Issue 869

K-STATE
Research and Extension

Extension Agronomy

eUpdate

08/20/2021

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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eUpdate Table of Contents | 08/20/2021 | Issue 869

1. Corn production issues - Droopy ears 3
2. New publication on selecting the optimal wheat variety 11
3. 2021 Wheat Variety Disease and Insect Rating publication 13
4. Final irrigation of the growing season - Timing is everything 15
5. Update on insect activity in alfalfa - Fall armyworms, armyworms, and alfalfa caterpillars 19
6. Grasshopper pressure is increasing in western Kansas 25
7. Fall weather outlook for Kansas and the science behind the predications 27

1. Corn production issues - Droopy ears

Corn farmers are reporting concerns as the crop is approaching maturity. One of the main issues is about the premature ear droop observed in several fields across the state. Corn plants typically maintain the ears in the upright position until after the crop has reached full maturity (black layer - around 35% grain moisture in the kernels). This process occurs due to the loss of turgidity in the shank that supports the ear (Figure 1). This condition observed in several fields across the state is a reflection that the movement of sugars and nutrients from the plant to the ear has been impaired and therefore grain filling is usually interrupted.

Figure 1. Droopy ears observed in a cornfield and a picture of the ear depicting kernels early in the grain filling process. Photos by Marvin Pipes.

The main consequence of this phenomenon is that all kernels in the ear will move prematurely to black layer formation (maturity) (Figure 2). This issue will have a larger impact on yield depending on the stage of the grain filling – with earlier occurrences during the grain filling presenting a larger impact on final yields, primarily by affecting the final kernel size.

Factors that influence droopy ears

Some of the conditions that favor this issue are related to: high temperatures, poor root development, and drought stress – with the latter as one of the most relevant factors in past seasons. However, it does not appear that drought was the main cause for this season since this issue has also being reported in many irrigated fields where water is not a limiting factor. At this point, we are still exploring different hypotheses for main causes. However, one certainty is the loss of turgidity in the shank is linked to a cannibalization of carbohydrates for the plant. Simply put, the plants (more specifically, the kernels) were running out of resources. When this occurs, the plant will use all the reservoirs of carbohydrates available – with the stem and shank organs as main plant storage units – until running out of sugars to satisfy the grain-filling demand.

A few factors that can affect the ability of the plant to produce fewer carbohydrates (and also have a low reservoir) are linked to the photosynthesis process. Optimal temperature, solar radiation, adequate water, and nutrition are key components for healthy plants and good conditions for improving the ability to produce carbohydrates. Many factors are still under evaluation. Based on our current analysis, there is clearly a combination of multiple stresses (less optimal temperatures, cloudy days, and high evapotranspiration) affecting photosynthesis and thus the capability of the corn plants to satisfy the demand coming from all the kernels in the ear.

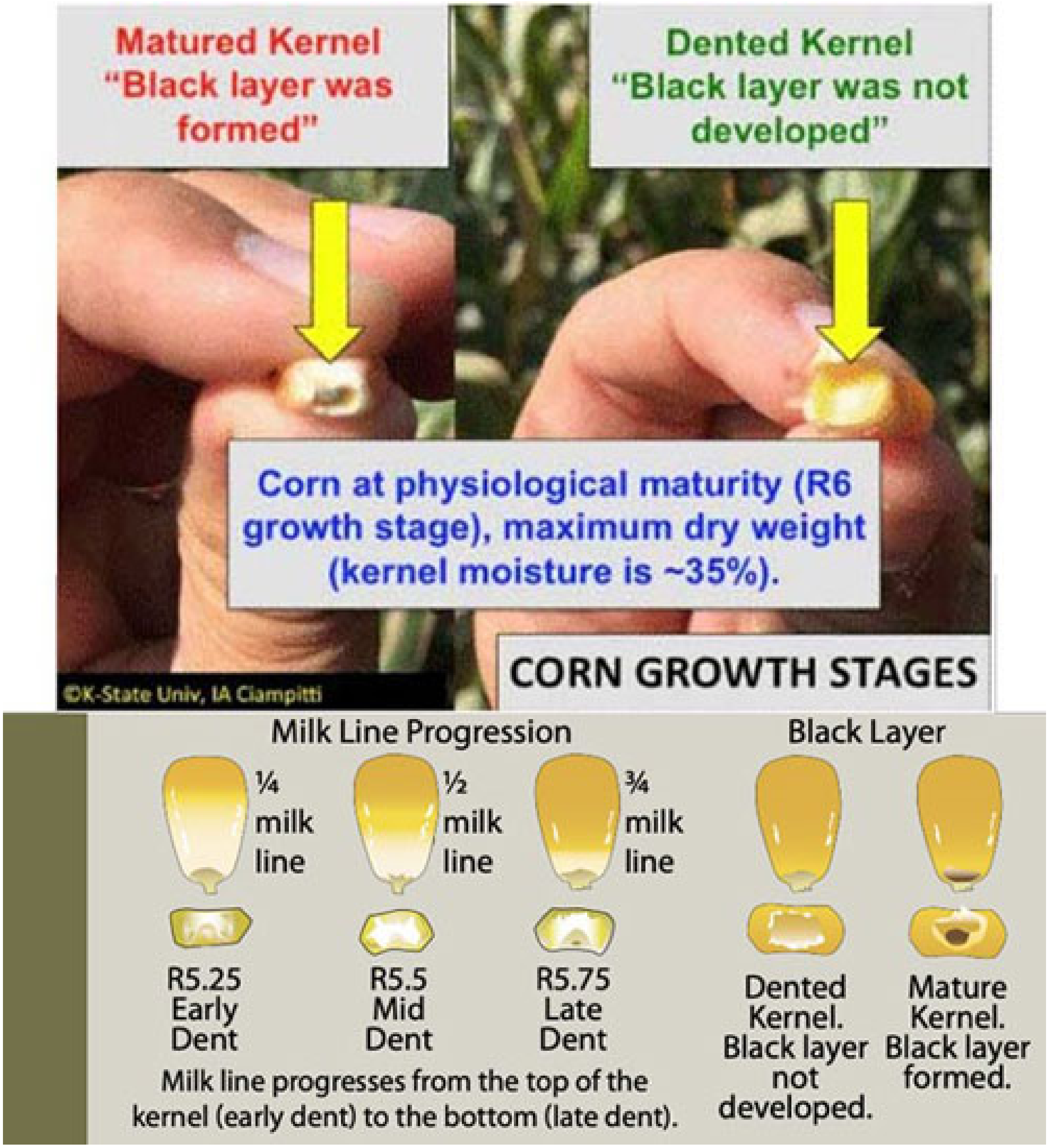


Figure 2. Corn at dent and black layer growth stages (upper panel) and progression of "milk line" for corn (lower panel; source: https://bookstore.ksre.ksu.edu/pubs/MF3305.pdf). Photo and infographic by Ignacio Ciampitti, K-State Research and Extension.

Another potential cause for 2021 season could be the smoke coverage from western wildfires (Figure 3). Overall, when looking at a few locations in Kansas, a very small reduction of incoming solar radiation for the last month was observed, potentially reducing the potential yield (Figure 4). Lastly, adding the effect of high temperatures and lack of precipitation combined with this stress can make an impact on the ability of the plant to sustain the filling of all kernels and to maintain yields.

