Issue 782

K-STATE Research and Extension

Extension Agronomy

eUpdate

01/24/2020

These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate 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 Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

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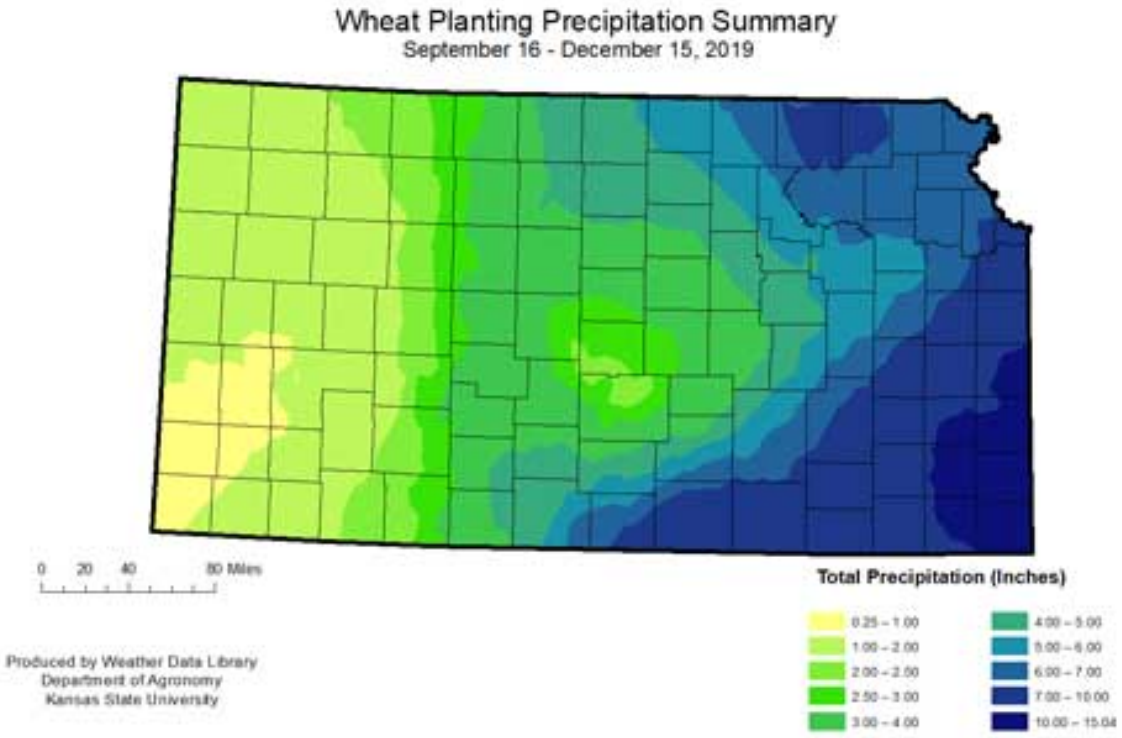
1. Learn what to expect from a spring-emerged winter wheat crop

Total precipitation during the period from September 16 to December 15 for Kansas is shown in Figure 1. The far portion of southwest Kansas (Morton, Stanton, and Hamilton counties) only received 0.25 to 1 inch of precipitation during this period, and a large portion of the western third of the state only received 1 to 2 inches. Likewise, a dry spell occurred in south central portions (Reno, Rice, Stafford, and Barton counties). These values represent a negative departure from the normal (3 to 6.4 inches) for the region. Consequently, many wheat fields in these regions either had poor emergence (Figure 2) or no emergence at all. In regions that had some fall moisture, planting mid-to-late September tended to produce better fall stands than planting mid-to-late October.



