Serving Residents of Northeast Kansas Since 1878

The Topeka Tiller

Spring 2019 Volume 12, Issue 1

National Weather Service
Topeka, KS

Inside this issue:

Severe Weather Preparedness

By Chad Omitt, Warning Coordination Meteorologist

Severe weather season is here in Kansas and it's important to understand your risk from severe storms and learn about ways to reduce that risk. Here in Kansas over the past 20 years there have been 37 fatalities from tornadoes, 27 from floods and 10 from lightning strikes. The greatest danger in a tornado is the result of the blowing and crushing debris so we need to do everything in our power to reduce the risks from the debris. You can reduce your risk from tornadoes significantly by just following the principle of getting as low as possible and putting as many walls between you and the outside. A basement or engineered safe room is your best option. Try and get underneath something sturdy like a table or staircase and use helmets for head protection! A bike helmet, baseball or softball helmet works great too! If you don't have a basement or safe room go to the lowest floor in an interior room and try to get underneath something sturdy or cover up with heavy blankets and don't forget your helmets! If you live in a mobile home you must evacuate the mobile home and shelter somewhere else. Go to your community shelter or if you don't have a community shelter then find a friend or relative nearby that has a basement or safe room and ask if you can shelter there. Practice your plan so you know how long it takes to get to your designated shelter and remember to stay aware of what's happening so you don't wait to leave until it's too late. If you own a business it is critical that you have a severe weather plan.

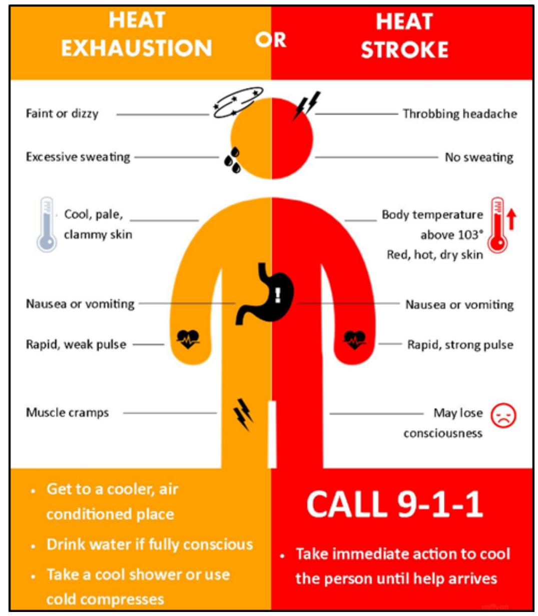
Article continues on page 6

The Dangers of Summer Heat

By Matt Wolters, Lead Forecaster

After a long cold winter, you might be excited to see warmer temperatures in the forecast. But it won't be long before the dog days of summer are here, and those warmer temperatures could turn dangerous. Last year saw the most child deaths[1] from being left in a hot car than in any of the past 20 years. And all of those 51 deaths could have been prevented. Even in the spring or fall, temperatures in a car can rapidly become deadly. That is why it is never safe to leave a toddler, disabled person or pet locked in a car. So ***look before you lock***, and make sure no one is left in the car.

A lot of the dangers from heat can be avoided simply by remaining in a cool building and drinking plenty of water. But there are a lot of times when activities take us outside. So recognizing the signs of heat related illnesses is important. This graphic describes some of the warning signs the body is getting over heated. If a person begins showing signs of heat exhaustion or heat cramps, they should be taken inside to an air-conditioned room. A cool shower or cold compresses could also be used to help the person cool off. If a person shows signs of a heat stroke, Call 9-1-1 and take immediate action to cool the person down. Heat stroke is an emergency and the victim needs medical attention immediately. Delay can be fatal.



The National Weather Service forecasts heat indices to help people know when the heat can be dangerous. The heat index is a measure of how hot it really feels to the human body when the humidity is factored in with the air temperatures. When the heat index gets around 105 degrees or higher, the heat can be dangerous. Heat Advisories and Excessive Heat Warnings are issued when these conditions are forecast.

So when the heat is on this summer, taking some simple precautions like staying hydrated and wearing light and loose fitting clothing can help to beat the heat and still enjoy the summer weather.

[1] Based on statistics from San Jose State University https://www.noheatstroke.org/.

Dust Devil on Radar?

By Kevin Skow, Forecaster

The NWS dual-polarization Doppler radar network has countless times proved its worth in detecting the presence of debris being lofted in real-time by tornadoes (known as tornadic debris signatures—or TDSs), aiding meteorologists in communicating certainty and impact severity in tornado warnings. But could the WSR-88D detect debris lofted by other, less formidable whirlwinds?

