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December 7, 2012

1. Winter survival of poorly developed wheat
2. Vernalization and yield potential of late-emerging wheat
3. Glyphosate-resistant Palmer amaranth in Kansas?
4. Development of crown roots in wheat
5. November 2012 weather summary for Kansas: Warm and dry
6. Comparative Vegetation Condition Report: November 20 – December 3

1. Winter survival of poorly developed wheat

Conditions remain very dry conditions in many areas of Kansas this year. Both the topsoil and subsoil are very dry. Where this is the case, wheat development has typically been poor. Will this make some wheat fields more susceptible more winter die-off or weakening than usual?

Factors to consider

The following are some of the factors to consider when evaluating the outlook for winter survival of wheat:

- * How well has the wheat cold hardened?

When temperatures through fall and early winter gradually get colder, that helps wheat plants develop good winterhardiness. When temperatures remain unusually warm late into the fall (which can lead to excessive vegetative growth) then suddenly drop into the low teens, plants are less likely to have had time to cold harden properly and will be more susceptible to winterkill. This fall, temperatures have fallen off gradually. As a result, the wheat should be adequately cold hardened in most cases.

- * How well developed is the root system?

Good top growth of wheat doesn't necessarily indicate good root development. Poor root development is a concern where conditions have been dry. Where wheat plants have a good crown root system and two or more tillers, they will tolerate the cold better. If plants are poorly developed going into winter, with very few secondary roots and no tillers, they will be more susceptible to winterkill or desiccation, especially when soils remain dry. Poor development of secondary roots may not be readily apparent unless the plants are pulled up and examined. If plants are poorly developed, it may be due to dry soils, poor seed-to-soil contact, very low pH, insect damage, or other causes.

- * How cold is the soil at the crown level?

This depends on snow cover and moisture levels in the soil. Winterkill is possible if soil temperatures at the crown level (about one inch deep) fall into the single digits. If there is at least an inch of snow on the ground, the wheat will be protected and soil temperatures will usually remain

above the critical level. Also, if the soil has good moisture, it's possible that soil temperatures at the crown level may not reach the critical level even in the absence of snow cover. But if the soil is dry and there is no snow cover, there may be the potential for winterkill, especially on exposed slopes or terrace tops, depending on the condition of the plants.

* Is the crown well protected by soil?

If wheat is planted at the correct depth, about 1.5 to 2 inches deep, and in good contact with the soil, the crown should be well protected by the soil from the effects of cold temperatures. If the wheat seed was planted too shallowly, then the crown will have developed too close to the soil surface and will be more susceptible to winterkill. Also, if the seed was planted into loose soil or into heavy surface residue, the crown could be more exposed and could be susceptible to cold temperatures and desiccation.

* Is there any insect or disease damage to the plants?

Plants may die during the winter not from winterkill, but from the direct effects of a fall infestation of Hessian fly. Many people are familiar with the lodging that Hessian fly can cause to wheat in the spring, but fewer recognize the damage that can be caused by fall infestations of Hessian fly. Wheat infested in the fall often remains green until the winter when the infested tillers gradually die. Depending on the stage of wheat when the larvae begin their feeding, individual tillers or whole plants can die. If the infestation occurs before multiple tillers are well established then whole plants can die. If the plants have multiple tillers before the plants are infested then often only individual tillers that are infested by the fly larvae will die.

The key to being able to confirm that the Hessian fly is the cause of the dead tillers is to carefully inspect the dead plants or tillers for Hessian fly larvae or pupae. This can be done by carefully removing the plant from the soil and pulling back the leaf material to expose the base of the plant. By late winter all of the larvae should have pupated and thus the pupae should be easily detected as elongated brown structures pressed against the base of the plant. The pupae are fairly resilient and will remain at the base of the plant well into the spring.

Damage from winter grain mites, brown wheat mites, fall armyworm, aphids, and crown and root rot diseases can also weaken wheat plants and make them somewhat more susceptible to injury from cold weather stress or desiccation.

Symptoms of winter survival problems

If plants are killed outright by cold temperatures, they won't green up next spring. If they are only damaged, it might take them a while to die. They will green up and then slowly go "backwards" and eventually die. There are enough nutrients in the crown to allow the plants to green up, but the winter injury causes vascular damage so that nutrients that are left cannot move, or root rot diseases move in and kill the plants. Slow death is probably the most common result of winter injury on wheat.

Direct cold injury is not the only source of winter injury. Under dry conditions, wheat plants may suffer from desiccation. This can kill or weaken plants, and is actually a more common problem than direct cold injury.

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2. Vernalization and yield potential of late-emerging wheat

Producers whose wheat has not yet emerged may be wondering now about whether their wheat will have enough exposure to cold temperatures to vernalize once it does emerge – and what kind of yield potential to expect.

* Vernalization. Wheat does not have to emerge as a seedling in order to be vernalized by cold temperatures. As long as the seed has received enough moisture to become physiologically active and begin the germination process, it can undergo vernalization. Winter wheat will vernalize after experiencing 3-6 weeks of soil temperatures below 48 degrees. Some varieties require a little longer period of cold to vernalize; and some require less. Jagger has one of the shortest vernalization requirements. In almost all cases, winter wheat planted in the fall will vernalize. The only exception would be if the soil is so dry during the fall and winter months that seed never becomes physiologically active until later in the spring, and it warms up very quickly in the spring. This would be rare.

* Yield potential. Research in Kansas has shown that the yield potential of wheat that emerges after January 1 is about 40 to 60 percent of normal, depending on spring weather conditions. Wheat that emerges late typically has fewer total tillers than wheat that emerges in the fall. Late-emerging wheat is also behind in development, and typically flowers and reaches grain fill later in the spring than fall-emerged wheat. If the spring weather is dry, or if it turns hot and dry early, the yield potential of late-emerged wheat could be even less than 40 percent of normal. However, in a cool spring with adequate moisture, late-emerged wheat will have enough time to develop and fill grain, and can yield relatively well.

Taking all these factors into consideration, it is likely that most wheat planted in the fall will eventually emerge and head out this spring. But it is also likely that if the wheat does not emerge until after January 1, yields will be less than 60 percent of normal. If blowing occurs or weeds become a problem before the wheat emerges, this could cause further problems. Late emergence of wheat also may reduce snow catch during the winter, and result in less snow cover than where the wheat has established a normal stand.

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3. Glyphosate-resistant Palmer amaranth in Kansas?

