



Number 356
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1. The effect of high heat and drought on corn

High temperatures can cause problems in corn even when soil moisture is adequate -- and will compound problems in drought-stressed corn. Hot, dry conditions are particularly damaging during pollination (VT-tassel through R1-silk). Much of the corn crop in Kansas is just now entering this critical period for determining grain yield.

Effects of stress at pollination time

There are several reasons why the four weeks centered around pollination are so critical for determining grain yield. During the last couple of weeks before tassels emerge, the potential ear length is being determined. Extreme stress at this time can reduce the number of kernels per row – affecting potential ear size. Extremely high temperatures prior to and during pollen shed can reduce pollen viability.

Drought stress can slow silk elongation so much that the pollen may be shed before the silks emerge. Lack of water can also result in poor tassel exertion. Combined with the leaf rolling associated with drought stress, the pollen may be shed before the tassel has emerged. Even if pollination does occur successfully, kernels may abort during the first several days of development under severe heat/drought stress. All of these factors can reduce successful pollination, kernel set, and kernel development, reducing the number of kernels per acre – the greatest determinant of grain yield.

Management options for stressed corn

Where dryland corn has been under severe drought stress, you'll have to decide whether to let it go and hope for some kind of grain yield, salvage the crop for silage or hay, or leave the crop in the field for its residue value. It likely will pay to wait until after pollination is complete before making this decision to get some idea of kernel set. If kernel set is good, the ears at least have the potential to

produce grain. If kernel set is severely reduced, the first step is to estimate potential grain yield based on kernel numbers per acre and average to slightly below average kernel size. This can help you make the grain vs. forage decision.

Economically, should you leave the corn or cut it for silage or hay, or leave it for residue? The value of the residue for moisture retention, soil quality, and future crop productivity will vary depending on the situation, and can be hard to quantify -- but it is considerable. As for the silage/hay vs. grain decision, if the yield potential is less than 25 bushels per acre, it's probably best to cut it for silage or hay. If the yield potential is 50 bushels or more, it's probably best to harvest it for grain. If the yield potential is between 25 and 50, the decision will depend on the price of corn, the quality of the silage, and on a producer's ability to use or sell the silage.

Of the two options for dryland corn that has limited yield potential – silage or hay -- silage is normally the preferred option. However, you need the facilities to make silage (or sell it to someone who does), and there must be enough moisture in the plants to properly ensile. And where there's no ear at all, silage may not be a good option. Where the ear is very small, or has poor seed set, the silage will have lower energy value (TDN) and lower overall forage quality than normal. Even at normal yield levels, silage quality begins to decline when grain yield drops below roughly 150 bushels per acre, and continues to decrease as grain yields keep going down.

To cut corn for silage, you need 65 to 75 percent moisture in the plant. If plants are suffering from drought, they may have lost some of the bottom leaves. The top leaves may have browned off or turned white. In that case, the plants probably do not have 65 percent moisture, depending on how much moisture is in the stalk.

Where that's the case, your only option is probably to chop and graze, or hay the crop like a summer annual forage. The pasture/hay shortage that exists in some areas of the state may make haying the failing corn crop a more desirable option this year.

When chopping or cutting for hay, stalks should be cut at least six to eight inches off the ground to avoid nitrate toxicity that may result when feeding forage made from drought-stressed corn. Under drought conditions, the plant does not grow normally and high levels of nitrate can accumulate, especially in the lower portions of the stalk. You should also have corn hay (or stubble if you plan to graze) tested for nitrates. A forage nitrate test costs only \$5-15 and it's the only sure way to make sure the hay is okay to feed to cattle. Ensiling the corn, if possible, is preferred to chopping or grazing because of that potential for nitrate toxicity.

If you plan to have cattle graze the corn field after it has been chopped or cut for hay or silage, watch for any shattercane or Johnsongrass that comes up after a rain. New regrowth from these sorghum-type plants after a drought can be dangerously high in prussic acid.

How much silage can producers get from drought-stressed corn? A publication from the University of Wisconsin estimates that for corn that has been stressed, with limited grain yield potential, producers can expect about one ton of silage per acre for every five bushels of grain yield. For corn that is not stressed, producers can get about one ton of silage for each six to seven bushels of grain yield. If little or no grain is expected, a very, very rough pre-harvest estimate of yield can be made by assuming that one ton of silage can be obtained for each foot of plant height, excluding the tassel.

Putting a value on silage or hay

One of the biggest questions is how to put a value on the silage or hay. The price of corn silage is typically based on corn or hay prices. The K-State Farm Management Guide crop budgets value silage in the field at 8 times the price of corn, meaning that if corn is \$6/bushel, the price of corn silage would be \$48/ton ($\6×8). However, drought-stressed corn typically will have a value of 75-95 percent of “normal” corn silage, so a more appropriate rule of thumb for drought-stressed corn silage standing in the field would be 6 times the price of corn.

Current projected costs for silage chopping, hauling, and silo filling range from \$8.00 to \$8.50/ton. Harvesting corn for grain is expected to cost \$0.50 - \$0.55 per bushel. Before any action is taken in regard to harvesting corn for grain, silage, or hay, producers should contact their crop insurance agent.

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2. Nitrate toxicity in drought-stressed corn

During times of drought, plants such as corn and sorghum tend to accumulate high levels of nitrate in the lower leaves and stalk of the plant. The accumulation is because the plant assimilation of these nitrates into amino acids is slowed because of the lack of water, a crucial component to numerous plant processes. Nitrate toxicity in livestock is because of its absorption into the bloodstream and binding to hemoglobin, rendering it unable to carry oxygen throughout the body. The result is eventual asphyxiation and death.

It is wise for producers to test their drought stricken forage prior to harvest. Nitrate testing can be done thru several labs including the K-State Soil Testing Laboratory. Harvesting the forage 8 to 12 inches above the ground to avoid the highest concentrations of nitrate in the plant is a good practice. Producers should collect a good representative forage sample above this cutting height to get an accurate determination of what the nitrate level could be.