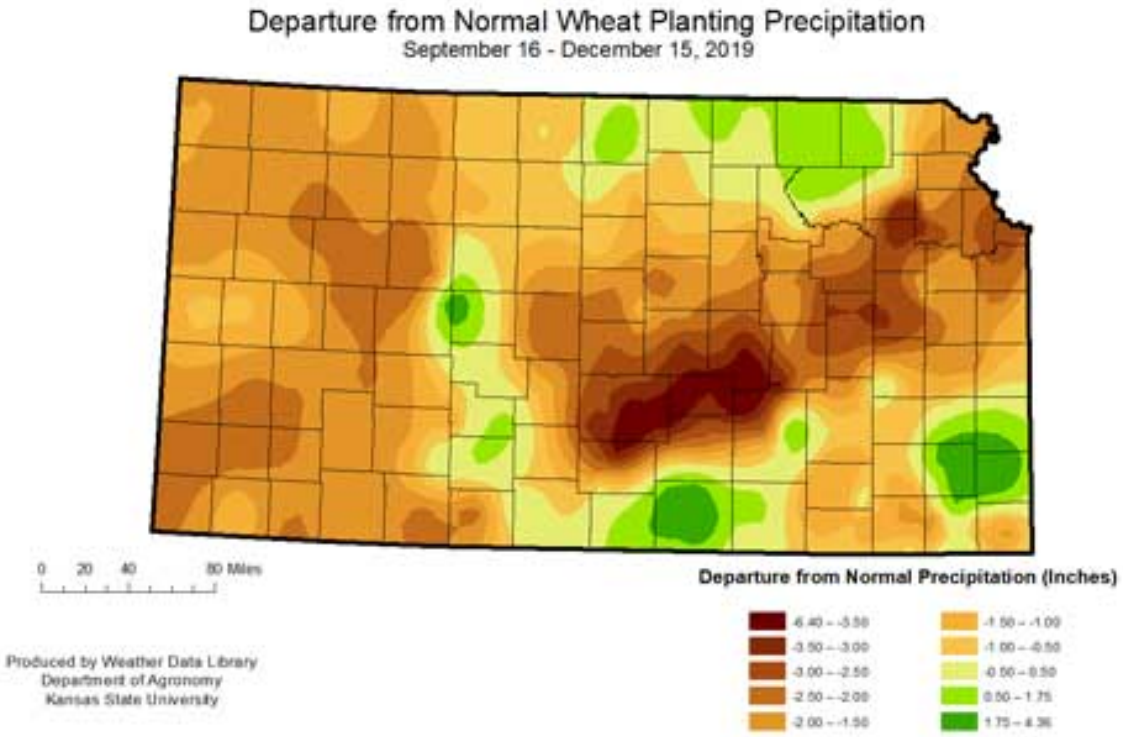


Figure 1. Precipitation summary for the period from September 16 to December 15, 2019 (upper panel) and departure from normal for the specified period (lower panel). Maps from the Weather Data Library, Kansas State University.

Figure 2. Poor stand establishment in wheat trials sown near Great Bend (Barton Co) due to extremely dry fall conditions. The target wheat population ranged from about 20 to 40 plants per square foot (depending on the study) and the actual emergence ranged from 5 to 12 plants per square foot. Trials were sown in the later portion of October and pictures taken on December 12 by Kavan Mark, Assistant Scientist at K-State Wheat and Forages Extension program in the Department of Agronomy.

Actual vs. effective sowing date

While many producers in southwest Kansas may have sown the crop on time, the effective sowing date (or the emergence date) is actually considerably later in many fields due to the dry conditions experienced during most of the fall. The recent precipitation (either as rainfall or ice, Figure 3) will benefit the crop, as the cumulative precipitation amounts would be sufficient for the crop to emerge. Studies showed that approximately 0.4 inch of precipitation should suffice for even emergence and a good stand establishment for a wheat crop sown about one inch deep or less. Thus, the precipitation received in southwest Kansas should be enough to help fields with no wheat emergence yet to make it out of the ground for as a spring-emerged crop, provided the seed is still viable. Un-germinated seed might not be viable in cases where it started to germinate and then dried out for lack of moisture, or maybe when suffered insect or disease damage, or wildlife feeding. There are some fields or areas within a field that germinated, but due to insect and dry conditions, the seedlings are no longer alive.

