



Extension Agronomy

eUpdate

03/20/2020

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. Soil temperature and moisture update in Kansas - March 20, 2020

Selection of the optimal planting date is one of the most critical factors in the decision-making process for farmers. In making this decision, producers should consider soil temperatures rather than just calendar dates. After a very mild start to March, air temperatures across Kansas cooled down this past week.

For the week of March 13-19, average weekly soil temperatures at 2 inches among crop reporting districts ranged from 41 °F (northern locations) to 53 °F (southern locations) (Figure 1). For instance, in the northeast region, soil temperatures ranged from 43 to 46 °F; while in the southwest region, soil temperatures varied from 44 to 53 °F. Soil temperatures were around 41-42 °F for the northwest region.

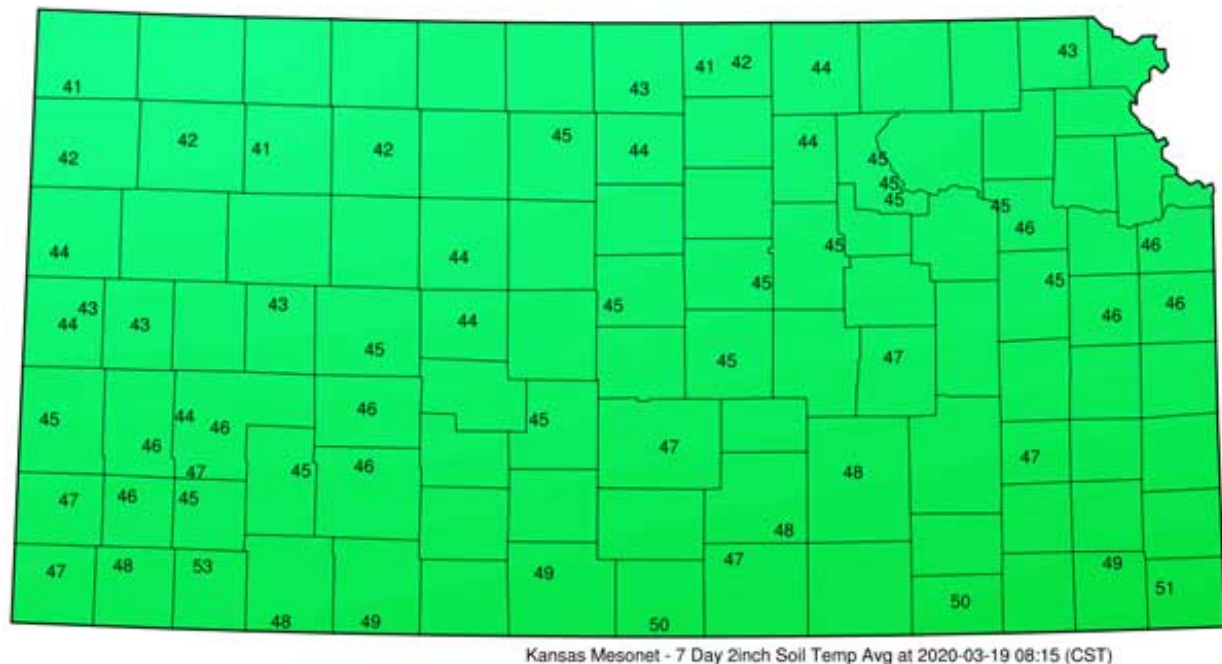


Figure 1. Average soil temperatures at 2-inch soil depth for the week of March 13-19, 2020.
(<http://mesonet.k-state.edu/>)

Differences in soil temperature were related to the large variations in average air temperatures experienced last week, from 37 °F in northern portions of the state to 56 °F for areas in southeast Kansas (Figure 2).

