

Storm Fury on the Plains

Inside this
issue:

2019 in Review 1

Hesston
Tornado 6

Meet Our New
ASA 7

Tornadoes by
the Numbers 7

Wow! Times
Have Changed
in the NWS 9

Summary of
2019 Severe
Weather Statis-
tics 15

2019 in Review

By Andy Kleinsasser – Meteorologist

Record Wet 2019

With the help of a very wet May and August, 2019 became one of the wettest years on record for many across Kansas tallying over 5 to 6 feet of precipitation which fell mostly as rain. Annual precipitation anomalies were 20 to 30 inches above normal. Consequently many tallied their wettest years on record. Altamont had the greatest annual rainfall across the state recording a staggering 75.08 inches. As stated previously, May and August were big contributors to the annual total with the two months combining to produce 40 to 50% of the annual total for many across the area. Just about the only locations across the Sunflower State that didn't see above normal precipitation in 2019 were portions of western, southwest, and a small portion of central Kansas.

2019 Rainfall	Normal Rainfall	Historic Rank	Location
75.08"	45.06"	1 st	Altamont
70.22"	44.65"	1 st	Bartlett
69.33"	39.29"	1 st	Rock 3 SW
68.24"	42.97"	1 st	Parsons 2 NW
67.00"	43.60"	1 st	Erie
66.83"	45.61"	1 st	Mound Valley 3 WSW
65.38"	40.22"	1 st	Winfield 3 NE
64.44"	44.47"	1 st	Chanute 4 E
63.15"	45.16"	2 nd	Oswego 1 N
62.67"	42.41"	1 st	Moran

Figure 1: Greatest reported rainfall totals across central, south-central and southeast Kansas in 2019. Most sites were 20 to 30 inches above normal, and mostly ranked as the wettest year since records began. All reports are courtesy of volunteer weather observers.

2019 Precipitation	Normal Precipitation	Historic Rank	Location
61.84"	45.05"	1 st	Independence
58.79"	34.70"	1 st	Wellington
58.33"	39.69"	4 th	Eureka
53.03"	37.09"	1 st	El Dorado
42.10"	32.64"	7 th	Wichita (ICT Airport)
41.80"	32.45"	11 th	Newton
37.12"	31.61"	8 th	Hutchinson
35.12"	32.79"	34 th	McPherson
35.10"	31.50"	14 th	Salina (SLN Airport)
34.38"	26.66"	10 th	Great Bend

Figure 2: 2019 rainfall and historic rank for other cities across central, south-central, and southeast Kansas. Many tallied top-ten wettest years on record.

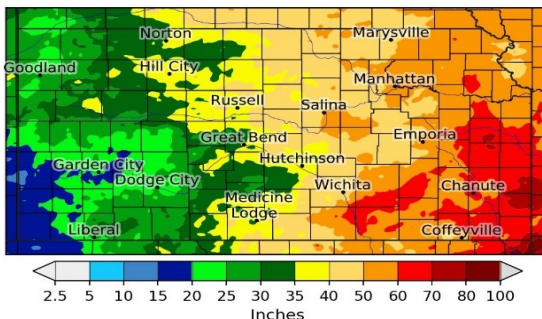


Figure 3: Precipitation across Kansas in 2019. Portions of eastern and southeast Kansas received more than 60 inches.

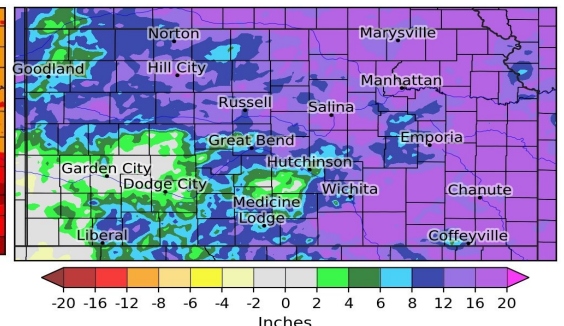


Figure 4: Precipitation departure from normal across Kansas in 2019. Large portions of the state saw anomalies greater than 12 to 16 inches above normal.

February 23rd Blizzard

For the second time in the 2018-19 winter season, a blizzard affected much of central Kansas on February 23rd as an intense low pressure system moved northeast across the region. Snowfall rates of 1 to 3 inch per hour combined with winds gusts up to 55 mph winds to create whiteout conditions. I-70 was closed from Salina to the Colorado border for much of the day.

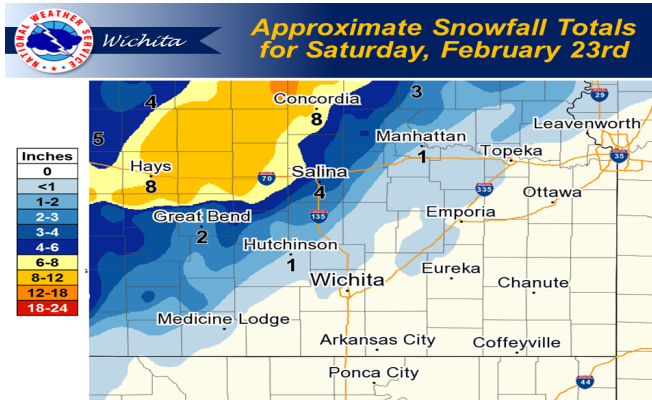


Figure 1: Snowfall totals from the February 23rd blizzard. Accumulations ranged from four to nine inches.



Figure 2: Numerous roads closed across central and western Kansas due to the heavy snow and strong winds.

Historic March Low Pressure System

On March 19th, a historic low pressure system moved out into the High Plains, spreading very strong winds and blizzard conditions across portions of the region. Much of eastern Colorado and western Kansas saw the lowest recorded atmospheric pressure on record. Meanwhile, Wichita experienced the 6th lowest pressure on record. This deep low pressure resulted in very strong winds ranging from 80 to 95 mph over eastern Colorado to 55 to 65 mph across much of Kansas. Heavy snow and blizzard conditions were noted across eastern Colorado with the strong winds causing varying degrees of damage across Kansas.



Figure 1: Strong winds overturned this semi on Highway 400 near the Butler/Greenwood county line. Courtesy of KSN News.

