

INTERIM RECOVERY PLAN NO. 102

FOOTE'S GREVILLEA
(*GREVILLEA CALLIANTHA*)
INTERIM RECOVERY PLAN
2001-2004

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Photograph: R. Carter

July 2001

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Western Australian Threatened Species and Communities Unit (WATSCU)
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FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (the Department's) 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.

The Department 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This Interim Recovery Plan will operate from July 2001 to June 2004 but will remain in force until withdrawn or replaced.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 Deputy Director, Biodiversity Conservation on 24 March 2002. The provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting the Department, as well as the need to address other priorities.

Information in this IRP was accurate at July 2001.

SUMMARY

Scientific Name:	<i>Grevillea calliantha</i>	Common Name:	Foote's Grevillea
Family:	Proteaceae	Flowering Period:	September – February; peaking Sept – Nov
Departmental Region:	Midwest	Departmental District:	Moora
Shire:	Dandaragan	Recovery Team:	Moora District Threatened Flora Recovery Team

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; Makinson, R.O. and Olde, P.M. (1991) A new species of *Grevillea* (Proteaceae: Grevilleoideae) from south-west Western Australia. *Telopea* 4(2), 351-355; Olde, P. and Marriott, N. (1995) *The Grevillea Book*. Vol. 2. Kangaroo Press, Kenthurst.

Current status: *Grevillea calliantha* was declared as Rare Flora in September 1989 and ranked as Critically Endangered (CR) in May 1997. It currently meets World Conservation Union (IUCN) Red List Category 'CR' under criteria B1ab(iii)+2ab(iii) and C1 (IUCN 2000) as it is known from only five small populations, and the quality of the habitat is continuing to decline. The main threats are road maintenance activities, poor regeneration, weed invasion, rabbits, inappropriate fire regimes, water erosion, chemical drift and disease.

Critical habitat: The critical habitat for *Grevillea calliantha* comprises the area of occupancy of the known populations; areas of similar habitat ie grey to yellow-brown sand over laterite or sandy clay, in low heath and dwarf scrub under open low woodland of *Eucalyptus todtiana* and *E. calophylla* (marri) within 200 metres of known populations; corridors of remnant vegetation that link populations; and additional occurrences of similar habitat that do not currently contain the species and represent likely translocation sites.

Habitat requirements: *Grevillea calliantha* is endemic to the Dandaragan area of Western Australia where it occurs over a range of about eight kilometres. The species grows in grey to yellow-brown sand over laterite or sandy clay, in low heath and dwarf scrub under open low woodland of *Eucalyptus todtiana* and marri (Brown *et al.* 1998).

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

1. All relevant land managers have been informed of the species' locations and the associated legal obligations.
2. Declared Rare Flora (DRF) markers have been installed at Populations 2, 5 and 6.
3. Dashboard stickers and posters that illustrate DRF markers and note their purpose, and a contact telephone number to use if such a marker is encountered have been produced and distributed.
4. Population 1 was fenced by staff of Department of Conservation and Land Management (the Department), in 1997. Cages have also been placed around emerging seedlings by staff of the Department to prevent grazing by kangaroos and rabbits.
5. In February 2000, *Grevillea calliantha* plants encroaching onto the road at Populations 2 and 5 were trimmed. These cuttings were provided to Botanic Garden and Parks Authority (BGPA) for future translocation.
6. Subpopulation 4b on private property was fenced in 1995 using funds from the Remnant Vegetation Protection Scheme.
7. Subpopulation 4a on private property was fenced in 1990 by the Department and the private property owner.
8. BGPA currently have 29 plants from seed and cuttings in the nursery and gardens.
9. *Grevillea calliantha* seed was collected from Population 2 in 1995 and stored in The Department's Threatened Flora Seed Centre at -18°C.
10. Research on the population dynamics of selected rare Grevillea species, including *G. calliantha*, was undertaken by the Department's Science Division and Murdoch University from 1993 to 1994.
11. A PhD project that includes investigation of population dynamics and life history of *Grevillea calliantha* has been completed.
12. An experimental translocation by the Department's Science Division was undertaken in 1998, 1999 and 2001.
13. An A4 sized poster that provides a description of the species and information about threats and recovery actions has been developed for *Grevillea calliantha*, and distributed.
14. The Moora District Threatened Flora Recovery Team is overseeing the implementation of this IRP.
15. Staff from the Department's Moora District office regularly monitor the populations.

