Issue 514

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eUpdate

06/05/2015

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. Late-developing tillers and green heads in wheat

Most of Kansas received significant rainfall in May after being dry for most of the winter and spring. One result of this has been a flush of growth in late-developing tillers. Where this has occurred, there is essentially a second canopy of green heads along with the main canopy of ripe heads.

Heads that form this late in the season in a crop otherwise nearing maturity usually add very little to the overall yield of a field. If these late, green heads are not close to being ready to harvest when the majority of the crop has dried down, then it's best to start harvesting the field anyway. Waiting for the green heads to mature would risk grain losses due to shattering or hail damage. With varieties that tend to shatter easily, producers should start harvesting as soon as the field reaches 15% moisture.

Most of the immature grain and green plant parts will go out the back of the combine when the crop is harvested, but enough green material may go into the bin to increase the dockage and overall moisture level of the load of wheat to some extent. Combine settings can help minimize problem, but not eliminate it. If a large amount of immature grain goes out the back of the combine, this could result in a greater-than-normal amount of volunteer on those fields this summer. In that cases, those fields will have to be watched especially closely and the volunteer controlled.

The situation is a little different where the main canopy is several weeks away from being mature. In that situation, the green tillers could develop quickly enough to add a significant amount to the yield potential. Still, unless the green tillers make up more than half the heads in the fields, it's probably best to just start harvesting when the majority of heads are ready to go if there is a maturity difference of several days or more between the ripest and least developed heads. Waiting for the green heads to ripen might lead to shattering of the more mature heads.

In northwest Kansas, for example, there is enough time in most cases to wait and see how the new green shoots develop. If the weather is favorable and the new tillers have time to mature, producers in northwest Kansas may want to wait until they have ripened before harvesting. In north central Kansas, where the existing yield potential in some fields is higher, the new tillers won't add that much to the final yield in most cases.

Producers who are harvesting wheat with some green heads present should take special care to measure the moisture content of the grain if they plan to store it on farm, and use air aggressively to dry the grain if the moisture content is high.

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2. Plant analysis for testing nutrient levels in corn

Plant analysis is an excellent "quality control" tool for growers interested in high-yield crop production. It can be especially valuable for managing secondary and micronutrients that don't have high quality, reliable soil tests available, and for providing insight into how efficiently you are using applied nutrients.

Plant analysis can be used by Kansas farmers in two basic ways: for diagnostic purposes, and for monitoring nutrient levels at a common growth stage. Diagnostics can be done any time, and is especially valuable early in the season when corrective actions can easily be taken. Monitoring is generally done at the beginning of reproductive growth.

Diagnostic sampling

Plant analysis is an excellent diagnostic tool to help understand some of the variation among corn plants 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. Don't wait for tasseling or silking to sample.

When sampling for diagnostic purposes, collecting specific plant parts is less important than obtaining comparison samples from good and bad areas of the field. As a general rule, if plants are less than 12 inches tall, collect the whole plant. Cut off the plant at ground level. With plants more than 12 inches tall and until reproductive growth begins, collect the top fully developed leaves (those which show leaf collars). Once reproductive growth starts, collect the same plant parts indicated for monitoring purposes, described below.

Along with taking plant tissue samples, it is also helpful to collect a soil sample from both good and bad areas when doing diagnostics. Define your areas, and collect both soil and plant tissue from areas that represent good and bad areas of plant growth. Soil samples can help define why a problem may be occurring. The soil sample may find certain nutrient levels are very low in the soil, helping to explain why a deficiency is occurring. But other factors can also cause nutrient problems. Soil compaction, for example, often limits the uptake of nutrients, especially potassium, which are otherwise present in adequate amounts in the soil.

Plant analysis for nutrient monitoring

For general monitoring or quality control purposes, plant leaves should be collected as the plant enters reproductive growth. Sampling under stress conditions for monitoring purposes can give misleading results, and is not recommended. Stresses such as drought will generally limit nutrient uptake, and result in a general reduction in nutrient content in the plant.

In the case of corn, 15-20 ear leaves, or the first leaf below and opposite the ear, should be collected at random from the field at silk emergence, before pollination, and before the silks turning brown.

Handling and shipping plant sample

How should you handle samples, and where should you 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 the leaves 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. Make sure to label things clearly for the lab.

What nutrients should be included in the plant analysis?

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), though widespread deficiencies of those micronutrients have not been found in the state. Many labs can analyze for these nutrients also. 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 14 mineral elements considered essential to plants. K-State offers a package which includes N, P, K, Ca, Mg, S, Fe, Cu, Zn, and Mn for $23.75.

What will you get back from the lab?

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 most of 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. It is 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, you should ask some serious questions about the availability and supply of that nutrient.

Keep in mind also that any plant stress (drought, heat, soil compaction, etc.) can have a serious impact on nutrient uptake and plant tissue nutrient concentrations. So a low value of a nutrient in the plant doesn't always mean the nutrient is low in the soil and the plant will respond to fertilizer. It may be that the nutrient is present in adequate amounts in the soil, but is either not available or not being taken up by the plant for a variety of reasons. Two examples are drought, which can reduce plant uptake of nutrients and cause low nutrient values in the plant; and high-pH soils, which can cause low iron availability.

On the other extreme, 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 that can be toxic when present in excess. This can occur at very low soil pH levels, generally well below 5.

The following table gives the range of nutrient contents considered to be "normal" or "sufficient" for corn seedlings below 12" tall, and for the ear leaf of corn at silking. Keep in mind that these are the ranges normally found in healthy, productive crops.

Range of nutrient contents considered "normal" or "sufficient" at two growth stages in corn			
Nutrient	Units	Whole Plant <12" tall	Corn Ear Leaf at Green Silk
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	20-200
Manganese	ppm	20-150	20-150
Zinc	ppm	20-60	15-70
Boron	ppm	5-25	4-25
Molybdenum	ppm	0.1-10	0.1-3.0
Aluminum	ppm	<400	<200

Summary

In summary, plant analysis is a good tool to monitor the effectiveness of your fertilizer and lime program, and a very effective diagnostic tool. Consider adding this to your toolbox.

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3. Glume blotch on wheat

There have been many reports this year of glume blotch on wheat, from southeast Kansas through north central Kansas. Glume blotch can be caused by the same fungus that causes *Stagonospora nodorum* blotch or the fungus that causes speckled leaf blotch. Initial symptoms of glume blotch are small brown spots on the glumes or awns. These expand to dark blotches, darkening the head. As lesions age, they may become tan and contain very small caramel-colored round fungal structures (visible with magnification).

Figure 1. Glume blotch in wheat. Photo by Jim Shroyer, K-State Research and Extension.

The septoria leaf and glume blotch pathogen survives within infested straw, seed, and on volunteer wheat. Infections on these sources serve as the source of inoculum to start off the disease cycle in the new crop of wheat. The disease is favored by splashing rain, high humidity, and temperatures between 68 and 82 degrees F. Where those conditions have occurred over the past month, glume blotch is now being found.

The disease characteristically moves upward from infection initiated on the low leaves within the crop canopy. If weather remains favorable, the disease will often spread to the heads. Foliar fungicides will protect wheat against glume blotch, but must be applied shortly after head emergence. Current fungicide labeling prevents application beginning at flowering or within 30 days of harvest. There are varietal differences in susceptibility to glume blotch; however, high levels of resistance are rare.

Glume blotch can result in yield losses between 10 and 20 percent. The greatest losses occur when the disease damages both the leaves and the heads. The grain produced in heads damaged by glume blotch is often small and shriveled.

Figure 2. Kernels on the left are from wheat infected with glume blotch. The kernels on the right are from normal, healthy wheat. Photo by Doug Shoup, K-State Research and Extension.

The fungus that causes glume blotch can survive in wheat residues. Fields with severe disease this year should not be planted to wheat this fall. The fungus can also survive in grain that is saved for seed. These seed infections can reduce the effectiveness of crop rotations and allow the disease to get established early in the growing season. Growers wanting to save seed from affected fields should have grain cleaned to remove the small heavily infected seeds, and use a fungicide seed treatment such as Vibrance Extreme or Gaucho XT.

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4. Loose smut: Causes and treatments

There have been several reports in recent years of loose smut in wheat. It is not uncommon to find low levels of loose smut in wheat fields, and the symptoms will be obvious by this time of year.

It is easy to pick out plants with loose smut in a field. The spikelets of infected heads are completely black and sooty instead of the normal, healthy color. There is no grain. Instead, infected heads consist entirely of a mass of fungal spores.

Figure 1. Loose smut in wheat. Photo by Erick DeWolf, K-State Research and Extension.

Loose smut is a seedborne disease that is caused by the fungus *Ustilago tritici*. The fungus that causes loose smut survives as dormant mycelia within the embryo of an infected wheat seed. When the seed germinates, the fungus becomes active again. The fungus develops within the growing point and moves into the developing grain tissue as the wheat plants grow.

When the head emerges, there are masses of black spores on the spikelets instead of flowering parts. By harvest only an erect bare rachis remains. The spores are released into the air and can be blown onto healthy wheat heads were infection takes place at flowering or the early stages of kernel development. If the infection is successful, the fungus begins to grow within the developing wheat seed embryo.

Newly infected grain appears healthy in every way, but when it germinates the following season, the plant that grows from the infected seed will produce nothing but a dark mass of spores instead of healthy grain. The yield loss on infected heads is total. On a field-wide basis, the amount of yield loss is proportional to the percentage of infected heads.

Cool (60-70 degrees F), humid weather accompanied by light showers or heavy dews is most favorable for infection. Under favorable weather conditions, the wheat produced from a field with only one percent of the heads infected, can have seed with 10 percent or more infection of loose smut.

Once loose smut becomes evident in the field, it is far too late to control the disease. The best option at that point is seed treatment. If producers have a field that is infected with loose smut and plan to keep some of the grain back for seed, they should be sure to have the seed commercially treated with a systemic fungicide seed treatment such as Gaucho XT, Vibrance Extreme, and Stamina F3 Cereals. These fungicides provide excellent control of loose smut, but good coverage of the seed is very important to ensure that the maximum benefit of the treatment is realized.

Another option is to sell all the wheat from the infected field as grain and buy certified seed to plant in the fall. Certified seed in Kansas is allowed to have as much as 10 heads in 1,000 (or 1 percent) that are infected with loose smut. There is no requirement that this seed be treated in order to qualify as certified seed by the Kansas Crop Improvement Association, but it would be a good idea to buy treated seed. The cost of having seed treated with a standard low-rate fungicide seed treatment for loose smut is relatively low. Costs are higher if the seed treatment also includes an insecticide.

