

## Managing Cool-Season CRP with Fire and Haying

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### Abstract

A study was conducted to determine if there were detrimental effects of timed burns and mowing or haying applied to Conservation Reserve Plantings (CRP) with birdsfoot trefoil (*Lotus corniculatus* L.) grown in combination with the cool-season grasses *Bromus inermis* (L.) and *Festuca arundinacea* (Shreb.). CRP lands must be managed to reduce the growth of undesirable weeds and brush and acceptable managements include mowing and burning, and optional rotational haying. Swards were sampled before a management treatment was applied, then the sward was monitored repeatedly (June, October, and June) for post-treatment changes in species proportion and the contribution of species to sward productivity and quality. Other forb and weed species were monitored. Few effects of managements were noted. Yield differences were observed only at the second June sampling; all managements were significantly higher than the control, but not from each other. Changes in botanical composition of the sward may result from the type and timing of management, but management treatments generally did not impact ADF, NDF, or CP significantly. The results indicate that a single management event on CRP does not have a detrimental effect on yield or herbage quality.

### Introduction

The Conservation Reserve Program (CRP) was created under the U.S. Department of Agriculture's Food Security Act of 1985. Through CRP, landowners receive annual rental payments and cost-share assistance to establish long-term, resource conserving covers on eligible farmland. Maintenance of CRP plantings requires the semi-annual control weeds and brush growth; approved methods include fire and mowing. Current CRP regulations allow more management options. Uses include haying and grazing, but they may be employed only on a portion of the enrolled lands. Hayed or grazed lands in one season must remain idle at least two growing seasons before a subsequent haying or grazing.

Historically, fire has played an important role in the maintenance of many ecosystems,

particularly grasslands (Hatch *et al.*, 1991). Prescribed burning is practiced generally on rangelands for long-term suppression of woody species (Mayeux and Hamilton, 1988; Senft, 1983) is not used generally on cool-season plantings. Exceptions on cool-season plantings are the burning of post-seed harvest residue (Rolston *et al.*, 1997).

## Objective

To determine if there were detrimental effects of timed burns and mowing or haying applied to a CRP of cool-season grass (*Bromus inermis* L. and *Festuca arundinacea* Shreb.) with birdsfoot trefoil (*Lotus corniculatus* L.).

## Experimental Methods

- ❑ Experiments were established on an existing CRP acreage established in 1986 in Kingdom City, Missouri (39:01 N Lat. 92:01 W Long.).
- ❑ Soil: Mexico silt loam (fine, montmorillinitic, mesic, Udollic Ochraqualf).
- ❑ History: This CRP received burning or mowing managements to control weeds since 1986; no records were kept.
- ❑ Treatments were applied to 2 experiments established as Randomized Complete Block designs.
- ❑ Plot size was 12.2 m × 18.3 m
- ❑ Four replications

Treatments for experiment 1 were applied in 2002 and observed through 2003, whereas treatments for experiment 2 were applied in 2003 and observed through 2004 (Table 1).

**Table 1.** Description and dates of treatments for each experiment.

Treatments	Experiment 1	Experiment 2
Control		
Dormant burn	08 March 2002	14 March 2003
Dormant mow <sup>t</sup>	09 March 2002	14 March 2003
Early green-up burn	05 April 2002	03 April 2003
Early green-up mow <sup>t</sup>	05 April 2002	03 April 2003
Late mow <sup>t</sup>	29 May 2002	16 June 2003

<sup>t</sup> herbage was removed after mowing.

