

# Vegetation Dynamics In Response To Fire And Slashing In Remnants Of Western Basalt Plains Grasslands: Preliminary Results

**Meredith Henderson** Department of Biological and Food Sciences,  
Victoria University of Technology, PO Box 14428, Melbourne, VIC.  
**Dr. Colin Hocking** Supervisor

## Introduction

The Western Basalt Plains is an area of flat to undulating land extending from Melbourne to Hamilton, in the west of Victoria. The area, covering some 10% of the state, historically was dominated by lowland grassland with *Themeda triandra*, *Danthonia* spp., *Stipa* spp. and *Poa labillardieri* appearing as main canopy species. Since European settlement, however, this area of native grassland has been much reduced and only 0.1% remain. Less than one-thousandth of a percent of this is reserved for conservation (DCE, 1992; Lunt, 1994).

Maintenance of biodiversity is an issue of critical importance in reserve management. The remnants of Western Basalt Plains grassland need to be actively managed through aboveground biomass reduction (Stuwe and Parsons, 1977; McDougall 1989; Lunt, 1994; Lunt and Morgan 1997 [this conference]). Previous studies show that without frequent aboveground biomass reduction, *Themeda triandra* detritus accumulates and tends to swamp out forbs in the inter-tussock gaps (Stuwe and Parsons, 1977; Lunt, 1991). In Western Basalt Plains grasslands, reduction in biodiversity can be attributed to the loss of the inter-tussock forb component.

This project investigates the dynamics of the vegetation in remnants of Western Basalt Plains grasslands, in the west of Melbourne, in response to fire and slashing. Results presented here address changes in biomass of *Themeda triandra* and exotic species with burning and slashing and gap size changes with burning and slashing.

## Methodology

Both sites, Derrimut Grassland Reserve and Laverton North Grassland Reserve, are located in the western suburbs of Melbourne, some 20 km from the CBD. Both have similar meteorological attributes and the experimental plots have had similar management histories. For the length of the study, both are reserved for conservation. The experimental plots are dominated by the native perennial tussock grass *Themeda triandra* Forssk.

Treatments consisted of slashed and burnt strips treated in April, 1996 (autumn). They form part of a greater set of treatments comprising:

burn		autumn		yearly	
or	X	or	X	or	+ control
slash		spring		triennially	

These treatments have eight replicates and are arranged in a random block factorial design.

**Gap Size** Tussocks of *Themeda triandra* were measured with an incremented ruler where the tussock clumps intersected a standard frame. Gap size measurements were calculated by subtracting the total basal distance of the tussocks from the total distance of the standard frame.

**Biomass** Standing biomass samples were taken from slashed, burnt and untreated plots in April 1997, one year following treatment. The samples were cut using hedge shears from a 0.25m X 0.25m quadrat frame and were bagged and tagged. Biomass samples were dried at 20°C and 10% humidity, sorted into species and weighed. Green biomass of *Themeda triandra* was separated from dead standing biomass to calculate productivity since treatment.

**Data** Mean gap size for each treatment with standard error were plotted. Means of standing biomass for all species encountered are presented; natives other than *Themeda triandra* were pooled.

## **Results**

### *Biomass*

Standing biomass of dead *Themeda triandra* was the greatest in untreated (control) plots at both Derrimut Grassland Reserve and at Laverton North Grassland Reserve (figs. 1 and 2). Burnt treatments at both sites had the lowest standing biomass of dead *T. triandra*. New growth (i.e. green *T. triandra*) was similar for untreated and slashed treatments at Derrimut, but was highest for the slashed treatments at Laverton North.

Overall, weedy species biomass was greater at Laverton than at Derrimut (figs. 1 and 2). At Laverton, there was little difference in weedy standing biomass between treatments (fig. 2) with the exception of *Briza minor*, which was greatest in the burnt treatment. The weed *B. maxima* had the greatest standing biomass in both the untreated and slashed treatments at Derrimut (fig. 1).

Total standing biomass for native species was very little at both sites. However, the total standing biomass of native species other than *T. triandra* at Laverton was greater than at Derrimut.

### *Gap Size*

Gap sizes varies between treatments. The gap distances were greater in burnt plots than in slashed or control plots (fig 3) one year after treatment at Laverton. The average total gap distance, per plot, in the burnt treatments were 651 cm and 707 cm at Derrimut and Laverton respectively (fig. 3). There was little difference in the size of gaps between the untreated and slashed plots. The average total gap distance at Derrimut was 643 cm and 646 cm for slashed and untreated plots respectively. The average total gap distance at Laverton is 673 cm and 683 cm for slashed and untreated plots respectively. Gaps were maintained in the burnt treatments at Laverton more readily than at Derrimut.

