romeoville, IL

To forecast what the winter season will be like requires studying large scale weather patterns (storm tracks) across the Northern Hemisphere, and trying to determine how these weather patterns may behave over the coming months. Ultimately, the mean position and strength of the storm track across North America has a large consequence on the type of winter season the area experiences. Unfortunately, there are several phenomena that have low predictability, which can have profound influences on the strength and placement of the winter season storm track. Therefore, forecaster uncertainty in the type of conditions that will be experienced a couple of months in advance tends to be much higher than a forecast for the next few days. This article will explain some of the common things we look at to try to figure out how longer term patterns may evolve. Although there is some general understanding on how these oscillations impact the larger scale weather patterns across North America, a complete understanding is lacking. Overall, long term forecasting, such as monthly and seasonal is still in its infancy, with much more research needed to totally understand and predict larger scale weather patterns, as well as their regional impacts for upcoming seasons.

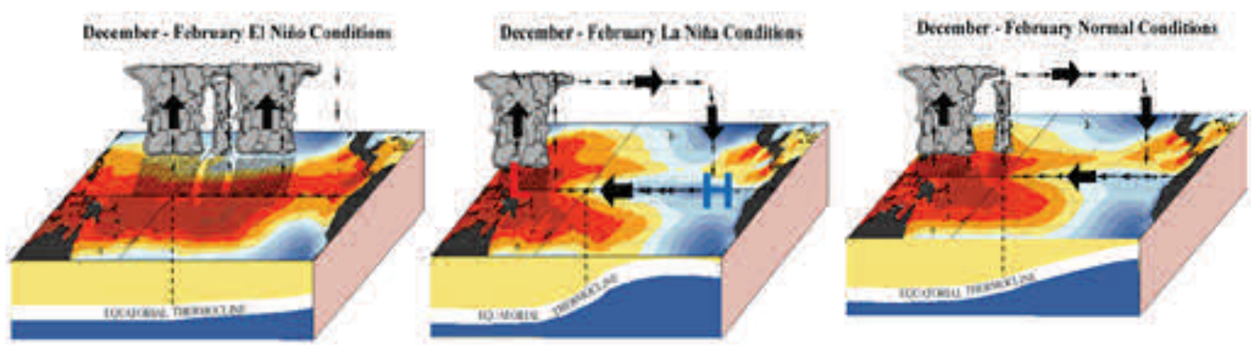


Figure 1 . The typical winter season conditions across the equatorial Pacific observed during El Niño (left) and La Niña (center) and Neutral (right).

One of the phenomena that can affect the winter season storm track across the country is the El Nino Southern Oscillation (ENSO). The ENSO is a naturally occurring oscillation that occurs across the equatorial Pacific. An oscillation is a motion that repeats itself over a period of time. For ENSO that period is between about 3 to 7 years. There are three phases that make up the ENSO. They are: El Nino, La Nina and Neutral. The defining characteristics of these three phases of ENSO are Sea Surface Temperature (SSTs) anomalies (departures from average) across the central and eastern equatorial Pacific. During La Niña conditions, cooler than average SSTs are found along the equator in the central and eastern Pacific region (center of figure 1 above). Just the opposite occurs during El Niño events (left-hand of figure 1). However, during ENSO Neutral events SST's are near normal across the equatorial Pacific (right-hand of figure 1).

Aspects of the Winter Outlook (cont)

The importance of these SST anomalies lies in the fact that they largely dictate where tropical thunderstorms will develop and be the most persistent. Thunderstorms thrive over warm ocean waters in the same way tropical storms and hurricanes do in the Atlantic. During La Niña events, the warmest ocean waters are confined to the western equatorial Pacific region. Therefore, this is the preferred placement for tropical thunderstorms during the Northern Hemisphere cold season. These thunderstorms can be considered as a "bridge" between the ocean and the atmosphere. As these thunderstorms develop, they induce atmospheric low pressure across the western Pacific region, while atmospheric high pressure sets up across the eastern equatorial Pacific where thunderstorms are less favorable (center of figure 1 above). This leads to stronger easterly trade winds (flow from high to low pressure). In return, these stronger trade winds help reinforce the SST pattern by pushing the warm water west and enhancing the strength of the cool eastern Pacific water. Just the opposite occurs during El Niño events. It is this process that produces significant changes to the atmospheric circulation in the tropics and also throughout much of the Northern Hemisphere.

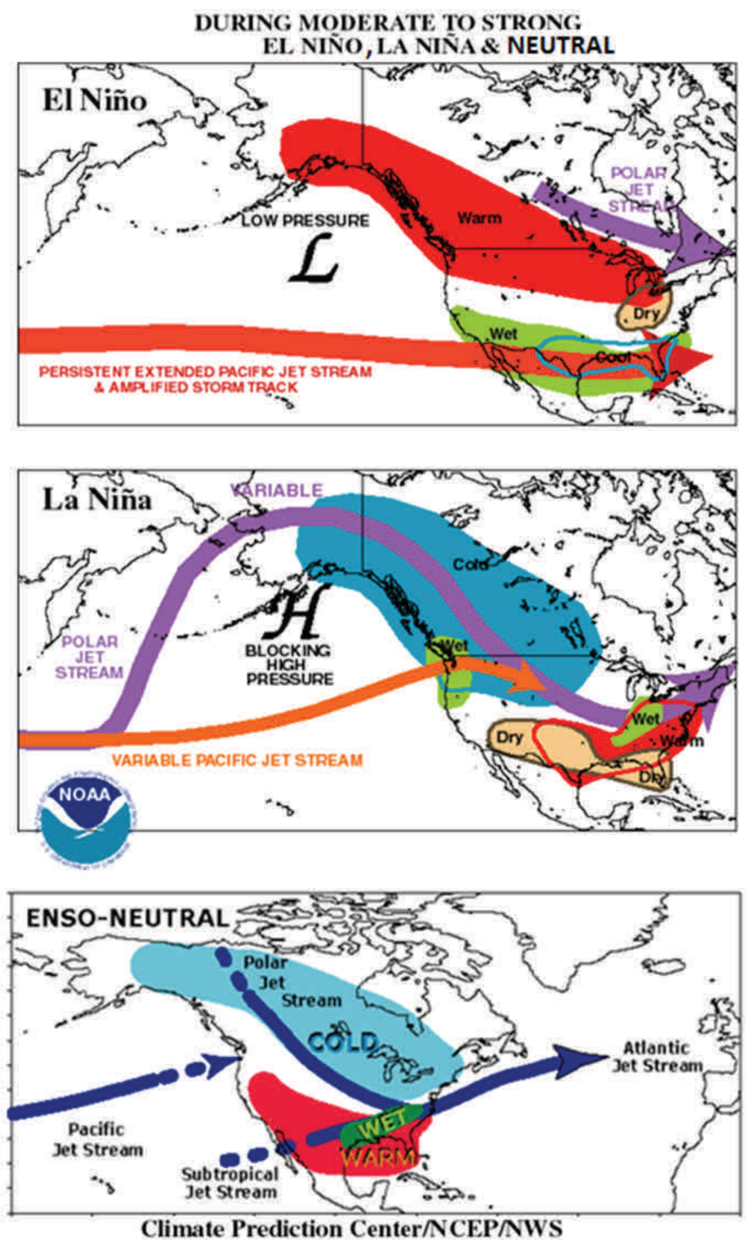


Figure 2. The typical upper level jet stream/storm track during El Niño (top), La Niña (middle) and Neutral (bottom) winters. Courtesy of NOAA, Climate Prediction Center

Aspects of the Winter Outlook (cont)

Usually the stronger an event is, the greater the impact it will have on the placement and strength of the cold season storm track across the Northern Hemisphere. Figure 2 displays the typical winter season storm track during each ENSO phase. The main characteristic of the flow pattern for La Nina is the presence of a large area of high pressure across the North Pacific. This area of high pressure acts as a "block" to the upper level flow which causes the storm track to buckle northward around the high and then southward across western North America. Dynamics associated with this atmospheric flow pattern also tends to favor high pressure across the southeastern United States, which in turn buckles the storm track back northward across the mid-Mississippi valley and the Great Lakes region. This tends to support colder and snowier conditions across the north central CONUS. In contrast, during El Nino events, the main storm track extends from the Pacific eastward across the southern portion of the country, which supports drier and warmer winters across much of the Great Lakes region. During ENSO Neutral winters, the overall storm track can mimic those of La Nina events, with cold conditions favored, especially across the northern CONUS. However, not every event is the same and although the figure above indicates that cold conditions may be favored during La Nina and ENSO neutral events, there are other factors that can modulate the effects of ENSO events.

