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

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The objective of this project is to determine if early intensive grazing can be used to control Kentucky bluegrass (Poa pratensis L.), an invasive grass species. Although still early in the study, 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 the grasses and forbs 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.

Two grazing treatments are included in the study: early intensive and season-long. Each of six pastures was assigned to one of these two treatments. 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 the season-long grazing treatments in 2011 or 2012 ($P>0.05$). Kentucky bluegrass aerial cover ($P=0.008$) and frequency of occurrence ($P=0.0434$) declined on the early intensive treatment and its aerial cover was higher on the season-long treatment in 2012.

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 that 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 season-long treatment, 15 to 19 cattle were placed on each pasture in mid-May and removed in mid-September, with the objective of grazing at a moderate stocking rate. The actual stocking rate was 1.3 animal unit month (AUM)/acre in 2011 and 1.84 AUM/acre in 2012 (Table 1). On the early intensive treatment, 41 to 46 cattle were stocked in each pasture as early as possible after Kentucky bluegrass greened up and removed when 30 percent of the native species had received some grazing. The objective was to achieve a similar grazing pressure as on the season-long pastures but in a shorter period of time (Table 1).

Changes in the plant community were monitored by sampling the frequency of occurrence, density per unit area and aerial cover of all the approximately 96 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 were determined using the cage comparison method, clipping three times per season. While clipping plots at peak production, an estimate was made of species percentage by weight. All samples were oven-dried and weighed.

Results

Forage production was not significantly different ($P>0.05$) between the early intensive and the season-long grazing treatments in 2011 or 2012 (Table 2). In 2011, when the cattle were taken off the early intensive treatment on June 6, they had used 59 percent of the forage produced so far that year but only 20 percent of the forage produced during the entire growing season. By mid-September, the cattle on the season-long treatment had used 47 percent of the forage produced during the growing season.

In 2012, when the cattle were taken off the early intensive treatment on May 24, they had used 49 percent of the forage produced so far that year, but only 31 percent of the forage produced during the entire growing season. By mid-September, the cattle on the season-long treatment had used 63 percent of the forage produced during the growing season.

The differences in total utilization were significantly different between the early intensive and season-long treatments each year ($P\leq0.05$). Figure 1 shows total forage production on each treatment in 2011 and 2012 and estimated production of selected species and species groups.

Table 1. Stocking history of the early intensive grazing trial for 2011 and 2012 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	748	April 13	May 24	41	1.26
Season-long	2011	15	780	May 13	Sept. 15	125	1.3
	2012	18.3	865	May 9	Sept. 21	135	1.85

Shrub production declined between 2011 and 2012 and was significantly less on the early intensive treatment than on the season-long treatment in 2012 ($P \leq 0.05$). Aerial cover of Kentucky bluegrass (Figure 2) and frequency of occurrence (Figure 3) declined on the early intensive treatment, but aerial cover increased on the season-long treatment ($P \leq 0.05$). The density of meadow anemone (*Anemone canadensis* L.) increased from 2009 to 2011 on the season-long treatment (Figure 4) ($P \leq 0.05$). From 2010 to 2012, buckbrush (*Symphoricarpos occidentalis* Hook.) frequency decreased on the early intensive treatment (Figure 5) ($P \leq 0.05$). The density of common dandelion (*Taraxacum officinale* F.H. Wigg.) decreased on early intensive and increased on season-long from 2011 to 2012 (Figure 6) ($P \leq 0.05$). Panicled aster density increased from 2009 to 2012 and increased the most on the early intensive treatment (Figure 7) ($P \leq 0.05$). Litter decreased on the season-long treatment from 2009 to 2012. In contrast, on early intensive pastures, litter decreased from 2009 to 2010, then increased from 2010 to 2012 (Figure 8) ($P \leq 0.05$).

Table 2. Total crop year precipitation (Oct. 1 to Sept. 30) and peak total above-ground biomass production on loamy overflow ecological sites on the early intensive and season-long grazing treatments from 2011 and 2012.

Year	Precipitation (inches)	Above-ground Biomass (lbs/acre)		
		Early Intensive	Season-long	Average Production
2011	25.01	7,847	6,348	7,098
2012	18.21	8,387	6,545	7,466
2-year average	21.61	8,117	6,447	7,282

Discussion

Kentucky bluegrass begins growth early, and early grazing appears it may reduce the abundance of Kentucky bluegrass in the community and favor other grasses and forbs. However, five to 10 years of grazing treatments will be required to fundamentally change the plant species composition. 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 last two years have been wetter than average, and most of the precipitation in 2012 was in the early part of the growing season. This provided good growing conditions for Kentucky bluegrass and Canada thistle. We will be interested in seeing what effect the grazing treatment has during the next several years.

