What we learned

Finding a suitable planting site has been challenging. Survival seems to be better within existing sites in sheltered situations, but has also been very good on an exposed road batter made up of subsoil. For a second translocation attempt at Nadgigomar Nature Reserve we will choose a site that already has at least one species of *Pomaderris* growing on it. We have noticed that where one *Pomaderris* species grows there are often several. Mycorrhizal associations have not been recorded, to our knowledge, for this genus, but perhaps cannot be ruled out.

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Threatened plant translocation case study:

Prostanthera eurybioides (Monarto Mintbush), Lamiaceae

KYLIE MORITZ[1]*, PHIL AINSLEY[2] AND DOUG BICKERTON[1]

[1]Department of Environment Water and Natural Resources, [2]Zoos South Australia.
*Email: kylie.moritz@sa.gov.au

The Species

- Low spreading shrub growing to less than 1 metre.
- Endemic to South Australia.
- Twelve extant natural populations that occupy an area of approximately 466 hectares.

Threatening Processes

- Small isolated populations.
- Lack of recruitment.
- Inappropriate disturbance regimes (e.g. infrequent fire).
- Grazing by kangaroos and pest herbivores.

Deciding to translocate

Prostanthera eurybioides has a limited distribution in two disjunct areas separated by 160 km, Monarto (near Murray Bridge) and the Mt Monster area in the south east of South Australia. The population size is estimated at 2,084 individuals; 1,175 at Mt Monster (152 planted) and 909 at Monarto (682 planted). There is very little evidence of recruitment at Monarto, with this population experiencing senescence and decline. By comparison, in 1992, an estimated one-third of individuals in Mt Monster Conservation Park were juveniles (Davies 1992).

Genetic and seed germination studies (Ainsley *et al.* 2008a, 2008b) were undertaken to investigate the lack of recruitment at Monarto. Genetic work showed

Figure 1. *Prostanthera eurybioides* flower. Photo: Chris Obst

that Monarto populations maintain high diversity and low inbreeding and are not at risk of extinction due to genetics. Germination studies found the seed to have low viability and seed dormancy in the form of a mericarp plug which acts as a barrier to germination. (*Editor's note: You can see a great depiction of what a mericarp plug is in Figure 3*).

Previously there had been 1,454 *P. eurybioides* plants translocated in the Monarto area: 423 from seed (1996, 1998-99), 1000 from cuttings (2003) and 31 from tissue culture (2007).

Despite these translocations, by 2013 the planted population at Monarto was only approximately 350 and the remnant population had declined significantly. It was clearly time to take further action at Monarto.

In 2013 the SA Seed Conservation Centre was asked to test the viability of *P. eurybioides* seed collected from Monarto sites, determine the best germination method for use by nurseries, and to use this method to produce a large number of plants for translocation.

Aim of the translocation

- To successfully establish 500 mature adult plants, raised from seed, into 10 new sites with secure tenure.
- To explore the response of planted *P. eurybioides* to management treatments (position within remnant vegetation, type and size of plant guard, weed control pre- and post-planting, watering through summer), and subsequently inform future translocations.

Translocation working group and key stakeholders

- SA Murray-Darling Basin Threatened Flora Recovery Team (SAMDB TFRT).
- SA Seed Conservation Centre – research.
- Mount Lofty Botanic Gardens – seedling propagation.
- Aboriginal Learning on Country, Zoos SA – planting, maintenance and survey assistance.

Biology and Ecology

- Flowers September to November.
- Pollinator is unknown, the introduced honey bee has been observed regularly visiting flowers.
- Seeds dehisce (i.e., burst open) December to January.
- Seeds consist of four mericarps enclosed by a persistent calyx.
- Removal of mericarp plug results in improved germination.
- Hot dry summer (hot temperatures help overcome dormancy associated with mericarp plug and seed embryo); germination usually occurs following autumn/winter rainfall.
- Plants associate with rocky granitic outcrops.
- Occurs in low open mallee woodland or tall shrubland often with *Melaleuca uncinata*.
- Occurs on sandy loam to loam, pH 6-7.

Site selection

Sites were identified in the Monarto area, within two km of existing remnant populations. Historical records of *P. eurybioides* were also used to inform planting locations. Locations with secure tenure were identified in two areas of Kinchina Conservation Park (CP) and private land protected by a Heritage Agreement (HA) (covenanted land). These areas supported habitat suitable for *P. eurybioides* and were being actively managed for rabbits and weeds.

Figure 2. Spreading *Prostanthera eurybioides* shrub. Photo: Clive Chesson

Nine sites were selected in Kinchina CP, and one in the HA. The HA property has the largest remnant population of *P. eurybioides*, while the Kinchina sites have historic or remnant records nearby.

