Issue 960

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Research and Extension

Extension Agronomy

eUpdate

06/08/2023

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. Managing late tillers in wheat

Rainfall during the past three weeks has resulted in a flush of late, green tillers in the wheat over much of Kansas, especially in the northwest corner of the state (Figure 1). In south-central Kansas, where the wheat is most advanced, these late-emerged tillers may have been burned back by the heat wave from a few weeks ago (Figure 2). This can create a problem, especially for wheat that is approaching harvest maturity. A question that usually arises when this happens is: Should I wait to start harvesting until most of the green heads have matured, or just start harvesting anyway?

Figure 1. Wheat plants in Wallace Co showing later-emerged tillers during the 2023 growing season as of June 7th. Notice the shorter and later heads in the middle to lower portions of the plants. Photo by Romulo Lollato, K-State Research and Extension.

Figure 2. Late-developed tillers have aborted after a combination of two freeze events followed by a heat stress wave in south-central Kansas. About half of the total number of tillers had been aborted in this field. Photo by Romulo Lollato, K-State Research and Extension, taken at Sedgwick Co, late May 2023.

This question is more relevant for the northwest part of the state, where the wheat in the most advanced heads is already between the flowering and early grain fill stages of development, and many late-produced tillers may still be in the boot. The answer on whether to wait on these tillers to harvest or not will depend on a few factors, mostly: (1) what will the weather be like for grain filling between now and harvest, and (2) what percent of total heads is represented by the late developed ones?

In cases where these tillers don't amount to more than 5% or so of the total amount of heads in the field, producers should not delay harvest because of the green tillers as they won't add much to the final yield anyway. Additionally, should the temperatures increase to more normal Kansas grain-filling weather in the near future, these late-developed tillers may be more exposed to heat stress. This would potentially result in lower test weight and shriveled kernels. So, producers should start harvesting as soon as the bulk of the field is ready. With varieties that tend to shatter easily, producers should start harvesting as soon as the field reaches 15% moisture.

In the off case that we have another ~3 weeks of below-average temperatures and above-average moisture, and when the green tillers make up for a large amount of the heads in the field, waiting to harvest until all heads ripen may be justified – but the chances here are slim. For most cases, it will probably be best to just start harvesting when the majority of heads are ready to go. Waiting for the green heads to ripen might lead to the shattering of the more mature heads.

Producers should be aware that the grain in the green heads may cause some storage problems. It's never easy to manage a late flush of green shoots in wheat. Unfortunately, there's no clear-cut answer, nor is there one best management strategy to fit all situations.

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2. What impact will late-season stripe rust have on the wheat crop?

Rainy, cool weather late in the season has led to trace levels of stripe rust showing up in many counties in central and western Kansas (Figure 1). In most locations, disease levels are well below action levels for a fungicide application, and there is very little concern about yield losses. Additionally, with much of the state moving into or past grain fill stages of development, it is largely too late to apply fungicides. As a reminder, all fungicides labeled for wheat have pre-harvest restrictions ranging from 30-35 days prior to harvest or that are growth stage specific. Most products with growth stage specific restrictions either cannot be applied past full head emergence (Feekes 10.5) or the watery ripe growth stage (Feekes 10.5.1). We have conveniently included these restrictions in the K-State Wheat Fungicide Publication (https://bookstore.ksre.ksu.edu/pubs/ep130.pdf). More information on growth staging wheat can be found here: https://bookstore.ksre.ksu.edu/pubs/MF3300.pdf. Always consult the label prior to application of any pesticide.

