Early Intensive Grazing Research in the Missouri Coteau Region of North Dakota: Year Three

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Early season intensive grazing is being tested as a means to control Kentucky bluegrass (Poa pratensis L.), an invasive grass species. After three years, initial results indicate that early grazing can reduce Kentucky bluegrass aerial cover and frequency. Removing cattle before the native grasses and forbs have received much grazing pressure should allow these species to increase in the community.

Summary

Kentucky bluegrass is a perennial cool-season grass that begins growth in the spring earlier than our native species. Its forage quality is high in the spring but decreases through the season, resulting in reduced overall forage quality during the summer (Patton et al. 2001). By grazing heavily while Kentucky bluegrass is growing actively, we may be able shift the balance in the plant community to favor the native species.

Each of six pastures was assigned to one of two treatments: early intensive and season-long. On the early intensive treatment, the cattle are stocked as early as possible after Kentucky bluegrass greens up, ideally prior to the three-leaf stage, and removed when 30 percent of the native species have received some grazing. On the season-long treatment, the cattle are placed on pasture in mid-May and removed in mid-September.

Forage production was not significantly different between the early intensive and season-long grazing treatments in 2011, 2012 or 2013 (P>0.05). Kentucky bluegrass aerial cover (P=0.001) and frequency of occurrence (P=0.003) declined on the early intensive treatment during the period, while its aerial cover increased on the season-long treatment in 2012 and 2013.

Introduction

Kentucky bluegrass was introduced by early colonists along the East Coast and spread across America by settlers and natural dissemination (Carrier and Bort 1916). Kentucky bluegrass can be a problem throughout the tallgrass and mixed-grass prairies (Sather 1996).

A perennial cool-season grass, Kentucky bluegrass begins growth in the spring earlier than our native species and gains competitive advantage by using soil water and shading the later-emerging species.

Forage quality is high in the spring when green and actively growing, but decreases as the summer progresses, although it can green up again in the fall if adequate moisture is available (Patton et al. 2001, North Dakota Department Lands 2011). The dominance of Kentucky bluegrass in the plant community results in reduced forage quality of the pasture in the summer months.

The timing of grazing can have a great impact on plant species composition by reducing those species that are growing actively during the grazing period and releasing from competition those plants that are growing actively when grazing pressure is absent (Stephenson 2010).

In the Flint Hills of Kansas, researchers found that intensive early stocking reduced Kentucky bluegrass, compared with season-long stocking (Smith and Owensby 1978). We believe we can shift the balance to favor the native species with early, heavy grazing followed by summer rest.

Procedures

This study is being conducted at the Central Grasslands Research Extension Center in Kidder County northwest of Streeter, N.D. The pastures have been used for a variety of grazing experiments in the past but in recent years have received only light grazing in the summer months. In 2009 and 2010, these pastures were lightly stocked mid-May. Half of the animals were removed in late June or late July, and the rest remained until late September to mid-October.

Kentucky bluegrass has become dominant, with aerial cover averaging about 30 percent and frequency of occurrence (in 25- by 25-centimeter frames) averaging 90 percent in 2011 on the sites selected for vegetation monitoring.

Six pastures of about 40 acres each were assigned to one of two treatments: early intensive grazing and season-long grazing. Livestock were not rotated among pastures, and each pasture received the same treatment each year. On the early intensive treatment, 41 to 50 head of cattle were stocked in each pasture as early as possible after Kentucky bluegrass greens up (as early as mid-April) and removed when 30 percent of the native species receive some grazing (Table 1).

On the season-long treatment, 15 to 19 head were placed on each pasture in mid-May and removed between the end of August and mid-September, with the objective of grazing at a moderate stocking rate. The actual stocking rate was between 0.96 and 1.85 animal unit months (AUMs)/acre. The overall objective is to achieve a similar grazing pressure on the early intensive pastures as on the season-long pastures but in a shorter period of time (Table 1).

Changes in the plant community are monitored by sampling the frequency of occurrence, density per unit area and aerial cover of all the approximately 97 plant species, using nested frames along a transect, with 50 readings per pasture.

Fortunately, we began monitoring these same parameters on these sites in 2009 in connection with a previous experiment, although the stocking rates were much lower during these years. Still, this gave us two years of baseline data.

Forage production and utilization are determined using the cage comparison method, clipping three times per season. While clipping plots at peak production, an estimate is made of species percentage by weight. All samples are oven-dried and weighed.

Results

Total production and utilization. Forage production was not significantly different ($P>0.05$) between the early intensive and the season-long grazing treatments in 2011, 2012 or 2013 (Table 2). At the time the cattle were taken off the early intensive treatment, they had utilized 42 to 59 percent of the forage produced so far in the season, but only 20 to 33 percent of the forage produced during the entire growing season.

At the time the cattle were taken off the season-long treatment, they had utilized 45 to 63 percent of the forage produced during the growing season (Table 2). The differences in total utilization were significantly different between the early intensive and season-long treatments each year ($P\leq0.05$).

