Issue 580

K-STATE
Research and Extension

Extension Agronomy

eUpdate

07/15/2016

These e-Updates are a regular weekly item from K-State Extension Agronomy and Steve Watson, 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 Steve Watson, 785-532-7105 swatson@ksu.edu, or Curtis Thompson, Extension Agronomy State Leader and Weed Management Specialist 785-532-3444 cthompso@ksu.edu.

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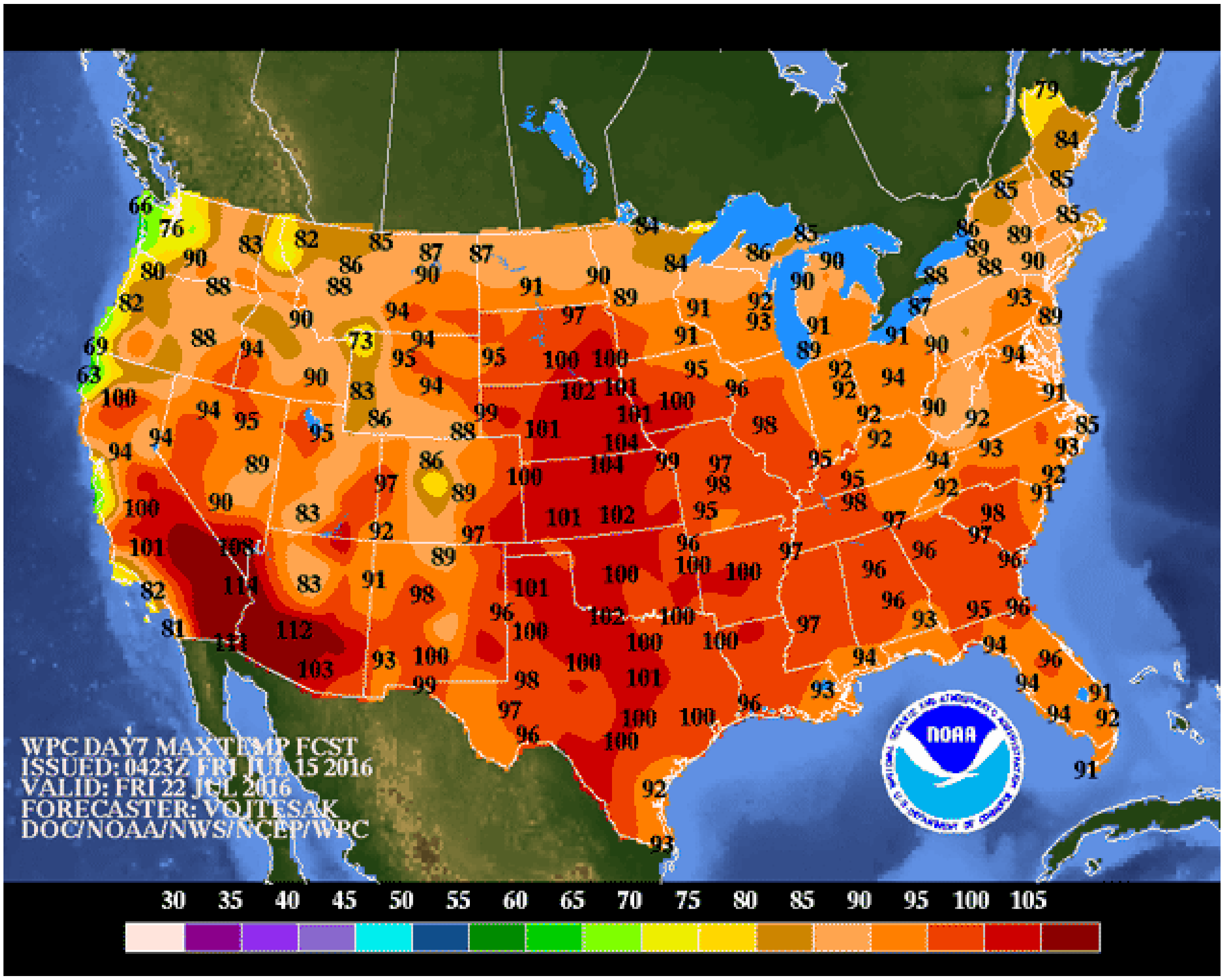
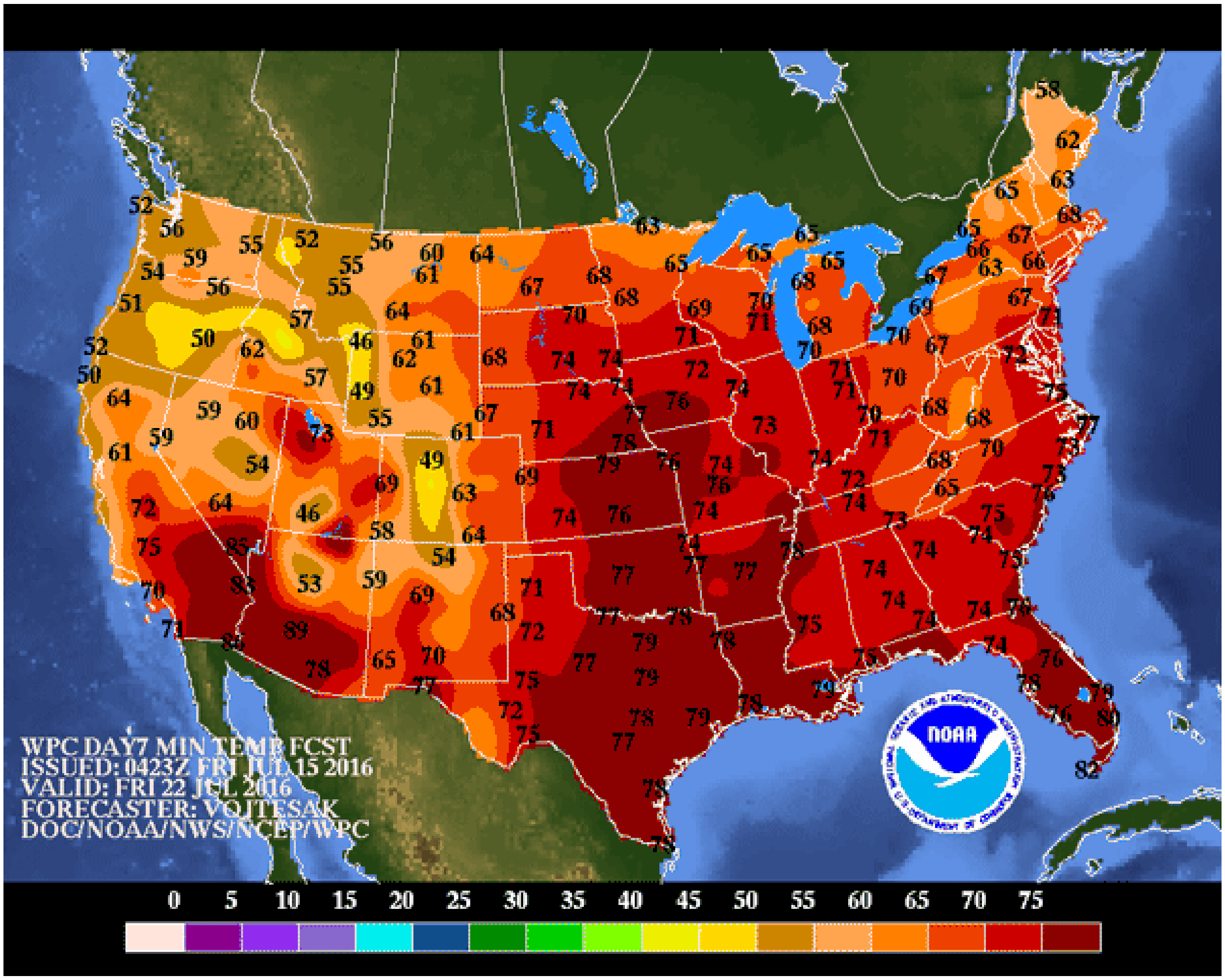
eUpdate Table of Contents | 07/15/2016 | Issue 580

