Issue 637

K-STATE Research and Extension

## Extension Agronomy

# eUpdate

*06/09/2017*

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, or Curtis Thompson, Extension Agronomy State Leader and Weed Management Specialist 785-532-3444 cthompso@ksu.edu.

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## 1. Postemergence marestail and pigweed control in soybean fields

Controlling marestail or pigweeds postemergence in soybeans is always easier when the weeds are small – less than 2 inches tall is preferable for good control. Once weeds get taller, they are often considerably more difficult to control. However, conditions are not always conducive to getting optimal postemergence weed control. The wet weather in many areas this spring may cause weeds in some fields to get larger than you intended. The following are some suggestions for controlling these weeds postemergence in soybeans.

**Marestail**

Marestail tend to be difficult to control even when the plants are small and in the rosette stage, but become even tougher when plants get more than 6 inches tall. That is why fall and early burndown treatments are critical to the long-term management of marestail. Unfortunately, that doesn't always happen. In addition, there are populations of marestail that have developed glyphosate resistance in many areas. However, some marestail populations are still susceptible to glyphosate, and even resistant plants are not completely immune to glyphosate.

Figure 1. Growth stages of marestail from seedling, rosette, to bolting state. Photos by Dallas Peterson, K-State Research and Extension.

The most effective herbicide treatment for controlling marestail in Roundup Ready soybeans is probably a tank-mix of glyphosate plus FirstRate. The combination of the two herbicides seems to work better than either herbicide alone, even on resistant plants. It is important to use the full labeled rates of glyphosate and recommended adjuvants, including ammonium sulfate, to optimize control and help minimize the risk of developing more resistance. Other tank-mixes to consider with glyphosate for controlling marestail would include Classic and Synchrony herbicides. Unfortunately, some marestail may also be ALS resistant, in which case FirstRate, Classic, and Synchrony would also be fairly ineffective. This just further emphasizes the importance of early spring weed control.

If Xtend soybeans are planted, Xtendimax, FeXapan, or Engenia should be some of the most effective herbicides for postemergence control of marestail in soybeans. Remember that Xtendimax, FeXapan and Engenia can only be applied to Xtend soybeans.

Another option to control marestail in soybean is to plant Liberty Link soybeans and use Liberty herbicide. It is important to remember that Liberty can only be applied postemergence on Liberty Link soybeans.

**Waterhemp and Palmer amaranth**

Figure 2. Glyphosate-resistant Palmer amaranth escapes in soybeans. Photo by Dallas Peterson, K-State Research and Extension.

If preemergence herbicides weren't applied or didn't get activated in a timely manner, early-emerging waterhemp or Palmer amaranth may not have been controlled and can grow rapidly. Flexstar, Cobra, Marvel, and Ultra Blazer can be fairly effective for controlling small pigweed, but are less effective as the pigweed gets larger, especially Palmer amaranth. These herbicides also provide some residual weed control, so tank-mixes of these herbicides with glyphsosate should be applied within 3 weeks after planting to optimize performance. Producers may try to cut the rates of these herbicides to reduce soybean injury. However, lower rates of these burner herbicides still cause similar soybean burn symptoms and weed control is often reduced.

Pursuit and Harmony were once fairly effective for pigweed control and can still provide good control of susceptible populations, but many fields now have ALS-resistant waterhemp and Palmer amaranth.

If Xtend soybeans were planted, the new dicamba products Xtendimax, Engenia, and FeXapan again are an option to help control broadleaf weeds, including the pigweeds. However, just as with other postemergence pigweed treatments, the pigweeds need to be less than 3 to 4 inches tall to achieve optimal control.

Likewise, Liberty herbicide can be used in Liberty Link soybeans to help control small pigweeds. Liberty is also most effective on smaller weeds and generally requires higher spray volumes to achieve good coverage and weed control.

Residual herbicides such as Zidua, Outlook, Dual Magnum, and Warrant can also be added to any of the previously mentioned postemergence herbicides to provide some extended residual control of pigweeds. This may be especially helpful if a good rate of residual herbicide was not used earlier or with heavy pigweed pressure.

Dallas Peterson, Weed Management Specialist
dpeterso@ksu.edu

Doug Shoup, Southeast Crops and Soils Specialist
dshoup@ksu.edu

## 2. Common bunt (stinking smut) in wheat

Common bunt (stinking smut) occurs in Kansas almost every year, but it is often not detected until a load of wheat is actually rejected at the elevator. This fungal disease causes moderate deformation of wheat kernels, and infected kernels often have a gray color. The infected kernels will also be filled with black powdery spores as opposed to the normal white starches of healthy kernels. The fungus produces volatile chemicals that have a strong fishy odor. This odor is readily detected in loads of grain and may persist through the milling and baking process. Clearly, this is not the smell most people would like to have filling their home when baking bread.

Figure 1. Normal wheat on left; wheat infected with common bunt on right. Photo by Bill Bockus, K-State Research and Extension.

It is possible to confuse grain damaged by common bunt with another common problem known as black point. Symptoms of black point include a partial dark brown or black discoloration of the kernels. There is no fishy odor associated with black point and the interior of the kernels has the normal white starchy appearance. Black point is often associated with hot and wet conditions that delay harvest. These conditions can predispose the plants to colonization by decay fungi, which can discolor the kernels. These decay fungi are not aggressive pathogens and they normally are restricted to the outer layers of the kernel. Black point can also be caused by a physiological response of plants to weather during the later stages of grain fill.

Figure 2. Physiological black point in wheat. Photo by Erick DeWolf, K-State Research and Extension.

Both problems can result in price discounts when marketing grain and may lead to rejection of loads of grain. The rejection of grain is more frequent with common bunt.

Common bunt is a seed-borne disease. The disease persists between seasons on seed contaminated with the black spores of the bunt fungus during harvest or subsequent grain handling. The spores will survive on the outside of the kernels until fall, when they germinate and infect the developing seedlings shortly after planting. This infection process is favored by cool and wet fall conditions.

Unfortunately, many farmers do not recognize the problem until they have loads of grain rejected by a grain elevator. There do not appear to be many options for using the rejected grain. Saving this grain for seed will increase the chances of having problems with bunt in following years. In some situations, I have heard of growers working with local feed lots to move rejected grain. The availability of this option will likely vary regionally in the state.

Management options for common bunt:

- Common bunt is most likely to be a problem when wheat has been saved for seed for 2 or more years. Renewing the seed supply every few years will greatly reduce the risk of future common bunt problems. Do not use heavily infected wheat as seed if at all possible. If infected wheat is used as seed, be sure to have it treated with a fungicide. Even a highly effective fungicide seed treatment (98% control), may not be enough to prevent price discounts or rejections in the subsequent crop.

