Issue 500

K-STATE
Research and Extension

Extension Agronomy

eUpdate

03/27/2015

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

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1. Causes of yellow wheat in the spring

There may be large areas, small patches, or streaks of yellowish wheat in some fields this spring. What are some of the main causes of yellow wheat in the spring?

The most common causes of yellow wheat in the spring are:

Poor root growth. This may be due to dry soils, waterlogging, or elevated crown height caused by shallow planting depth or excessive residue in the root zone. If the plants have a poor root system, then the plants are yellow because the root systems are not extensive enough to provide enough nutrients.

Nitrogen deficiency. Nitrogen deficiency causes an overall yellowing of the plant with the lower leaves yellowing and dying from the leaf tips inward. Nitrogen deficiency also results in reduced tillering, top growth, and root growth. The primary causes of nitrogen deficiency are insufficient fertilizer rates, application problems, applying the nitrogen too late, leaching from heavy rains, denitrification from saturated soils, and the presence of heavy amounts of crop residue, which immobilize nitrogen.

Figure 1. Nitrogen deficiency on wheat. The lower leaves are the first to become chlorotic. Photo by Dorivar Ruiz Diaz, K-State Research and Extension.

Sulfur deficiency. Sulfur deficiency is not as common as nitrogen deficiency, but there has been an increase in the numbers of fields with sulfur deficiency in recent years. Deficiency can be more common in areas where organic matter levels are low -- especially on sandier soils or eroded areas of a field. It can also occur where soils are cold and dry in the spring. Under these conditions, the rate of release of sulfur from organic matter is greatly reduced. The symptoms of sulfur deficiency are very similar to nitrogen deficiency. However, sulfur deficiency does differ from nitrogen deficiency in that the whole plant is pale with a greater degree of chlorosis in the young leaves. The pattern of chlorosis may show gradation in intensity with the younger leaves at the tip yellowing first because sulfur is not easily translocated within the plant. But the entire plants quickly become totally chlorotic and take on a light yellow color. Symptoms often become more pronounced when plants begin growing rapidly while soil conditions are such that organic matter mineralization and sulfur release rates are low. Symptoms may disappear as the temperature warms up and moisture conditions improve, which increases the rate of mineralization of sulfur from organic matter and the rate of root growth in the plants.

Figure 2. Sulfur deficiency in wheat, with symptoms appearing first on the younger leaves. Photo by K-State Research and Extension.

Iron chlorosis. Iron chlorosis is not common on wheat in Kansas, but does occur on certain high-pH, calcareous soils in western Kansas. Newly emerging leaves will have green veins, with yellow striping between the veins. Eventually, the entire leaf may turn yellow or white.

Soilborne mosaic or spindle streak mosaic. Soilborne mosaic and spindle streak mosaic are viral diseases that occur primarily in eastern and central Kansas, but can also occur in western Kansas. These diseases are most common in years with a wet fall, followed by a cool, wet spring. Lower areas of the field are most commonly affected. Symptoms are usually most pronounced in early spring, then fade. Leaves will have a mosaic of green spots on yellowish background; and plants will be stunted.

Wheat streak mosaic complex. This viral disease is vectored by the wheat curl mite. Yellow areas in field will appear in spring; usually on field edges adjacent to volunteer wheat. Leaves will have a mosaic of yellow streaks, stripes, or mottling. Plants will normally be stunted. Unlike soilborne/spindle streak mosaic, wheat streak mosaic is not associated with any particular type of weather pattern or soil condition.

Barley yellow dwarf. This viral disease is vectored by bird cherry oat aphids and greenbugs. Small or large patches of yellow plants will occur, typically around boot stage. Leaf tip turns yellow or purple, but midrib remains green. The yellow color is more intense, and in an even distribution pattern on the leaf surface compared to the yellowing caused by the mosaic diseases. Plants are usually, but not always, stunted.

Cold weather injury at the tillering stage. A sudden drop in temperatures after the wheat has greened up but before it reaches the jointing stage will burn back the topgrowth, often giving the field a yellowish cast but not reducing yield potential.

Figure 3. Yellowing wheat from cold weather injury at the tillering stage. Photo by K-State Research and Extension.

Freeze injury at the jointing stage. Jointing wheat can usually tolerate temperatures in the mid to upper 20's with no significant injury. But, if temperatures fall into the low 20's or even lower for several hours, the lower stems, leaves, or developing head can sustain injury. If the leaves of tillers are yellowish when they emerge from the whorl, this indicates those tillers have been damaged.

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2. Diagnosing causes of yellow wheat

By late March, wheat should be uniformly green. If there is yellowing in the field, determining the cause of the problem can be important. Some causes require a solution, such as applying more nitrogen; some causes are temporary and do not require any corrective actions; and some causes are beyond the control of producers.

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

- What parts of the plant are affected? Is the yellowing on older lower leaves only, newer leaves only, on the tips, or on the entire plants? If the yellowing is on lower leaves, that indicates nitrogen deficiency. If it is only on newer leaves or leaf tips, that could indicate cold temperature leaf burn, sulfur deficiency, barley yellow dwarf. If entire plants are yellowing, that might indicate atrazine carryover, liquid fertilizer burn, sulfur deficiency, or drowning.
- What have the temperature and growing conditions been over the past 30 days? If there has been a sudden drop in temperatures while leaves were green, you might suspect cold injury or leaf tip burn.
- Are fields unusually wet or dry? If soils are very dry, root growth will often be stunted and plants will gradually become chlorotic, then turn bluish or brown. If soils are excessively wet, roots can drown and nutrient uptake can be greatly reduced, resulting in yellowing of lower leaves first, then entire plants.
- Can the plants be pulled easily from the soil? If so, the root system is stunted and could be at least one cause of the yellowing.
- What is the pattern in the fields? If the yellowing is in streaks in the field, that implies a fertilizer application problem, or possibly atrazine carryover. If it is mostly on terrace tops, that might indicate a weather-related problem that would affect exposed plants first or an issue related to eroded or low-organic-matter soils, such as sulfur deficiency. If the yellowing is occurring in primarily in low areas, that might indicate freeze injury where cold air settled, drowning, soilborne mosaic, or spindle streak mosaic. If only the edge of the field is yellow, look for symptoms of wheat streak mosaic. If the yellowing is in roundish spots scattered throughout the field, suspect barley yellow dwarf. If the yellowing is uniform throughout the field, nitrogen deficiency, poor root growth due to drought or poor seed-to soil contact, cold weather leaf burn, or topdress fertilizer leaf burn are likely causes.
- Are other wheat fields in the general region of yours also yellow, or just a few scattered fields? If fields in the entire region are yellowing, that would imply a weather-related problem. If it is specific to just one or two fields, that implies a management-related or field-specific soil problem.
- What herbicides had been applied to the previous crop? If atrazine had been applied to the previous crop, check on the rate used and the environmental conditions since the application. If soils have been drier than normal after the atrazine was applied, this would increase the chances for atrazine carryover into the wheat crop.
- What did the most recent soil test show? Are there nutrient deficiencies or lime requirements that haven't yet been corrected?
- Is there a difference between early-planted and late-planted fields? Earlier planting usually results in bigger plants when going into winter, which can sometimes result in more drought stress or cold temperature injury to the leaves over the winter. Later-planted wheat often has less root development going into winter, which can make the plants more susceptible to nitrogen and other nutrient deficiencies. Plants will grow out of the yellowing from either of

these causes if growing conditions are good in spring.

Will yellow wheat at this point in the season lead to reduced yields? Can it be corrected?

In general, producers can correct a general nitrogen or sulfur deficiency, but not without some yield loss if the wheat is already jointed. If there are streaks in the field due to a misapplication problem, that may reduce yields a bit but it is probably not worthwhile to try to correct it unless the streaks are very wide and persistent throughout the field. Poor root growth may cause yield loss if it persists through the stem elongation stage. Virus diseases and atrazine carryover will very likely cause some yield loss, and nothing can be done about it at this point. Wheat will generally grow out of any temporary leaf burn due to cold weather or fertilizer applications with little or no yield loss. Yellowing due to late spring freeze injury after jointing, however, indicates death of the growing point and can result in yield loss.

