Serving Residents of Northeast Kansas Since 1878

The Topeka Tiller

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National Weather Service
Topeka, KS

Inside this issue:

NWS Topeka Meteorologists Give Back to their Hometown Schools

By Ariel Cohen, Science and Operations Officer

Ariel Cohen working with 9th grade science students and teacher Brian Luthy at Thomas Worthington High School, Worthington, Ohio. Photo: Lisa Gerard

Ariel Cohen (NWS Topeka, KS, Science and Operations Officer) teamed up with **Brian Haines** (NWS Wilmington, OH, Forecaster), **Alan Gerard** (Chief of the National Severe Storms Laboratory Warning Research and Development Division), Lisa Gerard (Alan's wife), and John Banghoff (graduate student in meteorology at Pennsylvania State University) to deliver a dozen classes of instruction and hands-on severe weather forecasting activities to approximately 350 students at Ariel's hometown schools in Worthington and Columbus, Ohio.

At Ariel's high school, Thomas Worthington High School, the presenters introduced ninth grade students in the Science, Technology, Engineering, and Math (STEM) program and general science classes to meteorological analysis and forecasting. Students learned about the ingredients for severe thunderstorms, and how hand analysis of weather observations plays a key role in diagnosing environmental conditions potentially favorable for severe storm development. The presenters guided students through a hands-on activity, in which the freshmen manually analyzed their own surface weather maps corresponding to a tornado event. They simulated the issuance and verification of their own Tornado Watches based upon their analyses, and even experienced the importance of leading team collaboration and consensus-building for forecasts. Students gained appreciation for the importance of studying science to message potentially critical, life-saving information pertinent to severe thunderstorms and tornadoes.

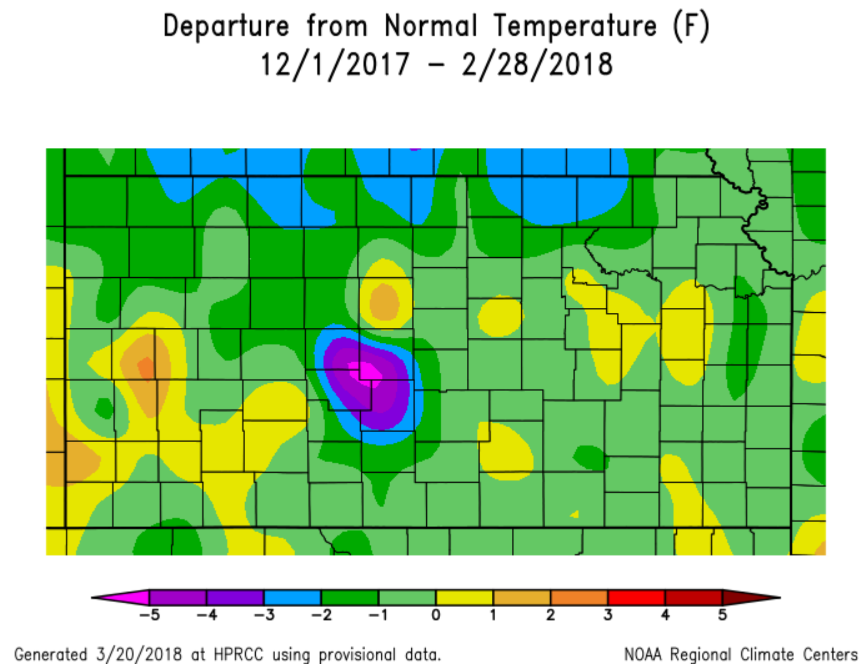
For the students at Ariel's elementary school, Worthington Estates Elementary School, this was an opportunity to introduce fourth graders to the basics of weather and forecasting, along with severe weather safety. Students rotated through different classrooms in which presenters showed photos and videos illustrating severe storms and tornadoes, discussed severe weather safety, illustrated remote sensing and meteorological instrumentation, and led hands-on activities in which students created their own weather instruments. **More on page 3..**

