Issue 913

K-STATE Research and Extension

Extension Agronomy

eUpdate

06/30/2022

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. Consider the value of soil residue before baling or burning wheat stubble

Following wheat harvest some producers might be thinking about baling or burning their wheat stubble. Producers may consider burning for several reasons: as a management practice to control plant diseases or weeds, to improve the seedbed for the subsequent crop, and possibly other reasons. While burning is inexpensive and baling provides additional income, producers should understand the true value of leaving crop residue in the field. Some of the information below comes from K-State Extension publication MF-2604, *The Value of Crop Residue*.

There are four main factors to consider:

Loss of nutrients

The products of burned wheat stubble are gases and ash. Nutrients such as nitrogen (N) and sulfur (S) are largely combustion products, while phosphorus (P) and potassium (K) remain in the ash. When residue is burned, about one-third to one-half of the N and S will combust. The nutrients in the ash may remain for use by the plants, if it doesn't blow or wash away first (more on that below). Therefore, instead of cycling these important plant nutrients back into the soil, they can essentially become air pollutants when the residue is burned. With the rise in price for nitrogen fertilizers, the amount of crop residue N that could be plant available in the future is worth more than in years past.

Table 1. Amounts of nutrients remaining in wheat stubble when assuming 50 bu/acre yield.

Nutrient	Pounds present in 5,000 lbs of wheat straw
N	27.0
P_2O_5	7.5
K_2O	37.5
S	5.0

Protection from soil erosion

Bare soil is subject to wind and water erosion. Without residue, the soil will receive the full impact of raindrops, thus increasing the amount of soil particles that may become detached during a rainfall event. Bare, tilled soils can lose up to 30 tons per acre topsoil annually. In no-till or CRP systems where residue is left, annual soil losses are often less than 1 ton per acre. The detachment of soil particles can lead to crusting of the soil surface, which then contributes to greater amounts of sediment-laden runoff, and thus, reduced water infiltration and drier soils.

Leaving residue on the field also increases surface roughness, which decreases the risk of both wind and water erosion. Most agricultural soils in Kansas have a "T" value, or tolerable amount of soil loss, of between 4 and 5 tons per acre per year, which is about equal to the thickness of a dime. To prevent water erosion, 30% ground cover or greater may be needed to reduce water erosion to "T" or less, especially in fields without erosion-control structures such as terraces.

Standing stubble is more effective at preventing wind erosion than flat stubble. On occasion, accidental residue burns have resulted in devastating wind erosion events that happen over and over again until a new ground cover is established (Figure 1). Once a field begins to erode from wind, it is extremely difficult to stop. During extended droughts the soil profile gets dried out and not even emergency tillage is effective at stopping the wind erosion. Losing topsoil degrades soil productivity, and the long-term effect of this loss is not easy to quantify.

Figure 1. Wind erosion event in northwest Kansas. Photo by Jeanne Falk Jones, K-State Research and Extension.

Research results from six locations in western Kansas are shown in Figure 2. In this experiment, crop residue was removed at different levels by cutting the crop residue at different heights. For example, if the residue was 10" after it was combined, the residue would be cut to 5" and removed from the plot, and that would equal 50% removal. The wind erodible fraction is the part of the soil less than 0.84 mm in size.

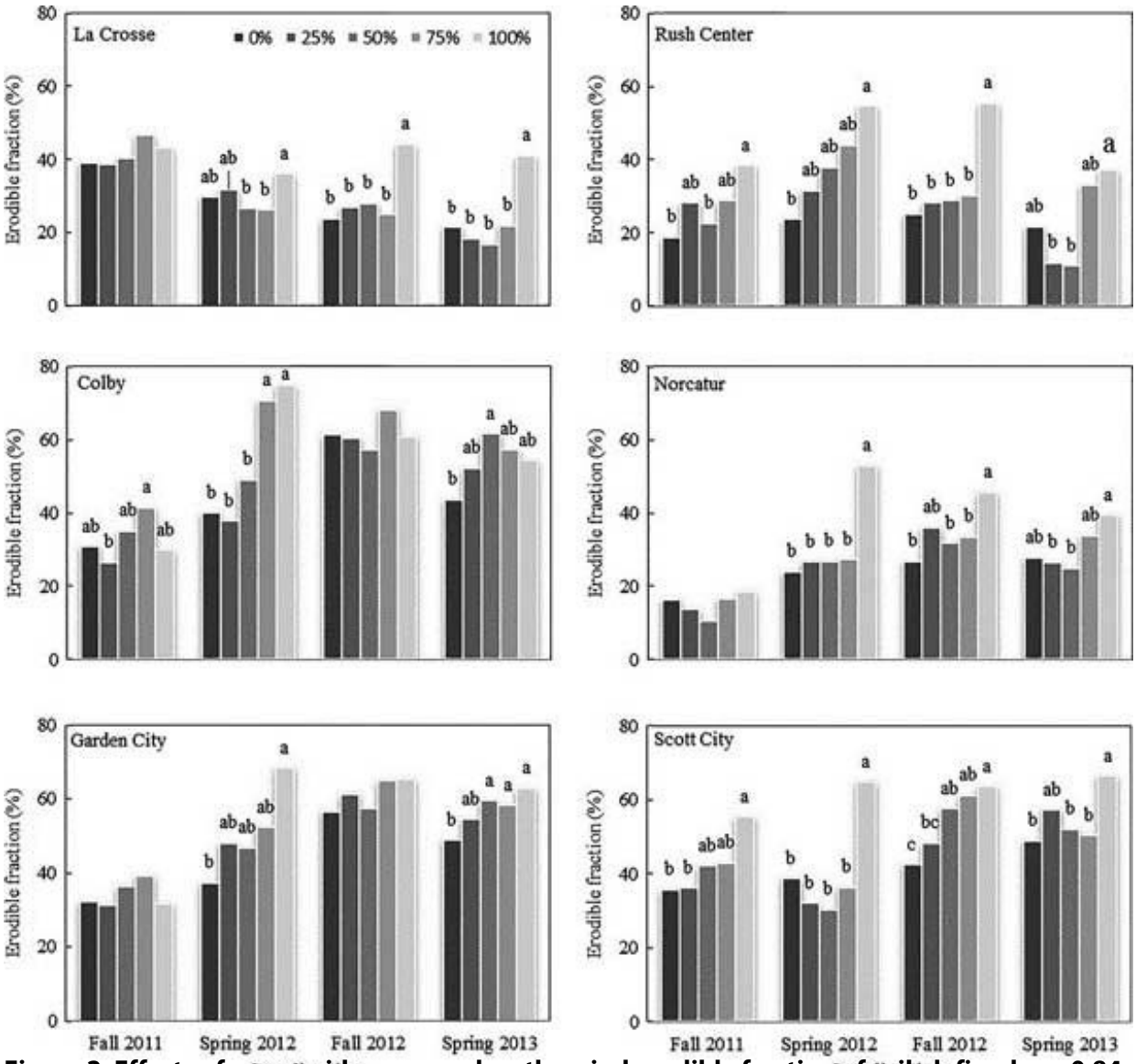

Figure 2. Effects of crop residue removal on the wind erodible fraction of soil, defined as <0.84 mm. Values on the x-axis (different shadings of the bars) refer to the percent residue removed. For example: 0% means no residue was removed, while 100% means that all residue was removed. Lowercase letters indicate treatment differences at p<0.05. From: He et al., 2017, available at: https://doi.org/10.1111/gcbb.12483

Soil moisture, infiltration rates, and conservation

Wheat residue enhances soil moisture by increasing rainfall infiltration into the soil and by reducing evaporation. Residues physically protect the soil surface and keep it receptive to water movement into and through the soil surface. Without physical protection, water and soil will run off the surface more quickly.

