Issue 916

K-STATE
Research and Extension

## Extension Agronomy

# eUpdate

*07/21/2022*

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. Estimating corn yield potential using the yield component method

**Corn flowering**

With most corn fields in Kansas already on reproductive stages (or close to flowering for late-planted fields), it is time to start assessing grain yield potential. Successful pollination is a critical aspect that farmers can evaluate by examining ear silks. Having conditions that favor the synchrony between the pollen shed by the tassels and the silks, the exposed silks should be turning brown and should easily separate from the ear when the husks are removed.

Water stress around flowering time (R1, http://www.bookstore.ksre.ksu.edu/pubs/MF3305.pdf) will negatively impact pollination due to a lack of synchrony between the pollen release and the emergence of the silks, which is a process that requires a lot of water. Heat stress around flowering will mainly impact the viability of the pollen. Normally, under dryland conditions in Kansas, water and heat stress use to happen together. Silks that have not been successfully pollinated will stay green, possibly growing several inches in length (Figure 1). Unpollinated silks also will be connected securely to the ovaries (the undeveloped kernels) when the husks are removed.

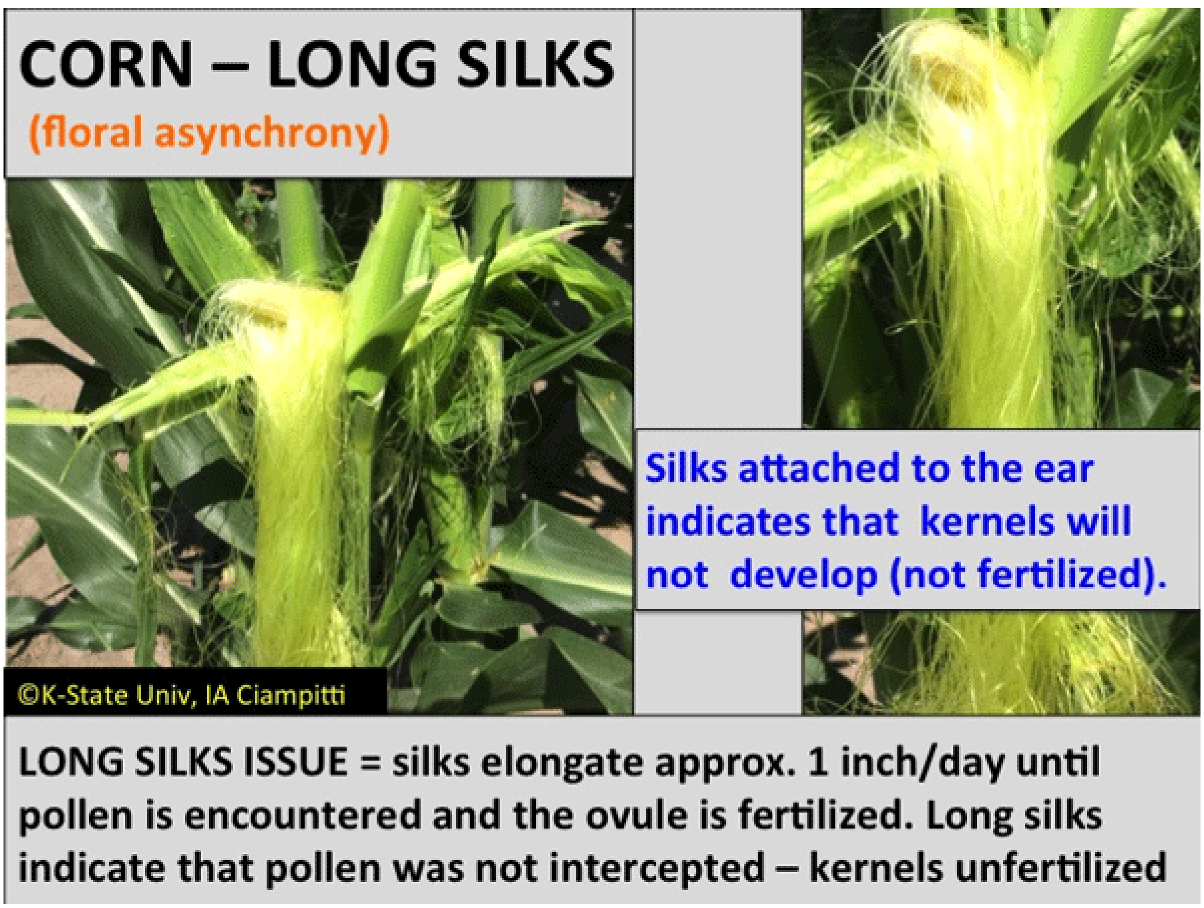


**Figure 1. Long silks primarily reflecting floral asynchrony. Silks that have not been successfully pollinated will stay green. Infographic by Ignacio Ciampitti, K-State Research and Extension.