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SEASONAL BURNING OF MITCHELL GRASSLAND ON THE BARKLY TABLELANDS

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INTRODUCTION

Understanding the relationship between fire and the Mitchell grasslands has been overlooked in the past due to a view that "the Mitchell grasslands are too valuable as a pasture to be burnt" (Thackway *et al.* 2007). However, more recently observations of Mitchell grassland recovery after wildfires by station managers and naturalists have stimulated curiosity into whether seasonal fire is needed to maintain the Mitchell grasslands of the Barkly Tablelands in good condition. Scanlan (1980) found that burning under low soil moisture conditions followed by low rainfall was detrimental to the pasture condition of Mitchell grasslands. Phelps and Bates (1996) demonstrated the use of spring fire as tool for managing the undesirable *Aristida latifolia* (Feathertop Wiregrass) in Mitchell grasslands of the intensively sheep grazed areas of Queensland. The aim of this trial was to better understand the importance of seasonal prescribed burning as a Mitchell grasslands management tool under continuous grazing and its effect on cattle production on the Barkly Tablelands.

METHODS

The trial was conducted on Alexandria Downs station between 2001 and 2004. The trial site (dominated by *Astrebla pectinata* (Barley Mitchell grass) and *A. elymoides* (Weeping Mitchell grass)) is in the sub-tropical (distinctively dry winter) grassland climate zone and has a median financial year rainfall of 350 mm. The effects of early and late-dry-season burning on native trees and shrubs, pasture dynamics, cattle diet quality and grazing characteristics were investigated using a randomised three plot (25ha each) block design with four replications in a paddock under conservative continuous grazing. Tree and shrub data were collected from individuals selected prior to treatment. Pasture yield, species composition and cover were collected from 50 x $1m^2$ quadrats on four parallel transects each 400m long. Pasture quality data was collected using the 'grab sampling' technique (Ash & McIvor 1995) and analysed using wet chemistry methods. Cattle diet was analysed using NIRS on a paddock scale, replicated twice. Repeated Measures ANOVA was used to test the interaction effect of treatment and time. *Post priori* comparisons were used to test for differences between treatments within different time periods.

RESULTS

The financial year (July to June) rainfall totals during the trial were close to the median of 350mm, although it became increasingly drier as the trial progressed. This followed consecutive above average seasons (top decile) in 99/00 and 00/01.

For all treatments cover and yield (Figures 1 and 2) progressively decreased over the trial period due to the decreasing seasonal rainfall ($F_{2,40}$=206, P<0.001, and $F_{2,40}$=316, P<0.001 respectively). Although no significant difference in cover ($F_{1,20}$=0.35; p=0.55) or yield ($F_{1,20}$=0.0; p=0.99) was recorded between the two seasonal burning treatments, burning itself significantly reduced both cover ($F_{1,20}$= 78.3; p<0.0001) and yield ($F_{1,20}$=35.9; p<0.0001) following the first growing season. Yield recovered but cover was still lower in burned plots after the second growing season ($F_{1,20}$=0.13; p=0.72, $F_{1,20}$=11.1, P<0.01 respectively).

Flora species richness was largely influenced by seasonal response ($F_{2,40}$=171.6; p<0.001). However, fire significantly increased species richness following the first growing season ($F_{1,20}$=7.8; p=0.01) (Figure 3). There was no significant difference between the two seasonal burning treatments after 1 year ($F_{1,20}$=0.4; p=.05). The effect of fire on flora richness disappeared after two growing seasons.

Woody plant death rates increased following the burning treatments and were greatest under the late-dry-season burns (Figure 4). Considerable re-sprouting did occur following burning, but consecutive drier than average years resulted in further deaths following the second year. The height of surviving woody vegetation was reduced on average by approximately 40% regardless of burning season (Figure 5).