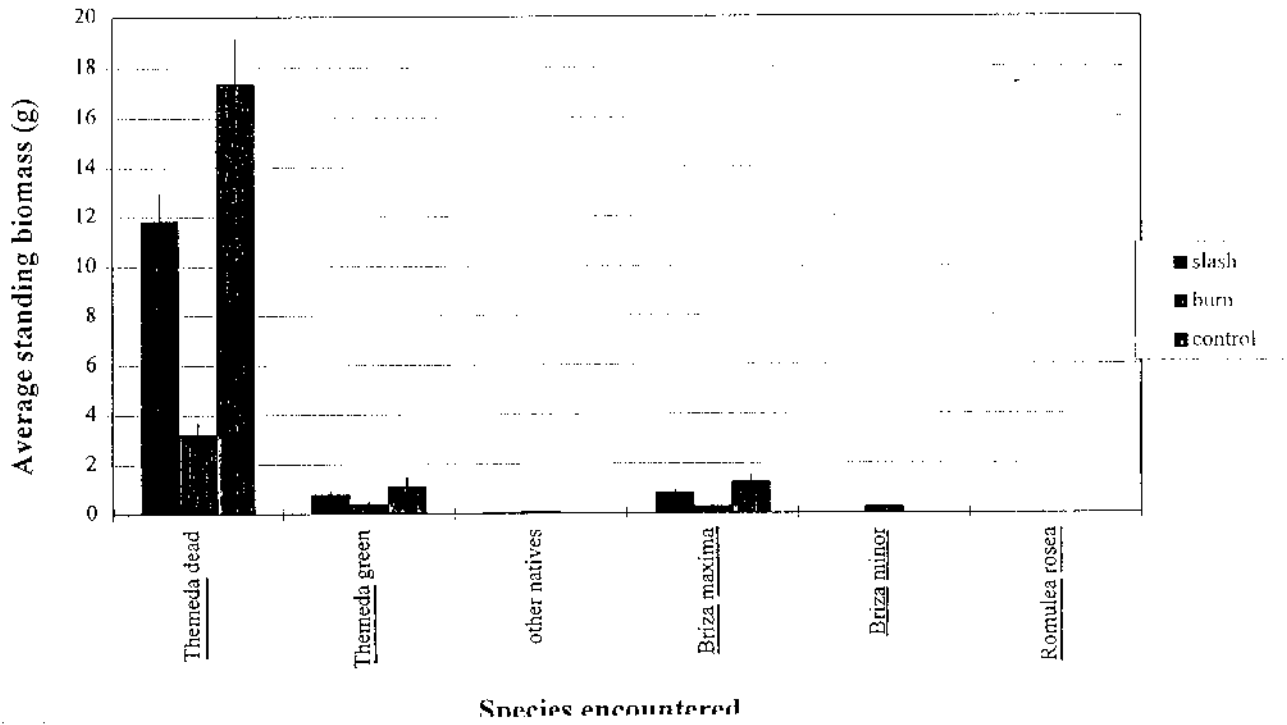


Figure 1. Average standing biomass (g, +/- sem) per plot for slashed (n=16), burnt (n=16) and control (n=8) treatments one year following treatment at Derrimut Grassland Reserve.

