

State-wide seed conservation strategy for threatened species, threatened communities and biodiversity hotspots

Project 033146a



Final Report

South Coast Natural Resource Management Inc. and
Australian Government Natural Heritage Trust
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Summary

In 2005 the South Coast Natural Resource Management Inc. secured regional competitive component funding from the Australian Government's Natural Heritage Trust for a three-year project for the Western Australian Department of Environment and Conservation (DEC) to coordinate seed conservation activities for listed threatened species and ecological communities and for Commonwealth identified national biodiversity hotspots in Western Australia (Project 033146).

This project implemented an integrated and consistent approach to collecting seeds of threatened and other flora across all regions in Western Australia. The project expanded existing seed conservation activities thereby contributing to Western Australian plant conservation and recovery programs. The primary goal of the project was to increase the level of protection of native flora by obtaining seeds for long term conservation of 300 species. The project was successful and 571 collections were made. The project achieved its goals by using existing skills, data, centralised seed banking facilities and international partnerships that the DEC's Threatened Flora Seed Centre already had in place. In addition to storage of seeds at the Threatened Flora Seed Centre, 199 duplicate samples were dispatched under a global seed conservation partnership to the Millennium Seed Bank in the UK for further safe-keeping. Herbarium voucher specimens for each collection have been lodged with the State herbarium in Perth, Western Australia. The information is accessible through *Florabase* (<http://florabase.dec.wa.gov.au/>).

The project was able to assist in the implementation of fundamental recovery processes for threatened flora by providing seed-based genetic resources for a number of flora reintroductions and by providing insurance against loss of plant species in the wild. Investigations into seed germination contributed to an understanding of the biology of the species, knowledge that underpins successful plant recovery and revegetation.

This project provided training to community members and other stakeholders in correct methods for seed collection and helped to foster an appreciation and awareness of *ex situ* conservation and its role in the recovery of threatened species and communities. The project produced a number of awareness raising and promotional products, in addition to popular and scientific articles and conference presentations on seed conservation and its role in supporting the survival of plant species in the wild.



A selection of conservation flora from across the NRM Regions targeted for seed collection and conservation through this project.

Introduction

One in five of the 13,000 species, subspecies and varieties of plant life found in Western Australia are of conservation concern. The majority of this flora occurs in the South West of the State, an area recognised as the only global biodiversity hotspot in Australia due to the rich diversity of plant life and the high level of threat facing that flora. A legacy of land clearing has resulted in substantial habitat fragmentation and salinisation of the landscape. Grazing by introduced herbivores, frequent fire and weed invasion further threaten already degraded landscapes. The introduced water mould, *Phytophthora cinnamomi*, threatens 40 per cent of the flora in the south west corner. A mass extinction of biodiversity is projected under future climate change scenarios. Conserving ecosystems in a changing environment will be a challenge. Where habitats are in immediate danger of destruction, and where on ground actions cannot guarantee species survival, the collection and maintenance of plant material from the wild becomes necessary, acting as insurance.

Seeds are nature's genetic storehouse and are a ready source of plant material for utilisation in restoring degraded lands, reintroducing species into the wild and restocking depleted populations. Conserving seeds off site represents a means of saving vital natural resources for the future. It is a complementary approach to on ground actions and a cost effective and efficient way to conserve genetic diversity. Good quality collections with a broad genetic base are required to reinforce and benefit species survival. Under some scenarios, seed conservation is the only realistic tool for some of our most at risk species.

This multi-regional, multi-year approach to delivering a major biodiversity conservation outcome aimed to increase the level of protection of native flora by collecting, conserving and making available material for recovery actions and seed research. Conservation of seed material provides insurance against loss of important flora in the wild and provides genetic material for its future use in reintroduction and restoration. Studies aimed to improve knowledge of seed biology, ecology and threatening processes underpin the management and conservation of plant species and lead to better on ground outcomes for the public benefit.

This project was linked to a global seed conservation partnership between the Western Australian Department of Environment and Conservation through the Millennium Seed Bank, Royal Botanic Gardens Kew UK where duplicate collections of seeds were sent for safe keeping.

Key investment areas addressed by this project.

1. Increased level of protection of native flora through seed conservation

Using existing skills, data and facilities this key investment area was met. A target of 300 native plant species was set at the onset of the project and between 2005 and 2008 571 collections (428 species and subspecies – see Appendix 1) were incorporated into, and are being actively managed in, DEC's seed conservation facility in Perth (Threatened Flora Seed Centre). This facility and its staff use internationally accepted genebanks standards for seed collection and storage (low temperature and low moisture). Sixty-two per cent of the collections made (230 taxa) are conservation-listed in Western Australia

and include 163 Declared Rare flora collections, 192 Priority flora collections and 217 non-conservation listed flora collections associated with Threatened Ecological Communities and Biodiversity Hotspots. In total 428 taxa from 45 families and 113 genera were collected from across the six NRM regions in Western Australia. Although only one half of the collections have been processed to date these collections amount to more than 10.5 kilograms of seeds (> 7 million individual seeds). All seed collections made through this project were accompanied by an herbarium voucher specimen that has been lodged at the Western Australian Herbarium. Details of these specimens can be accessed through the Department of Environment and Conservation herbarium database *Florabase* (<http://florabase.dec.wa.gov.au/>). Duplicate samples of 199 of these collections were dispatched to the Millennium Seed Bank at the Royal Botanic Gardens Kew United Kingdom for safe-keeping under an existing Access and Benefit Sharing Agreement between the Western Australian government and Kew.

This project assisted the Western Australian government through DEC's Threatened Flora Seed Centre to achieve and report against the international goals of Target 8 of the Global Strategy for Plant Conservation. The goals of this target are '60 per cent of threatened plant species in accessible ex situ collections, preferably in the country of origin, and 10 per cent of them included in recovery and restoration programmes'.



Ben Bayliss, Project Officer
collecting seeds of Priority listed
Dryandra stricta in the NACC Region.



Project Manager, Anne Cochrane,
documenting collection information
in the Rangelands Region.

