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

INTERIM RECOVERY PLAN NO. 330

PHALANX GREVILLEA

(*Grevillea dryandroides* subsp. *dryandroides*)

INTERIM RECOVERY PLAN

2012 –2017

November 2012
Department of Environment and Conservation
Kensington

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.

Plans 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 taxa, within one year of endorsement of that rank by the Minister.

This plan, which results from a review of, and replaces, IRP No. 64 *Grevillea dryandroides* subsp. *dryandroides* (Phillimore and Brown 2000), will operate from November 2012 to October 2017 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked as Critically Endangered in WA, this plan will be reviewed after five years and the need for further recovery actions assessed.

This plan was given regional approval on 02 November 2012 and was approved by the Director of Nature Conservation on 26 November 2012. The provision of funds identified in this plan is dependent on budgetary and other constraints affecting DEC, as well as the need to address other priorities.

Information in this plan was accurate at November 2012.

PLAN PREPARATION

This plan was prepared by Robyn Luu[1] and Andrew Brown[2].

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ACKNOWLEDGMENTS

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

Andrew Crawford	Principal Technical Officer (Threatened Flora Seed Centre), DEC Science Division
Natasha Moore	Conservation Officer (Flora and Fauna), DEC Central Wheatbelt District
Mia Podesta	Ecologist – TEC database, DEC Species and Communities Branch
Amanda Shade	Assistant Curator (Nursery), Botanic Gardens and Parks Authority

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

Cover photograph by Leonie Monks

CITATION

This plan should be cited as:

Department of Environment and Conservation (2012) Phalanx grevillea (*Grevillea dryandroides* subsp. *dryandroides*) Interim Recovery Plan 2012–2017. Interim Recovery Plan No. 330. Department of Environment and Conservation, Western Australia.

SUMMARY

Scientific name:	***Grevillea dryandroides*** subsp. ***dryandroides***	**Common name:**	Phalanx Grevillea
Family:	Proteaceae	**Flowering period:**	September to March
DEC region:	Wheatbelt	**DEC district:**	Central Wheatbelt
Shire:	Wongan- Ballidu	**NRM region:**	Wheatbelt
IBRA region	Avon Wheatbelt	**Recovery team:**	Central Wheatbelt District Threatened Flora and Communities Recovery Team (CWDTFCRT)
IBRA subregion	Avon Wheatbelt P		

Illustrations and/or further information: Brown, A., Thomson-Dans, C. and Marchant, N. (Eds) (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia; Collins, J. (2009) *Threatened Flora of the Western Central Wheatbelt*. Department of Environment and Conservation, Bentley, Western Australia; 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): 237-304; Olde, P.M. and Marriott, N.R. (1995) *The Grevillea Book* Volume 2, Kangaroo Press Ltd, New South Wales; Western Australian Herbarium (1998−) *FloraBase* − *The Western Australian Flora*. Department of Environment and Conservation. http://florabase.dec.wa.gov.au/.

Current status: *Grevillea dryandroides* subsp. *dryandroides* is declared as rare flora (DRF) under the Western Australian *Wildlife Conservation Act 1950* and in WA is ranked as Critically Endangered (CR) under International Union for Conservation of Nature (IUCN 2001) criteria B1ab(iii,v)+B2ab(iii,v); C2a(i) due to the extent of occurrence being less than 100km^2; severely fragmented populations; continuing decline in area, extent and/or quality of habitat and number of mature individuals; area of occupancy less than 10km^2; and no subpopulation estimated to contain more than 50 mature individuals. The subspecies is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main threats to the species are weed invasion, road, rail, track and firebreak maintenance, poor recruitment, inappropriate fire regimes, recreational activities, clearing, grazing, low genetic diversity, competition and future mining operations.

Description: *Grevillea dryandroides* subsp. *dryandroides* is a root suckering shrub to 50cm tall. It usually forms colonies of less than five plants or is scattered singly amongst associated vegetation. The leaves are dull, yellow-green, each with leaf lobes 5 to 15mm long. The inflorescence is 3 to 4cm long, and pedicles are 1 to 1.5mm long. Individual flowers are pink to orange-pink with a grey-green limb. The style is red or pink with a green tip. The perianth is 6 to 7mm long and the pistil 17 to 18mm long (Olde and Marriott 1993). Flowers occur from September to March (Brown *et al*. 1998).

Habitat requirements: *Grevillea dryandroides* subsp. *dryandroides* is endemic to WA where it is confined to the Ballidu area. It is found in open heath on grey sandy loam and yellow gravelly sand, with shrubs of *Allocasuarina* and *Melaleuca*.

Habitat critical to the survival of the species, and important populations: *Grevillea dryandroides* subsp. *dryandroides* is ranked in WA as CR, and as such it is considered that all known habitat for wild populations is habitat critical to its survival, and that all wild populations are important populations. Habitat critical to the survival of *G. dryandroides* subsp. *dryandroides* includes the area of occupancy of populations, areas of similar habitat surrounding and linking populations, 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. *dryandroides* will also improve the status of associated native vegetation including eight 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. The subspecies is not listed under Appendix II in the United Nations Environment Program World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES), and this plan does not affect Australia's obligations under any other international agreements.

Indigenous consultation: A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register revealed no sites of Aboriginal significance adjacent to populations of *Grevillea dryandroides* subsp. *dryandroides*. However, input and involvement has been sought through the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs to determine if there are any issues or interests with respect to management for this species at these sites.. Indigenous opportunity for future involvement in the implementation of the recovery plan is included as an action in the plan. Indigenous involvement in management of the land is also provided for under the joint management arrangements in the *Conservation and Land Management Act 1984*.