Ponded infiltration rates were measured at Hesston in September 2007. Very low infiltration rates (1.9 mm/hour) were observed for continuous winter wheat in which the residue was burned each year prior to disking and planting the following crop. In contrast, high infiltration rates (13.3 mm/hour) were observed for a no-till wheat/grain sorghum rotation (Presley, unpublished data).

Another way residue increases soil moisture is by reducing evaporation rates. Residue blocks solar radiation from the sun and keeps the soil surface cooler by several degrees in the summer. Evaporation rates can decline dramatically when the soil is protected with residue. Research from dryland experiments has shown that crop residues are worth 2 to 4 inches of water annually in the central Great Plains states (*Efficient crop water use in Kansas*, MF3066).

Soil quality concerns

Over time, the continued burning of cropland could significantly degrade soil organic matter levels. By continually burning residue, soil organic matter is not allowed to rebuild. Soil organic matter is beneficial for plant growth as it contributes to water holding capacity and cation exchange capacity. Soil organic matter binds soil particles into aggregates, which increases porosity and soil structure and thus, increases water infiltration and decreases the potential for soil erosion. One burn, however, will not significantly reduce the organic matter content of a soil (unless the field erodes, as discussed above).

If producers do choose to burn or harvest their wheat stubble, timing is important, and should minimize the time that the field will be without residue cover and vulnerable to erosion. Before choosing to burn residue, producers should check with the USDA Natural Resources Conservation Service and/or the Farm Service Agency to find out if this will affect their compliance in any conservation programs.

For more information, see:

- *Efficient crop water use in Kansas*, MF3066, available at: http://www.ksre.ksu.edu/bookstore/pubs/mf3066.pdf
- *Emergency wind erosion control*, MF2206, available at: http://www.ksre.ksu.edu/bookstore/pubs/MF2206.pdf
- *Crop residue harvest impacts wind erodibility and simulated soil loss in the Central Great Plains*. 2017. Global Change Biology Bioenergy, https://doi.org/10.1111/gcbb.12483

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2. Identifying nutrient deficiency symptoms in soybeans

This time of year, soybeans may begin showing signs of chlorosis or other leaf discoloration in all or parts of the field. There may be many causes of discoloration. Nutrient deficiencies are one possibility.

General considerations

The relative mobility of the nutrient within the plant will determine if the deficiency symptom will first be noticeable on the lower leaves or upper leaves.

Mobile Nutrients: These nutrients can be transferred from older tissues to the youngest tissues within the plant. Deficiency symptoms are first noticeable on the lower, oldest leaves.

- Nitrogen (N)
- Phosphorus (P)
- Potassium (K)
- Magnesium (Mg)

Immobile Nutrients: These nutrients are not easily transferred within the plant. Therefore, symptoms occur first on the upper, youngest leaves.

- Boron (B)
- Calcium (Ca)
- Copper (Cu)
- Iron (Fe)
- Manganese (Mn)
- Molybdenum (Mo)
- Sulfur (S)
- Zinc (Zn)

Possible causes of nutrient deficiencies:

1. Low soil levels of the nutrient
2. Poor inoculation (in the case of N deficiency)
3. Unusually low or high soil pH levels depending on the nutrient in question
4. Roots are unable to access sufficient amounts of the nutrients - due to poor growing conditions, excessively wet or dry soils, cold weather, or soil compaction
5. Root injury due to mechanical, insect, disease, or herbicide injury
6. Genetics of the plant

The following is a brief description of the symptoms of some of the most common nutrient deficiencies in soybeans.

Nutrient deficiency symptoms

Nitrogen. Chlorotic or pale green plants starting with the lower leaf (Figure 1a). Within the plant, any available nitrogen (N) from the soil or from nitrogen fixation within nodules on the roots goes to the new growth first. Soybeans prefer to take up N from the soil solution as much as possible, since this

requires less energy than the nitrogen fixation process. However, both sources of N are important for soybeans since they are a big user of N. Nitrogen deficiency can be associated with poor nodulation (Figure 1b).

Figure 1a. Soybean field showing signs of chlorosis. Photo by Dorivar Ruiz Diaz, K-State Research and Extension.

Figure 1b. Lack of nodulation on far-right soybean plants. Photo by Dorivar Ruiz Diaz, K-State Research and Extension.

Iron. Iron chlorosis, occurs in calcareous soils (contains calcium carbonates) with high soil pH. The classic symptom is chlorosis (yellowing) between the veins of young leaves since iron is not mobile within the plant (Figures 2 and 3). A side effect of iron deficiency can be N deficiency, since iron is necessary for nodule formation and function. If iron is deficient, N fixation rates may be reduced. Iron deficiency occurs on calcareous soils, in addition to high pH, plant stress can favor the development of iron chlorosis, and therefore the severity can vary significantly from year to year in the same field.

Figure 2. Iron chlorosis in soybeans; the upper leaves become chlorotic. Photo by Dorivar Ruiz Diaz, K-State Research and Extension.

Figure 3. Close-up of iron chlorosis in soybeans. Photo by Dorivar Ruiz Diaz, K-State Research and Extension.

Magnesium. Lower leaves will be pale green, with yellow mottling between the veins. At later stages, leaves may appear to be speckled bronze. This deficiency may occur on very sandy soils.

Manganese. Stunted plants with interveinal chlorosis (Figure 4). Can be a problem in soils with high pH (>7.0), or on soils that are sandy or with a high organic matter content (>6.0% OM). Manganese activates enzymes which are important in photosynthesis, as well as nitrogen metabolism and synthesis. Symptoms are hard to distinguish from iron chlorosis.

Figure 4. Manganese deficiency symptoms are similar to symptoms of iron chlorosis in soybeans. Photo by Jim Camberato, Purdue University.

Phosphorus. Phosphorus deficiency may cause stunted growth, dark green coloration of the leaves, necrotic spots on the leaves, a purple color to the leaves, and leaf cupping. These symptoms occur first on older leaves. Phosphorus deficiency can also delay blooming and maturity. This deficiency may be noticeable when soils are cool and wet, due to decrease in phosphorus uptake.

Potassium. Soybean typically requires large amounts of potassium. Like phosphorus deficiency, potassium deficiency occurs first on older leaves. Symptoms are chlorosis at the leaf margins and between the veins (Figure 5). In severe cases, all but the very youngest leaves may show symptoms.