Table 1. Collections by NRM Region

NRM Region	No collections
South Coast	319
Avon	192
South West	25
Rangelands	23
Northern Agricultural	7
Swan	5

Table 2. Collections by conservation status

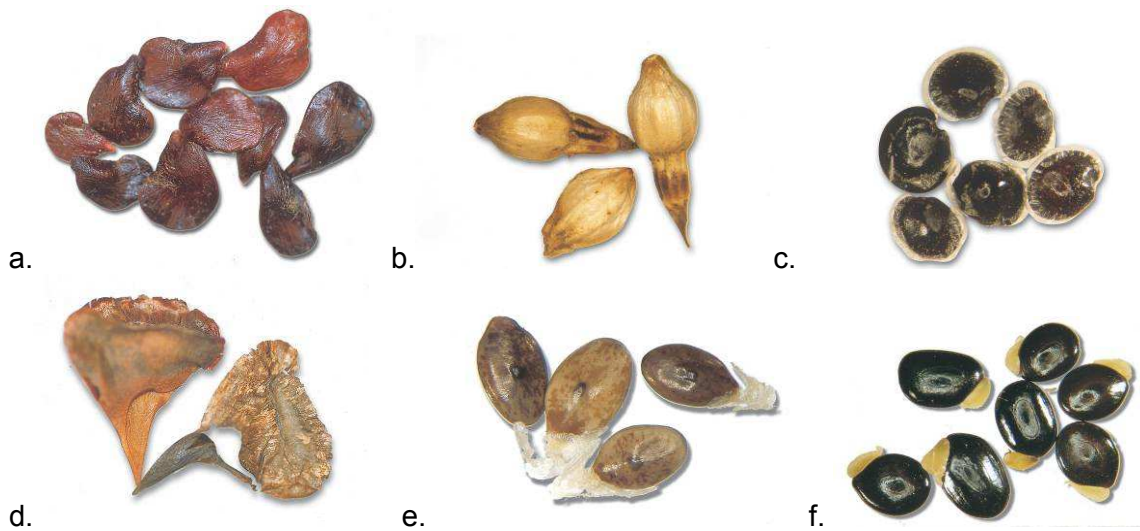
Conservation status	No collections
Critically Endangered	83
Endangered	30
Vulnerable	49
Priority 1	42
Priority 2	64
Priority 1	38
Priority 2	48
Common	217



Todd Erickson, Project Officer, collecting seeds of *Eucalyptus dolichorhyncha*.

2. Provision of material for recovery and information to assist recovery planning

Seeds from a number of threatened flora collected through this project were provided for *in situ* recovery works, and included the Critically Endangered *Lambertia fairallii*, *Banksia brownii*, *Dryandra anatona* and *Hemigenia ramossisima*. The first three species have been planted into a 'seed orchard' in the South Coast Region. The fourth was planted into a reserve in the Avon Region. These plantings have contributed to increased protection of these species through increase in numbers of on ground plants and an accumulation of knowledge regarding their biology and ecology.



Examples of seeds collected under this project for long term conservation and utilisation. a. *Dryandra*; b. *Caustis* c. *Dodonaea* d. *Banksia* e. & f. *Acacia*.

Ecological and biological data gathered at the time of seed collection has been stored in a departmental database. Information on fruit and seed production, population health and size, phenology and descriptions of fruit and seeds are data that assist our knowledge and understanding of native flora that lead to a better conservation outcome.



Albany Rare Flora Recovery team assisting DEC scientists with *Banksia brownii*.



Herbivore-proofing seedlings of *Banksia brownii* after reintroduction into a new safe location near Albany in the SCNRM Region.

3. Improvement in understanding biological processes

Germination trials for species collected through this project are providing information on seed dormancy and germination characteristics, information that is essential for achieving successful recovery and restoration of native species. Quality assessment has been made for more than 50% of collections – this is an ongoing process as is the monitoring of seed viability over time.

All seedlings derived from the routine germination investigations, and not required in on ground recovery actions, have been screened by DEC scientists for their response to inoculation with the dieback disease *Phytophthora cinnamomi* in order to gain an understanding of species susceptibility to the deadly disease. The results of these tests provide vitally important information for land managers. Susceptible species can be targeted for spraying with the fungicide Phosphite to prevent their decline in areas infested with the disease. Appropriate measures to control disease incursions can be adopted to help prevent species extinction and hygiene protocols can be implemented on site. This is particularly pertinent in the South Coast, South West and Swan Regions.

Recent laboratory investigations on seeds collected through this project have provided knowledge on species response to temperature during germination and early seedling growth in order to predict species potentially at risk of extinction due to climate change.



Routine germination investigations assess viability of seeds before storage.

4. Skills & training

Through this project both formal and informal training was provided by project staff (project manager and project officers) for interested stakeholders.

Formal: over the three years of the project, the project manager has provided a formal seed conservation training module within the DEC Flora Management Course for government employees involved in flora conservation. This course has recently become nationally recognised by becoming aligned to the TAFE Unit of Competency 'Monitor Biodiversity' and contributes to a Certificate IV in Conservation and Land Management. These government employees will in turn be able to pass on their knowledge and skills to community members in their own Regions throughout the State. A formal training day in seed collection and conservation was provided to members of the Friends of William Bay National Park and three government staff in 2004.



Presentation to DEC Flora Management Course

Informal: Training volunteer members of the community and government and industry stakeholders in seed collection activities has been an ongoing process for this project. Training varied from a single days on ground activities to a seven day intensive collection training in the field. Participants have ranged from members of the Wildflower Society of Western Australia, an indigenous cadet, an overseas student, members of the Badjaling Aboriginal Community, mining employees and government flora officers from DEC.

5. Public awareness and communications

Contact with community members on a constant basis through emails and face to face contact with seed collection volunteers and through seed collection training (as above) has increased the profile of seed conservation within the community. Progress in communication with the mining industry yielded considerable awareness and support for seed conservation activities in some regions. Specific products, articles and presentations produced as a result of this project are detailed below, in addition to other products produced for seed conservation activities in general:

Brochures/posters

- *Seed Conservation* brochure 2006.
- *Seed Conservation* poster produced for Albany Show 2006.
- *Tackling threats to plant diversity on the South Coast* poster produced for Australian Network for Plant Conservation national conference 2008.
- *Seed Conservation* fridge magnet 2008.



Seed conservation fridge magnet

Popular Articles:

- Cochrane A, Crawford A, Monks L 2007 Achieving Target 8 of the GSPC in Western Australia. *Samara* 13, 11-12.
- Cochrane A 2008 Preserving our flora's future. *LANDSCOPE* 23 (3), 17-21.

These articles detail the good news that seed conservation in Western Australia has helped to achieve global targets set by the Convention on Biological Diversity through the Global Strategy for Plant Conservation and specifically mentions the role that the South Coast NRM plays in supporting seed conservation in Western Australia.

Conference presentations:

- Cochrane A, Crawford A, Monks L 2005 The significance of ex situ conservation to plant recovery in Southern Australia. Paper presented to the international *Advances*

in plant conservation biology: implications for flora management and restoration conference Perth, Western Australia 25-27 October 2005.

- Cochrane A, Daws M 2007 Temperature limits to recruitment in narrow range endemics in south west Western Australia. Paper presented to the international 'Seed Ecology' conference in Perth, Australia September 6-13, 2007.
- Barrett S, Cochrane A 2007 Conservation in action: recovery of threatened flora in South West Western Australia. Paper presented to the *Biodiversity Extinction Crisis. A Pacific response* conference (Inaugural Meeting of the Society for Conservation Biology Australasia) Sydney July 2007
- Anon 2008 Tackling Threats to Plant Diversity on the South Coast of Western Australia. Poster paper presented at the *Our Declining Flora – Tackling the Threats* Australian Network for Plant Conservation national forum, Sydney, Australia 21-24 April, 2008.