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

Recovery criteria

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

Criteria 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. Stimulate and monitor germination.
4. Propagate plants for translocation.
5. Continue translocation process.
6. Implement disease hygiene measures.
7. Undertake rabbit control.
8. Monitor populations.
9. Develop and implement a fire management strategy.
10. Develop and implement a drainage strategy.
11. Seek measures to achieve conservation management.
12. Collect seed and cutting material.
13. Conduct further surveys.
14. Notify and liaise with relevant land managers.
15. Promote awareness.
16. Write a full Recovery Plan.

1. BACKGROUND

History

Grevillea calliantha was first discovered in 1981 by Nick Foote, a commercial plant collector who provided material to Zanthorrea Nursery. The nursery introduced the species to the Grevillea Study Group, which in turn notified the Department in 1988. The type specimen was collected in 1989 from near Cataby, by B.J. Conn and is lodged in the New South Wales Herbarium.

Much of the site of the first collections has since been cleared and the species is currently known from five wild populations that contain a total of 159 mature individuals.

Description

Grevillea calliantha has spreading branches that are ridged and covered with felty hairs. The leaves are rigid, greyish-yellow, green, up to 7.5 cm long and have up to 7 stiff, linear lobes. The flower heads are mainly on the edges and lower sides of the branches. Each head has 15 to 30 pouched flowers, about 8 mm long, which are hairy and greenish-yellow outside, ageing to apricot orange. The maroon to blackish style is 30 to 40 mm long. Fruits are up to 18 mm long and 9 mm wide, and are densely hairy with a persistent style. *G. calliantha* is closely related to *G. hookeriana* but has longer pistils and decurved inflorescences (Brown *et al.* 1998; Olde and Marriott 1995).

Distribution and habitat

Grevillea calliantha is endemic to the Dandaragan area of Western Australia where it occurs over a range of about eight kilometres. The species grows in grey to yellow-brown sand over laterite or sandy clay, in low heath and dwarf scrub under open low woodland of *Eucalyptus todtiana* and *E. calophylla* (Brown *et al.* 1998). Associated species include *Banksia attenuata*, *Conostylis teretifolia*, *Hakea incrassata*, *Allocasuarina humilis*, *Anigozanthos humilis*, *Calothamnus quadrifidus*, *Xanthorrhoea* sp., *Hibbertia hypericoides*, *Hakea trifurcata*, *Acacia saligna*, *Gastrolobium spinosum*, *Adenanthos cygnorum*, *Thryptomene* sp., *Acacia pulchella*, *Hypocalymma angustifolium* and *Synaphea spinulosa*.

Critical habitat

Critical habitat is habitat identified as being critical to the survival of a listed threatened species or listed threatened ecological community. Habitat is defined as the biophysical medium or media occupied (continuously, periodically or occasionally) by an organism or group of organisms or once occupied (continuously, periodically or occasionally) by an organism, or group of organisms, and into which organisms of that kind have the potential to be reintroduced (Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999).

The critical habitat for *Grevillea calliantha* comprises:

- the area of occupancy of the known populations,
- areas of similar habitat ie. grey to yellow-brown sand over laterite or sandy clay, in low heath and dwarf scrub under open low woodland of *Eucalyptus todtiana* and *E. calophylla*, within 200 metres of known populations (these areas provide potential habitat for natural range extension),
- corridors of remnant vegetation that link populations (these areas are necessary to allow pollinators to move between populations and are usually road verges),
- additional occurrences of similar habitat ie. grey to yellow-brown sand over laterite or sandy clay, in low heath and dwarf scrub under open low woodland of *Eucalyptus todtiana* and *E. calophylla*, that represent likely translocation sites.

