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eUpdate

03/09/2023

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

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1. Pay attention to growth stage for spring herbicide decisions on wheat

Producers should pay close attention to the growth stage of their wheat before making spring herbicide applications. Some herbicides must be applied after tillering, several must be applied before jointing, and others can be applied through boot stage. Remember that weeds are most susceptible at early growth stages and coverage becomes difficult as the wheat canopy develops, so the earliest practical and labelled applications generally result in the best weed control.

Applications permitted prior to jointing

Dicamba can be applied to wheat between the 2-leaf and jointing stages of wheat. Application of dicamba after wheat reaches the jointing stage of growth causes severe prostrate growth of wheat and significant risk of yield loss. Dicamba is effective for control of kochia, Russian thistle, and wild buckwheat, but is not good for control of mustard species. Kochia, Russian thistle, and wild buckwheat are summer annual weeds that may emerge before or after wheat starts to joint, so timing of dicamba for control of these weeds can sometimes be difficult. Fortunately, dicamba provides some residual control of these weeds following application.

Products labeled only for use on herbicide-resistant wheat must also be applied prior to jointing. Beyond should be applied to 1 gene ClearField wheats after tiller initiation and prior to jointing, but can be applied to 2-gene ClearField wheats until the second node is detected at the soil surface. Aggressor should be applied to CoAXium wheat varieties after 4-leaf growth stage and before jointing. Beyond should only be applied to ClearField wheat varieties and Aggressor should only be applied to CoAXium wheat varieties.

Other herbicides that must be applied prior to jointing include Agility SG, Olympus, Outrider, PowerFlex HL, Pulsar, Rave, and Tarzec.

Applications permitted through boot

Herbicides that can be applied later in the spring – prior to boot stage – include Ally + 2,4-D, Amber, Finesse, Glean, Starane Flex, and Starane NXT. Starane is a better choice than dicamba products for control of kochia after wheat moves into the jointing stage of growth

2,4-D is labeled for application to wheat from the full-tiller stage until prior to the boot stage of growth. Application of 2,4-D prior hinders the tillering process and can result in significant yield loss if applied too early. Wheat will sometimes exhibit prostrate growth when 2,4-D is applied in the jointing stage of growth, but yields generally are not significantly affected if applied before the boot stage of growth.

In general, MCPA is safer on wheat than 2,4-D, especially when applied prior to tillering. MCPA can be applied after the wheat is in the three-leaf stage (may vary by product label) until it reaches the boot stage of growth. Neither herbicide should be applied once the wheat is near or reaches the boot stage of growth, as application at that time can result in malformed heads, sterility, and significant yield loss (Figure 2).

Both 2,4-D and MCPA are available in ester or amine formulations. Ester formulations generally provide a little better weed control than amine formulations at the same application rates, but also are more susceptible to vapor drift. However, the potential for vapor drift damage in early spring is minimal. Ester formulations generally are compatible for use with fertilizer carriers, while amine formulations often have physical compatibility problems when mixed with liquid fertilizer.

Applications permitted through flag leaf

Many herbicides used in the spring on wheat can be applied up to the time the flag leaf is visible, or later. Some newer premix products based on the herbicide halauxifen methyl (Elevore) that can be applied through flag leaf are Pixxaro (with Starane), Quelex (with florasulam), Rezuvant (with Starane and Axial XL), and WideARMatch (with Starane and Stinger). Halauxifen methyl is a Group 4 herbicide that controls emerged broadleaf weeds, including marestail, flixweed, henbit. Elevore is not labeled for application to wheat.

Other herbicides that can be applied through flag leaf include Affinity BroadSpec, Affinity TankMix, Ally Extra SG, Express, Harmony, Harmony Extra, Huskie, Sentrallas, Supremacy, Talinor Weld, and WideMatch.

Figure 1. Stunting from an application of 2,4-D to wheat prior to tillering. Photo by Dallas Peterson, K-State Research and Extension.

Figure 2. Malformed heads from an application of 2,4-D at boot stage. Photo by Dallas Peterson, K-State Research and Extension.

For more detailed information, see the "2023 Chemical Weed Control for Field Crops, Pastures, and Noncropland" guide available online at https://bookstore.ksre.ksu.edu/pubs/SRP1176.pdf or check with your local K-State Research and Extension office for a paper copy.

The use of trade names is for clarity to readers and does not imply endorsement of a particular product, nor does exclusion imply non-approval. Always consult the herbicide label for the most current use requirements.

