

2020 KANSAS SEVERE WEATHER AWARENESS

Information Packet



**SEVERE WEATHER
AWARENESS WEEK**

March 2-6, 2020

TORNADO SAFETY DRILL

Tuesday, March 3, 2020

10am CST/9am MST

Kansas: 2019 Water Year (Oct. 1) Observed Precipitation
Valid on: October 01, 2019 12:00 UTC

[What is UTC time?](#)

[Map Help](#)

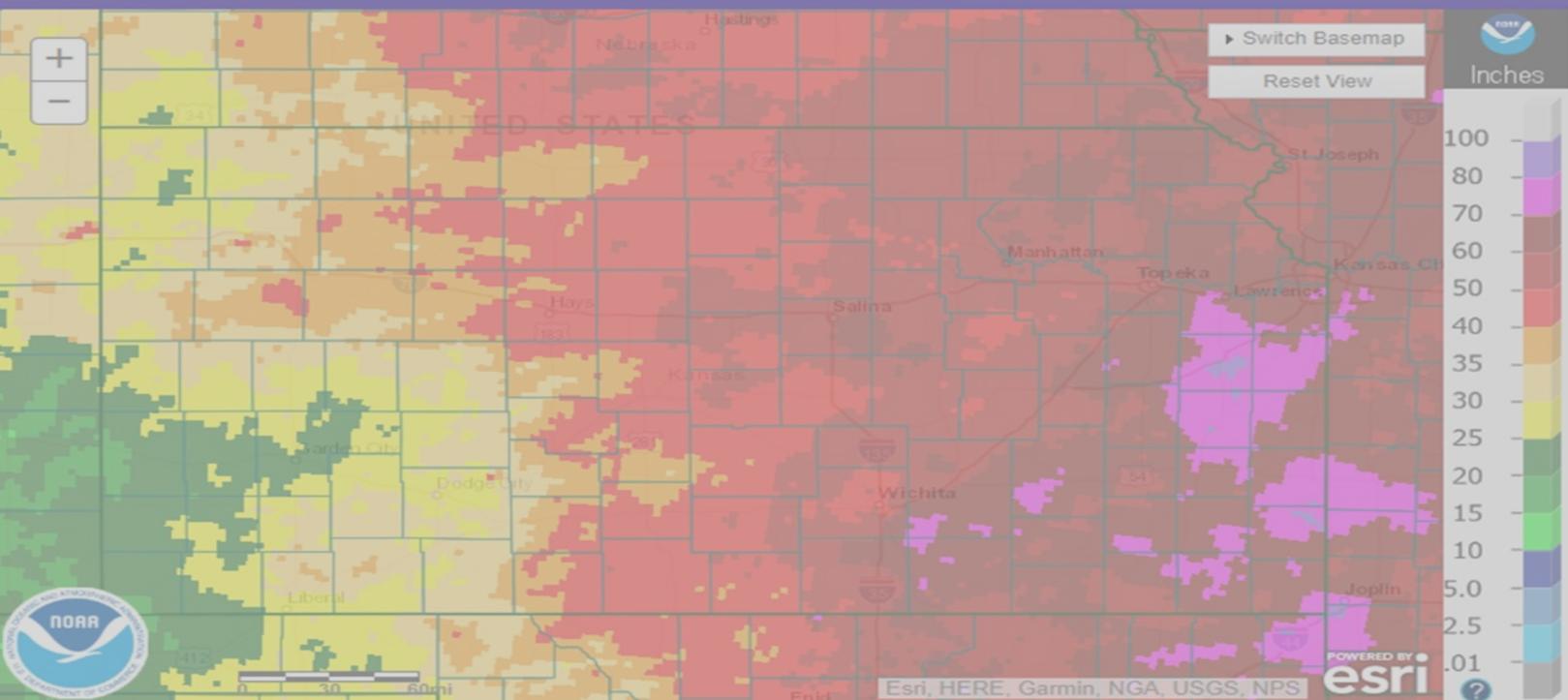


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2019 Kansas Tornado Overview

Tornadoes: 89 27 above the 1950-2019 average of 62
 Tied the past 30 year average of 89
 5 below the past 10 year average of 94

Fatalities: 0 **Injuries:** 16

Longest track: 29.62 miles (Meade-Clark-Ford, May 17, EF3)

Strongest: EF4 (Douglas-Leavenworth, May 28)

Most in a county: 6 (Ford, Meade).

Tornado days: 26 (Days with 1 or more tornadoes)

Most in one day: 13 (May 5, May 28)

Most in one month: 56 (May)

First tornado of the year: April 17 (Sumner Co., 5:38 pm CST, EFU 1.11 mile length, 30 yard width)

Last tornado of the year: Sept. 27 (Osage Co., 6:56pm CST, EF0, 0.19 mile length, 50 yard width)

Length of tornado season: 163 days (Days between first and last tornado)

2019 Monthly Tornado Totals

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
EF5	0	0	0	0	0	0	0	0	0	0	0	0	0	0%
EF4	0	0	0	0	1	0	0	0	0	0	0	0	1	1%
EF3	0	0	0	0	2	0	0	0	0	0	0	0	2	2%
EF2	0	0	0	0	5	0	0	0	0	0	0	0	5	6%
EF1	0	0	0	0	19	0	0	2	1	0	0	0	22	25%
EF0	0	0	0	1	15	2	4	0	2	0	0	0	24	27%
Unknown	0	0	0	4	14	9	0	6	2	0	0	0	35	39%
Total	0	0	0	5	56	11	4	8	5	0	0	0	89	100%
Percent	0.0%	0.0%	0.0%	5.6%	62.9%	12.4%	4.5%	9.0%	5.6%	0.0%	0.0%	0.0%		

Violent (EF4—EF5) in red, Strong (EF2-EF3) in yellow, Weak (EF0-EF1) in green, Unknown in orange. Monthly totals in gray. Tornadoes not causing damage ranked as unknown due to insufficient data to assign a rating. (Percent values may not add to 100% due to rounding)

Annual Highlights: A total of 89 tornadoes occurred in 2019 in Kansas which is nearly double the total (45) from 2018. One violent tornado occurred in Kansas last year, beginning in Douglas County before crossing into Leavenworth County. Damage from the tornado was estimated at \$26,000,000 which makes it the costliest tornado of 2019.

No tornado related fatalities were reported in 2019. Sixteen people were injured due to tornadoes last year, up from eight injuries in 2018. Four people were injured due to the EF4 tornado in Douglas and Leavenworth counties. Twelve people were injured in an EF2 tornado occurring in Osage and Douglas counties on May 28th.

May was an extremely active month, accounting for 56 of the 89 tornadoes reported in Kansas in 2019. This remains below the one month record of 127 tornadoes reported in May 2008. Thirteen tornadoes were reported on two separate days, May 5th and May 28th.

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Kansas Tornado Statistics

by County

1950 - 2019

TORNADOES, FATALITIES, AND INJURIES

Legend: Tor = Tornado | Fat = Fatalities | Inj = Injuries

County	Tor	Fat	Inj	County	Tor	Fat	Inj	County	Tor	Fat	Inj
Allen	27	0	4	Greenwood	45	0	18	Pawnee	54	0	1
Anderson	15	3	12	Hamilton	30	0	1	Phillips	41	0	1
Atchison	16	0	11	Harper	64	0	1	Pottawatomie	34	1	5
Barber	41	0	2	Harvey	49	1	63	Pratt	74	3	10
Barton	105	2	40	Haskell	32	0	10	Rawlins	48	0	4
Bourbon	19	0	7	Hodgeman	57	0	4	Reno	86	0	22
Brown	46	0	5	Jackson	33	4	17	Republic	62	0	3
Butler	87	28	225	Jefferson	41	0	101	Rice	49	0	6
Chase	41	0	2	Jewell	43	0	2	Riley	30	0	51
Chautauqua	21	0	0	Johnson	44	0	12	Rooks	53	0	6
Cherokee	40	4	66	Kearny	45	0	0	Rush	53	0	8
Cheyenne	46	0	0	Kingman	67	0	1	Russell	79	1	7
Clark	42	0	0	Kiowa	59	11	74	Saline	46	0	66
Clay	45	1	31	Labette	43	1	29	Scott	58	1	1
Cloud	52	1	8	Lane	48	0	2	Sedgwick	89	13	360
Coffey	24	0	5	Leavenworth	31	2	30	Seward	38	0	15
Comanche	42	0	2	Lincoln	33	0	2	Shawnee	56	18	528
Cowley	82	77	293	Linn	14	0	3	Sheridan	41	0	0
Crawford	37	4	43	Logan	32	0	0	Sherman	112	0	0
Decatur	47	0	5	Lyon	48	7	222	Smith	45	0	2
Dickinson	40	1	17	Marion	47	1	2	Stafford	73	3	5
Doniphan	19	0	2	Marshall	35	0	1	Stanton	22	0	0
Douglas	42	1	64	McPherson	55	1	16	Stevens	25	1	5
Edwards	54	0	7	Meade	57	0	0	Sumner	87	5	14
Elk	26	2	8	Miami	21	4	10	Thomas	47	0	1
Ellis	64	0	6	Mitchell	51	0	5	Trego	63	5	101
Ellsworth	51	0	0	Montgomery	36	1	1	Wabaunsee	42	1	26
Finney	100	1	41	Morris	34	0	7	Wallace	36	0	4
Ford	107	0	2	Morton	20	1	2	Washington	41	2	12
Franklin	30	3	34	Nemaha	40	0	3	Wichita	35	0	4
Geary	21	0	3	Neosho	31	0	4	Wilson	16	0	0
Gove	58	0	3	Ness	53	0	4	Woodson	12	0	8
Graham	42	0	0	Norton	30	0	0	Wyandotte	10	2	36
Grant	26	0	9	Osage	48	17	6				
Gray	53	0	3	Osborne	46	0	13				
Greeley	39	0	0	Ottawa	35	2	12	Total	4801	237	2950

