



K-STATE
Research and Extension

Extension Agronomy

eUpdate

03/26/2026

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.

Subscribe to the eUpdate mailing list: <https://listserv.ksu.edu/cgi-bin?SUBED1=EUPDATE&A=1>

1. Spring Planting in Kansas: Soil Temperature and Moisture Status.....	3
2. Corn Planting: Optimal Seeding Rate Recommendations.....	9
3. Soybean Planting Date and Maturity Group Selection for Kansas.....	13
4. Soybean Row Spacing and Seeding Rates: What Works Best in Kansas?.....	17
5. Late Freeze Effects on Winter Canola.....	21
6. K-State Tools for Interpreting Soil and Plant Tissue Tests for Fertility Management.....	25
7. Updated K-State Insect Pest Management Guides Now Available.....	29
8. An Early Spring Heat Wave Brings Summer-Like Temperatures to Kansas.....	31

1. Spring Planting in Kansas: Soil Temperature and Moisture Status

Spring planting decisions in Kansas should be guided by soil conditions rather than calendar dates. Both soil temperature and soil moisture play critical roles in determining successful crop emergence and early-season vigor. This article provides an overview of current soil temperature and moisture conditions across the state and discusses factors growers should consider as planting decisions approach.

Soil temperature

Despite a brief cool period early last week, March temperatures have been significantly warmer than normal. With this in mind, many are likely considering early planting. However, one should monitor soil temperature and moisture trends along with the forecast for the upcoming weeks.

For the 7-day period between March 17 and 24, average soil temperatures at 2 inches across Kansas districts ranged from 48°F to 62°F (Figure 1). You can monitor soil temperatures across the state by using the Kansas Mesonet’s soil temperature tracking tool at <https://mesonet.k-state.edu/agriculture/soiltemp/>.

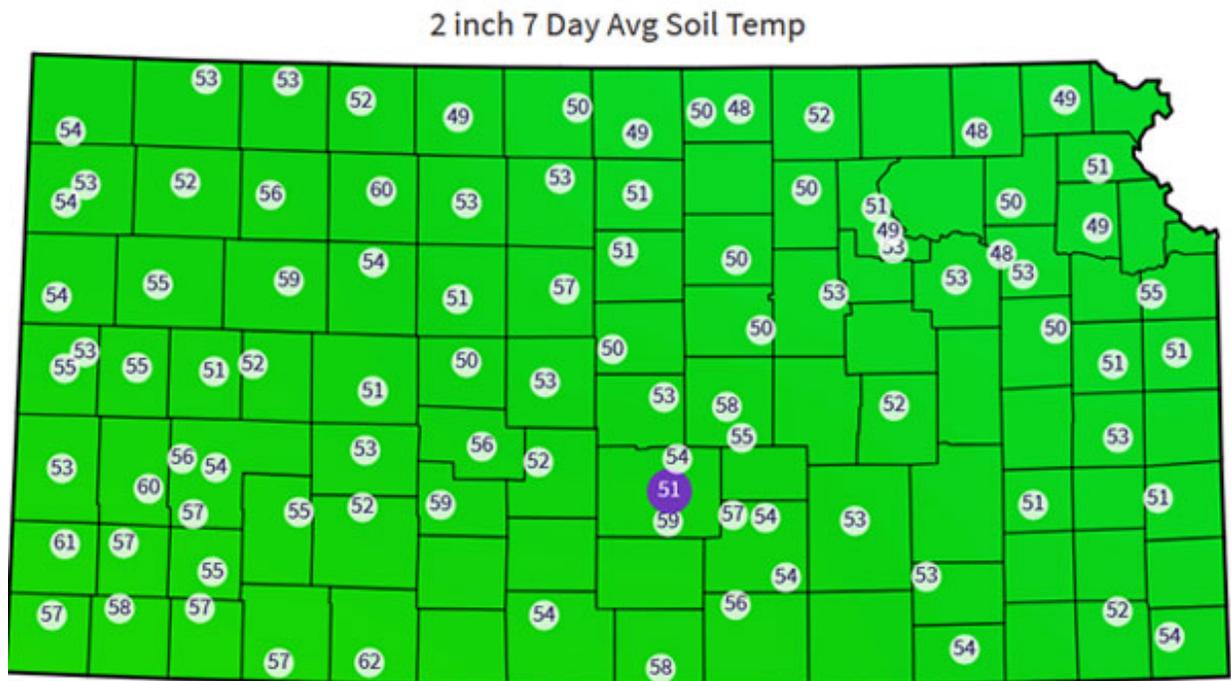


Figure 1. Average soil temperatures at 2-inch soil depth for the week of March 17 to 24, 2026. Source: Kansas Mesonet. (<https://mesonet.k-state.edu/agriculture/soiltemp/>)

Projections for the next 6-10 days lean toward above-normal temperatures statewide (Figure 2). In parallel, there is a slight favoring of above-normal precipitation across the entire region, which may help maintain cool soil temperatures (Figure 3). However, the probability of above normal precipitation isn’t overly high, just slightly more than normal/below normal chances for the period.

Topsoil temperature differences are field-dependent and are influenced by soil type, soil moisture, residue cover, tillage, landscape position, and many other factors. For example, wet soils under a no-

tillage system are expected to warm up more slowly. Dry soils will fluctuate more rapidly, matching air temperatures, particularly if skies are clear.

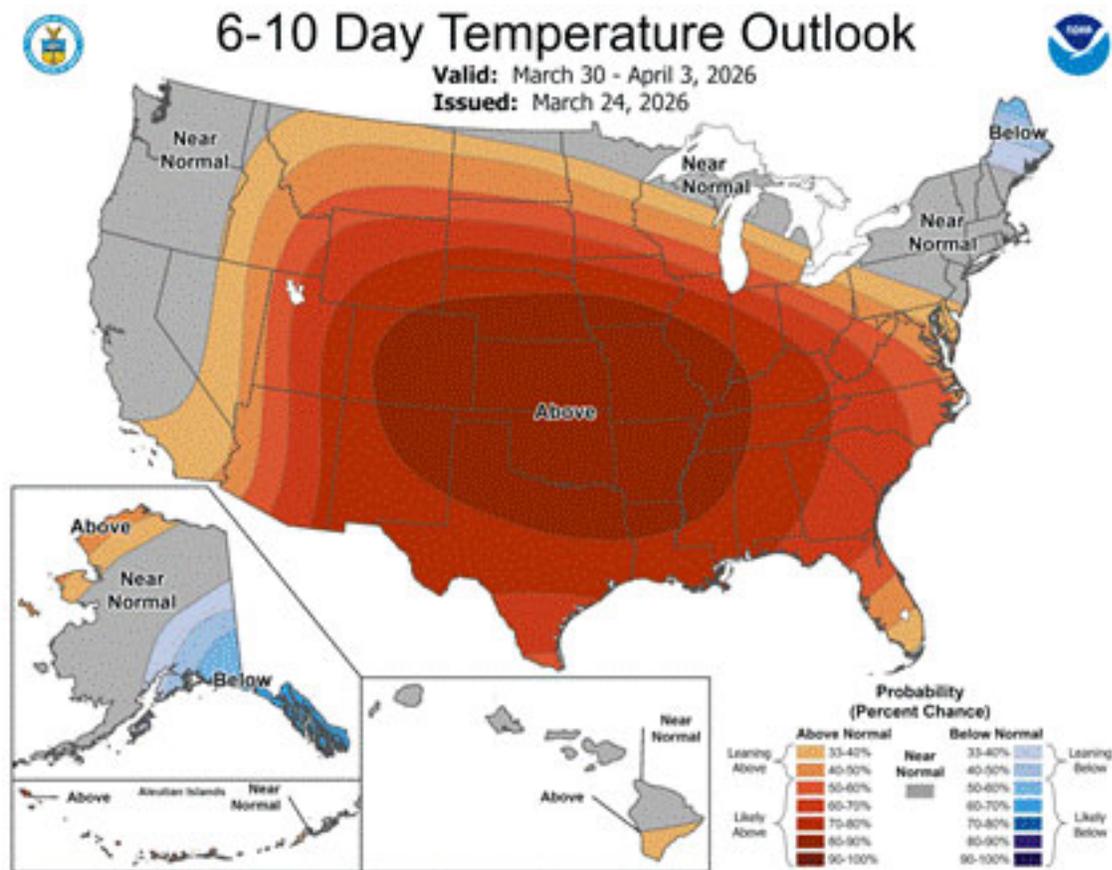


Figure 2. 6 to10-day temperature outlook for March 30 – April 3, 2026. Source: NOAA.

