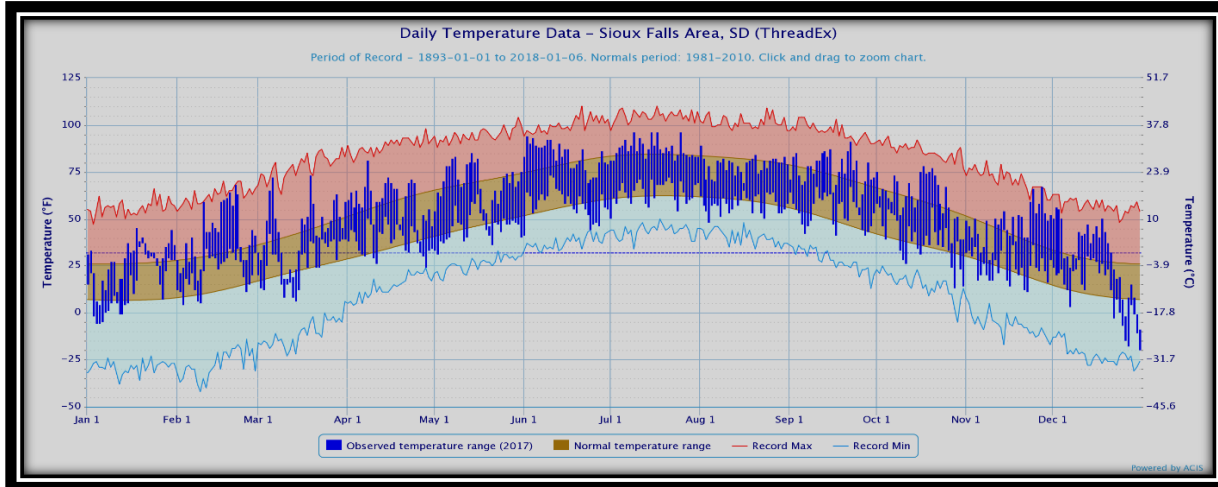


2017 Drier, But Still Warm in Sioux Falls

Conditions at the end of 2017, while fresh for the memory, would give a very poor impression of mean conditions for the year. A weak La Nina at the start of 2017 quickly gave way to neutral ENSO indices through most of the year, before a weak La Nina returned late. Hazardous events were again a rare commodity, only sporadically highlighting what was another warm but drier year for the Sioux Falls area.



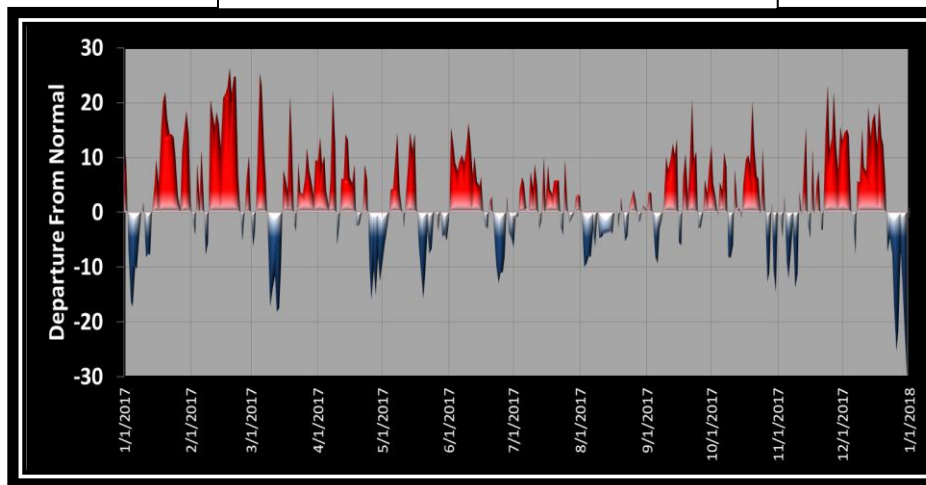
The annual average temperature for 2017 was 48.4 degrees (2.7 degrees above normal), making for the **13th warmest year on record**. This was 0.8 degree cooler than 2016, and a shade warmer than 2015. Minimum temperatures averaged **9th warmest on record** (37.8 degrees – 3.0 degrees above normal – 3rd warmest since 1987), once again the larger part of the warmer annual mean compared to the 22nd warmest average annual maximum temperature (59.0 degrees – 2.5 degrees above normal). Greatest monthly departures were concentrated largely during the cooler season. The big story for temperatures for the year was the ending of the consecutive above normal months at 20 (Sept. 2015 – April 2017), when May 2017 came up a bit shy of normal with chilly low temperatures to close out the month. Despite only three months within the top 25 warmest for the particular month [January (25th), February (5th) and September (25th)], the consistency to the warmth during the year helped bring the annual ranking to the 13th warmest. The highest ranking departure occurred in February (+10.2), which also acquired status as the warmest ranking month (5nd warmest). The coolest month compared to average occurred in August (-2.5), and May (-0.4) was the only other month that ranked in the lower half of monthly means. During 2017, 192 days were considered “above normal” (more than 2 degrees warmer than average), 117 “below normal” (more than 2 degrees colder than average) and 56 “normal”.

The **warmest temperature of the year was 96 degrees** on the 17th and 25th of July, the 23rd coolest of warmest maximum temperatures recorded during a year. 14 days with high temperatures of 90 degrees or above matched the average number (33rd fewest on record – equal to 2016), all but one occurring during the traditional summer months of June, July and August. 2017 contained the 7th earliest 70 degree or warmer reading (March 6). Even more random, considering 67 degree or warmer readings, the combination of second earliest (Feb. 21) and latest (Nov. 27) resulted in the longest consecutive stretch (278 days) by more than a week.

