

GREEN FLOWERED EMUBUSH, CAMPION EREMOPHILA

(*EREMOPHILA VIRENS*)

RECOVERY PLAN



Department of Environment and Conservation
Species and Communities Branch (SCB)
Kensington



Australian Government



**Department of
Environment and Conservation**

Our environment, our future



FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) [now Department of Environment and Conservation (DEC)] Policy Statements Nos. 44 & 50. Note: the Department of CALM formally became the Department of Environment and Conservation (DEC) in July 2006. DEC will continue to adhere to these Policy Statements until they are revised and reissued.

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.

DEC is committed to ensuring that Threatened taxa are conserved through the preparation and implementation of Recovery Plans (RPs) or IRPs, and by ensuring that conservation action commences as soon as possible and, in the case of Critically Endangered (CR) taxa, always within one year of endorsement of that rank by the Minister.

This Interim Recovery Plan will operate from May 2006 to April 2011 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Endangered (WA), this IRP will be reviewed after five years and the need for a full Recovery Plan will be assessed.

This IRP was given DEC regional approval on 13 February, 2006 and was approved by the Director of Nature Conservation on 22 February, 2006. The allocation of staff time and provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting DEC, as well as the need to address other priorities.

This IRP has been updated with information contained herein accurate as at April 2008.

This IRP was prepared with financial support from the Australian Government to be adopted as a National Recovery Plan under the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)

IRP PREPARATION

This IRP was prepared by Julie Patten¹, Kate Brunt² and Andrew Brown³.

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ACKNOWLEDGMENTS

The following people have provided assistance and advice in the preparation of this Interim Recovery Plan:

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Heather Adamson	Former Land for Wildlife Officer, DEC's Merredin District
Jon Pridham	District Wildlife Officer, DEC's Merredin District
Sarah Adriano	Reserves Officer, DEC's Goldfields Region
Mark Cowan	Former Regional Ecologist, DEC's Goldfields Region
Amanda Shade	Horticulturalist, Botanic Garden and Parks Authority
Anne Cochrane	Manager, DEC's Threatened Flora Seed Centre
Andrew Crawford	Senior Technical Officer, DEC's Threatened Flora Seed Centre
Brett Beecham	Regional Ecologist, DEC's Wheatbelt Region, Narrogin

Thanks also to the staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and DEC's Species and Communities Branch for assistance.

Cover photograph by Andrew Brown.

CITATION

This Interim Recovery Plan should be cited as:

Department of Environment and Conservation(2008). *Campion Eremophila*, Green flowered emubush (*Eremophila virens*) Recovery Plan. Interim Recovery Plan No. 219. Department of Environment and Conservation, Perth, Western Australia.

SUMMARY

Scientific Name:	<i>Eremophila virens</i>	Common Names:	Campion Eremophila, Green flowered emubush
Family:	Myoporaceae	Flowering Period:	June / August to October; occasionally November
DEC Region:	Wheatbelt	DEC District:	Merredin
Shires:	Mukinbudin, Westonia, Nungarin, Mount Marshall	Recovery Team:	Merredin District Threatened Flora Recovery Team

Illustrations and/or further information: Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Perth, Western Australia; Leigh, J., Boden, R. and Briggs, J. (1984) *Extinct and Endangered Plants of Australia*, McMillian Company of Australia, Melbourne; Mollemans, F.H., Brown, P.H. and Coates, D.J. (1993) *Declared Rare Flora and other plants in need of special protection in the Merredin District. Wildlife Management Program No. 9*. Department of Conservation and Land Management, Perth, Western Australia; Western Australian Herbarium (1998) *FloraBase* – Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia. <http://www.calm.wa.gov.au/science/>

Current status: *Eremophila virens* was declared as Rare Flora in November 1980 and ranked as Endangered (EN) under the Western Australian *Wildlife Conservation Act 1950* in May 1997. It currently meets World Conservation Union (IUCN 2000) Red List Category 'EN' under criteria C2a(i) due to their being fewer than 2500 mature individuals, an inferred continuing decline in the number of mature individuals and no subpopulation contains more than 250 mature individuals. The species is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main threats are drought, weeds, inappropriate fire regimes, restricted habitat, grazing, disturbance by stock and feral animals, chemical drift and maintenance activities for roads, tracks, power lines and firebreaks.

Description: *Eremophila virens* is an erect, slender shrub 1.5 to 5 m high with large, broad, shiny-green, sticky leaves 5 to 9 cm long by 20 to 30 mm wide that are folded lengthwise and pointed at the tip. The green flowers have small calyx lobes 7 to 10 mm long. The specific name is derived from the Latin *virens* (green), referring to the unusual green flowers that are typical of the species (Brown 2004).

Habitat requirements: *Eremophila virens* is endemic to Western Australia where it occurs over a geographic range of 55 km in the Mukinbuddin, Waralakina and Bonnie Rock areas. Its preferred habitat appears to be areas of light brown to red sandy loam over granite in rocky situations, growing in thicket or shrub with acacias and sheoaks.

