



Extension Agronomy

eUpdate

06/06/2014

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

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1. Controlling large weeds in wheat pre-harvest

Recent rains in parts of Kansas have caused weeds to begin growing rapidly, and in some cases overtaking fields of wheat that are thin and very short. No one wants to spend extra money on a below-average crop, but these weeds can make harvest very difficult.

There are several herbicide options producers can use as pre-harvest aids in wheat. There are differences in how quickly they act to control the weeds, the interval requirement between application and grain harvest, and the level or length of control achieved. All of them will require very good coverage to be effective, meaning a high gallonage spray volume should be used.

The various options include:

Product and rate	Advantages	Disadvantages	Comments
Aim EC (1 to 2 oz)	Acts quickly, usually within 3 days. Short waiting interval before harvest – 3 days.	Controls only broadleaf weeds. Regrowth of weeds may occur after 2-3 weeks or more, depending on the rate used.	Apply after wheat is mature. Always apply with 1% v/v crop oil concentrate in a minimum spray volume of 5 gal/acre for aerial application and 10 gal/acre for ground applications. Do not apply more than 2 oz of Aim during the growing season.
Dicamba (0.5 pt) + 2,4-D (0.5 to 1 qt of 4 lb/gal)	Broad-spectrum broadleaf weed control.	A waiting period of 10 to 14 days is required before harvest. Acts slowly to kill the weeds. Controls only broadleaf weeds.	Apply when the wheat is in the hard dough stage and green color is gone from nodes the stem. Do not allow grazing or use feed from treated area.
Glyphosate (1 to 2 pt of 3 lb ae/gal) + 2,4-D (1 to 2 pt)	Provides control of both grasses and susceptible broadleaf weeds.	Acts slowly. May take up to 2 weeks to completely kill weeds and grasses. Cannot harvest grain until 7 days after application.	Apply when wheat is in the hard dough stage (30% or less grain moisture). Consult label for recommended adjuvants. Do not feed treated straw or permit dairy animals or meat animals being finished for

			slaughter to graze treated fields within 2 weeks after treatment. Not recommended for wheat being harvested for use as seed.
Metsulfuron (0.1 oz) + 2,4-D (0.5 to 2 pt of 4 lb/gal)	Provides control of susceptible broadleaf weeds.	Acts slowly. Cannot harvest grain until 10 days after application. Controls only broadleaf weeds.	Apply when wheat is in the dough stage. Always apply with a nonionic surfactant at 0.25 to 0.5% v/v. Do not use on soils with a pH greater than 7.9. Weeds growing under limited moisture may not be controlled. Do not use treated straw for livestock feed.
2,4-D LVE	Provides control of susceptible broadleaf weeds.	Acts slowly. Weak on kochia and wild buckwheat.	Apply when wheat is in the hard dough stage to control large, actively growing broadleaf weeds. Weeds under drought stress may not be controlled. Do not use treated straw for livestock feed. Consult label of individual products for preharvest interval requirement.

There are several herbicide options producers can use as pre-harvest aids in wheat. It is especially important to know pre-harvest interval requirements and how treated wheat can be used after application.

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2. Assessing hail damage on soybeans

Hailstorms can severely damage soybean plants and stands. This brings up several questions: Can the soybeans recover? How much potential yield loss may have occurred? Is it worth replanting some fields? The answers depend on the severity of the damage and the stage of growth at the time of the damage.

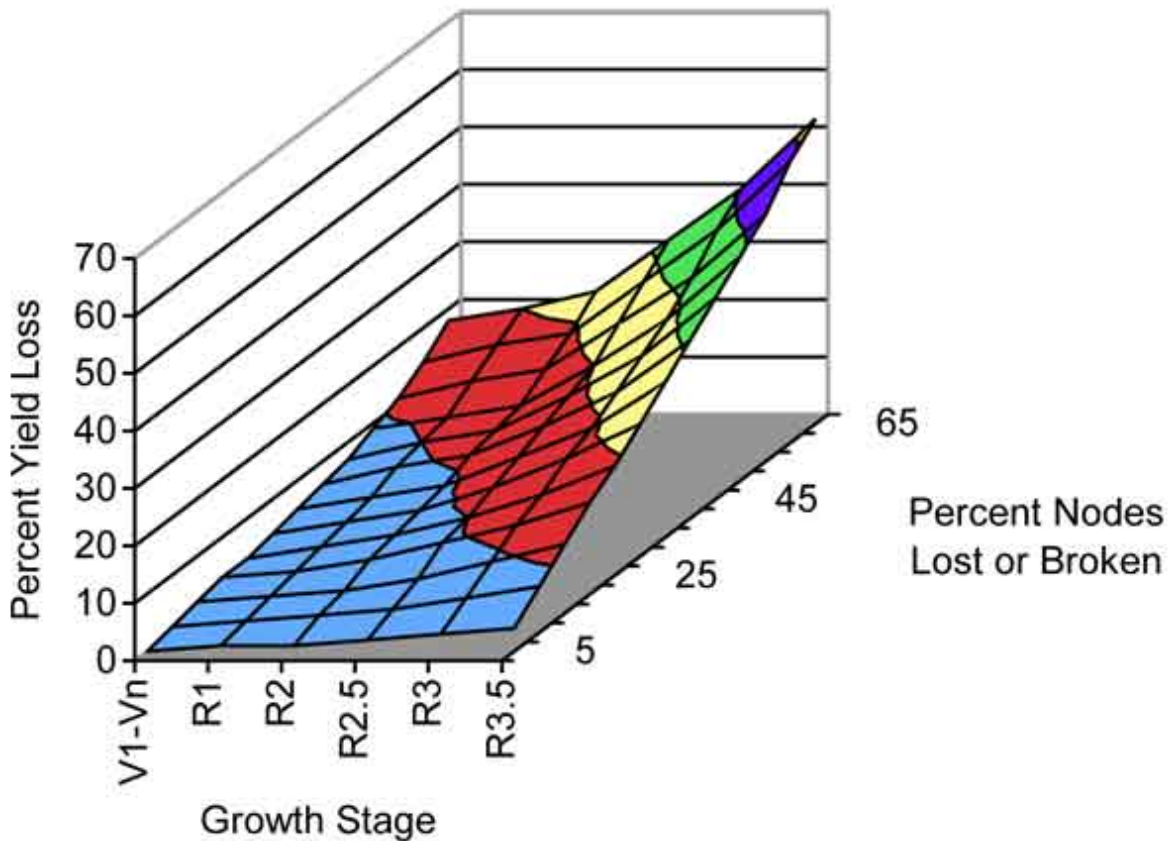
Assessing the effect of hail on soybean is not a simple matter. The method of assessment depends on the stage of growth at the time of the hail and must incorporate estimates of node damage, leaf loss, and stand loss.

The figures below were generated from data used by the crop insurance industry to estimate potential yield loss from percent stand reduction at different original plant populations, percent of nodes cut off or broken, and percent leaf loss (*Soybean Loss Adjustment Standards Handbook*, USDA-FCIC-25440, 06-1999).

Vegetative growth (VE, VC, V1 to VN)

Damage to nodes and leaves: Soybeans can tolerate quite a bit of hail damage to nodes at early stages of growth. If the plants have a leaf or two remaining, or even just the cotyledon leaves, after a hailstorm, they can branch extensively from axillary buds and compensate quite well. In the vegetative stages, more than 50% of the nodes must be cut off or broken before resulting in a yield reduction of more than 10%. Put another way, even if up to half the nodes are cut off or broken, yield loss will be only 10% or less -- if the soybean has not flowered. Bruising is another factor to take into consideration, deep bruises can promote lodging issues.

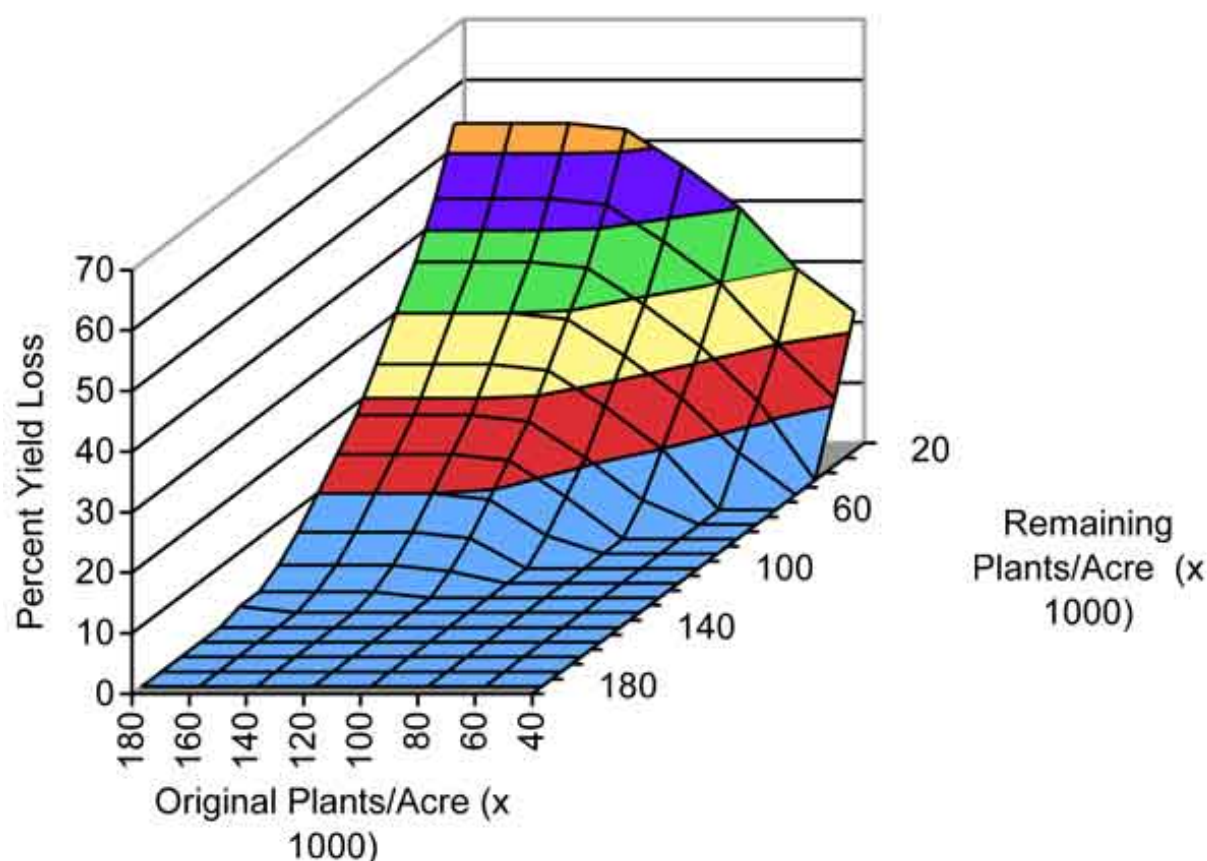
Node Loss - Yield Loss Relationships



Pre-flower stand loss: If the hail was severe enough to break the stem below the cotyledons, the plant will die. In that case, producers need to evaluate the extent of stand loss to estimate the potential effect on yield. The yield loss will normally be less than 10% as long as the remaining population is above the range 60,000 to 90,000 plants per acre, depending on the yield environment. In medium to low yielding environments, 50,000 to 60,000 plants per acre often will maximize yield. In higher-yielding environments, 80,000 to 100,000 plants per acre can maximize yield. We'd like to have more plants than that, but often don't see much of a yield response to the higher populations, especially in stressful years. In general, a 50% stand reduction can be expected to result in a 20 to 25% yield loss.