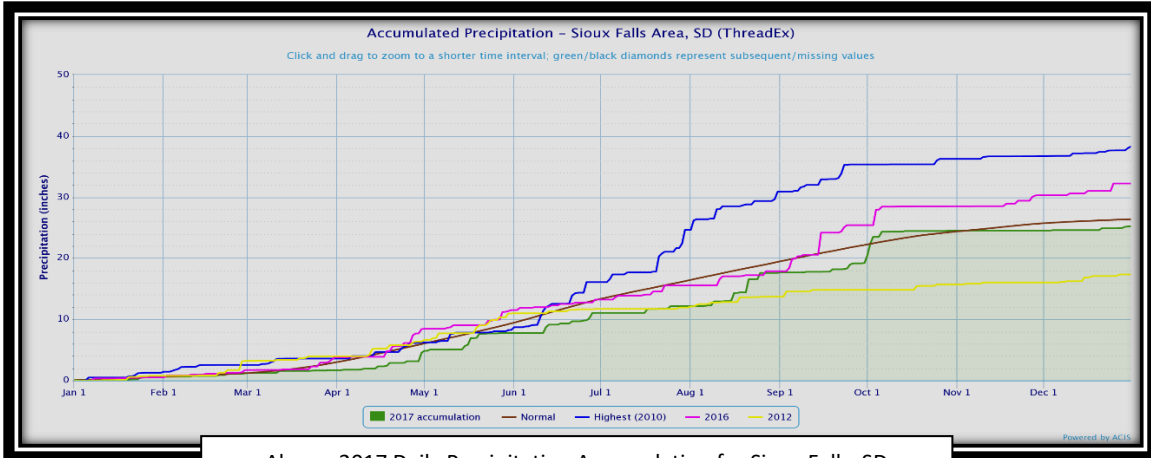
It literally waited until the last minute of 2017 to reach the **coldest reading of the year of 20 degrees below zero**. This was the 42nd warmest for the coldest reading during a calendar year. There were only 13 days with below zero readings (7 of which occurred in December) which **tied for the 10th fewest below zero readings in a calendar year**.

Sioux Falls, SD							
Month	Average Temperature			Departure from normal	Extremes		Temperature Rank
	Max	Min	Mean		High	Low	
January	28.1	14.1	21.1	4.5	45	-6	25th warmest
February	41.9	21.6	31.7	10.2	68	4	5th warmest
March	44.1	26.5	35.3	2.4	73	6	40th warmest
April	59.8	38.1	49.0	2.6	81	24	32nd warmest
May	69.5	45.6	57.6	-0.4	85	31	52nd coolest
June	83.3	57.7	70.5	2.7	94	41	28th warmest
July	87.2	63.9	75.6	2.6	96	50	34th warmest
August	78.6	57.6	68.1	-2.5	89	48	14th coolest
September	76.4	53.8	65.1	3.8	91	41	25th warmest
October	61.9	38.8	50.4	2.5	78	13	51st warmest
November	47.3	24.4	35.8	3.2	67	11	36th warmest
December	30.3	11.9	21.1	1.9	56	-20	60th warmest
Year	59.0	37.8	48.4	2.7	96	-20	13th warmest

Above: 2017 Monthly Temperature Data for Sioux Falls, SD
 Below: 2017 Daily Temperature Departures for Sioux Falls,



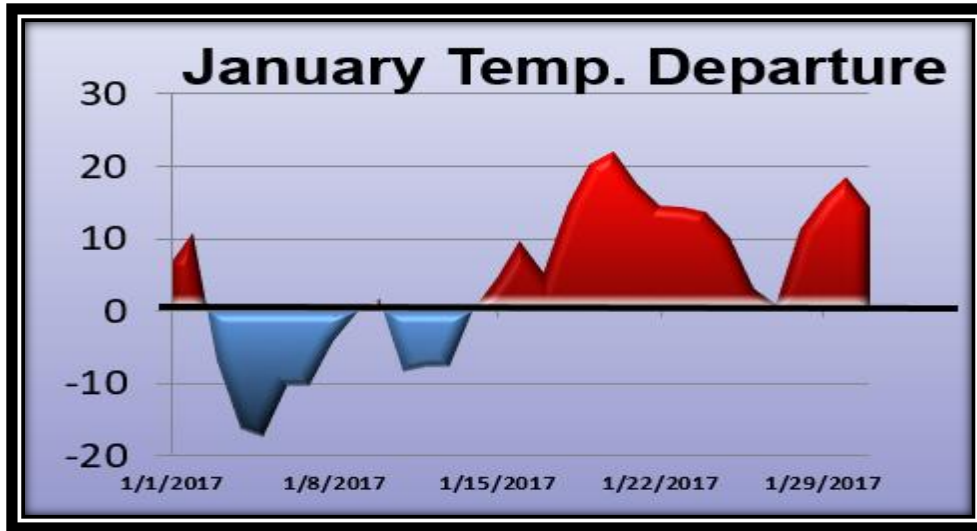
2017 annual precipitation measured up to the least since 2012, ending just a little over an inch shy of normal with 25.20 inches (-1.18 inches), which ranked as the **55th driest year on record**. Only two months (August and October) were appreciably above normal, and primarily a result of two major rainfall events. While not excessively dry, the combination of warm and dry conditions produced moderate drought conditions by mid-summer, alleviated by the August and early October rainfall. Annual snowfall totaled 36.6 inches (7.9 inches below normal), least since 2012, and more than a foot less than 2016. Snowfall bookended the year, above normal for January and December, although no departure was significant other than that of a very dry November. What was unlikely was the other above normal month – May!



Above: 2017 Daily Precipitation Accumulation for Sioux Falls, SD
 Below: 2017 Monthly Precipitation Data for Sioux Falls, SD

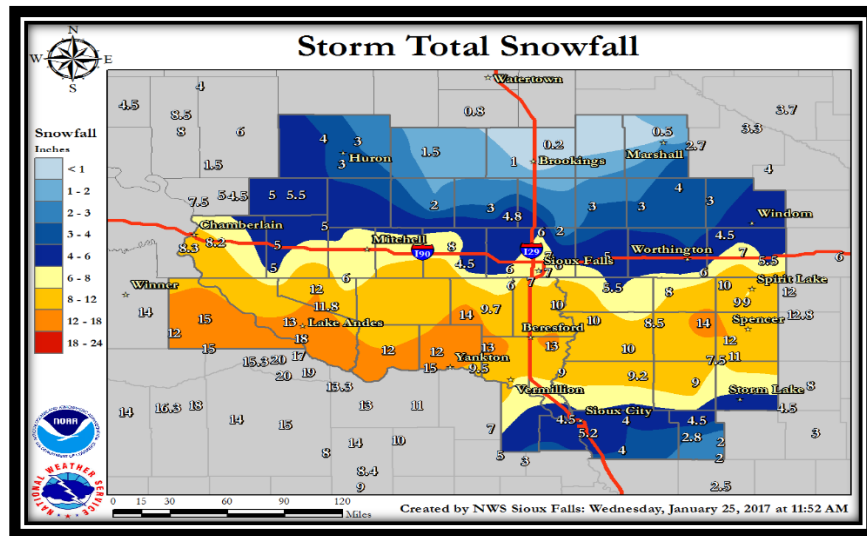
Sioux Falls, SD						
Month	Precipitation (in.)		Snowfall (in.)		Precipitation Rank	Max Wind Gust Direction/MPH/Date
	Amt.	Departure	Amount	Departure		
January	0.62	0.06	9.4	1.7	45th wettest	NW 43 mph on 30th
February	0.49	-0.11	5.1	-1.8	60th driest	N 40 mph on 24th
March	0.54	-1.22	8.0	-0.4	21st driest	W 50 mph on 7th
April	2.87	-0.14	1.3	-3.3	46th wettest	S 46 mph on 7th
May	3.23	-0.17	2.2	2.2	62nd wettest	S 43 mph on 25th
June	3.29	-0.63	0.0	0.0	46th driest	W 43 mph on 13th
July	1.13	-1.96	0.0	0.0	19th driest	W 52 mph on 17th
August	5.42	2.37	0.0	0.0	14th wettest	W 38 mph on 25th
September	1.62	-1.15	0.0	0.0	38th driest	W 59 mph on 19th
October	5.28	3.11	T	-1.3	7th wettest	NW 55 mph on 26th
November	0.03	-1.33	0.2	-7.2	5th driest	NW 55mph on 24th
December	0.68	-0.01	10.4	2.2	52nd wettest	NW 60 mph on 4th
Year	25.20	-1.18	36.6	-7.9	55th driest	NW 60 mph on Dec. 4

