Extension Agronomy

eUpdate

08/07/2020

These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

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Kansas State University Department of Agronomy
2004 Throckmorton Plant Sciences Center | Manhattan, KS 66506
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1. Liming prior to fall seeding of alfalfa

Correcting acidic soil conditions through the application of lime can have a significant impact on crop yields, especially for alfalfa. Since seeding alfalfa is expensive and a stand is expected to last for several years, getting lime applied and acidity corrected before seeding is critical. Liming is one of the most essential, but often overlooked, management decisions a producer can make for alfalfa production. Acidic soils can significantly reduce nodule establishment and activity in alfalfa, affecting nitrogen status and overall nutrient and water uptake (Figure 1).

Unfortunately, lime is not always available close to where it may be needed. In many cases, trucking and spreading costs may be more than the cost of the lime itself. Lime quality can also vary widely and no one wants to apply more than is necessary. So to make the best decisions on how much and what kind of lime to apply, it is useful to know how lime recommendations are made.

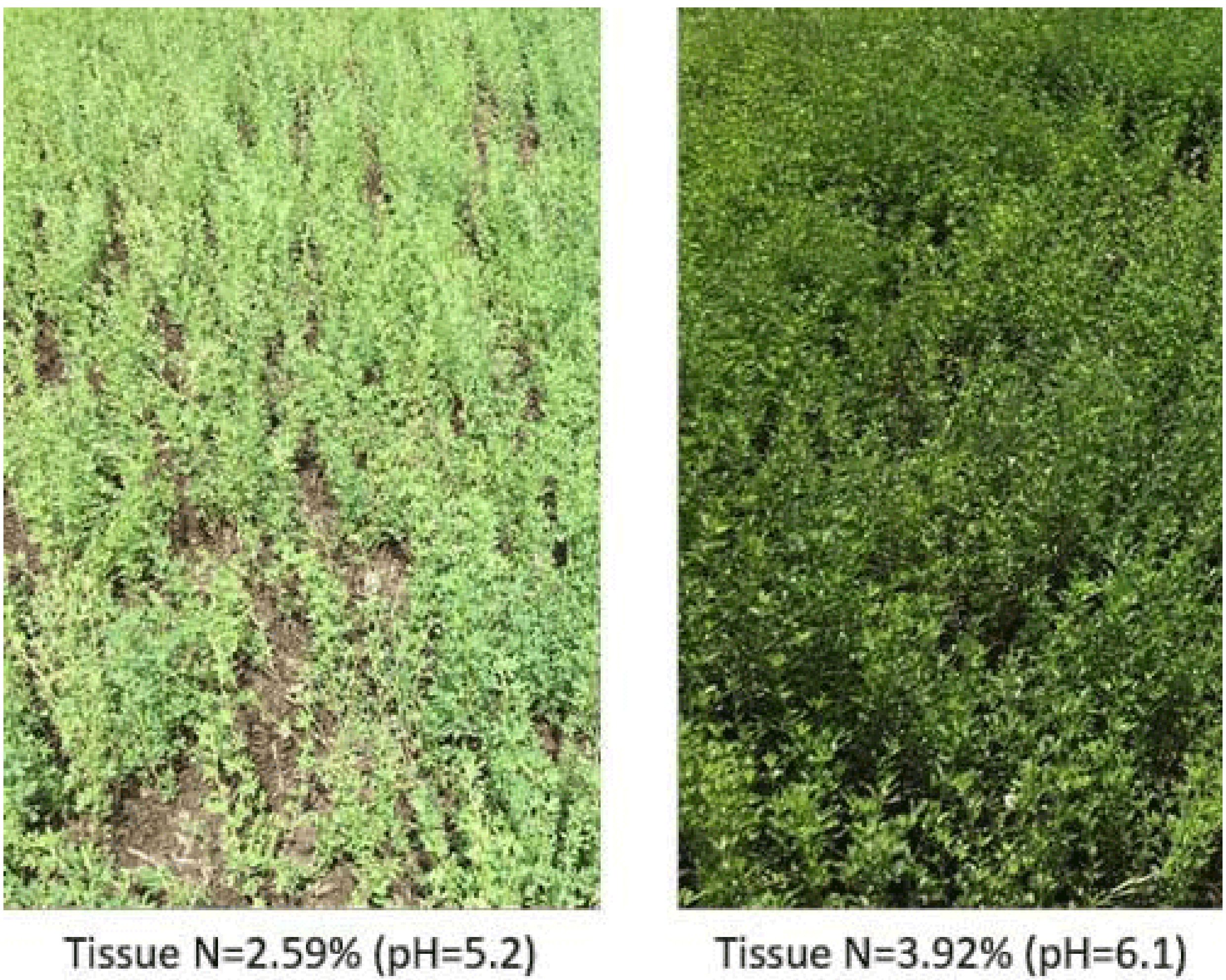

Figure 1. Soil pH affects nodule formation and activity for N fixation in alfalfa, in addition to nutrient availability and uptake. Photo by Dorivar Ruiz Diaz, K-State Research and Extension.

How lime recommendations are made by K-State

A routine soil test will reveal the pH level of the soil, and this will determine whether lime is needed on the field. Generally, east of the Flint Hills, lime is recommended for alfalfa if the pH drops below 6.4, with a target pH for liming of 6.8. In the Flint Hills and west, lime is recommended for alfalfa and all other crops when the pH drops below 5.8, with a target pH of 6.0. Target pH is simply the pH goal once the lime reacts with the soil.

Why is the target pH different for the two areas of Kansas?

They differ because of the pH of the subsoil. East of the Flint Hills, especially south of the Kansas River, the subsoil tends to be acidic, and a higher target pH is used to assure adequate pH conditions in the root zone, and provide sufficient amounts of calcium and magnesium. From the Flint Hills west, most soils have high-pH, basic subsoils that can provide additional calcium and magnesium to meet crop needs.

Determining the soil pH is the first step in determining if lime is needed. However, it does not tell you the amount of lime you need to apply. Soils with more clay and organic matter will have more acidity at a given pH, and will require more lime/ECC (effective calcium carbonate) to reach a target soil pH, than will a sandy soil. This is why two soils may have the same soil pH but have quite different buffer pHs, and different lime requirements.

To make that rate determination quickly in the lab, we use a buffer solution and measure the soil's buffer pH. A buffer is simply a strong salt solution designed to resist change in pH. The buffer is added at a high pH, 7.5, and calibrated so that when it reacts with an acid soil, the pH drops. The lower the buffer pH goes, the more lime will be needed to bring the pH up to the required target pH.

Calculating lime rates

Lime rates are given in pounds of effective calcium carbonate, ECC, per acre. How does that relate to agricultural lime and how much lime to apply? Lime materials can vary widely in their neutralizing power. All lime materials sold in Kansas must guarantee their ECC content and dealers are subject to inspection by the Kansas Department of Agriculture.

The two factors that influence the neutralizing value of aglime are the chemical neutralizing value of the lime material relative to pure calcium carbonate, and the fineness of crushing, or particle size, of the product. The finer the lime is ground, the greater the surface area of the product, the faster it will react, and the faster the neutralizing of the acidity will occur. These two factors are used in the determination of ECC. Expressing recommendations as pounds of ECC allows fine-tuning of rates for variation in lime sources, and avoids under- or over-applying lime products.

Lime sources

Research has clearly shown that a pound of ECC from agricultural lime, pelletized lime, water treatment plant sludge, fluid lime, or other sources is equal in neutralizing soil acidity. Therefore, under most circumstances, the cost per pound of ECC applied to your field should be a primary factor in source selection. Other factors such as rate of reaction (fineness), uniformity of spreading, and availability should be considered, but the final pH change, and subsequent alfalfa growth, will depend on the amount of ECC applied.

Application methods

All lime sources have a very limited solubility. When planting alfalfa, the best performance occurs when lime is incorporated and given time to react with and neutralize the acidity in the soil. When surface-applied and not incorporated, as in no-till systems, the reaction of lime is generally limited to only neutralizing the acidity and raising the pH in the top 2 to 3 inches of soil. Surface applications are adequate in slightly acidic soils, but may not provide as good a soil environment for nodulation and nitrogen fixation in the extremely acid soils.

In no-till or limited-till systems, where no incorporation of lime is planned, lower rates of lime application are normally recommended to avoid over-liming and raising the pH higher than needed in the surface 2-3 inches of soil. Over-liming can also reduce the availability of micronutrients such as zinc, iron, and manganese, and trigger deficiencies in some soils. Current K-State lime recommendations suggest that "traditional" rates designed for incorporation and mixing with the top 6 inches of soil should be reduced by 50 percent when surface-applied in no-till systems, or when applied to existing grass or alfalfa stands.

What about the calcium and magnesium contents?

Most agricultural limes found in Kansas contain both calcium and magnesium, with calcium exceeding magnesium. The exact ratio of these two essential plant nutrients will vary widely. Dolomitic lime (magnesium-containing) and calcitic lime (low-magnesium, high-calcium) provide similar benefits for most Kansas soils.

For more information, see K-State publication *Soil Test Interpretations and Fertilizer Recommendations*, MF-2586: http://www.bookstore.ksre.ksu.edu/pubs/MF2586.pdf

Dorivar Ruiz Diaz, Soil Fertility Specialist
ruizdiaz@ksu.edu

Dave Mengel, Professor Emeritus, Soil Fertility Specialist

2. Status of disease pressure in corn and soybeans

Corn in Kansas is rapidly progressing toward maturity with many fields having reached the hard dough to early dent stage of development. Most necessary fungicide applications have already been made, and there will be minimal returns to fungicide application made after dent. Later planted fields have or are just reaching the critical blister stage of development and should certainly be scouted for fungal disease development, severity, and progress.

Southern rust

Southern rust has been showing up in counties across eastern and central Kansas for the past few weeks (Figure 1). In northeast, north central, and east central Kansas, symptoms can be found in many fields, although most at very low levels. Fungicides will only be profitable prior to R4, if southern rust is moving into the upper canopy on > 30% of plants. Later planted fields that have just pollenated should be carefully scouted until the late soft dough stage of development. Cooler weather this past week may have slowed southern rust development, but scouting efforts should continue.

