



Extension Agronomy

eUpdate

11/13/2017

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. Considerations for fall applications of anhydrous ammonia

Soils in most of Kansas are now cool enough to allow producers to apply anhydrous ammonia for their 2018 corn crop (Figure 1). This practice has some appeal to producers. For one thing, fall fertilizer application spreads out the workload so there's more time to focus on corn planting in the spring. Secondly, wet conditions in the spring sometimes prevents producers from applying lower-cost anhydrous ammonia ahead of corn planting, and forces them to apply more expensive sources after planting. Equally important for many producers have been issues with anhydrous ammonia availability at times in the spring.

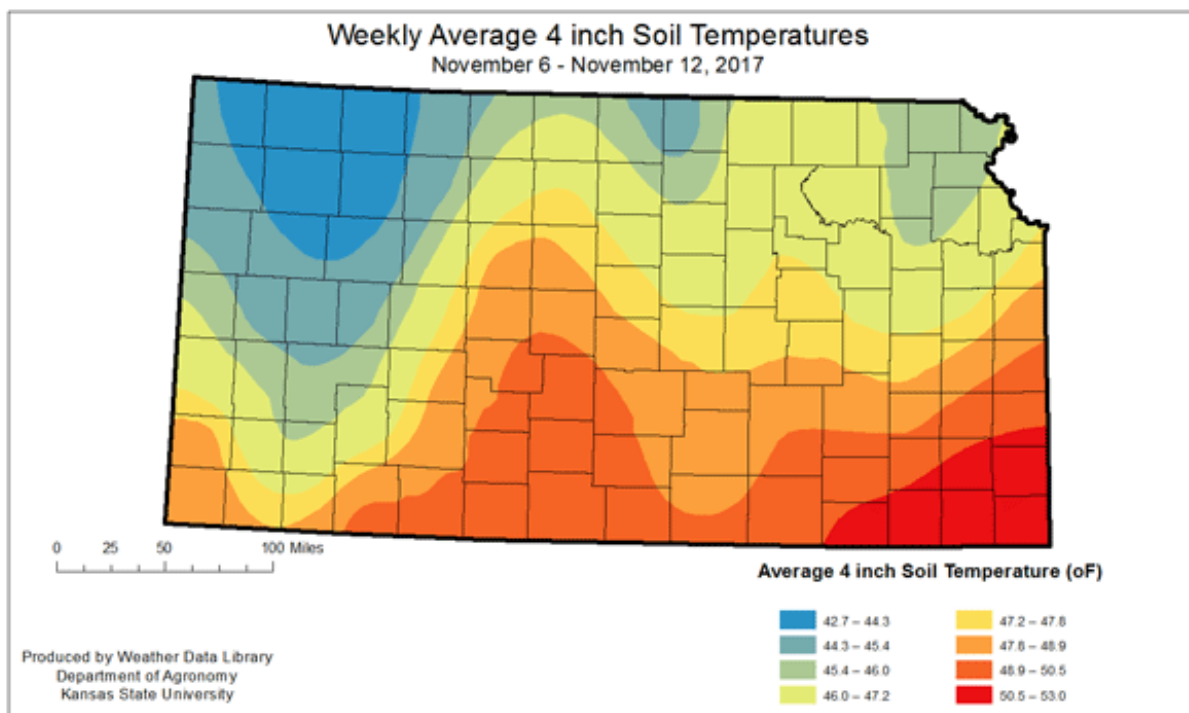


Figure 1. Weekly average 4-inch soil temperatures for the period of November 6-12, 2017. Soil temperatures in individual fields in any given area will vary with differences in vegetative cover, soil texture, soil moisture, and other factors.

Despite those advantages, producers should be aware that there is potential for higher nitrogen (N) loss in the spring following a fall application, as a result of nitrification of the ammonium during late winter and very early spring and subsequent leaching, or denitrification.

Reactions of anhydrous ammonia in the soil

When anhydrous ammonia is applied to the soil, a large portion of the ammonia is converted to

ammonium (NH_4^+), and can be bound to clay and organic matter particles within the soil. As long as the nitrogen remains in the ammonium form, it can be retained on the clay and organic matter, and does not readily move in most soils except sandy soils with very low CEC, so leaching is not an issue.

At soil temperatures above freezing, nitrification occurs - ammonium is converted by specific soil microbes into nitrate-N (NO_3^-). Since this is a microbial reaction, it is very strongly influenced by soil temperatures. The higher the temperature, the quicker the conversion will occur. Depending on soil temperature, pH, and moisture content, it can take 2-3 months or longer to convert all the ammonia applied in late summer/early fall to nitrate.

By delaying application until cold weather, most of the applied N can enter the winter as ammonium, and over-winter losses of the applied N will be minimal.

Traditionally, producers should wait until soil temperatures are less than 50 degrees F at a depth of 4 inches before applying ammonia in the fall or early winter. Nitrification does not cease below 50 degrees F, but rather soils will likely become cold enough to limit the nitrification process. In many areas of Kansas, soils may stay warmer than 50 degrees well into late-fall and only freeze for short periods during the winter.

The use of a nitrification inhibitor such as N-Serve can help reduce N losses from fall N applications under specific conditions, particularly during periods when soil temperatures warm back up for a period after application.

One should also consider soil physical properties when considering fall application. Fall applications of N for corn should not be made on sandy soils prone to leaching, particularly those over shallow, unprotected aquifers. Rather, fall N applications should focus on deep, medium- to heavy-textured soils where water movement through the profile is slower.

When is N lost?

When considering fall application of N, keep in mind that loss of N during the fall and winter is not normally a problem in Kansas. The conversion of “protected” ammonium to “loss prone” nitrate during the fall and winter can be minimized by waiting to make applications until soils have cooled, and by using products such as nitrification inhibitors. The fact that essentially all the N may remain in the soil as ammonium all winter, coupled with our dry winters, means minimal N is likely to be lost over winter.

However, soils often warm up early in the spring and allow nitrification to get started well before corn planting. Generally, if the wheat is greening up, nitrification has begun! Thus, one of the potential downsides of fall application is that nitrification can begin in late February and March, and essentially be complete before the corn crop takes up much N in late May and June.

Summary

The bottom line is this: If anhydrous ammonia is to be applied in the fall, there are a number of factors that must be considered, including soil texture, temperature, and soil moisture. Consider the following guidelines:

- Do not apply anhydrous ammonia in the fall on sandy soils.