Speed*	Location
68	Hutchinson Airport
66	8 NE of El Dorado
62	Russell Airport
60	Wichita Eisenhower
60	McPherson Airport
59	Wichita Jabara
58	Winfield Strother Field
58	Great Bend Airport

* in MPH

Figure 2: Strongest wind gusts across central, south-central and southeast Kansas March 19th.

May Heavy Rain and Flooding

The weather pattern during the month of May was characterized by a rather persistent upper level storm system spinning over the western and central US along with associated periodic fronts progressing across the region. These features forced rich Gulf of Mexico moisture to stream north into Kansas increasing atmospheric energy needed for thunderstorms. When a front would periodically interact with this moist/unstable air, thunderstorms occurred, some of which were numerous and severe, producing widespread very heavy rainfall across

River	May 2019 Max Level	Historic Rank	Highest Since
Whitewater @ Augusta	29.23'	6 th Highest	Apr 2009
Whitewater @ Towanda	28.10'	6 th Highest	Nov 1998
Walnut @ Winfield	36.84'	8 th Highest	Nov 1998
Walnut @ Arkansas City	28.52'	3 rd Highest	Nov 1998
Little Arkansas @ Sedgwick	25.41'	3 rd Highest	Nov 1998
Little Arkansas @ Halstead	27.12'	3 rd Highest	May 2007
Little Arkansas @ Alta Mills	25.79'	7 th Highest	May 2007
Arkansas @ Haven	12.99'	2 nd Highest	May 2007
Arkansas @ Mulvane	19.52'	3 rd Highest	Sep 2008
Ninnescah @ Belle Plaine	26.32'	5 th Highest	Sep 2016
Slate @ Wellington	25.70'	2 nd Highest	June 1975

much of the region. Most of the state experienced well above normal rainfall with some anomalies greater than 12 to 16 inches above normal across portions of south-central and southeast Kansas. A majority of rivers across the region responded to this rainfall with dramatic rises exceeding flood stage on many occasions. Much of the river flooding was the worst seen in 10 to 20 years. Many levee systems were tested and in some cases breached due to the high water. Consequently, many roads and towns were flooded producing varying degrees of damage. Emergency personnel performed numerous water rescues across the region. Furthermore, several miles of the Kansas Turnpike south of Mulvane closed for a few days in early to mid-May due to the swollen Slate Creek. A Turnpike closure of this magnitude and extent due to flooding hadn't occurred in over 30 years.

Figure 1: Maximum May 2019 river levels across south-central and southeast Kansas and their historic rank. It was some of the worst river flooding in 10 to 20 years.



Figure 4: A portion of the Kansas Turnpike south of Mulvane closed in early to mid-May due to the swollen Slate Creek. A Turnpike closure of this magnitude and extent due to flooding hadn't occurred in over 30 years.

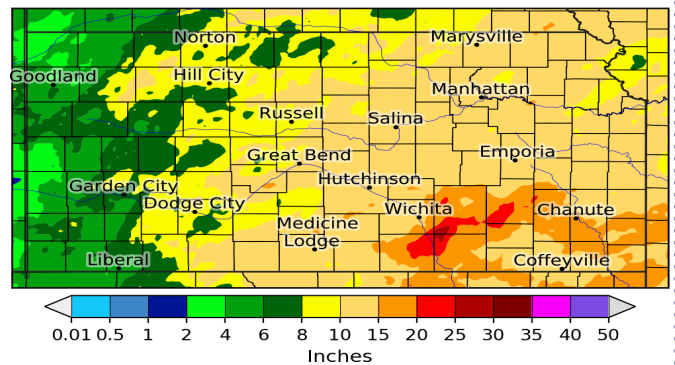


Figure 2: May rainfall totals across Kansas. Much of state saw greater than 8 to 10 inches, with portions of south-central and southeast Kansas seeing greater than 15 to 25 inches.



Figure 5: A levee system around the town of Halstead holds back the swollen Little Arkansas River in May.

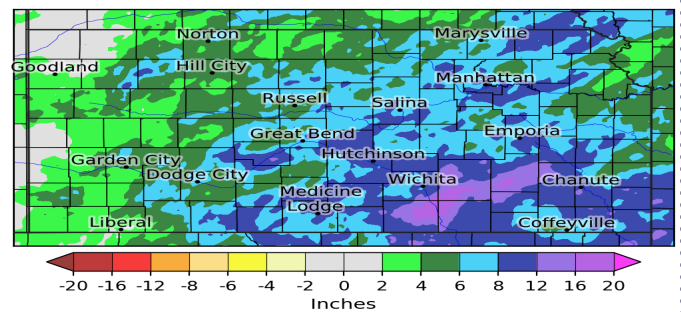


Figure 3: May rainfall departure from normal across Kansas. Most of the state saw well above normal rainfall, with some anomalies greater than 12 to 16 inches above normal across portions of south-central and southeast Kansas.

May 5th Severe Thunderstorms and Tornadoes

During the early evening of May 5th, thunderstorms developed across central Kansas. These storms tracked slowly southeast across central and into south-central Kansas as sunset approached producing nine relatively brief tornadoes along with occasional bouts of large hail as large as baseballs and damaging winds up to 100 mph. Sporadic tornado damage was inflicted on a residence, some grain silos, a center pivot irrigation system, downed power poles, outbuildings and downed trees. One particular tornado just south-southwest of Nickerson had a peculiar movement from the northeast to the southwest. It destroyed a 100-foot long pole barn, lofting some of the 1000 pound girders into a nearby field. The tornado then curled back to the southeast, hitting another farmstead further south, where it collapsed a pole barn and downed trees around the farmhouse. Occupants of the house were home but were thankfully uninjured.



Figure 1: Picture of a developing tornado northwest of Wellington. Courtesy of Corey Inmon.



Figure 2: EF1 damage southwest of Nickerson.



Figure 3: EF1 damage southeast of Ellinwood.

May 28th Central/North-Central Kansas Tornado

During the afternoon of May 28th, thunderstorms developed near the intersection of a dry-line and stationary front amidst an unstable environment. Severe thunderstorms produced large hail and tornadoes across Kansas. A large tornado developed in Russell County near Waldo and tracked northeastward 24 miles dissipating south of Tipton. Along its path, the tornado damaged several power poles, snapped and uprooted trees and overturned a grain cart. Three farmsteads were damaged including a destroyed grain bin, outbuildings and sheds. The tornado was one-half mile wide at its widest. Rated an EF2, the maximum wind speed was estimated to be 118 MPH. Fortunately, there were no injuries or fatalities.