- Fungicide seed treatments. I generally recommend that growers set priorities when using the fungicide seed treatments. The top priority for fungicide seed treatments should be on wheat that is intended for future seed production. Products such as Gaucho XT, Vibrance Extreme, and Stamina F3 Cereals are all highly effective at controlling seed-borne diseases like common bunt and loose smut. The use of these products on wheat intended for seed production should greatly reduce the risk of severe bunt or smut problems.

Erick DeWolf, Extension Wheat Plant Pathologist
dewolf1@ksu.edu

## 3. Loose smut: Causes and treatments

There have been several reports in recent years of loose smut in wheat. It is not uncommon to find low levels of loose smut in wheat fields, and the symptoms will be obvious by this time of year.

It is easy to pick out plants with loose smut in a field. The spikelets of infected heads are completely black and sooty instead of the normal, healthy color. There is no grain. Instead, infected heads consist entirely of a mass of fungal spores.

Figure 1. Loose smut in wheat. Photo by Erick DeWolf, K-State Research and Extension.

Loose smut is a seedborne disease that is caused by the fungus *Ustilago tritici*. The fungus that causes loose smut survives as dormant mycelia within the embryo of an infected wheat seed. When the seed germinates, the fungus becomes active again. The fungus develops within the growing point and moves into the developing grain tissue as the wheat plants grow.

When the head emerges, there are masses of black spores on the spikelets instead of flowering parts. By harvest only an erect bare rachis remains. The spores are released into the air and can be blown onto healthy wheat heads were infection takes place at flowering or the early stages of kernel development. If the infection is successful, the fungus begins to grow within the developing wheat seed embryo.

Newly infected grain appears healthy in every way, but when it germinates the following season, the plant that grows from the infected seed will produce nothing but a dark mass of spores instead of healthy grain. The yield loss on infected heads is total. On a field-wide basis, the amount of yield loss is proportional to the percentage of infected heads.

Cool (60-70 degrees F), humid weather accompanied by light showers or heavy dews is most favorable for infection. Under favorable weather conditions, the wheat produced from a field with only one percent of the heads infected, can have seed with 10 percent or more infection of loose smut.

Once loose smut becomes evident in the field, it is far too late to control the disease. The best option at that point is seed treatment. If producers have a field that is infected with loose smut and plan to keep some of the grain back for seed, they should be sure to have the seed commercially treated with a systemic fungicide seed treatment such as Gaucho XT, Vibrance Extreme, and Stamina F3 Cereals. These fungicides provide excellent control of loose smut, but good coverage of the seed is very important to ensure that the maximum benefit of the treatment is realized.

Another option is to sell all the wheat from the infected field as grain and buy certified seed to plant in the fall. Certified seed in Kansas is allowed to have as much as 10 heads in 1,000 (or 1 percent) that are infected with loose smut. There is no requirement that this seed be treated in order to qualify as certified seed by the Kansas Crop Improvement Association, but it would be a good idea to buy treated seed. The cost of having seed treated with a standard low-rate fungicide seed treatment for loose smut is relatively low. Costs are higher if the seed treatment also includes an insecticide.

There are no varieties are highly resistant to all races of loose smut.

Erick DeWolf, Extension Wheat Plant Pathologist
dewolf1@ksu.edu

## 4. Twisted, wrapped whorls and trapped, yellow leaves in corn

Most of the state has had a significant amount of precipitation in recent weeks. This situation, combined with an earlier period of below-normal temperatures, has been causing production issues for corn – some of which have been discussed in previous articles on "purple corn" (eUpdate Issue 635, https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=1401) and "standing water" (eUpdate Issue 632, https://webapp.agron.ksu.edu/agr_social/eu_article.throck?article_id=1362).

Aside from agronomic implications for corn planted this late, full crop insurance coverage for corn planted at this point is not available.

Some cornfields are showing early indications of nitrogen (N) deficiency. In other situations, yellow leaves on the top of the canopy ("yellow tops") can be confused with N deficiency. The cause of yellow leaves on the top of the canopy seems to be a combination of previous slow growth and current "good" growing conditions." Still, the main cause is not clearly known.

**Figure 1. Yellow leaf showing symptoms of sun starvation. Plants will recover after being exposed to sunny conditions for a couple of days. Photo by Ignacio A. Ciampitti, K-State Research and Extension.**

Twisted whorls can also be confounded with a herbicide damage issue from postemergence applications. But in this particular case it is related to the transition from a slow to a rapid growth conditions for corn plants. Leaves within the whorl do not unfurl ("twisted upper leaves"), producing an obstacle to the younger developing leaves for emerging. These younger leaves have been shaded until they finally emerge; thus the yellow appearance. Yellow leaves are accompanied by wrinkle pattern (Fig. 2), condition that will remain for the rest of the season (affected leaves due to "twisted whorls").

**Figure 2. Yellow corn leaf with a wrinkle pattern. Photo by Ignacio A. Ciampitti, K-State Research and Extension.**

In most of the fields inspected, this situation was isolated without affecting the entire field (Fig. 3). As a general pattern, corn presenting this condition was around the V4-V8 (four to eight-leaf) growth stage interval.

**Figure 3. Yellow tops in isolated patterns within the corn field. Photos by Ignacio A. Ciampitti, K-State Research and Extension.**

Yellow-tops will fade away as growing conditions (temperature) resumes to normal for this point in the season, and as the leaves accumulate chlorophyll. Previous reports related to this production issue did not document yield impacts. Thus, yield is not likely to be affected if the growing conditions resume to normal in the next days. Just make sure to scout your fields for this corn production issue.

Ignacio A. Ciampitti, Crop Production and Cropping Systems Specialist
ciampitti@ksu.edu

## 5. Evaluating non-uniform sorghum stands

Some fields of sorghum may have problems with non-uniform emergence for various reasons. In some cases, the surface soil was dry and some of the sorghum did not emerge immediately, or may not have emerged at all. In other cases, cool, wet soils slowed or reduced emergence on early-planted sorghum. The latter might be one of the most frequent cases occurring during this planting season. Insect damage can also cause emergence problems.

There are really two aspects to this situation: (1) sorghum stands with plants that are at different stages of development, and (2) sorghum stands that have fewer plants than desired.

**Plants at different stages of development**

If the stand has not been reduced substantially, there is seldom cause for concern with sorghum (Fig. 1). This is in contrast to corn. With corn, if some plants are developmentally ahead of others, this can lead to yield reductions. Plant-to-plant uniformity is a critical aspect in corn production systems. But there is little data to document severe yield reductions in sorghum, provided the plants have emerged within a period of 10-14 days of each other.

Sorghum often has tillers that act something like late-emerging plants. Usually these early tillers contribute a significant portion of the grain yield. Late-emerging plants may head and bloom slightly later than the early-emerging plants, but the difference typically is not nearly as great as the difference in emergence dates. As long as the sorghum does not lodge and is not killed by an extremely early frost, these later heads will fill adequately and mature in time for a normal harvest.

