



K-STATE
Research and Extension

Extension Agronomy

eUpdate

10/19/2018

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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Kansas State University Department of Agronomy

2004 Throckmorton Plant Sciences Center | Manhattan, KS 66506

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1. Replanting decisions for winter wheat

Many Kansas wheat fields that have already been planted might end up with poor stands due to the prolonged wet and cool period observed in the first few weeks of October. These cool and damp conditions can influence seed viability and have delayed emergence in many fields. Unfortunately, there is not much that can be done at this time. Right now, the best thing we can do is wait to see what proportion of the plants emerge, and critically evaluate whether the plant population is sufficient to meet our yield goals. Below, we outline some steps to assess the need for replanting in the near future.



Figure 1. Slow and scattered wheat emergence in a field planted October 2, 2018 near

Belleville, Republic Co., Kansas. Photo taken October 18, 2018 by Andrew Esser, K-State Research and Extension.

In many cases, the emergence is “spotty” with lower areas in the field presenting worst stand establishment (Fig. 2). These low-lying areas are typically not as well drained as other areas in the field. These areas can become saturated quickly resulting in a low oxygen soil environment that suppresses seed germination and seedling growth. In other fields, the upper portions of the soil were hardened by heavy rains. This “soil crusting” can prevent the coleoptile from breaking through the soil surface. If the coleoptile has not been able to break through to the soil surface within 7-10 days, the health of the young plants will decline rapidly. At that point, the producer will need to consider replanting.



Figure 2. Poor wheat emergence in lower portions of a wheat field in Saline County, Kansas. Higher areas, as seen in the back of the photo, tend to have good emergence and stand

establishment. Photo taken mid-October 2017 by Tom Maxwell, Extension Agent for the Central Kansas District.

Factors to consider when making replant decisions in wheat include: stand uniformity, actual stand compared to the target stand, replanting date, weed control, and insurance cutoff date.

- **Stand uniformity.** As shown in Figure 2, easily recognizable patterns occur in the field based on soil water drainage and accumulation when excessively moist soils cause poor wheat emergence. In this case, stands might be relatively uniform in better-drained areas but non-existent in poorer-drained areas, leading to a high within-field variability. Producers should have as top-priority replanting those large areas with poor emergence once conditions for fieldwork allow. If stand is patchy in areas that already emerged, producers should also consider replanting at lower seeding rates to bring final population closer to the desired stand, as discussed below.
- **Actual stand compared to the target stand.** In areas that already emerged despite the excessive moisture, stands might also be suboptimal and thinner than desired. In these situations, it is often helpful to compare the actual stand with what desired plant populations were to meet our yield goals. Table 1 shows the number of target plants per row foot depending on seeding rate, seed size (provided with certified seed), 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 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.

Recent K-State research indicates that approximately 900,000 emerged plants per acre are needed for most varieties to maximize yields under normal fertility conditions in Kansas. Thus, if producers are not aware of their target plants per row foot, the above threshold might be a good goal for central Kansas producers.

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 is past the optimum sowing date, maybe with the exception of south-central Kansas. For portions of the field with no stand established, where 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. Producers should consider replanting if fields with: partial stand (50% or less of target stand), highly variable stands, or large areas that have failed. 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 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. Treating the seed with a fungicide can help ensure viability in wet soil environments and reduce the risk of additional problems with stand establishment this season.
- Weed control.** A thin wheat stand can increase the potential for weed infestations. This was clearly a problem for many fields during the 2017-18 growing season. Therefore, we need to acknowledge that weed control needs to be part of the decision to replant or thicken wheat stands. Moreover, uneven wheat stands can also influence herbicide timing because parts of the field are at development stages. Herbicides such as 2,4-D and dicamba can cause serious crop injury when misapplied. Potential problems due to improper application timing include trapped heads, missing florets, or twisted awns. Accounting for this variability in growth stage within a field can lower the risk of crop injury and loss of yield.
- Insurance cut off dates.** Finally, some producers might also consider insurance cut off dates. Figure 3 shows the 2018 crop year final plant dates for wheat. For insurance purposes, crops planted before these dates 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 of 1% coverage per day until the end of the late-planting period. For wheat, late-planting period often occurs about 15 days after the final plant date shown in Figure 3.

KANSAS
2018 Crop Year Final Planting Dates
WHEAT

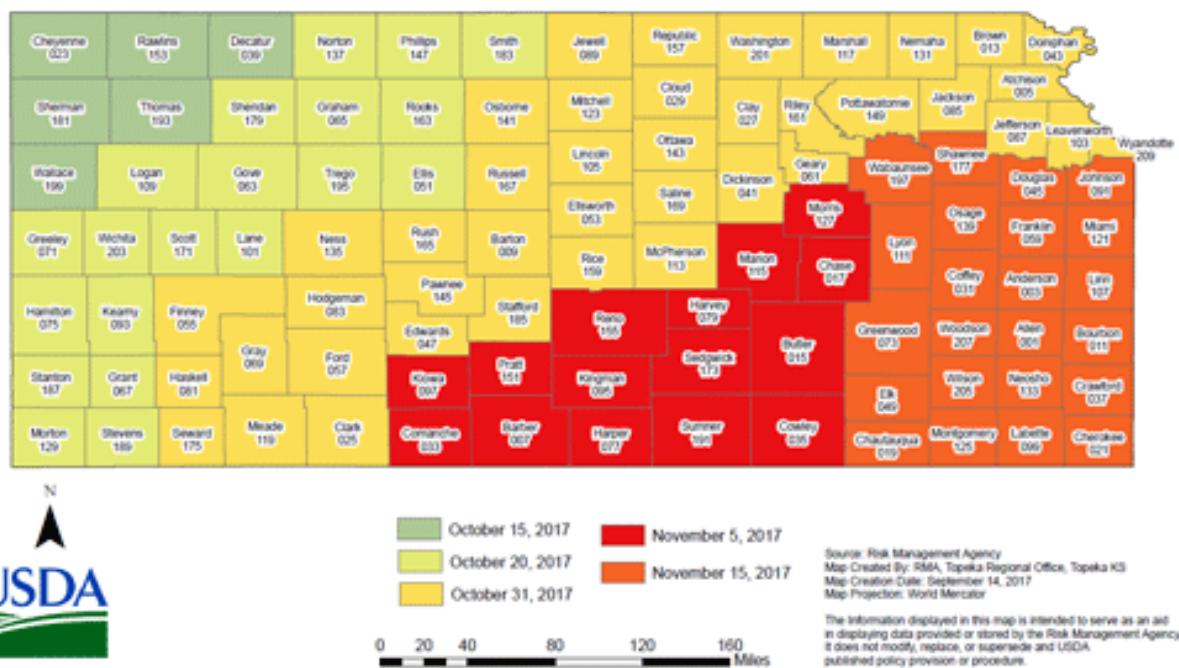


Figure 3. USDA 2018 crop year final planting date for wheat. Crops planted before the dates above can be insured with no reduction in coverage or adjustment to premium. The final planting date for wheat is generally 15 days after the dates above, at a reduction in coverage of 1% per day during the period between initial and final plant date.

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

Erick DeWolf, Extension wheat pathologist
dewolf1@ksu.edu

2. Alfalfa management: Deciding on last cutting this fall

For most of Kansas, alfalfa should be stopping growth after the hard freeze that occurred on October 15. The timing of the last cutting can impact the productivity of the stand in the following year. Thus, at this point in the year, the best approach is to cut right after the first killing freeze, before too many of the leaves have dropped. Producers should be prepared to enter the fields as soon as soil moisture conditions allow. After a killing freeze, the remaining forage (if any) can be hayed safely. However, the producer should act quickly because the leaves will soon drop off.

At this stage of the growing season, alfalfa plants need to store enough carbohydrates to survive the winter. If root reserves are not replenished adequately before the first killing freeze in the fall, the stand is more susceptible to winter damage than it would be normally. That could result in slower greenup and early growth next spring.

The last cutting, prior to fall dormancy, should be made based on expected crown regrowth rather than one-tenth bloom because of the decreasing photoperiod. The last cutting should be made so there will be 8 to 12 inches of foliage, or 4 to 6 weeks of growth time, before the first killing frost. This should allow adequate time for replenishment of root reserves.



Figure 1. Alfalfa stand with approximately 12 inches of top growth prior to winter dormancy.

The last cut in this stand was performed early September, and this photo was taken late October. This stand will be hayed immediately following the first killing frost. Photo by Romulo Lollato, K-State Research and Extension.

For northern areas of the state, particularly northwest, late September is usually the target date for the final cutting before dormancy. The last week of September is usually the cutoff date for southwest Kansas. The first week of October is usually the cutoff for southeast Kansas. However, we are well past those dates for the current year, and a killing freeze already occurred. Thus, producers should be prepared to perform the last cut as soon as conditions allow for fieldwork.

Making a cutting now, after the killing freeze occurred, should prevent regrowth, avoiding reducing root reserves during this critical time. About the worst thing that could happen to an alfalfa stand that is cut in late-October would be for the plants to regrow about 3 to 6 inches and then get a killing frost, which should not occur this year due as the killing frost already occurred and regrowth is less likely. In that scenario, the root carbohydrate reserves would be at a low point. That could hamper green-up next spring.

Consider soil sampling alfalfa fields now

Late fall is a great time of the year to soil sample alfalfa ground. This timing allows for an accurate assessment of available soil nutrients and provides enough time to make nutrient management decisions before the crop starts growing in the spring. Key soil tests include pH, phosphorus, and potassium, and to a lesser extent, sulfur and boron. In particular, potassium is highly related to winter survival so it's important to make sure to have optimum range of potassium in soil before entering winter. When sampling for immobile nutrients, sampling depth should be six inches, while mobile nutrients (sulfur) should be sampled to 24 inches.

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

Doohong Min, Forages Specialist
dmin@ksu.edu

3. Consider fall treatments for control of marestail in soybeans

Herbicide effectiveness on marestail depends largely on the stage of growth and size of the plants. Marestail generally is most susceptible to herbicides when it is small and still in the rosette stage of growth (Figure 1). Once marestail starts to bolt and exceed 4 to 6 inches tall, it becomes very difficult to kill with most herbicides. Since marestail can germinate throughout much of the year, a single herbicide application probably will not provide season-long control, particularly in no-till.



