INTERIM RECOVERY PLAN NO 42

SPLIT-LEAVED GREVILLEA (*GREVILLEA ALTHOFERORUM*)

INTERIM RECOVERY PLAN

1999-2002

by
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Photograph: Leonie Monks

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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.

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.

CALM is committed to ensuring that Critically Endangered taxa are conserved through the preparation and implementation of Recovery Plans or Interim Recovery Plans and by ensuring that conservation action commences as soon as possible and always within one year of endorsement of that rank by the Minister.

This Interim Recovery Plan will operate from July 1999 to June 2002 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Critically Endangered, this IRP will be replaced by a full Recovery Plan after three years.

This IRP was approved by the Director of Nature Conservation on 10 October 1999. The provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting CALM, as well as the need to address other priorities.

Information in this IRP was accurate at July 1999.

SUMMARY

Scientific Name: ***Grevillea althoferorum***
Common Name: Split-leaved grevillea
Family: Proteaceae
Flowering Period: August - October
CALM Regions: Midwest, Swan
CALM Districts: Moora, Mundaring
Shires: Coorow, Swan
Recovery Teams: Threatened Flora Recovery Teams are established in CALM's Moora District and Swan Region.

Illustrations and/or further information: 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; Brown, A., Thomson-Dans, C. and Marchant, N. (Eds) (1998). *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia;

Current status: *Grevillea althoferorum* was declared as Rare Flora in September 1986 and ranked as Critically Endangered (CR) in November 1998. It currently meets World Conservation Union (IUCN) Red List category 'CR' under criterion C2a (IUCN 1994) as there are less than 250 individuals known from two highly fragmented populations with continued decline in the quality of the habitat. The known populations are small and susceptible to threats including weed invasion, disease, disturbance due to agricultural activities and road maintenance, and inappropriate fire regimes

Habitat requirements: *Grevillea althoferorum* is known from two populations that are 200 km apart and grows on lateritic sandy clay or yellow colluvial sand.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented:
1. Relevant land managers have been notified of the presence of the populations.
2. DRF markers have been installed at the populations.
3. Some seed has been collected from Population 2 by the Threatened Flora Seed Centre (TFSC).
4. Cutting material collected by the TFSC has been propagated by Kings Park and Botanic Garden (KPBG).
5. CALM staff regularly monitor the populations.
6. The Moora District and the Swan Region Threatened Flora Recovery Teams (MDTFRT and SRTFRT respectively) are overseeing the implementation of this IRP.

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

Recovery criteria
Criterion for success: The number of individuals within populations and/or the number of populations have increased.
Criterion for failure: The number of individuals within populations and/or the number of populations have decreased.

Recovery actions

1. Coordinate recovery actions.
2. Undertake weed control.
3. Monitor dieback and assess the need for disease treatment, implement disease hygiene.
4. Collect seed and cutting material.
5. Liaise with relevant stakeholders.
6. Monitor populations.
7. Implement rabbit control.
8. Develop and implement a fire management strategy.
9. Conduct further surveys.
10. Start translocation process.

11. Propagate plants for translocation.
12. Obtain biological and ecological information.
13. Promote awareness.
14. Write a full Recovery Plan.

1. BACKGROUND

History

Grevillea althoferorum was first collected south of Eneabba in 1978 by E.A. Griffin. This population was destroyed during mining operations and subsequent surveys by Griffin failed to locate additional populations. In 1991, P. Olde discovered one of the two current known populations (Population 1) of about 100 plants, 5 km east of the Griffin collections. CALM staff and consultants carried out subsequent surveys of the area during 1991-1994, but no additional populations were located. A second population of 30 plants, 200 km south of the Olde population was located during a floristic survey of the southern Swan Coastal Plain (Gibson *et al.* 1994). To date there have been eleven collections from the three populations described above, all of which are lodged at the WA Herbarium.

Description

Grevillea althoferorum is a lignotuberous shrub with trailing stems up to 3 m long, and angular branchlets covered with very fine, long, soft hairs. Its leaves are 1.5 to 2 cm long, ascending to spreading, shortly petiolate and twice divided, lobes broadly triangular with recurved pungent points. The terminal florescence is 2 to 6 cm long and erect or decurved. The cream flowers (floral whorl and style) are regular (not one-sided), and the buds are covered in pinkish-brown hairs. The grooved, oblong fruit is 12 to 15 mm long and 3 to 4 mm wide.

