



Tanya Bailey [tgbailey@utas.edu.au](mailto:tgbailey@utas.edu.au)

School of Plant Science, University of Tasmania

Supervisors: Dr Neil Davidson, Dr Dugald Close, Dr Greg Unwin



## Introduction

With the expansion of plantations into agricultural areas and a program of incentives for fencing on farms, many previously grazed native vegetation remnants are being enclosed and released from intense grazing pressure. This has been acknowledged as a vital first step in rehabilitating remnants (Spooner *et al.* 2002) with recent work indicating that grazing history is the primary management factor separating healthy and poor remnants (Davidson *et al.* 2007). However, in a study of the sustainability of remnants, Saunders *et al.* (2003) predicted a 'bleak future' primarily due to a lack of recruitment in populations. The lack of eucalypt recruitment is a key factor in the decline of forest remnants in the low rainfall production regions of Tasmania. More active management of remnants to overcome the barriers to recruitment, encourage regeneration and conserve biodiversity is needed (Orr and Todd 1992). This study aims to develop restoration techniques that mimic the recruitment niche of eucalypts in regenerating forests.

## Describing the niche

We conducted a survey of naturally regenerating forests that had been burnt within the last five years at three sites in the Midlands and showed that the microsites in which eucalypt seedlings established were distinctly different from the general forest floor (Figure 1).

The recruitment microsite was characterised by a greater cover of charcoal and moss with deep mulch and shelter (Figure 2) while the surrounding environment had a greater cover of grasses, graminoids, small shrubs and trees.

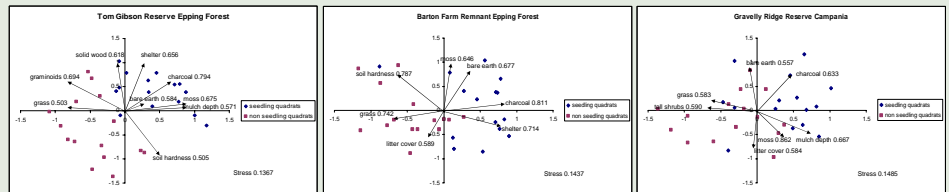


Figure 1: 3D Ordination of cover scores, soil and structural features from seedling microsites and general environment with significant PCC vectors & r<sup>2</sup>s



Figure 2: Seedling recruitment microsites are characterised by ash beds, charcoal and litter mulch and protection by woody debris

## Describing the niche

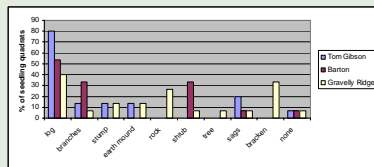


Figure 3: Types of shelter for seedlings at three Midlands sites

- 80% of seedlings surveyed were in canopy gaps.
- 93% of seedlings were in ash beds or partial ash beds (which showed evidence of fire such as chunks of charcoal and burnt debris) (Figure 2).
- The majority of seedlings had some form of physical protection with 84.4% of seedlings sheltered by woody debris such as large logs, branches and stumps (Figures 2 and 3).
- The average distance of a seedling from protection was  $17.5 \pm 5$  cm.
- The average extent of protection was 225 degrees.
- The majority of microsites had northerly aspects (Figure 4).

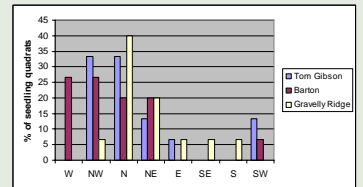


Figure 4: Aspect of seedling microsites at three Midlands sites

## Recreating the niche

This knowledge of the characteristics of the recruitment microsites is now being applied in patch-scale field restoration trials in which treatments of hot fire, cultivation and importing woody debris are being used to try and recreate microsites for seed germination and seedling establishment. More detailed measurements of the log microsite (moisture content, water infiltration, temperature) will be made at the natural forest and experimental sites to examine how well the recreated niche matches the natural niche.



Figure 5: 5x5m plots were marked out, half had wood piled on them and burnt, half were cultivated. Two large logs were placed on half of each of these. All plots were planted and sown with local eucalypts and fenced from browsers.

## Experimental design

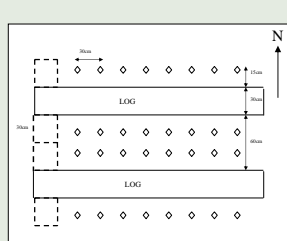
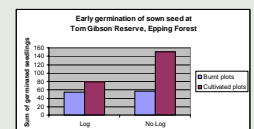
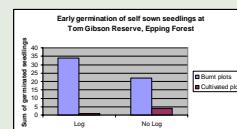


Figure 6: Layout for plots with logs. Dotted areas are 30 x 30 cm quadrats to be sown with local eucalypt seed, diamonds represent planted *Eucalyptus amygdalina* and *E. viminalis* seedlings.

- Six sites
- Two at Evercreech near Fingal
- Two at Epping Forest
- Two at Oatlands
- Sixteen 5m x5m plots in canopy gaps at each site
- Eight plots with intense autumn bonfire burn
- Eight plots sprayed for weeds then cultivated
- Half of each of these had two large logs added 60cm apart oriented east west (Figure 5).
- Seedlings of two local species of eucalypts have been planted beside and between the logs (Figure 6) or in a 30cm grid on non log plots.
- Locally collected eucalypt seed has been sown beside and between logs on west end while the rest of the plot has been left to receive natural seed rain.
- All plots are fenced to exclude browsing animals

## Preliminary results

- Germination, survival, health and growth of seedlings are being monitored.
- Initial germination at Epping Forest shows self sown and sown seedlings prefer different seed beds.



## Conclusion

This study highlights the importance of woody debris in dry forests as sites for eucalypt recruitment which has implications for the management of this resource. If successful, the application of these restoration techniques at a broad scale will make an important contribution to management of declining forest remnants.

## References

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