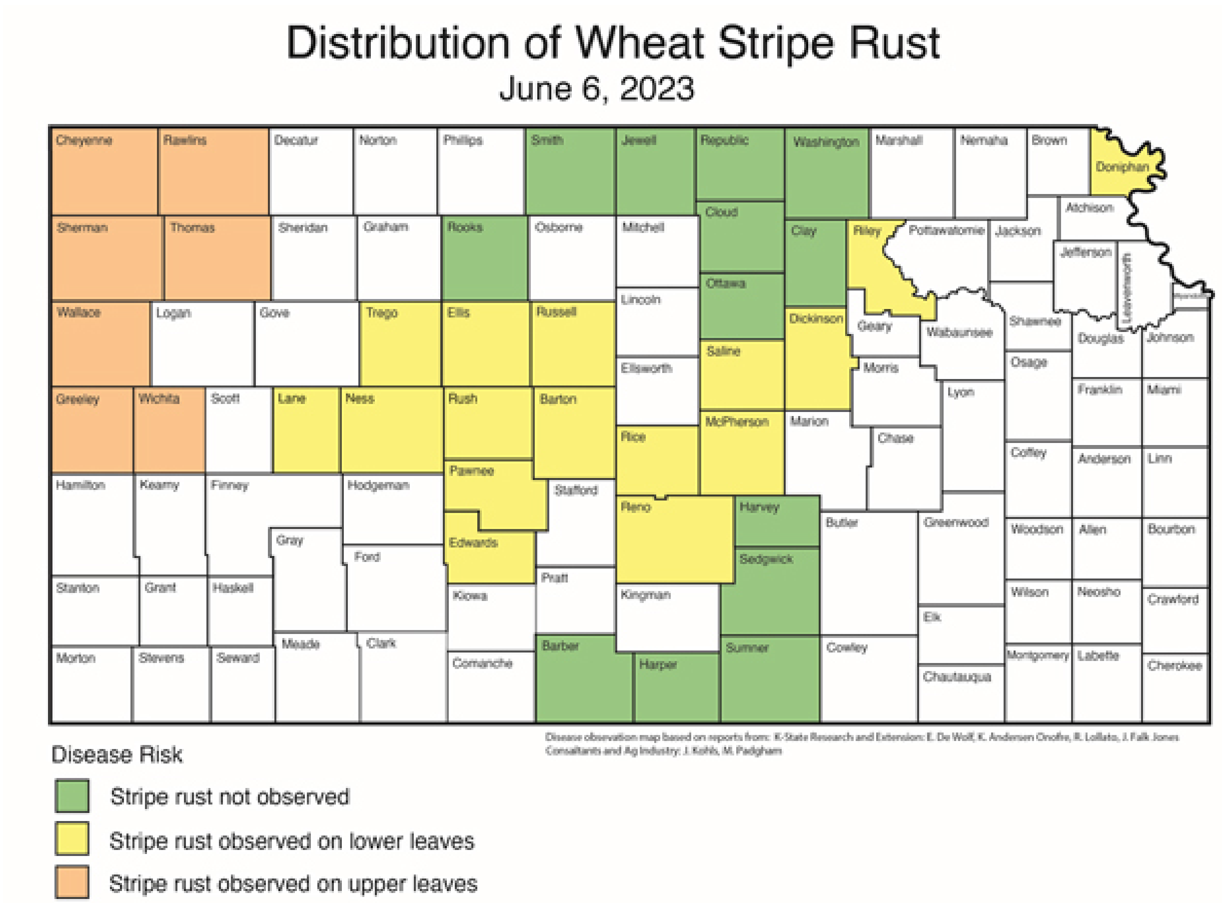

Figure 1. Distribution of stripe rust in Kansas as of April 29, 2021. The map is based on observations of K-State Research and Extension, crop consultants, and wheat producers in the state. Map created by Kelsey Andersen Onofre, K-State Research and Extension.

Stripe rust is most yield-limiting when it builds early in the season and advances to the upper canopy, particularly the flag leaf. The risk of stripe rust causing yield loss is a function of three things:

1. Timing of first local disease detection in relation to crop growth stage (earlier detection = higher risk)
2. Weather conditions: specifically, temperature and moisture after the first detection
3. Variety genetics: varieties with better resistance ratings will generally benefit less from a fungicide application. Variety ratings can be found in the K-State Wheat Variety Disease and Insect Rating Guide: https://bookstore.ksre.ksu.edu/pubs/MF991.pdf

Deciding on a fungicide application to control stripe rust

Most fields in Kansas are past the pre-harvest intervals for a fungicide application and no application should be considered at this point. The exception may be the state's northwest corner where some late-maturing wheat is still in the flowering or early kernel-filling stages of development.

The decision to apply a fungicide should be balanced with the yield potential of the crop and the current grain price. Fields potentially yielding greater than 40 bushels per acre or seed production fields should be prioritized for a fungicide application.

Scouting is a critical first step for stripe rust control. Stripe rust can be identified by characteristic orange lesions forming straight lines on mature plants (Figure 2). When you run your finger over a stripe rust pustule, the orange spores will be easily dislodged.

Figure 2. Classic symptoms of stripe rust. Photo by Kelsey Andersen Onofre, K-State Research and Extension.

Fungicide applications are most beneficial when the level of disease in the field is below 10% severity. University research has demonstrated that applications that protect the fully emerged flag leaf (between Feekes 8 and Feekes 10) are most effective, although late applications at flowering can provide stripe rust protection when disease onset is late (such as this year). See this K-State publication for additional information about growth staging wheat: https://bookstore.ksre.ksu.edu/pubs/MF3300.pdf. Applications applied prior to flag leaf emergence will not adequately protect the flag leaf or the head. Always check and follow product label recommendations to ensure full compliance with growth-stage limitations and pre-harvest intervals.

There are many products that are rated very good or excellent for stripe rust control (http://www.bookstore.ksre.ksu.edu/pubs/EP130.pdf).

The products listed in the K-State fungicide efficacy publication will generally provide at least 14-21 days of protection. This can vary between products and is also influenced by environmental conditions.

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3. Considerations for late-planted soybeans

By early June 2023, more than 80% of soybeans had been planted and less than half of all soybeans had emerged in Kansas (USDA Kansas Crop Progress and Report Condition, June 4, 2023).

Figure 1. Soybeans planted late (early June) into adequate soil temperature and moisture conditions. Photo by Ignacio A. Ciampitti, K-State Research and Extension.

Planting progress overview

Kansas farmers have been planting soybeans slightly earlier in recent years -- at the rate of about one-third day earlier every year (Figure 2). Statewide, in the past five growing seasons (2017-21), the "50% planting date" mark was achieved between the end of May (for the most recent decade) and the first of June (in the 1980s). The earliest date achieving half of the beans planted was May 12 in 2014, while the largest delay was June 28 in 1982.

Following the latest USDA Crop Progress and Condition report (June 4, 2023), soybean planting progress is above the 62% 5-year average (2018-2022); while emergence (62%) is also ahead of the 45% average.

