Grazing Fall Green-Up in Pastures May Take a Bite Out of Next Year's Production

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Treating young fall tillers of grasses as a source of bonus late-season forage for grazing livestock can be costly to producers, says a North Dakota State University range scientist.

"The fall tillers, which grow from the crowns of perennial grass species between mid August and the end of the active growing season, remain viable over the winter. They continue growth as lead tillers the following spring, producing a high proportion of that season's herbage," explains Lee Manske, a range scientist at NDSU's Dickinson Research Extension Center. "Although it's commonly accepted as an innocuous practice, fall grazing has the potential to degrade grassland ecosystems because it can remove or damage fall growth and other leaf material that the grass plant depends on to survive the winter and resume growth the next spring."

Understanding grass growth cycles allows livestock producers to coordinate management strategies with the biological requirements of grass plants in order to promote vigorous growth of the plants and efficient capture of the herbage dry matter and nutrients produced on grasslands, Manske emphasizes.

Perennial grasses are perpetuated primarily through vegetative reproduction by tillering rather than through sexual reproduction, which is the process of seed production and the uncertain growth of a seedling. Sexual reproduction is the only method by which annual grasses are perpetuated.

Perennial grasses start growth of next year's plants in late summer or early fall during winter hardening -- the plants' process of preparing for winter. Warm-season grasses produce a relatively large bud but suspend additional growth until the next spring. Cool-season grasses produce tillers with one and a half to four leaves.

Very few perennial grasses grow from seed in established grasslands. Almost all young plants are tillers that have grown from axillary buds on the crowns of established plants, Manske explains. The tiller is the basic unit of the grass plant. The lead tillers are most conspicuous during the early and mid portions of the growing season as the tillers progress through typical growth stages. After the lead tillers have flowered, secondary tillers can grow from axillary buds.

Secondary tiller growth can be suppressed or stimulated by the timing of grazing periods. Most secondary tillers do not complete their growth cycle during one growing season. Those that have not entered the sexually reproductive stage can overwinter and complete their growth stages the following year as lead tillers. Under some environmental conditions, like prolonged drought, lead tillers can overwinter and resume growth the following year. Lead tillers that have overwintered progress through their growth stages at abnormal times.

During the later portion of the growing season, the grass plant population consists of mature lead tillers, secondary tillers, and fall tillers. Mature lead tillers that are near the completion of their life cycle and secondary tillers that have developed seed heads will not overwinter but will progress through a natural aging process called senescence, Manske explains. During this aging process, the cell components of the aboveground structures are translocated to belowground structures. The translocation of cell contents reduces the nutritional quality and the weight of the herbage. The nutritional quality of mature herbage during fall is about 4.8 percent crude protein. The weight of the herbage is about 40 percent to 60 percent of the herbage weight during mid summer.

Secondary tillers and fall tillers that will overwinter have active leaf material until the end of the growing season when the chlorophyll fades and the leaves lose their green color, appearing brown like the lead tillers that have completed their growth cycle.

Perennial grasses remain alive and maintain physiological processes throughout the year, even during the winter, Manske observes. Winter dormancy for perennial grasses is not a period of total inactivity but a period of reduced biological activity. The crown, some portions of the root system, and some leaf tissue remain active by using stored carbohydrates. Survival and spring regrowth of secondary tillers and fall tillers depend on the plant's having adequate carbohydrate reserves.

The quantity of carbohydrates stored during the winter hardening process is closely related to the amount of active leaf material on each tiller. Tillers with abundant leaf area during late summer and early fall can store adequate quantities of carbohydrates to survive the winter and produce robust leaves the following spring, Manske emphasizes. "Generally, the greater the number of active leaves on a tiller during the fall, the more robust the plants will be the following spring."

Heavy grazing of grasslands during August to mid October removes sufficient leaf material from secondary and fall tillers that quantities of carbohydrates stored will be low. Tillers with low carbohydrate reserves may not survive until spring. Manske says researchers suspect that fall tillers with fewer than one and a half leaves may be unable to store adequate carbohydrate reserves to survive the winter. Plants that have low carbohydrate reserves and survive the dormancy period produce tillers with reduced height and weight.

The rate at which plants respire, or use, stored carbohydrates during the winter is affected by the amount of insulation standing plant material and snow provide from the cold winter air temperatures. "The greater the amount of insulation, the more slowly the plant draws on its carbohydrate reserves," Manske notes. When the standing herbage on a grassland is grazed short and most of the snow is blown off, very rapid respiration can occur and deplete carbohydrate reserves before spring, causing plant death called "winter kill."

On tillers that have overwintered, the leaf portions with intact cell walls can regreen early in the spring. The leaf portions with ruptured cell walls remain brown. The surviving leaves, with their brown tops and green bases, are most obvious soon after the snow melts. When the current year's early leaf growth has been exposed for several hours to air temperatures below 28°F, it may have large dry portions and appear similar to overwintering leaves.

"The green portion of the overwintered leaves provides nourishment from photosynthesis that, in combination with remaining stored carbohydrates, supports the development and growth of new leaves and roots. The robustness of spring growth in plants that overwinter is dependent on the amount of surviving leaf area," Manske says.

"Removal of the leaf area of the overwintering tillers by grazing during fall or winter deprives developing tillers of a major source of nutrients, increases the demand on low levels of carbohydrate reserves, and results in reduced leaf production," he says. Reductions in leaf height for the major grasses during the succeeding growing season range from 17 percent to 43 percent, and the contribution of herbage weight to the ecosystem biomass is greatly reduced.

"The common assumption that grazing perennial grasses after they turn brown following a hard frost will not harm grass plants guides numerous fall grazing practices. This popular belief is not consistent with the biology of grass growth and should not be used as a foundation for grazing management decisions because of the resulting reductions in grass production and increases in pasture-forage costs the following year," Manske stresses. "Implementing biologically effective grazing strategies results in considerable reductions in pasture-forage costs for cows and calves."