



Extension Agronomy

eUpdate

09/12/2014

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, Jim Shroyer, Crop Production Specialist 785-532-0397 jshroyer@ksu.edu, or Curtis Thompson, Extension Agronomy State Leader and Weed Management Specialist 785-532-3444 cthompso@ksu.edu.

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1. Low temperatures: Late-season freeze damage?

The low temperatures experienced in the early morning hours of September 12 might have some impact on the summer row crops, primarily in northwest and west central Kansas. The main question is: How will the low temperatures affect each crop? The answer won't be immediately known, but symptoms of low temperature injury might be seen in the next coming weeks.

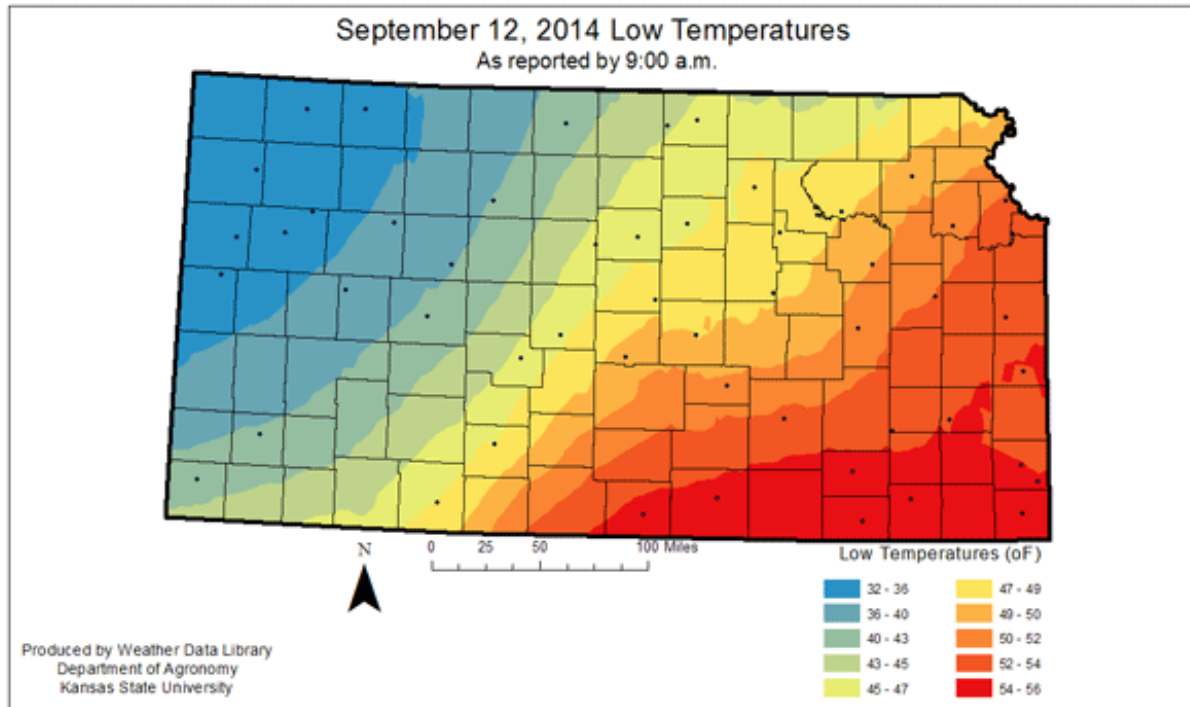


Figure 1. Map of the overnight low temperatures on September 12, 2014.

Corn:

In most of the state corn is at the dent stage or beyond. Corn will mature when the black layer is formed at the lower section of the kernel. Depending on the relative maturity of the hybrid, corn requires 200-240 growing degree units from dent stage until maturity (black layer). In terms of days, this growing degree requirement will be related to the air temperatures in the coming days. This may be about 20 days (plus or minus 10), but it will depend on the temperature until maturity. This assumes 20-24 growing degrees per day.

Corn is affected when temperatures are below or at 32 F. The lower the temperature, the less exposure time it will require to cause damage. Clear skies, low humidity, and minimum or no wind conditions can promote damaging frost even when temperatures are above 32 F. The temperatures of about 35 degrees F experienced during the early morning hours of September 12, especially in northwest and west central Kansas, can cause variable freeze damage, depending on the growth stage and position in the field among other factors. A proper assessment is recommended a week after the frost event. Green leaf canopy may be affected. Seed size and quality can also be impacted if the corn is in an early reproductive stage (dough vs. dent growth stages).

Soybean:

Most of the Kansas soybean crop has already set pods and is entering into the final reproductive stages (grain filling and senescence - dropping leaves). Low temperatures below 32 F can interrupt the seed filling in soybeans. Yield impacts can be expected when soybean are not yet at the R6 growth stage (full seed size). Similarly to corn, temperatures below 30 F can kill the soybean plants. With soybeans, the absolute temperature value is more important than the duration of the cold stress. The greatest damage is at temperatures less than 28 degrees F. If frost damage occurs when soybeans are at the beginning seed stage (R5, seeds are 1/8 inch long in the pod of one of the four uppermost nodes), yield can be dramatically impacted by the effect of the freeze on seed number and size. As the crop approaches maturity, the impact of a freeze event on soybean yields declines.

Sorghum:

Kansas's sorghum has already headed and almost half of the crop is coloring. Still, low temperatures might impact the crop through reductions in seed weight. Lower temperatures will decrease the growth rate of the seed, impacting seed size and making the harvesting process more difficult. Small and lightweight grain will be difficult to be thresh. The temperatures experienced last night may kill leaves, but if the conditions were not below 30 F, the plant will continue the grain filling until maturity (black layer). A freeze will kill the sorghum plant if the stalks are frozen, which would create an impediment for the flow of nutrients from the plant to the grain, stopping seed growth and impacting final yields. Freeze damage lowers the test weight of grain sorghum. In general, the less developed the sorghum is at the time of the killing freeze, the lower its test weight will be.

More information about the effect of these low temperatures will be provided in the next coming weeks. Stay tuned.

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2. Estimating seed counts in sorghum heads for making yield projections

The process of estimating grain sorghum yield potential was discussed in last week's Agronomy eUpdate (see: <http://ksu.ag/1pUo4U6>).

The three key components needed to estimate grain sorghum yield are the number of heads per acre, the number of seeds per head, and seed weight (number of seeds per pound). Perhaps the most tedious of these components to measure is the number of seeds per head. The total number of seeds per head can vary from 100 to 5,000 seeds per head, but most heads have between 1,500 and 2,500 seeds per head. That's a lot of seeds to count in just one head! A quick method of estimating seed counts would be useful.

Making a good estimate of seed number is especially important to getting a good estimation of yield. The number of seeds per head is better correlated with final sorghum yields than seed weight (Figure 1A & B, respectively).

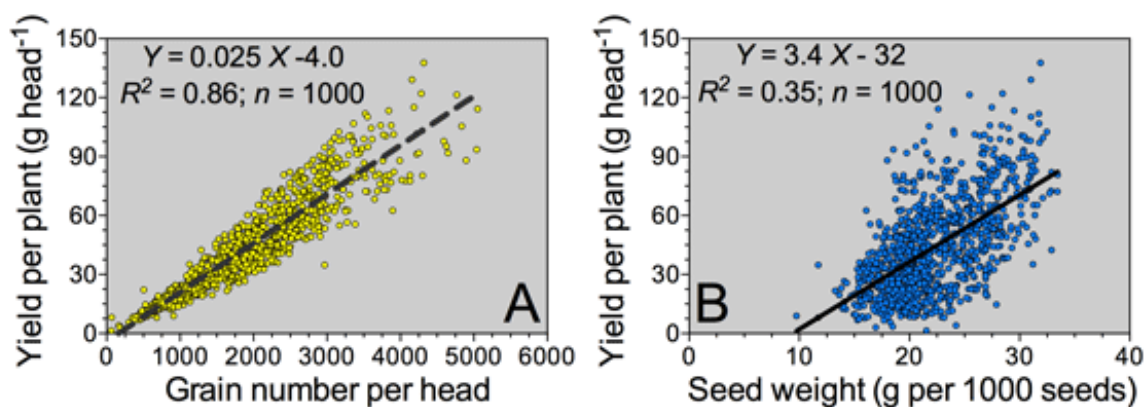


Figure 1. Relationship between yield components, grain number per head (A, left panel) and seed weight (B, right panel), and final yield per plant.

