



Extension Agronomy

eUpdate

06/19/2015

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. Does corn need additional nitrogen?

Prolonged wet soil conditions in parts of Kansas have resulted in large areas of some fields of corn turning (or remaining) yellow this spring – even up to the V8 stage or beyond. If the yellow color is due to nitrogen (N) deficiency, sidedressing will be needed.

This raises several questions. How much N will be needed? Should the N rate at sidedressing depend on the growth stage of corn? If urea-based products are applied, will it volatilize under current conditions?

The first question regarding rates is perhaps the most difficult to answer. This topic was discussed in some detail in Agronomy eUpdate No. 513, May 29, 2015:

https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=584

Much of that article discusses the use of a chlorophyll meter or optical crop sensor, along with a reference strip for comparison purposes, since soil tests are of limited value for sidedressing purposes. If these practices are not available, producers will have to rely on other methods to estimate sidedressing N rates needed.

Supplemental N needs for individual fields may range from 0 to 100 lbs N/acre, but will vary greatly depending on soil texture, drainage, N source applied and when applied. The keys are what loss mechanisms were involved -- leaching on sands or denitrification on heavier soils -- and how much of the fertilizer applied had been converted to nitrate. Urea and UAN fertilizers convert more rapidly to nitrate under most conditions than ammonia, thus are more rapidly lost. A well-drained silt loam soil which had ammonia applied a week or two prior to planting will likely have much less loss than a similar soil with urea broadcast applied in February or March.

The need for additional N also depends on what the remaining yield potential is. Yield potential has been reduced in many fields by the early-season N deficiency/stunting, especially on early planted corn. Delayed planting has reduced yield potential in other areas. In both situations, N requirements will also be reduced. Potential yield loss is difficult to estimate, but a good starting point might be about one bushel/acre for each day the crop development is delayed by stunting or delayed planting.

If additional N is to be applied, it needs to be applied as soon as possible. Also keep in mind that rainfall will be needed to move surface-applied N into the root zone. But keep in mind also, that there is likely a significant amount of N remaining in most fields, which will carry the plant for a while, which is why many fields are greening up as the soil dries and oxygen returns to the root zone. Much of the N applied now will be to avoid N stress later in the season as the current depleted preplant supplies run out.

It is difficult to say exactly how much, if any, additional N needs to be applied. If additional N is going to be applied, our estimate would be that amounts will vary from 30 to 80 lbs N/acre for many situations this year, with lower amounts on productive, well-drained silt loams which received spring, preplant ammonia. Higher N losses will have occurred on poorly drained soils, such as clay pan soils, or on sands or sandy loams prone to leaching, and higher sidedress N rates will be needed in many of those situations. Fields that received broadcast urea in late winter/early spring will also likely need larger amounts of supplemental N.

There are a number of ways to apply nitrogen after corn planting:

- Ammonia can be sidedressed, beginning as soon as the rows are up and visible, and the ground is in good enough condition that the application won't damage seedling corn with slabs of soil. Normally ammonia can still be applied with minimal stalk breakage or root pruning damage until the 6-7 leaf stage of corn, approximately 30-35 days after emergence.
- UAN solutions, either 28% or 32%, can be applied as a surface band after emergence. UAN can also be coultter-banded as a sidedress with ground equipment until the 6-7 leaf stage. If that's not possible or desirable, UAN can be applied with high clearance sprayers and drop hoses to the soil surface as a sidedress typically as late as the 16- to 17-leaf stage. However, new research shows that current corn hybrids can respond to N application as late as silking stage if N deficiencies are observed. This can provide a good window for N application if high-clearance equipment is available. It's important to avoid applying UAN over-the-top directly on the plant and damaging leaf tissue, especially at the 5- to 6-leaf stage and later, when the tassel is developing and when the number of rows of kernels on the ear are being determined. Research has shown that burning a leaf or two at the 2- to 4-leaf stage will have minimal effects on yield.
- Urea can also be broadcast after planting as late as the 5- or 6-leaf stage with minimal damage to plants and good response. In a rescue situation, urea has been successfully broadcast over the top of 10- to 12-leaf corn, or aerially applied even later. Some leaf speckling or flecking will be seen, but good responses can still be obtained. With surface application of urea-containing fertilizers, the risk of volatilization losses increases with warm temperatures. The application of urease inhibitor products can help to reduce N losses, particularly if no rainfall is forecasted for the next 7-10 days.

A final comment: Make sure that the cause of the stunting and off color corn is N deficiency. Odds are that if the corn has turned yellow mostly in the lower lying areas of the fields and the fields have been saturated or extremely wet, it is N deficiency due to denitrification or leaching – or simply the inability to make planned applications of N. But there are other causes of yellowing to consider.

There have also been cases in eastern Kansas in recent years where yellowing in corn is due to potassium deficiency, especially in reduced and no-till systems. Nitrogen deficiency symptoms are exhibited on the lower leaves first, with the leaves yellowing from the leaf tips back down the mid-rib in an inverted 'V' pattern.

Potassium deficiency also develops on the lower, older leaves first, but causes the leaf tips and margins to "fire" and die. Both N and K deficiency often do not occur uniformly across the whole field, but in an irregular pattern.

Other possible causes of yellowing may be sulfur or zinc deficiency. With sulfur deficiency, first the upper leaves then the entire plant turns a pale yellow. However, an overall plant chlorosis can also happen when the corn roots are too wet and deprived of oxygen. In that case, the overall yellowing will mask any true nutrient deficiencies until the soil begins to dry out and roots are able to resume growth.

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2. Very warm temperatures may decrease efficacy of HPPD-inhibitor herbicides

For several years, we have observed that Callisto products and other HPPD-inhibitor herbicides could be a little inconsistent in controlling Palmer amaranth and other pigweeds at times.

When a herbicide isn't controlling its target weed as it should, the first thing most producers suspect is that the weed has become herbicide-resistant. This may be the case. But environmental conditions or application methods could also be at play.

In this case, we have confirmed that there are populations of Palmer amaranth with resistance to HPPD-inhibitor herbicides. However, environmental conditions are also a factor in the inconsistent control being achieved.

Even with populations of Palmer amaranth that are susceptible to HPPD-inhibitor herbicides, control is sometimes poor. In general, these herbicides seem to be more effective on Palmer amaranth under cool conditions. In the field, HPPD-inhibitor herbicides have generally been more consistent when used in corn than when used in grain sorghum production. And they have been a little more consistent when applied in the early morning hours as opposed to applying them in the heat of the afternoon during late spring and early summer.

