

INTERIM RECOVERY PLAN NO. 264

Lake Varley Grevillea

(*Grevillea involucrata*)

RECOVERY PLAN



Department of Environment and Conservation
Kensington



Australian Government



Department of
Environment and Conservation

Our environment, our future



FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) 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This IRP will operate from April 2008 to March 2013 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Endangered (EN), this IRP will be reviewed after five years and the need for a full RP assessed.

This IRP was approved by the Director of Nature Conservation in 30 April 2008. 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 April 2008.

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

ACKNOWLEDGMENTS

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John Riley	Administrative Officer Flora, DEC
Andrew Brown	Threatened Flora Coordinator, Species and Communities Branch, DEC
Bob Elkins	Technical Assistant, Botanic Gardens and Parks Authority
Michael Annear	Curator, Burrendong Arboretum, New South Wales

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

Cover photograph by Andrew Brown.

CITATION

This Recovery Plan should be cited as:

Department of Environment and Conservation (2008). Lake Varley *Grevillea* (*Grevillea involucreta*) Recovery Plan, Department of Environment and Conservation, Western Australia.

SUMMARY

Scientific Name:	<i>Grevillea involucrata</i>	Common Name:	Lake Varley Grevillea; Pink bract Grevillea
Family:	Proteaceae	Flowering Period:	June-November
DEC Region:	Wheatbelt	DEC District:	Great Southern
Shire:	Lake Grace, Kent, Kulin	Recovery Team:	Great Southern District Threatened Flora Recovery Team

Illustrations and/or further information: Atkins, K. (2008) *Declared Rare and Priority Flora List for Western Australia*. Department of Environment and Conservation, Western Australia; 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. and Marriott, N. (1995). *The Grevillea Book*. 2: 215-16. Makinson, R.O. (2000). *Proteaceae 2, Grevillea. Flora of Australia Volume 17A*. Melbourne: ABRS/CSIRO Australia. pp 348-9. DEC (2007) *Western Australian Herbarium FloraBase 2 – Information on the Western Australian Flora*. Department of Environment and Conservation, Western Australia. Accessed 2007. <http://www.calm.wa.gov.au/science/>

Current status: *Grevillea involucrata* was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in 1980 and is currently ranked as Endangered (EN) under World Conservation Union (IUCN 1994) Red List criteria C2a;D due to populations being severely fragmented and in continuing decline and there being less than 250 mature individuals. The main threats are road maintenance, firebreak maintenance, gravel extraction, weeds and lack of a suitable disturbance regime. The species is ranked as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Grevillea involucrata is currently known in the wild from 23 populations and 154 mature plants in DEC's Great Southern District. Seventeen populations currently contain living plants.

Description: *Grevillea involucrata* is an open prostrate to decumbent shrub 0.15 to 0.5 m tall and 2 m across. The leaves are 1.5 to 4 cm long and 6 to 10 mm wide, feather shaped, with leaflets divided almost to the base. Each leaf has five to fifteen short mutually aligned oblong to linear lobes 1 to 8 mm long, 0.8 to 1.2 mm wide which are not pungent. The leaf margins are inrolled on the lower surface, enclosing the entire lower leaf surface except for the midvein, and are sometimes covered with scattered appressed hairs. The conflorescence is erect, terminal or axillary, simple, one to three flowered, and the rachis is 0.5 to 1 mm long. The flowers are erect, with the perianth pale pearly pink to dark pink, lacking hairs outside, but containing long, soft or distinct stiffened hairs inside, the style is deep pinkish red, covered in long, soft hairs, becoming sparsely haired towards apex. The pistil is 23 to 25 mm long, the ovary covered in long soft hairs. The follicle is obloid to ellipsoidal and apiculate, 13 to 15 mm long, and loosely covered in long, soft hairs (Makinson 2000).

Grevillea involucrata is closely related to *Grevillea fulgens* which differs in its hairy pedicels and perianth limb (Olde and Marriott 1995).

Habitat requirements: *Grevillea involucrata* occurs on gravelly sands or occasionally concretionary gravels in areas of mallee-heath.