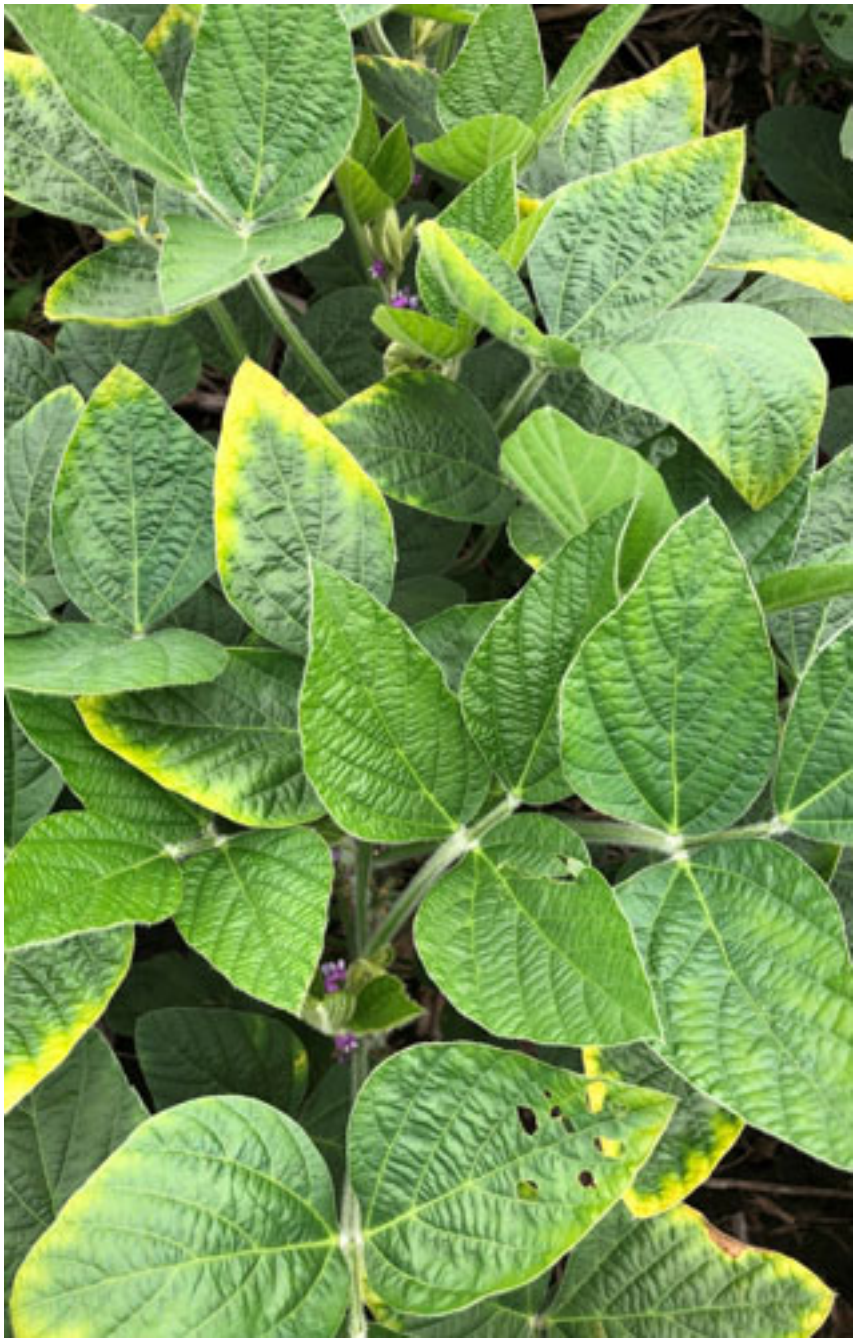

Figure 5. Potassium deficiency: chlorosis of the lower leaves. Photo by Dorivar Ruiz Diaz, K-State Research and Extension.

Sulfur. Stunted plants, pale green color, similar to N deficiency except chlorosis may be more apparent on upper leaves. Plant-available sulfur is released from organic matter. Deficiency is most likely during cool, wet conditions or on sandy soils with low organic matter content.

For more information, see K-State Research and Extension publication MF-3028, *Diagnosing Nutrient Deficiencies in the Field* at: http://www.ksre.ksu.edu/bookstore/pubs/MF3028.pdf

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3. Update on drought conditions in Kansas - June 28, 2022

Highlights:

- Isolated heavy rains in central/east with persistent dry conditions in the west.
- Drought conditions improved in central Kansas with small degradations in southeast and northwest.
- Showers and thunderstorms forecasted through weekend with highest amounts to 1.5 inches in the northeast, lighter elsewhere.
- Turning very hot after July 4th with below-normal precipitation expected.

Rainfall Summary – June 22-28

Precipitation statewide averaged slightly above normal for the week (0.93 inches, 107% of average), but the distribution of rainfall across the Sunflower State was uneven (Figure 1). The western third of Kansas received the least precipitation, with west central faring the worst: an average of 0.14 inches fell, just 20% of normal (Figure 2). Overall, northeast, east central and south central Kansas averaged 166 to 182% of normal weekly precipitation during the period (Figure 2). North central and central Kansas had near to slightly below normal precipitation, as did southeast Kansas. South central Kansas had two generous rain events, on the June 22 and June 26. On the 26th, Rock 3 SW NWS COOP (Sumner County) recorded 3.64 inches, the largest one-day rainfall of the week. A CoCoRaHS observer near Wellington (Sumner County) reported 5.83 inches, the highest weekly total in the state. North central and northeast Kansas had rainfall on the morning of the June 23 and again that evening into the pre-dawn hours of June 24. The heaviest rain fell in the I-70 corridor from Salina to Manhattan, extending east to Kansas City. A CoCoRaHS observer in Abilene (Dickinson County) recorded a 24-hour rainfall of 2.90 inches, while multiple observers in Riley and Pottawatomie Counties measured over 2 inches. Southwest Kansas received needed rainfall on June 27, when as much as half an inch fell, but that was limited to the far southwest and still below normal for the week.

