Issue 936

K-STATE Research and Extension

Extension Agronomy

eUpdate

12/15/2022

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. What factors influence the survival of winter canola?

In last week's eUpdate, we have discussed the impact of delayed emergence on canola winter survival. This week, we examine a few other factors that can influence winter survival. Winter survival is complicated as stand losses can be caused by one or more abiotic and biotic stresses including poor plant establishment, low temperatures, duration of cold temperatures, wind desiccation, dry soils, soil heaving, and damage by diseases and pests. These environmental factors, in addition to a cultivar's freezing tolerance and its ability to cold harden will ultimately determine whether a crop will survive cold temperatures.

The winter hardening process

In order to survive the winter, canola must go through a hardening process. This begins in the rosette stage in the late fall after several days of near-freezing temperatures (about 35°F). At these temperatures, plant growth is slowed, resulting in smaller cells with a higher concentration of soluble substances more resistant to frost damage. A few hard freezes (about 26°F) are beneficial for halting leaf growth and for hardening to "set in". Longer acclimation periods with fewer diurnal swings in temperatures above and below freezing are beneficial to hardening and increased freezing tolerance in plants. Hardened winter canola can endure a certain amount of time with temperatures at or below 0°F. However, extended periods of temperatures at or below 0°F, especially without snow cover, can be detrimental to survival.

In Figure 1, winter canola is pictured in a plot near Manhattan, KS on the morning of February 15, 2021. At the time, overnight low temperatures had fallen below 0°F for four consecutive nights. A low temperature of -18°F was recorded on the night of February 16. Fortunately, the plots experienced nearly 100% survival because the limited snow cover helped insulate them from the bitter cold.

Figure 1. Winter canola nursery under snow cover near Manhattan, KS on the morning of February 15, 2021. Picture by Mike Stamm, K-State Research and Extension.

Factors involved in the "un-hardening" of canola

Ultimately, it may not be the cold temperatures per se that cause winter kill but the rapid fluctuations in temperature, which can be a common occurrence in Kansas during the winter. "Un-hardening" of canola is accelerated when temperatures increase to 60°F or above for an extended period of time (approximately 2 weeks). Un-hardening is a loss of freezing tolerance. However, the effect of fluctuating temperatures and un-hardening during the winter is complex.

Research conducted by K-State indicates winter warming trends can actually have a positive effect on winter survival in some ways. Green leaf tissue may have increased metabolic activity, rejuvenating the overwintering plants. This partly explains why plants growing in the field can survive colder temperatures than plants acclimated at continuous cold temperatures in a controlled

environment. If the warming trend is followed by a gradual cool down and no stem elongation occurs, then plants can re-harden. In addition, as long as low nighttime temperatures accompany warmer daytime temperatures, the rate of un-hardening should be slowed.

Winter hardiness traits in canola cultivars

Winter hardiness is an important trait to consider when selecting a cultivar for any cropping system. Differences exist, however, so decisions should be based on results from multiple years and locations. A good rule of thumb to follow is to only select cultivars that show at least 60% or greater survival scores on a consistent basis across site years.

To increase canola's consistency in the southern Great Plains region, the canola breeding program at K-State continues to select and incorporate winter hardiness traits. Breeding accessions possessing longer vernalization periods are being crossed into the germplasm pool. One theory on improving winter hardiness is that canola can harden more easily after a winter warming trend prior to the vernalization requirement being reached. Therefore, extending the vernalization requirement may allow plants to withstand more variations in temperature during the winter months.

Two important phenotypic defenses against winterkill are a flat, prostrate growth habit, which keeps the crown protected at the soil surface, and the ability to avoid fall stem elongation. The K-State breeding program continues to select for both winter protecting traits among its breeding materials. Another beneficial trait could be the semi-dwarfing growth habit. The crowns of semi-dwarf hybrids are thicker, more compact (shorter internodes), and held closer to the soil surface. The breeding program continues to evaluate the semi-dwarfing trait for potential usefulness in future hybrids.

New research insights on winter survival

A recent review conducted by a team of researchers from K-State (Dr. M. Secchi, former PhD student; M. Stamm; and Dr. Ciampitti) in collaboration with other industry partners provided new insights on the role of environmental variables on winter canola survival. The main objective of this study was to improve our understanding of the impact of meteorological factors on survival of winter canola, in addition to providing an assessment of the risks for winter kill. Research data was obtained from the National Winter Canola Variety Trial from 2003 until 2018 (190 site-years) and auxiliary meteorological data over the last 40 years. Key findings of this study are summarized below.