There are no varieties are highly resistant to all races of loose smut.

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5. Twisted, wrapped whorls and trapped, yellow leaves in corn

Most of the state has had a significant amount of precipitation in recent weeks. This situation, combined with still below-normal temperatures, has been causing production issues for corn – some of which have been discussed in previous articles on "purple corn" (eUpdate Issue 512, https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=571) and "standing water" (eUpdate Issue 511, https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=557). In the worst-case scenarios, corn is still yet to get planted (eUpdate Issue 512, https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=572).

Aside from agronomic implications for corn planted this late, full crop insurance coverage for corn planted at this point is not available.

Some cornfields are showing early indications of nitrogen (N) deficiency. In other situations, yellow leaves on the top of the canopy ("yellow tops") can be confused with N deficiency. The cause of yellow leaves on the top of the canopy seems to be a combination of previous slow growth and current "good" growing conditions." Still, the main cause is not clearly known.

Figure 1. Yellow leaf showing symptoms of sun starvation. Plants will recover after being exposed to sunny conditions for a couple of days. Photo by Ignacio A. Ciampitti, K-State Research and Extension.

Twisted whorls can also be confounded with a herbicide damage issue from postemergence applications. But in this particular case it is related to the transition from a slow to a rapid growth conditions for corn plants. Leaves within the whorl do not unfurl ("twisted upper leaves"), producing an obstacle to the younger developing leaves for emerging. These younger leaves have been shaded until they finally emerge; thus the yellow appearance. Yellow leaves are accompanied by wrinkle pattern (Fig. 2), condition that will remain for the rest of the season (affected leaves due to "twisted whorls").

Figure 2. Yellow corn leaf with a wrinkle pattern. Photo by Ignacio A. Ciampitti, K-State Research and Extension.

In most of the fields inspected, this situation was isolated without affecting the entire field (Fig. 3). As a general pattern, corn presenting this condition was around the V4-V8 (four to eight-leaf) growth stage interval.

Figure 3. Yellow tops in isolated patterns within the corn field. Photos by Ignacio A. Ciampitti, K-State Research and Extension.

Yellow-tops will fade away as growing conditions (temperature) resumes to normal for this point in the season, and as the leaves accumulate chlorophyll. Previous reports related to this production issue did not document yield impacts. Thus, yield is not likely to be affected if the growing conditions resume to normal in the next days. Just make sure to scout your fields for this corn production issue.

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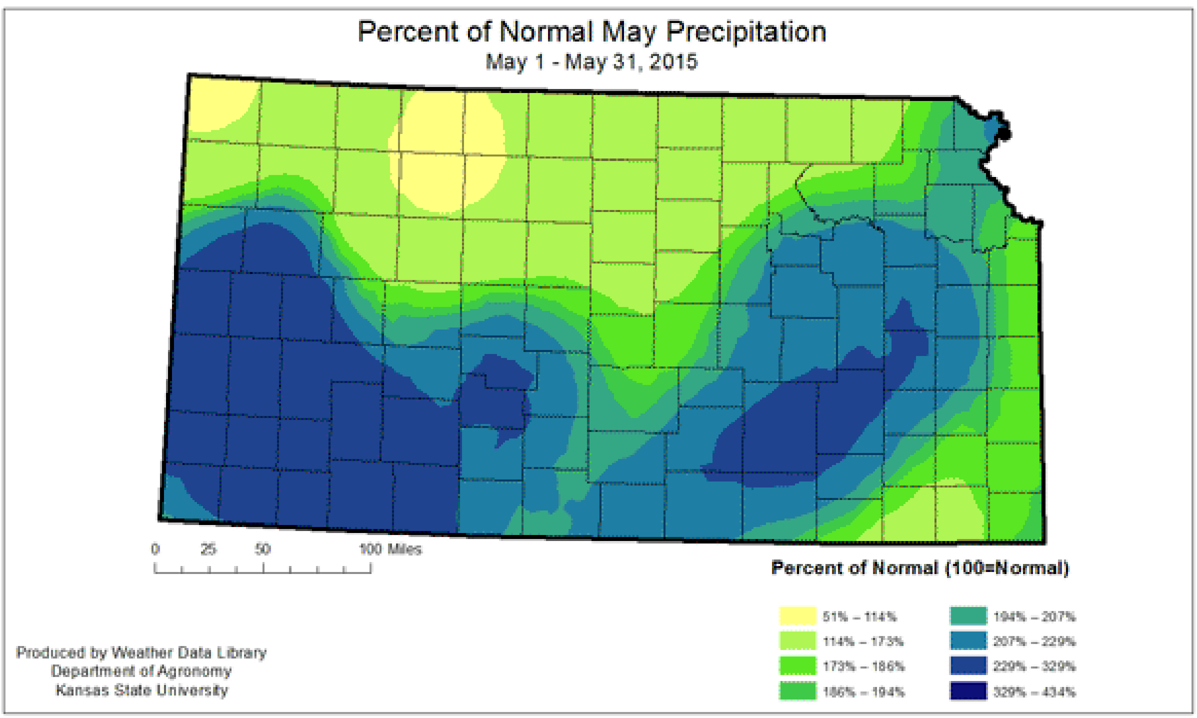
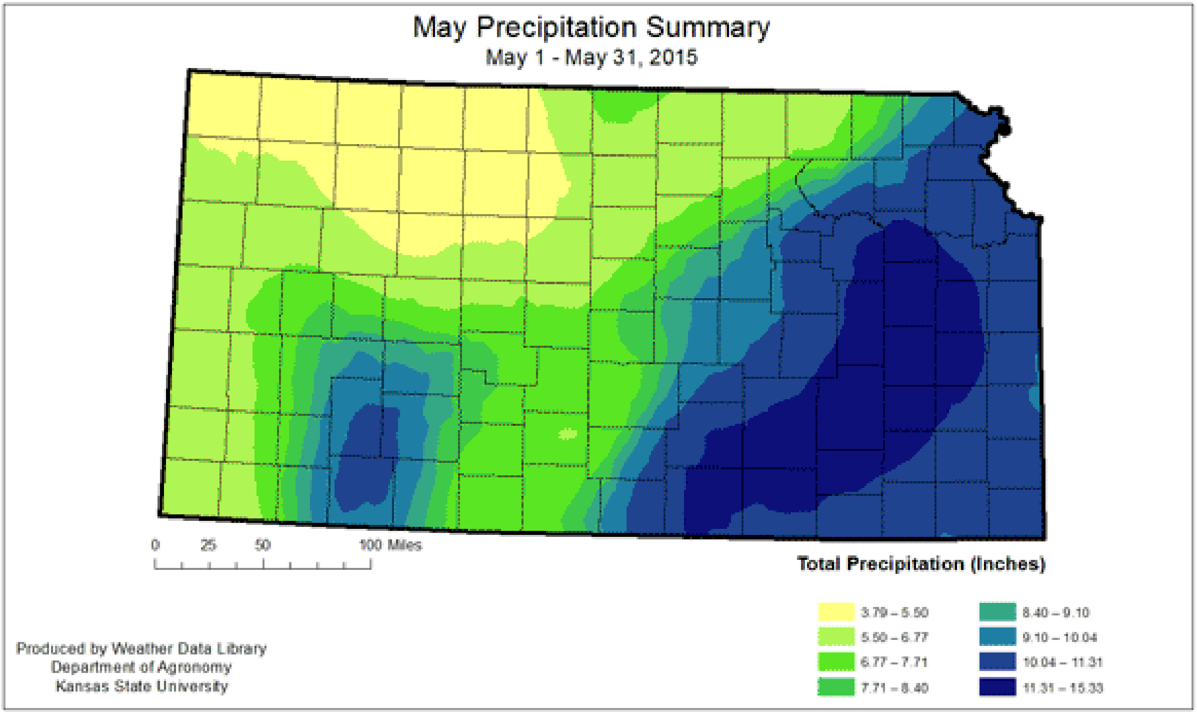
6. May weather summary for Kansas: Drought Buster

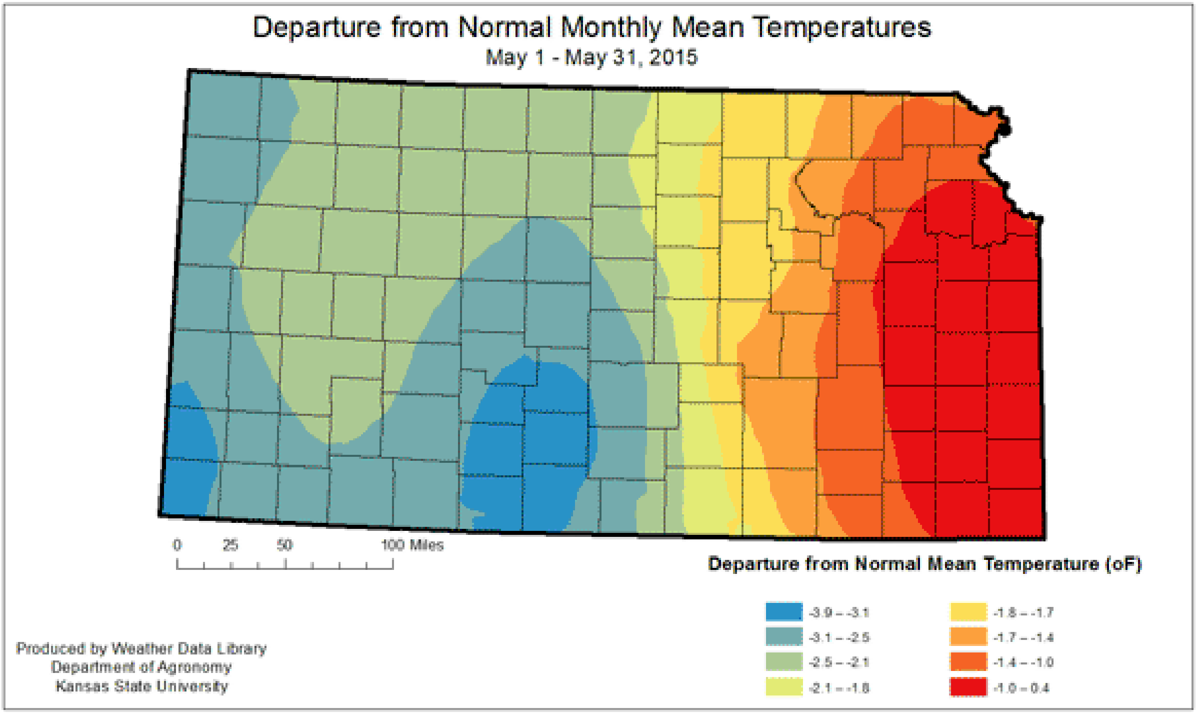
The combination of cooler-than-normal temperatures and much higher-than-average precipitation in May resulted in significant improvement in the drought situation in Kansas. At the start of the month approximately 2 percent of the state was in extreme drought and only 9 percent was drought-free. By the end of the month only 6 percent of the state was in moderate drought and 67 percent was drought-free.