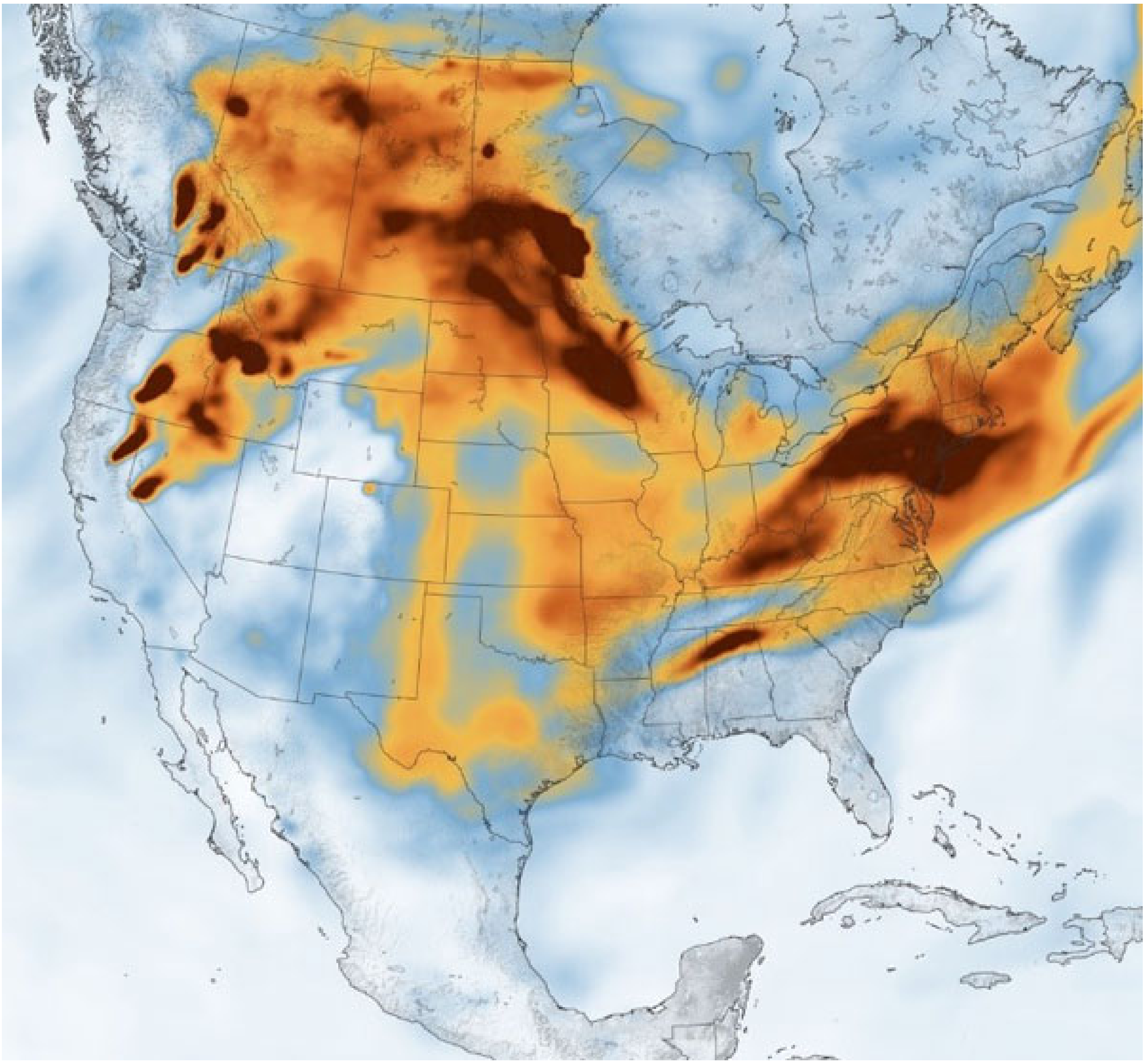
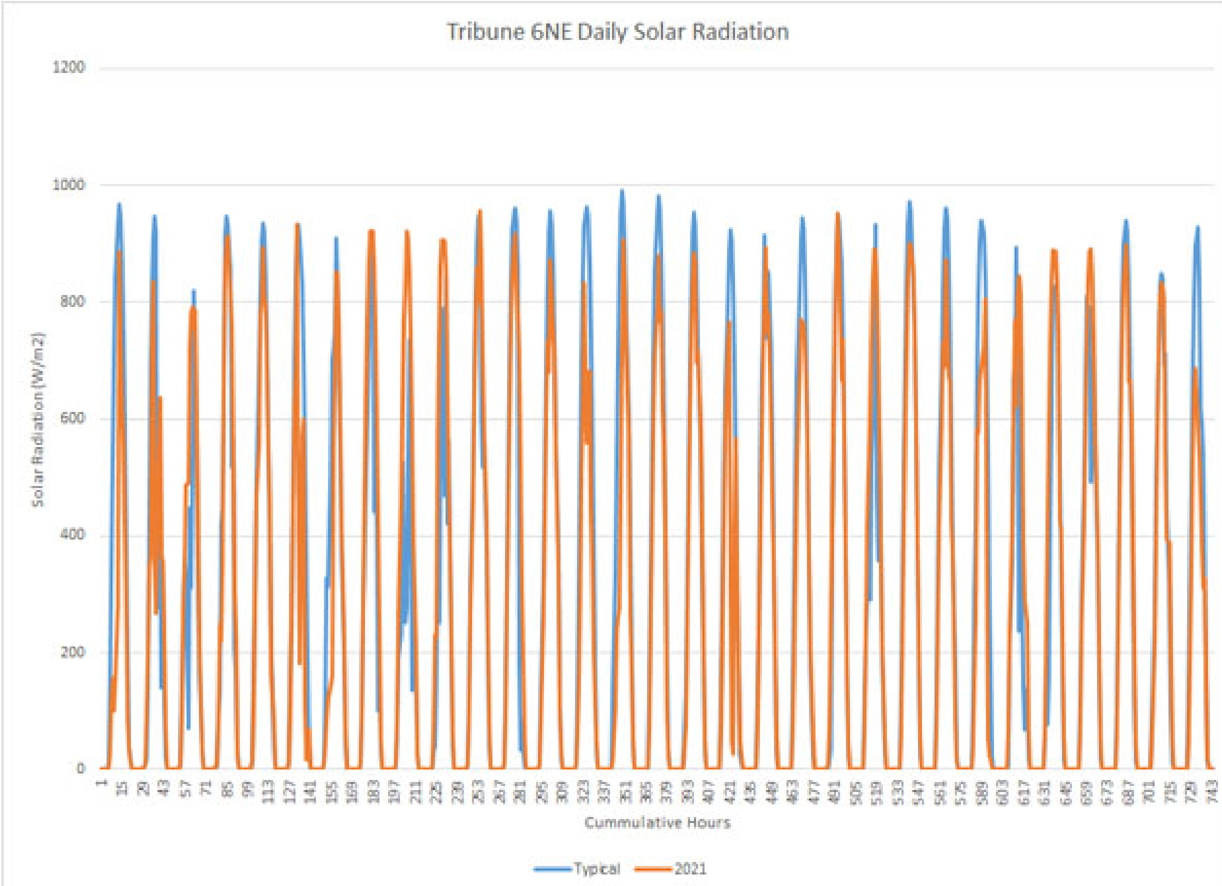


Figure 3. July 23, 2021 smoke coverage across the US. Source: NASA Earth observatory, https://earthobservatory.nasa.gov/images/148610/smoke-across-north-america


Tribune 6NE Daily Solar Radiation
1200
1000
800
600
400
200
0
Solar Radiation (W/m2)
Cummulative Hours
Typical
2021

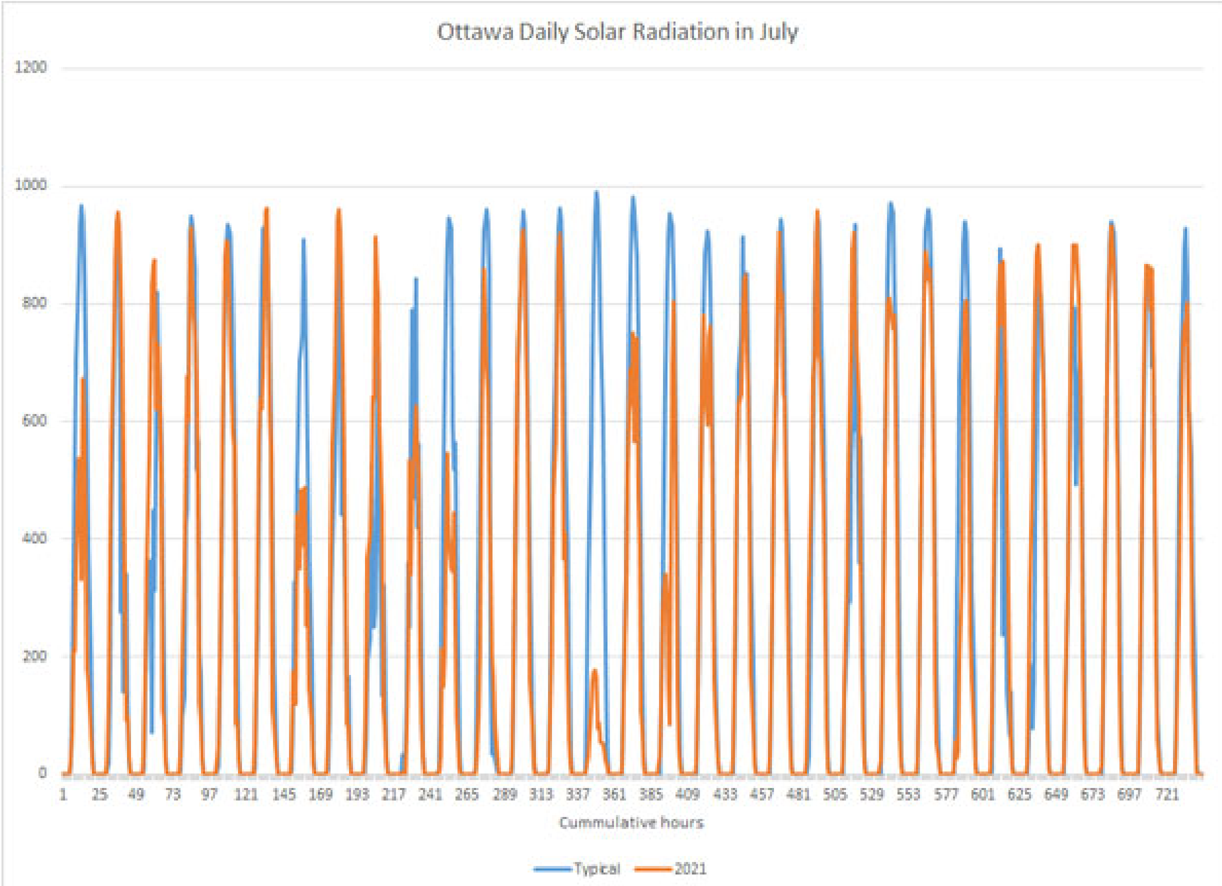


Figure 4. Comparison of 2021 solar radiation (orange) to typical (blue) during July (shown as cumulative hours from July 1 to July 31) at Tribune 6NE (top graph) and Ottawa 2SE (bottom graph). Source: Kansas Mesonet and the National Solar Radiation Database.