Habitat critical to the survival of the species, and important populations: Habitat critical to the survival of *Eremophila virens* is the area of occupancy of important populations; areas of similar habitat surrounding important populations i.e. (light brown, sandy loam over granite in rocky situations) and additional occurrences of similar habitat that do not currently contain the species but may have done so in the past and may be suitable for translocations. These areas of similar habitat are important where they provide potential habitat for natural range extension and/or for allowing pollinators or biota essential to the continued existence of the species to move between populations.

As *Eremophila virens* is listed as Endangered all populations are considered important populations.

Benefits to other species/ecological communities: Recovery actions implemented to improve the quality of the habitat of *Eremophila virens* will also improve the status of other threatened species including *Eremophila viscida* and *Acacia denticulosa*.

International obligations: This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity that was ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that Convention. The species is not listed under the United Nations Environment Program World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES). In addition, it is not listed under any other specific international treaty and this Interim Recovery Plan (IRP) does not affect Australia's obligations under these international agreements.

Role and interests of Indigenous people: Involvement of the Indigenous community is being sought through the advice of the Department of Indigenous Affairs to determine whether there are any issues or interests identified in the plan. A search of the Department of Indigenous Affairs Aboriginal Sites Register lists two painting sites in the vicinity of *Eremophila virens*. Implementation of recovery actions under this plan will include consideration of the role and interests of Indigenous communities in the region. Where no role is identified for the Indigenous community associated with this species in the development of the recovery plan opportunities may exist through cultural interpretation and awareness of the species. Indigenous involvement in the implementation of recovery actions will be encouraged.

Social and economic impacts: The implementation of this recovery plan has the potential to have some limited social and economic impact, as some populations are located on private property. Recovery actions refer to continued liaison between stakeholders with regard to these areas.

Affected interests: Stakeholders potentially affected by the implementation of this plan include the Shire of Mukinbudin, as managers of the areas containing Populations (1, 2a, 2b, 3a, 5, 6a and 12a), Shire of Westonia (Population 10a), Shire of Mount Marshall (Population 12a), West Net Rail (Population 9), Water Corporation (Population 11), and Main Roads WA (Populations 4b and 4c).

Evaluation of the plans performance: DEC will evaluate the performance of this IRP in conjunction with the Merredin District Threatened Flora Recovery Team. In addition to annual reporting on progress with listed actions and comparison against the criteria for success and failure, the plan is to be reviewed within five years of its implementation.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented:

1. With the exception of land containing populations 6b, 6c, 14a, 14b and 15, land owners and managers have been formally notified of the location and threatened status of the species. The notification details the Declared Rare status of *Eremophila virens* and the legal responsibility to protect it.
2. Declared Rare Flora (DRF) markers have been installed at Populations 2a, 2b, 3a, 4b, 4c, 6, 9, 10a, 12a and 15.
3. Dashboard stickers and posters describing the significance of DRF markers have been produced and distributed.
4. DEC has liaised with the Nungarin Shire works supervisor and community Landcare Officer with regard to management of *Eremophila virens* populations in their Shire.
5. 591 fruits (~401 seeds) were collected from Population 4 by staff from DEC's Threatened Flora Seed Centre (TFSC) in December 2000. The initial germination rate was found to be 48%. Seed was also collected from Population 6b in 2003; however no germination testing has yet been carried out.
6. The Botanic Gardens and Parks Authority (BGPA) currently have 6 plants of *Eremophila virens* from 7 clones in their nursery and gardens.
7. All but eight plants in Population 9 were fenced to prevent damage during rail maintenance activities in 1997.
8. In 1992, a landholder sought an alteration to the tenure and management of adjacent Water Authority land that contains Population 11. Following negotiations between DEC and the Water Authority the application was not approved and the land continues to be managed for conservation.
9. The Merredin District Recovery Team (MDTFRT) is overseeing the implementation of this Interim Recovery Plan.
10. Staff from DEC's Merredin District regularly monitor populations of the species. Staff from DEC's Goldfields Region has been involved in searches for the species.

IRP Objective: The objective of this Interim Recovery Plan is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the species in the wild.

Recovery criteria

Criteria for success: The number of individuals within populations and/or the number of populations have increased by ten percent or more over the five years of the plan.

Criteria for failure: The number of individuals within populations and/or the number of populations have decreased by ten percent or more over the five years of the plan.

Recovery actions

- | | |
|---|---|
| 1. Coordinate recovery actions | 8. Formally notify land managers |
| 2. Map total habitat | 9. Liaise with land managers |
| 3. Obtain biological and ecological information | 10. Monitor populations |
| 4. Promote awareness | 11. Install fencing |
| 5. Conduct further surveys | 12. Seek long-term protection of habitat and secure tenure |
| 6. Develop and implement a fire management strategy | 13. Undertake weed control |
| 7. Collect seed and cutting material | 14. Review the IRP and assess the need for further recovery actions |

1. BACKGROUND

History

The first known collection of *Eremophila virens* was made in 1931 from the Campion area by C.A. Gardner, who formally described the species in 1942. The name *virens* is Latin for green, referring to the distinctive green flowers of the species. Between 1942 and the present day a further 13 collections were made over a relatively small geographical range. A population that was thought to occur in Boorabbin National Park well east of other populations is now known to be *Eremophila serrulata*. *Eremophila virens* is currently known from 14 populations over a range of 55 km between Mukinbudin and Weira in the eastern Wheatbelt.

