Issue 1026

K-STATE Research and Extension

Extension Agronomy

eUpdate

10/24/2024

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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eUpdate Table of Contents | 10/24/2024 | Issue 1026

1. Considerations for fall applications of anhydrous ammonia

Soils across Kansas are still running above 50°F at the 4-inch depth (Figure 1), and most of Kansas is either abnormally dry or experiencing some level of drought. It is best to delay anhydrous ammonia applications until soil temperatures drop below this threshold and soil moisture improves. Applying anhydrous ammonia in the fall ahead of the following corn crop has some appeal to producers. For one thing, fall fertilizer application spreads out the workload, so there's more time to focus on corn planting in the spring. Secondly, wet conditions in the spring sometimes prevent producers from applying lower-cost anhydrous ammonia ahead of corn planting and force them to apply more expensive sources after planting. Equally important for many producers have been issues with anhydrous ammonia availability at times in the spring.

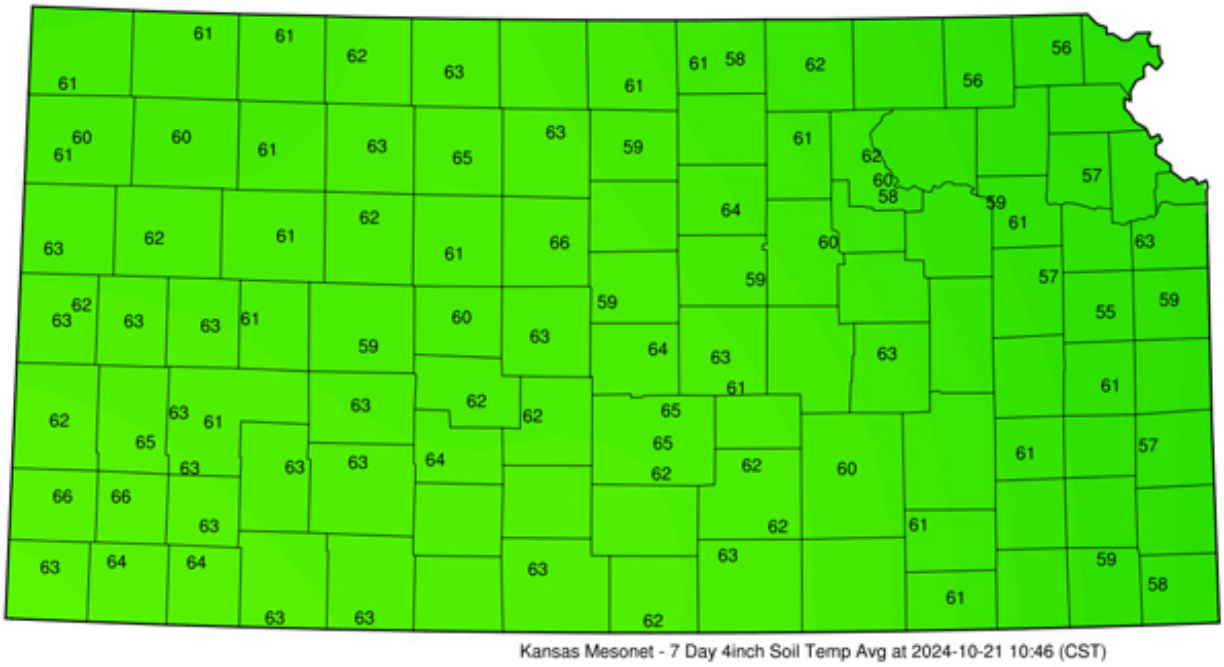

Figure 1. Average soil temperature (°F) at 4 inches for the 7-day period ending on October 21, 2024. Soil temperatures in individual fields in any given area will vary with differences in vegetative cover, soil texture, soil moisture, and other factors. (Kansas Mesonet)

Despite those advantages, producers should be aware that there is potential for higher nitrogen (N) loss in the spring following a fall application due to nitrification of the ammonium during late winter and very early spring and subsequent leaching or denitrification**.**

Reactions of anhydrous ammonia in the soil

Anhydrous ammonia has a strong affinity for water (hydrophilic) and readily reacts with water in its surrounding environment. This hydrophilic nature can be detrimental if the ammonia comes in direct contact with plants or exposed skin, but it can also be advantageous when applied correctly as a

fertilizer.

When anhydrous ammonia is injected into the soil, the ammonia gas (NH_3) reacts rapidly with moisture in the soil and is converted to ammonium (NH_4^+). This ammonium is no longer in a gas form, and, being positively charged, it can be bound to clay and organic matter particles within the soil. This bound ammonium does not readily move in most soils, and leaching is not an issue except for some sandy soils with very low cation exchange capacity (CEC).

While this process does require moisture, the amount of water needed is quite low. The physical properties of dry soils cause the most common problems when applying anhydrous ammonia to dry soils. Poor closure of the injection furrow and voids and cracks in the dry soil can allow the ammonia to escape to the surface before converting it to ammonium. Using deeper injection depths and wing sealers in dry soils increases the amount of soil the gas comes into contact with and can significantly reduce ammonia losses back through the surface. Closing disks can also help seal the injection furrow and prevent losses at the injection site. **More information on applying anhydrous to dry soils is available in a companion article in this eUpdate issue**.

