Issue 824

K-STATE
Research and Extension

Extension Agronomy

# eUpdate

10/23/2020

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.

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

# eUpdate Table of Contents | 10/23/2020 | Issue 824

## 1. Replanting decisions for winter wheat

As wheat growers evaluate their wheat stand, some may be considering replanting fields yet this fall. The most likely cause of poor or uneven emergence for many fields is a severe lack of precipitation prior to planting and in the following days. If dry soils are the cause of the problem, replanting will not bring many benefits unless the seed has partially germinated and perished before emerging. It is very important to dig into the soil and evaluate the seed to determine the cause of poor emergence. Wheat seeds may still be germinating and emergence may occur in the next few days, depending on temperatures. Thus, if seed are still hard and viable, or if germination started to occur recently and there are very short coleoptile emerging from the seed (Figure 1), the best advice is to leave the field alone.


**Figure 1. Wheat seed with elongating coleoptile visible below ground. Photo by Romulo Lollato, K-State Research and Extension.**

**When deciding whether to replant wheat fields it is helpful to consider these factors**: i) stand uniformity, ii) percent stand compared to the target stand, iii) replanting date, iv) weed control, and v) insurance cutoff date.

**Stand uniformity**

In fields in which topsoil moisture was variable at time of planting, some seeds might have germinated and emerged where soil moisture was sufficient, while others might have started the germination process but perished where soil moisture was too low, while others might not have started the germination process at all. This will cause poor wheat emergence across the field, with sometimes recognizable field patterns associated with the moisture distribution in the soil. In this case, stands might be relatively uniform in poorer-drained areas where moisture might have accumulated, but non-existent in better-drained areas, leading to a high within-field variability. In this case, growers should check for seed viability in areas with poor emergence. If the seed is still viable, then the field should be left alone. If the seeds imbibed water, started to germinate but perished, then these portions of the field should have top-priority for replanting. If a stand is sparse in areas that already emerged, producers should also consider replanting these areas with lower seeding rates to bring final population closer to the desired stand, as discussed below.

**Percent stand compared to the goal**

In areas with suboptimal and thinner stands than desired, counting the number of emerged plants per row foot and comparing the observed stand to target populations (Table 1) is a good place to start.

The target number of plants per row foot (Table 1) is influenced by seeding rate, seed size, and row spacing, and considering 80% emergence. If seed size is not known, 14,000 to 16,000 seeds per pound can be used for most wheat varieties in Kansas, except those with rather large or small kernels. To determine the average number of plants per foot of row, several random plant counts across the field should be taken, given a more or less uniform emergence throughout the field. If the average number of plants is about 50 percent or more of normal and the stand is evenly distributed, the recommendation is to keep the stand. Wheat's tillering ability can greatly compensate for poor stand provided soil fertility is adequate and the weather is favorable. With less than 40 percent of normal stand, the recommendation is to replant the field. If possible, replanting should be done at a 45-degree angle to the original stand to minimize damage to the existing stand.

**Table 1. Target plants per row foot (80% emergence) based on seeding rate, seed size, and row spacing.**

| Seeding rate | Seed size | Row spacing (inches) | | | | |
|---|---|---|---|---|---|---|
| | | 6 | 7.5 | 8 | 10 | 12 |
| lb/ac | seeds/lb | Target plants per row foot (80% emergence) | | | | |
| 45 | 12,000 | 5 | 6 | 7 | 8 | 10 |
| | 14,000 | 6 | 7 | 8 | 10 | 12 |
| | 16,000 | 7 | 8 | 9 | 11 | 13 |
| | 18,000 | 7 | 9 | 10 | 12 | 15 |
| 60 | 12,000 | 7 | 8 | 9 | 11 | 13 |
| | 14,000 | 8 | 10 | 10 | 13 | 15 |
| | 16,000 | 9 | 11 | 12 | 15 | 18 |
| | 18,000 | 10 | 12 | 13 | 17 | 20 |
| 75 | 12,000 | 8 | 10 | 11 | 14 | 17 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | 14,000 | 10 | 12 | 13 | 16 | 19 |
| | 16,000 | 11 | 14 | 15 | 18 | 22 |
| | 18,000 | 12 | 15 | 17 | 21 | 25 |
| 90 | 12,000 | 10 | 12 | 13 | 17 | 20 |
| | 14,000 | 12 | 14 | 15 | 19 | 23 |
| | 16,000 | 13 | 17 | 18 | 22 | 26 |
| | 18,000 | 15 | 19 | 20 | 25 | 30 |
| 120 | 12,000 | 13 | 17 | 18 | 22 | 26 |
| | 14,000 | 15 | 19 | 21 | 26 | 31 |
| | 16,000 | 18 | 22 | 24 | 29 | 35 |
| | 18,000 | 20 | 25 | 26 | 33 | 40 |

**Replanting date and seeding rate**

As of late October, most of the state has passed the optimum sowing date, with maybe the exception of south-central or southeast Kansas. For portions of the field with no established stand (the entire stand will need to be replanted), producers should plan to increase their seeding rates by 10-15% for every week past the optimum sowing date.