**

**Corn yield potential estimation**

Once pollination is complete or near completion, farmers could begin to estimate corn yield potential. To obtain a reasonable estimate, corn should be at least in the milk stage (R3). Before the milk stage, since grain abortion is still possible under stress conditions (mainly due to drought and/or heat stresses), it is difficult to tell which kernels will develop and which ones will abort.

To estimate yields, we can use the *yield component method* (Figure 2). This approach uses a combination of known and projected yield components. It is "potential" yield because one of the critical yield components, kernel size, remains unknown until physiological maturity. Therefore, we can only make an estimate of predicted yield based on expected conditions during the grain filling period (e.g. favorable, average, or poor).

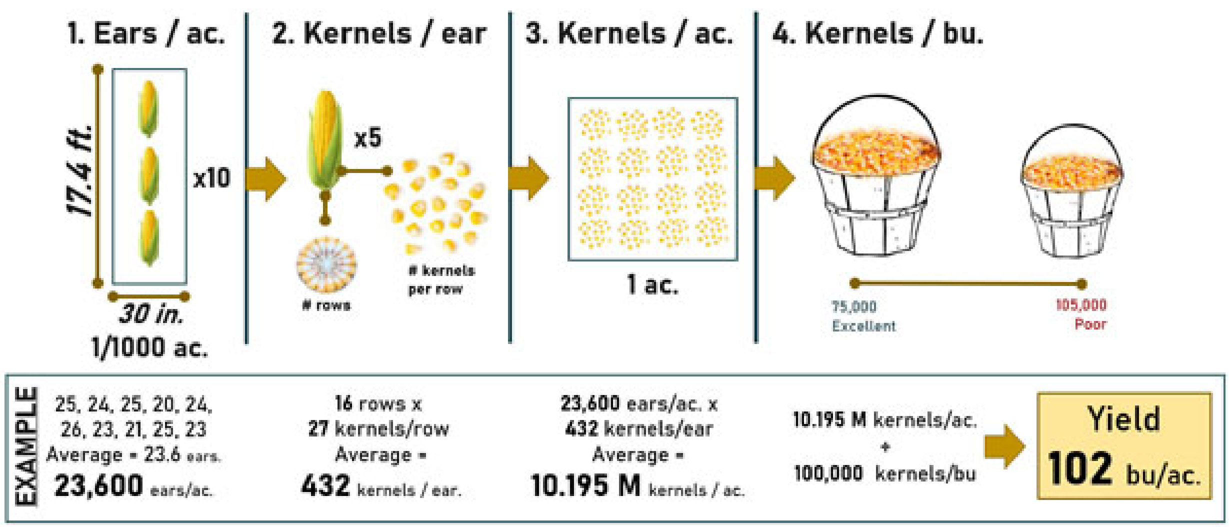


**Figure 2. Example of corn yield estimation under the "yield components method".**

Estimating potential corn yield using yield components uses the following elements:

**Step 1. Ears per acre**: This is determined by counting the number of ears in a known area. With 30-inch rows, 17.4 feet of row = 1,000th of an acre. This is probably the minimum area that should be used. The number of ears in 17.4 feet of row x 1,000 = the number of ears per acre. Counting a longer length of row is fine, just be sure to convert it to the correct portion of an acre when determining the number of ears per acre. Make ear counts in 10 to 15 representative parts of the field or management zones to get a good average estimate. The more ear counts you make (assuming they accurately represent the field or zone of interest), the more confidence you have in the yield estimate.