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Kansas Tornadoes 2019

Cheyenne	Rawlins	Decatur	Norton	Phillips	Smith	Jewell	Republic	Washington	Marshall	Nemaha	Brown	Doniphan	
3	1							1	1	3			
Sherman	Thomas	Sheriden	Graham	Rooks	Osborne	Mitchell	Cloud	Clay	Pottawatomie	Jackson	Atchison		
2	1			1	1	2			1	2	1		
Wallace	Logan	Gove	Trego	Ellis	Russell	Lincoln	Ottawa	Riley	Shawnee	Jefferson			
1	3			2	1			1	1	1			
Greeley	Wichita	Scott	Lane	Ness	Rush	Barton	Ellsworth	Saline	Wabaunsee	Morris	Lyon	Osage	Douglas
			1		1	3		2	2	4		3	2
Hamilton	Kearny	Finney	Hodgeman	Pawnee	Stafford	Rice	McPherson	Marion	Chase		Coffey	Anderson	Linn
		2	2	2	1	2							
Stanton	Grant	Haskell	Gray	Ford	Edwards	Reno	Harvey	Butler	Greenwood	Woodson	Allen	Bourbon	
	1		2	6	4	5		3	1				
Morton	Stevens	Seward	Meade	Clark	Kiowa	Pratt	Kingman	Sedgwick	Elk	Wilson	Neosho	Crawford	
			6	2		1			2			2	
					Comanche	Barber	Harper	Sumner	Cowley	Chautauqua	Montgomery	Labette	Cherokee
						1	2	2		1		1	3

89 tornadoes (numerous county crossers)

Kansas Tornado Facts

Days with more than 20 tornadoes

Date	#Tornadoes
05/23/08	70
04/14/12	43
06/15/92	39
05/05/07	36
05/24/16	34
06/04/55	33
05/29/04	28
10/26/06	28
05/25/97	25
06/09/05	25
05/15/91	24
07/07/04	23
05/06/15	22
04/26/91	21
06/15/09	21

Kansas Tornado Count by Decade

1950s: 560
1960s: 457
1970s: 303
1980s: 339
1990s: 789
2000s: 1192
2010s: 768 (through 2019)

Most Tornadoes in One Episode

May 23, 2008	70 Tornadoes
April 14, 2012	43 Tornadoes
June 15-16, 1992	41 Tornadoes

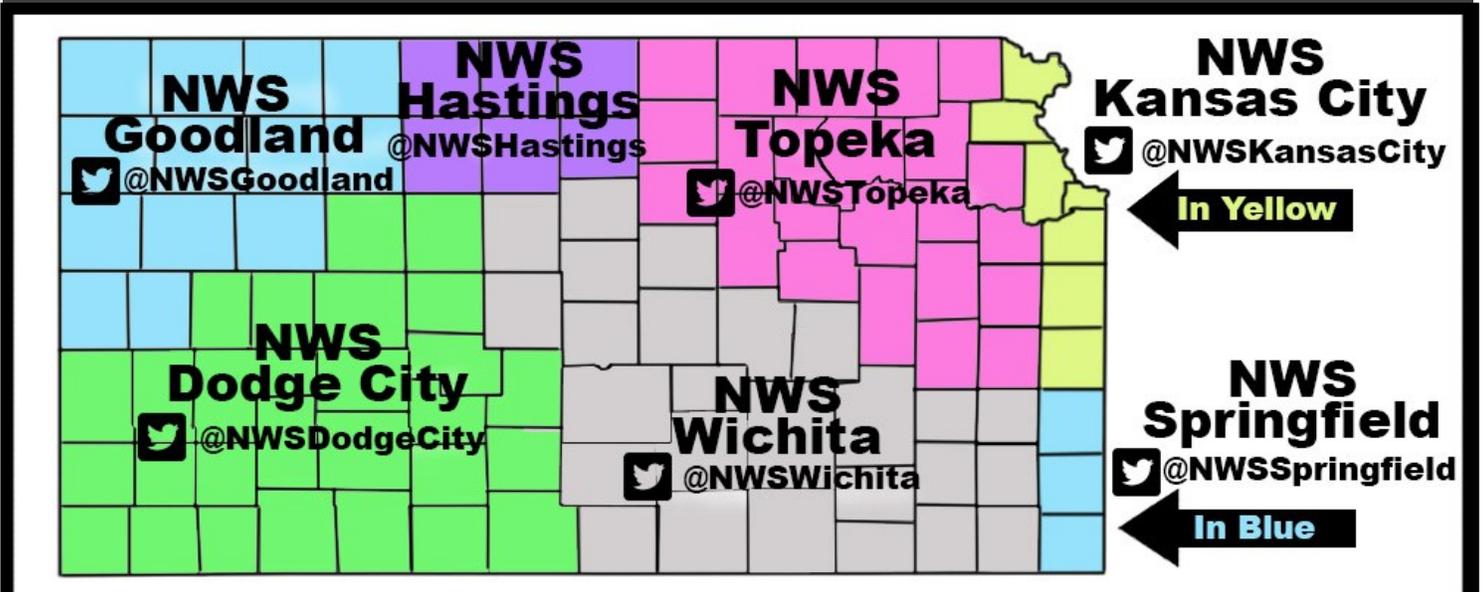
Did you know...

There are seven National Weather Service offices that serve portions of Kansas!

National Weather Service (NWS) offices in Kansas are located in Goodland; Dodge City; Wichita; Topeka; Hastings, Nebraska; Pleasant Hill (Kansas City), Missouri; and Springfield, Missouri. Each office is staffed by a team of highly trained meteorologists, technicians, electronics technicians, information technology specialists, hydrologists, and administrative assistants. The NWS offices are staffed 24 hours a day, seven days a week, 365 days a year.

Contact the NWS office in your area to learn more about weather, weather safety, NOAA Weather Radio, office tours, or to learn more about careers in meteorology in the NWS or in NOAA.

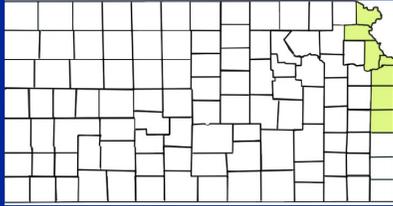
We are here to serve you!



The following pages contain 2019 severe weather summaries for each NWS office. Here is severe weather terminology you may encounter.

- **Severe Thunderstorm** – The National Weather Service issues severe thunderstorm warnings for storms that are currently or are capable of producing winds of 58 mph or stronger and/or hail one inch in diameter or larger. Severe thunderstorms are often much stronger than this minimum criteria, so it is a good idea to take severe thunderstorm warnings seriously.
- **Tornado** – A tornado is a violently rotating column of air in contact with the ground either as a pendant from a cumuliform cloud or underneath a cumuliform cloud, and it is often (but not always) visible as a funnel cloud. A funnel cloud is a condensation cloud typically funnel-shaped and extending outward from a cumuliform cloud and is associated with a rotating column of air.
- **Flash Flood** – A flash flood is flooding that occurs very rapidly and usually within 6 hours of heavy rainfall. Flash flooding may occur along creeks, rivers or streams. It can also occur in low lying or urban areas where drainage is poor. Water levels can rise very quickly during flash flooding including locations that did not receive the heavy rainfall but are located downstream from areas that received an extreme amount of rainfall. Flash flooding can occur in the winter months when rain falls on existing snowpack and causes it to melt rapidly. Flooding is the number one severe weather killer in the U.S.

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2019 Severe Weather Summary Extreme East Central and Northeast Kansas National Weather Service - Pleasant Hill, MO

2019 Far Northeast Kansas Severe Weather Stats By The Numbers

**Number of Severe Wind,
Hail, Flooding Reports: 79**
(2018: 63)

Tornado: 3 EF-0 Miami Co.
EF-1 Atchison Co.
EF-4 Leavenworth Co.