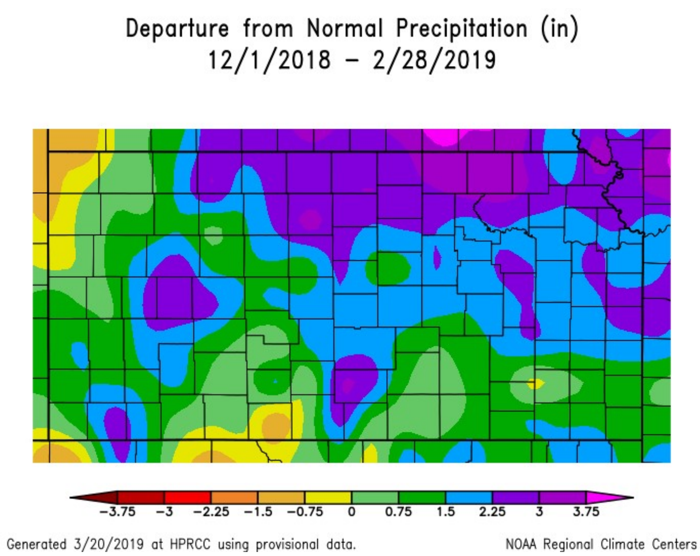
The afternoon of April 7, 2019 was quiet and seasonable across eastern Kansas with a weak frontal boundary sliding through the area. The near-surface environment along the front was characterized by steep low-level lapse rates, modest low-level instability, and ample near-surface vertical vorticity (spin)—many of the ingredients used to determine the potential for landspout tornadoes. The only ingredient missing was an updraft to stretch this vorticity into a landspout. However, around 3:00pm, a small, circular feature was noticed on reflectivity near the intersection of this front and another convergence zone in southern Shawnee County, south of Topeka's Forbes Airport. The signature retained its structure and identity for over 30 minutes as it travelled first along, then gradually behind, the boundary intersection on an east-southeast heading. Using the behavioral characteristics of this radar feature, in tandem with other datasets, we can investigate and narrow down the potential causes for this signature.

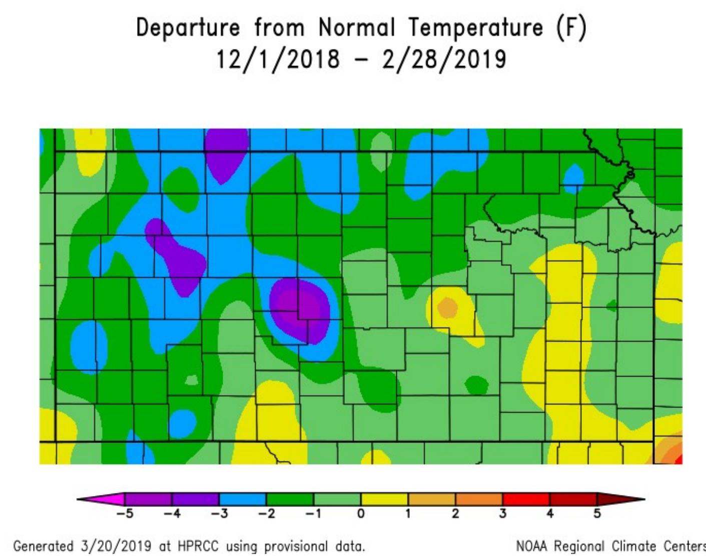
Article continues on page 7...

Winter 2018-2019 Summary

By Kyle Poage, Forecaster

Precipitation for the winter weather season, defined as December through February, was frequent and at times heavy. 6.55 inches of precipitation fell at Topeka, placing as the fifth-wettest winter and the wettest since the 2007-2008 season, which at 8.10 inches was the wettest winter on record. The total amount of snowfall for the winter was 14.8 inches, just 0.2 inches above normal. 4.50 inches of precipitation was measured at Concordia, which was the eighth-wettest on record for this location, and the wettest since the winter of 2006-2007. Snowfall was rather impressive, with 30.7 inches accumulating. This was the fourth-highest total on record and the highest since 37.1 inches fell in the 2000-2001 season. The normal winter snowfall for Concordia is 14.2 inches. Temperatures for the entire season averaged to be slightly below normal for most of the area.





On the heels of the Thanksgiving weekend blizzard, December started with a strong storm system on the 1st that produced record precipitation of 1.14 inches and record snowfall of 4.4 inches at Concordia and 1.06 inches at Topeka. Most of the accumulating snow with this event was in northern locations. There were not many noteworthy events over the next several weeks, though another record-breaking event on December 26 produced one to two inches of rain across the area. Precipitation events producing at least some snowfall were rather common from mid-January through the end of February, with accumulating snowfall for at least portions of the area occurring on average once every five to six days. Events that produced a few inches of snow for much of the area included those on January 22, February 15, and February 19.