When soil temperatures are above freezing, specific soil microbes convert ammonium into nitrate-N (NO_3^-) in a process called nitrification. Since this is a microbial reaction, soil temperatures strongly influence it. The higher the temperature, the quicker the conversion will occur. Depending on soil temperature, pH, and moisture content, converting all the ammonia applied in the fall to nitrate can take 2-3 months or longer.

By delaying application until cold weather, most of the applied N can enter the winter as ammonium, and over-winter losses of the applied N will be minimal. Producers should wait until soil temperatures are less than 50°F at a depth of 4 inches before applying ammonia in the fall or early winter. Nitrification does not cease below 50°F, but the soil will likely become cold enough to limit the nitrification process. In many areas of Kansas, soils may stay warmer than 50 degrees well into late fall and only freeze for short periods during the winter.

Using a nitrification inhibitor can help reduce N losses from fall N applications under specific conditions, particularly when soil temperatures warm up for a period after application.

One should also consider soil physical properties when considering fall application. Fall applications of N for corn should not be made on sandy soils prone to leaching, particularly those over shallow, unprotected aquifers. Instead, fall N applications should focus on deep, medium- to heavy-textured soils where water movement through the profile is slower.

When is nitrogen lost?

When considering fall applications of N, remember that loss of N during the fall and winter is not usually a problem in Kansas. The conversion of "protected" ammonium to "loss-prone" nitrate during the fall and winter can be minimized by waiting to make applications until soils have cooled and using products such as nitrification inhibitors. The fact that essentially all the N may remain in the soil as ammonium all winter, coupled with our dry winters, means minimal N is likely to be lost over winter.

However, soils often warm up early in the spring, allowing nitrification to start well before planting corn. Generally, if the wheat is greening up, nitrification has begun! Thus, one potential downside of

fall application is that nitrification can begin in early March and essentially be complete by late May and June.

Summary

If anhydrous ammonia is to be applied in the fall, several factors must be considered, including soil texture, temperature, and soil moisture. Consider the following guidelines:

- Do not apply anhydrous ammonia in the fall on sandy soils.
- On silt loam or heavier-textured soils, wait to apply anhydrous ammonia until soil temperatures at the 4-inch depth are below 50 °F. Grass-covered soil at the 2-inch depth typically reaches 50 degrees around November 20 in central Kansas (Figure 2). Depending on the soil type, you can expect the 4-inch depth to lag behind that date and earlier if the ground is bare.
- Deeper injection depths (6 to 8 inches), wing sealers, and closing disks can help mitigate application problems when soils are dry.
- Use a nitrification inhibitor with anhydrous ammonia to help reduce fall nitrification.
- To check the soil temperature in your area, visit the K-State Research and Extension Weather Data Library at http://mesonet.k-state.edu/agriculture/soiltemp/

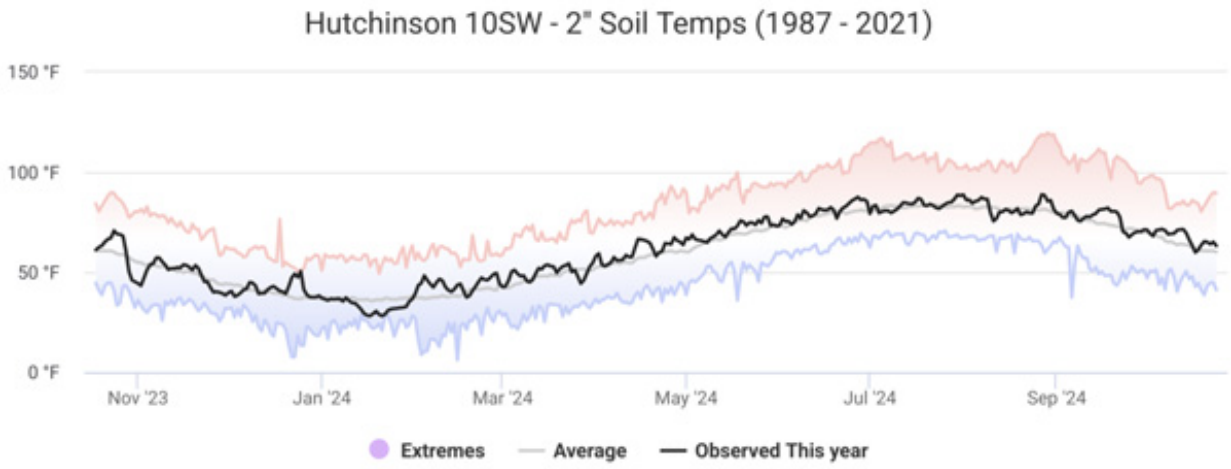

Figure 2. Hutchinson 10SW Mesonet station 2024 2-inch soil temperature compared to climatology (1987-2021) under grass cover. Soil temperatures in individual fields in any given

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2. Can dry soil affect anhydrous ammonia applications?

Many producers are getting ready for fall anhydrous application. However, very dry soils in many areas of Kansas can be a concern. When the soil is dry, will it be able to hold anhydrous ammonia, or will some or most of the ammonia be lost shortly after application?

There are three factors that come into play when applying anhydrous ammonia to dry soils.