- On silt loam or heavier-textured soils, wait to apply anhydrous ammonia until soil temperatures at the 4-inch depth are below 50 degrees F (records indicate in most years this will be in November).
- Use a nitrification inhibitor such as N-Serve with anhydrous ammonia to help reduce fall nitrification rates.
- To check the soil temperature in your area visit the K-State Research and Extension Weather Data Library at: <http://climate.ksu.edu>

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2. Using satellite data to help guide agronomic decisions

Use of satellite imagery is becoming widely adopted in farm operations to better guide the decision-making process of farmers. This article summarizes the basic principles of optical remote sensing applied to agricultural monitoring by describing the fundamentals, most relevant vegetation indices (VIs), and most common applications in agriculture.

Basics of Remote Acquisition

Solar electromagnetic radiation drives photosynthesis on Earth. Three things occur when the electromagnetic radiation (irradiance) hits an object. A portion of the irradiance is reflected (reflectance), a second portion is transmitted (transmittance; i.e. passes through the object), and a third portion is absorbed (absorbance) by the object (Figure 1). The proportion for each fraction (reflectance, transmittance, and absorbance) differs depending on the physical and chemical properties of the target object. Plants have a medium, low, and high reflective pattern in the green, red, and near-infrared portions of the electromagnetic spectrum, respectively. A significant portion of visible light is used as energy to trigger important biochemical processes in plants.

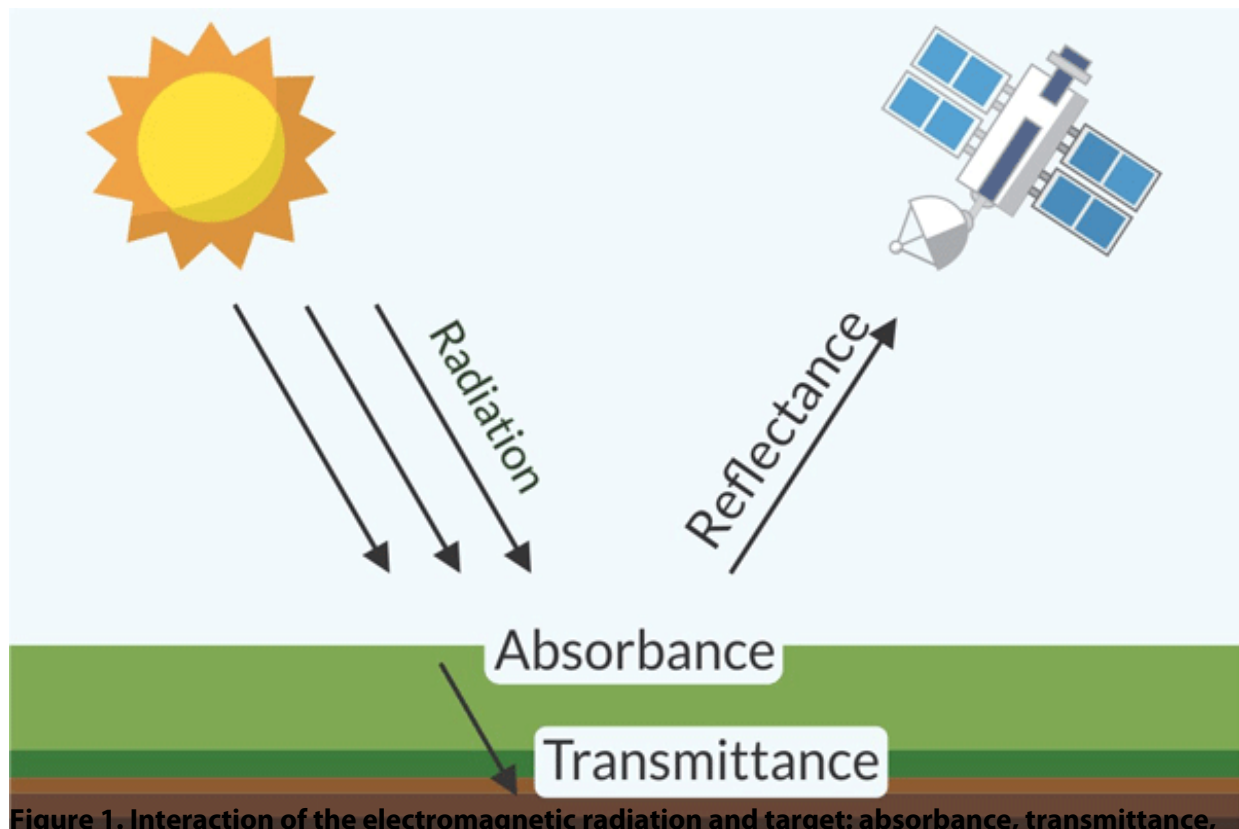


Figure 1. Interaction of the electromagnetic radiation and target: absorbance, transmittance, and reflectance. Infographic developed by Luciana Nieto and Ignacio Ciampitti, K-State Research and Extension.

The term “band” is used to identify the regions of electromagnetic spectrum where a satellite is sensitive to the reflected signal from the ground. Vegetation indices (VIs) relates different bands or (regions) and are used to derive biophysical information important to monitor the status of the crops. Multispectral on-board sensors retrieve data from the visible part of the spectrum (520-600 nanometers (nm)=green, 630-680 nm=red, and 450-520 nm=blue), infrared (IR), and microwaves. The IR band, depending on the characteristics of the satellite sensor, can also be divided into close IR or near IR (NIR=760-900 nm), medium IR (MIR) and far IR (FIR), or thermal (Table 1). As an example, the chlorophyll in the leaves absorbs more red (630-680 nm) and less green (520-600 nm) electromagnetic radiation. This is the reason why plants appear green to our eyes (more green radiation is reflected back to our eyes).

