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More case studies from around the globe
Edited by Pritpal S. Soorae

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Trial translocations of *Leionema equestre* on Kangaroo Island, South Australia

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Introduction

Leionema equestre (DA Cooke) Paul G. Wilson (Rutaceae) is a dwarf, spreading shrub with small, saddle-shaped leaves, bearing terminal white-pink flowers in late winter-spring. It is endemic to Kangaroo Island, South Australia, where it occurs on sandy to lateritic soils. The natural population was restricted to a 10 km x 10 km area lying between D'estrees Bay and Nepean Bay, until in 2002 an outlier population was discovered near Stokes Bay, about 44 km away. The total population of *L. equestre* on the island has been estimated at approximately 2,600 plants (Taylor, 2008). Most plants occur on roadsides, although about 35% are presently conserved on private land under Heritage Agreements (Jusaitis, 2000). Roadside populations are threatened by encroaching agricultural and environmental weeds as well as road maintenance operations. *L. equestre* growing in seral communities were found to decline as ecosystems approached climax. The species prefers open, well-lit areas for establishment from seed. Recruitment occurs primarily in response to land clearance or bushfire events, both of which also encourage weed spread into small roadside populations adjacent to agricultural land. *L. equestre* is listed as Endangered under the Australian Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and under IUCN (2001) criteria (CR B1&2ab(ii)(iii)(v)).

Flowers and buds of *L. equestre* © M. Jusaitis

Goals

- Goal 1: Safeguard the natural populations of *L. equestre* by establishing a new population in a nearby protected Conservation Park.
- Goal 2: Examine the influence of herbivores and propagule type on translocation success.

Success Indicators

- Indicator 1: Survival, flowering, reproduction and recruitment of *L.*

equestre over a period of 18 years following translocation to a secure, conserved habitat.
- Indicator 2: The completion of an experimental translocation to evaluate the effects of herbivores and propagule type on establishment success.

Project Summary

Trials were set up at 3 sites in Beyeria Conservation Park, about 4 km from the nearest remnant population (Jusaitis, 1996). The sites varied in soil texture: Site 1, sandy with ironstone gravel; Site 2, sandy; Site 3; lateritic soil with ironstone gravel.

Direct seeding and herbivory: Translocation by direct seeding was trialled at each site by clearing a 1 m^2 quadrat of vegetation using a fire rake and loosening the soil surface sufficiently to provide a friable seed bed. *L. equestre* seeds were pre-scarified with concentrated H_2SO_4 for 5 min, then incubated with 50 mg/l gibberellin $GA_{4/7}$ for 5 days before sowing in May, 1992 (Jusaitis, 2000). Fifty pre-treated seeds were sown into each of 3 replicate quadrats at each site, and the soil packed down tightly to cover the seed. Wire baskets (430 mm x 430 mm x 100 mm; L, W, H) were up-ended over a portion of each quadrat as protection from herbivory.

Maximum seedling numbers were observed after 4 months, when 39%, 55% and 62% of sown seed had emerged at Sites 1, 2 and 3 respectively. Survival subsequently declined at all sites over time, but remained stable at about 10% for 13 years. From 2006 - 2008 we experienced three consecutive years of severe drought, resulting in further declines in seedling survival. Most recently (2009) 5%, 3% and 1% of sown seed survived as seedlings at Sites 1, 2 and 3 respectively. All survivors were growing under the protection of wire baskets. Seedlings emerging outside baskets were always shorter in height than protected seedlings, and none survived beyond Year 10. Thus herbivore grazing contributed substantially to seedling mortality.

Growth of seedlings (measured by plant height) was highest at Site 1 and lowest at Site 3. Flowers were first observed on seedlings in their 7^{th} year (although plants were not checked in Year 6). This contrasted with naturally occurring seedlings that flowered in their 4^{th} year of growth and also tended to be taller at an equivalent age.

Transplants and the effect of propagule type: In May 1992, one-year-old seedlings were transplanted in 3 replicates of 10 plants at each site. At Site 3, an additional 3 replicates of five cutting-propagated plants were transplanted to compare their growth with that of seedlings. Site 3 consistently showed the best survival of transplants for the first 14 years, at which time (2006) 13%, 7% and 27% of transplants remained at Sites 1, 2 and 3 respectively. However, this was followed by 3 consecutive years of drought which left no survivors at Site 2 and only 3.3% and 2.2% at Sites 1 and 3 respectively, by 2009.