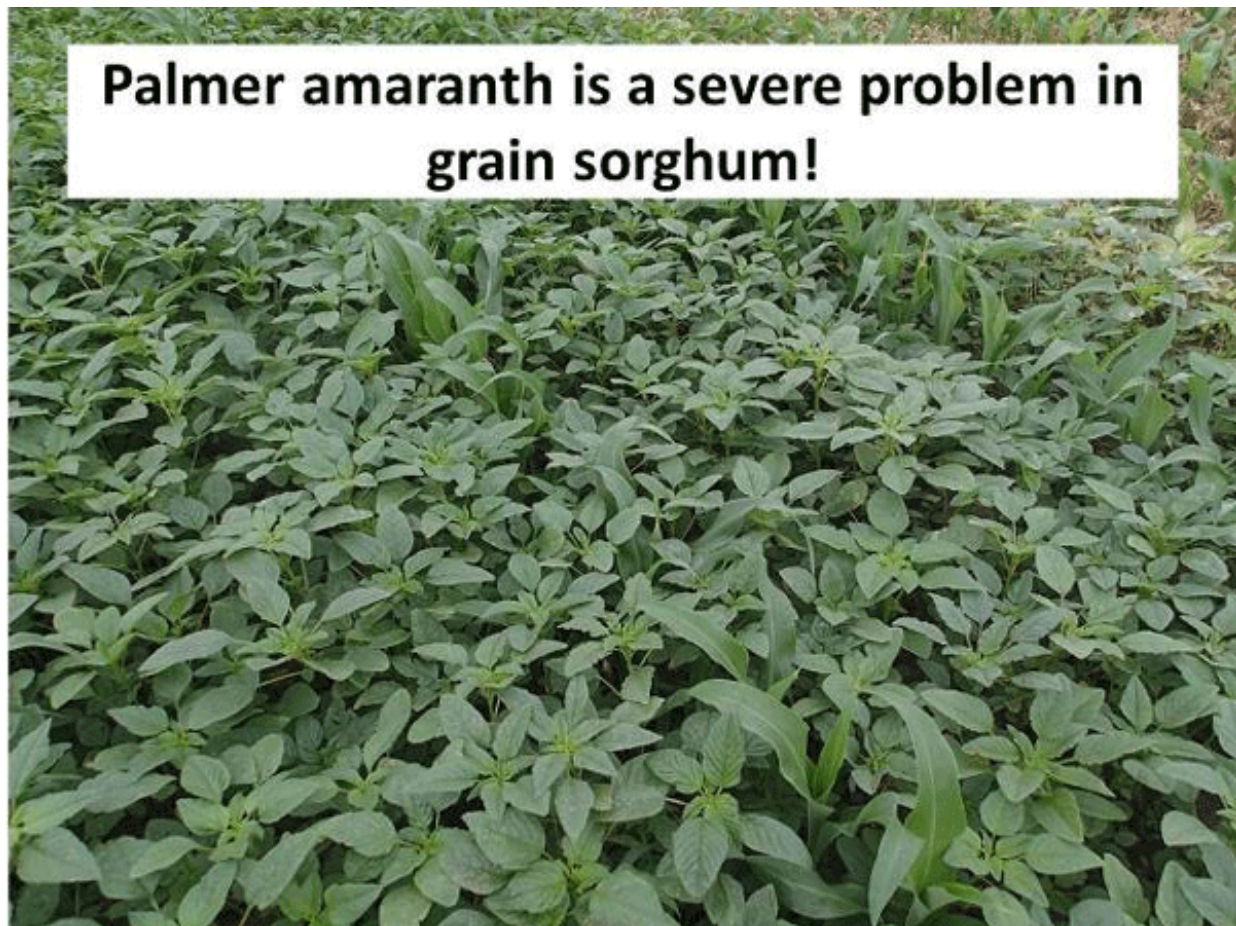


Figure 1. Palmer amaranth in grain sorghum. Photo by Curtis Thompson, K-State Research and Extension.

To verify this and explain what is going on, we conducted a series of growth chamber tests applying mesotrione (Callisto) at different rates to 3- to 5-inch tall Palmer amaranth under three temperature schemes:

- Low (77 degrees F daytime high and 59 degrees nighttime low)
- Optimum (90.5 degrees F daytime high and 72.5 degrees nighttime low)
- Elevated (104 degrees F daytime high and 86 degrees nighttime low)

We also studied what was happening to mesotrione within the Palmer amaranth plants, and how the plants reacted physiologically under the different temperature schemes.

First, we found that temperature did have a significant impact on the effectiveness of mesotrione on susceptible Palmer amaranth plants (Figure 2).

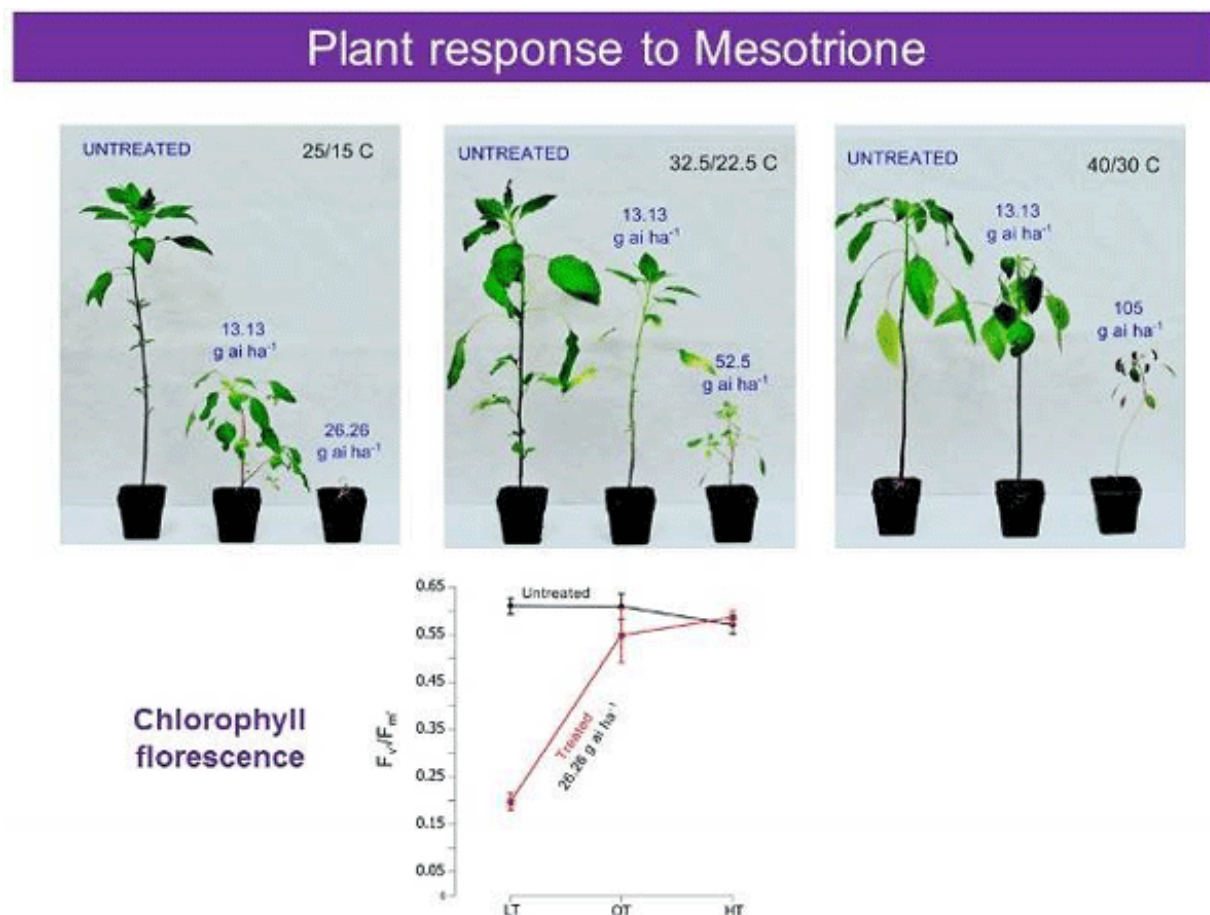


Figure 2. Temperature has an impact on the effectiveness of Palmer amaranth to mesotrione. Mesotrione is much more effective when applied under cooler temperatures (photo on left). Source: Mithila Jugulam, K-State Research and Extension.