Figure 1. Growth stages of marestail at seedling, rosette, and bolting. Photos by Dallas Peterson, K-State Research and Extension.

The most effective marestail control program should start with fall treatments, especially in fields with a history of marestail problems, fields with senesced plants that have shed seed, or fields where seedlings and rosettes are already present. A number of different herbicides can be applied in the fall for marestail control ahead of soybeans, such as 2,4-D, dicamba, Sharpen, Canopy EX, Autumn Super, or Valor XLT. The addition of glyphosate helps control grasses and other broadleaf weeds, and can even help on glyphosate-resistant marestail.

Fall applications can be effective even into December as long as applications are made to actively growing weeds during a stretch of mild temperatures. In fact, for fall applications, it may be better to wait until November to allow most of the fall-germinating winter annuals to emerge (Figure 2).



Figure 2. Photo taken in April 2017 of a plot sprayed with glyphosate plus dicamba in late November 2016. Photo by Dallas Peterson, K-State Research and Extension.

A residual herbicide such as metribuzin-, Valor- or Classic-containing products (unless the marestail is ALS resistant) can be added to help control marestail through winter and early spring. However, do not expect a residual herbicide applied in the fall to provide good residual weed control through the spring and summer of the next year. If a fall treatment is not made, early spring treatments in March to early April should be applied to help control fall-germinated marestail.

Dallas Peterson, Weed Management Specialist
dpeterso@ksu.edu

4. Controlling annual weeds with fall-applied herbicides ahead of corn and sorghum

Now that row crop harvest is underway and fall moisture has been received, it is time to start planning your fall herbicide applications to control winter annual broadleaf weeds and grasses ahead of grain sorghum or corn.

Fall applications during late October and through November can greatly assist control of difficult winter annuals and should be considered when performance of spring-applied preplant weed control has not been adequate. Henbit and marestail frequently are some of the most troublesome weeds we try to manage with these fall herbicide applications.

Fall applications have another side-benefit. While it is always important to manage herbicide drift, herbicide applications made after fall frost have less potential for drift problems onto sensitive targets.

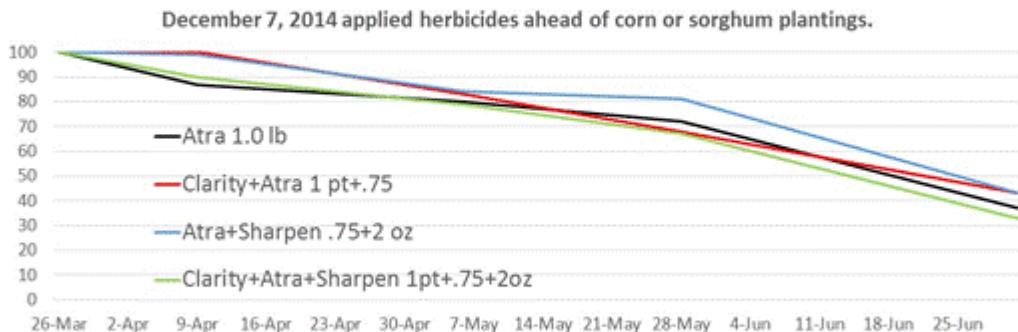
There are several herbicide options for fall application. If residual weed control is desired, atrazine is among the lowest-priced herbicides. However, if atrazine is used, that will lock the grower into planting corn or sorghum the following spring, or leave the land fallow during the summer and come back to winter wheat in the fall. If atrazine is applied too early, warm weather and moisture will reduce the length of residual. November is often the best time for atrazine applications.

Atrazine is labeled in Kansas for fall application over wheat stubble or after row crop harvest any time before December 31, as long as the ground is not frozen. Consult the atrazine label to comply with maximum rate limits and precautionary statements when applying near wells or surface water. No more than 2.5 lbs per acre of atrazine can be applied in a calendar year on cropland.

One half to two pounds (maximum) per acre of atrazine in the fall, tank-mixed with 1 to 2 pints per acre of 2,4-D LV4 or 0.67 to 1.33 pints LV6, can give good burndown of winter annual broadleaf weeds -- such as henbit, dandelion, prickly lettuce, Virginia pepperweed, field pansy, evening primrose, and marestail -- and small, non-tillered winter annual grasses. Atrazine's foliar activity is enhanced with crop oil concentrate, which should be included in the tank-mix. Winter annual grass control with atrazine is discussed below.

Atrazine residual should control germinating winter annual broadleaves and grasses. When higher rates of atrazine are used, there should be enough residual effect from the fall application to control early spring-germinating summer annual broadleaf weeds such as kochia, common lambsquarters, wild buckwheat, and Pennsylvania smartweed – unless the weed population is triazine-resistant. The two graphs (Figure 1 and 2) below show the residual control effects of December herbicide applications on kochia ahead of corn and sorghum planting.

Kochia control with Late Fall Herbicides.



Kochia control with Late Fall Herbicides.

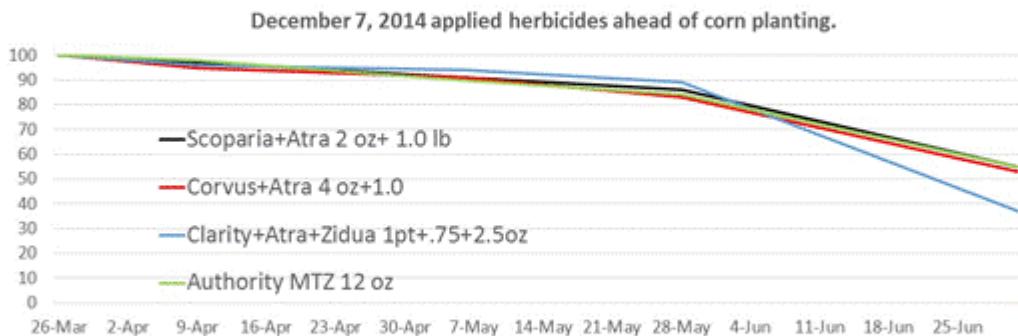


Figure 1 and 2. K-State trials measuring kochia control with late-fall herbicide applications.
Source: Curtis Thompson, K-State Research and Extension.

Marestail is an increasing problem in Kansas that merits special attention. Where corn or grain sorghum will be planted next spring, fall-applied atrazine plus 2,4-D or dicamba have effectively controlled marestail rosettes and should have enough residual activity to kill marestail as it germinates in the spring. Atrazine alone will not be nearly as effective postemergence on marestail as the combination of atrazine plus 2,4-D or dicamba. Sharpen can be very good on marestail, but

should be tank-mixed with 2,4-D, dicamba, atrazine, or glyphosate to prevent regrowth.

If the spring crop will be corn, other residual herbicide options include ALS herbicides such as Autumn Super or Basis Blend. ALS-resistant marestail will survive an Autumn Super or Basis Blend treatment if applied alone. For burndown, producers should mix in 2,4-D, dicamba, and/or glyphosate. Winter annual grasses can also be difficult to control with atrazine alone. Success depends on the stage of brome growth. For downy brome control, 2 lbs per acre of atrazine plus crop oil concentrate (COC) has given excellent control, whereas 1 lb per acre has given only fair control. Volunteer wheat and brome species that have tillered and have a secondary root system developing will likely not be controlled even with a 2-lb rate. Adding glyphosate to atrazine will ensure control of volunteer wheat, annual bromegrasses, and other winter annual grassy weeds. Atrazine antagonizes glyphosate, so if the two are used together, a full rate of glyphosate (0.75 lb ae) is recommended for good control. The tank-mix should include AMS as an adjuvant.

Where fall treatments control volunteer wheat, winter annuals, and early-emerging summer annuals, producers should then apply a preemerge grass-and-broadleaf herbicide with glyphosate or paraquat at corn or sorghum planting time to control newly emerged weeds. Soils will be warmer and easier to plant where winter weeds were controlled in fall.

Dallas Peterson, Extension Agronomy State Leader and Weed Management Specialist
dpeterso@ksu.edu

5. Rate of dry down in sorghum before harvest

The latest Crop Progress and Condition report from Kansas Agricultural Statistics, on October 15, stated that grain sorghum maturity was 79%, ahead of last year and near the average. Harvest is also ahead of last year, 19% for this year but behind from the last 5-year average (28%). Nonetheless, wet conditions and mild temperatures will delay harvest in several regions across the state.

The weather conditions experienced from early-September to early-October are critical for sorghum as related to the grain filling rate and determining final grain weight. Temperatures and precipitation have split across the state, with warmer-than-normal conditions in the northwest and southeast. Cooler conditions prevailed in the north central and central parts of the state. There was a small area of east central Kansas that had excessive moisture but much of the state had less than half of the normal precipitation for the period (Figure 1).

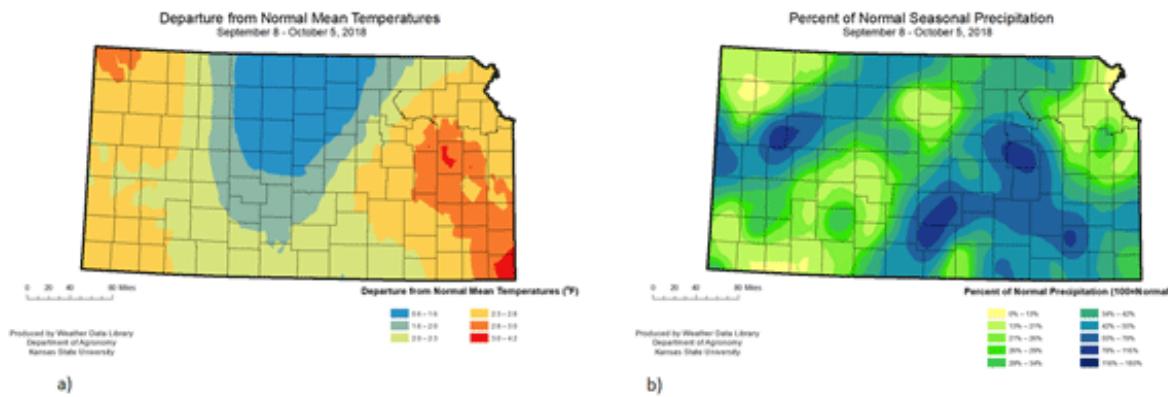


Figure 1. a) Departure from normal temperatures; b) Departure from normal precipitation.