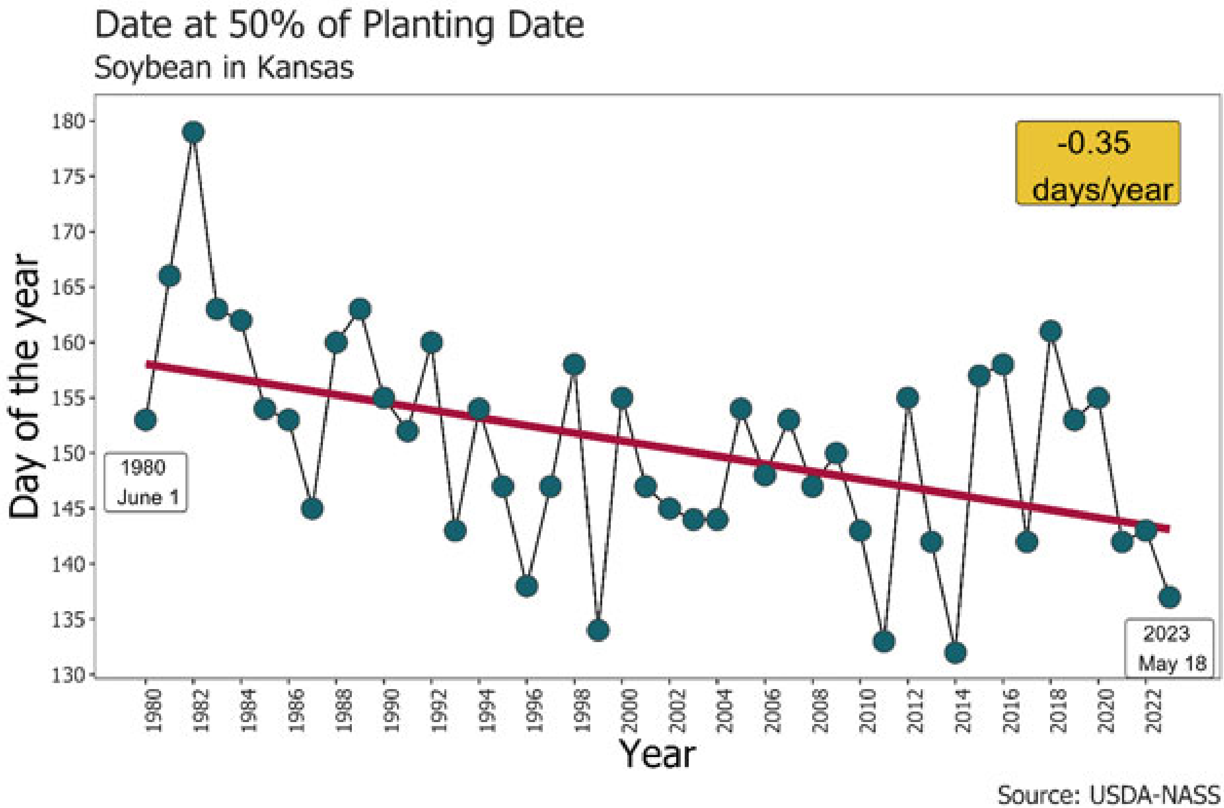


Figure 2. The trend in the date at which 50% of planting progress was achieved for soybean from 1980 to 2022 in Kansas (the last four decades of soybean progress in Kansas). Source: USDA-NASS.

Considerations for Late Planting

Where soybean planting has been delayed (or in double crop soybean systems), producers should consider a few key management practices. Planting soybeans in the right soil conditions is essential for establishing an adequate soybean canopy and improving chances to increase yield potential.

Planting date and maturity group

By planting in early June, soybeans are expected to bloom and fill seed from mid-August to mid-September, when nights are cooler, and the worst of heat and drought stress is usually over.

From mid-April to mid-July, we may expect maximum soybean yield in Kansas reduced by about 0.3 bu/a per day of delay past mid-April, from yield levels of about 80-90 bu/a to ~50 bu/a (Figure 3). On the other hand, the yield variability range is expected to narrow down as the planting date is delayed, which may result in improved yield "stability" for late-planted soybeans (although achieving a lower maximum yield). More information related to this topic available at https://eupdate.agronomy.ksu.edu/article_new/soybean-planting-date-and-maturity-group-selection-539-2