Production by species and groups. Figure 1 shows total forage production on each treatment from 2011 to 2013 and the estimated production of selected species and species groups. The species shown produced at least 10 percent of the total biomass production on at least one treatment in one year.

Production of Kentucky bluegrass was not significantly different in any year, but the three-year average was greater on the season-long treatment: 2,998 vs. 2,343 pounds/acre on the early intensive treatment ($P=0.017$).

Shrub production declined between 2011 and 2012 and was significantly less on the early intensive treatment than on the season-long treatment in 2012

Table 1. Stocking history of the early intensive grazing trial for 2011 to 2013 at Central Grasslands Research Extension Center, Streeter, N.D.

Treatment	Year	Average Head/ pasture	Average Starting Weight (lbs)	Date On	Date Off	Days Grazed	Stocking Rate (AUM/ acre)
Early Intensive	2011	41.7	750	May 2	June 6	35	0.98
	2012	46.0	748	April 13	May 24	41	1.26
	2013	50.0	773	May 6	June 7	32	1.10
Season-long	2011	15.0	780	May 13	Sept. 15	125	1.30
	2012	18.3	865	May 9	Sept. 21	135	1.85
	2013	15.7	694	May 23	Aug. 28	97	0.96

Table 2. Total crop year precipitation (Oct. 1 to Sept. 30), peak total above ground biomass production, and percent of forage utilization on loamy overflow ecological sites on the early intensive and season-long grazing treatments from 2011 to 2013.

Year	Precipitation (inches)	Early Intensive			Season-long		Average Production (lbs/acre)
		Above ground biomass (lbs/ acre)	Utilization when removed (percent)	Utilization at end of season (percent)	Above ground biomass (lbs/acre)	Utilization at end of season (percent)	
2011	25.01	7847	59	20	6348	47	7098
2012	18.21	8387	49	31	6545	63	7466
2013	16.97	6314	42	33	5556	45	5935
3-year Avg.	**20.06**	**7516**	**50**	**28**	**6150**	**52**	**6833**

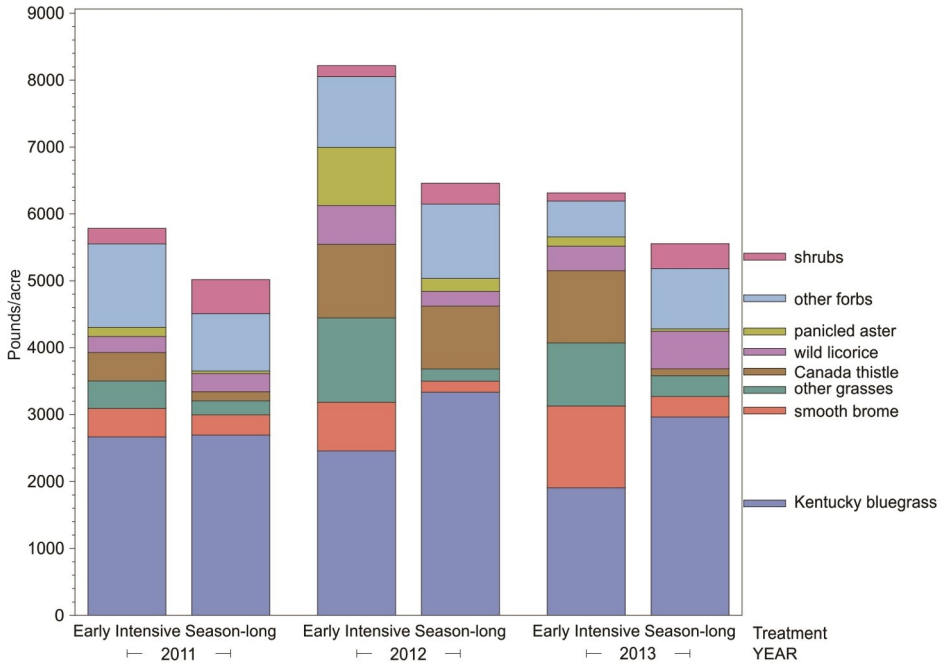

Figure 1. Total production and estimates of production of selected species and species groups on the early intensive and season-long grazing treatments from 2011 to 2013.

and 2013 ($P \leq 0.05$). Prairie rose (*Rosa arkansana* Porter) production was greater on the season-long than on the early intensive treatment in 2012: 35 vs. 9 pounds/acre ($P=0.019$). Buckbrush (*Symphori-carpos occidentalis* Hook.) production was greater on the season-long treatment than on early intensive treatment in 2013: 370 vs. 108 pounds/acre ($P=0.022$).

Green needlegrass (*Nassella viridula* [Trin.] Barkworth) was not found on the early intensive treatment in 2013, but 12 pounds/acre were produced on the season-long treatment ($P=0.011$).

Western ragweed (*Ambrosia psilo-stachya* DC.) originally was not different between treatments, but it has decreased on the early intensive treatment and now is most abundant on the season-long treatment with 85 pounds/acre as compared to 19 pounds/acre on the early intensive ($P=0.001$).

