



K-STATE
Research and Extension

Extension Agronomy

eUpdate

03/27/2020

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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1. K-State's Soil Testing Lab and Plant Disease Diagnostic Lab are OPEN!

During this time of reduced operations at K-State due to COVID-19, there have been questions on the operational status of the Soil Testing and Plant Disease Diagnostic Labs on the Manhattan campus. Both of these labs are open and accepting samples, however submission of samples has been modified to accommodate new distancing guidelines. Please read below for specific instructions on how to submit samples (each lab has their own instructions).

KSU Soil Testing Lab

The Soil Testing Lab is fully staffed and operational. Given that we are able to operate with a full staff, the turnaround time for sample analysis is not expected to change. However, sample submission procedures have been modified and are outlined below.

- **No in-person sample delivery to lab.** However, samples can be left in the **Soil Drop Box** located on the NW side of Throckmorton (1712 Claflin Rd.) There is map on the door of the building or on the Lab website at <https://www.agronomy.k-state.edu/services/soiltesting/> (Figure 1). Samples will be picked up at least twice a day.
- **Samples can be mailed via USPS or UPS.** To create a UPS shipping label, please visit our website and input your mailing address: https://ksusoiltesting.com/ups_form.php. If using the U.S. Postal Service, the mailing address for the lab is:

KSU Soil Testing Lab
2308 Throckmorton Plant Science Center
1712 Claflin Road
Manhattan, KS 66506-5503

- **Samples can be submitted to your local county Extension office.** County offices will forward samples to the lab (postage and handling may be charged). Contact your local office for samples bags, instructions, and if you have questions.



Figure 1. Location of the Soil Sample Drop Box located on the NW side of Throckmorton Plant Sciences Center in Manhattan.

Homeowners and producers are encouraged to contact the lab with any questions. The Soil Testing Lab is working hard to best accommodate the soil testing needs for everyone during this critical time of the year. **Please reach out by phone at 785-532-7897 or by email at soiltesting@ksu.edu.**

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KSU Plant Disease Diagnostic Lab Update

The KSU Plant Disease Diagnostic Lab continues to remain open at this time. However, we are working under limited operations and staff, so turn around may take a little longer than usual. There have been a few changes to our submission procedures. Please read the information below:

- **No in-person sample delivery to lab.** Instead, if you are in **Manhattan** please use the **soil drop box** located on the Northwest side of Throckmorton PSC (Figure 1).
- **USPS sample delivery to 4032 Throckmorton PSC 1712 Claflin Rd Manhattan, KS 66506**

is still available, but will be checked at a minimum of twice a week. Time sensitive samples such as **Wheat should NOT use USPS** and instead use the new temporary address below.

- **The best mailing option for samples to the plant disease diagnostic lab** is BELOW.

Please email us the tracking # so we know that a sample is coming to the lab.

Our NEW TEMPORARY SHIPPING ADDRESS for UPS/FEDEX packages

KSU Plant Disease Diagnostic Lab
1310A Westloop PI #351
Manhattan, KS 66502

The growing season is about to kick off and we want to support Kansas growers and county extension offices. If you have questions, please contact us at clinic@ksu.edu

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2. Optimal corn seeding rate recommendations

The optimal corn seeding rate depends on the hybrid (genotype, G) and the interaction with the environment (E), researchers termed this as the G x E interaction. Producers can look back to their corn crop from the previous growing season, or wait until the current growing season is nearly complete, and evaluate whether the plant population they used was adequate. Another factor that sometimes we neglect to mention is the effect of management practices (M). Planting date, row spacing, and crop rotations can also exert some influence on the yield response to the plant population factor.

Individual hybrids can respond differently, but the following guidelines may help in deciding if current seeding rates need to be adjusted.

- If more than about 5% of the plants are barren or if most ears have fewer than 250 kernels per ear, the plant population may be too high.
- If there are consistently more than 600 kernels per ear or if most plants have a second ear contributing significantly to grain yield, the plant population may be too low. Of course the growing conditions will influence ear number and ear size as well, so it is important to factor in the growing conditions for that season when interpreting these plant responses.
- In addition to the growing conditions, nutrient status can also influence the final number of grains per ear. For example, severe nitrogen (N) deficiency will have a high impact on the final number of grains, ear size and ear number.

Don't be too concerned if a half-inch or so of the ear tip has no kernels. If kernels have formed to the tip of the ear, there may have been room in that field for more plants contributing to grain yield. Again, "tipping back" will vary with the G x E x M interaction. Potential ear size and potential number of kernel (1,000-1,200 per ear) are set before silking, but the actual final number of kernels is not determined until after pollination and early grain fill due to relative success of fertilization and degree of early abortion.

Always keep the long-term weather conditions in mind. In a drought year, almost any population is too high for the available moisture in some areas. Although it's not a good idea to make significant changes to seeding rates based only on what has happened recently, it is worthwhile taking into consideration how much moisture there is currently in the soil profile and the long-term forecasts for the upcoming growing season.

Making a decision on whether to keep seeding rates at your usual level, or increase somewhat this year if the soil profile is wetter-than-normal is a little like the famous line in the movie Dirty Harry: "Do I feel lucky?" If you think weather conditions will be more favorable for corn this year than the past years, stay about in the middle to upper part of the range of seeding rates in the table below. If you do not think growing conditions will improve enough to make up for dry subsoils, you might want to consider going toward the lower end of the range of recommended seeding rates, with the warning that if growing conditions improve, you will have limited your top-end yield potential.

Optimal seeding rates may need to be adjusted for irrigated corn if fertilizer or irrigation rates are

sharply increased or decreased. For example, research at the Irrigation Experiment Field near Scandia has shown that if fertilizer rates are increased, seeding rates also have to be increased to realize the maximum yield benefit. Consult seed company recommendations to determine if seeding rates for specific hybrids should be at the lower or upper end of the recommended ranges for a given environment.

