INTERIM RECOVERY PLAN NO. 8

RED SNAKEBUSH (*HEMIANDRA GARDNERI*) INTERIM RECOVERY PLAN

1996-1999

by

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FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos 44 and 50. IRPs are designed to run for three years only and will be replaced by full Recovery Plans where required.

IRPs outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or ecological communities, and begin the recovery process.

CALM is committed to ensuring that Critically Endangered taxa are conserved through the preparation and implementation of Recovery Plans or Interim Recovery Plans and by ensuring that conservation action commences as soon as possible and always within one year of endorsement of that rank by the Minister.

This IRP was approved by the Director of Nature Conservation on 7 May 1997. Approved IRPs are subject to modification as dictated by new findings, changes in status of the taxon or ecological community and the completion of recovery actions. The provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting CALM, as well as the need to address other priorities.

Information in this IRP was accurate at March, 1997.

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SUMMARY

Red Snakebush, *Hemiandra gardneri* **Family:** LAMIACEAE

Flowering period: September - January

CALM Region: Midwest **CALM District:** Moora **Shire:** Moora and Coorow

Current status: Declared as Rare Flora in September 1987, ranked as Critically Endangered in September 1995

Recovery team: Moora District Threatened Flora Recovery Team

Illustrations and/or further information: S.J. Patrick and A.P. Brown *Declared Rare and Poorly Known Flora in the Moora District* (in prep); J. Leigh *et al. Extinct and Endangered Plants of Australia* (1984).

Hemiandra gardneri is a prostrate perennial shrub forming a mat up to 2 m in diameter. The leaves are up to 20 x 5 mm in size, linear lanceolate, green or grey-green with pungent points and three raised veins on the lower surface. Both leaves and calyx are covered with short hairs, giving the plant a grey appearance. The dark red to pink flowers, which appear in late spring and summer, are bell shaped and clustered towards the end of the stems.

H. gardneri was first collected from near Watheroo in 1926 by C. A. Gardner and was described from those specimens by O. Sargent in 1927. It was later collected from Wubin (1959) and near Jurien Bay (1978). By December 1982 the species was known from six sites and a total of 2206 plants.

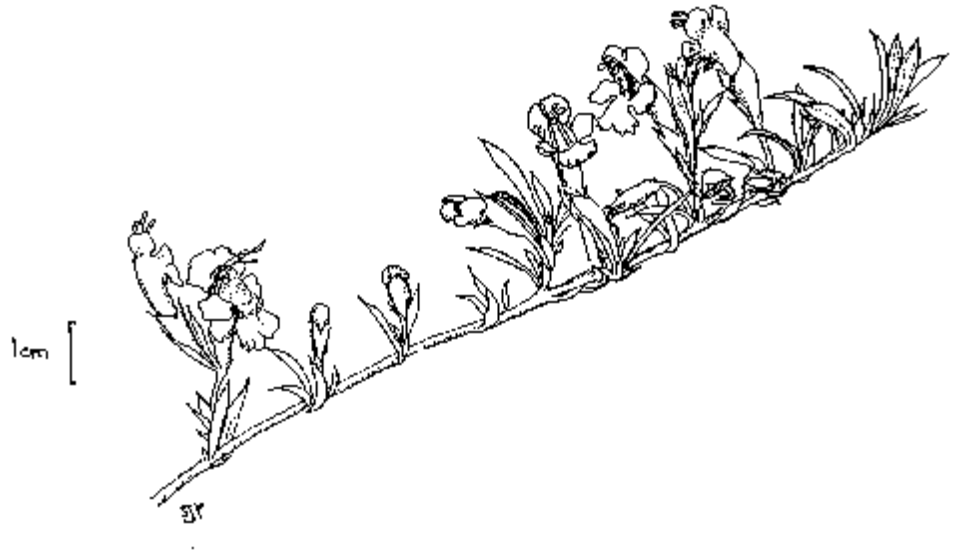
During surveys near Watheroo in September, October 1995, five populations were found scattered along road and railway reserve and in private property with a total of 667 plants.

All populations are exposed to threats associated with weed invasion, agricultural chemical drift and grazing from rabbits. The aim of this Interim Recovery Plan is to abate identified threats and maintain viable *in situ* populations of *Hemiandra gardneri* in order to preserve the wild genetic stock of the species. To achieve this aim the following recovery actions are recommended.