Chemical - Ammonia (NH_3) needs to react with water shortly after application in order to convert into ammonium (NH_4^+), which is a molecule that can adhere to clay and organic matter in the soil. Ammonia is very soluble in water. After it is placed in the soil, NH_3 reacts with water in the soil to form NH_4^+, which is retained on the soil cation exchange capacity sites. This process takes a little time – it does not occur immediately upon contact with the soil. The main controlling factors in the conversion of NH_3 to NH_4^+ are soil temperature, soil moisture, and soil pH. The higher the soil temperature and the wetter the soil, the more rapid the conversion occurs. If the ammonia does not react with water, it will remain as a gas that could escape from the soil. Also, the equilibrium between NH_3 and NH_4^+ is affected by soil pH. More NH_3 will remain unconverted in the soil longer at higher application rates and at higher soil pH levels.

Physical - Dry soils may be cloddy, with large air spaces where the soil has cracked. This can allow the gas to physically escape into the air before it has a chance to be converted into ammonium. Getting the soil sealed properly above the injection slot can also be a problem in dry soils. Loss of the ammonium gas can begin immediately after application and continue for several days to weeks if there is no moisture. N losses can be greater than 50%.

Application depth - The deeper the ammonia is applied, the more likely the ammonia will have moisture to react with, and the easier the sealing.

So, can anhydrous ammonia be applied to dry soils?

The answer is **yes** - as long as the ammonia is applied deep enough to reach some moisture and the soil is well sealed above the injection slot. If the soil is dry and cloddy, there may be considerable losses of ammonia within just a few days of application if the soil is not well sealed above the injection slot and/or the injection point is too shallow.

Producers should be able to tell if anhydrous is escaping from the soil during application or if the ammonia isn't being applied deeply enough. If ammonia can be smelled, the producer should either change the equipment setup to get better sealing or deeper injection or wait until the soil has better moisture conditions.

In short, producers can minimize this potential loss problem by applying the anhydrous ammonia at the proper depth (at least 6 to 8 inches in 30- to 40-inch spacings) and using covering disks behind the knives or sealing wings ("beaver tails") on the knives.

Please see the companion article in this eUpdate issue for more information about other factors to consider when applying anhydrous ammonia in fall.

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3. Entry deadline is approaching for the 2024 Kansas Soybean Yield and Value Contest

All soybean farmers in Kansas are encouraged to enter their competitive soybean crop into the Kansas Soybean Yield Contest. The statewide Kansas Soybean Value Contest, which analyzes protein, oil, and other soybean qualities, is also open for entries. Strong participation across the state provides a snapshot of growing conditions in each region and allows friendly competition among peers.

The Kansas Soybean Association has implemented important date changes for the 2024 contests, including an expedited postmark-by date of November 15 and revisions to the announcement timeline. Results are expected to be released mid-December, followed by official winner recognition at the inaugural Kansas Soybean Celebration on January 31 in Salina.

Yield contest districts are determined by region, tillage method, and irrigation status, with 18 districts in consideration. No-till on the Plains supplies additional awards in the no-till categories. Farmers may enter multiple categories but only one entry per field.

Eligible fields must consist of at least five contiguous acres as verified by the Farm Service Agency, GPS printout, or manual measurement. A non-relative witness, either Kansas State Research and Extension personnel or a specified designee, must be present at harvest and should ensure that the combine grain hopper is empty prior to harvest. Official elevator-scale tickets with moisture percentage and foreign matter included must accompany entries to be considered.

The Kansas Soybean Commission sponsors a monetary prize for the top three finishers in each district, as well as an additional $1,000 for the overall dryland and irrigated winners and any who top the 114.3 bushel-per-acre record. The amounts per district are that the first place receives $300, the second receives $200, and the third receives $100.

Individuals looking to submit a value contest entry should send a 20-ounce sample, which Ag Processing, Inc. evaluates to determine its value. Monetary awards are also given to the three highest-value entries.

Farmers may enter both the yield and value contests and must do so to be eligible to win a trip to Commodity Classic in Denver. The top yield entry, top value entry, and one randomly drawn entry earn a trip to the 2025 Classic March 2-4. All participants receive a T-shirt.?

A full guide of contest rules and regulations and the digital entry form are available at kansassoybeans.org/contests. Questions may be directed to the Kansas Soybean office by phone at 877-KS-SOYBEAN (877-577-6923) or local KSRE offices.

4. Kansas Drought Update and Climate Report for the week ending October 22, 2024

Temperature summary

The period began on a chilly note, with the first widespread freeze of the fall season on the morning of the 16th for most of the state. Only a dozen Mesonet sites failed to reach 32°F. Five sites registered very cold lows in the teens, led by Phillipsburg, where the low was 18°, the week's coldest reading and also the coldest temperature in the state so far this fall. Over a dozen record lows were set or tied that morning, including at Hutchinson (23°), Salina (24°), Hill City (24°), Russell (25°), and Chanute (27°). The 16th was the only day below normal for the period, and a rapid warmup ensued the following day. Morning lows after the 16th averaged above normal for the remainder of the period. Lows from the 18th through the 22nd averaged from 49° to 52° or 8 to 10 degrees above normal.