1. Hot weather ahead -- Impacts on summer row crops

Weather models are indicating a return to the warmer weather that was prevalent in mid-June. By the end of next week, temperatures are expected to be in the low 100's as shown on the map below:

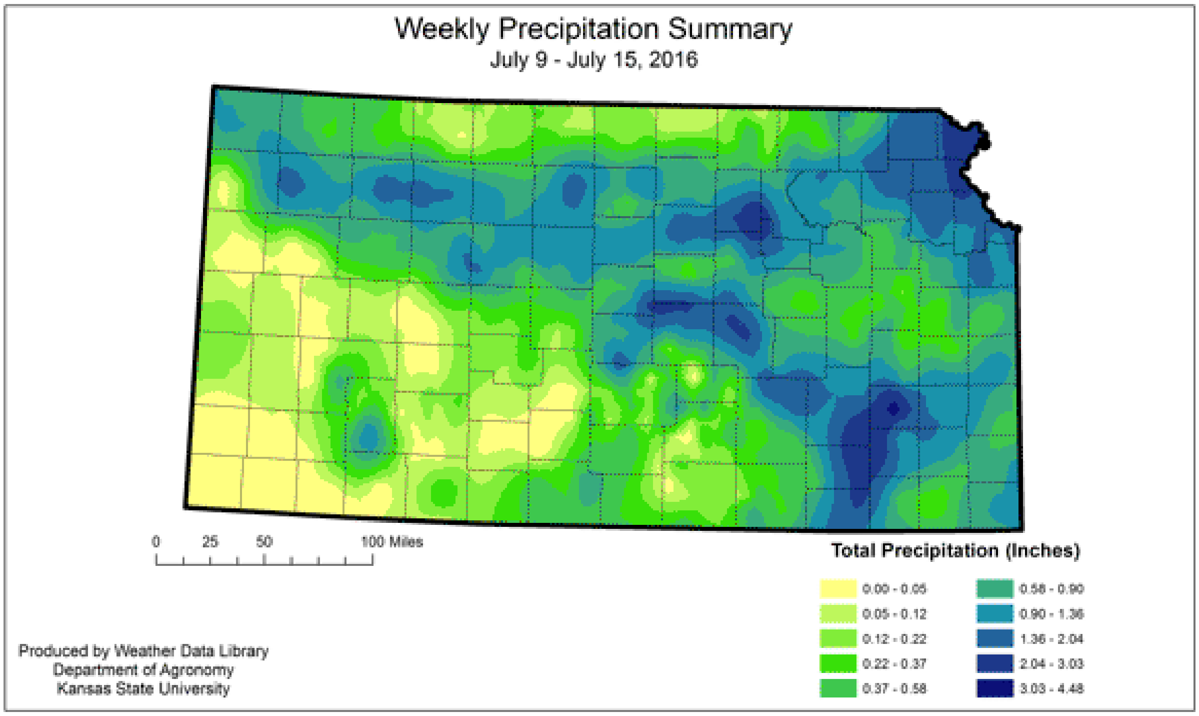


Overnight low temperatures are not expected to provide much relief. Again, by Friday of next week, low temperatures are expected to stay in the mid to upper 70's, as illustrated below:



Areas that missed out on this week's moisture are more likely to show signs of stress.

Below is a map of the 7-day precipitation totals ending on July 15th at 7:00 a.m.



The heat in the coming weeks can cause problems for all summer row crops in Kansas. With corn, the latest Crop Progress and Conditions Report from USDA-NASS shows that most of the crop has already reached 50% silking, except in the western districts of the state. At this point, high heat could have an impact on abortion of early-formed grains -- and could also impact pollination across the western section of the state. Overall, temperatures above 95 degrees F, and more importantly lower fluctuations between day and night temperatures, will have a critical impact on kernel number (abortion process) and also on the duration of grain filling (occurring in southeast Kansas), consequently impacting final kernel size (grain weight).

Heat stress will have more of an impact on corn at this stage of growth when combined with drought stress. But even in the absence of drought stress, heat stress alone will increase the asynchrony between pollen shed and silk extrusion when corn reaches flowering time. The potential for yield reductions around pollination are quite high, diminishing as the crop progresses into later stages (blister and milk stage).

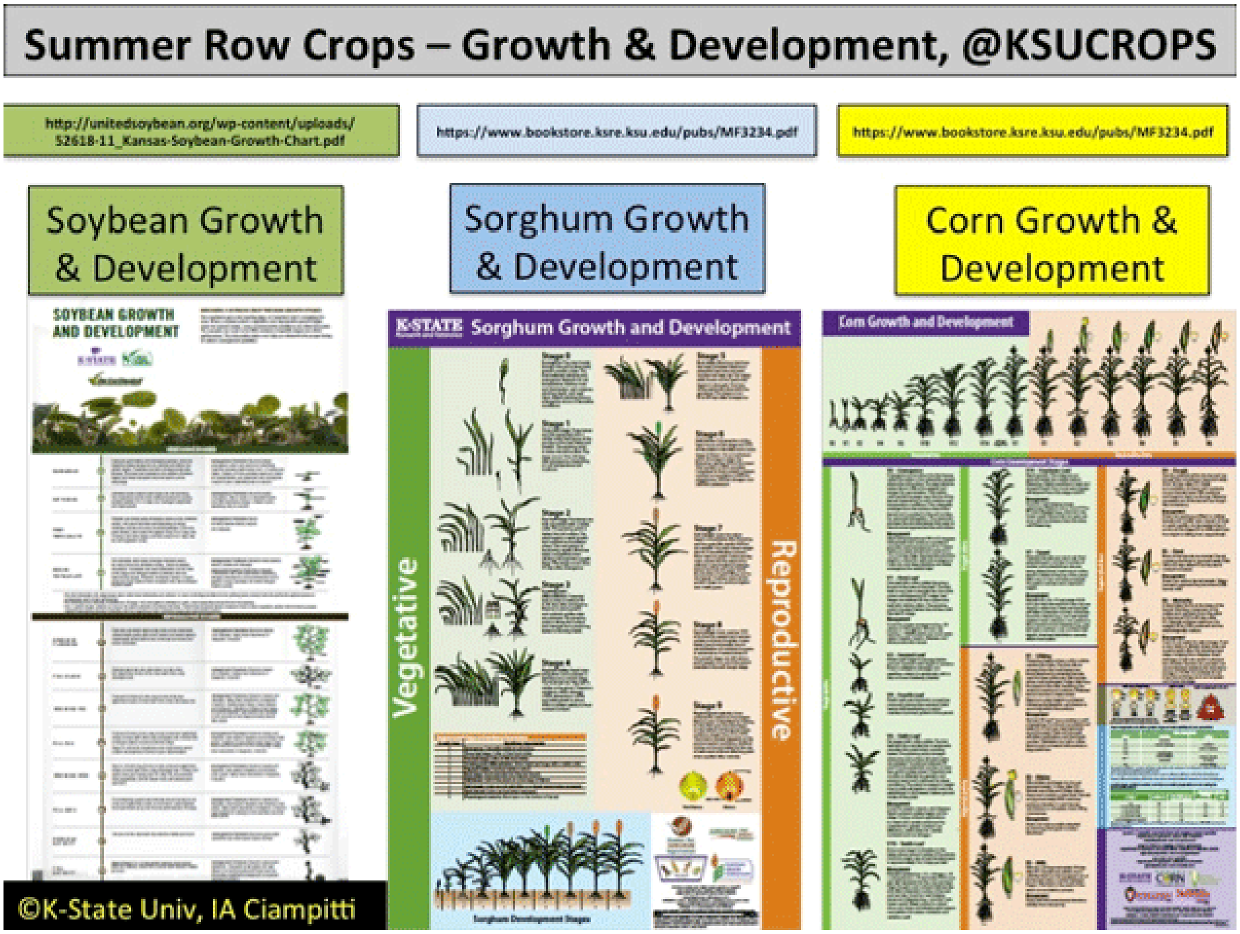
For soybean and sorghum, heat stress next week could also impact plant growth and maximum yield potential but the risk is less than for corn at this point in the season since soybeans and sorghum are not yet in the high-water-demand period. Based on the last Crop Progress and Conditions Report from USDA-NASS, soybeans are just blooming in some areas of the state and sorghum is only starting to head in the Eastern and South Central Districts of our state. These crops would have a higher level of risk of yield reductions due to high temperatures, combined with drought stress, if the stress were to occur toward the end of July.