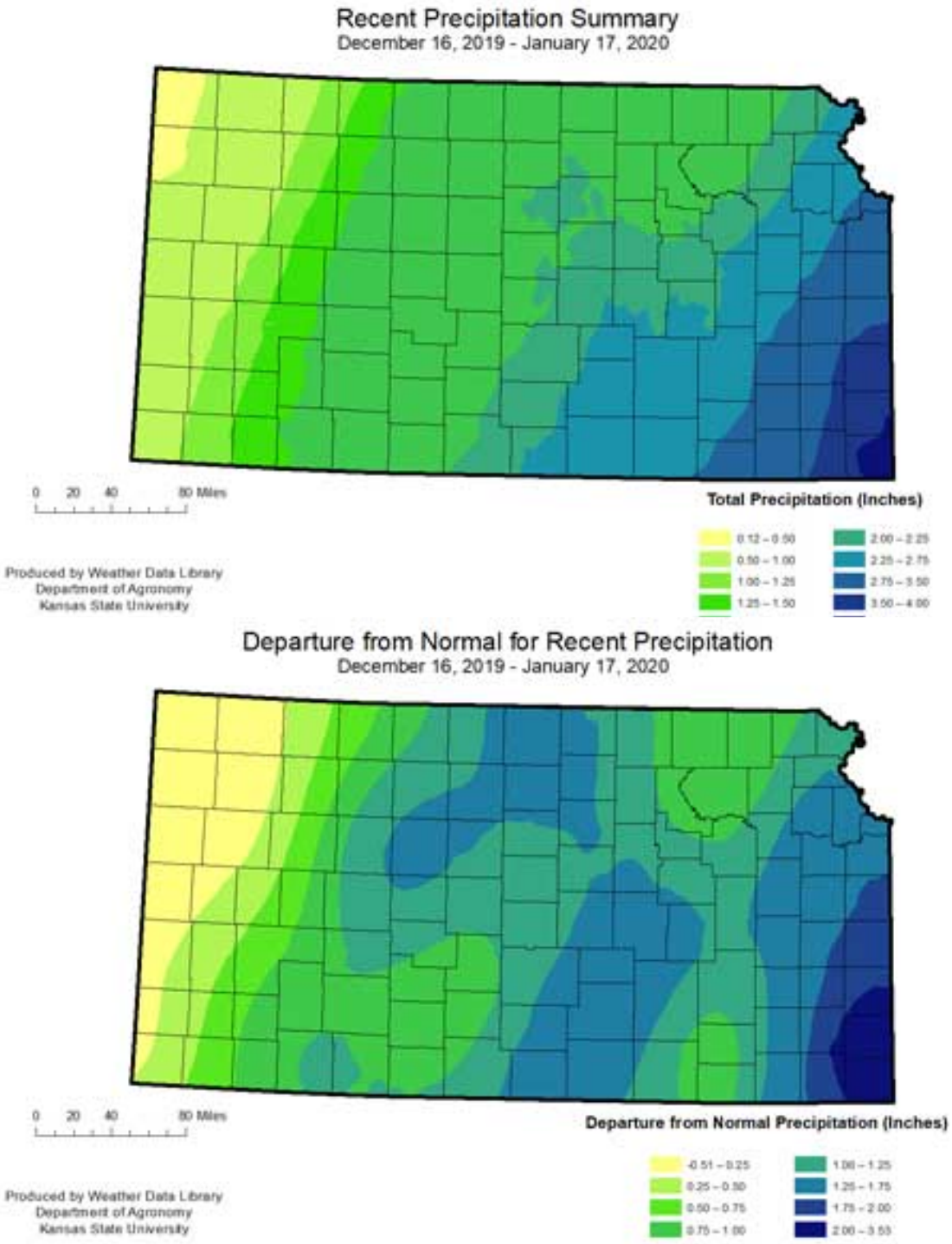


Figure 3. Precipitation summary for the period from December 19, 2019 to January 17, 2020 (upper panel) and departure from normal for the specified period (lower panel). Maps from the Weather Data Library, Kansas State University.

What to expect from a yield potential stand point?

It is important to keep in mind that spring-emerged winter wheat has considerably less yield potential than a fall-emerged crop. Producers will have to decide whether maintaining the crop is a

viable option.

Reasons for the generally observed decreased yield potential with a delay in sowing date include:

- **Less fall tillering potential**: fall-formed tillers are generally more productive than spring-formed tillers. When wheat is sown late, it will have less time to tiller in the fall, which decreases the production of higher yielding tillers as well as total tiller production. Due to the dry fall conditions, many producers planted at a higher population to overcome less tillering - this will help reduce the yield loss that would have occurred.
- **Delayed cycle**: late sowing often delays the entire crop cycle as compared to a crop sown earlier. As a consequence, the grain-filling period might occur a few days later and under hotter air temperature conditions, which decreases yield and test weight.
- **Greater exposure to winterkill**: a wheat crop with 3 to 5 fall-formed tillers has greater cold tolerance than a crop that has only one or two tillers. As a consequence, late-sown fields might be more exposed to winterkill, especially in dry conditions.

Research conducted by Merle Witt with late-sown wheat in Garden City during 1985 through 1991 is summarized in Figure 4. Averaged across all these years, delaying wheat sowing from October 1 to November 1 delayed heading date by six days and decreased wheat yields 23%. Grain filling period was progressively shortened in about 1.7 days and occurred under hotter temperatures (about 1.5 degrees F) for every month of delay in sowing date.