Figure 2: Courtesy of John Monteverdi.



Figure 1: Courtesy of Connor McCrorey.



Figure 3: Tornado damage to a farmstead northwest of Waldo.

June 22-23 Severe Storms and Flooding

A moist and unstable atmosphere supported three rounds of severe thunderstorms across south-central and east-central Kansas from the predawn hours on the 22nd to the morning hours of the 23rd. The first round during the predawn hours on the 22nd produced a bullseye of five to eight inches of rain across northeast Harvey through southern Marion counties. Flash flooding ensued in and around Peabody where streets and businesses flooded; mandatory evacuations were enforced.

The 2nd round of thunderstorms struck during the evening of the 22nd producing 60 to 80 mph winds and hail up to baseball size across portions of central and south-central Kansas causing tree damage and power outages. The 3rd round of thunderstorms hit south-central and southeast Kansas during the early morning hours of the 23rd producing winds up to 100 mph that caused significant damage in and around Derby. Heavy rainfall also caused flash flooding, and sent numerous rivers back into flood across the entire area.



Figure 1: Extensive tree damage in Derby due to straight-line thunderstorm winds. Photo courtesy of Sandi Pratt.



Figure 2: Extensive flooding in the Peabody area due to five to eight inches of rainfall in a short period of time.

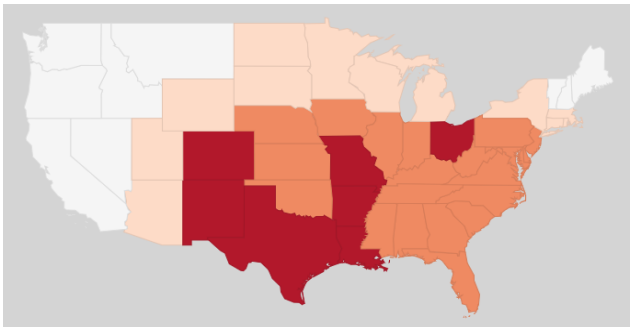


Figure 1: US climate division September temperature ranks since 1895. It was Kansas' 2nd warmest September on record.

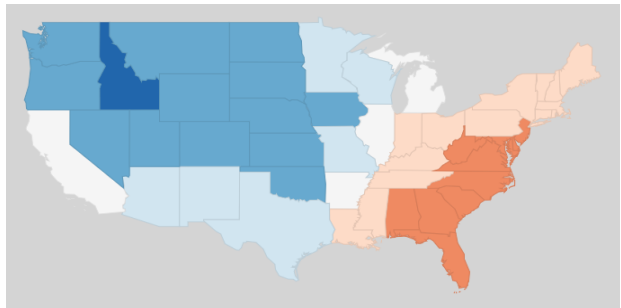


Figure 2: US climate division October temperature ranks since 1895. It was Kansas' 7th coolest October on record. Image courtesy of the National Center for Environmental Information.

Warm September, Cold October

The large-scale weather pattern supported well above normal temperatures across much of the central and eastern US during the month of September including Kansas. It was Kansas' 2nd warmest September on record (since 1895). The number of days exceeding 90°F and 70°F across the region were well above normal for the month. Many daily warm records were set. In contrast, the weather turned much cooler in October with Kansas recording its 7th coolest October on record. Especially chilly was the last week of the month, when daily average temperatures were as much as 20 to 30 degrees colder than normal. Consequently, many daily cold records were set.

Kansas Tornadoes in 2019

As is typically the case, it was another active year across Kansas tornado-wise. A preliminary number of 87 twisters touched down across the Sunflower State in 2019. This was just a few tornadoes below the 1990-2019 annual normal of 89. It was the most active year across the state since 2016. The strongest tornado was an EF-4 that tracked nearly 32 miles across northeast Kansas on May 28th producing extensive damage around the Linwood and Bonner Springs area. It was the first EF-4 in the state since 2016. In all, 2019 Kansas tornadoes produced 16 injuries, no fatalities and an estimated property damage amount of \$28,160,000.

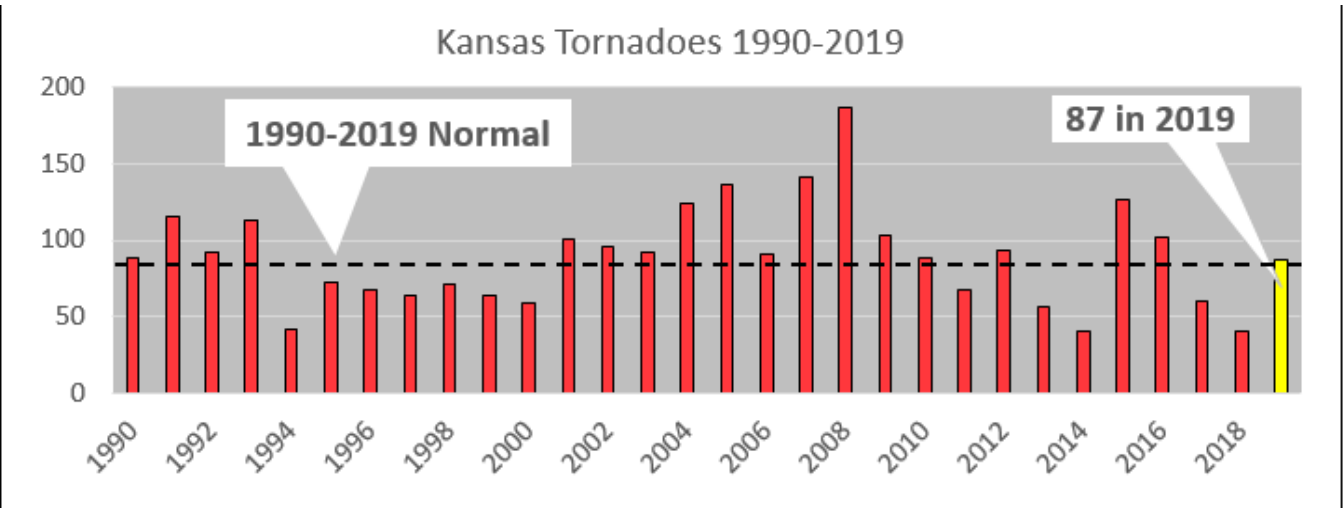
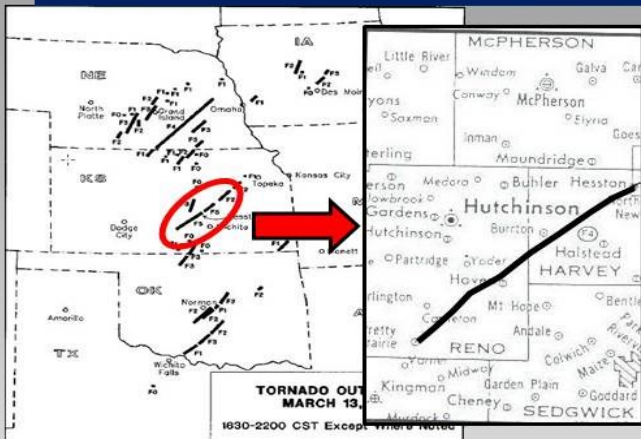