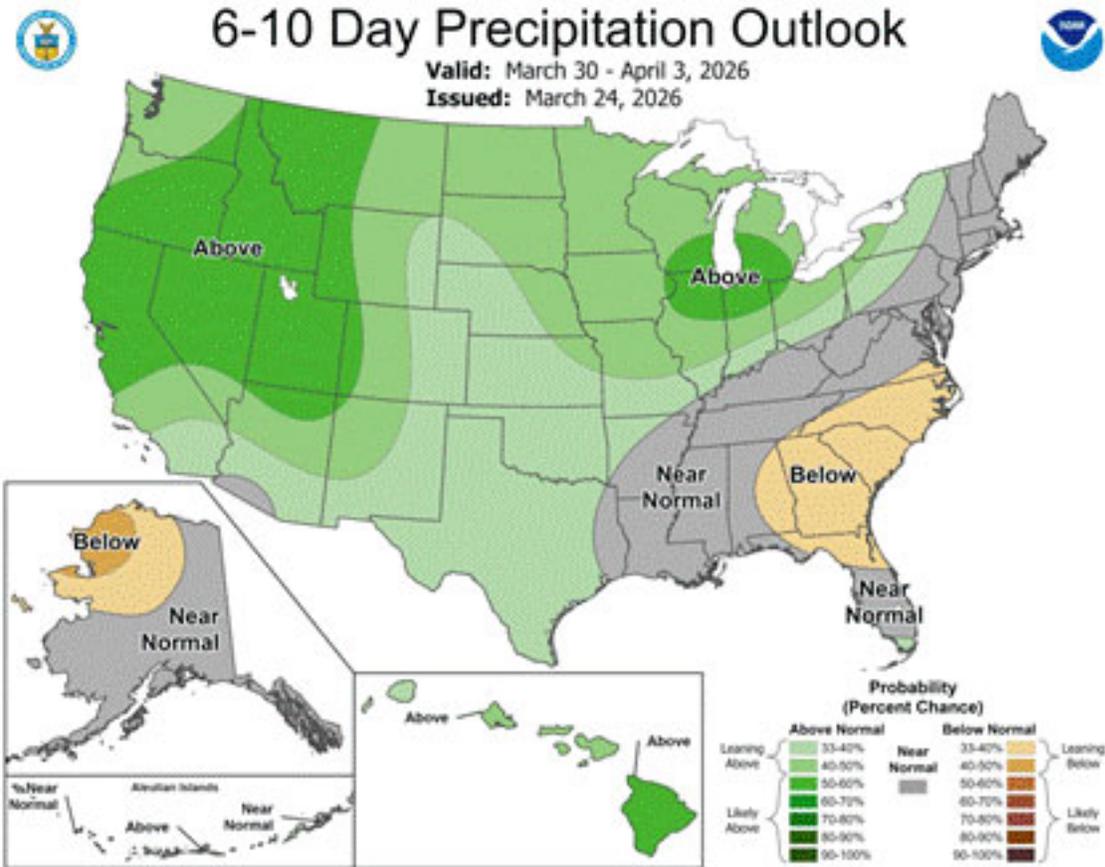


Figure 3. 6 to10-day precipitation outlook for March 30 – April 3,2026. Source: NOAA.

Soil moisture

Current soil moisture is lowest across portions of western Kansas (Figure 4), where some areas have gone three months without a wetting (0.1" in a day) rainfall. Precipitation earlier this month improved moisture in the eastern parts of the state. However, even those locations have observed a significant drying trend with recent hot/dry conditions.

Percent of Saturation at 5 cm

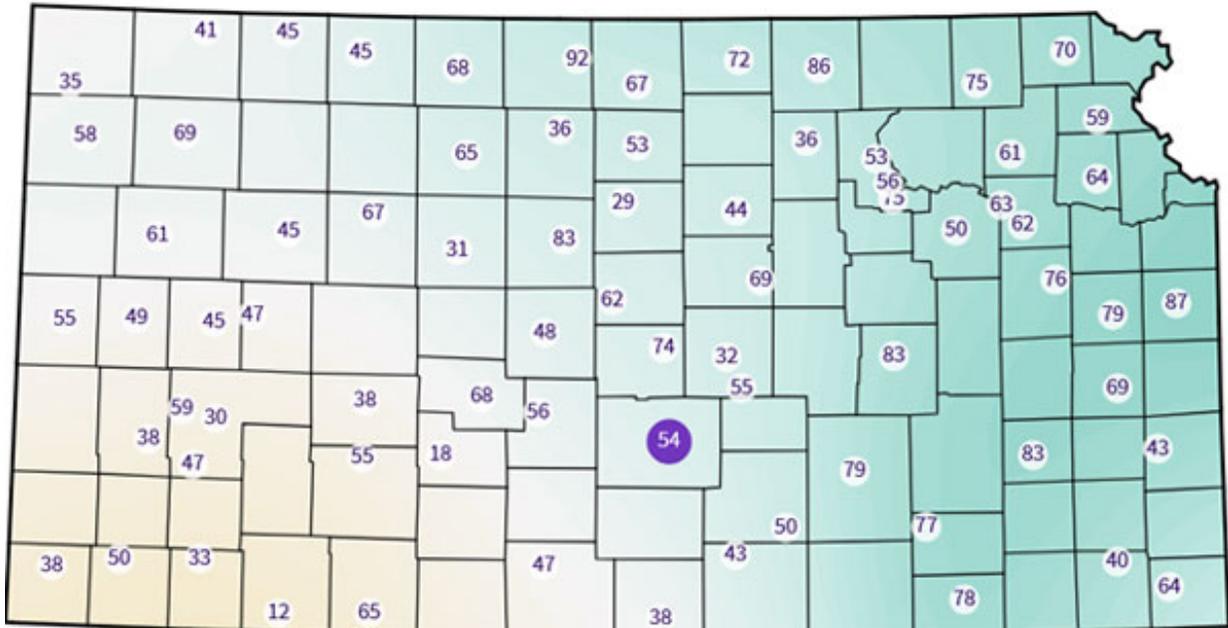


Figure 4. Soil moisture as percent of saturation at 2 inches (5 cm) as of March 24, 2026. Source: Kansas Mesonet <https://mesonet.k-state.edu/agriculture/soilmoist/>

Only a very small portion of the state along the Missouri border has observed above-normal precipitation over the last two weeks, with the remainder of the state measuring practically no moisture (Figure 5). No substantial change in moisture is expected in this region, and March is likely to be one of the driest on record without a drastic change in the forecast (Figure 3).

Departure - 14 Days Through Yesterday

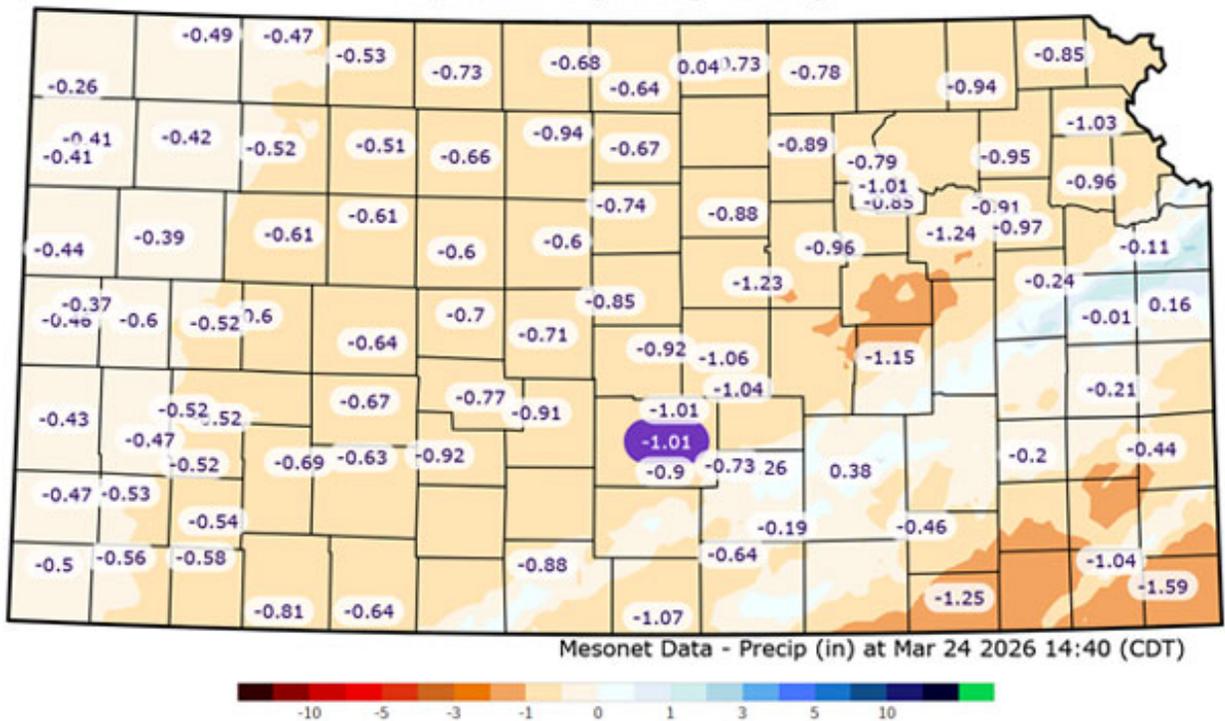


Figure 5. Departure from normal precipitation for the last two weeks ending March 24, 2026. Shades of orange indicate below normal precipitation. Source: [Kansas Mesonet](#).

Management considerations

Optimal soil temperature for crop emergence

Corn and soybeans share a minimum germination and early growth temperature of 50°F. When soil temperatures remain at or below 50°F after planting, the damage to germinating seeds can be particularly severe. This is because the seed imbibes (absorbs) cold soil water within the first 24-48 hours after planting, causing damage to the cell membranes that assist in germination. This can result in seeds that are swollen, but do not germinate, or germination that stops after the radicle/coleoptile begins to emerge.

Uniformity and synchrony in emergence are critical and primarily achieved when soil temperatures are consistently above 55°F. Uneven soil temperatures around the seed zone can lead to non-uniform germination and emergence. Lack of uniform emergence can greatly impact corn yield potential due to inter-plant and weed competition and limited tillering capacity compared to other grains. Soybeans often overcome emergence issues due to their ability to branch

Impact of a hard freeze

Both corn and soybeans can be damaged by a hard freeze after emergence. The impact of a hard freeze on emerged corn and soybeans will vary depending on how low the temperature drops, the intensity and duration of the low temperatures, field variability, residue distribution, tillage system, soil type, moisture conditions (more severe under dry conditions), and the plant's growth stage.