Biology and ecology

Research undertaken by Armstrong (2001) provides information about a number of aspects of the biology of *Grevillea calliantha*. The taxon produces large numbers of flowers in spring to summer (>70,000 per plant) but produces limited amounts of seed, usually 120 seeds per plant. The species has variable seed-set that is influenced by pollinator activity, and plants in more disturbed sites produce fewer seeds. Seed is dehisced from mid-October to at least February. Germination is typically stimulated by fire, or other disturbance such as smoke treatment. Moderate numbers of plants are produced, but few survive to maturity. *G. calliantha* appears to regenerate from seed after fire but has also been noted sprouting from lower stems. Plants regenerating from lignotubers after fire are able to set seed three years later. Armstrong (2001) also noted that what appear to be daughter plants appear from the roots of mature plants after fire. Plants that germinate from seed following fire do not flower for at least five years.

Grevillea calliantha is in cultivation throughout Australia, although it is more difficult to cultivate than many other grevilleas. Propagation is successful only from cuttings taken from vigorous plants (Olde and Marriott 1995).

Threats

Grevillea calliantha was declared as Rare Flora in September 1989 and ranked as Critically Endangered (CR) in May 1997. It currently meets World Conservation Union (IUCN) Red List Category 'CR' under criteria B1ab(iii)+2ab(iii) and C1 (IUCN 2000) as it is known from only five small populations, and the quality of the habitat is continuing to decline. The main threats are road maintenance activities, poor regeneration, weed invasion, rabbits, inappropriate fire regimes, water erosion, chemical drift and disease.

- **Road maintenance activities** threaten all road verge populations. Threats include actions such as grading of road reserves and access tracks, spraying of chemicals, constructing drainage channels and mowing or completely removing the roadside vegetation to improve visibility. These disturbance events also often encourage weed invasion into adjacent habitat, as well as causing damage to actual plants. A drainage channel through the site of Population 4 also carries contaminated water and nutrients directly to the plants.
- **Poor regeneration**, due to lack of appropriate disturbance, threatens most populations. Many *Grevillea calliantha* plants are old and reaching senescence.
- **Weed invasion** is a threat to all populations. 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.
- **Rabbits** (*Oryctolagus cuniculus*) and kangaroos (*Macropus fuliginosus*) have the potential to impact on Population 1. Besides grazing on mature plants, they may impact on the establishment of seedlings thereby limiting natural recruitment. In addition, disturbance of soil by rabbit warren construction, and an increase in nutrient levels from their droppings may occur, and result in increased weed invasion. In recent years, the impact of rabbits has declined due to rabbit baiting by many landholders, and the introduction of the calici virus.
- **Inappropriate fire** is likely to affect the viability of populations, as germination of seeds of *Grevillea calliantha* is stimulated by fire (Armstrong 2001). Therefore the soil seed bank would rapidly be depleted if fires recurred before regenerating or juvenile plants reached maturity and replenished the soil seed bank. Occasional disturbances such as fire are required for the species to propagate from soil stored seed, however (Armstrong 2001).
- **Water erosion** in drainage channels at Populations 5 and 6 is directly effecting *Grevillea calliantha* plants and their habitat. Water runoff from the road has caused sections of the road reserve to erode, resulting in up to 0.5 m of soil being lost. Some plants may have been washed away or have substantial root damage.
- **Chemical drift** from herbicide and fertiliser applications from adjacent farmland may affect the species' growth and survival.
- **Disease** is a potential threat to all *Grevillea calliantha* populations. Dieback disease caused by the plant pathogen *Phytophthora* spp. causes roots to rot and results in susceptible plants dying of drought stress. The species is presumed to be susceptible although it is not known whether dieback is actually present in the habitat of the populations.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1T. WSW of Dandaragan	Shire Water Reserve	1998 + (106) 1999 73 + (188) 2000 181 2001 140 + (114)	Healthy	
1. WSW of Dandaragan	Shire Water Reserve	1988 4 (4) 1991 2 1993 6 (16) 1994 1 (10) 1998 6 1999 7 (1) [1 dead] 2000 5 (2) [1 dead]	Healthy	Disease, inappropriate fire, grazing
2. WSW of Dandaragan	Shire Road Reserve	1988 14 1991 14 1993 17 1994 14 1995 17 [3 dead] 1996 5 1998 18 (1) [3 dead] 2000 34 (9) [2 dead]	Moderate	Road maintenance, grazing, weeds, inappropriate fire
4A. WSW of Dandaragan	Private Property	1988 5+ (36) 1990 14 1993 4 1994 2	Moderate	Weeds, inappropriate fire, chemical drift
4B. WSW of Dandaragan	Private Property	1993 100+ 1994 100+ 1998 100+	Healthy	Weeds, inappropriate fire, chemical drift
5. WSW of Dandaragan	Shire Road Reserve	1988 7 1991 4 1992 2 1995 5 1996 5 1998 3 2000 6	Disturbed	Road maintenance, water erosion, vehicle disturbance, weeds, grazing, inappropriate fire
6. WSW of Dandaragan	Shire Road Reserve	1990 14 1993 6 1994 5 1995 14 1996 14 [2 dead] 1998 6 (1) 2000 12 [1 dead]	Moderate/ Poor	Senescence, road maintenance, grazing, weeds, inappropriate fire, water erosion

