



**K-STATE**  
Research and Extension

## Extension Agronomy

# eUpdate

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*09/22/2017*

These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy e-Update 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 Curtis Thompson, Extension Agronomy State Leader and Weed Management Specialist 785-532-3444 cthompso@ksu.edu.

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## 1. Summer field crop status in Kansas

At this point in the 2017 growing season, all summer field crops around the state are in their final reproductive stages. Corn has already gone through the dent stage (R5) on most fields and, depending on the weather conditions, could take from a few days to weeks to become fully mature -- 25-35% moisture content, formation of black layer (61% of the corn in Kansas is mature). In some areas such as SE Kansas, 50% of the corn has been harvested (>90% in the south part and >20% in the north section of the SE-EC regions of the state). Soybean and grain sorghum will be ending the grain filling stage and reaching maturity in the coming weeks. Grain fill duration will be connected to temperature, radiation (sunny days), precipitation conditions, and the source:sink balance within the plant, which involves the leaf-to-grain relationship. A lack of functional green canopy will result in a short grain fill period; and a similar situation will occur if the grain number was reduced.

At the national level, the most recent [USDA crop progress report](#) estimated total corn production at about 14 billion bushels, 6% lower than in 2016. The average yield is predicted to be close to 170 bu/acre, 5.1 bushels lower than in 2016. Soybean is forecast at a record close to 4.4 billion bushels, 3% higher than in 2016. Sorghum yield per acre was projected on September 1 to be close to 70 bu/acre, 6 bushels lower than in 2016, and an estimated overall production of 370.7 million bushels.

### Corn

The most recent [Kansas Agricultural Statistics Service crop progress report](#) estimates that 91% of the corn crop in Kansas has reached at least the dent stage, more than 60% of the crop is mature, and 19% has been harvested. Overall, 55% of the corn crop in Kansas was classified by the USDA as being in good or excellent condition (down 11% from 2016). For the early-planted corn, pollination was not placed under great moisture conditions (but this varied across the state), but grain-fill period was more favorable for corn yields in some areas of the state.

The dent stage (R5) takes place 40 days after silking, which varies with weather conditions. Kernels are drying down in the dent stage; grain moisture declines to 55% as the starch content increases. Past experience has shown that when corn is reaching the dent stage, biotic or abiotic stress conditions (i.e. high temperatures, drought, pests, hailstorm, etc.) may exert some impact on final kernel weight by shortening the dry matter accumulation period. From dent to the formation of black layer (maturity), corn will lose moisture and total dry weight will increase until filling ceases (Table 1).

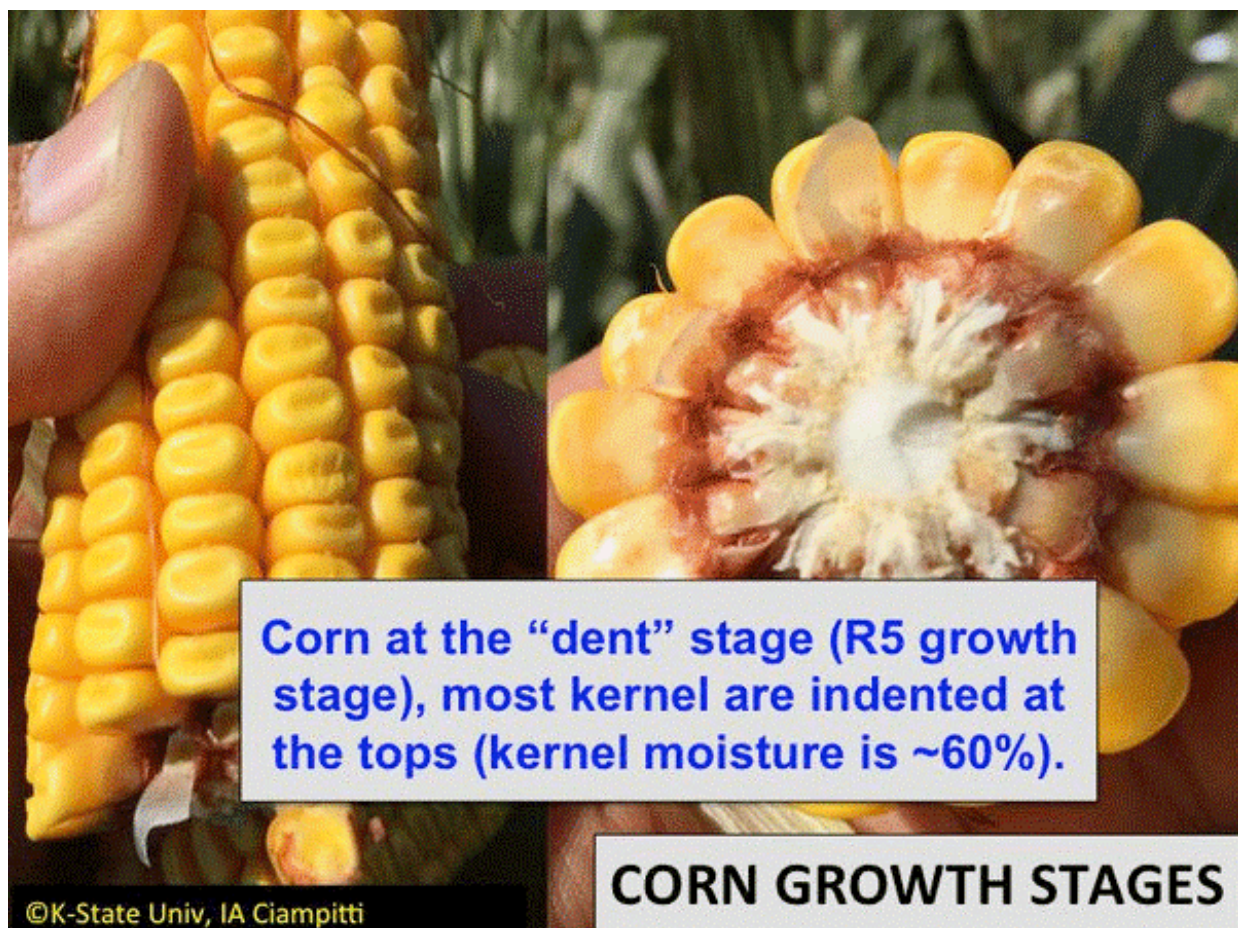
**Table 1. Growth stages, moisture content, and total dry matter progression for corn from late to physiological maturity. Extracted from K-State Research and Extension publication MF3305.**

			Average per Substage	
R Stage	Moisture %	Dry Matter (% of Total Dry Weight)	Growing Degree Days, °F	Days
5.0	60	45	75	3
5.25 (¼ milk line)	52	65	120	6
5.5 (½ milk line)	40	90	175	10
5.75 (¾ milk line)	37	97	205	14
6.0 (Physiological maturity)	35	100		

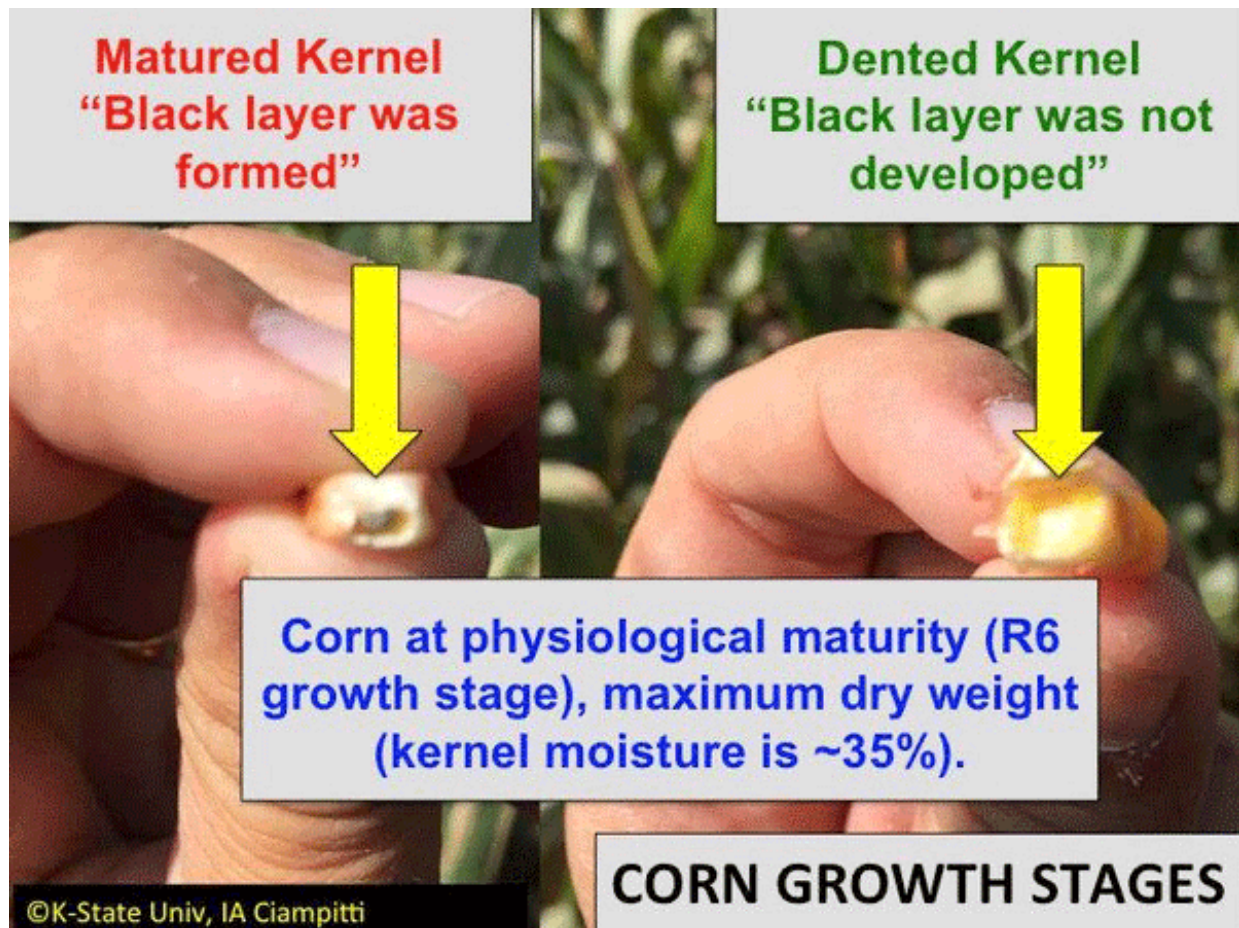
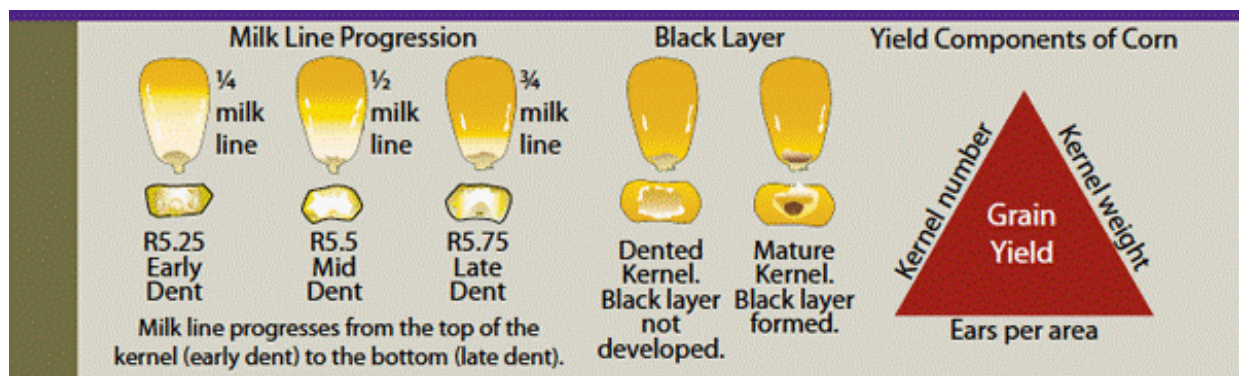
<sup>1</sup>Abendroth, L.J., R.W. Elmore, M.J. Boyer, and S. K. Marlay. 2011. *Corn Growth and Development*. PMR 1009. Iowa State Univ. Extension. Ames Iowa.

Currently, most of the corn is approaching maturity; thus, the influence of stress conditions on yield would be small. Final kernel weight is determined as the crop reaches full physiological maturity, or maximum dry mass accumulation. This can be identified as the formation of the black layer, the black line formed at the bottom of the grain (Figure 1).

Further details related to changes in growth and development for corn can be found at:  
<https://www.bookstore.ksre.ksu.edu/pubs/MF3305.pdf>







**Figure 1. Corn at dent stage and at black layer growth stages. Photos and infographic prepared by Ignacio Ciampitti, K-State Research and Extension.**

The most important task from this point on is to scout the fields for the presence of weak stalks and plan harvest accordingly -- prioritizing cornfields with weak or broken stalks.

## Soybean

In most of the areas of the state the soybean crop (full season soybean) is reaching the final stages of the reproductive phase, ranging from R5 (beginning seed) to R7 (beginning maturity) stages.

