



**K-STATE**  
Research and Extension

## **Extension Agronomy**

# eUpdate

---

*12/05/2014*

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](mailto:swatson@ksu.edu), Jim Shroyer, Crop Production Specialist 785-532-0397 [jshroyer@ksu.edu](mailto:jshroyer@ksu.edu), or Curtis Thompson, Extension Agronomy State Leader and Weed Management Specialist 785-532-3444 [cthompso@ksu.edu](mailto:cthompso@ksu.edu).

---

<b>1. Mustard species in Kansas.....</b>	<b>3</b>
<b>2. Control of mustards in wheat.....</b>	<b>12</b>
<b>3. Update on fall infections of leaf rust in wheat.....</b>	<b>14</b>
<b>4. K-State Corn Production Management Schools scheduled for January.....</b>	<b>15</b>
<b>5. November weather summary for Kansas: Arctic outbreak.....</b>	<b>17</b>
<b>6. Comparative Vegetation Condition Report: November 18 - December 1.....</b>	<b>22</b>

## 1. Mustard species in Kansas

### Tansy mustard and flixweed

Tansy mustard and flixweed are two similar mustard species common in central and western Kansas. These weeds emerge in the fall and grow as a rosette with finely lobed compound leaves. Tansy mustard and flixweed bolt in the spring. Small orange seeds are produced in long, narrow seed pods. Seed pods of tansy mustard are usually about 1/2 inch long and thicker than flixweed seed pods, which are generally 1 to 1 1/2 inches long.

Tansy mustard (*Descurainia pinnata*) is a native winter annual. The plant is covered with fine hairs. The stem is erect, branched and 4 - 30" high. The flowers are small, pale yellow, and occur in small clusters. Tansy mustard spreads by seed from early to late summer.



**Tansy mustard on left; flixweed on right. (All photos by Dallas Peterson, K-State Research and Extension)**

Flixweed (*Descurainia sophia*) is very similar to tansy mustard, and often confused with it. It is an introduced annual or winter annual which reproduces by seed. Stems are erect, branched, and 4 - 40" high. Flixweed often grows taller than wheat, while tansy mustard generally does not. Leaves have a lacy appearance. The stem and leaves are covered with fine hairs. Flowers are small, pale yellow, and grow in small clusters. Flixweed is one of the first weeds to appear in spring.







**Flixweed adult and seedling. Tansy mustard and flixweed seedlings and rosettes are similar in appearance.**

### **Bushy wallflower (treacle mustard)**

Bushy wallflower, or treacle mustard, (*Erysimum repandum*) is a common weed in central and eastern Kansas. It is native to Eurasia. It usually emerges in the fall and forms rosettes with long narrow leaves and irregular leaf margins. Most vegetative growth occurs during the spring. Bushy wallflower rosettes bolt in the spring and bear bright yellow flowers at the top of the plant, which only grows to about 12 – 18" tall. Seeds are produced in long, narrow seed pods.





## **Bushy wallflower, or treacle mustard, adult and seedling.**

### **Field pennycress**

Field pennycress (*Thlaspi arvense*) is native to Eurasia. The seedling develops as a compact, vegetative rosette. If it emerges in the fall, it overwinters either as seed or vegetative rosettes. It can also emerge from seed in the spring. It bolts in the spring and bears white flowers at the top of the plant, which may grow from 1 to 2 feet tall. Field pennycress has a flat, broadly winged seed capsule that looks something like a penny. Field pennycress reproduces solely by seed. It is often found in grain fields, roadsides and other disturbed areas. Once this weed is established in a field, the soil will soon become contaminated with its seeds. It is an aggressive competitor with crops, and can cause significant yield reductions. Field pennycress may produce from 1,600 to 15,000 seeds/plant. The seed shatters readily. Seed dispersal is chiefly by wind. Seeds can remain viable for as long as 6 - 10 years or more in the soil. This persistent viability of field pennycress seeds in the soil, their capacity to germinate when brought to the surface by cultivation, and the very large reservoir of dormant seeds present in the soil of a heavily infested area are all factors that contribute significantly to the persistence of this troublesome weed. Field pennycress has a strong, foul odor -- even causing cows to produce bitter flavored milk after eating it. It is sometimes called stinkweed.









**Field pennycress adult and seedling.**

### **Blue mustard**

Blue mustard (*Chorispora tenella*) is a winter annual that germinates in the late summer and fall, and produces a rosette similar in appearance to a dandelion. The plant overwinters as the rosette. Blue mustard bolts in the spring. With mild February weather the flower stalk may elongate in early March. Cold weather in February results in late March elongation. It bears purple or blue flowers at the top of the plant, which may grow from 12 – 18" tall. Seeds are produced in long, narrow seed pods 1 to 2 inches long. Viable seed can be produced approximately 10 days after bloom. Blue mustard is a problem in winter annual crops, such as winter wheat, throughout Kansas. Blue mustard was introduced into the U.S. from Siberia.







**Blue mustard adult plant and seedling.**

Dallas Peterson, Weed Management Specialist  
[dpeterso@ksu.edu](mailto:dpeterso@ksu.edu)



## 2. Control of mustards in wheat

Mustards are a common broadleaf weed in wheat throughout Kansas. Unfortunately, producers often do not notice these weeds in their fields until they start to bloom in the spring. As a result, producers often don't think about control until that time. Although it is still possible to get some control at that time with herbicides, mustards are much more difficult to control at that stage and often have already reduced wheat yields by then.

To keep yield losses to a minimum, mustards should be controlled by late winter or very early spring, before the plants begin to bolt, or stems elongate. If winter annual broadleaf weeds are present in the fall, they can be controlled with any number of ALS-inhibiting herbicides, including Ally, Amber, Finesse, Affinity, Rave, Olympus, or PowerFlex. Huskie, 2,4-D, and MCPA can also provide good control of most mustards if the weeds are at the right stage of growth and actively growing, and if the wheat is at the correct growth stage. Dicamba and Starane are not very effective for mustard control.

In the later winter or early spring, blue mustard is perhaps the most difficult of the winter annual broadleaf weeds to control because it bolts very early. To be effective on blue mustard, herbicides typically need to be applied to blue mustard in late February or early March. Blue mustard is more difficult to control than tansy mustard with 2,4-D because blue mustard has often already bolted by the time 2,4-D can be safely applied to wheat. Thus, 2,4-D often is applied too late to be effective on blue mustard.

Flixweed and tansy mustard should be treated when they are no larger than two to three inches across and two to three inches tall. As these plants become larger the control decreases dramatically. Ester formulations of 2,4-D and MCPA are more effective on tansy mustard and flixweed than amine formulations. Field pennycress is easier to control than tansy mustard or flixweed. Herbicide applications made before the pennycress bolts are usually effective. Wheat should be fully tillered before applying 2,4-D or tillering will be inhibited and wheat yields may be decreased.

Most ALS-inhibiting herbicides control winter annual mustards very well, although there are populations of treacle mustard and flixweed in Kansas now that are ALS-resistant, and cannot be controlled by these products.

Alternative control measures will be needed to control these populations. The best approach is to use other herbicides such as 2,4-D, MCPA, or Huskie as an alternative or in a tank-mix with the ALS herbicides. MCPA can be applied after the wheat is in the 3-leaf stage; but as mentioned above, 2,4-D should not be applied until after wheat is fully tillered -- which often doesn't occur until spring. Huskie can be applied between the 1-leaf and flag leaf stage of growth. None of these herbicides has much residual control, so the majority of weeds need to be emerged and actively growing at the time of treatment.

Some producers commonly apply ALS herbicides with fertilizer in January or February. Unfortunately, MCPA, 2,4-D, and Huskie are most effective when applied to actively growing weeds, so application when weeds are dormant may not provide good control. As a result, if an ALS-inhibitor tank-mix with one of these herbicides is applied to dormant ALS-resistant mustards in the winter, poor control can be expected.

ALS-resistant bushy wallflower seems to be present in a number of fields in central Kansas. ALS-resistant flixweed has only been confirmed in the Saline county area, but may start to show up elsewhere. Producers should watch for cases of poor control, and consider alternative herbicides or herbicide tank-mixes to help prevent or manage ALS-resistant weeds.

