April 2009

Tuart decline

RESEARCH FINDINGS

Eucalyptus gomphocephala

Tuart Bulletin No.11 A series outlining key research findings associated with tuart health in south-west Western Australia

11

Restoring degraded woodlands

Katinka Ruthrof, Tegan Douglas, So Thea, Bernard Dell

In many places on the Swan Coastal Plain *Eucalyptus gomphocephala* (tuart) woodlands are in decline or are degraded (Bulletin 1). This occurs for many reasons, including grazing by stock, weed invasion, logging and clearing. It is often a combination of these factors that gradually lead to a decline in the tuart populations.

Research into the decline of tuart is continuing. Meanwhile, methods of increasing the success of restoration efforts are being investigated. The major challenges for restoration can be summarised in three categories (modified from Lamb 1994; Yates and Hobbs 1997):

1) reducing the degrading factors (e.g. removing herbivores);
2) ameliorating the ecosystem changes (e.g. reducing compaction and increasing water availability); and
3) reintroducing local species (e.g. broadcast seeding or planting seedlings, reintroducing fauna and fungi).

Two major tuart woodland areas are the focus of restoration trials: the Yalgorup area south of Mandurah and the Ludlow Tuart Forest near Busselton. These trials are investigating methods of reversing ecosystem degradation and reintroducing local plant species following the management of threatening processes. The methods include the addition of site and plant treatments to increase the survival and growth of seedlings.

Treatments that have been trialed have to fit certain criteria. They must be:

- site appropriate (e.g. to ameliorate particular soil conditions);

Figure 2: Growth and vigour responses of tuart seedlings to different restoration treatments. Healthy robust seedling (left) and nutrient stressed seedling (right).

- inexpensive (i.e. affordable to land care groups, councils and other agencies);
- easy to use (i.e. one does not need a licence);
- applicable for large scale restoration activities; and
- applicable for use in other degraded sites (e.g. mine sites, old field restoration, infrastructure projects, ex-pine plantations).

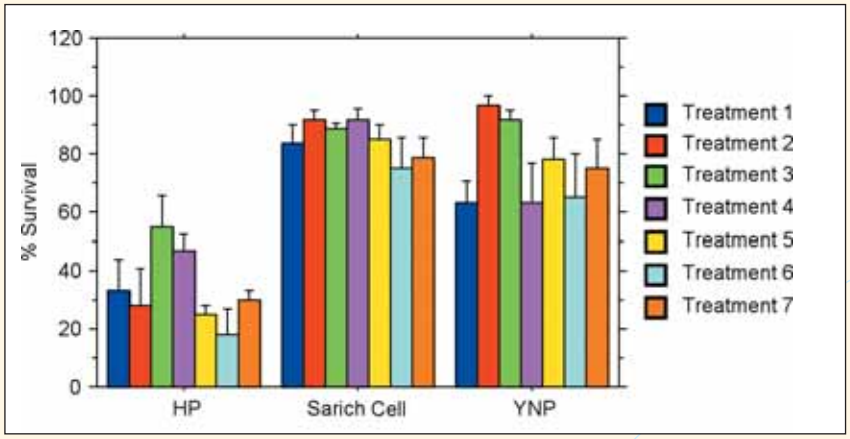

Figure 1: *Survival of tuart seedlings at 11 months following the addition of 7 treatments. HP = Harry Perry Reserve, Sarich = private property adjacent to Yalgorup National Park, YNP = Yalgorup National Park.*

Treatments that are currently being tested include those that not only ameliorate the factors inhibiting seedling establishment and growth, but also act to mimic conditions that seedlings would have when they naturally recruit. For example, episodic mass seedling recruitment of temperate eucalypts, such as Tuart, can occur following fire due to a number of factors, such as higher levels of available moisture and nutrients in the soil (see Bulletin No. 7; Ruthrof 2002; Ruthrof et al. 2002; 2003).

A collaboration of Government, research and industry partners supporting research into tree decline science and management in south-west Western Australia. **www.tuarthealth.murdoch.edu.au**

The Yalgorup trials

With the help of private land owners, staff from the City of Mandurah, and members of the Friends of Island Point, over 2000 tuart and associated understorey species were planted or sown in areas fenced to exclude kangaroo grazing. Treatments that were added to the seedlings or seed included: local fungi inoculum, fertilizer tablets, saturated water holding crystals, dry water crystals, zeolite, and a liquid chelating agent.