As mentioned in last week's article mentioned above, we are currently working on a new method for making a quick estimation of the grain number. In our new method, the estimation is based on predicting the final head volume.

We are exploring two approaches: 1) allometric estimations and 2) head imagery.

Allometric calculation: Briefly, the allometric calculation is an estimation of the head volume through measurements of head diameter (width) and length, with final calculation using a spherical volume equation (Figure 2). This tool provides a fair prediction of the final grain number (Figure 3).

In addition, we quantify the relative frequency in variation for head length and width for all sorghum heads. The most frequent numbers for head length ranged from 8 to 12 inches; while head width varied mostly from 1 to 3 inches. In average commercial sorghum hybrids, yield variation is more related to increments in head width than modifications in head length.

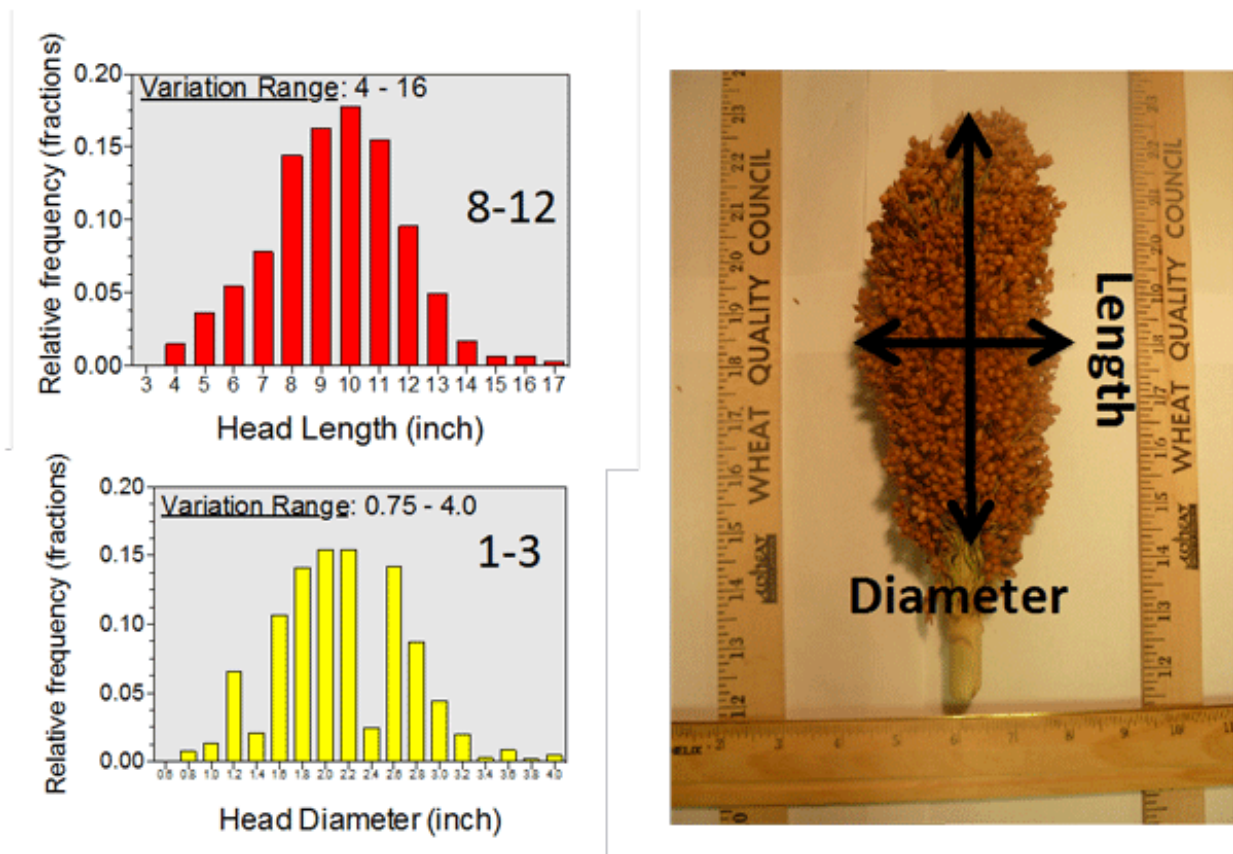


Figure 2. Allometric determination of head volume via measurement of head length and diameter (width). Photo by Ignacio A. Ciampitti, K-State Research and Extension.

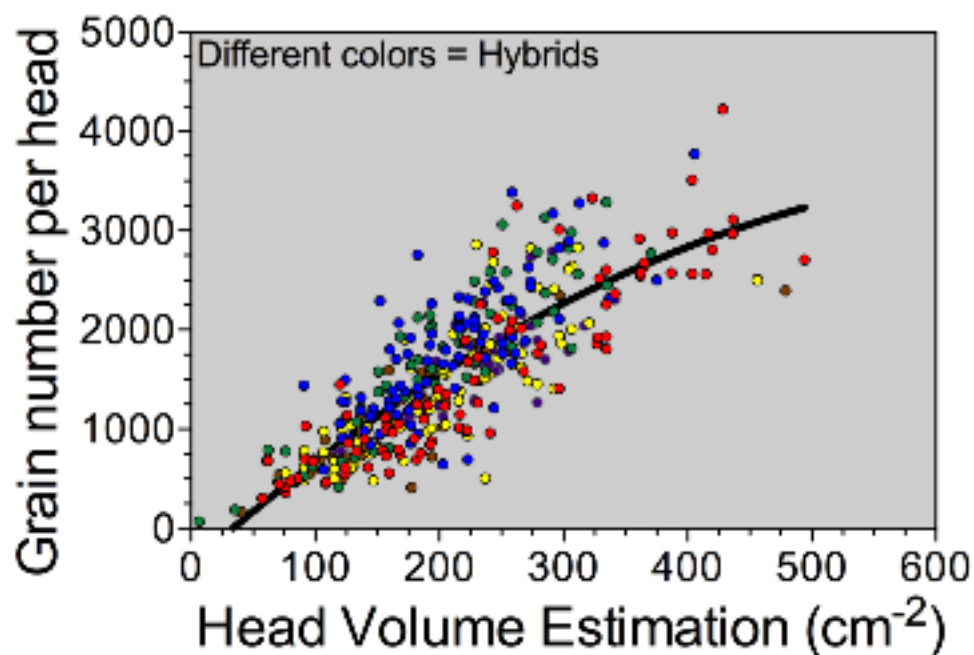


Figure 3. Fair correlation between head volume estimation using the allometric method and actual grain number per head.

Head imagery: The second approach is via head imagery. In this method, all you need to do is take a photo of a head and the computer program will estimate the head volume. This approach seems to be more accurate and less labor-intensive than the allometric method. At present, we are working on a way to automatize this process and develop an App for making sorghum yield estimation prior to harvest.

There will be more details about this project in coming months.

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3. Gypsum vs. lime: Facts about minerals

Evaporite minerals occur naturally in Kansas as geologic deposits. As the name would imply, these form by the evaporation of sea water millions of years ago.