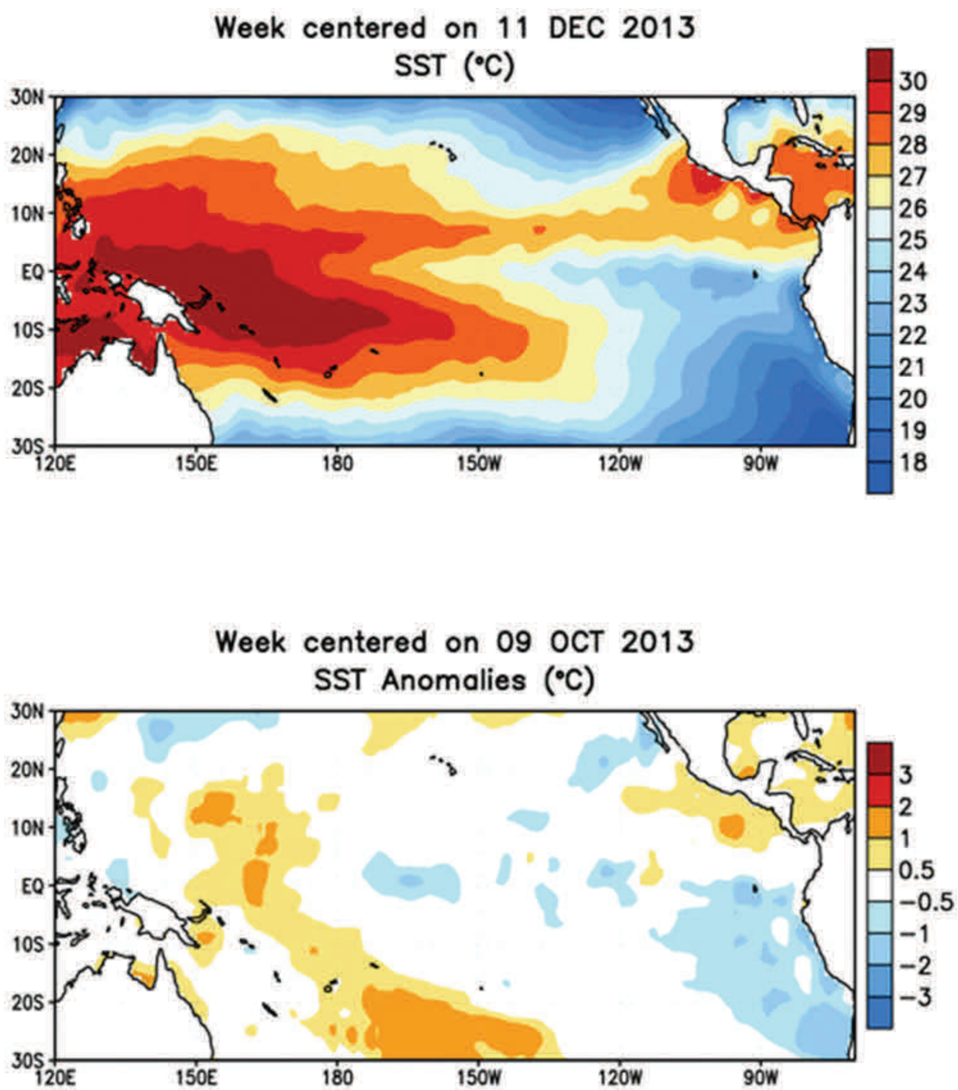


Figure 3 Observed sea surface temperatures across the equatorial Pacific (top) and their departures from average (bottom). Courtesy of NOAA, Climate Prediction Center

Aspects of the Winter Outlook (cont)

Conditions across the equatorial Pacific resemble ENSO Neutral conditions. Notice that the SST departures from average across the equatorial Pacific are near average (bottom of figure 3). The latest forecasts indicate a high likelihood that ENSO Neutral conditions will continue through the rest of the winter season. This means neither El Nino, nor La Nina conditions are expected to impact the winter season.

The Pacific Decadal Oscillation

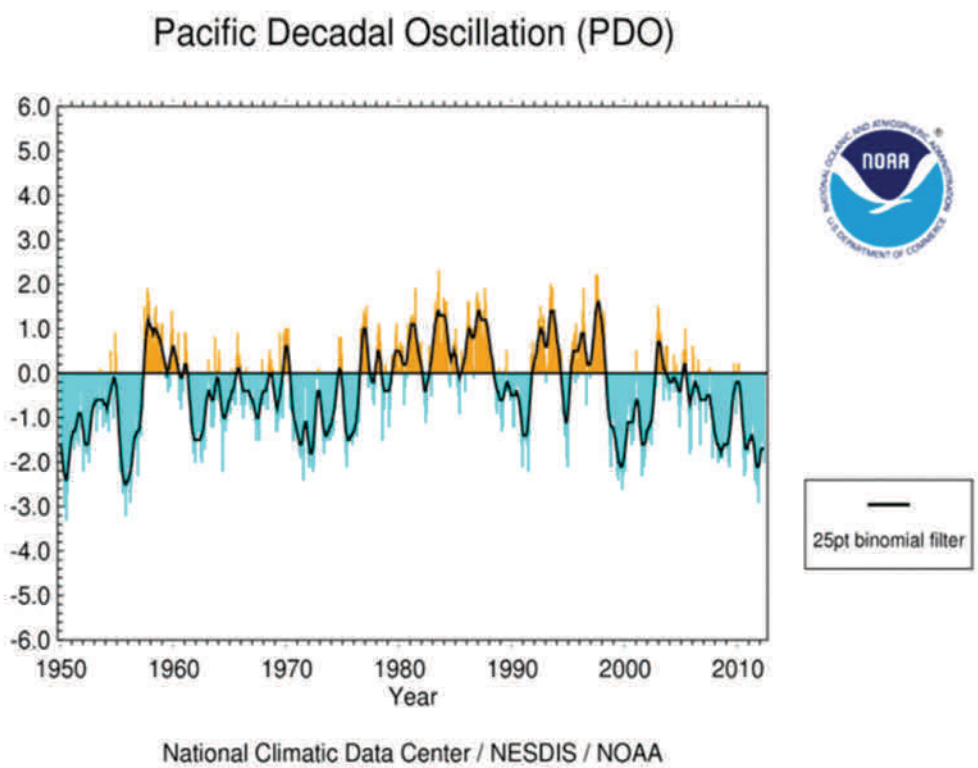


Figure 4. Behavior of the Pacific Decadal Oscillation (PDO) since 1950.

Aspects of the Winter Outlook (cont)

Another player that may have an impact on the winter season storm track is the fact that the Pacific Decadal Oscillation (PDO) is in its negative phase. The PDO is an ENSO-like oscillation that occurs in the North Pacific (Northward of 20° latitude). However, unlike ENSO, the PDO tends to have a period of variability on interdecadal time scales (Figure 4). This means that one phase of the PDO will usually last a decade or two. The figure above displays the behavior of the PDO since 1950. The red areas represent times in which the PDO was predominately in its positive phase. Conversely, the blue areas represent times that the negative phase dominated. The figure shows that the phase of the PDO has predominantly remained negative for the past several years and it continues to strengthen.

Figure 5 below displays the characteristics of the two phases of the PDO. The positive phase is characterized by warmer than average eastern Pacific water and cooler western and north central Pacific water. However, during the negative phase, the warmest SST anomalies are confined to the western and north central Pacific with relatively cool SSTs across the eastern Pacific.

