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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. Sharp decline in temperatures: Possible impacts on the Kansas wheat crop..... 3

1. Sharp decline in temperatures: Possible impacts on the Kansas wheat crop

The sudden, sharp drop in temperatures across Kansas observed in the early part of November 2018 could have different consequences to the wheat crop, varying from no impact to some injury in particular fields. Temperatures dropped from around mid-50 to 60 degrees F on November 5 to approximately 20 degrees F the mornings of November 10-12 (Figure 1).

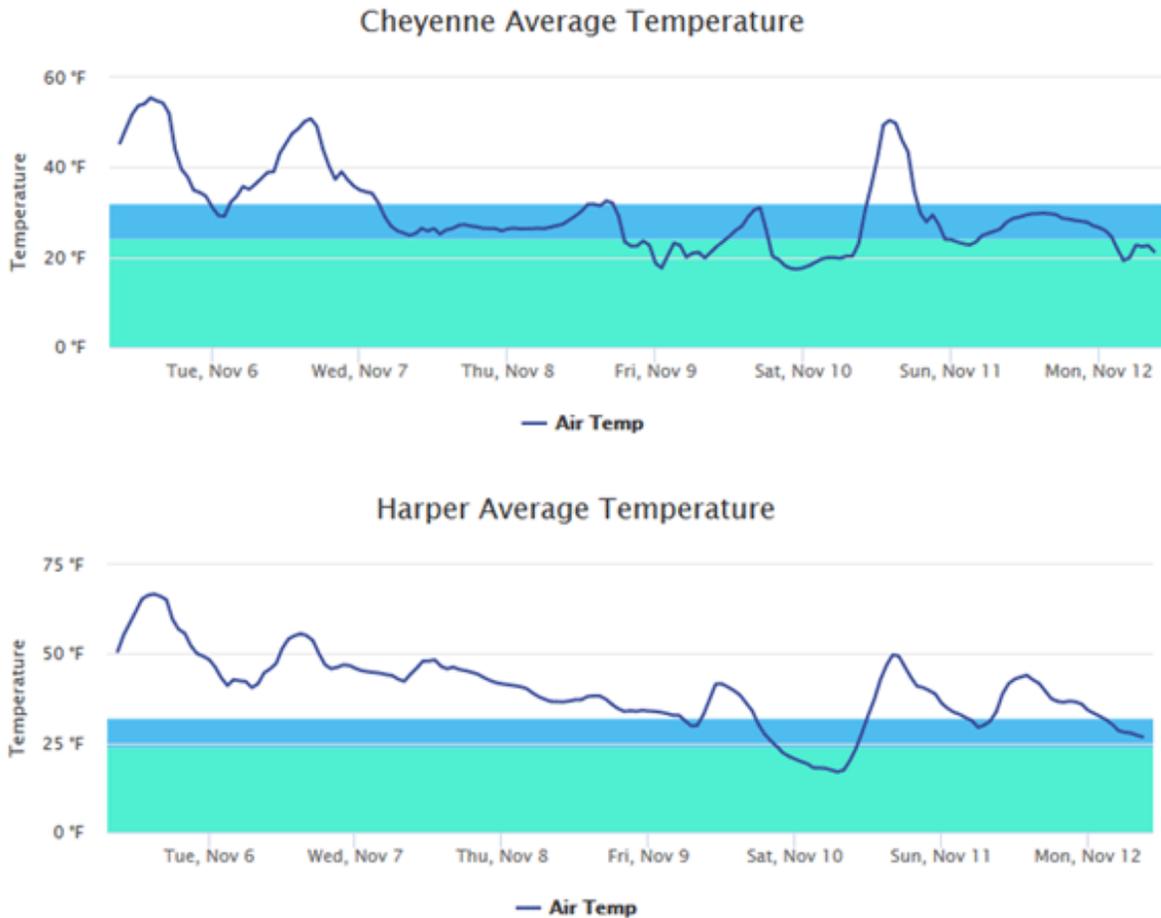


Figure 1. Hourly temperature dynamics from November 5-12, 2018 for Cheyenne (upper panel), and Harper (lower panel). Data courtesy of Kansas Mesonet.