Depending on the planned feeding method, a producer may wish to harvest different parts of the plant. If wrapping the forage into a bale and feeding it directly to livestock, a producer may want to test the lowest part of the stalk to determine the greatest risk of nitrate forage that could be ingested by the animal. If a producer was planning on grinding the bale, a whole-plant sample above what will be left in the field may be a more accurate representation of what will be eaten. If a harvested forage is high in nitrate, blending the feed with another forage such as prairie hay or brome will dilute the total nitrates in the animal's diet and could potentially reduce the risk of poisoning.

High-nitrate forages chopped for silage and properly ensiled are a safer option for livestock feeding. During the ensile process, potentially 50 percent of the nitrates in the forage will be metabolized by the microbes and can vastly reduce the risk of poisoning. It is still not a bad idea to leave 6 inches of stubble in the field. That is the portion of the stem with the highest concentration of nitrates.

Grazing high nitrate forages is a dangerous practice. Although animals tend to consume the leaves and the top portions of the plant, which contain less nitrates, the risk of consuming a high-nitrate portion of the plant still exists. In addition, the longer the animal is left on a field and the more that animal is forced to eat the remaining forage at the lower portions of the plant, the greater risk of nitrate poisoning.

For more information, see K-State Research and Extension publication MF3029, *Nitrate Toxicity* at your local county Extension office, or at <http://www.ksre.ksu.edu/library/crpsl2/mf3029.pdf>

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3. Plant analysis for corn

With corn, plant analysis can be especially valuable for managing secondary and micronutrients which don't have high quality soil tests available, and providing insight into how efficiently you are using applied nutrients.

What and when should producers sample? For general monitoring or quality control purposes, 15-20 ear leaves or the leaf below and opposite the ear, should be collected at random from the field at silk emergence, before pollination, and the silks turning brown. Sampling under stress conditions for monitoring purposes can give misleading results, and is not recommended.

How should samples be handled, and where should producers send the samples? The collected leaves should be allowed to wilt over night to remove excess moisture, placed in a paper bag or mailing envelope, and shipped to a lab for analysis. Do not place the leaves in a plastic bag or other tightly sealed container, as they will begin to rot and decompose during transport, and the sample won't be usable. Most of the soil testing labs working in the region provide plant analysis services, including the K-State lab.

What nutrients should producers analyze for? In Kansas nitrogen (N), phosphorus (P), potassium (K), sulfur (S), zinc (Zn), chloride (Cl) and iron (Fe) are the nutrients most likely to be deficient. Recently questions have been raised by consultants and others concerning copper (Cu), manganese (Mn) and molybdenum (Mo). Most labs can analyze for most of these. Normally the best values are the "bundles" or "packages" of tests offered through many of the labs. They can be as simple as N, P and K, or can be all of the 13 mineral elements considered essential to plants.

The data returned from the lab will be reported as the concentration of nutrient elements, or potentially toxic elements in the plants. Units reported will normally be in percent for the primary

and secondary nutrients (N, P, K, Ca, Mg, S, and Cl) and ppm or parts per million, for the micronutrients (Zn, Cu, Fe, Mn, B, Mo, and Al).

Most labs/agronomists compare plant nutrient concentrations to published sufficiency ranges. A sufficiency range is simply the range of concentrations normally found in healthy, productive plants during surveys. It can be thought of as the range of values optimum for plant growth. The medical profession uses a similar range of normal values to evaluate blood work. The sufficiency ranges change with plant age (generally being higher in young plants), vary between plant parts, and can differ between hybrids. So a value slightly below the sufficiency range does not always mean the plant is deficient in that nutrient, but it is just an indication that the nutrient is relatively low. Values on the low end of the range are common in extremely high yielding crops. However, if that nutrient is significantly below the sufficiency range, then one should ask some serious questions about the availability and supply of that nutrient.

The following table gives the range of nutrient content considered to be "normal" or "sufficient" for corn early in the season (less than 12" tall) and later in the season, at silking. Keep in mind that these are the ranges normally found in healthy, productive corn.

Nutrient Content Considered "Normal" or "Sufficient" for Corn at Two Growth Stages			
Nutrient	Units	Growth Stage	
		Whole plant, less than 12" tall	Ear leaf at green silk stage
Nitrogen	%	3.5-5.0	2.75-3.50
Phosphorus	%	0.3-0.5	0.25-0.45
Potassium	%	2.5-4.0	1.75-2.25
Calcium	%	0.3-0.7	0.25-0.50
Magnesium	%	0.15-0.45	0.16-0.60
Sulfur	%	0.20-0.50	0.15-0.50
Chloride	%	not established	0.18-0.60
Copper	ppm	5-20	5-25
Iron	ppm	50-250	30-200
Manganese	ppm	20-150	20-150
Zinc	ppm	20-60	15-70
Boron	ppm	5-25	4.0-25
Molybdenum	ppm	0.1-10	0.1-3.0
Aluminum	ppm	<400	<200

Keep in mind also that any plant stress (drought, heat, soil compaction, root insect damage etc) can have a serious impact on nutrient uptake and plant tissue nutrient concentrations. So a low value in the plant doesn't always mean the nutrient is low in the soil and the plant will respond to fertilizer, rather that the nutrient may not be available to the plant.

Levels above sufficiency can also indicate problems. High values might indicate over fertilization and luxury consumption of nutrients. Plants will also sometimes try to compensate for a shortage of one nutrient by loading up on another. This occurs at times with nutrients such as iron, zinc and manganese. Plants will load up on iron at times, in an attempt to compensate for low zinc. In some situations very high levels of a required nutrient can lead to toxicity. Manganese is an example of an essential nutrient which can be toxic when present in excess. This can occur at very low soil pH, generally well below 5.