After the exceptionally mild finish to 2016 which wiped out the snow cover by Christmas Day, the new year was greeted with lingering mild temperatures with a touch of light snowfall. Only a couple days into the month, the first arctic blast of the year would change this abruptly on the 3rd. While snowfall with the system was minimal, winds increased to around 40 mph in the rush of arctic air, creating brief periods of blowing snow and dangerous wind chills. The next week and a half would be the coolest stretch of the month averaging over 8 degrees below normal, and containing the coldest temperatures of the month. The 13th would be final below normal day of the month as the “January Thaw” became reality with 13 of the final 16 days of the month more than 10 degrees above normal! This includes the warmest high temperature of the month (45 on the 18th) as well as a pair of **record high minimum temperatures on the 19th (35) and 20th (37)**, the **6th and 4th warmest readings on record for January minimums**. The warmer and moist pattern would break down into a winter storm on the 24th into early on the 25th that brought **record precipitation (0.31”) and snowfall (4.2”) on the 24th** to Sioux Falls. The greatest snow depth of the year occurred on the 26th and 27th with 7 inches.

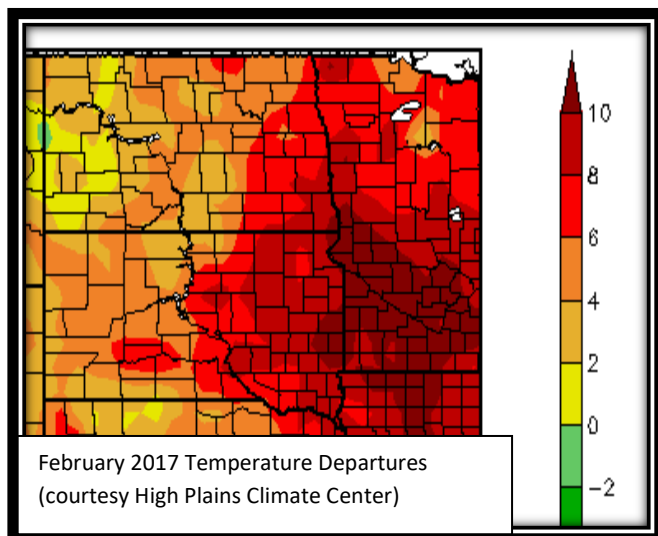


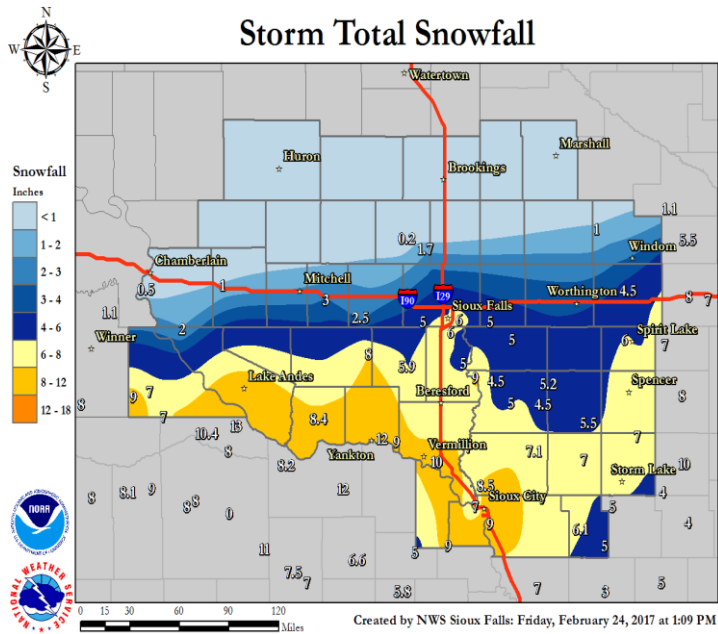
Above: Daily January Temperature Departures

Below: Accumulated Snowfall from Jan. 24-25



The most memorable feature of February 2017 was certainly the excessive warmth - the **5th warmest February on record**. Much of the area had temperatures in excess of 8 degrees above normal for the month, and for Sioux Falls it was the **greatest departure from normal for the year (+10.2 degrees)**. Record highs were set on the 10th (59 degrees) and the 21st (68 degrees). The 68 degree reading tied for the **4th warmest high temperature for the month of February**. A record high minimum temperatures (34 degrees) was also set on the 11th.



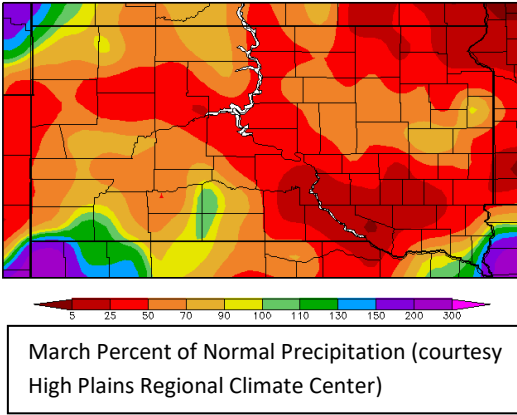


This was not to say that February did not have its wintry period. The Sioux Falls metro area was on the north edge of a significant winter storm which struck during the afternoon on the 23rd and continued into the 24th. Blizzard conditions with nearly impossible travel occurred as winds topped 40 mph and 5 to 8 inches of snow accumulated around the Tri-State area. This would be the only measurable snowfall for the month. After a couple of days, the above normal temps wiped out the snow cover and bare ground returned at the end of the month.