Injury on corn is most likely to young seedlings or plants beyond the V5-6 growth stage when the growing point is above the soil surface.

For soybeans, the most susceptible stage is at emergence (cotyledons emerged) because the growing point is above the soil surface and more exposed to the cold temperatures. The most common sign of the impact of freezing temperatures on soybeans is damage to the stem and yellowing of the cotyledons.

The average day for the last spring freeze (32°F) varies considerably across the state (Figure 6). From southeast to northwest Kansas, the earliest last spring freeze date is April 1-14, and the latest is May 5-12. Thus, corn planting dates before the second week of April in the southeast or the second week of May in the northwest would pose a high risk of late-spring frost damage.

Average Date of Last Spring Temp $\leq 32^{\circ}\text{F}$

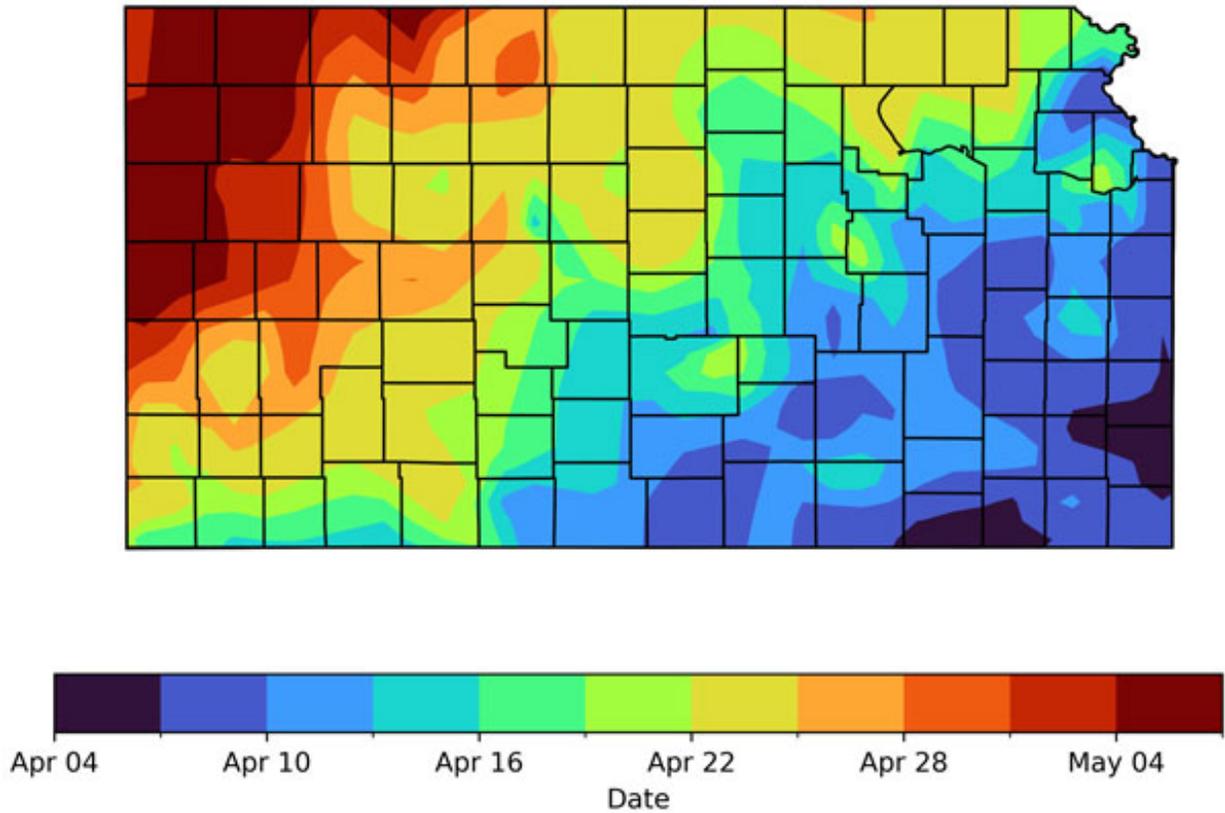


Figure 6. Average last spring freeze (32 degrees F) for Kansas. Source: Kansas Mesonet. Map created by Matthew Sittel.

More information about the planting status of summer row crops will be provided in upcoming issues of the Agronomy eUpdate. Stay tuned!

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu

Logan Simon, Southwest Area Agronomist
lsimon@ksu.edu

Jeanne Falk Jones, Northwest Area Agronomist
jfalkjones@ksu.edu

Christopher "Chip" Redmond, Kansas Mesonet Network Manager
christopherredmond@ksu.edu

2. Corn Planting: Optimal Seeding Rate Recommendations

When determining the optimal seeding rate for corn, it is important to remember that management, hybrid, and environment interact to determine the optimal seeding rate. Producers may look back at their corn crop from the previous growing season or wait until the current growing season is nearly complete to evaluate whether the corn seeding rate they have used was adequate. Management factors often overlooked include planting date, nitrogen fertilization, row spacing, and crop rotation. All affect optimal seeding rates differently.

Although specific hybrids may respond differently, the following guidelines may help determine whether the selected corn seeding rates need adjustment.

Few kernels per ear: If more than 5% of the plants are barren or most ears have fewer than 250 kernels per ear, the corn seeding rate may be too high.

Too many kernels per ear: If there are consistently more than 600 kernels per ear or most plants have a second ear contributing significantly to grain yield, the corn seeding rate may be too low. Growing conditions can influence ear number and size, making it important to consider the conditions for that season when interpreting these plant responses. The hybrid can also play an important role. For example, some hybrids are non-prolific (only produce one ear per plant) at any seeding rate. For these hybrids, when ear size is pushing towards the limit, too few plants per acre can limit yield potential.

Tipping back: Don't be too concerned if a half-inch or so of the ear tip has no kernels. If kernels had formed to the tip of the ear, there may have been room in the field for more plants, which would have contributed to higher grain yield. Again, this "tipping back" will vary with the interaction among the hybrid, management, and growing environment.

Water availability: Dryland producers and those with limited well capacity should consider profile-available water at planting. While not always a reliable predictor of yield potential due to the importance of in-season precipitation, it does provide some guidance on potential outcomes. Producers with irrigation limitations, either due to regulatory or well capacity constraints, should account for them when selecting an optimal seeding rate.

Nutrient status: In addition to the growing conditions, nutrient status can also influence the final number of grains per ear. For example, severe nitrogen (N) deficiency will greatly affect grain number, ear size, and ear number. Research at the Irrigation Experiment Field near Scandia (North Central Kansas) has shown that corn seeding rates must also be increased to attain the maximum yield benefit when fertilizer rates are increased.

Keep in mind that the potential ear size and the potential number of kernels (1,000-1,200 per ear) are being determined around V5-V6 (the collar of the 5th or 6th leaf is visible). The final number of kernels is not determined until after pollination and early grain fill (R2: blister stage-R3: milk stage) due to the relative success of fertilization and the degree of kernel abortion during the early stages of grain fill.

Weather considerations

Always keep long-term weather conditions in mind. In a drought year, almost any corn seeding rate is too high for the available moisture in some areas. Although it's not a good idea to make significant changes to seeding rates based solely on recent events, it is worth considering the current moisture in the soil profile and long-term forecasts for the upcoming growing season.

For this growing season, if you think weather conditions will be more favorable for corn this year than in past years, stay about in the middle to the upper part of the range of seeding rates in the table below. If not, and you expect dry subsoils, you might want to consider moving towards the lower end of the recommended seeding rate range, with the warning that if growing conditions improve, you will have limited your top-end yield potential.

Seeding rates and plant populations

The recommended corn seeding rate and final plant population in the following tables aim to address these types of questions for typical corn-growing environments in Kansas. Adjust within the recommended ranges based on the specific conditions you expect and the hybrid you plan to use. Consult your seed dealer to determine if seeding rates for specific hybrids should be at the lower or upper end of the recommended ranges for a given environment.

Table 1. Suggested dryland corn seeding rates and target plant populations for six cropping regions in Kansas.

Region	Seeding Rate	Target Plant Population
Northwest	15,000 – 22,000	12,750 – 18,700
Southwest	14,000 – 20,000	11,900 – 17,000
North Central	19,000 – 26,000	16,150 – 23,000
South Central	19,000 – 26,000	16,150 – 22,000
Northeast	Medium: 26,000 – 30,000	Medium: 22,000 – 25,000
	High: 28,000 – 33,000	High: 24,000 – 28,000
Southeast	Short Season: 24,000 – 26,000	Short Season: 20,000 – 22,000
	Full Season: 28,000 – 30,000	Full Season: 24,000 – 26,000

Table 2. Suggested irrigated corn seeding rates and target plant populations in Kansas.

Environment	Hybrid Maturity	Seeding Rate*	Target Plant Population
		(seeds per acre)	(plants per acre)
Full irrigation	Full-season	27,500-35,000	23,375-29,750
	Shorter-season	29,000-37,000	24,650-31,450
Limited irrigation	All	22,000-27,500	18,700-23,375

* Assumes high germination and that 85 percent of seeds produce plants. Seeding rates can be reduced if field germination is expected to exceed 85%.