The recommended planting rates in the following tables attempt to factor in these types of questions for the typical corn growing environments found in Kansas. Adjust within the recommended ranges depending on the specific conditions you expect to face and the hybrid you plan to use.

Table 1. Suggested dryland corn final populations and seeding rates

Area	Environment	Final Plant Population	Seeding Rate*
		(plants per acre)	(seeds per acre)
Northeast	100-150 bu/a potential	22,000-25,000	26,000-29,500
	150+ potential	24,000-28,000	28,000-33,000
Southeast	Short-season, upland, shallow soils	20,000-22,000	23,500-26,000
	Full-season bottom ground	24,000-26,000	28,000-30,500
North Central	All dryland environments	20,000-22,500	23,500-26,500
South Central	All dryland environments	18,000-22,000	21,000-26,000
Northwest	All dryland environments	16,000-20,000	19,000-23,500
Southwest	All dryland environments	14,000-20,000	16,500-23,500

Table 2. Suggested irrigated corn final populations and seeding rates

Environment	Hybrid Maturity	Final Plant Population	Seeding Rate*
		(plants per acre)	(seeds per acre)
Full irrigation	Full-season	28,000-34,000	33,000-40,000
	Shorter-season	30,000-36,000	35,000-42,500
Limited irrigation	All	24,000-28,000	28,000-33,000

* Assumes high germination and that 85 percent of seeds produce plants. Seeding rates can be reduced if field germination is expected to be more than 85%.

New research on corn seeding rates

An intensive review of a large database from Corteva Agriscience (2000-2014 period) was utilized to synthesize yield response to plant population under varying yield environments (<100 bu/acre to >200 bu/acre).

Overall, yield response to plant population depended on the final yield environment (Figure 1). In yield environments below 100 bu/acre, yield response to plant population was slightly negative. Yield response to plant population tended to be flat when yield environment ranged from 100 to 150 bu/acre; positive and quadratic with the yield environment improving from 150 to 180 bu/acre; and lastly, increasing almost linearly with increasing plant populations when the yield environment was more than 200 bu/acre (Figure 1).

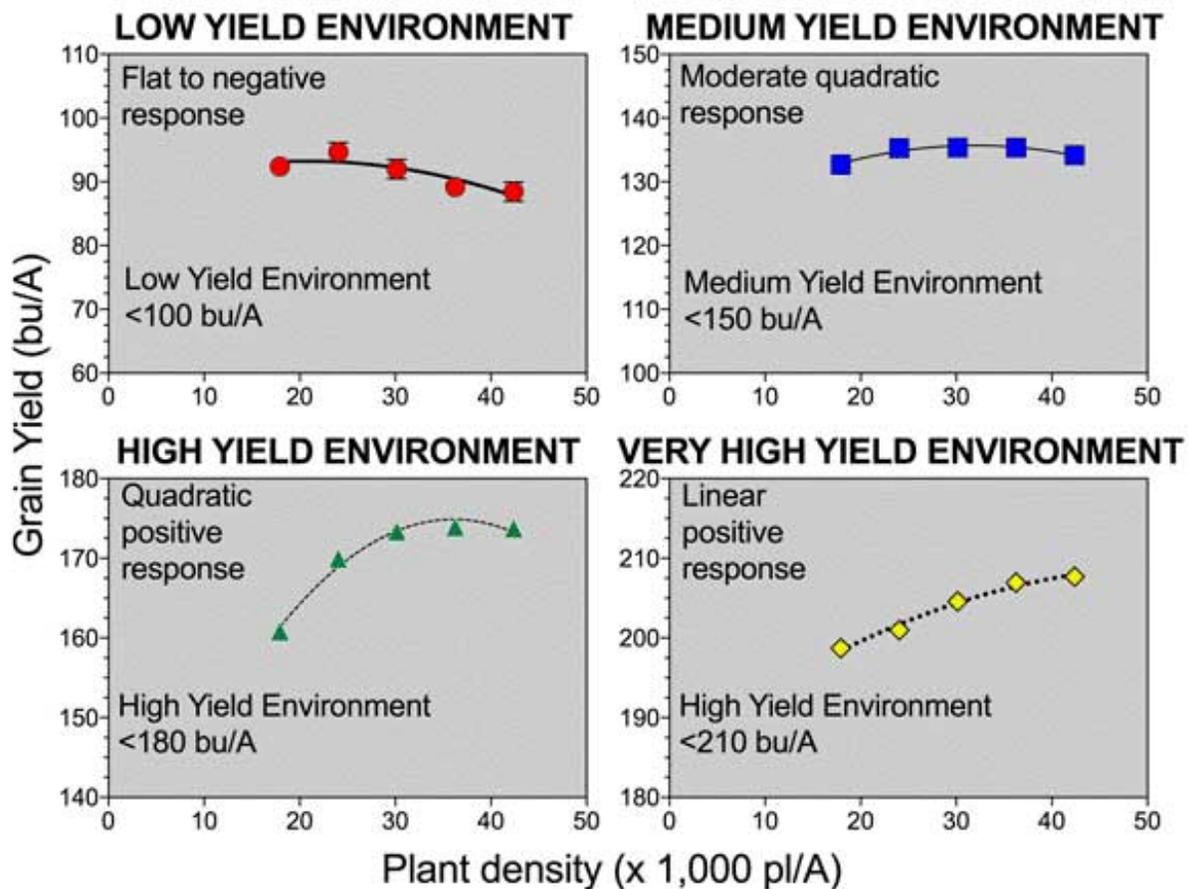


Figure 1. Corn grain yield response to plant density in four yield environments, a) <100; b) 100-150; c) 150-180; and d) > 180-210 bu/acre (Assefa, Ciampitti et al., 2016, Crop Science Journal).

As a disclaimer, “agronomically” optimum plant population does not always coincide with the “economically” optimal plant population. We are currently working on a new research study that will shed some light into the economic optimum plant population for corn, so stay tuned to future eUpdate articles from the KSUCROPS group. Lastly, final seeding rate depends on the environment, hybrid, and production practices (e.g., planting date, rotation, tillage).