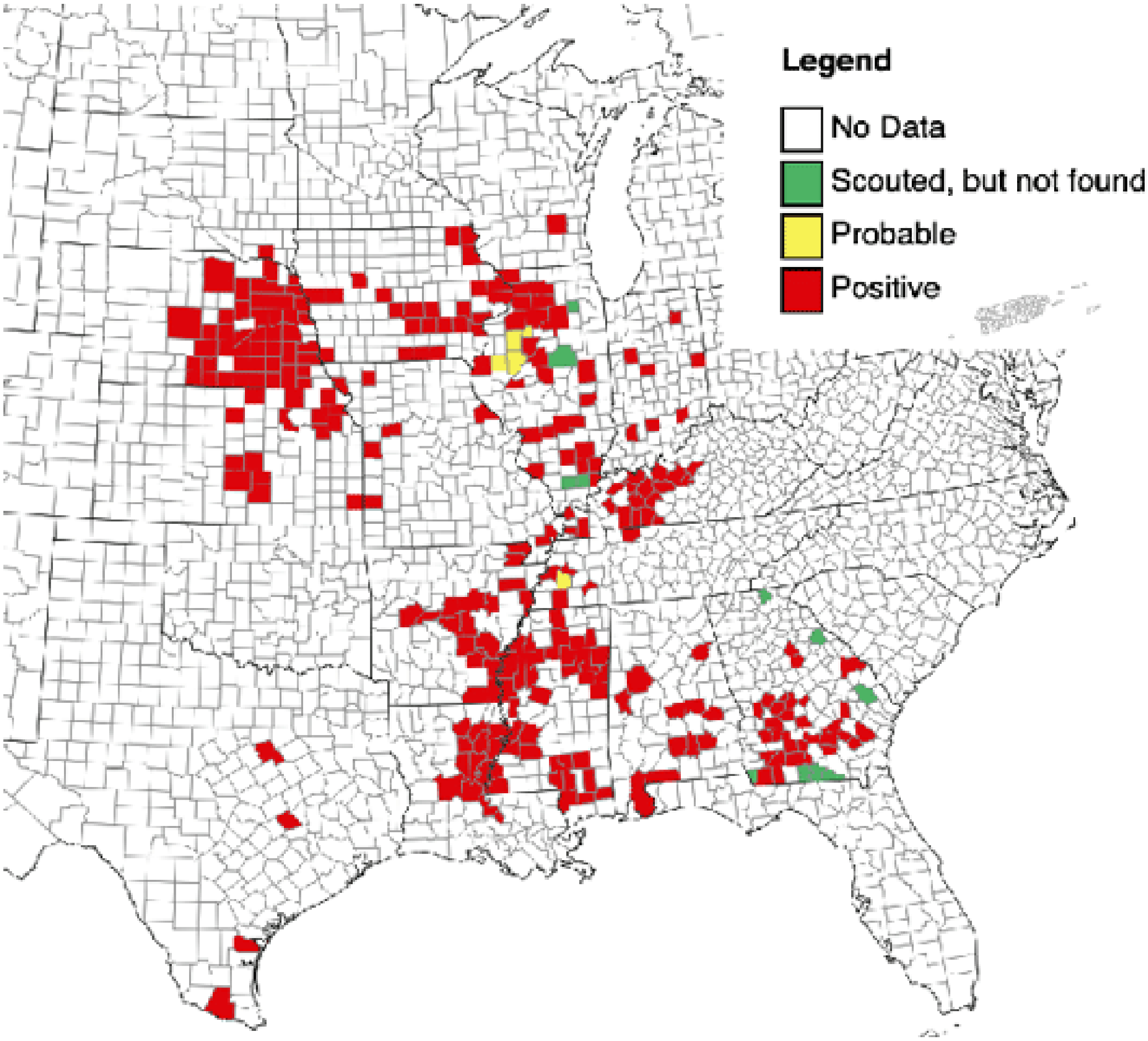

Figure 1. Map of reported southern rust distribution as of August 7, 2020. Map from agpestmonitor.org.

Gray leaf spot

Late fields that are not past R2 should be evaluated for gray leaf spot (Figure 1), as there have been reports of the disease moving into the upper canopy in eastern Kansas. Fields that are in or past the hard dough stage should not be sprayed with fungicides, even if gray leaf spot incidence in high, as this application would not be profitable. The K-State Hybrid Performance Tests and fungicide test plots at the Kansas River Valley Experiment Fields (KRV) at Silver Lake and Rossville have high levels of gray leaf spot, but the crop has already reached dent stage. Gray leaf spot severity is variable between commercial fields. This could be due to fungicide applications, hybrid resistance, or because weather conditions in the field were not conducive for disease development. More information about gray leaf spot can be found here: https://bookstore.ksre.ksu.edu/pubs/mf2341.pdf

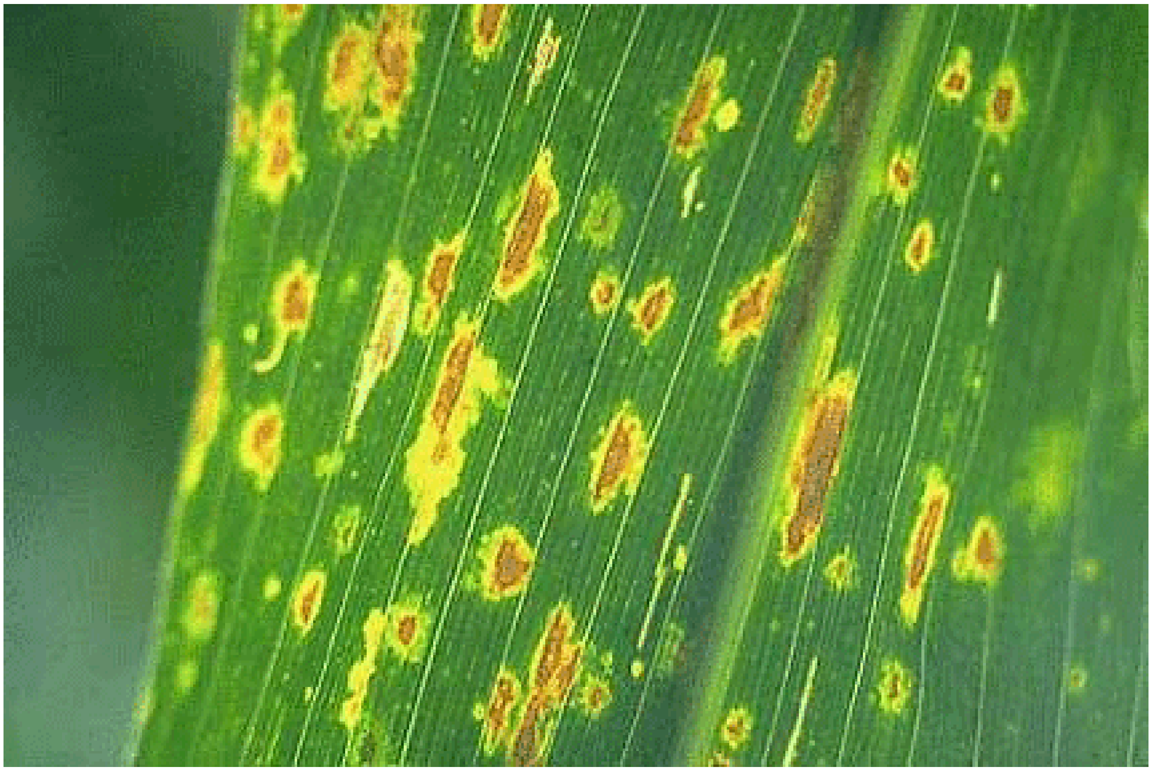

Figure 2. Early development of gray leaf spot lesions showing a distinct yellow halo. Photo by Doug Jardine, K-State Research and Extension.

Stalk rots and top dieback

As corn moves to maturity, stalk rots are starting to be reported. In the K-State irrigated hybrid performance trial in Shawnee County, most hybrids have symptoms of Anthracnose stalk rot. Now would be the time be on the lookout for other stalk rots, such as charcoal rot and Fusarium stalk rot. Wet weather over the last two weeks has been favorable for stalk rot development. Fields with stalk rot should be targeted for early harvest to prevent lodging.

A different symptom of the same disease that causes Anthracnose stalk rot is Anthracnose top dieback (Figure 3). This week, the beginnings of Anthracnose top dieback have begun to show up at KRV. In 2016, top dieback infections resulted in significant yield losses (13+ bu/a) compared to plots treated with fungicides at tasseling and later.

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2004 Throckmorton Plant Sciences Center | Manhattan, KS 66506
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Figure 3. Anthracnose top dieback in irrigated Hybrid Performance trials at the Kansas River Valley Experiment station. Photo by Eric Adee, Kansas State Research and Extension.

Lesion mimic

An unusual symptom has been found in a small number of fields in northeast Kansas, known as corn lesion mimic (Figure 4). This symptom can be confused with disease, but no pathogen has been recovered from the lesions. It is believed that this disorder is genetic. Fungicides will not have any effect on this disorder.

Figure 4. Symptoms of corn lesion mimic, a disorder not known to be caused by a pathogen. Photo courtesy Kansas State Research and Extension.

Soybean disease update

The soybean crop is amazingly healthy at this point and fields are in the R3 to R5 growth stages.

Frogeye leaf spot is just showing up at very low levels in northeast Kansas, with no fields observed with levels of the disease that would warrant a fungicide application. In addition to frogeye leaf spot, there have been a few reports of sudden death syndrome symptoms. Sudden death syndrome is typically most apparent around R3. Symptoms (Figure 5) are the result of infection of the roots by a fungal pathogen. There are seed treatment options for the control of sudden death syndrome at planting, and foliar fungicides should not be used to control this disease.

The predominant diseases spotted in soybeans have been Septoria brown spot and bacterial blight. Bacterial blight is associated with big, blowing thunderstorms that spread bacteria around the field. Fungicides will not be effective on bacterial diseases; however, this disease is not known to be yield limiting.

Septoria brown spot, also known as brown spot, has developed in the lower canopies across the soybean growing region and is often confused with frogeye leaf spot. Brown spot development was favored in dense canopies by warm/hot, moist weather, which promoted sporulation of the pathogen in the primary lesions. Severity increases due to increasing leaf wetness periods of 6 to 36 hours. Conidia are dispersed by wind or splashing rain. The optimum temperature for brown spot development is 77°F, but disease symptoms develop at 60-85°F. Fungicide treatment is effective in controlling brown spot, but rarely, if ever, warranted.

Fungicides for foliar disease problems are rarely warranted at this point of the season. Results from 27 replicated studies conducted from 2007-2019 across northeast and east central Kansas have indicated a positive return on investment by properly applying fungicides to soybeans only 35-40% of the time. Fungicide efficacy ratings for various soybean diseases can be found at: https://cropprotectionnetwork.org/resources/publications/fungicide-efficacy-for-control-of-soybean-foliar-diseases.

