



**K-STATE**  
Research and Extension

## **Extension Agronomy**

# eUpdate

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*03/03/2017*

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), 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. Split fungicide treatments on wheat: Should producers consider an early application?

In general, fungicides have proven to be most effective in controlling foliar diseases on wheat in Kansas when applied in a single application sometime around flag leaf to head emergence stages, depending on level of disease risk (disease pressure and predicted weather conditions), variety resistance to the most threatening fungal diseases, yield potential, foliar fungicide efficacy, and other factors.

Fungicides can also be applied in a split application, with an early application made around early spring greenup followed by a later application at flag leaf to early heading stage. That approach adds a little extra expense, and may or may not pay off compared to the single application approach, as the majority of the yield response is normally associated with the flag leaf application. It is also important to remember that fungicides will only protect the leaves present at time of application; thus, an application during jointing does not substitute for a flag leaf application, as any leaf that emerged after the application will not be protected.

When making split applications, the early application often uses a low rate of product to save money. This provides a shorter length of control than a full-rate application. With the prevalence of low-cost generic fungicides on the market now, some producers are using a full rate of fungicide for the early application. The full-rate of most fungicides provides about two weeks of good protection, followed by a third week of partial protection to the leaves present at the time of application. Using a full rate early, however, could have implications for the second, later application. Growers will need to select a product and rate that stays within the labeled limits on the amount of each active ingredient used in a single season. You don't want an early fungicide application to remove the ability to apply your preferred product at flag leaf.

### **Advantages and limitations of split applications**

There are some advantages to making an early application, and some limitations. The advantages of early-season fungicide application include:

- Low cost. There is no additional cost for application if the fungicide is tank mixed with other products, such as liquid nitrogen fertilizer or herbicide. Often, however, the optimal timing for an early fungicide application is not until after the wheat has jointed – with one or two joints present. This is usually sometime in mid- to late-March in southern Kansas and a little later in northern Kansas, although the warm winter during this growing season has made some fields start spring development earlier than usual. Topdressed nitrogen and many postemergence herbicides should be applied before this stage to be most effective, so the optimal timing of both applications may not match. If a separate trip is made for an early fungicide application, that adds to the cost. Since the payoff for an early application is less certain than with later applications, it is perhaps best to consider using a low-cost generic fungicide for the early application and saving more expensive products, if desired, for the later application.
- Provides suppression of early-season diseases such as tan spot, powdery mildew, speckled leaf blotch, and possibly stripe rust.

The limitations of early-season fungicide application:

- Leaves not present at the time of application will not be protected. Therefore, these applications will not control leaf rust or stripe rust epidemics that come in from the south at later stages of growth. The early applications are most effective when combined with a second, later application of a fungicide.
- Additional product cost may not pay off under some conditions, especially this growing season when the wheat prices are low. Remember, the second application does the heavy lifting in the dual-application approach. If capital resources are limited because of low prices, it may be best to invest your money where you are likely to see the largest yield response.

### **K-State research**

K-State test results of early, low-rate fungicide applications indicate this practice is most likely to be effective in continuous wheat grown in high-residue conditions, and with varieties that are susceptible to either tan spot or powdery mildew. The value of the early applications is diminished in other rotations, conventional tillage systems, or with a variety that is moderately resistant or resistant to the targeted disease – usually tan spot or septoria leaf blotch, and possibly stripe rust or powdery mildew some years. K-State has not tested the practice of making split applications using a full-rate of product at both times.

### **Which diseases are present early?**

Stripe rust and leaf rust rarely overwinter in Kansas. These diseases typically blow into the state from Texas and Oklahoma during the spring, and often do not begin to cause significant infections on wheat until about flag leaf emergence at the earliest.

However, stripe rust (Fig. 1) bears watching. It is primarily a cool-weather disease and starts a little earlier in the season than leaf rust. Stripe rust infections can quickly become severe and damage leaves. Leaf rust does not act quite as quickly, nor does it damage leaves as readily as stripe rust. Tan spot and septoria leaf blotch (Figs. 2 and 3), can also damage leaves quickly and may need to be controlled early if present in a field. Powdery mildew can become established early in a growing season, but this disease does not normally cause severe yield losses in Kansas, except on varieties that are very susceptible.

If a field has some hot spots of stripe rust at jointing or earlier, that would be an additional factor to take into consideration when deciding whether a split application of fungicide would be helpful. The same applies to tan spot, septoria leaf blotch or leaf rust. An early infection of or powdery mildew, however, would not be as important in making that decision.



**Figure 1. Symptoms of stripe rust on wheat. Notice the blister-like lesions arranged in stripes. Photos by Erick DeWolf, K-State Research and Extension.**





**Figure 2. Symptoms of tan spot on wheat. Lesions are tan, with yellow margins, and mature lesions often have a darkened spot in the center. Photos by Erick DeWolf, K-State Research and Extension.**



**Figure 3. Symptoms of septoria leaf blotch. Lesions are tan, elongated, with thin yellow margins. Black speckles in the center are key identifying features. Photos by Romulo Lollato, K-State Research and Extension.**

### **Product rates and restrictions**

Producers considering the use of split applications must pay close attention to label restrictions. Every active ingredient in a fungicide has a maximum total amount that can be applied during the season.

For example, if an early application of a generic form of tebuconazole is applied at 4 oz/acre, a subsequent application of any fungicide containing tebuconazole around heading would put you over the 4 oz limit for the crop season. In addition, a subsequent application of a fungicide premix that contained tebuconazole would put you over the limit.

Thus, be sure to read the label to determine the maximum amount of a chemical that can be applied in a single season and the exact amount of a chemical(s) that is in a fungicide.

For information the efficacy of different foliar fungicide products, refer to K-State Research and Extension publication [Foliar Fungicide Efficacy Ratings for Wheat Disease Management 2016](#), EP130.

### **Conclusions**

The main conclusions we can draw from recent studies in Kansas and Oklahoma:

- In K-State studies, the greatest average profit has come from the flag leaf application of fungicides. Fungicides applied during jointing have rarely shown positive profit.
- The likelihood of profit for an early-season fungicide application is greatest for susceptible varieties in continuous wheat systems with a high level of surface wheat residue, and when the level of disease risk for stripe rust is high.
- Tan spot, septoria leaf blotch, and stripe rust found in hot-spots in a field are candidate for an early fungicide application, provided environmental conditions are conducive for further disease development.

For information on disease susceptibility of wheat varieties, see K-State Research and Extension publication [Wheat Variety Disease and Insect Ratings 2016](#), MF991.

For information on assessing the need for wheat foliar fungicide, refer to K-State Research and Extension publication [Evaluating the Need for Wheat Foliar Fungicides](#), MF3057.

Another publication providing good information, from which a few excerpts were used in this article, is Oklahoma State University's [Split Versus Single Applications of Fungicides to Control Foliar Wheat Diseases](#), PSS-2138.

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## 2. Spring herbicide application decisions on wheat: The importance of growth stage

The unseasonably warm temperatures off-and-on during February and early March have caused wheat to green up and begin spring growth a little earlier than normal in parts of Kansas. Producers should pay close attention to the growth stage of their wheat before making their herbicide applications.

Dicamba can be applied to wheat between the 2-leaf and jointing stages of wheat. Application of dicamba after wheat reaches the jointing stage of growth causes severe prostrate growth of wheat and significant risk of yield loss. Dicamba is effective for control of kochia, Russian thistle, and wild buckwheat, but is not good for control of mustard species. Kochia, Russian thistle, and wild buckwheat are summer annual weeds that may emerge before or after wheat starts to joint, so timing of dicamba for control of these weeds can sometimes be difficult. Fortunately, dicamba provides some residual control of these weeds following application.

Other herbicides that must be applied prior to jointing include Agility SG, Beyond (on Clearfield varieties only), Olympus, Orion, PowerFlex, Pulsar, Rage D-Tech, and Rave.

MCPA and 2,4-D have different application guidelines. In general, MCPA is safer on wheat than 2,4-D, especially when applied prior to tillering. We recommend that 2,4-D not be applied to wheat until it is well-tillered in the spring. Application of 2,4-D prior to tillering hinders the tillering process, causes general stunting and can result in significant yield loss.



**Figure 1. Stunting from an application of 2,4-D to wheat prior to tillering. Photo by Dallas Peterson, K-State Research and Extension.**

2,4-D is labeled for application to wheat from the full-tiller stage until prior to the boot stage of growth, but is probably safest between full-tiller and jointing stages of growth. Wheat will sometimes exhibit prostrate growth from 2,4-D applications applied in the jointing stage of growth, but yields generally are not significantly affected if applied before the boot stage of growth.

MCPA is relatively safe on young wheat and can be applied after the wheat is in the three-leaf stage (may vary by product label) until it reaches the boot stage of growth. Consequently, MCPA would be preferred over 2,4-D if spraying before wheat is well-tillered. Neither herbicide should be applied once the wheat is near or reaches the boot stage of growth, as application at that time can result in malformed heads, sterility, and significant yield loss (Figure 2).



**Figure 2. Malformed heads from an application of 2,4-D at boot stage. Photo by Dallas Peterson, K-State Research and Extension.**

Both 2,4-D and MCPA are available in ester or amine formulations. Ester formulations generally provide a little better weed control than amine formulations at the same application rates, but also are more susceptible to vapor drift. However, the potential for vapor drift damage in early spring is minimal. Ester formulations generally are compatible for use with fertilizer carriers, while amine formulations often have physical compatibility problems when mixed with liquid fertilizer.

Other herbicides used in the spring on wheat can be applied up to the time the flag leaf is visible, or



later. Affinity BroadSpec, Affinity TankMix, Ally Extra SG, Express, Harmony + 2,4-D or MCPA, Harmony Extra, Huskie and Supremacy must be applied before the flag leaf is visible. Huskie, Weld, and WideMatch can be applied through the flag leaf stage. Herbicides that can be applied later in the spring – prior to the boot stage -- include Ally + 2,4-D, Amber, Finesse, Starane Ultra, and Starane Plus Salvo. Starane is a better choice than dicamba products for control of kochia after wheat moves into the jointing stage of growth.

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### 3. First hollow stem update March 3, 2017

Cattle should be removed from wheat pastures when the crop reaches first hollow stem (FHS).

Grazing past this stage can severely affect wheat yields (for a full explanation, please refer to our previous Agronomy eUpdate article "[Optimal time to remove cattle from wheat pastures: First hollow stem](#)").

#### First hollow stem update

In order to screen for FHS during this important time in the growing season, the K-State Extension Wheat and Forages crew measures FHS of 20 different commonly grown wheat varieties in Kansas. The varieties are in a September-sown replicated trial at the South Central Experiment Field near Hutchinson, in cooperation with Gary Cramer, Agronomist-in-Charge of the Field.

Ten stems are split open per variety per replication, for a total of 40 stems monitored per variety. The average length of hollow stem is reported for each varieties in Table 1. As of Feb.28, none of the varieties had yet reached first hollow stem but all varieties had started to elongate the stem.

**Table 1. Length of hollow stem measured Feb. 28, 2017 of 20 wheat varieties sown mid-September 2016 at the South Central Experiment Field near Hutchinson. The critical FHS length is 1.5 cm (about a half-inch or the diameter of a dime).**

Variety	Hollow stem length (cm)*
1863	0.42
Bentley	0.25
Doublestop	0.20
Everest	0.38
Gallagher	0.58
Iba	0.38
KanMark	0.34
KS061193K-2	0.34
KS080448C*102	0.33
Larry	0.18
OK11D25056	0.44
OK12716	0.27
OK12DP22002-042	0.40
Ruby Lee	0.27
Stardust	0.53
SY Flint	0.46
SY Grit	0.48
SY Llano	0.60
Tatanka	0.35
Zenda	0.36
* Critical hollow stem length to remove cattle is 1.5 cm, or roughly the diameter of a dime.	

Varieties are elongating stems at different rates. Some varieties are reaching close to 0.6 cm of hollow stem elongation (such as SY Llano, Stardust, and Gallagher), as compared to 0.4 cm on February 22

for these same varieties on our last measurements.