Description

Comprising some two hundred named and many unnamed species, the genus *Eremophila* is endemic to Australia where it is represented in all mainland states. Western Australia has by far the greatest number of species with some 184 currently known. Commonly known as emu bushes or poverty bushes many species have been found to contain chemicals that may be of great pharmaceutical value in modern medicine. Aboriginal people have used *Eremophila* species in ceremonial rites and in liniments, medicines and antiseptics. Mainly due to land clearing for Agriculture several species are now listed as threatened. One of the rarest is *Eremophila virens*.

Eremophila virens grows between 3 and 5 m tall by 1.5 to 3.5 m across. Mature plants have slender, erect branches with alternate shiny, often sticky leaves to 8 cm long by 3.5 cm across. Its hairy tubular flowers, which are up to 2 cm long, have a green exterior and pointed floral lobes. One or two flowers are held on slender pedicels up to 2cm long in the upper leaf axils. Its hairless, egg-shaped globular fruit are 3–5 mm long and about 3 mm wide (Brown *et al.* 1998).

Eremophila virens is distinguished by its large, shiny leaves, green flowers and the prominent tufts of yellow-white hairs on its sepals and buds.

Distribution and habitat

Eremophila virens is endemic to Western Australia where it is found over a geographic range of 55 km in the Mukinbuddin, Warralakin and Bonnie Rock areas. Its preferred habitat appears to be areas of light brown or red sandy-loam over granite and quartzite in rocky situations, growing in thicket or shrub with acacias, mallees and sheoaks (Mollemans *et al.* 1993).

Associated species include *Acacia acuminata*, *A. coolgardiensis*, *A. erinacea*, *A. hemiteles*, *A. tetragonophylla*, *A. denticulosa*, *Allocasuarina acutivalvis*, *Allocasuarina campestris*, *Avena fatua*, *Borya* sp., *Dianella revoluta*, *Dodonaea inaequifolia*, *Dodonaea attenuata*, *Eucalyptus capillosa*, *E. hypochlamydea*, *E. loxophleba*, *E. sheathiana*, *E. redunca*, *E. salubris*, *E. wandoo*, *Eremophila viscida*, *Glischrocaryon* sp., *Grevillea paradoxa*, *Melaleuca uncinata*, *M. lateriflora*, *Olearia* sp., *Santalum acuminatum* and *Ptilotus obovatus*.

Summary of population land vesting, purpose and tenure

Pop. No. & Location	DEC District	Shire	Vesting	Purpose	Tenure
1. South west of Mukinbudin	Merredin	Mukinbudin	Shire of Mukinbudin	Road Reserve	Non-DEC Act- General
2a. North west of Mukinbudin	Merredin	Mukinbudin	Shire of Mukinbudin	Road Reserve	Non-DEC Act- General
2b. North west of Mukinbudin	Merredin	Mukinbudin	Shire of Mukinbudin	Road Reserve	Non-DEC Act- General
2c. North west of Mukinbudin	Merredin	Mukinbudin	Unvested	Private Property	Freehold

3a. South west of Mukinbudin	Merredin	Mukinbudin	Shire of Mukinbudin	Road Reserve	Non-DEC Act- General
3b. South west of Mukinbudin	Merredin	Mukinbudin	Unvested	Private Property	Freehold
3c. South west of Mukinbudin	Merredin	Mukinbudin	Unvested	Private Property	Freehold
4a. Weira	Merredin	Nungarin	Unvested	Private Property	Freehold
4b. Weira	Merredin	Nungarin	Main Roads WA	Road Reserve	Non-DEC Act- General
4c. Weira	Merredin	Nungarin	Main Roads WA	Road Reserve	Non-DEC Act- General
5. North west of Mukinbudin	Merredin	Mukinbudin	Shire of Mukinbudin	Road Reserve	Non-DEC Act- General
6a. North west of Mukinbudin	Merredin	Mukinbudin	Shire of Mukinbudin	Road Reserve	Non-DEC Act- General
6b. North west of Mukinbudin	Merredin	Mukinbudin	Unvested	Private Property	Freehold
6c. North west of Mukinbudin	Merredin	Mukinbudin	Unvested	Private Property	Freehold
8. North of Warrachuppin	Merredin	Westonia	Conservation Commission	Conservation of Flora and Fauna	Nature Reserve
9. East of Bonnie Rock	Merredin	Mukinbudin	West Net Rail	Rail Reserve	Non-DEC Act- General
10a. North of Warralakin	Merredin	Westonia	Shire of Westonia	Road Reserve	Non-DEC Act- General
10b. North of Warralakin	Merredin	Westonia	Unvested	Private Property	Freehold
10c. North of Warralakin	Merredin	Westonia	Unvested	Private Property	Freehold
11. Wilgoyne	Merredin	Mukinbudin	Minister for Water Resources	Water Reserve	Non-DEC Act- General
12a. Danjinning	Merredin	Mount Marshall	Shire of Mount Marshall	Road Reserve	Non-DEC Act- General
12b. Danjinning	Merredin	Mount Marshall	Unvested	Private Property	Freehold
13. North west of Mukinbudin	Merredin	Mukinbudin	Unvested	Private Property	Freehold
14a. South of Bonnie Rock	Merredin	Mukinbudin	Unvested	Private Property	Freehold
14b. South of Bonnie Rock	Merredin	Mukinbudin	Unvested	Private Property	Freehold

Biology and ecology

The lifespan of *Eremophila virens* is unknown. It is thought to be a relatively short-lived disturbance opportunist, but as plants age individuals can die back or break off above ground and reshoot from the base. When this happens plants may live for many more years.