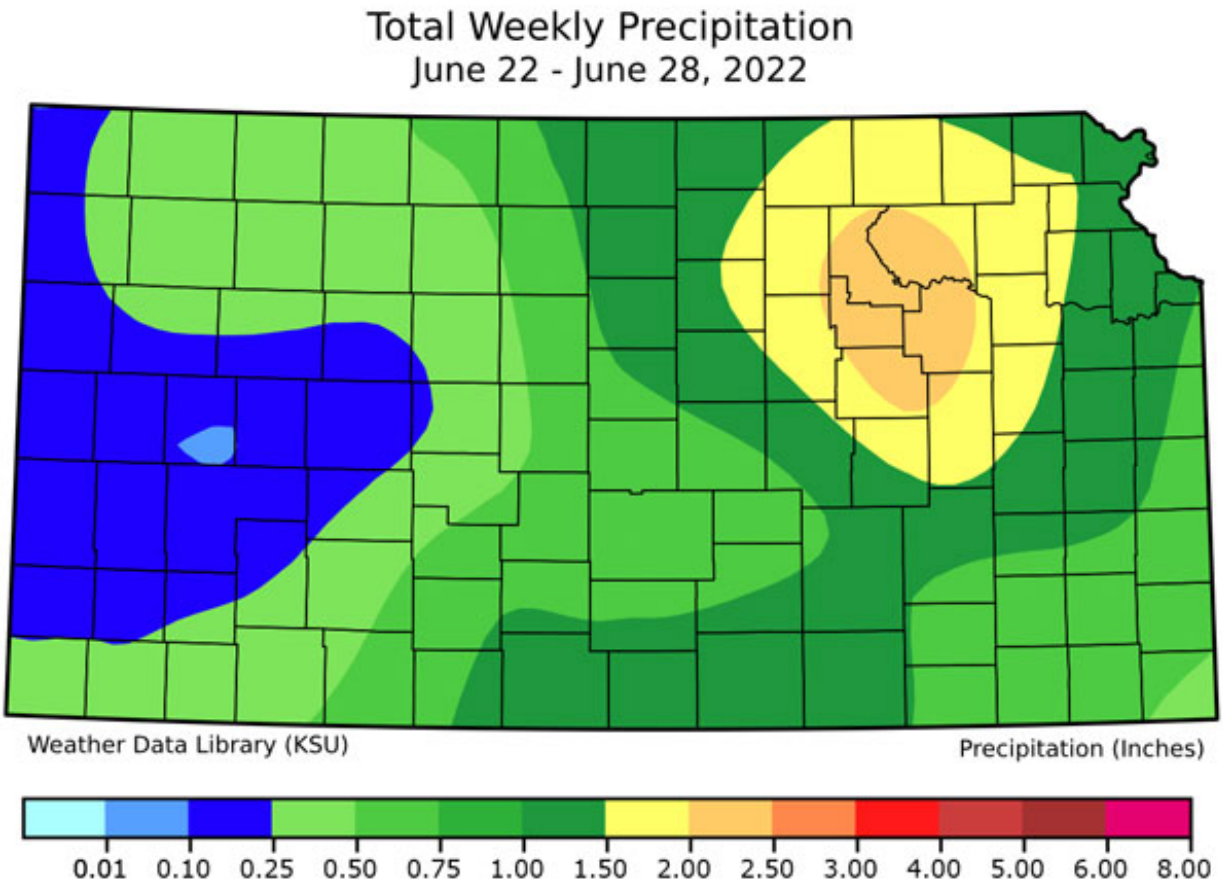

Figure 1. Total precipitation (inches) recorded for the week. Map by the Kansas Weather Data Library.

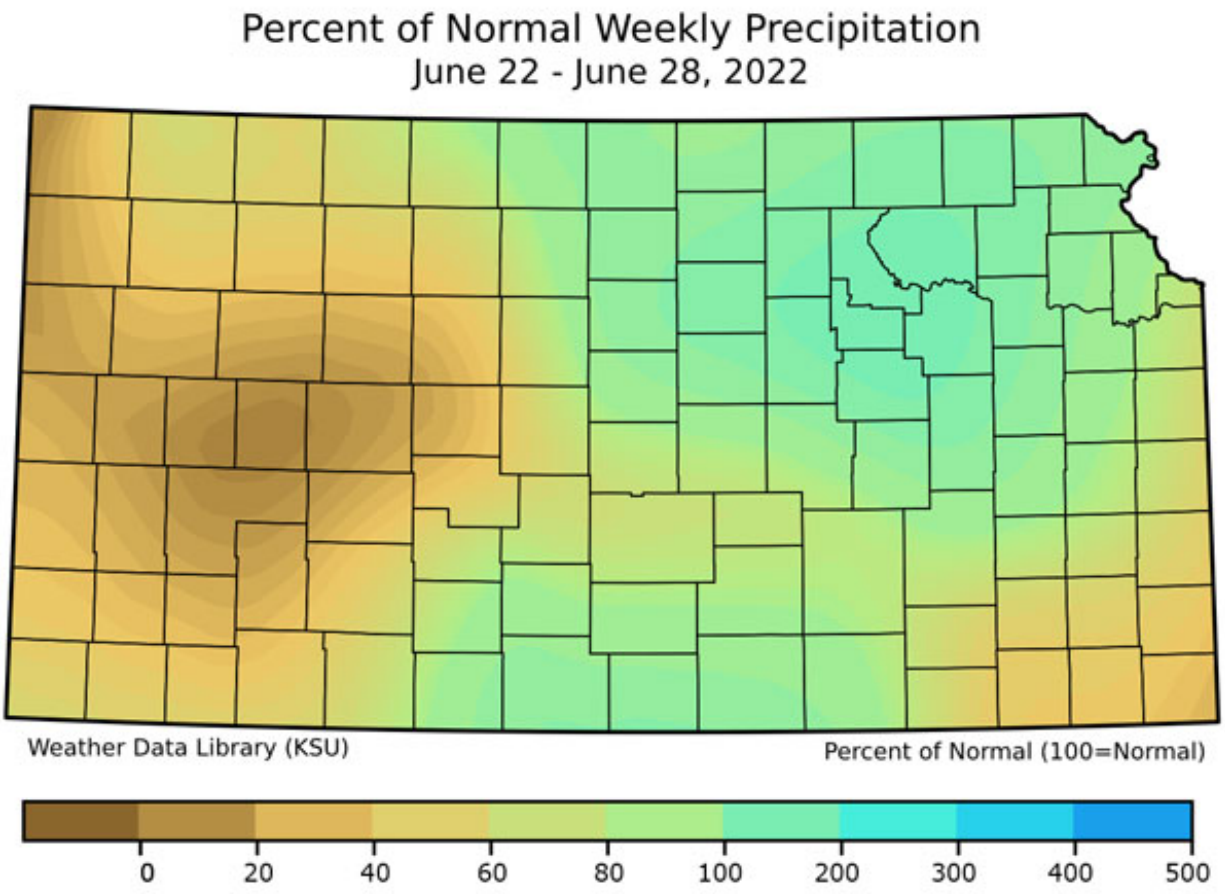

Figure 2. Percent of normal precipitation for the week. Map by the Kansas Weather Data Library.

Temperature Summary

With increased cloud cover and a cooler air mass, temperatures across Kansas averaged 1.9°F below normal for the week (Figure 3). Southeast Kansas was the only part of the state that averaged above normal (+0.4°). Southwest Kansas averaged the most below normal (-3.5°). Even though the statewide average was below normal, there were some hot days. Many locations in the western half of the state had highs near or over 100°F on both the afternoons of the 23rd and 24th. Dodge City (Ford County) reached 102° on the 23rd and 106° on the 24th. Hays (COOP, Ellis County) recorded the highest temperature of the week: 107° on the 24th. The end of the period featured more comfortable conditions, with cooler temperatures. Thirty of the Kansas Mesonet sites recorded lows in the 40s on the morning of the 28th, with Scott City 3SE (Scott County) the coldest at 41°. The COOP observer 1 mile west of Tribune recorded a record low of 42°, 4 degrees colder than the previous record low for the 28th. Record keeping at that site began in 1893.