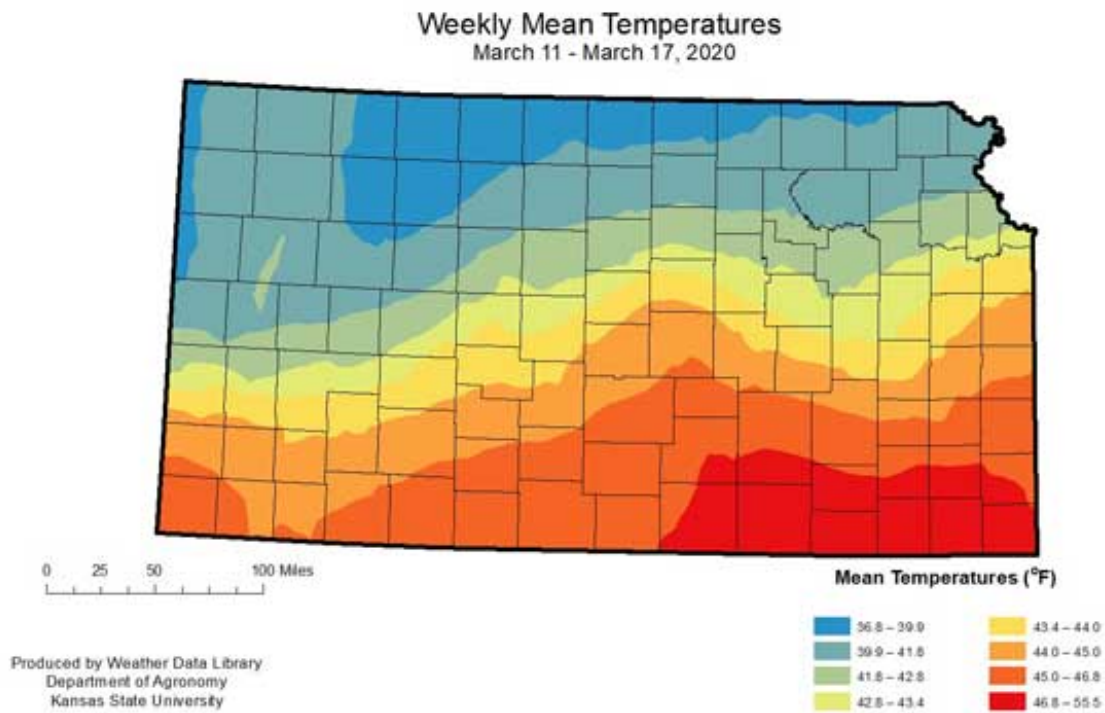


Figure 2. Weekly mean air temperatures for the week of March 11-17, 2020.

Projections for the coming weeks call for warmer-than-normal temperatures statewide, which will speed the process of warming up the soils. (Figure 3).

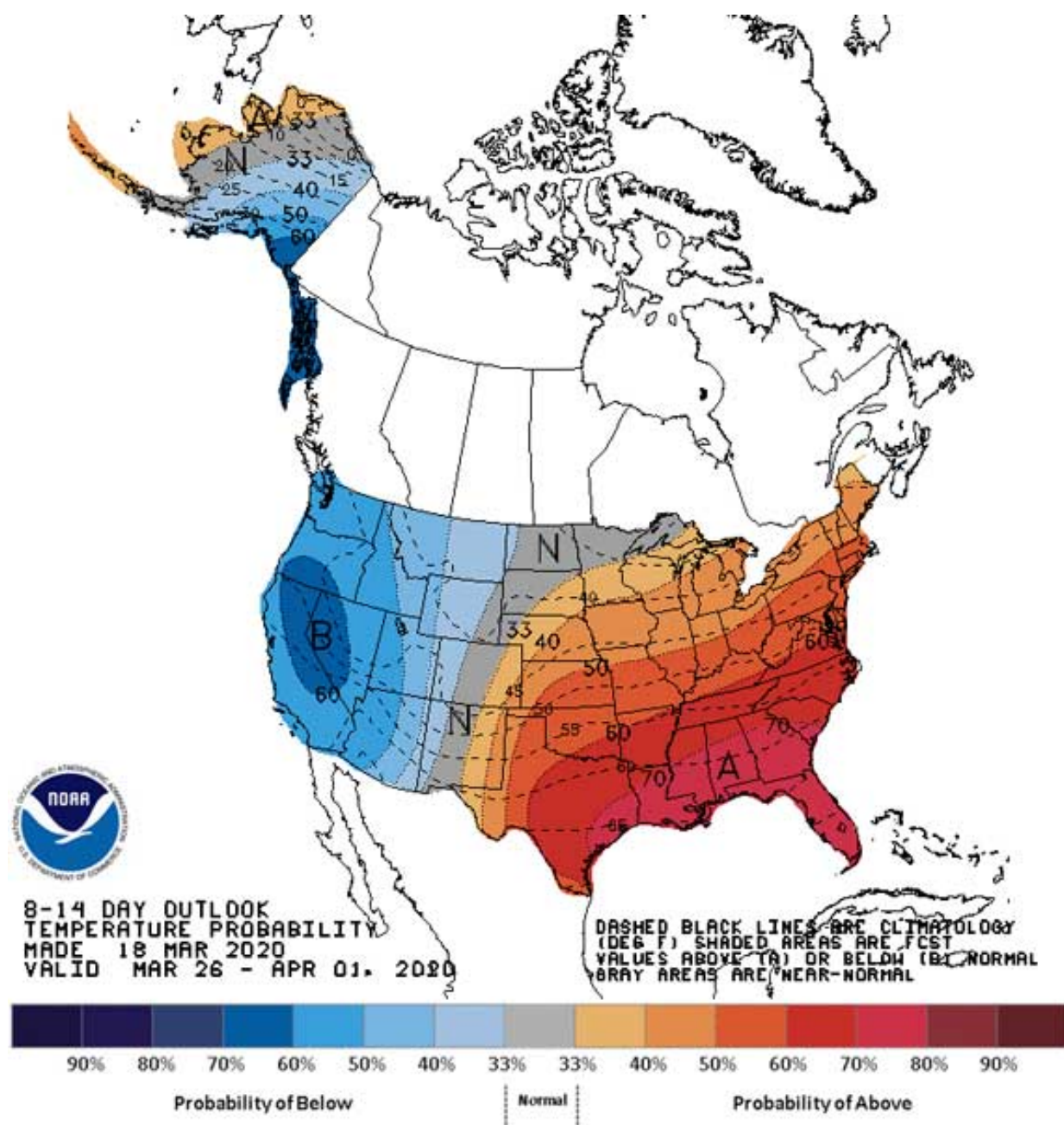


Figure 3. 8 to 14-day outlook temperature probability for March 26 – April 1, 2020. (NOAA)

The actual change in soil temperatures in any given field will be affected by amount of residue cover, soil moisture, and landscape position. Wet soils under a no-tillage system will be slower to warm. Dry soils will fluctuate more rapidly, matching air temperatures, particularly if skies are clear. (Figure 4).

