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Research and Extension

Extension Agronomy

eUpdate

11/18/2016

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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1. Cold hardening in winter wheat

In general, temperatures have been unusually mild in Kansas so far this fall. Some record high temperatures have even been recorded during Nov. 14-16. As of Nov. 18, however, temperatures are getting much colder and more seasonal. Given how warm it has been until now -- and how actively the wheat has been growing in many areas -- the question is: Will be wheat in Kansas be ready for a switch to very cold temperatures?



Figure 1. Wheat burned back by cold temperatures. Photo by Jeanne Falk Jones, K-State Research and Extension.

In short, the answer is “probably so.” Where wheat has been growing actively as recently as Nov. 17, that doesn’t mean the wheat will not have developed enough winterhardiness to withstand cold temperatures. The topgrowth will normally get “burned back” by a hard freeze (Figure 1), but the plants themselves should be adequately hardened to survive the kind of low temperatures predicted for the Nov. 18-20 period.

It helps to know how winter wheat typically survives the winter. During the fall, winter wheat seedlings spend the first month or so of their lives developing their first leaves, the crown, and a secondary root system (Figure 2). All the while, the seedlings are building and storing the energy they will need to go through the cold acclimation process and survive the winter. Normally seedlings will need at least 2-3 true leaves and a tiller or two to have built up enough stored energy reserves to survive the winter. The seedlings will have a better chance of winter survival if their crowns are well developed in firm soil, about a half-inch below the soil surface.



Figure 2. Differences in wheat development prior to winter dormancy. Both examples above should be able to make it through the winter, although the more developed root system is preferred as long as vegetative development is not extremely lush. Photos by Romulo Lollato, K-State Research and Extension.

Winter hardiness or cold tolerance is a physiological process triggered by gradually cooling temperatures in the fall. During the process of cold acclimation, certain genes within winter wheat begin to initiate the production of “anti-freeze” type substances to protect the cell membranes.

The process of cold acclimation within a sufficiently developed wheat seedling begins when soil temperatures at crown depth fall below about 50 degrees F. Below this threshold, there is an inverse relationship of cold acclimation as affected by crown temperatures; in other words, wheat plants will acclimate twice as fast when crown temperatures are 32°F as compared to 40°F. Photoperiod also plays a role in the process of cold hardening, with shorter days and longer nights helping initiate the process. Winter survival depends on the crown remaining alive, and the substances that produce cold acclimation are most needed within the crown.

It takes about 4 to 6 weeks of soil temperatures below 50 degrees at the depth of the crown for winter wheat to fully cold harden. The colder the soil at the depth of the crown, the more quickly the plants will develop winter hardiness. As indicated by the mean soil temperature map in Figure 3, soil temperatures at the 2-inch depth were generally above 50 degrees in most of Kansas as of the week of Nov. 11-17. Temperatures at the crown will be influenced by the amount of residue as well as the amount of soil moisture. Wet soils with heavy residue will cool more slowly than dry bare soils

