Issue 979

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eUpdate

10/19/2023

These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

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1. Wheat planting conditions in Kansas: Middle of October 2023

Prolonged drought continues across Kansas. The state only received a little over half of the statewide average precipitation for September. Only isolated areas of north central, southwest, and southeast Kansas saw at or above-normal moisture, enough to improve soil moisture conditions temporarily (Figure 1). Unfortunately, even these areas have seen benefits rapidly diminished due to warm and breezy conditions. Over the last week, soil moisture has continued to dry out with negative changes at the 4-inch (10-cm) depth (Figure 2). Areas with little soil moisture change over the last week are likely already completely dried out.

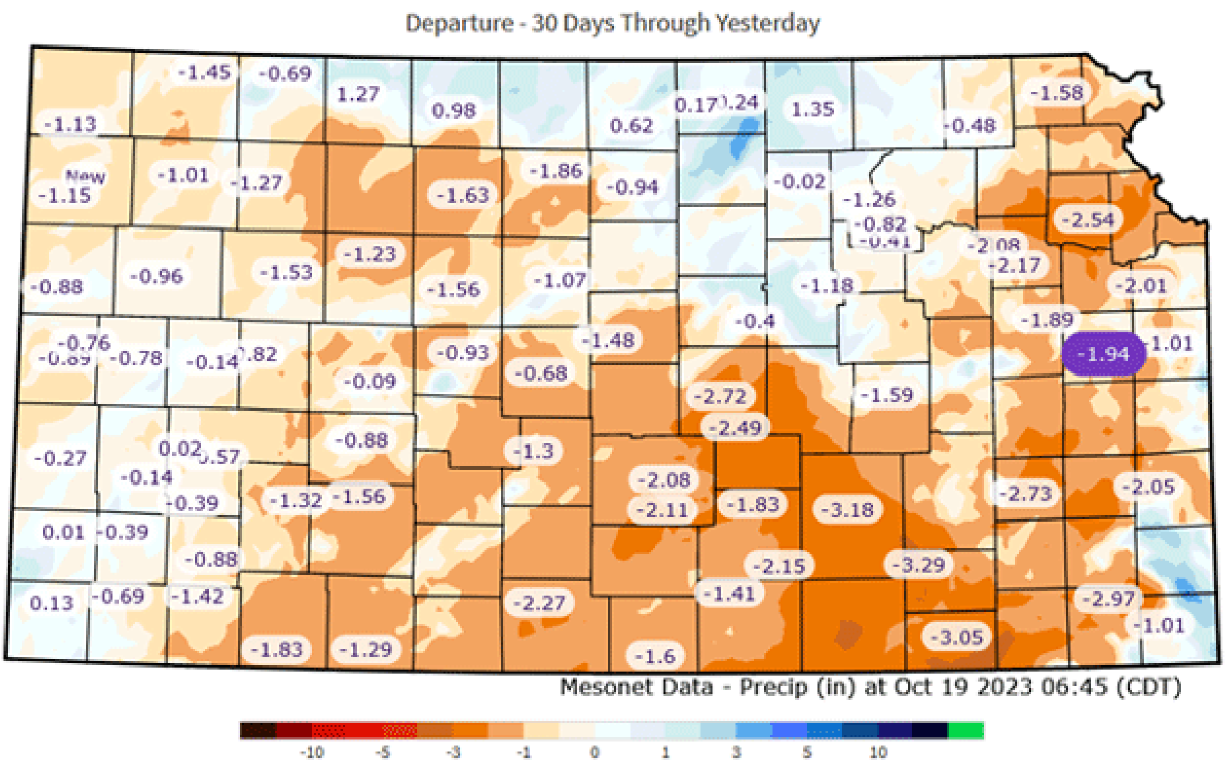

Figure 1. Departure from normal precipitation over the last thirty days, from September 21 to October 18, 2023. Map by the Kansas Mesonet.

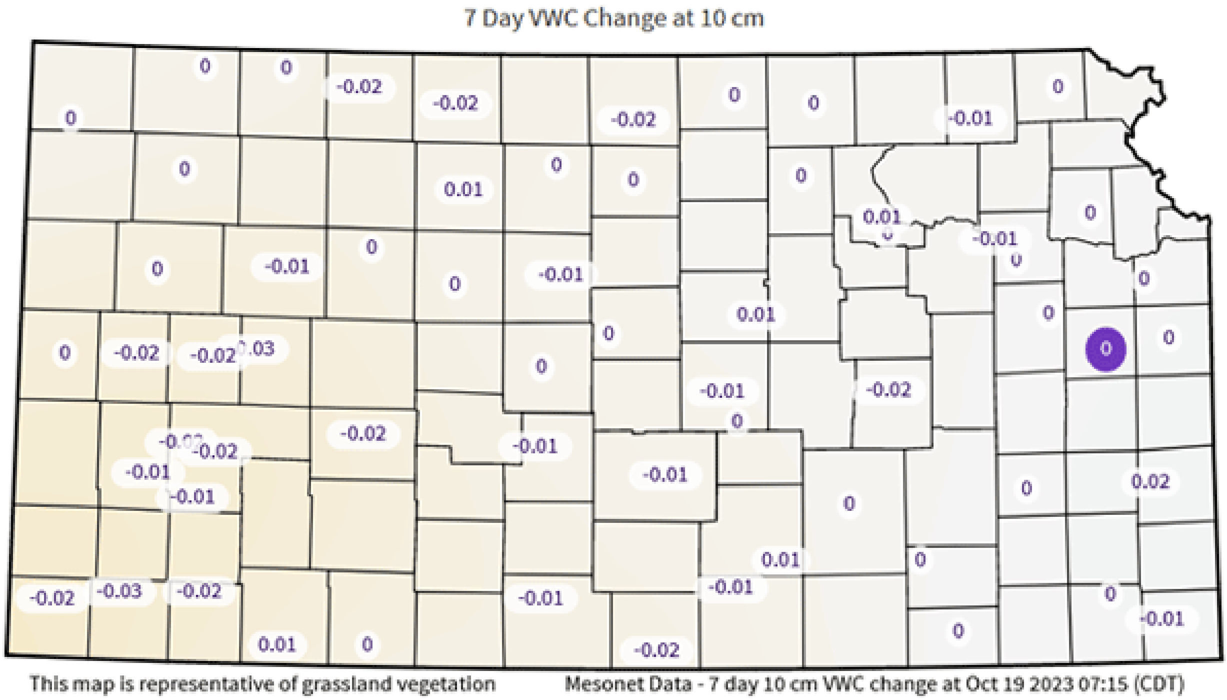

Figure 2. Change in volumetric water content at the 4-inch soil depth (10 cm) over the last seven days, as of October 18, 2023. Map by the Kansas Mesonet.

Weather forecast

Kansas's next 7-day precipitation forecast indicates that the region could see widespread moisture (Figure 3). Totals are only expected to range from 1-2 inches for much of the state, with locally higher amounts to 3 inches possible in south central Kansas. This would be well above average for the time of year, which ranges from 0.3 inches in the west to 0.8 inches in the southeast. The 6- to 10-day forecast favors an increased probability of above-normal precipitation continuing statewide (Figure 4). Beyond this period, conditions should dry back out for most of the state into early November.