Figure 1: Kansas annual tornadoes since 1990. A preliminary number of 87 twisters touched down across the state in 2019, just a few below the normal of 89.

The Hesston Tornado March 13th 1990

- **Rated F5 – winds 261-318 mph**
- **226 homes & 21 businesses damaged**
- **2 fatalities & 60 injuries**
- **Checks from a plumbing and heating supply store in Hesston were found 85 miles to the northeast in Manhattan**



Meet Our New Administrative Support Assistant

Welcome Stacey Rasmussen

Stacey Rasmussen joined the National Weather Service team in September as Administrative Support. As a native Kansan, she has always been fascinated by the weather. She grew up in Northwest Kansas where her parents farmed and the weather was an extremely important part of life. Today, Stacey and her husband live in Newton. They have 3 adult daughters that live all over the world, encountering everything from hurricanes in the South Pacific to snow storms in the Bavarian mountains. She is happy to support the team that does so much to impact the communities that the National Weather Service serves.



Tornadoes by the Numbers

By: Chance Hayes—Warning Coordination Meteorologist

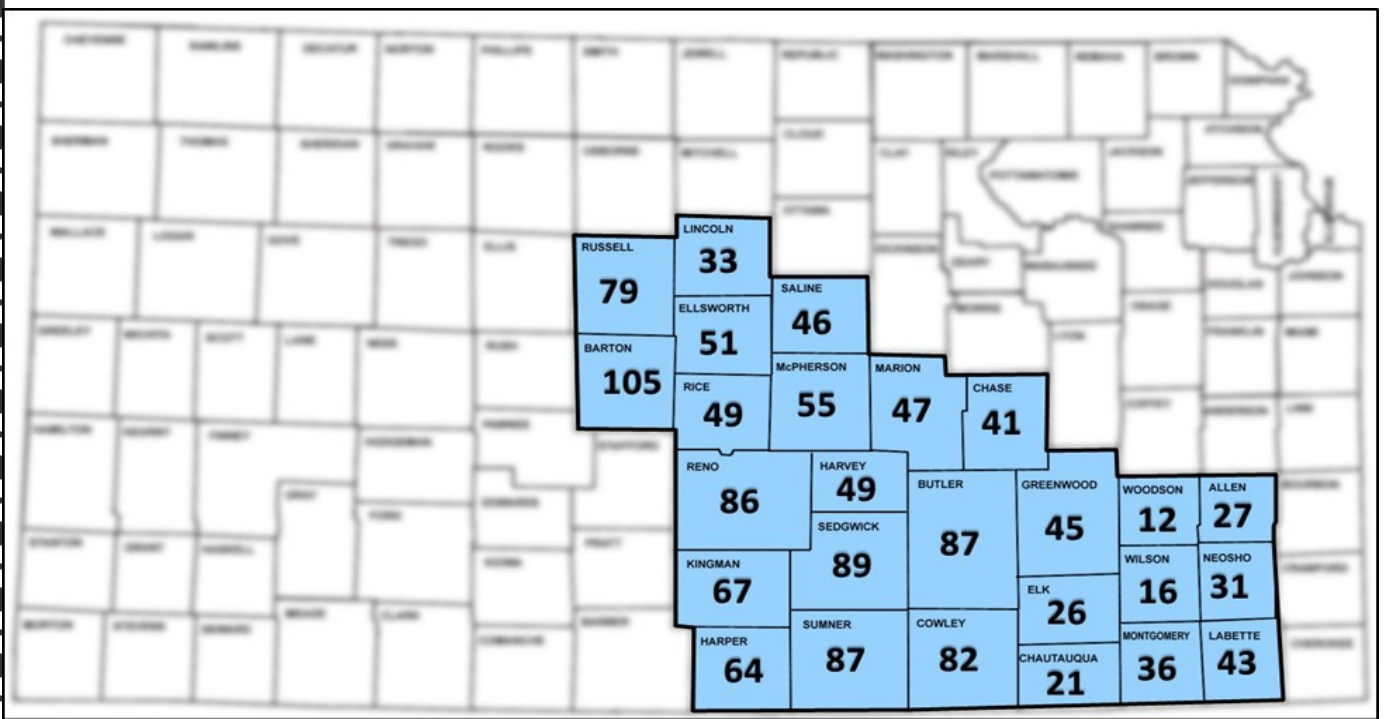


Figure 1 Number of Tornadoes since 1950

Since 1950 when monthly and yearly tornado records began, the counties served by the National Weather Service office in Wichita, KS have had a reported total of 1326 tornadoes. Let's take an in depth look at the number of tornadoes for the counties NWS Wichita serves (highlighted in blue) as shown in Figure 1. Figure 2 depicts the yearly number of tornadoes and compares them to the average since 1950 and a running 10 year average.