Social and economic impacts: The implementation of this recovery plan may result in some social and economic impact. For populations on land vested with Main Roads WA, and under the management of Shire of Wongan-Ballidu and Brookfield Rail, it may be through the cost of recovery actions and impacts on land management practices. A mineral exploration lease also covers the area containing all populations and there is potential for economic impact should mining operations go ahead.

Affected interests: The implementation of this plan has some implications for land managers, such as Main Roads WA, Brookfield Rail and the Shire of Wongan-Ballidu, particularly where populations occur on lands not specifically managed for conservation. Mining tenement holders Yilgarn Iron Pty Ltd may also be affected by actions referred to in this plan.

Evaluation of the plan's performance: DEC, with assistance from the Central Wheatbelt District Threatened Flora and Communities Recovery Team (CWDTFCRT), will evaluate the performance of this plan. 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. Stakeholders have been made aware of the existence of this species and its locations.
2. Subpopulation 1b was fenced following the destruction of ten plants during firebreak grading and weedicide activities in 1991. Subpopulation 3b was also fenced in 1999 to reduce the risk of plants being trampled.
3. 1,027 seeds collected from *Grevillea dryandroides* subsp. *dryandroides* are stored in DEC Threatened Flora Seed Centre (TFSC) at –18°C.
4. The Botanic Garden and Parks Authority (BGPA) currently has 48 plants grown from cuttings.
5. Declared Rare Flora (DRF) markers have been installed at Population 2 and Subpopulations 1a, 1b, 3a, 3b, 4a and 5a.
6. An information sheet for *Grevillea dryandroides* subsp. *dryandroides* was produced using funding jointly supplied by the Natural Heritage Trust and DEC.
7. A reply paid postal drop illustrating *Grevillea dryandroides* subsp. *dryandroides* and describing its distinctive features and habitat was distributed by DEC to local farmers and residents in the Wongan-Ballidu Shire in 1999.
8. Smoke trials undertaken by BGPA in 1995 on two adult *Grevillea dryandroides* subsp. *dryandroides* plants resulted in 60 seedlings germinating in a 15 metre radius around the plants.
9. A translocation proposal aimed at establishing a population of *Grevillea dryandroides* subsp. *dryandroides* on a more secure site was developed and implemented by DEC in 2000 (Phillimore *et al*. 2000).
10. Monitoring of the translocated population was undertaken initially, six monthly after planting, and annually thereafter and to include the number of surviving plants, height and width of crown in two directions, reproductive state, number of flowers and drupes, and general health of plants.
11. Staff from DEC Central Wheatbelt District monitor the populations.
12. DEC, with assistance from the CWDTFCRT, is overseeing the implementation of threatened flora recovery/management in the Central Wheatbelt District, which will also incorporate implementation of this plan

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

Recovery criteria

Criteria for success: The number of populations has increased and/or the number of mature individuals has increased by 10 per cent or more over the term of the plan.

Criteria for failure: The number of populations has decreased and/or the number of mature individuals has decreased by 10 per cent or more over the term of the plan.

Recovery actions

1. Coordinate recovery actions
2. Fence Subpopulations 4a and 4c
3. Install and reposition DRF markers
4. Conduct weed control
5. Determine genetic variation between and within populations
6. Monitor populations
7. Develop and implement a fire management strategy
8. Undertake regeneration trials
9. Collect and store seed
10. Manage recreational impacts at Population 4 and Subpopulation 3b
11. Control grazing
12. Obtain biological and ecological information
13. Undertake surveys
14. Develop and implement additional translocation proposals
15. Monitor translocated populations
16. Liaise with land managers and indigenous communities
17. Map habitat critical to the survival of *Grevillea dryandroides* subsp. *dryandroides*
18. Promote awareness
19. Review this plan and assess the need for further recovery actions

1. BACKGROUND

A review of outputs and effectiveness of IRP 64 (2000-2003) by R. Phillimore and A. Brown follows. This plan replaces IRP No. 64.

Review of approved Western Australian Recovery Plans adopted as National Recovery Plans under the EPBC Act (by Fairs 2008).

The criteria for success in the previous plan (the number of individuals within populations and/or the number of populations have increased) was met with the extent of occurrence of plants increased through the location of three additional subpopulations since the commencement of the plan. The main recovery actions from the previous plan and their results are listed in Table 1 below.

Table 1: Status of specific recovery actions from previous plan (1999-2002)