For more information, see the following K-State Research and Extension publications:

Diagnosing Wheat Production Problems in Kansas
http://www.ksre.ksu.edu/bookstore/pubs/S84.pdf

Diagnosing Nutrient Deficiencies in the Field
http://www.ksre.ksu.edu/bookstore/pubs/MF3028.pdf

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3. Planting conditions as of late March

Selection of the optimal planting date is one of the most critical factors in the farming decision-making process. In making this decision, producers should consider soil temperatures rather than just calendar schedule. There has been a declining trend in air temperature across Kansas in the last two weeks of March.

For the week of March 16-22, average weekly soil temperatures at 4 inches varied greatly among crop reporting districts in Kansas (Fig. 1). For example, in the NE region, soil temperatures ranged from 46 to 49 F; while in the SW region, those temperatures varied from 50 to 56 F. Soil temperatures at 4 inches were below 50 F in most of Kansas, with the exception of western areas. Projections for the coming weeks are for increasing air temperatures, which can increase soil temperatures. The actual change in soil temperatures in any given field will be affected by amount of cover, amount of soil moisture, and landscape position. Wet soils in a no-till situation will be slower to warm. Dry soils will vary more rapidly, and match air temperatures more closely.

Each summer row crop has an optimal soil temperature for emergence. A minimum for corn is 50 F for germination and early growth. However, uniformity and synchrony in emergence is primarily achieved when soil temperatures are above 55 F. Uneven soil temperature around the seed zone can produce non-uniform crop germination and emergence. Lack of uniformity in emergence can greatly impact corn potential yields.

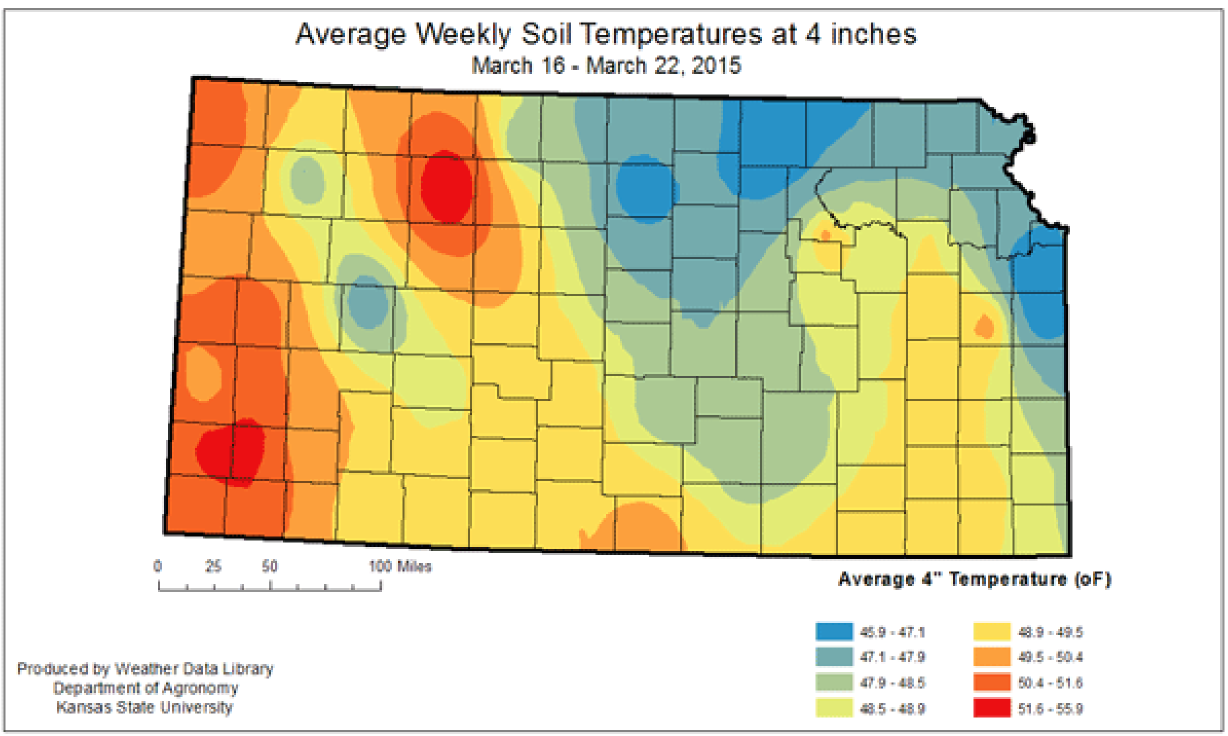

Figure 1. Average soil temperatures at 4-inches for Kansas for the week of March 16-22, 2015.

The average date of the last spring freeze is quite variable around the state (Fig. 2). The earliest dates are in southeast Kansas (April 5-15) and the latest dates are for the northwest area (May 3-8). Thus, planting dates for corn before April 15 in the southeast region would increase the likelihood of the crop to suffer from a late spring freeze (temperatures below 32 F). That would also be the case in northwest Kansas if corn is planted before May 8.

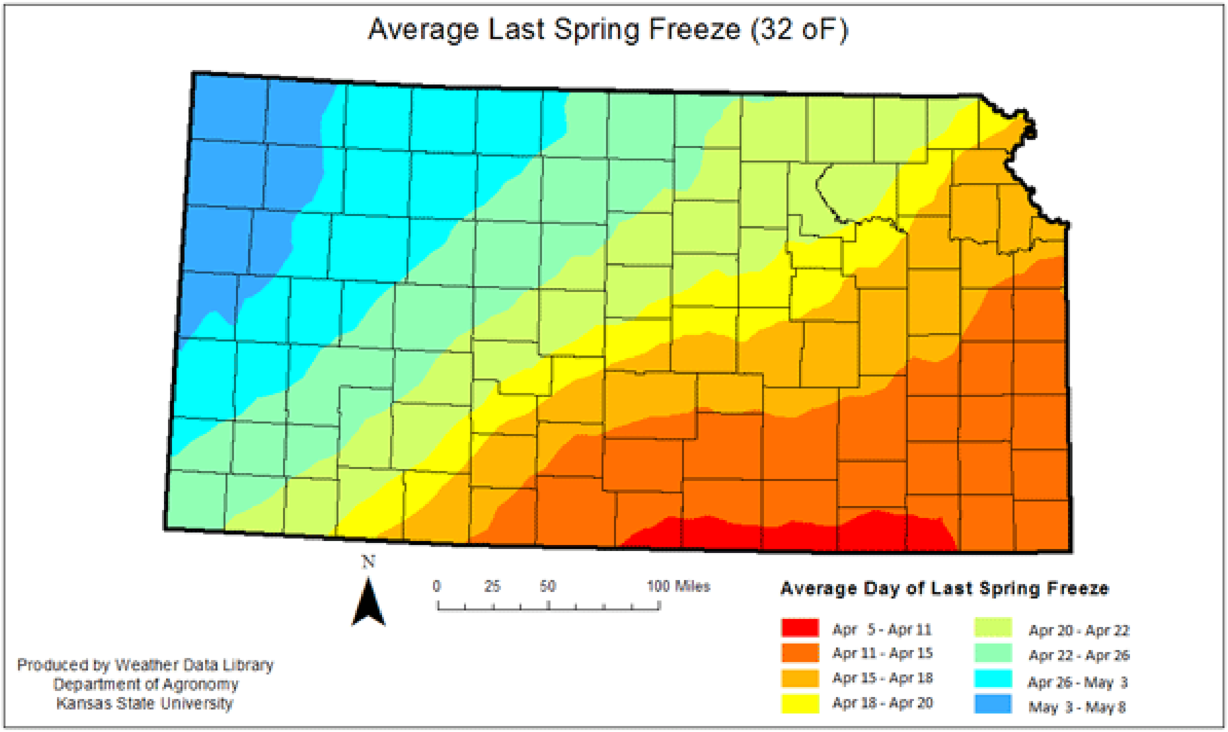

Figure 2. Average last spring freeze (32 F) for Kansas.