What is the impact on final yield?

Yield impact will depend on the timing of stress. From early dent stage to physiological maturity, the overall duration of grain filling is around 33 days (depending on environmental and plant factors; Table 1).

- If the stress takes place early during the dent stage (R5 stage), the final dry matter in the kernel is only at about 45% (kernels with 60% moisture).
- If the stress occurs a week after the onset of dent stage (R5.25 stage), the kernel moisture is usually at around 50%, with + 30% of dry matter still to be accumulated until maturity.
- If the stress occurs at mid-point of dent stage (1-2 weeks after early dent; R5.5 stage) or late dent (2-3 weeks after early dent; R5.75), then the overall impact on dry matter accumulation until maturity will be relatively small, ranging from 3-10%.

Table 1. Growth stages, moisture content, and total dry matter progression for corn from late

to physiological maturity. Table from K-State Research and Extension publication MF3305 (Ciampitti, Elmore, Lauer, 2016).

R Stage	Moisture %	Dry Matter (% of Total Dry Weight)	Average per Substage: Growing Degree Days, °F	Average per Substage: Days
5.0	60	45	75	3
5.25 (¼ milk line)	52	65	120	6
5.5 (½ milk line)	40	90	175	10
5.75 (¾ milk line)	37	97	205	14
6.0 (Physiological maturity)	35	100		

[1]Abendroth, L.J., R.W. Elmore, M.J. Boyer, and S. K. Marlay. 2011. *Corn Growth and Development*. PMR 1009. Iowa State Univ. Extension. Ames Iowa.

The timing of stress influences the final accumulation of dry matter, affecting kernel size. Common values range of kernels per bushel range from 75,000 to 80,000 for favorable, 85,000 to 90,000 for average, and 95,000 to 105,000 for poor grain filling conditions. An example of the potential impacts for extreme cases (average vs. favorable filling) is presented below, but these estimations depend on the total number of ears affected by this issue.

Example:

Ears per acre: (30-inch rows), 24,000 ears per acre

Kernels per ear = 650 kernels;

Kernels per acre = 15,600,000 kernels per acre

Kernels per bushel:

- Average filling = 15,600,000 kernels per acre ÷ 90,000 kernels per bushel = 173 bu/acre
- Favorable filling = 15,600,000 kernels per acre ÷ 80,000 kernels per bushel = 195 bu/acre

At this point, scouting fields will be important in order to check for the integrity of the ear shanks and to explore potential issues affecting harvest operations (e.g., presence of ears on the ground).

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2. New publication on selecting the optimal wheat variety

In recent years, wheat producers are faced with an increasing number of varieties from which to choose. Producers can use different tools and publications to study each variety's strengths and weaknesses, selecting varieties that best match their needs.

A new publication from K-State Research and Extension aims to help producers chose wheat varieties that should perform well for various regions, soil types, weather, production systems, insect and disease pressure, maturity, and to meet the needs of millers and bakers.

This comprehensive resource is part of a new outreach program called Kansas Wheat Rx and is a partnership between Kansas Wheat and K-State Research and Extension to share the latest research recommendations for high-yielding and high-quality wheat to Kansas wheat farmers.

You can access this publication at: https://bookstore.ksre.ksu.edu/pubs/MF3587.pdf

Figure 1. Producers in Kansas have many wheat varieties to evaluate. Photo by Romulo Lollato, K-State Research and Extension.

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3. 2021 Wheat Variety Disease and Insect Rating publication

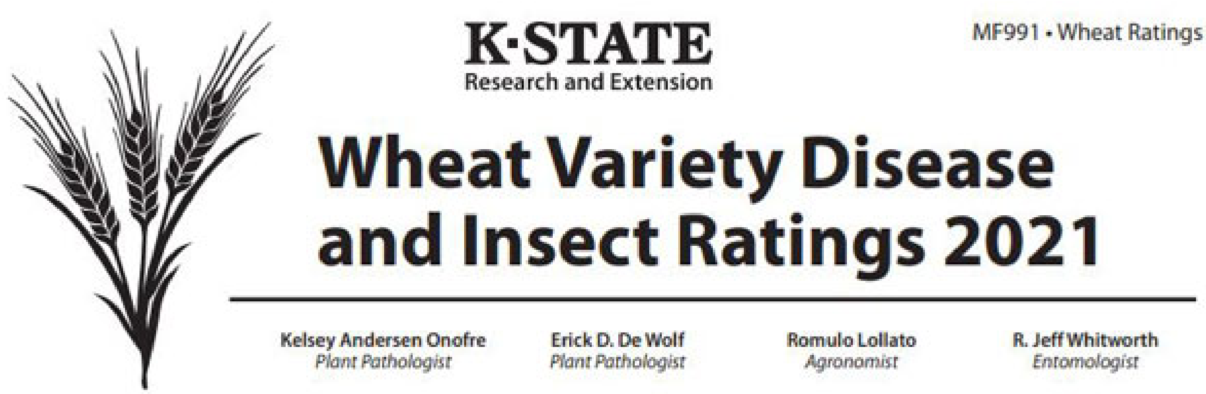
Variety selection is one of the most important decisions that a grower can make to ensure success on their farm. Now is the time when wheat producers across Kansas are reviewing yield data and making decisions about the varieties they will plant in the fall. Although yield is always a top priority, disease and insect resistance, along with appropriate agronomic traits, can buffer against crop losses. In addition, genetic resistance to diseases and insect pests can be the most effective, economical, and environmentally sound method for control.

Wheat Variety Disease and Insect Ratings 2021, from K-State Research and Extension, has now been released for this year. Agronomic characteristics, disease, and pest resistance information is included, as well as profiles that highlight some more common or new varieties for the state of Kansas.

Updates this year include the addition of variety profiles for varieties KS Hatchett, Rockstar, WB4699, and SY Wolverine, as well as disease, insect, and agronomic ratings for several other new varieties. As many producers are looking for tools to manage weed pressure, we have added additional varieties with Clearfield and CoAXium herbicide resistance traits.

Ratings in this publication represent results from field and greenhouse evaluations by public and private wheat researchers at multiple locations over multiple years.

An electronic version of the *Wheat Variety Disease and Insect Ratings 2021* publication MF991 can be found here: https://www.bookstore.ksre.ksu.edu/pubs/MF991.pdf



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4. Final irrigation of the growing season - Timing is everything

As the growing season wraps up, producers have an opportunity to improve their water productivity by properly timing their final irrigation application. This is an important decision as an early termination of irrigation can result in reductions in grain yield, primarily through reductions in the kernel weight yield component. Conversely, a late termination of irrigation results in unnecessary pumping, energy consumption, and increasing the risk of soil compaction at harvest due to increased soil water and the risk of water loss through drainage.

With the goal of matching available water to crop needs while avoiding excess, it is important to understand crop water use requirements late in the growing season. Anticipated water use from various growth stages until physiological maturity for corn, grain sorghum, and soybeans is shown in Table 1.

Table 1. Anticipated water use for corn, grain sorghum, and soybeans at various growth stages.

Stage of Growth	Approximate number of days to maturity	Water use to maturity (inches)
Corn		
Blister	45	10.5
Dough	34	7.5
Beginning dent	24	5
Full dent	13	2.5
Black layer	0	0
Grain Sorghum		
Mid bloom	34	9
Soft dough	23	5
Hard dough	12	2
Black layer	0	0
Soybeans		
Full pod	37	9
Beginning seed	29	6.5
Full seed	17	3.5
Full maturity	0	0

Adapted from K-State MF2174, Rogers and Sothers.

Research in western Kansas has shown the importance of keeping the management allowable depletion limited to 45% during the post-tassel period. In other words, maintaining available soil water contents above 55%. By knowing anticipated water use from a given growth stage and the remaining soil water in the profile, producers can add just enough irrigation water to meet that demand and maintain profile available soil water content above 55%.

By closely following the growth and development of the crop, one can know when physiological maturity, i.e. black layer in corn, has been reached and at that point water use for the production of grain yield has ceased and additional irrigation is certainly unnecessary.

