Central Illinois Lincoln Logs

National Weather Service
Lincoln, Illinois

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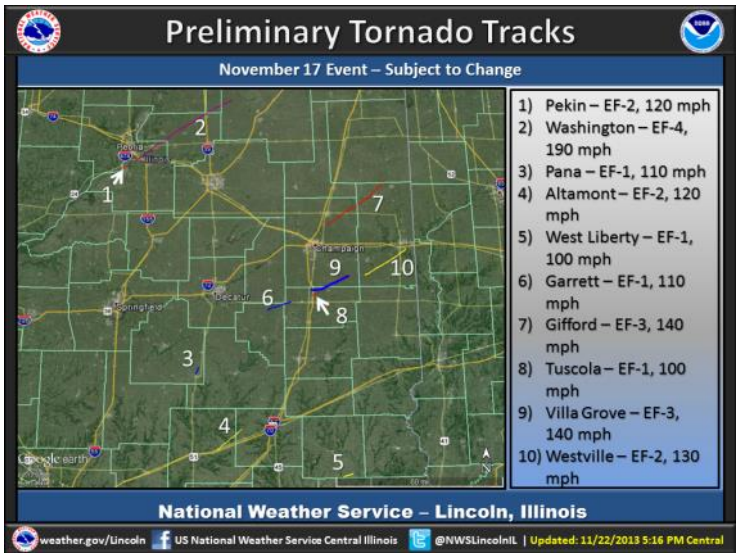
The Historic November 17, 2013 Tornado Outbreak: The NWS Lincoln Perspective

By: Chris Miller, Warning Coordination Meteorologist



In the last edition of this newsletter, which was posted on November 6th, I wrote an article about the threat for severe storms and tornadoes during the fall and winter months. One of the things we mentioned in the article was the following:

"When a warm day is forecast, many are thankful for "…one last nice day…" before winter sets in. However, meteorologists start concentrating on the potential for severe weather. Warm and humid days in the last three months of the year can be just as explosive for powerful thunderstorms as it is during the spring."

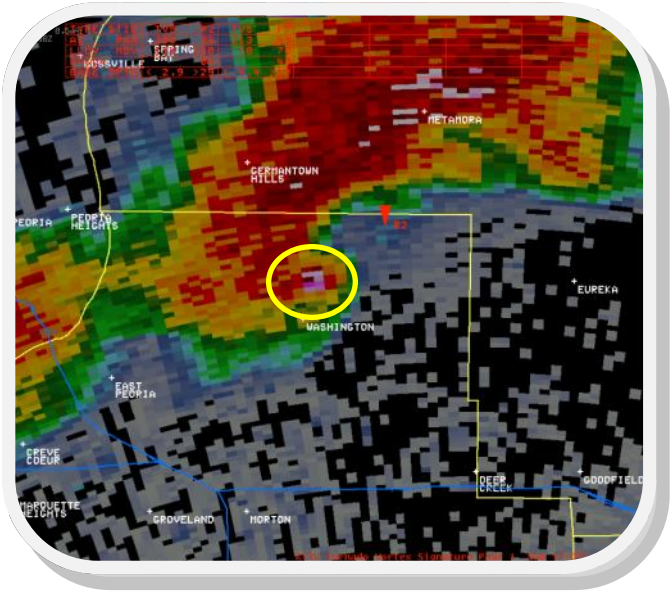
The article concluded with these comments: *"…if the weather is unusually warm and humid, don't forget about the possibility of severe thunderstorms and tornadoes late in the season! This would be a good time to brush up on severe thunderstorm and tornado preparedness."*

Little did we know at the time the newsletter was posted, 11 days later, the biggest tornado outbreak in the month of November in recorded weather history would target central and eastern Illinois. Two violent tornadoes (EF4 / EF5) were reported in Illinois – one in Washington, IL and one in New Minden, IL. These were the only violent tornadoes to occur in Illinois during the month of November, according to weather records which go back to the mid-1800s.

(continued on page 2)

The Historic November 17, 2013 Tornado Outbreak *(cont.)*

The meteorologists at the NWS Lincoln office became concerned about the potential for severe weather five days prior to the event. Our forecast models were indicating that all of the ingredients for a severe weather outbreak were available for Sunday, November 17th. Temperatures and humidity levels would be unseasonably high. A strong cold front was forecast to approach, and the winds in the upper levels of the atmosphere were expected to be quite strong. We started advertising this potential in our Daily Weather Story graphic, Hazardous Weather Outlook, Facebook and Twitter posts, and other forecast products two to four days ahead of time.



Doppler radar image shortly after the EF-4 tornado moved out of Washington. The pink and white shades within the circle are being caused by the radar beam reflecting off of debris in the air.

On Saturday November 16th, the NWS Lincoln office held a conference call for emergency managers and local media to highlight the threat and narrow down the timing of the event to Sunday morning and early afternoon. Again, various products and social media posts by our office – in combination with efforts by local broadcasters – got the word out to as many as people as possible. The message was this: "…be alert Sunday morning and afternoon for intense thunderstorms with tornadoes and damaging wind."

