



# Global Re-introduction Perspectives: 2013

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



IUCN/SSC Re-introduction Specialist Group (RSG)





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## Experimental translocation of the Peep Hill hop-bush into conservation reserves in the semi-arid Mallee of South Australia

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### Introduction

The Peep Hill hop-bush (*Dodonaea subglandulifera* JG West) (Sapindaceae) is a dioecious, erect shrub to 2 m high. It flowers from February to June, seed capsules mature between August and December, and seeds dehisce over the warmer months of December and January (Jusaitis & Sorensen, 1994). The plant is endemic to South Australia and restricted to several disjunct populations in the semi-arid mallee areas of the South Australian Murray Darling Basin, with an outlying population near Wallaroo on the upper Yorke Peninsula (Moritz & Bickerton, 2010). It is usually found on loamy soils over limestone or slate, on private land or roadsides. None of the known wild populations occur in conservation reserves. The main threats to the species include herbivore grazing and environmental weeds. Roadside populations are usually small and isolated and can be subject to road maintenance and agricultural activities. *Dodonaea*s produce copious amounts of small, light pollen and are typically wind pollinated (West, 1993), so adequate cross-pollination is generally assured within sub-populations. The species is listed as Endangered under the Australian Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act), and assessed as Vulnerable under IUCN (2001) criteria (VU B1&2ab(iii,v)).

### Goals

- **Goal 1:** Safeguard the natural populations of *D. subglandulifera* by establishing new populations in two protected and secure conservation reserves.



*Dodonaea subglandulifera* shoot showing leaves and fruit © B. Sorensen

- Goal 2: Examine the influence of founder propagule on translocation success.
- Goal 3: Examine the influence of herbivore grazing on plant establishment following direct seeding.

## Success Indicators

- Indicator 1: Survival, flowering, reproduction and recruitment of *D. subglandulifera* over a period of 20 years following translocation to suitable secure sites.
- Indicator 2: The completion of an experimental translocation to evaluate the effect of founder propagule type on establishment success.
- Indicator 3: The completion of an experimental translocation to evaluate the effect of herbivores on plant establishment from direct seeding.

## Project Summary

*Dodonaea subglandulifera* was translocated into two protected conservation parks; Yookamurra Sanctuary, secured against rabbits and feral animals by a 2 m high electric fence around its boundary, and Brookfield Conservation Park, ostensibly free-range to rabbits, goats and other vermin. These parks are respectively 8 and 15 km from the nearest wild population of *D. subglandulifera* and are the closest conserved areas with similar habitat and soil types to those in the natural range of the species. Yookamurra has a slightly higher average annual rainfall (270 mm) than Brookfield (248 mm).

Seed collected from the nearby Peep Hill population in February 1991 was used to raise seedlings for translocation and also as a source of seed for direct seeding trials. Five-month-old nursery-raised seedlings were transplanted to three sites in each park in June 1992 (30 plants per site, laid out as 3 replicates of 10 plants). At the same time, direct seeding trials were set up at a single site in each park. Seed was pre-treated by soaking in just-boiled water for 30 seconds, then kept

moist until sown the next day (Sorensen & Jusaitis, 1995). Control seed was untreated and sown dry. Small plots (1 m<sup>2</sup>) were cleared of vegetation and the soil surface was loosened using a fire rake. Seed was mixed with coarse sand and sprinkled evenly over plots (50 seed/plot, 3 replicates). Soil was tamped down using the flat end of a fire rake. Herbivore grazing was studied by



Two rows of seedlings 3 years after transplanting at Yookamurra Sanctuary © M. Jusaitis

covering a proportion of emerged seedlings with wire baskets to exclude herbivores.

**Direct seeding and herbivory:**

Seed pretreatment with boiling water was essential for germination, and up to a maximum of 14% of pretreated seed germinated during the first spring and summer after sowing. Survival of seedlings declined over the next summer as a result of moisture stress,

leaving only 15% of emerged seedlings surviving at Yookamurra and 30% at Brookfield. Seedlings covered with wire baskets grew significantly taller at both sites than those exposed to grazers. At Brookfield, unprotected seedlings were largely destroyed as a result of grazing within 2 - 3 years, while at Yookamurra survival was not affected by grazing because of ongoing vermin control and effective exclusion fencing surrounding the sanctuary. Survival remained constant at these levels for the next 11 years, until a series of severe drought years (2006 - 2009) resulted in the loss of all remaining seedlings at both sites by September 2008. Although seedlings had reached heights of 600 mm by this time, they had not developed sufficiently robust root systems to withstand several consecutive years of below average rainfall. Fruit was observed on Brookfield plants 10 years after sowing.