In areas where a partial stand was achieved but for a total of about 50% stand, or parts of the field that did not emerge evenly, or that the seedlings have perished after planting, producers should make the decision about replanting immediately to avoid further compromising the yield potential.

In portions of the field where stand is below optimum, producers can cross-drill at the rate of 30-40 pounds per acre in western Kansas and 40-60 pounds per acre in central and eastern Kansas, using a double-disc opener drill, if at all possible, to minimize damage to the existing stand. If the replanting is done in November or later, increase the seeding rates to 60-75 pounds per acre in western Kansas and 75-90 pounds per acre in central Kansas. If stands are less than 30 percent of normal, increase these seeding rates by 20-30 pounds per acre. The higher seeding rates are needed because the cool soil temperatures encountered by late planted wheat will likely slow emergence, favor seedling diseases and reduce the potential for fall tillering. Using a fungicide seed treatment can reduce the potential for seedling disease and help achieve the target populations.

**Weed control – Pay attention to application timing**

A thin wheat stand can increase the potential for weed and grass infestations. In fields with a history of severe weed problems, the wheat stand should probably be replanted or thickened. Keep in mind that the uneven wheat stands can also influence herbicide timing due to different staging of the crop within the same field. Herbicides, such as 2,4-D and dicamba, have very specific application guidelines and attention must be paid to the herbicide label to avoid injury to the wheat crop. Paying attention to wheat leaf staging when controlling weeds can help minimize the consequences of applying these herbicides outside the labeled recommendations. Potential problems due to improper application timing include trapped heads, missing florets, or twisted awns. More-developed plants during the fall often hold the best yield potential; thus, this factor might be considered if a decision needs to be taken between risking some herbicide injury to more developed plants versus those that emerged late in uneven wheat fields.

**Insurance cut-off dates**

Finally, some producers might also consider insurance cut-off dates, as they need to ensure their crop is planted prior to this date. For insurance purposes, crops planted before the final planting dates as specified by the USDA are insured with no reduction in coverage or adjustment to premium. The final plant date is already past for parts of western Kansas, which means that producers replanting after this date will have a reduction in 1% coverage per day until the end of the late-planting period. For wheat, the late-planting period often occurs about 15 days after the final plant date.

Romulo Lollato, Wheat and Forages Specialist
lollato@ksu.edu

## 2. Management adjustments when sowing wheat late

According to the most recent USDA report released on October 19, about 84% of Kansas wheat has been planted this fall, which is above the 5-yr average of 70%. However, some producers may have delayed planting for different reasons, including harvesting a summer crop during late October or, especially during this growing season, dry soils and waiting for significant precipitation to occur. Planting wheat in late October-early November is within the acceptable range in southeast and far south central Kansas. In other areas of the state, this is later than desirable, and later than the cutoff date for full crop insurance benefits. Although good yields may still be reached when wheat is planted outside the optimal planting window, late-planted wheat is often subjected to colder fall temperatures and has less time to tiller prior to winter dormancy, which can reduce wheat yield potential and increase the risks of winter injury. Under these circumstances, some management adjustments can be made to try to compensate for the consequences of late planting. These adjustments include:

**Increase seeding rate**

Late-planted wheat tends to produce fewer tillers during the fall than wheat planted at the optimal time. Fall tillers are generally more productive than spring tillers, contributing more to the crop's yield potential. Therefore, there is a need to compensate for the reduced tillering by increasing seeding rates and adding extra seed per row foot. Wheat seeding rates for Kansas vary depending on the precipitation zone, and increase from west to east (Table 1). Likewise, every week planting is delayed from the end of the optimal planting date range should be compensated by increasing seeding rates by about 150,000 – 225,000 seeds per acre (or 10 to 15 lb/acre) in western Kansas, or 225,000 – 300,000 seeds per acre (15 – 20 lb/acre) in eastern Kansas. Final seeding rate should not be above 90-100 pounds per acre in western Kansas and 120-130 pounds in eastern and central Kansas for grain-only wheat production.

**Table 1. Seeding rates for different Kansas regions when planted during optimum planting dates and in grain-only systems. Upwards adjustments to these rates are needed when planting wheat late.**

| Region within Kansas | Seeding rate for grain-only wheat production, assuming optimum planting date | | | |
|---|---|---|---|---|
| | seeds/acre | | seeds/sq. ft.* | |
| | Min. | Max. | Min. | Max. |
| Western | 750,000 | 900,000 | 17 | 21 |
| Central | 900,000 | 1,125,000 | 21 | 26 |
| Eastern | 1,125,000 | 1,350,000 | 26 | 31 |
| Irrigated | 1,200,000 | 1,500,000 | 28 | 34 |

*To determine row length needed for one square foot based on row spacing, divide 12 by the row spacing of your field. For example, if row spacing is 7.5 inches, 12/7.5 = 1.6 feet, or 19.2 inches of row are needed to be equivalent to one square foot.

