PUBLISHED VERSION

Manfred Jusaitis

Threatened plant translocation case study: Prostanthera eurybioides (Monarto Mintbush), Lamiaceae

Australasian Plant Conservation, 2018; 26(4):15-17

© Australian Network for Plant Conservation

Originally Published at: https://www.anpc.asn.au/apc/

PERMISSIONS

https://www.anpc.asn.au/wp-content/uploads/2019/10/Revised-APC-instructions-for-authors081019.pdf

Opinions expressed in this publication are those of the authors and are not necessarily those of the ANPC or its sponsors. Material presented in *Australasian Plant Conservation* may be copied for personal use or published for educational purposes, provided that any extracts are fully acknowledged. Where any material is credited to and/or copyright to another source we encourage that you contact the original source for permission to reprint.

9 April 2020

http://hdl.handle.net/2440/124127

- Greater survival of tubestock derived from seed rather than cuttings.
- Investment in research provides critical information for successful plant establishment and an experimental framework that identifies and refines the best approach for future translocations.

References

Cliffs. (2011). *Yilgarn Operations Windarling Range Report on Ricinocarpos brevis Seeding Trials*. Revision 0 October 2011.

Cliffs. (2012). *Yilgarn Operations Windarling Range Report on Ricinocarpos brevis Seedling Trials at Windarling*. Revision 0 October 2012.

Department of Environment and Conservation (DEC). (2011). *Ricinocarpos brevis Interim Recovery Plan 2011 – 2016*. Interim Recovery Plan No. 312.

Elliott C.P., Miller, B. and Turner, S. (2018). *Practitioner Restoration Manual for* Ricinocarpos brevis. Report to Cliffs Asia Pacific Iron Ore Pty Ltd. by the Botanic Gardens and Parks Authority.

Krauss, S. and Anthony, J. (2011). *A population genetic assessment of* Ricinocarpos brevis *(Euphorbiaceae) with 144 amplified fragment length polymorphism (AFLP) markers*. Report to Cliffs Asia Pacific Iron Ore Pty Ltd. by the Botanic Gardens and Parks Authority.

Turner, S., Lewandrowski, W., Elliott, C.P., Merino-Martin, L., Miller, B., Stevens, J., Erickson, T. and Merritt D. (2018). Seed ecology informs restoration approaches for threatened species in water-limited environments: a case study on the short-range Banded Ironstone endemic *Ricinocarpos brevis* (Euphorbiaceae). *Australian Journal of Botany:* https://doi.org/10.1071/BT17155

Threatened plant translocation case study:

Prostanthera eurybioides (Monarto Mintbush), Lamiaceae

MANFRED JUSAITIS

South Australian Seed Conservation Centre, Botanic Gardens of South Australia, and School of Biological Sciences, University of Adelaide.
Email: Manfred.Jusaitis@sa.gov.au

The Species

- Small, erect, aromatic, perennial shrub with violet flowers during spring (Figure 1).
- Endemic to South Australia.
- Two disjunct populations at Monarto (near Murray Bridge) and Mount Monster Conservation Park (near Keith).

Threatening Processes

- Habitat loss and fragmentation through agricultural development and quarrying.
- Weed competition.
- Herbivore grazing.
- Lack of natural recruitment, particularly at Monarto.

Deciding to translocate

Approximately 1200 wild plants were estimated to occur in the Monarto and Mount Monster populations in 2010 (Pound *et al.* 2010). The species is listed as Endangered under the Australian Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*, and Critically Endangered under IUCN criteria.

Figure 1. *Prostanthera eurybioides* in flower. Photo: M Jusaitis

Translocation trials were conducted at both population centers with the aim of enhancing natural populations while at the same time testing various techniques and management options (Jusaitis 2010). This case study focusses on a trial originally designed to examine the influence of herbivory on translocant establishment, but long-term monitoring additionally revealed an intriguing interaction of climate with herbivory (Jusaitis 2012).

Aim of the translocation

The aim of this translocation was to examine the influence of herbivores on growth and survival of transplants.