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2. Wheat growth and development: Tool for estimating first hollow stem

Winter wheat is beginning to break dormancy, and the Kansas Mesonet has a tool to help track the crop development: Wheat First Hollow Stem (https://mesonet.k-state.edu/agriculture/wheat/hollowstem/). 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 output of the model provides the probability of first hollow stem occurrence (current and historical) both for early- and late-maturing wheat varieties.

Wheat First Hollow Stem

Wheat first hollow stem is the stage when there is about 1.5 cm of hollow stem growth underneath the developing wheat head (Figure 1). This is the beginning of stem elongation and, for winter wheat, it occurs in the spring after winter dormancy. This stage is important for dual-purpose wheat growers (grazing plus grain) because it is the optimal time for grazing termination to maximize forage yield while minimizing grain yield losses. The rationale is that up to this point, grazing cattle only remove foliage and consequently, yield losses due to grazing are modest. However, beyond this point, grazing can remove the developing wheat heads, increasing the potential for yield reductions due to grazing.

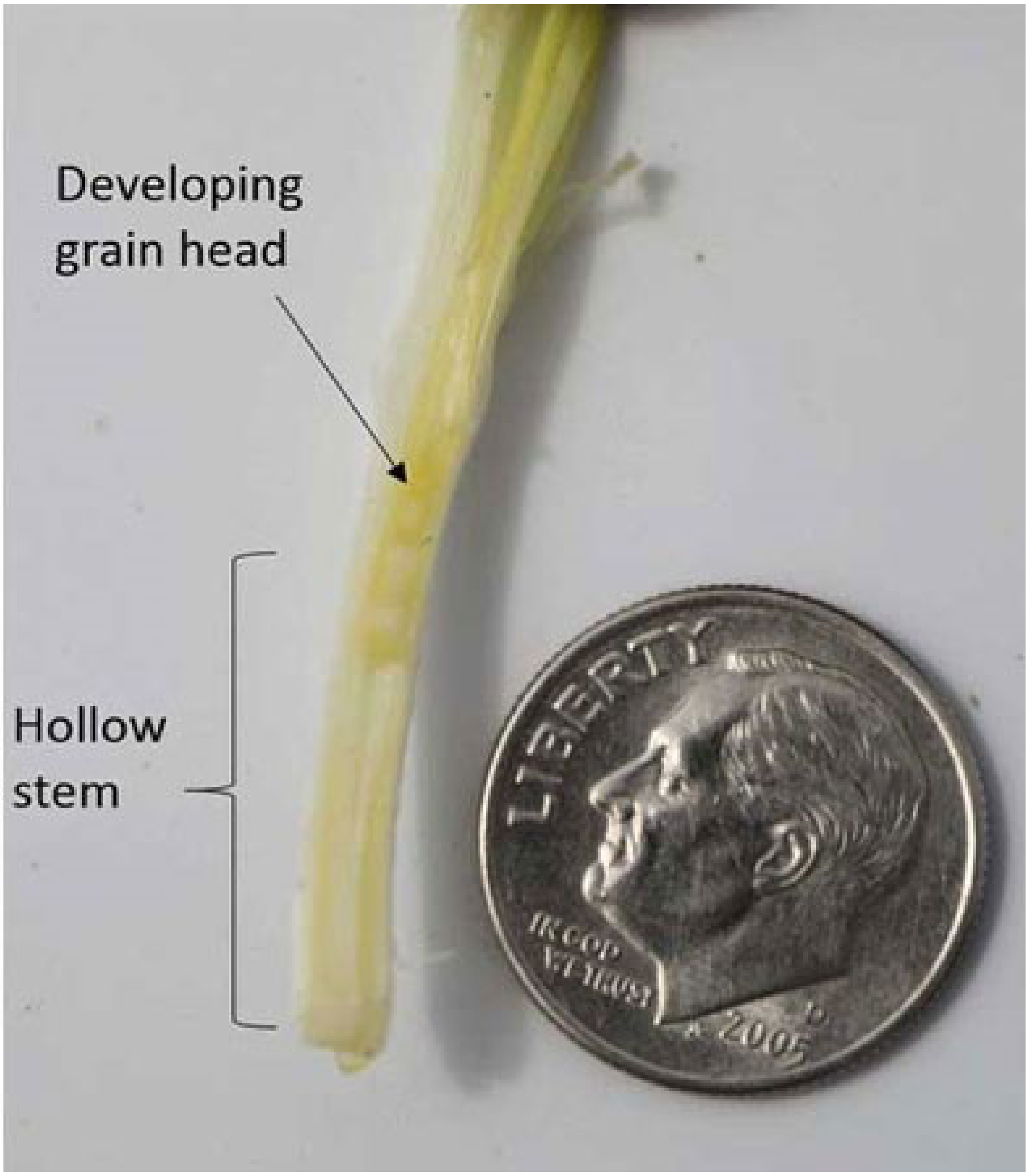


Figure 1. Wheat plant reaching the first hollow stem stage of growth, characterized by approximately 1.5 cm (or roughly the diameter of a dime) of hollow stem underneath the developing grain head. Photo by Romulo Lollato, K-State Research and Extension.