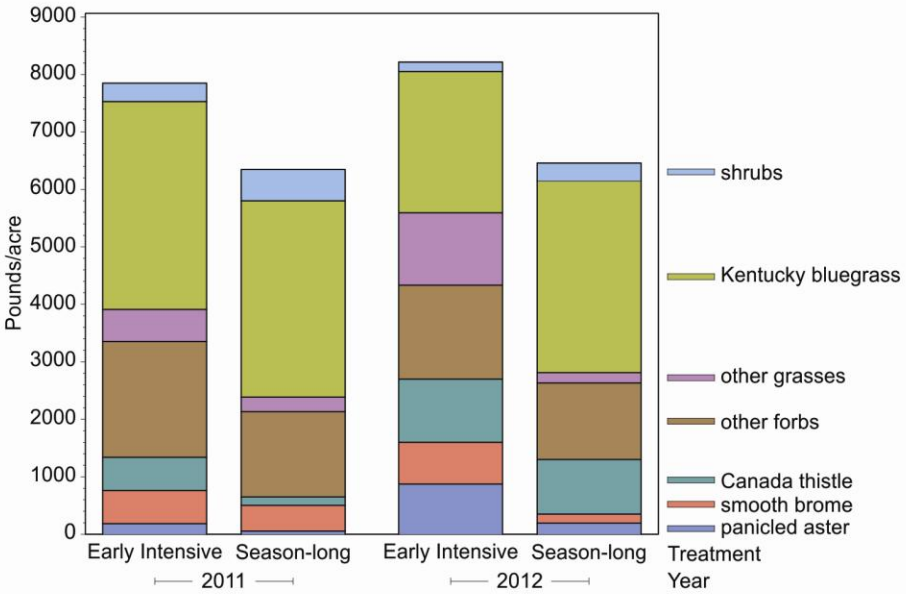

Figure 1. Total production and estimates of production of selected species and species groups on the early intensive and season long grazing treatments in 2011 and 2012.

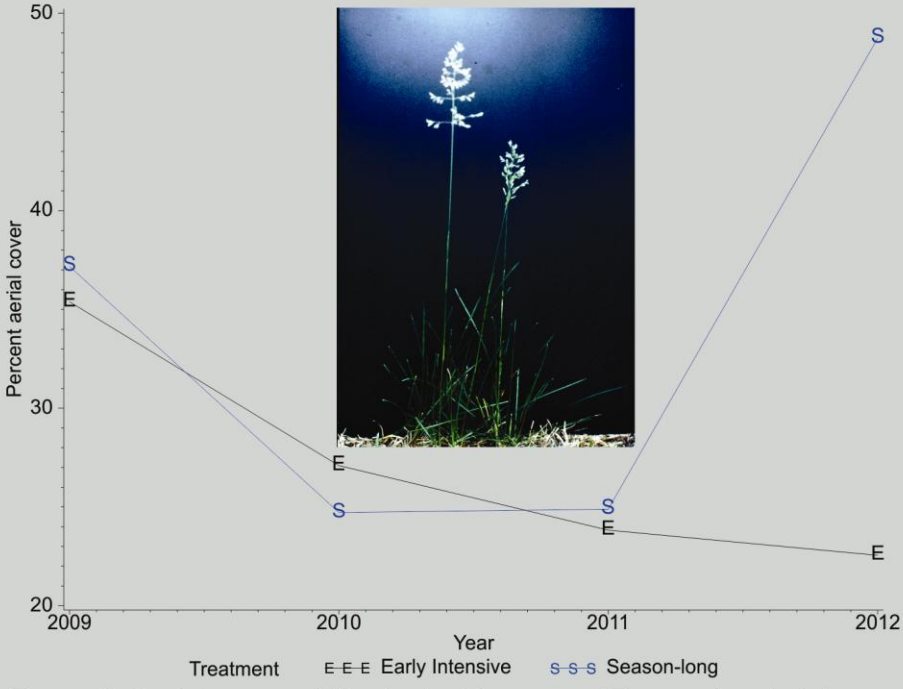

Figure 2. Aerial cover of Kentucky bluegrass (*Poa pratensis* L.) on the early intensive and season long grazing treatments in 2009 to 2012.

