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**Figure 6. Regeneration 11 months after a controlled burn. Photo: Peter Dufourq**

## Threatened plant translocation case study:

# *Androcalva perlaria* (Pearl-like Androcalva) Malvaceae


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### The species

- Low growing, shorter-lived perennial shrub.
- Endemic to Western Australia.
- Seven extant natural populations.
- Narrow geographic range (~800 km$^2$).

### Threatening processes

- Habitat loss and fragmentation.
- Grazing.
- Mining.
- Altered hydrology and water quality.
- Weed competition.
- Altered fire regimes.
- Climate change.

### Deciding to translocate

*Androcalva perlaria* was first collected on the south coast of Western Australia in 1993. Intensive surveys in 2006 and 2007 of 124 wetlands identified three additional populations with several more recently discovered (Grange Resources Limited 2009). Currently, seven natural populations are known which collectively contain no more than 400 individuals. Five of these populations are found on farms in bushland fragments. The largest population is found along a roadside reserve. The second largest (~70 plants) occurs within a proposed mine and may be removed in future (Grange Resources Limited 2009). Due to the future mine impacts as well as a lack of long-term protection within a reserve, two experimental translocations were implemented at two different locations.

### Aim of the translocation

Two research-only translocation trials were conducted to establish some principles for undertaking large-scale conservation focussed translocations. The first translocation (2012) gathered baseline information about the general *in situ* plant performance and no specific treatments were assessed. The aim was to identify critical factors that may reduce overall translocation success using a site that reflected the attributes of natural *A. perlaria* populations (*i.e.,* wetland habitats), had long-term security (C Class Nature Reserve) and was in close proximity (< 5 km) to natural populations.

A second translocation was established (2014) that was based on the outcomes of the first translocation.

The second trial tested several treatments, aimed to improve overall survival, plant health and performance in response to: 1) two different planting sites; 2) different propagating material (cuttings vs seeds); 3) addition of fertiliser and 4) the use of an anti-stress agent (Acetylsalicylic acid [Aspirin]) to temper the potential effects of transplant shock.

**Figure 1. Top: Proposed Southdown minesite where *A. perlaria* plants are found naturally (large plant in the foreground) and where a research translocation was implemented for this species in 2014 (the location is indicated in this image by the presence of the bamboo stakes and white pin flags in the background); middle left: Six month old translocated *A. perlaria* plant at the Mettler Nature Reserve site that is indicative of the poor health of the majority of plants found at this location; middle right: Six month old translocated *A. perlaria* plant at the proposed Southdown minesite that is indicative of the excellent health of the majority of plants found in this location; and bottom: healthy 18 month old translocated flowering *A. perlaria* plant at the proposed Southdown minesite. All photos: Shane Turner.**

## Translocation working group and key stakeholders

- Kings Park Science – to oversee development and implementation of both translocations, the production of plants and ongoing monitoring and maintenance of translocation sites.
- The University of Western Australia – School of Biological Sciences – for development of the experimental approach, the analysis of data and reporting of research findings.
- Department of Biodiversity, Conservation and Attractions, Western Australia – Albany District – for organising the approvals process for the translocation, as well as logistical support.
- Albany District Threatened Flora Recovery Team – assisted with site selection, report findings to the relevant stakeholders and as a point of contact for the local community.
- Grange Resources –provision of funds to support both translocations and the use of one translocation site.

## Biology and ecology

- Insect pollinated.
- Small arillate ant dispersed seeds.
- Recruits from seeds which are physically dormant and form a persistent soil seed bank.
- Dormancy is broken by heat (*i.e.,* fire) so recruitment is mainly after a fire.
- Rapid growth.
- Shorter-lived (~10 years).
- Mediterranean climate with hot dry summers and cool wet winters.
- Restricted to fringing vegetation around wetlands.
- Found in close association with threatened ecological communities.

## Site selection

A potential translocation site was initially identified through a desktop assessment of bushland remnants. The search focused on wetland areas with a similar vegetation assembly to natural *A. perlaria* populations, land with secure tenure and security, and a general absence of plant disease and weeds. Mettler Lake Nature Reserve (~400 ha) was selected which is within 8–20 km of natural *A. perlaria* populations. The specific location reflected the natural attributes of *A. perlaria* sites such as similar soil, adjacent to a wetland and a ~60% vegetation similarity.

In response to the relatively poor plant performance a second translocation trial was established two years later. For comparative purposes, the original Mettler site was used again as part of this trial with a second translocation site selected at the proposed minesite, adjacent to natural *A. perlaria* plants. This second site was selected

as the natural *A. perlaria* plants at this site were in good health. At both sites, a series of identical treatments were assessed to determine whether the poor results observed in the first trial were due to specific site problems or other causes.

## Translocation proposal

Two translocation proposals were developed using a template provided by the (then) Department of Parks and Wildlife (DPaW). The proposal was written in the context of scientific research rather than for achieving specific conservation outcomes. Both were assessed by two independent reviewers to determine whether they met DPaW's policies and guidelines. Written feedback was provided after the initial review process with revised proposals resubmitted for final approval.

## Pre-translocation preparation, design, implementation and ongoing maintenance

For the first translocation, a small fire was put through the site (May 2012) before the trial was installed in July 2012, to reduce interspecies competition and to provide increased resources (water, light and nutrients).

For this trial, 235 plants were produced (cuttings) from 78 different genotypes six months prior to planting. The whole site was fenced (~20 m x 20 m wire fence to 1.2 m tall) to deter herbivores. After six months initial survival was high (~70%), but after nine months (April 2013) the fence was deemed inadequate because many plants were significantly eaten. A second taller (1.5 m), more secure fence was installed which prevented further herbivory.