Glyphosate-resistant weeds continue to be an increasing problem in Kansas. Glyphosate-resistant marestail, common waterhemp, common ragweed, giant ragweed, and kochia have been previously confirmed in Kansas and have become very problematic in certain areas of the state.

Glyphosate-resistant Palmer amaranth is a serious problem in the Southeast U.S. and has dramatically impacted weed control programs and even cropping systems. Palmer amaranth is also a serious weed problem in Kansas, but glyphosate-resistant Palmer amaranth has not been previously confirmed in the state. The hot, dry weather the last couple of years has made it difficult to assess herbicide performance and resistance problems, but poor control of Palmer amaranth with glyphosate has raised questions about whether glyphosate-resistant Palmer amaranth populations are now showing up in Kansas.

To attempt to verify this one way or another, waterhemp and Palmer amaranth seed were collected in the fall of 2011 from various soybean and cotton fields in eastern and south central Kansas. These fields had abundant pigweed escapes after being treated with glyphosate.

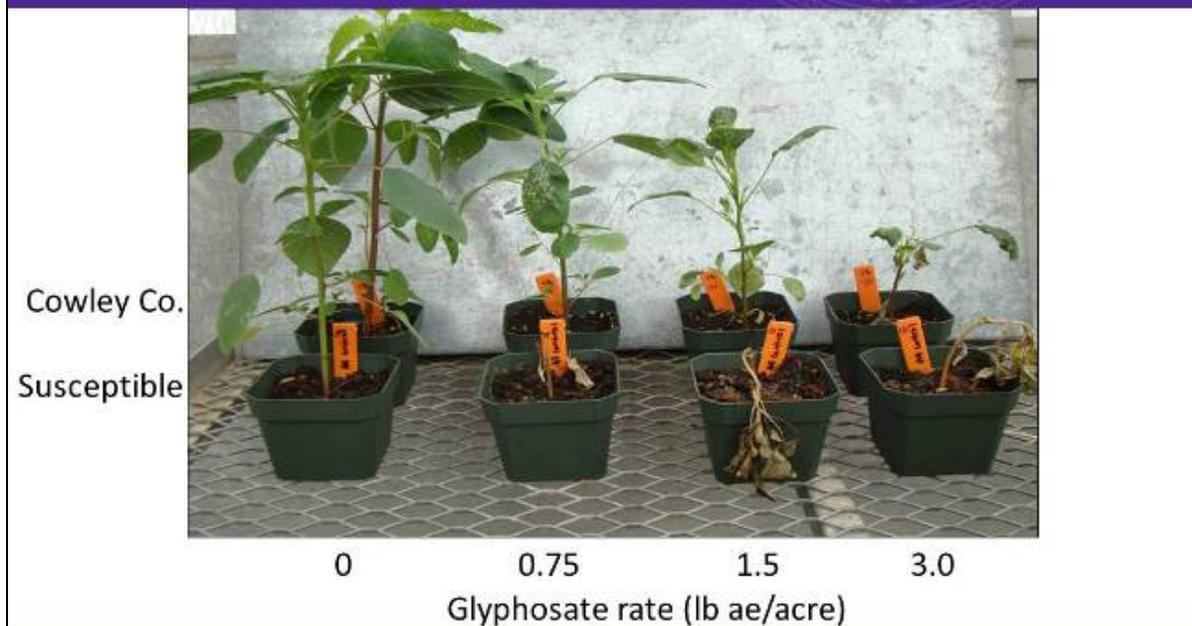


Palmer amaranth escapes in soybeans treated with glyphosate. Photos by Josh Putman, Graduate Research Assistant, Agronomy, K-State Research and Extension.

Waterhemp and Palmer amaranth plants from these different populations were grown in the greenhouse and treated with glyphosate at 0.75 (1X), 1.5 (2X), and 3 (4X) lb ae /acre to evaluate for resistance. Response of the different populations was compared to susceptible populations of both species collected from the Ashland Bottoms experiment field south of Manhattan. The susceptible check populations of both species were completely controlled by all rates of glyphosate.

As expected, a number of the waterhemp populations from across eastern Kansas survived glyphosate treatment up to a 4X rate, and appeared to be resistant. Two populations of Palmer amaranth from Cowley County in south central Kansas also had a high percentage of plants that survived the 1X and 2X rates of glyphosate, and had some plants that survived the 4X rate. These Palmer amaranth populations did not appear to be as resistant to glyphosate as some of the Palmer amaranth from the Southeast U.S., but weren't being controlled by typical field rates in the greenhouse or with multiple applications of glyphosate in the field. Thus, it appears that glyphosate-resistant Palmer amaranth may now be present in Kansas.

Palmer amaranth from Cowley County, Kansas



Palmer amaranth plants in the back row were taken from a field in Cowley County, and had a high percentage of plants that survived the 1X and 2X rates of glyphosate, and had some plants that survived the 4X rate. The plants in the front row were from a population of Palmer amaranth susceptible to glyphosate.

Palmer amaranth seed was collected from additional fields this past fall and is now being evaluated in the greenhouse. Preliminary observations suggest that we are seeing similar survival after glyphosate treatments from Palmer amaranth collected from fields south of Great Bend, along with additional populations collected south of Wichita. Research on inheritance and the mechanism of resistance will need to be conducted to further characterize and confirm glyphosate resistance in these populations. Confirming herbicide resistance is a long and detailed process.

Regardless of whether glyphosate-resistant Palmer amaranth is present in your area now, there is a good chance it will develop at some point based upon what has happened in the Southeast U.S., especially if growers rely heavily on glyphosate for weed control.

Palmer amaranth is an extremely competitive weed, and the development of glyphosate resistance means it will require an effective integrated weed management program to achieve acceptable control. Continuing to rely only on glyphosate for weed control will only speed up the development of glyphosate-resistant weeds and diminish its effectiveness. Utilizing residual herbicides with different modes of action throughout the cropping system will help to manage existing glyphosate-resistant weeds and slow the development of new glyphosate-resistant weed populations.

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4. Development of crown roots in wheat

In the November 19, 2012 issue of the Agronomy e-Update, I had a photo of a wheat plant from the Agronomy North Farm showing very poor crown root development due to dry topsoil. This photo was taken November 14. I said at the time that all was not lost, and crown roots could start developing if moisture conditions improved.



Wheat plant with only one, very short crown root on November 14, 2012 at the Agronomy North Farm near Manhattan. The crown root system should have been much more fully developed by this point, but was been delayed by dry topsoil conditions. Photo by Jim Shroyer, K-State Research and Extension.