Plant analysis is also an excellent diagnostic tool to help understand some of the variation seen in the field. When using plant analysis to diagnose field problems, try to take comparison samples from both good/normal areas of the field, and problem spots. Also collect soil samples from the same good and bad areas since physical problems such as soil compaction often limits the uptake of nutrients present in adequate amounts. Don't wait for tasseling or silking to sample. Early in the season (prior to the 5-6th leaf, or roughly a foot high) collect whole plants from 15 to 20 different places in your sampling area. Later in the season, but prior to tasseling, collect 15-20 top, fully developed leaves (those with leaf collars visible). Handle the samples the same as those for monitoring, allowing them to wilt to remove excess moisture and avoiding mailing in plastic bags.

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4. Eighth Annual Oklahoma-Kansas Canola Conference planned

Kansas State University and Oklahoma State University will team up next month to hold the Eighth Annual Oklahoma-Kansas Winter Canola Conferences. The July 26 conference will be held in the Hoover Building at the Garfield County Fairgrounds in Enid, Okla. The July 31 conference will be held at Western Oklahoma State College in Altus, Okla.

Each conference, which is free and includes morning refreshments and a sponsored lunch, begins at 8 a.m. with registration, coffee, and doughnuts. Door prizes will be given away during each conference. Presentations include:

- Economics of Wheat/Canola Rotations
- Winter Canola Varieties / Insects and Diseases
- Production Management
- County Demonstrations
- Fertilizing Canola: In-furrow / pH effects
- Crop Insurance
- Grain Handlers Perspective
- Industry Update

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5. K-State Radio series on lesser prairie chicken

Lesser prairie chicken habitat is almost exclusively rangeland and is impacted by range management practices. The lesser prairie chicken will be proposed for listing as a threatened and endangered species this September. How would a threatened and endangered listing affect your operation and land use choices if you work, live, or own land in prime prairie chicken habitat in western Kansas?

This and many more questions will be answered during the course of an upcoming K-State Radio series on the lesser prairie chicken. The 8-part series will be hosted by Eric Atkinson and broadcast on the Agriculture Today program. The series will begin July 3, 2012 at 10:36 a.m. with an overview of the lesser prairie chicken situation by Charlie Lee, K-State Research and Extension wildlife specialist.

Subsequent interviews will be broadcast during the same time slot every Tuesday throughout July and August. Interviewees will be from Kansas Department of Wildlife, Parks, and Tourism; USDA Natural Resources Conservation Service; USDA Farm Service Agency; Kansas Forest Service; and the U.S. Fish and Wildlife Service.

Broadcasts will be streamed live and then archived on the Agriculture Today website:

<http://www.ksre.ksu.edu/news/p.aspx?tabid=66>

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6. Comparative Vegetation Condition Report: June 12 – 25

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=CRP3Y5NIggw>

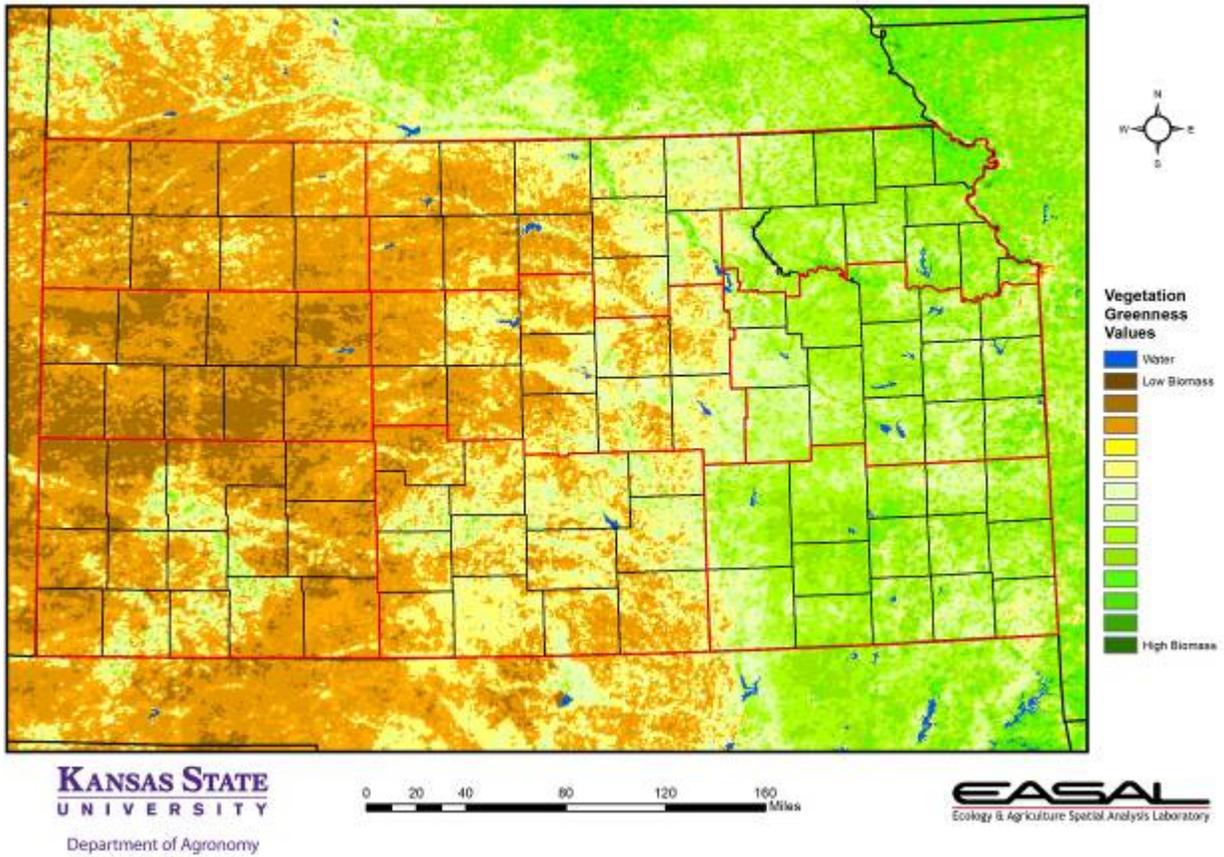
<http://www.youtube.com/watch?v=tUdOK94efxc>

