K-STATE Research and Extension

Extension Agronomy

eUpdate

04/10/2015

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. Soybean planting dates and maturity group: Trends and K-State recommendations

Trends in Kansas

In recent decades, Kansas producers have been planting soybeans slightly earlier through the years -- at the rate of about a half-day per year (Fig. 1). After considering the effects of genetic yield potential and the environment, planting date is one of the primary management practices under the farmer's control that can highly influence soybean yields.

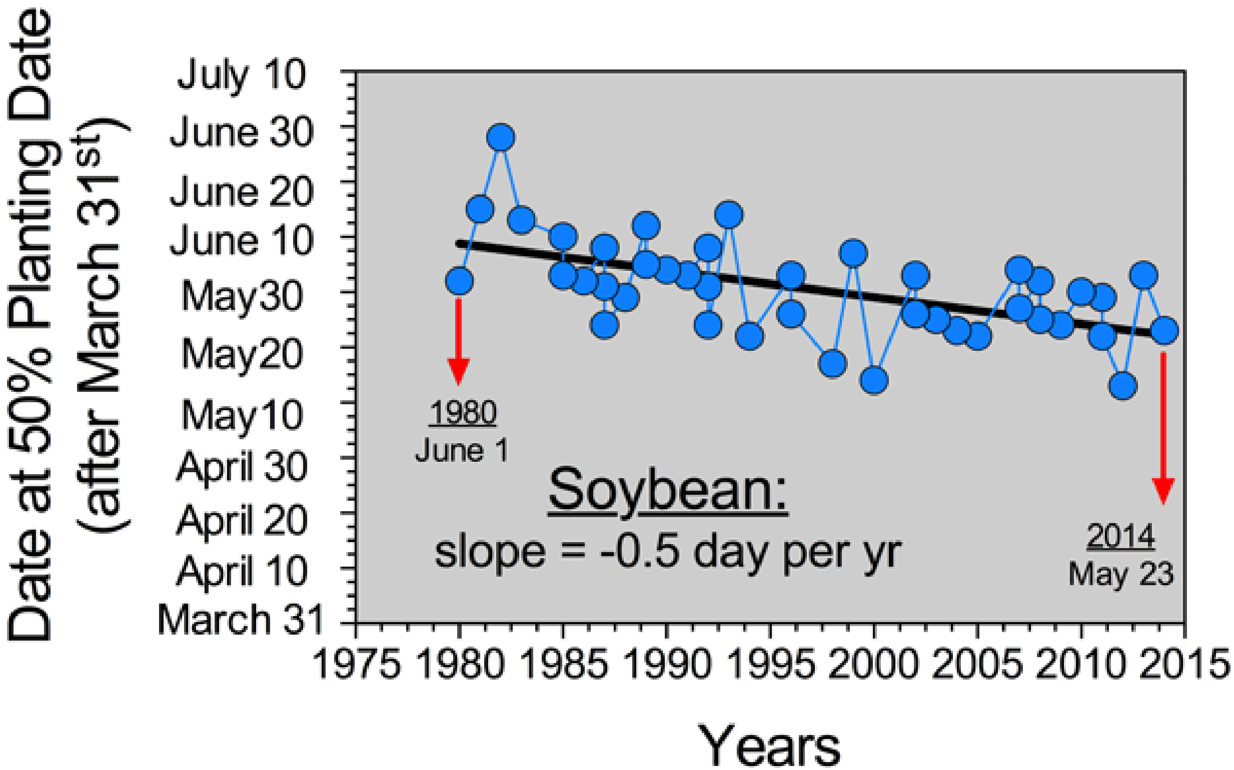
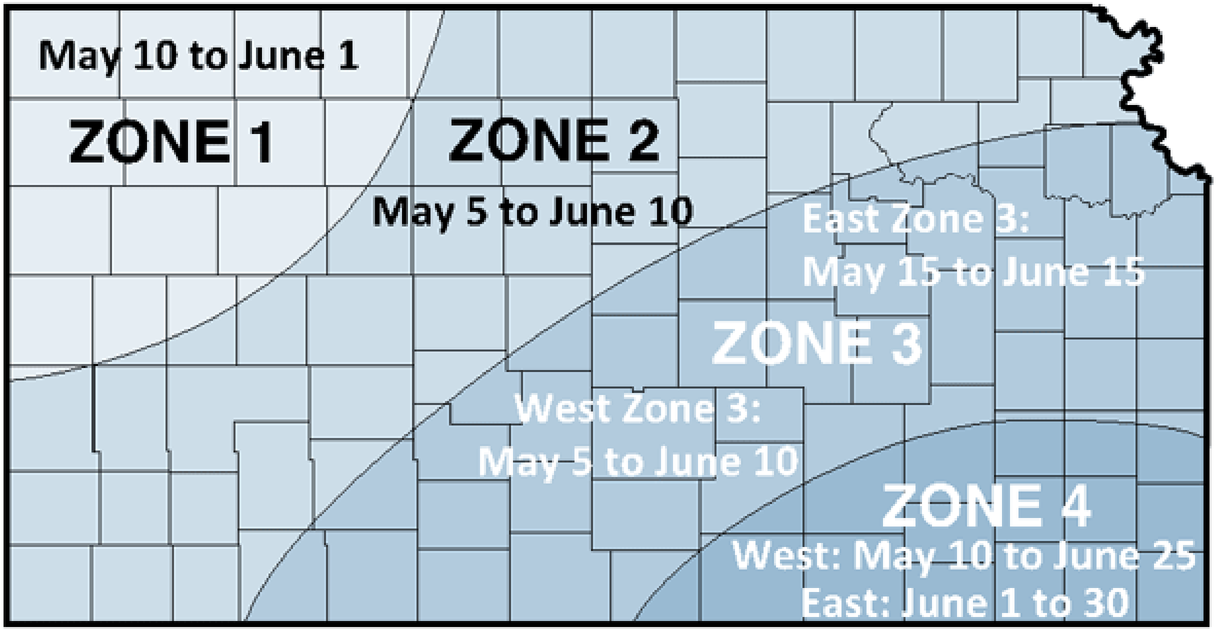
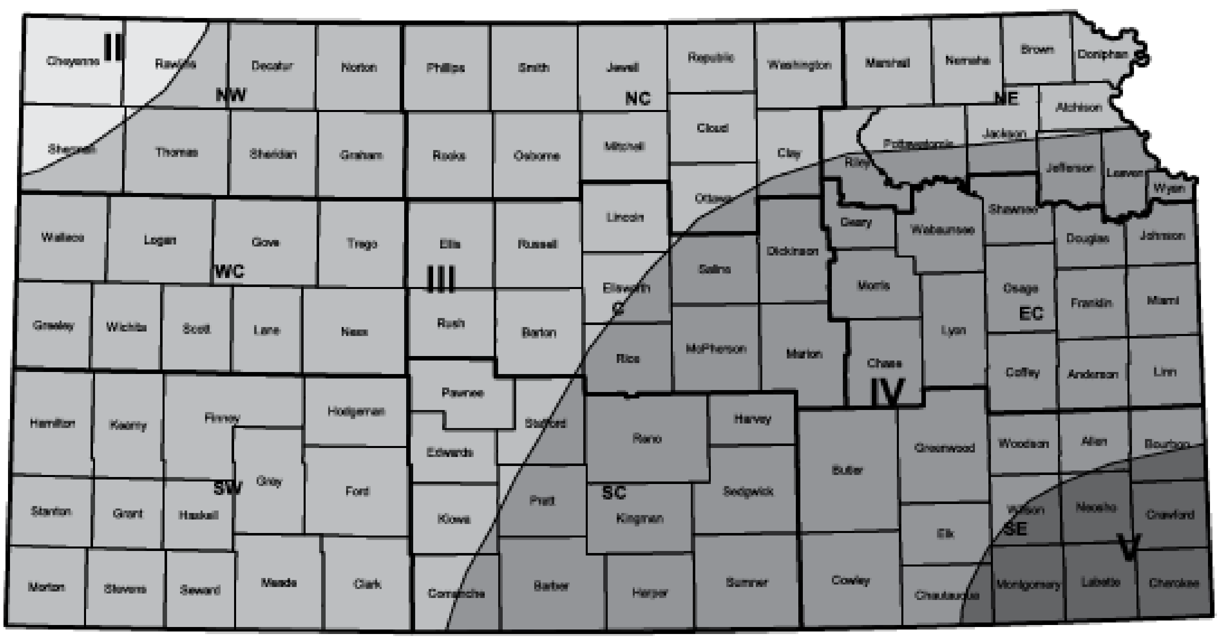


Figure 1. Trend in the date at which 50 percent of planting progress was achieved for soybean in each year from 1980 to 2014 in Kansas. Source: USDA-NASS.

Kansas Planting Dates and Maturity Groups

Soybean can be planted over a wide range of planting dates (Fig. 2a) under adequate soil moisture conditions, although germination and emergence could be reduced and delayed in cool soils, less than 50 degrees F. Recommended maturity groups vary by the area across the state (Fig. 2b).





Figures 2a and 2b. Recommended soybean planting dates and suggested maturity groups across Kansas.

K-State research: Planting Dates

A summary of K-State research studies on planting dates and relative yield advantages or disadvantages of early May planting in Kansas is presented Table 1.

Table 1. Effect of planting dates on soybean yields at seven locations in Kansas, based on K-State research. The information in this table was calculated as the yield obtained in early May planting date compared to the yield at later planting dates (mid-late May, early-mid June, and mid-late June).

	Planting Date		
	Mid-Late May	Early-Mid June	Mid-Late June
Location, Year	Yield (bu/acre) compared to Early May planting		
Powhattan, 2000-02[1]	1.7	11.4	-9.0
Belleville, 1999, 2001[1]	4.4	-26.2	-55.2
Topeka, 2000-02[1]	-4.8	-15.1	-19.2
Ottawa, 1999-2002[1]	6.6	-0.3	-25.8
Belleville, 2009-10		-6.5	
Scandia, 2009-10		-4.5	
Manhattan, 2010	-7.7	-15.3	-26.1
[1] No seed treatment in these studies			

The results can be summarized as follows:

- For Topeka and Manhattan sites, planting in early May consistently produced higher yields than other planting dates. Each day that planting was delayed from early May up to mid-late June, yields declined at an overall rate of close to 0.5 bu/acre/day.
- In Belleville (1999, 2001), mid-May planting presented a small yield benefit (4.4 bu/acre) compared to the early May time, with yields declining as the date was delayed beyond mid-late May. Research at Belleville and Scandia in 2009-2010 confirmed this trend, with a clear yield advantage for early May as compared with early-mid June planting.
- In Powhattan, under lower soybean yield (<30 bu/acre) environments, yields declined with mid-late June planting dates, and was maximized with the early-mid June planting time. Thus, for Powhattan, there was no yield benefit in planting in early May.
- In Ottawa, planting in mid-May resulted in a yield benefit of 6.6 bu/acre compared to planting in early May.