Winter of 2017-2018 Review

By Kyle Poage, General Forecaster

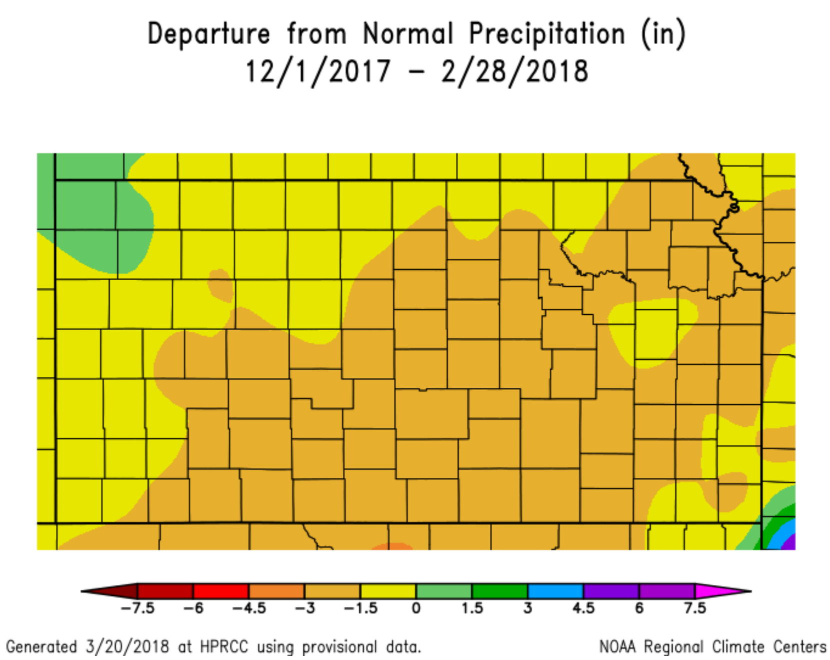
Winter conditions in the area were generally less severe than normal. Light to moderate wintry precipitation events were fairly frequent, but heavy amounts did not fall during any one storm and helped keep the total precipitation for the season below normal. Although there were several days of both well above and well below normal temperatures, on the whole, temperatures for the season were very close to normal.

The first month of the season brought a variety of conditions. Temperatures on December 4 were quite warm, peaking in the middle 60s to lower 70s, including a record high of 68 degrees at Concordia. Light snow fell across the area on Christmas Eve, with 0.5 to 2.5 inch amounts common and the highest amounts near the Nebraska border. Very cold air moved into Kansas December 31 with wind chill values as low as -15 to -25 degrees and low temperatures on New Year's Day of -4 to -15 degrees.



Map depicting the departure of average precipitation from normal for the winter.

The middle and end of January saw a variety of weather conditions as well. Three light precipitation events occurred from January 11 to January 14, the heaviest on January 11 when 2 to 4 inches of snow and light freezing rain fell. Another surge of very cold air reached the state January 15 and 16 with wind chills both days in the -15 to -20 degree range. Just five days later, on January 21, temperatures rose into the middle 60s, feeling around 85 degrees warmer. Warm conditions returned January 25 with highs in the 60s and a record high temperature of 68 degrees set at Topeka.



Map depicting the departure of average temperatures from normal for the winter.

The first ten days of February saw three light snowfall events with 0.5 to 3 inch amounts common in each one. A wider variety of precipitation fell from February 19 through February 22. Hail up to the size of nickels fell in portions of Marshall and Riley counties in the late evening of February 19, while much of northeast and east central Kansas experienced freezing rain and sleet accompanied by some thunderstorms on February 20. Light freezing rain and freezing drizzle returned to much of this same area on February 22.

NWS Topeka Meteorologists Give Back to their Hometown Schools (continued)...

Bryan Baerg (NWS Topeka, KS) speaking to students at McPherson Middle School in McPherson, KS.

