Issue 993

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eUpdate

02/29/2024

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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1. The 2024 Kansas fire season is here

The start of 2024 has been quiet wildfire-wise across Kansas. However, as we have seen this week, fire season is here for the Central Plains. Take this opportunity to refresh your situational awareness resources and make preparations so you can be ready should there be a wildfire near you.

Last year's rain helps drive fire season

Last year was an interesting year for wildfires with most occurring in late March and April. Overall, the fire season was near normal. There were not many large and/or disruptive wildfires like we had seen the previous year with the Four County, Starbuck, and Anderson Creek Fires. Despite growing drought in the Plains early season, timely moisture delayed fire season somewhat. As a result, fire season was mainly driven by copious prescribed fire escapes and driven by increased grass growth in the Flint Hills.

Precipitation in the preceding year is a deciding factor on how much grass growth (or fine fuels) we see across Kansas for the coming fire season. 2023 consisted of a rainfall pattern opposite to what we would climatologically expect for the region. The state's western portion saw above-normal precipitation during the spring and early summer. Meanwhile, drought continued to expand and worsen further east in central and east Kansas. The increased moisture led to above-normal grass growth (Figure 1) in the southwest and along the Oklahoma border. This is where fires could burn more aggressively and be much harder to suppress. Meanwhile, below-normal grass growth and fuel loading are expected in the north-central part of the state. Fires are still possible here, but the overall available fuel to burn is likely less than a normal year.

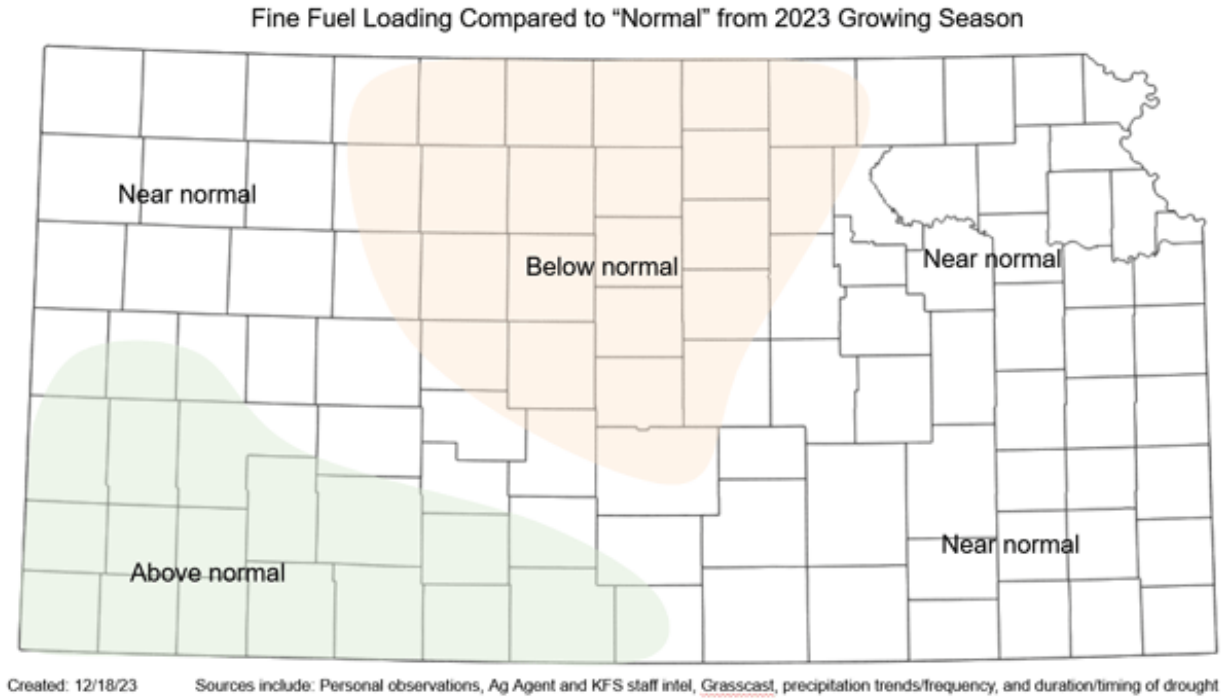

Figure 1. Areas of estimated above/below/at normal grass (or fuel) loading. Above-normal areas observed increased moisture during the growing season and have potentially more

potential for increased fire behavior and large fire potential. The opposite is expected in the below-normal area. Estimates from numerous sources were also considered. Source: Kansas Forest Service and Kansas Mesonet.

Weather patterns play an important role

Contrary to popular belief, large wildfires in Kansas are usually independent of long-term drought conditions. Short-term weather drives fire potential in the state and determines the availability of grass to burn. This makes predicting a fire season challenging because one or two conducive days can skew an entire season. We see similar challenges to seasonal tornado predictions in Kansas.

Several weather events are responsible for the biggest wildfires in Kansas history. The most dangerous is what meteorologists call a "mid-latitude cyclone," a low-pressure system that typically forms east of the Rocky Mountains and moves eastward across the Plains. These dynamic systems typically feature strong winds and drastic air masses separated by fronts as they spin counterclockwise around the center. Systems of this nature provide significant challenges with shifting winds that make firefighting dangerous and fire spread nearly impossible to suppress.

Mid-latitude cyclones are also often responsible for severe weather and even blizzards - all dependent on your location to the center of the low. The area between the dryline and cold front is most conducive for wildfires. Historical fires such as Four Corner, Starbuck, and Anderson Creek all developed in the shaded orange area of a low-pressure system (Figure 2).

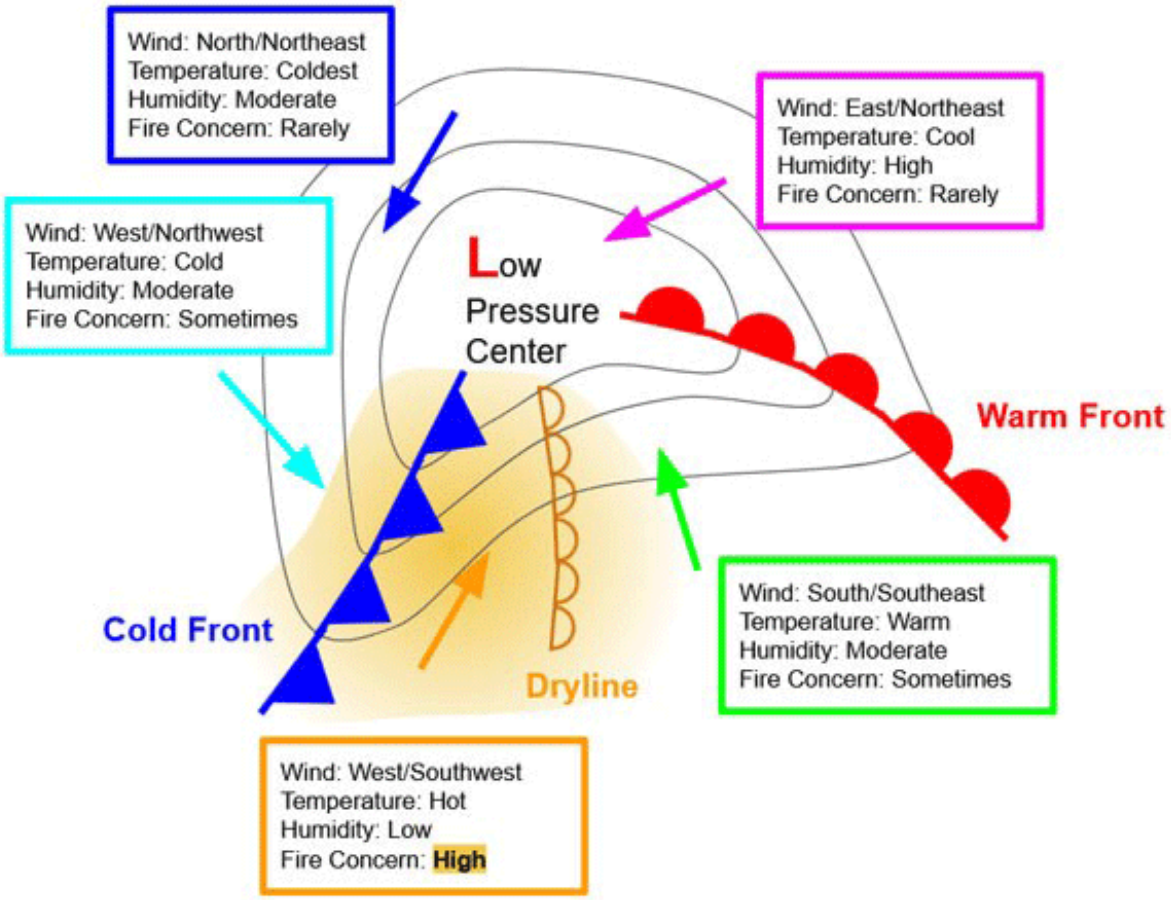

Figure 2. Diagram depicting a surface low-pressure system responsible for the most active weather on the Plains. Significant wildfires may develop south of the low pressure center between the dryline and the cold front.

Strong low-pressure systems are usually well forecasted at most one to two weeks in advance. Beyond that, we must consider whether upcoming patterns favor such systems. By looking at large-scale patterns across the globe, like the ENSO region and El Nino, we can usually get an idea of how frequent these events may be.

Looking to the future

Despite the two-week cold period in January 2023, winter 2023-2024 has been extremely warm. In fact, December and February (likely) are on the top five list of warmest Kansas months on record. The impressive warmth of February has taken a toll, with numerous records broken across the region. In addition, dry conditions during the last month (as of this writing, much of the state has gone 20+ days without 0.1 inches of moisture, https://mesonet.k-state.edu/precip/consecutive/) have offset the previous wet conditions. This has primed the Kansas landscape for wildfires. These conditions are fueled by an active weather pattern with prevalent winds that combine for a recipe for large fires.

Fortunately, the Climate Prediction Center (CPC) calls for above-normal moisture to be centered around a storm system on March 8th (give or take a day or two). With very potent fire weather conditions up to that event, the track of that storm system will determine who gets continued fire weather concerns into mid-March and who will get a much-needed moisture event that slows things

down. Kansas fire season typically extends into April, and as we saw last year, we can have large fires into mid and even late that month. Any precipitation would just be a slowing event. Especially considering the amount of fire that is put down in the Flint Hills each March/April.

This winter has been characterized by an El Niño phase of the ENSO. This warmer water off the equatorial east Pacific region drives a stronger-than-normal jet stream into the southern United States. This has been the main contributor to warmer-than-normal temperatures and the above-normal moisture of December and January. It also tends to result in less large wildfire activity, with only about 500,000 acres burned during El Niño Springs. La Niña, the opposite (of which we have been in the previous three winters), tends to lead to much more wildfire activity, with an average of 1.5 million acres burned during those springs. Therefore, we typically expect less fire activity during an El Niño spring.

Shrinking the 2024 wildfire potential window

The conclusion of fire season is typically considered when cool season grasses green up and prevent fire spread. This varies by year and is primarily dependent on soil moisture and temperatures. Thus far in 2024, green up nationally is moving northward at (for the second year in a row) record pace and arriving up to a month early (Figure 3). With the current projection of temperatures and continued abundance of soil moisture (Figure 4), it is expected to continue to proceed rapidly. It is important to note that fires will still be possible; however, barriers to spread and smoke production will increase. Early green-up also increases the potential for late frost/freezes, which may damage wheat/grasses and make them able to burn later in spring.