Recovery action	% Implemented	Result
Coordinate recovery actions	Started, ongoing	Recovery actions were conducted by the Merredin District Flora Conservation Officer prior to June 2006. Since 2006 the Avon-Mortlock District has coordinated recovery actions, with assistance from the Avon-Mortlock District Threatened Flora Recovery Team.
Install Declared Rare Flora markers	100% complete	DRF markers have been installed at all road and rail reserve occurrences. Signage has been selectively installed at the Golf course to minimise impact of trampling by recreationists.
Undertake weed control	Started, ongoing	Some weed control has been implemented by the Shire and Main Roads.
Liaise with land managers	100% complete	All relevant authorities and land managers have been formally notified and are aware of the subspecies presence, the need to protect it and are familiar with the current threatening processes.
Conduct further surveys	Started, ongoing	The subspecies has been extensively and opportunistically surveyed for in areas of suitable habitat. A Rare Flora survey was conducted with the Wongan-Ballidu Bushcare Group on 19 June 2005 and one new Subpopulation (4d) was discovered.
Monitor populations	Started, ongoing	The Conservation officer has regularly monitored populations during the term of the plan.
Develop and implement a fire management strategy	0% complete	The Wheatbelt Region Fire Response Plan covers all the Nature Reserves in the Avon Mortlock District. A fire strategy has not been developed specifically for this subspecies.
Collect seed and cutting material	Started, ongoing	DEC ‘s Threatened Flora Seed Centre (TFSC) has five seed collections in storage comprising approximately 1074 seeds. Germination testing recorded between 80 to 100% success. Thirty cuttings were collected from four populations in 1999 and later 42 cuttings were collected in 2007, representing all populations. Cuttings were sent to Botanic Gardens and Parks Authority (BGPA) to propagate for translocation restocking. BGPA currently has 62 living specimens located in the nursery and botanic gardens.
Obtain biological and ecological information	Started, ongoing	One plant was tested for susceptibility to *Phytophthora cinnamomi*, however, there was insufficient data to confirm susceptibility.
Propagate plants for translocation	Started, ongoing	Plants were propagated by BGPA for translocation in May 2000. Seeds were collected and germinated by TFSC in November 2001 with seedlings raised by BGPA for restocking the translocation.
Undertake and monitor translocation	100% complete	Translocation (4T) of 135 plants, carried out in May 2000, was unsuccessful due to the unseasonably dry year. A further translocation of 81 seedlings took place in July 2003. All seedlings were recorded as dead in 2005.
Promote awareness	Started, ongoing	A glossy double sided postcard letterbox drop "Have you seen this flower?" was distributed to residents in Wongan-Ballidu Shire in 1999. Species translocation featured in DEC 'Diversity' newsletter. Local article published in Ballidu newspaper regarding survey of subspecies by Wongan Ballidu Bushcare. A poster describing the subspecies was produced and distributed prior to the commencement of the plan.
Write full Recovery Plan	0% complete	DEC does not generally produce full recovery plans for flora and current interim recovery plans have been extended to a five year term.

The majority of the recovery actions included in the previous plan have been fully or partially implemented. *Action 13* Develop a full Recovery Plan, is redundant as DEC does not generally produce full recovery plans

for flora and current interim recovery plans have been extended to a five year term. Ongoing recovery actions included in the previous plan are included in this revised plan.

New recovery actions included in this plan are to fence Subpopulations 4a and 4c, determine genetic variation within and between populations, undertake regeneration trials, manage recreational impacts at Population 4 and Subpopulation 3b, control grazing, map habitat critical to the survival of *Grevillea dryandroides* subsp. *dryandroides*, and review this plan and assess the need for further recovery actions.

History

W.E. Blackall made the first collection of *Grevillea dryandroides* from the Pithara area in 1931. In 1964 a specimen of *Grevillea dryandroides* was collected from north of Cadoux. This was later determined to be a different subspecies of *Grevillea dryandroides*, based on the persistence of foliar indumentum, leaf lobe length, conflorescence and pistil length (Olde and Marriott 1993). *G. dryandroides* subsp. *dryandroides* differs from the subspecies *hirsuta* in having smooth leaves with lobes that are less than 12mm long.

Further collections of *Grevillea dryandroides* subsp. *dryandroides* were made from Ballidu, Pithara and Wubin between 1934 and 1996. Despite recent surveys in the region, only five populations, consisting of 159 mature individuals (including the translocation), are currently known from a single area near Ballidu.

Description

Grevillea dryandroides subsp. *dryandroides* is a root suckering shrub to 50cm tall. It usually forms colonies of less than five plants or is scattered singly amongst associated vegetation. The leaves are dull, yellow-green, each with leaf lobes 5 to 15mm long. The inflorescence is 3 to 4cm long, and pedicles are 1 to 1.5mm long. Individual flowers are pink to orange-pink with a grey-green limb. The style is red or pink with a green tip. The perianth is 6 to7mm long and the pistil 17 to 18mm long (Olde and Marriott 1993). Flowers occur from September to March (Brown *et al*. 1998).

Distribution and habitat

Grevillea dryandroides subsp. *dryandroides* is endemic to Western Australia where it is confined to the Ballidu area. It is found in open heath on grey sandy loam and yellow gravelly sand, with shrubs of *Allocasuarina* and *Melaleuca*. Associated species include *Acacia resinomarginea*, *Acacia yorkrakinensis* subsp. *acrita*, *Acacia sessilispica*, *Dampiera lavandulacea*, *Calytrix breviseta* subsp. *stipulosa*, *Chorizema rhynchotropis*, *Opercularia spermacocea*, *Melaleuca cordata*, *Waitzia acuminata*, *Hakea scoparia*, *Allocasuarina campestris*, *Conospermum stoechadis* subsp. ?*sclerophyllum*, *Hakea meisneriana*, *Glischrocaryon aureum*, *Melaleuca conothamnoides*, *Verticordia chrysantha*, *Petrophile incurvata*, *Melaleuca uncinata*, *Melaleuca orbicularis* and *Hibbertia huegelii*.

Table 2. Summary of population land vesting, purpose and manager

Pop. no. & location	DEC district	Shire	Vesting	Purpose	Manager
1a. Ballidu	Central Wheatbelt	Wongan-Ballidu	Main Roads WA	Road reserve	Main Roads WA
1b. Ballidu	Central Wheatbelt	Wongan-Ballidu	Public Transport Authority	Rail reserve	Brookfield Rail
2. Ballidu	Central Wheatbelt	Wongan-Ballidu	Unvested	Road reserve	Shire of Wongan-Ballidu
3a. Ballidu	Central Wheatbelt	Wongan-Ballidu	Main Roads WA	Road reserve	Main Roads WA
3b. Ballidu	Central Wheatbelt	Wongan-Ballidu	Shire of Wongan-Ballidu	Reserve	Shire of Wongan-Ballidu
3c. Ballidu	Central Wheatbelt	Wongan-Ballidu	Public Transport Authority	Rail reserve	Brookfield Rail
4a. Ballidu	Central Wheatbelt	Wongan-Ballidu	Shire of Wongan-Ballidu	Recreation reserve	Shire of Wongan-Ballidu
4b. Ballidu	Central Wheatbelt	Wongan-	Shire of Wongan-Ballidu	Recreation	Shire of Wongan-

