



University of Kentucky  
College of Agriculture,  
Food and Environment  
Cooperative Extension Service



# Wheat Science

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## Scouting for Wheat and Small Grains Condition following Bitter Cold Temperatures

Dr. Carrie Knott, Grain Crops Extension Agronomist—Princeton

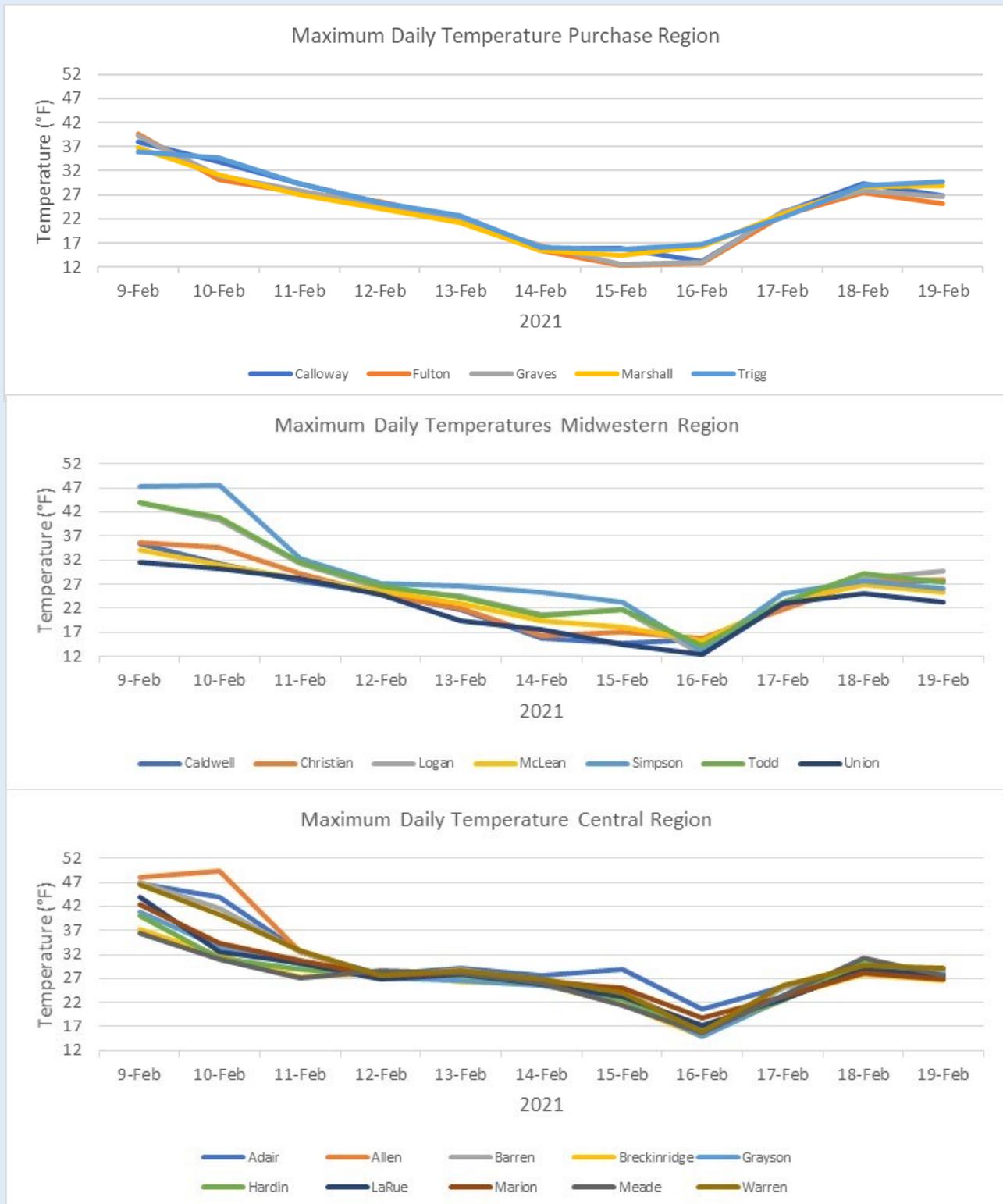
Article written Feb 21, 2021



To say that we have had a cold and snowy 10 days would be an understatement! Since Feb 9 a large portion of the state has had ice, snow, more ice, and more snow, all with bitterly cold temperatures that are truly unheard of in Kentucky. Not to mention that all this happened during a La Niña winter that was predicted to be warmer than average!