Others varieties are elongating stem at a slower rate and have now about 0.2-0.3 cm (Bentley, Doublestop CL Plus, and Larry). This compares to about 0.1-0.2 cm as of February 22<sup>nd</sup>, our last measurements.

While none of the varieties had yet reached first hollow stem as of February 28, this stage is generally achieved within a few days from when the stem starts to elongate, provided sufficient moisture and warm temperatures. Thus, producers should keep a closely monitor first hollow stem in their wheat pastures at this time.

The intention of this report is to provide producers a weekly update on the progress of first hollow stem development in different wheat varieties. Producers should use this information as a guide, but it is extremely important to monitor FHS from an ungrazed portion of each individual wheat pasture to take the decision of removing cattle from wheat pastures.

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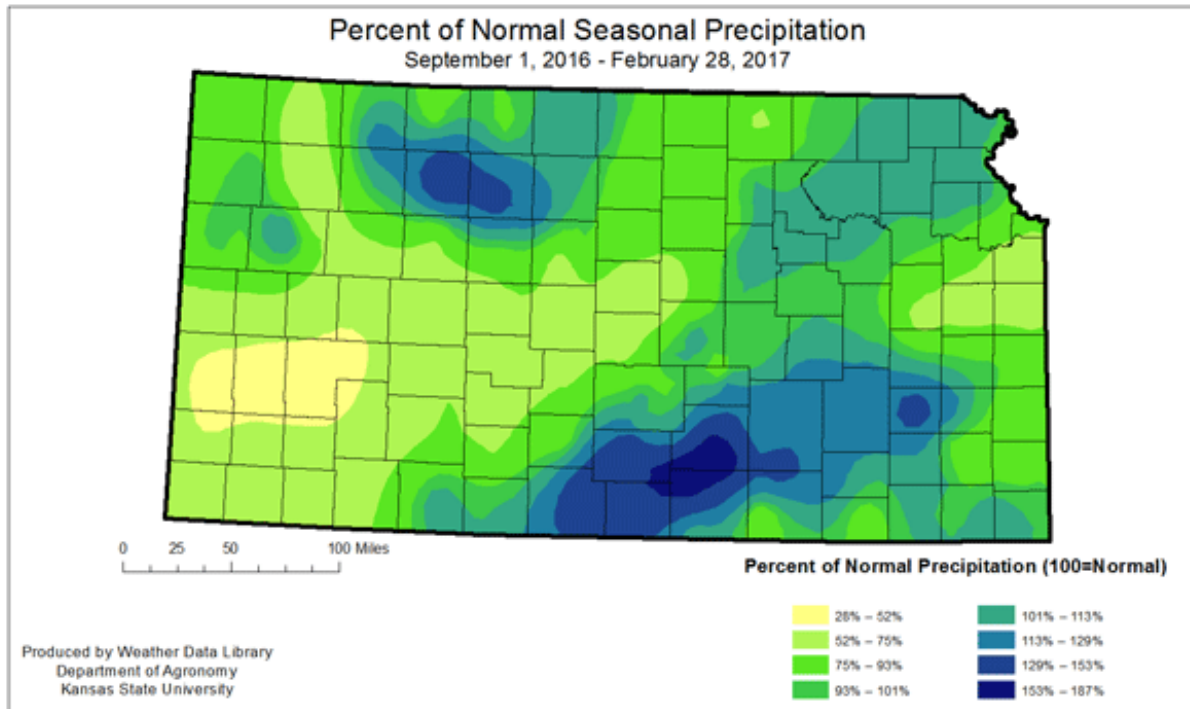
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#### 4. Wheat update: Precipitation, air temperatures, vegetative conditions as of March 3

##### Precipitation totals

Total precipitation during the winter wheat growing season from September 1, 2016 until February 28, 2017 ranges from less than one inch in portions of western Kansas to more than 23 inches in south central Kansas. These totals correspond to 28% and 187% of the long-term normal for these regions, respectively (Fig. 1). The majority of the central, eastern, and portions of northwest Kansas have received above-normal precipitation this growing season, while the entire southwest quarter of the state is below normal by as much as 4 inches.



**Figure 1. Departure from normal seasonal precipitation from September 1, 2016, to February 28, 2017.**

As a consequence of the precipitation shortage last fall in southwest Kansas, many fields in that region have erratic stands, or are just now germinating and, in some cases, emerging. For plants from fields in this situation, such as those shown in Figure 2, producers need to consider several agronomic and economic factors when making the decision to maintain the crop. Some of these include:

##### Final stand:

Some plants may have initiated the first leaf while still below ground, giving them an accordion-like appearance, as shown in Fig. 2. This probably happened because the sowing depth in this specific field was relatively deep (2 inches). Plants in which the first leaf emerged below ground might never grow through the soil surface and this field might end up with very scattered stand. In cases in which the seed has been dry since last fall and now has moisture, the shoots could very well make it

through the surface. Where that occurs, chances are that producers will end up with a decent stand. Sowing depth, seed treatment, and seed vigor will affect the final stand.



**Figure 2. Wheat seedlings just now germinating and, in many cases, not being able to emerge as the first true leaf emerged below ground, causing the accordion-like shape above. Photo taken February 27 by Glenn Newdigger and Marin Gleason, K-State Extension agents in Stafford and Edwards counties.**

#### Yield potential:

Based on previous K-State research evaluating spring-planted winter wheat, fields that are just now emerging will probably have about half of the yield potential of a crop that emerged and tillered last fall. Weather conditions will influence this yield potential: If the weather turns cool and moist during the spring, these fields might still yield okay; but if we have a more normal warm and dry year, the yield reduction could be even worse than half.

#### Weed pressure:

Spring-emerged wheat will more likely experience greater weed pressure due to a thinner crop. In this case, producers need to be aware of herbicide timing and rotation restrictions in case they want to terminate the crop later.

#### Vernalization:

Fields that are just now emerging might also have problems vernalizing, as some varieties need 6-8 weeks of soil temperatures below 50°F to meet vernalization requirements. In varieties with shorter vernalization requirements, such as Overley, this might not be as big of a problem. It will mostly depend on temperatures from here on and variety-specific vernalization requirements.

### The decision of whether to keep the stand

Where the wheat doesn't emerge until this spring, producers have a tough decision to make. If the resulting stand is decent, the crop will still have a reduced yield potential compared to a fall-emerged crop, as spring tillers are less productive than fall tillers. Producers in this situation should take a stand count to determine final number of plants emerged per row foot. If stand is decent compared to the target stand (Table 1), consider whether having a reduced yield potential is affordable. If the stand is not decent or producers cannot afford having the reduced yield potential, terminating the crop and going into a summer crop would be an option, herbicide restrictions allowing.

**Table 1. Target plants per row foot (80% emergence) based on seeding rate, seed size, and row spacing.**

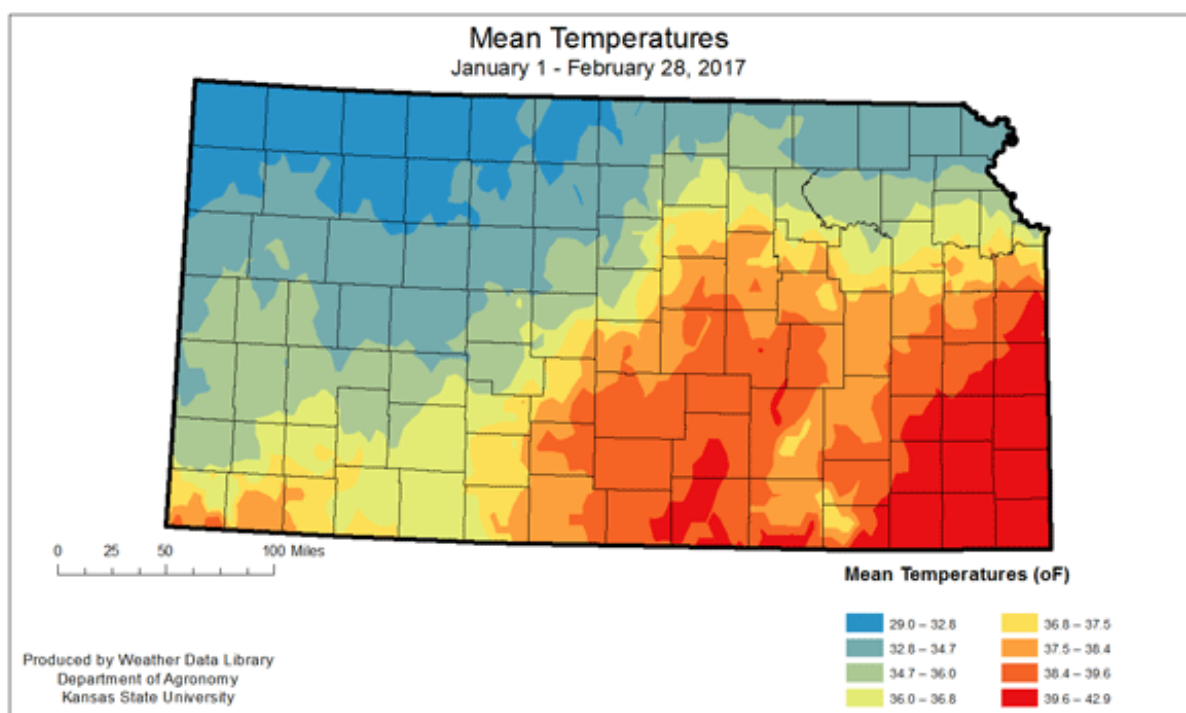
Seeding rate	Seed size	Row spacing (inches)				
		6	7.5	8	10	12
lb/ac	seeds/lb	Target plants per row foot (80% emergence)				
45	12,000	5	6	7	8	10
	14,000	6	7	8	10	12
	16,000	7	8	9	11	13
	18,000	7	9	10	12	15
60	12,000	7	8	9	11	13
	14,000	8	10	10	13	15
	16,000	9	11	12	15	18
	18,000	10	12	13	17	20
75	12,000	8	10	11	14	17
	14,000	10	12	13	16	19
	16,000	11	14	15	18	22
	18,000	12	15	17	21	25
90	12,000	10	12	13	17	20
	14,000	12	14	15	19	23
	16,000	13	17	18	22	26
	18,000	15	19	20	25	30
120	12,000	13	17	18	22	26
	14,000	15	19	21	26	31

16,000	18	22	24	29	35
18,000	20	25	26	33	40

In order to check how far actual stands are from the target stand, count the number of emerged plants per row foot, and compare that to the values in Table 1. That should give a good estimate. Table 1 shows the number of target plants per row foot depending on seeding rate, seed size, and row spacing, and assuming 80% emergence. If seed size is not known, 14,000 to 16,000 seeds per pound can be used for most wheat varieties in Kansas, except those with rather large or small kernels. For certified seed, considering 12,000 seeds per pound when seed size is unknown is a good estimate. To determine the average number of plants per foot of row, several random plant counts across the field should be taken, given a more or less uniform emergence throughout the field.