Under the coolest temperature scheme (the photo at left in Figure 2, "25/15 C"), Palmer amaranth

was controlled satisfactorily at the 1X application rate of 26.26 g ai/hectare. Under the two higher temperature schemes, Palmer amaranth survived even at 2X and 4X rates of mesotrione.

In looking at the physiology of the plants, we found two primary factors involved in this temperature effect.

1. The plants were able to metabolize mesotrione more readily at the higher temperatures. This means Palmer amaranth can essentially deactivate the herbicide within the plant, before the herbicide can control the plant, to a greater degree when temperatures are very warm.
2. At the same time, Palmer amaranth is able to increase HPPD gene expression under very warm temperatures compared to when it grows under cool temperatures. Mesotrione and other HPPD-inhibitor herbicides kill plants by binding and stopping the activity of HPPD enzymes within the plant. These enzymes indirectly produce compounds needed by the plants to remain alive. By ramping up the HPPD gene expression, as well as increasing the herbicide metabolism, when temperatures are very warm, Palmer amaranth is making it very difficult for HPPD-inhibitor herbicides to do their job.

These findings are important because it provides a solid basis to explain what is happening. The temperature effect on HPPD-inhibitor herbicides is real.

To increase the efficacy of HPPD-inhibitor herbicides on Palmer amaranth, it should be applied under the coolest conditions possible. It is very likely that tall waterhemp and other pigweeds react in the same way as Palmer amaranth to HPPD-inhibitor herbicides and temperatures.

Besides Callisto, other HPPD-inhibitor herbicides include the corn herbicides Laudis, Capreno, Armezon, Impact, Balance Flexx, and Corvus. Huskie has a mode of action similar to the HPPD-inhibitor herbicides. Therefore, it is very possible that Huskie is also more effective on Palmer amaranth when applied under cool conditions for the same reason that HPPD-inhibitor herbicides are more effective under those conditions.

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3. 3. Common bunt (stinking smut) in wheat

Common bunt (stinking smut) occurs somewhere in Kansas almost every year, but may not be detected until a load of wheat is actually rejected at the elevator. This fungal disease causes moderate deformation of wheat kernels, and infected kernels often have a gray color. The infected kernels will also be filled with black powdery spores as opposed to the normal white starches of healthy kernels. The fungus produces volatile chemicals that have a strong fishy odor. This odor is readily detected in loads of grain and may persist through the milling and baking process. Clearly, this is not the smell most people would like to have filling their home when baking bread.



Figure 1. Normal wheat on left; wheat infected with common bunt on right. Photo by Bill Bockus, K-State Research and Extension.

It is possible to confuse grain damaged by common bunt with another common problem known as black point. Symptoms of black point include a partial dark brown or black discoloration of the kernels. There is no fishy odor associated with black point and the interior of the kernels has the normal white starchy appearance. Black point is often associated with hot and wet conditions that delay harvest. These conditions can predispose the plants to colonization by decay fungi, which can discolor the kernels. These decay fungi are not aggressive pathogens and they normally are restricted to the outer layers of the kernel. Black point can also be caused by a physiological response of plants to weather during the later stages of grain fill.



Figure 2. Physiological black point in wheat. Photo by Erick DeWolf, K-State Research and Extension.

Both problems can result in price discounts when marketing grain and may lead to rejection of loads of grain. The rejection of grain is more frequent with common bunt.

Common bunt is a seed-borne disease. The disease persists between seasons on seed contaminated with the black spores of the bunt fungus during harvest or subsequent grain handling. The spores will survive on the outside of the kernels until fall, when they germinate and infect the developing seedlings shortly after planting. This infection process is favored by cool and wet fall conditions.

Unfortunately, many farmers do not recognize the problem until they have loads of grain rejected by a grain elevator. There do not appear to be many options for using the rejected grain. Saving this grain for seed will increase the chances of having problems with bunt in following years. In some situations, I have heard of growers working with local feed lots to move rejected grain. The availability of this option will likely vary regionally in the state.

Management options for common bunt:

- Common bunt is most likely to be a problem when wheat has been saved for seed for 2 or more years. Renewing the seed supply every few years will greatly reduce the risk of future common bunt problems. Do not use heavily infected wheat as seed if at all possible. If infected wheat is used as seed, be sure to have it treated with a fungicide. Even if the fungicide provides 97% control, however, that may not be enough to prevent price discounts or rejections in the subsequent crop.

- Fungicide seed treatments. I generally recommend that growers set priorities when using the fungicide seed treatments. The top priority for fungicide seed treatments should be on wheat that is intended for future seed production. Products such as Gaucho XT, Vibrance Extreme, and Stamina F3 Cereals are all highly effective at controlling seed-borne diseases like common bunt and loose smut. The use of these products on wheat intended for seed production should greatly reduce the risk of severe bunt or smut problems.

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4. Late planting of soybeans: Management considerations

Wet spring planting conditions have caused a delay in the soybean planting across the state. In the latest Crop Progress and Condition report from Kansas Agricultural Statistics (June 15, 2015), soybeans planting was at 57% complete, well behind the 85% for 2014 and the long-term average. Total soybeans emerged is also behind normal by a similar amount. East central, northeast, and southeast Kansas seem to be the regions most impacted by wet spring conditions. The most active planting dates for soybeans are between May 15 and June 20 (USDA NASS). The total number of days suitable during the “most active” planting dates for soybean over the last 33 years by Crop Reporting District can be found in Griffin and Ciampitti in the Agronomy [eUpdate Issue 501](#) (April 3, 2015).

Where soybean planting has been delayed, producers should consider a few key management practices. Planting soybeans in the right soil conditions is essential for establishing an adequate soybean canopy and improving chances to increased yield potential.



Figure 1. Late-planting soybeans (June 10) into adequate soil conditions. Photo by Ignacio A. Ciampitti, K-State Research and Extension.

Maturity group factor: From our planting date x maturity group study in 2014, late planting did not clearly result in a yield reduction at the dryland sites, and caused only a minimal yield reduction at the irrigated site. Medium maturity groups (ranging from 3.8 to 4.8) yielded better, depending on the site (Fig. 2). More information related to this study can be found at:

<http://newprairiepress.org/kaesrr/vol1/iss2/21/> [Ciampitti, I. A.; Shoup, D. E.; Sassenrath, G.; Kimball, J.; and Adey, E. A. (2015) "Soybean Planting Date x Maturity Group: Eastern Kansas Summary," Kansas Agricultural Experiment Station Research Reports: Vol. 1: Iss. 2.]