These presentations at national and international conferences helped foster an awareness of *ex situ* conservation and its role in species recovery in Western Australia.

Scientific Articles

- Barrett S, Cochrane A 2007 Population demography and seed bank dynamics of the threatened obligate seeding shrub *Grevillea maxwellii* McGill (Proteaceae). *Journal of the Royal Society Western Australia* 90, 165-174.
- Cochrane A, Crawford A, Monks L 2007 The significance of *ex situ* seed conservation to threatened plant reintroduction. *Australian Journal of Botany* 55, 356-361

Other presentations:

- Wildflower Society Western Australia (Albany)
- WA Chief Scientist (Dr Lynn Beazley)

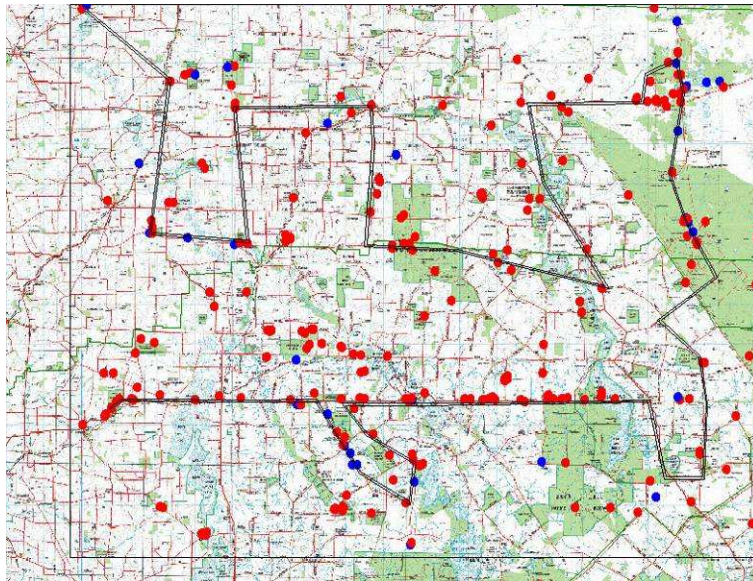
Attendance and presentations at Albany and Esperance Rare Flora Recovery Team meetings on seed conservation outcomes.



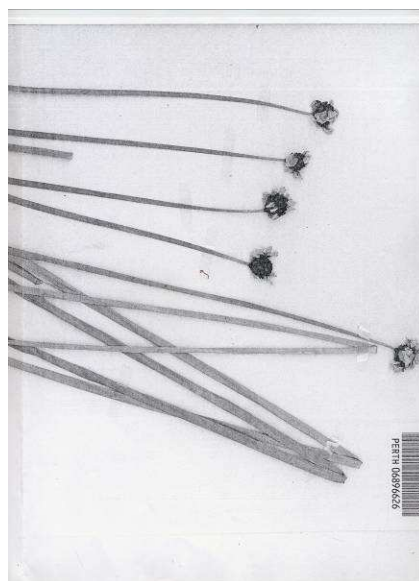
Albany Rare Flora Recovery Team field meeting 2007

Products, services and other activities

This project built capacity for those involved through publicity, training and awareness raising of seed conservation issues in Western Australia, including formal seed conservation. Project planning included compilation of data for targeted species (includes herbarium specimens and associated herbarium collection information, taxonomic descriptions, rare flora report forms) and production of maps highlighting those species within targeted collection areas. Assessment of health and reproductive status of threatened and other significant flora on site and quality assessment of seed collections through laboratory studies was a major service of this Project. On ground works other than seed collection included some botanical survey that identified new populations of conservation-listed species and discovery of potentially new species.



Mapping species in the Avon Region for seed collection



Herbarium voucher specimen examples

Seed Conservation

Supporting the survival of plant diversity in Western Australia

Conserving life on earth

Plants are the basis of life on earth. They trap the sun's energy, generate oxygen and provide nourishment and habitat for almost all life forms. The tremendous diversity of life on earth is largely dependent on the diversity of plant species that sustains it. Any loss of species diversity has irreversible negative impacts on ecosystem processes.

Nature's genetic storehouse

Seeds are nature's genetic storehouse and seed collections provide a ready source of plant material. Seeds can be used to help restore degraded lands, reintroduce species into the wild and restock depleted populations, therefore helping to conserve natural habitats and ecosystems. Seeds are used for scientific research into biology, conservation genetics and disease susceptibility, providing information that assists on ground conservation and management.



Helping on ground conservation

Collecting seeds for conservation represents a complementary approach to on ground actions and has some useful advantages. Seed conservation is an efficient and cost effective method of conserving the variation within and between individual species. Seeds occupy little space and require little attention over long periods of time. Seeds are portable and can be stored at a number of sites reducing their vulnerability to loss. Seeds can produce whole plants with minimal technology.



Good conservation strategies

As global threats to biodiversity escalate the most judicious conservation strategies will be ones that combine available resources to provide the highest possible degree of protection. Banked seeds are available irrespective of season and can be used immediately to support species survival in the wild. Data collection associated with the species or population from which the seed is taken is a potentially vital contribution to knowledge about these plants and should always be obtained at the time of seed collection.

Quality collections

Good quality seed collections with a broad genetic base are required to reinforce and benefit species survival. Storage conditions that minimise deterioration of seeds will maximise the quality and quantity of seeds available for future use.

Species at risk

Species targeted for conservation are those most at risk in the wild. Species with low plant numbers, few populations or limited geographic range and those highly threatened by human and other influences (for example disease, salinity, weed invasion and grazing) may all warrant priority for seed conservation. Other priorities include those experiencing rapid decline in conservation status or health, and those thought to be genetically or taxonomically different from more common species. Where habitats are in immediate danger of destruction, and where on ground actions cannot guarantee species survival, the collection and maintenance of plant material from the wild becomes necessary, acting as insurance.



Seed conservation directly and indirectly assists species survival in the wild. It is an integral part of the Western Australian Department of Environment and Conservation's Flora Conservation and Herbarium Program, supported by national and international conservation strategies.

Enquiries

If you wish to know more about seed conservation please contact
The Seedbank Manager
Threatened Flora Seed Centre
Department of Environment and Conservation
Locked Bag 104
Bentley Delivery Centre
Western Australia 6983

www.naturebase.wa.gov.au



Department of
Environment and Conservation



Seed conservation poster

Lessons learnt

Some of the lessons learnt through this project include the need for early identification of threatened species status to maximise diversity so that collections can be made before population size and genetic diversity decline. This is particularly important in areas where pathogens threaten the survival of plant diversity. Meeting conservation goals without impacting on wild populations is an on-going challenge. Whilst many collections made during the course of this project are quite small, they still provide material that can prove vital for long term species survival.