Termination Based on Calendar Dates

Traditionally many producers have used a fixed calendar date to determine their final irrigation. Long-term studies conducted at the Northwest Research-Extension Center at Colby show the potential problems in this approach. Table 2 shows silking, maturity, and irrigation termination dates for a long term study in corn. Over the course of this study, the irrigation termination date for maximum grain yield varied from August 12 to September 21. This is a significant departure from a general rule of thumb using Labor Day as a termination date. As shown, the use of a fixed date on the calendar without regard to crop progress, soil water status, or ET demand would have resulted in both forfeited yield and wasteful pumping across this timeframe.

Table 2. Silking, maturity, and irrigation termination dates for a long-term study in corn.

Year	Date of Anthesis	Date of Maturity	Irrigation Season Termination Date For		
			80% Max Yield	90% Max Yield	MaxYield
1993	20-Jul	30-Sep	5-Aug	5-Aug	15-Aug
1994	20-Jul	15-Sep	5-Aug	15-Aug	15-Aug
1995	20-Jul	29-Sep	5-Aug	13-Aug	18-Aug
1996	20-Jul	3-Oct	17-Jul	17-Jul	29-Aug
1997	23-Jul	1-Oct	23-Jul	23-Jul	27-Aug
1998	20-Jul	28-Sep	20-Jul	20-Jul	24-Aug
1999	23-Jul	6-Oct	24-Jul	13-Aug	20-Sep
2000	12-Jul	20-Sep	14-Sep	20-Sep	20-Sep
2001	16-Jul	29-Sep	30-Jul	22-Sep	22-Sep
2002	22-Jul	30-Sep	4-Aug	30-Aug	7-Sep
2003	22-Jul	23-Sep	3-Aug	3-Aug	18-Aug
2004	19-Jul	28-Sep	8-Aug	21-Aug	27-Aug
2005	20-Jul	28-Sep	2-Aug	9-Aug	29-Aug
2006	17-Jul	25-Sep	30-Jul	13-Aug	13-Aug
2007	18-Jul	19-Sep	14-Aug	21-Aug	28-Aug
2008	24-Jul	10-Oct	31-Jul	6-Aug	27-Aug
Average	**19-Jul**	**27-Sep**	**2-Aug**	**13-Aug**	**28-Aug**
Standard Dev.	**3 days**	**6 days**	**13 days**	**19 days**	**13 days**
Earliest	**12-Jul**	**14-Sep**	**17-Jul**	**17-Jul**	**12-Aug**
Latest	**24-Jul**	**10-Oct**	**14-Sep**	**21-Sep**	**21-Sep**

* *Estimated dates are based on the individual irrigation treatment dates from each of the different studies when the specified percentage of yield was exceeded.*

Consequences of Excess Late-Season Irrigation

In the silt-loam soil profiles common in western Kansas, water drainage out of the soil profile starts to occur when the profile water content rises above 60% available soil water. The rate of drainage loss increases rapidly with increasing water content. Late-season irrigation in excess of crop water use results in increased accumulation of water in the profile, which is subject to drainage losses. A survey of irrigated corn fields was conducted in 2010 and 2011 (Figure 1). Fields were surveyed after corn harvest across three east-west transects in western Kansas.

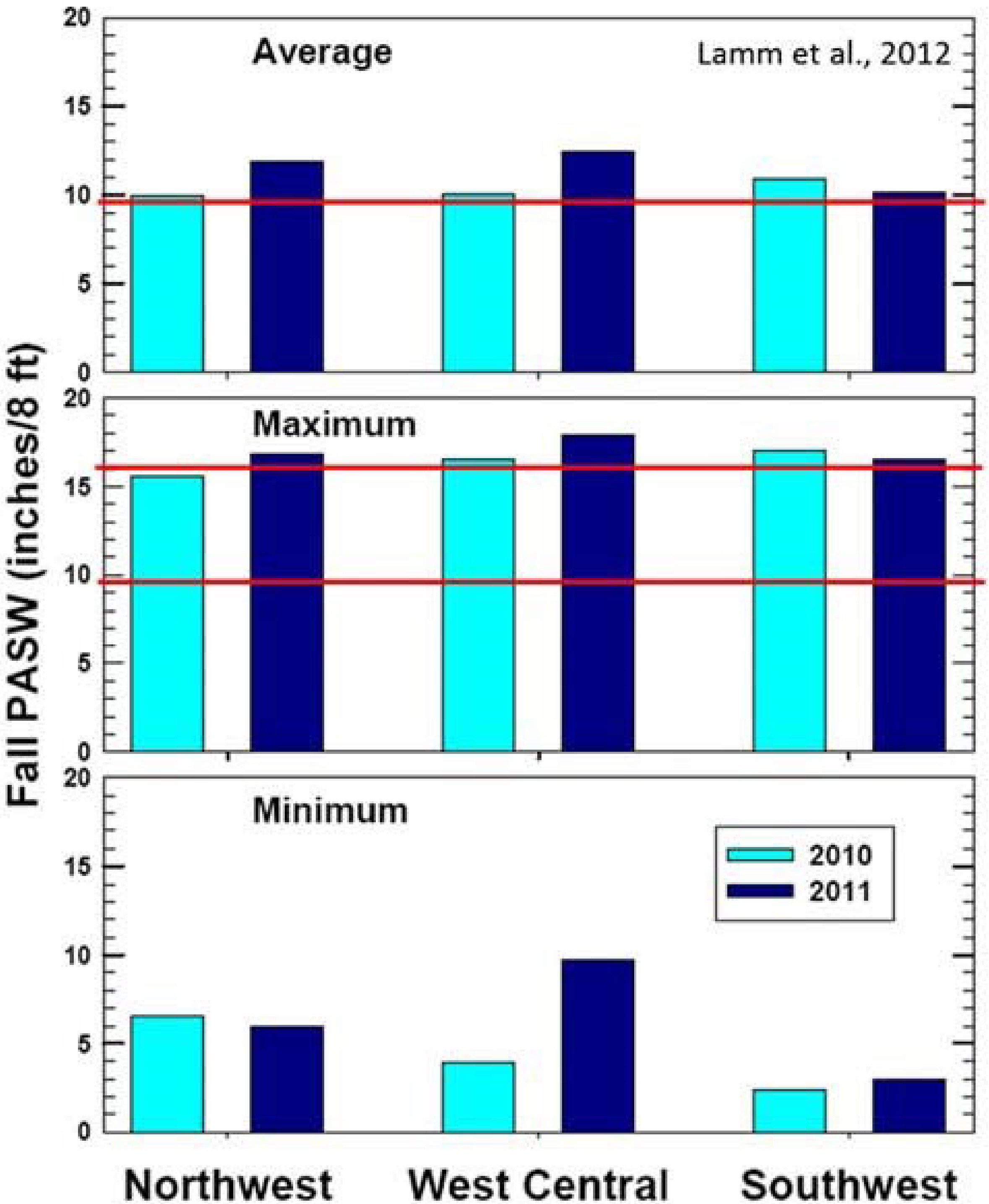

Figure 1. Results from 2-year survey of irrigated corn fields. Fields were surveyed after harvest across three east-west transects in western KS.

The line at 9.6 inches of plant-available soil water (PASW) denotes the approximate water content where drainage losses would start to occur. On average, most producer fields were near this level of soil water storage indicating a good management strategy as drainage losses had been minimized while yet maintaining adequate soil water to complete grain fill.

Producer fields near the minimum observed values likely did not have adequate soil water to ensure maximum grain yields. The most concerning scenario however, are the fields at the upper end of soil water values such as the maximum observation. The red line at 16 inches PASW represents field capacity, the point at which free drainage and significant water losses from the profile would occur. In the wettest producer fields, in all three regions, significant amounts of free drainage and water loss would have been occurring at the time of crop maturation and harvest.

Timing of the final irrigation:

1. Determine crop growth stage and anticipated remaining water use
2. Determine soil water status in the field by probe or calibrated soil sensor technology
3. Determine irrigation strategy necessary to meet remaining crop water use while maintaining soil water content at or above 55% (limit depletion to 45%).
4. Be ready to make adjustments based on changes in ET demand, precipitation, etc.

Additional information, including a step-by-step procedure, can be found in publication MF2174: "Predicting the final irrigation for corn, grain sorghum, and soybeans"; http://www.bookstore.ksre.ksu.edu/pubs/MF2174.pdf

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5. Update on insect activity in alfalfa - Fall armyworms, armyworms, and alfalfa caterpillars

High forage yields and great forage quality are characteristics that growers desire in their alfalfa fields. However, producers are often focused on the weather to harvest hay or occupied with other farm duties that we do not pay attention to the details. Worms are one of these details that need to be considered this time of the year.

Worms have been voraciously feeding throughout at least the eastern 2/3 of Kansas for about the last 3 weeks. However, they have only recently gotten large enough to cause considerable damage and become a concern. The main problem in alfalfa seems to be a combination of fall armyworms (Figure 1), armyworms (Figure 2), and somewhat surprising, alfalfa caterpillars (Figure 3). Their appetite can cost you one harvest if an action is not quickly taken (Figure 4).