Example (Figure 2, step 1):

- Counting 10 times 17.4-foot sections: (25 + 24 + 25 + 21 + 24 + 26 + 23 + 21 + 25 + 23)
- 236/10 = 23.6 ears. Scaling up to an acre: 23.6 x 1,000 = **23,600 ears per acre.**

**Step 2. Kernels per ear**: There are two sub-components of kernels pear ear: (i) the number of rows per year, and (ii) the number of kernels within each row. Most likely, the number of rows will be around 16, and ears always keep and even number of rows. The number of kernels per row depends on multiple factors, starting from the hybrid, but it mainly depends on the growing conditions around flowering. To arrive at kernels per ear just multiply the two sub-components (number of rows x kernels per row). *Note: do not count aborted kernels or the kernels on the butt of the ear; count only kernels that are in complete rings around the ear. Do this for every 5th or 6th plant in each of your ear count areas. Avoid odd, non-representative ears.*

Example (Figure 2, step 2):

- Counting 5 ears from each 17.4-foot area had an average of 16 rows and 27 kernels per row: 16 x 27 = **432 kernels per ear**

**Step 3. Kernels per acre** = Ears per acre x kernels per ear

Example (Figure 2, step 3):

- 23,600 ears per acre x 432 kernels per ear = **10,195,000 kernels per acre**

**Step 4. Kernels per bushel**: This will have to be estimated until the plants reach physiological maturity. Common values range from 75,000 to 80,000 for excellent, 85,000 to 90,000 for average, and 95,000 to 105,000 for poor grain filling conditions. The best you can do at this point is estimate a range of potential yields depending on expectations for the rest of the season.

Example: Under a scenario of temperatures above 100° F for the next 7-14 days and lack of rains (and if these conditions persist), it might be more than reasonably to assume below-average grain filling conditions producing overall medium to small kernels. Based on the projected weather, a reasonable value might be **100,000 kernels per bushel** (Figure 2, step 4).

**Step 5. Bushels per acre:**

- 10,195,000 kernels per acre ÷ 100,000 kernels per bushel ~ **102 bushels per acre**

**Final considerations**

If these estimates are close to correct, the field in this example is probably worth taking to grain harvest. Past experience indicates that this method of estimating yield usually provides fairly optimistic estimates. Please consider these points when doing these field estimations during the current challenging conditions.

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## 2. Heat stress can elevate the risk of pest damage to summer crops

As we face an extended period of high temperatures in central Kansas, often exacerbated by strong winds, farmers should remain conscious of how heat stress can elevate the risk posed to summer crops by various pests. Although pests are also negatively impacted by extreme high temperatures, their feeding and reproduction will accelerate with increasing temperature until that point is reached. A plant's 'tolerance' of pest damage is mostly due to its capacity for compensatory growth and productivity, which enable it to sustain some loss of leaf area without any impact on final yield. All crops become less able to tolerate pest damage as moisture becomes limiting and high temperatures shut down photosynthesis. For example, alfalfa regrowth is at risk under dry conditions, because adult weevils can kill plants by feeding on the stems while the plants are unable to outgrow the damage. Dryland soybeans are also acutely vulnerable when seedling plants remain stunted by drought, but feeding by insects like mites and thrips continues. Later on, mature plants become less able to compensate for damage as they enter reproductive stages, and when damage directly affects reproduction as opposed to vegetative structures. Thus, late-maturing fields of soybeans tend to be more susceptible to late-season outbreaks of defoliators such as green cloverworm or soybean webworms, whereas earlier plantings will have already filled most pods.