I went out to the same location on Thursday, December 6, to see whether the situation had improved. The field had not received much precipitation, but when I pulled up plants this week, the soil was moist and crown root development was much better. There must have been moisture just below the soil surface which moved upward just enough to reach the crown area. The wheat is now in much better condition to survive the winter.



A wheat plant from the same location, pulled on December 6, 2012. The soil had more moisture by this point in the season, and crown root development had improved significantly. The primary root system from the seed is also well developed. Interestingly, a coleoptilar tiller has begun growing from the seed area. The majority of tillers develop from the crown. Photo by Jim Shroyer, K-State Research and Extension.

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5. November 2012 weather summary for Kansas: Warm and dry

The brief period of cooler-than-average temperatures in October switched back to the warmer-than-average pattern in November that has persisted for much of the year. November preliminary statewide average temperature is 46 degrees F, which is 3.6 degrees above normal. There were 64 new record daily highs and 34 records that were tied. There were also 29 daily records for high minimum temperatures, and 4 record high minimums that were tied. Still, cold weather was present. While no record low minimum temperatures were set, all divisions saw low temperatures dip below 20 degrees F,. The lingering impact of the exceptionally warm spring continues, with the January through November average of 60 degrees F, ranking as the warmest on record. Second place goes to 1934, with a January-November average of 59.9 degrees F,. The highest temperature was 87 degrees F, at multiple locations. The monthly average temperature was 46.4 degrees F,, which was 3.6

degrees above normal. The warmest November was recorded in 1999, when the average temperature was 50.4 degrees F. The coldest November on record occurred in 1929, when the average temperature was 34.4 degrees F,.

Preliminary statewide average precipitation was 0.58 inches, which was 30% of normal. This makes it the 35th driest November since 1895. Both the Northwest and the West Central divisions averaged zero precipitation for the month. The Southwest fared only a little better with an average of 0.02 inches, or one percent of normal. The Southeast had the greatest average precipitation at 1.27 inches, but that was only 48 percent of normal. The Northeastern division fared the best with an average of 1.19 inches or 66 percent of normal. On 22 days in November, no precipitation was recorded anywhere in the state. Only two days saw statewide average precipitation at a tenth of an inch or better. Drought conditions persist across the state, and are slowly worsening in the areas where moderate and severe conditions remain. The majority of the state is in extreme to exceptional drought conditions.

The latest Drought Monitor extreme drought now covers 77.6 percent of the state, with nearly 36 percent of the state in exceptional drought. Given the lack of rain over the last several weeks, the area of extreme drought is likely to expand, particularly the eastern third of Kansas, which typically sees more precipitation in November than the western areas of the state. The latest Drought Outlook indicates drought conditions are expected to continue through February. The expected El Niño has failed to develop, and neutral conditions are expected to persist through the winter. That means the signal for increased winter precipitation will also be weaker. For December, chances are equally likely for precipitation to be above or below normal statewide. The temperature outlook calls for equal chances of above or below normal temperatures in the eastern third of the state, with greater chances for above normal temperatures in the rest of the state.

November 2012 Kansas Climate Division Summary										
Division	Precipitation (inches)						Temperature (°F)			
	Nov. 2012			Jan. through Nov. 2012			Ave	Dep. 1	Monthly Extremes	
	Total	Dep. ¹	% Normal	Total	Dep. ¹	% Normal			Max	Min
Northwest	0.00	-0.79	0	11.27	-8.54	56	43.1	3.8	80	9
West Central	0.00	-0.82	0	11.34	-7.94	58	45.0	4.9	84	9
Southwest	0.02	-0.79	1	13.58	-5.31	71	47.6	5.1	87	11
North Central	0.26	-0.87	21	17.89	-8.32	67	44.5	3.6	81	9
Central	0.55	-0.84	37	18.77	-9.04	67	46.7	3.8	82	11
South Central	0.81	-0.75	51	20.44	-6.93	74	48.2	4.0	87	15
Northeast	1.19	-0.60	66	22.72	-11.26	67	44.8	2.5	80	9
East Central	1.19	-0.96	55	22.64	-12.77	64	46.4	2.7	80	10
Southeast	1.27	-1.39	48	29.96	-6.92	81	47.8	2.2	87	15
STATE	0.58	-0.88	30	18.84	-8.28	68	46.0	3.6	87	9