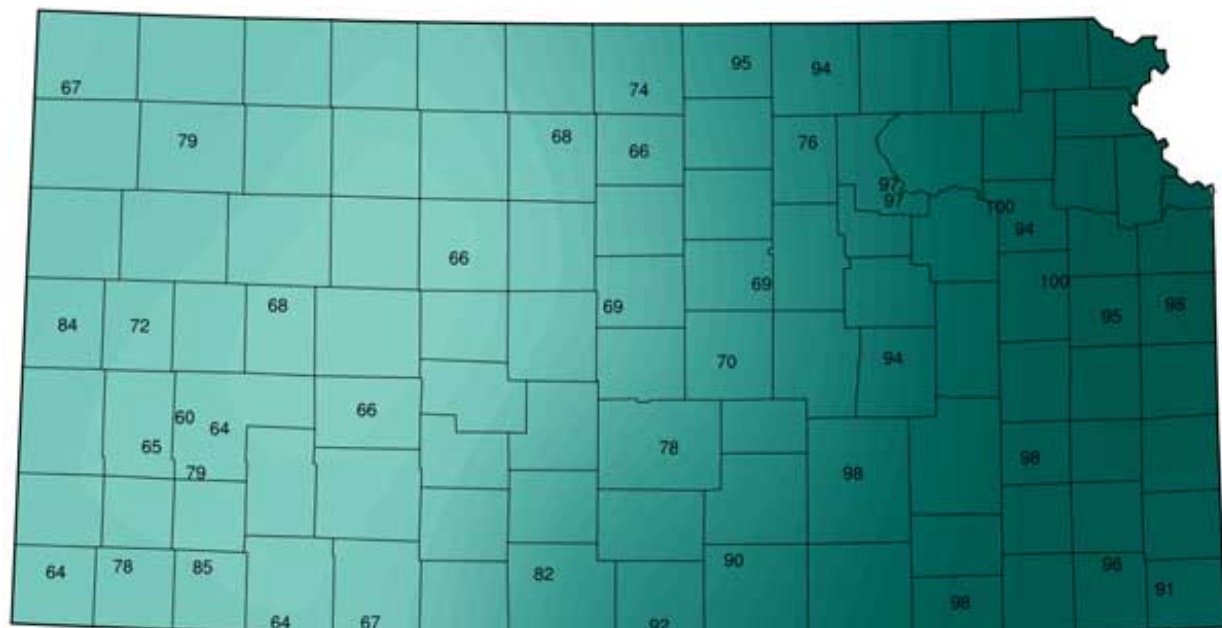


Figure 4. Soil moisture as of March 19, 2020 (Kansas Mesonet).
Map is representative of grassland vegetation. Kansas Mesonet 65 cm % of Saturation at 2020-03-19 08:17 (CST)

Current moisture status across Kansas is quite wet, with the largest weekly departure in precipitation in the southeast corner (Figure 5). Projections for coming weeks are for precipitation to be above-normal for the eastern parts of Kansas and drier for the west (Figure 6), slowing down soil warming and any potential plans for an early start to planting.