Early Sunday morning, November 17th, the Storm Prediction Center (SPC) in Norman, Oklahoma put much of central and eastern Illinois in a "HIGH RISK", with a high probability of strong to violent tornadoes. This was soon followed by a Particularly Dangerous Situation (PDS) Tornado Watch for all of central and eastern Illinois. In the Tornado Watch, the SPC stated: "…conditions will be favorable for long tracked, significant tornadoes." This was two hours before the first thunderstorm even formed.

The Lincoln NWS office is a 24x7 operation. There are always two, and often times three, staff members on duty at any given time. Due to the magnitude of the anticipated event, our staffing was increased to 11 people – including an electronics technician to monitor the equipment we use to issue warnings, and our computer specialist (called an ITO) to monitor our software and communications.

Within 2.5 hours, from just before 11:00 am to about 1:30 pm, ten tornadoes moving at speeds of greater than 60 mph devastated parts of central and eastern Illinois. Tragically, two people died and 142 were injured. Fifteen other tornadoes impacted northern, western and southern Illinois, resulting in another five fatalities and 39 injuries. Damages from the central and eastern Illinois tornadoes exceeded **$1 billion**. This was, without a doubt, one of the biggest – if not THE biggest – tornado outbreaks in recent Illinois history.

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The Historic November 17, 2013 Tornado Outbreak *(cont.)*

Damage in Washington from the EF-4 tornado.

All of the tornadoes were destructive and devastating; however the cities of Pekin, East Peoria, Washington (all in Tazewell County) and Gifford (Champaign County) encountered the brunt of the damage. Debris from the destroyed homes was found as far away as the northern Chicago suburbs. In the days following the storm, the one question we kept getting asked, over and over, from media outlets across the country (and a few other countries as well), was this: "With so much destruction why were the numbers of fatalities and injuries lower than other recent, but similarly strong, tornado events in the country?"

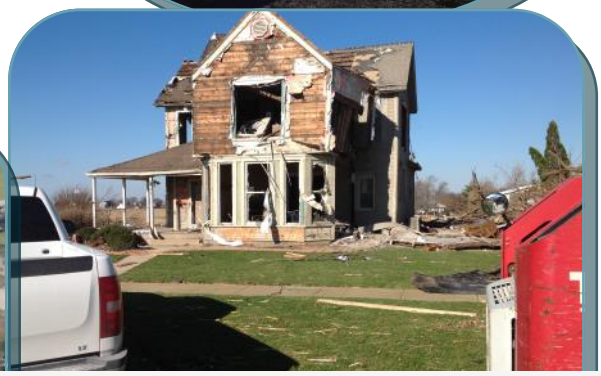
We will never know all the reasons, but there was a rather consistent theme:

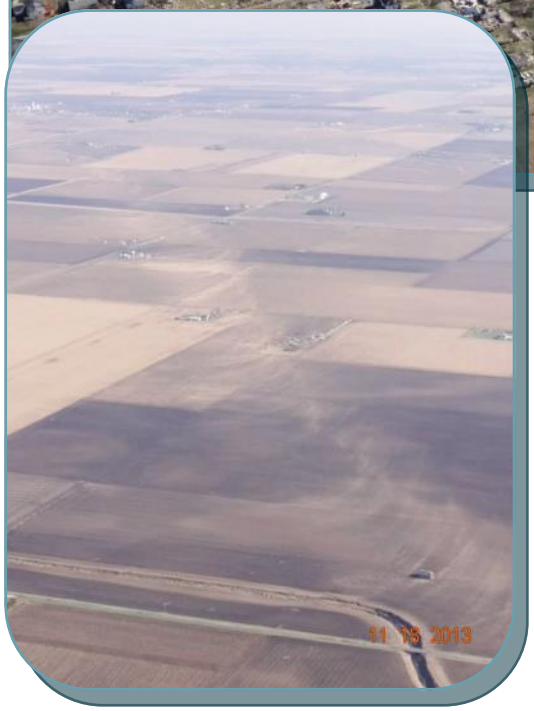
- The potential for a high impact severe weather event was talked about days ahead of time. Many people were prepared.
- It was a Sunday morning and early afternoon. Many people were in church, out for brunch, or shopping for the upcoming holiday season, so they were not home when the storms struck residential areas.
- Many people had basements or storm shelters to go to during the storm. This was EXTREMELY important considering the strength of these tornadoes.
- We have more ways than ever before to warn people. There were numerous stories about people being warned on television, radio, weather alert radios, cell phone messages (also known as Wireless Emergency Alerts – WEA), social media sites like Facebook and Twitter, and outdoor warning sirens.

Every year during Severe Weather Preparedness Week – which will be March 2nd through the 8th this year – we talk about what people can do to protect themselves at home, work, school or anywhere groups of people gather. This was one event where preparedness, monitoring conditions BEFORE the storms approached, heeding warnings, and having MULTIPLE ways to get information made a difference.

In the next edition of the Central Illinois Lincoln Logs newsletter we will review important severe weather safety tips and highlight the different methods of receiving information regarding tornadoes, severe storms and flash floods.