Flowers are pollinated by birds, although native bees have also been seen on flowers. Plants produce numerous fruits but few seeds (Chinnock 1980).

The species appears to be unable to tolerate excessive waterlogging (Coughran 1981). This was indicated by a large number of dead plants (100) in a localized run off-area in Population 4a.

Eremophila virens has been cultivated in Adelaide since 1976 and is said to be moderately easy to propagate from cuttings or seed but may be extremely slow to form roots. In contrast, staff from the Botanic Gardens and Parks Authority (BGPA) have reported that propagating the species can be difficult with strike rates varying from 0-33% from cuttings and grafts (unpublished data A. Shade¹).

The response of *Eremophila virens* to fire is unknown, however, being a disturbance opportunist it is thought that soil-stored seed would germinate following fire.

Threats

¹ Amanda Shade, Horticulturalist, Botanic Garden and Parks Authority

Eremophila virens was declared as Rare Flora in November 1980 and ranked as Endangered (EN) under the Western Australian *Wildlife Conservation Act 1950* in May 1997. It currently meets World Conservation Union (IUCN 2000) Red List Category 'EN' under criteria C2a(i) due to their being fewer than 2500 mature individuals, an inferred continuing decline in the number of mature individuals and no subpopulation containing more than 250 mature individuals. The species is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main threats are drought, weeds, inappropriate fire regimes, restricted habitat, grazing, disturbance by stock and feral animals, chemical drift and maintenance activities for roads, tracks, power lines and firebreaks.

- **Road, track, powerline and firebreak maintenance** threatens many existing populations. Threats include grading, construction of drainage channels and the mowing of roadside vegetation. Some of these actions also encourage weed invasion.
- **Inappropriate fire regimes** may affect the long term viability of populations. It is thought that occasional fire or other disturbance may necessary for recruitment, however, frequent fire that occurs before regenerating or juvenile plants have reached maturity and have replenished the soil seed bank is likely to result in the loss of populations.
- **Restricted habitat** is a threat to roadside populations as many have no opportunity for population expansion.
- **Drought** it a continuing threat to the long-term survival of *Eremophila virens*. Many plants observed in recent years are extremely stressed, with few leaves and live branches.
- **Weed invasion** is a threat to most populations that occur in degraded areas. Although not an immediate threat to mature plants, weeds suppress early plant growth (seedlings) by competing for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of high fuel loads.
- **Grazing and disturbance by stock** (sheep and cattle) are a threat to subpopulations 2a, 2b, 2c, 3c, 4a, 6c, 10b and 10c. Apart from direct damage to plants, increased nutrient levels from sheep and cattle droppings are likely to result in the proliferation of weeds. Grazing may also have an impact on the establishment of *Eremophila virens* seedlings, thereby limiting the natural recruitment of the species.
- **Chemical drift** from herbicide and fertilizer applications may affect the species' long-term survival. The effects of herbicides on the plants are not known but are likely to be detrimental.
- **Senescence** is a threat to old populations where little or no recruitment is occurring.

Summary of population information and threats

Pop No. & Location	Land Status	Year/No. plants	Habitat Condition	Threats
1. South west of Mukinbudin	Shire Road Reserve	1987 50+ 2004 0	No extant plants	Inappropriate fire regimes, drought, roadworks, restricted habitat, senescence, weeds and chemical drift
2a. North west of Mukinbudin	Shire Road Reserve	1989 13* 2004 8 (1)*	Moderate	Inappropriate fire regimes, drought, senescence, weeds, grazing, roadworks, restricted habitat, weeds and chemical drift
2b. North west of Mukinbudin	Shire Road Reserve	1989 13* 2004 8 (1)*	Moderate	Inappropriate fire regimes, drought, senescence, sheep grazing, weeds, roadworks, restricted habitat, weeds and chemical drift
2c. North west of Mukinbudin	Private Property	1990 3 2004 0	No extant plants	Inappropriate fire regimes, drought, senescence, weeds and grazing

