

# **Extension Agronomy**

# eUpdate

# 04/25/2014

These e-Updates are a regular weekly item from K-State Extension Agronomy and Steve Watson, Agronomy e-Update Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Steve Watson, 785-532-7105 swatson@ksu.edu, Jim Shroyer, Crop Production Specialist 785-532-0397 jshroyer@ksu.edu, or Curtis Thompson, Extension Agronomy State Leader and Weed Management Specialist 785-532-3444 cthompso@ksu.edu.

# eUpdate Table of Contents | 04/25/2014 | Issue 453

1. Outlook for short, stressed wheat	3
2. Causes of pale or yellow wheat	7
3. Wheat disease update	10
4. Rangeland invasive species in Kansas	12
5. Soybean seeding rates and optimum plant populations	19
6. Comparative Vegetation Condition Report: April 8 - 21	25

## 1. Outlook for short, stressed wheat

The wheat crop in much of central and western Kansas has many problems this year. It is about two weeks behind normal in development, shorter than normal (on dryland fields at least), has a shortened flag leaf, and/or has a poorly developed root system. In addition, some fields are still under drought stress, have freeze injury, or suffered winterkill damage.



Figure 1. Wheat only 9 inches tall with flag leaf emerged. Saline County demonstration plots, April 24, 2014. Photo by Jim Shroyer, K-State Research and Extension.

If wheat remains under drought stress and the weather turns unusually hot, producers can expect to see the following symptoms:

• White heads, which can develop very quickly

- Curled and dried up flag leaf
- Sloughed tillers
- Loss of one or more small developing kernels in the spikelet
- Poorly developing kernels
- Chlorotic leaves due to poor root development and nutrient deficiencies

From the boot stage through heading and grain fill is a period of high moisture use, with wheat using about 0.25 to 0.30 inches of moisture per day. If the moisture isn't available, the wheat will begin to show the symptoms listed above. The combination of dry soils and heat, in particular, will cause heads to turn white rather quickly, almost overnight. Any additional stress, such as diseases or insects, will just add to the stress.

If temperatures are cool to moderate in the coming weeks and rain comes to stressed wheat sometime before the flowering stage, the wheat may be able to recover some yield and test weight potential as long as the flag leaves are still alive. If the plants are under severe stress and shut down while kernels are in the early dough stage, it is unlikely that any subsequent rain will help the kernels complete their fill. This will result in a loss of yield and low test weight regardless of the weather during the remainder of the season. The early dough stage, of course, is at least a month away.

The drought this year has resulted in very short flag leaves in many cases, and reduced the overall photosynthetic potential of the wheat. All of this will have an effect on grain fill, yields, and test weight.

Drought-stressed wheat is already shorter than normal. In some cases, these plants may eventually recover if they get some rain by the boot or early heading stage – even wheat that turned blue from drought stress. But yield potential will be reduced. In severe cases, however, some of these plants may turn brown and die.



Figure 2. Wheat that turned blue in part of the field due to drought stress. Photo by Jim Shroyer, K-State Research and Extension.

This brings up two main questions:

1. How much yield loss will wheat suffer if it is short and late, with a small flag leaf? At this point in the season, it is impossible to answer that question. It depends on the weather from now through the soft dough stage.

2. How can you go about deciding when it's time to pull the trigger and destroy the crop to get ready for a follow-up crop of grain sorghum, soybeans, summer annual forage, or sunflowers? That's another tough question, and involves crop insurance considerations. If the wheat is very short and stands are thin, you can probably make the call any time now, pending approval by your crop insurance representative. If stands are good but the crop is short and late, it's best to wait until about the soft dough stage. By then you will be able to get kernel counts and make an estimate of grain fill.

If the wheat crop is terminated, producers may be able to plant a follow-up crop. Two of the most commonly planted summer crops after wheat are grain sorghum and soybeans. The crop choice will depend on soil moisture and wheat herbicide carryover considerations -- see eUpdate No. 445, March 14, 2014 at: <u>https://webapp.agron.ksu.edu/agr\_social/eu\_article.throck?article\_id=184</u>

Grain sorghum.

