National Recovery Plan for the Downy Star-bush *Asterolasia phebalioides*

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Australian Government

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This is a Recovery Plan prepared under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999, with the assistance of funding provided by the Australian Government.

This Recovery Plan has been developed with the involvement and cooperation of a range of stakeholders, but individual stakeholders have not necessarily committed to undertaking specific actions. The attainment of objectives and the provision of funds may be subject to budgetary and other constraints affecting the parties involved. Proposed actions may be subject to modification over the life of the plan due to changes in knowledge.

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Cover photograph: Downy Star-bush *Asterolasia phebalioides* by Oberon Carter.

Table of Contents

Summary

The Downy Star-bush (*Asterolasia phebalioides*) is a small shrub endemic to south-eastern Australia, where it occurs in South Australia (Kangaroo Island) and western Victoria. There are estimated to be 50,000–300,000 plants occurring in 15–25 wild populations, although most known plants occur in just one extended population on Kangaroo Island in South Australia. Fire or other disturbance is important in regenerating populations, and therefore population size fluctuates greatly according to fire history. Threats are not well known, but may include altered fire frequency, other disturbance, *Phytophthora cinnamomi* infection, weed invasion and browsing. The species is listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999, as Vulnerable in South Australia under the *National Parks and Wildlife Act* 1972, and as Threatened in Victoria under the *Flora and Fauna Guarantee* Act 1988. This national Recovery Plan for *A. phebalioides* is the first recovery plan for the species, and details its distribution, habitat, threats and recovery objectives and actions necessary to ensure its long-term survival.

Species Information

Description

The Downy Star-bush (*Asterolasia phebalioides*) belongs to the family Rutaceae. It is an open to compact shrub growing to 1 m high. The leaves are wedge- to heart-shaped with rounded tips, often partly or strongly folded, 5–10 mm long and 2–6 mm wide, and densely crowded on short branches. The stems and leaves have a dense covering of short, grey to brown, star-shaped, woolly hairs. The small, starry bright yellow flowers are terminal, solitary, sessile and closely subtended by five leafy bracts. The petals are 6-10 mm long and covered with fine star-shaped hairs on the outer surface, while the sepals are greatly reduced or absent. The stigma is deeply divided into five spreading linear lobes (description from Armstrong & Telford 1986; Duretto 1999).

Asterolasia muricata grows with *A. phebalioides* on Kangaroo Island in the Ravine de Casoars Wilderness Area. It differs from *A. phebalioides* in having oblong leaf lamina and the upper surface of leaves covered with short, hard-pointed protuberances (Armstrong & Telford 1986).

Distribution

Asterolasia phebalioides occurs in South Australia and Victoria (Figure 1). In South Australia it occurs in the Ravine de Casoars Wilderness Area and adjacent roadsides and private properties, and Flinders Chase National Park and adjacent Heritage Agreement property, on Kangaroo Island (Taylor 2003; Adherb 2008), in the Kanmantoo IBRA bioregion (*sensu* DEH 2000). In Victoria it occurs in the Grampians National Park and Black Range State Park (and a few surrounding roadsides) in the west of the State, in the Victorian Midlands and Murray Darling Depression bioregions. A small population also occurs on private land adjacent to the northern edge of Little Desert National Park in Victoria. Maps showing the distribution of *A. phebalioides* are available from the Department of Sustainability and Environment (for Victoria) and the Department for Environment and Heritage (for South Australia).

Habitat

Asterolasia phebalioides grows in a variety of habitats. In Victoria it grows in **Heathy Mallee** containing *Astroloma conostephioides* Flame Heath, *Babingtonia behrii* Broom Baeckea, *Calytrix tetragona* Common Fringe-myrtle, *Cassytha glabella* Slender Dodder-laurel, *Dillwynia sericea* Showy Parrot-pea, *Eucalyptus leptophylla* Slender-leaf Mallee, *Glischrocaryon behrii* Golden Pennants, *Hakea mitchellii* Desert Hakea, *Hibbertia virgata* Twiggy Guinea-flower, *Melaleuca lanceolata* subsp. *lanceolata* Moonah and *M. wilsonii* Violet Honey-myrtle. On rocky slopes in the Grampians it also grows in **Rocky Shrubland** containing *E. goniocalyx* Bundy, *Thryptomene calycina* Grampians Thryptomene*, Hib. riparia* Erect Guinea-flower*, Cal. alpestris* Snow Myrtle*, Leptospermum turbinatum* Shiny Tea-tree*, Acacia rupicola* Rock Wattle and *Pultenaea williamsoniana* Williamson's Bush-pea. Where these rocky shrublands abut streams,

M. decussata Totem-poles is common, with a dense ground layer of *Drosera* spp. sundews, mosses, *Utricularia dichotoma* Fairies aprons and a sparse cover of small heathy shrubs.