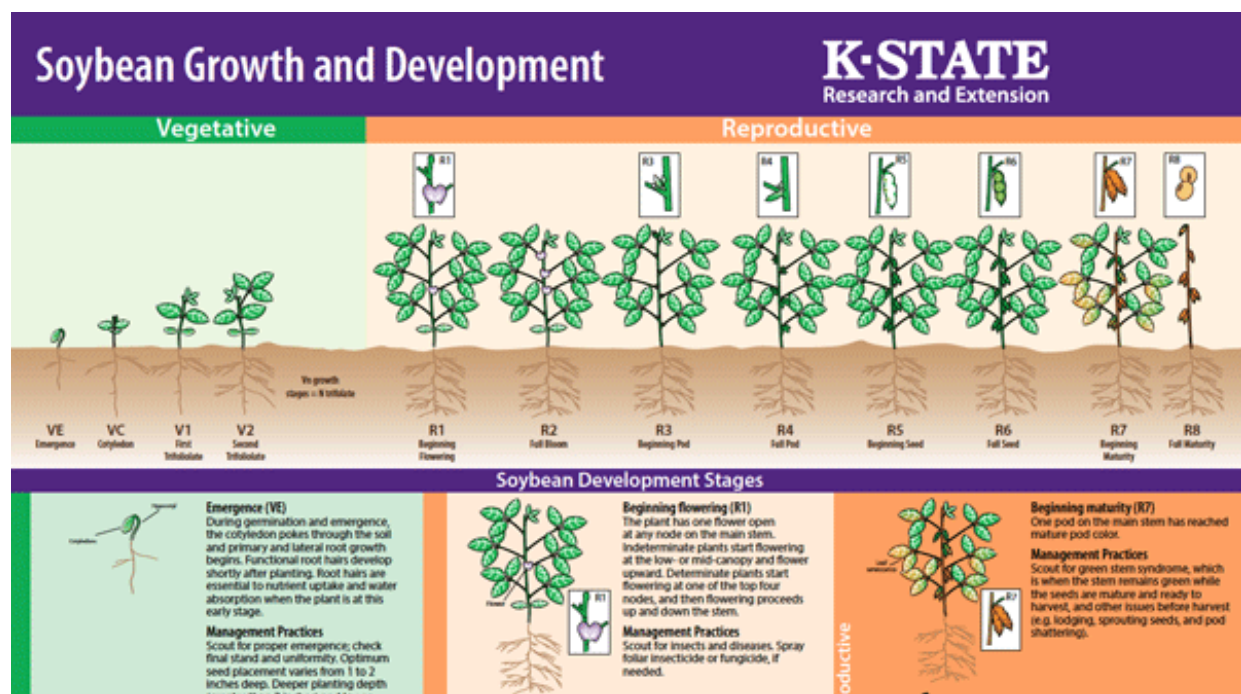
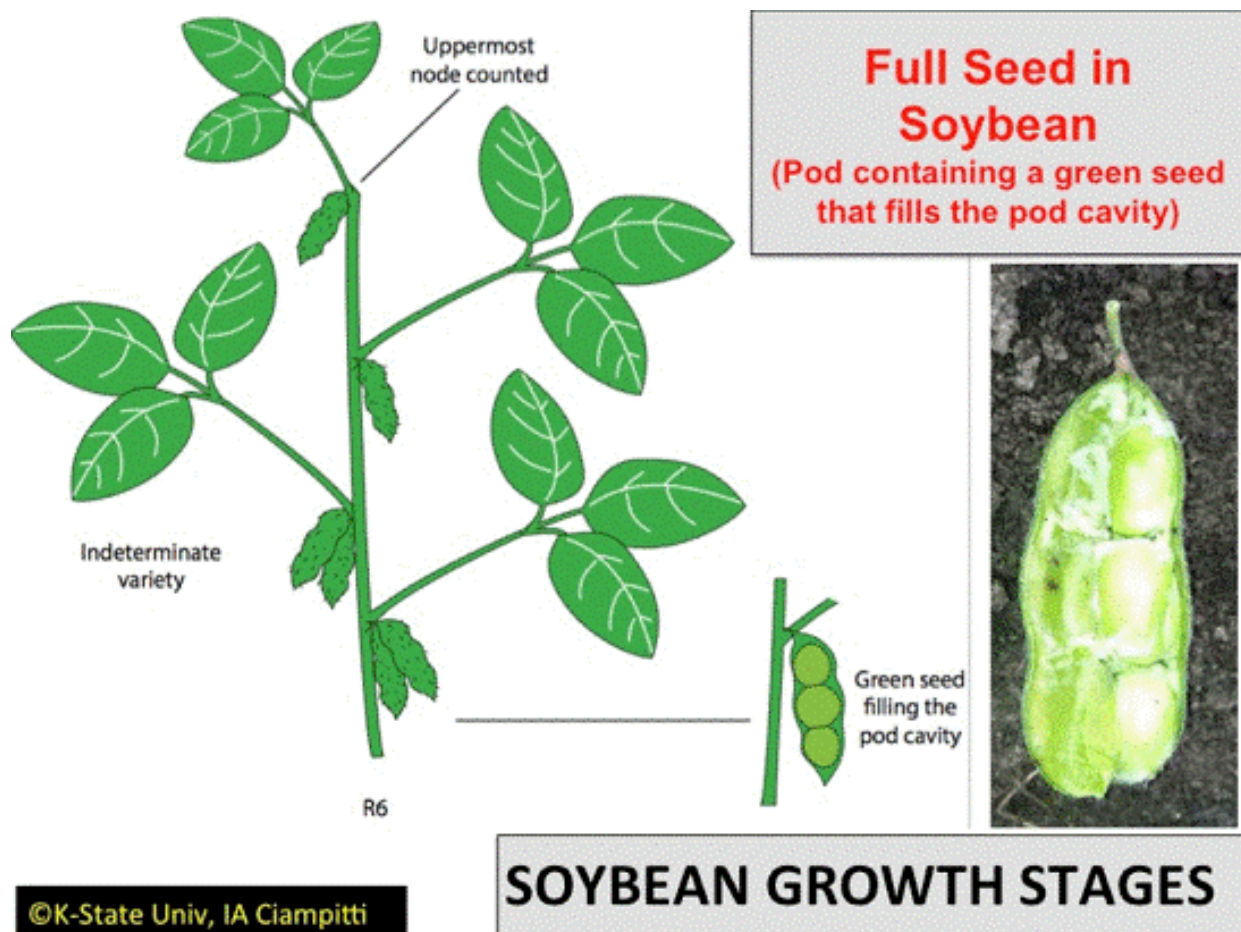
The most recent Kansas Agricultural Statistics crop conditions report noted that 38% of the state's soybean crop is dropping leaves, ahead of the last three growing seasons. At present, 45% of the soybean crop condition has been rated good or excellent. Soybean has been fairly drought stressed up until this last weekend when some areas of KS received much needed rainfall. Seed number has been set on many fields in KS but the remaining yield component is seed size. With the recent rainfall, seed size will see improvement and add soybean yield. The senescence process, detected as yellowing in soybean fields, is progressing quickly with the dry conditions experienced in many areas of the state.

A considerable portion of the potential soybean yield will be determined in the upcoming weeks, between full seed stage (R6; Figure 2) and the beginning of maturity (R7). The beginning of maturity is recognized when only one pod on the main stem has reached mature color (e.g. brown color). At this point of the season, any biotic or abiotic stress can still impact seed size. As discussed in a previous eUpdate article ("Estimating soybean yield potential," [eUpdate #648](#)), drought and heat conditions at this point in the season could severely impact seed size. Large changes (i.e. 10-20%) in yield could result from changes in the final seed weight.

Continue to scout your soybean fields for crop production issues. Lodging, effect of late-season diseases on leaf canopy and severe defoliation (primarily caused by insects) can be an issue for soybeans. Lodging can affect harvesting, as well as the late-season photosynthetic efficiency of soybeans – which can accelerate senescence and cause reductions in seed size and yield. In addition, green stem syndrome, a condition in which the stem remains green while the seeds are mature, can be an important problem when harvesting. More information on this topic will be in the next issue of the Agronomy eUpdate.

Detailed information about soybean growth and development can be found at:  
<https://www.bookstore.ksre.ksu.edu/pubs/MF3339.pdf>





**Figure 2. Soybean at full seed stage and final development stages extracted from the Soybean Growth and Development chart (K-State, United Soybean Board, and Kansas Soybeans). Photo and infographic prepared by Ignacio Ciampitti, K-State Research and Extension.**

## Grain sorghum

Kansas Agricultural Statistics projected that 81% of the sorghum crop in Kansas is currently at or beyond the coloring stage (Figure 3), 10% behind of last year's pace. Close to one fourth of the entire sorghum acreage in Kansas was reported at full maturity, 7% behind of last year. Harvested acreage was 2% based on the most recent report, similar to that at this time last season. 65% of the sorghum crop was classified as being in good or excellent condition; with a 9% projected as a very poor or poor. Similar to soybean, a portion of the potential sorghum yield remains to be determined in the next coming weeks.

One of the main late-season factors that can affect sorghum yields in Kansas is the possibility of a killing freeze before maturity. An early freeze will reduce the final seed weight due to a cessation in the dry matter allocation to the grain. The only management practice to avoid this phenomenon is to use shorter-season hybrids and earlier planting dates in environments prone to early freezes. Early planting was difficult to accomplish in the challenging wet spring of 2017.

Another challenge for sorghum farmers is the presence of sugarcane aphids. Timely scouting for the presence of the aphids and taking appropriate action if the economic threshold is achieved is critical. Update on the current status on sugarcane aphids and other pests can be found at:  
[https://webapp.agron.ksu.edu/agr\\_social/eu\\_article.throck?article\\_id=1520](https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=1520)

Continue to scout your sorghum fields for crop production issues, including lodging or bird feeding. Often the utilization of pre-harvest desiccation will help reduce the moisture content and will promote a more uniform maturation and an earlier harvest time. Utilization of pre-harvest desiccants is recommended when the crop is fully mature (25-35% moisture content), which is the stage at which a desiccant will not affect yields. Applications before maturity could compromise the final yield.

Information related to different preharvest desiccant products and waiting periods can be found at:  
<http://www.bookstore.ksre.ksu.edu/pubs/MF3046.pdf>

Check your crop to see if it is mature before harvest, and for black layer formation. Differences in black layer formation, or maturity, can be present at the same time in different positions of the head. Usually, grain sorghum is mature when grain moisture content is the range of 25-35% (Figure 3).

Further details related to changes in growth and development for sorghum can be found at:  
<https://www.bookstore.ksre.ksu.edu/pubs/MF3234.pdf>