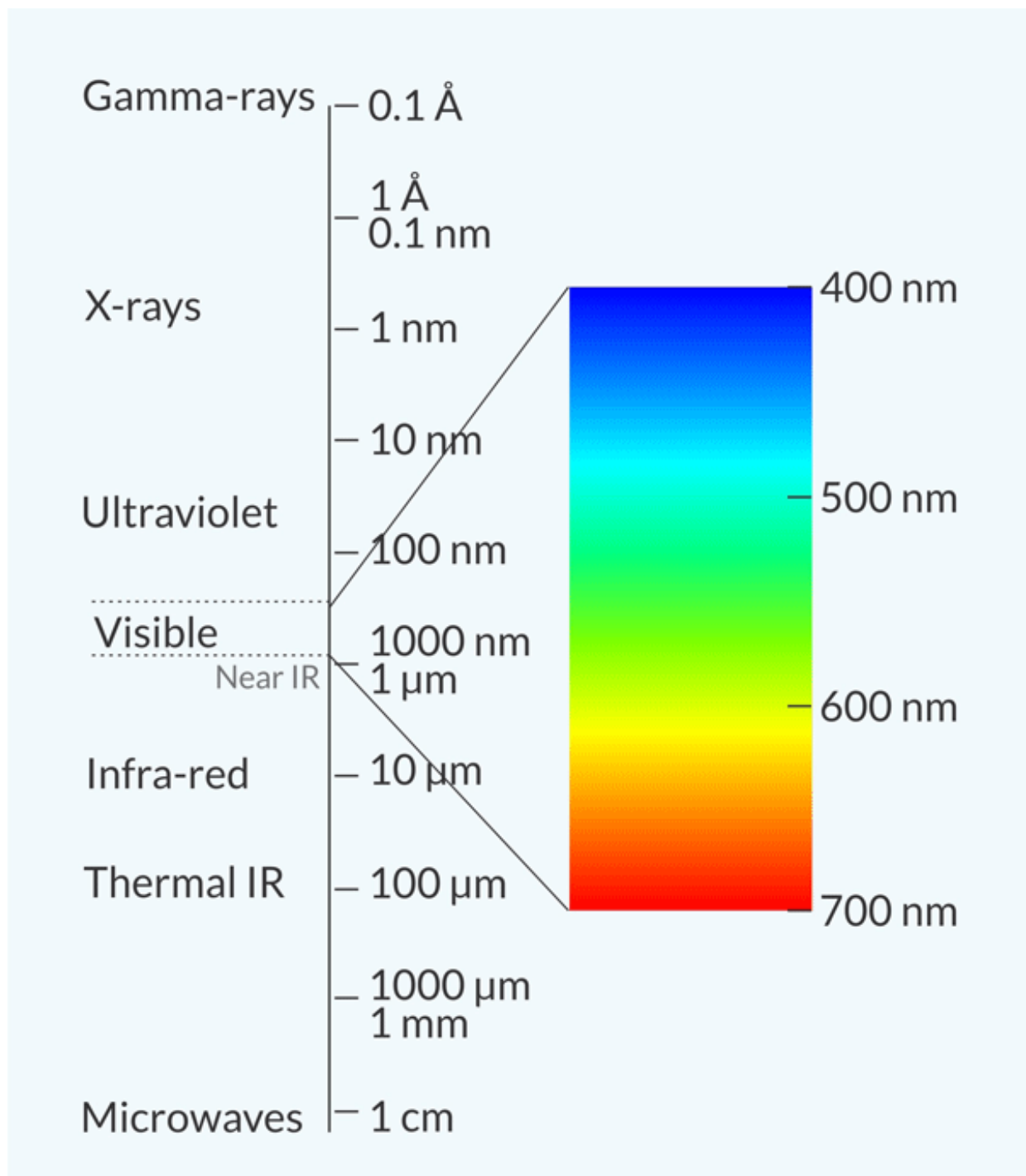


Figure 2. Graphical representation of the different portions of electromagnetic radiation spectrum organized by wavelength (nm=nanometer or 1 millionth of a meter). Infographic developed by Luciana Nieto and Ignacio Ciampitti, K-State Research and Extension.

Sources of Satellite Imagery

Many of the satellites orbiting the Earth have been mainly designed to monitor changes in land

cover. The main characteristics of the satellites for agricultural application are:

- 1) **Temporal Resolution** indicates the frequency (time interval) for obtaining imagery data from the same point on the surface.
- 2) **Spatial Resolution** refers to the level of detail visible in an image (pixel dimensions): the smaller the area represented by each pixel in a digital image, the greater the details.
- 3) **Spectral Resolution** denotes the width of the spectral bands recorded by a sensor. The narrower these bands are, the higher the spectral resolution. Table 1 presents the number of bands per satellite sensor.

Table 1. Number of bands per satellite (different sensors).

<i>Band Name</i>	<i>Modis</i>	<i>Landsat 7</i>	<i>Landsat 8</i>	<i>Sentinel 2</i>	<i>Rapid Eye</i>
<i>Red</i>	1	3	4	4	3
<i>Blue</i>	3	1	2	2	1
<i>Green</i>	4	2	3	3	2
<i>NIR</i>		4	5	8	5
<i>Red Edge</i>		-	-	5, 6, 7	4

The most commonly used sensors for agricultural applications are (Figure 3):

- **MODIS (Moderate Resolution Imaging Spectroradiometer)** sensor aboard the Terra and Aqua satellites, with a high temporal resolution (daily) but low spatial resolution. The minimum pixel size is 250 m, ideal for large-scale or regional work, for example county-level data. MODIS has a total of 36 bands.
- **Landsat**, with different mission (5, 7 and 8), has a finer spatial resolution (30 m), but with a lower temporal resolution than MODIS. The number of bands is 11.
- **Sentinel 2, A and Sentinel 2 B**, from the European Space Agency (twin satellites), these sensors allow more detailed spatial resolution (10 m) and weekly imagery data when both are functional. The number of bands is 13.

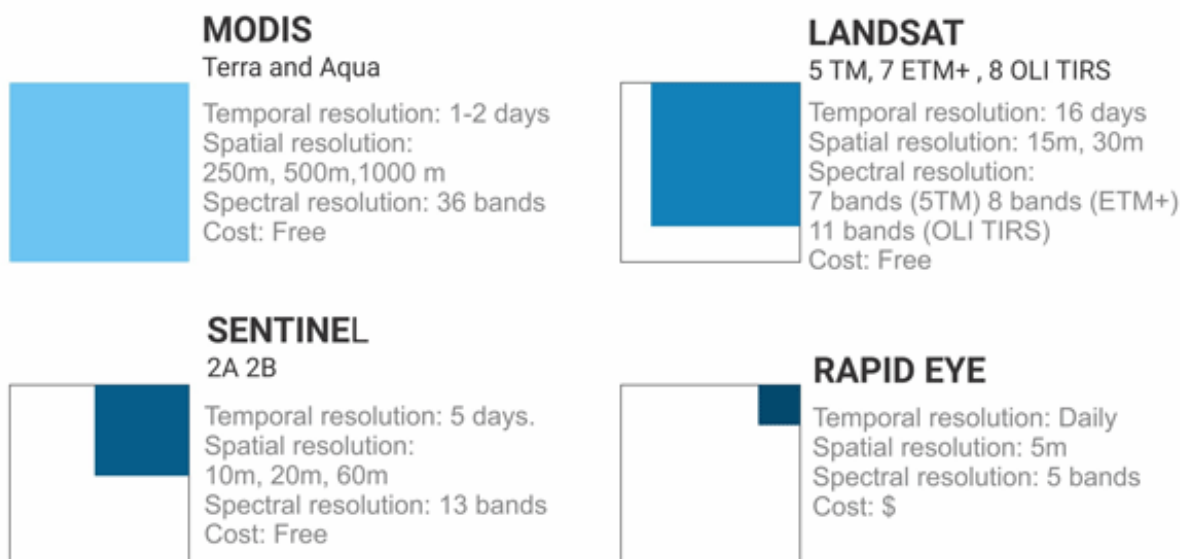


Figure 3. Different satellites and characterization for Spatial, Temporal, and Spectral resolution. Infographic developed by Luciana Nieto and Ignacio Ciampitti, K-State Research and Extension.

