HAIRY PHALANX GREVILLEA

(*Grevillea dryandroides* subsp. *hirsuta*)

RECOVERY PLAN

Department of Conservation and Land Management

Kensington

Australian Government

Government of Western Australia

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 and 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This Interim Recovery Plan will operate from May 2006 to April 2011 but will remain in force until withdrawn or replaced.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 Vulnerable, this IRP will be reviewed after five years and the need for a full recovery plan assessed.

This IRP was given regional approval on 13 February, 2006 and was approved by the Director of Nature Conservation on 22 February, 2006. The provision of funds and personnel 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 Kate Brunt[1], Kim Kershaw[2], Andrew Brown[3] and Greg Durell[4].

[1]Former Conservation Officer (Flora), Yilgarn District, DEC, PO Box 332, Merredin WA 6415
[2]Former Conservation Officer (Flora), Avon-Mortlock District, DEC, PO Box 100, Narrogin WA 6312
[3]Coordinator Threatened Flora, Species and Communities Branch, DEC, PO Box 51 Wanneroo, 6946
[4]District Manager, Great Southern District, DEC, PO Box 100, Narrogin WA 6312.

ACKNOWLEDGMENTS

The following people have provided assistance and advice in the preparation of this IRP:

Andrew Crawford	Technical Officer, DEC's Threatened Flora Seed Centre
Amanda Shade	Horticulturalist, Botanic Garden and Parks Authority

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 Recovery Plan should be cited as:

Department of Environment and Conservation (2008). Hairy Phalanx Grevillea (*Grevillea dryandroides* subsp. *hirsuta*) Recovery Plan. Interim Recovery Plan No. 222. Department of Environment and Conservation, Perth, Western Australia.

SUMMARY

Scientific Name:	*Grevillea dryandroides* subsp. *hirsuta*	**Common Name:**	Hairy Phalanx Grevillea
Family:	Proteaceae	**Flowering Period:**	September-March
DEC Regions:	Wheatbelt,	**DEC Districts:**	Avon-Mortlock
Shires:	Wongan-Ballidu, Dowerin, Brookton, Corrigin, Kellerberrin	**Recovery Teams:**	Avon-Mortlock District Threatened Flora Recovery Team

Illustrations and/or further information: A. Brown, C. Thomson-Dans and N. Marchant (Eds) (1998) *Western Australia's Threatened Flora*; P.M Olde & N.R Marriot (1993) New species and taxonomic changes in *Grevillea* (Proteaceae: Grevilleoideae) from south-west Western, *Nuytsia* 9(2):237-304.

Current status: *Grevillea dryandroides* subsp. *hirsuta* was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in 1999 (when the subspecies was formally recognised) and currently meets World Conservation Union (IUCN 2000) Red List Category Vulnerable 'VU' under criteria B1ab(iii,v)+2ab(iii,v) as it has a geographic range of less than 20,000 km^2, an area of occupancy of less than 2000 km^2, is severely fragmented and there is a continuing decline in the extent and quality of habitat and the number of mature individuals. The subspecies is also listed as Endangered (EN) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main threats are continuing damage to plants and habitat during road and rail way maintenance, accidental destruction, lack of and poor remaining habitat, weeds, poor recruitment and salinity.

Description: *Grevillea dryandroides* subsp. *hirsuta* is a tufted, ground-hugging shrub 10 to 30 cm high and up to 1 m in diameter. Within natural stands, it tends to grow as a spreading rather than clumped plant. The greyish-green leaves, up to 12 cm long, have many hairy, liner segments up to 12 mm long, forming a V-shape with a midrib. The leaf axis is pressed closely against the stem and is covered with soft hairs. The leaf lobes are 12 to 35 mm long, with crisped hairs. The hairy fruits are about 1 cm long (Olde & Marriot, 1993; Brown, Thomson-Dans & Marchant 1998)

Habitat requirements: *Grevillea dryandroides* subsp. *hirsuta* is currently found over a range of approximately 250 km, between the Cadoux area and Corrigin, growing in yellow sand-heath, sometimes with *Eucalyptus* or *Banksia* species. Several populations occur in areas of relatively undisturbed remnant vegetation in nature reserves and private property, however most populations are found on narrow disturbed roadsides, which are severely weed infested. Associated species include: *Hakea platysperma, Verticordia eriocephala, Conospermum* sp., *Grevillea excelsior, Verticordia serrata, Verticordia tumida* subsp. *tumida, Synaphea spinulosa, Dianella revoluta, Grevillea hookeriana, Verticordia* sp., *Allocasuarina campestris, Gastrolobium spinosum, Hakea incrassata, Leptospermum erubescens* and *Grevillea cagiana.*

Habitat critical to the survival of the species, and important populations: Habitat critical to the survival of *Grevillea dryandroides* subsp. *hirsuta* is the area of occupancy of important populations, areas of similar habitat surrounding important populations i.e. yellow sand-heath, sometimes with *Eucalyptus* or *Banksia* species 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.

