Issue 719

K-STATE Research and Extension

Extension Agronomy

eUpdate

11/09/2018

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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1. What are some options for damaged soybeans?

Large areas of the soybean belt have poor quality soybeans that are being either severely discounted or outright refused at the elevator. In Kansas, there are confirmed reports of loads being rejected at local elevators and large terminals due to high levels of purple seed stain (Figure 1). One reason for these rejections could be due to a reduction in feed value.

Figure 1. Purple seed stain on soybeans (Photo by Michael Tokach, K-State Research and Extension).

What led to the reduction in quality?

When seeking a cause, look no further than the constant rain during the crop's reproductive period.

According to Kansas Mesonet records, many areas in northeast and east central Kansas received between 5 to 16 inches of rain between August 7 and September 7. Rain during these parts of the reproductive growth stages provides an ideal climate for infection by seed and stem pathogens including pod and stem blight, purple seed stain, and anthracnose. Following this initial infection period, further significant rainfall in the early part of October allowed these diseases to progress. Collectively, they are responsible for the shrunken, discolored, poor quality beans. Besides the poorer quality, these diseases can cause empty pods or pods with seeds so small they are left in the field because they are too light to make it past the fans, resulting in direct yield loss.

Options for feeding damaged soybeans

Rather than taking a significant dockage or even a rejection at the elevator, producers have the option to use these soybeans as a feed source for animals, particularly cattle. Given their protein value, soybeans are a good source of protein for cows and can be used in developing heifers. However, given the fat content in soybeans, damaged soybeans can become rancid. This is less of an issue in colder weather. Aside from younger calves, it is recommended to limit inclusion of these beans to no more than 10-15% dry matter in a ration. If possible, its preferred to slightly roll them as they are being used. Mature cows could be allowed up to 4 pounds before fat levels and ruminal fiber digestion is a concern. For pigs, the soybeans would need to be roasted or extruded prior to feeding to destroy the urease activity.

Considerations for grain storage

For producers seeking to store their beans rather than take the elevator discount, they should keep in mind that the quality of grain coming out of a bin will never be better than when it went in. Therefore, the main storage goal is to keep it from further deteriorating. Since bean mold and discoloration is caused by actively growing fungi, the aim is to slow or stop further growth in the bin. This is best done by controlling grain moisture, temperature, and relative humidity in the bin. For longer-term storage, grain moisture needs to be below 15% moisture, but 12 – 13% would be even better. Cool the grain to below 50 degrees F as quickly as possible. Initially, when weather is still warm, this is difficult to do. It is best to run bin fans at night when temperatures are cooler and then shut them off during the day as it warms. Eventually, you will be able to reach the 50-degree mark, but of course, cooler is better. As the grain dries, relative humidity levels should also decrease. These storage conditions will be sufficient for short-term storage over the winter.

Regularly monitor storage bins. Check for leaks in the structure and be on the lookout for condensation in the headspace. If condensed water drips on the grain surface, fungi may resume growing and this may lead to surface crusting. Inspect bins for sour, musty, earthy, or putrid odors. These odors indicate a fungal problem — most likely due to high grain moisture from improper drying, leaks, or insect activity. If the grain gets wet, use a fan to increase airflow and reduce grain moisture — this can halt fungal growth.

Before filling any grain bin, be sure to clean it by removing all grain from the floor and walls. Thorough cleaning will help remove any grain carryover from the previous crop that may increase the chances of additional contamination. Some of this information has been adapted from *Storing Mycotoxin Affected Grain*, Bulletin CPN-2004, https://cropprotectionnetwork.org

Other options

For producers that do not wish to feed or store these beans, they can blend affected loads with clean soybeans to reduce the dockage and reach an acceptable threshold. Some growers may not harvest some of their soybean fields this season. Grazing these fields is an option. It is important to supplement with an additional forage source, such as hay or corn residue, as soybean plants have little nutritional value. Also, cattle may select full bean pods and can scour if they consume too much. Avoid over consumption of soybeans by providing limited access to these fields and/or having hay or another feed as an alternative.

Remember, do not provide access to any supplements that contain urea when allowing cattle to consume raw soybeans.

For more information on using soybeans as cattle feed, please see an article from University of Nebraska's CropWatch: *Can Damaged or Discolored Soybeans be used as Cattle Feed?* at: https://cropwatch.unl.edu/2018/soybeans-as-cattle-feed

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2. Considerations for fall applications of anhydrous ammonia

Soils across much of Kansas are now cool enough to allow producers to apply anhydrous ammonia for their 2019 corn crop (Figure 1). This practice 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.