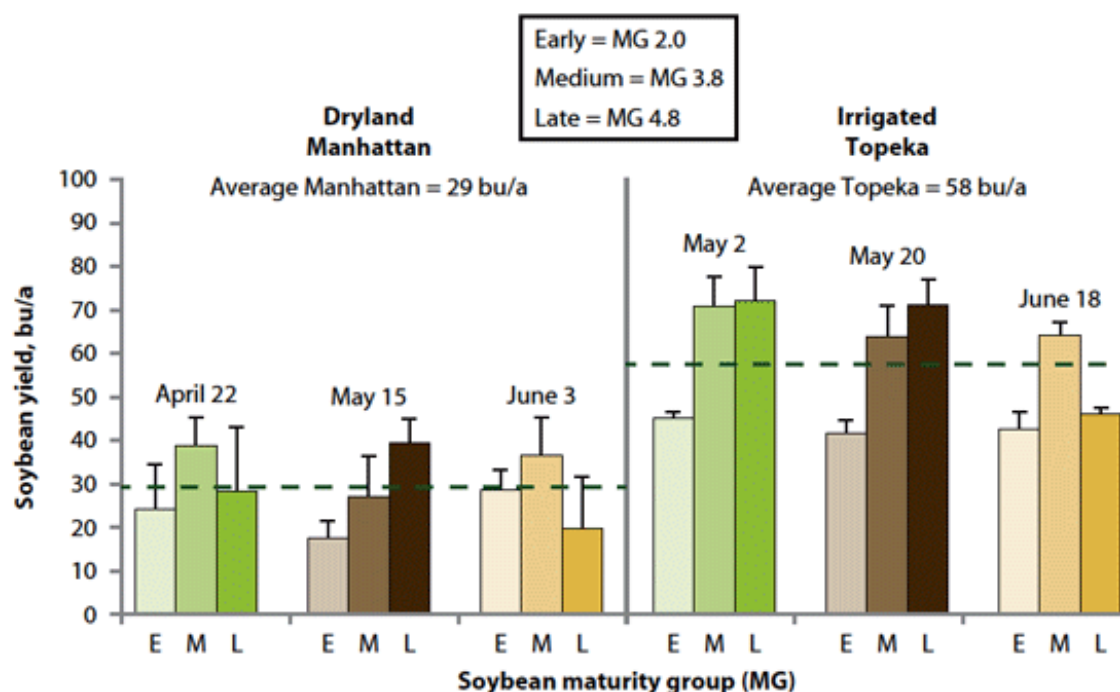


Figure 1. Soybean yields under varying planting dates (early, mid, and late) and maturity groups (E = early, M = medium, L = late maturing groups) for Manhattan and Topeka.

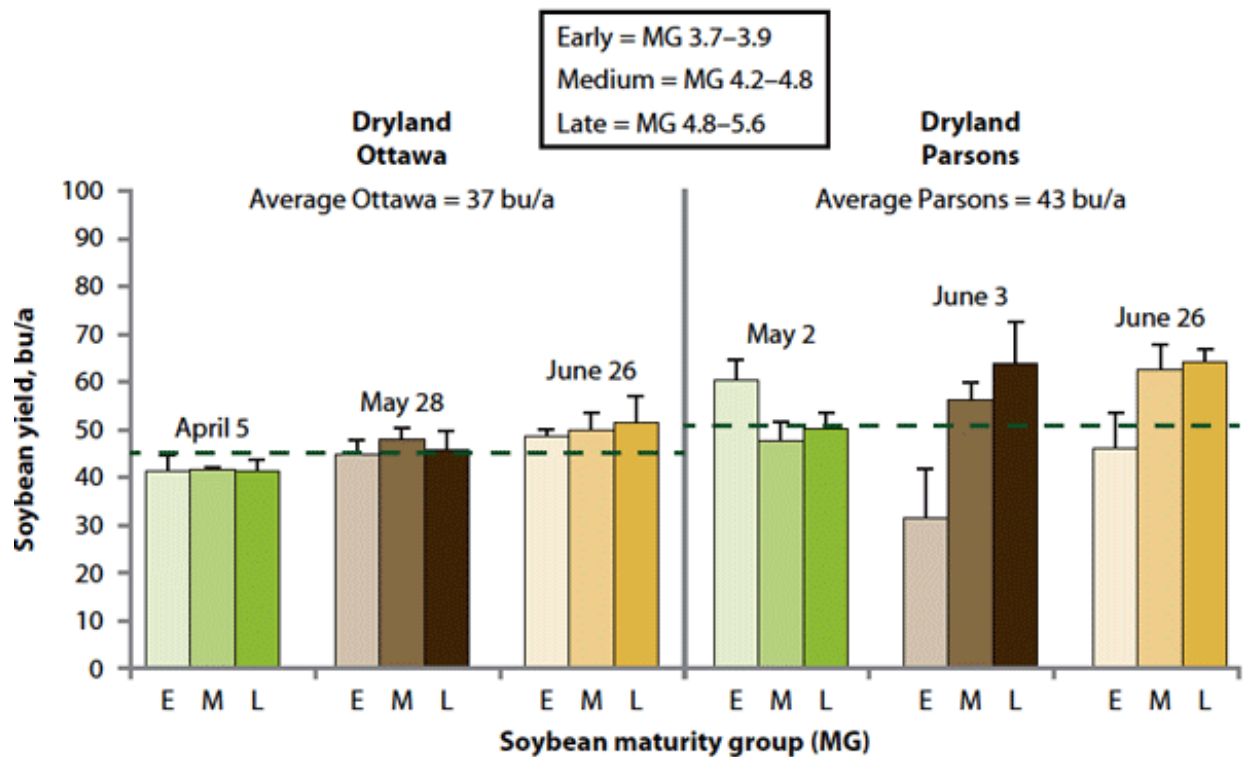


Figure 2. Soybean yields under varying planting dates (early, mid, and late) and maturity groups (E = early, M = medium, L = late maturing groups) for Manhattan (dryland), Topeka (irrigated), Ottawa (dryland), and Parsons (dryland) during 2014 growing season.

Seeding rate factor: Increasing the seeding rate of late-planted soybeans by 10-20% as compared to optimal seeding rate can help compensate for the shortened growing conditions. Research information on seeding rate and late planting of soybeans is currently being investigated further, with more updates on this topic in future issues of the eUpdate. The same soybean cultivar planted early in the planting window, under normal conditions, will develop nearly 50% more productive nodes than when planted in late June: 19-25 nodes when planted early vs. 13-16 nodes when planted late. For soybean seeding rates and optimum plant populations, see [eUpdate Issue 508](#) (May 1, 2015).

Row spacing factor: Information on late-planted soybean across multiple row spacings suggests that narrow-rows (e.g. 7" or 15" vs. 30") can hasten canopy closure, increasing season-long light interception, weed suppression, and potentially improving biomass and final yield. In some cases, the likelihood of finding yield responses to narrowing rows increases as the planting is delayed later in the season.

Finally, proper identification of soybean growth stages can make a difference in yield. We have

worked recently with the United Soybean Board and the Kansas Soybean Commission recently to produce a soybean growth and development chart. It can be downloaded at:

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

More information about key aspects of each growth stage and management practices can be found in that soybean chart. Weekly and timely updates on soybean are also provided via Twitter @KSUCROPS and @KStateAgron, and on our Facebook page.

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5. Comparative Vegetation Condition Report: June 2 - 15

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 26-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, assistant state climatologist:

Kansas Vegetation Condition

Period 24: 06/02/2015 - 06/15/2015

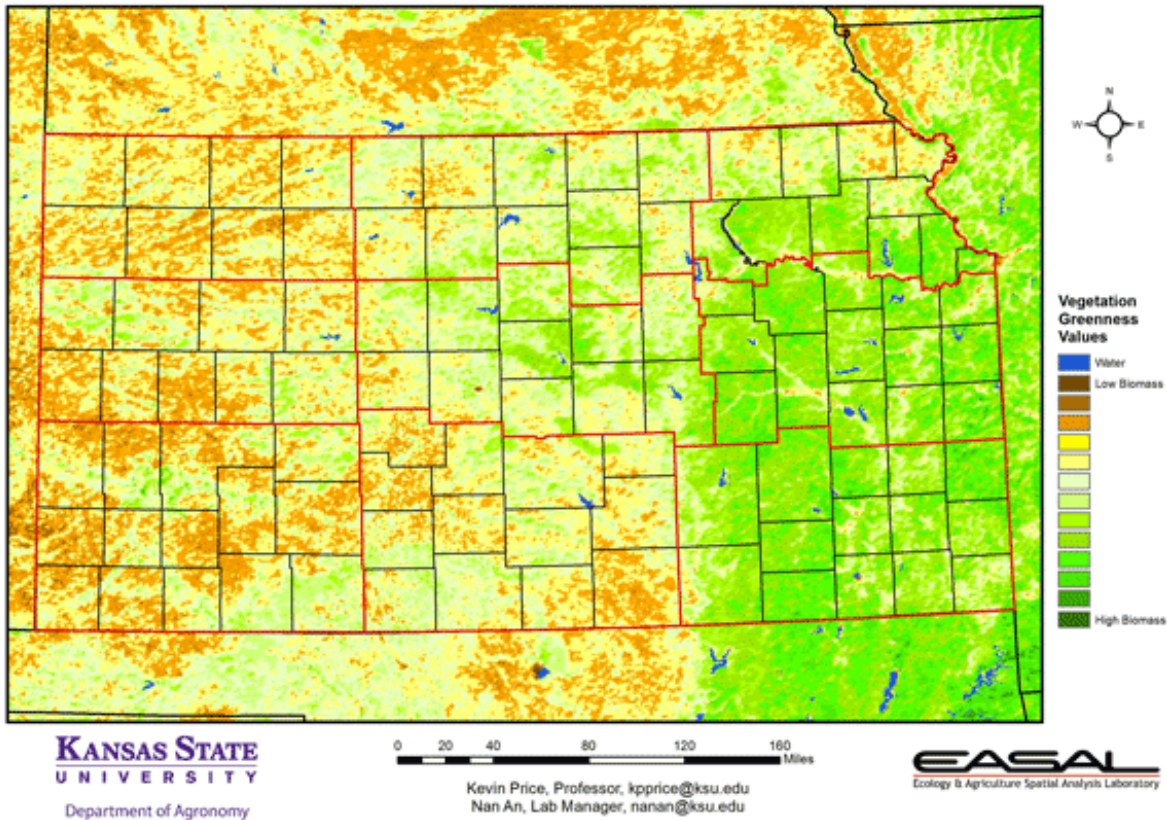


Figure 1. The Vegetation Condition Report for Kansas for June 2 – 15, 2015 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that vegetative activity has continued to increase across the state. There are areas of low biomass production in eastern Kansas that align with stream areas that are at high levels due to heavy rains in May. Meanwhile higher NDVI values are visible along the stream beds of west central and southwest Kansas, where rainfall has been higher-than average but not as excessive.

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Kansas Vegetation Condition Comparison

Early-June 2015 compared to the Early-June 2014

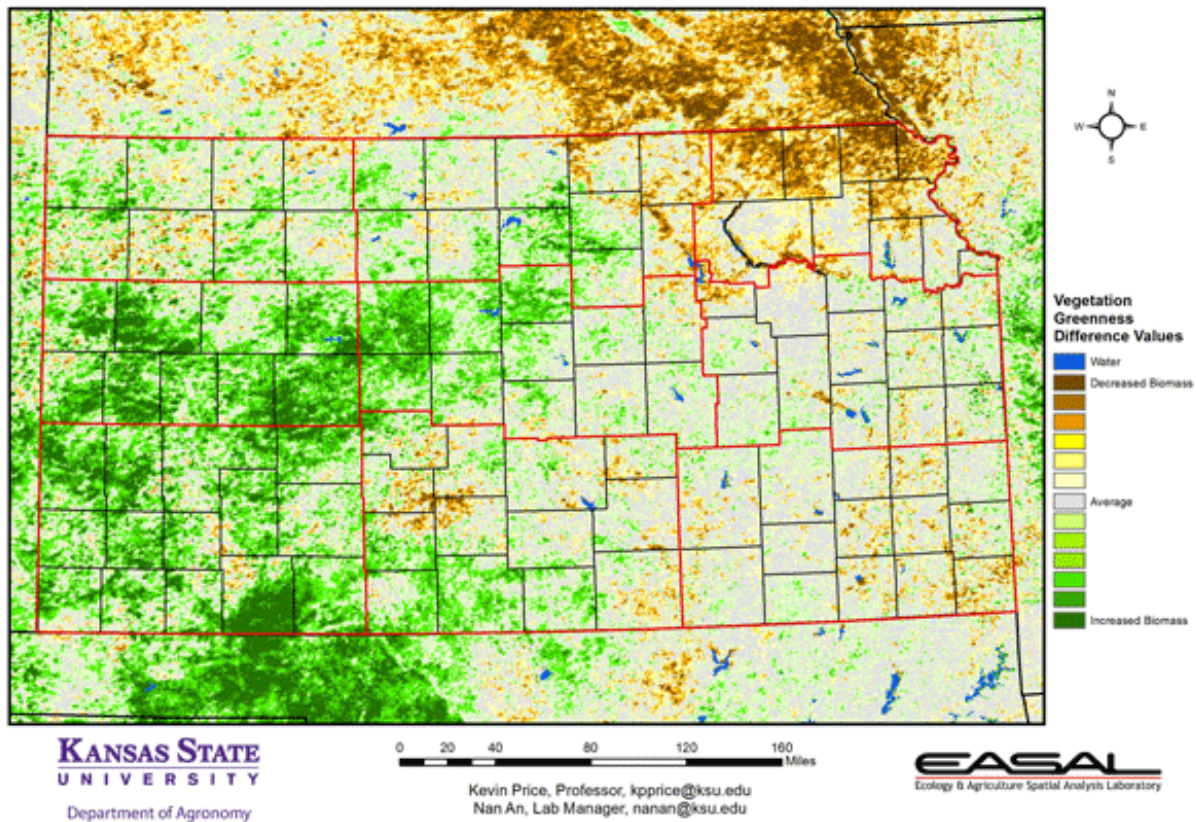


Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for June 2 - 15 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows biomass production is much higher across much of the state. It is particularly noticeable in southwest and south central Kansas. Last year, precipitation didn't pick up until late June. This year, moisture in the region is averaging 120 to 150 percent of normal. In northeast Kansas, excess moisture continues to hinder both planting and crop development.