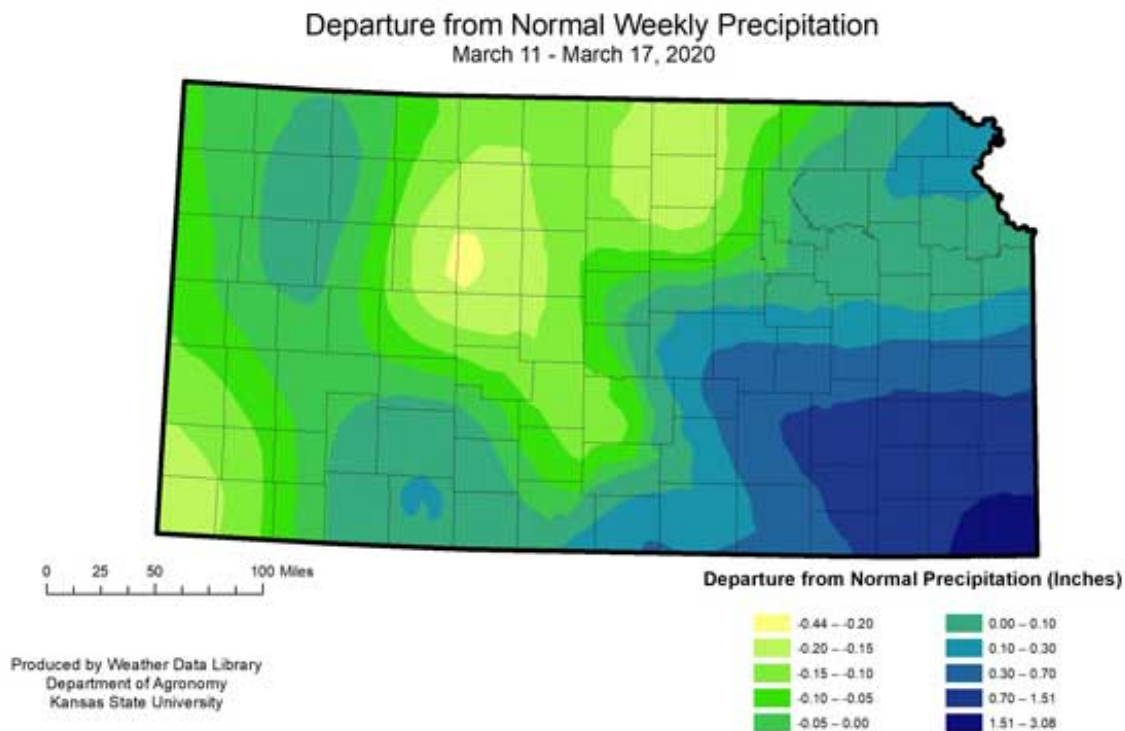


Figure 5. Departure from normal precipitation for the week of March 11-17, 2020

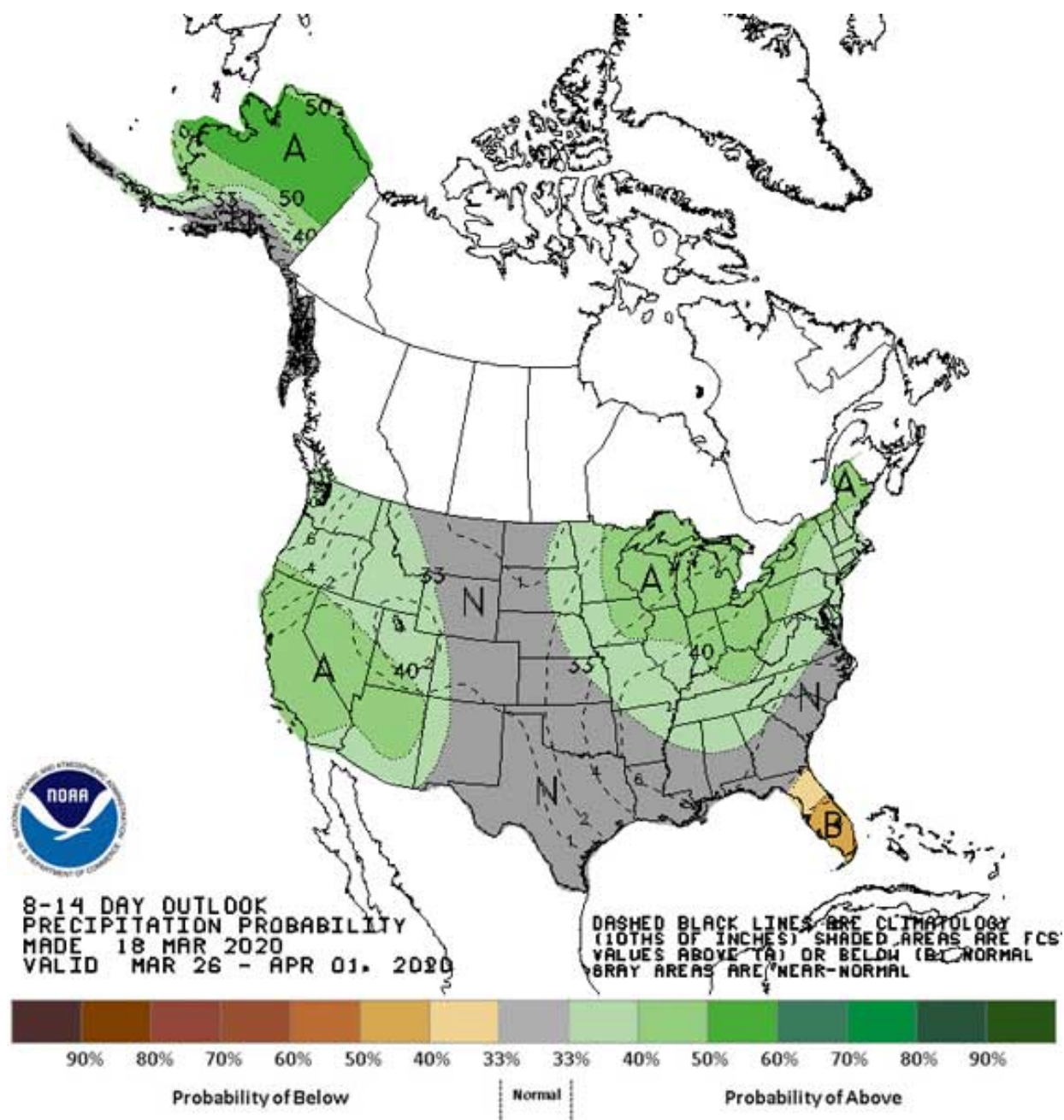


Figure 6. 8 to 14-day outlook precipitation probability for March 26 – April 1. (NOAA)

Optimal soil temperature for crop emergence

Every summer row crop has an optimal soil temperature for emergence. A minimum for corn is 50 °F for germination and early growth. However, uniformity and synchrony in emergence is primarily achieved when soil temperatures are above 55 °F. Uneven soil temperatures around the seed zone can produce non-uniform crop germination and emergence. Lack of uniformity in emergence can

greatly impact corn potential yields. This is particularly true for corn, since it is the earliest summer row crop planted. When soil temperatures remain at or below 50 °F after planting, the damage to germinating seed can be particularly severe.