In recent years, a common question from producers is related to the dry down rate for sorghum when approaching the end of the season. Based on previous information, the average dry down rate depends on the weather, primarily temperature and moisture conditions – but data from modern hybrids is not available. The weather outlook for November calls for an increased chance of above-normal temperatures with chances for normal precipitation. Normal precipitation in November is much less than in October. This would favor a faster dry down rate than average but any sorghum impacted by freeze will present challenges in the final dry down rate.

From a crop perspective, the overall cumulative GDD from flowering to maturity is about 800-1200 (based on 50 degrees F as the base temperature), with the shortest requirement in GDD for short-season hybrids. Before maturity, from beginning of grain filling (soft dough until maturity), grain moisture content within a grain will go from 80-90% to 25-35% where black layer is usually formed (Figure 2). From maturity (seen as a “black-layer” near the seed base; Figure 2) to harvest time, sorghum grain will dry down from about 35 to 20 percent moisture, but the final maximum dry mass accumulation and final nutrient content will have already been attained at maturity.

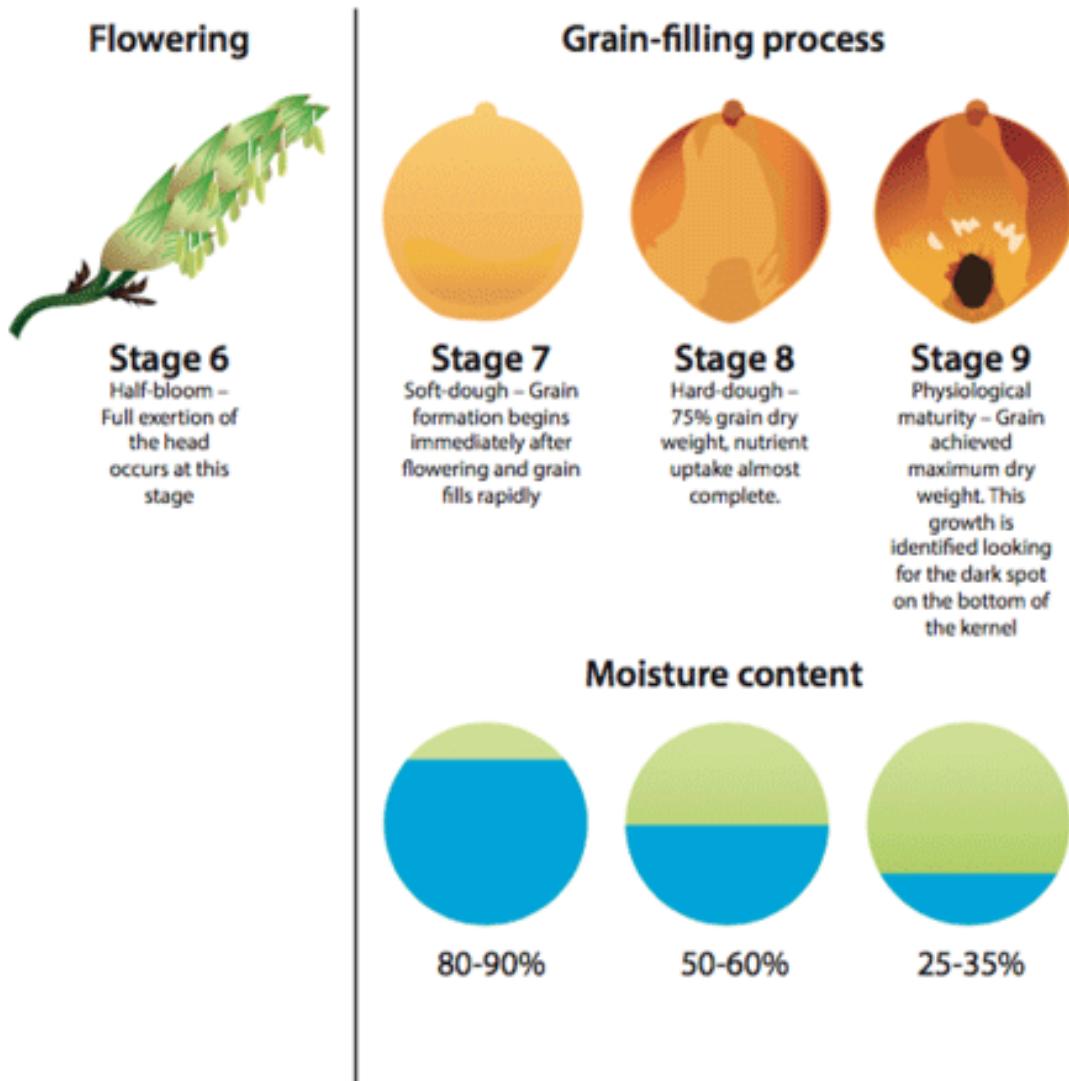


Figure 2. Sorghum growth stages from half-bloom and grain filling (including soft dough, hard dough, and physiological maturity). Infographic representing changes in grain coloration and moisture content during grain filling period until black layer formation, maturity. K-State Research and Extension.

Grain water loss occurs at different rates but with two distinct phases: 1) before “black layer” or maturity (Figure 2), and 2) after black layer. For the first phase, the Figure 2 presents the changes in grain moisture from soft dough until physiological maturity of sorghum.

To answer the rate of dry down question from many of our producers, a study was conducted to investigate the effect of the grain dry down rate from the moment of “black layer” until commercial harvest grain moisture is reached. For the conditions experienced in 2018 (from early September until early October), the overall dry down rate was around 0.7% per day (from 33% to 14% grain moisture) – taking an overall period of 28 days (from September 5 to October 8).

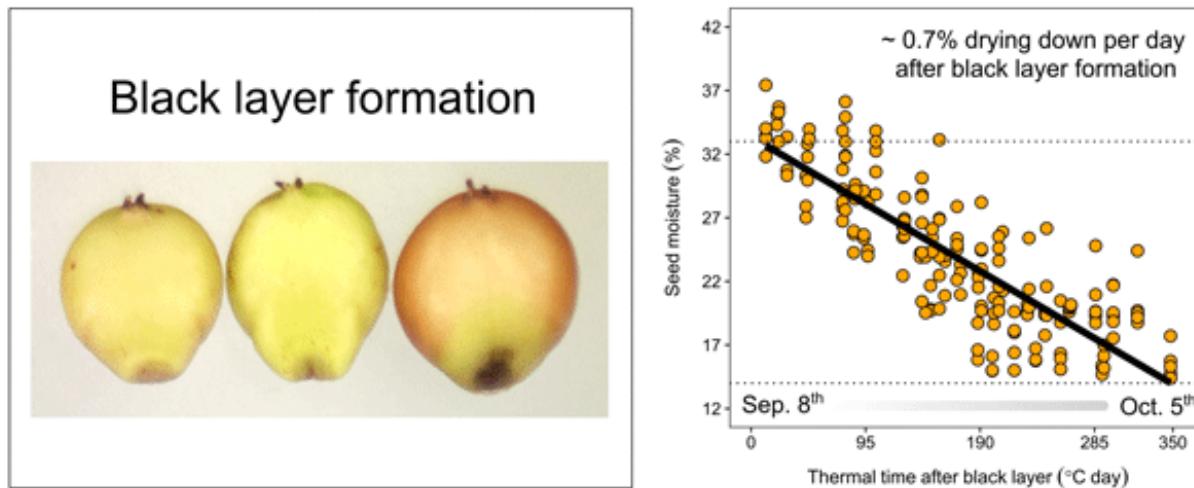


Figure 3. Grain moisture dry down across different sorghum hybrids for a study located near Manhattan, KS. Horizontal dashed lines marked the 33% grain moisture at black layer formation and 14% grain moisture around harvest time*. The infographic in the right panel reflects the different stages of the grain for sorghum from right to left – before to black layer formation. K-State Research and Extension.

This dry down process can be delayed by:

- Low temperatures
- High humidity
- High grain moisture content at black layer (38-40%)

It is expected that the dry down rate will decrease to <0.5% per day for late-planted sorghum entering reproductive stages later in the growing season (similar as reported in corn). A similar decrease is also expected for sorghum that was exposed to late-season stress conditions (e.g., drought, heat, and freeze). Under these conditions, maturity may be reached with high grain water content and the last stages after black layer formation could face lower temperatures and higher humidity. These main factors should be considered when the time comes to schedule harvest.

You can track temperature and humidity levels on the Kansas Mesonet web site at <http://mesonet.k-state.edu/weather/historical/> by selecting the station and time period of interest.

Ignacio A. Ciampitti, Crop Production and Cropping Systems Specialist
ciampitti@ksu.edu

Mario Secchi, KSUCROPS Production, Dr. Ciampitti's Lab
secchi@ksu.edu

Luiz Moro Rosso, KSUCROPS Production, Dr. Ciampitti's Lab
lhrossro@ksu.edu

Mary Knapp, Weather Data Library

mknapp@ksu.edu

Kansas State University Department of Agronomy
2004 Throckmorton Plant Sciences Center | Manhattan, KS 66506
www.agronomy.ksu.edu | www.facebook.com/KState.Agron | www.twitter.com/KStateAgron

6. Update - Forecasting corn yields for Kansas for 2018

Corn yields on target to USDA-NASS projections

A new and last crop yield forecast was released last week on October 11 by the USDA-NASS reporting a decrease on corn yield at the state level (-1 bu/acre, averaging 130 bu/acre) relative to the past yield forecast (September 1, 2018), including the final statewide crop acreage (+200,000 acres, averaging 5.2 million acres total). For the full report published by USDA-NASS see:

<http://usda.mannlib.cornell.edu/usda/current/CropProd/CropProd-10-11-2018.pdf>

In a previous issue of the K-State Department of Agronomy eUpdate ([Issue 712, September 28](#)), a new yield forecast tool was discussed for corn in the state of Kansas (project sponsored by Kansas Corn). This tool is primarily based on real-time satellite data, historical yield data at county-level, and prediction of current geo-location of cornfields across the state. To obtain more information about the K-State "Yield Forecasting Tool" (YFT), visit the previous a previous eUpdate article related to this topic ([Issue 653, September 29, 2017](#)). The primary steps for this tool, presented in a simplified approach, are highlighted in Figure 1.