Sioux Falls, SD					
Season	Average Temperature				Temperature Rank
	Max	Min	Mean	Departure	
Winter '16-'17	32.9	15.6	24.2	5.1	11th warmest
Spring '17	57.8	36.7	47.3	1.5	40th warmest
Summer '17	83.0	59.7	71.4	0.9	58th warmest
Fall '17	61.9	39.0	50.4	3.2	21st warmest

The winter season of Dec. 2016-Feb. 2017 with a mean temperature of 24.2 degrees (+5.1 degrees) would go down as the **11th warmest on record**. There were 14 days with temperatures below zero, well below the 30-year normal of 24 days. Of those below zero days, only 2 had low temperatures of -10 or colder, tied for the 10th fewest for a winter period on record. Overall, winter precipitation (3.03 inches) was well above normal (23rd wettest), with snowfall (25.4 inches) a little above normal for the period. Snowfall generally came in pulses throughout the winter, with the greatest 24 hour accumulation on January 24-25 (7.3 inches). However, it should be noted that without a **RECORD RAINFALL** event (1.23 inches) on Christmas Day 2016, complete with thunder and lightning, precipitation for the season would surely been well below normal.

Sioux Falls, SD			
Season	Precipitation		Precipitation Rank
	Total	Departure	
Winter '16-'17	3.03	1.18	23rd wettest
Spring '17	6.64	-1.53	52nd driest
Summer '17	9.84	-0.22	58th driest
Fall '17	6.93	0.63	34th wettest



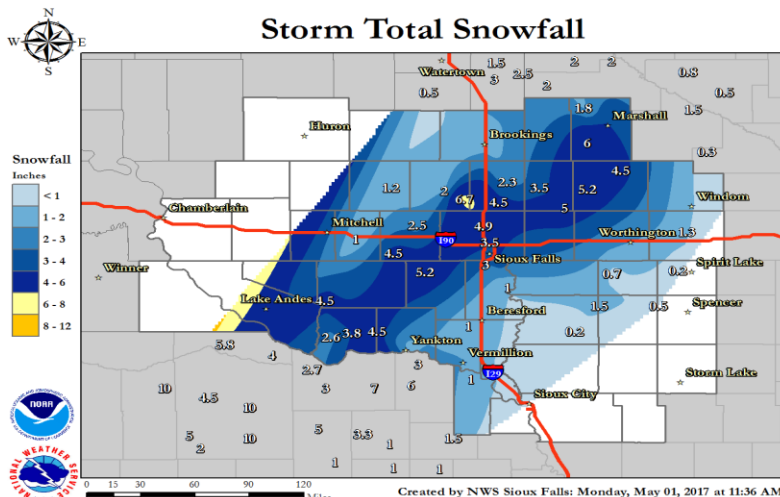
March again started on the cold side with light snowfall, but the chill faded quickly as temperatures warmed to well above normal by the latter half of the opening week. A 72 degree reading on the 6th was the **7th earliest occurrence of a 70 degree reading**, more than 3 weeks before the average date. Amazingly enough, the passage of a strong cold front that afternoon would bring not only strong winds, but enough of a temperature drop for **accumulating snow to fall a mere 9 hours after the 72 degree reading!** A wintry system on the 12th and 13th dropped 4 to 6 inches of snowfall,

and ushered in the coldest temperatures of the month. This would also be the final measurable snowfall until – spoilers - the very end of April! As for most of the cold spells over the winter, this was a brief trek as only two days in the final half of the month would be below normal and the month ended up the 40th warmest with a departure of +2.4 degrees. For the most part, precipitation was sparse and the Sioux Falls area varied between one-fifth and one-third of normal precipitation. The first thunderstorm of the year occurred on the 23rd.

The character of April was one of mild temperatures with occasional precipitation, mostly light. Nineteen days during the month would record at least a trace of precipitation. The fairly moist times led to a couple days of dense fog on the 3rd and 15th. Strong winds and dry conditions on the 7th led to several fires in Minnehaha County. The warmest reading of the month occurred on the 8th (81 degrees), which also featured a **record high minimum temperature (50 degrees)**. Several thunderstorms rumbled from the 15th to the 19th, including one in the predawn hours of the 15th that awoke many Sioux Falls residents with prolific lightning and thunder. The fairly mild temperatures of the month gave a quick start to vegetation, which then battled several freezes the last third of the month, including a **record low of 24 degrees on the 28th**. The most noteworthy feature of the month was a very late season snowfall which began on the evening of the 30th after heavy rainfall earlier in the day. This was the **first recorded snowfall on April 30 (1.3 inches)**, and the first measurable snow since March 13. Despite the third greatest daily precipitation for 2017 occurring on the final day of the month (1.38 inches) - almost

half the monthly precipitation - April 2017 still ended up a shade below normal.

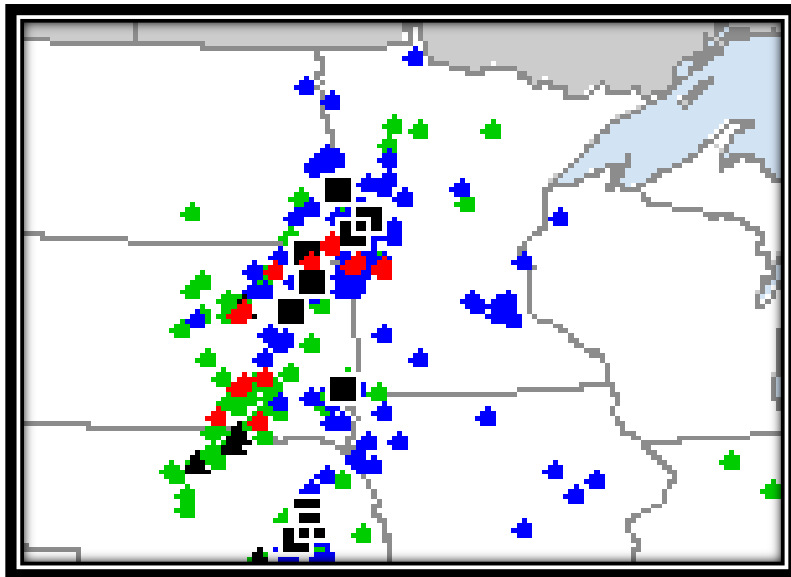
The unusual late season snowfall continued into May Day with an additional **2.2 inches snowfall – a record for the date**. Combined with the snowfall on April 30, this represented the greatest snowfall on record in Sioux Falls so late in the



season (3.5 inches), and there was much more just north and west of the metro area, up to 6.7 inches.