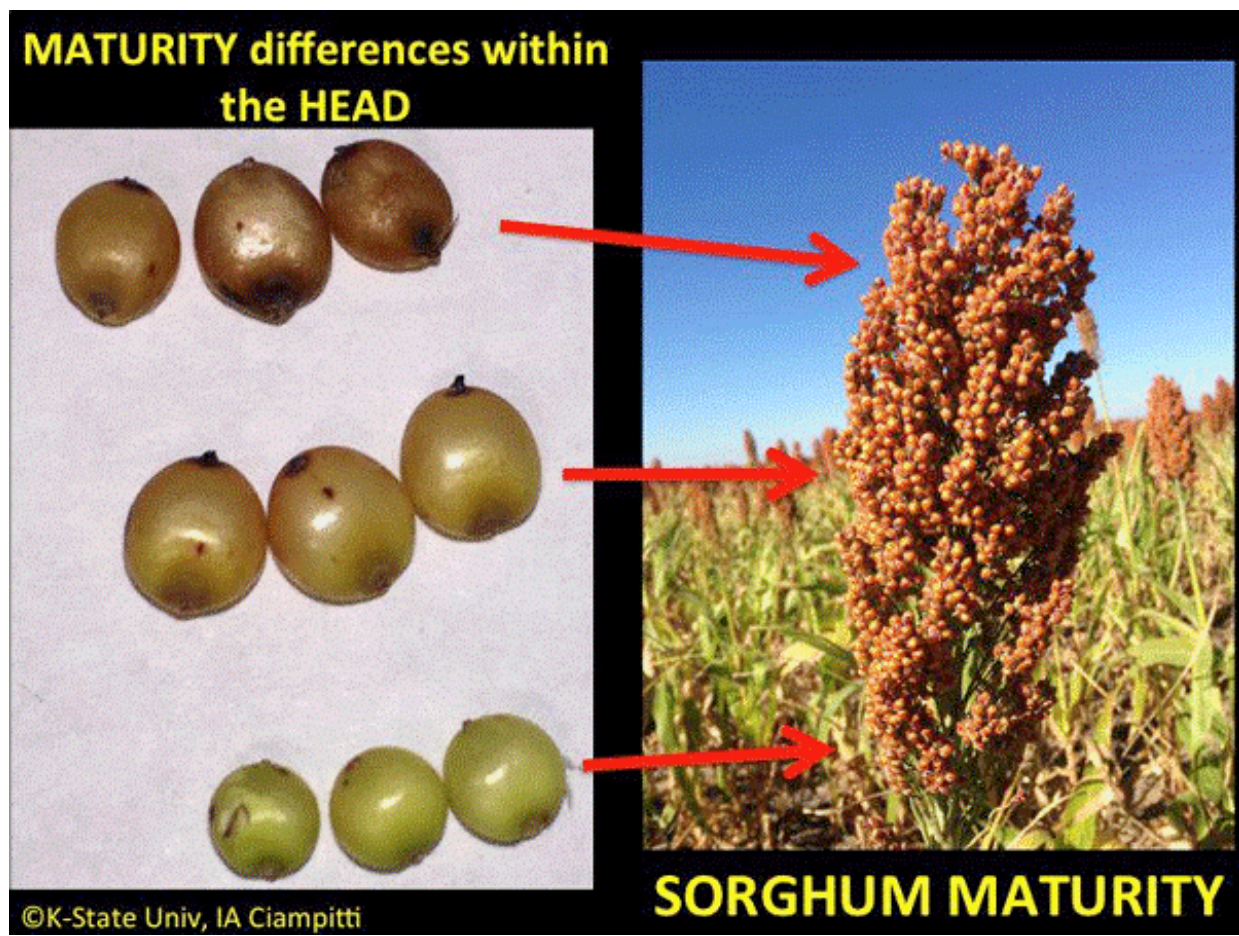
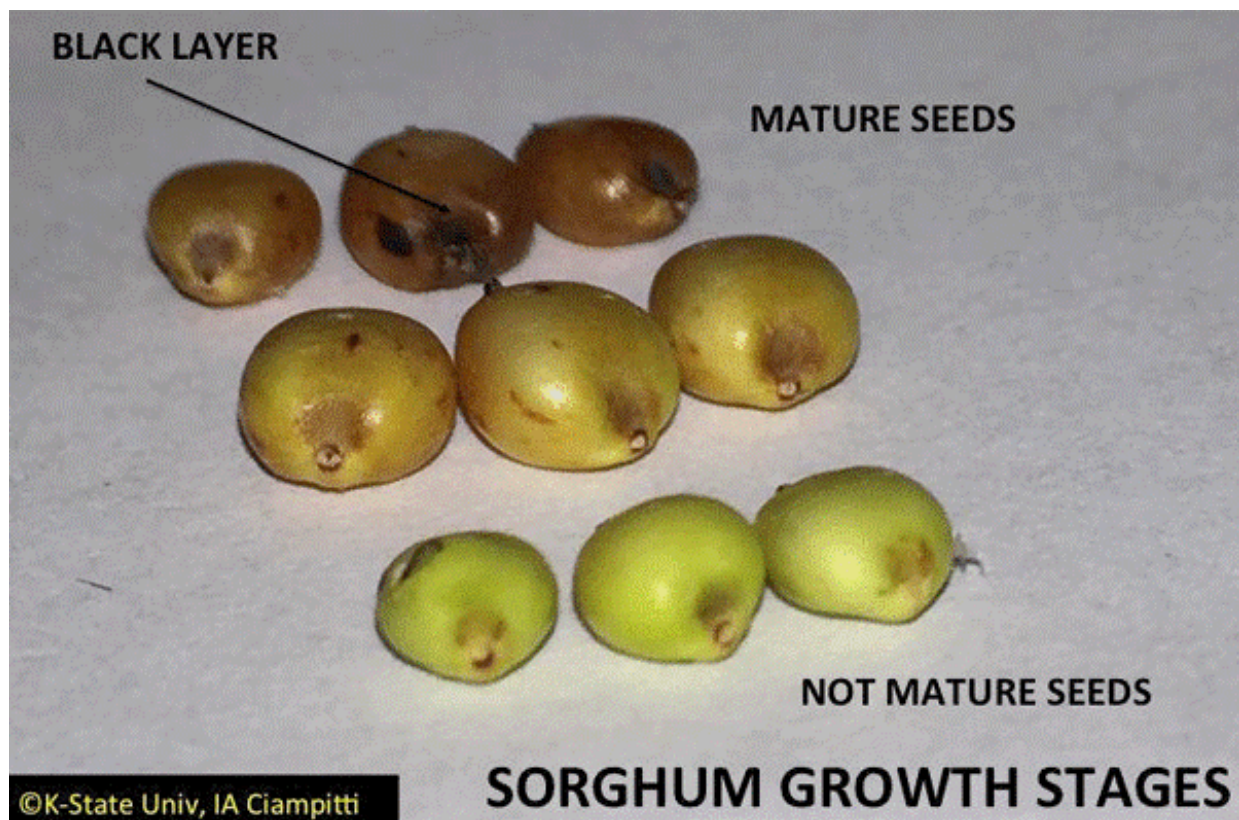
©K-State Univ, IA Ciampitti

**Sorghum at  
Coloring Stage**



**SORGHUM GROWTH STAGES**

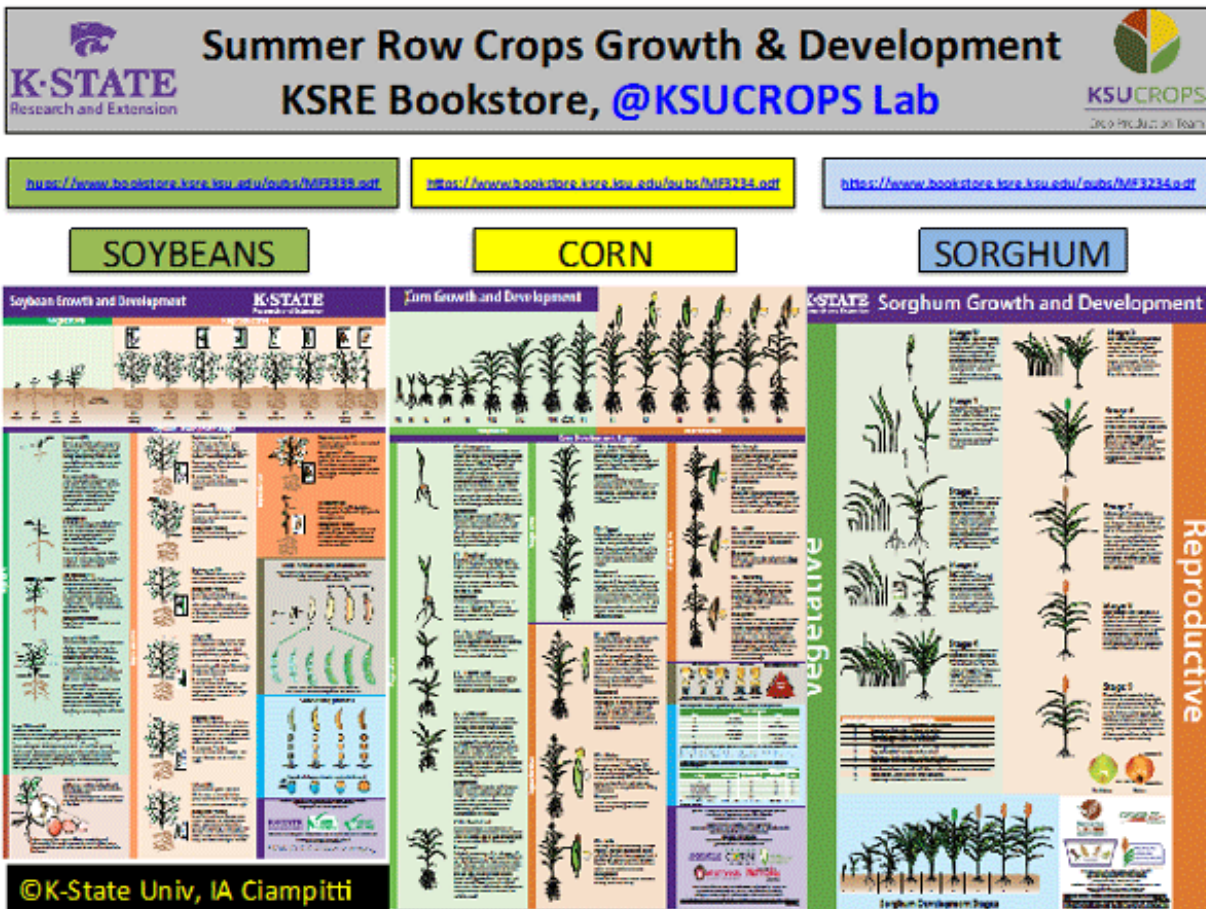






**Figure 3. Sorghum at the coloring stage and mature/not mature seeds at different positions in the sorghum head. Photos and infographic prepared by Ignacio Ciampitti, K-State Research and Extension.**

Further information on corn, soybean, and sorghum growth and development can be found at:



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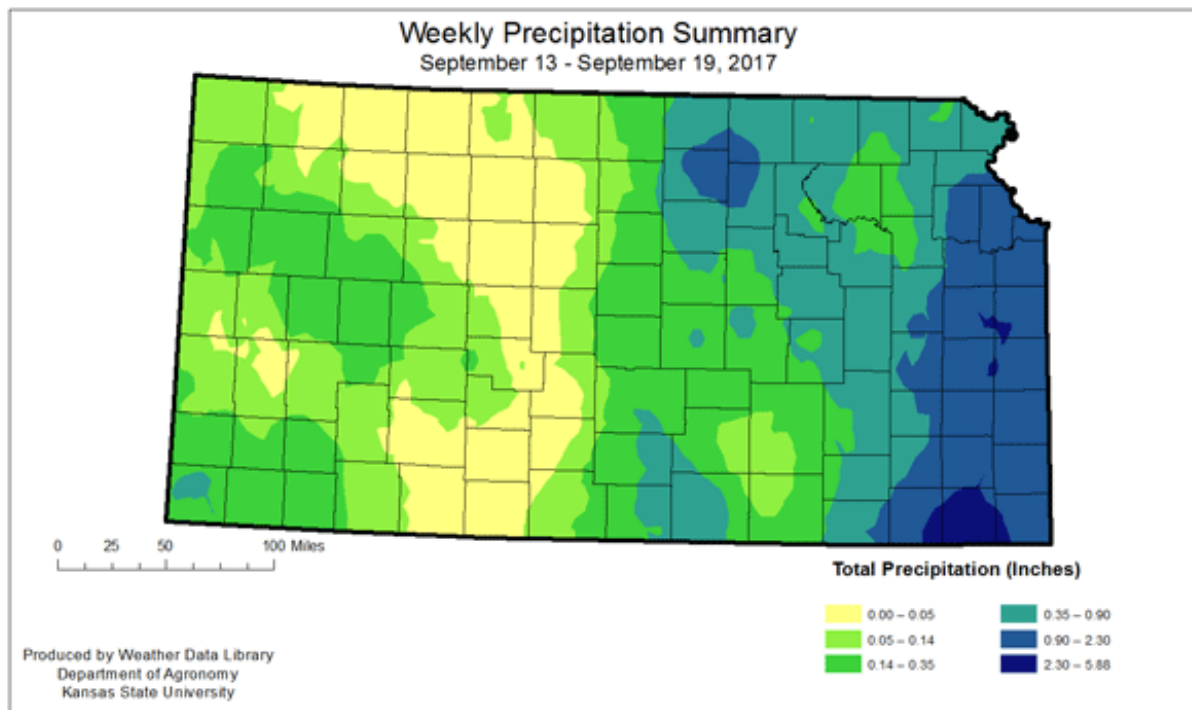
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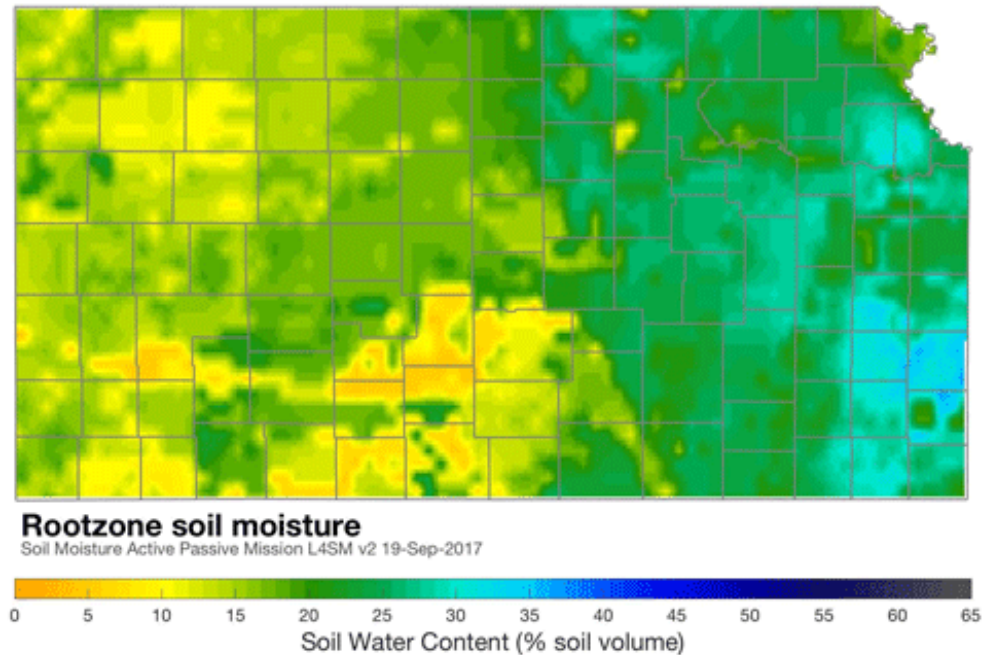
## 2. Wheat planting conditions as of mid-September 2017

### Recent weather pattern

The last week brought significant rains in the eastern portion of the state, with as much as 5.88 inches accumulated between September 13 and 19 (Figure 1). The majority of the wheat growing region of the state, though, namely central and western Kansas, had very limited precipitation totals, ranging from 0 to 0.14 inches. As a consequence, estimated root zone soil moisture is relatively low in the west as compared to eastern Kansas (Figure 2).