Translocation working group and key stakeholders

- Conservation Biology Unit, Botanic Gardens of South Australia – to plan and implement the translocation and perform ongoing monitoring and maintenance of the translocation site.
- Friends of the Upper South-East Parks – to assist with site selection and trial set up.
- *Prostanthera eurybioides* Recovery Team – to oversee planning and implementation of the translocation.

Biology and Ecology

- Seeds have physiological dormancy.
- The mericarp plug acts as a mechanical barrier preventing germination (Ainsley *et al.* 2008).
- Hot, dry summers can trigger loosening of the mericarp plug to enable germination.
- Plants are killed by fire, but fire stimulates recruitment (Jusaitis, unpubl. data).

Site selection

Plants grow on shallow, sandy loams associated with outcrops of granite or schist. A site with similar edaphic characteristics was selected within the existing population of *P. eurybioides* at Mount Monster Conservation Park.

Translocation proposal

The design for this experiment was submitted to and approved by the *Prostanthera eurybioides* Recovery Team.

Pre-translocation preparation, design, implementation and ongoing maintenance

Seeds collected from plants at the Mount Monster population were germinated and raised in our nursery. Twelve-month old seedlings were transplanted from tubes into replicated, paired, fenced and unfenced plots. Fenced plots (3 x 3 m) were enclosed by a chicken-wire fence to exclude rabbits and kangaroos. Planting layout and locations were accurately mapped, and no ongoing maintenance was necessary.

Monitoring and evaluation

We monitored plant survival, growth (height, width) and seedling recruitment over 17 years (1995–2011). Frequent grazing damage was observed on unfenced plants over this time, although this rarely proved fatal once plants were established, as grazed plants were able to regenerate with a new flush of growth when grazing was relaxed (Figure 2). By year 7, survival had stabilized at 96% (fenced) and 67% (unfenced), remaining at those levels for the next 4 years. In year 11 (2006), the translocation site experienced its lowest rainfall on record, followed by 2 years of below average rainfall. This severe drought resulted in a dramatic loss of fenced plants, while having no effect at all on the survival of unfenced plants (Figure 3 and 4). In the early stages of drought stress, fenced plants experienced dieback of stems, followed by shoot regeneration after seasonally favourable conditions (Figure 5). However, prolonged drought reversed this recovery and resulted in the death of many fenced plants.

The explanation for this unforeseen phenomenon lay in the size of unfenced plants which, due to frequent grazing, were about one third the size of fenced (ungrazed) plants (Figure 6). The larger size of the latter meant a far greater leaf surface area, higher transpirational losses and thus increased susceptibility to water stress, compared with the smaller, unfenced,

Figure 2. Regeneration of 13-year old transplant of *Prostanthera eurybioides* (unfenced) following repeated grazing. Photo: M. Jusaitis

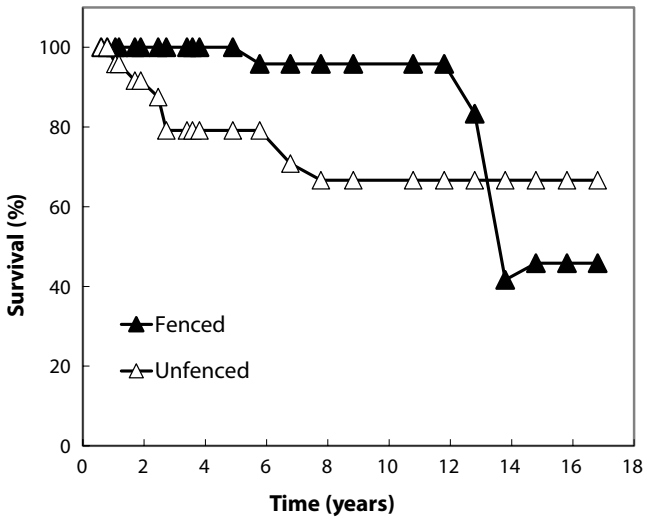

Figure 3. Survival of *Prostanthera eurybioides* translocants in fenced and unfenced plots over 17 years.