Habitat critical to the survival of the species and important populations: *Grevillea involucrata* is ranked EN, and is known from 22 populations, a number of which are presumed to be extinct or not viable. It is considered that all known habitat of viable populations of the species is habitat critical to its survival, and that all extant, or presumed extant, wild populations are important populations. Habitat critical to the survival of the species includes the area of occupancy of known extant populations, areas of similar habitat (i.e. gravelly sands or concretionary gravels in mallee-heath) surrounding important populations (this is necessary to provide habitat for pollinators and future population expansion) and additional occurrences of similar habitat that may contain the species or be suitable for future translocations.

Benefits to other species or ecological communities: Recovery actions implemented to improve the quality or security of the habitat of *Grevillea involucrata* will also improve the status of remnant native vegetation in which it is located. One threatened and two Priority flora species are located with *G. involucrata*.

International obligations: This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity that was ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that convention. *Grevillea involucrata* is not listed under any specific international treaty however, and therefore this IRP does not affect Australia's obligations under any other international agreements.

Indigenous consultation: According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register, no sites of Aboriginal significance are known at or near populations of the species covered by this IRP. 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 species, opportunities may exist through

cultural interpretation and awareness of the species.

The advice of the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs is being sought to assist in the identification of potential indigenous management responsibilities for land occupied by threatened species, or groups with a cultural connection to land that is important for the species' conservation.

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

Social and economic impact: The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts. However, as some populations occur on, or adjacent to, private land the protection of them has the potential to affect farming activities. Minor adjustments to management practices may be required to ensure the protection of populations on lands not managed primarily for conservation. Recovery actions refer to continued liaison between stakeholders in regards to these areas.

Affected interests: Stakeholders potentially affected by the implementation of this plan include Western Power, the Shires of Lake Grace, Kulin and Kent and owners of private property.

Evaluation of the plan's performance: DEC in conjunction with the Great Southern District Threatened Flora Recovery Team (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 within five years of implementation.

Completed Recovery Actions

1. Land managers including private land owners, Western Power and Shires with populations on land under their management have been made aware of the threatened nature of this species, its location and their legal obligations to protect it.
2. Declared Rare Flora (DRF) markers have been installed at most road verge populations.
3. Fencing of Populations 7 and 9 and Subpopulation 11a on Private Property has been undertaken.
4. The gravel pit in which part of Population 18 is located has been rehabilitated.
5. Botanic Gardens and Parks Authority (BGPA) have two grafted *Grevillea involucreta* in their gardens.

Ongoing and future recovery actions

1. The 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.
2. Staff from DEC's Great Southern District office are monitoring all known populations.

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 species in the wild.

Recovery criteria

Criteria for success: The number of populations have increased and/or the number of mature individuals in populations have increased by ten percent or more over the five year term of the plan.

Criteria for failure: The number of populations have decreased and/or the number of mature individuals in populations have decreased by ten percent or more over the five year term of the plan.

Recovery actions

- | | |
|---|--|
| 1. Coordinate recovery actions | 8. Promote awareness |
| 2. Liaise with relevant land managers | 9. Collect seed |
| 3. Monitor populations | 10. Map habitat critical to the survival of <i>Grevillea involucreta</i> |
| 4. Install DRF markers | 11. Undertake weed control |
| 5. Develop and implement disturbance trials | 12. Obtain biological and ecological information |
| 6. Develop and implement a fire management strategy | 13. Review the plan and assess the need for further recovery actions |
| 7. Conduct further surveys | |

1. BACKGROUND

History

Alex George described *Grevillea involucrata* in 1974 from specimens he collected between Hyden and Lake Varley in 1970 (George 1974).

Since 1983 *Grevillea involucrata* has been cultivated widely in the eastern states of Australia, especially New South Wales and Victoria. It is grown at the Mount Annan Botanic Gardens and Burrendong Arboretum in New South Wales, as well as many private gardens and in the United States of America (Olde and Marriott 1995).