Calculation of Wheat GDD and Estimated Probability of First Hollow Stem

There are two different models currently in place at the Kansas Mesonet, one representing the probability of occurrence of first hollow stem for an early-maturing variety, and another for a late-maturing variety. The calculations employed in this tool are identical to those employed at the Oklahoma Mesonet, with the single difference that the model representing varieties of medium maturity in Oklahoma is used to represent varieties of late maturity in Kansas.

Both models calculate the probability of first hollow stem based on accumulated soil temperatures at the 4-inch depth, using a base temperature of 31°F and a start date of December 22 of the previous year. Soil temperature accumulation is calculated as daily soil temperature minus 31°F, and daily accumulated temperature values are summed from December 22 of the previous year until current date to estimate probability of first hollow stem. The accumulated temperatures are then contrasted with Table 1 below to determine the probability of first hollow stem at a given calendar date.

Table 1. Probability of first hollow stem for early and a late-maturing varieties based on accumulated soil temperatures at the 4-inch depth beyond 31°F. Table courtesy of Oklahoma Mesonet.

Probability of FHS occurrence	Accumulated soil temperature beyond 31°F	
	Early	Late (note that this model is for medium varieties in Oklahoma)
2.5%	543	702
5.0%	576	731
10.0%	612	763
25.0%	670	812
50.0%	734	864
75.0%	809	920
90.0%	879	980
95.0%	935	1022
97.5%	991	1065

We acknowledge that these models were developed in Oklahoma. To ensure their accuracy in Kansas, we tested their performance against six years of first hollow stem data collected near Hutchinson, Kansas. The model performance was excellent, with $r^2 = 0.92$ and root mean square error of 4.1 days (Figure 2).