As long as hail damage causes only 25 to 30% stand loss or less, it's probably best to leave the stand alone and not replant. Of course, much depends on how the rest of the season plays out. In 2013, later-planted soybeans tended to outperform soybean fields that were planted earlier.

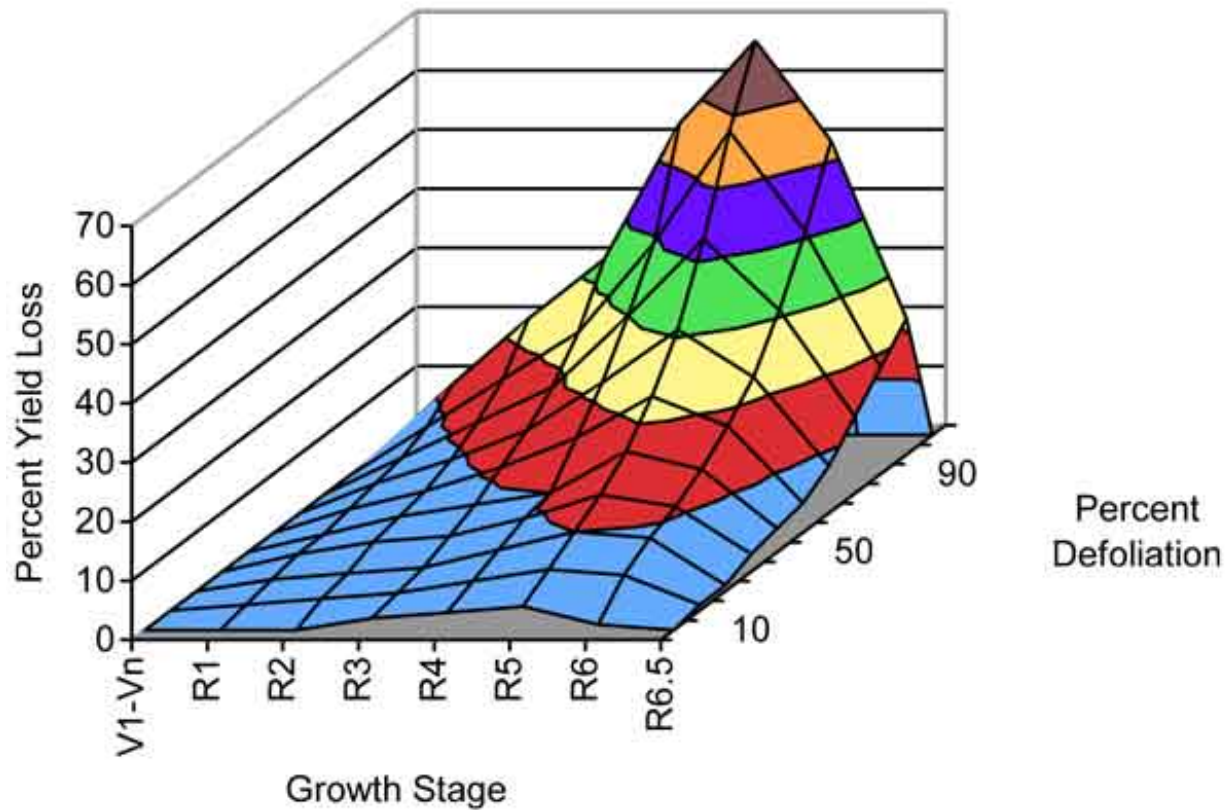
Stand Loss - Yield Loss Relationships



Flowering and pod set (R1 to R6)

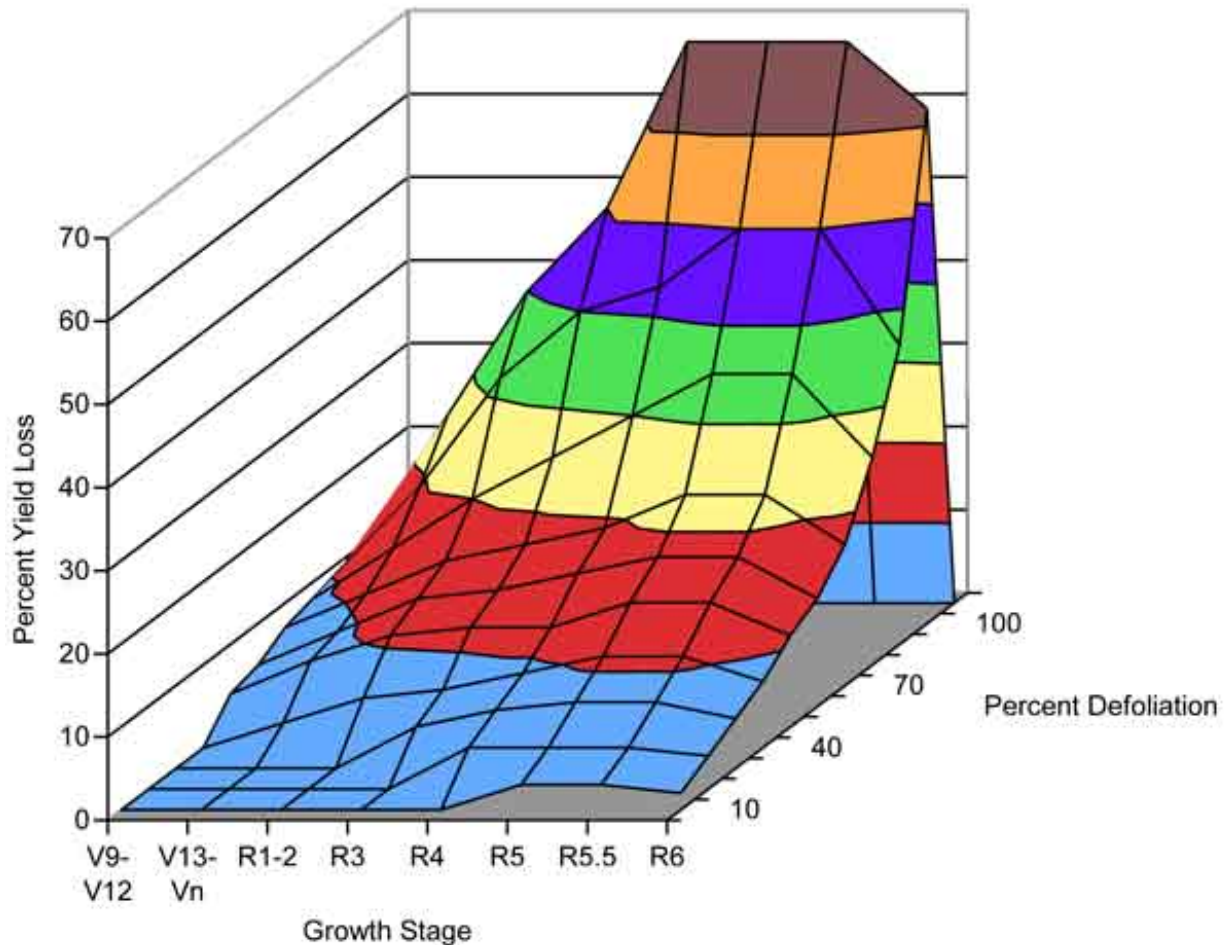
Damage to nodes and leaves: Indeterminate varieties will grow and flower over a 3 to 4 week period. As a result, soybean plants can recover fairly well from a hailstorm that causes significant loss of leaves, flowers, and early pods during the first 2 weeks or so of this period of flowering. Unless the weather is very hot and/or dry after the hailstorm, more flowers will form and set pods. If the hail occurs toward the end of that 4-week window a significant loss of flowers and pods from hail damage can dramatically reduce yields. For indeterminate varieties at any level of leaf loss, yield losses are maximized when damage occurs at R5, and are less at earlier and later stages.

Leaf Loss - Yield Loss Relationships (Indeterminate)



Loss of leaf area causes greater yield losses over more stages of development for determinate than for indeterminate varieties. The flowering period is shorter for determinate varieties, so they have less opportunity to compensate for loss flowers, and pods. Yield losses of up to 10% can result from significant leaf loss in the later vegetative stages. Determinate varieties have 3% to 17% greater yield losses than indeterminate varieties from damage that occurs in the early reproductive stages (R2 to R3), depending on the extent of leaf loss. Yield losses are greatest from damage at R4 to R5.5.

Leaf Loss - Yield Loss Relationships (Determinate)



Stand loss: If hail breaks the stems of plants and causes plant death in the R1 to R6 reproductive stages of growth, the remaining plants will normally have only limited ability to branch out and compensate.

Pod fill through maturity (R6.5 and later)

Plants cannot compensate through either additional flowering or new branch development after R6.5. Therefore, the way to estimate yields at these stages is to make a direct seed count. Hail damage to leaves at these stages will have little or no effect on seed development or yields unless the leaves are knocked off the plant.