Cold temperatures and strong winds frequently followed these snowfall events, bringing wind chill values several degrees below zero on January 19, into the -10 to -25 degree range on January 30, and around -10 on February 7. A very windy morning was experienced on January 28 as north winds gusted to near 60 miles per hour in some northeastern locations. A tractor-trailer was blown over by these winds near Lawrence that morning.

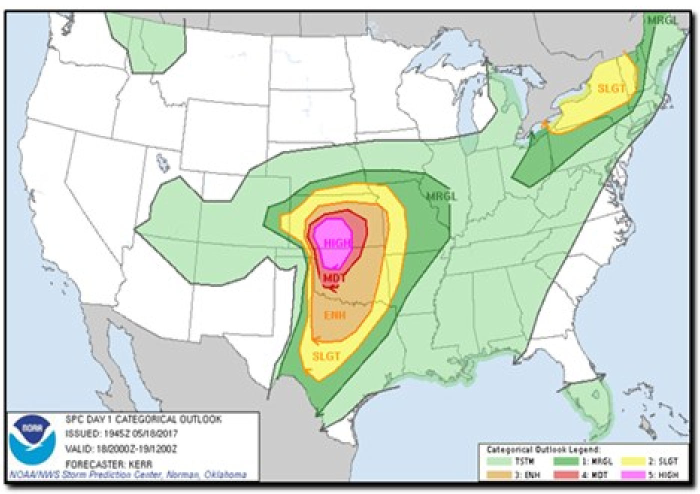
Situational Awareness of Hazardous Weather Threats

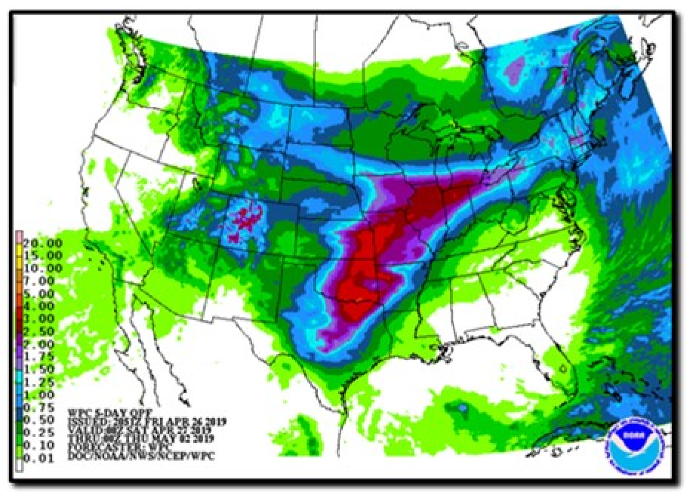
By Sarah Teefey, Forecaster

Each season here in the Midwest offers its own set of potentially hazardous weather conditions. Now that spring has arrived, attention has turned to the threat for severe weather, including damaging winds, destructive hail and tornadoes. Being aware of when and where those threats could occur, including several days in advance, can be critical to decision making that will help ensure safety. As such, there are many convenient resources available from NOAA and the NWS that can be used to stay aware of impending inclement weather conditions in the timeframe of days, hours, and minutes prior to events.

Outlooks can be used to identify potential threats several days in advance. The Topeka NWS office routinely issues two outlook products every day, both of which highlight potential hazardous conditions that could occur within the next seven days. These two outlook products are the Situation Report (Sit Rep) and the Hazardous Weather Outlook (HWO). The Sit Rep is a short document that describes the what, when, and where of potential hazards and discusses the forecaster's confidence level in those details. Images are often included to provide a visual representation of the threats and threat areas/timeframes. The HWO is a text product that also discusses potential threats for the next seven days. Both the Sit Rep and HWO are issued at least twice daily even if there are no expected threats during the next week. A link to where these products can be obtained is provided at the end of this article.

In addition to outlooks issued locally, there are some national branches of the NWS that issue hazardous weather outlooks, including the Storm Prediction Center (SPC) and the Weather Prediction Center (WPC). The convective outlooks developed by the SPC highlight areas of thunderstorm and elevated severe weather threats for the next seven days. A link to those outlooks is included at the end of this article. The WPC is a good resource for information about heavy rainfall potential with outlooks showing forecast precipitation amounts for up to seven days into the future.





On the timescale of hours preceding expected dangerous weather conditions, weather watches are issued by either local NWS offices or the SPC. A weather watch, such as a Severe Thunderstorm Watch or a Tornado Watch is issued to indicate that atmospheric conditions are favorable for the threat to develop within the next few hours. Information on watches, including when the watch is in effect and the aerial coverage of the watch can be received via NWS websites, including the Topeka site given below, local television reports and mobile phone weather apps. A heightened sense of awareness should be exercised when watches are issued, as the weather threat could develop or occur at any time.

Article continues on page 8...