***Fall sampling for botanical composition***

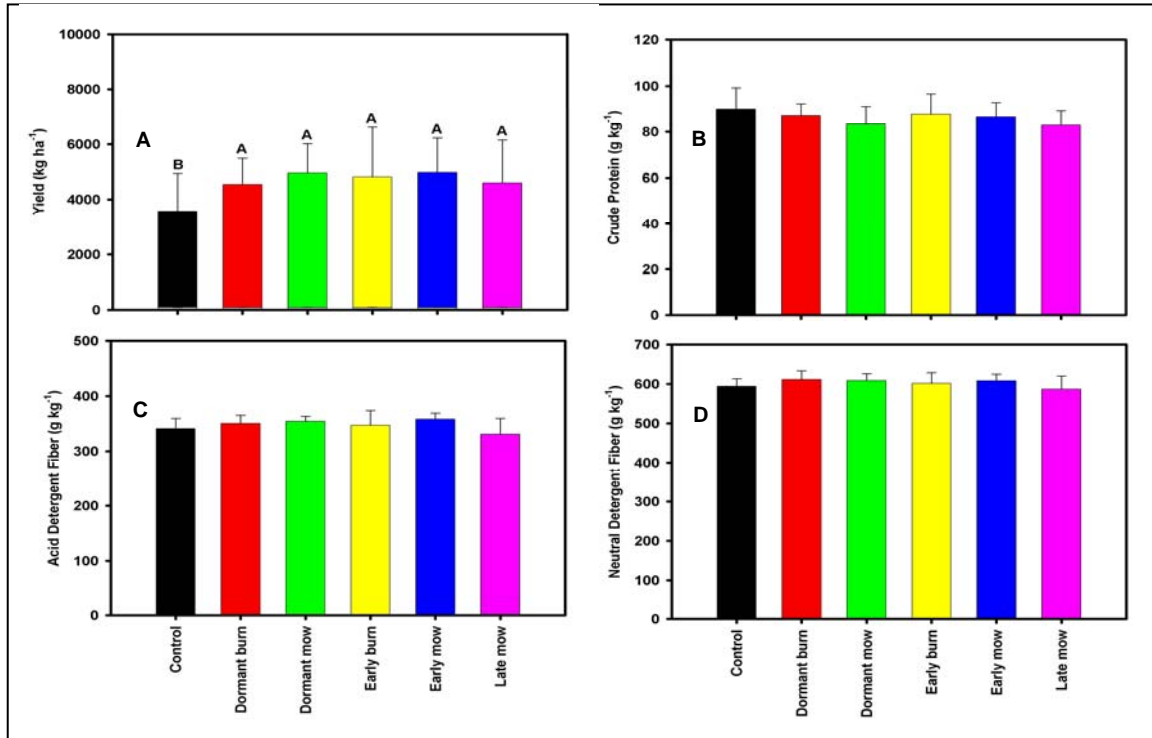
- Herbage samples were collected from all plots for botanical composition.
- 4, 25 x 100 cm strips harvested at 4 cm at random sites within each plot.
- Pure samples of grass, trefoil, and weeds were collected for NIR calibration.
- Herbage samples oven dried and ground.
- Sampling dates
  - 25 October 2001
  - 02 October 2002
  - 03 October 2003

***Summer sampling for yield and quality***

- Herbage samples were collected from all plots.
- 4, 25 x 100 cm strips harvested at 4 cm at random sites within each plot.
- Herbage samples were oven dried, weighed and ground.
- Herbage quality determinations were made using NIR for crude protein ( $\%N \times 6.25$ ), acid detergent fiber (ADF), and neutral detergent fiber (NDF).
- Sampling dates were:
  - 29 May 2002 (Experiment 1)
  - 16 June 2003 (Experiments 1 and 2)
  - 16 June 2004 (Experiment 2)

**Results and Discussion**

- Differences between experiments were not significant, so data were combined. The yields of all treatments were different only from control (Figure 1A) at the June sampling of the second year.
- Crude protein of all treatments were not different (Figure 1B).
- ADF of all treatments were not different (Figure 1C).
- NDF of all treatments were not different (Figure 1D).
- Burning and mowing of the CRP comprised of smooth brome/tall fescue/birdsfoot trefoil at dormancy, early green-up, and late spring benefited yield, but had no beneficial effects on crude protein, ADF, or NDF.
- Development of a predictive NIR equation for botanical composition has not been completed. Any changes in botanical composition associated to management treatment will be valuable for landowner management decisions.



**Figure 1.** Burning, mowing and haying management effects on yield, crude protein, ADF, and NDF.

- ❑ We observed the encroachment of goldenrod (*Solidago* spp.), a family of rhizomatous herbs that grow to a height of about 1 m, into burn treatments. The increase in goldenrod likely reflects reduced competition from the forage species. Invasive weeds often become established following disturbances, including mechanical disruption or fire. Disturbances allow rapid establishment and spread of many weedy species. The greater the disturbance, the more likely that an invasive weed will occupy all available niches and form a monotypic stand (Sheley *et al.*, 1998). Fire may promote colonization by many weeds or rapid recovery of noxious perennial species (Lacey *et al.*, 1992) or infestations of invasive annual grasses (Young and Evans, 1978).
- ❑ Ortega and Laterra (2003) reported that burning *Paspalum quadrifarium* in the of the Flooding Pampa grasslands favors the establishment of opportunistic species, especially *Lotus glaber* (syn. *L. tenuis*) and the thistles *Cirsium vulgare* and *Carduus acanthoides*. Seed of *L. glaber* can survive fire and seedlings can benefit from reduced competition in a post-burn environment (Laterra *et al.*, 2003). In the past, we have observed that dormant *L. corniculatus* plants within a grass community survive fire events.
- ❑ The *L. corniculatus* survived in all treatments in this management study. Burning and mowing created more opportunities for seedling germination and establishment.

Established, dormant plants survived the burn treatments and appeared unaffected by fire. There has been conjectural evidence that *L. corniculatus* survives episodes of fire, but this is the first study that will document survival. Fire combusted all dead tissues aboveground, leaving surviving plants in an environment relatively free of competition for light and space to regenerate new photosynthetic and reproductive tissues.

- ❑ These findings provide evidence that CRP options can provide landowners with available feed from hay, and likely grazing, without detrimental impacts on the recovery of the CRP. Managers however will need to exercise diligence to monitor weed populations and employ necessary control practices.

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