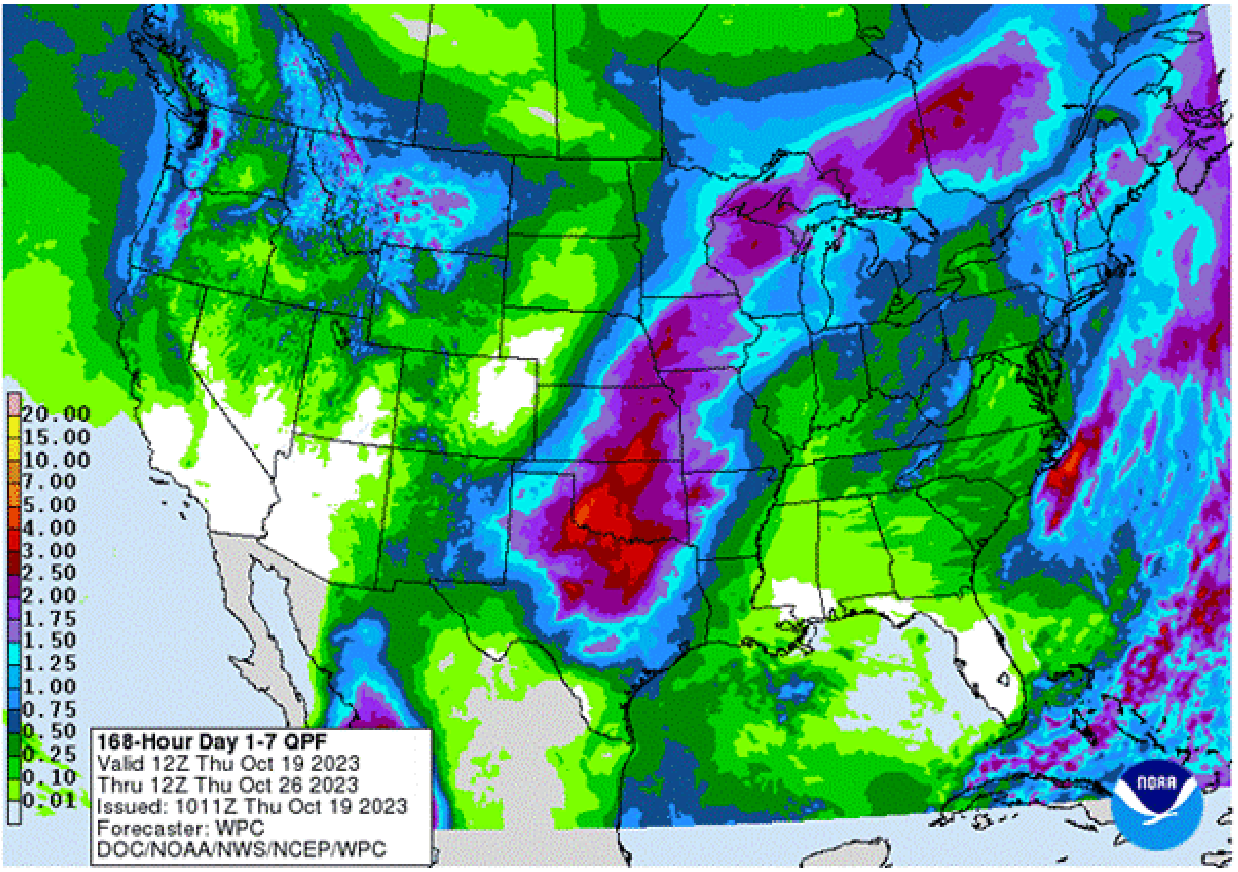

Figure 3. Weekly precipitation forecast as of October 19, 2023, by the National Weather Service Weather Prediction Center (NOAA). For the next seven days, forecasted precipitation amounts in Kansas range from 1-2 inches, with locally higher amounts possible.

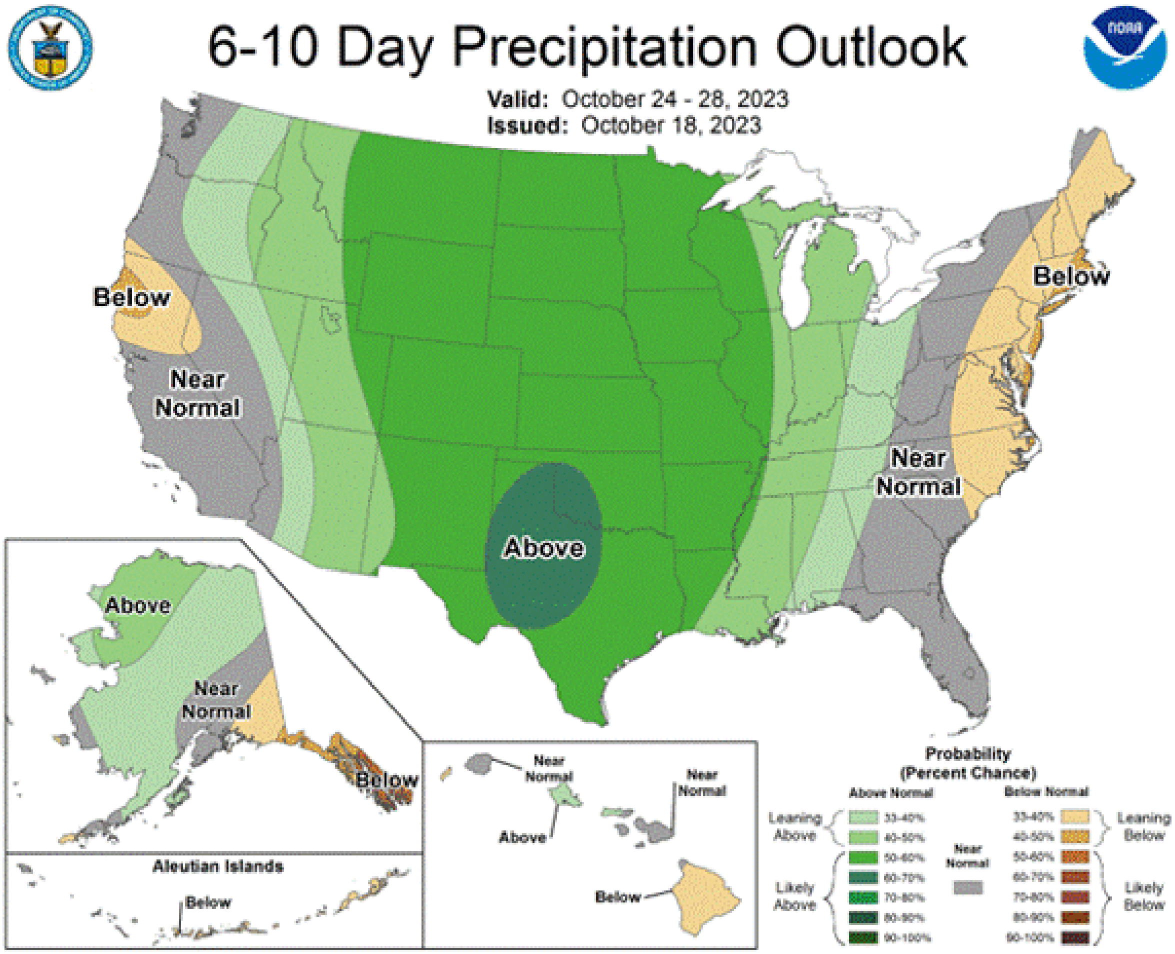

Figure 4. The 8- to 14-day precipitation forecast as of October 19, 2023, by the Climate Prediction Center, NOAA.

Wait for rain or continue with planting progress?

According to the USDA-NASS crop progress report, the current wheat-planted acreage in Kansas was 70% as of October 15, 2023. This is just above the 5-year average of 68%.

The biggest question in growers' minds is: **Should I continue planting the crop, or should I wait for rain?**

Each grower must consider his or her situation before making this decision, as the rainfall distribution shown in Figure 1 is interpolated across weather stations and might not represent the reality for a few fields that were far from a given weather station.

At this point in time (October 19), and based on current soil conditions and weather forecasts, the advice would be to continue with crop planting now since we are at or past the optimum planting date for much of the state. Continuing crop planting now allows for taking advantage of the available moisture where recent rainfall occurred (that is, where moisture is still available, which is the case for some regions in north central Kansas) and also a good seed distribution in dryer soils where rainfall did not occur. In this situation, growers also have the opportunity to plant a large number of acres before it rains. If the short-term forecast of 1-3" precipitation materializes, this should allow for uniform crop emergence. However, suppose no rain occurs in the near future. In that case, the crop might not emerge until it rains later in the fall or even winter, delaying the "effective planting date" to whenever the rain occurs. Thus, at this point, growers should start to treat these fields as if they were sowing late, where increases in seeding rate and applications of in-furrow starter fertilizer are recommended. These might also be situations in which seed treatments can be beneficial, as the seeds will be exposed to weather in the fields for several days. See the accompanying article about management adjustments for late-planted wheat.