Gypsum and limestone are two evaporite minerals found in Kansas and used for agricultural amendments. Some facts:

- Lime is CaCO_3 . The chemical name is calcium carbonate.
- Gypsum is $\text{CaSO}_4 \cdot \text{H}_2\text{O}$. It can occur in many forms. Selenite is the crystal form shown in the photo below. The powdery form mined for sheetrock and agriculture is called alabaster.
- Lime and gypsum can both be used to supply calcium as a fertilizer.
- Gypsum contains sulfur (S) and a ton of gypsum contains about 320 pounds of S.
- Lime is used to increase soil pH.
- Gypsum does not affect soil pH. Elemental S is the correct form to use to reduce pH.
- Gypsum's most common use in Kansas agriculture is to remediate sodic soils.
- Gypsum is ≈ 200 times more soluble than lime.
- Gypsum is usually only found naturally in the soil profiles of the more arid parts of the state.
- Lime occurs as nodules of calcium carbonate deep in the soil profile in most of eastern Kansas. In western Kansas, it can occur very near the surface.
- "FGD" stands for flue gas desulfurization. FGD gypsum is produced at coal-burning power plants in the process of removing S from the air emissions, and is approved for land-application in Kansas.



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Figure 1. Gypsum (in selenite form) outcrop in Hodgeman County. Photo by DeAnn Presley, K-State Research and Extension.

For more information, see a 2011 Extension publication titled "Gypsum as an agricultural amendment" by L. Chen and W.A. Dick, Ohio State University, at:

<http://ohioline.osu.edu/b945/b945.pdf>

For more on saline and sodic soils, refer to the eUpdate:

https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=87

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4. Hessian fly fall activity on wheat

Recent rains in Kansas will cause some Hessian fly adults to begin emerging from the overwintering flaxseed. Summer survival of the Hessian fly is usually enhanced under no-till or reduced-till systems.

One of the most critical times in the life cycle of Hessian fly, from the perspective of newly planted wheat, is late summer and early fall. The Hessian fly lives through the summer in residue of wheat, wheat-related species, rye, and barley as brown, 1/8-inch long capsule-like cases (puparia) commonly called flaxseeds.

Tiny, fragile flies emerge from the flaxseed on warm fall days from August through November, often after a rain. It does not take much moisture to get adult fly activity. We have had spikes in activity from just fog/heavy dew events.

The adult Hessian fly is a tiny, dark-colored insect about 1/8-inch long that resembles a gnat. These adults only live for one to three days, during which time they mate. After mating, females lay eggs in the leaf grooves of fall-seeded (preferably seedling) wheat. Though tiny, eggs can be seen with the unaided eye and resemble early stages of wheat leaf rust.

Only a portion of the population will emerge as adults at any one time. Some flaxseeds survive in a dormant stage for weeks, months, or even years. This makes the exact source of an infestation difficult to document and allows additional broods to develop. Under favorable weather conditions, volunteer wheat present in or adjacent to infested fields can support development of a summer brood. Injury to volunteer wheat is of little consequence, but the individuals arising from this brood may produce a secondary fall brood that is likely to injure the planted crop.

After the eggs are laid on wheat, they will hatch into tiny larvae within three to 10 days. These larvae migrate downward during the night when humidity is high. Larvae cannot survive exposed on the leaf surface. They move down the plant between the sheath and stem, stopping just above the crown, generally just below the soil surface. Larvae feed by withdrawing sap from the plant for eight to 30 days. Temperature influences development, and most larvae mature before the onset of cold weather. Mature larvae are shiny, whitish, legless and headless maggots about 3/16-inch long. Full-grown larvae gradually form flaxseed, and just as in the summer, the insects pass the winter in this flaxseed stage.

Fall infestations are not always conspicuous at first. Infested shoots are stunted and sometimes killed. The entire stand may be lost, especially if significant infestation occurs while plants are in the seedling stage. If tillering has begun at the time of infestation, only individual tillers may actually be killed. Examination of an infested tiller usually reveals an undeveloped central shoot with an unusually broad and thickened, bluish-green leaf. To confirm the diagnosis, carefully remove the plant and roots from the soil. Look closely for maggots or flaxseeds by gently pulling the leaf sheath away from the stem and inspecting all the way down to the base of the plant.



Figure 1. Wheat infested with Hessian fly (left) compared with non-infested wheat. Photos by Holly Schwarting, K-State Research and Extension.



Figure 2. Hessian fly puparia, or "flaxseed," on wheat.

For more information, see K-State publication MF-2866, *Hessian Fly*, at:
<http://www.ksre.ksu.edu/bookstore/pubs/MF2866.pdf>

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5. Calibration of yield monitors

Row crop harvest has begun, or will soon begin, in many areas of the state. While we are focused on harvesting grain, it's also important to remember the other harvest we have going on -- the harvest of yield data.

Why collect yield data?

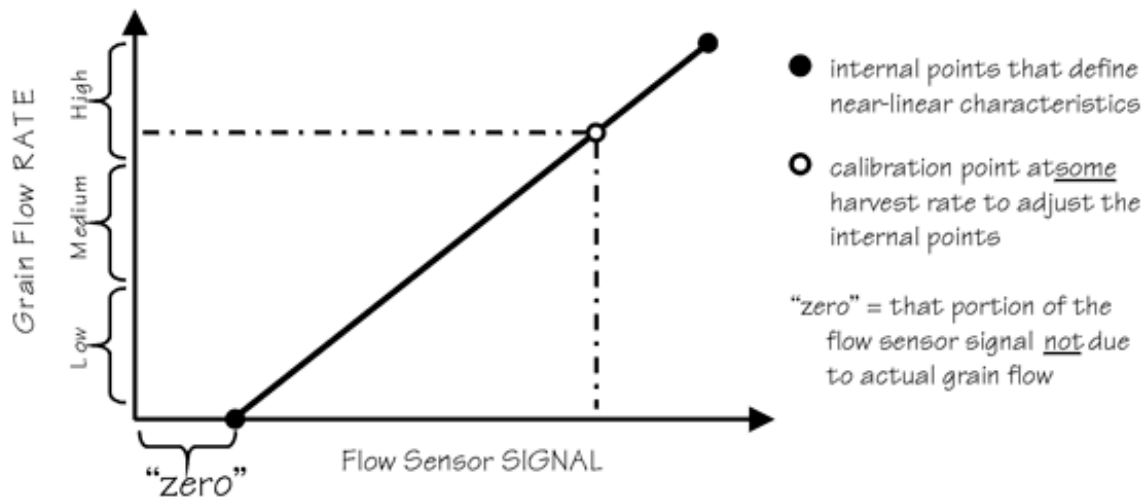
Crop yield, or yield potential, is the basis of almost all agronomic decision-making. Everything from nitrogen rates to seeding rates are tied to yield potential, either explicitly or implicitly. Yield varies spatially within a field, and yield monitor data is the only way to truly quantify spatial variability in crop yield within a field.