Recovery actions:

Essential	Desirable
1. Implement weed control	1. Preserve genetic diversity of the species
2. Develop a fire management plan	2. Conduct further surveys
3. Monitor populations	3. Information dissemination
	4. Conduct research
	5. Survey for translocation sites if deemed necessary

Hemiandra gardneri



Susan J. Patrick

Distribution of *Hemiandra gardneri*
Illustration not available

1. BACKGROUND

1.1 History, taxonomy and status

Hemiandra gardneri Sargent is a prostrate perennial shrub forming a mat up to 2 m in diameter. The green or grey-green leaves are up to 20 x 5 mm in size, linear to linear oblanceolate with a pungent point and three raised veins on the lower surface. Both leaves and calyx are covered with short hairs, giving the plant a grey appearance. The dark red to pink flowers are clustered towards the end of the stems. The calyx is bell shaped, two lipped and 5 mm long. The corolla tube is 14 mm long, with inserted stamens and anthers protruding a short way from the corolla mouth. This species was first thought to be a variety of *Hemiandra pungens* but is distinguished by the velvety indumentum, shortly exerted anthers and characters of the corolla. A full taxonomic description is provided by O.H. Sargent in Latin (1927) and in English (1984), the latter is included in Appendix 1.

H. gardneri was collected from near Watheroo in 1926 by C. A. Gardner and described by O. Sargent in 1927 from those specimens. Historical records show that it was collected from Wubin in 1959 and near Jurien Bay in 1978, however recent surveys have failed to relocate the species in these localities.

Prior to 1982 the species was known from two sites, south of Gunyidi and north of Watheroo. Comprehensive surveys for the species were conducted in November and December 1982 by M. A. Burgman, resulting in four new sites being found and a total of 2206 plants recorded. The species was again surveyed in September and October 1995 by E. Holland and found to consist of five populations (all north of Watheroo) with a total of 667 plants. All plants were recorded in full flower. Population 6 (Jurien Bay) was not surveyed in 1995 as limited information is available and it is only known as a herbarium record.

Due to its restricted distribution and the continuing decline in the quality of its habitat, *H. gardneri* was declared as Rare Flora on 25 September 1987 and ranked as Critically Endangered in September 1995.

1.2 Distribution and habitat

H. gardneri was found in 1995 over a range of approximately 11 km north of Watheroo where it grows in deep yellow to yellow-white sand on sandplains and hills. It is most abundant in open areas under low woodland of *Banksia prionotes, B. attenuata, Xylomelum angustifolium, Actinostrobus pyramidalis, Jacksonia eremodendron, Conospermum stoechadis* and *Verticordia* species, occasionally with low sedges and grasses. A list of associated species is included in Appendix 2.

Table 1: Summary of population information

Pop. No & Location.		Land Status	No. of plants.	Condition	Threats
1.	N of Watheroo	Shire Road Reserve	1982, 8 1995, 16	Poor	Road and rail works, weeds, inappropriate fire
2a.	N of Watheroo	Shire Road Reserve	1991, 10 1995, 4	Poor	Road and rail works, weeds, inappropriate fire
2b.	N of Watheroo	Private.	1989, 400+ 1995, 58	Moderate	Weeds, inappropriate fire
3.	N of Watheroo	Shire Road Reserve	1982, 1196 1995, 543	Poor	Road and rail works, weed, inappropriate fire
4.	N of Watheroo	Railway Reserve	1982, 222 1995, 1	Poor	Road and rail works, weed, rabbits
5.	N of Watheroo	Shire Road Reserve & Private	1982, 7 1995, 45	Moderate	Road and rail works, weed, inappropriate fire
5*.	Cockleshell Gully	?National Park			

* Population 6 is known only from a Herbarium specimen.

1.3 Biology and ecology

Sargent (1927) discussed corolla characteristics and the possibility of the flowers being bird pollinated.

Burgman (1983) noted that seed set was adequate in natural populations with seedlings making up 16.3 % of the total number of plants in the populations studied. *H. gardneri* seedling recruitment is concentrated on open disturbed or cleared areas. However, the mechanisms involved in the response of this species to disturbance are not fully understood. Seedlings appear to compete poorly with native vegetation that is mid-dense or dense (Burgman 1983).

