Issue 657

K-STATE
Research and Extension

Extension Agronomy

eUpdate

10/13/2017

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. Freezing temperatures: Potential yield impacts on summer row crops?

Minimum air temperatures during the October 5th to 12th period dropped well below 30 degrees F in the north central and western regions of Kansas, which could pose a problem during the grain filling period of summer row crops. The eastern and south central parts of the states did not get as cold during that time period (Figure 1).

The risk of damage to summer row crops is a function of the current developmental stage of the crop and the minimum temperature and the duration of the freeze events.

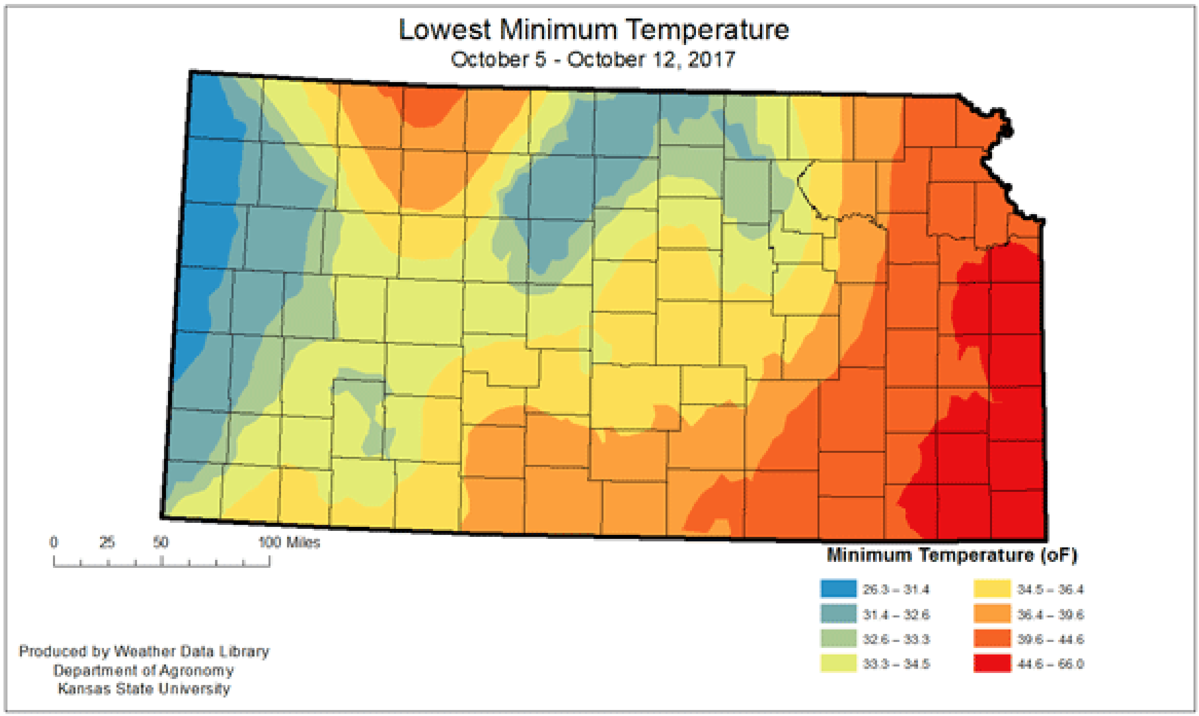

Figure 1. Lowest minimum temperatures measured from October 5 to 12, 2017.

Duration of damaging temperatures

The coldest temperatures from October 5 to 12 were in small pockets in the northwest, southwest, and north central portions of Kansas, where air temperatures were below 32 degrees F for more than 6 hours (Figure 2). The rest of the state had temperatures close to 32 degrees F with minimum exposure to temperatures low enough to have a consistent impact on grain filling and final yields. Other areas, including a small portion in west central Kansas, had temperatures below 32 degrees F, ranging in duration from 2 to more than 4 hours (Figure 2).

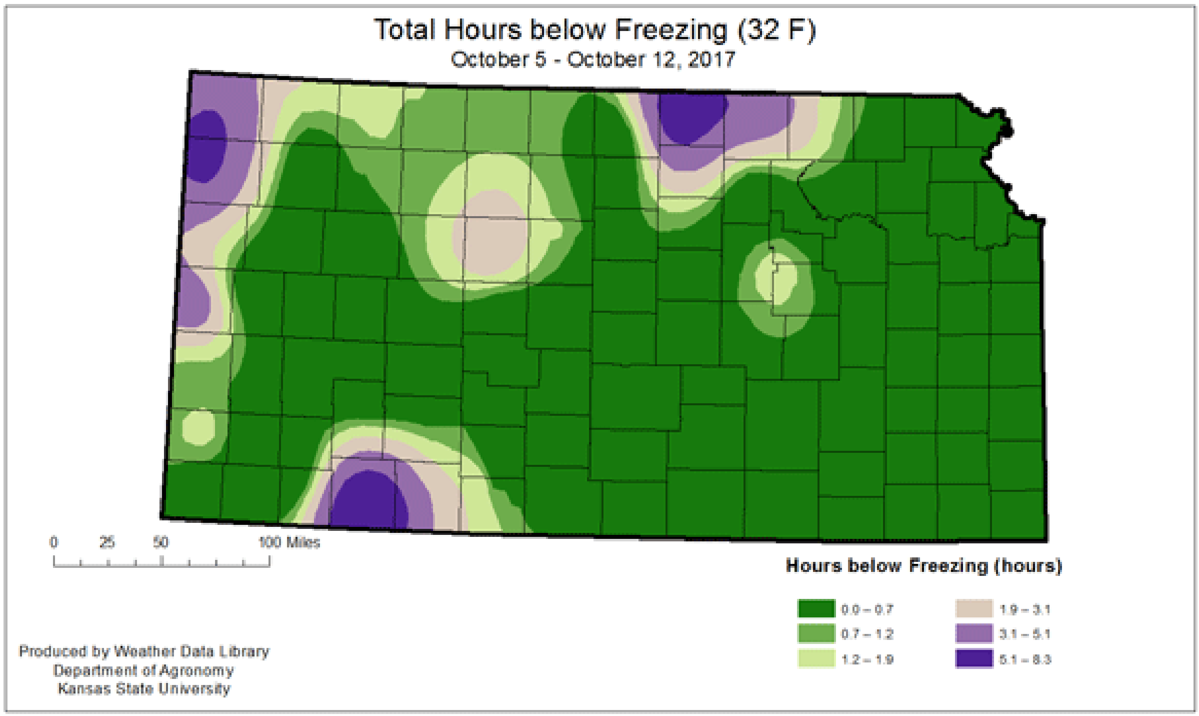

Figure 2. Total hours of air temperatures below 32 degrees F measured from October 5 to 12.

Effect on summer row crops

Corn:

In most of the state, corn is mature (88% based on the most recent USDA Crop Progress and Condition report). The most sensitive areas, with higher probabilities of showing effects of low temperature impacts, are the northwest and west central parts of Kansas (<70% mature) but with a potential low impact on number of acres affected due to the advanced phenology (close or already matured). Corn can be affected when temperatures are below or at 32 degrees F. The further temperatures drop below 32 degrees, the less exposure time it takes to damage the corn. However, corn is not affected once the black layer is formed.

Soybean:

Soybean is currently in the final reproductive stages (dropping leaves) in Kansas (87% dropping leaves based on the most recent USDA Crop Progress and Condition report). Temperatures below 32 degrees F can interrupt seed fill and impact yield through lower test weight and seed quality (primarily affecting protein deposition). Necrosis (death) of the leaf canopy is a visible symptom of freeze damage in soybeans. With soybean, absolute temperature is more important than the duration of the freeze event. The most severe injury occurs with temperatures less than 28 degrees F. As the crop approaches maturity, the impact of a freeze event on soybean yields declines. The most affected soybean acreage will be related to late-planted and double crop soybean areas around the north central and western parts of the state.