### Air temperatures

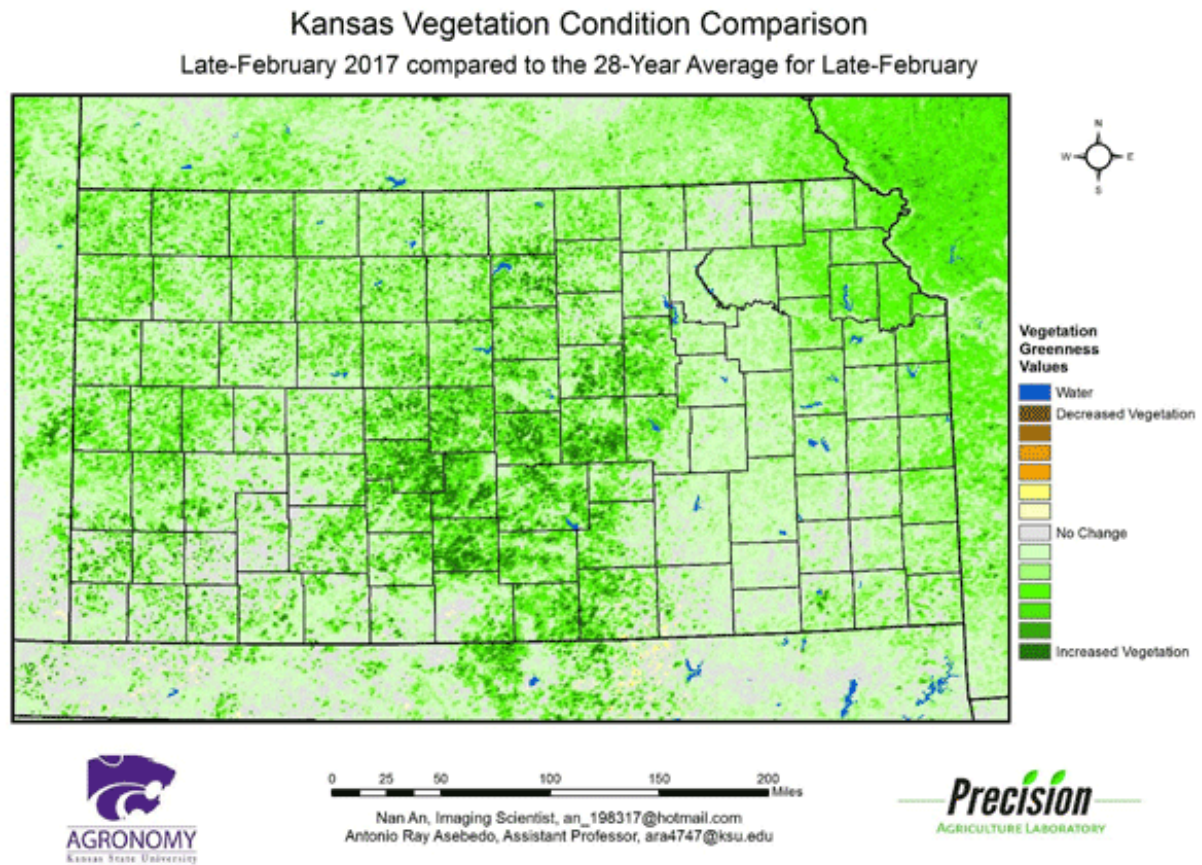
Mean air temperatures during the Jan. 1 – Feb. 28 period ranged from approximately 30°F in northwest Kansas, to close to 43°F in southeast Kansas (Fig. 3). This corresponds to a departure from normal mean temperatures for the same period of less than 3°F in the western tier of counties to as much as 10°F in portions of eastern Kansas.



**Figure 3. Mean (upper panel) and departure from normal mean (lower panel) temperatures for the January 1 – February 28, 2017, period for Kansas.**



Regardless of the magnitude of the temperature departure, the entire state has experienced above-average temperatures this winter. As a consequence, the crop has had an early spring greenup, with some fields already past jointing in the south central portion of the state. The extent of this early greenup is depicted in Fig. 4, a comparison of vegetative condition index for Kansas between the current growing season and the 28-year average.



**Figure 4. Compared to the 28-year average at this time for Kansas, this year's Vegetation Condition Report for February 21- February 27, 2017 from K-State's Precision Agriculture Laboratory much of the state has above-normal vegetative activity, especially in the central and south central parts of the state, where precipitation has been more favorable.**

The Wheat Production group at Kansas State University is keeping track of the spring development of several varieties. Readers can find the latest measurement of hollow stem elongation in the accompanying article "First hollow stem update" in this issue (March 3, 2017) of the Agronomy eUpdate.

### **Consequences of warm winter temperatures**

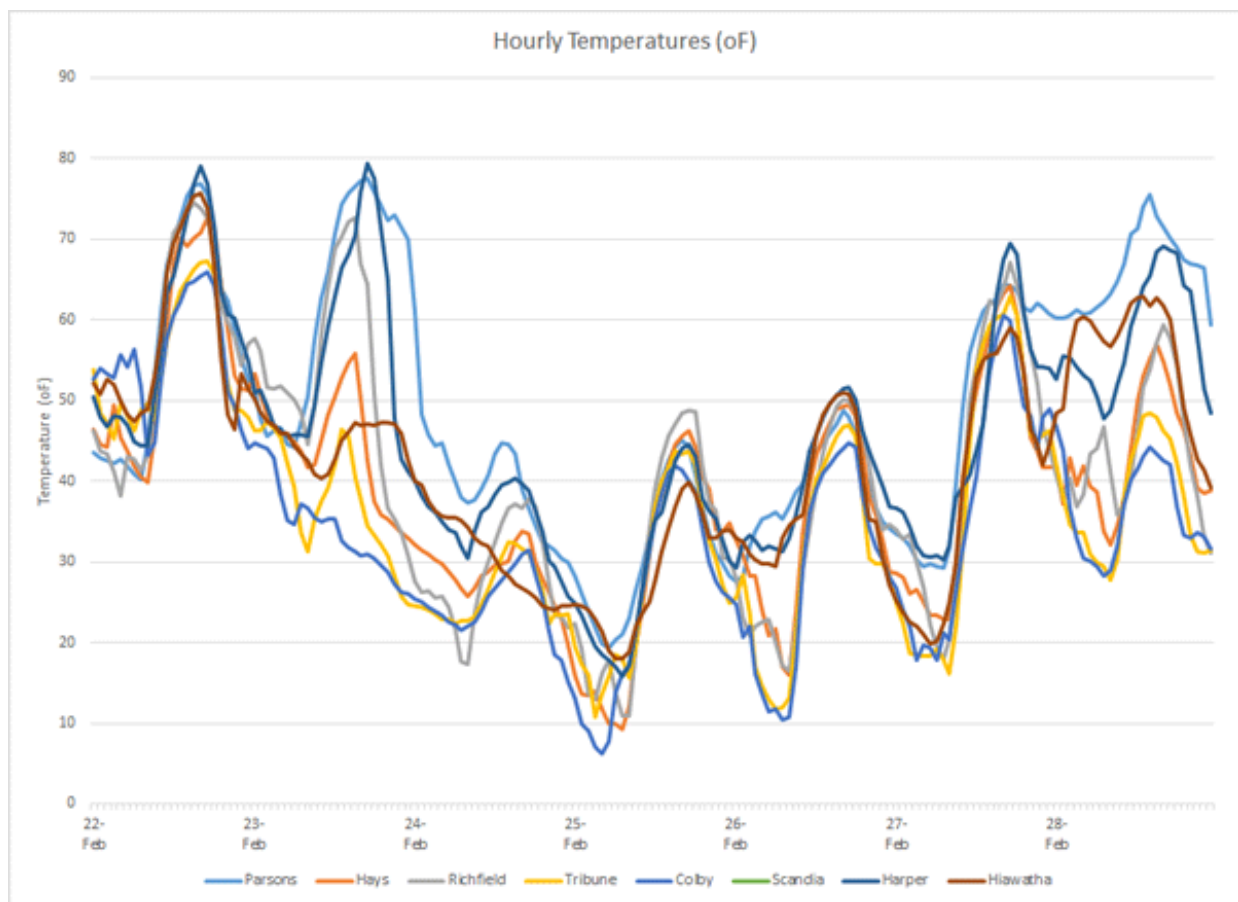
The early spring greenup will require producers to make certain management practices, such as nitrogen fertilization, earlier in the spring than normal. Winter wheat turns from vegetative to



reproductive development after the vernalization requirements are met early spring; thus, the number of spikelets per head is determined at greenup. Having N in the root zone by then is critical to ensure good head formation and maximize the number of spikelets per head. Another important management practice producers need to be aware of is insect management, as aphids and other pests will be more active under warmer conditions.

Another major consequence of the early start to this growing season is the heightened risk of freeze injury. The average last date for freezing (32°F) temperatures ranges from early April in southeast Kansas to early May in northwest Kansas. Where the crop is developing early, it will be more likely to be in more sensitive phases of crop development if and when a freeze occurs later this winter and spring. Heading and anthesis are not the only growth stages sensitive to freeze injury. Once the hollow stem pushes the growing point above the soil surface, the crop is more exposed to risk of freeze injury. Temperature fluctuations such as the drop observed for most of Kansas during the Feb. 23-25 period (Fig. 5) can also be harmful to the wheat crop if it is already jointed, especially if the air temperatures fall below 20°F and remain there for a few hours. The temperature drop in the Feb. 23-25 period was as much as 70°F in Harper County, falling from approximately 80°F on the afternoon of Feb. 23 to less than 10°F in the morning of Feb. 25.

Despite the increased risk for freeze injury, if the crop escapes freeze injury -- either by a mismatch between freeze occurrence and highly sensitive growth stages or simply due to the absence of a freeze -- an early spring greenup might signify an early grain fill period. During the 2015-16 growing season, the crop was able to avoid three major freeze events due to a mismatch between freeze occurrence and sensitive stages of development, and yields were generally very good since the crop experienced good grain filling conditions. It will all depend on the weather moving forward.



**Figure 5. Temperature dynamics during the Feb. 22 – 28 period at eight selected locations across Kansas.**

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## 5. On-farm Research Collaborative Project: Non-biased, Research-based, and Grower-driven

K-State Extension state specialists, area agronomists, and county/district agents are again seeking to collaborate with producers in establishing on-farm and large-scale research plots in 2017. Last year, we had on-farm projects in diverse areas around Kansas, setting up tests involving primarily corn and soybeans, with a few studies on sorghum as well. Funding support from Kansas Corn and Kansas Soybean is helping to increase our on-farm network.

The goal of our on-farm research collaborative project is to establish a network of on-farm research collaborators with the main purpose of providing research results on production practices at the state, regional or local scale, under a wide set of growing conditions and soil types.

There are no losers in this program. All parties will benefit. Farmers involved in this collaborative research effort will be empowered to solve their own problems and will have greater confidence in making decisions related to their production practices. The standard practice of the program involves producers having a question, then researching the answer on their own farm and soil with a simple strip trial designed with the assistance of K-State researchers. With this information, K-State Extension specialists will be able to check the validity of previous findings conducted with traditional research in small plots and more controlled environments, and to identify and communicate areas for future research.

The on-farm research collaborative project is farmer-run research; thus, information will be produced and used by farmers. Farmer participation is the key component of this project and farmers will be the main beneficiary.

Why should I get involved in this project?

1. The project has a main goal of improving yields and/or minimizing input costs, increasing overall efficiency.
2. The project will help producers learn the best ways to design an on-farm test so they can obtain reliable information on a specific question related to their own farms.
3. The outcomes from this project will empower our producers to make sound decisions with confidence and will aid researchers in identifying and communicating areas for future research.

Who are the key players?

1. Kansas farmers: Farmers are the main players, the ones who will implement the trials, collect the data and utilize the results.
2. Extension Agricultural Agents: The agents are the “gatekeepers” of this project. They will work very closely with farmers and can assist, if needed, with information and/or help on implementing the trials.
3. K-State Extension State and Area Specialists: K-State faculty will assist Extension agents and Kansas farmers in developing the protocols, implementing trials and analyzing the data generated at the on-farm scale.

Research data (small-plots) vs. On-farm data (large-plots): What is the main different between these concepts?

Information produced at research stations has the following features:

1. Small plot size = small variability (“controlled conditions”)
2. Intensive sampling = usually related to a graduate student project, with many samples taken throughout the growing season
3. More complex and more treatments can be evaluated
4. Small sample size = measurements may be less representative of “real” farm conditions

On-farm data have the following features:

1. Large plot size = higher variability due to uncontrollable variation within each plot
2. Less intensive sampling
3. Less complex and fewer (two or three) treatments can be evaluated
4. Large sample size = measurements may more closely represent “real” farm conditions

Are the on-farm protocols the same for all environments and farmers or should they be farmer- or site-specific?

Farmers have their own interests and specific questions that need to be properly addressed. Protocols will be designed to fit each farmer’s situation. Some of the diverse topics that we have discussed include: corn/ soybean/ sorghum seeding rates; corn/ sorghum hybrids; sorghum/ soybean row spacing; corn/ soybean/ sorghum planting dates; full or limited irrigation; and other topics.