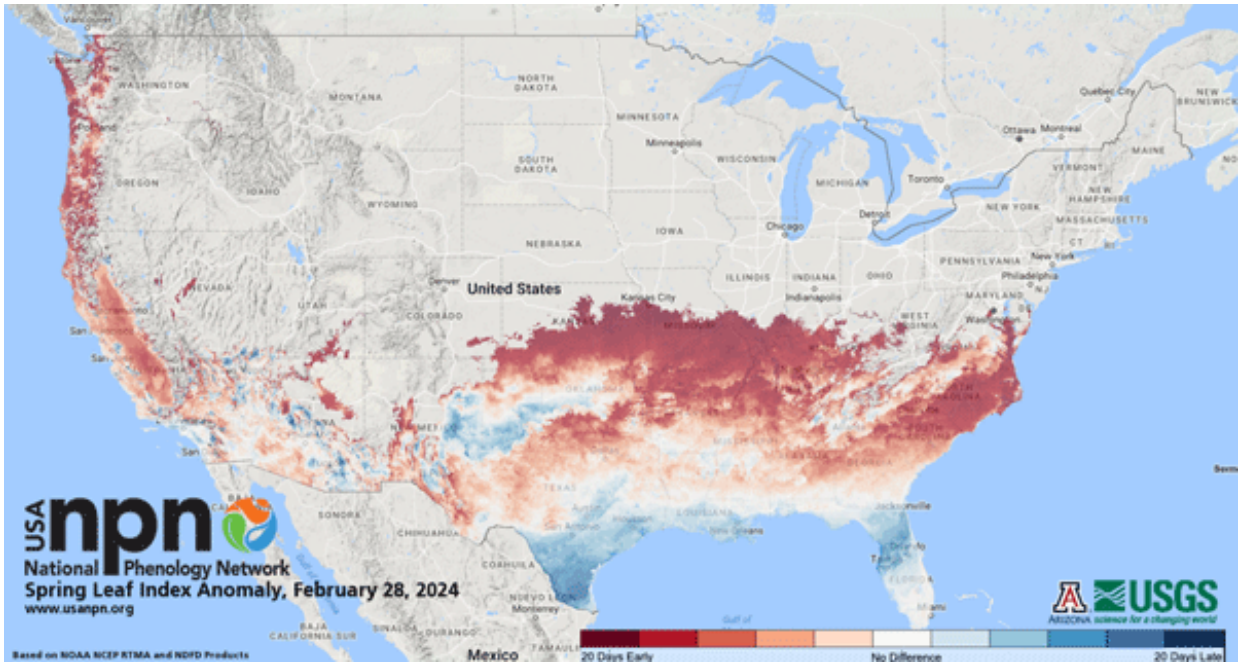

Figure 3. National Phenology Network Spring Leaf Index Anomaly as of February 28, 2024. Red areas represent where green up is occurring up to a month early.

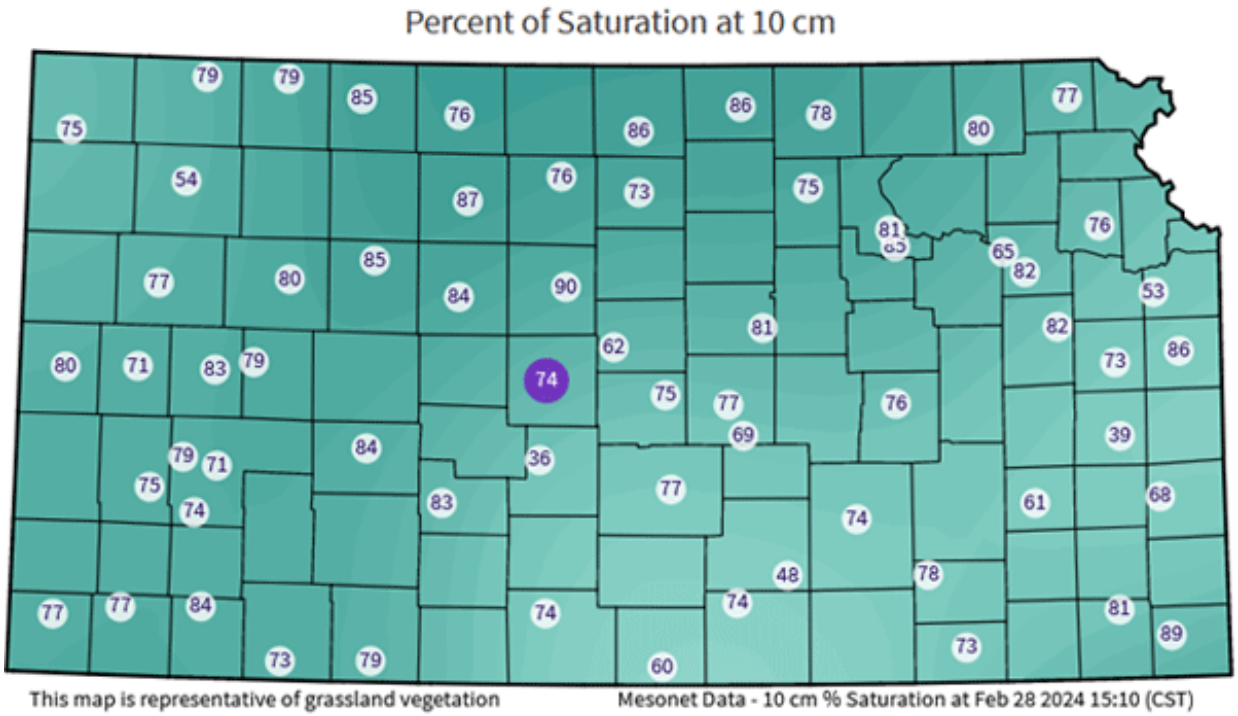

Figure 4. Kansas Mesonet soil moisture percent of saturation at the 10 cm (4 inches) depth. Higher values provide increased soil moisture content compared to 100% saturation. Data from the Kansas Mesonet: https://mesonet.k-state.edu/agriculture/soilmoist/.

Preparing for wildfires

Most fires in Kansas are caused by human activity. Debris burning, escaped prescribed burn, welding or cutting in dry grass, dragging chains, and defective equipment are examples of human-induced fires. Be especially cautious on any dry, breezy day – which is pretty common during spring in Kansas before green up.

Take steps to prepare your property to survive a fire - Clear brush from the house, keep gutters cleaned out, have non-combustible siding and roofing material, and more. In a major wildfire, the fire department will not have enough resources to protect every home or property, so those who can survive independently have the best chance. For more information, please refer to KSRE publication MF2241 *Protecting your home from wildfire* at https://bookstore.ksre.ksu.edu/pubs/MF2241.pdf.

More information on how to have a successful and safe prescribed burn will be available in an upcoming eUpdate.

The bottom line

Conditions into spring will become increasingly conducive for wildfires statewide until widespread moisture or green-up occurs. Overall, fire season is expected to be at/below average for March and April. You can monitor the forecasted fire danger on the Mesonet here: https://mesonet.k-state.edu/fire/danger/. Wildfires are a real risk for Kansans, even with recent moisture. People should

have a plan and take proper precautions to avoid fire starts and limit fire spread.

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2. Burn bans and red flag warnings in Kansas

Wildfires in the central and southern Great Plains have been major news items lately. Fires in the Texas panhandle have consumed over 1 million acres. In addition, wildfires have also occurred in Oklahoma and Kansas.

Burn bans and red flag warnings have been issued on a regular basis. A burn ban in Kansas is put into effect by action of county commissioners. Your local radio station will usually announce burn bans when they are issued. How do you know if a burn ban is in effect? In each county, an individual wanting to burn needs to notify some local authority of their intent. That may be the fire chief, police department, or emergency management office. They should know when a burn ban has been implemented and when it is safe to burn.

Other information related to burning conditions is a designation of Red Flag Warning. Figure 1 shows a Red Flag Warning for parts of Kansas, Nebraska, Missouri, and Iowa for February 29, 2024. A Red Flag Warning means that critical fire weather conditions will occur. Strong winds, low relative humidity,

and warm temperatures can contribute to extreme fire behavior.

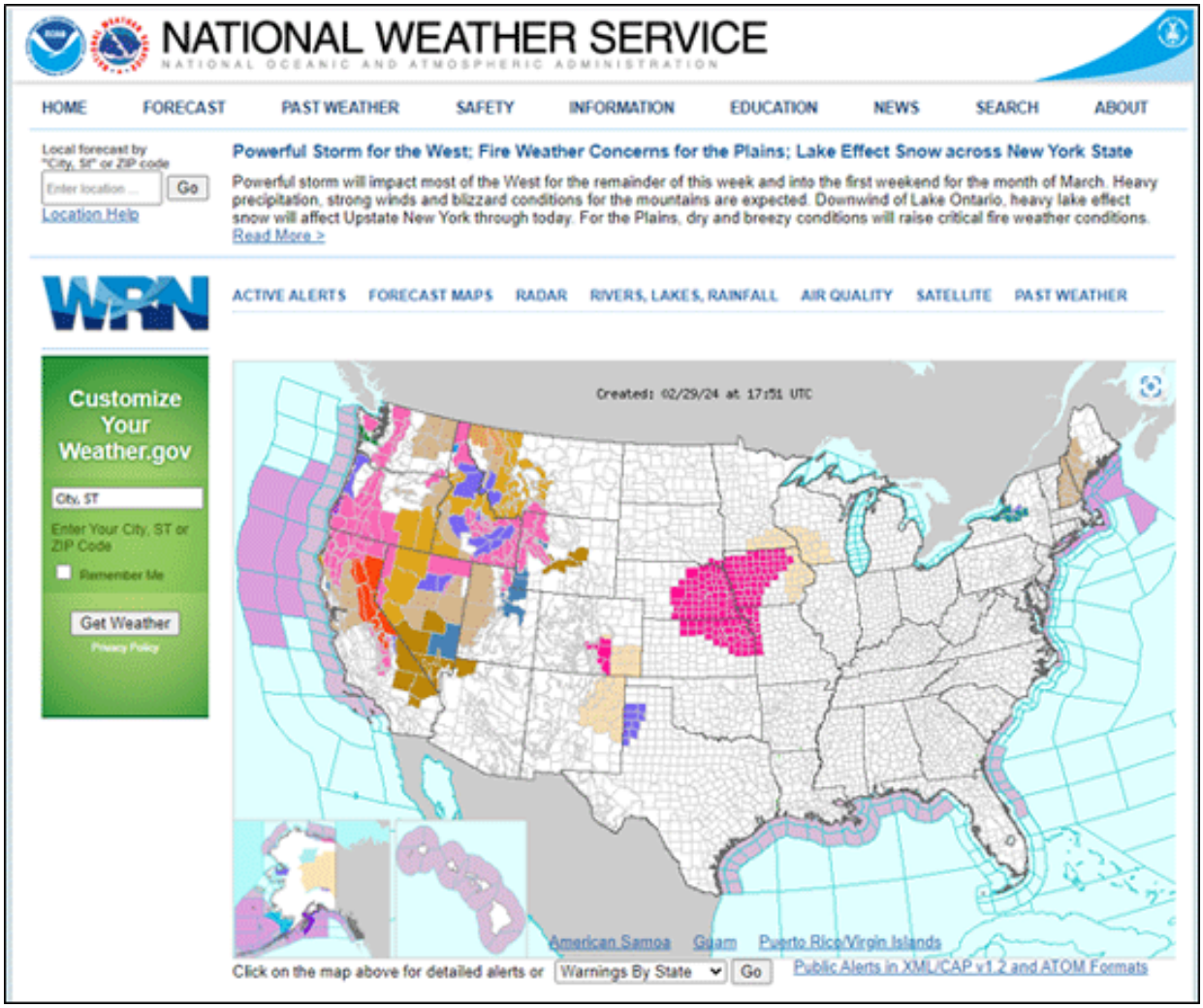

Figure 1. Alerts are provided by the National Weather Service (https://www.weather.gov).

Additional information related to fire weather can be found at the Kansas Mesonet site https://mesonet.k-state.edu/fire/danger/. The fire danger forecast is based on a scale from low to extreme. The best conditions to conduct a prescribed burn would be when the fire danger forecast is in the moderate or high category.

Always check out weather forecasts if you plan to conduct a prescribed burn. The weather during the day of the burn and the day or two after the burn are important for conducting a safe prescribed burn. Never conduct a prescribed burn during a burn ban or if the fire danger forecast is in the very high or extreme category.

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3. Potential effects of recent warm temperatures on the wheat crop

Since late January, most of Kansas has experienced much warmer-than-average air temperatures for this time of the year. During the first 20 days of February, the state ran an average temperature of 41°F, an impressive 8°F above normal, ranking 8th for warmest February on record until February 21. The current 8 to 14-day outlook favors above-normal temperatures to continue into mid-March (Figure 1). The effects of these warmer-than-average temperatures on the wheat crop are concerning producers and crop consultants.