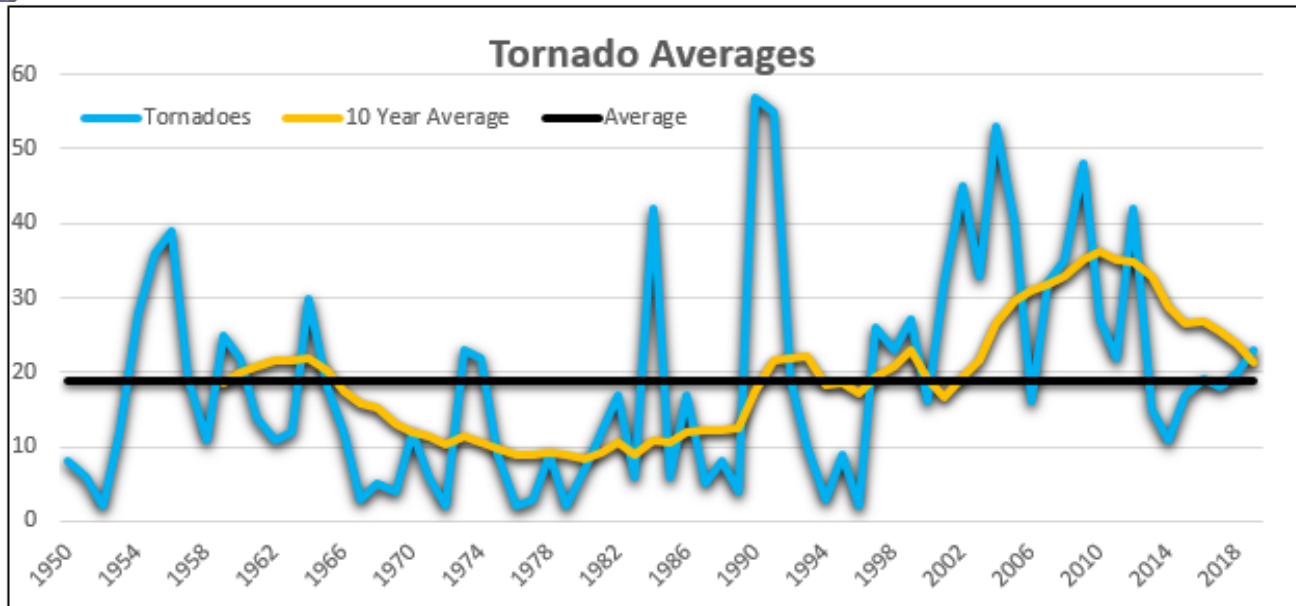


Figure 2

It is interesting and somewhat difficult to find any major trends in the yearly data. Figure 2 does depict a lull in the number of tornadoes between the mid 60's and 1990. Then we notice a definite increase in activity beginning in the early 2000's and continuing into 2014 before a downward trend. These trends are picked up quite well by observing the running ten year average. It will be interesting to see how the 10 year running average reacts in the near future with the actual number of tornadoes slightly rising each of the past few years.

Not surprising, the month in which the most tornadoes occurred was in May. Figure 3 shows the monthly breakdown of tornadoes across the 26 counties NWS Wichita serves.

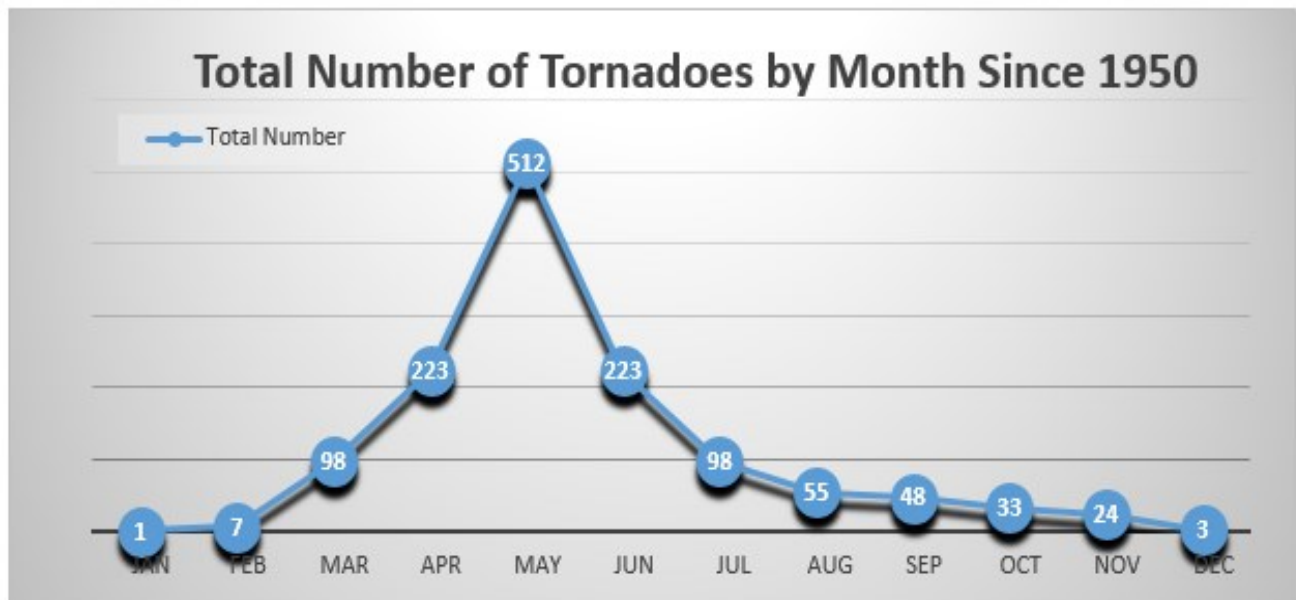


Figure 3



Be sure to find us on

Facebook: [US National Weather Service Wichita Kansas](#)

Twitter: [@NWSWichita](#)

YouTube: Search [NWS Wichita](#)

The overall rising and falling monthly trend is also depicted quite well in Figure 4 by comparing the average number of monthly tornadoes since 1950, since 1980, and since 2000. For example, the average number of tornadoes for the month of May beginning in 1950 through 2019 was 7.31, the average from 1980 through 2019 was 9.3 tornadoes, and the average from 2000 through 2019 was 11.4 per month.