The statewide average precipitation for the month was 7.73 inches -- 188 percent of normal. It ranks as the third wettest May since 1895. All divisions had greater-than-average precipitation for the month. The Northwest Division came closest to average at 113 percent of normal, with an average of 3.93 inches. The Southeast Division averaged the greatest overall precipitation at 10.63 inches, but that was just 186 percent of normal. The Southwest Division averaged 7.79 inches, which was 279 percent of normal. Lebo in Coffey County was the wettest NWS Cooperative observer station with 15.56 inches. The wettest station in the Community Collaborative Rain Hail and Snow Network (CoCoRaHS) was at Topeka 5.5 SE, Shawnee County, with 15.53 inches. Manhattan (Riley County) had the highest 24-hour total for the NWS network with 4.85 inches on the 5th. The highest daily total for the CoCoRaHS network was 7.92 at Webber 2.6 ENE, Jewell County on the 7th. Three all-time May record daily rainfall amounts were set: 3.83 inches at Lindsborg on the 5th, 3.72 inches at Overbrook on the 22nd and 3.95 inches at John Redmond on the 28th.





The May temperatures were cooler-than-normal. The mean monthly temperature was 61.6 degrees F, or 1.9 degrees cooler than normal. This ranks as the 31st coldest May in the 121-year record. That would place it in the upper portion of the coldest third on the record. The coldest reading was 29 degrees F at Norton (Norton County) and Oberlin (Decatur County) on May 12th. The warmest reading was 95 degrees F, Sharon Springs (Wallace County) on the 20th. The widespread low temperatures on the 12th of May continued to stress winter wheat, particularly in fields where wheat was flowering. Additionally, the cool, wet conditions have resulted in uneven emergence in the spring planted crops, such as corn and soybeans. The warmest divisions were the Southeast and East Central, which averaged 1.0 degrees cooler than normal. The Southwest had the largest departure with an average of 61.1 degrees F, or 2.7 degrees cooler than normal. With the cooler-than-average temperatures for the month, it is not surprising that 99 new record daily cool highs were set. None of those records were new record for the month. There were 7 records set for high daily maximums. On the low temperature side, fewer records were set. There were 18 record low minimums set and 2 record high minimums recorded.


Departure from Normal Monthly Mean Temperatures
May 1 - May 31, 2015
0 25 50 100 Miles
Departure from Normal Mean Temperature (oF)
-3.9 – -3.1
-3.1 – -2.5
-2.5 – -2.1
-2.1 – -1.8
-1.8 – -1.7
-1.7 – -1.4
-1.4 – -1.0
-1.0 – 0.4
Produced by Weather Data Library
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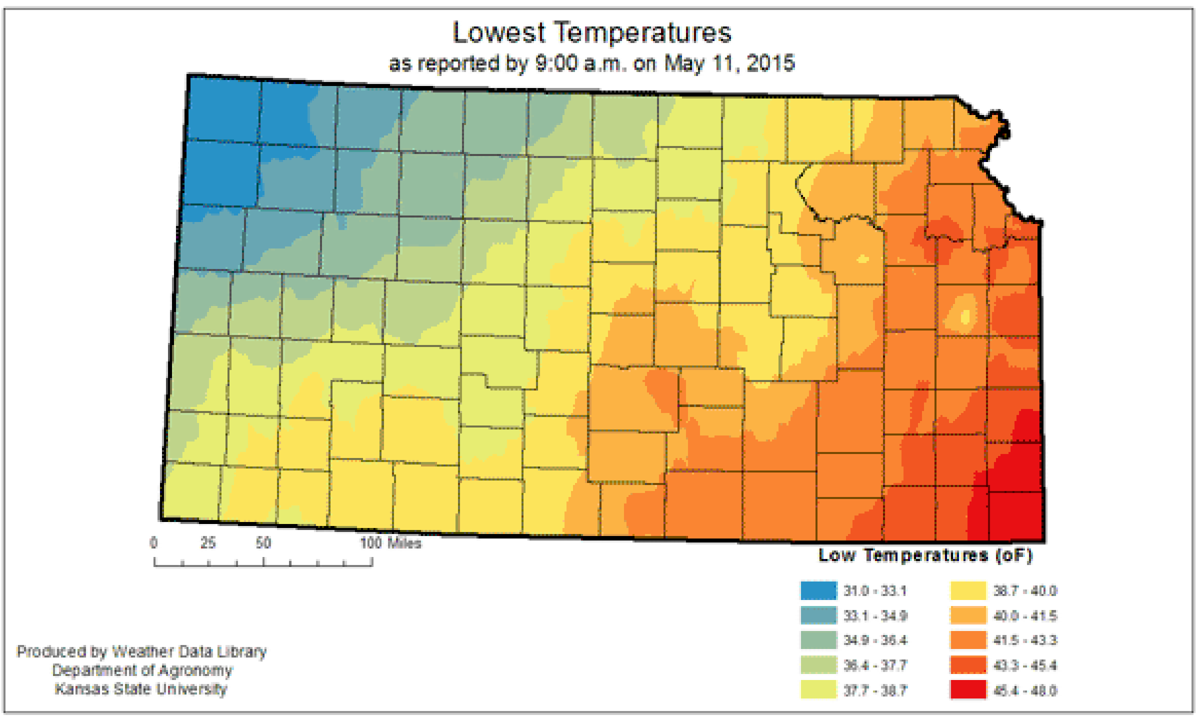
Kansas State University


