# Productive Grazing, Healthy Rivers

## Module 3: Regeneration in remnant vegetation: Overcoming the barriers

F. Ede

### Why investigate tree regeneration in riparian remnants?

Remnants of riparian vegetation of various sizes and condition exist on both public and private land across Victoria. These remnants perform a number of ecosystem functions, including providing habitat for terrestrial and aquatic species, contributing to riverine food webs, improving water quality and stabilising river banks. However, these vegetation communities also have intrinsic value, in and of themselves, and are important components of the overall landscape.

If these remnants are to persist in the long term, it is important that the natural processes of regeneration occur, to enable new individuals to be recruited into the adult population of each species. In the riparian remnants of interest to this project (riparian forests and woodlands), trees form the key structural components of the vegetation communities. Several factors can prevent tree recruitment in riparian communities. These barriers include a lack of viable seed if there are insufficient healthy adult trees in the vicinity, degraded soils that limit seed germination and seedling establishment, browsing or damage from a range of native and feral species (for example rabbits, hares and wallabies), and the impacts of floods, droughts and fires. Weed competition is also believed to impact on tree recruitment in many riparian systems but, despite the considerable anecdotal evidence, there was little scientific data to support this belief. Weed competition is the factor that formed the basis of this research.

### What did we do?

The aim of this research module was to better understand the relationship between weeds and tree recruitment. A field survey was undertaken in spring 2003 to identify the range of lifeforms associated with native tree seedling occurrence in ungrazed riparian sites. One of the outcomes of this survey was the strong relationship between the presence of bare ground at a site (potential areas for weed invasion) and the occurrence of tree seedlings. Based on this relationship, an experimental field trial was undertaken, commencing in October 2004, to determine how much bare ground tree seedlings required for successful establishment.

### Status of this Module

*Complete*

This module commenced in April 2003 and concluded in April 2006. The researchers received support from the CRC for Australian Weed Management. Scientific publications are being prepared from this research. The results are also contributing to a new project investigating willow management in riparian areas.

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### How?

*Field survey 2003 – Factors influencing native tree recruitment*

Thirty-six ungrazed riparian sites of a minimum 20m width were surveyed across the state to understand the factors influencing native tree recruitment. Vegetation cover was measured along several 20m transects at each site by life form – classifying species into native and exotic species of trees, shrubs, vines, herbs, grasses and ferns. Tree seedlings were counted and measured, and the diameter of all older trees was measured. The presence of litter, rock and bare ground was also recorded.

Sowing manna gum (*E. viminalis*) seeds into 120cm blue periwinkle (*V. major*) plots.

*Experimental field trial 2004 - Bare ground and tree seedling establishment*

Based on the results of the field survey, a field trial was established to investigate the effect of width of cleared areas in two weed species (ie area of bare ground) on emergence and establishment of two native tree species. Six sites were selected in West Gippsland and the Mornington Peninsula, three of which had a solid canopy cover of blackberry (*Rubus fruticosus* agg.), and three with blue periwinkle (*Vinca major*).

Bare ground plots of 0cm, 40cm, 80cm, and 120cm diameter were cleared in the weeds, with all above-ground vegetation and litter removed from the plots. Small seedlings of either manna gum (*Eucalyptus viminalis*) or blackwood (*Acacia melanoxylon*) were planted in the plots. Seeds of these species were also sown in six of the largest plots at each site. These plots were then monitored for seedling emergence, survival, growth, and the rate of closure of the weed gap.

### What did we find?

*Field survey*

- Blackberry was the most commonly found exotic species, present at 33 of 36 sites
- The proportion of native to exotic taxa was 60:40 across all sites, with one site having only one weed plant present (a thistle), while some other sites had more than 30 species of weeds
- Seedlings of *Acacia* spp were found at 23 of 36 sites, and seedlings of *Eucalyptus* spp were found at 12 of 36 sites. *Acacia* seedlings were also present in greater numbers than *Eucalyptus* seedlings
- The likelihood of finding tree seedlings at a site was
  - **positively** associated with
    - i) the amount of bare ground and rock,
    - ii) the extent of exotic herb cover
    - iii) total number of taxa
  - **negatively** associated with the extent of native grass and fern cover
  - **unrelated** to the extent of blackberry cover.