The team of presenters also led atmospheric sciences students at Ariel's and John's alma mater, Ohio State University, through a severe weather forecasting workshop, where students used meteorological data to collaborate their own simulated outlooks in small groups, before reaching a class outlook consensus. Students learned the value of collaboration and teamwork in providing an improved, unified, and consistent message of important forecast information.

This is the second year that Ariel has worked with Alan, Lisa, and others to deliver outreach to his hometown schools. Students and teachers have shown tremendous appreciation for the meteorologists giving back to the schools, which not only strengthens bonds between the NWS and the community, but also motivates students to achieve their dreams. Yet another meteorologist at NWS Topeka has undertaken similar initiatives. NWS Topeka Meteorologist **Bryan Baerg** has also reached out to his middle school in McPherson, KS, McPherson Middle School, where he presented to around 300 students in the past year. He taught students about what a day in the life of an NWS employee is like, severe storm ingredients, weather safety, and career paths in meteorology. Similar to Ariel for his hometown schools, this was a very special opportunity for Bryan to inspire students at his hometown school to pursue their dreams.

Attending the 98th Annual AMS Conference

From January 7th-11th, 2018, NWS meteorologist **Audra Hennecke** attended the 98th Annual American Meteorological Society (AMS) Conference in Austin, Texas. The annual AMS meeting is the largest gathering of weather, water, and climate communities in the world, and this year over 4,000 scientists, educators, students, and other professionals attended. Such conferences provide a valuable opportunity to share, learn, and collaborate on a broad range of topics within the weather, water, and climate communities. This year the theme of the conference was "Transforming Communication in the Weather, Water, and Climate Enterprise," which is very fitting considering the growing technological ways in which we can communicate critical weather information to both core partners and the public. By the numbers, this conference was made up of 419 sessions, 2,181 oral presentations, 1,126 poster presentations, and 21,900 sq. ft. of special exhibits.

One of those 2,181 oral presentations was done by Audra, where she presented: "A Social Science Analysis of Weather Messaging in the Decision Support Services Situation Report for Northeast Kansas Integrated Warning Team Core Partners." This presentation shared the results from the social science analysis that was done on feedback received from NWS core partners through a survey and small focus groups. This analysis focused on gathering information regarding the usefulness of weather messaging within the Situation Report product, how this product is utilized during their decision-making process, and what improvements can be made to ensure consistent clear and concise weather messaging. Presenting at this conference provided an amazing opportunity to share this valuable information with others in the weather community (especially within the NWS) so that they too can hopefully apply these results to improve how they communicate hazardous weather information to their core partners.

Spring Safety: Severe Weather

By Emily Heller. Meteorologist Intern

Although the spring season has started off cold and dreary, temperatures are bound to warm up and severe weather season once again takes over the central Plains. Are you prepared and have a plan ready to go when a warning is issued? Do you know how to receive warning information no matter where you are at? Reduce your risk from severe weather by paying attention to weather conditions and having a plan in place on where to go and what to do when a warning is issued!

No matter what the weather hazard, put together a plan that indicates where you and your family will go in the event a severe thunderstorm, flash flood, or tornado warning is issued. Make sure to practice that plan as people are much more likely to follow through if they have already practiced it at least once. Also, be sure you have at least two methods to receive weather information and warnings, and think about what you would do if the power goes out.

Wireless Emergency Alerts are a new way to get this information directly onto your mobile device. Warnings are essentially "pushed" to your phone and use GPS in order to alert you when you are in or enter an area where this is a warning. Besides this, there are many other free or low cost options available for your mobile device.

In the last 20 years, there have been 37 fatalities in Kansas from tornadoes. There are many ways to help reduce the risk of injury in these situations, with the main thing being to get as low as possible and put as many walls as you can between you and the tornado. Many deaths occur due to flying debris, so going underneath something sturdy or even using helmets can help mitigate this risk. Lastly, remember that if you are in a mobile home, there is no safe place to be and you must get out and find shelter somewhere else. Large hail and strong, damaging winds may also be seen in these strong thunderstorms. Keeping this information in mind during an emergency is vital to you and your family's safety.