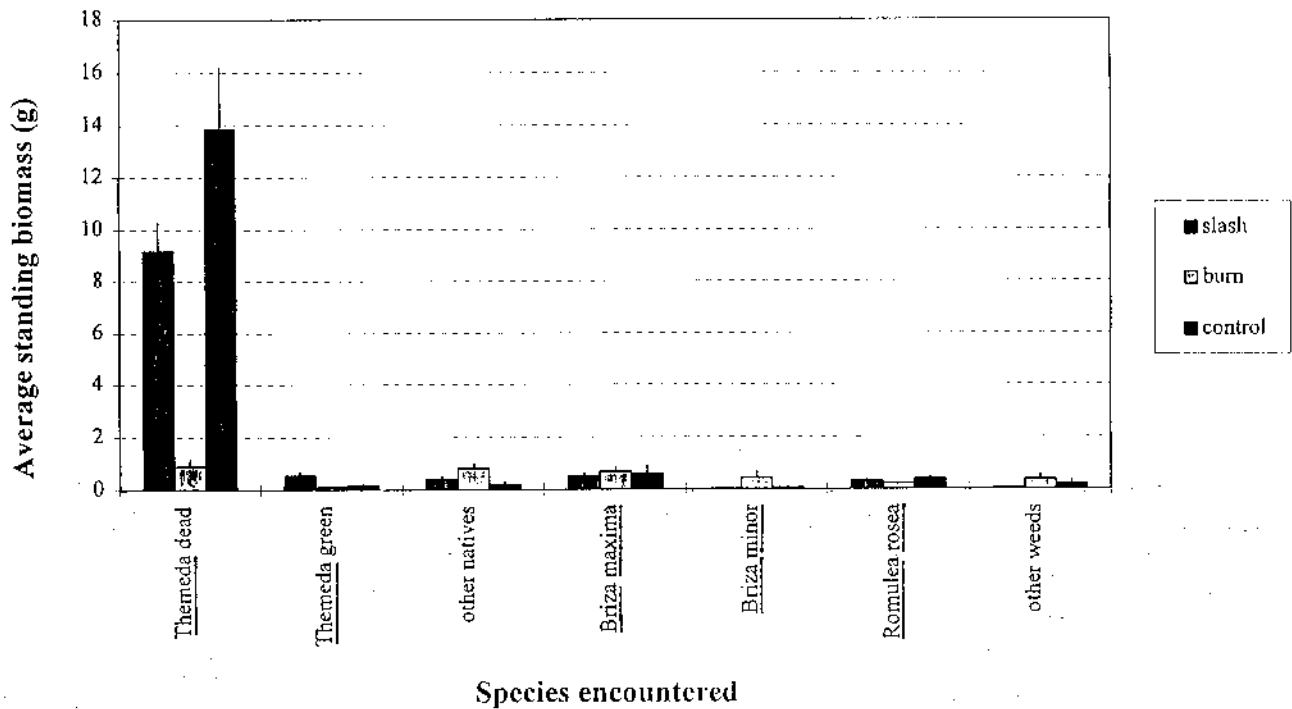
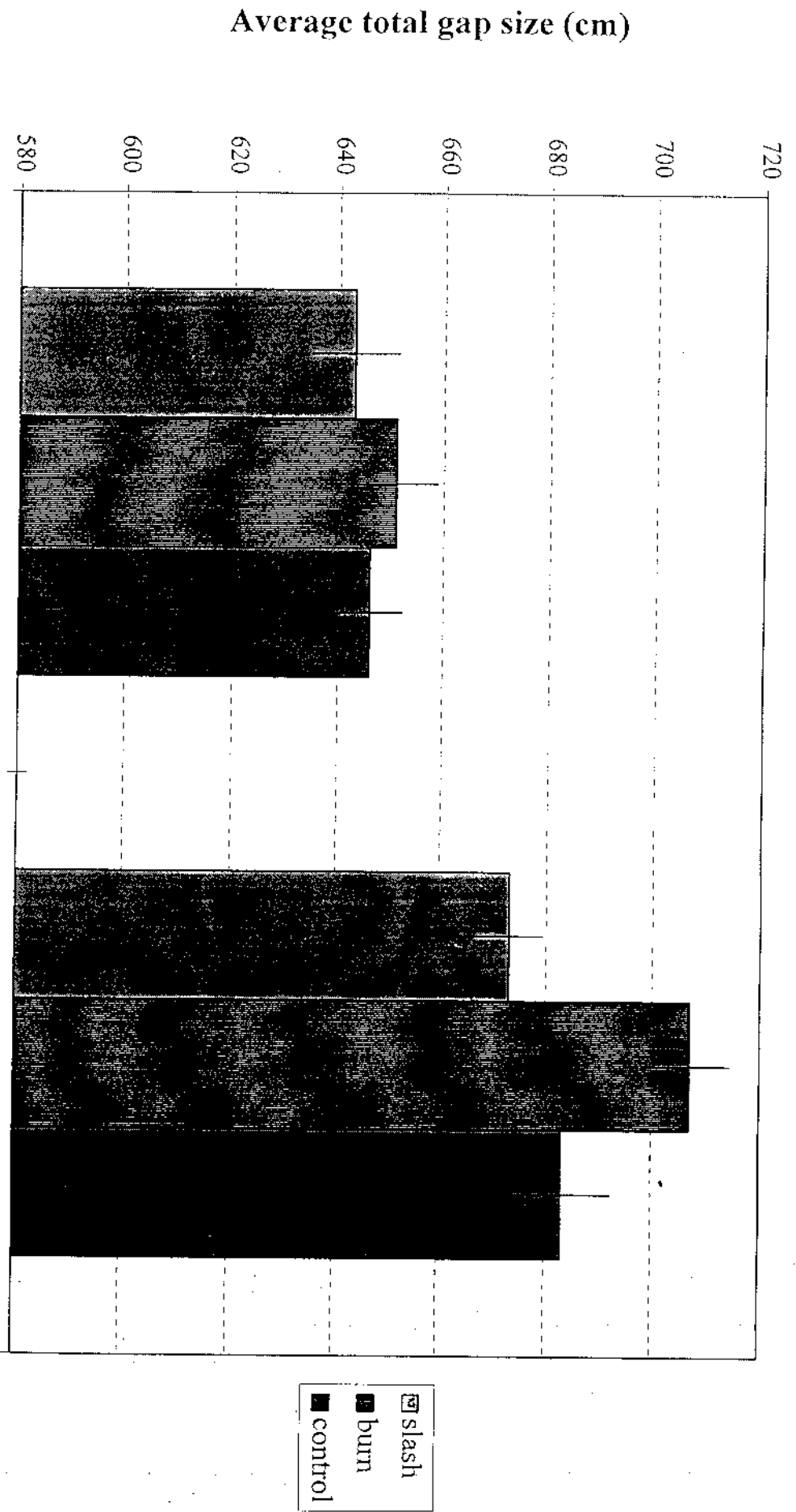