K-State research on corn seeding rates

An intensive review of a large database spanning the US corn growing region from Corteva Agriscience (2000-2014) was used to synthesize yield responses to plant population across varying yield environments (ranging from <100 bu/acre to >200 bu/acre).

Overall, the yield response to plant population depended on the final yield environment (Figure 1). In yield environments below 100 bu/acre, yield response to plant population was slightly negative. Yield response to plant population tended to be flat when the yield environment ranged from 100 to 150 bu/acre, positive and quadratic with the yield environment improving from 150 to 180 bu/acre, and lastly, increasing almost linearly with increasing plant populations when the yield environment was more than 200 bu/acre (Figure 1).

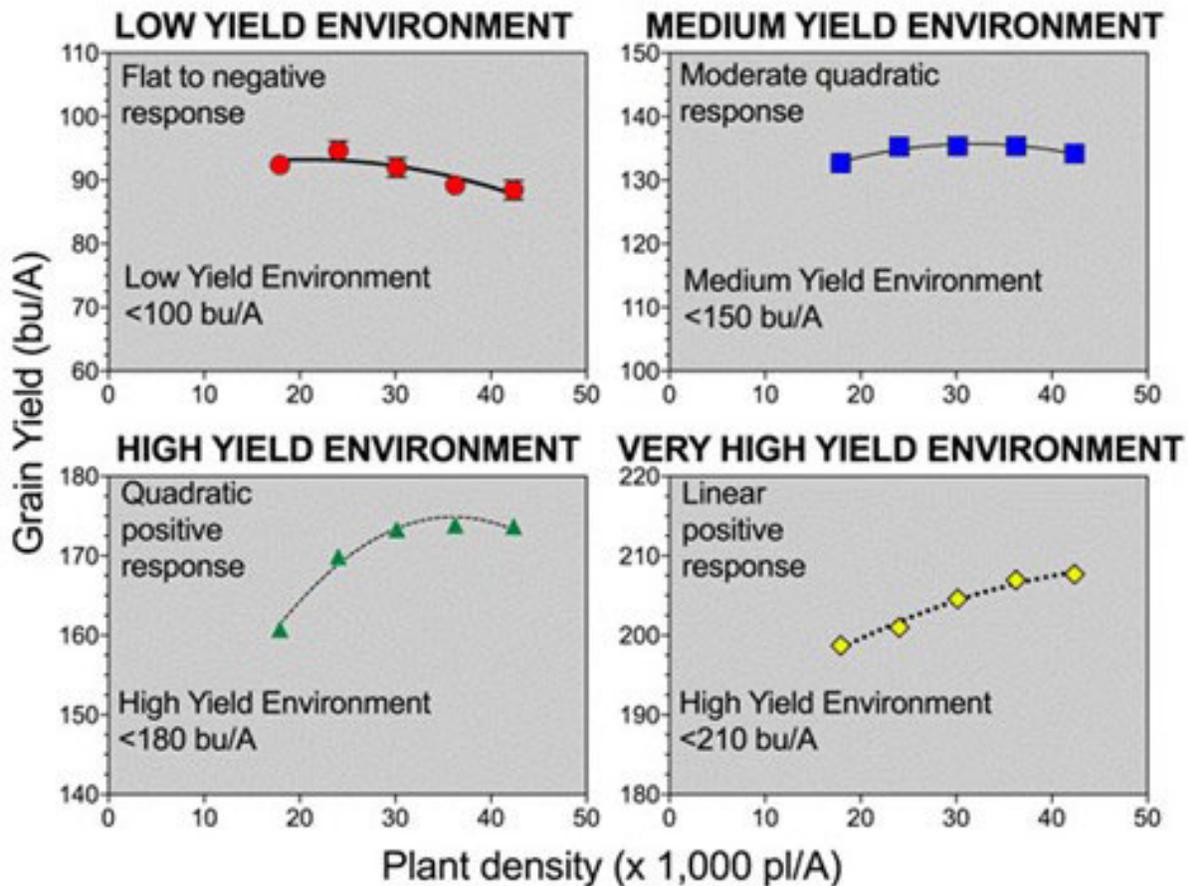


Figure 1. Corn grain yield response to plant density in four yield environments, a) <100; b) 100-150; c) 150-180; and d) > 180-210 bu/acre (Assefa, Ciampitti et al., 2016, Crop Science). Figure created by I.A. Ciampitti, K-State Extension.

As a disclaimer, the “agronomically” optimum plant population does not always match the “economically” optimal plant population. The final seeding rate depends on the genetics (hybrid), the environment, and other production practices (e.g., planting date, crop rotation, tillage). Also, keep in mind that the corn yield response to plant density curves is merely indicative, as they

represent simplified models that carry uncertainty (error).

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu

Logan Simon, Southwest Area Agronomist
lsimon@ksu.edu

Lucas Haag, Agronomist - Tribune
lhaag@ksu.edu

Jeanne Falk Jones, Northwest Area Agronomist
jfalkjones@ksu.edu

3. Soybean Planting Date and Maturity Group Selection for Kansas

This article presents tips for selecting the best planting date and maturity group for each crop region in Kansas to maximize yield. Planting date is one of the primary management practices under farmers' control that can strongly influence soybean yields, independent of variety differences and environment.

There has been a trend of planting soybeans early, before corn in some cases, at a rate of about one-third of a day per year. In 2025, the "50% planting date" mark was achieved around May 26 statewide (ahead of the 42% historical average) – with planting progress moving closer to mid-May if conditions are optimal at that time ([USDA-Crop Progress Reports](#)). A note of caution: lower soil temperatures will delay emergence and could compromise stand uniformity. In addition, dry conditions can further delay overall emergence, impacting early-season uniformity.

If planting early, try to maximize plant survival and reduce threats to emergence by:

- Avoiding planting when soil temperatures are below 60°F (Figure 1). If planted into soils cooler than 60°F, seedlings may eventually emerge but will have poor vigor.
- Treating seeds with fungicide and insecticide.
- Selecting varieties with resistance to soybean cyst nematode and Sudden Death Syndrome.

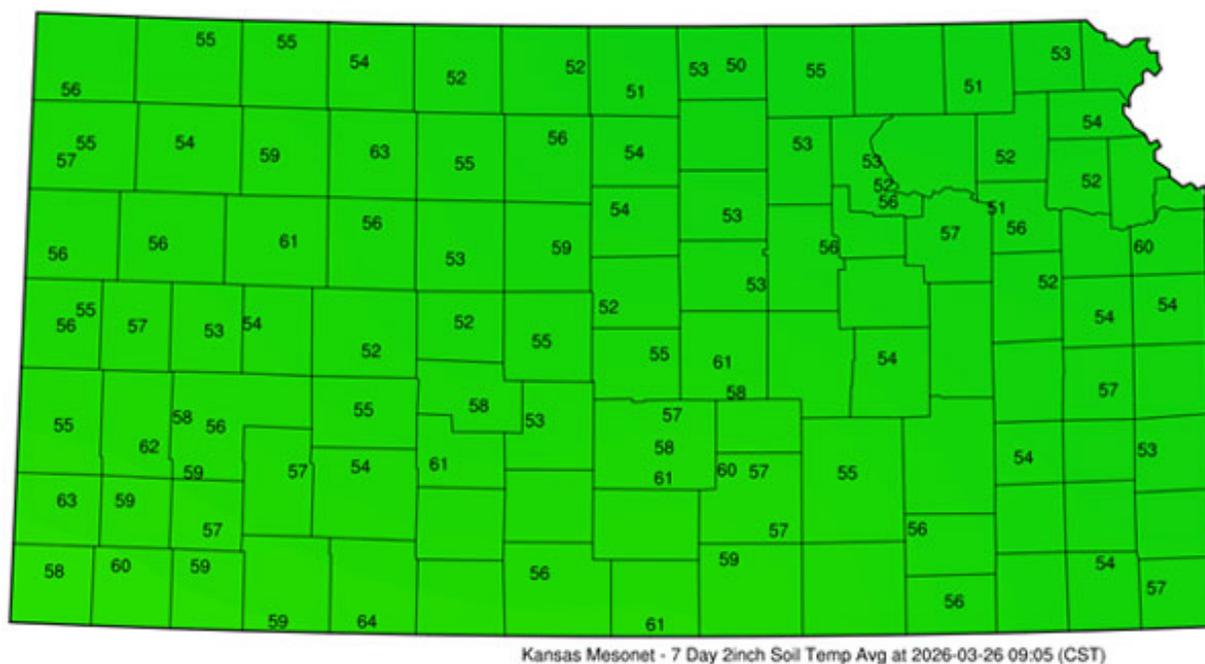


Figure 1. Average 7-day soil temperature at the 2-inch depth for the week of March 20-March 26, 2026. Map from Kansas Mesonet.

Planting dates and maturity group guidelines

Soybeans can be planted over a wide range of dates with adequate soil moisture conditions, although germination and emergence could be reduced and/or delayed in cool soils (less than 60°F).

In the last few years, many farmers have anticipated soybean planting dates earlier relative to the ones presented in Figure 2, in many situations, planting soybeans before corn. The recommended maturity group varies across Kansas by area (Figure 3).



Figure 2. Recommended soybean planting dates under dryland conditions. K-State Research and Extension.