Sorghum:

More than half of the sorghum in Kansas has already reached maturity (60% mature based on the most recent USDA Crop Progress and Condition report). The lowest proportion of mature sorghum is in the north central (49% mature) and northwest (29% mature) areas of Kansas. Low temperatures will reduce seed growth and affect final test weight and seed quality, making the harvest process more difficult. A freeze will kill sorghum if the stalks are frozen, impairing the flow of nutrients to the grain. A freeze at the hard dough stage (before grain matures) will result in lower weight and chaffy seeds.

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2. Newly emerging volunteer wheat and the risk of wheat streak mosaic

In some areas of the state, recent rains have stimulated yet another flush of volunteer wheat (Figure 1). Volunteer wheat is known to be an important reservoir for wheat streak mosaic and wheat curl mites that spread this disease. Many growers are asking if this newly emerged volunteer elevates the risk for problems with wheat streak mosaic becoming established this fall.

Figure 1. Newly emerging volunteer wheat. Photo by Erick DeWolf, Extension Plant Pathology.

While volunteer wheat is known to be an important reservoir for wheat streak mosaic, all volunteer wheat is not equal in its contribution to disease outbreaks. The greatest risk comes from volunteer wheat that emerged shortly after harvest and was left all summer long. This volunteer wheat is rapidly colonized by the curl mites and infected with viral diseases. When this volunteer wheat is removed, the risk is reduced because the virus and curl mites do not survive more than a few hours without a living host. If new volunteer wheat emerges during the summer or fall, the risk of disease returns but not to the same degree. The risk is lower relative to the initial flush because there is less time for it to be colonized by curl mites and infected with virus prior to wheat planting. Volunteer wheat that emerges at planting, or just as the new wheat crop is emerging, is less likely to become a reservoir for disease than volunteer that has been present all summer. If fact, the late emerging volunteer wheat may pose no more risk than early planted wheat fields.

The need to control this volunteer wheat depends on the density of the stand and rotational plans for individual fields. A thin stand of sparse volunteer wheat may be able to wait until other planned herbicide applications are made in the spring. In contrast, a heavy or thick stand of volunteer wheat or other winter annual grasses like jointed goatgrass, downybrome, or other brome species may necessitate some action this fall. Glyphosate is our best herbicide for controlling these winter annual grasses. Glyphosate can be tank-mixed with other residual herbicide programs that often are used to manage winter annual broadleaf weeds such as mustards, henbit, or marestail.

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3. Update on forecasting corn yields - 2017 Kansas corn yields close to USDA-NASS projections

A new and final crop yield forecast was released yesterday (Oct 12, 2017) by USDA-NASS reporting an increase in corn yield at the state-level (+1 bushels per acre, averaging 134 bushels per acre) and also in the final statewide crop acreage (+200,000 acres, averaging 5.2 million acres total). Check out the full report published by USDA-NASS for further details.

In a previous Agronomy eUpdate article in Issue 653, "Forecasting 2017 Kansas corn yields" on September 29, 2017, a new yield forecast tool was discussed for Kansas corn. This tool is primarily based on real-time satellite data, historical yield data at county-level, and prediction of current geo-location of corn fields across the state (based on satellite data and a field survey of +500 field locations across the state). To obtain more information about the K-State "Yield Forecasting Tool" (YFT), visit the previous article referenced above. The primary steps for this tool, presented as a simplified approach, are highlighted in Figure 1.

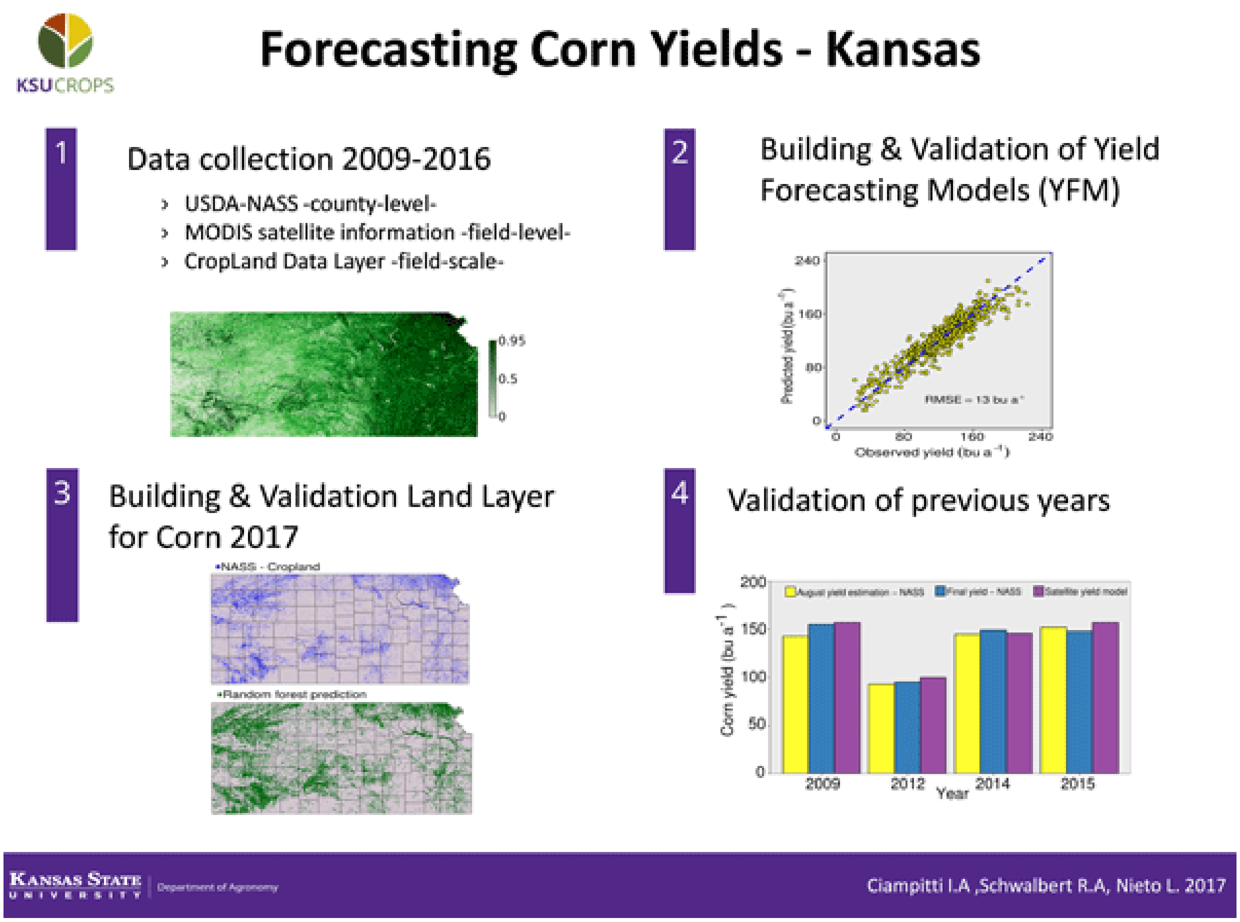

Figure 1. Theoretical framework portraying the main steps involved in the development of forecasting corn yields for Kansas. Steps: 1- Data collection; 2- Building and validating yield forecasting models (YFM); 3- Building and validating land layer for corn 2017; and 4- validation of previous years. Infographic developed by Ignacio Ciampitti, Rai Schwalbert, and Luciana Nieto, K-State Research and Extension.

This corn yield forecast tool will be evolving in the coming months with the goal of providing producers reliable yield predictions for improving the decision-making process.

An updated corn yield forecast was obtained for Kansas via utilization of satellite imagery from planting until beginning of September for this current growing season. Based on the satellite yield model developed by our team, the state-level yield prediction is 134.1 bushels per acre, which is right on target to the yield prediction released by USDA-NASS (134 bushels per acre; link**)**.