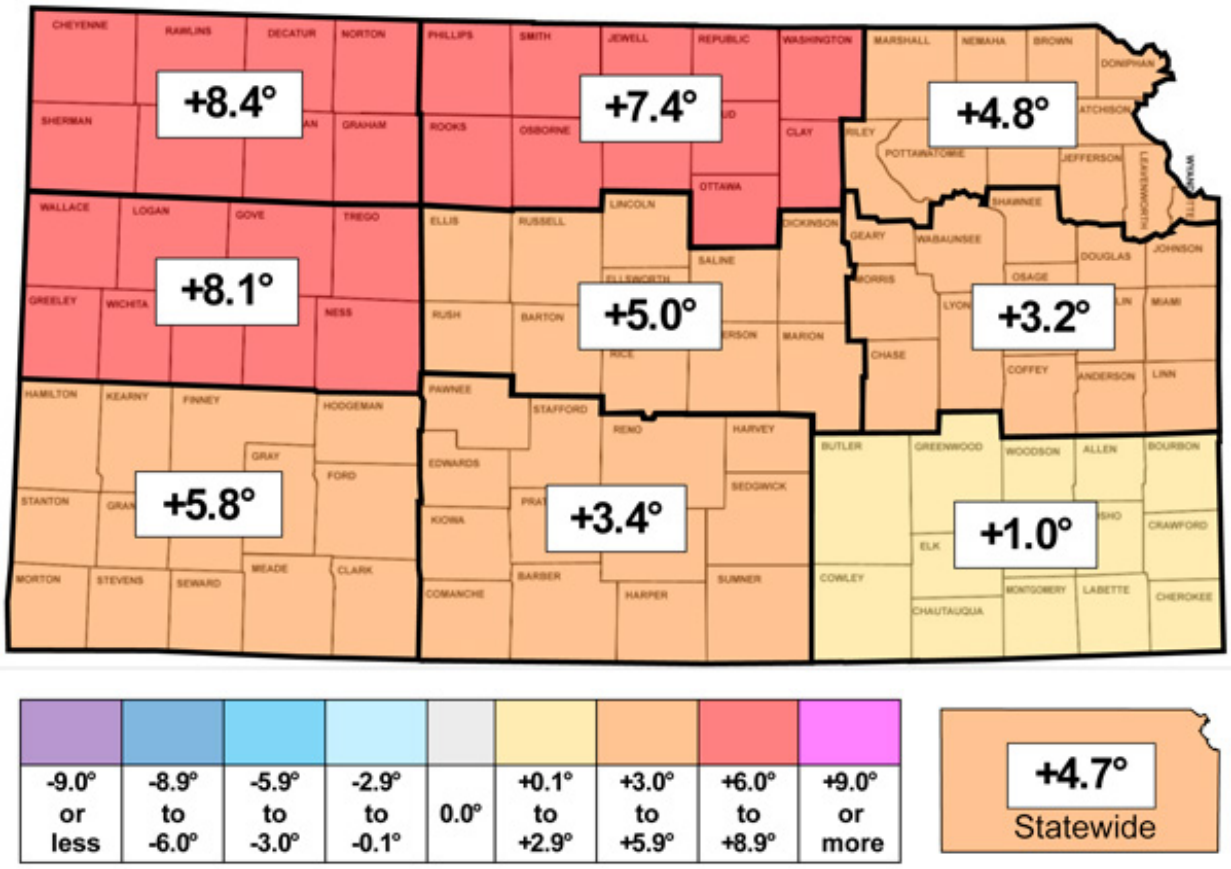
Daytime highs averaged in the mid to upper 70s from the 17th through the 21st. The 22nd was the warmest day, with a statewide average high of 85°. A few 90s were recorded in southern Kansas. Four locations shared honors for the week's warmest temperature of 93° that afternoon: Chanute, Winfield, Parsons, and Sedan. This was warm enough to tie or set new record highs for the date at all four locations. Additional record highs for the 22nd were set at Wichita (88°), Emporia (88°), and Olathe-Industrial Airport (86°). The statewide 7-day average temperature was 59.5°, or 4.7° above normal (Figure 1). All nine divisions were above normal; divisional departures ranged from +1.0° in southeast to +8.4° in northwest Kansas. The average temperature this month through the 22nd stands at 62.5°, or 4.4° above normal. If the average remains at this value at the end of the month, it will be the 4th warmest October on record and the warmest October in Kansas since 1963.

Precipitation summary

A storm system that was forecast last week to deliver significant precipitation to the western half of the state delivered some rainfall, but not as much as was anticipated. Totals in southwest Kansas, the area expected to receive up to 2 inches of rain, were much lower, as locations further north ended up getting more rain. Counties along the Colorado border in west central and northwest Kansas generally picked up from one-half to one inch of rain. Further east, there were isolated pockets of higher totals. CoCoRaHS observers in Ness, Trego, and Graham Counties reported between 1 and 1.25" precipitation. One county had even more rainfall. A severe thunderstorm impacted parts of Phillips County on the afternoon of the 21st. The Kansas Mesonet site 1-mile southwest of Phillipsburg received 2.60" of rain in just 80 minutes. Large hail accompanied this storm, as the town of Glade was pelted with golf-ball size hail, and there were multiple reports in Phillipsburg of hail from 1 to 1.5" in diameter. Further to the east, lighter amounts were reported, and areas east of a line from Wichita to Manhattan to Hiawatha picked up a quarter inch of rain or less. Most of southeastern Kansas missed out entirely, and many locations are still precipitation-free for the month, including El Dorado, Independence, Iola, Parsons, and Pittsburg.