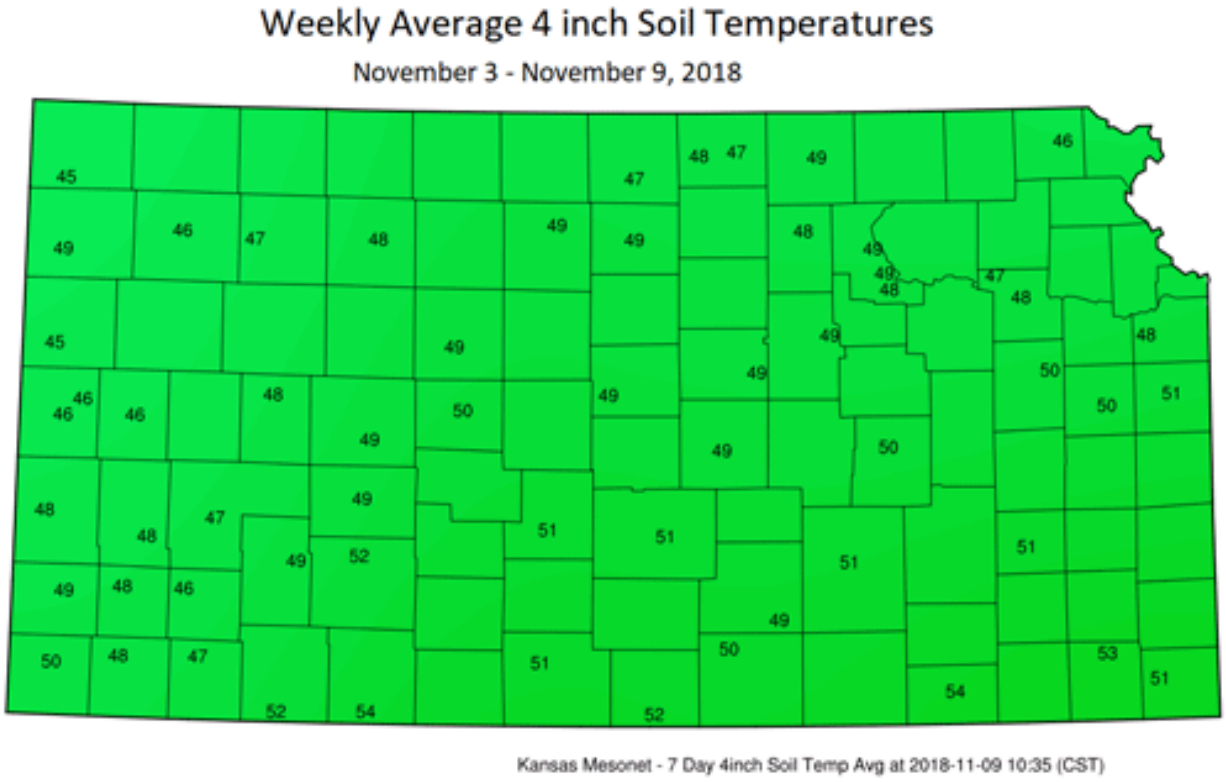

Figure 1. Weekly average 4-inch soil temperatures for the period of November 3-9, 2018. Soil temperatures in individual fields in any given area will vary with differences in vegetative cover, soil texture, soil moisture, and other factors. (Kansas Mesonet)

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 late summer/early 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.

Traditionally, 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 such as N-Serve 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 late February and March, and essentially be complete before the corn crop takes up much N in late May and June.

Summary

The bottom line is this: 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.

- 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 such as N-Serve 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//agriculture/soiltemp

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3. CoAXium wheat and Aggressor herbicide for grass weed control

CoAXium™ wheat is a new herbicide-resistant (non GMO) wheat technology that contains the AXigen™ trait that was developed at Colorado State University and has resistance to the ACCase (Group 1) class of herbicides. The ACCase herbicides have good foliar activity on grasses, so the CoAXium wheat varieties provide an opportunity to use a new class of herbicides for postemergence winter annual grass control in wheat.

CoAXium wheat varieties are designated with an AX suffix. PlainsGold Incline AX and LCS Fusion AX are two CoAXium winter wheat varieties that were available for planting on a limited basis this fall. Both varieties are best adapted to western Kansas.

Aggressor is the herbicide labeled for use on CoAXium wheat. Aggressor is marketed by the Albaugh, LLC and contains the active ingredient quizalofop-p-ethyl. **Do not apply Aggressor to non-AX wheat varieties (including Clearfield wheat) or wheat will be severely injured or killed.** Aggressor can be applied at a single application rate of 8 to 12 fluid ounces per acre in the fall or spring, or as a split application of 8 fl. oz. in each application. Split applications should be separated by at least 14 days and most likely would be a fall/spring split. Aggressor should be applied in combination with methylated seed oil, crop oil concentrate, or nonionic surfactant to optimize performance. Applications can be made with liquid fertilizer as part of the spray carrier, but the fertilizer concentration shouldn't exceed 50% of the total spray volume. Aggressor can be applied to wheat from the 4-leaf to the jointing stage of wheat growth for control of actively growing grasses before they exceed the 5 leaf stage. Aggressor should not be applied if the daily maximum air temperature is not expected to exceed 40 degrees F within 1 week following application. It is important to note that spring applications of Aggressor should be made when winter annual grasses have completely come out of winter dormancy or efficacy of Aggressor herbicide will be compromised.

Aggressor should provide good control of most winter annual grasses (including ALS-resistant weed biotypes) such as downy brome, jointed goatgrass, feral rye, Italian ryegrass, and volunteer cereals. Downy brome control with Aggressor herbicide treatments in CoAXium wheat at Hays in 2017-18 is presented in the Table below.

Table 1. Effectiveness of fall/spring-applied Aggressor on downy brome control in Incline AX CoAxium winter wheat at KSU Ag Research Center-Hays, Kansas in 2018[abc].

Herbicide	Rate	Timing	Downy brome		Wheat yield
			4/11/18	5/6/18	
	(oz/a)		-----(% control)-----		(bu/a)
Aggressor	8	FP	94	96	27
Aggressor	10	FP	94	96	28
Aggressor	8	SP	73	91	23

Aggressor	10	SP	69	91	23
Aggressor	12	SP	73	94	25
Aggressor	8/8	FP/SP	94	98	28
Untreated	-	-	-	-	18
LSD (5%)			5	5	3

[a] Fall Post (FP) was applied on Nov 6, 2017, Spring Post (SP) was applied on Mar 28, 2018.