Stakeholders

Stakeholder groups involved in this project included five community members affiliated with the Wildflower Society of Western Australia, a foreign seed collection volunteer, an indigenous cadet from the National Indigenous Cadetship Project, a school student on work experience and a range of DEC staff (casual, part-time and full-time) who assisted in providing information or actively were involved in seed collection or curation activities.



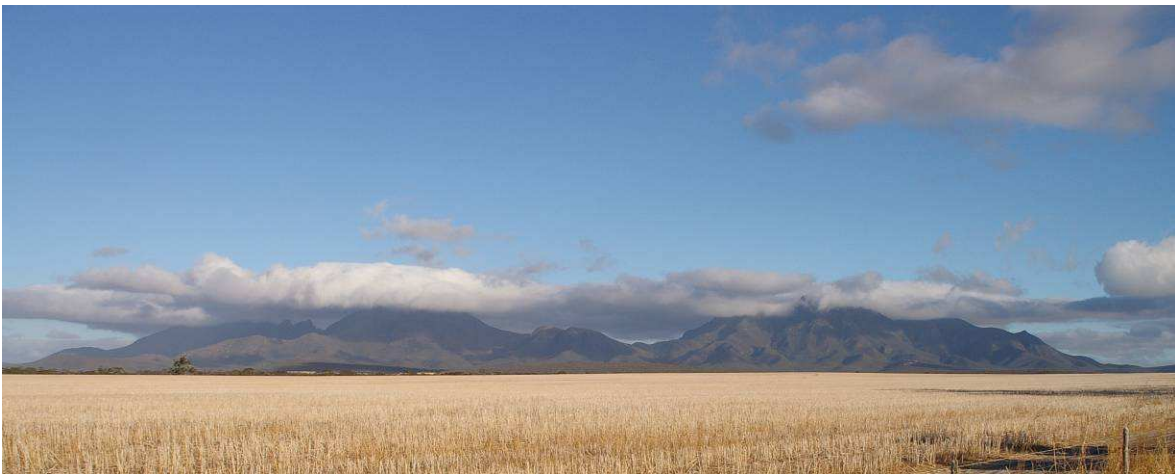
Volunteer Bev Davis collecting *Goodenia* at Clyde Hill, in the SCNRM Region.

A number of other people and groups derived benefit from this project. Taxonomists and botanists from the Western Australian Herbarium were provided with herbarium voucher specimens accompanied seed collections that assisted with determining the taxonomic and conservation status of species (eg Fig. 12). For example, a potentially new species was found at Lake King in the AVCC Region and new populations of a

number of threatened flora have been found leading to an increase in range extension for these species. In addition, DEC staff working on reintroductions of threatened flora have benefited from this project through the provision of seed material for recovery. Two university researchers have also benefited from receiving seed material collected through this project for investigations into mycorrhiza associations and response to temperature.

Ongoing responsibility for the Project outcomes

The Western Australian Department of Environment and Conservation is responsible for the ongoing maintenance of the seed bank and for the monitoring and use of collections made under this NHT funded South Coast NRM led project. Seed samples duplicated through the international seed conservation partnership between the Western Australian Department of Environment and Conservation with the UK Millennium Seed Bank Project will be maintained by the Royal Botanic Gardens, Kew, United Kingdom under an Access and Benefit Sharing Agreement. Further funding is being sought to continue seed conservation activities to enable a larger proportion of the Western Australian flora to be protected through *ex situ* measures in the future.



It is our collective responsibility to ensure the protection and recovery of our native flora so that future generations can inherit and benefit from our rich natural plant diversity.

The Department of Environment and Conservation manages lands and waters in Western Australia for the conservation of biodiversity at ecosystem, species and genetic levels, including management for the renewable resources they provide, and for the recreation and visitor services they can sustainably support.

Appendix 1. List of species by family from which seeds were collected during Project 033146a (April 2005-June 2008). Conservation status and NRM Region provided.

Family	Conservation status	Species	NRM Region
Amaranthaceae	P4	<i>Ptilotus halophilus</i>	ACC
		<i>Ptilotus holosericeus</i>	SCNRM
		<i>Ptilotus spathulatus</i>	ACC
Anthericaceae		<i>Chamaescilla spiralis</i>	SCNRM
		<i>Laxmannia minor</i>	SCNRM
Apiaceae	P1	<i>Thysanotus sabulosus</i>	ACC
	P2	<i>Actinotus whicheranus</i>	SWCC
	E	<i>Apium prostratum</i> subsp. <i>phillipii</i>	SCNRM
	P1	<i>Hydrocotyle diantha</i>	ACC
	P1	<i>Hydrocotyle hexaptera</i>	ACC
	P1	<i>Hydrocotyle muriculata</i>	ACC
Asteraceae	P1	<i>Hydrocoyle sp. Truslove</i>	SCNRM
		<i>Blennospora phlegmatocarpa</i>	ACC
	P3	<i>Erymophyllum tenellum</i>	ACC
		<i>Haegiela tatei</i>	SCNRM
		<i>Ozothamnus lepidophyllus</i>	SCNRM
		<i>Podolepis rugata</i>	SCNRM
Boryaceae	P2	<i>Pterochaeta paniculata</i>	SCNRM
		<i>Borya longiscapa</i>	SCNRM
Brassicaceae	P2	<i>Lepidium genistoides</i>	ACC
Caesalpiniaceae		<i>Senna sp.</i>	SCNRM
		<i>Senna sp. Pallinup River (J.W. Green 4847)</i>	SCNRM
Casuarinaceae	P3	<i>Allocasuarina decussata</i>	SCNRM
		<i>Allocasuarina eriochlamys</i> subsp. <i>grossa</i>	Rangelands
		<i>Allocasuarina humilis</i>	NACC
	P3	<i>Allocasuarina hystricosa</i>	SCNRM
		<i>Allocasuarina tortiramula</i>	ACC
	V	<i>Allocasuarina trichodon</i>	SCNRM
Colchicaceae		<i>Wurmbea sp. (NEW - Lake King)</i>	ACC
Cyperaceae	P1	<i>Caustis sp. Boyanup (GS McCutcheon 1706)</i>	ACC
	P2	<i>Lepyrodia fortunata</i>	SCNRM
	E	<i>Reedia spathacea</i>	SWCC
Dasypogonaceae	CR	<i>Calectasia cyanea</i>	SCNRM
		<i>Chamaexeros macranthera</i>	Rangelands
Dilleniaceae	P3	<i>Hibbertia argentea</i>	SCNRM
	P2	<i>Hibbertia charlesii</i>	SCNRM
	P2	<i>Hibbertia fitzgeraldensis</i>	SCNRM
	P3	<i>Hibbertia glomerata</i> subsp. <i>wandoo</i>	Swan
	E	<i>Hibbertia priceana</i>	SCNRM
		<i>Hibbertia sp.</i>	ACC
Droseraceae	P1	<i>Drosera salina</i>	ACC
Epacridaceae	P2	<i>Acrotiche dura</i>	SCNRM
		<i>Andersonia caerulea</i>	SCNRM
	P2	<i>Andersonia bifida</i>	ACC