**Sorghum midge**

Sorghum midge, *Stenodiplosis sorghicola*, is a pest that has been slowly expanding its range northward, and is no longer limited to southern Kansas along the Oklahoma border. Many sorghum farmers in Kansas are not yet familiar with this pest, or its potential to inflict serious yield loss and test weight (Figure 1). Adult females lay eggs at the base of sorghum florets at anthesis and larvae feed within developing kernels, destroying them (Figure 2). The generation time is only 2-3 weeks in hot weather, so many generations can occur in a single season as the midge moves north. A field that is infested in early stages of flowering may sustain damage from more than one midge generation. Because the larvae feed internally, there is no rescue treatment and control depends on scouting of fields at onset of flowering. This is accomplished by knocking heads into a white bucket and looking for the small, orange or reddish adults. Ten heads should be sampled at each of five different locations in a field; the treatment threshold is one midge per head. Please refer to the Kansas Sorghum Insect Pest Management Guide for treatment options.

**Figure 1. Damage to sorghum heads by sorghum midge feeding activity. Photo credit: K-State Research and Extension.**

**Figure** 2**. Close-up photo of a sorghum midge. Photo credit: K-State Research and Extension.**

**Sorghum headworms**

Headworms are another possible concern as sorghum begins to mature (Figure 3). Older, 'generic' insecticides are often selected for headworm control given their lower cost, but these are becoming less effective against both fall armyworm, *Spodoptera frugiperda*, and corn earworm, *Helicoverpa zea*, as the insects have been exposed to these modes of action for many years on many different crops. In addition, resistance to the *Bt* traits expressed in corn ears appears to be widespread in *H. zea*, which means we might expect increased numbers of migrant moths arriving from the south. There are now cost-effective alternatives to synthetic insecticides for control of these pests, sold commercially under the names Heligen® and Fawligen®. These products are biological pesticides, formulations of virus diseases specific to each of these insects that will not harm beneficial species, or indeed any other insects. They are more of a prevention than a cure, but if applied in early stages of an infestation, a single treatment can be very effective. Please refer to the current Kansas Sorghum

Insect Pest Management Guide for more on these and other treatment options.

**Figure 3. Headworms on a grain sorghum head. Photo credit: K-State Research and Extension.**

**Sorghum aphids**

The sugarcane aphid has recently been reported from some fields in Oklahoma, but populations remain isolated and small. We should now refer to this pest as the 'sorghum aphid', as its scientific name has been changed to *Melanaphis sorghi*, and it is not the same species that infests sugarcane. We do not expect economically significant infestations of sorghum aphid in Kansas to ever become as widespread as they were 5 or 6 years ago, but it is still a good idea to scout any late-planted fields that will be most at risk, in case we receive any large flights of winged aphids later in the summer.

We have also been seeing late flights of corn leaf aphid in recent years, which are not usually a concern, but might exacerbate any developing infestations of greenbugs or sorghum aphids if they colonize flag leaves and co-infest heads during grain fill. Transform and Sivanto remain the materials of choice if any threshold populations are detected. There is now a smart-phone app developed by OSU Extension that streamlines the sampling procedure for this pest considerably. You can find more information about it here: https://www.youtube.com/watch?v=sYx1y1h8Et8. Note that a plant is only considered 'infested' if it has more than 50 aphids on a leaf, as any colonies smaller than this have very low survival probability.

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## 3. Growing season precipitation for Kansas in 2022

Adequate moisture is a must for crops and ultimately yield. Problems arise when too much or too little precipitation falls. Unfortunately, the nature of climate is the average of extremes on the high and low end of the spectrum. Additionally, geography favors more moisture for eastern Kansas, with a decrease in averages with western extent. This year, we have a drought situation across much of the state. This article will provide some historical perspective of 2022 precipitation thus far.

