Threatened plant translocation case study:

Acacia cochlocarpa subsp. *cochlocarpa* (Spiral Fruited Wattle), Fabaceae

LEONIE MONKS*, DAVE COATES AND REBECCA DILLON
Department of Biodiversity, Conservation and Attractions, Western Australia
*Email: leonie.monks@dbca.wa.gov.au

The Species

- Prostrate long-lived shrub.
- Endemic to Western Australia.
- Five extant natural populations that occur over a 300 km range to the north and east of Perth.

Threatening Processes

- Habitat loss and significant habitat fragmentation through agricultural development.
- Weed competition.
- Herbicide spray drift.
- Risk of accidental destruction during maintenance of the road verges.

Deciding to translocate

In 1997 *Acacia cochlocarpa* subsp. *cochlocarpa* was known from just two small populations confined to a narrow linear remnant along a road verge with a combined total of 51 plants. As a result of its rarity and the ongoing threats, *A. cochlocarpa* subsp. *cochlocarpa* was listed as Rare Flora in 1997 under the Western Australia *Wildlife Conservation Act 1950* and ranked as Critically Endangered. Subsequently an Interim Recovery Plan was developed to oversee the recovery process. Despite the discovery of three new populations more recently, a combination of the small number of populations, extremely limited available habitat and threats that were difficult to manage effectively *in-situ* meant that the species was always likely to continue to decline without significant management intervention. The establishment of a translocated population in a new secure location was considered to be the most effective action to initiate successful recovery of the species.

Aim of the translocation

The aim of the translocation was to successfully establish 200 mature adult plants in a secure site where threats were absent or could be effectively managed. We aimed to establish a viable population, one that was capable of undergoing natural population processes, such as producing viable seed and recruitment of subsequent generations.

Golden flowers of the Spiral fruited wattle. Photo: L. Monks/DBCA

Translocation working group and key stakeholders

- Department of Biodiversity, Conservation and Attractions, Western Australia (formerly Department of Conservation and Land Management) – to oversee development and implementation of translocation and ongoing monitoring and maintenance of translocation sites.
- Department of Biodiversity, Conservation and Attractions, Western Australia (Botanic Gardens and Parks Authority) – propagation of seedlings.
- Moora District Threatened Flora Recovery Team – to oversee implementation of Interim Recovery Plan for the species, including translocation.

Biology and Ecology

- Insect pollinated.
- Seeds are gravity dispersed and can also be dispersed by ants.
- Seeds are physically dormant.

- Dormancy is broken when the seed coat is breached, often by fire, so recruitment is primarily confined to post-fire period (Yates and Broadhurst 2002).
- The subspecies is known from areas of red to brown clay within open low scrubland.
- Climate is Mediterranean with hot dry summers and cool wet winters.

Site selection

Site selection initially involved overlaying vegetation maps and geological maps and highlighting areas that contained similar vegetation associations and underlying geology as that found at the remaining locations of this species. Site visits were made to the areas that had similar vegetation and geology, particularly those sites that occurred on conservation estate. Plant species that occurred at the potential site were identified, soil type was described and any threats that occurred or could potentially occur in the future were noted.

Initially, two sites were chosen in a nature reserve that was less than 5 km from the natural populations, as these sites had the same soil type and vegetation type as the natural populations and many associated plant species in common. A further two sites were chosen in another nature reserve, also with similar habitat features, a decade after the first two sites had been established.

Translocation proposal

A Translocation Proposal was developed using a template provided by the (then) Department of Conservation and Land Management (CALM) to guide and provide justification for the translocation. The Proposal was submitted to CALM where it was assessed by two independent reviewers as to whether it met the Department's policy on plant translocations (Anon 1995), before being given approval for the translocation process to commence.

Pre-translocation preparation, design, implementation and ongoing maintenance

Both sites were areas where gravel extraction had previously occurred. In preparation for the translocation both were deep ripped to alleviate the compaction from the former use of these sites.