Kansas State University Department of Agronomy

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3. Outlook for stripe rust in the 2020 Kansas wheat crop

The days are getting longer and the wheat crop is actively growing in most areas of the state. With the onset of spring weather, it is time to look at factors that could influence the yield potential of the Kansas wheat crop. A quick look at the drought monitor suggests that soil moisture is good in many areas of the state and that is a huge plus as we move into this growing season. Many growers are already moving forward on fertility and weed management plans. Disease management decisions will be the next major hurdle for the 2020 growing season.

Looking south helps predict disease outbreaks in Kansas

Experience has taught us that weather conditions in Texas play a critical role in the development of regional outbreaks of the disease. Recent research at K-State is bringing new insights into what weather patterns are most conducive or suppressive for the development of stripe rust in the Great Plains region.

In general, this research helps document that stripe rust survives in southern Texas, and wet conditions in this region increase the risk of stripe rust problems throughout the Great Plains. Moreover, dry conditions in this region often suppress the risk of outbreaks.

The research also points to two time periods that strongly influence the amount of disease in the region. The first time period occurs in the preceding fall (October - December) when the wheat crop is being planted and beginning to grow. The second time period occurs in the early spring (February - March) as the crop in Texas moves into the grain-filling stage. To illustrate these findings, let us look at a series of maps showing moisture conditions in southern Texas over some recent growing seasons (Figure 1). These maps indicate that stripe rust epidemics in Kansas are often preceded by above-normal moisture conditions in these key overwintering locations for the rust diseases. However, when these regions are dry, stripe rust severity in Kansas generally remains low. A look at the moisture patterns for 2020 indicates that rainfall in this area was below normal (see the 2020 map in Figure 1). This pattern suggests that the risk of a severe outbreak of stripe rust in Kansas is low.

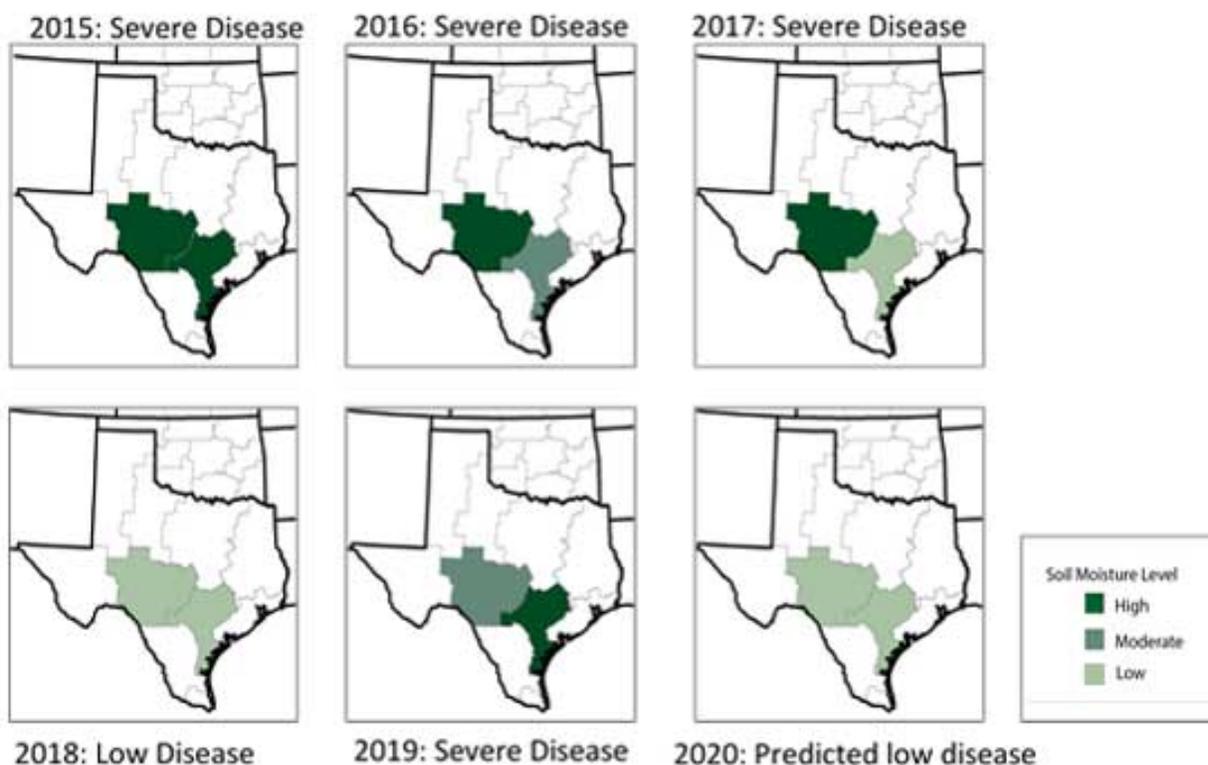


Figure 1. Soil moisture levels in southern Texas when the wheat crop was established for the 2015-2020 growing seasons. Notice that in the low disease years, dry conditions (lightest green colors on the maps) dominate southern Texas. In years with severe stripe rust, moderate or high soil moisture conditions are prevalent in these same regions. These maps show soil moisture levels based on November “Palmer Z-Index” provided by NOAA-National Centers for Environmental Information.

This is consistent with observations from Dr. Amir Ibrahim, Wheat Breeder for Texas A&M University, who indicated that conditions for stripe rust were not favorable and that disease development was slow in his research plots near San Antonio, Texas this year. Bob Hunger, Plant Pathologist for Oklahoma State University, noted that only low levels of stripe rust were reported in southern Oklahoma so far in 2020. However, Dr. Ibrahim did note that leaf rust was still very active at this same location. Clearly, there are many more factors that will influence the final disease levels in Kansas this year. While these early indicators look encouraging, let’s keep an eye on the disease situation and see what develops as the season progresses.