**Rainfall period: April 1 to July 20, 2022**

The dataset for this report consists of precipitation received at 36 different locations across Kansas from the period April 1-July 20, 2022 (Table 1), which we will refer to herein as the "growing season" to date. For inclusion, a site must have at least 50 years of data, and each year must have no more than 7 missing records. Four sites were selected from each of Kansas' nine climate regions (Figure 1) to give equal representation across all areas of the state. The rank listed for each city is calculated by sorting each site's precipitation totals for the same period in ascending order, from driest to wettest. The driest of all years ranks 1st, the next driest 2nd, and so forth. But, since each site has been around for a different number of years, evaluating sites by ranks doesn't fairly compare them. A better way to compare sites with different periods of record is to sort by percentiles.

**Table 1. Total precipitation from April 1-July 20, 2022, in order of increasing percentile.**

| Site | County | Climate Division | Precip. (in.) | Rank | Years | Percentile |
|---|---|---|---|---|---|---|
| Healy | Lane | KS04 | 2.64 | 1 | 122 | 1 |
| Garden City | Finney | KS07 | 1.89 | 1 | 70 | 1 |
| Russell Springs | Logan | KS04 | 3.96 | 3 | 75 | 4 |
| Tribune | Greeley | KS04 | 3.60 | 5 | 113 | 4 |
| WaKeeney | Trego | KS04 | 5.35 | 5 | 112 | 4 |
| Dodge City | Ford | KS07 | 4.28 | 5 | 109 | 5 |
| Colby | Thomas | KS01 | 5.10 | 5 | 68 | 7 |
| Hill City | Graham | KS01 | 5.18 | 7 | 89 | 8 |
| Ashland | Clark | KS07 | 5.83 | 10 | 123 | 8 |
| Atwood | Rawlins | KS01 | 6.03 | 9 | 96 | 9 |
| Goodland | Sherman | KS01 | 5.35 | 16 | 109 | 15 |
| Beloit | Mitchell | KS02 | 9.73 | 28 | 108 | 26 |
| Russell | Russell | KS05 | 8.57 | 19 | 71 | 27 |
| Smith Center | Smith | KS02 | 8.96 | 30 | 107 | 28 |
| Hugoton | Stevens | KS07 | 7.38 | 33 | 107 | 31 |
| Greensburg | Kiowa | KS08 | 9.05 | 35 | 105 | 33 |
| Holton | Jackson | KS03 | 14.09 | 35 | 101 | 35 |
| Chanute | Neosho | KS09 | 16.04 | 46 | 111 | 41 |
| Concordia | Cloud | KS02 | 11.64 | 63 | 137 | 46 |
| Atchison | Atchison | KS03 | 15.61 | 59 | 116 | 51 |
| Clay Center | Clay | KS02 | 13.59 | 60 | 114 | 53 |
| Emporia | Lyon | KS06 | 16.66 | 29 | 52 | 56 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Lawrence | Douglas | KS06 | 16.96 | 73 | 122 | 60 |
| Topeka | Shawnee | KS06 | 16.29 | 47 | 76 | 62 |
| Arkansas City | Cowley | KS09 | 16.83 | 49 | 79 | 62 |
| McPherson | McPherson | KS05 | 15.28 | 84 | 126 | 67 |
| Wellington | Sumner | KS08 | 18.38 | 78 | 109 | 72 |
| Osage City | Osage | KS06 | 19.13 | 72 | 99 | 73 |
| Parsons | Labette | KS09 | 22.90 | 73 | 97 | 75 |
| Manhattan | Riley | KS03 | 19.05 | 98 | 126 | 78 |
| Wichita | Sedgwick | KS08 | 18.58 | 55 | 69 | 80 |
| Newton | Harvey | KS08 | 18.64 | 96 | 119 | 81 |
| Salina | Saline | KS05 | 16.41 | 53 | 65 | 82 |
| Marysville | Marshall | KS03 | 17.93 | 63 | 75 | 84 |
| Fort Scott | Bourbon | KS09 | 22.87 | 95 | 113 | 84 |
| Abilene | Dickinson | KS05 | 19.04 | 89 | 99 | 90 |