Kelsey Andersen, Extension Plant Pathologist
andersenk@ksu.edu

Eric Adee, Agronomist-in-charge, Kansas River Valley Experiment Field
eadee@ksu.edu

Stewart Duncan, Northeast Area Agronomist
sduncan@ksu.edu

3. Summary of the 2020 Kansas wheat growing season

From extreme drought and harsh spring freezes to an almost stress-free growing season; variability is the key word describing the 2020 winter wheat growing season in Kansas. Different parts of the state were exposed to different levels of stresses, resulting in very different crop conditions and yield levels.

Fall drought: Wheat needs (at least some) water to emerge

While the majority of the state started out the 2020 wheat growing season with enough precipitation to get good crop establishment, this was not the case for a large portion of southwest Kansas. Cumulative precipitation between September 1and December 31, 2019 ranged from 0.84 inches in the far southwest corner of Kansas to as much as 18.71 inches in far southeast (Fig. 1, upper panel). The majority of the wheat growing region (namely central and western Kansas) received between 0.84 and about 7.5 inches of precipitation during this period. For southwest Kansas, this precipitation amount represents a deficit of about 3.5 to 6.4 inches as compared to the long-term normal precipitation for that period. With such a limited precipitation amount in the southwest, the wheat crop was not able to germinate and emerge during the fall in approximately eight counties west and south of Finney County. The southwest Kansas crop did not emerge until December 28, 2019 when amounts of up to 1.25 inches of precipitation occurred. This was also true for some late-sown crops in the central portion of the state (Fig. 1, lower panel). While a spring-emerged winter wheat crop can still vernalize and produce grain, its yield potential is about half of a fall-emerged crop; so the wheat season in southwest Kansas already started with a reduced yield potential.

While the remainder of the state had enough precipitation to emerge in the fall, it is important to note that an increasing amount of wheat is double-cropped after a summer crop every year, especially after soybeans in central Kansas and after corn in western Kansas. These cropping systems delay wheat sowing and decrease the time for wheat tillering in the fall. There was a striking difference in fall development as affected by sowing date in the 2020 wheat crop; with early-sown fields attaining up to 6-8 tillers by December while late-sown fields only had the main tiller and perhaps an additional, secondary tiller at the same time. This difference is important because the fall-developed tillers have a greater yield potential than spring-developed tillers. Nonetheless, the winter was mild (average temperature of 34.3 °F as compared to the long term mean 31.8 °F), which allowed the wheat crop to tiller through the winter and somewhat compensate for the delayed sowing in many cases.

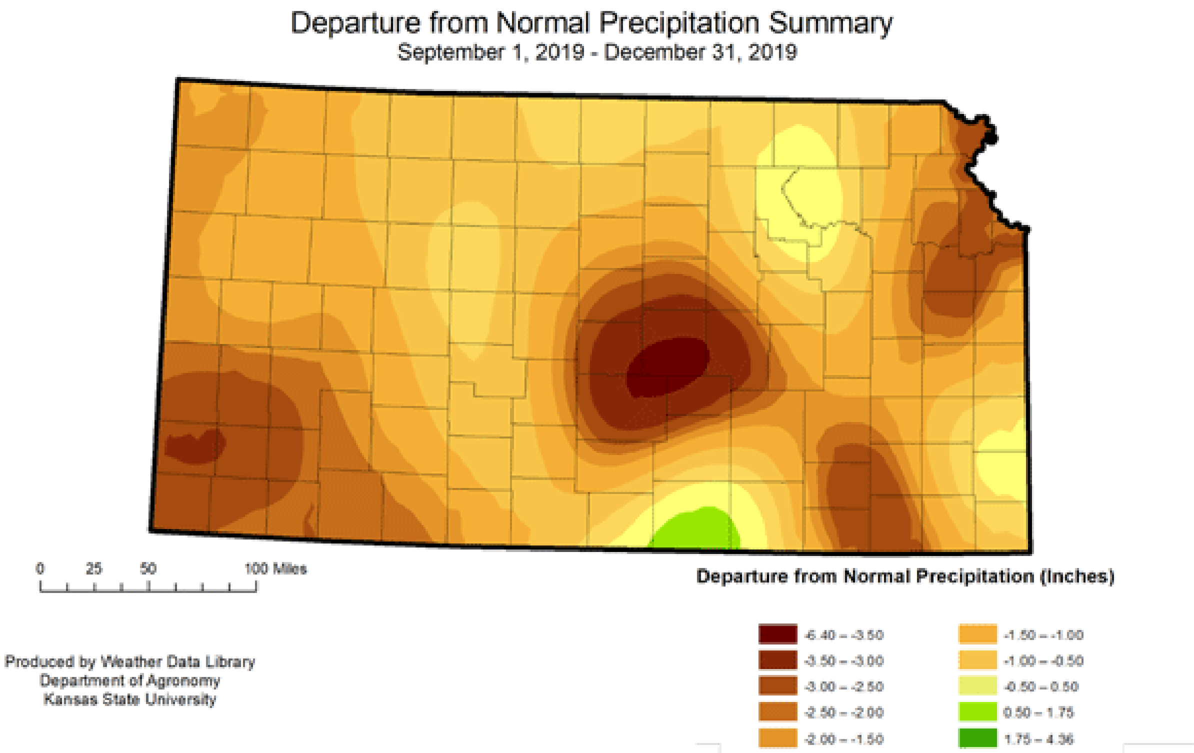


Figure 1. Departure from normal precipitation during the September 1-December 31, 2019 period (upper panel), and poor stand establishment in wheat near Great Bend (Barton Co) due

to extremely dry fall conditions. The target wheat population ranged from about 20 to 40 plants per square foot and the actual fall emergence ranged from 5 to 12 plants per square foot. Trials were sown in the later portion of October and pictures taken on December 12 by Kavan Mark, Assistant Scientist at K-State Wheat and Forages Extension program in the Department of Agronomy.

Expansion of area under drought stress during the spring

While southwest Kansas was the most affected area by fall drought, the water deficit expanded to the northwest and north central parts of the state during winter and early spring (Fig. 2). The cumulative precipitation between September 1, 2019 and May 18, 2020 ranged from 2.85 inches in southwest Kansas, to about 7.75 inches in northwest Kansas, and up to about 11 inches in north central Kansas. When compared to the long-term normal for these regions, these total precipitation amounts correspond to a deficit of as much as 7.2 inches in north central and parts of southwest Kansas.

Wheat fields were showing signs of drought stress that ranged from rolling up of leaves that added to a blue tint to the crop in the west-central part of the state; to a very stunted crop with senescence of lower canopy and tiller loss in north central and especially southwest Kansas. Meanwhile, central and south central Kansas had a relatively moist winter and early spring, accumulating between 13 and 21 inches of precipitation during the same period. As compared to the long-term normal, these values correspond to a slight deficit of about 1 inch to as much as 5 inches above normal.

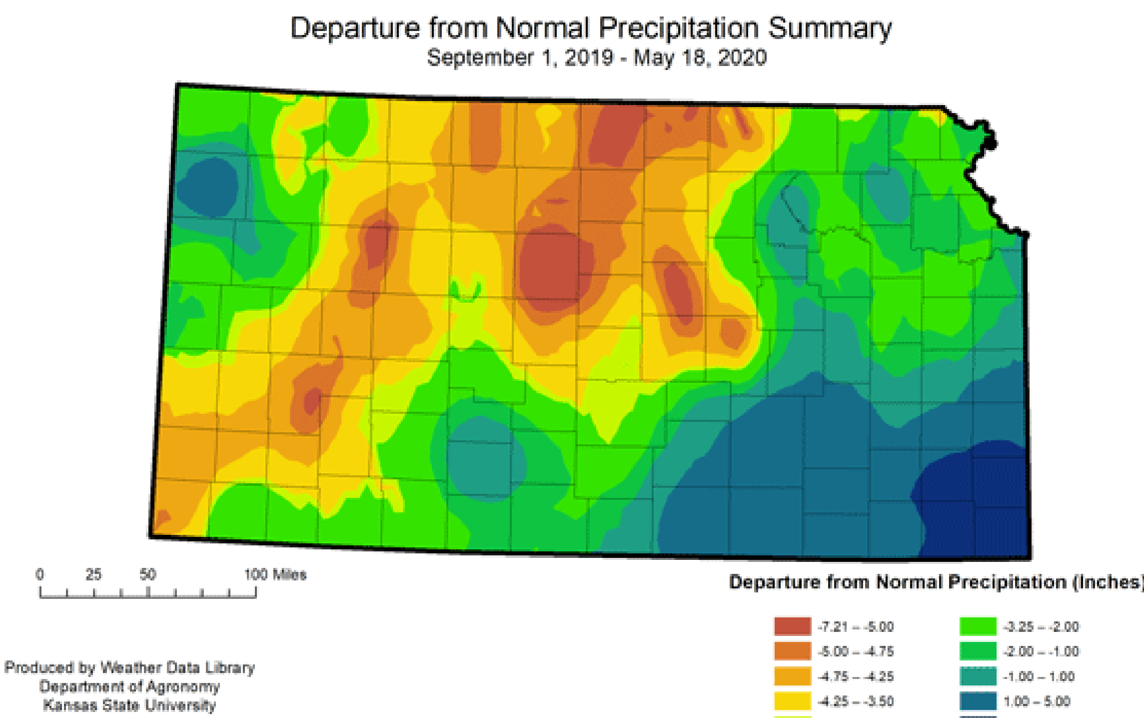


Figure 2. Departure from normal precipitation during the September 1, 2019 through May 18, 2020 period. The comparison between this figure and the upper panel in Figure 1 depicts the expansion of the dry conditions, originally restricted to southwest Kansas, to the central and north central portions of the state during the spring. Map by Kansas Weather Data Library.

Regional differences in spring development due to moisture and temperature regimes

With good moisture availability and a mild winter, the spring development of the wheat crop started on an average date in south central Kansas, with the majority of the wheat varieties reaching first hollow stem sometime in mid-March. For southwest and north central Kansas, however, wheat development during early spring was delayed due the dry conditions, leading to a significant difference in development at different parts of the state. The wheat crop was still reaching the first node in north central Kansas by the time the crop was already heading in south central and southeast Kansas.