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4. First hollow stem update: March 26, 2020

Cattle should be removed from wheat pastures when the crop reaches first hollow stem (FHS). Grazing past this stage can severely affect wheat yields (for a full explanation, please refer to the eUpdate article "[Optimal time to remove cattle from wheat pastures: First hollow stem](#)").

First hollow stem update

In order to screen for FHS during this important time in the growing season, the K-State Extension Wheat and Forages crew measures FHS on a weekly basis in 28 different commonly grown wheat varieties in Kansas. The varieties are in a September-sown replicated trial at the South Central Experiment Field near Hutchinson.

Ten stems are split open per variety per replication (Figure 1), for a total of 40 stems monitored per variety. The average length of hollow stem is reported for each variety in Table 1. Twenty varieties had already reached first hollow stem on March 18, 2020, and the remaining eight varieties had reached first hollow stem by March 26, 2020.



Figure 1. Ten main wheat stems were split open per replication per variety to estimate first hollow stem for this report, for a total of 40 stems split per variety. Photo by Romulo Lollato, K-State Research and Extension.

Table 1. Length of hollow stem measured March 26, 2020 of 28 wheat varieties sown mid-September 2019 at the South Central Experiment Field near Hutchinson. The critical FHS length is 1.5 cm (about a half-inch or the diameter of a dime).

Variety	First hollow stem (cm)				
	2/25/2020	3/2/2020	3/11/2020	3/18/2020	3/26/2020
09BC308-14-16	0.07	0.25	0.62	1.51	.
AM Cartwright	0.23	0.31	0.60	1.24	6.45
AM Eastwood	0.11	0.19	0.41	1.00	7.05
Bentley	0.11	0.34	0.68	1.28	4.80
Bob Dole	0.06	0.15	0.54	1.04	7.16
Doublestop CL Plus	0.06	0.22	0.46	1.75	.
Gallagher	0.14	0.33	0.58	1.83	.
Green Hammer	0.05	0.16	0.52	1.93	.
Guardian	0.04	0.18	0.70	1.47	7.33
KS Dallas	0.11	0.29	0.72	1.82	.
KS Silverado	0.12	0.26	0.72	1.77	.
KS Western Star	0.11	0.29	0.64	2.04	.
LCS Valiant	0.07	0.29	0.47	1.27	7.10
Long Branch	0.28	0.43	1.15	4.02	.
Paradise	0.08	0.34	0.60	1.77	.
Rock Star	0.08	0.27	0.57	1.57	.
Showdown	0.12	0.32	0.67	2.07	.
Smith's Gold	0.11	0.28	0.49	0.81	7.70
SY Achieve CL2	0.12	0.28	0.70	2.16	.
SY Wolverine	0.14	0.23	0.66	1.79	.
TAM205	0.08	0.29	0.78	1.82	.
WB4269	0.10	0.22	0.53	0.97	7.03
WB4303	0.09	0.21	0.51	1.64	.
WB4595	0.21	0.33	0.68	1.74	.
WB4699	0.01	0.21	0.51	1.54	.
WB4792	0.11	0.36	0.86	2.35	.
Whistler	0.06	0.32	0.64	2.11	.
Zenda	0.08	0.28	0.63	1.77	.

All varieties evaluated in this trial had reached first hollow stem by March 26, 2020. We advise producers to closely monitor their wheat pastures at this time as they should be very likely attaining or already past first hollow stem.

The intention of this report is to provide producers an update on the progress of first hollow stem development in different wheat varieties. Producers should use this information as a guide, but it is extremely important to monitor FHS from an ungrazed portion of each individual wheat pasture to make the decision of removing cattle from wheat pastures.

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5. Army cutworm and pea aphid activity in wheat and alfalfa fields

Army cutworm feeding, more in alfalfa fields than wheat, is starting to become more noticeable in fields that have not had the best growing conditions throughout north central Kansas. Army cutworm larvae (see pic) are still active (Figure 1). However, the larvae have not grown much larger, probably due to the cool temperatures over the last couple weeks. As temperatures warm, expect army cutworm feeding to increase and thus size. Fortunately, most fields have now enough foliage and can withstand considerable feeding without significant damage. These army cutworm infestations are really spotty throughout north central Kansas--with some heavily infested areas in fields and some fields with infestations so small they cannot be detected. Thus, sampling should be conducted before considering an insecticide treatment.



Figure 1. Army cutworm larvae. Photo by Cayden Wyckoff, K-State Research and Extension.

Pea aphids were also common in every field sampled over the last week (Figure 2). No fields, however, were even close to approaching a treatment threshold. **Also, no alfalfa weevil larvae**

were detected in any field but they will be hatching soon.





**Figure 2. Pea aphids (blue arrows point to the green-colored aphids on the alfalfa foliage).
Photos by Cayden Wyckoff, K-State Research and Extension.**

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6. Spring 2020 flood outlook for Kansas

Flooding, and flood risk, is a combination of many factors but is predominately determined by the antecedent soil moisture conditions (amount of water in the soil before a storm event) and the rainfall rates. Wet soils, high water tables, and high stream flows increase the chance of flooding with even light to moderate rainfall rates. Heavy rainfall rates or amounts can produce flooding even with dry soils and low stream flows.

The National Weather Service has issued a spring flood outlook (Figure 1), which shows moderate risk of flooding in parts of the East Central and Southeast Divisions of the state, minor chances through the central divisions, and undetermined in the rest of the state.