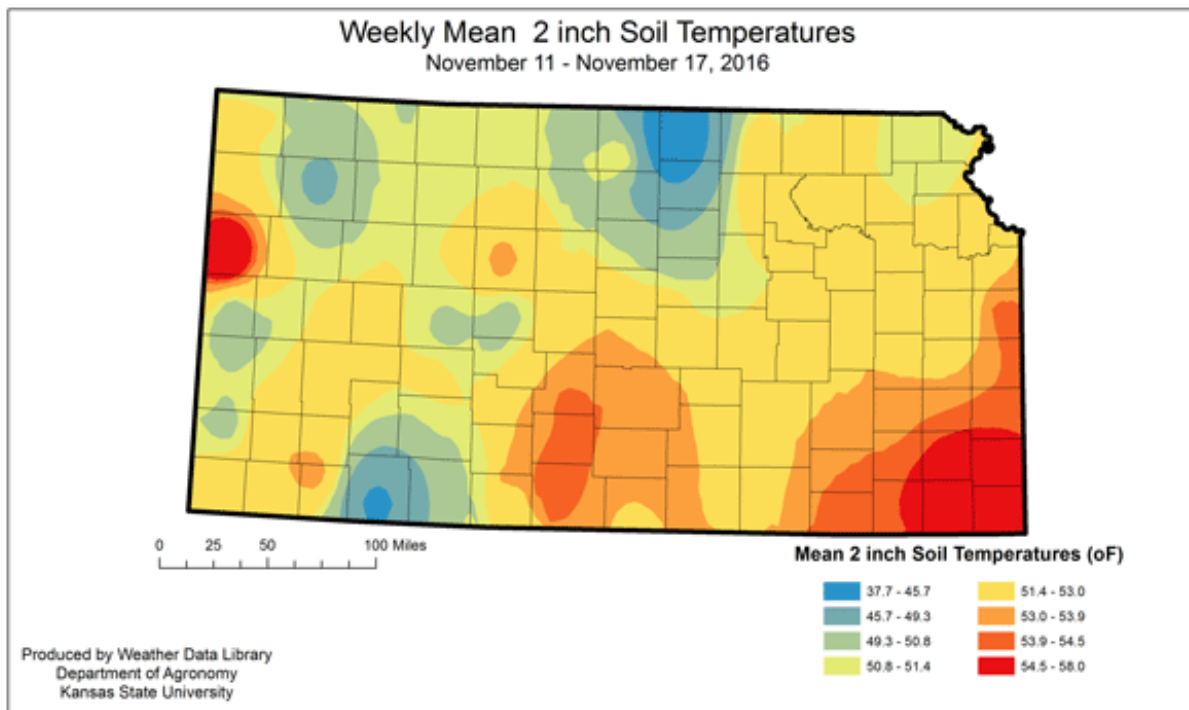


Figure 3. Average weekly 2-inch soil temperatures at K-State Mesonet stations.

Cold hardiness is not a static state, however. After the cold hardening process begins in the fall, wheat plants can rapidly un-harden when soil temperatures at the depth of the crown get above 50 degrees. But the plants will re-harden as crown temperatures cool below 50 degrees again. By the time winter begins, winter wheat will normally have reached its maximum level of cold hardiness. Wheat in Kansas normally has its maximum level of winter hardiness from mid-December to mid-January, unless there are high temperatures during that period.

Even during the depths of winter, winter wheat is still respiring and roots may be growing – as long as the ground is not frozen. It is not unusual to find a much more developed crown root system in early February than existed in early December.

It is not unusual to see some green leaves intermingled with straw-colored or pale leaves in the winter. The fact that some of the leaves have some green color does not mean the wheat is not cold tolerant.

Once winter wheat has reached the level of full cold hardiness, it will remain cold hardy as long as crown temperatures remain below about 32 degrees– assuming the plants had a good supply of energy going into the winter.

If soil temperatures at the crown depth rise to 50 degrees or more for a prolonged period, there will be a gradual loss of cold hardiness, even in the middle of winter. The warmer the crown temperature during the winter, the more quickly the plants will start losing their maximum level of cold hardiness. Winter wheat can re-harden during the winter if it loses its full level of winter hardiness, but will not regain its maximum level of winter hardiness.

Even at its maximum level of winter hardiness, winter wheat can still be injured or even killed by cold temperatures if temperatures at the crown level reach single digits or if plants are subjected to long periods when soil temperatures approach the minimum survival temperatures. Thus, not only the actual minimum temperature achieved can affect winter survival, but also the time period spent at those temperatures. There are varietal differences in winter hardiness. As soil temperatures at the crown level rise to 50 degrees or more, usually in late winter or spring, winter wheat will gradually lose its winter hardiness entirely. Photoperiod also plays a role in this process. When the leaves switch from being prostrate to upright, the plants will have completely de-hardened.

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2. Late-season update on the sugarcane aphid in Kansas

The sugarcane aphid (SCA) has been causing a range of harvesting problems in central Kansas. In some cases, sticky honeydew has been gumming up combines, sometimes bringing harvest to a halt, or slowing combine speeds. Fortunately, provided the grain has hardened, you can wait for a week or so and this honeydew will be weathered by the elements (and sooty mold) so that it is no longer sticky. The sooty mold that grows on it is not toxic, and so is not a concern for cattle that graze the stubble. However, palatability and nutritional value of the stubble may be somewhat reduced if aphid infestations have been heavy.

A more widespread problem is that aphid infestations in maturing panicles have caused uneven ripening of the grain, which in turn has caused uneven drying. Harvest has been delayed in some cases because grain moisture measurements in a field can be so variable that a decision to harvest is difficult to make.

Back in late September, a sudden cold snap in southwest Kansas (overnight low of 39 degrees F) caused significant aphid mortality (Figures 1 and 2). This suggested that large numbers of aphids might be killed by low temperatures that were still well above freezing.



Figure 1. Sugarcane aphid summer forms killed by 39 degree F cold shock in Garden City on Sept. 28, 2016. Dead aphids are black. Photo by Sarah Zukoff, K-State Research and Extension.



Figure 2. Close-up of summer forms of sugarcane aphids killed by cold shock. Photo by Sarah Zukoff, K-State Research and Extension.

As daylength shortens and temperatures get gradually cooler in the fall, the aphids transition to a “winter phenotype” with biology quite different from the pale yellow forms we see in summer. The aphids become much darker in color, slower to grow and reproduce, longer lived, and much more cold tolerant.