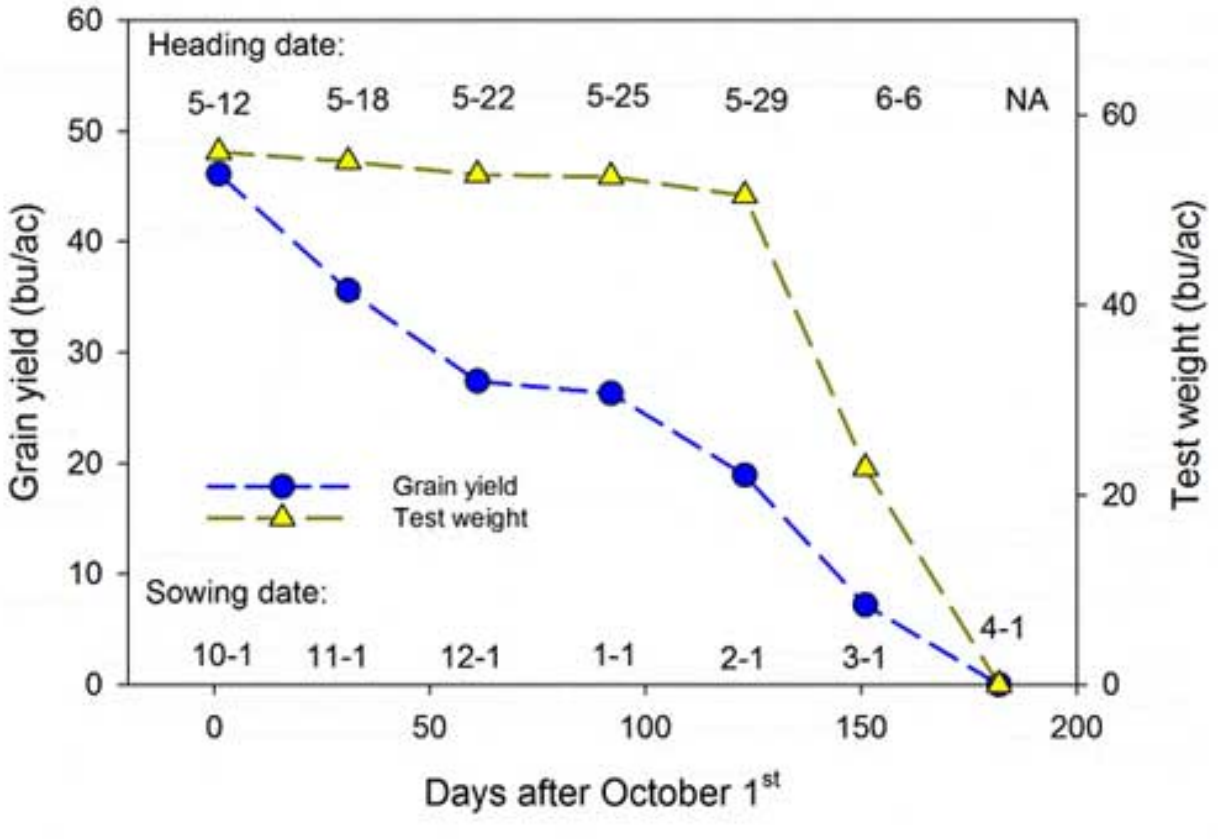


Figure 4. Wheat grain yield, test weight, and heading date responses to sowing date between

1985 and 1991. Data adapted from Kansas Agric. Exp. St. SRL 107.

Therefore, the potential consequences of the delayed progress of the Kansas wheat crop during October include greater exposure to winterkill, delayed crop cycle for grain filling under warmer conditions, and a lower yield potential due to decreased fall tillering. Particularly in the western half of Kansas, research evaluating effects of weather conditions on long-term variety performance tests indicated that wheat yields were influenced the most by favorable precipitation conditions during the fall that promoted stand establishment and moist soil conditions (Holman et al. 2011). However, if the weather conditions during the remaining season are favorable (mild winter, and cool and moist spring), the crop might still result in a decent yield (Figure 5).

Figure 5. K-State wheat demonstration plot near Dodge City, KS, during June 2017. While this crop was sown normally during October 2016, it had not emerged in the fall due to extremely dry conditions. An ice storm on January 2017 sufficed for the crop to emerge, and favorable winter and spring weather conditions led to a decent yield potential despite harsh initial conditions.