- Needs 21 inches of combined stored soil moisture and available precipitation for a full season hybrid; a little less for a medium maturity hybrid.
- Takes 6.9 inches of combined stored soil moisture and available precipitation to get grain sorghum to the first bushel of yield
- After that, each inch of available precipitation received and utilized will return about 9.4 bushels per acre
- Prefers soil temperatures above 60° F at planting time
- Medium-early hybrids planted the first 10 days of May can reach harvestable maturity in mid to late September
- Planting in June means later October harvest
- Earlier planting = taller plants with more foliage
- The later the planting usually the greater the lodging potential

Soybeans.

- Needs/would like about 24 inches of available soil moisture and precipitation.
- Takes 9 inches of combined stored soil moisture and available precipitation to get soybeans to the first bushel of yield.
- After that, each inch of available precipitation received and utilized will return about 4.5 bushels per acre.
- Also prefer soil temps above 60° F at planting time.
- If planting prior to Memorial Day and especially in no-till, use a good seed treatment fungicide.
- Early Group III's planted in early May should be physiologically mature by September 20-25 and be ready for harvest 10-14 days later.
- Group IV's planted in early May will normally run about 10-14 days later than the early III's.
- For every 3 days delay in planting, plan on the crop maturing 1 day later. Example: The same variety planted June 12 will reach physiological and harvest maturity approximately 2 weeks later than if it was planted May 1.

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# 2. Causes of pale or yellow wheat

Some fields of wheat in Kansas have a pale or yellowish color. In most cases this is a direct result of nitrogen deficiency, sulfur deficiency, wheat streak mosaic, or barley yellow dwarf.



Figure 1. Pale wheat in north central Kansas, April 22, 2014. This field had nitrogen applied recently but needed rain to move it into the soil. Photo by Jim Shroyer, K-State Research and Extension.

The most common causes of yellow wheat this spring are:

**Poor root growth**. This is most often due to dry soils, late planting, or poor seedbed conditions at planting time. If the root system is poorly developed, plants are more likely to have a nutrient deficiency, such as nitrogen or sulfur deficiency.

**Nitrogen (N) deficiency**. Nitrogen deficiency causes an overall yellowing of the plant with the lower leaves yellowing and dying from the leaf tips inward. Nitrogen deficiency also results in reduced tillering, top growth, and root growth. The primary causes of N deficiency are insufficient fertilizer rates, poor root growth, drought, a problem with application methods, leaching from heavy rains, and the presence of heavy amounts of crop residue, which immobilize N. If the yellowing occurs in

streaks in the field and a surface topdress application was made, the deficiency is probably due to an application equipment problem or the presence of residue windrows. If the yellowing is more general in nature, it could be that the fertilizer has not yet moved into the soil because of a lack of rain.

**Sulfur deficiency**. Sulfur deficiency symptoms in wheat can be similar to nitrogen deficiency, with a general chlorosis of the leaf. However, with S deficiency the whole plant is pale, with a greater degree of chlorosis in the young leaves. Sulfur is not mobile in the plant like N, so lower leaves do not show more severe deficiency symptoms than the upper leaves unlike N. The uniform nature of the yellowing on the plants is one means of diagnosing S deficiency in wheat. Another common difference compared to N deficiency is the pattern in the fields. Sulfur deficiency often occurs first on slopes, eroded areas, on coarser soils, or wherever organic matter levels are lowest. Therefore, deficiencies are usually limited to only certain areas of the field.