Recommendations for other regions:

Southeast: Planting from mid-May to the end of June is recommended for this region (Fig. 2). For Parsons, early-to-mid June and early July planting dates maximizes yield production. Those planting dates tend to increase soybean production because they usually allow the beans to avoid heat-drought stress and increase the probability of catching summer rains during the reproductive period.

South Central: Early planting dates are recommended for this region. For Hutchinson and Wellington, yields in K-State tests were maximized by planting in late April, which is a couple of days before the range of dates recommended in our K-State soybean management guide for planting dates (Fig. 2).

Western Kansas: Low yields were recorded in the western Kansas tests and planting dates did not affect yields.

K-State 2014 research: Planting date by maturity group

A summary of four studies on soybean planting date by maturity group performed during the 2014 growing season was recently published: Ciampitti, I. A.; Shoup, D. E.; Sassenrath, G.; Kimball, J.; and Adee, E. A. (2015) "Soybean Planting Date × Maturity Group: Eastern Kansas Summary," *Kansas Agricultural Experiment Station Research Reports*: Vol. 1: Iss. 2.
http://newprairiepress.org/kaesrr/vol1/iss2/21/

The primary outcome is that the optimum combination of soybean planting dates and maturity groups was governed by the environment (site) evaluated.

In this research, three soybean varieties (early, medium, and late maturity groups) were planted at three planting dates during the 2014 season, at Topeka, Manhattan, Parsons, and Ottawa. Maturity groups at Topeka and Manhattan locations were 2.0, 3.8, and 4.8. Planting dates were April 22, May 15, and June 3 at Manhattan; and May 2, May 20, and June 18 at Topeka. Maturity groups at Ottawa were 3.7, 4.2, and 4.8; and planting dates were May 5, May 28, and June 26. At Parsons, maturities 3.9, 4.8, and 5.6 were planted May 2, June 3, and June 26.

Under rainfed conditions at Manhattan, the mid-maturity group (3.8) was the highest-yielding at both early and late planting date. The late maturity group (4.8) outyielded the other maturity groups at the mid planting date of May 15 (Fig. 3).

Under irrigation at Topeka, group 3.8 and 4.8 (medium and late) varieties maximized yields at the earliest planting date (May 2), with yields >70 bu/a (Fig. 3). Lower yields were observed for the mid-May vs. early planting date, with the exception of the late-maturing group (4.8). For the late planting time (June 18), group 3.8 (yields >60 bu/a) significantly outyielded groups 2.0 and 4.8 (yields <45 bu/a).

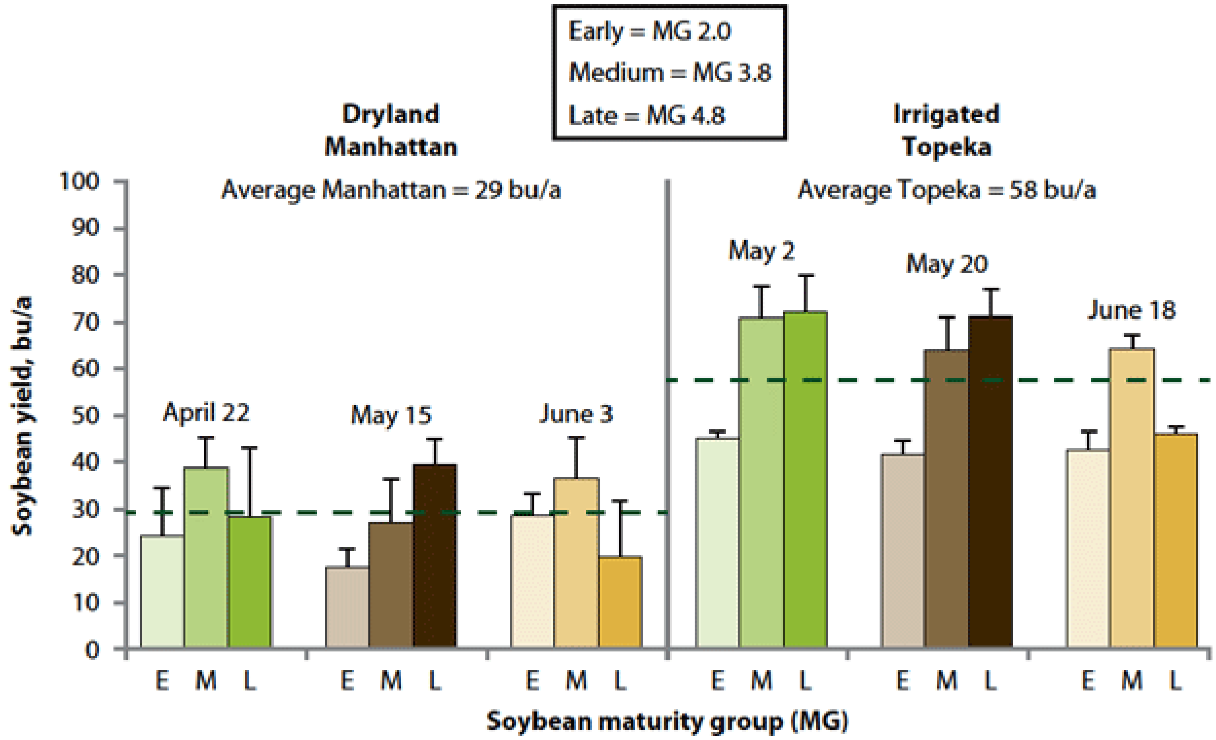


Figure 3. Soybean yields with different planting dates (early, mid, and late) and maturity groups (E = early, M = medium, L = late maturing groups) for Manhattan and Topeka.

Under rainfed conditions at Ottawa, yields were similar, but generally greater for May 28 (mid-planting date) as compared with May 5 (early) across all maturity groups (around 35 bu/a) (Fig. 4). At the late planting date (June 26), yields increased with the later maturity groups.

At Parsons (rainfed), group 3.9 (early) outyielded the other maturity groups for the May 2 planting date. On the opposite side, later-maturing soybean groups yielded better for the other planting dates (June 3 and 26) (Fig. 4). Although a trend in the data supported timing of planting to capture fall rains to enhance yield, the results were not statistically significant between the later maturity groups.

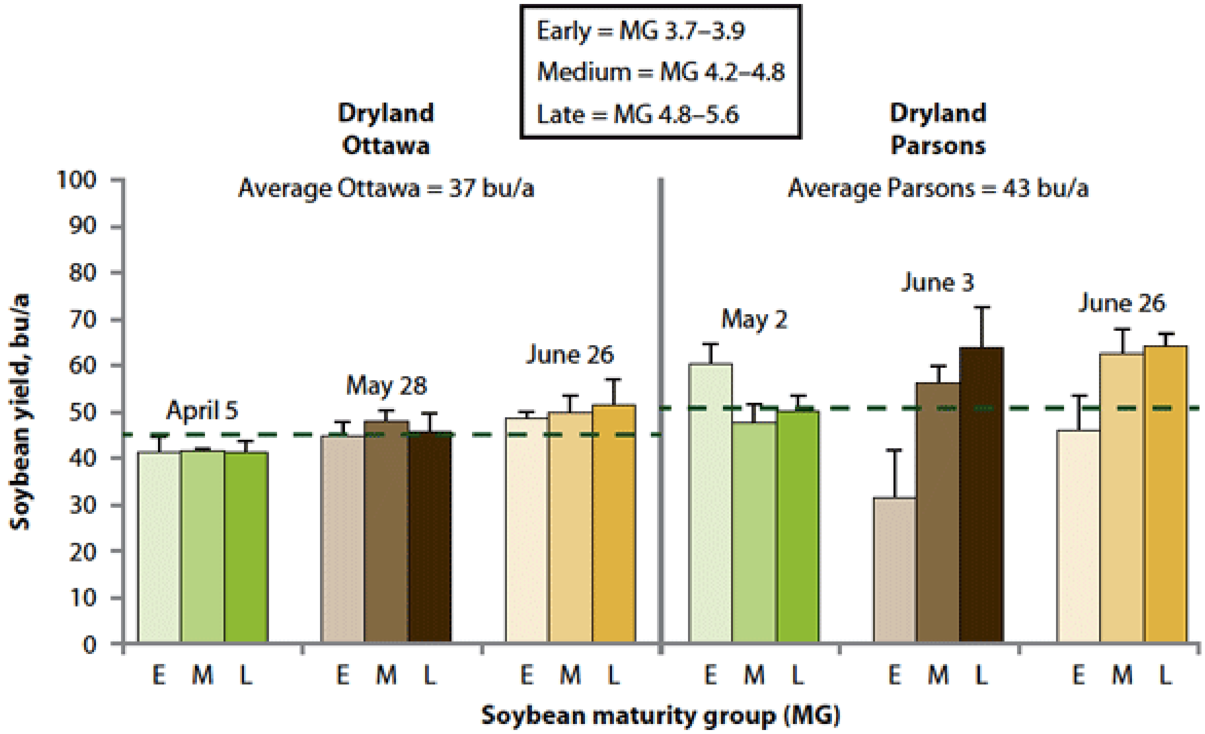


Figure 4. Soybean yields with different planting dates (early, mid, and late) and maturity groups (E = early, M = medium, L = late maturing groups) for Ottawa and Parsons.

Conclusions and recommendations

- Ultimately, weather patterns dictate soybean yields, especially under dryland conditions. There is no guarantee that any certain planting date will always work out the best when it comes to soybean yields in Kansas. In fact, the distribution and amount of rainfall and the day/night temperature variations around flowering and during the grain filling periods have large impacts in defining soybean yield potential. Thus, when the risk of drought stress during the growing season is high, diversifying planting dates may be a good approach to consider.
- When planting early, seed should be treated with a fungicide and insecticide. Selecting varieties with resistance to soybean cyst nematode and sudden death syndrome is advisable. Do not plant into soils that are too wet, however. Also, do not plant until soil temperatures are at least 50 degrees F. If planted into soils cooler than that, seedlings may eventually emerge but will have poor vigor.
- In drier areas of Kansas and on shallow soils, yields have been most consistent when planting soybeans in late May to early June. By planting in that timeframe, soybeans will bloom and fill seed in August and early September, when nights are cooler and the worst of heat and

drought stress is usually over.

- In our 2014 planting date by maturity group study, interactions with the environment are the primary factor in the yields and maturity group responses. Under full irrigation, the earliest planting date maximized yields with groups close to 4 and 5 maturity at Topeka. For our rainfed sites, there is not one rule that can apply to all conditions, but late planting showed good yields at Ottawa and Parsons (June 26) with later-maturing groups.
- New studies are planned for the 2015 growing season for similar locations.