NWS Meteorologists' Team Up to Teach at KU

By Bryan Baerg, Forecaster

NWS Topeka meteorologists Bryan Baerg, Ariel Cohen, Bill Gargan, Audra Hennecke, Jenifer Prieto, and Kevin Skow had the opportunity to teach the 'Operational Meteorology' course at the University of Kansas during the Spring 2019 semester. Each instructor taught two to three class periods with topics tailored to the strengths of each meteorologist. Selected topics discussed included the following: radar interrogation techniques, mesoanalysis procedures, aviation forecasting, and weather communications. Not only was this course very beneficial to the students but it also was the first opportunity for many of the instructors to teach a college-level course. In addition, the NWS-academia relationships built can be further utilized to conduct research which can be directly implemented within operations, better known as research-to-operations (R2O). With the course material and blue-print developed, KU administrators are eager for NWS meteorologists to teach the course each year. The collaborative effort amongst NWS meteorologists should promote an exciting, informative, and sustainable class for the foreseeable future!

Climatology of Severe Winds

By Bill Gargan, Lead Forecaster

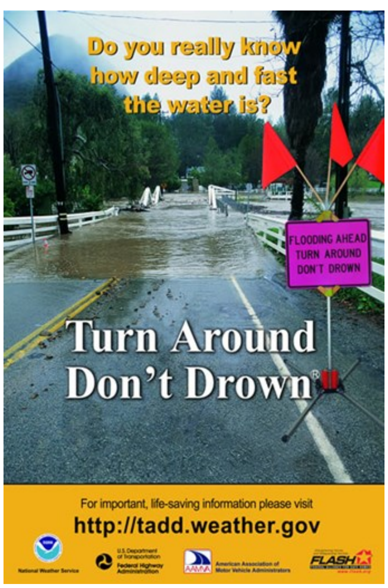
Thunderstorm wind gusts of 58 MPH or greater are considered severe thunderstorm wind gusts. From 1955 through 2018 there have been 3,780 measured, or estimated from damage, severe thunderstorm wind gusts across northeast Kansas within the Topeka National Weather Service's County Warning Area (CWA).

Severe wind gusts are generated by thunderstorm downdrafts. Most widespread wind damage occurs from Quasi-Linear Convective Systems, which includes squall lines with embedded bow echo structures (Figure 1 on page 8). Discrete supercells (Figure 2 on page 8) and pulse thunderstorms (Figure 3 on page 8) usually produce more localized wind damage in the form of the Rear Flank Downdrafts for supercells and microburst for other intense updrafts.

Article continues on page 8...

Severe Weather Preparedness (Continued…)

That brings us to situational awareness or simply knowing what is possible in the next several hours or what is going on now. Check www.weather.gov/top and check out our sit-rep outlook document for the latest on severe weather risks. Another source of outlook information is available via www.spc.noaa.gov Monitor your local TV and radio media for the latest on watches and warnings and put an app on your mobile device that can deliver watch and warning information for your location. There are many free and low cost options out there including tornado from the Red Cross. There is another free opt out alert service called Wireless Emergency Alerts that originates from FEMA. You will receive flash flood warnings and tornado warnings through this free opt out service. Ultimately, your safety and the safety of your family are up to you and by being prepared and staying aware you can significantly reduce the risk of serious injury or death from tornadoes. You can find more information about situational awareness in the article titled “Situational Awareness of Hazardous Weather Threats”.



When it comes to flooding we say “turn around, don’t drown”. The vast majority of flood fatalities occur when people drive into flooded roads in vehicles and get caught in the current and drown. You can reduce your risk from flash flooding here in Kansas by simply not driving through flooded roads especially at night when you can’t tell the depth of the water or condition of the road under the water. Turn around and find another route because it’s simply not worth the risk since it only takes a few feet of water to float a vehicle.