Wheat streak mosaic and barley yellow dwarf. Symptoms of barley yellow dwarf and wheat streak mosaic often become more evident during a period of rapid growth than at earlier growth stages. In general, these diseases cause a yellow discoloration of plants that can be confused with nutrient deficiency or environmental injury. Viral diseases, such as barley yellow dwarf and wheat streak mosaic, tend to occur in patches within affected fields. Barley yellow dwarf is most commonly found in small patches randomly scattered within a field. Wheat streak mosaic often is more severe on the edges of a field closest to volunteer wheat. The symptoms of barley yellow dwarf and wheat streak mosaic are most intense on the upper leaves of infected plants. In contrast, nitrogen deficiency symptoms are more severe on the lower leaves and sulfur deficiency symptoms occur uniformly throughout the plants. The upper leaves of plants infected with barley yellow dwarf are normally bright yellow, but some varieties may also have a red discoloration. This discoloration is more intense near the tip of the leaf than at the base, giving the leaves a flame-like appearance. Plants infected early in their development are often slightly shorter than healthy plants. Wheat streak mosaic also causes a yellow discoloration of the upper leaves but the affected leaves have a more streaked or blotchy appearance. Plants infected with wheat streak mosaic may be dramatically shorter than healthy plants and often have a more prostrate growth pattern.

To determine the cause of the yellowing, check the following:

- What parts of the plant are affected? Is the yellowing on older lower leaves only, newer leaves only, on the tips, or on the entire plants? If the yellowing is on lower leaves, that indicates nitrogen deficiency. If it is only on newer leaves or leaf tips, that could indicate barley yellow dwarf. If entire plants are yellowing, that might indicate sulfur deficiency.
- Are fields unusually dry? If soils are very dry, root growth will often be stunted and plants will gradually become chlorotic, and then turn bluish or brown.
- What is the pattern in the fields? If the yellowing is in streaks in the field, that implies a fertilizer application problem, or possibly a residue distribution problem. If it is mostly on terrace tops, that might indicate a weather-related problem that would affect exposed plants first. If it is occurring in primarily in low areas, that might indicate freeze injury where cold air settled or drowning. If the yellowing is uniform throughout the field, any of the factors above could be the cause.
- Are other wheat fields in the general region of yours also yellow, or just a few scattered fields? If fields in the entire region are yellowing, that would imply a weather-related problem. If it is

specific to just one or two fields, that implies a management-related or field-specific soil problem.

• Is there a difference between early-planted and late-planted fields? Later-planted wheat often had less root development going into winter this year, which made the plants more susceptible to nitrogen and other nutrient deficiencies.

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### 3. Wheat disease update

The risk of severe leaf diseases remains low throughout Kansas. My own scouting and reports from K-State agronomists indicate that leaf rust and stripe rust are not present in the state. Tan spot, septoria leaf blotch, and powdery mildew were absent in most fields; however, we did find a small number of fields with low levels of tan spot in Saline, McPherson, and Sedgwick counties. These fields all had wheat residue from previous crops on the soil surface. This residue is important because it often harbors the fungus that causes tan spot.

Drought stress was evident in most fields and the dry conditions are holding disease in check for now. Recent rains have brought some temporary relief to the dry conditions in a few areas of the state. We will continue monitoring the disease situation as this moisture may stimulate some disease. The symptoms of any new infections would not become evident for 7-10 days. The current risk of severe disease in Kansas and the need for foliar fungicides is low.

Summary of disease conditions in other states:

Texas has reported some stripe rust activity just south of Dallas but warm temperatures have slowed the progress of that disease. Bob Bowden, USDA Plant Pathologist, reports that leaf rust remains active in research plots near San Antonio, Texas. However, the disease remains at low levels in commercial fields according to Tom Isakeit, Extension Plant Pathologist for Texas A&M. Wheat fields in southern Texas are nearly ready for harvest. The trace levels of rust reported in central Texas have not advanced to cause problems in that area according to Ron French, Extension Plant Pathologist for Texas.

In Oklahoma, Bob Hunger, Extension Plant Pathologist for OSU indicates that leaf rust and stripe rust have not been found in Oklahoma yet this season. Conditions remain dry in Oklahoma and they are currently evaluating fields for evidence of freeze injury that occurred on April 15.

