



## EXTENSION

# First Hollow Stem: A Critical Wheat Growth Stage for Dual-purpose Producers

Amanda de Oliveira Silva  
Small Grains Extension Specialist

Oklahoma farmers sow approximately four million acres of wheat annually. Anywhere from 40% to 60% of these acres are grazed by cattle during the winter. Producers wishing to graze wheat and subsequently harvest grain must decide when to remove cattle from wheat pasture. Grazing too long will reduce wheat yields but removing cattle too early will reduce profit potential of the stocker cattle enterprise. Finding the correct balance between these two factors has been the subject of investigation for decades.

As early as the 1930s, Kansas State University researchers published Extension bulletins indicating that cattle should be removed from wheat pasture by jointing. Oklahoma State University researchers investigated the issue further in the early 1990s and found that if profitability of the overall wheat stocker cattle enterprise was the primary goal, removing cattle from wheat pasture by jointing was too late. They identified first hollow stem (i.e., the beginning of stem elongation, or just before the jointing stage) as the optimal wheat growth stage for removing cattle from wheat pasture. The purpose of this fact sheet is to explain why first hollow stem is the best time to remove cattle from wheat pasture, provide details on how to identify first hollow stem, and discuss some of the environmental and physiological factors that determine when first hollow stem occurs.



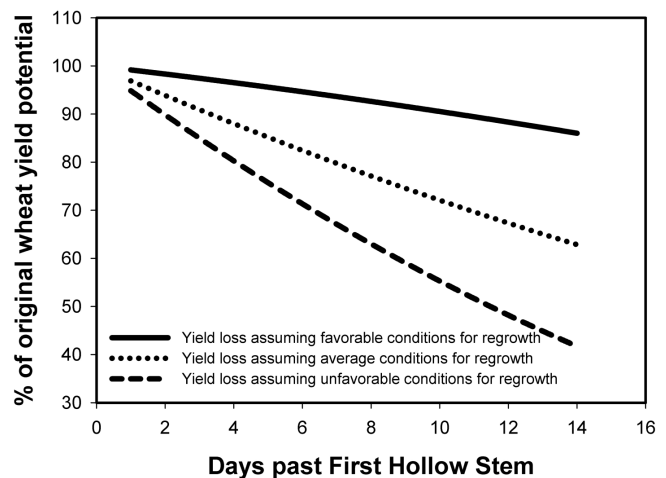
**Figure 1.** Dual-purpose wheat system. Cattle grazes winter wheat during the winter and should be removed from wheat pasture by first hollow stem stage. Photo taken at Apache, OK.

### Importance of First Hollow Stem

Wheat intended for grazing is generally sown in early- to mid-September. Due to this earlier-than-optimal sowing date, grazed wheat will generally yield less than nongrazed wheat sown in mid-October. Since dual-purpose wheat producers are already dealing with reduced yield potential, as compared to a grain-only system, it is extremely important to protect the yield potential present by removing cattle from wheat pasture prior to first hollow stem. As shown in Figure 2, the average grain yield reduction from grazing wheat pasture past first hollow stem depends on several factors.

Oklahoma Cooperative Extension Fact Sheets  
are also available on our website at:  
<http://osufacts.okstate.edu>

Studies conducted at the Wheat Pasture Research Unit near Marshall during the early 1990s and at Stillwater during the 2003 and 2005 crop years have shown that grazing past first hollow stem decreases grain yield by as much as 5% per day or as little as 1% per day. The amount of green leaf area left after grazing, for example, will significantly impact wheat recovery after grazing. Green leaf tissue is the factory that powers wheat growth. The more green leaf tissue left at grazing termination, the greater the yield potential. So wheat pasture that is not grazed as hard or not grazed during muddy conditions will recover from grazing more quickly than wheat that is grazed short or stomped into the ground. Ideally, there should be a minimum of 60% canopy coverage (measured from the Canopeo app) left to allow the crop to recover from grazing (PSS-2170: [extension.okstate.edu/fact-sheets/dual-purpose-wheat-improving-grazing-management-using-a-smartphone-app.html](http://extension.okstate.edu/fact-sheets/dual-purpose-wheat-improving-grazing-management-using-a-smartphone-app.html)).