3a. South west of Mukinbudin	Shire Road Reserve	1991 2003	49 29	Poor due to senescence	Inappropriate fire regimes, drought, senescence, roadworks, spray drift, restricted habitat and weeds.
3b. South west of Mukinbudin	Private Property	1989 2003	18 6	Moderate	Inappropriate fire regimes, drought, senescence, powerline maintenance, grazing, clearing, firebreaks, restricted habitat and chemical drift.
3c. South west of Mukinbudin	Private Property	1994 2003	1 0	No extant plants	Inappropriate fire regimes, drought, senescence, firebreaks, clearing and grazing
4a. Weira	Private Property	1981 1990	536 [100] 100 (20)	Moderate	Inappropriate fire regimes, drought, senescence and grazing
4b. Weira	MRWA Road Reserve	1997 2003	14 6(2)*	Poor, most plants senescent	Inappropriate fire regimes, drought, senescence, clearing, roadworks, restricted habitat, weeds and chemical drift
4c. Weira	MRWA Road Reserve	1991 2003	3 6 (2)*	Poor, habitat disturbed	Inappropriate fire regimes, drought, senescence, clearing, roadworks, restricted habitat, weeds and chemical drift
5. North west of Mukinbudin	Shire Road Reserve	1991 2004	34 0	No extant plants	Inappropriate fire regimes, drought, senescence, roadworks, restricted habitat, weeds and chemical drift
6a. North west of Mukinbudin	Shire Road Reserve	1989 2003	26 (2) 7	Moderate	Inappropriate fire regimes, drought, senescence, grazing, weeds, roadworks, restricted habitat, weeds and chemical drift
6b. North west of Mukinbudin	Private Property	2003	12(1)	Good	Inappropriate fire regimes, drought, senescence, weeds
6c. North west of Mukinbudin	Private Property	2003	30	Good	Inappropriate fire regimes, drought, senescence, grazing, weeds and fire
8. North of Warrachuppin	Nature Reserve	1991	1	Burnt by wildfire in Jan/2000	Inappropriate fire regimes, drought, senescence
9. East of Bonnie Rock	Rail Reserve	1991 2004	92 25(3)	Moderate	Inappropriate fire regimes, drought, senescence, track maintenance and firebreaks
10a. North of Warralakin	Shire Road Reserve	1991 2004	7 2	Moderate	Inappropriate fire regimes, drought, senescence, grazing, clearing, roadworks, fencing, weeds and chemical drift
10b. North of Warralakin	Private Property	1991 2004	200 0	No extant plants. Burnt 1990	Inappropriate fire regimes, drought, senescence, grazing, clearing and fencing
10c. North of Warralakin	Private Property	1991 2000	27 1	Poor	Inappropriate fire regimes, drought, senescence, grazing, clearing and fencing
11. Wilgoyne	Water Reserve	1992 2004	18 (2) 9	Moderate	Inappropriate fire regimes, drought, senescence
12a. Danjinning	Shire Road Reserve	1993 2004	9 2	Moderate	Inappropriate fire regimes, drought, senescence, roadworks, weeds and chemical drift
12b. Danjinning	Private Property	1993 2004	2 34	Good	Inappropriate fire regimes, drought, senescence
13. North west of Mukinbudin	Private Property	2003	22 (7)	Good	Inappropriate fire regimes, drought, senescence, weeds and fencing
14a. South of Bonnie Rock	Private Property	2004	2	Good	Inappropriate fire regimes, drought, senescence
14b. South of Bonnie Rock	Private Property	2004	4	Good	Inappropriate fire regimes, drought, senescence

Numbers in brackets = number of seedlings. * = total for subpopulations combined. [] = number dead.

Populations in **bold text** are considered to be Important Populations

Guide for decision-makers

Section 1 provides details of current and possible future threats. Proposed developments and on-ground works (clearing, firebreaks etc) in the immediate vicinity of habitat critical to the survival of *Eremophila virens* will require assessment (WA). Works should not be approved unless the proponents can demonstrate that they will have no significant impact on the species, its habitat or potential habitat, or the local surface or ground water hydrology.

Habitat critical to the survival of the species, and important populations

Habitat critical to the survival of *Eremophila virens* is the area of occupancy of important populations; areas of similar habitat surrounding important populations i.e. (light brown, sandy loam over granite in rocky situations) and additional occurrences of similar habitat that do not currently contain the species but may have done so in the past and may be suitable for translocations. These areas of similar habitat are important where they provide potential habitat for natural range extension and/or for allowing pollinators or biota essential to the continued existence of the species to move between populations.

As *Eremophila virens* is listed as Endangered all populations are considered important populations.

Benefits to other species/ecological communities

Recovery actions implemented to improve the quality of the habitat of *Eremophila virens* will improve the status of other threatened species including *Eremophila viscida* (Endangered under both the Western Australian *Wildlife Conservation Act 1950* and EPBC Act) and *Acacia denticulosa* (Vulnerable under both the Western Australian *Wildlife Conservation Act 1950* and EPBC Act) both of which occur in the habitat of *Eremophila virens*. Recovery actions implemented to improve the quality or security of the habitat of populations of *E. virens* are likely to improve the status of other rare flora.

International Obligations

This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity that was ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that Convention. The species is not listed under the United Nations Environment Program World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES). In addition, the species is not listed under any other specific international treaty and this Interim Recovery Plan (IRP) does not affect Australia's obligations under these international agreements.

Role and interests of Indigenous people

Involvement of the Indigenous community is being sought through the advice of the Department of Indigenous Affairs to determine whether there are any issues or interests identified in the plan. A search of the Department of Indigenous Affairs Aboriginal Sites Register lists two painting sites in the vicinity of *Eremophila virens*. Implementation of recovery actions under this plan will include consideration of the role and interests of Indigenous communities in the region. Where no role is identified for the Indigenous community associated with this species in the development of the recovery plan opportunities may exist through cultural interpretation and awareness of the species. Indigenous involvement in the implementation of recovery actions will be encouraged.