**Maintain the optimal planting depth (1 to 1.5 inch deep)**

Wheat needs at least 4-5 leaves and 1-2 tillers prior to winter dormancy for maximum cold tolerance. Late-planted wheat will most likely have fewer tillers and leaves than wheat planted at the optimal timing, and therefore will be more susceptible to winter kill. It is important to plant wheat at the normal planting depth (1 to 1.5 inches below the soil surface) to ensure good root development and anchorage, as well as good crown insulation by the soil during the winter, increasing the chances of winter survival. Shallow-planted wheat is at greater risk of winter injury. If the seed is placed too deeply, it may not have enough vigor in cold soils to emerge well.

**Place starter phosphorus (P) fertilizer with the seed**

Phosphate-based starter fertilizer promotes early-season wheat growth and tillering, which can help compensate for the delayed sowing date. Additionally, P is less available under colder soil temperatures, which can result in P deficiency under cold weather conditions. When planting late, producers should strongly consider using about 20-30 lbs/acre of P fertilizer directly with the seed, regardless of soil P levels. This placement method is more effective at that time of year than other application methods. The later the planting date, the more fall root development is slowed. The closer the fertilizer is to the seed, the sooner the plant roots can get to it.

**Use fungicide seed treatment or plant certified seed**

Late-planted wheat is sown into colder soils, which generally increases the time needed for germination and emergence to occur. As a consequence, there is increased potential for seed and soil-borne diseases that affect seedlings and early-season wheat development. Fungicide seed treatment can protect the seed and seedling during the extended time it is subjected to potential seedling diseases, improving stand establishment under poor growing conditions. It is important that the seed treatment thoroughly coat the seeds to ensure good protection. For fungicide seed treatment options, please refer to the most current version of K-State fungicide seed treatment chart available at: https://www.bookstore.ksre.ksu.edu/pubs/MF2955.pdf

**Variety selection**

It is probably too late to make any changes as far as which wheat variety to plant this fall. However, a few points to consider when it is known that wheat will be planted late (e.g. when planning to sow wheat following soybeans) are tillering ability and maturity. A variety that has good tillering ability may offset some of the consequences of late planting, as it might still be able to produce one or two tillers during the fall whereas a low-tillering variety may produce none. Also, late-planted wheat is typically behind in development going into the winter, which might translate into slower development in the spring. This delay can result in plants being exposed to moisture stress and especially heat stress during grain filling, reducing the duration of the grain filling period. Thus, selecting an early-maturity variety with good yield potential may offset to some extent the consequences of late planting by decreasing the chances of a grain filling period subjected to warmer temperatures.

Romulo Lollato, Wheat and Forages Specialist
lollato@ksu.edu

## 3. Considerations for fall applications of anhydrous ammonia

Soils across most of Kansas are still running above 50 degrees F at the 4-inch depth in most locations (Figure 1). It is best to delay application of anhydrous ammonia until soil temperatures drop below this threshold. Applying anhydrous ammonia in the fall ahead of the next corn crop has some appeal to producers. For one thing, fall fertilizer application spreads out the workload so there's more time to focus on corn planting in the spring. Secondly, wet conditions in the spring sometimes prevents producers from applying lower-cost anhydrous ammonia ahead of corn planting, and forces them to apply more expensive sources after planting. Equally important for many producers have been issues with anhydrous ammonia availability at times in the spring.