[b] Experimental field was under continuous winter wheat for several years.

[c]NIS was used in all herbicide applications per label guidelines.

Aggressor provides no broadleaf weed control and very minimal residual control. Aggressor can be tank-mixed with certain broadleaf herbicides, but should not be tank-mixed with the amine formulations of 2,4-D or MCPA or grass weed control will be severely reduced.

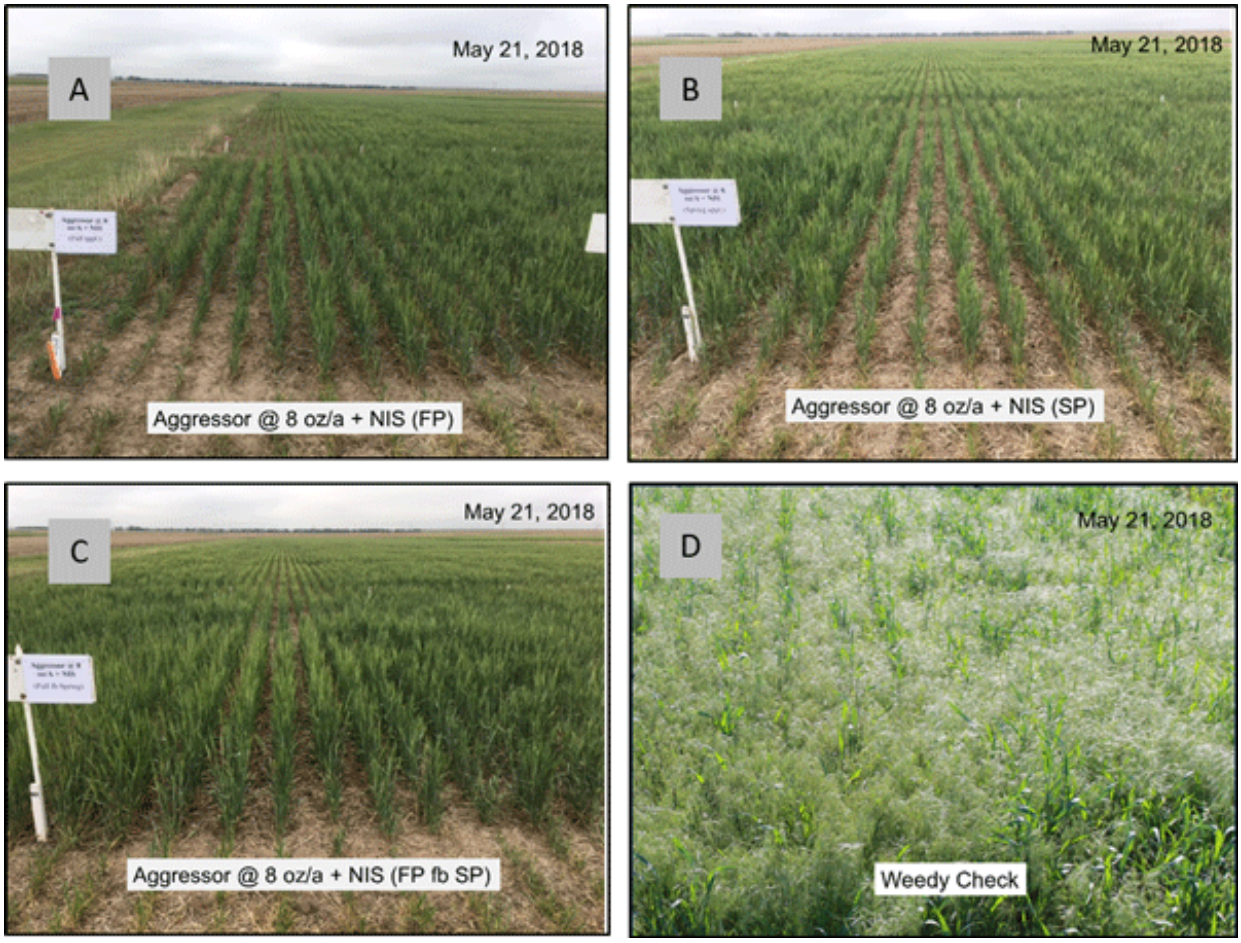

Figure 1. Visual response of CoAXium wheat plots treated with Aggressor herbicide in fall (A), spring (B), fall followed by spring (C) and non-treated weedy check (D). Photos by Vipan Kumar, K-State Research and Extension.

Growers will be required to sign a CoAXium stewardship agreement when they purchase certified AX

wheat varieties. The stewardship agreement prohibits saving seed and limits planting CoAXium wheat varieties in the same field to every other year. Growers also agree to follow the Aggressor herbicide label guidelines to optimize performance and minimize the potential for developing ACCase resistant weeds.

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4. Kansas Mesonet launches soil moisture monitoring tool

The Kansas Mesonet is launching a new tool: soil moisture monitoring. Soil moisture is important for many field decisions. The Mesonet Soil Moisture page provides a general overview of the conditions across the state and by each station. This article gives a description of how soil moisture is monitored and reported.