We would rather see a nice uniform field, but it is probably not worthwhile to destroy a stand and replant just because a significant percentage of plants emerged several days later than the others.

**Figure 1. Sorghum presenting differences in size and development (number of leaves), Shawnee County. Photo by Ignacio Ciampitti, K-State Research and Extension.**

### Fewer plants than desired

The second result of delayed or reduced emergence may be a reduction in stand, often in a non-uniform manner (Figure 2). Sorghum is notoriously non-responsive to changes in stand within a fairly wide range for a given environment. Often it takes a reduction of more than 25 to 30% before yield is reduced, as long as the plant spacing is relatively uniform.

**Figure 2. A field of sorghum with differences in emergence, Riley County. Photo by Ignacio Ciampitti, K-State Research and Extension.**

Several years ago Richard Vanderlip, K-State crop physiologist, examined the impact of reductions in stand and the number and size of gaps in sorghum plantings in experiments at Manhattan and St. John. Some conclusions from that work:

1. Plants within the row containing skips and in adjacent rows compensated for missing plants by producing more heads per plant, more seeds per head, and – to a lesser extent – heavier seeds.

2. Differences in tillering ability of hybrids did not influence grain yield. Hybrids that tillered less compensated by increasing head size (seeds/head).

3. Yield compensation increased as plant spacing uniformity improved. Yield reductions were more likely or severe where skips resulted in severe lack of uniformity within the plant spacing and there were large gaps side-by-side in adjacent rows.

Every field will be different, but the research seems to indicate that stand reductions must be at least 25% to 30% or more before yields are affected, even with occasional gaps up to 9 feet long. Gaps of less than 9 feet likely will not reduce yield provided adjacent rows have no gaps and stands are not reduced by more than 25%.

Sorghum has a great capacity to compensate for stand reductions, which reduce the impact on non-uniform stands on the crop yield. Keeping an established stand is usually the better choice than spending the money and facing the risks associated with destroying the stand and replanting, provided the stand has not been reduced too much and does not contain too many large gaps. Risks of yield reductions with replanting will increase as the season progresses and planting dates get later.

Ignacio Ciampitti, Cropping Systems and Crop Production Specialist
ciampitti@ksu.edu

Kraig Roozeboom, Cropping Systems and Crop Production Agronomist
kraig@ksu.edu

Kansas State University Department of Agronomy
2004 Throckmorton Plant Sciences Center | Manhattan, KS 66506
www.agronomy.ksu.edu | www.facebook.com/KState.Agron | www.twitter.com/KStateAgron

## 6. K-State wheat plot tours for June 12 - 16

The week of June 12 – 16 has seven wheat plot tours in Kansas. Producers willing to learn about the different varieties can choose to attend one (or several) plot tours in their county or agricultural district.

The plot tours generally include a discussion of wheat conditions across the state, as well as tips on what to look for when selecting wheat varieties for one operation. New and upcoming varieties are discussed, as well as older and more established ones and a discussion of how all these varieties are responding to this growing season's conditions.

For the week of June 12 – 16, the scheduled plot tour locations include:

**Monday, 6/12/2017, 7:00 a.m.**
**Location: Decatur Co., Oberlin**
Contact: Keith VanSkike, 785-877-5755, kvan@ksu.edu
Directions: Roger May, 2 ½ mi west of Oberlin on Hwy 36 to 800th Rd., then ½ mi south.

**Tuesday, 6/13/2017, 7:30 a.m.**
**Location: Thomas Co., Levant**
Contacts: Kurt Sexton, 785-460-4582, kurtsexton@ksu.edu
Directions: Solomon Creek farm, (Mike, Jeanene, & Tanner Brown) 5 miles south of the Levant/I-70 interchange, at the shop on the east side of the road.

**Tuesday, 6/13/2017, 4:00 p.m. MDT**
**Location: Sherman Co., Kanorado**
Contact: Jeanne Falk Jones, 785-443-3403, jfalkjones@ksu.edu
Directions: Truman Hooker 4-H plot. From Kanorado, go east one mile to Rd 3, go north to Rd 64 and go ¼ mi west.

**Tuesday, 6/13/2017, 5:30 p.m. MDT**
**Location: Sherman Co., Goodland**
Contact: Jeanne Falk Jones, 785-443-3403, jfalkjones@ksu.edu
Directions: F&J Farms. 10 mi. north of Goodland on Hwy 27.

U. **6/14/2017, 7:30 a.m. MDT (6:30 a.m. breakfast)**
**Location: Wallace Co., Sharon Springs**
Contact: Jeanne Falk Jones, 785-443-3403, jfalkjones@ksu.edu
Directions: Mai Farms, 9 mi south of Sharon Springs to Field Rd and 3 1/2 mi east.

**Wednesday, 6/14/2017, 10:0 a.m. MDT**
**Location: Wallace Co., Weskan**
Contact: Jeanne Falk Jones, 785-443-3403, jfalkjones@ksu.edu
Directions: E&H Farms. From Weskan, go 3 mi west on Hwy 40 to Rd 3. Then go south 6 1/4 mi to Field Rd.

**Wednesday, 6/14/2017, 5:30 p.m. CDT**
**Location: Cheyenne Co., Wheeler**
Contact: Jeanne Falk Jones, 785-443-3403, jfalkjones@ksu.edu
Directions: Sunny Crest Farm, 5 mi south of Wheeler on Hwy 27 to Rd I, west ¼ mi.

Romulo Lollato, Extension Wheat Specialist
lollato@ksu.edu

Erick DeWolf, Extension Wheat Pathologist
dewolf1@ksu.edu

## 7. Field pea plot tours, June 15

Three field pea plot tours from K-State Research and Extension have been scheduled for June 15.

1. Gove County, 8:30 a.m. CT. From Grainfield/Hoxie exit on I-70 go 2 ¾ miles south on Road 50, then 2 ½ miles east on Road Z.

- Variety performance test with 17 entries
- Seeding rate study, seed treatment study, and in-furrow fertilizer study

2. Northwest Research-Extension Center, 1 p.m. CT. 105 Experiment Farm Road, Colby. Come in the main drive and follow the signs.

- Variety performance test with 19 entries
- Seeding rate study
- In-furrow fertilizer application study
- Lentil variety evaluation

3. Rawlins County, 4 p.m. CT. From the intersection of Hwy US 36 and K-25 in Atwood go 6 miles north on K-25, then 1/8 mile west on Road X.

- Variety performance test with 17 entries
- Seeding rate study
- Seed treatment study
- Wheat plot tour to follow at 5:30 p.m. CT

K-State faculty, industry representatives, and experienced producers will be on hand to discuss pea growth and development, variety selection, herbicide options, production practices, disease management and producer experiences.