Largest Hail: 1.75" (Multiple
Counties)

Strongest Wind: 80 mph
(Wyandotte) May 28, 2019
(estimated from damage)

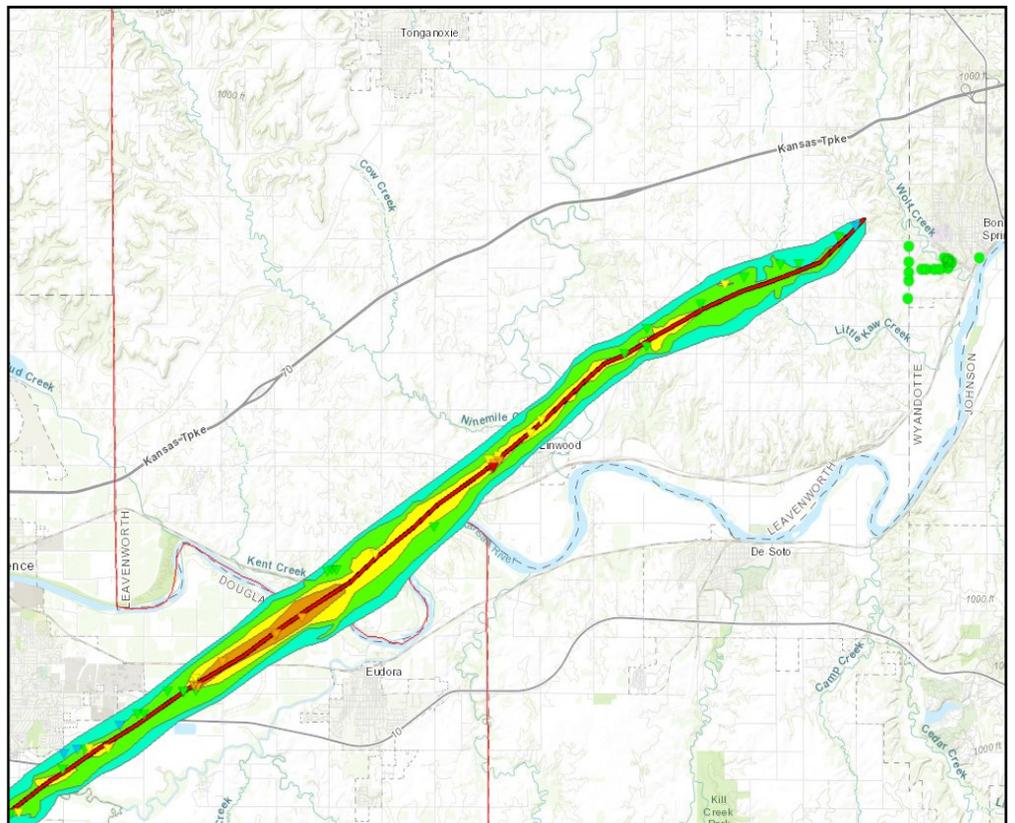
Most reports received:
Johnson County (30)

2019 Severe Storm Summary For Extreme Northeast Kansas

The most significant tornado to impact the area since 2003 formed just south of Lawrence and moved northeastward toward the Kansas City metro area. The tornado became nearly a mile wide and produced EF-4 damage near the city of Linwood, Kansas. Two other tornadoes (EF-0 and EF-1) impacted the far northeastern Kansas counties during the spring. Both produced minimal impacts.

May 28, 2019 - EF-4 Lawrence - Linwood Tornado

In the evening of May 28 a strong tornado formed in Douglas County and grew to a wide EF-4 tornado. This is the same storm that caused a storm chasing group to fly off the road just south of Lawrence, Kansas. Once the tornado crossed into Leavenworth County it impacted mainly rural residence but also heavily impacted the city of Linwood. It was



Widespread EF-2 damage occurred as a result of the Lawrence-Linwood Tornado on May 28, 2019. The worst of the damage occurred near Linwood where isolated EF-4 damage occurred to one of the residences. One of the more dramatic images from this tornado was the large greenhouse that was destroyed (lower left).

here that isolated EF-3 and EF-4 damage was noted. The tornado continued on to the Bonner Springs area before it dissipated just southwest of the Kansas Speedway and I-70. Preliminary estimates for damage exceeded 26 million dollars per the Leavenworth Times. Despite the EF-4 rating and widespread devastation to rural areas near Lawrence and Linwood no serious injuries occurred. This was the strongest tornado to impact the Kansas City metro area since 2003.

April 29, 2019 Overnight Tornado Damages Church in Miami County

During an overnight complex of thunderstorms a QLCS tornado formed just south of Paola. The tornado impacted a church and did damage to several grave markers. Part of the roof of the nearby church was ripped off. Despite the dramatic looking damage, the tornado was rated as an EF-0.



Photos of the church and grave markers damaged by the April 29 EF-0 tornado.

May 21, 2019 Low-Topped Supercell Tornado in Atchison County

A line of generally sub-severe thunderstorms moved through the region during the early morning hours on May 21. This line did produce a brief tornado in Atchison County (KS) which caused some minor damage. Otherwise, these storms didn't produce any more severe winds or hail, but as they moved east wake low winds produced damage consisting of several tree limbs down as well as power lines and power poles. The storms then went on to produce torrential rains which caused areas of flooding.



Be sure to find your local NWS office on Social Media

NWSDodgeCity

NWSSpringfield

NWSGoodland

NWSTopeka

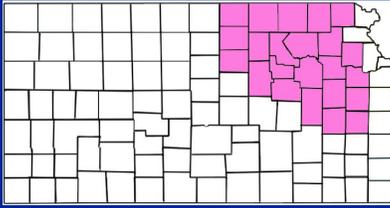
NWSHastings

NWSWichita

NWSKansasCity

Also be sure to check if your county emergency manager has a facebook page for your county.

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2019 Severe Weather Summary Northeast and East Central Kansas National Weather Service - Topeka, KS

2019 Northeast and East Central Kansas Kansas Severe Weather Stats

Tornados: 18
Strongest: EF3 Douglas
County on May 28th

The 2019 severe weather season will be remembered as another year of extremes with excessive flooding rains falling throughout spring and into summer while on May 28th a large violent tornado cut a 39 mile long path across northeast Kansas. This tornado split the cities of Lawrence and Eudora, passed just west of Linwood and dissipated as it approached the western parts of the Kansas City metro region. Miraculously there were no fatalities associated with this tornado.

May 28, 2019 Lawrence Tornado

Just before 6PM a small tornado developed near the small town of Overbrook Kansas and tracked northeast into Douglas County. This small circulation strengthened as it moved northeast through rural areas causing damage to farm outbuildings, trees and power poles. This tornado was likely invisible to spotters as no storm chasers in the vicinity reported a visible condensation funnel. The tornado was already rain wrapped making it especially dangerous. The narrow rain wrapped tornado approached Long Star Lake and crossed the path of a storm chaser tour group tossing 2 vans into a pasture which resulted in 12 injuries.

Meanwhile, a new tornado was developing and merged with the smaller tornado and intensified rapidly. As the tornado plowed



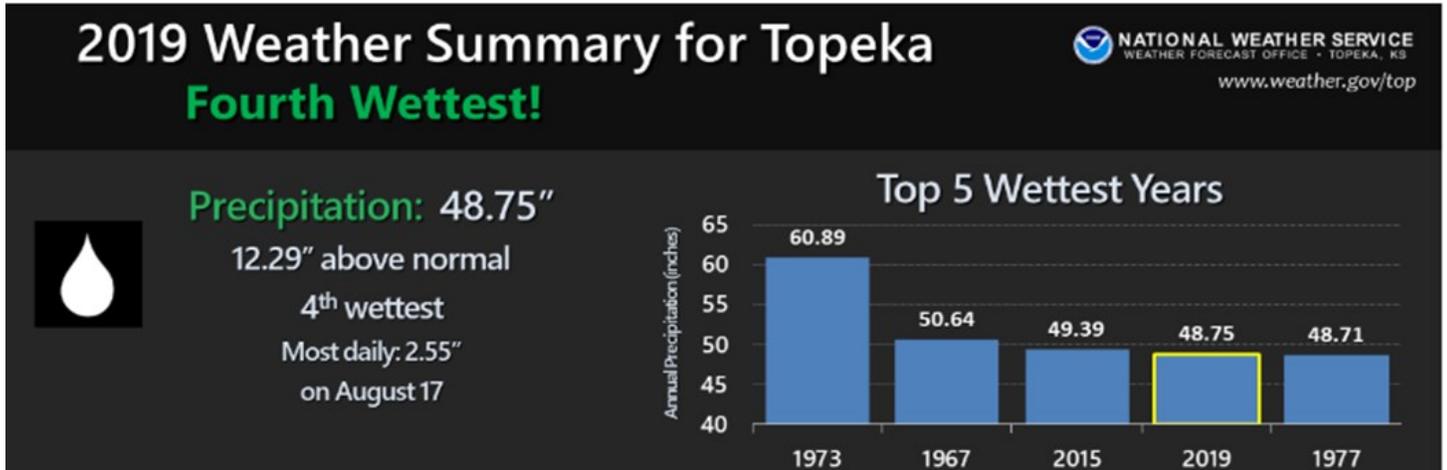
image courtesy of Brett Adair - LSM

through heavily wooded and hilly areas south of Clinton Lake it produced EF3 damage; however, as before the tornado was rain wrapped and difficult to see. The tornado contained multiple destructive sub vortices and these likely produced the strong EF3 damage noted along the path that continued across parts of extreme southeast Lawrence and eventually into southern Leavenworth County. Amazingly there were no fatalities associated with this tornado although many homes were severely damaged. A fact due in part to early warnings and effective teamwork between EM, NWS and media partners.