Impact of a hard freeze on corn

Corn is also more likely than other summer crops to be affected by a hard freeze after emergence if it is planted too early. The impact of a hard freeze on emerged corn will vary depending on how low the temperature gets, the intensity and duration of the low temperatures, field variability and residue distribution, tillage systems, soil type and moisture conditions (more severe under dry conditions), and the growth stage of the plant. Injury is most likely on very young seedlings or on plants beyond the V5-6 growth stage, when the growing point is above the soil surface.

The average day for last spring freeze (32 °F) is quite variable around the state (Figure 7). The largest variability is from southeast to northwest Kansas; with the earliest last spring freeze date for the southeast region (April 5-15) and latest for the northwest area (>May 3). Corn planting dates before April 15 in the southeast region would increase the likelihood of the crop suffering from a late spring freeze. Similar conditions can be projected for northwest Kansas if corn is planted before May 3.

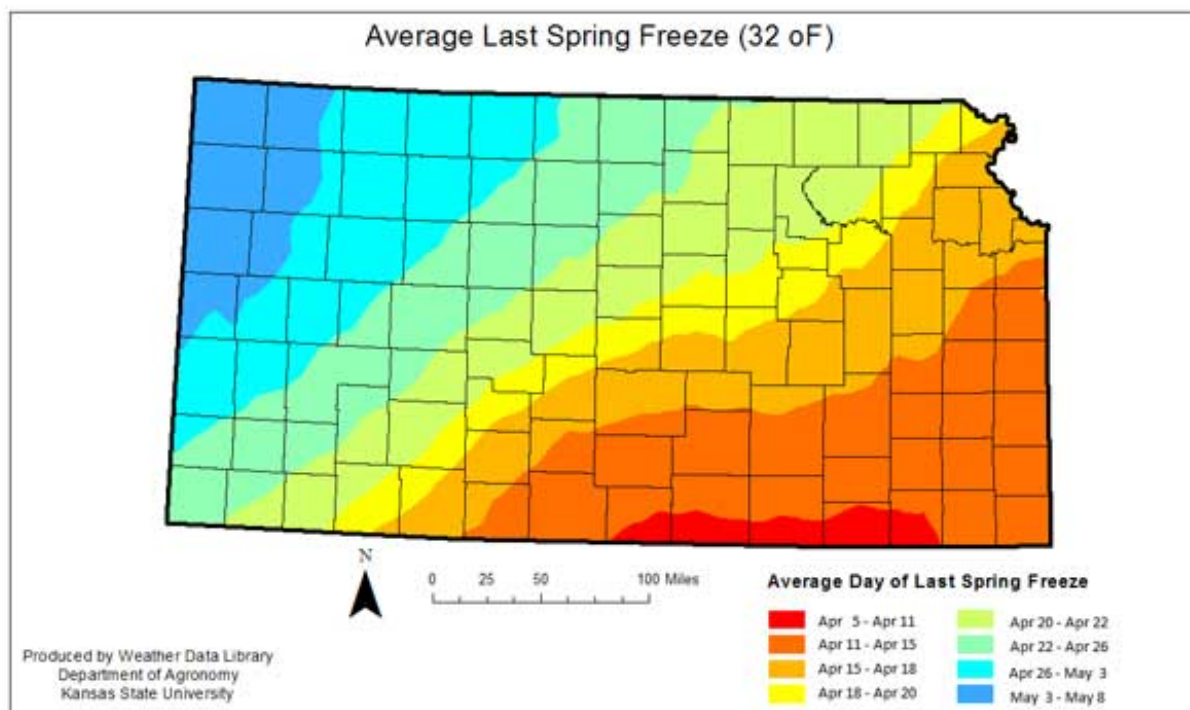


Figure 7. Average last spring freeze (32 degrees F) for Kansas.

Producers should consider all these factors when deciding on the optimal planting time.

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

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2. 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.

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.

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

Many herbicides used in the spring on wheat can be applied up to the time the flag leaf is visible, or later. One new product that can be applied from 2-leaf and flag leaf is called Pixxaro EC. It is labeled for control of flaxweed, horseweed, kochia, wild buckwheat, and other troublesome weeds.

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

MCPA and 2,4-D have different application guidelines. In general, MCPA is safer on wheat than 2,4-D, especially when applied prior to tillering. We recommend that 2,4-D not be applied to wheat until it is well-tillered in the spring. Application of 2,4-D prior to tillering hinders the tillering process, causes general stunting and can result in significant yield loss.



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

2,4-D is labeled for application to wheat from the full-tiller stage until prior to the boot stage of growth, but is probably safest between full-tiller and jointing stages of growth. Wheat will sometimes exhibit prostrate growth from 2,4-D applications applied in the jointing stage of growth, but yields generally are not significantly affected if applied before the boot stage of growth.

MCPA is relatively safe on young wheat and 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. Consequently, MCPA would be preferred over 2,4-D if spraying before wheat is well-tillered. 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).



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

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.

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.

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3. First hollow stem update: March 18, 2020

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 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 Forages crew measures FHS on a weekly basis in 28 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 hollow stem is reported for each variety in Table 1. **While no varieties had reached first hollow stem in our last measurement on March 11, 20 varieties had already reached first hollow stem on March 18, 2020**, demonstrating how quickly wheat varieties can grow and develop in the spring once favorable conditions (i.e., warmth, moisture, and nutrients) are present.