Grevillea involucrata is currently known in the wild from 23 populations and 154 mature plants in DEC's Great Southern District. Seventeen populations currently contain living plants.

Description

Grevillea involucrata is an open prostrate to decumbent shrub 0.15 to 0.5 m tall and 2 m across. The leaves are 1.5 to 4 cm long and 6 to 10 mm wide, feather shaped, with leaflets divided almost to the base. Each leaf has five to fifteen short mutually aligned oblong to linear lobes 1 to 8 mm long, 0.8 to 1.2 mm wide which are not pungent. The leaf margins are inrolled on the lower surface, enclosing the entire lower leaf surface except for the midvein, and are sometimes covered with scattered appressed hairs. The confluence is erect, terminal or axillary, simple, one to three flowered, and the rachis is 0.5 to 1 mm long. The flowers are erect, with the perianth pale pearly pink to dark pink, lacking hairs outside, but containing long, soft or distinct stiffened hairs inside, the style is deep pinkish red, covered in long, soft hairs, becoming sparsely haired towards apex. The pistil is 23 to 25 mm long, the ovary covered in long soft hairs. The follicle is obloid to ellipsoidal and apiculate, 13 to 15 mm long, and loosely covered in long, soft hairs (Makinson 2000).

Grevillea involucrata is closely related to *Grevillea fulgens* which differs in its hairy pedicels and perianth limb (Olde and Marriott 1995).

Distribution and habitat

Grevillea involucrata is confined to the south-eastern Wheatbelt of Western Australia.

Its habitat is gravelly sands or occasionally concretionary gravels in mallee-heath. Associated species include *Eucalyptus pleurocarpa*, *E. albidia*, *Allocasuarina pinaster*, *Grevillea cagiana*, *Hakea cygna*, *Melaleuca pungens*, *Verticordia chrysantha*, *V. integra*, *V. picta*, *V. roei*, *Gastrolobium spinosum* and *Adenanthos argyreus*.

Summary of population land vesting, purpose and tenure

Pop. No. & Location	DEC District	Shire	Vesting	Purpose	Manager
1a S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Road Reserve	Shire of Lake Grace
1b S of Newdegate	Great Southern	Kent	Freehold	Private Property	Landholders
2 S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Road Reserve	Shire of Lake Grace
3a S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Road Reserve	Shire of Lake Grace
3b S of Newdegate	Great Southern	Lake Grace	Freehold	Private Property	Landholders
3c S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Road Reserve	Shire of Lake Grace
3d S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Gravel Reserve	Shire of Lake Grace
4 S of Newdegate	Great Southern	Kent	Unvested Reserve	Road Reserve	Shire of Kent
5 S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Road Reserve	Shire of Lake Grace
6a S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Road Reserve	Shire of Lake Grace
6b S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Road Reserve	Shire of Lake Grace
6c S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Road Reserve	Shire of Lake Grace
7 S of Newdegate	Great Southern	Kent	Shire of Kent	Private Property	Freehold

Pop. No. & Location	DEC District	Shire	Vesting	Purpose	Manager
8 S of Newdegate	Great Southern	Kent	Unvested Reserve	Road Reserve	Shire of Kent
9 S of Newdegate	Great Southern	Kent	Freehold	Private Property	Landholders
10 S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Road Reserve	Shire of Lake Grace
11a SE of Newdegate	Great Southern	Lake Grace	Freehold	Private Property	Landholders
11b SE of Newdegate	Great Southern	Lake Grace	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
12 SE of Newdegate	Great Southern	Lake Grace	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
13 S of Newdegate	Great Southern	Kent	Unvested Reserve	Road Reserve	Shire of Kent
14 S of Hyden	Narrogin	Kulin	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
15a S of Hyden	Narrogin	Kulin	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
15b S of Hyden	Narrogin	Kulin	Unvested Reserve	Road Reserve	Shire of Kulin
16 S of Hyden	Great Southern	Lake Grace	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
17 S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Road Reserve	Shire of Lake Grace
18 S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Road Reserve	Shire of Lake Grace
19 S of Newdegate	Great Southern	Lake Grace	Freehold	Private Property	Landholders
20 S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Road Reserve	Shire of Lake Grace
21 S of Newdegate	Great Southern	Lake Grace	Unvested Reserve	Road Reserve	Shire of Lake Grace
22 S of Hyden	Narrogin	Kulin	Conservation Commission of Western Australia	Conservation of Flora and Fauna	DEC
23 S of Hyden	Narrogin	Kulin	Unvested Reserve	Road Reserve	Shire of Kulin