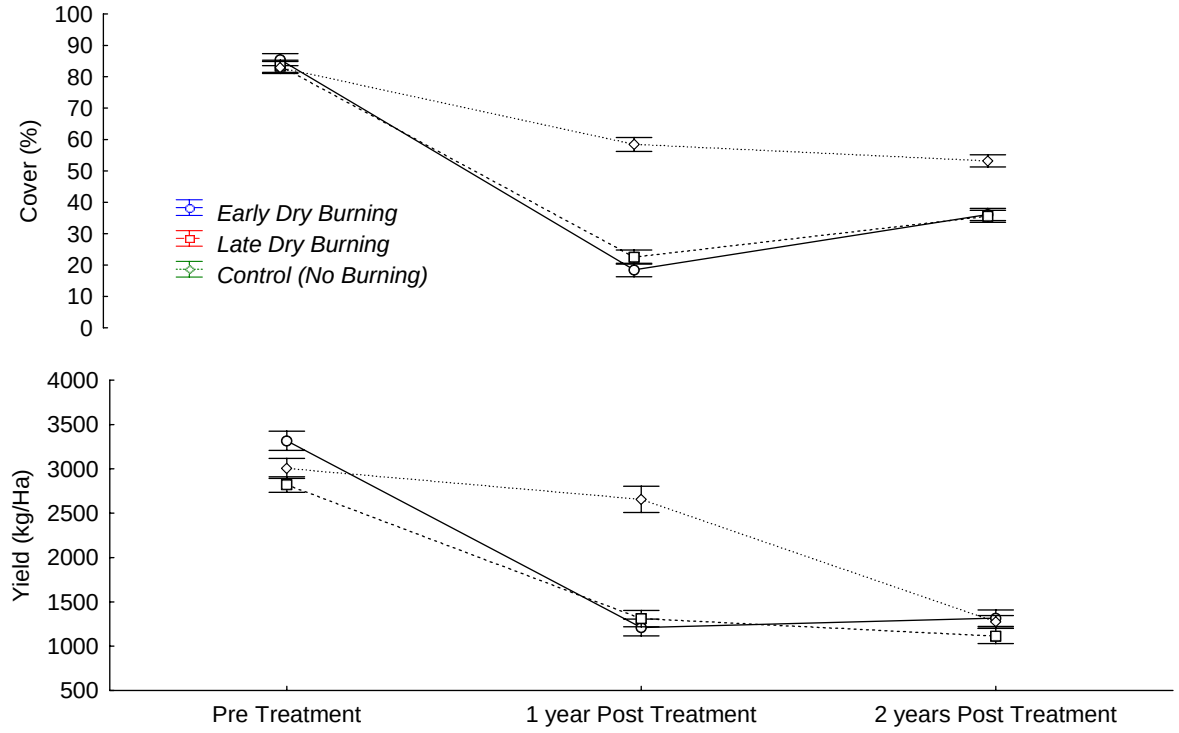


Figure 1 and 2: Seasonal burning effect on ground cover and pasture yield under grazing, with 95% confidence limits (measured in April).

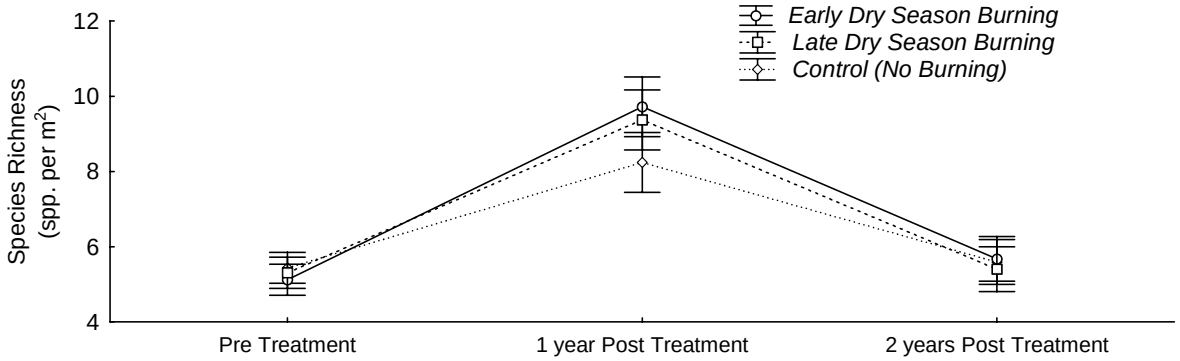


Figure 3: The effect of seasonal burning on species richness within a one metre area over time with 95% confidence intervals (measured in April).

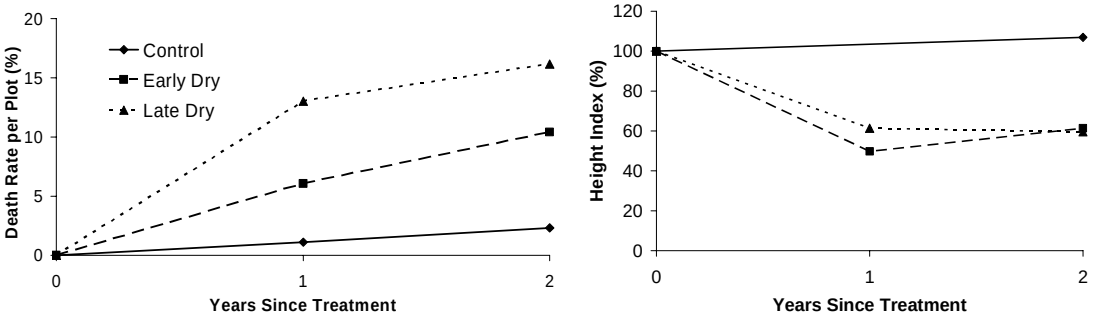


Figure 4 and 5: Woody vegetation death rate and height under different seasonal burning regimes