Users can access this new tool from either the main Mesonet page by selecting from the drop down menu, Agriculture, then Soil Moisture (Figure 1); or directly from this link: http://mesonet.k-state.edu/agriculture/soilmoist/

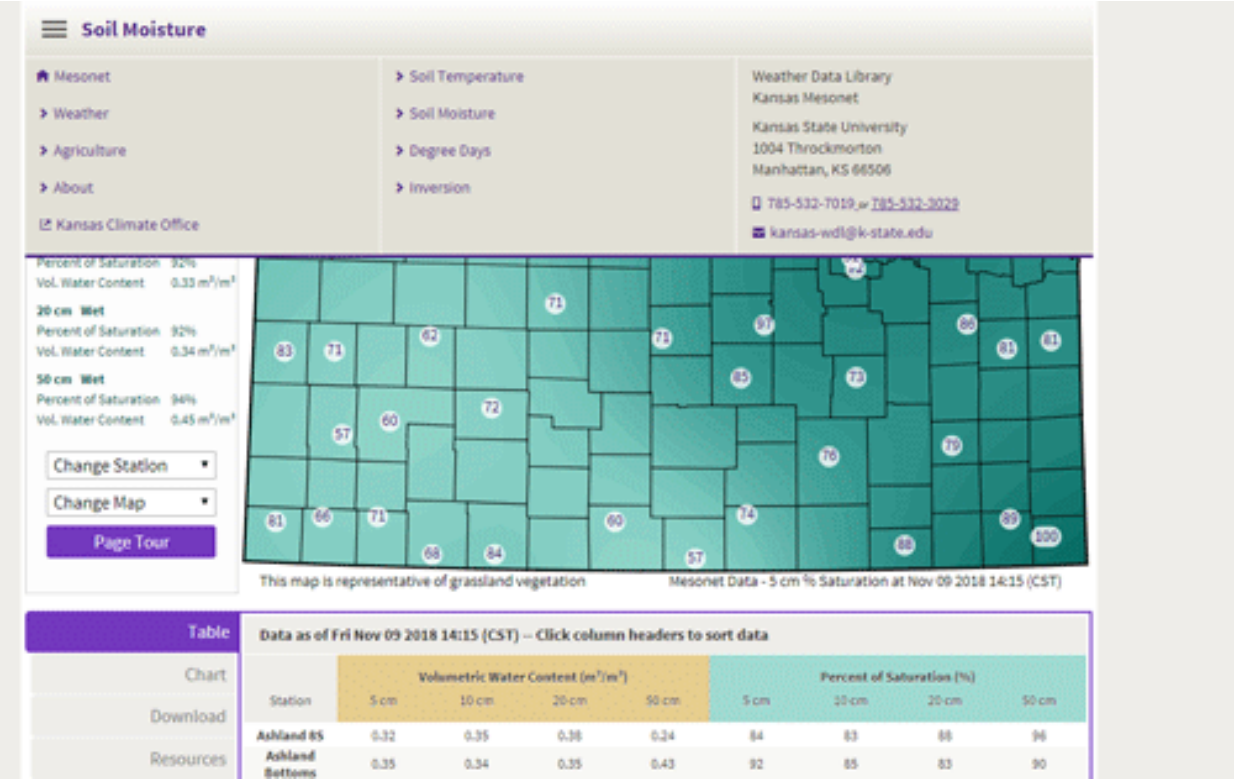

Figure 1. Screenshot of the menu path to the new Soil Moisture page on the Kansas Mesonet.

Soil Moisture

All Kansas Mesonet tower stations measure soil moisture at four depths. We utilize a time differential reflectometer probe (TDR) by Campbell Scientific, the CS655 model. Installation of current sensors began in mid-2017 and were completed early 2018. Data beyond 365 days is not currently available online but can be obtained by emailing the Mesonet (kansas-wdl@ksu.edu).

Soil Depths and Location

- Standardized depths consist of: 5, 10, 20, and 50 cm (approximately 2, 4, 8, and 20 inches).

- Locations of the sensors are also standardized at all stations with all soil sensors placed four feet south of the station.

Influencing Factors on Soil Moisture

Soil moisture is highly dependent on countless variables that can have local influences on the measured values, thus creating biases in the data. The Kansas Mesonet strives to limit these factors and make individual station data as representative of the surrounding region as possible.

- **Soil type**: Kansas has a diverse range of soil types, from sandy soils in the southwest to shallow soil over limestone in the Flint Hills. Often these types vary over very small distances and may not be representative of your location. Keep this in mind when using the data.
- **Sandy soil**: Grass is hard to maintain as a cover. Often, it is dug up by animals, blown away, or redeposited. This can allow water to penetrate easier into the soil or resurface a sensor making it respond faster than expected to atmospheric changes.
- **Clay soil**: Often the freeze/thaw process along with wetting/drying will cause uplift and/or sinking of the surface soil. As with erosion, this action can uplift or shift sensors deeper/shallower in the soil.
- The Mesonet staff verifies sensors aren't disturbed during maintenance visits.
- **Ground cover**: Soil measurements are taken under sod at all stations. However, there are a few exceptions where grass struggles to grow and it may change between maintenance visits. Grass cover will create faster uptake of soil moisture during the growing season due to plant demand.
- **Soil depth**: The depth of the sensors will often determine the type of soil and responsiveness to precipitation. The deeper in the soil, the slower the response time. Therefore, 2-inch sensors will often respond immediately to rainfall. Moisture takes longer to penetrate deep into the soil and therefore, the 8- and 20-inch sensors will take the longest to increase after a rain event. They will also take the longest to dry out (Figure 2).