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3. Replanting soybeans late: Variety selection, seeding rate, and row spacing

Where soybean stands have been severely damaged or lost, producers may be thinking about replanting. The later it gets, the more difficult that decision becomes. With later-than-optimal planting dates, should producers make any changes in management strategies? Should a shorter-season variety be substituted as we move into late-June planting dates?

As planting is delayed, the situation begins to resemble doublecrop soybean production. The soybean crop following wheat is usually planted 2 to 6 weeks later than the optimum date for maximizing yields. Since planting is delayed, often until the end of June or early July, one is tempted to switch to a shorter-season variety to ensure the crop will mature before frost.

Although planting a late-maturing variety may increase the likelihood of frost damage, switching to a substantially earlier-maturing variety should be resisted. This is for two reasons:

- 1) Early-maturing varieties planted late in the season will usually have limited vegetative development (flowering earlier), short stature, and low yield potential.
- 2) Any variety will have fewer days to flowering, pod development, and maturity when planted late compared to earlier planting dates.

As planting dates get later into June, the day length has begun or will soon begin to shorten and nights will start getting longer. This change in photoperiod causes plant development to speed up. As a general rule, for every three days delay in planting, maturity is delayed by one day.

Since soybean development is hastened in later plantings, the highest yields in a late-planted or doublecropped system are often achieved by using the same variety, or one only slightly shorter in maturity, as what is used in full-season production. Sometimes a slighter later maturing variety is preferred for late or doublecrop plantings, just to encourage more canopy development before flowering.

Other management practices can be affected by late planting, however. Because late planting shortens the period for vegetative growth and reduces canopy development, increasing the seeding rate alone or in combination with narrow row spacing can help the crop compensate by providing the opportunity to produce more pods in the canopy.

Seeding rates can be increased by 30% to 50% in high-yielding environments if planting is delayed until late June or July. Although past research has demonstrated no consistent benefit for narrow row spacing (less than 30 inches) in Kansas, narrow rows may have an advantage in late plantings in the eastern half of the state.

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4. Corn leaf diseases in Kansas

There are several leaf diseases that can infect corn in Kansas in any given year. They can all be controlled with some combination of hybrid selection, tillage management, crop rotation, planting dates, or foliar fungicides.

The primary corn leaf diseases of concern in Kansas are:

Anthracnose leaf blight



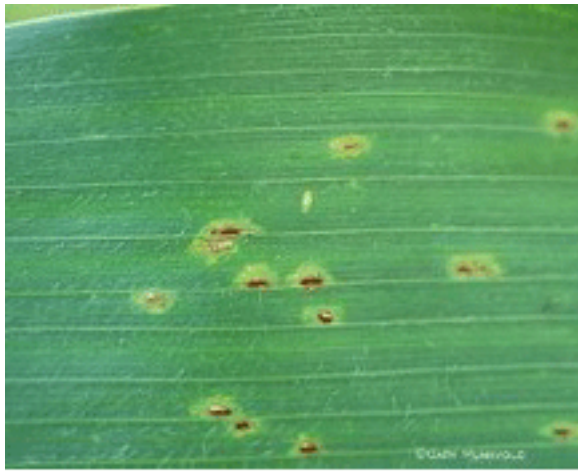
Anthracnose leaf blight. Photo courtesy of Ohio State University, ohioline.osu.edu/ac-fact/0022.html

Symptoms are tan, irregular-shaped lesions on the lower leaves as early as V3 to V4. Lesions may reach a half-inch in length, with a red, reddish brown, or yellow orange border.

Anthracnose is most common in fields with old corn debris present. High temperatures and cloudy, rainy weather favor infection.

Resistant hybrids can be used to control this disease, but producers should be sure that the hybrid is resistant to anthracnose leaf blight, not just anthracnose stalk rot, since the two types of resistance are different. Producers can also help reduce this disease by using rotation or tillage to eliminate crop debris. Use of foliar fungicides to control early anthracnose has not been demonstrated to be profitable.

Common rust



Common rust on corn. Photo courtesy of Iowa State University,
www.ent.iastate.edu/imagegal/plantpath/corn/comrust/0796.37comrust.html

This disease is typically less serious in Kansas than the other leaf diseases. Symptoms are small, round to elongated pustules that start out golden brown then turn darker later in the season. Common rust pustules commonly form on both sides of the leaf and are sparser than those of southern rust.

This disease can occur wherever corn is grown. Infection is favored by moderate temperatures (60 to 77 degrees) and high relative humidity (greater than 95 percent for at least six hours).

Common rust is easily controlled by using resistant hybrids. Fungicides are not recommended for this disease alone since common rust causes only minimal yield loss.

Goss's bacterial wilt



Goss's wilt. Photo courtesy of University of Nebraska, pdc.unl.edu/agriculturecrops/corn/gosswilt

This disease is caused by a bacterial, not a fungal, infection. Symptoms are gray to light yellow stripes with wavy margins that follow the leaf veins. Within these lesions, dark green to black, water-soaked spots that take on the appearance of freckles usually appear and are an excellent diagnostic symptom.

This disease occurs primarily in northwest Kansas, northeast Colorado, and southwest Nebraska. It

can be controlled with resistant hybrids and crop rotation.

Gray leaf spot



Gray leaf spot on corn. Photo by Doug Jardine, K-State Research and Extension

Symptoms develop on the lowest leaves first and progress upward. The first symptoms are tiny lesions surrounded by a yellow halo. These eventually elongate into pale brown or gray rectangular lesions ranging from less than an inch to two inches in size. The entire leaves may become blighted.

Gray leaf spot survives in infested plant debris on the soil surface. In Kansas, initial infections occur in late June and early July. Cloudy weather accompanied by prolonged periods of leaf wetness and high humidity favor disease development. Severe damage often occurs in low spots or in fields bordered by trees or streams where air circulation is poor.

To control gray leaf spot, producers can use a crop rotation that is long enough to eliminate corn debris. Producers can also till under the old corn debris. There are many hybrids available with at least partial resistance. Producers can also use foliar fungicides when the economic threshold is exceeded. Application of a fungicide prior to full tasseling is not recommended as crop damage can occur prior to this stage of development.

Northern corn leaf blight



Northern corn leaf blight. Photo courtesy of Iowa State University,
www.ent.iastate.edu/imagegal/plantpath/corn/northleafblight/ncorn_leaf_blight_0796_02.html

Symptoms are gray, elongated lesions 1 to 6 inches long. The lesions appear on the oldest leaves first, and progress upward. Lesions may become tan as they mature.

Northern corn leaf blight is most common in continuous corn where crop debris remains on the surface. Conditions that favor infection are temperatures of 65 to 80 degrees with extended periods of dew.

There are several hybrids with resistance to northern corn leaf blight. Producers can also help reduce this disease by using rotation or tillage to eliminate crop debris.

Southern rust



Southern rust on corn. Photo courtesy of University of Nebraska,
<http://cropwatch.unl.edu/archives/2006/Crop18/socornrust.htm>

Southern rust pustules look similar to common rust, but there are usually a lot more of them and they occur only on the upper leaf surfaces. This often gives the upper leaves a dusty appearance.

Southern rust does not overwinter in Kansas. Spores blow up from southern production areas in mid- to late-July. Warm, humid weather favors infection.

Resistant hybrids are the best choice for management. If susceptible hybrids are planted late, and disease conditions are favorable, applications of a systemic foliar fungicide may be warranted.

Summary

The following are leaf diseases that can occur in certain situations:

Continuous corn, with residue on the surface: All

Continuous corn, no residue on the surface: Common rust, southern rust

Rotated corn: Common rust, southern rust

The following lists leaf diseases according to the time of year they typically occur in Kansas:

1. (Earliest in the season) Anthracnose leaf blight
2. Gray leaf spot
3. Common rust
4. Northern corn leaf blight
5. Goss's wilt
6. (Latest in the season) Southern rust

The following lists leaf diseases according to how commonly they occur in Kansas:

1. (Most common) Common rust
2. Gray leaf spot
3. Southern rust
4. Anthracnose leaf blight
5. Goss's wilt
6. (Least common) Northern corn leaf blight

The following lists corn leaf diseases in order of the potential yield loss they typically cause under moderate to severe infections:

1. (Most severe yield loss) Gray leaf spot
2. Southern rust
3. Goss's wilt
4. Anthracnose leaf blight
5. Northern corn leaf blight
6. (Least severe yield loss) Common rust

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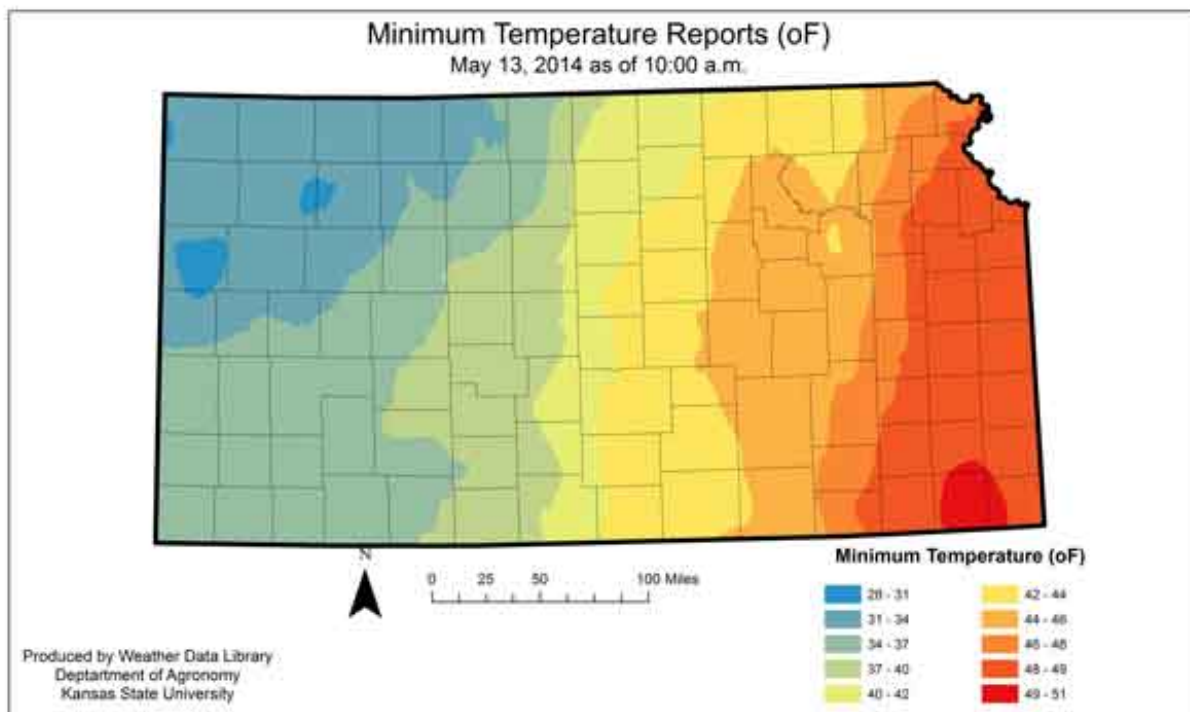
5. Summary of Kansas weather in May: A month of extremes