Crop rotation with corn, grain sorghum, soybeans, cotton, or sunflowers is a good way of controlling the mustards as long as they are controlled in the spring prior to producing seed. Crop rotation will usually result in a gradual reduction of mustard populations in the future as the seedbank in the soil gradually decreases.

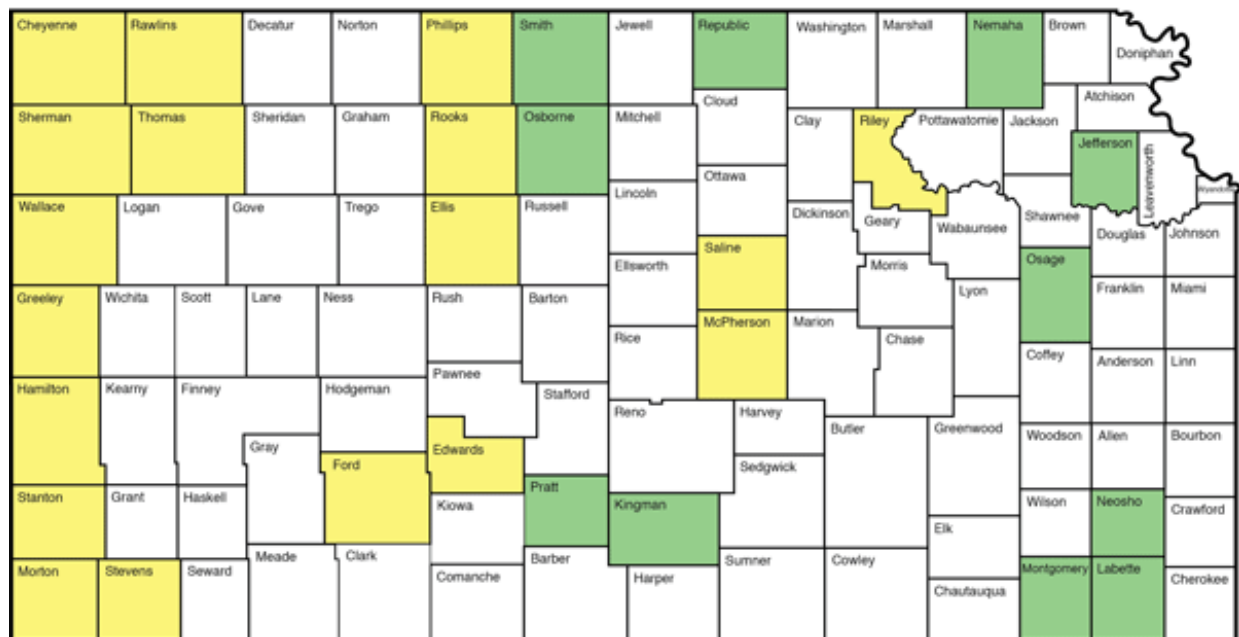
Dallas Peterson, Weed Management Specialist  
[dpeterso@ksu.edu](mailto:dpeterso@ksu.edu)

### 3. Update on fall infections of leaf rust in wheat

Since the initial reports of leaf rust in Kansas in November, I have been gathering more information about the status of this disease in the state. Leaf rust was observed in 18 counties in Kansas this fall, with severe infections noted in the western counties bordering Colorado (Figure 1). The disease was also reported at low levels in central Kansas. The disease was not observed in most areas we checked in eastern Kansas.

Fall infections of leaf rust are common in Kansas and in most years harsh winter weather will dramatically reduce the leaf rust population. In approximately 30% of the years, however, leaf rust will survive the winter in the Kansas, resulting in an elevated risk of severe disease the following spring. Growers in areas of the state known to have leaf rust should be monitoring the status of disease carefully this spring.

#### Distribution of Wheat Leaf Rust October - November, 2014



#### Disease Risk

- Leaf rust not observed
- Leaf rust observed on lower leaves

Disease observation map based on reports from: E. De Wolf, D. Shoup, J. Faulk-Jones, C. Miller, T. Maxwell, D. Hallauer, D. Coltrain, J. James, J. Coltrain, M. Owen, A. Burns, S. Wick, and S. Campbell.

Erick De Wolf, Extension Plant Pathologist  
[dewolf1@ksu.edu](mailto:dewolf1@ksu.edu)



#### 4. K-State Corn Production Management Schools scheduled for January

Two K-State Corn Production Management Schools will be offered in early January 2015 in northeast and central Kansas. Each school will provide in-depth training targeted for corn producers. Primary sponsors of the schools include the Kansas Corn Commission and DuPont Pioneer.

The one-day schools will cover several current corn topics relevant to corn producers in Kansas: drought-tolerant hybrids, high-yielding corn factors, weed control, soil fertility, and price and market perspectives.

The schools will begin at 9 a.m. and adjourn at 2 p.m., followed by a tour of facilities. The dates and locations are:

Jan. 9: Hesston, AGCO building, 420 W. Lincoln Blvd

Local Research and Extension office contacts:

- Ryan Flaming, Harvey County, [flaming@ksu.edu](mailto:flaming@ksu.edu) 316-284-6930
- Jonie James, McPherson County, [jjames@ksu.edu](mailto:jjames@ksu.edu) 620-241-1523
- Rickey Roberts, Marion County, [rroberts@ksu.edu](mailto:rroberts@ksu.edu) 620-382-2325
- Darren Busick, Reno County, [darrenbusick@ksu.edu](mailto:darrenbusick@ksu.edu) 620-662-2371
- Zach Simon, Sedgwick County, [zsimon@ksu.edu](mailto:zsimon@ksu.edu) 316-660-0153

Jan. 16: Atchison, Atchison Heritage Conference Center, 710 S. Ninth

Local Research and Extension office contacts:

- Ray Ladd, Atchison County, [cladd@ksu.edu](mailto:cladd@ksu.edu) 913-833-5450
- David Hallauer, Meadowlark District, [dhallaue@ksu.edu](mailto:dhallaue@ksu.edu) 785-863-2212
- Matt Young, Brown County, [mayoung@ksu.edu](mailto:mayoung@ksu.edu) 785-742-7871
- Mindy Young, Doniphan County, [myoung5@ksu.edu](mailto:myoung5@ksu.edu) 785-985-3623

Lunch will be provided, courtesy of the sponsors. There is no cost to attend, but participants are asked to pre-register before Jan. 5 for the Jan. 9 school in Hesston and Jan. 12 for the Jan. 16 school in Atchison.

Online registration is available at K-State Corn Production Management Schools (<http://bit.ly/KSCORNSchools>) or by emailing or calling the nearest local Research and Extension office for the location participants plan to attend.

For more information, contact: Ignacio Ciampitti, K-State Crop Production and Cropping Systems Specialist, [ciampitti@ksu.edu](mailto:ciampitti@ksu.edu) 785-532-6940; or Greg Krissek, CEO Kansas Corn, [gkrissek@ksgrains.com](mailto:gkrissek@ksgrains.com) 785-448-6922.