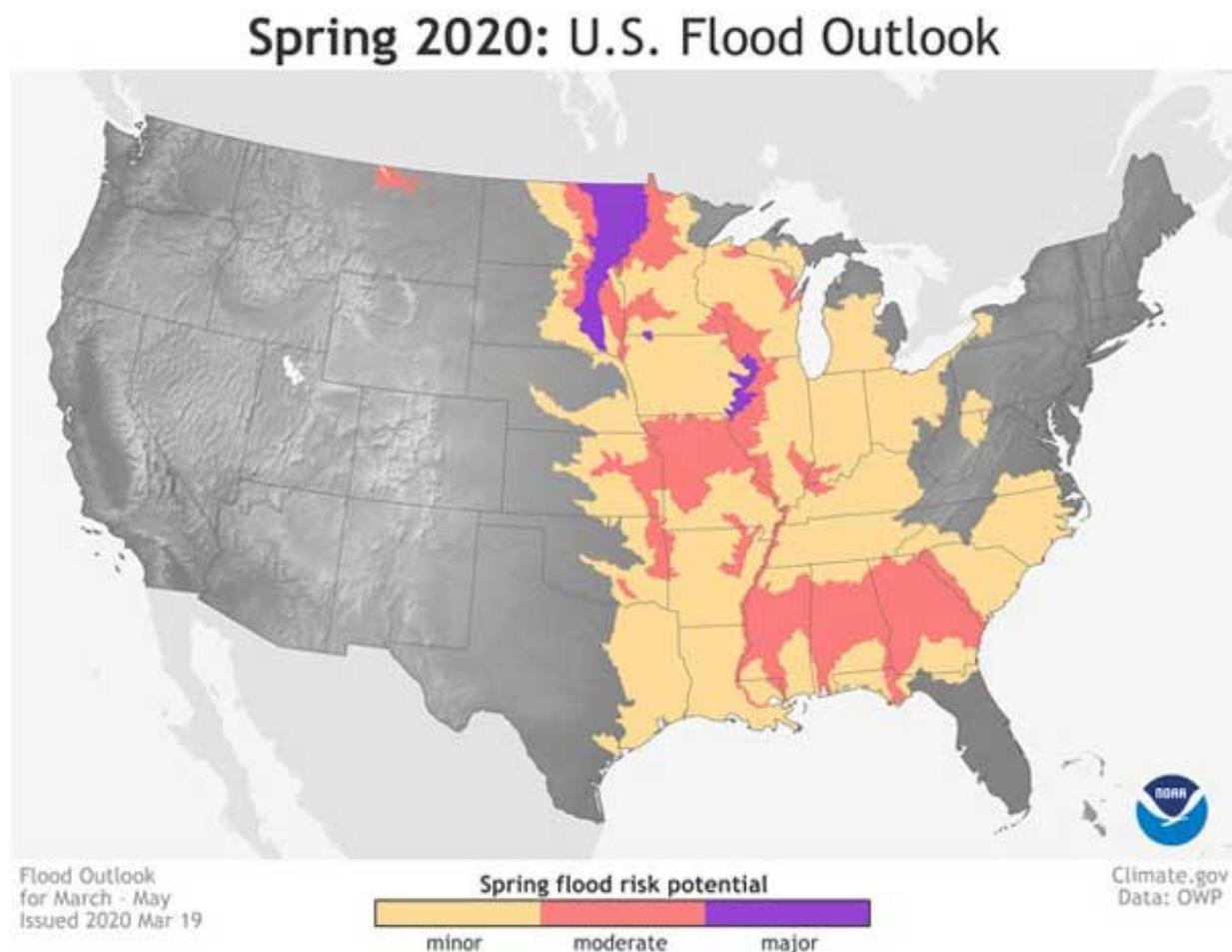


Figure 1. Spring 2020 flood risk for the United States. Source: NOAA

Antecedent soil moisture conditions

Precipitation was varied for period from October 1, 2019 through March 23, 2020 (Figure 2).

Southeast Kansas remains above normal, while much of the west and northern portions of Kansas have measured less-than-normal precipitation through the winter.

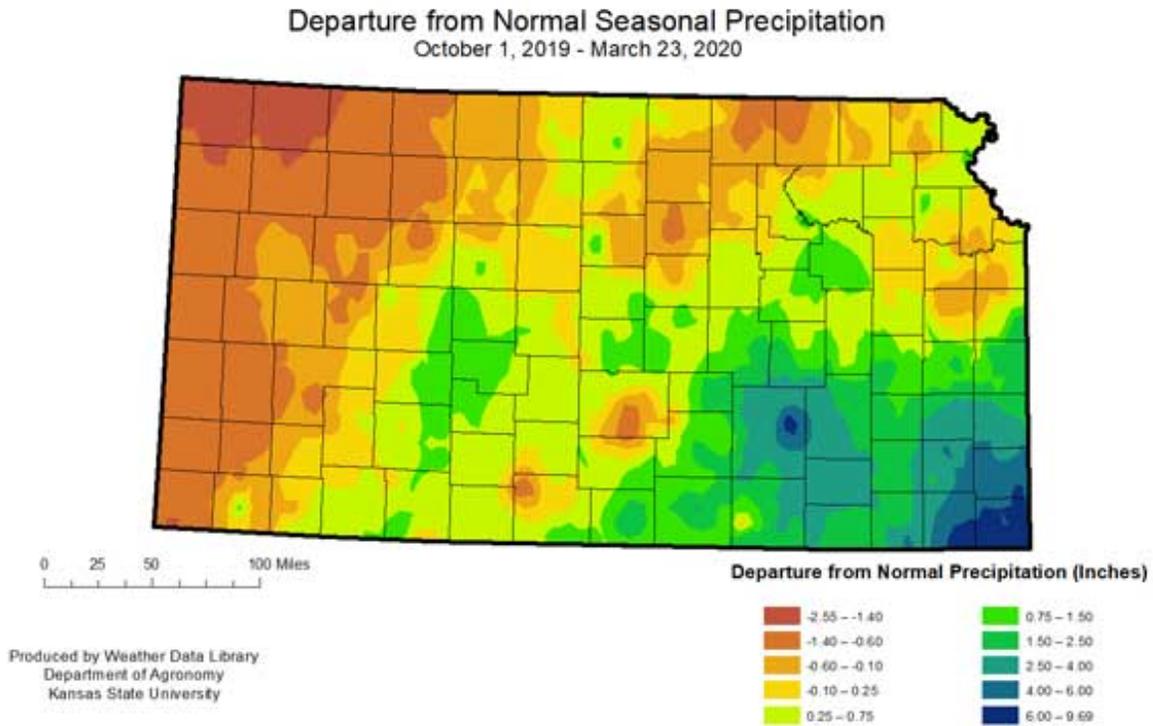


Figure 2. Departure from normal seasonal precipitation. Source: Kansas Weather Data Library

Although precipitation amounts have been lower than normal across much of the western and northern parts of the state, surface soil moisture has been adequate at 70-100% saturated (Figure 3). Frequent light rain and snow events have kept the surface wet. However, the lack of precipitation is more evident deeper in soil profile where moisture levels are lower, especially in southwest Kansas where drought persists and 20 inches is only ~50% saturated (Figure 4).