May was a month of extremes in Kansas. Temperatures ranged from a high of 103 degrees F at Ashland (Clark County) on the 20th to a low of 25 degrees at Wilmore (Comanche County) on the 2nd. Many stations reported the highest temperature and the lowest temperature within two days. Windy weather continued to aggravate the dry conditions in western and central Kansas. The month ended with a widespread precipitation event. Some stations had as much in the last three days of the month as in the previous three months combined.

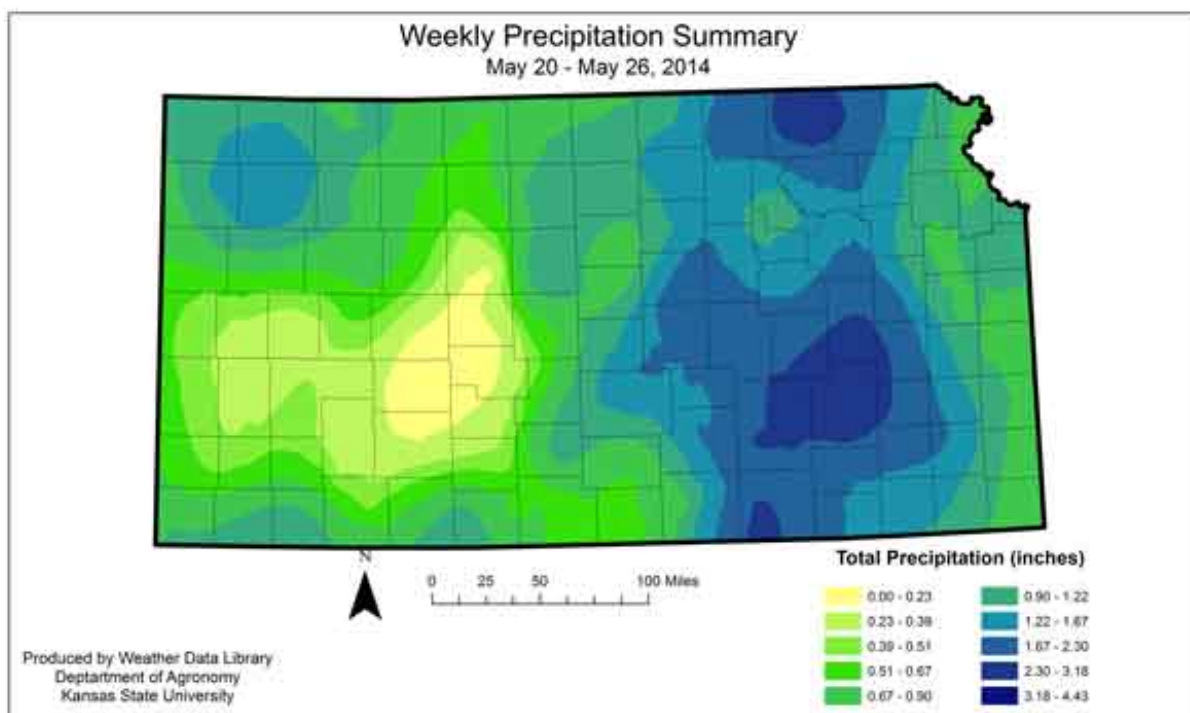
Table 1										
May-14										
Kansas Climate Division Summary										
Division	Precipitation (inches)			Temperature (°F)						
	May-14			2014 through May				Dep.	Monthly Extremes	
	Total	Dep. ¹	% Normal	Total	Dep. ¹	% Normal	Ave		Max	Min
Northwest	1.42	-2.04	40	3.75	-4.08	47	60.0	-0.3	98	27
West Central	0.92	-2.11	29	2.63	-4.60	34	61.8	0.6	101	27
Southwest	0.89	-1.84	33	2.15	-4.60	32	64.9	1.2	104	28
North Central	1.94	-2.14	46	4.91	-5.16	48	64.0	0.8	100	29
Central	2.15	-2.12	48	4.87	-6.01	43	64.0	-0.3	104	28
South Central	1.87	-2.52	42	4.13	-7.58	35	66.9	1.6	102	25
Northeast	2.25	-2.54	46	7.41	-4.84	60	64.5	0.7	93	29
East Central	2.41	-2.74	46	6.80	-8.83	49	65.7	1.6	97	31
Southeast	3.13	-2.66	55	6.88	-8.78	44	66.6	1.2	100	32
STATE	1.88	-2.29	42	4.71	-5.97	42	64.3	0.8	104	25
1. Departure from 1981-2010 normal value 2. State Highest temperature: 104 °F on the 20th at Ashland (Clark County). 3. State Lowest temperature: 25 °F on the 2nd at Wilmore (Comanche County). 4. Greatest 24hr. rainfall: 9.22 inches at Thrall 4W, Greenwood County (NWS); 6.54 inches at Eureka 0.9 NW, Greenwood County (CoCoRaHS) Source: KSU Weather Data Library										

Despite the rain to end the month, precipitation averaged below normal for the state. The statewide average precipitation was 1.88 inches, or 42 percent of normal. The wettest division was the Southeast with an average of 3.13 inches, or 55 percent of normal. The remaining divisions are all at less than half of normal for May. For the year-to-date, all divisions are significantly below normal. Statewide, at 4.80 inches, this is the second driest start to the year on record. The driest was in 1966, when the Jan-May total was 4.16 inches.

The statewide average temperature for the month was very close to normal, at 64.3 degrees F, or just 0.8 degrees warmer than normal. The range of temperatures, however, was quite wide. There were 105 new daily record highs established, and 2 new record highs for May. Wichita recorded a high of 102 degrees on the 4th. On the other extreme, there were 75 new daily record low temperature readings set, and sub-freezing values as late as the 15th of May.

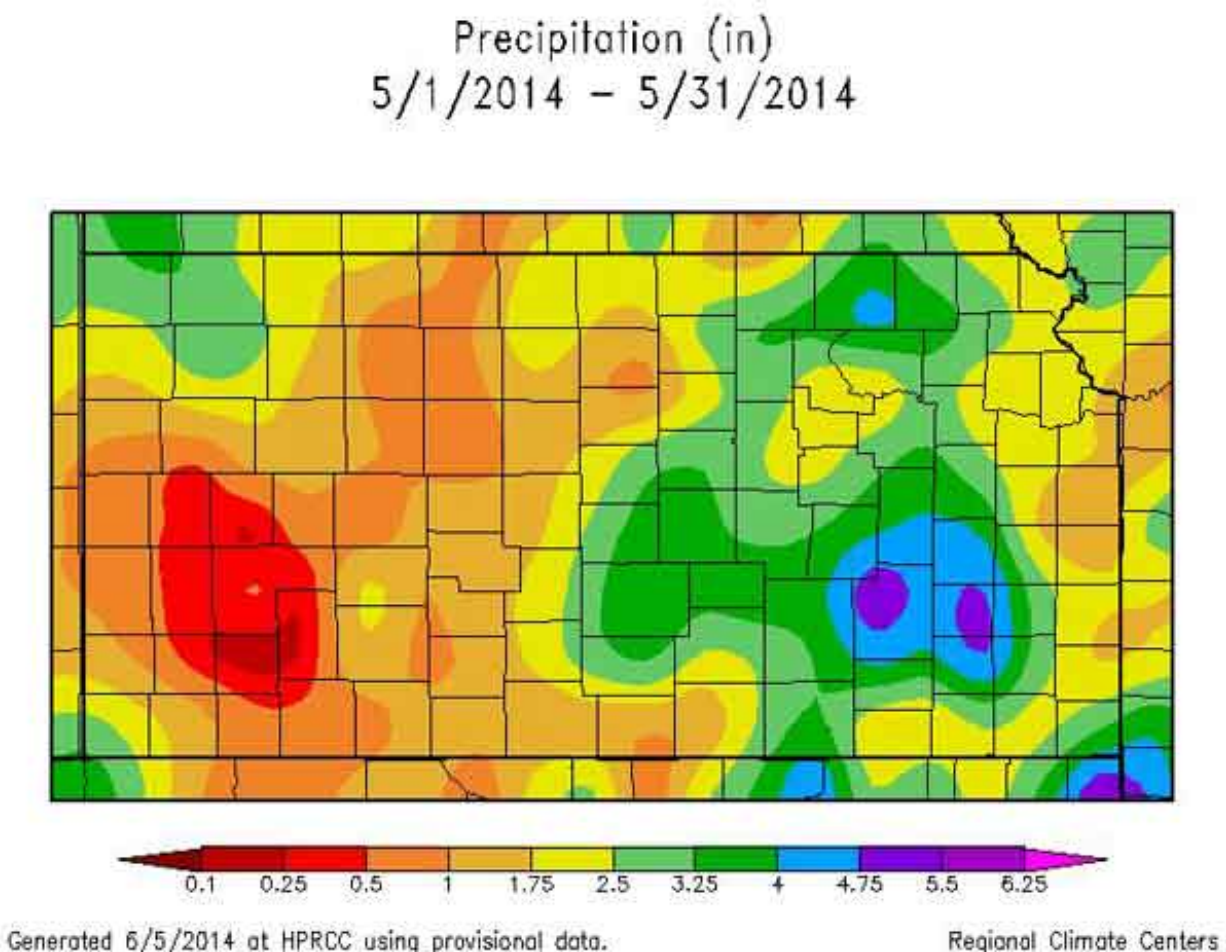


Severe weather was also a feature for the month. There were 10 tornadoes reported, but fortunately no fatalities. There were also 125 reports of hail damage and 50 reports of wind damage. Despite the lower-than-normal rainfall for the month, there were a few reports of isolated flooding. This was particularly true with the isolated heavy rains on May 11th and 12th, and again with the storm complex that moved through the state May 21st through the 25th.