Lowest Temperatures
as reported by 9:00 a.m. on May 11, 2015
0 25 50 100 Miles
Low Temperatures (oF)
31.0 - 33.1
33.1 - 34.9
34.9 - 36.4
36.4 - 37.7
37.7 - 38.7
38.7 - 40.0
40.0 - 41.5
41.5 - 43.3
43.3 - 45.4
45.4 - 48.0
Produced by Weather Data Library
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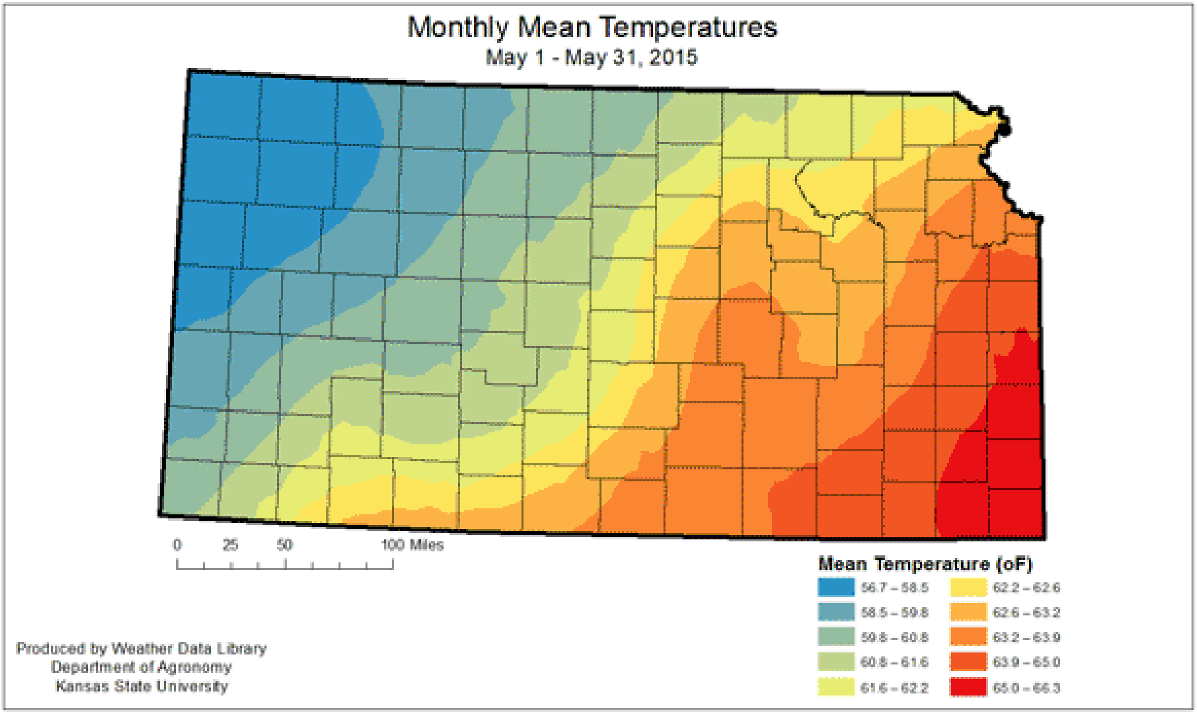
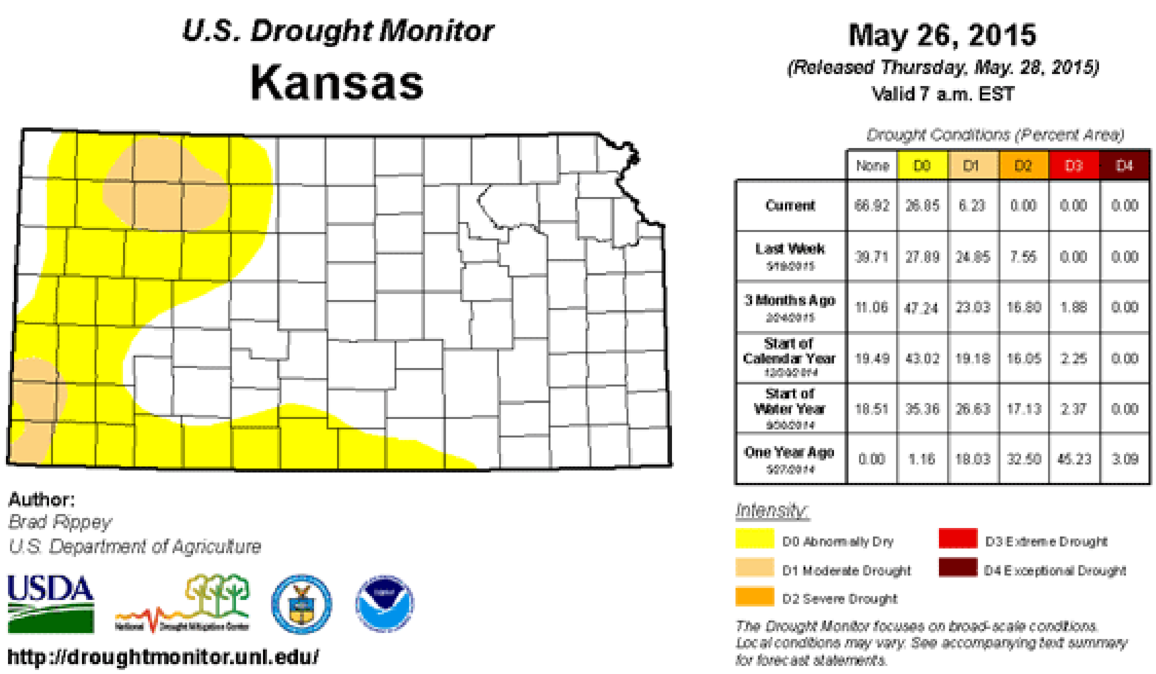
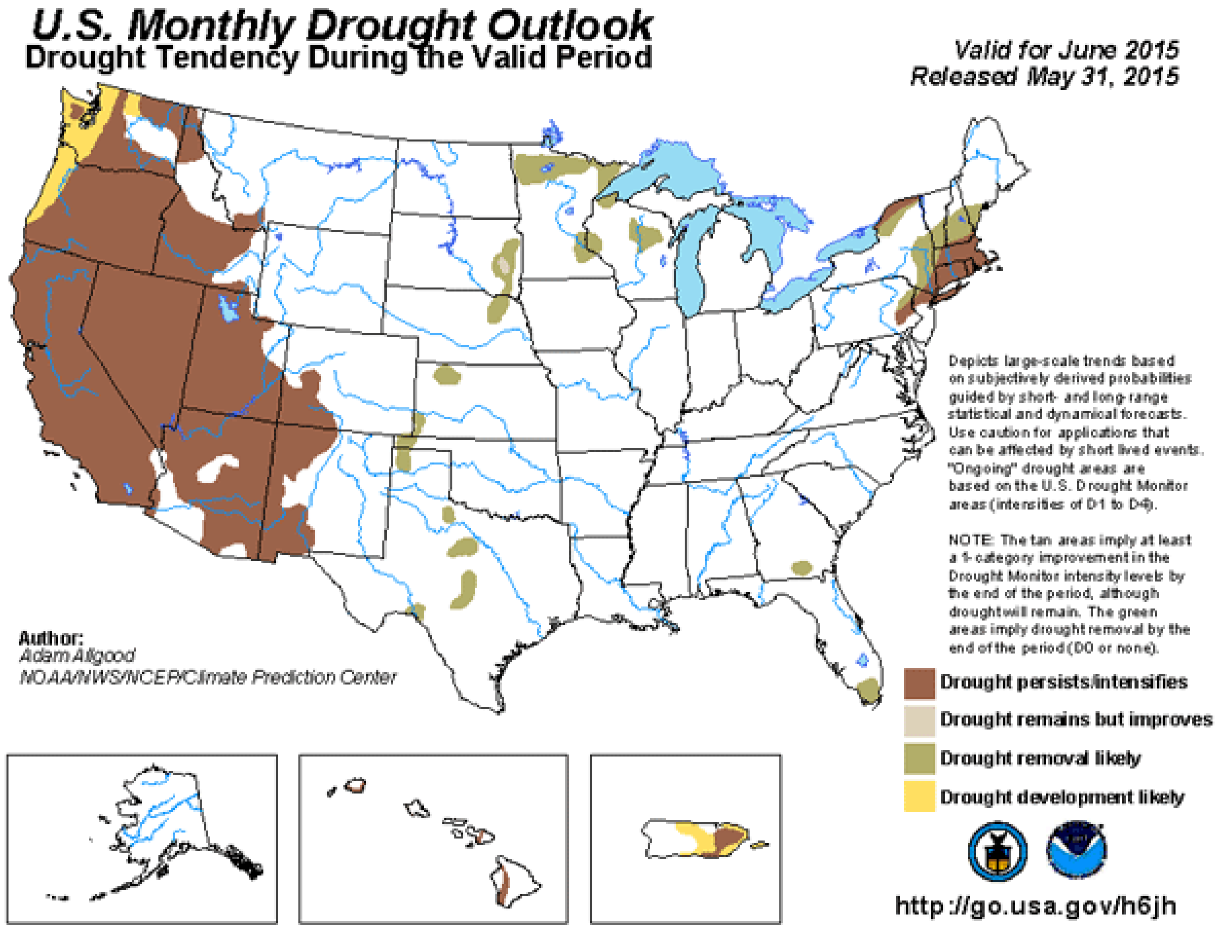


Drought conditions improved dramatically in May. Only small pockets of moderate drought remain in extreme southwest Kansas and parts of north central Kansas. However, continued normal to above-normal precipitation is needed to continue improvements. Also, some long-term hydrological deficits are in place affecting some water supplies and reservoirs. For example, Norton, Cedar Bluff, Kirwin, and Webster reservoirs are all less than 75 percent of conservation pool.





May 2015

Kansas Climate Division Summary

	Precipitation (inches)						Temperature (°F)			
	May 2015			2015 Jan through May					Monthly Extremes	
Division	Total	Dep.[1]	% Normal	Total	Dep.[1]	% Normal	Ave	Dep.[1]	Max	Min
Northwest	3.93	0.47	113	7.16	-0.67	92	57.9	-2.3	93	29
West Central	5.83	2.80	199	8.69	1.26	118	58.9	-2.3	95	32
Southwest	7.73	5.00	279	10.67	3.92	156	61.1	-2.7	91	37
North Central	5.11	1.03	122	9.29	-0.78	90	61.2	-2.0	93	30

Central	7.59	3.32	178	11.42	0.54	104	62.1	-2.2	92	32
South Central	9.52	5.13	215	15.00	3.29	128	62.9	-2.4	87	34
Northeast	7.95	3.16	167	12.65	0.40	103	62.7	-1.1	87	37
East Central	9.80	4.65	188	14.82	1.19	107	63.2	-1.0	86	36
Southeast	10.63	4.84	186	16.65	0.99	107	64.4	-1.0	86	38
STATE	7.73	3.56	188	12.01	1.33	114	61.6	-1.9	95	29