Yield monitoring systems and calibration

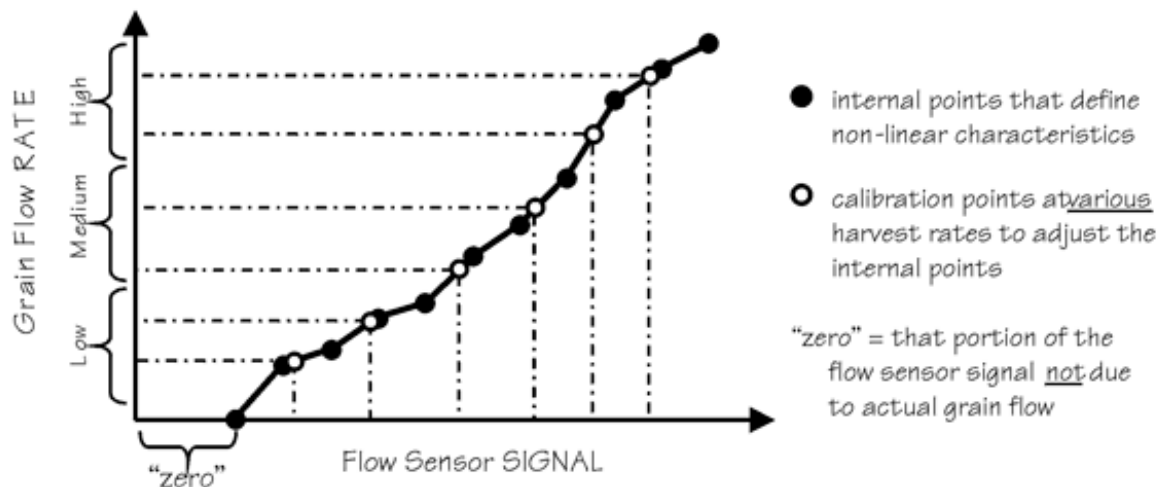
Most commercial yield monitoring systems work by measuring mass (weight) over a given area, and assigning that value to a geographic location via GPS. Grain mass is measured by a mass flow sensor located at the top of the clean grain elevator. Grain moisture is obtained by a capacitance-type sensor that is placed in the flow of clean grain somewhere on the combine. The grain moisture sensor is calibrated by adjusting the average moisture content of a yield monitor load to the moisture of a sample. Ideally this is conducted while harvesting an area of the field that is relatively uniform in moisture content.

It is important to keep the top of the clean grain elevator chain and paddles at the proper distance to the mass flow sensor, as this affects the trajectory of grain into the sensor's strike plate. Any change in this distance must be accompanied by recalibration of the monitor; distances outside of tolerance will result in reduced accuracy. It is important that proper calibration procedures are implemented so that the system can correlate a measured force to a known mass. The type of calibration to be performed depends on your yield monitoring system. A yield monitor can either be a single point (often 2 point) linear or a multi-point calibration. The differences between calibration methods are illustrated below:

(a) Example “near-straight” (near-linear) grain flow calibration curve.



(b) Example “not-straight” (non-linear) grain flow calibration curve.



Common single point systems on the market include Greenstar systems in John Deere combines prior to the S-series and Gleaner factory equipped combines. The multi-point method is used by Case-IH, AgLeader, and S series John Deere systems.

It is important to remember that a yield monitor is only as good as the calibration performed on it. A suggested flow calibration procedure for a multi-point type monitor is illustrated below. The full flow pass is done with full width and while “pushing” harvest speed. The resulting flows are then accomplished by traveling at a steady speed while using fractions of the available header width. For example, if running an 8-row head the operator would harvest 8, 6, 4, and 2 rows at the same ground speed to get the varying flow rates. Calibration loads should be between 3,000 and 6,000 lbs and taken from as uniform of an area in the field as possible. Using large calibration loads (i.e. truck loads) for a multi-point calibration will result in reduced accuracy.

Full Flow

Blank Area	¼ Full Flow	Blank Area
	½ Full Flow	
	¾ Full Flow	
	Additional Pass As Needed	

After completing calibration, errors should be in the range of 1.5 – 2.5% and must be less than 3% if the data is to be used for USDA Risk Management Agency (RMA) yield reporting purposes. Different calibrations are needed for each crop and multiple calibrations may be needed for extreme changes in crop type or condition (i.e. high moisture corn vs. drier corn).

In general, calibrations should be fairly stable across years unless changes are made to the clean grain elevator or yield monitor system components. Be aware that while some yield monitors will back-calculate and correct previous harvest data with the new calibration, not all will. For those yield monitors that cannot correct previous data it is important to perform calibration early in the harvest season.

Benefits of using properly calibrated yield monitors

Changes in RMA procedures regarding the use of precision agriculture technology have opened up many opportunities. Yield monitor data can be used to document production for APH (actual production history) reporting. Yield monitors data can also be used to report production separately for different practices in a given area even when the entire area is planted and harvested together (e.g. pivot corners and irrigated).

It is important to note than in order to meet RMA requirements the producer must have GPS technology integrated into the planter monitor, combine yield monitor, and yield mapping software. All three technologies are required if precision agriculture technology is to be used to provide information for RMA. Yield monitors used for RMA reporting must be calibrated to less than 3% error and the calibration procedure must be documented.

It is important to regularly transfer the data from your yield monitor to the datacard or flashdrive for transfer to your PC and to keep backup copies of the raw files on the card. It is best to evaluate yield data immediately after harvest while your observations from the operator's seat are fresh in your mind.

Summary

Many opportunities exist to make decisions such as site-specific agronomics based on yield monitor data. Although you may not be ready to make a move into site-specific agronomic management today, having multiple years of high-quality yield monitor data will be invaluable when making this step in the future. Just make sure the yield monitors are properly calibrated so that the data is reliable. It's better to have no data than bad data.

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6. K-State Research and Extension to Host Field Day at Columbus September 26

K-State Research and Extension will host a field day at Columbus on September 26. The event will start at the Cherokee County 4-H building located at 114 W. Country Rd. in Columbus. Registration will begin at 8 a.m., with the program beginning at 8:30. Coffee and donuts will be furnished by the Columbus Chamber of Commerce.

Several topics will be discussed during the morning presentations by K-State faculty:

- Crop Production in Southeast Kansas - Gretchen Sassenrath, Southeast Agricultural Research Center Crop Production Agronomist
- Cover Crops and Soil Health - DeAnn Presley, Soil and Water Conservation Specialist
- Corn and Soybean Disease Update - Doug Jardine, Plant Pathology Specialist
- Annual Forage Crops for Grazing - Jaymelynn Farney, Southeast Area Beef Systems Specialist
- Grain Sorghum Management in Southeast Kansas - Doug Shoup, Southeast Area Crops and Soils Specialist

Lunch will be provided after the presentations, sponsored by Ag Choice of Weir, Bartlett Coop, Beachner Grain, DeLange Seed, Farmers Coop of Baxter Springs and Columbus Kansas, Faulkner Grain, Kansas Alliance for Wetlands and Streams, McCune Coop, Modern Ag, and DuPont Pioneer. Booths will be available to visit with the sponsors.

Following lunch, the program will move to the Southeast Agricultural Research Center Columbus experiment field located 2 miles west of the intersection of Hwy 160 and K-7 then 2.5 miles north.

Demonstrations at the experiment field will include:

- Changes in Soil Health with Management Practices - DeAnn Presley
- Cover Crops in Crop Rotations - Gretchen Sassenrath
- Grazing Preferences of Cattle - Dale Helwig, Cherokee County Research and Extension Agent
- Cattle Rumen Microbiology - Jaymelynn Farney

For more information, contact Dale Helwig, Cherokee County Research and Extension, at 620-429-3849 or dhelwig@ksu.edu.

7. Comparative Vegetation Condition Report: August 26 - September 8

K-State's Ecology and Agriculture Spatial Analysis Laboratory (EASAL) produces weekly Vegetation Condition Report maps. These maps can be a valuable tool for making crop selection and marketing decisions.

Two short videos of Dr. Kevin Price explaining the development of these maps can be viewed on YouTube at:

<http://www.youtube.com/watch?v=CRP3Y5Nlggw>

<http://www.youtube.com/watch?v=tUdOK94efxc>

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 25-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.

NOTE TO READERS: The maps below represent a subset of the maps available from the EASAL group. If you'd like digital copies of the entire map series please contact Nan An at nanan@ksu.edu and we can place you on our email list to receive the entire dataset each week as they are produced. The maps are normally first available on Wednesday of each week, unless there is a delay in the posting of the data by EROS Data Center where we obtain the raw data used to make the maps. These maps are provided for free as a service of the Department of Agronomy and K-State Research and Extension.