Kansas Vegetation Condition Comparison

Early-June 2015 compared to the 26-Year Average for Early-June

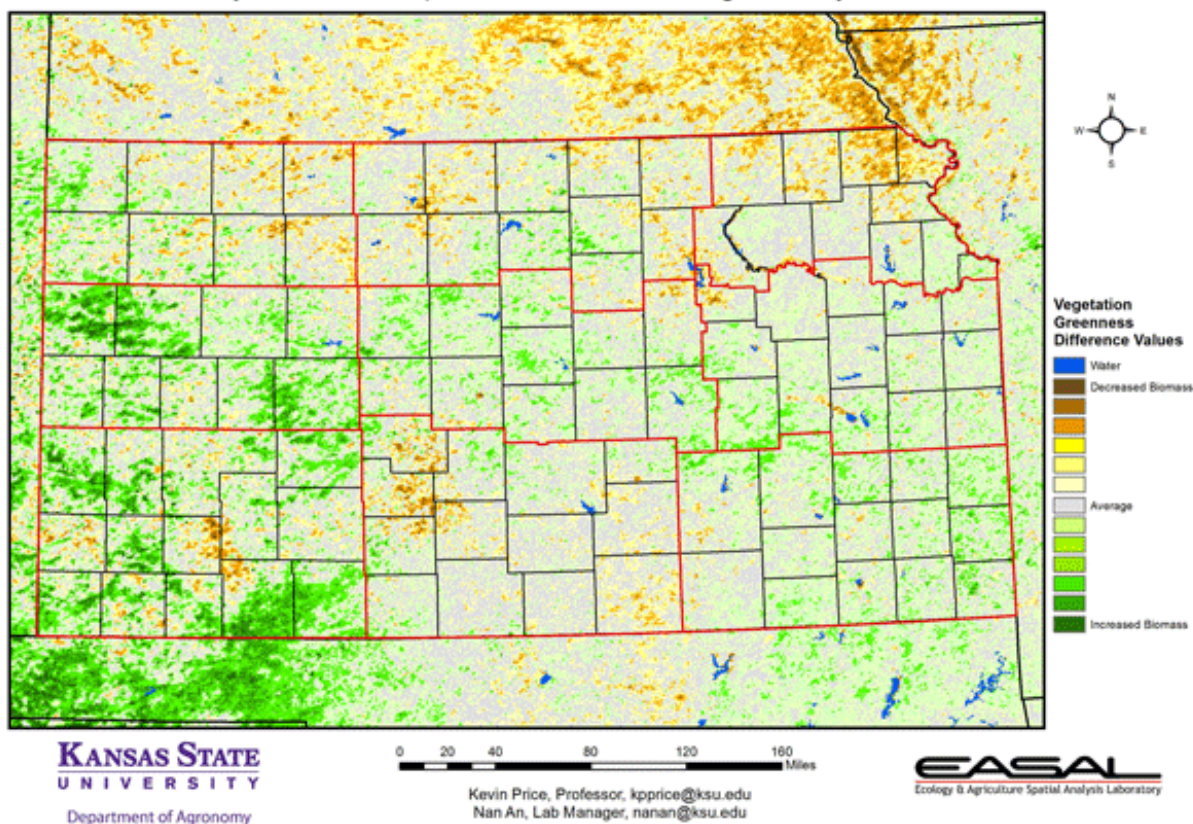


Figure 3. Compared to the 26-year average at this time for Kansas, this year's Vegetation Condition Report for June 2 – 15 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the western divisions have the greatest increase over normal photosynthetic activity. While precipitation in this region is much above normal, it has not been quite as excessive as in the Northeastern Division. Warmer temperatures and drier weather over the central part of the state toward the end of the period has resulted in a moderate increase in photosynthetic activity.

U.S. Corn Belt Vegetation Condition

Period 24: 06/02/2015 - 06/15/2015

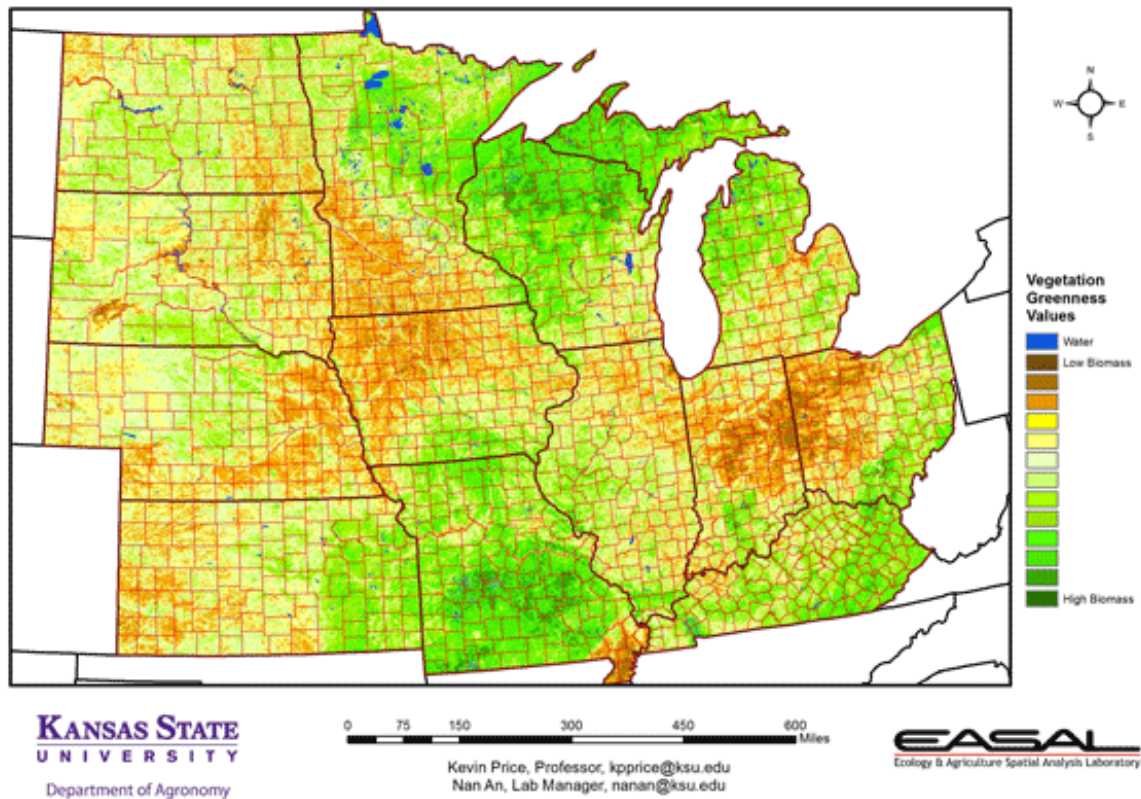


Figure 4. The Vegetation Condition Report for the Corn Belt for June 2 – 15 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that lowest photosynthetic activity is across the center of the region, from southern Minnesota through western Ohio. This region has seen cooler-than-normal temperatures for much of the period and that continues to delay crop progress.

U.S. Corn Belt Vegetation Condition Comparison
Early-June 2015 Compared to Early-June 2014

