



RESEARCH FINDINGS 2011

A *Hemianthra pungens* flower.

Testing techniques for promoting revegetation: mimicking the effects of fire

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Marlee Reserve is a major area of remnant woodland in the Mandurah area. This 48ha reserve encompasses beautiful *Eucalyptus-Banksia* woodland with high conservation, social, and educational values. However, a number of areas are degraded.

Revegetation is one way of assisting recovery in these degraded areas. In a drying climate, however, merely planting seedlings may not be sufficient to ensure vegetation recovery. Therefore new methods to increase the success of revegetation need to be found.

Fire contributes towards seedling recruitment

Fire can improve germination and recruitment of many native plant species. Fire removes biological opposition to recruitment and creates an 'ash-bed' (Pryor 1963), a substrate high in plant-available nutrients and with an abundance of safe sites for germination and establishment. The ash-bed also has altered soil characteristics, including reduced bulk density that increases water infiltration and availability. The fire sterilizes soil (killing pathogens and herbivores) and removes vegetation (reducing competition for resources such as light, nutrients and water).



Tuart seedling recruitment in an ash-bed formed from burned woody debris.

As many of our native plant species regenerate after fire, one way to increase the success of revegetation may be mimic the effects of fire. For example, reduced competition due to removal of established trees means that higher levels of light, moisture and nutrients may be available to plants after a fire. This study examined the effects of additional moisture and nutrient resources upon revegetation success of local plant species.

Methods & Results

The Friends of Marlee Reserve worked alongside Murdoch University researchers, City of Mandurah staff, and Friends of Island Point to choose and plant seedlings, provide planting equipment, plant treatments and undertake monitoring. Fencing was also required to prevent kangaroo herbivory; this was provided by the City of Mandurah.

Three treatments were tested:

- 1. Additional water:** water crystals (hydrated water-holding crystals) were added to the soil beneath each seedling to provide moisture over the summer months (the aim was to make this trial applicable to larger-scale revegetation which precluded hand watering as a treatment).
- 2. Additional nutrients:** a slow-release fertiliser tablet was buried below each seedling.
- 3. Control** plants did not receive either water or nutrients.

Each treatment was replicated over four sites, with 20 plants of each of four local species planted. Following one year of growth, these plants were monitored for survival, health and growth.

After one year, overall survival rate of seedlings averaged 50% (which is low compared with other revegetation activities in the region, which averages over 70%).

The species did not vary greatly in their survival rates: tuart *Eucalyptus gomphocephala* (51%), prickly moses *Acacia pulchella*

(55%), native wisteria *Hardenbergia comptoniana* (49%) and *Hemiandra pungens* (45%) (Figure 1).

Fertiliser did not alter the survival compared with the control plants (Figure 2a), but significantly increased seedling growth (Figure 2b). Paradoxically, the water holding crystals significantly reduced survival of the species monitored, while those seedlings that did survive did not show additional growth.

Conclusions & Recommendations

- The use of hydrated water holding crystals significantly reduced survival of seedlings, without increasing growth of the surviving plants, in the way they were applied in this trial. This treatment was also difficult to apply as part of revegetation activities as a second person was required to carry a bucket of crystals.
- However, **fertiliser tablets could be considered as a nutrient source to increase seedling growth**. It should be noted that this type of fertiliser tablet should not be used on *Hakea*, *Banksia* and *Grevillea* species, which have highly specialised nutrient uptake methods.



Figure 1 *Hemiandra pungens* in flower in the foreground and a *Eucalyptus gomphocephala* seedling in the background.

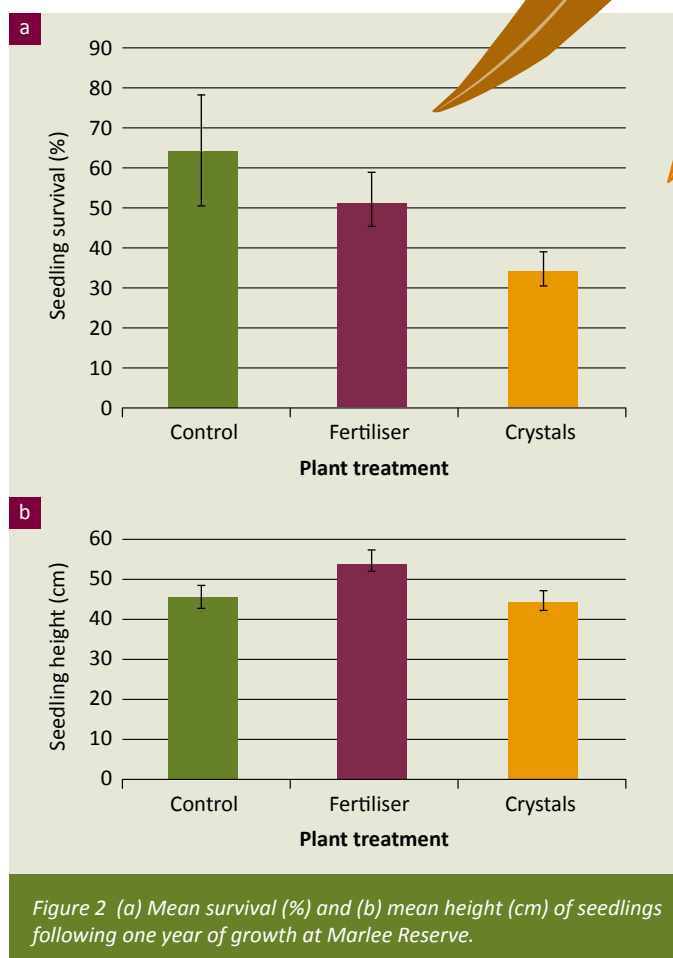


Figure 2 (a) Mean survival (%) and (b) mean height (cm) of seedlings following one year of growth at Marlee Reserve.

- The relatively high plant mortality rate recorded in this study was suspected to be due to late planting. **Future trials should aim for earlier planting** (at the start of the winter rains rather than mid-winter) to allow plants to establish and develop their roots prior to their first summer drought period.
- Finally, **revegetation collaborations involving local government agencies and community groups can be very rewarding and mutually beneficial**. Clear benefits to the environment as well as community (including improving agency-community relations and psychological and physiological outcomes) are evident.

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