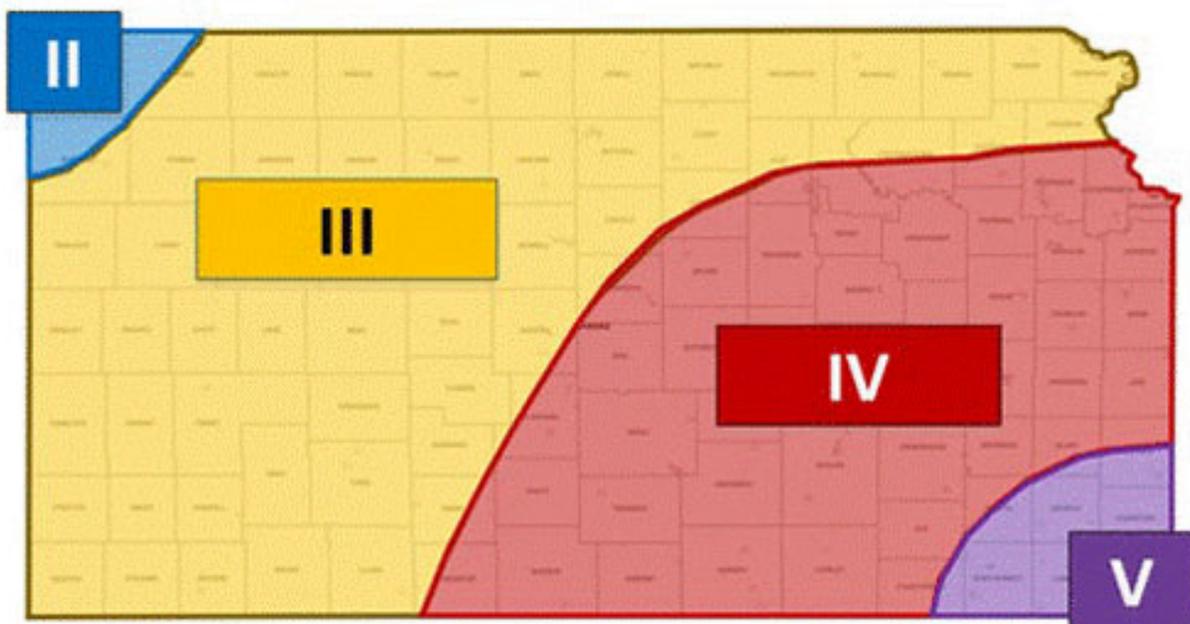


Figure 3. Recommended soybean maturity groups (II to V) across Kansas. K-State Research and Extension.

Over four years at the Kansas River Valley Experiment Field at Topeka, soybean yields were either

stable or increased when planting in late March/early April compared to planting in mid-to-late April and early-to-mid May (Figure 4). Similar observations were made at the North Central Experiment Field at Scandia.

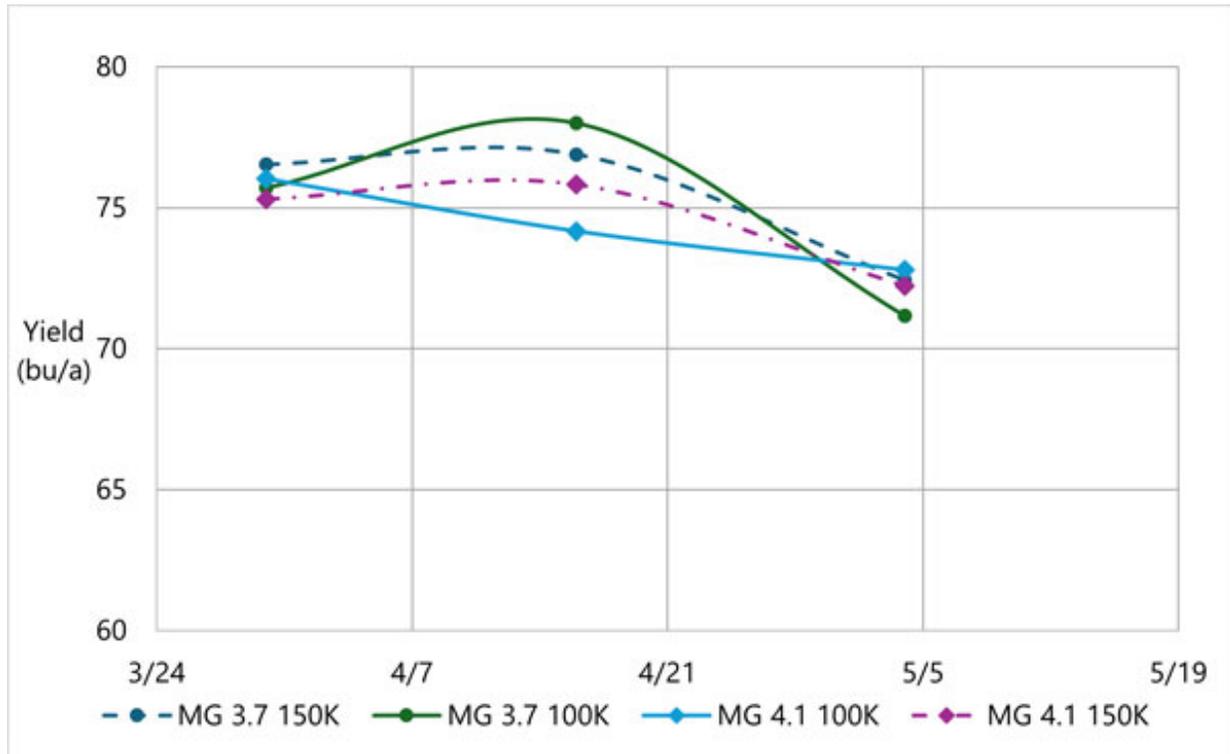


Figure 4: The effect of planting date on irrigated soybean yield at the Kansas River Valley Experiment Field in 2021-2024. Each line represents a maturity group (MG 3.7 or MG 4.1) and seeding rate (100K or 150K).

Generalized for Kansas, the maximum soybean yield is reduced by 0.3 bu/a per day as planting dates move later, with higher yield when planting in mid-April compared to moderate yields (50 bu/a) when planting in mid-July. These results highlight the importance of early planting for obtaining maximum yields and the yield penalty associated with later planting dates. Earlier planting means more risk and yield variability, but a potentially higher yield or reward. Later-planted beans tend to be less variable with more yield stability, though maximum yield potential may be lost.

Final considerations

- In general, do not plant in soils that are too wet, and until soil temperatures are close to 60°F. If planted into soils cooler than 60°F, seedlings may eventually emerge but will have poor vigor.
- The distribution and amount of rainfall and the day/night temperature variations around flowering and during the grain-filling periods also greatly impact soybean yields.
- In drier areas and shallow soil, yields have been most consistent when soybeans are planted in late May to early June.

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu

Logan Simon, Southwest Area Agronomist
lsimon@ksu.edu

Eric Adee, Agronomist
eadee@ksu.edu

4. Soybean Row Spacing and Seeding Rates: What Works Best in Kansas?

Seed cost is a critical economic factor, and selecting the proper seeding rate is a key management practice. This article reviews key factors in determining optimal soybean seeding rates and row spacing.

Key terminology

- **Seeding rate** refers to the target number of planted seeds per acre.
- **Plant population or plant density** refers to the effective number of plants growing in a field.
- **Survival rate** refers to the percent of sown seeds that germinate and emerge. Normally, we may expect about 80% of the seeds planted to survive and become part of the final plant population.

Calculating Final Plant Density to Calculate Seeds per Acre

It's best to start by specifying the desired final plant density, then use the expected survival rate to calculate the number of seeds per acre you'll need to plant.

$$\text{Seeding rate } \left(\frac{\text{seeds}}{\text{acre}} \right) = \frac{\text{Plant density target } \left(\frac{\text{plants}}{\text{acre}} \right)}{\text{Survival rate } \left(\frac{\text{plants}}{\text{seeds}} \right)}$$

Example of seeding rate calculation with a plant density target of 100,000 plants/acre and expected survival rate of 80% (0.8 plants/seed):

$$\frac{100,000 \text{ plants/acre}}{0.8 \text{ plants/seed}} = 125,000 \frac{\text{seeds}}{\text{acre}}$$

Note: The seed survival rate varies depending on specific environmental conditions and the quality of the planting practice. Thus, before deciding the seeding rates, it is necessary to consider potential soil and weather conditions that could affect the success of final stand establishment to achieve the proper plant density required.

Adjusting seeding rates by yield environment

Identifying yield potential for each environment in your field is a good practice to use when refining the soybean seeding rate decision. A [study by Carciochi, Ciampitti, and others in 2019](#) evaluated soybean seed yield response to plant density by yield environment using a database of hundreds of experiments across the Midwest. Seeding rates ranged from 69,000 to 271,000 seeds/a. The data was classified by yield environments as follows: **Low** (<60 bu/a), **Medium** (60-64 bu/a), and **High** (>64 bu/a).

The main outcomes of this study were:

- **Most probable values.** On average, optimum plant densities were:
 - Low-yield environments: 127,000 plants/a
 - Medium-yield environments: 96,000 plants/a
 - High-yield environment: 97,000 plants/a
- **Expected uncertainty.** In 50% of cases, optimum plant densities ranged from:
 - Low-yield environments: 109,000 - 144,000 plants/a
 - Medium-yield environments: 77,000 to 114,000 plants/a
 - High-yield environments: 76,000 to 117,000 plants/a
- In low-yield environments, the need for higher optimal plant density was not related to a low plant survival rate, but to a reduced potential growth rate per plant.
- Another reason for the need for higher plant density in low-yield environments is that there is often less precipitation during the reproductive period in these environments, reducing the crop's reproductive ability (reduction in yield contribution from branches).

