Issue 894

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Extension Agronomy

eUpdate

02/24/2022

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. Potential for winterkill to the Kansas wheat crop

The extremely cold temperatures observed in Kansas in mid-February 2022 have the potential to cause winterkill to the winter wheat crop. However, several factors determine whether winter wheat will actually survive the winter and this particular cold spell. The most important factors from the crop's perspective include proper cold hardening and root system development, as well as the overall crop status in terms of damage from pests. From an environmental perspective, important factors include air temperature, consequent soil temperatures at the crown level, snow cover, and soil moisture content.

Crop conditions by region

The crop conditions of the 2022 Kansas wheat crop are variable depending on the region and the planting and emergence dates. A mid-September rainfall in southwest and west central Kansas led many growers to plant during the early side of the planting window, resulting in ~50% emergence by early October (Figure 1). This crop produced a large amount of biomass during the fall and started to deplete soil moisture. While the large number of tillers may have allowed for good winterhardiness development, the high moisture consumption of this crop may have worsened its potential to survive through the winter due to a dryer subsoil. Conditions were dryer from then on, slowing down the progress of crop emergence in that region of the state. Thus, even crops planted on time may not have emerged until later in the year. Consequently, the remainder of the state did not reach 50% crop emergence until around October 20, with 30-40% of the wheat not emerging until sometime in November. This is considerably late for regions such as northwest and north central Kansas, although the crop may still perform well when emerged this late in south central Kansas. The crop that emerged by mid-October should have accumulated enough tillers in the fall for a good winterhardiness development. Meanwhile, fields that emerged late had a much more limited development in the fall both in terms of tillers and root development, due to a combination of a late emergence and cool and dry weather conditions. Thus, fields in this condition will be more exposed to potential consequences of the cold temperatures.

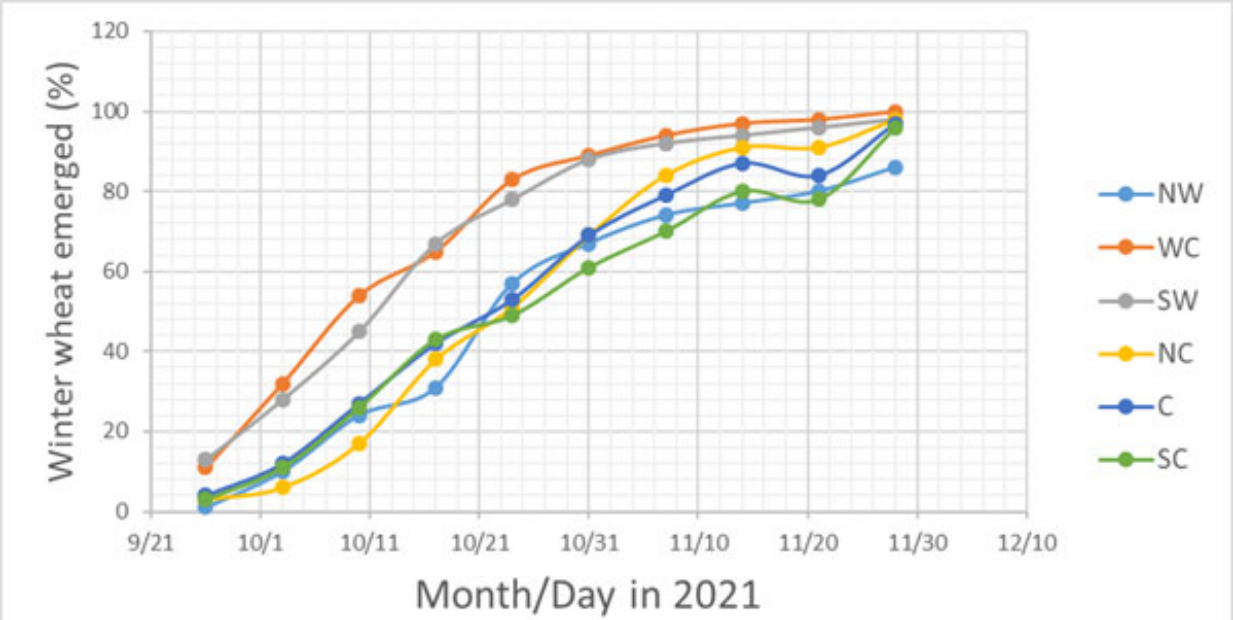

Figure 1. Percent emergence of winter wheat as a function of date for the six major winter wheat producing regions of Kansas: West, West Central, Southwest, North Central, Central, and South Central. Data courtesy of USDA-NASS.

The departure from normal precipitation during the August 28, 2021 to February 24, 2022 period is mostly negative in the majority of the wheat growing area of the state (Figure 2), suggesting that the dry conditions experienced during October and into November extended through the winter – with the exception of a couple of isolated stations that show a positive deviation in south central Kansas. These dry conditions decreased crop growth potential and development during the fall and early winter.

A well-developed crop, in fields that emerged in mid-September to early-October, can handle air temperatures during the winter in the single digits fairly well. However, soil temperatures in the single digits can cause significant damage and winterkill. A less developed crop, such as that fields emerged in late October or afterwards, will be more sensitive to winterkill with higher temperature thresholds for damage.