Given that this species is listed as Vulnerable (WA) it is considered that it is likely that some populations are more important to the species' ongoing survival than others. These are the larger populations (Populations 1a, 1c, 2a, 4b and 7), those on conservation estate (Populations 5 and 6) and those at the extremes of its range (Populations 1a, 1c, 4b, 7 and 8). On the basis of this it appears that most of the populations are important. This will need to be reappraised when further survey for new populations has been completed and also after the results of genetic studies are known.

Benefits to other species or ecological communities: One population of *Grevillea dryandroides* subsp. *hirsuta* occurs on private property bushland with the rare (Priority 4) *Daviesia oxylobium.* It also occurs on a nature reserve with the Endangered *Verticordia hughanii* (Endangered under the EPBC Act) and the poorly known (Priority 3) species *Grevillea roycei* and *Calothamnus brevifolius* (Priority 4). The reserve has been identified as a potential translocation site for the Critically Endangered *Daviesia euphorbioides.* Some of the southern populations grow with the Critically Endangered species *Grevillea scapigera* (Endangered under the EPBC Act). Recovery actions implemented to improve the quality or security of the habitat of *Grevillea dryandroides* subsp. *hirsuta* will improve the status of these rare and priority species and the remnant vegetation in which it and they are located.

International obligations: This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that Convention. Although the taxon is listed under the United Nations Environment Program World Convention Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES) this IRP does not affect Australia's obligations under 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. The Department of Indigenous Affairs Aboriginal Sites Register does not list any significant sites in the vicinity of populations. However, not all significant sites are listed on the Register. Implementation of recovery actions under this plan will include consideration of the role and interests of Indigenous communities in the region. 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: One population of *Grevillea dryandroides* subsp. *hirsuta* occurs on private land and there is some potential for limited social and economic impact. However, as the area is small and recovery actions will involve liaison and cooperation with all stakeholders, it is unlikely that the social and economic impact will be significant.

Affected interests: Stakeholders potentially affected by the implementation of this plan include the Shire of Brookton, as managers of the areas containing Populations (1a, 1b, 1c), Shire of Corrigin (Populations 2a, 2b, 3, 8), Shire of Wongan-Ballidu (Population 4a), Shire of Kellerberrin (Population 10), and West Net Rail (Populations 4b and 9).

Evaluation of the plans performance: DEC will evaluate the performance of this IRP in conjunction with the Avon-Mortlock District Threatened Flora Recovery Teams. 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. Most relevant land managers have been made aware of the location and threatened status of the subspecies.
2. Declared Rare Flora (DRF) Markers have been installed at all populations and subpopulations 1a, 1c, 4a and 9.
3. Dashboard stickers, posters and can-holders that illustrate DRF markers and describe their purpose have been produced and distributed.
4. Approximately 131 seeds collected from Population 4a are stored in DEC's Threatened Flora Seed Centre at –18°C.
5. Weed control trials were undertaken to determine the effect of Fusilade on the subspecies, in an endeavour to control grassy weeds infesting several populations. It was found that *Grevillea dryandroides* subsp. *hirsuta* was not adversely affected by this trial and the treatment did reduced some of the grassy weeds.
6. CSIRO staff investigated the effects of fire on one population of *Grevillea dryandroides* subsp. *hirsuta.* The investigation concluded that the fire did not adversely affect the population.
7. Staff from DEC's Avon-Mortlock District regularly monitors populations of this subspecies.
8. Population 9 along the Amery-Kalannie Railway line was fenced to protect plants from damage during rail maintenance.
9. The Avon-Mortlock District Threatened Flora Recovery Team is overseeing the implementation of this IRP and will include information on progress in an annual report to DEC's Corporate Executive and funding bodies.