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

Biology and ecology

Grevillea involucrata is bird pollinated. Mature seed drops to the ground and germinates following disturbance such as light grading and fire. The species is relatively short-lived, reaching senescence at around ten years.

Flowering is mainly between June and November.

The species is morphologically uniform showing little variation apart from minor variation in flower and bract colour (Olde and Marriott, 1995).

Threats

Grevillea involucrata was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in 1980 and is currently ranked as Endangered (EN) under World Conservation Union (IUCN 1994) Red List criteria C2a;D due to populations being severely fragmented and in continuing decline, and an estimated total population size of less than 250 mature individuals. The main threats are road and firebreak maintenance, gravel extraction, weeds and lack of a suitable disturbance regime. *G. involucrata* is ranked as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

- **Road and firebreak maintenance.** Several populations have been graded in the past. Apart from causing direct damage to plants, frequent grading encourages weed invasion. Liaison with relevant land managers is ongoing to ensure the species is protected. See action 2.
- **Gravel extraction.** Population 10 and Subpopulations 3d and 6c occur in gravel reserves and may be threatened by a resumption of gravel extraction. See action 2.
- **Weed invasion** has been noted as a minor threat to Population 12 and Subpopulations 7a and b.

- **Lack of suitable disturbance regime.** *Grevillea involucrata* germinates following disturbance and reaches senescence after about 10 years. There is currently a lack of suitable disturbance and many populations are declining.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Current Condition	Threats
1a S of Newdegate	Road Reserve	1985 15-20* 1993 5 1997 1 2004 0	Presumed Extinct	Road maintenance
1b S of Newdegate	Private Property	1985 15-20* 2000 0*	Presumed Extinct	Road maintenance
2 S of Newdegate	Road Reserve	1985 20 1987 2 (4) 2004 0	Presumed Extinct	Road maintenance
3a S of Newdegate	Road Reserve	1985 12 [6] 1999 7 (1) [1] 2005 46 [6] 2005 0	Dormant	Road realignment
3b S of Newdegate	Private Property	1985 1 1993 0	Presumed Extinct	
3c S of Newdegate	Road Reserve	1992 3 2004 7	Healthy	Road maintenance, gravel extraction
3d S of Newdegate	Gravel Reserve	1999 3 [1] 2004 3	Healthy	Gravel extraction
4 S of Newdegate	Road Reserve	1987 11 1997 2 (1) 2000 21 (3) [1] 2004 18 2008 9	Healthy	Road maintenance
5 S of Newdegate	Road Reserve	1985 1 2004 0 2008 1	Extinct	Road and Firebreak maintenance
6a S of Newdegate	Road Reserve	1985 3 1999 3 2008 0	Healthy	Road maintenance
6b S of Newdegate	Road Reserve	1985 5 [4] 2004 11 [1] 2008 0	Healthy	Road maintenance
6c S of Newdegate	Road Reserve	2000 11 2005 3 2008 11	Healthy	Road maintenance
7 S of Newdegate	Private Property	1987 20 (15) 1999 9 (2) [7] 2008 11	Moderate	Minor weed invasion
8 S of Newdegate	Road Reserve	1993 27 1996 2 2004 13 2008 12	Healthy	Road maintenance
9 S of Newdegate	Private Property	1988 6 2008 6	Healthy	Unknown
10 S of Newdegate	Road Reserve	1996 1 1999 5 [2] 2004 4 [2] 2008 5	Moderate	Road and Firebreak maintenance, gravel extraction
11a S of Newdegate	Private Property	1989 64 2004 2 2005 0 2008 14	Dormant	Firebreak maintenance
11b S of Newdegate	Nature Reserve	1989 64 2004 2 [2] 2005 1 2008 12	Poor	Firebreak maintenance
12 S of Newdegate	Nature Reserve	1990 14 2004 1	Dormant	Firebreak maintenance, Farming - soil erosion