The satellite imagery collected via MODIS, Landsat and Sentinel are available to the public. Other commercial platforms are available such as Rapid Eye, a private satellite with a very high temporal (daily) and spatial resolution (5 m), but only with 5 bands available (Figure 3).

Vegetation Indices (VIs) and Applications in Agriculture

Vegetation indices (VIs) are combinations of certain spectral bands, which allow us to monitor changes in vegetation. Examples of some of the most commonly utilized indices are: Normalized Difference Vegetation Index (NDVI), Enhance Vegetation Index (EVI), Normalized Difference Water Index (NDWI), red edge NDVI (NDVIRE), red edge simple ratio (SRRE), and green NDVI (gNDVI).

The NDVI is universally utilized as an index for reflecting temporal and spatial differences in overall plant health and, in consequence, utilized for yield prediction. For agricultural purposes, NDVI values ranges from **0 to 1**, with values ranging from 0.1 to 0.2 for soil surfaces and 0.3 to 1.0 for crop canopies. The NDVI and the greenness of an object are positively related between each other (e.g., field crop). Some VIs with their respective equations are introduced in Table 2.

Table 2. Description, acronym, equations, and references for all vegetation indices (VIs).

Index	Acronym	Equation	Reference
Enhance Vegetation Index	EVI	$2.5 * (NIR - Red) / (NIR + 6 * Red - 7.5 * Blue + 1)$	Liu and Huete (1995)
Normalized Difference Water Index	NDWI	$(Green - NIR) / (Green + NIR)$	Gao (1996)
Normalized Difference Vegetation Index	NDVI	$(NIR - RED) / (NIR + RED)$	Rouse et al. (1994)
Green Normalized	NDVIG	$(RNIR - Rgreen) /$	Gitelson et al. (1996)

Difference Vegetation Index		(RNIR + Rgreen)	
Red-edge Normalized Difference Vegetation Index	NDVire	(RNIR-REDedge)/ (RNIR + REDedge)	Gitelson and Merzliak (1994)
Red-edge simple ratio	SRre	RNIR/REDedge	Gitelson and Merzliak (1994)

Some examples of agriculture applications:

- Early-season crop classification
- Characterization of nutrient status of the plants
- Providing an overall status of field crops and other vegetation
- Prediction of biomass levels
- Forecasting crop yields; estimating crop yield before harvest
- Flooding; water excess

Summary for Satellite Data – Applications in Agriculture

Below is a selected list of the main applications of satellite data in agriculture:

- Site-Specific Management (SSM), using prescription maps to variable seeding rate and fertilization, depending on the potential of the environments within the field.
- In-seasonal (within a season) and temporal (across seasons) monitoring of crop vegetation (diagnosis of potential stress factors such as drought, nutrient deficiencies, diseases, insects, etc.).
- Forecasting crop yields at different scales: county, district, regional, state, and national levels.
- Crop scouting and sampling according to the field dimensions.
- Environmental impact assessment, fires, floods, to track land use and land cover change.

What are we expecting for the future?

- New public satellites allowing a finer time resolution (e.g. Sentinel-3) and avoiding problems with cloud interference.
- Higher spectral resolution satellites that will benefit a more intensive monitoring of functional crop growth parameters (e.g., ESA FLEX mission - planned launch date is 2022).
- More studies to focus on how to integrate information from different satellites while taking advantage of the different features from each one.
- Development of remote sensing end-to-end solutions by agricultural providers for farmers (integration with ground sensors, mobile apps, etc.).

In summary, the future of satellite data is unknown but more exciting opportunities for several agricultural applications will be available in the near future. As a final reminder, any remote sensing data (e.g., imagery collected from satellites, drones, or planes) do not replace the need for agronomists and crop scouting. These technologies provide a reliable and timely source of data to direct our efforts and increase our efficiency in targeting the main crop production problems with the ability to react and provide 'real-time' solutions for protecting and sustaining farming productivity.

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3. Safety first when planning deep tillage or earthwork: Call before you dig!

After harvest, many producers might head to the field for deep tillage such as ripping, or to make earthwork repairs around the farm. A few days before you want to start these activities, it's worth a call to 811 for your safety and to prevent expensive damage to underground utilities. The website, <http://call811.com>, has easy-to-follow instructions for requesting this free service and detailed information concerning why you need to know what's below.

A video produced by Marathon Oil tells the story of a farm family and their close-call with a pipeline when installing tile drains. The landowner knew where the pipeline entered and exited the field, and they assumed the pipeline was straight— it wasn't. Watch this 6-minute, eye-opening video for the whole story; <https://youtu.be/oe-iknpYzF8>.

Sadly, fatal accidents do happen in soil excavations. If you dig any trenches or soil pits, safety should be considered from the very beginning of the project. Soils with sandy textures are more susceptible to a collapse than soils with a higher clay content. If standing water is present in the pit, the walls are more apt to collapse.

There are Occupational Safety and Health Administration (OSHA) [guidelines](#) on excavation safety, such as when it is necessary to shore the walls of a soil pit or trench. One important consideration is soil should be piled a minimum of 2 feet away from the walls of the trenches for two reasons:

1. Soil clods or excavating tools could roll back into the trench and cause injury to occupants.
2. Reduces the risk of a trench collapse by keeping the weight of the soil piles away from the trench edges.

Even if a soil pit is 4 feet deep or less, it is a good idea to angle the edges of the soil pit. This does create more disturbance, but if it prevents an accident, it's worth it.

For more information on trenching and excavation safety, see the following OSHA publication:

"Trenching and Excavation Safety", <https://www.osha.gov/Publications/osh2226.pdf>



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4. K-State Crop Production Schools scheduled for 2018

Nine K-State Crop Production Schools will be offered from early-January to early-February 2018 across the entire state. Each school will provide in-depth training targeted for corn, soybean, or sorghum producers.

The one-day schools will cover several current crop-related topics relevant to corn, soybean, and sorghum producers in Kansas.



- **Monday Jan 8, Hesston.**
- **Tuesday Jan 9, Garden City.**
- **Thursday Jan 11, Leavenworth.**



- **Monday Jan 22, Phillipsburg.**
- **Tuesday Jan 23, Salina.**
- **Wednesday Jan 24, Rossville.**



- **Tuesday Feb 6, Dodge City.**
- **Wednesday Feb 7, Hutchinson.**
- **Thursday Feb 8, Washington.**

Further details on the final agenda (speakers/topics), schedule, registration, and contact information for each Crop School will be available in the coming weeks.