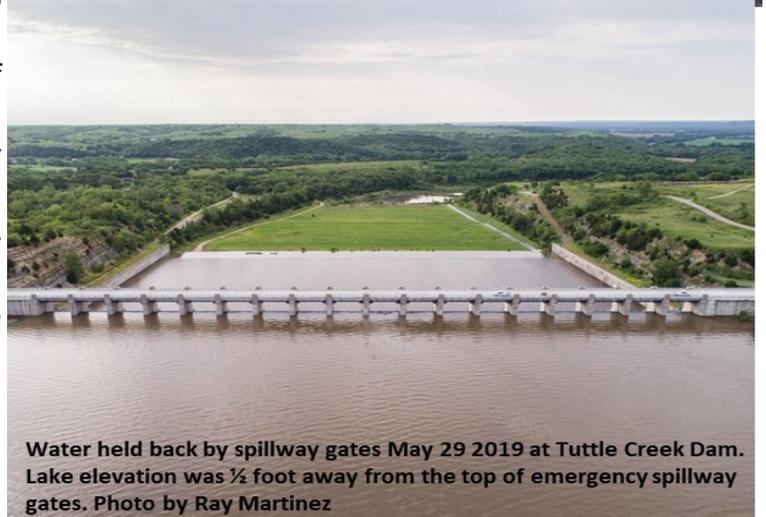
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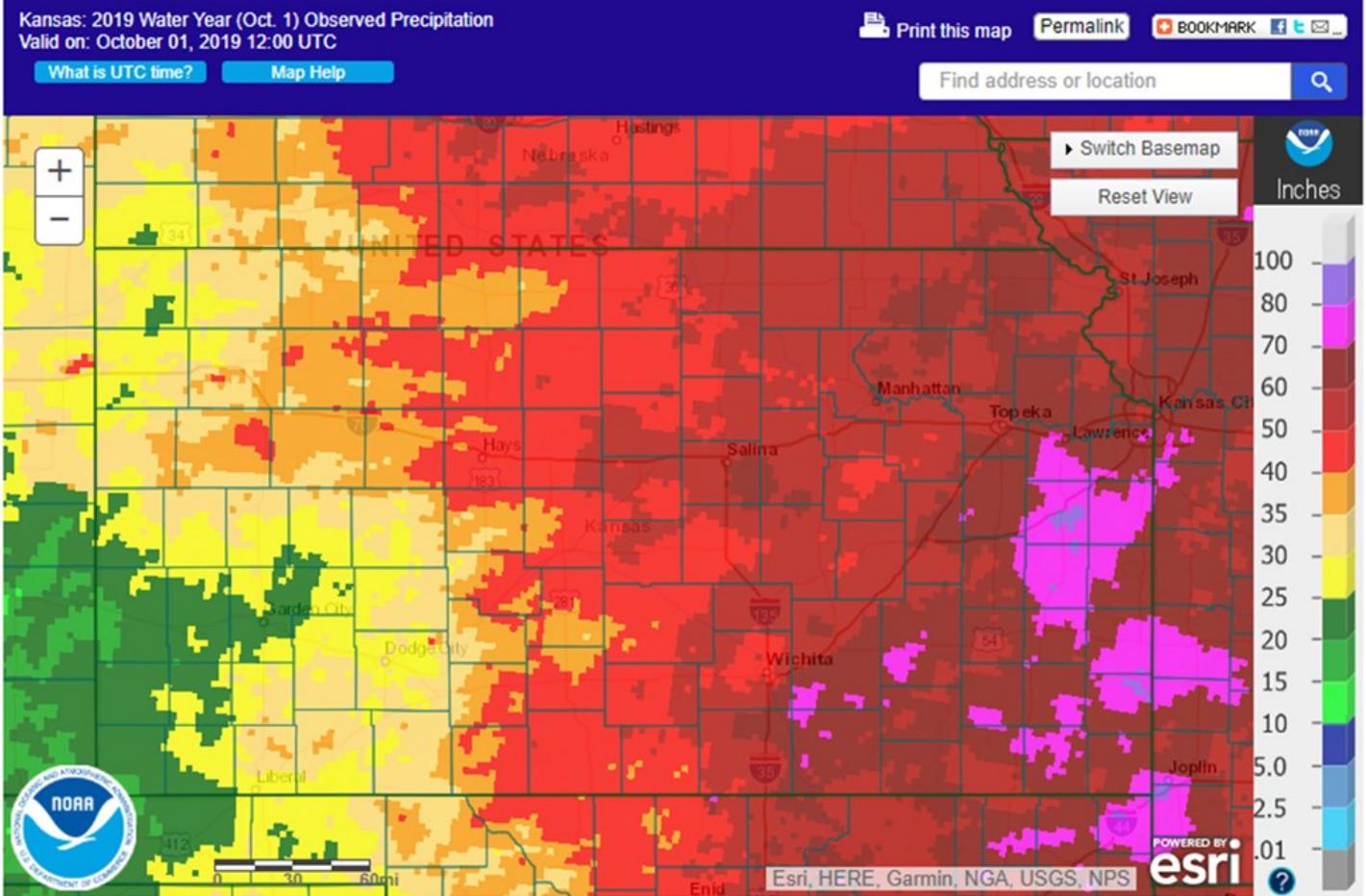
2019 Flooding

To say that 2019 was a wet year in Kansas is an understatement. It was a record year in many cases including the wettest March-May period for many areas of the state, the wettest May on record and although the pattern did dry out for a time in Fall many areas ended up seeing annual rainfall amounts that were in the top 5 on record. It was the 4th wettest year on record at Topeka with more than an extra foot of rain measured.

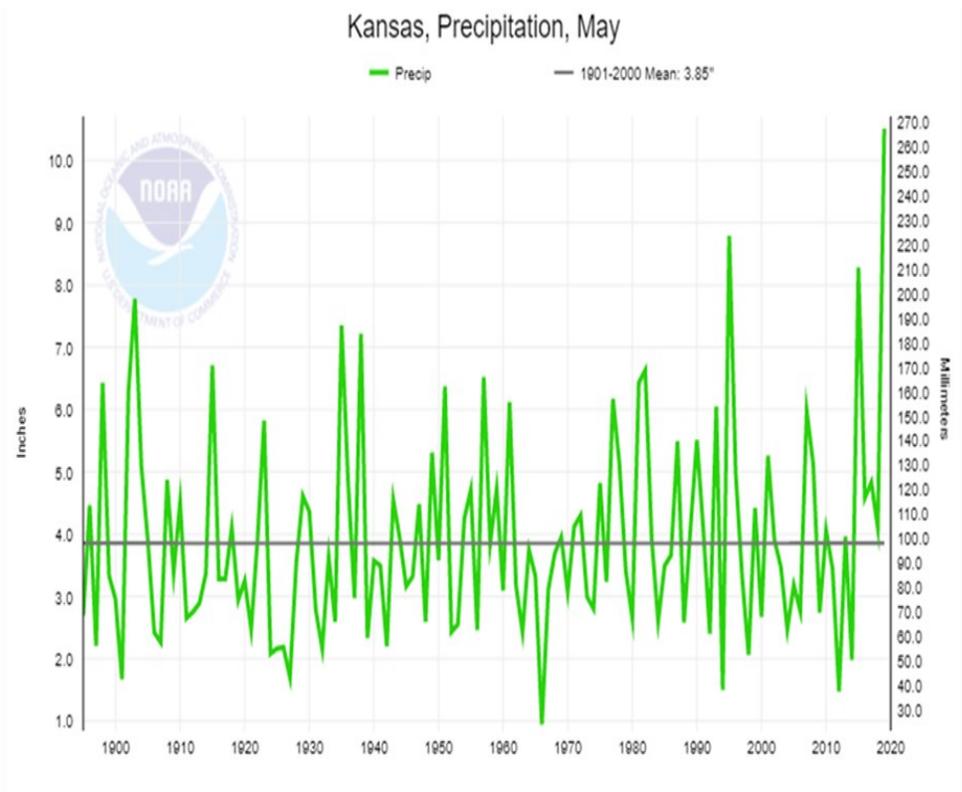


Many reservoirs including Tuttle Creek approached their emergency spillway levels and were forced to release water downstream to protect the integrity of their dams. May saw the worst flooding due to already high lake levels and continued heavy flooding rains. The heavy rains continued to plague the state into June and finally by early July we saw a break. The year was also notable for flood events that dumped record amounts of rain in a short period of time. Once such event was on Aug 1 south of Lawrence where slow moving storms dumped 6-10 inches of rain overnight and caused destructive flooding to areas south of Lone Star Lake that had also been hit by a large tornado back in May. All told, many across the eastern half of the state received an extra foot or more of rain. In some cases, locations received over 20-30 inches more rain than average. Those areas are shown in the pink shading on the image on the next page. In many cases this amount of rain exceeded the amounts that were recorded in 1993.

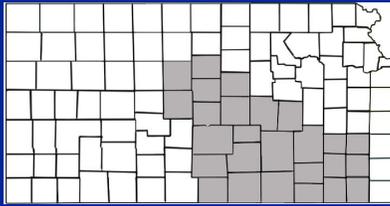




The image above shows the observed rainfall from October 2018 to October 2019. The bright pink shading indicates where amounts in excess of 70 inches were measured. In fact, some parts of eastern Kansas received rainfall amounts in excess of 80 inches during this period of time! That's nearly 7 feet of rain in a one year period and over 30 inches of extra rainfall. The image to the right shows how wet the month of May 2019 was across the entire state. The average precipitation for all observation sites in the month of May ended up being a record dating back 100 years. Let's hope that we do not see a repeat of this in 2020!