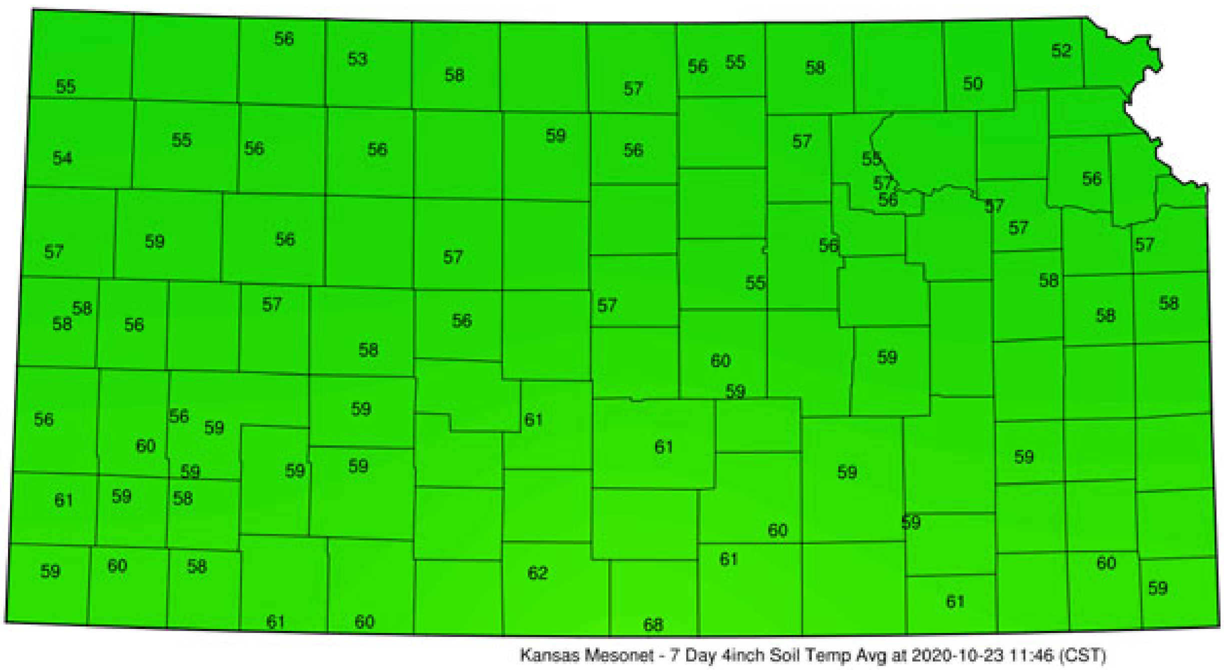


**Figure 1. Average soil temperature at 4 inches for the 7-day period ending on October 23, 2020. Soil temperatures in individual fields in any given area will vary with differences in vegetative cover, soil texture, soil moisture, and other factors. (Kansas Mesonet)**

Despite those advantages, producers should be aware that there is potential for higher nitrogen (N) loss in the spring following a fall application, as a result of nitrification of the ammonium during late winter and very early spring and subsequent leaching, or denitrification.

### Reactions of anhydrous ammonia in the soil

When anhydrous ammonia is applied to the soil, a large portion of the ammonia is converted to ammonium ($NH_4^+$), and can be bound to clay and organic matter particles within the soil. As long as the nitrogen remains in the ammonium form, it can be retained on the clay and organic matter, and does not readily move in most soils except sandy soils with very low CEC, so leaching is not an issue.

At soil temperatures above freezing, nitrification occurs - ammonium is converted by specific soil microbes into nitrate-N ($NO_3^-$). Since this is a microbial reaction, it is very strongly influenced by soil temperatures. The higher the temperature, the quicker the conversion will occur. Depending on soil temperature, pH, and moisture content, it can take 2-3 months or longer to convert all the ammonia applied in the fall to nitrate.

By delaying application until cold weather, most of the applied N can enter the winter as ammonium, and over-winter losses of the applied N will be minimal.

Producers should wait until soil temperatures are less than 50 degrees F at a depth of 4 inches before applying ammonia in the fall or early winter. Nitrification does not cease below 50 degrees F, but rather soils will likely become cold enough to limit the nitrification process. In many areas of Kansas, soils may stay warmer than 50 degrees well into late-fall and only freeze for short periods during the winter.

The use of a nitrification inhibitor can help reduce N losses from fall N applications under specific conditions, particularly during periods when soil temperatures warm back up for a period after application.

One should also consider soil physical properties when considering fall application. Fall applications of N for corn should not be made on sandy soils prone to leaching, particularly those over shallow, unprotected aquifers. Rather, fall N applications should focus on deep, medium- to heavy-textured soils where water movement through the profile is slower.

**When is N lost?**

When considering fall application of N, keep in mind that loss of N during the fall and winter is not normally a problem in Kansas. The conversion of "protected" ammonium to "loss prone" nitrate during the fall and winter can be minimized by waiting to make applications until soils have cooled, and by using products such as nitrification inhibitors. The fact that essentially all the N may remain in the soil as ammonium all winter, coupled with our dry winters, means minimal N is likely to be lost over winter.

However, soils often warm up early in the spring and allow nitrification to get started well before corn planting. Generally, if the wheat is greening up, nitrification has begun! Thus, one of the potential downsides of fall application is that nitrification can begin in early March, and essentially be complete by late May and June.

**Summary**

If anhydrous ammonia is to be applied in the fall, there are a number of factors that must be considered, including soil texture, temperature, and soil moisture. Consider the following guidelines:

- Do not apply anhydrous ammonia in the fall on sandy soils (see companion article in this eUpdate for more information).
- On silt loam or heavier-textured soils, wait to apply anhydrous ammonia until soil temperatures at the 4-inch depth are below 50 degrees F (records indicate in most years this

will be in November).

- Use a nitrification inhibitor with anhydrous ammonia to help reduce fall nitrification rates.
- To check the soil temperature in your area visit the K-State Research and Extension Weather Data Library at: http://mesonet.k-state.edu/agriculture/soiltemp/

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

Mary Knapp, Weather Data Library
mknapp@ksu.edu

## 4. Can dry soils affect anhydrous ammonia applications in Kansas?

Many producers are getting ready for fall anhydrous application, however very dry soils in most of Kansas can be a concern. When the soil is dry, will it be able to hold anhydrous ammonia or will some or most of the ammonia be lost shortly after application?