Low temperatures at planting can greatly impact the final number of plants through non-uniform emergence and early growth), which will consequently reduce final yields. This is particularly true for corn, since it is the earliest summer row crop planted. When soil temperatures remain at or below 50 degrees F after planting, the damage to germinating seed can be particularly severe.

Corn is also more likely than other summer crops to be affected by a hard freeze after emergence if it is planted too early. The impact of a hard freeze on emerged corn will vary depending on how low the temperature gets, the intensity and duration of the low temperatures, field variability and residue distribution, tillage systems, soil type and moisture conditions (injury is more severe under dry conditions), and the growth stage of the plant. Injury is most likely on very young seedlings or on plants beyond the V5-6 growth stage, when the growing point is above surface.

Think about all these factors when deciding the optimal planting time for corn and your other summer row crops. More information about planting status of summer row crops will be provided in coming issues of the Agronomy eUpdate newsletter. Stay tuned!

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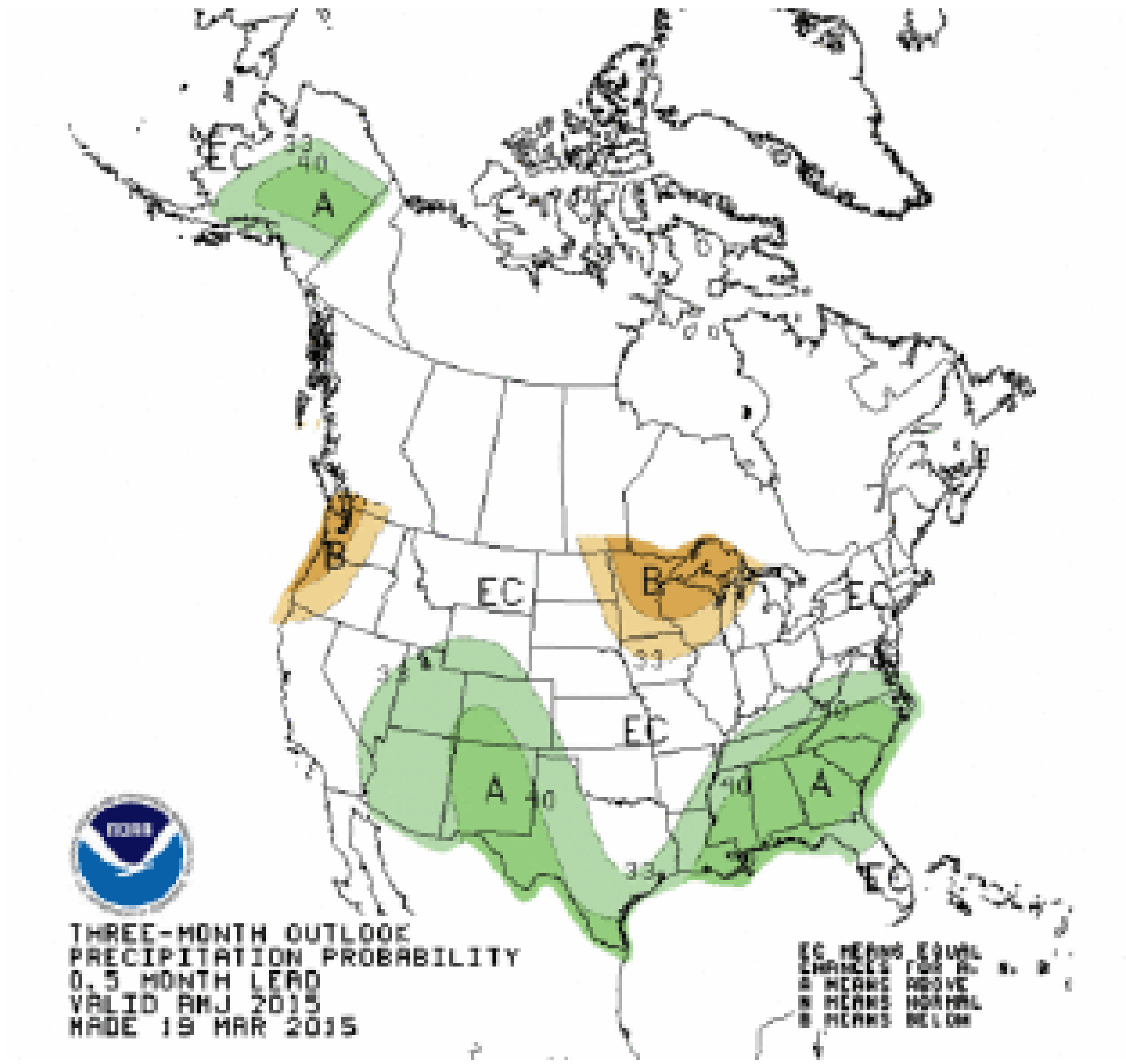
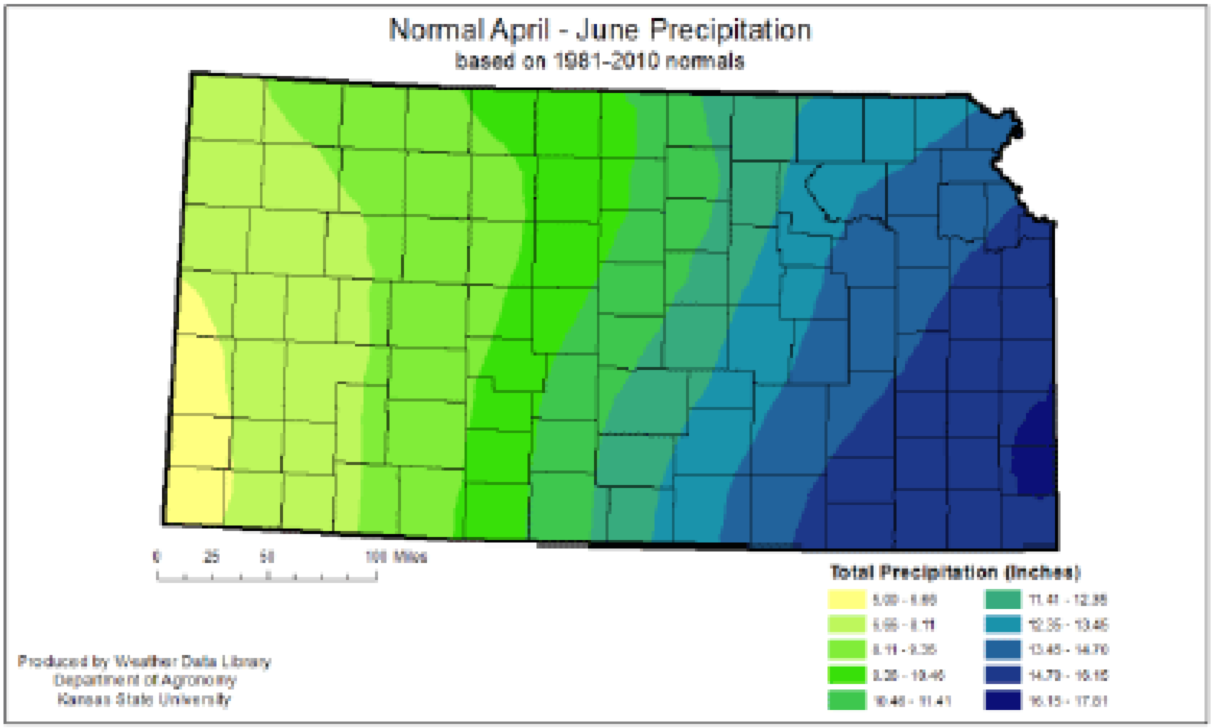
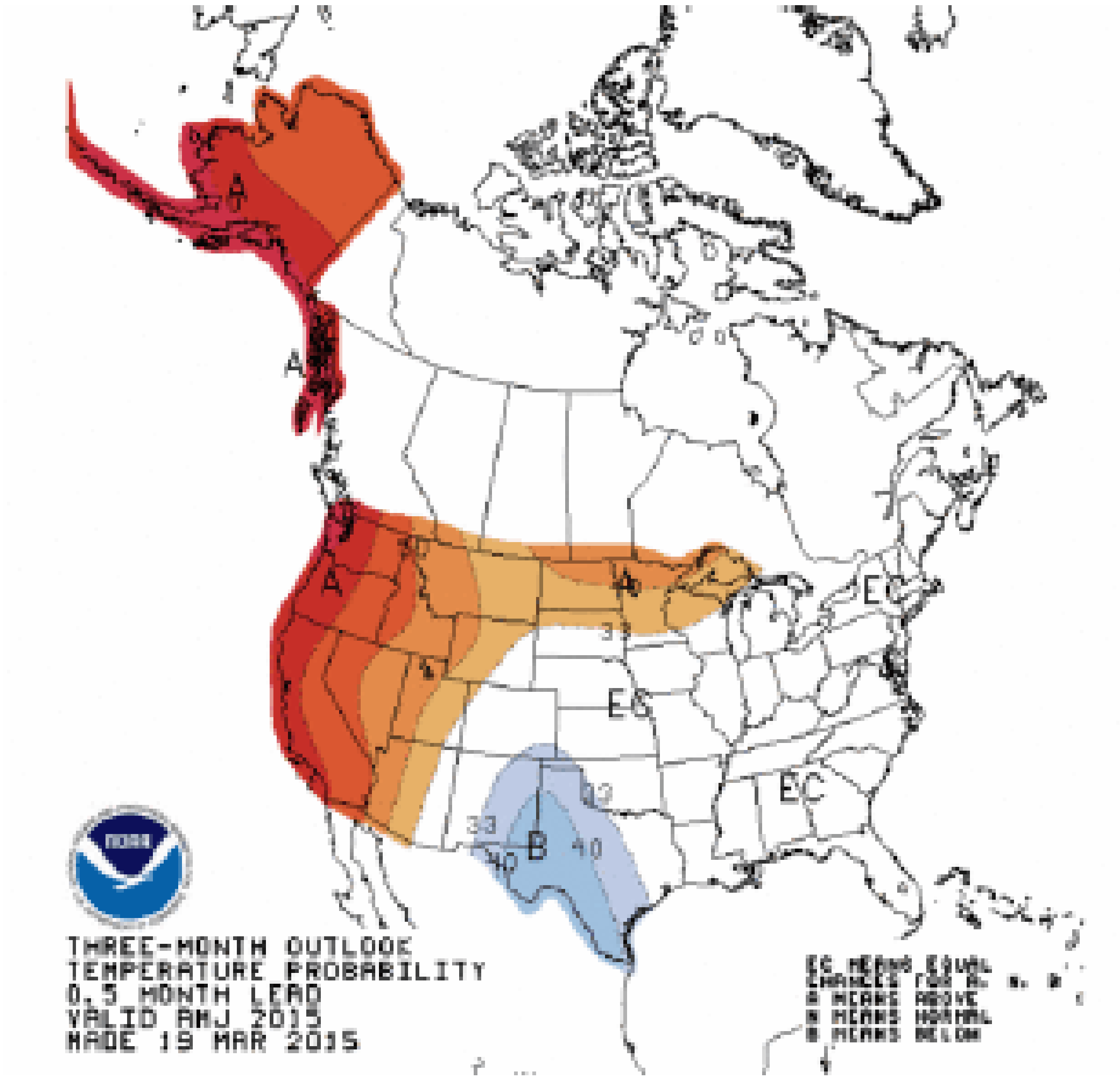
4. Spring/early summer weather outlook for Kansas

