INTERIM RECOVERY PLAN NO. 305 (revised)

HAIRY PHALANX GREVILLEA

(*Grevillea dryandroides* subsp. *hirsuta*)

INTERIM RECOVERY PLAN

2010-2015

December 2010

Department of Environment and Conservation
Kensington

Australian Government

GOVERNMENT OF WESTERN AUSTRALIA

Government of **Western Australia**
Department of **Environment and Conservation**

FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos. 44 and 50. 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 IRP replaces IRP 222, prepared by Kate Brunt, Kim Kershaw, Andrew Brown and Greg Durell in 2004.

This IRP will operate from December 2010 to November 2015 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still listed as threatened flora this IRP will be reviewed after five years and the need for further recovery actions assessed.

This IRP was approved by the Director of Nature Conservation on 2 December 2010. The allocation of staff time and provision of funds identified in this IRP is dependent on budgetary and other constraints affecting DEC, as well as the need to address other priorities.

Information in this IRP was accurate in December 2010.

IRP PREPARATION

This IRP was prepared by Craig Douglas[1], Wendy Johnston[2], Marie Strelein[3], Lorraine Duffy[4] and Joel Collins[5].

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ACKNOWLEDGMENTS

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

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Kate Brunt	Former Flora Conservation Officer, Central Wheatbelt District, DEC
Andrew Crawford	Technical Officer, Threatened Flora Seed Centre, DEC
Greg Durell	District Manager, Great Southern District, DEC
Bob Elkins	Technical Assistant, Botanic Gardens and Parks Authority
Kim Kershaw	Former Flora Conservation Officer, Great Southern District, DEC
Carly Naughton	Vegetative Propagation Horticulturist, Botanic Gardens and Parks Authority

We would like to thank the staff of the WA Herbarium for providing access to Herbarium databases and specimen information, and DEC's Species and Communities Branch and Wildlife Branch for their extensive assistance.

Cover photograph by Andrew Brown

CITATION

This IRP should be cited as:

Department of Environment and Conservation (2010) Hairy Phalanx Grevillea (*Grevillea dryandroides* subsp. *hirsuta*) Interim Recovery Plan 2010-2015. Interim Recovery Plan No. 305. Department of Environment and Conservation, Western Australia.

SUMMARY

Scientific Name:	***Grevillea dryandroides* subsp. *hirsuta***	**Common Name:**	Hairy Phalanx Grevillea
Family:	Proteaceae	**Flowering Period:**	Opportunistic, September-March
DEC Region:	Wheatbelt	**DEC District:**	Central Wheatbelt and Great Southern
Shires:	Wongan-Ballidu, Dowerin, Brookton, Corrigin, Kellerberrin	**Recovery Teams:**	Central Wheatbelt District Threatened Flora Recovery Team and Great Southern District Threatened Flora Recovery Team

Illustrations and/or further information: Brown, A., Thomson-Dans, C. and Marchant N. (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia. pp 97; Olde, P.M and Marriot, N.R (1993) New species and taxonomic changes in *Grevillea* (Proteaceae: Grevilleoideae) from south-west Western Australia. *Nuytsia* 9(2): 270-271; Olde, P.M. and Marriott, N.R. (1995) *The Grevillea Book Volume 2*. New South Wales, Kangaroo Press Ltd. pp 139-140; Western Australian Herbarium (2008) *FloraBase 2 – Information on the Western Australian Flora*. Department of Environment and Conservation, Western Australia. http://www.calm.wa.gov.au/science/.

Analysis of outputs and effectiveness of *Grevillea dryandroides* subsp. *hirsuta* IRP 222 (1999-2002) prepared by Kate Brunt, Kim Kershaw, Andrew Brown and Greg Durell:

The criteria for success in the previous plan ('the number of individuals within populations and/or the number of populations have increased') has not been met, as the number of known populations has not increased and still remains at 10. The number of known plants in populations has also declined from 6530 to 5894, a decrease of approximately 10% in numbers of mature plants.

Recovery actions listed in the IRP have started and are ongoing or in some cases have yet to be started. Non urgent actions will be implemented as resources become available. Below is a summary of recovery actions.

Action 3	Declared Rare Flora (DRF) markers have been placed at Populations 4 and 10.
Action 6	Markers at Population 1 and 2 repositioned.
Action 7	Seed collections made and ongoing.
Action 8	Weed control has been undertaken for some road reserve populations and is ongoing.
Action 11	Surveys have been conducted with no new populations found.
Action 12	A letter drop has been completed and a poster produced.
Action 13	Rabbit control has been implemented for Populations 5 and 6.
Action 14	Fenced area around Population 9 has been enlarged.
Action 15	All relevant land managers have been notified.

Actions 4, 5 and 10 and other recovery actions included in the plan are ongoing and are included in this revised plan. New recovery actions included in this plan are 'Re-evaluate and update ranking criteria' and 'Develop and implement fire and disturbance trials'.