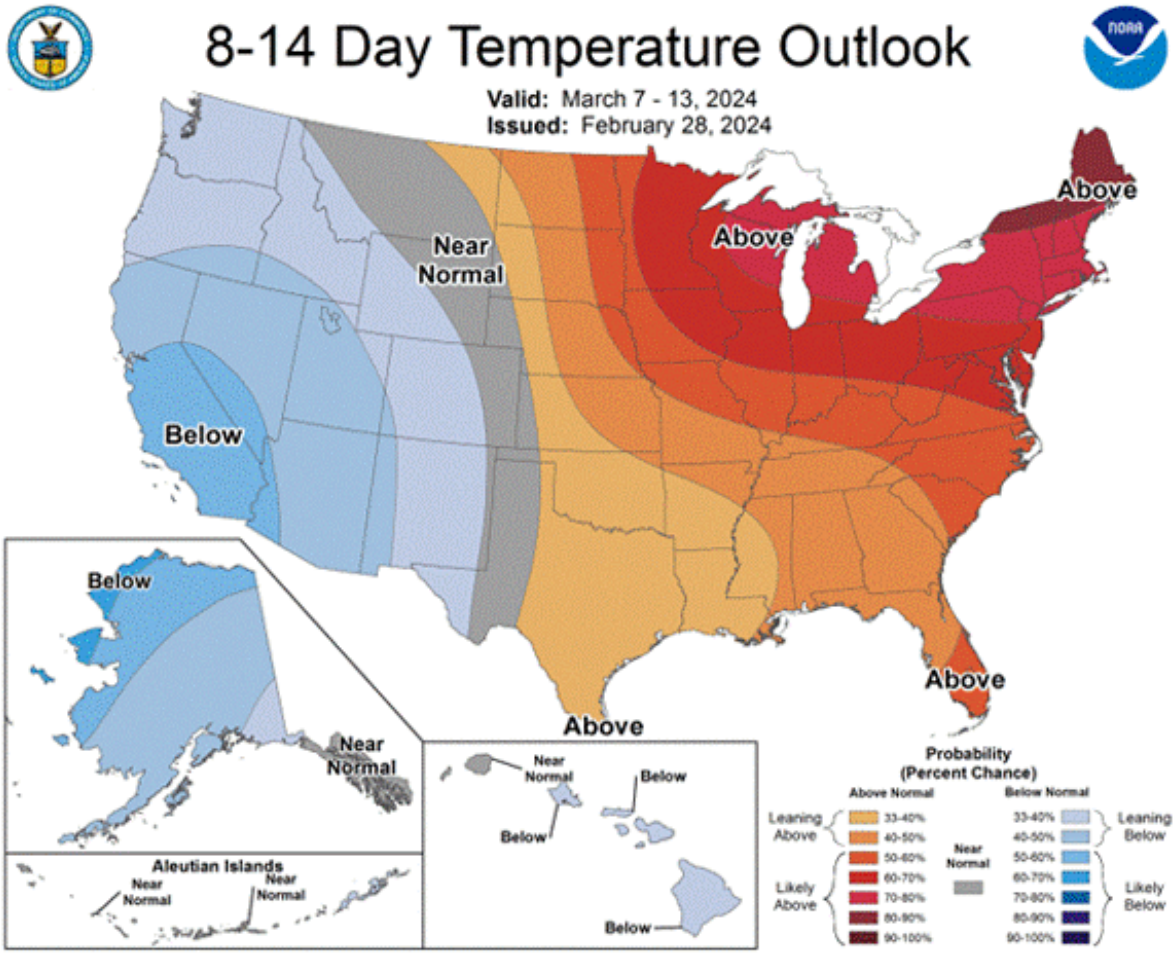

Figure 1. The Climate Prediction Center's 8 to 14-day temperature outlook as of February 28, 2024.

How warm have soil temperatures been?

The physiology of wheat vernalization and cold hardiness suggests that soil temperatures at the crown level rather than air temperatures should be the primary driver of increased or decreased cold hardiness during the winter. Soil temperatures will be influenced by tillage practice, the amount and type of residue on the soil surface, position on the landscape, and soil moisture. Soils with a thick

residue layer on the surface often have lower temperatures than bare soils, as the residue blocks direct exposure to sunlight and reduces soil evaporation, generally conserving more moisture. Moist soils require more energy to cause any change in temperature than dry soils; thus, any increase or decrease in temperature occurs more slowly than in dry soils. As a result, moist soils with heavy residue will heat more slowly than dry bare soils.

Soil temperatures at the 2-inch depth ranged from around 39°F in the northwest portion of the state, to as high as 48°F in the southern portions of the state (Figure 2). The warmest soil temperatures were along the Oklahoma border in south-central counties.

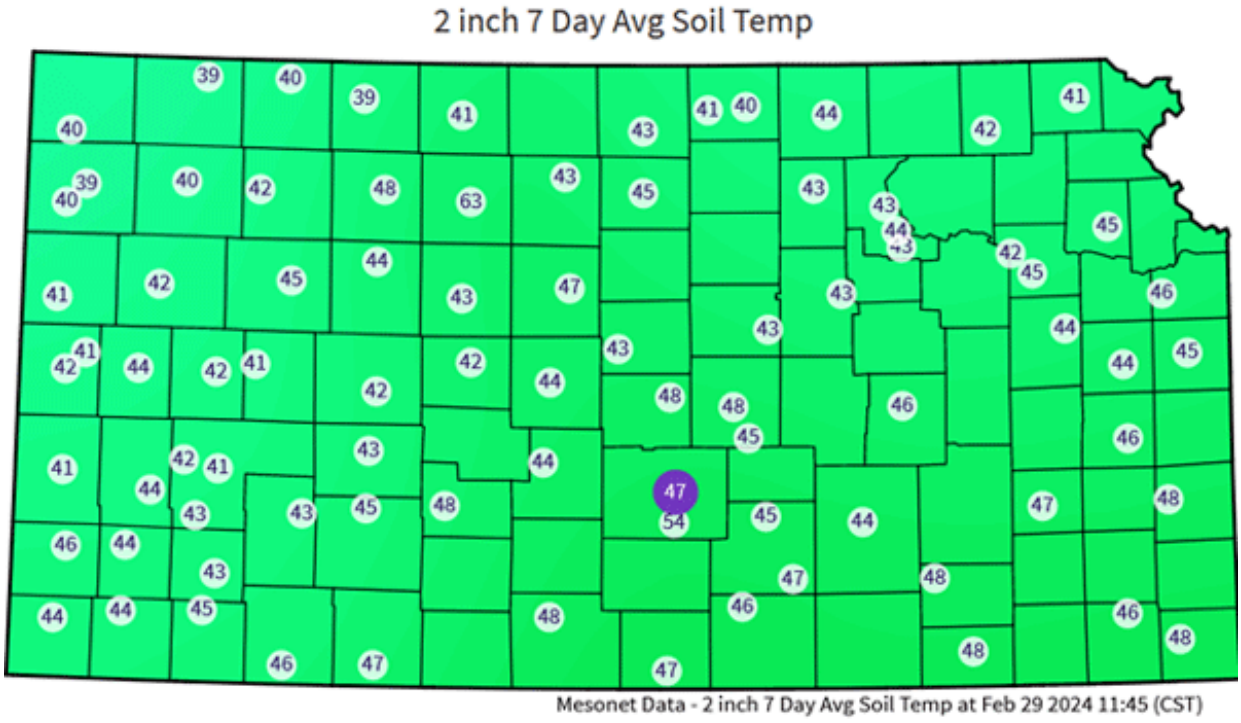

Figure 2. Weekly 2-inch average soil temperatures across Kansas during the February 22-29, 2024 period. Data from the Kansas Mesonet at mesonet.ksu.edu/agriculture/soiltemp**.**

Daily soil temperature variations varied with the amount of solar input and remaining grass cover. Some locations have briefly approached/reached the 58-61°F mark in recent afternoons (Figure 3). With temperatures running 15-20°F above normal, the soil temperatures are greatly reflecting these conditions.

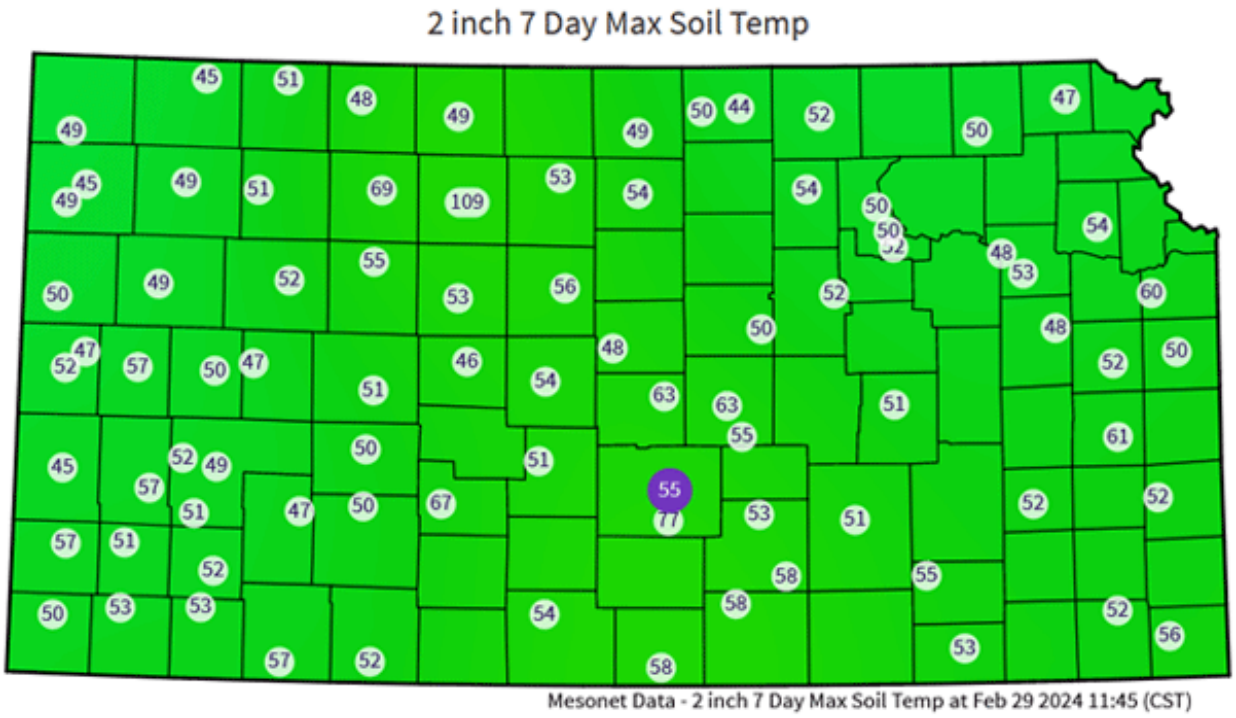

Figure 3. Maximum soil temperature at the 2-inch depth during the February 22-29, 2024 period. Data from the Kansas Mesonet at mesonet.ksu.edu/agriculture/soiltemp**.**

Understanding the vernalization process in winter wheat

Winter hardiness or cold tolerance is a physiological process triggered by gradually cooling temperatures in the fall. During the process of cold acclimation, there is a reduction in moisture content in the cells of the crown, which slows growth processes and the accumulation of soluble carbohydrates, all of which protect the cell membranes from freeze damage.

The process of cold acclimation within a sufficiently developed wheat seedling begins when soil temperatures at crown depth fall below 49 degrees F. Below this threshold, there is an inverse relationship of cold acclimation as affected by crown temperatures; in other words, wheat plants will acclimate twice as fast when crown temperatures are 32°F as compared to 40°F. Photoperiod also plays a role in cold hardening, with shorter days and longer nights helping initiate the process. With good and timely stand establishment for most of Kansas, the fall conditions experienced during 2023 were favorable for winterhardiness development of the 2023-24 wheat crop. Winter survival depends on the crown remaining alive; the substances that produce cold acclimation are most needed within the crown.

It takes about 4 to 6 weeks of soil temperatures below 50 degrees at the depth of the crown for winter wheat to fully cold harden. The colder the soil at the depth of the crown, the more quickly the plants will develop winter hardiness.

Temperature fluctuations during the winter and its effects on wheat cold hardiness

Cold hardiness is not a static state. After the cold hardening process begins in the fall, wheat plants can rapidly unharden when soil temperatures at the depth of the crown get above 49 degrees. But the plants will re-harden as crown temperatures cool below 49 degrees again. By the time winter begins, winter wheat will normally have reached its maximum level of cold hardiness. Wheat in Kansas normally has its maximum level of winter hardiness from mid-December to mid-January unless there are high temperatures during that period.

Once winter wheat has reached full cold hardiness, it will remain cold hardy as long as crown temperatures remain below about 32 degrees – assuming the plants had a good supply of energy going into the winter.