A new step on the Yield Forecast Tool

Since our last news release, several farmers were also asking about information related to statewide total corn production for the 2017 growing season. The main challenges on any crop production estimates are to adequately account for the number of acres across the state. In order to move forward with this step of the forecasting tool, models were developed to estimate the number of corn acres for past growing seasons and to compare those values with final corn acreage. A validation analysis was done to test the precision our models in predicting corn acreage relative to the final number reported by USDA-NASS in each growing season. For this purpose, four past growing seasons (2009, 2012, 2014, and 2016) were selected to forecast total production benchmarking these values against the final reports published by USDA-NASS. As reflected in Figure 2, forecasted total corn production was close (1.8% deviation from mean) relative to the final values.

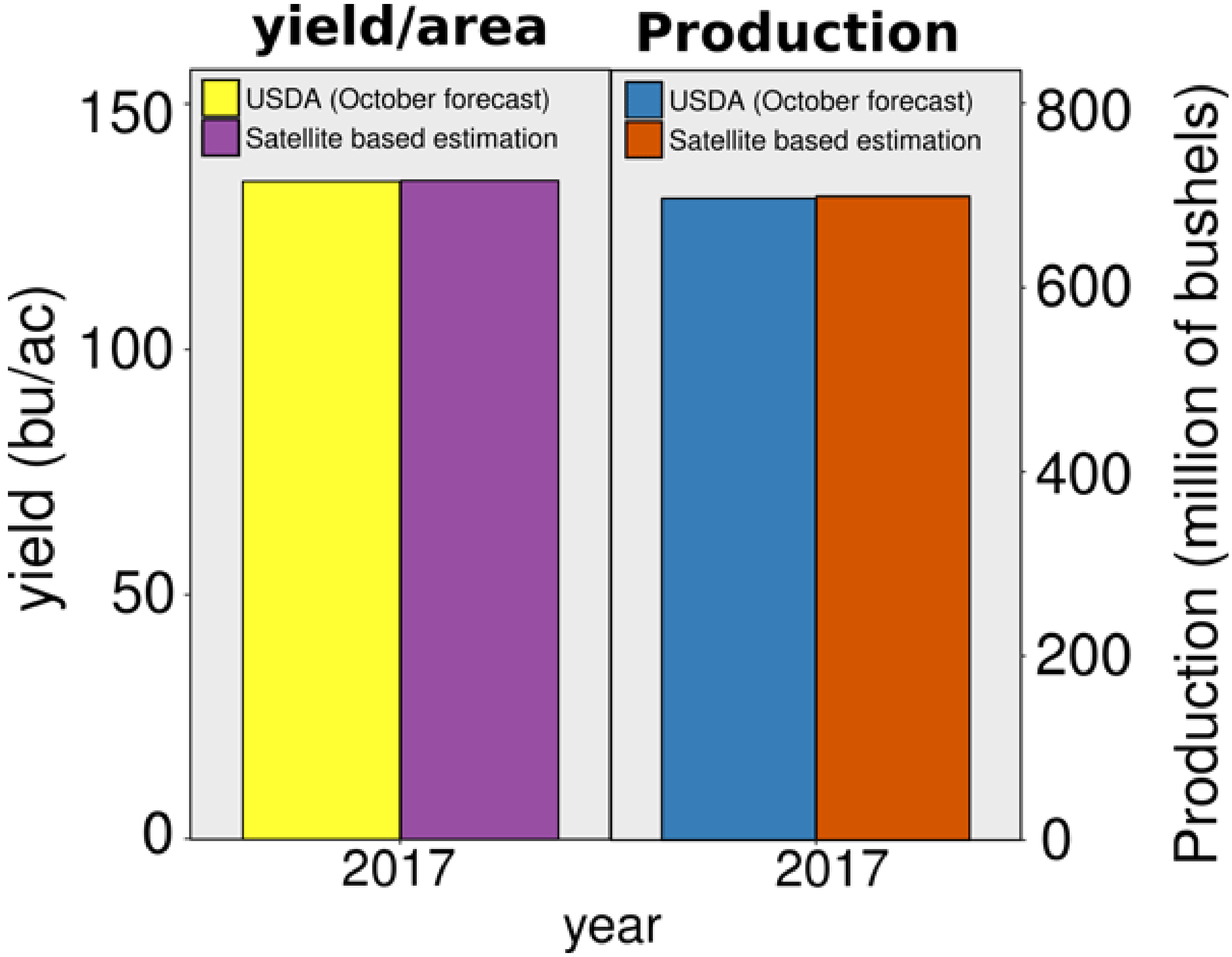

Figure 2. Forecasting corn yields (left panel) and total production (right panel) derived from satellite data for the state of Kansas. Graph developed by Ignacio Ciampitti, Rai Schwalbert, and Luciana Nieto, K-State Research and Extension.

In summary, the Yield Forecasting Tool (YFT) predicted an average state yield value of 134.1 bushels per acre (including satellite imagery data until corn maturity) and a total production of 698 million bushels for corn for the state. The predicted values are in agreement with the latest forecast released yesterday by USDA-NASS (Oct 12, 2017) for the overall corn production in Kansas (Figure 2).

Stay tuned for further details coming out about the YFT as we continue to work on other components, such as early-season crop classification (related to remote sensing and satellite imagery data), to be integrated to these complex crop yield forecast models.

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4. Controlling annual weeds with fall-applied herbicides ahead of corn and grain sorghum

Now that row crop harvest is underway and fall moisture has been received, it's time to start planning your fall herbicide applications to control winter annual broadleaf weeds and grasses ahead of grain sorghum or corn.

Fall applications during late October and through November can greatly assist control of difficult winter annuals and should be considered when performance of spring-applied preplant weed control has not been adequate. Henbit and marestail frequently are some of the most troublesome weeds we try to manage with these fall herbicide applications.

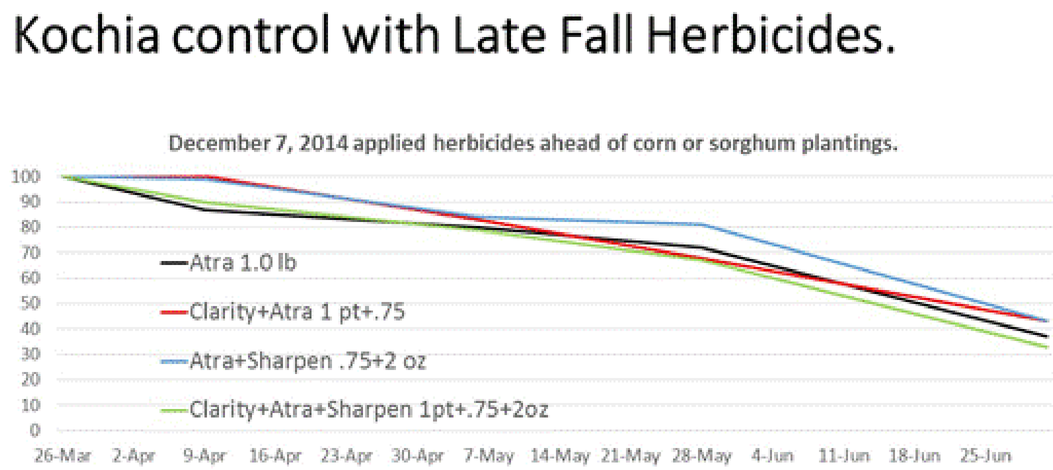
Fall applications have another side-benefit. While it is always important to manage herbicide drift, herbicide applications made after fall frost have less potential for drift problems onto sensitive targets.

There are several herbicide options for fall application. If residual weed control is desired, atrazine is among the lowest-priced herbicides. However, if atrazine is used, that will lock the grower into planting corn or sorghum the following spring, or leave the land fallow during the summer and come back to winter wheat in the fall. If atrazine is applied too early, warm weather and moisture will reduce the length of residual. November is often the best time for atrazine applications.