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2. Updated publication comparing wheat fungicides now available

The newly updated K-State publication *Foliar Fungicide Efficacy Ratings for Wheat Disease Management, 2015*, EP130, is now available. This publication focuses on the most widely marketed fungicides in Kansas and examines how effective these products are at controlling the most common leaf diseases. This publication can be found at: http://www.ksre.ksu.edu/bookstore/pubs/EP130.pdf

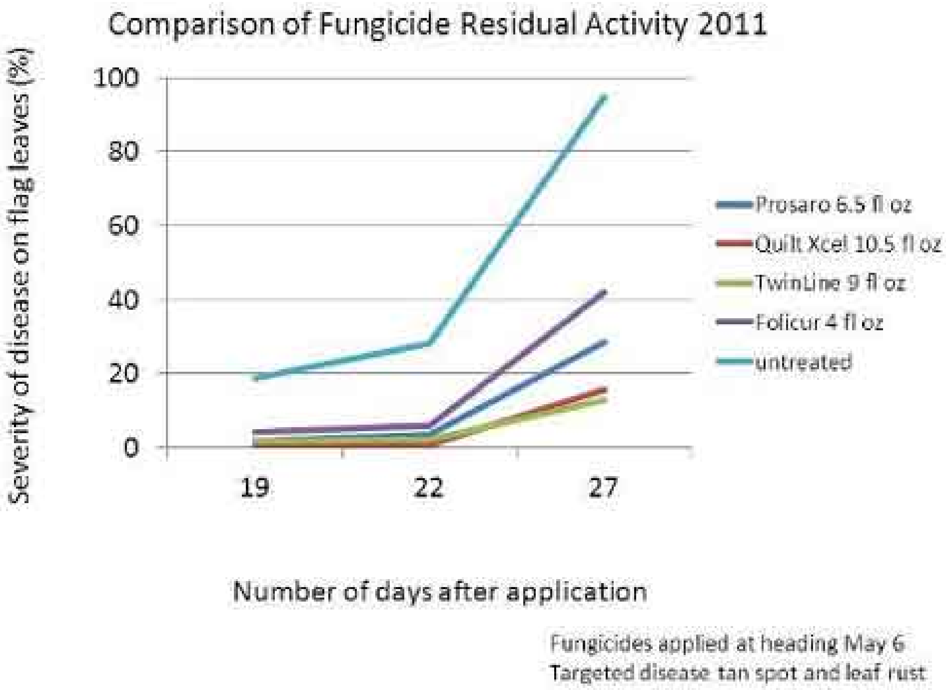
In recent years, I have received a lot of questions about the length of residual activity of the different fungicide products and questions about the nature of the fungicidal activity of the products. Below are some thoughts to consider when evaluating the product options.

Residual life of fungicides

The research that I have reviewed indicates that fungicides listed in the publication *Foliar Fungicide Efficacy Ratings for Wheat Disease Management 2015* will generally provide 21 days of good protection against fungal diseases. This includes products with the active ingredient tebuconazole that is listed in the table as the product Folicur but is also marketed in a number of generic formulations. The diseases will often begin to recover and there are differences in residual life after this 21-day period.

The residual life of the fungicide is influence by many factors, including the rate at which the product is applied, the targeted disease, the level of disease pressure, and weather conditions. Fungicides applied at the full-labeled rate will generally have longer residual life. Fungicides will generally provide longer residual life against rust diseases (often more than 21 days) than leaf spot diseases. Some of the products may provide additional residual life but this extra residual does not always translate into more grain yield.

The chart below is just one example of the type of data that supports the 21-day residual activity for the various fungicide products.



Pre- and post-infection activity

The comparison of fungicide products often includes a discussion of terms like preventive vs. curative activity. These terms have confused a lot of people and I think we should be discussing the fungicides in terms of pre-infection or post-infection activity.

Both the triazole fungicides (Prosaro, Caramba, Tilt, and Folicur) and the strobilurin fungicides (Headline, Aproach, and Evito) prevent new infections from developing on healthy plants and are best applied when disease is at low levels. We might consider this pre-infection activity. The triazole fungicides are generally considered to provide some post-infection activity as well. This means that they can stop the development of fungi during the early stages of the infection process when the fungus begins to invade and colonize the plant. Because the strobilurin fungicides lack this post-infection activity, they are often combined with triazoles in mixed mode of action fungicides such as Quilt Xcel, Stratego YLD, and Twinline.

Summary

The bottom line is that producers have a lot of excellent fungicide options. A little time spent up front evaluating the options and their costs will help make you make a good decision later. In my experience, based on the all the data I have seen in research trials in Kansas and other states, correctly identifying when fungicides are needed, or not needed, is more important than which product you use.

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In the article on weed control in grain sorghum in last week's issue of the Agronomy eUpdate (No. 501, April 2, 2015) there was a discussion of preemergence products for pigweed control. In that discussion, one section may have implied that Verdict could be added to Lumax EZ or Lexar EZ to enhance pigweed control. This should have been more clearly stated to explain that Verdict could be added to an atrazine-chloracetamide herbicide product to enhance pigweed control, not to Lumax EZ or Lexar EZ. The correct information, which is reflected in the version of that article on our eUpdate web site, is as follows:

"Control of pigweeds in sorghum is an increasing concern across the state. Using a soil-applied chloracetamide herbicide with atrazine (such as Bicep II Magnum, Bicep Lite II Magnum, Outlook, Degree Xtra, Fultime NXT, or generic equivalents of these products) will greatly enhance controlling pigweeds. Some of the broadleaf escapes producers can expect when using the chloracetamide/atrazine mixtures are devilsclaw, puncturevine, velvetleaf, morningglory, atrazine-resistant kochia, and atrazine-resistant pigweeds. The addition of 10 oz of Verdict, which is a mix of 2 oz of Sharpen and 8.3 oz of Outlook, can help control triazine-resistant pigweeds as well as the large-seeded broadleaf weeds. The chloracetamide/atrazine herbicides will do a very good job of controlling most annual grassy weeds.

"Using a product such as Lumax EZ or Lexar EZ preemergence, which contains mesotrione (Callisto), will help control the triazine-resistant pigweeds and kochia."

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4. Winter stand losses in canola: A comparison of two seasons

For the second straight year, the hardiness of winter canola has been put to the test across Kansas. Winterkill has been observed in research trials and producers' fields from the Nebraska border to the Oklahoma border. Winterkill can depend on location, variety, and management. Fields planted a few miles from each other have shown dramatic variation in survival. Not all fields have been affected this year; fields in some parts of south central Kansas will see no impacts from winter stand losses. However, some precipitation would be helpful.

The freeze of November 2014

Winter survival is a complex trait that is influenced by many factors. We often see winterkill when a period of warm temperatures is followed by an intense decline in temperatures. That was definitely the case in 2014-2015, as the mid-November cold snap came at an inopportune time for the crop. For example, in Manhattan temperatures were very mild from September through early November, with only one hard freeze event about November 1. However, for adequate winter hardening prior to bitterly cold temperatures setting in, a few hard freezes (~26 degrees F) are beneficial to slow leaf growth, reduce cell size, and increase the concentration of soluble substances in cells making the plants more tolerant to freezing.

Figure 1 shows the low temperatures for the time period of September 1 to March 31 for the 2013-2014 and 2014-2015 growing seasons, and the 30-year average lows. A few differences can be observed. First, winter temperatures in 2013-2014 were bitterly cold for several long and frequent periods of time throughout the season. Ultimately, the duration of the cold temperatures was the most impactful factor causing winterkill.

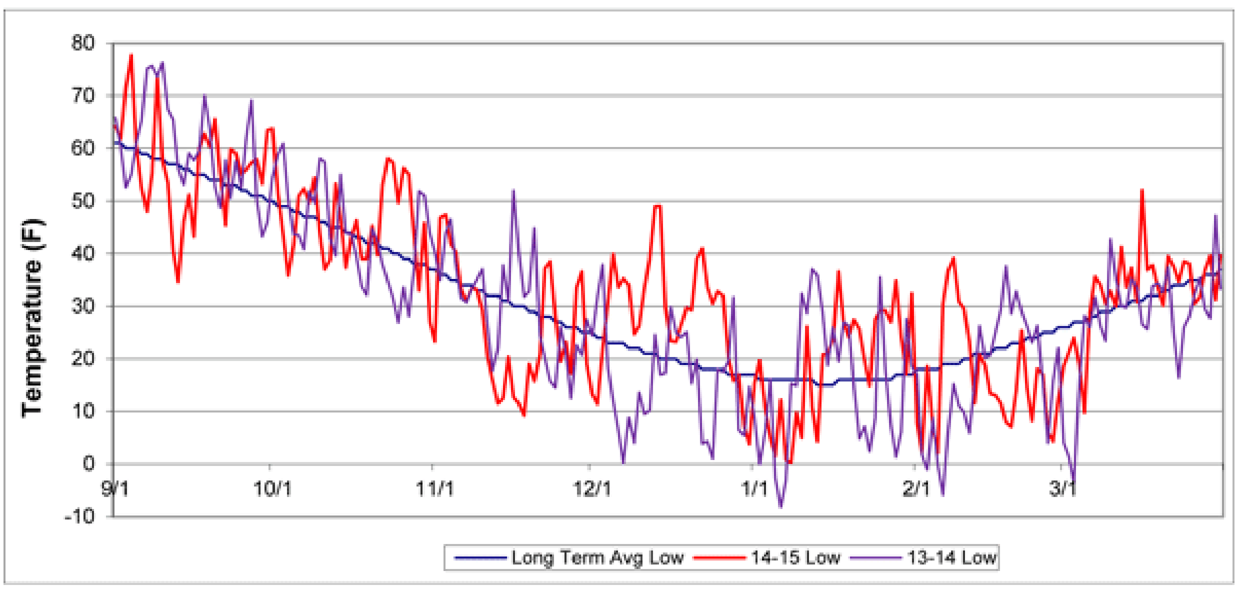

Figure 1. Low temperatures recorded in Manhattan for the past two canola growing seasons.

Secondly, in 2014-2015, low temperatures were running about normal in the early fall, then there was a rapid decline in low temperatures in mid-November, followed by periods of above-normal low temperatures then by periods of below-normal low temperatures. The rapid decline in low temperatures quickly and severely desiccated a green, leafy crop that had not adequately winter-hardened. Additionally, low temperatures didn't return to normal for more than a week. This and the up-and-down fluctuations in winter temperatures were the most impactful factors causing winterkill in 2014-2015. In all likelihood, if we would have experienced a normal acclimation period, the rapid decline in temperatures would not have been so devastating.

In some cases, there was complete winterkill when the crop had adequate growth going into the winter. See figures 2 and 3 as an example. This has been a rare occurrence over the past two decades. Major winter stand losses most often occur when a management factor is involved. For example: 1) late planting resulting in too little fall plant growth, 2) too much fall plant growth causing crown elevation to an unprotected position above the soil surface, 3) no-till seeding without proper residue management, and/or 4) planting a variety outside of its area of adaptation.

Figure 2. Winter canola trials at the South Central Experiment Field – Redd Foundation on October 23, 2014, with adequate growth for the winter. Photo by Mike Stamm, K-State Research and Extension.

Figure 3. Winter canola trials at the South Central Experiment Field – Redd Foundation on March 10, 2015. These trials were abandoned because of complete winterkill. Photo by Mike Stamm, K-State Research and Extension.