Since about Feb 11, the high temperatures across the state have been and remained below freezing (Figure 1). In addition, the low temperatures have been bitterly cold with single digit and even negative values recorded across the entire state, which is particularly unusual for the Purchase and Midwestern regions of the state (Figure 2).

Figure 1. Daily maximum temperatures for many of the wheat producing regions, by county, in Kentucky. Data obtained from the KyMesonet (<https://www.kymesonet.org/>).



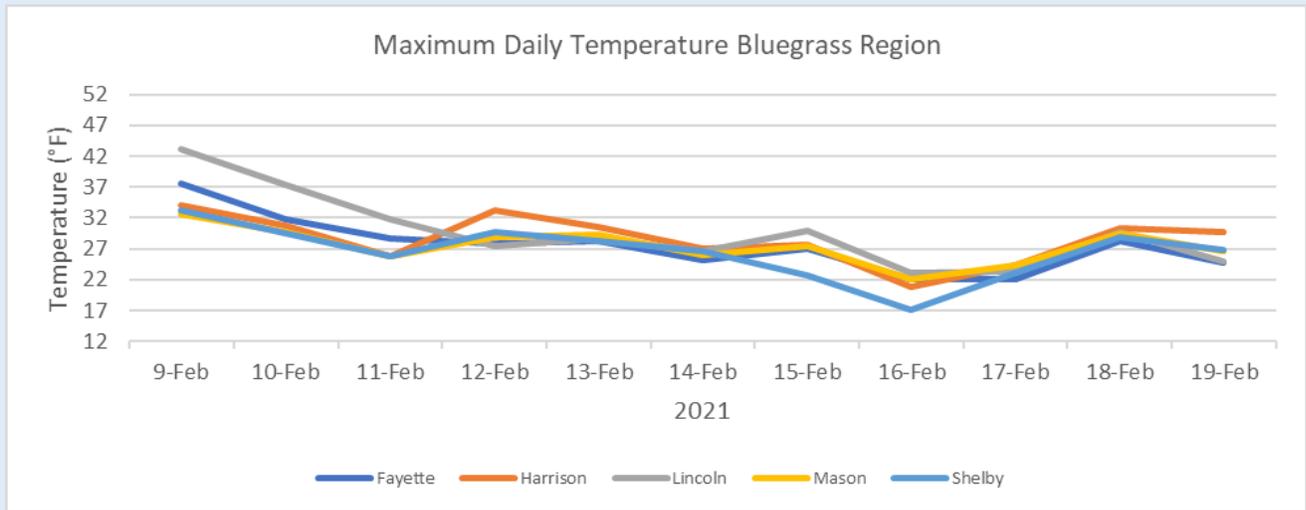
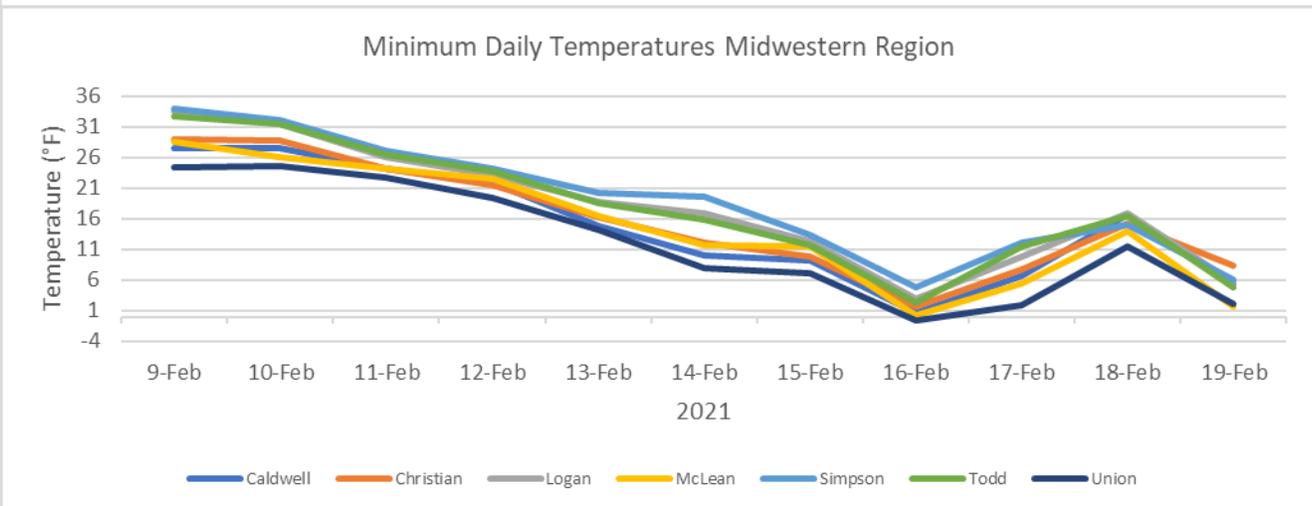
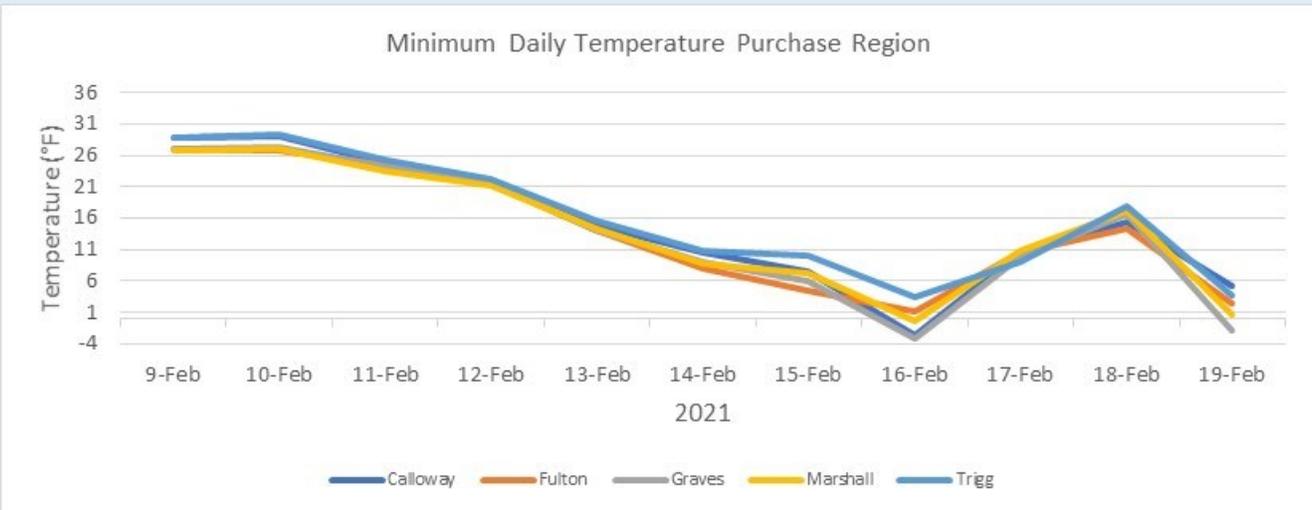
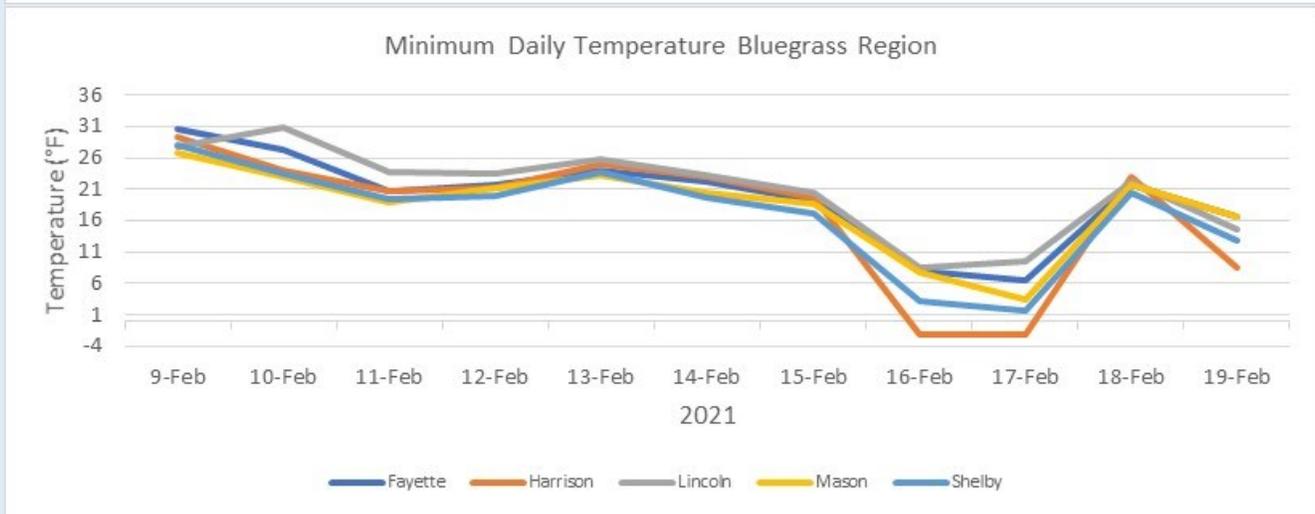
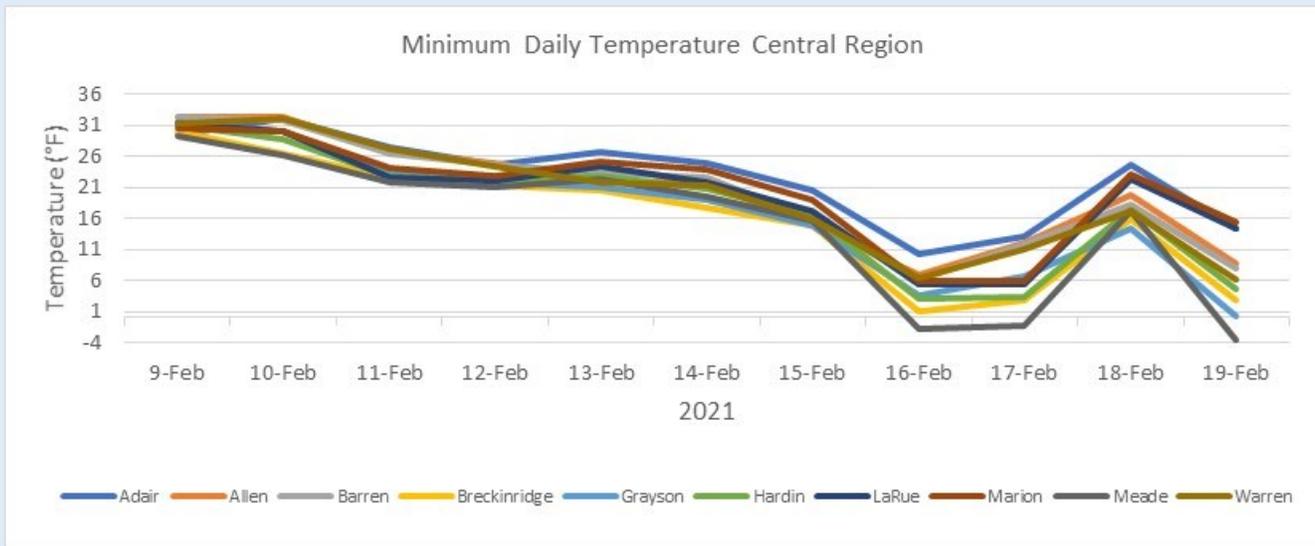