Atrazine is labeled in Kansas for fall application over wheat stubble or after row crop harvest any time before December 31, as long as the ground isn't frozen. Consult the atrazine label to comply with maximum rate limits and precautionary statements when applying near wells or surface water. No more than 2.5 lbs per acre of atrazine can be applied in a calendar year on cropland.

One half to two pounds (maximum) per acre of atrazine in the fall, tank-mixed with 1 to 2 pints per acre of 2,4-D LV4 or 0.67 to 1.33 pints LV6, can give good burndown of winter annual broadleaf weeds -- such as henbit, dandelion, prickly lettuce, Virginia pepperweed, field pansy, evening primrose, and marestail -- and small, non-tillered winter annual grasses. Atrazine's foliar activity is enhanced with crop oil concentrate, which should be included in the tank-mix. Winter annual grass control with atrazine is discussed below.

Atrazine residual should control germinating winter annual broadleaves and grasses. When higher rates of atrazine are used, there should be enough residual effect from the fall application to control early spring-germinating summer annual broadleaf weeds such as kochia, common lambsquarters, wild buckwheat, and Pennsylvania smartweed – unless the weed population is triazine-resistant. The two graphs (Figure 1 and 2) below show the residual control effects of December herbicide applications on kochia ahead of corn and sorghum planting.



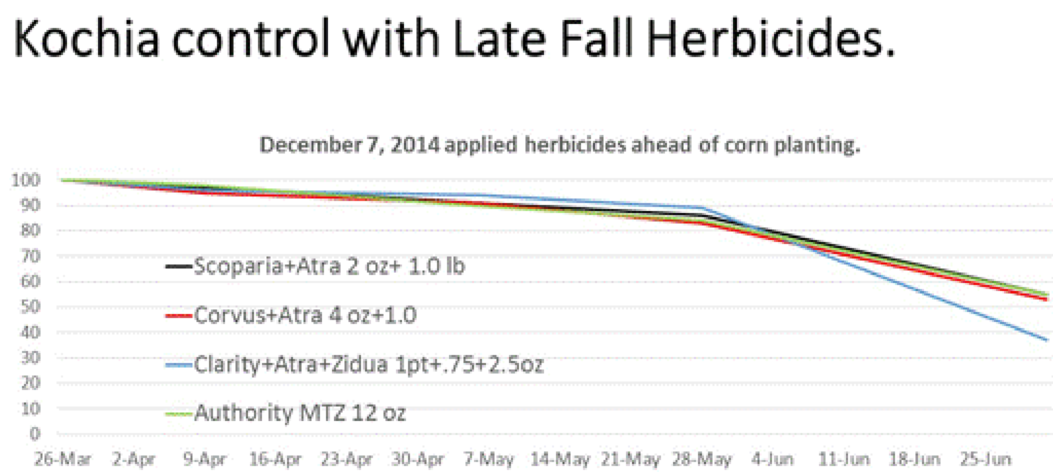


Figure 1 and 2. K-State trials measuring kochia control with late-fall herbicide applications. Source: Curtis Thompson, K-State Research and Extension.

Marestail is an increasing problem in Kansas that merits special attention. Where corn or grain sorghum will be planted next spring, fall-applied atrazine plus 2,4-D or dicamba have effectively controlled marestail rosettes and should have enough residual activity to kill marestail as it germinates in the spring. Atrazine alone will not be nearly as effective postemergence on marestail as the combination of atrazine plus 2,4-D or dicamba. Sharpen can be very good on marestail, but should be tank-mixed with 2,4-D, dicamba, atrazine, or glyphosate to prevent regrowth.

If the spring crop will be corn, other residual herbicide options include ALS herbicides such as Autumn Super or Basis Blend. ALS-resistant marestail will survive an Autumn Super or Basis Blend treatment if applied alone. For burndown, producers should mix in 2,4-D, dicamba, and/or glyphosate. Aim + 2,4-D or Rage D-Tech are additional herbicide options for fall application with only the 2,4-D component providing a very short residual.

Winter annual grasses can also be difficult to control with atrazine alone. Success depends on the stage of brome growth. For downy brome control, 2 lbs per acre of atrazine plus crop oil concentrate (COC) has given excellent control, whereas 1 lb per acre has given only fair control. Volunteer wheat and brome species that have tillered and have a secondary root system developing will likely not be controlled even with a 2-lb rate. Adding glyphosate to atrazine will ensure control of volunteer wheat, annual bromegrasses, and other winter annual grassy weeds. Atrazine antagonizes glyphosate, so if the two are used together, a full rate of glyphosate (0.75 lb ae) is recommended for good control. The tank-mix should include AMS as an adjuvant.

Where fall treatments control volunteer wheat, winter annuals, and early-emerging summer annuals, producers should then apply a preemerge grass-and-broadleaf herbicide with glyphosate or paraquat at corn or sorghum planting time to control newly emerged weeds. Soils will be warmer and easier to plant where winter weeds were controlled in fall.

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5. Warm air atop cold: Quantifying temperature inversions on the Kansas Mesonet

In 2017 the Kansas Mesonet underwent an upgrade that included adding a second 30-foot (10 meters) high temperature/humidity sensor to tower stations (Figure 1). This upgrade coincides with the already existing 6-foot (2 meters) temperature humidity sensor. With temperature measurements at different heights, the Mesonet is able to provide a small vertical profile of the lower atmosphere. This lowest layer provides great insight into the vertical mixing occurring over land which has substantial impact on smoke dispersal, spraying results, and temperature forecasting.

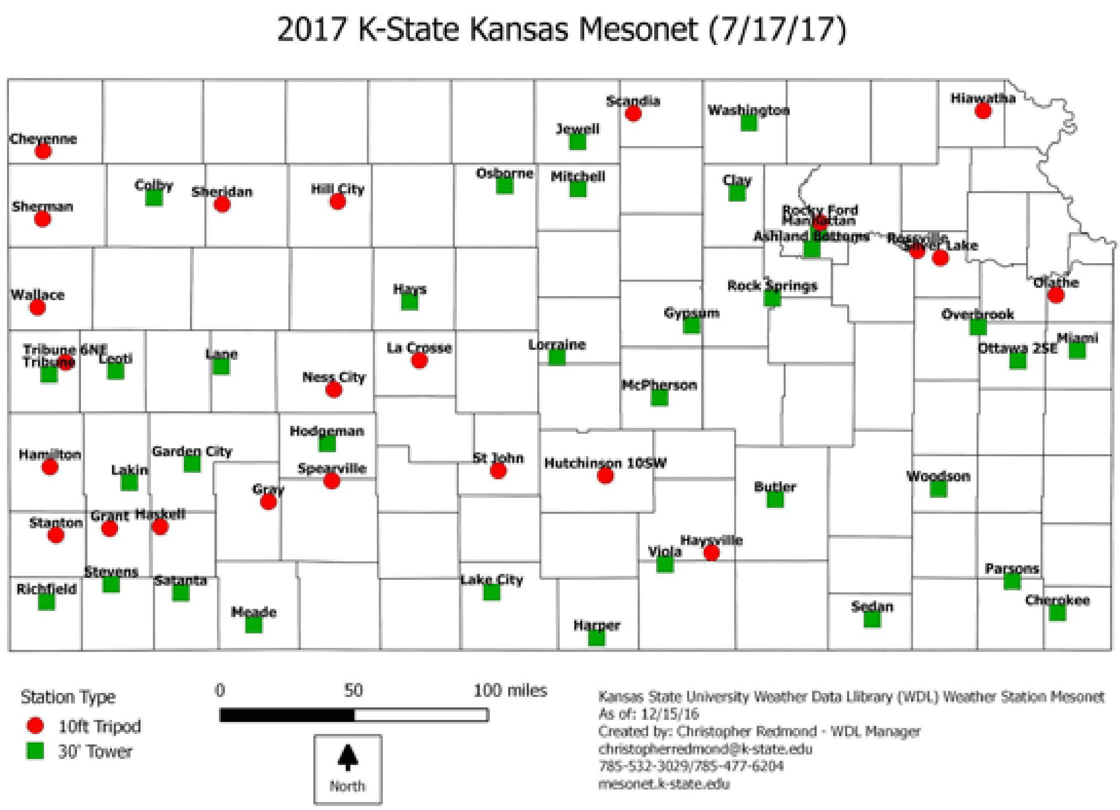

Figure 1. All 30-feet towers measure temperatures at 30 feet and observe inversions on the Kansas Mesonet.