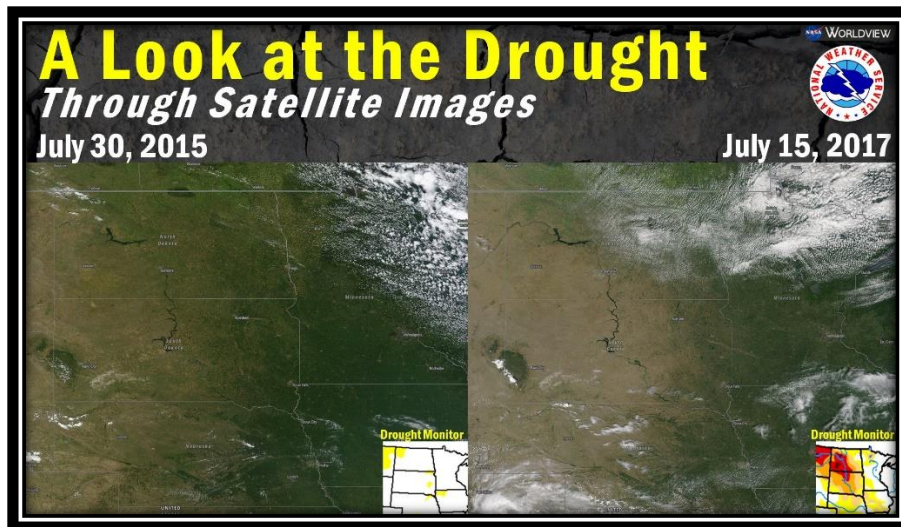
A few cool days after the snowfall would yield to another very mild period through the first 17 days of the month. No better example was Mother's Day, which ended up a top 10 warmest at 85 degrees, as well as the warmest May reading. Several thunderstorms occurred from the 15th to 17th, producing rainfall from 2 to 3 inches around Sioux Falls over the three day period. A severe storm crept from near Harrisburg into far southern portions of Sioux Falls during the afternoon of the 17th, producing damage to trees. A sharply colder period initiated on the 18th, with a **record low maximum temperature occurred on the 20th** (46 degrees). After the 21st, no day would be warmer than normal through the rest of the month, neither more than 7 degrees below normal, but it would be enough to make the monthly mean temperature end up below normal (-0.4 degrees) for the first time in 20 months!

The spring months of March through May accumulated 6.64 inches of precipitation (1.53 inches below normal) and ended **52nd driest on record**. Temperatures averaged a shade to the warm side of normal with a mean temperature of 47.3 degrees (departure of +1.5 degrees) to finish **40th warmest on record**. Low temperatures continued to carry a bulk of the warming weight, ranking 28th warmest on record compared to maximum temperatures (58th warmest).



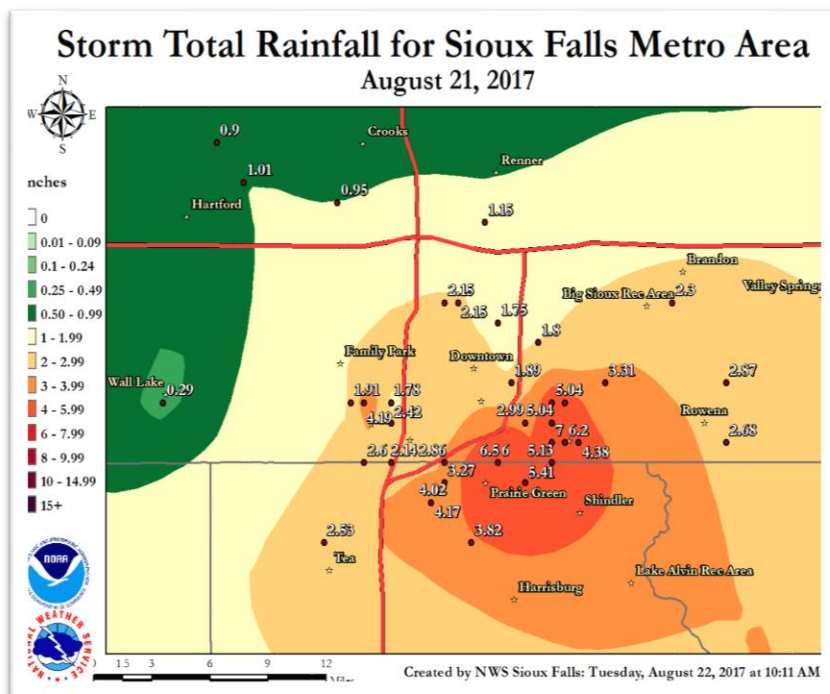
Storm Reports for early morning June 13 2017 (courtesy Storm Prediction Center archives)

June started on a very warm and dry note. No precipitation fell through the first 11 days, with temperatures averaging a whopping 10.3 degrees above normal, the **4th warmest start to the month on record**. Increased humidity toward the end of the period propped up low temperatures, with a **record high minimum of 72 degrees on the 11th**. Rainfall finally arrived on the 12th, with an eruption of severe storms around Sioux Falls on the evening of the 13th. Between 9 and 930 pm, winds from 60 to 75 mph blew into the Sioux Falls metro area as well as scattered hail of nickel to quarter size. Cooler and occasionally wetter conditions filled the balance of the month - neither cool enough to keep June 2017 from being the **28th warmest** (mean 70.5 degrees/+2.7 degrees departure), nor wet enough to avoid the **46th driest** (0.63 inches below normal). A record low temperature of 44 degrees was set on June 24.