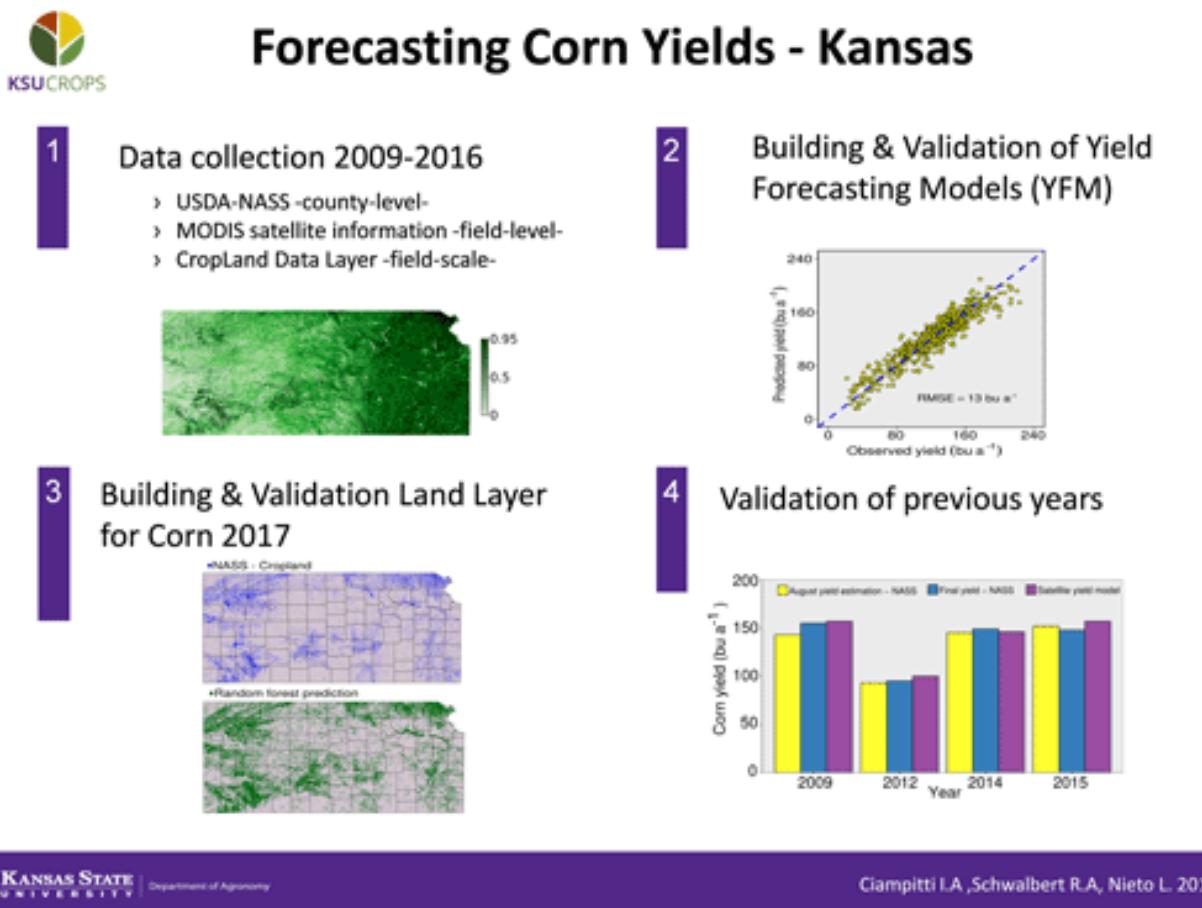


Figure 1. Theoretical framework portraying the main steps involved in the development of forecasting corn yields for the state of Kansas. Steps: 1- Data collection; 2- Building and validating yield forecasting models (YFM); 3- Building and validating land layer for corn 2017 (similar process was followed for 2018); and 4- validation of previous years. Infographic

developed by Ignacio Ciampitti, Rai Schwalbert, and Luciana Nieto, K-State Research and Extension.

One of the main complexities is the lack of knowledge on the current cornfield locations across the state; therefore, a complex statistical technique was employed (random forest prediction) to predict corn geo-locations across the state for the current season (Figure 2).

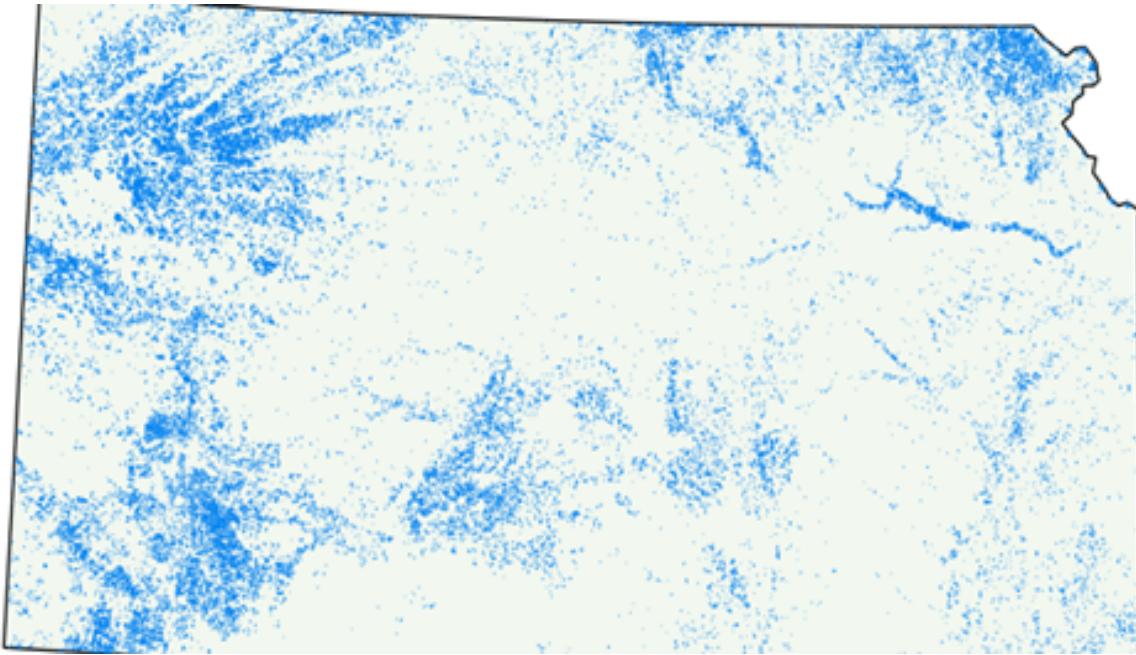


Figure 2. Geolocation for cornfields predicted by the Random Forest classification model for 2018.

An updated corn yield forecast was obtained for the state of Kansas via utilization of satellite imagery from planting until beginning of October for this current growing season. Based on the satellite yield model developed by our team, the state-level yield prediction is 130 bu per acre (Figure 3), right on target to the yield prediction released by [USDA-NASS](#) (130 bu/acre).

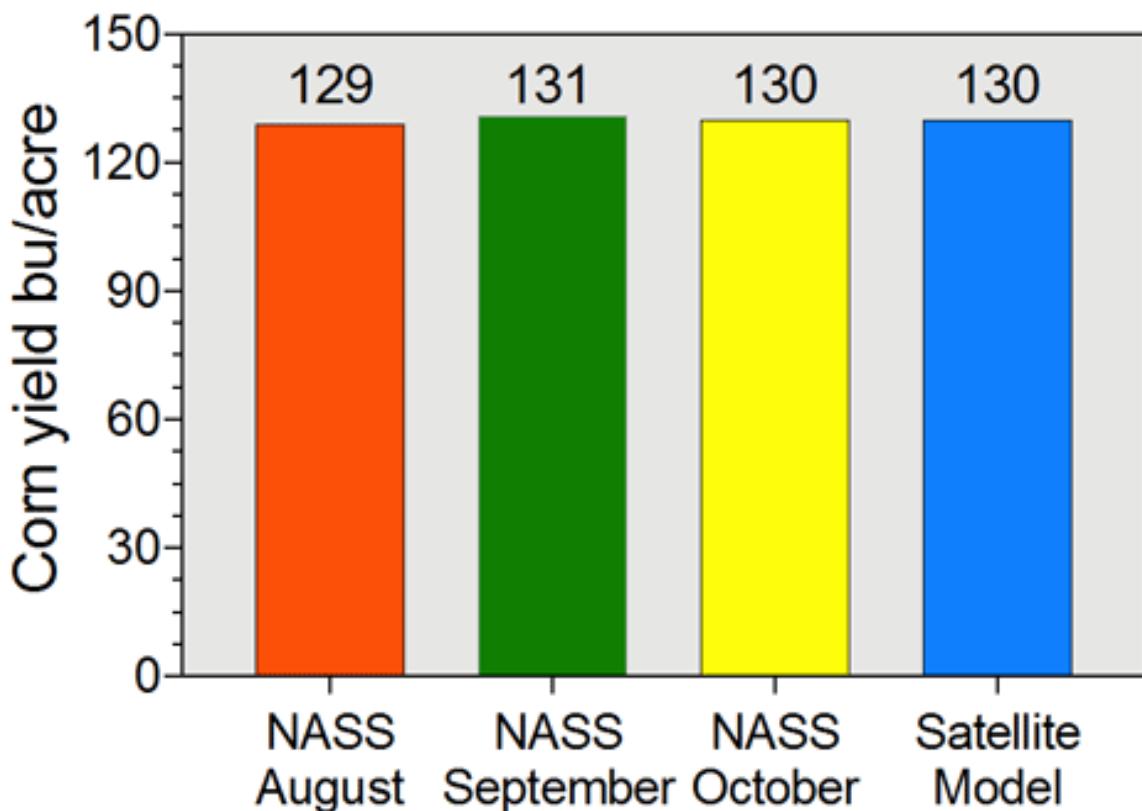


Figure 3. Forecasting corn yields derived from satellite data for the state of Kansas.

A new step on the Yield Forecast Tool: County-yield prediction

Since our last eUpdate article, our team worked on developing a yield forecast at the county-level. Final validation of the county-yield data will be done once the county-yield information is released by USDA-NASS. Based on the yield forecast model, even when the model presents a degree of error close to 20 bu/acre, it is expected that yield trends should follow the expected projections. Overall, lower yields are projected for the eastern part of the state relative to the 2017 growing season, with yields improving as you move toward the western part of the state (Figure 4).