In South Australia, *A. phebalioides* grows in **Heathy Mallee** containing *E. remota* Kangaroo Island Whipstick Mallee and occasional *E. baxteri* Brown Stringybark (Overton 1998, Robinson & Armstrong 1999). Common species include *Caustis pentandra* Thick Twist-rush*, Hib. incana* Hoary Guinea-flower*, M. gibbosa* Slender Honey-myrtle*, Phyllota pleurandroides* Heathy Phyllota*, Pul. trifida* Kangaroo Island Bush-pea with stunted *Banksia marginata* Silver Banksia and *Ban. ornata* Desert Banksia (B. Overton pers. comm.). It has also been recorded growing in roadside mallee regrowth with other shrubs including *Allocasuarina* spp., *L. myrsinoides*, *Hib. sericea* and *Gompholobium ecostatum*.

Actions recommended in this Plan include surveys and analysis aimed at identifying habitat critical to survival.

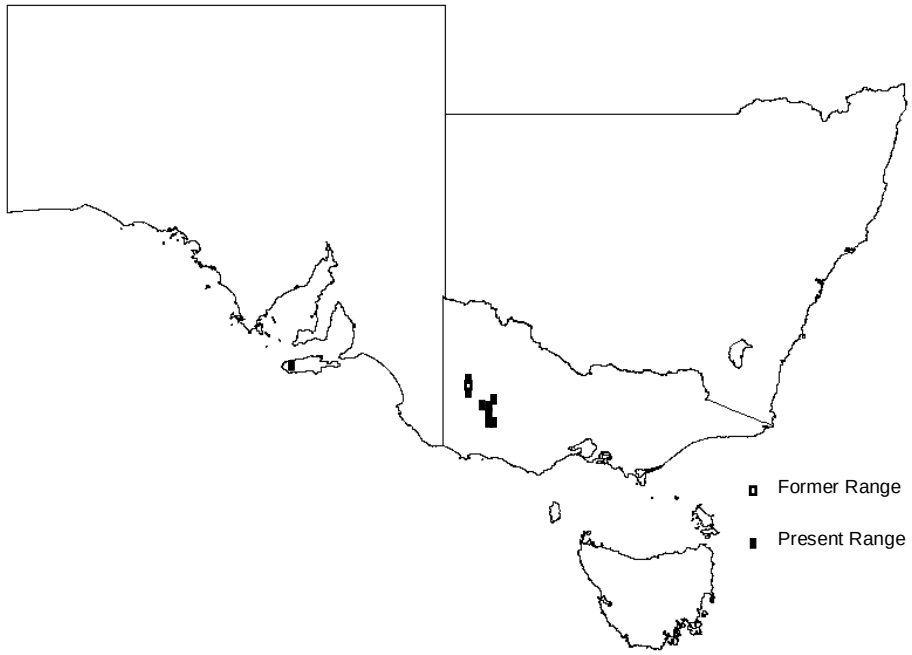

Figure 1. Distribution of *Asterolasia phebalioides*

Population Information

It is difficult to estimate the number of populations and individuals of *A. phebalioides*, as population sizes are likely to fluctuate greatly, and abundance will often be much greater in the first few years after a recruitment event such as fire. The exact number of persisting populations within the Grampians is unclear, as many recorded sites in close proximity to others may form continuous populations. However, there appear to be 15–25 populations containing 50,000–300,000 plants, with almost all of these plants occurring in just the one population, in Ravine de Casoars Wilderness Area (see below). Important populations necessary to the long term survival and recovery of *A. phebalioides* have been determined to occur in the following locations:

South Australia

- Ravine de Casoars Wilderness Area, Kangaroo Island (contains the majority of known mature individuals)
    - Estimated 50,000 plants in 1989 (30 years since fire) by Overton (1998). In 1997 (six years after fire in 1990), over one million seedlings of *A. phebalioides* were

- About 25% of this population occurs outside the park, in adjacent roadside vegetation and private property (Overton *et al*. 1991).
- Two small populations were recorded within c. 20 km of the main Ravine de Casoars population prior to 1995 but have not been recorded since (D. Taylor pers. comm.). Further survey effort is required to determine the status of those populations.