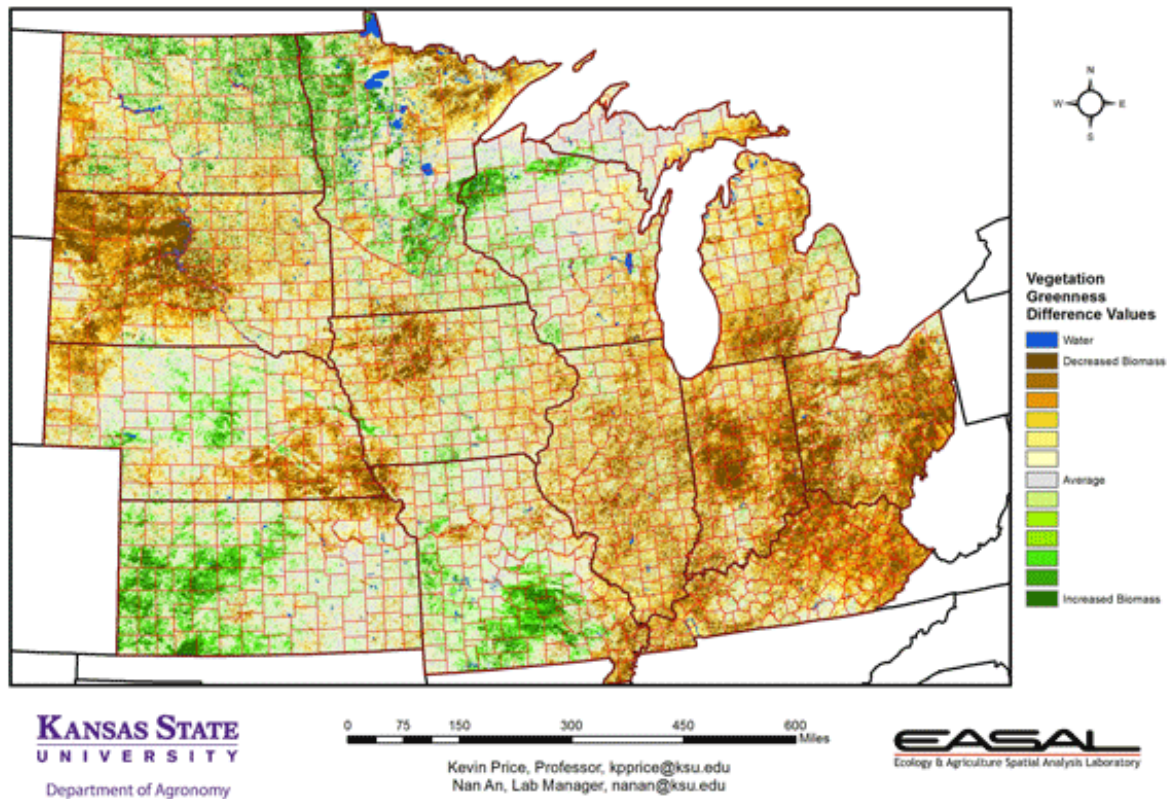


Figure 5. The comparison to last year in the Corn Belt for the period June 2 – 15 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows much of the region has much lower biomass production. The eastern parts of the region, particularly Ohio, Indiana, and northern Kentucky, have much lower photosynthetic activity. The greatest increase in photosynthetic activity is in North Dakota and western Kansas.

U.S. Corn Belt Vegetation Condition Comparison

Early-June 2015 Compared to the 26-Year Average for Early-June

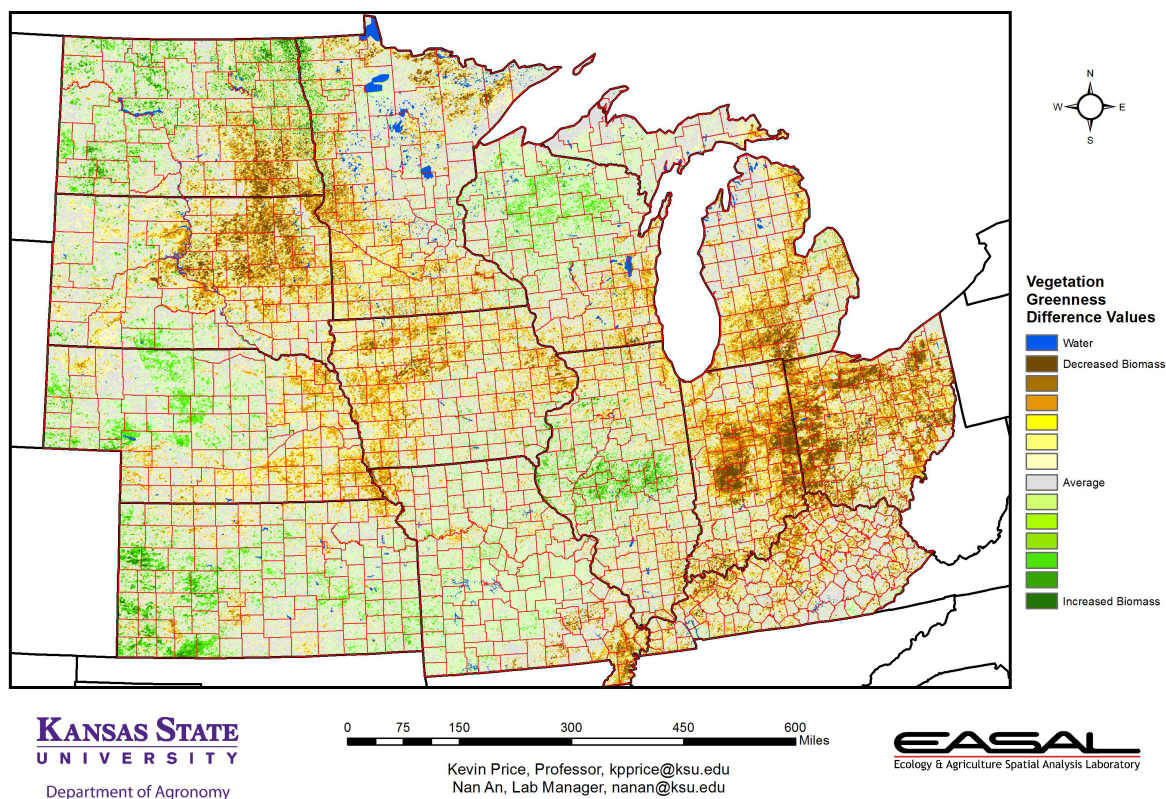


Figure 6. Compared to the 26-year average at this time for the Corn Belt, this year's Vegetation Condition Report for June 2 – 15 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the eastern portion of the region has much below-average photosynthetic activity. Cool, wet conditions continue to slow plant development in eastern South Dakota and in Illinois and Ohio.

Continental U.S. Vegetation Condition

Period 24: 06/02/2015 - 06/15/2015

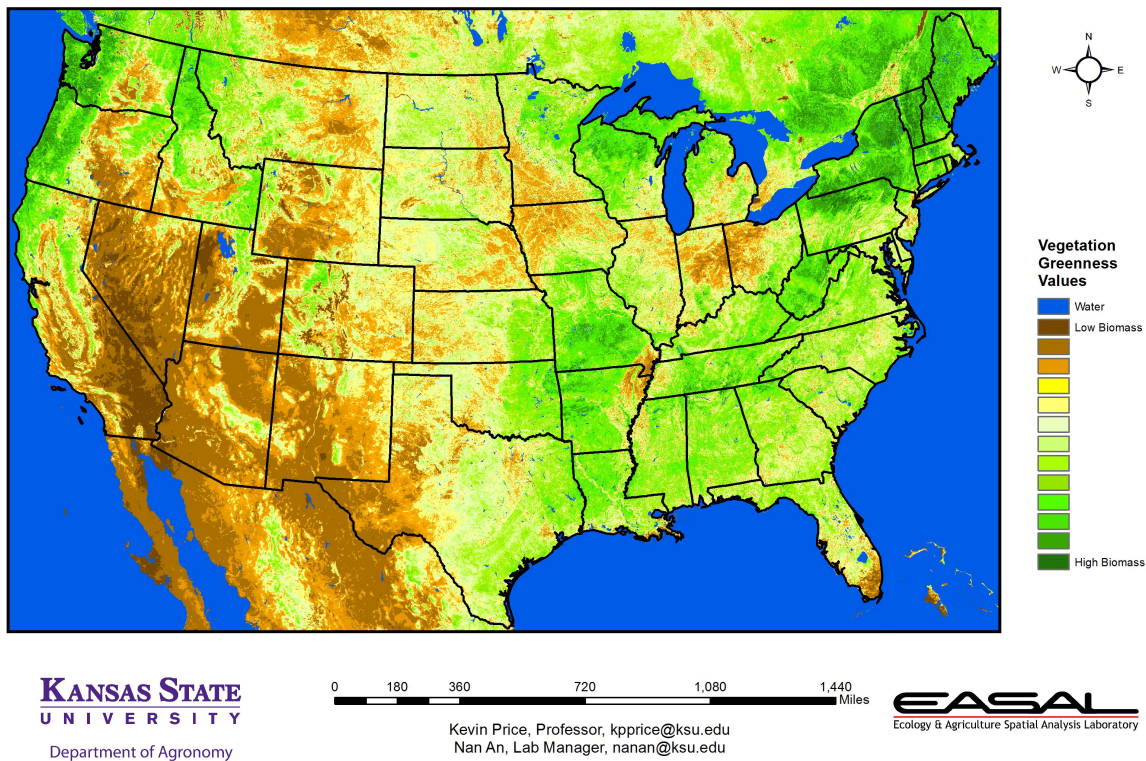


Figure 7. The Vegetation Condition Report for the U.S. for June 2 – 15 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that high photosynthetic activity is most visible in the New England area and along the Pacific Northwest. Plant development has been favored by the warmer-than-normal temperatures. There is also an area of high photosynthetic activity in Arizona and New Mexico in response to increased precipitation in the region.