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 21-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 maps below show the current vegetation conditions in Kansas, the Corn Belt, and the continental U.S, with comments from Mary Knapp, state climatologist:

Kansas Vegetation Condition

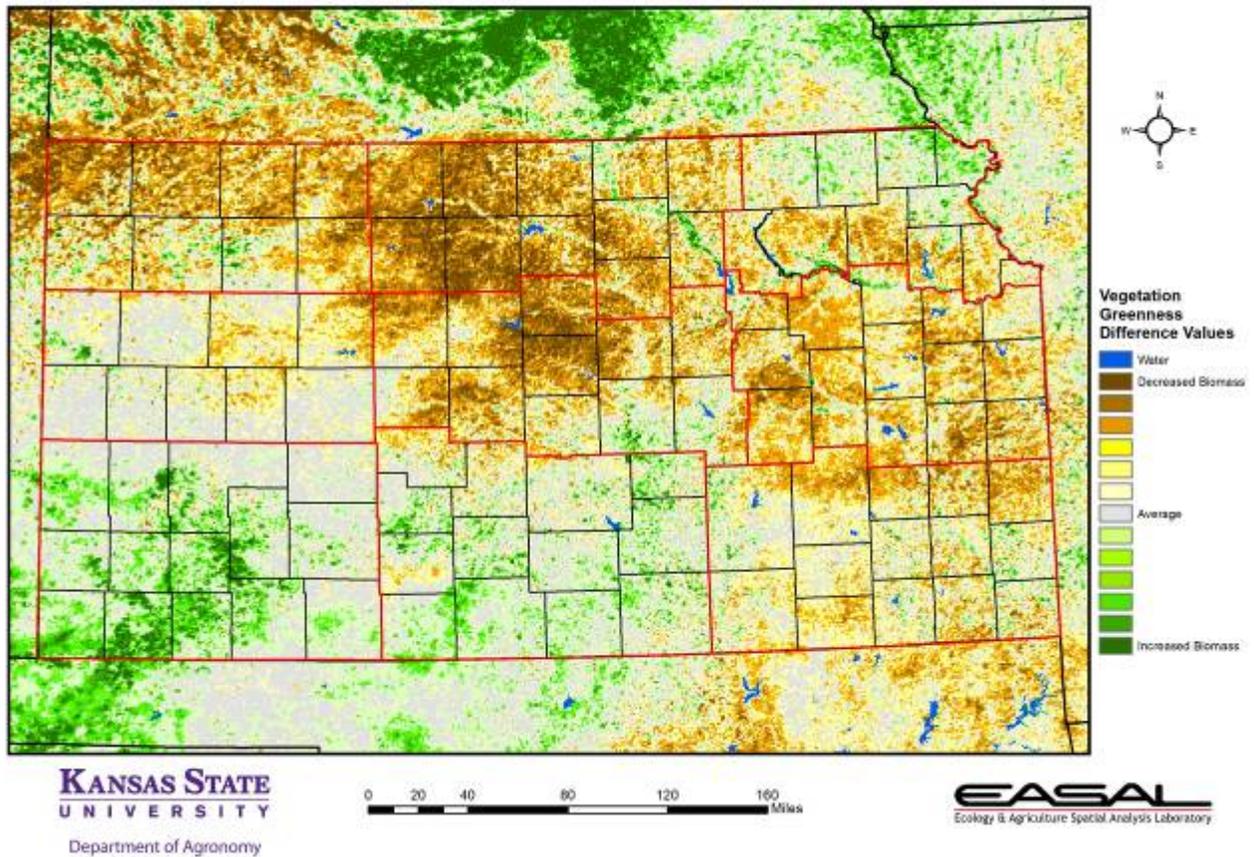
Period 25: 06/12/2012 - 06/25/2012



Map 1. The Vegetation Condition Report for Kansas for June 12 – 25 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the highest NDVI values continue to shrink eastward. The western half of the state has little ongoing biomass production.