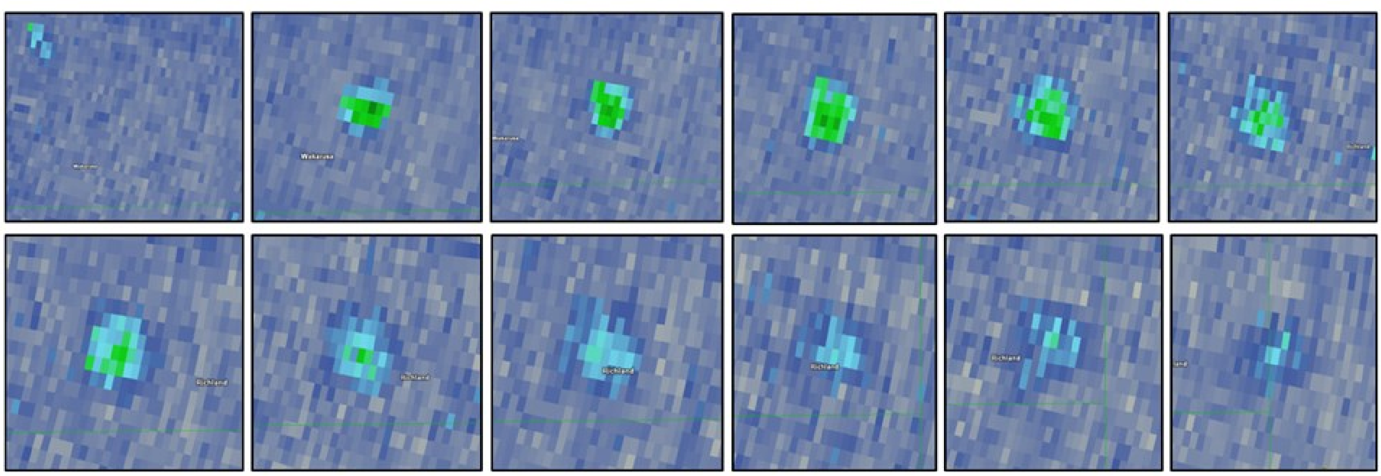
Finally, when it comes to lightning if you can hear thunder you are close enough to be struck. Remember “when thunder roars go indoors”. Get into an enclosed building or structure or if none are available get inside your car, roll up the windows and keep your hands on your lap. The body of the vehicle acts like a cage and will allow a lightning strike to conduct through the vehicle into the ground. How can you estimate the distance of a lightning strike? Count the number of seconds between a flash and the bang and divide by 5. This can provide a rough approximation of the distance in miles between you and a lightning strike.

In summary, severe weather including tornadoes, lightning and flooding are going to happen like they do every year. The risks associated with those hazards can be reduced with proper preparedness and by staying aware before and during severe weather. As mentioned, your safety and the safety of your family are up to you and by being prepared and staying aware you can significantly reduce the risk of serious injury or death from severe weather here in Kansas.

Dust Devil on Radar? (Continued…)

Satellite imagery from the GOES-East satellite showed no clouds in the vicinity, ruling out the chance that this was a landspout or shower of any nature. Dual-polarization radar data also contained very low correlation coefficient (near 0.20) and near zero differential reflectivity values; indicating non-meteorological, tumbling/circular targets—such as dust—were being sampled. There was nothing of note in the radial velocity and spectrum width data, which is not surprising as any circulation in this environment would be weak and have a very small footprint. There were no hot-spots observed on the GOES-East imagery in the vicinity of the signature, though the lack of a hot-spot by itself would not completely rule out the possibility of it being from a smoke plume. The radar signature retained a circular shape during its entire lifespan and extended to a depth of over a mile above ground for multiple volume scans, behaving eerily similar to a TDS correlation coefficient debris pattern.

Had this been a smoke plume, one would have expected a more elongated signature emanating from its source origin and dispersing as it travels downwind. This behavior was not observed, indicating that a nearly continuous, moving source of debris lofting was taking place and holding that debris together in a circular orientation. Coupled with its location in proximity of the advancing front/ boundary intersection, the data increasingly points towards this being a dust devil/gustnado. There was ample solar heating in the air mass ahead of the front which could generate thermals capable of stretching the vertical vorticity along the boundary. The signature stayed south of any major populated areas and no reports were received of dust devils. Therefore, it is difficult to say for sure what this phenomena was. Nevertheless, this is a great case of leveraging behavioral-based techniques to provide further insight into radar signatures.



Radar reflectivity time-series over the lifespan of the possible dust devil as it traveled through south-east Shawnee County (2:48 to 3:27pm, 3 to 5 minute intervals, beam height of 2200-2300 ft above ground).

Situational Awareness of Hazardous Weather Threats (Continued…)

A weather warning is then issued when a threat, such as a tornado, dangerous winds or large hail, has developed or is occurring. The key to being situationally aware of threats that are occurring or imminent to your location is to have multiple ways to receive warnings. The NWS strongly encourages everyone to have at least two ways to receive warnings. Examples of where to find details of warnings include the internet, television and weather radios. It is also especially important to be able to receive warning information on the go. There are many cellular phone weather apps available that will show weather warnings along with radar data. Furthermore, most mobile phones are capable of receiving Wireless Emergency Alerts (WEA), which are alerts used to notify the phone user to specific safety or missing person information in the area of the mobile phone location. Tornado Warnings and Flash Flood Warnings are two examples of weather warning information that get transmitted through the WEA system. As a very important bonus, weather radios and cell phone emergency alerts can be loud enough to wake a person from sleep when nighttime threats occur. Stay aware and stay safe this severe weather season!