Stem frost further decreased the yield potential

The occurrence of frost events during the spring is not unusual for Kansas and, depending on the region of the state and also on cropping system/sowing date, those freezes impacted the wheat crop in different ways. In particular, the week of April 13-17 had several frost events in which air temperatures dipped close to single digits in northwest Kansas, and below 24 °F for at least a few hours in most areas of the state, with the exception of south central and southeast Kansas. The areas most affected by these cold temperatures were north central and northwest Kansas, where dry conditions exacerbated the negative impacts of the cold spell. While the crop was mostly still between tillering (northwest) and jointing (north central) stages, which are more tolerant to cold temperatures than more advanced stages, temperatures were cold enough to cause severe tiller and leaf losses. These losses were more apparent in the late-sown crops, usually following soybeans in north central and corn in western Kansas, mostly due to a small canopy having less potential to buffer the cold temperatures, where individual fields had 50-75% of tiller loss (Fig. 3). In earlier sown fields, the tiller loss was more in the 20-40% range, and the plants were usually developed enough to compensate for this loss with secondary tillers. With the freeze events happening in mid-April and no significant precipitation occurring in these locations until mid- to late-May, the dry conditions that followed the freeze events further hampered wheat development and decreased the crop's yield potential. In the area around Ellsworth, where some precipitation occurred following the severe freeze, these conditions led to the loss of several primary tillers, which allowed for increased weed populations at harvest and a less uniform maturity in head stages due to the development of new tillers (Fig. 4). While the crop was more advanced in central and south central Kansas, the temperatures were not nearly as cold and therefore the crop sustained no injury from the freeze. Thus, the area south of McPherson County through Cowley County, and west to Meade County, was likely showing the best yield potential for wheat in Kansas during the 2020 season.

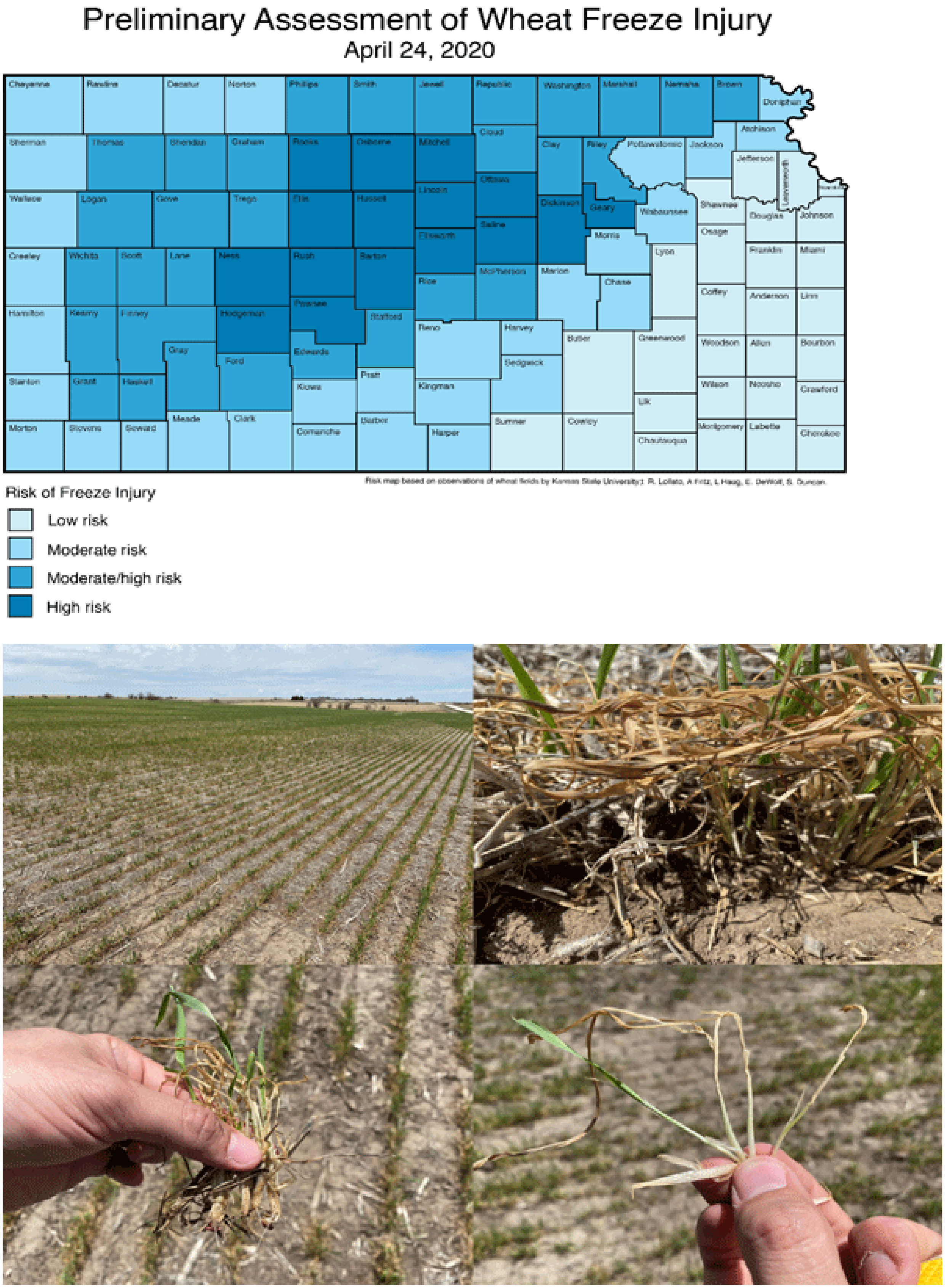


Figure 3. Preliminary assessment of wheat freeze injury potential for Kansas following the freeze events of April 13-15, 2020 (upper panel), and symptoms of freeze damage on late-sown

wheat crops in north central Kansas (lower panel). The freeze risk assessment combined an estimated crop growth stage with the magnitude and duration of cold temperatures. Symptoms of freeze damage include severe loss of leaves and tillers. Photos by Romulo Lollato, K-State Research and Extension.

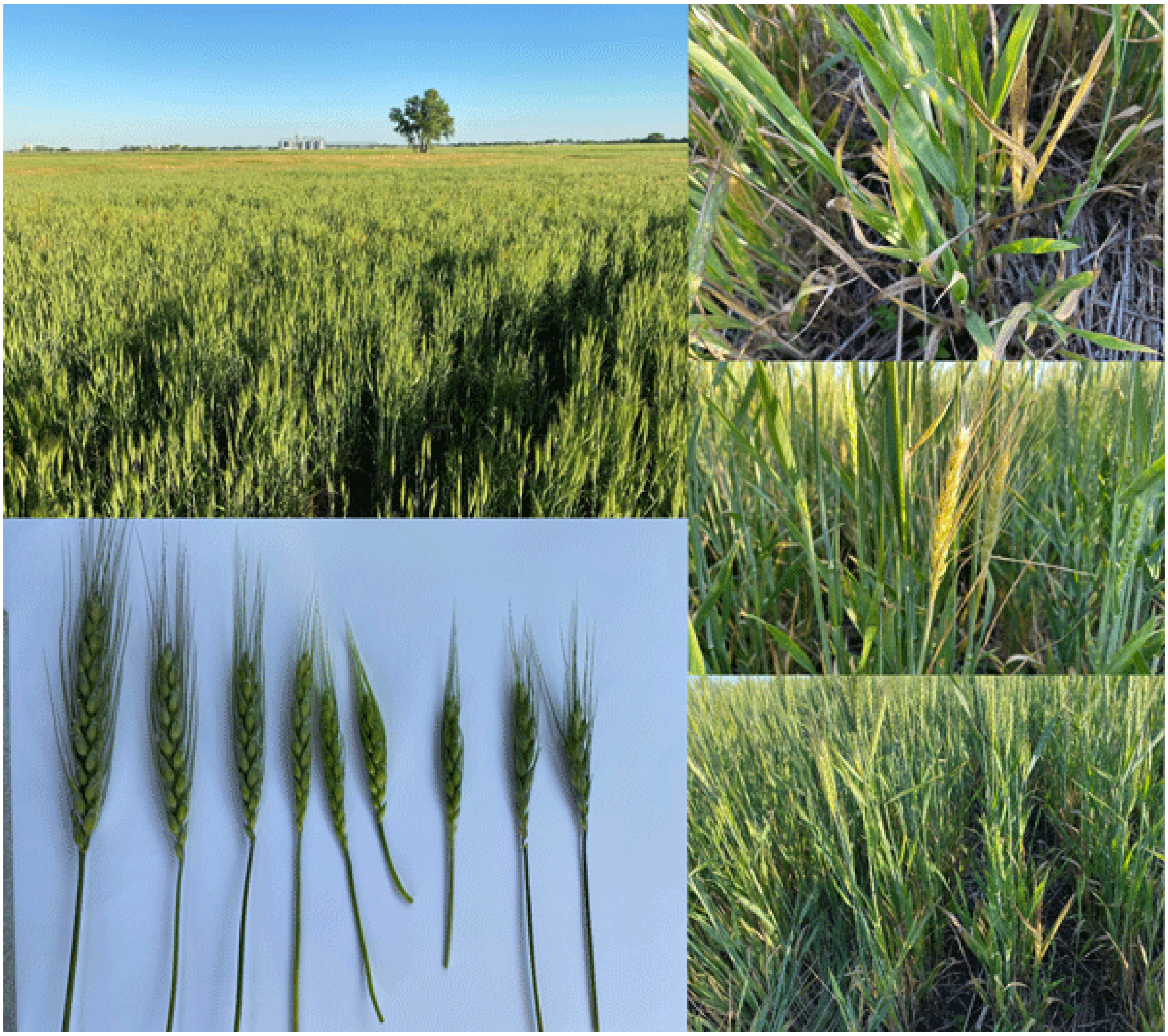


Figure 4. In areas where the severe stem frost was followed by precipitation, many primary tillers were lost but this was to some extent compensated by new tillers. These situations allowed for increased weed pressure and less uniform head maturity. Photos by Romulo Lollato, near Ellsworth, KS.

Grain filling period

As the 2020 wheat crop went through the grain filling period, the occurrence of precipitation in the last ten days of May helped the crop in most of the state. The precipitation during this period ranged from 0.97 inches to 2.99 inches, which was enough rain for most of the state to ensure at least an average crop despite all the previously mentioned adversities. However, southwest Kansas only received 0.97 inches of precipitation, with a divisional average of only 7.04 inches for the September to May period. In fact, many dryland fields in the region were going through the grain fill period and were only about 10 inches tall, leading to area abandonment (Fig. 5).

Another issue faced by the crop were warm temperatures during the grain filling. The first week of June brought extremely high temperatures across the entire state, with as many as 58 hours above 91 °F (Fig. 6). While the crop in southwest and south central Kansas were already in the late dough stages by that time, the crop in north central and northwest Kansas were still at the early stages of grain fill. Those temperatures were likely enough to decrease photosynthetic rates and consequently further reduce yields in those regions.