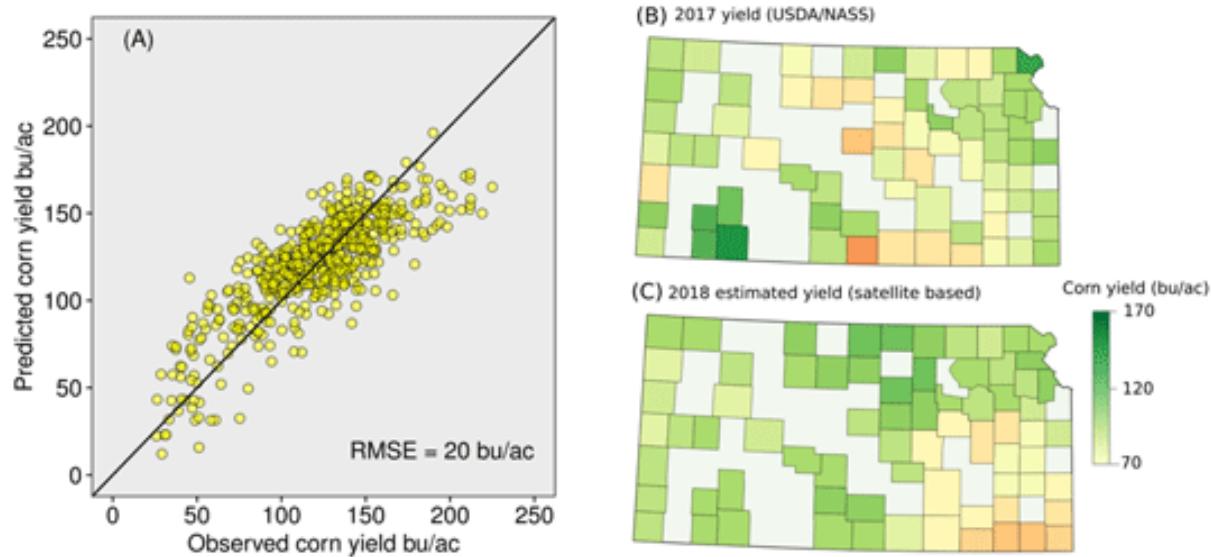


Figure 4. Predicted (based on satellite imagery) versus observed corn yields (panel A), average-county yield data from USDA-NASS for the 2017 growing season (panel B), and average-county yield data estimated from satellite imagery for the 2018 growing season (panel C) for the Kansas corn crop.

Summary

The Yield Forecasting Tool (YFT) predicted an average state-yield value of 130 bu/acre and lower yields for corn in eastern Kansas and higher yields for the western regions. At the state-level, the YFT was precise in predicting corn yields as related to the last forecast released last week by USDA-NASS (Oct 11, 2018).

Stay tuned for the further details coming out concerning the YFT as we continue to incorporate other components such as integration of weather data and other tools to improve identification of crop growth stages during the corn growing season.

Ignacio A. Ciampitti, Crop Production and Cropping Systems Specialist
ciampitti@ksu.edu

Rai Schwalbert, KSUCROPS Production, Dr. Ciampitti's Lab
rais@ksu.edu

Luciana Nieto, KSUCROPS Production, Dr. Ciampitti's Lab
lnieto@ksu.edu

7. Kansas climate patterns: Earliest snowfall and first snowfall dates since 1950

The recent snow that fell across Kansas was a topic of conversation around the Department of Agronomy this week. It is interesting that this early snowfall event was across a majority of Kansas (Figure 1) and was the first snowfall event for many areas. "First snowfall" is defined as the first occurrence of 24-hour snowfall (daily) accumulation of 0.1 inches or greater. Here we used the global historical climatology network data set from 1950 to 2018. Please note that 2018 is incomplete so this analysis is limited to 1950 to 2017.

Our analysis is based on the following assumptions:

- A year was considered as missing if this station contains more than 20 days missing (5% of 365 days) in a year.
- A station was selected in this analysis when it has at least 50 years data of available first snowfall dates between 1950 and 2017.

Using the assumptions above, 15 stations were selected across Kansas to show the earliest snowfall dates and the first snowfall dates from 1950 to 2017.



Figure 1. Snowfall events dated on October 14, 2018 in Colby, western Kansas (left) and Manhattan, eastern Kansas (right). The photos were taken by Dr. Rob Aiken and Dr. Guihua Bai.

The earliest snowfall dates ranged from September 21 in northwest Kansas to November 8 in southeast Kansas. This diagonal upward pattern of earliest snowfall date is consistent with the average annual snowfall depths (i.e. climatology snowfall depth across Kansas). Compared to historical records shown in Figure 2, the first snowfall event, that occurred last weekend in Kansas,

was relatively early for eastern Kansas. However, this was not the case for central and western Kansas.

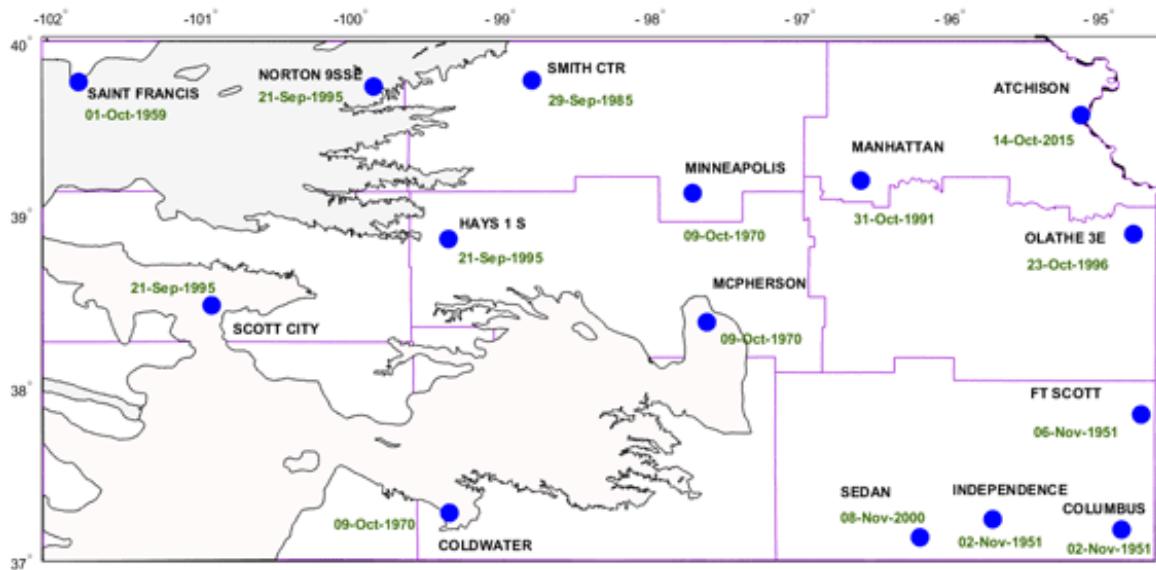


Figure 2. Earliest snowfall dates across Kansas from 1950 to 2017 for 15 select stations.

Three stations (eastern, central, and western Kansas) are highlighted to examine the first snowfall dates across Kansas (Figure 3). Figure 3 shows a time series of the first snowfall event in Manhattan, Hays, and Scott City, respectively. The result shows that there is approximate a weeklong gradient in the average first snowfall dates from eastern Kansas, central Kansas, to western Kansas. The average first snowfall dates are December 12 (Manhattan), December 6 (Hays), and November 27 (Scott City). It should be noted that this result was not mainly attributed by physical latitudes (Figure. 2) but perhaps more by moisture and storm circulation patterns in the Kansas atmosphere.

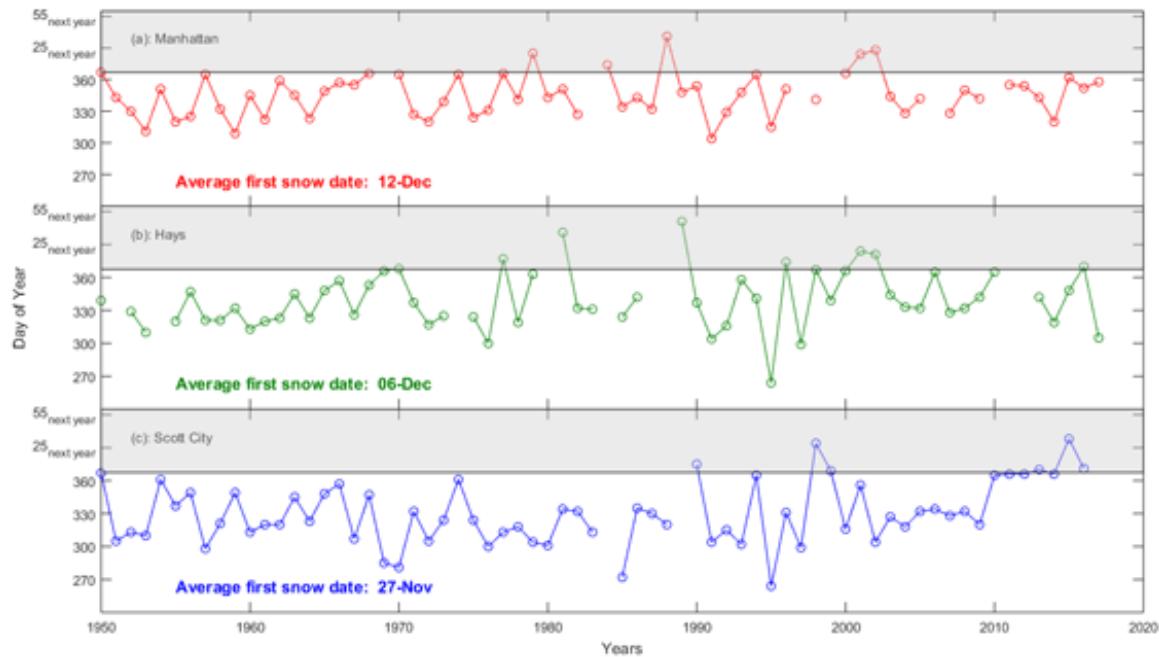


Figure 3. Time series of first snowfall dates in (a) Manhattan, (b) Hays, and (c) Scott City from 1950 to 2017. First snowfall events that lie within the shaded areas are events that occurred after the beginning of a new year (i.e. in January or February).