There are three factors that come into play when applying anhydrous ammonia to dry soils.

**Chemical** - Ammonia ($NH_3$) needs to react with water shortly after application in order to convert into ammonium ($NH_4^+$), which is the molecule that can adhere to clay and organic matter in the soil. Ammonia is very soluble in water. After it is placed in the soil, $NH_3$ reacts with water in the soil to form $NH_4^+$, which is retained on the soil cation exchange capacity sites. This process takes a little time – it does not occur immediately upon contact with the soil. The main controlling factors in the conversion of $NH_3$ to $NH_4^+$ are soil temperature, soil moisture, and soil pH. The higher the soil temperature and the wetter the soil, the more rapid the conversion occurs. If the ammonia does not react with water, it will remain as a gas that could escape from the soil. Also, equilibrium between $NH_3$ and $NH_4^+$ is affected by soil pH. More $NH_3$ will remain unconverted in the soil longer at higher application rates and at higher soil pH levels.

**Physical** - Dry soils may be cloddy, with large air spaces where the soil has cracked. This can allow the gas to physically escape into the air before it has a chance to be converted into ammonium. Getting the soil sealed properly above the injection slot can also be a problem in dry soils. Loss of the ammonium gas can begin immediate after application continuing for several days to weeks if there is no moisture. N losses can be greater than 50%.

**Application depth** - The deeper the ammonia is applied, the more likely the ammonia will have moisture to react with, and the easier the sealing.

So, can anhydrous ammonia be applied to dry soils?

The answer is **yes** - as long as the ammonia is applied deep enough to get it in some moisture and the soil is well sealed above the injection slot. If the soil is dry and cloddy, there may be considerable losses of ammonia within just a few days of application if the soil is not well sealed above the injection slot and/or the injection point is too shallow.

Producers should be able to tell if anhydrous is escaping from the soil during application or if the ammonia isn't being applied deeply enough. If ammonia can be smelled, the producer should either change the equipment setup to get better sealing or deeper injection, or wait until the soil has better moisture conditions.

In short, producers can minimize this potential loss problem by applying the anhydrous ammonia at the proper depth (at least 6 to 8 inches in 30 to 40 inch spacings), and using covering disks behind the knives or sealing wings ("beaver tails") on the knives.

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

Peter Tomlinson, Environmental Quality Specialist
ptomlin@ksu.edu

## 5. Cooler weather brings the return of the Mesonet Freeze Monitor

The first freeze of the season occurred in September, and a hard freeze is expected this weekend. The Freeze Monitor is a handy tool to check conditions in your area. Have freezing conditions been recorded? How does it compare to average? The average freeze date in northwest Kansas is as early as the last week in September. However, southeast Kansas does not usually see freezing temperatures until the end of October (Figure 1). Average dates for the first occurrence of 24 °F temperatures are even later (Figure 2).