The outlooks for spring and early summer period have been released by the National Oceanic and Atmospheric Administration. Unfortunately, for Kansas these outlooks are neutral. Projections for both temperature and precipitation are that it is equally likely to be above or below the normal. The Spring Outlook shows Kansas between areas of drier-than-normal conditions to the northeast and wetter-than-normal conditions to the southwest. For Kansas, the average precipitation ranges from just under 18 inches in southeast Kansas and as little as 5 inches in extreme southwest Kansas.





The temperature outlook calls for warmer-than-normal conditions to dominate the country west of the Rockies and begin to move across the Northern Plains. Cooler-than-normal conditions are confined to the west Texas region. In Kansas, the average temperatures for the period range from over 65 degrees F in the South Central and Southeastern Divisions to less than 60 degrees in extreme northwestern Kansas.


THREE-MONTH OUTLOOK
TEMPERATURE PROBABILITY
0.5 MONTH LEAD
VALID AMJ 2015
MADE 19 MAR 2015
EC MEANS EQUAL
CHANCES FOR A, N, B
A MEANS ABOVE
N MEANS NORMAL
B MEANS BELOW
A
A
A
A
EC
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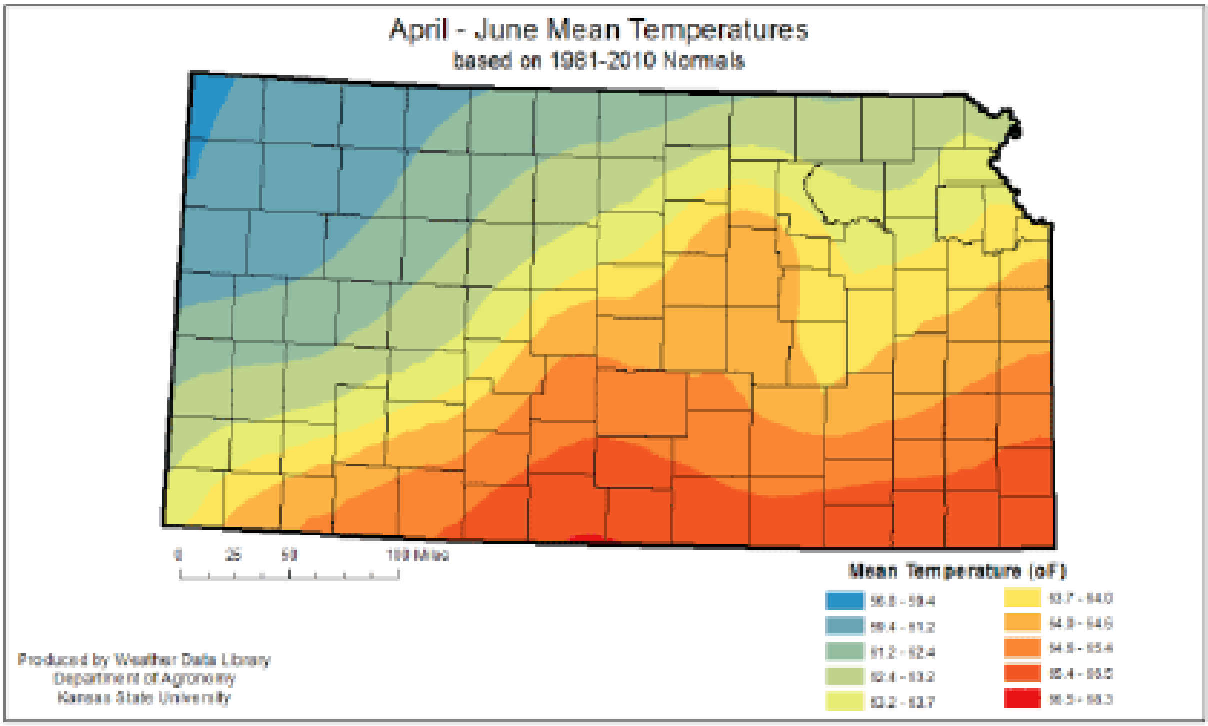
EC
B
33
40
40



An El Niño has been declared. However, it is very weak and it is uncertain how much impact will result from that pattern. An El Niño generally favors wetter-than-normal conditions in the Central Plains. The ridging pattern along the western Rockies is also expected to continue. This has resulted in a split pattern, with the Central Plains as the dividing line. Warmer-than-normal conditions are to the west, while much cooler-than-normal conditions are in place to the east.