If soil temperatures at the crown depth rise to 50 degrees or more for a prolonged period, there will be a gradual loss of cold hardiness, even in the middle of winter. The warmer the crown temperature during the winter, the more quickly the plants will start losing their maximum level of cold hardiness. This is the situation being experienced during the 2023-24 wheat season since the many weeks of warm temperatures during early February have started to green up the crop ahead of the long-term average (Figure 4). Winter wheat can re-harden during the winter if it loses its full level of winterhardiness, but will not regain its maximum level of winter hardiness.

As soil temperatures at the crown level rise to 50 degrees or more, usually in late winter or spring, winter wheat will gradually lose its winter hardiness entirely. Photoperiod also plays a role in this process. When the leaves switch from prostrate to upright, the plants will completely de-harden.

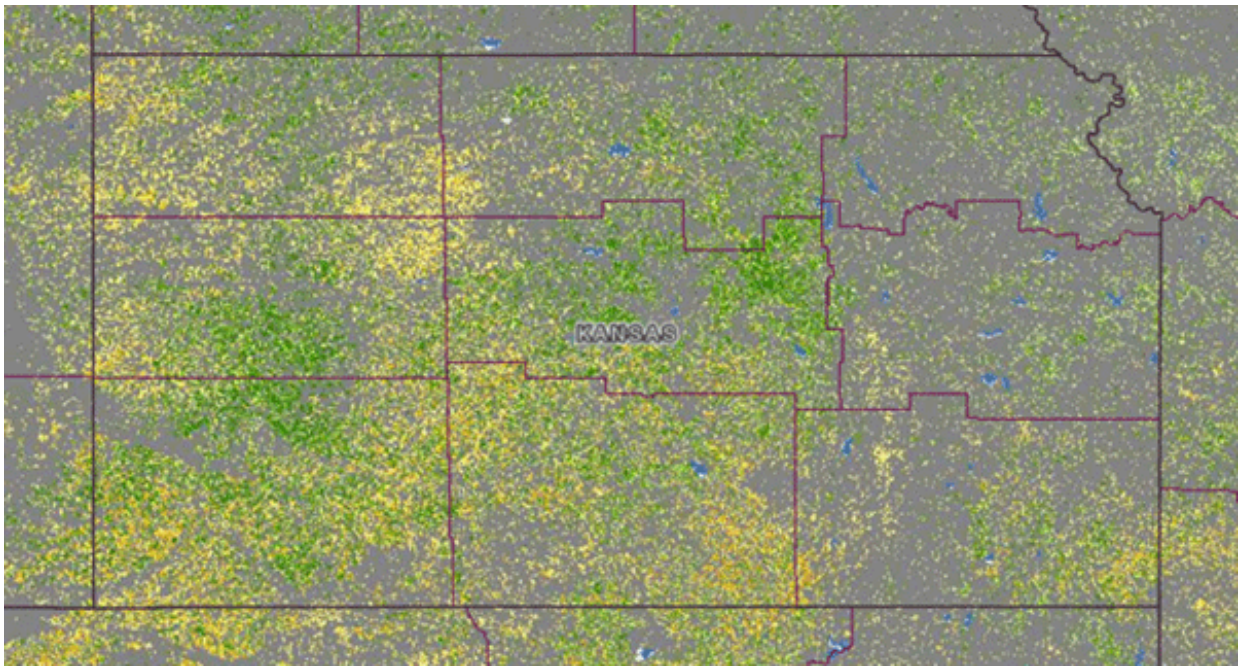

Figure 4. Difference from average Normalized Difference Vegetative Index (NDVI) for the state of Kansas during the February 12-26, 2024 period as compared to the long-term average. Source: Kansas Applied Remote Sensing (KARS), available at: https://greenreport-kars.ku.edu/**.**

Possible consequences to the wheat crop

The effect of the high soil temperatures during February on the wheat crop will depend on several factors, particularly on temperatures during early March.

Where temperatures were consistently close to 50°F and with little fluctuation during the recent period, such as in many areas throughout the southeast quarter of the state, the high temperatures should cause a gradual loss of cold hardiness. The warmer the crown temperature got during this recent period, the more quickly the plants will start losing their maximum level of cold hardiness.

The forecast indicates much above normal temperatures are likely to continue into mid-March. Winter wheat can re-harden to some extent during the winter, even if it loses its full level of winter hardiness but will not regain its maximum level of winter hardiness. Thus, in the regions where soil temperatures have been warmest, the crop may be less tolerant to low temperatures for the remainder of this winter, becoming more susceptible to freeze injury if temperatures decrease to single digits in the near future. Another potential consequence of warm winter temperatures is an overall accelerated crop development during the spring, leading to the early heading of the wheat crop. A primary potential consequence of an early heading is to position heading dates within a window when freeze occurrence in the spring is more likely. If a hard freeze (28-32°F) occurs during anthesis, the consequences can be very damaging to the crop's yield potential. However, a positive note in earlier heading is that grain filling also tends to occur earlier in the year, when hot temperatures are less likely. Cooler temperatures during grain filling can relate to increased grain yields as long as damaging frosts are avoided.

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4. Optimal time to remove cattle from wheat pastures: First hollow stem

The unique climate characteristics of the US southern Great Plains allow producers to use wheat as a forage and grain crop (dual-purpose), potentially increasing overall profitability compared to grain-only or forage-only systems. The date of grazing termination is an important factor in determining wheat's recovery potential and ability to produce grain. First hollow stem (FHS) is the optimal time to remove cattle from wheat pastures to protect grain yield potential.

What is the first hollow stem (FHS) stage of wheat development?

Before the wheat leaf sheaths become erect after spring green-up, the developing growing point below the soil surface will soon begin to form a tiny head. Although the head is quite small at this point, it has already established some important yield components. At this stage, the maximum potential number of spikelets is determined. Sufficient nitrogen (N) should already be available in the root zone at this growth stage to maximize the potential number of seeds per head.

Once the embryo head has developed, the first internode will begin to elongate, pushing the head up through the leaf sheaths. This first internode will be hollow. This will be visible before you can actually feel the first node (joint, located just above the first internode).

FHS is the point at which a 1.5 cm (about half-inch) length of hollow stem can first be identified below the developing head (Figure 1). This length is roughly equivalent to a dime's diameter, making its identification in the field easier. FHS occurs when the developing head is still below the soil surface. This means that producers must dig plants out of the ground to measure it.

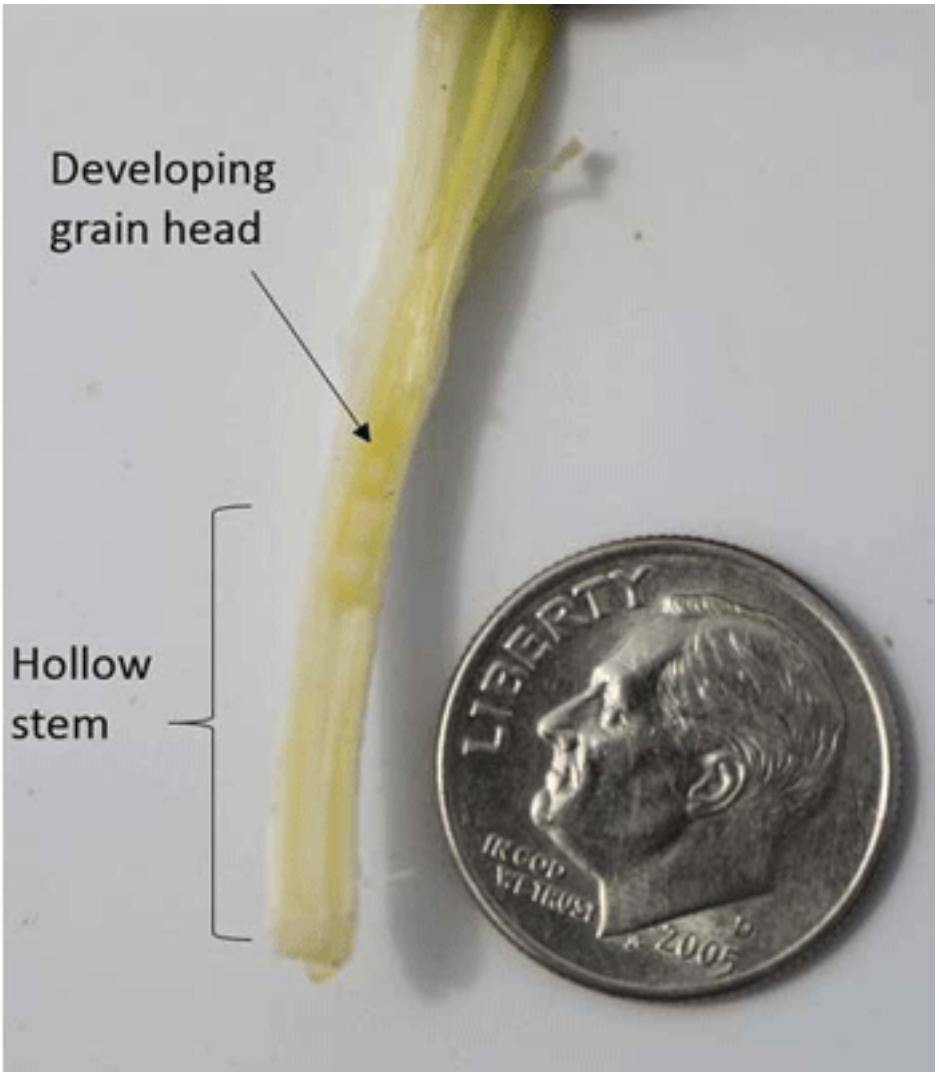

Figure 1. Wheat plant reaching the first hollow stem stage of growth, characterized by approximately 1.5 cm (or roughly the diameter of a dime) of hollow stem underneath the developing grain head. Photo by Romulo Lollato, K-State Research and Extension.

Assessing for first hollow stem

To look for FHS, start by digging up some plants from fields or areas that have not been grazed, such as field corners or just outside the fence. The date of FHS is variety- and field-specific, so it is important to sample each individual field. Select the largest tillers to examine, and slice the stem open from the crown area up. Look for the developing head, which will be very small. Next, see if you can find any hollow stem between the developing head and the crown area. The hollow stem is elongating if there is any separation between the growing point and crown. If that separation is 1.5 cm, the wheat plant is at FHS. FHS occurs between a few days to a week or more prior to jointing, depending on temperatures.

New tool for estimating first hollow stem in wheat

Winter wheat is beginning to break dormancy, and the Kansas Mesonet has introduced a new tool to help track the crop development: Wheat First Hollow Stem page. This page tracks soil temperature to

calculate wheat growing degree days (GDD) associated with first hollow stem occurrence. This tool employs a wheat growth model developed by Oklahoma State University and the Oklahoma Mesonet, which was validated for wheat growing conditions experienced in south central Kansas during the 2016-2021 growing seasons. The model output provides the probability of the first hollow stem occurrence (current and historical) for early and late-maturing wheat varieties. More details for the tool are found here.

Yield losses from grazing past first hollow stem

Cattle should be removed if the wheat has reached FHS to prevent grain yield loss. Yield losses from grazing after FHS can range from 1% to 5% per day, depending on grazing intensity and the weather following cattle removal (Figure 2). If cattle removal is followed by cool, moist weather, yield losses will often average about 1% per day grazed after FHS; if weather is hot, dry, and harsh, yield losses of 5% per day or more can be expected. It is easy for producers to be late by a few days in removing livestock as they wait for obvious nodes and hollow stems to appear, and even the first few days can be significant.