Holman, J.D., A.J. Schlegel, C.R. Thompson, and J.E. Lingenfelser. 2011. *Influence of Precipitation, Temperature, and 56 Years on Winter Wheat Yields in Western Kansas*. Crop Management 10(1): https://dl.sciencesocieties.org/publications/cm/abstracts/10/1/2011-1229-01-RS

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2. Possible consequences of icy conditions to the Kansas wheat and alfalfa crops

The weather during the period of December 16, 2019 to January 17, 2020 brought some much needed moisture to the Kansas wheat crop, with some areas seeing a considerable amount of ice and snow. Precipitation totals ranged from about 0.12 inch in far northwest Kansas, to just over 5.5 inches in southeast Kansas (Fig. 1). The majority of the state received more than 0.5 inches of precipitation. The snowfall that accompanied some of these precipitation events can help protect the crop from extreme cold temperatures, although it may not bring much moisture (usually, one foot of snowfall translates into about 1 inch of moisture).

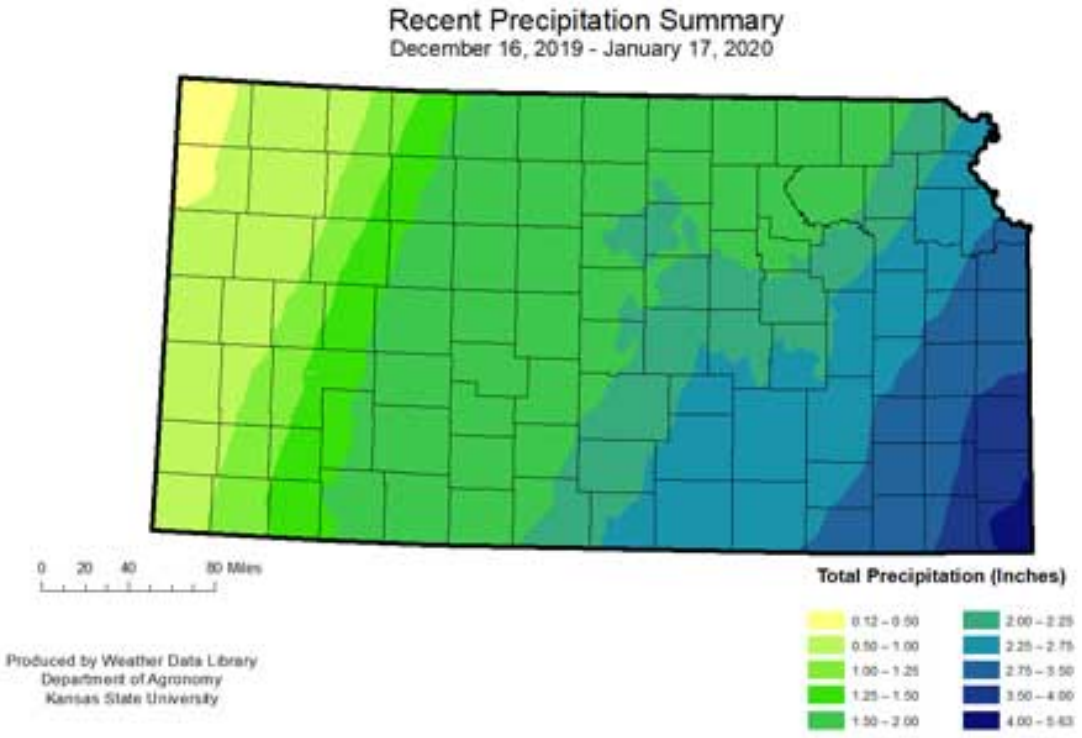
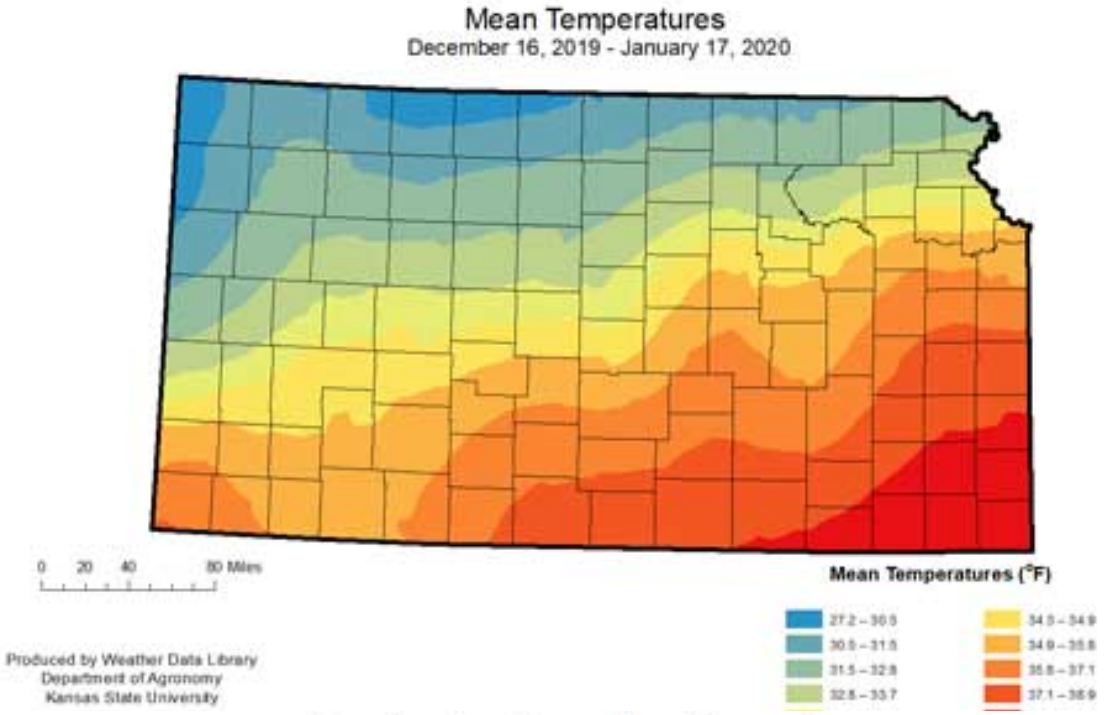