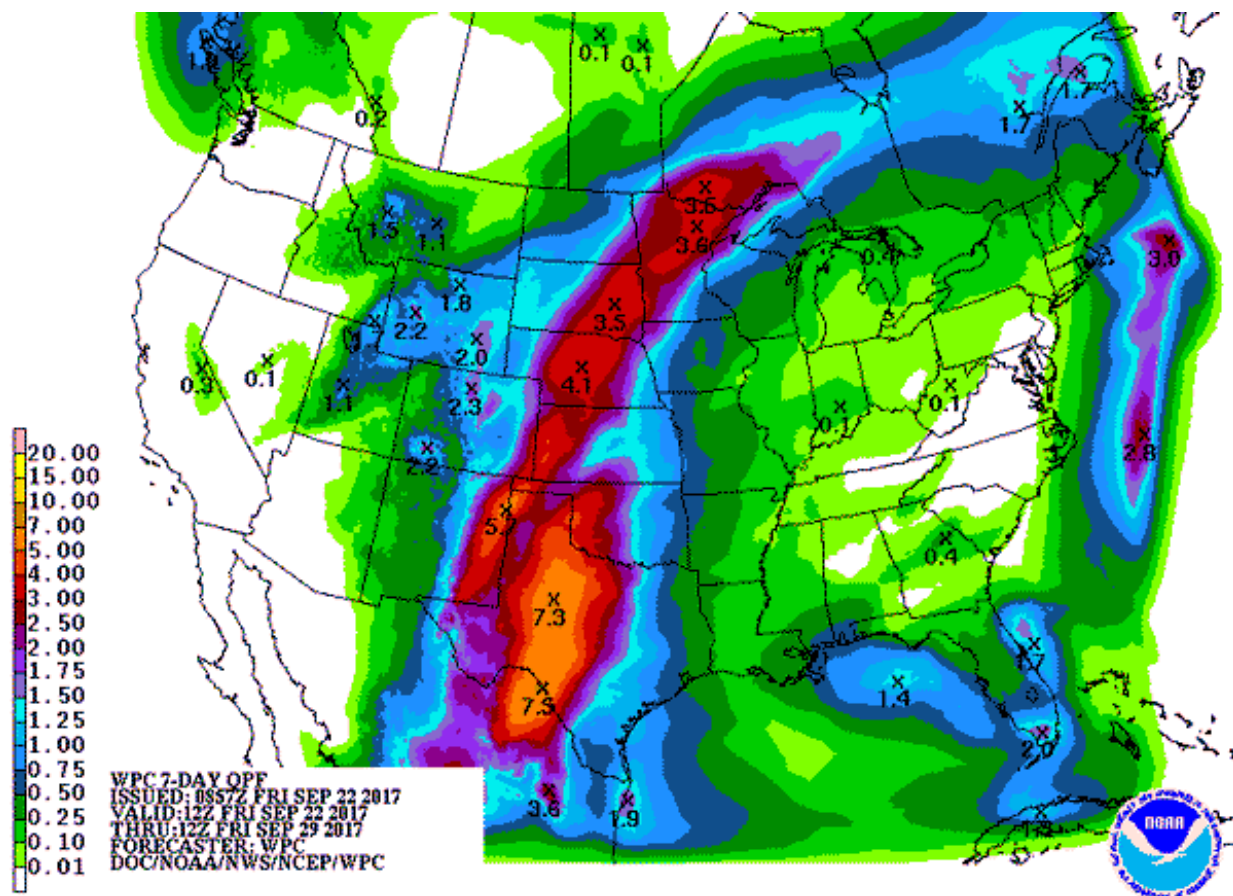
**Figure 1. Total cumulative precipitation in the period between September 13 and 19, 2017. Map by K-State Weather Data Library.**



**Figure 2. Estimated root zone (~3 ft) soil moisture in percent of soil volume as of 19 September 2017. Map by Dr. Andres Patrignani, K-State Soil Water Processes specialist.**

### **Future forecast**

The weekly precipitation forecast for Kansas indicates that the probability of precipitation for the next 7 days exists for totals ranging from 1.7 inches in eastern Kansas to as much as 5.7 inches in the western portion of the state (Figure 3). Despite the drier profile in western Kansas, the future forecast is favorable and might bring much needed moisture for a good start to the wheat growing season.

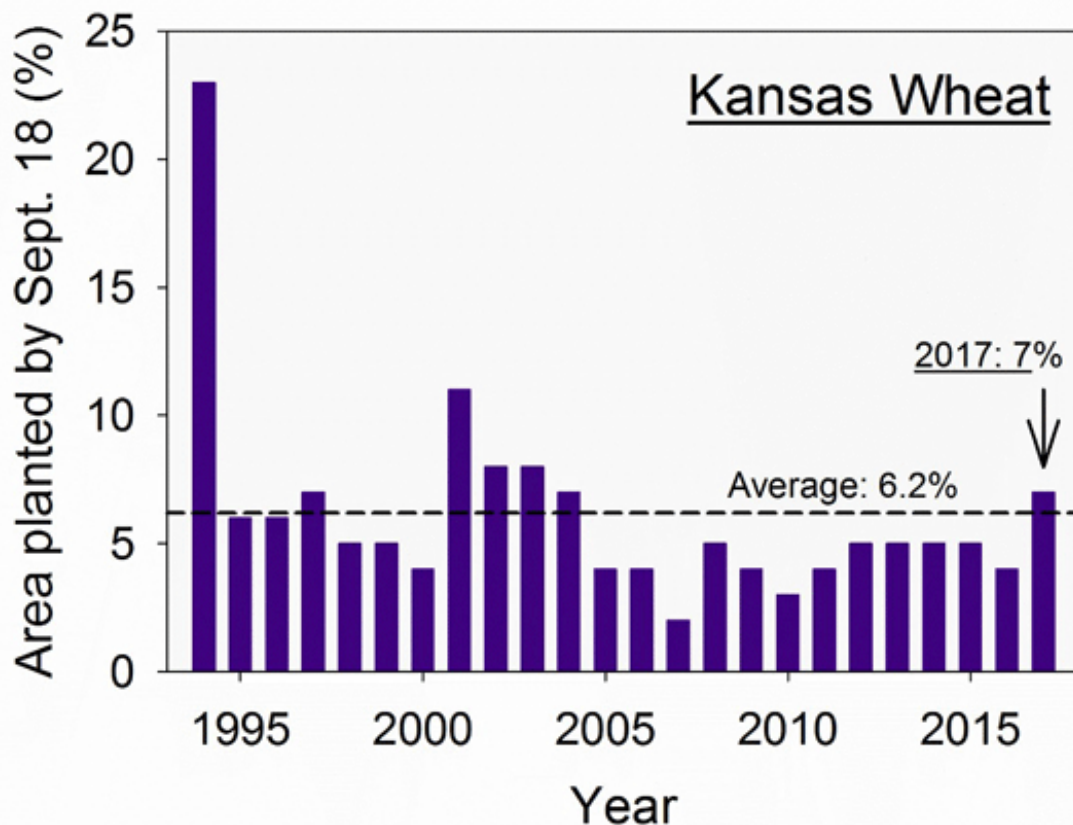


**Figure 3. Weekly precipitation forecast as of September 22, 2017 by the National Weather Service Weather Prediction Center (NOAA). Precipitation probabilities in Kansas for the next 7 days range from 1.7 to 5.7 inches.**

### **Possible challenges for wheat planting and crop establishment**

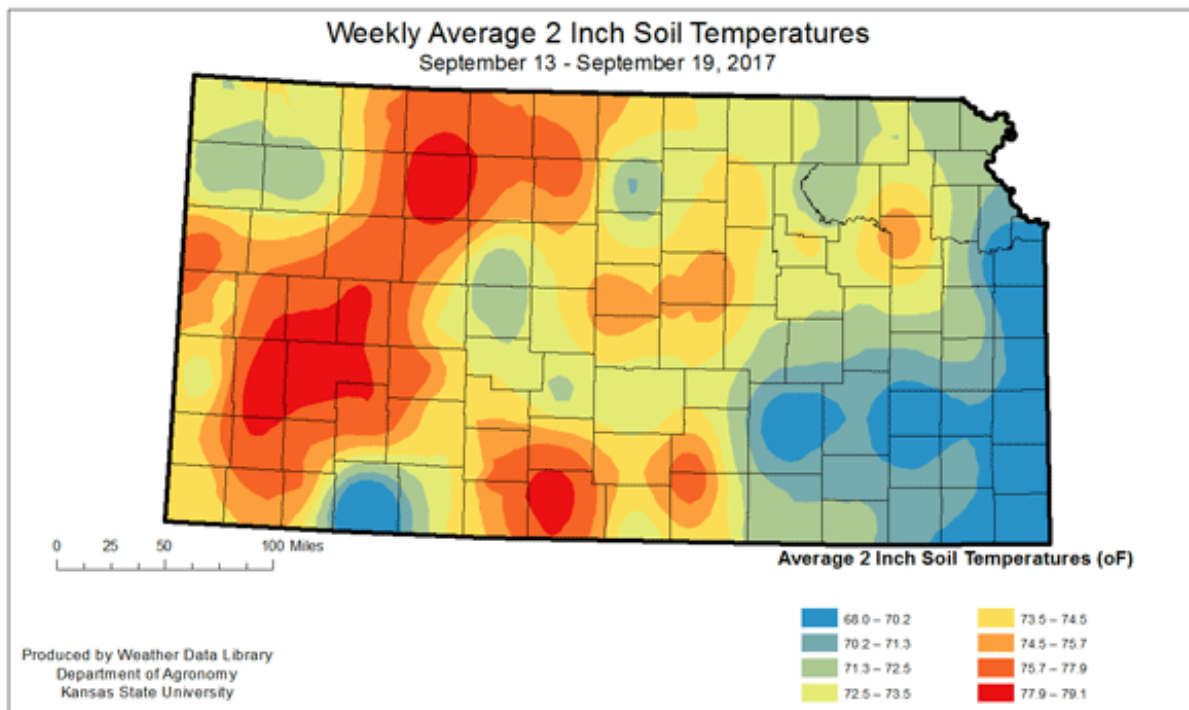
The current wheat planted acreage in Kansas, according to the USDA-NASS crop progress report, was 7% as of September 18. This is slightly above the 1994 – 2016 average of 6.2% (Figure 4), and the crop might be favored by the forecast rain.





**Figure 4. Percent wheat area in Kansas planted by September 18, 2017. Data shown for the period 1994 – 2017 as reported by the USDA-NASS Crop Progress Reports ([https://www.nass.usda.gov/Publications/National\\_Crop\\_Progress/](https://www.nass.usda.gov/Publications/National_Crop_Progress/)).**

One challenge that fields already planted can face is high soil temperature stress, which can lead to germination problems especially in wheat varieties with high-temperature germination sensitivity (varieties that won't germinate when soil temperatures are greater than 85 degrees F). Average weekly 2-inch soil temperature during September 13-19 ranged from 68 to 79.1 degrees F (Figure 5), indicating soil temperatures above 85 degrees F were likely experienced. In fields currently experiencing poor germination due to hot soil temperatures, a cold rainfall event will decrease soil temperatures and germination should occur.



**Figure 5. Weekly average 2-inch soil temperature during the September 13 – 19 period. Map by K-State Weather Data Library.**

With 93% of the winter wheat area still to be planted, the crop sowing progress in the following days will depend on weather conditions. While many producers might try to plant some acres before the forecast rain, a delay in planting progress can be expected after the rains depending on total precipitation and soil moisture conditions.

If precipitation is excessive, producers should not hurry and sow wheat into extremely moist soils. Planting wheat under wet conditions can present either mechanical or biological challenges.

Mechanical challenges include:

- Inability to get the equipment in the field to perform plowing or sowing operations.
- Mudding up the equipment after field operations are started.
- Increased soil compaction due to machinery traffic in moist soils. Soil compaction can restrict adequate root growth, affecting plant anchorage and decreasing its ability to uptake water and nutrients.

Biological challenges include:

- Delayed crop emergence due to wet and cold soils.
- Possibly increasing early-season disease and insect problems.

Planting wheat into a dry topsoil, as is the condition of many parts of southwest and south-central Kansas, can also be challenging. While a good seed distribution is generally achieved when sowing

wheat into dry soils, if the forecast rain does not materialize, the lack of moisture for germination can result in uneven stands and high within-field stand variability (Figure 6), which can ultimately impact grain yield. Otherwise, the forecast rain will help ensure a good stand establishment.



**Figure 6. Uneven wheat stands resultant from sowing into dry soils. Photo by Romulo Lollato, Extension wheat and forage specialist.**

In mid-September, we are still in the beginning of the optimum planting date for wheat for most of the state, so producers should not hurry and sow wheat into extremely moist soils. Waiting for the water to drain and/or evaporate so the soil dries adequately before performing the sowing operation would be the best option.

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### 3. Bur ragweed control with early fall treatments

With good moisture conditions in parts of Kansas this year, this is a good time to treat fields for perennial broadleaf weeds such as bur ragweed, bindweed, and Canada thistle.