1. Departure from 1981-2010 normal value

2. State Highest temperature: 87 degrees F at multiple locations; latest at Ulysses on the 27th.

3. State Lowest temperature: 9 degrees F at multiple locations on the 27th

4. Greatest 24-hour rainfall: 2.56 inches at Hillsdale Lake, Miami County; 2.34 inches at Mayetta 5.5, Jackson County

Source: KSU Weather Data Library

6. Comparative Vegetation Condition Report: November 20 – December 3

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

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

<http://www.youtube.com/watch?v=CRP3Y5NIggw>

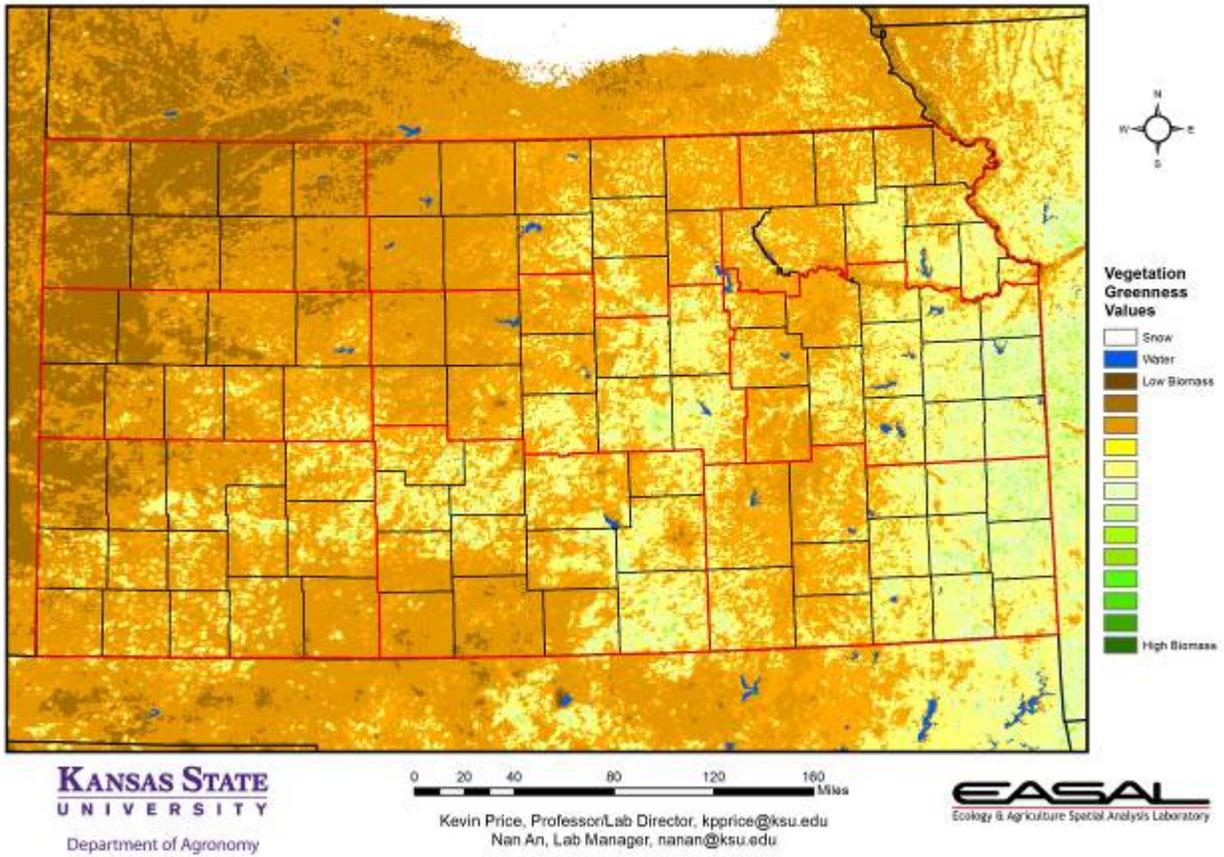
<http://www.youtube.com/watch?v=tUdOK94efxc>

The objective of these reports is to provide users with a means of assessing the relative condition of crops and grassland. The maps can be used to assess current plant growth rates, as well as comparisons to the previous year and relative to the 21-year average. The report is used by individual farmers and ranchers, the commodities market, and political leaders for assessing factors such as production potential and drought impact across their state.

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 Kevin Price at kpprice@ksu.edu and we can place you on our email list to receive the entire dataset each week as they are produced. The maps are normally first available on Wednesday of each week, unless there is a delay in the posting of the data by EROS Data Center where we obtain the raw data used to make the maps. These maps are provided for free as a service of the Department of Agronomy and K-State Research and Extension.

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

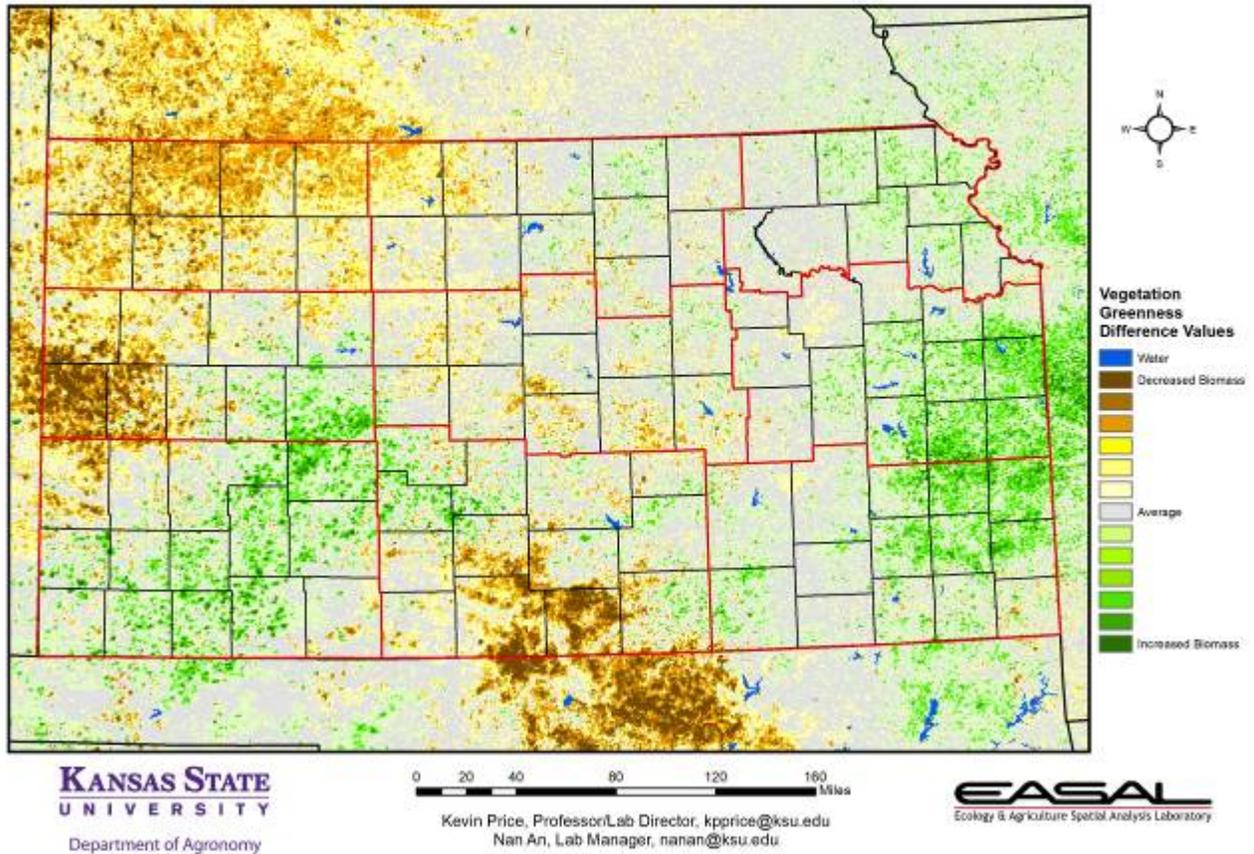
Kansas Vegetation Condition
Period 48: 11/20/2012 - 12/03/2012



Map 1. The Vegetation Condition Report for Kansas for November 20 – December 3 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that current photosynthetic activity is very low, as most vegetation has moved into winter dormancy. NDVI values are slightly higher in eastern Kansas, where temperatures have been milder.