Figure 1. Cumulative precipitation for the period from December 16, 2019 to January 17, 2020. Maps by Weather Data Library, Kansas State University.

These storms were accompanied by relatively mild temperatures throughout the state, with mean temperatures ranging from ~27.2 to 41.4 degrees Fahrenheit so that the entire state had a positive departure from the normal mean temperature for the period (Figure 2).



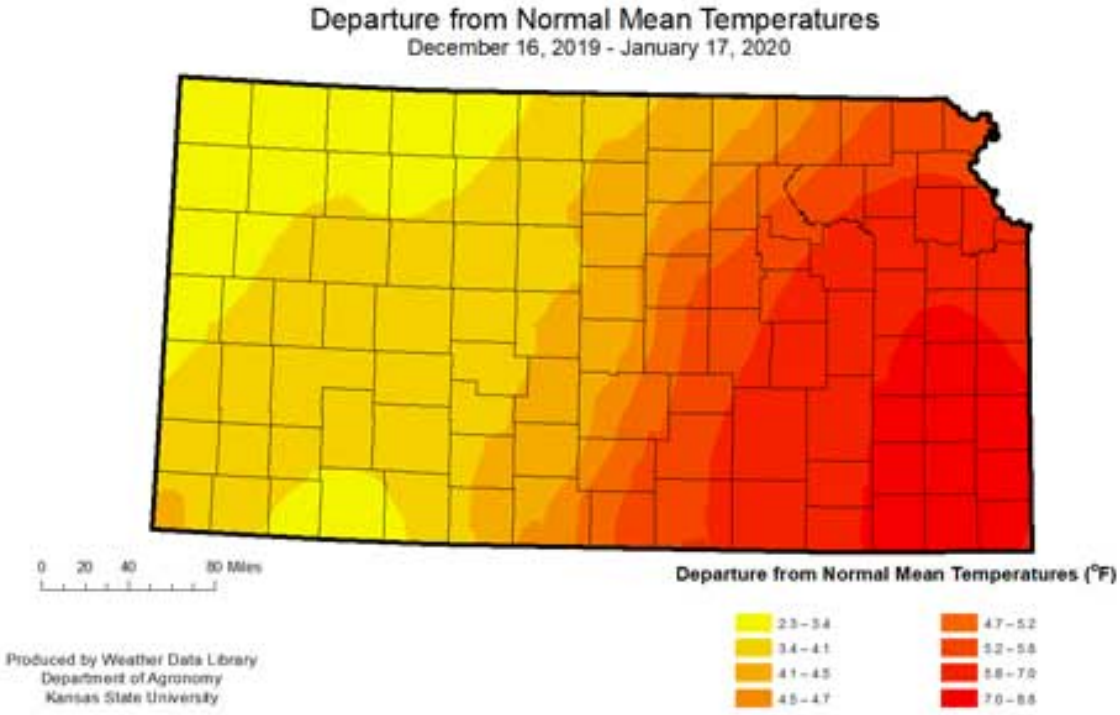


Figure 2. Mean temperature (upper panel) and departure from the mean temperature (lower panel) for Kansas during period from December 16, 2019 to January 17, 2020. Maps from Kansas Weather Data Library, Kansas State University.