- Environment was the main factor explaining the variation in winter survival, accounting for 71% of the variation on this variable. Overall winter survival averaged 84%, but a large range of variation across all site-years was present.
- The main meteorological variables explaining mean winter survival were the number of days with temperatures between 14°F and 5°F, the number of cycles when temperatures fluctuated above or below 32°F, and wind chill temperature during the cold period (i.e. the time between the first and last date when average daily temperature reaches 32°F).
- Lastly, variety selection is a key factor for improving the probabilities of obtaining better winter survival. Most of the current varieties and hybrids available fall into either the semi-tolerant or semi-susceptible characterizations, indicating there is room to improve winter survival traits in winter canola.

This information will be valuable in assessing new growing environments for winter canola and will aid breeding programs in evaluating the impact of environment on selection for this trait. Click here

to read the full article.

Assessing winter canola stands

After average daily temperatures warm to approximately 40°F, producers can begin evaluating their stands for winter kill. When evaluating winter survival, look for green leaf tissue at the center of the rosette. If green leaf tissue is present and the crown (stem) is firm when squeezed, it is likely the crop will resume active growth as temperatures rise and day length increases. The root may be examined as well for firmness and vigor. If temperatures warm for several days and the crowns remain limp and fleshy, this could be indication that cold temperature damage has occurred. Remember that the crop can sustain some winter stand loss and still produce an acceptable yield as long as the losses are evenly distributed across the field. Normally, a final winter survival assessment can be made after the danger of further stand loss has passed, which is usually mid-March to early-April in Kansas. As long as the center crown and root remain green and firm, the crop has the potential to recover.

Summary

Winter survival will depend on the ultimate cold temperature, the duration and fluctuations of those temperatures, and the variety selected, among other meteorological factors. Improving our understanding on the main factors affecting winter survival is critical for consistent canola production.

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2. Damaged or dead fescue pastures: Options for 2023

Farmers manage one million acres of tall fescue which are important forage sources for livestock production in Kansas. However, once in a while we end up facing weather conditions like the summer of 2022. Most of southeast Kansas was in D3 or D4 drought from late June through the fall. Because of the lack of rainfall, forage growth was very limited, and, in many operations, due to heavy grazing pressure and the low cutting height (if hayed), some of the fescue stands may have died or been extremely damaged (Figure 1).

Figure 1. Tall fescue field in October 2022 at Southeast Research and Extension Center. Photo by Bruno C. Pedreira, K-State Research and Extension.

In this scenario, there is not much to be done during the winter, but a plan is needed for the spring. In some places, after a few rainfall events in early fall, the fescue was greening up and looked to be in good condition, but in some places this is not the case and many producers are concerned.

Spring is not the ideal time to plant fescue as it takes time for the plant to develop a root system that will be able to withstand a dry period in the summer. Not that fescue cannot be planted in the spring, but management is critical. If planted in the spring, do not cut it for hay the first season, and be careful if it is grazed. If grazing, leave a minimum of 4 inches of stubble height and move the

livestock around fairly quickly, giving the plant time to recover before the dry summer periods.

Assuming that time will tell whether the fescue is damaged or not, maybe the best plan would be to consider other forage options for spring and summer, and then replant the fescue in the fall when it is more suited for establishment.

Oats and warm-season annuals. Drilling oats into fescue pastures in February may be an option. Oats grow quickly and may be ready for grazing in late March or at least by mid-April. If the fescue is really damaged, oats may be a forage option for the livestock to graze or a crop that can be baled for hay. After grazing or haying the oats, some warm-season annuals (millet, sudan, etc.) can be seeded for summer hay or grazing.

Warm-season grasses. If fescue appears very damaged (maybe dead) next spring, this may be an opportunity to establish a warm-season grass such as crabgrass or bermuda. These grasses have a fairly quick establishment if a seeded variety is chosen. Then no-till fescue into the field next fall. Fescue and crabgrass work well together if managed correctly. In a recent trial carried out in Cherokee County, KS (2020 and 2021), crabgrass yielded from 1700 to 7600 lb. DM/acre during the growing season depending on fertilizer application. This will provide extended grazing throughout the year and will be a win in the long run.