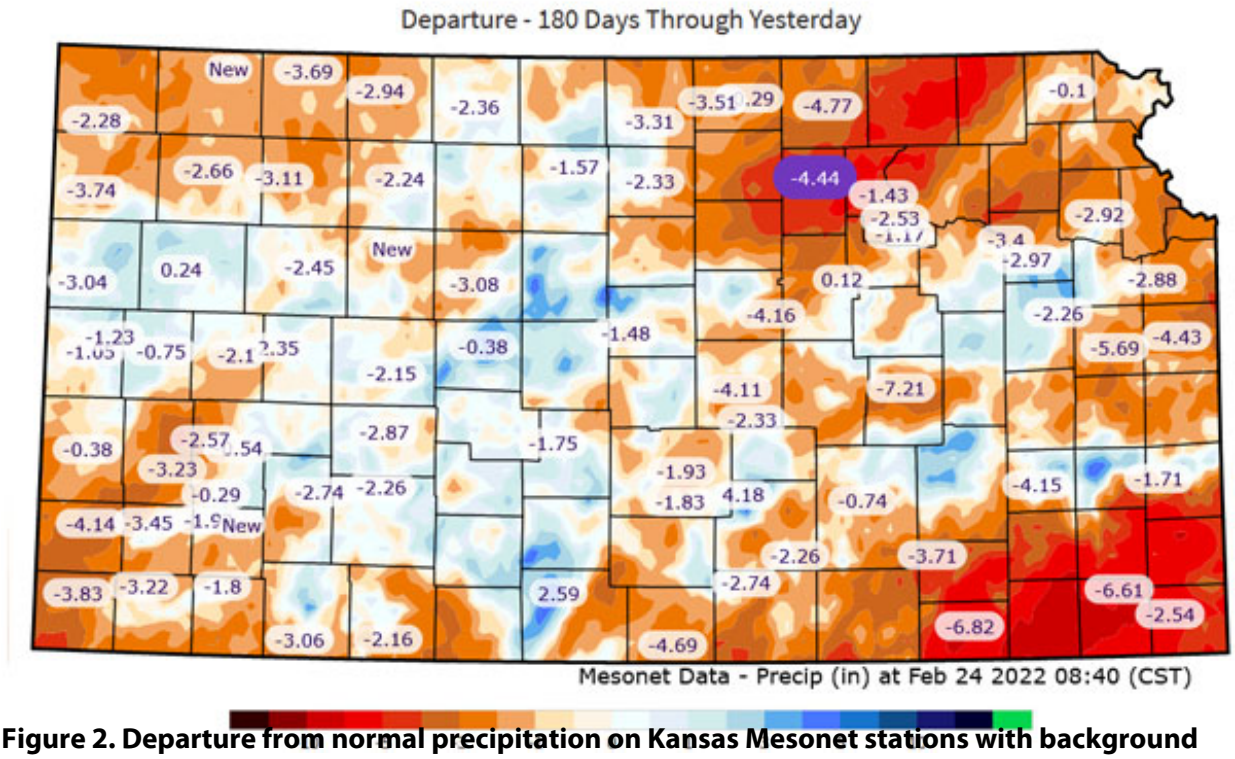

Figure 2. Departure from normal precipitation on Kansas Mesonet stations with background National Weather Service quantitative precipitation estimates (using radar, observations, and satellite) during the winter wheat growing season over the last 180 days (August 28, 2021 – February 24, 2022) for Kansas. Map courtesy of the Kansas Mesonet (https://mesonet.k-state.edu/precip/daily/).

Weather conditions: Air and soil temperatures

During the current cold stretch that began on February 21, temperatures have dropped as low as -11°F in the northwest and 10°F in the southeast (Figure 3). These temperatures would be low enough to cause leaf burn and, if soil temperatures reached these levels, winterkill. While average soil temperatures warmed last week, they have fallen as low as the mid-20s in the northwest and low 30s in the southeast as of February 24 (Figure 4). These intermittent high- and low-temperatures are not beneficial for winter survival, as the warm temperatures may trigger the crop to start with spring development and decrease its cold tolerance. Soil temperatures in the low teens or single digits occurred mostly in northwest Kansas, but were also present in parts of southwest and central Kansas.

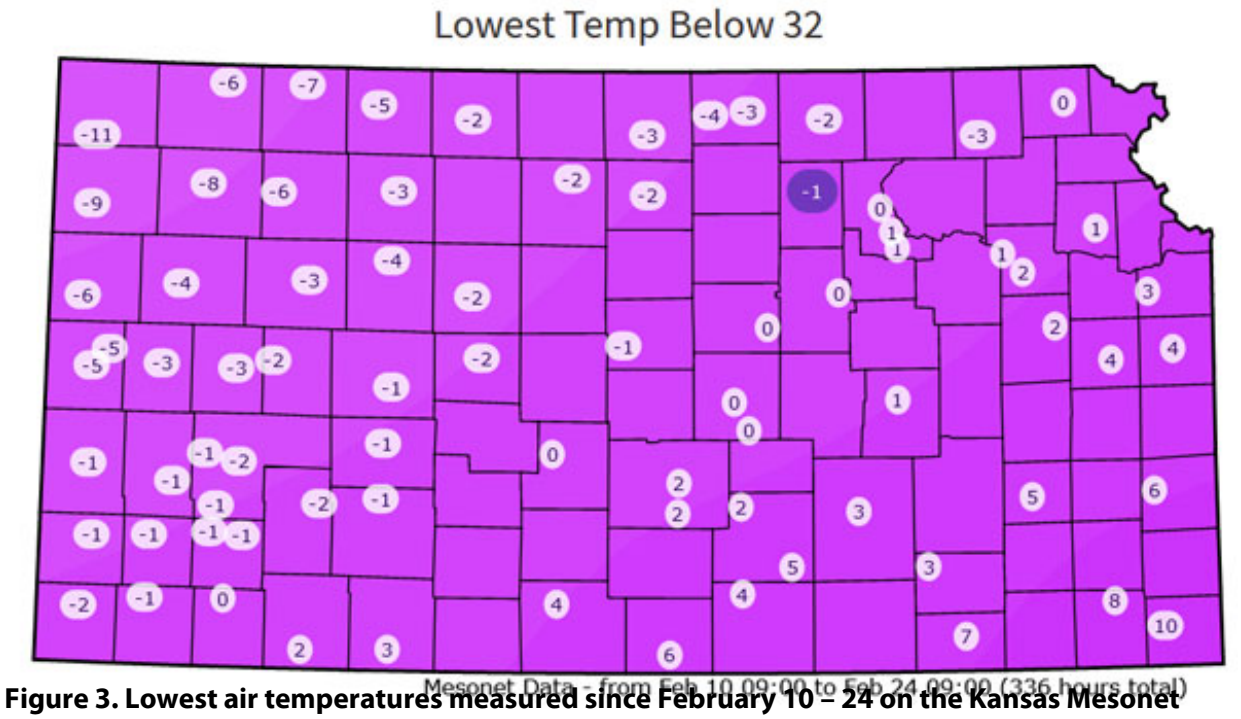

Figure 3. Lowest air temperatures measured since February 10 – 24 on the Kansas Mesonet Freeze Monitor (https://mesonet.k-state.edu/airtemp/min/hoursbelow/).