The response of *H. gardneri* to fire is unknown, however, as it is a disturbance opportunist, it is likely that appropriate fire is desirable and perhaps necessary for its long term survival.

Most species of the Mint family are grown easily from cuttings, though they often develop poor root systems. Seed germination would be required to overcome this problem (B. Conn[1] pers comm 1996).

1.4 Threatening processes

1.4.1 Causes of the critically endangered status of the species

The cause of the critically endangered status of *Hemiandra gardneri* may be due to the clearing for agriculture which began in the region at the turn of the century, resulting in the loss of much of its former habitat. The five extant populations are restricted to narrow road and rail reserves and adjacent remnant vegetation, with high perimeter to area ratios. This results in virtually the whole habitat being subjected to edge effects from management of the adjacent land (Lynch 1987; Saunders *et al* 1987; Taylor 1987). Effects include increased wind speed, increased fertiliser runoff, modified hydrology and altered disturbance regimes, including fire. The fragmentation of the corridors, combined with edge effects, subjects the vegetation to high levels of stress and periodic acute disturbances.

The historical distribution of the species suggests that it may have been far more widespread (Burgman 1983). A lack of suitable disturbance (fire/grading), combined with a naturally restricted distribution may also have contributed to the decline of the species. The prerequisites required for stimulating germination and the factors involved in determining seed viability for this disturbance opportunistic species are unknown.

1.4.2 Threats to the ongoing survival of the species in the wild

- **Weed invasion** is evident in all populations, almost certainly as a result of edge effects such as increased nutrient levels (fertiliser runoff, rabbit droppings) and soil disturbance (rabbits, earthworks). Introduced weedy species respond more favourably to a combination of nutrient addition and soil disturbance (Hobbs and Atkins 1988). *H. gardneri* is both directly and indirectly affected by weeds due to:

    - direct competition, inhibiting the growth of *Hemiandra gardneri* and displacing the species where it once grew.
    - a decrease in the diversity of the habitat of *Hemiandra gardneri*.
    - an alteration in nutrient cycling.
    - a change in soil acidity.
    - an increased fire hazard due to easy ignition, high fuel loads produced annually, and the formation of a continuous fuel bed permitting a fire to spread quickly (Hussey and Wallace 1993).

- **Rabbits** (*Oryctolagus cuniculus*) have caused disturbances at population 4. Warren construction, increased nutrient levels from their droppings, introduction of weeds and grazing are all having an impact on the habitat. Mature *Hemiandra* plants appear to be able to tolerate a fairly high level of grazing, possibly an adaptation for seed dispersal. However, seedlings and immature plants have softer leaves and hence are more palatable (B. Conn[2] pers comm 1996). Grazing may have an impact on the establishment of *H. gardneri* seedlings thus limiting the natural recruitment of the species.

- **Inappropriate fire regimes** during the reproduction phase of *H. gardneri* (ie. flowering, pollination, seed growth and seed dispersal) may result in low/nil seedling recruitment. High fire frequency may also lead to the degradation of the habitat of *H. gardneri* due to a depletion of soil seed banks and a temporary increase in the availability of nutrients for weed establishment (Panetta and Hopkins 1991). Appropriate irregular summer fire may be an important part of the life cycle of this species and be necessary for regeneration.

[1] Dr. Barry Conn, The National Herbarium of NSW
[2]Dr Barry J. Conn, The National Herbarium of NSW

1.5 Conservation status

Hemiandra gardneri occurs on Shire Road Reserve, Westrail Reserve and private property. No populations are known from conservation reserves.

1.6 Strategy for recovery

A Moora District Threatened Flora Recovery Team has been established. The Recovery Team will oversee the implementation of this IRP and report annually to CALM's Corporate Executive.

The following essential strategies will be implemented:

1. Implement weed control in all populations (see 3.2.1).
2. Exclude fire from all populations and implement a fire management plan (see 3.2.2).
3. Monitor all populations annually (see 3.2.3).