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5. Comparative Vegetation Condition Report: March 10 - 23

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

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

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

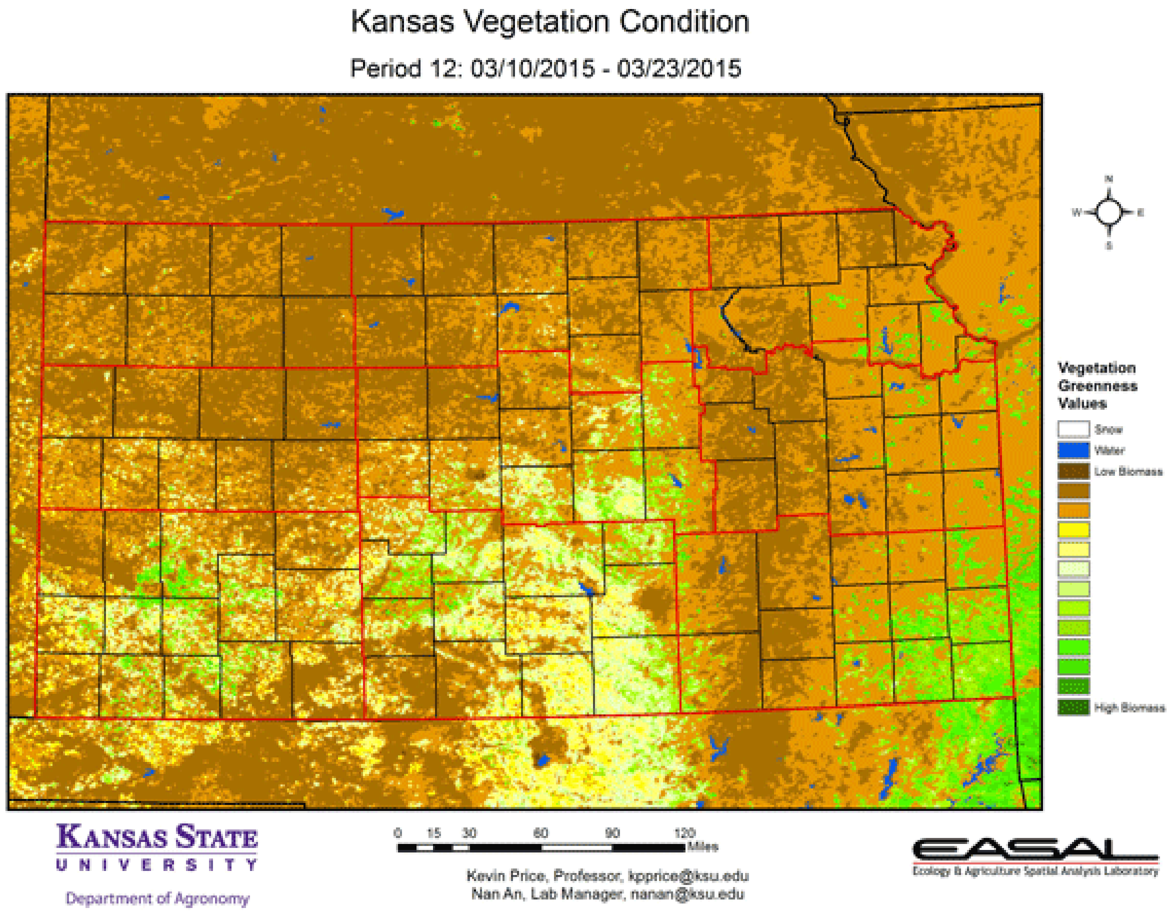

Figure 1. The Vegetation Condition Report for Kansas for March 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that plant activity is most developed along the Arkansas River basin in Southwest Kansas and extreme southeast Kansas, particularly in Neosho, Labette, Crawford, and Cherokee counties.

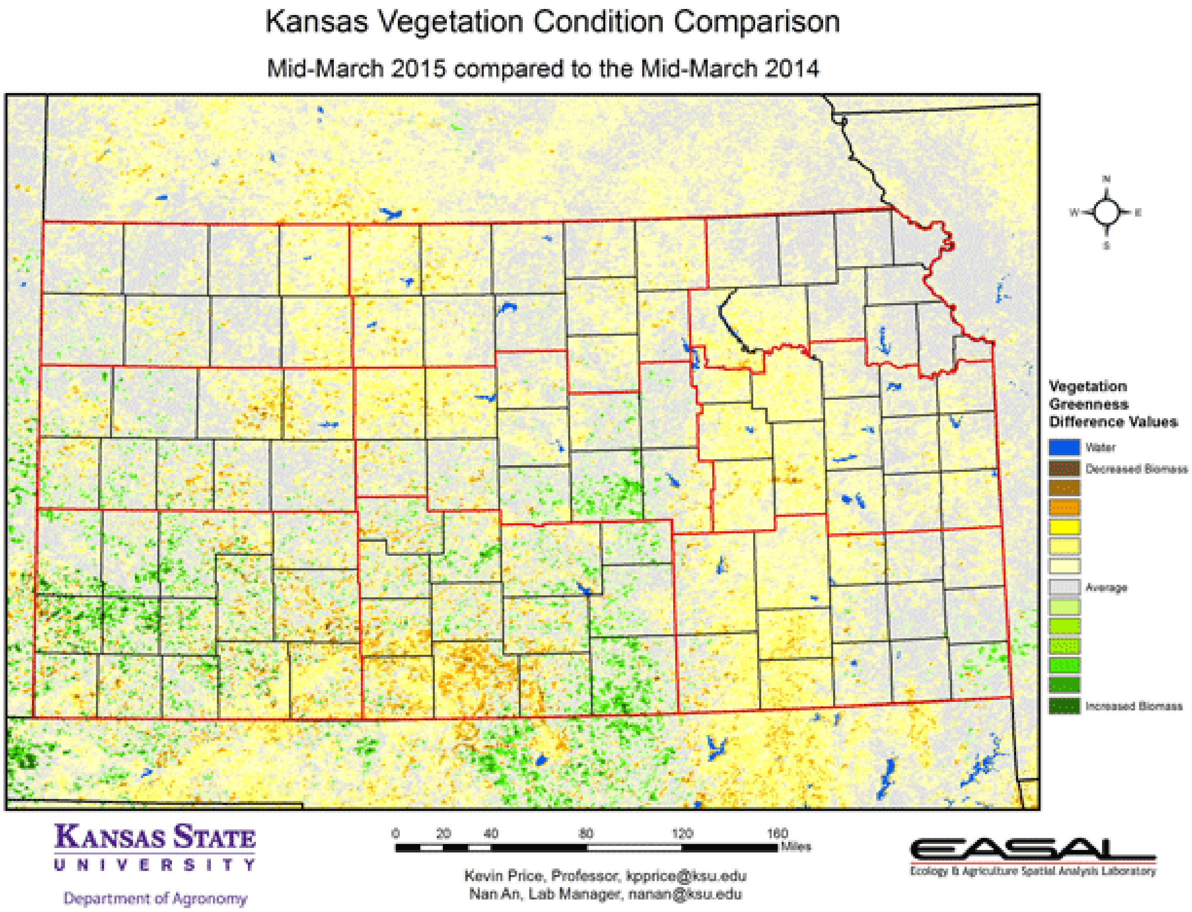

Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for March 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows more photosynthetic activity in southwest Kansas and in parts of central and south central Kansas. This is particularly visible in McPherson and Sumner counties. Winter wheat is beginning to break dormancy and impacts from winter damage and drought conditions are likely to be more visible in the coming weeks.