# 2015 CORN SCHOOLS

**KANSAS STATE**  
**UNIVERSITY**

Department of Agronomy

K A N S A S  
**CORN**  
COMMISSION

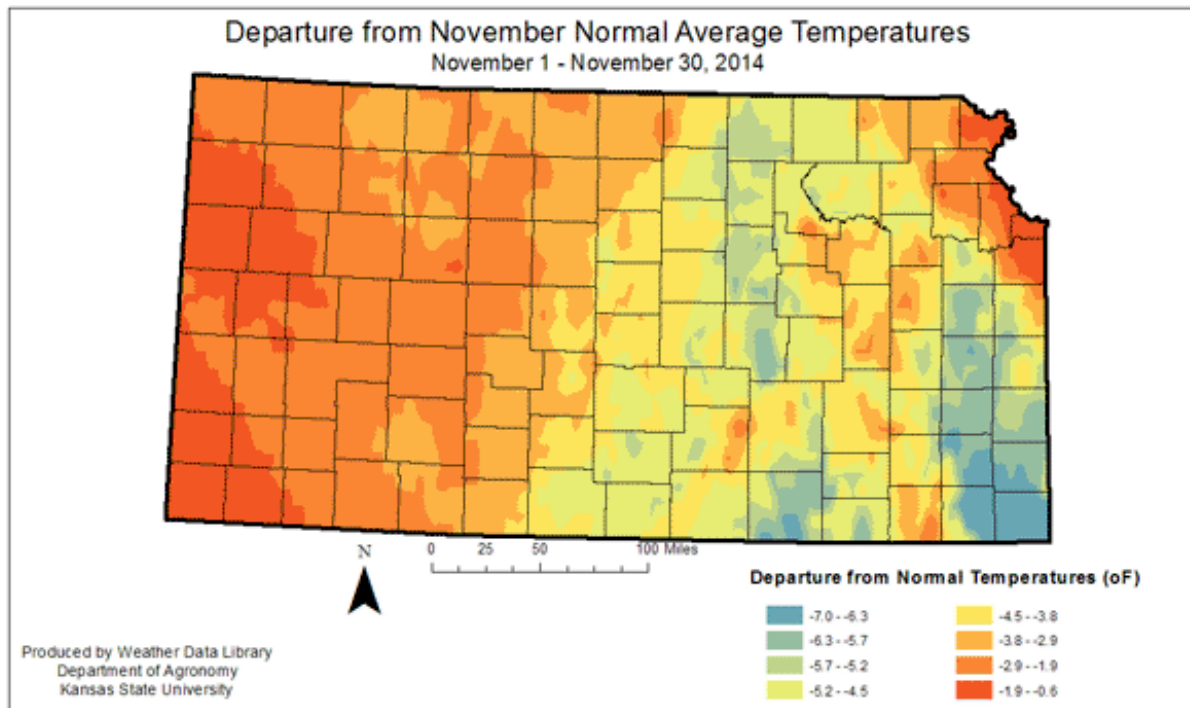
**Primarily  
supported by:**



Ignacio Ciampitti, Crop Production and Cropping Systems Specialist  
[ciampitti@ksu.edu](mailto:ciampitti@ksu.edu)

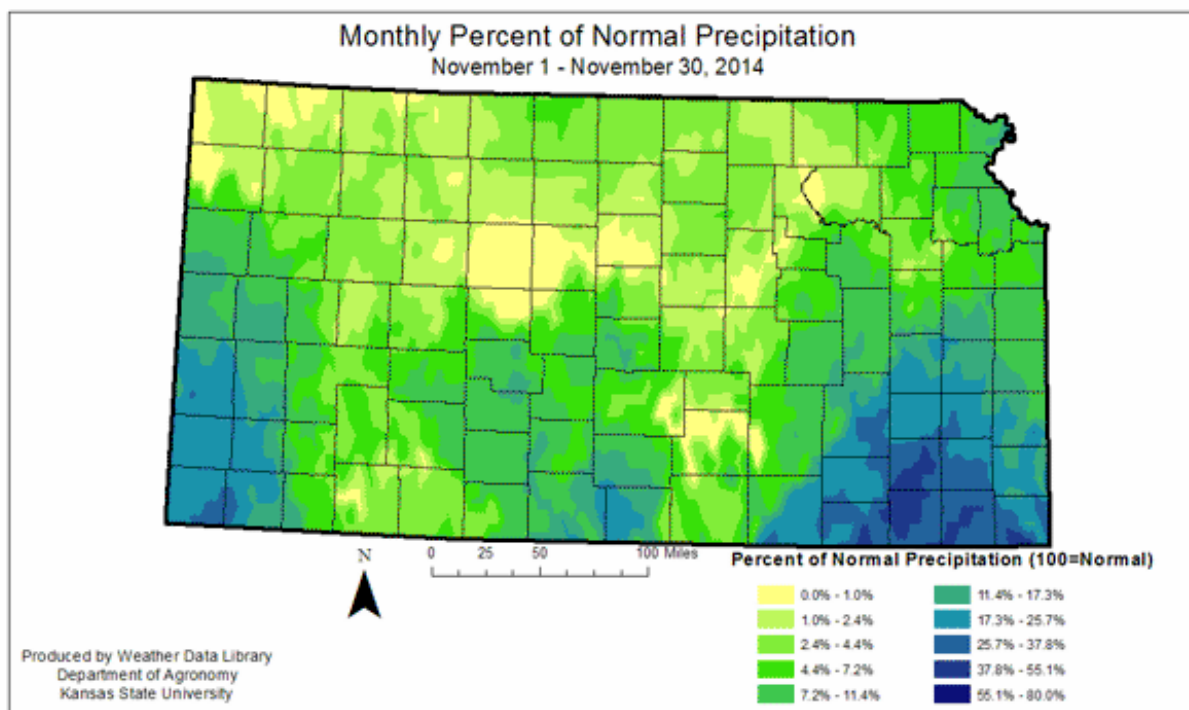
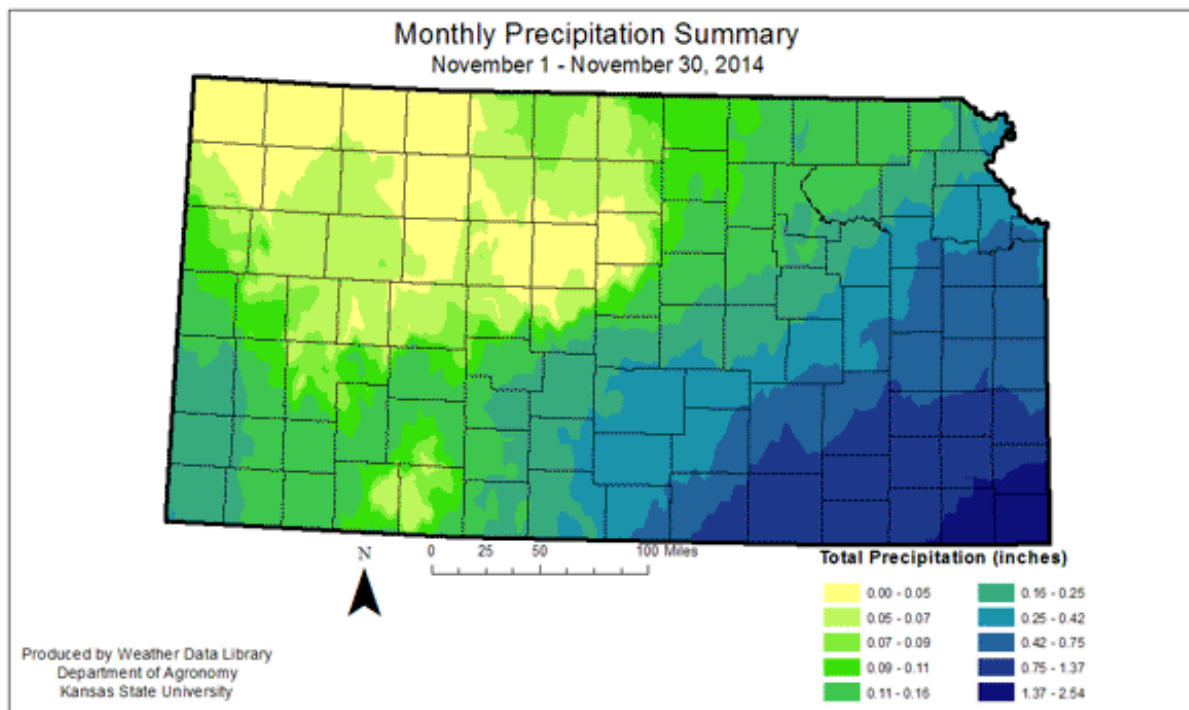
## 5. November weather summary for Kansas: Arctic outbreak

The major weather story in November was the abrupt arrival of winter weather, including extremely cold temperatures. The chill started on the 11<sup>th</sup>, when highs were in the 70s and 80s. In western Kansas, Tribune went from a high of 76 degrees F on the 11<sup>th</sup> to a high of 13 degrees on the 13<sup>th</sup>. Low temperatures below zero were common in the western third of the state, with low temperatures in the single digits reaching as far as Columbus in southeast Kansas. State-wide this year ranks as the 15<sup>th</sup> coldest November since 1895. The warmest reading for the month was 86 degrees at Ashland on the 11<sup>th</sup>. The coldest reading for the month was -6 degrees, which was reported at multiple locations, the latest occurrence of which was at Mankato on the 18<sup>th</sup>.