Ice formation

Ice storms occur when freezing rain falls for a long period of time, accumulating on roads, trees, and over the winter wheat crop. Typically, ice storms begin with snow which changes to sleet, and then to rain, which in turn freezes on contact, coating all exposed surfaces with a layer of ice that expands as the storm continues.

Is there possible ice damage to the wheat and alfalfa crops?

Most likely, no. For an established alfalfa stand or wheat crop to suffer damage from ice, previous research has shown that a minimum 10 to 40 days of ice surrounding the leaves is necessary. Ice generally damages plants by sealing leaves, stems, and buds from the surrounding air, creating an anaerobic environment. When ice surrounds the crown of wheat or alfalfa for long periods of time, it allows toxic metabolites resulting from this anaerobic environment (ethanol and carbon dioxide) to build up, preventing the natural gas exchange that occurs during respiration. In other words, it "suffocates" the plants. Still, for this suffocation to occur, a long period of ice-covered leaf surface is needed; thus, the crops in Kansas should not suffer from ice damage resulting from the recent storms. Overall, the recent precipitation events should be beneficial to supply moisture for both crops going into the spring.

What should you look for when assessing plant survival?

We should not expect any cold damage from the more recent storm, but a few extreme drops in temperature with very little snow cover may have happened in specific fields, which might result in some cold damage. It will not be possible to fully know whether winter cold has caused damage to the wheat or alfalfa crops approximately until spring green-up, when the crops are breaking winter dormancy. At that point, it is extremely important to go out and check the fields, preferably destructive sampling it, before investing any more money in the crop.

For wheat, producers should pull plants out of the ground, pull the leaves back to expose the crown and stems, and check for color. Brown color with shriveled, mushy stems indicate damage and possibly, winterkill (Figure 3). White stems and healthy-looking crown area, even when some slight injury is present (Figure 3), should not be of major concern.

Producers should check to determine plant survival, and shoot for anywhere from 20 to 30 healthy plants per square foot, depending on location within the state (20 plants for the western portion of the state, 30 plants for central and eastern portions). If the final healthy wheat stand is lower than those 20 to 30 plants per square foot (approximately 50% being a threshold for maintaining or terminating the crop), producers can try and compensate with additional N to enhance spring tillering. If stands are lower than about 10 plants in western Kansas, and 15 plants in central and eastern Kansas, producers could consider planting a spring crop as an alternative.

Figure 3. Comparison between a winter wheat plant that suffered winter injury, characterized by brown crown and srhiveler stems (left panel) and a plant that shows minor symptoms of cold damage (brown leaves) but overal white and healthy stems (right panel). Photos by Sandra Wick, K-State Extension agent in the Post Rock District.

For alfalfa, the procedure should be similar. Producers should use a spade to cut into the taproot and crown, and checking whether the color is a healthy whitish-beige, or a darker brown which would be an indicative of an ice-damaged crown. Additionally, producers should look for newly appeared green crown buds at ground level. A good goal to shoot for is approximately 30 vigorous tillers per square foot. If poorer stands are found, producers can consider a soil test to determine whether added nutrients are needed. Another option is to delay the first harvest to beyond the late bud stage, which would decrease the quality of the first cut but reserves for regrowth will be higher, most likely improving persistence of the stand.

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3. Free online book on soil and water conservation resources now available

An open textbook, *Soil and Water Conservation: An Annotated Bibliography*, was recently published by New Prairie Press, Kansas State University's open access digital press. The book highlights credible, free, and openly available online content related to soil and water conservation, including extension bulletins, government reports, technical bulletins, and more.

The book was edited by Colby Moorberg, an assistant professor of soil science in the Department of Agronomy at Kansas State University. The book was authored in a collaborative effort, led by Moorberg, that included 24 other experts and practitioners in soil and water conservation. Contributors also included students who were enrolled in AGRON 635 – Soil and Water Conservation in 2018 and 2019, a class taught by Moorberg. Funding for the book was provided by the K-State Open and Alternative Textbook Initiative.

What is an annotated bibliography?

Simply put, a bibliography is list of cited resources that all pertain to a specific subject. An annotated bibliography goes a step further and provides a brief descriptive summary of each citation.

Soil and Water Conservation: An Annotated Bibliography provides full citations and links to websites where resources can be accessed. Each citation is followed by an annotation that summarizes the resource and provides context (Figure 1).