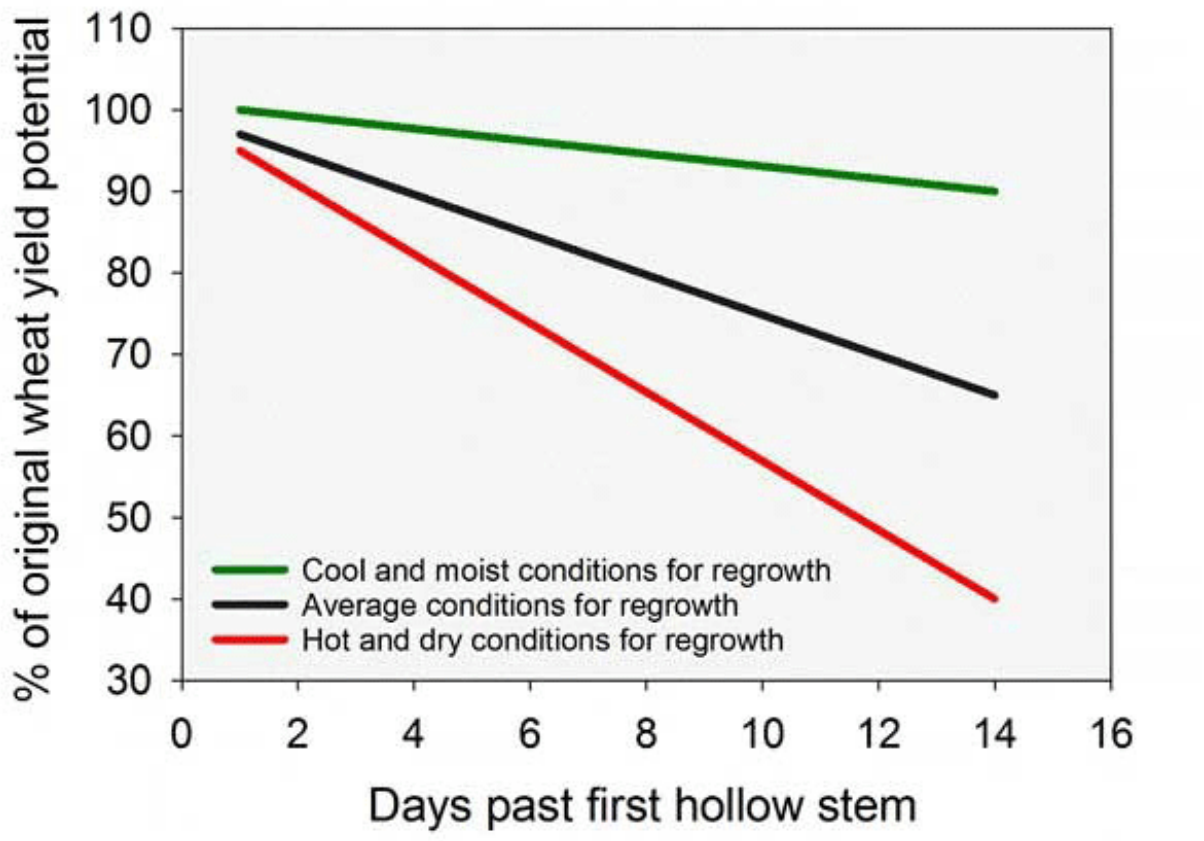

Figure 2. Percent of original wheat yield potential as affected by days of grazing past first hollow stem and weather conditions following grazing termination. Average yield losses by grazing for 14 days past first hollow stem ranged from 10% under favorable conditions to 60% under non-favorable conditions. Research conducted by Oklahoma State University (OSU) and published as K-State publication MF3375 and OSU publication PSS-2178.

Two things can occur when wheat is grazed too long: 1) fewer heads per acre because the primary

tiller has been removed, and 2) smaller and lighter heads than expected because the leaf area has been removed. As cattle continue grazing, the wheat plant is stressed and begins to lose some of the tillers that would produce grain. A little later, if there are not enough photosynthates, the plant begins aborting the lower spikelets in the head or some of the florets on each head. Finally, if there is not enough photosynthate during grain filling, the seed size will be reduced, and if the stress is severe enough, some seeds will abort.

Air and soil temperatures during 2024

Crop development is mostly a function of available water, nutrients, and temperature. Nutrient availability is field-specific, and thus, we will not discuss it here. Water has been limited since the fall for the majority of the wheat-growing region of the state, which will likely slow down crop development. Likewise, average temperatures across most of Kansas were warmer than normal for the growing season this far, which is reflected in much of the crop across the state already having greened up (accelerating the progression toward the first hollow stem compared to most years). As temperatures increase and wheat grows more rapidly in the spring, producers should start thinking about when to pull cattle off pasture to protect grain yields. Soil temperatures may quickly warm as much of the state has dry soils. As the soils thaw, muddy conditions may also influence the decision to remove cattle in some areas.

For more information on managing wheat in dual-purpose systems, check the K-State Research and Extension publication MF3375 [PSS-2178 from Oklahoma State Extension], "Dual-purpose wheat: Management for forage and grain production" at https://www.bookstore.ksre.k-state.edu/pubs/MF3375.pdf.

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5. First hollow stem update - Feb. 29, 2024

Cattle should be removed from wheat pastures when the crop reaches first hollow stem (FHS). Grazing past this stage can severely affect wheat yields (for a full explanation, please refer to the eUpdate companion article: *Optimal time to remove cattle from wheat pastures: First hollow stem*.

First hollow stem update

In order to screen for FHS during this important time in the growing season, the K-State Extension Wheat and Forage's crew measure FHS on a weekly basis in 16 different commonly grown wheat varieties in Kansas. The varieties are in a September-sown replicated trial at the South Central Experiment Field near Hutchinson.

Ten stems are split open per variety per replication (Figure 1), for a total of 40 stems monitored per variety. The average length of the hollow stem is reported for each variety in Table 1. As of February 26, 2024, no variety had reached first hollow stem, although a couple of varieties had started to elongate their stems.

Figure 1. Ten main wheat stems were split open per replication per variety to estimate first hollow stem for this report, for a total of 40 stems split per variety. Photo by Romulo Lollato, K-State Research and Extension.

Table 1. Length of hollow stem measured on 19th and 26th of February 2024 of 16 wheat varieties sown mid-September 2024 at the South Central Experiment Field near Hutchinson. The critical FHS length is 1.5 cm (about a half-inch or the diameter of a dime). Value(s) in bold indicate the highest FHS group.

	First hollow stem (cm)	
Variety	**2/19/2024**	**2/26/2024**
AP Prolific	0	0
AP24 AX	0	0.02
AR Iron Eagle 22AX	0	0
CP 7017AX	0	0
CP 7266AX	0	0
CP 7869	0	0
CP 7909	0	0.01
Croplan	0	0
CP15CW3388#011		
Guardian	0	0
Kivari AX	0	0
KS Ahearn	0	0
KS Providence	0	0
Limagrain	0	0
LCH16AC403-158		
Polansky XP24-11	0	0
Roadrunner	0	0
WB4347	0	0
Average	0	0.00
Min.	0	0
Max.	0	0.02

We will report the first hollow stem in the next few weeks until all varieties are past this stage. Additionally, first hollow stem is generally achieved within a few days from when the stem starts to elongate, so we advise producers to closely monitor their wheat pastures at this time.

This report intends to provide producers with an update on the progress of the first hollow stem development in different wheat varieties. Producers should use this information as a guide. Still, it is extremely important to monitor FHS from an ungrazed portion of each individual wheat pasture to decide on removing cattle from wheat pastures.

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6. Wheat variety fall forage yield comparison for 2023-24

Fall forage yield is an important aspect of dual-purpose wheat production. In this system, wheat is typically sown earlier than grain-only production, at higher seeding rates, and with additional nitrogen fertilizer to maximize forage production.

The weather experienced during the fall is crucial to determine the average level of forage yield, with warm and moist weather typically resulting in greater forage yield than cool and dry weather conditions. Management practices that also maximize forage yield are early sowing, higher seeding rates, placement of in-furrow phosphorus fertilizer with the seed at sowing, and fall nitrogen fertilization.

While the weather is typically the largest player in determining fall forage production, followed by management, there are also differences among wheat varieties in forage production potential. Thus, the K-State Wheat Production Group compares the forage yield of several commonly grown wheat varieties and upcoming lines every year. This test is usually performed in the South Central Experimental Field near Hutchinson, Kansas (Fig. 1), and the forage sampling occurs sometime during December (Table 1).

At the sampling conducted on November 30, 2023, there were significant differences among varieties regarding forage accumulation. The average forage yield was 1,353 lbs dry matter (DM) per acre with a range from 871 to 1,969 lbs DM/a. The varieties that exhibited the highest forage yield were AP24AX, AP Prolific, AR Iron Eagle 22AX, CP7017AX, CP7266AX, CP7909, Croplan CP15CW3388#011, Guardian, KS Ahearn, KS Providence, and Limagrain LCH16AC403-158 (Table 1). The remaining varieties produced statistically less forage than these.

Figure 1. Dual-purpose wheat trial near Hutchinson, KS. Photo by Romulo Lollato, K-State Research and Extension.

Table 1. Fall forage yield of wheat varieties sown under dual-purpose system near Hutchinson, KS. Forage biomass was collected on November 30, 2023. Data is shown in pounds of dry matter per acre (lbs DM/ac). There were significant statistical differences among varieties at the 5% probability level. Varieties are listed in alphabetical order, and the bold highlight indicates the highest forage-yielding group.

Variety	Forage DM yield (lbs/a)
AP24 AX	**1492**
AP Prolific	**1678**
AR Iron Eagle 22AX	**1473**
CP 7017AX	**1606**
CP 7266AX	**1649**
CP 7869	871
CP 7909	**1665**
Croplan CP15CW3388#011	**1370**
Guardian	**1510**
KS Ahearn	**1740**
KS Providence	**1958**
Kivari AX	1082
Limagrain LCH16AC403-158	**1969**
Polansky XP24-11	875
Roadrunner	1246
WB4347	1154
Average	1459
Minimum	871
Maximum	1969

Another important aspect of dual-purpose wheat production is how long each variety can be grazed in the spring. This is measured as the date for the first hollow stem, and varieties can differ in as much as 20-30 days in achieving the first hollow stem in the spring. The Wheat Production Group at K-State uses this very same trial to measure first hollow stem development during late February and early March. The eUpdate will publish updates on the progress of first hollow stem development until all tested varieties have reached this stage.

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7. Late winter kochia control in fields going to soybeans, sunflowers, and wheat

This is the third and final article discussing pre-emergence herbicides for kochia control. This week, we will discuss recommendations specific to fields planted to soybeans or sunflower this spring and wheat in the fall. Previous articles have discussed general considerations for late-winter kochia control (https://bit.ly/3OLDWIu - Issue 991) and pre-emergence herbicides for kochia control in fields that will be planted to corn or grain sorghum (https://bit.ly/3Ics6DU - Issue 992).

Fields going to soybeans

Start in February or early March with a tank mix of glyphosate (using a minimum of 0.75 lb ae/acre) or Gramoxone SL (minimum of 2 pts/acre) and 8 to 16 oz/acre of Clarity before kochia emergence. Clarity requires a minimum accumulation of 1 inch of rain and 28 days before planting soybeans, except for Roundup Ready 2 Xtend or XtendFlex soybeans. As indicated by the label, Clarity cannot be used as a pre-plant treatment in soybeans in areas with less than 25 inches of annual rainfall. Paraquat tank-mixed with metribuzin (Dimetric, others) will provide extended residual control of kochia as long as the kochia population is susceptible to triazine herbicides. Be aware of rate restrictions for metribuzin in western KS, as soil and environmental characteristics influence the potential for soybean injury following metribuzin.

Sulfentrazone-based products (Spartan, others) could also be considered for use prior to kochia emergence to manage an early flush of kochia (Figures 1 and 2). However, it's important to note the crop rotation restrictions on these products. Pyroxasulfone (Zidua) also has activity on kochia, although more rain is required for activation. Figure 1 illustrates the efficacy of various pre-emergence herbicide programs for controlling glyphosate- and dicamba-resistant kochia in Roundup Ready 2 Xtend soybeans planted in no-till dryland fields at Hays, KS. These treatments were applied to emerged kochia on May 23. All treatments also included Roundup PowerMax.