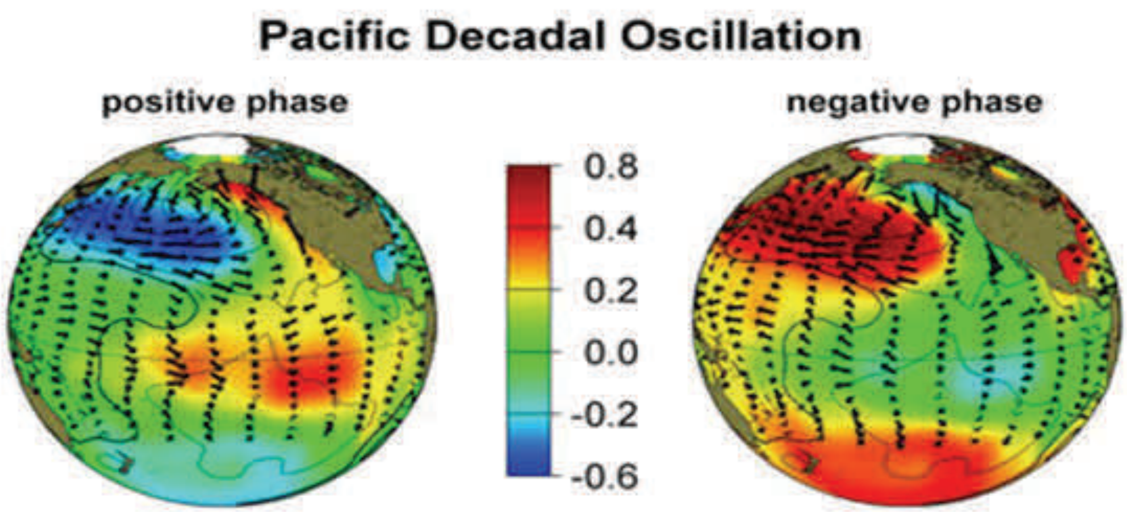


Figure 5. The typical sea surface temperature anomalies typically associated with the positive (left) and the negative (right) phases of the PDO. Figure reproduced from http://jisao.washington.edu/pdo/

Aspects of the Winter Outlook (cont)

The typical winter season conditions associated with negative and positive PDO phases are shown in figure 6. Notice that conditions are nearly the opposite from one phase to the other. For example, the Jet stream tends to be very strong across the central Pacific during the positive PDO and very weak during the negative phase. The result of this weaker Pacific Jet during the negative phase leads to increased blocking (meridional or north to south flow) across the North Pacific, and consequently buckles the polar jet southward across western Canada and the northwestern and north central portion of the United States. This allows cold air to spill southward across Alaska, western Canada and the northern portions of the U.S. However, warmer winter season conditions are favored across the southeastern CONUS, where the jet stream lifts back northward across eastern Canada. The active jet across the central portion of the country during these episodes also favor above average winter season precipitation across the Ohio valley and Great Lakes Region.

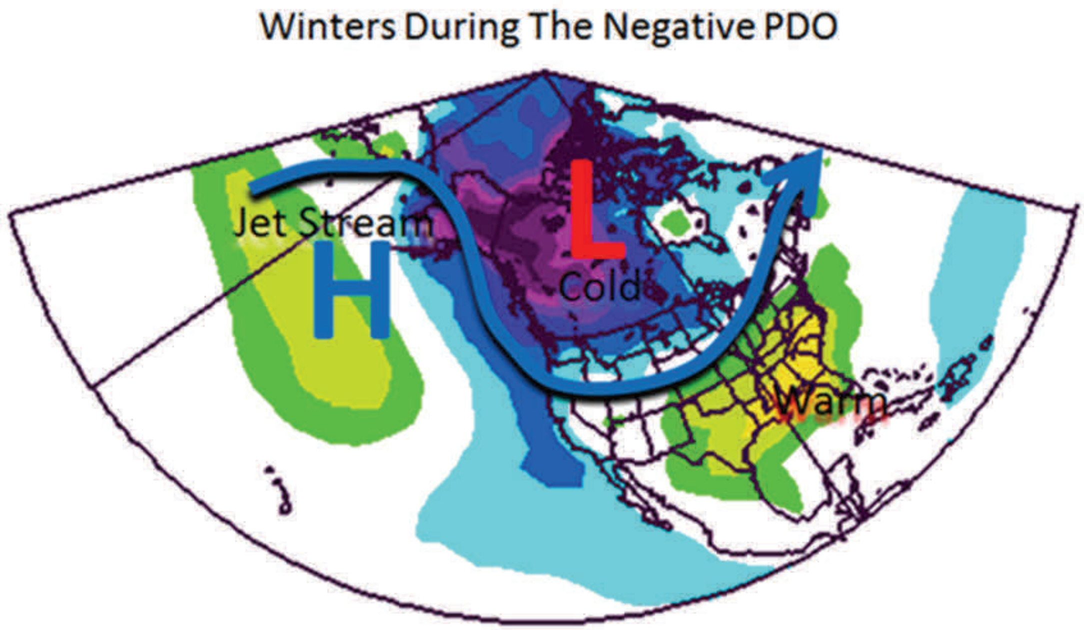
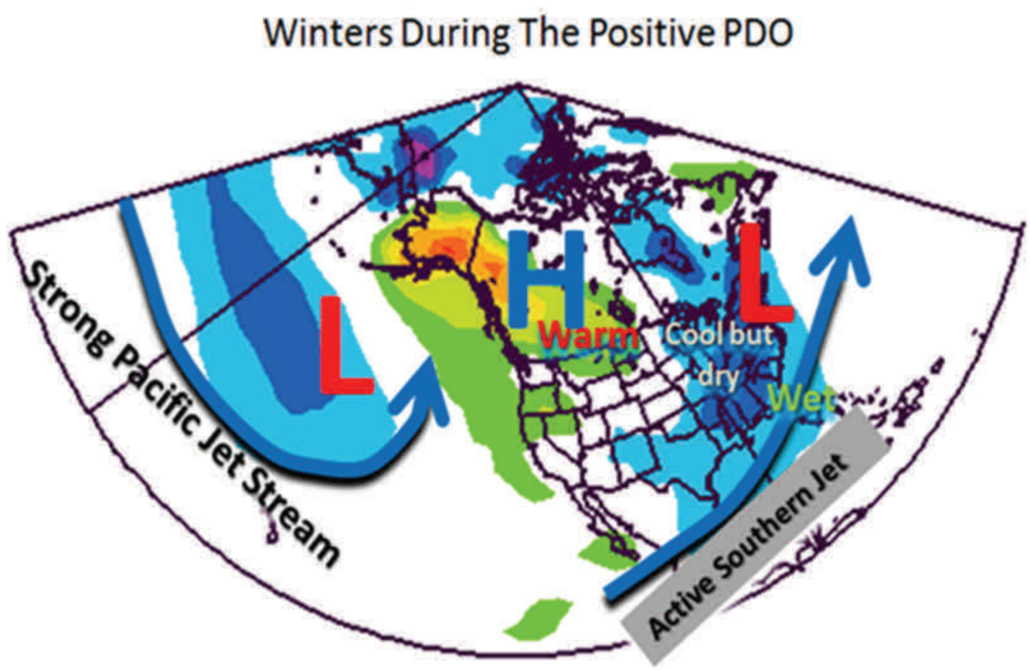


Figure 6. Typical winter season conditions during the negative PDO (top) and the positive PDO (bottom). The large blue arrow indicates the approximate placement of the Jet



Aspects of the Winter Outlook (cont)

Research has shown that the PDO can act to modulate the typical effects of ENSO. Specifically, it has been suggested that during positive PDO El Nino events constructive interference occurs, meaning that the El Nino event is more efficient in producing the typical El Nino signal across North America during the winter. The same can be said for La Nina events during the negative phase of the PDO. However, when El Nino links up with the negative PDO or La Nina links up with a positive PDO then destructive interference occurs, resulting in a modified effect on the mean winter season flow pattern across North America.

Compare the top of figure 6 (negative PDO) with the figure for La Nina in figure 2 above. Notice that the Jet stream, represented by the large blue arrow, behaves similarly in both. Both negative PDO and La Nina events favor blocking high pressure across the North Pacific and the downstream southward buckling of the jet stream across western Canada and the northern CONUS. So, it should not be too surprising that when La Nina and a negative PDO are in place across the Pacific that the effects to the winter season jet stream across North America will be enhanced. The PDO can also have a similar effect on ENSO neutral events.