Pop. No. & Location	Land Status	Year/No. plants	Current Condition	Threats
		2005 0 2008 1		
13 S of Newdegate	Road Reserve	1993 5 1992 1 2004 1 2008 1	Healthy	Road maintenance
14 S of Hyden	Nature Reserve	1991 3 2004 0 2008 1	Presumed Extinct	Road maintenance
15a S of Hyden	Nature Reserve	1991 1 1999 18 2004 0 2008 18	Dormant	Unknown
15b S of Hyden	Road Reserve	1991 3 1999 18 2004 10 2008 0	Moderate	Road maintenance
16 S of Hyden	Nature Reserve	1991 7 (2) 1993 100 (20) 2004 0 2008 33	Dormant	Road maintenance, Firebreak maintenance, minor weed invasion
17 S of Newdegate	Road Reserve	1985 1 2004 0 2008 0	Presumed Extinct	Road maintenance
18 S of Newdegate	Road Reserve	1985 0 2005 0 2008 0	Presumed Extinct	Resumption of gravel extraction
19 S of Newdegate	Road Reserve	1984 several 1994 0 2008 0	Extinct	Unknown
20 S of Newdegate	Road Reserve	1992 2 1999 3 2004 0 2008 3	Presumed Extinct	Road maintenance
21 S of Newdegate	Road Reserve	1992 1 2000 0 2004 0 2008 1	Presumed Extinct	Road maintenance
22 S of Hyden	Nature Reserve	1997 1 1999 6 2004 0 2008 0	Dormant	Firebreak maintenance
23 S of Hyden	Road Reserve	1992 5 1999 5 2004 8 2008 5	Moderate	Road maintenance

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

Guide for decision-makers

The above table provides details of current and possible future threats. Proposed actions in the immediate vicinity of populations or within the defined habitat critical to the survival of *Grevillea involucrata* require assessment for the potential for a significant level of impact.

Habitat critical to the survival of *Grevillea involucrata*, and important populations

Grevillea involucrata is ranked EN, and is known from 22 populations, a number of which are presumed to be extinct or not viable. It is considered that all known habitat of viable populations of the species is habitat critical to its survival, and that all extant, or presumed extant, wild populations are important populations. Habitat critical to the survival of *G. involucrata* includes the area of occupancy of known extant populations, areas of similar habitat (i.e. gravelly sands or concretionary gravels in mallee-heathland) surrounding important

populations (this is necessary to provide habitat for pollinators and possible future population expansion) and additional occurrences of similar habitat that may contain the species or be suitable for future translocations.

Benefits to other species or ecological communities

Recovery actions implemented to improve the quality or security of the habitat of *Grevillea involucrata* will also improve the status of remnant native vegetation in which it is located. One threatened and two priority flora species are located with *G. involucrata* (see table below).

Conservation-listed flora species occurring in habitat of *Grevillea involucrata*

Species name	Conservation Status (WA)	Conservation Status (EPBC Act)
<i>Calectasia pignattiana</i>	DRF, Vulnerable	Vulnerable
<i>Synaphea canaliculata</i>	Priority 2	Not listed
<i>Grevillea prostrata</i>	Priority 4	Not listed

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

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 involucrata* is not listed under any specific international treaty however and therefore this Interim Recovery Plan (IRP) does not affect Australia's obligations under any other international agreements.

Indigenous consultation

According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register, no sites of Aboriginal significance are known at or near populations of the species covered by this IRP. 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 species, opportunities may exist through cultural interpretation and awareness of the species.