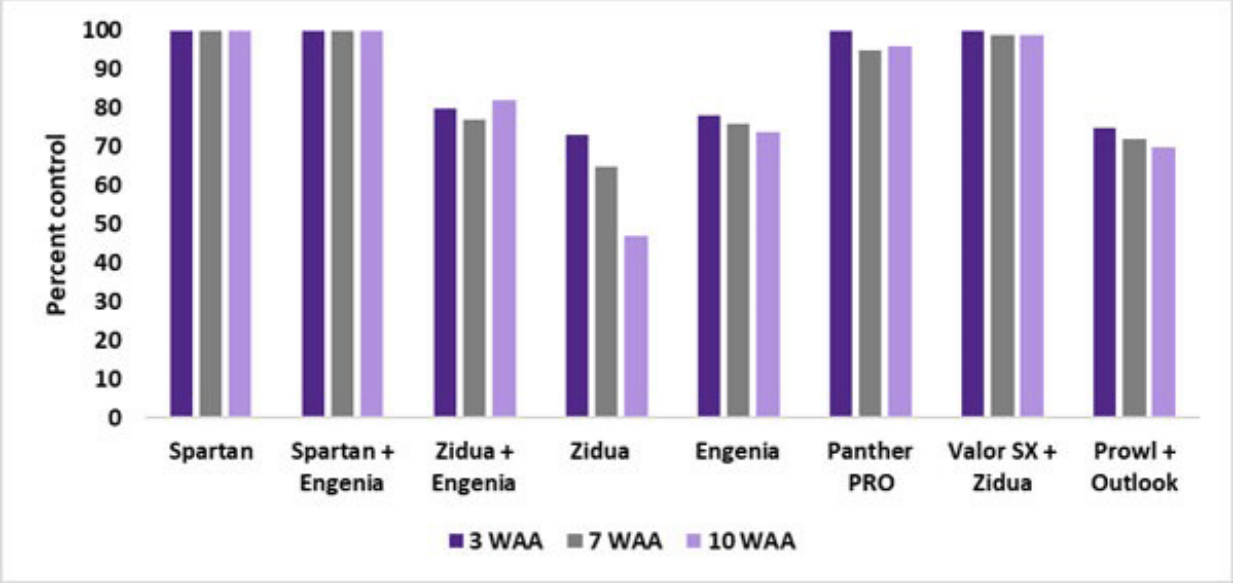

Figure 1. Kochia control following pre-emergence herbicide application in no-till dryland soybean in Hays, KS (WAA= weeks after application). Data collected by Vipan Kumar, K-State

Research and Extension.

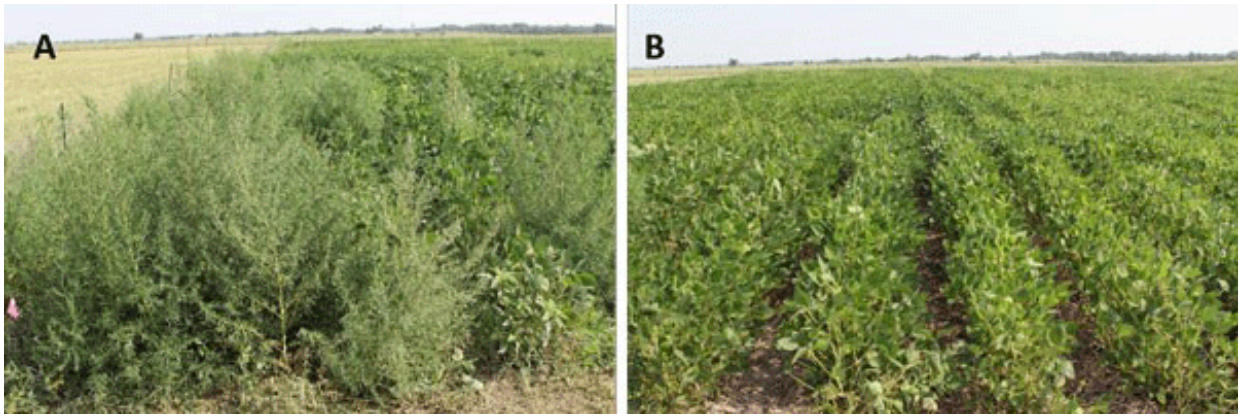

Figure 2. Kochia control in non-treated plot (A) and with PRE applied Spartan (B) in Roundup Ready 2 Xtend soybean at 7 weeks after treatment (WAT). Photos by Vipan Kumar, K-State Research and Extension.

Fields going to sunflowers

Planting sunflowers into a clean seedbed is a key step to achieving good season-long control of all broadleaf and grassy weeds. But, it is especially important for getting good control of any weed populations, such as kochia, that are resistant to glyphosate or ALS-inhibiting herbicides and cannot be controlled with post-emergence herbicides-applied herbicides in sunflower.

The best approach to control ALS/glyphosate-resistant kochia in sunflower is to start in February/early March with a tank-mix of Gramoxone (using a minimum of 2 pts/acre) and Spartan, Spartan Charge (sulfentrazone+Aim), Broadaxe or Authority Elite (sulfentrazone+Dual Magnum), or Authority Supreme/Authority Edge (sulfentrazone+Zidua) before kochia begins to germinate. Select pre-emergence products that are effective on kochia and apply additional pre-emergence herbicides at planting to extend control of kochia and other weeds. Dicamba is not an option in these applications due to label restrictions. Monitor fields closely as additional Gramoxone SL treatments may be required prior to sunflower planting.

Fields going to fall-planted wheat

If kochia is emerging in fields to be planted to wheat this fall, atrazine cannot be used. Metribuzin can substitute for atrazine and has a 4-month plant-back restriction to wheat. Additional products include Scoparia or Authority MTZ and products containing sulfentrazone or isoxaflutole. Zidua also has good activity but requires significant rainfall for activation, so it should be applied with dicamba.

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8. Looking ahead to spring weather in Kansas

Despite two cold weeks in January, winter 2023-2024 has been warm. Precipitation was much above normal until February. Now, things are drying out and greening up, and the landscape is in need of precipitation. This article will look to the future and provide some ideas of what to expect for spring and early summer 2024.

The Past

Since meteorological winter began in December, many locations in the state are running in the top five warmest and wettest winters on record. This is despite a very cold middle of January and a very dry last 20 days across the region. During typical El Niño winters, Kansas usually finds itself on the battleground of typical above/below normal precipitation and temperature with anomalies near normal. However, we usually see an increased probability of warm extremes (Figure 1, left) and wet extremes (Figure 1, right). This has been well aligned with conditions across the state in the winter.

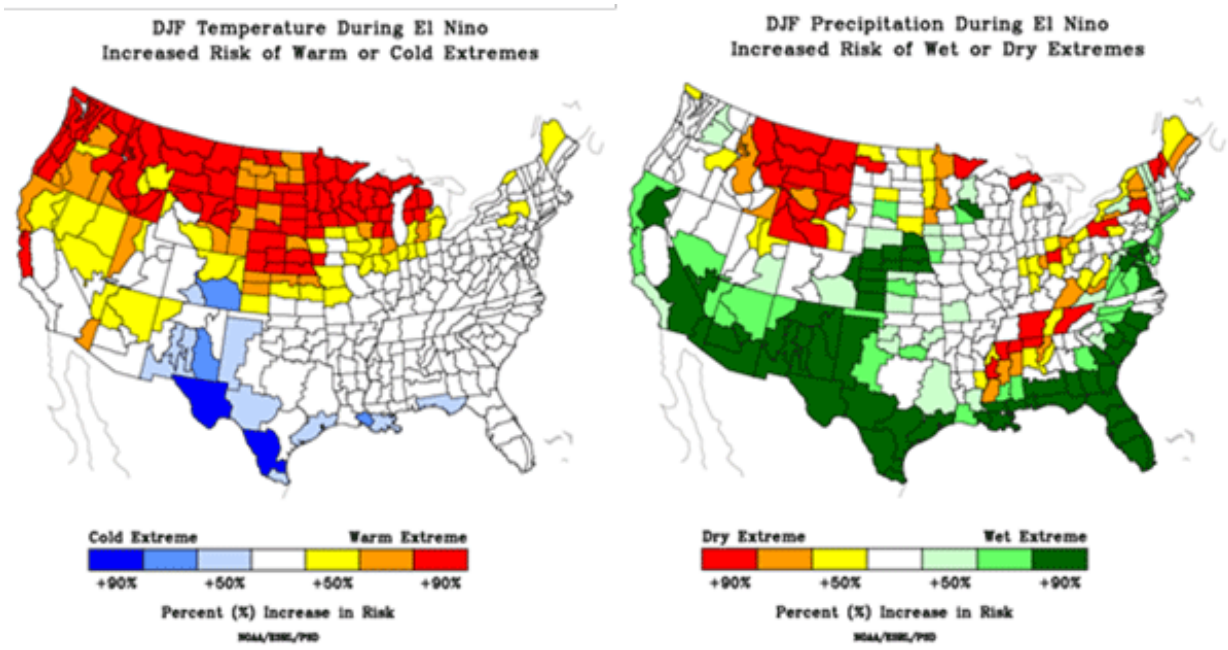


Figure 1. Probability of extremes during El Niño winters (December, January and February) for temperatures (left) and precipitation (right). Source: https://psl.noaa.gov/enso/climaterisks/**.**

This is great news with the drought significantly improved this winter (Figure 2). In fact, we completely removed all D4 (exceptional) and D3 (extreme) drought across the state. This has resupplied soil moisture compared to November (Figure 3) and helped improve the wheat to 57% rated good or excellent (compared to only 19% this time in 2023), according to USDA NASS.

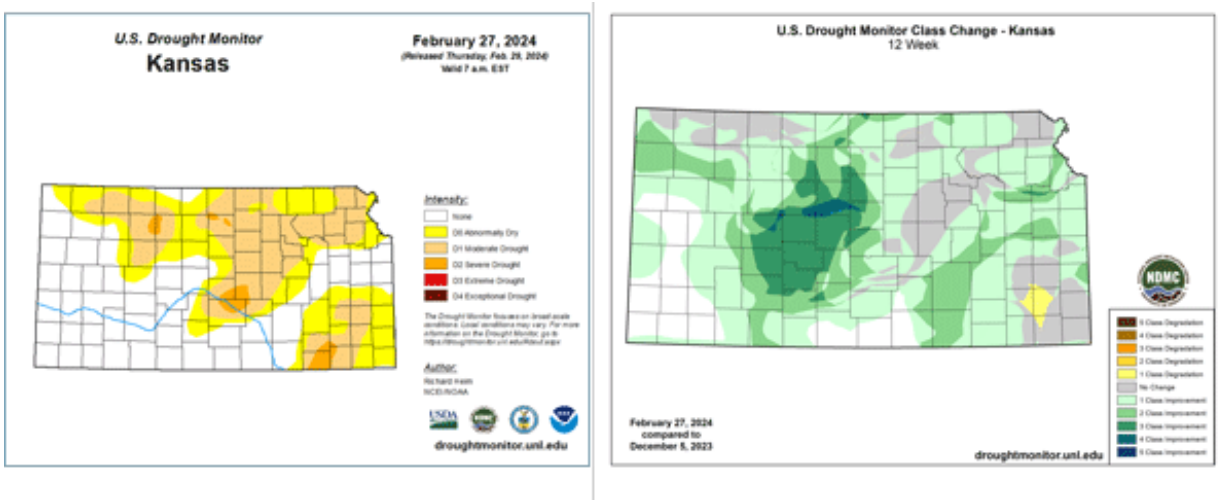
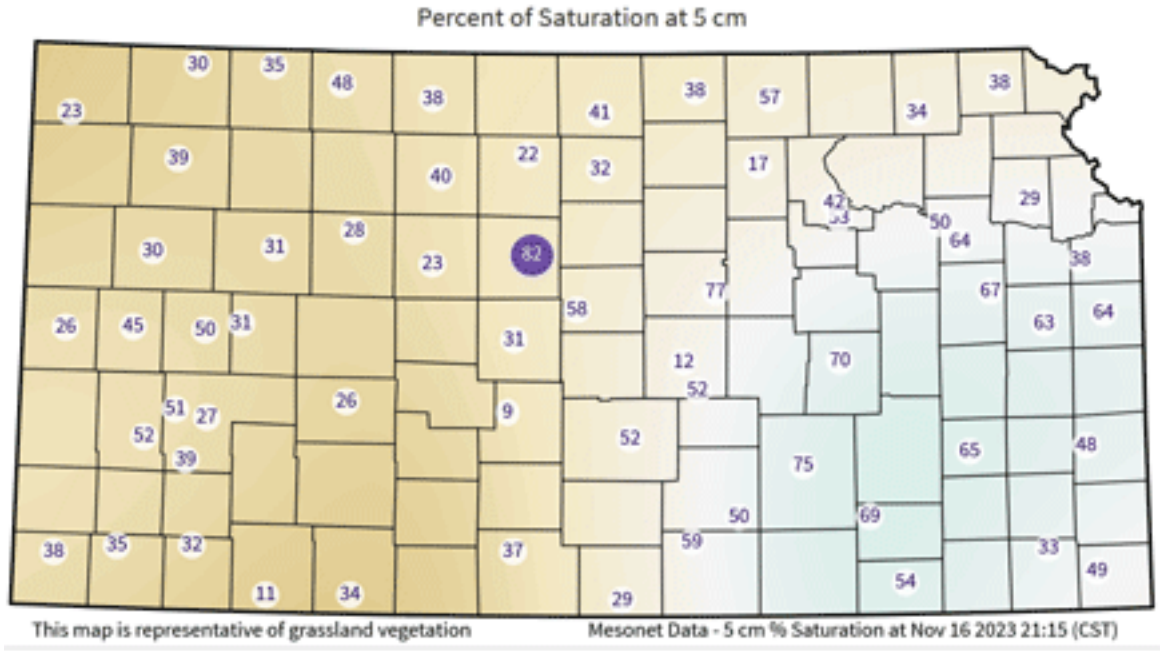


Figure 2. The United States Drought Monitor as of February 20, 2024 (left) and the change in the Drought Monitor over the last 12 weeks.