Drought Conditions
Worsen During July 2017

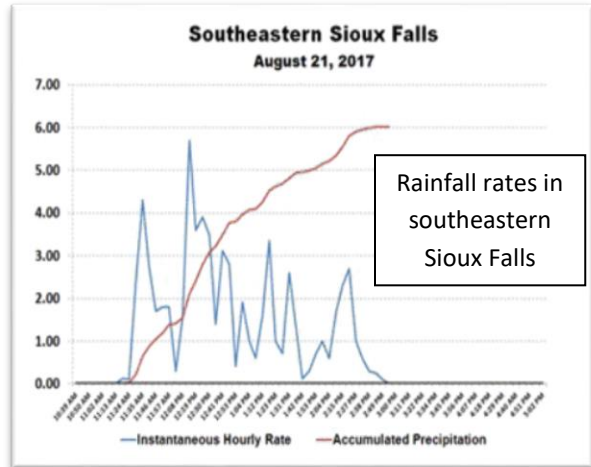
July 2017 saw the dry conditions across the region take a rapid turn for the worse, with moderate to severe drought developing across southeast SD and adjacent areas. As in June, the month started with a prolonged dry stretch. There was no measurable rainfall through the first 16 days at the Sioux Falls Airport, and only spotty very light amounts in and around the city. The following week would feature frequent thunderstorms, but again producing only modest rainfall at best. Storms late in the evening on the 17th produced 52 mph winds at Joe Foss Field, the strongest winds of the month, along with blowing dust. While July finished as the **19th driest** with only 1.13 inches of rainfall, for the sake of the developing drought there were fortunately only two days 10 degrees or more above normal. The consistent and relatively modest warmth resulted in only a **34th warmest** monthly ranking. 96 degrees on the 9th, 15th, 17th and 25th tied for the warmest readings of the year.



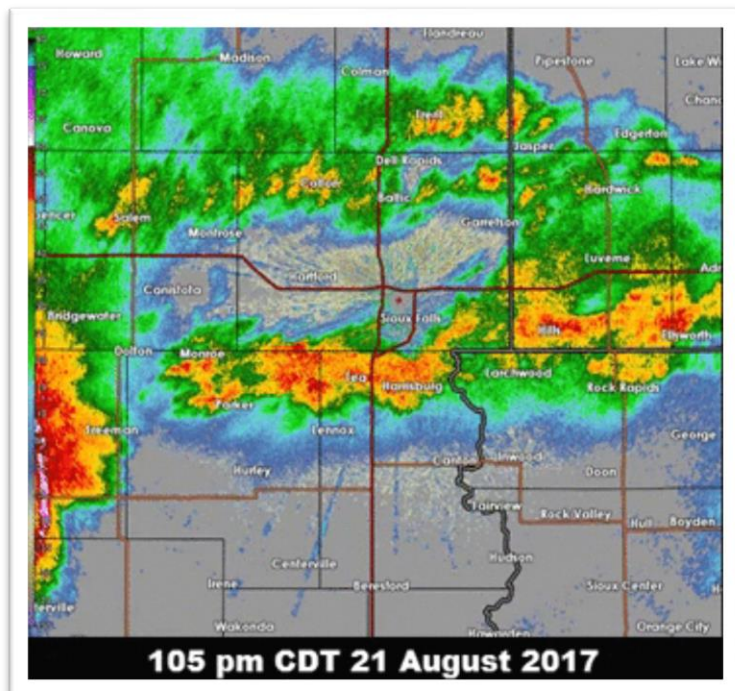
In most regards, August will be known for its astronomical, not meteorological, phenomenon. Of course, the solar eclipse of the 21st was what the world was watching, but for Sioux Falls and some surrounding locations, the weather would not only throw a monkey wrench into viewing aspects, but would create some havoc around the city during the peak of the eclipse. A complex of storms would develop during the morning, dropping large hail from quarter to egg size and damaging winds from



Flash Flooding at 69th St. and Minnesota Ave. (courtesy of ArgusLeader911)



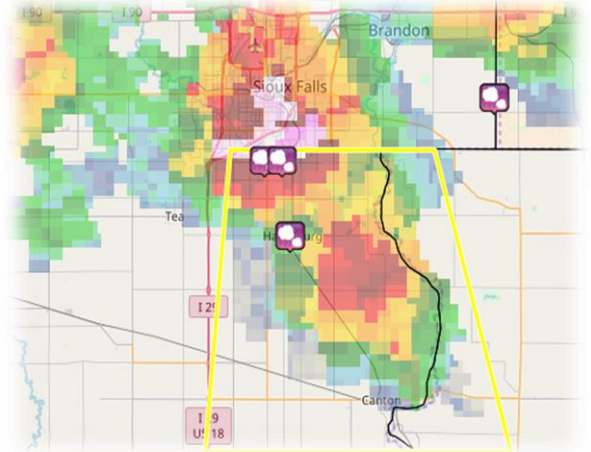
Rainfall rates in southeastern Sioux Falls



south central South Dakota to as close as Parker. While storms weakened from a severe perspective, they become prolific rain producers and continued to train across Sioux Falls into early afternoon. Four to seven inches of rain would drench the southeast side of Sioux Falls in just a couple of hours, producing significant flash flooding. Even the lesser amount of **2.15 inches at the airport was the greatest daily precipitation of the year.**

Left: Radar Image at approximate time of Flash Flooding and maximum eclipse
Below: 4pm Radar Image and Storm Reports on August 1 (Courtesy IEM)

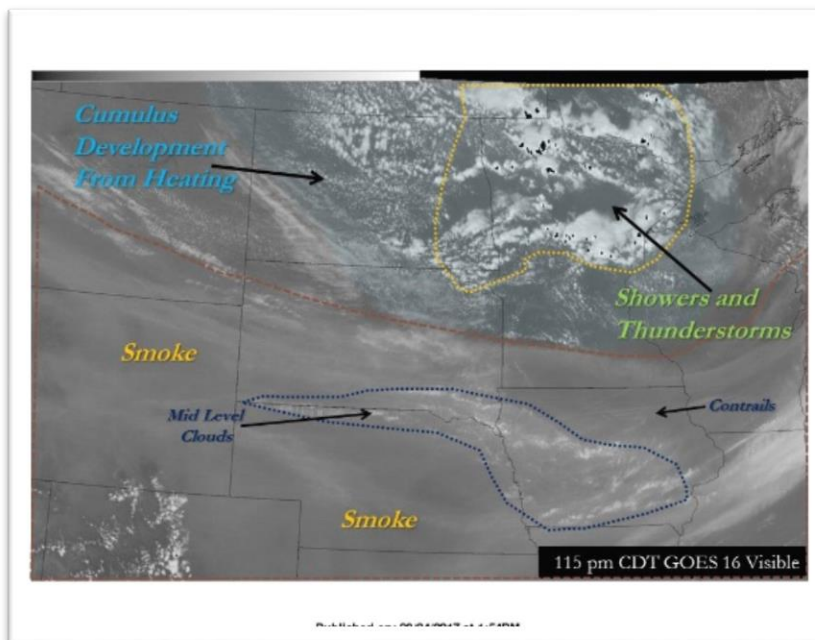
This was not to say there wasn't any other interesting weather in August. The month actually kicked off on the 1st with severe storms on the south side of Sioux Falls producing hail up to half dollar size. Periodic moderate to heavy rains during the month would accumulate to produce the **14th wettest August** (2.37 inches above normal), easing drought conditions. Nine days with thunder would tie June for the most of any month of 2017.