For all treatments cattle activity increased over the trial period (Figure 6) due to the decreasing seasonal rainfall ($F_{2,40}$=124.9, P<0.001). Burning further significantly increased cattle activity ($F_{1,20}$=6.7; p=0.01) over at least two dry-seasons. Short-term improvements in Mitchell grass feed quality over the first growing season were found following fire (Figure 7, Photos 1 and 2). However NIRS sampling (Figure 8) indicated the effect on diet was relatively small and only at the beginning of the growing season before the annual grasses and forbs germinated.

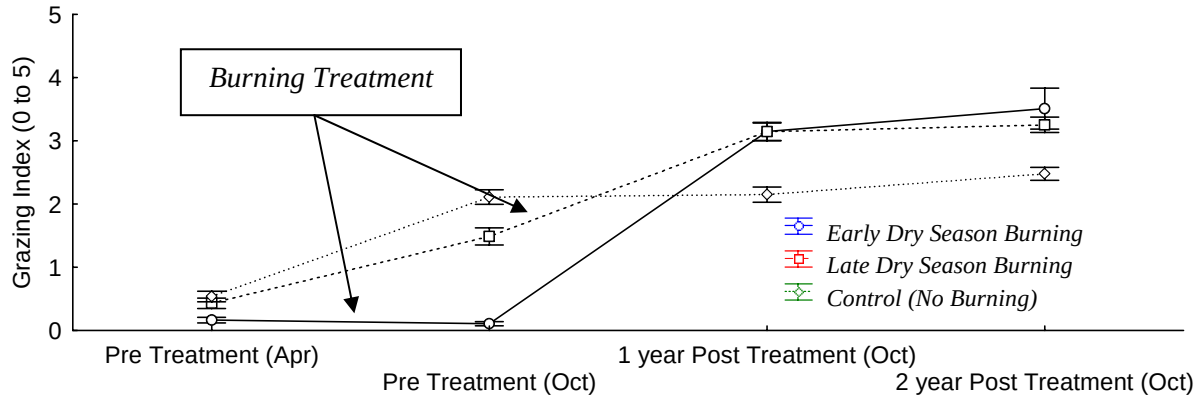
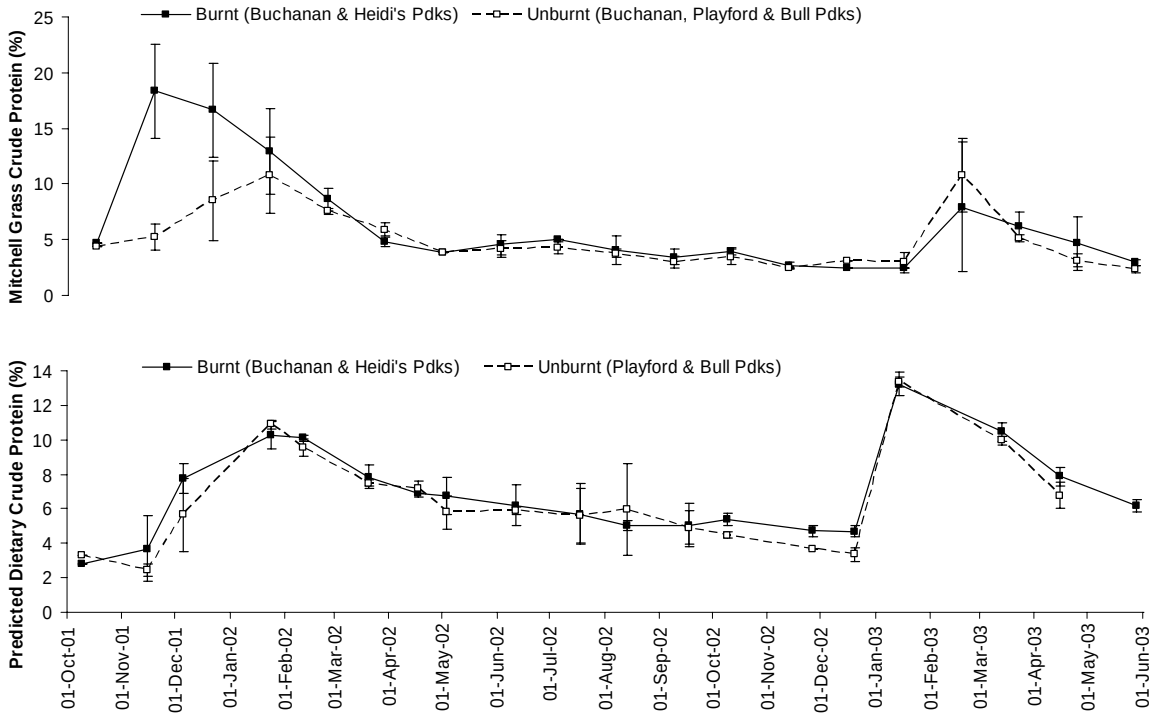