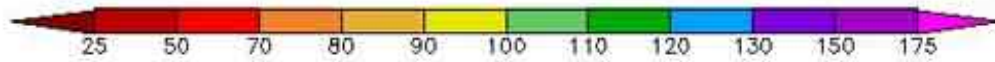
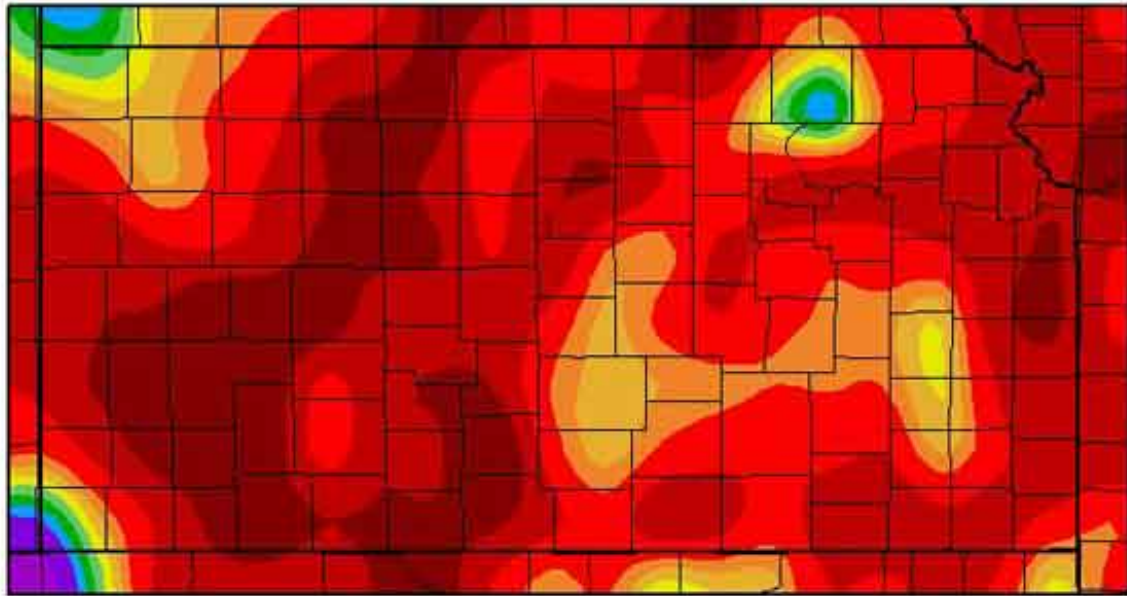


Drought conditions persist across the state. No portion of the state was in near normal conditions, and the portion of the state in abnormally dry conditions continues to shrink. Nearly 45 percent of the state is now in extreme drought conditions and an additional 29 percent of the state is in severe drought. A wet start to June gives some hope that conditions will improve. The El Niño/Southern Oscillation (ENSO) is expected to switch to an El Niño event by late summer, but it remains to be seen what impact will be felt. The June temperature outlook is neutral for much of the state, with warmer-than-normal temperatures expected in the southwest. The precipitation outlook calls for wetter-than-normal conditions for all but the extreme southwestern portion of the state. This does not indicate how much wetter conditions might be, and does not exclude the possibility of drier-than-normal weather in the period.

Precipitation comparison maps:



Percent of Normal Precipitation (%)
5/1/2014 – 5/31/2014

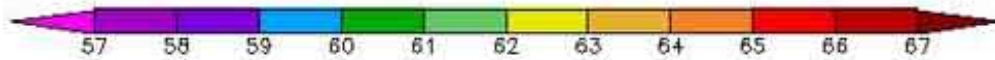
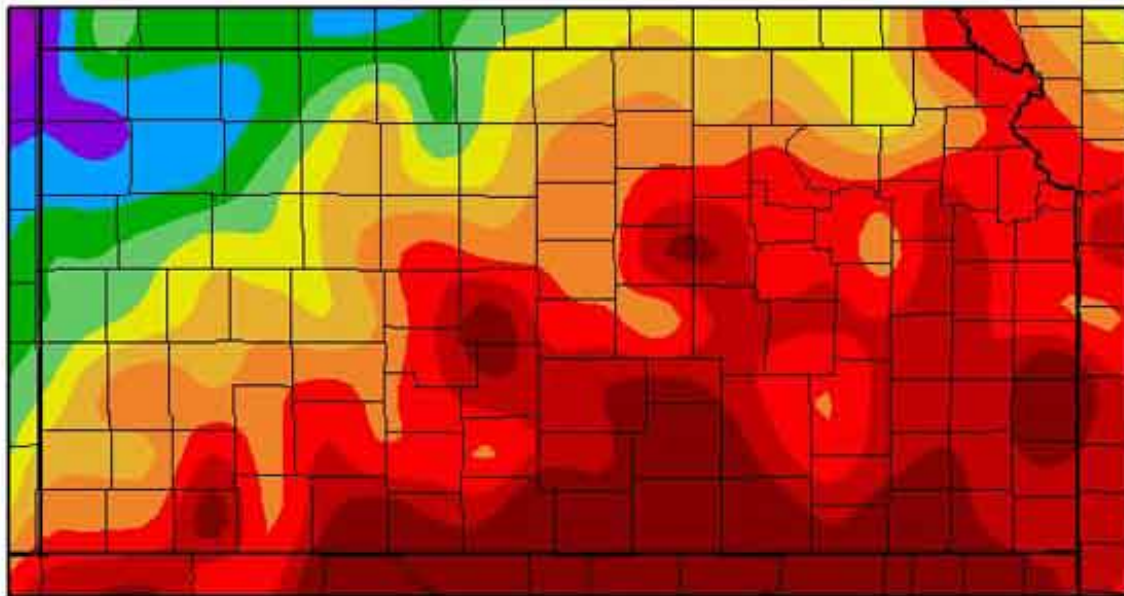


Generated 6/5/2014 at HPRCC using provisional data.

Regional Climate Centers

Temperature comparison maps:

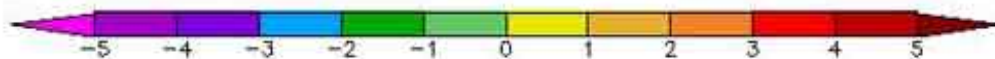
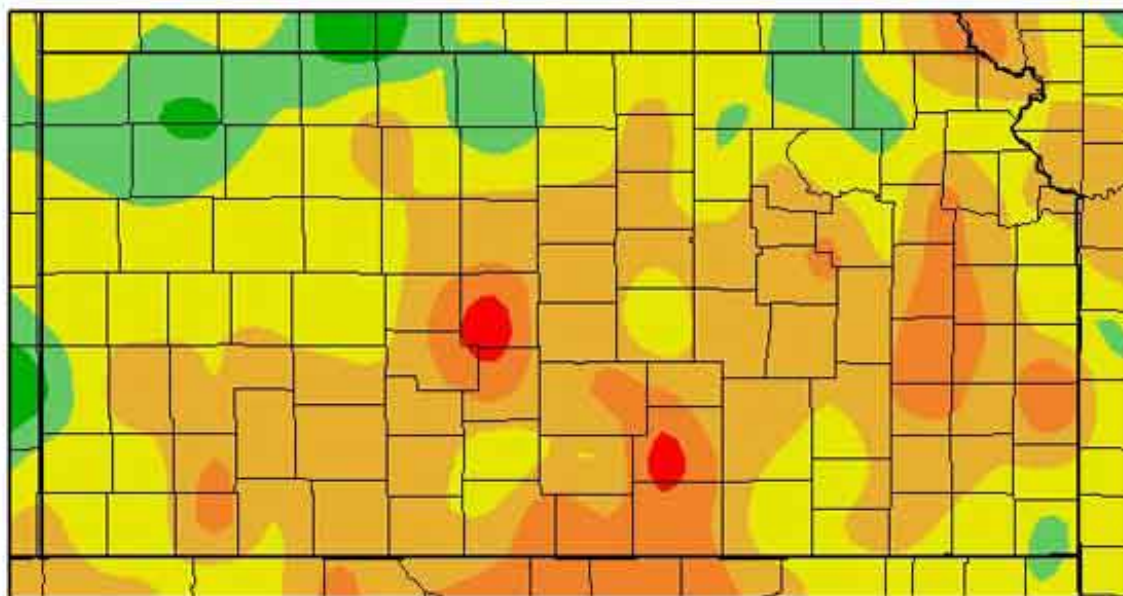
Temperature (F)
5/1/2014 – 5/31/2014



Generated 6/5/2014 at HPRCC using provisional data.

Regional Climate Centers

Departure from Normal Temperature (F)
5/1/2014 – 5/31/2014



Generated 6/5/2014 at HPRCC using provisional data.

Regional Climate Centers

Mary Knapp, Weather Data Library
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6. Comparative Vegetation Condition Report: May 20 - June 2

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

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

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

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

The objective of these reports is to provide users with a means of assessing the relative condition of crops and grassland. The maps can be used to assess current plant growth rates, as well as comparisons to the previous year and relative to the 25-year average. The report is used by individual farmers and ranchers, the commodities market, and political leaders for assessing factors such as production potential and drought impact across their state.