**KANSAS SEVERE WEATHER AWARENESS WEEK
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2019 Severe Weather Summary Central, South Central & Southeast Kansas National Weather Service - Wichita, KS

2019 Central, South Central and Southeast Kansas Severe Weather Stats By The Numbers

**Number of Severe Wind,
Hail, Flooding Reports:**
736 (2018: 297)

Tornadoes: 23 (Average
19); Strongest (EF-2) Rus-
sell County, May 28, 2019

Largest Hail:
2.75" (Barton County: May
5, McPherson County:
May 6, Reno County: June
22)

Strongest Wind: 100
mph (Rice County)
May 5, 2019 estimated)

**Most
reports
received:**
Sedgwick County (119)

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

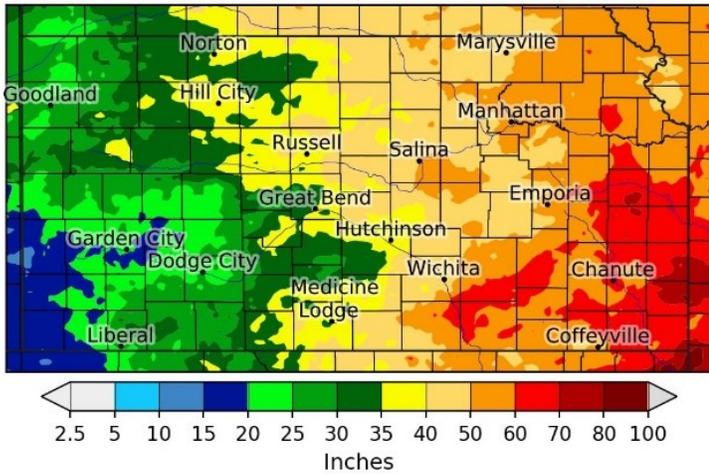


Figure 3: Precipitation across Kansas in 2019. Portions of eastern and southeast Kansas received more than 60 inches.

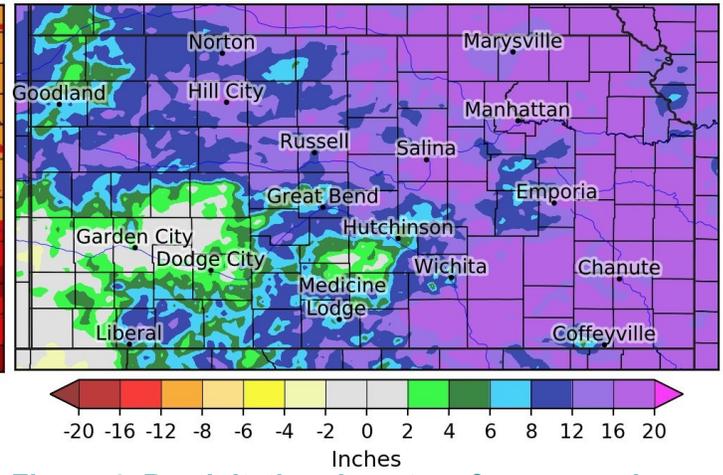


Figure 4: Precipitation departure from normal across Kansas in 2019. Large portions of the state saw anomalies greater than 12 to 16 inches above normal.

February 23rd Blizzard

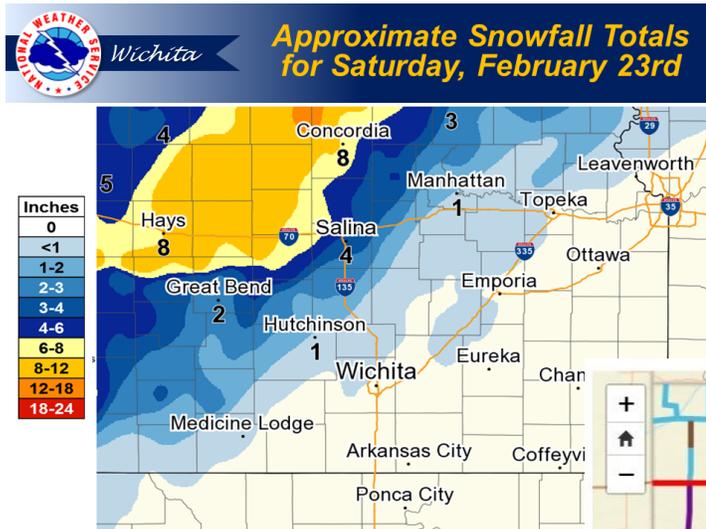


Figure 1: Snowfall totals from the February 23rd blizzard. Accumulations ranged from four to nine inches.

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 and 55 to 65 mph across much of Kansas. Heavy snow and blizzard conditions were

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 2: Numerous roads closed across central and western Kansas due to the heavy snow and strong winds on February 23rd.

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. Photo 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

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

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.

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 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 nu-

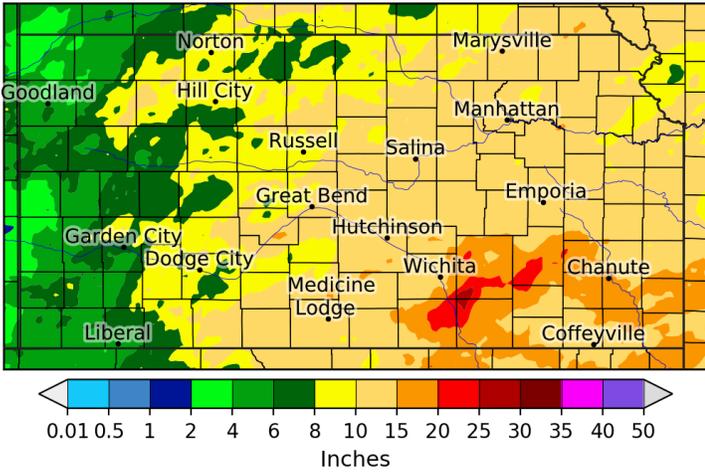


Figure 2: May rainfall totals across Kansas. Much of state saw greater than 8 to 10 inches with portions of south-central and southeast Kansas seeing greater than 15 to 25 inches.

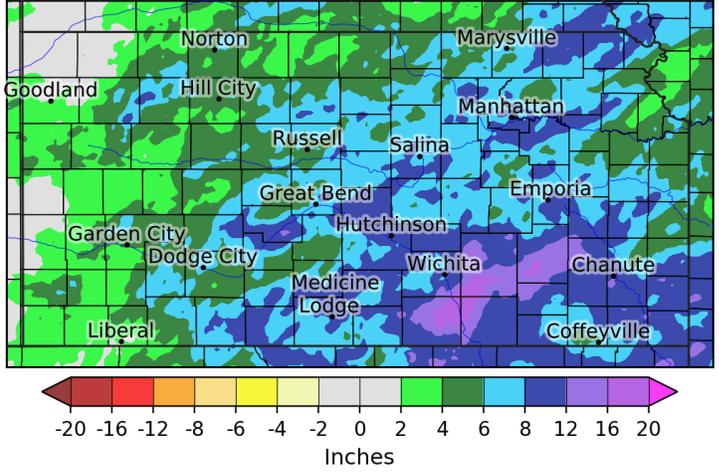


Figure 3: May rainfall departure from normal across Kansas. Most of the state saw well above normal rainfall with some anomalies greater than 12 to 16 inches above normal across portions of south-central and southeast Kansas.



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

merous 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.

May 5th Severe Thunderstorms and Tornadoes

During the early evening of May 5th, thunderstorms developed across central Kansas. These storms tracked slowly south-



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.

east 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 and lofted some of the 1000 pound girders into a nearby field. The tornado then curled back to the southeast and hit 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.

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 Kan-



Figure 1: Photo courtesy of Connor McCrorey.



Figure 2: Photo courtesy of John Monteverdi.

sas. 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



Figure 3: Tornado damage to a farmstead north-west of Waldo.

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.

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, and 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 thunder-



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



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

storms 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.

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.

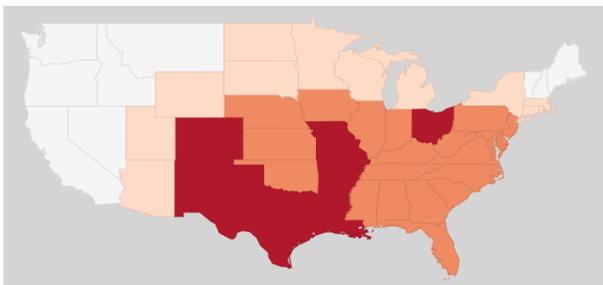


Figure 1: US climate division September temperature ranks since 1895. It was Kansas' 2nd warmest September on record.