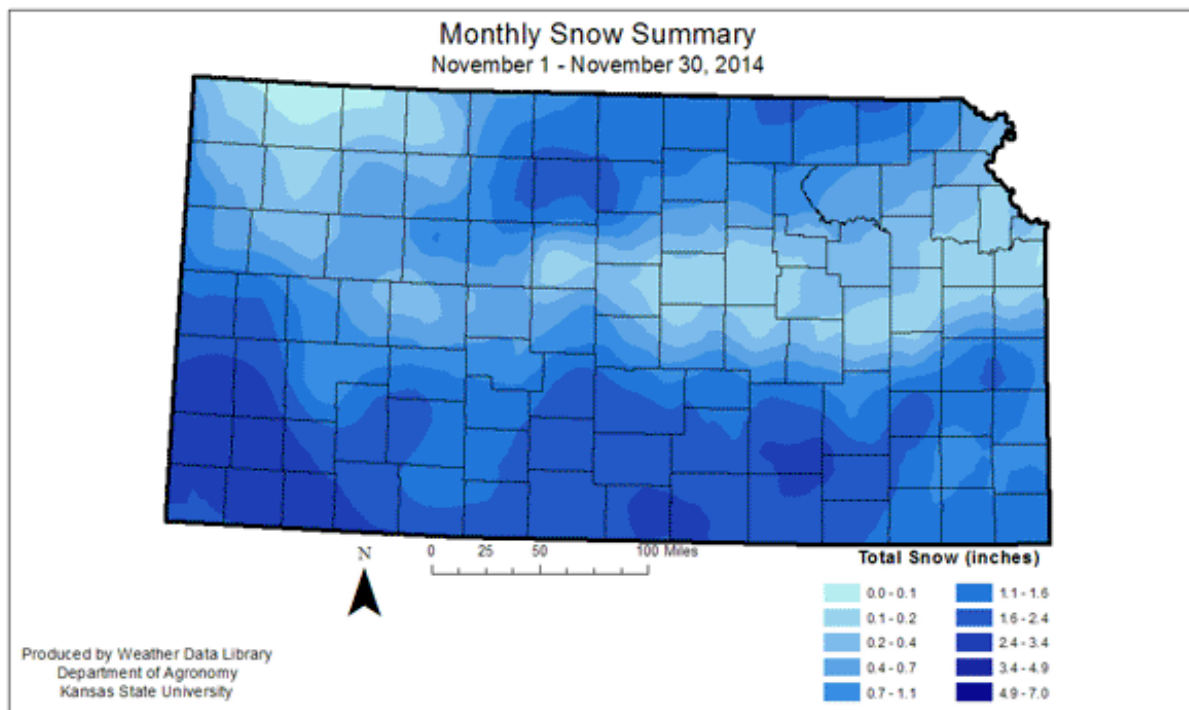


After a wetter-than-normal October, precipitation dropped dramatically in November. The statewide average precipitation for November was 0.28 inches, which is a 1.16 inch deficit for the month. The total is just 16 percent of the normal precipitation for the month, and is tied for the 22<sup>nd</sup> driest of 120 years. Northwest Kansas fared the worst, with an average of just 0.02 inches or 2 percent of normal. The North Central Division fared only slightly better with an average of 0.05 inches or 3 percent of normal.





There was one snow event, but amounts were not troublesome. The highest daily total reported was 3.7 inches at Johnson, in Stanton County, on the 16<sup>th</sup>. Unfortunately, the moisture from the snow was limited, with just 0.21 inches of liquid equivalent from the event.



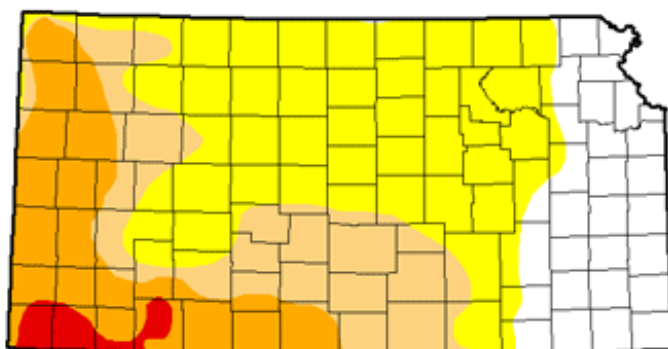
Drought conditions persist across the state, particularly in the west. There was some degradation in the eastern portions of the state. At the end of October the drought-free area had increased to almost 33 percent. By the end of November, the drought-free area had shrunk to 29 percent. The colder temperatures during this month and the residual moisture from October moderated some of the negative impact from the lack of moisture in November. However, the continued dry pattern is likely to result in further expansion of drought in the North Central Division.

# U.S. Drought Monitor Kansas

**December 2, 2014**

(Released Thursday, Dec. 4, 2014)

Valid 7 a.m. EST



Author:  
Anthony Artusa  
NOAA/NWS/NCEP/CPC



<http://droughtmonitor.unl.edu/>

Drought Conditions (Percent Area)

	None	D0	D1	D2	D3	D4
<b>Current</b>	18.56	42.86	19.25	17.08	2.25	0.00
<b>Last Week</b> 11/25/2014	29.10	32.32	19.25	17.08	2.25	0.00
<b>3 Months Ago</b> 9/2/2014	5.91	22.00	53.73	12.91	5.46	0.00
<b>Start of Calendar Year</b> 1/2/2013	4.71	48.37	13.04	28.30	5.58	0.00
<b>Start of Water Year</b> 8/2/2014	18.51	35.36	26.63	17.13	2.37	0.00
<b>One Year Ago</b> 12/2/2013	12.48	46.84	9.10	28.42	3.16	0.00

Intensity

D0 Abnormally Dry	D3 Extreme Drought
D1 Moderate Drought	D4 Exceptional Drought
D2 Severe Drought	

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

The likelihood of an El Niño/Southern Oscillation (ENSO) continues to diminish. It is still expected to switch to an El Niño event before winter, but it also remains to be seen what impact will be felt. Other global circulation patterns, including the North Atlantic Oscillation (NAO), can have significant impacts on the winter season. The December temperature outlook is for warmer-than-normal temperatures for the entire state. The precipitation outlook is neutral, with precipitation equally likely to be above normal, normal or below normal.

**Table 1**

**Nov 2014**

## Kansas Climate Division Summary

Precipitation (inches)						Temperature (°F)			
Nov 2014			2014: Jan through Nov			Monthly Extremes			
Division Total	Dep. <sup>1</sup>	% Normal	Total	Dep. <sup>1</sup>	% Normal	Ave	Dep. <sup>1</sup>	Max	Min
<b>Northwest</b>	0.02	-0.80	2	16.04	-4.75	77	36.3	-2.7	80 -6

Kansas State University Department of Agronomy

2004 Throckmorton Plant Sciences Center | Manhattan, KS 66506

[www.agronomy.ksu.edu](http://www.agronomy.ksu.edu) | [www.facebook.com/KState.Agron](https://www.facebook.com/KState.Agron) | [www.twitter.com/KStateAgron](https://www.twitter.com/KStateAgron)



<b>West Central Southw est</b>	0.05	-0.74	7	19.29	-0.85	94	38.0	-2.5	83	-5
	0.19	-0.47	32	17.28	-1.95	88	40.8	-2.1	86	0
<b>North Central Central South Central</b>	0.05	-1.18	3	22.15	-4.98	81	36.3	-4.9	79	-6
	0.08	-1.16	5	24.69	-3.67	87	38.8	-4.0	80	1
	0.44	-1.05	27	24.04	-6.16	79	39.5	-5.0	84	0
<b>Northeast East Central Southeast</b>	0.15	-1.62	8	27.61	-6.17	81	36.3	-6.0	72	7
	0.25	-1.92	11	25.84	-10.68	70	37.4	-6.2	73	4
	1.05	-1.54	39	29.47	-10.21	74	39.1	-6.7	77	0
<b>STATE</b>	0.28	-1.14	16	22.86	-5.49	81	38.1	-4.5	86	-6