Stay tuned for more information on all the 2018 Crop Schools!

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5. Coming this December - The 2017 Census of Agriculture

Kansas farmers and ranchers have the opportunity to make a positive impact on their communities by participating in the 2017 Census of Agriculture. Conducted every five years by the USDA's National Agricultural Statistics Service (NASS), the Census of Agriculture is a complete count of all U.S. farms and ranches as well as those who operate them.

The Census is the only source of uniform, comprehensive agricultural data for every county in the nation. It is a critical tool that gives producers a voice to influence decisions shaping the future of their community, industry and operation. The Census looks at land use and ownership, operator characteristics, production practices, income, expenditures, and other topics. This information is used by all who serve farmers and rural communities from federal, state and local governments to agribusinesses and trade associations. Answers to the Census impact farm programs and rural services that support Kansas communities. So whether you're rural or urban, working thousands of acres or just a few plots, your information matters.

Census forms will be mailed to producers in December. Completed forms are due by **February 5, 2018**. Producers may complete the Census online via a [secure website](#), or return their forms by mail.

"The updated online questionnaire is very user-friendly – it can now be used on any electronic device, and can be saved and revisited as the producer's schedule allows," said NASS Census and Survey Division Director Barbara Rater. "Responding online saves time and protects data quality. That's our mission at NASS – to provide timely, accurate, and useful statistics in service to U.S. agriculture. Better data mean informed decisions, and that's why it is so important that every producer respond and be represented."

Federal law requires all agricultural producers to participate in the Census and requires NASS to keep all individual information confidential. Remember, the Census of Agriculture is your voice, your future, your opportunity. Respond when you receive your census in December.

For more information about the process, including a list of frequently asked questions, please visit www.agcensus.usda.gov.



**2017 | CENSUS OF
AGRICULTURE**
YOUR VOICE. YOUR FUTURE. YOUR OPPORTUNITY.



COMING THIS DECEMBER
www.agcensus.usda.gov

6. Great Plains Grazing to host 'New Insights into Flash Droughts across the United States' webinar

Flash droughts are characterized by the rapid onset and development of drought conditions. These types of droughts can adversely affect vegetation health by quickly depleting root zone soil moisture and increasing moisture stress. Significant yield loss can occur in agricultural regions if a flash drought develops during sensitive stages in the growing season.

Great Plains Grazing team members, Jordan Christian and Dr. Jeffrey Basara, will present a free webinar, "New Insights into Flash Droughts across the United States", at 1:30 p.m. Thursday, November 16. This webinar is open to anyone interested in learning more about flash droughts. Specifically, webinar participants can expect to learn what defines a flash drought, hot spots for flash droughts in the U.S., and characteristics of flash drought.

Interested individuals can register for the free webinar at the following website, <http://www.greatplainsgrazing.org/webinars.html>, and clicking the "Register now" link.

Jordan Christian is a Ph.D. student working under the direction of Dr. Basara in the School of Meteorology at the University of Oklahoma. His dissertation work is focused on flash droughts, with current research investigating the characteristics and regional hot spots of flash droughts across the United States.

Dr. Basara, Associate Professor, serves as both the Director of the Kessler Atmospheric and Ecological Research Station and the Director of Research at the Oklahoma Climatological Survey. His research focuses on the integration of our understanding across weather, climate, water, and ecosystems. A large component of his research program deals with hydrometeorology – the study of the transfer of water and energy between the land surface and the atmosphere. This includes the physical processes which impact the development of the lower layer of the atmosphere; the development, validation, and improvement of weather prediction models; and severe weather, such as droughts and flash floods.

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7. Cover crop field day: November 29 in Holton, Kansas

A cover crop field day will take place on November 29 from 9:30 am to 12:00 pm. Topics to be covered include:

- Benefits of planting cover crops
- Selecting a cover crop – Midwest Cover Crop Council
- Grazing management on cover crops
- Life in the soil – Build organic matter
- Infiltration
- Funding programs available for implantation of cover crops
- Cover crops in brome – Benefits to wildlife

Featured speakers include:

- Dr. DeAnn Presley, K-State Research and Extension
- David Hallauer, Meadowlark Extension District
- Jamie Johnson, NRCS
- Tyler Warner, KDW&P
- Henry Hill and Kurt Kathrens, producers

There is no cost to attend the field day and registration is not required. The event will take place on producers Henry Hill and Kurt Kathrens' cropland fields – 254th and S Road, Holton, KS. Go 3 miles north of Holton to 254th road, then east to S Road. A noon lunch will be held at El Milagro in Holton.

For detailed information on sponsors, please see the field day flier below.

Questions should be directed to Roberta Spencer, Jackson County Conservation District, at 785-364-3329, ext. 136



Cover Crop Field Day

November 29, 2017 -

9:30 a.m. - Noon

Henry Hill and Kurt Kathrens'
Cropland Fields—254th & S Rd,
Holton, KS

3 Miles North of Holton to 254th
Road, East to S Road

Noon Lunch at El Milagro, Holton

Featured Speakers:

Dr. Deann Presley, KSU

David Hallauer, Meadowlark Extension District

Jamie Johnson, NRCS DC

Tyler Warner, KDW&P

Producers - Henry Hill and Kurt Kathrens

Topics Covered:

Benefits of planting cover crops

Selecting a Cover Crop - Midwest Cover Crop
Council

Grazing Management on cover crops

Life in the Soil—Build Organic Matter
Infiltration

Programs Available to fund cover crops

Cover Crops in Brome - Wildlife Benefits

Questions? Call (785)364-3329, ext. 136 - Roberta
Spencer, Jackson County Conservation District

Sponsored by:

Jackson County Conservation District

K-State Research & Extension

Meadowlark Extension District

Natural Resource Conservation Service

KDA-DOC "Funding provided by the KDA-
DOC through appropriation from the Kan-
sas Water Plan."