Fluctuating temperatures can have unseen negative consequences on crop growth and development. Sometimes freezing and thawing causes cracking in the crown or root, allowing fungi to enter that cause root decay (figure 4). Plants may appear to regrow normally in the spring, but after some time the severely damaged plants will wilt, turn bluish-gray, and eventually die (figure 5). We are starting to see this occur in a few fields. Other plants may continue to grow normally and never show any signs of damage.

Figure 4. Root decay caused by physical crown damage as a result of freezing and thawing. If severe enough, this could cause further plant loss. Photo by Mike Padgham, private crop consultant.

Figure 5. Spring stand loss caused by severe crown damage over the winter. Photo by Scott Dooley, K-State Research and Extension.

What is the impact for 2014-2015?

Canola can compensate for a thin stand because it is an indeterminate crop, producing more flower buds than it can actually support. Canola will branch out and fill in gaps in the field when stands are reduced, much like a soybean will in a reduced stand. However, moisture is critical for recovery, especially when much of the aboveground vegetation has been lost.

In 2013-2014, the canola crop in this region suffered a lack of precipitation and repeated late spring freezes at flowering and grain fill. The flowering and grain fill periods are the points of peak water demand for canola. Thus, dry spring weather in combination with winter stand thinning caused yields to be below average across much of the state. This was the case in Belleville and Hutchinson last season. See the *2014 National Winter Canola Variety Trial* report of progress for Kansas locations and others across the U.S. (http://www.ksre.ksu.edu/bookstore/pubs/SRP1116.pdf)

In 2014-2015, spring conditions have been mild but we are starting to see the impact of the continued drought as the crop enters flowering. Timely rainfall and mild temperatures would go a long way toward helping the crop recovery from another challenging winter.

There are positives to this story. 1) Differential winterkill (figure 6) did occur at a few locations, meaning we have useable winter survival ratings for many of the commercial varieties we grow. 2) We now know the adaption limits of many varieties and we can make better variety recommendations for Kansas canola growers. This is important information for us to make winter canola consistent and profitable. We certainly have to be more careful in which varieties we choose, especially for canola growers north of US Hwy.50 in Kansas. Watch future Agronomy eUpdates for a summary of survival ratings and additional discussion on variety selection.

Figure 6. Differential winterkill was observed in the OSU Winter Canola Performance Trial near Pond Creek, Okla. Photo taken on March 15, 2015, by Mike Stamm, K-State Research and Extension.

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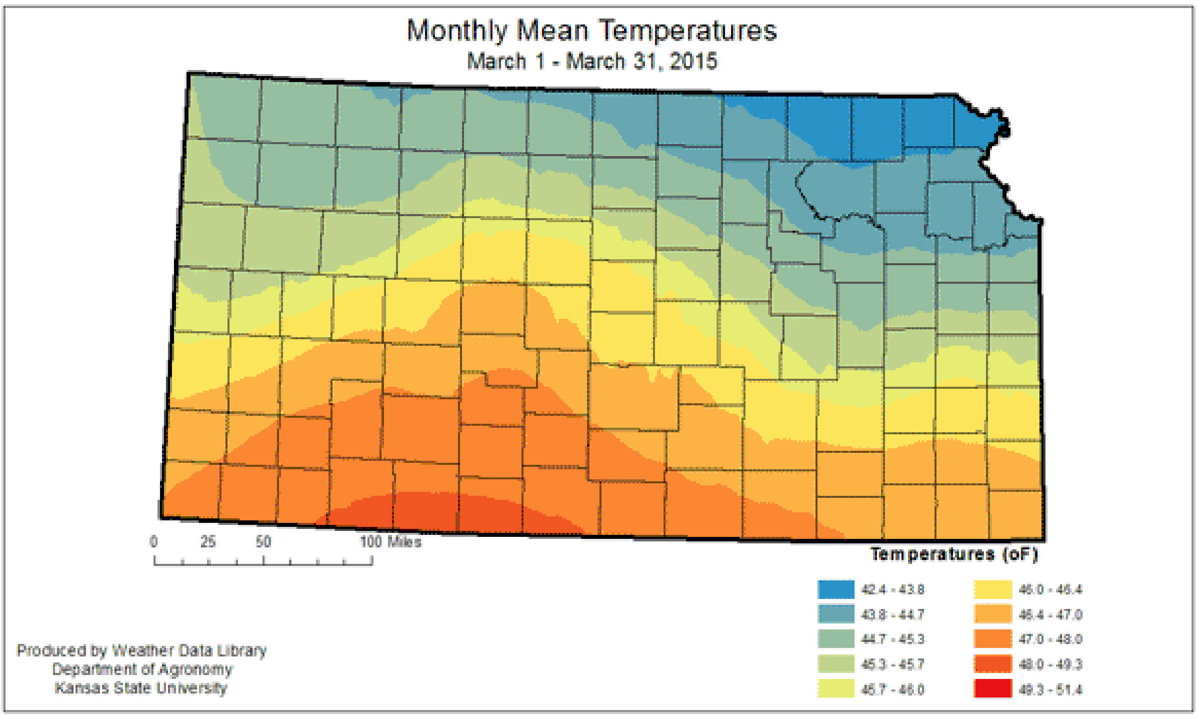
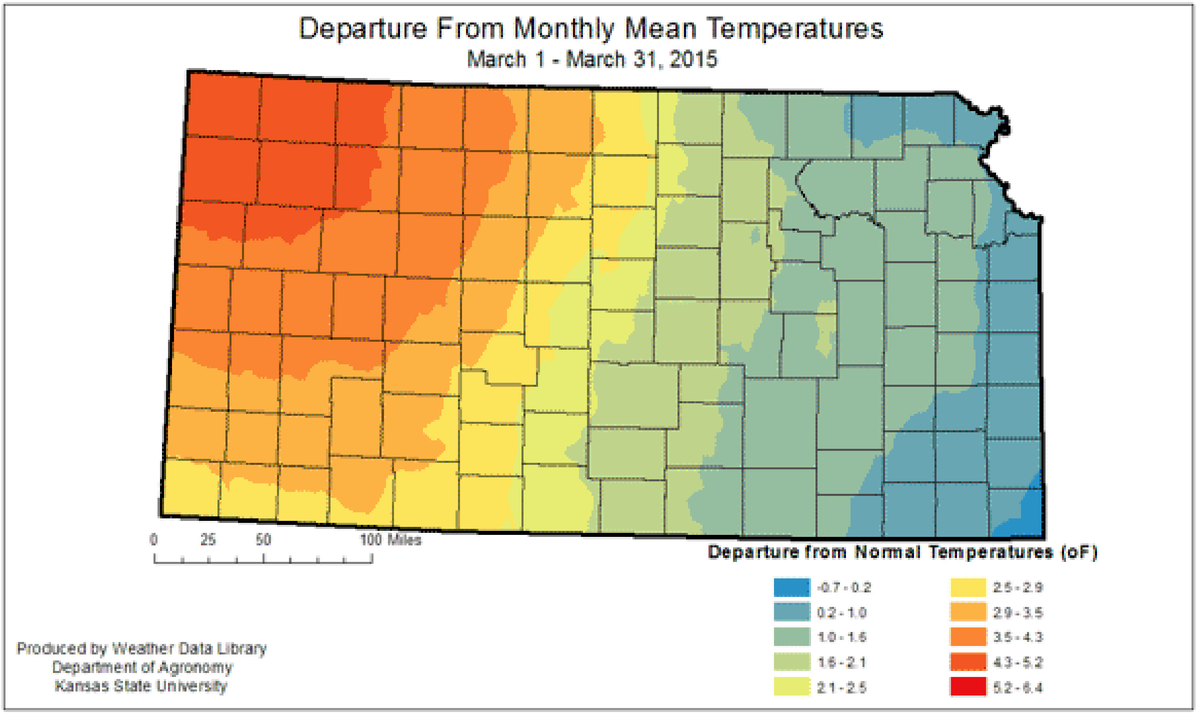
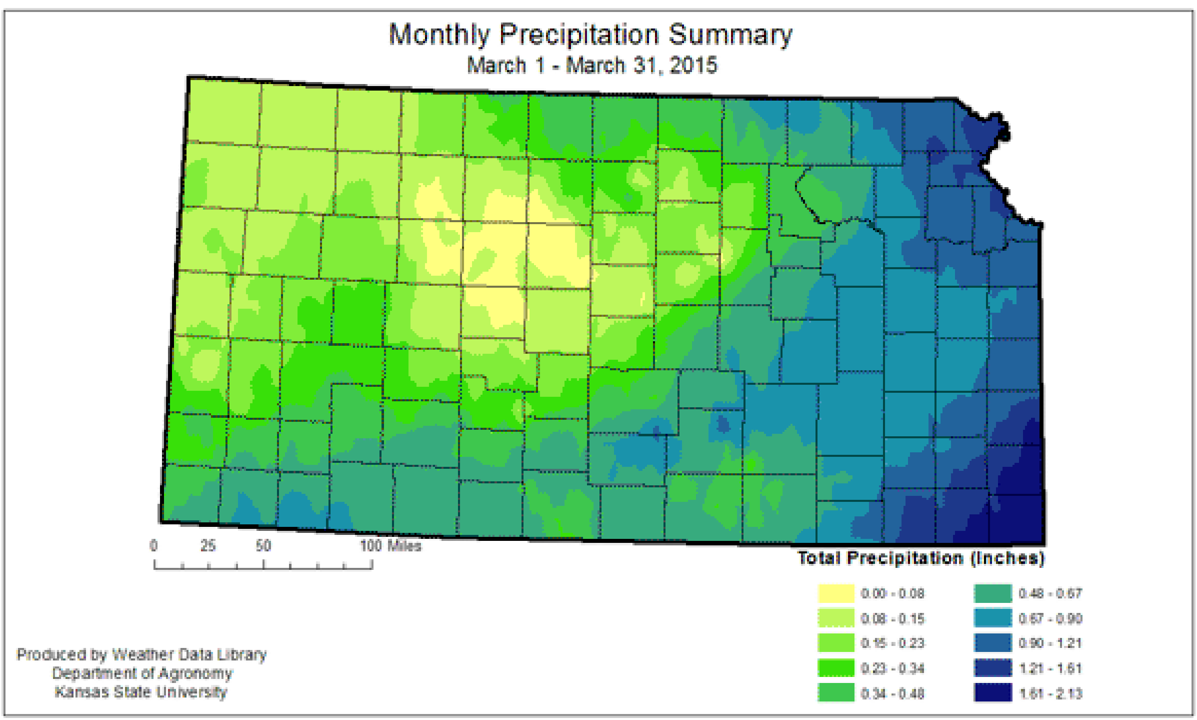
5. Summary of March weather in Kansas: Another roller coaster