Kansas Vegetation Condition Comparison

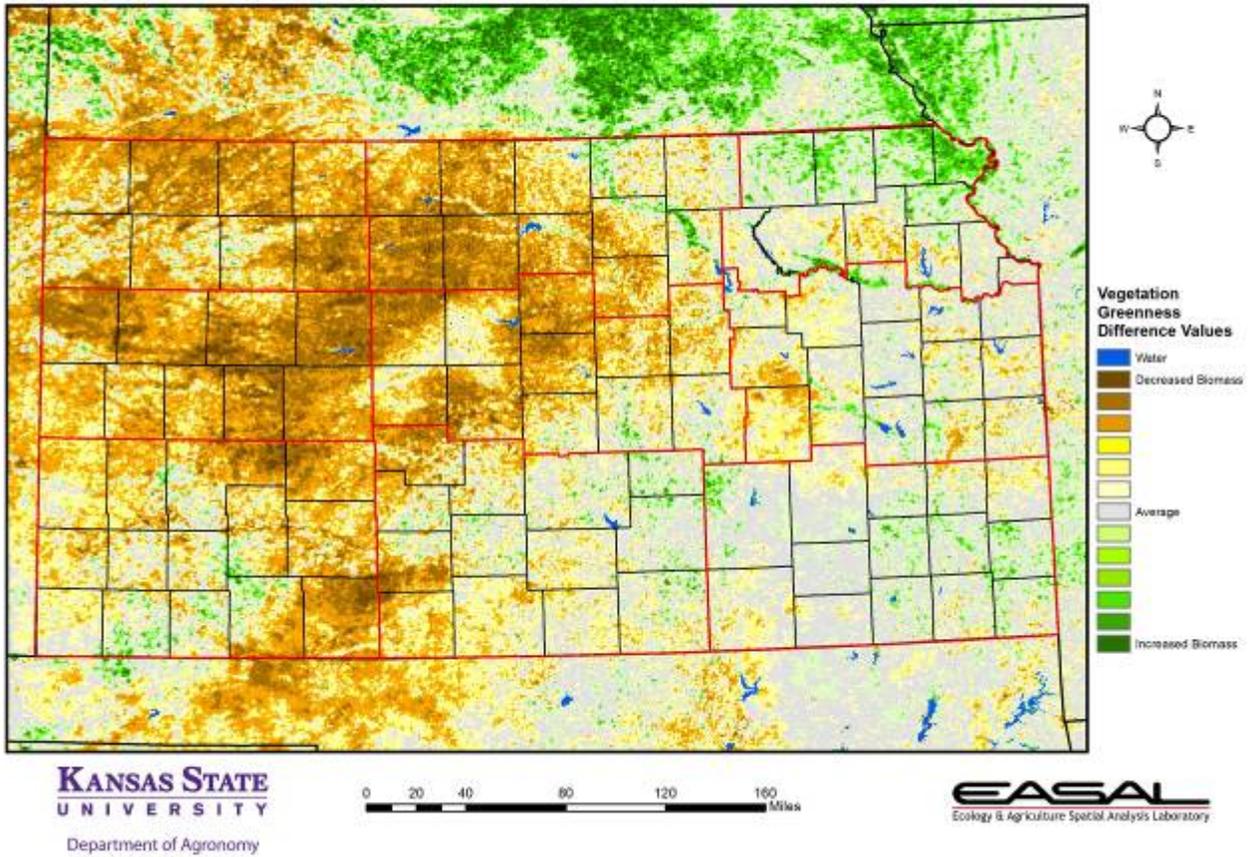
Late-June 2012 compared to the Late-June 2011



Map 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for June 12 – 25 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that, dry as it is, conditions in southwest and south central Kansas are better than they were during this same two-week composite period last year. In contrast, the northern and eastern portions of the state are seeing much less photosynthetic activity than last year at this time.

Kansas Vegetation Condition Comparison

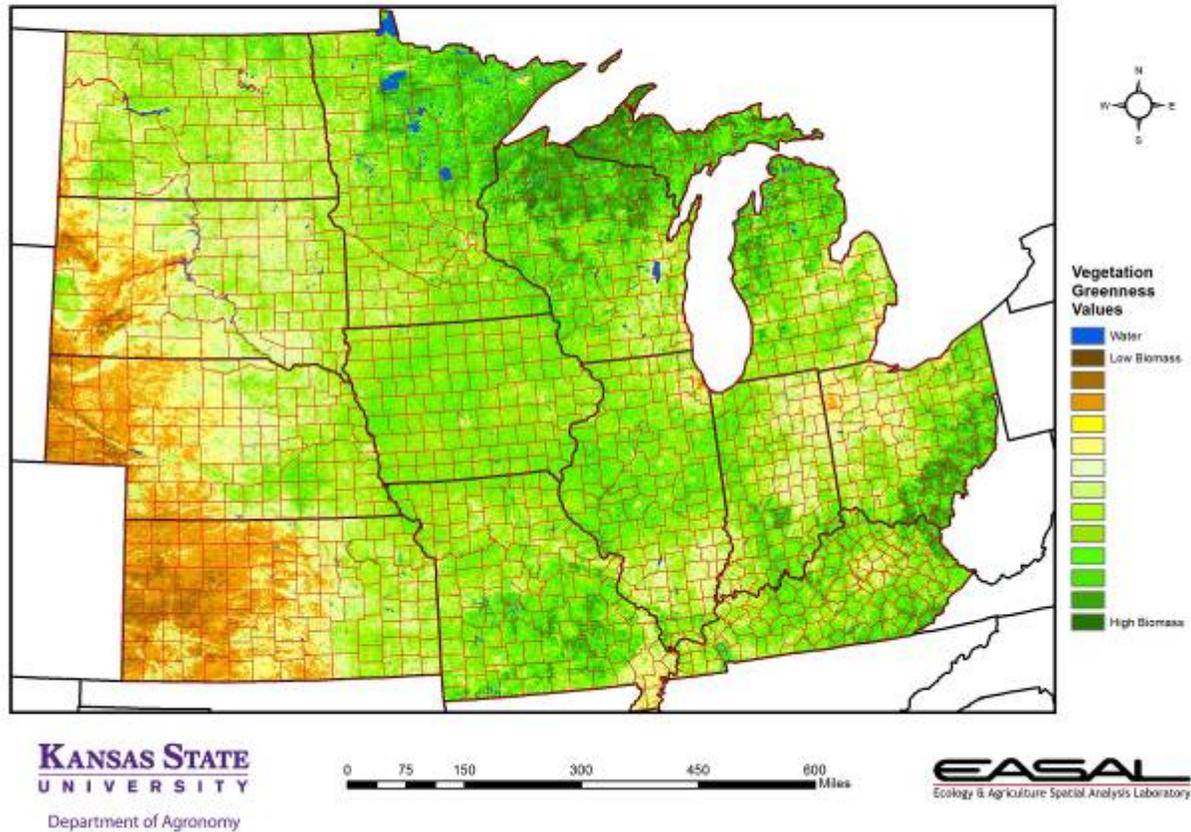
Late-June 2012 compared to the 23-Year Average for Late-June



Map 3. Compared to the 23-year average at this time for Kansas, this year's Vegetation Condition Report for June 12 – 25 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that much of the state has below-average photosynthetic activity. The most notable exception is in northeast Kansas, where rains during this two-week composite period slowed drought development. In Nemaha County, there are several reports of rainfall over 6 inches for June.