Victoria

- Grampians National Park, Vic
  - Beehive Falls: approximately 600 plants at two nearby locations (2005)
  - Golton Gorge: approximately 135 plants in rocky shrubland (1988).
  - Hollow Mountain area: approximately 50 plants in rocky shrubland (1999).
  - Lodge Rd: approximately 100 plants (1988).
  - Mt Abrupt upper western slope: c. 10–25 plants in 1989 (B. Overton pers. comm.). Site is relatively remote and within intact native vegetation.
  - Mt Sturgeon: abundance unknown, but site within relatively remote and intact native vegetation (last recorded in 1962).
  - Victoria Range goat track: seven plants in wet hollows of moist rocky outcrop (1988).
  - Victoria Range - W of Indian Head: Estimated small population only (<100 plants) (1986).
  - West of Pine Plantation: ten plants in rocky streamside shrubland (2004).

The status of populations in the southern Grampians Nationa Park at Mt Sturgeon and Mt Abrupt is unknown. These sites were last recorded in the 1960s and require further survey.

- Black Range State Park, Vic
  - Brimpean-Talangatuk Rd: 70 plants in a roadside strip (2004).
  - Corner of Black Range Rd and Telangatuk Rd: Plants recorded in 1967; none seen in 2004, suspected senescence or clearing during track maintenance.
- Nurcoung Flora and Fauna Reserve, Vic: 13 plants (2004).

Asterolasia phebalioides growing on roadside, Black Range Vic. (photo by O. Carter 2004)

Decline and Threats

There is little information on the previous distribution and abundance of *A. phebalioides*, although it is likely that there were more (and larger) populations across the western Victorian Wimmera, notably near the now much-cleared area around Nurcoung Flora Reserve, immediately north and south of Little Desert National Park and around Black Range State Park. A previously recorded population from Little Desert National Park is believed to have been cleared during mining (Overton 1998). A proposed recovery action is to more fully determine threats to populations. Type and timing of disturbance events are likely to be important for conservation, while *Phytophthora cinnamomi* may be a threat, and weed invasion and browsing may be minor threats to several populations. These threats are discussed in more detail below.

Vegetation Clearance
Portions of the main Ravine de Casoars population are threatened by vegetation clearance (Taylor 2003).

Disturbance (minor to major threat, depending on site)
Periodic disturbance, especially in the form of fire, is presumed to be an important requirement for long-term persistence of *A. phebalioides* populations. Abundant recruitment has been recorded after fire at the Ravine de Casoars population. Observations of the life-cycle of *A. phebalioides* following these fires have been used to estimate fire regimes that favour persistence (Overton 1998). Ninety percent of plants flowered in the sixth year after a 1990 wildfire, with 42% of these having produced seed, but only 2% of seeds were viable.

However, there are no known reports of post-fire response from Victorian populations, probably because most sites are long-unburnt, although it is expected that fecund populations would respond favourably to fire. The persistence of seeds in the soil is unknown.

Many Victorian populations are located along the edges of tracks and roads, where persistence of at least some of these populations has probably been the result of track creation or maintenance, where soil disturbance has stimulated seed germination (see photo). Human-induced soil disturbance may incidentally favour *A. phebalioides* in some instances, and these effects may be more noticeable in areas where there has been a lack of recent fire. It is unclear how many populations have disappeared due to lack of fire or other soil-disturbance related processes. Whilst some roadside slashing or disturbance may have inadvertently led to localised recruitment of *A. phebalioides*, frequent and heavy slashing is likely to be generally detrimental to populations. The two populations in Black Range State Park are potentially at risk from inappropriate roadside maintenance, especially as one population has not been seen recently and may have declined due to roadworks.

Absence of periodic disturbance may cause the decline and senescence of some populations. Overton (1998) proposed fire intervals of 25 years to maintain *A. phebalioides* and associated habitat at the Ravine de Casoars. Manual soil disturbance may be beneficial to populations of *A. phebalioides* where fire is difficult to apply. Overton (1998) suggests deliberate soil disturbance to small portions of populations at irregular intervals of 15–35 years.

Cinnamon Fungus *Phytophthora cinnamomi*
Asterolasia phebalioides may be highly susceptible to disease caused by the plant pathogen *Phytophthora cinnamomi* (Reiter *et al.* 2004). Symptoms of *P. cinnamomi* infection in *A. phebalioides* in pot experiments included root death, chlorosis, abscission and seedling death (Reiter *et al*. 2004). There are many signs of *P. cinnamomi* infestation in the immediate area of *A. phebalioides* populations in Ravine de Casoars WA and Flinders Chase National Park (Taylor 2003).