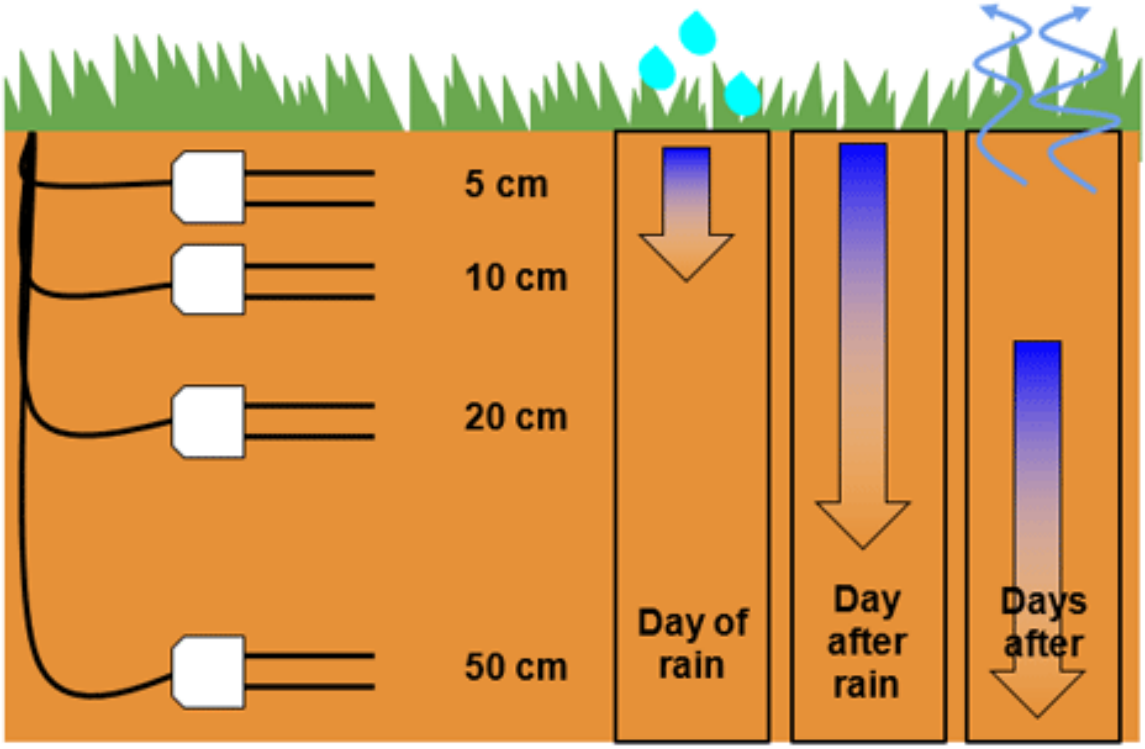

Figure 2. Soil moisture sensors at four soil depths (5, 10, 20, and 50 cm) and a general depiction of soil water movement following a rain event. Graphic from Kansas Mesonet.

Understanding the Webpage

There are some changes compared to other web pages on the Mesonet. The soil moisture measurements are displayed in two forms:

- **VWC, volumetric water content**. This can be calculated directly through the sensor and describes the amount of water contained within the area measured by the sensor. This value is unitless and considered to be cubic meter/cubic meter (m^3/m^3). The Mesonet uses a refined version of this calculation that incorporates other raw measurements from the sensor for a more accurate representation of soil moisture.
- **% sat, percent of saturation**. Using volumetric water content over time, upper and lower limits of the soil moisture are obtained during very wet and drought periods. These limits can define the wettest (100%) and driest (0%) percentage and provide historical context to current measurements.

"Wet vs Dry" verbiage is used at each station and depth to provide a quick and easy understanding of the current moisture present. Occasionally, "getting wetter" and "getting drier" will also follow the generic description. This description is the difference between the current measurement and that of seven days ago. It provides insight into general trends observed at each depth to assist in understanding the current state of the soil. Different from previous pages, you also have the ability to see these changes on a map with the "7-Day Change" for each depth using volumetric water content.

Lastly, the chart section has also been revised/improved to show larger scale trends beyond the initial seven days. The map is interactive as on previous pages. However, users now have the option to display the last 30, 90, and 365 days. This is a great tool to see numerous phenomena and trends during corresponding wet/dry periods. See below for some examples.

Using the Data

How might you benefit from Kansas Mesonet soil moisture data? Here are a few examples:

- **Non-irrigated fields**: A direct correlation to the demand and water availability during plant growth. Can assist in crop yield estimates.
- **Irrigated fields**: Though relationship may be different between water availability, the curves and trends can be very useful for determining the water demand. Mesonet measurements can also be used to calibrate and provide a standard reference to other soil module monitoring systems. With one comparable standard, sensors in specific applications can now be cross-analyzed from individual farm/fields making it more useful on a regional scale.
- **Drought awareness**: Though rainfall deficit can provide a quick proxy for drought, soil moisture is the best indicator for vegetative water demand. It can also provide an early warning for increasing demands of irrigation and other water use/storage trough curves and rapid declines.
- **Runoff estimates**: Heavy rainfall impacts are usually dictated by how saturated the surface is at the time of the event. Through curves on the chart, you can observe hourly rainfall and resulting influences by depth. During high rain rates, you can calculate the impact runoff may have due to resulting curves by depth. If there is a high rain rate, reactions may only be noted in the 2-inch sensor and thus significant runoff is/may be occurring.
- **Statewide statistics**: The table lets you quickly view and sort data from across the state. You can also download data to perform your own analysis (see the Download tab).
- **Graphics and social media**: Download any of the maps in .PNG format for easy sharing.