So the question is what are the favored atmospheric circulation patterns during negative PDO ENSO Neutral conditions? Figures 7 and 8 below indicate that the phase of the PDO helps drive drastically different conditions across the Pacific region during ENSO Neutral winters. During negative PDO ENSO neutral events increased mid and upper level atmospheric high pressure tends to be favored across the North Pacific, while lower than normal atmospheric pressure is favored during positive PDO Neutral events. The consequences of these different pressure patterns across the Pacific drive different jet stream patterns across North America during the winter. The tendency for higher pressure in the mid and upper levels of the North Pacific during negative PDO Neutral events acts as a block to the flow pattern and buckles the winter season jet stream southward across the northern CONUS. This is similar to the composite shown for the negative PDO events in figure 6. This jet stream pattern favors colder conditions across much of the northern half of the CONUS and above average precipitation across portions of the Ohio and Tennessee Valleys. In contrast, the tendency for lower pressure across the central and northern Pacific during positive Neutral events favors a northwesterly jet stream pattern across the central states. This tends to produce below average precipitation across the Ohio and Tennessee Valleys.

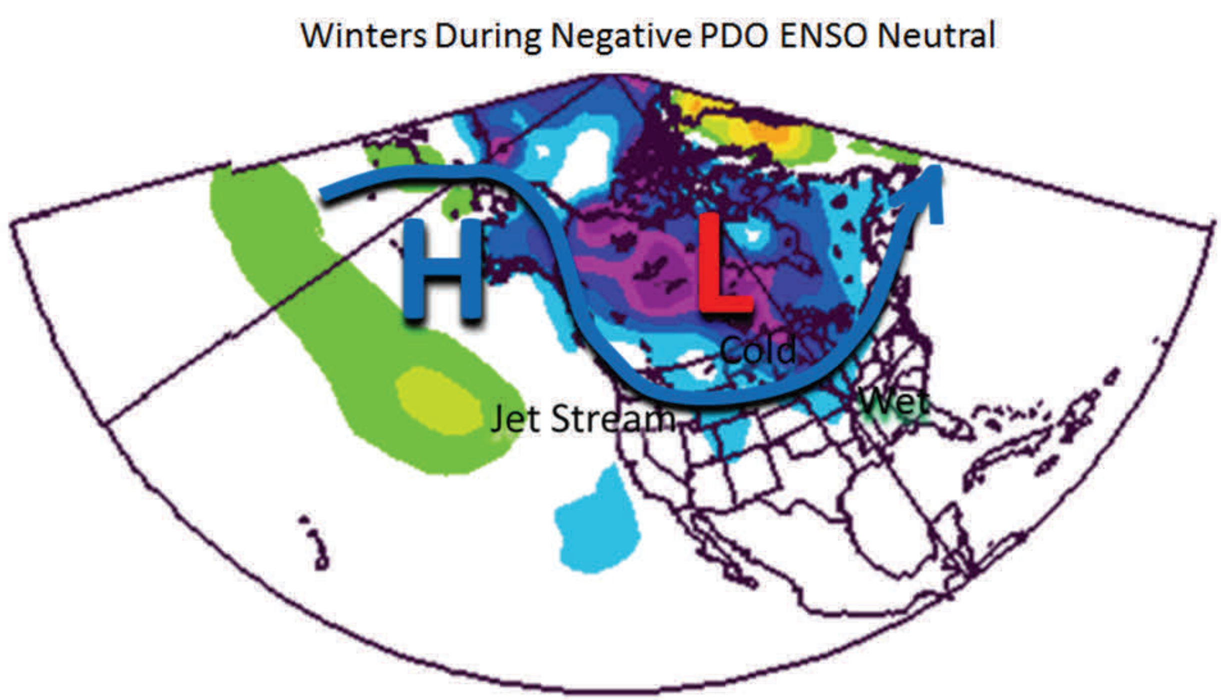


Figure 7. Typical winter season conditions during negative PDO Neutral events. The large blue arrow indicates the approximate placement of the Jet stream.

Aspects of the Winter Outlook (cont)

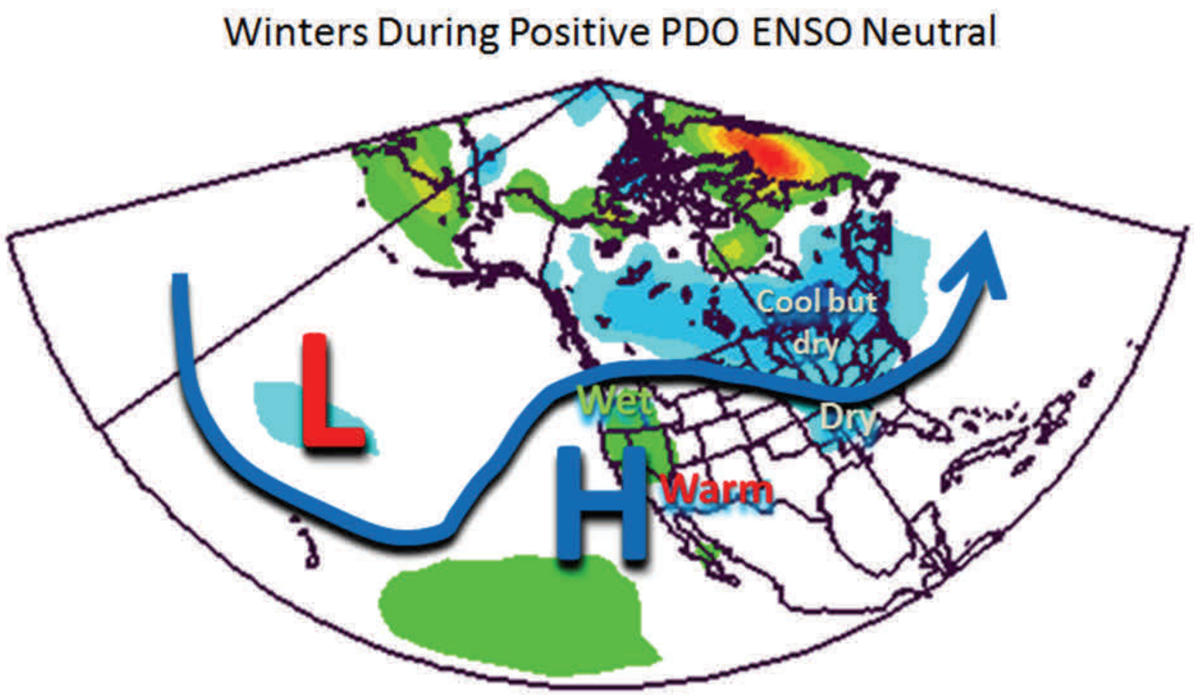


Figure 8. Same as figure 7 except during positive Neutral events.

So what are some of the typical effects locally? Table 1 below displays normal temperatures and snowfall amounts for each winter season month along with the average departures from average for each particular event (Note that the averages calculated here are for a long period running from 1900 to 2011 and not the 1981-2010 normal). Additionally, figure 9 displays the distributions for winter season temperatures (left) and snowfall (right). This data indicates that there is a slight tendency for ENSO Neutral events to produce below average temperatures across the region. This is especially true during the –PDO events. However, none of this temperature data was found to be statistically significant for the area. This is likely due to the fact that we tend to lie on the boundary between areas that are more prone to being cold across the north central CONUS and those areas more favored for warmer conditions across the south. Considering this, it is likely that we experience a bit of both warm and cold periods during these winter seasons.