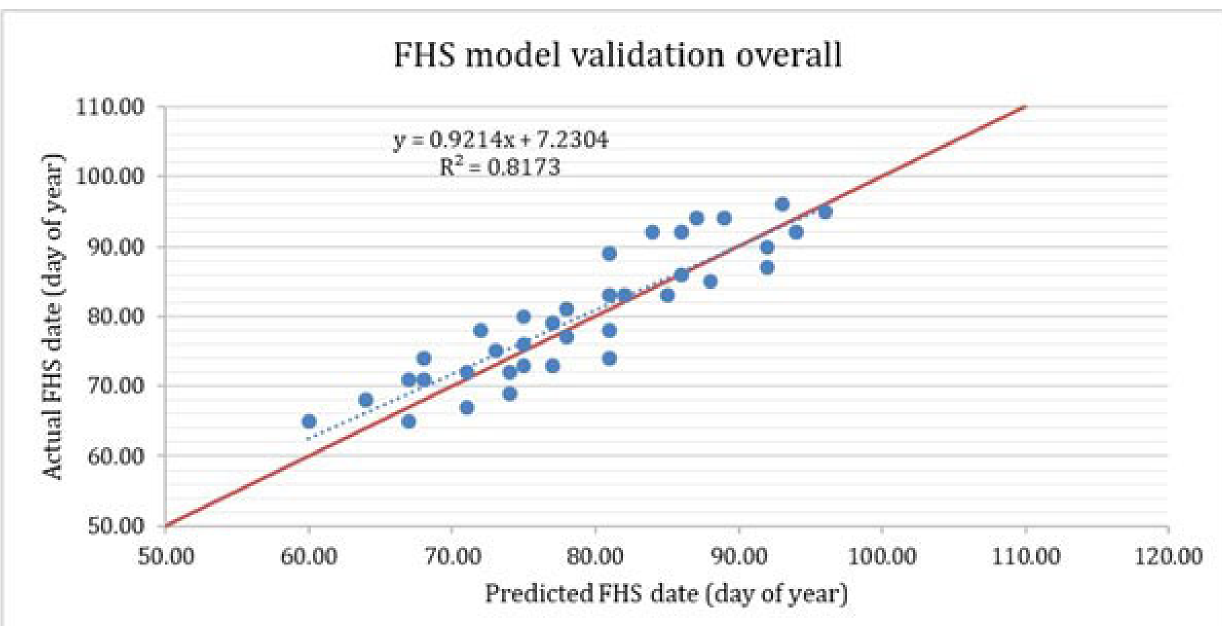
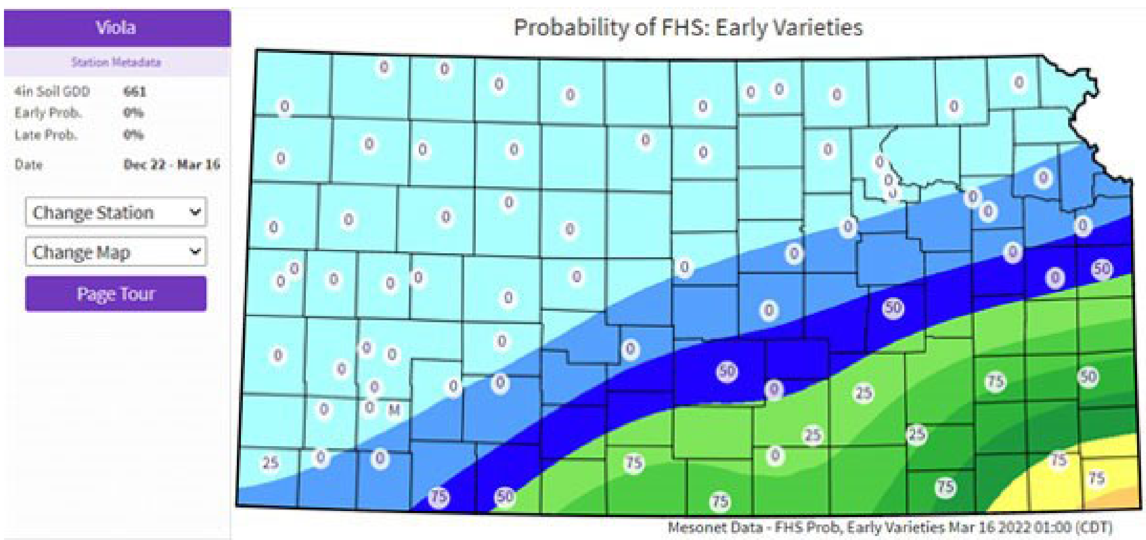


Figure 2. Predicted versus actual first hollow stem dates (day of year) for data collected near Hutchinson, KS, during 2016-2021. For each year, model performance was compared against 25, 50, and 75% probabilities for early- and late-maturing varieties. Note that the Oklahoma model for medium-maturing varieties is used for late-varieties in Kansas.

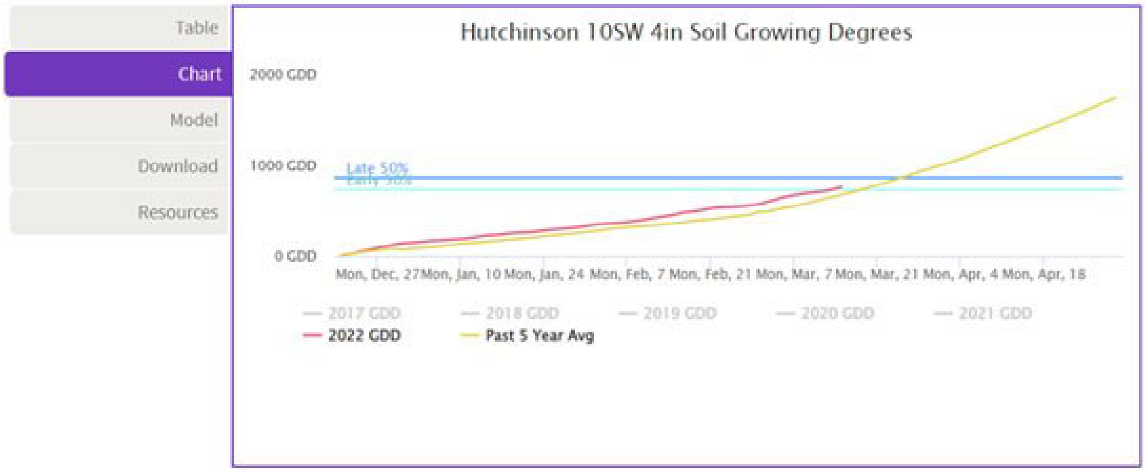
How might you benefit from the Kansas Mesonet Wheat First Hollow Stem page?