The statewide average precipitation for the 7-day period was 0.27", or 46% of the normal weekly amount of 0.58" (Figure 1). Two divisions had above-normal precipitation and were also the two wettest divisions this past week: west central (0.49"; 127%) and northwest (0.46"; 112%). Southeast Kansas was the driest division (0.02"). The average precipitation for October is also 0.27", which would be the 2nd driest October on record and the driest since 1952 should this amount end up as the monthly statewide average. Since April 1st, the average precipitation across Kansas is 18.69", which is 78% of the normal amount of 23.95", a departure of -5.26". Southeast Kansas is now the division with the largest departure from normal (-6.83"), followed by central (-6.51") and north central

(-6.10") Kansas. Divisional percentages of normal range from 72% in central Kansas to 95% in southwest Kansas. A total of 84% of the state is running below normal for the growing season. Since January 1st, the average statewide precipitation is 21.96". This amount is 79% of normal or a departure of -5.74". All divisions remain below normal for the year; departures from normal range from -7.36" in southwest to -1.24" in southwest Kansas. A total of 85% of the state is below normal for the year.



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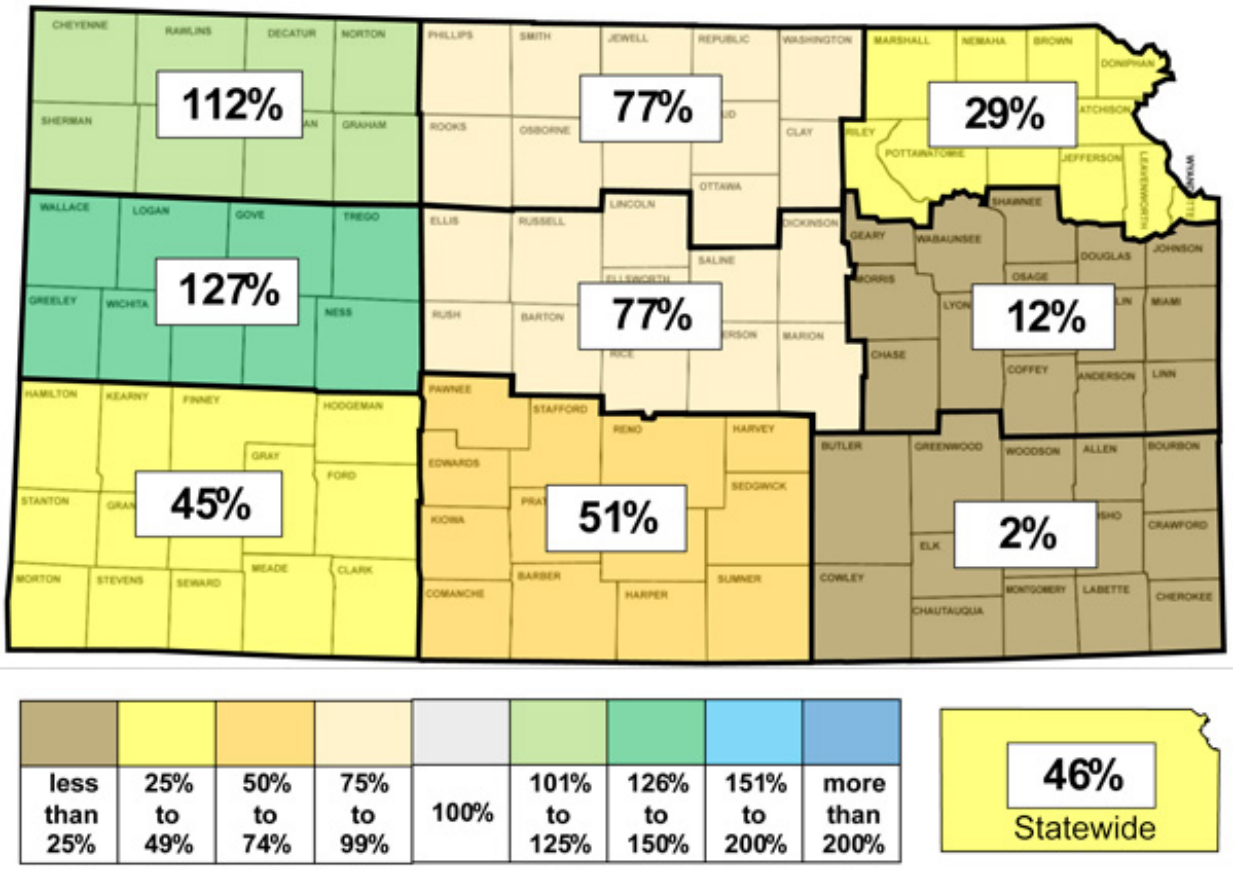

Figure 1. This week's departure from normal temperature (°F, top) and percent of normal precipitation (bottom) by Kansas climate division. Source: MRCC.

Growing degree days, evapotranspiration, and soil temperatures

There was an average of 95 growing degree days across the state this past week, or 27 above the normal amount of 68. Divisional totals ranged from 88 in northwest to 98 in north central Kansas. Departures ranged from +20 in southeast to +35 in north central Kansas. Since April 1st, there has been an average of 3,991 growing degree days in Kansas, or 201 above normal. There was an average of 1 corn stress degree day across the state this past week which is normal. The average evapotranspiration for grass across the state for the week was 1.07". This is well above the normal of 0.82" for the 7-day period. Divisional averages ranged from 0.96" in east central to 1.19" in central Kansas. The statewide average 2" soil temperature across the Kansas Mesonet fell 4.1° this week to 61.1°. This average is 2.7° above normal.