		Ballidu		reserve	Ballidu
4c. Ballidu	Central Wheatbelt	Wongan-Ballidu	Shire of Wongan-Ballidu	Recreation reserve	Shire of Wongan-Ballidu
4d. Ballidu	Central Wheatbelt	Wongan-Ballidu	Shire of Wongan-Ballidu	Recreation reserve	Shire of Wongan-Ballidu
4T. Ballidu	Central Wheatbelt	Wongan-Ballidu	Shire of Wongan-Ballidu	Recreation reserve	Shire of Wongan-Ballidu
5a. Ballidu	Central Wheatbelt	Wongan-Ballidu	Main Roads WA	Road reserve	Main Roads WA
5b. Ballidu	Central Wheatbelt	Wongan-Ballidu	Public Transport Authority	Rail reserve	Brookfield Rail

Note: Subpopulation 4T is a translocated population.

Biology and ecology

It is known that *Grevillea dryandroides* subsp. *dryandroides* is pollinated by birds and regenerates from seed or suckers after fire or disturbance (Olde and Marriott 1995). Smoke trials undertaken by the Botanic Gardens and Parks Authority (BGPA) in 1995 on two adult plants supports this hypothesis, with up to 60 seedlings germinating in a 15 metre radius around the plants. Otherwise the biology and ecology of *Grevillea dryandroides* subsp. *dryandroides* is poorly known.

Threats

Grevillea dryandroides subsp. *dryandroides* is declared to be rare flora (DRF) under the Western Australian *Wildlife Conservation Act 1950* and is ranked as Critically Endangered in WA under International Union for Conservation of Nature (IUCN 2001) criteria B1ab(iii,v)+B2ab(iii,v); C2a(i) due to its extent of occurrence being less than 100 km^2; populations being severely fragmented; there being a continuing decline in area, extent and/or quality of habitat and number of mature individuals; its area of occupancy being less than 10 km^2; and no subpopulation estimated to contain more than 50 mature individuals. The extent of occurrence is 4.3 km^2 and the area of occupancy is approximately 0.03 km^2. The subspecies is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999). The main threats to the species are:

- **Weed invasion.** Linear remnant habitat, such as those located on road and rail reserves, are severely affected by weed seed blown in from adjacent cleared land. Weeds suppress early plant growth by competing for soil moisture, nutrients and light. They also increase the fire hazard due to the easy ignition of high fuel loads, which are produced annually by many grass weed species.
- **Road, rail, track and firebreak maintenance.** Threats to Population 2 and Subpopulations 1a, 1b, 3a, 3c, 5a and 5b include maintenance of telephone cables located underneath subpopulation 3a, grading, chemical spraying, construction of drainage channels and the mowing of roadside vegetation. Several of these actions also encourage weed invasion.
- **Poor recruitment.** This may be due to a reduction of factors that positively influence reproduction and an increase in factors (weeds, grazing) which may negatively influence reproduction.
- **Inappropriate fire regimes.** Seed of *Grevillea dryandroides* subsp. *dryandroides* is known to germinate following fire. However, frequent fire would deplete the soil seed store. Fire also facilitates weed invasion and when it occurs should be followed up with appropriate weed control.
- **Recreational activities.** Subpopulations 3b, 4a, 4b, 4c and 4d, which are located in a cemetery and Shire Golf course, are threatened by trampling and accidental mowing.
- **Clearing.** Three plants in Subpopulation 3b, which is located in a cemetery, were removed in 2004 for the construction of new graves.
- **Grazing.** Rabbits (*Oryctolagus cuniculus*) and kangaroos are a threat to the majority of populations. As well as grazing plants these animals impact on the habitat by digging, trampling and breaking foliage. An increased nutrient level in the soil from droppings is also likely and may encourage weed invasion. Grazing would have an impact on the establishment of young plants of *Grevillea dryandroides* subsp. *dryandroides* thereby limiting natural recruitment.
- **Low genetic diversity.** *Grevillea dryandroides* subsp. *dryandroides* 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.

- **Competition.** Dodder laurel (*Cassytha* sp.) is a threat to Subpopulations 1b and 5b, as the vine covers many adult plants. Dodder laurel not only competes for light, nutrients and possibly pollinators but also physically restricts the host.
- **Future mining operations.** A mineral extraction lease 70/4120 (Yilgarn Iron Pty Ltd) covers the site and has the potential to severely impact or destroy the habitat.

The intent of this plan is to provide actions that will deal with immediate threats to *Grevillea dryandroides* subsp. *dryandroides*. 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 3. Summary of population information and threats

Pop. no. & location	Land status	Year / no. of plants	Current condition (habitat)	Threats
1a. Ballidu	Main Roads WA Road Reserve	1991 9 2000 4	Healthy	Road maintenance, weeds
1b. Ballidu	Rail reserve	1995 40 1999 26 2007 24 (3) [9]	Moderate	Rail maintenance, weeds, competition
2. Ballidu	Shire road reserve	1980 36 2000 3 [2] 2003 0	Extinct	Grazing, road maintenance
3a. Ballidu	Main Roads WA road reserve	1988 62 1999 20+ 2001 8	Moderate	Road and cable maintenance, grazing, weeds
3b. Ballidu	Cemetery	1994 2 2001 11 2005 3 [2]	Moderate	Weeds, grazing, clearing, recreational activities
3c. Ballidu	Rail reserve	1999 5 2000 10 2001 8 [3]	Moderate	Weeds, rail maintenance, competition
4a. Ballidu	Recreation reserve	1985 2 1999 9 2005 9 [5]	Moderate	Weeds, recreational activities, grazing
4b. Ballidu	Recreation reserve	2000 3 2005 3	Moderate	Weeds, recreational activities, grazing
4c. Ballidu	Recreation reserve	2005 3 (1)	Moderate	Weeds, recreational activities, grazing
4d. Ballidu	Recreation reserve	2005 5 [9]	Moderate	Weeds, recreational activities, grazing
4T. Ballidu	Recreation reserve	2001 0 [130] 2008 (103) 2010 54		
5a. Ballidu	Main Roads WA road reserve	1999 45* 2007 9 [2]	Moderate	Road maintenance, weeds
5b. Ballidu	Rail reserve	1999 45* 2004 32 [2] 2007 29 [7]	Moderate	Rail maintenance, weeds, competition