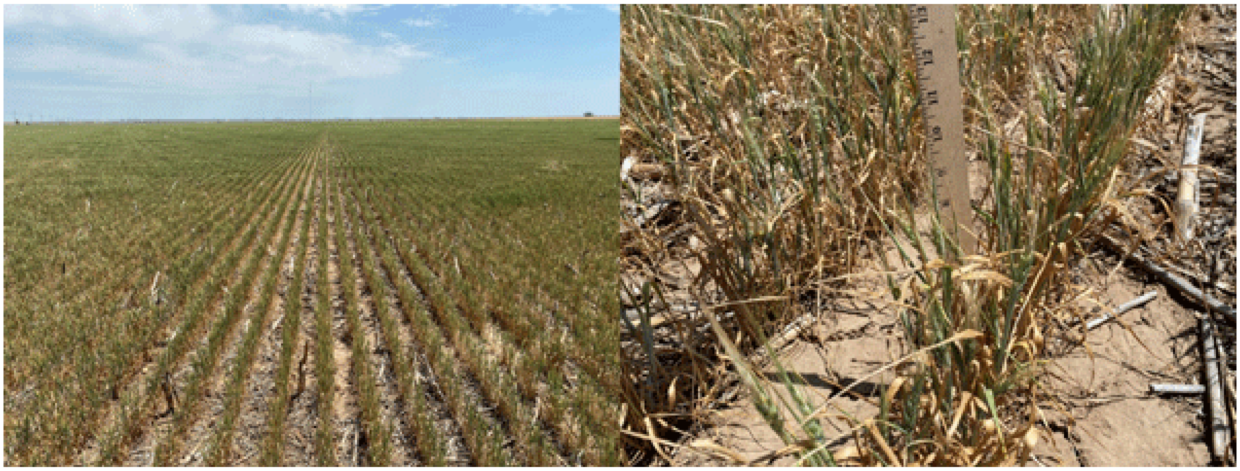
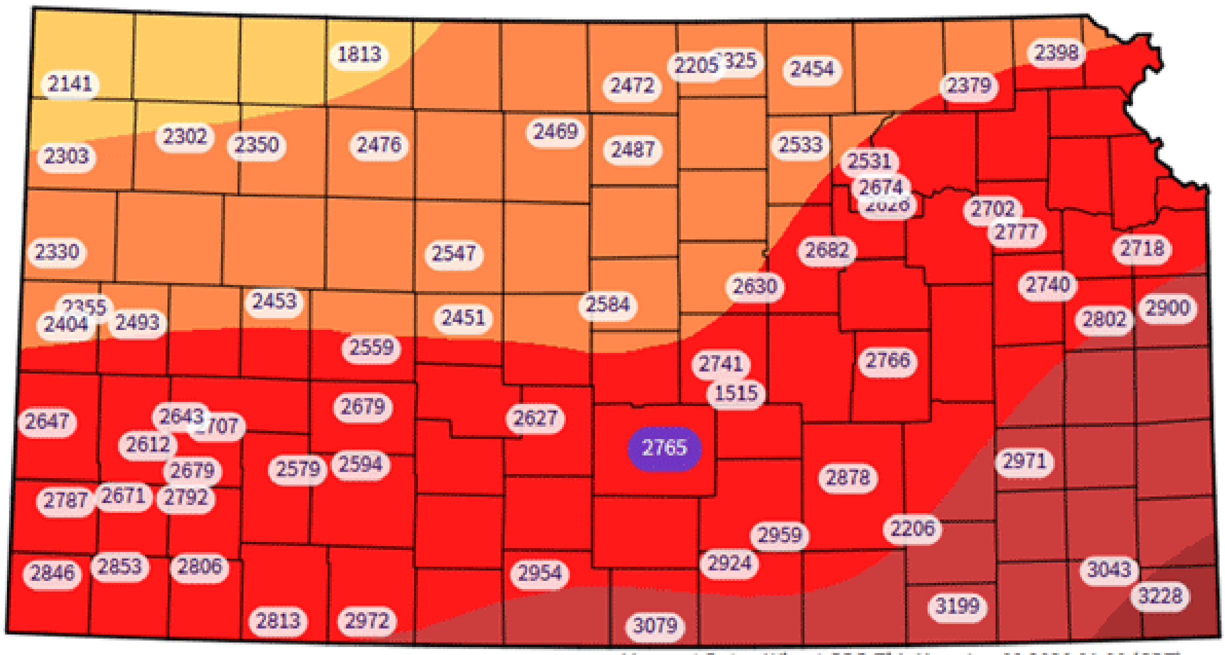


Figure 5. Severely drought stressed wheat near Liberal, KS (upper panels), and wheat abandonment in Finney county, KS (lower panel). Photos by Romulo Lollato, K-State Research and Extension.

Growing Degrees This Year



Mesonet Data - Wheat GDD This Year Jun 09 2020 01:00 (CDT)

Color	GDD °F	Estimated Wheat Growth Stage
	2200 to < 2400	Watery ripe or milk
	2400 to < 2600	Milk or dough
	2600 to < 2800	Dough or kernels maturing
	2800 to < 3000	Kernels maturing or physiologically mature
	>= 3000	Physiologically mature or approaching harvest

Total Hours with Temperatures above 91 °F (33 °C)

June 1 - June 8, 2020

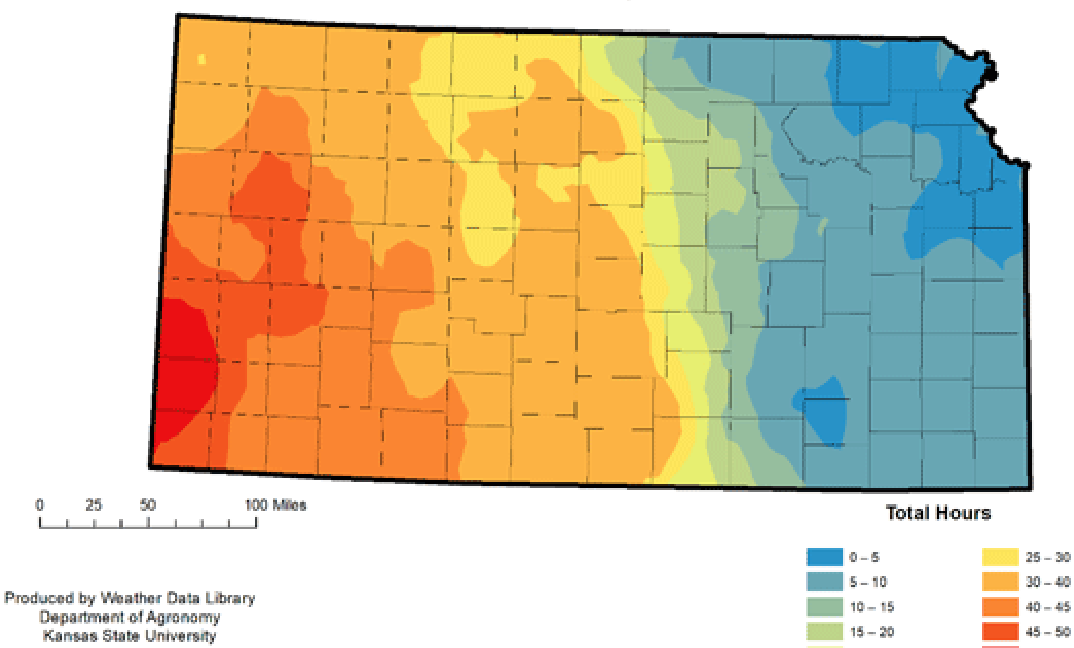


Figure 6. Estimated wheat growth stage on June 9, 2020 (upper panel), and number of hours with temperatures above 91 °F during the June 1-8 period (lower panel). Maps by Kansas Mesonet and Weather Data Library.

Wheat disease summary

Overall, the 2019-2020 wheat crop was spared the major disease losses of years past. This year stripe rust was first reported in Kansas in late April in Sedgwick, Reno and Pratt counties. This late April arrival was at least two weeks later than in previous seasons, one factor that may have contributed to lower levels of the disease statewide than in previous seasons. Stripe rust was most severe in southeast and southcentral Kansas, where cool wet weather was favorable for disease development in early May. Reports of trace levels of the disease, however, were made in most counties across the state (Figure 6, Panel 1).

Very warm weather during the grain fill period was not favorable for disease development and may have spared many fields late-season losses. Weather conditions were favorable for Fusarium head blight during the critical flowering period in southeast and central Kansas, although fields with economic losses were rare. This may have been due to an extended dry period at the end of the flowering window, and at the start of the grain fill period in this region.

Reports of the seed-borne diseases loose smut and common bunt were higher than typical this season, with reports of grain being discounted due to high levels of common bunt in some areas. Producers should take particular care to clean and treat seed lots that will be saved for planting in the fall that originated in fields with these diseases in 2019-2020. In addition, there were areas in central and southcentral Kansas with high levels of residue-borne foliar fungal diseases, such as Septoria tritici blotch and tan spot. These diseases were most common in fields with heavy wheat residue. These fields should be managed carefully in the 2020-2021 seasons as inoculum levels will likely be very high as additional infested wheat stubble was left behind. In north west and west central Kansas, there were intermittent reports of wheat streak mosaic, mostly in fields that were downwind of neighboring fields that had volunteer wheat in 2019.