Here are a few examples:

1. **See an estimated probability of FHS across the state for varieties with contrasting maturities.** In "Change Map", select either "Early probability" or "Late probability" to see the probability of first hollow stem occurrence across the entire state. The example below illustrates the statewide probability of first hollow stem for early maturing varieties across the state, with greater changes in SE KS (75% probability) and SC KS (25-75% probability depending on station) chance as compared to the rest of the state (0% probability).



2. **Compare previous years with a chart**. Select chart tab within the wheat growth tools. By selecting specific years of interest, it is possible to compare the current year to other recent years and the 5-yr average for a given location. Current data supports comparisons between 2017-present year. The solid blue lines indicate when an early (light blue) or late (dark blue) varieties are expected to reach 50% probability of first hollow stem. The example below illustrates a comparison made for Hutchinson KS. Note how the current year (red line) is slightly earlier than the 5-yr average (yellow line).



3. **Statewide statistics:** The table lets you quickly view and sort data from across the state. You can also download data to perform your own analysis (see the Download tab).

4. **Graphics and social media:** Download any of the maps in .PNG format for easy sharing.

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3. 2022 Kansas warm-season forage performance tests

The results of the 2022 Kansas Performance Tests for warm-season annual forage varieties are available online at https://www.agronomy.k-state.edu/outreach-and-services/crop-performance-tests/forages/hay-and-silage/. The results are summarized by location (Garden City, Hays, and Scandia) and are split into hay and silage categories.

At this time, only the yield results are available for the warm-season varieties. Forage quality results will be posted soon.

Annual forage performance tests are conducted each year by the Kansas Agricultural Experiment Station (Figure 1). The objectives of these variety trials are to evaluate the performance of released and experimental varieties, determine where these varieties are best adapted, and increase the visibility of summer annual forages in Kansas. Breeders, marketers, and producers use data collected from the trials to make informed variety selections. The locations of the forage trials for 2022 were Garden City, Hays, and Scandia.

This work was funded in part by the Kansas Agricultural Experiment Station and seed suppliers. Sincere appreciation is expressed to all participating researchers and seed suppliers who have a vested interest in expanding and promoting annual forage production in the U.S.

Figure 1. Harvesting a forage variety trial at the Southwest Research and Extension Center in

Garden City, KS. Photo from John Holman, K-State Research and Extension.

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4. Foliar fungicide efficacy ratings for wheat disease management

The K-State Research and Extension publication *Foliar Fungicide Efficacy for Wheat Disease Management* has been updated for 2023. Check out the updated pub here: http://www.bookstore.ksre.ksu.edu/pubs/EP130.pdf.

The recommendations in this publication reflect several years of head-to-head comparisons of products in Kansas and many other wheat producing states. These ratings were verified by members of the North Central Extension and Research Committee (NCERA-184) for the management of small grain diseases, which is composed of extension plant pathologists from universities throughout the U.S.

It's important to keep in mind that all efficacy ratings listed here are based on proper application timing. Differences in efficacy among fungicide products were determined by direct comparisons among products in field tests and are based on a single application of the labeled rate as listed in the table. This publication includes fungicides widely marketed in Kansas and is not intended to be a list of all labeled products. Many products have specific use restrictions which can include the amount of active ingredient that can be applied within a period of time or on the number of sequential applications that can be made. Read and follow all use restrictions described on individual product labels prior to use.

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5. Precipitation summary for Kansas during winter 2022-2023

Meteorological winter recently ended on February 28. In this report, we take a look at precipitation data across the state for winter 2022-2023.

For the 3-month period, Kansas averaged 2.91 inches for winter, slightly above the seasonal normal of 2.76 inches. December was drier than normal in all areas (Table 1). West central and southwest Kansas were the driest divisions, receiving just 0.12 inches of precipitation each. These amounts rank in the top 30 driest Decembers on record in those two divisions. January was wetter than normal in all divisions except for the southwest. The highest percentages were in northwest and west central Kansas in January, thanks to multiple winter storms which dropped generous amounts of snow. It was the 4th snowiest January on record in Goodland, where 16.5 inches of snow fell. February featured above-normal precipitation in eastern Kansas as well as northwest and west central Kansas, where snow was once again plentiful. When the three winter months are combined, six of the nine divisions had above-normal precipitation, with three divisions below normal. Eastern Kansas averaged from 4.5 to 5.0 inches of precipitation. There are some higher totals at individual locations in east central and southeast Kansas of 6.5 up to 7.3 inches of precipitation (Table 2). The wetter-than-normal conditions in the east led to 15% of Kansas being declared drought-free by the end of February (Source: US Drought Monitor). The composite Drought Severity Coverage Index (DSCI) fell from 345 at the end of November, 2022 to 311 at the end of February, 2023. Southwest Kansas, unfortunately, remains in a serious drought. February 2023 was the 17th consecutive month with below-normal precipitation in that division. Since October 2021, southwest Kansas' total precipitation is just 13.33 inches, or 55% of the normal amount of 24.22 inches. As a result, 35% of the state remains in D4 drought status, the most severe category. This is almost four times larger than the next highest percentage of D4 for any US state (Oklahoma, 9%).