Note: Subpopulation 4T is a translocated population. * = total for subpopulations combined. () = number of seedlings. [] = number of dead. Populations in **bold text** are considered to be important populations.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Actions for development and/or land clearing in the immediate vicinity of *Grevillea dryandroides* subsp. *dryandroides* may require assessment.

Actions that could result in any of the following may potentially result in a significant impact on the subspecies:

- Damage or destruction of occupied or potential habitat
- Alteration of the local surface hydrology or drainage
- Reduction in population size

- A major increase in disturbance in the vicinity of a population.

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

Grevillea dryandroides subsp. *dryandroides* is ranked in WA as CR, and as such it is considered that all known habitat for wild populations is critical to the survival of the subspecies, and that all wild populations are important populations. Habitat critical to the survival of *G. dryandroides* subsp. *dryandroides* includes the area of occupancy of 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. *dryandroides* will also improve the status of associated native vegetation. Eight priority flora taxa occur within 500m of *G. dryandroides* subsp. *dryandroides*. These taxa are listed in the table below:

Table 4. Conservation–listed flora species occurring within 500m of *Grevillea dryandroides* subsp. *dryandroides*

Species name	**Conservation status (WA)**	**Conservation status (EPBC Act 1999)**
Dampiera glabrescens	Priority 1	
Acacia lirellata subsp. *compressa*	Priority 2	
Acacia scalena	Priority 3	
Gompholobium wonganense	Priority 3	
Lepidobolus densus	Priority 3	
Synaphea constricta	Priority 3	
Urodon capitatus	Priority 3	
Verticordia venusta	Priority 3	

For a description of the Priority categories see Smith (2012).

Grevillea dryandroides subsp. *dryandroides* does not occur within or adjacent to any Threatened (TEC) or Priority (PEC) Ecological Communities.

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. *dryandroides* is not listed under Appendix II in the United Nations Environment Program World Conservation Monitoring Centre (UNEP-WCMC) Convention on International Trade in Endangered Species (CITES) and this plan does not affect Australia's obligations under any other international agreements.

Indigenous consultation

A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register revealed no sites of Aboriginal significance adjacent to populations of *Grevillea dryandroides* subsp. *dryandroides*. However, input and involvement has been sought through the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs to determine if there are any issues or interests with respect to management for this species at these sites. Indigenous opportunity for future involvement in the implementation of the Recovery plan is included as an action in the plan. Indigenous involvement in management of the land is also provided for under the joint management arrangements in the *Conservation and Land Management Act 1984*.

Social and economic impacts

The implementation of this recovery plan may result in some social and economic impact. For populations on land managed by Main Roads WA, Shire of Wongan-Ballidu and Brookfield Rail, it may be through the cost of recovery actions and impacts on land management practices. A mineral exploration lease also covers the area containing all populations and there is potential for economic impact should mining operations go ahead.

Affected interests

The implementation of this plan has some implications for land managers, such as Main Roads WA, Brookfield Rail and the Shire of Wongan-Ballidu, particularly where populations occur on lands not specifically managed for conservation. Mining tenement holders Yilgarn Iron Pty Ltd may also be affected by actions referred to in this plan.

Evaluation of the Plan's Performance

DEC, with assistance from with the Central Wheatbelt District Threatened Flora and Communities Recovery Team (CWDTFCRT), will evaluate the performance of this plan. 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.

2. RECOVERY OBJECTIVE AND CRITERIA

Objective

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

Criteria for success: The number of populations has increased and/or the number of mature individuals has increased by 10 per cent or more over the term of the plan.

Criteria for failure: The number of populations has decreased and/or the number of mature individuals has decreased by 10 per cent or more over the term of the plan.

3. RECOVERY ACTIONS

Existing recovery actions

Staff from DEC's Central Wheatbelt District regularly monitor extant populations.

DEC with assistance from the CWDTFCRT is overseeing threatened flora recovery/management in the Central Wheatbelt District, which will also incorporate implementation of this plan.

Stakeholders have been made aware of the existence of this subspecies and its locations. These notifications detail the current status of the subspecies as DRF and the associated legal obligations in regards to their protection.

Subpopulation 1b was fenced following the destruction of ten plants during firebreak grading and weedicide activities in 1991. Subpopulation 3b was fenced in 1999 to reduce the risk of plants being trampled.

1,027 seeds collected from a number of populations are stored in DEC Threatened Flora Seed Centre (TFSC) at –18°C (see table 5). Some seed has been processed and the germination rate ranges from 75 to 100%.

Table 5. Threatened Flora Seed Centre collection details for *Grevillea dryandroides* subsp. *dryandroides*

Accession number	Date collected	Population number	Collection type	Number of seed	Germination rate (%)
00343	26/10/1996	5	B/10	372	75
00512	13/11/1997	1	B/10	33	-
00576	2/11/1998	1	B/10, B/5, B/20	132	90
00633	16/11/1999	5	B/20	320	100
00804	1/11/2000	1 and 5	B/11, I/4, I/9	117	-
03119	4/11/2009	5	I/1	53	-

Note: 'I' = a collection of individuals and the number of plants collected; 'B' = a bulked collection and the number of plants sampled

Botanic Gardens and Parks Authority (BGPA) currently has 48 plants grown from cuttings. Propagation success for the subspecies has been varied (see table below).