Figure 2. Average standing biomass (g, +/- sem) per plot for slashed (n=16), burnt (n=16) and control (n=8) treatments one year following treatment at Laverton North Grassland Reserve.



**Figure 3.** Average total gap size (cm, +/- sem) per plot for slashed (n=16), burnt (n=16) and control (n=8) treatments, one year following treatment at Derrimut and Laverton North Grassland Reserves.

## **Discussion**

### ***Biomass***

The preliminary results indicate that by reducing biomass, accumulation of detritus is also reduced. The burning treatments produced the least amount of dead *Themeda triandra* biomass, suggesting that fire is an effective method of removing a build up of detritus. It is this accumulated detritus which tends to smother and thus reduce the biodiversity of inter-tussock herbaceous species (Stuwe and Parsons, 1977; McDougall, 1989; Lunt, 1991). Overall, burnt plots had the greatest biomass of exotic species. This differs from anecdotal evidence that repeated fires reduces the exotic component of native grasslands. There could be several reasons for this:

- that the management histories are quite different;
- that by creating gaps in the canopy, initially, exotics are more able to invade the burnt plots;
- that perhaps repeated burning exhausts the soil seed bank of exotics.

Slashing reduces accumulated biomass of *Themeda triandra* compared with the untreated plots and has less exotic species biomass than does the burn treatment. After slashing there is a more contiguous canopy over the plot than with burnt plots. This cover means that there are less bare gaps for exotic invasion. The nutrient load returned to the soil (after initial treatment) would be less in slashed plots than in burnt plots and perhaps it is this increased nutrient load which can favour exotics (see Wijesuriya, 1997 [this conference]).

Biomass of green *T. triandra* is greater in slashed plots than in burnt plots. This suggests that productivity in slashed plots is greater than in burnt plots. More clumps of *T. triandra* appeared to die following the burn treatment than the slash treatment. This could account for the greater production of green *T. triandra* biomass. Slashing, whilst removing biomass, leaves more of the tussock intact than does burning (see plate 1). It is thought that by removing biomass below the growth points on *T. triandra* tillers, there will be an increase in death of the tussocks.

### ***Gap Size***

It was expected that gap sizes would be greater in the burnt treatment than in any other treatment. Since total overall biomass is much reduced in the burnt treatment, most of the canopy cover is also reduced, leaving gaps between the tussocks. However, this was only true at Laverton, where there was a difference in gap size between the burnt plots and untreated plots. There was no difference between treatments at Derrimut.

It is expected that more pronounced differences will become apparent with the round of second treatments.

## **References**

- Department of Conservation and Environment (1992) Draft Conservation Program for Native Grasslands and Grassy Woodlands in Victoria. DCE, Melbourne.
- Lunt, I.D. (1991) Management of lowland grasslands and grassy woodlands for nature conservation: a review. *Vict. Nat.* **108** (3): 56-66.
- Lunt, I.D. (1994) Variation in flower production of nine grassland species with time since fire, and implications for grassland management and restoration. *Pac. Con. Biol.* **1**: 359-366.
- Lunt, I.D., and Morgan, J.W. (1997) Long-term impact of grazing exclusion and intermittent burning on remnant *Themeda* grasslands in southern Victoria. [This conference]
- McDougall, K. (1989) The re-establishment of *Themeda triandra* (Kangaroo Grass): Implications for the restoration of grassland. *Arthur Rylah Inst. Env. Tech. Rep. Ser. No. 89*. Department of Conservation, Forests and Lands.
- Stuwe, J., and Parsons, R.F. (1977) *Themeda australis* grasslands on the Basalt Plains, Victoria: floristics and management effects. *Aust. J. Ecol.* **2**: 467-476.