Current status: *Grevillea dryandroides* subsp. *hirsuta* was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in 1999 and is currently ranked as Vulnerable (VU) under the World Conservation Union (IUCN 2001) Red List criterion B1ab(iii,v)+2ab(iii,v), due to a geographic range of less than 20,000 km^2, area of occupancy less than 2,000 km^2, populations severely fragmented, it being known from no more than ten locations and there being a continuing decline in the extent and quality of habitat and the number of mature plants. As at December 2009 the subspecies no longer meets criterion (v) due to an increase in the number of known mature plants and now meets VU B1ab(iii)+2ab(iii). The subspecies is listed as Endangered (EN) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999) as *Grevillea dryandroides*. The main threats are road, track, rail and firebreak maintenance, weed invasion and competition, inappropriate fire regimes, chemical spray drift, rabbit grazing, salinity, insecure land tenure, low genetic diversity, poor recruitment and disease.

Description: *Grevillea dryandroides* subsp. *hirsuta* is a tufted, ground-hugging shrub 10 to 30 cm high and up to 1 m in diameter. Like other subspecies of *G. dryandroides* the subspecies suckers vigorously from roots. The greyish-green leaves, up to 12 cm long, have many hairy, linear segments up to 12 mm long, forming a V-shape with the 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 dull red racemes to 7 cm long are one sided and held at the end of long, bare, ground-hugging stems. The hairy fruits are about 1 cm long. *G. dryandroides* subsp. *hirsuta* can be distinguished from subspecies *dryandroides* in its longer leaf lobes and covering of hairs, also its longer conflorescences and pistils.

Habitat requirements: *Grevillea dryandroides* subsp. *hirsuta* occurs on yellow sand-heath, occasionally with *Eucalyptus* or *Banksia* species.

Habitat critical to the survival of *Grevillea dryandroides* subsp. *hirsuta* and important populations: Habitat critical to the survival of *Grevillea dryandroides* subsp. *hirsuta* includes the area of occupancy of important populations, areas of similar habitat surrounding and linking populations (these providing potential habitat for population expansion and for pollinators), additional occurrences of similar habitat that may contain undiscovered populations of the subspecies or be suitable for future translocations, and the local catchment for the surface and/or groundwater that maintains the habitat of the subspecies.

Benefits to other species or ecological communities: Recovery actions implemented to improve the quality or security of the habitat of *Grevillea dryandroides* subsp. *hirsuta* will also improve the status of associated native vegetation, as well as three Declared Rare Flora (DRF) species and nine Priority flora taxa.

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. *Grevillea dryandroides* subsp. *hirsuta* is not specifically listed under any international treaty, however, and this IRP does not affect Australia's obligations under any other international agreements.

Role and interests of indigenous people: No sites of Aboriginal significance are known at or near populations of *Grevillea dryandroides* subsp. *hirsuta*. However, the involvement of the indigenous community is currently being sought to determine whether there are any issues or interests identified in the plan. If no role is identified for indigenous communities in the recovery of this subspecies, opportunities may exist through cultural interpretation and awareness. Continued liaison between DEC and the indigenous community will identify areas in which collaboration will assist implementation of recovery actions.

Social and economic impact: As one population is located on private property, its protection has the potential to affect farming activities and recovery actions refer to continued liaison between stakeholders.

Affected interests: Stakeholders potentially affected by the implementation of this plan include the owners of private property, the Public Transport Authority and the Shires of Wongan-Ballidu, Brookton, Kellerberrin and Corrigin.

Evaluation of the plans performance: DEC, in conjunction with the Central Wheatbelt and Great Southern District Threatened Flora Recovery Teams (CWDTFRT and GSDTFRT) will evaluate the performance of this IRP. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed following five years of implementation.

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

1. Land managers have been made aware of the threatened nature of this subspecies, its location and their legal obligations to protect it.
2. Declared Rare Flora (DRF) markers have been installed at Populations 3, 8, 9 and 10; and at Subpopulations 1a-c and 2a and b.
3. Fencing of Population 9 has been undertaken. It has since been expanded to protect plants that have spread outside the area.
4. Seed collections are stored with DEC's Threatened Flora Seed Centre (TFSC).
5. The Botanic Gardens and Parks Authority (BGPA) have 18 *Grevillea dryandroides* subsp. *hirsuta* plants in the botanic garden and five plants in the nursery. They also have tissue material in cryostorage.
6. A number of plants propagated by BGPA have also been planted in the Merredin Rare Flora Garden.
7. Plants grown from seven clones are to be planted into the Dowerin-Goomalling Rare Flora Garden.
8. In 1994, weed control trials were undertaken to determine if Fusilade could be used safely to control annual grasses in the vicinity of *Grevillea dryandroides* subsp. *hirsuta*.
9. Staff from the CSIRO have investigated the effect of fire on *Grevillea dryandroides* subsp. *hirsuta*.
10. A reply paid postal drop, illustrating *Grevillea dryandroides* subsp. *hirsuta* and describing its distinctive features and habitat has been distributed by DEC Central Wheatbelt District staff.
11. Rabbit control was implemented for Populations 5 and 6 of *Grevillea dryandroides* subsp. *hirsuta* by DEC staff from the Central Wheatbelt District.
12. The CWDTFRT and GSDTFRT are overseeing the implementation of this IRP and will include information of progress in their annual report to DEC's Corporate Executive and funding bodies.
13. Staff from DEC's Great Southern and Central Wheatbelt Districts regularly monitor all populations of this subspecies.

IRP objective: The objective of this IRP is to abate identified threats and maintain or enhance viable *in situ* populations to ensure the long-term preservation of the subspecies in the wild.