Family	Conservation status	Species	NRM Region	
Epacridaceae	P2	<i>Andersonia hammersleyana</i>	SCNRM	
	P3	<i>Brachyloma mogin</i>	ACC	
	P2	<i>Leucopogon psilopus</i>	SCNRM	
	CR	<i>Leucopogon</i> sp. Helena & Aurora Range	Rangelands	
	P2	<i>Leucopogon</i> sp. Ongerup	SCNRM	
	P2	<i>Leucopogon</i> sp. Tutanning	ACC	
		<i>Monotoca leucantha</i>	SCNRM	
Euphorbiaceae	CR	<i>Stachystemon vinosus</i>	SCNRM	
Fabaceae		<i>Bossiaea dentata</i>	SCNRM	
	E	<i>Daviesia megacalyx</i>	SCNRM	
Goodeniaceae	P4	<i>Dampiera deltoidea</i>	SCNRM	
		<i>Goodenia decursiva</i>	SCNRM	
	CR	<i>Goodenia integerrima</i>	ACC	
		<i>Goodenia krauseana</i>	SCNRM	
	P1	<i>Goodenia phillipsiae</i>	SCNRM	
		<i>Goodenia pinifolia</i>	SCNRM	
	P2	<i>Goodenia quadrilocularis</i>	SCNRM	
	P2	<i>Goodenia scapigera</i> subsp. <i>graniticola</i>	SCNRM	
	P1	<i>Goodenia varia</i>	Rangelands	
	P3	<i>Velleia foliosa</i>	SCNRM	
	Gyrostemonaceae	P3	<i>Gyrostemon prostratus</i>	ACC
		P2	<i>Gyrostemon sessilis</i>	SCNRM
	Haemadoraceae	P3	<i>Anigozanthos bicolor</i> subsp. <i>extans</i>	ACC
CR		<i>Anigozanthos bicolor</i> subsp. <i>minor</i>	ACC	
		<i>Anigozanthos flavidus</i>	SCNRM	
E		<i>Conostylis seorsiflora</i> subsp. <i>trichophylla</i>	ACC	
CR		<i>Conostylis setigera</i> subsp. <i>dasys</i>	ACC	
V		<i>Conostylis rogeri</i>	ACC	
P1		<i>Tribonanthes minor</i>	ACC	
P3		<i>Tribonanthes</i> sp. Lake Muir	SWCC	
Iridaceae		V	<i>Orthrosanthus muellerii</i>	SCNRM
			<i>Triglochin centrocarpa</i>	ACC
Juncaginaceae		<i>Triglochin minutissima</i>	ACC	
		<i>Triglochin</i> sp.	ACC	
	P3	<i>Triglochin stowardii</i>	ACC	
	Lamiaceae	CR	<i>Hemigenia ramosissima</i>	ACC
P1		<i>Microcorys pimeleoides</i>	SCNRM	
P4		<i>Microcorys</i> sp. <i>Forrestania</i>	ACC	
Loganiaceae		<i>Logania buxifolia</i>	SCNRM	
	P2	<i>Logania exilis</i>	ACC	
Malvaceae		<i>Alyogone hakeifolia</i>	SCNRM	
		<i>Sida calyxhymenia</i>	SCNRM	
Menyanthaceae	E	<i>Villarsia calthifolia</i>	SCNRM	
Mimosaceae	P1	<i>Acacia adinophylla</i>	Rangelands	
		<i>Acacia assimilis</i>	SCNRM	
	CR	<i>Acacia auratiflora</i>	ACC	
	V	<i>Acacia awestoniana</i>	SCNRM	
	V	<i>Acacia brachypoda</i>	ACC	

Family	Conservation status	Species	NRM Region
Mimosaceae		<i>Acacia cedroides</i>	SCNRM
	P2	<i>Acacia cowaniana</i>	ACC
	P3	<i>Acacia crenulata</i>	ACC
	P3	<i>Acacia declinata</i>	SCNRM
	P3	<i>Acacia deflexa</i>	ACC
	E	<i>Acacia depressa</i>	ACC
	P2	<i>Acacia disticha</i>	SCNRM
	P1	<i>Acacia dorsenna</i>	Rangelands
	P2	<i>Acacia drewiana</i> subsp. <i>minor</i>	ACC
	P3	<i>Acacia durabilis</i>	SCNRM
	P4	<i>Acacia emplioclada</i>	SCNRM
	P3	<i>Acacia euthyphylla</i>	SCNRM
	P2	<i>Acacia gemina</i>	ACC
	P3	<i>Acacia glaucissima</i>	SCNRM
		<i>Acacia gonophylla</i>	SCNRM
	P4	<i>Acacia grisea</i>	ACC
		<i>Acacia harveyii</i>	SCNRM
		<i>Acacia heterochroa</i> subsp. <i>heterochroa</i>	SCNRM
	P2	<i>Acacia incanicarpa</i>	SCNRM
		<i>Acacia lachnophylla</i>	SCNRM
		<i>Acacia lasiocalyx</i>	SCNRM
	E	<i>Acacia leptalea</i>	ACC
	P4	<i>Acacia merrickiae</i>	ACC
		<i>Acacia phlebopetala</i> subsp. <i>phlebopetala</i>	SCNRM
	P4	<i>Acacia pinguiculosa</i> subsp. <i>pinguiculosa</i>	SCNRM
		<i>Acacia pusilla</i>	SCNRM
	CR	<i>Acacia rhampophylla</i>	SCNRM
	CR	<i>Acacia sciophanes</i>	ACC
	P1	<i>Acacia sclerophylla</i> var. <i>teretiuscula</i>	ACC
	P3	<i>Acacia sedifolia</i> subsp. <i>pulvinata</i>	ACC
	P1	<i>Acacia</i> sp. <i>Kulin</i>	ACC
	P1	<i>Acacia stanleyi</i>	ACC
		<i>Acacia subcaerulea</i>	SCNRM
CR	<i>Acacia subflexuosa</i> subsp. <i>capillata</i>	ACC	
	<i>Acacia sulcata</i> subsp. <i>platyphylla</i>	SCNRM	
P2	<i>Acacia tuberculata</i>	ACC	
	<i>Acacia urophylla</i>	SWCC	
P4	<i>Acacia varia</i> var. <i>parviflora</i>	SCNRM	
Myoporaceae		<i>Eremophila densifolia</i>	SCNRM
	V	<i>Eremophila denticulata</i> subsp. <i>denticulata</i>	SCNRM
	V	<i>Eremophila pinnatifida</i>	ACC
P4	<i>Eremophila veneta</i>	ACC	
Myrtaceae		<i>Agonis thieformis</i>	SCNRM
	P1	<i>Astartea</i> sp. <i>Jerdacuttup</i>	SCNRM
	P3	<i>Baeckea</i> sp. <i>Hyden</i>	ACC
		<i>Beaufortia anisandra</i>	SCNRM
		<i>Beaufortia decussata</i>	SCNRM
		<i>Beaufortia orbifolia</i>	SCNRM