Although differences appear to occur in production of some of the other dominant species in Figure 1, they were not significantly different between treatments.

Frequency, density and aerial cover. Eight species showed responses to the grazing treatments with respect to frequency, density and aerial cover (Figures 2 through 10). Species of note: Kentucky bluegrass, for which aerial cover ($P=0.001$, Figure 2) and frequency ($P=0.003$, Figure 3) declined on the early intensive treatment and increased on the season-long treatment.

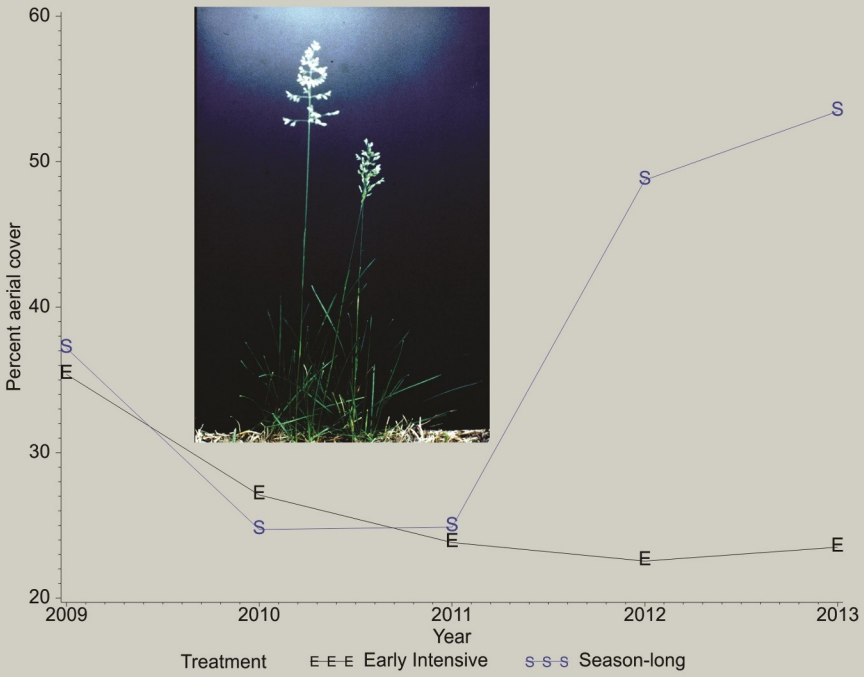

Figure 2. Aerial cover of Kentucky bluegrass (*Poa pratensis* L.) on the early intensive and season-long grazing treatments in 2009 to 2013.

Figure 3. Percent frequency of occurrence of Kentucky bluegrass (*Poa pratensis* L.) in 5 x 5 centimeter frames on the early intensive and season-long grazing treatments in 2009 to 2013.

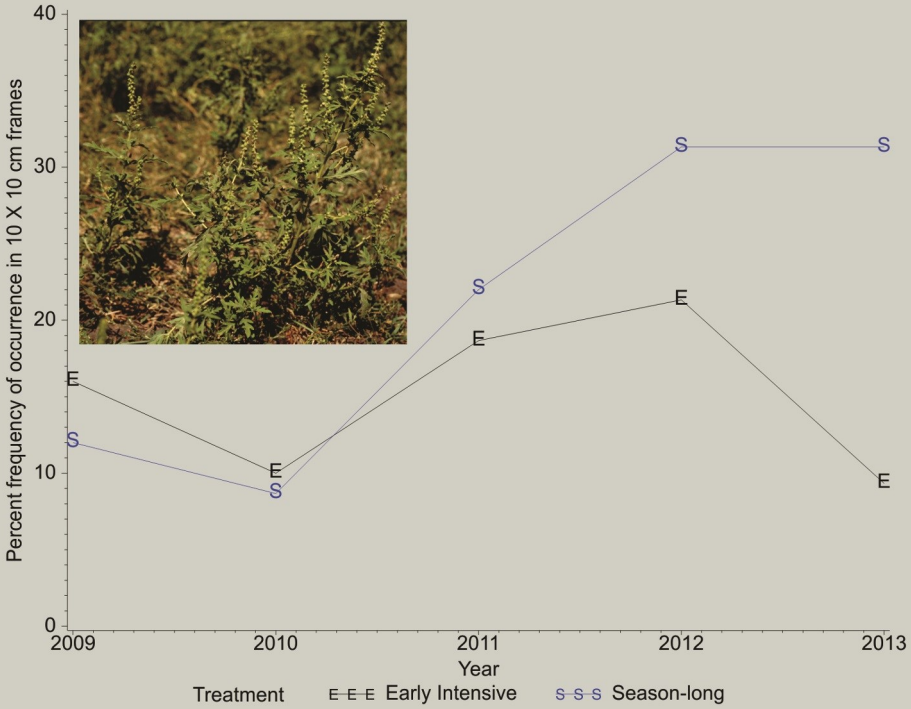

Figure 4. Percent frequency of occurrence of western ragweed (*Ambrosia psilostachya* DC.) in 10 x 10 centimeter frames on the early intensive and season-long grazing treatments in 2009 to 2013.