The Historic November 17, 2013 Tornado Outbreak *(cont.)*





THE NATIONAL WEATHER SERVICE IN LINCOLN HAS ISSUED A

* TORNADO WARNING FOR...
  SOUTHEASTERN MARSHALL COUNTY IN CENTRAL ILLINOIS...
  NORTHEASTERN TAZEWELL COUNTY IN CENTRAL ILLINOIS...
  WOODFORD COUNTY IN CENTRAL ILLINOIS...

* UNTIL 1145 AM CST

* AT 1107 AM CST...A CONFIRMED LARGE AND EXTREMELY DANGEROUS TORNADO
  WAS LOCATED NEAR WASHINGTON...AND MOVING NORTHEAST AT 65 MPH.

  THIS IS A PARTICULARLY DANGEROUS SITUATION.

  HAZARD...DAMAGING TORNADO.

  SOURCE...RADAR CONFIRMED TORNADO.

  IMPACT...YOU ARE IN A LIFE THREATENING SITUATION. MOBILE HOMES WILL
           BE DESTROYED. CONSIDERABLE DAMAGE TO HOMES...BUSINESSES
           AND VEHICLES IS LIKELY AND COMPLETE DESTRUCTION POSSIBLE.
           FLYING DEBRIS WILL BE DEADLY TO PEOPLE AND ANIMALS. EXPECT
           TREES TO BE UPROOTED OR SNAPPED.

* LOCATIONS IMPACTED INCLUDE...
  ROANOKE...MINONK...TOLUCA...WENONA...CAZENOVIA...LOW POINT...BENSON
  AND PATTONSBURG.

THIS INCLUDES INTERSTATE 39 BETWEEN MILE MARKERS 22 AND 38.

Snow Measurement Reminders for Weather Observers

By: Billy Ousley, Data Acquisition Program Manager

24 Hour Precipitation - 24 Hour Precipitation is just that - the routine 24 hour precipitation report, usually taken at around 7 am. It may be regular rainfall, snow, sleet, freezing rain, or freezing drizzle. It is the water content of that precipitation. This measurement is easy in the summer, as it is simply the rainfall in your precipitation gage. In the winter, it is USUALLY the melted snowfall from your rain gage. Melted precipitation is measured to the nearest 0.01 inch, just like rainfall using the NWS provided measuring stick and the smaller inner measuring tube. Do not measure the melted precipitation directly in the larger 8 inch outer cylinder, it must be poured into the smaller inner measuring tube to be measured.

Occasionally, especially during windy conditions, you may have a significant snowfall, yet your gage remains nearly empty. It will then be necessary to take a core sample of just the newly fallen snow from the previous 24 hours. During windy conditions when it is determined that the amount of snow caught in the gage is not representative the observer will have to measure the snow at several points to try to come up with a representative amount of newly fallen snow and this is the amount to be melted for the water content and this is the figure that is reported in the observation as the 24 Hour Precipitation. It is reported to the nearest 0.01 inch.

