Grazing Management Affects Forage Potential of Native Grasses

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Background

Native warm season grasses once blanketed central North America and covered over 7,000,000 acres in Wisconsin. Today, less than 2% of those native stands remain, but Wisconsin producers may want to consider incorporating them into pasture systems. Warm season grasses are drought tolerant, heat tolerant, low input grasses that thrive under hot, dry conditions, complementing the more common cool season species that grow best in early summer and fall. These grasses may be an ideal component for Wisconsin pasture systems as climate and rainfall become more unpredictable.

A fundamental goal of grass-farmers is (or should be) to capture the sun's energy and convert it into something cows can eat. Warm season grasses are very effective at this since they use a different, more efficient form of photosynthesis. Warm season, or C4 plants, fix four carbon molecules for every three molecules that cool season C3 plants fix. They are better adapted in an environment with high daytime temperatures, intense sunlight, drought and nitrogen limitation. At 86°F, C3 grasses lose about three times as much water per CO_2 molecule fixed as C4 grasses. C4 plants represent about 5% of Earth's plant biomass, yet they account for about 30% of terrestrial energy capture.

Native grasses also provide other 'ecosystem services' like slowing water runoff and improving infiltration, improving soil structure, increasing the soil organic matter (carbon sequestration), buffering and connecting wildlife habitat and natural areas in and near farms, and providing habitat for pollinators, insect predators and other beneficial wildlife.

- **Are current seeding rates appropriate?**
- **Can establishment be improved by using named varieties?**
- **What are best grazing timings for optimizing yield and quality?**
- **Do named varieties or local ecotypes perform better in a grazing system in terms of yield, quality and longevity?**

Native grasses provide both economic and environmental benefits for farmers, yet they are challenging to establish and manage, so few Wisconsin farmers utilize them. They also tend to have a different forage quality profile – lower protein levels and moderate energy levels. This research seeks to overcome some of these challenges and develop guidelines to successfully incorporate native warm season grasses into pasture systems.

Research Questions

Objectives for this study can be grouped into two categories: 1) improving the chances for successful establishment, and 2) maintaining a productive stand of high quality forage.
The hypothesis is that recommendations provided by natural resource agencies are based on information not yet validated for harvesting warm season grasses in Wisconsin. Using only local ecotypes, seeding at 6-8 lb/ac pure live seed and grazing after July 15 (rotationally graze 2-3 times), may not allow warm seasons to function effectively within a managed grazing system.

Methods and Materials

In 2007, the study was planted in a 2-ac field on the Paine Family Farm in Columbia County. Soils were silt and sandy loams. Treatments included two seeding mixtures and two grazing timings (randomized complete block; three replications). Grazing by beef steers started in 2009.

Seeding mixtures compared: 1) local ecotype conservation mix from a Wisconsin company (big bluestem, indiangrass, switchgrass, little bluestem, sideoats grama, Canada wildrye), and 2) mix of named varieties adapted to northern latitudes (Bison big bluestem, Tomahawk indiangrass, Sunburst switchgrass).

The hypothesis is that named varieties selected under harvested conditions may establish more easily and perform better in a grazing system than local ecotypes.

Grazing timings compared: 1) standard conservation recommendation – after July 15th (calendar or CAL), and 2) timing based on development of the grasses – farmer determines the pasture is 'ready to graze' (development or DEV).

The rationale behind this comparison is that the warm season grasses should respond well to the same sort of rotational grazing management used for cool season pastures and the stand should provide higher quality forage and maintain vigor. Plots were rotationally grazed by a group of 8-12 beef steers (weighing 600-800 lbs) for 12-24 hours. A residual of 6-12" was remaining. Plots were rotationally grazed twice in 2009 and 2010 (Table 1).

Table 1. *Grazing dates.*

	Development	Calendar
1st grazing	June 6-9, 2009	July 18-21, 2009
2nd grazing	July 22-25, 2009	Sept. 18-21, 2009
1st grazing	June 9-14, 2010	July 14-18, 2010
2nd grazing	July 19-24, 2010	Sept. 9-13, 2010

Results

Although the research is on-going, the first two years of data provide some answers to these questions:

Does a higher seeding rate improve establishment? Within each plot, single vs. double seeding rates were compared to determine whether a higher seeding rate would improve establishment. There were no significant differences in establishment between high and low rates of the local ecotypes, but there was better establishment of the named varieties with a higher seeding rate (Table 2). This suggests that for local ecotypes, current seeding rates are appropriate. For named varieties, while the differences in establishment are statistically significant, they may not be meaningful in terms of long-term stand health and productivity. The minor differences

Table 2. *Single vs. double-seeding rates.*

Seeding Rate & Seed Type	Percent Stand
Single Seeded (6-8 lb/ac)	60.6%
Double Seeded	64.4%
Local Ecotype, Single Seeded	66.8%
Local Ecotype, Double Seeded	67.8%
Named Variety, Single Seeded	54.3%
Named Variety, Double Seeded	61.1%

between named varieties and local ecotypes suggest that there are no advantages to using named varieties aside from the fact that the named variety seed is usually less expensive.

What are the best grazing timings for optimizing yield, quality and longevity? The data discussed below are from 2009. The 2010 data is in the process of being analyzed. It is reasonable to argue that several years of data collection will be needed to definitively answer the question of how grazing timing affects yield, quality and longevity.

Warm season grasses tend to have lower protein and higher fiber levels than cool season grasses. Although seed stalk development is later in these species, by mid-July when the standard recommendations call for the first grazing, the plants were headed out and forage quality was very low. For the July and September calendar grazing times, protein levels were 7% and 5%, respectively, and relative forage quality (RFQ) levels were 99 and 82, respectively.

For the DEV plots, forage quality data was gathered when the plants were immature and vegetative or 'ready to graze,' based on regrowth and plant development, rather than calendar timing. In both years, these plots were grazed in early June. In 2009, forage quality in early June averaged 15% protein and 147 relative forage quality (RFQ), excellent for growing steers and almost good enough for lactating dairy cows. Forage quality was lower for the second grazing in mid-July at 8% protein and 109 RFQ. In spite of June grazing, by mid-July, the DEV plots were also stemmy and low quality. In future years, the plan is to clip pastures after grazing as is often done in cool season pastures, to eliminate the stemmy material and improve quality later in the season.

The DEV grazing timing had a lower overall yield (7,000 lb/ac for DEV vs. 9,500 lb/ac for CAL), however, the forage quality of the CAL plots was too low for growing steers and really too low for anything but dry cows. Note that these yields of four to five tons represent just two late summer grazing cycles.

Finally, only time will answer the question of longevity. Stand composition will continue to be monitored over the next several years of the study.

Do named varieties or local ecotypes perform better in a grazing system in terms of yield, quality and longevity? In the first sampling year, there were no clear patterns of differences in overall forage quality between named varieties and local ecotypes. For the first DEV grazing in 2009, crude protein levels were similar for the local ecotype (ECO) and the named variety mix (VAR) at approximately 15%. Relative Forage Quality was also similar at about 145. Figure 1 provides a breakdown of RFQ for monthly forage monitoring dates. There appears to be a trend toward slightly higher RFQs for the local ecotype plots for later sampling periods. Further research will determine whether these patterns reflect actual differences in the performance of these seed types

Figure 1. *2009 Forage quality.*