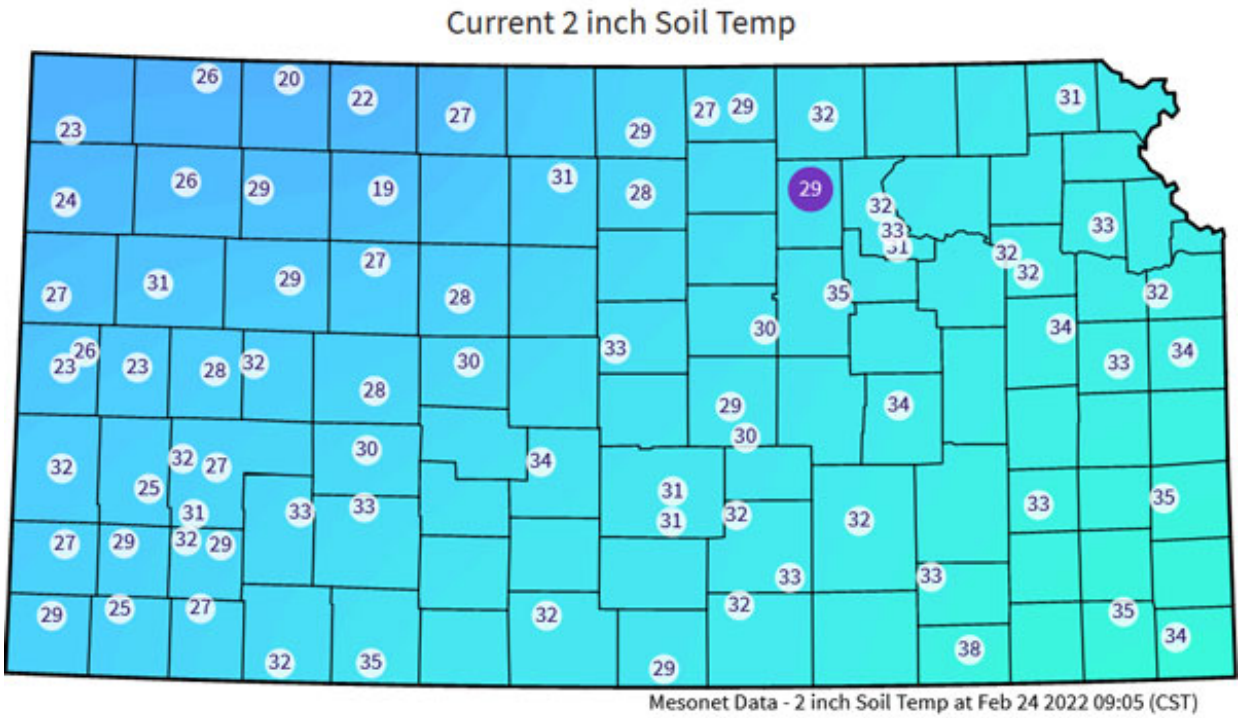

Figure 4. Current soil temperatures (2 inches) at 9:00 am on February 24, 2022. Data from the Kansas Mesonet (https://mesonet.k-state.edu/agriculture/soiltemp/).

Weather conditions: Soil moisture and snow cover

Two environmental factors that affect the crop's response to cold temperatures due to their potential of buffering of low air temperatures are soil moisture content and snow cover. The dry spell observed in the majority of the winter wheat growing region of Kansas prior to the cold spell (Figure 2) also resulted in very low topsoil moisture, which does not help in buffering the lower air temperatures.

Regarding snow cover, the majority of the wheat growing region of Kansas is virtually snow-free with some very light snowfall, less than an inch, the morning of February 24 (Figure 5). This snow was relatively dry and light-weight, decreasing its buffering potential and blowing easily. This snow came too late to insulate the wheat since the coldest temperatures had already impacted the region. The combination of extremely cold air temperatures and dry soils, with a limited amount of snow across the majority of the state, might have caused damage to some fields.

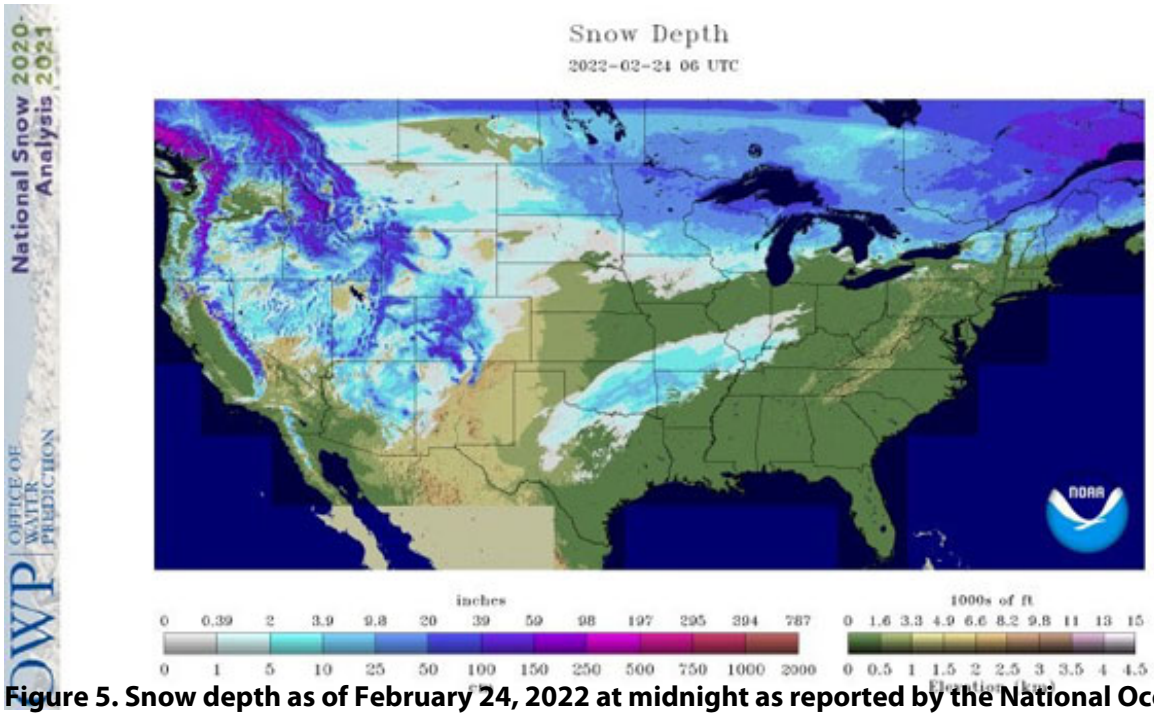

Figure 5. Snow depth as of February 24, 2022 at midnight as reported by the National Oceanic and Atmospheric Administration.

What is the potential for damage and what to look for?

The biggest potential for winterkill is in fields that either emerged too early and had a very lush top-growth, consequently drying the soil; or those fields that emerged late and thus had limited tiller and root development. Because there was very limited snow cover across the state (less than 2 inches), regions where soil temperatures reached the low teens to single digits are more prone to winterkill.