1. Departure from 1981-2010 normal value

Source: KSU Weather Data Library

Mary Knapp, Weather Data Library  
[mknapp@ksu.edu](mailto:mknapp@ksu.edu)

## 6. Comparative Vegetation Condition Report: November 18 - December 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=CRP3Y5Nlggw>

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

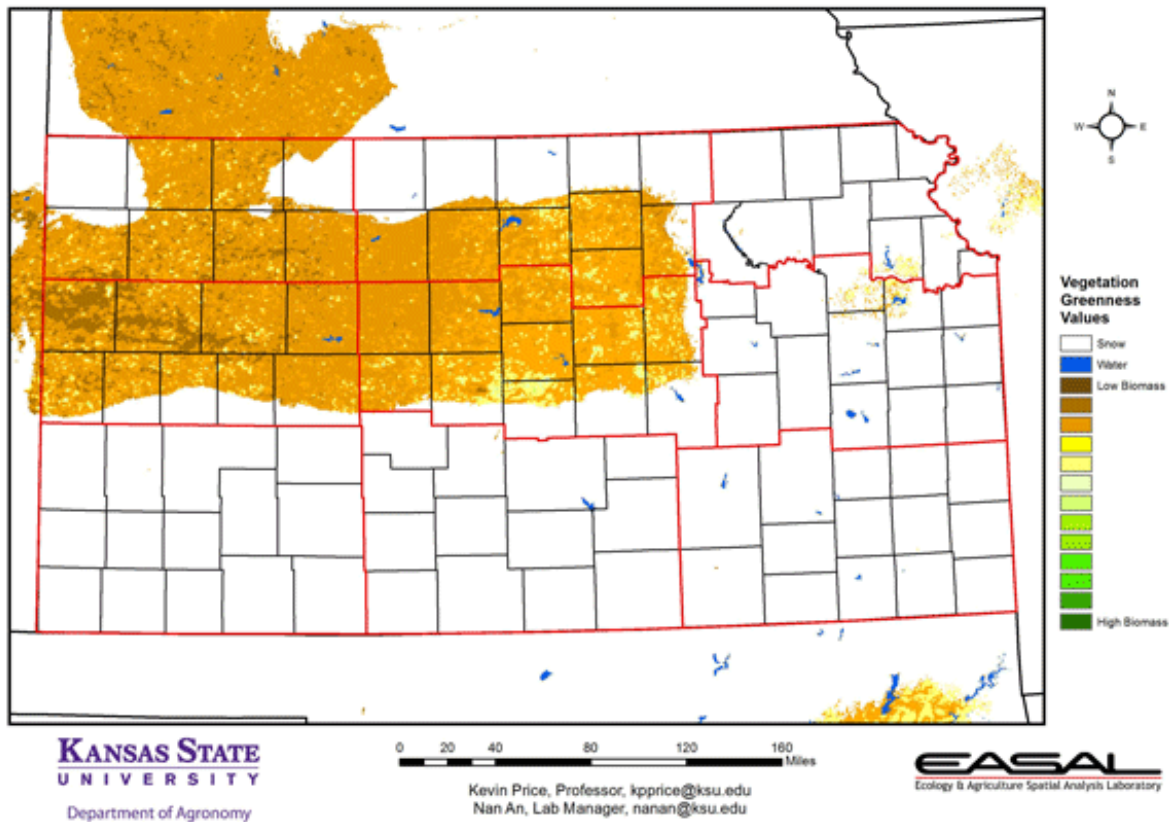
The objective of these reports is to provide users with a means of assessing the relative condition of crops and grassland. The maps can be used to assess current plant growth rates, as well as comparisons to the previous year and relative to the 25-year average. The report is used by individual farmers 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](mailto: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

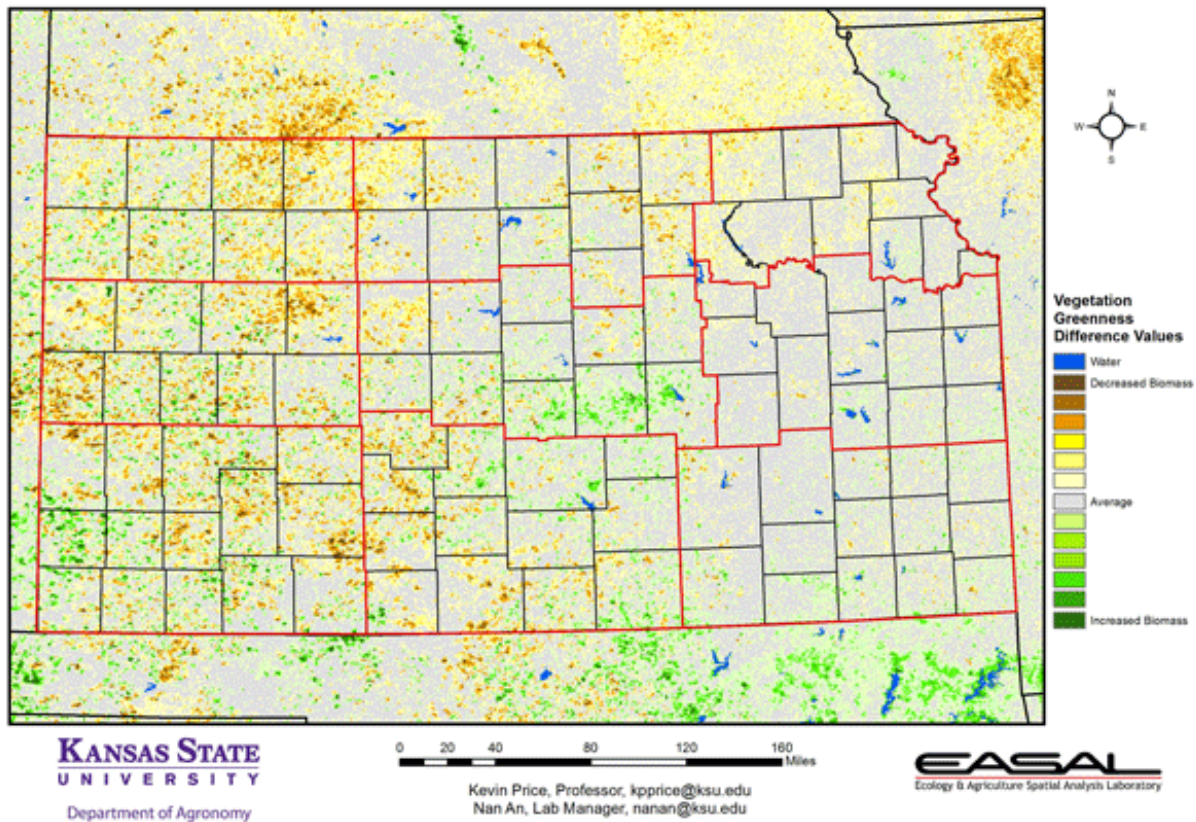
Period 48: 11/18/2014 - 12/01/2014



**Figure 1. The Vegetation Condition Report for Kansas for November 18 – December 1 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that while much of the state had snow during the period, the West Central and Central divisions missed out. In the Northwest, the snow that fell was limited, and resulted in only a trace of precipitation.**