For the first time in the previous 22 months, the monthly mean temperature (68.1 degrees) would register as solidly below normal as the 14th coolest August. In fact, the 89 degree maximum on the first was the warmest reading of the month, and was the **5th coldest on record for warmest temperature of the month of August**. The high temperature of 71 degrees on the 5th would set a **record low maximum** for the date.

Looking at the big picture, summer 2017 ranked close to the median for temperature (58th warmest) and precipitation (58th driest). Despite the wet finale of the summer season, total precipitation amassing 9.84 inches would end up a shade less than a quarter inch below normal. Mean maximum and minimum temperatures provided a fairly balanced share of the 0.9 degree above normal departure.

September arrived peacefully – mainly dry with near normal temperatures through the first nine days. Over the following two weeks, nine days would register 10 degrees or more above normal, with only sporadic modest precipitation. Gusty thunderstorms blasted into the Sioux Falls metro area during the evening of the 19th with winds to 60 to 70 mph and some tree damage across northern Sioux Falls. Shortly after these summer-like storms, the first day of autumn reached a toasty and summery 91 degrees, the **second warmest start of autumn on record**. The only concentrated period of rainfall would occur from the 23rd-26th, with a maximum 24 hour rainfall of 0.65 inches on the 25th-26th, the only two days below normal toward the end of the month. With few days below normal, the month ranked as the **25th warmest September** on record. The coolest reading of the month (41 degrees) was reached twice (17th and 27th), marking the **second warmest value for warmest low** during the month of September. Monthly rainfall of 1.62 inches was back below normal, ranking 38th driest.

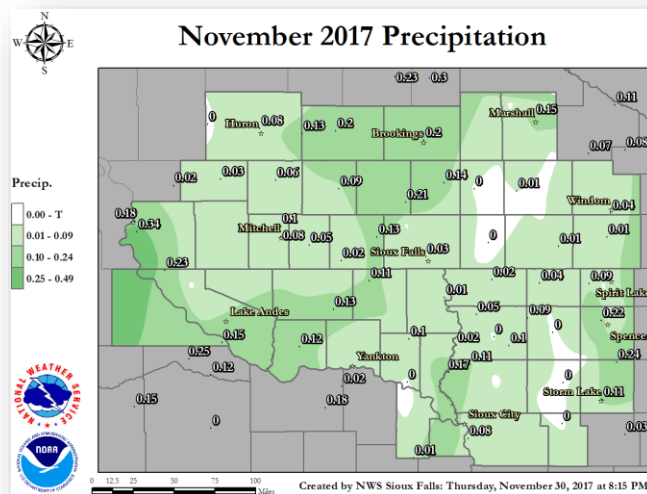


Smoke from western U.S. fires returned in September

Three days of heavy rainfall marked the start of October. Record rainfall doused Sioux Falls residents on the 2nd (1.91 inches) and 3rd (1.10 inches). Combined with over an inch of rainfall on the 1st, the first three days were far and above the **wettest start on record for October**. After nearly another inch of rain

on the 6th, precipitation became very scarce with only another 0.16 inches through the remainder of the month. Even with the prolonged dry spell, it was the **7th wettest October on record**. The rainfall on the 2nd was the **10th wettest October day on record**, and **half the top 10 wettest October days have now occurred in the last decade**. Other than one brief period from the 9th to the 11th, temperatures through the first 3 ½ weeks of October were above normal. This window did contain the first sub-freezing temperature, ending the growing season with a **hard freeze of 28 degrees on the 10th**. The growing season was an impressive 166 days, 20 more than the average length of 146 days, and 20th longest on record. Four out of the last five days of the month were more than 10 degrees below normal, and the low of 14 on Halloween certainly put some frost on the pumpkins. Overall, October ended slightly

above normal (+2.5 degrees, **51st warmest**) with a mean of 50.4 degrees. A trace of sleet on the 9th was the first solid precipitation of the season.



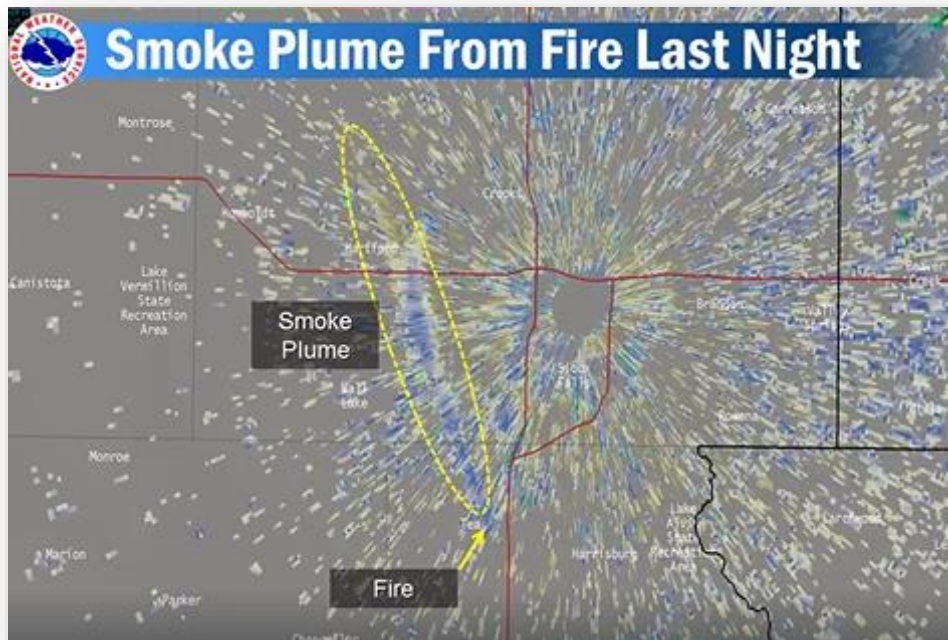
November was a strange month. While the first week of the month featured a mean temperature of 34.8 degrees, the last seven days averaged 41.1 degrees. This occurred during a time when the average temperature sees a drop of around 15 degrees, instead of an increase of over 6 degrees. The **five-day period from the 26th to 30th was the warmest on record**, which included a **record high**

temperature of 67 degrees on the 27th. November 2017 ended 3.2 degrees above normal, **36th warmest on record**. The other noteworthy occurrence for November was actually a lack of occurrence – of precipitation. It was quite dry, with a paltry .03 inches of precipitation over the month. This placed November 2017 at the **5th driest November on record** and the **driest month since Oct. 1988**. The greatest precipitation (0.02”) was actually the first measurable snowfall (0.2”) of the year on the 6th.