What are inversions?

In the troposphere, the lowest layer of the atmosphere that reaches the earth's surface, temperature typically declines as altitude increases. This rough estimation of temperature with height doesn't always fit the situation due to weather, terrain, and solar radiation. Anomalies in the lowest layer of the atmosphere occur when temperatures increase with height due to these factors. These anomalies are called inversions. When cooler, higher density air, is in place under warm, less dense air the atmosphere can behave much differently than expected. These differences include poor air dispersion, light winds, and fog.

Using the Mesonet to determine presence of an inversion:

The difference between the 2-meter (2m) and 10-meter (10m) sensors will indicate the presence of an inversion as well as low-level stability. Keep in mind, inversions often differ greatly over very small distances. These observations provide a small snapshot of regional conditions but aren't necessarily representative at your location.

When viewing the inversion data here: mesonet.ksu.edu/agriculture/inversion, the following data implies:

- Positive values infer that temperatures are warming with height and a surface inversion is in place. The more positive the value, the stronger the inversion at the surface. Inversion values 5F and higher are considered a strong inversion with values greater than 10F considered very strong. Oklahoma Mesonet has recorded inversions up to 20F, a very rare phenomenon that implies a significant inversion (Hunt et al., 2007).

- Negative (-) values indicate the temperature cools with height and the lower atmosphere is unstable. Therefore, no inversion is in place and mixing is effectively occurring. The more negative the value, the more cooling with height exists and the faster air parcels will rise.

- Zero values represent temperatures at 2m and 10m are the same. This indicates either stability or instability at the surface, dependent upon the time of day.
    - In the morning: zero values indicate the inversion developed vertically to heights higher than 10-meters.
    - In the afternoon: strong mixing of the layer has equalized the temperatures between the two levels and the atmosphere is unstable.
    - In the evening: atmosphere is likely stabilizing and an inversion may soon develop.

- Winds at 2m are critical when an inversion is in place. They will vary and be mainly light and terrain influenced. However, these light winds will dictate the direction that spray, for example, may drift when it remains near the surface. The wind barb (represented by a line protruding outward from the value at a specific location) will indicate the direction the wind is coming from (direction wind would blow in your face if you were turned that way). Flags on the end of the wind barb indicate speed. A short flag = 5 mph, long = 10 mph, and a triangle = 50 mph. Add up all the flags on a wind barb to obtain the total wind speed. For additional description on wind barbs visit: http://mesonet.k-state.edu/about/windbarbs/

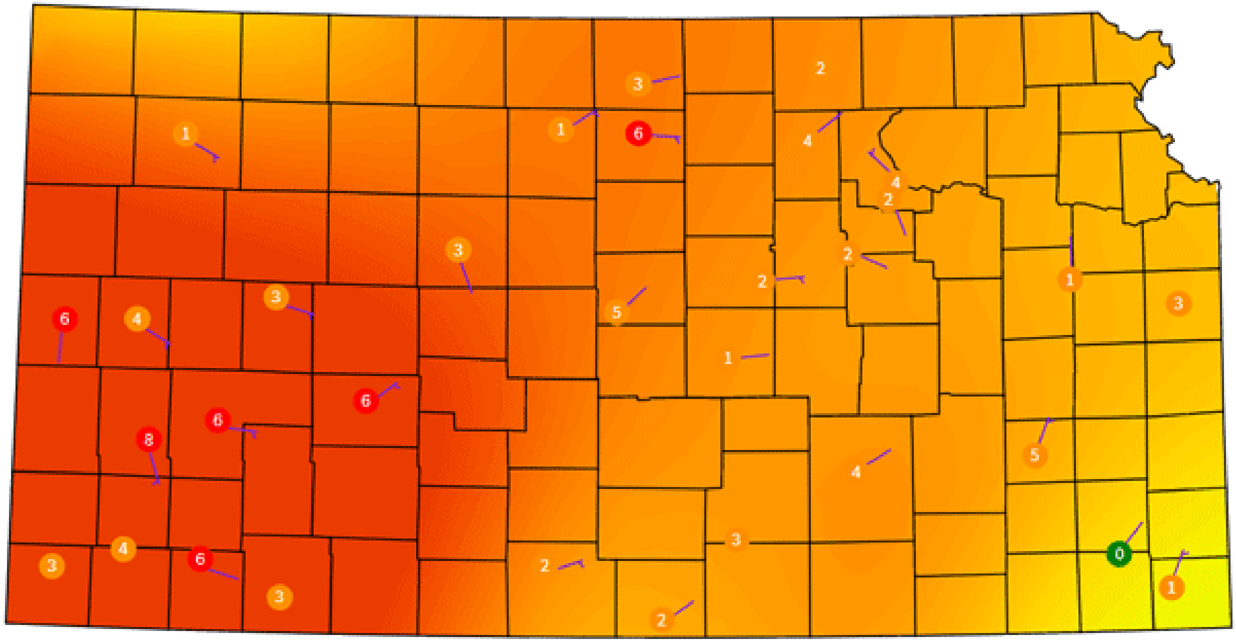

Figure 2. Data from August 30, 2017 at 9:00 pm. Strong inversions (values >5) are in place across much of western Kansas with weak to moderate inversions across central and eastern Kansas.
View data here: http://mesonet.k-state.edu/agriculture/inversion/

How can you tell in the field if an inversion is present?

More often than not, there is no simple way to determine the presence of an inversion. You absolutely must take temperature measurements at two different heights to determine the change in temperature with height.

Occasionally, there are some visual indicators of an inversion. A few of these indicators are:

- Low lying fog in valleys, low points, and over different ground cover.
- Poor dispersion from chimneys, industry, and dusty roads.
- Frost/dew on the ground.
- Sounds traveling large distances.

Want to learn more about inversions?

Visit the Mesonet Inversion page here: http://mesonet.k-state.edu/about/inversion/

Sources:

Hunt, E. D., J. B. Basara, and C. R. Morgan, 2007: Significant inversions and rapid in situ cooling at a well-sited Oklahoma mesonet station. J. Appl. Meteor. Climatol., 46, 353–367, doi:10.1175/JAM2467.1.

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6. The spotlight is on cover crops at the 2017 Agronomy Field Day, November 3

Exciting advances in cover crop research will be featured at the 2017 Agronomy Field Day on November 3 at the Ashland Bottoms Research Farm in Manhattan. Topics will focus on understanding the role cover crops play in water quality, weed control, soil quality, and more.

The full list of topics and K-State speakers:

- Using cover crops for weed suppression – Anita Dille, Weed Ecology
- Improving soil quality with cover crops – DeAnn Presley, Soil Management Specialist
- Protecting surface water with healthy soils, cover crops, and fertilizer management – Nathan Nelson, Soil Fertility and Nutrient Management
- Soybean yields and cover crops – Ignacio Ciampitti, Crop Production Specialist and Doug Shoup, South East Area Agronomist.
- Ten years of cover crops in a no-till wheat-sorghum-soybean rotation – Kraig Roozeboom, Cropping Systems Agronomist
- Cover crops and nitrogen management – Peter Tomlinson, Environmental Quality Specialist

The field day will begin with registration at 9 a.m. and wrap up at 1 p.m. Sessions include two concurrent one-hour tours in the morning, starting at 9:30, followed by a poster session during and after lunch.