For more information contact:
Lucas Haag, K-State Northwest Area Agronomist (785) 462-6281, LHaag@ksu.edu
Golden Prairie Extension District (785) 673-4805
Rawlins County Extension (785) 626-3192

K-STATE
Research and Extension

# 2017 Field Pea Plot Tours
# June 15th

## Gove County, 8:30 AM CT

- Variety Performance Test with 17 entries
- Seeding rate study, seed treatment study, and in-furrow fertilizer study
- From Grainfield/Hoxie exit on I-70 go 2 ¾ miles south on Road 50, then 2 ½ miles east on Road Z.

## Northwest Research-Extension Center – 1:00 PM CT

- Variety Performance Test with 19 entries
- Seeding Rate Study
- In-Furrow Fertilizer Application Study
- Lentil variety evaluation
- 105 Experiment Farm Road, Colby, KS. Come in the main drive and follow the signs

## Rawlins County– 4:00 PM CT

- Variety Performance Test with 17 entries
- Seeding Rate Study
- Seed Treatment Study
- Wheat plot tour to follow at 5:30 CT
- From the intersection of Hwy US 36 and K-25 in Atwood go 6 miles north on K-25, then 1/8 mile west on Road X

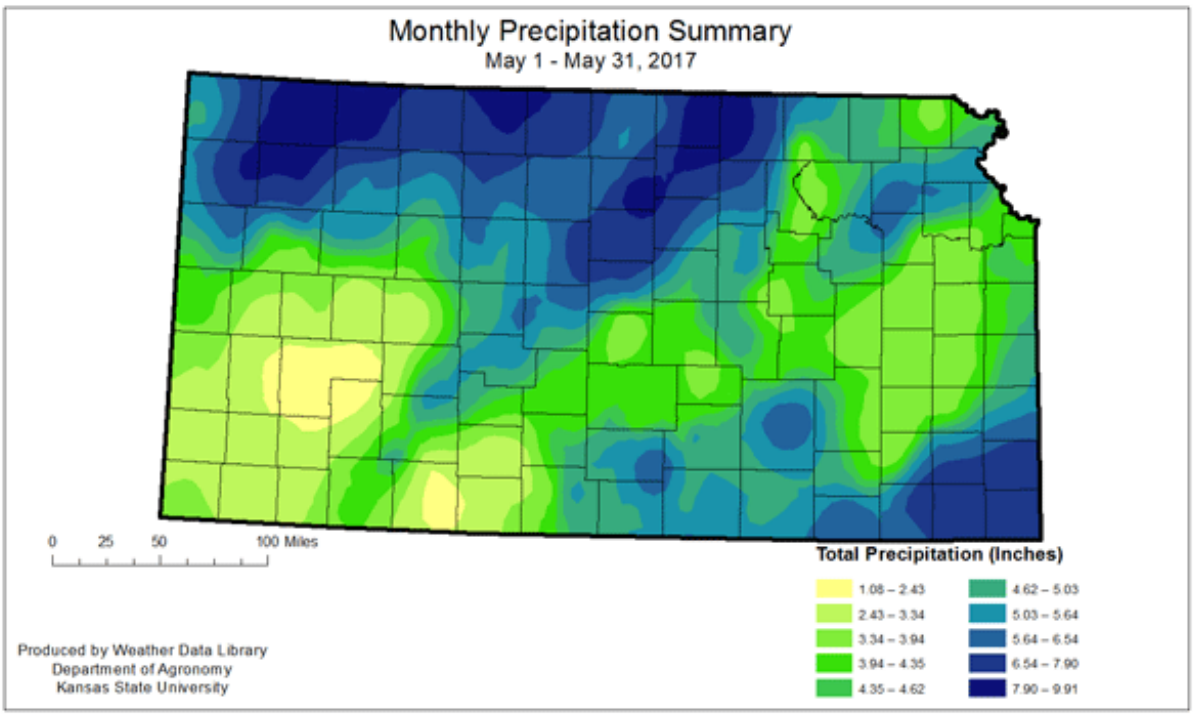
**K-State faculty, industry representatives, and experienced producers will be on hand to discuss pea growth and development, variety selection, herbicide options, production practices, disease management and producer experiences.**

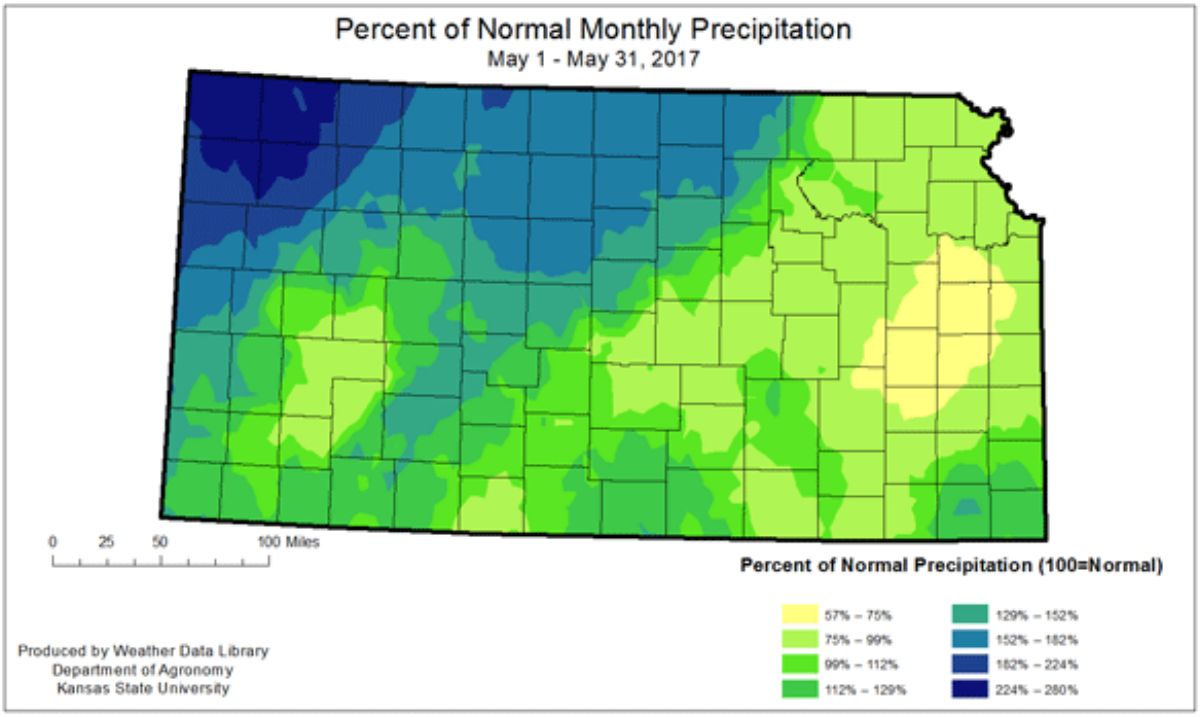
***For questions or more information contact:***