For more information on navigating this resource, users can select a page tour from the main soil moisture page located at the top of the featured map.

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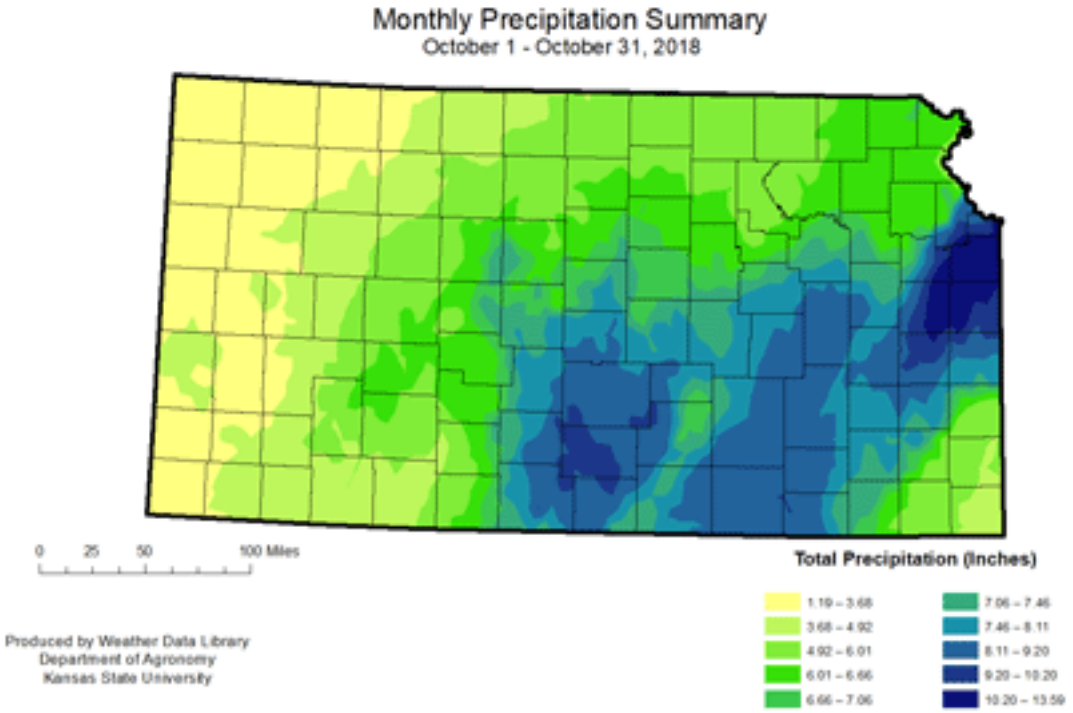
5. October climate summary for Kansas - Cool and wet

October was a very wet month across the state. In fact, it ranks as the second wettest October since 1895. The wettest October on record was in 1941 when the state-wide average precipitation was 5.99 inches. For October 2018, the state-wide average precipitation was 5.88 inches, 259 percent of normal.

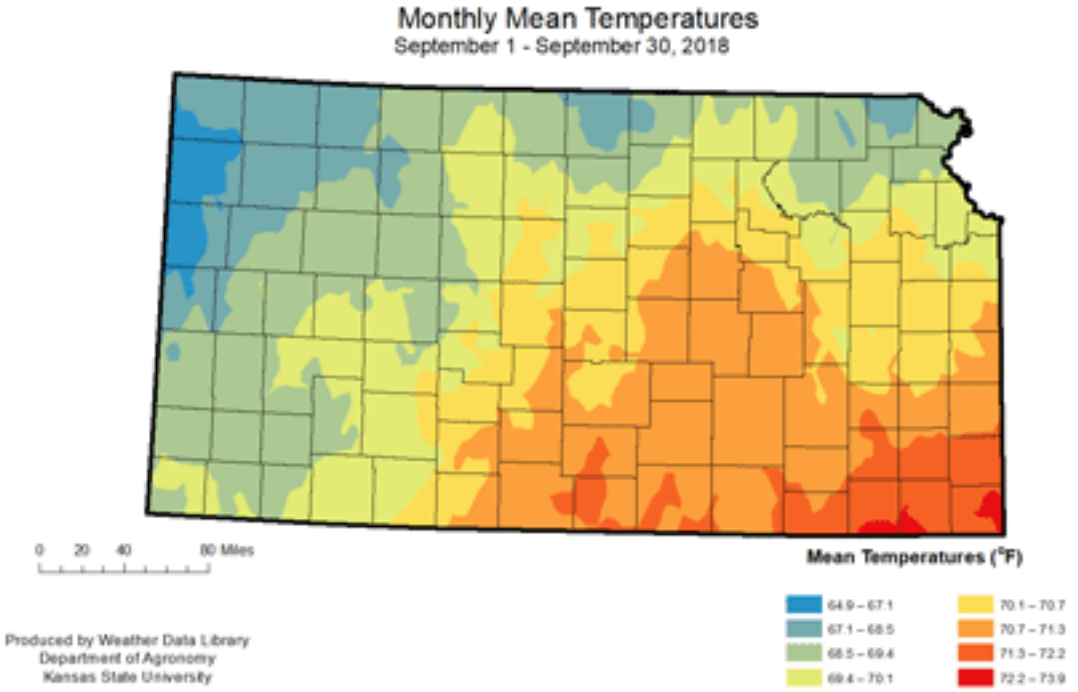
The Northwest Division received the least rainfall with an average of 2.62 inches. That is a surplus of 1.06 inches, or 165 percent of normal. The South Central Division was the wettest, with an average of 7.97 inches at 5.33 inches above normal, or 305 percent of normal. There were 165 new daily record rainfall totals, of which 3 were records for any day in October. The highest 24-hour rainfall total for a National Weather Service Cooperative (NWS Coop) station was 5.55 inches at Stilwell 1N, Johnson County, on the October 8. The greatest 24-hour rainfall total for a Community Collaborative Rain Hail and Snow network station (CoCoRaHS) was 6.44 inches recorded at Coats 3.3 NNE, Pratt County, on October 9. The greatest monthly precipitation totals for October: 13.59 inches at Stilwell 1N, Johnson County (NWS) and 13.24 inches at Princeton 2.0 NE, Franklin County (CoCoRaHS).