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 March 18, 2020 of 28 wheat varieties sown mid-September 2019 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). The least significant difference for varieties to be considered statistically different was 0.71 cm.

Variety	First hollow stem (cm)			
	2/25/2020	3/2/2020	3/11/2020	3/18/2020
09BC308-14-16	0.07	0.25	0.62	1.51
AM Cartwright	0.23	0.31	0.60	1.24
AM Eastwood	0.11	0.19	0.41	1.00
Bentley	0.11	0.34	0.68	1.28
Bob Dole	0.06	0.15	0.54	1.04
Doublestop CL Plus	0.06	0.22	0.46	1.75
Gallagher	0.14	0.33	0.58	1.83
Green Hammer	0.05	0.16	0.52	1.93
Guardian	0.04	0.18	0.70	1.47
KS Dallas	0.11	0.29	0.72	1.82
KS Silverado	0.12	0.26	0.72	1.77
KS Western Star	0.11	0.29	0.64	2.04
LCS Valiant	0.07	0.29	0.47	1.27
Long Branch	0.28	0.43	1.15	4.02
Paradise	0.08	0.34	0.60	1.77
Rock Star	0.08	0.27	0.57	1.57
Showdown	0.12	0.32	0.67	2.07
Smith's Gold	0.11	0.28	0.49	0.81
SY Achieve CL2	0.12	0.28	0.70	2.16
SY Wolverine	0.14	0.23	0.66	1.79
TAM205	0.08	0.29	0.78	1.82
WB4269	0.10	0.22	0.53	0.97
WB4303	0.09	0.21	0.51	1.64
WB4595	0.21	0.33	0.68	1.74
WB4699	0.01	0.21	0.51	1.54
WB4792	0.11	0.36	0.86	2.35
Whistler	0.06	0.32	0.64	2.11
Zenda	0.08	0.28	0.63	1.77

A total of 20 varieties reached first hollow stem in the period between March 11 and March 18. The only varieties that had yet to reach first hollow stem were AM Cartwright, AM Eastwood, Bentley, Bob Dole, Guardian, LCS Valiant, Smith's Gold, and WB4269. We will report first hollow stem during the next week again 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.

The intention of this report is to provide producers an update on the progress of first hollow stem development in different wheat varieties. Producers should use this information as a guide, but it is

extremely important to monitor FHS from an ungrazed portion of each individual wheat pasture to take the decision of removing cattle from wheat pastures.

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4. Recommendations for topdressing wheat with sulfur

Traditionally, sulfur (S) deficiency was most common on high-yielding crops grown on irrigated sandy soils that are low in organic matter and subject to leaching. However, due to reduced S additions from the atmosphere (there is less S in the air now) and continued crop removal, an increasing number of finer-textured soils have shown S deficiency.

In recent years, sulfur deficiency in wheat has become common in many areas of Kansas, particularly in no-till wheat where cooler soil temperatures can slow S mineralization in the soil. Classic S deficiency symptoms, confirmed by soil and plant analysis, have been observed in many no-till wheat fields during periods of rapid growth in the spring. These observed deficiencies generally occur during periods of rapid growth prior to jointing or during stem elongation.

The photos below are a good representation of the problem. Generally, the S-deficient wheat is yellow and stunted (Figure 1-top photo), and the problem is found in patches in the field (Figure 1-bottom photo), especially in areas where there has been previous soil erosion or soil movement. Sulfur deficiency in growing crops is often mistaken for nitrogen (N) deficiency. However, unlike N deficiency where the older leaves show firing and yellowing, with S deficiency, the pale yellow symptoms of S deficiency often appear first on the younger or uppermost leaves. Wheat plants with S deficiency often eventually become uniformly chlorotic. The patchy S-deficient areas of the field are often found on hilltops or sideslopes where erosion has occurred and soil organic matter is reduced, or where leaching is more pronounced. In terraced or leveled fields, wheat in areas where topsoil was removed or significant cuts were made, also commonly shows symptoms.





Figure 1. Sulfur deficiency in wheat. Photos by Dorivar Ruiz Diaz, K-State Research and Extension.

The majority of S in soil is present in organic forms (requires mineralization to become plant available) in surface soils and as sulfate (SO_4^{2-}), an inorganic form and plant available. Sulfate is relatively soluble, so it tends to leach down from the surface soil into the subsoil. In many of our Kansas soils it will accumulate in the B horizon (subsoil) in two forms:

- Some sulfate will be sorbed to clay surfaces and coatings similar to the processes whereby phosphates are sorbed, though sulfate will not be sorbed as strongly.
- Sulfate will also be present in the subsoil of many Kansas soils as gypsum.

A soil test for available sulfate in the soil profile is available. For proper interpretation of this test, soil organic matter, soil texture, the crop to be grown, and the expected yield level all need to be considered. Since sulfate is mobile, sampling to a 24-inch depth is important. Accurate estimates of S needs cannot be made from a surface sample alone. However, due to the relatively high demand for S during the rapid vegetative growth phase of wheat and relatively shallow rooting by the wheat crop at this time, the S measured in the deeper subsoil by the test may not be available to wheat in the early spring, especially where soils are still cold.