The worst-case scenario would include planting into a limited amount of moisture, just enough for the emergence of some plants but not enough to maintain these seedlings after they emerge. This situation can result in uneven stands and high stand variability within the field (Figure 5), or even crop failure. Thus, if good moisture cannot be reached in about the top 1.5 to 2 inches of soil, growers would likely be better off sowing it shallower and waiting for rain.

From a regional perspective, we are either around or slightly past the optimum planting window (south central and southeast Kansas) or already considerably past the optimum planting window (remainder of the state) for wheat. In these regions, if no moisture is available for immediate emergence and growers decide to plant the crop, they should start increasing seeding rates and adding more in-furrow phosphorus fertilizer to compensate for a late emergence.

For more information on planting wheat into dry soils, please see a previous eUpdate article from September 28, 2023: https://eupdate.agronomy.ksu.edu/article_new/considerations-when-planting-wheat-into-dry-soil-564-1.

Figure 5. Uneven wheat stands as a result of sowing into dry soils. Photo by Romulo Lollato, K-State Research and Extension.

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2. Delayed planting dates and seeding rates for wheat in northwest Kansas

The optimal planting window for wheat has passed for many areas of the state, such as northwest Kansas, with the end of the optimal window approaching in other areas. What is the effect on yield potential? Can increased seeding rates compensate if wheat planting is delayed beyond the optimal window?

It is important to recall that we rely heavily on fall-initiated tillers to contribute to grain yield. Fall tillers are generally more productive than spring tillers and are less prone to abandonment by the plant in the spring if stress conditions occur. Fall tiller initiation is driven by resource availability (water and fertility) and temperature. As planting is moved later into the fall, the window of opportunity for initiating fall tillers becomes much smaller. In the event of reduced fall tillering, the question becomes: Could increased seeding rates maintain yield potential?

To answer these questions, a four-year study was initiated in 2009 at the Northwest Research-Extension Center in Colby and completed in 2012. The results in 2011 were not used due to the dry spring conditions that reduced yields across all treatments. TAM 111 was seeded at four rates (60, 90, 120, and 150 lbs/acre) and at the four planting dates of September 26, October 9, October 28, and November 7. The actual planting date for a particular year was within three days of these planned planting dates. For the Colby area, September 26 would be considered an optimal planting date in most years, and October 10 would be the latter end of the optimal timeframe. October 28 is late for this area, while November 7 is very late. Figure 1 shows the four-year average yields for each treatment in the study.

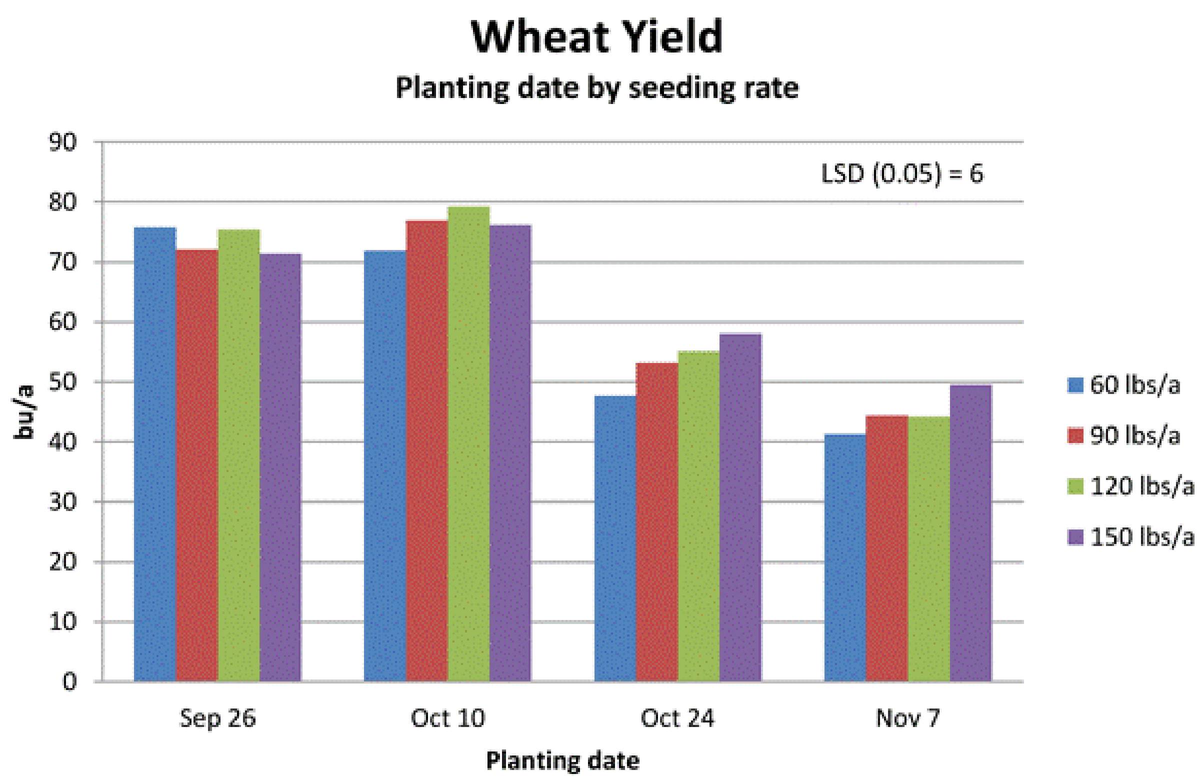

Figure 1. Average 4-year dryland wheat yields for a study conducted in northwest Kansas

evaluating planting date and seeding rates.

The following conclusions can be made from this study:

- Wheat yields were much higher when planted at the optimal time: Sept. 26 or Oct. 10.
- The studied range in seeding rates did not affect grain yield at the earliest planting date. This is because the plants have plenty of time to tiller, especially at the lower seeding rates.
- At the Oct. 10 planting date, the seeding rate did impact yield, with the 120 lbs/acre seeding rate yielding more than the 60 lbs/acre rate.
- When planting dates were later than optimal, increasing the seeding rate improved yields significantly. However, the higher seeding rates did not fully compensate for the effect of delayed planting. Even with an increased seeding rate, the combined effect of reduced tillering and lack of time for crown development resulted in lower yield potential.
- Increasing the seeding rate at late planting dates has the potential to compensate for the decreased tillering potential of wheat planted late, and increases yields compared to the lower seeding rates – although no amount of seed at a late planting date can overcome the overall effects of late planting.

In addition to the dryland study, beginning with the 2017-2018 wheat crop, seeding rate x planting date studies for irrigated wheat were started at Colby (Figure 2). Seeding rates ranged from 900,000 seeds per acre to 2.25 million seeds per acre while planting dates ranged from September 19 to November 1. While only one site-year of data has been collected, it is worth noting that the apparent response to seeding rate with delayed planting appears to be similar for irrigated wheat as was observed in the dryland study.