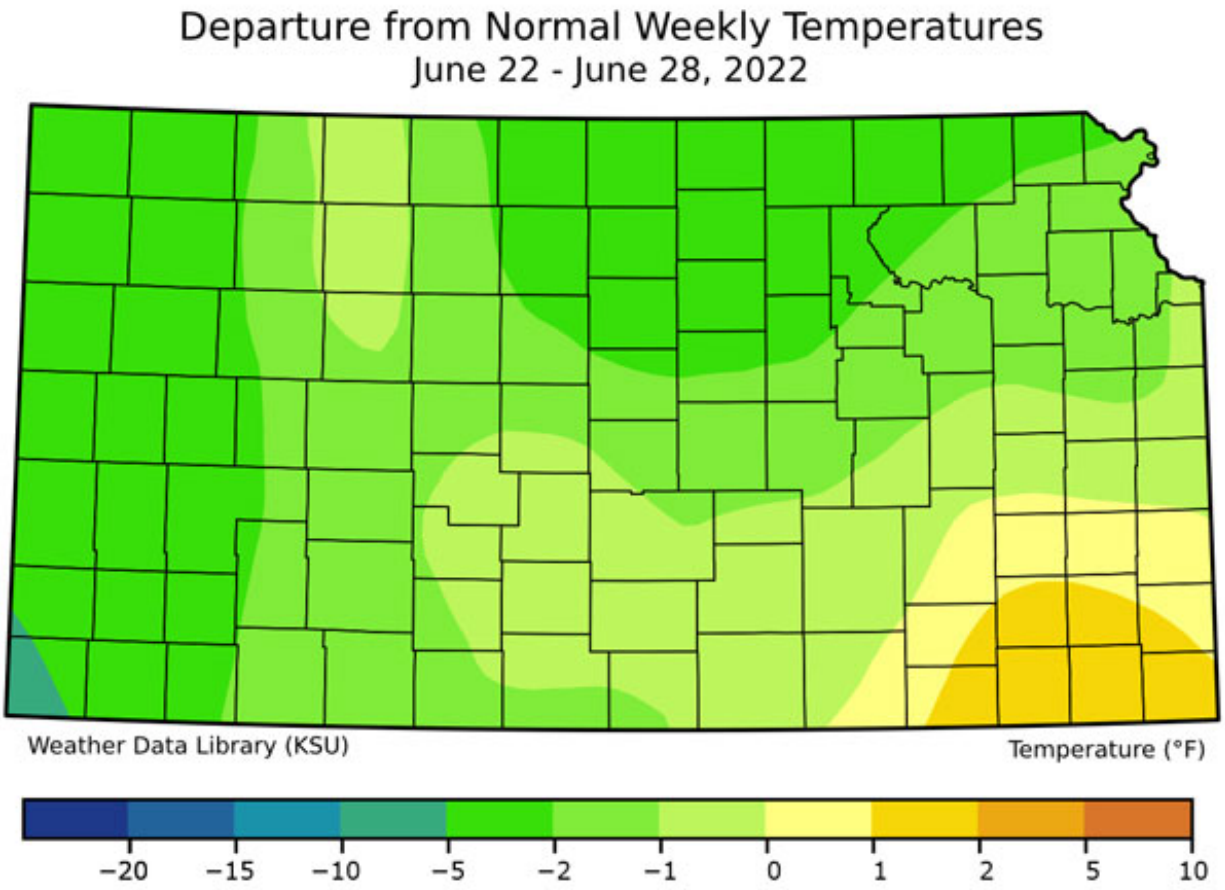

Figure 3. Departure from Normal Weekly Mean Temperatures for week. Map by the Weather Data Library.

Weather Outlooks and Drought Status for Kansas

While parts of southeast and west central Kansas fell one class in the latest US Drought Monitor (i.e., worsening conditions), many areas of central Kansas improved one class (Figure 4). A total of 43 percent of the state is classified as drought-free, an increase of 6% from last week (Figure 5). This led to a composite Drought Severity Coverage Index (DSCI) decrease of 10 points from last week to 148.

The Weather Prediction Center's 7-day total precipitation forecast, covering most of the first week of July, suggests northeast Kansas has the best chance at above normal precipitation, with the rest of the state seeing near or below normal precipitation (Figure 6). Temperatures will trend higher as we approach the 4th of July, with highs near or above 100° possible continuing through the week, particularly in western Kansas (Figure 7).

The 8 to 14-day outlook from the Climate Prediction Center forecasts a better than even chance of above normal temperatures statewide, especially in the east (Figure 8). Precipitation is forecast to be near to below normal. Should the precipitation forecast fail to verify, hot temperatures and little to no precipitation are never a good combination, as these conditions lead to worsening drought conditions.

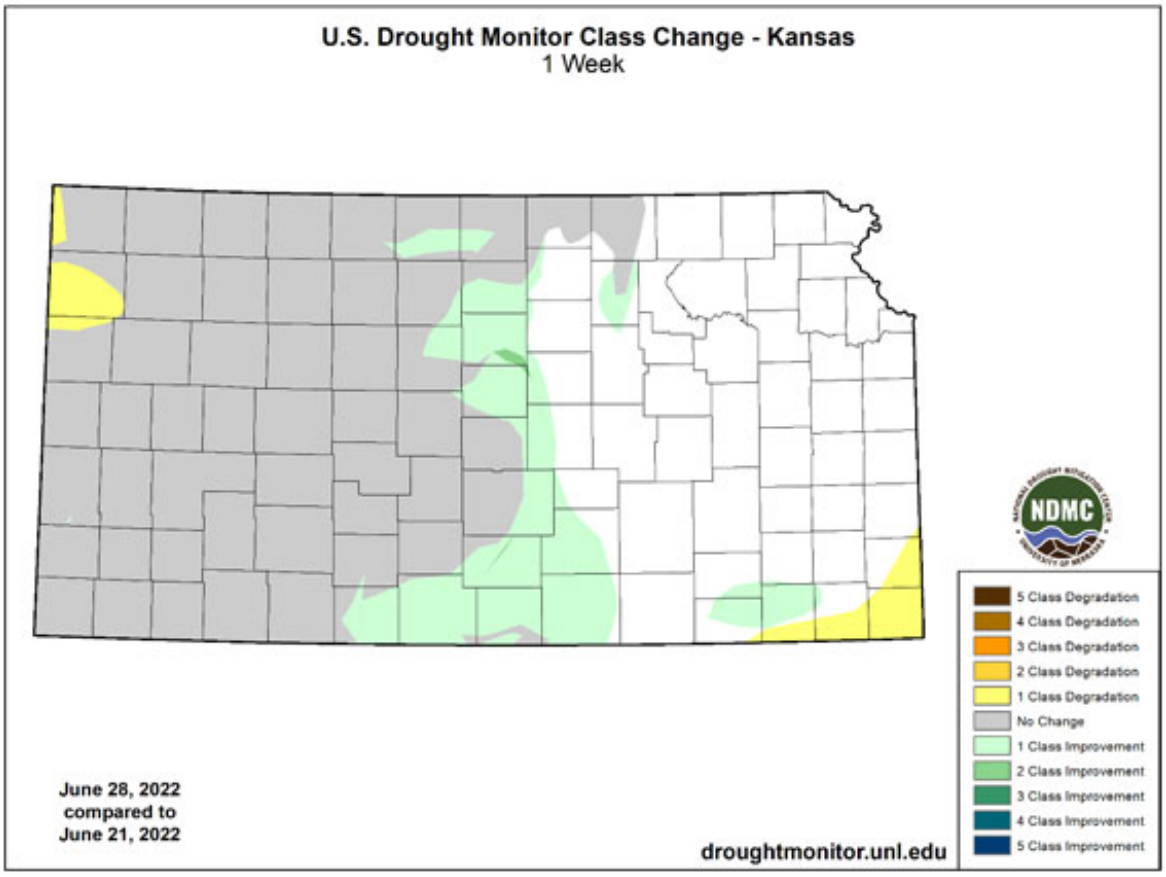

Figure 4. Change in weekly drought status (U.S. Drought Monitor)