The book is divided into four parts:

I. **History and fundamentals**
   a. Introduction
   b. Key concepts in soil science
   c. Soil erosion processes

II. **Conservation practices**
   a. Farmland
   b. Shorelines, streams, and wetlands
   c. Forest, range, and wildlands
   d. Construction sites and disturbed areas
   e. Rehabilitation of problem soils
   f. Water quality and quantity conservation

III. **Conservation implementation**
   a. Conservation agencies
   b. Conservation polices

IV. **Careers**
   a. Soil and Water Conservation

Cover Crops

An Iowa farmer using a roller crimper to terminate a cover crop and planting into the cover crop residue in the same pass. Photograph courtesy of the USDA NRCS.

Clark, A., ed. 2007. Managing Cover Crops Profitably. 3rd Edition. College Park, MD: SARE Program. https://www.sare.org/Learning-Center/Books/Managing-Cover-Crops-Profitably-3rd-Edition/Text-Version.

This book, produced by SARE, provides in-depth information for nearly all aspects of cover crops as a conservation practice. Readers can navigate to an online version of each chapter in the book using the links on the left side of the screen. A printable PDF version of the book is also available. This book includes chapters on cover crop selection, rotations, soil fertility, pests, and more. Producer profiles are used throughout the book to provide real world scenarios and case studies for implementing cover crop in a production system. The book was designed to be a thorough resource, but not all encompassing, as was acknowledged in the foreword of the book.

Figure 1. Example of an annotated citation for using cover crops as a conservation practice on farmland. Each resource includes an online link and a short summary of the publication. Some citations include a relevant image like the one shown above. https://newprairiepress.org/ebooks/30

This type of resource has much potential for agriculture, which has few open textbooks available to date, yet has a wealth of free, credible, and accessible technical resources such as university extension bulletins from Land Grant Institutions like K-State and government reports from

conservation agencies like the USDA Natural Resources Conservation Service.

While the goal was to create a free textbook option for the AGRON 635 course, the potential audience extends beyond the college classroom. The resources in this book are summarized for a general audience and are easy to read. Extension agents and agricultural educators could enhance their soil and water conservation programs using this comprehensive book to locate credible and up-to-date information.

Soil and Water Conservation: An Annotated Bibliography can be downloaded from the New Prairie Press website, https://newprairiepress.org/ebooks/30/. It is available as a PDF, a web book, and e-book formats for Kindles and other electronic readers.

For more information, please contact:

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4. K-State Sorghum Schools scheduled for late January

Three K-State Sorghum Production Schools will be offered in late January to provide in-depth training targeted for sorghum producers and key-stakeholders. The schools are sponsored by Kansas Grain Sorghum Commission, Agwest Commodities, Advanta Seeds, and ShieldAg Equipment.

The schools will cover a number of issues facing sorghum growers: weed and insect control strategies, crop production practices, nutrient management and soil fertility, risk management, farm bill programs, marketing, and seed technology development.

- **January 29, Wednesday – Scott City**
  2:30 p.m. to 7:00 p.m.
  William Carpenter 4 H Building
  608 North Fairground Road

Contact: John Beckman - jbeckman@ksu.edu

- **January 30, Thursday – Great Bend**
  8:30 a.m. to 1:00 p.m.
  Great Bend Recreation Commission
  Burnside Room, 1214 Stone Street

Contact: Stacy Campbell - scampbel@ksu.edu

- **January 30, Thursday – Hutchinson**
  2:30 p.m. to 7:00 p.m.
  South Hutchinson Community Building
  101 W Ave C
  South Hutchinson KS 67505

Contact: Darren Busick - darrenbusick@ksu.edu

The schools are free to attend and a meal will be provided courtesy of the Kansas Grain Sorghum Commission. Participants are asked to pre-register by **January 27**. Online registration is available at K-State Sorghum Schools (http://bit.ly/KSUSorghum) or by emailing/calling the nearest local K-State Research and Extension office for the location participants plan to attend.

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DATES & LOCATIONS

WEDNESDAY, JANUARY 29
Scott City, KS
2:30 — 7:00 p.m

THURSDAY, JANUARY 30
Great Bend, KS
8:30 a.m. — 1:00 p.m

Hutchinson, KS
2:30 — 7:00 p.m

REGISTRATION

ONLINE | http://bit.ly/KSUSorghum
A meal will be provided at each of the free schools.
RSVP requested by Monday, January 27.

TOPICS

The one-day school will cover issues facing sorghum producers.
Weed Control | Crop Production | Pest Management | Soil Fertility

Kansas State University Department of Agronomy
Kansas Grain Sorghum — Growers Working Together
K-State Research and Extension

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