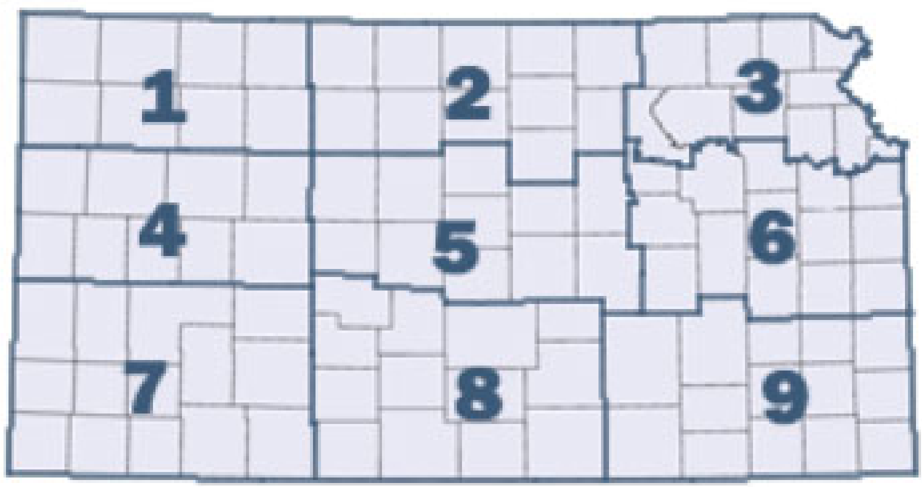


**Figure 1. Map of Kansas Climate Divisions.**

A quick example to clarify the interpretation of percentiles is in order. For example, at Manhattan, precipitation for the growing season this year ranks as the 98th driest out of 126 years. The listed percentile, 78, means that 78% of the 126 years on record at Manhattan are drier than 2022 for the growing season. A percentile of 50 indicates the median, or middle, value out of all seasons. Percentiles less than 50 indicate drier years than the median, and those above 50 are wetter years.

The lack of precipitation in the western third of Kansas is clearly evident in the data. Eleven of the twelve lowest percentiles are in western Kansas, with Healy and Garden City the most extreme, as both of their growing seasons rank as the driest on record! Looking at Garden City since the beginning of the year, it remains the driest on record (Figure 2). Colby, Dodge City, and Hill City are just three of the locations experiencing one of their 10 driest growing seasons. Central and eastern Kansas have had more precipitation, and most of those sites have above median precipitation, with a few exceptions. As we know, a stray thunderstorm can drop a lot of rain in one county and miss the next one, so there is variation in percentiles even within the same climate division. Wichita, Salina, and Manhattan have all had copious amounts of precipitation this spring, but it's Abilene that has the highest percentile currently of 90. Only ten percent of the years on record in Abilene have had more precipitation.