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
2. Map total habitat
3. Install Declared Rare Flora markers
4. Liaise with relevant land managers
5. Achieve long-term protection of habitat
6. Reposition of Declared Rare Flora markers
7. Collect seed and cutting materials
8. Develop and implement a weed control strategy
9. Develop and implement a fire management strategy
10. Monitor populations
11. Conduct further surveys
12. Promote awareness
13. Develop and implement a rabbit control strategy
14. Determine genetic variation within populations
15. Maintenance of existing fencing
16. Notify land managers
17. Review the need for further recovery actions

1. BACKGROUND

History

Named in honour of Charles Greville, Vice President of the Royal Society who introduced and cultivated many Australian plants in England, *Grevillea* is a genus of over 340 species that occur throughout Australia in a wide range of habitats and range in size from small shrubs to large forest trees. A. few species are found outside Australia in Malaysia, New Guinea and New Caledonia. The centre of diversity is in the South Western Botanical Province of Western Australia where over half the species are found. Here, they are concentrated in kwongan habitat, growing in sandheaths, lateritic rises and in association with granite outcrops.

Charles Gardner first collected *Grevillea dryandroides* in 1931 near Ballidu. It was subsequently (1993) split into two subspecies, based on the persistence of foliar indumentum, leaf lobe length, conflorescence and pistil length. *Grevillea dryandroides* subsp. *hirsuta* is distinguished from *Grevillea dryandroides* subsp. *dryandroides* in its longer leaf lobes with persistent indumentum and in its longer conflorescences and pistils.

The subspecies has been severely affected in the past by roadside maintenance. However it has been observed that populations are able to persist if not frequently disturbed. A number of populations have also been subject to “applications to take” as a result of plants encroaching onto road verges.

*Grevillea dryandroid*es subsp. *hirsuta* is currently known from 10 populations comprising of 7 subpopulations. The subspecies is located in nature reserves, shire roadside reserves, private property, rail reserves and an aerodrome reserve over a large geographic area between Corrigin and Cadoux.

Description

Grevillea dryandroides subsp. *hirsuta* is a tufted, ground-hugging shrub 10 to 30 cm high and up to 1 m in diameter. Within natural stands, it tends to grow as a spreading rather than clumped plant. The greyish-green leaves, up to 12 cm long, have many hairy, liner segments up to 12 mm long, forming a V-shape with a midrib. The leaf axis is pressed closely against the stem and is covered with soft hairs. The leaf lobes are 12 to 35 mm long, with crisped hairs. The hairy fruits are about 1 cm long (Olde and Marriot 1993; Brown et al. 1998).

Distribution and habitat

Grevillea dryandroides subsp. *hirsuta* occurs over a large geographic area between Corrigin and Cadoux, growing in open heathland and *Banksia* woodland, usually in yellow sandy loam over laterite or in shallow sandy loam over clay**.** Associated species include *Hakea platysperma, Verticordia eriocephala, Conospermum* sp. *Grevillea excelsior, Verticordia serrata, Verticordia tumida* subsp. *tumida, Synaphea spinulosa, Dianella revoluta, Grevillea hookeriana, Verticordia* sp., *Allocasuarina campestris, Gastrolobium spinosum, Hakea incrassata, Leptospermum erubescens, Banksia* sp and *Grevillea cagiana.* The soil type is quite specific for this subspecies and, as it occurs in areas that have been largely cleared for agricultural purposes, only small areas of good quality remnant vegetation remain.

Summary of population land vesting, purpose and tenure

Pop. No. & Location	DEC District	Shire	Vesting	Purpose	Tenure
1a West of Brookton	Avon-Mortlock	Brookton	Shire of Brookton	Road Reserve	Non-DEC Act- General
1b West of Brookton	Avon-Mortlock	Brookton	Shire of Brookton	Road Reserve	Non-DEC Act- General
1c West of Brookton	Avon-Mortlock	Brookton	Shire of Brookton	Road Reserve	Non-DEC Act- General
2a Northwest of Corrigin	Avon-Mortlock	Corrigin	Shire of Corrigin	Road Reserve	Non-DEC Act- General
2b Northwest of Corrigin	Avon-Mortlock	Corrigin	Shire of Corrigin	Road Reserve	Non-DEC Act- General
3 Northwest of Corrigin	Avon-Mortlock	Corrigin	Shire of Corrigin	Road Reserve	Non-DEC Act- General
4a North of Cadoux	Avon-Mortlock	Wongan-Ballidu	Shire of Wongan-Ballidu	Road Reserve	Non-DEC Act- General
4b North of Cadoux	Avon-Mortlock	Wongan-Ballidu	West Net Rail	Rail Reserve	Non-DEC Act- General
5 Southeast of Dowerin	Avon-Mortlock	Dowerin	Conservation Commission	Conservation of Flora and Fauna	Nature Reserve
6 North of Kelleberrin	Avon-Mortlock	Kellerberrin	Conservation Commission	Conservation of Flora and Fauna	Nature Reserve
7 South of Kellerbrrin	Avon-Mortlock	Kellerberrin	Unvested	Private Property	Freehold
8 West of Corrigin	Avon-Mortlock	Corrigin	Shire of Corrigin	Airport	Non-DEC Act- General
9 North of Amery	Avon-Mortlock	Dowerin	West Net Rail	Rail Reserve	Non-DEC Act- General
10 South of Kellerberrin	Avon-Mortlock	Kellerberrin	Shire of Kellerberrin	Road Reserve	Non-DEC Act- General