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

Kansas Vegetation Condition

Period 36: 08/26/2014 - 09/08/2014

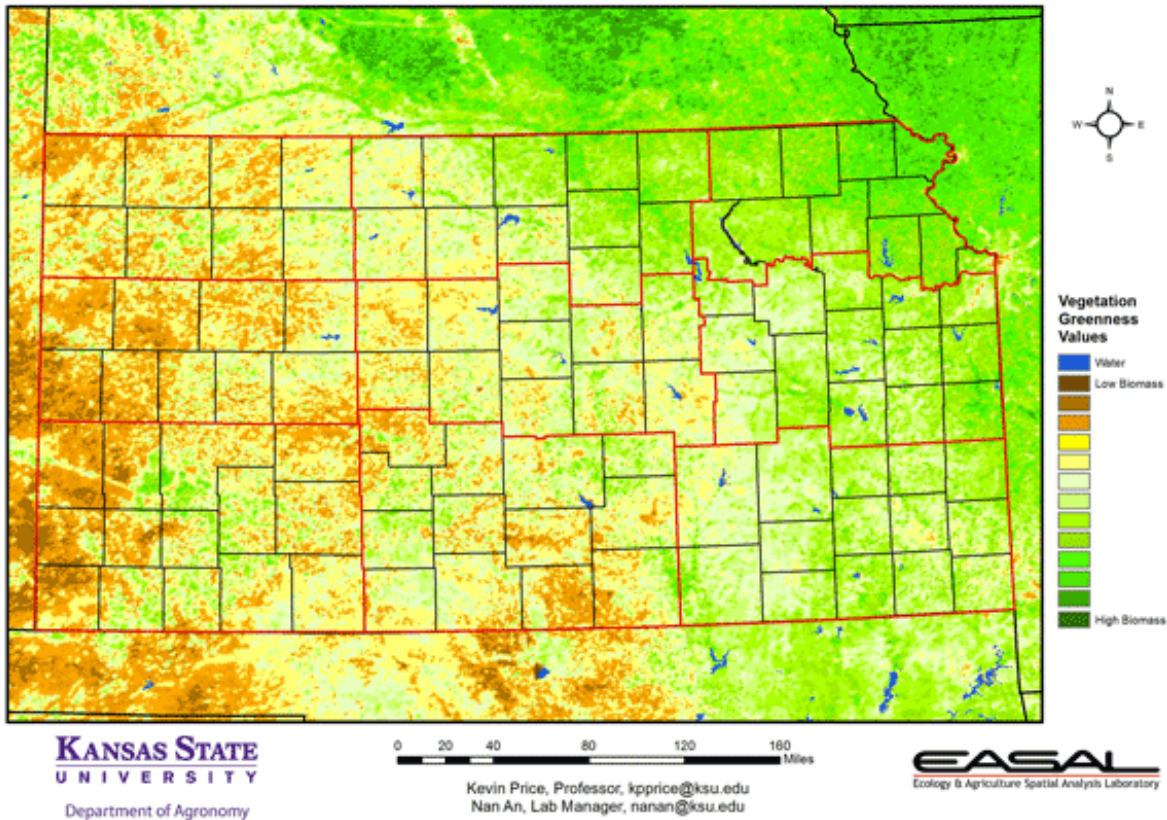


Figure 1. The Vegetation Condition Report for Kansas for August 26 – September 8 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the highest biomass production continues to be in northeast Kansas. Higher values are also seen in southwest Kansas along and south of the Arkansas River Valley.

Kansas Vegetation Condition Comparison

Late-Aug/Early-Sept 2014 compared to the Late-Aug/Early-Sept 2013

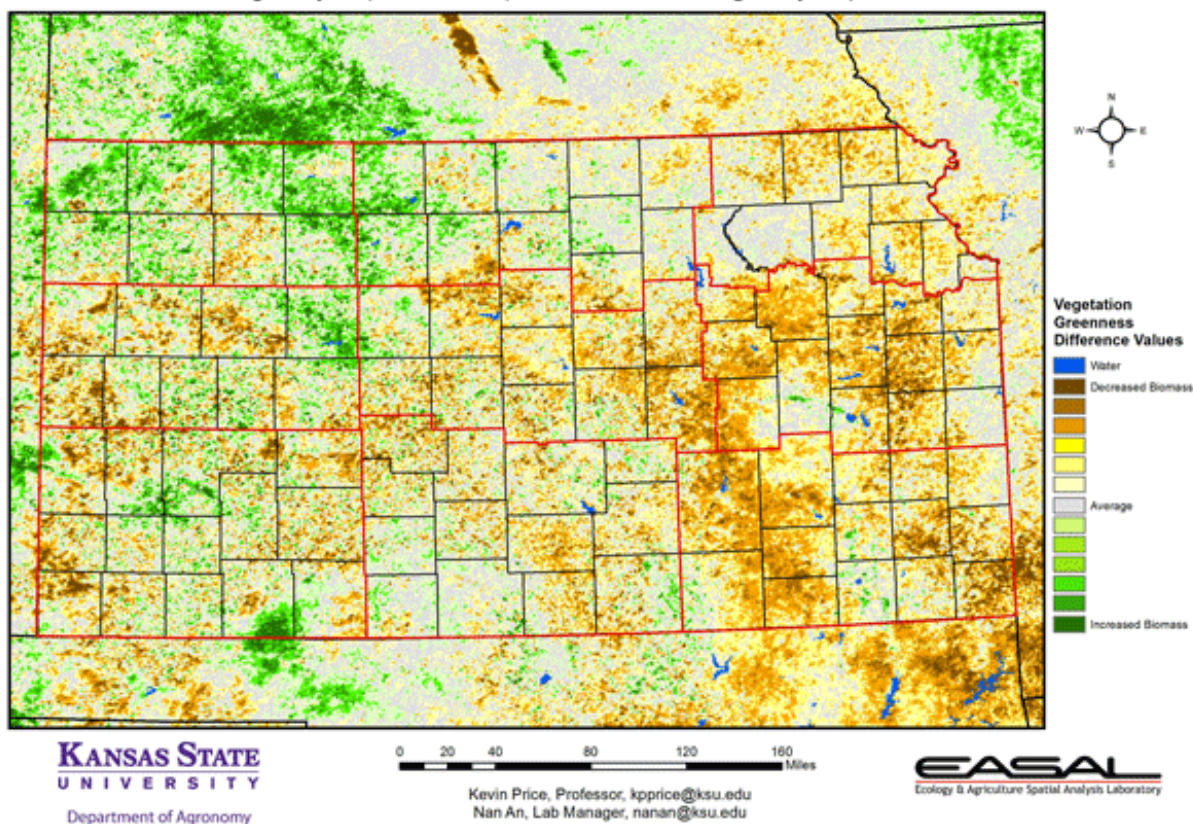


Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for August 26 – September 8 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the greatest increase is in northwest Kansas. Southern Meade County also has much higher NDVI values than last year at this time. In contrast, from the Flint Hills through east central and southeast Kansas, NDVI values are much lower than last year at this time. In southeast Kansas, 85 percent of the corn is mature and 60 percent has been harvested.