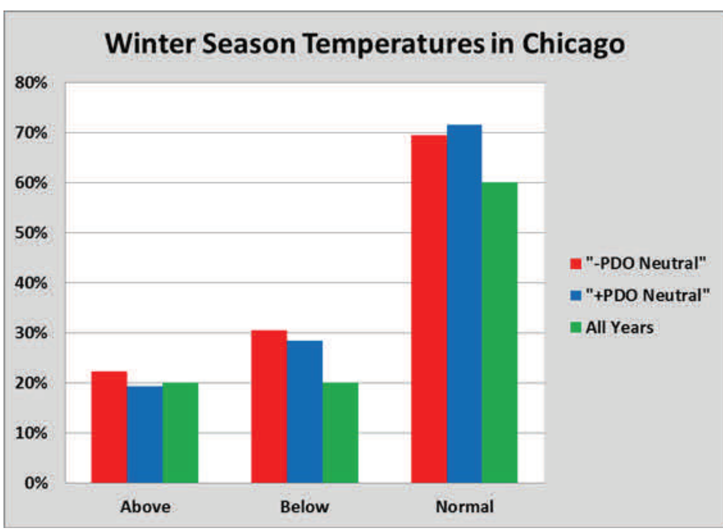
Aspects of the Winter Outlook (cont)

Unlike with temperatures, snowfall showed a high bias of nearly 7 inches during the –PDO ENSO Neutral winters, which was found to be statistically significant. In fact, some of the snowiest winters in Chicago's history occurred during these particular events, including the 1978-79 winter season. Furthermore, the distribution shown on the right hand chart in figure 9 for the –PDO Neutral events (shown in red) also indicates the tendency for more snowy winter seasons, with a large skew towards the snowy winters (above category). This signal for increased precipitation and snowfall is due to the fact that these –PDO Neutral events favor a stronger upper level westerly jet stream right across the central section of the country (figure 7 above). The presence of this would increase the odds of having a more active weather pattern with a larger number of potent winter storm systems.

Table 1. Monthly and winter season average temperatures and their departures from average during both positive and negative PDO ENSO Neutral events (left) and for snowfall (right). Chicago data is shown, but all of northwestern Indiana and northern Illinois are similar.

Winter Temperatures in Chicago			
	Normal	-PDO Neutral	+PDO Neutral
December	28.7°F	-1.5°F	-0.4°F
January	24.3°F	-1.2°F	-0.8°F
February	27.2°F	+2.1°F	-0.7°F
Winter Season	26.7°F	-1.3°F	-0.5°F

Winter Snowfall in Chicago			
	Normal	-PDO Neutral	+PDO Neutral
December	8.7"	+2.40"	-2.00"
January	10.2"	+2.15"	-1.39"
February	8.6"	-2.6"	+1.49"
Winter Season	27.4"	+6.9"	-1.12"



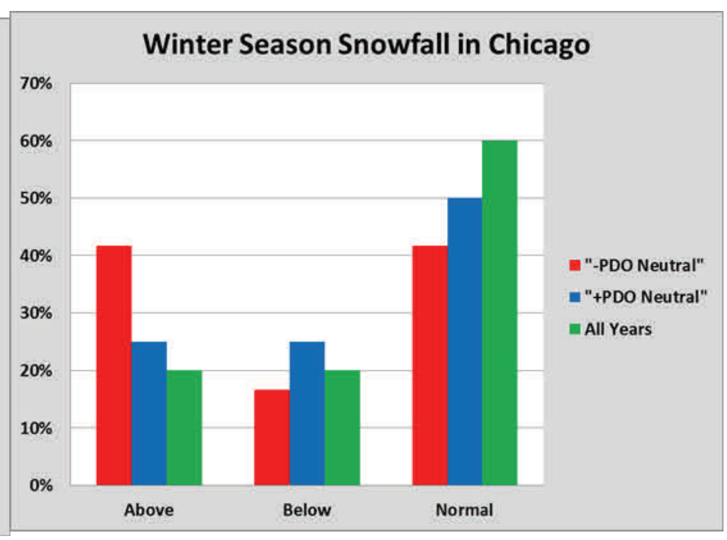


Figure 9. Distribution of winter season temperatures (left) and snowfall (right). The bars indicate the distributions during the: –PDO ENSO Neutral years (red), +PDO ENSO Neutral years (blue) and for Climatology (green). Climatology was calculated by classifying the middle 60% of the seasonal temperature and snowfall data from 1900-2011 as being near normal. The above and below each represent the highest and lowest 20% extremes from the 1900-2011 dataset.

Aspects of the Winter Outlook (cont)

The North Atlantic/Arctic Oscillation

Both ENSO and the PDO discussed above deal with natural variability across the Pacific. However, another important driver of the storm track during the winter season is the North Atlantic Oscillation (NAO). The NAO is related to the Arctic Oscillation (AO), only it focuses on conditions across the North Atlantic. The AO and NAO are both naturally occurring oscillations that represent flip flops in atmospheric pressure between the high latitudes and the mid latitudes of the Northern Hemisphere. The main difference is that the NAO is just localized to the North Atlantic Ocean. The NAO can significantly alter the winter jet stream pattern across North America over what the ENSO and the PDO phases might otherwise suggest.

Similar to the PDO, there are two phases that make up the NAO and the AO; a positive and a negative phase. The negative phase of the AO features relatively high atmospheric pressure across the high latitudes of the arctic, with lower pressure across the mid-latitudes. Similarly the negative phase of the NAO features above average pressure across the high latitudes of the North Atlantic near Greenland and Iceland, and lower pressure across the mid-latitudes of the Atlantic (top right of figure 10). The positive phases of the AO and NAO are the opposite of the negative phase (top left of figure 10).

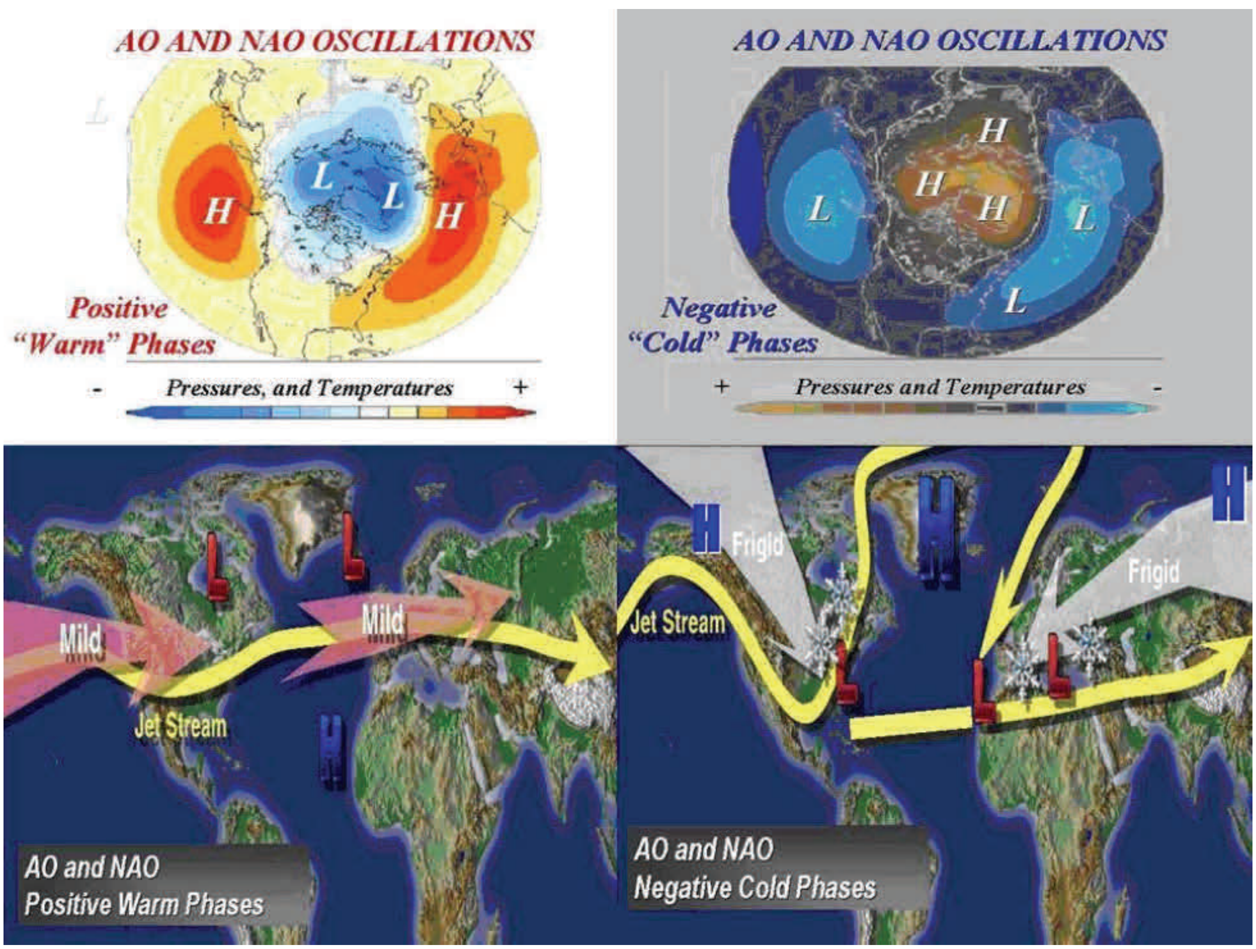


Figure 10. The Positive and Negative Phases of the AO and NAO (icecap.us)