Social and economic impacts

The implementation of this recovery plan is unlikely to cause significant adverse social or economic impacts. However, as some populations are located on private property (Populations 2c, 3b, 3c, 4a, 6b,

6c, 10b, 10c, 12b, 13, 14a and 14b) their protection may potentially affect farming activities. However, most landholders notified are amenable to managing the habitat of the species for conservation and actions will involve liaison and cooperation with all stakeholders with regard to these areas.

Affected interests

Stakeholders potentially affected by the implementation of this plan include the Shire of Mukinbudin, as managers of the areas containing Populations (1, 2a, 2b, 3a, 5, 6a and 12a), Shire of Westonia (Population 10a), Shire of Mount Marshall (Population 12a), West Net Rail (Population 9), Water Corporation (Population 11), and Main Roads WA (Populations 4b and 4c).

Evaluation of the Plan's Performance

DEC will evaluate the performance of this IRP in conjunction with the Merredin District Threatened Flora Recovery Team. In addition to annual reporting on progress with listed actions and comparison against the criteria for success and failure, the plan is to be reviewed within five years of its implementation.

2. RECOVERY OBJECTIVE AND CRITERIA

Objectives

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

Criteria for success: The number of individuals within populations and/or the number of populations have increased by ten percent or more over the five years of the plan.

Criteria for failure: The number of individuals within populations and/or the number of populations have decreased by ten percent or more over the five years of the plan.

3. RECOVERY ACTIONS

Existing recovery actions

With the exception of land containing populations 6b, 6c, 14a, and 14b land owners and land managers have been formally notified of the location and threatened status of the species. Notification details the Declared Rare status of *Eremophila virens* and the legal responsibility to protect it.

Declared Rare Flora (DRF) markers have been installed for Populations 2a, 2b, 3a, 4b, 4c, 6, 9, 10a, and 12a. These serve to alert people working in the vicinity to the presence of DRF and the need to avoid work that may damage plants or their habitat. There has been liaison with the Nungarin Shire works supervisor and community Landcare Officer with regard to the management of *Eremophila virens* populations in their Shire. Dashboard stickers and posters describing the significance of DRF markers have been produced and distributed.

All but eight plants in Population 9 were fenced to prevent damage during rail maintenance in 1997.

In 1992, a landholder sought an alteration to the tenure and management of adjacent Water Authority land that contains Population 11. Following negotiations between DEC and the Water Authority the application was not approved and the land continues to be managed for conservation.

In December 2000, 401 seeds were collected from Population 4 by staff from DEC's Threatened Flora Seed Centre (TFSC). The initial germination rate was found to be 48% (unpublished data, A.

Crawford²). Seed was also collected from Population 6b in 2003; however no germination testing has yet been carried out.

The Botanic Gardens and Parks Authority (BGPA) currently have 6 plants of *Eremophila virens* from 7 clones, in their nursery and gardens (A. Shade unpublished data).

The Merredin District Threatened Flora Recovery Team (MDTFRT) is overseeing the implementation of this IRP and includes information on progress in their annual report to DEC's Corporate Executive and funding bodies.

Staff from DEC's Merredin District regularly monitors all populations of this species.

Future recovery actions

Where populations occur on lands other than those managed by DEC, permission has been or will be sought from appropriate land managers prior to recovery actions being undertaken. The following recovery actions are roughly in order of descending priority. However, this should not constrain addressing any action for those listed as 'lower' priorities if funding is available or other opportunities arise.

1. Coordinate recovery actions

The Merredin District Threatened Flora Recovery Team (MDTFRT) coordinates recovery actions for *Eremophila virens* and will include information on progress in their annual report to DEC's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: DEC (Merredin District) through the MDTFRT
Cost: \$1,000 per year

2. Map total habitat

Although habitat critical to the species' survival is described in Section 1, the areas as described have not yet been mapped and that will be redressed under this action. If any additional populations are located, then total habitat will also be determined and mapped for these locations.

Action: Map total habitat
Responsibility: DEC (Merredin District, SCB) through the MDTFRT
Cost: \$4,000 in the first year

3. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Eremophila virens* will provide a better scientific basis for management of the wild populations. An understanding of the following is particularly necessary for effective management:

1. Soil seed bank dynamics and the role of various disturbances (including fire), competition, rainfall and grazing in germination and recruitment.
2. The reproductive strategies, phenology and seasonal growth of the species.
3. The population genetic structure, levels of genetic diversity and minimum viable population size.
4. The impact of drought on *Eremophila virens* and its habitat.
5. Investigation of the mating system and pollination biology.
6. The effects of salinity and waterlogging on the species.

² Andrew Crawford, Senior Technical Officer DEC's Threatened Flora Seed Centre

Action: Obtain biological and ecological information
Responsibility: DEC (Science Division, Merredin District) through MDTFRT
Cost: \$20,800 per year for the first three years

4. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of wild populations of this species will be promoted to the community through poster displays and the local print and electronic media. Formal links with local naturalist groups and interested individuals will also be encouraged. An information sheet, which includes a description of the plant, its habitat, threats, recovery actions and photos will be produced and distributed.