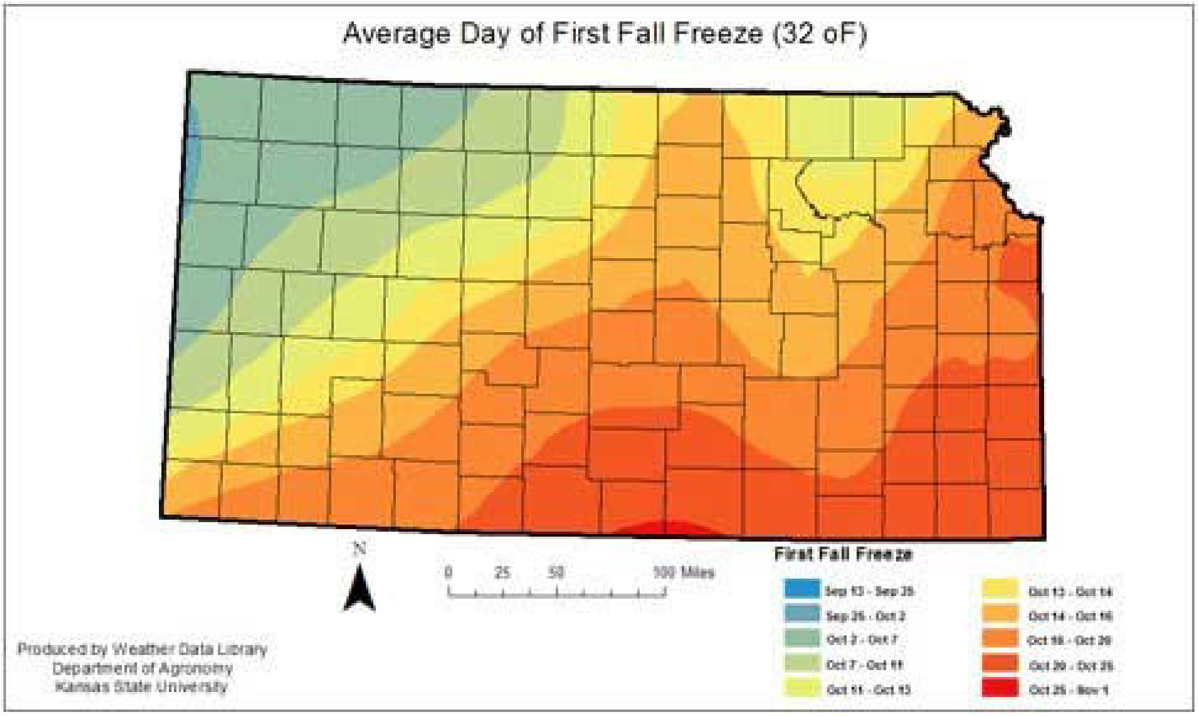


**Figure 1. Average fall freeze dates (Weather Data Library).**

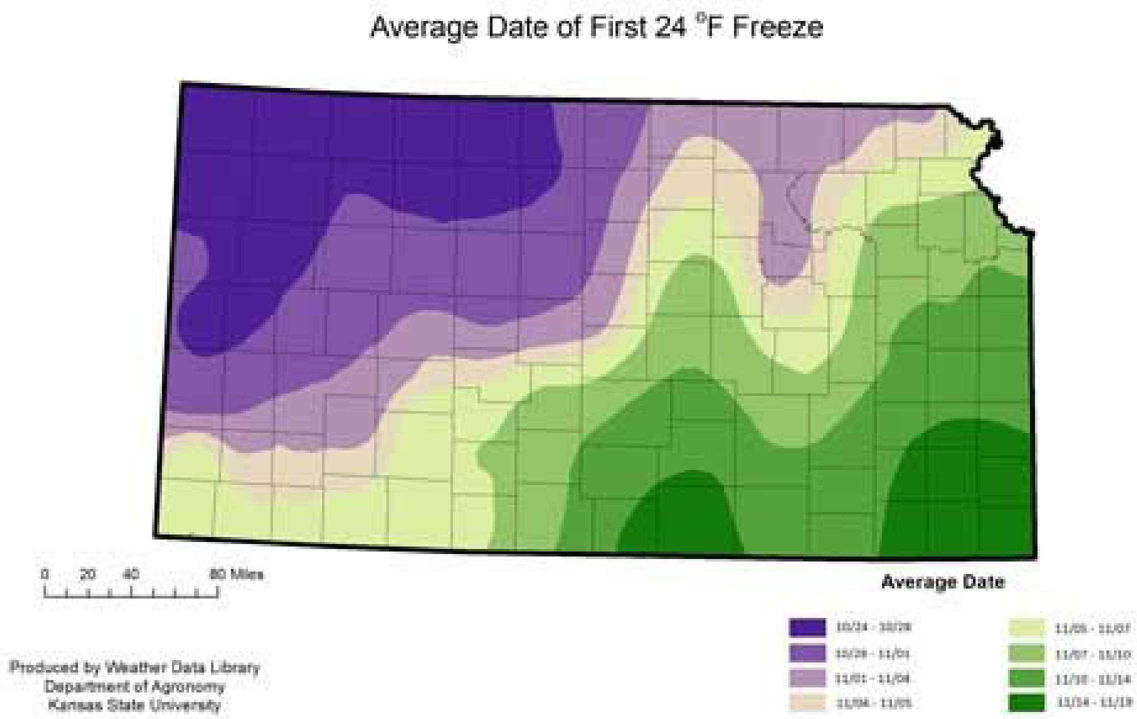


**Figure 2. Average 24 °F freeze dates (Weather Data Library).**

Historically, almost all parts of the state have recorded freezing temperatures as early as September. Earliest first freeze on record in Kansas is September 3, 1974, when many stations dropped below freezing. This year we've seen some record early dates for the first freeze.

The Kansas Mesonet's Freeze Monitor (http://mesonet.k-state.edu/weather/freeze/) is now available for the 2020 fall frost/freeze season. This tool displays the coldest temperatures observed across Kansas during the previous 24 hours. It answers the frequent question: How cold did it get last night**?** It also tracks the first fall freeze date for each station for comparison to local climatology (http://mesonet.k-state.edu/weather/freeze/#tab=chart-tab&mtIndex=1). Data updates every twenty minutes on both the map and the table (Figure 3).

Another tool important for producers and gardeners is the duration below freezing, as some crops and commodities have lower thresholds for damage. This feature allows users to select options to view maps/data of the duration below freezing (32 degrees F http://mesonet.k-state.edu/weather/freeze/#tab=chart-tab&mtIndex=1) and the number of hours below 24 degrees F (http://mesonet.k-state.edu/weather/freeze/#tab=table-tab&mtIndex=2). While both are of interest, the lower threshold is of great importance to wheat growers later into the fall/winter season.

