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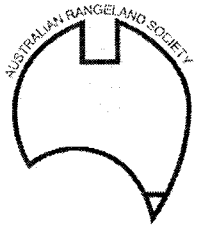

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CLEARING, GRAZING AND BURNING INTERACTIONS ON TREE DYNAMICS IN AN *ARISTIDA/BOTHRIOCHLOA* COMMUNITY

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ABSTRACT

Management options of clearing, altering grazing pressure and burning, were applied to trees and shrubs in poplar box (*Eucalyptus populnea*) woodlands of the *Aristida/Bothriochloa* community. Mature tree populations were stable over 5 years from 1994. Density of the shrubs, broad leaf hop bush (*Dodonaea viscosa*) and yellow-berry bush *(Maytenus cunninghamii),* and the small trees, false sandalwood (*Eremophila mitchellii*), myall (*Acacia pendula*) and whitewood (*Atalaya hemiglauca),* were most dynamic. Greatest population changes occurred in 1999, after a wet autumn and spring.

Keywords: tree, shrub, clearing, burning, grazing pressure, *Aristida, Bothriochloa*

INTRODUCTION

Stable and productive pastures with controlled woody vegetation competition can be developed from understanding tree dynamics under different management options. Commercial practice in the poplar box (*Eucalyptus populnea*) woodlands of the *Aristida/Bothriochloa* (A/B) native pasture community (Weston *et al.* 1981) is to clear mature trees to increase grass growth for cattle production. Subsequent woody regrowth control is by periodic burning. Understanding the interactions between management options of clearing, altering grazing pressure and burning, on populations and sizes of trees and shrubs can lead to the development of strategic management options to sustain productive pastures.

METHODS

There were 2 experiments in eucalypt woodland, in the A/B community near Injune (25^0 45'S, 148^0 25'E; mean annual rainfall 625 mm). Pastures were predominantly *Bothriochloa, Dichanthium, Aristida* and *Chloris* on yellow and brown duplex soils. Poplar box density was 210 trees/ha and basal area was 5 m^2/ha. Silver-leaved ironbark *(E. melanophloia)*, bull oak *(Allocasuarina luehmannii)* and myall (*Acacia pendula*) trees were sub-dominants, but on different soils. Experiment 1 had three cattle grazing pressures (low, medium and high) under trees or clearing (by stem injection of Tordon^R) with 2 replications in 12 paddocks of 4-18 ha. The ungrazed experiment 2 had similar treed and cleared paddocks, burnt annually or unburnt, with 3 replications in 12 cells of 1 ha. Treatments were applied in mid-1994. Height, canopy cover, stem diameter at 30 cm and stem number of woody plants were recorded along permanent transects 4m wide by 450m (experiment 1) or 200m long (experiment 2) in the 24 treatments in 1995, 1996, 1997 and 1999 using the TRAPS methodology (Back *et al.* 1997). Annual rainfall (July-June) was 392, 571, 654, 707 and 844 mm for 1994-95 to 1998-99 respectively.

RESULTS

Of the 60 species recorded, poplar box was dominant (34.6%) in all treatments and its populations remained stable over 5 years. The shrubs, broad-leaf hop bush (*Dodonaea viscosa*) and yellow-berry bush *(Maytenus cunninghamii),* and the small trees, false sandalwood (*Eremophila mitchellii*), myall, bitter bark *(Alstonia constricta)* and whitewood (*Atalaya hemiglauca),* were most dynamic.

Clearing. Stem injection killed all mature eucalypt trees. There was no significant eucalypt, poplar box or ironbark, seedling recruitment in any treatment over the first 5 years. In the treed treatments, shrub populations increased by 43.4% over 5 years compared with a 5% increase after clearing. Limebush *(Eremocitrus glauca)* increased by 27% in one paddock under clearing and low grazing pressure on an area of clay soil.

Grazing pressure. Hop bushes, present under clearing and medium grazing pressure in 1995 and 1997, died in 1999. Under trees and high grazing pressure, hop bushes increased 340% and yellow-berry bush increased 170% between 1995 and 1999, while under trees and low grazing pressure, whitewood

increased 215% and in one paddock bull oak increased 300%. Myall increased 12% under clearing and high grazing pressure, in one paddock over the 5 years. The high grazing pressure treatments caused total shrub population to increase 52%.

Burning. Populations of mature woody species were not affected by burning in experiment 2. There was an increase in small woody plants in the unburnt plots between 1997 and 1999 (Figure 1). A patch of 26 false sandalwood seedlings established in one cleared, unburnt replicate in 1999, following a wet autumn (192 mm), spring (241 mm) and summer (340 mm).

DISCUSSION

Eucalypt populations remained stable. In contrast, shrubs and small trees increased most under treed, high grazing pressure and no burning treatments. Burning was not an effective strategy to control mature trees, but it prevented establishment of most shrubs. Jones (pers. comm.) has also found that burning a mature silver-leaved ironbark woodland in central Queensland prevented seedling recruitment, while having no effect on the mature trees. Seedling recruitment of some woody species was promoted by the wet autumn to spring period in 1998. The need for parent plants nearby was evident for all significant recruitment and most new seedlings were in patches and not evenly spread.

The stable mature tree populations and sporadic recruitment of shrub species only in some paddocks during these experiments suggests that establishment events may only occur intermittently in this environment, and then under certain climatic and management conditions. Such ideal conditions may not have occurred during this 5-year period. A study of the main woody shrub species seeding, seed viability and recruitment over a wider range of seasonal conditions is needed to gain a better understanding of their establishment requirements. This will allow the development of strategic management options for maintaining pasture productivity and regrowth control after initial clearing.

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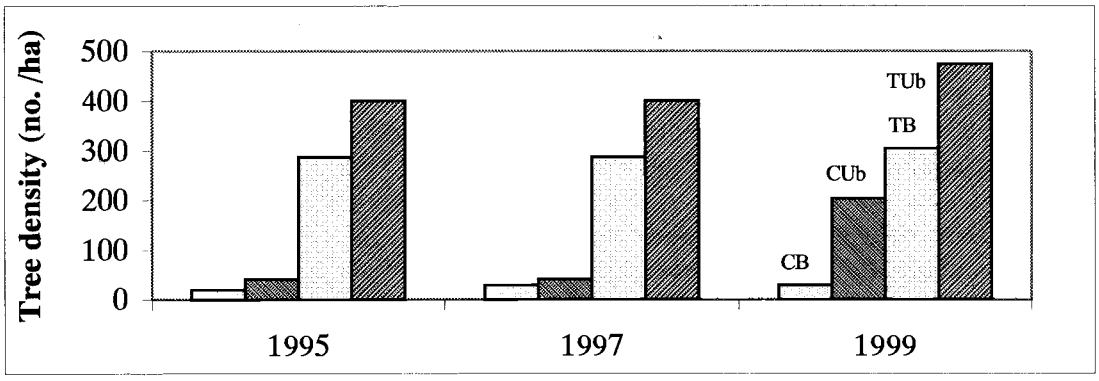

Figure 1. Tree density (no./ha) in cleared burnt (CB), cleared unburnt (CUb), treed burnt (TB), and treed unburnt (TUb) treatments in experiment 2 in 1995, 1997 and 1999.