Aspects of the Winter Outlook (cont)

These pressure anomalies have a profound impact on the strength and geographical location of the storm track across the Northern Hemisphere. The negative phases produce a weaker jet across the higher latitudes of Canada and the North Pacific (bottom right figure 10). This allows the storm track and the cold arctic temperatures to drop southward across the central and eastern United States. The higher pressures over the Arctic and Greenland areas also serve as a bottle neck, or blocking in the atmosphere at the higher latitudes. This high latitude blocking also prevents cold air masses from quickly exiting the central and eastern United States. As a result, winters can tend to be colder during prolonged periods of the negative phase of the AO and NAO (left side of figure 11). In contrast, the anomalous pressure patterns associated with the positive phases of the NAO and AO induce a stronger westerly upper level jet across the northern latitudes of Canada and the North Atlantic and reflect a lack of high latitude blocking (bottom left figure 8). This makes it very difficult to get cold air to spill southward across the central and eastern United States, and any cold air that does move into the region is not blocked from exiting quickly off to the east with the fast jet stream flow. As a consequence, winters tend to be warmer during prolonged periods of the positive phase of the AO and NAO (right side of figure 11).

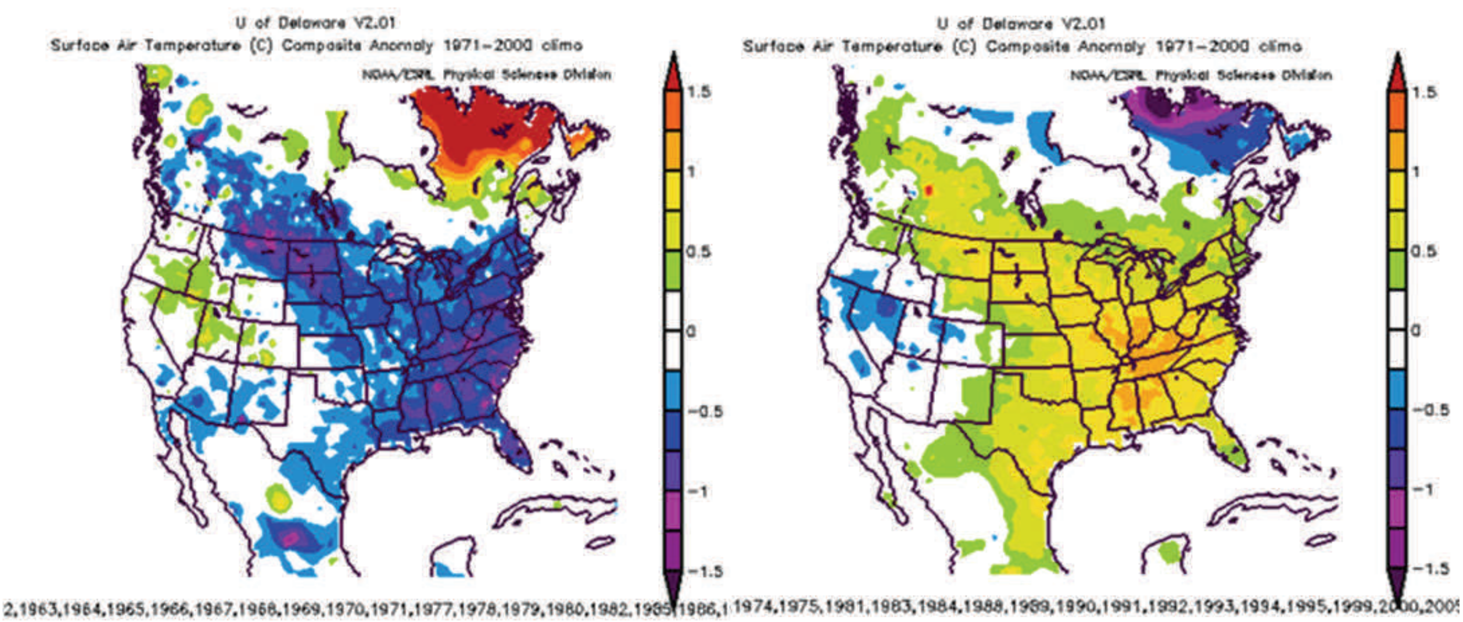


Figure 11. Winter season surface temperature anomalies during a negative NAO (left) and during the positive NAO (right)

Aspects of the Winter Outlook (cont)

Given the impacts the NAO has on the winter season conditions; it is definitely another very important player for determining what this winter will bring. The NAO is very difficult to predict more than a few weeks in advance, so many long range forecasts do not take this into account. However, new research within the past few years is promising in terms of predictability of the predominant seasonal scale AO/NAO pattern. Overall, the NAO has variability on timescales ranging from a few weeks all the way up to several decades. The negative phase of the NAO tended to dominate the winters of 2009-10 and 2010-11, which helped lead to some cold and snowy winter seasons. However, during the winter of 2011-12 the NAO remained strongly positive through much of the winter season (Table 2 Below). This helped produce a very warm winter across a good portion of the COUNS. So the big question is how will the AO/NAO behave for the rest of this winter? The AO/NAO has been predominately positive lately and it is possible that this may continue to be the case for much of the winter.

Table 2. North Atlantic Oscillation (NAO) index for the winter season months over some of the past winters.

North Atlantic Oscillation (NAO) index			
	December	January	February
2009/2010	-1.9	-1.1	-2.0
2010/2011	-1.9	-0.9	+0.7
2011/2012	+2.5	+1.2	+0.4

What's interesting is that in spite of the fact that the AO/NAO have been predominately positive of late, conditions have been much colder than normal. This is not typically associated with the positive phases of the AO/NAO. This is a good example of how the phases of the AO/NAO will not always directly correlate with temperatures locally. In other words, a positive (negative) AO/NAO will not always lead to warmer (colder) conditions. In this case, the persistent cold for the first half of December is a result of other factors. It appears the main driver for our cold December is the persistent strong upper-level ridging (high pressure) across the Northern Pacific (see right hand figure in figure 12). This northern Pacific high pressure ridge is a classic signal for the negative phase of the Eastern Pacific Oscillation (EPO), which is also correlated with colder than normal conditions across the central CONUS (Low pressure across the northern Pacific near Alaska is a characteristic of the positive phase of the EPO, which would correlate to warmer conditions across the central CONUS). This area of much higher than normal pressure in the mid and upper levels of the atmosphere has acted to "block" the west to east flow across the Pacific. The main result of this pattern has been buckle the storm track (polar jet) southward across the western and central CONUS, which allows deeper cold to spill out of Canada.

Aspects of the Winter Outlook (cont)

The left hand figure in figure 12 below illustrates the typical storm track and resultant thermal conditions across North America during a predominately +NAO/AO ENSO Neutral winter month. Notice that lower pressure and colder than average conditions tend to be favored across much of Canada, with higher pressure favored across the southern CONUS and the northern Pacific. This type of pattern favors a storm track across the northern CONUS and warmer than average conditions across much of the southeastern half of the country. This is not to dissimilar to the storm track for the first portion of December (bottom of figure 12). However, thus far this December, the colder air has been forced farther south across much of the central CONUS, with only the far southeastern CONUS under the higher mid level pressure anomalies. This could change, however. For example, If the ridging (higher pressures) across the southeastern CONUS become more prominent and expands west and northward through the winter season, then the potential for some warmer conditions locally would likely result. This possibility will have to be watched in the coming weeks.