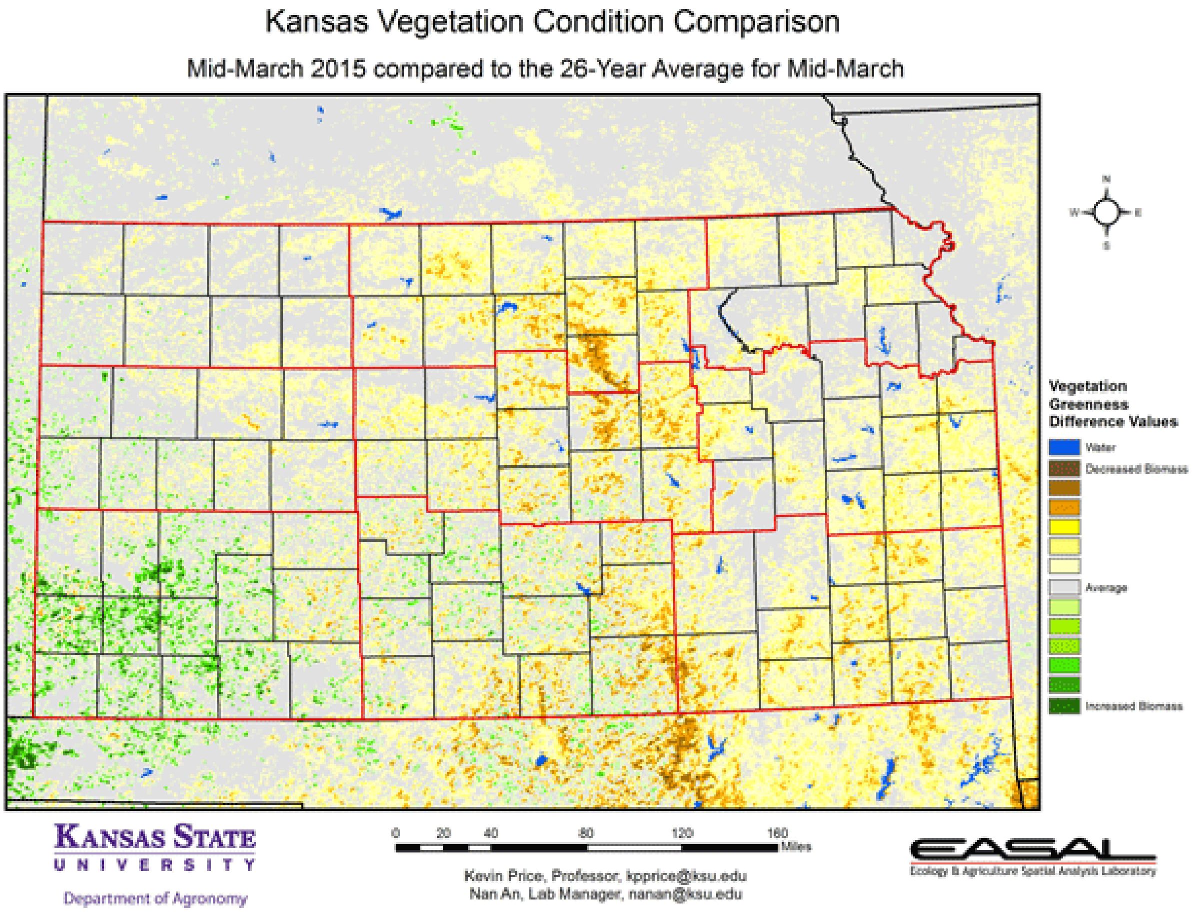

Figure 3. Compared to the 26-year average at this time for Kansas, this year's Vegetation Condition Report for March 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the greatest decrease from average is in the eastern parts of the state, where cooler weather has been more dominant. Increased vegetative activity is most visible in the Southwestern Division. In this area, temperatures have been warmer than average, but rainfall for the September-to-present period has been slightly above average.

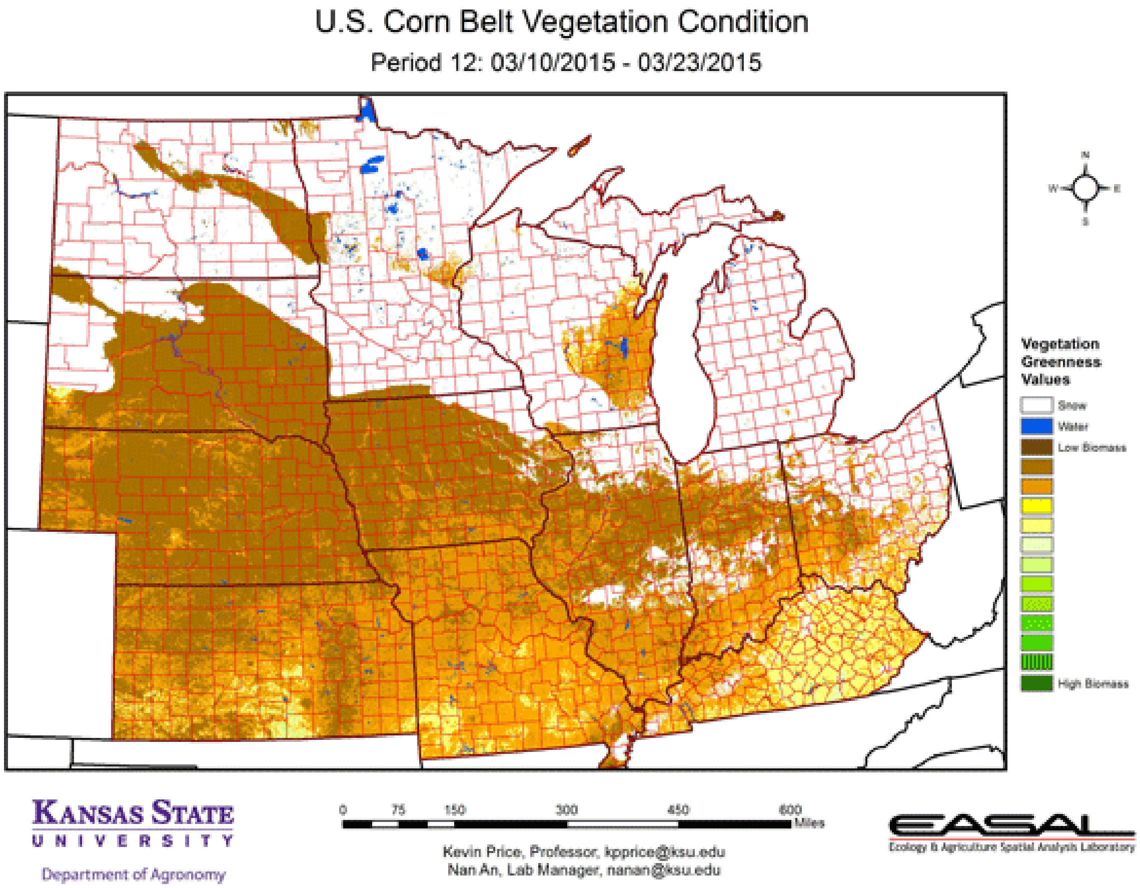

Figure 4. The Vegetation Condition Report for the Corn Belt for March 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the occurrence of snow has moved to the northern portions of the region. In most cases, the amounts were light.