Drought update

In this week's US Drought Monitor update (Figure 2), one-category degradations were made to much of the eastern half of Kansas, with two small areas of degradation in southwest Kansas. Wichita is now in D1, and Topeka is now in D2. A total of seven counties are partially in D3, all along the Oklahoma and/or Missouri borders. The D3 area includes the towns of Coffeyville, Oswego and Baxter Springs.

Collectively, D3 covers 2.1% of Kansas, the highest amount since the first week in January. Only 1.7% of the state remains free of any drought status, down from 3.3% last week. Parts of three counties comprise this area: Meade, Clark and Comanche. A total of 25.9% of the state is in D2 or worse status, up nearly 10 percent since last week. The statewide Drought Severity and Coverage Index (DSCI) rose 23 points and now stands at 202, the highest DSCI since last November.

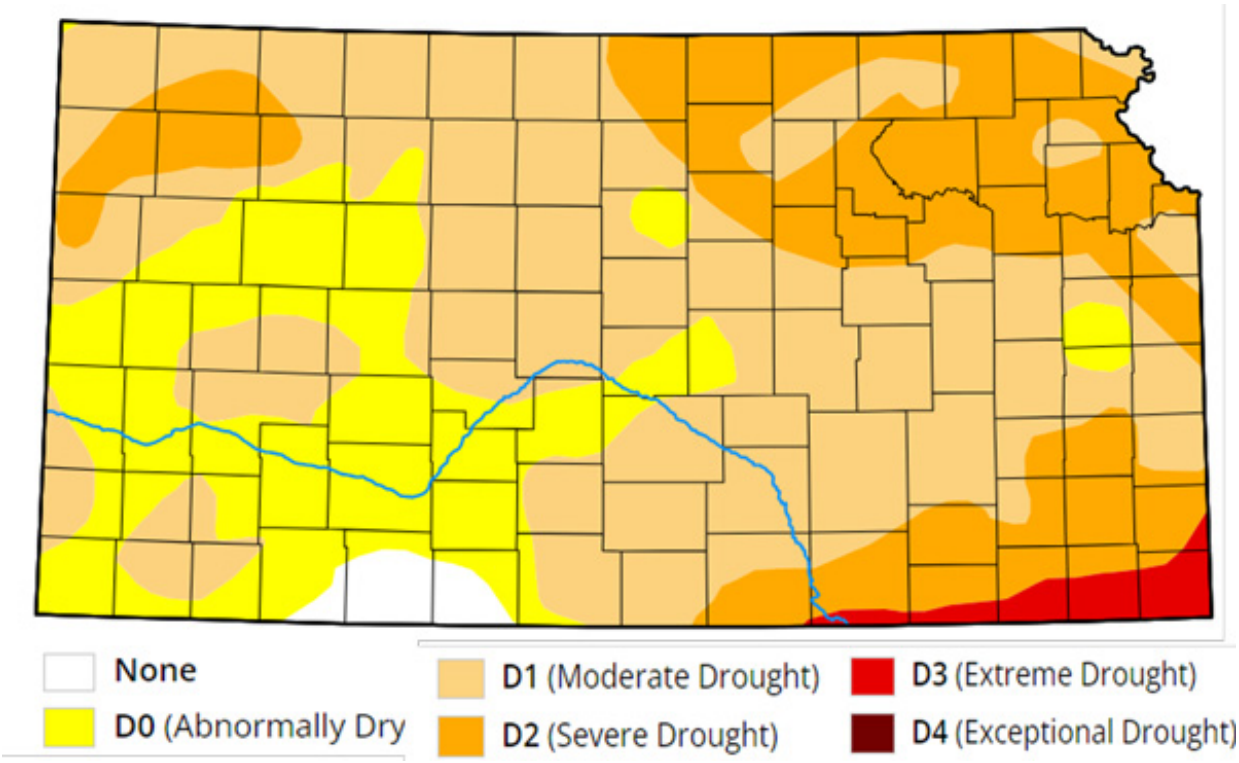

Figure 2. Drought status for the week ending on October 22, 2024. Source: UNL Drought Monitor.

Weather outlooks

The Weather Prediction Center's 7-day precipitation forecast, valid for October 23 through the 29th, forecasts no precipitation in the western third of Kansas (Figure 3). In the eastern two-thirds of the state, below-normal precipitation is expected in most areas, but parts of east central Kansas could receive as much as one inch of rain. Another very mild week is expected, with temperatures expected to average from 9 to 14 degrees above normal. Record highs may be set on the 24th, with highs in the 80s to low 90s expected. The average daily high and low across Kansas for this period are 65° and 39°. Average 7-day precipitation is 0.32" in western Kansas, 0.42" in central Kansas, and 0.63" in eastern Kansas.