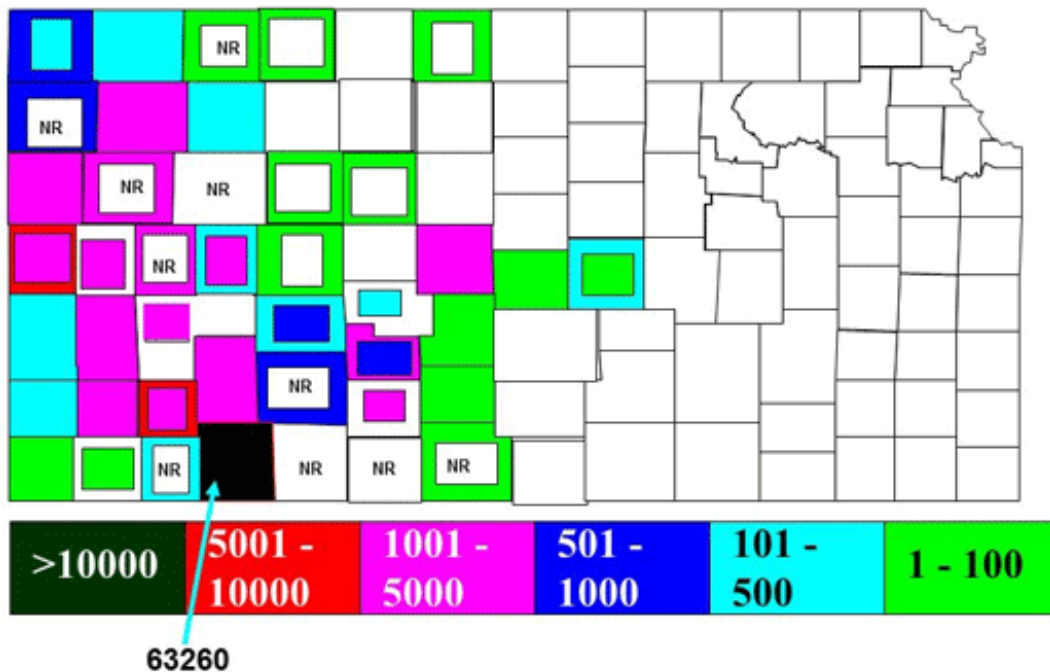
Bur ragweed (also called woollyleaf bursage) is a perennial broadleaf weed, and is classified as a noxious weed in Kansas. It is a significant problem on nearly 94,000 acres in the western half of the state. It is adapted to low areas where water runoff collects in cultivated fields or in noncropland areas. Its ability to extract water with its deep perennial root system, which can reach a depth of 15 feet, allows bur ragweed to survive extended periods of drought or harsh weather. These circumstances make it very difficult to control.



**Figure 1. Bur ragweed. Photo by Curtis Thompson, K-State Research and Extension.**

## Woollyleaf Bursage Distribution in Kansas

**2015 summary 100,805 up 7% from 2014 of 93855**



**Figure 2. Distribution of bur ragweed in Kansas, in terms of acreage.**

Bur ragweed is extremely competitive with crops, and can reduce grain yield by 100 percent in dry years. Even with irrigation, losses of 40 to 75 percent are common. Bur ragweed is more competitive with summer crops than with winter wheat because bur ragweed growth is minimal during much of the winter wheat life cycle. However, in dry years, bur ragweed will deplete soil moisture for fall-planted wheat and without adequate moisture will thereby reduce grain yield significantly.

Flower development begins in late July or early August. Seed contributes to the spread of bur ragweed and likely is a source of new infestations. New plants also arise from the vegetative buds, which develop on the root stocks, thus contributing to the spread of bur ragweed. Tillage also can redistribute vegetative buds, aiding the spread of bur ragweed.

Bur ragweed control is best when treated in late summer or fall, prior to a killing frost, with Tordon tank mixed with dicamba or 2,4-D ester. Control will not be as effective if the bur ragweed plants are under stress at the time of treatment. Bur ragweed is a difficult weed to control, and a single treatment application will usually not be sufficient. A fall treatment with the herbicides mentioned above followed by glyphosate treatments in glyphosate-tolerant crops during the growing season can help manage bur ragweed long-term. However, spring crops may be injured severely from fall applications of Tordon. Wheat has the most tolerance and can be planted 45 days following a ½ pint of Tordon 22K application. Apply each herbicide or herbicide mixture according to directions,

warnings, and precautions on the product label(s).

**Table 1. Control of bur ragweed in western Kansas with mid-September treatments**

Treatment	Rate (lb/acre)	% Control 11 months after treatment (2-year average)
Tordon + Banvel	0.25 + 0.5	82
Tordon + 2,4-D LVE	0.25 + 1	74
Roundup + Banvel	1.5 + 0.5	16
Roundup + 2,4-D LVE	1.5 + 1	27

**Source: Woollyleaf Bursage Biology and Control, MF 2239** <http://www.ksre.ksu.edu/bookstore/pubs/MF2239.pdf>

For more information, see [2017 Chemical Weed Control for Field Crops, Rangeland, Pastures, and Noncropland](#), K-State publication SRP-1126, or [Woollyleaf Bursage Biology and Control](#), K-State publication MF-22239.

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#### 4. Fall control of bindweed

Field bindweed is a deep-rooted perennial weed that severely reduces crop yields and land value. This noxious weed infests just under 2 million acres and is found in every county in Kansas. Bindweed is notoriously difficult to control, especially with a single herbicide application. The fall, prior to a killing freeze, can be an excellent time to treat field bindweed -- especially in a year when good fall moisture has been received. This perennial weed is moving carbohydrate deep into its root system during this period, which can assist the movement of herbicide into the root system.



**Figure 1. Field bindweed ready for a fall treatment. Photo by Curtis Thompson, K-State Research and Extension.**

The most effective control program includes preventive measures over several years in conjunction with persistent and timely herbicide applications. The use of narrow row spacings and vigorous, competitive crops such as winter wheat or forage sorghum may aid control.

Dicamba, Tordon, 2,4-D ester, Facet L (also generics) and glyphosate products alone or in various combinations are registered for suppression or control of field bindweed in fallow and/or in certain crops, pastures, and rangeland. Apply each herbicide or herbicide mixture according to directions,

warnings, and precautions on the product label(s). Single herbicide applications rarely eliminate established bindweed stands.

Applications of 2,4-D ester and glyphosate products are most effective when spring-applied to vigorously growing field bindweed in mid to full bloom. However, dicamba and Tordon applications are most effective when applied in the fall. Herbicide treatments are least effective when applied when bindweed plants are stressed.

Facet L, at 22 to 32 fl oz/acre, a new quinclorac product which now replaces Paramount at 5.3 to 8 oz or QuinStar quinclorac products, can be applied to bindweed in fallow prior to planting winter wheat or grain sorghum with no waiting restrictions. All other crops have a 10-month preplant interval. Quinclorac products can be used on a sorghum crop to control field bindweed during the growing season. In past K-State tests, fall applications of Paramount have been very effective as shown below (Tables 2 and 3).

Additional noncropland treatments for bindweed control include Krenite S, Plateau, and Journey.

Considerable research has been done on herbicide products and timing for bindweed control. Although the research is not recent, the products used for bindweed control and the timing options for those products haven't changed much since this work was done. As a result, the research results in the tables below remain very useful today.

**Table 1. Fall vs. spring and summer herbicide application for control of field bindweed in the Texas Panhandle: 1976-1982.**

Treatment	Rate (lbs ai/acre)	Season of application		
		Spring	Summer	Fall
		(April or May)	(June, July, or Aug.)	(Sept. or Oct.)
% Control one year after treatment				
Roundup	2.9	83	77	60
Banvel	1.0	56	41	71
2,4-D ester	1.0	65	49	55
Tordon + 2,4-D ester	0.25 + 0.5	55	56	84
Tordon + Banvel	0.25 + 0.25	47	73	87
Tordon + Roundup	0.20 + 1.6	52	73	79
% Control two years after treatment				
Roundup	2.9	67	63	32
Banvel	1.0	31	37	34
2,4-D ester	1.0	46	42	10

Source: Field Bindweed Control in Field Crops and Fallow, MF-913  
<http://www.ksre.ksu.edu/bookstore/pubs/MF913.pdf>

**Table 2. September-applied treatments for control of field bindweed: Randall Currie and Curtis**

**Thompson, Southwest Research-Extension Center 1992-1993.**

<b>Treatment</b>	<b>Rate</b>	<b>Average % control in spring</b>
Banvel	4 oz	31
Banvel	8 oz	44
Banvel	1 pt	85
2,4-D	1 pt	48
Banvel + 2,4-D	8 oz + 8 oz	82
Paramount	5.3 oz	91
Paramount + Banvel	5.3 oz + 4 oz	98
Paramount + Banvel	5.3 oz + 8 oz	97

Source: 1995 Field Day Southwest Research-Extension Center, Report of Progress 739

<http://www.ksre.k-state.edu/historicpublications/pubs/SRP739.pdf>

**Table 3. September-applied treatments for control of field bindweed: Randall Currie, Southwest Research-Extension Center 1992-1997.**

<b>Treatment</b>	<b>Rate</b>	<b>Average % Control in Spring</b>
Banvel	4 oz	19
Banvel	8 oz	65
Banvel	1 pt	89
2,4-D	1 pt	72
2,4-D	1 qt	81
Glyphosate	1 qt (IPA)	68
Paramount	5.3 oz	90
Tordon	8 oz	75
Tordon	1 pt	98

Source: 1999 Field Day Southwest Research-Extension Center, Report of Progress 837

<http://www.ksre.k-state.edu/historicpublications/pubs/SRP837.pdf>

For more information on controlling bindweed, see [2017 Chemical Weed Control for Field Crops, Rangeland, Pastures, and Noncropland](#), K-State publication SRP-1132.

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## 5. Fall Soil Sampling: Instructions for sample collection and submission to K-State Soil Testing Lab

Soil testing provides producers and homeowners important information concerning the fertility status of the soil. This information can lead to better crops and reduce costs by guiding management decisions like the type and amount of fertilizers to apply. If you plan to do your own soil sampling and use the K-State Soil Testing Laboratory, the following provides specific information on soil sample collection methods and mailing instructions.

- To take a sample, you will need a probe, auger or spade, and a clean pail. (If you're also having the soil analyzed for zinc, be sure to use a plastic container to avoid contamination from galvanized buckets or material made of rubber.) You will also need soil sample containers and a soil information sheet from your local Extension office or fertilizer dealer. You can also order soil sample bags online from K-State Research and Extension by clicking [here](#).



- Draw a map of the sample area on the information sheet and divide your fields into uniform areas. Each area should have the same soil texture, color, slope, and fertilization and cropping history.
- From each area, take a sample of 20-30 cores or slices for best results. At the very minimum, 10-15 cores should be taken per sample. Mix the cores thoroughly in a clean container and fill your soil sample container. For available nitrogen, chloride, or sulfur tests, a subsoil sample to 24 inches is necessary.



- Avoid sampling in old fencerows, dead furrows, low spots, feeding areas, or other areas that might give unusual results. If information is desired on these unusual areas, obtain a separate sample from the area.
- Be sure to label the soil container clearly and record the numbers on the soil container and the information sheet.
- Air dry the samples as soon as possible for the available nitrogen test. (Air drying before shipment is recommended, but not essential, for all other tests.) Do not use heat for drying.
- Fill out the information sheet obtained from your Extension office, or download a sheet [here](#).
- Take the samples to your local Research and Extension office for shipping. Samples may also be sent directly to the lab by placing them in a shipping container. Information sheets should be included with the package. Shipping labels can be printed from the Soil Testing Lab website listed below. Mail the package to:

Soil Testing Laboratory  
2308 Throckmorton PSC  
1712 Claflin Road  
Manhattan, KS 66506-5503

A listing of the types of soil analysis offered, and the costs, is available on the Soil Testing Lab web site, <http://www.agronomy.k-state.edu/services/soiltesting> . You can also contact the lab by email at [soiltesting@ksu.edu](mailto:soiltesting@ksu.edu) and by phone at 785-532-7897.

For more information on the proper procedures for the Soil Testing Laboratory, see K-State publication MF-734 at: <https://www.bookstore.ksre.k-state.edu/pubs/MF734.pdf>. Detailed information on soil sample collection can be found in the accompanying article “The challenge of collecting a representative soil sample” in this eUpdate issue.