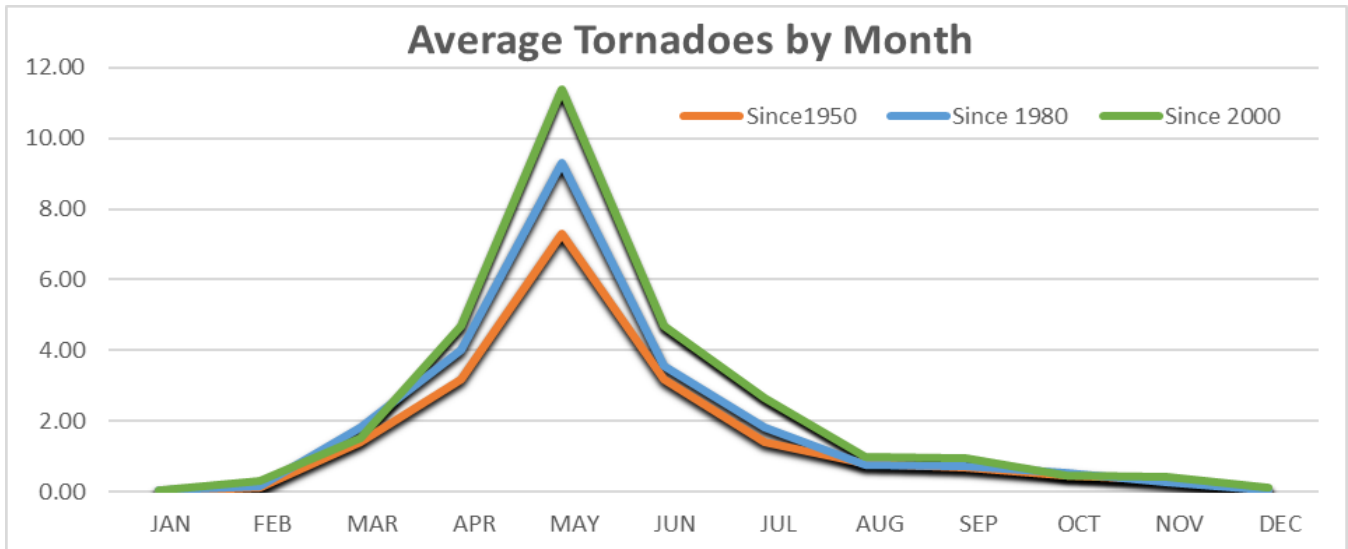


Figure 4

One can speculate on the reasons why the number of tornadoes on average have gone up over the years. One thing that we know for sure is that more tornadoes are being seen and reported by storm spotters, storm chasers and the public. All of these reports help the NWS in providing the most accurate and up to date warnings and statements to help keep the citizens we serve safe from harm's way.

Wow! How Times Have Changed in the National Weather Service

By Eric Schminke – Meteorologist

As all know, times are always changing in every realm of life. The National Weather Service is obviously no exception. One staff member, who joined the National Weather Service 40 years ago, has compared working for the NWS back in the early 1980s to what it's like today in this manner:

"It's comparable to the adjustments a pilot would have had to make from operating the Douglas DC-6B to the Airbus A380-800."



Figure 1A
The Douglas DC-6B: Built 1946-1958



Figure 1B
The Airbus A380-800

The comparison isn't nearly as far-fetched as it seems, but before we proceed, let's turn back the clock to those "glory days" of yester decade.

June 19th, 1992

The night shift, a Meteorological Technician, who would take over radar and surface observation duties, reported for the midnight to 8 AM CDT shift. The evening shift briefed him that there was a 30% chance of thunderstorms. The thunderstorms weren't expected to be strong or severe. The mid-watch observer, who worked alone, thought to himself, "Gee, what else is new?"

The first 3 hours were very quiet. There probably wasn't a thunderstorm within 500 miles of Wichita. After recording and then broadcasting the 3 AM weather reports on the old-fashioned cassette tapes, also called carts, the Met. Tech. returned to the operations area. He noticed the red light on the AFOS console was flashing. (AFOS stood for Automation of Field Operations and Services.)

Also known as the "Blue Beast", each of the AFOS screens were displayed in technicolor black with white-print.



Figure 2: The AFOS Console



Figure 3: The WSR-57 Radar Console

The cause for the flashing red light was that the National Severe Storms Forecast Center in Kansas City had reported that 2 thunderstorms had just formed in South-Central Kansas about 20-30 miles southwest of Hutchinson.

By now it was time for the radar observation. The radar used at the Wichita office was a WSR-57 model (Weather Surveillance Radar 1957) built in 1957.

When he returned to the radar room, sure enough, the radar displayed two small thunderstorms (from now on referred to as cells or echoes). on the center scope (Figure 3) about 30 miles southwest of Hutchinson. After plotting their positions, he had to check their cloud tops. To do this, he had to stop the radar on the cell in question. To measure the cloud top, he had to reach for the Range Height Indicator scope and hand crank the radar antenna to the echo top (Figure 3, right scope). The height of the stronger thunderstorm was 27,000 ft. At this time it was about 325 AM. As he recorded the observation, another cell appeared. Then another. Then another. In about 5 minutes the 2 original cells had more than doubled in intensity and had maximum tops that reached around 50,000 ft. "Man, I need to hurry. These cells are not only strengthening, they're popping up everywhere!" Just then, all 3 phone lines lit up and were "ringing off the hooks". He decided to answer them from left to right.

The first call was from radio station KFDI. The D.J. wanted to know if there was any unusual thunderstorm activity in the Wichita area. He had received a report of torrential rains at the Central Avenue/Tyler Road intersection. The observer informed KFDI that thunderstorms were breaking out across South-Central Kansas. The next call answered was from the forecast office in Norman, OK. The forecaster informed the observer that a severe thunderstorm had erupted almost directly over WSO Wichita. The 3rd call was from the Topeka Forecast Office. “Hi Eric, this is Larry in Topeka. How are you doing?” Larry had called to coordinate the forecast. “Larry, I don’t have time to talk.”

All of these events occurred in about 20 minutes. The observer then had to broadcast the Severe Thunderstorm Warning *live* on the NOAA Weather Radio. He then had to manually stop the radar, turn off AFOS and switch to emergency power. Thank goodness the station didn’t lose power. He was able to bring the radar back up as well as AFOS. He then had to take the surface observation, after which he was finally able to call for help. Two staff arrived quickly.

This event proved to be historic. It was the first of 2 outbreaks of severe thunderstorms that produced hail as large as softballs, destructive 70-80 mph winds and a few tornadoes. Both outbreaks combined to cause \$650 million in damages.

Let’s check the equipment in greater detail.

Back in 1980, the following equipment was used by the National Weather Service:

Communications:

Teletypes.

Reperforators. (Used to receive teletype messages then retransmit that same message to another circuit.)