This was evident in a field in Rooks County where there were two successive freeze events on Nov. 12-13 (overnight lows were 23 and 26 degrees F, respectively) and yet had remarkably high numbers of aphids still alive as harvest began on Tuesday, Nov. 15, as reported by Cody Miller, Phillips Rooks Extension District agriculture agent. It is possible that aphids lower down within the crop canopy were buffered somewhat from the extreme lows. However, even though all the leaves were killed by the freeze, many aphids remained alive on the stems and in the leaf axils, with freeze-killed aphids appearing black and shriveled (Figure 3).

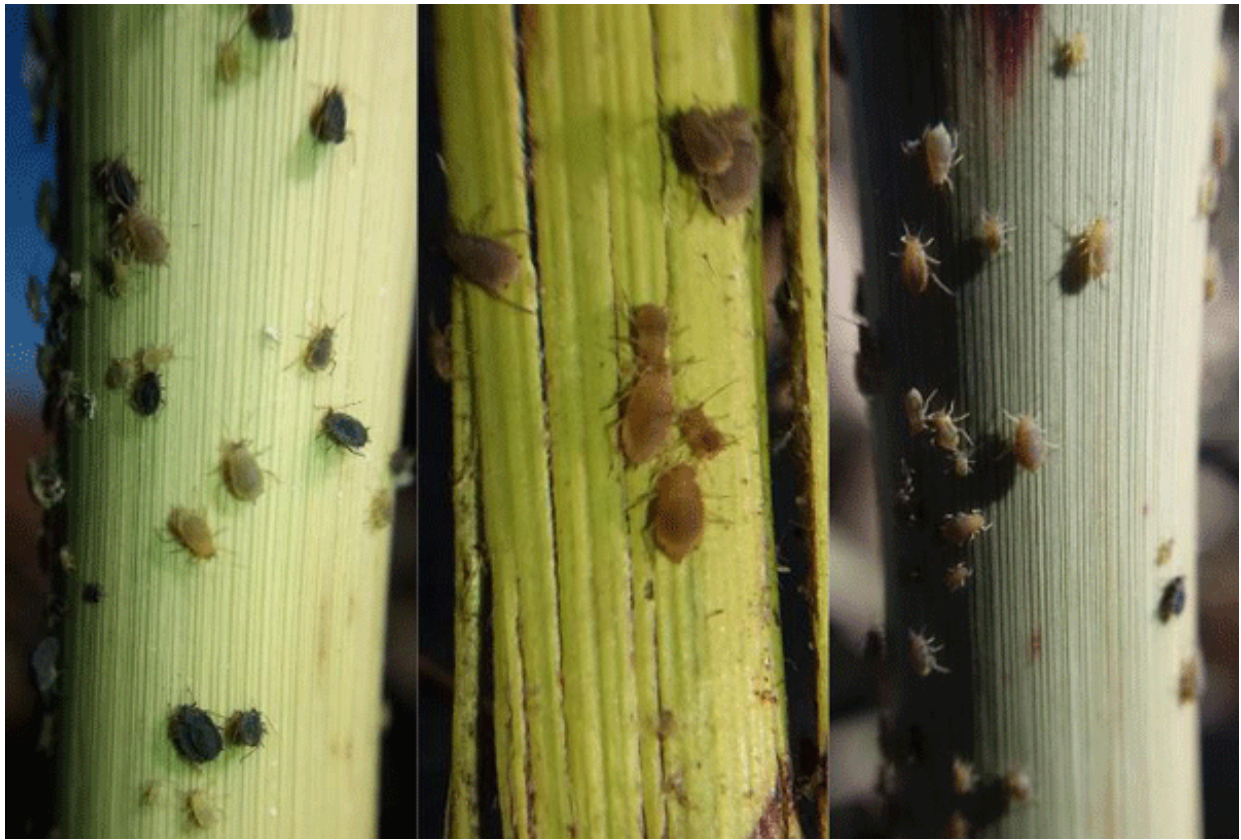


Figure 3. Winter phenotype of sugarcane aphid that survived two freeze events, Rooks County, Nov. 15 2016. The black-colored aphids are those that did not survive the cold. Photos by Ahmed Hassan, K-State Research and Extension.

The winter phenotype of SCA is clearly adapted to survive short, sub-tropical winters by remaining alive on any green plant tissues or vegetative regrowth, as they have been doing in south Texas. Of course, this will not happen in Kansas, so all the aphids will disappear once the plants are completely dead.

Great variation in hybrid susceptibility to SCA has been evident in a number of grain sorghum performance tests this year, with many seed companies identifying one or more lines with substantial resistance and/or tolerance to these aphids. Farmers should seek advice from seed company representatives on which of their hybrids have performed best under aphid pressure.