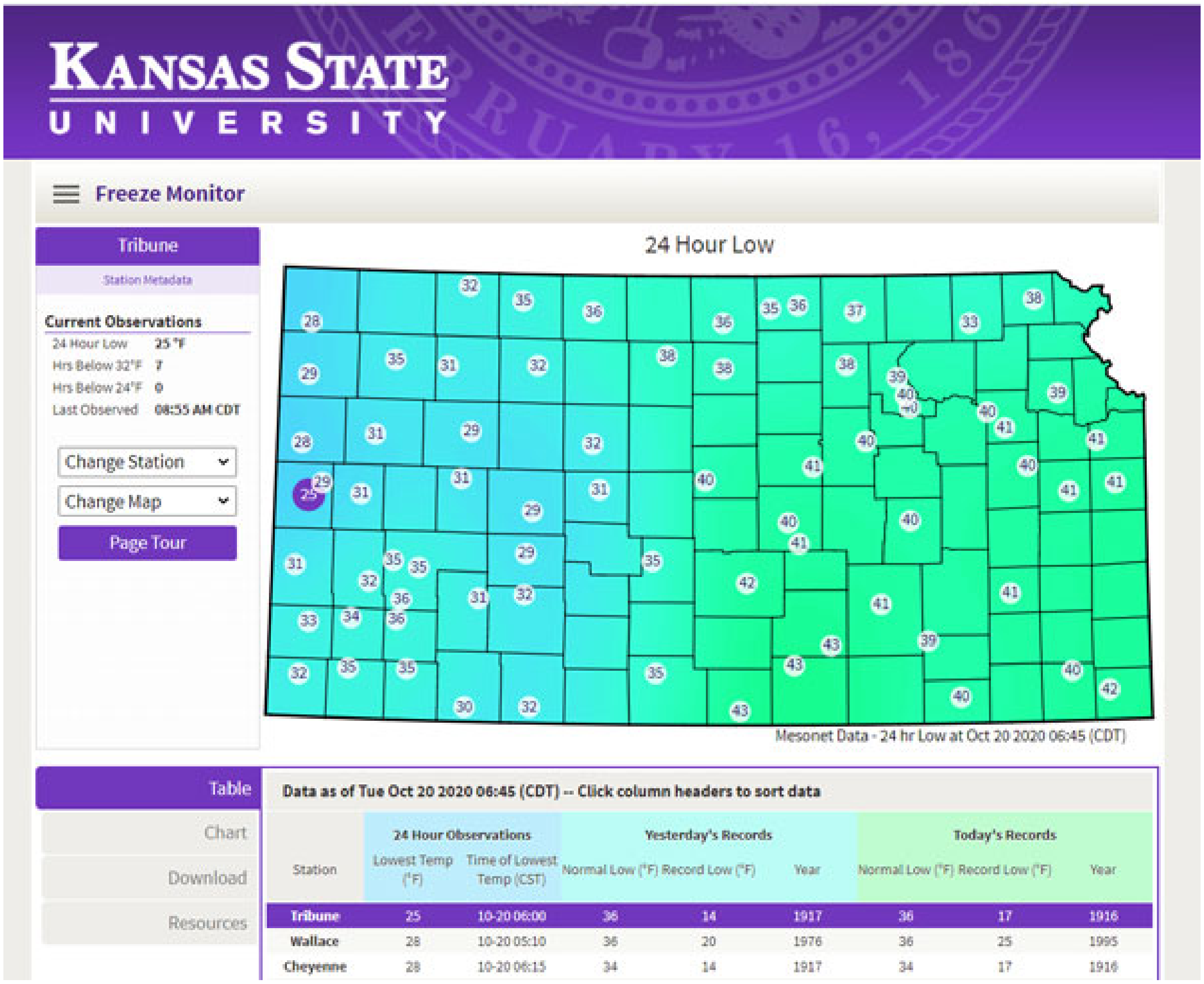


**Figure 3. View of the Freeze Monitor webpage for October 20, 2020, with the Tribune station selected as an example. Source: mesonet.ksu.edu/weather/freeze**

The data displayed in the tables below the maps can be sorted. Clicking on the header of a particular column will sort the table by that column. This makes it much easier to see what area was the coldest in the state, as well as earliest freeze and earliest climatological freeze data. There are a number of download options, including table and chart data, and images of the maps (Figure 4).