A 16 yr old plant translocated from seed at Site 1 under the protection of a wire basket © M. Jusaitis

Grazing damage to transplants was evident at all sites, as no grazing protection was provided in this trial. Plants were able to recover from quite heavy grazing, as long as 30 mm - 50 mm of basal shoots remained, by regrowing from dormant axillary buds (Jusaitis, 2000). However, repeated bouts of grazing, probably by kangaroos, at all sites meant that survivors did not grow significantly over the course of this trial (18 years), remaining at average heights of between 100 mm - 150 mm. Grazing damage appeared to be correlated with the degree of exposure of transplants; those in exposed, open areas were usually more severely grazed than those planted under or amongst other shrubs. Sheltered transplants may have evaded grazing because they were less conspicuous to herbivores, or because adjacent plants discouraged close scrutiny by herbivores because of spiny leaves or other defensive properties.

In comparing seedlings with cutting-derived transplants at Site 3, survival did not differ significantly between the two founder propagule types. However, plant growth (measured by height) was affected. At planting, seedlings were (on average) taller than cuttings, but by the first assessment date, their heights no longer differed. Cutting-derived transplants grew rapidly during their first spring, but seedlings decreased in height over this time, showing evidence of grazing damage. After acclimatisation, grazing rates for both sets of plants equalized. This result suggests that early in establishment, seedlings were more palatable than cutting-derived plants and were thus more often targeted by herbivores. Indeed, shoots of transplanted seedlings were generally softer and more tender than those of cutting-derived plants. Furthermore, the initially larger seedlings may have been more conspicuous to grazers than the smaller cutting-derived plants.

Cutting-derived plants flowered earlier than seedlings. All cutting transplants flowered in their first spring (4 months after planting), but 15% of seedling transplants first flowered two years after planting. Seed-set of translocated plants was compared with that of wild populations in 2002 and 2003. An average of 15% of flowers set seed in wild populations in both years, although individual populations varied widely (2% - 28%). However, translocants had a significantly

lower average seed set, particularly in 2002 (1%) which was a dry year, compared with 2003 (4%).

Translocated *Leionema equestre* seedling showing regrowth from grazing damage © M. Jusaitis

Major difficulties faced

- Three consecutive years of severe drought (2006 - 2008) resulted in significant plant losses in the translocated population.
- Herbivores grazed foliage of exposed translocants throughout the course of the trial.
- Sites chosen for translocation were not within the known natural range of the plant (although only 4 km from it) and so may not be perfectly ideal habitat.

Major lessons learned

- Early protection of transplants and seedlings from herbivore grazing is important. All translocation sites were close to the edge of the park, and this may have amplified grazing pressure.
- Chose planting sites near or under the protective canopies of herbivore-deterrent plants such as *Grevillea ilicifolia* or *Petrophile multisecta*.
- Germinating seedlings rapidly developed a deep tap root to optimize survival over their first summer. This may give them an early advantage over transplants.
- *L. equestre* established and flowered sooner from cutting-derived transplants than from seed-derived transplants. Direct seeding using pretreated seed was also successful, although resulting seedlings took longer to establish and become reproductive.
- Lower growth rates, delayed flowering, reduced seed set, and heavier grazing of translocants compared with wild plants suggest that the 3 translocation sites chosen in Beyeria Conservation Park may be less than optimal habitats for *L. equestre*.

Success of project

Highly Successful	Successful	**Partially Successful**	Failure
		√	

Reasons for success/failure:

- As of September 2009 (Year 18), 20 translocants remained alive in Beyeria Conservation Park, consisting of 15 seedlings from the direct seeding trial, 3 cutting-derived transplants, and 2 seed-derived transplants. Eleven of these survivors were at Site 1.
- Translocants reached reproductive capacity and set seed, but natural recruitment from seed was not observed at any site within the timescale of this project.
- Several consecutive drought years caused significant plant losses.
- Ongoing grazing by kangaroos reduced growth and reproductive capacity of translocants.
- Preliminary research on propagation methods for *L. equestre* (Jusaitis, 2000) enabled sufficient plants to be propagated for translocation trials.

References

IUCN. 2001. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

Jusaitis, M. 1996. Experimental translocations of endangered *Phebalium* spp. (Rutaceae) in South Australia: an update. Re-introduction News No. 12: 7 - 8.

Jusaitis, M. 2000. The ecology, biology and conservation of threatened *Phebalium* species in South Australia. Plant Biodiversity Centre, State Herbarium of South Australia, Department for Environment & Heritage, South Australia.

Taylor, D.A. 2008. Draft recovery plan for 15 nationally threatened plant species on Kangaroo Island, South Australia (2nd edn): 2003 - 2013. Department for Environment & Heritage, Government of South Australia.