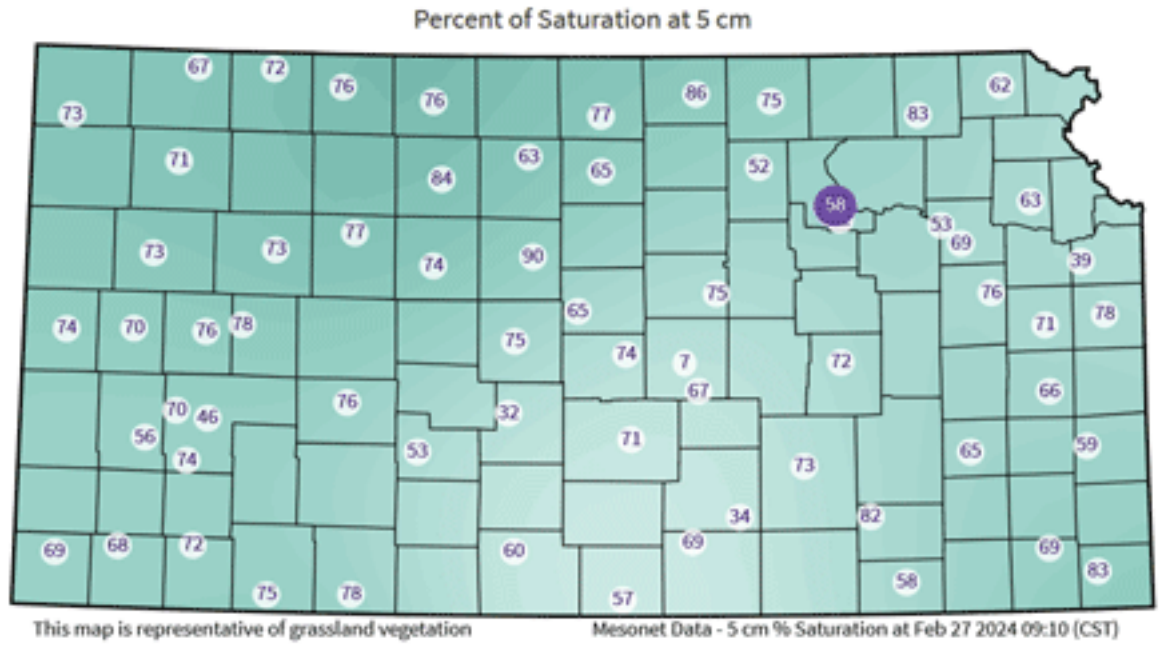


Figure 3. Soil moisture percent of saturation at the 5 cm (2 inches) depth in November (left) and February (right) on the Kansas Mesonet. Source: https://mesonet.k-state.edu/agriculture/soilmoist/

The Current

While El Niño has contributed to our weather pattern this winter, it wasn't the only influencer. The Pacific Decadal Oscillation (PDO) in the North Pacific, the Polar Vortex, and the Madden-Julian Oscillation (MJO) have all played roles in this warm and wet winter. As we move further into early spring, the Polar Vortex climatologically weakens and is usually a shrinking factor. So, we will focus

on the North Pacific (PDO) and the equatorial East Pacific ENSO (where El Niño resides) for this outlook.

With the persistent El Nino enhanced jet stream, we continue to have an active weather pattern across North America as in a classic Niño winter pattern (Figure 4). Additionally, we have a negative PDO, basically warm water in the middle North Pacific and cold water off the Alaska/Canadian Pacific coast. This decadal oscillation often lasts around ten years. We are several years into the current cycle and it has weakened some. However, this helps drive more of a dry, northwest flow into the United States and usually contradicts El Niño. This has resulted in a split flow (two active jet streams) across the US (Figure 4, right). This does several things. First, it allows for a continued active pattern with storm systems and frequent cold fronts. It doesn't allow for a true "arctic" air mass to build but rather allows for short-duration frequent "cooler" air masses to push south into the US. This, in turn, typically steers Gulf of Mexico moisture, our main source of precipitation, off to the east and away from Kansas. This is the main reason we have been dry across the Central Plains for the last 25+ days. Until the pattern breaks with a more "phased" or unified jet stream, we won't get a stout weather change. This means more warmth, wind, and fire weather, and less precipitation and cold. While the current outlook for March is for wetter than normal precipitation and equal chances of at/above/below normal temperatures from CPC, this may be a challenge to verify with the current expected pattern into mid-March.

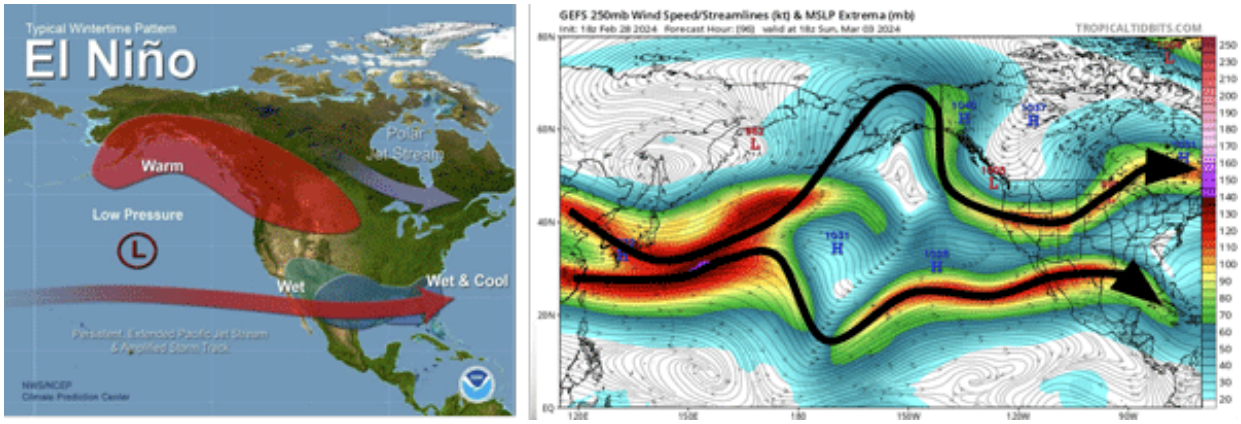


Figure 4. Typical winter El Nino pattern from the Climate Prediction Center (left) and the current upper-level wind/jet streams across the Pacific Ocean (right) from TropicalTidbits.com and arrows annotated by the author.

The Future

As we move into mid-spring, there are many concerns despite recent positives with soil moisture and drought. First is winter wheat. While it is rated well, the early green-up will lead to extreme vulnerability to freeze and frost in late spring (see the companion article in the eUpdate about the risk of warm winter temperatures on wheat). Even with a warmer-than-normal spring, one or two brief cold air intrusions could be detrimental. Secondly, precipitation will need to keep up with actively growing vegetation to ensure that there is topsoil moisture for crop planting.

First, with the persistence of the PDO and the upwelling of colder water in the Pacific, it is almost guaranteed that El Niño will diminish. In fact, we are already seeing a downward trend in the temperature anomalies in the East Pacific. This transition isn't uncommon for the spring but does bring with it some challenges. We still face the "spring barrier" that usually results in some forecast uncertainty for the summer. Some models even suggest that waters cool to the point of potential La Niña emergence mid-summer. There have been ten years in which we transitioned from El Niño in December through February to La Niña in the June - August timeframe. This transition is favorable for severe weather and regional tornado outbreaks (Figure 5), according to a 2016 NOAA study (Lee et al. 2016).

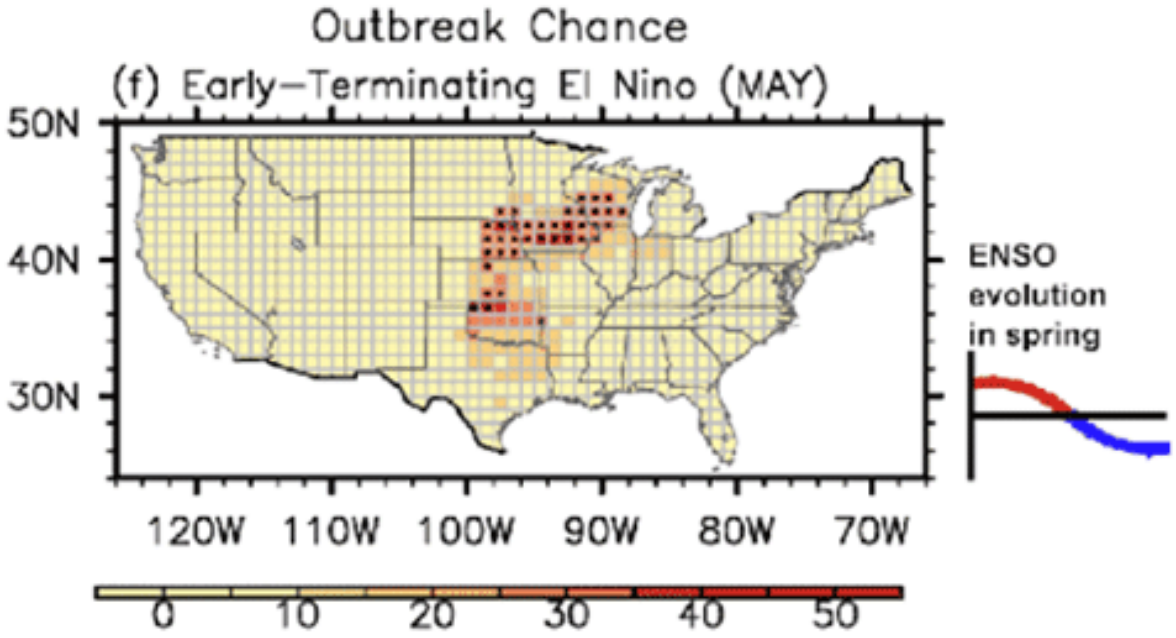


Figure 5. Regional tornado outbreak probability during a weakening El Niño centered on a transition in May (Lee et al. 2016).

When we consider an increase in severe weather, we must also consider the increased probability of moisture as a result. When an active El Nino jet stream seasonally shifts north, this opens the door for increased storm systems that also provide precipitation. In the ten years of the previous El Niño to La Niña transition, the months of March-May have yielded a statewide average precipitation departure from normal of +0.52". However, that doesn't mean the precipitation was spread equally.

Spring-driven storm systems usually have a dry side that is oriented along the High Plains with an easterly pushing dryline. These dry areas of the storm often setup in the same area that had above-normal precipitation last growing season. This resulted in a substantial amount of grass growth, which then increased wildfire concern (see companion article on wildfires). We have already seen large fires in Texas, Oklahoma, and Nebraska. The probability of an increase in wildfires in western Kansas is higher than normal during these events. With these considerations, the CPC is calling for above-normal moisture for March-May in eastern portions of the state where storms are most

favored (Figure 6). Further west, with those dryline intrusions, there is less precipitation certainty with equal chances of at/above/below normal moisture being favored.

