



## Extension Agronomy

# eUpdate

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*03/28/2014*

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).

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## 1. Dry soils, cold temperatures affect wheat

There is a wide range of wheat conditions in central Kansas so far this spring. While that's not unusual, what is notable this year is that in a few cases entire fields of wheat have died. Where wheat has died, the main factors other than temperatures are loose dry soils, seed placement and crown set, planting date, and varietal differences.

The worst-case scenario has been the combination of a variety with poor drought tolerance planted shallow and late into a loose, fluffy soil. If wheat had a very poor root system due to dry soil conditions or late planting, the crown was close to the soil surface or in residue, and soil conditions were dry and loose – allowing cold temperatures to penetrate the soil more easily – the wheat was more likely to have died or suffered severe injury. Varieties with marginal winterhardiness have had problems overall, but the worst problems have been under the conditions described above.



**Dead wheat in McPherson County, March 27, 2014. The soil was dry and loose from too much tillage. Photo by Jim Shroyer, K-State Research and Extension.**



**Close-up of dead wheat. Photo by Jim Shroyer, K-State Research and Extension.**

On the other hand, most wheat in central Kansas planted into firm soil at the proper seeding depth is in relatively good condition now. Growth is generally behind normal for this time of year, but winterkill has not been a widespread problem under these conditions.





**Wheat planted into nice firm soil in McPherson County, March 27, 2014. This wheat is doing fine, although it is a little behind normal in development for this time of year. Photo by Jim Shroyer, K-State Research and Extension.**

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## 2. Drought-tolerant corn hybrids: Yield benefits

In the last few years, drought conditions have raised questions about the utilization of corn as the main crop for maximizing yield production per unit of available water in dryland environments.

Non-transgenic (conventionally bred, Pioneer and Syngenta) corn hybrids, or so-called “drought-tolerant” (DT) hybrids, came to the market with the expectation of increasing corn production in water-limited regions. In the last growing season, Monsanto released its new biotech transgenic-DT hybrid.

Overall, the information from seed companies indicates that DT hybrids could provide from 2 to more than 15 percent yield increase over “competitor hybrids” in non-limiting and water-limiting environments, respectively.

At the present, there is limited “public” information supporting the data presented by the private seed companies; thus the K-State research data summarized in this article provides some guidance on the expected response of the DT corn hybrids when grown in diverse water regimes across the Kansas.

K-State research conducted over the last two growing seasons (2012-2013) in east central, north central, south central, and west central Kansas (six site-years) was recently summarized. The objective is to present an overview of the DT vs. non-DT responses to management practices (i.e. plant population and irrigation).

The information below is intended to provide some guidance to farmers, consultants, and agronomists in making the right decision for selecting corn hybrids. In addition, we hope to develop a better understanding of the kinds of environments in which DT hybrids could be most likely to result in a yield benefit. These hybrids are generally targeted for water-limited environments in the Western Great Plains.

### Results

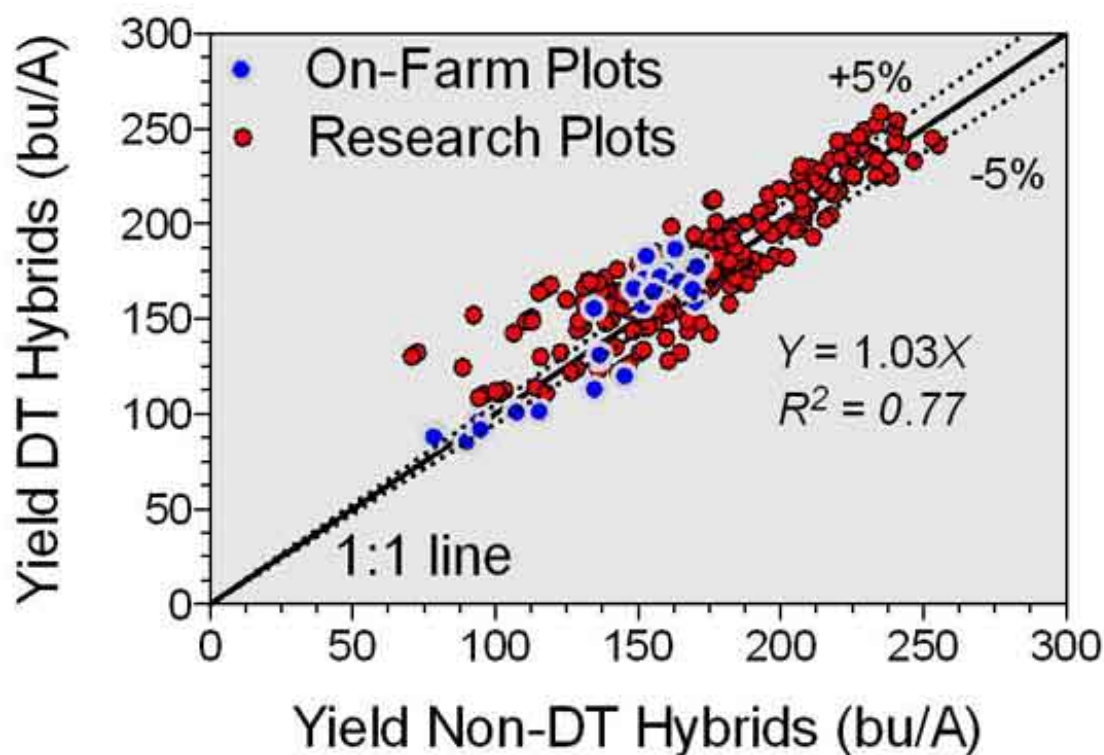
Our research compared DT hybrids from diverse companies with a standard non-DT counterpart of similar maturity. The tests also evaluated of the yield response to varying plant population and irrigation levels.

At the plant scale, our analysis did not reveal any change in the plant response to plant population between DT and non-DT hybrids. This indicates no need to change plant population when using DT hybrids. This conclusion was briefly introduced in a previous eUpdate article on corn seeding rates (eUpdate 445, March 14, 2014).

We also analyzed yields obtained at the plot level for DT vs. comparable DT hybrids with similar maturity. The information presented in the figure below (Fig. 1) depicts the association of the yields for the DT vs. non-DT corn hybrids (red points = research plots; and blue points = on-farm plots).

Overall, the analysis found a yield benefit of 3 percent for DT vs. non-DT hybrids under diverse environments and stress conditions across Kansas during the 2012-2013 seasons. In absolute terms, the yield advantage of using DT hybrids was around 7 bushels per acre compared to the non-DT material. Similar yield trends were observed in research plots and on-farm demonstration plots. A

great proportion of the yield response, positive or negative for DT vs. non-DT, was comprised between the 5% confidence interval highlighted in the below figure (Fig. 1), except at low-yielding environments (<150 bushels per acre). In low yielding-environments, there was a greater proportion of observations in which DT out-yielded non-DT corn hybrids compared to the situation in higher-yield environments (>150 bushels per acre).



**Figure 1. Yield for the DT versus non-DT corn hybrids across 6 site-years for the 2012-2013 growing seasons.**

#### *DT vs. non-DT corn hybrids: Yield Environment Analysis*

The analysis of information across diverse yielding environments allows us to more clearly visualize where there would be a yield advantage from planting DT hybrids. It is clear from Figure 2 that the yield advantage of the DT corn hybrids increases as the yield potential of the crop decreases. This graph shows that there is basically no yield difference when yields are around 170 bushels per acre or greater. The yield advantage for DT hybrids gradually increases as the yield of the regular hybrids decreases from 170 bushels per acre.