1. Departure from 1981-2010 normal value

Source: KSU Weather Data Library

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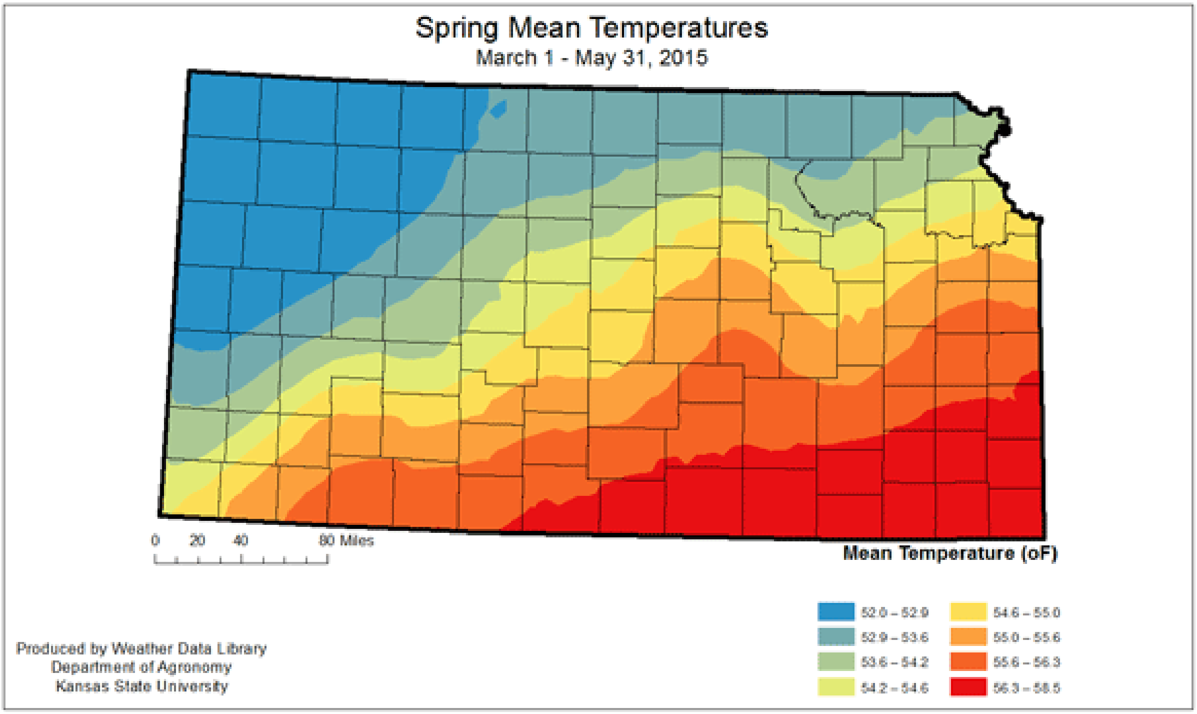
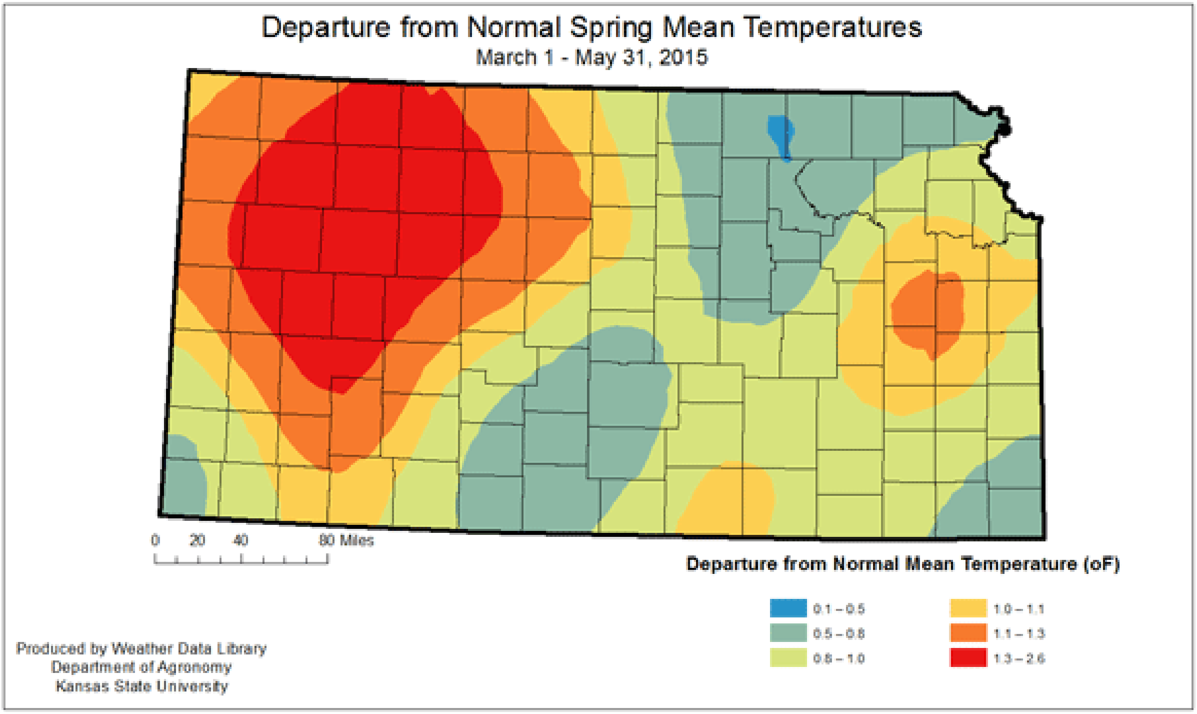
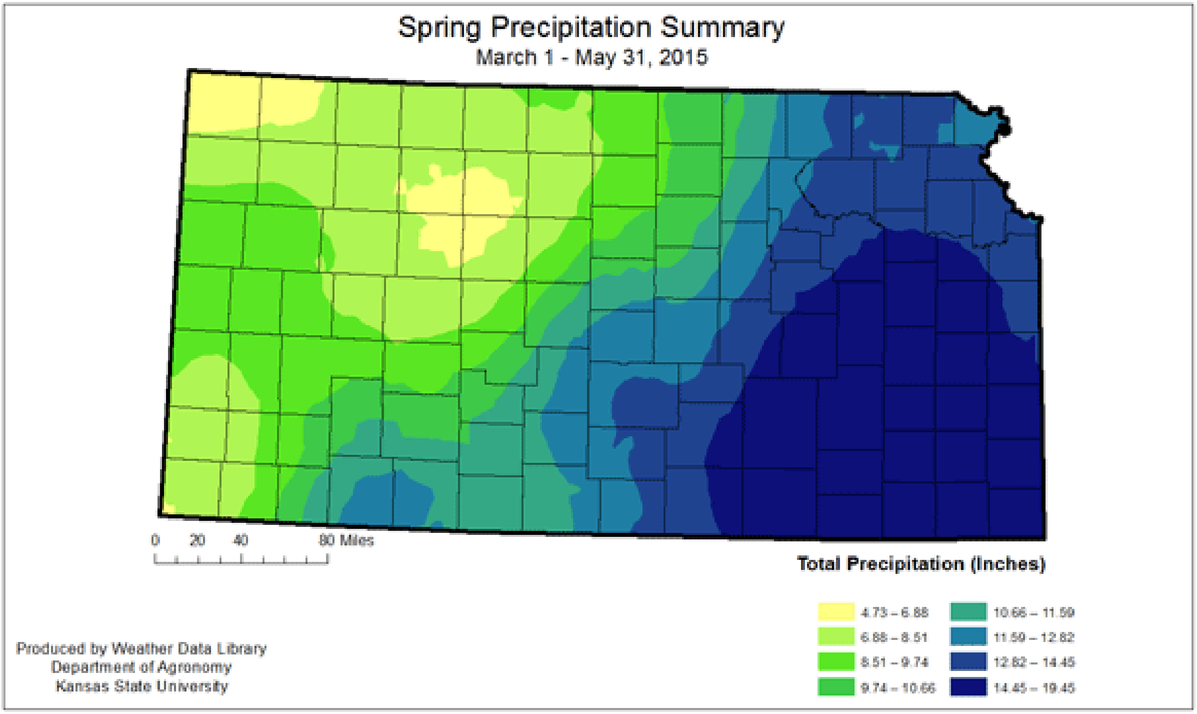
7. Spring weather summary for Kansas

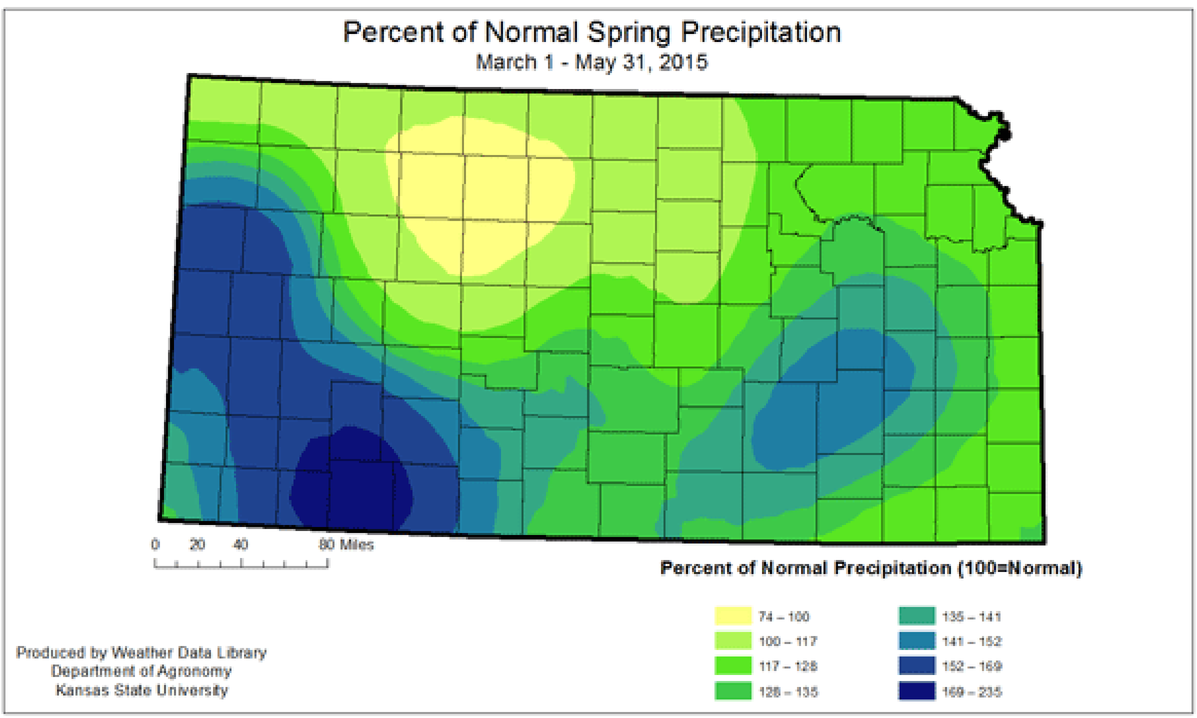
With the end of May, we move out of the meteorological spring into summer. It might be somewhat surprising to see that the spring period actual averaged warmer than normal in Kansas.The March-May period averaged 54.3 degrees F, placing it as the 39th warmest spring since 1895. May was cooler than average statewide, with an average of 61.6 degrees F, or 31st coldest May on record. Warmer-than-average temperatures in March and April resulted in a warmer-than-average bias for the overall period. This is also why the growing degree day departures are not as large as might be expected. The maps below show that the greatest departures occurred in the western part of the state, particularly in the Northwest, North Central and West Central Divisions.





Precipitation for the spring period was greater than normal across most of the state. This March-May period ranks as the 16th wettest since 1895. Not all areas had excess moisture. The border between the Northwest and North Central Divisions was the center of the below-normal precipitation. May was wetter than average, but not enough to overcome the deficits from March and April. This is also the portion of the state that still registers as moderate drought on the U.S. Drought Monitor, according to the latest release.





The Climate Prediction Center's outlook for the summer calls for increased chances of wetter- and cooler-than-normal conditions for the June-August period. The El Niño continues to strengthen and is expected to persist into the winter. This pattern frequently favors wetter-than-average conditions in the Plains. Chances of warmer-than-normal temperatures are reduced when wetter conditions persist in the summer. However, increased humidity could result in higher Heat Index values, with the apparent temperature feeling much warmer that the observed temperature. Heat stress could be a problem, particularly in confined animal operations.