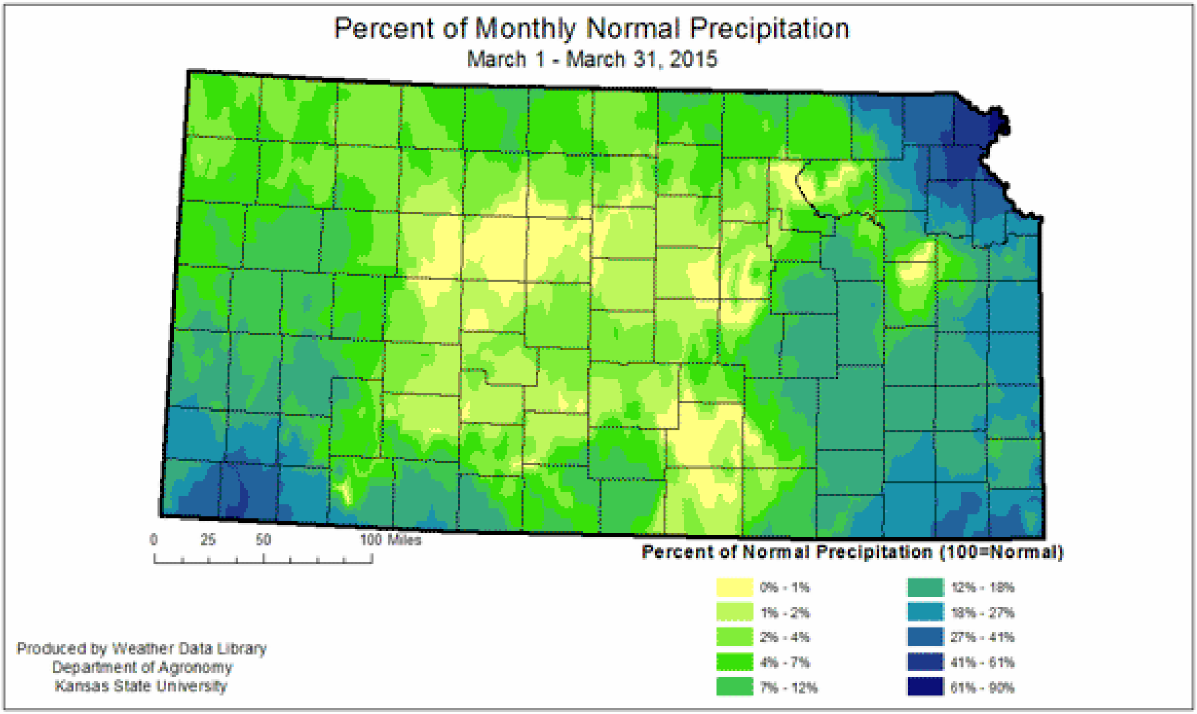
March lived up to its reputation as a transitional month. Overall, the temperatures averaged 45.7 degrees F, which was 2.4 degrees warmer than normal. It ranks as 33rd warmest since 1895 or in the warmest third of the period of record. This tells only part of the story, as temperatures went from lows in the single digits at the beginning of the month to highs above 90 degrees F in the middle of the month. The warmest departures from average were in the Northwestern Division, while the coolest conditions prevailed in the Southeastern Division. The highest temperature recorded for the month was 95 degrees F at Norton Dam the 17th. The coolest reading for the month was 1 degrees F at Mankato on the 5th. With the warmer-than-average temperatures for the month, it is not surprising that 79 new record daily highs were set. None of those records were new record highs for the month. More surprising is the fact that we still had 4 record low daily maximums. On the low temperature side, few records were set. There were 2 record low minimums set and 2 record high minimums recorded.



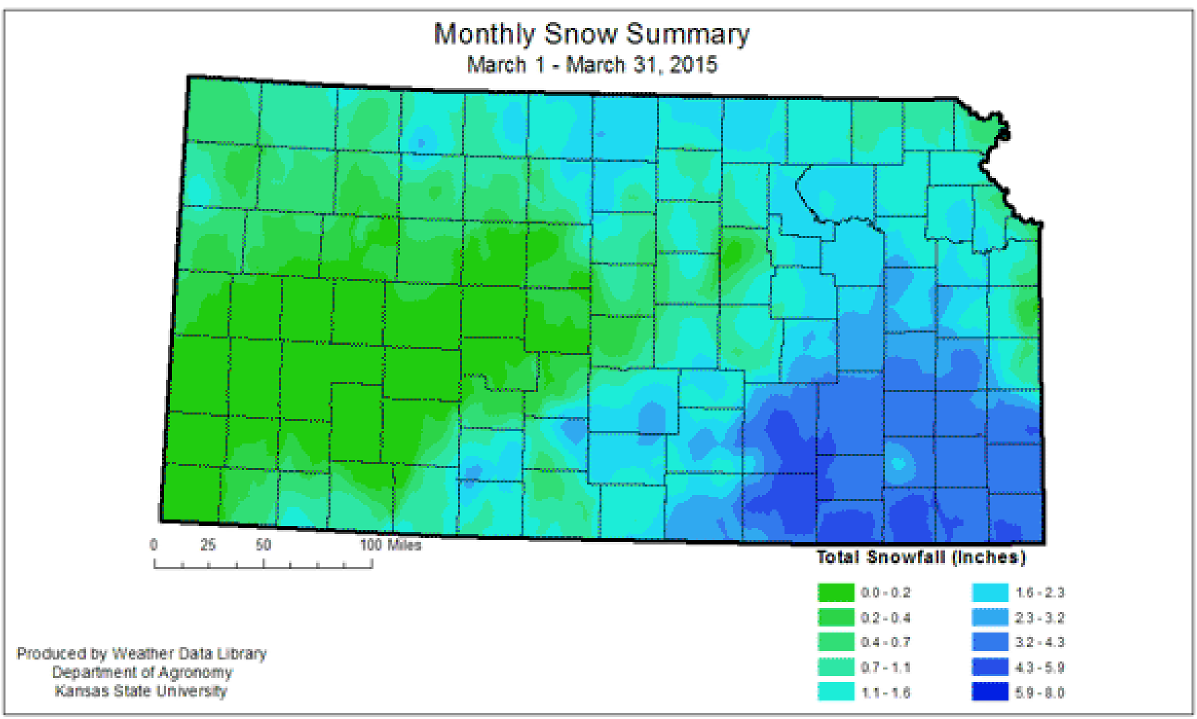


Statewide average precipitation was 0.45 inches which was just 19 percent of normal. Unfortunately, that deficit averages -1.67 inches. The Northwest and West Central Divisions averaged less than 10 percent of normal for the month. The Southwestern Division came closest to normal with an average of 0.46 inches, or 34 percent of normal. The Southeastern Division had the highest average amount at 0.92 inches. Unfortunately, they typically see more precipitation in March than other divisions, and that amount translates to just 29 percent of normal.





Few severe weather events were reported in March. A major snow event occurred at the first of the month, with highest totals in the Southeastern Division. There were also 13 hail events, most occurring in the South Central and Southeastern divisions.



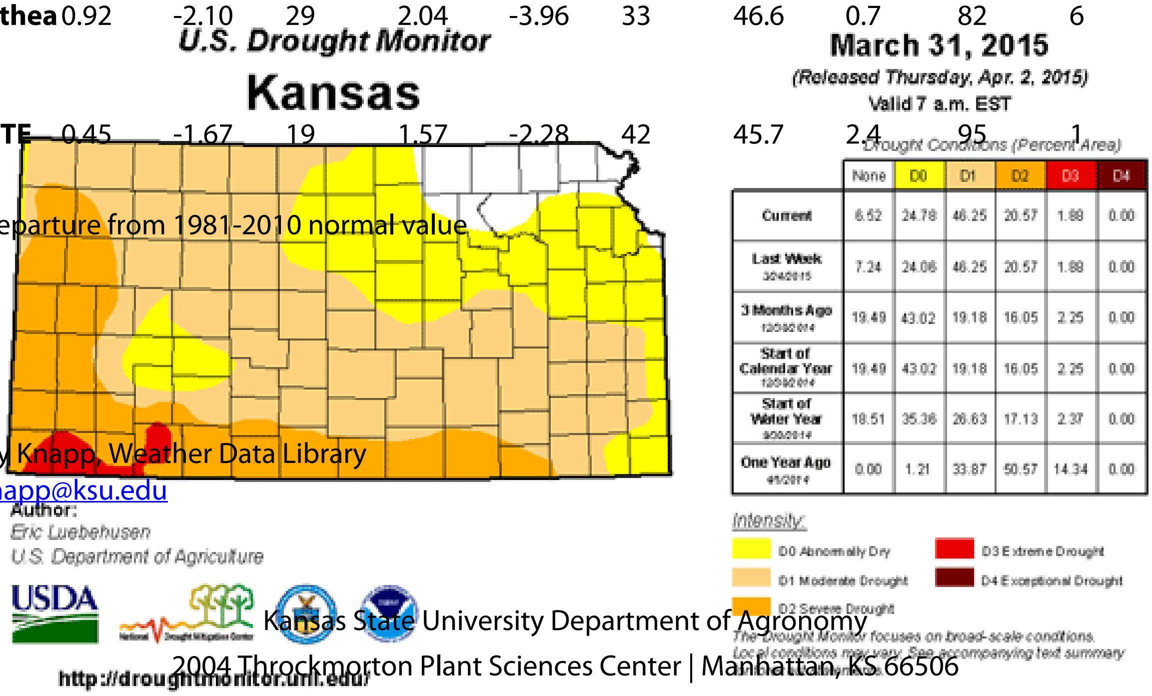
Drought conditions persist across the state, particularly in the west. There was widespread degradation in the western portions of the state. The drought-free portion of the state shrunk to nearly zero. While an El Niño/Southern Oscillation (ENSO) continues, it is weak and the impacts are uncertain. The April temperature outlook calls for warmer-than-normal conditions for most of the state. The precipitation outlook is for drier-than-normal conditions. This does not indicate how that moisture might be distributed. Given the monthly outlooks, drought conditions are likely to intensify over the next month.