Novel tall fescue. If you need to reseed the pasture, use this as an opportunity to make a positive change towards novel fescue using the spray-smother-spray method:

1. Use a burndown herbicide such as glyphosate in early March.
2. Plant a summer annual. Soybeans would allow one to control many types of unwanted grasses and weeds throughout the summer. Soybeans could be harvested as a cash crop (grain) or as high-quality hay. Other options are sudan, millet, crabgrass, or other summer annuals.
3. Spray burndown herbicide in mid-August or early September and plant the novel fescue. In a grazing situation, novel fescue has shown to have a tremendous advantage over Kentucky-31 when it comes to cattle performance and weight gain.

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3. K-State 2023 Chemical Weed Control Guide now available online

One of the most popular K-State Extension and Research publications is here!

This publication provides suggestions for chemical weed control in several major crops. Herbicides, when properly used, are one component of an effective weed management program. Tillage, crop competition, cropping rotation, mowing, and fire are additional weed control methods that may be used alone or in combinations. Available time, labor, equipment, and other costs as well as types of weeds and areas infested need to be considered when planning a weed control program. Crop and soil management practices such as planting high-quality seed, planting at the optimum rate and date, and maintaining optimum soil fertility should also be considered. Contact your local Extension agent to answer questions not addressed in the guide.

The 2023 Chemical Weed Control Guide is available online at:

https://bookstore.ksre.ksu.edu/pubs/SRP1176.pdf

When viewing online file in a web browser or in Adobe, there is access to bookmarks that will guide you to the first page of every section (options vary per program settings and device type).

Hard copies of the books will be available in January. Orders can be placed at https://bookstore.ksre.ksu.edu/Item.aspx?catId=236&pubId=25002

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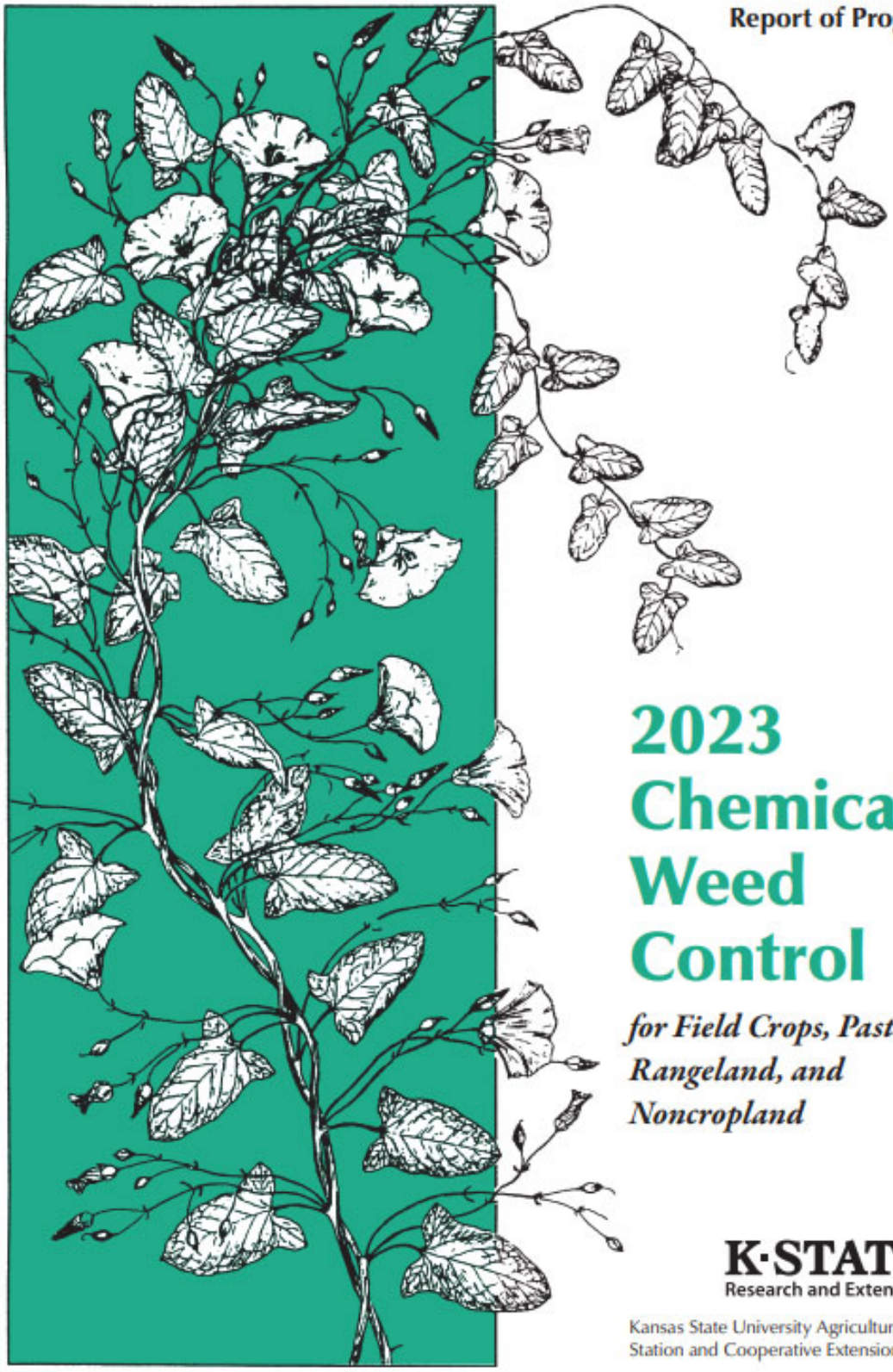