Effect of row spacing on seeding rates and yield

The optimum soybean seeding rate is tied to other practices, such as **row spacing** and **planting date** (see companion article on soybean planting dates). The final number of seeds per linear foot of row decreases as row spacing narrows. For example, at a target plant density of 105,000 plants per acre and 85 percent germination, 30-inch rows will have twice the number of seeds per linear foot as 15-inch rows (6 vs. 3 seeds per linear foot). However, the seeding rate per acre would remain the same for both row spacings, as only the number of seeds per linear foot would change, not the seeding rate per acre.

There are still many questions about soybean row spacing. Six on-farm experiments in eastern and central Kansas were conducted from 2015 to 2017, one each in Franklin County, Hutchinson, Jefferson County, and Manhattan. For the 2017 season, two additional studies were conducted in Ashland Bottoms near Manhattan and Franklin County.

Compared to the conventional 30-inch row spacing, narrow row soybeans (15-inch or less) showed similar or slightly greater yields (**2-12%**), particularly in low-yield environments (< 60 bushels per acre), independent of planting date, seeding rate, or maturity. Above this yield threshold level, soybeans did not show a yield response to changing the row spacing (Figure 1). However, the data suggested that the response to row spacing is inconsistent, as indicated by the wide margin of error of responses and the variability between site years.

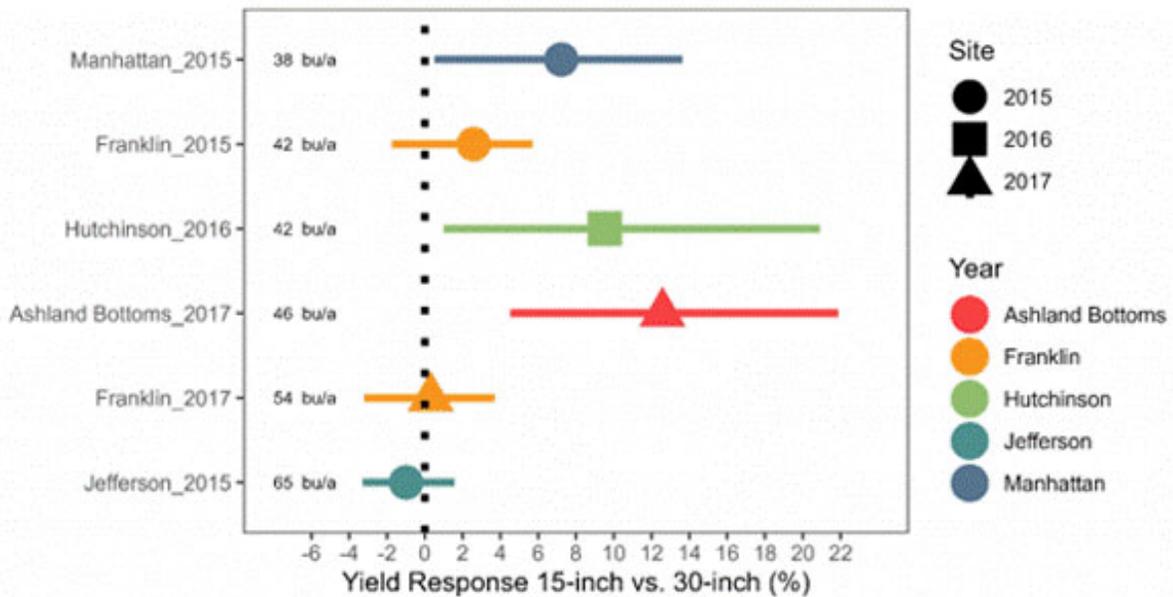


Figure 1. Observed yield response in soybeans to narrow rows (15-inch) compared to conventional spacing (30-inch). The average yield of 30-inch strips is indicated on the left side of the figure (bu/a).

Take-home message

Benefits of narrow row spacing:

- Early canopy closure for better light interception and improved weed control.
- Reduced potential for soil erosion.

Disadvantages of narrow rows:

- Potential reductions in the final stand at a given seeding rate due to equipment and within-row compaction.
- In very dry years, narrow row spacing may consume soil water earlier in the growing season, reducing the amount of water available for the critical period around pod-setting and seed filling.
- In wet years, very narrow spacing (less than 15 inches) may allow less airflow within the canopy and favor the occurrence of certain diseases, such as white mold.

Adjusting seeding rates based on plant survival rates, soil conditions, and planting dates can reduce the risk of yield and profit losses from lower-than-optimal densities in low-yield environments, while limiting higher seed costs from higher-than-optimal densities, especially in medium- and high-yield environments. Soybean plant density above the optimal level increases the risk of lodging and disease without yielding benefits.

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu

Logan Simon, Southwest Area Agronomist
lsimon@ksu.edu

Eric Adee, Agronomist
eadee@ksu.edu

5. Late Freeze Effects on Winter Canola

Over the years, we have observed the effects of late freezes on canola at the rosette, bolting, and flowering stages. We can draw on these experiences to understand how the recent hard freeze events might impact the crop. The extent of the damage will ultimately depend on several factors, including the lowest temperature reached, the duration below freezing, the crop's growth stage, and other environmental factors such as soil moisture and wind exposure.

Common hard-freeze damage include:

- leaf discoloration and loss
- stem cracking and splitting
- bud, flower, and pod loss
- plant lodging.

In some instances, the crop may suffer a yield penalty because the damage is too severe to overcome. In other instances, growing conditions afterward allow the crop to produce more flower buds, flowers, and seed pods; thus, a yield penalty may not be significant. Canola is indeterminate (continues to flower and produce seed pods for an extended period), and because of this, it possesses numerous growing points on the plant. These growing points can develop new flowering sites that will compensate for damaged ones when stresses occur.

The growth stage can affect the extent of crop damage depending on how low and how long temperatures were below freezing. Canola is most tolerant of freezing temperatures during the rosette stage prior to green-up and is more susceptible during the bolting, flowering, and pod-filling stages. This year, canola was in the rosette, bolting, and early flowering stages across the state when temperatures dropped into the low teens and single digits. Previously, we have observed severe damage from freezes below 20 degrees F at this stage of the growing season.

What happened this year?

Temperatures dropped to 10.0 degrees F and remained below freezing for 24 hours near Manhattan. There was a good chance of seeing freeze injury in plants at the early bolting stage. The canola was abruptly frozen and filled with ice on the morning of March 16. When swiping a hand across the canopy, leaf tissue shattered, and plant stems could be broken in two with ease (Figure 1). The following night, temperatures dropped as low as 18.0 degrees F.



Figure 1. Frozen plant tissue and broken stems at the Rocky Ford Plant Pathology Farm near Manhattan the morning of March 16. Photos by Mike Stamm, K-State.

Plants on the morning of March 17 at the Agronomy North Farm had more of a rubbery feel after temperatures rose above freezing only briefly the day before. There appears to be injury to buds on the main stem on plants that were bolting. (Figure 2). Leaf damage was widespread. As temperatures remain much above normal, it will be interesting to see if the vascular tissue is too damaged to initiate regrow. Similar potential damage was observed at the North Central Kansas Experiment Field near Belleville.



Figure 2. Winter canola plants following a second cold night on the morning of March 17 at the Agronomy North Farm near Manhattan. Photos by Mike Stamm.

Still canola plants in the early flowering stage near Pretty Prairie seemed relatively unphased following the freeze events. Temperatures did not get as cold in this area of the state. Slight leaf discoloration and bending and twisting of the main raceme were the primary injury symptoms. The crop should straighten up and regain new growth with time (Figure 3).



Figure 3. Winter canola field near Pretty Prairie following hard freeze. Photo courtesy of Jeff Frazier, Scoular.

Common indicators of injury to late freeze in canola

At any growth stage following a spring freeze, leaf discoloration, or bleaching, is often observed. The

plant can easily tolerate some leaf discoloration without slowing new biomass development. However, if the crop does not return to normal growth after the freeze, and turns pale green, white, or brown, then the damage was likely severe. Discoloration is most evident on leaf tissue, and to a lesser extent, on the stem. Sometimes, stems and flower buds turn pale green or purple, which is a symptom of cold temperatures and does not necessarily indicate tissue damage.

Stem cracking can be observed on bolting and flowering canola following freeze events. Even if the stem cracks, the canola plant should continue to grow normally. Splitting occurs when the stem fills up with ice and ruptures. If the stem splits completely open, it may result in the plant eventually falling over. Severe freeze injury occurs when stems are translucent and mushy. Cracked and split stems can become entry points for fungal decay.

At the flowering stage, we often see a bend or crook in the stem and flowering racemes. Often, these bends may take the flowering racemes to the ground; however, we have seen plants straighten and continue flowering normally. The only problem may be the racemes set seed below the main canopy of pods, potentially creating problems at harvest.

After any spring freeze event, blank areas will likely be observed on flowering racemes. In severe cases, we have seen the main raceme and some secondary branches completely freeze off and die. However, the crop can compensate for the losses with secondary branching.

Long-term impact of freeze damage

Repeated freeze events and longer durations of temperatures below 20 may increase the severity of damage. The extent of damage and potential yield loss relative to how long it stays cold is somewhat of an unknown. But if the plants show normal growth following freeze events, reasonable yields can be expected. The longer it takes the plants to recover may also give some indication of how severe the freeze impacts were.