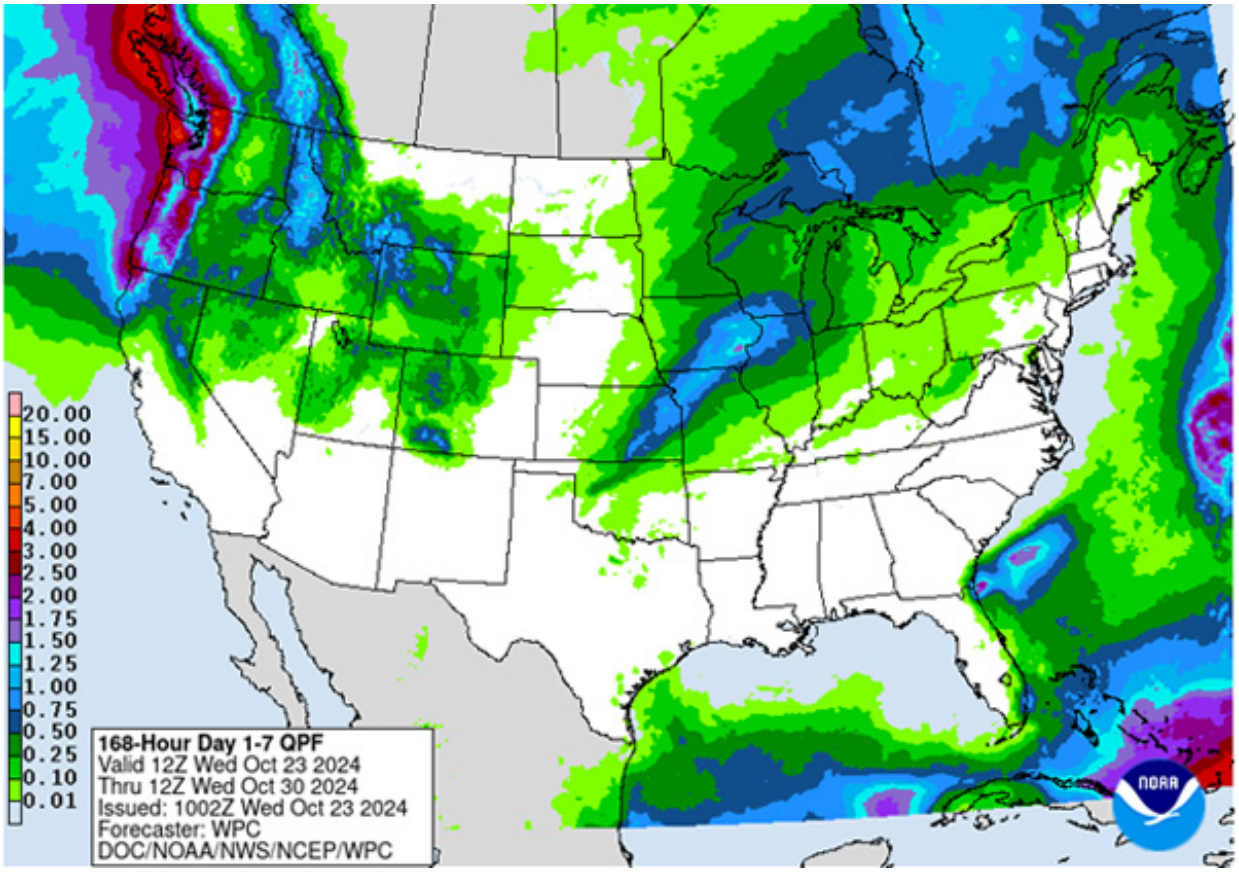

Figure 3. The National Weather Service Weather Prediction Center's (NWS-WPC) 7-day precipitation forecast.

The 8 to 14-day outlook, valid for October 30th through November 5th, favors above-normal temperatures in all areas, with increasing probabilities from northwest to southeast (Figure 4). The probabilities of above-normal temperatures range from 39% in the far northwest to 60% in the southeast corner of Kansas. Precipitation probabilities favor above-normal amounts, with increasing probabilities from west to east. Probabilities range from 36% in western to 46% in eastern Kansas.

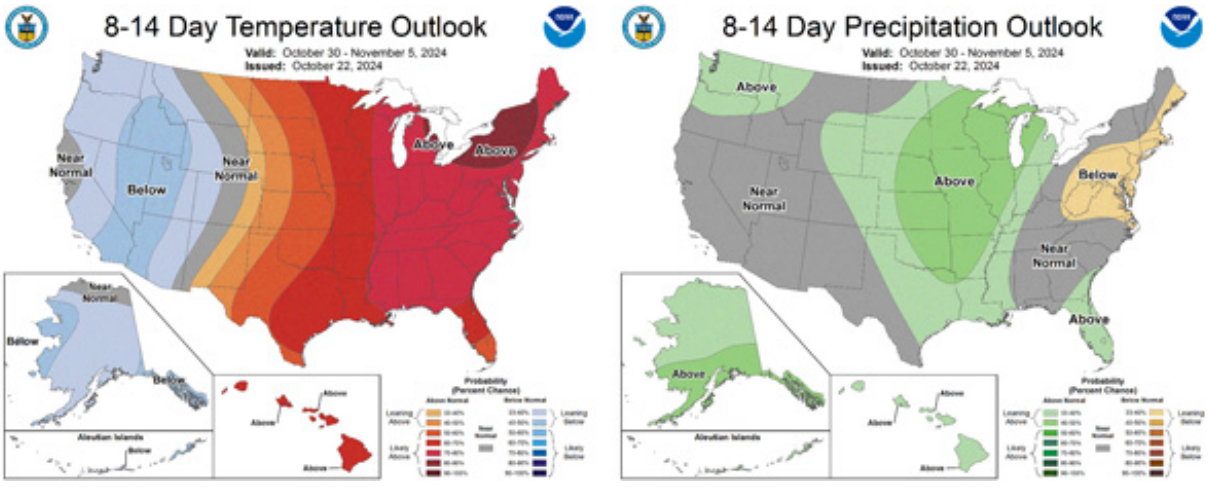

Figure 4.The National Weather Service Climate Prediction Center's (NWS-CPC) 8 to 14-day

temperature (left) and precipitation (right) outlooks.