Report of Progress 1176

2023 Chemical Weed Control

for Field Crops, Pastures, Rangeland, and Noncropland

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4. What are the chances of a White Christmas for Kansas?

A white Christmas, by meteorological definition, is defined as at least 1 inch of snow on the ground on Christmas morning, December 25, at 7 AM local time. The National Centers for Environmental Information (NCEI, www.ncei.noaa.gov) have produced an official map with the probabilities of a white Christmas across the lower 48 states. The map is based on 30-year climatological normals that are issued by NCEI every 10 years. The most recent edition is based on data for the latest set, spanning the years 1991-2020 (Figure 1).

There are only a few areas of the country where a white Christmas is a near certainty: northern Minnesota, northern New England, and the highest terrain of the western United States, such as the Rockies, the Sierra Nevadas, and the Cascades. There is a very low chance of a white Christmas for the southeastern states, including Florida, as well as along the Gulf coast. Probabilities are also very low for Texas, the desert southwest and along the west coast. For all other locations, the chances fall somewhere in between impossible and certain, such as here in the central states.

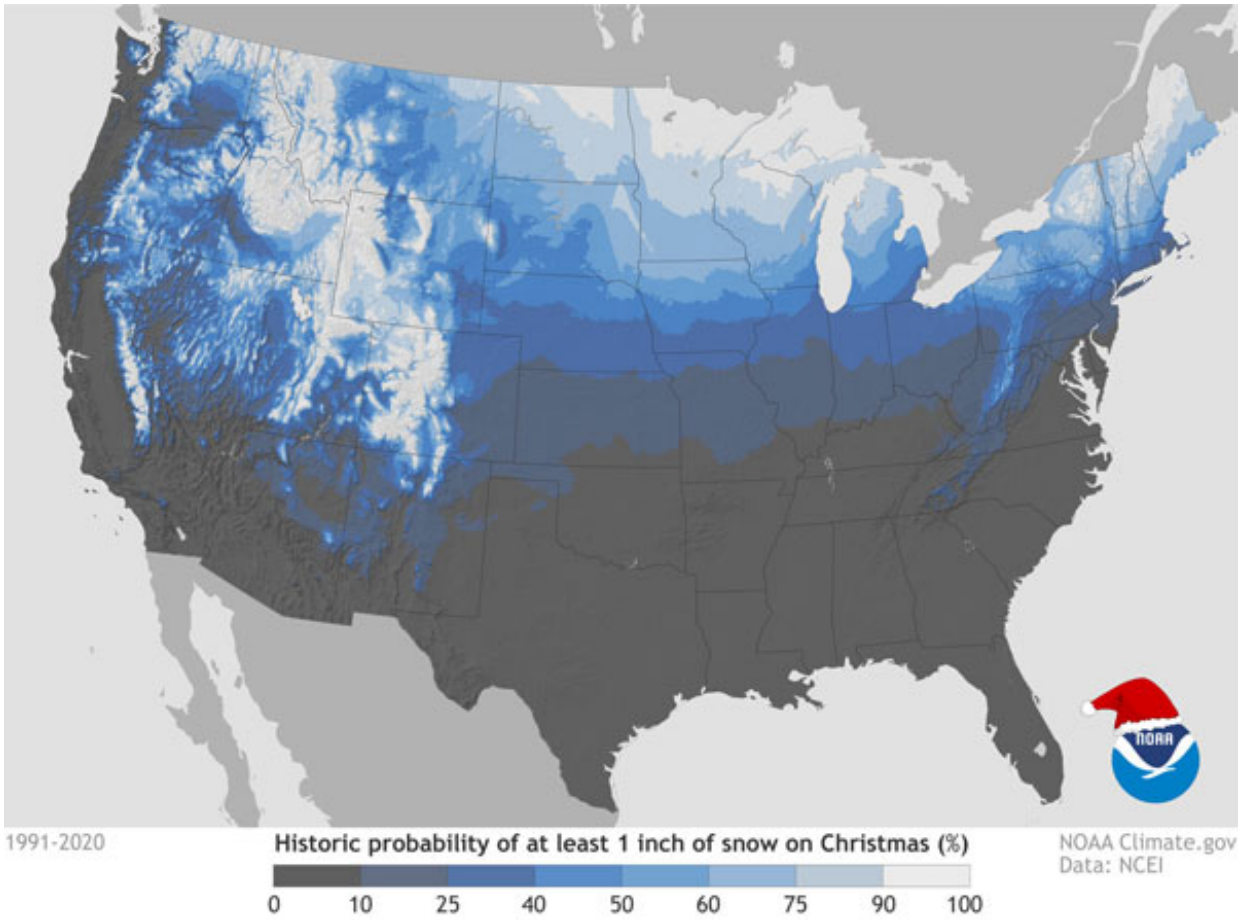

Figure 1. The probability of a white Christmas across the lower 48 states. Source: noaaclimate.gov

In Kansas, the probabilities are highest in the north along the Nebraska border, and lowest in the southeast. The highest probability in the state is in Mankato, in Jewell County, with a 33% chance of a white Christmas. Table 1 lists the probabilities of a white Christmas at selected locations around Kansas. The table also includes information such as the most recent white Christmas, average snowfall, and record temperatures for Christmas Day.