Table 1. Kansas precipitation totals by division for winter 2022-2023. Source: National Centers for Environmental Information. Above normal=green cells; below normal=orange cells.

Winter 2022-2023 Monthly Precipitation					
Climate Division	December (% Normal)	January (% Normal)	February (% Normal)	Winter (% Normal)	Winter Rank
Northwest	0.48″ (87%)	0.90″ (220%)	0.63″ (115%)	2.01″ (133%)	21st Wettest
North Central	0.63″ (68%)	1.08″ (169%)	0.72″ (85%)	2.43″ (100%)	49th Wettest
Northeast	0.82″ (63%)	1.55″ (196%)	2.22″ (190%)	4.59″ (141%)	20th Wettest
West Central	0.12″ (21%)	1.01″ (235%)	0.71″ (125%)	1.84″ (116%)	34th Wettest
Central	0.66″ (62%)	0.99″ (139%)	0.79″ (78%)	2.44″ (88%)	53rd Wettest

East Central	1.17″ (77%)	1.52″ (157%)	2.26″ (159%)	4.95″ (127%)	24th Wettest
Southwest	0.12″ (16%)	0.47″ (96%)	0.37″ (74%)	0.96″ (56%)	44th Driest
South Central	0.87″ (76%)	0.94″ (119%)	0.84″ (77%)	2.65″ (87%)	55th Wettest
Southeast	1.68″ (95%)	1.37″ (112%)	1.95″ (123%)	5.00″ (109%)	39th Wettest
STATE	0.73″ (68%)	1.06″ (147%)	1.12″ (115%)	2.91″ (105%)	40th Wettest

Table 2. Highest winter precipitation totals across Kansas. Source: SC-ACIS.

Location	County	Network	Amount
Fredonia	Wilson	COOP	7.32″
Parsons 0.8 SE	Labette	CoCoRaHS	7.22″
Oswego 1 N	Labette	COOP	7.20″
Ottawa	Franklin	COOP	6.96″
Garnett 1 E	Anderson	COOP	6.92″
Columbus	Cherokee	COOP	6.88″
Bartlett	Labette	COOP	6.77″

The predominant storm track this winter was one that brought snowfall to northwest Kansas as well as areas along the Kansas-Nebraska border, with rainfall for eastern Kansas. As a result, northwest Kansas is the only area with above-normal snowfall for the six-month period ending February 28, 2023 (Figure 1). Goodland's 35.5 inches is around 14 inches above normal, and ranks as their 10th snowiest, fall and winter combined, on record. Meanwhile, Manhattan's 3.3 inches ranks as the 6th least snowfall, and Topeka's 5.8 inches ranks just outside the top 10 least snowy. Much of the snowfall in the northwest was unable to soak into the ground as it melted, as 4-inch soil temperatures were below freezing for weeks, after a bitter cold spell just before Christmas dropped air temperatures to as low as -19°F. Thus, improvements to drought conditions were not as widespread as the above-normal precipitation amounts would suggest.