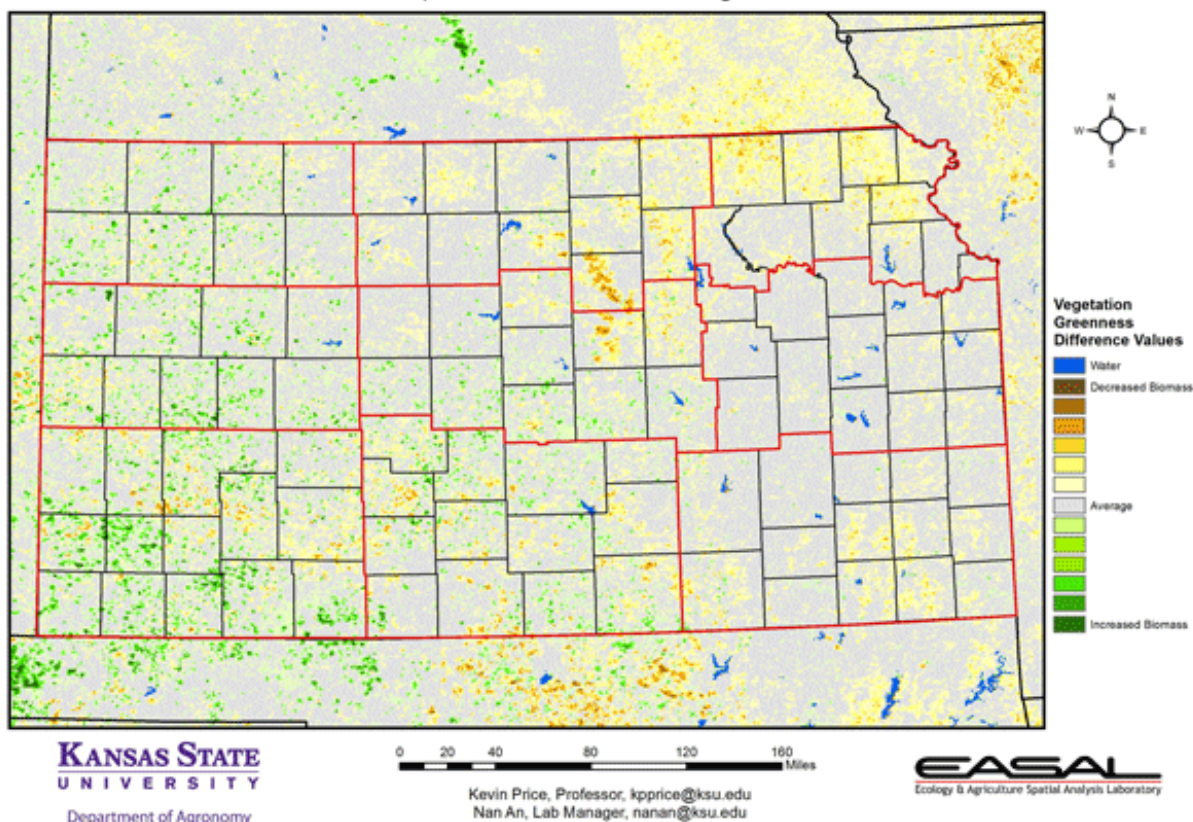
**Kansas Vegetation Condition Comparison**  
Late-November 2014 compared to the Late-November 2013



**Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for November 18 – December 1 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the level of photosynthetic activity was about the same as last year at this time. Norton and Phillips show the largest areas of lower biomass production.**

## Kansas Vegetation Condition Comparison

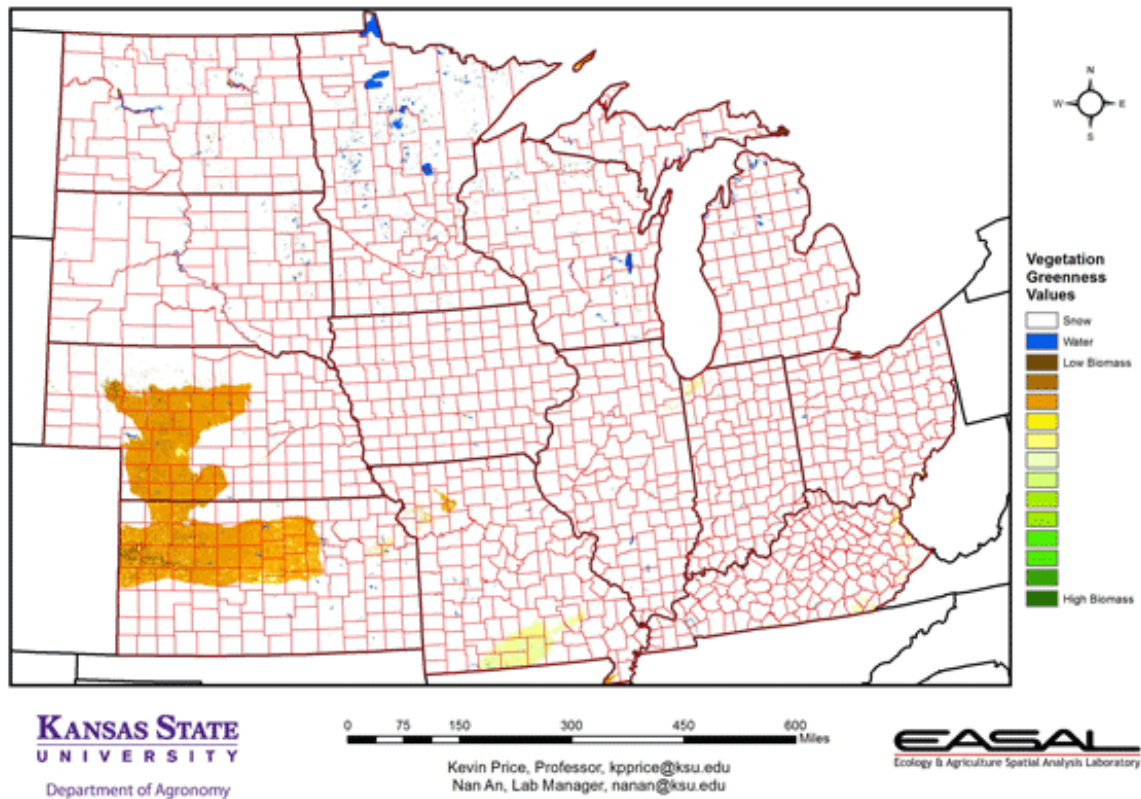
Late-November 2014 compared to the 25-Year Average for Late-November



**Figure 3. Compared to the 25-year average at this time for Kansas, this year's Vegetation Condition Report for November 18 – December 1 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows most of the state has close to average photosynthetic activity. Below-average values are seen in Ottawa County, along the Solomon River basin. Slightly above-average values can be seen in the extreme Southwestern Division, particularly in Grant County.**