The first planting, in 1998, utilised direct seeding, where seeds were pre-soaked in boiling water prior to translocation planting in an attempt to break physical dormancy. Seeds were planted in one of five small fenced areas (16 m x 5 m) to protect any germinants from grazing by vertebrate herbivores. Initial germination was poor (just 4%) and prompted a move to use nursery-propagated seedlings in subsequent plantings. An experimental design to assess whether summer watering, mulch or a combination of water and mulch would enhance survival and growth of germinants was set up, but due to the poor germination, results were not able to be analysed.

Experiments designed to assess translocation methods were undertaken in 1999 and 2000. These investigated seedling age at planting, summer watering, and grazing. The impact of grazing was assessed by planting seedlings within or outside five small fenced areas which excluded kangaroos and rabbits. The influence of summer watering was assessed by applying one litre once a week (delivered by an automated gravity fed system) to half the plants. The effect of plant age at planting was assessed by planting seedlings that had either been grown for one year or two years in the nursery.

Monitoring and evaluation

We monitored plant survival, growth (plant height and width), health, flowering and fruiting. By 2009, annual monitoring had shown the two sites doing well, with survival at 40% (214 plants) at the first site and 70% (318 plants) at the second site. All plants had flowered and set viable seed. In both cases the numbers of adult plants at the translocation sites had exceeded our goal of 200 adult plants.

Monitoring enabled evaluation of the effectiveness of the grazing, watering and plant age treatments. Results, ten years after planting, indicated that by excluding herbivores almost twice as many plants survived (55% of fenced plants compared to 29% of unfenced plants),

Implementing a prescribed fire on a translocated population of the Spiral fruited wattle to induce recruitment. Photo: L. Monks/DBCA

Infill planting at a translocation site for the Spiral fruited wattle. Photo: L. Monks/DBCA

The characteristic seed pods of the Spiral fruited wattle. Photo: L. Monks/DBCA

slightly more plants watered over the first summer survived (81% compared to 76%) and marginally more one year old seedlings survived than the older two year old seedlings (80% compared to 76%).

Subsequent actions

Based on the ten years of monitoring data from the first translocations the decision was made to establish additional populations in other locations to ensure the long term viability of the species. Two new sites were chosen in another nearby reserve and planted with seedlings in 2010 and 2017. Using the knowledge gained from the first two translocations the sites were both fenced and all seedlings were watered over the initial establishment period, during the summer months.

Whilst the monitoring data showed good survival, and flowering and fruiting occurring at rates similar to the natural population, there had been no recruitment. For the translocations to be considered successful the population must be able to recruit subsequent generations. This lack of recruitment was not unexpected as previous research had indicated that recruitment was largely confined to a post-fire period (Yates and Broadhurst 2002). However, in the fragmented, highly cleared landscape in which the translocation sites are located, fires are unlikely. So the decision was made to carry out a management burn at the original translocation site to encourage recruitment. The population of 183 adult plants was burnt in 2015 and follow up monitoring showed significant recruitment from the seed bank (>900 seedlings) and some survival and resprouting of a small number of adult plants. Seedling survival two years after the burn, was close to 80% and a small proportion of plants (25%) had become reproductive.

This research will be incorporated into a Population Viability Model that is being developed for the species. The model will aid decisions relating to long term population viability such as how many plants are required per population, how many populations will ensure species persistence and what is the appropriate fire regime.

Outcomes

The original aim, which was to establish 200 adult plants, was met and exceeded with the establishment of four new viable populations of greater than 200 adult plants each, in secure, threat free sites.

What we learned

- It is possible to establish new populations of this species.
- Using an experimental framework when establishing translocations can provide critical information for long term translocation success.
- Fencing and summer watering improves survival of planted seedlings.
- Younger (1 year old) seedlings established better than older (2 year old) seedlings.
- Controlled burn of an adult population, which had set seed, stimulated recruitment.

References

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