If you are interested in additional information about Kansas Climate, including the latest weekly and monthly snowfall totals, check out the website: <http://climate.k-state.edu>

Xiaomao Lin, State Climatologist
xlin@ksu.edu

Gerard Kluitenberg, Soil and Environmental Physics
gjk@ksu.edu

Rob Aiken, Crop Research Scientist, Northwest Research-Extension Center, Colby
raiken@ksu.edu

8. Drought update for Kansas - October 19, 2018

Drought status

It was another wet week ending on October 16. The statewide average precipitation for the period was 1.18 inches, 235 percent of normal. The Central Division was the wettest with an average of 1.62 inches or 344 percent of normal. The Northeast Division was the “driest”, with an average of 1.00 inch, 167 percent of normal. The largest weekly total for a NWS COOP station was 3.09 inches at Willowdale, Kingman County. The largest total for a Community Collaborative Rain Hail Snow Network station (CoCoRaHS) was 3.48 inches at Ottawa 5.6 SW, Ottawa County.

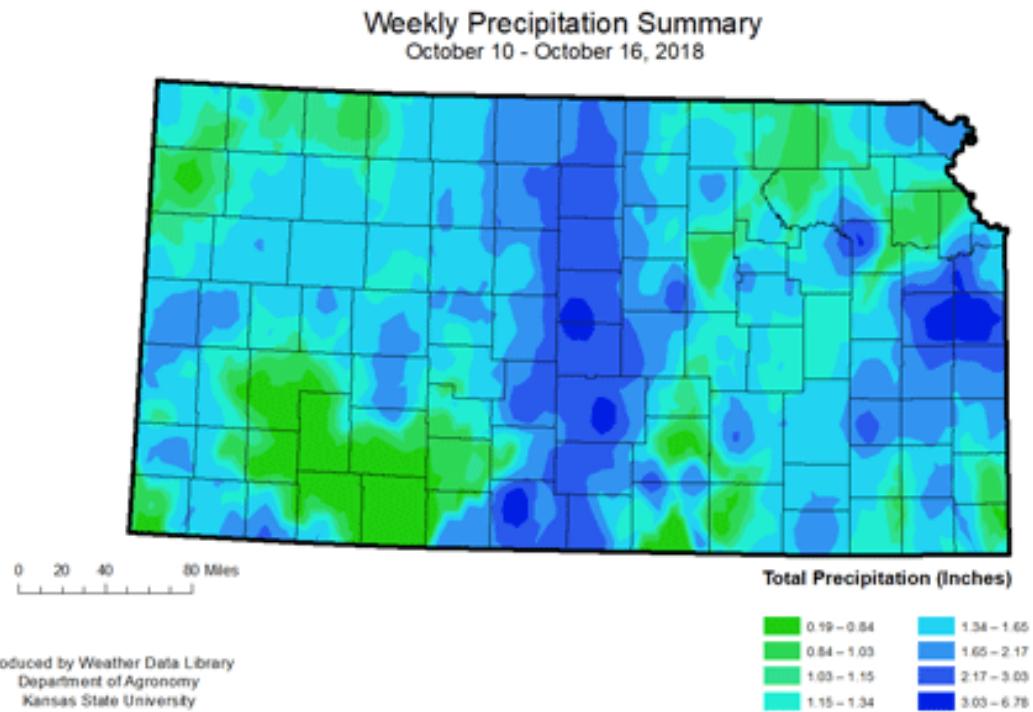


Figure 1. Weekly total precipitation for Kansas during the week of October 10 – 16, 2018 via Cooperative Observer (COOP), Community Collaborative Rain Hail Snow Network (CoCoRaHS), and Kansas Mesonet.

Departure from Normal Weekly Precipitation
October 10 - October 16, 2018

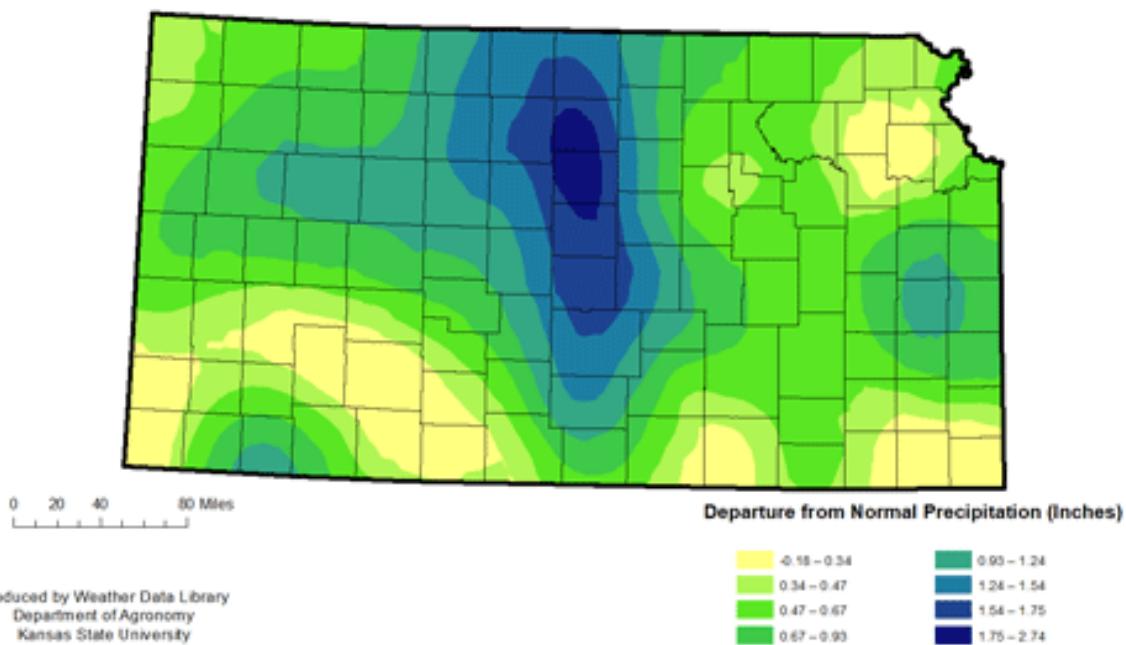


Figure 2. Departures of weekly precipitation from normal for Kansas during the week of October 10 – 16, 2018 via Cooperative Observer (COOP), Community Collaborative Rain Hail Snow Network (CoCoRaHS), and Kansas Mesonet.

Temperatures were much cooler than normal across the state for the week. All divisions saw freezing temperatures, with widespread hard freeze conditions in all but the Southeast Division. The statewide average temperature was 44.1 degrees F, which is 12.7 degrees cooler-than-normal. The Southeast Division came closest to normal, with an average temperature of 48.9 degrees F, 9.8 degrees cooler-than-normal. The Northwest Division had the greatest departure from average, with 38.3 degrees F, 15.2 degrees cooler-than-average. The highest maximum temperature was 77 degrees F at multiple locations on the October 10. The lowest minimum temperature was 9 degrees F at Cheyenne Mesonet station south of St. Francis, Cheyenne County, on the October 15.

Weekly Mean Temperatures
October 10 - October 16, 2018

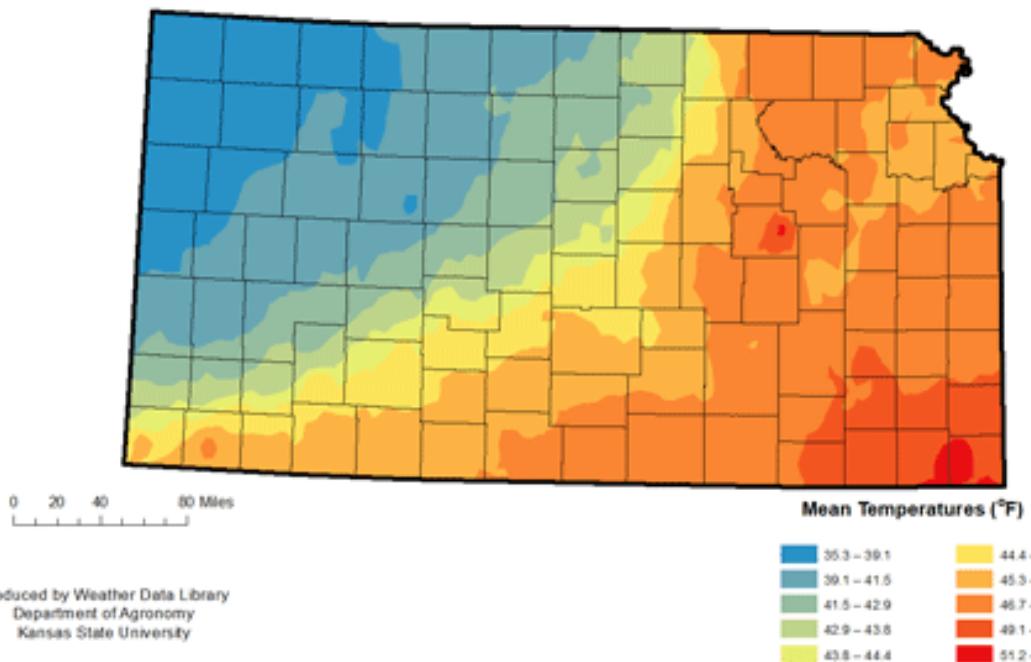


Figure 3. Weekly mean temperatures for Kansas during the week of October 10 – 16, 2018 via Cooperative Observer (COOP) and Kansas Mesonet.