For more information on summer row crops growth and development, visit all K-State and KSUCROPS Lab publications.

Corn: http://www.bookstore.ksre.ksu.edu/pubs/MF3305.pdf

Soybean:
http://unitedsoybean.org/wp-content/uploads/52618-11_Kansas-Soybean-Growth-Chart.pdf

Sorghum: https://www.bookstore.ksre.ksu.edu/pubs/MF3234.pdf



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2. Canola yields rebound across Kansas in 2016

Canola yields at K-State Research and Extension trial sites and producer fields rebounded in 2016 after a couple of challenging years. The higher yields were primarily the result of a mild winter, adequate precipitation during the growing season, and optimum temperatures at grain filling.

Figure 1. Canola variety yield trial at Hutchinson, 2016. Photo by Mike Stamm, K-State Research and Extension.

The production year began with very favorable soil moisture conditions in most areas, except for north central Kansas. Establishment of the winter canola trial at the North Central Experiment Field near Belleville was erratic because of dry soils and thus the site was abandoned. All other trial sites entered the winter with ideal top growth and adequate soil moisture provided by late fall rains. Soils were saturated at some points in December and January across the state.

Producer canola yields in Kansas averaged around 45 to 50 bushels/acre, with a yield range from the mid-20s to upper 70s. Producers around Kiowa reported yields of 45 to 65 bushels/acre, and Harper County yields ranged from about 35 to 55 bushels/acre. Some producers in central Kansas reported somewhat lower yields, in the mid-20s to low-40s, mostly due to the effects of late spring freezes and insects. A producer near Concordia had yields that ranged from 42 to 67 bushels/acre. A producer in southwest Kansas reported a high yield of 59 bushels/acre under limited irrigation, but some of his yields were as low as 20 bushels/acre because of harvest losses caused by late-season heavy rainfall and wind events. With an average price of around $7.00/bushel at peak harvest, many producers were satisfied with the returns they received.

Yield trials that included commercial winter canola varieties were harvested at Conway Springs, Hutchinson, Kiowa, and Manhattan. The trial at Garden City was lost to rabbit feeding in fall 2015. A seven-year yield summary is provided in Table 1. Trial site yields reflected very closely the yields of producers in 2016. For a preliminary summary of 2016 yield results, please see the Kansas Crop Performance Testing website (http://www.agronomy.k-state.edu/services/crop-performance-tests/canola-and-cotton.html).

Table 1. Summary of yields (bushels/acre) of K-State Research and Extension trials including commercial winter canola cultivars, 2010-2016.

Location	2010	2011	2012	2013	2014	2015	2016
	Yield (bushels per acre)						
Andale	36	12*	26*	58	Winterkill	N/A	N/A
Belleville	N/A	N/A	80	59	10	Winterkill	Stand failure
Conway Springs	N/A	N/A	N/A	N/A	N/A	Winterkill	38
Garden City	47	46	46	Hail	22	Winterkill	Rabbits
Hutchinson	41	Herbicide carryover	Drought	42	32	Winterkill	47
Kiowa	Herbicide damage	21*	42	Drought	Drought	Winterkill	62
Manhattan	41	46	44	67	35	Winterkill	33
Marquette	41	42	15*	Late freeze	N/A	Winterkill	N/A
Avg. by year	42	34	42	57	25	N/A	45
*Yields effected by severe weather.							

Yearly averages are very close to 40 bushels/acre, which is the yield potential we should expect from canola year-in and year-out. The 2015 losses were nearly 100% caused by the mid-November cold snap that occurred before the crop had been completely hardened off for the winter. More than likely the losses would have been much less had we experienced conditions favorable for developing winter hardiness prior to the cold snap. We also must remember that many producers still harvested canola in 2015, but the trial sites unfortunately did not fare so well.

Probably the biggest concern of the 2015/16 season was the leaf purpling that many producers observed as a result of anthocyanin build up in the leaves as temperatures turned colder. Anthocyanin production is a natural response to stress in winter canola. As a general rule, as the crop hardens off it will almost always have a purple tint to its leaves. There are a few reasons why the purpling was more evident this year. First, the saturated soils at that time of year caused some stress on the crop. Second, the purpling was more pronounced in fields that had lower N rates going into the winter. Deficiencies in available nutrients can cause stress on overwintering canola and result in anthocyanin production. Third, varieties differ in the amount of anthocyanin produced. As a general observation, hybrids tended to show less purpling than open-pollinated varieties. Part of the reason may be the increased fall vigor we see in hybrids as a result of rapid growth and a more extensive root system. Fourth, purpling seems to last longer in milder winters, primarily because the crop takes longer to go dormant.

Nonetheless, as temperatures warmed up in the spring and the canola began to break dormancy, the crop regained its green color and there was little evidence that the buildup of anthocyanin had any impact on final yields. It is presumed, however, that in some of the fields with lower rates of fall N, the anthocyanin and stunting resulted reduced yields. Other causes of yield loss in producer fields included late spring freezes at flowering; late-season insect infestations – primarily cabbage aphid, diamondback moth larvae, and lygus bugs; and shattering from severe thunderstorms.

Careful variety selection is very important for producing winter canola. Watch future Agronomy eUpdates for a review of winter canola varieties and suggestions to help with variety selection. Despite any of canola's recent struggles, many producers are encouraged by canola's resiliency and the benefits it provides to their cropping systems.

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3. Liming prior to fall seedings of alfalfa

Correcting acid soil conditions through the application of lime can have a significant impact on crop yields, especially for alfalfa. Since seeding alfalfa is expensive and a stand is expected to last for several years, getting lime applied and acidity corrected before seeding is critical. Liming is one of the most essential, but often overlooked, management decisions a producer can make.

Unfortunately lime is not always available close to where it may be needed. In many cases trucking and spreading costs may be more than the cost of the lime itself. Lime quality can also vary widely and no one wants to apply more than is necessary. So to make the best decisions on how much and what kind of lime to apply, it is useful to know how lime recommendations are made.

How lime recommendations are made by K-State

A routine soil test will reveal the pH level of the soil, and this will determine whether lime is needed on the field. Generally, east of the Flint Hills, lime is recommended for alfalfa if the pH drops below 6.4, with a target pH for liming of 6.8. In the Flint Hills and west, lime is recommended for alfalfa and all other crops when the pH drops below 5.8, with a target pH of 6.0. Target pH is simply the pH goal once the lime reacts with the soil.

Why are the target pH's different for the two areas of Kansas? They differ because of the pH of the subsoil. East of the Flint Hills, especially south of the Kansas River, the subsoil tends to be acidic, and a higher target pH is used to assure adequate pH conditions in the root zone, and provide sufficient amounts of calcium and magnesium. From the Flint Hills west, most soils have high-pH, basic subsoils that can provide additional calcium and magnesium to meet crop needs.

Determining the soil pH is the first step in determining if lime is needed. But it doesn't tell you the amount of lime you need to apply. Soils with more clay and organic matter will have more acidity at a given pH, and will require more lime/ECC (effective calcium carbonate) to reach a target soil pH, than will a sandy soil. This is why two soils may have the same soil pH but have quite different buffer pH's, and different lime requirements.

To make that rate determination quickly in the lab, we use a buffer solution and measure the soil's buffer pH. A buffer is simply a strong salt solution designed to resist change in pH. The buffer is added at a high pH, 7.5, and calibrated so that when it reacts with an acid soil, the pH drops. The lower the buffer pH goes, the more lime will be needed to bring the pH up to the required target pH.