The second trial (July 2014) tested different plant treatments. Cutting-derived plants were produced through directly striking cuttings into forestry pots while seed derived plants were sown directly into pots. The two sites selected were 1) Mettler Lake fenced site (same site as 2012 translocation) and 2) the proposed minesite, adjacent to healthy *A. perlaria* plants. Within each site, plants were randomly placed in lines 1 m apart, with subsets receiving fertiliser and/or Asprin. Plants were assessed at the beginning, after 6 weeks, then 6 monthly thereafter for up to two years.

## Monitoring and evaluation

Plants were regularly assessed for survival, health, growth, flowering and fruiting. After nine months for the first translocation it was evident that plants were struggling with only 46% of plants alive and 67% of these showing significant signs of stress. Over the next few years survival continued to decline and plants continued to exhibit significant signs of stress and produced limited growth.

Monitoring for the second translocation was undertaken using the same regime. Interestingly, plants at the new site performed much better in terms of overall survival (91.3 ± 3.1%), plant health (4.5 ± 0.6) and growth (100 ± 39 cm wide) compared to the other (Mettler) site where plants performed much more poorly *i.e.,* lower survival (41.3 ± 11.8%), poorer plant health (2.8 ± 0.5) and smaller growth (33 ± 14 cm wide). Within both sites consistent and significant treatment effects were noted.

## Subsequent actions

The translocation program was completed and no further monitoring has occurred since August 2016. Nevertheless, given that the project was principally for scientific purposes we believe all the goals that we set out to achieve have been attained. Outcomes and approaches assessed during both translocations have been summarised as an industry report to inform and guide future translocation attempts undertaken on this species should mining commence in the future.

## Outcomes

The original aim, which was to assess the feasibility of undertaking a successful translocation on *A. perlaria* exceeded all expectations with the successful long-term (>2 years) establishment of over 150 plants that have since flowered and produced viable seeds. While the initial site (*i.e.,* Mettler site) did not meet expectations the use of a second site (proposed minesite) proved that a high level of success (>90%) can be achieved. Poor site selection was by far the biggest single factor affecting translocation success. Plants at the proposed minesite have grown at rates similar to plants observed in natural populations (Turner *et al.* 2013).

## What we learned

When attempting a translocation for the first time do not overcomplicate things – keep it simple and small and use this initial attempt to establish a series of first principles to base, develop and inform future translocation attempts. Supplementary watering was not essential for establishing this species from tubestock (>90% survival without irrigation). Plants performed exceptionally well in suitable habitat (in this case a site where *A. perlaria* plants occur naturally) so spending the time to carefully identify suitable planting sites based on floristic assembly, soil types, aspect and landform is likely to be a good investment of resources.

## Acknowledgements

This translocation program would not have been possible without the assistance and financial support of Grange Resources and in particular Brendan Corry, Michael Everitt and Glenda Stirling. Southdown manager Peter Diprose and Jenny North are also thanked for their assistance in providing quick and easy access to the Southdown translocation site as well as on site accommodation. Sarah Barrett, Susanne Schreck, Dylan Lehmann and Susan Whiteley are also thanks for their valuable support and assistance with planting and monitoring.

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## Threatened plant translocation case study:

# *Astelia australiana* (Tall Astelia) Asteliaceae


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### The species

- Long-leaved, tufted, perennial herb.
- Reproduces both sexually and vegetatively.
- Long-lived (30+ years).
- Endemic to cool temperate rainforests and riparian forests of Victoria.
- Narrow and fragmented distribution in the Central Highlands (14 sites) and Otway Ranges (one site).
- Overall abundance is estimated at 10,000 plants.
- Abundance within sites is highly variable, from areas in which it is the dominant component of the understorey with ~4000 individuals to areas with fewer than 10 individuals.

### Threatening processes

- Grazing by introduced herbivores (deer species).
- Wildfire.
- Diseases caused by *Pythium* and *Phytophthora* species.
- Seed predation through frugivory.
- Changes in stand structure.
- Habitat fragmentation.
- Climate change.

### Deciding to translocate

*Astelia australiana* is listed as a threatened species (Cutler and Murphy 2010) due to the decline and fragmentation of its populations attributed to successive wildfires in the 1920s (Willis 1939). It is associated with the cool temperate rainforest community, which is also listed as a threatened vegetation community in Victoria, due to significant decline in its extent, which is attributed to an increase in wildfire frequency since European colonisation (Department of Sustainability and Environment 2009; SAC 1992). Long-term (20-year) monitoring of *A. australiana* populations revealed that the species has continued to decline across its range with a 57% reduction in abundance in monitored population between 1993 and 2013.

### Aim of translocation

This translocation involved two translocation programs. The first program was a trial with the aim to assess if translocation was a viable option for the species and to assess if seed or seedlings could be used for translocation. The second program had several aims:

- To increase the species range.
- To reduce the risk of a single wildfire taking out remaining populations.
- To mitigate the risk of climate change on the species by moving individuals into a few higher elevation sites.
- To replace a population that had gone locally extinct in 2016 at one site.

### Translocation working group and key stakeholders

- School of Ecosystem and Forest Sciences, The University of Melbourne.
- Conservation Ecology Centre, Otway Lighthouse Rd, Cape Otway, VIC 3233.
- Parks Victoria.
- Department of Environment, Land, Water and Planning (DELWP).
- Foundation for Australia's Most Endangered Species (FAME).