Weed invasion (minor threat)
Pasture grasses and introduced herbs (e.g. Cape Weed (*Arctotheca calendula*)) may be threats at some sites close to agricultural land.

Browsing (minor threat)
Native and introduced herbivore browsing is evident at one site in the Grampians National Park.

Small population size/declining genetic variability
The two smaller populations on Kangaroo Island are believed to be isolated and potentially declining in abundance and genetic variability (Taylor 2003).

Recovery Information

Existing Conservation Measures

Several projects for conservation of *A. phebalioides* have been initiated, including a study of biology and population dynamics of *A. phebalioides* in Ravine de Casoars Wilderness Area, Kangaroo Island, and understanding susceptibility of *A. phebalioides* to *Phytophthora cinnamomi*. *Asterolasia phebalioides* is covered under the Kangaroo Island Threatened Plant Project (funded by the Kangaroo Island Natural Resource Management Board and the Department for Environment and Heritage).

Recovery Objectives

The **Overall Objective** of recovery is to minimise the probability of extinction of *Asterolasia phebalioides* in the wild and to increase the probability of important populations becoming self-sustaining in the long term. Within the life span of this Recovery Plan (5 years), the **Specific Objectives** of recovery for *Asterolasia phebalioides* are to:

1. Determine distribution, abundance and population structure
2. Determine habitat requirements
3. Ensure that all populations and their habitat are protected and managed appropriately
4. Manage threats to populations
5. Identify key biological functions
6. Determine growth rates and viability of populations
7. Establish a seedbank to store seed.
8. Build community support for conservation

Program Implementation and Evaluation

This Recovery Plan guides recovery actions for *A. phebalioides* and will be implemented and managed by the Department of Sustainability and Environment (in Vic) and the Department for Environment and Heritage (in SA), supported by other agencies, educational institutions, regional natural resource management authorities and community groups as appropriate. Technical, scientific, habitat management or education components of the Recovery Plan will be referred to specialist groups on research, *in situ* management, community education and cultivation as required. Contact will be maintained between the State agencies on recovery issues concerning *A. phebalioides*. The Recovery Plan will run for a maximum of five years from the date of its adoption under the EPBC Act, and will be reviewed and revised within five years of the date of its adoption.

Recovery Actions and Performance Criteria

Action	Description	Performance Criteria
Specific Objective 1: Determine distribution, abundance and population structure		
1.1	Undertake surveys to determine the area and extent of populations, the number, size and structure of populations, and inference or estimation of population change. **Responsibility: DSE, PV, DEH**	• 10 priority population sites surveyed and mapped for population size, condition and habitat.
Specific Objective 2: Determine habitat requirements		
2.1	Survey known habitat and collect floristic and environmental information relevant to community ecology and condition. **Responsibility: DSE, PV, DEH**	• Species/habitat specific survey design prepared. • Habitat critical to survival mapped for any extant populations.
2.2	Identify and survey potential habitat, using ecological and bioclimatic information that may indicate habitat preference. **Responsibility: DSE, DEH**	• Potential habitat and searches for populations in the vicinity of the Ravine de Casoars WA (SA) & Mt Abrupt and Mt Sturgeon in Grampians NP (Vic) undertaken. • Predictive model for potential habitat developed & tested at four sites.
Specific Objective 3: Ensure that all populations and their habitat are protected and managed appropriately		
3.1	Protect populations on private land. **Responsibility: DSE, DEH**	• Voluntary conservation agreement in place for Bridgewater Block (Vic) population and as important populations are identified in SA.
3.2	Implement appropriate disturbance regimes (see actions 4.3, 5.2 and 5.3 below).	• Disturbance regimes developed and implemented.
Specific Objective 4: Manage threats to populations		
4.1	Assess and control threats from pest plants and animals. **Responsibility: DSE, PV, DEH**	• Level of threats determined and control programs developed and implemented if appropriate.
4.2	Determine and control threat from Cinnamon Fungus. **Responsibility: DEH**	• Level of threat determined and control program developed and implemented if appropriate.
4.3	Control the threat of direct damage by human activities. **Responsibility: DSE, PV, DEH**	• Important roadside populations signposted. • Impact of roadworks monitored and reduced if required.
Specific Objective 5: Identify key biological functions		
5.1	Evaluate current reproductive status, seed bank status, longevity, fecundity and recruitment levels. **Responsibility: DSE, DEH**	• Reproductive ecology and regenerative potential quantified for four representative sites. • Seed bank potential quantified for five representative sites.
5.2	Identify key stimuli for seed germination requirements. **Responsibility: DSE, DEH**	• Stimuli for recruitment identified. • Management strategies identified to maintain, enhance or restore processes fundamental to reproduction and survival.
5.3	Identify optimal fire regimes to maintain habitat. **Responsibility: DSE, DEH**	• Preparation and implementation of management prescriptions for ecological burning at Ravine de Casoars WA, Grampians NP, Black Range SP, and Nurcoung FR undertaken.
Specific Objective 6: Determine the growth rates and viability of populations		
6.1	Measure population trends and responses against recovery actions by collecting demographic information including recruitment and mortality, timing of life history stages and morphological data. **Responsibility: DSE, PV, DEH**	• Techniques for monitoring developed and implemented. • Population growth rates determined and Population Viability Analysis completed for five populations.
Specific Objective 7: Establish a seedbank		