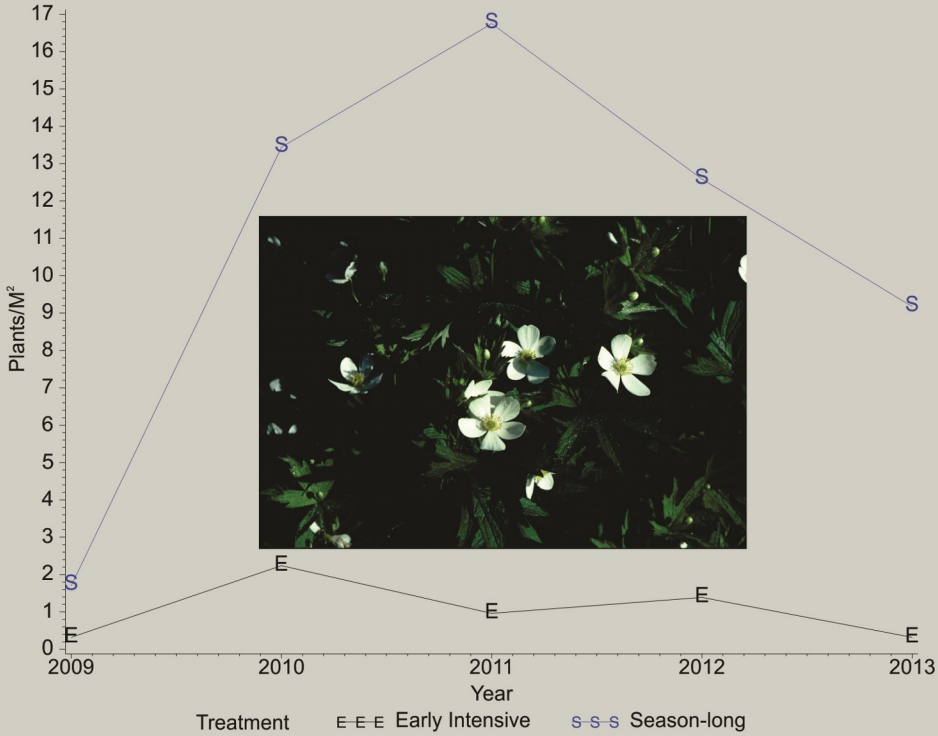

Figure 5. Density of meadow anemone (*Anemone canadensis* L.) on the early intensive and season-long grazing treatments in 2009 to 2013.

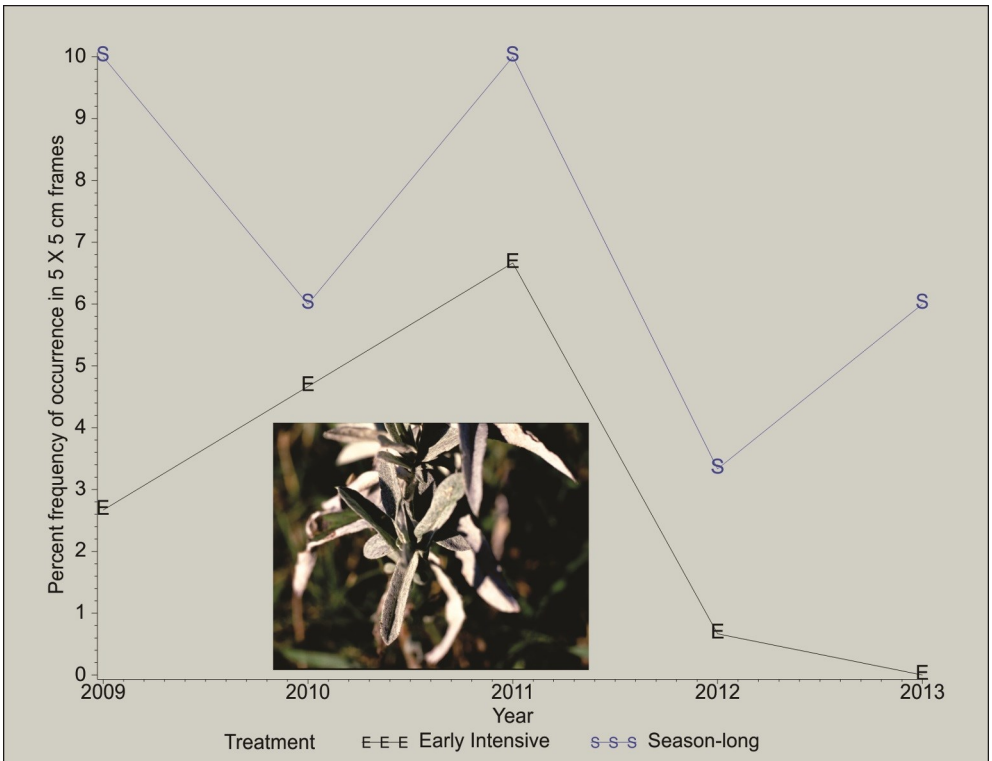

Figure 6. Percent frequency of occurrence of cudweed sagewort (*Artemisia ludoviciana* Nutt.) in 5 x 5 centimeter frames on the early intensive and season-long grazing treatments in 2009 to 2013.