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3. Kansas Forage and Grasslands Council annual meeting, December 13, Wichita

The Kansas Forage and Grassland Council will hold its Winter Conference and Annual Meeting on Tuesday, December 13, 2016, at the Sedgwick County Extension Education Center, 7001 West 21st Street, Wichita.

Registration begins at 8:30 a.m. and the conference kicks off at 9:00 a.m. A Grower Panel will be part of this year's program along with breakout sessions led by Kansas State University and industry experts covering topics including: Forage/Pasture Insect Control, Late Season Burning and Sericea Lespedeza Control, Range Beef Cattle Nutrition and Management; Forage/Pasture Fertility Management, Mineral Supplementation in Grazing Cattle, Wheat Grazing Management.

"Forage Profit Strategies" will be the keynote address by Dr. Don Ball, Professor Emeritus Auburn University and author of the books *Southern Forages* and *Practical Forage Concepts*. The full agenda is available on the KSFGC website, <https://ksfgc.org/annual-meeting/>

Individual Conference Registration is \$65 in advance by Dec. 2 (\$85 at the door) and includes lunch and both KSFGC and AFGC membership for 2017. Additional registration information for businesses, vendors, and forage industry boosters can be found on the KSFGC website.

To register go to <https://ksfgc.org/annual-meeting/> and complete and send the registration form, along with the appropriate fee payable to KSFGC, 1228 Westloop Place, PMB #144, Manhattan, KS 66502-2840; Or simply register online. Direct any questions to Mark Nelson at info@ksfgc.org.

4. K-State Corn Management Schools scheduled for January 2017

A series of three K-State Corn Production Management Schools will be offered in early January of 2017 to provide in-depth training targeted for corn producers. The schools are primarily sponsored by Kansas Corn Commission and Pioneer.

The one-day schools will cover up-to-date and specific corn topics: on-farm research, high-yielding corn production practices, weed control, soil fertility, and price and market perspectives. The focus of the Corn Production Schools will be in northwest, central, and eastern Kansas. Schools will be followed by a tour.

Jan. 9 – Wichita – Drury Plaza Hotel Broadview Wichita, 400 West Douglas Ave.

Jan. 11 – Oakley – Buffalo Bill Cultural Center, 3083 US 83

Jan. 13 – Olathe – John Deere Ag Marketing Center, 10789 South Ridgeview Rd.

Jan. 9 – Wichita

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Jan. 11 – Oakley

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Jan 13 – Olathe (John Deere facility) – Registration is needed

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Lunch will be provided courtesy of the sponsors. There is no cost to attend, but participants are asked to pre-register before or by January 6.

Online registration is available at K-State Corn Schools: <http://bit.ly/KSCORNSchools>

You can also preregister by emailing or calling the nearest local Research and Extension office for the location you plan to attend.

For more information, contact:

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5. Comparative Vegetation Condition Report: November 8 - 14

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:

Kansas Vegetation Condition

Period 46: 11/08/2016 - 11/14/2016

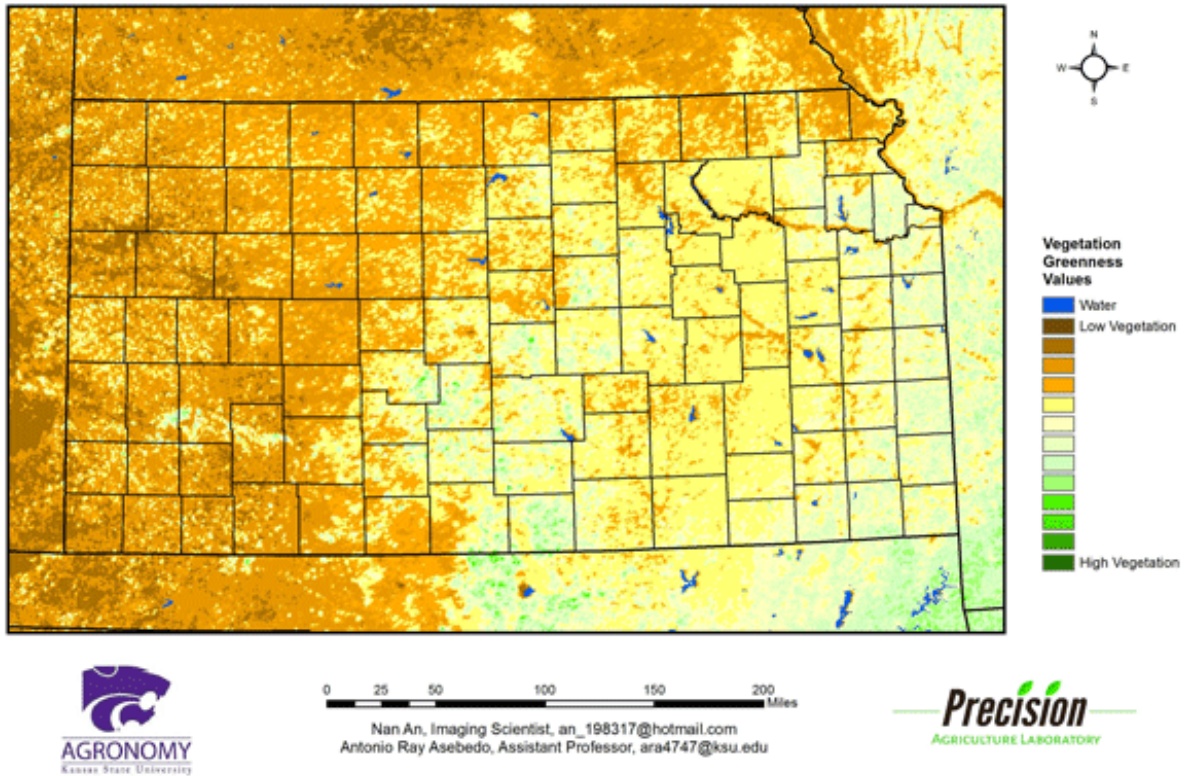
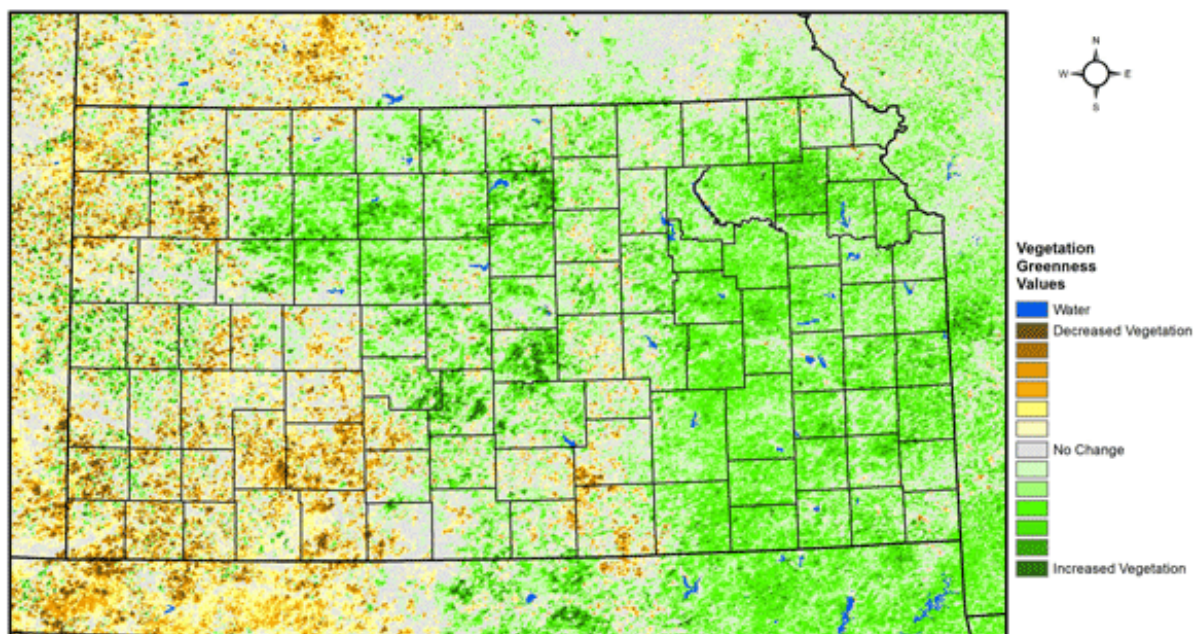


Figure 1. The Vegetation Condition Report for Kansas for November 8 – November 14, 2016 from K-State’s Precision Agriculture Laboratory shows only light photosynthetic activity, particularly along the Arkansas River Basin into south central Kansas. There is also light activity in southeast Kansas, where the first frost has yet to occur.

Kansas Vegetation Condition Comparison Early-November 2016 compared to the Early-November 2015



0 25 50 100 150 200 Miles

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Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for November 8 – November 14, 2016 from K-State’s Precision Agriculture Laboratory shows higher vegetative activity from north central Kansas to the eastern third of the state. Favorable early autumn rainfall, coupled with warmer-than-normal temperatures continue to be the major contributor to this higher vegetative activity. Expanding drought conditions and the slow establishment of winter wheat in the Southwest into the South Central Divisions is visible as reduced NDVI values there.