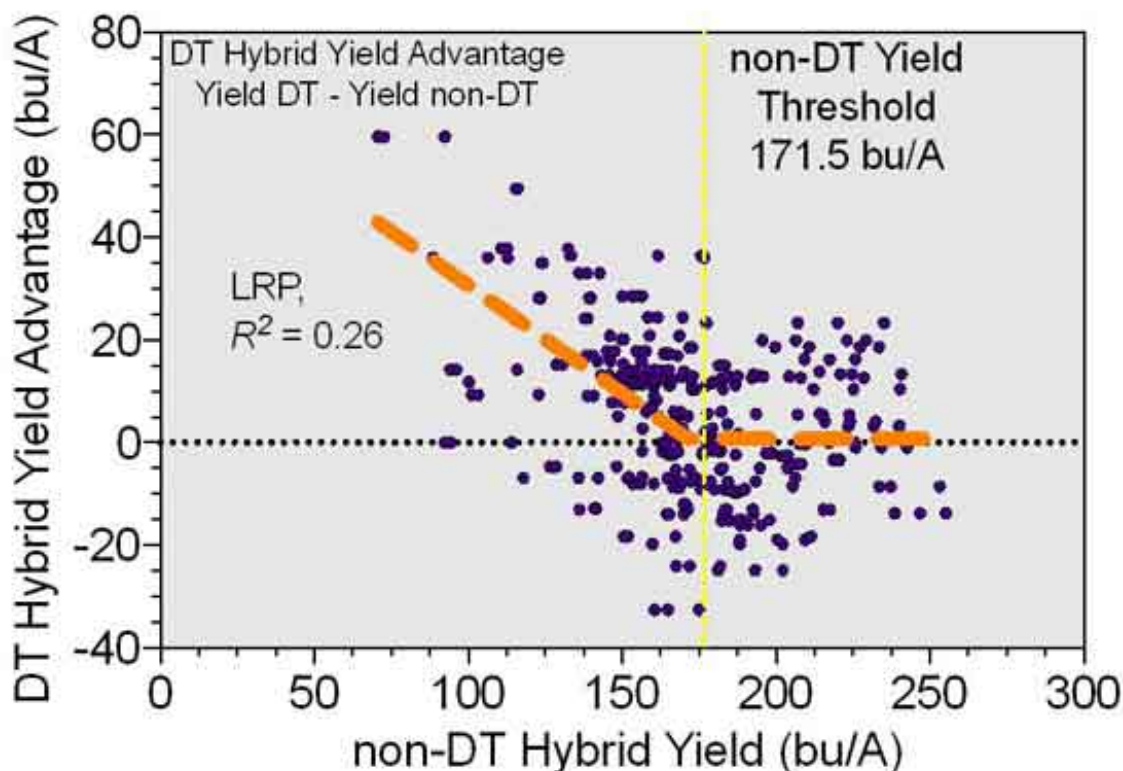
It is important to note however, that these are generalized relationships, and that there are varied responses at each yield level. Some individual points show no difference between DT vs. non-DT hybrids at yields of 100 bushels per acre. Other points show a 30-bushel-per-acre yield advantage for non-DT hybrids at 160 to 170 bushels per acre, and still other show a 60-bushel-per-acre yield advantage for DT hybrids when non-DT hybrid yields were near 70 bushels per acre. How individual hybrids respond to a specific environment is influenced by a number of factors, including the timing and duration of the stress.

One more technical clarification is important to note. The linear response and plateau (LRP model) function model fitted in the Figure 2, presented an  $R^2$  of 0.26 units, which can be interpreted to indicate that this model is accounting for slightly more than one-fourth of the total variation presented in the data. In other words, there are many management factors involved in the yield results, which makes it difficult to separate out the effect of hybrid alone.

#### *DT vs. non-DT corn hybrids: Yield Winners Analysis*

An extra step in our analysis can be taken by identifying the individual data points where the DT hybrids out yielded non-DT hybrids of similar maturity (DT Winners observations) and the opposite situation, in which non-DT hybrids had greater yield than the DT hybrids (non-DT Winners observations). The analysis of the data set using this approach shows a similar and consistent difference: DT hybrids out yielded non-DT hybrids when the yield for the non-DT corn material was below 171 bushels per acre (Fig. 2).

When the yield environment was higher -- above the 50<sup>th</sup> percentile for both DT and non-DT Winners -- yields of the two types of hybrids were comparable. But the DT hybrids had higher yields more often than the non-DT hybrids (n=106 for DT Winners and n= 68 non-DT Winners) (Table 1).



**Figure2. Yield advantage for DT compared to non-DT corn hybrids at the same environment and population, ranging from low-yielding environments to high-yielding environments**



**across 6 site-years for the 2012-2013 growing seasons.**

**Table 1. Yield Winners for DT and non-DT corn hybrids under diverse yield environments across 6 site-years for the 2012-2013 growing seasons.**

Yield Winners	Yield environment for non-DT	Data Points (Percentile)	Mean DT Yield (bu/acre)	Mean non-DT Yield (bu/acre)
DT > non-Dt	(bu./acre)			
	<146	54 (25 <sup>th</sup> )	149	124
	146-161	54 (50 <sup>th</sup> )	169	155
	161-182	52 (75 <sup>th</sup> )	183	171
	182-241	54 (100 <sup>th</sup> )	221	210
Non-DT > DT	<165	33 (25 <sup>th</sup> )	143	152
	165-181	34 (50 <sup>th</sup> )	162	171
	181-197	34 (75 <sup>th</sup> )	175	187
	187-255	34 (100 <sup>th</sup> )	208	216

Still, we need to be cautious using and interpreting this information. More experiments and research data need to be collected, and a deeper understanding is needed to more properly comprehend the main causes of the yield benefits for the DT vs. the non-DT corn genotypes. Potential interpretations offered for the yield advantage for the DT corn hybrids are related to:

- Slower vegetative growth, saving water for reproductive stages (stress avoidance)
- Greater root biomass with superior water uptake
- Differential regulation in the stomata opening, controlling water and CO<sub>2</sub> exchange processes
- Other potential physiological modifications

## Summary

General observations from this analysis employing six site-years across the state of Kansas and two growing seasons (2012-2013) are:

1) Performance of individual hybrids within the drought-tolerant and regular categories may vary. Some regular hybrids can perform nearly as well as the drought-tolerant hybrids even in stressful conditions, and drought-tolerant hybrids have the potential to yield with regular hybrids when water isn't limiting.

2) The advantage of the drought-tolerant hybrids became more evident when the water stress increased to the point of leaves rolling most days.

3) From the information at hand, it is reasonable to expect a drought-tolerant hybrid to serve as a type of insurance policy to sustain yield potential under water-limited environments. It also appears that there is no yield penalty associated with drought-tolerant hybrids if water-limiting conditions do not occur.

Lastly, it is critical to understand that these corn genetic materials will not produce yield if the environment is subjected to terminal drought; thus, we cannot expect them to thrive when moisture is severely limited, especially in dryland systems. As properly and explicitly stated by all seed companies, these DT materials have demonstrated the ability maintain yields to a certain degree in water-limited situations, and those differences will likely be in the order of 5 to 15 bushels per acre (depending on the environments and crop practices), when compared with a similar maturity non-DT corn hybrid.

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### 3. Maintaining grassed waterways

Grassed waterways play an important role in improving water quality. Prevention of gully erosion is the primary contribution, but grassed waterways also intercept pollutants leaving the field. Grassed waterways are designed, however, for the safe and rapid transport of water, not for the shallow sheet flow necessary to effectively intercept pollutants. Because waterways are a flow-way for excess runoff, nutrient and pesticide applications within the boundaries of grassed waterways must be carefully managed to avoid movement of pollutants directly to surface water.

Waterways are only one component of a conservation system that includes terraces, conservation tillage, and nutrient and pest management. A well-designed and maintained soil conservation system helps sustain productivity while providing clean water to the watershed.

#### **Fertilization and liming of waterways**

The primary purpose of a good fertilization program is to ensure that waterway grasses grow vigorously and maintain a dense, tough, non-erodible sod. Soil testing is an integral part of establishing waterways. Soils should be limed and fertilized according to soil test recommendations. In areas where the subsoil is exposed during construction, a onetime application of manure is a good way to build organic matter and provide nutrients. Any amendments should be well incorporated before seeding. Once established, waterways require annual maintenance. For stand maintenance of cool season grasses, an annual application of 30 to 40 pounds of nitrogen per acre is recommended. Nitrogen should be applied between late November and mid-March. Higher nitrogen rates will be necessary when managed for hay or seed production.

If seed production is desired, nitrogen fertilizer should be applied before soil freezing in November or December. On soils low in phosphorus (P) or potassium (K), an application of these nutrients, according to soil test recommendations, should be included. Soil tests should be conducted every 3 to 4 years on established waterways to monitor soil pH, P, and K levels. Needed phosphorus and potassium can be applied at the same time as nitrogen fertilization. If lime is needed on established waterways, apply no more than 2,000 pounds ECC/a (effective calcium carbonate per acre).

#### **Routine inspections and maintenance**

Waterways should be inspected at least annually and, if possible, after each heavy rain. When problems develop, perform needed maintenance promptly to prevent additional, costly damage to the waterway. Abuse and neglect are the most common causes of waterway failure. Common maintenance problems include weeds and brush, eroded spots, sediment deposits, bare spots, and insufficient grass stands. Maintenance activities may be needed more frequently when the waterway handles a large volume of water or is on a steep slope.

A vigorous grass stand, maintained with routine mowing and a well-balanced fertilization program, will help control with weeds and brush. Weeds and brush also can be controlled by cutting, grazing, or herbicide use. The current issue of the K-State Research and Extension publication *Chemical Weed Control for Field Crops, Pastures, Rangeland, and Non-cropland* has recommendations on herbicide use. See: <http://www.ksre.ksu.edu/bookstore/pubs/SRP1099.pdf>

Avoid herbicides with a high potential for runoff. Herbicides used on adjacent cropland may harm grass stands when transported in runoff water or attached to sediment. Damage also can occur when the sprayer is not turned off while crossing waterways.

Waterway maintenance includes mowing. Timely mowing provides an even growth of grass in the spring and minimizes sediment buildup where terraces connect to the waterway. Frequent mowing or shredding can prevent smothering without removing the clippings. Some grasses, such as fescue, tend to become clumpy when mowed infrequently. Grass clumps can concentrate water flow, causing erosion and creating channels.

Gully formation is the most serious problem in a waterway. It is usually caused by poor management, sediment deposits, using the waterway as a roadway or livestock trail, or by an unstable outlet. Eroded spots should be filled promptly, compacted, and reseeded or sodded. Slight overfilling allows settling. Reseeding perennial grasses with annuals such as wheat, oats, rye, or annual ryegrass will help ensure that good cover is quickly re-established. During grass establishment, divert runoff by use of silt fences or by low elevation earth berms. For unstable outlets, grade stabilization structures may be necessary. Minimize machine travel within waterways, especially when the soil is wet or soft. Try to limit traffic within the waterway, using the sides, or berms to drive.