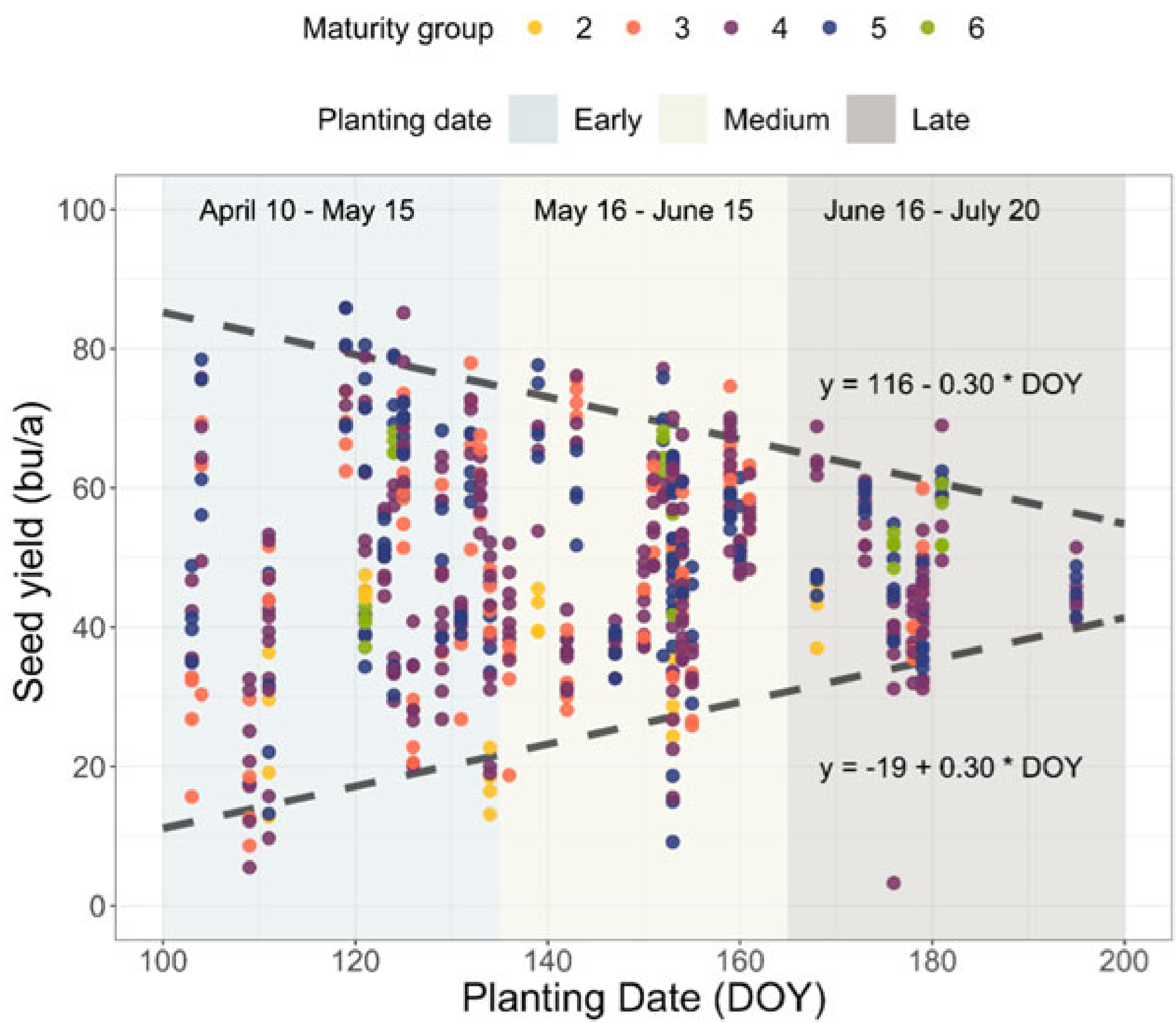


Figure 3. Soybean seed yields as a function of planting date from Early (mid-April to mid-May) to Medium (mid-May to mid-June) to Late (mid-June to mid-July) for a diverse set of maturity groups (from Maturity Group 2 to 6).

Seeding rate and plant density

Increasing the seeding rate of late-planted soybeans by 10-20% as compared to the optimal seeding rate can help compensate for the shortened growing conditions. Under normal conditions, the same soybean cultivar planted early in the planting window will develop nearly 50% more productive nodes than when planted in late June: 19-25 nodes when planted early vs. 13-16 nodes when planted late.

Soybean emergence could be delayed or compromised where there has been an excessive amount of rainfall in recent weeks. Replanting soybeans should be reserved only for exceptional cases where the stand counts and the uniformity look seriously affected. Otherwise, the cost of replanting is unlikely to pay off. Initial assessments should be done by the cotyledon stage (VC) and a week or so after the initial damage to assess the overall condition of plants and potential issues related to lack of uniformity, which could be a problem when stands are severely reduced.

Ensuring final plant populations are not too far from the optimal levels is crucial. In medium and high-yield environments, yields begin to decline at stands of less than ~100,000 plants per acre. In low-yield environments, however, yields may begin to decline at stands of less than ~125,000 plants per acre. At optimal planting dates, yields can be reduced by up to 15% with a stand of 80,000 plants per acre. This may be exacerbated under late planting dates due to the reduced capacity of the plants to produce compensatory yield growth, for example via branches.

For more on this topic, check this our eUpdate article on "Adjusting seeding rates for soybeans"

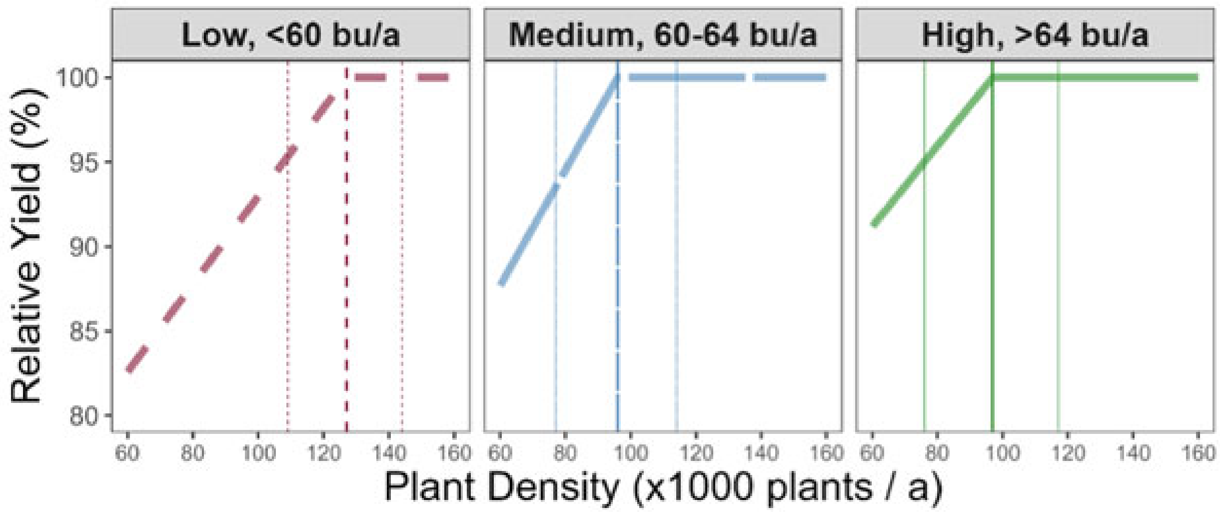


Figure 4. Expected soybean relative yield (%) with respect to the optimal plant density by yield environment. Vertical lines indicate expected optimal plant densities (Low: 127,000 plants/a; Medium: 96,000 plants/a; High: 97,000 plants/a) and their corresponding uncertainty (95% intervals). Adapted from Carciochi et al. (2018).