One of the most underrated weather hazards is lightning. Since lightning occurs with every thunderstorm, every storm can be a potential killer. If you can hear thunder, you are within striking distance and should seek shelter immediately! Get inside an enclosed building or structure, but if none are available get inside your car and roll up the windows and keep your hands away from windows.

Flooding is another underrated hazard with 26 fatalities in the last 20 years seen in Kansas, five of which occurred in the last five years. It only takes six inches of moving water to knock you off your feet and two feet of moving water to sweep a vehicle off the road. Remember, "turn around, don't drown" and never assume you know how deep flowing water could be.

With severe weather season back, just remember to prepare and have a plan ready for any severe weather hazard in order to mitigate your risk and protect your family.

When NWS Offices Need Backup

By Kris Craven, Lead Forecaster

It was a dark and stormy night, but rest assured that the staff at the National Weather Service in Topeka is on duty and issuing warnings to help protect the people of northeast Kansas. A supercell thunderstorm producing a tornado takes direct aim at the National Weather Service office itself, and the staff needs to take cover...what then?

The National Weather Service has a plan in place for just such an emergency. Whether it's a physical threat to the office such as a tornado or a large scale software upgrade, each office within the NWS has both backup office responsibilities for other offices as well as offices to back them up. For Topeka, our primary NWS backup office is NWS Wichita, with a secondary backup at NWS Kansas City / Pleasant Hill. And if the scale of the impact is large enough that all of these offices are impacted, we have a tertiary backup in Cheyenne, Wyoming. Often times we choose our backup office based on who has more available staffing or less ongoing activity. So for example if Wichita is busy with school outreach and spotter talks but Pleasant Hill has extra staff on hand, the latter may take over for us.

Many times backups are planned for upgrades to computers or equipment, but what if they aren't? What if there is a situation like the above where an office that is actively issuing warnings finds themselves needing to take cover? There's a plan for that, and this happened to the NWS in Wichita on April 14th, 2012 when the office needed to take cover for about half an hour as a tornadic storm approached their office. With the click of a button, Topeka instantly become able to issue warnings on their behalf. NWS Topeka issued a tornado emergency for the Wichita area, given the strength of the tornado in a heavily populated area. More information about this day can be found on the NWS Wichita website at: https://www.weather.gov/ict/april14_additionalinfo

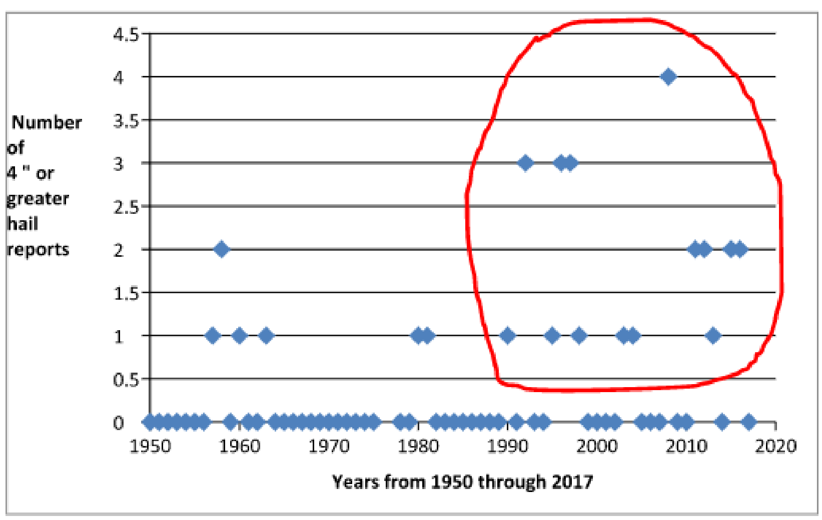
What if there is uncertainty about the weather on a back-up day that has been prearranged? At times staff can move between offices, backing up their own office at the remote office site. Kansas City was set for a major upgrade in July of 2015, but as the day drew closer it became apparent that storms were expected. Instead of having NWS Topeka take over all of the backup duties as usual, a forecaster from Kansas City came over to join the office in Topeka and set up shop to operate as NWS Pleasant Hill. That day produced tornadoes and flooding over northeast Kansas, with the two meteorologists from Topeka and Kansas City sitting side by side issuing warnings for the same tornadic storm as it crossed the boundary between our areas of responsibility near Eudora.