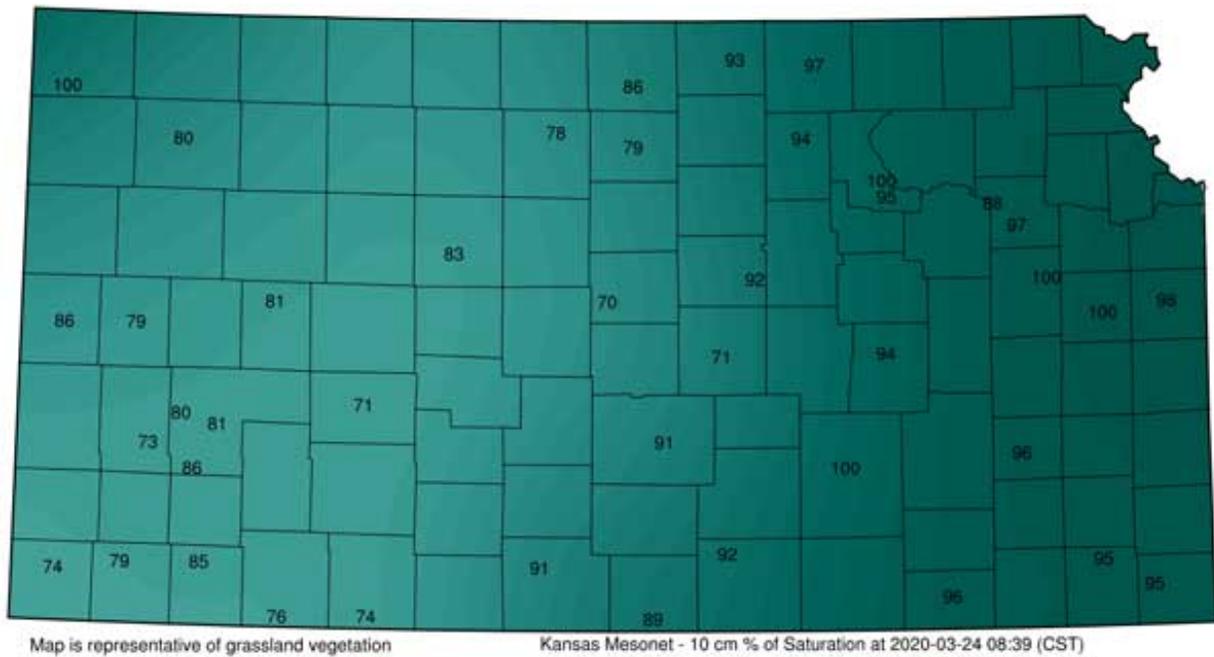


Figure 3. Soil saturation at approximately 4 inches as of March 24, 2020. The map is representative of grassland vegetation. Source: Kansas Mesonet

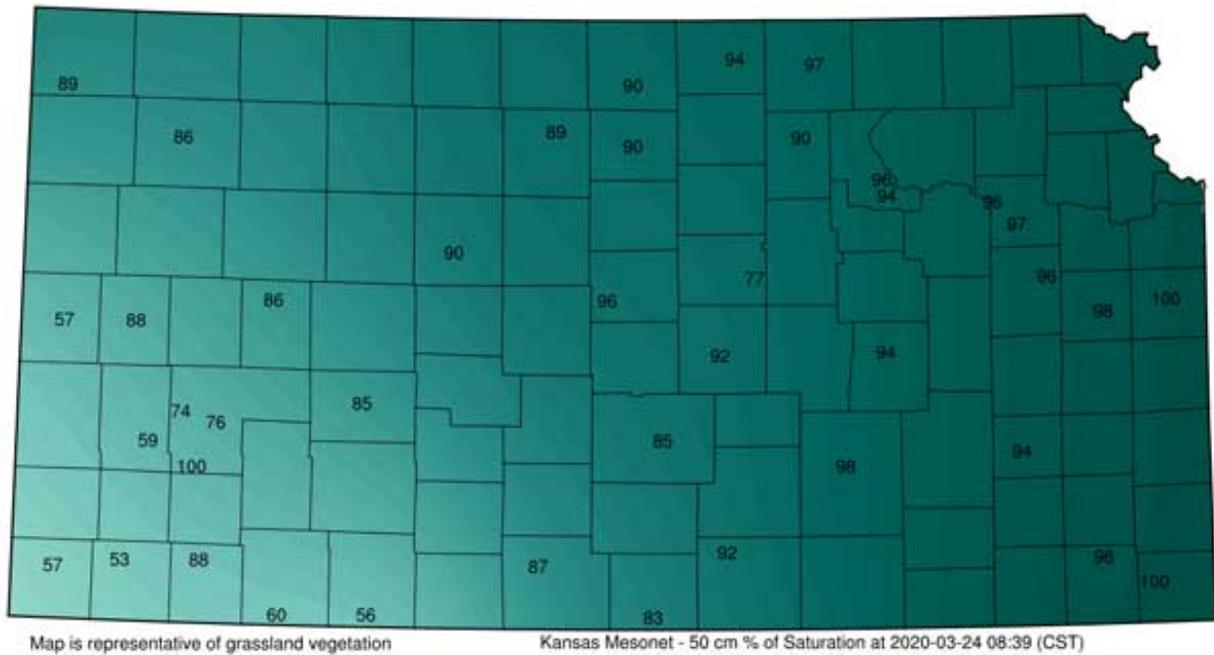


Figure 4. Soil saturation at approximately 20 inches. The map is representative of grassland vegetation. Source: Kansas Mesonet

Reservoirs continue to be elevated. Nine of the Corps of Engineer reservoirs in Kansas have expanded into the flood pool, including all three in the lower Kansas River Basin and the four in the Osage-Marais Des Cygnes River Basin. Stream flows also continue to be elevated (Figure 5), particularly in the eastern two-thirds of the state.