A reply paid postal drop illustrating *Eremophila virens* and describing its distinctive features and habitat will be produced and distributed to residents in Shires that contain possible habitat for the species. Postal drops aim to stimulate interest, provide information about threatened species and a name and number to contact if new populations are located.

Action: Promote awareness
Responsibility: DEC (Merredin District, SCB) through MDTFRT
Cost: \$2,800 in first year, \$1,400 in second year and \$1,100 in remaining years

5. Conduct further surveys

It is highly likely that there are more extant populations than are currently known. Further surveys will be conducted during the flowering period of *Eremophila virens* (mainly September to October). Areas considered suitable for translocation will also be noted. Volunteers from the local community, Wildflower Societies and Naturalist Clubs will be encouraged to be involved in surveys supervised by DEC staff. Areas of similar soil type and habitat will be searched and where possible surveys will also include private land. Areas where disturbance has occurred such as Chiddarcooping Hill NR which was burnt in 2000 contain likely habitat and are a high priority for survey.

Action: Conduct further surveys
Responsibility: DEC (Merredin District) through MDTFRT
Cost: \$5,700 per year

6. Develop and implement a fire management strategy

The response of *Eremophila virens* and its habitat to fire has not been documented. Until its affect is better understood fire will, if possible, be prevented from occurring in the habitat of populations, except where it is being used experimentally or as a recovery tool. Most populations have not been burnt for a considerable amount of time and whilst some populations e.g. Population 6b and 6c are located in habitat that would not carry fire under normal summer conditions, others, such as Populations 4a, 12b and 14, are in areas that have high fuel loads. A fire management strategy will be developed to determine a recommended fire frequency, intensity and control measures.

Action: Develop and implement a fire management strategy
Responsibility: DEC (Merredin District) through MDTFRT
Cost: \$2,200 in first year and \$800 in subsequent years

7. Collect seed and cutting material

Preservation of germplasm is essential to guard against the possible extinction of wild populations with seed and cuttings used to propagate plants for future translocations. Seed is required from all populations to maximise the genetic diversity of *ex situ* material. Cuttings will be obtained to establish a living collection at BGPA.

Action: Collect seed and cutting material
Responsibility: DEC (TFSC, Merredin District) and BGPA through MDTFRT
Cost: \$5,200 in first year and \$3,800 in subsequent years

8. Formally notify land managers

Whilst the owners of remnant bush that contains Subpopulations 6a, 6b, 14a and 14c are aware of *Eremophila virens* on their property, they have not yet been formally notified. Notification details the Declared Rare status of the species and the associated legal responsibilities.

Action: Formally notify land owners
Responsibility: DEC (SCB)
Cost: \$200 in first year

9. Liaise with land managers

Staff from DEC's Merredin District will continue to liaise with relevant landowners and land managers to ensure that populations are not accidentally damaged or destroyed. Two significant sites that occur in the vicinity of *Eremophila virens* are listed on the Aboriginal Sites Register maintained by the Department of Indigenous Affairs. The custodians of these areas will be identified, and their input and involvement will be sought in the management of populations. Input and involvement will also be sought from any other Aboriginal groups that may have an active interest in areas that contain the habitat of *E. virens*.

Action: Liaise with land managers
Responsibility: DEC (Merredin District) through MDTFRT
Cost: \$1,500 per year

10. Monitor populations

Annual monitoring of habitat degradation (including weed invasion and plant diseases), population stability (expansion or decline), pollination activity, seed production, recruitment, longevity and predation is essential.

Action: Monitor populations
Responsibility: DEC (Merredin District) through MDTFRT
Cost: \$2,200 per year

11. Install fencing

An investigation will be carried out into which populations are currently under threat from grazing. For those populations where stock is thought to be a threat, DEC staff will seek to have a fence erected, including a buffer of surrounding habitat. Funding will be sought from various sources.

Action: Install fencing
Responsibility: DEC (Merredin District) through MDTFRT
Cost: To be determined

12. Seek long-term protection of habitat and secure land tenure

Methods of improving the security of populations on private property will be investigated. Many populations are also located on narrow, degraded road reserves that provide little opportunity for population expansion. DEC staff will investigate options for increasing the area of habitat available to the species to decrease edge effects. Ways and means of increasing the security of tenure for the populations will also be sought. This may include land acquisition, covenants, or the Land for Wildlife Scheme.

Action: Seek long-term protection of habitat
Responsibility: DEC (Merredin District) and landowners through the MDTFRT
Cost: \$1500 per year for liaison

13. Undertake weed control

A number of populations are currently threatened by weed invasion. Weed control, including hand weeding and localised application of herbicide, will be undertaken in consultation with land managers. All weed control will be followed by a report on the method, timing and the success or otherwise of the treatment and any adverse effect on *Eremophila virens* and associated native plant species.

Action: Undertake weed control
Responsibility: DEC (Merredin District) through MDTFRT
Cost: \$1,800 per year

14. Review the IRP and assess the need for further recovery actions

If *Eremophila virens* is still ranked Endangered (WA) at the end of the fourth year of the five-year term of this IRP, the plan will be reviewed and the need for further recovery actions assessed.