The most recent white Christmas in Kansas was in 2017. Much of northern Kansas received 1-2 inches of snow on the 23rd and 24th which was still on the ground Christmas morning. Prior to 2017, most of Kansas had a white Christmas in 2013, after a heavy snow event on the 21st. Cold air behind the storm system preserved the snow cover through Christmas morning.

The average snowfall across Kansas for the month of December ranges from 2 to 5 inches. Much like the probabilities, the higher December averages are in northern Kansas. While every year is different, on average, we expect to receive some snow each December. The only question is when will it happen? Will we get snow just in time for Christmas?

Table 1. White Christmas, average snowfall and record temperatures for selected Kansas locations.

City	Probability of a white Christmas (1991-2020)	Most recent white Christmas (inches)	Deepest Christmas snow cover (year)	Average December Snowfall (inches)	Average Annual Snowfall (inches)	Record High/Low for December 25
Manhattan	22%	2017 (1″)	7″ (2013)	4.8″	18.3″	70° (1889) -13° (1983)
Topeka	18%	2013 (1″)	6″ (1983)	4.1″	17.1″	68° (1922,2016) -11° (1983)
Wichita	12%	2013 (2″)	4″ (1962, 2007)	3.1″	12.7″	68° (2019) -6° (1983)
Dodge City	17%	2013 (3″)	12″ (1997)	4.0″	19.1″	74° (1950) -13° (1879)
Goodland	22%	2017 (1″)	13″ (1941)	5.2″	30.0″	74° (1950) -9° (2012)
Hays	21%	2011 (7″)	11″ (1945)	3.3″	15.8″	73° (1955) -11° (1983)
Concordia	23%	2017 (1″)	10″ (1983)	4.5″	19.3″	64° (2016) -8° (1983)

Weather outlook for Christmas week

The current outlook for Christmas week has high probabilities of below-normal temperatures (Figure 2) statewide with near-normal precipitation across most of the state (Figure 3). Temperatures will be cold enough for snow should this forecast verify, and near normal precipitation suggests what falls is likely to be snow. But it's hard to pin down an exact location and timing for precipitation over a week before Christmas. Keep an eye to the sky and an ear to the forecast as the 25th approaches, and maybe, just maybe, some Kansans will have some snow on Christmas morning.