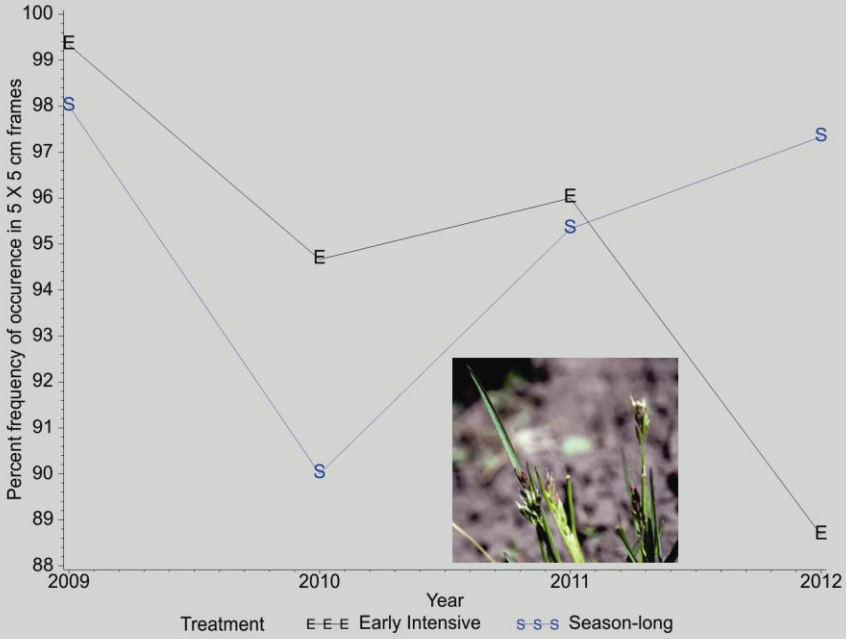

Figure 3. Percent frequency of occurence of Kentucky bluegrass (*Poa pratensis* L.) in 5 x 5 cm frames on the early intensive and season long grazing treatments in 2009 to 2012.

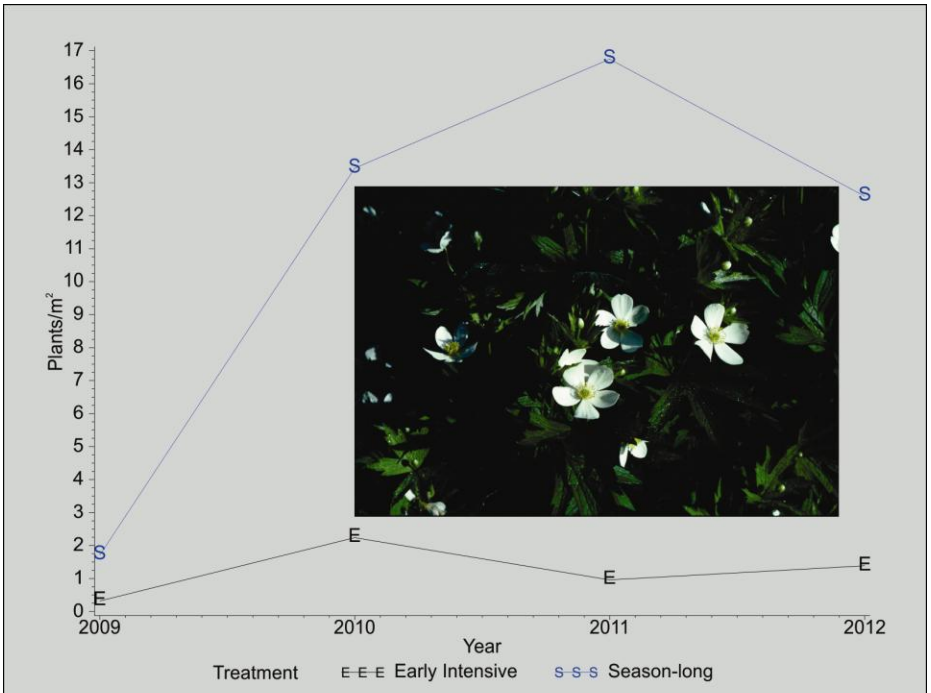

Figure 4. Density of meadow anemone (*Anemone canadensis* L.) on the early intensive and season long grazing treatments in 2009 to 2012.