Figure 1: Fall armyworm. Photo credit: K-State Entomology

Figure 2: Armyworm. Photo credit: K-State Entomology

Figure 3: Alfalfa caterpillar. Photo credit: K-State Entomology

Figure 4: Alfalfa field after an intense worm defoliation. Photo by Bruno Pedreira, K-State Research and Extension.

Alfalfa caterpillars are usually quite common in alfalfa and soybeans, however, not at the densities detected this year. Alfalfa caterpillars pupate then emerge as the common yellow (Figure 5) or white butterflies usually seen flying around alfalfa and soybean fields.

Regardless of which larval species, it is apparent that the majority of the larvae are relatively mature and thus will be/or are pupating soon. Pupation will probably take 4-5 days, then the adults will emerge, mate, and start depositing eggs. These eggs will hatch and then in 4-7 days the new, but very small, larvae will start the feeding process all over again. Armyworms will attack mainly grasses, i.e. brome, late-planted sorghum, wheat, etc. Alfalfa caterpillars will mostly stay in alfalfa or soybeans, before they get too mature, and fall armyworms may feed on just about any crop. However, sorghum should only be susceptible to "headworms" from flowering until soft dough.

All three species may have at least one more generation, if not more, until a hard freeze puts a stop to them. The most important point is to keep scouting your field to identify their presence before significant damage, thus avoiding large yield losses.

Figure 5: Adult alfalfa caterpillar. Photo credit: K-State Entomology

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6. Grasshopper pressure is increasing in western Kansas

Weather patterns can have a significant impact on grasshopper populations from year to year. Hot, dry summers increase survival of nymphs and adult grasshoppers, leading to increased egg production during the growing season. Cool, wet weather promotes fungal pathogens that can reduce egg and nymph survival, but if the following spring is warm and wet, egg hatching will increase and more nymphs survive. So, several years of hot, dry summers followed by warm, wet springs can eventually lead to large populations of grasshoppers in some regions.

As the weather in western Kansas continues to be hot and dry this summer and areas of drought increase, larger populations of grasshoppers going into the fall season could be possible. This year's USDA Rangeland Grasshopper Hazard map may explain the recently observed buildup of grasshoppers along field edges and in grassy areas (Figure 1). As non-crop sources of food are exhausted, grasshoppers will shift their grazing over to anything still growing in the landscape. In areas with greater grasshopper pressure seedling alfalfa and wheat could be at risk.

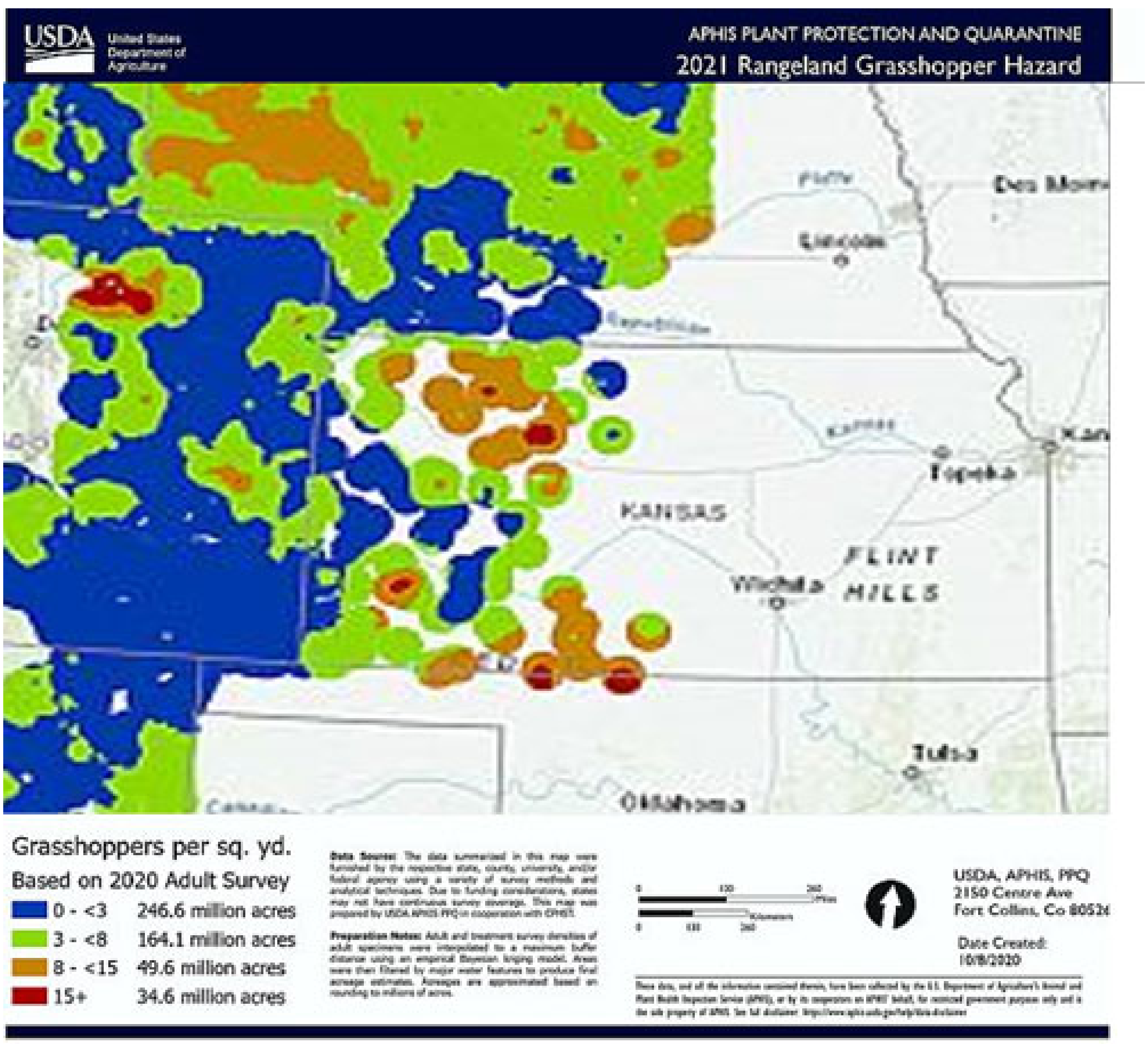

Figure 1. Areas shaded in orange and red could experience increased grasshopper pressure through this fall.

Treatment thresholds

Before planting alfalfa, treatment should be considered if there are 15 or more grasshoppers per square yard around the planting area. Once planted and growing, consider treatment if 3-5 grasshoppers per square yard are found in the seedling alfalfa stand.

Vegetated borders around areas where wheat will be planted should be scouted 10 days before planting. Consider treating those borders if there are 7 to 12 grasshoppers per square yard. Once growing, 3 or more grasshoppers per square yard within the field can destroy seedling wheat stands.

If grasshopper populations are low to moderate, seed treatments can protect emerging wheat plants for several weeks if products are applied at the highest registered rate. Seed treatments will be less effective under severe grasshopper pressure. Avoid planting too early as this will help reduce the time that wheat will need to be protected.

In either crop, depending on the products used and severity of the season's grasshopper buildup, multiple applications might be necessary. Please refer to the most recent Alfalfa and Wheat Insect Management Guides for specific control information.

Alfalfa Insect Management Guide: http://www.bookstore.ksre.ksu.edu/pubs/MF809.pdf

Wheat Insect Management Guide: http://www.bookstore.ksre.ksu.edu/pubs/mf745.pdf

Source of map in Figure 1: https://www.ars.usda.gov/plains-area/sidney-mt/northern-plains-agricultural-research-laboratory/pest-management-research/pmru-docs/grasshoppers-their-biology-identification-and-management/outbreak-and-survey-info/outbreak-and-survey-info/

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7. Fall weather outlook for Kansas and the science behind the predications

Highlights

- Fall is a transition season: cooling temperatures and decreasing normal rainfall daily.
- Warm east Pacific and Atlantic Ocean waters will affect weather.
- Current ENSO neutral conditions are forecasted to decrease towards La Niña - often a dry pattern for Kansas.
- The current September-November forecast from the Climate Prediction Center calls for increased potential of warmer temperatures and below normal precipitation.

The science behind the fall outlook

The fall weather outlook can be complex and is reliant on many various patterns across the globe. Many changes in regions outside the United States influence our persistent patterns. However, it only takes one storm system, or wiggle in the pattern, to have a pronounced impact on Kansas weather. In recent memory, 2018 was extremely dry for Manhattan (and across the east Kansas) - however, two significant rain events (one in September and October) triggered flooding and changed the course of not only the fall, but also set the stage for the wet conditions into 2019.