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

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

Kansas Vegetation Condition

Period 22: 05/20/2014 - 06/02/2014

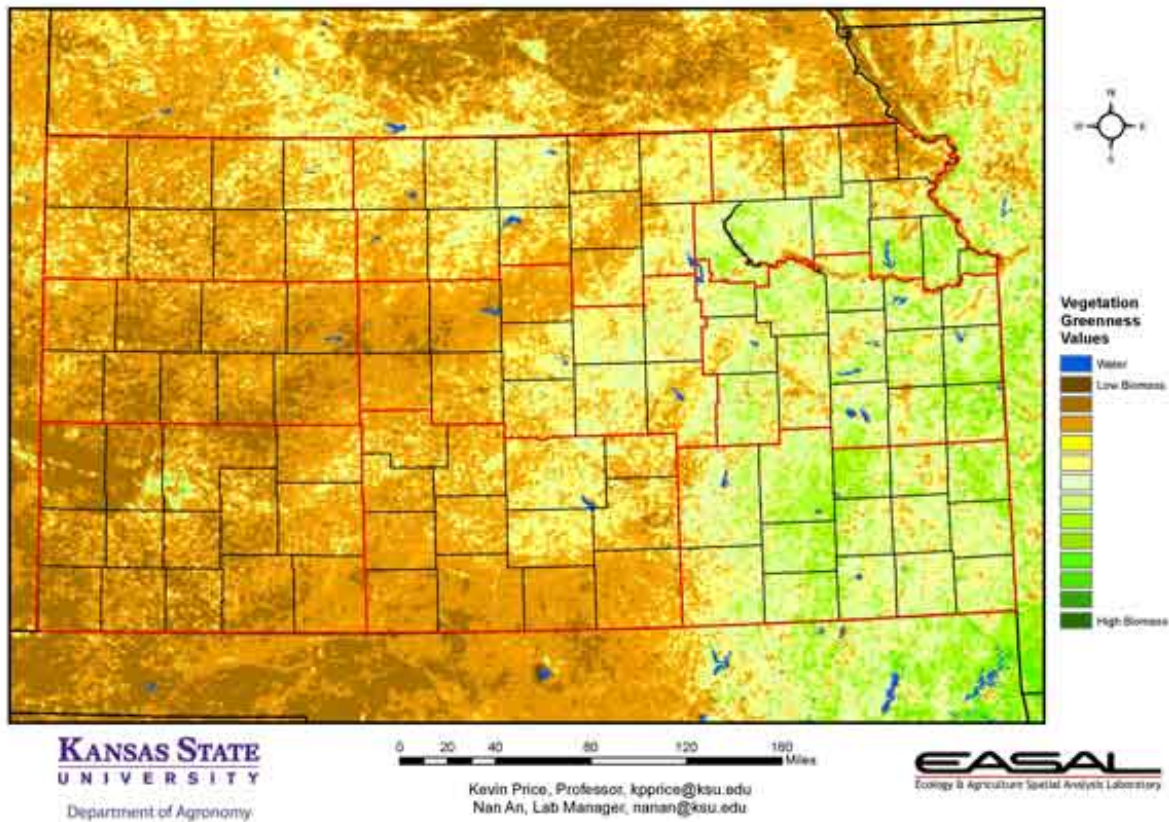


Figure 1. The Vegetation Condition Report for Kansas for May 20 – June 2 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the greatest level of vegetative activity is in the eastern third of the state. Even in this region there are pockets of reduced photosynthetic activity due to unfavorable local conditions.

Kansas Vegetation Condition Comparison

Late-May 2014 compared to the Late-May 2013

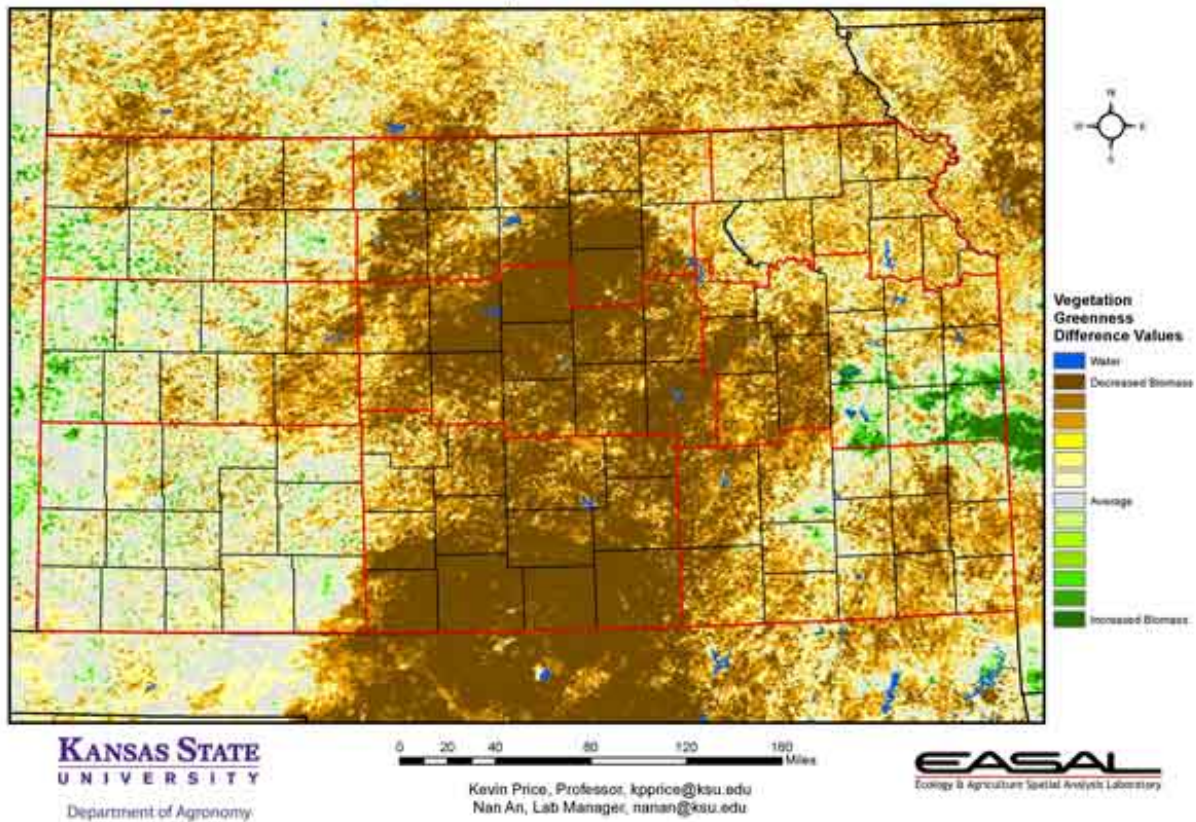


Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for May 20 – June 2 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the central portion of the state has much lower productivity. The combination of the late freeze and drought conditions has seriously reduced vegetative production this year. A small portion of east central Kansas has increased vegetative activity this year. This area missed the May freeze and has had more favorable moisture this year than last.

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Kansas Vegetation Condition Comparison
Late-May 2014 compared to the 25-Year Average for Late-May

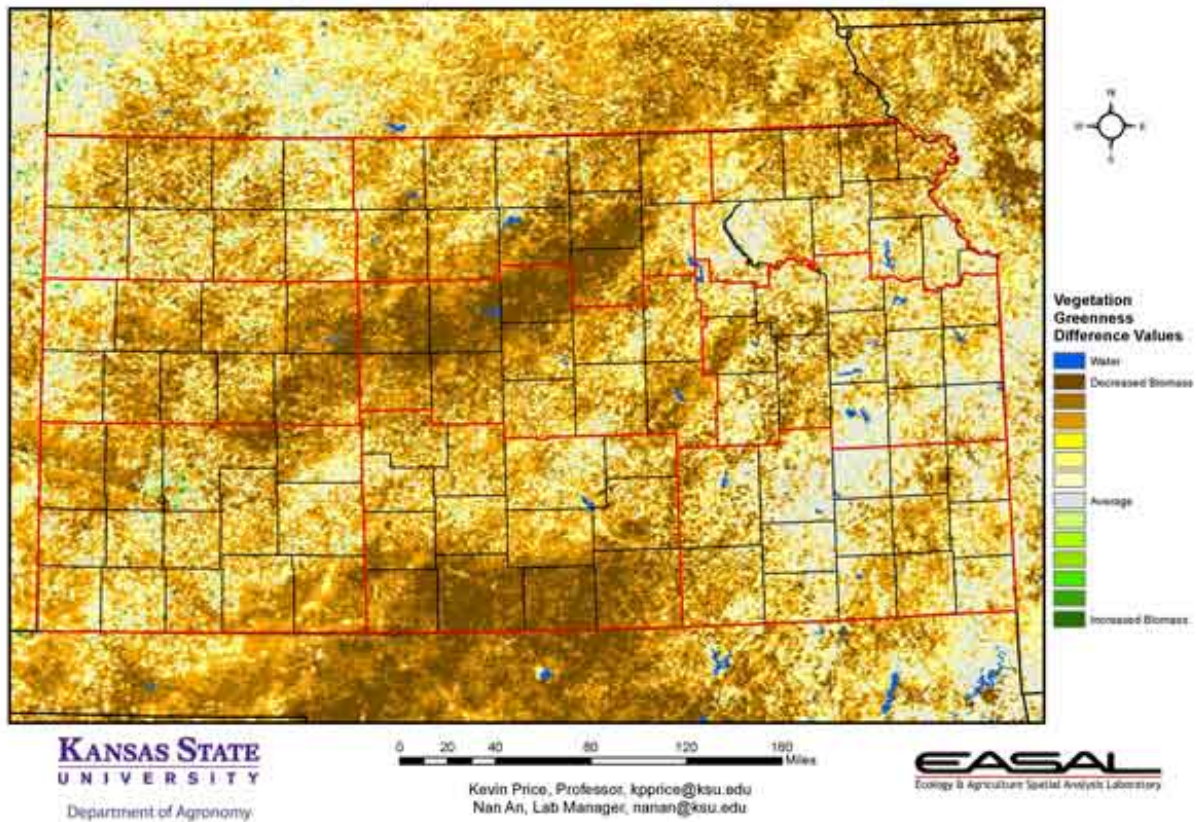


Figure 3. Compared to the 25-year average at this time for Kansas, this year's Vegetation Condition Report for May 20 – June 2 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows the entire state with lower-than-average biomass production. The greatest decrease can be seen across areas from north central to south central Kansas. In the north central region, damage from freezing temperatures in mid-May is becoming visible. In south central Kansas the high temperatures in late May coupled with high winds have decreased vegetative activity.