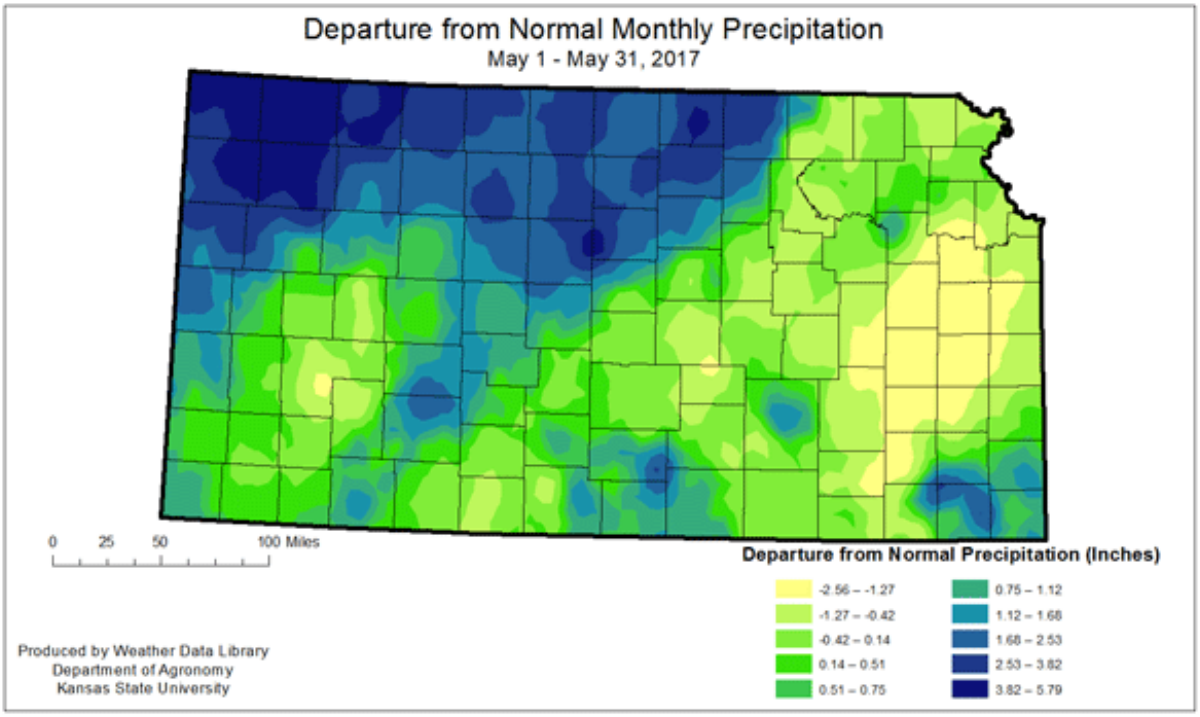
Lucas Haag, K-State Northwest Area Agronomist (785) 462-6281, LHaag@ksu.edu
Golden Prairie Extension District (785) 673-4805
Rawlins County Extension (785) 626-3192

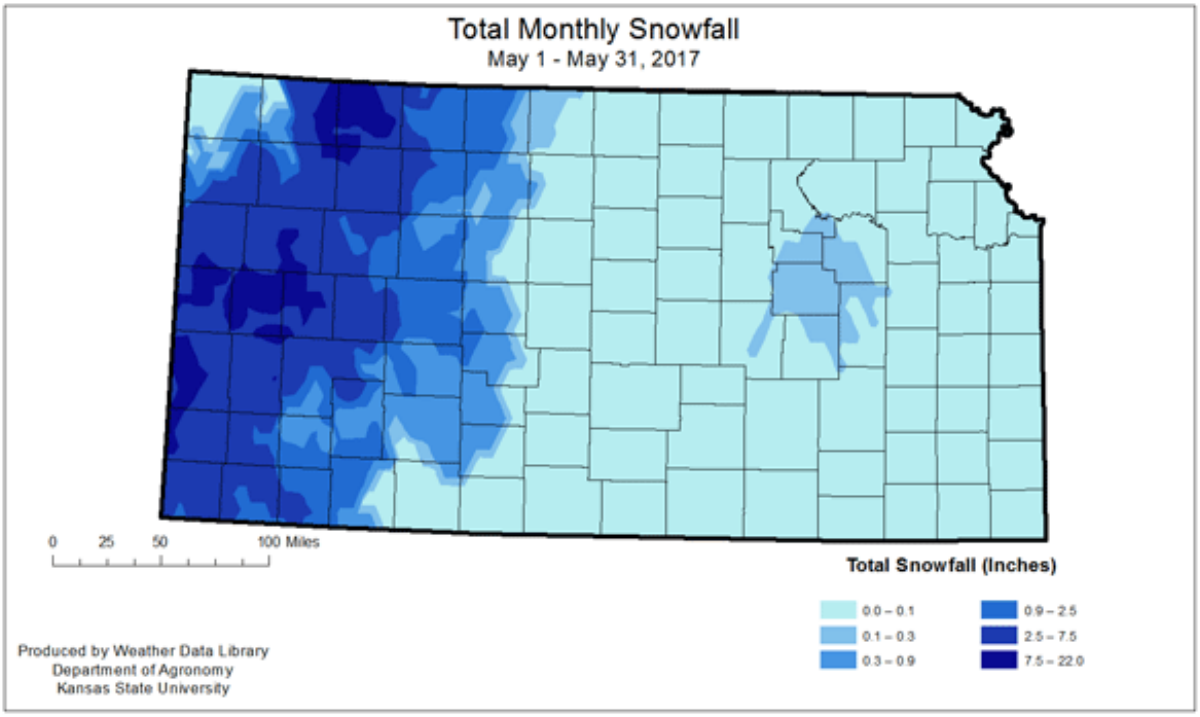
## 8. Kansas weather summary for May: Cold, wet start

The epic April blizzard in Kansas carried into the first of May, with significant snowfall reported from the event. This started a wetter-than-normal month for most of the state. The statewide average precipitation was 4.66 inches, which is 113 percent of normal. The North Central Division had the highest percent of normal with an average of 6.32 inches, or 154 percent of normal. The Northeast, East Central, and Southwest Divisions were below normal for the month, but given the very wet conditions in April, all divisions are above normal for the April – May period. Rains were frequent enough that even the Divisions with below-normal precipitation had planting delays. The greatest monthly precipitation total for a National Weather Service (NWS) Coop station was 9.49 inches at Oswego 1N, Labette County. The greatest monthly total for a Community Collaborative Rain, Hail and Snow (CoCoRaHS) station was 9.91 inches at Beloit 9.9 SSW, Mitchell County. The highest 24-hour totals: 5.18 inches at Norwich, Kingman County, on the 12th (NWS); and 5.00 inches at Abilene 0.7 E, Dickinson County, on the 19th (CoCoRaHS).