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## 6. The challenge of collecting a representative soil sample

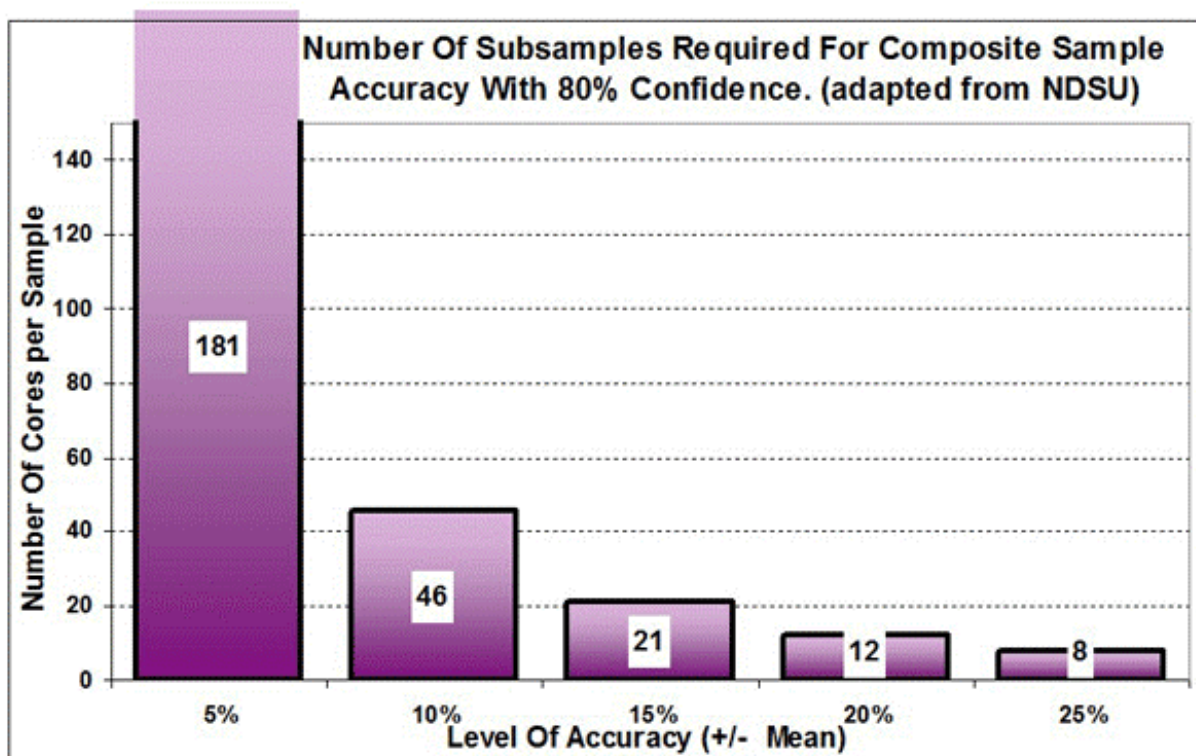
At first glance, soil sampling would seem to be a relatively easy task. However, when you consider the variability that likely exists within a field because of inherent soil formation factors and past production practices, the collection of a representative soil sample becomes more of a challenge.

Before heading to the field to collect your samples, be sure you have your objective clearly in mind. For instance, if all you want to learn is the average fertility level of a field to make a uniform maintenance application of P or K, then the sampling approach would be different than sampling for pH when establishing a new alfalfa seeding or sampling to develop a variable rate P application map.

In some cases, sampling procedures are predetermined and simply must be followed. For example, soil tests may be required for compliance with a nutrient management plan or environmental regulations associated with confined animal feeding operations. Sampling procedures for regulatory compliance are set by the regulatory agency and their sampling instructions must be followed exactly. Likewise, when collecting grid samples to use with a spatial statistics package for drawing nutrient maps, sampling procedures specific to that program should be followed.

Regardless of the sampling objectives or requirements, there are some sampling practices that should be followed:

- A soil sample should be a composite of many cores to minimize the effects of soil variability. A minimum of 10 to 15 cores should be taken from a relatively small area (two to four acres). Taking 20-30 cores will provide more accurate results (Figure 1). A greater number of cores should be taken on larger fields than smaller fields, but not necessarily in direct proportion to the greater acreage. A single core is not an acceptable sample.



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**Figure 1. The level of accuracy of the results of a soil test will depend, in part, on how many subsamples were taken to create the composite sample. In general, a composite sample should consist of at least 10-15 subsamples. For better accuracy, 20-30 cores, or subsamples, should be taken and combined into a representative sample. This chart shows that if 21 cores per sample are taken, the results will be within 15% either way of the actual mean value.**

- A consistent sampling depth for all cores should be used because pH, organic matter, and nutrient levels often change with depth. Sampling depth should be matched to sampling objectives. K-State recommendations call for a sampling depth of two feet for the mobile nutrients – nitrogen, sulfur, and chloride. A six-inch depth is suggested for routine tests of pH, organic matter, phosphorus (P), potassium (K), and zinc (Zn).
- When sampling a specific area, a zigzag pattern across the field is better than following planting/tillage pattern to minimize any past non-uniform fertilizer application/tillage effects. With a GPS system available, georeferencing of core locations is possible. This allows future samples to be taken from the same locations in the field.
- When sampling grid points for making variable rate nutrient application maps, collecting cores in a 5-10 foot radius around the center point of the grid is preferred for many spatial statistical software packages.
- Unusual spots obvious by plant growth and/or visual soil color/texture differences should be avoided. If information on these unusual areas is wanted, collect a separate composite sample from these spots.
- If banded fertilizer has been used on the previous crop (such as strip till), then it is suggested that the number of cores taken should be increased to minimize the effect of an individual core on the composite sample results, and to obtain a better estimate of the average fertility for the field.
- For permanent sod or long-term no-till fields where nitrogen fertilizer has been broadcast on the surface, a three- or four-inch sampling depth would be advisable to monitor surface soil pH.

Soil test results for organic matter, pH, and non-mobile nutrients (P, K, and Zn) change relatively slowly over time, making it possible to monitor changes if soil samples are collected from the same field following the same sampling procedures. However, there can be some seasonal variability and previous crop effects. Therefore, soil samples should be collected at the same time of year and after the same crop.

Soil testing should be the first step for a good nutrient management program, but it all starts with the proper sample collection procedure. After harvest in the fall is good time for soil sampling for most limiting nutrients in Kansas.

For instructions on submitting soil samples to the K-State Soil Testing Lab, please see the accompanying article “Fall soil sampling: Instructions for sample collection and submission to K-State Soil Testing Lab” found in this eUpdate issue.



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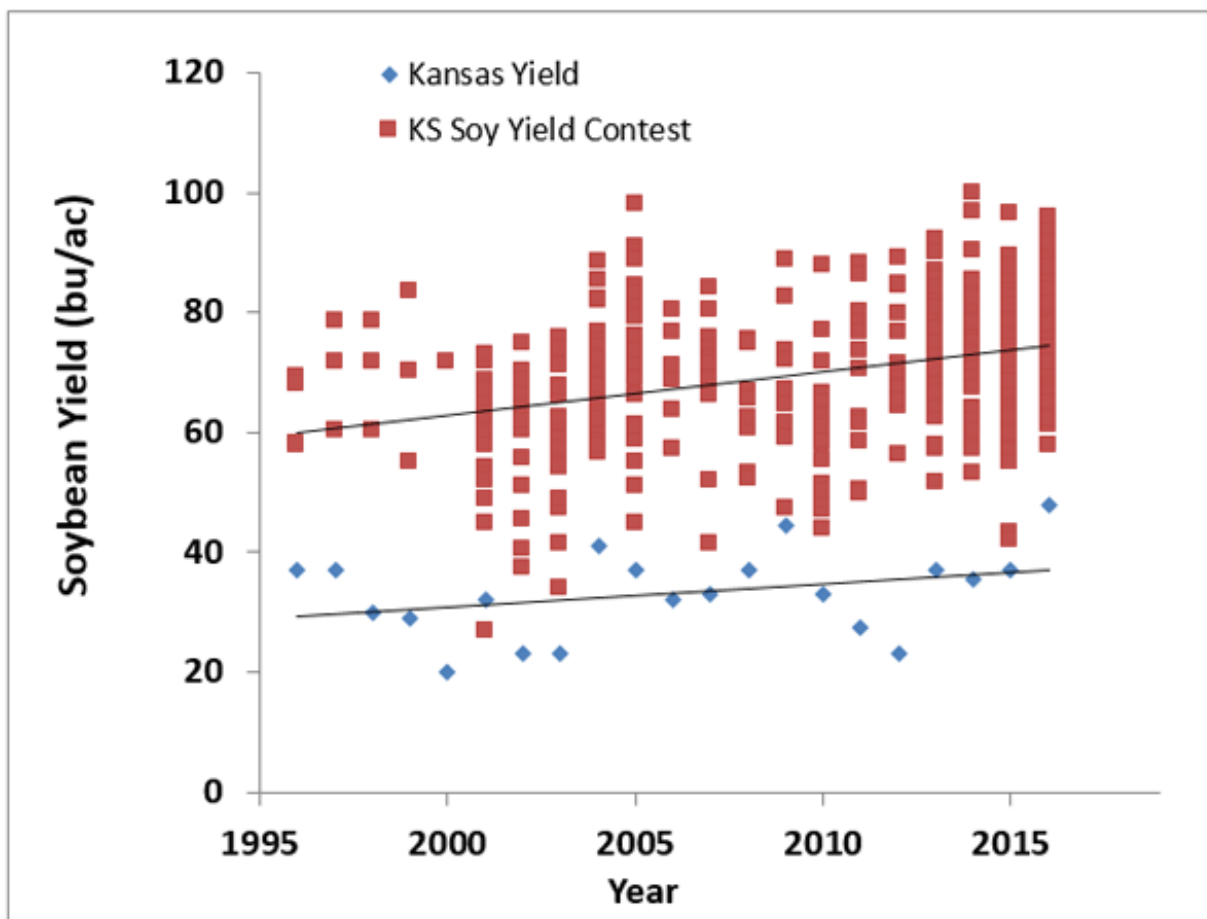
## 7. 2017 Kansas Soybean Yield and Value Contest

Soybean harvest is just around the corner in Kansas. It is a good idea for producers to keep in mind the Kansas Soybean Yield and Value contest before they fire up the combines.

Each year the Kansas Soybean Association, with help from K-State Research and Extension, and sponsorship from the Kansas Soybean Commission, conducts the Kansas Soybean Yield and Value Contest. The contest is a fun way for producers to showcase their high yielding and high quality soybean with other growers in the state, and to provide information on what production practices they did to achieve those excellent yields. In addition to grower recognition, cash awards are distributed to the 1st, 2nd, and 3rd place winners for the 9 districts across Kansas and the top three finishers in the quality contest. Contest rules and entry forms are found online at <http://kansassoybeans.org/association/contests/>

The yield contest first began in the early 1980's but more detailed historical data began in the early 2000's. When growers submit entry forms for the contest, they are asked to share some of their production practices that they used on the soybean crop. Using this information we can identify shifts in producer practices over the last two decades from high yielding soybean growers.

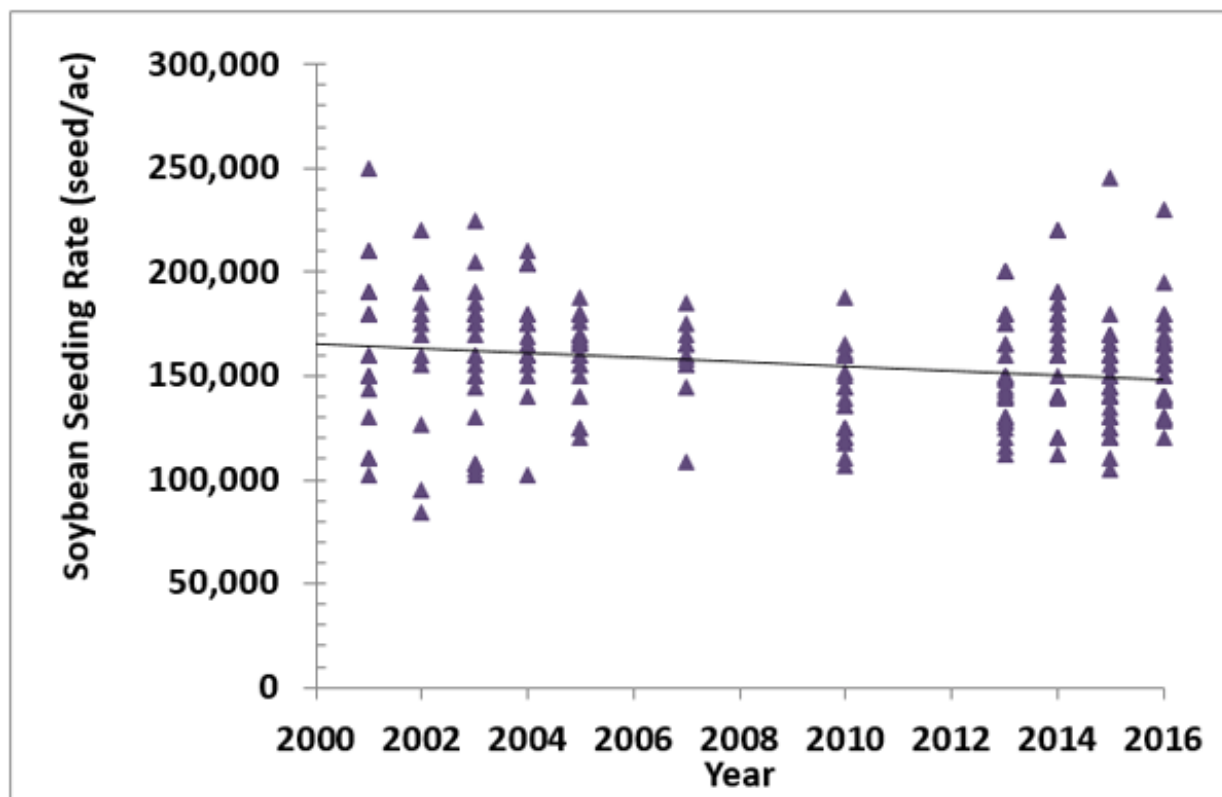
When plotting out the state yields over the last 20 years, state soybean yields have improved almost 8 bushels per acre (bu/acre) while soybean yield contest entrants have gained nearly double that (15 bu/acre) in the same span of time (Figure 1). This indicates that soybeans are a crop that can be managed for higher yield when proper high yield practices are adopted. The average yield gap between high yield soybean and state average soybean is nearly 37 bu/acre. In addition, the yield gap has enlarged from 1996 to 2016.