Family	Conservation status	Species	NRM Region
Myrtaceae		<i>Beaufortia sparsa</i>	SCNRM
	P4	<i>Calothamnus crassus</i>	SCNRM
		<i>Calothamnus gracilis</i>	SCNRM
		<i>Calothamnus pinifolius</i>	SCNRM
		<i>Calothamnus quadrifidus</i>	SCNRM
		<i>Calothamnus villosus</i>	SCNRM
		<i>Calytrix depressa</i>	SCNRM
		<i>Calytrix flavescens</i>	SCNRM
		P2	<i>Chamelaucium croxfordiae</i>
	<i>Corymbia haematoxylon</i>		SCNRM
	V	<i>Darwinia calothamnoides</i>	SCNRM
	CR	<i>Darwinia carnea</i>	ACC
	P4	<i>Darwinia leiostyla</i>	SCNRM
	P4	<i>Darwinia</i> sp. Chiddarcooping (S.D. Hopper 6944)	ACC
	P2	<i>Darwinia</i> sp. Mt. Ragged	SCNRM
	E	<i>Darwinia</i> sp. Stirling Range	SCNRM
	V	<i>Darwinia squarrosa</i>	SCNRM
		<i>Eucalyptus aequioperta</i>	ACC
		<i>Eucalyptus albida</i>	ACC
	V	<i>Eucalyptus alipes</i>	ACC
		<i>Eucalyptus argutifolia</i>	Swan
		<i>Eucalyptus argyphaea</i>	ACC
	E	<i>Eucalyptus articulata</i>	Rangelands
		<i>Eucalyptus astringens</i> subsp. <i>redacta</i>	ACC
	P4	<i>Eucalyptus brachyphylla</i> x	Rangelands
		<i>Eucalyptus cernua</i>	SCNRM
		<i>Eucalyptus conferruminata</i>	SCNRM
		<i>Eucalyptus dissimulata</i>	ACC
	P4	<i>Eucalyptus dolichorhyncha</i>	SCNRM
		<i>Eucalyptus doratoxylon</i>	SCNRM
	P4	<i>Eucalyptus exilis</i>	Swan
	P4	<i>Eucalyptus georgei</i> subsp. <i>fulgida</i>	ACC
		<i>Eucalyptus gradybrandiana</i>	SCNRM
	P4	<i>Eucalyptus hebetifolia</i>	SCNRM
		<i>Eucalyptus horistes</i>	ACC
		<i>Eucalyptus incrassata</i>	SCNRM
		<i>Eucalyptus kruseana</i>	Rangelands
		<i>Eucalyptus lehmannii</i> subsp. Narrow Leaf	SCNRM
		<i>Eucalyptus livida</i>	ACC
		<i>Eucalyptus luculenta</i>	SCNRM
		<i>Eucalyptus luteola</i>	ACC
		<i>Eucalyptus marginata</i>	SCNRM
		<i>Eucalyptus megacarpa</i>	SCNRM
		<i>Eucalyptus megacomuta</i>	SCNRM
	V	<i>Eucalyptus merrickiae</i>	SCNRM
	P2	<i>Eucalyptus mimica</i> subsp. <i>mimica</i>	ACC
		<i>Eucalyptus moderata</i>	ACC
<i>Eucalyptus myriadena</i>		ACC	

Family	Conservation status	Species	NRM Region	
Myrtaceae	P4	<i>Eucalyptus nigrifunda</i>	Rangelands	
	V	<i>Eucalyptus nutans</i>	SCNRM	
		<i>Eucalyptus obesa</i>	ACC	
		<i>Eucalyptus olivina</i>	ACC	
		<i>Eucalyptus pachyloma</i>	SCNRM	
		<i>Eucalyptus petrensis</i>	Swan	
		<i>Eucalyptus phenax</i>	ACC	
		P3	<i>Eucalyptus pimpiniana</i>	Rangelands
		P4	<i>Eucalyptus proxima</i>	SCNRM
		P4	<i>Eucalyptus rigidula</i>	ACC
			<i>Eucalyptus rugulata</i>	ACC
	<i>Eucalyptus salubris</i>		SCNRM	
	<i>Eucalyptus scyphocalyx</i>		ACC	
	<i>Eucalyptus singularis</i>		ACC	
	<i>Eucalyptus</i> sp. Yealering		ACC	
	P2		<i>Eucalyptus sparsicoma</i>	ACC
	P3		<i>Eucalyptus spathulata</i> subsp. <i>salina</i>	ACC
			<i>Eucalyptus staeri</i>	SCNRM
	P1		<i>Eucalyptus subangusta</i> subsp. <i>virescens</i>	ACC
		<i>Eucalyptus suggrandis</i>	SCNRM	
	V	<i>Eucalyptus synandra</i>	ACC	
		<i>Eucalyptus tephroclada</i>	ACC	
		<i>Eucalyptus vegrandis</i>	ACC	
		<i>Eucalyptus uncinata</i>	ACC	
		<i>Homalospermum firmum</i>	SCNRM	
		<i>Kunzea recurva</i>	SCNRM	
		P2	<i>Kunzea</i> sp. Dragon Rocks	ACC
			<i>Leptospermum incanum</i>	SCNRM
			<i>Leptospermum spinescens</i>	SCNRM
			<i>Melaleuca acuminata</i>	ACC
	P3	<i>Melaleuca apostiba</i>	Rangelands	
		<i>Melaleuca blaeriifolia</i>	SCNRM	
		<i>Melaleuca calycina</i>	SCNRM	
		<i>Melaleuca camptoclada</i>	SCNRM	
		<i>Melaleuca concinna</i>	SCNRM	
		<i>Melaleuca conothamnoides</i>	ACC	
		<i>Melaleuca cucullata</i>	SCNRM	
		<i>Melaleuca densa</i>	SCNRM	
		<i>Melaleuca elliptica</i>	SCNRM	
		<i>Melaleuca fulgens</i>	SCNRM	
<i>Melaleuca glaberrima</i>		SCNRM		
<i>Melaleuca globifera</i>		SCNRM		
P1		<i>Melaleuca grieviana</i>	ACC	
		<i>Melaleuca hamata</i>	ACC	
		<i>Melaleuca hamulosa</i>	ACC	
	<i>Melaleuca haplantha</i>	ACC		
	<i>Melaleuca laxiflora</i>	ACC		
		<i>Melaleuca leptospermoides</i>	ACC	