Numbers in brackets = number of seedlings.

Note: Population 2 and 3 have been amalgamated into one (Population 2).

Guide for decision-makers

Section 1 provides details of current and possible future threats. Developments in the immediate vicinity of any of the populations or within the defined critical habitat of *Grevillea calliantha* require assessment. No developments should be approved unless the proponents can demonstrate that they will have no significant impact on the species, or on its habitat or potential habitat.

2. RECOVERY OBJECTIVE AND CRITERIA

Objectives

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

Criteria for success: The number of individuals within populations and/or the number of populations have

increased.

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

3. RECOVERY ACTIONS

Existing recovery actions

Private property owners and the Shire of Dandaragan have been formally notified of the presence of *Grevillea calliantha* populations on or adjacent to their land. This notification details the Declared Rare status of the taxon and the associated legal responsibilities. Relevant land managers have been informed of the locations to prevent possible damage due to grazing, crop maintenance, firebreak and access track maintenance or other activities that may damage populations.

Declared Rare Flora (DRF) markers have been installed at Populations 2, 5 and 6. These alert people working in the area to the presence of significant flora, helping to prevent accidental damage during maintenance operations. Awareness of the significance of these markers is being promoted to relevant bodies such as Shires. To this end, dashboard stickers and posters have been produced and distributed. These illustrate DRF markers, inform of their purpose and provide a contact telephone number to use if such a marker is encountered.

Population 1 was fenced by the Department in 1997. Cages have also been placed around emerging seedlings by District staff from the Department to prevent grazing by kangaroos and rabbits.

In February 2000, in response to a request from the Shire of Dandaragan, staff of the Department trimmed *Grevillea calliantha* plants that were encroaching onto the road at Populations 2 and 5. These cuttings were then provided to BGPA for development into plants for future translocation.

One hundred hectares containing Subpopulation 4b on private property was fenced in 1995. This was funded by the Remnant Vegetation Protection Scheme.

Subpopulation 4a on private property was fenced in 1990 by the Department and the private property owner.

The Botanic Gardens and Parks Authority (BGPA) currently have 29 plants of *Grevillea calliantha* grown from seed and cuttings, 26 of which are in the Botanic Gardens. The strike rate for cuttings is generally between about 7% and 60% (pers. comm. A. Shade¹).

Approximately 509 seeds were collected from Population 2 in November 1995 and stored in the Department's Threatened Flora Seed Centre (TFSC) at -18°C. The TFSC test the viability of the seed initially and after one year in storage. The initial germination rate of *Grevillea calliantha* seed was found to be 81% and after one year in storage was 88%. In November 1995, other collections consisted of 49 seeds from Population 5 and 409 seeds from Population 6. The initial germination rate was 100% and after one year in storage was 84% (unpublished data, A. Cochrane²).