Recovery criteria

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

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

Recovery actions

1. Coordinate recovery actions
2. Liaise with land managers and Indigenous groups
3. Monitor populations
4. Determine genetic variation within and between populations
5. Collect seed and other material to preserve genetic diversity
6. Conduct further surveys
7. Undertake weed control and follow-up with regular monitoring and additional control if required
8. Implement rabbit control where necessary
9. Map habitat critical to survival of *Grevillea dryandroides* subsp. *hirsuta*
10. Develop and implement fire and disturbance trials
11. Promote awareness
12. Seek security of tenure for populations
13. Develop and implement a fire response strategy
14. Re-evaluate and update ranking criteria
15. Review this plan and assess the need for further recovery actions

1. BACKGROUND

An analysis of outputs and effectiveness of IRP 222 (2006-2011) by Kate Brunt, Kim Kershaw, Andrew Brown and Greg Durell follows. This IRP replaces IRP No. 222.

The criteria for success in the previous plan ('the number of individuals within populations and/or the number of populations have increased') has not been met, as the number of known populations has not increased and still remains at 10. The number of known plants in populations has also declined from 6530 to 5894, a decrease of approximately 10% in numbers of mature plants.

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History

Charles Gardner first collected *Grevillea dryandroides* near Ballidu in 1931. In 1993 it was split into two subspecies, *G. dryandroides* subsp. *hirsuta* and *G. dryandroides* subsp. *dryandroides* based on taxonomic features (Olde and Marriott 1993).

The first complete record of a collection of *Grevillea dryandroides* subsp. *hirsuta* was made by a Miss R. Gibbons in 1964 from a locality north of Cadoux. However the subspecies was collected earlier by a P. Harris from a locality near Dowerin. Collections held by the Western Australian Herbarium indicate that *G. dryandroides* subsp. *hirsuta* has only ever been collected from the locations it currently occupies, with the exception of a collection made in 1964 from a locality slightly south of the existing Population 4, north of Cadoux.

Grevillea dryandroides subsp. *hirsuta* is known from just ten populations, totalling approximately 5,894 mature plants. More than half (53%) the number of plants occur on highly degraded road and rail reserves, making them extremely susceptible to maintenance activities. The taxon has been subject to a number of 'Permits to Take', the largest of these being in 2004 for railway maintenance. This involved the taking of up to 1,153 plants from Population 9.

Description

Grevillea dryandroides subsp. *hirsuta* is a tufted, ground-hugging shrub 10 to 30 cm high and up to 1 m in diameter. Like subspecies *dryandroides* it suckers vigorously from roots forming colonies. The greyish-green leaves to 12 cm long have hairy, linear segments to 12 mm long forming a V-shape with the 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 dull red racemes, up to 7 cm long are one sided and held at the end of long, bare, ground-hugging stems. The hairy fruits are about 1 cm long (Brown *et al*. 1998; Olde and Marriott 1993).

Grevillea dryandroides subsp. *hirsuta* is distinguished from subspecies *dryandroides* by its longer leaf lobes with a covering of hairs and its longer conflorescences and pistils (Olde and Marriott 1993).

Distribution and habitat

Grevillea dryandroides subsp. *hirsuta* occurs over a large geographic range of approximately 8,993 km^2 in the central Wheatbelt of Western Australia and includes the Shires of Wongan-Ballidu, Dowerin, Brookton, Corrigin and Kellerberrin.

Habitat is typically yellow sand-heath, occasionally with *Eucalyptus* or *Banksia* species. Species associated with *Grevillea dryandroides* subsp. *hirsuta* include *Hakea platysperma*, *H. incrassata*, *Verticordia eriocephala*, *V. serrata*, *V. tumida* subsp. *tumida*, *Grevillea excelsior*, *G. hookeriana*, *G. eriostachya*, *G. cagiana*, *Banksia prionotes*, *Allocasuarina campestris*, *Gastrolobium spinosum*, *Leptospermum erubescens*, *Synaphea spinulosa* and *Dianella revoluta*.

The soil type is quite specific and, as it occurs in areas that have been largely cleared for agricultural purposes, only small areas of good quality remnant vegetation on this soil-type remain.

Table 1: Summary of population land vesting, purpose and management

Pop. No. & Location	DEC District	Shire	Vesting	Purpose	Management
1a. S of Quairading	Great Southern	Brookton	Unvested Reserve	Road Reserve	Shire of Brookton
1b. S of Quairading	Great Southern	Brookton	Unvested Reserve	Road Reserve	Shire of Brookton
1c. S of Quairading	Great Southern	Brookton	Unvested Reserve	Road Reserve	Shire of Brookton
2a. W of Corrigin	Great Southern	Corrigin	Unvested Reserve	Road Reserve	Shire of Corrigin
2b. W of Corrigin	Great Southern	Corrigin	Unvested Reserve	Road Reserve	Shire of Corrigin
3. W of Corrigin	Great Southern	Corrigin	Unvested Reserve	Road Reserve	Shire of Corrigin
4a. N of Cadoux	Central Wheatbelt	Wongan-Ballidu	Unvested Reserve	Road Reserve	Shire of Wongan-Ballidu
4b. N of Cadoux	Central Wheatbelt	Wongan-Ballidu	Public Transport Authority of WA	Railway Reserve	Public Transport Authority of WA
5. SE of Dowerin (Nature Reserve)	Central Wheatbelt	Dowerin	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
6. N of Kellerberrin (Nature Reserve)	Central Wheatbelt	Kellerberrin	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
7. NW of Bruce Rock	Central Wheatbelt	Kellerberrin	Freehold	Private Property	Landholders
8. W of Corrigin	Great Southern	Corrigin	Unvested Reserve	Airport	Shire of Corrigin
9. NE of Dowerin	Central Wheatbelt	Dowerin	Public Transport Authority of WA	Railway Reserve	Public Transport Authority of WA
10. NW of Bruce Rock	Central Wheatbelt	Kellerberrin	Unvested Reserve	Road Reserve	Shire of Kellerberrin