March 2015

Kansas Climate Division Summary

	Precipitation (inches)						Temperature (°F)			
	Mar 2015			2015 Jan through Mar					Monthly Extremes	
Division	**Total**	**Dep.** [1]	**% Normal**	**Total**	**Dep.** [1]	**% Normal**	**Ave**	**Dep.** [1]	**Max**	**Min**
Northwest	0.06	-1.25	4	0.53	-1.77	24	44.9	4.7	95	4
West Central	0.09	-1.31	6	0.84	-1.66	34	45.4	3.8	94	8
Southwest	0.46	-0.90	34	1.83	-0.55	79	47.4	3.3	93	7
North Central	0.25	-1.77	11	1.31	-2.16	36	44.6	2.4	93	1
Central	0.32	-1.93	13	1.48	-2.47	37	46.1	2.4	90	6
South Central	0.47	-2.16	18	1.63	-2.99	36	47.4	1.9	88	5
Northeast	0.68	-1.60	29	2.13	-2.08	50	44.0	1.4	87	4
East Central	0.67	-1.98	25	2.12	-2.80	43	44.9	1.1	87	5
Southeast	0.92	-2.10	29	2.04	-3.96	33	46.6	0.7	82	6
STATE	0.45	-1.67	19	1.57	-2.28	42	45.7	2.4	95	1

1. Departure from 1981-2010 normal value



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6. Comparative Vegetation Condition Report: March 24 - April 6

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:

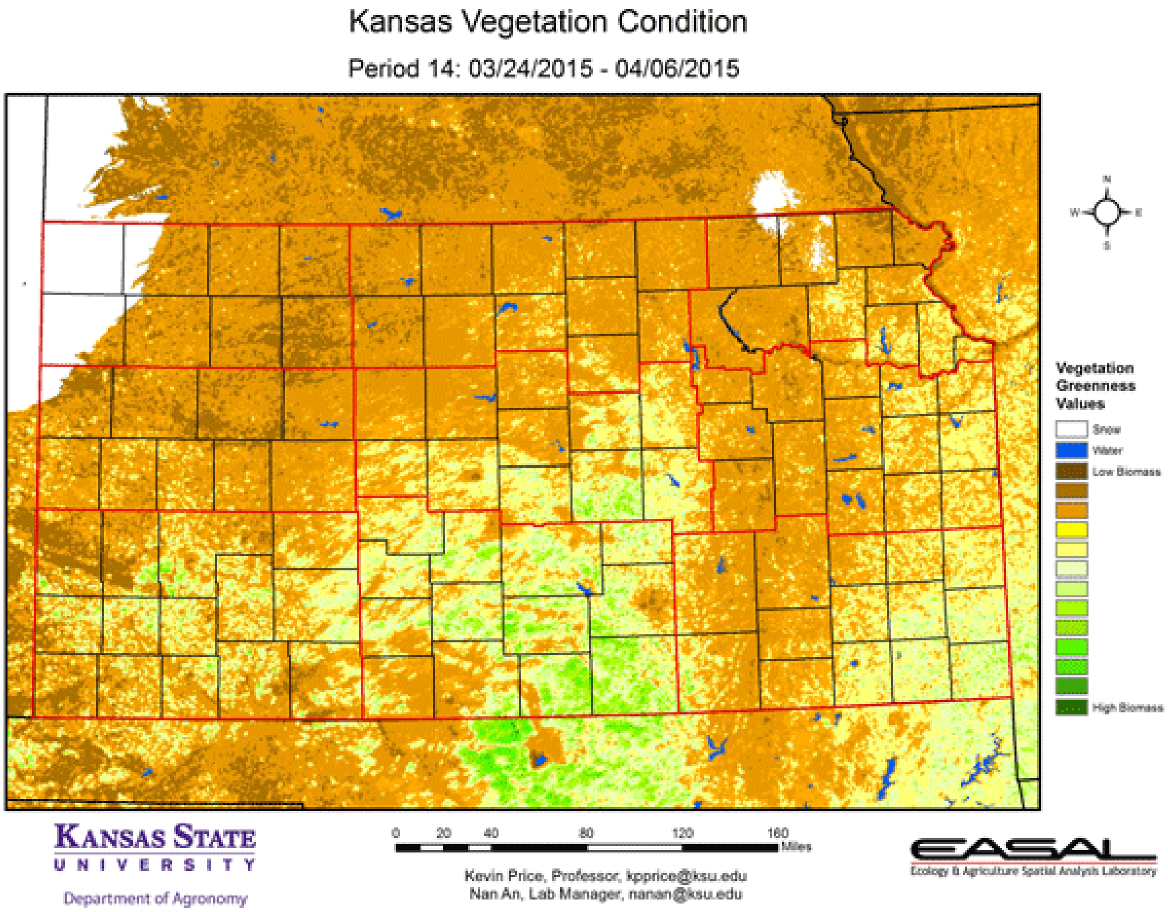

Figure 1. The Vegetation Condition Report for Kansas for March 24 – April 6 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that snow still hadn't left the state during this two-week period. Amounts were limited and quickly melted. From preliminary numbers, the highest amount reported was 3.6 inches on April 4th, at Colby. Unfortunately, the moisture was limited. That snow total translated to just 0.53 inches of precipitation.

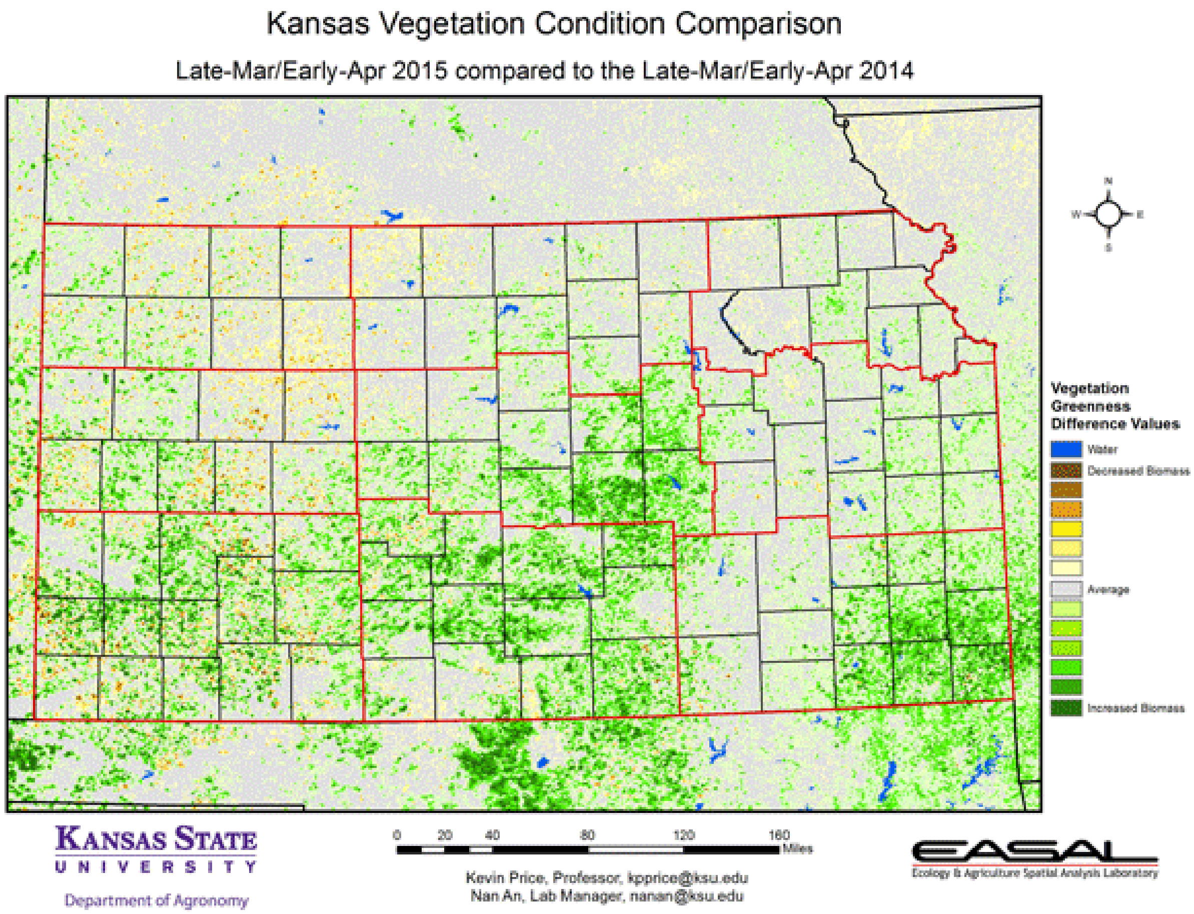

Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for March 24 – April 6 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows the warmer conditions have led to a greater level of photosynthetic activity over most of the central and southern divisions. Extreme southeastern Kansas, where moisture has been more plentiful, has the broadest area of increased vegetative activity.

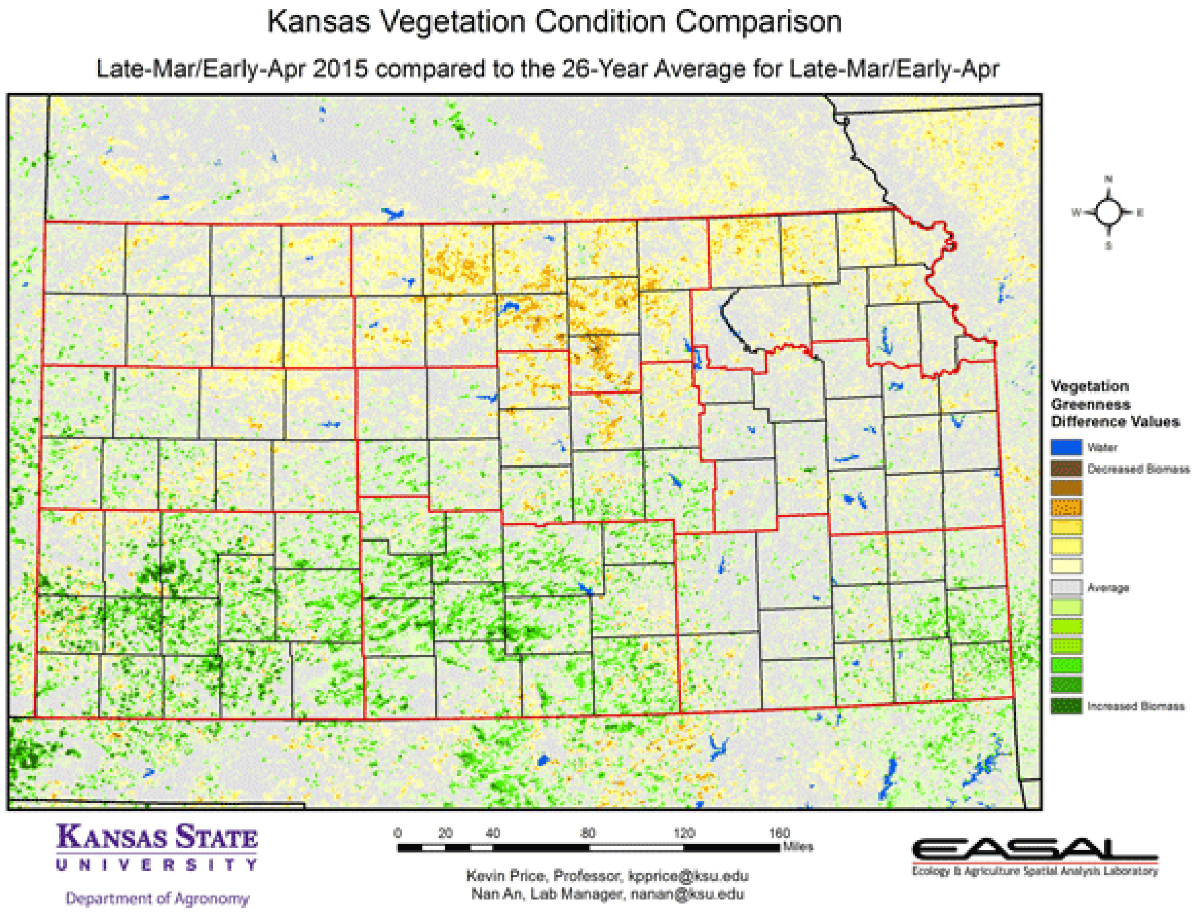

Figure 3. Compared to the 26-year average at this time for Kansas, this year's Vegetation Condition Report for March 24 – April 6 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that southwest and south central have the greatest increase in plant development. Unfortunately, this is the area with the lowest temperatures during the April 3-4 freeze event. Damage from that freeze will take some time to be visible on the condition map. In north central Kansas the combination of cool temperatures, dry soils, and winterkill are visible in lower-than-average photosynthetic activity.

