Uninhibited Sexual Activity on the Prairie Reduces Regional Profits

Llewellyn L. Manske PhD, Range Scientist
Amy M. Kraus, Composition Assistant
Thomas C. Jirik, Agriculture Communication Editor
North Dakota State University
Dickinson Research Extension Center

Managing rangelands to promote sexual reproduction in grasses is not ecologically necessary, nor is it economically beneficial to beef operations, says a North Dakota State University range scientist.

"Most traditional grazing management practices using two or more pastures during the grazing season are based on the concept that maintaining the plant population requires grass sexual reproduction--seed stalk development, seed set, and seedling production. Strong animal performance depends on healthy, vigorous grasslands, so producers are wise to place priority on grass plant health," says Lee Manske, a range scientist at NDSU's Dickinson Research Extension Center. "However, managing pastures for grass sexual reproduction is not an effective method of achieving either plant population health or strong animal performance."

Sexual reproduction is not the only method by which perennial grasses multiply. Most young grass plants in a Northern Plains grassland start not as seedlings but as tillers that grow from axillary buds on the crowns of an established plant, Manske explains.

These vegetative tillers make up the majority of the plant population because they have a competitive advantage over seedlings. Tillers initially draw support from the root systems of parent tillers, while seedlings rely on their own less-developed structures. Seed production to maintain genetic diversity of grasses is needed only every 40 or 60 years on healthy prairies. Proliferation of plants is most effectively achieved with grazing management practices that stimulate vegetative reproduction by tillering, Manske says.

A study at the Dickinson facility indicates that grazing management that stimulates vegetative tiller growth also strengthens animal performance. The study compared native rangeland pastures on the twice-over rotation treatment, which promotes grass vegetative reproduction, to native rangeland pastures under deferred grazing management, which promotes grass sexual reproduction. The evaluation was based on costs of livestock feed for 1,200-pound range cows during the grazing season, costs per pound of calf gain, and returns after pasture costs.

Summer native rangeland forage on the deferred strategy had production costs of $8.76 per acre and forage dry matter costs of $42.52 per ton. During the 122-day summer grazing period, a grazing cow-calf pair required 8.88 acres, at a cost of $77.79 for the period, or 64 cents per day. Calves gained 1.8 pounds per day, or 24.73 pounds per acre, at a cost of 35 cents per pound of gain. When calf weight was assumed to have a value of 70 cents per pound, returns after pasture costs were $75.93 per cow-calf pair and $8.55 per acre.

Grazing management that promoted grass vegetative reproduction was more economically efficient. Summer native rangeland forage on the twice-over rotation strategy had production costs of $8.76 per acre and forage dry matter costs of $39.02 per ton. During the 137-day summer grazing period, a grazing cow-calf pair required 9 acres, at a cost of $78.84 for the period. At 58 cents per day, livestock feed costs were 9.4 percent lower than those of the deferred treatment.

Cow accumulated weight was 118 percent greater on the biologically effective treatment than on the deferred strategy, Manske says. Calves on the twice-over rotation strategy gained 2.21 pounds per day, or 33.64 pounds per acre, at a cost of 26 cents per pound of gain. Calf accumulated weight gain was 54 percent greater and the cost per pound was 25.7 percent less on the twice-over pastures than on the deferred treatment.

When calf weight was assumed to have a value of 70 cents per pound, returns after pasture costs for the twice-over rotation strategy were $133.10 per cow-calf pair, 75.3 percent greater than those for the deferred strategy, and $14.70 per acre, 72 percent greater than those for the deferred strategy. Profits on summer pasture were $57.17 more from grazing management that promoted vegetative reproduction than from grazing management that promoted

grass sexual reproduction. "The differences in animal performance and forage costs per day result from differences in plant response to grazing treatments," Manske explains.

While ungrazed lead tillers of a grass plant are in the vegetative stage, they produce hormones that prevent the six to eight axillary buds located on the crown from developing into tillers. When an ungrazed lead tiller enters the flowering stage, production of these inhibitory hormones decreases and the blocking of axillary bud activation is reduced. Usually only one of the axillary buds begins growth into a secondary tiller, and it produces the inhibitory hormones to suppress growth of the remaining axillary buds.

The goal of deferred management is to direct grassland ecosystem energy and resources into sexual reproduction of grasses by withholding grazing from one or two pastures until grass tillers have produced seed. As the lead tillers of grasses mature, the leaves dry and age. When cows are turned out onto deferred pastures, the grass plants have already reached their full weight in growth, and most of the leaves on lead tillers are fully expanded and at later stages of drying.

"The nutritional quality of grasses decreases substantially after plants have flowered, and it soon drops below livestock minimum dietary requirements," Manske says. "During the grazing period, the nutritional quality of native rangeland herbage on the deferred treatment was at or above the cows' requirements 13.1 percent of the time and below the requirements 86.9 percent of the time." When the crude protein content of the herbage drops below the 9.6 percent that lactating cows require, the animals use body fat for some of their milk production. The resulting weight loss leads to decreased milk production, which leads to lower calf weight gain per day.

The twice-over rotation strategy produces greater calf gain per acre at a lower cost per pound of gain because the system coordinates grazing periods with plant growth stages, stimulating beneficial processes within grass plants and the ecosystem. Under this strategy, cows are turned out onto the pastures during the early portion of the grazing season between early June and mid July, when lead tillers are between the third-leaf stage and the flowering stage. Grazing that removes a small amount of leaf material from grasses within this developmental period reduces the amount of inhibitory hormone produced and stimulates several secondary tillers to develop from the set of axillary buds.

The proliferation of secondary tiller growth on the twice-over rotation treatment increases plant density and herbage production. During the middle and late portions of the grazing season, leaves on this stimulated tiller growth are younger, less developed, and of higher nutritional quality than leaves on lead tillers. During the grazing period, the nutritional content of native rangeland herbage on the twice-over rotation treatment was at or above the cows' requirements 89.8 percent of the time and below the animals' requirements 10.2 percent of the time.

"The greater availability of herbage to meet the nutrient requirements of lactating cows improves animal performance, leading to reductions in the cost per pound of nutrient and in turn to reductions in the cost of livestock feed," Manske says. "The increased herbage quantity and quality extend the period of improved livestock performance two to two and a half months longer on the twice-over strategy than on pastures managed by traditional practices. These improvements result in the lower costs of calf weight gain and the higher net returns of the twice-over rotation strategy."

"Deferred grazing, which promotes sexual reproduction in grasses, offers neither ecological benefits nor economic advantages," he says. "The twice-over rotation strategy, which promotes vegetative reproduction, produces both healthy grasslands and healthy profits."