<u>Links to Outlooks</u>
Situation Report: https://www.weather.gov/media/top/sitreport/SitReport1.pdf
Hazardous Weather Outlooks: https://forecast.weather.gov/product.php?issuedby=TOP&product=HWO&site=top
Storm Prediction Center: https://www.spc.noaa.gov/products/outlook/
Weather Prediction Center: https://www.wpc.ncep.noaa.gov/#page=qpf

Climatology of Severe Winds (Continued…)

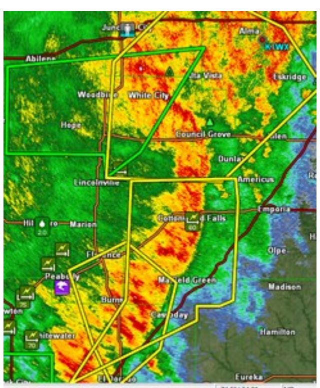


Figure 1. Quasi-Linear Convective System

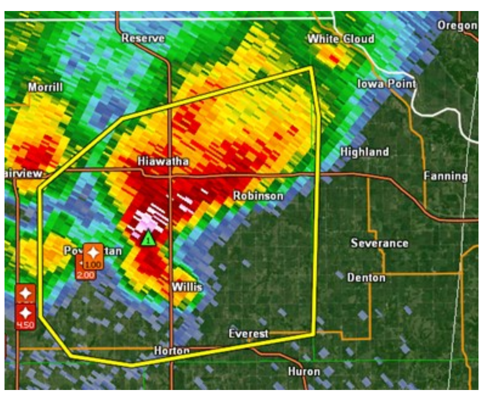


Figure 2. Supercell Thunderstorm

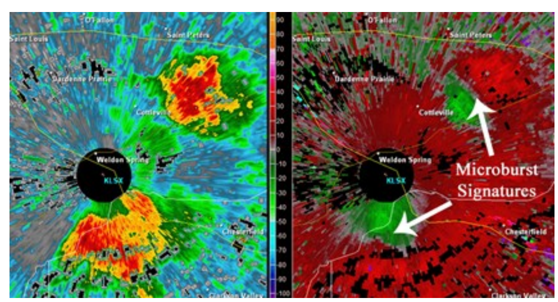


Figure 3. Pulse Thunderstorms

The two strongest severe thunderstorm wind reports were estimated at 115 MPH. One occurred in Douglas County, 2 miles north of Lawrence on July 9th in 1969. This was reported by a citizen and was most likely an over estimated wind gust. The second 115 MPH wind gust occurred in Morris County, near Council Grove on December 13th, 1975. This wind gust speed was determined by extensive damage to homes, trees and utility poles. The evidence pointing to the Morris County severe thunderstorm wind gust may have been accurate from the evaluation of the damage surveyed.

The strongest severe thunderstorm wind gust measured between 1975 and 2018 occurred on August 13, 2010 when a well calibrated anemometer near the Manhattan Regional Airport control tower measured a wind gusts of 93 MPH. There was a lot of down trees and damage to residential homes and buildings on the KSU campus.

Article continues on page 9...

Climatology of Severe Winds (Continued…)

The severe thunderstorm wind gust that produced the greatest amount of damage within the Topeka NWS CWA, was 8 million dollars of damage in Lawrence, KS on March 12, 2006 at 8 AM CST. An elevated supercell thunderstorm producing large hail across northern Osage and southern Shawnee counties during the morning of March 12, 2006, moved east-northeast and produced a microburst just west of Lawrence, causing a large swath of 70 to 90 MPH straight line winds, that moved east-northeast through town.

The most severe thunderstorm wind gust reports during one day occurred during the evening hours of June 16, 2009 where 46 separate severe thunderstorm wind gusts occurred across northeast and east central KS.

The number of severe thunderstorm wind gust reports have been increasing during the 90s and up through 2018, shown in Figure 4. This is probably due to the fact that there are more spotters and storm chasers to report severe wind gusts. Also, social media now allows the public to easily make real-time reports.

Overall, half of the reports of severe thunderstorm wind gusts or damage that the NWS received were from trained spotters, storm chasers and law enforcement. Only around 12% of the reports were from the general Public. Measured severe thunderstorm wind gusts only made up 3.7% of the reports. Many severe thunderstorm wind gust reports from the mid 1950s through the mid 1980s did not place a source within the local storm report (Figure 5).