Family	Conservation status	Species	NRM Region	
Myrtaceae	P2	<i>Melaleuca microphylla</i>	SCNRM	
		<i>Melaleuca penicula</i>	SCNRM	
		<i>Melaleuca pomphostoma</i>	SCNRM	
	V	<i>Melaleuca procera</i>	ACC	
		<i>Melaleuca sciotostyla</i>	ACC	
		<i>Melaleuca spathulata</i>	SCNRM	
		<i>Melaleuca stereophloia</i>	ACC	
		<i>Melaleuca subfalcata</i>	SCNRM	
		<i>Melaleuca thymoides</i>	SWCC	
		<i>Melaleuca torquata</i>	SCNRM	
		<i>Melaleuca villosisepala</i>	ACC	
		<i>Melaleuca violacea</i>	SCNRM	
		<i>Taxandria conspicua</i>	SCNRM	
		<i>Taxandria juniperina</i>	SCNRM	
	<i>Taxandria spathulata</i>	SCNRM		
	CR	<i>Verticordia albida</i>	NACC	
	P3	<i>Verticordia attenuata</i>	SWCC	
	V	<i>Verticordia helichrysantha</i>	SCNRM	
	P2	<i>Verticordia multiflora</i> subsp. <i>solox</i>	ACC	
	Papilionaceae	V	<i>Bossiaea linophylla</i>	SCNRM
			<i>Daviesia elongata</i> subsp. <i>elongata</i>	SWCC
		<i>Daviesia emarginata</i>	SCNRM	
CR		<i>Daviesia euphorbioides</i>	ACC	
CR		<i>Daviesia glossosema</i>	SCNRM	
E		<i>Daviesia megacalyx</i>	SCNRM	
CR		<i>Daviesia pseudaphylla</i>	SCNRM	
		<i>Eutaxia myrtifolia</i>	SCNRM	
		<i>Gastrolobium bilobum</i>	SCNRM	
		<i>Gastrolobium coriaceae</i>	SCNRM	
P3		<i>Gastrolobium cruciatum</i>	SCNRM	
P4		<i>Gastrolobium densifolium</i>	ACC	
P2		<i>Gastrolobium elegans</i>	SCNRM	
P1		<i>Gastrolobium euryphyllum</i>	ACC	
P2		<i>Gastrolobium ferrugineum</i>	SCNRM	
P1		<i>Gastrolobium hians</i>	Rangelands	
P2		<i>Gastrolobium leakeanum</i>	SCNRM	
CR		<i>Gastrolobium luteifolium</i>	SCNRM	
		<i>Gastrolobium rubrum</i>	SCNRM	
P1		<i>Gastrolobium tenue</i>	ACC	
P2		<i>Gastrolobium tergiversum</i>	SCNRM	
	<i>Gompholobium gompholobioides</i>	SCNRM		
	<i>Gompholobium villosum</i>	SCNRM		
	<i>Hovea elliptica</i>	SWCC		
P4	<i>Jacksonia calycina</i>	SCNRM		
CR	<i>Jacksonia pungens</i>	NACC		
E	<i>Jacksonia quairading</i>	ACC		
	<i>Jacksonia viscosa</i>	SCNRM		
	<i>Kennedia eximia</i>	SCNRM		

Family	Conservation status	Species	NRM Region
Papilionaceae		<i>Mirbelia dilatata</i>	SWCC
	V	<i>Muelleranthus crenulatus</i>	ACC
	P4	<i>Pultenaea calycina</i> subsp. <i>proxena</i>	SCNRM
	V	<i>Pultenaea pauciflora</i>	ACC
		<i>Pultenaea verruculosa</i>	SCNRM
	P2	<i>Gastrolobium involutum</i>	SCNRM
	P2	<i>Gastrolobium pycnostachyum</i>	SCNRM
	P4	<i>Kennedia beckxiana</i>	SCNRM
		<i>Labichea lanceolata</i>	SCNRM
	Pittosporaceae	P4	<i>Bentleya spinescens</i>
V		<i>Marianthus mollis</i>	SCNRM
Poaceae		<i>Marianthus bicolor</i>	SCNRM
		<i>Austrostipa exilis</i>	ACC
Polygonaceae		<i>Neurachne alopecuroidea</i>	ACC
Polygonaceae	E	<i>Muellenbeckia horrida</i> subsp. <i>abdita</i>	ACC
Portulacaceae		<i>Calandrinia corrigioloides</i>	SCNRM
Proteaceae	P3	<i>Andersonia echinocephala</i>	SCNRM
		<i>Banksia baueri</i>	SCNRM
	P4	<i>Banksia benthamiana</i>	ACC
	CR	<i>Banksia brownii</i>	SCNRM
		<i>Banksia caleyi</i>	SCNRM
	P4	<i>Banksia chamaephyton</i>	NACC
	CR	<i>Banksia cuneata</i>	ACC
		<i>Banksia dryandroides</i>	SCNRM
		<i>Banksia ilicifolia</i>	SCNRM
	P4	<i>Banksia laevigata</i> subsp. <i>laevigata</i>	SCNRM
		<i>Banksia media</i>	SCNRM
	P4	<i>Banksia meisneri</i> subsp. <i>ascendens</i>	SWCC
	P3	<i>Banksia micrantha</i>	NACC
		<i>Banksia nutans</i>	SCNRM
		<i>Banksia quercifolia</i>	SCNRM
		<i>Banksia seminuda</i>	SWCC
	P4	<i>Banksia solandri</i>	SCNRM
		<i>Banksia sphaerocarpa</i>	SCNRM
	V	<i>Banksia sphaerocarpa</i> var. <i>dolichostyla</i>	ACC
	V	<i>Banksia verticillata</i>	SCNRM
	<i>Banksia violaceae</i>	SCNRM	
CR	CR	<i>Dryandra anatona</i>	SCNRM
		<i>Dryandra carlinoides</i>	NACC
	P4	<i>Dryandra comosa</i>	ACC
	P4	<i>Dryandra concinna</i>	SCNRM
	P4	<i>Dryandra cynaroides</i>	ACC
	P2	<i>Dryandra epimicta</i>	ACC
	P2	<i>Dryandra erythrocephala</i> var. <i>inopinata</i>	SCNRM
	P2	<i>Dryandra ferruginea</i> subsp. <i>tutanningensis</i>	ACC
	P2	<i>Dryandra foliolata</i>	SCNRM
	P2	<i>Dryandra lindleyana</i> subsp. <i>agricola</i>	ACC