Biology and ecology

Grevillea dryandroides subsp. *hirsuta* has been observed to sucker from underground root stock following physical disturbance and has been observed to re-sprout from rootstock and germinate from soil-stored seed post fire.

Grevillea dryandroides subsp. *hirsuta* is likely to be pollinated by birds and small native terrestrial marsupials.

Germination trials using *Grevillea dryandroides* subsp. *hirsuta* seed indicates that the subspecies has a reasonably high germination rate of 80% *ex-situ* when seeds are soaked in smoke water, the coat is nicked and seeds are plated in agar containing 25 mg/L of Gibberellic acid.

Although the main flowering period for *Grevillea dryandroides* subsp. *hirsuta* is between September and March, opportunistic flowering has been recorded throughout the year with accompanying fruit development.

An orange flowering form of *Grevillea dryandroides* subsp. *hirsuta* is located towards the southern end of Population 6 in Durokoppin Nature Reserve.

Threats

Grevillea dryandroides subsp. *hirsuta* was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in 1999 and is currently ranked as Vulnerable (VU) under the World Conservation Union (IUCN 2001) Red List criterion B1ab(iii,v)+2ab(iii,v), due to a geographic range of less than 20,000 km^2, area of occupancy less than 2,000 km^2, populations severely fragmented, it being known from no more than ten locations and there being a continuing decline in the extent and quality of habitat and the number of mature plants. As at December 2009 the subspecies no longer meets criterion (v) due to an increase in the number of known mature plants and now meets VU B1ab(iii)+2ab(iii). The subspecies is listed as Endangered (EN) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999) as *Grevillea dryandroides*. The main threats are road, track, rail and firebreak maintenance, weed invasion and competition, inappropriate fire regimes, chemical spray drift, rabbit grazing, salinity, insecure land tenure, low genetic diversity, poor recruitment and disease.

- **Road, track, rail and firebreak maintenance** threatens Populations 3 and 10 and Subpopulations 1a-c, 2a and b, 4a on road reserves, Population 9 and Subpopulation 4b on rail reserves, Subpopulations 2a and b on firebreaks and Population 8 on a Shire maintenance track. These are threatened by grading, chemical spraying, construction of drainage channels and mowing of roadside vegetation. Relevant authorities have been informed of the location of *Grevillea dryandroides* subsp. *hirsuta* so that appropriate protective actions can be implemented.
- **Weed invasion and competition** is a threat to Populations 3, 9 and 10; and Subpopulations 1a-c, 2a and b, and 4a and b. Observations show that plants in Populations 1 and 3 are able to persist at least in the short-term in the presence of introduced grasses. Weeds compete for resources with the subspecies reducing the health of plants, and reducing fecundity and recruitment. Heavy weed infestation also generates high fuel loads which increase the frequency and intensity of fire.
- **Inappropriate fire regimes** affects Populations 3, 5-8 and Subpopulations 1a-c. It is likely that infrequent fire or soil disturbance is needed for seed germination in this subspecies. However, if fire re-occurs before juvenile plants are mature enough to resprout they are likely to be killed. Many populations have weeds that are currently restricted to the edges of the habitat, but are likely to invade further post-fire.
- **Chemical spray drift** of herbicides threatens Population 3 and Subpopulations 1a-c, 2a and b, and 4a which occupy narrow road reserves bordering farmland. Relevant authorities have been informed of the location of this subspecies in order to reduce this threat.
- **Rabbit (*Oryctolagus cuniculus*) grazing** is a threat to Populations 5 and 6. As well as direct grazing of plants, digging, erosion, the addition of nutrients and introduction of weed seeds may result from rabbit activity.
- **Salinity** is currently noted as a threat to Population 1.
- **Insecure land tenure.** All but two populations found on conservation reserves are on land tenure that is inconsistent with conservation and is generally of poor and deteriorating quality.
- **Low genetic diversity** is a potential threat. *Grevillea dryandroides* subsp. *hirsuta* reproduces both sexually via seed and asexually via underground stems. Due to the suckering habit the number of actual genotypes in populations is potentially limited as several plants may originate from a single parent.
- **Poor recruitment** is observable in most populations due to active fire suppression and or other factors in the subspecies habitat which may positively influence reproduction. The subspecies shows strongest recruitment post fire.
- **Disease.** Scale insect has been noted on plants in Population 10.

The intent of this plan is to provide actions that will deal with immediate threats to *Grevillea dryandroides* subsp. *hirsuta*. Although climate change may have a long-term effect on the subspecies, actions taken directly to prevent the impact of climate change are beyond the scope of this plan.