Sediment accumulation results from insufficient water velocity and is most common where water from terraces discharges into the waterway. Sediment deposits should be removed promptly, because they tend to increase with subsequent runoff events, eventually blocking the waterway. In severe cases, reshaping and reseeded the waterway may be the best option for restoring waterway capacity. Reseeding grass in a waterway may be necessary in cases of initial establishment problems, smothering from lodged growth or improper mowing, sedimentation, weed and brush competition or herbicide damage. For limited sized areas, reseeded can be enhanced by mulching and slight overfilling of reseeded areas. Before reseeded, correct nutrient or soil pH deficiencies and perform any other maintenance. Sometimes temporary dikes constructed at terrace outlets are necessary to protect reseeded areas from runoff.

### **Managing for production**

Waterways not only serve to route excess runoff safely to streams, but they also can be a source of income. Grassed waterways frequently lie within productive soils and by design receive a greater proportion of precipitation than the fields they drain. Waterways can provide protein-rich forage for grazing or haying, or they can be managed for seed production. A good fertility program can increase production of forage and/or seed. Well-fertilized waterways can provide high protein forage that helps balance the ration when crop residue is grazed in the fall.

Annual haying is an excellent management practice. With adequate fertility and timely cutting, waterways can provide high-quality forage. Cutting height should not be less than 3 to 4 inches. To maximize quality and quantity, fescue hay should be made in the early boot stage, and brome should be hayed in full bloom.

For specific management recommendations, consult K-State Research and Extension publications:

*Smooth Brome Production and Utilization, C-402*

<http://www.ksre.ksu.edu/bookstore/pubs/C402.pdf>

or

*Soil Test Interpretations and Fertilizer Recommendations*, MF-2586

<http://www.ksre.ksu.edu/bookstore/pubs/MF2586.pdf>

Keeping the waterway clear prevents the slowing of water and reduces the sediment accumulation. Any harvested hay should be quickly removed to prevent smothering of vegetation. However, harvest only when the waterway is firm enough to prevent wheel ruts. If the soil is too wet for traffic, postpone harvest to prevent damage to the waterway. This may reduce hay quality, but protecting the waterway structure is more important.

Waterways also can provide excellent seed production. After the seed is harvested, the remaining grasses should be hayed or mowed and clippings removed.

Grazing of waterways may be possible, but grazing should be strictly controlled. Enough plant growth must be left to maintain a healthy, vigorous sod. Never permit overgrazing, and do not graze when the soil is too wet, during initial establishment, or during reseeding of problem areas.

A waterway also can be managed for optimum wildlife habitat by selecting specific grass species and mowing practices. Mowing should be done at a time that does not interfere with the nesting, hatching, or rearing of wildlife. Contact your local Natural Resources Conservation Service or Kansas Wildlife and Parks Department office for additional information.

## **Summary**

### **Do:**

- Inspect waterways once a year and after every heavy rainstorm.
- Remove grass by mowing, haying, or grazing. If mowing with a sickle mower, remove clippings; if mowing frequently or if using a rotary mower, the clippings are chopped up and need not be removed.
- Fertilize according to soil test recommendations and forage or seed needs.
- Lift tillage equipment and shut off sprayers when crossing waterways.
- Remove sediment and fill eroded spots and wheel ruts quickly.
- Control erosion and runoff in fields draining into the waterway to reduce sedimentation and possible herbicide damage.

### **Do not:**

- Mow shorter than 3 to 4 inches
- Use the waterway as a road or cattle path. Tire tracks or cattle trails are often the beginning of gully erosion.
- Let the grass get clumpy. Water will cut channels between clumps rather than flow through the grass. This will cause erosion.
- Overgraze the waterway. Bare spots are subject to wash-out, and grass that is too short does not provide adequate erosion protection.

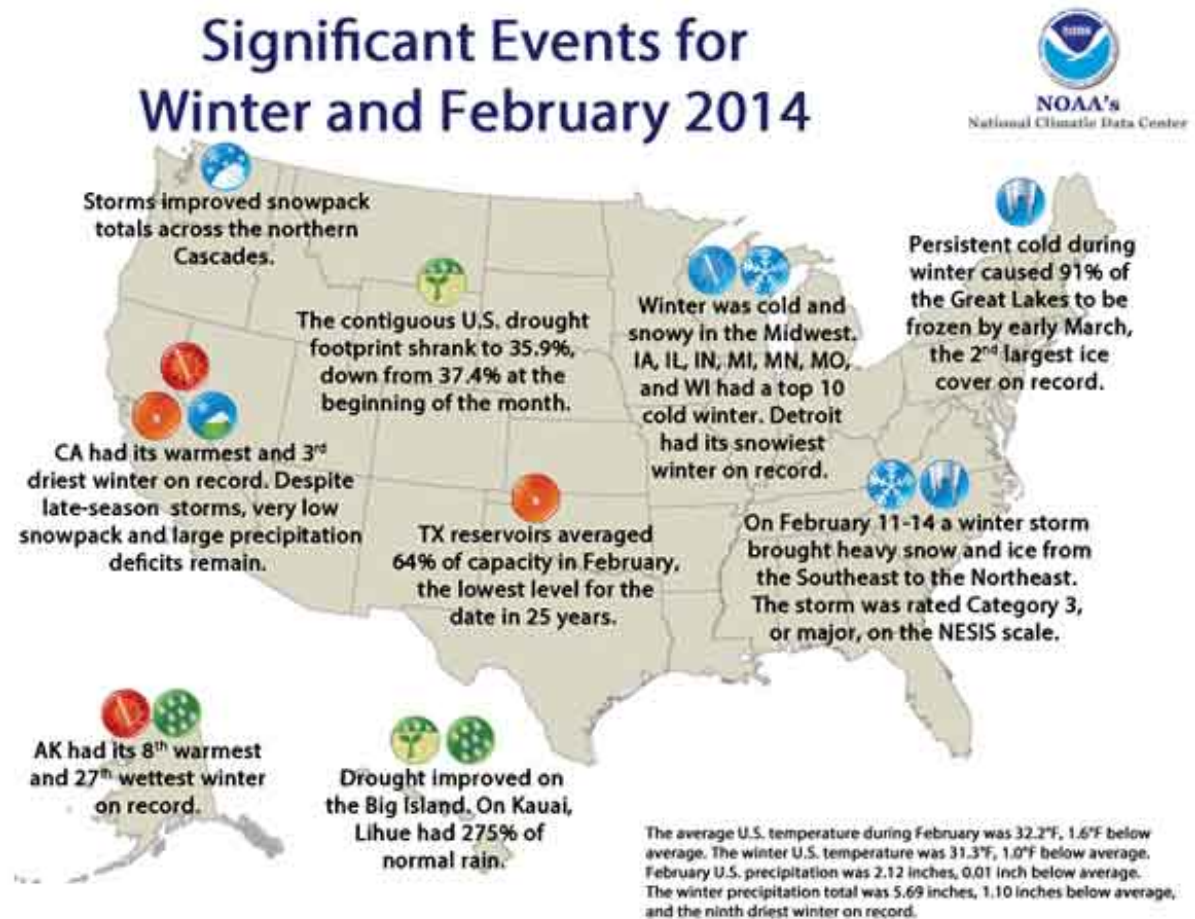


Note: This article is adapted from Maintaining Grass Waterways, K-State publication MF-1064 at:  
<http://www.ksre.ksu.edu/bookstore/pubs/MF1064.pdf>

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## 4. Missouri River Basin: Quarterly Climate Impacts and Outlook

National significant events for December 2013 – February 2014



### Highlights for the Missouri River Basin

Although one of the coldest winters in recent memory, only a few states in this region broke into the top 10 rankings. North Dakota had its 8<sup>th</sup> wettest and 9<sup>th</sup> coldest December on record. Meanwhile, Montana and Wyoming had their 7<sup>th</sup> and 9<sup>th</sup> wettest February on record, respectively.

The largest temperature departures in the region were confined to eastern North Dakota and northeastern South Dakota where temperatures were up to 10°F below normal. Grand Forks, ND had its 3<sup>rd</sup> coldest winter on record with an average temperature of 0.4°F. Aberdeen, SD had its 5<sup>th</sup> coldest winter with an average temperature of 7.3°F.

This winter was particularly windy across the region. In January, Rapid City, SD had an average wind speed of 13.6 mph which was the windiest January since records began in 1970.