Looking even further ahead, the Climate Prediction Center's weeks 3 and 4 outlooks, valid for the 14-day period from November 2 through the 15th, slightly favors above-normal temperatures (50-55%) across far southern and east central Kansas, with equal chances of above and below normal temperatures in the remainder of the state (Figure 5). Below-normal precipitation is favored in the western half of the state, with the highest probabilities in far western Kansas (55-60%). Equal chances of above and below-normal precipitation are forecast for the eastern half of Kansas.

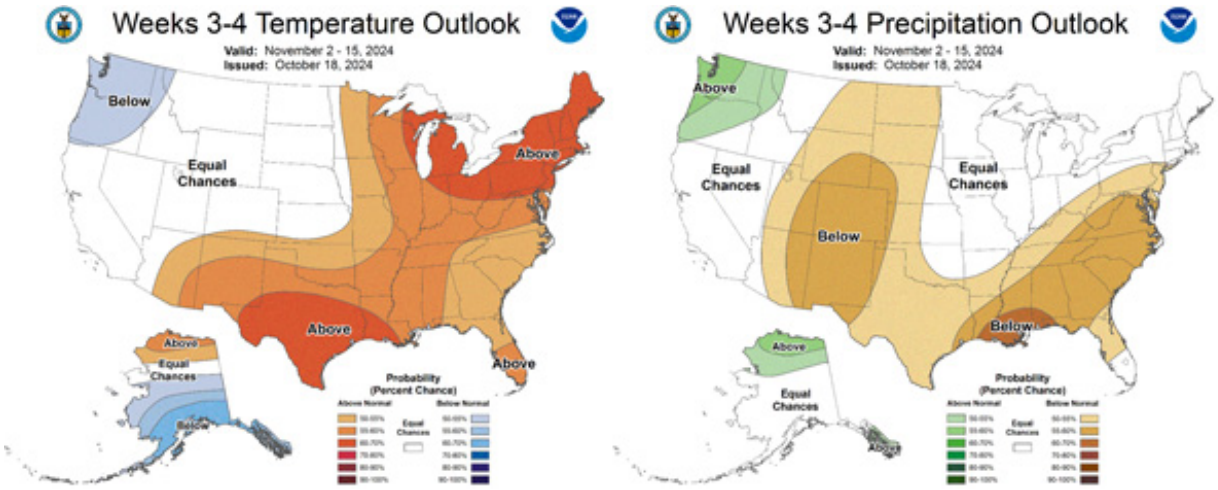

Figure 5.The Climate Prediction Center's weeks 3 and 4 outlooks for temperature (left) and precipitation (right).

This article is a shortened version of the weekly Kansas Drought Update and Climate Report**.** If you would like to receive the full report delivered to your email each week, please send a request to Matt at msittel@ksu.edu. He will add you to his distribution list.

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5. 2024 K-State Crop Pest Management Schools - Nov. 19 and 20

K-State Research and Extension and the Northwest/North Central Extension Districts are hosting two Crop Pest Management Schools in mid-November. The first one is set for Nov. 19 in Beloit at the Beloit Methodist Church, and the second one will take place on Nov. 20 in Dighton at the United Methodist Church. Both events will begin at 7:45 a.m. with registration and conclude at 5:00 p.m.

Join us in person to learn how to control the latest pests – weeds, insects, and diseases – affecting all crops in central and western Kansas!

Event Schedule:

7:45 **Registration**
8:05 **Welcome**
8:15 **Weed research update for western KS** - Jeremie Kouame, Weed Scientist at Hays
9:10 **Row crop disease that should be on your radar** – Rodrigo Onofre, Row Crop Pathologist
10:05 **Break**
10:20 **A new corn disease that should be on your radar** – Anthony Zukoff, Entomologist, Garden City
11:15 **Insect outlook for 2025** – Anthony Zukoff
12:10 **Lunch**
12:50 **Drones in agronomic pest management** – Deepak Joshi, Precision Ag Specialist
1:45 **Recipe for tank mixing successfully** – Sarah Lancaster, Weed Science Specialist
2:40 **Break**
2:55 **Wheat diseases to watch for next spring** – Jeanne Falk Jones, Craig Dinkel, Sandra Wick
3:50 **Kansas Regulation (Core Hour)** – Kansas Dept. of Ag
4:45 **Questions/Adjourn**

Commercial Applicators will earn 1 Core Hour & 7 Hours for 1A, certified by the Kansas Department of Agriculture. Certified Crop Advisors (CCA) will also earn 8 Pest Management Credits. These schools would also be an excellent educational opportunity for producers.

The cost to participate is $50 if registered by **November 11**; after that date, the fee is $75. To register, go to https://www.wkrec.org/events/crop-pest-management-school.html. You can also scan the QR code below. If you register at the door, cash and checks will be accepted. We are unable to accept credit/debit cards at the door. If inclement weather occurs, the program will be held at a later date in an online format.

For questions, please contact Jeanne Falk-Jones, Multi-County Agronomist, at 785-462-6281 or Sandra Wick, Post Rock District Crop Production Agent, at 785-282-6823.

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For 1A Commercial Applicators, 7 hours and core hour
For Certified Crop Advisors, 8 pest management credits
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