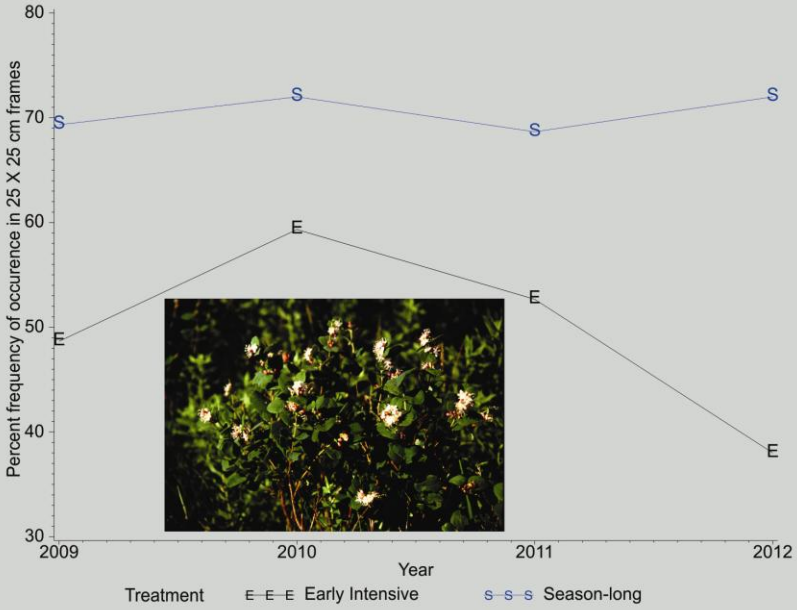

Figure 5. Percent frequency of occurrence of buckbrush (*Symphoricarpos occidentalis* Hook.) in 25 x 25 cm frames on the early intensive and season long grazing treatments in 2009 to 2012.

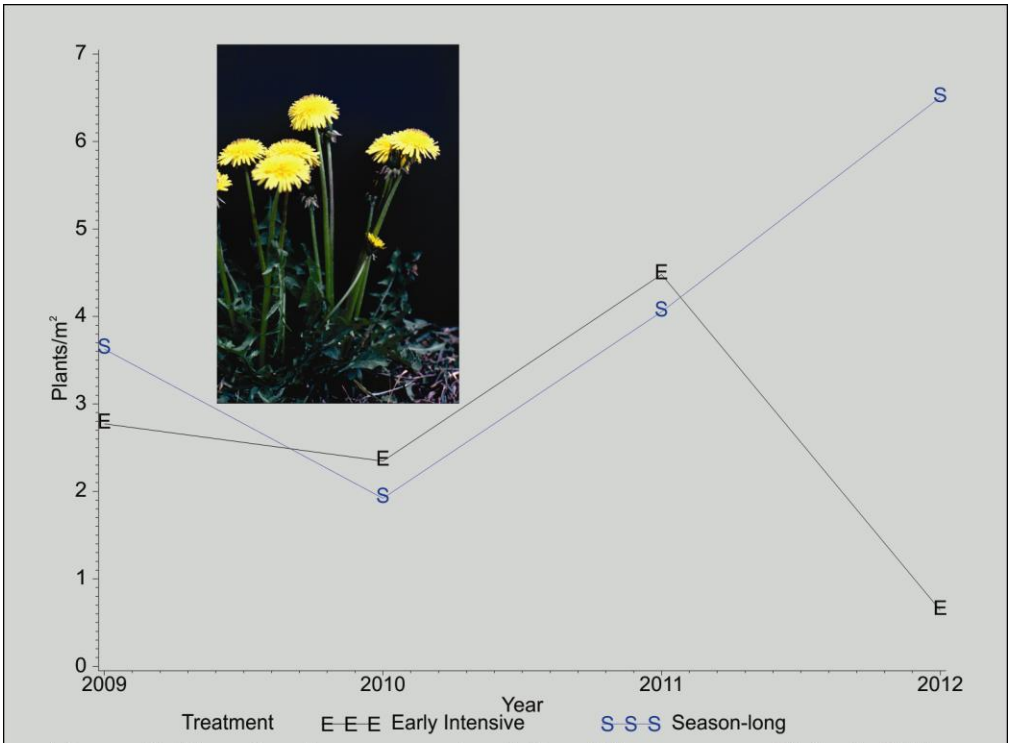

Figure 6. Density of common dandelion (*Taraxacum officinale* F.H. Wigg.) on the early intensive and season long grazing treatments in 2009 to 2012.