Biology and ecology

Grevillea dryandroides subsp. *hirsuta* freely suckers from underground root stock as a result of physical disturbance or exposure of the root at the soil surface as is indicated by a number of roadside populations growing in highly disturbed areas. The subspecies also re-sprouts from rootstock and germinates from soil-stored seed after fire. Observation has shown that some adult plants recovered well after fire. *Grevillea dryandroides* subsp. *hirsuta* is likely to be pollinated by birds but pollination may also be by native marsupials.

Trials carried out in the Avon-Mortlock District indicate that *Grevillea dryandroides* subsp. *hirsuta* has some tolerance to herbicides that target narrow leaf grasses and the health of populations improved when grassy weed competition was eliminated. However further investigation is required to determine what plants replace the grassy weeds once they are gone.

Tests in the Threatened Seed Centre have shown the seed has a high germination rate.

Threats

Grevillea dryandroides subsp. *hirsuta* was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in 1999 (when the subspecies was formally recognised) and currently meets World Conservation Union (IUCN 2000) Red List Category Vulnerable 'VU' under criteria B1ab(iii,v)+2ab(iii,v) as it has a geographic range of less than 20,000 km^2, an area of occupancy of less than 2000 km^2, is severely fragmented and there is a continuing decline in the extent and quality of habitat and the number of mature individuals. The subspecies is also listed as Endangered (EN) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main threats are:

- **Road and rail maintenance** threatens all road and rail reserve populations. Threats include grading, chemical spraying, construction of drainage channels and mowing roadside vegetation. Several of these actions also encourage weed invasion.

- **Weed invasion and competition** is a potential threat to all populations. Visual evidence suggests that at Population 1 and 3 plants are able to persist in the presence of introduced grasses but these may be preventing or limiting recruitment. Weeds suppress plant growth and recruitment 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, which are produced annually by many grass weed species.

- **Inappropriate fire regimes** may result in the depletion of the soil-stored seed bank and populations reproducing solely from suckers. Soil-stored seeds of *Grevillea dryandroides* subsp. *hirsuta* probably germinate following fire and, if fires recur before regenerating or juvenile plants reach maturity the soil seed bank would be rapidly depleted. However, it is likely that occasional fires are needed for reproduction of this subspecies. An additional consideration is the role of fire in facilitating weed invasion. Many populations have weeds currently that are restricted to the edges of the habitat, but are likely to invade post-fire without prompt and effective weed control.

- **Herbicide application** by land managers and adjacent private property owners threatens most populations of *Grevillea dryandroides* subsp. *hirsuta* that grow within narrow road reserves. While spray is aimed at eradicating weeds it is likely that it is also adversely affecting native plant species including the *Grevillea*.

- **Grazing by rabbits** has been recorded at a significant population on a nature reserve. In addition to grazing, rabbits also impact on populations by encouraging invasion of weeds through digging, erosion, the addition of nutrients and introduction of weed seeds. The high level of palatable weeds near this population in adjacent farming properties attracts herbivorous animals that are often unselective between species when grazing.

- **Insecure land tenure** With the exception of two that occur on conservation reserves, all populations are found on land tenure that is not consistent with conservation and Population 8 near Corrigin is increasingly being influenced by recreational purposes. The primary uses of these areas are not for the conservation of flora.

- **Low genetic diversity** is a potential threat. Research into the plant reproductive biology is required to assess this.

- **Salinisation** of groundwater as a result of altered hydrology is a severe and increasing problem in the Wheatbelt. Populations of *Grevillea dryandroides* subsp. *hirsuta* that grow in the low lying areas may be threatened by rising saline water tables.

Summary of population information and threats

Grevillea dryandroides subsp. *hirsuta* has suckered extensively in a number of locations and, as a result, the number of plants recorded may be much lower than counted. This may provide a false representation of the status of the subspecies and further research to determine exact numbers of plants is needed.