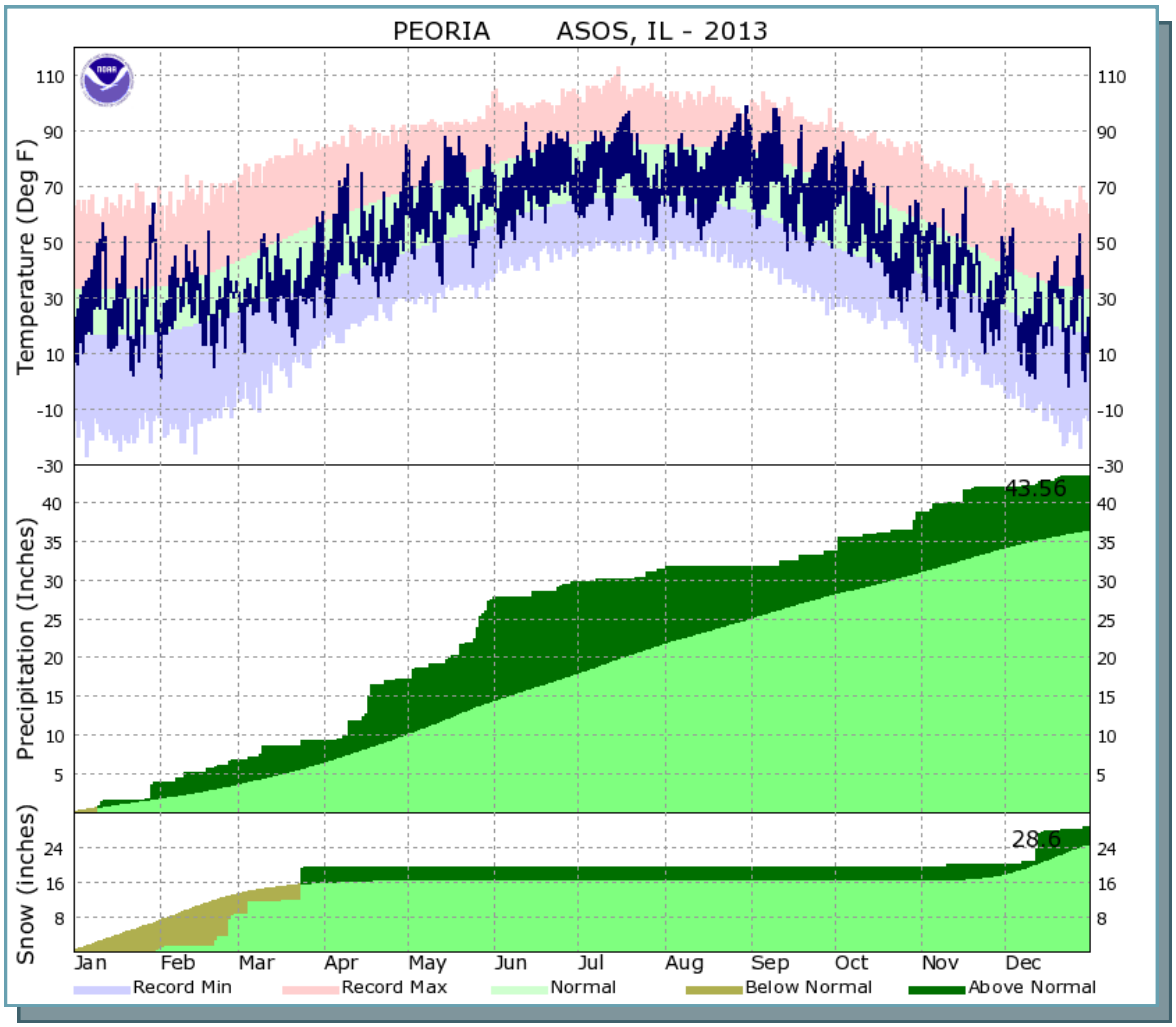
24 Hour Snowfall - This is the amount of newly fallen snow in the past 24 hours. It is reported to the nearest 0.1 inch. It is not the total depth of snow on the ground, but the additional accumulation in the past 24 hours. If the ground was bare on the previous days observation, then of course, it would be the total snow on the ground.

Snow Depth - This is the total depth of the snow on the ground. It is reported to the nearest whole inch, e.g. 2.4 inches is reported as 2 inches, and 2.5 inches is reported as 3 inches.

Shae Cohan of the Lincoln NWS's Significant Weather Observer Program measured this 15 inch snow depth from the snowstorm on Palm Sunday of 2013.

Snow Water Equivalent - This is the water content of ALL snow on the ground — old and new. It is reported at designated times during late Winter and early Spring (time of year when the snow pack melts), usually about February 1 to the end of the snow season. The Snow Water Equivalent is obtained by inverting the 8 inch rain gage can and pushing it through the entire depth of snow on the ground that represents the average snow depth. Make sure that snow does not fall out of the 8 inch can when you remove the snow core. It is very helpful to have a firm, thin sheet of metal to slide between the surface of the ground and the rim of the 8 inch can to cleanly gather the entire sample of snow. The snow is melted and the liquid is measured by pouring it into the smaller inner measuring tube and using the NWS provided measuring stick. This is reported to the nearest tenth of an inch.

2013 Annual Climate Statistics: Peoria



Average temperature: 51.1 degrees *(0.8 degree below normal)*
Highest temperature: 99 degrees on August 30
Lowest temperature: -2 degrees on December 24

Total precipitation: 43.56 inches *(7.07 inches above normal)*
Most in 24 hours: 3.79 inches on April 17-18

Total snowfall: 28.6 inches *(4 inches above normal)*
Most in 24 hours: 7.0 inches on March 24
Greatest snow depth: 7 inches on December 16