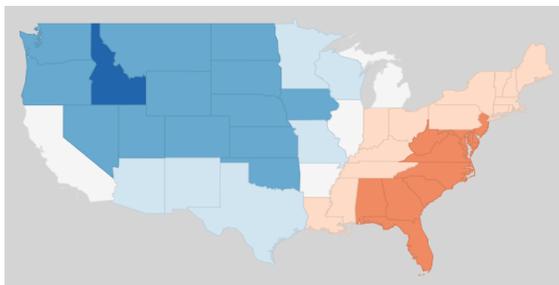
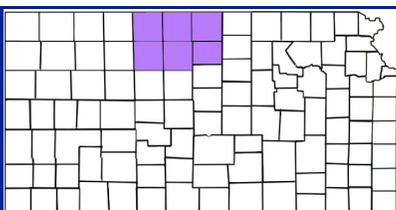


Figure 2: US climate division October temperature ranks since 1895. It was Kansas' 7th coolest October on record. Image courtesy of the National Center for Environmental Information



2019 Severe Weather Summary North Central Kansas National Weather Service - Hastings, NE

2019 North Central Kansas Severe Weather Stats By The Numbers

Number of Severe Wind, Hail, Flooding Reports:
73 (2018: 69)

Tornado: 1; Strongest (EF-2) Osborne/Mitchell Counties.,
May 28, 2019

Largest Hail:
3.00" (Rooks County)
May 28, 2019

Strongest Wind: 70-80mph (Rooks County)
August 29, 2019 (estimated)

Most reports received:
Jewell County (20)

Off the top of your head, the 2019 severe weather season across north central Kansas may not jump out at you, but on closer review several events were quite noteworthy.

Early in the season on April 21, 75 mph winds raced across Phillips and Rooks counties downing tree limbs and power poles.

It was active for the last part of May for north central Kansas. On May 21, a brief tornado was photographed northwest of Webster Reservoir in Rooks County, but no damage was reported. On May 27, one home was damaged by a brief EF0 rated tornado near Tipton in Mitchell County. The owners noted a piece of straw wedged between a sliding window. And in a 1, 2 punch, a more significant tornado occurred in Osborne and Mitchell counties on May 28, the second day



1st Tornado, Near Tipton May 28.
Photo courtesy of Matt Coker



2nd Tornado, Near Tipton May 28.
Photo courtesy of Mike Delange

in a row. This EF2 rated tornado started in Russell County before laying down its 22 mile path in Osborne and Mitchell counties. At least three farmsteads were damaged along with several power poles, sheds and fences. Maximum wind speed was estimated to be 118 mph.

With the tornadoes out of the way in May, high winds, hail and flooding were the main stories the rest of the season. August saw multiple days with thunderstorm wind gusts of over 70 mph. At Glen Elder State Park on August 11th, 75 mph winds damaged trees. A wind gust of 73 mph was recorded at Codell on August 17. However, August 29th was the most damaging wind event of the season. Wind gusts of at least 80 mph caused severe damage in southwest Rooks County. Multiple trees were downed by the wind in the Plainville area along with part of the roof from a lumberyard. A communications tower was also toppled in Rooks County.

Flooding also impacted the area, on August 24th, flooding caused widespread county road damage in Rooks county. The South Fork of the Solomon River near Osborne crested at 21.37" which was the 5th highest crest on record (and the highest since 1993). Also of note was a series of heavy rain events which forced the



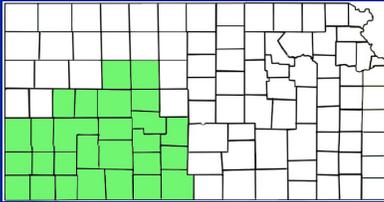
***Tornado Damage from May 28 in Osborne County.
Picture courtesy of Chris Rhoades,
Osborne County EM.***

Prairie Dog Creek west of Woodruff in northern Phillips County out of its banks. Even though the creek only rose to reach minor flood stage, the crest of 22.1 feet was the 6th highest on record and the first time the gauge site had reached flood stage since 1977.



***Flash flooding washed out County Road in Rooks County.
Picture courtesy of Rooks County Roads Department.***

**KANSAS SEVERE WEATHER AWARENESS WEEK
MARCH 2-6, 2020**



2019 Severe Weather Summary Southwest Kansas National Weather Service - Dodge City, KS

2019 Southwest Kansas Severe Weather Stats By The Numbers

**Number of Severe Wind,
Hail, Flooding Reports:**
(2019: 428)

Tornadoes: 29-30;
Strongest: EF-3 in Ford
County - May 17th
Average: 28

Largest Hail: 3.00" (Ford
County) June 19, 2019

Strongest Wind: 90 mph
(Hodgeman County)
May 26, 2019
(estimated)

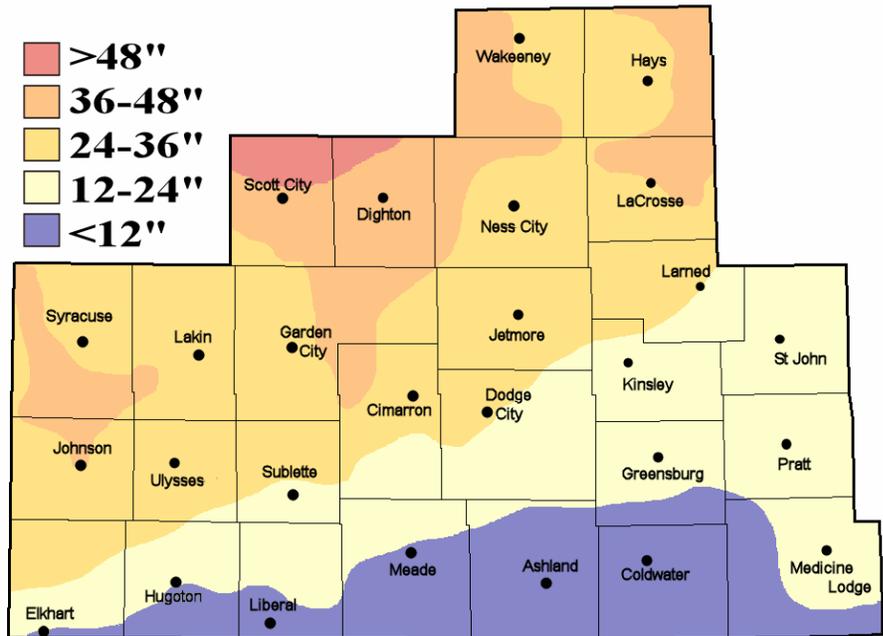
**Most
reports
received:**
Ellis (42)

Temperature, Wind & Precipitation Summary

The year 2019 across Southwest Kansas once again experienced many extremes in weather.

The winter of 2018-2019 that ended in April of 2019 was a snowy one for many locations. Some parts of western Kansas had several major blizzards during the winter, and total snowfall for the season was substantial!

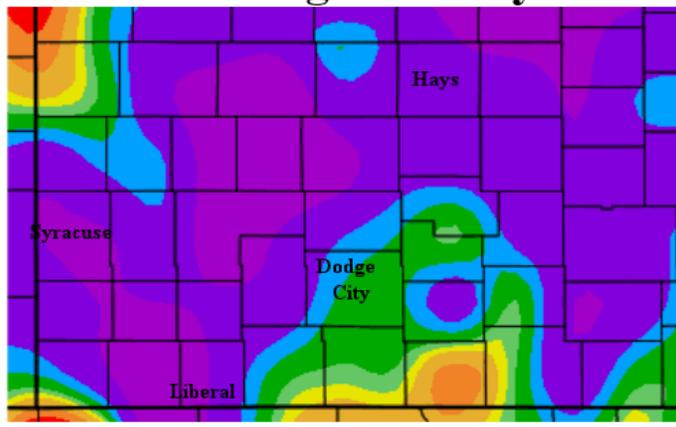
2018-19 Season Snowfall



Precipitation (rain and snow combined) continued to accumulate from the very wet previous years. Following that up for the winter months ending February 2019, amounts were more than 2 times what is normal across much of the area! This continued the trend of excessively wet soils across the region.

However, by summer drier conditions returned to parts of western Kansas. In fact, it got dry enough by the end of summer that moderate drought conditions were developing.

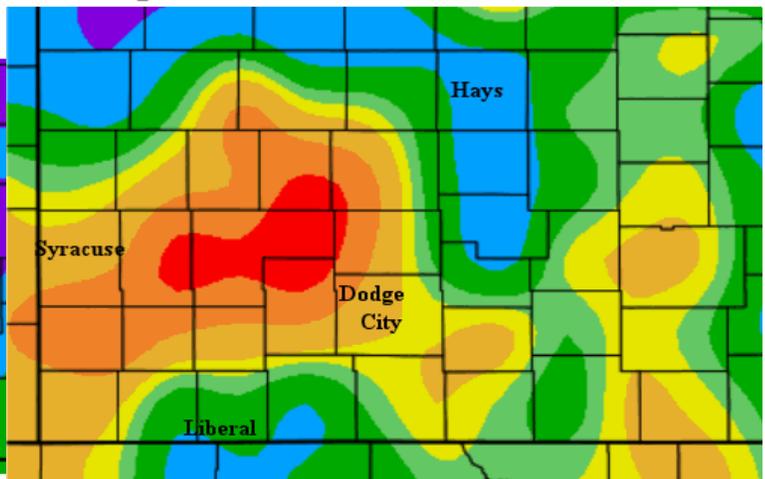
Precip % of normal Winter ending February 2019



50 70 90 100 110 130 150 200

NOAA Regional Climate Centers

Precip % of normal Summer 2019



50 70 90 100 110 130 150 200

NOAA Regional Climate Centers

Tornadoes

An explosive severe weather setup existed across the Central Plains on May 17th resulting in several tornadic storms from southwest Kansas into western Nebraska. As a severe thunderstorm intensified in Meade County, a long tracked tornado developed southeast of Fowler in Meade County. This tornado tracked 26 miles before dissipating east of Dodge City but not before inflicting EF3 damage northeast of Minneola. Fortunately, there were no injuries. Several more long tracked tornadoes developed from the same storm as it moved to near the Stafford-Barton county line. Additional damage up to a rating of EF2 occurred. Again, fortunately there were no injuries.