It is closely related to rough grevillea (*Grevillea rudis*) but differs in that the leaves are more deeply divided to the midrib, and it has a shorter (generally not exceeding the leaves), denser inflorescence.

Distribution and habitat

Grevillea althoferorum is currently restricted to two known populations 200 km apart, one south of Eneabba and the other near Bullsbrook.

Population 1 is found on the crest of a low rise on pale brown loamy sand or grey sand supporting low heath. *Grevillea althoferorum* forms a part of the mid-dense shrub layer with *Grevillea integrifolia, G. shuttleworthiana, Verticorida grandis, Viminaria juncea, Hakea prostrata* and numerous other shrub species. The population occurs on a 12 m wide road verge and is threatened by weed invasion, road maintenance and agricultural activities, grazing, general ground disturbance by rabbits and foxes, and inappropriate fire regimes.

Population 2 occurs at the base of the Darling Scarp in greyish yellow sand in *Banksia* low woodland. It forms part of the shrub layer in a *Banksia menziesii* and *B. attenuata* woodland with *Hibbertia hypericoides*, *Xanthorrhoea preissii*, *Conostephium pendulum*, other shrubs, and herb species. The population is in a conservation reserve adjacent to agricultural land. The reserve is known to contain dieback disease caused by the plant pathogen *Phytophthora* spp. and the *Grevillea althoferorum* population is also at risk from firebreak maintenance, inappropriate fire regimes and possibly herbicide or fertiliser drift associated with agricultural activity on adjacent land.

Any future searches for the species, and for possible translocation sites should be focussed in both habitats described above, as both appear suitable for the species.

Biology and ecology

While the biology of many *Grevillea* species is well researched, the biology of *Grevillea althoferorum* is poorly known. *G. althoferorum* is known to resprout from a lignotuber after fire, and is also suspected to be susceptible to dieback disease.

Threats

Grevillea althoferorum is currently ranked Critically Endangered under IUCN Red List criterion C2a (IUCN 1994) as there are less than 250 adult plants known from two highly fragmented populations, with continued decline in the quality of the habitat largely due to disease and weeds.

- **Weed invasion** is a threat to Population 1, in particular. Weeds suppress early plant growth by competing for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of the large quantities of fuel that are produced annually by many grass weed species.

- **Disease** could be a serious threat to Population 2. Dieback, in this case believed to be caused by the plant pathogen *Phytophthora megasperma*, occurs in the immediately vicinity of Population 2. This plant pathogen causes the roots to rot and results in death from drought stress. It is suspected that *G. althoferorum* is susceptible to this pathogen. While some Grevilleas are not susceptible to *Phytophthora* spp., the Banksia woodland habitat that occurs at this site is characteristically highly susceptible. Changes in the structure of the habitat caused by dieback, for example opening up of the canopy, may then impact the *G. althoferorum* population. As this is only one of two known *in situ* populations, preventing the spread, or amplification of the impacts of the disease in the populations is very important.

- **Road, track and firebreak maintenance activities** have threatened both populations in the past. Construction of drainage channels, grading and other road maintenance activities impact on road verge populations of *G. althoferorum*. Relevant authorities have been informed of the road reserve population and have been advised of the need for appropriate protective measures.

- **Grazing** by rabbits (*Oryctolagus cuniculus*) and/or kangaroos (*Macropus* spp.) has had a major impact on Population 1. In addition, disturbance of soil by rabbit warren and fox midden construction, increased nutrient levels from their droppings and the introduction of weeds are impacting the habitat of the species. Grazing may have an impact on the establishment of *G. althoferorum* seedlings, thereby limiting natural recruitment.

- **Inappropriate fire regimes** would affect the viability of populations, as seeds of *Grevillea althoferorum* probably germinate following fire. If this is the case, the soil seed bank would rapidly be depleted if fires recurred before regenerating or juvenile plants reached maturity and replenished the soil seed bank. However, it is likely that occasional fires are needed for reproduction of this species.