"The U.S. Department of Agriculture is an equal opportunity
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Grazing After Frost

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8. Comparative Vegetation Condition Report: October 31, 2017 - November 6, 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 45: 10/31/2017 - 11/06/2017

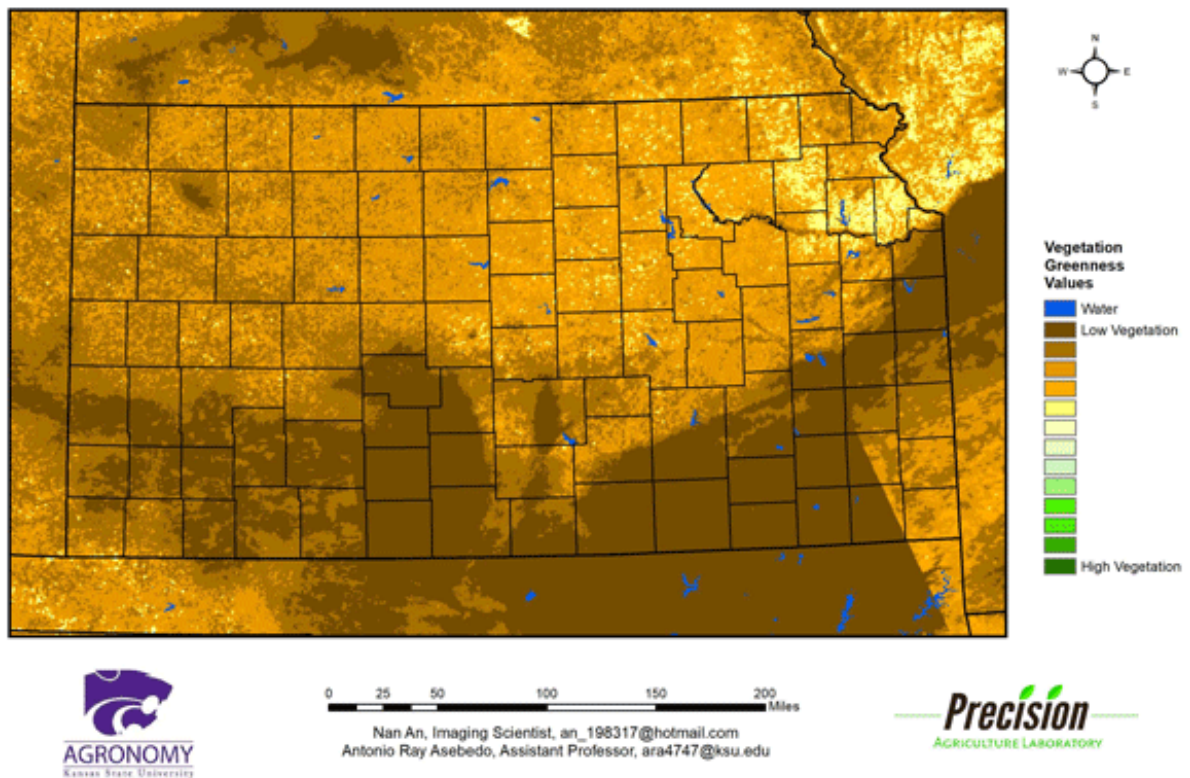


Figure 1. The Vegetation Condition Report for Kansas during October 31 – November 6, 2017 from K-State’s Precision Agriculture Laboratory shows very little vegetative activity this week, as the growing season comes to an end. Temperatures were between 5 and 9 degrees F below-normal for the week.

Kansas Vegetation Condition Comparison
Late-Oct/Early-Nov 2017 compared to the Late-Oct/Early-Nov 2016

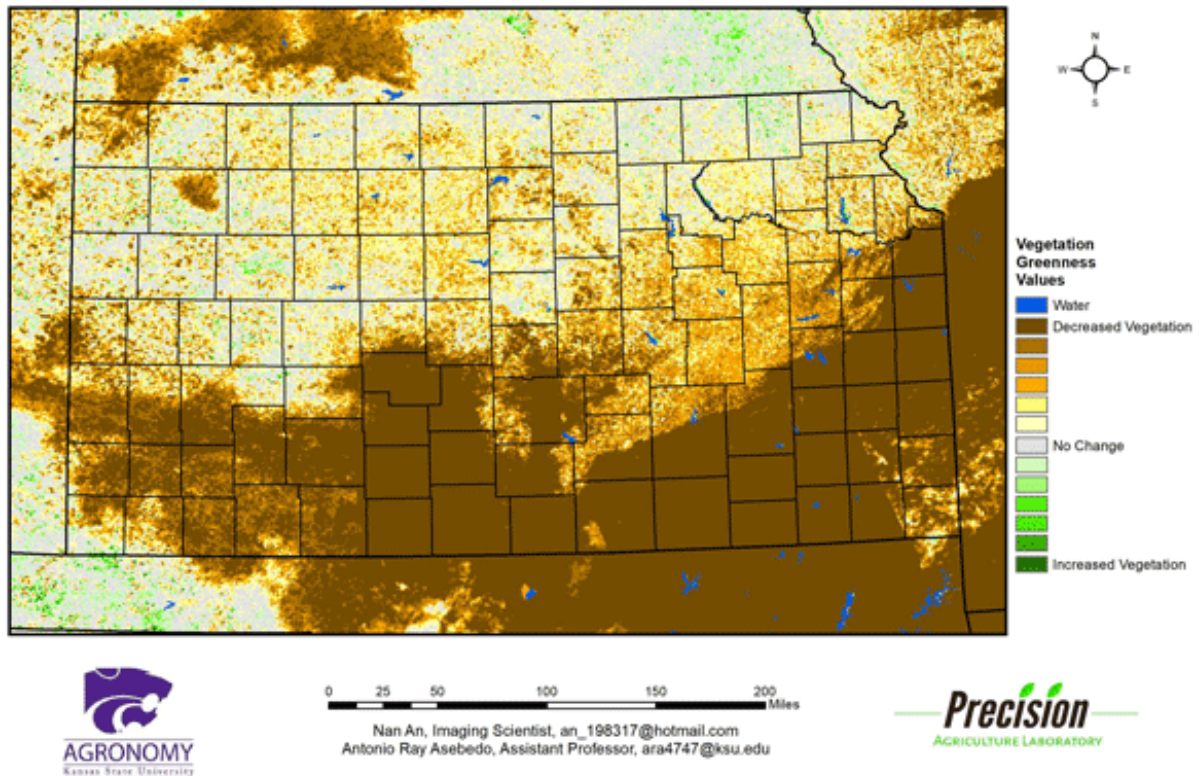


Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for October 31 – November 6, 2017 from K-State’s Precision Agriculture Laboratory shows a decrease in vegetative activity. This is particularly true in the southern third of the state, where cooler temperatures have slowed vegetative activity.