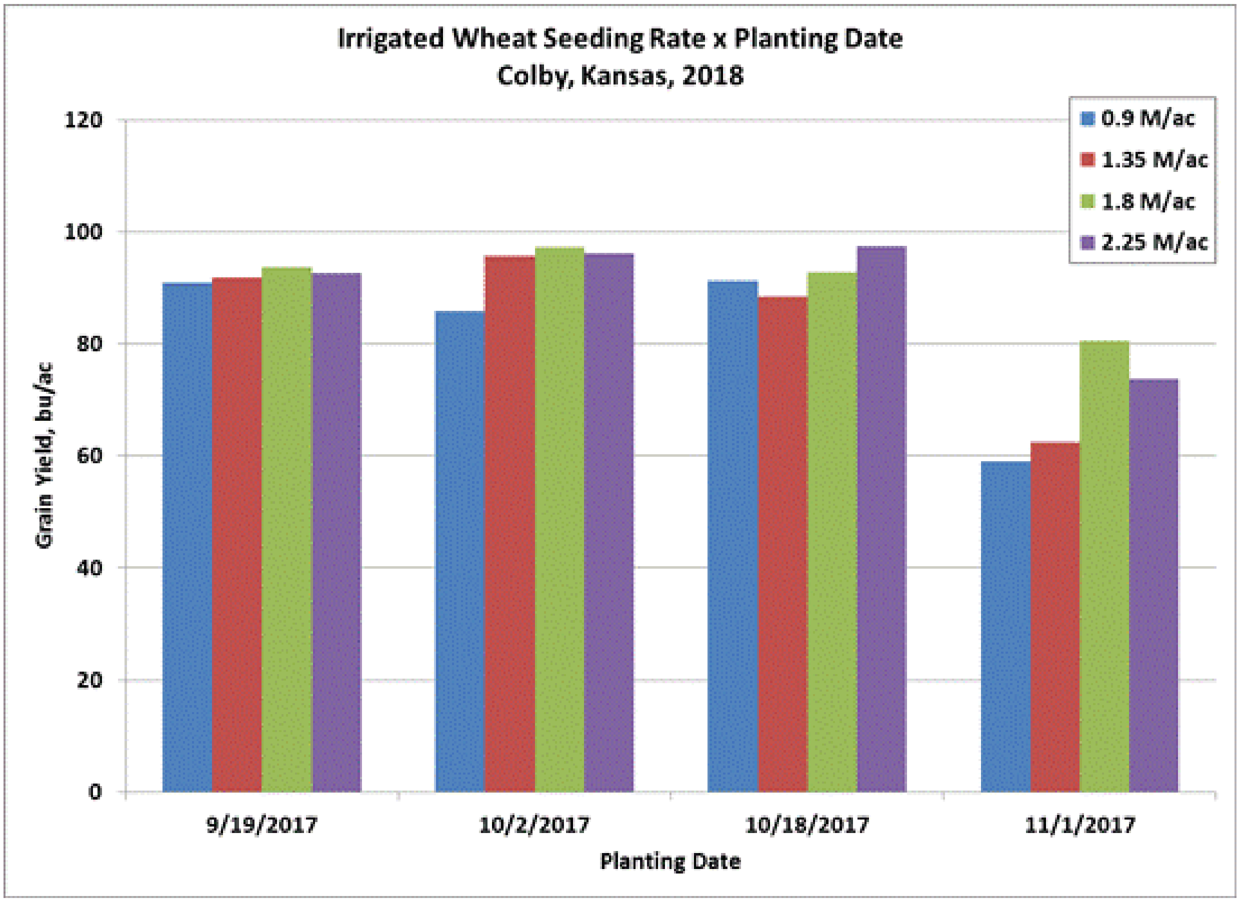

Figure 2. Irrigated wheat yields from 2017 for a study conducted in northwest Kansas evaluating planting dates and seeding rates.

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3. Fall fertilization of brome pastures

Brome requires annual fertilization for optimum production. Fall is a good time to plan on fertilizing cool-season perennial grasses such as smooth brome (Figure 1). Particular attention must be paid to nitrogen, phosphorus, potassium, and pH.

Balanced fertility is essential. For example, adding nitrogen will not produce optimum yields if phosphorus is low. Soils low in phosphate limit plant and root growth. Fertilizer should be applied by broadcasting in the fall or before spring growth begins.

Figure 1. Fall growth of established smooth brome field prior to fertilizer application. Photos by John Holman, K-State Research and Extension.

Nitrogen Source. Nitrogen management is critical for optimum smooth brome production. Several nitrogen sources are available—liquid nitrogen solutions, urea, ammonium nitrate, and anhydrous ammonia. Anhydrous ammonia is not extensively used on permanent pastures because application is difficult. Nitrogen source research generally has shown little difference among sources under most conditions. When urea fertilizers—including liquid nitrogen—are applied to moist soils covered with grass residue, an enzyme called urease can break down the urea to ammonia, which is lost to the air. This can occur fairly rapidly when moist conditions are followed by warm temperatures and rapid drying occurs without rain to move the urea into the soil. If urea is applied from November through February, volatilization loss should be minimal.

Application Timing. When brome is grazed in the fall, the yearly nitrogen application should be split. If adequate soil moisture is available for good growth in late August and early September, apply all phosphorus and potassium indicated by a soil test plus 30-40 pounds of nitrogen per acre. Before the soil freezes in November or December, apply the remainder of the nitrogen recommended for haying or grazing. Split or late fall applications generally initiate earlier green-up in the spring.

If soil moisture is limited, apply all nitrogen, phosphorus, and potassium before the soil freezes in November or December. **Do not apply fertilizer to frozen soil to minimize loss.**

Spring applications as soon as the soil thaws are acceptable for spring-only grazing. Timely application is often delayed because of wet soils. An application needs to be applied in the fall or early spring to allow sufficient time for fertilizer incorporation to benefit forage production (Figure 2).

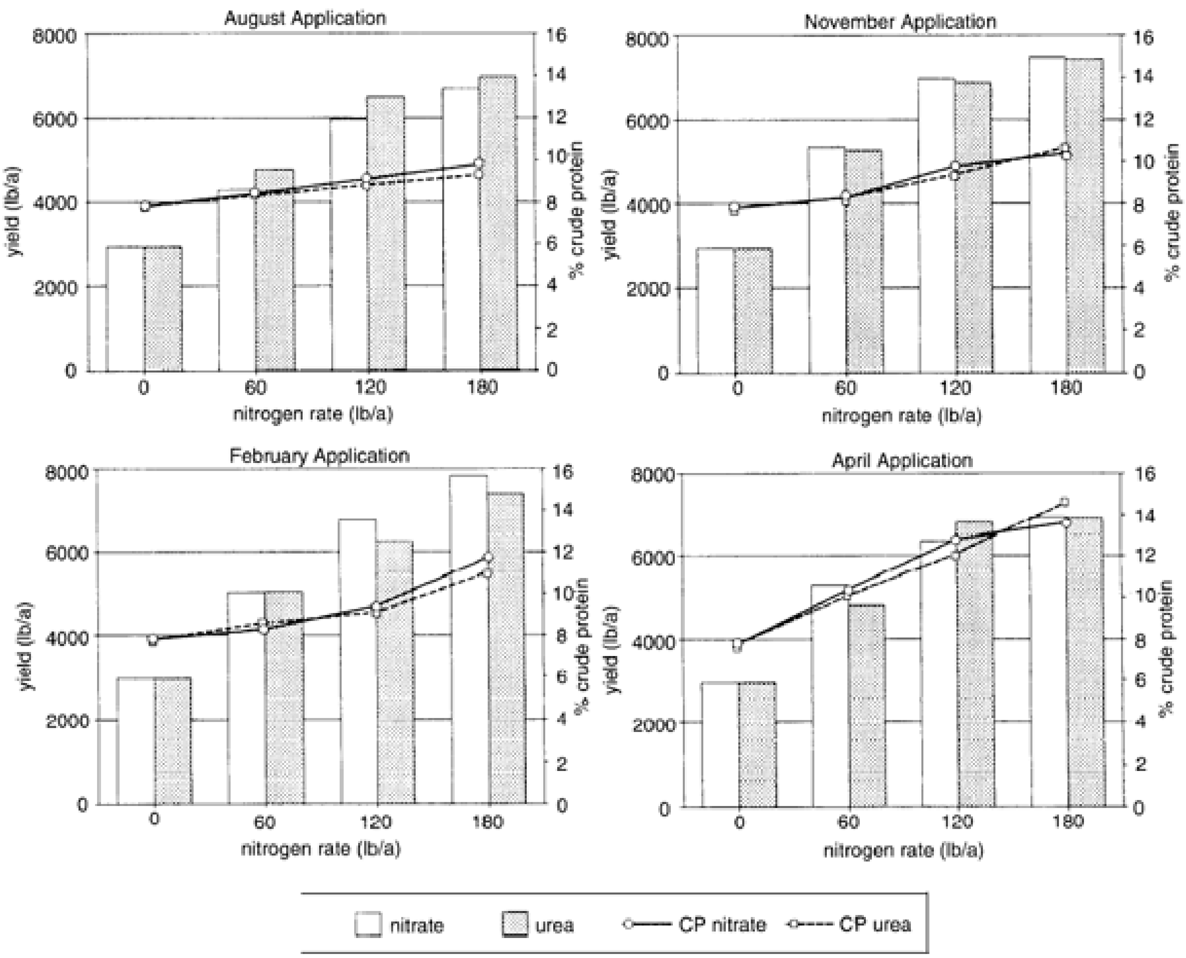

Figure 2. Timing of N application on smooth brome yield. Source: KSRE publication C402 Smooth Brome Production and Utilization.