Figure 4. Fenced translocants of *Prostanthera eurybioides* showing dieback of 13-year old plants during a prolonged period of drought. Photo: M. Jusaitis

Figure 5. Regrowth of *Prostanthera eurybioides* shoots following earlier dieback of stems as a result of drought. Photo: M. Jusaitis

grazed plants which survived the drought (Veneklaas and Poot 2003, Virgona *et al.* 2006). Thus, although it was tempting to abandon monitoring after the population had been stable for 5 years, the next 5 years revealed an unexpected result which suggests that this plant is far more tolerant of grazing than was first thought. Indeed, grazing may assist these plants to withstand severe periods of drought. Interestingly, the first significant recruitment of new seedlings was observed following this drought (year 14), so the drought may also have played a role in overcoming seed dormancy (Ainsley *et al.* 2008).

Outcomes

This trial showed that *P. eurybioides* is indeed grazed by herbivores, resulting in lower growth and survival of translocants. However, long-term monitoring suggested that this may not necessarily be a bad thing, as the reduced leaf area of grazed plants assisted in their survival over an extended period of drought.

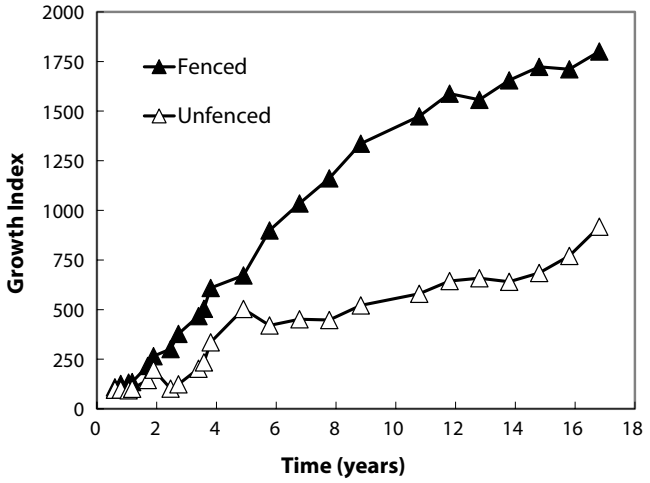

Figure 6. Growth of *Prostanthera eurybioides* translocants in fenced and unfenced plots over 17 years. Growth Index is the average of height, widest width and orthogonal width.

What we learned

- It is possible to establish new populations of this species.
- Protection from grazing, particularly during the early stages of plant establishment, encouraged vigorous growth, rapid flowering and seed production, and ultimately natural recruitment.
- Established plants were less susceptible to grazing damage once they reach their mature size.
- Grazed plants were less susceptible than ungrazed (fenced) plants to prolonged drought.

References

Ainsley, P.J., Jones, M.K. and Erickson, T.E. (2008). Overcoming physiological dormancy in *Prostanthera eurybioides* (Lamiaceae), a nationally endangered Australian shrub species. *Australian Journal of Botany* 56: 214-219.

Jusaitis, M. (2010). Enhancement of Monarto Mintbush populations in South Australia by translocations. In: P.S. Soorae (ed). *Global Re-introduction Perspectives: Additional case-studies from around the globe*, pp. 306-310. IUCN/SSC Re-introduction Specialist Group, Abu Dhabi, UAE.

Jusaitis, M. (2012). Serendipity during long-term monitoring of translocation trials. *Australasian Plant Conservation* 20(3): 8-10.

Pound, L., Obst, C. and How, T. (2010). *Recovery Plan for* Prostanthera eurybioides *(Monarto Mintbush)*. Report to the Recovery Planning and Implementation Section, Department of the Environment, Water, Heritage and the Arts, Canberra, Australia.

Veneklaas, E.J. and Poot, P. (2003). Seasonal patterns in water use and leaf turnover of different plant functional types in a species-rich woodland, south-western Australia. *Plant and Soil* 257: 295-304.

Virgona, J.M., Gummer, F.A.J. and Angus, J.F. (2006). Effects of grazing on wheat growth, yield, development, water use, and nitrogen use. *Australian Journal of Agricultural Research* 57: 1307-1319.