Departure from Normal Weekly Mean Temperatures
October 10 - October 16, 2018

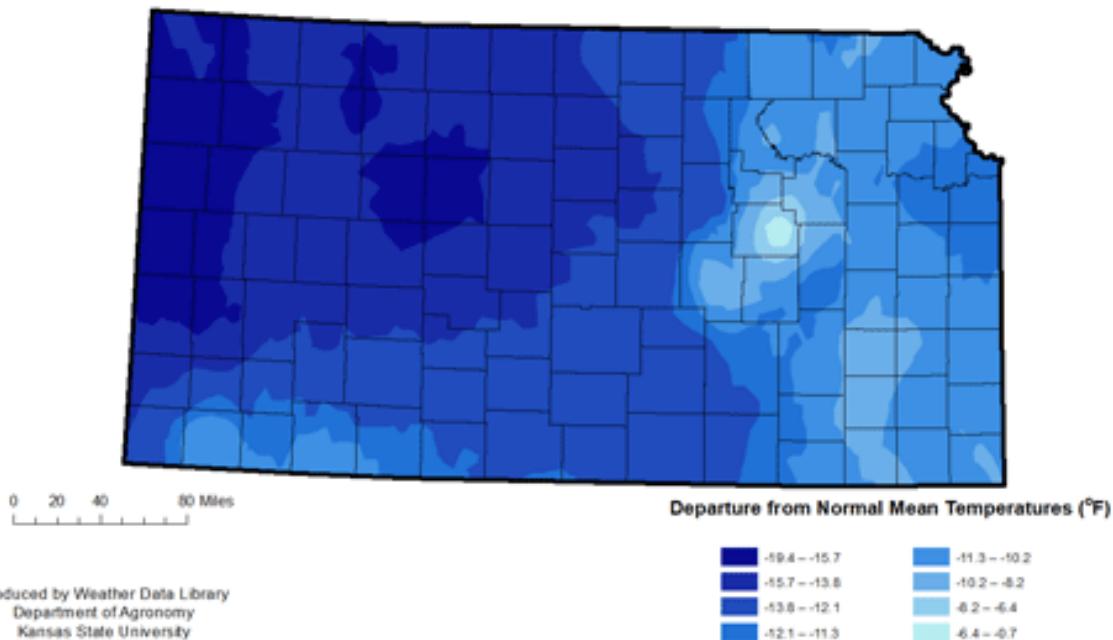


Figure 4. Departures of weekly mean temperatures for Kansas during the week of October 10 – 16, 2018 via Cooperative Observer (COOP) and Kansas Mesonet.

With another wet week, drought conditions continue to improve (Figure 5). Drought-free conditions now cover most of the state. Currently, just over 90 percent of the state is drought-free. The change in drought categories map (Figure 6) shows where changes occurred since the middle of September.

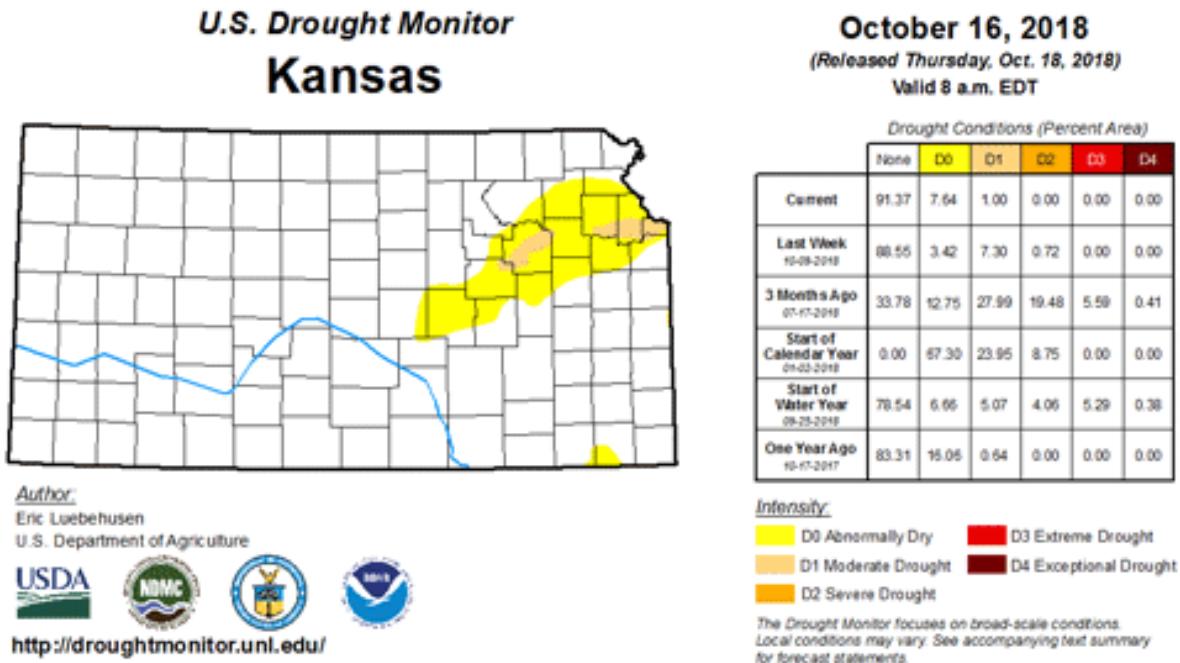


Figure 5. Current drought conditions from the U.S. Drought Monitor.

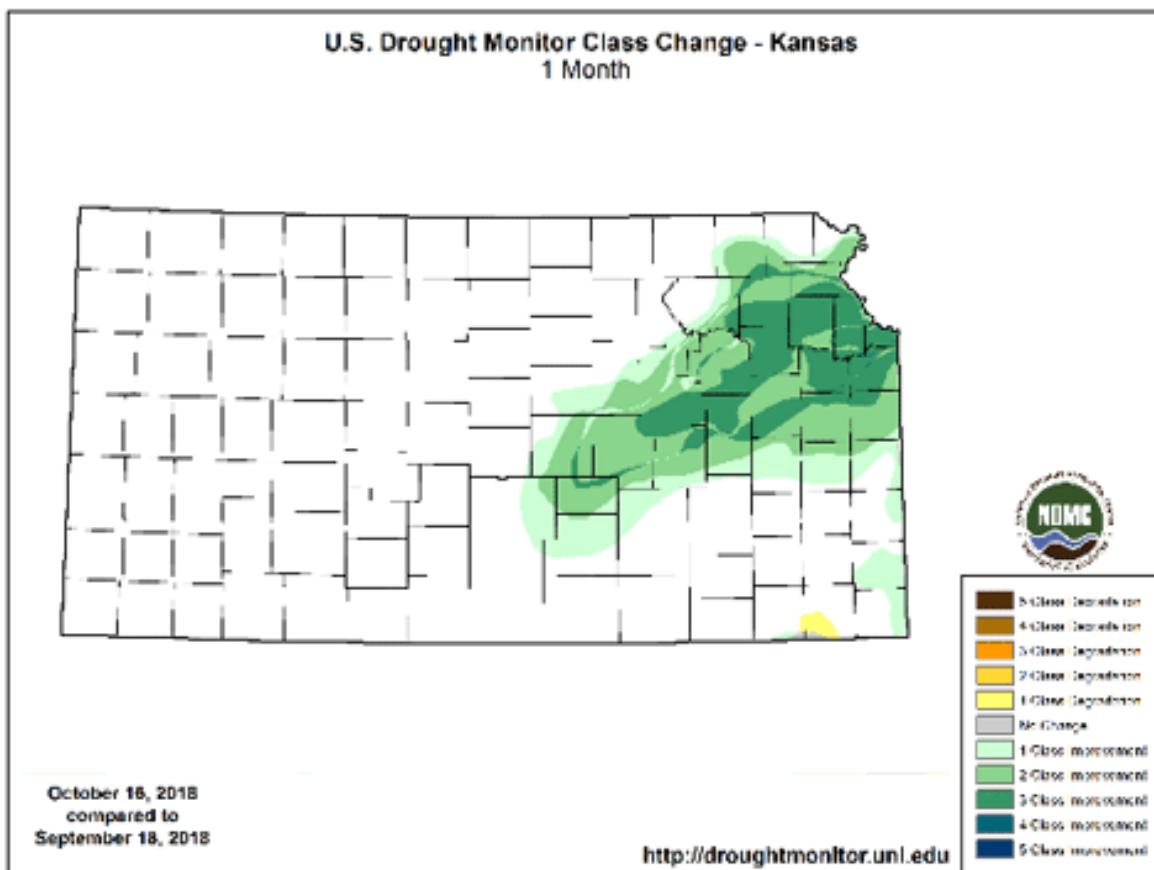


Figure 6. Change in drought categories (US Drought Monitor).

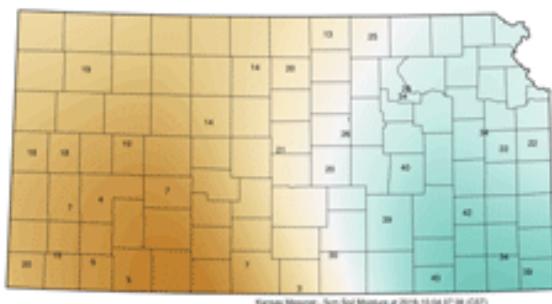
The high amounts of precipitation resulted in flooding, particularly in south central Kansas. Floodwaters from Cow Creek and the Arkansas River in Barton County are just beginning to recede. The moisture has resulted in saturated soils across the state, which have caused harvest delays, as well as planting delays for fall-seeded crops such as wheat and canola.☒

The change in soil moisture conditions is dramatic. Figure 7 shows the 2-inch and 8-inch soil moisture measurements on October 4. Figure 8 shows the soil moisture at the 2- and 8-inch depths as of October 18.

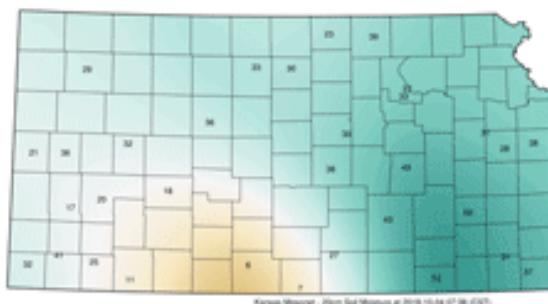
Percent Volumetric Soil Moisture

as of 4-October-2018

2 inch



8 inch



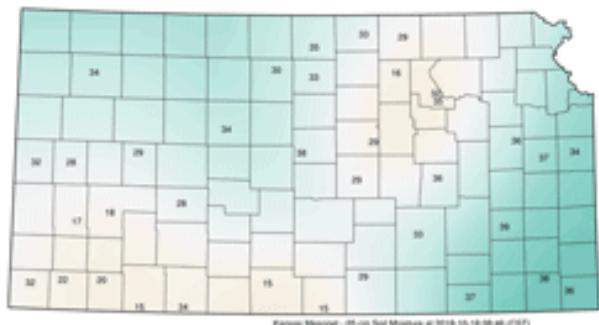
Maximum value is ~50

Figure 7. Volumetric water as of October 4, 2018 (Kansas Mesonet)

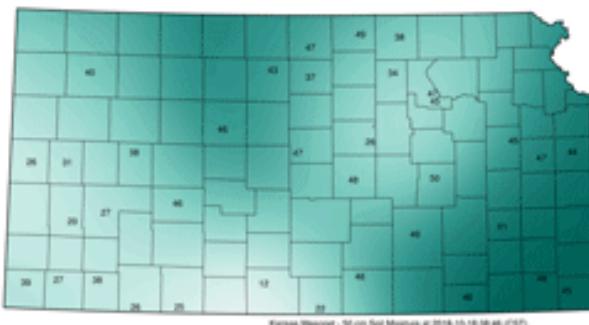
Percent Volumetric Soil Moisture

as of 18-October-2018

2 Inch Soil Moisture



8 Inch Soil Moisture



Maximum possible is ~50

Figure 8. Volumetric water content as of October 18, 2018 (Kansas Mesonet)

The quantitative precipitation forecast for the 7-day period, ending on October 26, shows the heaviest rainfall targeting the southern portions of the state (Figure 9). However, the highest precipitation amounts are expected to be under half an inch, which will allow for some drying of the surface. The 8 to 14-day precipitation outlook (Figure 10) is neutral with equal chances of above- or below-normal precipitation across Kansas. The temperature outlook favors a pattern of cooler-than-

normal temperatures for the period.