Buckbrush frequency of occurrence decreased on the early intensive treatment from 2010 to 2012 ($P \leq 0.05$, Figure 7).

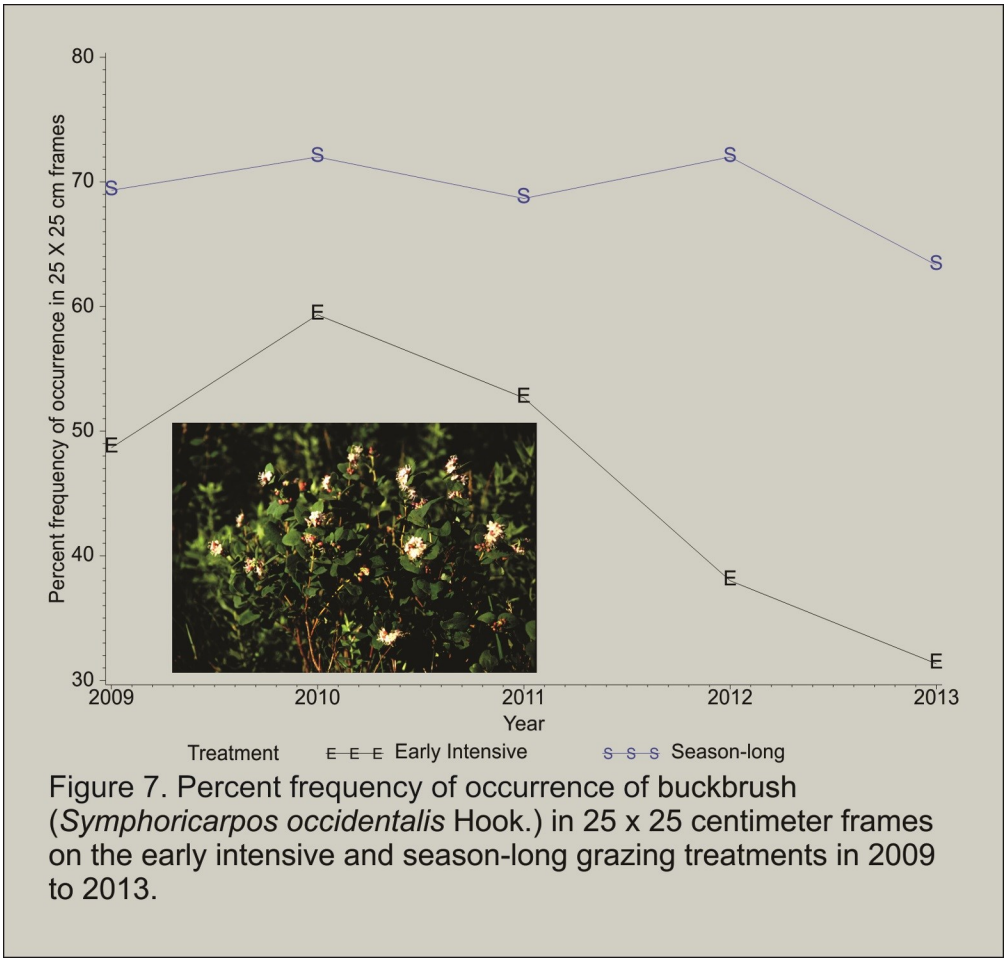

Figure 7. Percent frequency of occurrence of buckbrush (*Symphoricarpos occidentalis* Hook.) in 25 x 25 centimeter frames on the early intensive and season-long grazing treatments in 2009 to 2013.