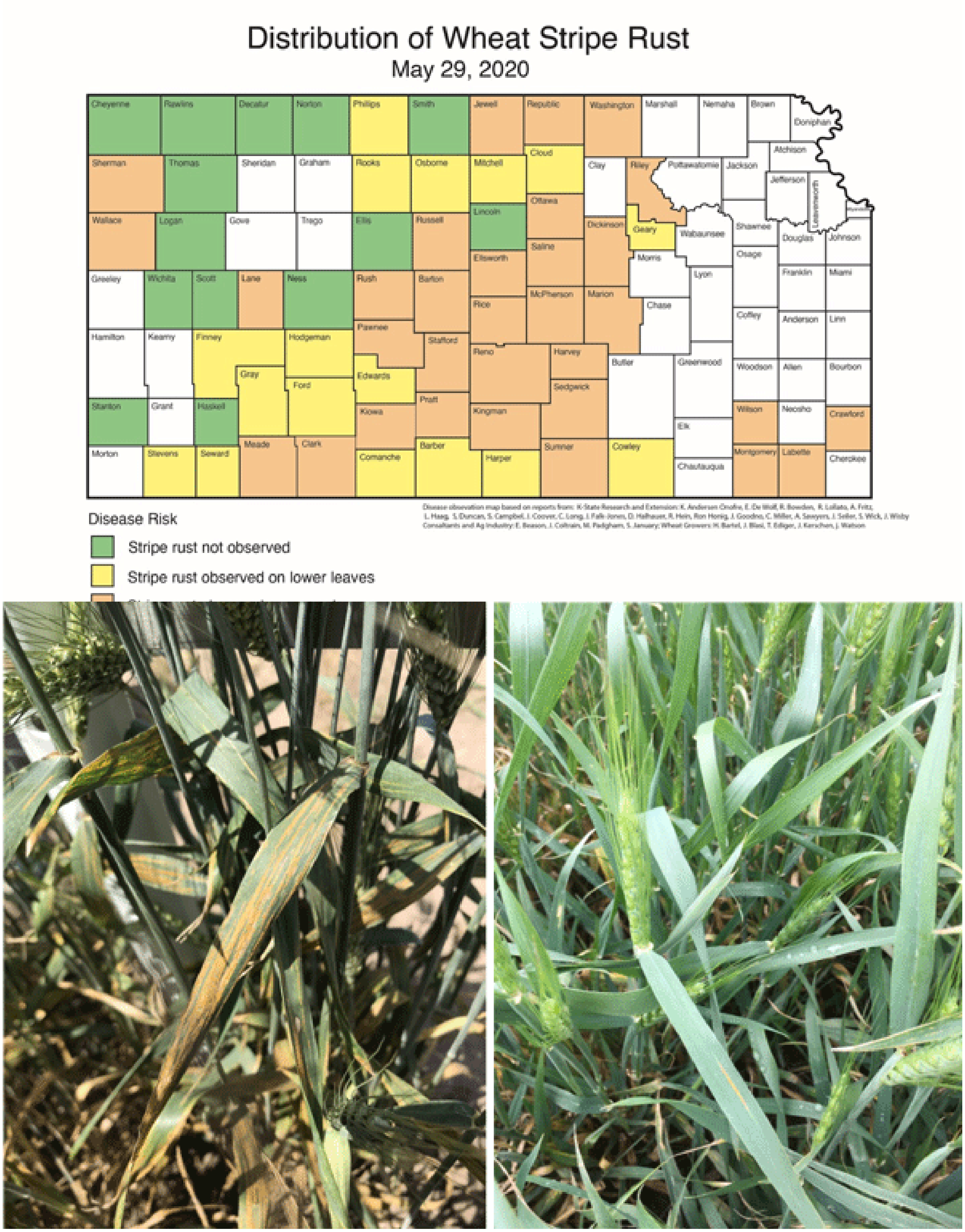


Figure 7. Stripe rust was reported throughout Kanas by May 29, 2020 (panel 1). Map is based on observations of K-State Research and Extension, crop consultants, and wheat producers in the state. Map created by Kelsey Andersen Onofre and Erick DeWolf, K-State Research and Extension. Although disease severity remained low in many fields, some fields in central Kansas had severe foci of infection (panel 2, left) while fields in northern and western counties

only had trace symptoms (panel 2, right).

Romulo Lollato, Extension Wheat and Forage Specialist
lollato@ksu.edu

Mary Knapp, Weather Data Library
mknapp@ksu.edu

Kelsey Andersen Onofre, Extension Plant Pathologist
andersenk@ksu.edu

4. Kansas weed survey - Reminder to participate before August 31

Herbicide-resistant weeds are threatening the profitability and long-term sustainability of Kansas cropping systems. To help develop innovative, cost-effective, and integrated weed management practices for controlling herbicide-resistant weeds and to further improve the outreach programs for various regions of the state, the Weed Science group at the K-State Ag Research Center in Hays seeks input from Kansas producers and ag professionals (crop consultants, county agents, certified crop advisors). We invite you to please complete a brief survey related to weed management practices and herbicide-resistant weed problems.

The survey will take 5-8 minutes and can be completed using the given link or by scanning the QR code on your smart phone. The survey will close at the end of August.

If you have further questions on the survey, please contact Dr. Vipan Kumar, Weed Management Specialist at vkumar@ksu.edu.

Survey Link: Kansas Weeds Survey

QR Code:

5. Update on the fall weather outlook for Kansas - August 6, 2020

Highlights

- Fall is a transition season: cooling temperatures and decreasing normal rainfall daily.
- Weather will be impacted by warm waters of the east Pacific and Atlantic Oceans.
- Current ENSO neutral conditions are forecasted to decrease towards La Niña - often a dry pattern for Kansas.
- The current August-October forecast from the Climate Prediction Center calls for increased potential of warmer temperatures and near-to-slightly-below precipitation.

The Science going into fall

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 impact 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 eastern Kansas) - however, two significant rain events (one in September and October) which consisted of flooding, changed the course of not only the fall but also set the stage for the wet conditions into 2019.

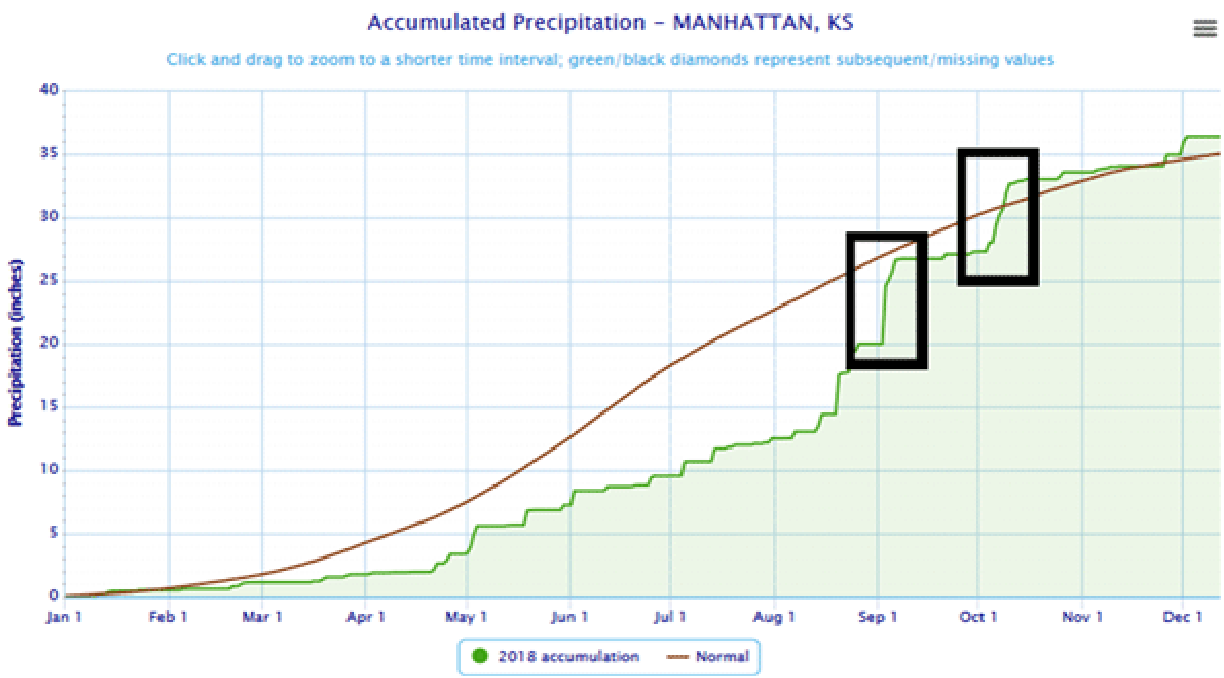


Figure 1. Manhattan precipitation (green) compared to normal (brown line) with the two significant rain events in September and October highlighted. Source: XMACIS.

We can take guidance on the existing patterns 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, see 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 wouldn't be overly conducive to fall moisture in the central Plains as forecast models are suggesting (Figure 3).

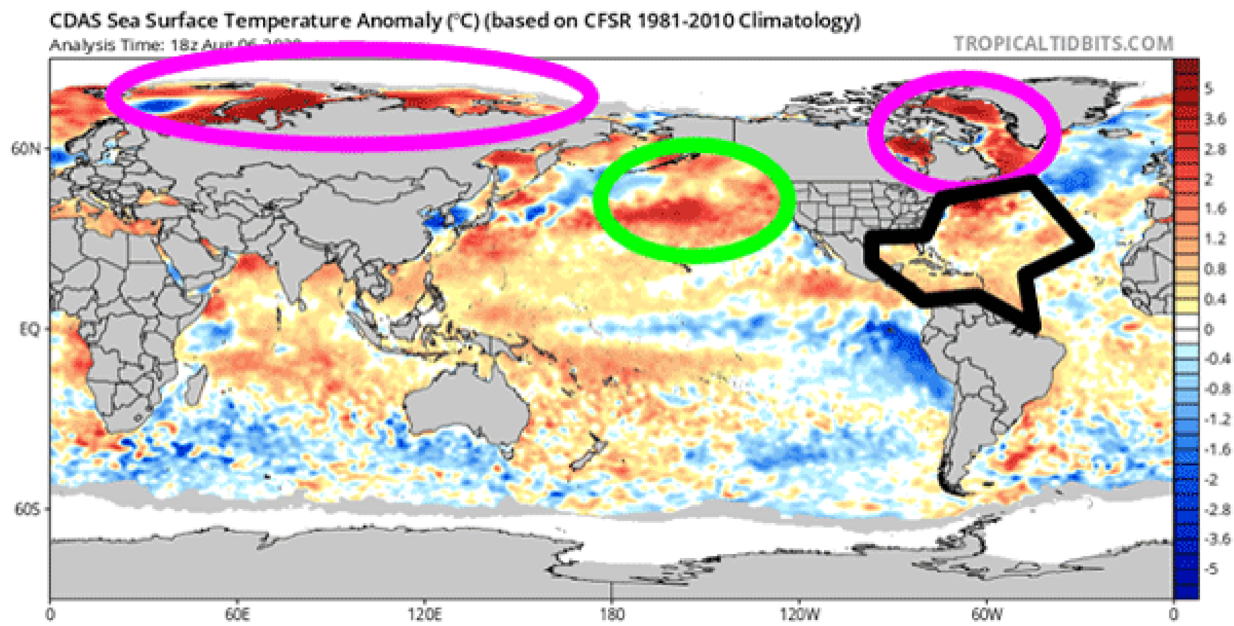


Figure 2. Sea surface temperature anomalies (warmer than normal in shades of red) across the globe. Highlighted are the Atlantic warm waters (black), the Arctic hot waters (purple) and the east Pacific warm waters (green). Source: TropicalTidbits.com

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 - it shifts the active jet stream northward. Often, this 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's 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).