Family	Conservation status	Species	NRM Region	
Proteaceae	P1	<i>Dryandra longifolia</i> subsp. <i>calicicola</i>	SCNRM	
	P3	<i>Dryandra meganotia</i>	ACC	
	CR	<i>Dryandra montana</i>	SCNRM	
		<i>Dryandra pallida</i>	SCNRM	
		<i>Dryandra proteoides</i>	ACC	
	P4	<i>Dryandra pulchella</i>	ACC	
	P3	<i>Dryandra senecifolia</i>	SCNRM	
		<i>Dryandra</i> sp.	ACC	
	P3	<i>Dryandra stricta</i>	NACC	
	P4	<i>Dryandra wonganensis</i>	ACC	
	P4	<i>Grevillea asteriscosa</i>	ACC	
	V	<i>Grevillea dryandroides</i> subsp. <i>hirsuta</i>	ACC	
	E	<i>Grevillea involucrata</i>	ACC	
	P1	<i>Grevillea lullfitzii</i>	ACC	
	P3	<i>Grevillea pilosa</i> subsp. <i>redacta</i>	ACC	
		<i>Grevillea shuttleworthiana</i> subsp. <i>obovata</i>	SCNRM	
		<i>Grevillea spinosissima</i>	ACC	
		<i>Hakea ambigua</i>	SCNRM	
		<i>Hakea clavata</i>	SCNRM	
		<i>Hakea elliptica</i>	SCNRM	
		<i>Hakea falcata</i>	SCNRM	
		<i>Hakea laurina</i>	SCNRM	
		<i>Hakea marginata</i>	SCNRM	
		<i>Hakea subsulcata</i>	SCNRM	
		<i>Hakea trifurcata</i>	Swan	
		<i>Hakea tuberculata</i>	SCNRM	
		<i>Hakea verrucosa</i>	SCNRM	
		<i>Isopogon attenuatus</i>	SCNRM	
		<i>Isopogon baxterii</i>	SCNRM	
		<i>Isopogon</i> sp. Fitzgerald River	SCNRM	
		<i>Isopogon</i> sp. Newdegate (D.B. Foreman 771)	ACC	
		CR	<i>Lambertia echinata</i> subsp. <i>echinata</i>	SCNRM
		CR	<i>Lambertia echinata</i> subsp. <i>occidentalis</i>	SWCC
		CR	<i>Lambertia fairallii</i>	SCNRM
		CR	<i>Lambertia orbifolia</i> subsp. <i>orbifolia</i>	SCNRM
		E	<i>Lambertia orbifolia</i> subsp. Scott River Plains	SWCC
		<i>Petrophile anceps</i>	SCNRM	
		<i>Petrophile cyathiforma</i>	ACC	
		<i>Petrophile divaricata</i>	SCNRM	
		<i>Petrophile diversifolia</i>	SCNRM	
		<i>Petrophile fastigiata</i>	SCNRM	
		<i>Petrophile serruriae</i>	SCNRM	
	P2	<i>Synaphea boyaginensis</i>	ACC	
Rhamnaceae	P1	<i>Cryptandra arbutiflora</i> var. <i>intermedia</i>	SCNRM	
	P2	<i>Cryptandra congesta</i>	SCNRM	
	P1	<i>Cryptandra</i> sp. Hopetoun	SCNRM	
	P2	<i>Gyrostemon sessilis</i>	SCNRM	
	P4	<i>Pomaderris grandis</i>	SCNRM	

Family	Conservation status	Species	NRM Region	
Rhamnaceae	P4	<i>Siegfriedia darwinioides</i>	SCNRM	
		<i>Spyridium majoranifolium</i>	SCNRM	
	P3	<i>Stenanthemum newbeyii</i>	Rangelands	
		P2	<i>Trymalium monospermum</i>	ACC
Rubiaceae	<i>Opercularia</i> sp.		SCNRM	
	<i>Opercularia vaginata</i>	SWCC		
Rutaceae	P2	<i>Asterolasia pallida</i> subsp. <i>hyalina</i>	ACC	
		<i>Bertya dimerostigma</i>	ACC	
		<i>Boronia alata</i>	SCNRM	
	V	<i>Boronia revoluta</i>	ACC	
	V	<i>Drummondita longifolia</i>	SCNRM	
		<i>Phebalium tuberculosum</i>	SCNRM	
Sapindaceae		<i>Dodonaea concinna</i>	SCNRM	
	<i>Dodonaea pinifolia</i>	SCNRM		
	<i>Dodonaea ptarmiceafolia</i>	SCNRM		
Sterculiaceae	P1	<i>Commersonia</i> sp. <i>Mt Groper</i>	SCNRM	
		<i>Guichenotia macrantha</i>	ACC	
		<i>Lasiopetalum compactum</i>	SCNRM	
	P2	<i>Lasiopetalum maxwellii</i>	SCNRM	
		CR	<i>Lasiopetalum rotundifolium</i>	ACC
	CR		<i>Lysiosepalum aromaticum</i>	ACC
		<i>Thomasia heterophylla</i>	SWCC	
	V	<i>Thomasia montana</i>	ACC	
	Stylidiaceae	P2	<i>Levenhookia pulcherrima</i>	SCNRM
			<i>Stylidium albomontis</i>	SCNRM
P1		<i>Stylidium applanatum</i>	ACC	
		P3	<i>Stylidium barleei</i>	SWCC
<i>Stylidium breviscapum</i>			SCNRM	
<i>Stylidium caespitosum</i>			SWCC	
P2		<i>Stylidium coatesianum</i>	ACC	
		<i>Stylidium emarginatum</i> subsp. <i>exappendiculatum</i>	ACC	
P3		<i>Stylidium lepidum</i>	ACC	
		<i>Stylidium pseudosacculatum</i>	ACC	
P3		<i>Stylidium pulviniforme</i>	ACC	
		<i>Stylidium scandens</i>	SCNRM	
		<i>Stylidium sejunctum</i>	ACC	
	<i>Stylidium tenuicarpum</i>	ACC		
	Thymelaeaceae	P4	<i>Pimelea cracens</i> subsp. <i>cracens</i>	SCNRM
<i>Pimelea erecta</i>			SCNRM	
P4		<i>Pimelea physodes</i>	SCNRM	
Tremandraceae	V	<i>Tetratheca aphylla</i> subsp. <i>aphylla</i>	Rangelands	
	V	<i>Tetratheca aphylla</i> subsp. <i>megacarpa</i>	ACC	
Violaceae		<i>Hybanthus floribundus</i> subsp. <i>adpressus</i>	SCNRM	
Xyridaceae		<i>Xyria lacera</i>	SWCC	
		<i>Xyris lanata</i>	SCNRM	
		<i>Xyris laxiflora</i>	SWCC	
	P2	<i>Xyris maxima</i>	SWCC	