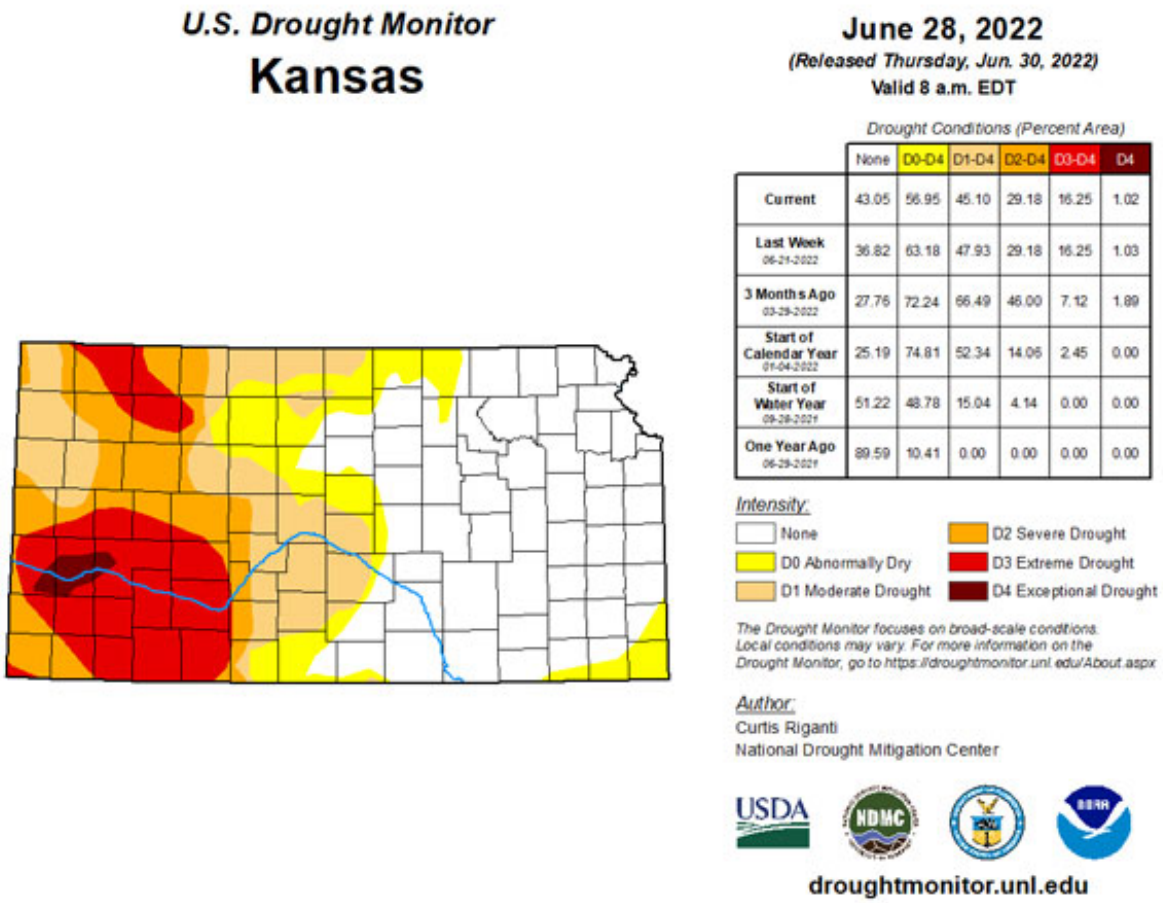

Figure 5. Current weekly drought status (U.S. Drought Monitor).

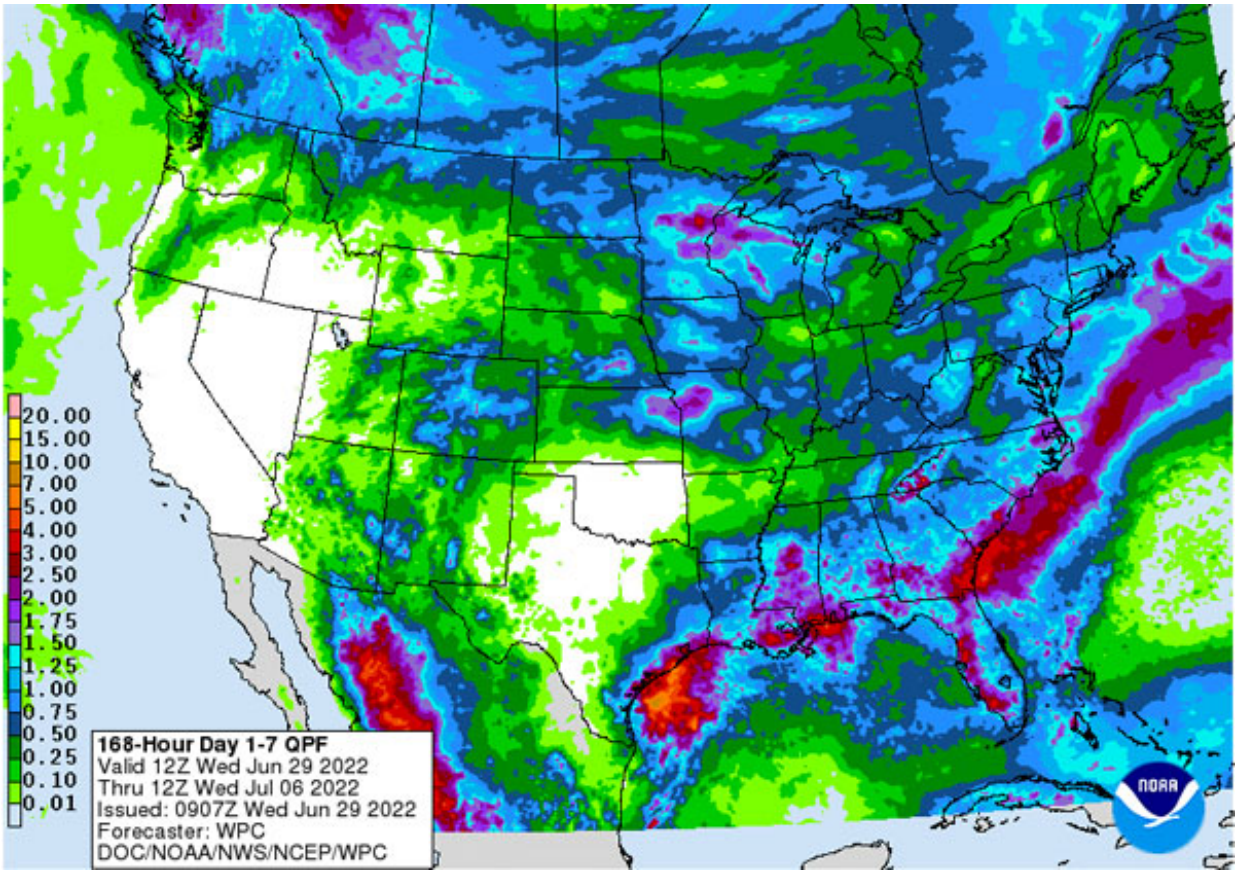

Figure 6. National Weather Service forecasted precipitation estimates through July 6th.