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# 4. Rangeland invasive species in Kansas

What is an invasive species? Executive Order 13112 defines an invasive species as a species that is "non-native (or alien) to the ecosystem under consideration and where introduction causes or is likely to cause economic or environmental harm to human health." Invasive species can be plants, animals, or other organisms. Invasives may have one or more of the following characteristics:

- 1. tolerance to a variety of habitat conditions
- 2. rapid growth and reproduction
- 3. compete aggressively for resources
- 4. lack of natural enemies or pests

A number of alien or introduced plant species occur in Kansas. Not all of these species are invasive. Some of the species that have become a problem in Kansas rangeland include: musk thistle, sericea lespedeza, Old World Bluestems, and saltcedar.

Musk thistle (*Carduus nutans*) was first reported in Kansas in 1932. By 1963, musk thistle was declared as a noxious weed throughout Kansas. Today, musk thistle infests about 900,000 acres in Kansas. Musk thistle is primarily a biennial or winter annual, reproducing only by seed. A single plant can produce in excess of 10,000 seeds. Scattered plants can be removed mechanically by digging below the crown. Other options for control include biological and herbicide application. The musk thistle head weevil, *Rhinocyllus conicus*, and the rosette weevil, *Trichosirocalus horridus*, have been released in Kansas to help reduce seed production. Musk thistle is easily controlled by herbicides if treated during the rosette stage. Commonly used herbicides on rangeland and pasture, such as 2,4-D, dicamba (Banvel), metsulfuron (e.g. Escort XP), and picloram (e.g. Tordon 22K), used alone or in combination can provide good to excellent control. Further information on identification and control of musk thistle can be found at http://www.ksre.ksu.edu/bookstore/pubs/L231.pdf.



Figure 1. Musk thistle rosette. Photos courtesy of Walt Fick, K-State Research and Extension.



#### Figure 2. Musk thistle in bloom.

Sericea lespedeza (*Lespedeza cuneata*) has probably been in Kansas since the 1930s. An herbaceous, perennial legume, sericea lespedeza is used as a forage crop in the southeastern United States and for mine land reclamation. As such, sericea lespedeza is a federally listed forage crop. However, the species' invasive nature led to a declaration as a county option noxious weed in Kansas in 1988 and as a statewide noxious weed in 2000. An estimated 700,000 acres in Kansas are infested with sericea lespedeza. A high condensed tannin concentration in sericea lespedeza generally makes the plant unpalatable to grazing cattle. Sheep and goats are not affected by the tannin and graze sericea readily in the mid- and late-summer. Recent research by Dr. KC Olson and his students in the Department of Animal Sciences and Industry at Kansas State University has demonstrated increased utilization of sericea lespedeza by cattle when the animals are supplemented with corn steep liquor. Herbicides containing triclopyr (e.g. Remedy Ultra, PastureGard HL) or metsulfuron (e.g. Escort XP, Chaparral, Cimarron Plus) can provide control of sericea lespedeza for 1-3 years. After a period of time, sericea populations seem to recover from old crowns and/or a tremendous seedbank. Further information on sericea lespedeza can be found at

http://www.ksre.ksu.edu/bookstore/pubs/mf2408.pdf.



Figure 3. Sericea lespedeza in bloom.

Old World Bluestems (OWB) including Caucasian bluestem (*Bothriochloa bladhii*) and yellow bluestem (*Bothriochloa ischaemum*) are scattered around the state and are increasing. These species were planted during the "soil bank" period in the late 1950s and 1960s. Today, we have OWB invading rangeland in Kansas. These species are commonly seen along roadsides in the state. Old World Bluestems are perennial warm-season grasses, just like the majority of native grasses that dominate our rangelands

in Kansas. As a forage crop, OWBs can be burned, fertilized, and stocked heavily. The problem has been that OWBs won't stay where they have been planted. Compared to our native, warm-season grasses, OWBs are lower in quality and mature more rapidly. Selectively removing an invasive grass like OWB from our rangelands will be difficult. Research conducted by Dr. Keith Harmoney at the Western Kansas Agricultural Research Center-Hays, me, and others in the region have concentrated on the use of glyphosate (e.g. Roundup) and imazapyr (e.g. Arsenal). Both of these herbicides are non-selective, especially at high rates. Imazapyr may provide some selectivity, but more research is needed. At this time, patches of OWB that have invaded rangeland should be treated with glyphosate or imazapyr to prevent seed production.