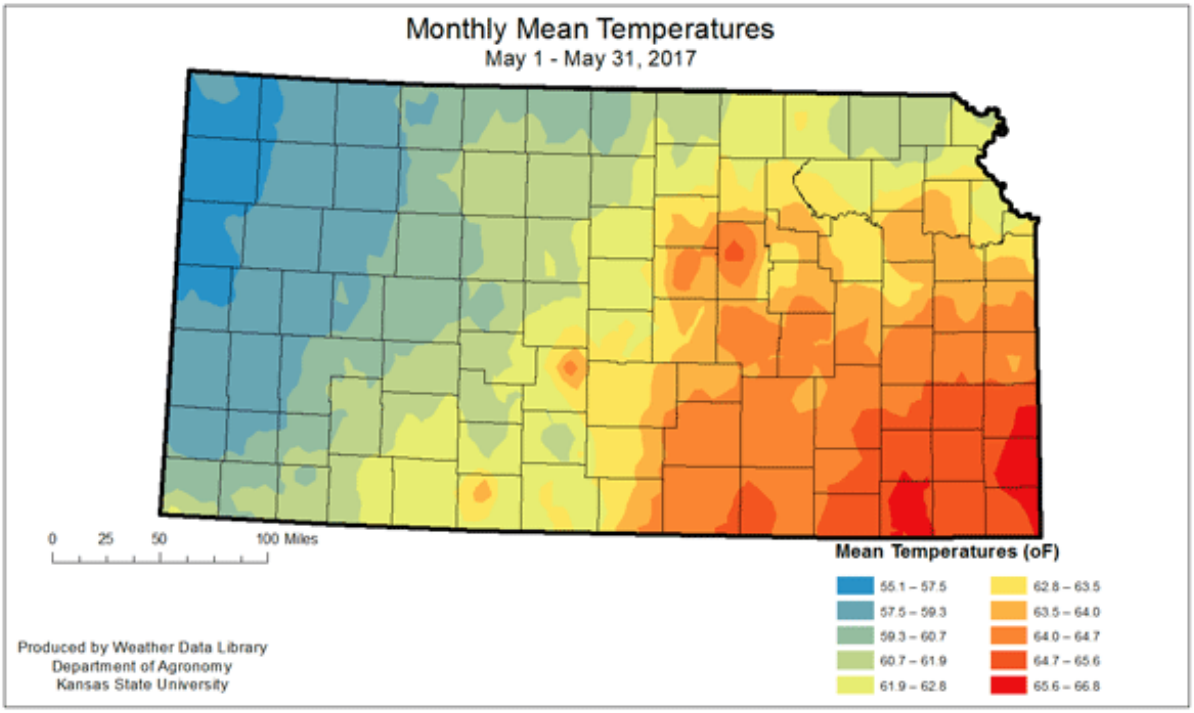


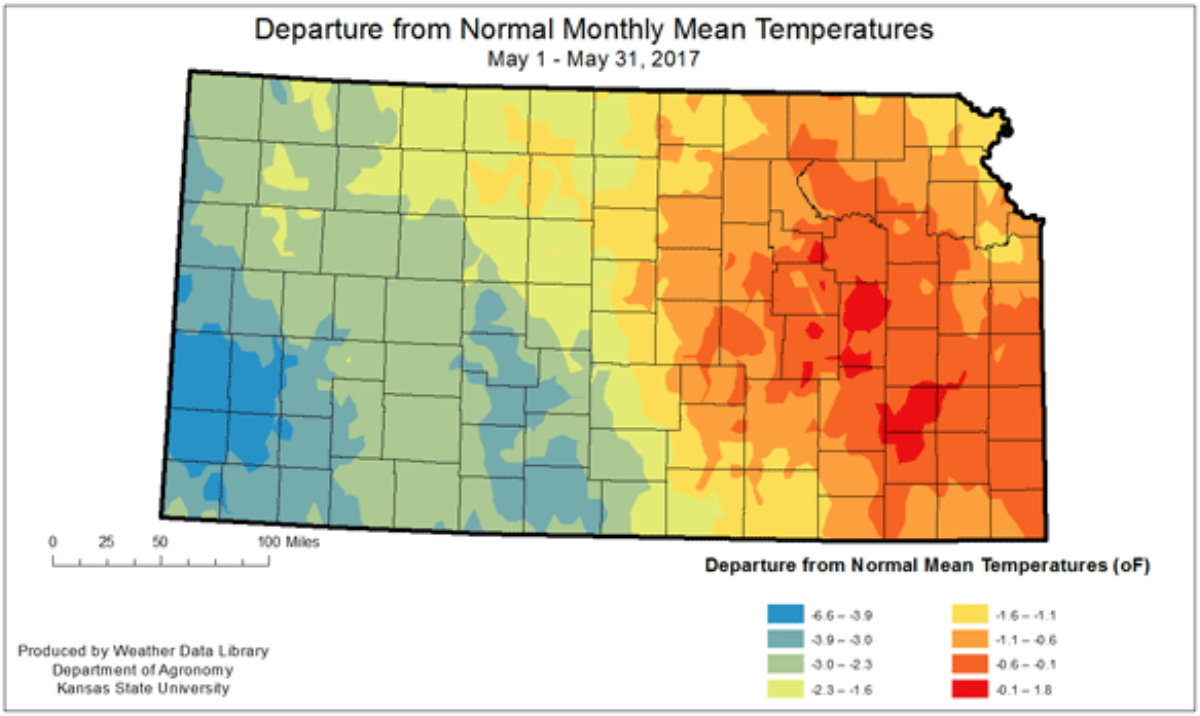

Percent of Normal Monthly Precipitation
May 1 - May 31, 2017
0 25 50 100 Miles
Percent of Normal Precipitation (100=Normal)
57% – 75%
75% – 99%
99% – 112%
112% – 129%
129% – 152%
152% – 182%
182% – 224%
224% – 280%
Produced by Weather Data Library
Department of Agronomy
Kansas State University


Departure from Normal Monthly Precipitation
May 1 - May 31, 2017
0 25 50 100 Miles
Departure from Normal Precipitation (Inches)
-2.56 – -1.27
-1.27 – -0.42
-0.42 – 0.14
0.14 – 0.51
0.51 – 0.75
0.75 – 1.12
1.12 – 1.68
1.68 – 2.53
2.53 – 3.82
3.82 – 5.79
Produced by Weather Data Library
Department of Agronomy
Kansas State University

