

# GLOBAL RE-INTRODUCTION PERSPECTIVES

*Re-introduction case-studies from around the globe*



**Edited by  
Pritpal S. Soorae**



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**Cover photo:** Clockwise starting from top-left:

- Formosan salmon stream, Taiwan
- Students in Madagascar with tree seedlings
- Virgin Islands boa

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**Contact**

**Details:** Pritpal S. Soorae, Editor & RSG Program Officer  
E-mail: [psoorae@ead.ae](mailto:psoorae@ead.ae)

## Re-introduction of the endangered Bancroft's *Symonanthus* in Western Australia

Eric Bunn<sup>1</sup> & Bob Dixon<sup>2</sup>

<sup>1</sup> - Senior Research Scientist, Botanic Gardens and Parks Authority, Perth, Western Australia ([ebunn@bgpa.wa.gov.au](mailto:ebunn@bgpa.wa.gov.au))

<sup>2</sup> - Bob Dixon, Manager - Biodiversity & Extensions, Botanic Gardens and Parks Authority, Perth, Western Australia ([bdixon@bgpa.wa.gov.au](mailto:bdixon@bgpa.wa.gov.au))

### Introduction

*Symonanthus bancroftii* (Solanaceae) was declared as Rare Flora (ref. Western Australian Wildlife Conservation Act 1950) in October 1996 and later ranked as Critically Endangered (CR) in November 1997; also met IUCN 2000 Red List Criteria A1c and D (based on suspected 90% population reduction over the last three generations due to: decline in area and quality of habitat - with an estimated population size of less than 50 mature individuals). The species is also listed as Endangered under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). Considered extinct (prior to 1997) a male plant was found in 1997, followed by a female plant in 1998. The female plant died in 1999, however material of both plants was preserved via *in vitro* culture (both plants were micropropagated at Kings Park & Botanic Garden). Project location: field sites in Shire of Merredin near Ardath townsite and at Nangeen Hill Nature Reserve in south-west Western Australia. This region is extensively farmed (mainly wheat and sheep), with >90% of indigenous vegetation cleared by the 1960s. The landscape is flat with occasional outcrops of granite rocks, soils generally sand/clay, native vegetation mainly open mallee (eucalypt) woodland with perennial shrub (and seasonal herbaceous) understory.

### Goals

- Goal 1: “abate identified threats and maintain or enhance the *in situ* populations to ensure the long-term preservation of the species in the wild. (see box) - NOTE: CALM now known as Dept of Environment and Conservation (DEC).

**NB: Text in quotations thus (“...”) is quoted directly from: Department of Conservation and Land Management (2006). *Bailey’s Symonanthus (Symonanthus bancroftii)* Interim Recovery Plan 2006-2011. Interim Recovery Plan No. 225. Department of Conservation and Land Management (CALM), Western Australia.**

### Success Indicators

- Indicator 1: “The number of individuals within populations and/or the number of populations have stabilized and/or increased and translocated populations have produced a viable soil seed bank large enough to create a self-sustaining population. NOTE: Failure of seeds to germinate *in situ* may be due to environmental conditions (e.g. lack of stimuli such as fire, smoke and/or weathering - scarification of seed) and such issues as seed viability must be addressed satisfactorily before an accurate criterion for success can be achieved.”
- Indicator 2: “There is an increase in the knowledge of the biology and ecology



Field site for *Symonanthus bancroftii* at Ardath, WA © I. R. Dixon

of *Symonanthus bancroftii* that improves the probability of survival and aids in future management of the species.”

- **Indicator 3:** “Sufficient genetic material for the long-term survival of the species is stored at BGPA or TFSC.”
- **Indicator 4:** “All populations are protected from threatening processes (e.g. human activity), as defined in this document.”

## Project Summary

### Feasibility:

- **Habitat** - Flat, open mallee (eucalypt) woodland (*Eucalyptus*

*erythronema* subsp. *erythronema*, *E. salmonophloia*, *E. sheathiana*, *E. salubris*) with perennial shrubs (e.g. *Acacia orbifolia*) and seasonal herb understorey. Soil type shallow granitic soil (prone to hard setting) in the vicinity of the sole remaining wild (male) plant.

- **Species** - “*Symonanthus bancroftii* is a low, many-stemmed herbaceous undershrub to 25 cm. Its stalkless, egg-shaped to narrow, more or less spreading leaves are 5 - 17 mm long and up to 3 mm wide. They are hairy, somewhat warty and rolled over at the margins. Plants are dioecious. Flowers are white in colour, small, hairy and streaked with violet inside. The fruit is a nearly globular capsule, 3 - 4 mm long, 2.5 - 4 mm wide, with 3 - 5 seeds. Seeds are 2 mm long and 1 mm wide. An aroma of tobacco emanates from Charles Gardner’s 75-year-old collection; however this has not been evident from freshly collected material.”
- **Socio-political & economic** - “The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts as all known populations occur on crown land and Shire reserves.”