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8. Comparative Vegetation Condition Report: May 19 - June 1

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 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:

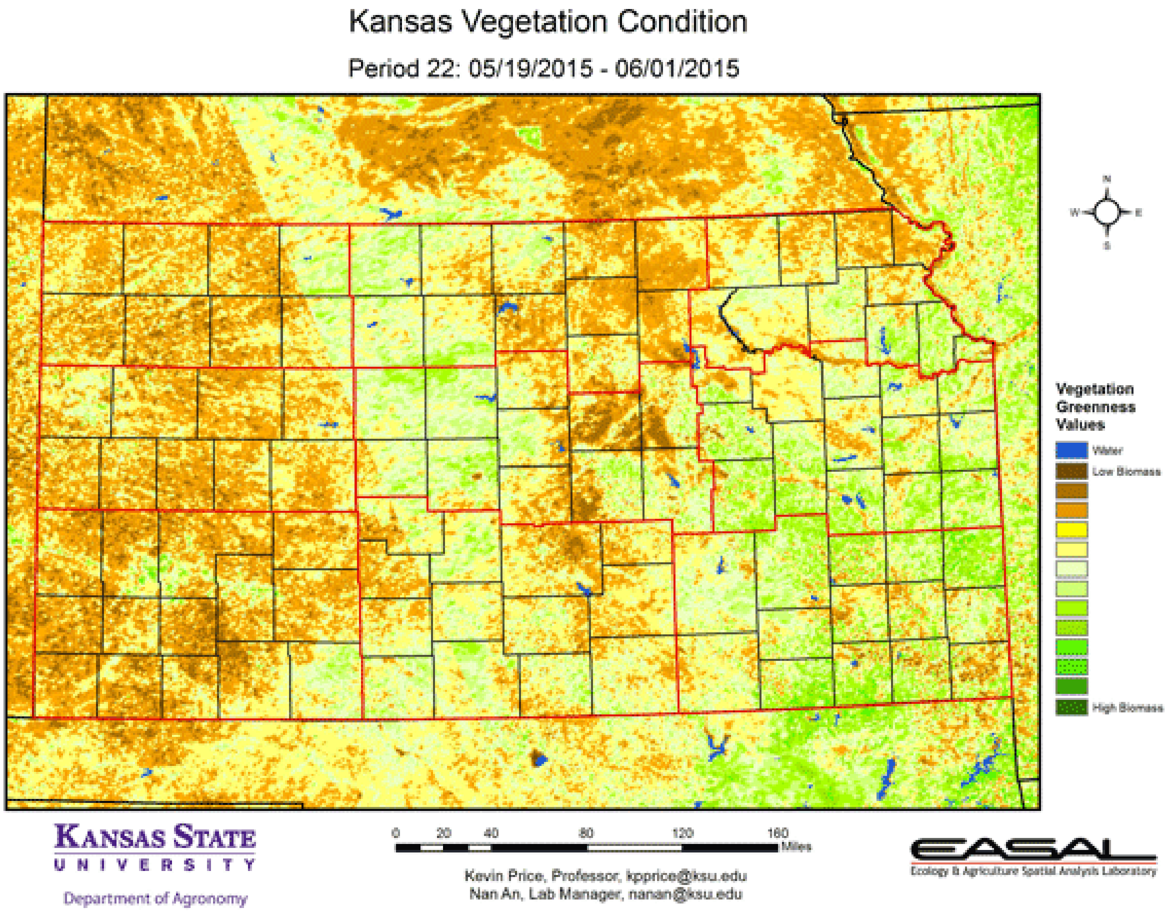

Figure 1. The Vegetation Condition Report for Kansas for May 19 – June 1 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that photosynthetic activity has increased in north central Kansas. Precipitation has also returned to the area, though not to the degree that it has in the rest of the state.

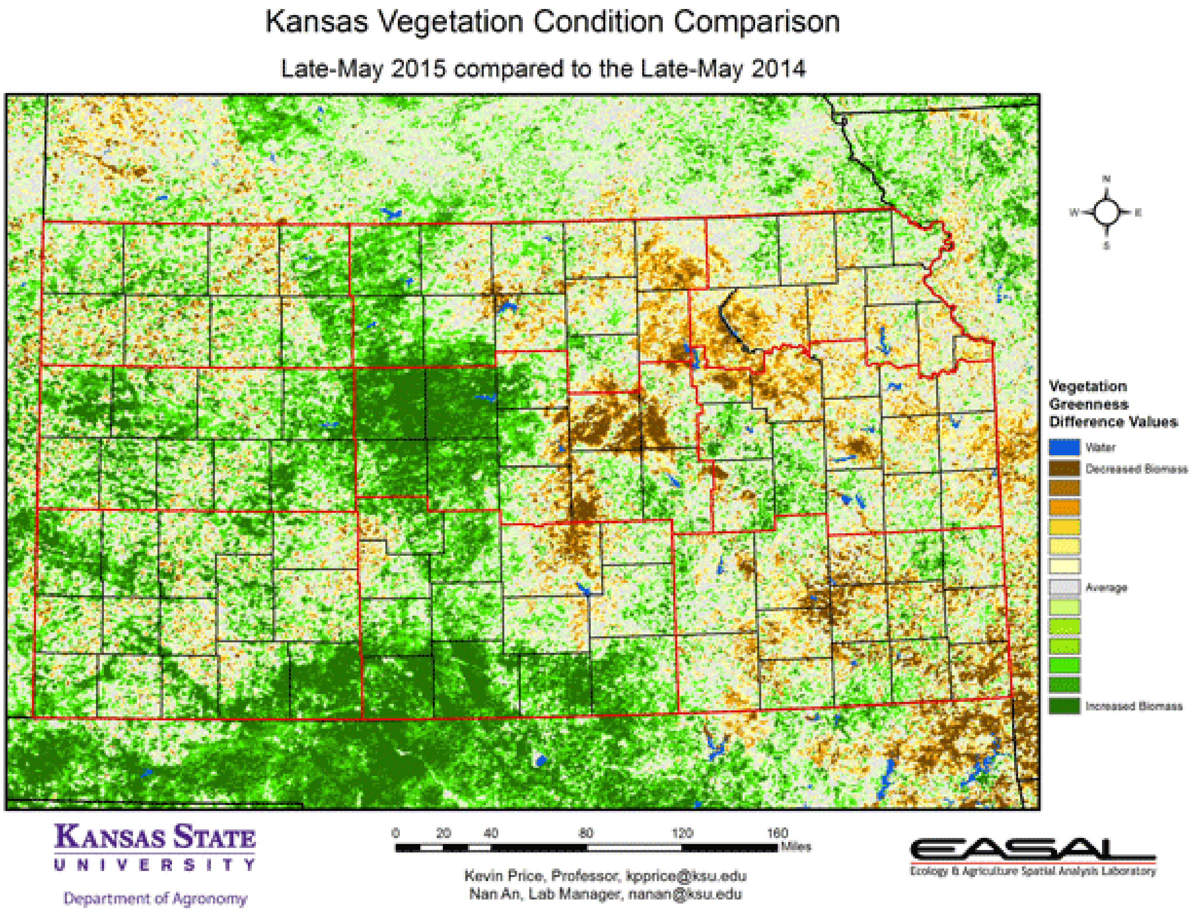

Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for May 19 – June 1 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows much of the state has higher NDVI values. There are areas of lower photosynthetic activity in the central and eastern portions of the state, where wet soils and cooler-than-average temperatures have resulted in delayed planting and uneven emergence of spring planted crops.

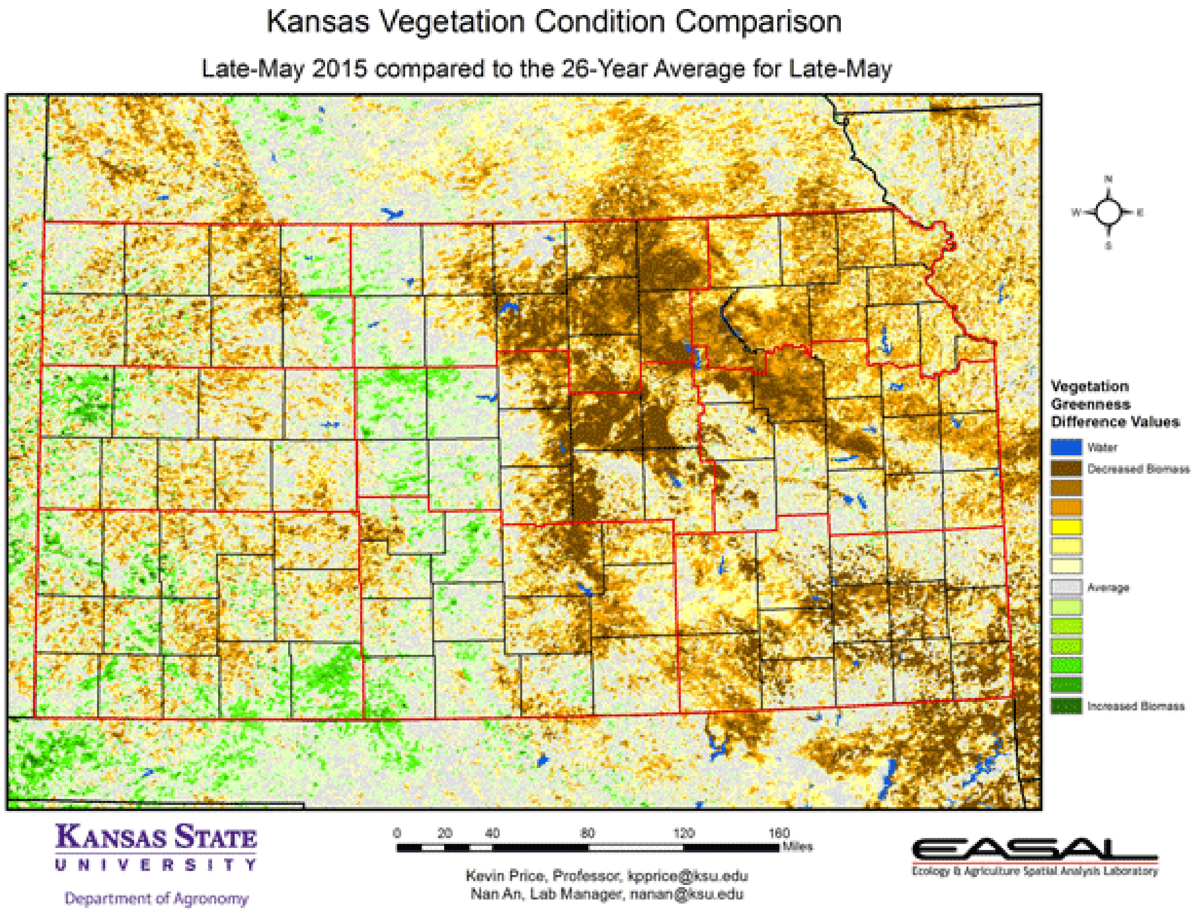

Figure 3. Compared to the 26-year average at this time for Kansas, this year's Vegetation Condition Report for May 19 – June 1 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that biomass production in mostly below average. This departure is greatest in the eastern half of the state where wet conditions have slowed planting and delayed emergence of spring planted crops.