The next 4-6 weeks will be crucial to determine the recovery potential of the crop. Ideally, precipitation would alleviate the current dry conditions and temperatures would warm up slowly so that the crop can start spring development. Continuation of the dry conditions can further impair crop recovery.

There is nothing growers can do at the moment, other than wait until green-up for further evaluation of the crop. As wheat green-up progresses, any winter injury will become more apparent. Injured wheat may initially green up, then go backwards.

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2. Topdressing wheat with nitrogen

Current condition of the wheat crop and nitrogen considerations

The status of the 2021-22 winter wheat crop in Kansas continue to deteriorate due to the combination of drought conditions that have lasted since the fall and a few events of extremely cold temperatures that occurred during the winter. Some fields in southwest and west central Kansas were sown relatively early (mid-September 2021) to capitalize on available soil moisture, resulting in lush crop growth in the fall that depleted soil moisture. This seems to be the case for about 50% of the crop in that region. For the remainder of the state, as much as 30-40% of the crop did not emerge until sometime in November due to dry conditions at sowing, showing very limited development of tillers during the fall. Many fields that were planted late, after soybeans in central Kansas or after corn in western Kansas, have yet to emerge. Because conditions since sowing have deteriorated for the majority of the wheat growing region due to virtually no rainfall, the wheat crop might be in critical condition for some growers. These different crop conditions across the state result in contrasting yield potentials, which should be taken into consideration when managing the nitrogen (N) fertilizer rate.

For the most part and regardless of crop conditions, now is a good time to start planning for topdressing nitrogen. Some key elements that need to be considered when deciding on the exact program you plan to use include: timing, N source, application method and N rate. Ideally, the N in topdress applications will be moved into the root zone with precipitation well before jointing begins in order to be most efficiently utilized by wheat. With some of the small wheat out there with limited tillers, having adequate N available to support spring tillering when it breaks dormancy will be important. Also, the potential number of kernels per head is determined right after spring green-up and prior to jointing; thus, having available N in the root zone can help ensure a good yield potential. Some combination of fall pre-plant, at-seeding N, and/or early topdressed N is also normally needed to supply adequate N to support head differentiation. This article will discuss some of the issues to consider when making topdressing decisions.

Timing

The most important factor in getting a good return on topdress N is usually timing. It is critical to get the N on early enough to have the maximum potential impact on yield, especially in a year with limited fall tillering. While waiting until spring just prior to jointing can be done with success, this can be too late in some years, especially when little or no N was applied in the fall. For the well-drained, medium- to fine-textured soils that dominate our wheat acres, the odds of losing much of the N that is topdress-applied in the winter is low. For these soils, topdressing can begin anytime now, and usually the earlier the better. For wheat grown on sandier soils, earlier is not necessarily better for N applications. On these soils, there is a greater chance that N applied in the fall or early winter could leach completely out of the root zone if precipitation is unusually heavy. Waiting until closer to spring green-up to make topdress N applications on sandier soils will help manage this risk.

On poorly drained and/or shallow claypan soils, especially in south central or southeast Kansas, N applied in the fall or early winter would have a significant risk of denitrification N loss. Waiting until closer to spring green-up to make topdress N applications on these soils will help minimize the potential for this N loss.

Keep in mind that N should not be applied to the soil surface when the ground is deeply frozen and

especially when snow covered. This will help prevent runoff losses with snow melt or heavy precipitation. Additionally, once the soils start to melt, they will likely be too wet for any field work. Therefore, every field should be considered for characteristics such as slope, N source, tillage system, and the short-term forecast for temperature and precipitation.

On both sandy soils subject to leaching and poorly-drained soils prone to denitrification, split applications may be a strategy to consider. This would involve applying enough N in the fall at or prior to planting to give good support for fall growth and tillering -- generally 20-30 pounds of N. Then follow up with an additional application of about 20-30 pounds of N in late winter or early spring to support spring tillering, possibly applied with herbicides. This late-winter/early-spring application becomes especially important when stands are thin due to poor emergence, as many fields are this year. Finally, come back around jointing or a few days later with a final application to support heading and grain fill. This strategy can also provide flexibility in a year like this with poor fall growth, allowing to hold back part of the N for later in the spring as we have a better idea of soil moisture and weather conditions for the season.

Application method

Most topdressing is broadcast applied. In high-residue situations, this can result in some immobilization of N, especially where liquid UAN is used. If no herbicides are applied with the N, producers can get some benefit from applying the N in a dribble band on 15- to 18-inch centers. This can minimize immobilization and may provide for a more consistent crop response.

Nitrogen source

The typical sources of N used for topdressing wheat are UAN solution and dry urea. Numerous trials by K-State over the years have shown that both are equally effective. In no-till situations, there may be some slight advantage to applying dry urea since some of it will fall to the soil surface (Figure 1) and be less affected by immobilization than broadcast liquid UAN, which tends to get hung up on surface residues.

Figure 1. Urea broadcast to tillering wheat in a topdress application. Photo by Romulo Lollato, K-State Research and Extension.

Dribble (surface band) UAN applications would also avoid some of this tie-up on surface crop residues. However, if producers plan to tank-mix with an herbicide, they will have to use liquid UAN and broadcast it.

Controlled-release products such as polyurethane coated urea (ESN) might be considered on very sandy soils prone to leaching, or poorly-drained soils prone to denitrification. Generally, a 50:50 blend of standard urea and coated urea will provide some N immediately to support tillering and head development, and also continue to release some N in later stages of development. This would work best in settings with high loss potential.

Nitrogen rate

Producers should have started the season with a certain N recommendation in hand, ideally based on a profile N soil test done before the crop is planted and before any N has been applied. If a soil sample was taken at sowing, profile nitrate-N can help determine the rate to be applied based on the yield goal. However, it is not too late to use the profile N soil test if taken in late winter/very early spring before green-up. While it will not be as accurate as when sampled in the fall, it can still identify fields or areas in fields with high levels of available nitrate N. Unfortunately, it is not reliable in measuring recently applied N. So if a high rate of N has already been applied, a late winter profile sample probably shouldn't be taken. Remember that topdressing should complement or supplement the N applied in the fall and the residual soil N present in the soil. The total N application, planting and topdressing, should equal the target recommended rate.

If the wheat was grazed this fall and winter, producers should add an additional 30-40 lbs N/acre for

every 100 lbs of beef weight gain removed from the field. If conditions are favorable for heavy fall and/or spring grazing, additional N maybe necessary, especially for a grain crop.

Some fields may also benefit from an application of sulfur and chloride. Like N, these nutrients are mobile in the soil, and a topdress application before jointing is considered an effective application time. Sulfur and chloride topdress applications should be made based on soil test and history of response.