Translocation proposal

A formal plan was not prepared for this translocation. The translocation process was directed by the SAMDB TFRT following their approval of a report prepared on the seed collection, viability studies and treatment through to propagation. Data on the translocation was included in the region's translocation database and monitoring was undertaken for each site.

The Recovery Team approved the translocation as it aligned with recovery plan targets to double the population size in five years by planting from seed stock into secure sites.

Pre-translocation, preparation design, implementation and ongoing maintenance

Seed was collected from seven sites (seed batches) across Monarto (within a 55 ha area of occupancy), tested for viability and treated with a dry heat pulse (80˚C) / smoked water combination. Seedlings emerged within 2-3 weeks of sowing and were transferred to tubes. Each tube was labelled according to its original seed batch. In all, 413 seedlings were produced; 333 of which were of suitable size for planting in the first year.

In June 2014 the 333 seedlings were planted out. Planting batches comprised a mix of the seven seed batches. Mixing the seed was deemed acceptable due to the close proximity of the Monarto remnant sites to each other, the fact that none of the populations are large and that mixing would potentially enhance genetic diversity. The 10 planting sites varied in size from 12 to 85 plants.

At nine of the sites (Kinchina sites only) weeds were treated in one metre spray circles around the planting zone (glyphosate), at least two weeks before planting. Seedlings were planted into a depression to increase water holding potential, a fertiliser tablet was provided and a corflute guard was installed. Plants were watered in.

In 2015, a further 80 seedlings were planted into one of the Kinchina CP sites. Total planting across both years was 413 plants. These plants received the same treatment, except that both a corflute and larger mallee mesh guard were installed together in the second year.

Figure 3. Seed of the Monarto mint bush with mericarp plug intact (top) and removed (bottom). Photo: Phil Ainsley

Monitoring and evaluation

Monitoring of plant survival, health and flowering was undertaken for three years following the translocation.

By September 2014 the survival rate was 63%, with significant loss at two sites due to competition with established mallee vegetation, no watering to date, and a very dry spring. By April 2015, 46% had survived. With supplementary planting in June 2015 (a further 80 seedlings), the count in September 2016 was 218 plants (52% survival rate across both plantings). Survival of the second-year plants was much higher. In the second summer following planting, approximately 70% of the plants were flowering.

Subsequent actions

- Watering occurred twice over the first summer for all sites.
- Hand weeding occurred within the guards for the first two years.
- Mallee mesh wire guards (800 x 350 mm) replaced corflute guards after 12 months, as plants were outgrowing the guards.

Outcomes

- The original target of 500 plants was not achieved, due to the low viability of the 2013 seed and high plant mortality.
- Propagation methods suitable for use by community nurseries were developed from this process and a community propagation workshop was held in 2016, attended by 25 people.

Figure 4. Planted *Prostanthera eurybioides* flowering at 12 months. Photo: Kylie Moritz

Figure 5. 1000 *Prostanthera eurybioides* seedlings for planting in 2018. Photo: Matt Coulter

What we learnt

Seedlings planted close to established vegetation did not survive, presumably due to water stress and competition from mature plants.

- Plants need to be watered through the first two summers.
- Guards are essential as the plants are highly palatable and seemingly targeted for 'rubbing' by herbivores.
- 2017 saw very high seed production across Monarto, and collections were made from all sites. Testing indicates that this seed is highly viable. Subsequently 1000 plants have been propagated from seed, for translocation in June 2018.
- Seed collection should be timed during high seed production years to achieve higher seed viability.

Editor's note: This is the second article to be published by APC on translocation of Prostanthera eurybioides *in recent times. You may also be interested in the article on* Prostanthera eurybioides *translocation by Manfred Jusaitis in the previous issue of APC (27-1).*

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Threatened plant translocation case study:

Translocation of threatened flora for the Warrell Creek to Urunga upgrade of the Pacific Highway, Mid North Coast NSW

ANDREW BENWELL

Director, Ecos Environmental Pty Ltd.
Email: andrewbenwell@bigpond.com

The Species

Six threatened species impacted by the highway upgrade were translocated:

- *Marsdenia longiloba* (Slender Marsdenia).
- *Dendrobium melaleucaphilum* (Large-flowered Spider Orchid).
- *Alexfloydia repens* (Floyds Grass).
- *Niemeyera whitei* (Rusty Plum).
- *Hickesbeachia pinnatifolia* (Red Bopple Nut).
- *Artanema fimbriatum* (Koala Bells) (recommended for threatened species listing).

Threatening Processes

Threatening processes affecting these species include habitat clearing, timber harvesting, small population size, poor understanding of species life cycle and ecology, plant collectors (Spider Orchid) and sea level rise (Floyds Grass).

Deciding to translocate

A translocation feasibility assessment was undertaken before deciding to translocate each species. The main factors considered were:

- Technical feasibility, including previous translocation results for the same or similar species.
- Potential for generation of new and useful scientific information.
- Availability of receival sites with suitable habitat and security of tenure.