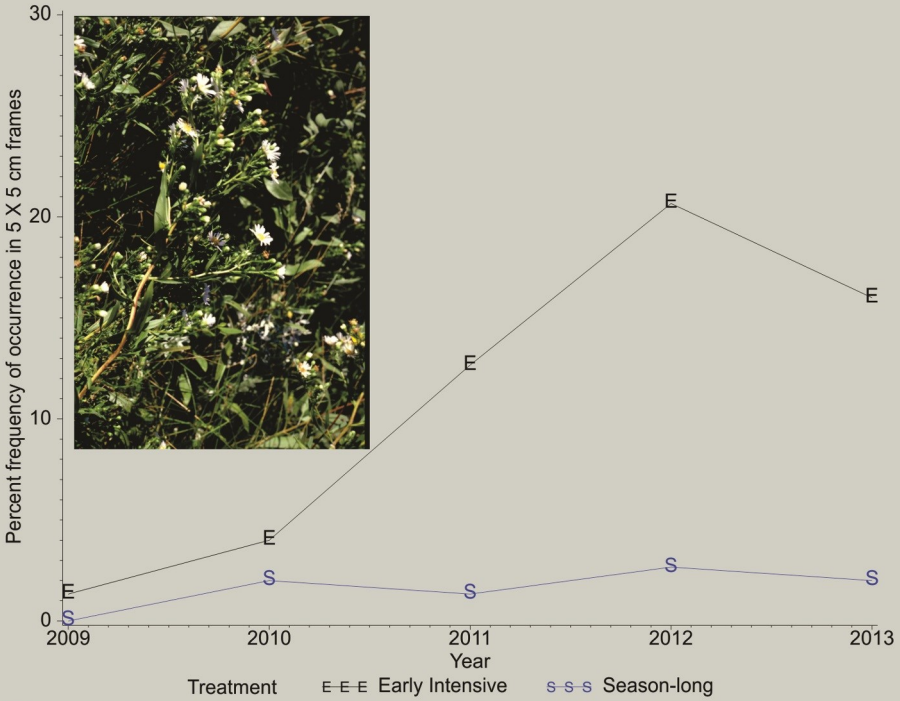

Figure 8. Percent frequency of occurrence of panicled aster (*Symphyotrichum lanceolatum* (Willd.) G.L. Nesom ssp. *lanceolatum* var. *lanceolatum*) in 5 x 5 centimeter frames on the early intensive and season-long grazing treatments in 2009 to 2013.

Smooth brome (*Bromus inermis* Leyss.) aerial cover increased on the early intensive treatment from 2011 to 2013 ($P \leq 0.05$, Figure 9).

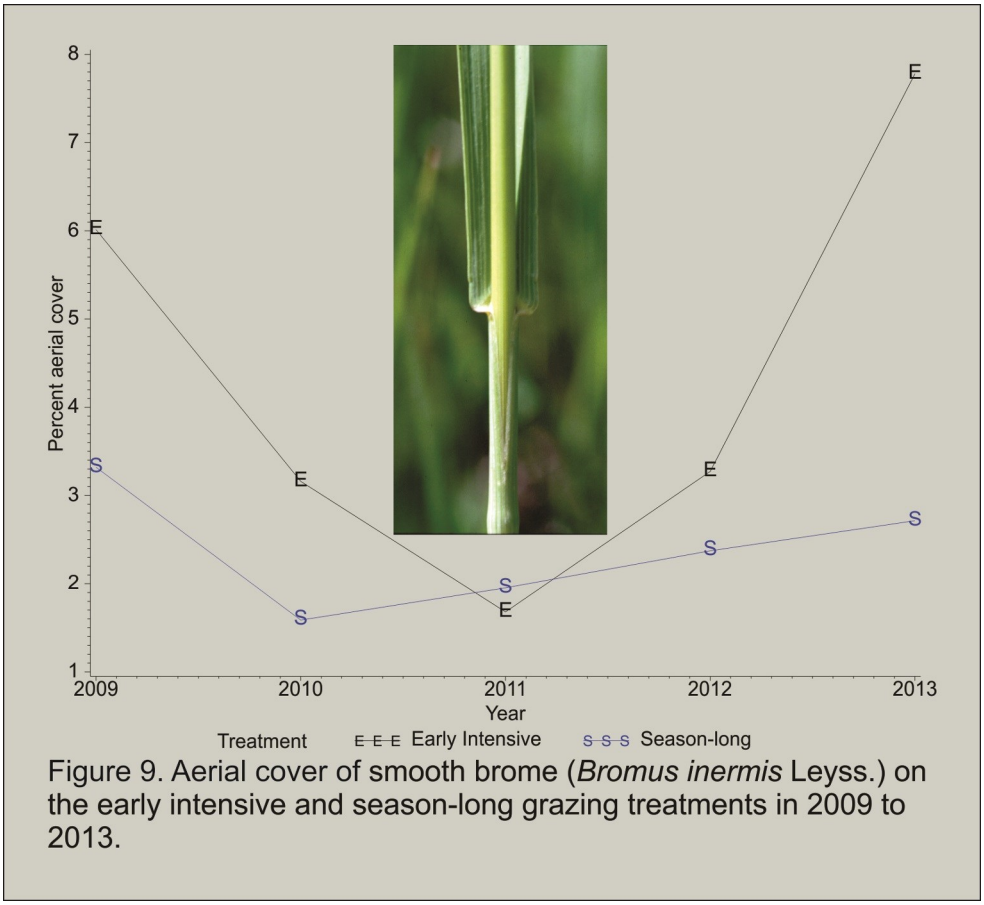

Figure 9. Aerial cover of smooth brome (*Bromus inermis* Leyss.) on the early intensive and season-long grazing treatments in 2009 to 2013.