There is no charge to attend, and a complimentary lunch will be available. Preregistration is requested by October 30th so that a lunch count can be made. To preregister online, see: https://agron-field-day-2017.eventbrite.com. You can also preregister by calling Troy Lynn Eckart at 785-532-5776. On-site registration will also be available.

Directions to the Ashland Bottoms Research Farm are given in the graphic below. The address for the farm is 2801 W. 40th Ave, Manhattan, KS 66502.

For more information, interested persons can contact Dorivar Ruiz Diaz at 785-532-6183 or ruizdiaz@ksu.edu

K·STATE Research and Extension | Department of Agronomy

Cover Crops Field Day

Ashland Bottoms Research Farm
November 3, 2017

Topics and K-State speakers:

Using cover crops for weed suppression
Anita Dille

Improving soil quality with cover crops
DeAnn Presley

Protecting surface water with healthy soils, cover crops, and fertilizer management
Nathan Nelson

Soybean yields and cover crops
Ignacio Ciampitti and Doug Shoup

Ten years of cover crops in a no-till wheat-sorghum-soybean rotation
Kraig Roozeboom

Cover crops and nitrogen management
Peter Tomlinson

Schedule:

Registration at 9 a.m. (lunch included)
Sessions include two concurrent one-hour tours in the morning
Poster session during and after lunch.

Registration:

Please register online by October 30 at:
agron-field-day-2017.eventbrite.com
or by phone: 785-532-5776

For more information contact:
Dorivar Ruiz Diaz
785-532-6183 | ruizdiaz@ksu.edu

Directions to Ashland Bottoms Research Farm:

- From K-177 Highway (south of the Kansas River Bridge): turn west on McDowell Creek Road and follow it 7.4 miles, turn right (north) on W. 40th Ave. and travel 1.2 miles
- From Interstate 70, take Exit 307 and follow McDowell Creek Road 3.6 miles north before turning left (north) on W. 40th Ave and follow it 1.2 miles north.

Kansas State University Agricultural Experiment Station and Cooperative Extension Service

7. Comparative Vegetation Condition Report: October 3, 2017 - October 9, 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:

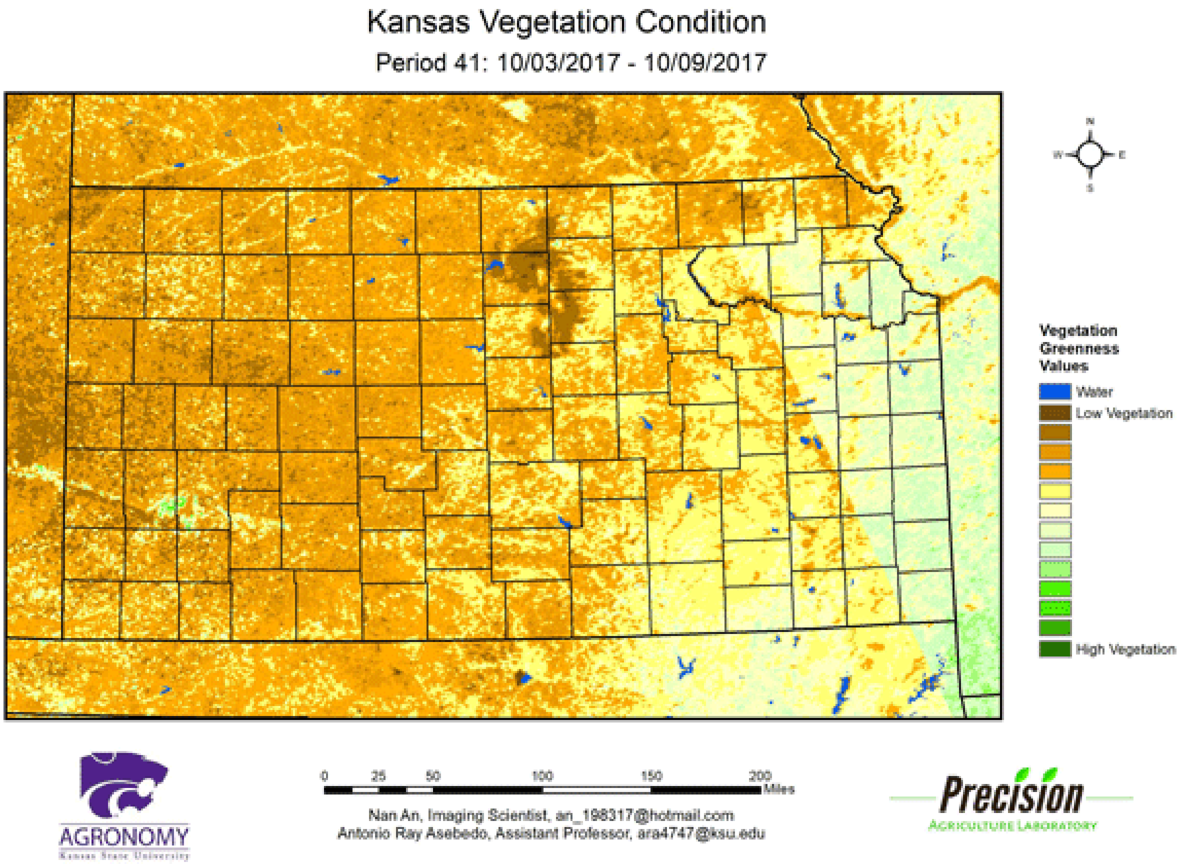

Figure 1. The Vegetation Condition Report for Kansas October 3 – October 9, 2017 from K-State's Precision Agriculture Laboratory shows very little vegetative activity this week. The greatest areas of photosynthetic activity are in eastern Kansas, with a small pocket along the Arkansas River near the Kearney/Finney county border. Recent warm weather has increased crop maturity and reduced photosynthetic activity.

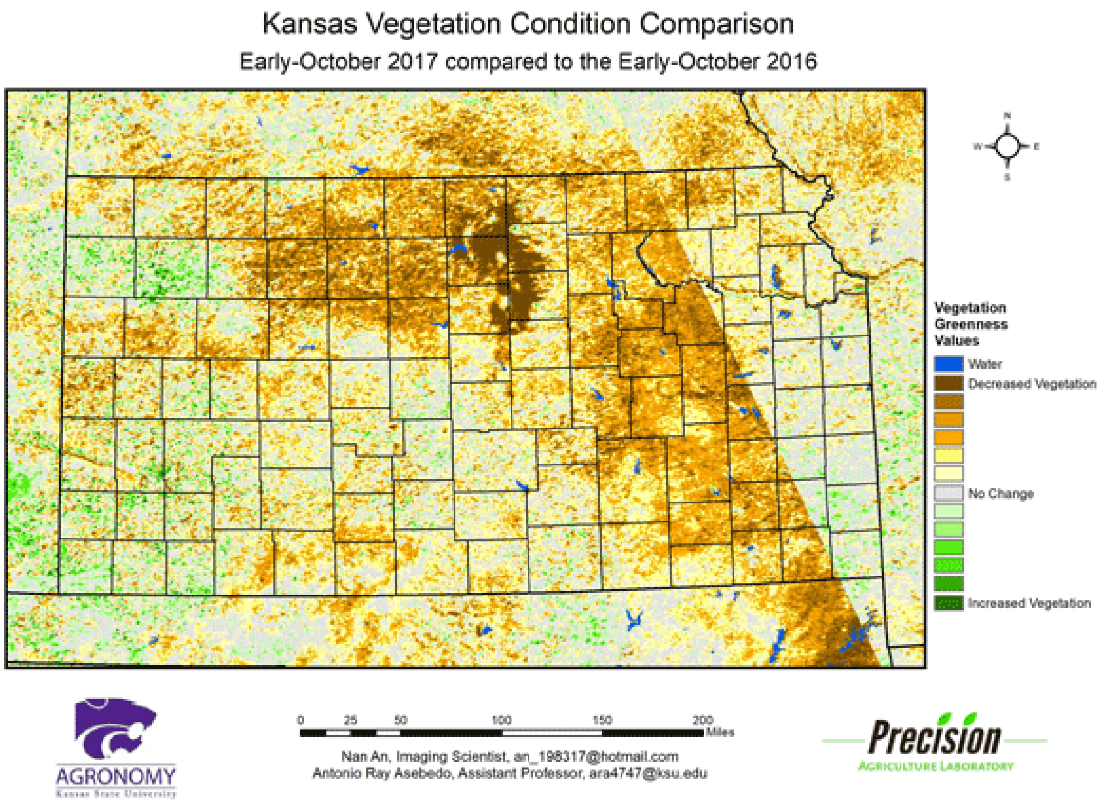

Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for October 3 – October 9, 2017 from K-State's Precision Agriculture Laboratory shows lower vegetative activity across the North Central Division into the southeast. Much of that is due to increased cloud cover. That cloud cover also resulted in the distinct splice line in eastern Kansas. Western Kansas has some higher vegetative activity this year due to the more favorable moisture conditions for winter wheat emergence.