Table 2: Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Pop Condition	Threats
1a. S of Quairading	Road Reserve	1987 75 1990 1,000* 1991 2,000* 2000 1,500 2004 3,095 2007 767	Moderate	Road maintenance, weeds, inappropriate fire regime, salinity, spray drift
1b. S of Quairading	Road Reserve	1990 1,000* 1991 2,000* 2000 6 2004 4 2007 1	Moderate	Road maintenance, weeds, inappropriate fire regime, salinity, spray drift
1c. S of Quairading	Road Reserve	1990 1,000* 1991 2,000* 2000 600 2004 1,000 2007 332	Moderate	Road maintenance, weeds, inappropriate fire regime, salinity, spray drift
2a. W of Corrigin	Road Reserve	1989 5 1990 0 1994 7 2000 300 2004 800* 2007 200	Moderate	Road and firebreak maintenance – grading and herbicide application, weeds, spray drift
2b. W of Corrigin	Road Reserve	1989 1 1990 0 1994 21 2000 25 2004 800* 2007 24	Moderate	Road and firebreak maintenance – grading and herbicide application, weeds, spray drift
3. W of Corrigin	Road Reserve	1989 4 2000 10 2004 10 2007 0	Poor	Road maintenance, weeds, inappropriate fire regime, spray drift
4a. N of Cadoux	Road Reserve	1988 2,000 (100)* 1990 700 1992 3,300* 1994 2,000* 2001 500 2006 500+ (200)	Healthy	Road maintenance, weeds, spray drift
4b. N of Cadoux	Rail Reserve	1987 500 [100] 1988 2,000 (100)* 1991 1,300 1992 3,300* 1994 2,000* 2006 1,000+ (200)	Healthy	Rail maintenance, weeds
5. SE of Dowerin	Nature Reserve	1984 40 1986 300 1988 80 (50) 1991 300 (30) [15] 1992 255 (30) [15] 1994 300 2003 380 2005 287 [37] 2006 480	Healthy	Rabbit grazing, inappropriate fire regimes, weeds
6. N of Kellerberrin	Nature Reserve	1985 80 1990 1,000 1994 1,000 2005 2 2008 0	Poor	Rabbit grazing, inappropriate fire regimes
7. NW of Bruce Rock	Private Property	1991 1,000 2004 1,000 2008 2000+ [1]	Healthy	Inappropriate fire regimes
8. W of Corrigin	Aerodrome Reserve	1988 100 [25] 1993 100 (100) 2000 112 2004 320 2007 284	Healthy	Shire track maintenance, inappropriate fire regimes
9. NE of Dowerin	Rail Reserve	1992 150	Healthy	Rail maintenance – herbicide

Pop. No. & Location	Land Status	Year/No. plants	Pop Condition	Threats
		2001 150 (50) 2003 500 2006 300+ [1]		application, weeds
10. NW of Bruce Rock	Road Reserve	2000 1 2004 30 [10] 2005 28 [15] 2006 28 [15] 2008 6 [4]	Poor	Road maintenance, disease, weeds

Populations in **bold text** are considered to be Important Populations; Note: * = total for both subpopulations, ( ) = number of seedlings, [ ] = number dead. Note: *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.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Developments and/or land clearing in the immediate vicinity of *Grevillea dryandroides* subsp. *hirsuta* populations require assessment and should not be approved unless the proponents can demonstrate that their actions will have no significant impact on the subspecies, its habitat or potential habitat, or the local surface and ground water hydrology, such that drainage in the habitat of the subspecies would be altered.

Habitat critical to the survival of *Grevillea dryandroides* subsp. *hirsuta* and important populations

Habitat critical to the survival of *Grevillea dryandroides* subsp. *hirsuta* includes the area of occupancy of important populations, areas of similar habitat surrounding and linking populations (these providing potential habitat for population expansion and for pollinators), additional occurrences of similar habitat that may contain undiscovered populations of the subspecies or be suitable for future translocations, and the local catchment for the surface and/or groundwater that maintains the habitat of the subspecies.

Given that *Grevillea dryandroides* subsp. *hirsuta* is listed as Vulnerable, it is considered that it is likely that some populations are more important to the subspecies' ongoing survival than others. These are the larger populations (Populations 4b and 7), those on conservation estate (5 and 6) and those at the extremes of its range (1, 4, 7, 8 and 10). This may need to be reappraised if new populations are discovered.

Benefits to other species or ecological communities

Recovery actions implemented to improve the quality or security of the habitat of *Grevillea dryandroides* subsp. *hirsuta* will also improve the status of associated native plant species including *Hakea platysperma*, *H. incrassata*, *Verticordia eriocephala*, *V. serrata*, *V. tumida* subsp. *tumida*, *Grevillea excelsior*, *G. hookeriana*, *G. eriostachya*, *G. cagiana*, *Banksia prionotes*, *Allocasuarina campestris*, *Gastrolobium spinosum*, *Leptospermum erubescens*, *Synaphea spinulosa* and *Dianella revoluta*.

Three threatened and nine priority flora taxa located with *Grevillea dryandroides* subsp. *hirsuta* are listed in the table below.