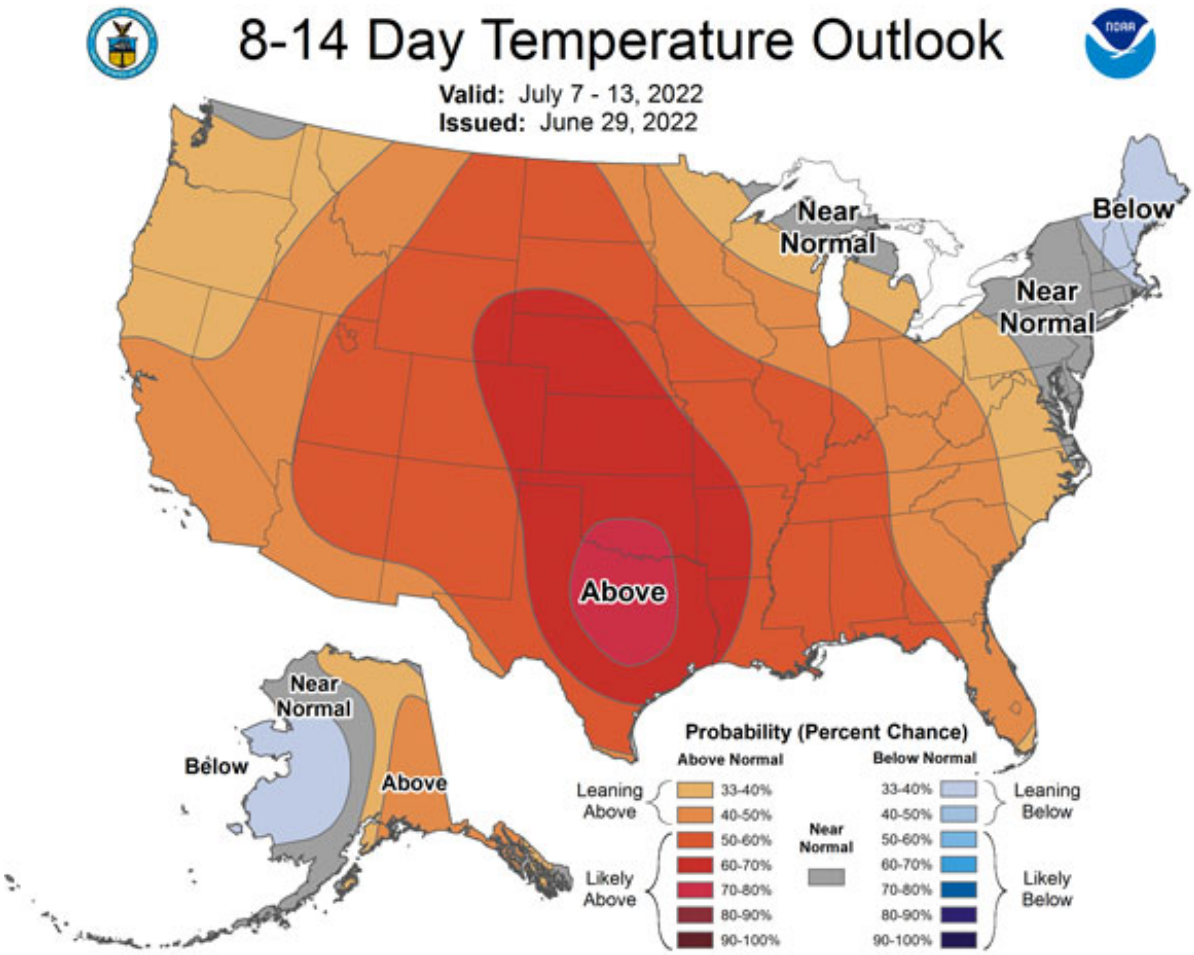

Figure 7. Climate Prediction Center temperature outlook for July 7-13.

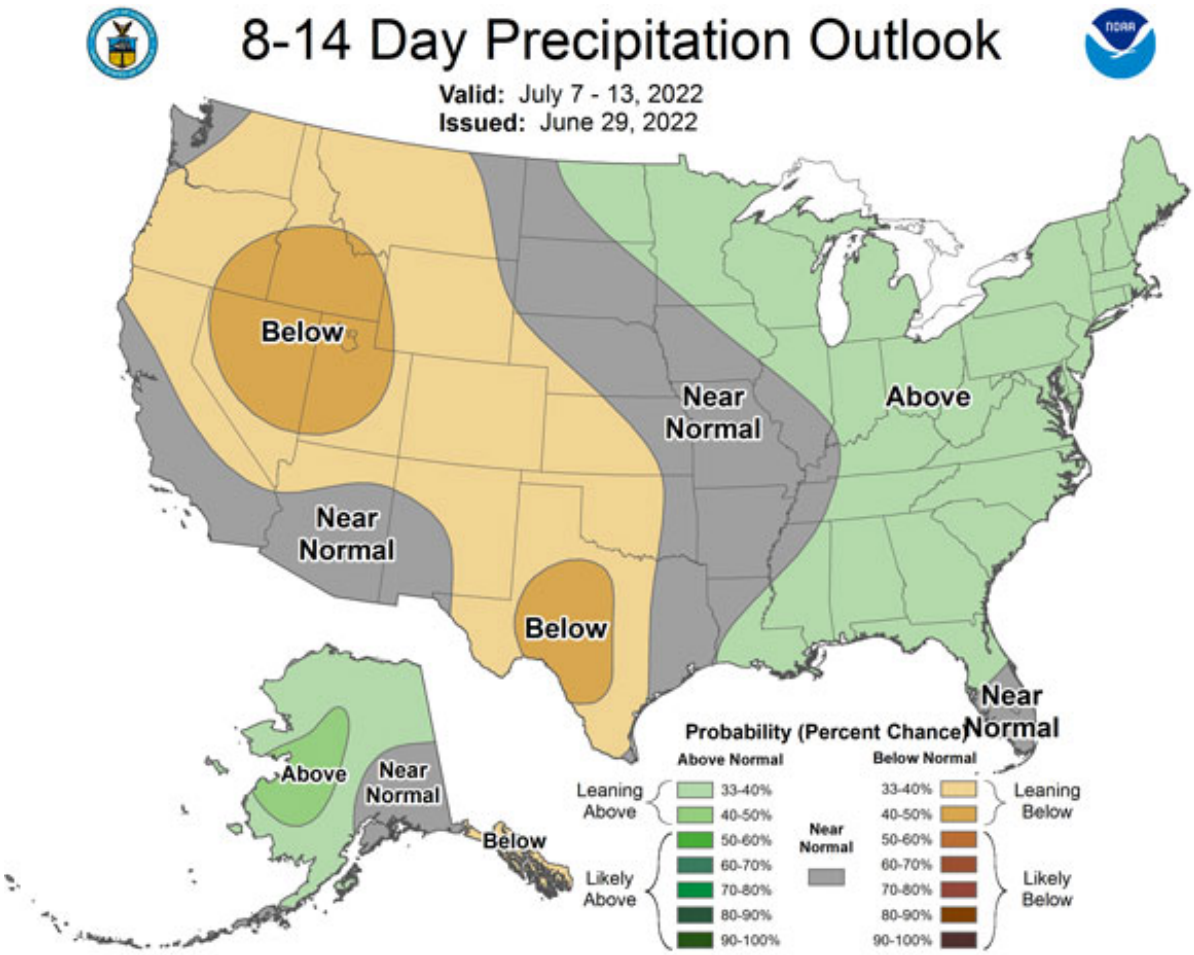

Figure 8. Climate Prediction Center precipitation outlook for July 7-13.

Table 1. Extremes of temperature and precipitation reports across Kansas last week.

Extreme	Value	Location (Observer Category)	County	Date
Highest Temperature	107°	Hays (COOP)	Ellis	June 24
Lowest Temperature	41°	Scott City 3SE (Mesonet)	Scott	June 28
Highest 1-Day Precipitation	3.64"	Rock 3 SW (COOP)	Cowley	June 26
Highest 7-Day Average Temperature	80.6°	Coffeyville Mun. Airport (WBAN)	Montgomery	
Lowest 7-Day Average Temperature	66.6°	Elkhart (COOP)	Morton	
Highest 7-Day Total Precipitation	5.83"	Wellington 1.3 W (CoCoRaHS)	Sumner	

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4. Kansas Corn Yield Contest: Early deadline June 30

The Kansas Corn Yield Contest is joined with the National Corn Yield Contest (NCYC). Kansas growers who enter the NCYC are automatically entered in the Kansas Corn Yield Contest. To participate in the Kansas contest, you must enter NCYC. This simplifies entries for growers and builds Kansas participation in both contests.