Protocols:

Crops: Corn / Soybean / Sorghum / Winter Canola

Topics:

- Seeding Rates
- Planting Dates
- Row Spacing
- Hybrid/ Variety Selection

- Tillage
- Others

How many factors need to be evaluated?

The idea is to perform “simple” on-farm experiments evaluating one or two factors at a time.

How many levels for each factor?

This will depend on the availability of space in the field, but to properly understand the optimum crop management level, 4 to 5 levels of “treatments” or “variables” are usually needed. For example, if corn seeding rate is being evaluated, five seeding rates will allow the grower to properly identify the optimum seeding rate for each specific farm environment. The diagram below presents an example of 5 test levels for a seeding rate study.



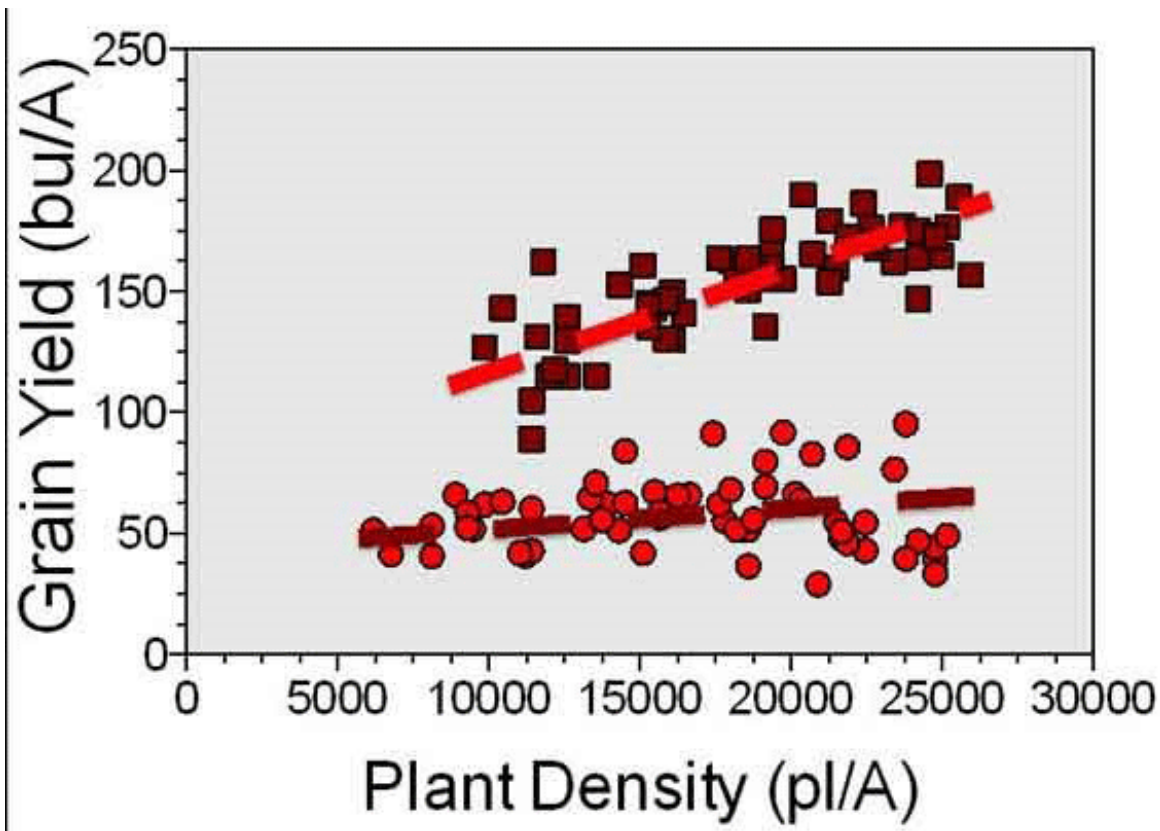
Replications?

To obtain statistically sound and solid recommendations, a minimum of 3 replications are recommended.

Are crop production practices environment-specific?

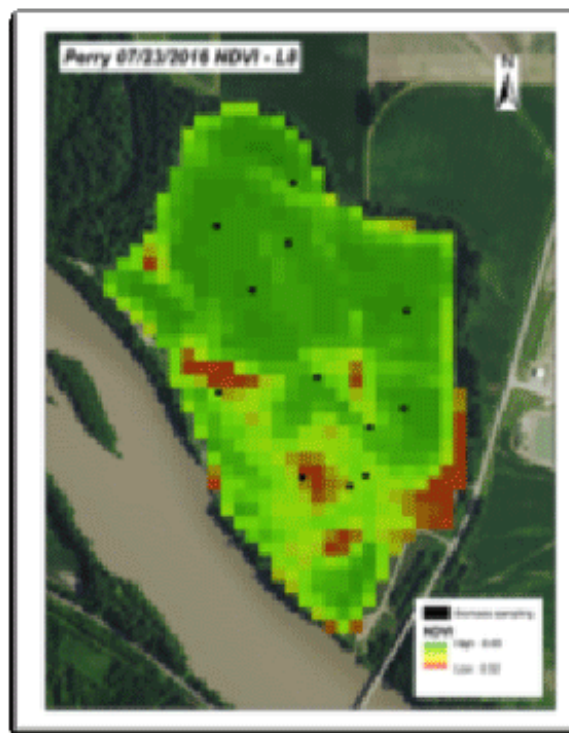
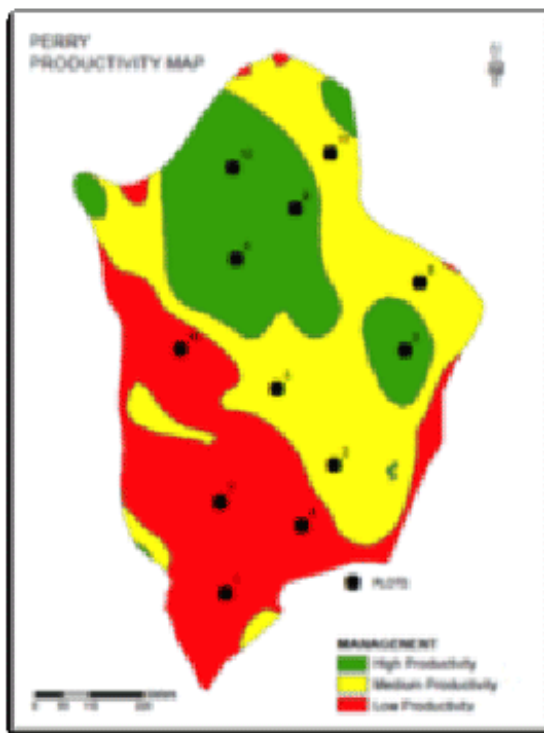
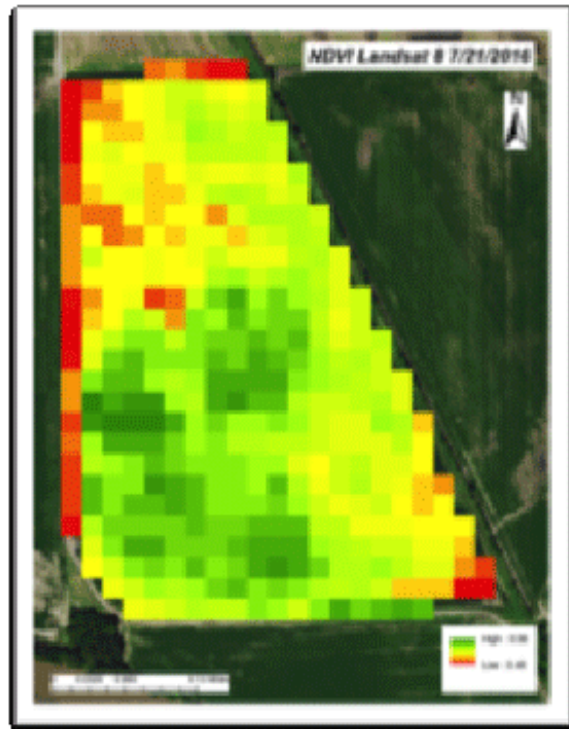
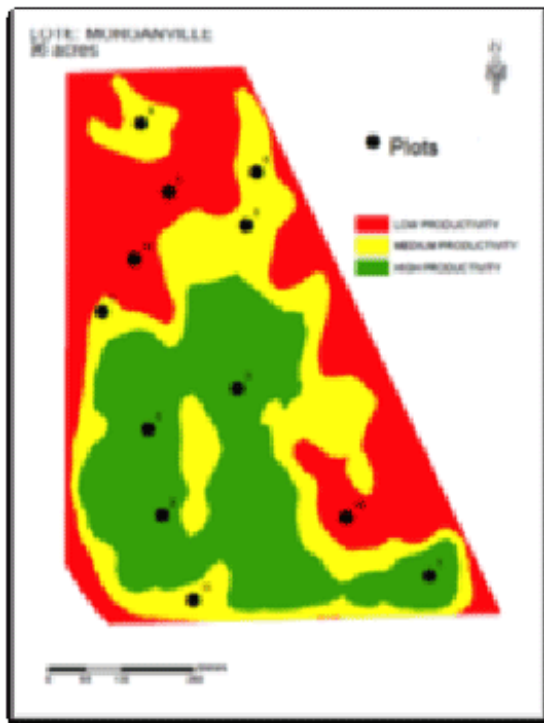
The example in the graphic below shows how the optimum plant density to maximize corn grain yield will vary according to different environments. For the low yielding environment (<100 bu/acre), the economically optimum plant density was about 15,000 to 20,000 plants per acre; while for the high-yielding site, economically optimum maximum plant density is about 25,000 plants per acre. Therefore, different yield potentials in different environments have different “optimum” crop production practices to maximize net returns.





#### Precision Ag technologies

In addition, on-farm studies in 2016 evaluated new technologies and added Precision Ag tools to the evaluation of variability and determination of zone management. Utilization of satellite imagery and precision soil sampling, in combination with yield monitor data, allowed us to obtain high-resolution for spatial variability within a field in order to investigate crop production issues and properly address them. Below is an example of some fields for which utilization of satellite imagery in combination with other data layers allowed us to obtain “management-zones” from low, medium, and high productivity area within the field.