Although the mountain snow season extends well beyond the winter months, many locations fared

Kansas State University Department of Agronomy

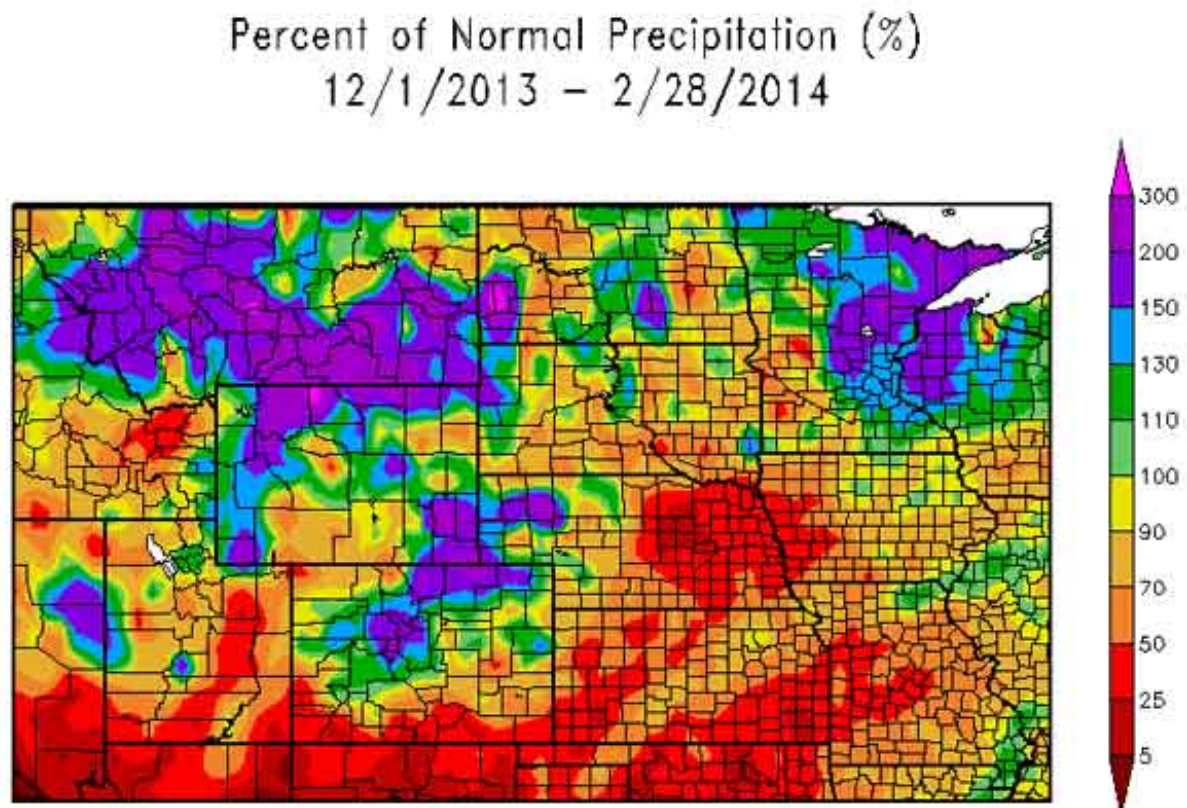
2004 Throckmorton Plant Sciences Center | Manhattan, KS 66506

[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)

well over the winter. One example is from the popular ski destination of Breckenridge, CO which had its 3<sup>rd</sup> snowiest winter on record with 131.6 inches.

### **Precipitation and temperature summaries**

Precipitation varied across the region this winter. Generally, the eastern half of the region had below normal precipitation and the western half had above normal precipitation. Montana had the highest departures in the region with much of the state receiving at least 200 percent of normal precipitation. However, lower portions of the basin, including Nebraska, Kansas, and Missouri were well below normal. Significant portions of these states received 50 percent of normal precipitation at best.

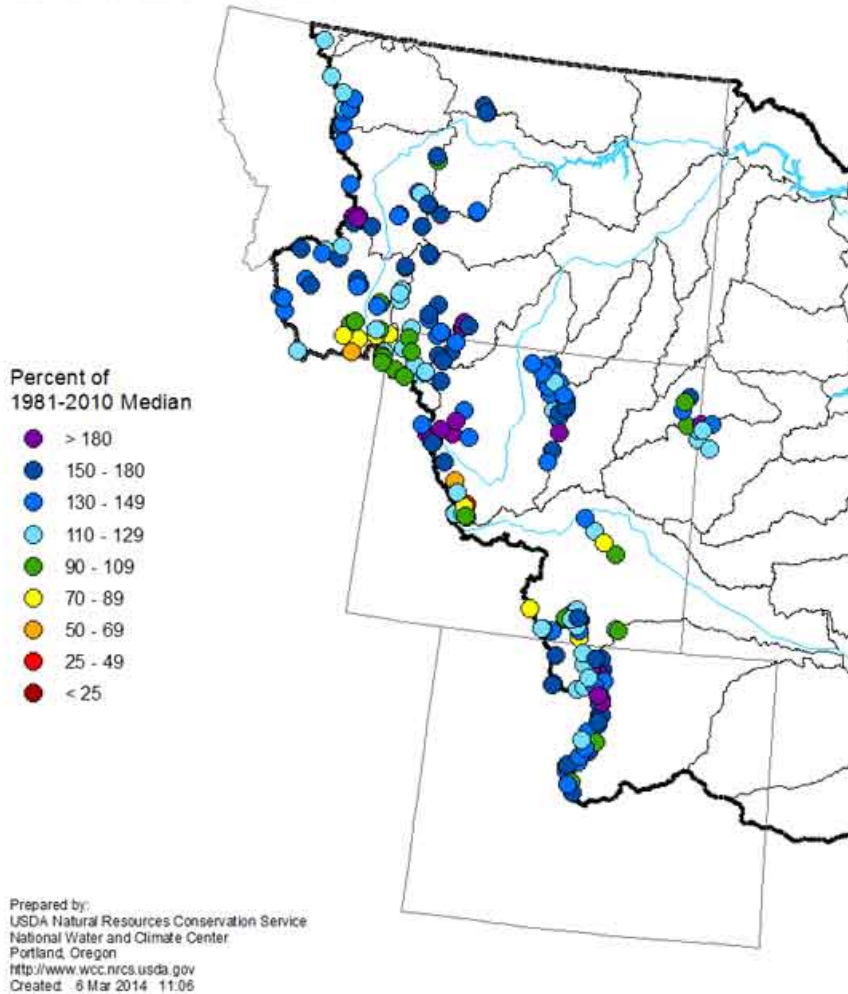


Generated 3/11/2014 at HPRCC using provisional data.

Regional Climate Centers

Although there is limited snowpack across the Plains portion of the Missouri Basin states, above-average mountain snowpack is present in the headwaters. This is in stark contrast to the past two years when the snowpack was well below normal. This snowpack may draw concern of a repeat of the 2011 flooding, however that is rather unlikely at this time. Keep in mind that record May precipitation in Montana greatly contributed to the flooding in 2011. Also, there is additional flood storage as a result of the 2012 drought.

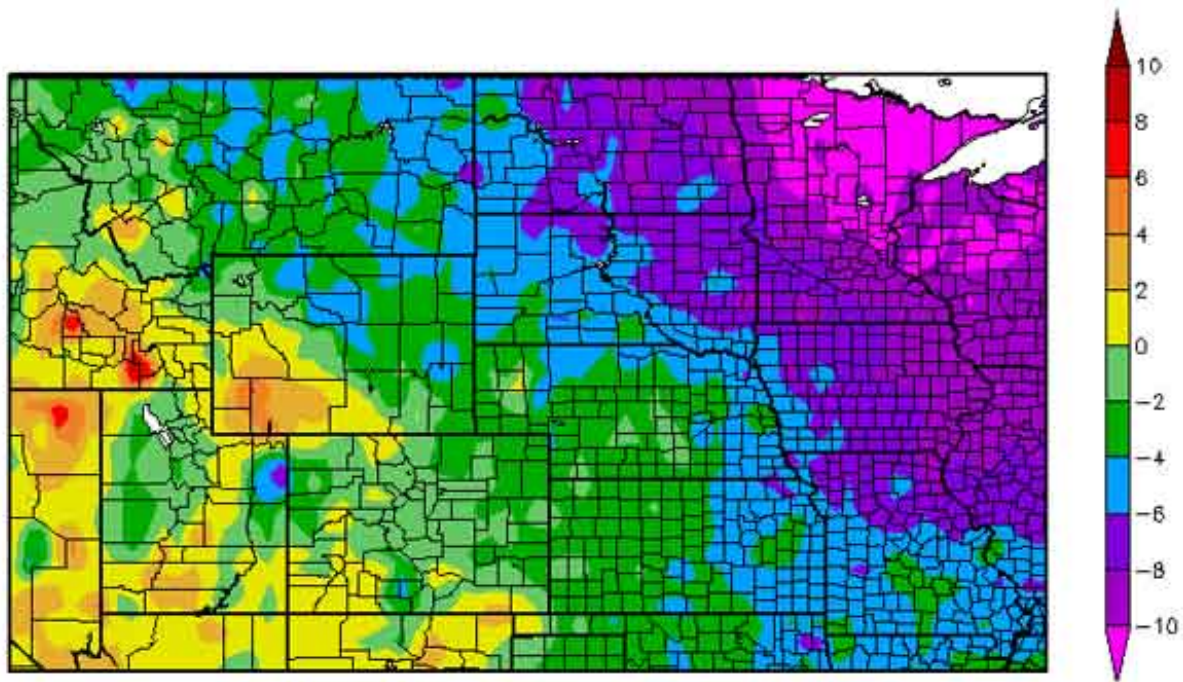
## Missouri River Basin Mountain Snowpack as of March 1, 2014



A strong ridge/trough pattern was present over the United States this winter, which resulted in cold, stormy weather in the east and dry, warm conditions in the west. Situated in the middle, the Missouri Basin states had both above- and below-normal temperatures. The northern and eastern sides averaged 4.0°F-10.0°F below normal while portions of Wyoming and Colorado were near normal and up to 6.0°F above normal. For some parts of the region, this was the coldest winter in 25-30 years.