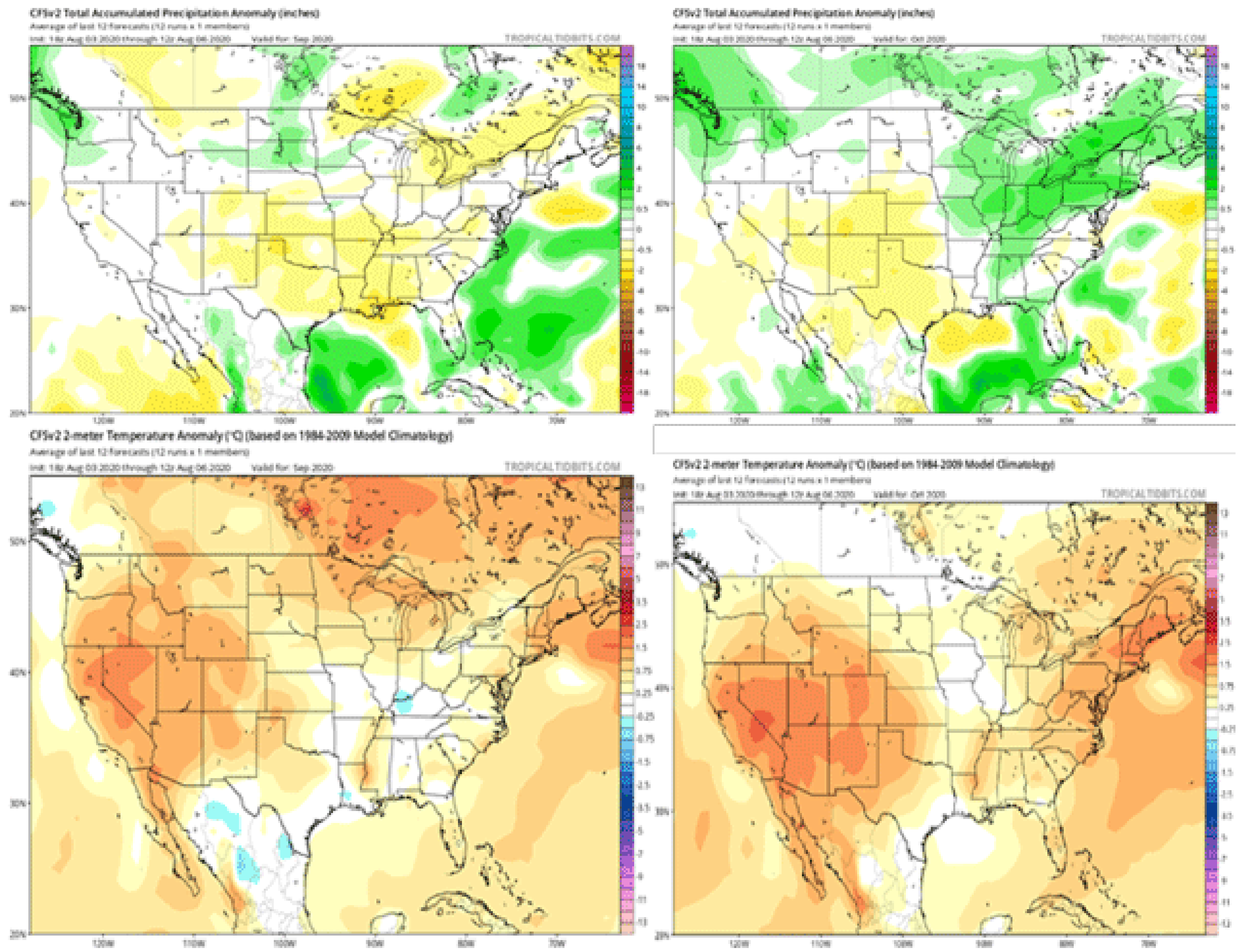


Figure 3. Climate Forecast System monthly forecasts for September (left) and October (right); precipitation (top) and temperature (bottom). Source: Tropicaltidbits.com

El Niño Southern Oscillation

The El Niño Southern Oscillation (ENSO) has been neutral for most of year. However, conditions in the Pacific are changing, and a La Niña watch has been issued. The most recent ONI (Oceanic Niño Index) for the April, May, June (AMJ) period is 0.0 degrees Celsius, which is exactly neutral. However, the weekly update from August 4th shows a significant decrease in the anomalies across the equatorial Pacific. The outlook favors continued neutral conditions during the summer, with a 55 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 August to October period, while the second (Figure 5) shows the August to October precipitation anomalies during La Niña events.

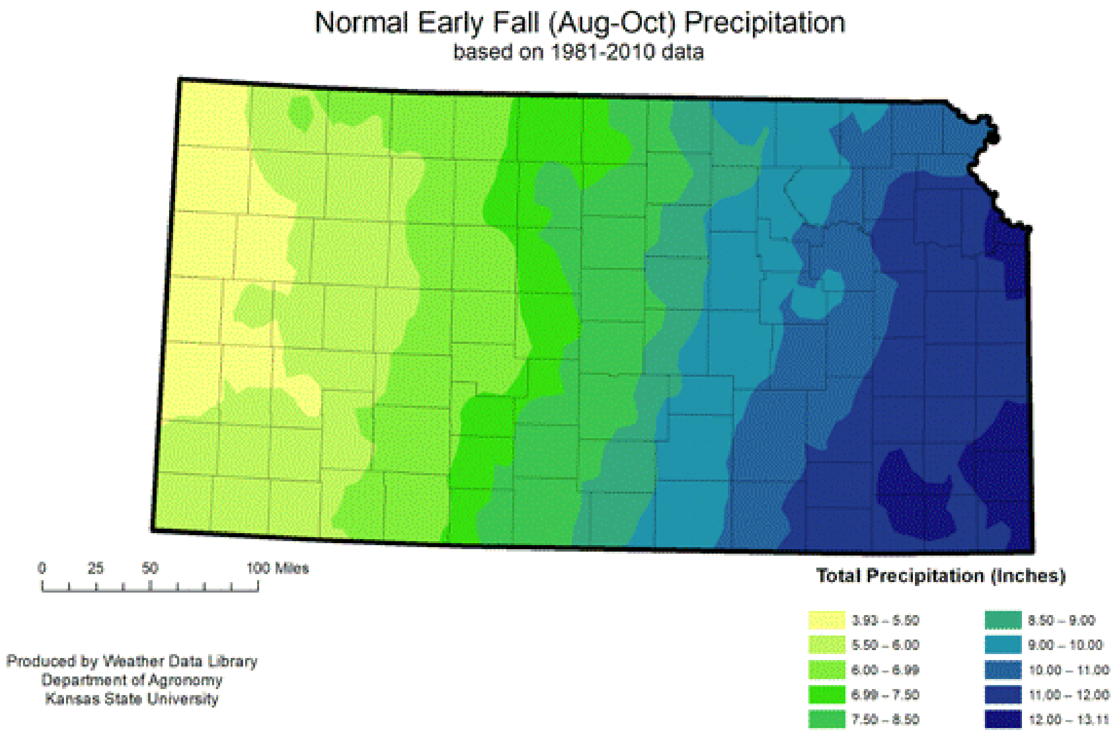


Figure 4. Normal Precipitation Totals for Aug-Sep-Oct (WDL)

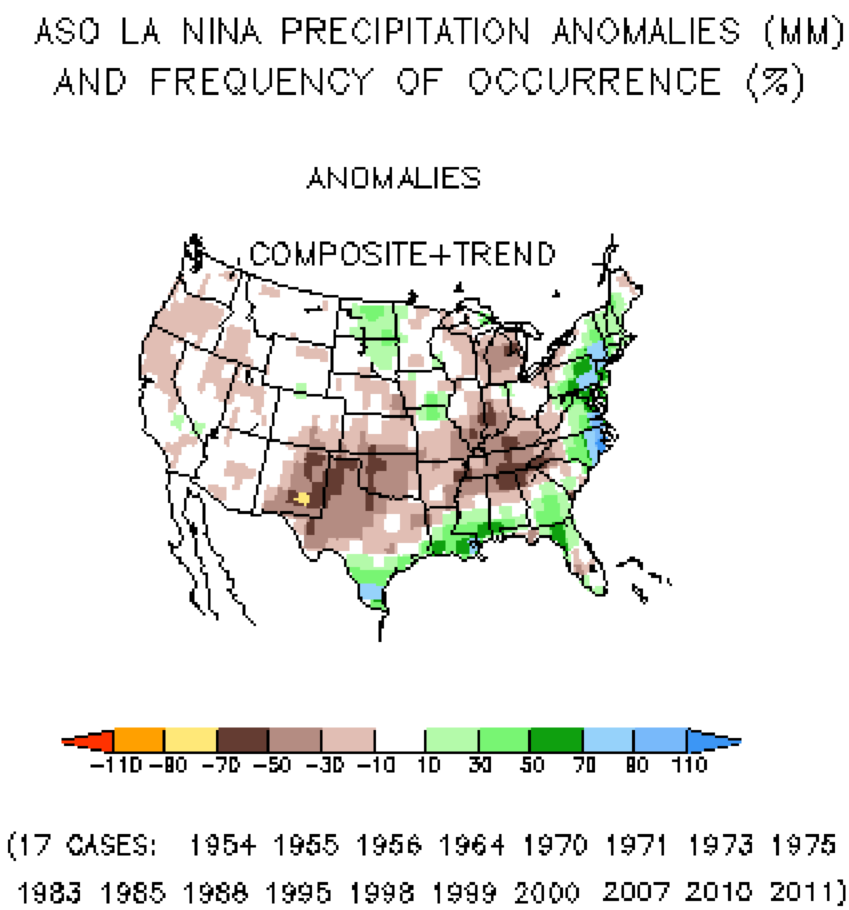
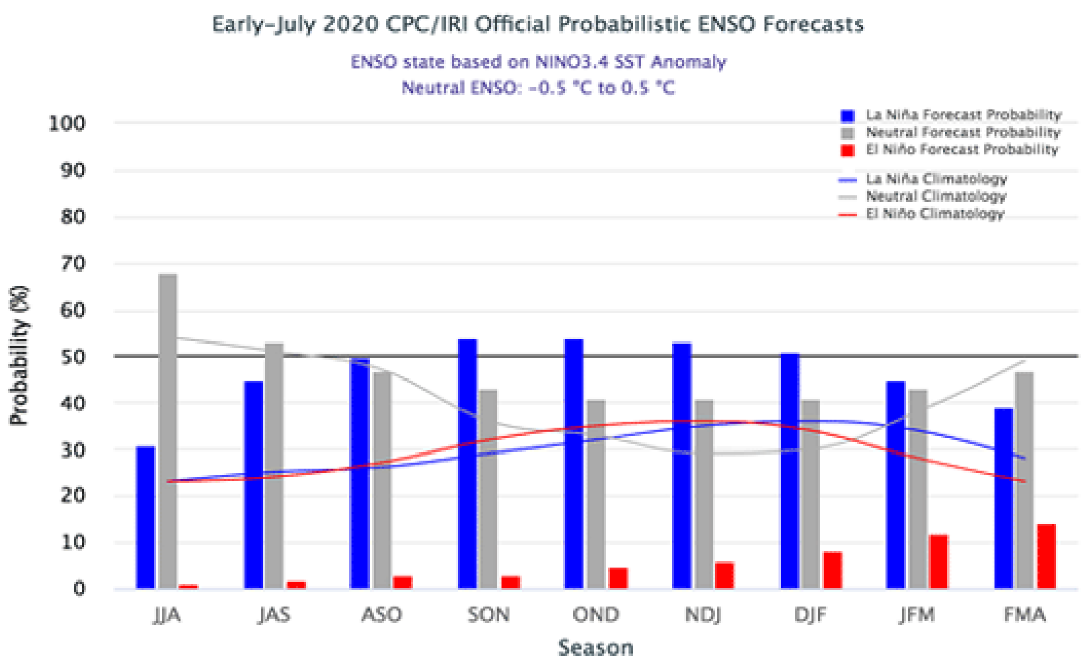