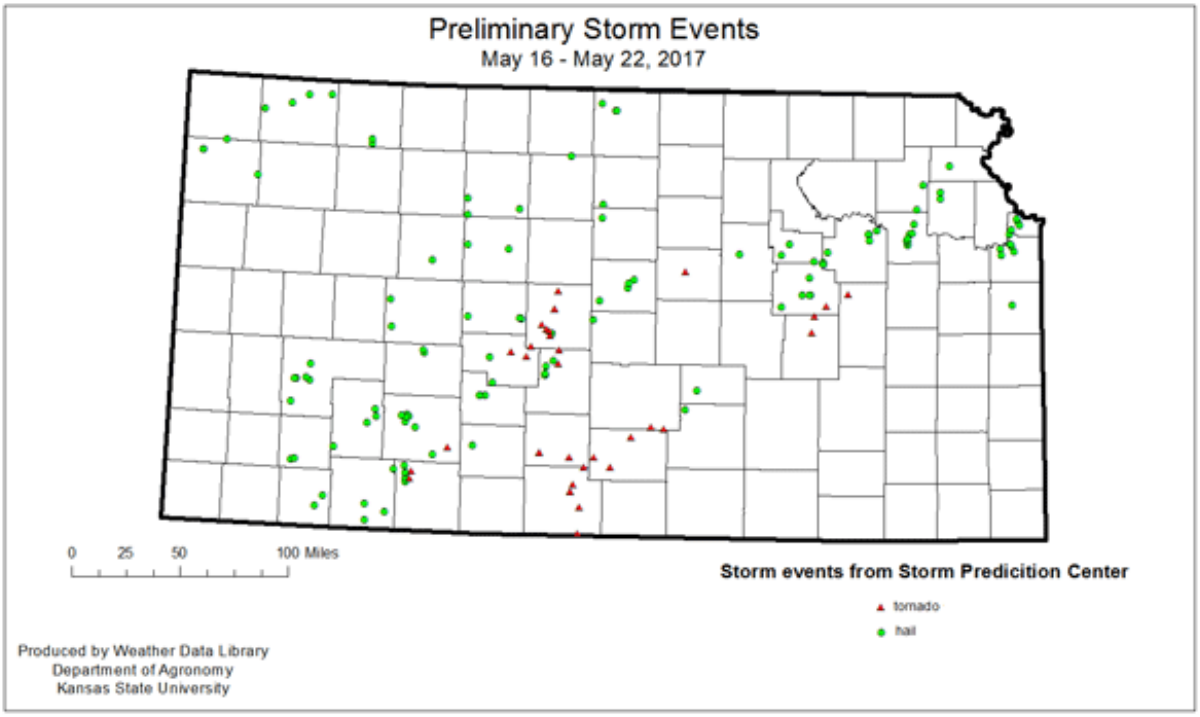



Temperatures were slow to recover from the cooler-than-normal start. Statewide temperatures averaged 61.8 °F or -1.7 degrees from normal. The East Central and Southeast Divisions averaged closest to normal with a departure of -0.7 °F respectively. The warmest reading for the month was 95 °F at Elkhart, Morton County, on the 26th. The coldest reading, not surprisingly, was at the beginning of the month when Hays 1ESE recorded a low of 22 °F on the 1st. Despite the cool temperatures, there were five record high maximum temperatures during the month and seven record high minimum temperatures. On the cold side, there were 41 new record cold maximum temperature in May and 33 new record low minimum temperatures. Of the record cold maximum temperatures, 15 set new records for any day in May. Freezing temperatures were reported in five of the nine climate divisions. The exceptions were the South Central Division and the eastern Divisions. All Divisions, except the Southeast, saw high temperatures reach 90 °F or more.