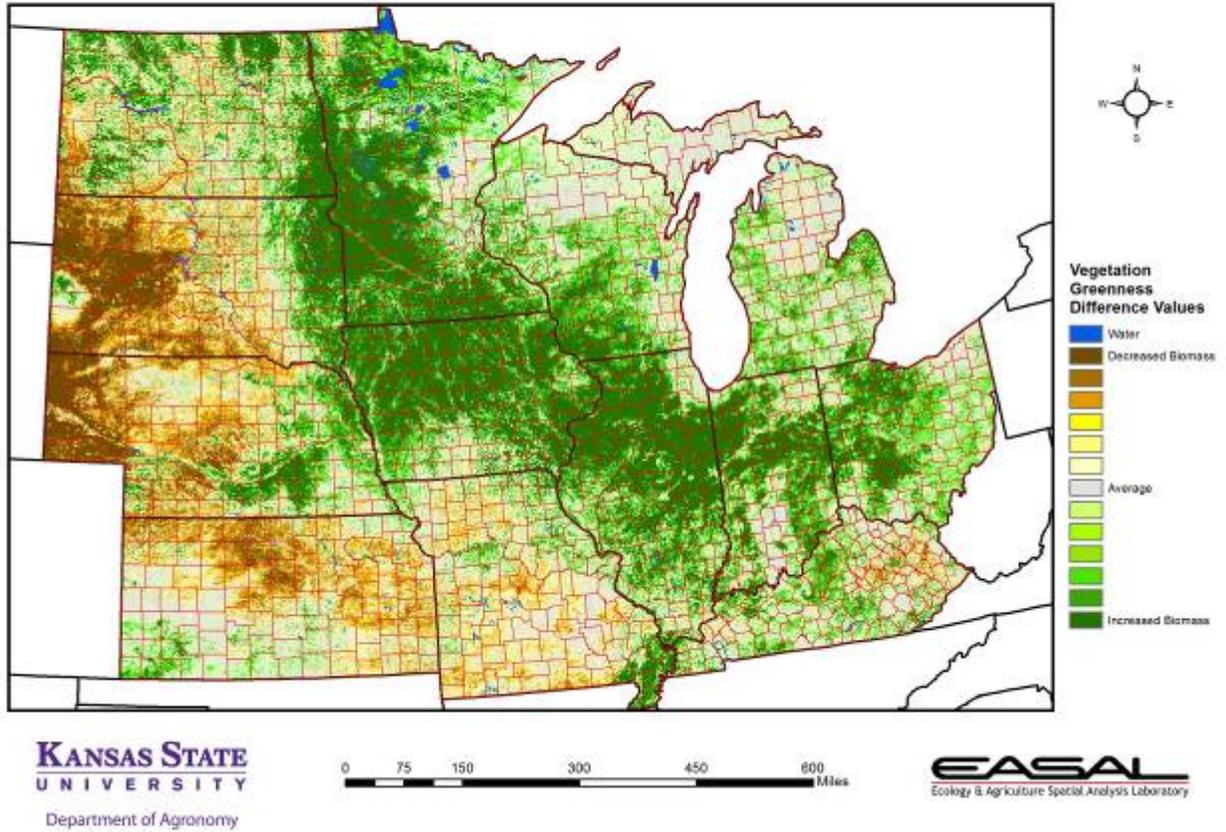
U.S. Corn Belt Vegetation Condition

Period 25: 06/12/2012 - 06/25/2012



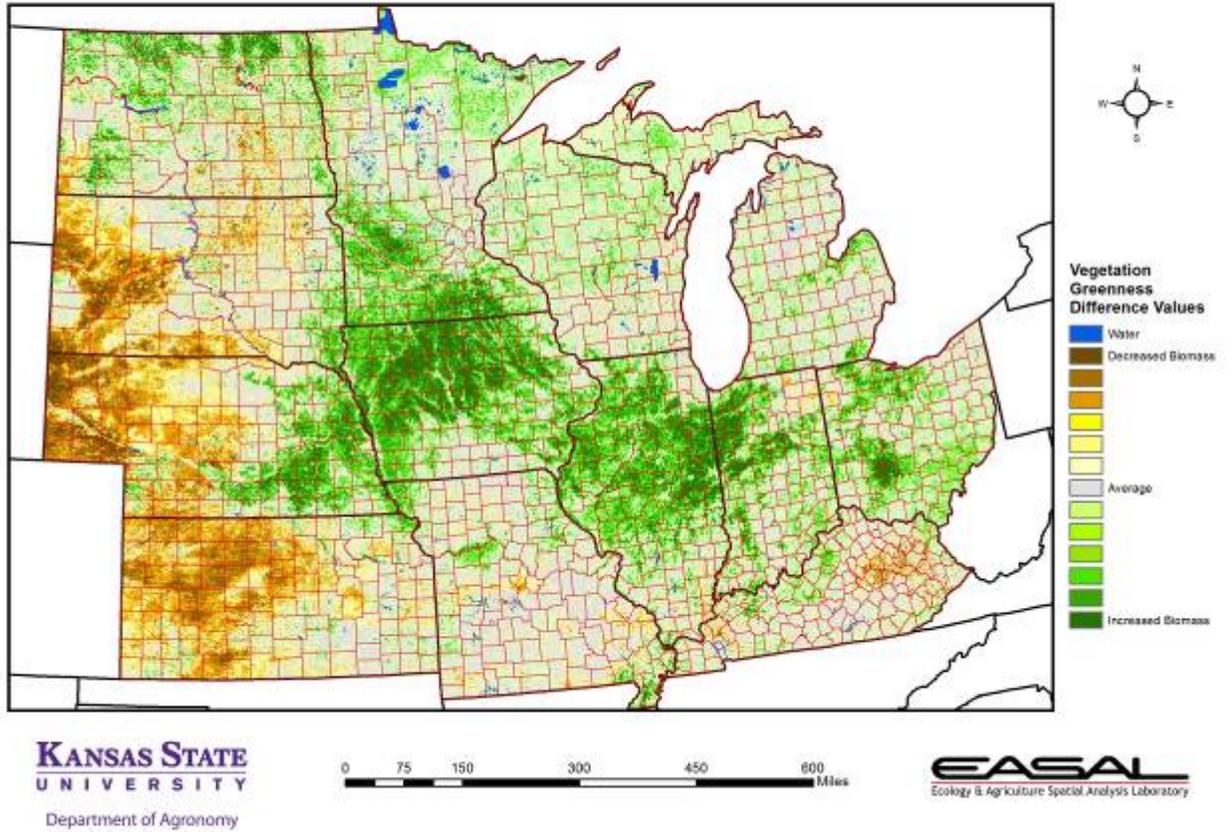
Map 4. The Vegetation Condition Report for the Corn Belt for June 12 – 25 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that greatest NDVI values have retreated to northern Minnesota, northern Wisconsin, and the Upper Peninsula of Michigan. These areas have seen greater rainfall and more seasonal temperatures. In Illinois and Indiana the increasing impact of drought conditions are beginning to be visible. Problems with kernel set due to heat stress won’t be visible in these composite images.