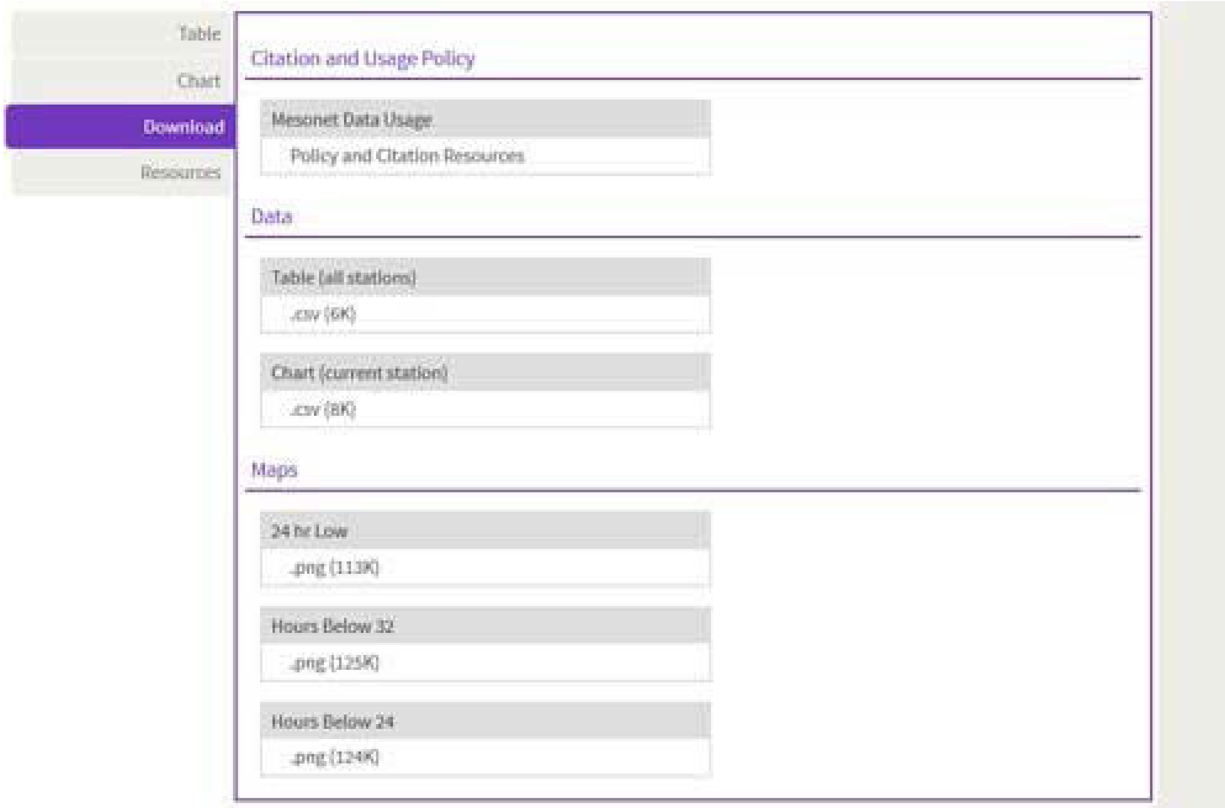


**Figure 4. Download options on the Freeze Monitor website.**

The Freeze Monitor is updated in the spring, as a new growing season arrives, to show the spring freeze climatology.

The Freeze Monitor is available at: http://mesonet.k-state.edu/weather/freeze/

Chip Redmond, Weather Data Library/Mesonet
christopherredmond@ksu.edu

Mary Knapp, Weather Data Library/Mesonet
mknapp@ksu.edu

Dan Regier, Weather Data Library/Mesonet
regierdp@ksu.edu

## 6. Save the Date - Crop Pest Management Schools in Russell, Phillipsburg, and Oakle

Be sure to save the date on your calendar to attend one of the 2020 Crop Pest Management Schools scheduled in December 2020. Each school will start at 7:50 am with registration and conclude at 5:00 pm. A lunch will be provided to all participants. The cost to attend is $40. Each school will feature a variety of topics on weed control, insects, and diseases.

Registration information and a detailed agenda with speakers will be available soon and will be shared in an upcoming eUpdate. The dates and locations of each school are:

- **December 8 – Russell, KS**
  Fossil Creek Hotel
  Dole-Specter Conference Center
- **December 9 – Phillipsburg, KS**
  Huck Boyd Community Center
- **December 10 – Oakley, KS**
  Buffalo Bill Cultural Center

Commercial applicator and Certified Crop Advisor credits have been applied for.

For more information, please visit:

www.midway.ksu.edu

www.goldenprairie.ksu.edu

www.phillipsrooks.ksu.edu

## CROP PEST MANAGEMENT SCHOOLS

# SAVE THE DATE

## DECEMBER 2020

**7:50AM - 5PM**

**COST TO ATTEND $40**

**Russell 8th**
Fossil Creek Hotel
Dole-Specter Conference Center

**Phillipsburg 9th**
Huck Boyd Community Center

**Oakley 10th**
Buffalo Bill Cultural Center

**Credits Available:**

Commercial Applicators:
1 Core Hour & 7 for 1A

Certified Crop Advisors:
8 Pest Management Credits

(Credits Applied for)

**For more information please visit:**

www.midway.ksu.edu

www.goldenprairie.ksu.edu

www.phillipsrooks.ksu.edu

K-STATE Research and Extension

K-State Research and Extension is an equal opportunity provider and employer