Not all precipitation was in the form of rainfall. A total of 257 stations reported snowfall in October, with monthly totals ranging from trace amounts in eastern Kansas to 9 inches at the CoCoRaHS station north of St. Francis, Cheyenne County.



Despite a warm start to the month, October temperatures were cooler-than-normal. State-wide average temperature for the month was 53.0 degrees F, which is 2.3 degrees cooler-than-normal. All divisions across Kansas were cooler-than-normal. The Northwest Division and the West Central

division tied for the largest departure, with an average of 48.6 and 50.0 degrees F, or 3.6 degrees cooler-than-normal. The Southeast Division came closest to normal with an average of 57.1 degrees F or 0.8 degrees cooler-than-normal. The variability was evident in the range of temperatures. The warmest maximum temperature was 101 degrees F at Tribune 13NNE, Greeley County, on October 4. The coldest minimum temperature at a NWS station was 12 degrees F, recorded at Brewster 4W, Sherman County, on October 16. The Kansas Mesonet station in Cheyenne County, south of St. Francis, reported a low of 9 degrees F. There were 11 record daily high maximum temperatures in October and 121 record daily low maximum temperatures. On the minimum temperature side, there was one record high minimum compared and only 60 record low minimums.

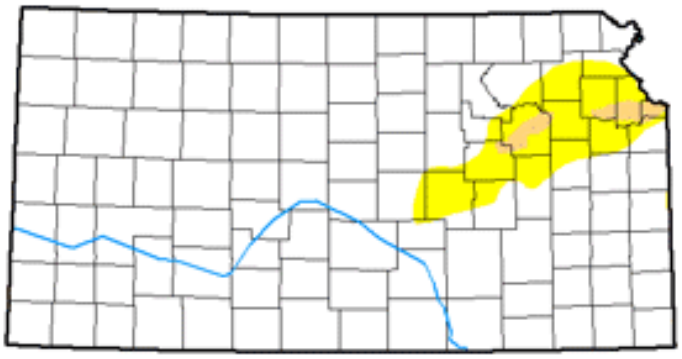


For once, hail was not featured in the severe weather reports. High winds and a tornado were major contributors to severe weather in Kansas during October. Flooding was again present, with much of the damage occurring in South Central, Kansas.

Drought update

Much higher-than-normal precipitation, coupled with cooler-than-normal temperatures resulted in major improvements in the drought conditions. The area of the state that was drought-free jumped from 78 percent at the beginning of October to 91 percent by the end of the month. Moderate drought and abnormally dry conditions linger in the eastern parts of the state. The November outlook has increased chances for above-normal precipitation across most of Kansas. However, given the typically low precipitation at this time of the year, continued improvement is likely to be slow. The temperature outlook is for cooler-than-normal temperatures across all but the western edges of Kansas.

U.S. Drought Monitor
Kansas



Author:
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National Drought Mitigation Center