Fertilizer Rates (N, P, and K). Fertilizer rate recommendations for N, P, and K for established stands of smooth bromegrass are shown in Tables 1, 2, and 3, respectively. When brome is to be utilized for hay production, excessive nitrogen may cause lodging and reduce the amount of harvestable hay. In Table 1, the lower values in the rate range are for hay production. Nitrogen rate should be selected based on factors such as fertilizer cost, hay price, and/or grazing pressure.

Table 1. Nitrogen recommendations for smooth bromegrass.

Type	**Area of State**	**lb/a N[1]**
New Seeding	Entire	30-40
Established Stands:		
Non-irrigated	Eastern	80-120

Non-irrigated	Central	40-80
Irrigated	Entire	125-200

[1]In established stands, the lower recommendations are for hay management only. The higher rates are for grazing or grazing and hay management.

Table 2. Phosphorus recommendations for smooth bromegrass.

	Soil Test Level (ppm P)				
	Very Low	Low	Medium	High	Very High
Type	(0-5)	(6-12)	(13-25)	(26-50)	(51 or more)
			lb/a P_2O_5		
New Seeding	60-80	40-60	20-40	None	None
Established Stands:					
Non-irrigated	30-50	20-40	0-30	None	None
Irrigated	50-60	40-50	20-40	10-20	None

Table 3. Potassium recommendations for smooth bromegrass.

	Soil Test Level (ppm K)				
	Very Low	Low	Medium	High	Very High
Type	(0-40)	(41-80)	(81-120)	(121-160)	(161 or more)
			lb/a K_2O		
New Seeding	80-100	60-80	30-60	0-30	None
Established Stands:					
Non-irrigated	30-50	20-40	0-30	None	None
Irrigated	50-60	40-50	20-40	0-20	None

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4. Musk thistle control in the fall

Musk thistle (*Carduus nutans*) is one of 12 noxious weeds in Kansas, infesting over 420,000 acres. Musk thistle has been reported in nearly every county in Kansas (Figure 1) and is found primarily in pastures, rangeland, hay meadows, alfalfa, fallow, roadsides, and waste areas. Under the new Noxious Weed Law (March 2021), musk thistle is considered a Category C weed. That means musk thistle is well established within the state and has an extensive population.

Control efforts should be aimed at reducing or eliminating new populations, and established stands should be managed with any accepted control method. Accepted control methods include mechanical, chemical, and biological approaches. Mechanical control involves removing the entire plant or just the reproductive parts to prevent the plants from producing flowers/seeds. Mowing, digging, and hoeing are common mechanical methods of controlling musk thistle. Several herbicides are labeled for musk thistle control and are discussed below. Biological control requires a permit and needs to be integrated with other methods. Head and crown weevils are found in the state but cannot be transported across state lines. A flower fly (*Cheilosia corydon*) is a new candidate species for biological control of musk thistle.

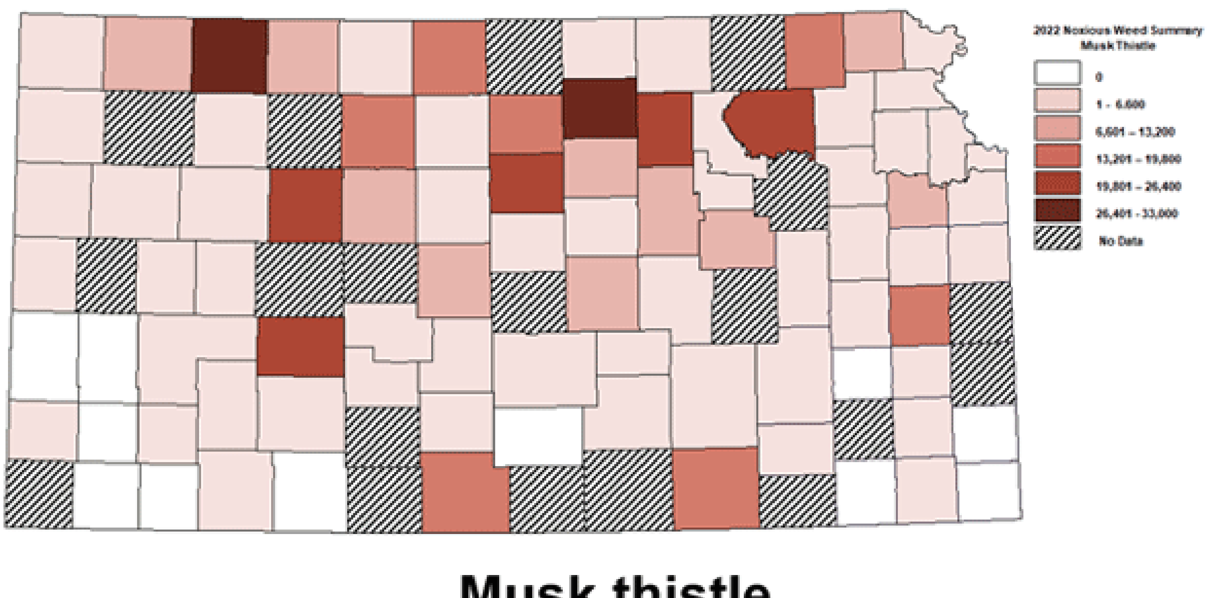

Figure 1. Distribution of musk thistle in Kansas. Map courtesy of the Kansas Department of Agriculture.

Musk thistle is primarily a biennial or winter annual species. Biennials take two growing seasons to complete their life cycle. Thistles germinating in the spring will spend the entire summer as a rosette, live through the winter, and bolt the next year in May and June. Winter annual plants will germinate with moisture and warm temperatures in the fall, live through the winter, and bolt the following year.

Most people recognize musk thistle during the early summer when the plants are actively blooming (Figure 2, top photo). However, musk thistle control is easiest as a rosette (Figure 2, bottom photo).

Figure 2. Musk thistle in flowering and rosette stages of growth. Photos courtesy of Walt Fick, K-State Research and Extension.

Fall is an excellent time to spray musk thistle as all are in the rosette growth stage. Another advantage of treatment in the fall is reduced risk of off-target drift. Waiting until most deciduous trees have lost their leaves and most crops are harvested will greatly reduce the likelihood of damage from herbicide drift. A wider window of opportunity for treating musk thistle also exists in the fall. The spraying window in the fall probably extends until the ground is frozen, and the musk thistle plants have shut down activity until warmer temperatures in the spring. Freezing temperatures will start to damage musk thistle plants, with some yellowing and curling of leaves. However, the plants are susceptible to herbicides as long as green tissue exists.

Dry conditions in the fall can reduce control of musk thistle with certain herbicides. Still, studies in Kansas indicated that a fall application of 2,4-D LVE at 2 lbs per acre was more effective (80% control) than a similar rate of 2,4-D amine (49% control). Dicamba + 2,4-D amine at 0.25 + 0.75 lbs per acre and picloram at 0.125 lbs per acre were also effective (>90% control) on musk thistle treated in the fall. Other herbicides that have proven effective include 3-5 fl oz/acre aminopyralid (Milestone) and aminopyralid + metsulfuron (Chaparral at 1.5 oz/acre). Products containing picloram and aminopyralid will not only control rosettes treated in the fall but will have enough carryover to control emerging seedlings the following spring.

If you need to treat musk thistle this fall, select the proper herbicide. If possible, select a warm, sunny day to spray. Scattered rosettes can be mechanically removed by digging below the crown.