Figure 4. Rangeland invaded with Caucasian bluestem.



Figure 5. Caucasian bluestem.

Saltcedar (Tamarix ramosissima) is an invasive tree along streams and rivers in Kansas. More than 56,000 acres are infested with saltcedar along the Arkansas and Cimarron rivers. Saltcedar has also been identified along the Republican, Smoky Hill, and Kansas rivers. Unlike red cedar, saltcedar is a deciduous tree. It does have needle-like leaves. Saltcedar was first introduced into the U.S. in the 1850s. Originally, saltcedar was used as an ornamental, for wind breaks, and for erosion control along stream banks. Once established, saltcedar modifies the plant community by cycling salt to the soil surface. Grasses like salt grass and alkali sacaton coexist with saltcedar. The trees use about 80 gallons of water per day. Cutting or burning saltcedar results in prolific resprouting. Applications of herbicides on cut-stumps or basal treatments can effectively control saltcedar. Triclopyr (e.g. Remedy Ultra) and imazapyr (e.g. Arsenal) are effective cut-stump treatments and triclopyr applied in diesel can be applied as a basal treatment. The most effective foliar treatments for saltcedar control are imazapyr and glyphosate used alone or in combination. The non-selective nature of glyphosate and imazapyr may require renovation of sites broadcast or aerially sprayed with these herbicides.



Figure 6. Saltcedar in bloom.



Figure 7. Saltcedar in Cimarron River basin.

Learn to recognize these and other invasive species in Kansas. If a plant species shows up and starts to spread, get it identified. Unwanted species are easier to control when they first show up than later when they have taken over.

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# 5. Soybean seeding rates and optimum plant populations

Deciding the right seeding rate is one of the most influential factors for increasing soybean

profitability, as seed cost is one of the most expensive inputs.

Soybean seeding recommendations, row spacing, and planting date are tied together. The final number of seeds per linear foot of row decreases as row spacing narrows. For example, at a target population of 105,000 plants per acre and 85 percent germination, 30-inch rows will need twice the number of seeds per linear foot as 15-inch rows -- 6 vs. 3 seeds per linear foot (Table 1). Seeding rates will need to increase at later planting dates to compensate for the reduction in the growing season (more plants are needed to increase early light interception and biomass production).

The environment also exerts an influence on deciding the final seeding rate. Dry and hot conditions require fewer plants to maximize yields; while favorable environments need higher seeding rates to capture the maximum yield potential. Under high-yielding irrigated environments, the final seeding rate should be greater than 160,000 seeds per acre (assuming high % emergence) with a final plant population close to 150,000 plants per acre.

	Target plants per acre (x 1,000)					
	<45	45-70	70-90	90-115	115-140	>`
	Seeds per acre (x 1,000; 85% emergence)					
	<50	50-80	80-100	100-130	130-160	>`
Row Spacing	Seeds per linear foot (assuming 85% field emergence)					
8-inch	<1	1	1	1-2	2	>
10-inch	<1	1	1-2	2	2-3	>
15-inch	<1	1-2	2-3	3	3-4	>
20-inch	<2	2-3	3-4	4	4-5	>
30-inch	<3	3-4	4-5	5-7	7-8	>

#### Table 1. Recommended soybean plant density and seed spacing.

In recent years, a summary from 21 on-farm strip trials and 5 replicated experiment station studies in Kansas prepared by Kraig Roozeboom provided an opportunity to revisit current soybean recommendations. Most of the studies were performed in dryland environments (23 out of 26, with 3 studies under irrigation) and under no-till systems. All were in central and eastern Kansas counties: Butler, Harvey, Nemaha, Republic, Riley, Saline, and Shawnee.