Pop. No. & Location	Land Status	Year/No. plants	Habitat Condition	Threats
1a West of Brookton	Shire Rd Reserve	2000 1500 2000 2000 2004 3095	Healthy	Road maintenance, weeds, inappropriate fire regimes, salinity
1b West of Brookton	Shire Rd Reserve	2000 6 2004 4	Healthy	Road maintenance, weeds, inappropriate fire regimes, salinity
1c West of Brookton	Shire Rd Reserve	2000 600 2004 1000	Healthy	Road maintenance, weeds, inappropriate fire regimes, salinity
2a Northwest of Corrigin	Shire Rd Reserve	2000 300 2000 7 2004 800	Healthy	Firebreak maintenance, weeds, road maintenance, herbicide application
2b Northwest of Corrigin	Shire Rd Reserve	2000 25 2000 21	Healthy	Firebreak maintenance, weeds, herbicide application
3 Northwest of Corrigin	Shire Rd Reserve	2000 10 2000 4 2004 10	Healthy	Road maintenance, weeds, inappropriate fire regimes
4a North of Cadoux	Shire Rd Reserve	1991 700 1995 500 2001 00	Healthy	Weeds, road maintenance
4b North of Cadoux	Rail Reserve	1988 000 [100] 1991 1300 1994 1000 1995 500+	Healthy	Weed invasion, rail maintenance
5 Southeast of Dowerin	Nature Reserve	1991 300 1994 300 2001 300 2003 80	Healthy	Rabbits, inappropriate fire regimes
6 North of Kelleberrin	Nature Reserve	1990 1000 1991 75 1994 000	Healthy	Rabbits, inappropriate fire regimes
7 South of Kellerbrrin	Private Property	1992 1000+	Healthy	Inappropriate fire regimes, insecure land tenure
8 West of Corrigin	Shire Reserve	1993 200 2201 12 2004 20	Healthy	Track maintenance, inappropriate fire regimes
9 North of Amery	Rail Reserve	1992 150 2001 150 [50] 2003 00	Healthy	Weed invasion, rail maintenance, herbicide application
10 South of Kellerberrin	Shire Rd Reserve	2000 2004 0	Healthy	Weeds, road works

Numbers in brackets = number of juveniles.
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 *Grevillea dryandroides* subsp. *hirsuta* 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 groundwater hydrology.

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

Habitat critical to the survival of *Grevillea dryandroides* subsp. *hirsuta* is the area of occupancy of important populations, areas of similar habitat surrounding important populations i.e. yellow sand or brown sand with gravel in low scrub or heath 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.

Given that this species is listed as Vulnerable (WA) it is considered that it is likely that some populations are more important to the species' ongoing survival than others. These are the larger populations (Populations 1a, 1c, 2a, 4b and 7), those on conservation estate (Populations 5 and 6) and those at the extremes of its range (Populations 1a, 1c, 4b, 7 and 8). On the basis of this it appears that most of the populations are important. This will need to be reappraised when further survey for new populations has been completed and also after the results of genetic studies are known.

Benefits to other species or ecological communities

One population of *Grevillea dryandroides* subsp. *hirsuta* occurs on private property bushland with the rare (Priority 4) *Daviesia oxylobium.* It also occurs on a nature reserve with the Endangered *Verticordia hughanii* (Endangered under the EPBC Act) and the poorly known (Priority 3) species *Grevillea roycei* and *Calothamnus brevifolius* (Priority 4). The reserve has been identified as a potential translocation site for the Critically Endangered *Daviesia euphorbioides.* Some of the southern populations grow with the Critically Endangered species *Grevillea scapigera* (Endangered under the EPBC Act). Recovery actions implemented to improve the quality or security of the habitat of *Grevillea dryandroides* subsp. *hirsuta* will improve the status of these rare and priority species and the remnant vegetation in which it and they are located.

International obligations

This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that Convention. Although the taxon is listed under the United Nations Environment Program World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES) this IRP does not affect Australia's obligations under 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. The Department of Indigenous Affairs Aboriginal Sites Register does not list any significant sites in the vicinity of populations. However, not all significant sites are listed on the Register. Implementation of recovery actions under this plan will include consideration of the role and interests of Indigenous communities in the region. 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

Population 7 of *Grevillea dryandroides* subsp. *hirsuta* occurs on private land and there is some potential for limited social and economic impact. However, as the area is small and recovery actions will involve liaison and cooperation with all stakeholders, it is unlikely that the social and economic impact will be significant.