Sulfur deficiency in wheat has been showing up early in the spring, shortly after green-up, before organic S is mineralized from soil organic matter, and before wheat roots can grow into the subsoil to utilize sulfate accumulated there. Deficiencies of S are often difficult to identify because the paling in

crop color is not always obvious. Wheat plants lacking S also may be stunted, thin-stemmed, and spindly. In the case of wheat and other cereal grains, maturity is delayed. Due to the slower growth and lack of good tillering, winter annual weed competition is also enhanced.

Many fields in north central and northeast Kansas now have an established history of S deficiency for wheat. In this situation, rather than waiting for symptoms to appear in the spring, farmers may want to consider a winter topdress application of S as a preventive measure.

There are many S-containing fertilizer materials. Several dry materials are available that can be blended with dry phosphorus or nitrogen fertilizers for winter/spring topdressing. Some of these products are best used in preplant applications, however.

- **Elemental S** (typically 90-95 percent S) is a dry material marketed by several manufacturers. Before it becomes available for plant uptake, elemental S must first be oxidized by soil microorganisms to sulfate-S and this can be a slow process when surface-applied. As a result, this material is well suited for preplant applications only. Elemental S is not suited for corrective applications to S-deficient wheat in the spring.
- **Ammonium sulfate**, (21-0-0-24S) is a dry material that is a good source of both N and available S. It has high acid-forming potential, however, and soil pH should be monitored. Ammonium sulfate is a good source to consider for both preplant or topdressing to correct existing sulfur deficiencies.
- **Gypsum** (analysis varies) is calcium sulfate, and is commonly available in a hydrated form containing 18.6 percent S. This material is commonly available in a granulated form that can be blended with other materials. Since it is a sulfate source, it would be immediately available, and is another good source for spring topdressing.
- **New N-P-S products**, such as Microessentials, 40-Rock, and others, are ammonium phosphate materials formulated with sulfur, and in some cases micronutrients such as zinc. In most of these products the sulfur is present as a combination of elemental-S and sulfate-S.

There are also liquid sources of sulfur fertilizers available:

- **Ammonium thiosulfate**, (12-0-0-26S) is the most popular S-containing product used in the fluid fertilizer industry, as it is compatible with N solutions and other complete liquid products.
- **Potassium thiosulfate**, (0-0-25-17S) is a clear liquid product that can be mixed with other liquid fertilizers.

Liquid and dry fertilizer sources can be applied in combination with N at topdressing this spring. However, it is important to consider the potential plant availability of each S fertilizer source for this wheat growing season.

For more information see K-State publication MF 2264 *"Sulfur in Kansas"* at <http://www.ksre.ksu.edu/bookstore/pubs/MF2264.pdf>

For estimations of required application rates of S see K-State publication MF-2586 *"Soil Test Interpretation and Fertilizer Recommendations"* at <http://www.ksre.ksu.edu/bookstore/pubs/mf2586.pdf>

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5. Chloride as a topdressing nutrient for wheat

Chloride (Cl) is a highly mobile nutrient in soils and topdressing is typically a good time for application, especially in regions with sufficient precipitation or with coarse-textured soils are prone to leaching.

One of the main benefits from good Cl nutrition is the improvement in overall disease resistance in wheat. Wheat response to Cl is usually expressed in improved color, suppression of fungal diseases, and increased yield. It is difficult to predict whether Cl would significantly increase wheat yields unless there has been a recent soil test analysis for this nutrient. Chloride fertilization based on soil testing is becoming more common in Kansas.

As with nitrate and sulfate, Cl soil testing is recommended using a 0-24 inch profile sample. Based on current data, the probability of a response to Cl in dryland wheat production in northeast and central Kansas seems higher than in western Kansas.

The interpretation of the Cl test and corresponding fertilizer recommendations for wheat are given in the table below. Chloride fertilizer is recommended when the soil test is below 6 ppm, or 45 pounds soil chloride in the 24-inch sample depth. Dry or liquid fertilizer sources are all plant available immediately. Potassium chloride (potash) and ammonium chloride are commonly available and widely used fertilizer products, though other products such as calcium, magnesium, and sodium chloride can also be used and are equal in terms of plant availability.

Table 1. Soil test chloride interpretations for wheat in Kansas

Category	Soil Chloride in a 0-24 inch sample		Chloride Recommended
	(lbs/acre)	(ppm)	(lbs Cl/acre)
Low	<30	<4	20
Medium	30-45	4-6	10
High	>45	>6	0

Chloride deficiency symptoms appear as leaf spotting and are referred to as physiological leaf spot (Figure 1).





Figure 1. Upper and lower photos both depict chloride deficiency symptoms (physiological leaf spotting) in wheat. Photos by Dorivar Ruiz Diaz, K-State Research and Extension.

K-State has done considerable research on Cl applications to wheat since the early 1980's, mostly in the eastern half of the state. Results have been varied, but there have been economic yield responses in almost all cases where soil test Cl levels have been less than 30 lbs per acre (Figure 2).