Calculating lime rates

Lime rates are given in pounds of effective calcium carbonate, ECC, per acre. But how does that relate to agricultural lime and how much lime to apply? Lime materials can vary widely in their neutralizing power. All lime materials sold in Kansas must guarantee their ECC content and dealers are subject to inspection by the Kansas Department of Agriculture.

The two factors that influence the neutralizing value of aglime are the chemical neutralizing value of the lime material relative to pure calcium carbonate, and the fineness of crushing, or particle size, of the product. The finer the lime is ground, the greater the surface area of the product, the faster it will react, and the faster the neutralizing of the acidity will occur. These two factors are used in the determination of ECC. Expressing recommendations as pounds of ECC allows fine-tuning of rates for variation in lime sources, and avoids under- or over-applying lime products.

Lime sources

Research has clearly shown that a pound of ECC from agricultural lime, pelletized lime, water treatment plant sludge, fluid lime, or other sources is equal in neutralizing soil acidity. Therefore under most circumstances, the cost per pound of ECC applied to your field should be a primary factor in source selection. Other factors such as rate of reaction (fineness), uniformity of spreading, and availability should be considered, but the final pH change, and subsequent alfalfa growth, will depend on the amount of ECC applied.

Application methods

All lime sources have a very limited solubility. When planting alfalfa, best performance is obtained when lime is incorporated and given time to react with and neutralize the acidity in the soil. When surface-applied and not incorporated, as in no-till systems, the reaction of lime is generally limited to only neutralizing the acidity and raising the pH in the top 2 to 3 inches of soil. Surface applications are adequate in slightly acidic soils, but may not provide as good a soil environment for nodulation and nitrogen fixation in the extremely acid soils, those with pH below 5.0, currently found in some areas of Kansas.

In no-till or limited-till systems, where no incorporation of lime is planned, lower rates of lime application are normally recommended to avoid over-liming and raising the pH higher than needed in the surface 2-3 inches of soil. Over-liming can also reduce the availability of micronutrients such as zinc, iron, and manganese, and trigger deficiencies in some soils. Current K-State lime recommendations suggest that "traditional" rates designed for incorporation and mixing with the top 6 inches of soil should be reduced by 50 percent when surface-applied in no-till systems, or when applied to existing grass or alfalfa stands.

Calcium and magnesium contents

What about the calcium and magnesium contents? Most agricultural limes found in Kansas contain both calcium and magnesium, with calcium exceeding magnesium. The exact ratio of these two essential plant nutrients will vary widely. While the advantages and disadvantages of using a dolomitic (magnesium-containing) lime versus a calcitic (low-magnesium, high-calcium) lime have been cussed and discussed for years, the differences are very, very slight in most cases. The exception is on soils deficient in magnesium, in which case a dolomitic lime source is needed. In Kansas, both dolomitic lime and calcitic lime are suitable for use on cropland.

For more information, see K-State publication *Soil Test Interpretations and Fertilizer Recommendations*, MF-2586: http://www.bookstore.ksre.ksu.edu/pubs/MF2586.pdf

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4. Plant analysis for testing nutrient levels in soybeans

With delayed soybean planting in many areas of the state again this year, many fields look a little rough and variable. One of the questions commonly asked is whether this is due to a nutrient problem. An excellent tool that can be used to answer this question is plant analysis or tissue testing.

As with corn, wheat, and other crops, there are two primary ways plant analysis can be used: as a routine monitoring tool to ensure nutrient levels are adequate in the plant in normal or good looking crops, and as a diagnostic tool to help explain some of the variability and problems we see in soybean growth and appearance in fields.

Plant analysis as a routine monitoring tool

For monitoring nutrient levels purposes, collect 20-30 sets of the upper, fully developed trifoliate leaves, less the petiole, at random from the field anytime between flowering and initial pod set (growth stages R1-4). The top fully developed leaves are generally the dark green leaves visible at the top of the canopy, which are attached at the second or third node down from the top of the stem.

Sampling later, once seed development begins, will give lower nutrient contents since the soybean plant begins to translocate nutrients from the leaves to the developing seed very quickly. Sampling leaf tissue under severe stress conditions for monitoring purposes can also give misleading results and is not recommended.

The sampled leaves should be allowed to wilt overnight to remove excess moisture, placed in a paper bag or mailing envelope, and shipped to a lab for analysis. Producers should not place the leaves in a plastic bag or other tightly sealed container, as they will begin to rot and decompose during transport, and the sample won't be usable.

For what nutrients should you request analysis? In Kansas nitrogen (N), phosphorus (P), potassium (K), sulfur (S), zinc (Zn) and iron (Fe) are the nutrients most likely to be deficient in soybeans. Normally the best values are the “bundles” or “packages” of tests offered through many of the labs. The packages can be as simple as N, P and K, or can consist of all of the 14 mineral elements considered essential to plants. K-State offers a package that includes N, P, K, Ca, Mg, S, Fe, Cu, Zn, and Mn for $23.75.

The data returned from the lab will be reported as the concentration of nutrient elements, or potentially toxic elements in the plants. Units reported will normally be in terms of “percent” for the primary and secondary nutrients (N, P, K, Ca, Mg, and S) and “ppm,” or parts per million, for the micronutrients (Zn, Cu, Fe, Mn, B, Mo, and Al). Most labs/agronomists compare plant nutrient concentrations to published sufficiency ranges. A sufficiency range is simply the range of concentrations normally found in healthy, productive plants during surveys. A diagram explaining this concept is shown in Figure 1.

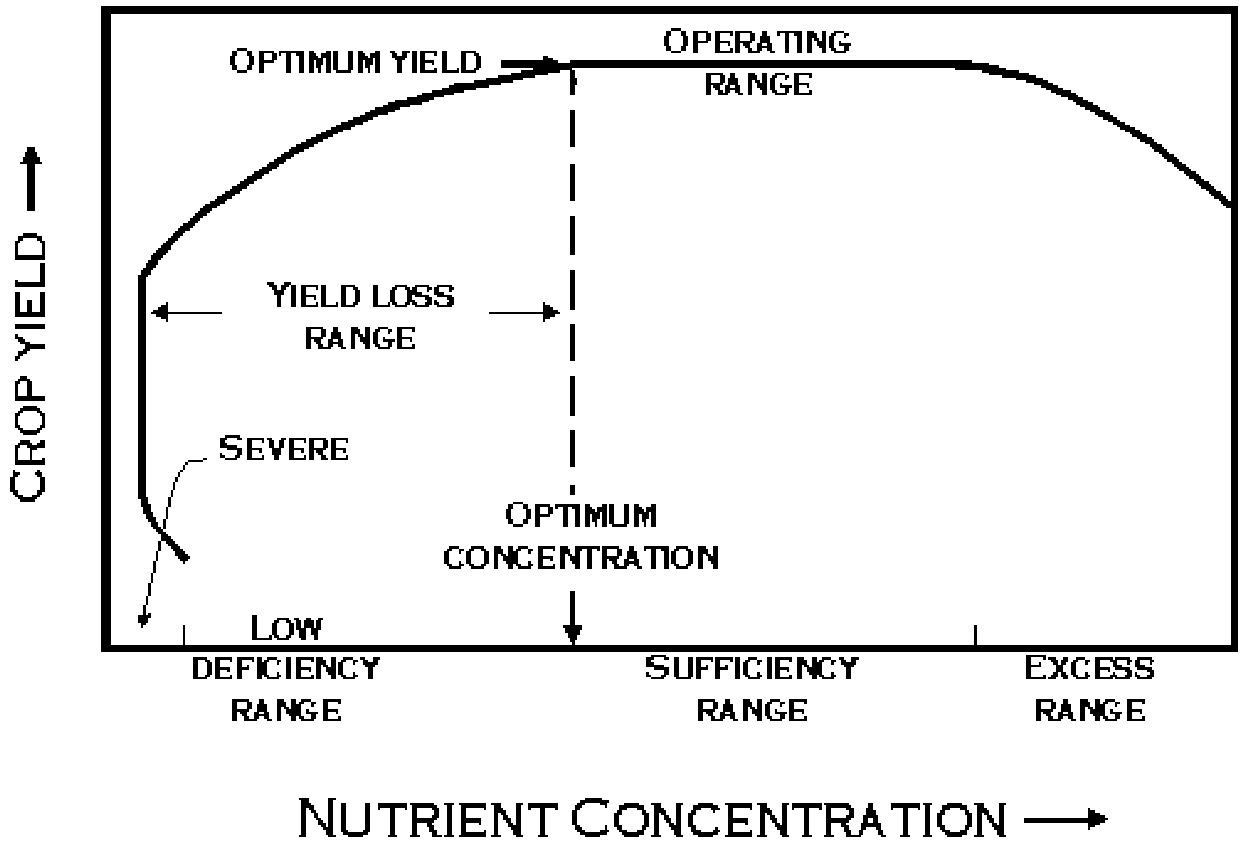

Figure 1. Example of plant analysis interpretation using the concept of a sufficiency range.