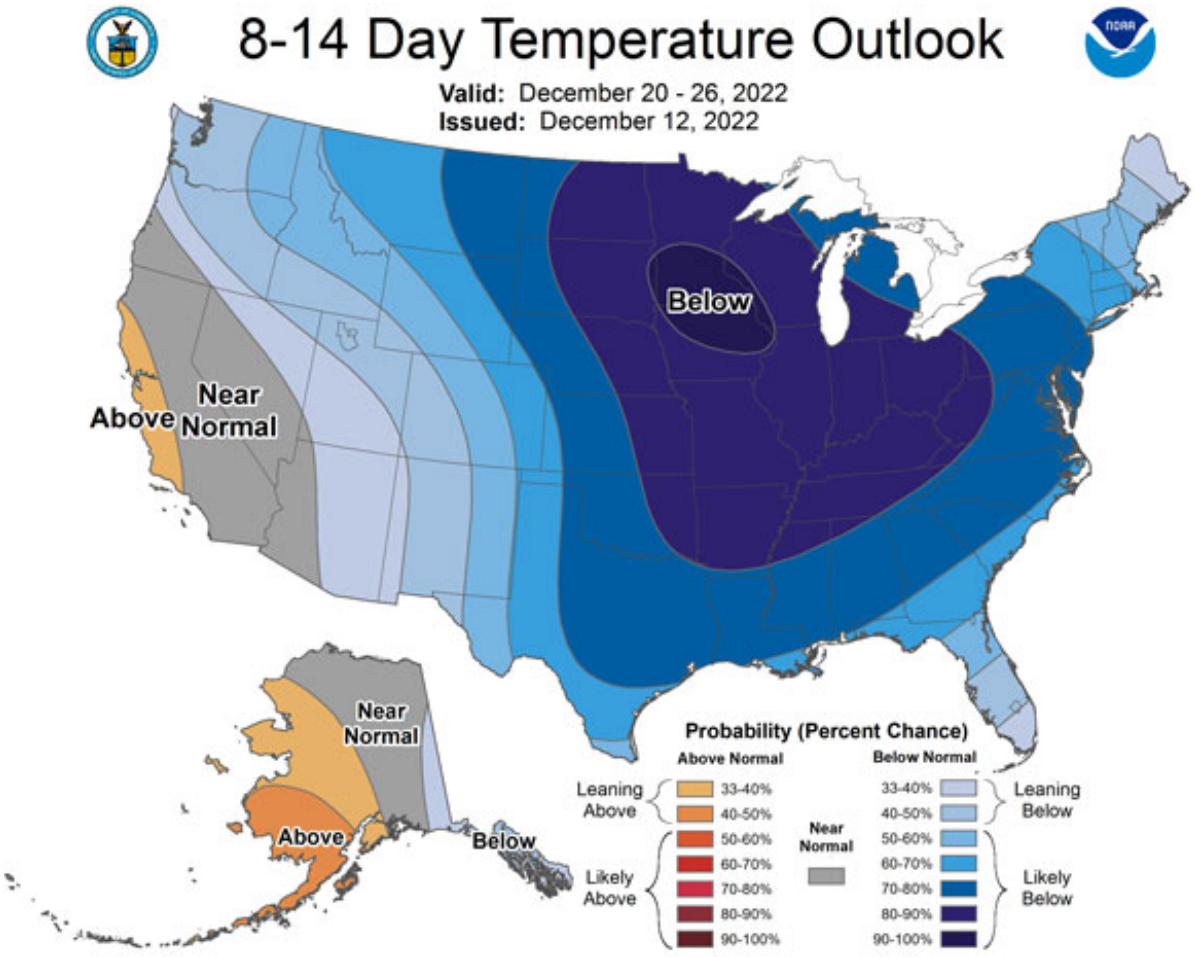

Figure 2. The Climate Prediction Center's 8 to 14-day outlook for temperatures.