A research project on the population dynamics of selected rare *Grevillea* species, including *G. calliantha*, was undertaken by the Department's Science Division and Murdoch University between 1993 and 1994.

The aims of the project were to:

1. Prepare life history records.
2. Examine patterns in the habitat of the species to seek generalisations about traits that correlate with rarity or commonness.
3. Design models of population behaviour.
4. Examine the genetic structure of populations.

A PhD project entitled 'Population dynamics with life history modelling of rare and common *Grevillea* species in Western Australia' has been completed (Armstrong 2001). *Grevillea calliantha* was included in this study.

In 1998, 106 seedlings of *Grevillea calliantha* were planted into a Shire Reserve in Dandaragan, in accordance with an approved Translocation Proposal (Coates and Monks 1998). The seedlings were a result of seed collected by the TFSC and grown by the BGPA. The translocation is being conducted on an experimental basis, and will also provide information

¹ Amanda Shade, Horticulturalist, Botanic Garden and Parks Authority

² Anne Cochrane, Manager, the Department's Threatened Flora Seed Centre

about effective techniques for future translocations. In 1998, three treatments were tested, water, mulch and control (no watering or mulching). The number of surviving germinants, height, crown width, reproductive state, number of inflorescences and follicles, presence of second generation plants and general health are being monitored. In 1999, another 115 plants (five were from seed, the rest grown from cuttings propagated at the BGPA) were planted. Treatments applied were early plantings (early in winter months) and late plantings (late in winter months). In 2001, 114 plants were planted into the same reserve, with caged versus uncaged treatments applied. Preliminary monitoring data from those planted in 1998 suggests that watering of seedlings resulted in a higher survival than all other treatments (Monks and Coates 2000).

An A4 sized poster, which provides a description of the species, and information about threats and recovery actions, has been developed for *Grevillea calliantha*. It is hoped that the poster will result in the discovery of new populations.

Staff from the Department's Moora District office regularly monitor the populations.

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

Future recovery actions

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

1. Coordinate recovery actions

The MDTFRT will continue to oversee the implementation of recovery actions for *Grevillea calliantha* and will include information on progress in their annual report to the Department's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: The Department (Moora District) through the MDTFRT
Cost: \$500 per year

2. Undertake weed control

Weeds are a threat to all populations. The following actions will be implemented:

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

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

Action: Undertake weed control
Responsibility: The Department (Moora District) through the MDTFRT
Cost: \$1,000 per year

3. Stimulate and monitor germination

Burning, smokewater and other methods of disturbance are effective in stimulating germination of *Grevillea calliantha* (Armstrong 2001) and will be trialed around a number of dead plants. The time when germination occurs, flowering first occurs, seed is produced and the age at which senescence is reached will then be monitored.

Action: Stimulate and monitor germination
Responsibility: The Department (Moora District) through the MDTFRT
Cost: \$3,600 in first and second years, \$900 in third year

4. Propagate plants for translocation

The propagation of plants for translocation is essential as the known populations are under threat in the wild.

Action: Propagate plants for translocation
Responsibility: The Department (Moora District, TFSC), and the BGPA through the MDTFRT
Cost: \$2,800 in first and second years

5. Continue translocation process

Continuation of the translocation process is essential for the conservation of the species, as the total number of extant plants still remains low, and the wild populations are not secure from threats including disease and fire. Although translocations are generally undertaken under full Recovery Plans, a translocation proposal has been developed (Coates and Monks 1998) and approved, and implementation has begun. The Department will continue to implement this proposal throughout the time frame of this IRP. This will be coordinated by the MDTFRT. Information on the translocation of threatened animals and plants in the wild is provided in the Department's Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. Monitoring of the translocation is essential and will be undertaken according to the timetable set out in the Translocation Proposal.