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5. Kansas Mesonet measured atmospheric changes during recent solar eclipse

On October 14, an infrequent astronomical event took place: a partial solar eclipse. The moon's orbit passed between Earth and the sun, temporarily blocking Kansas' view of the entire solar disc for about 3 hours during the late morning and early afternoon hours. At its peak, 60 to 80% of the solar disc was obscured in Kansas, with the lowest percent of coverage in the northeast and the highest in the southwest. Unfortunately, cloud cover obscured a clear view of the eclipse across most of the state (Figure 1). The best views were in the southwest part of the state, where skies were generally clear to partly cloudy. Even where there were clouds, the eclipse was still visible in a meteorological sense. Our Kansas Mesonet sites captured some changes to meteorological variables during the eclipse. In this report, we look at some of the changes to sensible weather that occurred.

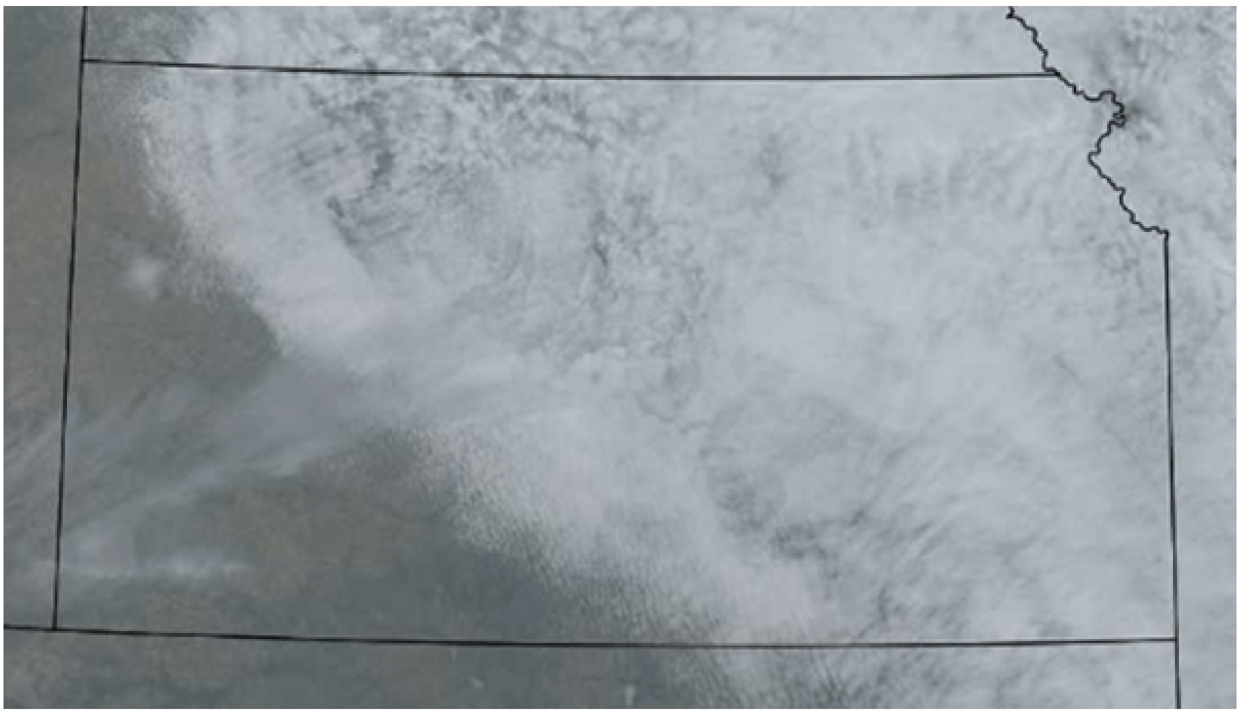

Figure 1. Satellite image of Kansas at 1 p.m. CT on October 14, 2023. Source: http://weather.rap.ucar.edu/satellite**.**

One Mesonet site with little to no cloud cover during the eclipse was the Clark County tower 8 miles south of Ashland, which made it an ideal candidate for examination of its observational data. A plot of solar radiation (Figure 2), measured at 5-minute intervals at Ashland, shows the eclipse resulted in less solar radiation reaching the Mesonet site from roughly 10:30 AM until 1:30 PM, the approximate beginning and end of the eclipse. At 11:50 AM, the solar radiation was only 147 watts per square meter when the eclipse was near its peak. Compared to the following day, one in which the skies were also clear, the eclipse's difference to incoming solar radiation is evident, as 147 was just 22% of the solar radiation from 11:50 AM on the 15th when 665 watts per square meter was measured.

The reduction of incoming solar radiation decreased air temperature at Ashland (Figure 3). The temperature fell from 51.2° F at 10:50 AM to 49.2° F by 11:55 AM, just after the eclipse's peak. The wind speed dropped as well (Figure 4). The average wind speed from 30 minutes before to 30 minutes after the eclipse's peak was 12.3 mph, compared to 15.8 mph from the preceding hour (90 to 30 minutes before the peak) and 15.2 mph in the following hour (30 to 90 minutes after the peak).

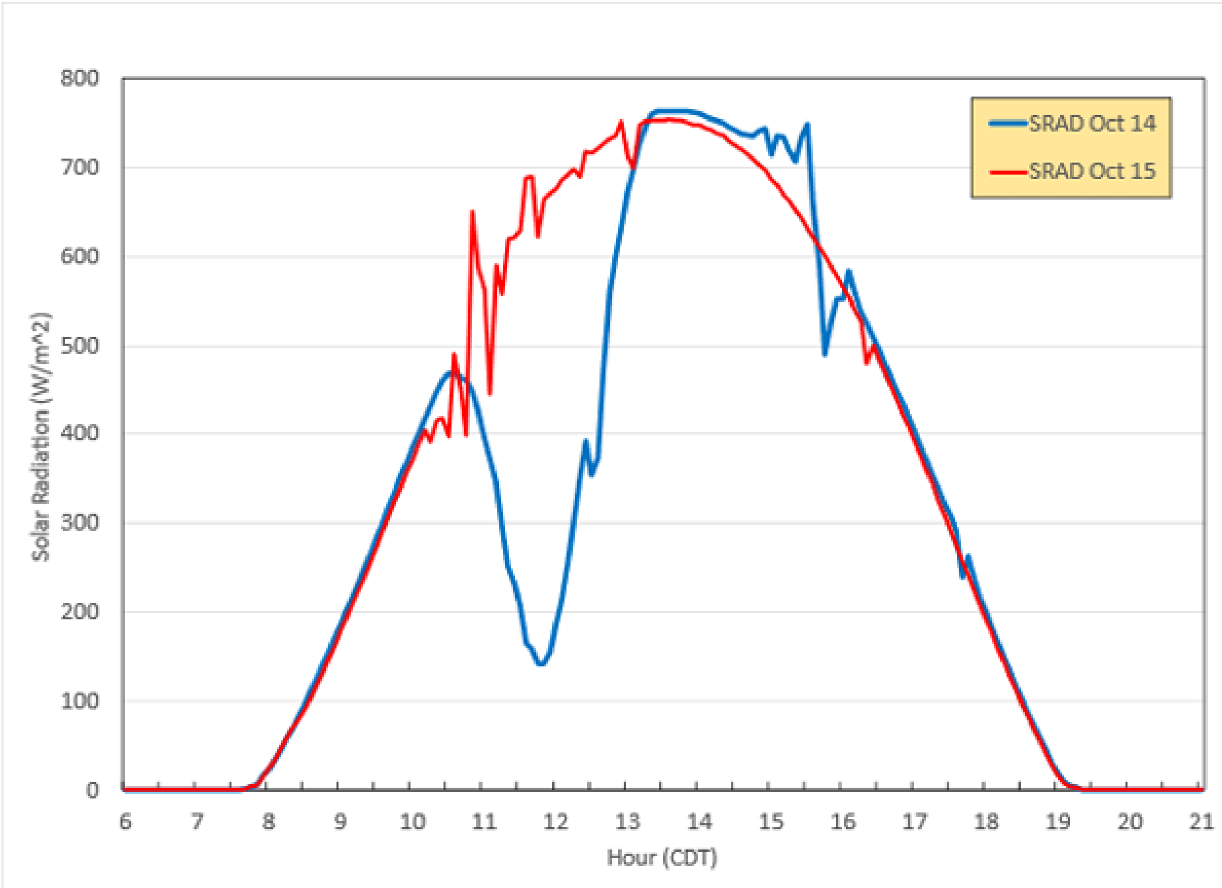

Figure 2. A plot of solar radiation measured by the Ashland Mesonet site on October 14 and 15, 2023.