Row spacing

Information on late-planted soybeans across multiple row spacing suggests that narrow rows (e.g. 7" or 15" vs. 30") can hasten canopy closure, increasing season-long light interception, weed suppression, and potentially improving biomass and final yield. The likelihood of a positive yield response to narrow rows increases as the yield environment lowers (Figure 5), for example with delayed planting. For more details on this topic, check our eUpdate article on soybean row spacing.

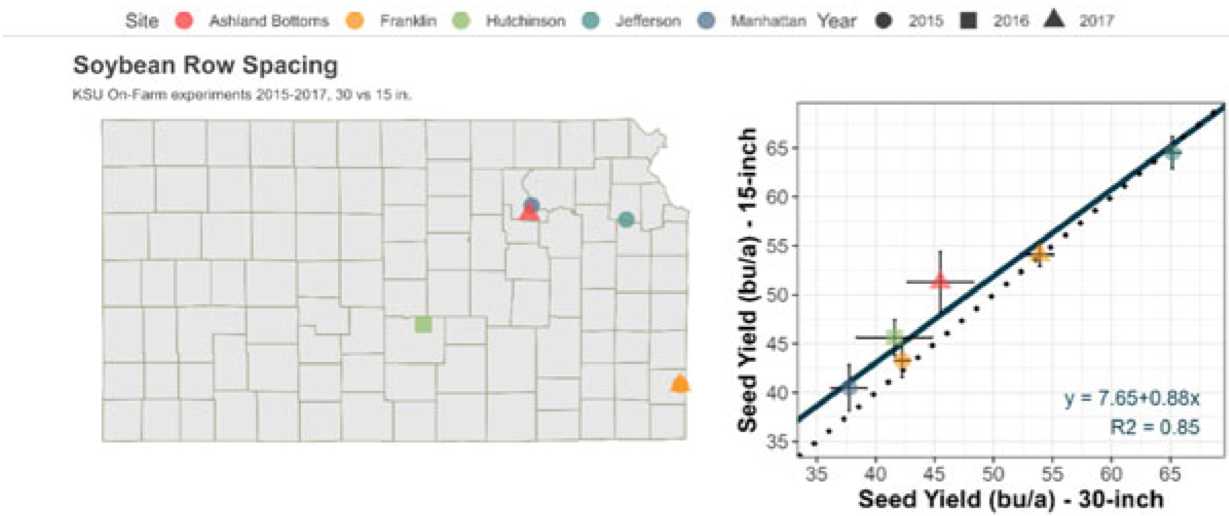
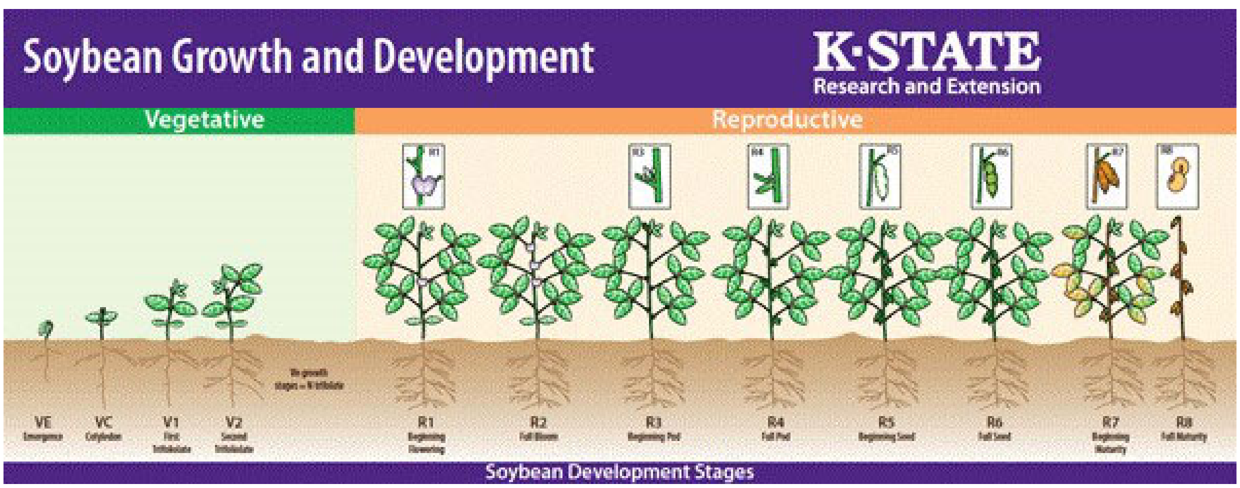


Figure 5. On-farm experiments on soybean row spacing comparing conventional (30-inch) vs. narrow rows (15-inch). Collaborators: Kansas State University, United Soybean Board, North Central Soybean Research Program.