## U.S. Corn Belt Vegetation Condition

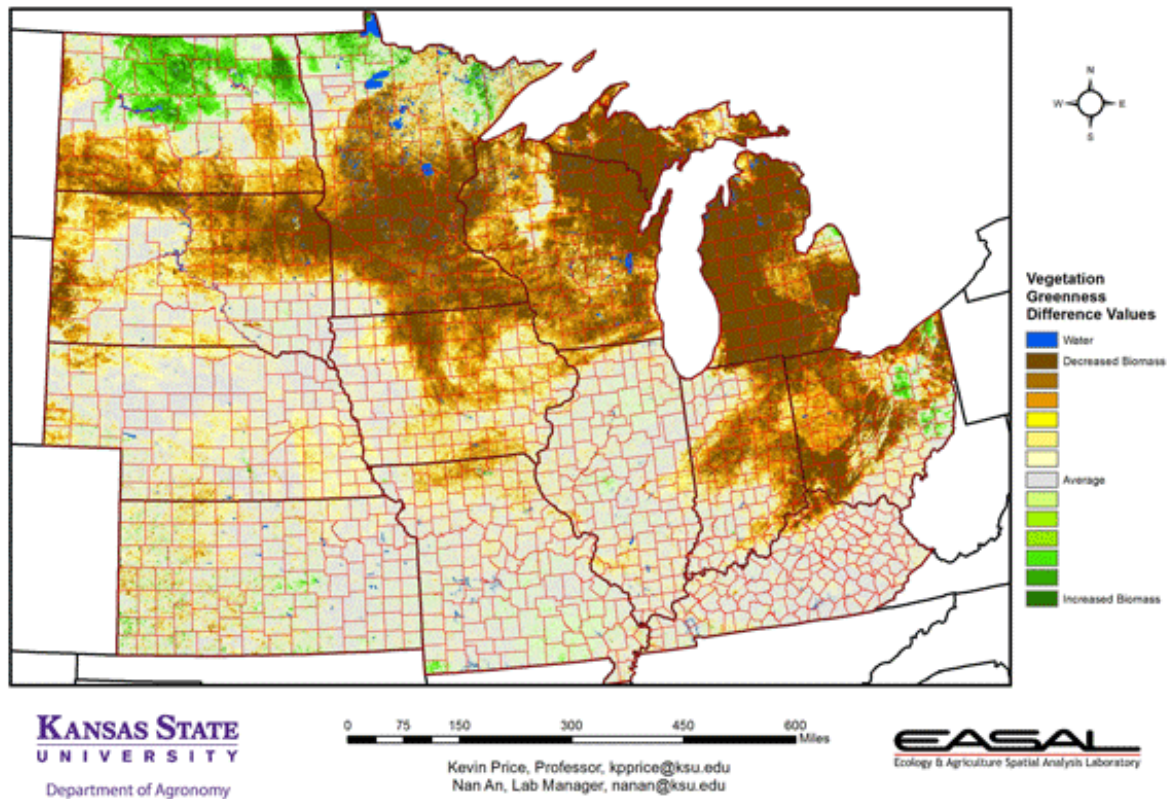
Period 48: 11/18/2014 - 12/01/2014



**Figure 4. The Vegetation Condition Report for the Corn Belt for November 18 – December 1 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that snow covered most of the region. The exception was from the Sand Hills of Nebraska through west central and central Kansas. The heaviest snows were in the eastern portion of the Corn Belt region.**

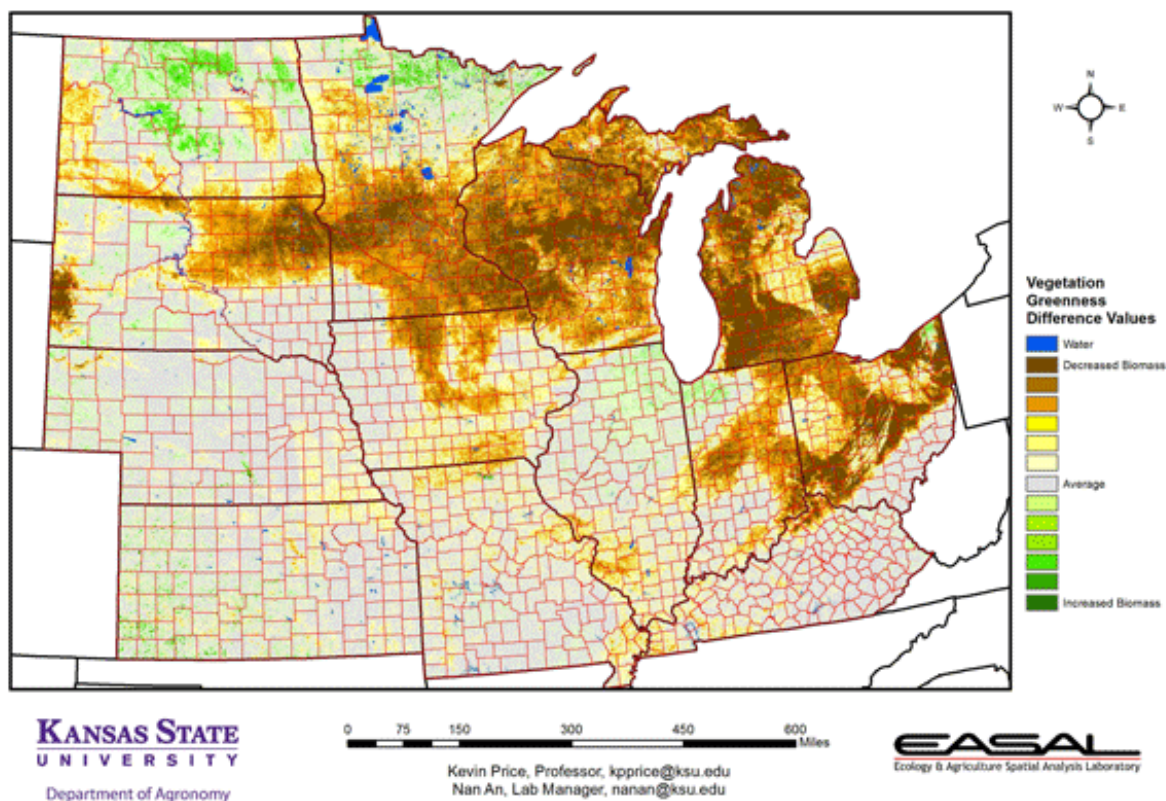


**U.S. Corn Belt Vegetation Condition Comparison**  
 Late-November 2014 Compared to Late-November 2013



**Figure 5. The comparison to last year in the Corn Belt for the period November 18 – December 1 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the greatest departure ranges from southern Minnesota across Wisconsin and Michigan. There has been much heavier snow in these regions in comparison to last year. For example, Reed City in western Michigan, reported more than 15 inches of snow in November. Last year, Reed City reported just 4 inches for November.**

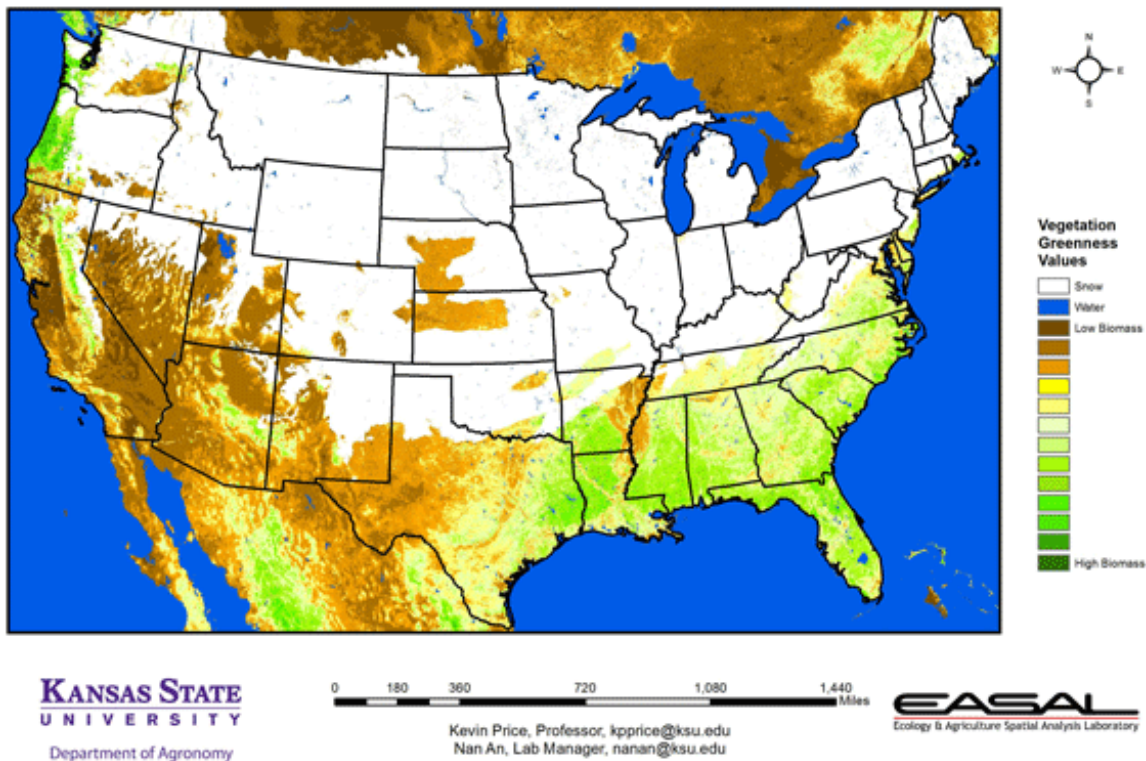
**U.S. Corn Belt Vegetation Condition Comparison**  
Late-November 2014 Compared to the 25-Year Average for Late-November



**Figure 6. Compared to the 25-year average at this time for the Corn Belt, this year's Vegetation Condition Report for November 18 – December 1 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that there is a wide area of lower-than-average NDVI values across the central portion of the Corn Belt. This is a result of higher snow cover. The biggest impact from this is likely to be delayed harvest or abandonment of late fall crops. In Michigan, almost a quarter of the corn still hadn't been harvested at the end of November.**