The following table gives the range of nutrient content considered to be "normal" or "sufficient" for top fully developed soybean leaves at early pod set. Keep in mind that these are the ranges normally found in healthy, productive soybeans.

Nutrient Content Considered "Normal" or "Sufficient" for Soybeans		
		Growth Stage
Nutrient	**Units**	**Top, fully developed leaves at pod set**
Nitrogen	%	4.25-5.50
Phosphorus	%	0.25-0.5
Potassium	%	1.70-2.50
Calcium	%	0.35-2.00
Magnesium	%	0.26-1.00
Sulfur	%	0.15-0.50
Copper	ppm	10-30
Iron	ppm	50-350
Manganese	ppm	20-100
Zinc	ppm	20-50
Boron	ppm	20-55
Molybdenum	ppm	1.0-5.0
Aluminum	ppm	<200

Plant analysis as a diagnostic tool

Plant analysis is an excellent diagnostic tool to help understand some of the variation seen in the field. When using plant analysis to diagnose field problems, producers should try to take comparison samples from both good/normal areas of the field, and problem areas. Collect soil samples from the same good and bad areas, and don't wait for flowering to sample soybeans. Early in the season, when plants are 8-10 inches tall collect whole plants from 15 to 20 different places in the sampling areas. Later in the season, collect 20-30 sets of top, fully developed leaves. Handle the samples the same as those for monitoring, allowing them to wilt to remove excess moisture and avoiding mailing in plastic bags.

Soil samples are important in diagnostic work, because while a plant may be deficient in a nutrient, it may not be due to a shortage in the soil. Other factors such as soil compaction, insect or disease damage to the roots, low pH limiting nodulation or many other issues can limit nutrient uptake in soybeans.

Summary

In summary, plant analysis is a good tool producers can use to monitor the sufficiency of soil fertility levels and inoculant effectiveness, and a very effective diagnostic tool. Producers should consider adding this to their toolbox.

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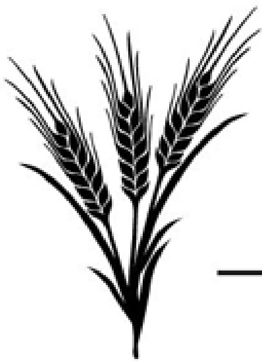
Many farmers are now evaluating the performance of their current varieties and considering new varieties they should grow in the future. Clearly, the yield potential of wheat variety is a top priority, but other traits are also important to consider when selecting a variety.

Wheat Variety Disease and Insect Ratings 2016, from K-State Research and Extension, has been revised and expanded from past editions. Agronomic characteristics and expanded disease resistance information is included, as well as a brief description of some of the more commonly grown and upcoming wheat varieties in the state.

Genetic resistance to diseases and insect pests is usually the most effective, economical, and environmentally sound control method. Resistance ratings represent results of multiple field and greenhouse evaluations by public and private wheat researchers. These ratings can help producers select wheat varieties and minimize potential for serious yield losses.



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MF991 • Wheat Ratings

Wheat Variety Disease and Insect Ratings 2016

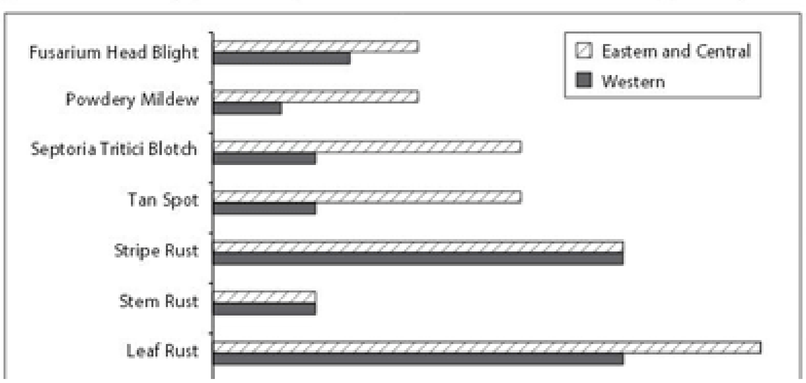
Erick D. De Wolf, *Plant Pathologist*
Romulo Lollato, *Agronomist*
R. Jeff Whitworth, *Entomologist*

Variety selection is one of the most important decisions a wheat grower makes. This choice profoundly influences the potential wheat crop's productivity. Agronomic characteristics, such as height, acid soil tolerance, and maturity, determine how well a variety is adapted for a region or desired cropping system. Selecting a good variety also influences how well the crop tolerates drought or resists diseases and insects.

The agronomic characteristics and resistance ratings in this publication summarize results of multiple field and greenhouse tests by public and private wheat researchers.

The ratings are intended to help producers select wheat varieties according to their specific needs. The paragraphs below contain suggestions for using this information to minimize the potential for production problems and resulting yield losses. Growers should consult the latest K-State wheat performance test report for additional information about varieties that have yielded well in their area.

Although great efforts were made to confirm the accuracy of these ratings, no guarantee can be made that the information is without error. A variety's agronomic characteristics are generally stable but can be influenced by unanticipated interactions with production practices or environment. Disease and pest reactions are influenced by regional populations of the pathogens or insects and may vary between years.



How to Use the Variety Ratings

Evaluate how well a variety is adapted for your area. The agronomic characteristics of a wheat variety influence its ability

Electronic versions of the *Wheat Variety Disease and Insect Ratings 2016* publication MF991 can be found (and ordered) at: http://www.bookstore.ksre.ksu.edu/Item.aspx?catId=299&pubId=1564

Printed copies of the publication should be available in many county Extension offices in the coming weeks.

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6. Saline County dryland corn plot /on-farm research tour, July 28

K-State Research and Extension and the Central Kansas Extension District will host tours of two dryland corn seeding rate plots and one stop featuring site-specific precision ag technology using satellite imagery in Saline County on Thursday, July 28.

Focus of the tour will be a discussion of the on-farm research plots at each farm -- evaluating twin row vs. 30" row corn, the use of satellite imagery in site-specific precision farming, and dryland corn seeding rates.

The first stop will begin at 8:30 a.m. at the Dwight Conley farm located 1 mile south of Gypsum on Gypsum Valley Rd. and then 1/4 mile east on Assaria Rd. An on-farm research plot sponsored by Great Plains Manufacturing, comparing twin row corn vs. 30" row corn at three seeding rates will be discussed.

The second stop will begin at 9:30 a.m. at Shadelawn farm, operated by Justin Knopf, located 1 mile north of Gypsum, just north of the Gypsum Valley Rd. and McReynolds Rd. intersection. An on-farm research plot featuring the use of site-specific precision agriculture tools and satellite imagery will be discussed, as will the use of a triticale cover crop following corn last year, and where no-till soybeans were planted in 2016.