## Departure from Normal Temperature (F) 12/1/2013 – 2/28/2014



Generated 3/11/2014 at HPRCC using provisional data.

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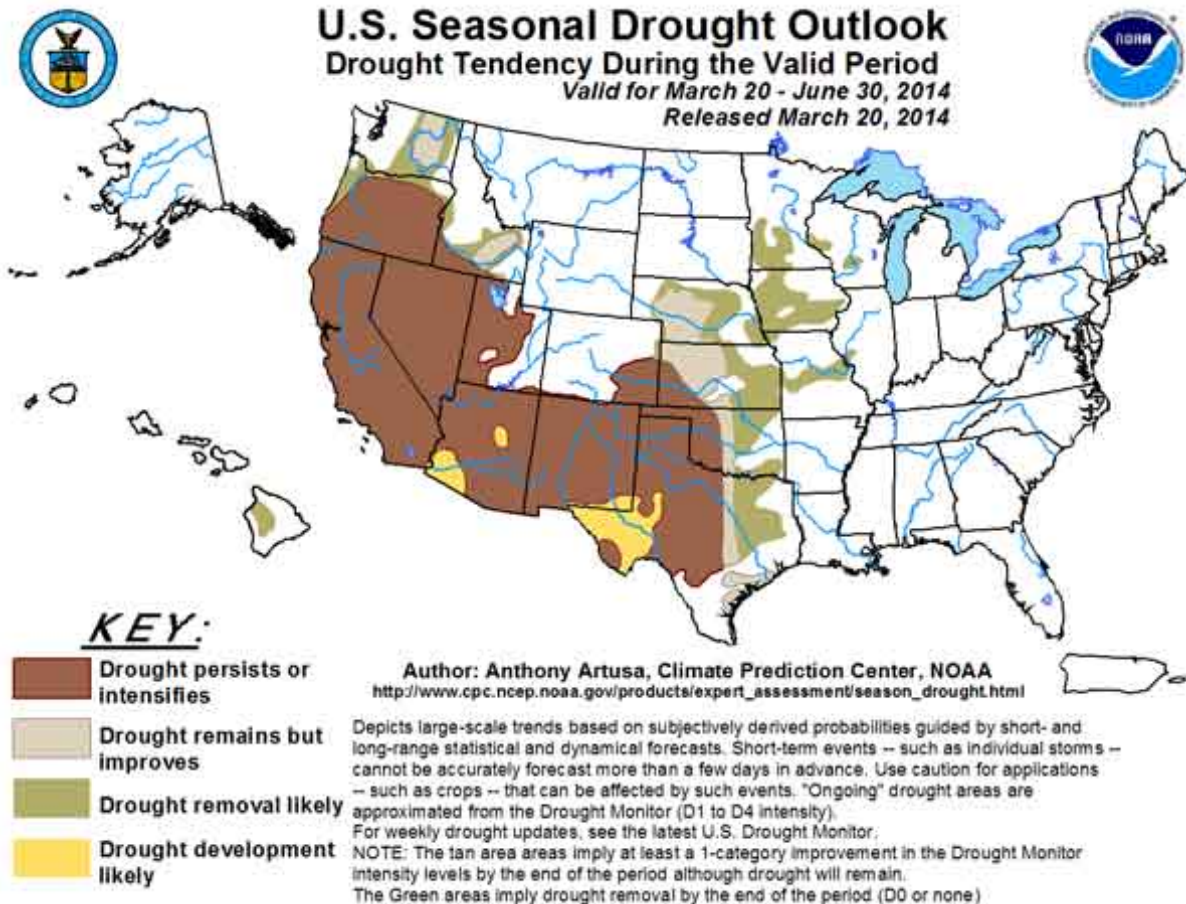
### Impacts on agriculture

Extended cold this winter had impacts on many aspects of agriculture. Propane shortages were a challenge for corn producers who still had corn in their fields waiting to be dried. Some livestock stress due to the cold was reported. Additionally, there are concerns over the winter wheat crop. After a cold and windy winter, producers will have to wait until the crop breaks dormancy to find out the extent of the damage.

### U.S. seasonal drought outlook

Drought conditions have only changed slightly over the winter months. For the areas in this region dealing with drought, the winter is typically the driest part of the year. This means that significant changes in drought conditions (either improvements or degradations) would not be expected. The seasonal outlook indicates that much of the drought conditions in the region will either be erased or be improved. The area of drought encompassing the southeast corner of Colorado and the southwest corner of Kansas is expected to persist through June.





### Missouri Basin flood outlook

ENSO (El Niño/Southern Oscillation) neutral conditions were still present and are forecast to continue through spring, with a 50% chance of El Niño developing this summer or fall. There are no indications of either a wetter or drier than normal spring at this time, however northern areas of the basin should expect below normal temperatures.

Ice jam flooding has occurred on many rivers and is expected to continue into the spring. Minor to moderate flooding is projected for the northern plains based on the potential for snowmelt and rain-on-snow events. Minor to moderate flooding is also expected in Kansas and Missouri due to convective rainfall. This projected flooding is not atypical.



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*Missouri River Basin Quarterly Climate Impacts and Outlook* | March 2014

[www.drought.gov/drought/content/resources/reports](http://www.drought.gov/drought/content/resources/reports)

## 5. Comparative Vegetation Condition Report: March 11 - 24

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>

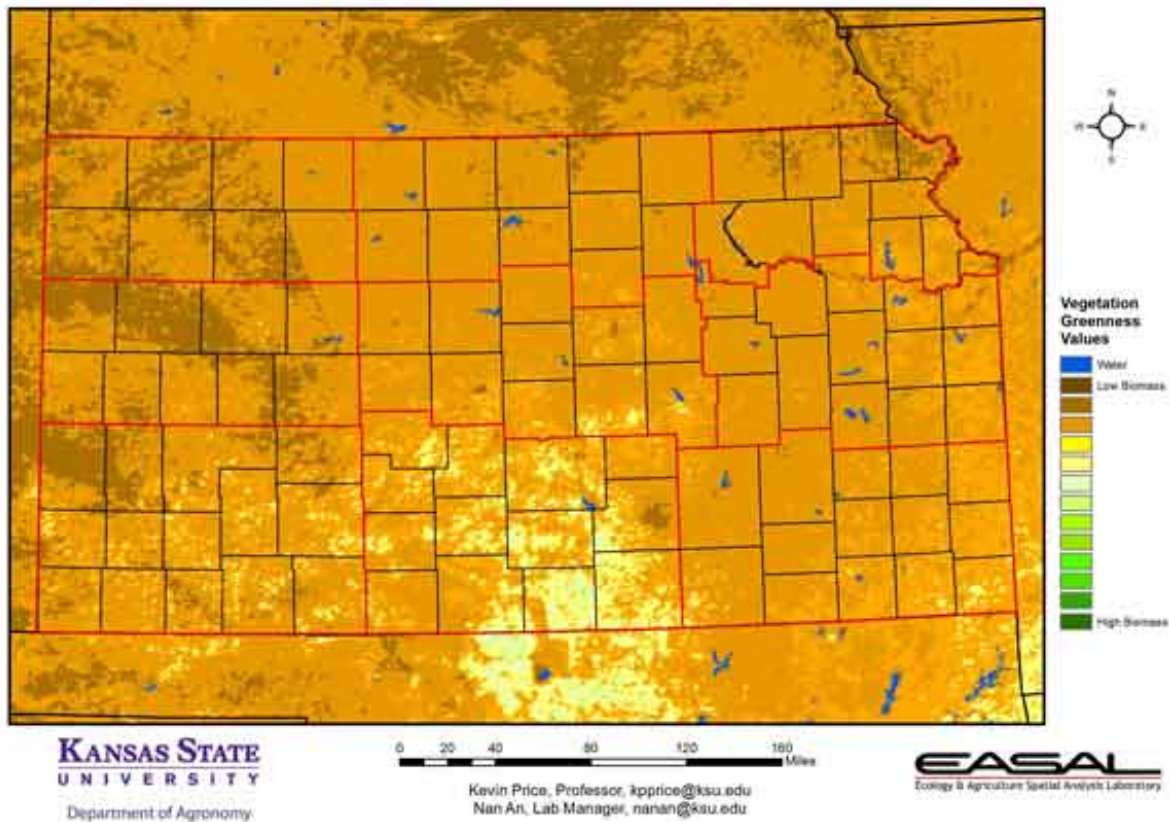
The objective of these reports is to provide users with a means of assessing the relative condition of crops and grassland. The maps can be used to assess current plant growth rates, as well as comparisons to the previous year and relative to the 25-year average. The report is used by individual farmers 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 12: 03/11/2014 - 03/24/2014