Highest wind speed: 70 mph on November 17 *(all-time record for November)*

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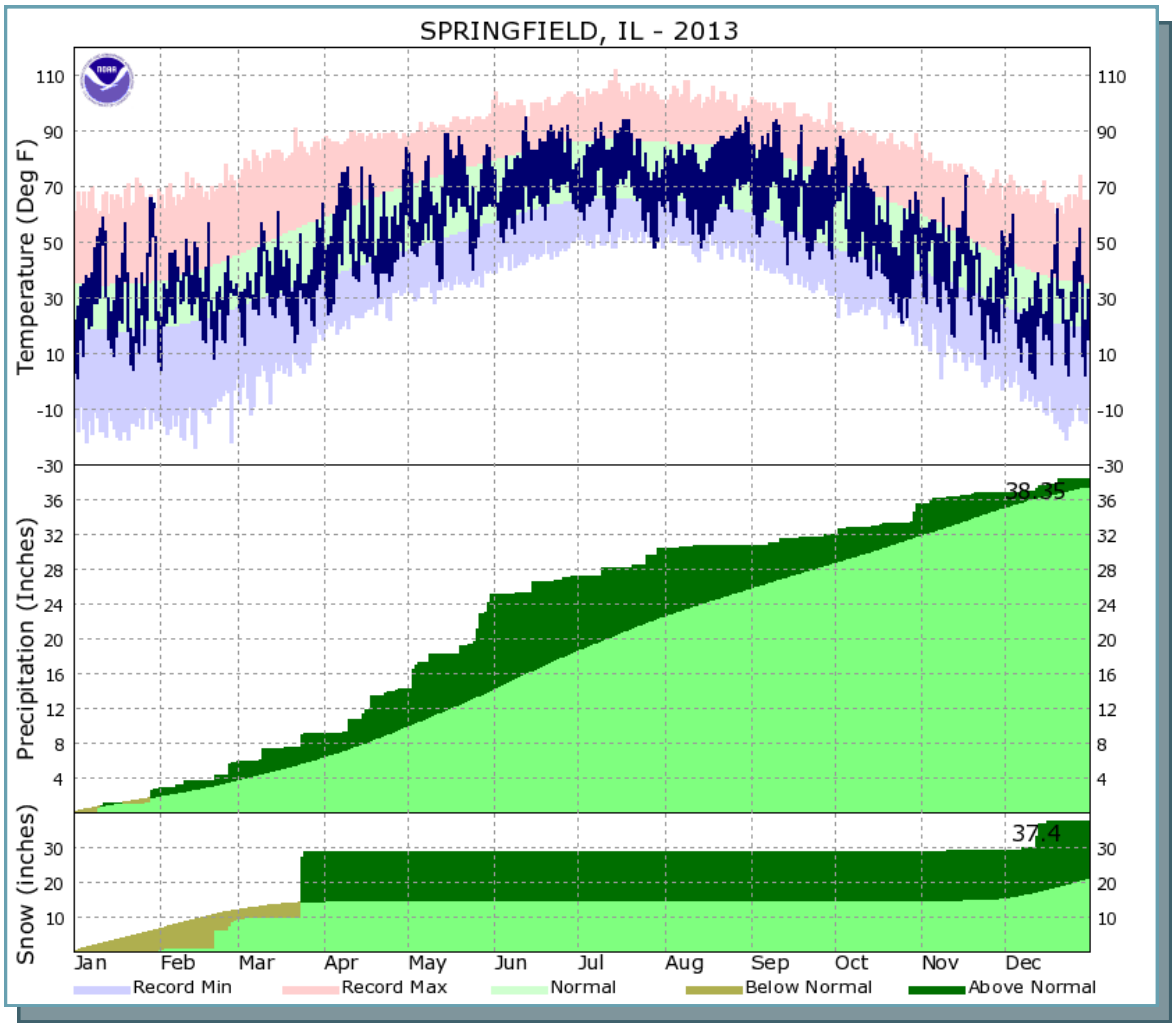
2013 Annual Climate Statistics: Springfield



Average temperature: 51.8 degrees *(1.2 degrees below normal)*
Highest temperature: 95 degrees on June 12 and August 30
Lowest temperature: 1 degree on January 2 and December 12

Total precipitation: 38.35 inches *(0.92 inches above normal)*
Most in 24 hours: 2.27 inches on May 26-27

Total snowfall: 37.4 inches *(16.5 inches above normal)*
Most in 24 hours: 17.4 inches on March 24-25 *(all-time record)*
Greatest snow depth: 16 inches on March 25 *(tied all-time record)*