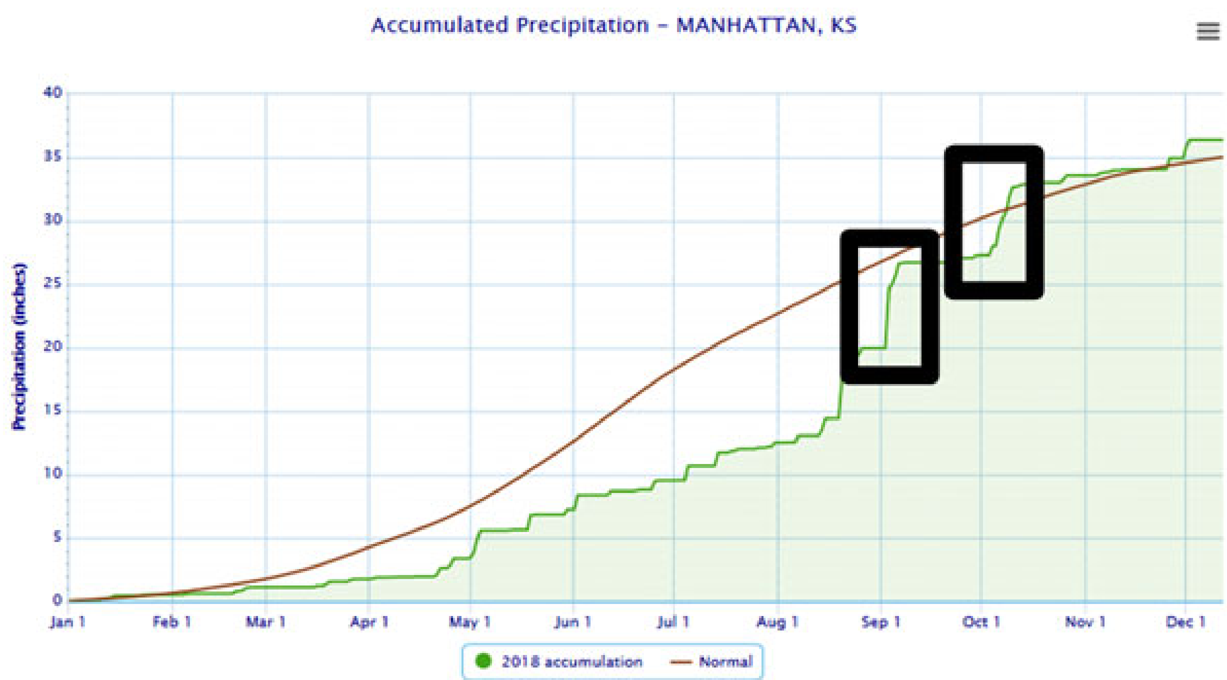

Figure 1. Manhattan precipitation in 2018 (green) compared to normal (brown line) with the two significant rain events in September and October highlighted. Source: XMACIS.

We can take guidance on the existing patterns of late summer and use them to project what may happen during the transition between summer and winter. Ocean temperatures not only have an implication on ENSO (El Niño or La Niña, explained in next section), but also provide input from other trends.

Warm Atlantic: First, of interest is the area highlighted in black in Figure 2. These Atlantic waters are above normal temperature-wise and have already led to one of the most active hurricane seasons to date. This trend is expected to continue. Unfortunately, these tropical storms don't often provide direct impacts to Kansas. These storms usually develop high pressure and subsidence around them which depending on where they persist, can create warm/dry conditions in adjacent areas. While not completely telling, an active season would not be overly conducive to fall moisture in the central Plains as forecast models are suggesting (Figure 3).

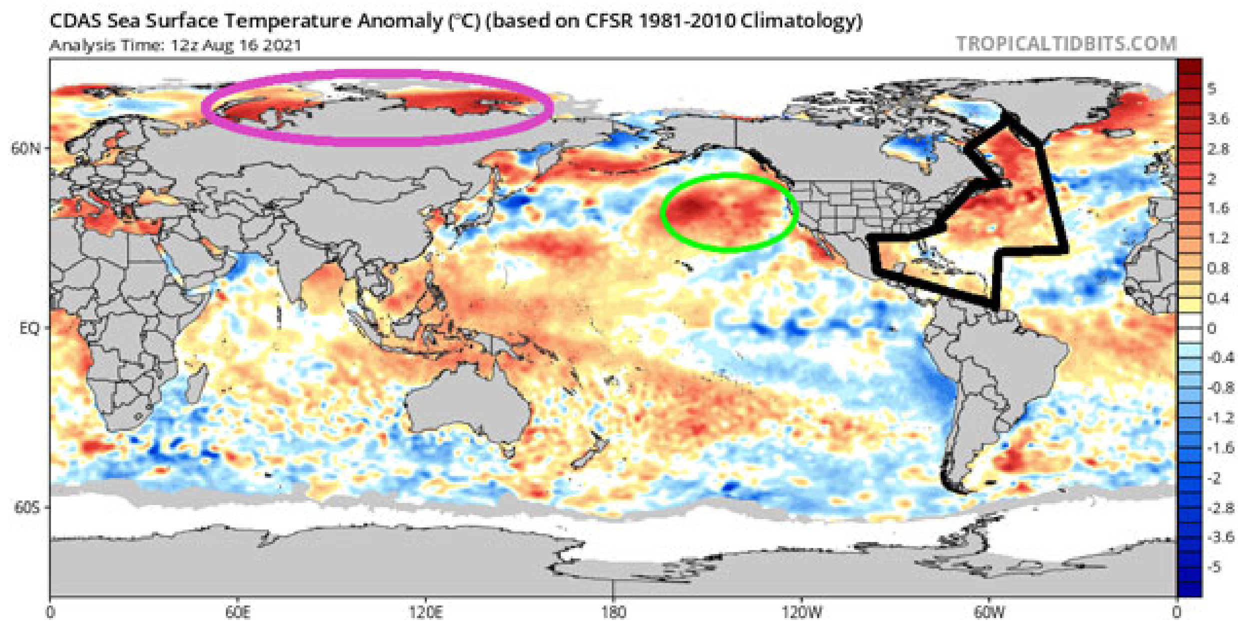

Figure 2. Sea surface temperature anomalies (warmer than normal in shades of red) across the globe. Highlighted are the Atlantic warm waters (black), the Arctic hot waters (purple) and the east Pacific warm waters (green). Source: TropicalTidbits.com

Warm east Pacific: Another area of focus is the eastern Pacific where warmer waters have redeveloped over the past few months (green circle, Figure 2). When warm water resides in this region, the active jet stream is shifted northward. This often results in storm systems being injected further south over central/east US and colder-than-normal temperatures. However, when combined with the previous Atlantic state, this could lead to broad ridging (high pressure) across much of the US. This would then imply warmer and drier-than-normal conditions across much of the continental US as models are also suggesting (Figure 3).

Warm Arctic waters: A trend of recent years, the drastic reduction of Arctic sea ice has allowed for a negative feedback cycle of warmer waters (purple highlight, Figure 2) and warmer temperatures. While this doesn't directly impact Kansas fall weather, it could have later implications on the Arctic Oscillation (AO) and the North Atlantic Oscillation (NAO). Warmer-than-normal conditions tend to imply a negative condition of the AO and NAO which often drive hurricanes up the East Coast and allow a higher amplitude storm track (periods of warm/cold with heavy rain events instead of a prolonged warm or cold period). While that may help Kansas' moisture chances into early winter, combined with especially the warm east Pacific, it may track a majority of the rainfall further east (as hinted in the forecast models - especially in October, Figure 3).