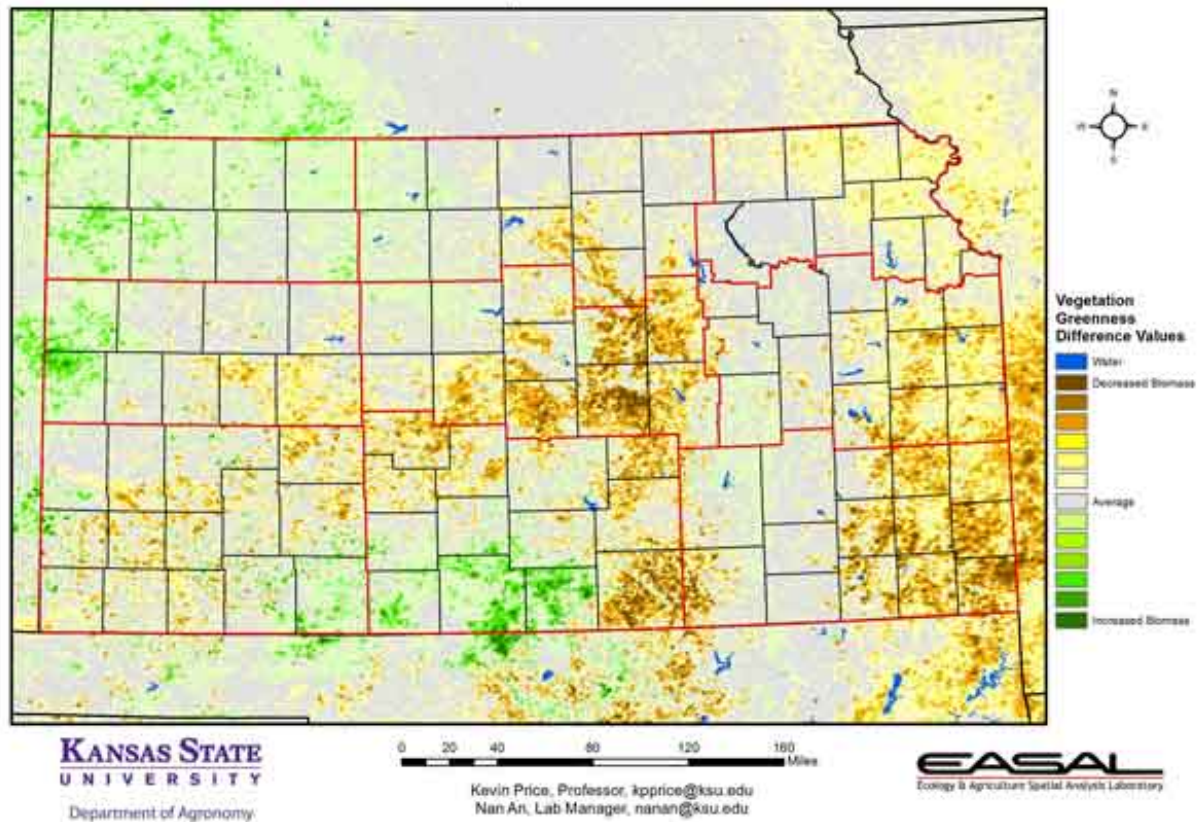


**Figure 1. The Vegetation Condition Report for Kansas for March 11 – 24 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that vegetative activity is very low. The greatest activity is seen in in Harper and Sumner counties, where winter wheat is more advanced.**



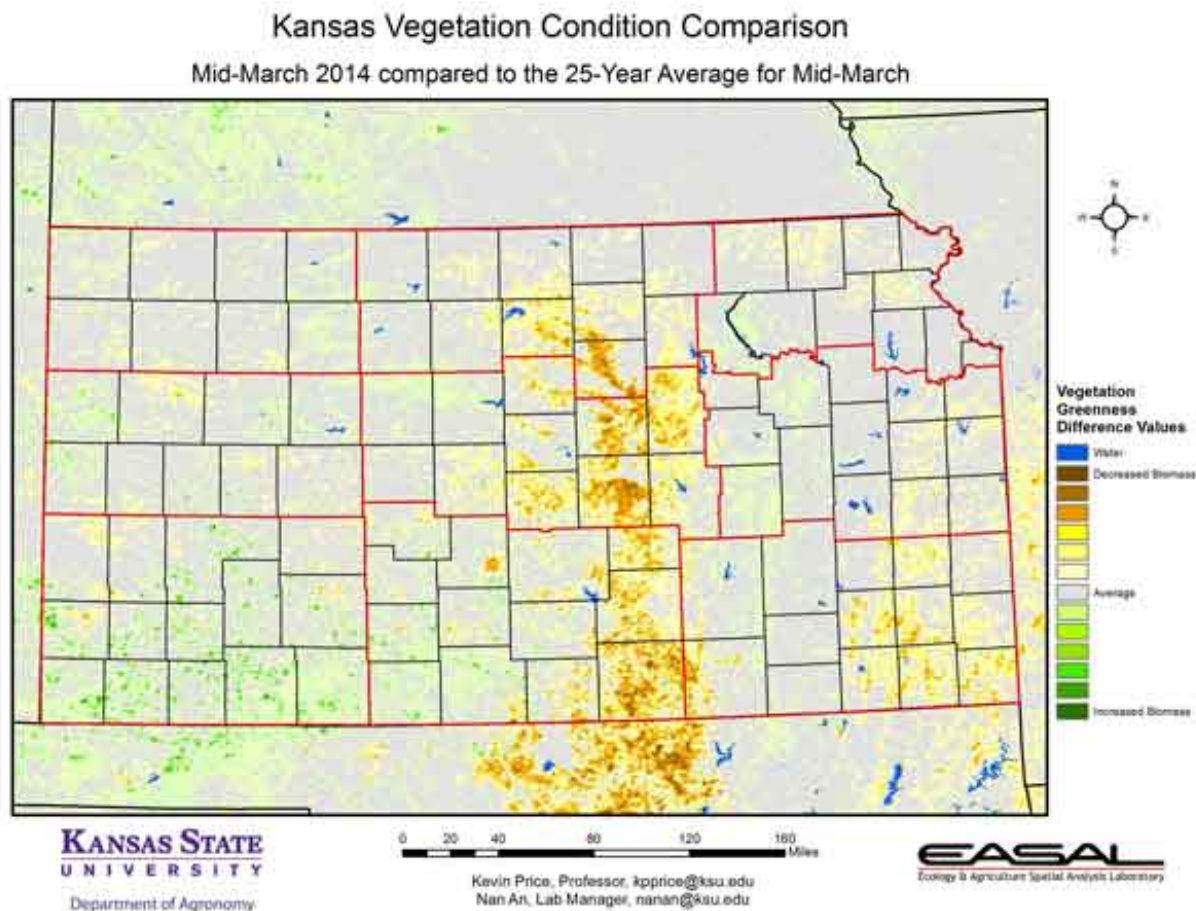
## Kansas Vegetation Condition Comparison

Mid-March 2014 compared to the Mid-March 2013



**Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for March 11 – 24 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows NDVI values are lower in the Central Division and in the Eastern Divisions. Southeastern Kansas, in particular has much lower values. Last year, precipitation was just more than normal for the year-to-date. This year, precipitation is only 35 percent of normal.**

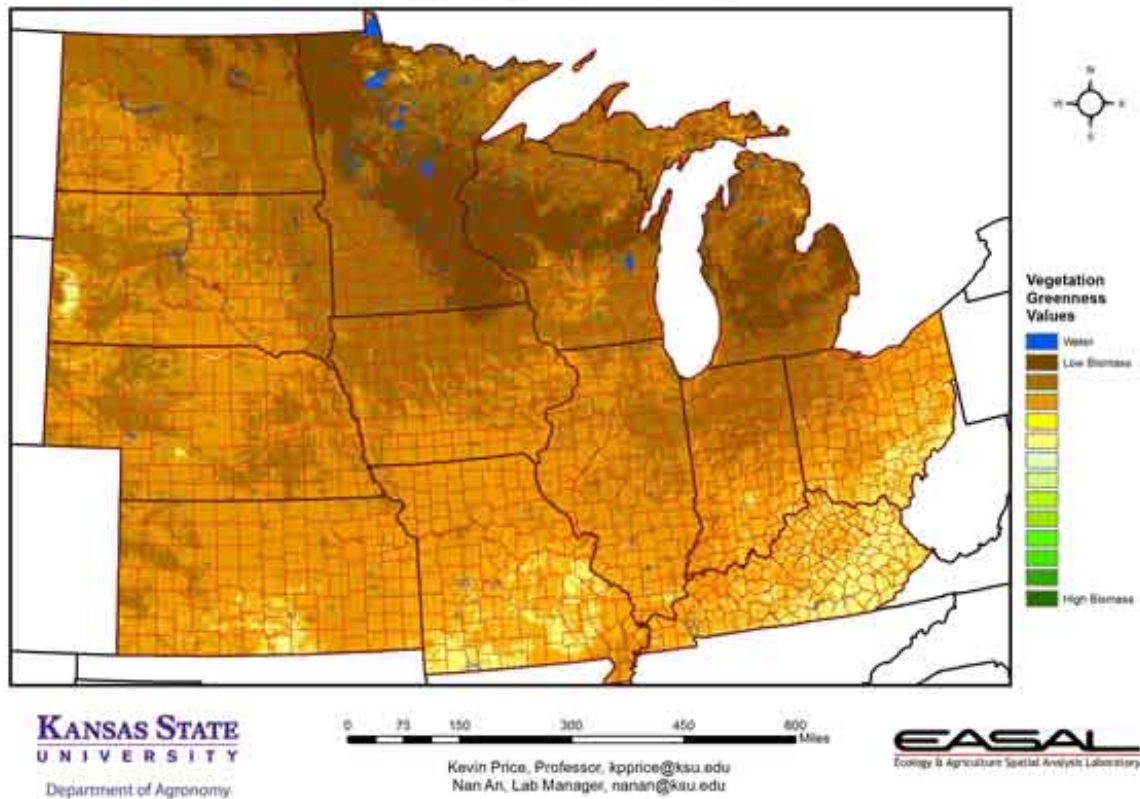




**Figure 3. Compared to the 25-year average at this time for Kansas, this year's Vegetation Condition Report for March 11 – 24 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows the biggest departure is in the Central Divisions. The combination of cooler-than-average temperatures and dry soils has slowed plant development relative to the 25-year average.**