Highest wind speed: 62 mph on November 17

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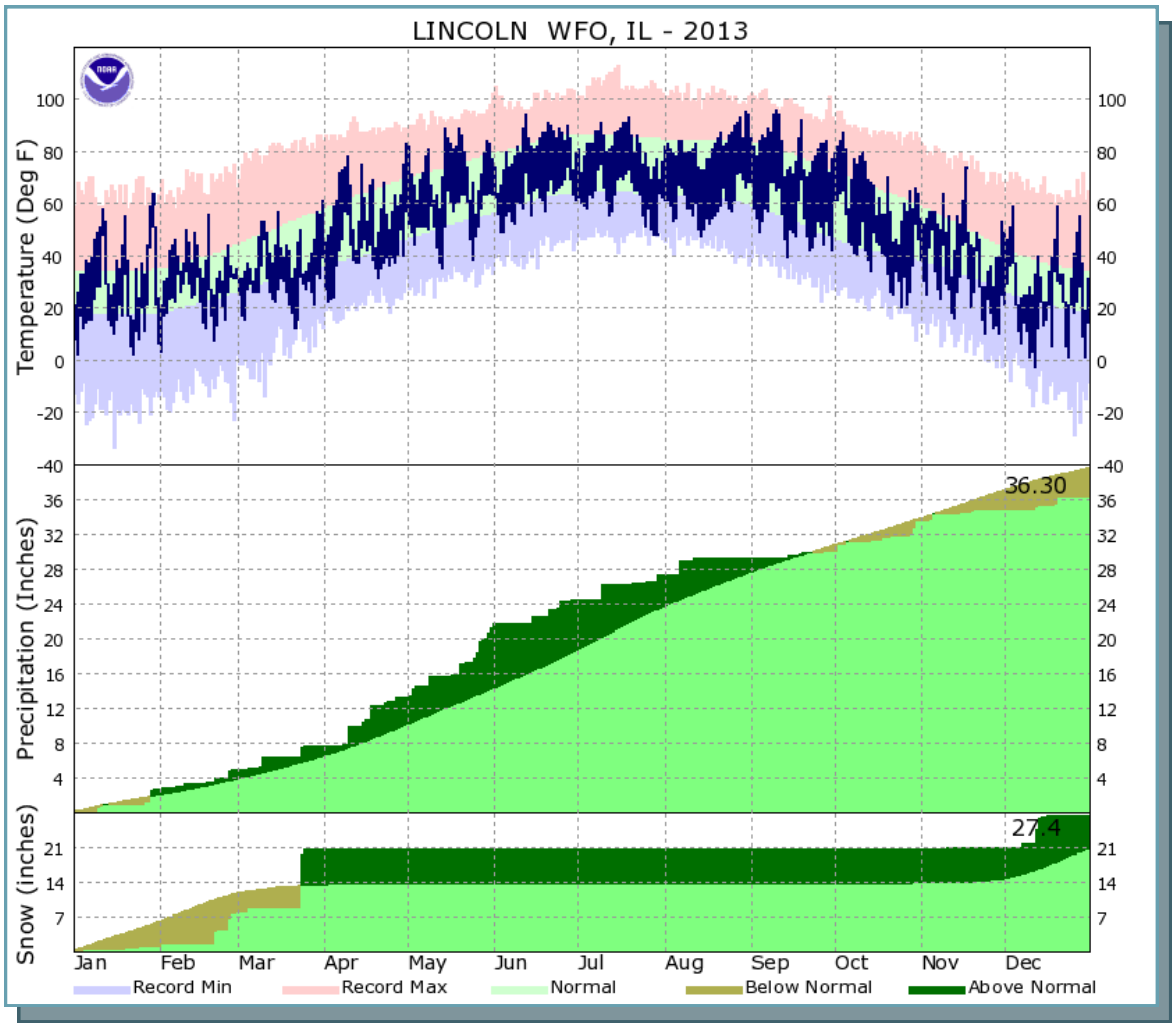
2013 Annual Climate Statistics: Lincoln



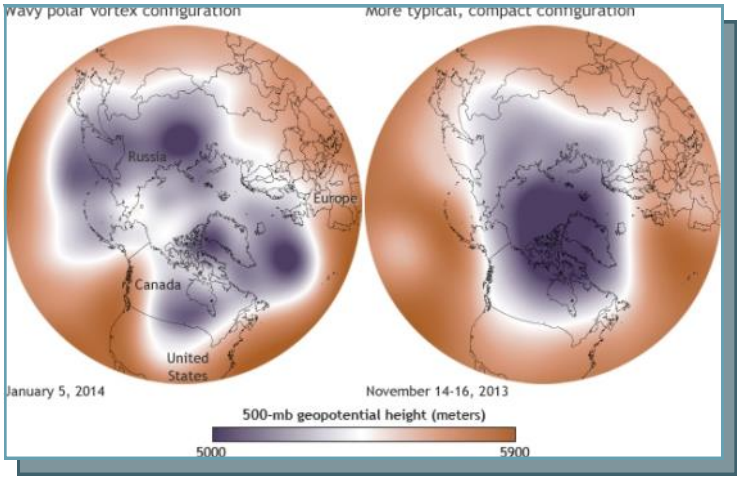
Average temperature: 50.5 degrees *(1.6 degrees below normal)*
Highest temperature: 96 degrees on September 10
Lowest temperature: -3 degrees on December 12

Total precipitation: 36.30 inches *(3.30 inches below normal)*
Most in 24 hours: 2.02 inches on April 10

Total snowfall: 27.4 inches *(6.9 inches above normal)*
Most in 24 hours: 10.8 inches on March 24 *(new record for March)*
Greatest snow depth: 11 inches on March 25

Wobbly Polar Vortex Triggers Extreme Cold Outbreak

By: Caitlyn Kennedy, NOAA



Maps show the 500-millibar geopotential height (the altitude where the air pressure is 500 millibars) on January 5, 2014 (left), and in mid-November 2013 (right). The cold air of the polar vortex is purple.

Maps by NOAA Climate.gov, based on NCEP Reanalysis data from NOAA ESRL Physical Sciences Division.

"Polar vortex" is the new buzzword of 2014 for the millions of Americans learning about its role in producing record cold temperatures across the country. Meteorologists have known for years that the pattern of the polar vortex determines how much cold air escapes from the Arctic and makes its way to the U.S. during the winter. Now climate scientists want to know if a warmer Arctic is influencing its behavior.

The polar vortex is a high altitude low-pressure system that hovers over the Arctic in winter. When the polar vortex is strong, it acts like a spinning bowl balanced on the top of the North Pole. The image on the right shows a strong phase of the polar vortex in mid-November 2013. Dark purple depicts the most frigid air tightly contained in an oval-shaped formation inside the invisible bowl. The light purple line forming the outermost boundary of the cold Arctic air is the jet stream in its normal west-to-east pattern.