So whether it's a quiet weather day or a very busy one, your NWS is here and ready to go to protect life and property across the country - even when it's some of our own.

Giant Hail Occurrences Across Northeast Kansas

By Bill Gargan, Lead Forecaster

Giant hail is defined as a hail stone with a diameter of 4 inches (softball size) or greater. Since 1950 there have been 35 reports of giant hail across the Topeka NWS County Warning Area of northeast Kansas. Since 1990, the number of giant hail reports has been increasing, probably due to an increase in storm chasers and storm spotters who follow severe thunderstorms across the area. There are probably many more giant hailstones produced by intense supercells that fall in rural areas across northeast Kansas that never get observed or reported.

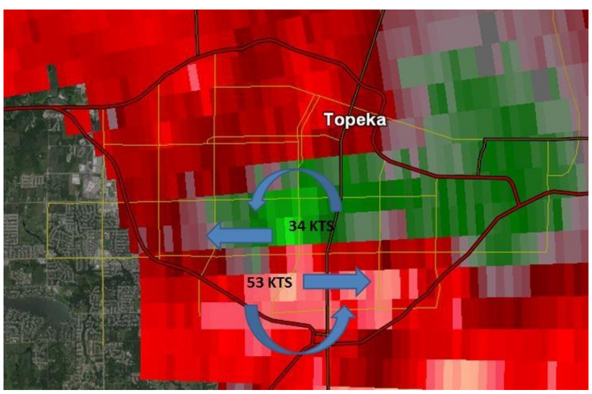


The red circle region shows the increase of large hail reports since about 1990.

Giant Hail (Continued…)

All giant hail is produced from rotating thunderstorms called supercell thunderstorms. The more intense supercell thunderstorms, with the stronger low and mid level rotation (mesocyclone), have the greater chance to produce giant hail. Intense supercell thunderstorms may also produce tornadoes, damaging wind gusts along with the giant hail. However, some intense supercell thunderstorms that develop during the night and morning hours are elevated above a shallow cooler air mass at the surface. Often the only hazard with elevated intense supercell thunderstorms is giant hail.

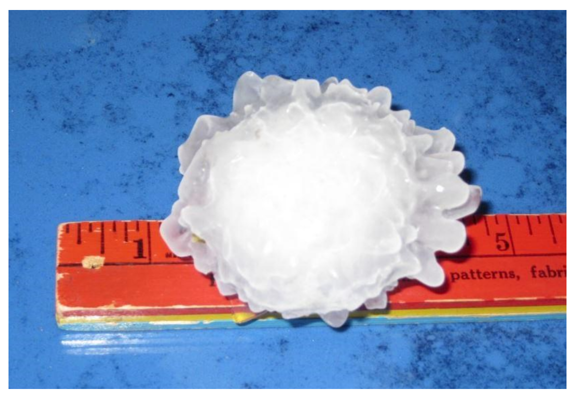
The largest hail stone observed and recorded across northeast Kansas occurred in Topeka, KS on May 21st of 2011. This hail stone measured 5.25 inches in diameter. The largest hailstone to fall in the state of Kansas occurred in Southwest Wichita on September 15, 2010. This hail stone measured 7.75 inches in diameter beating the previous record setting hailstone from Coffeyville, KS which measured 5.7 inches in diameter on September 3, 1970. The world record largest hail stone was 8.0 inches in diameter that fell in Vivian, SD on July 23rd, 2010.