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3. Wheat variety fall forage yield comparison for 2021-2022

Fall forage yield is an important aspect of dual-purpose wheat production. In this system, wheat is typically sown earlier than for 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 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, every year, the K-State Wheat Production Group compares the forage yield of several commonly grown wheat varieties and upcoming lines. This test is usually performed in the South Central Experimental Field near Hutchinson, Kansas (Figure 1), and the forage sampling occurs sometime during December (Table 1).

At the sampling conducted on December 15, 2021, there were significant differences among varieties in terms of forage accumulation. Average forage yield was high (2715 lb dry matter (DM)/a) and with a wide range (from 2119 to 3752 lb DM/a). The varieties that exhibited the highest forage yield were KS Ahearn and KS Hatchett. LCS Atomic AX also had high forage yield with over 3,000 lb DM/a. The high forage yield was function of the combination of an early sowing with good moisture conditions (Figure 1).

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 first hollow stem, and varieties can differ in as much as 20-30 days in achieving first hollow stem in the spring. The Wheat Production Group at K-State uses this very same trial to measure first hollow stem during late February and early March, so keep tuned to the eUpdate for more information on this developmental milestone.

Figure 1. Dual-purpose wheat trial near Hutchinson, KS. The trial was sown on September 21, 2021, with 50 lbs DAP/acre applied in furrow. Weeds were controlled the week prior to sample collection, thus control is still incipient in the photo above. 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 December 15, 2021. 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 text indicates highest forage yielding group. Different varieties with overlapping letters in the "Statistical group" column indicates that varieties did not differ from each other.

Variety	Forage DM yield (lb/a)	Statistical group
AP Exp#1	2479	defg
AP Roadrunner	2119	g
AP18AX	2770	cdef
AM Cartwright	2472	defg
Crescent AX	2941	cde
KS Ahearn	**3752**	**a**
KS Hatchett	**3689**	**ab**
KS13DH0041-35	2829	cdef
LCS Atomic AX	3110	bc
LCS Chrome	2304	fg
LCS Helix AX	2337	efg
LCS Julep	2484	defg
LCS Photon AX	2723	cdefg
LCS Revere	2459	defg
LCS Runner	2273	fg
LCS Steel AX	2798	cdef

LCS Valiant	2517	cdefg
Plains Gold Ray	2564	cdefg
Zenda	2962	cd
Average	2715	
Min.	2119	
Max	3752	

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4. Spring weather outlook for 2022 in Kansas

Have you found yourself asking this question: "Why do the storms keep missing most of Kansas to the east/south and will it continue?" The one sure thing with weather is it always changes. Let's look at what has happened, the current scenario, and what the forecast looks like heading into spring.

Winter Summary – November until present

Meteorological winter ends in a week with the arrival of March. Thus far in winter, we have observed a very warm December and more a seasonable January and February. However, one thing has been consistent: it has been dry. A majority of our precipitation has fallen in January/February and mostly as snow (or some type of frozen precipitation). Despite this moisture, much of the state continues to see below-average snowfall and below-to-near record dryness. Statewide, the time period of November through February (as of 2/23/22) was the fourth driest on record. If Kansas receives no more moisture in February, there is the potential to break that record.

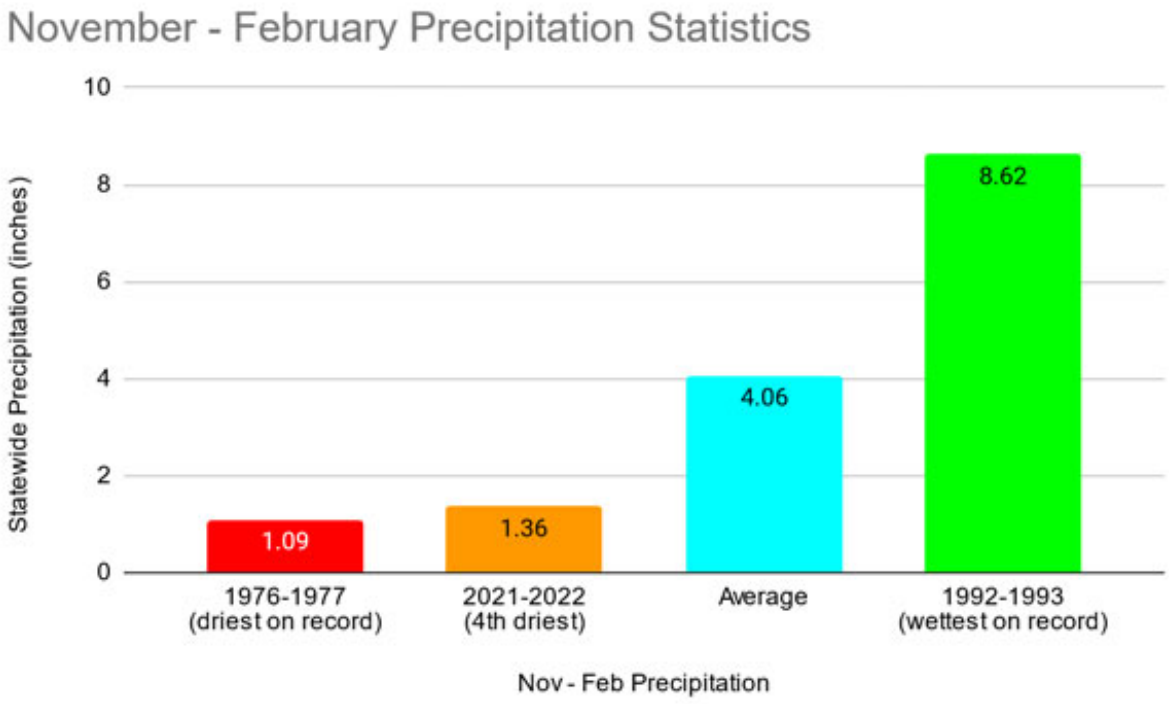

Figure 1. November 2021 through February 23, 2022 precipitation for Kansas is the fourth driest on record (Source: K-State Weather Data Library).

The only areas of the state that have observed any above normal precipitation (Figure 2) are the areas in west central (which observed a heavy snow event in January) and northeast Kansas (where a narrow band of thunderstorms dropped heavy rain in early November). Since that time, deficits have grown as much as – 4 inches in the east and - 1 to – 3 inches elsewhere. This is the result of a classic

La Niña pattern which has held the state siege. Wetter conditions exist to the east in the Midwest, avoiding most of the state. In addition, much colder temperatures have resided to our north, with warmer conditions to the south.