In early January, the polar vortex weakened and broke down*, allowing fragments of cold air to slosh out of the bowl into mid-latitudes. The image on the left shows the weakened vortex formation on January 5, 2014. The high pressure building up in the Arctic slowed down the jet stream, which caused it to buckle into deep folds and flow farther south than usual, introducing cold Arctic air into the central and eastern U.S.

In recent years, climate scientists have noticed that the jet stream has taken on a more wavy shape instead of the more typical oval around the North Pole, leading to outbreaks of colder weather down in the mid-latitudes and milder temperatures in the Arctic, a so-called "warm Arctic-cold continents" pattern. Whether this is normal randomness or related to the significant climate changes occurring in the Arctic is not entirely clear, especially when considering individual events. But less sea ice and snow cover in the Arctic and relatively warmer Arctic air temperatures at the end of autumn suggest a more wavy jet stream pattern and more variability between the straight and wavy pattern.

Understanding the connections between the Arctic warming trend and more severe weather in the mid-latitudes remains an active area of research. But even as Earth's average temperature rises, natural patterns of climate variability are expected to still operate in a warmer world. There have been many other cases of natural climate oscillations influencing our winter weather in recent years. The unusually cold winter of 2009-2010 proved that record-breaking snowstorms can still coexist with global warming, as did the frigid start to 2011, which resulted in another wintry winter for the eastern United States.

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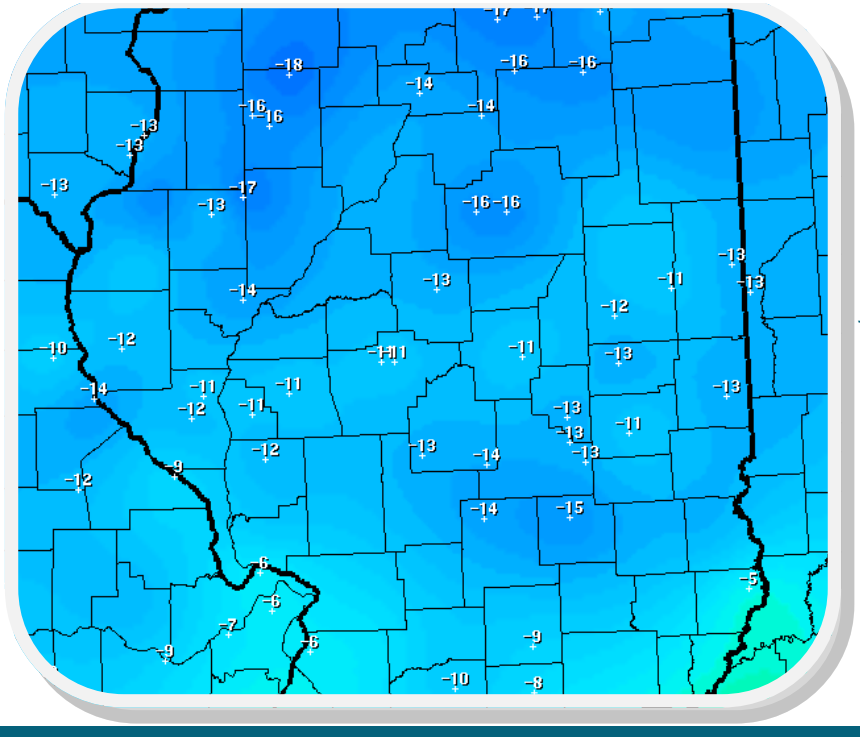
Polar Vortex Triggers Extreme Cold Outbreak (cont.)

Airport	Jan 5 Coldest Temp	Jan 5 Coldest Wind Chill	Jan 6 Coldest Temp	Jan 6 Coldest Wind Chill	Jan 7 Coldest Temp	Jan 7 Coldest Wind Chill
Bloomington	-7	-33	-17	-44	-12	-33
Champaign	-1	-25	-13	-41	-10	-32
Danville	-1	-26	-14	-40	-11	-29
Decatur	-2	-27	Missing	Missing	Missing	Missing
Effingham	2	-20	-13	-32	-13	-28
Flora	2	-21	-16	-31	-14	-32
Galesburg	-9	-36	-15	-42	-10	-26
Jacksonville	Missing	Missing	-12	-36	-6	-23
Lacon	-7	-31	-14	-39	Missing	Missing
Lawrenceville	4	-31	-8	-31	-4	-22
Mattoon	-1	-26	-14	-38	-10	-30
Mount Carmel	5	-17	-6	-28	-2	-20
Olney	3	-19	-11	-31	-9	-14
Paris	-1	-23	-13	-34	-13	-31
Peoria	-5	-26	-14	-36	-9	-25
Rantoul	-4	-29	-12	-37	-7	-27
Robinson	-5	-17	-14	-33	-12	-28
Springfield	-2	-24	-13	-38	-9	-29
Taylorville	0	-23	-11	-35	-9	-28



Top: Lowest temperatures and wind chills reported at airports in central and southeast Illinois. Since wind chill is not a direct measurement (it is calculated based on temperature and wind speed at any given time), the lowest values are based on the regularly scheduled observations.