Action: Continue translocation process
Responsibility: The Department (Science Division, Moora District) through the MDTFRT
Cost: \$7,900 in first and second years, \$1,700 in third year

6. Implement disease hygiene measures

Many flora species in the plant community in which *Grevillea calliantha* occurs are presumed susceptible to the plant pathogens, *Phytophthora* species. It is necessary to maintain disease hygiene measures, to reduce the likelihood of introducing or amplifying the impacts of the disease. Access to Population 1 will be restricted, especially when the soil is moist. A sign advising of the dieback risk will be posted at this population.

Action: Implement dieback hygiene measures
Responsibility: The Department (Moora District) through the MDTFRT
Cost: \$1,800 in the first year

7. Undertake rabbit control

Rabbits have the potential to cause minor damage to Populations 1, 2, 5 and 6. The Department will initiate control using the most appropriate method in cooperation with land owners and managers where monitoring indicates rabbits are damaging populations. There are legislative restrictions on the use of 1080 Poison by staff of the Department on land not under direct management of the Department.

Action: Undertake rabbit control
Responsibility: The Department (Moora District) through the MDTFRT
Cost: \$800 per year

8. Monitor populations

Annual monitoring of factors such as habitat degradation, dieback, salinity, waterlogging, population stability (expansion or decline), weed invasion, pollinator activity, seed production, recruitment, longevity and predation is essential. Monitoring the impact of grazing will indicate if plants will need to be individually caged.

Action: Monitor populations
Responsibility: The Department (Moora District) through the MDTFRT
Cost: \$2,000 per year

9. Develop and implement a fire management strategy

Fire or other disturbance is likely to be required to stimulate the germination of soil-stored seed. Frequent fire may, however, prevent the accumulation of sufficient seed to allow regeneration of the populations. A fire management strategy that incorporates autumn fires at an interval of seven to twelve years, with occasional 15 yearly fires as recommended by Armstrong (2001) will be utilised wherever possible. As recommended by Armstrong (2001), smoke water will be used to stimulate germination at an interval of seven years to maintain populations if burning is undesirable. The strategy will also describe fire control measures.

Action: Develop and implement a fire management strategy
Responsibility: The Department (Moora District) through the MDTFRT
Cost: \$2,500 in first year and \$1,000 in subsequent years

10. Develop and implement a drainage strategy for Populations 5 and 6

A strategy is required to manage drainage at Populations 5 and 6. A drainage control and rehabilitation strategy will be developed and implemented in liaison with relevant stakeholders including the local shire. Water flows around the population will be examined during a high rainfall event to help determine local topography and to help determine the most appropriate actions.

Action: Develop and implement a drainage strategy for Populations 5 and 6
Responsibility: The Department (Moora District) through the MDTFRT
Cost: To be determined.

11. Seek measures to achieve conservation management

Ways and means of achieving protection of the land on which Populations 1 and 4 of *Grevillea calliantha* occur will be investigated. Possible methods of achieving future conservation management include developing a Management Plan in consultation with the land manager, covenanting, and acquiring the land.

Action: Seek measures to achieve conservation management
Responsibility: The Department (Moora District) through the MDTFRT
Cost: To be determined

12. Collect seed and cutting material

Preservation of germplasm is essential to guard against extinction if wild populations are lost. Seed has been collected from Populations 2, 5 and 6 but is required from other populations. Seed and cutting collections are also needed to propagate plants for translocations.

Action: Collect seed and cutting material
Responsibility: The Department (Moora District) through the MDTFRT
Cost: \$3,200 in first and second years

13. Conduct further surveys

Community-based groups and individuals will be encouraged to be involved in further surveys supervised by staff of the Department, during the species' flowering period (September to February).

Action: Conduct further surveys
Responsibility: The Department (Moora District) through the MDTFRT
Cost: \$2,300 per year

14. Notify and liaise with relevant land managers

Owners of land adjacent to Population 1 need to be officially notified of the presence of *Grevillea calliantha*. Staff from the Department's Moora District will continue to liaise with land managers to ensure the populations are not damaged or destroyed accidentally.