7.1	Establish a seed bank in storage and determine seed viability. **Responsibility: DSE, DEH**	• Seed from five representative populations in storage.
Specific Objective 8: Build community support for conservation		
8.1	Identify opportunities for community involvement in the conservation of the *A. phebalioides*. **Responsibility: DSE, PV, DEH**	Community nature conservation and Landcare groups aware of the species and support its conservation.

Abbreviations: DEH – Department for Environment and Heritage (SA); DSE – Department of Sustainability and Environment (Victoria); PV – Parks Victoria

Management Practices

The philosophy of the strategy for recovery is habitat conservation, restoration and management combined with an understanding of the ecological and biological requirements of *Asterolasia phebalioides*. The emphasis is on using knowledge to better implement *in situ* management techniques that protect populations and promote regeneration and recruitment. To achieve this, recovery actions are primarily structured to (i) acquire baseline data, (ii) assess habitat condition including ecological and biological function, (iii) protect populations to maintain or improve population growth and (iv) to engage the community in recovery actions.

On-ground site management will aim to mitigate threatening processes and thereby insure against extinction. Major threats requiring management include accidental destruction (e.g. road works) and inappropriate fire regimes. A range of strategies will be necessary to alleviate these threats including better communication between government and land managers, and implementation of appropriate fire regimes to maintain habitat. Broad scale protection measures applicable to all populations include legal protection of sites, habitat retention and liaison with land managers including private landholders. In addition, searches of known and potential habitat should continue to better define the distributions and size of populations.

The Recovery Plan also advocates strategies to fill some of the major gaps in our knowledge to date. These include an understanding of the role of fire and soil seed banks in population persistence. Successful *in situ* population management will be founded on understanding the relationships between *Asterolasia phebalioides* and associated flora, and its response to environmental processes. These are directly linked to biological function and are thus vital to recovery. Demographic censusing will be necessary to gather life history information and to monitor the success of particular management actions. Community participation in recovery actions will be sought, particularly in regard to recovery team membership and implementation of on-ground works.

Affected Interests

Important populations of *A. phebalioides* are managed by the Department of Sustainability and Environment (Vic), Parks Victoria and the Department for Environment and Heritage (SA). These managers have been contacted and have approved the actions outlined in this recovery plan subject to availability of sufficient funding.

Role and Interests of Indigenous People

Indigenous communities on whose traditional lands *A. phebalioides* occurs are being advised, through the relevant regional Indigenous facilitator, of the preparation of this Recovery Plan and will be invited to provide comments and be involved in the implementation of the plan.

Biodiversity Benefits

The Recovery Plan includes a number of potential biodiversity benefits for other species and vegetation communities. Principally, this will be through the protection and management of habitat. The adoption of broad-scale management techniques and collection of baseline data will also benefit a number of other plant species growing in association with *A. phebalioides*, particularly those species with similar life forms and/or flowering responses. The nationally Vulnerable Williamson's Bush-pea *Pultenaea williamsoniana* has been recorded growing in

association with *A. phebalioides*, and recovery actions will benefit both species at the location. The Recovery Plan will also provide an important public education role as threatened flora have the potential to act as 'flagship species' for highlighting broader nature conservation and biodiversity issues such as land clearing, grazing, weed invasions and habitat degradation.

Social and Economic Impacts

The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts. Most populations occur on public land, either crown land reserved for various public purposes, or on road reserves, managed by a variety of local and State government agencies. Any protection measures required at these sites (e.g. fencing, signage, track closures) will have minimal impact on current recreational and commercial activities. Protection of these populations has been negotiated with the relevant land manager. Protection of the few populations on private land or on land managed by other authorities will be achieved through voluntary agreements with landowners and managers.