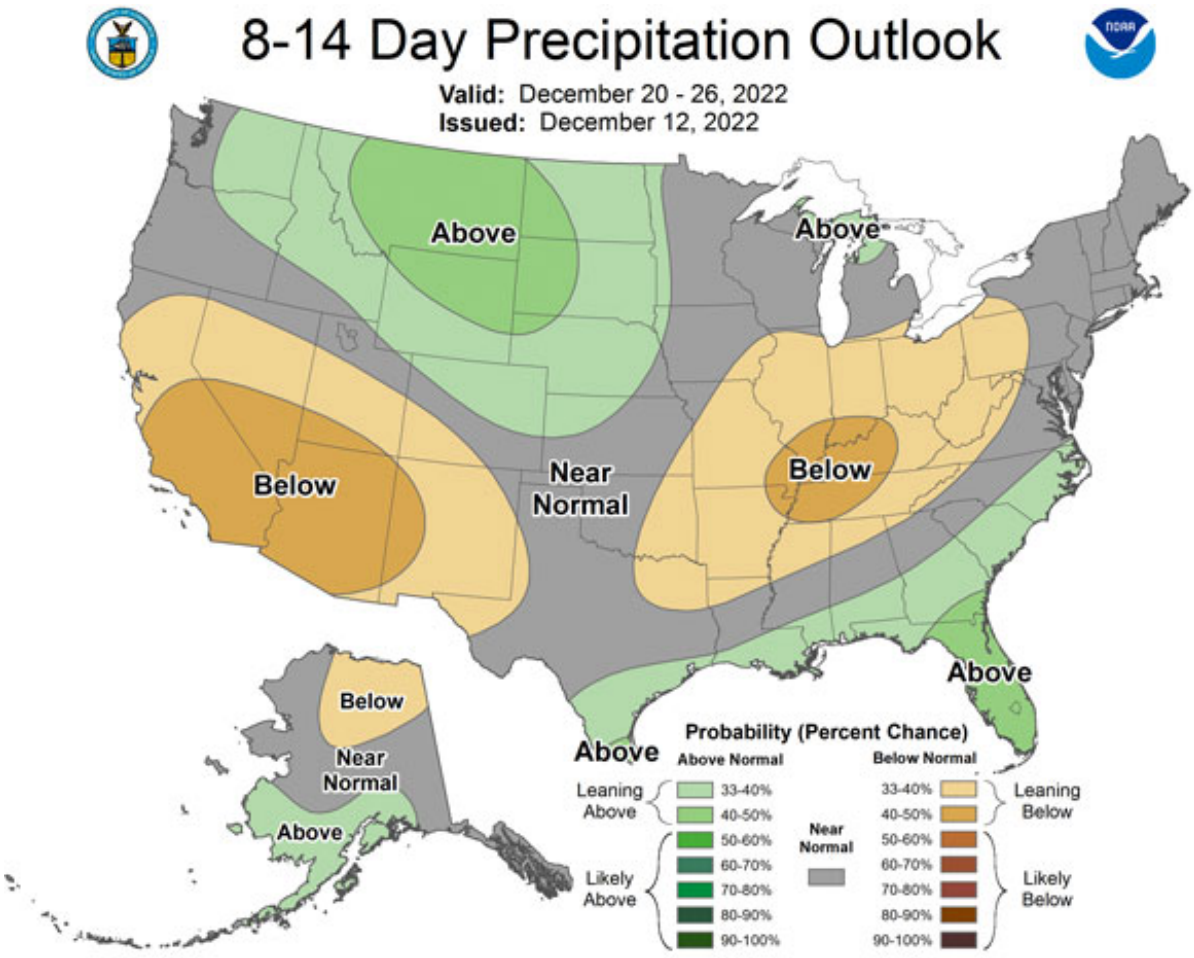

Figure 3. The Climate Prediction Center's 8 to 14-day outlook for precipitation.

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5. Kansas Ag-Climate Update for November 2022

The Kansas Ag-Climate Update is a joint effort between our climate and extension specialists. Every month the update includes a brief summary of that month, agronomic impacts, relevant maps and graphs, 1-month temperature and precipitation outlooks, monthly extremes, and notable highlights.