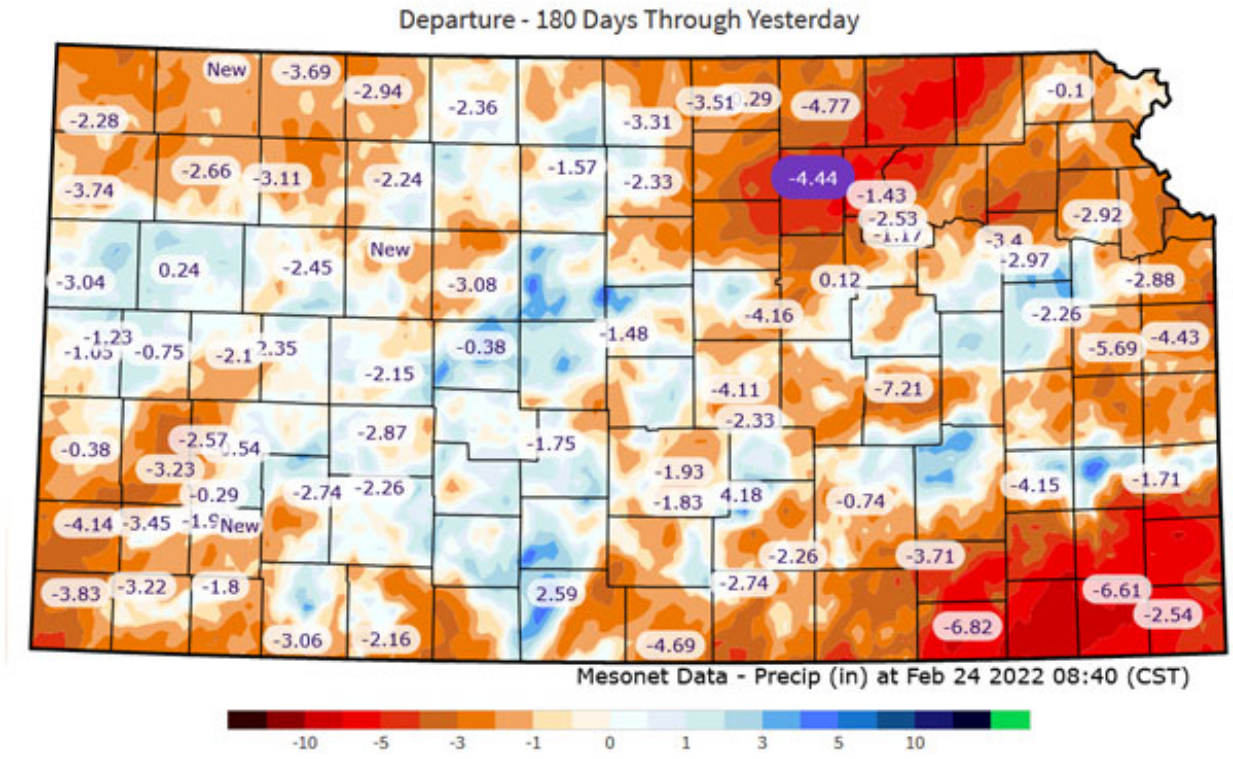

Figure 2. Precipitation departures from normal on the Kansas Mesonet with National Weather Service QPE gridded data since October 26, 2021 (Source: Kansas Mesonet, https://mesonet.k-state.edu/precip/daily/**).**

With persistent short precipitation, drought continues to expand across the state (Figure 3). Severe drought or worse conditions have expanded to 31% of the state since January 1st. Drought free areas of the state have shrunk to only 14%. Impacts from the growing drought have consisted of ideal calving conditions but also increased surface water evaporation, poor cover crop/wheat performance, depleting surface water moisture, and increased wildfire potential.

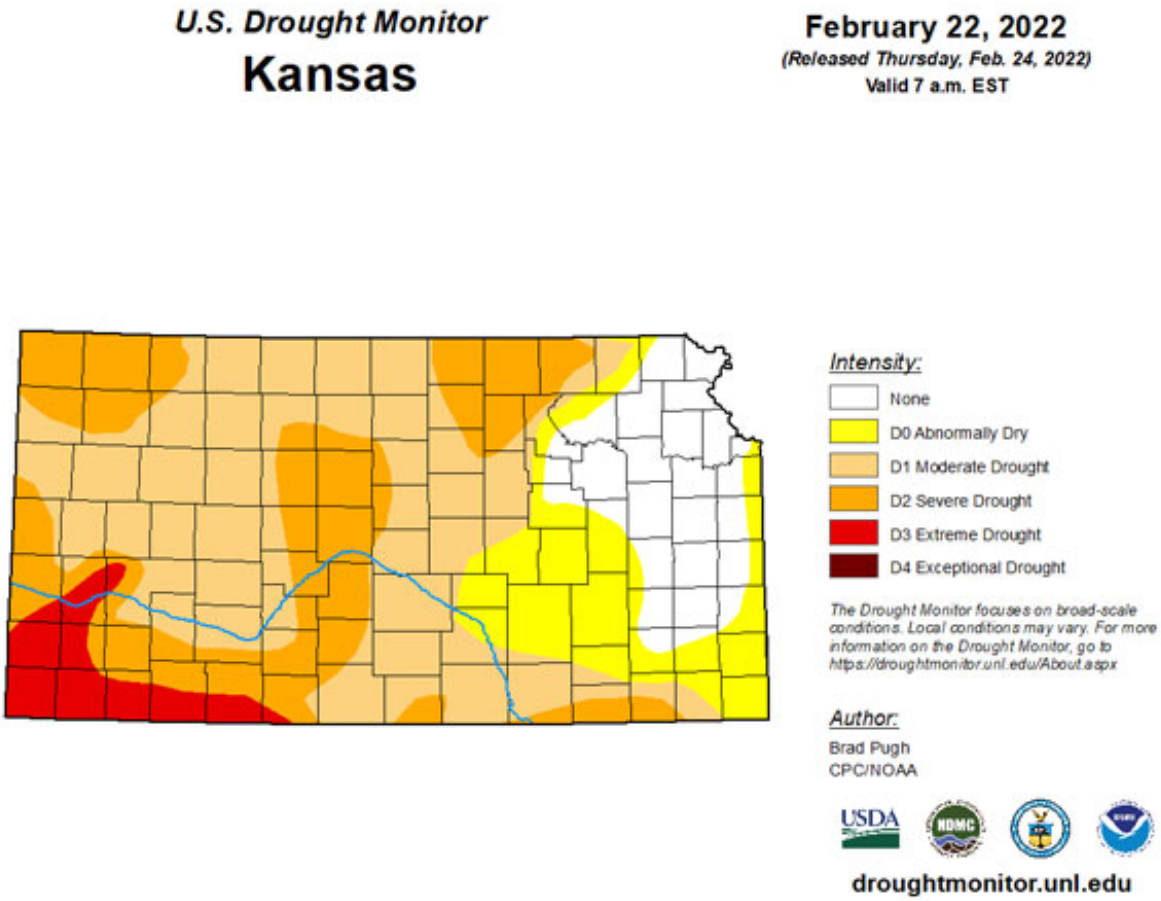

Figure 3. Drought conditions for Kansas as of February 22, 2022 (map released on February 24). Source: https://droughtmonitor.unl.edu/.