Farmers interested in participating in this project can fill out an interest form online at:

<http://bit.ly/KSUONFARMPROJECT>

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K-State Area Extension Agronomists:

Lucas Haag, Northwest Area Crops and Soils Specialist, [lhaag@ksu.edu](mailto:lhaag@ksu.edu)

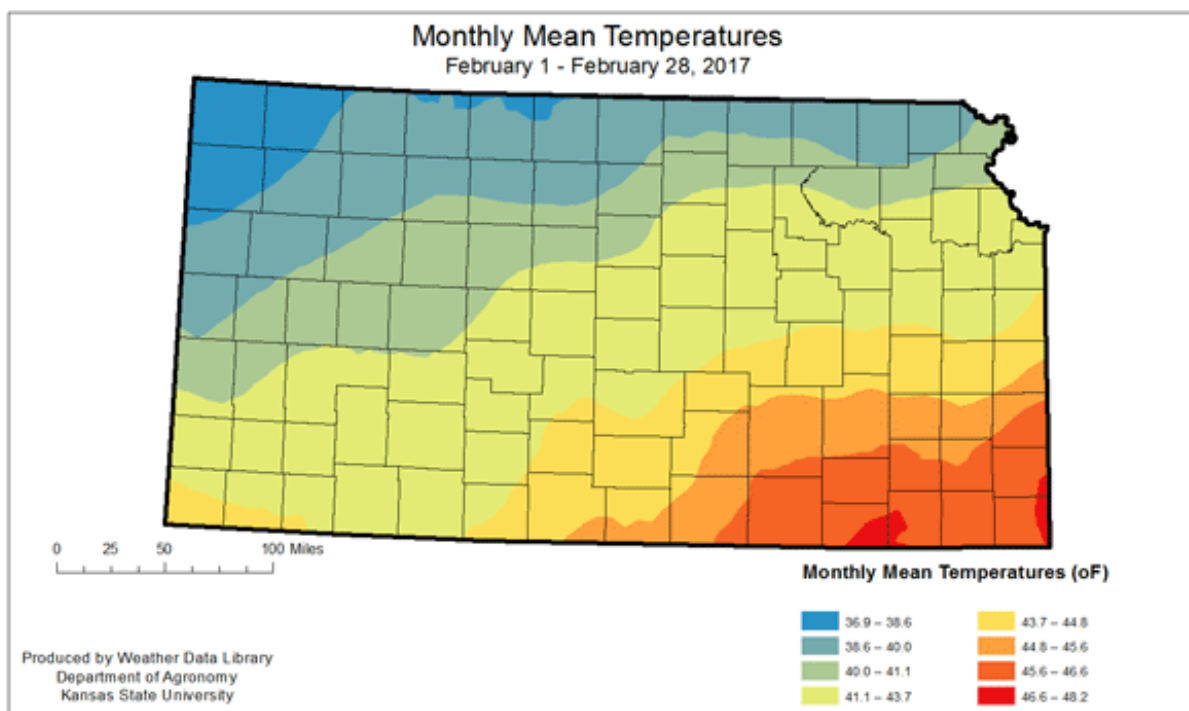
AJ Foster, Southwest Area Crops and Soils Specialist, [anserdj@ksu.edu](mailto:anserdj@ksu.edu)

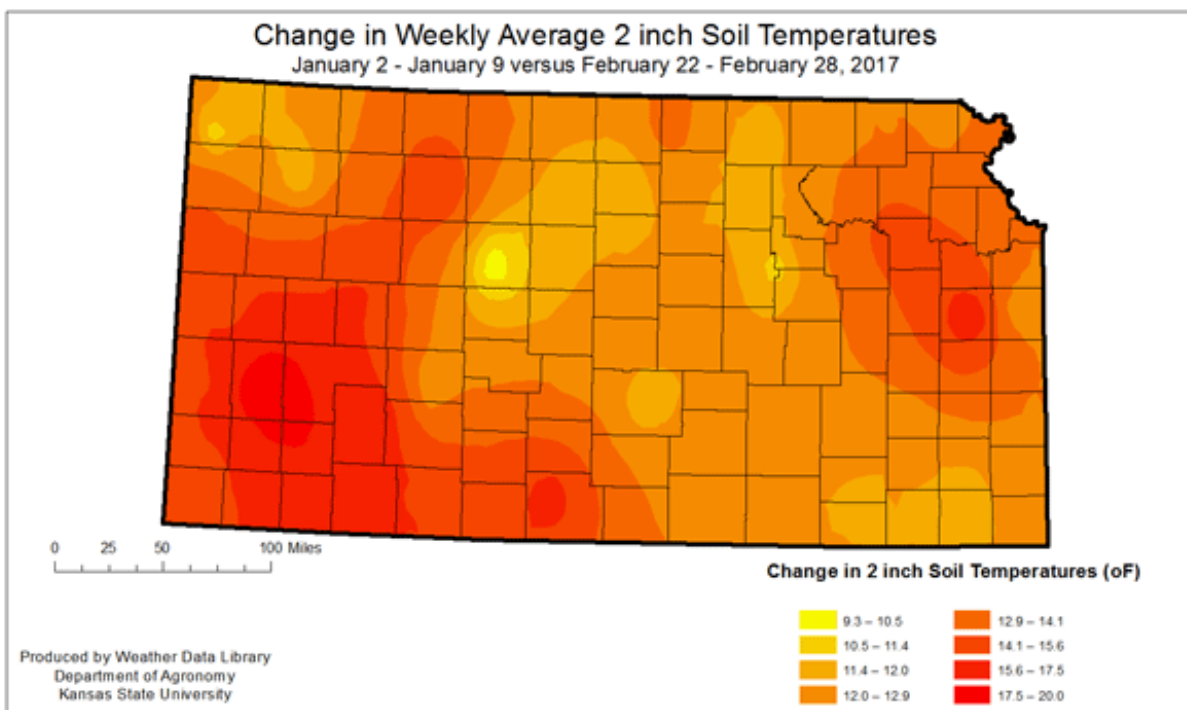
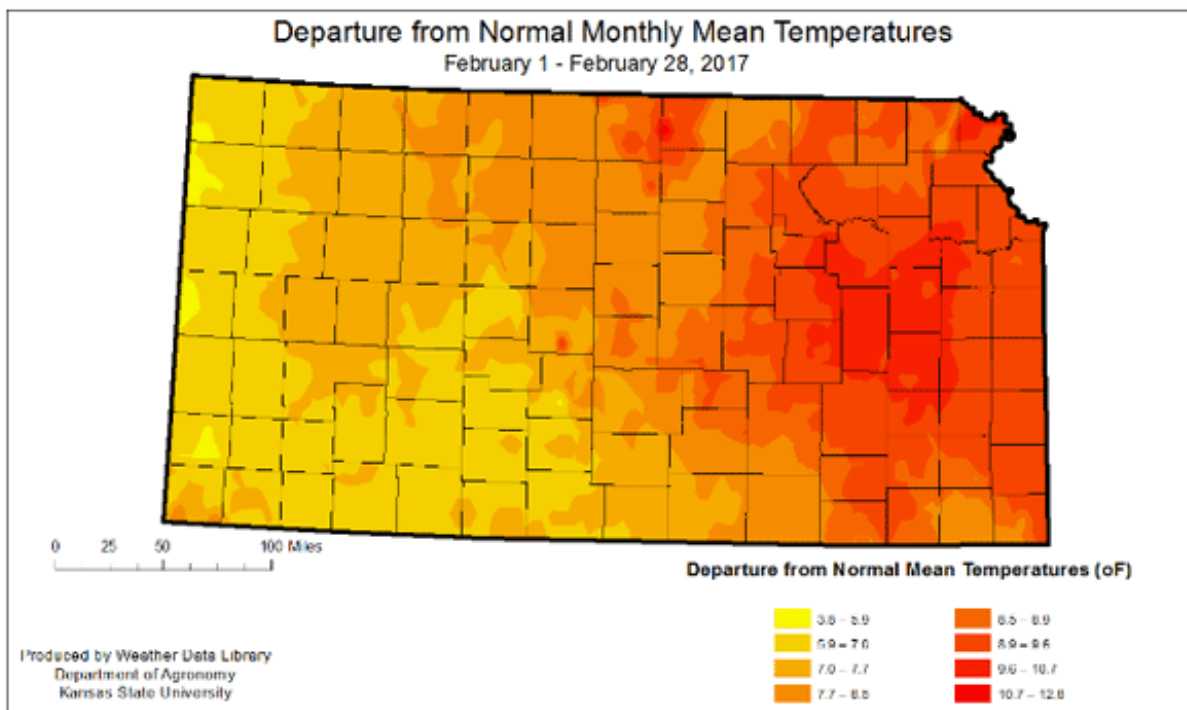
Stu Duncan, Northeast Area Crops and Soils Specialist, [sduncan@ksu.edu](mailto:sduncan@ksu.edu)

Doug Shoup, Southeast Area Crops and Soils Specialist, [dshoup@ksu.edu](mailto:dshoup@ksu.edu)

## 6. February weather summary for Kansas: Warm and dry

February was much warmer and drier than normal in Kansas. The statewide average temperature was 41.9 °F, which is 7.9 degrees warmer than normal. This places it as the 7<sup>th</sup> warmest since 1895. The January to February period, not surprisingly, also ranks in the top ten warmest as the 9<sup>th</sup> warmest. Overall, the East Central Division showed the greatest departure from normal with an average of 42.8 °F and a departure of 9.0 degrees. The West Central Division, which averaged 40.1 °F, was the closest to normal and was still 7.0 degrees warmer. The highest temperature reported was 90 °F at Liberal, Seward County, on the 11th. The lowest temperature reported was 0 °F at Brewster 4W, Thomas County, on the 4th. Not surprisingly, there were no record cold maximum or minimum temperatures. There were 155 new daily record high maximums, and 10 of those set new record highs for February. There also were 106 new daily record high minimum temperatures, of which 6 set new records for the month.