Figure 2. Daily minimum temperatures for many of the wheat producing regions, by county, in Kentucky. Data obtained from the KyMesonet (<https://www.kymesonet.org/>).





Fortunately for our wheat and small grains crops, there is a layer of ice (Figure 3) and several inches of snow that has insulated the crop from these bitterly cold temperatures. Both should provide enough protection that freeze damage is not expected. However, it is likely a good plan to go ahead and scout for any potential freeze injury or damage as soon as temperatures warm up.



**Figure 3. Layer of ice and some snow on cereal rye at Spindletop Research Farm, Lexington. Photo: Dave Van Sanford**

Currently, the extended forecast for most of the state is calling for high temperatures to be greater than 40°F beginning Feb 21. Given that we need about 5 to 7 days of active growth, high temperatures  $\geq 40^{\circ}\text{F}$ , we should be able to scout for any damage by about Saturday Feb 27 at the earliest. Likely there will be cosmetic damage to leaves or leaf tips, which will include yellowing and for certain varieties, particularly cereal rye, purpling (Figure 4). There is little concern about this damage. The damage that would be of concern is if you can smell a 'silage' odor coming from the fields, if the entire fields appear 'blue' in color, or if the stems of the plants have lost their firmness and definition and feel 'mushy'. Again, this damage is unlikely given that we had an insulating ice/snow cover. But it is worth a trip to the field to identify if damage occurred so that you can plan for the most profitable course forward for 2021.

For additional information on identifying freeze damage in winter wheat, which can be used for all small grains, refer to [Identifying Damage and Estimating Yield Reductions following a Spring Freeze in Winter Wheat](#).

**Figure 4. Cosmetic yellowing of leaves and leaf tips that is characteristic of freeze damage at early growth stages. This damage does not impact final grain yield as long as stems remain firm and undamaged.**



  
Carrie Knott, Extension Grain Crops Specialist

## *Considerations for Frozen Ground Nitrogen Applications*

Dr. Edwin Ritchey, Dr. John Grove and Dr. Josh McGrath—Soil Science Research & Extension

The time for the first application of nitrogen (N) to winter wheat is approaching. Split N application is typically the best management approach to maximizing yield and minimizing N loss. Nitrogen application should occur around Feekes 2-3 (typically mid-February to early March) and again at Feekes 5-6 (typically mid to late March) with the N split roughly 1/3 in the first, and 2/3 in the second, applications. Wheat stands that are thin or exhibit too-little tillering should receive higher rates of N in the first application to encourage tillering. Although N rate is an important consideration in setting up the crop for success, the purpose of this article is to discuss environmental conditions and potential outcomes from the first application, particularly this year.

Late winter can be difficult finding soil conditions suitable to support fertilizer applicators used to apply N. Often the soil is wet, resulting in ruts or compaction from equipment traffic. Some producers will take advantage of frozen ground to support N application to avoid creating ruts or causing compaction. The remainder of this article will discuss this practice and potential impacts that might arise from frozen ground nutrient application.

Nutrient management guidance from NRCS (590 Conservation Practice Standard <https://www.nrcs.usda.gov/wps/portal/nrcs/main/ky/technical/ecoscience/nutrient/>), advises against nutrient applications to frozen or saturated ground. The reason for this is the potential for nutrient runoff loss when a nutrient application is followed by rainfall before the ground thaws. When the soil is frozen, precipitation is not able to infiltrate and surface water runoff occurs. This surface runoff can contain soluble, recently applied nutrients and move these to adjoining properties and surface water, leading to degraded water quality.

Some producers might make N applications in the morning to frozen soil that then thaws in the afternoon. While by definition this is still a frozen ground nutrient application, the potential for nutrient loss is minimal compared to recent soil conditions where the ground was frozen solid and remained so for many days.

In 2014, a considerable amount of ground in western Kentucky was frozen to a depth of 6 to 9 inches. A study investigated the potential for N loss when several N rates were applied to frozen soil and were followed by significant rainfall. Approximately 3 inches of rain, followed by 1.6 inches of snow, fell while the ground was still frozen. The N applications made to frozen soil resulted in 40 to 70% less nitrate in the surface 12 inches of soil and 9% lower wheat yields compared to N applications made after the soil thawed. More details regarding this study can be found at the following the link: [rr201420-20edwin20-20nitrogen20loss20for20frozen20soil.pdf](http://rr201420-20edwin20-20nitrogen20loss20for20frozen20soil.pdf) ([uky.edu](http://uky.edu))

Before making the decision to apply N to frozen soil, carefully consider the potential consequences. While rutting and compaction can be avoided by utilizing frozen soil for the first N application, the potential agronomic (N loss), economic (N and wheat yield loss), and environmental (offsite N movement) impacts could make this practice much less favorable than it initially appears. Waiting until the ground thaws and the wheat is actively growing could result in higher yields, greater profit and lessen N loss potential.