Other tornadoes, but not nearly as significant, occurred during the remainder of 2019. By the end of the year, the tally was 29 tornadoes across our region which is very near the yearly "normal."



*Tornado north of Minneola
(Photo courtesy of Jon Borchard)*



*Damage northeast of Minneola
(Image from the NWS)*

**KANSAS SEVERE WEATHER AWARENESS WEEK
MARCH 2-6, 2020**

Wind

Once again, there were quite a few high wind events not associated with tornadoes. At Dodge City, 10 of the 12 months during 2019 had at least one 50 mph wind gust. The strongest wind was 71 mph which occurred on March 14 behind a strong cold front. The high wind during the day across the region was 75 mph near Elkhart but there were numerous observations of 65 to 70 MPH. For the year, there were 25 days that had at least a 50 mph wind gust at Dodge City.

Temperatures

Temperatures ended the year on a “milder” note. At Dodge City for December, the mercury never fell below 18 degrees which ties the record for temperatures not falling below that reading for December. This all despite October and November experiencing temperatures in the single digits above and below zero on a few mornings!

DSS OnSite Support Providing support for Kansas Decision Makers



On-site Decision Support Services is increasing for each Kansas forecast office. Members of the Kansas National Weather Service Offices are requested by emergency management to provide on-site services. These services are invaluable. One example during 2019 was support of the Kansas Division of Emergency Management State Emergency Operations Center during historic flooding that impacted the state which included briefing local emergency managers, the governor, state legislators, US Senator Jerry Moran, and numerous other government offices. This support helped expedite communications to ensure a more effective and efficient state response to support local jurisdictions that were impacted.

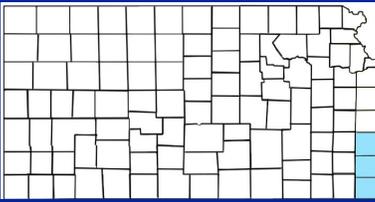


Decision support was not limited to the state level; multiple offices provided on-site support during other high impact events. Those included supporting a local EOC in Cheyenne County during wildfires and another local EOC when a prominent music artist performed in an outdoor venue. On-site support has many faces, but they all come back to directly supporting our Core Partners!



Pictures of NWS Employees Supporting Emergency Management Operations Top left: Stephanie Sipprell supporting the Kansas Emergency Operations Center during devastating 2019 flooding. Top Right: Jesse Lundquist supporting Cheyenne County EOC during wildfires. Bottom Pictures: Kevin Darmofal, Robb Lawson, Vanessa Pearce and Andy Kleinsasser supporting Reno County EOC during a large music concert.

**KANSAS SEVERE WEATHER AWARENESS WEEK
MARCH 2-6, 2020**



2019 Severe Weather Summary Southeast Kansas National Weather Service - Springfield, MO

2019 Southeast Kansas Severe Weather Stats By The Numbers

**Number of Severe Wind,
Hail, Flooding Reports:**
92 (2018: 37)

Tornadoes: 4; Strongest:
EF-1

Largest Hail:
1.75" (Cherokee County)
May 22, 2019 & August
26, 2019

Strongest Wind: 75 mph
(Cherokee County)
August 26, 2019
(estimated)

**Most
reports
received:**
Crawford (44)

Looking back at 2019, severe weather over southeast Kansas was a bit more active than in years of late.

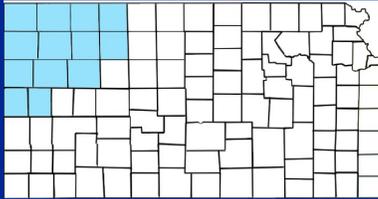
After isolated severe storms produced small hail early in the spring, prolonged severe storms from May 20-22 produced the most noteworthy events as four tornadoes caused damage across portions of Cherokee and Crawford counties. On May 20th, an EF1 tornado caused over a \$1M in damage to homes and businesses on the south and east side of Pittsburg, KS. Another EF1 tornado touched down on the 20th near Daisy Hill in northern Cherokee County as well.

Two days later a tornado touched down near Cardin, Oklahoma and intensified to an EF1 as it tracked through Treece, KS. Fortunately, trees were the main target of this tornado; however, as the supercell moved over Galena it produced a second EF1 that touched down just west of the state line then became an EF3 shortly after crossing into Missouri.

The supercells on May 22nd also produced some of the largest hail of the year as up to golf ball size hail was reported near Sherwin. Golf ball size hail was also reported in Riverton on August 26th as well.

As is often the case, flooding was the most widespread threat throughout the year, most notably during the late spring and early summer though periods of moderate to heavy rain continued into the fall. Late on April 30th continuing into May 1, Redfield in Bourbon County received seven inches of rain with several other sites reporting over 4 inches as a slow moving cold front moved across the region. In addition to the tornadoes on May 20 and 22nd, these storms produced another round of 3-4 inch rains that led to flooding. Still more storms on the 23-27th led to more flooding and water rescues. While not as extreme, localized flooding accompanied thunderstorms in each of the summer months.

What was missing this past year was wintry weather as yet another winter passed without a significant winter storm over southeast Kansas.



2019 Severe Weather Summary Northwest Kansas National Weather Service - Goodland, KS

2019 Northwest Kansas Severe Weather Stats By The Numbers

**Number of Severe Wind,
Hail, Flooding Reports:**
303 (2018: 279)

Tornadoes: 11; Strongest: EF-1 in Cheyenne County on August 11th

Largest Hail: 3.00”
May 23rd, in Thomas County, May 28th in Gove County and August 11 in Cheyenne County

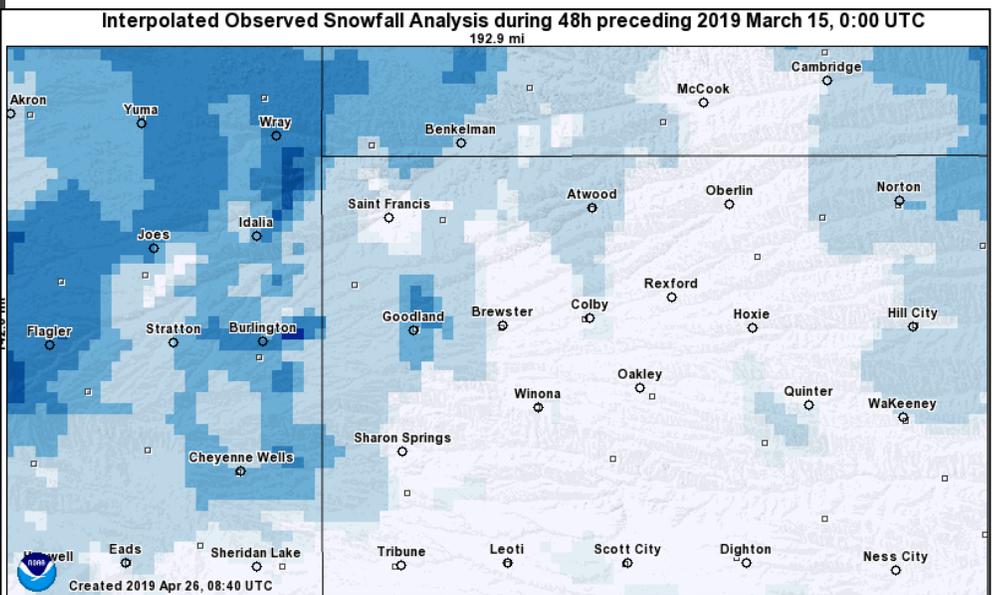
Strongest Wind:
105 mph:
Wallace County on June 21th & Cheyenne County on August 11th

Most reports received:
Thomas (52)

Northwest Kansas was impacted by several wind and flooding events in 2019 in addition to an uptick in tornadoes from 2018. A total of seven tornadoes were reported in 2019, up from three reported tornadoes in 2018. While the year started off quiet, ample moisture kept the region free of drought conditions for much of the year.

March 13th Blizzard and Flooding

On March 12th, a storm system moved through the Four Corners region and up into southeastern Colorado. Over the next 24 to 36 hours, the system underwent “bombogenesis” or rapid intensification over eastern Colorado and western Kansas. This was the “bomb cyclone” event.



Snowfall amounts were low across Northwestern Kansas. Higher accumulations were reported in Colorado and the Nebraska Panhandle.

On the afternoon of March 13th, the storm system continued to track into Nebraska bringing rain and snow to the region. On the warm side of the low, nearly one inch of rain fell near Colby Kansas. Almost three quarters of an inch of rainfall was reported by a COOP observer in Decatur County.