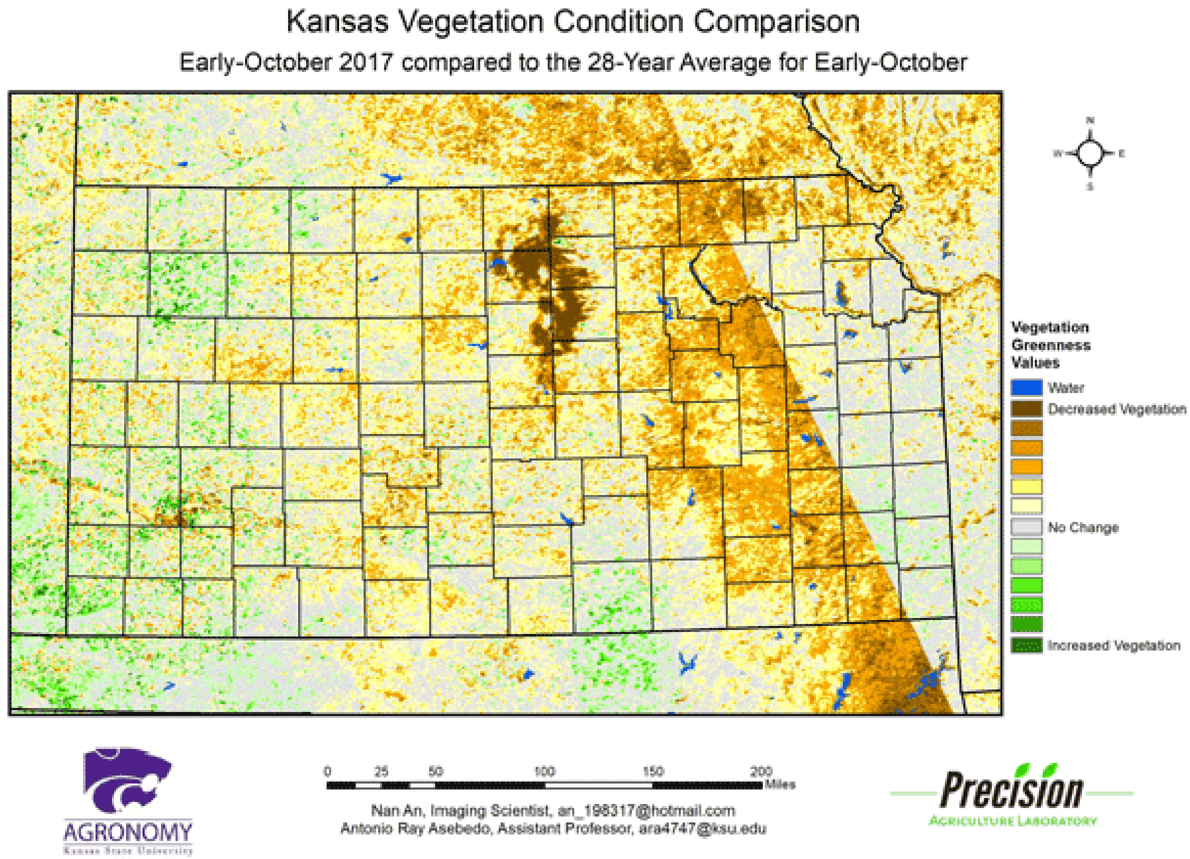

Figure 3. Compared to the 28-year average at this time for Kansas, this year's Vegetation Condition Report for October 3 – October 9, 2017 from K-State's Precision Agriculture Laboratory shows above-average activity is confined to the western third of the state, where favorable moisture has dominated.

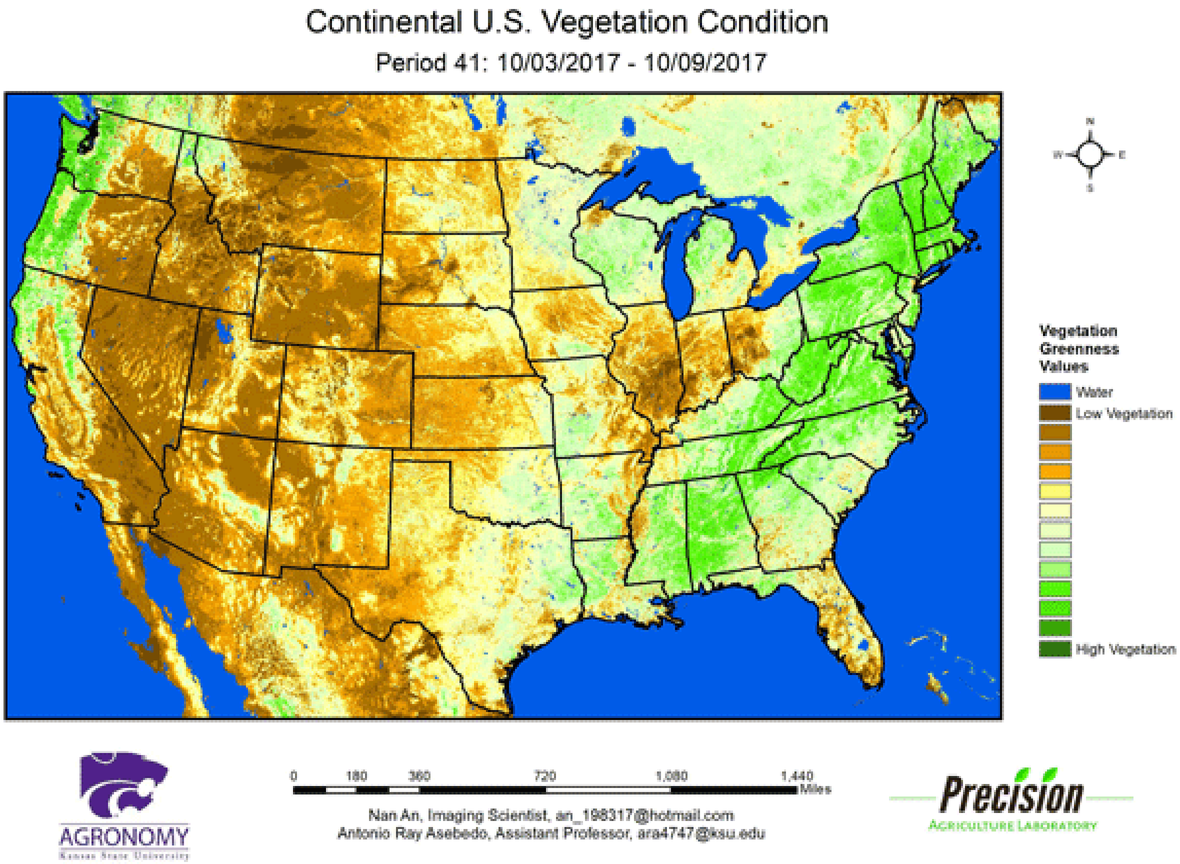

Figure 4. The Vegetation Condition Report for the U.S for October 3 – October 9, 2017 from K-State's Precision Agriculture Laboratory shows highest NDVI values centered along and east of the Appalachians, where rainfall has reduced drought stress. High NDVI values are also visible in the Pacific Northwest.