Table 6. BGPA Propagation information for *Grevillea dryandroides* subsp. *dryandroides*

Year collected	Number of plants held	Original material received as	Population number	Propagation information
1994	43	cuttings	3b	cuttings 46.8% success grafting 36.6% success
2008	1	cuttings	1b	cuttings 11.1% success
2008	1	cuttings	5a	cuttings 25% success
2008	3	cuttings	5a	cuttings 100% success

Declared Rare Flora (DRF) markers have been installed at Subpopulations 1a, 1b, 2, 3a, 3b, 4a and 5a. These alert people working in the vicinity to the presence of DRF and the need to avoid work that may damage the species or its habitat. Dashboard stickers and posters describing the significance of DRF markers have been produced and distributed to relevant Shires and other organisations.

An information sheet for *Grevillea dryandroides* subsp. *dryandroides* was jointly produced by the Natural Heritage Trust and DEC. The sheet contains photographs, a description of the plant, its habitat type, threats and management actions. This poster was distributed to owners of land that contains this species, to landowners who live in close proximity to known populations, as well as to local Shires.

A reply paid postal drop illustrating *Grevillea dryandroides* subsp. *dryandroides* and describing its distinctive features and habitat was distributed by DEC to local farmers and residents in the Wongan-Ballidu Shire in 1999. Postal drops aim to provide information about threatened species and a contact name and number. It was hoped that by targeting residents of specific areas new populations were located. However, no new populations were reported.

Smoke trials undertaken by BGPA in 1995, on two adult *Grevillea dryandroides* subsp. *dryandroides* plants resulted in 50 to 60 seedlings germinating in a 15 metre radius around the plants.

A translocation proposal aimed at establishing a population of *Grevillea dryandroides* subsp. *dryandroides* on a more secure site was developed and implemented by DEC in 2000 (Phillimore *et al*. 2000). Cutting material was sourced from 30 plants from four populations and resulted in 10 plants being grown. The remainder of the plants were from seed collected from a bulk of around 20 plants from two populations. Plants were raised at BGPA resulting in 130 plants which were planted out in winter 2000. All plants were protected from grazing by fencing, thereby increasing survival and hence seed production. Due to an unseasonably dry year and early planting timing, none of the plants survived. In 2003 a further 77 seedlings were planted at the same site and although a watering system was installed by 2005 all plants were dead. A further 103 seedlings were planted in 2008. In June 2010, 54 of the 103 seedlings planted remained alive.

Monitoring of the translocated population was undertaken initially, six months after planting and annually thereafter. Monitoring by staff from DEC Central Wheatbelt District included the number of surviving plants, height and width of crown in two directions, reproductive state, number of flowers and drupes, and

general health of plants. Monitoring of the original populations was also undertaken to provide essential baseline data for assessing the performance of the translocated population.

Future recovery actions

Where recovery actions are to occur on lands other than those managed by DEC, permission has been or will be sought from appropriate owners/land managers prior to recovery 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 any of the actions if funding is available and other opportunities arise.

1. Coordinate recovery actions

DEC, with assistance from the CWDTFCRT, will oversee the implementation of recovery actions for *Grevillea dryandroides* subsp. *dryandroides*.

Action: Coordinate recovery actions
Responsibility: DEC (Central Wheatbelt District) with assistance from the CWDTFCRT
Cost: $6,000 per year

2. Fence Subpopulations 4a and 4c

Agreement will be sought to fence Subpopulations 4a and 4c to protect *Grevillea dryandroides* subsp. *dryandroides* from disturbance.

Action: Fence Subpopulations 4a and 4c
Responsibility: DEC (Central Wheatbelt District), Shire of Wongan-Ballidu
Cost: $10,000 in years 1 and 2

3. Install and reposition DRF markers

DRF markers are needed at Subpopulation 3c and need to be repositioned at Subpopulation 3a.

Action: Install and reposition DRF markers
Responsibility: DEC (Central Wheatbelt District)
Cost: $2,000 in year 1

4. Conduct weed control

Weeds are a threat to the majority of populations and the following actions are recommended:

1. Determine which weeds are present and map them.
2. Select appropriate technique; herbicide, mowing or hand weeding.
3. Control invasive weeds by hand removal and/or spot spraying around the *Grevillea dryandroides* subsp. *dryandroides* plants when weeds first emerge.
4. Revegetation with site specific species is required (in Autumn) to maintain low weed levels.
5. Monitor the success of the treatment on weed death and the tolerance of *Grevillea dryandroides* subsp. *dryandroides* and associated native plant species to the treatment.
6. Report on the method and success of the threatment, and effect on *Grevillea dryandroides* subsp. *dryandroides* plants and associated species.

Action: Conduct weed control
Responsibility: DEC (Central Wheatbelt District)
Cost: $6,000 per year, as required

5. Determine genetic variation within and between populations

It is likely that *Grevillea dryandroides* subsp. *dryandroides* 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 need to be carried out to determine the actual number of plants.

Action: Determine genetic variation within and between populations
Responsibility: DEC (Central Wheatbelt District; Science Division)
Cost: $10,000 in years 1 and 2

6. Monitor populations

Monitoring of factors such as grazing, weed invasion, habitat degradation, hydrology (including salinity), population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity is essential. Although not currently a threat seed predation has previously occurred and will therefore need to be monitored. The populations will be inspected and an accurate location recorded.