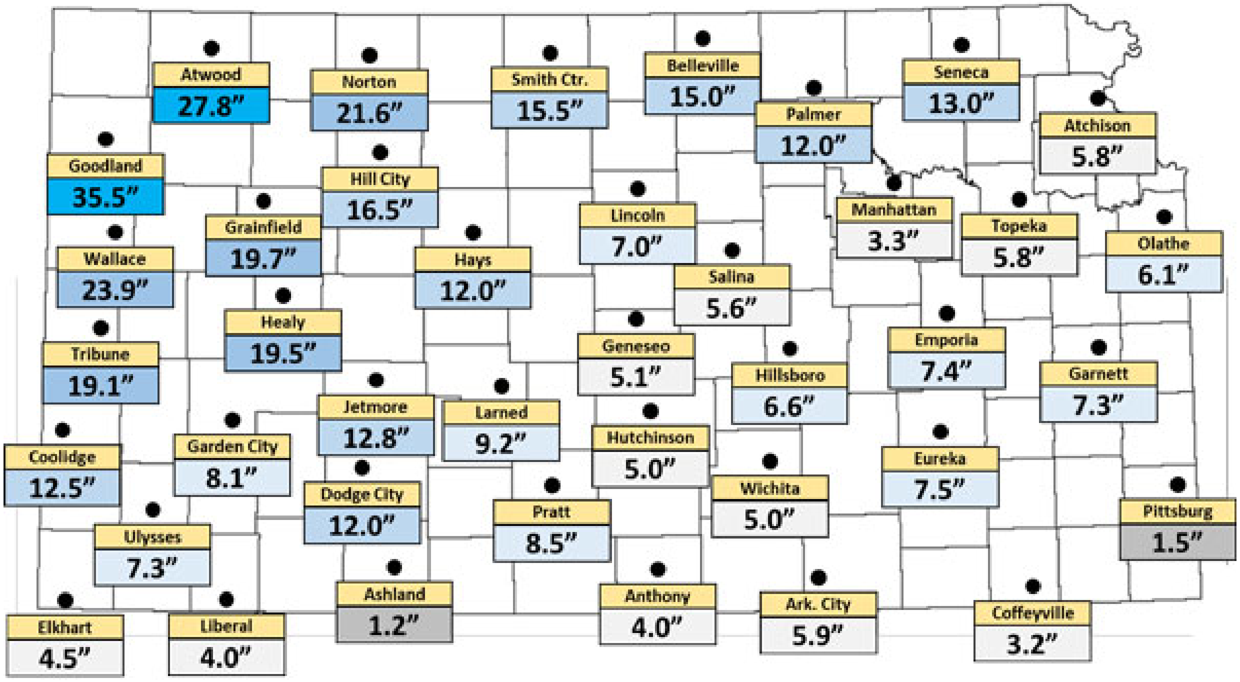

Figure 1. Total snowfall for select Kansas locations from September 1, 2022 through February 28, 2023. Source: SC-ACIS.

Spring precipitation outlook for Kansas

Will 2023 end up being one of the wetter years on record? Eastern Kansas seems to be off to a good start. As we look into spring, the current outlook for March through May shows equal chances of above, below and near normal precipitation for Kansas (Figure 2). There is no clear indication from this map that a wet winter will lead to a wet spring as well, but we can certainly hope for improvement, particularly in the southwest.