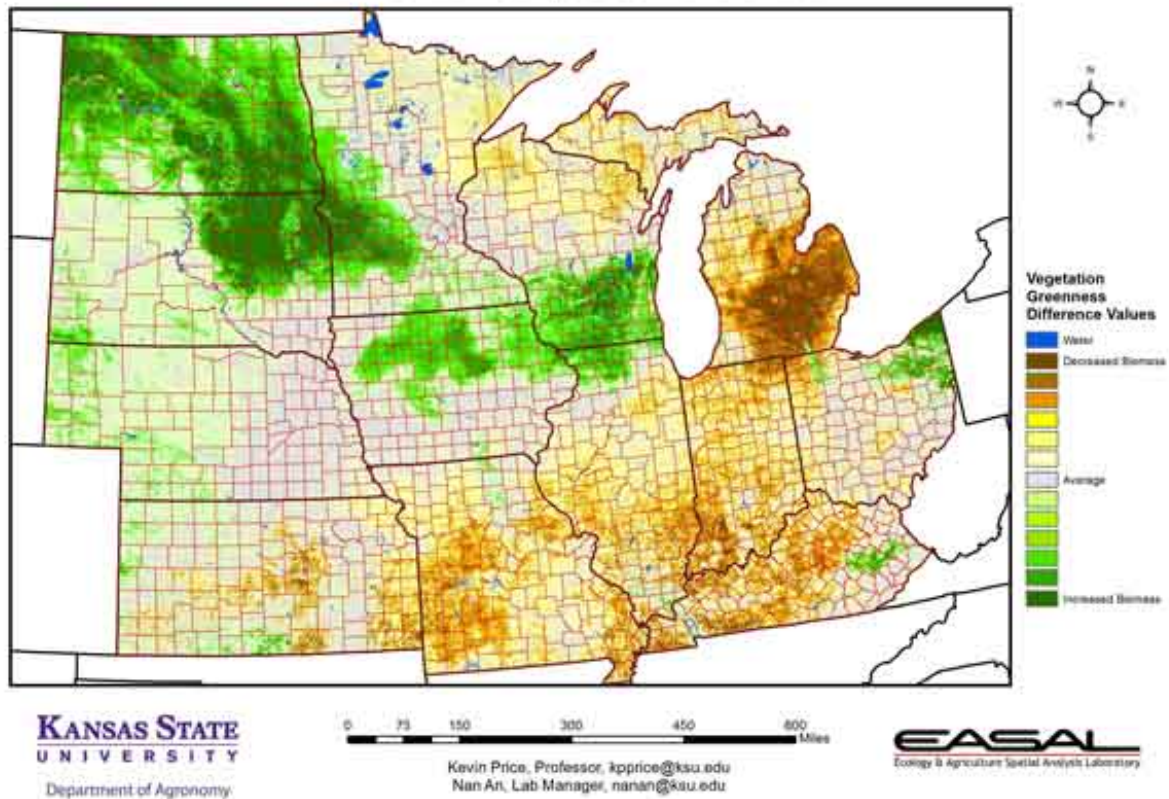
## U.S. Corn Belt Vegetation Condition

Period 12: 03/11/2014 - 03/24/2014



**Figure 4. The Vegetation Condition Report for the Corn Belt for March 11 – 24 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that vegetation is just beginning to be active across the southern and eastern portions of the region. The darkest areas are those which still have significant snowpack. Temperatures continue to be below average across the region.**

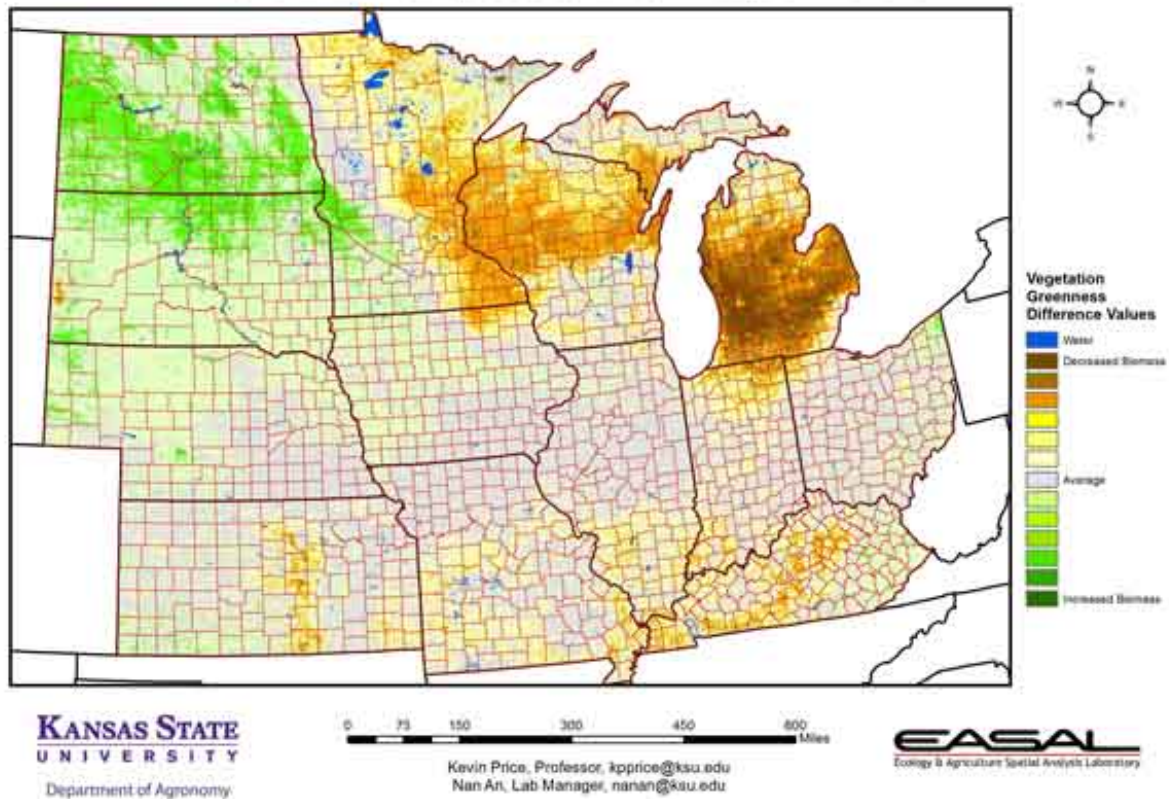
**U.S. Corn Belt Vegetation Condition Comparison**  
 Mid-March 2014 Compared to Mid-March 2013



**Figure 5. The comparison to last year in the Corn Belt for the period March 11 – 24 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows an area of increased plant activity across North Dakota into northeastern South Dakota and parts of Minnesota. While snow is still a factor, the coverage is less than last year.**