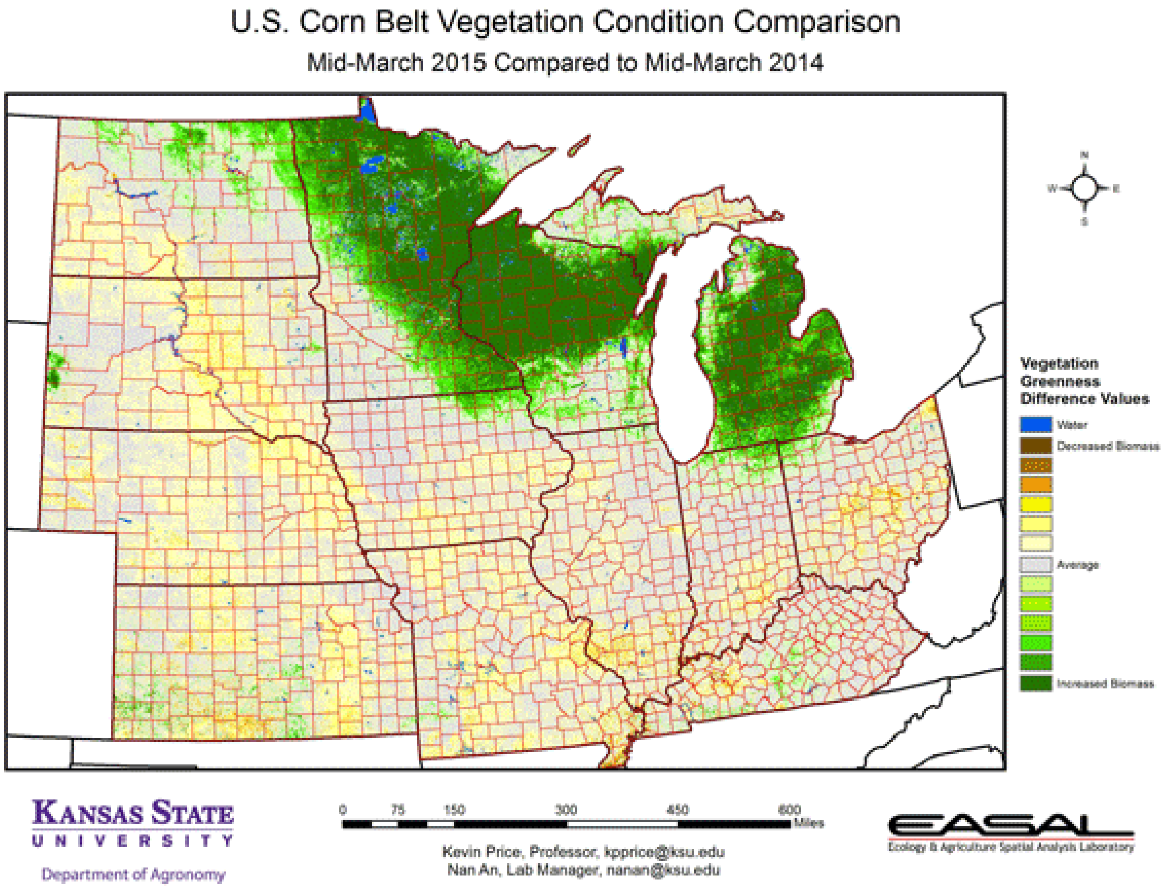

Figure 5. The comparison to last year in the Corn Belt for the period March 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that biggest increase in NDVI readings is across Minnesota, Michigan, and northern Wisconsin. This is deceptive, as drought conditions begin to intensify in these areas based on lack of winter moisture. Temperatures continue to trend cooler-than-average in these areas.

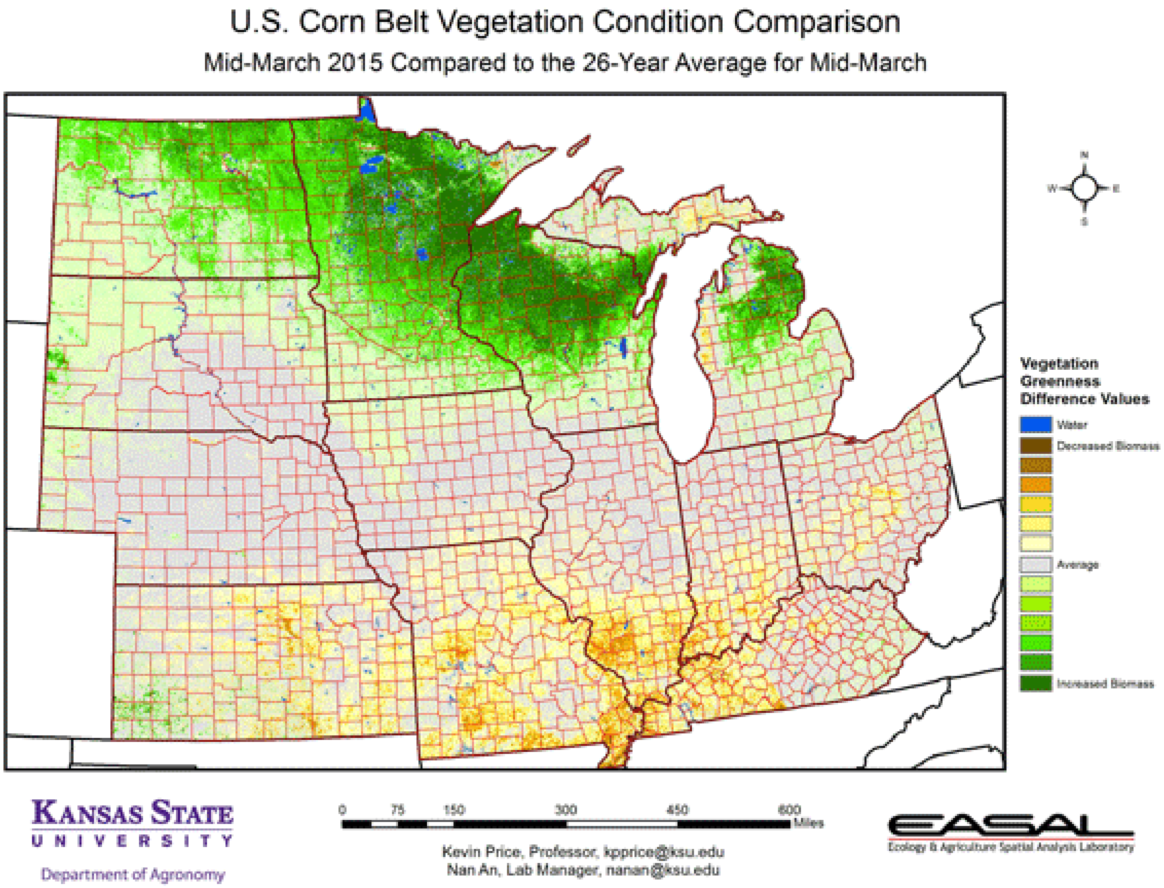

Figure 6. Compared to the 26-year average at this time for the Corn Belt, this year's Vegetation Condition Report for March 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows the biggest departure is in the northern regions. Below-average snow is a major component for the higher NDVI readings.

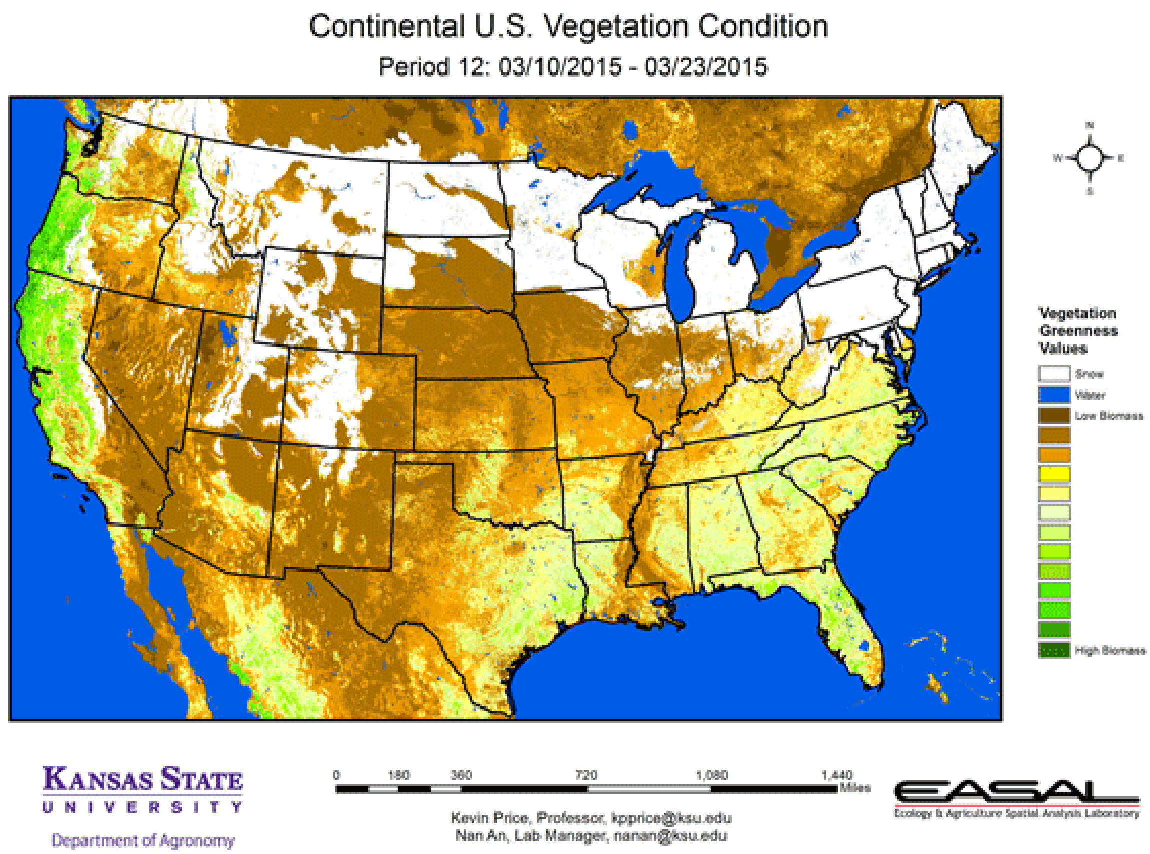

Figure 7. The Vegetation Condition Report for the U.S. for March 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that snow is mostly confined to the New England region. While snow events did occur in the Northern Plains, these were limited in amounts. Early snow melt is reported in Montana and Wyoming, while continued low snow pack is an issue in the Pacific Northwest.