The following desirable strategies will be implemented if resources permit:

1. Protect *H. gardneri* from possible future threats (eg. clearing) by appropriate management practices (see 3.3).
2. Conserve the genetic resources of *H. gardneri* by including it in cryostorage and/or *ex situ* cultivation (see 3.3.1).
3. Ensure that relevant land managers and CALM personnel are aware of the presence of *H. gardneri*, and the need to protect it (eg. notification) and ensure that all are familiar with the threatening processes identified in these guidelines (see 3.3.3).
4. Research the biology, ecology and management of *H. gardneri* (see 3.3.4).
5. If deemed necessary, enhance plant numbers (eg. by removal of a limiting factor or direct interference with propagation and translocation techniques, see CALM Policy Statement No 29, *Translocation of Threatened Flora and Fauna* (see 3.3.5).

2. RECOVERY OBJECTIVE AND CRITERIA

2.1 Objective

The objective of this Interim Recovery Plan is to abate identified threats and maintain viable *in situ* populations to ensure the long term preservation of the species in the wild.

2.2 Criteria

2.2.1 Criteria for success

Recovery will be deemed a success if threatening processes identified within this IRP have been reduced or removed within the three year period.

2.2.2 Criteria for failure

The recovery process will have been unsuccessful if identified threats have not abated within the three year period of this IRP or there has been a substantial decrease in the number of mature plants.

3. RECOVERY ACTIONS

3.1 Existing recovery actions

The owners of the private property containing Population 2b were notified of the presence of the species in September 1988. The population is located in remnant vegetation which is adequately fenced from stock.

Declared Rare Flora markers are in place for all roadside populations. Westrail markers are in position along the railway reserve. These alert road and rail maintenance workers to the presence of each population, and enable them to take appropriate care.

Approximately 300 cuttings were taken by staff from Kings Park and Botanic Garden (KPBG) in 1987, and trialed using a variety of hormone strengths. Only five cuttings produced roots, two of which were planted out and soon died.

The remaining three survived in pots. More cutting material was collected in 1994, three of which were grown on and are on display at Kings Park. No seed has been collected.

3.2 Essential recovery actions

3.2.1 Implement weed control

All populations are affected by weeds to varying degrees. Effective weed control with the use of herbicides and hand pulling is recommended for these areas. The tolerance of native plant species to herbicides at *H. gardneri* sites is unknown and it is recommended that weed control programs are undertaken in conjunction with research (see 3.3.5). The aim of weed control is to maintain the pre-invasion condition of the habitat (prevention), control or arrest ongoing weed invasion (intervention) and reverse the degraded condition of the habitat where applicable (rehabilitation) (Panetta and Hopkins 1991). A weed control program is required and will involve:

1. Accurately mapping the boundaries of the populations.
2. Selection of an appropriate herbicide or other method of weed control after determining which weeds are present.
3. Controlling invasive weeds internal to the boundary by hand removal and spot spraying around individual *H. gardneri* plants when weeds first emerge.
4. Scheduling to include weed spraying of other Declared Rare Flora (DRF) populations requiring weed control within the Moora District.

All roadside populations are on land vested with the Shires of Moora and Coorow and the rail reserve population is on land vested with Westrail. A weed control program should be developed in consultation with these agencies.

Action:	Implement weed control
Responsibility:	CALM (Moora District, Science and Information Division (SID), Western Australian Threatened Species and Communities Unit (WATSCU))
Cost:	$1050 pa.

3.2.2 Develop a fire management plan

Little is known of the effects of fire on *H. gardneri*. However, as it is a disturbance opportunist it is likely that it requires occasional fire for recruitment. Until research is undertaken (3.3.5) to determine if this is the case, it is recommended that fire be excluded from all populations and a fire management plan be developed in consultation with relevant authorities and land managers. Collation of historical fire data is essential in developing such a plan..

Action:	Develop a fire management plan
Responsibility:	CALM (Moora District, WATSCU), relevant authorities and land managers
Cost:	$250

3.2.3 Monitor populations

Monitoring of factors such as weed encroachment, habitat degradation, population stability (expanding or declining), pollination activity, seed production, recruitment and longevity is prescribed.

Populations should be inspected annually as a requirement under CALM's Policy Statements, No. 9 *Conservation of Threatened Flora in the Wild* and No 28 *Reporting Monitoring and Re-evaluation of Ecosystems and Ecosystem Management*. See also below 3.3.4, *Development of a quadrat/transect based monitoring system for threatened plant species.*

Action:	Monitor populations
Responsibility:	CALM (Moora District, SID, WATSCU)
Cost:	$450 pa.