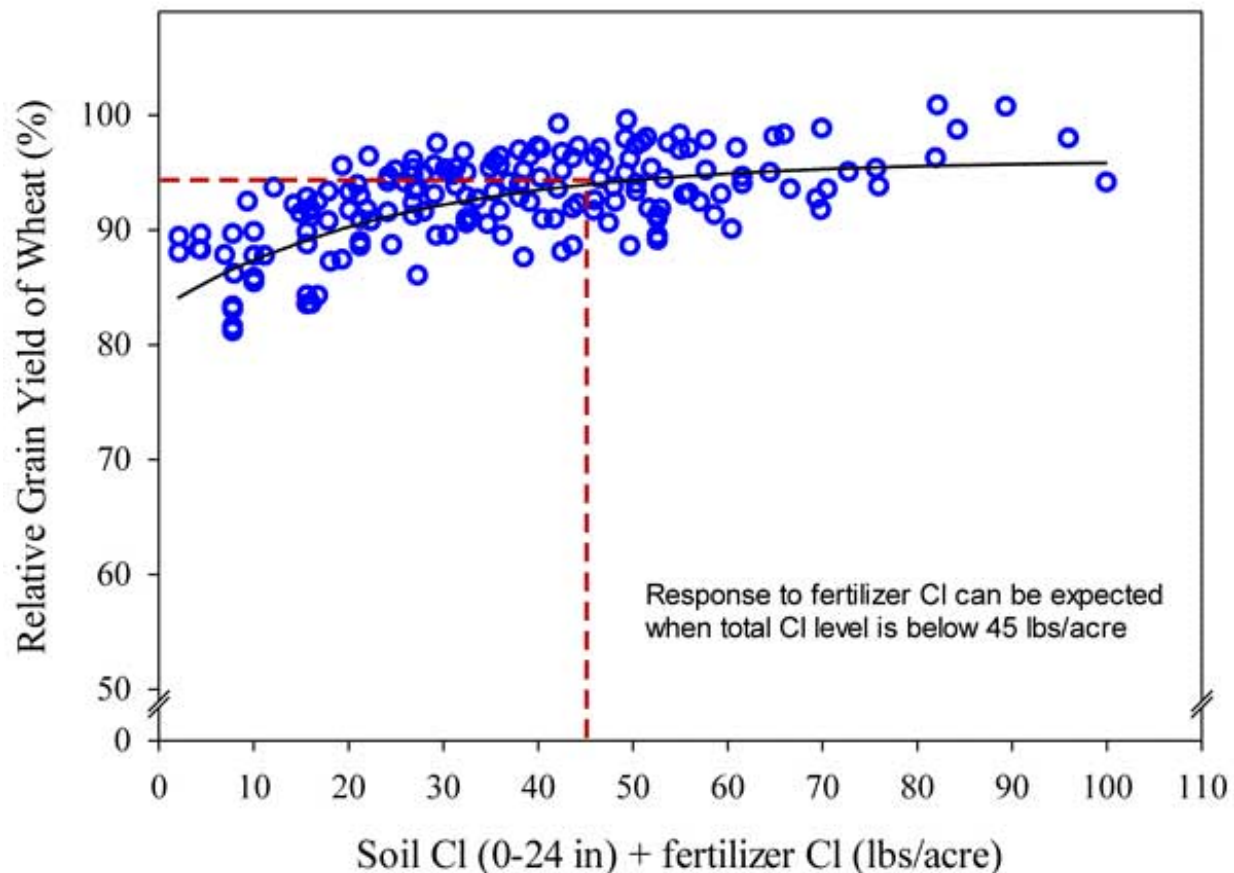


Figure 2. Relative wheat grain yield as affected by total chloride supply (soil + fertilizer) in Kansas.

Deficiencies were most likely to be found on fields with no history of potash (KCl) applications. Recent studies showed that there are variety differences in response to Cl and are likely associated with the tolerance of that variety to fungal diseases.

For more information, please refer to the KSRE publication *Chloride in Kansas: Plant, Soil, and Fertilizer Considerations*, MF2570: www.ksre.ksu.edu/bookstore/pubs/MF2570.pdf

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6. 2020 Kansas Leopold Conservation Award call for nominations

Since 2015, the Sand County Foundation, in partnership with the Ranchland Trust of Kansas (RTK) and the Kansas Association of Conservation Districts, has recognized a private land owner and/or family in Kansas who exemplifies the land ethic that Aldo Leopold framed in his book, *A Sand County Almanac*. Information and a short video about past recipients can be found on the Sand County Foundation website at <https://sandcountyfoundation.org/our-work/leopold-conservation-award-program/state/kansas>.

The Leopold Conservation Award honors Kansas farmers, ranchers, and other private landowners who are conservation leaders in the state. This award recognizes extraordinary achievement in voluntary conservation, inspires other landowners through their example, and helps the general public understand the vital role private landowners can and do play in conservation success. The Leopold Conservation Award recipient receives \$10,000 and a crystal award.

Ranchland Trust of Kansas, the Sand County Foundation, and the Kansas Association of Conservation Districts are accepting applications for the 2020 award. Applications for the award must be postmarked by June 1, 2020.

How to apply

Nominations may be submitted on behalf of a landowner or landowners may nominate themselves. Nominators are asked to address five key areas in the application. The key areas include:

- Conservation Ethic
- Resilience
- Leadership and Communication
- Innovation and Adaptability
- Ecological Community

Additionally, three letters of recommendation should be included with the application. The application can be found online at:

<https://sandcountyfoundation.org/uploads/KANSAS-CFN-2020.pdf>



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