Figure 5. Precipitation Anomalies during La Niña (CPC)

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.



http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/lanina/enso_evolution-status-fcsts-web.ppt

Figure 6. ENSO outlook (CPC)

Fall Outlook (will be updated on August 16th)

Whew, that is a lot of information to take in! So, what does it all mean for Kansas this fall? Here are the Climate Prediction Center's thoughts on the outlook for fall (August, September, and October). They consider all the factors (and more) discussed above and came up with the following (Figure 7):

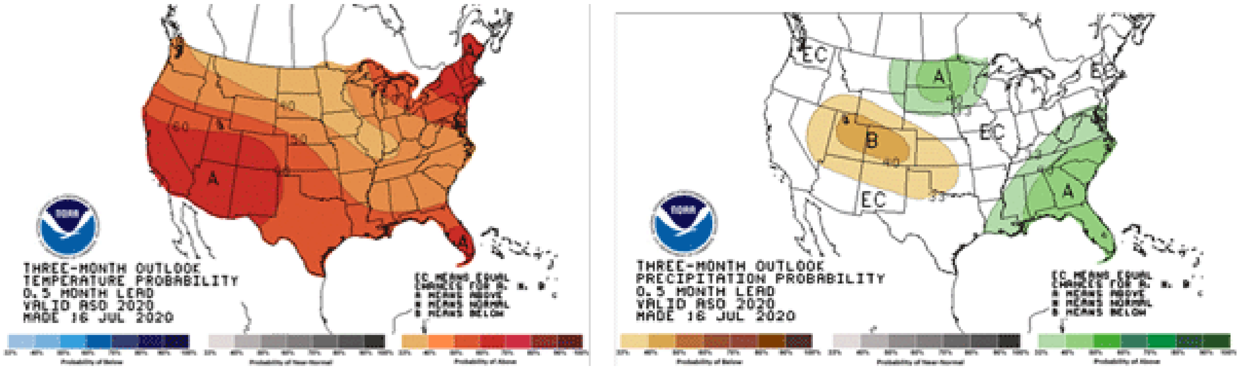


Figure 7. Three-month temperature and precipitation outlooks for Aug-Sep-Oct (temperature on left, precipitation on right). Source: CPC.

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 conditions over the three-month period. It is also important to keep in mind that just an increased chance of warmer/drier doesn't 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 50% for much of the state - a much higher confidence interval than below normal precipitation which is only slightly hedged above one third probability.

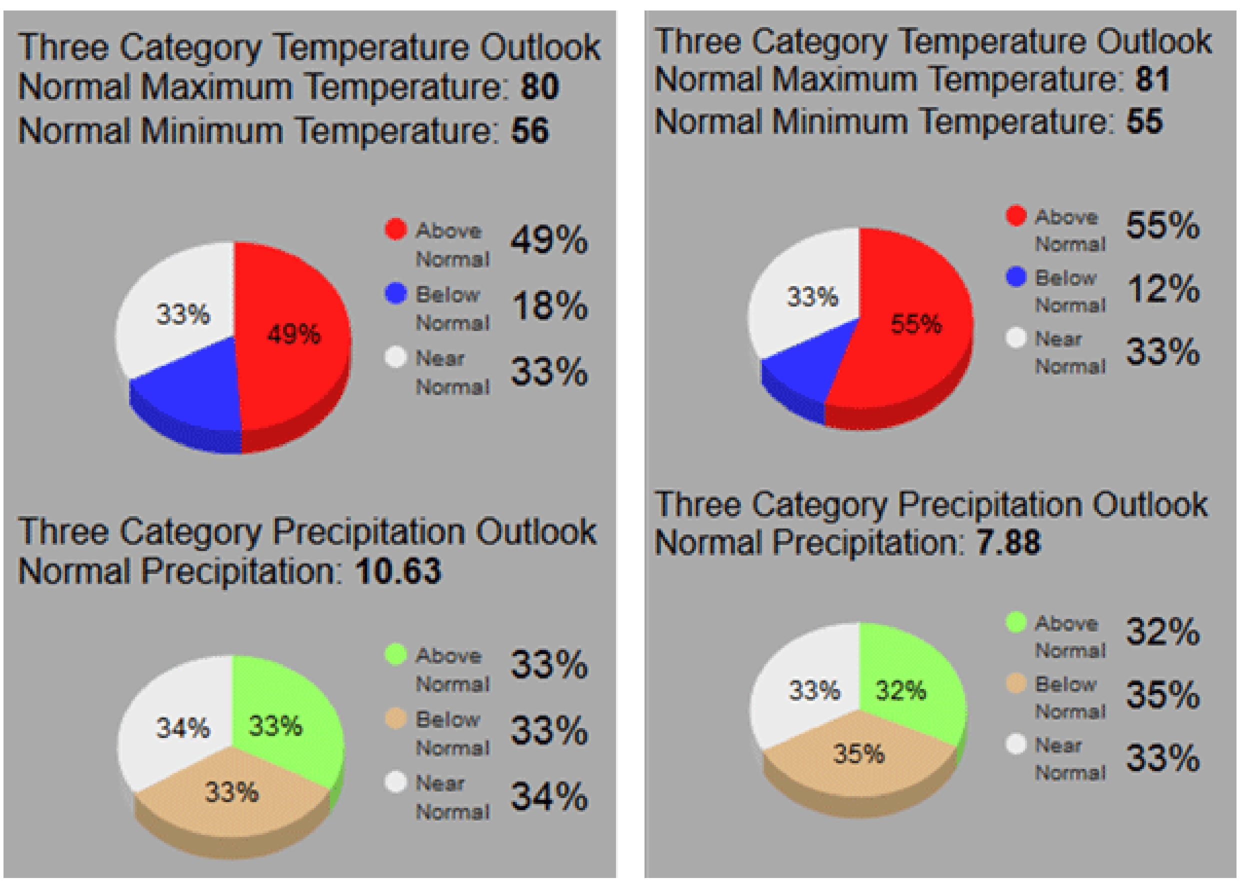


Figure 8. Probability of above, below, and normal conditions for Cottonwood Falls (left) and Ness City (right). Source: CPC.

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.

Mary Knapp, Assistant State Climatologist
mknapp@ksu.edu

Christopher Redmond, Kansas Mesonet Manager
christopherredmond@ksu.edu

6. Ag-Climate Update for July 2020

The Ag-Climate Update is a joint effort between our climate and extension specialists. Every month the update includes a brief summary of that month, agronomic impacts, relevant maps and graphs, 1-month temperature and precipitation outlooks, monthly extremes, and notable highlights.

July 2020: Wet condition across Kansas except two corners

Rainfall for July was above normal statewide and for most divisions, but still was short in much of southeast Kansas (Fig. 1). Statewide average precipitation was 5.94 inches, 160% of normal. The North Central Division was the wettest with an average of 8.43 inches, 206% of normal. Overall, there were 128 new daily precipitation records in the state, five of which set new monthly records.

Temperatures were close to normal. The statewide average for July was just 0.2 degrees warmer than normal. The thermal heat unit was largely driven by record warm minimum temperatures. Statewide there were 2 new daily record highs and 4 new record warm lows.

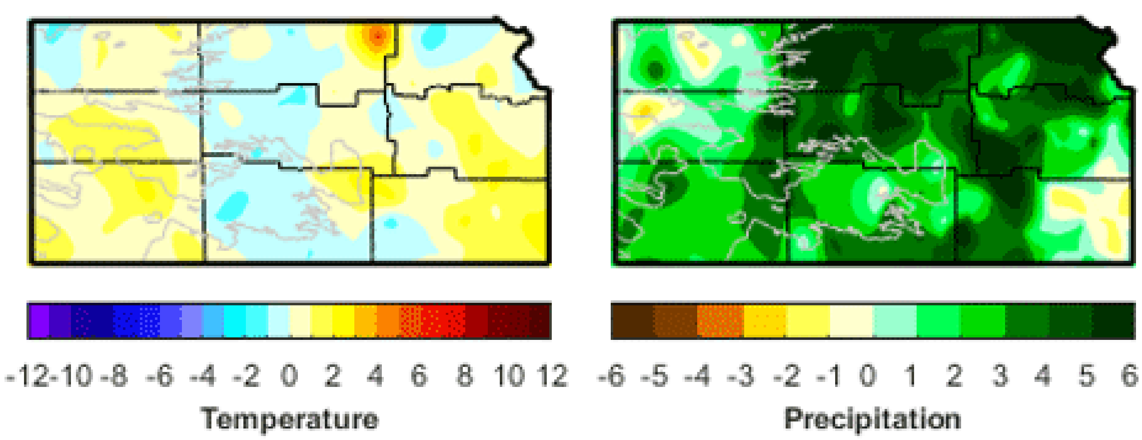


Figure 1. Departures from normal temperature (°F) and precipitation (inches) for July 2020.

View the entire July Ag-Climate Summary, including the accompanying maps and graphics (not shown in this summary), at http://climate.k-state.edu/ag/updates/.

7. Soil Health Partnership Field Day - August 18

The Soil Health Partnership Field Day will be held on August 18 at Guetterman Brothers Family Farms, 14633 W. 239th St., Spring Hill, KS. Two sessions will be offered: a morning session beginning at 8 a.m. and an evening session beginning at 5:30 p.m.

Topic areas that will be featured include:

- Soil Health Partnership Cover Crop report
- On-farm soil health data
- Nutrient management for healthy soils
- Cover crop garden and root structure demonstration

Attendees must register online to attend in order to comply with local health directives for COVID-19. Registration will allow for adequate planning to ensure proper spacing, supplies, and meal counts. To register, visit kscorn.com/fieldday. Event organizers will supply masks and hand sanitizer at each event.

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