3.3 Desirable recovery actions

3.3.1 Preserve genetic diversity of the species

Germplasm collections should be given a high priority if the extinction of populations *H. gardneri* is considered a high probability through disease, its limited distribution or low number of plants. If this is deemed to be the case, recovery of the species is likely to need *ex situ* conservation techniques.

Genetic diversity conservation of the species should be incorporated into the research component (see 3.3.4) and should include collection of seed from all populations, ensuring an adequate representation of genetic diversity.

If it is not possible to collect adequate quantities of viable seed, other more costly germplasm storage methodologies may need to be investigated. These can involve living collections from cutting or other source material, or storage of tissue culture material. If resources are limited these techniques will need to be carefully prioritised in relation to *in situ* conservation. This will be coordinated by the MDTFRT.

It is also important that the size and viability of the soil seed bank is determined and research undertaken to develop techniques for stimulating germination of soil stored seed. Care, however, should be taken as these processes inherently carry a significant risk of depletion of seed bank reserves.

Action:	Collect seed and/or other genetic material from all populations
Responsibility:	MDTFRT, CALM (Moora District, Threatened Flora Seed Centre (TFSC), WATSCU), KPBG
Cost:	$1600

3.3.2 Conduct further surveys

It is recommended that suitable reserves in the Moora and Coorow Shires be surveyed on a systematic basis for the presence of the species, particularly during its flowering period (September-January) and following disturbances such as fire and road works (grading, widening).

Action:	Conduct further surveys
Responsibility:	CALM (Moora District, WATSCU)
Cost:	$900 pa.

3.3.3 Information dissemination

To promote an awareness of *H. gardneri* among relevant CALM staff and the staff of the Shires of Moora and Coorow, the production of vehicle dashboard stickers and posters are recommended. Dashboard stickers should illustrate a rare flora marker and provide a contact telephone number if one is encountered. Posters should illustrate and provide information on the species.

The importance of biodiversity conservation and the preservation of critically endangered species need to be promoted to the general public, however, it is recommended that the exact location of populations of *H. gardneri* remain confidential. Awareness can be encouraged throughout the community by a publicity campaign using the local print and electronic media and by setting up poster displays in venues of high exposure. Formal links with local naturalist groups and interested individuals should also be encouraged. Such activities may lead to the discovery of new populations of the species.

Action:	Produce posters and dashboard stickers, implement a publicity campaign
Responsibility:	CALM (Corporate Relations Division, Moora District, WATSCU)
Cost:	$2000

3.3.4 Conduct research

Research designed to increase understanding of the biology and ecology of *H. gardneri* will provide a scientific base for management of the species in the wild. Research should include:

1. The response of *H. gardneri* to herbicide treatments.
2. Pollination biology and seed set.
3. Investigation of factors determining level of flower and fruit abortion.
4. Quantification of level of invertebrate grazing or removal of seed.
5. The size and viability of seed bank.
6. Seed germination requirements.
7. The role of disturbance in regeneration.
8. The longevity of plants, and time taken to reach maturity.
9. The response of *H. gardneri* and its habitat to fire.
10. Knowledge of the extent of genetic variation within and between populations. This is essential if new populations are to be established.
11. Effects of weeds on recruitment and establishment.
12. The development of a monitoring system. Specific protocols for rare flora will be outlined in a future CALM discussion paper "*Development of a quadrat/transect based monitoring system for threatened plant species*", A. Brown, P. Pigott and D. Coates (in prep).

Action:	Conduct research
Responsibility:	CALM (SID, Moora District, WATSCU)
Cost:	$3000

3.3.5 Translocation

Information on the translocation of threatened animals and plants in the wild is provided in CALM Policy Statement No 29. Surveys for potential habitats for possible future translocation sites are recommended within the scope of IRPs, with actual translocation addressed in full Recovery Plans where necessary. This should be coordinated by the MDTFRT. All translocation proposals require endorsement by the Director of Nature Conservation.