The indeterminate growth habit still gives canola an opportunity to compensate for lost yield. How well the crop yields will be a function of the weather over the next few weeks.

Mike Stamm, Canola Breeder
mjstamm@ksu.edu

6. K-State Tools for Interpreting Soil and Plant Tissue Tests for Fertility Management

Soil and plant tissue tests can provide critical information for growers, but interpreting the results can be daunting. Several digital tools are available from K-State for free to assist with this process. These tools help growers apply published nutrient guidelines while reducing the risk of calculation errors. They are available as both web-based applications and spreadsheet programs, providing flexibility across different devices and work environments.

These tools can be accessed or downloaded from the soil testing lab's webpage:

<https://www.agronomy.k-state.edu/outreach-and-services/soil-testing-lab/recommendations.html>

Web-based Fertilizer Recommendation Tool

The Fertilizer Recommendation Tool is a web-based application designed to apply the fertilizer recommendation procedures described in [Soil Test Interpretations and Fertilizer Recommendations in Kansas \(MF2586\)](#). The tool is organized into modules (tabs) for each nutrient and includes a general user guide (Figure 1). This lightweight application is particularly useful for quick “on-the-go” calculations, as it is mobile-friendly and does not require a download.

Access the tool at https://ksusoiltesting.shinyapps.io/FertReCKS_App-R-v2/



Figure 1. Screenshot of the Kansas Fertilizer Recommendation Tool home screen and layout.

How it works

Users specify crop information, expected yield, soil test values, and relevant management practices.

The tool then applies the equations and logic described in MF-2586 to generate recommended fertilizer application rates. Automating calculations helps reduce errors and missed steps that can arise when recommendations are calculated manually. The calculator includes modules for nitrogen, phosphorus, potassium, sulfur, selected micronutrients (chloride, boron, and zinc), lime, and crop nutrient removal, along with a general user guide. Each module functions independently, allowing users to focus on specific nutrients as needed.

Spreadsheet-based Fertilizer Recommendation

An Excel-based program is also available to support the calculation of fertility prescriptions (Figure 2). Designed for those with access to a laptop or desktop computer, it provides recommendations for multiple nutrients simultaneously in a familiar spreadsheet format. The tool is particularly useful for growers with detailed soil test results from multiple samples or with different crops associated with each sample.

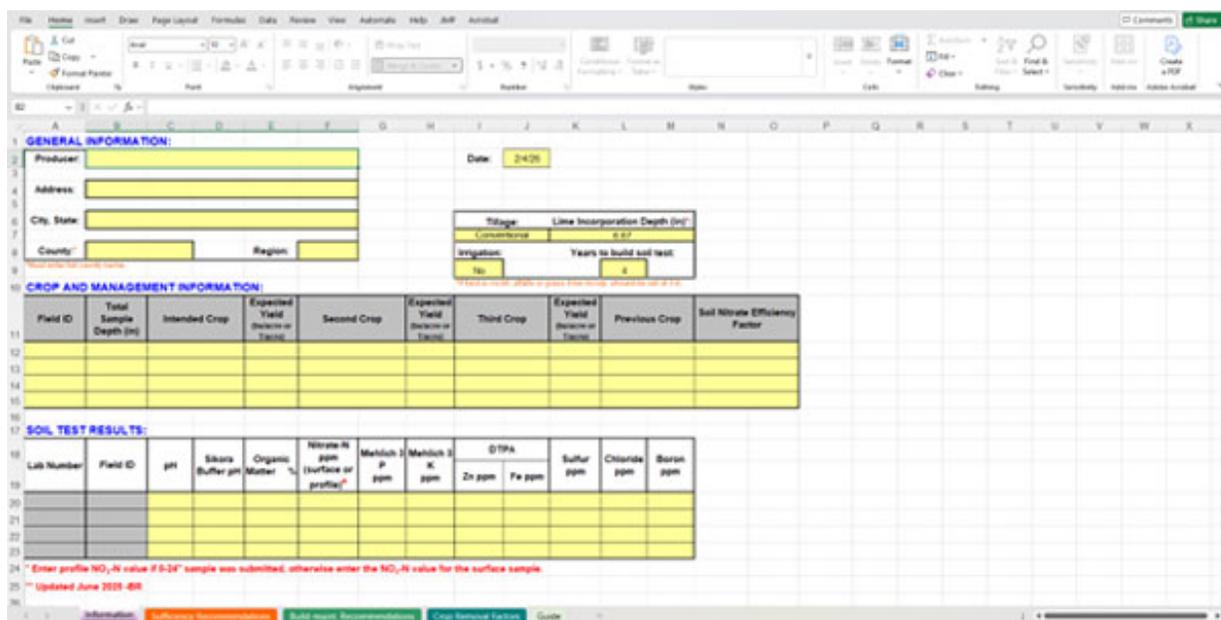


Figure 2. Screenshot of the Excel-based fertilizer recommendation program showing organization of field information, soil test results, and management inputs.

How to access the tool

The calculator is available for download through a link on the soil testing lab’s webpage:

<https://www.agronomy.k-state.edu/outreach-and-services/soil-testing-lab/documents/resources/ksu-fertilizer-recommendations.xlsx>

How it works

Similar to the web application, users enter general field information, crop and management details, and results from their soil test report. The workbook then generates fertility recommendations based on both “sufficiency” and “build/maintain” approaches in accordance with the MF-2586 fact sheet.

Plant Tissue Test Interpretation Tool

The Plant Tissue Test Interpretation Tool is a web-based tool that provides a visual aid for interpreting plant tissue test results. The tool creates a graph showing sufficiency ranges of multiple nutrients based on the crop type, maturity, and plant part (Figure 3). It can also serve as a reference for determining which growth stages and plant parts should be sampled when comparisons to published ranges are needed.

Access the tool at <https://ksusoiltesting.shinyapps.io/PlantTissueApp/>

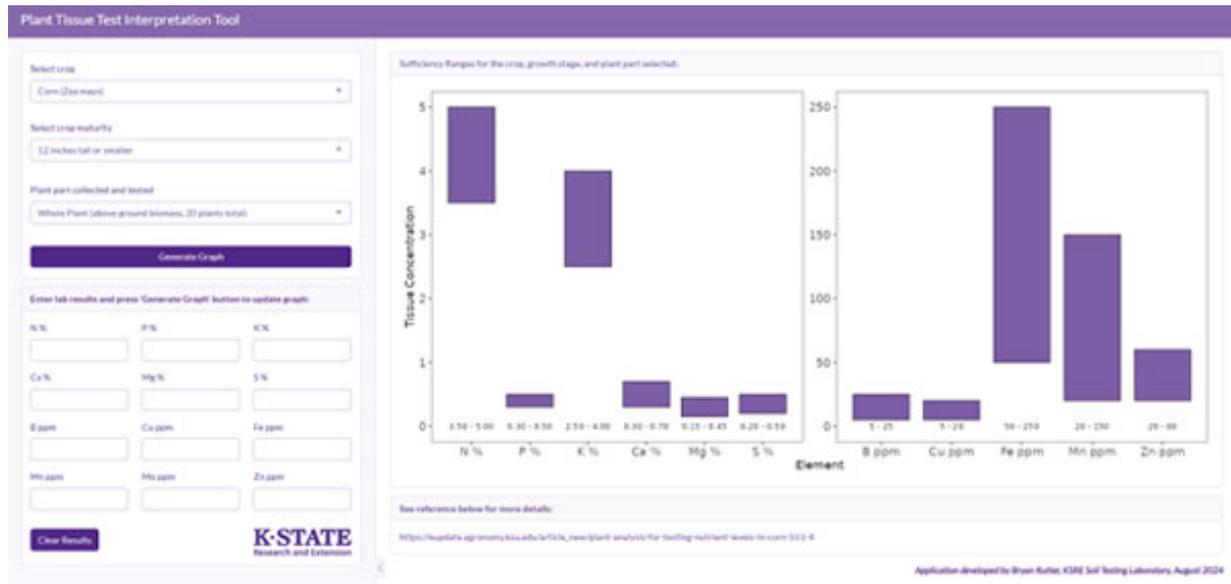


Figure 3. Example output from the Plant Tissue Test Interpretation Tool for corn tissue tests at the V6 growth stage.

How the calculator works

Users specify the crop type, growth stage, and part of the plant that was or will be tested by the lab. The tool then generates a graph illustrating the sufficiency ranges for several nutrients. Users may also enter their own lab results to create a visual comparison of their tissue analysis against the sufficiency ranges.

Supporting Materials and Development

These tools are intended to be used alongside existing fertilizer recommendation publications and soil testing resources to help users apply nutrient guidelines consistently. Additional references, guidance documents, and tools are available through the soil testing lab's webpage at:

<https://www.agronomy.k-state.edu/outreach-and-services/soil-testing-lab/recommendations.html>

Future efforts are focused on improving usability, consistency, and integration across tools. User comments and suggestions are welcome and will help guide future refinements.

Gustavo Roa, Graduate Research Assistant
groa@ksu.edu

Bryan Rutter, K-State Soil Testing Lab Manager
rutter@ksu.edu; soiltesting@ksu.edu

Dorivar Ruiz Diaz, Nutrient Management Specialist
ruizdiaz@ksu.edu

7. Updated K-State Insect Pest Management Guides Now Available

Several K-State Research and Extension publications related to insect management in Kansas were recently updated and are available to the public.