Early results of these trials suggest that (Figure 1 and 2):

- The use of planted seedlings is more successful in terms of survival than broadcast seed, particularly in tuart;
- the use of fertilizer tablets together with a chelating agent significantly increases the survival and growth of seedlings; and
- water holding crystals are more successful when applied in the wet state, rather than in dry form, as early rains cause the dry crystals to swell and can cause the newly planted seedlings to 'pop' out of the soil and dry out.

The Ludlow trials:

The Ludlow forest has a long history of degrading factors, including grazing by cattle and kangaroos and weed invasion. As a result, many parts of the forest have very low levels of plant diversity, with only a few understorey species existing beneath the magnificent tuart canopy.

A trial has been set up to determine the effect of soil treatments on the growth and survival of various local canopy and understorey species, both planted as seedlings and broadcast as seed. Treatments included ripping, the creation of ashbeds (Figure 3), and a combination of the two.

The trial was established with the help of the Department of Environment and Conservation and Bemax Resources Limited incorporating Cable Sands. Over 3000 seedlings were planted in one day with the assistance of some very keen and capable members of the Busselton Naturalists Club and the Friends of Island Point.

Early results suggest that:

- the ashbed effect has a significantly positive influence on seedling survival (Figure 4). However, although it is recommended that ashbeds continue to be used as part of the restoration process, most areas that need to be restored will not able to be subject to the ashbed effect. Therefore, other treatments that provide similar results will need to be found.
- Although ripping, in its current form, has not produced significant results regarding seedling survival or growth, the use of light ploughing just prior to restoration activities may be beneficial for providing more safe sites for seed broadcasting activities. Therefore, this site treatment is being evaluated as part of the 2008 restoration trial.

With further monitoring and testing of sites, plant and seed treatments, these results will be able to drive continued improvement of restoration techniques, and will provide management options for restoration of other areas of degraded woodland in Western Australia.

Figure 4a and 4b: Growth and vigour responses of tuart and associated understorey species on an ashbed (a) and on a ripped site (b)

Acknowledgements

The restoration team would like to thank:

- Ralph Sarich;
- Department of Environment and Conservation staff, particularly John Carter and Jason Foster;
- Bemax Resources Limited incorporating Cable Sands staff member Brant Edwards;
- Friends of Island Point members, particularly Lyn O'Brien;
- City of Mandurah staff members, especially Lisa Wray;
- Busselton Naturalists Club, particularly Bernie Masters;
- Department of Environment and Conservation Fairbridge Trainees; and
- Forest Products Commission, especially Monica Dalton and Margaret Johnston.

References

Bulletin 1: Why are the tuarts dying? Barber, P & Haswell, D. (2006). Tuart Health Research Group

Lamb, D. (1994). Restoration of degraded forest ecosystems for nature conservation. In 'Conservation Biology in Oceania'. (Eds C. Moritz and J. Kikkawa.) pp. 101–114. (Surrey Beatty and Sons: Sydney.)

Ruthrof, K. X., Yates, C. J. and Loneragan, W. A. (2002) The Biology of *Eucalyptus gomphocephala* DC. (Tuart). In: Tuart (Eucalyptus gomphocephala) and Tuart Communities (ed. B.J. Keighery and Longman, V. M.). pp. 108-22. Wildflower Society of Western Australia (Inc.)

Ruthrof, K. X. (2003) Seedling survival, growth and health of *Eucalyptus gomphocephala* (Tuart) seedlings in Yalgorup National Park. Report for the Department of Conservation and Land Management, Perth, Western Australia.

Ruthrof, K. X., Loneragan, W.A. & Yates, C.J. (2003) Comparative population dynamics *Eucalyptus cladocalyx* in its native habitat and as an invasive species in an urban bushland in south-western Australia. *Diversity and Distributions*. 9, 469-483.

Yates, C. J & Hobbs R. H. (1997) Temperate Eucalypt Woodlands: a Review of Their Status, Processes Threatening Their Persistence and Techniques for Restoration. *Australian Journal of Botany*. 45, 949–973.

2009xxx-10-500