**Figure 1. Difference in yield between state-average as reported by Kansas Ag Statistics and the entries in the Kansas Soybean Yield Contest from 1996 to 2016.**

A few soybean production practices have changed over time as well. Over the last decade, producers in the soybean yield contest have moved to a lower seeding rate (Figure 2). In 2001, seeding rate averaged just over 165,000 seeds per acre and by 2016 seeding rates dropped below 150,000 seeds per acre. This may be a function of seed prices increasing over time and producers have more confidence in final plant stand with improved planting equipment and seed treatments. In addition to seeding rate changes, soybean row spacing has also seen a decline over time with narrower rows (<30 in) being adopted more by growers in the Kansas Soybean Yield Contest (Figure 3). This decline is likely due to reduction in use of drills and the increase use of planters to sow soybean.





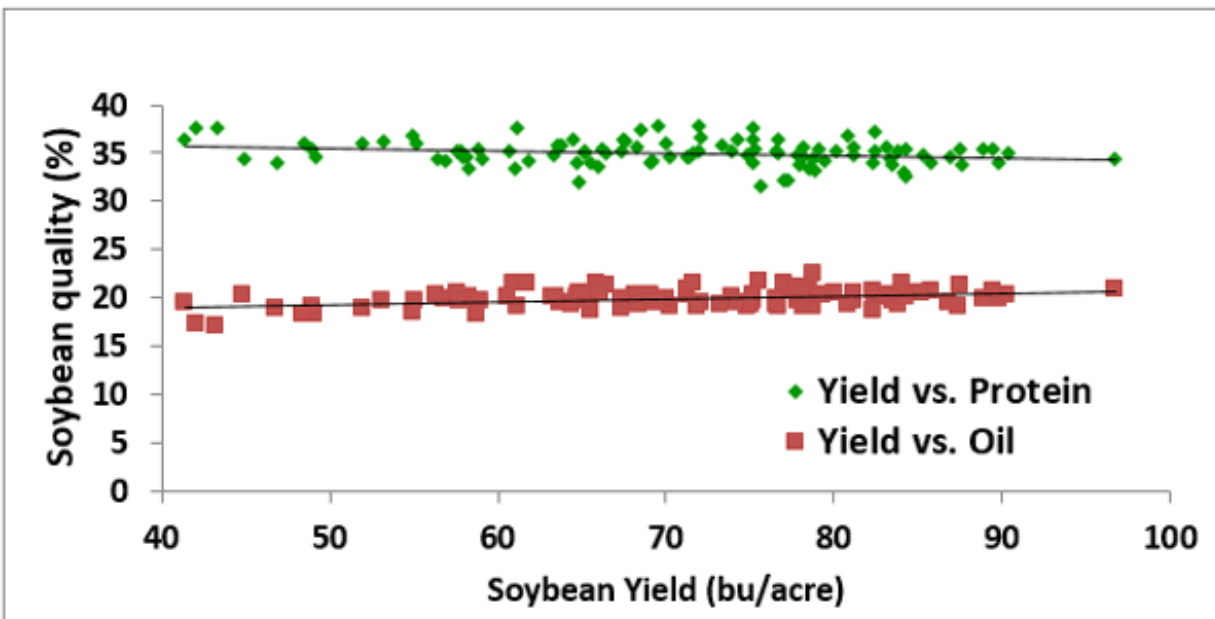
**Figure 2. Seeding rate of contestants in the Kansas Soybean Yield Contest from 2001 to 2016.**



**Figure 3. Row spacing of Kansas Soybean Yield Contest entrants from 2001 to 2016. Narrow rows were any spacing 10-in or less. Wide rows were any spacing 30-in or greater. Mid-rows were any spacing between 10- and 30-inch.**

Since 2004, Kansas soybean producers have had the opportunity to enter their soybeans into the Value Contest. With this information, the contest is able to showcase the true end-use value of soybeans including protein, oil, and other value added products.

With many field crops, a relationship exists between yield and protein where protein decreases as yield increases. However in the case of the soybean yield contest, there doesn't appear to be a strong relationship in protein (slight negative relationship) nor in oil (slight positive relationship) relative to yield over the last 13 years (Figure 4).



**Figure 4. Relationship between soybean oil and protein vs. soybean yield for 100 entries in the Kansas Soybean Value Contest between 2004 and 2016.**

If a producer has interest in submitting an entry in the Kansas Soybean Yield Contest, they need:

1. A minimum of 5 contiguous acres of soybean
2. To contact their County Extension Agent for witnessing the harvest
3. Have the entry postmarked by December 1, 2017

The Soybean Yield and Value Contest is free to producers. One does not have to enter the Yield contest to enter the Soybean Value Contest, just fill out the entry form and mail a 20 ounce soybean sample to the Kansas Soybean Office by December 1, 2017. The contest winners will be announced at the Kansas Soybean Expo on January 10, 2018 in Topeka. To find the rules and entry form, visit <http://kansassoybeans.org>

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## 8. Comparative Vegetation Condition Report: September 12 - September 18, 2017

The weekly Vegetation Condition Report maps below can be a valuable tool for making crop selection and marketing decisions.

The objective of these reports is to provide users with a means of assessing the relative condition of crops and grassland. The maps can be used to assess current plant growth rates, as well as comparisons to the previous year and relative to the 28-year average. The report is used by individual farmers and ranchers, the commodities market, and political leaders for assessing factors such as production potential and drought impact across their state.

The Vegetation Condition Report (VCR) maps were originally developed by Dr. Kevin Price, K-State professor emeritus of agronomy and geography, and his pioneering work in this area is gratefully acknowledged.

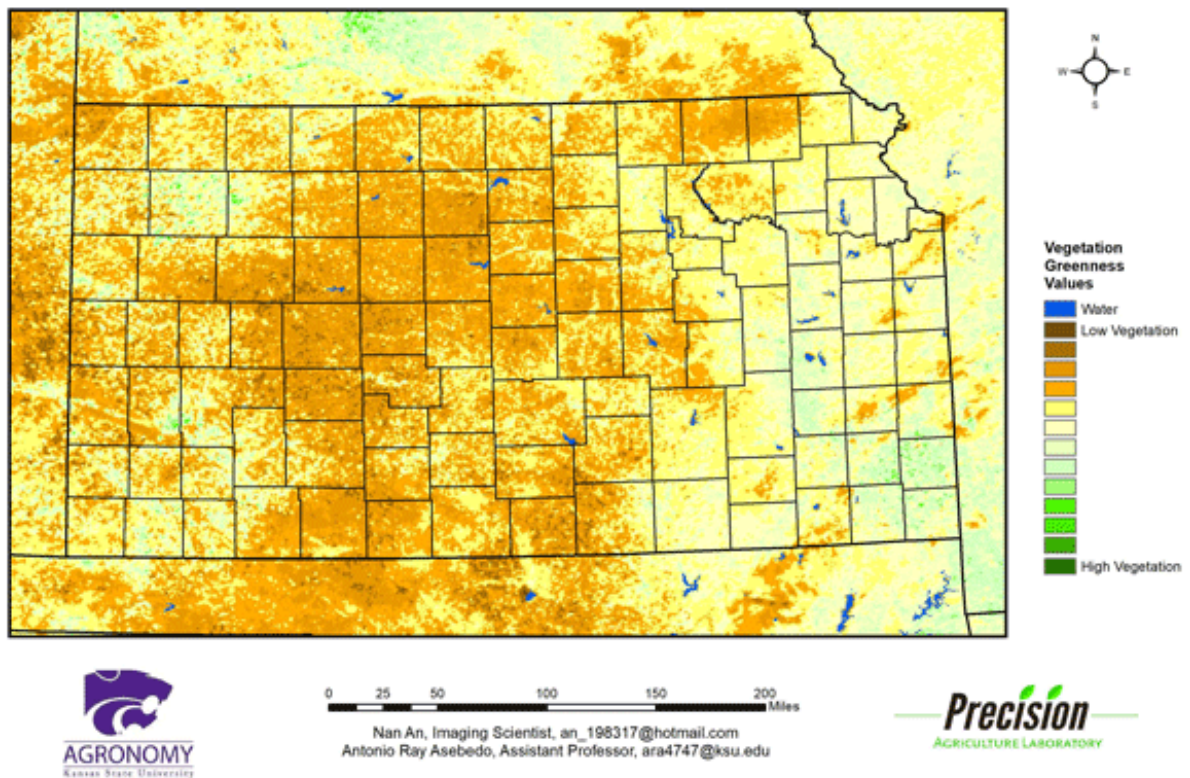
The maps have recently been revised, using newer technology and enhanced sources of data. Dr. Nan An, Imaging Scientist, collaborated with Dr. Antonio Ray Asebedo, assistant professor and lab director of the Precision Agriculture Lab in the Department of Agronomy at Kansas State University, on the new VCR development. Multiple improvements have been made, such as new image processing algorithms with new remotely sensed data from EROS Data Center.

These improvements increase sensitivity for capturing more variability in plant biomass and photosynthetic capacity. However, the same format as the previous versions of the VCR maps was retained, thus allowing the transition to be as seamless as possible for the end user. For this spring, it was decided not to incorporate the snow cover data, which had been used in past years. However, this feature will be added back at a later date. In addition, production of the Corn Belt maps has been stopped, as the continental U.S. maps will provide the same data for these areas. Dr. Asebedo and Dr. An will continue development and improvement of the VCRs and other advanced maps.

The maps in this issue of the newsletter show the current state of photosynthetic activity in Kansas, and the continental U.S., with comments from Mary Knapp, assistant state climatologist:

## Kansas Vegetation Condition

Period 38: 09/12/2017 - 09/18/2017



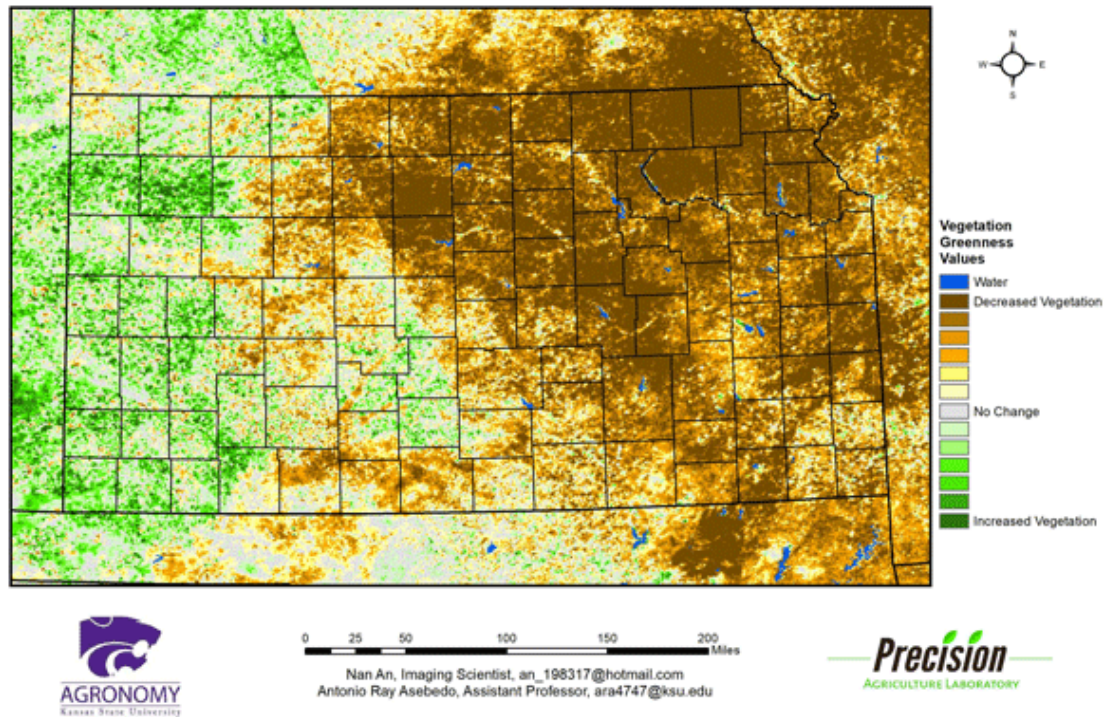
**Figure 1. The Vegetation Condition Report for Kansas for September 12 – September 18, 2017 from K-State’s Precision Agriculture Laboratory shows very little vegetative activity this week. The greatest area of photosynthetic activity is in southeast Kansas. Recent warm, dry weather has increased crop maturity and reduced photosynthetic activity.**

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Kansas Vegetation Condition Comparison  
Mid-September 2017 compared to the Mid-September 2016