Kansas Vegetation Condition Comparison

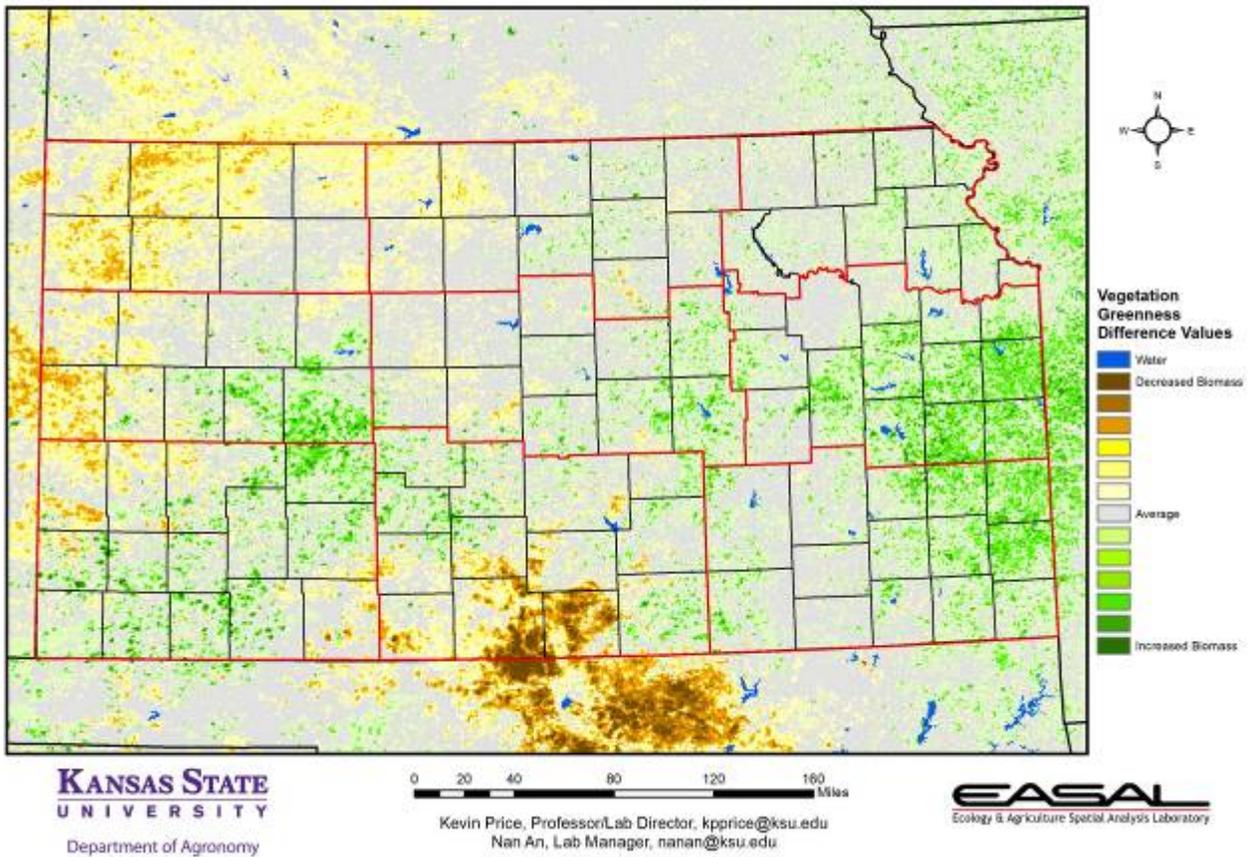
Late-Nov/Early-Dec 2012 compared to the Late-Nov/Early-Dec 2011



Map 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for September November 20 – December 3 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that eastern and parts of southwest Kansas have the biggest increase in photosynthetic activity. West central and south central Kansas have the biggest decrease in photosynthetic activity y from last year. The year-to-date precipitation for Tribune is only 6.95 inches. Last year, Tribune had recorded 21.14 by the end of November.