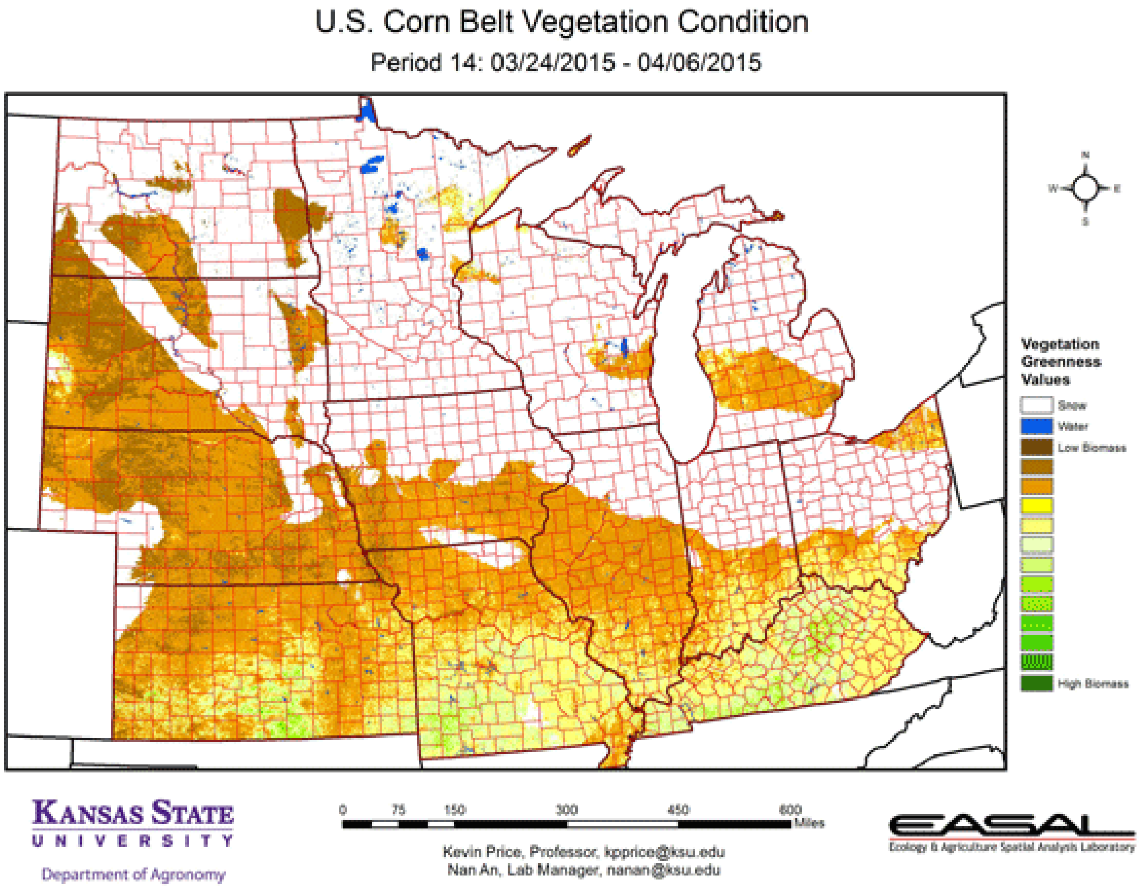

Figure 4. The Vegetation Condition Report for the Corn Belt for March 24 – April 6 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that snow continues in the northern portions of the region. This snow was mostly light and limited in coverage. Snow cover does persist in the Upper Peninsula of Michigan.

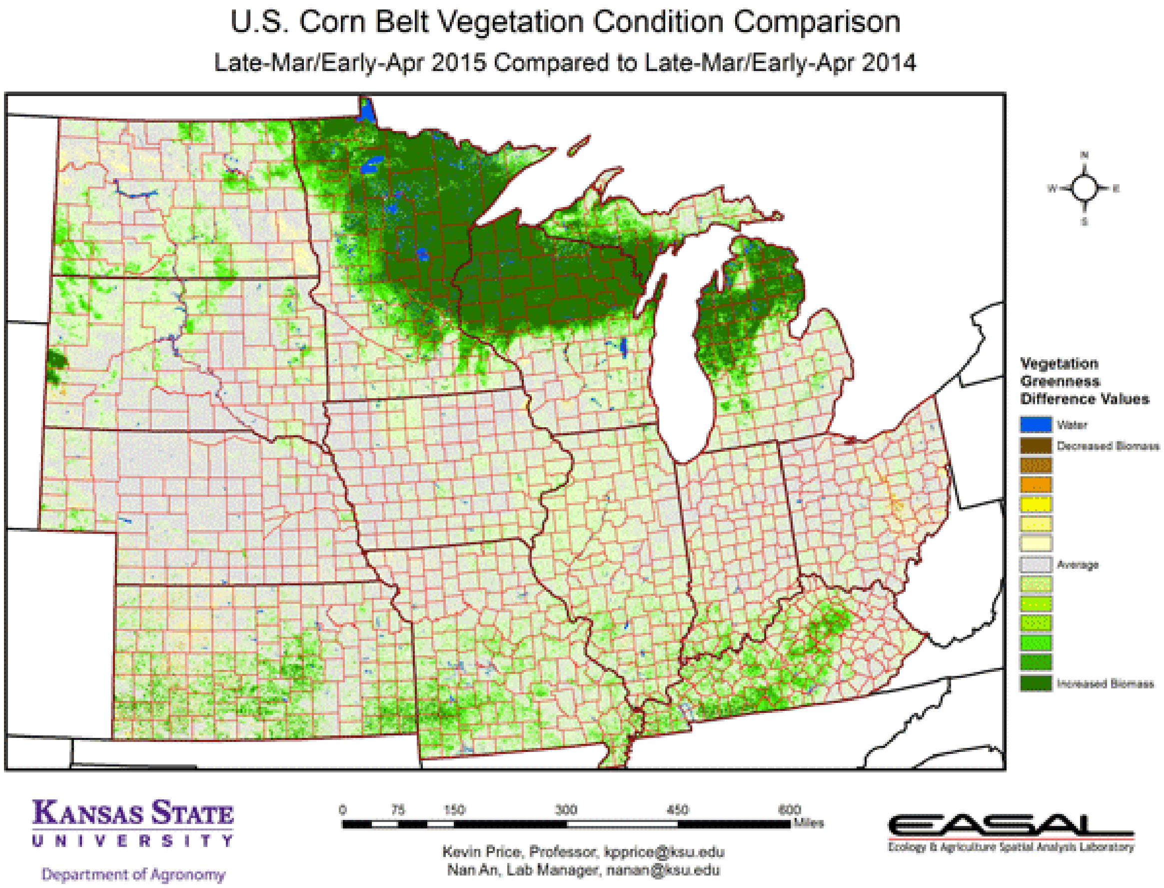

Figure 5. The comparison to last year in the Corn Belt for the period March 24 – April 6 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the area of greatest increase in photosynthetic activity is in northern Minnesota and Wisconsin. This drops off quickly in the Upper Peninsula of Michigan, where snow cover is still prominent.

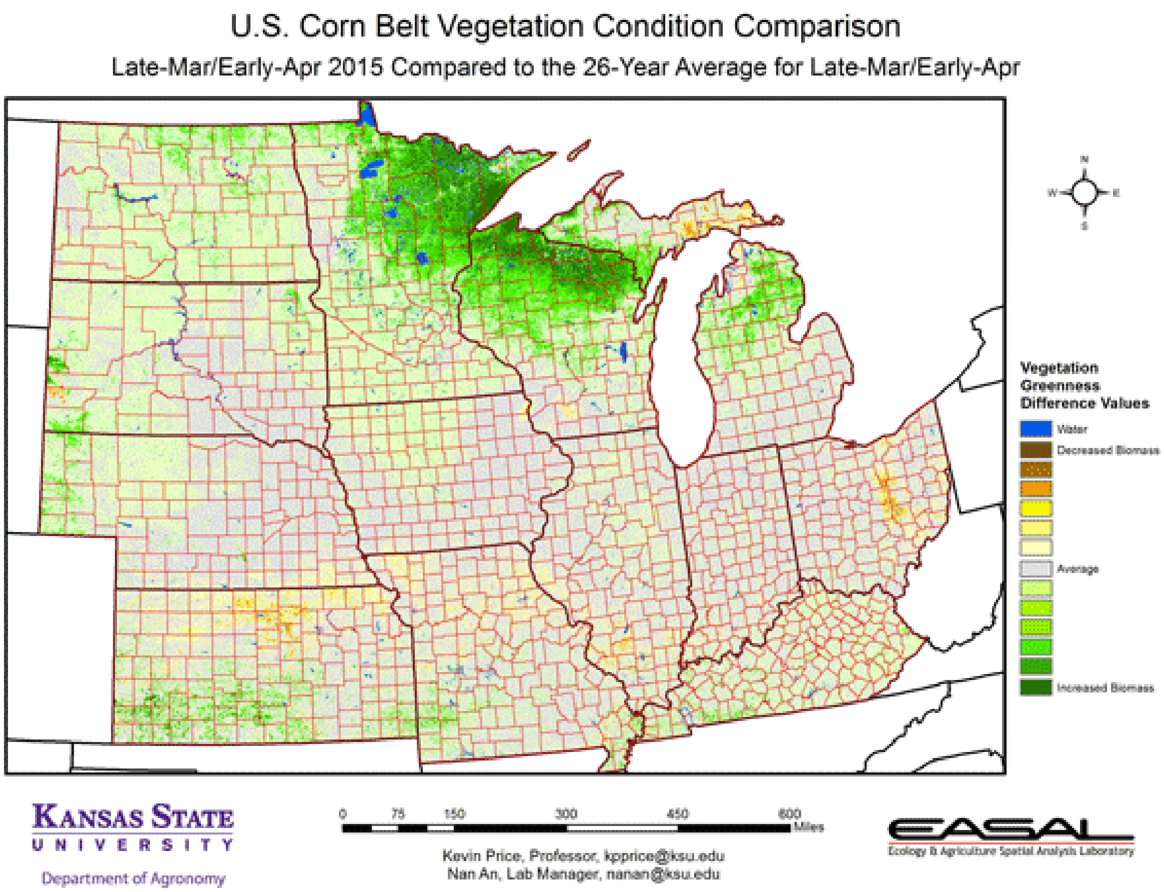

Figure 6. Compared to the 26-year average at this time for the Corn Belt, this year's Vegetation Condition Report for March 24 – April 6 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows the sharp contrast between the snow-covered Upper Peninsula of Michigan and the clear areas of northern Wisconsin. Drought conditions continue to intensify in northern Minnesota and Wisconsin.