Kansas Vegetation Condition Comparison

Early-November 2016 compared to the 27-Year Average for Early-November

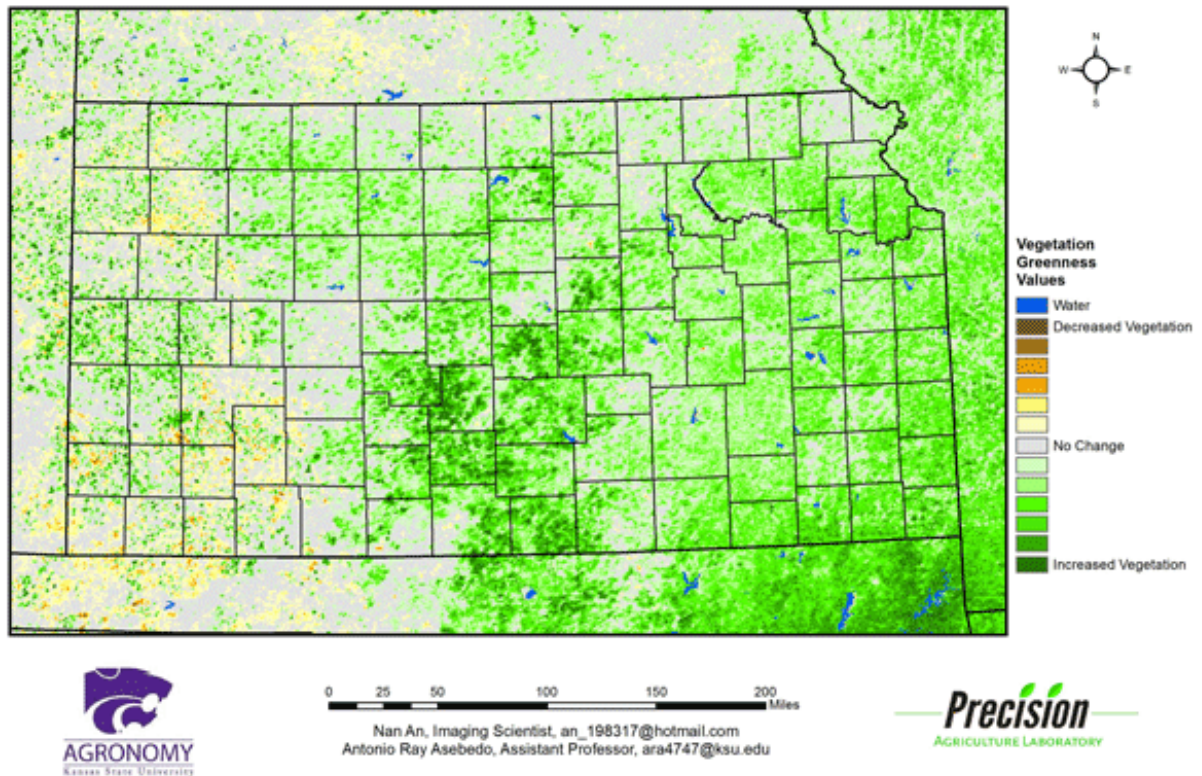


Figure 3. Compared to the 27-year average at this time for Kansas, this year's Vegetation Condition Report for November 8 – November 14, 2016 from K-State's Precision Agriculture Laboratory shows much of the state has above-average vegetative activity. Parts of central and eastern Kansas have had the latest first frost on record this year, allowing for an extended growing period.

