

Winter Kill in Wheat

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The extremely cold temperatures observed in Kansas in mid-January 2025 have the potential to cause winterkill to the winter wheat crop. However, several factors determine whether winter wheat will survive the winter and this particular cold spell. The most important factors from the crop's perspective include proper cold hardening and root system development, as well as the overall crop status in terms of damage from pests. From an environmental perspective, important factors include air temperature, consequent soil temperatures at the crown level, snow cover, and soil moisture content.

The condition of the 2025 Kansas wheat crop is variable depending on the region and the planting and emergence dates. Overall, some precipitation occurred in parts of the state in September, which was followed by a dry spell in late September and into October, followed by a wet late-October into November. This precipitation dynamics allowed growers to harvest summer crops on time and to move along on wheat planting, whose pace was very close to the historical average. However, the dry spell during October somewhat delayed the emergence of the crop that did not get planted after the early September rain events until late October. At this point, when precipitation occurred again across the state, the percent emerged increased and surpassed the historical average since most of the summer crops had been harvested and the wheat planted.

The good amount of late fall precipitation, coupled with above-average fall temperatures, were positive in allowing the crop to establish and tiller during the fall. In fact, some reports from growers in south central Kansas suggest that the early planted crop produced a large amount of biomass during the fall, perhaps being considered "too big". The large number of tillers and consequent good root development may have allowed for good winterhardiness development, although excessive tillering can increase moisture consumption and worsen the crop's potential to survive through the winter due to a dryer subsoil. Some fields planted after the harvest of a summer crop could be exceptions, perhaps emerging late and having much more limited development in the fall both in terms of tillers and root development, thus being more exposed to potential consequences of the cold temperatures. However, for the most part, the Kansas wheat crop was off to a good start in the 2025 growing season.

A well-developed crop with 3-5 tillers can handle air temperatures during the winter in the single digits fairly well. Over 60% of the Kansas wheat crop emerged by mid-October and likely fall in this category. However, soil temperatures in the single digits can cause significant damage and winterkill, especially to less developed crops, such as the fields that emerged after November (about 25% of the Kansas crop), which will be more sensitive to winterkill with higher temperature thresholds for damage.

During the current cold stretch that began on January 18 and lasted through the 21st, air temperatures have dropped as low as -15°F in lower valleys of the state. These temperatures were cold enough to cause leaf burn and, if soil temperatures reached these levels, could potentially cause winterkill. However, some areas of the state, central and northeast, were still snow-covered from the January 6th snowfall event. Despite the west remaining mostly snow-free, soil temperatures at the 2" depth never dropped below 20°F across the state. Soil temperatures at these levels are likely not cold enough to cause winterkill to a well winter-hardened wheat crop.

Two environmental factors that affect the crop's response to cold temperatures due to their potential of buffering of low air temperatures are soil moisture content and snow cover. The relatively moist fall led to high percent saturation of soil water at the majority of the state (while 5- and 10-cm measures are mostly unavailable due to frozen soils, the 20- and 50-cm maps of the Kansas Mesonet Soil Moisture suggest that most stations are currently above 70-80% saturation, <https://mesonet.k-state.edu/agriculture/soilmoist/#mtIndex=2>). Wetter soils help in buffering changes in soil temperature as a function of the low air temperatures observed.

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Regarding snow cover, most of Kansas's wheat-growing region had good snow cover levels from January 6 until about January 14, and parts of central and north central Kansas had decent snow cover until January 21. The western portion of the state had only limited and shallow snow during the cold temperatures experienced on January 18-21. Where the crop had at least 2-3 inches of snow cover, this snow should have been sufficient to insulate the wheat crop from the coldest temperatures. However, the combination of extremely cold air temperatures and lack of snow coverage, particularly in western Kansas, could leave the crop exposed and result in some winterkill, particularly in terrace tops, late-planted fields, and other more exposed areas.

The biggest potential for winterkill is in fields that either emerged too early and had a very lush top growth, consequently drying the soil, or those fields that emerged very late and thus had limited tiller and root development. In particular, fields with very limited snow cover (less than 2-3 inches) in more exposed areas of the terrain (e.g., terrace tops) are more prone to winterkill.

We will not know the extent of winterkill in the state until temperatures start to warm up and the wheat starts to green up later in the spring, so there is nothing growers can do at the moment. This will likely occur in mid- to late-March, so at least another 50-60 days. As wheat green-up progresses later in the year, any winter injury will become more apparent. Injured wheat may initially green up, then go backward.

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