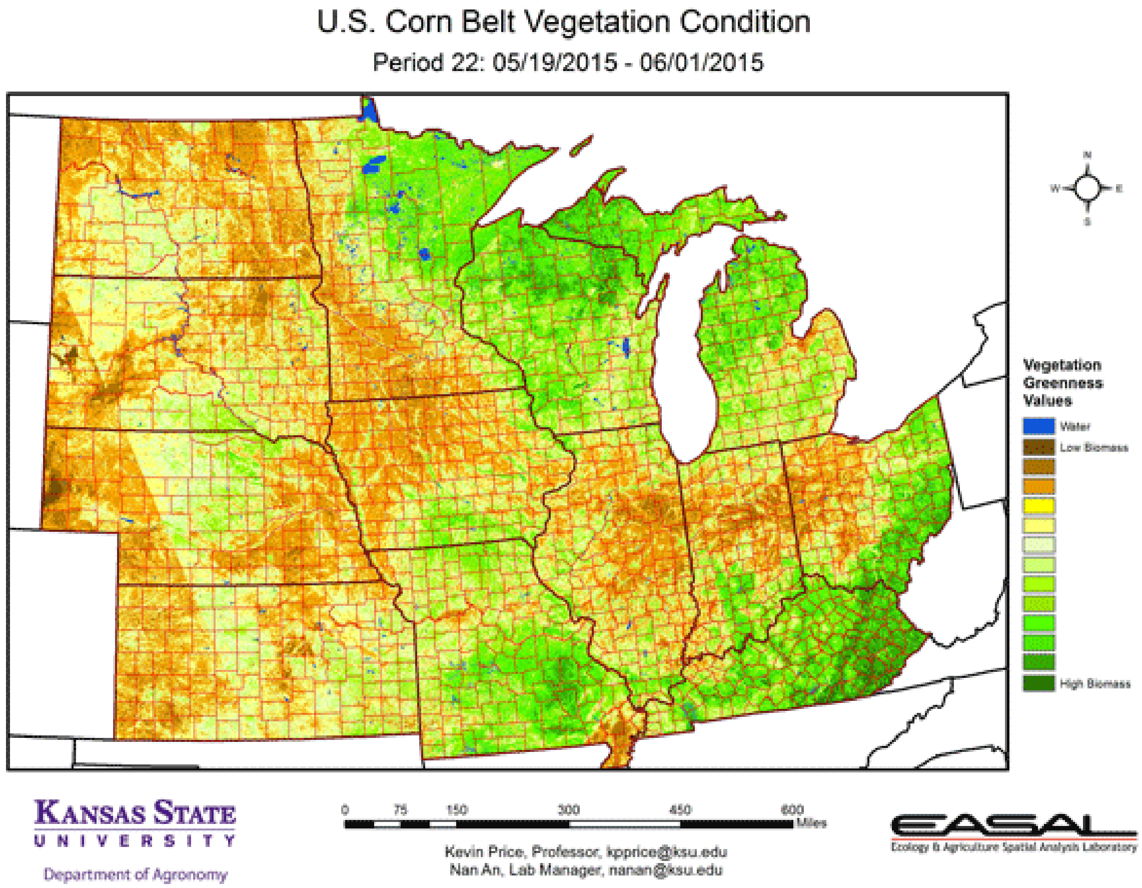

Figure 4. The Vegetation Condition Report for the Corn Belt for May 19 – June 1 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that areas of low biomass production continue to shrink. The greatest biomass production continues in the eastern parts of the region, particularly in Kentucky, where temperatures and precipitation levels have been most favorable for production.

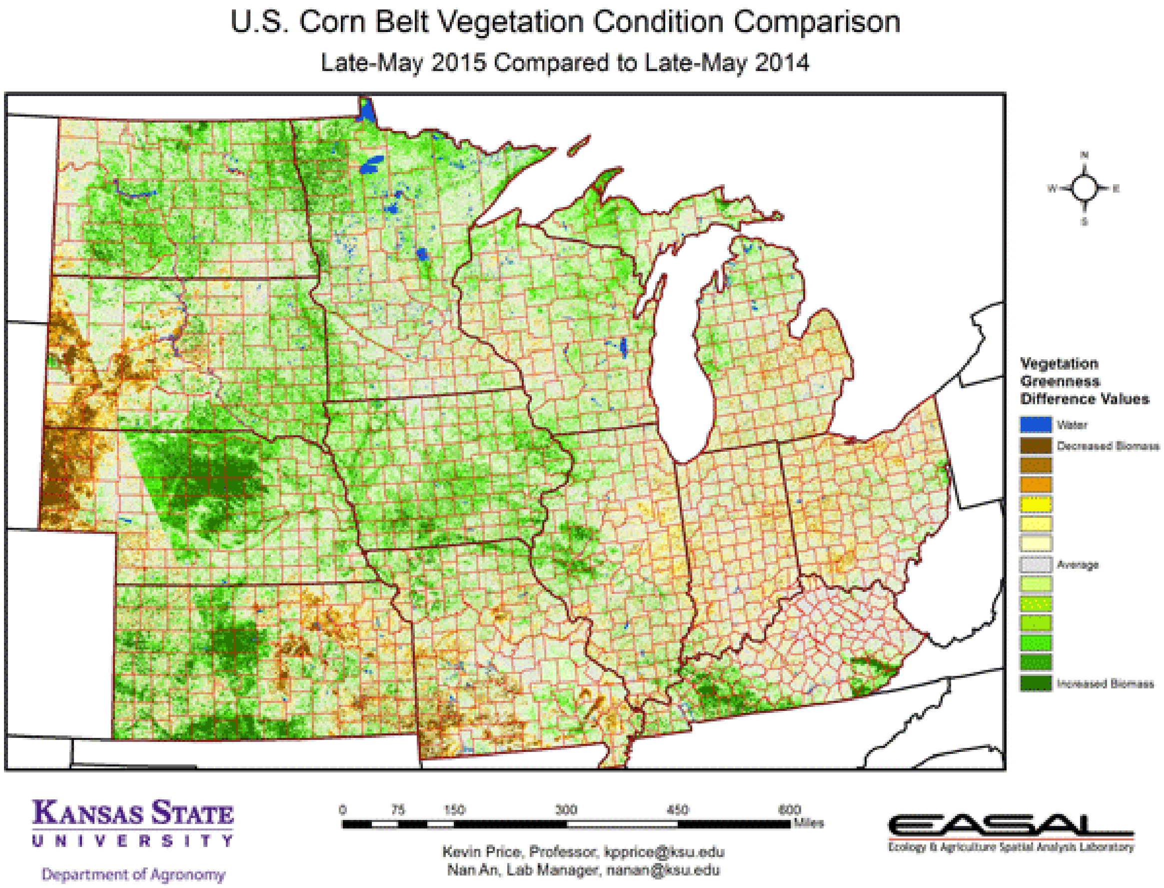

Figure 5. The comparison to last year in the Corn Belt for the period May 19 – June 1 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows most of the region with the same or higher NDVI values. In the western portion of the Corn Belt, there is an area of much lower productivity centered around the Black Hills of South Dakota.

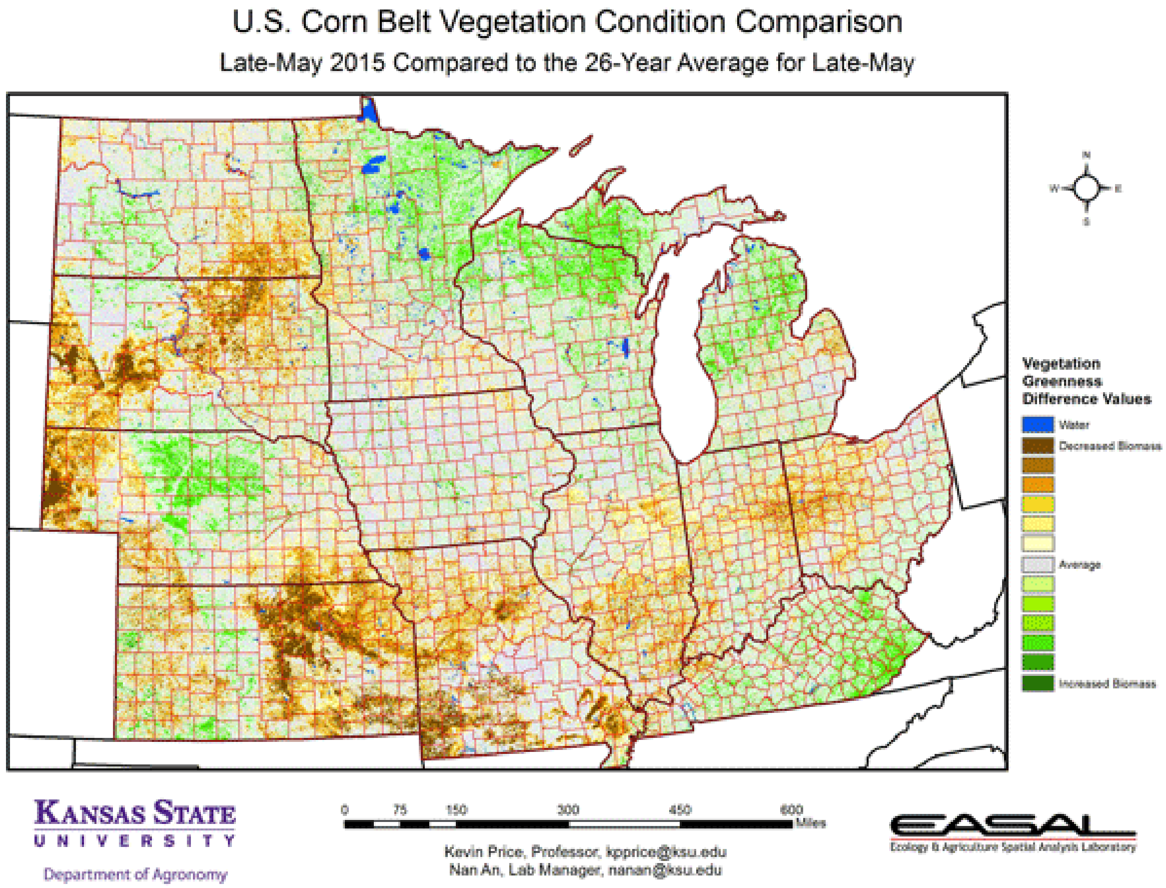

Figure 6. Compared to the 26-year average at this time for the Corn Belt, this year's Vegetation Condition Report for May 19 – June 1 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows lower-than-average NDVI values across South Dakota, eastern Nebraska, and into Kansas and Missouri. The rapid switch from drought to excess moisture has slowed plant development.