As related to final field establishment, the current recommendations assume 80% emergence. Emergence in the studies ranged from less than 50% to 100%, illustrating the importance of knowing just how many dropped seeds will produce plants in each situation (Fig. 1). Studies that have compared planters and drills indicate that the 80% estimate is not far off for planters, but emergence for drills is usually closer to 65%. There is tremendous variability around both of these averages, but it illustrates the need to drop more seed per acre if field emergence is less than the 80% assumed for the current recommendations.



#### Figure 1. Percentage of field establishment and final seeding rate.

The primary conclusion from the summary of soybean seeding rate studies was that the optimum number of seeds per acre seemed to be highly dependent on the yield level attained at each location. Table 2 depicts the soybean seeding rate summary stratified by yield range.

	Yield range	Mean yield	Optimum population
Environment	bu a <sup>-1</sup>	bu a <sup>-1</sup>	plants a <sup>-1</sup>
Low	< 30	24	70-75,000
Medium low	30 - 40	36	75-80,000
Medium high	40 - 50	43	≈ 120,000
High	> 50	68	≈ 105,000
Average	12-78	42	

**Table 2.** Recommended soybean plant density and seed spacing.

*A)* Low yielding environments (test average <30 bushels per acre):

Yields were maximized at plant populations of less than 80,000 plants per acre. Optimum final plant

population was achieved around 70,000 to 75,000 plants per acre (Fig. 2). Thus, if we assume 80% emergence (as presented in Figure 1), then the optimum seeding rate for this environment will range from 85,000 to 90,000 seeds per acre.



Figure 2. Optimum plant population, final plants per acre, for "low" yielding environments across Kansas, less than 30 bushels per acre.

B) Medium-low yielding environments (average ranged from 30 to 40 bushels per acre):

Yields were maximized with final plant populations around 75,000 to 80,000 plants per acre, presenting an evident plateau in maximum yield as the number of plants per acre increases beyond 80,000 plants per acre (Fig. 3). Seeding rates ranging from 90,000 to 95,000 plants per acre were required to achieve these final plant populations (assuming overall 80% emergence).



Figure 3. Optimum plant population, final plants per acre, for "medium-low" yielding environments across Kansas, ranging from 30 to 40 bushels per acre.

*C)* Medium-high yielding environments (average ranged from 40 to 50 bushels per acre):

Yields were usually maximized at populations of 105,000 to 120,000 plants per acre. The break-even point for the association between yield and plant population was set at around 120,000 plants per acre (Fig. 4). Increasing population above 130,000 plants per acre did not increase yields. Considering an average 80% field establishment, optimum seeding rate for this yield environment was 140,000 seeds per acre.



Figure 4. Optimum plant population, final plants per acre, for "medium-high" yielding environments across Kansas, ranging from 40 to 50 bushels per acre.

#### D) High yielding environments (test average above 50 bushels per acre):

The highest yields, under irrigation, were achieved with 105,000 plants per acre (or close to 130,000 seeds per acre with 80% emergence) (Table 2). There were relatively few experiments with yields in this range, so this may not represent a typical response. However, it does illustrate the tremendous ability of soybean plants to adjust the number of pods (and seeds) per plant to available resources. Other studies have shown that, given favorable growing conditions, yields of 80 to 90 bushels per acre can be achieved with 100,000 to 120,000 plants per acre.

Another series of studies funded by the United Soybean Board was conducted in 2012 and 2013 across the Midwest and Mid-South (including Kansas) to examine high-input soybean production practices. Initial results have shown that maximum yields were obtained between 100,000 and 165,000 seeds per acre across all nine states. In the southern states (Kansas, Kentucky, and Arkansas), seeding rates between 130,000 to 170,000 seeds per acre were needed to obtain maximum yields. This response was consistent across production systems regardless of whether they included a large number of yield-enhancing treatments (seed treatments, fungicides, growth promoters, etc.) or not.

Always take into consideration the yield potential for that environment when deciding the final soybean seeding rate. Yield potential is primarily defined by the weather conditions (before and after planting), genetic potential, soil type and supplemental fertility program, and use of best management practices for producing the crop (proper weed, insect, and disease control from

planting until harvest). This summary allows confirming that the current recommendations are adequate, with the possible exception of extremely high-yield situations, which may require roughly 150,000 plants per acre to maximize yield. Using seeding rates higher than those recommendations seldom reduced yield, but did increase seeding cost.