Table 3: Conservation-listed flora species occurring in habitat of *Grevillea dryandroides* subsp. *hirsuta*

Species name	Conservation Status (Western Australia)	Conservation Status (EPBC Act 1999)
Grevillea scapigera	DRF, Critically Endangered	Endangered
Verticordia hughanii	DRF, Endangered	Endangered
Thelymitra stellata	DRF, Endangered	Endangered
Lechenaultia pulvinaris	Priority 4	
Calothamnus brevifolius	Priority 4	
Daviesia oxylobium	Priority 4	
Acacia campylophylla	Priority 3	
Cryptandra dielsii	Priority 3	
Acacia gemina	Priority 2	
Banksia dallanneyi subsp. *agricola*	Priority 2	
Leucopogon amplectens	Priority 2	
Acacia lirellata subsp. *compressa*	Priority 2	

DRF – Declared Rare Flora; for a description of the priority categories see Atkins (2008)

The subspecies is not known to occur in association with any Threatened Ecological Community.

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. *Grevillea dryandroides* subsp. *hirsuta* is not specifically listed under any international treaty, however, and this IRP does not affect Australia's obligations under any other international agreements.

Role and interests of indigenous people

According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register, no sites of Aboriginal significance are known at or near populations of the subspecies. However, the involvement of the indigenous community including the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs, is currently being sought to determine whether there are any issues or interests identified in the plan. If no role is identified for indigenous communities in the recovery of this subspecies, opportunities may exist through cultural interpretation and awareness of the subspecies.

Continued liaison between DEC and the indigenous community will identify areas in which collaboration will assist implementation of recovery actions.

Social and economic impacts

As one population is located on private property, its protection has the potential to affect farming activities and recovery actions refer to continued liaison between stakeholders.

Affected interests

Stakeholders potentially affected by the implementation of this plan include owners of private property, the Public Transport Authority and the Shires of Wongan-Ballidu, Brookton, Kellerberrin and Corrigin.

Evaluation of the plans performance

DEC, in conjunction with the Central Wheatbelt and Great Southern District Threatened Flora Recovery Teams (CWDTFRT and GSDTFRT) will evaluate the performance of this IRP. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed following four five of implementation.

2. RECOVERY OBJECTIVE AND CRITERIA

Objectives

The objective of this IRP is to abate identified threats and maintain or enhance viable *in situ* populations to ensure the long-term preservation of the subspecies in the wild.

Criteria for success: The number of populations have increased or the number of individuals within populations have increased by ten percent or more over the term of the plan.
Criteria for failure: The number of populations have decreased or the number of individuals within populations have decreased by ten percent or more over the term 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 Populations 3, 8, 9 and 10; and at Subpopulations 1a-c, and 2a and b. These serve to alert people to the presence of DRF and the need to avoid work that may damage it. The significance of these markers is being promoted to relevant bodies such as Shires and Main Roads WA through posters, dashboard stickers and stubby holders.

Fencing of Population 9 has been undertaken to protect plants from accidental damage during rail maintenance. The fence has since been expanded to protect plants that have spread outside the area.

DEC's Threatened Flora Seed Centre (TFSC) collected 131 seed of *Grevillea dryandroides* subsp. *hirsuta* from Population 4 in 2001, which had a germination rate of 80%. Further seed collections include 42 seed also from Population 4 collected in 2006 to 2008; and 14 seed in 2007 from Population 2. Seeds from these collections are currently stored in DEC's Threatened Flora Seed Centre (TFSC) at –18°C.

The Botanic Gardens and Parks Authority (BGPA) hold some tissue material in cryostorage.

The BGPA have 23 clones collected in 1990 from Population 4, with 18 plants in the botanic gardens and five plants in the nursery. A number of plants propagated by BGPA have also been planted in the Merredin Rare Flora Garden. Plants grown from seven clones are to be planted into the Dowerin-Goomalling Rare Flora Garden.

Herbicide trials were undertaken to control exotic grasses at Population 3 and to determine the effect of Fusilade on *Grevillea dryandroides* subsp. *hirsuta*. This weed control method was successful in managing some of the weedy grasses while not adversely affecting *G. dryandroides* subsp. *hirsuta*.

CSIRO undertook a trial research burn in the area of Population 6 in 1989 with *Grevillea dryandroides* subsp. *hirsuta* appearing to recover rapidly post fire. However the most recent population counts from 2005 and 2008 suggest the population has since declined.

A reply paid postal drop, illustrating *Grevillea dryandroides* subsp. *hirsuta* and describing its distinctive features and habitat has been distributed by DEC Central Wheatbelt District staff to local farmers and other residents in local Shires. Postal drops aim to provide information about the threatened subspecies and a contact name and number if new populations are found.

Rabbit control was implemented for Populations 5 and 6 of *Grevillea dryandroides* subsp. *hirsuta* by DEC staff from the Central Wheatbelt District.

The CWDTFRT and GSDTFRT are overseeing the implementation of this IRP and will include information on progress in their annual report to DEC's Corporate Executive and funding bodies.

Staff from DEC's Central Wheatbelt and Great Southern Districts, regularly monitor all populations of the subspecies.

Future recovery actions

Where recovery actions occur on lands other than those managed by DEC, permission has been or will be sought from appropriate owners/land managers prior to these actions being undertaken. The following recovery actions are generally in order of descending priority, influenced by their timing over the life of the plan. However this should not constrain addressing lower ranked actions if funding is available and other opportunities arise.