U.S. Corn Belt Vegetation Condition

Period 22: 05/20/2014 - 06/02/2014

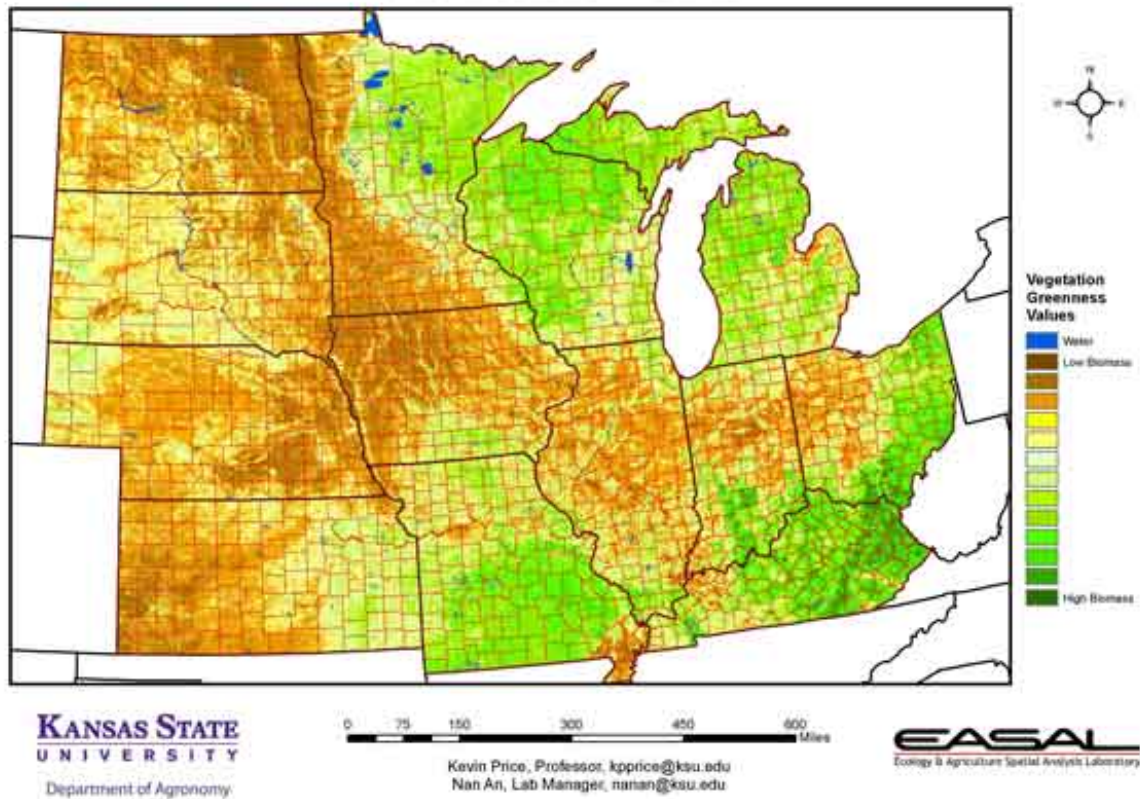


Figure 4. The Vegetation Condition Report for the Corn Belt for May 20 – June 2 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the greatest vegetative activity is in the extreme eastern portions of the region. The area around the Great Lakes is also showing high levels of biomass production, as winter finally releases its grip on the region. From North Dakota across Iowa and into the Ohio River Valley, plant progress is still behind the 5-year average.

U.S. Corn Belt Vegetation Condition Comparison
Late-May 2014 Compared to Late-May 2013

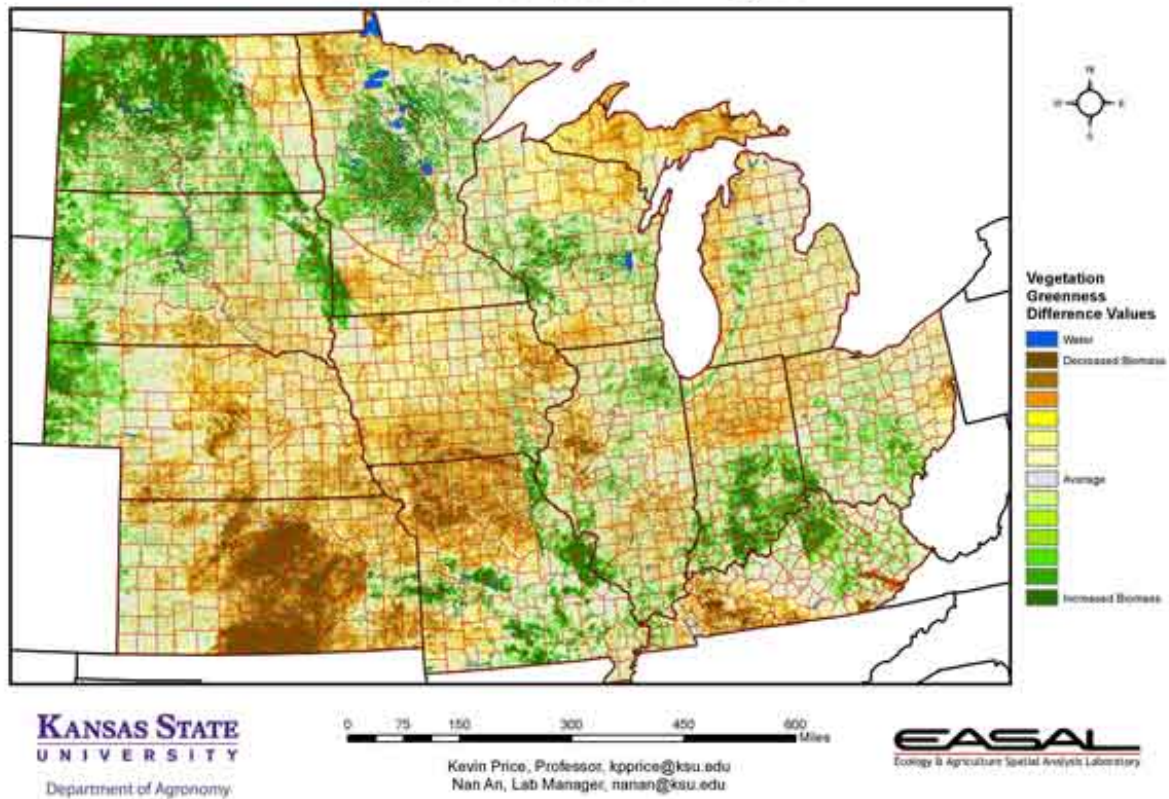


Figure 5. The comparison to last year in the Corn Belt for the period May 20 – June 2 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the northern and eastern areas of the region have increased vegetative activity, while Kansas and northern Missouri have much lower biomass production. In Missouri, soil moisture is rated 70 percent adequate or surplus. In Kansas, that value is only 40 percent.

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

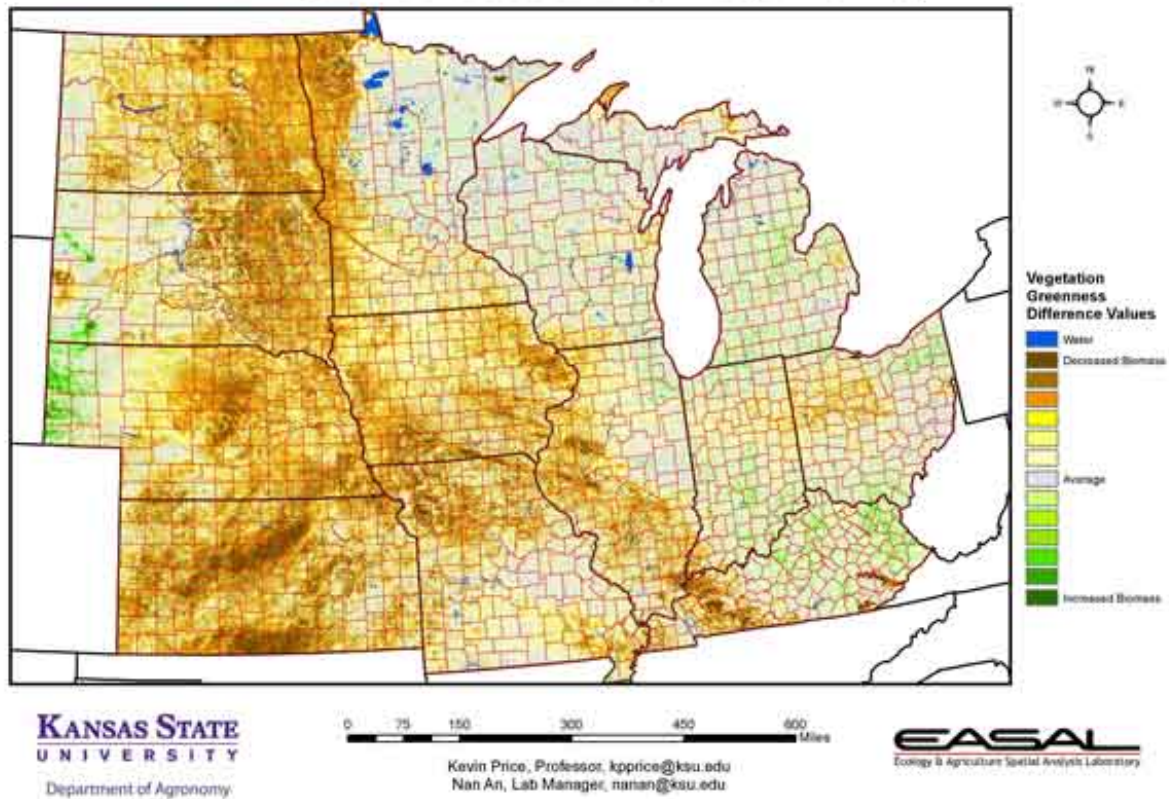


Figure 6. Compared to the 25-year average at this time for the Corn Belt, this year's Vegetation Condition Report for May 20 – June 2 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that most of the western areas of the region are below average. From North Dakota through Iowa and northern Missouri cold, wet soils have delayed activity. In Kansas, a late freeze and continuing drought are the major causes of the decreased plant productivity.

