Cutting Management for Cool-Season Forage Grasses

The height and frequency that you harvest grass can affect yield, quality and the longevity of your grass hayfields and pastures.

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Some of the questions that inevitably come up when talking with grass producers are what is the best height at which grass hayfields and pastures should be harvested? Why do some farm managers have grass stands of improved hay or pasture last for years and others have them fade away sooner than they like? Is it poor soils, lack of nutrition, winter kill, or something else? The answer to these questions may be in the management associated with the harvesting height of the plants. The goal of this article is to help grass hay and pasture producers understand the effect their cutting management decisions have associated with the longevity of their stands. This can be beneficial for increased profits and efficiency.

Grass plant defoliation can have either a positive or a negative effect based on several factors including grazing or mowing height, frequency of cutting or grazing, the duration of the defoliation and the rest interval after defoliation. Especially with today's modern harvesters that can mow close to the soil surface, this issue has become more important than ever.

Tolerance to frequent defoliation (harvest or grazing) varies by species. This makes it important to consider the cutting or grazing schedule based on the types of grasses present in their fields. For example, close, frequent harvests of timothy will quickly reduce the amount of timothy in the stand, while the same treatment of Kentucky bluegrass may actually increase the Kentucky bluegrass content of stand. Short-shooted species[1] (Kentucky bluegrass, orchardgrass, perennial ryegrass, tall fescue and meadow brome) will generally be more tolerant to defoliation. The long-shooted species (smooth brome, timothy, reed canary-grass and intermediate wheatgrass) are generally more sensitive to defoliation and recover at a slower rate.

Some grasses have a variety of growing mechanisms (meristems) that permit multiple harvests within a season. The growth occurs at the base of the leaf resulting in the youngest leaf tissue being at the base and the oldest at the leaf tip. If grasses are protected during critical periods, they are adapted to timely, moderate defoliation.

Management (or the degree of defoliation) of grass pastures and hayfields is not a one-size-fits-all approach and requires good planning to be successful. The following key areas should be examined to reach the goals of producers.

- Bud and carbohydrate management
- Remaining leaf area management
- Defoliation
- Tiller management

Bud and carbohydrate management: Non-structural carbohydrate (stored energy) levels within a grass plant decrease as growth occurs and levels remain low until the boot stage. At this time, a portion of the carbohydrates are stored. Allowing grasses such as timothy to reach this stage increases regrowth potential. Energy reserves also increase in the crowns of plants during the latter part of the growing season, just prior to dormancy as buds develop for next year's tillers. So, if severe defoliation occurs near the end of the growing season, the production of crown tissue will decrease and cause next year's crop production to yield less.

Remaining leaf area management: Maintaining enough leaf area after harvesting, whether by grazing or mowing, will minimize plant dependency on using carbohydrate reserves found in the root system. This will help insure continued root growth and carbohydrate storage for winter survival. Because there is a large increase of water deposition associated with elongation, the grass growth

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zone is extremely delicate and susceptible to damage if not protected by the sheaths of older leaves. The remaining leaf material continues to be important as it grows during the growing season and improves rain interception, insulation and snow capture.

Defoliation: Producers should avoid repeated defoliation of a tiller without a recovery period or rest. Even though the plant may appear to be growing slowly, the grass is actively preparing for more growth. Severe defoliation can cause root growth to stop and be cast off; hamper photosynthesis that keeps the plant low in energy; channel carbohydrates to leaf growth rather than into photosynthesis, minimizing movement of carbohydrates into root growth; and cause roots to die and keep the plants in a low energy state that further maintains a shallow root system. This results in the plants being more susceptible to stresses such as dry weather or weed infestation. An example of how defoliation can affect different species based on cutting management can be seen at University of Kentucky Forage Regrowth Videos and PowerPoints

(http://www.uky.edu/Ag/Forage/Forage%20Related%20Powerpoints.htm).

The effect on roots when leaf volume has been removed up to the point of 50 percent (grazing from 12 inches down to 6) is negligible. Go above 50 percent, however, and serious damage to the root system can occur with only a 10-percent increase as shown in Table 1. This is consistent for both cool- and warm-season grasses. The exception was orchardgrass after the first clipping, which can tolerate more leaf removal at that time.

Table 1. Root-Growth Stoppage

Percent leaf volume removed	Percent root growth stopped
10 %	0 %
20 %	0 %
30 %	0 %
40 %	0 %
50 %	2-4 %
60 %	50 %
70 %	78 %
80 %	100 %
90 %	100 %

Crider, F. J., 1955

Tiller Management: Some grasses, such as tall fescue, are more productive with defoliation and timely removal of the canopy can be used to stimulate more regrowth through tillering. Research has shown that the greatest number of tillers for tall fescue varied depending on clipping schedule, N rate and height of clipping and season. It seemed the greatest tillers were when grass clipping was continued monthly year-long or monthly from September to May.

Table 2. The stubble height to leave to optimize forage production.

Forage species	Post-harvest height (inches)
Bluegrass	1-2
Orchardgrass	4-5
Tall fescue (endophyte free)	4-5
Bromegrass	2-3
Timothy	2-3
Reed canarygrass	2-3

Rayburn, E., Pasture Management for Pasture-finished Beef, March 2005.

In summary, it's not a simple process to manage fields for increased yields and profitability. It's important for producers to have a plan for managing their grass hayfields and pastures. The plan needs to start with the genetics in your fields and then understanding why defoliation can help or hurt the longevity of your stands. Other factors such as the time of year and environmental factors like temperature and rainfall will also affect the response of grasses. Strive to maintain an actively growing plant for as long as possible and then provide conditions for the plants to retiller or have carbohydrate storage.

References:

[1]S. Fransen and T. Griggs, 2010, Principles of Pasture Irrigation, Chapter 6, University of Idaho, PNW0614.