1. Coordinate recovery actions

The CWDTFRT and GSDTFRT will coordinate recovery actions for *Grevillea dryandroides* subsp. *hirsuta* and other Declared Rare Flora in their respective districts. They will include information on progress in their annual report to DEC's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT
Cost: $6,000 per year

2. Liaise with land managers and Indigenous groups

Staff from DEC's Central Wheatbelt and Great Southern Districts will liaise with appropriate land owners to ensure that populations are not accidentaly damaged or destroyed. Input and involvement will also be sought from any Aboriginal groups that have an active interest in areas that are habitat for *Grevillea dryandroides* subsp. *hirsuta*.

Action: Liaise with land managers and Indigenous groups
Responsibility: DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT
Cost: $2,000 per year

3. Monitor populations

Annual monitoring of factors such as 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, and scale insect activity is essential. The visibility of DRF markers will also be monitored to ensure they remain effective and have not faded, been removed or covered by vegetation.

Action: Monitor populations
Responsibility: DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT
Cost: $10,000 per year

4. Determine genetic variation within and between 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, and it is thought that there are a lot less individual plants than indicated in monitoring data. Molecular studies therefore need to be carried out to determine the actual number of plants. Most importantly it will allow the conservation status of the subspecies and importance of recovery actions be assessed accurately.

Action: Determine genetic variation within and between populations
Responsibility: DEC (Central Wheatbelt and Great Southern Districts; Science Division) through CWDTFRT and GSDTFRT
Cost: $12,000 in years 1 and 2

5. Collect seed and other material to preserve genetic diversity

DEC's Threatened Flora Seed Centre (TFSC) currently holds seed from Populations 2 and 4. BGPA have tissue in cryostorage and live collections of *Grevillea dryandroides* subsp. *hirsuta* in their gardens and nursery. However all the BGPA material comes from Population 4 and it is recommended that further seed and cuttings be collected. Consideration should be given to holding material in a variety of forms, including seed storage,

living collections and tissue collections. Collections should aim to sample and preserve the maximum range of genetic diversity possible. Therefore the genetic variation of the subspecies should be determined (as per action 4), by an appropriate molecular technique such as genetic fingerprinting if feasible, prior to seed collection occurring. The "Germplasm Conservation Guidelines for Australia" produced by the Australian Network for Plant Conservation (ANPC) should be used to guide this process (ANPC 1997).

Action: Collect seed and other material to preserve genetic diversity
Responsibility: DEC (Central Wheatbelt and Great Southern Districts; TFSC; BGPA) through CWDTFRT and GSDTFRT
Cost: $5,000 in years 3, 4 and 5

6. Conduct further surveys

Following a desktop survey to determine suitable areas of habitat that can be targeted, further surveys by DEC staff and community volunteers will be conducted during the flowering period of the subspecies. Records of areas surveyed will be sent to DEC's Species and Communities Branch (SCB) and copies retained at the relevant DEC Districts, even if no new plants are found.

Action: Conduct further surveys
Responsibility: DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT
Cost: $5,000 in years 1, 3 and 5

7. Undertake weed control and follow up with regular monitoring and additional control if required

Weeds are a threat to all roadside populations. Weeds impact on the subspecies by competing for resources, degrading habitat, exacerbating grazing pressure and increasing the frequency and severity of fire. Development of a weed control strategy will determine how large the threat is to populations, how and if weed control should be carried out and what methods should be used for long-term monitoring and management of the sites.

Any weed control will include 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 other native species will regenerate after weed competition is removed.

Action: Undertake weed control and follow up with regular monitoring and additional control if required
Responsibility: DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT
Cost: $6,500 per year

8. Implement rabbit control where necessary

The level of threat at populations posed by rabbits may vary from year to year with conditions and numbers. When monitoring ascertains the threat is high, control measures may be required. Control should be undertaken in summer months when less green feed is available as an alternative food source.

Action: Implement rabbit control where necessary
Responsibility: DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT; relevant land managers
Cost: $7,000 in years 1, 3 and 5

9. Map habitat critical to survival of *Grevillea dryandroides* subsp. *hirsuta*

It is a requirement of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) (Section 207A) that spatial data relating to habitat critical to the survival of the subspecies be determined. Although this habitat is alluded to in Section 1, the areas described have not yet been accurately mapped and will be addressed

under this action. If additional populations are located, then habitat critical to their survival will also be determined and mapped.

Action: Map habitat critical to survival of *Grevillea dryandroides* subsp. *hirsuta*
Responsibility: DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT
Cost: $6,000 in year 2

10. Develop and implement fire and disturbance trials

DEC's Central Wheatbelt and Great Southern Districts will, in consultation with private landowners, the Shires of Wongan-Ballidu, Brookton, Kellerberrin and Corrigin, Public Transport Authority and other relevant authorities, conduct research into the effectiveness of fire and mechanical disturbance in stimulating germination of soil-stored seed. Care will be taken to avoid stimulating competition with existing *G. dryandroides subsp. hirsuta* plants. The results of all trials will be monitored and, if successful, a larger scale operation undertaken. Attention will be given to each of the following to ensure maximum recruitment but at the same time maintaining the integrity of the population:

a) burning discrete dead plants
b) raking of the soil near dead plants

Action: Develop and implement fire and disturbance trials
Responsibility: DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT; relevant authorities
Cost: $7,000 in years 1 and 3; $2,000 in years 2, 4 and 5

11. Promote awareness

The importance of biodiversity conservation and the protection of *Grevillea dryandroides* subp. *hirsuta* will be promoted to the public. This will be achieved through an information campaign using local print and electronic media and by setting up poster displays. An A4 sized information sheet that provides a description of the subspecies and information about threats and recovery actions needs to be developed and distributed to local land owners, relevant authorities and volunteer organizations, libraries and schools. It is hoped that the poster will result in the discovery of new populations. Formal links with local naturalist groups and interested individuals should also be encouraged.