The advice of the South West Aboriginal Land and Sea Council (SWALSC) and Department of Indigenous Affairs is being sought to assist in the identification of potential indigenous management responsibilities for land occupied by threatened species, or groups with a cultural connection to land that is important for the species' conservation.

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

Social and economic impact

The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts. However, as some populations occur on, or adjacent to, private land their protection has the potential to affect farming activities. Minor adjustments to management practices may be required to ensure the protection of populations on lands not managed primarily for conservation. Recovery actions refer to continued liaison between stakeholders in regards to these areas.

Affected interests

Stakeholders potentially affected by the implementation of this plan include Western Power, the Shires of Lake Grace, Kulin and Kent and owners of private property.

Evaluation of the plan's performance

DEC in conjunction with the Great Southern District Threatened Flora Recovery Team (GSDFRT) 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.

2. RECOVERY OBJECTIVE AND CRITERIA

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 species in the wild.

Criteria for success: The number of populations have increased and/or the number of mature individuals in populations have increased by ten percent or more over the five year term of the plan.

Criteria for failure: The number of populations have decreased and/or the number of mature individuals in populations have decreased by ten percent or more over the five year term of the plan.

3. RECOVERY ACTIONS

Completed recovery actions

Land managers including private land owners, Western Power and the Shires of Lake Grace, Kulin and Kent have been made aware of the threatened nature of this species, its location and their legal obligations to protect it.

Declared Rare Flora (DRF) markers have been installed at Populations 2, 4, 5, 8, 10, 12-14, 16, 17, 20 and 23 and Subpopulations 1a, 3a, 3c, 6a-c, 11b and 15b.

Fencing of Populations 7 and 9 and Subpopulation 11a on Private Property has been undertaken.

The gravel pit in which part of Population 18 is located has been rehabilitated.

Botanic Gardens and Parks Authority (BGPA) have two grafted *Grevillea involucreta* growing in their gardens.

Ongoing and future recovery actions

The Great Southern District Threatened Flora Recovery Team (GSDFRT) is overseeing the implementation of this IRP and will include information on progress in its annual report to DEC's Corporate Executive and funding bodies.

Staff from DEC's Great Southern District office will continue monitoring all populations.

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

1. Coordinate recovery actions

The Great Southern District Threatened Flora Recovery Team is coordinating the implementation of recovery actions for *Grevillea involucreta* and will include information on progress in its annual report to DEC's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: GSDFRT

Cost: \$1,400 per year

2. Liaise with relevant land managers

Staff from DEC's Great Southern District will liaise with appropriate land owners to ensure that populations are not accidentally 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 involucrata*.

Action: Liaise with relevant land managers
Responsibility: DEC (Great Southern district), through the GSDFRT
Cost: \$4,800 per year

3. Monitor populations

Monitoring of factors such as weed invasion, habitat degradation, population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity is essential.

Action: Monitor populations
Responsibility: DEC (Great Southern District) through the GSDFRT
Cost: \$4,100 per year

4. Install DRF markers

DRF markers are required at Population 21. Population 2 needs new markers installed. Subpopulations 3a and 15b need DRF markers to be repositioned.

Action: Install DRF markers
Responsibility: DEC (Great Southern District) through the GSDFRT
Cost: \$500 in the first year

5. Develop and implement disturbance trials

DEC's Great Southern District will, in consultation with private landowners and the Shires of Lake Grace, Kulin and Kent develop and implement disturbance trials to stimulate germination of *Grevillea involucrata* soil-stored seed. Care will be taken to avoid stimulating competition with existing *G. involucrata* plants. The results of trials will be monitored and, if successful, a larger scale operation undertaken.

Action: Develop and implement disturbance trials
Responsibility: DEC (Science Division, Great Southern District) through the GSDFRT and relevant authorities.
Cost: \$7,000 per year for the first two years; \$1,400 in years 3-5.

6. Develop and implement a fire management strategy

Grevillea involucrata is a known disturbance opportunist. It is therefore important that a fire regime with appropriate fire intensity, frequency and season be developed.