November 2022: Exceptional drought conditions across the state

The statewide average temperature for November was 41.2°F, or 2.1°F below normal. This ranks as the 49th coldest November out of the last 128 years, dating back to 1895. November was the first below normal month statewide since March. All divisions finished the month below normal; departures ranged from -2.9°F in the southwest to -1.6°F in northeast Kansas.

The statewide average precipitation for November was 1.44", or 0.14" above normal. This was the first above normal month statewide since May. Five of the nine climate divisions finished the month above normal, but northwest and west central remained very dry, both receiving less than 10% of their normal monthly precipitation. Combined with last month, the three western Kansas climate divisions rank in their top 5 for the driest October-November on record. The 0.15" total for west central Kansas is the driest October-November on record in that division, breaking the old record of 0.16" set in 1939.

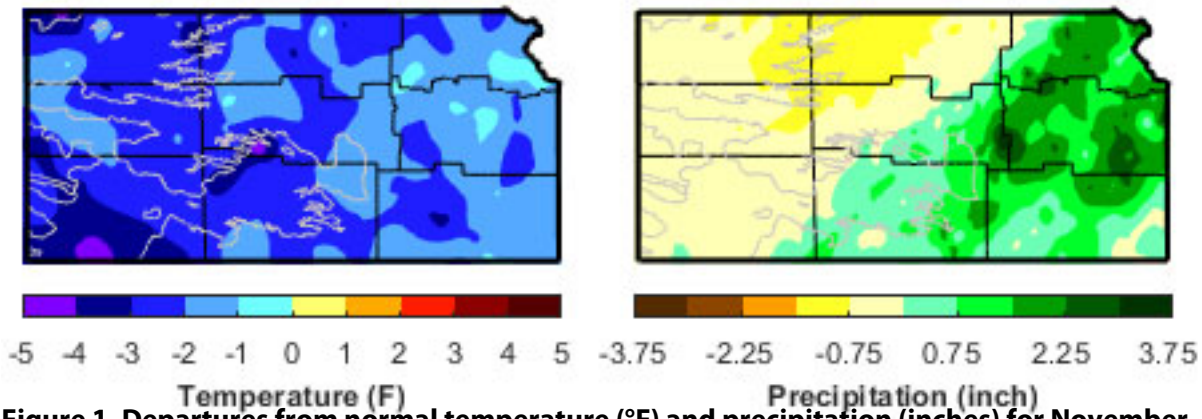

Figure 1. Departures from normal temperature (°F) and precipitation (inches) for November 2022.

View the entire November 2022 Ag-Climate Update, including the accompanying maps and graphics (not shown in this eUpdate article), at http://climate.k-state.edu/ag/updates/

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6. Flickner Innovation Farm to present current projects at workshop on January 12

The Flickner Innovation Farm will host a January 12 workshop to present up-to-date outcomes from the farm's technology implementation and projects studying natural resource use. There will also be a presentation from NASA about how their programs can benefit farm management.

The workshop will take place at the Inman Community Center and will feature a range of experts speaking on a variety of subjects, including groundwater nitrate dynamics, protein sampling and grain quality, using cover crops for soil health, irrigation management, and more. Organizers say the investigations from Kansas State University and University of Kansas researchers, local producers, and industry partners are helping to fine-tune current and emerging technologies that conserve water use while improving water quality and soil health.

"We have done just about everything this year, from looking at the water quality in our wells to chatting with scientists from NASA about the satellites in space," said Ray Flickner, who owns and operates the Flickner Innovation Farm. "I'm excited to let people know what we've learned, in hopes that it will make a difference for other producers."

The program begins at 10 a.m. and ends at 3 p.m. The event is free, and lunch will be provided. More information, including registration, is available online from the Kansas Center for Agricultural Resources and the Environment (KCARE). Those interested in attending should register with KCARE by January 9.

The Innovation Farm is a partnership between Flickner, university scientists, watershed specialists and industry leaders. Together, they are conducting studies in a large-farm setting to identify the most efficient technologies and techniques for Kansas producers to use on their own farms.

Several K-State faculty members are conducting research at the Innovation Farm, including studies about soil health and cover crops; nutrient management; weed management; protein mapping and grain quality studies; and investigations on the effects of long-term cropping systems on fertilizer requirements.

In addition to presentations about ongoing projects and upcoming research, the meeting will also include opportunities to meet with vendors and other industry representatives.

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