Continental U.S. Vegetation Condition

Period 46: 11/08/2016 - 11/14/2016

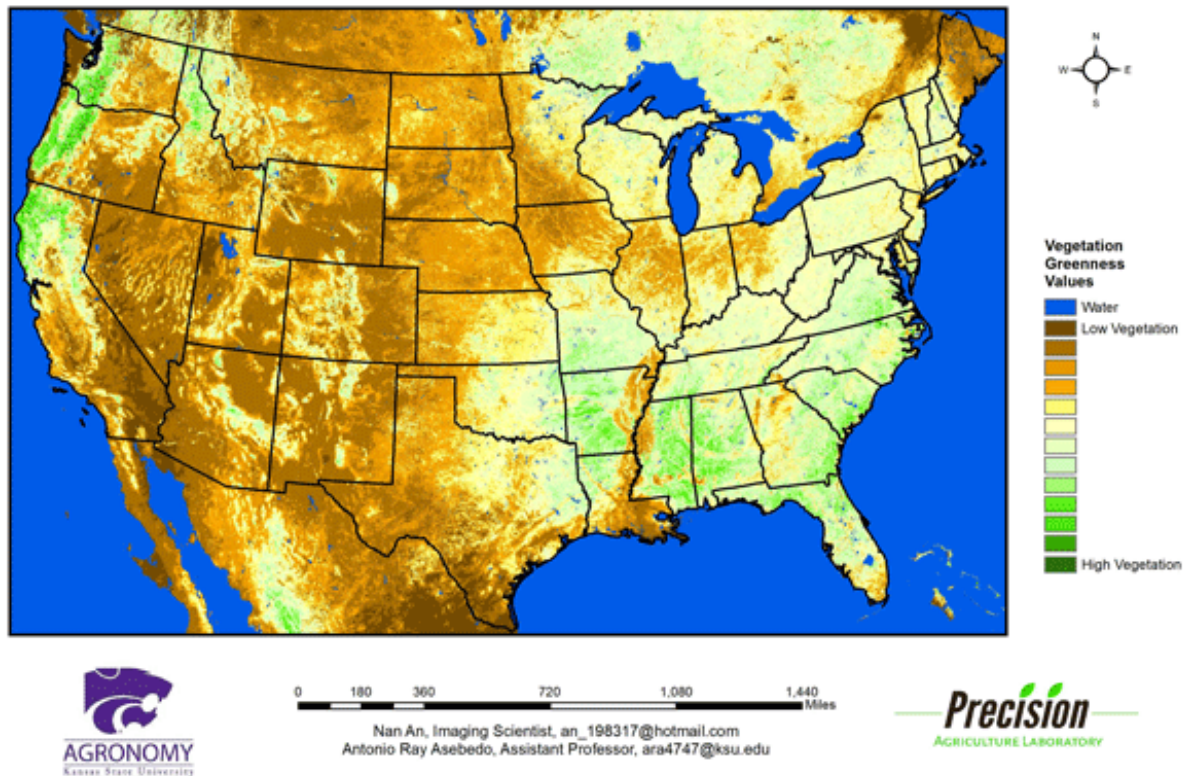


Figure 4. The Vegetation Condition Report for the U.S for November 8 – November 14, 2016 from K-State’s Precision Agriculture Laboratory shows highest NDVI along the Pacific Northwest where wet conditions have fueled photosynthetic activity. In the Southeast mild temperatures have extended the growing season, creating problems as drought intensifies in the area. Low NDVI values are visible in the Corn Belt and along the Mississippi River Valley, where crops are mostly mature, and harvest is coming to an end.

Continental U.S. Vegetation Condition Comparison
Early-November 2016 Compared to Early-November 2015