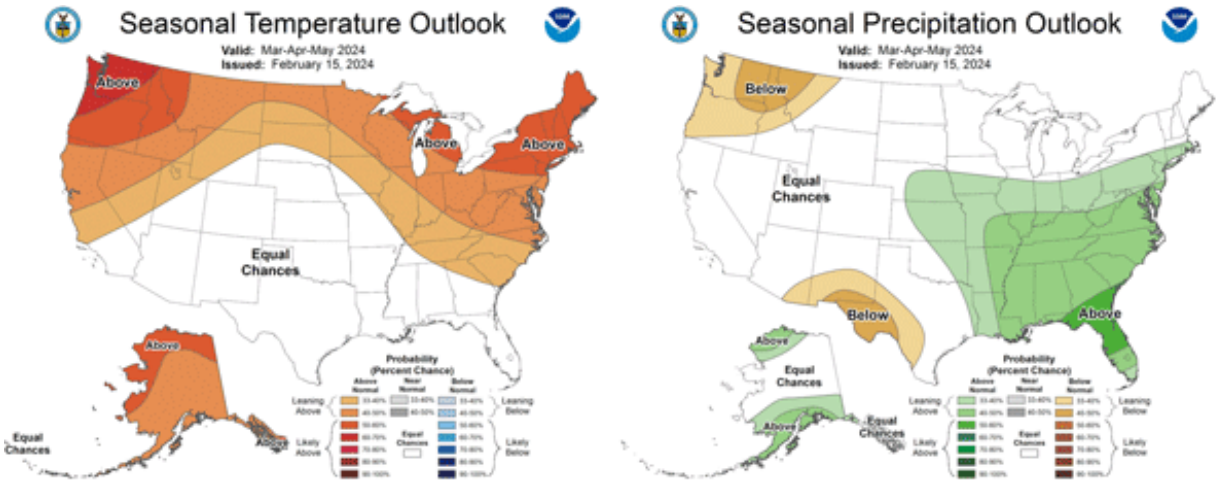


Figure 6. CPC probability outlooks for the three-month average of March, April, and May 2024.

Unfortunately, the average precipitation becomes less than normal for the summer in the ten El Niño spring transitions to La Niña. While there were wetter years and some areas of above-normal precipitation, the June - August average for those summers is -0.17" below normal. Additionally, the probability of precipitation dry extremes during a La Niña period in the summer is higher for portions of Kansas, the Rockies, and the northern Plains (Figure 7, left). Using an average of all the climate models that can forecast precipitation anomalies, a drier-than-normal signal is prominent for the June - August timeframe (Figure 7, right). Therefore, it seems likely that drier than normal would emerge this summer. Some models even have the switch occurring rapidly in the middle of spring. Our focus turns towards the southern High Plains where drought has already been re-established. This could be a source area for drier/warmer conditions to create a negative feedback cycle, potentially expanding northward into Kansas during the summer. Therefore, there is a higher likelihood of greater agricultural stress on warm-season crops. The CPC seems to agree about these trends with their June - August outlook (Figure 8). Above-normal temperatures are also favored. This would lead to an increased risk of flash drought and higher atmospheric moisture demands.

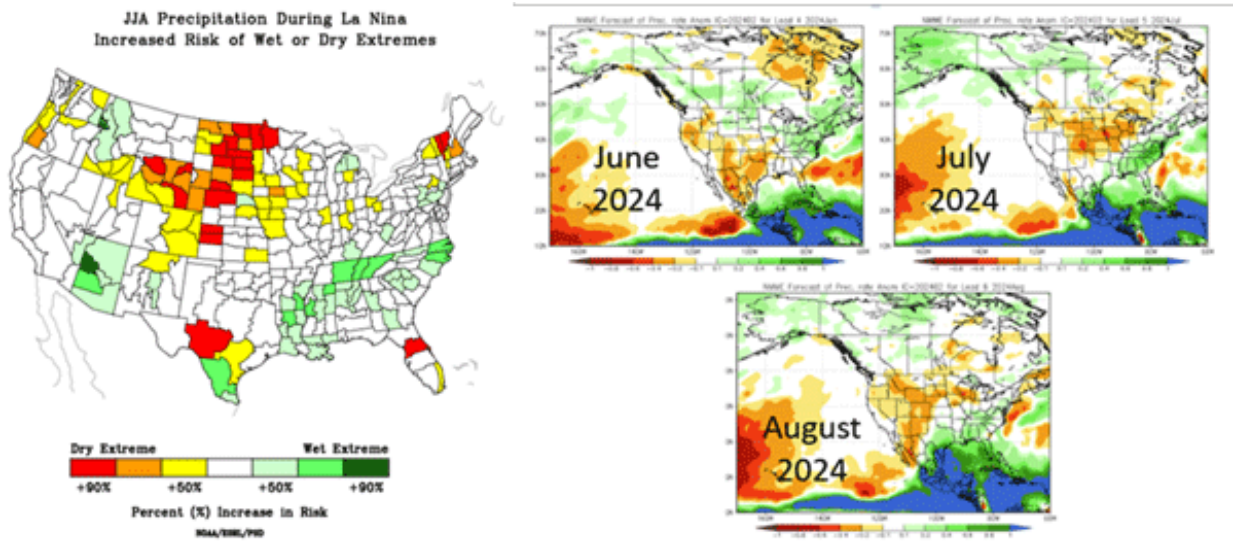


Figure 7. Probability of wet and dry extremes during La Niña summers (https://psl.noaa.gov/enso/climaterisks/) and the precipitation anomalies forecasted from an average of all climate models for June, July, and August 2024 as of February 2024 model runs (https://www.cpc.ncep.noaa.gov/products/NMME/).

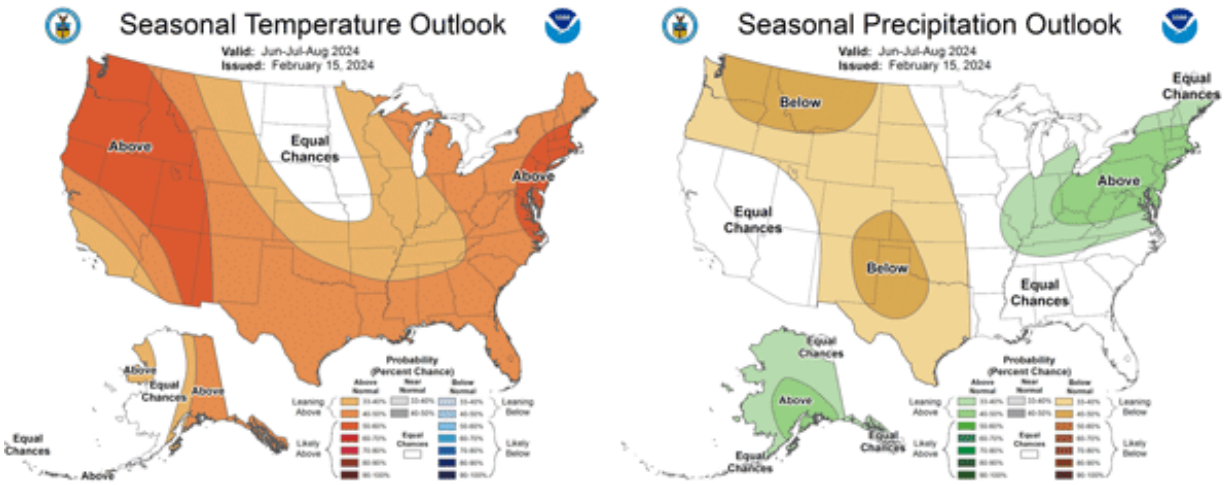


Figure 8. CPC probability outlooks for the three-month average of June, July, and August 2024.

The Bottom Line

As with any transition season (spring and fall) there are many unknowns of the expected weather. El Niño remains our most dominant seasonal driver, but as it weakens, the negative Pacific Decadal Oscillation and underlying potential emerging La Niña may take over late spring and early summer. This would likely result in a more active than normal spring with severe weather and potentially moisture, especially for eastern Kansas. Unfortunately, drought is already established in southern New Mexico and southwest Texas. This dryness is likely to expand northward with a drier and warmer

than normal summer favored for Kansas.

Reference

Lee, S.-K., A. T. Wittenberg, D. B. Enfield, S. J. Weaver, C. Wang, and R. M. Atlas. US regional tornado outbreaks and their links to spring ENSO phases and North Atlantic SST variability. 2016. Environmental Research Letters. DOI:10.1088/1748-9326/11/4/044008

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9. Don't miss the remaining K-State Crop Talk webinars

The popular K-State Crop Talk webinar series started on February 20, 2024. This year, Crop Talk is focused on agronomic topics for producers across the western half of Kansas. Topics include management for wheat production, biological products concerning soil fertility, high pH soils, and fallow replacement options in dryland systems. Continuing education credits will be offered, with one credit for each session.

Each webinar will begin at 12:00 pm (CST) and last until 1:00 pm, beginning with the first one on Tuesday, February 20.

Upon registration, participants will receive an email with instructions to attend via Zoom or YouTube. These webinars are open to all, and there is no cost. Visit the K-State Northwest Research and Extension Center's website to register: https://www.northwest.k-state.edu/events/.

Please contact your local KSRE extension office or the Northwest Research and Extension Center at 785-462-6281.

A complete list of webinars, with dates, topics, and speakers, is detailed below.

February 20 – Management Tactics for Wheat Production
Romulo Lollato, K-State Wheat and Forages Specialist

February 27 - Biological Products and their Role in Soil Fertility
Dave Franzen, North Dakota State Soil Specialist

March 5 – **Managing Areas of Fields with High pH**
Dorivar Ruiz Diaz, K-State Soil Fertility Specialist

March 12 – **Fallow Replacement Options in Dryland Rotations**
Lucas Haag, K-State Northwest Area Agronomist

K-STATE Research and Extension

CropTalk

Webinar Series

Broadcast Live from 12:00 – 1:00 pm CT
via Zoom and YouTube

February 20
Management Tactics for Wheat Production
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Register to attend at
www.northwest.ksu.edu/events

Links for joining will be sent after registration.

Certified Crop Advisor (CCA) Credits have been applied for.

If you have questions, please contact your local Extension agent or the K-State Northwest Research and Extension Center at 785-462-6281.

10. Update - Full program details are set for two Wheat Rx seminars

A prescription for producing high-yielding and high-quality wheat is just what the doctor ordered for Kansas wheat producers — referring to expertise from Kansas State University like Drs. Romulo Lollato, Carlos Bonini Pires, Kelsey Andersen Onofre, Dorivar Ruiz Diaz, Dan O'Brien, and others.

Kansas Wheat Rx is a combination of suggested management practices for the economical and sustainable production of high-quality winter wheat in Kansas.

Mark the calendar now for two upcoming seminars in Dodge City and Wichita. Speakers will discuss cover crops and soil health, the role of wheat in a cropping system, soil fertility, fungicides, and economics of wheat production.

"We cannot change the impact of weather on each year's crop, but we can arm wheat producers with the knowledge they need to maximize profitability through utilizing the genetic potential of new varieties and best management practices," said Aaron Harries, vice president of research and operations for Kansas Wheat. "We're excited to share with Kansas wheat producers what we've learned through the Kansas Wheat Commission's research investments — from the importance of variety selection to the practices and tools farmers can use to improve quality."

These programs are part of Wheat Rx, a partnership between Kansas Wheat and K-State Research and Extension, to disseminate the latest research recommendations for high-yielding and high-quality wheat to Kansas wheat farmers. This effort includes a series of extension publications at https://kswheat.com/wheatrx and educational outreach like the upcoming seminars.

Registration fee is $110; Kansas Association of Wheat Growers members receive one free registration. Lunch will be provided.

These programs are scheduled for March 7, 2024, in Dodge City, and March 8, 2024, in Wichita, with more details provided below. The program will include:

8:30 a.m. – 8:50 a.m. Registration, coffee and donuts

8:50 a.m. – 9:00 a.m. Welcome and Wheat Rx background – Aaron Harries

9:00 a.m. – 9:50 a.m. Economics of wheat production (and outlook) in central Kansas – Dan O'Brien (Wichita) or Gregg Ibandahl (Dodge City)

10:00 a.m. – 10:50 a.m. Beyond grain: Benefits of wheat to cropping systems – Romulo Lollato

11:00 a.m. – 11:50 a.m. Wheat fertility management – Dorivar Ruiz Diaz

12:00 p.m. – 1:00 p.m. Lunch

1:00 p.m. – 1:50 p.m. Important wheat diseases and their management – Kelsey Andersen Onofre

2:00 p.m. – 2:50 p.m. Soil health and cover crops – Carlos Pires and Logan Simon

March 7, 2024
8:00 a.m. to 3:00 p.m.
7:30 a.m. Registration
Dodge City, Depot Theater, 201 E Wyatt Earp Blvd.

Breakfast and lunch will be provided. View the full agenda and register for the event at https://kswheat.com/dodgecity.

March 8, 2024
8:00 a.m. to 3:00 p.m.
7:30 a.m. Registration
Wichita, Double Tree at the Airport, 2098 Airport Road

Breakfast and lunch will be provided. View the full agenda and register for the event at https://kswheat.com/wichita.

Members of the Kansas Association of Wheat Growers receive one free registration to these full-day seminars. The nonmember registration fee is $110. To take advantage of this benefit, join or renew your membership today at https://kswheat.com/join.

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