Affected interests

Stakeholders potentially affected by the implementation of this plan include the Shire of Brookton, as managers of the areas containing Populations (1a, 1b, 1c), Shire of Corrigin (Populations 2a, 2b, 3, 8), Shire of Wongan-Ballidu (Population 4a), Shire of Kellerberrin (Population 10), and West Net Rail (Populations 4b and 9).

Evaluation of the plans performance

DEC will evaluate the performance of this IRP in conjunction with Avon-Mortlock 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

Appropriate land managers have been notified of the location and threatened status of the subspecies. The notification details the Declared Rare status of *Grevillea dryandroides* subsp. *hirsuta* and associated legal obligations.

Declared Rare Flora (DRF) markers have been installed at most roadside populations. These serve to alert people working in the vicinity to the presence of DRF, and the need to avoid work that may damage it in that area. The significance of these markers is being promoted to relevant bodies such as Shires and Department of Main Roads through posters, dashboard stickers and stubby holders that illustrate DRF markers and explain their purpose.

Approximately 131 seeds were collected from Populations 4a and b in 2001, and these have been found to have a high germination rate of 80%. Seeds from both collections are stored in DEC's Threatened Flora Seed Centre (TFSC) at –18°C.

Population 9 is fenced to protect plants from possible accident damaged during rail maintenance.

Herbicide trials were undertaken on population 3 to determine the effect of Fusillade on *Grevillea dryandroides* subsp. *hirsuta* whilst at the same time controlling exotic grasses infesting the population. This weed control method was successful in managing some of the weedy grasses and *Grevillea dryandroides* subsp. *hirsuta* was not adversely affected.

CSIRO undertook a research burning trial in the Reserve containing population 6. The effect fire had on *Grevillea dryandroides* subsp. *hirsuta* was noted and showed that the population recovered rapidly after fire. The report did not specify if the regeneration was from seed or root-stock.

Staff from DEC's Avon-Mortlock District regularly monitor all populations of this subspecies.

The Avon-Mortlock District Threatened Flora Recovery team is overseeing the implementation of this IRP and will include information on progress in their annual reports to DEC's Corporate Executive and funding bodies.

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; influenced by their timing over the term of the Plan. This does not suggest that 'lower' priorities should not be implemented if funding becomes available or if an opportunity arises to complete the action.

1. Coordinate recovery actions

The Avon-Mortlock District Threatened Flora Recovery team will coordinate recovery actions for *Grevillea dryandroides* subsp. *hirsuta* and other Declared Rare Flora in its district. They will include information on progress in their annual report to DEC's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: DEC (Avon-Mortlock District) through the recovery team
Cost: $2,000 per year

2. Map total habitat

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

Action: Map total habitat
Responsibility: DEC (Avon-Mortlock District, SCB) through the recovery team
Cost: $4,000 in the first year

3. Install Declared Rare Flora markers

Declared Rare Flora (DRF) markers are required at Populations 4 and 10. These will help road maintenance workers to avoid accidental damage to the plants or their habitat.

Action: Install DRF markers
Responsibility: DEC (Avon-Mortlock District) through the recovery team
Cost: $200 in first year

4. Liaise with relevant land managers

Staff from DEC's Avon-Mortlock District will continue to liaise with relevant land managers and landowners to ensure that populations are not accidentally damaged or destroyed.

Action: Liaise with relevant land managers
Responsibility: DEC (Avon-Mortlock District) through the recovery team
Cost: $1,400 per year

5. Achieve long-term protection of habitat

Ways and means of improving the security of populations and their habitat will be investigated for population 7 & 8. This may include conservation covenants with a range of agencies or registration through the Land for Wildlife scheme or, where possible, including land within the conservation reserve system.

Action: Achieve long-term protection of habitat
Responsibility: DEC (Avon-Mortlock District) through the recovery team
Cost: $1,500 per year NDTFRT

6. Repositioning and maintaining Declared Rare Flora Markers

The repositioning of DRF markers is required at population 1 and 2 to enable greater visibility.

Action: Reposition DRF markers at population1 and 2
Responsibility: DEC (Avon-Mortlock District) through the recovery team
Cost: $800 in first year

7. Collect seed and cutting material

Germplasm stored as a genetic resource for use in translocations and as an *ex situ* genetic 'blueprint' of the subspecies, will include both seed and live plants in cultivation. Some seed has been collected from Population 4 but additional collections are required from it and other populations to maintain adequate representation of the remaining genetic diversity of this taxon. The patterns of viability that emerge from standard tests on seed collected may indicate the need for other recovery actions. Cuttings will also be collected to enhance the living collection at BGPA.