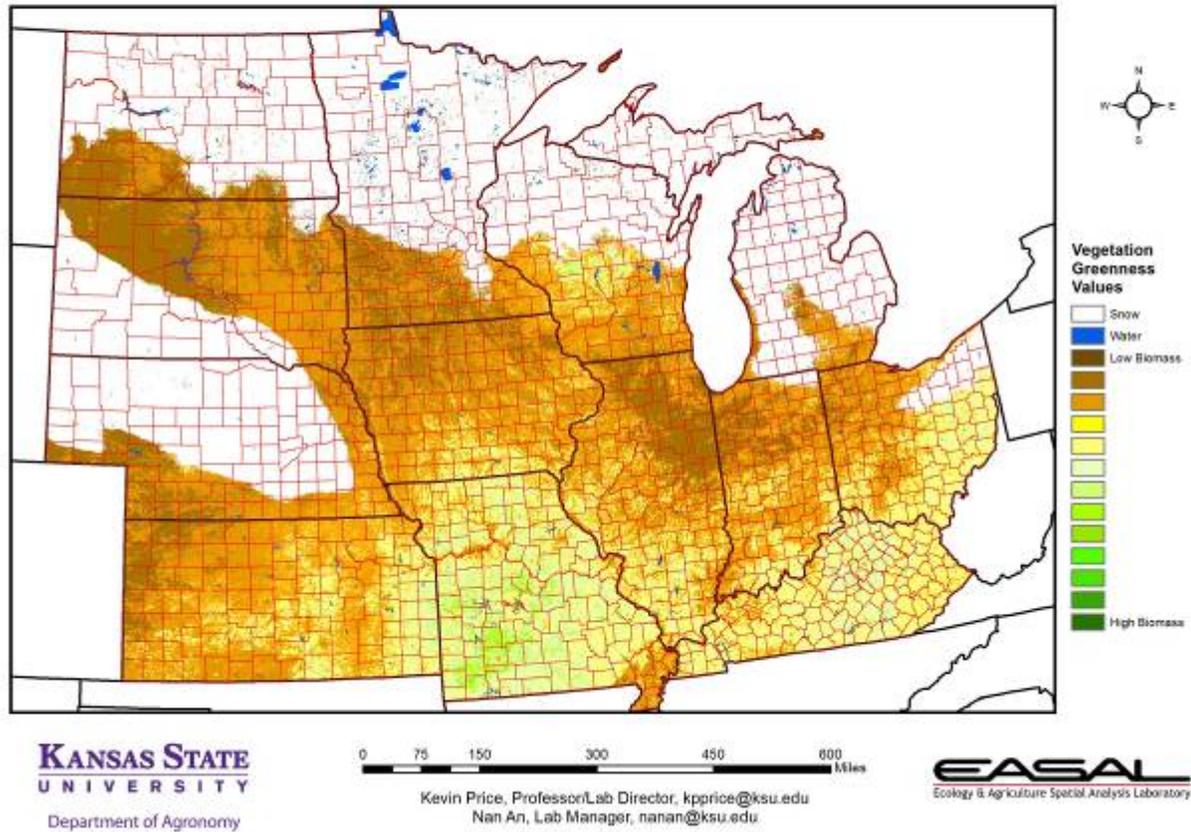
Kansas Vegetation Condition Comparison

Late-Nov/Early-Dec 2012 compared to the 23-Year Average for Late-Nov/Early-Dec



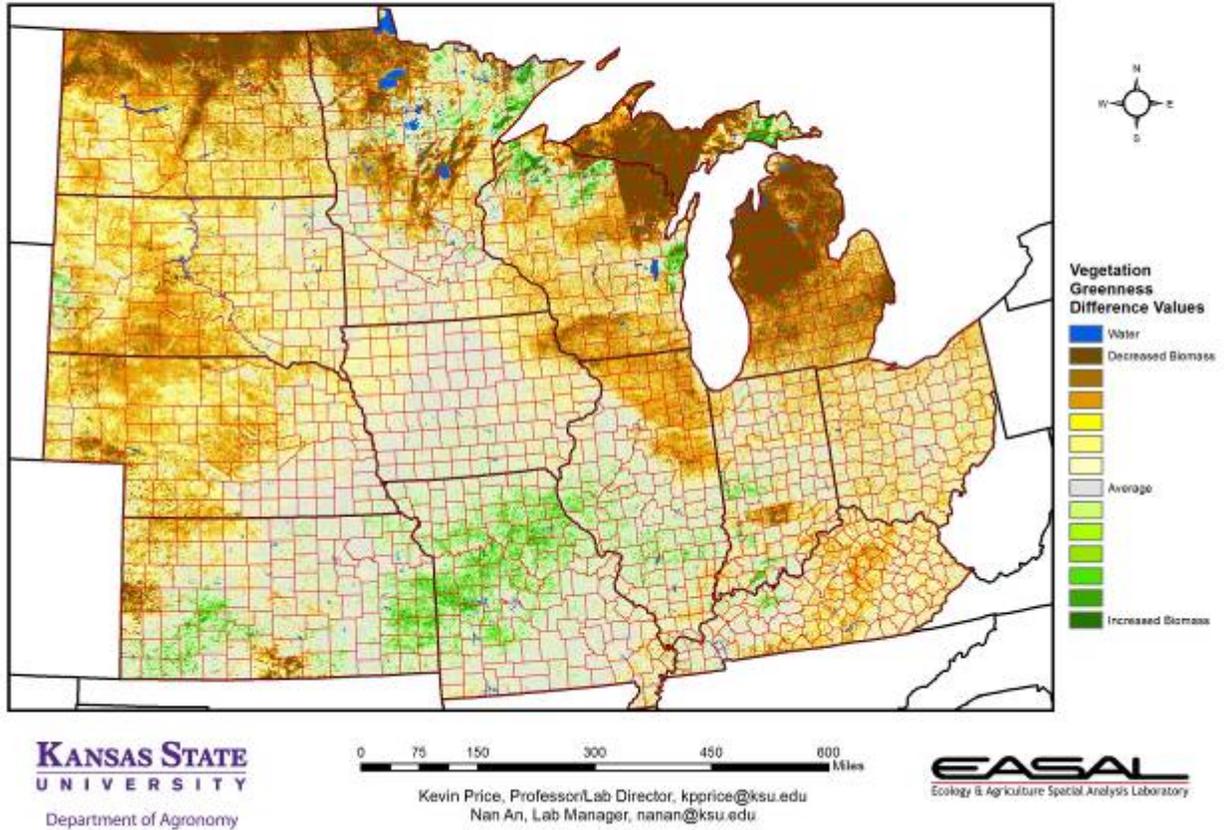
Map 3. Compared to the 23-year average at this time for Kansas, this year's Vegetation Condition Report for November 20 – December 3 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that some parts of the state continue with higher-than-average photosynthetic activity. This is due mainly to delayed dormancy in areas with some residual moisture.

U.S. Corn Belt Vegetation Condition
Period 48: 11/20/2012 - 12/03/2012



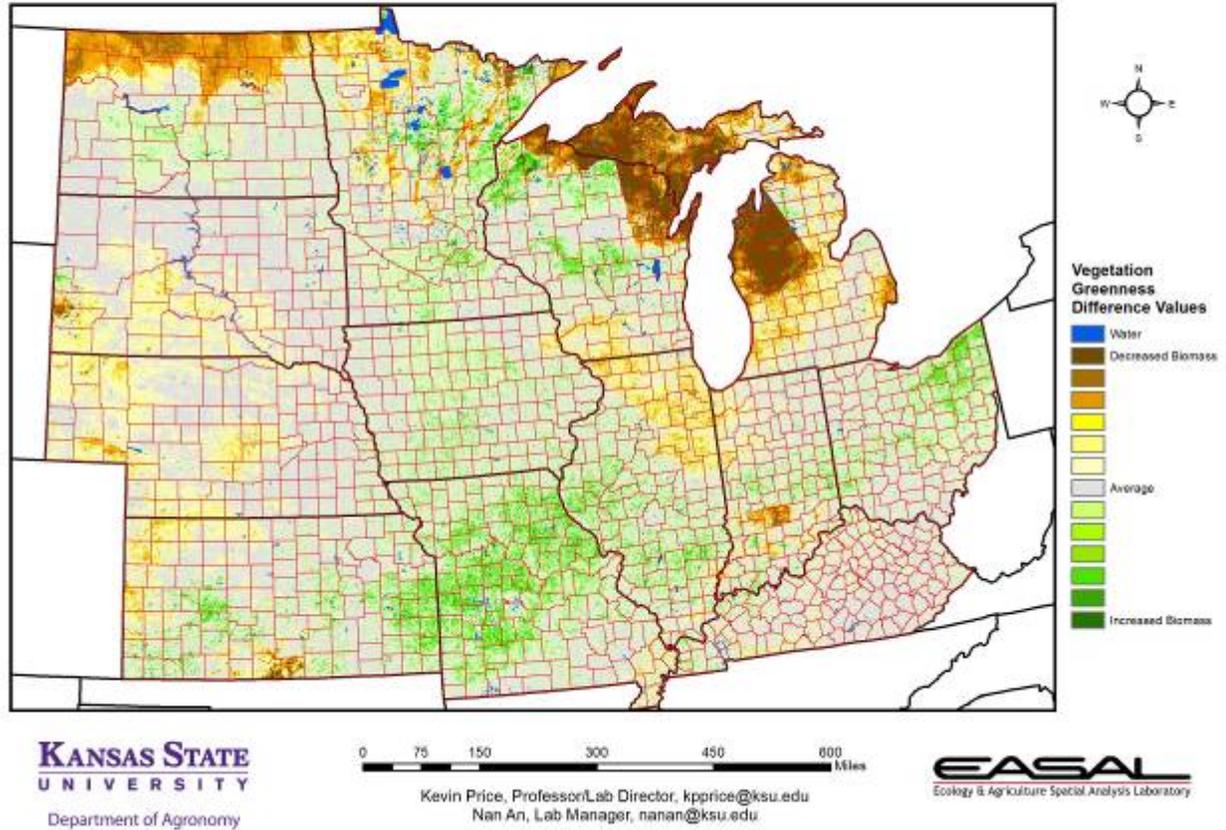
Map 4. The Vegetation Condition Report for the Corn Belt for November 20 – December 3 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that only a small portion of southwestern Missouri has moderate photosynthetic activity. Snow has been confined mostly to the northern portion of the Corn Belt, and most of this occurred at the beginning of this period. Maximum snow depth reported in Valentine, NE was 6 inches.