Finally, proper identification of soybean growth stages can make a difference in yield. Consult our soybean growth and development chart at:

https://www.bookstore.ksre.ksu.edu/pubs/MF3339.pdf



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4. Kansas Mesonet has improved evapotranspiration estimates

Evapotranspiration (ET) is a measure of how much water is lost by evaporation from the soil surface and transpiration from plants. The Kansas Mesonet, a standardized agriculture-driven weather station network, has historically provided reference ET estimates used for hydrological studies, climate and crop modeling, and irrigation management. In the current drought, irrigation decisions can have critical effects on the underlying aquifers and potential long-term impacts, making ET an extremely valuable Kansas Mesonet output variable. This spring, the Mesonet is updating both how ET is estimated and providing a new tool to access the data.

Previous Data Access

Previously the Kansas Mesonet made ET data available through the historical data page (https://mesonet.k-state.edu/weather/historical/). Evapotranspiration was estimated on a daily basis and users could download up to a year's worth of daily data.

Historical Weather

Mesonet Data Policy

English | Metric | Table | Graph | CSV | SHEF | Weather Parameters

Colby

2023-05-01 — 2023-05-10

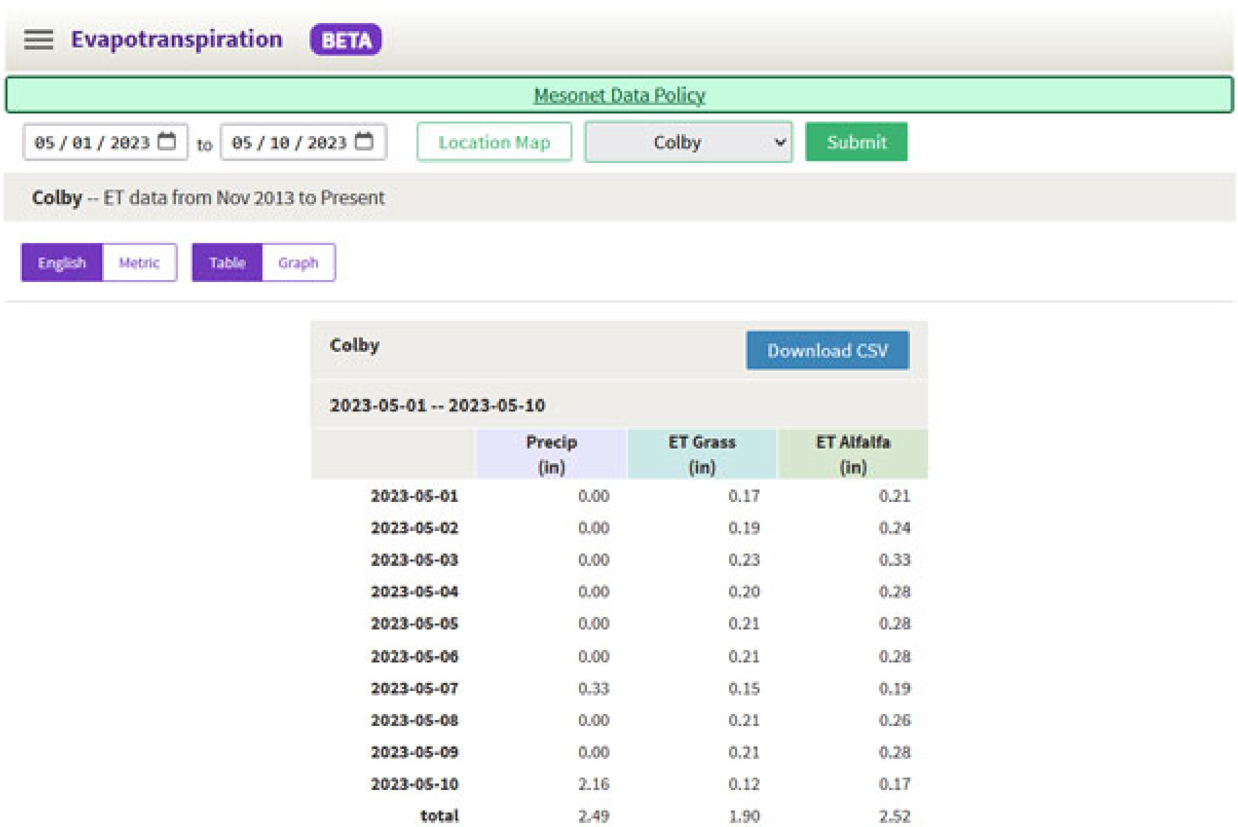
	Air Temperature		Relative Humidity	Precip	Wind Speed		2" Soil Temperature		4" Soil Temperature		Solar Radiation	ETo	
	Max °F	Min °F	Avg %	Total inches	Avg mph	Max mph	Max °F	Min °F	Max °F	Min °F	Total ly	Grass inches	Alfalfa inches
05-01	67.3	34.9	32.6	0	3.6	15.9	64.6	49.0	60.3	50.0	647.7	0.18	0.23
05-02	68.5	39.0	31.1	0	4.8	16.3	65.4	50.2	61.2	51.4	648.4	0.20	0.27
05-03	78.6	41.8	38.5	0	11.3	25.9	63.4	52.4	60.3	53.2	568.0	0.28	0.41
05-04	82.3	46.1	54.6	0	8.0	24.7	65.8	54.9	62.6	55.3	550.6	0.24	0.35
05-05	82.5	50.8	56.9	0	8.0	22.8	69.5	57.7	65.7	57.8	578.5	0.25	0.34
05-06	84.0	50.9	48.6	0	6.1	25.7	71.9	59.5	67.9	59.5	615.5	0.26	0.37
05-07	78.4	39.1	66.8	0.33	7.8	39.2	68.0	57.0	65.2	58.7	486.6	0.22	0.31
05-08	79.2	45.2	54.4	0	5.6	18.2	71.9	54.3	67.3	55.7	650.1	0.23	0.31
05-09	75.9	58.8	57.1	0	9.8	22.3	73.5	59.8	69.2	60.1	559.2	0.23	0.31
05-10	79.4	53.7	72.9	2.16	10.5	43.6	70.9	59.2	67.6	59.9	256.6	0.20	0.31
summary	77.6	46.0	51.4	2.49	7.6	43.6	68.5	55.4	64.7	56.2	556.1	2.29	3.20

Figure 1. The old method of accessing reference ET data on the Kansas Mesonet.