For more details see: *Kansas Soybean Management 2014*, MF3154 http://www.ksre.ksu.edu/bookstore/pubs/MF3154.pdf

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# 6. Comparative Vegetation Condition Report: April 8 - 21

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 25-year average. The report is used by individual farmers and ranchers, the commodities market, and political leaders for assessing factors such as production potential and drought impact across their state.

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

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

Kansas Vegetation Condition

Period 16: 04/08/2014 - 04/21/2014



Figure 1. The Vegetation Condition Report for Kansas for April 8 – 21 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that vegetative activity continues to be low. The greatest level of activity is in south central Kansas and along the Kansas-Missouri border. These areas have had the warmest temperatures over the last two weeks.

#### Kansas Vegetation Condition Comparison



Mid-April 2014 compared to the Mid-April 2013

Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for April 8 – 21 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows the biggest contrast is in the Northwestern and the Central Divisions. In the northwest, moisture levels have been slightly better than last year. In contrast, in the Central Division moisture levels are less favorable than last year at this time. This was also true, to a lesser degree, in east central and southeast Kansas.

Mid-April 2014 compared to the 25-Year Average for Mid-April

Kansas Vegetation Condition Comparison Mid-April 2014 compared to the 25-Year Average for Mid-April

Figure 3. Compared to the 25-year average at this time for Kansas, this year's Vegetation Condition Report for April 8 – 21 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that while the entire state is below average, the biggest area of belowaverage biomass activity is in the Central Division. Cold temperatures and dry conditions have continued to delay vegetative development. U.S. Corn Belt Vegetation Condition Period 16: 04/08/2014 - 04/21/2014



Figure 4. The Vegetation Condition Report for the Corn Belt for April 8 – 21 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that lowest NDVI values are in the northern and western parts of the region. Lingering snow cover is a particular problem in northern Wisconsin and the Upper Peninsula of Michigan.



#### U.S. Corn Belt Vegetation Condition Comparison Mid-April 2014 Compared to Mid-April 2013

Figure 5. The comparison to last year in the Corn Belt for the period April 8 – 21 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows the greatest increase is in the upper Plains. Much of the difference is due to lower snow cover. Last year, Kennebec, SD reported 24 inches of snow. This year they've reported just an inch.



U.S. Corn Belt Vegetation Condition Comparison Mid-April 2014 Compared to the 25-Year Average for Mid-April

Figure 6. Compared to the 25-year average at this time for the Corn Belt, this year's Vegetation Condition Report for April 8 – 21 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that much of the region is below average. In the northern Great Lakes region, lingering snow has delayed photosynthetic activity. In the southern and western areas, cooler-than-average temperatures and drought have delayed activity.



Continental U.S. Vegetation Condition Period 16: 04/08/2014 - 04/21/2014

Figure 7. The Vegetation Condition Report for the U.S. for April 8 – 21 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the Southeast and the Pacific Northwest has the greatest level of vegetative activity, although increased biomass production is also seen along the coast in New England. In the Pacific Northwest, the low snow pack continues to be of concern as it moves out of its wet season.



Continental U.S. Vegetation Condition Comparison Mid-April 2014 Compared to Mid-April 2013

Figure 8. The U.S. comparison to last year at this time for the period April 8 – 21 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the biggest difference is in the Northern Plains, where lower snow cover has allowed for more biomass production.



Continental U.S. Vegetation Condition Comparison Mid-April 2014 Compared to 25-year Average for Mid-April

Figure 9. The U.S. comparison to the 25-year average for the period April 8 – 21 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the area of below-average production has retreated northward as the snow cover melts. Above-average NDVI values are seen along the mountains of California, where low snow packs are fueling drought concerns for the summer. In the Central Plains, cold temperatures and/or dry conditions have delayed vegetation.

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