Action: Develop and implement a fire management strategy
Responsibility: DEC (Great Southern District) through the GSDFRT and relevant authorities.
Cost: \$6,000 in the first year.

7. Conduct further surveys

Most populations of *Grevillea involucrata* were surveyed by DEC District staff in 2004 however Population 9 was last surveyed in 1988 due to being on private property, Subpopulations 7a and b which were last surveyed

in 1999 and Subpopulation 1b was last surveyed in 2000. Surveys will be done during the species' flowering period between October and November.

It is suggested that surveys should include appropriate habitat on private land if possible. Volunteers from the local community, wildflower societies and naturalists clubs could be involved in surveys supervised by DEC staff.

Action: Conduct further surveys
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: \$4,000 in years 1, 3 and 5.

8. Promote awareness

The importance of biodiversity conservation and the protection of *Grevillea involucreta* 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 information sheet that provides a description of the species and information about threats and recovery actions, needs to be developed for *G. involucreta* 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.

Action: Promote awareness
Responsibility: DEC (Great Southern District, Species and Communities Branch (SCB) and Strategic Development and Corporate Affairs Division) through the GSDTFRT.
Cost: \$1,600 in the first year, \$1,000 in years 3 and 5.

9. Collect seed

Currently, no seed has been collected by the Botanic Gardens and Parks Authority (BGPA) or DEC's Threatened Flora Seed Centre (TFSC). Seed collections should therefore be made. The "Germplasm Conservation Guidelines for Australia" produced by the Australian Network for Plant Conservation (ANPC) should be used to guide this process.

Actions: Collect seed
Responsibility: DEC (Great Southern District, TFSC), and BGPA through the KDTFRT and NDTFRT
Cost: \$2,600 in years 1, 3 and 5.

10. Map habitat critical to the survival of *Grevillea involucreta*

Although habitat critical to survival is described in Section 1, areas described have not yet been mapped, and this will be redressed under this action.

Action: Map habitat critical to the survival of *Grevillea involucreta*
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: \$3,000 in the first year

11. Undertake weed control

As weeds are a minor threat to several populations the following actions will be implemented:

1. Select appropriate herbicides after determining which weeds are present.
2. Control invasive weeds by hand removal or spot spraying when weeds first emerge.
3. Schedule weed control to include spraying in the areas of other threatened flora populations.

The tolerance of associated native plant species to herbicides at the sites of *Grevillea involucreta* are not known and weed control programs will be undertaken in conjunction with research.

Action: Undertake weed control
Responsibility: DEC (Great Southern District, Science Division) through the GSDTFRT
Cost: \$8,200 per year

12. Obtain biological and ecological information

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

1. Research appropriate disturbance regimes to maximise recruitment and population health.
2. Research the necessity of weed control to accompany a disturbance regime.
3. Research herbicides that can be used around *G. involucrata* without affecting this species adversely.

Action: Obtain biological and ecological information
Responsibility: DEC (Science Division, Great Southern District) through the GSDTFRT
Cost: \$13,000 in years 2, 3 and 4.

13. Review the plan and assess the need for further recovery actions

At the end of its five-year term this IRP will be reviewed and the need for further recovery actions assessed.

Action: Review the plan and assess the need for further recovery actions
Responsibility: DEC (Great Southern District) through the GSDTFRT
Cost: \$1,500 in the fourth year.