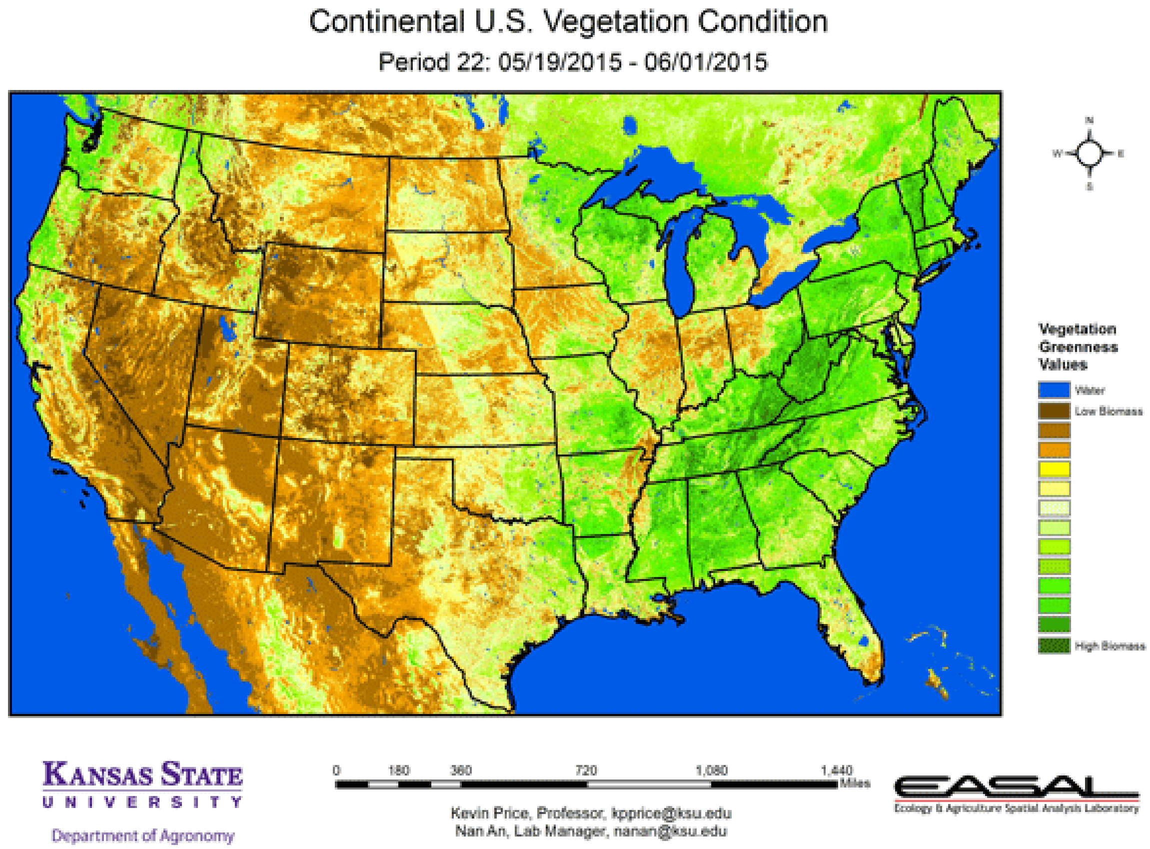

Figure 7. The Vegetation Condition Report for the U.S. for May 19 – June 1 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the highest NDVI values are in the mid-Atlantic region, particularly in Kentucky, the Virginias, and North Carolina. Lower biomass production is present in the Ohio River Valley and parts of the Plains. Wet soils and flooding are a problem in parts of Texas, Kansas, and Nebraska. Cooler soil temperatures are a problem in western Nebraska and western South Dakota. Soil temperatures there are still in the 50s.

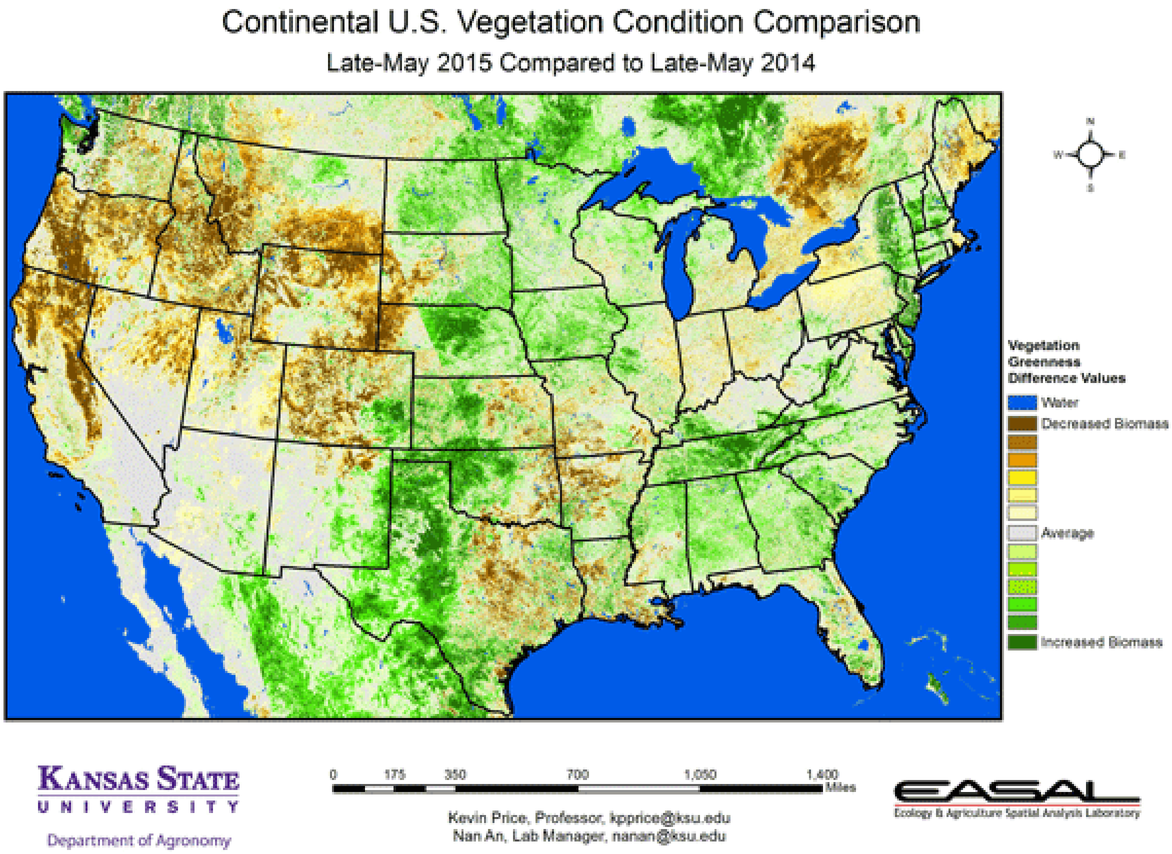

Figure 8. The U.S. comparison to last year at this time for the period May 19 – June 1 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows lower biomass production in the Northern Rockies and the Southern Plains. Excess moisture in the Plains and late snow in the mountains are the major factors in the reduction.

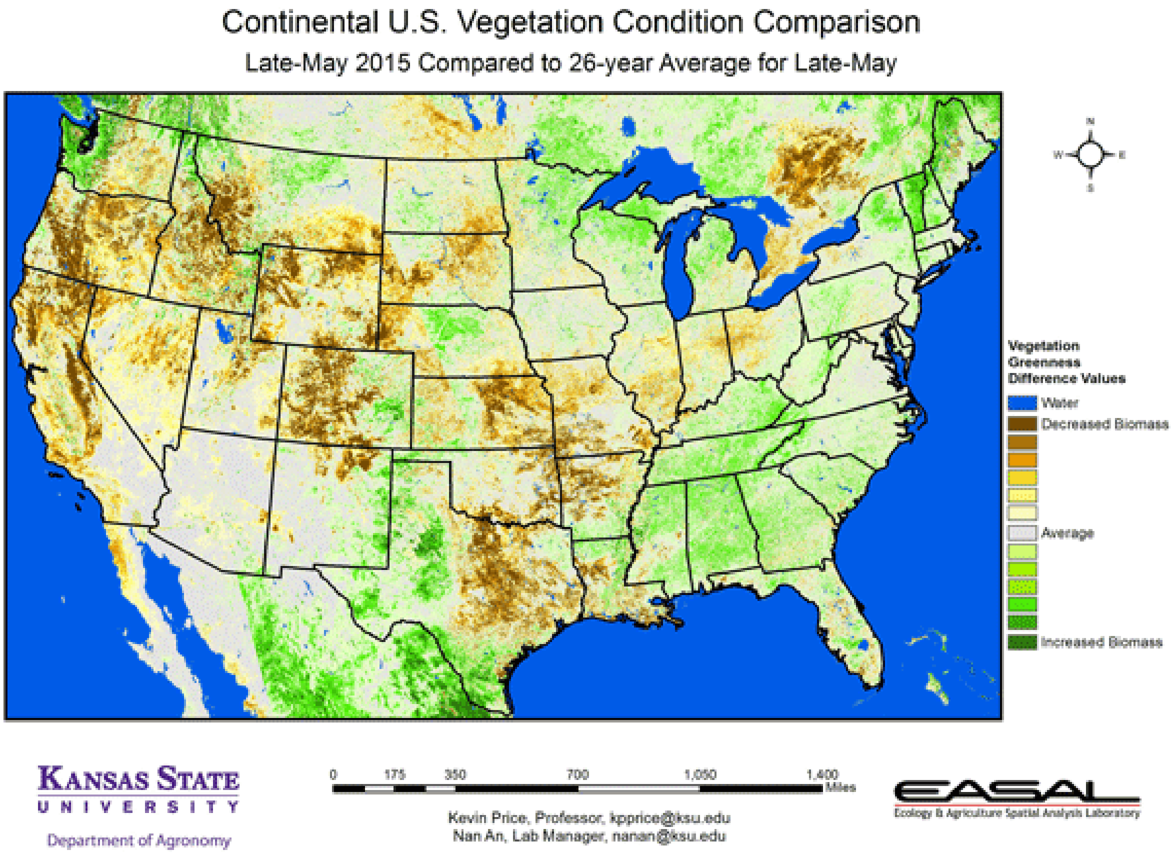

Figure 9. The U.S. comparison to the 26-year average for the period May 19 – June 1 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows below-average biomass production in the Southern Plains and the Northern Rockies. Heavy rains and flooding have continued to reduce productivity in the Southern Plains, while drought conditions have reduced biomass production in the West. Out-of-season rainfall has allowed for some growth in the foothills of California, but that hasn't relieved the larger drought issues in the state.

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