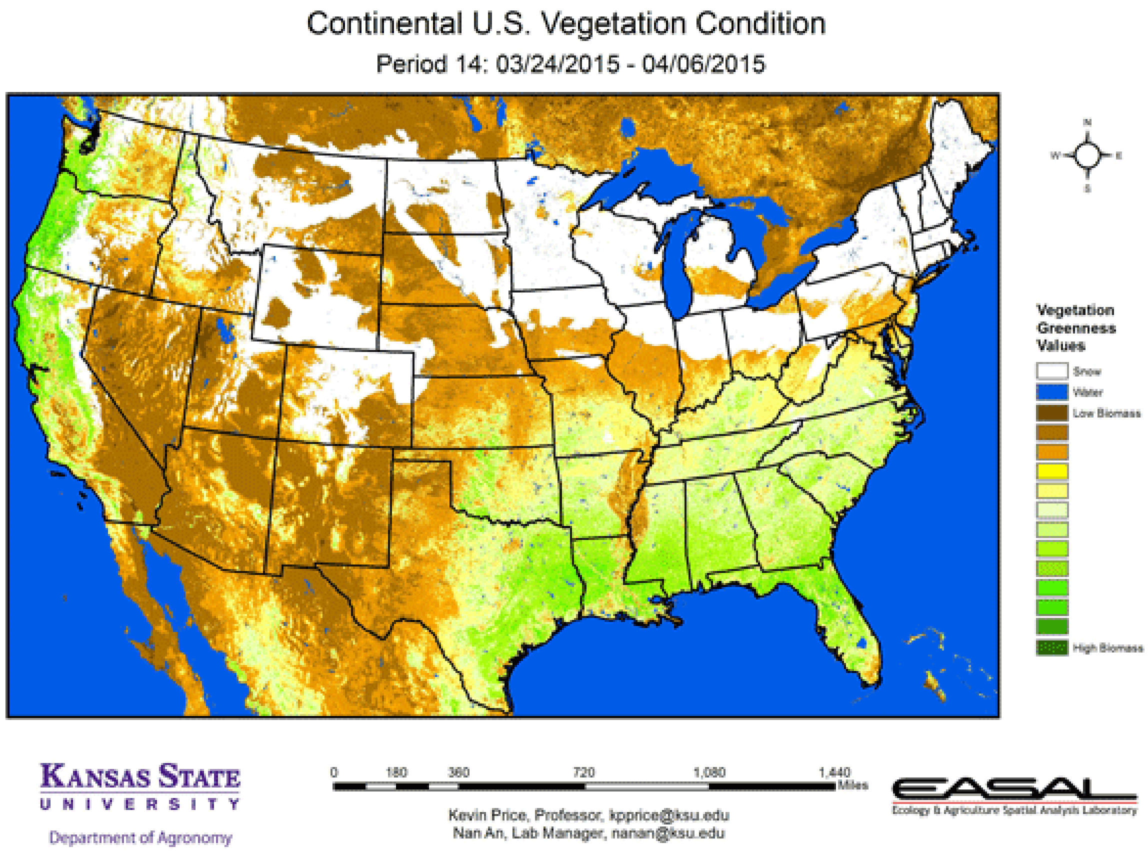

Figure 7. The Vegetation Condition Report for the U.S. for March 24 – April 6 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the most concentrated snow cover remains in northern New England. Snow pack in the Pacific Northwest and northern California continues to shrink rapidly.

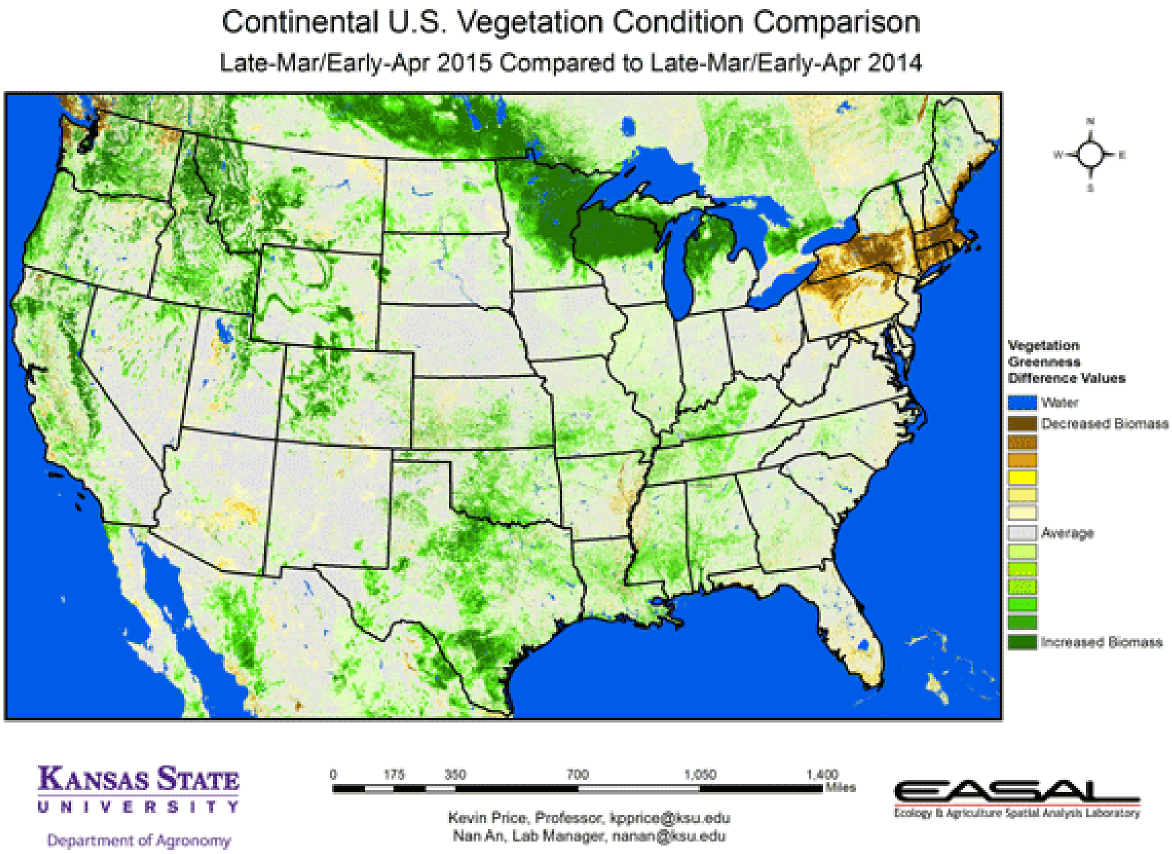

Figure 8. The U.S. comparison to last year at this time for the period March 24 – April 6 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows that the only area of lower photosynthetic activity is east of the Great Lakes from southern New York to the Atlantic. This area continues to show the impact of the extremely heavy snowfall during the earlier part of the year.

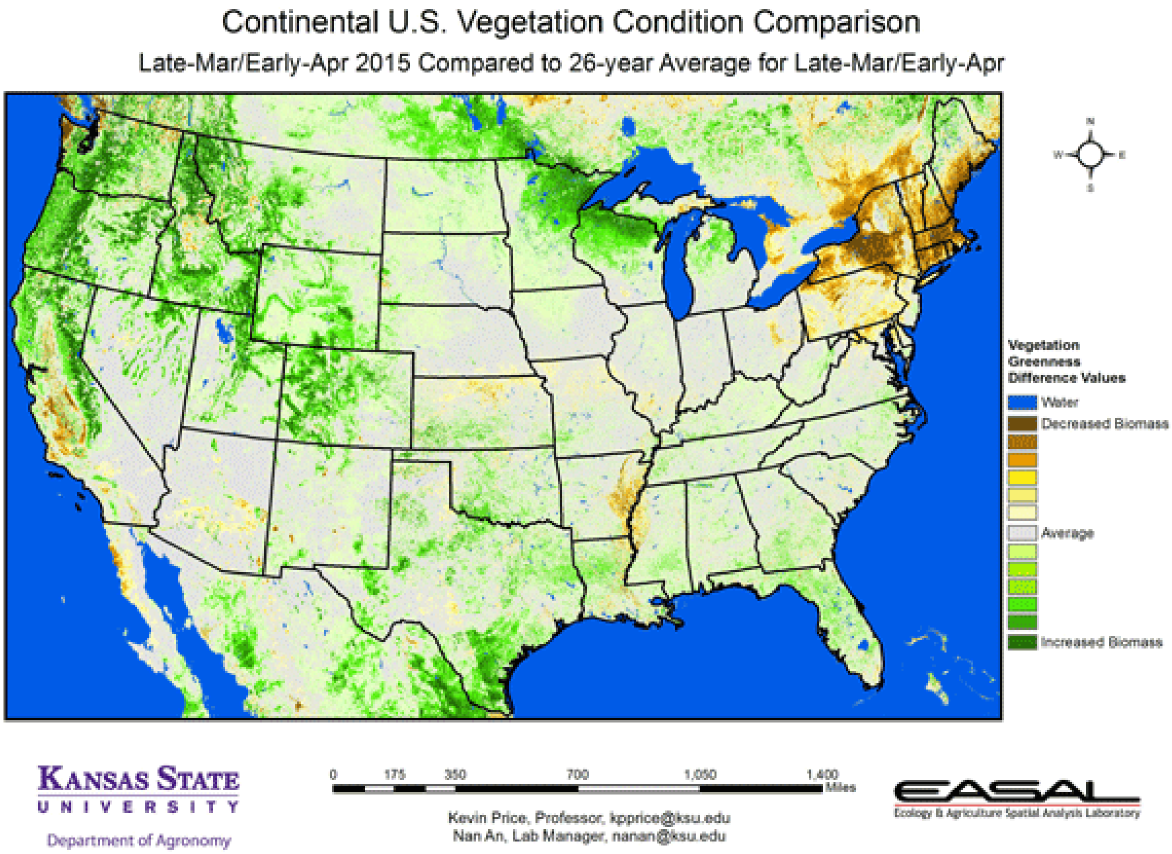

Figure 9. The U.S. comparison to the 26-year average for the period March 24 – April 6 from K-State's Ecology and Agriculture Spatial Analysis Laboratory shows higher-than-average photosynthetic activity in the Pacific Northwest and much lower-than-normal activity in New England. The cool, wet conditions have delayed vegetative activity in the Northeast, while lack of snow continues to allow greater photosynthetic activity in the Northwest. Signs of the western drought conditions are more visible in the central valleys of California.

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