Action: Collect seed and cutting material
Responsibility: DEC (TFSC, Avon-Mortlock District) through the recovery team
Cost: $2,200 in the first, third and fifth years

8. Develop and implement a weed control strategy

Weeds are a threat to all the roadside populations. Weeds impact on the subspecies by competing for resources, degrading habitat, exacerbating grazing pressure, and increasing the risk and severity of fire. The development of the strategy will determine how large the threat is to the population, how the weed control will be carried out and the methods of long-term monitoring and management of the site.

Weed control, undertaken in consultation with relevant land managers, will be achieved through hand weeding or localised application of herbicide. Any weed control will be followed by a report on the methods, timing and success of the treatment, and any detrimental affect on *Grevillea dryandroides* subsp. *hirsuta* and associated native plant species. It is anticipated that a number of native species will regenerate after weed competition is removed.

Action: Develop and implement a weed control strategy
Responsibility: DEC (Avon-Mortlock District) through the recovery team and relevant land managers
Cost: $700 first year $500 in subsequent years

9. Develop and implement a fire management strategy

Although it is known that *Grevillea dryandroides* subsp. *hirsuta* recovers well from occasional fire, fire is thought to kill or damage some adult plants and frequent fires could be detrimental to the long-term survival of the subspecies as it may prevent the accumulation of sufficient soil-stored seed for recruitment.

A fire management strategy will be developed in consultation with relevant authorities and land managers to determine fire control measures and fire frequency. This strategy should incorporate other priority and threatened species in the district.

Action: Develop and implement a fire management strategy
Responsibility: DEC (Avon-Mortlock District) through the recovery team
Cost: $2,500 in first year, and $1,700 in subsequent years

10. Monitor populations

Annual monitoring of factors such as response to physical disturbance, habitat degradation (including weed invasion, salinity and plant diseases such as *Phytophthora cinnamomi*), population stability (expansion or decline), pollination activity, seed production, recruitment, longevity and predation is essential. The visibility of DRF markers will also be monitored to ensure they remain effective, and have not faded or been covered by vegetation growth.

Action: Monitor populations and the species response to physical disturbance
Responsibility: DEC (Avon-Mortlock District) through the recovery team
Cost: $2,000 per year

11. Conduct further surveys

A desk top survey is to be conducted to determine suitable areas of habitat that can be targeted for survey. Further surveys by DEC staff and community volunteers will then be conducted during the flowering period of the subspecies. Records of areas surveyed will be sent to DEC's Wildlife Branch and copies retained at the districts, even if *Grevillea dryandroides* subsp. *hirsuta* is not found. Population 11 would be a priority for a more thorough survey as its discovery occurred during the preparation of this IRP.

Action: Conduct further surveys
Responsibility: DEC (Avon-Mortlock District) through the recovery team
Cost: $2,500 per year in the first, third and fifth years

12. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of wild populations of this subspecies 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 will be produced, and will include a description of the plant, its habitat, threats, recovery actions and photos. This will be distributed to the public through DEC's Avon-Mortlock District office and at the offices and libraries of the relevant Shires. Such information distribution may lead to the discovery of new populations.

Action: Promote awareness
Responsibility: DEC (SCB, Avon-Mortlock District) through the recovery team
Cost: $1,700 in first year, and $1,100 per year

13. Develop and implement a rabbit control strategy

Rabbits are thought to be a threat to a large population located in a nature reserve. Rabbits are known to preferentially graze soft young growth, and it seems likely that they will either reduce or prevent recruitment by grazing on young seedlings. In addition to grazing, rabbits also impact on populations by encouraging the invasion of weeds through soil digging, erosion, addition of nutrients and the introduction of weed seeds.

Control strategies will be developed and implemented in consultation with relevant land managers.

Action: Develop and implement a rabbit control strategy
Responsibility: DEC (Avon-Mortlock District) through the recovery team
Cost: $800 in first year then $600 for second and third years.

14. Determine genetic variation within populations

It is possible that *Grevillea dryandroides* subsp. *hirsuta* is rarer than the population counts indicate. Currently it is very difficult to determine population sizes due to the number of plants that have suckered as a result of physical disturbance. It is therefore thought that there are a lot less individual plants than indicated in previous monitoring data. Molecular studies need to be carried out at a number of sites to determine the amount of variability within and between populations. This will provide information on the actual number of plants and allow us to ascertain the long-term viability of populations.