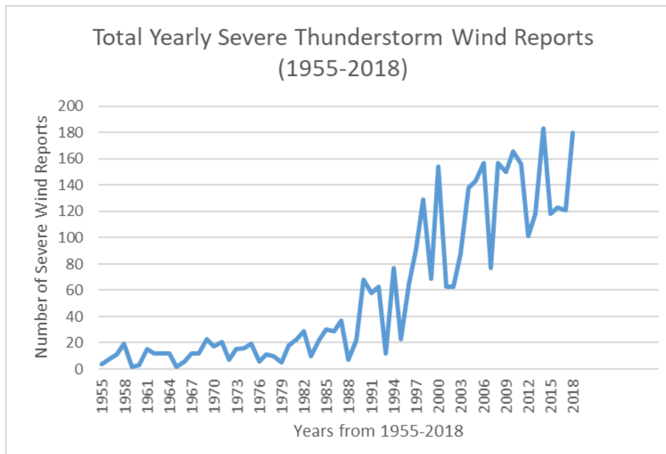


Figure 4. Yearly Severe Wind Reports

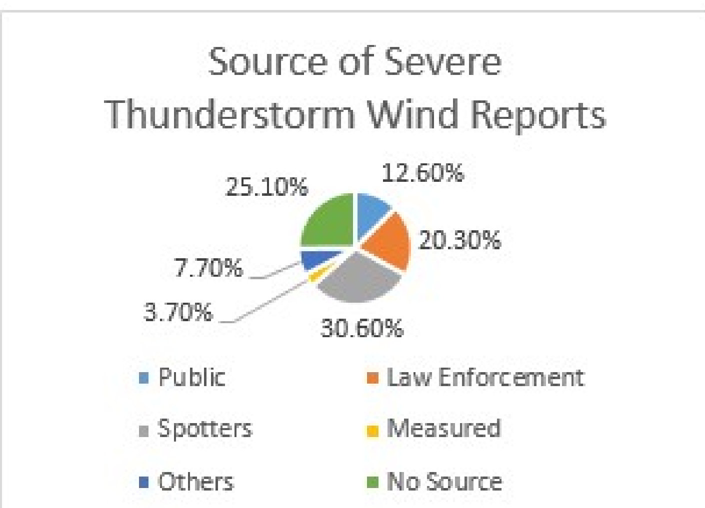


Figure 5. Source of Wind Reports

The county with the most severe thunderstorm wind reports from 1955 through 2018 was Shawnee County and was probably due to the fact that Shawnee County, with a population of 178,190, has the highest population in the Topeka NWS CWA. Jefferson County has a population near 19,000 but also has a high number of severe thunderstorm wind reports with 217. Figure 6 is a map of the number of severe thunderstorm wind reports for each county in the Topeka NWS CWA from 1955 through 2018.

Article continues on page 10...

Climatology of Severe Winds (Continued…)