Left: Low temperatures across central and southeast Illinois the morning of Monday, January 6. Temperatures of 10 below to 15 below zero were common across much of the area. Only extreme southeast Illinois, near Lawrenceville, did not get as cold as 10 below zero. However, even there, wind chills fell to around 30 below zero. During the day on Monday, temperatures failed to reach zero over most of the area, with the coldest high temperature of 10 below zero at Bloomington.

Geothermal Ventilation System Being Installed at Lincoln NWS

By: Ed Martin, Electronics System Analyst

The National Weather Service office at Lincoln is undergoing an upgrade to the Heating Ventilation and Air Conditioning (HVAC) system. The new system incorporates a redundant ground source heat pump system. The office computer room generates significant heat, and the new HVAC system will utilize the excess heat from the computer room to offset heating requirements for the remainder of the building. The exchange of outside air will be managed more efficiently and a new Building Automation System (BAS) will be installed to control the new HVAC system.

Workers drill holes in the land in front of the NWS office on November 25, as part of the installation of a geothermal heating system that is being installed.

This project will provide a significant energy reduction at the Central Illinois WFO. The expectation is that an energy savings of up to 50% will be realized. This project also will help meet President Obama's 2009 Executive Order mandating federal agencies to seek a way to reduce energy usage.

The project is expected to be completed by the end of February.

Social Media Addresses for the Lincoln NWS:

Facebook — US National Weather Service Central Illinois
Twitter — @NWSLincolnIL
YouTube — YouTube.com/NWSlincoln

Autumn Climate Statistics
(September 1 through November 30)

Peoria:

- Average temperature: 54.3°F (0.4°F above normal)
- Total precipitation: 10.24" (1.12" above normal)
- Total snowfall: 0.6" (0.5" below normal)

Lincoln:

- Average temperature: 52.9°F (1°F below normal)
- Total precipitation: 5.65" (3.89" below normal)
- Total snowfall: 0.5" (0.1" below normal)

Springfield:

- Average temperature: 54.1°F (0.9°F below normal)
- Total precipitation: 6.08" (3.18" below normal)
- Total snowfall: 0.7" (0.1" above normal)

Central Illinois Lincoln Logs

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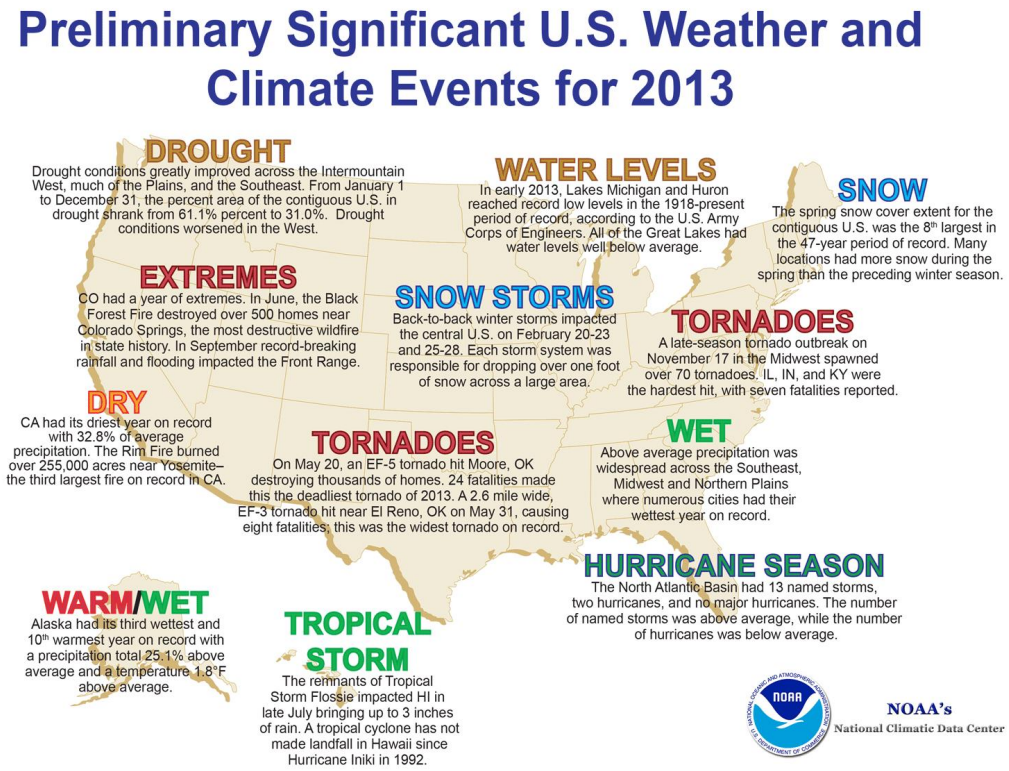
2013 National Weather Highlights



Top: National highlights, courtesy of the National Climatic Data Center.

Bottom: Tornado trends the last several years, courtesy of the Storm Prediction Center. The 2013 tornado season is represented by the black line in the graph.