The last stop will begin at 11:00 a.m. at the Mark Pettijohn farm located southwest of Solomon. From Solomon, go 1 ½ mile west on Old Hwy 40 then 3/4 mile south on Donmyer Rd. to Campbell Rd., then east 1 mile to the T intersection, and then south 1 mile to the plot. If coming from the south, from the Donmyer Rd./Country Club Rd. intersection go 4 miles north to Campbell Rd. then east 1 mile to the T intersection and then south 1 mile to the plot. An on-farm research plot, featuring dryland corn seeding rates of 14, 18, 22, 26 and 30,000 seeds per acre, will be discussed.

Speakers include K-State Extension specialists Ignacio Ciampitti, Stu Duncan, and Jeff Whitworth; Tom Maxwell, Central Kansas District extension crop production agent; and the cooperating farmers.

For more information about the tours, contact Tom Maxwell at the CKD3 - Salina office at 785-309-5850. All interested persons are invited to attend any or all of these tour stops. No RSVP is needed.

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Ignacio Ciampitti, Crop Production and Cropping Systems Specialist
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7. Kansas River Valley Experiment Field fall field day, August 9

The Kansas River Valley Experiment Field near Rossville will host its fall field day on Tuesday, August 9. The field day begins at 6 p.m. sharp.

Field day topics and K-State presenters include:

- Seed treatments update and current disease issues – Doug Jardine, Extension Plant Pathologist
- Update on planter research at K-State – Ajay Sharda, Extension Biological and Agricultural Engineering
- When does it pay to apply foliar fungicides in the Kaw River Valley? – Stu Duncan, Northeast Area Crops and Soils Specialist
- Tip dieback on corn: Cause and cure – Eric Adee, Agronomist-in-Charge, Kansas River Valley and East Central Experiment Fields

The field is located 1 mile east of Rossville on U.S. Hwy 24, on the south side of the road.

A BBQ meal will be provided after the field day, sponsored by Wilbur-Ellis. To pre-register, call Joanne Domme at the Shawnee County Extension office at 785-232-0062, ext. 100 by 5 p.m. on Monday, August 8. Commercial pesticide applicator continuing education credits have been applied for.

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8. Comparative Vegetation Condition Report: July 5 - 11

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 27-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. 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:

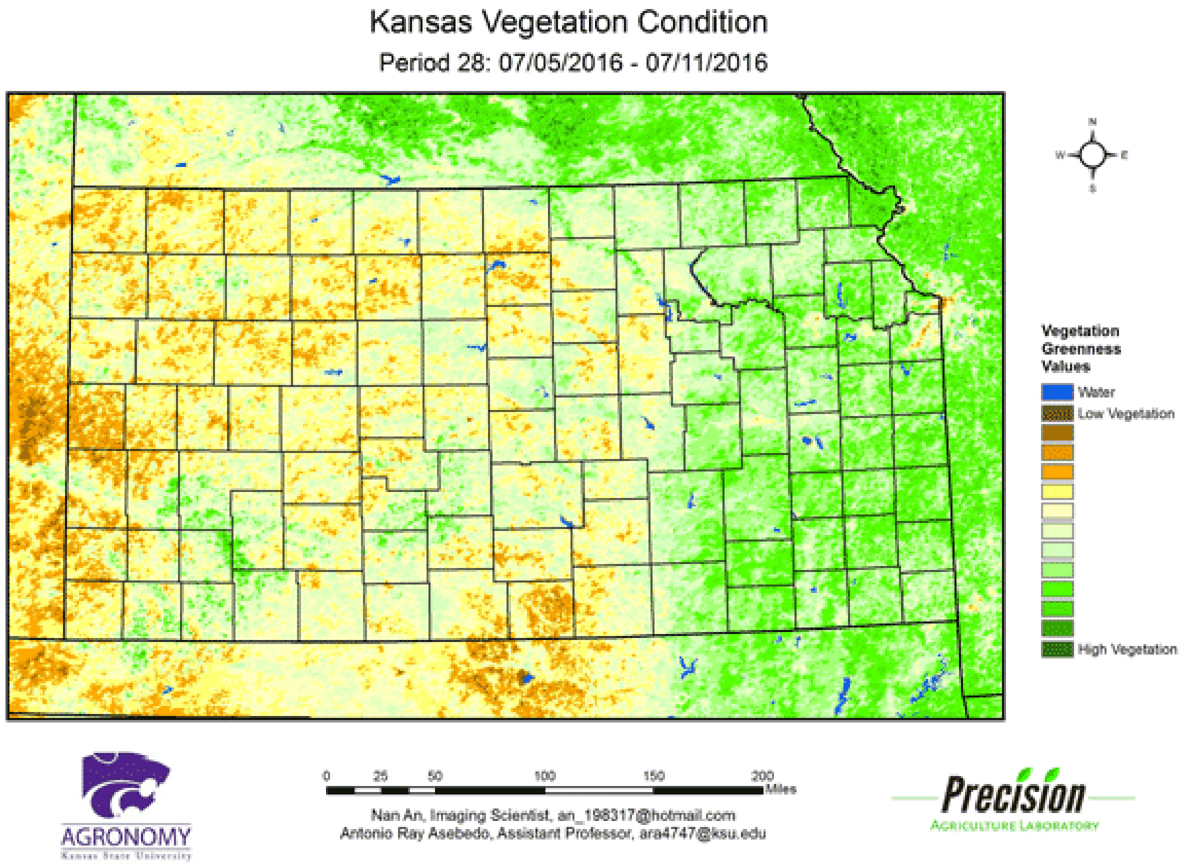

Figure 1. The Vegetation Condition Report for Kansas for July 5 – July11, 2016 from K-State's Precision Agriculture Laboratory continues to show high NDVI values across the eastern third of the state, as well as pockets of central and southwest Kansas. The rains that started in early July, coupled with more seasonal temperatures, have favored vegetative development.