Action: Notify and liaise with relevant land managers
Responsibility: The Department (Moora District) through the MDTFRT
Cost: \$500 per year

15. Promote awareness

The importance of biodiversity conservation and the protection of the Critically Endangered *Grevillea calliantha* will be promoted to the public. Awareness will be encouraged in the community by a publicity campaign through the local print and electronic media and poster displays. Formal links with local naturalist groups and interested individuals will also be encouraged.

Action: Promote awareness
Responsibility: The Department (Moora District) through the MDTFRT
Cost: \$900 per year

16. Write a full Recovery Plan

At the end of the second-year of implementation of this IRP, the need for further recovery will be assessed. If *Grevillea calliantha* is still ranked Critically Endangered at that time a full Recovery Plan will be developed that prescribes actions required for the long-term recovery of the species.

Action: Write a full Recovery Plan
Responsibility: The Department (WATSCU, Moora District) through the MDTFRT
Cost: \$20,500 once in the final year

4. TERM OF PLAN

This Interim Recovery Plan will operate from July 2001 to June 2004 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:

Anne Cochrane	Manager, The Department's Threatened Flora Seed Centre
Leonie Monks	Research Scientist, the Department's Science Division
Alice Reaveley	Flora Conservation Officer, the Department's Moora District
Amanda Shade	Horticulturalist, Botanic Gardens and Parks Authority

Thanks also to staff of the WA Herbarium for providing access to Herbarium databases and specimen information, and the Department's Wildlife Branch for assistance.

6. REFERENCES

- Armstrong, P.A (2001). Population dynamics with life history modelling of rare and common *Grevillea* species in Western Australia. Unpublished PhD Thesis submitted to Murdoch University.
- Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. 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 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 (1995) Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. Department of Conservation and Land Management, Western Australia.
- Coates D. and Monks L. (1998) *Translocation Proposal – Foote's Grevillea, Grevillea calliantha* R.O. Makinson & P.M. Olde (*PROTEACEAE*). Unpublished report. Department of Conservation and Land Management.
- IUCN (2000) *IUCN red list categories prepared by the IUCN Species Survival Commission, as approved by the 51st meeting of the IUCN Council*. Gland, Switzerland.
- Makinson, R.O. and Olde, P.M. (1991) A new species of *Grevillea* (Proteaceae: Grevilleoideae) from south-west Western Australia. *Telopea* 4(2), 351-355.
- Monks, L. and Coates, D. (2000) Critically Endangered WA Plants- Translocation and Re-establishment Trials. Department of Conservation and Land Management, Western Australia.
- Olde, P. and Marriott, N. (1995) *The Grevillea Book*. Vol. 2. Kangaroo Press, Kenthurst.
- Western Australian Herbarium (1998) FloraBase – Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia. <http://www.calm.wa.gov.au/science/>

7. TAXONOMIC DESCRIPTION

Makinson, R.O. and Olde, P.M. (1991) A new species of *Grevillea* (Proteaceae: Grevilleoideae) from south-west Western Australia. *Telopea* 4(2), 351-355.