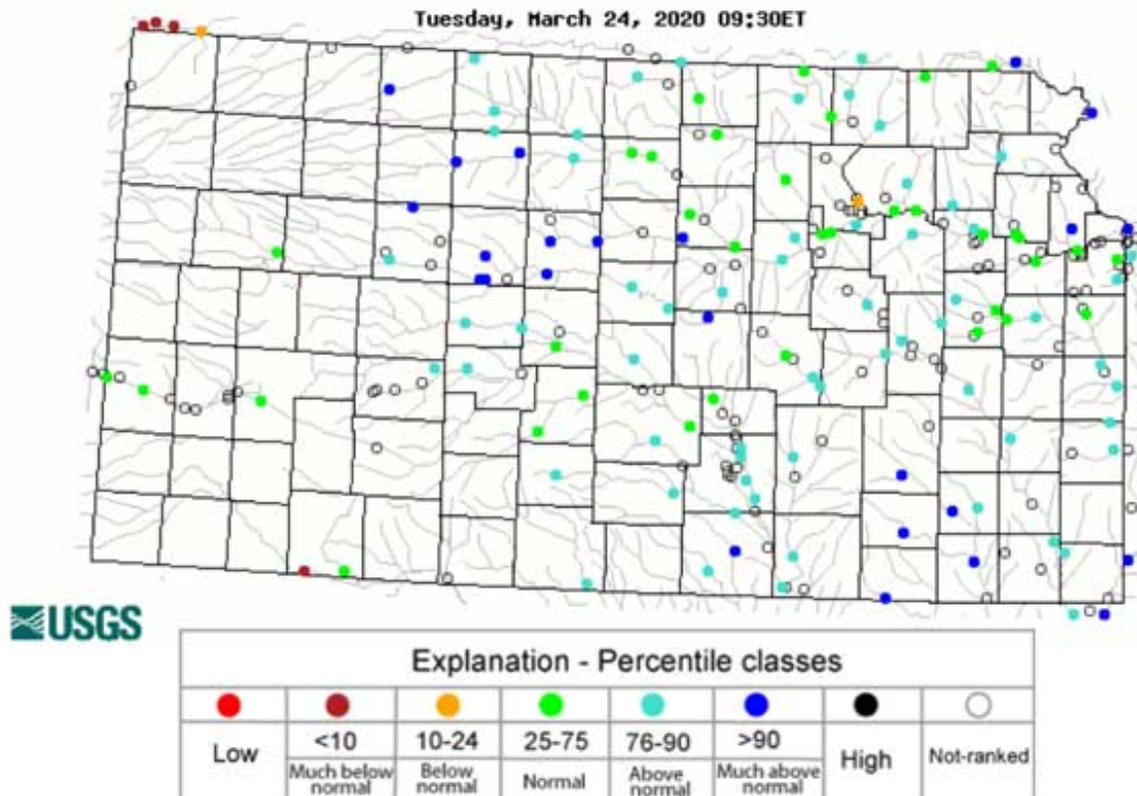


Figure 5. Kansas stream flows as of March 24, 2020. Source: USGS

Spring precipitation outlook

The second factor for flood risk is the amount and rate at which the rainfall occurs. In southeast Kansas, with completely saturated soils and high rivers, even moderate rainfall rates will produce flooding. In western Kansas, where drier soils dominate, a heavy thunderstorm could still produce flash flooding; however, the capacity to hold more moisture remains.

The spring (April, May, June) precipitation outlook favors wetter-than-normal conditions in the east, with equal chances of above- or below-normal precipitation in the central and western portions of the state. Keep in mind that this outlook does not indicate how the moisture might be distributed over the three-month period.