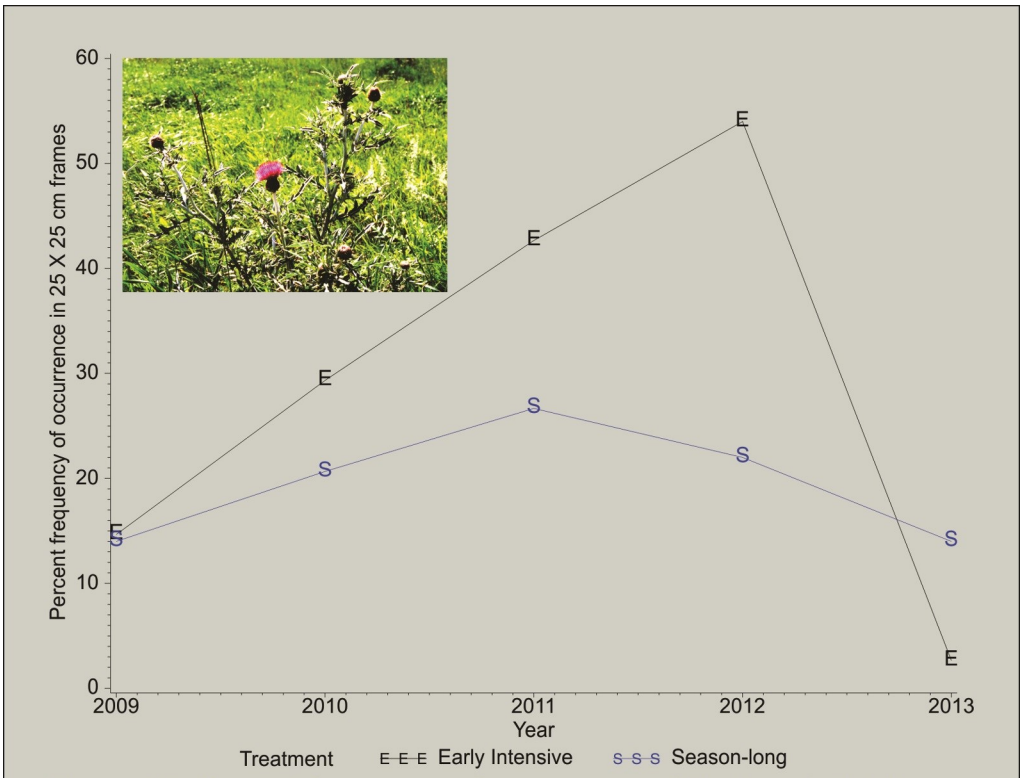

Figure 10. Percent frequency of occurrence of Flodman's thistle (*Cirsium flodmanii* (Rydb.) Arthur) in 25 x 25 centimeter frames on the early intensive and season-long grazing treatments in 2009 to 2013.

Litter decreased on the season-long treatment from 2009 to 2013. In contrast, on early intensive pastures, litter decreased from 2009 to 2010, then increased from 2010 to 2012 ($P \leq 0.001$, Figure 11).

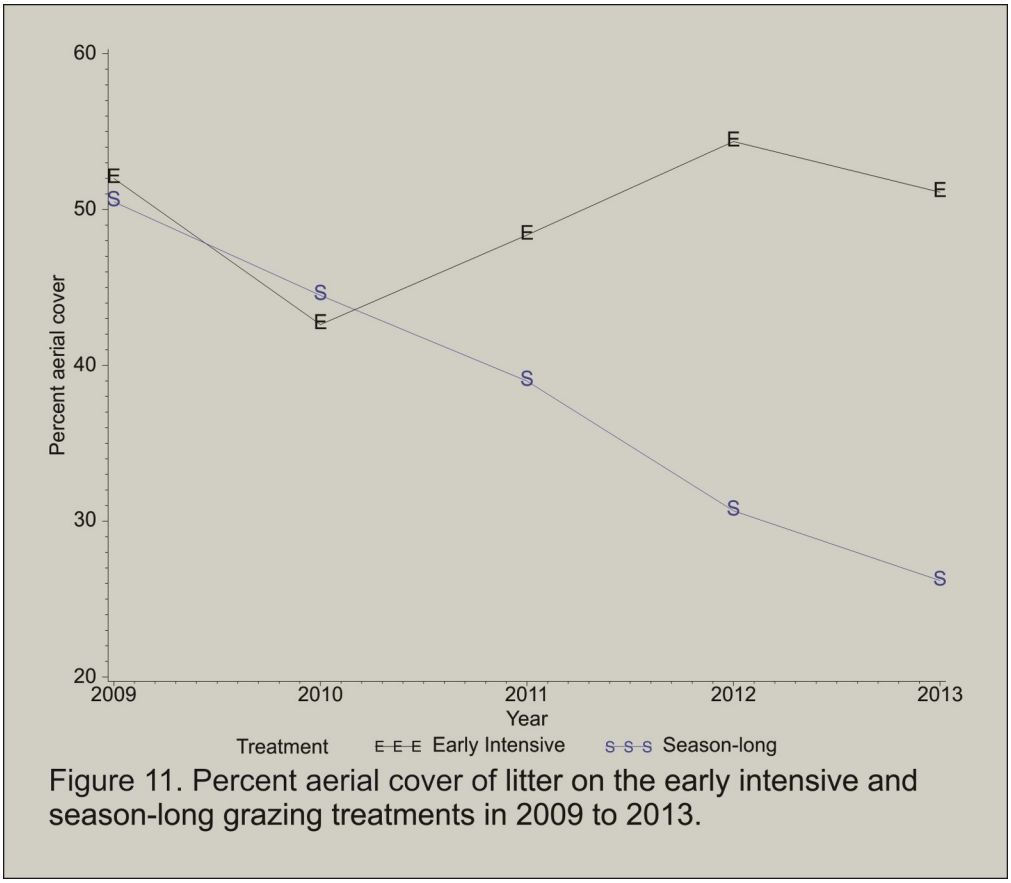

Figure 11. Percent aerial cover of litter on the early intensive and season-long grazing treatments in 2009 to 2013.