Action: Monitor populations
Responsibility: DEC (Central Wheatbelt District)
Cost: $10,000 per year

7. Develop and implement a fire management strategy

Grevillea dryandroides subsp. *dryandroides* is known to regenerate from seed or suckers and may recruit from seed after fire. However, fire will be prevented from occurring in the habitat of populations, except where it is being used experimentally as a recovery tool. A fire management strategy will be developed that recommends fire frequency, intensity, season, and control measures.

Action: Develop and implement a fire management strategy
Responsibility: DEC (Central Wheatbelt District)
Cost: $10,000 in first year and $2,000 in subsequent years

8. Undertake regeneration trials

Natural disturbance events (physical or fire) may be the most effective means of germinating *Grevillea dryandroides* subsp. *dryandroides* in the wild. Although smoke trials undertaken by BGPA in 1995 resulted in the germination of numerous seedlings, different disturbance techniques should be investigated (i.e. soil disturbance and fire), to determine the most successful and appropriate method. Records will need to be maintained for future research. Regeneration trials will need to be undertaken in conjunction with weed control.

Action: Undertake regeneration trials
Responsibility: DEC (Science Division, Central Wheatbelt District)
Cost: $7,000 in years 1 and 3, $2,000 in years 2, 4 and 5

9. Collect and store seed

Preservation of genetic material is essential to guard against extinction of the subspecies if the wild populations are lost. It is recommended that seed be collected and stored at the TFSC. A small amount of seed has been collected from Populations 1 and 5 but further collections are required.

Action: Collect and store seed
Responsibility: DEC (Central Wheatbelt District, TFSC) through the CWDTFCRT
Cost: $5,000 per year

10. Manage recreational impacts at Population 4 and Subpopulation 3b

To prevent trampling of plants at Population 4 and Subpopulation 3b from visitors, barriers such as bollards or fencing may be needed. Signs indicating the significance of the area may also need to be introduced.

Action: Manage recreational impacts at Population 4 and Subpopulation 3b
Responsibility: DEC (Central Wheatbelt District), Shire of Wongan-Ballidu
Cost: $10,000 in year 1

11. Control grazing

The level of threat posed by rabbits and kangaroos may vary from year to year with conditions and numbers. When monitoring ascertains the threat is high, control measures may be required.

Action: Control grazing
Responsibility: DEC (Central Wheatbelt District), Shire of Wongan-Ballidu
Cost: $5,000 per year

12. Obtain biological and ecological information

Improved knowledge of the biology and ecology of the subspecies will provide a scientific basis for management in the wild and should include research on:

1. the soil seed bank dynamics and the role of various factors including disturbance, competition, drought, inundation and grazing in recruitment and seedling survival
2. reproductive strategies, phenology and seasonal growth
3. reproductive sucess and pollination biology
4. minimum viable population size, and
5. the impact of changes in hydrology in the habitat.

Action: Obtain biological and ecological information
Responsibility: DEC (Science Division, Central Wheatbelt District)
Cost: $10,000 per year

13. Undertake surveys

It is recommended that areas of potential suitable habitat be surveyed for the presence of *Grevillea dryandroides* subsp. *dryandroides* during its flowering period.

All surveyed areas will be recorded and the presence or absence of the subspecies documented to increase survey efficiency and reduce unnecessary duplicate surveys. Where possible, and technically feasible, volunteers from the local community, landcare groups, wildflower societies and naturalists clubs will be encouraged to be involved.

Action: Undertake surveys
Responsibility: DEC (Central Wheatbelt District)
Cost: $5,000 per year

14. Develop and implement additional translocation proposals

Using the knowledge gained from current translocation of *Grevillea dryandroides* subsp. *dryandroides* another site will be selected and a translocation proposal developed and implemented. Information on the translocation of threatened plants and animals in the wild is provided in DEC's Policy Statement No. 29 *Translocation of Threatened Flora and Fauna* (CALM 1995), and the Australian Network for Plant Conservation translocation guidelines (Vallee *et al*. 2004). All translocation proposals require endorsement by DEC's Director of Nature Conservation. Monitoring of translocations is essential and will be included in the timetable developed for the Translocation Proposal.

Action: Develop and implement additional translocation proposals
Responsibility: DEC (Science Division, Central Wheatbelt District), BGPA
Cost: $20,000 in year 2; and $10,000 in years 3-5

15. Monitor translocated populations

Monitoring of translocation will determine their long-term success. Monitoring will be undertaken as per approved Translocation Proposals (see Phillimore *et al*. 2000).

Action: Monitor translocated populations
Responsibility: DEC (Central Wheatbelt District, Science Division)
Cost: $10,000 per year

16. Liaise with land managers and indigenous communities

Staff from DEC Central Wheatbelt District will liaise with land managers to ensure that populations of *Grevillea dryandroides* subsp. *dryandroides* are not accidentaly damaged or destroyed. Indigenous consultation will take place to determine if there are any issues or interests in areas that are habitat for *G. dryandroides* subsp. *dryandroides*.

Action: Liaise with land managers and indigenous communities
Responsibility: DEC (Central Wheatbelt District)
Cost: $2,000 per year

17. Map habitat critical to the survival of *Grevillea dryandroides* subsp. *dryandroides*

Although habitat critical to the survival of the subspecies is alluded to in Section 1, it has not yet been mapped and will be addressed under this action. If additional populations are located, then habitat critical to their survival will be determined and mapped also.

Action: Map habitat critical to the survival of *Grevillea dryandroides* subsp. *dryandroides*
Responsibility: DEC (SCB, Central Wheatbelt District)
Cost: $6,000 in year 2

18. Promote awareness

The importance of biodiversity conservation and the protection of *Grevillea dryandroides* subsp. *dryandroides* 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. Formal links with local naturalist groups and interested individuals will also be encouraged.