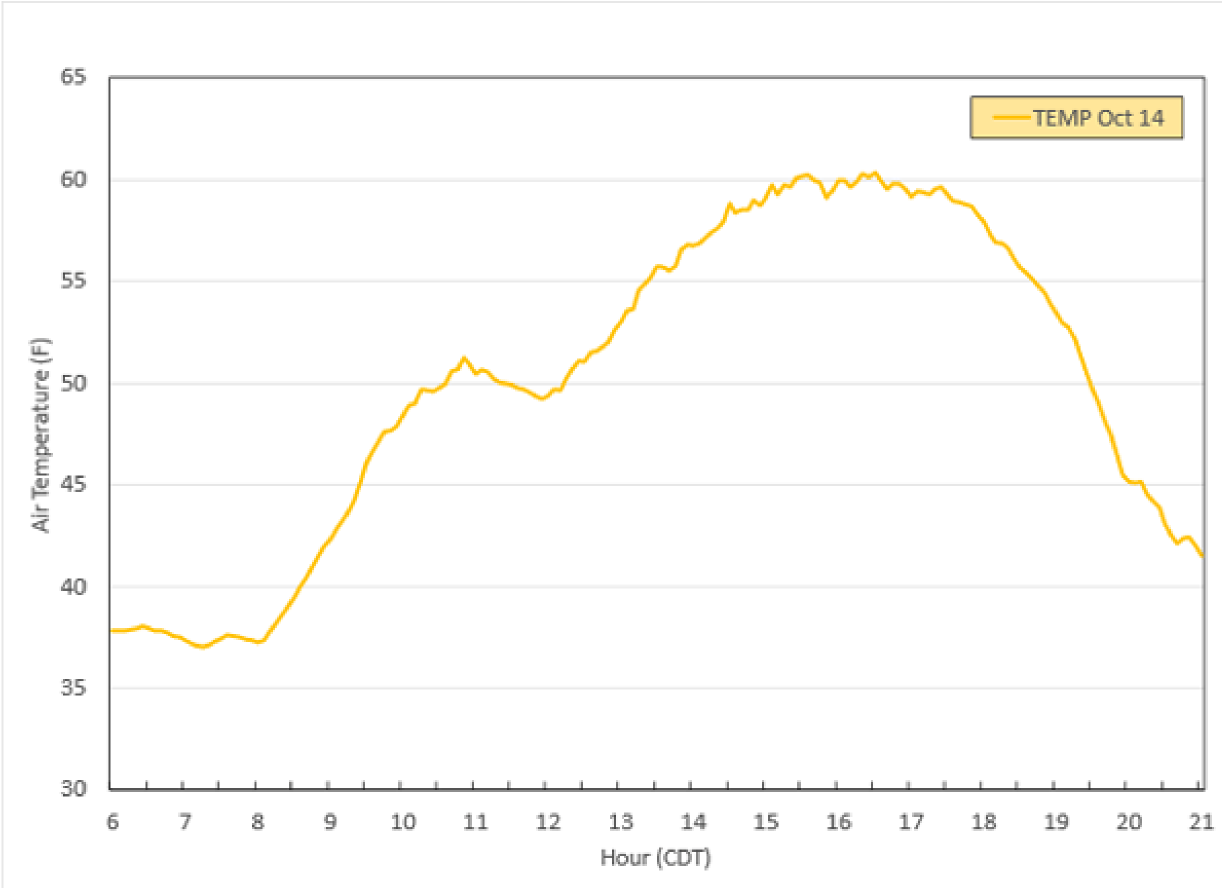

Figure 3. A plot of air temperature measured by the Ashland Mesonet site on October 14, 2023.

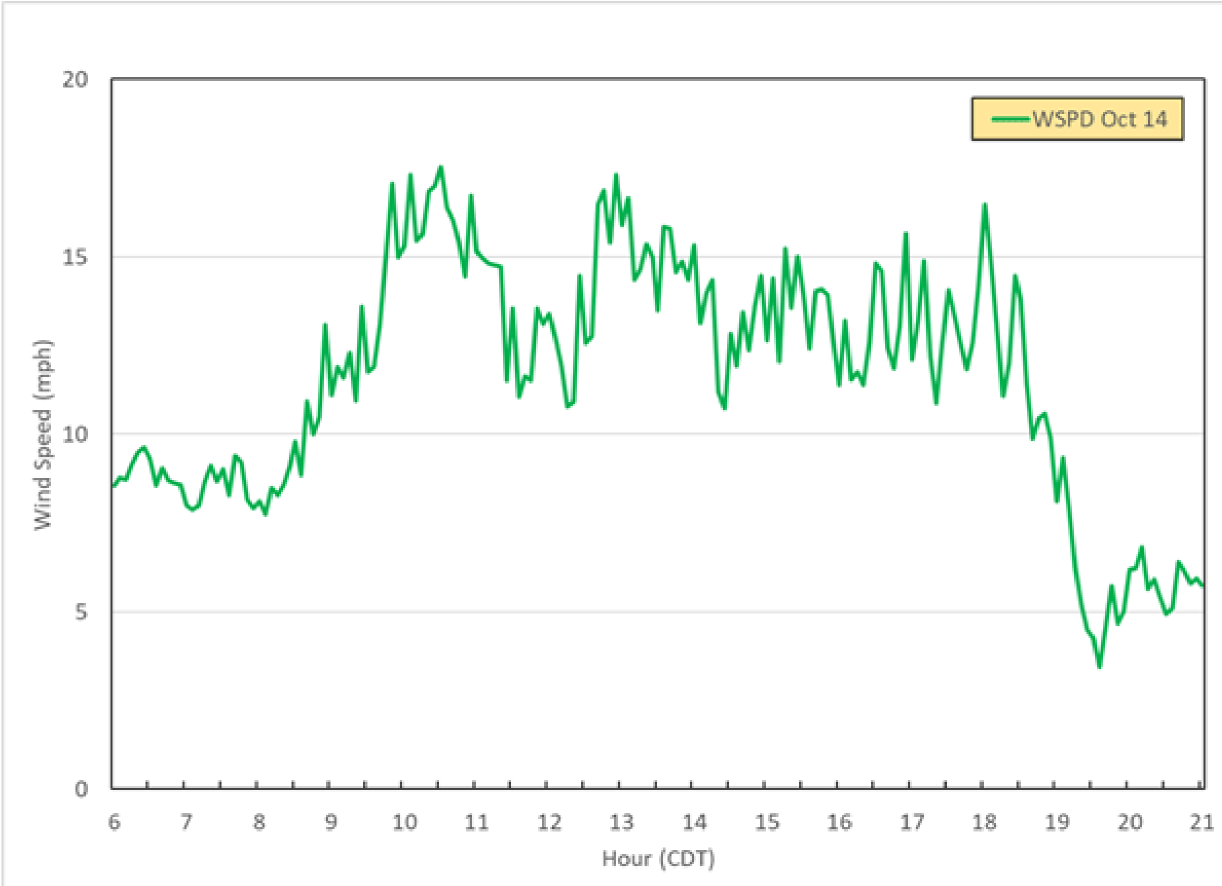

Figure 4. A plot of 10-meter wind speed measured by the Ashland Mesonet site on October 14, 2023.

Interestingly, the effects of incoming solar radiation from the eclipse were also detectable at locations where skies were cloudy. The decrease in solar radiation during the eclipse was smaller in magnitude at cloudy locations like Manhattan (Figure 5), but it was still measurable. However, there were no apparent temperature and wind speed decreases in Manhattan during the eclipse.