- **Chemical drift** from herbicide and fertiliser application on adjacent farmland may affect the species' growth and survival, particularly at Population 1. The owners of land adjacent to Population 1 have also been informed of the species' presence, to prevent possible grazing, fire damage and agricultural chemical drift.

Summary of population information and threats

Pop. No.	Location	CALM District	Land Status	Year and No. Plants	Condition	Major Threats
1	South of Eneabba	Moora	Shire road reserve	1999: 100+	Healthy	Weeds, road maintenance activities, warren and midden construction, grazing
2	Bullsbrook	Mundaring	Nature Reserve	1997: 30	Good	Disease, firebreak maintenance

2. RECOVERY OBJECTIVES AND CRITERIA

Objectives

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

Criterion for success: The number of individuals within populations and/or the number of populations have increased.
Criterion for failure: The number of individuals within populations and/or the number of populations have decreased.

3. RECOVERY ACTIONS

Existing recovery actions

Appropriate land managers have been made aware of the locations of populations of this species.

DRF markers have been installed at the populations.

CALM's Threatened Flora Seed Centre collected and stored 66 seeds from population 2 in November 1997. An initial germination rate of 50% was recorded for this seed.

Two plants raised from seed and two from cuttings propagated from material collected by the TFSC are held in Kings Park and Botanic Garden nursery.

The Moora District and the Swan Region Threatened Flora Recovery Teams are overseeing the implementation of this IRP and will include information on progress in reports to CALM's Corporate Executive and funding bodies.

Staff from CALM's Moora and Mundaring Districts regularly monitor the populations.

Future recovery actions

Where populations occur on lands other than those managed by CALM, permission has been or will be sought from the appropriate land managers prior to recovery actions being undertaken.

1. Coordinate recovery actions

The Moora District and Swan Region Threatened Flora Recovery Teams (MDTFRT and SRTFRT respectively) will continue to oversee the implementation of recovery actions for *Grevillea althoferorum*.

Action: Coordinate recovery actions
Responsibility: CALM (Mundaring and Moora Districts) through the Recovery Teams
Cost: $5,900 per year.

2. Undertake weed control

CALM will implement a weed control program, particularly at Population 1 that will involve:

Selection of an appropriate herbicide after determining which weeds are present.
Controlling invasive weeds by hand removal or spot spraying around *Grevillea althoferorum* plants when weeds first emerge.
Scheduling weed control to include spraying at other threatened flora populations within the district.

The tolerance of associated native plant species to herbicide at the site of *Grevillea althoferorum* is not known and it is recommended that weed control programs are undertaken in conjunction with research (see Action 12).

Action: Undertake weed control
Responsibility: CALM (Moora and Mundaring District, CALMScience) through the MDTFRT and SRTFRT
Cost: $700 per year.

3. Monitor dieback and assess the need for disease treatment, implement disease hygiene

G. althoferorum is likely to be affected by dieback disease. The disease is known to occur very close to Population 2, and the dieback front near this population will be mapped and monitored at least every five years in summer and flagging marking the front replaced regularly. The species of the plant pathogen that occurs near Population 2 will also be determined. Dieback hygiene measures as outlined in the Dieback Hygiene Manual (CALM 1992b) will be adhered to in the reserve that contains Population 2. Hygiene measures will primarily involve restricting access to the area, especially when the soil is wet. Signs advising of the dieback risk will be posted at this site. The need for dieback treatment of the site will also be assessed through evaluation of the impact of the disease on the habitat and, specifically, on *Grevillea althoferorum*.

Action: Monitor dieback and assess the need for disease treatment, implement disease hygiene
Responsibility: CALM (Mundaring District) through the SRTFRT
Cost: $1,200 in the first year, $500 in the second and third years.

4. Collect seed and cutting material

A small quantity of seed has been collected from Population 2. Additional seed will be collected as required. Cuttings will also be collected to establish a living collection of genetic material at KPBG.

Action: Collect seed and cutting material
Responsibility: CALM (CALMScience, Moora and Mundaring Districts) and KPBG, through the Recovery Teams
Cost: $2,600 per year.

5. Liaise with relevant stakeholders

CALM staff will continue to liaise with staff of the Shire of Coorow for Population 1, and other relevant managers of land adjacent to both populations on the management of the species.