Action: Promote awareness
Responsibility: DEC (Central Wheatbelt District, SCB, Strategic Development and Corporate Affairs)
Cost: $4,000 in year 1 and $2,000 in years 2-5

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

If *Grevillea dryandroides* subsp. *dryandroides* is still ranked Critically Endangered at the end of the five-year term of this plan, the need for further recovery actions or a review of this plan will be assessed and a revised plan prepared if necessary.

Action: Review this plan and assess the need for further recovery actions
Responsibility: DEC (SCB, Central Wheatbelt District)
Cost: $3,000 in year 5

Table 7. Summary of Recovery actions

Recovery action	Priority	Responsibility	Completion Date
Coordinate recovery actions	High	DEC (Central Wheatbelt District) with assistance from the CWDTFCRT	Ongoing
Fence Subpopulations 4a and 4c	High	DEC (Central Wheatbelt District), Shire of Wongan-Ballidu	2013
Install and reposition DRF markers	High	DEC (Central Wheatbelt District)	2013
Conduct weed control	High	DEC (Central Wheatbelt District)	Ongoing
Determine genetic variation between and within populations	High	DEC (Central Wheatbelt District, Science Division)	2013
Monitor populations	High	DEC (Central Wheatbelt District)	Ongoing
Develop and implement a fire management strategy	High	DEC (Central Wheatbelt District)	Developed by 2012 with implementation ongoing
Undertake regeneration trials	High	DEC (Science Division, Central Wheatbelt District)	2017
Collect and store seed	High	DEC (Central Wheatbelt District, TFSC)	2017
Manage recreational impacts at Population 4 and Subpopulation 3b	High	DEC (Central Wheatbelt District), Shire of Wongan-Ballidu	2013
Control grazing	High	DEC (Central Wheatbelt District), Shire of Wongan-Ballidu	Ongoing
Obtain biological and ecological information	High	DEC (Science Division, Central Wheatbelt District)	2017
Undertake surveys	High	DEC (Central Wheatbelt District)	Ongoing
Develop and implement additional translocation proposals	High	DEC (Science Division, Central Wheatbelt District), BGPA	2016
Monitor translocated populations	High	DEC (Science Division, Central Wheatbelt District)	Ongoing
Liaise with land managers and indigenous communities	Medium	DEC (Central Wheatbelt District)	Ongoing
Map habitat critical to the survival of *Grevillea dryandroides* subsp. *dryandroides*	Medium	DEC (SCB, Central Wheatbelt District)	2013
Promote awareness	Medium	DEC (Central Wheatbelt District, SCB, Strategic Development and Corporate Affairs Division)	Ongoing
Review this plan and assess the need for further recovery actions	Medium	DEC (SCB, Central Wheatbelt District)	2017

4. TERM OF PLAN

This plan will operate from November 2012 to October 2017 but will remain in force until withdrawn or replaced. If the species is still ranked Critically Endangered after five years, the need for further recovery actions will be determined.

5. REFERENCES

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6. TAXONOMIC DESCRIPTION

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): 237-304.

Grevillea dryandroides

Tufty, root-suckering shrub 10–50cm high with leafless peduncles trailing up to 1m from the foliage; branchlets angular, villous. Leaves 5–20cm long, ascending, shortly petiolate, subpinnatisect, secund; leaf rachis straight, incurved or recurved; leaf lobes 5–35mm long, 1.2–2.5mm wide, linear, closely aligned, the apex uncinate; upper surface glabrous to villous, the midvein evident; margin angularly to smoothly refracted; lower surface binucleate, the lamina obscured or almost so by the margins, villous on the grooves, the midvein prominent. Conflorescences erect on trailing peduncles, terminal, usually branched, sometimes simple; unit conflorescence 3–10cm long, conico-to oblong-secund, dense; peduncles sparsely to densely sericeous to appressed-villous; floral rachis sericeous; floral bracts 1–2mm long, ovate-acuminate, some usually at anthesis. Flowers: pedicels 1–2mm long, sericeous; torus 1–1.5mm across, oblique to almost straight; perianth 6–8mm long, pink to purplish-red, ovoid-sigmoid, sericeous to tomentose outside, glabrous inside limb green, revolute, ellipsoid; pistil 17–23mm long; stipe 0.5–1.5mm long; ovary appressed-villous; style red, straight, sparely villous becoming glabrous near the style-end; pollen presenter straight, erect, very narrowly elongate-conical, the base slightly bulbous. Fruits 14–16.5mm long, 8.5mm wide, oblique, oblong to ellipsoid; pericarp 0.5mm thick throughout. Seed 7mm long, 2.5mm wide, oblong-ellipsoid; outer face convex, rugulose; inner face flat, channelled around the margin: margin recurved with a papery or waxy border.

Discussion

Two subspecies are here recognised based on the persistence of foliar indumentum, leaf lobe length, conflorescence and pistil length.

Key to subspecies of *Grevillea dryandroides*

1. Most leaf lobe <10mm long, glabrescent; pistil 17mm long; ovarian stipe < 1mm long

…… ..... ***Grevillea dryandroides* subsp. *dryandroides***

2. Most leaf lobe >12mm long, persistently hairy; pistil 19–23mm long; ovarian stipe 1–1.5mm long

.....***Grevillea dryandroides* subsp. *hirsuta***

Grevillea dryandroides* subsp. *dryandroides

A lightly root-suckering shrub 10–50cm high, usually forming colonies of <5 plants or scattered singly among the vegetation; leaves dull, yellow-green; leaf rachis glabrous; leaf lobes 5–10 (15)mm long, glabrescent; unit conflorescence 3–4cm long, oblong-secund; pedicels 1–1.5mm long; torus oblique at c. 30°; perianth 6–7mm long; pistil 17mm long; ovarian stipe 0.5–0.7mm long.