Action: Undertake molecular studies to determine the variation within populations.
Responsibility: DEC (Science Division, Avon-Mortlock District) through the recovery team.
Cost: $10,000 in the second year

15. Maintenance of existing fencing

A fence was constructed around population 9 several years ago to protect plants from railway maintenance activities. However, as the population has since spread outside the fenced area it should be enlarged to encompass them and allow for further expansion.

Action: Enlarge the fenced area to encompass all known plants and allow for further population growth.
Responsibility: DEC (Avon-Mortlock District) through the recovery team
Cost: $500 in the first year

16. Notify shires

Currently, the records show that several shires have not been formally notified. A review of the notification letters will be undertaken to ensure that all current land managers are aware of the presence of the subspecies on their land and their responsibilities under the Wildlife Conservation Act.

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

17. Review the need for further recovery actions

If the subspecies is still ranked as Vulnerable at the end of the fourth year of the five-year term of this Interim Recovery Plan, the need for further recovery actions will be assessed.

Action: Review the need for further recovery actions
Responsibility: DEC (SCB, Avon-Mortlock District) through the recovery team
Cost: $20,300 in the fifth year (if a further Recovery Plan is 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 Vulnerable (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, Western Australia.

CALM (1992) Policy Statement No. 44 *Wildlife Management Programs*. Department of Conservation and Land Management, Western Australia.

CALM (1994) Policy Statement No. 50 *Setting Priorities for the Conservation of Western Australia's Threatened Flora and Fauna*. Department of Conservation and Land Management, Western Australia.

Olde, P.M & Marriot, N.R (1993) New species and taxonomic changes in *Grevillea* (Proteaceae: Grevilleoideae) from south-west Western, *Nuytsia* 9(2):237-304.

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/

World Conservation Union (1994) *IUCN red list categories prepared by the IUCN Species Survival Commission*, as approved by the 40th meeting of the IUCN Council. Gland, Switzerland.

6. TAXONOMIC DESCRIPTION

Olde, P.M & Marriott, N.R (1993) New Species and taxonomic changes in *Grevillea* (Proteaceae: Grevilleoideae) from south-west Western Australia. *Nuytsia* 9(2), 270-271.

Grevillea dryandroides* subsp. *hirsuta is a tufty, vigorously root-suckering shrub 10-30 cm high, usually forming colonies in excess of 50 clones; leaves grey; rachis appressed-villous; leaf lobes (8)12-35 mm long, persistently hirsute, the hairs crisped, until conflorescence 5.5-10 cm long, conico-secund; pedicels 1.5-2 mm long; perianth 7-8 mm long; pistil 19-23 mm long; ovarian stipe 1-1.5 mm long.

SUMMARY OF RECOVERY ACTIONS AND COSTS

Recovery Action	Year 1			Year 2			Year 3			Year 4			Year 5		
	DEC	**Other**	**Ext.**	**DEC**	**Other**	**Ext.**	**DEC**	**Other**	**Ext.**	**DEC**	**Other**	**Ext.**	**DEC**	**Other**	**Ext.**
Coordinate recovery actions	1,000	1,000		1,000	1,000		1,000	1,000		1,000	1,000		1,000	1,000	
Map total habitat	3,000		1,000												
Install DRF markers	100		100												
Liaise with land managers	600		800	600		800	600		800	600		800	600		800
Achieve long-term protection of habitat	1,000		500	1,000		500	1,000		500	1,000		500	1,000		500
Repositioning and maintaining Declared Rare Flora markers	800														
Collect seed & cutting material	1,200		1,000				1,200		1,000				1,200		1,000
Develop and implement a fire management strategy	400		300	300		200	300		200	300		200	300		200
Develop and implement a fire management strategy	1,000	1,000	500	600	600	500	600	600	500	600	600	500	600	600	500
Monitor populations	1,000		1000	1,000		1000	1,000		1000	1,000		1000	1,000		1000
Conduct further surveys	800	800	900				800	800	900				800	800	900
Promote awareness	1,100		600	1,100			1,100			1,100			1,100		
Develop and implement a rabbit control strategy	800			600						600			1,200		1,000
Determine genetic variation within populations				10,000											
Maintain existing fencing	500														
Notify Shires				200											
Review the need for a full Recovery Plan													11,200	9,100	
Total	13,300	2,800	6,700	16,400	1,600	3,000	7,600	2,400	4,900	6,200	1,600	3,000	20,000	11,500	5,900
Yearly Total	**22,800**			**21,000**			**14,900**			**10,800**			**37,400**		

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

Total DEC: $63,500
Total Other: $19,900
Total External Funding: $23,500
Total Costs: $106,900