Continental U.S. Vegetation Condition

Period 22: 05/20/2014 - 06/02/2014

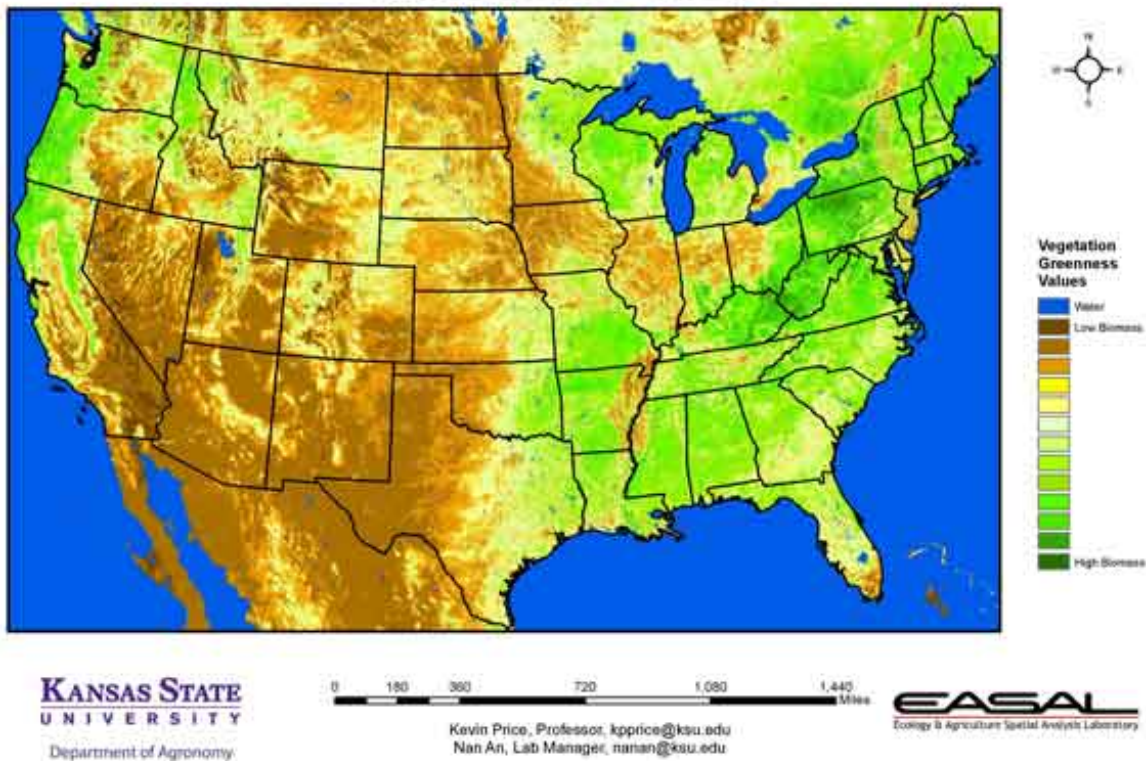


Figure 7. The Vegetation Condition Report for the U.S. for May 20 – June 2 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the area from Iowa through eastern Indiana has lower biomass production than most of the eastern U.S. The cold, wet start to the growing season continues to influence these areas. In contrast, favorable moisture has resulted in higher NDVI values in the Inter-Mountain West, particularly in Idaho and western Montana.

Continental U.S. Vegetation Condition Comparison
Late-May 2014 Compared to Late-May 2013

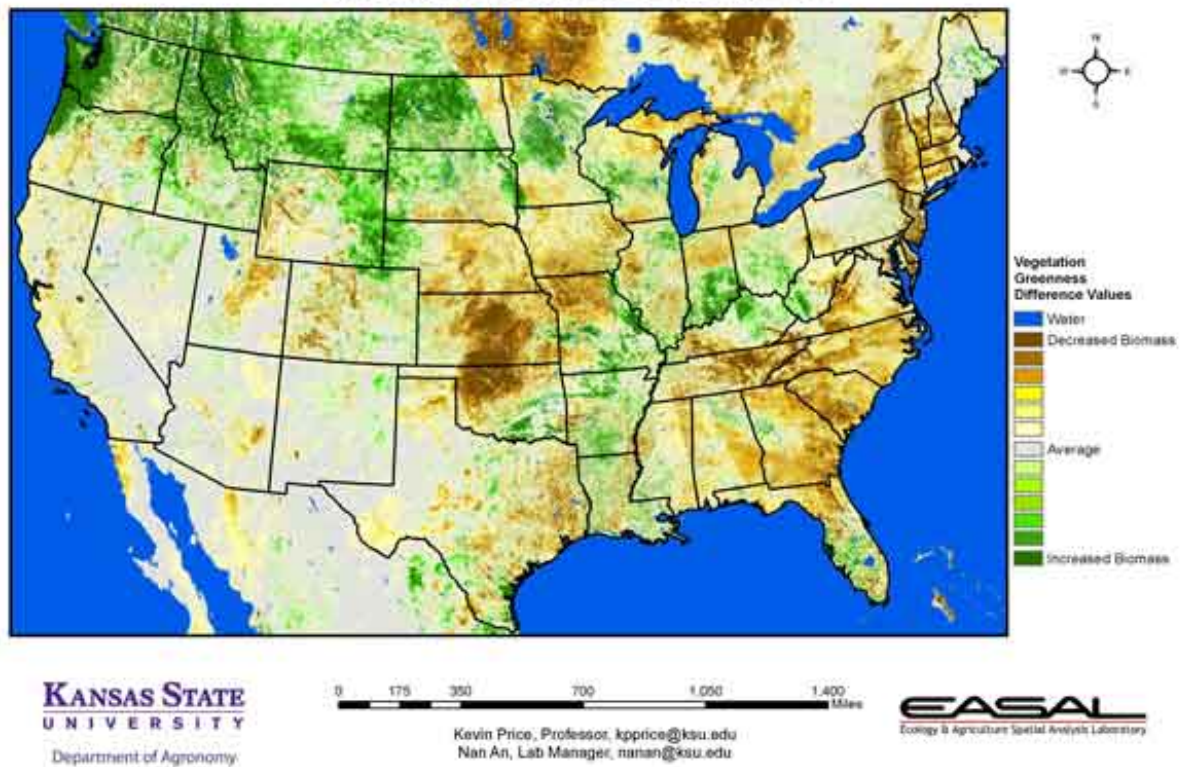


Figure 8. The U.S. comparison to last year at this time for the period May 20 – June 2 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the greatest increase in biomass production is concentrated in the Northwest, from Washington through Minnesota. Favorable conditions to start the growing season have resulted in high biomass production in these areas.

Continental U.S. Vegetation Condition Comparison
Late-May 2014 Compared to 25-year Average for Late-May

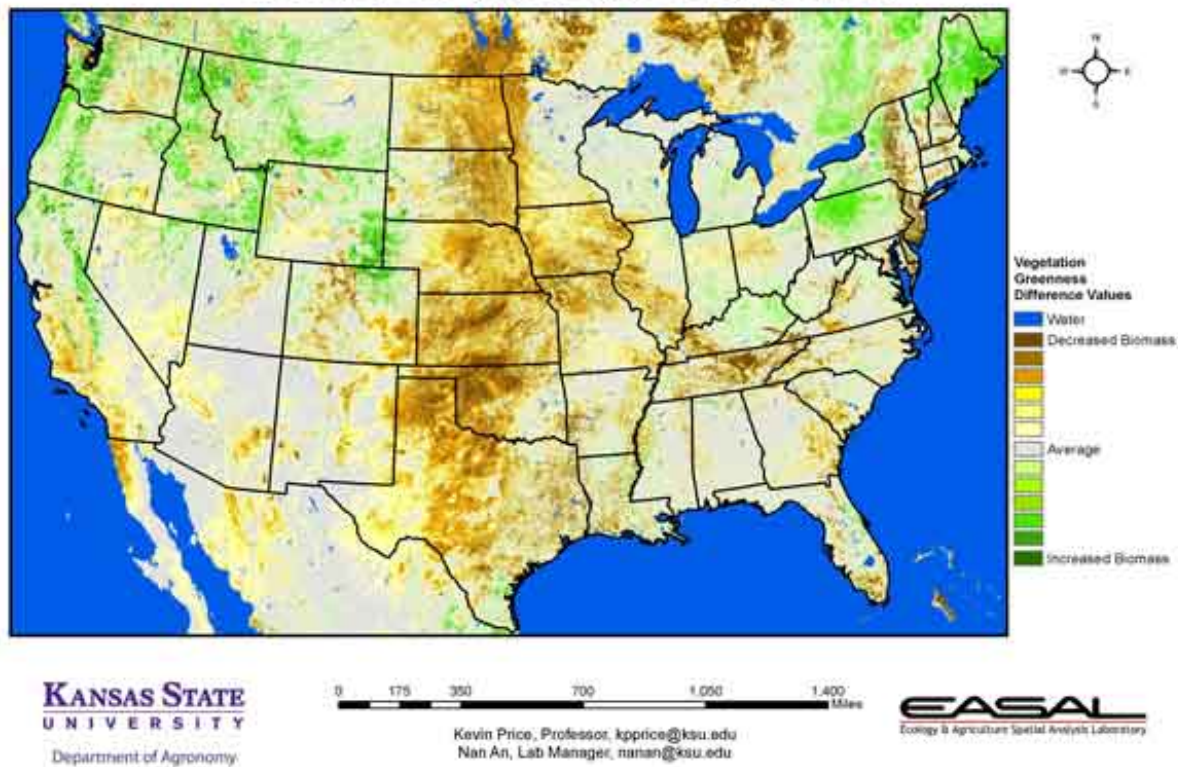


Figure 9. The U.S. comparison to the 25-year average for the period May 20 – June 2 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the central U.S. has the biggest area of below-average photosynthetic activity. Cold, wet conditions delayed development to the north, while extreme temperatures (both hot and cold), and continued drought have reduced production to the south. The greatest area of above-normal biomass production can be seen in the Pacific Northwest and in New England, particularly in Maine.

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