### *Frozen Ground Nitrogen Applications: A Follow Up*

Recently the soil was deeply frozen for several days and had several inches of snow cover. This ground was capable of supporting sprayer and tractor weights without causing soil rutting. Some wheat producers may have taken advantage of this to make their first nitrogen (N) application to the still dormant crop. This article will discuss some of the potential implications of that action and what to look for later in the season.

When soil is saturated, most all pores all full of water. In our latest soil freeze, the soil pores were also water-filled. In these situations precipitation and snow melt are not able to infiltrate the soil, and will either pond on the surface when the field is level or move laterally over the surface in sloping fields/field areas. Unfortunately, applied N has the potential to move with the water, typically ending up somewhere other than where originally applied. Additionally, wheat does not readily take up N when dormant, further increasing N loss potential in these scenarios.

The majority of N is applied as urea-ammonium nitrate (UAN) solution with an N concentration of 28 to 32%. UAN contains 50% urea and 50% ammonium nitrate and half the ammonium nitrate is in the nitrate form, which equals 25% of the total UAN-N applied. Nitrate-N ( $\text{NO}_3^-$ -N) is readily mobile in the soil and soil solution due to its negative charge and the predominantly positive charge of soil particle surfaces. When snow melts, nitrate-N is likely to move with the melt water or any rainfall while the soil is still frozen, and the soil pores are unable to infiltrate water. The same fate is possible with the urea and ammonium forms of N contained in the UAN. However, there is a reduced potential for N loss with these N forms since they are more likely to interact with the soil if soil contact is made prior to moving with the runoff water.

Moving forward in the season, be sure to scout for adequate stands and tillering, paying close attention to different topographic areas in the field. The areas in the field most likely to experience N loss (or offsite movement) are the side slopes. This N will move to lower parts of the field and potentially move completely off-site if the lowest part of the field is a drainage ditch or waterway. The N that moves to depressions may eventually be lost to denitrification if the soil is saturated for long periods of time. The N that doesn't denitrify in the depressions will be available to the wheat. This could lead to greater amounts of total available N when the second N application is made and increased potential for lodging in the depressions. The sloping areas that experienced N loss may need additional N compared to level field areas that had less N movement and loss.

Be aware of these potential situations when making N management decisions for the second N application this season. It is possible that N movement was inconsequential in some areas, but for those areas where this occurred wheat yield could be reduced if N nutrition is not adequately balanced with the second N application.

## ***KATS is Making Plans for 2021!***



The Kentucky Agriculture Training School (KATS) is making plans for 2021! Many of the 2020 KATS trainings were canceled due to Covid-19, however, it looks promising for us to hold in-person trainings this year. We will follow Covid-19 safety measures and announce more details closer to each event.

<b>April 26, 28, &amp; 30</b>	<b>Developing Management Zones for Soil Sampling</b> —an <u>online</u> interactive event (8—9:30 AM Central Time)
<b>May 6, 2021</b>	<b>Crop Scouting Clinic (Option 1)</b>
<b>May 20, 2021</b>	<b>Crop Scouting Clinic (Option 2)</b>
<b>June 15, 2021</b>	<b>Forage Workshop</b>
<b>July 15, 2021</b>	<b>Spray Clinic</b>
<b>TBA</b>	<b>Self-Led Educational KATS Plot Tour (in person)</b>

Please go to [kats.ca.uky.edu](https://kats.ca.uky.edu) for schedule and training information and updates.

If you have questions or would like to be added to the email list, contact Lori Rogers [lori.rogers@uky.edu](mailto:lori.rogers@uky.edu)



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# Upcoming Events

<b>March 10, 2021</b>	<b>IPM Training School (Virtual)</b>
<b>April 26, 28 &amp; 30, 2021</b>	<b>Developing Management Zones for Soil Sampling—Series</b>
<b>May 6, 2021</b>	<b>Crop Scouting Clinic (Option 1)</b>
<b>May 11 &amp; 18, 2021</b>	<b>2021 Virtual Wheat Field Day</b>
<b>May 20, 2021</b>	<b>Crop Scouting Clinic (Option 2)</b>
<b>June 15, 2021</b>	<b>Forage Workshop</b>
<b>July 15, 2021</b>	<b>Spray Clinic</b>
<b>July 27, 2021</b>	<b>Corn &amp; Soybean Field Day</b>
<b>TBA</b>	<b>Self-Led Educational KATS Plot Tour (in person)</b>

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