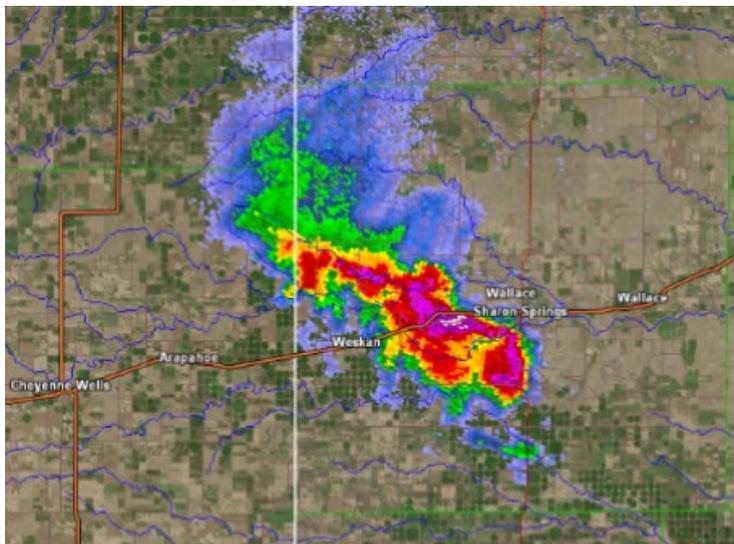
This area had previously received six to seven inches of snow in a storm several days earlier. High temperatures had ranged from the mid-30s to the mid-40s in the days leading up to the rainfall event,

and high temperatures in the 60s on the 13th. The combination of snowmelt and the additional rainfall resulted in flooding along the North Fork of the Prairie Dog Creek in Thomas and Decatur counties. Roads crossing the creek were flooded in the area with up to three and one half feet of water reported over one road near the Sheridan/Decatur county line.

Where cold air had already filtered into the region, snow developed during the afternoon. Soon after the onset of the snow, winds became strong continuing through the evening hours and into the 14th. The snow and high winds resulted in near zero visibility across Cheyenne, Sherman, and Wallace counties. Blizzard conditions were reported across Cheyenne and Sherman counties. Despite the higher snowfall amounts across portions of Colorado, Nebraska, and South Dakota, northwest Kansas missed out on much snow receiving a trace to two inches of snow with a few localized higher amounts reported across the border in north-east Colorado.

June 21st Wind Event

The June 21st wind event was unique in the fact that the winds changed direction through the course of the storm as it moved through the region. A lone supercell in Cheyenne County, Colorado moved across state lines into north-western Kansas in the evening. Following a stationary boundary that extended through north-western Kansas, the storm intensified as it inter-



A severe storm moving toward Sharon Springs, Kansas on June 21, 2019. The storm went on to produce wind gusts over 80 mph and large hail.



Strong winds brought down a large shed in Sharon Springs on June 21st. Photo courtesy of Ron Blaesi

acted with the boundary and moved into a more favorable storm environment.

As the storm continued to progress through Wallace County, it showed some signs of low level rotation in addition to a core of stronger winds aloft. The core eventually descended near Sharon Springs, Kansas. West of Sharon Springs, two buildings collapsed due to the winds. Numerous irrigation pivots were overturned, and one farm lost

two large farm structures. Several other farms also received damage due to the winds.

A large tree was uprooted, and several other trees were downed. A measured wind gust of 82 mph was reported via a Mesonet site with several other reports of wind gusts estimated to be from 50 to 75 mph.

The worst of the damage occurred in an area from west-central Wallace County to Sharon Springs.

This was the location where the core of stronger winds aloft reached the surface.

In addition to damage due to the strong winds, wind driven hail was also reported as causing damage. Hail sizes ranged from ping pong ball to golf ball in Wallace County with tennis ball sized hail

reported later in the evening as the storm passed through Logan County.

August 11th Severe Weather Event

One of the larger severe weather events of the season for northwest Kansas occurred on August 11th. A couple supercell thunderstorms were located over Yuma County in eastern Colorado and Cheyenne County in northwest Kansas. The storms produced tornadoes including an EF1 tornado southeast of Wheeler.

The tornado had a width of 175 yards and traveled 1.23 miles leaving a path of damage behind. Several lean-to shelters were collapsed in addition to a sturdy farm outbuilding. Numerous trees were uprooted or snapped, and fences were blown over. A grain bin was blown off its foundation,



An EF1 tornado blew a grain bin of its foundation in Cheyenne County, Kansas on August 11th. Photo courtesy of NWS Storm Survey Team

traveling over one tenth of a mile. Farm equipment was damaged due to being tossed around or being hit by flying debris.

These storms also produced severe hail across Cheyenne County, Kansas. Reported hail sizes ranged from quarters to tea cup sized. The event transitioned into a heavy rain and flash flooding event when several lines of storms developed and moved across northwest Kansas, including Cheyenne, Rawlins, Decatur, Norton, Sherman, Thomas, Sheridan, and Graham counties.

Numerous reports of water covering roads came from Cheyenne, Sherman and Rawlins counties. At least six inches of water were reported over a county road in Sherman County and up to one foot of water was reported running down a street in Goodland, Kansas. Wind damage was reported across several counties resulting in downed tree branches and at least four communities in Cheyenne County without power.

A second line of storms over Cheyenne County, Colorado crossed into Kansas producing heavy rain in its path across Wallace, Logan, and Gove counties.

August 29th Wind Damage

On the evening of August 29th, a supercell thunderstorm formed in Lincoln County in Nebraska. The storm moved south producing straight line wind damage across several Nebraska counties before crossing the border into northwest Kansas.

Significant damage resulting from straight line winds were reported in Graham County. A National



Straight line wind damage from storms moving through Graham County on August 29th. Photo courtesy NWS Storm Survey Team

Weather Service Storm Survey Team discovered damage from winds with estimated speeds of 90 to 105 mph. Several farms had overturned pivots and hay bales blown around. Farm buildings were destroyed in addition to power poles and fences. A few grain bins were also reported to have been blown over in the storm.

September 9th and 10th Flooding

A supercell thunderstorm produced hail and heavy rain in Logan County on the evening of September 9th. Hail ranging in size from penny to half dollar fell across the county. The Logan County Emergency Manager reported dime to quarter sized hail covering the ground to a depth of at least one inch south-southeast of McAllaster.

The storm also produced heavy rain and flash flooding throughout the county. Radar estimates ranged from four to seven inches across most of central Logan County. Just north of Russell Springs, a COOP observer measured a 24 hour total of 2.50 inches of liquid in addition to receiving hail. In the northeastern part of the county west of Oakley, just over an inch of rain was measured by a COOP observer.

The Logan County Emergency Manager reported several inches of water covering a road near the in-

tersection of Hwy 25 and Vista. The flooding continued into September 10th as additional reports came in. The USGS river gauge at the intersection between the Smoky Hill River and Hwy 83 registered above flood stage for a brief period of time. Several additional reports of roads covered with water were received; however, there were no reports of damage.



Time lapse of the water rise in Logan County. Photos Courtesy: Kyle Lyons



Best case scenario,
he needs to buy a new truck.

Worst case scenario,
he's not going to make it home to see his family.

**THE WATER IS 6 FEET DEEP
AND SOME OF THE ROAD
HAS WASHED AWAY.**

Turn Around, Don't Drown



Be a Force of Nature

Help Build a Weather-Ready Nation™

Do you know what to do in a severe weather emergency? Each year, people in this country are killed or seriously injured by all types of extreme weather, despite advance warning.

NOAA's Weather-Ready Nation (WRN) initiative is about helping our nation become more resilient to increasing extreme weather, water and climate events. NOAA is working to keep these threats from becoming disasters with greater accuracy in forecasts and warnings, evolving services to community decision makers, and better ways to communicate risk to stakeholders and the public.

As part of the WRN initiative, NOAA partners with emergency management officials, businesses, and the media to motivate individuals and communities to prepare for a potential weather disaster. And these actions can save lives – at home, in schools, and in the workplace.

What Does a Weather-Ready Nation Look Like?



A Weather-Ready Nation takes well-informed communities, businesses and individuals that are ready, responsive and resilient to extreme events. Key actions include:

- **Know your risk** by discovering the weather risks where you live and closely following National Weather Service forecasts and warnings.



- **Take action** by creating a family emergency plan and kit, and making sure you can receive emergency messages (e.g., NOAA Weather Radio, wireless emergency alerts).
- **Be an example** by using social media to share important hazard information.

How Your Organization Can Help Build a Weather-Ready Nation

Building a WRN requires the participation and commitment of a vast nationwide network of “Ambassadors” – organizations contributing in the best ways they can:

- Broadcasters advocating preparedness on-air
- Schools/universities teaching about the risks associated with severe weather and resiliency best practices
- Companies within the weather enterprise building the technological infrastructure for weather information and alerts
- Insurance companies providing discount incentives to policyholders who meet certain mitigation criteria

By becoming a **WRN Ambassador**, your organization can serve a pivotal role in affecting societal change by:

- Promoting Weather-Ready Nation messages
- Collaborating with NOAA
- Sharing your success stories
- Serving as an example



Enroll Here to Become an Ambassador
www.weather.gov/wrn/amb-tou

KANSAS SEVERE WEATHER AWARENESS WEEK
MARCH 2-6, 2020