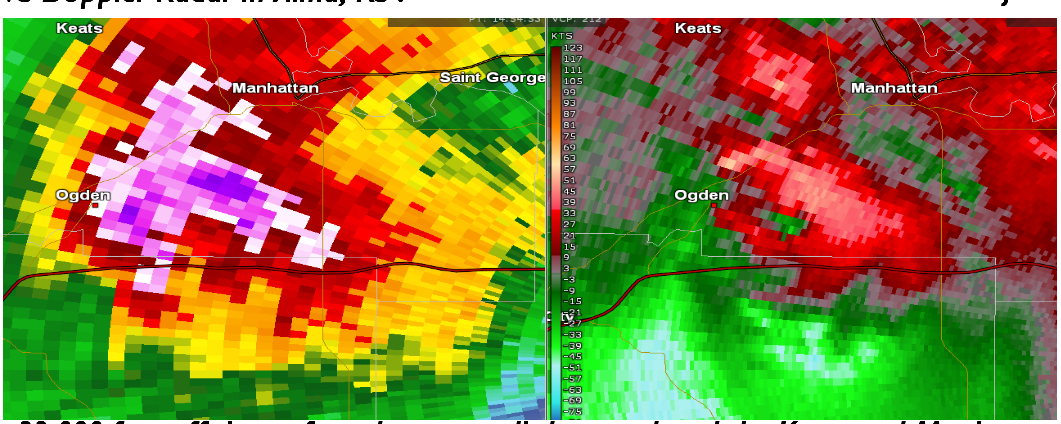
The supercell that produced the 5.25" diameter hail stone had a strong mid level mesocyclone at about 10,000 feet off the surface as seen by this image form the NWS Doppler Radar in Alma, KS .

The blue star shows where largest hail report (5.25") in northeast Kansas fell on May 21, 2011 and was observed by a storm spotter near the intersection of SW 21st St and SW McAllister Dr.

The most damaging giant hail event across northeast Kansas occurred during the morning hours of June 2, 2008, when an intense elevated supercell (shown on radar) moved east across Keats, KS into the southwest and southern sections of Manhattan. The large hail up to 4.25 inches in diameter (Softball to Grapefruit size) caused 5 million dollars' worth of damage.



A large hailstone fell in west central Topeka on May 21, 2011. This hail stone measure just over 4.75".



22,000 feet off the surface the supercell that produced the Keats and Manhattan damaging hail at 954 AM CDT had a mid level rotational velocity of 41 KTS (right image) and reflectivity core of nearly 90 dbz (left image).

Documenting Tornadoes from the Sky

Improvements in Aerial Surveying Techniques

By Kevin Skow, Forecaster

The last ten to fifteen years have witnessed an explosion in new technologies to aid in the documentation of severe weather. The ability for the public to take and upload photos/videos instantly online, combined with GIS-based storm surveying tools at the fingertips of NWS storm surveyors, has led to major improvements in the timeliness and quality of post-event storm surveys. In addition to ground data, airborne and satellite photographic technologies have seen remarkable advances in this timeframe. In the past, NWS aerial damage surveys were limited to Civil Air Patrol flights or flights from private pilots, which were often expensive and reserved for only high impact events. Since the beginning of the 21st century, the following new tools have been leveraged by the NWS:

Satellite Imagery: Research studies into the usefulness of satellite imagery in storm surveying began in the late 1990s, but it wasn't until 2011 that the NWS was able to utilize satellite imagery to augment a damage survey. In 2013, the NWS partnered with the U.S. Geological Survey to provide NWS offices with the ability to order high resolution satellite data (<1 m resolution) for an impacted location and receive it in a matter of weeks. In addition to this on-demand imagery, high-resolution satellite data is available on other platforms such as Google Earth and updated relatively frequently.

Routine Aerial Flights: In 2004, the U.S. Department of Agriculture began routine, yearly flights over much of the continental U.S. during the grown season (called the National Agriculture Imagery Program, or NAIP, image on right). Oftentimes, damage from events within the last several months remains visible in these images and can be used to find new areas of damage and improve previous storm surveys.