New Data Web Tool

Over the past year, our team has improved our ET calculations by using higher-resolution weather data to better match field conditions in Kansas. The daily reference ET is no longer calculated and displayed on the historical page. However, this opened new possibilities for a stand-alone ET web tool which can be found at https://mesonet.k-state.edu/agriculture/et/, or via the ☰ menu under "Agriculture" -> "Evapotranspiration".

This new tool allows users to select a station and time period, view data numerically/graphically, and download data in CSV format (Figure 2). For our oldest stations, data goes back to late 2013.



	Precip (in)	ET Grass (in)	ET Alfalfa (in)
2023-05-01	0.00	0.17	0.21
2023-05-02	0.00	0.19	0.24
2023-05-03	0.00	0.23	0.33
2023-05-04	0.00	0.20	0.28
2023-05-05	0.00	0.21	0.28
2023-05-06	0.00	0.21	0.28
2023-05-07	0.33	0.15	0.19
2023-05-08	0.00	0.21	0.26
2023-05-09	0.00	0.21	0.28
2023-05-10	2.16	0.12	0.17
total	2.49	1.90	2.52

Figure 2. Screenshot of the simple interface of the new ET tool found at https://mesonet.k-state.edu/agriculture/et/.

The new tool also features some significant improvements. Users are no longer limited to 365 days of data. In fact, the new tool allows the comparison of ET and precipitation data for multiple years. In the example below (Figure 3), we changed the starting date for Colby to 2019, so the graphs show the cumulative reference ET for the station for five consecutive years.

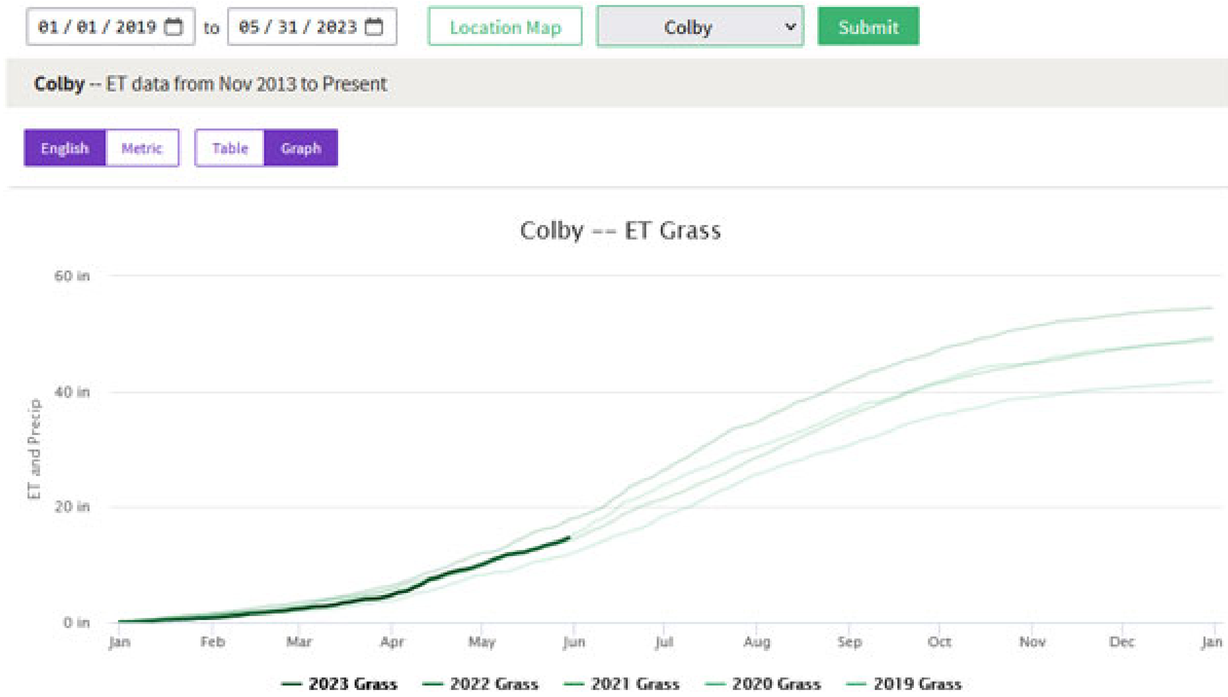


Figure 3. By pulling multiple years' data, users can compare ET to previous years when they select the "Graph" option at the top of the new ET tool: https://mesonet.k-state.edu/agriculture/et/.

ET Calculation Enhancements

For this new product, we have extensively evaluated reference ET calculations. The Kansas Mesonet utilizes the widely accepted reference ET Penman-Monteith equation parameterization provided by the American Society of Civil Engineers (Allen et al. 2005). Previous data availability from our older weather station programs limited us to using daily maximum and minimum temperature and humidity data. We found that this typically resulted in an overestimation of daily ET day in comparison with a preferred calculation using hourly air humidity data.