http://droughtmonitor.unl.edu/

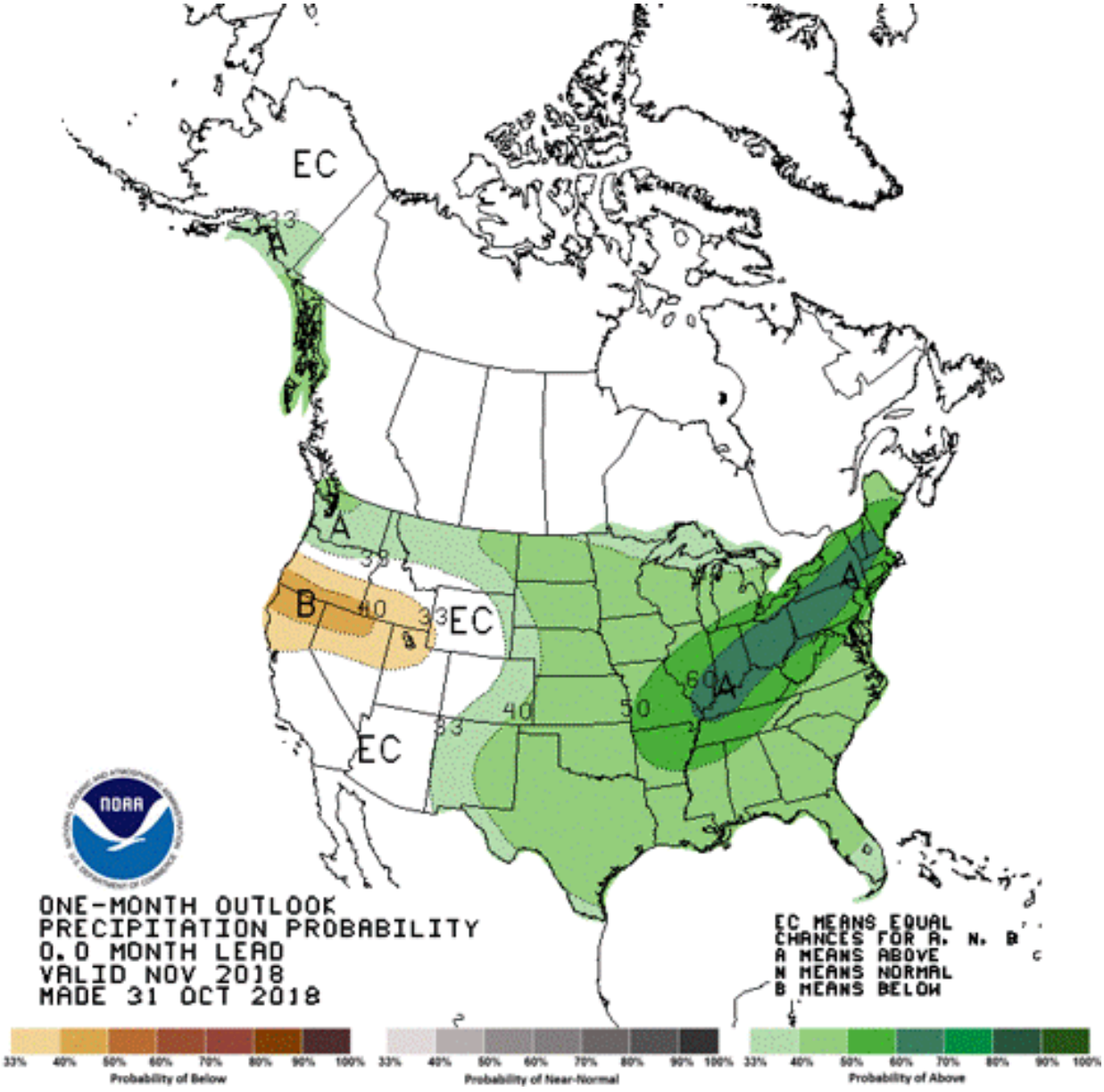
October 30, 2018
(Released Thursday, Nov. 1, 2018)
Valid 8 a.m. EDT

Drought Conditions (Percent Area)

	None	D0	D1	D2	D3	D4
Current	91.63	7.37	1.00	0.00	0.00	0.00
Last Week 10-23-2018	91.62	7.38	1.00	0.00	0.00	0.00
3 Months Ago 07-31-2018	28.11	24.14	20.12	19.31	7.37	0.95
Start of Calendar Year 01-02-2018	0.00	67.30	23.95	8.75	0.00	0.00
Start of Water Year 09-25-2018	78.54	6.66	5.07	4.06	5.29	0.38
One Year Ago 10-31-2017	85.96	13.40	0.64	0.00	0.00	0.00

Intensity:
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.


EC
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EC
NOAA
ONE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
0.0 MONTH LEAD
VALID NOV 2018
MADE 31 OCT 2018
EC MEANS EQUAL
CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW
33% 40% 50% 60% 70% 80% 90% 100%
Probability of Below
33% 40% 50% 60% 70% 80% 90% 100%
Probability of Near-Normal
33% 40% 50% 60% 70% 80% 90% 100%
Probability of Above

Table 1. Kansas Climate Division Summary										
October 2018										
	Precipitation (inches)						Temperature (°F)			
	Oct 2018			2018 through October					Monthly Extremes	
Division	Total	Dep. [1]	% Normal	Total	Dep. [1]	% Normal	Ave	Dep. [1]	Max	Min
Northwest	2.62	1.06	165	21.62	1.66	107	48.6	-3.6	95	12
West Central	3.90	2.44	265	23.18	3.83	118	50.0	-3.6	101	13
Southwest	4.57	3.05	300	24.67	6.09	132	53.1	-2.9	99	21
North Central	5.26	3.28	264	29.75	3.82	115	51.7	-3.3	97	20
Central	6.90	4.77	332	29.88	2.75	111	53.5	-2.8	97	20
South Central	7.97	5.33	309	34.03	5.32	119	55.4	-2.3	97	26
Northeast	6.44	3.71	238	30.74	-1.26	97	52.7	-2.7	91	26
East Central	7.13	4.04	226	29.22	-5.13	84	54.6	-1.7	93	26
Southeast	7.33	3.66	204	36.94	-0.15	99	57.1	-0.8	91	27
STATE	5.88	3.56	259	29.13	2.19	110	53.0	-2.6	101	12
1. Departure from 1981-2010 normal value										
2. State Highest temperature: 101 oF at Tribune 13NNE, Greeley County, on the 4th.										
3. State Lowest temperature: 12 oF at Brewster 1W, Sherman County, on the 16th.										
4. Greatest 24hr: 5.55 inches at Stilwell 1N, Johnson County, on the 8th (NWS); 6.44 inches at Coats 3.3 NNE, Pratt County, on the 9th (CoCoRaHS).										
Source: KSU Weather Data Library										

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