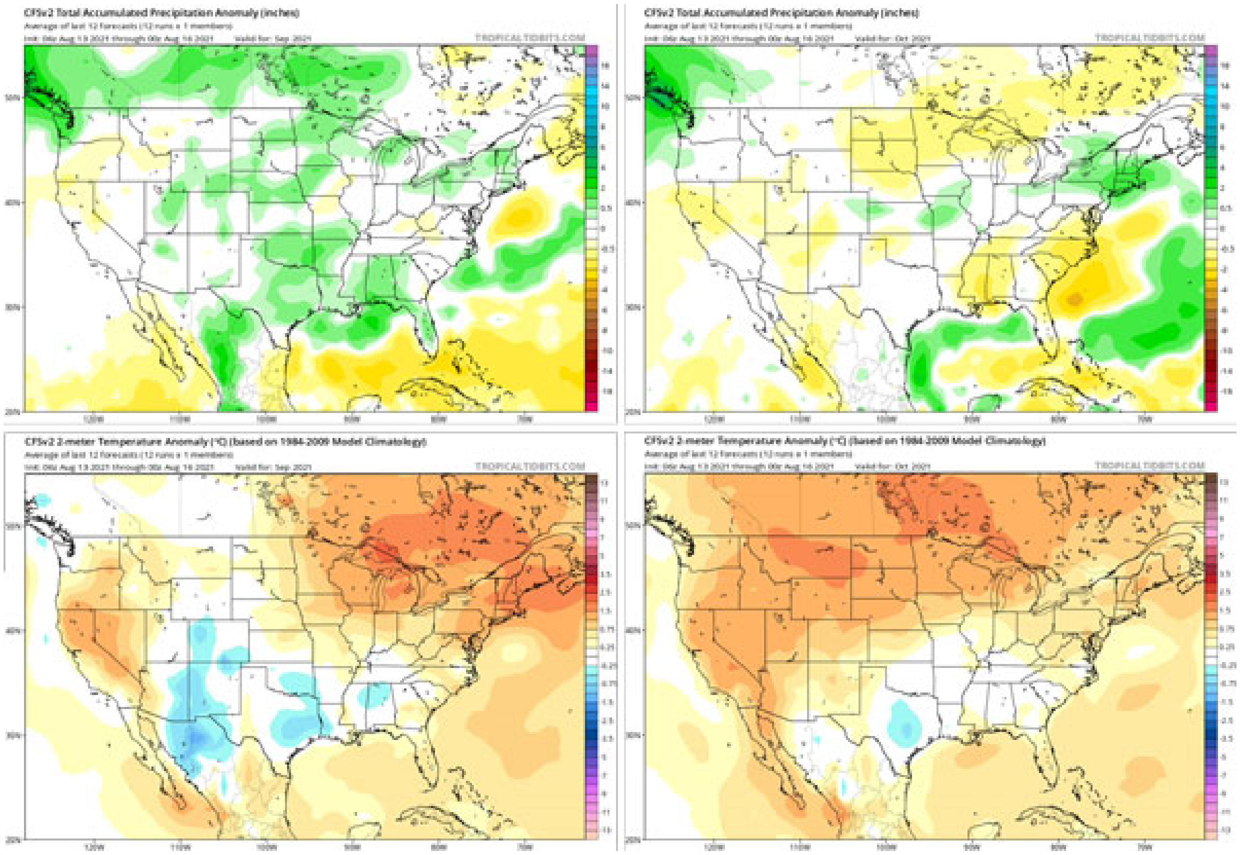

Figure 3. Climate Forecast System monthly forecasts for September (left) and October (right); precipitation (top) and temperature (bottom). Source: Tropicaltidbits.com

The El Niño Southern Oscillation

The El Niño Southern Oscillation (ENSO) was in the negative (La Niña) state until the May-July period when it went neutral. However, conditions in the Pacific are changing, and a La Niña watch has been issued. The most recent ONI (Oceanic Niño Index) for the May, June, July (MJJ) period is -0.4 degrees Celsius, which is just above the La Niña threshold of -0.5 degrees Celsius. However, the weekly update from August 11 shows a negative pattern in the anomalies across the equatorial Pacific. The outlook favors continued neutral conditions during the summer, with a 60 percent chance of a La Niña by autumn.

A La Niña event typically brings warmer and drier-than-normal conditions to the Plains during the late summer and early fall. The first map (Figure 4) shows the normal precipitation in Kansas for the September to November period, while the second (Figure 5) shows the September to November precipitation anomalies during La Niña events.

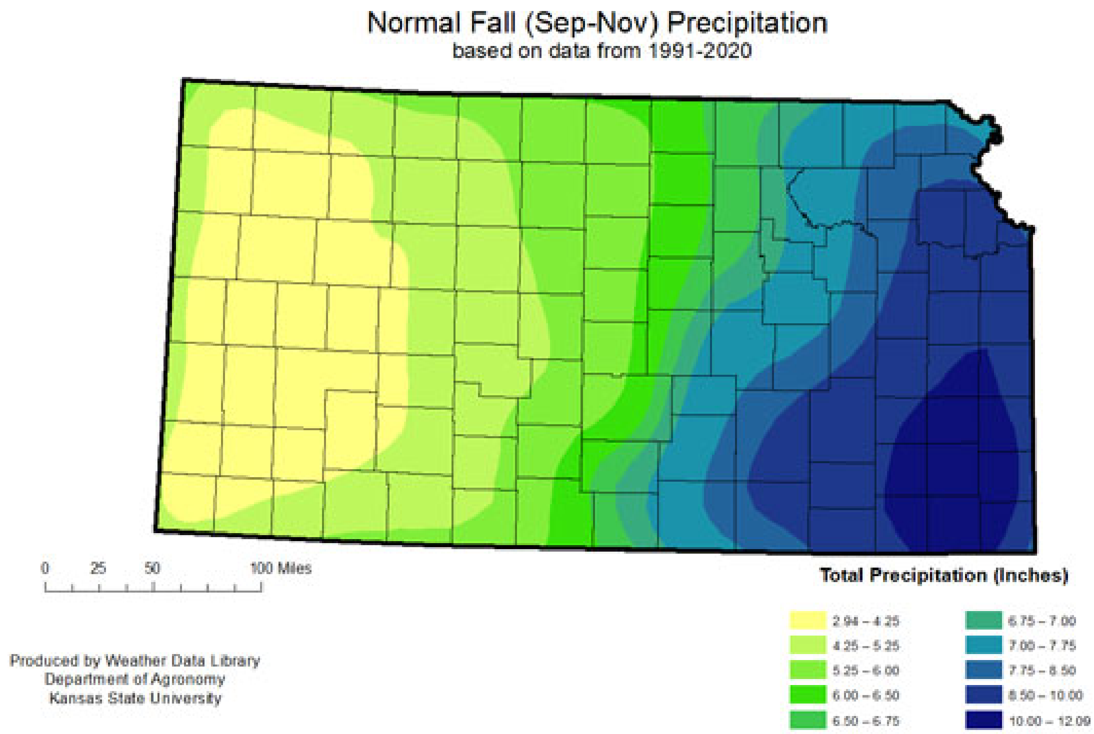

Figure 4. Normal Precipitation Totals for Sep-Oct-Nov (WDL)

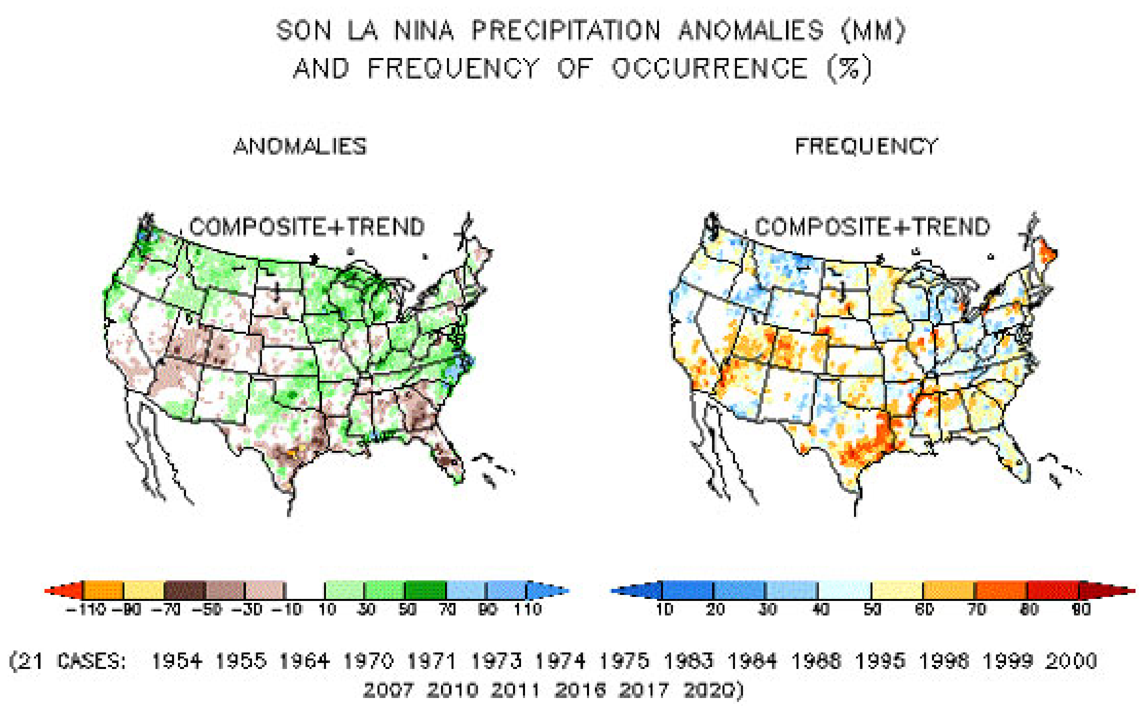

Figure 5. Precipitation Anomalies during La Niña (CPC)

The Climate Prediction Center's long-lead outlooks have the greatest skill when the ENSO is strongly in one phase or another. The outlooks are least reliable when the ENSO is in the neutral phase, as other global circulation features battle for dominance. Historically, summer is a neutral period and serves as the transition between either Nino/Nina or vice versa. However, as summer ends, the probability of a dominant pattern (Nino/Nina) increases as shown below, justifying the CPC's outlooks for this coming late summer and fall (Figure 6).