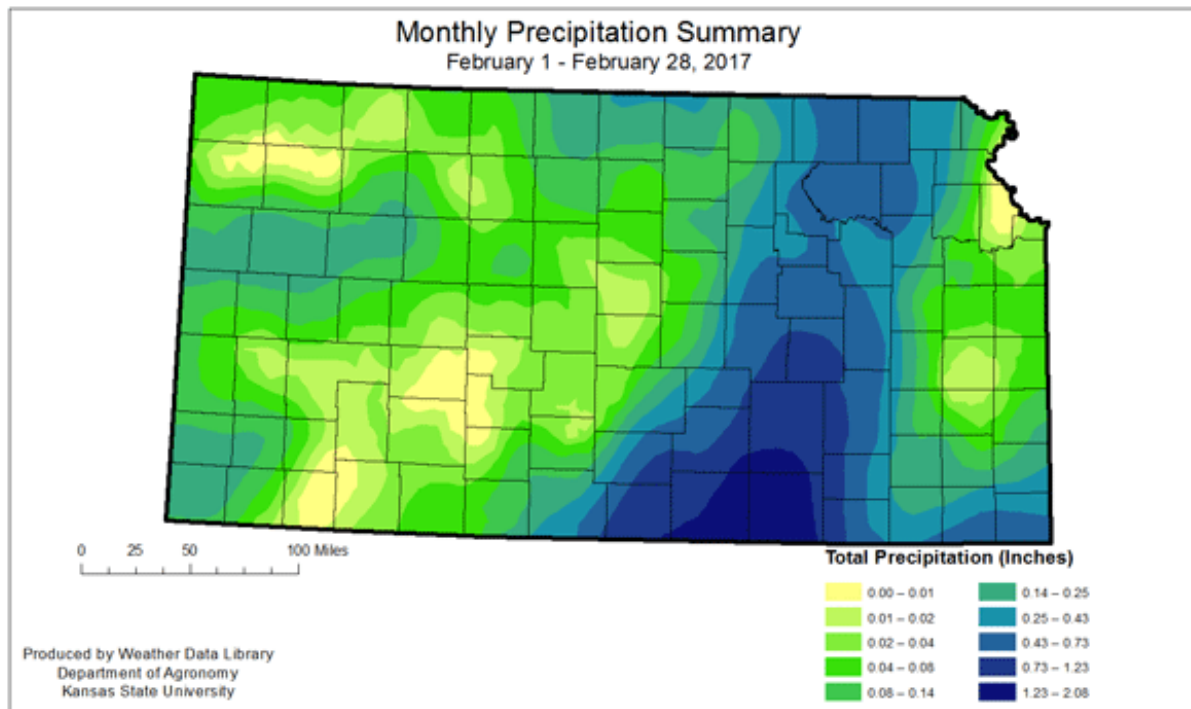


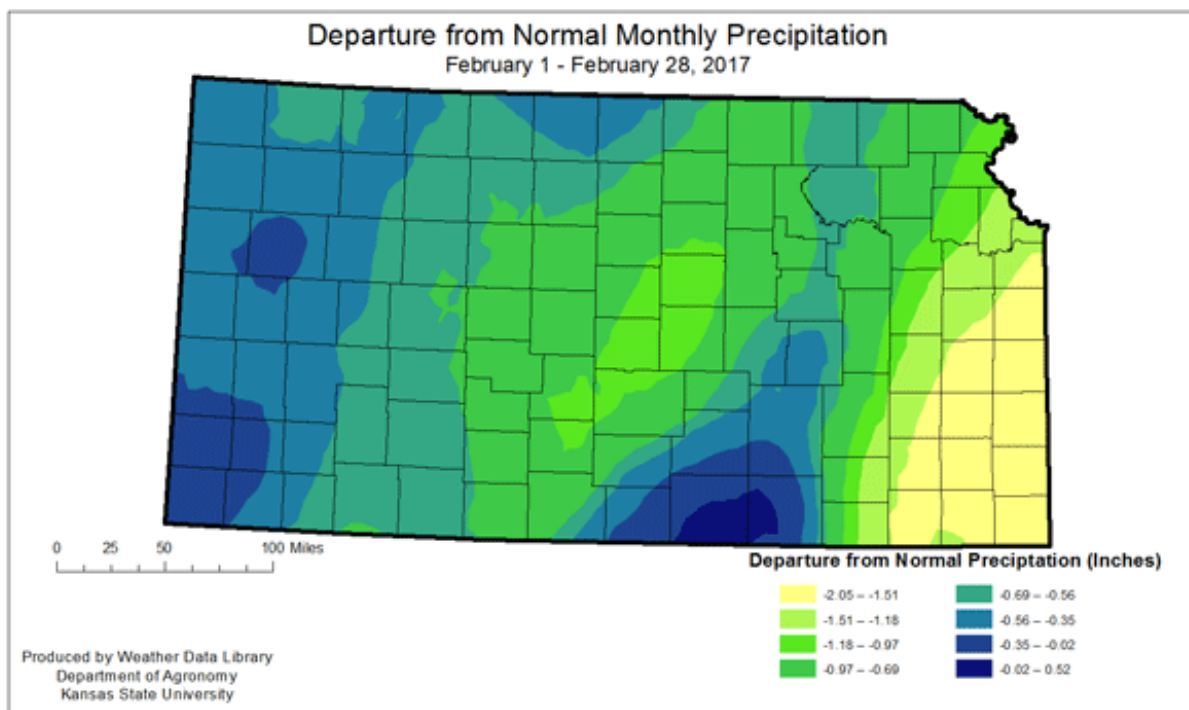
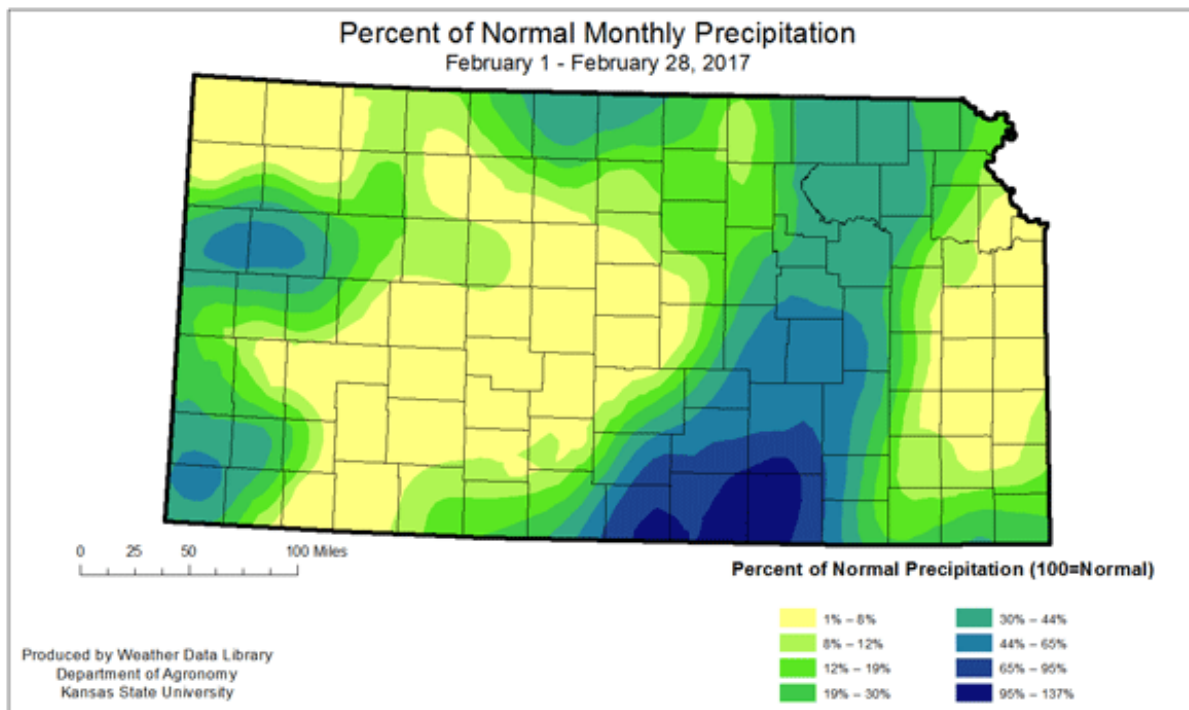


The warmer-than-normal temperatures were accompanied by much drier than usual conditions. The statewide average precipitation was 0.23 inches, or just 23 percent of normal. This ranks as the 14<sup>th</sup> driest February since 1895. The South Central Division came closest to normal with an average of 0.44 inches or 44 percent of normal. The Northwest Division was the driest with an average of just 0.01 inches, which was 2 percent of normal. Still, despite the dry pattern, 14 stations set daily record precipitation values. The greatest 24-hour precipitation total for a National Weather Service (NWS)



station was 1.87 inches at Smileyberg, Butler County, on the 20<sup>th</sup>. The greatest 24-hour precipitation total for a Community Collaborative Rain Hail and Snow (CoCoRaHS) station was 1.93 inches at Arkansas City 3.1 N, Cowley County, also on the 20<sup>th</sup>. The stations with the greatest monthly totals: 2.03 inches at Winfield 3NE, Cowley County (NWS); 2.08 inches at Arkansas City 3.9 SSW, Cowley County (CoCoRaHS). While snow wasn't a huge factor, there were still some snow events during the month. The greatest snowfall total for February at a National Weather Service station was 1.8 inches at Smith Center, Smith County. The greatest snowfall total for the month at a CoCoRaHS station was 2.5 inches at Phillipsburg 5.7 E, Phillips County.

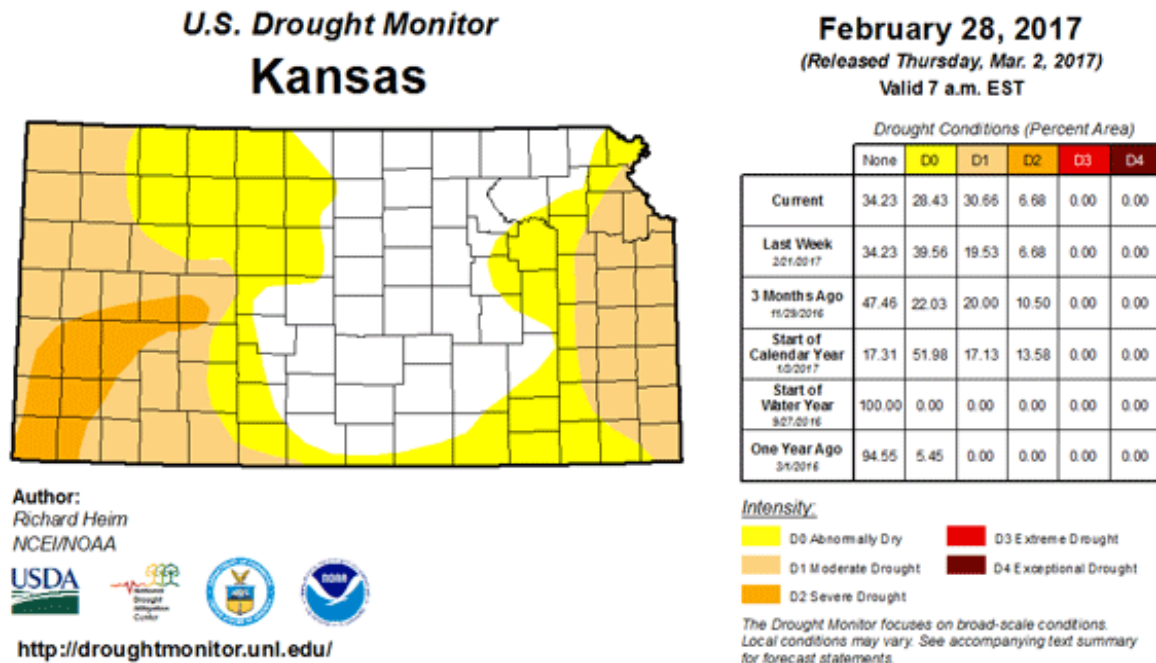


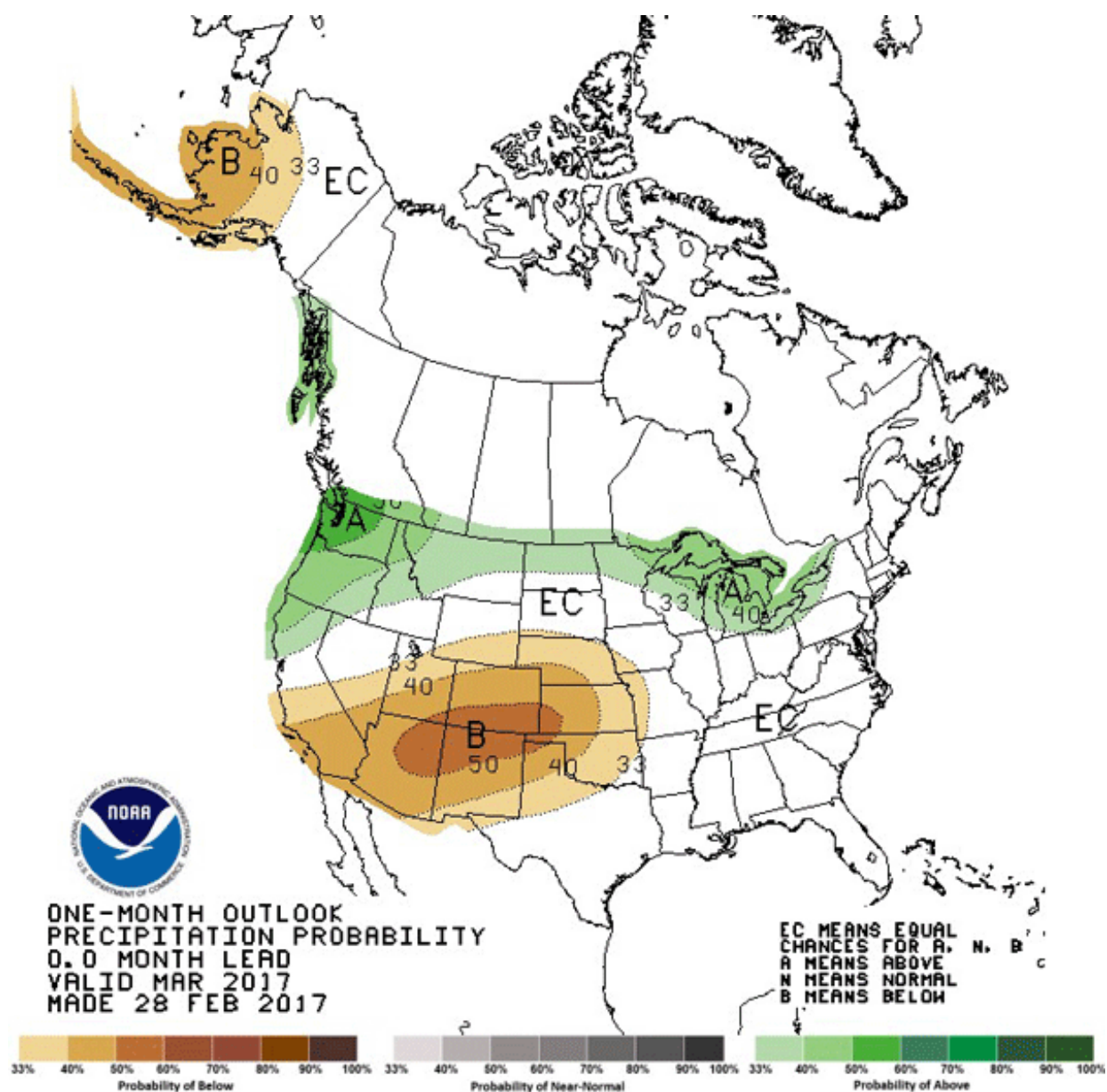


The month was again calm as far as severe weather events. There were no reports of tornadoes, hail or high winds. The biggest concern was the increase in extreme fire weather days, with the potential for wildfires.