With a more modern weather station program, we are able to measure temperature and average vapor pressure (instead of humidity) to more accurately measure ET at sub-daily intervals. This gives us higher-resolution daily measurements that capture changes throughout the day. We found this not only provides a better measurement but will also result in lower, more realistic, values in daily reference ET. This improved accuracy results in producers applying less irrigation to sustain crop growth during periods of increased environmental ET demand. For some locations such as Colby, Garden City, and Tribune 6NE, we observed over 10 inches lower growing season ET with the revised calculation compared to what was previously available over the last three years (Table 1). When we consider the need for minimal water use to preserve aquifers, accurate ET estimation is extremely important for producers in western Kansas.

Table 1. Average difference in evapotranspiration with the Mesonet's modernized equation compared to the previous from 2019-2022. Negative values less estimated overall ET over the growing season (April 1 - September 30) with the revised equation.

Weather Station	ETgrass (inches)	ETalfalfa (inches)
Ashland Bottoms	-3.04	-5.53
Colby	-6.84	-12.09
Garden City	-6.85	-11.97
Gypsum	-4.24	-7.65
Hutchinson 10SW	-4.78	-8.46
Ottawa 2SE	-3.17	-5.68
Parsons	-2.41	-4.67
Scandia	-3.56	-6.35
Tribune 6NE	-6.43	-11.28

The Future

These changes were brought about by feedback from producers. We are striving to provide tools that improve field decisions and hopefully extend our water resources. Through a representative committee across multiple departments, we were able to do the required research and apply these changes to our website. A huge thanks to all those who assisted in this project. If you feel there are additional changes that could be made in the future - please don't hesitate to reach out to the authors!

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5. Control options for roughleaf dogwood and smooth sumac

Two common brush species native to Kansas and widely spread across the state are roughleaf dogwood (*Cornus drummondii*) and smooth sumac (*Rhus glabra*).

Roughleaf dogwood is a shrub that can reach 15 feet in height. Flat-topped clusters of white flowers usually appear in late May to early June. The round white fruits appear from September to October. Roughleaf dogwood occurs in fencerows, edge of woods, along streams, and on open prairies. It provides cover for wildlife and nesting birds.

Smooth sumac will grow to a height of 5-7 feet and produces an open milo-like head in early June Leaves are odd-pinnately compound and turn bright red in the fall. The round red fruits are produced from August to September. It grows on rocky soils in pastures and along fencerows. Some birds will eat the seed and the plants provide cover for birds and mammals.

These shrubs can produce clumps that will shade out and reduce forage production. Cattle generally do not browse these species. Sheep and goats are more likely to utilize these woody plants.

Be on the lookout for roughleaf dogwood and smooth sumac and implement a control plan if needed.

Roughleaf dogwood control

Roughleaf dogwood is rarely grazed and invades grassland in the absence of prescribed burning. Pastures that are frequently burned usually do not have a roughleaf dogwood problem. A Konza Prairie study near Manhattan indicated that roughleaf dogwood increases dramatically on grazed or ungrazed watersheds with a burning frequency of 4 years, compared to annual burning. Once established, roughleaf dogwood is difficult to remove with fire alone as the plant usually leafs out after the burning season. Long-term late-spring burning may gradually reduce stands of roughleaf dogwood.

The optimum time to spray roughleaf dogwood is between the flower bud state and early seed production (Figure 1). A number of foliar-applied herbicides including triclopyr (Remedy Ultra), dicamba (Banvel), and picloram (Tordon 22K) used alone or in combination with 2,4-D will defoliate roughleaf dogwood, but actual mortality is usually less than 25%.

Roughleaf dogwood can be difficult to control. High-volume treatments providing greater than 50% mortality include 0.5-1% PastureGard HL (triclopyr + fluroxypyr), 1% Surmount (picloram + fluroxypyr), and 1% Grazon P+D + 0.5% Remedy Ultra (picloram + 2,4-D + triclopyr). All these herbicides are applied with water. Adding a 0.25 to 0.5% v/v non-ionic surfactant may enhance control. Aerial applications should be applied in a minimum 3 gallons per acre total spray solution to ensure adequate coverage.

A single application of any herbicide does not completely eliminate roughleaf dogwood but may open up the stand enough to carry a fire. In subsequent years, a combination of prescribed burning in the late spring followed by a herbicide application 4-6 weeks post-burning should provide good control.

Figure 1. Roughleaf dogwood in full bloom. Photo by Walt Fick, K-State Research & Extension

Smooth sumac control

Late-spring burning will keep smooth sumac shorter in stature, but generally increases stem density. The optimum time to spray smooth sumac is between the flower bud stage and early seed production (Figure 2). Smooth sumac is among the easiest woody plants to control with herbicides if applied at the proper time. With ground or aerial applications, smooth sumac is controlled with 2-3 pint/acre 2,4-D.

Figure 2. Smooth sumac in early seed production stage. Photo by Walt Fick, K-State Research & Extension

Measures that can mitigate both roughleaf dogwood and smooth sumac

Soil-applied materials such as Spike 20P (tebuthiuron) and Pronone Power Pellets (hexazinone) can provide control of roughleaf dogwood and smooth sumac. Spike 20P should be applied during the dormant season at 0.75 ounces per 100 square feet of product. This is equivalent to 20 pounds of product per acre. Pronone Power Pellets should be applied when the soil is moist and rainfall is expected within 2 weeks of application. For plants 3-6 feet tall apply 2-4 pellets at the base of the plant. Expect to see grass damage following the use of Pronone Power Pellets. These dry soil-applied products may be useful in areas where spray drift may cause considerable non-target damage.

Growing season burns, e.g. in August, have the potential to reduce stands of roughleaf dogwood and smooth sumac.

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