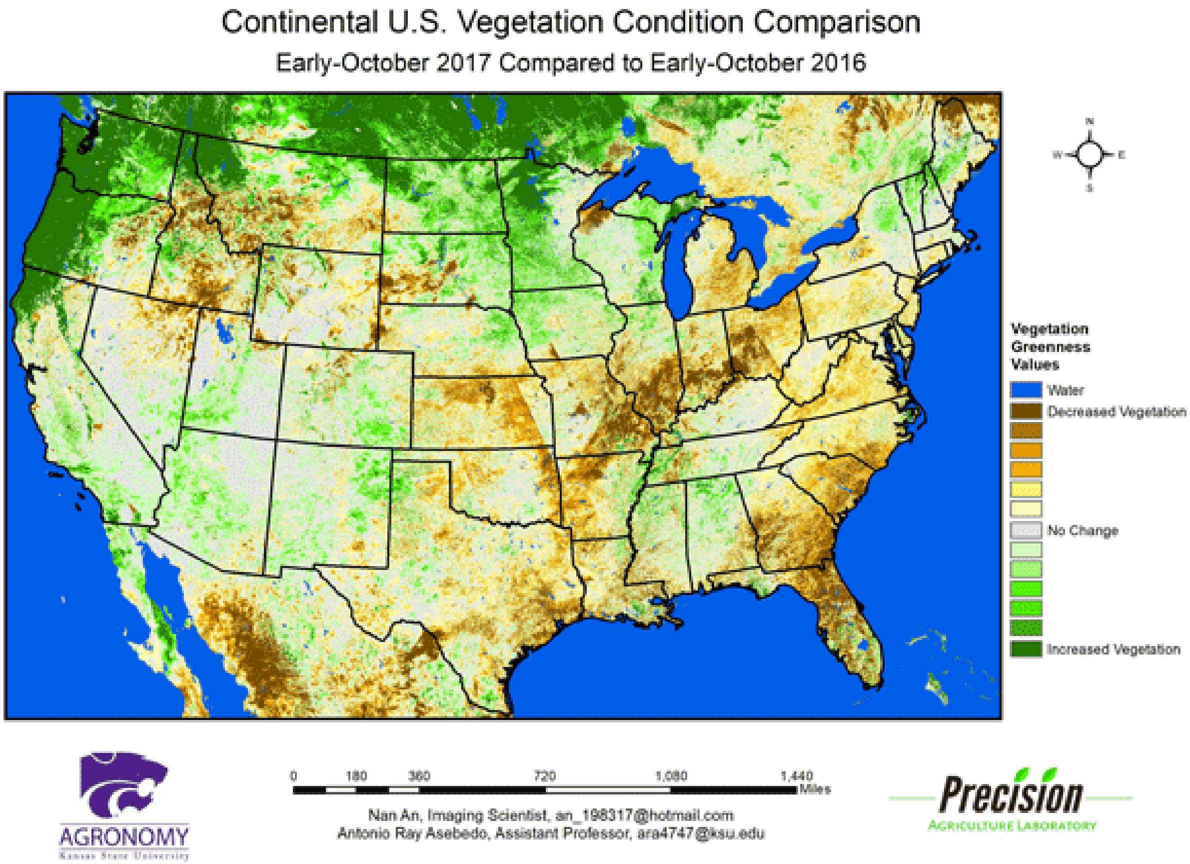

Figure 5. The U.S. comparison to last year at this time for October 3 – October 9, 2017 from K-State's Precision Agriculture Laboratory again shows the impact that the split in moisture has caused this year. Much higher NDVI values are visible across the northern states. Last October, Montana and the Dakotas were moving into a dry pattern that became the start of the intense drought the dominated this year. Recent rains have resulted in some recovery in that area.

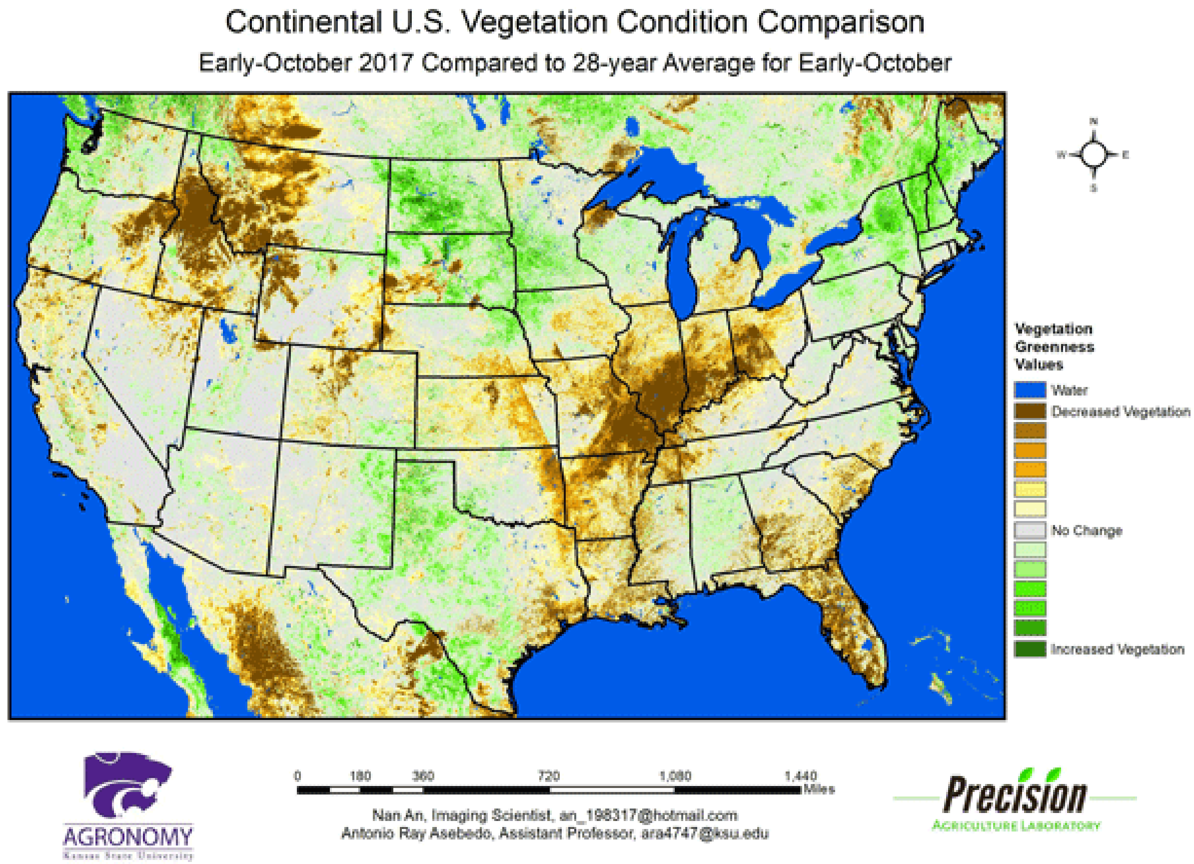

Figure 6. The U.S. comparison to the 28-year average for the period of October 3 – October 9, 2017 from K-State's Precision Agriculture Laboratory shows improvement in the drought conditions in the northern Plains. Below-average NDVI values in Idaho, western Montana, and parts of Wyoming are the result of recent snow in the region. In parts of Missouri, Ohio, and Illinois, below-average NDVI values reflect the combination of dry conditions and rapid maturity of crops.

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