*Experimental field trial – emergence and survival*

- There was very little germination of sown seed or of seed from the existing soil seed bank at any of the sites
- Survival of manna gum seedlings after 5 months was lower than that of blackwood seedlings for all plot sizes and under both weed canopies
- No manna gum seedlings survived in the uncleared plots of either blackberry or blue periwinkle
- Plot size had a significant impact on seedling survival for both tree species

  Blackberry - manna gum seedling survival increased with increasing plot size to 50% in the 120cm plots

  Blue periwinkle - manna gum survival was similar for the 40cm and 80cm plots (28 - 33%), but significantly greater in the 120cm plots (89%)

  Both weed canopies - blackwood survival was significantly greater in the 120cm plots than in the 0cm plots (94% compared with 33% under blackberry, and 94% compared with 67% under blue periwinkle)

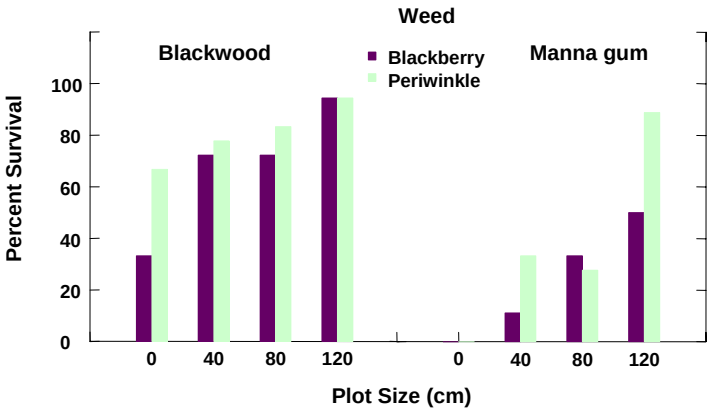


Figure 9. Percent survival of blackwood (*Acacia*) and manna gum (*Eucalyptus*) seedlings in blackberry (*Rubus*) and periwinkle (*Vinca*) canopies cleared to different plot sizes.

*Experimental field trial - growth*

- The height of the surviving manna gums seedlings five months after planting was not different between plot sizes, but seedlings were taller in the blue periwinkle plots (27cm) than in the blackberry plots (16cm)
- The height of surviving blackwood seedlings were taller in the 120cm plots (40cm) compared with the 0cm plots (17cm), and were taller in the blue periwinkle plots (34cm) than in the blackberry plots (24cm)
- Blackberry plots - regrowth of blackberry canes had occurred across the majority of the plots within two months for the 40cm and 80cm plots, and within three months for the 120cm plots
- Blue periwinkle plots - regrowth of the weed had occurred in the majority of the 40cm and 80cm plots after three months, and after five months in the 120cm plots.

**What does it mean?**

- Areas of **bare ground** (without litter cover) provide **important recruitment sites** for tree seedlings in riparian areas.
- Riparian sites with a high cover of exotic herbs and high numbers of total taxa (**high diversity**) are sites that also favour **tree recruitment.**
- Riparian sites with high cover of native grasses or native ferns do not provide favourable conditions for tree recruitment.
- There are greater numbers of *Acacia* seedlings in unmanaged riparian areas than *Eucalyptus* seedlings.
- Manna gum (*E. viminalis*) seedlings are more susceptible to **weed competition** than the blackwood (*A. melanoxylon*) seedlings, with no manna gum seedlings surviving after five months in the uncleared plots in the field trial.
- To maximise manna gum **seedling survival and establishment**, areas should be kept **weed free** for at least three months, or an area of at least 120cm cleared around the seedlings.
- Blackwood seedlings can survive and grow under uncleared canopies of blackberry and blue periwinkle, but seedling survival and growth improves with decreasing competition (increasing plot size).