## Continental U.S. Vegetation Condition

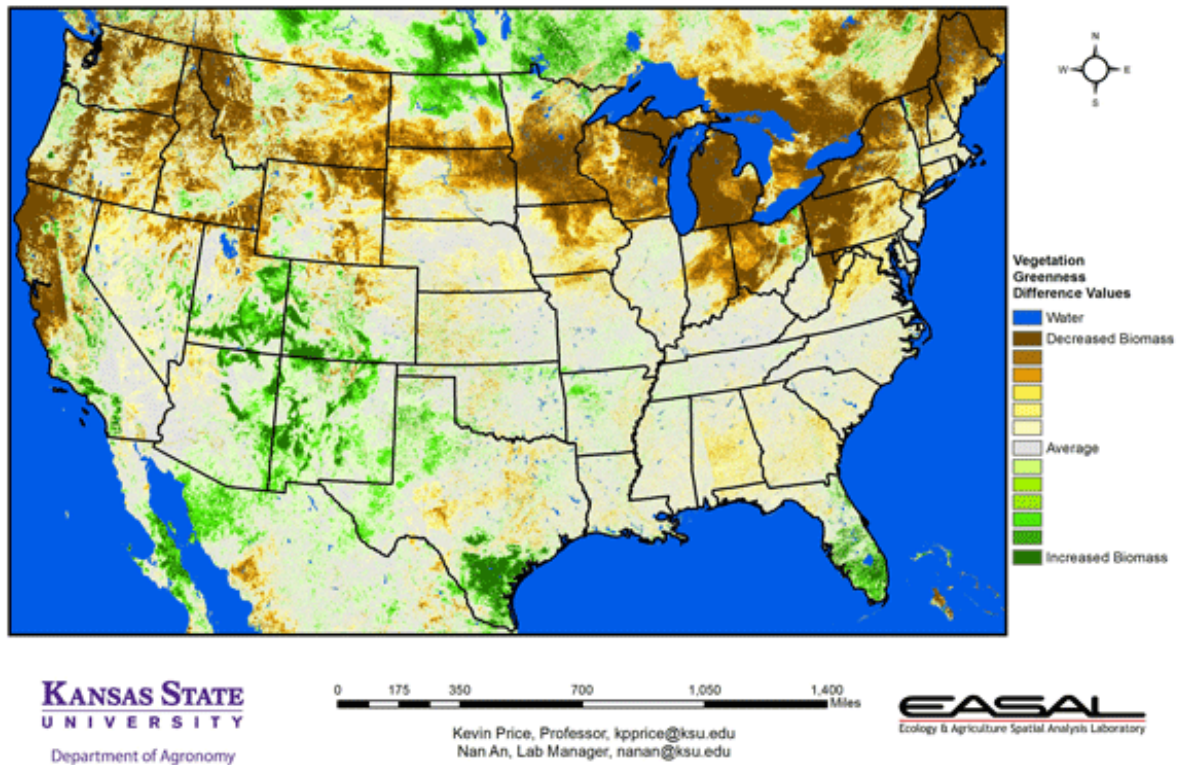
Period 48: 11/18/2014 - 12/01/2014



**Figure 7. The Vegetation Condition Report for the U.S. for November 18 – December 1 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that snow extended into the Texas Panhandle. However, snow pack in the California Mountains, while a bit higher than last year, is still low. Along the West Coast region, coverage is at almost 1 percent compared to a tenth of a percent last year.**

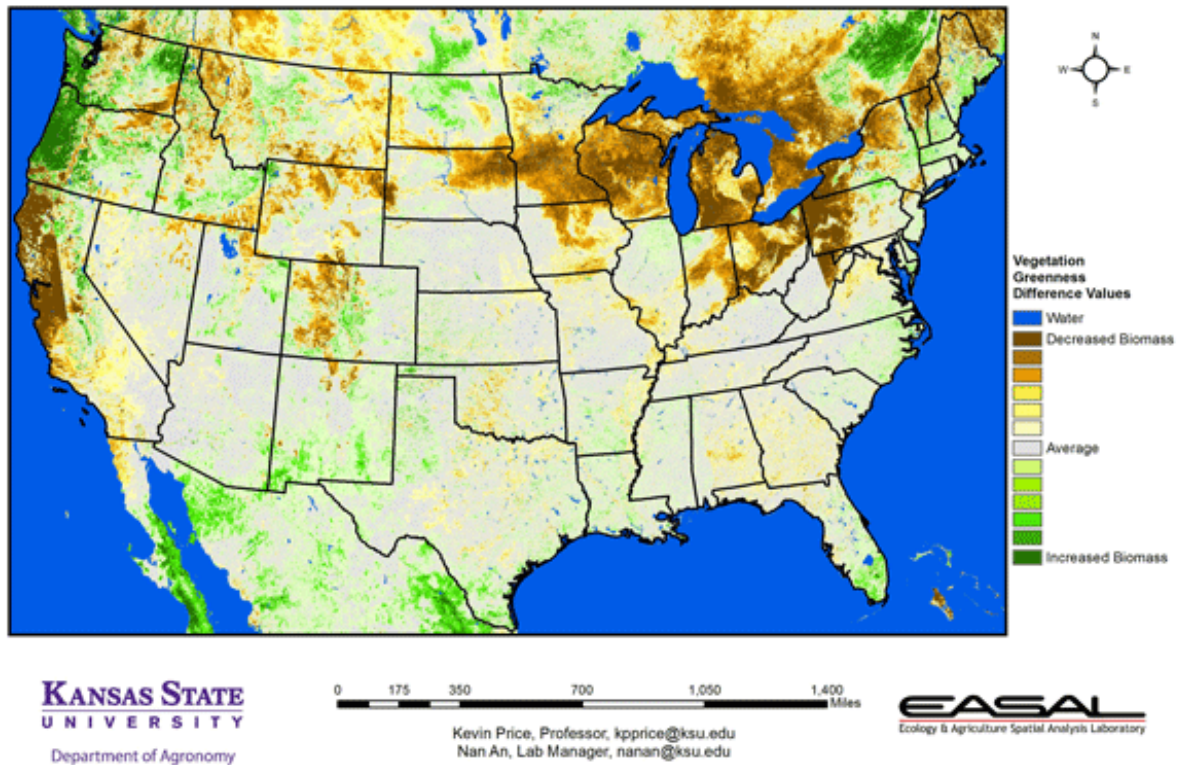


Continental U.S. Vegetation Condition Comparison  
Late-November 2014 Compared to Late-November 2013



**Figure 8. The U.S. comparison to last year at this time for the period November 18 – December 1 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that lower NDVI values are most prevalent along the northern portion of the contiguous 48 states. Snow cover is the major factor in this across the eastern U.S., while persistent cloud cover reduced NDVI values along the northern California Coast during this two-week composite period. Unfortunately, for significant drought relief much higher snow totals in the mountains is imperative. In the Central Rockies, higher NDVI values are the result of lower snow totals this season. Snow coverage is reported at less than 50 percent of the area this year, while last year the area had coverage of more than 96 percent at this time.**

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



**Figure 9. The U.S. comparison to the 25-year average for the period November 18 – December 1 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that northern California and the Upper Midwest have the greatest level of below-average photosynthetic activity. For the upper Midwest heavy snow significantly reduced biomass activity. Along the California Coast, persistent cloud cover was the major fact. In the Pacific Northwest, above-average photosynthetic activity is visible. Snow cover remains lighter-than-average in the region.**

Mary Knapp, Weather Data Library  
[mknapp@ksu.edu](mailto:mknapp@ksu.edu)

Kevin Price, Professor Emeritus, Agronomy and Geography, Remote Sensing, GIS  
[kpprice@ksu.edu](mailto:kpprice@ksu.edu)

Nan An, Graduate Research Assistant, Ecology & Agriculture Spatial Analysis Laboratory (EASAL)  
[nanan@ksu.edu](mailto:nanan@ksu.edu)