Kansas Vegetation Condition Comparison

Late-Aug/Early-Sept 2014 compared to the 25-Year Average for Late-Aug/Early-Sept

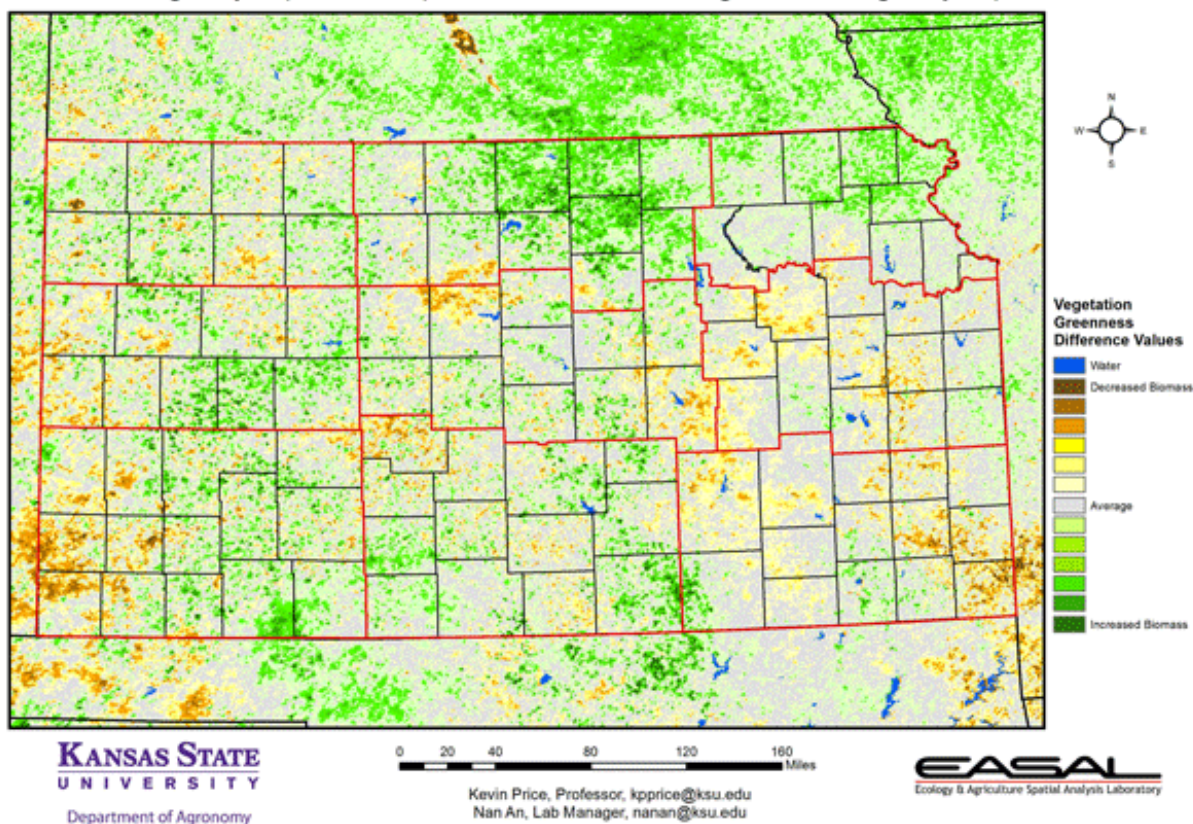


Figure 3. Compared to the 25-year average at this time for Kansas, this year's Vegetation Condition Report for August 26 – September 8 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows north central KS has the greatest increase in biomass production. Stanton and Morton counties in the southwest continue to have lower-than-average biomass production.

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U.S. Corn Belt Vegetation Condition

Period 36: 08/26/2014 - 09/08/2014

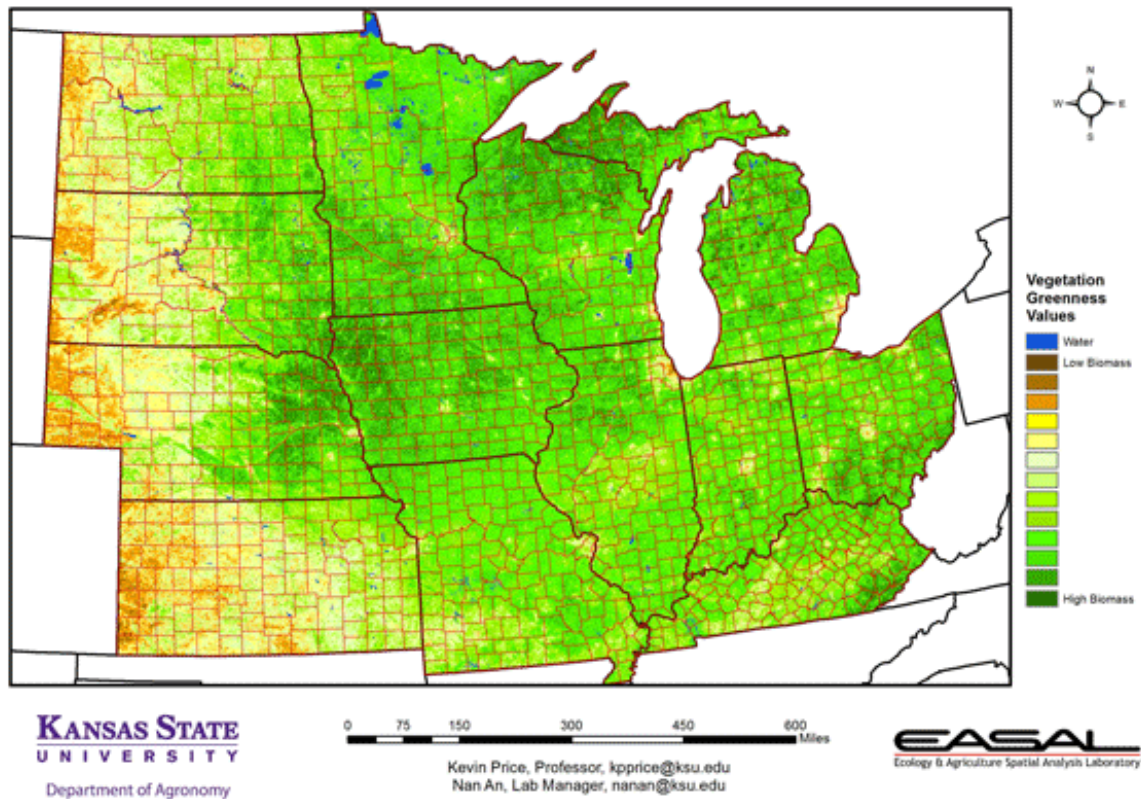


Figure 4. The Vegetation Condition Report for the Corn Belt for August 26 – September 8 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that photosynthetic activity is highest in the central portion, from northeastern Nebraska through the Upper Peninsula of Michigan. High photosynthetic values can also be seen in the Black Hills of South Dakota, along the Platte River in western Nebraska and along the Arkansas River in western Kansas. Cooler temperatures and favorable moisture have enhanced biomass production in these areas.

U.S. Corn Belt Vegetation Condition Comparison
Late-Aug/Early-Sept 2014 Compared to Late-Aug/Early-Sept 2013