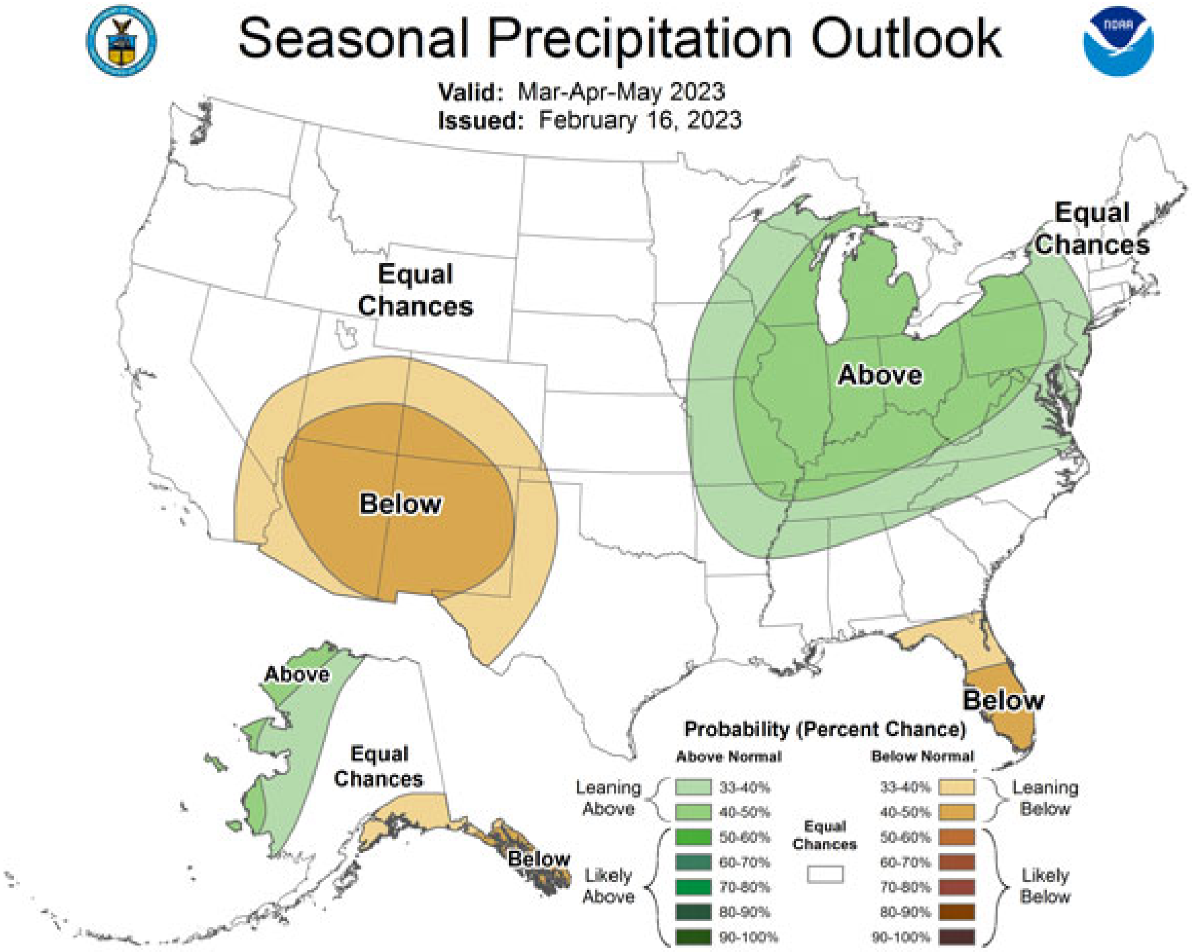

Figure 2. Meteorological spring precipitation outlook. Source: Climate Prediction Center.

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6. Kansas Ag-Climate Update for February 2023

The Kansas Ag-Climate Update is a joint effort between our climate and extension specialists. Every month the update includes a brief summary of that month, agronomic impacts, relevant maps and graphs, 1-month temperature and precipitation outlooks, monthly extremes, and notable highlights.

February 2023: Exceptional drought persisted in southwestern Kansas

The average temperature for February was 35.4°F, 0.4°F above normal. This ranked as the 48th warmest year on record out of 129 years of records, dating back to 1895. The three western divisions finished the month below normal, while all divisions in the eastern two-thirds of Kansas were above normal.

Average precipitation for February was 1.12 inches, or 0.15 inches above normal. This ranked as the 40th wettest February on record. Five of the nine divisions had above normal precipitation: northwest, west central, and the three eastern divisions. It was the 10th wettest February on record in northeast Kansas, where nearly twice the normal precipitation was received. East central Kansas had its 16th wettest February. Both of these divisions averaged around 2.2 inches of precipitation for the month.

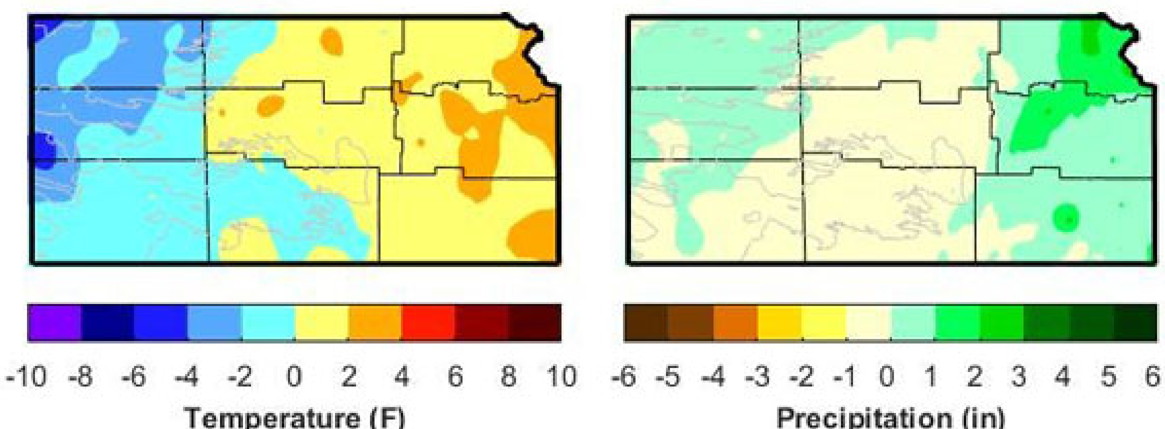

Figure 1. Departures from normal temperature (°F) and precipitation (inches) for February 2023.

View the entire February 2023 Ag-Climate Update, including the accompanying maps and graphics (not shown in this eUpdate article), at http://climate.k-state.edu/ag/updates/

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