U.S. Corn Belt Vegetation Condition Comparison
Late-June 2012 Compared to Late-June 2011



Map 5. The comparison to last year in the Corn Belt for the period June 12 – 25 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that NDVI values in the heart of the Corn Belt are much higher than they were during this same two-week composite period last year. Much of this is due to earlier crop development and not to better crop conditions at this time. Crop progress continues to be 2-3 weeks ahead of average.

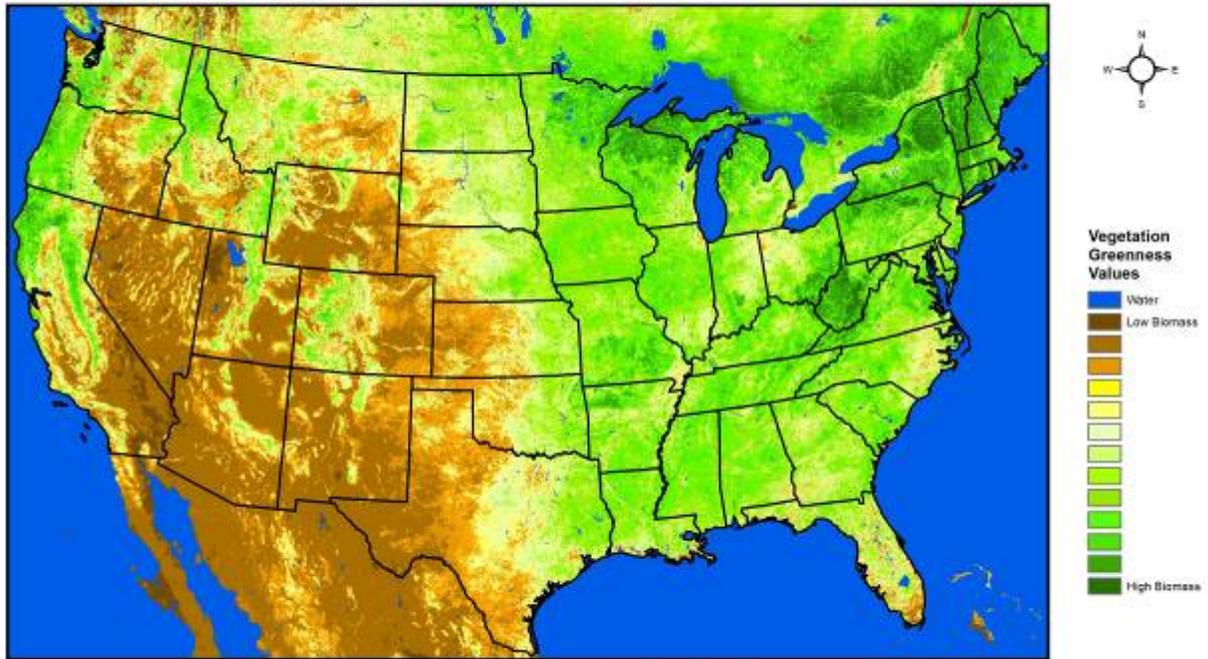
U.S. Corn Belt Vegetation Condition Comparison
Late-June 2012 Compared to the 23-Year Average for Late-June



Map 6. Compared to the 23-year average at this time for the Corn Belt, this year's Vegetation Condition Report for June 12 – 25 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows below-average conditions in the western areas. Eastern Nebraska, northern Iowa, and northern Illinois continue to experience greater-than-average levels of photosynthetic activity.