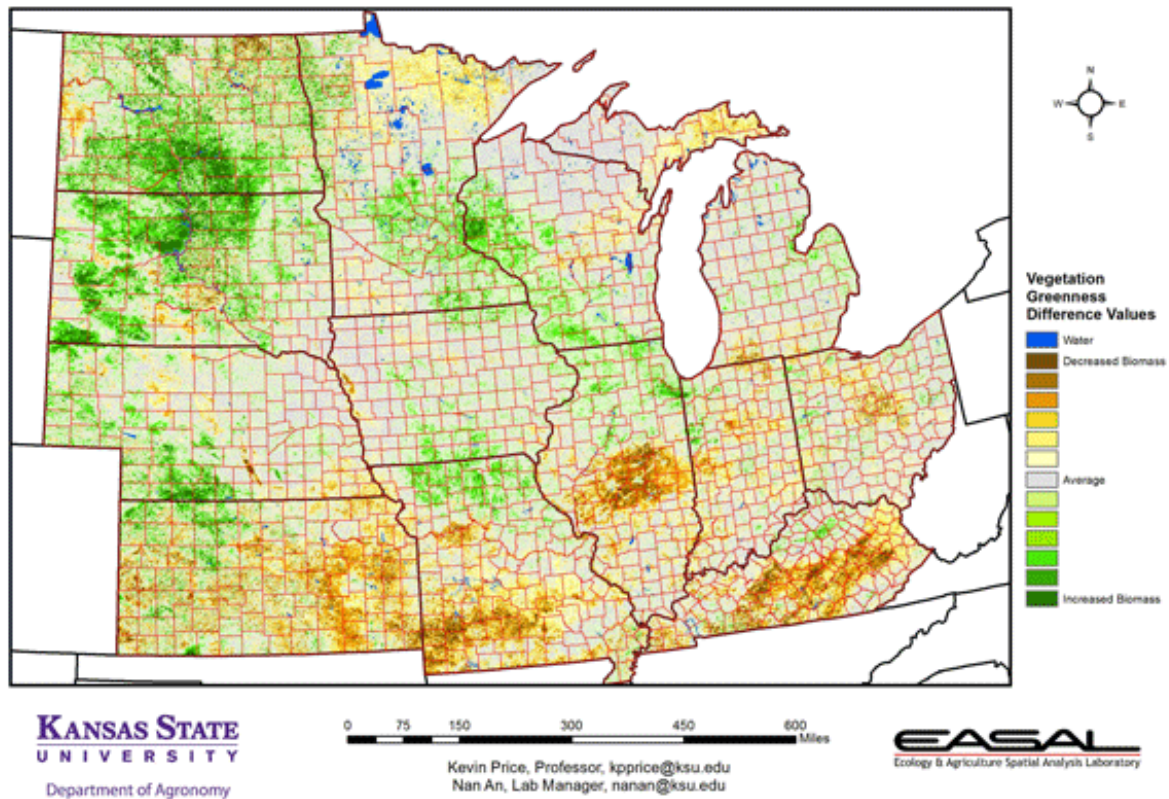


Figure 5. The comparison to last year in the Corn Belt for the period August 26 – September 8 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the Dakotas have much higher NDVI values, while southern Missouri and Kentucky have much lower NDVI values. Last year, Kentucky reported more than 85 percent of the corn in good to excellent condition. This year, less than 60 percent of the corn is reported in good to excellent condition.

U.S. Corn Belt Vegetation Condition Comparison
Late-Aug/Early-Sept 2014 Compared to the 25-Year Average for Late-Aug/Early-Sept

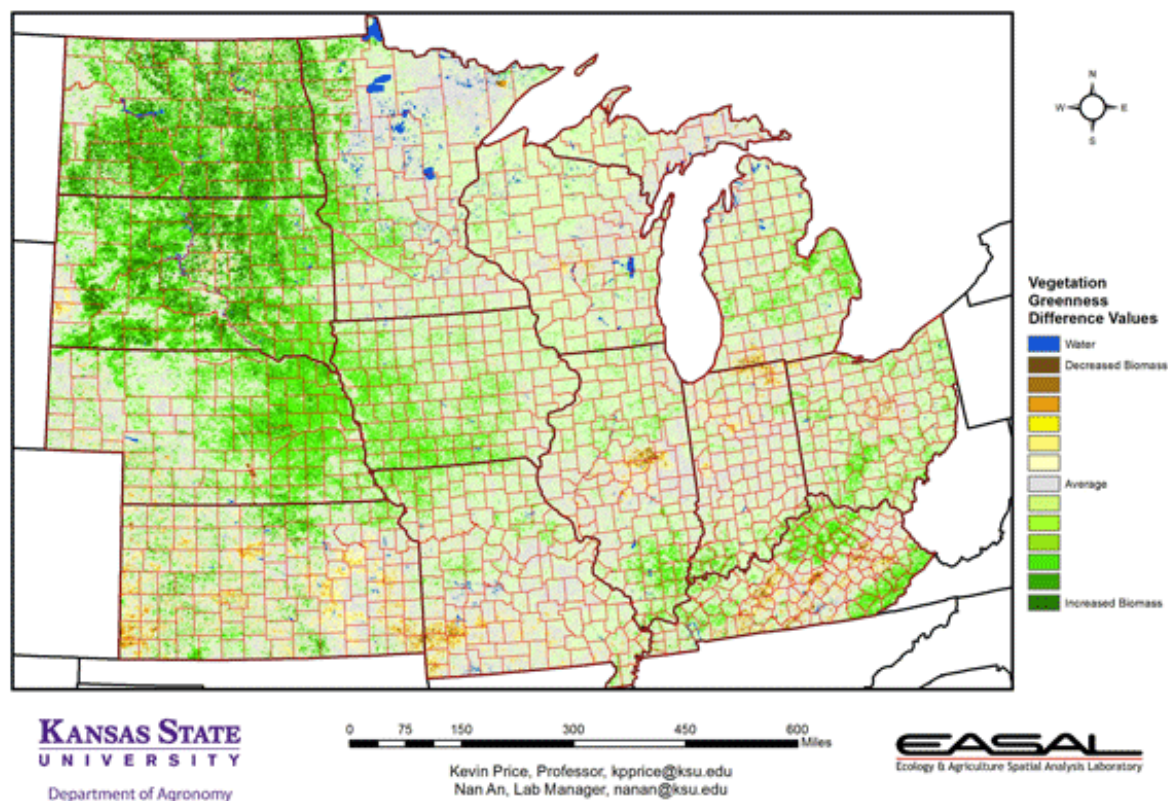


Figure 6. Compared to the 25-year average at this time for the Corn Belt, this year's Vegetation Condition Report for August 26 – September 8 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that most of the region is close to average. The Dakotas and eastern Nebraska are showing much higher biomass production. In North Dakota, pastures are reported at 84 percent in good to excellent conditions. The concern is that the cool, wet weather continues to delay row crop development and wheat harvest.

Continental U.S. Vegetation Condition

Period 36: 08/26/2014 - 09/08/2014

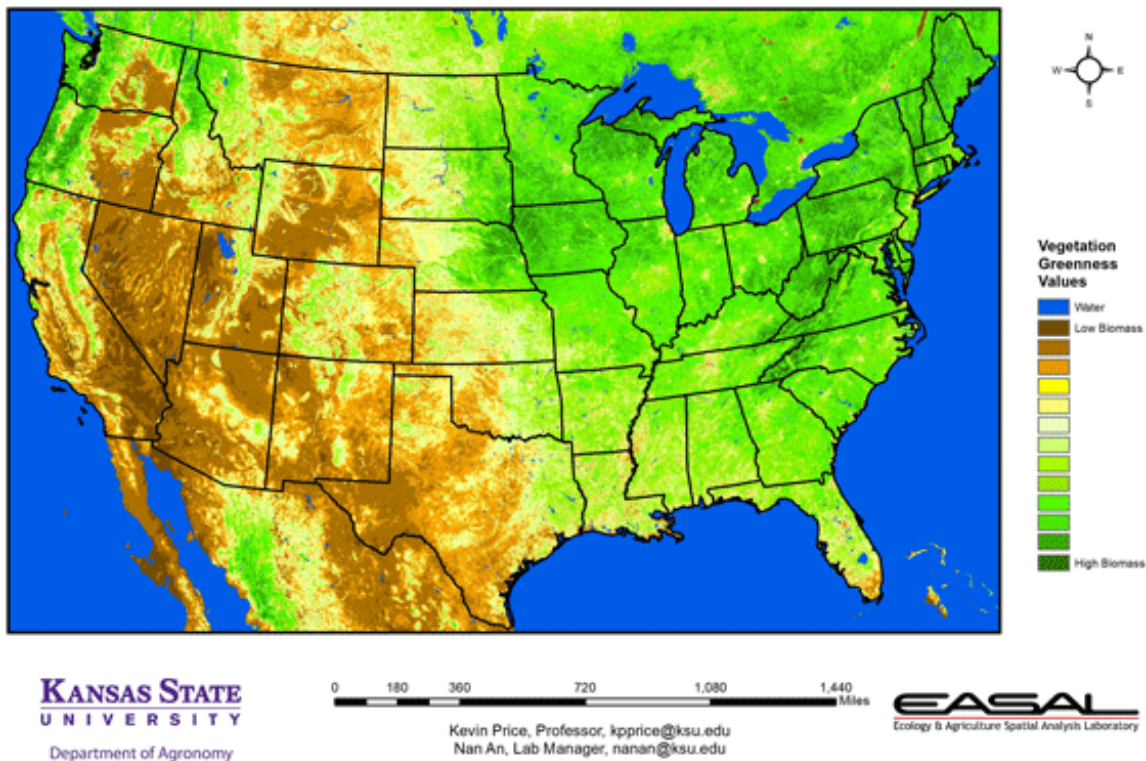


Figure 7. The Vegetation Condition Report for the U.S. for August 26 – September 8 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the highest NDVI values continue to be in the upper Midwest and along the Appalachians. High biomass production is also visible along the Cascades in the Pacific Northwest. ...