Discussion

Kentucky bluegrass begins growth early, and early grazing appears to reduce its abundance in the community and favor other grasses and forbs. However, five to 10 years of grazing treatments will be required to change the plant species composition fundamentally.

At this early stage in the project, Kentucky bluegrass still makes up a large part of the plant community, and if early grazing was to cease, Kentucky bluegrass would recover quickly.

Weather and the timing of precipitation can play as great as or greater role in determining plant species composition. The years 2011 and 2012 were wetter than average, and most of the precipitation in 2012 was in the early part of the growing season (see page 48). Although total precipitation was less than average in 2013, precipitation in May and September was well above average. This provided good growing conditions for Kentucky bluegrass, smooth brome and Canada thistle.

We will continue to monitor the impact of the early grazing treatment during the next several years.

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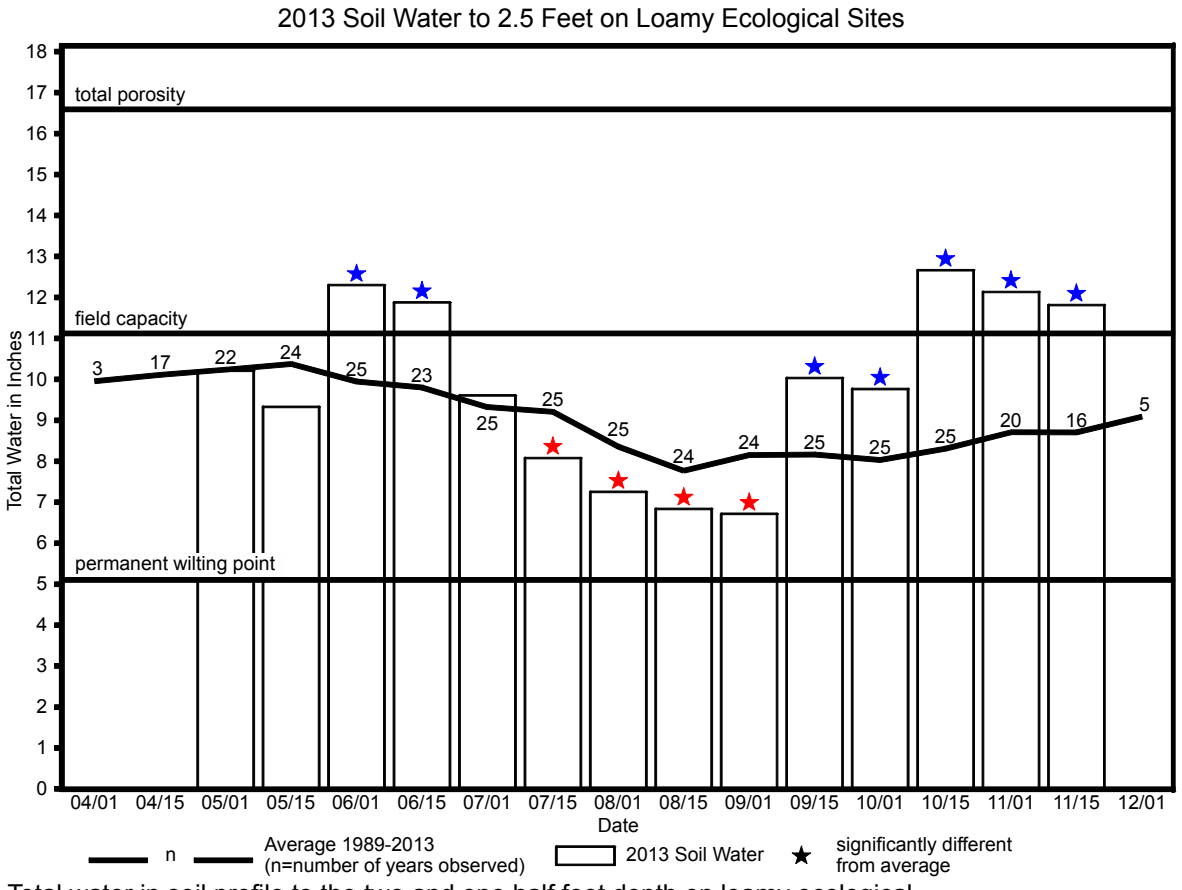

Total water in soil profile to the two and one half foot depth on loamy ecological sites at the Central Grasslands Research Extension Center in 2013.