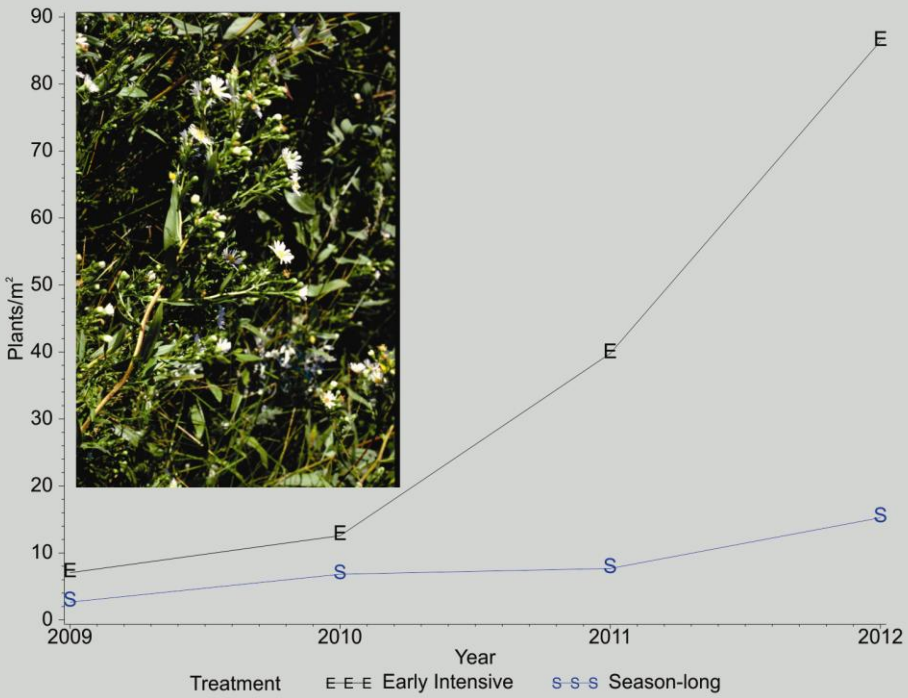

Figure 7. Density of panicled aster (*Symphyotrichum lanceolatum* (Willd.) G.L. Nesom ssp. *lanceolatum* var. *lanceolatum*) on the early intensive and season long grazing treatments in 2009 to 2012.

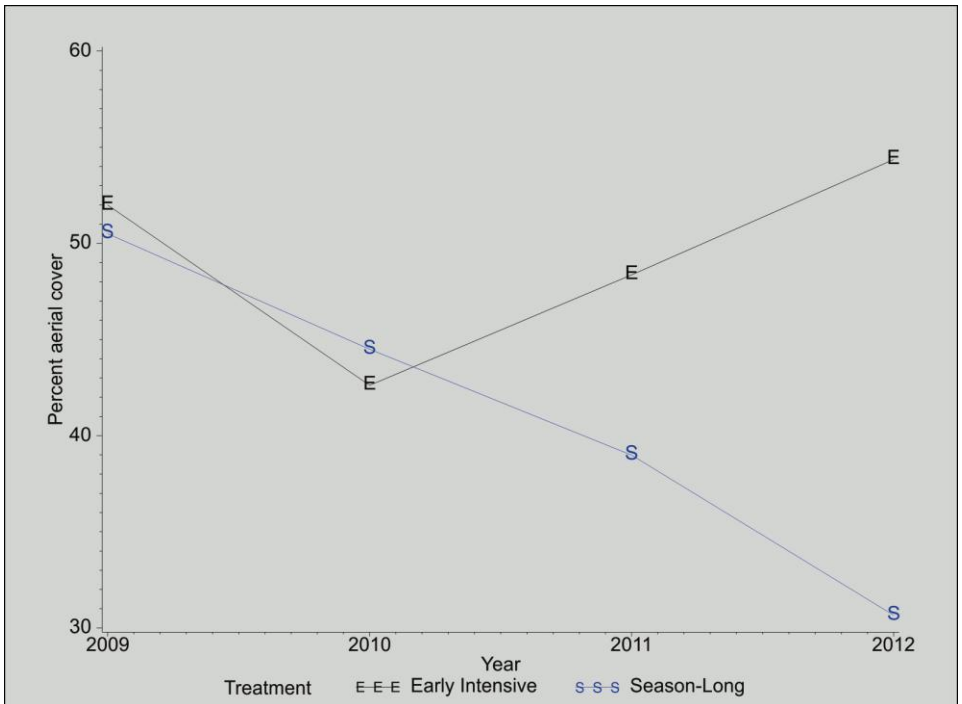

Figure 8. Percent aerial cover of litter on the early intensive and season long grazing treatments in 2009 to 2012.

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