Kansas Vegetation Condition Comparison

Late-Oct/Early-Nov 2017 compared to the 28-Year Average for Late-Oct/Early-Nov

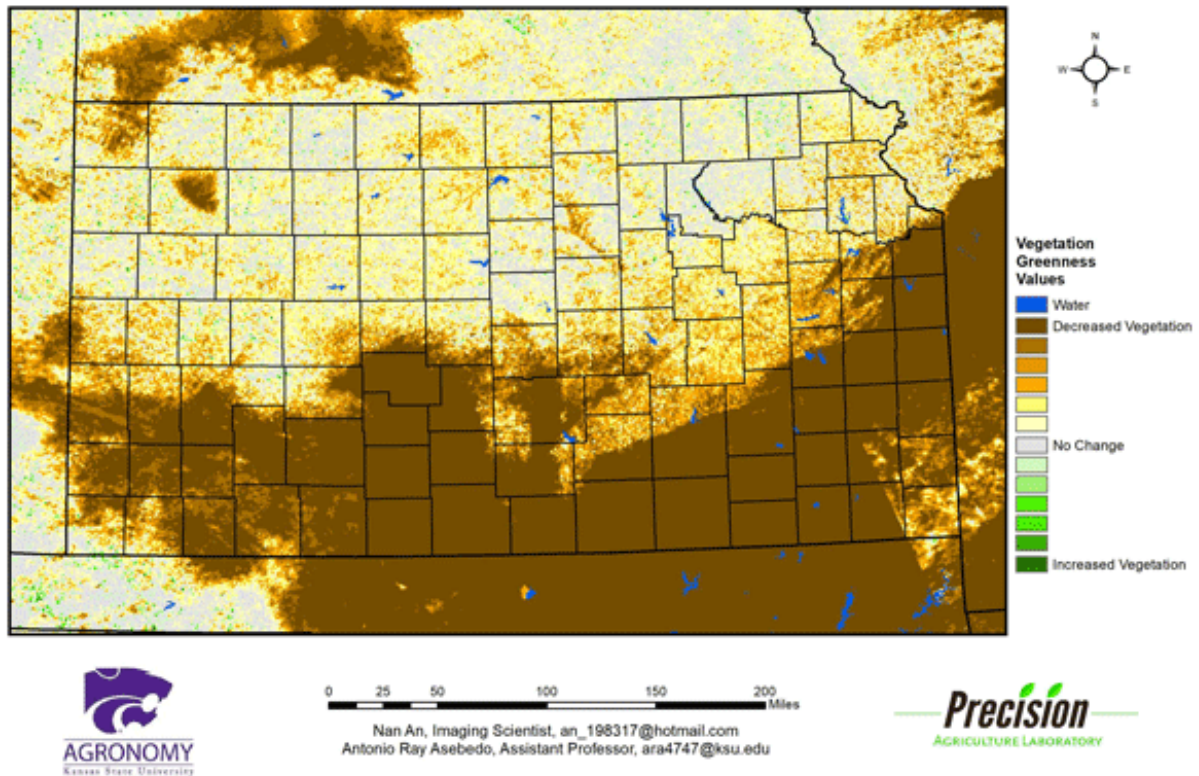


Figure 3. Compared to the 28-year average at this time for Kansas, this year's Vegetation Condition Report for October 31 – November 6, 2017 from K-State's Precision Agriculture Laboratory show much below-average conditions across the southern third of the state. Higher-than-average NDVI values are visible in eastern Kansas. These values correspond to areas of the state had a later end to the growing season with favorable moisture in the previous weeks.

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Continental U.S. Vegetation Condition

Period 45: 10/31/2017 - 11/06/2017

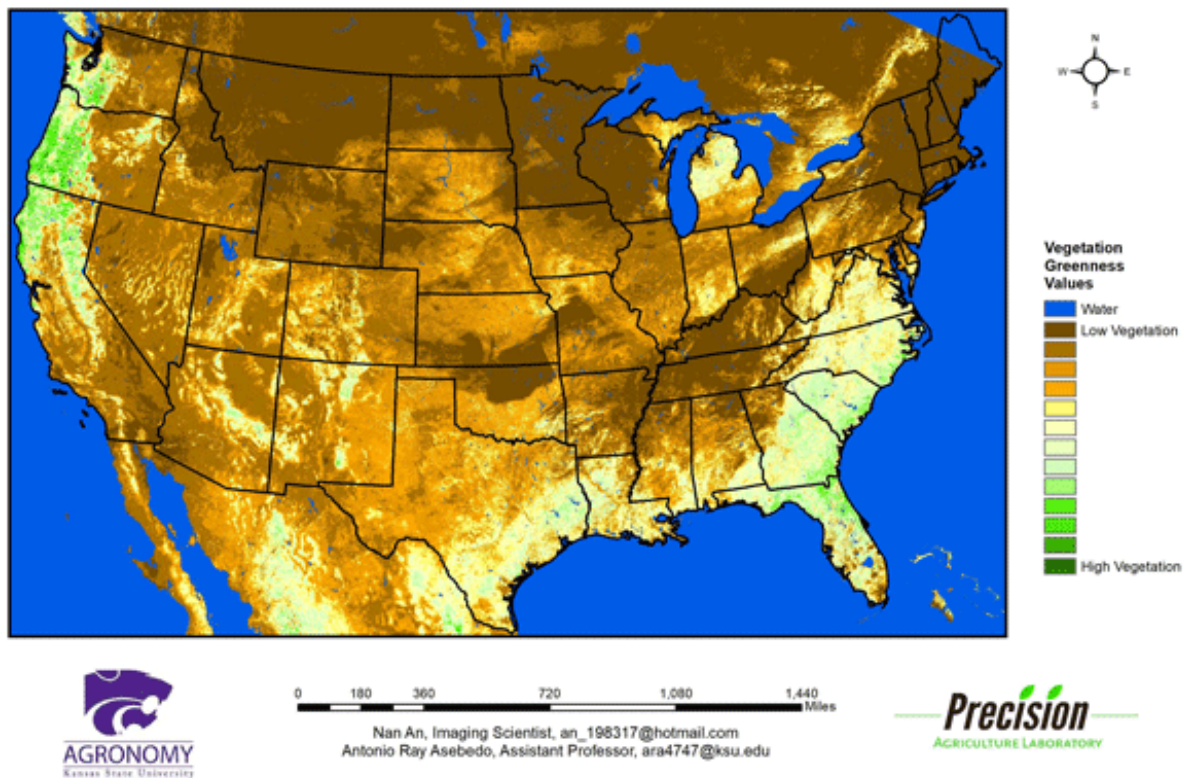


Figure 4. The Vegetation Condition Report for the U.S for October 31 – November 6, 2017 from K-State’s Precision Agriculture Laboratory shows the highest NDVI values centered along the Pacific Northwest. Clouds and cool weather have limited vegetative activity in the Central and Northern Plains.