### Implementation:

- **Translocation** - Field sites were chosen based on availability of suitable land and similarity to existing habitat of remaining wild plants. Trial plantings were undertaken in May - June in 2002 - 2007. Each plant was numbered, irrigated and monitored. Watering of translocated plants occurred 1 - 2 times/week depending on site and prevailing conditions over the summer period. Plants receive 2 - 4 liters/hr via a gravity fed watering system over a 2 - 4 hour period. In June 2004 the Ardath site was ripped two weeks prior to the planting session to attempt to increase plant survival. The Yilgarn District Threatened Flora and Ecological Communities Recovery Team (YDTFECRT) is now overseeing the implementation of this IRP and will include information on progress in their annual report to CALM's Corporate Executive and funding bodies. Information on the translocation of threatened species in the wild is

provided in CALM Policy Statement No. 29 Translocation of Threatened Flora and Fauna.

- Cultural/tribal - “Indigenous communities interested or involved in the region affected by this plan have not yet been identified. The Aboriginal Sites Register maintained by the Department of Indigenous Affairs does not list any significant sites in the vicinity of these populations. However, not all significant sites are listed on the Register. Implementation of recovery actions under this plan will include consideration of the role and interests of indigenous communities in the region.”
- Trans-border - Not applicable.
- Veterinary/phytosanitary - Re-introduced plants were micropropagated via sterile (*in vitro*) culture and grown on in an accredited nursery (Kings Park and Botanic Garden Nursery) prior to planting in re-introduction sites, thereby posing no inherent phytosanitary risks.



**BGPA, DEC staff & volunteers out-planting into a field site © I. R. Dixon**

**Post-release monitoring:** Regular monitoring of all plants is being undertaken by DEC regional staff and staff from BGPA. The current results indicate just over 250\* plants are surviving over the two sites (211 at the Ardath site and 44 at the Nangeen site as at Oct 2007). Survival of plants has varied with early plantings victims of severe drought years (2002 - 2003, zero survival). Post 2003 has seen good survival of plantings from 2004 (>90 plants, Ardath site only), 2005 (10 plants at Nangeen site and 22 at Ardath site), 2006 (nine plants at both sites) and 2007 with >120 seedlings surviving over both sites. The collection of seed that became feasible from 2005 onwards due to good survival of plants from the 2004 plantings at the Ardath site has allowed production of plants from collected seed. Germination characteristics have been investigated by BGPA seed scientists (D. Merritt and S. Turner, pers. comm.) and this research has allowed *S. bancroftii* seedlings to be grown at Kings Park nursery for planting into field sites. This will reduce dependence on the more technically demanding process of *in vitro* propagation of *S. bancroftii* (Panaia *et al.*, 2000). It remains to be seen whether survival of seedlings is superior to that of micropropagated plants, however seasonal variations in rainfall and temperature are still highly likely to pose threats to survival of plants during the introduction phase, regardless of how they are produced. The ability to access scheme water to fill irrigation tanks at both field sites since 2006 (through collaboration with Water Authority of WA) has greatly enhanced the chances of keeping plants alive through the difficult Summer months particularly in the first 1 - 2 seasons when the plants are most vulnerable to desiccation. It is hoped that as the introduced populations become stabilized seedling recruitment will occur naturally as the soil seed bank accumulates. At

this stage there is no knowledge of the particular environmental conditions required for natural seed germination with *S. bancroftii*. Further research on these introduced populations is needed to reveal the details of the reproductive biology of this endangered species in a natural habitat. *In vitro* and cryogenic collections of *S. bancroftii* are being maintained at KPBG.

\*Census undertaken by E. Bunn and B. Dixon (BGPA, 11<sup>th</sup> October, 2007)

## Major difficulties faced

- Fragmentation of existing 'natural' bushland remnants.
- Poor knowledge of biology/ecology of *S. bancroftii*.
- Lack of perceived genetic diversity.
- Lack of knowledge on natural recruitment and the role of fire.
- Grazing by introduced or native animals.
- Weed invasion.
- Increasing frequency/severity of drought (climate change).

## Major lessons learned

- Frequent irrigation of plants required during establishment phase and beyond especially in drought years.
- Reliable monitoring of watering essential as soils prone to rapid drying between infrequent rain or less than adequate irrigation.
- Fencing of plants essential (feral rabbit predation especially lethal to small plants) to prevent herbivory by feral animals and livestock and accidental disturbance by native fauna.
- Weed control essential in weed-prone sites.
- Seed collection must be done via bagging branchlets following pollination (other methods tried lead to poor seed harvests, IR Dixon & E. Bunn, unpubl.).

## Success of project

Highly Successful	Successful	Partially Successful	Failure
		√	

### Reasons for success/failure:

- Yet to demonstrate that seedling recruitment from soil seed bank is feasible.
- Yet to demonstrate that re-introduced populations are stable and self-sustaining.

## References

- Department of Conservation and Land Management (2006) Bailey's *Symonanthus* (*Symonanthus bancroftii*) Interim Recovery Plan 2006-2011. Interim Recovery Plan No. 225. Department of Conservation and Land Management, Western Australia.
- Panaia M, Senaratna T, Bunn E, Dixon K & Sivasithamparam K. (2000) Micropropagation of the critically endangered Western Australian species *Symonanthus bancroftii* (F. Muell) L. Haegi (Solanaceae). *Plant Cell, Tissue and Organ Culture* 63(1): 23 - 29.