Grass Fire near Tea on the evening of November 16. Courtesy of Maria Kramer.

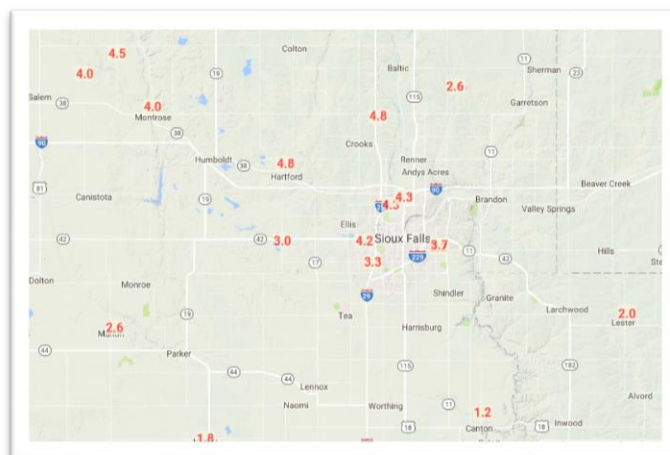
As conditions dried out during the mild and snowless month fire danger became an almost daily concern with increased winds and lower humidity. Many days were more critical than the 16th, but it was that evening that saw a grass fire erupt near Tea, SD. Nearly 160 acres burned very rapidly, but avoided damaging any structures. With the proximity of the fire, the smoke plume was clearly visible on the radar.



Three months of modestly ranked above normal temperatures made the fall season the 21st warmest on record with a mean temperature of 50.4 degrees, 3.2 degrees above normal. The soggy October was more than enough to offset the extreme dryness of November and well below normal September to tally the 34th wettest fall with 6.93 inches of precipitation.

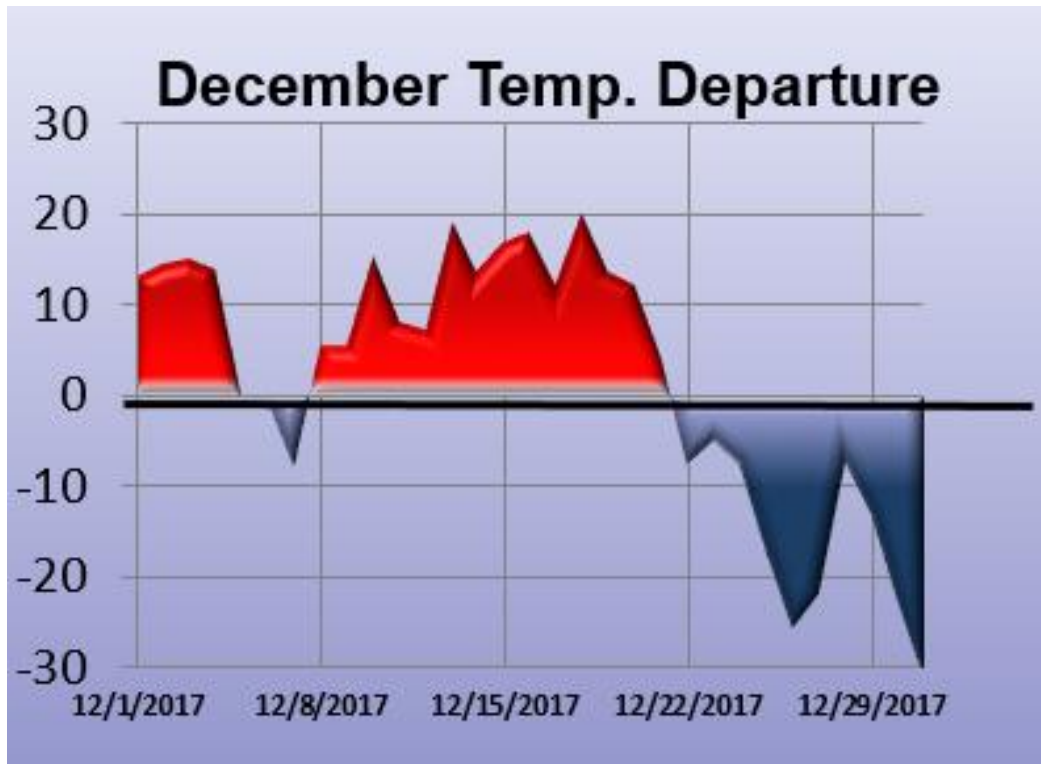
December was just another month of extremes. The start of the month continued the unseasonable warmth of the end of November, with four days more than 10 degrees above normal. The final day of this streak would bring a first cold blast accompanied near whiteout conditions in snow and blowing snow for several hours around the evening rush. The wind reached 60 mph to outpace any other of 2017 and become the **strongest wind gust of the year**.

Snowfall on the 4th was the first of the winter season to exceed an inch, just over a couple weeks later than the long term average. Temperatures would settle to a little either side of normal from the 5th to the 9th with some occasional flurries. From the 10th through the 20th, the dry weather and mild temperatures would return along with periodic fire concerns. Right on



schedule, the next snow storm arrived on the first day of winter, blanketing the area with 3 to 5 inches of snow. With the pattern change, frigid air would invade the tri-state area through the end of the year.

Three days (26th, 30th and 31st) failed to break zero, the **most number of below zero days since 1996**. The high of 9 below zero on New Year's Eve **tied a record low maximum**. In fact, for the last week of the year from Christmas through New Year's Eve, the **mean temperature (-3.0 degrees) was the coldest on record**.



Wind chills at the end of the year made for a dangerous time for celebrating New Year's Eve, plunging to 25 below to 40 below zero.

Sitting at over 10 degrees warmer than normal at the winter solstice, temperatures would battle to the final minutes of the year to remain just above normal. Overall, December was the **60th warmest** on record, with a departure from normal of +1.9 degrees. It was the 52nd wettest month, and the third month with above normal snowfall for the year (+2.2 inches).