The lower-than-normal precipitation resulted in worsening conditions in the U.S. Drought Monitor. The biggest deterioration occurred in the eastern parts of the state, where February precipitation is

generally higher and deficits accumulate much more quickly. Unfortunately, the updated March outlook does not indicate any immediate chance for improvement.





**Table 1**

**Feb 2017**

**Kansas Climate Division Summary**

Precipitation (inches)						Temperature (°F)				
Feb 2017			2017 Jan through Feb			Monthly Extremes				
Division	Total	Dep. <sup>1</sup>	% Normal	Total	Dep. <sup>1</sup>	% Normal	Ave	Dep. <sup>1</sup>	Max	Min
Northwest	0.01	-0.53	2	0.89	-0.10	89	39.3	7.7	87	0
	0.08	-0.51	15	0.89	-0.21	81	40.1	7.0	88	4

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<b>Central Southw est</b>	0.05	-0.50	10	1.78	0.76	171	43.3	7.7	90	6
<b>North Central</b>	0.09	-0.73	10	1.40	-0.05	95	40.3	8.1	80	9
<b>Central</b>	0.12	-0.89	10	1.69	-0.01	97	42.0	7.9	85	7
<b>South Central</b>	0.57	-0.59	44	3.46	1.47	175	43.6	7.1	85	6
<b>Northeast</b>	0.27	-0.85	24	1.33	-0.59	73	40.2	8.0	78	12
<b>East Central</b>	0.24	-1.09	19	1.44	-0.84	63	42.8	9.0	82	11
<b>Southeast</b>	0.55	-1.17	35	2.69	-0.28	93	45.4	8.9	85	13
<b>STATE</b>	0.23	-0.76	19	1.83	0.10	109	41.9	7.9	90	0

1. Departure from 1981-2010 normal value
2. State Highest temperature: 90 oF at Liberal, Seward County, on the 11th.
3. State Lowest temperature: 0 oF at Brewster 4W, Thomas County, on the 4th.
4. Greatest 24hr: 1.87 inches at Smileyberg, Butler County, on the 20th (NWS);1.93 inches at Arkansas City 3.1 N, Cowley County, on the 20th.

**Source: KSU Weather Data Library**

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



## 7. Comparative Vegetation Condition Report: February 21 - 27

The weekly Vegetation Condition Report maps below can be a valuable tool for making crop selection and marketing decisions.

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 27-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.

The Vegetation Condition Report (VCR) maps were originally developed by Dr. Kevin Price, K-State professor emeritus of agronomy and geography, and his pioneering work in this area is gratefully acknowledged.

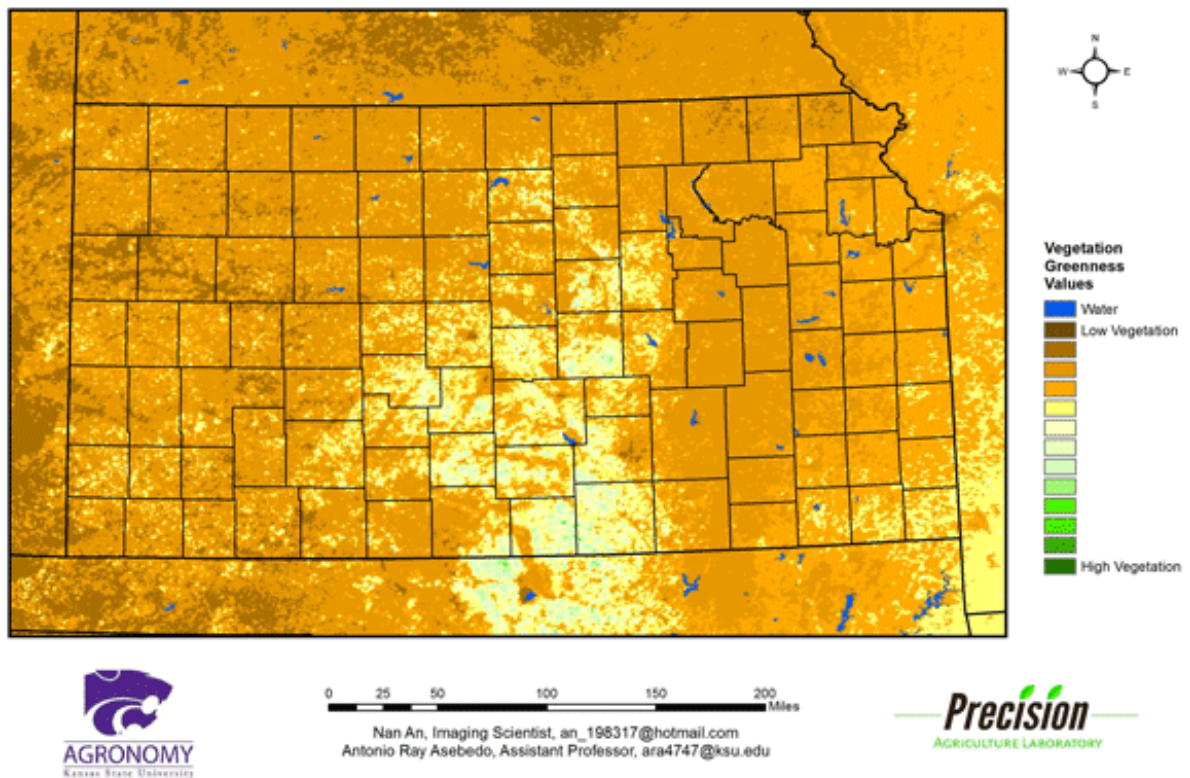
The maps have recently been revised, using newer technology and enhanced sources of data. Dr. Nan An, Imaging Scientist, collaborated with Dr. Antonio Ray Asebedo, assistant professor and lab director of the Precision Agriculture Lab in the Department of Agronomy at Kansas State University, on the new VCR development. Multiple improvements have been made, such as new image processing algorithms with new remotely sensed data from EROS Data Center.

These improvements increase sensitivity for capturing more variability in plant biomass and photosynthetic capacity. However, the same format as the previous versions of the VCR maps was retained, thus allowing the transition to be as seamless as possible for the end user. For this spring, it was decided not to incorporate the snow cover data, which had been used in past years. However, this feature will be added back at a later date. In addition, production of the Corn Belt maps has been stopped, as the continental U.S. maps will provide the same data for these areas. Dr. Asebedo and Dr. An will continue development and improvement of the VCRs and other advanced maps.

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

## Kansas Vegetation Condition

Period 09: 02/21/2017 - 02/27/2017



**Figure 1. The Vegetation Condition Report for Kansas for February 21- February 27, 2017 from K-State's Precision Agriculture Laboratory shows only light photosynthetic activity. The little production is mainly in central Kansas, although it has begun to expand northward. This is not unexpected even with the warmer-than-normal temperatures. Low temperatures are still falling below freezing and average soil temperatures are still below the 50-degree range.**

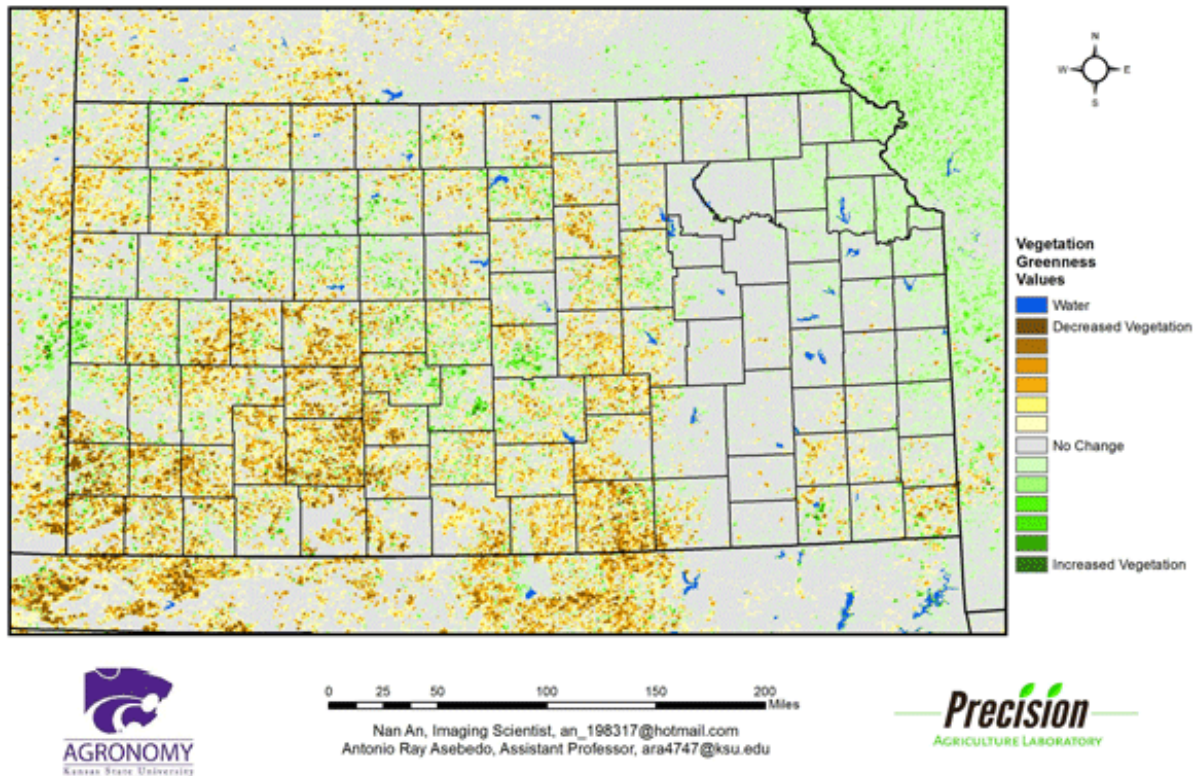
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# Kansas Vegetation Condition Comparison

## Late-February 2017 compared to the Late-February 2016

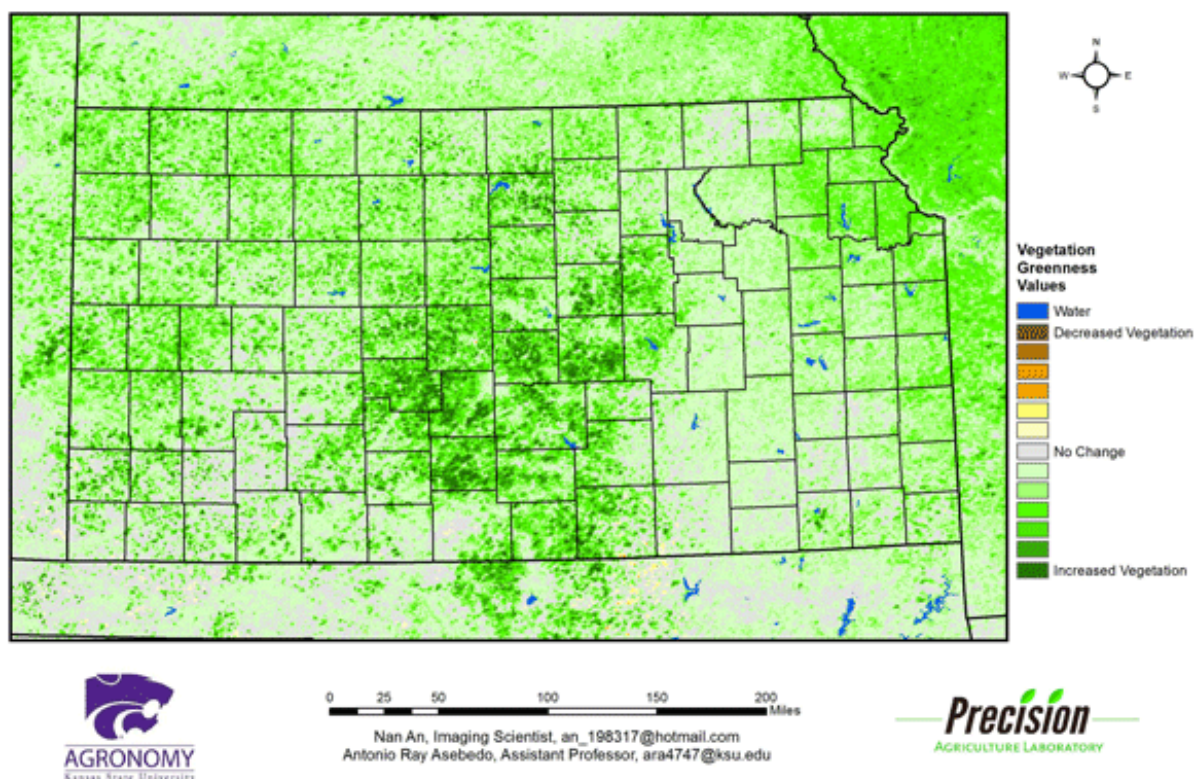


**Figure 2. Compared to the previous year at this time for Kansas, the current Vegetation Condition Report for February 21- February 27, 2017 from K-State's Precision Agriculture Laboratory shows much lower NDVI values across southern Kansas. The winter wheat is less advanced this year than last, particularly in western Kansas, where dry fall conditions hampered establishment.**