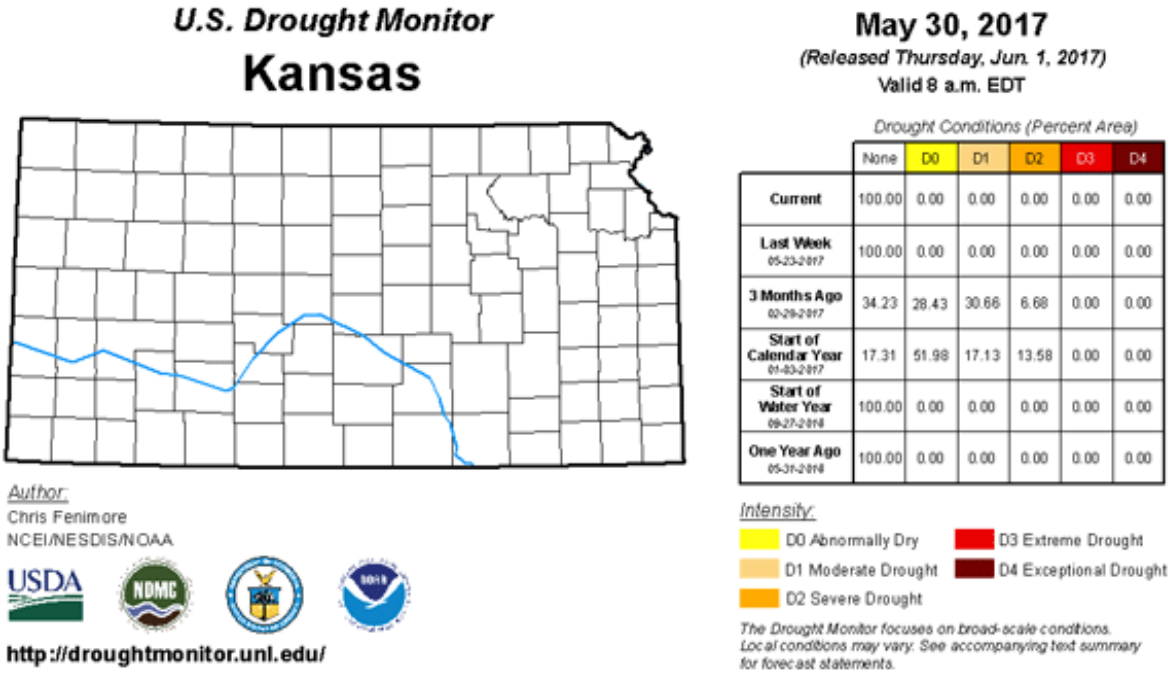


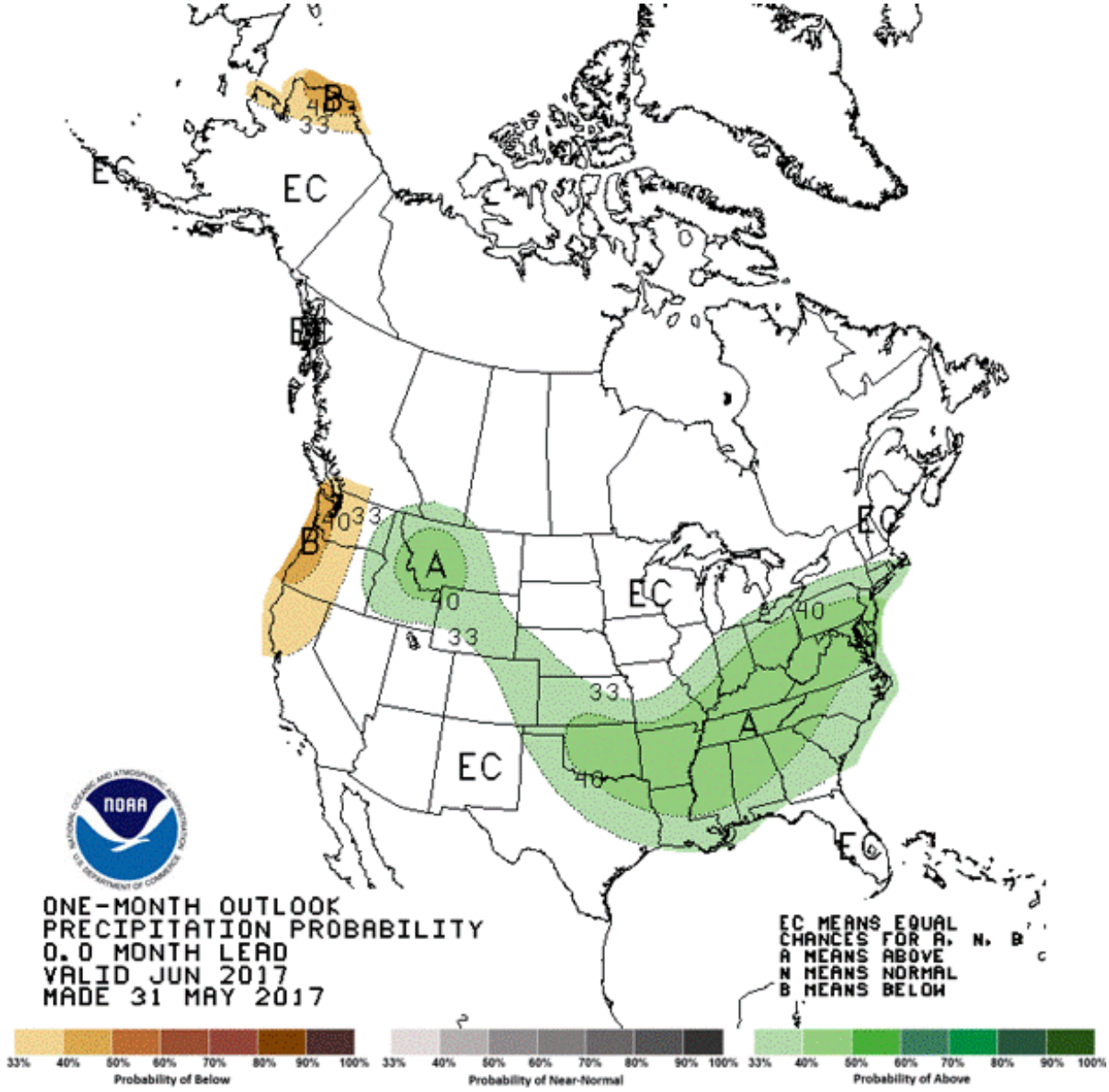




After the remnants of the winter storm, an outbreak of typical spring severe weather occurred. There were 37 reports of tornadoes, 160 hail reports, and 106 high wind reports. The largest outbreak came during the week of May 16th to May 22nd when 35 tornadoes and 123 hail events were reported.




The higher-than-normal precipitation resulted in continued drought-free conditions statewide. The June outlook calls for a slightly increased chance of wetter-than-normal conditions across the state coupled with equal chances of above- or below-normal temperatures. At this point, the dry pattern expected for the next week is providing a welcome window for field work.



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| **May 2017** | | | | | |
| **Kansas Climate Division Summary** | | | | | |
| | **Precipitation (inches)** | | | **Temperature (°F)** | |
| | | | | | |

| | May 2017 | | | 2017 Jan through May | | | | | Monthly Extremes | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Division** | **Total** | **Dep.[1]** | **% Normal** | **Total** | **Dep.[1]** | **% Normal** | **Ave** | **Dep.[1]** | **Max** | **Min** |
| **Northwest** | 4.66 | 1.20 | 134 | 7.93 | 0.10 | 100 | 58.2 | -1.9 | 93 | 29 |
| **West Central** | 4.26 | 1.23 | 140 | 9.75 | 2.32 | 131 | 59.2 | -2.1 | 93 | 28 |
| **Southwest** | 2.39 | -0.34 | 88 | 11.34 | 4.59 | 168 | 61.1 | -2.7 | 95 | 30 |
| | | | | | | | | | | |
| **North Central** | 6.32 | 2.24 | 154 | 13.29 | 3.22 | 131 | 61.6 | -1.6 | 91 | 28 |
| **Central** | 5.42 | 1.15 | 130 | 14.80 | 3.92 | 137 | 62.8 | -1.5 | 93 | 22 |
| **South Central** | 5.02 | 0.63 | 114 | 17.61 | 5.90 | 151 | 62.9 | -2.5 | 92 | 34 |
| | | | | | | | | | | |
| **Northeast** | 4.14 | -0.65 | 88 | 12.66 | 0.41 | 105 | 62.0 | -1.7 | 91 | 36 |
| **East Central** | 4.11 | -1.04 | 79 | 13.32 | -0.31 | 97 | 63.5 | -0.7 | 90 | 35 |
| **Southeast** | 5.85 | 0.06 | 101 | 19.80 | 4.14 | 127 | 64.8 | -0.7 | 88 | 36 |
| | | | | | | | | | | |
| **STATE** | 4.66 | 0.49 | 113 | 13.68 | 3.00 | 130 | 61.8 | -1.7 | 95 | 22 |

1. Departure from 1981-2010 normal value

2. State Highest temperature: 95 oF at Elkhart, Morton County, on the 26th.

3. State Lowest temperature: 22 oF at Hays 1 ESE, Ellis County, on the 1st.

4. Greatest 24hr: 5.18 inches at Norwich, Kingman County, on the 12th (NWS); 5.00 inches at Abilene 0.7 E, Dickinson County, on the 19th (CoCoRaHS).

**Source: KSU Weather Data Library**

Mary Knapp, Weather Data Library
mknapp@ksu.edu