Forecast for March

Unfortunately, no big pattern change towards above-normal moisture is expected. La Niña is forecasted to begin the slow climb (an increase in east Pacific surface water temperatures) towards neutral conditions. While that may seem optimistic, a diminishing La Niña in spring, especially a second consecutive winter with such conditions, tends to bring with it a very active pattern. We have begun to see that already in mid-February. However, the favored eastern track of moisture could potentially begin shifting westward compared to previous weeks. As a result, the Climate Prediction Center's (CPC) outlook for March favors equal chances of above/below/average precipitation in the east (Figure 4). However, that isn't good news for the western two-thirds of the state which has higher favor toward continued drier than normal conditions. There is much more confidence that even as the precipitation corridor shifts west, it won't shift enough to benefit the western half of Kansas. To compile even further, an active pattern will increase the strong south/southwest wind events for west Kansas. With substantial drought further south/west, this means pushes of warm/dry air conducive for wildfire concerns and blowing dust.

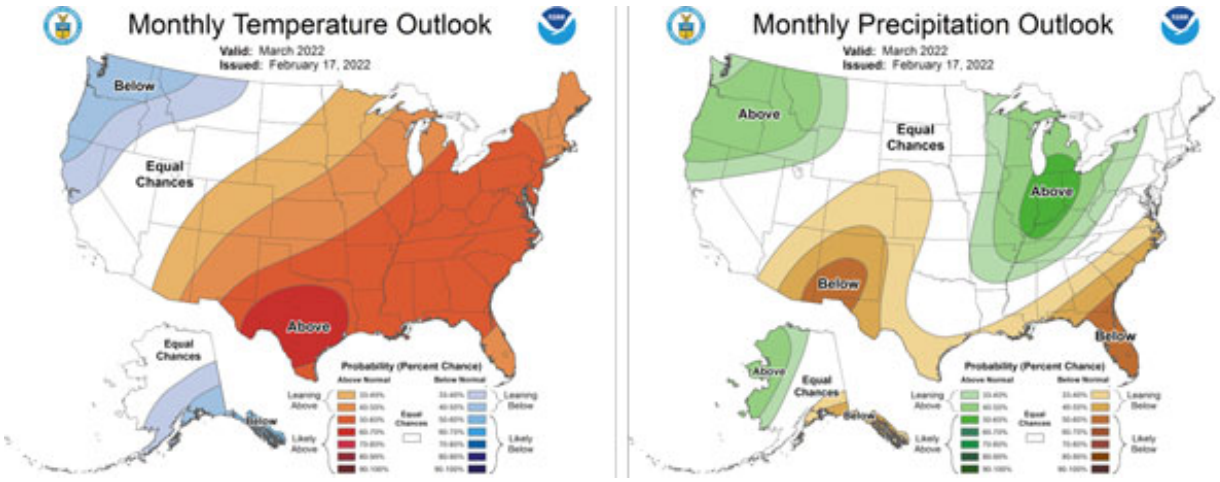

Figure 4. Climate Prediction Center temperature (left) and precipitation (right) outlooks for March as of 2/17/22 (Source: CPC).

While the forecast isn't overly optimistic, there is one positive. Despite a dry first two months of 2022, precipitation climatically trends upward with each month (Figure 5). Therefore, while below average may not be ideal, it doesn't mean the tap will be completely cut off. In fact, with a similar ENSO pattern and February precipitation to last year, March 2021 was well above normal precipitation-wise.

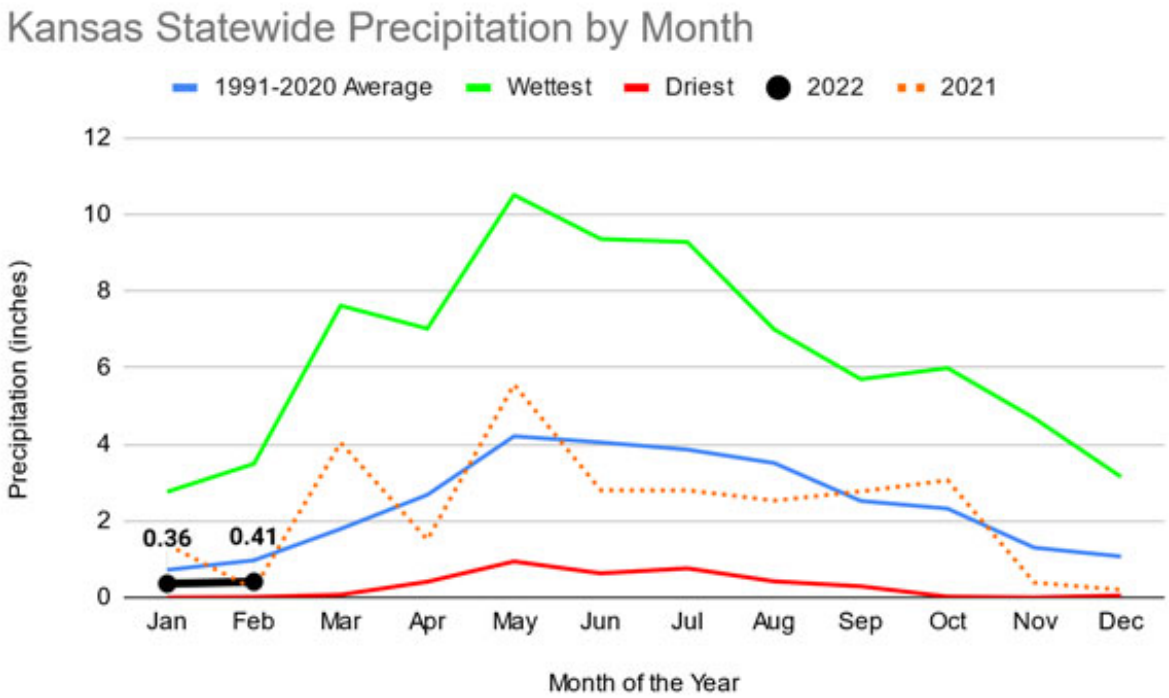

Figure 5. Kansas statewide precipitation averages compared to normal (blue line), 2021 (orange line), 2022 (black line), and the wettest/driest month (green/red lines) on record. Source: Kansas Weather Data Library.