U.S. Corn Belt Vegetation Condition Comparison
Late-Nov/Early-Dec 2012 Compared to Late-Nov/Early-Dec 2011



Map 5. The comparison to last year in the Corn Belt for the period October 20 – December 3 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows areas of higher biomass production in Missouri, as well as parts of Minnesota and Wisconsin. Mild temperatures and low snow totals have contributed to these differences. In contrast, the areas of North Dakota and the Upper Peninsula of Michigan had snow depths up to 13 inches.

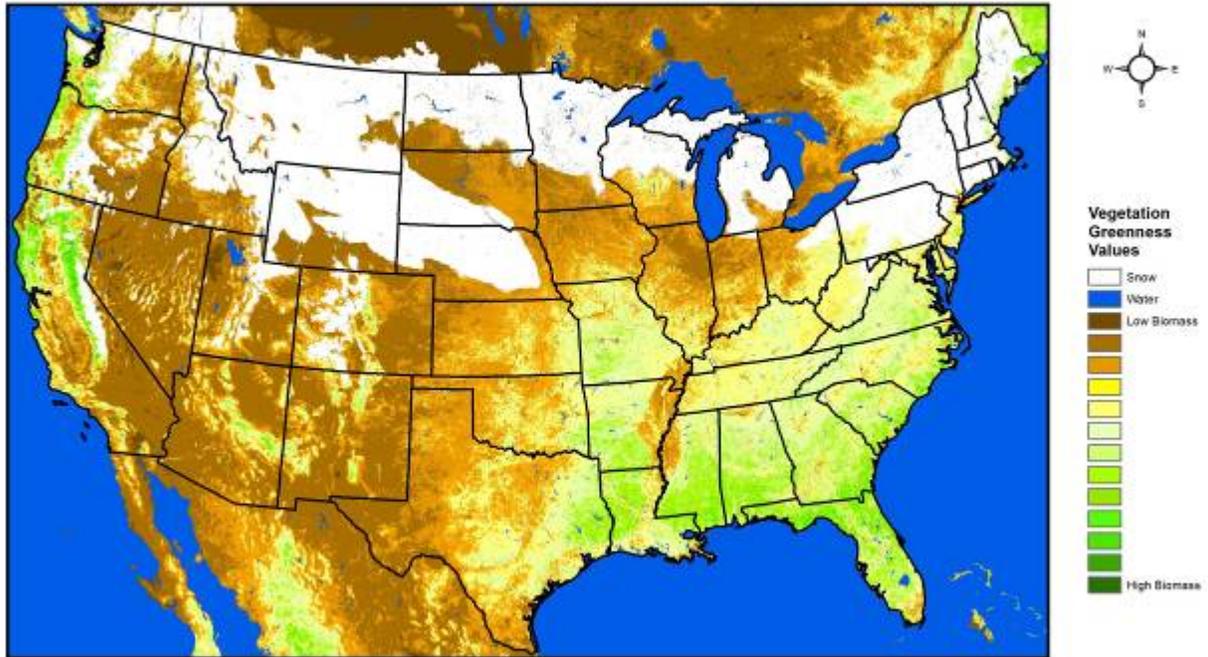
U.S. Corn Belt Vegetation Condition Comparison
Late-Nov/Early-Dec 2012 Compared to the 23-Year Average for Late-Nov/Early-Dec



Map 6. Compared to the 23-year average at this time for the Corn Belt, this year's Vegetation Condition Report for November 20 – December 3 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that areas of greatest decrease in photosynthetic activity along the northern portions correspond to areas of greatest snow cover. Greater-than-average photosynthetic activity across Central Missouri corresponds to areas of milder-than-average temperatures and favorable rainfall.