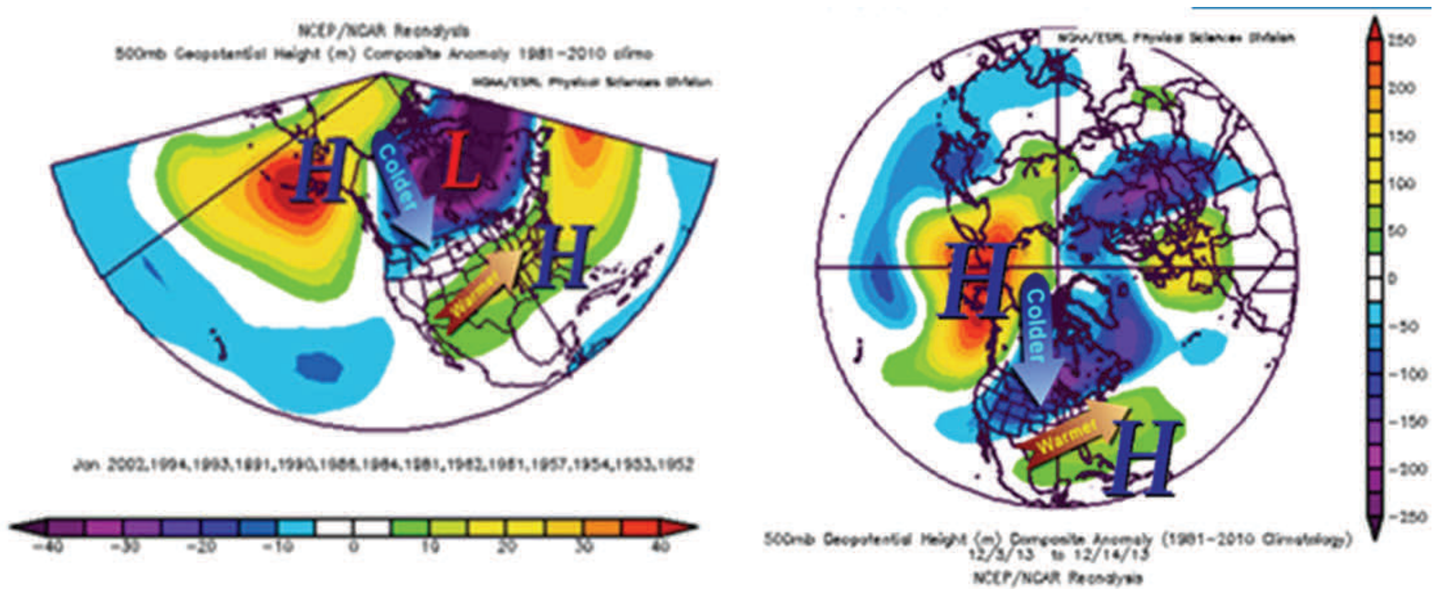


Figure 12. Winter season storm track and during a positive NAO ENSO Neutral January (left), and the storm pressure anomalies from December 5th through the 14th 2013 (right).

Overall, the data in table 3 does not show any significant tendency for above or below average winter monthly temperatures or snowfall during Neutral ENSO conditions in conjunction with predominately +NAO (table 3 below). However, there is a small tendency for warmer conditions.

Table 3. North Atlantic Oscillation (NAO) index for the winter season months over some of the past winters.

+NAO Neutral Anomalies		
	Temperatures	Snowfall
December	+0.7°F	-4.1"
January	+0.8°F	-1.7"
February	+0.4°F	+0.8"

Aspects of the Winter Outlook (cont)

Given the impacts the NAO has on the winter season conditions; it is definitely another very important player for determining what this winter will bring. The NAO is very difficult to predict more than a few weeks in advance, so many long range forecasts do not take this into account. However, new research within the past few years is promising in terms of predictability of the predominant seasonal scale AO/NAO pattern. Overall, the NAO has variability on timescales ranging from a few weeks all the way up to several decades. The negative phase of the NAO tended to dominate the winters of 2009-10 and 2010-11, which helped lead to some cold and snowy winter seasons. However, during the winter of 2011-12 the NAO remained strongly positive through much of the winter season (Table 2 Below). This helped produce a very warm winter across a good portion of the COUNS. So the big question is how will the AO/NAO behave for the rest of this winter? The AO/NAO has been predominately positive lately and it is possible that this may continue to be the case for much of the winter.

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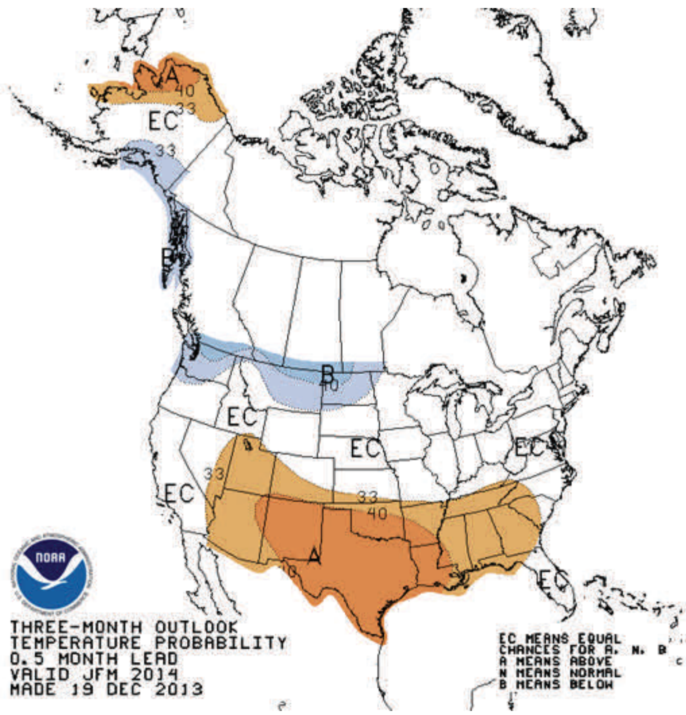
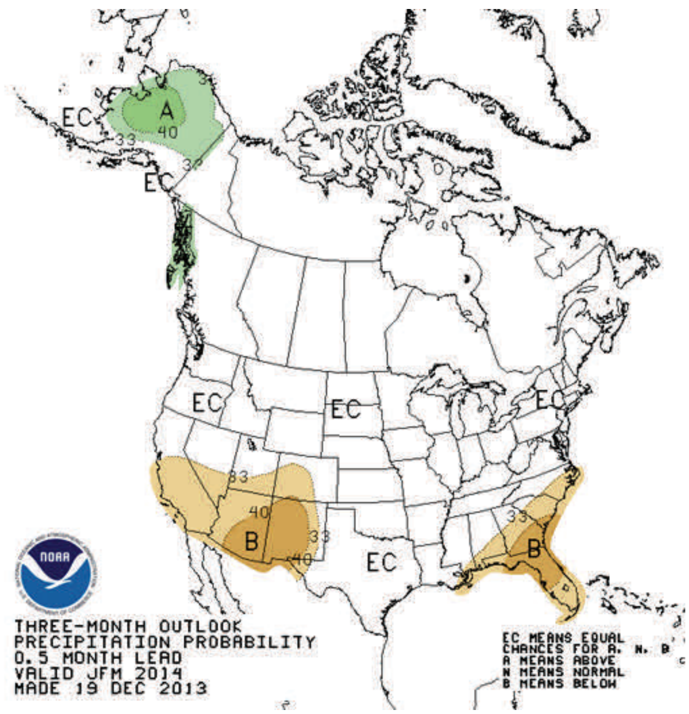
Aspects of the Winter Outlook (cont)

Summary and Official Outlook from the Climate Prediction Center (CPC)

So, overall it appears that if the AO/NAO remain predominately positive through the winter, then the main question is does the strong persistent blocking high pressure across the northern Pacific remain in place, or will it weaken. If this pattern begins to weaken, it will likely allow the ridging across the southeastern COUNS to build northward, which help the cold retreat into southern Canada and favor us for some warmer conditions later in the season. This of course is uncertain at this time.

The information shown above is not meant to be an official forecast, but merely a look at some of the possibilities that could set up this winter. Here is the official forecast for the rest of the winter season (January through March) from the Climate Prediction Center. Overall the area remains in equal changes for above, below or near average temperatures and precipitation. However, there are enhanced probabilities for colder than average conditions to our northwest across the Dakotas.