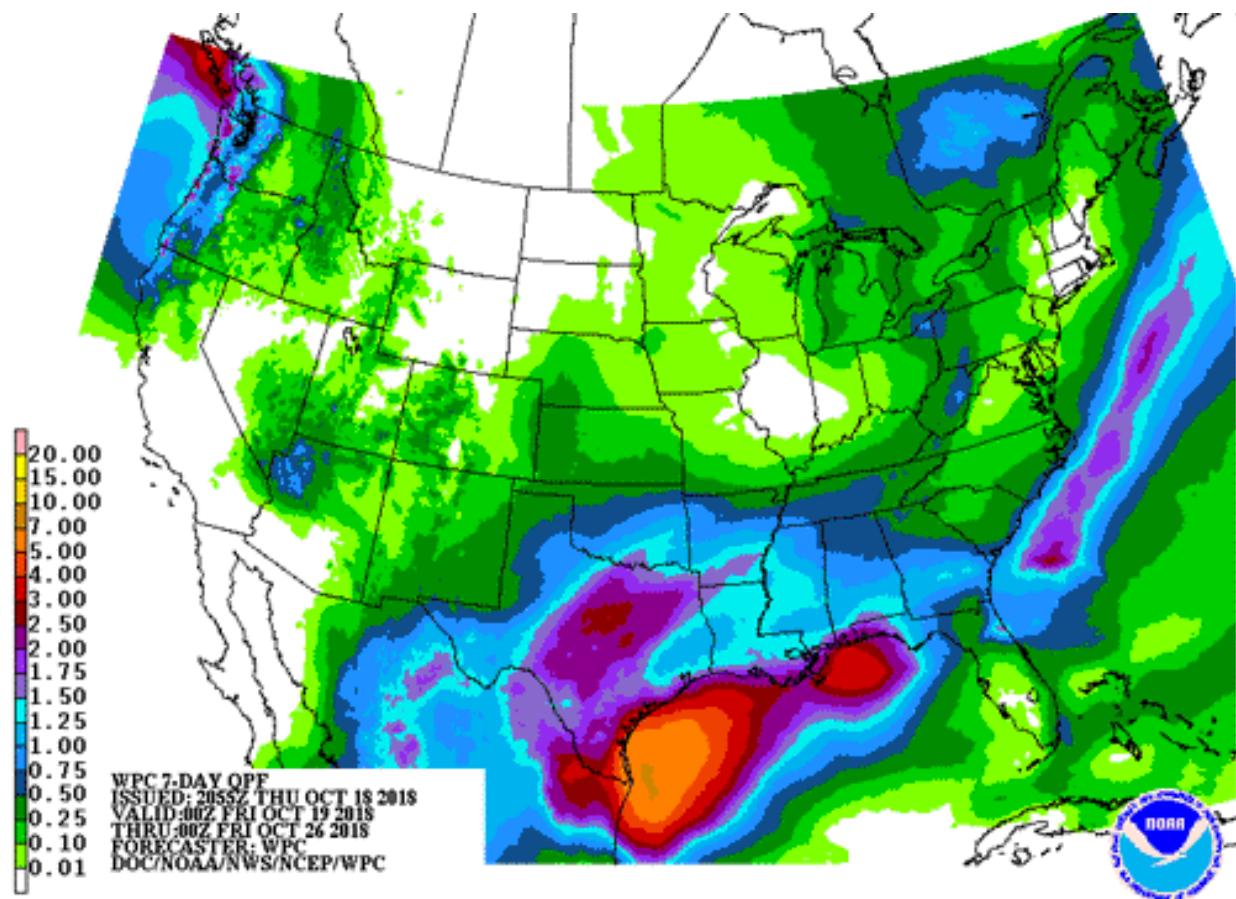


Figure 9. Quantitative Precipitation Forecast the 7-day period ending October 26, 2018 (NCEP)

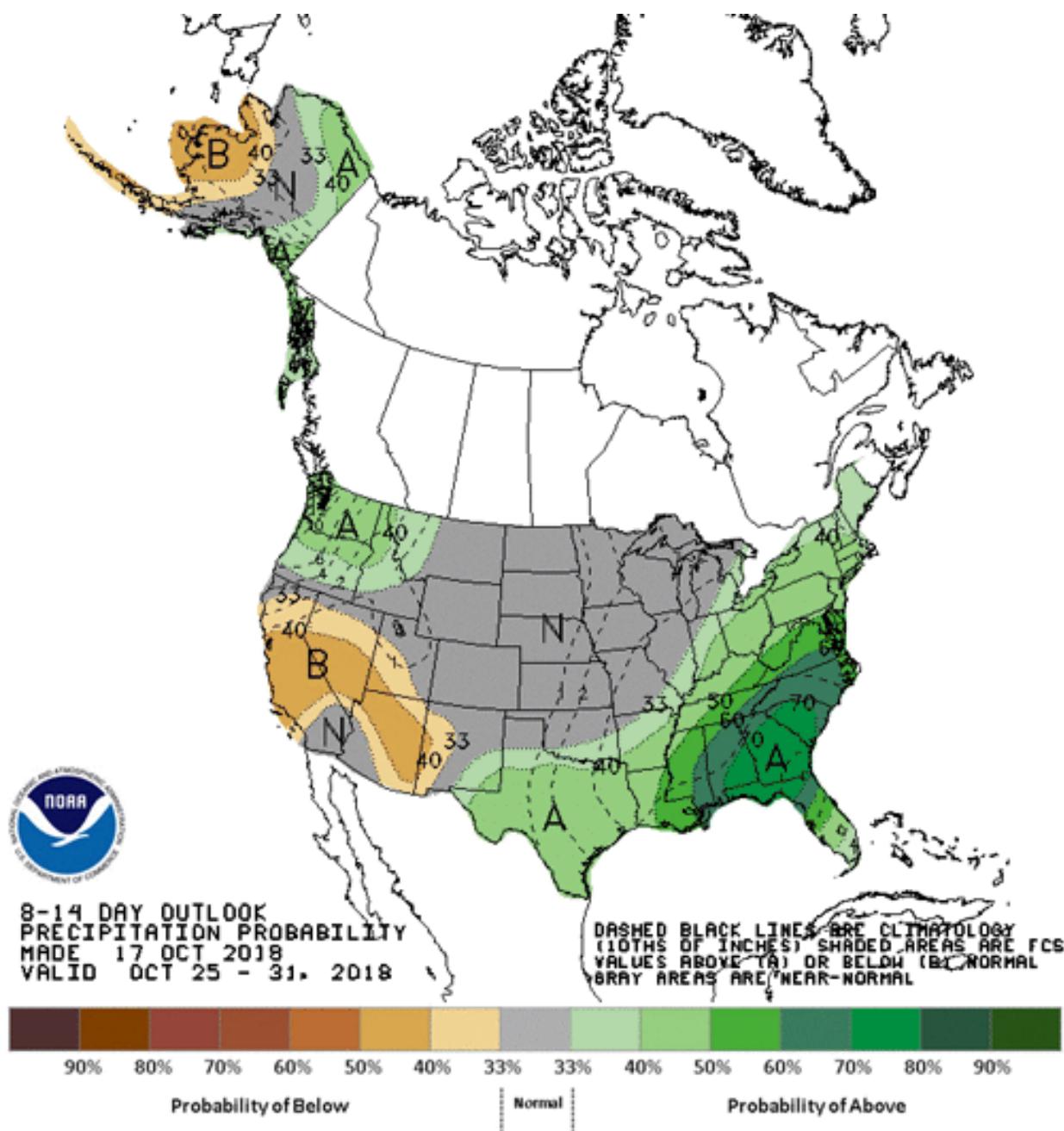


Figure 10. 8-14 day Precipitation Outlook for period ending October 31, 2018 (CPC)

Additional information can be found in the latest Agronomy eUpdate at
https://webapp.agron.ksu.edu/agr_social/eu.throck

Or on the Kansas Climate website under weekly maps or drought reports at

<http://climate.k-state.edu/maps/weekly>

<http://climate.k-state.edu/reports/weekly/2018/>

Mary Knapp, Weather Data Library
mknapp@ksu.edu

Christopher Redmond, Kansas Mesonet
Christopherredmond@ksu.edu

9. Save the date - 2019 K-State Corn Schools

The Department of Agronomy and K-State Research and Extension, in partnership with Kansas Corn, are planning to host three Corn Schools and three Pre-Plant Corn Schools in 2019. Please save the date for the location nearest you. Details on speakers and topics will be coming soon. Stay tuned to future eUpdates for more information!

Corn Schools

- **January 7 – Saline County**
- **January 9 – Thomas County**
- **January 11 – Douglas County**

Pre-Plant Corn Schools

- **February 11 – Labette County (Parsons)**
- **February 13 – Harvey County**
- **February 15 – Finney County**

Your input is requested to ensure the topics covered at these schools are the most pertinent to our Kansas producers. A short survey is available at this link: <http://bit.ly/CornSchSurvey>. The deadline to complete the survey is **October 31, 2018**.

Ignacio Ciampitti, Crop Production and Cropping Systems Specialist
ciampitti@ksu.edu