Continental U.S. Vegetation Condition Comparison
Early-June 2015 Compared to Early-June 2014

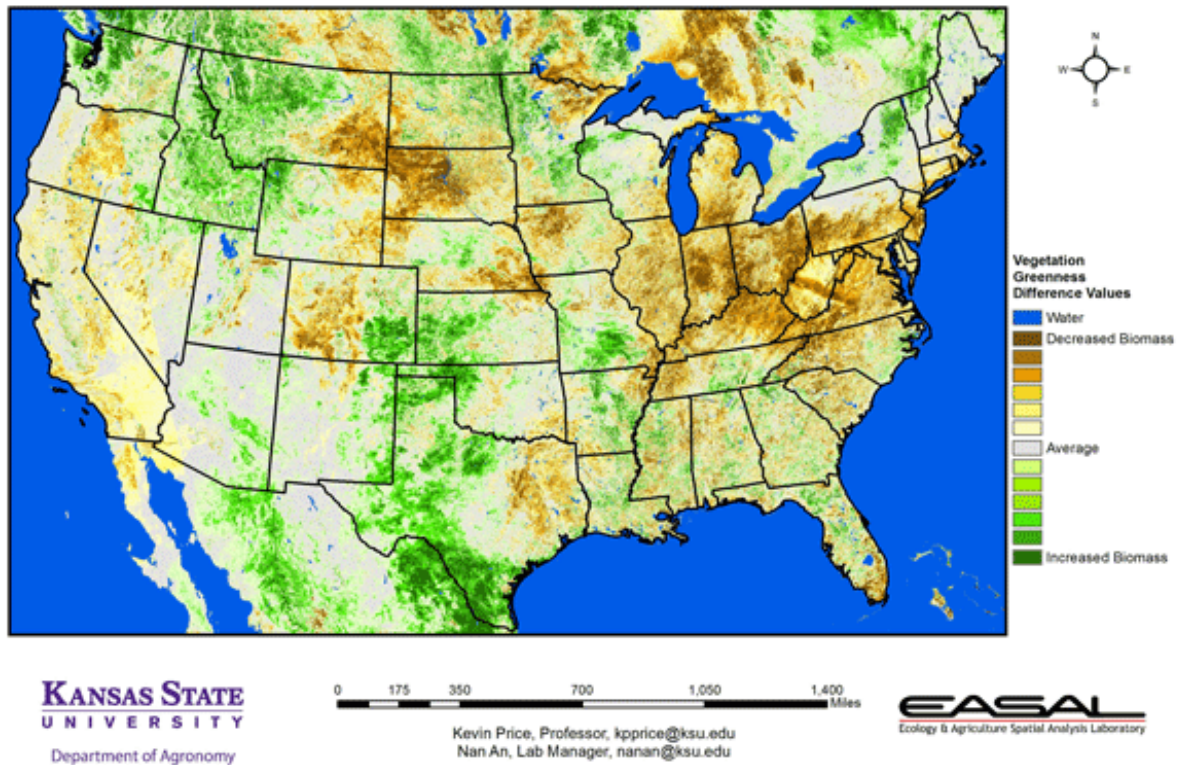


Figure 8. The U.S. comparison to last year at this time for the period June 2 – 15 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows lower photosynthetic activity in the eastern regions from Illinois through the Atlantic Seaboard. Cool spring temperatures have delayed biomass development. In the West, from Oregon through California, differences have been minimal. Conditions were poor last year and continue to be poor this year.

Continental U.S. Vegetation Condition Comparison
Early-June 2015 Compared to 26-year Average for Early-June

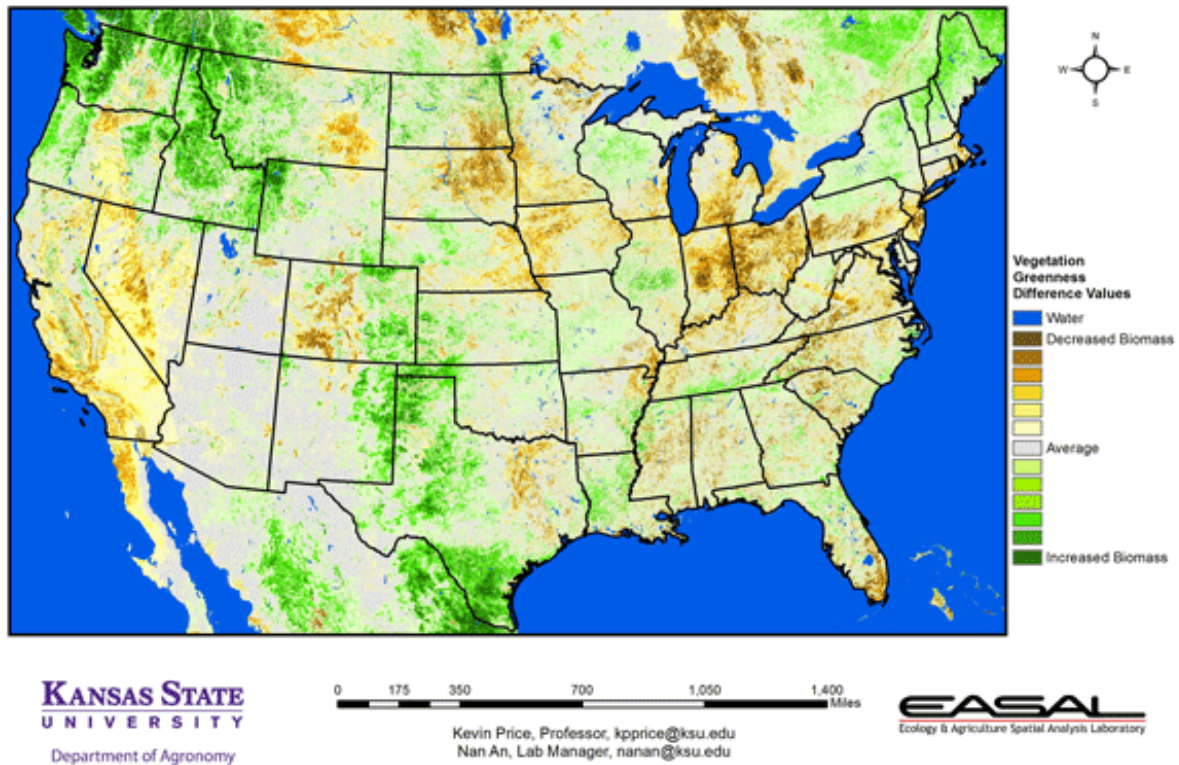


Figure 9. The U.S. comparison to the 26-year average for the period June 2 – 15 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows much of the country has close-to-average photosynthetic activity. Washington and Idaho stand out with higher-than-average biomass production, as early snowmelt and heavier-than-usual rainfall have reduced some of the drought impacts. Lower-than-average biomass production is concentrated in the Ohio River Valley, where cooler temperatures and saturated soils have slowed plant development.

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