Levelling the Playing Field: Exploring Methods of Reducing Weed Competition to Improve the Establishment of Native Ground Cover on Former Agricultural Land

Thesis submitted in fulfilment of the requirements for the Doctor of Philosophy (Faculty of Science)

May 2015

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ABSTRACT

In order to restore endangered native ecosystems such as Grey Box grassy woodlands, research is required on the establishment of native groundcover to ensure functioning ecosystems with greater structural complexity are created. Invasive, exotic plant species (weeds) are a major threat to restoration efforts. This study explores a variety of potential methods and strategies to control weeds in an effort to determine which ones may be effective in promoting the reestablishment of native understorey on previously farmed land.

The three main strategies tested were; carbon addition, topsoil removal and tree canopy planting. Carbon addition reduces the available soil nitrate and can inhibit nitrophilic weeds, topsoil removal depletes the weedy soil seed bank as well as soil nutrients, and trees are believed to outcompete weeds in some situations and facilitate native understorey establishment.

A glasshouse study was carried out to test the effects of these methods directly on common invasive annual grasses. Topsoil removal, tested by planting the grasses in subsoil collected from the field, reduced biomass of three out of four invasive annual grass species when compared with plants grown in topsoil. All four species had biomasses over 60% lower than the control when carbon was added, whereas shade had no effect.

This was followed by a field experiment at Glenthorne Farm, O'Halloran Hill, South Australia. Plots were set up with five treatments; carbon addition, topsoil removal, artificial shade, natural shade under tree canopies and a control. Plots were cleared initially and the reestablishment of weeds monitored for 18 months. Native seeds were also sown and the survival of any germinants monitored. Carbon addition plots had decreased weed cover but no increase in native species establishment compared to the controls. Topsoil removal plots had the lowest percentage weed cover and also the

highest number and cover of native plants. Shade and tree canopy treatments did not reduce the cover of weeds and native species establishment was very low.

Topsoil removal was the most effective method in the above experiment, and a second trial was set up at Glenthorne Farm to test this method further. Larger tracts of land were scalped and some of these were also sprayed with herbicide three weeks after topsoil removal to further reduce the number of weeds subsequently germinating from the soil seed bank. Total weed cover was not significantly reduced on topsoil removal plots compared to controls, but native species establishment was higher.

After analysing these results, some of my recommendations for improving the revegetation of native groundcover from seed on former agricultural land include:

- Ensuring topsoil removal is to a relevant depth and following up with herbicide applications or other weed removal methods to ensure the soil seed bank is sufficiently depleted before planting;
- Where native species already grow, carbon addition can be used to inhibit some weeds, such as nitrophilic annual grasses, although it may not be appropriate to use while native species are germinating;
- Groundcover species should be planted at the same time or before tree species as the shade and increased fertility under tree canopies can promote the growth of some weed species.

ACKNOWLEDGEMENTS

Completing a Doctorate thesis is a long and difficult process that I could never have accomplished without the assistance and support of a number of people. Firstly, I would like to thank my supervisor David Paton whose contributions, advice and editing have been invaluable. I would also like to thank;

- My parents, who have helped me a lot, both physically out in the field at Glenthorne Farm digging up plots, as well as emotionally, encouraging me to persevere.
- Martin, the caretaker of Glenthorne Farm for unlocking the gate for me every day and pulling my car out of the mud when I got bogged.
- Greg Dalton and his staff for looking after my plants in the nursery and the slashing, scalping and spraying work they carried out at Glenthorne Farm.
- Rob Cirocco for his assistance in the greenhouse
- Colin Bailey, Tom Hunt and the Friends of Glenthorne Farm members who helped me to set up my field experiments.

A special cheers to the folk of Room 118 for the random chats and important frustration venting (Amanda McLean, Tim Richards, Rebecca West, Casey O'Brien etc.). Most importantly I'd like to thank my partner Kaetlyn for her eternal patience and much needed support.