Action: Liaise with relevant stakeholders
Responsibility: CALM (Moora and Mundaring Districts) through the Recovery Teams
Cost: $800 per year.

6. Monitor populations

Monitoring of factors such as weed invasion, habitat degradation, population stability (expansion or decline), pollination activity, seed production, recruitment, and longevity is essential. The populations will be inspected annually. In particular, the urgency of the requirement for translocation will be determined by monitoring the natural rate of recruitment.

Action: Monitor population
Responsibility: CALM (Moora and Mundaring Districts) through the Recovery Teams
Cost: $700 per year.

7. Implement rabbit control

Rabbits have caused major disturbance in Population 1. Rabbit control measures will be undertaken at Population 1. Baiting for rabbits using 1080 is likely to be the best option. Baiting is generally conducted in summer and repeated each year if rabbits reappear.

Action: Implement rabbit control
Responsibility: CALM (Moora District) through the MDTFRT
Cost: $600 per year for baiting using 1080.

8. Develop and implement a fire management strategy

It is likely that the species requires occasional fire for recruitment from soil-stored seed, but frequent fire may deplete the soil seed bank. A fire management strategy will be developed that will describe fire regimes and control measures.

Action: Develop and implement a fire management strategy
Responsibility: CALM (Moora and Mundaring Districts) through the Recovery Teams
Cost: $1,500 in the first year, $1,000 in subsequent years.

9. Conduct further surveys

Further surveys will be conducted during the species' flowering period (August to early November). Members of community groups such as local Naturalists Clubs and Wildflower Societies will be encouraged to be involved in surveys supervised by CALM staff. Likely habitat on land adjacent to Population 2, in particular, in areas between this population and the Darling Scarp will be searched if possible.

Action: Conduct further surveys
Responsibility: CALM (Moora and Mundaring Districts) through the Recovery Teams
Cost: $1,800 per year.

10. Start translocation process

Translocation is likely to be essential for the conservation of this species, as the total number of extant plants is low, and the only known populations are not secure from threats including disease and weeds. Although translocations are generally undertaken under full Recovery Plans, it is possible to develop a Translocation Proposal and start propagating plants within the time frame of an Interim Recovery Plan. Information on the translocation of threatened animals and plants in the wild is provided in CALM Policy Statement No. 29 *Translocation of Threatened Flora and Fauna.* All Translocation Proposals require endorsement by the Director of Nature Conservation.

Areas of habitat suitable for translocation sites will be investigated in the first two years of implementation of this plan. Additional plants will not be translocated into the existing populations of *Grevillea althoferorum* for two years, to allow the continuation of natural recruitment. The need for enhancement of the population that occurs in a secure conservation reserve, or translocation of the species into other suitable habitat will then be considered.

Action: Start translocation process
Responsibility: CALM (CALMScience, Moora and Mundaring Districts) through the Recovery Teams
Cost: $3,000 in the third year.

11. Propagate plants for translocation

Plants will be propagated in the third year of implementation of this plan if monitoring indicates that translocation is required (collection of seed and cutting material is included in Recovery Action 4).

Action: Propagate plants for translocation
Responsibility: CALM (Moora and Mundaring Districts), and KPBG through the Recovery Teams
Cost: $2,000 in the third year.

12. Obtain biological and ecological information

Research designed to increase understanding of the biology of *Grevillea althoferorum* will provide a scientific basis for management of the species in the wild. Research will ideally include:

1. Investigation of the impacts of dieback disease and control techniques on *Grevillea althoferorum* and its habitat.
2. Study of the soil seed bank dynamics and the role of various factors (including disturbance, competition, rainfall, grazing) in recruitment and seedling survival.
3. Determination of reproductive strategies, phenology and seasonal growth.
4. Investigation of the mating system and pollination biology.
5. Investigation of population genetic structure, levels of genetic diversity and minimum viable population size.

Action: Obtain biological and ecological information
Responsibility: CALM (CALMScience, Moora and Mundaring Districts) through the Recovery Teams
Cost: $16,100 per year.