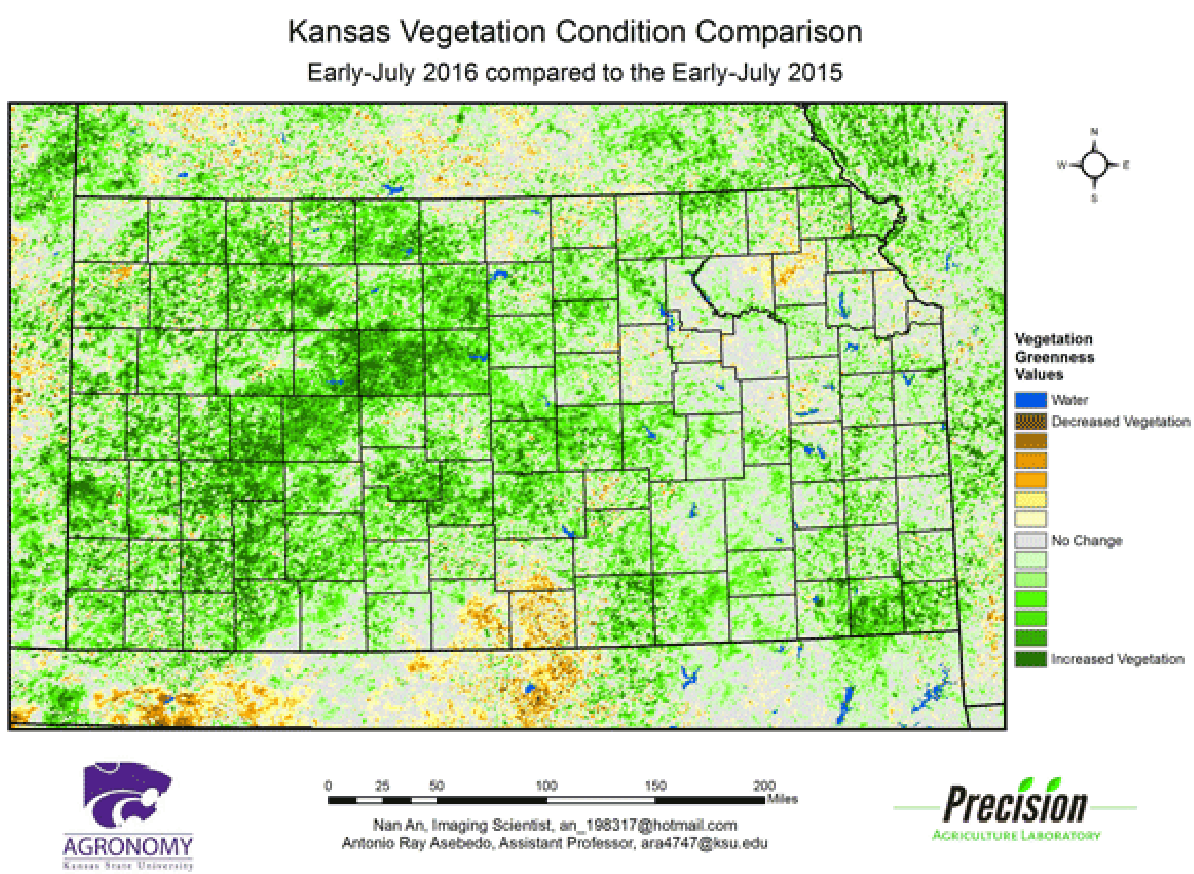

Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for July 5 – July 11, 2016 from K-State's Precision Agriculture Laboratory shows much higher photosynthetic activity across most of the state. The greatest increase in photosynthetic activity is in western Kansas. Rainfall has continued to be well distributed in the region and crop progress continues ahead of last year at this time.

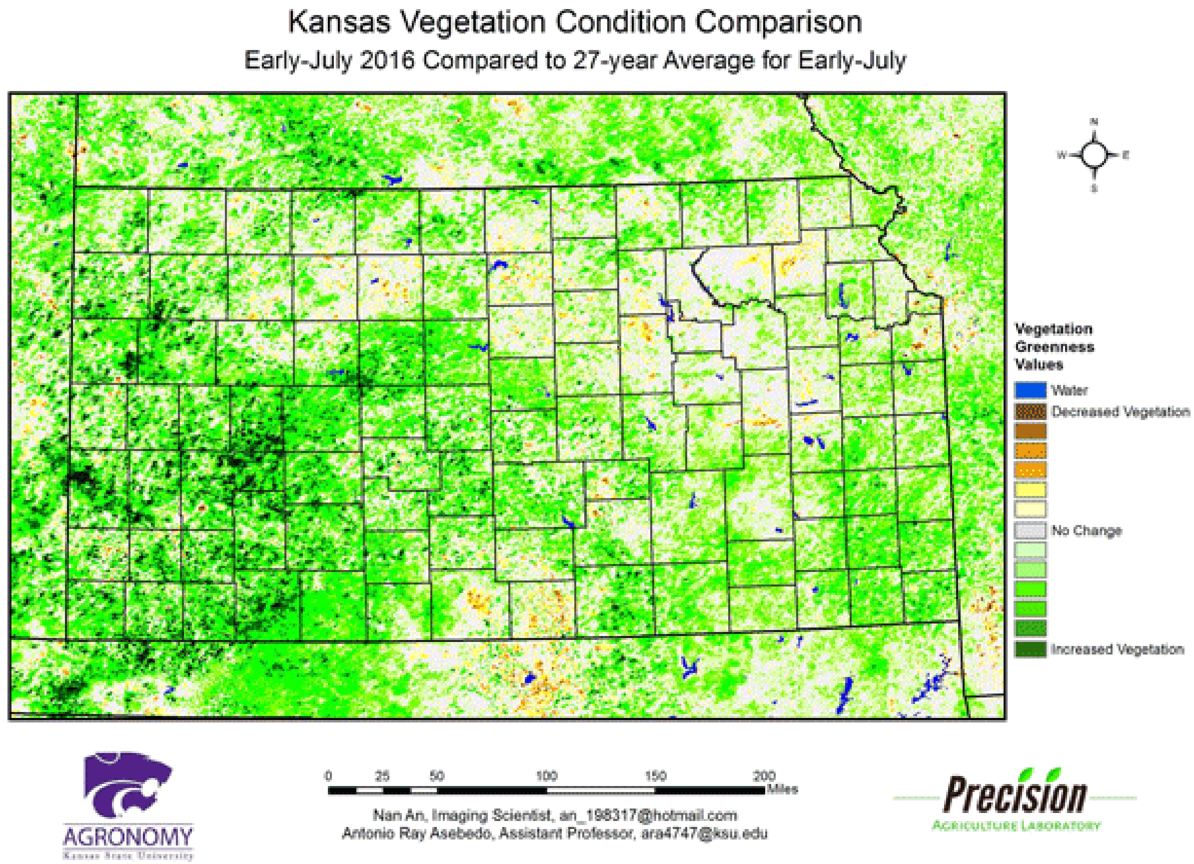

Figure 3. Compared to the 27-year average at this time for Kansas, this year's Vegetation Condition Report for July 5 – July 11, 2016 from K-State's Precision Agriculture Laboratory shows below-average vegetative activity is greatest in the western third of the state. In other regions of the state, last week's rainfall has resulted in increased photosynthetic activity.

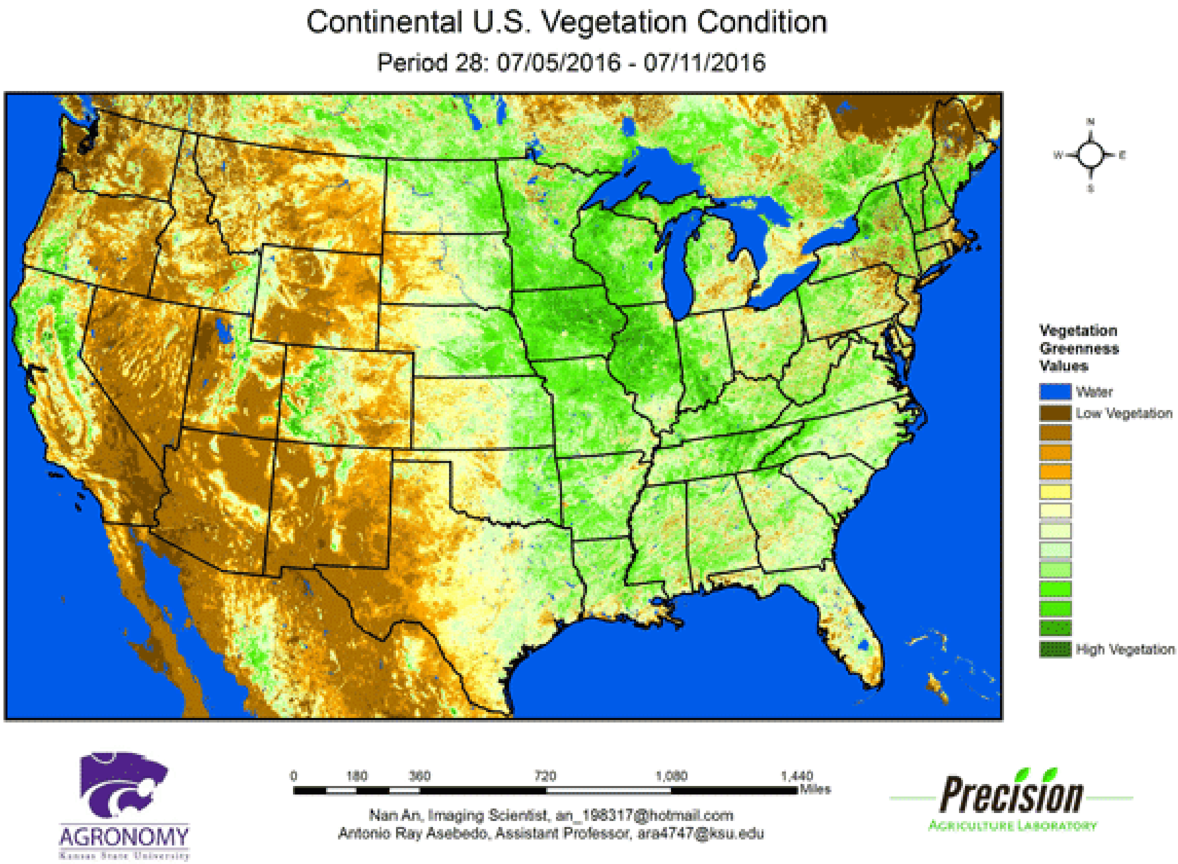

Figure 4. The Vegetation Condition Report for the U.S for July 5 – July114, 2016 from K-State's Precision Agriculture Laboratory shows high NDVI values in the western Corn Belt. Favorable rainfall and more seasonal temperatures favored photosynthetic activity across the region.