All products were broadcast on NOAA Weather Radio using cassette tapes or carts. Certain warnings, most notably Tornado Warnings, were tone alerted and broadcast live.

Forecasts and climate summaries were manually recorded on public information lines.

At the end of 1980, the first computer system, called AFOS for Automation of Field Operations and Services, arrived.

The advent of AFOS did not, however alleviate the time required to author products. This was still a major problem during severe weather as all warnings and statements still had to be typed. This especially was a *major* issue during the early morning severe thunderstorm outbreak that occurred on June 19th, 1992.

This is how the National Weather Service operated for about 12 or 13 years. Then in the early 90s, operations began to change as offices began to “spin up”.

Today:

AWIPS (Advanced Weather Interactive Processing System) is used for processing all products; Routine, severe weather of all types, aviation, etc. AWIPS arrived at Weather Forecast Office (WFO) Wichita in the fall of 1996.

As recently as the early 1990s, all products had to be typed. Now all products are programmed, preformatted and processed, keeping typing to a minimum and in many instances eliminated altogether. This, no doubt, would have been invaluable on June 19th, 1992.

All products are automatically transferred to NOAA Weather Radio while all forecasts and climate products are automatically transferred to the public information line.

During severe weather, the AWIPS is invaluable. All warnings and statements are processed via the WARN-GEN program where all products are already preformatted and transmitted at the click of a button. This enables the warning forecaster to issue warnings within 30 seconds as opposed to 3-5 minutes back in the 1980s. This isn’t taking into account NOAA Weather radio. In today’s time, it is automatically sent to the radio and alerts within seconds, whereas, in the early 90s and prior, it was manually programmed to alert and read by a person which once again took valuable lead time away from the people we were trying to protect.

Forecasting:

In the early 1980s, there were 2 forecast models:

The Limited Fine Mesh or LFM. (It was definitely limited.)

The Nested Grid Model or NGM.

Processed every 12 hours concurrent with scheduled upper air soundings.

Today: There are 187.

Besides 6 and 12-hour model runs such as the Global Forecast System (GFS) and the North American Model (NAM), most update much more frequently; even *every hour*, which of course aids the short-term forecaster and meso-analyst during severe weather.

There is access to countless parameters and algorithms to enable one to assess such characteristics as instability, moisture and rotation potential instantaneously and simultaneously.

Forecasters can now develop and customize their own procedures, including developing color schemes to enable critical features to stand out. Nowadays one can command AWIPS to display as many as 9 panels on one screen, thus enabling one to display as many as 9 prognostics on one screen simultaneously.

This not only applies to forecast models, but also to radar and satellite imagery.

Of course, with the Internet, forecasters have access to endless sources of data via national centers such as The Storm Prediction Center in Norman, OK.

Radars:

In the 1980s:

Weather stations that were required to maintain continuous radar surveillance responsibilities were equipped with the WSR-57. (WSR: Weather Surveillance Radar 1957.)

Stations with local warning responsibilities were equipped with the WSR-74C which was developed in 1974.

Displays were limited to reflectivity.

WSR-57 radars had 3 scopes of which 2 were used for interrogation.

A Plan Position Indicator or PPI (Figure 4A, Center Scope).

A Range/Height Indicator or RHI (Figure 4A, Right Scope).



Figure 4A: WSR-57 Console.

Since all radars were operated manually, this meant that in order to measure the tops of any echoes the radar had to be stopped on the PPI scope. Then once the echo to be interrogated had been selected, the operator had to shift to the RHI scope and “hand crank” the radar to the echo top. To check the echo’s intensity, he would then select the Video Integrator & Processor (VIP) and repeat the procedure. This enabled the operator to determine how high a certain echo intensity extended.

There were 6 VIP levels. VIP level 1 indicated light precipitation; level 2 light-moderate; levels 3-4 heavy and so on. In terms of severe thunderstorm determination the 2 most critical were of course VIP levels 5 and 6. The RHI scope was especially critical in that it would enable the operator to not only determine where the most intense echoes were located,

but how high they reached. Moreover, the RHI scope would enable the operator to detect whether or not a stronger VIP level was completely aloft. For example, if he observed a VIP 5 echo that started at 5,000ft and reached 30,000ft, it would indicate that the thunderstorm had a strong updraft and was likely severe. On June 19th, 1992, the first 2 thunderstorms were small, moderate rain-producers. In about 5 minutes, these thunderstorms had reached VIP 5 and were likely severe.

The operator then hand-plotted the echoes on a plastic overlay along with their respective intensities. Echoes were then plotted on a map. The radar observation was then written on a form that contained the locations of the echoes as well as a digital code depicting precipitation intensity. When there were numerous thunderstorms this would no doubt be a daunting procedure, sometimes requiring as much as 15 minutes to complete. Network radar stations were required to take observations every hour at around 30 minutes past the hour.

Tornado detection was especially primitive for the sole determinant was the ever popular “hook echo” (see Figure 4B). The “hook” did not, however, always indicate that a tornado was occurring as neither the WSR-57 nor the WSR-74C measured wind velocities (either towards or away from the radar) so spotter reports were especially critical. In the case of Figure 4B where/when the hook signature was clearly dramatic, one would *easily* infer that a tornado was occurring, especially when a threat for tornadoes existed. (Incidentally, the hook signature displayed in Figure 4B was from the April 11th, 1965 Palm Sunday Tornado Outbreak, when 47 tornadoes (of which 19 were violent), struck 6 Mid-western States.)

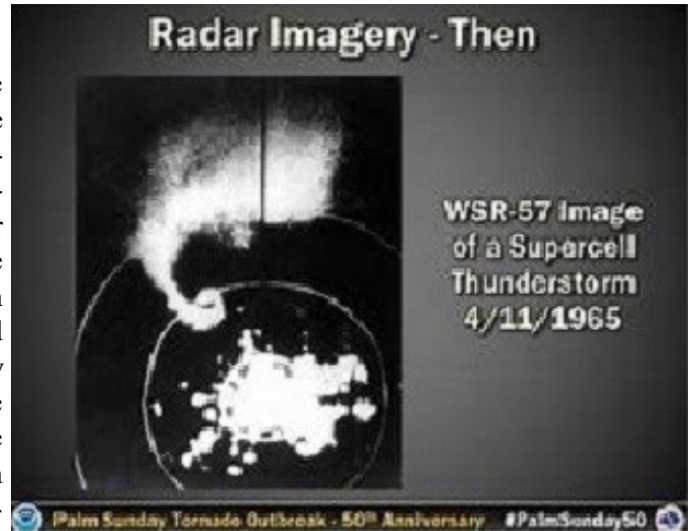


Figure 4B: A Classic Hook Echo.