# Kansas Vegetation Condition Comparison

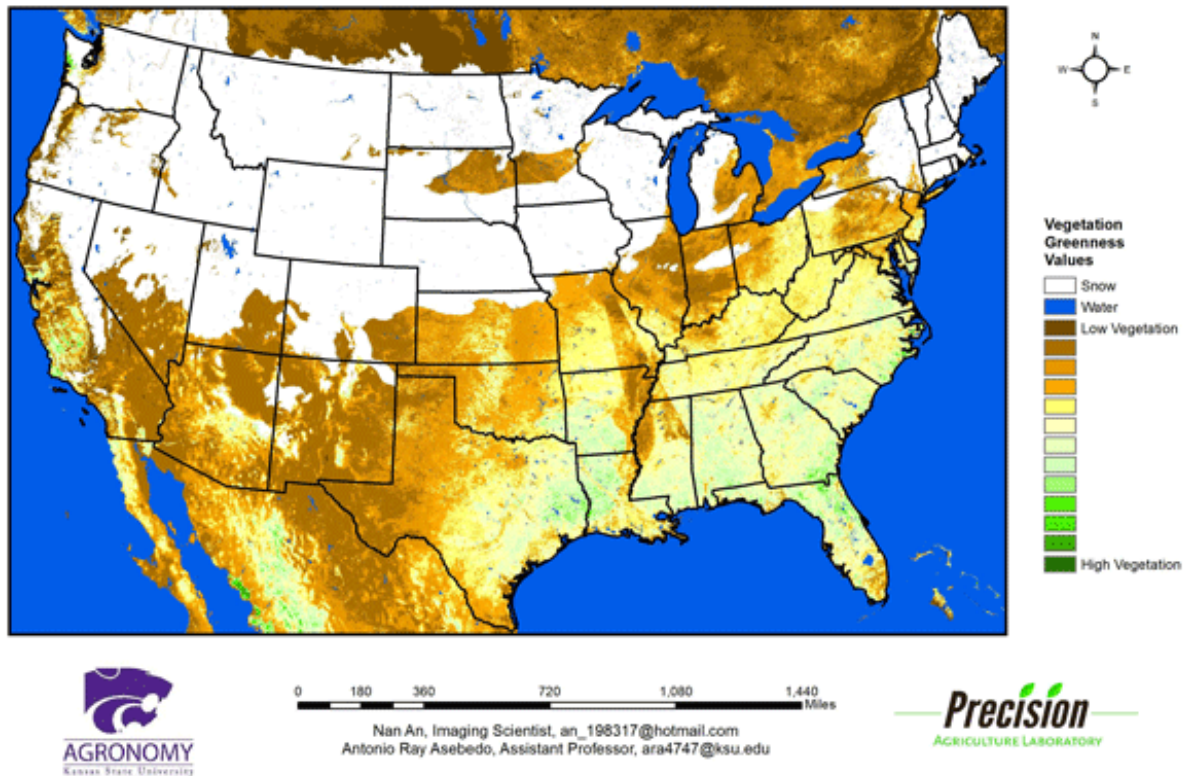
Late-February 2017 compared to the 28-Year Average for Late-February



**Figure 3. Compared to the 28-year average at this time for Kansas, this year's Vegetation Condition Report for February 21- February 27, 2017 from K-State's Precision Agriculture Laboratory much of the state has above-normal vegetative activity, especially in the central and south central parts of the state, where precipitation has been more favorable.**

## Continental U.S. Vegetation Condition

Period 09: 02/21/2017 - 02/27/2017



**Figure 4. The Vegetation Condition Report for the U.S for February 21- February 27, 2017 from K-State's Precision Agriculture Laboratory shows the area of highest NDVI values is confined to the South, particularly in east Texas and Louisiana. Snow coverage has retreated to the north, with a small pocket in northeastern Colorado and northwest Kansas. The Sierra Nevada of California continues with tremendous snowpack, and snow returned to the Great Lakes and Upper New England regions.**

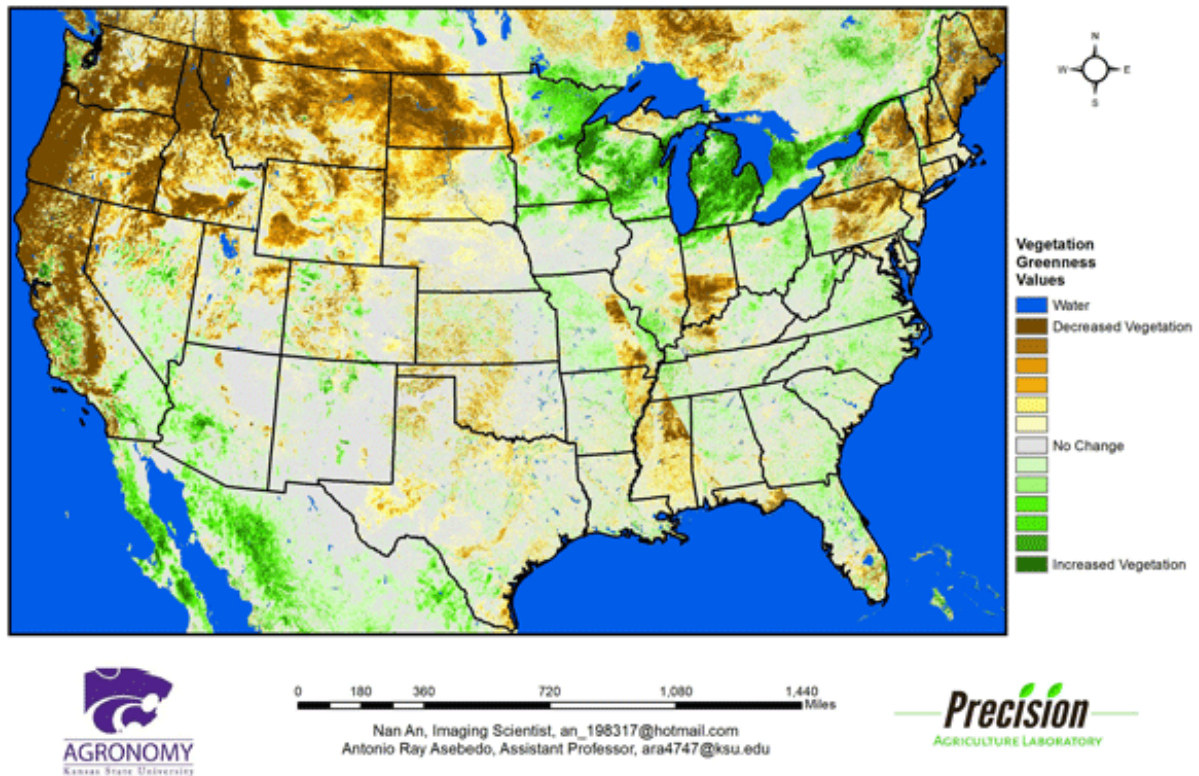
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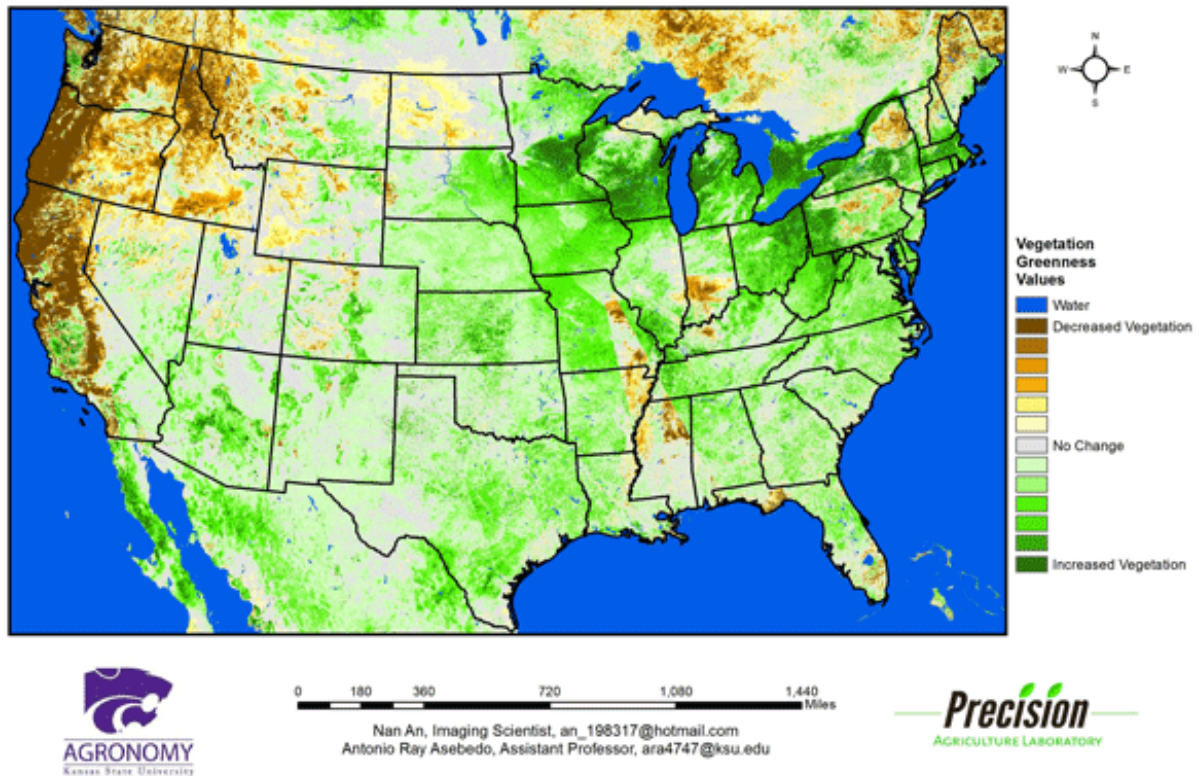


Continental U.S. Vegetation Condition Comparison  
Late-February 2017 Compared to Late-February 2016



**Figure 5. The U.S. comparison to last year at this time for February 21- February 27, 2017 from K-State's Precision Agriculture Laboratory shows the impact the split in the snow cover has caused. Much lower NDVI values prevail from the Pacific Northwest through the Northern Plains, where snow coverage has been much higher this year. In contrast, the region along the Great Lakes has seen much lower snowfall. This, coupled with warmer-than-average temperatures, has favored early vegetative growth.**

Continental U.S. Vegetation Condition Comparison  
Late-February 2017 Compared to 28-year Average for Late-February



**Figure 6. The U.S. comparison to the 28-year average for the period of February 21- February 27, 2017 from K-State's Precision Agriculture Laboratory shows an area of below-average photosynthetic activity in the Intermountain West, where snow cover is greatest. Above-average NDVI values are visible in the Midwest from Iowa through Pennsylvania and northward. Warmer-than-normal temperatures and little snow cover has favored early vegetative growth there.**

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