13. Promote awareness

The importance of biodiversity conservation and the protection of the Critically Endangered *Grevillea althoferorum* will be promoted to the public. An information sheet, that includes a description of the plant, its habitat type, threats and management actions, and photos will be produced. Formal links with local naturalist groups and interested individuals will also be encouraged.

Action: Promote awareness
Responsibility: CALM (Moora and Mundaring Districts) through the Recovery Teams
Cost: $500 in the second year.

14. Write a full Recovery Plan

At the end of the three-year term of this Interim Recovery Plan, the need for further recovery will be assessed. If the species is still ranked Critically Endangered a full Recovery Plan will be prepared.

Action: Write a full Recovery Plan
Responsibility: CALM (Moora and Mundaring Districts) through the Recovery Teams
Cost: $18,800 in the final year.

4. TERM OF PLAN

This Interim Recovery Plan will operate from July 1999 to June 2002 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Critically Endangered, this IRP will be replaced by a full Recovery Plan after three years.

5. ACKNOWLEDGMENTS

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

John Carter	Senior Reserves Officer, CALM Mundaring District
Anne Cochrane	Manager, CALM Threatened Flora Seed Centre
Sophie Juszkiewicz	Propagator, Kings Park and Botanic Garden
David Mitchell	Program Leader Nature Conservation, CALM Swan Region
Diana Papenfus	Botanist, previously CALMScience

Thanks also to staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and CALM's Wildlife Branch for their extensive assistance.

6. REFERENCES

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7. TAXONOMIC DESCRIPTION

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

Compact, rounded **shrubs** 0.3-0.5 m high, 0.5-1 m wide; flexuose, ascending to spreading branches, dense to the ground. **Branchlets** round, scabrous to sparsely hirsute. **Leaves** 3-7.5 cm long, 1-5 cm wide, including petioles 1-5 cm long, bluish green, tangled, persistent after death, secund, ascending to erect, persistent, usually pinnatipartite; rarely (confined to foliage at the base of the plant) simple, pinnatifid, obovate-cuneate with 3-4 apical teeth, sometimes with secondary lobing of apical lobe, sometimes leaves subtending the peduncles simple and entire, 1.8-2.4 cm long, 0.1-0.2 cm wide, linear, often fasciculate near the base of the conflorescence, sessile, usually curved, pungent; primary leaf lobes 3-7 per leaf, 2-2.5 cm long, 1-3 cm wide, obovate-cuneate, distant, cuspidate, apically 3(4)-fid, the ultimate secondary lobe broadly triangular, pungent; the apical lobe often linear, occasionally the secondary lobes bifid; upper and lower surfaces similar, scabrous to sparsely hirsute; concolorous; venation prominent, more conspicuous on undersurface; mixed craspedodromous with prominent reticulum, margin flat, coincident with a conspicuous, rounded, scabrous vein; texture firmly chartaceous to coriaceous. **Conflorescence** terminal, usually simple, rarely 1-3 branched, erect, sessile, scarcely or not exceeding the foliage; unit conflorescence 2-5 cm long, 1.5 cm wide, cylindrical, loose, development acropetal; floral rachis 1.5 mm wide at the base, arising from a leaf-opposed rosette of bracts, villous; floral bracts 6-7 mm long, 1.5 mm wide, narrowly triangular with apex acuminate, villous outside with mixed biramous and glandular trichomes, glabrous inside, caducous. **Flowers** pedicels 2-3 mm long, villous, patent; torus ±1 mm across, straight; nectary not evident; **perianth** 5-6 mm long, 1.5-1.8 mm wide, actinomorphic, reddish when young, ageing dull creamy-yellow, oblong below the limb, villous outside with a mixed indumentum of biramous and glandular trichomes; tepals cohering to anthesis, becoming free to base and strongly rolled down after anthesis, exposing an inner surface either densely papillose or bearing short papilloid trichomes; limb 1.5-2 mm long, 1.5-2 mm wide, erect, densely villous with spreading to erect straight trichomes; style creamy yellow, kinked or folded above ovary, glandular-pubescent on lower filiform portion, papillose on the upper third where continuously dilated to c. 4mm wide below the broadly expanded style-end; pollen presenter c. 0.8 mm long, 0.6-0.7 mm wide at its base, straight, conico-cylindrical with cupuliform apex. **Fruits** not seen.