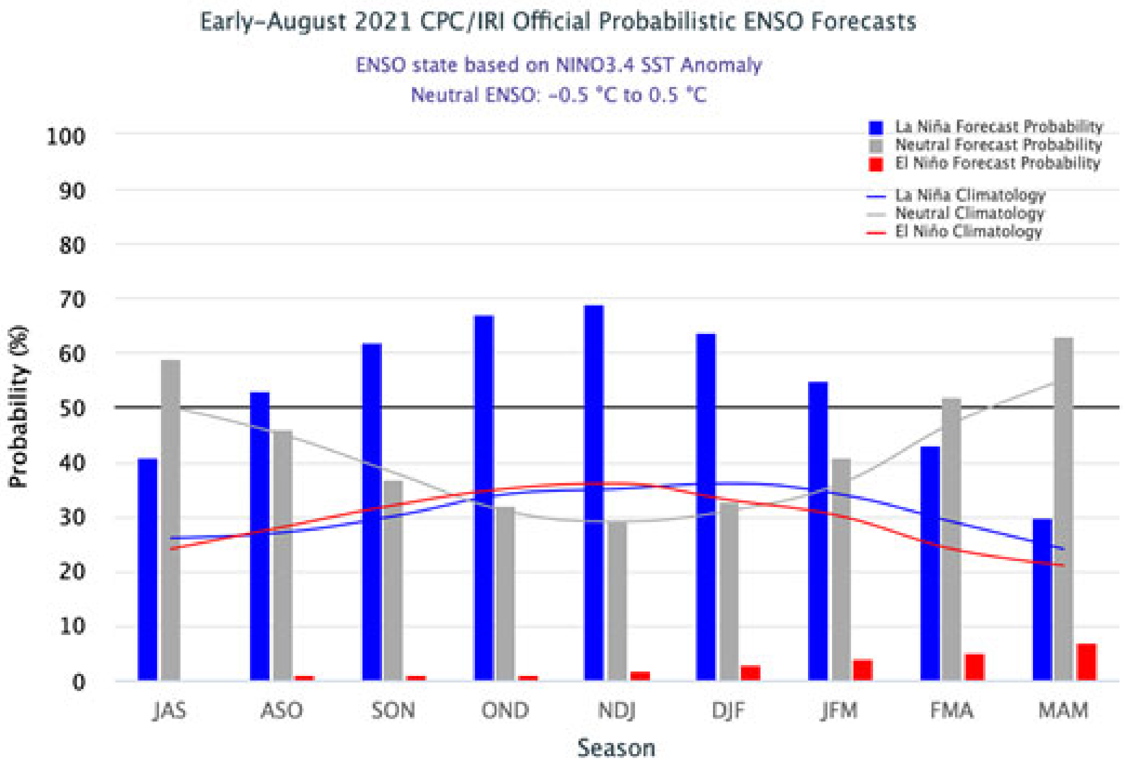

Figure 6. ENSO outlook (CPC)

Fall Outlook for Kansas

So what does it boil down to? Here are the Climate Prediction Center's thoughts on the outlook for fall (September, October and November). They consider all the factors (and more) discussed above and came up with the following (Figure 7):

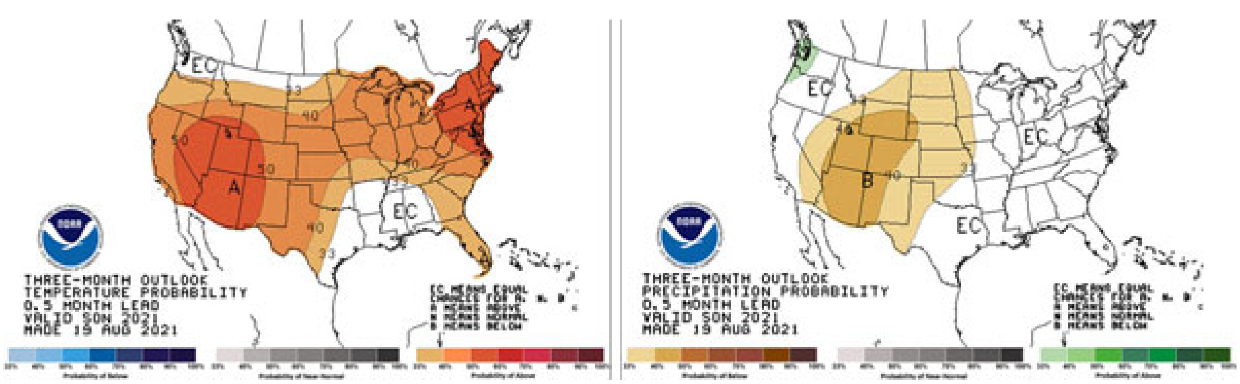

Figure 7. Three-month temperature and precipitation outlooks for Sep-Oct-Nov (temperature on left, precipitation on right). Source: CPC.

While there are higher chances of a warmer-than-normal period and drier than normal - averaging over a three-month period can often dilute a period of anomalous weather. Therefore, one event would not be represented well - such as the few days of heavy rain in 2018. However, trends are definitely supportive of higher chances of drier-than-normal conditions over the three-month period. It is also important to keep in mind that just an increased chance of warmer/drier does not mean that a cooler/wetter or normal period is out of the question - they just have lower probabilities (Figure 8). The probability of warmer weather is at/above 40% for much of the state - a much higher confidence interval than below normal precipitation, which is only slightly hedged above one third probability.

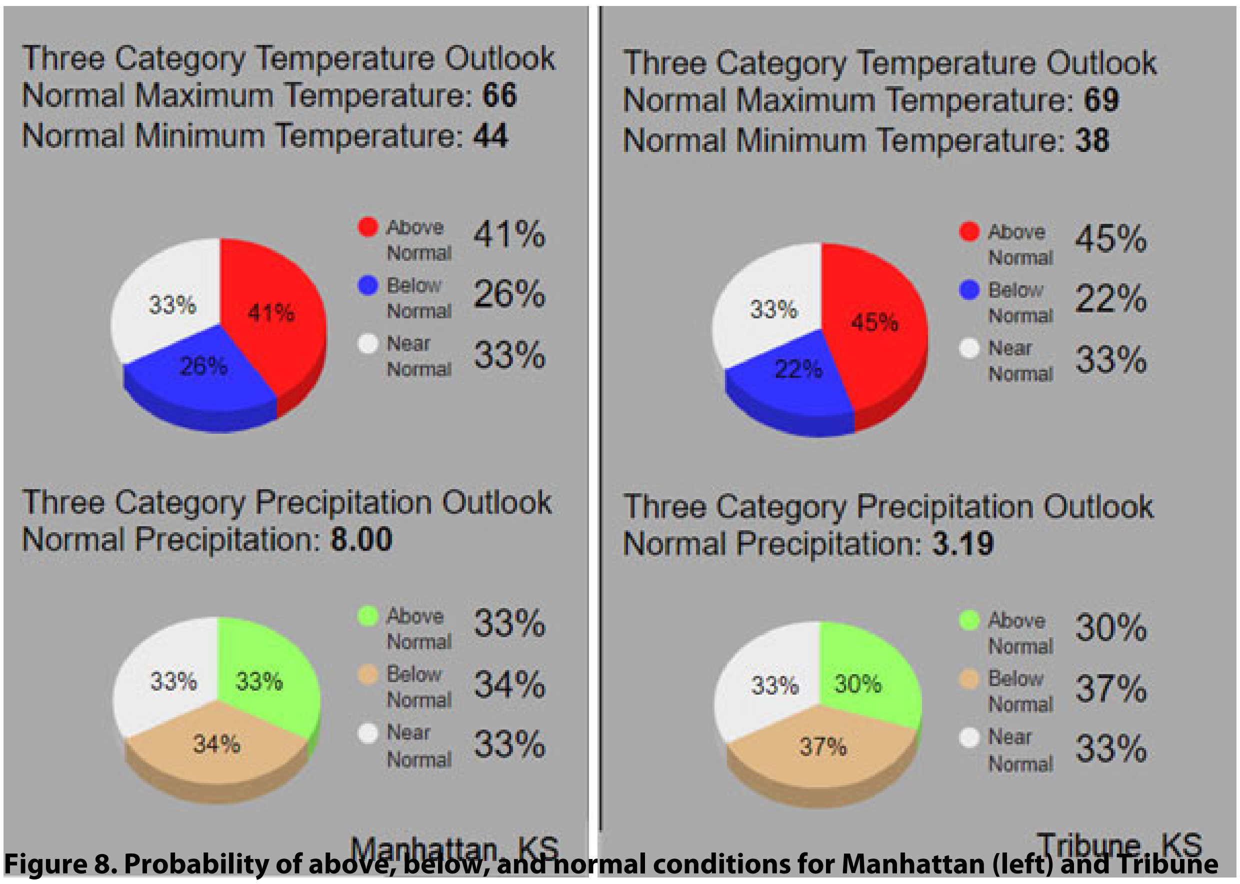

Figure 8. Probability of above, below, and normal conditions for Manhattan (left) and Tribune (right). Source: CPC

Lastly, keep in mind that the coming months are a transition season. During the fall, average temperatures are falling daily and normal precipitation amounts are decreasing as we approach the coldest and driest period of the year for Kansas - winter.

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