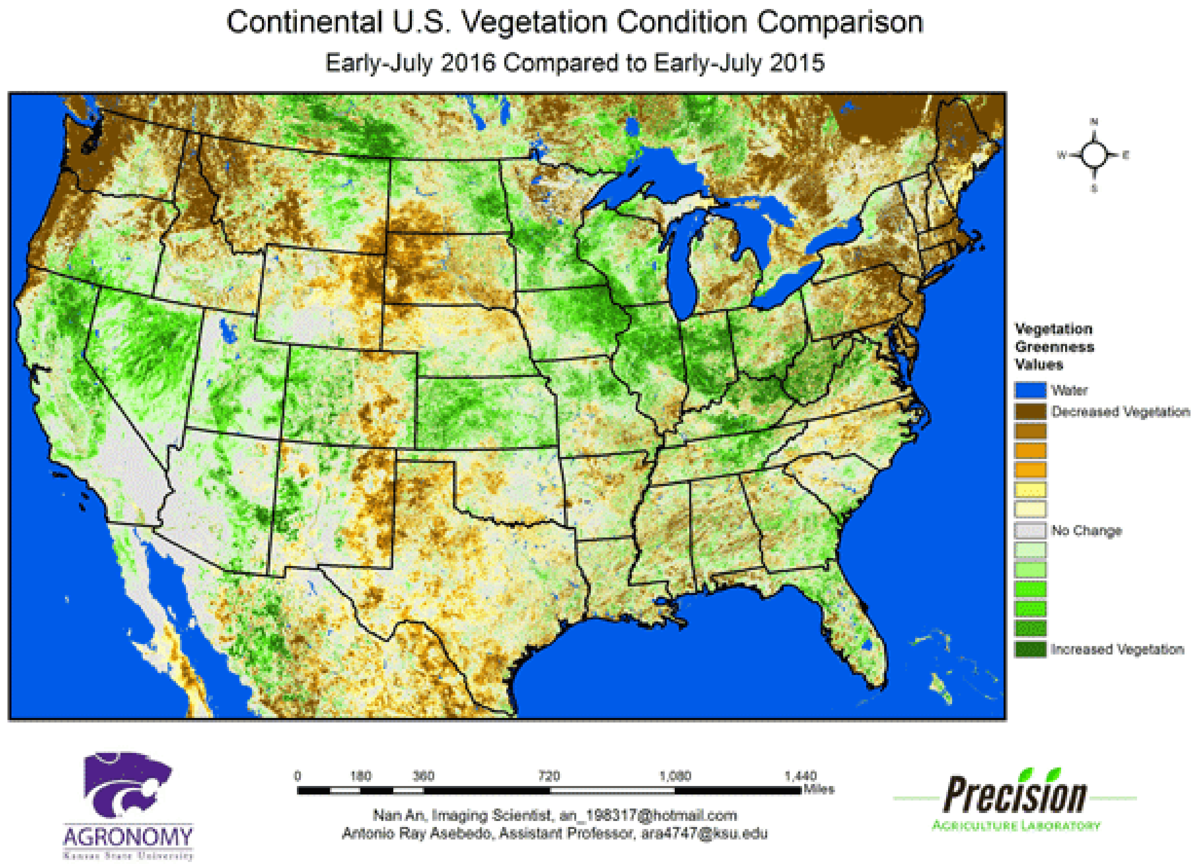

Figure 5. The U.S. comparison to last year at this time for July 5 – July 11, 2016 from K-State's Precision Agriculture Laboratory shows that lower NDVI values are most evident in the Mountain West where continued drier-than-average conditions, coupled with extremely hot weather, have stressed vegetation compared to last year. In the East, heavy rains have limited NDVI values.

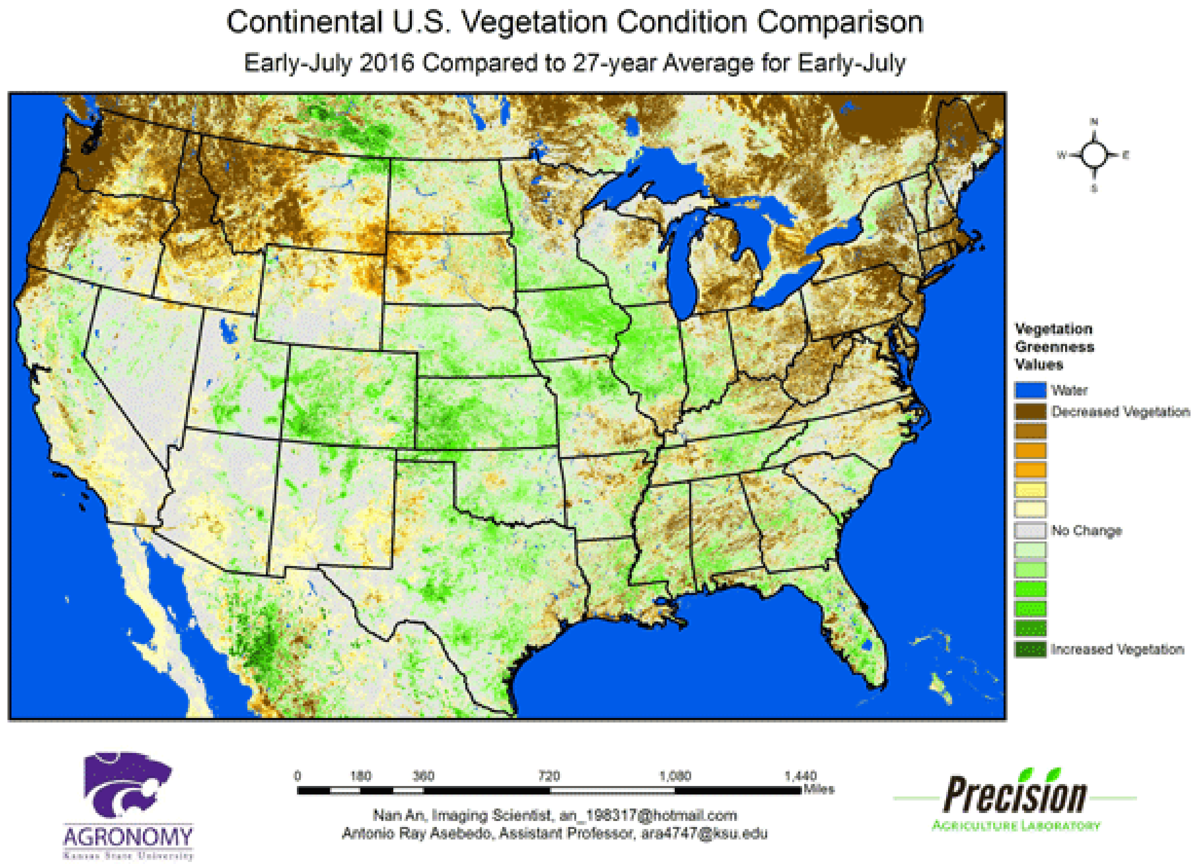

Figure 6. The U.S. comparison to the 27-year average for the period July 5 – July 11, 2016 from K-State's Precision Agriculture Laboratory shows areas of below-average photosynthetic activity across most of the northern continental U.S. Rapidly drying conditions in the Pacific Northwest are the major cause of the lower-than-average NDVI values in that area, while persistent rainfall across the Mid-Atlantic states and New England reduced photosynthetic activity in the East.

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