When it came to radar operations, those were literally “The Dark Ages” as lighting in the radar room had to be kept to a minimum.

Today:

There are **93** products, many of which thanks to AWIPS, may be combined to quicken storm interrogation. While back in the 1980s, conventional radars displayed one product – reflectivity.

Tornado Detection:

The value of the Doppler radar has been *immeasurable*, for not only does it measure velocities and rotation at/near the surface but also aloft. When the Doppler detects rotation only occurring aloft in a severe thunderstorm, the warning forecaster is able to study any changes in its character before it reaches the surface. If the rotation occurring aloft increases with inbound (towards the radar) and outbound (away from the radar) velocities immediately adjacent to each other, the warning forecaster can then issue a Tornado Warning long before the rotation occurs at/near the surface, thus providing the public with more warning time to take protective action. This was especially true during the May 3rd, 1999 and April 14th, 2012 tornado outbreaks.

July 7th, 2016 was a classic example of when the warning forecaster detected rotation occurring entirely aloft. Being able to display multiple radar signatures and intensities on one screen allowed the warning forecaster to study the severe thunderstorm’s rotation at various levels simultaneously. When the rotation aloft increased, he issued a Tornado Warning for Chase and Greenwood counties long before the rotation reached the ground. As

was the case on June 19th, 1992, the thunderstorm development that occurred in the evening on July 7th was *explosive*. In this case, the public was provided with 45 minutes to take evasive action. This would not have been possible with the conventional radars from the 1950s to the 1980s.

This event also proved how valuable hourly model updates could be, as the atmosphere changed *quickly* from one in which only general thunderstorms had been forecast, to one that quickly indicated that severe thunderstorms and tornadoes were possible.

Flooding/Flash Flooding:

The Doppler radar is also able to estimate rainfall rates and amounts in short periods of time. This enables the warning forecaster to provide clientele with Flood and Flash Warnings that contained rainfall estimates with greater lead times. An excellent example occurred August 14th, 2018 when 4 to 6 inches were estimated in 1 hour.

The warning staff issued Flash Flood Warnings that provided as much as an hour and a half lead time for Northern Montgomery County where a Flash Flood Emergency was eventually issued. The Doppler's ability to estimate rainfall amounts enabled the warning staff to provide such valuable information during what proved to be a life-threatening situation; critical information that the conventional radars would've never have provided.

Remember also that multiple radar products may be displayed on one screen. Today, AWIPS can display data from radars all across the country. This proved especially valuable during the 1998 Halloween Flood during which nearly all of South-Central and Southeast Kansas were inundated with 6-12 inches of rain. "Dialing" in on radars in Southwest Kansas and Oklahoma provided forecasters with much more detailed information that, when combined with equally far more detailed forecast models, enabled the long-range forecaster to *greatly* increase forecast rainfalls. In fact, the long-range forecaster who worked the night shift on October 30th forecast so much rain that the River Forecast Center in Tulsa questioned him; stating that based on his forecast, 5 rivers would go into record flood. As it turned out, record flooding occurred on *7 rivers*.

There can be little, if any, doubt that the meteoric technological advancements have resulted in vastly improved services in all respects. The technological advances/enhancements that have occurred over the past 5-10 years were inconceivable even 20 years ago.

There is, however, a downside: Keeping up with the multitude and magnitude of changes that continue to this day makes working for today's National Weather Service *challenging*. In fact, 2 lead forecasters here at the Wichita Weather Forecast Office believe that it's possible that in 5 years, most, if not all, of the technology that is now being used by the National Weather Service may be obsolete. Such is life in the 21st Century.

Such is life in the 21st Century.

**Thank You for Your Years of Service to the
National Weather Service thru 2019**

**40 years - Eric Schminke
30 years - Mike Urban**

Summary of NWS Wichita's Severe Weather Statistics for 2019

Number of severe wind, hail, flood and flash flood reports: 736

Number of tornadoes: 23; strongest EF-2 in Russell County on May 28

Largest hail: 2.75; May 5 in Barton County, May 6 in McPherson County and June 22 in Reno County

Strongest wind: 100mph (estimated gust); May 5 in Rice County





Most reports received (wind, hail, flash flood and tornado): Sedgwick County with 119



Sign up your organization to be a
Weather Ready Nation Ambassador!

Help the NWS spread the word about weather safety and preparedness.

Go to: weather.gov/wrn/ambassadors

 <p>National Weather Service Wichita, Kansas</p> <p>Report</p> <p>Time of Event Event Type Location of the Storm Location of Yourself</p> <p>www.weather.gov/wichita</p> <p>Example: "I saw a tornado at 4:43pm approximately 2 miles south of my location, which is 4 miles NW of Winfield."</p>	 @NWSWichita  @NWSWichita #kswxz		Hail Sizes		Tornadoes		Wind Reports	
			0.75" Penny 1.00" Quarter 1.25" Half Dollar 1.75" Golf Ball 2.00" Egg 2.50" Tennis Ball 2.75" Baseball 4.00" Grapefruit	Damaging Winds Wall Cloud Funnel Cloud Hail Flooding Snow Totals Ice Accumulation	> 58 MPH 58-72 MPH 73-112 MPH 113+ MPH	Twigs & small limbs break off Shingles damaged & large limbs broken Roof damage, windows break, & trees uprooted Roofs torn off & trailer homes destroyed		



National Weather Service

2142 S. Tyler Rd.
Wichita, KS 67209
Phone: 316-942-8483 ext. 726
Email: Chance.Hayes@noaa.gov

Newsletter Editor:
Vanessa Pearce
Meteorologist
Email: Vanessa.Pearce@noaa.gov

Online: www.weather.gov/wichita

"The National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings for the United States, its territories, adjacent waters and ocean areas, for the protection of life and property and the enhancement of the national economy. NWS data and products form a national information, database and infrastructure which can be used by other government agencies, the private sector, the public, and the global community."

Got any ideas for articles? Please let us know!

Email: vanessa.pearce@noaa.gov