To minimize the risk of accidental or deliberate destruction, it is recommended that the exact location of *Grevillea dryandroides* subsp. *hirsuta* be kept from the general public. Such information should, however, be provided to persons with a management interest in the land or adjacent lands where the plants occur, including relevant landowners, Shire staff and government authorities.

Action: Promote awareness
Responsibility: DEC (Central Wheatbelt and Great Southern Districts; SCB and Strategic Development and Corporate Affairs Division) through CWDTFRT and GSDTFRT
Cost: $4,000 in year 1 and $2,000 in years 2-5

12. Seek security of tenure for populations

The conservation status of land that supports Populations 7 and 8 will be reviewed and the possibility of purchase and/or a change of land tenure investigated. Protecting important populations on private land through conservation covenants or other schemes will also be investigated.

Action: Seek security of tenure for populations
Responsibility: DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT
Cost: $3,000 per year

13. Develop and implement a fire response strategy

Fire will be prevented from occurring in the habitat of populations, except where it is being used experimentally as a recovery tool. Based on the findings of action 10, a fire response strategy will be developed that recommends fire frequency, intensity, season, and control measures.

Action: Develop and implement a fire response strategy
Responsibility: DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT; relevant authorities
Cost: $10,000 in year 1; $2,000 in subsequent years

14. Re-evaluate and update ranking criteria

Grevillea dryandroides subsp. *hirsuta* is currently ranked as Vulnerable (VU) under the World Conservation Union (IUCN 2001) Red List criterion B1ab(iii,v)+2ab(iii,v). However, as the number of extant mature plants has increased, it no longer meets criterion (v). The species will be re-evaluated and the criteria updated to VU B1ab(iii)+2ab(iii).

Action: Re-evaluate and update ranking criteria
Responsibility: DEC (SCB)
Cost: $1,000 in year 1

15. Review this plan and assess the need for further recovery actions

At the end of the five-year term of this IRP, DEC, in conjunction with the CWDTFRT and GSDTFRT, will evaluate its performance against the criteria for success and failure. If the subspecies is still listed as threatened, the need for further recovery actions, or a review of this IRP will be assessed by the teams and a revised plan prepared if necessary.

Action: Review this plan and assess the need for further recovery actions
Responsibility: DEC (Central Wheatbelt and Great Southern Districts; SCB) through CWDTFRT and GSDTFRT
Cost: $3,000 in year 5

Table 4: Summary of recovery actions

Recovery Actions	Priority	Responsibility	Completion date
Coordinate recovery actions	High	DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT	Ongoing
Liaise with land managers and Indigenous groups	High	DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT	Ongoing
Monitor populations	High	DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT	Ongoing
Determine genetic variation within and between populations	High	DEC (Central Wheatbelt and Great Southern Districts; Science Division) through CWDTFRT and GSDTFRT	2012
Collect seed and other material to preserve genetic diversity	High	DEC (Central Wheatbelt and Great Southern Districts; TFSC; BGPA) through CWDTFRT and GSDTFRT	Ongoing
Conduct further surveys	High	DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT	Ongoing
Undertake weed control and follow-up with regular monitoring and additional control if required	High	DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT	Ongoing
Implement rabbit control where necessary	High	DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT; relevant land managers	Ongoing
Map habitat critical to survival of *Grevillea dryandroides* subsp. *hirsuta*	High	DEC (Central Wheatbelt and Great Southern Districts; SCB) through CWDTFRT and GSDTFRT	2012
Develop and implement fire and disturbance trials	High	DEC (Central Wheatbelt and Great Southern Districts; Science Division) through CWDTFRT	Ongoing

		and GSDTFRT; relevant authorities	
Promote awareness	Moderate	DEC (Central Wheatbelt and Great Southern Districts; SCB; Strategic Development and Corporate Affairs Division) through CWDTFRT and GSDTFRT	Ongoing
Seek security of tenure for populations	Moderate	DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT	Ongoing
Develop and implement a fire response strategy	Moderate	DEC (Central Wheatbelt and Great Southern Districts) through CWDTFRT and GSDTFRT; relevant authorities	Developed by 2011 with implementation ongoing
Re-evaluate and update ranking criteria	Moderate	DEC (SCB)	2011
Review this plan and assess the need for further recovery actions	Moderate	DEC (Central Wheatbelt and Great Southern Districts; SCB) through CWDTFRT and GSDTFRT	2015

4. TERM OF PLAN

This IRP will operate from December 2010 to November 2015 but will remain in force until withdrawn or replaced. If the taxon is still listed as threatened after five years, the need for further recovery actions will be determined.

5. REFERENCES

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6. TAXONOMIC DESCRIPTION

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

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.