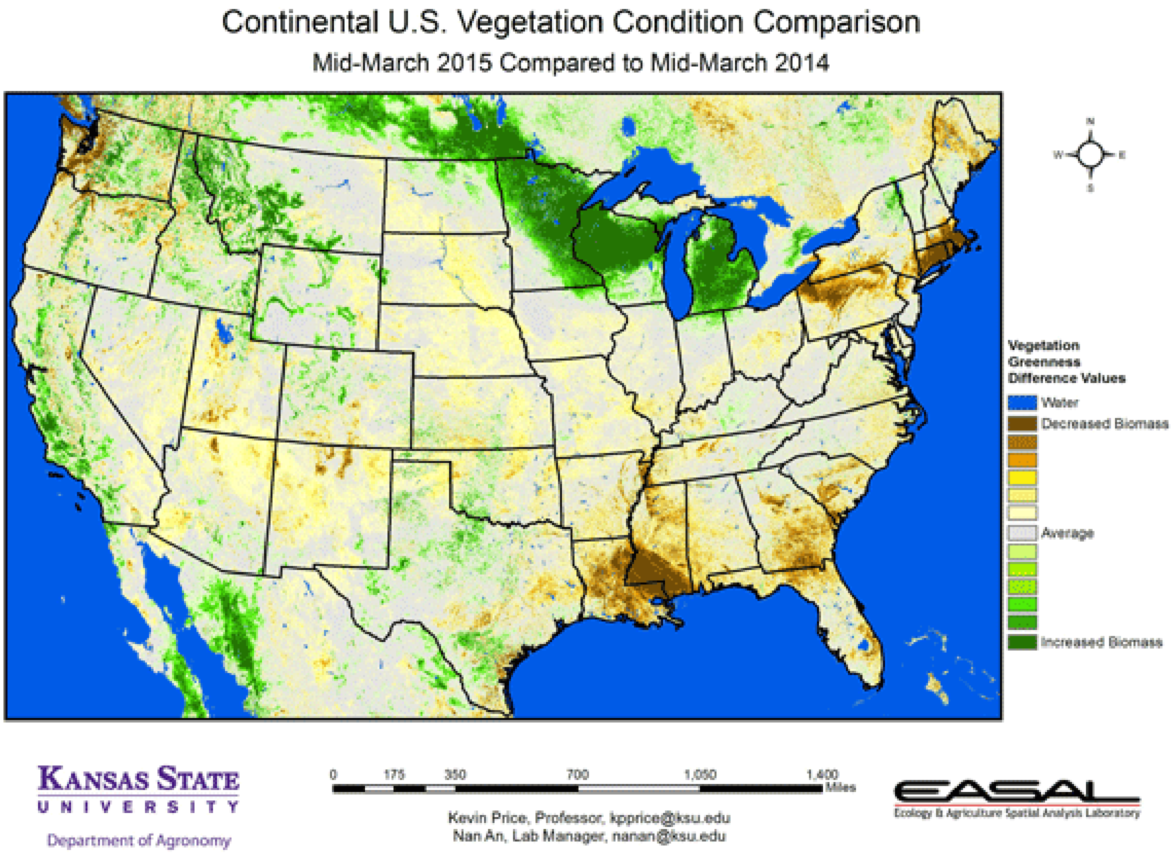

Figure 8. The U.S. comparison to last year at this time for the period March 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that greatest increase in NDVI readings is in the Northern Plains into Minnesota, Wisconsin, and Michigan. The biggest decrease is visible in areas of the Gulf Coast and the Atlantic Seaboard. For these areas, increased moisture has limited plant activity.

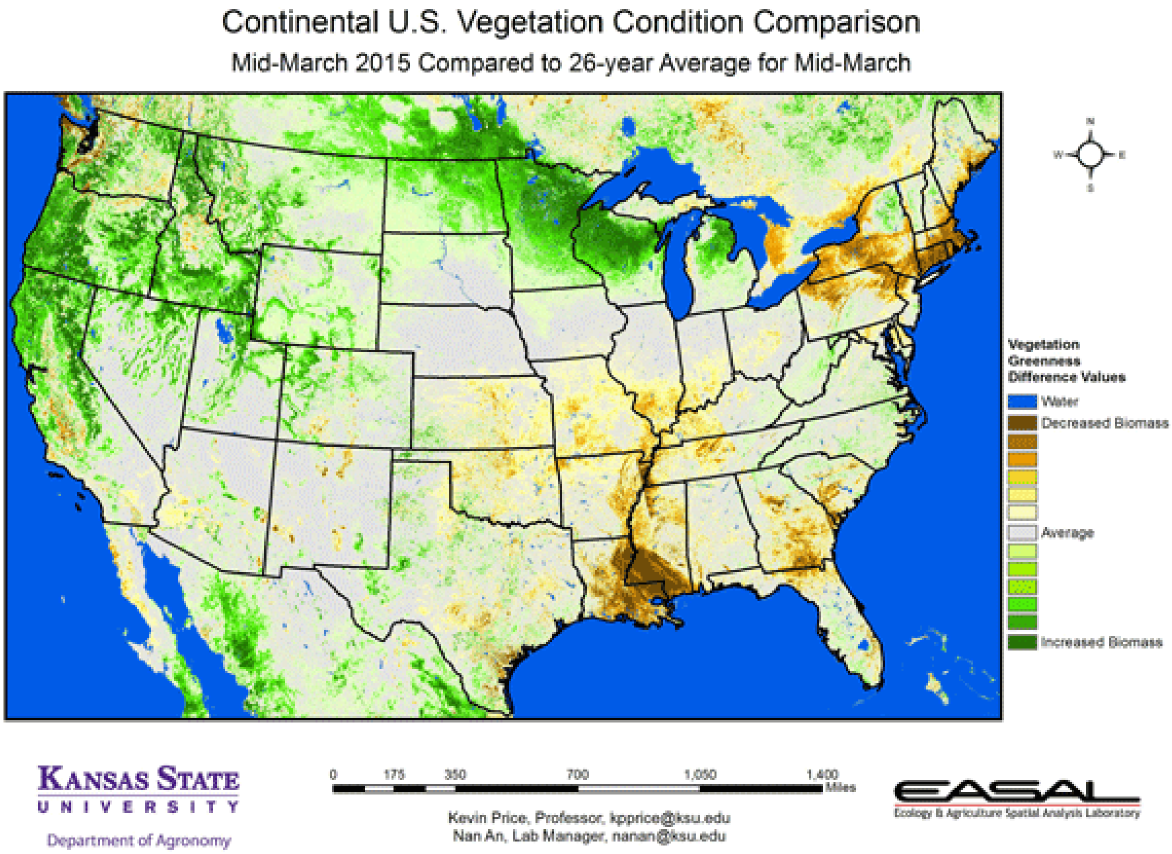

Figure 9. The U.S. comparison to the 26-year average for the period March 10 – 23 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows above-average NDVI readings from the Pacific Northwest through the northern Plains to the Great Lakes. An increase in photosynthetic activity at this time will increase water demands in areas that face intensification of drought conditions. The decreased vegetative activity in the lower Mississippi Delta region is reflective of flooding in the region.

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