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Bibliography

Adherb 2008. Unpublished data extracted from Adelaide Herbarium database 22nd September 2008. Department for Environment and Heritage, South Australia.

Armstrong, J.A. & Telford, I.R. 1986. *Rutaceae*, In: Jessop, J.P. & Toelken, H.R. (eds.), *Flora of South Australia Part II Leguminosae – Rubiaceae*. South Australian Government Printing Division, Adelaide.

DEH 2000. Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1. - Summary Report. Department of Environment and Heritage, Canberra.

Duretto, M.F. 1999. *Rutaceae*, In: Walsh, N.G. & Entwisle, T.J. (eds.), *Flora of Victoria Volume 4: Dicotyledons Cornaceae to Asteraceae*, Inkata Press, Melbourne.

Overton, B. 1998. *Post-fire ecology of Flinders Chase National Park specifically for* Asterolasia phebalioides, Logania insularis *and* Olax obcordata*, Kangaroo Island, South Australia*, Unpublished report.

Overton, B.M., Overton, D.S. and McKelvey, M.W. 1991. Field notes on *Asterolasia phebalioides* F.Muell. (Rutaceae). *South Australian Naturalist* 66(2/3): 39–48.

Reiter, N., Weste, G. and Guest, D. 2004. The risk of extinction from disease caused *by Phytophthora cinnamomi* to endangered, vulnerable or rare plant species endemic to the Grampians, western Victoria. *Australian Journal of Botany* 52: 425–433

Robinson, A.C. and Armstrong, D.M. (eds) 1999. *A Biological Survey of Kangaroo Island, South Australia, 1989 & 1990*. Heritage and Biodiversity Section, Department for Environment, Heritage and Aboriginal Affairs, South Australia.

Taylor, D.A. 2003. *Recovery Plan for 15 Nationally Threatened Plant Species on Kangaroo Island, South Australia*. Report to the Threatened Species and Communities Section, Department for the Environment and Heritage.

Priority, Feasibility and Estimated Costs of Recovery Actions

Action	*Description*	*Priority*	*Feasibility*	*Responsibility*	*Cost estimate*					
					Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	**Distribution, abundance**									
1.1	Surveys	1	100%	DSE, PV, DEH	$8,000	$8,000	$8,000	$8,000	$8,000	$40,000
2	**Habitat requirements**									
2.1	Known habitat	1	75%	DSE, PV, DEH	$10,000	$10,000	$0	$0	$0	$20,000
2.2	Potential habitat	2	75%	DSE, PV, DEH	$0	$6,000	$10,000	$10,000	$0	$26,000
3	**Habitat protection**									
3.1	Private land	3	75%	DSE, DEH	$2,000	$2,000	$0	$0	$0	$4,000
3.2	Disturbance regimes	2	75%	DSE, DEH	$10,000	$10,000	$10,000	$10,000	$10,000	$50,000
4	**Threat management**									
4.1	Pest plants & animals	2	75%	DSE, PV, DEH	$5,000	$5,000	$5,000	$5,000	$5,000	$25,000
4.2	Cinnamon Fungus	1	50%	DEH	$10,000	$10,000	$0	$0	$0	$20,000
4.3	Human damage	2	75%	DSE, PV, DEH	$5,000	$5,000	$5,000	$2,000	$2,000	$19,000
5	**Biological functions**									
5.1	Reproductive status	2	75%	DSE, DEH	$0	$5,000	$5,000	$5,000	$0	$15,000
5.2	Seed germination	2	75%	DSE, DEH	$0	$0	$5,000	$5,000	$0	$10,000
5.3	Disturbance regimes	1	75%	DSE, DEH	$15,000	$15,000	$15,000	$5,000	$5,000	$55,000
6	**Population viability**									
6.1	Censusing	1	100%	DSE, PV, DEH	$10,000	$10,000	$10,000	$10,000	$10,000	$50,000
7	**Cultivation**									
7.1	Seed bank	3	75%	DSE, DEH	$5,000	$3,000	$1,000	$1,000	$1,000	$11,000
8	**Community support**									
8.1	Community extension	3	75%	DSE, PV, DEH	$1,000	$1,000	$1,000	$1,000	$1,000	$5,000
				TOTALS	$81,000	$90,000	$75,000	$62,000	$42,000	$350,000