The actual consequences of this temperature drop should be field specific, dependent on the region within the state, and on several other factors. The snowfall and the moisture level in the topsoil will be important to help buffer possible injuries resulting from the cold temperatures. When more than 2-3 inches of snow is on the soil surface, it helps buffer temperature changes, thus protecting the wheat crop. Soil moisture is generally good in most of the state due to all the October rainfall, which should also help as it will cause the soil to have a better thermal buffer capacity, compared to a dry soil. While the average soil temperatures followed a similar trend to that observed for air temperatures (Figure 2), the minimum 2-inch soil temperatures measured across the state did not fall below 33 degrees F at any of the K-State Mesonet (<http://mesonet.k-state.edu/>) weather stations

Figure 2. Average soil temperature at the 2-inch and 4-inch depths from November 5-12, 2018 for Cheyenne (upper panel) and Harper (middle panel). Lowest 2-inch soil temperature during the last 7 days (from Nov. 12) across the state (lower panel). Minimum soil temperatures did not fall below 33 degrees F across Kansas. Data courtesy of Kansas Mesonet.

Possible exceptions could include fields planted in heavy no-till residue where the furrow might not have been closed properly at sowing, or where there was not good seed-soil contact. Under these conditions, the lack of furrow closure results in a less protected seedling (and in some fields, crown) which might be more exposed to cold temperatures (Figure 3).

Producers are encouraged to start checking for possible injury on lower portions of the fields and especially in no-till fields with heavy residue. The cold temperatures also will be more likely to cause injury to wheat if the plants were showing drought stress symptoms and soil temperature might have fallen below those shown on Figure 2, as dry soils will get colder more easily than wet soils. Additionally, the drier and looser the seed bed soil is, the greater the potential for the planting to be exposed to cold temperatures resulting in injury. Meanwhile, firmer and moister soils should help to minimize rapid fluctuations in soil temperatures allowing the wheat to better withstand cold temperatures.



Figure 3. Effect of soybean residue on wheat cold damage. Yellow portions of the field correspond to greater residue left by the combine at soybean harvest, and resulted in reduced seed-soil contact at wheat planting. As a consequence, the plants are more exposed to colder temperatures and potential injury. Photo provided by Romulo Lollato, K-State Research and Extension.

Another factor affecting wheat's response to the cold is whether the wheat had time to become

properly cold-hardened. It is important to remember that a large portion of the Kansas wheat crop was planted late, after the October rainfall events; therefore, it is still too early to suggest that the wheat has been cold-hardened. In fact, many fields have not even emerged or are just now starting to emerge.

In fields that have not yet emerged but in which seeds are already sprouted, no significant injury should be expected. This is because recently sprouted wheat...

- generally handles temperatures above 5-10 degrees F well, and air temperatures never reached those levels.
- is still below the soil surface. The warmer soil temperatures will likely help buffer the seedling from being damaged by the cold.

In fields where the crop has already emerged, temperatures around 15 degrees F or less can injure the newly emerged wheat, and these limits decrease as the crop progresses to tillering later in the fall and become more cold-hardy. Thus, some fields in western Kansas where the crop has recently emerged, especially the northwest part of the state, could sustain some level of damage. We likely will not know for sure until temperatures warm up and give us an opportunity to scout.

If fields were affected, the first symptom will be burndown of the wheat from these cold temperatures as shown in Figure 3. If the wheat was larger-than-normal, the plants may look "rough" with a lot of brown, dead-looking foliage on the soil surface. That does not mean the plants are dead. The important factor will be whether the crown below the soil surface remains alive. Having a well-developed secondary root system will help the plants survive. As temperatures did not drop as low in the central portion of the state, the concern with possible cold injury is not as great as fields that recently emerged in northwest Kansas.

In summary, the extent of the unusually large and rapid drop in temperatures is a concern in certain scenarios described above. In fields that were planted earlier, if the wheat did not develop sufficient cold-hardiness, it will be more susceptible to injury from the recent cold snap.

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