Full Spring Outlook

Long-term models show similar trends to March for the remaining spring months of April and May. As a result, the CPC placed increased favor towards below normal precipitation in western Kansas and above normal temperatures statewide (Figure 6). This would sustain an active period through spring. As we get further into spring, the average precipitation increases as does the ability to transport tropical moisture from the Gulf of Mexico northward. This would likely favor an increase in severe weather, especially for eastern Kansas. In 2021, we saw an uptick in tornadoes in May which was more than that observed in 2020. As a result, this pattern could feature a more active severe weather season. Diminishing La Nina's often support more severe weather events. Unfortunately, continued negative outlooks for moisture will likely lead to struggles for winter wheat in central/west Kansas. Spring planting may also be impacted by decreased soil moisture and warmer than normal temperatures.

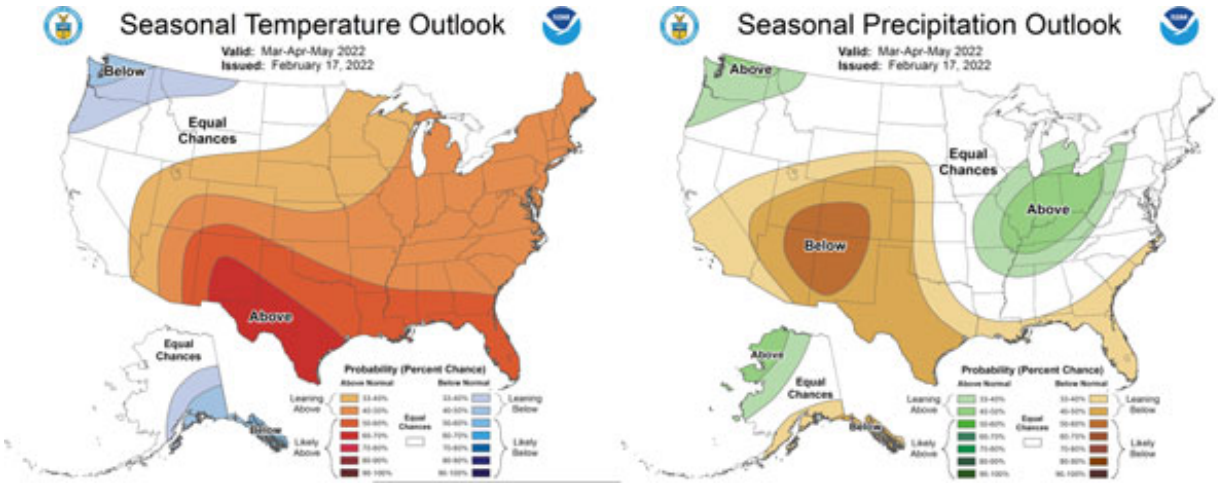

Figure 6. Climate Prediction Center average forecasts for the March-May 2022 timeframe for temperature and precipitation, updated on 2/17/22 (Source: CPC).

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5. 2022 Grain sorghum management publication now available

A newly revised K-State Research and Extension publication, *Kansas Grain Sorghum Management 2022*, is now available and can be accessed online at:
https://bookstore.ksre.ksu.edu/pubs/MF3046.pdf

This publication offers advice to producers, crop consultants, and agronomists to manage their sorghum crop as efficiently and profitably as possible. Recommendations should be considered as guidelines and must be tailored to situations based on the cropping system, soils, and weed populations encountered in that field.

This comprehensive guide is written specifically for Kansas and includes valuable, up-to-date information on:

- Tillage and rotations
- Hybrid selection
- Planting practices
- Rate of dry down before harvest
- Weed management
- Irrigation management
- Fertilizer requirements
- Diseases
- Insects
- Pre-harvest desiccants

Contributors to the 2022 version of this publication include:

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Jonathan Aguilar, Bio and Ag Engineering – Irrigation
Rodrigo Onofre, Plant Pathology
Jeff Whitworth, Entomology
Ana Carcedo, Crop Production and Cropping Systems

6. Soil Health Field Day - March 28, 2022

The Kansas Soil Health Partnership is hosting a soil health field day on March 28, 2022 at Guetterman Brothers Family Farms, 9970 W. 215th Street, Bucyrus, KS 66013. A map link to the location is available at: https://goo.gl/maps/UrULttyJtuQXF8ak8. The event will start 9:00 am and conclude at 2:00 pm.

Agenda

9:00 - Welcome (Dr. Chuck Rice and Guetterman Brothers Family Farms)

9:10 - Research Update and Soil Health (Carlos Pires and Dr. Chuck Rice - Kansas State University)

9:40 - Sustainability (Dr. Alex Rosa and Dr. Brian Olson - Bayer Crop Science)

9:50 - Crop Intensification (KSCROPS/Ciampitti Lab - Kansas State University)

10:20 - Fertility Management (Dr. Dorivar Ruiz Diaz - Kansas State University)

10:50 - Making a change in the way we farm (Rick Clark - Indiana Farmer)

11:50 - Lunch

12:00 - Lunch + Farmers Panel

1:15 - Visit cover crop research plots and soil pit

Please register online at www.kscorn.com/soilhealth **.** Registration will allow for adequate planning to ensure adequate supplies and meal counts.

Soil Microbial Agroecology Lab, Kansas State University | Kansas State University Department of Agronomy | North Central SARE Sustainable Agriculture Research & Education | Guetterman Brothers Family Farms | Bayer | Kansas Soil Health Alliance | Kansas Corn Growers Association

7. K-State CropTalk webinar series

In 2021, a new series of hour-long webinars was launched with great success. For 2022, the K-State CropTalk webinar series is back and will be focused on agronomic topics targeted for northwest and north central Kansas. Topics range from soil fertility, weed management, cover crops, and weather resources. Continuing education credits have been applied for and will vary based on the subject area of each webinar.

Each webinar will begin at 12:00 pm (CST) and last until 1:00 pm. 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 any local KSRE extension office in north central or northwest Kansas for any questions.

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

February 28 – **Growing Nitrogen with Cover Crops**
DeAnn Presley, Soil Management Specialist

March 7 – **Climate Update and Kansas Mesonet**
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