Skywarn Recognition Day
by Ben Deubelbeiss, Forecaster

On December 7th, the National Weather Service and the American Radio Relay League celebrated its 15th annual SKYWARN Recognition Day. During this 24-hour event, amateur radio operators visit NWS offices and try to make contacts with other radio operators across the nation and the world, exchanging names and local weather conditions. This year the team at NWS Chicago braved frigid weather conditions as temperatures fell through the teens into the single digits to hang up HF antennas outside the office. They received a special visit from the Will County EMA who brought their mobile command center to set up additional stations. Because this was also the anniversary of Pearl Harbor, between the hours of noon and 1PM CST, instead of exchanging local weather conditions, operators were asked to state the conditions at Pearl Harbor on December 7th 1941, which were mostly sunny and 75 degrees. The team at Chicago made 407 unique contacts including 55 other NWS offices. Their contacts spanned 49 states, missing only Vermont, and seven other countries including South Africa, Venezuela, Mexico, Slovak Republic, Honduras, Canada, and Italy.

Jim Allsopp, WFO Chicago Warning Coordination Meteorologist, Retires
By Amy Seeley, Hydro Meteorological Technician

Jim Allsopp, the first Warning Coordination Meteorologist (WCM) at NWS Chicago retired at the end of November, which marked the end of a 35 year, 3 month, and 3 day career in the NWS. He grew up in the west suburbs of Chicago and took interest in weather at age 9 following the Palm Sunday April 11, 1965 tornado that struck Crystal Lake. Jim's former neighbors had just moved to Crystal Lake, and fortunately escaped the tornado's wrath. But the wind was so strong at Jim's house that a porch support post blew into the front door window... shattering the glass. It was Jim's first storm damage survey!

Jim graduated from Florida State University with a B.S. degree in Meteorology in 1978. After a brief stint with the Defense Mapping Agency as a cartographer, he took a Meteorological Intern position at WSFO Los Angeles in September, 1979. In 1981 he transferred to the CWSU in Indianapolis and then to the WSFO Indianapolis in 1984. Jim fulfilled a lifelong dream of being a hometown forecaster for NWS Chicago in January, 1991, and was selected as WCM a month later.

Jim’s career included working such notable events as the F3 Lemont tornado (March 1991), the July, 1995 heat wave, the July 1996 flash flood (16.94 inches at Aurora), the January 1999 snowstorm (21.6 inches at Chicago), the April 2004 Utica F3 tornado, the wintertime Boone County EF3 tornado in 2008, and the 2011 Groundhog Day Blizzard.

Other highlights in Jim’s career are:

- Made 23 appearances at Fermilab with total attendance approximately 50,000
- Over 25 years, gave approximately 600 basic spotter training talks, with attendance around 30,000
- Gave approximately 300-400 school talks teaching 25,000 kids about severe weather safety
- Recognized 65 StormReady entitites
- Gave 1000 office tours for 15,000 people

Congratulations Jim!

NWS Chicago StormReady: A Busy 2013

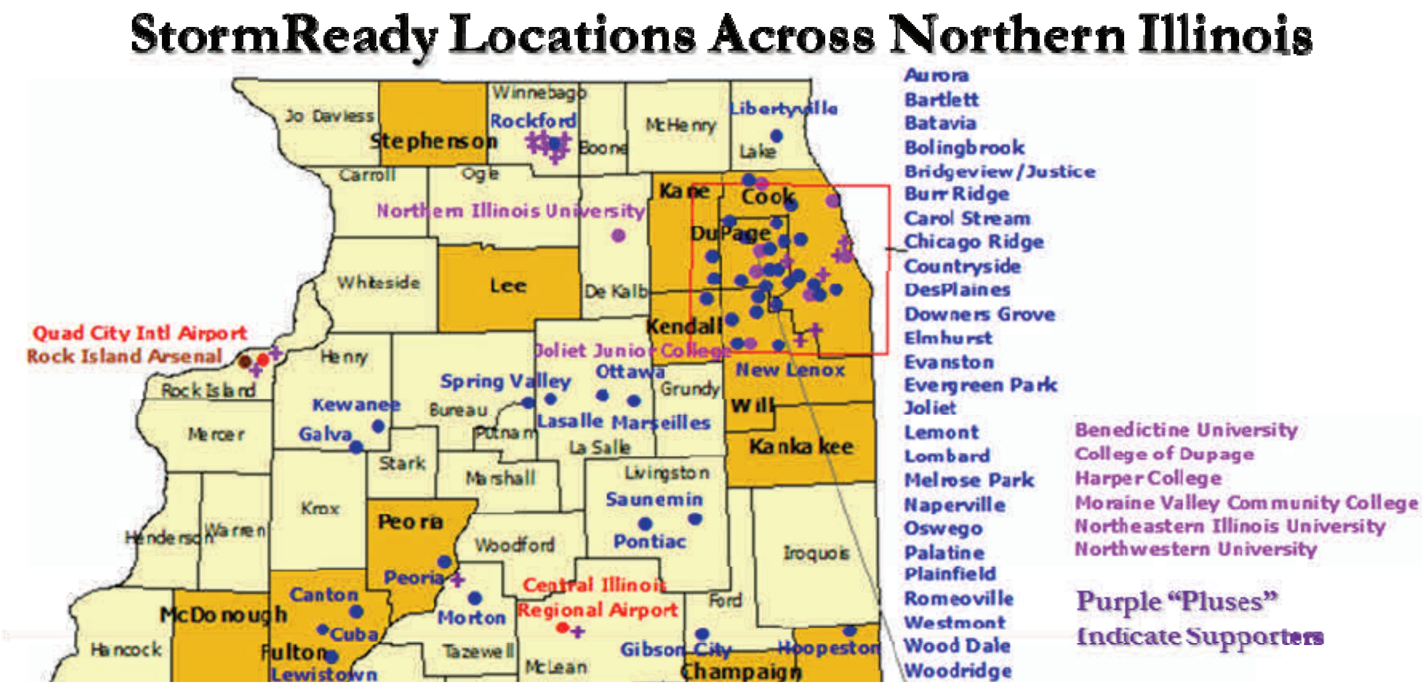
By Mike Bardou, Jamie Enderlen, Matt Friendlein, Forecasters

The NWS Chicago office's StormReady program had a successful year in 2013. As a reminder, StormReady is an NWS initiative that was started in 1999 in Tulsa, OK which helps arm America's communities with the communication and safety skills needed to save lives and property before and during the event. The program helps community leaders and emergency managers strengthen local safety programs. The StormReady communities are better prepared to save lives from the onslaught of severe weather through advanced planning, education and awareness.

In 2013 there were 15 locations in the forecast area certified as StormReady, or as StormReady Supporters, which is more than in any prior year for our office. Here is a listing of the 2013 certified locations:

Name	Type	Certification Date
Toyota Park	Supporter	3/29/2013
Navy Pier	Supporter	5/14/2013
Northeastern Illinois University	University	6/3/2013
U.S. Cellular Field	Supporter	6/3/2013
OSF St. Anthony Medical Center	Supporter	7/30/2013
Rockford Memorial Hospital	Supporter	7/30/2013
Rockford Public School District 205	Supporter	7/30/2013
Swedish American Health System	Supporter	7/30/2013
Harper College	University	8/15/2013
Moraine Valley Community College	University	8/15/2013
Palatine	Community	8/15/2013
Lee County	County	8/23/2013
Northwestern Univeristy	University	10/31/2013
Joliet	Community	11/8/2013
Romeoville	Community	11/8/2013

NWS Chicago StormReady: A Busy 2013 (cont)



StormReady is not possible without collaborative and planning efforts by community and county decision-makers. One will also notice within the list of 2013 certified locations are several outdoor venues. The effort to work with these locations where weather can have significant impacts to a high number of people will remain critical going forward.

Becoming StormReady includes:

- Having redundant methods of receiving NWS watches and warnings
- Having redundant methods of disseminating warnings to the community/campus
- Deploying NOAA Weather Radios in all public buildings
- Monitoring weather
- Public education programs
- Trained Skywarn storm spotters and communications with the NWS
- Annual severe weather drills or table top exercises

The recent **tornado outbreak of November 17th** reflected the importance of being prepared and the need for StormReady. For more information on the StormReady program for your community, college, or business, visit **http://www.stormready.noaa.gov/**

NWS Chicago StormReady: A Busy 2013 (cont)

Toyota Park: Storm Ready Supporter Certified in March, 2013