Action: Survey potential habitats for translocation
Responsibility: MDTFRT, CALM (Moora District, WATSCU)
Cost: See section 3.3.2

Table 2: Summary of recovery actions

Recovery Actions	Population	Priority	Responsibility	Completion date
Essential				
Implement weed control	All	High	CALM (Moora District, SID, WATSCU)	1996, annually
Develop a fire management plan	All	High	CALM (Moora District, WATSCU), relevant authorities and land managers	1996.
Monitor populations	All	High	CALM (Moora District, SID, WATSCU)	1996, annually
Desirable				
Preserve genetic diversity of the species	All	Moderate	MDTFRT, CALM (TFSC, Moora District, WATSCU), KPBG,	Commenced, ongoing
Conduct further surveys		Moderate	CALM (Moora District, WATSCU)	Commence October 1996
Information dissemination		Moderate	CALM (Corporate Relations Division, Moora District, WATSCU)	1996
Conduct research	All	Moderate	CALM (SID, Moora District, WATSCU)	1996, ongoing
Translocation	-	Low	MDTFRT, CALM (Moora District, WATSCU)	October 1996

3.4. Costs

Table 3: Summary of costs for each recovery action

Recovery Action	1996			1997		1998	
	CALM	EA	KPBG	CALM	EA	CALM	EA
Essential							
Implement weed control	800	250		800	250	800	250
Develop a fire management plan	250			250		250	
Monitor populations	200	250		200	250	200	250
Sub-total	**$1250**	**$500**		**$1250**	**$500**	**$1250**	**$550**
Desirable							
Preserve genetic diversity of the species		500	1100				
Conduct further surveys	400	500		400	500	400	500
Information dissemination		500			1500		
Conduct research	1000			2000			
Sub-total	**$1400**	**$1500**	**$1100**	**$2400**	**$2000**	**$400**	**$500**
Total	**$2650**	**$2000**	**$1100**	**$3650**	**$2500**	**$1650**	**$1050**

EA Environment Australia (formerly ANCA)

Total of all costs $14600

ACKNOWLEDGMENTS

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Susan J. Patrick Senior Research Scientist, Western Australian Herbarium

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Appendix One: Taxonomic description

English Translation of Sargent's (1927) taxonomic description of *Hemiandra gardneri*, in J. Leigh *et al* (1984).

Hemiandra gardneri P.H. Sargent
STATUS 3E
DESCRIPTION Prostrate, hairy or sometimes hairless shrub to 1 m in diameter. *Leaves* are light-green or greyish-green, opposite, oblanceolate, stiff, 2 cm long and 5 mm wide, rather congested and pointed. *Flowers* are usually dark brick-red but ranging from orange to pinkish-mauve, borne singly in the leaf axils and clustered towards the ends of the stems. Individual flowers are bell-shaped, with the lower part of the corolla tubular, about 1.4 cm long, the upper part spreading and divided into 2 lips and 2 large lateral lobes as long as the lips. The upper lip is divided into 2 short lobes and the lower lip is also 2-lobed with each lobe having 3 distinct teeth. The calyx is narrowly bell-shaped and opens into 2 lips, the upper lip being 3-lobed. *Fruit* has not been described. *Flowering* September and October.

Appendix Two: Associated species

CUPRESSACEAE
Actinostrobus pyramidalis

RESTIONACEAE
Ecdeiocolea monostachya
Lyginia barbata

PHORMIACEAE
Dianella revoluta

HAEMODORACEAE
Conostylis neocymosa
Conostylis aculeata
Macropidia fuliginosa

CASUARINACEAE
Allocasuarina campestris

MIMOSACEAE
Acacia pulchella
Acacia pulchella var. *glaberrima*

PROTEACEAE
Banksia attenuata
Banksia menziesii
Banksia prionotes
Conospermum stoechadis
Grevillea amplexans
Grevillea eriostachya
Grevillea integrifolia
Grevillea leucopteris
Grevillea polybotrya
Hakea prostrata
Synaphea spinulosa subsp *spinulosa*
Xylomelum angustifolium

PAPILIONACEAE
Kennedia sp.
Jacksonia eremodendron
Jacksonia sp.

RUBIACEAE
Opercularia vaginata

MYRTACEAE
Beaufortia elegans
Eremaea pauciflora
Eremaea pilosa
Eucalyptus todtiana
Leptospermum erubescens
Lhotskya acutifolia
Scholtzia drummondii
Verticordia brownii
Verticordia densiflora
Verticordia nitens
Verticordia pennigera

CHLOANTHACEAE
Lachnostachys eriobotrya

GOODENIACEAE
Lechenaultia linarioides
Lechenaultia juncea