Summary of recovery actions

Recovery Actions	Priority	Responsibility	Completion date
Coordinate recovery actions	High	GSDTFRT	Ongoing
Liaise with relevant land managers	High	DEC (Great Southern District), through the GSDTFRT	Ongoing
Monitor populations	High	DEC (Great Southern District) through the GSDTFRT	Ongoing
Install DRF markers	High	DEC (Great Southern District) through the GSDTFRT	2009
Develop and implement disturbance trials	High	DEC (Science Division, Great Southern District) through the GSDTFRT, and relevant authorities	Ongoing
Develop and implement a fire management strategy	High	DEC (Great Southern District) through the GSDTFRT, and relevant authorities	Develop by 2007 with implementation ongoing
Conduct further surveys	High	DEC (Great Southern District) through the GSDTFRT	2013
Promote awareness	High	DEC (Great Southern District, SCB and Strategic Development and Corporate Affairs Division) through the GSDTFRT.	2013
Collect seed	Moderate	DEC (Great Southern District, TFSC), and BGPA through the GSDTFRT	2013
Map habitat critical to the survival of <i>Grevillea involucrata</i>	Moderate	DEC (Great Southern District) through the GSDTFRT	2009
Undertake weed control	Moderate	DEC (Great Southern District, Science Division) through the GSDTFRT	Ongoing
Obtain biological and ecological information	Moderate	DEC (Science Division, Great Southern District) through the GSDTFRT	2012
Review the plan and assess the need for further recovery actions	Moderate	DEC (Great Southern District) through the GSDTFRT	2013

4. TERM OF PLAN

Western Australia

This IRP will operate from April 2008 to March 2013 but will remain in force until withdrawn or replaced. If the species is still ranked EN after five years, the need for further recovery actions and an update of this IRP will be assessed.

Commonwealth

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

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

5. REFERENCES

- Atkins, K. (2008) *Declared Rare and Priority Flora List for Western Australia*. Department of Environment and Conservation, Western Australia.
- Australian Network for Plant Conservation. (1997). *Germplasm Conservation Guidelines for Australia, An introduction to the principles and practices for seed and germplasm banking of Australian Species*. Canberra, Australian Network for Plant Conservation Germplasm Working Group.
- Brown, A., Thomson-Dans, C. and Marchant N. (1998). *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia. pp 97.
- Department of Conservation and Land Management (1994) Policy Statement No. 50 *Setting Priorities for the Conservation of Western Australia's Threatened Flora and Fauna*. Department of Conservation and Land Management, Western Australia.
- Department of Conservation and Land Management (1992) Policy Statement No. 44 *Wildlife Management Programs*. Department of Conservation and Land Management, Western Australia.
- Department of Environment and Conservation (2007) *Threatened Flora Database (DEFL)*. Species and Communities Branch, Department of Environment and Conservation, Western Australia. Accessed 2007.
- Department of Environment and Conservation (2007) *Western Australian Herbarium FloraBase 2 – Information on the Western Australian Flora*. Department of Environment and Conservation, Western Australia. Accessed 2007. <http://www.calm.wa.gov.au/science/>.
- George, A.S. (1974). Seven new species of *Grevillea* (Proteaceae) from Western Australia. *Nuytsia*. **1(4)**: 372.
- IUCN (1994). *IUCN Red List Categories: Version 2.3*. Prepared by the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.
- Makinson, R.O. (2000). *Proteaceae 2, Grevillea. Flora of Australia Volume 17A*. Melbourne: ABRS/CSIRO Australia. pp 348-9.
- Olde, P. and Marriott, N. (1995). *The Grevillea Book*. **2**: 215-16.

6. TAXONOMIC DESCRIPTION

Excerpt from: Makinson, R.O. (2000). *Proteaceae 2, Grevillea. Flora of Australia Volume 17A*. Melbourne: ABRS/CSIRO Australia. pp 348-9.

Open prostrate to decumbent shrub 0.15-0.5m tall, to 2m across. Leaves 1.5-4cm long, 6-10mm wide, second, pinnatipartite (almost pinnatisect) with 5-15 short mutually aligned oblong to linear lobes 1-8mm long, 0.8-1.2mm wide, not pungent; margins revolute: lower surface enclosed except for midveins, bisulcate, sometimes with a few scattered appressed hairs. Conflorescence erect, terminal or axillary, simple, 1-3 flowered, rachis 0.5-1mm long. Flowers erect. Flower colour: perianth pale pearly pink to dark pink; style deep pinkish red. Perianth glabrous outside, pilose to villous inside. Pistil 23-25mm long; ovary villous; style loosely villous, becoming sparsely so towards apex. Follicle obloid to ellipsoidal and apiculate, 13-15mm long, loosely villous.