Action: Review the IRP and assess the need for further recovery actions
Responsibility: DEC (SCB and Merredin District) through the MDTFRT
Cost: \$15,700 in the fifth year (if required)

4. TERM OF PLAN

Western Australia

This Interim Recovery Plan will operate from May 2006 to April 2011 but will remain in force until withdrawn or replaced. If the taxon is still ranked as Endangered (WA) after five years, this IRP will be reviewed and if necessary, further recovery actions put in place.

Commonwealth

In accordance with the provisions of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) this adopted recovery plan will remain in force until revoked.

The recovery plan must be reviewed at intervals of not longer than 5 years.

5. REFERENCES

- Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Perth, Western Australia.
- Chinnock, R.J. (1980) Notes on rare Myoporaceae (Unpublished).
- Coughran, D.K. (1981) *Eremophila virens* survey (Unpublished report).
- CALM (1992) Policy Statement No. 44 *Wildlife Management Programs*. Perth, Western Australia.
- CALM (1994) Policy Statement No. 50 *Setting Priorities for the Conservation of Western Australia's Threatened Flora and Fauna*. Perth, Western Australia.
- CALM (1995) Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. Perth, Western Australia.
- IUCN (2000) *IUCN red list categories prepared by the IUCN Species Survival Commission*, as approved by the 51st meeting of the IUCN Council. Gland, Switzerland.
- Leigh, J., Boden, R. and Briggs, J. (1984) *Extinct and Endangered Plants of Australia*, McMillian Company of Australia, Melbourne
- Mollemans, F.H., Brown, P.H. and Coates, D.J. (1993) *Declared Rare Flora and other plants in need of special protection in the Merredin District. Wildlife Management Program No. 9*. Department of Conservation and Land Management, Western Australia.
- Western Australian Herbarium (1998) *FloraBase* – Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia. <http://www.calm.wa.gov.au/science/>

6. TAXONOMIC DESCRIPTION

- Leigh, J., Boden, R. and Briggs, J. (1984) *Extinct and Endangered Plants of Australia*, McMillian Company of Australia, Melbourne

Eremophila virens CA Gardner. Green Flowered Emu Bush.

Very slender erect sparsely foliated shrub 3-5 m high with somewhat sticky branchlets. Leaves are alternate, flat or folded upon themselves, oblong-lanceolate to ovate-lanceolate, up to 7 cm long and 2.5 cm wide, abruptly contracted unequally at the base and with a pointed tip, dark green, soft and very sticky, borne on stalks up to 1.5 cm long. Flowers are green and sparsely covered with white wooly hairs on the outside, borne singularly or in pairs on long S-shaped (sigmoid)incurved peduncles up to 2 cm long arising from the leaf axils. Individual flowers tubular, about 3 cm long, widening into two distinct lips, the lower lip downwardly curved and deeply cut into the corolla, the upper lip with 4 very small triangular lobes. The calyx has 5 overlapping lobes cut to its base, the outer ones ovate, the inner ones oblong-ovate, wooly on the inside, all enlarging after flowering from about 6 mm to 13 mm long. Fruit is a drupe not described in detail. Flowering august to early September but occasionally to November.

SUMMARY OF RECOVERY ACTIONS AND COSTS

Recovery Action	DEC	Year 1 Other	Ext.	DEC	Year 2 Other	Ext.	DEC	Year 3 Other	Ext.	DEC	Year 4 Other	Ext.	DEC	Year 5 Other	Ext.
Coordinate recovery actions	500	200	300	500	200	300	500	200	300	500	200	300	500	200	300
Map total habitat	3000		1000												
Obtain biological and ecological information	10800	0	10000	10800	0	10000	10800	0	10000	0	0	0	0	0	0
Promote awareness	1100	0	1700	1100	0	300	1100	0	0	1100	0	0	1100	0	0
Conduct further surveys	2500	1400	1800	2500	1400	1800	2500	1400	1800	2500	1400	1800	2500	1400	1800
Develop and implement a fire management strategy	600	200	1400	400	200	200	400	200	200	400	200	200	400	200	200
Collect seed and cutting material	2200	1500	1500	1600	600	1600	1600	600	1600	1600	600	1600	1600	600	1600
Formally notify land managers	200	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liaise with land managers	1000	500	0	1000	500	0	1000	500	0	1000	500	0	1000	500	0
Monitor populations	1000	400	800	1000	400	800	1000	400	800	1000	400	800	1000	400	800
Install fencing*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Seek long-term protection of habitat and secure tenure	1000	500	0	1000	500	0	1000	500	0	1000	500	0	1000	500	0
Undertake weed control	900	0	900	900	0	900	900	0	900	900	0	900	900	0	900
Review the IRP and assess the need for further recovery actions	0	0	0	0	0	0	0	0	0	0	0	0	6600	0	9100
Total	24,800	4,700	19,400	20,800	3,800	15,900	20,800	3,800	15,600	10,000	3,800	5,600	16,600	3,800	14,700
Yearly Total		48,900			40,500			40,200			19,400			35,100	

Ext = External funding (funding to be sought), Other = funds contributed by NHT, in-kind contribution and BGPA, *=costs to be determined.

Total DEC: \$93,000

Total Other: \$19,900

Total External Funding: \$71,200

TOTAL COSTS: \$184,100