**Figure 2.** Grazing past first hollow stem has been shown to reduce grain yield by as much as 5% per day or as little as 1% per day. Factors such as wheat variety, grazing intensity and environmental conditions will determine the actual yield penalty for grazing past first hollow stem. This figure shows the anticipated yield loss for grazing past first hollow stem given favorable (solid line), unfavorable (dashed line) and average (dotted line) conditions for wheat regrowth following grazing termination.

Cool, wet conditions after cattle removal are favorable for wheat recovery. These environmental conditions allow the wheat plant extra time to regain some of the vegetative growth lost to grazing prior to switching to reproductive mode. An additional two weeks of grazing past first hollow stem could cost the producer as little as 14% or as much as 58% of original yield potential. In most circumstances, the additional cattle weight gain from grazing past first hollow stem would not be sufficient to offset the loss in grain yield. To determine the economic impact of grazing past first hollow stem on your farm, consult the Oklahoma Wheat Stocker Graze Out Decision Aid available at AGEC-263 ([extension.okstate.edu/fact-sheets/agribusiness-management-series-oklahoma-wheat-stocker-graze-out-decision-aid.html](https://extension.okstate.edu/fact-sheets/agribusiness-management-series-oklahoma-wheat-stocker-graze-out-decision-aid.html)).

## What Determines When First Hollow Stem Occurs?

First hollow stem is affected by genetic and environmental factors. Varieties can differ by as much as three-four weeks in onset of first hollow stem, and later maturity varieties generally reach first hollow stem later. OSU researchers measure and record dates of first hollow stem of popular wheat varieties each year.

Data is also used to classify varieties as either very early, early, medium, late or very late in occurrence of first hollow stem. These ratings can be found at the OSU Small Grains website ([extension.okstate.edu/programs/wheat-research-and-extension/variety-testing/forage-yield.html](https://extension.okstate.edu/programs/wheat-research-and-extension/variety-testing/forage-yield.html)) and Extension Fact Sheet PSS-2142 Wheat Variety Comparison. Dual-purpose producers are encouraged to select varieties that are rated as medium, late or very late in occurrence of first hollow stem.

Early-sown wheat will reach first hollow stem earlier than late-sown wheat. Moderate conditions during the winter months and adequate rainfall also promote earlier onset of first hollow stem. Due to the strong effects of planting date and environment, it is extremely difficult to accurately predict the onset of first hollow stem with weather data. The most reliable method of determining first hollow stem is to check every field and check often.

## Checking for First Hollow Stem

To check for first hollow stem, go to a nongrazed area and pull four or five plants. Plants must be dug up to check for hollow stem because much of the hollow stem present at this time is still below the soil surface. Hollow stem must be measured from a nongrazed area in the same field because grazing delays stem elongation and when first hollow stem occurs. Good places to find areas of nongrazed wheat are field corners or nongrazed areas just outside of the electric fence.

Select the largest tillers on the plants. Split the stems open lengthwise starting at the base. A sharp razor or box cutter will make this job easier. If there is 1.5 cm (5/8 inch) of hollow stem below the developing wheat head (Figure 3), the wheat is at first hollow stem stage. The 1.5 cm is about the same as the diameter of a U.S. dime, making the dime a perfect measuring device for first hollow stem.



**Figure 3.** First hollow stem occurs when hollow stem equivalent to the diameter of a dime (1.5 cm) is present below the developing grain head.

## Summary

- First hollow stem (i.e., the beginning of stem elongation, or just before the jointing stage) is the optimal wheat growth stage for removing cattle from wheat pasture.
- Grazing past first hollow stem decreases grain yield from 1%-5% per day.
- First hollow stem is affected by genetic and environmental factors.
- Varieties can differ by as much as four weeks in onset of first hollow stem.

Oklahoma State University, as an equal opportunity employer, complies with all applicable federal and state laws regarding non-discrimination and affirmative action. Oklahoma State University is committed to a policy of equal opportunity for all individuals and does not discriminate based on race, religion, age, sex, color, national origin, marital status, sexual orientation, gender identity/ expression, disability, or veteran status with regard to employment, educational programs and activities, and/or admissions. For more information, visit <https://eeo.okstate.edu>.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Director of Oklahoma Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President for Agricultural Programs and has been prepared and distributed at a cost of 20 cents per copy. April 2023 KG.