These publications were prepared to help producers manage insect populations using the best available methods proven practical under Kansas conditions. They are revised annually and intended for use during the current calendar year. The user should know that pesticide label directions and restrictions are subject to change, and some may have changed since the publication date.

Full versions of each fact sheet are available online, with links provided below.

Alfalfa Insect Pest Management - <https://bookstore.ksre.ksu.edu/pubs/MF809.pdf>

Corn Insect Pest Management - <https://bookstore.ksre.ksu.edu/pubs/MF810.pdf>

Cotton Insect Pest Management - <https://bookstore.ksre.ksu.edu/pubs/MF2674.pdf>

Sorghum Insect Pest Management - <https://bookstore.ksre.ksu.edu/pubs/MF742.pdf>

Soybean Insect Pest Management - <https://bookstore.ksre.ksu.edu/pubs/MF743.pdf>

Sunflower Insect Pest Management - <https://bookstore.ksre.ksu.edu/pubs/MF814.pdf>

Wheat Insect Pest Management - <https://bookstore.ksre.ksu.edu/pubs/MF745.pdf>

The economics of control should be considered in any pest management decision. Because costs vary significantly over time and are influenced by factors beyond the scope of this publication, product cost is not a consideration for including or omitting specific insecticide products in these recommendations. Growers should compare product price, safety, and availability when making treatment decisions. Growers also need to consider the impacts of insecticides on non-target organisms like pollinators and natural enemies. Rotating insecticide groups can help combat insecticide resistance issues by leveraging different modes of action.

The user bears ultimate responsibility for correct pesticide use. For proper use, always read the label directions carefully before applying pesticides. Remember that illegal contamination of the treated crop or commodity can occur if pesticides are misused. K-State entomologists assume no responsibility for product performance, personal injury, property damage, or other types of loss resulting from the purchase, handling, or use of the pesticides listed.

More information on pests covered in these publications is available at:

www.entomology.k-state.edu/extension/insect-information/crop-pests/

Anthony Zukoff, Instructor of Entomology – Garden City

azukoff@ksu.edu

Jeff Whitworth, Extension Entomology Specialist
jwhitwor@ksu.edu

Brian McCornack, Entomologist
mccornac@ksu.edu

8. An Early Spring Heat Wave Brings Summer-Like Temperatures to Kansas

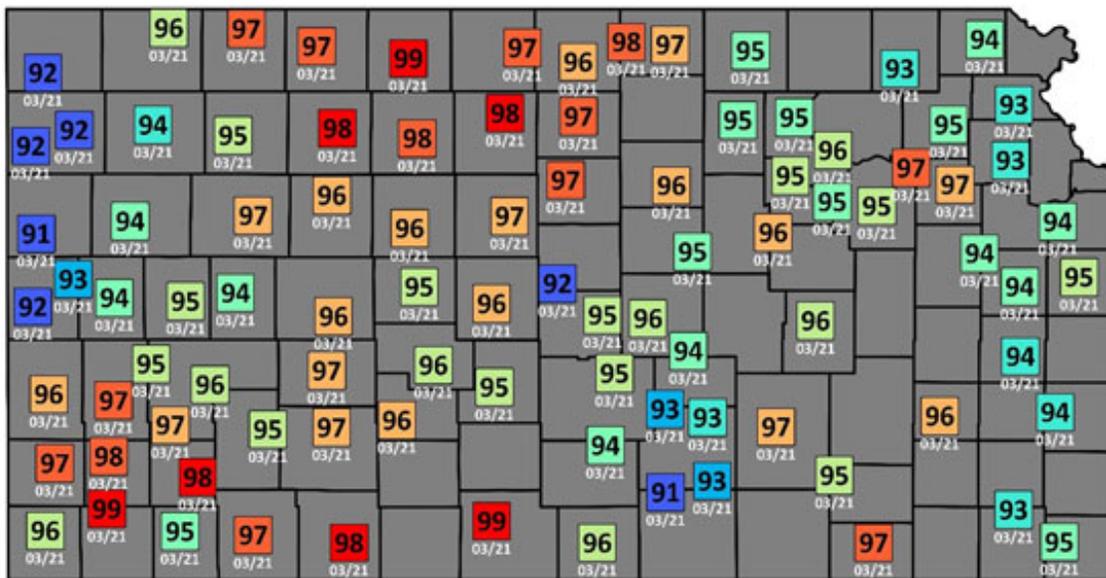
A strong ridge of high pressure brought intense heat to the southwest and south central United States, including Kansas, this past week. Temperatures more reminiscent of mid-summer than early spring resulted in numerous daily and monthly record highs across the state. In this article, we take a look at some of the records and the rarity of such an event.

Rapid Warm-Up and Daily Temperature Records

The onset of the heat was quite rapid. Back on the 16th, the average daily high across the Kansas Mesonet was a chilly 41°F. In the next five days, the average high increased: 63°, 81°, 87°, 91°, and finally a scorching 95° on the 21st, some 35 degrees above normal for the date. A few daily record highs were set prior to the 21st, but it was on the last day of this stretch that the most records were set. In the following review of records, we focus only on observing sites with at least 50 years of historical climate data. There are over 100 such sites in Kansas.

First, let's start with the daily records set on March 21 (note: the highs on March 21 appear in the March 22 climate report of co-operative sites, where a 7 AM-7 AM day is used; that convention has been taken into account to compare the high reached on the afternoon of the 21st with its corresponding record). Over 60 new record highs were set for the date by an average of over 6 degrees. Fifteen sites set new records by at least ten degrees, led by Pittsburg, where the high of 91° was a new record by an amazing 15 degrees!

Highest Temperature (°F): 03/21/2026



Average: 95.4° (93 stations).
 Highest: 99.0° at Moscow 10NW. Lowest: 91.0° at Wallace.
 Map prepared: 03/23/2026 at 09:31 CT

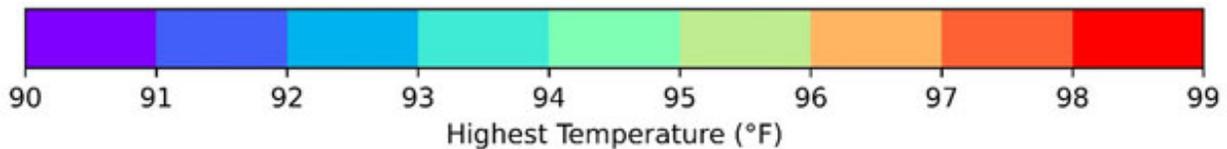


Figure 1. The highest temperature recorded at each Kansas Mesonet site on March 21, 2026.

Even more impressive, there were 64 new record highs for March set on the 21st. Melvern Lake and Atwood’s highs had the largest margin of victory, each setting new monthly marks by eight degrees. Four locations in Kansas reached 100 degrees, an incredibly rare feat for March. Prior to this month, a high of 100° in March had happened only once: way back on March 21, 1907, at Ashland. Of the four highs this year, one station, Plainville, made it to 101°, and in the process set Kansas’ new record for March. The other three sites to reach 100° were Webster Dam, Atwood, and Sedan. For the latter two locations, reaching 100° this early in the year is unprecedented. This was Atwood’s earliest 100-degree day by 45 days; the old record was May 6. Even more impressive, the 100° high at Sedan set a new record for the earliest 100-degree reading by more than 2 months; the old record was May 31st. Not only did Sedan set a new record for March, but this mark is also higher than the record high for April (99°) and equal to the record high for May as well!

Not all stations managed a record high, as the aforementioned 1907 played spoiler. Prior to this month, there were 27 record highs for the month of March set that year. A total of 19 of those are still standing after this year’s heat event. The seven locations where the 2026 high bested their 1907 marks were Burr Oak (98°), Chapman (96°), Goodland (92°), McPherson (95°), Osage City (96°), Salina (97°), WaKeeney (96°), and Yates Center (97°). Three additional sites tied their monthly records from 1907: Greensburg (95°), Healy (97°), and Manhattan (95°).

Extreme Temperature Swings

The Kansas Mesonet did not record any triple-digit temperatures during the event, but three locations were very close. The Stevens, Phillips and Barber County Mesonet sites all peaked at 99° (Fig. 1). These three sites, and at least 40 others, all exceeded the Mesonet's previous record high for March: 96° set at three locations on March 19, 2017. Historical Mesonet data dates back to 1985. A few Mesonet sites in western Kansas experienced both winter and summer last week, with temperature swings between the 16th and 21st of over 90 degrees. The largest swing was at the Stevens County site: 93 degrees, between a low of 6° on the 16th and a high of 99° on the 21st.

The Bigger Climate Picture

Thanks to this hot spell and above-normal temperatures earlier this month, March is almost certain to be the seventh consecutive above-normal month, a string that began last September. It's unlikely that March 2026 will finish as the warmest March on record, a spot currently held by 2012 (average temperature 55.5°). A top 10 finish is quite possible, depending upon how the last week of the month plays out. The current outlook for the remainder of March favors above normal temperatures, so a high ranking is likely. For the record, 1907 ranks as the 6th warmest March on record (50.5°).

Kansas was one of many states to experience record heat this past week. Preliminary data from the National Centers for Environmental Information indicate that over 500 new monthly records were set. A few of these from neighboring states include: 86° at Denver and Colorado Springs, CO, 97° at Lincoln and Hastings, NE, 93° at Kansas City, MO, and 97° at Ponca City, OK. Hotter still, four locations in Arizona and California reached 112°, the United States' new record high for the month of March.

Matthew Sittel, Assistant State Climatologist
msittel@ksu.edu