Continental U.S. Vegetation Condition

Period 48: 11/20/2012 - 12/03/2012



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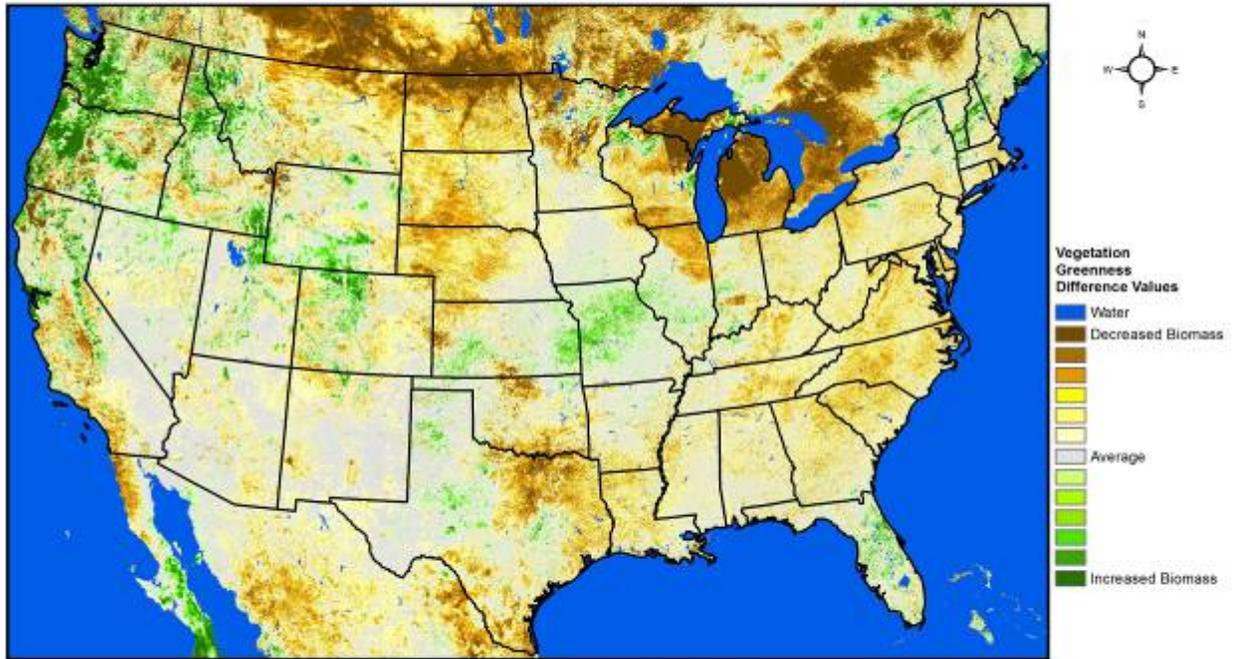
0 180 360 720 1,080 1,440 Miles

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EASAL
Ecology & Agriculture Spatial Analysis Laboratory

Map 7. The Vegetation Condition Report for the U.S. for November 20 – December 3 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that snow cover was, for the most part, confined to the northern parts of the country. Winter dormancy continues to move south. Low biomass production is particularly noticeable in the central Mississippi Valley Region.

Continental U.S. Vegetation Condition Comparison
 Late-Nov/Early-Dec 2012 Compared to Late-Nov/Early-Dec 2011



KANSAS STATE UNIVERSITY
 Department of Agronomy

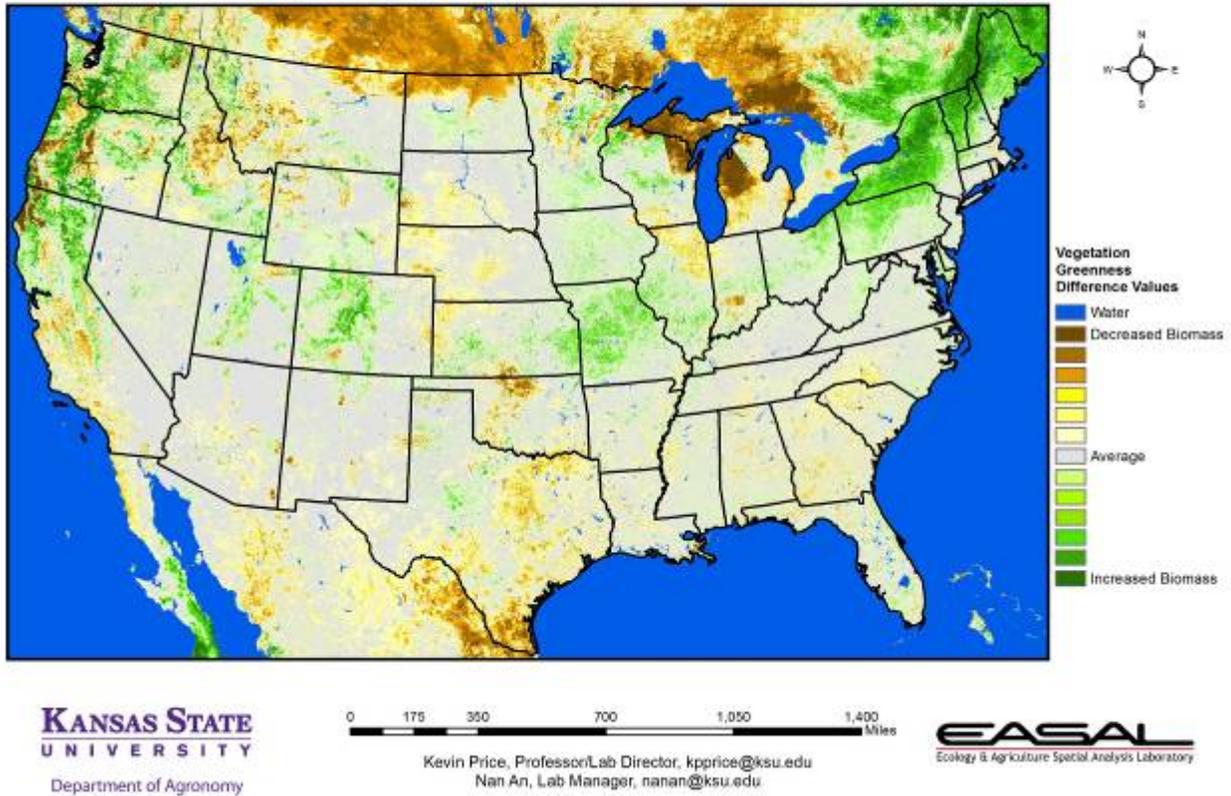
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EASAL
 Ecology & Agriculture Special Analysis Laboratory

Map 8. The U.S. comparison to last year at this time for the period November 20 – December 3 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that biggest increase in NDVI values can be seen in the Pacific Northwest, with the biggest decrease along the Canadian border from North Dakota to Michigan. Both are the result of the persistent moisture across the regions. In Washington and Oregon, that has come mainly in the form of rain, while along the Canadian border more of the moisture has been in the form of snow.

Continental U.S. Vegetation Condition Comparison
Late-Nov/Early-Dec 2012 Compared to 23-year Average for Late-Nov/Early-Dec



Map 9. The U.S. comparison to the 23-year average for the period November 20 – December 3 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the greatest increase in photosynthetic activity has been in New England. Low photosynthetic activity is of particular concern in the southern states where the growing season is longer. Areas from northern Texas into the Brownsville area show lower-than-average biomass productivity. Severe to Exceptional drought is expanding in these regions.

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These e-Updates are a regular weekly item from K-State Extension Agronomy and Steve Watson, Agronomy e-Update Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. 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 cthompson@ksu.edu.