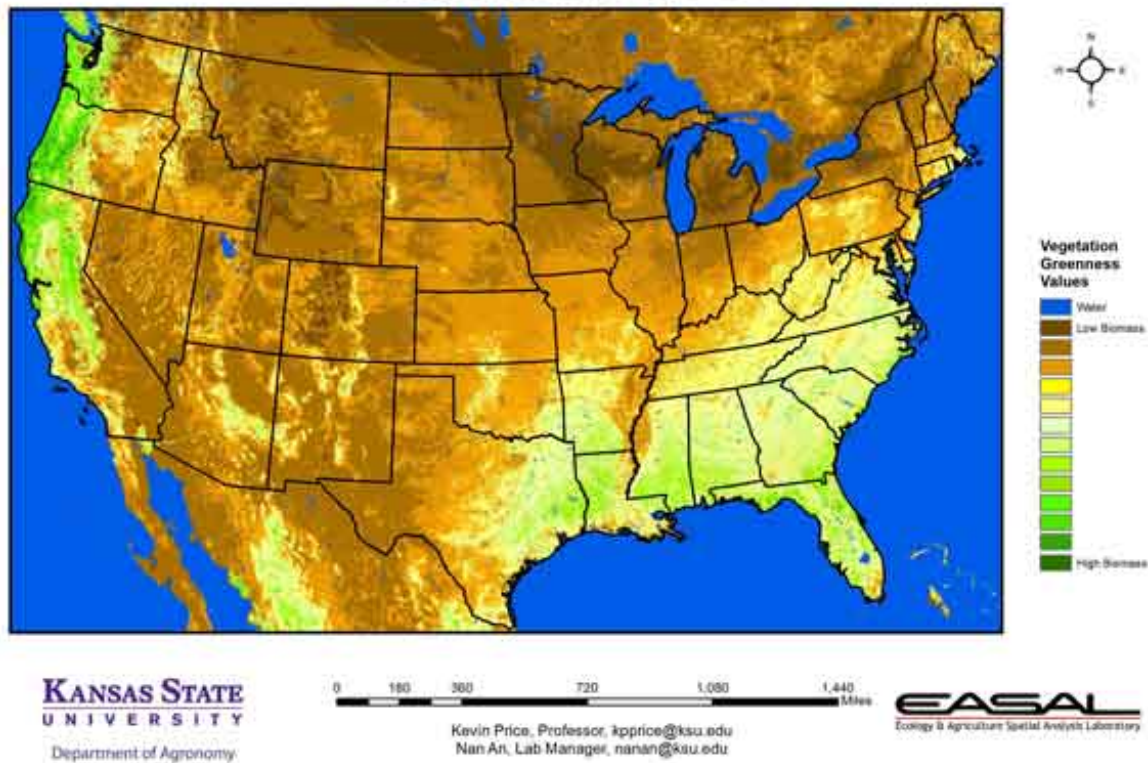
**U.S. Corn Belt Vegetation Condition Comparison**  
 Mid-March 2014 Compared to the 25-Year Average for Mid-March



**Figure 6. Compared to the 25-year average at this time for the Corn Belt, this year's Vegetation Condition Report for March 11 – 24 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the cold weather and consistent snowpack continues to reduce vegetative activity. The greatest area of above-average activity is in the western portions of the region. The area of snow coverage in North Dakota is less than half of what it was last year at this time. Average depth is less than 3 inches, whereas last year this area had an average depth of 11 inches during this two-week composite period.**

## Continental U.S. Vegetation Condition

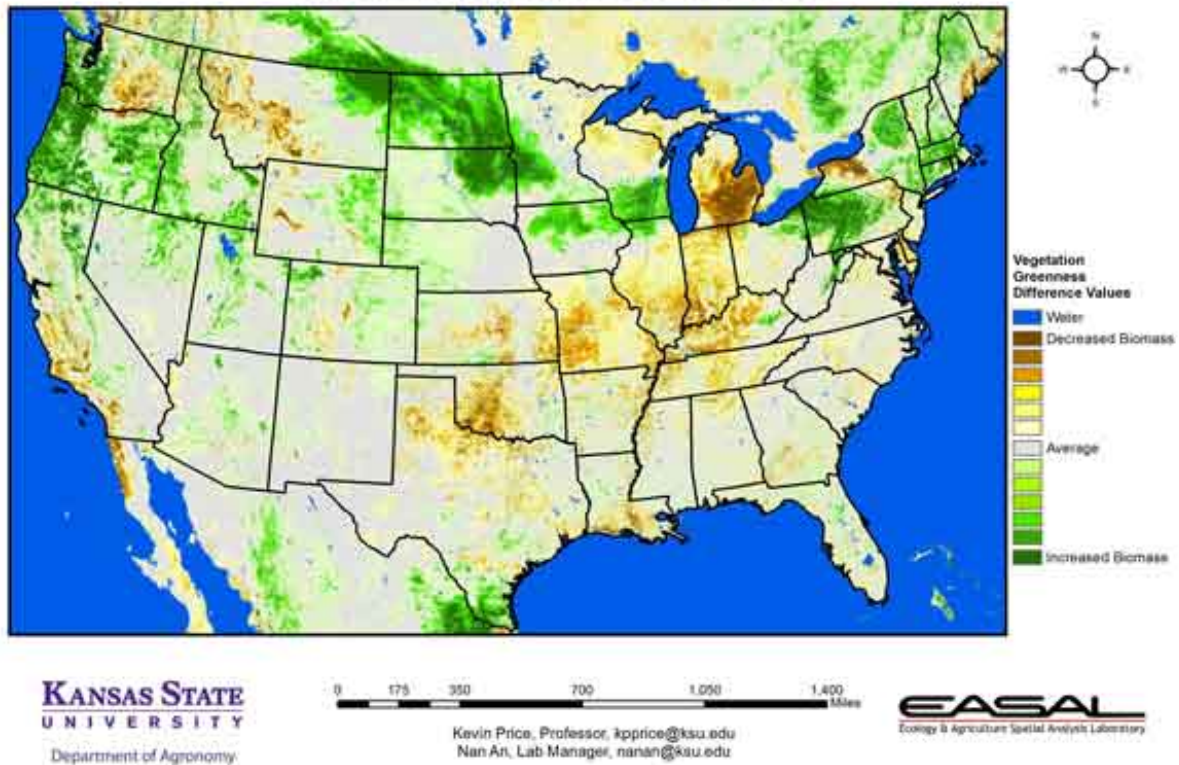
Period 12: 03/11/2014 - 03/24/2014



**Figure 7. The Vegetation Condition Report for the U.S. for March 11 – 24 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that most of the vegetation is still dormant. Areas of lowest biomass productivity in the Great Lakes region correspond to areas with heaviest remaining snow cover. Despite the high biomass productivity in Northern California, that region remains in severe to extreme drought.**

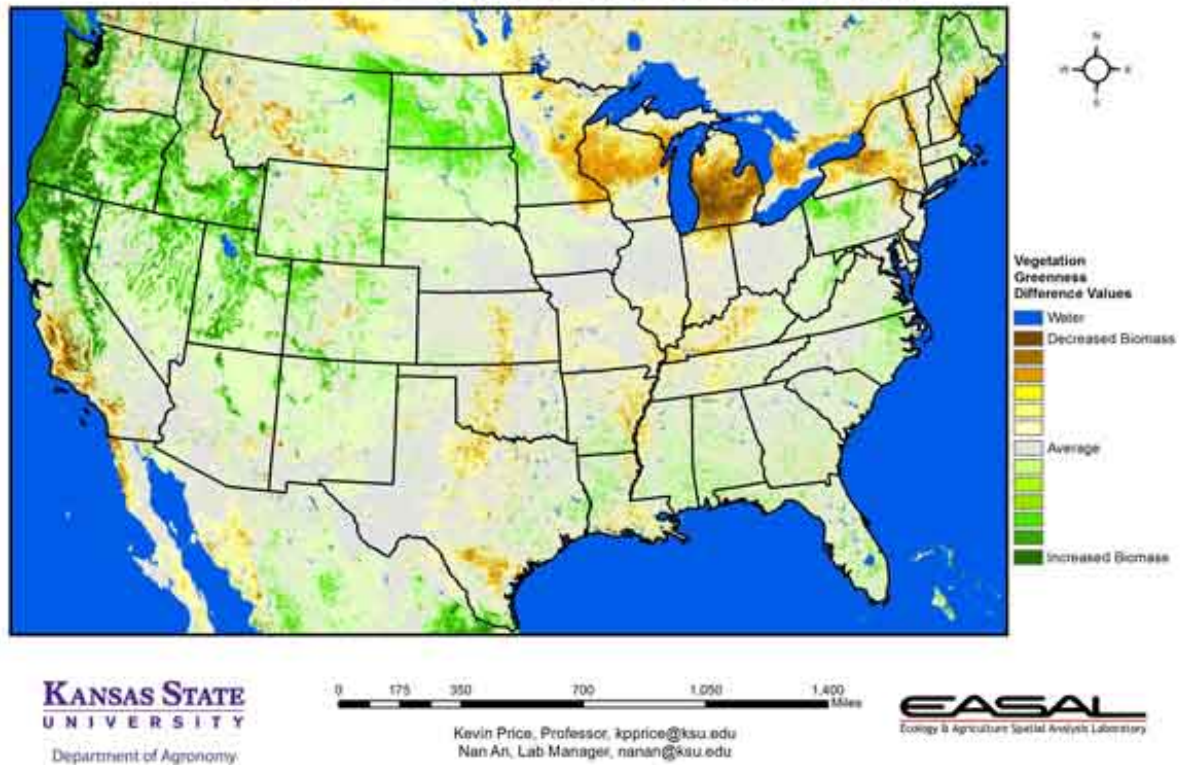


Continental U.S. Vegetation Condition Comparison  
Mid-March 2014 Compared to Mid-March 2013



**Figure 8. The U.S. comparison to last year at this time for the period March 11 – 24 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that the greatest increase in vegetative activity is in the Northern High Plains. Snow cover in this area is less than a third of what it was last year at this time.**

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



**Figure 9. The U.S. comparison to the 25-year average for the period March 11 – 24 from K-State’s Ecology and Agriculture Spatial Analysis Laboratory shows that higher-than-normal vegetative activity is most concentrated in the Pacific Northwest. March rains in Washington and Oregon have reduced drought in those states.**

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