Unmanned Aerial Vehicles (UAVs): While the NWS does not possess UAVs of its own, UAVs owned by private citizens and NWS partners have proven useful as a rapidly-deployable, real-time source of aerial imagery and cost far less than satellite data.

Aerial surveying tools have proven time and time again their utility in fine-tuning and oftentimes lengthening previously surveyed damage tracks. However, aerial data can also find previously unknown tornado tracks, especially in events where the tornadoes may be short-lived or obscured by rain or darkness. In one case in central Iowa, aerial data from the NAIP revealed 111 vortex damage paths from <u>ONE</u> squall line, 35 of which

were classified as being highly tornadic. Before this aerial data, only two tornadoes were known to exist from this event. Other tornadoes have been located via aerial products, leveraging debris signatures visible on dual-pol WSR-88D radar data.

Despite the numerous advantages of aerial datasets, there remain challenges in the availability and utility of the data. Satellite imagery may take weeks or even over a month to acquire and process, with cloud cover being a significant limitation. NAIP imagery is only taken once a year at best and may take 6-12 months to be made available. Finally UAVs only can survey small sections of a damage track at any one time and are limited by winds, battery life, and privacy concerns. Land cover also plays a direct role in the visibility of the damage tracks, with barren fields and grassland oftentimes failing to resolve weak or even moderate strength tornadoes. On the other hand, mature corn crops are ideal for visualizing storm-scale wind patterns.

Nevertheless, the future is bright for continued improvements in the storm surveying process. These new tools will help foster a more accurate historical event record, which is crucial to understanding how storms behave and how to predict their hazards in the future.

COOP Corner

Spring is in the air once again! That means all liquid precipitation, so I'd like to ask that everyone place their inner rain gauge tubes and funnels on their rain gauges.

Some exciting equipment upgrades will hopefully be coming soon within the next year or so! It has been a while since the Maximum/Minimum Temperature System (MMTS) has been upgraded. The older systems are becoming more difficult to repair due to parts no longer being produced. The new system should be RF (radio frequency) based, so we will no longer require a wire to be attached to the temperature sensor and readout! As I get a better timeline, I will let those affected know about system replacements and how that will work.

I want to thank everyone for a wonderful job this fall and winter season! I will be travelling to each of you sometime this year, so looking forward to visiting with all our COOP observers! Thanks for all you do! I wanted to take the time to recognize a few observers for their dedication throughout the years, and who received Length of Serve Awards for the latter half of 2017!

Loren and Deborah Sudbeck 10 years of Service!

City of Holton 10 years!

The USACE Perry Lake Project received an Honored 50 year Institution Award for 50 years of service taking weather observations for the NWS Cooperative Program. Perry Lake observes the temperature, precipitation, both the standard rain gauge, and the Fischer Porter HPD rain gauge, and evaporation. We thank Jason and John for helping with this program through their tenure at the lake. Thank you!!

Nancy and Leo Pollard have been providing observations for precipitation and river readings for 35 years! They took over for Leo's Father, Roland Kraft, in 1982, and Mr. Roland had performed the duty since November 1962. Therefore, the Polard family has been performing the observations in their family for the past 55 years. We thank you for your family's service for this length of time!

Other award recipients included:

Barry Finlayson for 65 years of service for the gauge located at the Washington Power Plant.

Debra Kruse, of Bremen, for 20 years of service.

Debra Kruse: 20 years

John Foster: 20 years

Jim Kraft: 10 years

Carol Linden: 25 years

James and Mary Graf Pierson: 10 years

Lance Bailey: 10 years

Kevin Foerschler: 20 years

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.

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Severe Weather Spotting Card :

Weather to Report:

Hail (report any size)

Strong Wind Gusts (58+ MPH)

Any notable wind damage to trees, homes, businesses

Funnel Cloud/Rotating Wall Cloud or Tornado

What to Include in your Report:

Your Name and/or Call Sign (Spotter Number)

Your Location

Time and Date of Event

Location and Duration of Event

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