Continental U.S. Vegetation Condition Comparison
Late-Aug/Early-Sept 2014 Compared to Late-Aug/Early-Sept 2013

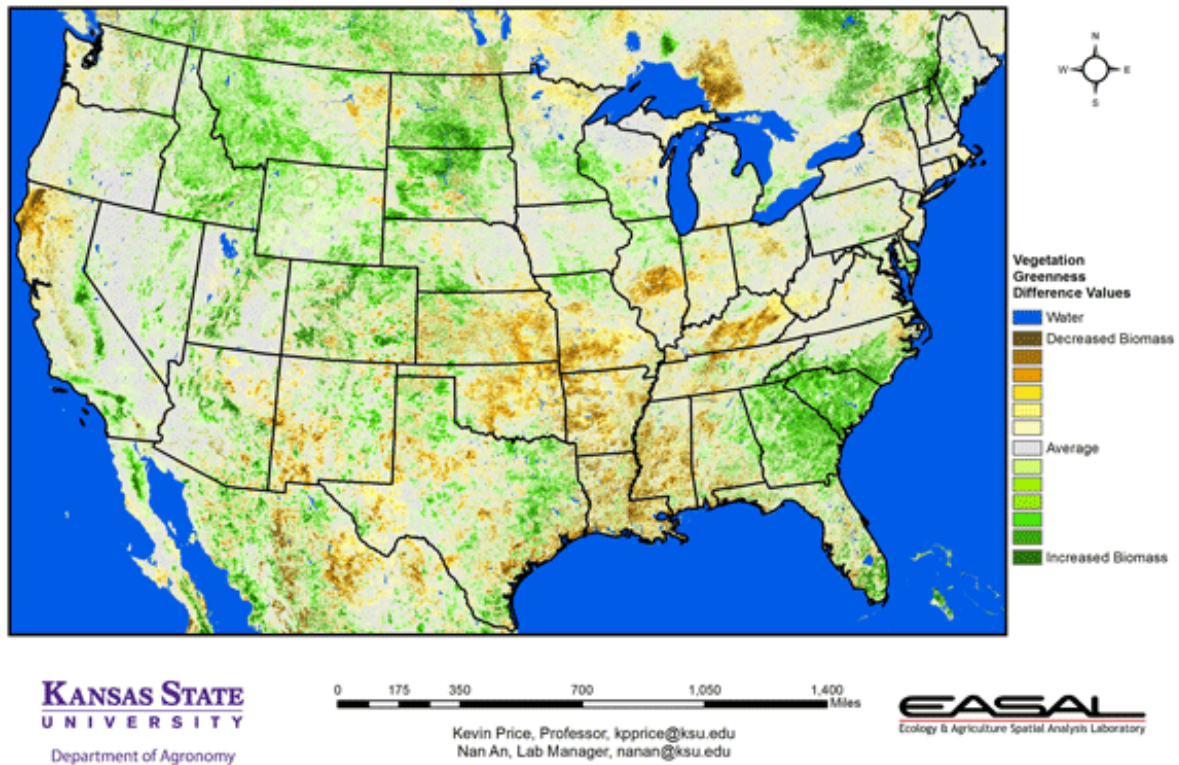


Figure 8. The U.S. comparison to last year at this time for the period August 26 – September 8 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that much lower NDVI values are visible in northern California and in parts of the South, particularly in Arkansas, Louisiana, and Alabama. In the South, wetter conditions are the major factor rather than drought. In Louisiana, only 11 percent of the topsoil moisture is reported short compared to an average of 40 percent at this time of the year.

Continental U.S. Vegetation Condition Comparison
Late-Aug/Early-Sept 2014 Compared to 25-year Average for Late-Aug/Early-Sept

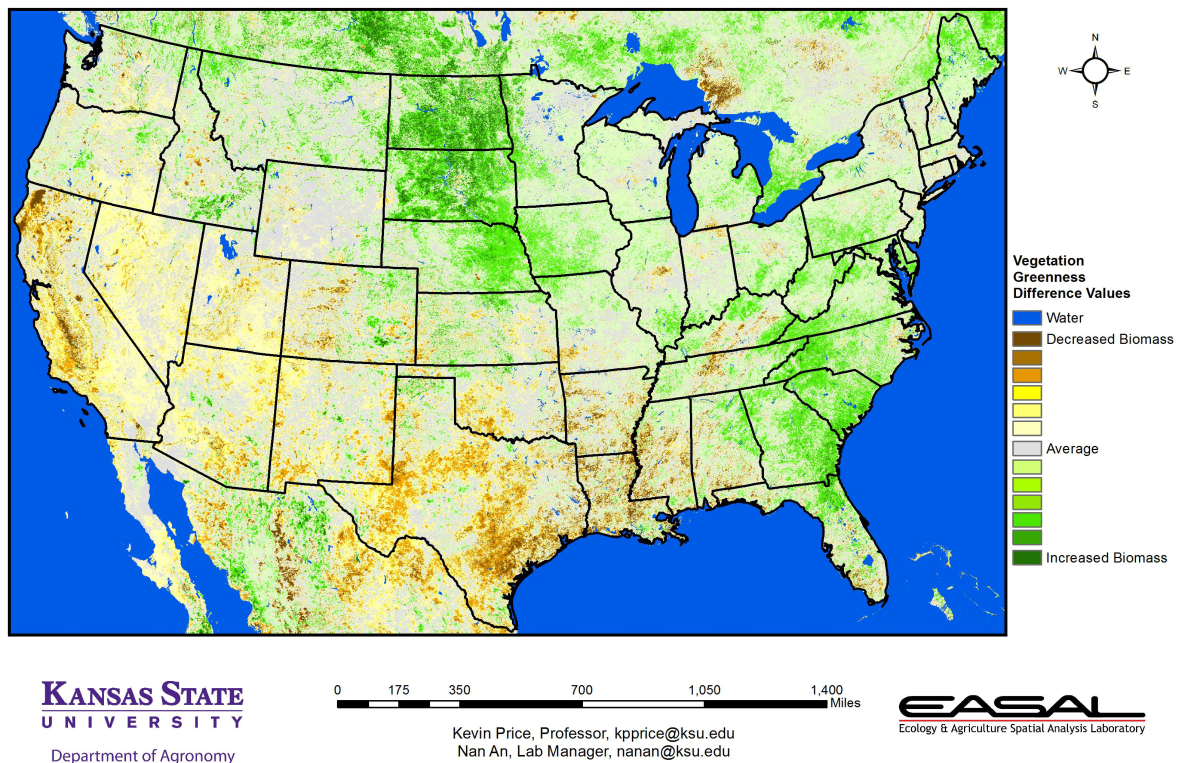


Figure 9. The U.S. comparison to the 25-year average for the period August 26 – September 8 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the highest biomass production continues to be in the Northern Plains. Low biomass production is notable in northern California and along the Central Valleys of California. Exceptional drought continues in these areas.

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