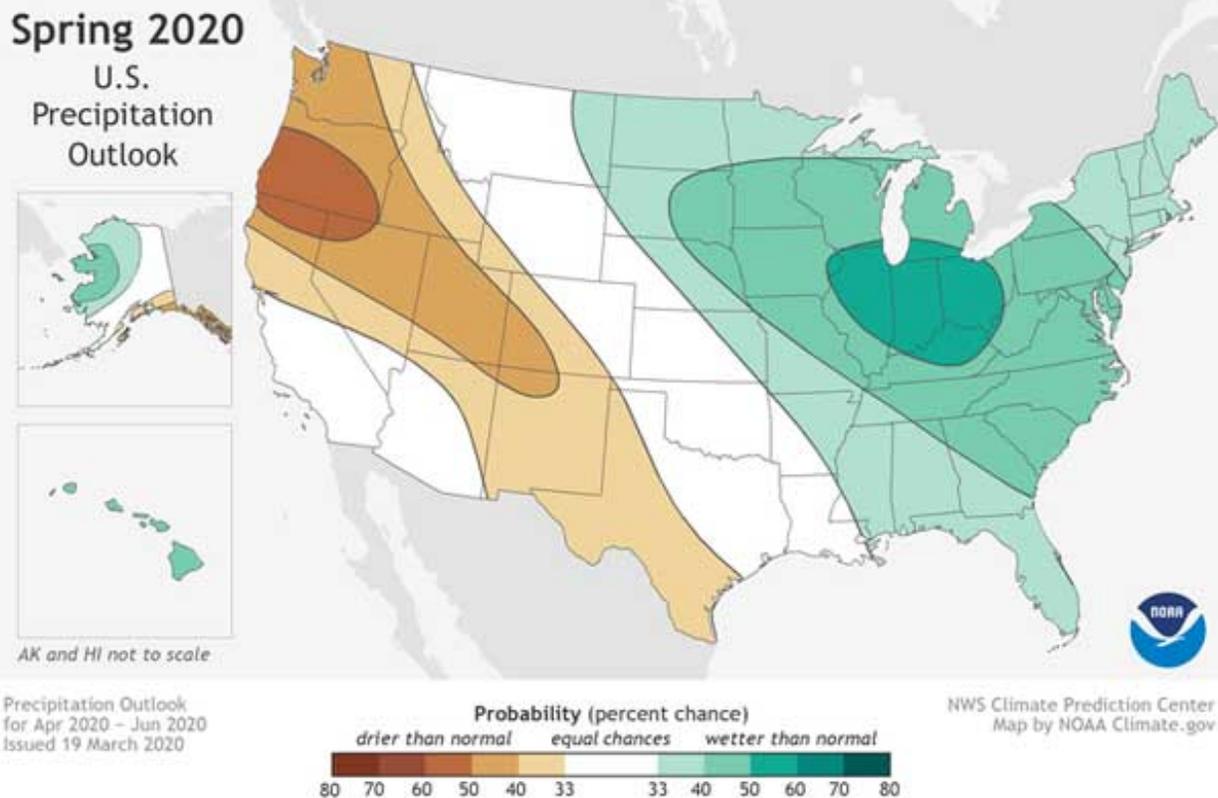


Figure 6. Spring precipitation outlook for the U.S. Source: NOAA

Combining forecast models

Forecast models provide a wide variance in possible precipitation outcomes for the season and resulting drought impacts. While there are many models, one method is to blend the models together in what is called an “Ensemble Mean”. This provides a quick glimpse at the overall trend in all forecast models for the period. The result of the April through June model output is overall low confidence in above-normal (green) or below-normal (orange) precipitation (Figure 7). All of Kansas, and the central United States, is in the equal chances of either possibility, with little guidance on trends for the remainder of spring and early summer. This would favor average precipitation. However, that precipitation can fall all at once or be spread out over many days and does not provide further guidance on flood impacts.

NMME Precipitation Anomalies (mm/day)
Apr2020–Jun2020 March2020 initial conditions

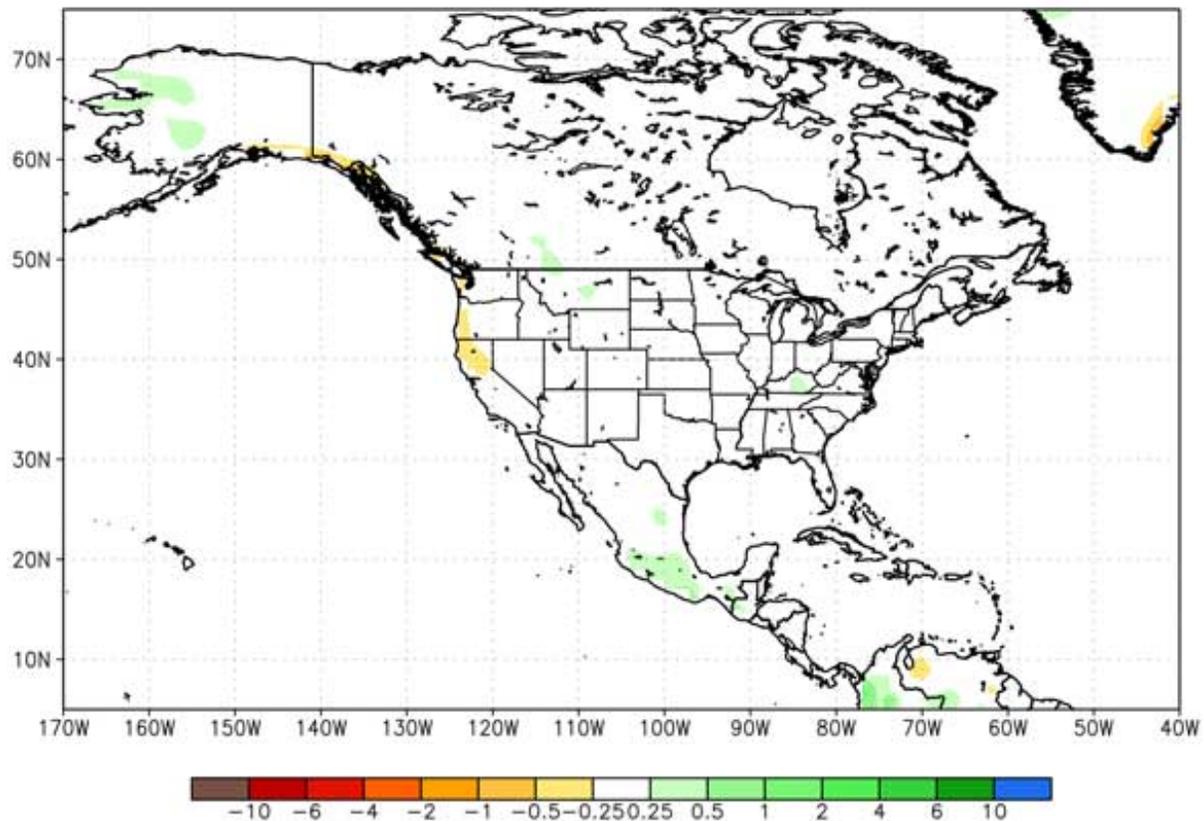


Figure 7. National Model Mean Ensemble forecast into June 2020. Source: Climate Prediction Center

Summary of key points

- Flooding potential is increased this spring for the rivers and streams of eastern Kansas.
- Wet soils, increased reservoir levels, and high rivers/streams are being observed in the east.
- Above-normal precipitation is favored in the northeast through spring, below-normal in the southwest.
- Going into summer, the precipitation forecast becomes more uncertain.

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