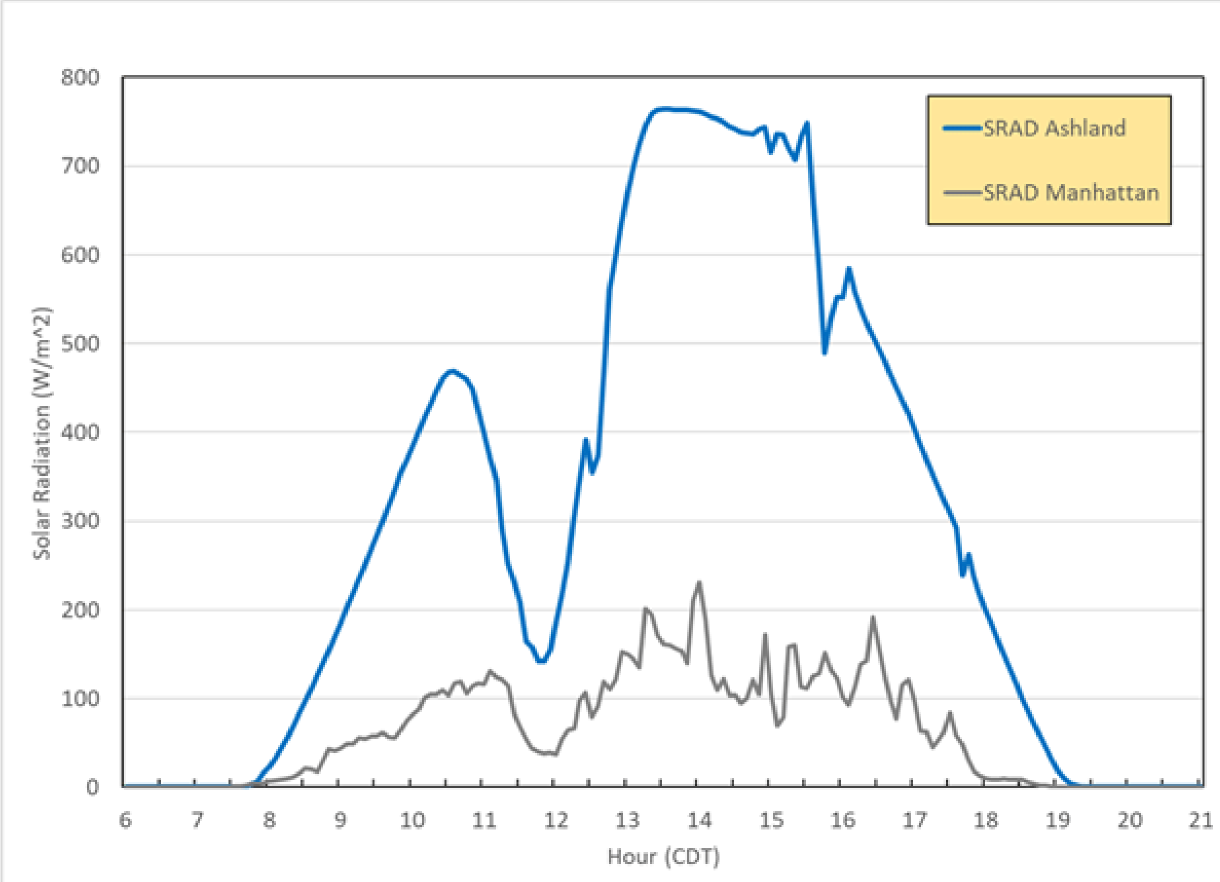

Figure 5. A plot of solar radiation measured by the Ashland and Manhattan Mesonet sites on October 14, 2023.

Future solar eclipses in Kansas

If you missed out on witnessing this eclipse, you won't have to wait long until the next one. Another solar eclipse will occur less than six months from now, on Monday, April 8, 2024 (Figure 6). It will be only a partial eclipse in Kansas, with the percentage of sun obscuration ranging from 71% in the northwest to 96% in the southeast. Unlike the eclipse on October 14, there will be a total eclipse in some parts of the United States. To witness the total eclipse, you'll need to drive south and east to places like Dallas, Texas, Little Rock, Arkansas, or Cape Girardeau, Missouri. Let's hope for clear skies that day, for good viewing and data collection during a rare astronomical phenomenon.

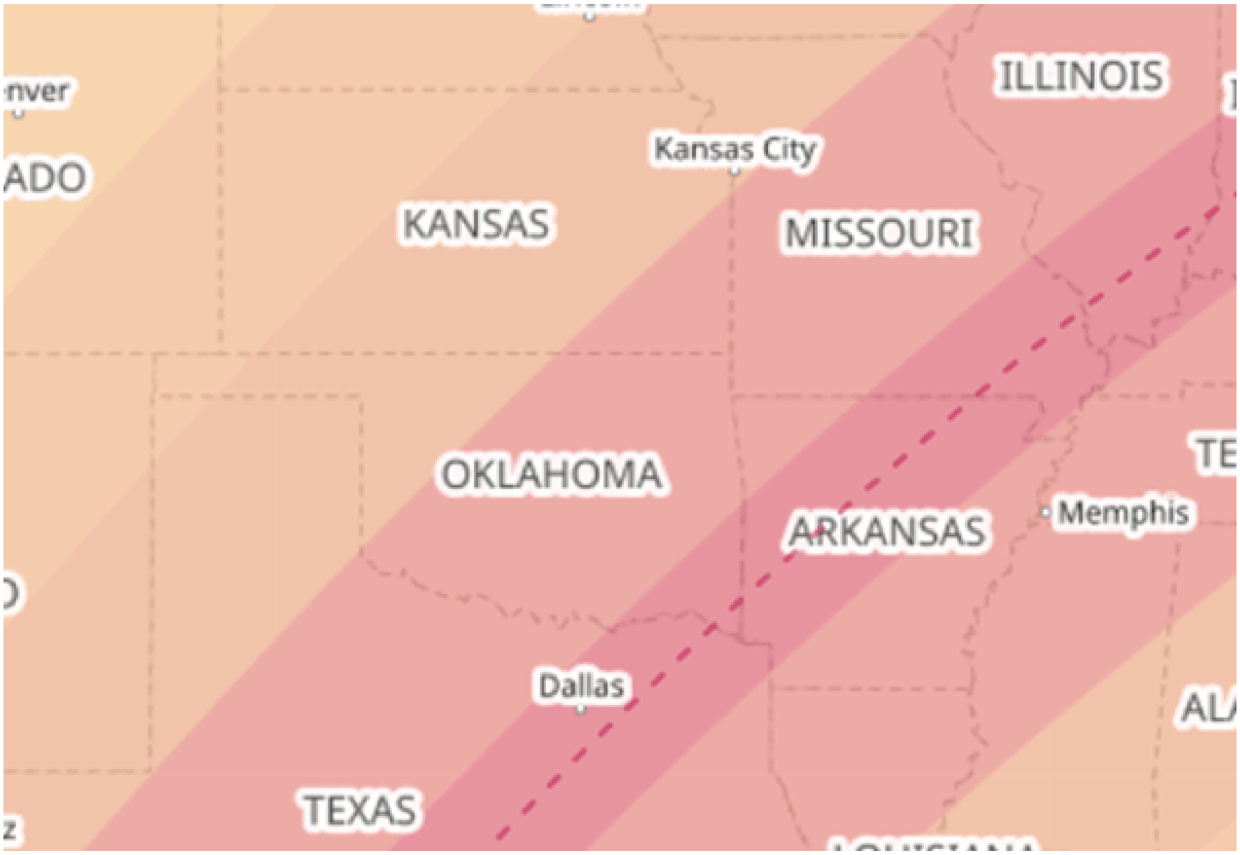

Figure 6. The solar eclipse on April 8, 2024, will be partial in the state of Kansas, with a path of totality to the southeast across parts of Texas, Oklahoma, Arkansas, and Missouri. Source: https://www.timeanddate.com/eclipse/map/2024-april-8.

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