Continental U.S. Vegetation Condition Comparison
Late-Oct/Early-Nov 2017 Compared to Late-Oct/Early-Nov 2016

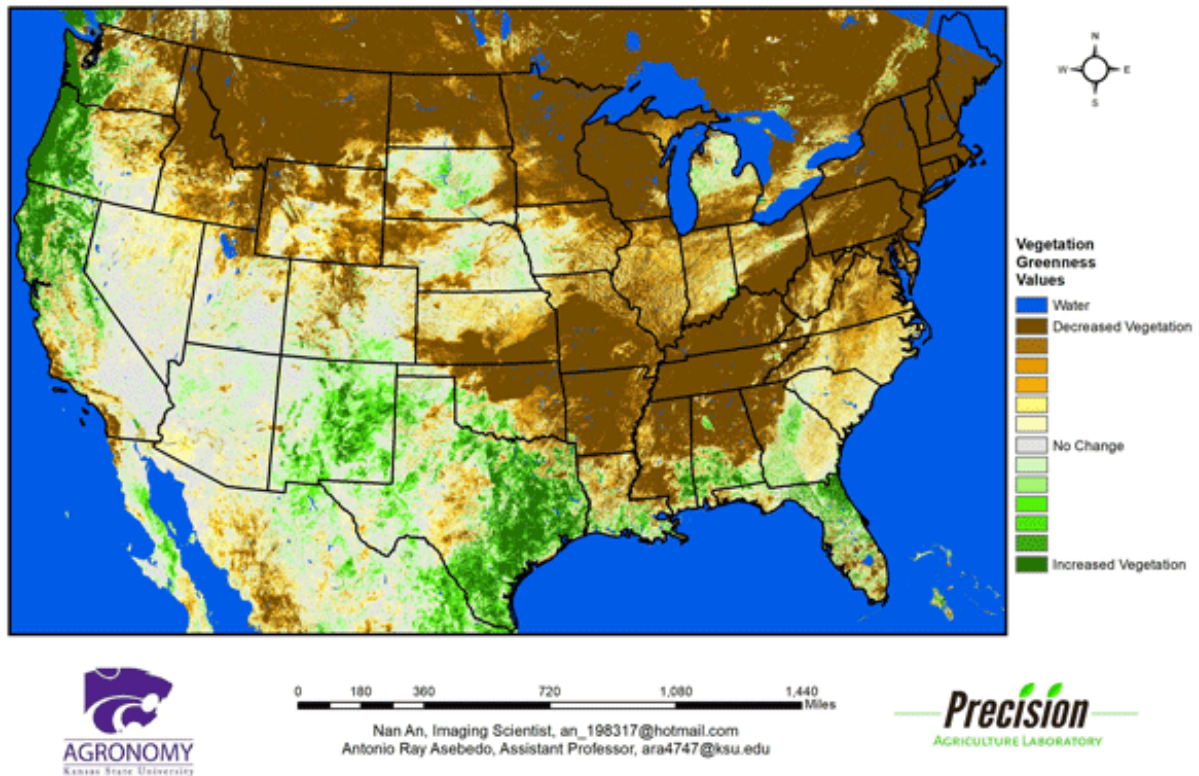


Figure 5. The U.S. comparison to last year at this time October 31 – November 6, 2017 from K-State's Precision Agriculture Laboratory shows higher NDVI values across the Pacific Northwest and eastern Texas. Last year, Montana and the Dakotas were moving into a dry pattern that became the start of the intense drought the dominated this year. This year, snow, clouds, and rain mask the vegetative activity. This also extends across southern Kansas into New England.

Continental U.S. Vegetation Condition Comparison
Late-Oct/Early-Nov 2017 Compared to 28-year Average for Late-Oct/Early-Nov

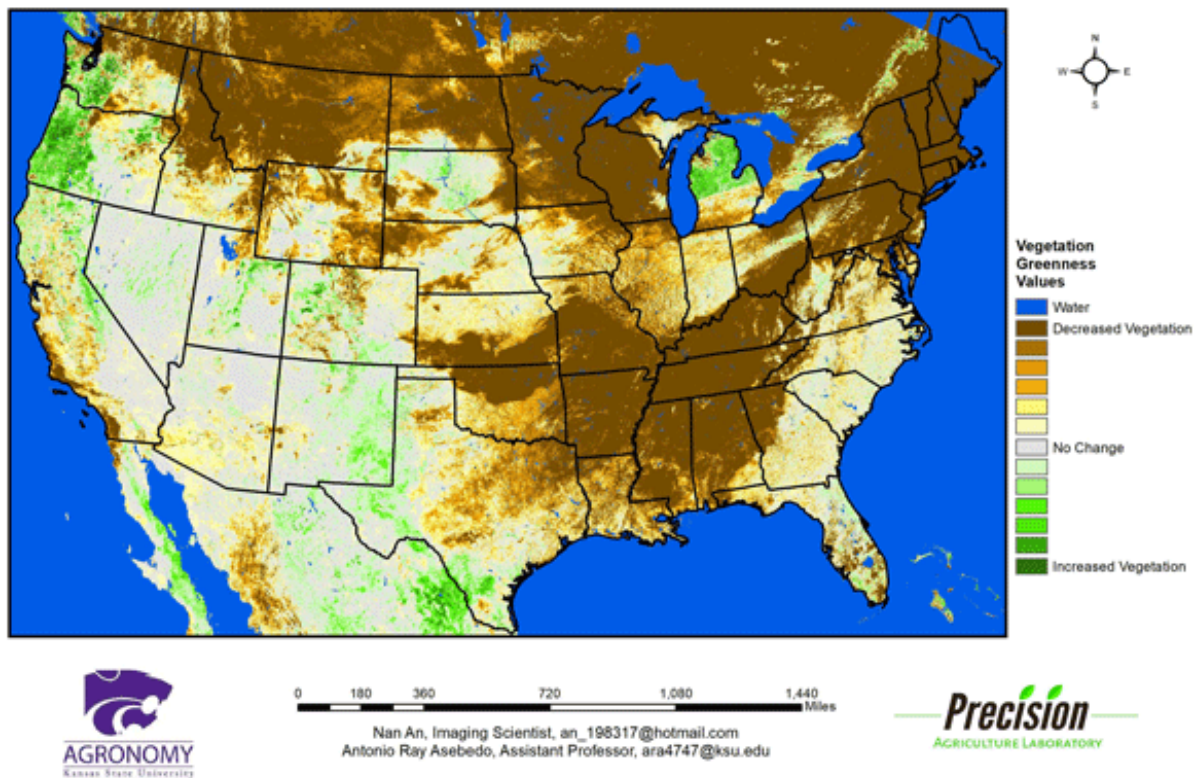


Figure 6. The U.S. comparison to the 28-year average for the period of October 31 – November 6, 2017 from K-State’s Precision Agriculture Laboratory shows a large area of below-average NDVI values across the northern United States and from the Ohio River Valley to the lower Mississippi Valley. These low NDVI values are the result of persistent cloud cover, coupled with snow and/or rain in the regions.

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