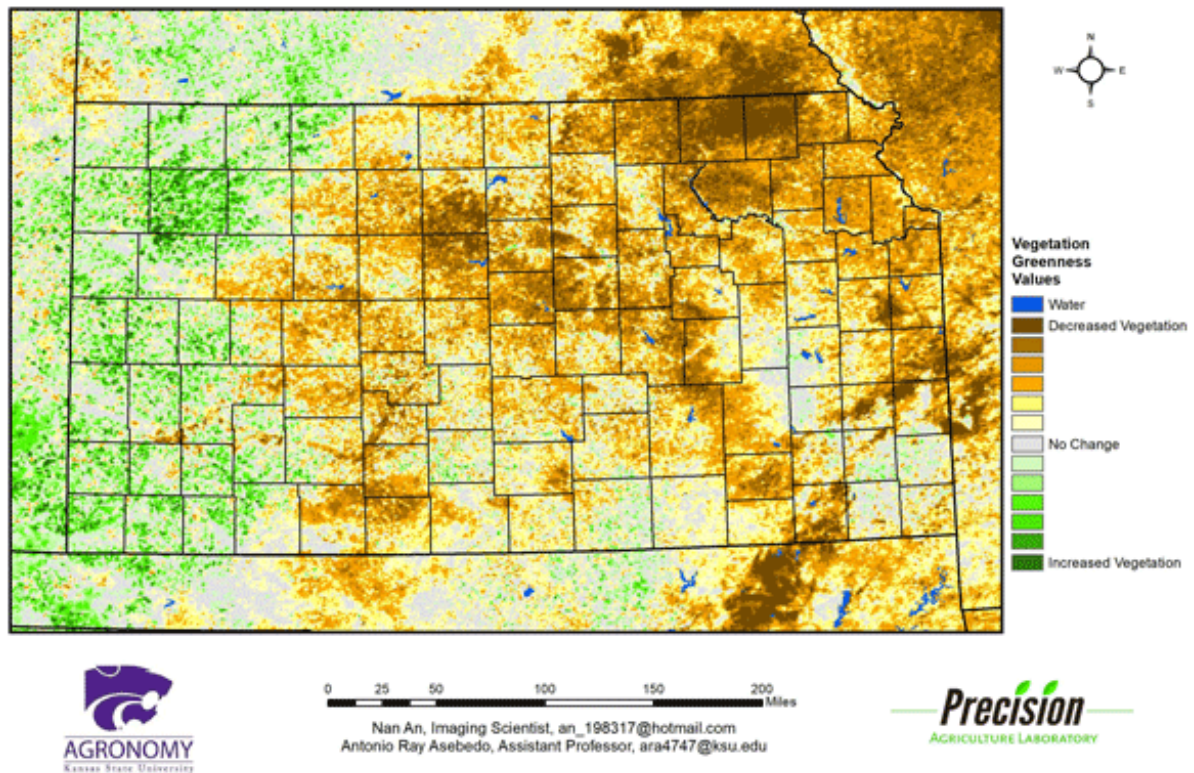


**Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for September 12 – September 18, 2017 from K-State’s Precision Agriculture Laboratory shows lower vegetative activity across the eastern two-thirds of the state. Much of that is due to increased cloud cover rather than heavy rains, which was confined to the southeastern division.**



## Kansas Vegetation Condition Comparison

Mid-September 2017 compared to the 28-Year Average for Mid-September



**Figure 3. Compared to the 28-year average at this time for Kansas, this year's Vegetation Condition Report for September 12 – September 18, 2017 from K-State's Precision Agriculture Laboratory shows above-average vegetative activity in the western third of the state. Increasing drought conditions has stressed vegetation in parts of central and northeast Kansas, particularly in Nemaha and Marshall counties.**

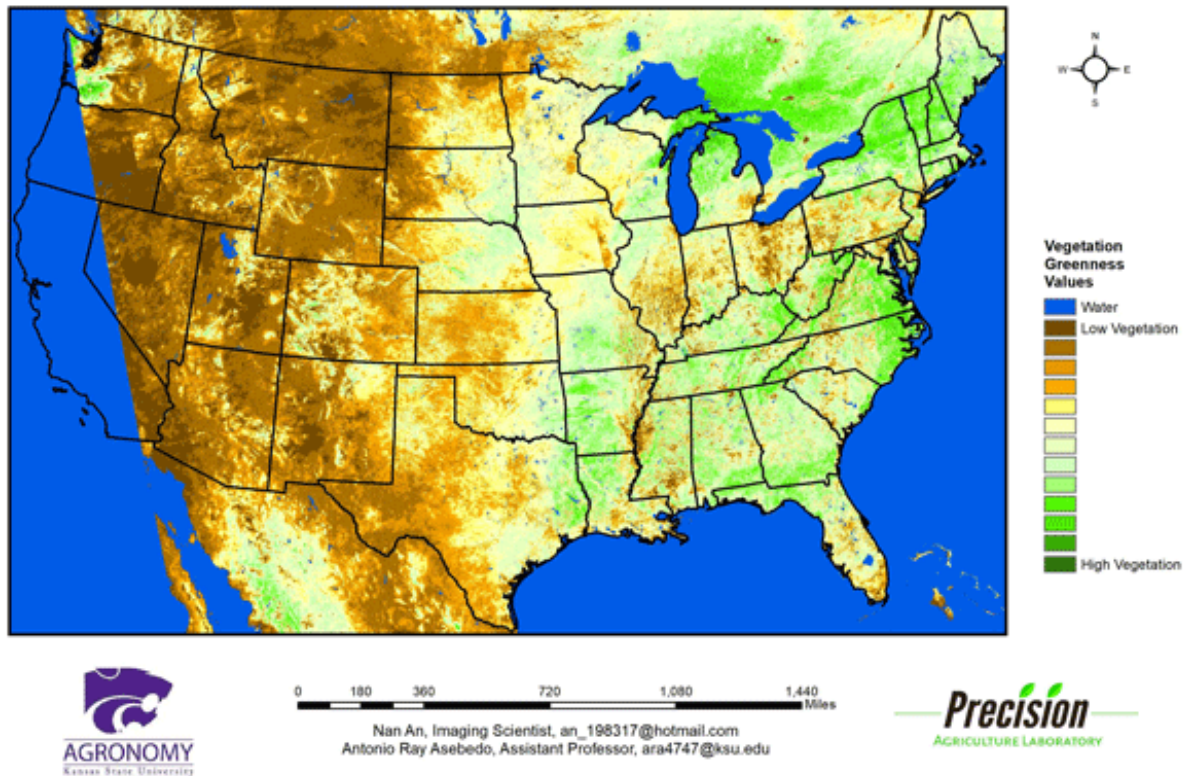
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## Continental U.S. Vegetation Condition

Period 38: 09/12/2017 - 09/18/2017



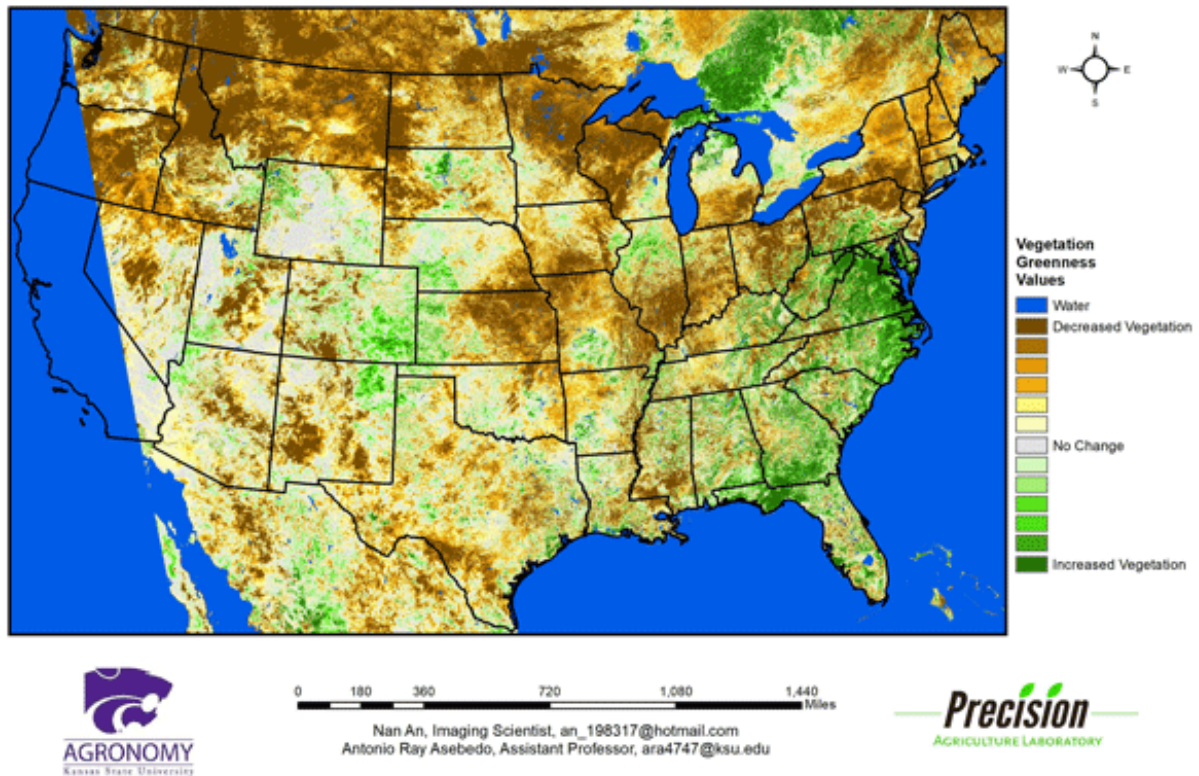
**Figure 4. The Vegetation Condition Report for the U.S for September 12 – September 18, 2017 from K-State’s Precision Agriculture Laboratory shows the highest NDVI values centered across the Great Lakes into upper New England. A second area of higher vegetative activity is also visible along the Carolinas, where the recent rainfall has reduced drought stress. Extremely low NDVI values continue to highlight the severe drought in eastern Montana and western South Dakota, while the excess rainfall along the Gulf Coast is beginning to show visible impacts, particularly in Florida which experienced Hurricane Irma. No data was available for much of the West Coast, which is blank.**

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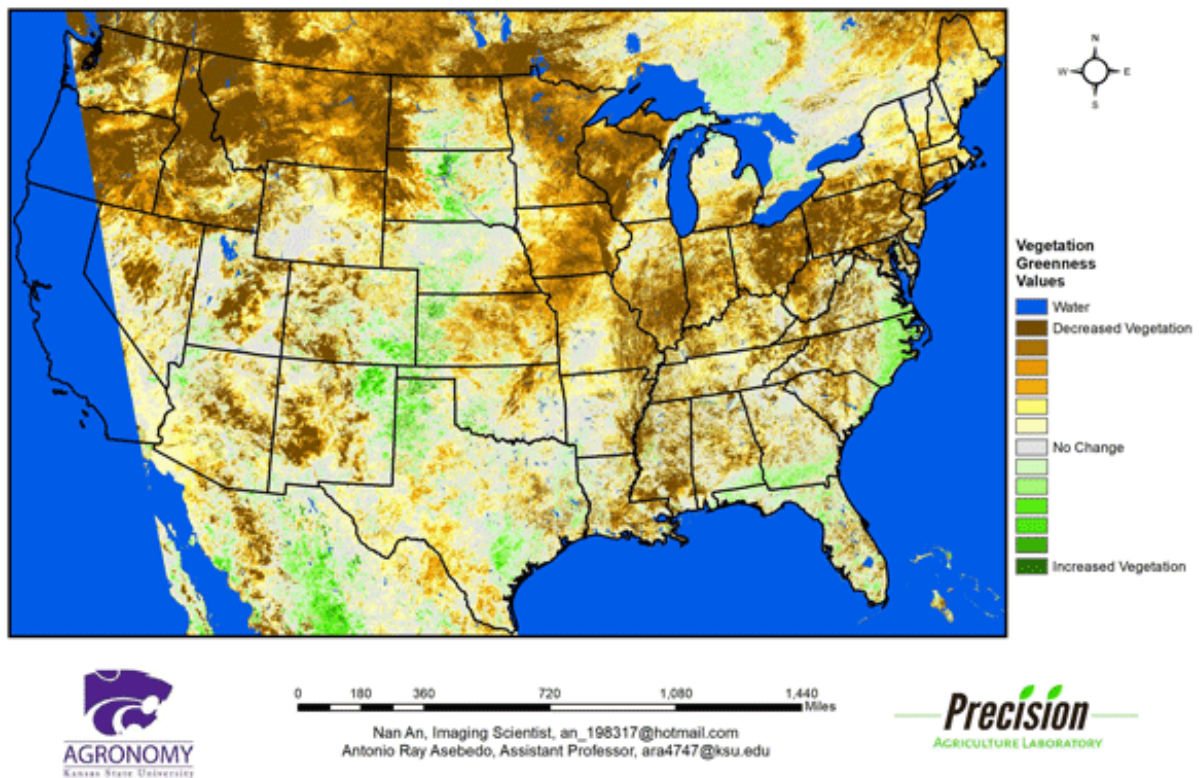
Continental U.S. Vegetation Condition Comparison  
Mid-September 2017 Compared to Mid-September 2016



**Figure 5. The U.S. comparison to last year at this time for September 12 – September 18, 2017 from K-State’s Precision Agriculture Laboratory again shows the impact that the split in moisture has caused this year. Much lower NDVI values are visible across the northern states with slightly lower values in the Plains. In contrast, the desert Southwest has much higher NDVI values than last year at this time. Pockets of low NDVI values in Colorado and Wyoming are the result of early mountain snows.**



Continental U.S. Vegetation Condition Comparison  
Mid-September 2017 Compared to 28-year Average for Mid-September



**Figure 6. The U.S. comparison to the 28-year average for the period of September 12 – September 18, 2017 from K-State’s Precision Agriculture Laboratory shows the drought impacts in the Northern Plains are visible as below-average NDVI values. In Louisiana and the Ohio River Valley, below-average NDVI values are associated with cloud cover and rain from Hurricane Irma. Higher-than-average vegetative activity is most visible in west Texas, eastern New Mexico, and western Kansas where rainfall and temperatures have been favorable.**

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