***Grevillea calliantha* R. Makinson & P. Olde, sp. nov.** is a spreading flat-topped shrub c. 1 m tall, 2-3 m wide; branches spreading or slightly ascending, somewhat secund on older plants; bark rough, grey over red-brown; branchlets (younger) flattened, strongly ridged, and tomentose with wavy hairs; when older the branchlets more terete, ridged, sublanate with curled hairs; branchlets indumentum whitish with reddish brown stripes corresponding to ridges and decurrent from the leaf-bases. *Leaves* greyish yellow-green, ascending, sessile (appearing petiolate) or with petioles up to c. 3 mm long, pinnatipartite (almost pinnatisect), 4.0-7.5 cm long with (3-) 5-7 (-11, cultivated) entire ascending linear lobes, lobes 1-4.5 cm long, 1.0-1.1 mm wide, basal lobes longest; apex and apices of lobes acute with a sometimes pungent point; margin smoothly revolute, enclosing the lower surface except for the midvein(s) of leaf and lobes; upper surface of leaves and lobes with an inconspicuous midvein; young leaves with an open to dense indumentum of wavy to curly hairs on upper surface and the exposed veins of the lower surface, older leaves becoming glabrous and faintly granulate on these parts; texture chartaceous. *Inflorescences* on older plants largely confined to a zone beneath and at the edge of the layered foliage, terminal and simple but sometimes on short lateral branchlets arising from successive nodes and appearing branched, decurved to sigmoid from near the base of the peduncle, conspicuous, many (15-30) flowered, secund, centripetal (?20-) 50-70 mm long; peduncles bracteate, densely tomentose, 5-15 mm long; rachises densely tomentose to sublanate with whitish hairs only, ridged beneath the indumentum, up to c. 60 mm long; bracts spreading (spreading to recurved, and conspicuous, on very young bud-bearing rachises), ovate-acuminate, 2.2-2.9 mm long, 1.3-1.8 mm wide, outer and inner surfaces tomentose with straight to wavy hairs, bracts persistent at anthesis; pedicels 1.0-2.5 (-3.5 cultivated) mm long, tomentose; torus oblique at 15°-30°, 1.3-2.1 mm across, projecting strongly at the ventral side where it is adnate to the prominent nectary; perianth obliquely ovate to rather saccate below the curve, 2.2-3.0 (-4.0 cultivated) mm across, outer surface tomentose with white and reddish two-armed hairs (and rarely, cultivated NSW 228067), some simple erect multicellular glandular hairs), the indumentum longer (to villous) on the limb; inner surface of perianth glabrous; limb of bud spheroidal, 1.7-2.2 mm long 2.4 mm wide; dorsal tepals (10.5 -) 11.3-12.8 mm long, 1.8-2.6 mm wide; nectary conspicuous, prominent, spreading, linguiform, sometimes decurved at tip, usually partly enclosed with the torus, 0.7-1.9 mm long, projecting 0.3-0.6 (-0.8 cultivated) mm beyond the rim, margin entire; pistil (28.5-) 30-40 mm long, stipe absent or obscure, up to c. 0.5 mm long ovary sessile, 1.3-1.6 mm long, subvillous with two-armed hairs only. Some reddish blotching evident in the indumentum; ovules attached about the medial position; style appearing glabrous but occasionally with two-armed hairs extending for about 2-3 mm above the ovary, and sometimes with few to many short (c. 0.1 mm) inconspicuous erect multicellular ?glandular hairs, especially on the ventral side, or glabrous throughout; apical c. 2 mm of style dilating smoothly into the back in the style-end; pollen-presenter ovate, oblique at c. 45°, strongly and obliquely convex, 1.1-1.5 mm long, 1.0-1.2 mm wide, 0.3-0.5 mm high, stigma distally off-centre. *Fruits* 2-seeded, more or less spreading from the rachis, erect to somewhat reflexed at the apex of the decurved pedicel, obliquely oblong-ellipsoid, somewhat laterally compressed, 13-18 mm long, 8-9 mm wide, c. 6 mm thick; styles persistent; surface with a dense matted tomentose indumentum of multicellular glandular hairs, sometimes interspersed with a few two-armed hairs (most or all of the two-armed hairs of the ovary shed as the fruit matures); on young fruits up to c. 8 mm long two-armed hairs still predominate, with longitudinal reddish striping of the indumentum; mature fruits with surface beneath the indumentum unevenly pitted; pericarp 0.3-0.4 (0.7, Conn 3278) mm across at the suture, 0.4-0.8 mm thick at centre-face, 0.5-0.8 mm thick at the dorsal side, texture weakly crustaceous. *Seeds* slightly curved, obliquely elliptical, 12.5 mm long, 5.0 mm wide, 2.0-2.5 mm thick; outer face convex, with a slight submarginal ridge, tissue outside the ridge paler than the central elliptical area; inner face with a central more or less flat elliptical area c. 60 mm long and 1.0 mm wide, surrounded by an outer ring of radially-oriented upright lamellae of papery or waxy tissue.