The Kansas Corn Yield Contest is sponsored by Kansas Corn and K-State Research and Extension. The Kansas Corn Yield Contest, gives Kansas farmers an opportunity to compete for cash prizes and recognition and see how their yields stack up against other growers in their area.

This contest:

• recognizes Kansas farmers achieving high corn yields,

• shares crop management and efficiency data among Kansas growers, and

• provides on-farm sustainability and profitability insights.

All corn farmers are eligible to enter to the contest, but must be members of KCGA/NCGA. Your KCGA membership also includes membership in NCGA. Join here.

NCYC/KCYC Entry and Deadline Information:

- **Early entry: May 2 – June 30**, **2022** $75 per online entry plus one-time affiliated State/NCGA membership fee (if applicable)
- **Final entry: July 1 – Aug. 17**, **2022** $110 per online entry plus one-time affiliated State/NCGA membership fee (if applicable)
- Harvest entry: Aug. 18 – Nov. 30, 2022
- NCGA National Corn Yield Contest Winners will be announced Dec. 14, 2022
- Kansas Corn Yield Contest Winners will be announced by Dec. 23, 2022.

Many seed companies will cover the cost of entry and membership. Details for 2022 can be found at https://www.ncga.com/get-involved/national-corn-yield-contest/profile/voucher-program

For more information, contact Deb Ohlde at dohlde@ksgrains.com or see:

https://kscorn.com/yieldcontest/

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5. Registration is open for the 2022 K-State/KARA Summer Field School

Kansas State University and the Kansas Agribusiness Retailers Association (KARA) will be hosting two, 2-day field schools on July 12-13 and July 14-15 at the K-State Agronomy North Farm (2200 Kimball Ave) located just north of the football stadium. This year's program will focus on corn and sorghum production and fertility. In addition, there will be comprehensive hands-on training in herbicide efficacy and injury, weed identification, soil and water management, crop diseases, and insects. Agendas for both sessions are included at the end of this article.

The complete program and registration link can be found at https://www.ksagretailers.org/events-training/ksu-field-days/. The cost for the program is $210 and includes lunch on both days and the opportunity to earn 12 CCA credits and multiple 1A credits.

Please note: KSRE agents should register via the registration link distributed over the Ag Agent email list serve.

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Agenda for Session 1: July 12 and July 13

Kansas State University/KARA Summer Field School (Session 1)

North Agronomy Farm, Manhattan, KS, July 12-15 2022

	Tuesday 7/12/2022		
8:00 AM	Registration – **North Agronomy Farm**		
8:30 AM	Welcome, Instructions		
	Group A	**Group B**	**Group C**
8:45 AM	Herbicide Efficacy/Injury (Lancaster)	Weed ID (Dille)	Corn/Sorghum Growth & Development (Correndo, Ciampitti)
9:35 AM	Adjuvants (Lancaster)	Weed ID (Dille)	Corn/Sorghum production issues (Correndo, Ciampitti)
10:25 AM	**Break**		
10:40 AM	Weed ID (Dille)	Corn/Sorghum Growth & Development (Correndo, Ciampitti)	Crop Insect Pests (Whitworth)
11:30 AM	Weed ID (Dille)	Corn/Sorghum production issues (Correndo, Ciampitti)	Crop Diseases (Onofre)
12:20 PM	**Lunch – North Agronomy Farm**		
1:10 PM	Corn/Sorghum Growth & Development (Correndo, Ciampitti)	Crop Insect Pests (Whitworth)	Weed ID (Dille)
2:00 PM	Corn/Sorghum production issues (Correndo, Ciampitti)	Crop Diseases (Onofre)	Weed ID (Dille)
2:50 PM	**Adjourn**		
	Wednesday 7/13/2022		
7:00 AM	Registration – **North Agronomy Farm**		
	Group A	**Group B**	**Group C**
7:30 AM	Corn Fertility (Ruiz Diaz, Haag)	Herbicide Efficacy/Injury (Lancaster)	Forage Production (Pedreira)
8:20 AM	Sorghum Fertility (Ruiz Diaz, Haag)	Adjuvants (Lancaster)	Water Quality (Tomlinson)
9:10 AM	**Break**		
9:25 AM	Forage Production (Pedreira)	Corn Fertility (Ruiz Diaz, Haag)	Herbicide Efficacy/Injury (Lancaster)
10:15 AM	Water Quality (Tomlinson)	Sorghum Fertility (Ruiz Diaz, Haag)	Adjuvants (Lancaster)
11:05 AM	**Lunch – North Agronomy Farm**		
11:55 AM	Crop Insect Pests (Whitworth)	Forage Production (Pedreira)	Corn Fertility (Ruiz Diaz, Haag)
12:45 PM	Crop Diseases (Onofre)	Water Quality (Tomlinson)	Sorghum Fertility (Ruiz Diaz, Haag)
1:35 PM	**Adjourn**		

Agenda for Session 2: July 14 and July 15

Kansas State University/KARA Summer Field School (Session 2)

North Agronomy Farm, Manhattan, KS, July 12-15 2022

K-STATE Research and Extension

	Thursday 7/14/2022		
8:00 AM	Registration – **North Agronomy Farm**		
8:30 AM	Welcome, Instructions		
	Group A	**Group B**	**Group C**
8:45 AM	Corn Fertility (Ruiz Diaz, Haag)	Herbicide Efficacy/Injury (Lancaster)	Forage Production (Pedreira)
9:35 AM	Sorghum Fertility (Ruiz Diaz, Haag)	Adjuvants (Lancaster)	Water Quality (Tomlinson)
10:25 AM	**Break**		
10:40 AM	Forage Production (Pedreira)	Corn Fertility (Ruiz Diaz, Haag)	Herbicide Efficacy/Injury (Lancaster)
11:30 AM	Water Quality (Tomlinson)	Sorghum Fertility (Ruiz Diaz, Haag)	Adjuvants (Lancaster)
12:20 PM	**Lunch – North Agronomy Farm**		
1:10 PM	Crop Insect Pests (Whitworth)	Forage Production (Pedreira)	Corn Fertility (Ruiz Diaz, Haag)
2:00 PM	Crop Diseases (Onofre)	Water Quality (Tomlinson)	Sorghum Fertility (Ruiz Diaz, Haag)
2:50 PM	**Adjourn**		
	Friday 7/15/2022		
7:00 AM	Registration – **North Agronomy Farm**		
	Group A	**Group B**	**Group C**
7:30 AM	Herbicide Efficacy/Injury (Lancaster)	Weed ID (Dille)	Corn/Sorghum Growth & Development (Correndo)
8:20 AM	Adjuvants (Lancaster)	Weed ID (Dille)	Corn/Sorghum production issues (Correndo)
9:10 AM	**Break**		
9:25 AM	Weed ID (Dille)	Corn/Sorghum Growth & Development (Correndo)	Crop Insect Pests (Whitworth)
10:15 AM	Weed ID (Dille)	Corn/Sorghum production issues (Correndo)	Crop Diseases (Onofre)
11:05 AM	**Lunch – North Agronomy Farm**		
11:55 AM	Corn/Sorghum Growth & Development (Correndo)	Crop Insect Pests (Whitworth)	Weed ID (Dille)
12:45 PM	Corn/Sorghum production issues (Correndo)	Crop Diseases (Onofre)	Weed ID (Dille)
1:35 PM	**Adjourn**		