Continental U.S. Vegetation Condition

Period 25: 06/12/2012 - 06/25/2012



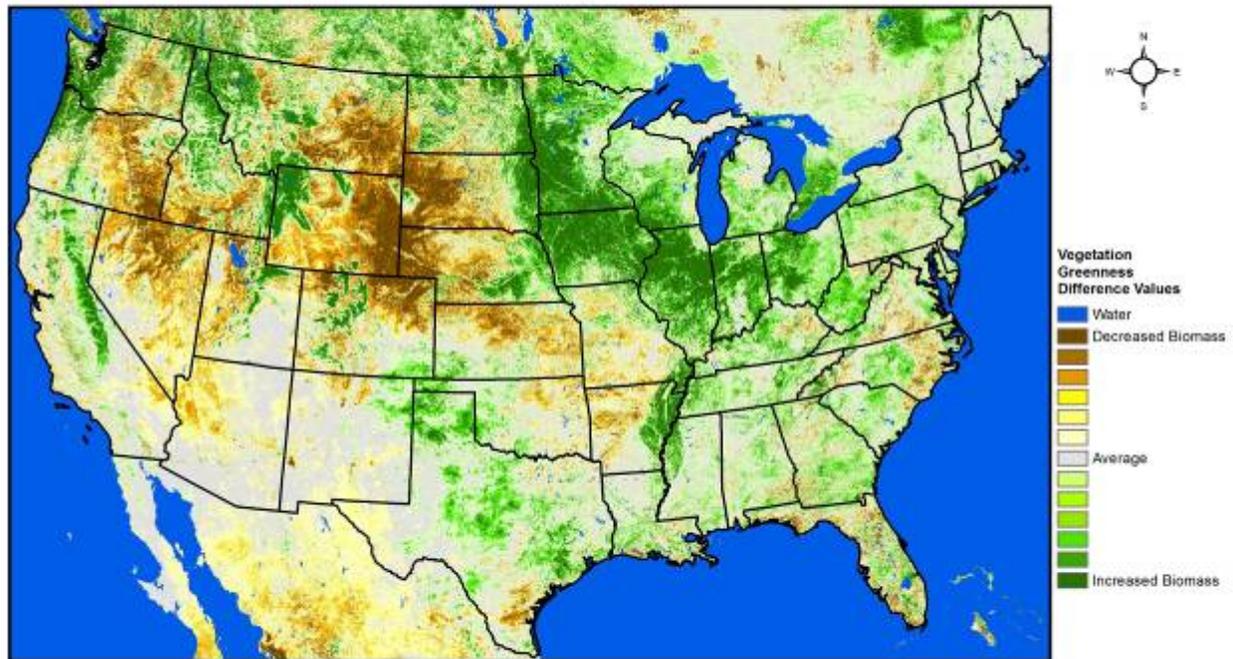
KANSAS STATE
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Department of Agronomy

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EASAL
Ecology & Agriculture Special Analysis Laboratory

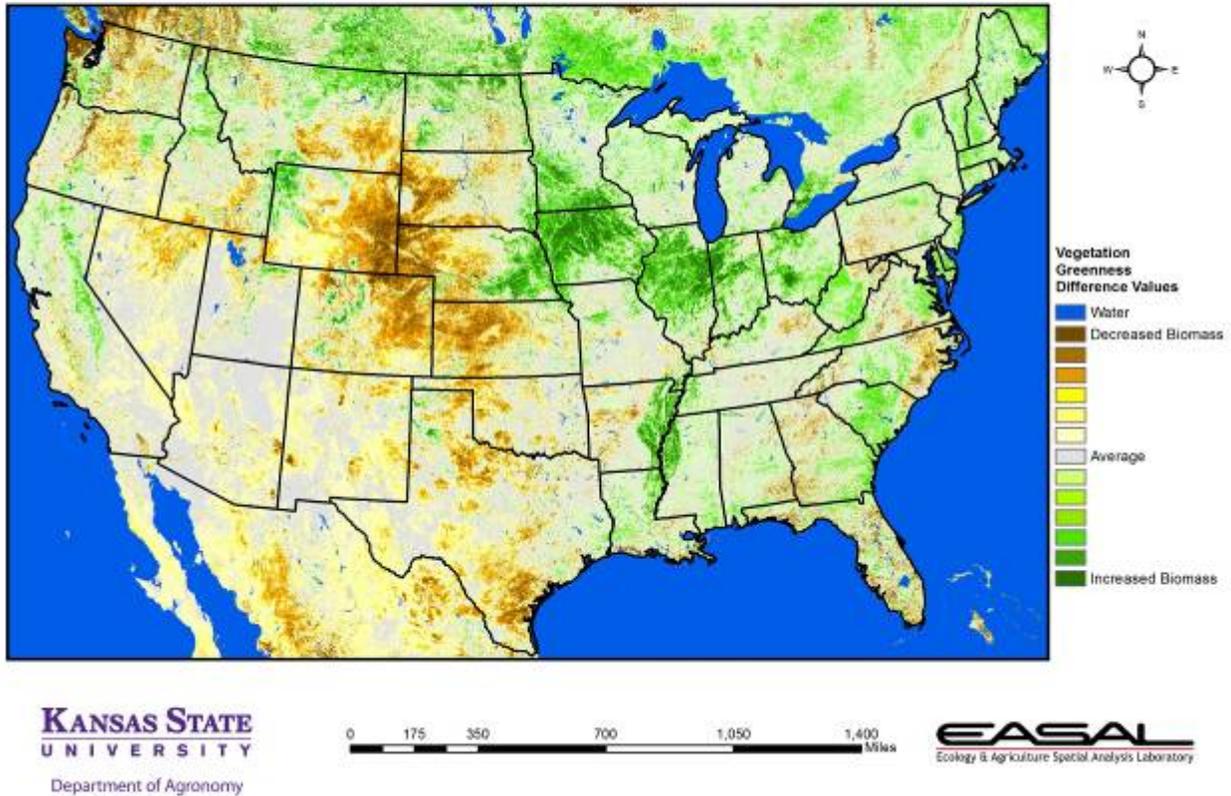
Map 7. The Vegetation Condition Report for the U.S. for June 12 – 25 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that greatest NDVI values can be seen along the northern border into New England. Higher elevations in the West also are seeing moderate photosynthetic activity.

Continental U.S. Vegetation Condition Comparison
Late-June 2012 Compared to Late-June 2011



Map 8. The U.S. comparison to last year at this time for the period June 12 – 25 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that much greater photosynthetic activity in the Midwest and along the Mississippi River Valley, as well as in parts of Texas. In the Midwest, this is due mainly to the more advanced season as plant development continues to be several weeks ahead of average. The Northern Plains shows much lower biomass production than last year, as temperatures and rainfall have been less favorable this year.

Continental U.S. Vegetation Condition Comparison
Late-June 2012 Compared to 23-year Average for Late-June



Map 9. The U.S. comparison to the 23-year average for the period June 12 – 25 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that much of the High Plains is below average in biomass production. This is particularly evident in eastern Wyoming, eastern Colorado, western Kansas, and the Nebraska Panhandle. Areas of the Mississippi River Valley, which were flooded last year, are showing above-average biomass production this year.

Note to readers: The maps above represent a subset of the maps available from the EASAL group. If you’d like digital copies of the entire map series please contact us at kpprice@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.

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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.
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