Figure 6: The effect of seasonal burning on cattle grazing activity, with 95% confidence limits.



Figures 7 and 8: Crude protein content of late-dry-season burnt and unburnt Mitchell grass (*Astrebla pectinata* & *A. elymoides*) from grab sampling (analysis using dry chemical methodology); and the predicted cattle diet quality from dung samples (NIRS analysis), with 95% confidence limits.

Photos 1 and2: Rank pasture pre burning in December and again in late January after burning and rain.

DISCUSSION

The greatest pasture management risk with prescribed burning in Mitchell grasslands in more arid areas is a lack of follow-up rain, and the resulting short-term feed loss and production (Daubenmire 1968, Scanlan 1980). However, dry matter differences between the burnt and unburnt plots under drier seasons appear to be due to carry over feed in the unburnt plots, rather than a lack of seasonal growth from the burnt plots. Following the second consecutive below average growing season no difference was identified in the available feed between the burnt and unburnt sites, similar to Scanlan's (1983) findings even though the burnt areas remained axillary tiller free. With adequate rainfall Scanlan (1980) found these grasslands can recover rapidly within one growing season supporting the observations found in this study.

Following fire Mitchell grassland cover appears to require three growing seasons to recover, findings similar to Dyer *et al.* (2003) in the higher rainfall Victoria River District of the Northern Territory. Cover is considered an important land condition indicator (Materne 2005, Chilcott *et al*. 2007). However, personal observations, supported by Scanlan, J.C. (1983), suggest the cover change was dominated by the litter component and not the more stable Mitchell grass basal area, and hence is not considered an indicator of declining land condition. This reduced litter cover is likely to have contributed to increased species richness by removing its suppressive tendencies.

Even though many woody species within the trial area are considered to be relatively fire tolerant re-sprouters, fire still had a significant effect on survival and height.

Although short-term negative impacts were recorded following fire in the Mitchell grassland on the Barkly Tablelands the results of this trial indicate that these grasslands are resilient to fire and conservative stocking, even under less than favourable growing conditions. Late-dry-season burning has the potential to provide production benefits and can be a useful cost effective management tool for the removal of rank pasture, reducing tree and shrub cover, and influencing cattle movements and short-term diet quality.

REFERENCES

Ash, J. & McIvor, J.G. (1995). Land condition in the tropical tall grass pastures lands. 2. Effects on herbage quality and nutrient uptake. *Aust. Rangel. J.* 17 (1): 86-98.

Dyer, R., Café, L., Cobiac, M. & Cowley R. (2003). Developing sustainable grazing management systems for the semi-arid tropics of the Northern Territory. **MLA, Sydney, Australia.**

Daubenmire, R. (1968). Ecology of fire in grasslands. *Adv. Ecol. Res.* 5: 209-66.

Chilcott, C.R., Rodney, J.P., Kennedy, A.J. & Bastin, G.N. (2005). Grazing Land Management – Central Australia Version: Workshop notes, **MLA, Sydney, Australia.**

Materne, C. (2005). Mitchell grasslands quality & quantity guide. **BL&CA, Tennant Creek**.

Phelps, D.G. & Bates, K.N. (1996). Burning can reduce feathertop (*Aristida latifolia*) unvasion in the Mitchell grasslands. *Proceedings 9th Aust. Range. Conf.*, **Port Augusta, Australia.**

Scanlan, J.C. (1980). Effects of spring wildfires on *Astrebla* (Mitchell grass) grasslands in north-west Queensland under varying levels of growing season rainfall. *Aust. Rangel. J.* 2: 162-8.

Scanlan, J.C. (1983). Changes in tiller and tussock characteristics of *Astrebla lappacea* (curly Mitchell grass) after burning. *Aust. Rangel. J.* 5: 13-9.

Thackway, R., Eddington, M., Walcott, J., Burton, K., Frakes, I. and Randall, L. (2007). Vegetation Management – Towards sustainability for vegetation management – Mitchell grasslands. **BRS, Canberra, Australia.**