6 yr. old plant from the direct seeding trial at Brookfield Conservation Park © M. Jusaitis

**Transplants:** Seedling transplants of *D. subglandulifera* showed an average survival of 70% in Yookamurra Sanctuary, and between 50% - 60% at Brookfield after 10 yrs. Growth differences between sites at Yookamurra were attributed to edaphic factors, and the reduced survival at Brookfield was largely a result of herbivore grazing and burrowing activities evident in the park. At one translocation site at Brookfield no plants survived beyond their second year due to herbivore activity. Transplants at both parks first developed fruit in their fourth year. By 14 years (2006) after transplanting, plants at Yookamurra and Brookfield had reached average heights of 600 mm and 400 mm respectively. When the drought came in 2006, the Yookamurra site lost nearly 70% of its surviving plants, while Brookfield lost only 15% as a result of severe moisture stress. This interesting result may be due to the larger Yookamurra plants requiring more moisture to support their larger leaf canopies than the smaller Brookfield plants, thus enabling the latter to survive a longer period of soil water deficit. Dieback generally occurred from the shoot tips, down, and in a few instances apparently dead plants were found to resprout from basal stems and to recover once good rains returned.

In summary, transplants formed the more effective founder propagule for this species. While grazing was not a significant threat to larger plants, it did affect small seedlings developing through their early growth stages, particularly at Brookfield where herbivores were more prevalent. All seedlings developing as a result of the direct seeding trial were lost during the drought of 2006 - 2009. Of the original transplanted seedlings, 13% still survive at Yookamurra and 45% survive at Brookfield 20 years after translocation. While Yookamurra encouraged more rapid early growth of transplants possibly due to its higher rainfall, these plants also suffered more as a result of the prolonged drought than did the Brookfield planting. Although plants were observed to flower and set fruit, no new recruits were seen at either site over the course of 20 years.

## Major difficulties faced

- Lack of suitable conserved habitat within the population range of *D. subglandulifera* in South Australia resulted in translocation occurring outside it.
- Both Yookamurra and Brookfield parks are in lower rainfall areas than the naturally occurring populations of *D. subglandulifera*, and this has contributed to lower growth and survival rates and higher plant losses than expected in natural populations.
- Several consecutive years of below average rainfall (2006 - 2009) contributed to severe plant losses at both translocation sites.
- Plant losses were experienced at Brookfield due to herbivore grazing and burrowing activities.

## Major lessons learned

- Transplanted *D. subglandulifera* seedlings were able to establish and survive more successfully than directly sown seed, as evidenced by the complete extermination of direct sown seedlings as a result of the 2006 - 2009 drought.
- Protection of small seedlings from the effects of herbivores improved establishment success, particularly at Brookfield where rabbits, goats and kangaroos were more prevalent.
- Larger, established plants were not susceptible to grazing, although dieback of shoot tips was observed in response to severe water stress.
- Lower growth rates, delayed flowering, reduced seed set, and plant losses due to drought and water stress suggest that the translocation sites chosen in these two parks may be less than optimal habitats for *D. subglandulifera*.

## Success of project

Highly Successful	Successful	Partially Successful	Failure
		√	

## Reasons for success/failure:

- Good survival, growth, flowering and fruiting of transplants was observed at three sites in Yookamurra Sanctuary and at two sites in Brookfield Conservation park after 20 years, although no new recruitment was observed over that time.

- The highly effective 2 m high electric fence around the Yookamurra Sanctuary was crucial to exclude feral animals from grazing or disrupting transplants.
- Demonstrated that the source of founder propagule (seed vs. transplants) had a significant influence on translocation success.
- Severe, prolonged drought between 2006 and 2009 caused total loss of emerged plants in direct-seeded trials, and significant losses in transplant trials. Losses may have been exacerbated by the already low average annual rainfall at these two sites.
- Preliminary research on propagation methods for *D. subglandulifera* (Sorensen & Jusaitis, 1995) enabled large numbers of plants to be propagated when required for translocation.
- Commitment to long-term management and monitoring of translocated populations ensured goals were successfully achieved.
- The commitment of the Australian Wildlife Conservancy and Conservation Volunteers Australia to maintaining Yookamurra Sanctuary and Brookfield Conservation Park respectively as conservation sanctuaries for wildlife, and for supporting research and education on threatened species is acknowledged.

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