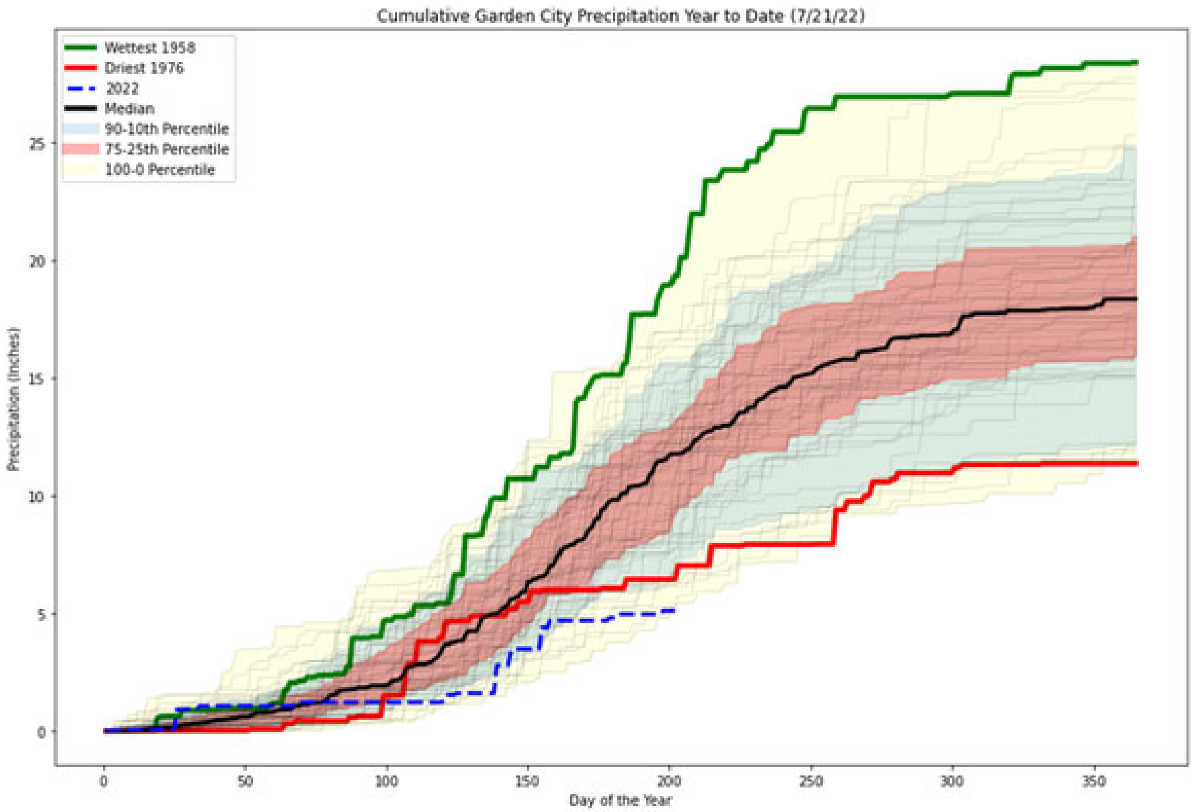


**Figure 2. Garden City accumulated precipitation since January 1st showing the driest on record as of July 20, 2022.**

As we move into late summer, it will be interesting to see how this year will stack up compared to previous years across the state. One thing is for certain: western Kansas desperately needs moisture. Driest on record, while climatologically significant, is potentially devastating to agriculture interests in Kansas. Here's hoping things change for the better soon.


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## 4. Beef Cattle and Forage Field Day, August 4

All are invited to attend the K-State Beef Cattle and Forage Field Day on August 4. The event will start at 7:30 am and take place at the Southeast Research and Extension Center in Parsons, KS (25092 Ness Road).

High input prices, weather events, encroachment of invasive plant species...they're all important topics that affect cattle producer's profits. The rest of the program includes a morning trip to the field to discuss broomsedge control in pasture and other fertility management, and an afternoon discussion about annual forages. The field day also includes several indoor presentations, which will be recorded and posted online at www.southeast.ksu.edu/field_days.

Presentations and presenters include:

- Broomsedge and fertility in pastures, Bruno Pedreira, K-State.
- What is happening and what is coming with antibiotic usage in cattle, Greg Hanzlicek, K-State.
- Using fire and small ruminants for pasture management of undesirable plant species, Laura Goodman, Oklahoma State University.
- Demonstration of online tool to determine stocking rates on a per pasture basis, Goodman.
- Annual forages for cattle production including development of heifers on different forages, Jaymelynn Farney, K-State.

The field day is free to attend and includes lunch. This year's field day sponsors include Green Cover Seeds, Mountain View Seeds, Producers Coop, SEK Genetics, South Coffeyville Livestock, WD Ag Insurance and Zoetis.

Those interested in attending are urged to contact Trista Jones no later than Aug. 1 by phone, 620-820-6133, or online at https://forms.gle/V2CL2fbP2UmQQnPF6 to help organizers with a meal count.