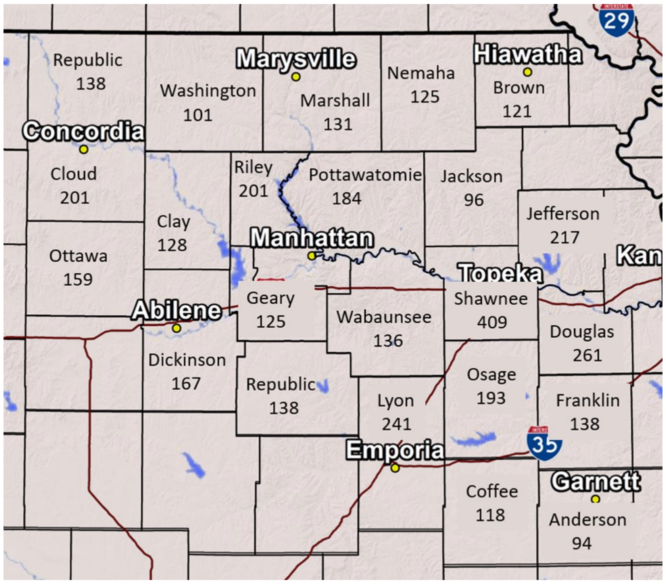


Figure 6. Severe Thunderstorm Wind Reports per County from 1955-2018

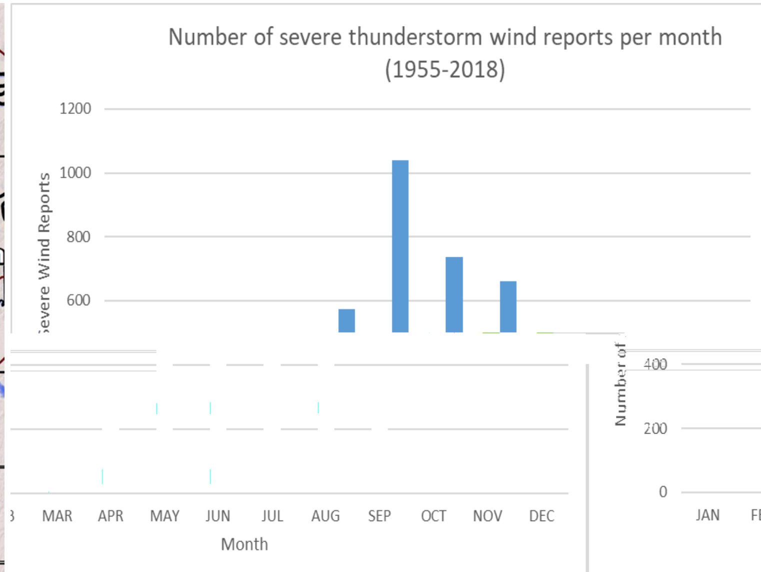


Figure 7. Monthly Distribution of Severe Thunderstorm Wind Gusts from 1955-2018

On a per month basis, the greatest number of severe thunderstorm wind gusts occurred in June with 1,040 reports. July had the 2nd highest number of reports, with August having the 3rd highest number of reports. The number of severe thunderstorm wind gust reports, fit the overall climatology for severe weather but the severe thunderstorm wind reports were higher during the summer months as opposed to April and May (Figure 7).

If we look on an hourly basis, the number of reports peak at 1800 hours (7 PM CDT or 6 PM CST) with 445 severe thunderstorm wind reports from 1955-2018 (Figure 8).

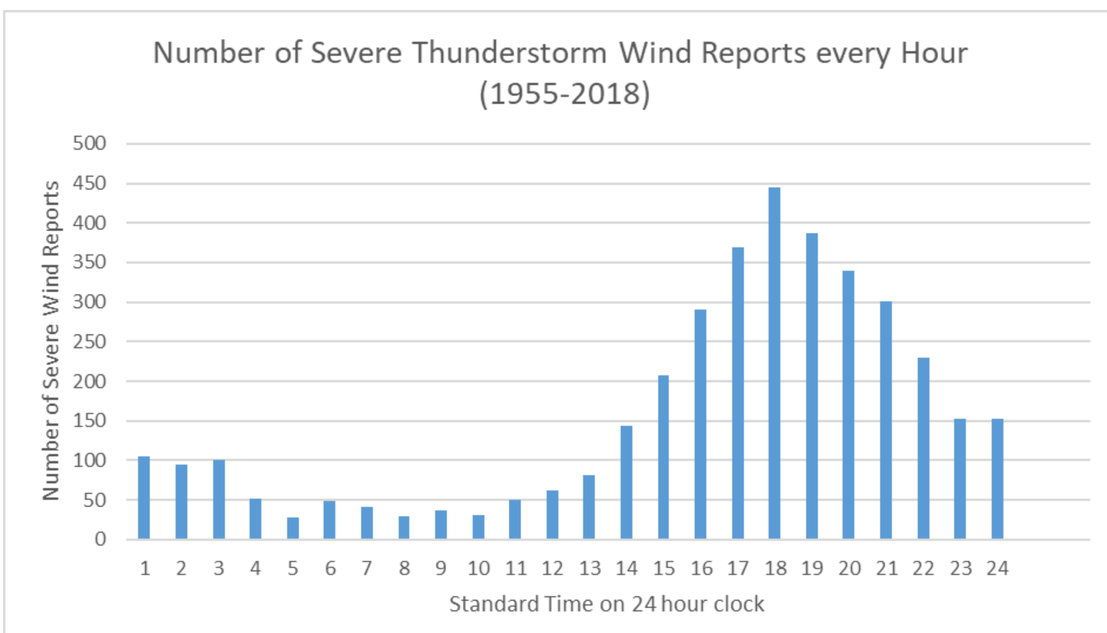


Figure 8. Hourly Distribution of Severe Thunderstorm Wind Gusts from 1955-2018

COOP Corner

Some exciting experimental equipment upgrades will hopefully be coming soon within the next few months. One of our sites has been chosen to take place in a national test for an automated CO-OP station. Here is an example of what the experimental station will consist of. This one is located in Gilroy, CA.

The 2018-2019 winter season was a cold and snowy one. Concordia received 48.2 inches of snow from October 1 to March 31 with several instances of blizzard conditions recorded this past season. Topeka received 27.1 inches which was much higher snowfall amount than in recent years. I want to thank everyone for their dedication and hard work this past winter!

I have several length of service awards to hand out this year. Top spot this year goes to Raymond O'Neil with 40 years of service!!

We are looking for dedicated volunteers!!! COOP Observers are still **NEEDED** in the following locations: Lawrence, KS (within a few miles of the airport), Riley or Leonardville, KS, and Sabetha, KS

If you are interested in becoming a CO-OP observer, please contact me by email shawn.byrne@noaa.gov.

I will be travelling to each of you sometime this year, so looking forward to visiting with all our COOP observers!

Thank you one and all for all that you do! It does not go unnoticed or unappreciated. If you have any problems or questions, please do not hesitate to contact me at shawn.byrne@noaa.gov or 785-232-1493.