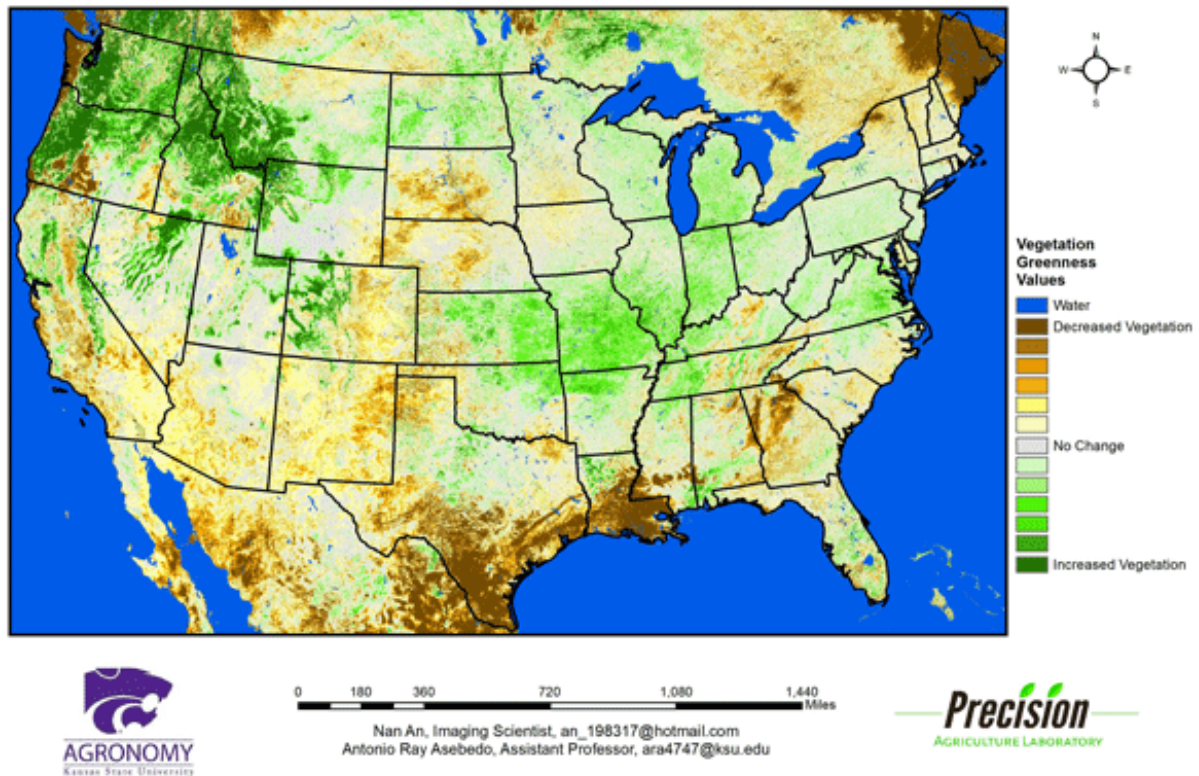


Figure 5. The U.S. comparison to last year at this time for November 8 – November 14, 2016 from K-State’s Precision Agriculture Laboratory shows that higher NDVI values in the Pacific Northwest. Rainfall has been much more plentiful this year, and snowfall has been limited. Along the Gulf Coast, warmer-than-normal temperatures and little rainfall continue to be an issue. In the Southeast, the worsening drought conditions are visible, particularly in northern Georgia.

Continental U.S. Vegetation Condition Comparison
Early-November 2016 Compared to 27-year Average for Early-November

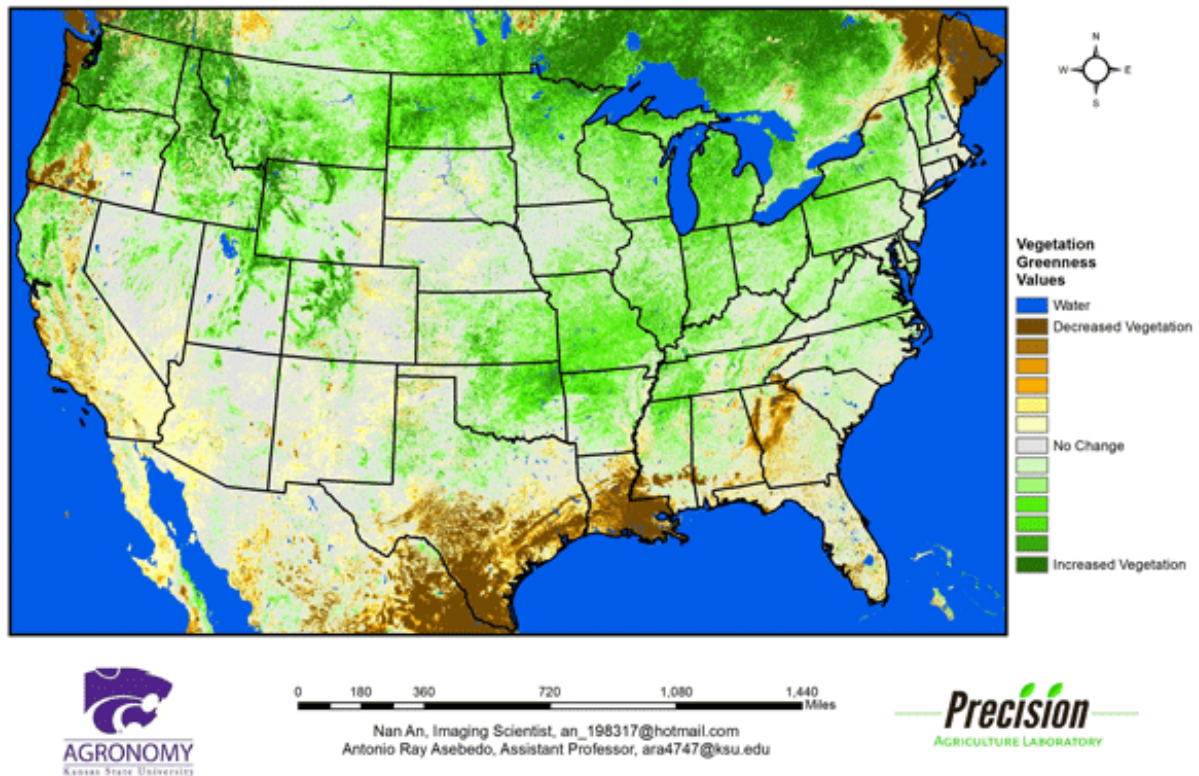


Figure 6. The U.S. comparison to the 27-year average for the period November 8 – November 14, 2016 from K-State’s Precision Agriculture Laboratory shows below-average photosynthetic activity along the Gulf Coast. Warm temperatures and lack of rains are issues in this area. The South continues to have persistent drought conditions. In contrast, much higher-than-normal NDVI values are visible across the Northern Plains. Warmer-than-normal temperatures and lack of snow cover have resulted in higher-than-average vegetative activity.

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