INTERIM RECOVERY PLAN NO. 130

SPREADING GREVILLEA
(*Grevillea humifusa*)

INTERIM RECOVERY PLAN

2003-2008

Gillian Stack and Val English

Photograph: Kate Brown

May 2003

Department of Conservation and Land Management
Western Australian Threatened Species and Communities Unit (WATSCU)
PO Box 51, Wanneroo, WA 6946

Natural Heritage Trust
Helping Communities Helping Australia

Government of Western Australia

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (the Department) 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 results from a review of, and replaces, number 25 *Grevillea humifusa* (G. Stack and V. English, 1999). This Interim Recovery Plan will operate from May 2003 to April 2008 but will remain in force until withdrawn or replaced.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 reviewed after five years and the need for a full Recovery Plan will be assessed.

This IRP was approved by the Director of Nature Conservation 20 June, 2003. 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 in May 2003.

SUMMARY

Scientific Name:	*Grevillea humifusa*	**Common Name:**	Spreading Grevillea
Family:	Proteaceae	**Flowering Period:**	June – September
Dept Region:	Midwest	**Dept District:**	Moora
Shire:	Dandaragan	**Recovery Team:**	Moora District Threatened Flora Recovery Team (MDTFRT)

Illustrations and/or further information: A. Brown, C. Thomson-Dans and N. Marchant (Eds) (1998) *Western Australia's Threatened Flora*; P.M. Olde and N.R.Marriott (1995) *The Grevillea Book* 2.

Current status: *Grevillea humifusa* was Declared as Rare Flora under the Western Australian *Wildlife Conservation Act* 1950 in October 1996 and ranked as Critically Endangered (CR) in November 1998. It currently meets World Conservation Union (IUCN 2000) Red List Category 'CR' under criteria B1ab(iii)+2ab(iii) (IUCN 2000) as there is only one known population with continuing decline in the quality of habitat. The species is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). There are approximately 1500 plants known in one population. This population occurs in a highly disturbed area and the species is affected by loss and fragmentation of habitat. The main threats are weed competition, inappropriate fire regimes and road and firebreak maintenance activities.

An Interim Recovery Plan was developed for the species in 1999 (Stack and English 1999). Information collected since that plan was completed has been incorporated into this plan and this document now replaces Stack and English (1999).

Critical habitat: The critical habitat for *Grevillea humifusa* comprises the area of occupancy of the known population; similar habitat within 200 metres of known population; corridors of remnant vegetation that link subpopulations and additional nearby occurrences of similar habitat that do not currently contain the species but may have done so and may be suitable for translocations.

Habitat requirements: *Grevillea humifusa* occurs on an undulating plain of gravelly loam that supports very disturbed open low *Eucalyptus loxophleba* and *E. wandoo* woodland over species including *Kennedia prostrata*, *Jacksonia* sp. and *Dianella revoluta*. Plants occur in highly disturbed areas on private property and Shire road reserves. *G. humifusa* is apparently endemic to the Eneabba area of Western Australia.

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

Given that this species is Critically Endangered it is considered that all known habitat is habitat critical. There is only one known population, and this population is therefore absolutely critical to the survival of the species.

Benefits to other species/ecological communities

There are no other known threatened species or ecological communities in the immediate vicinity of *Grevillea humifusa*. However, recovery actions implemented to improve the quality or security of the habitat of the species, such as weed control and rehabilitation, will be of benefit to the entire plant assemblage.

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. However, as *Grevillea humifusa* is not listed under any international agreement, the implementation of other international environmental responsibilities is not affected by this plan.

Role and interests of indigenous people

There are no known indigenous communities interested or involved in the management of areas affected by this plan. Therefore no role has been identified for indigenous communities in the recovery of this species.

Social and economic impacts

There are not likely to be any major social or economic impacts associated with the implementation of this plan. There are subpopulations located on private land and Shire managed road reserves. Recovery actions refer to continued negotiations between stakeholders with regard these areas.

Evaluation of the Plan's Performance

The Department of Conservation and Land Management, in conjunction with the Recovery Team will evaluate the performance of this IRP. In addition to annual reporting on progress with listed actions and comparison against the criteria for success and failure, the plan is to be reviewed within five years of its implementation.

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

1. Relevant land managers have been made aware of the location and threatened status of the species.
2. Declared Rare Flora (DRF) markers have been installed at Population 1a.
3. A stock-exclusion fence was erected at Population 1b in 1997.
4. Surveys for new populations have been conducted.
5. Seed has been collected and stored at the Department's Threatened Flora Seed Centre.
6. A number of live plants are maintained in cultivation at the Botanic Garden and Parks Authority.
7. Detailed research into the species' biology and ecology was begun in 2002.
8. An information sheet has been produced that describes and illustrates the species.
9. Staff from the Department's Moora District regularly monitor the population.
10. The Moora District Threatened Flora Recovery Team is overseeing the implementation of this IRP.

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

Recovery criteria

Criteria for success: The number of individuals within the population and/or the number of populations have increased by ten percent or more.

Criteria for failure: The number of individuals within the population and/or the number of populations have decreased by ten percent or more.

Recovery actions

1. Coordinate recovery actions
2. Rehabilitate habitat as necessary
3. Undertake weed control
4. Map critical habitat
5. Develop guidelines for slashing of habitat
6. Undertake rabbit control
7. Develop and implement a fire management strategy
8. Seek long-term protection of habitat
9. Monitor population
10. Conduct further surveys
11. Collect germplasm
12. Undertake and monitor translocation
13. Promote awareness
14. Obtain biological and ecological information
15. Review the need for a full Recovery Plan

1. BACKGROUND

History

Grevillea humifusa was originally collected from the Eneabba area in May 1968 by H. Demarz, a collector for Kings Park and Botanic Garden (KPBG). It was then identified as a specimen of *G. thelemanniana* (prostrate form). It has been in cultivation since the 1960s as *G. thelemanniana* (grey-leaf prostrate form). A number of botanists have conducted surveys in the general area without locating new populations of *G. humifusa*. The private property area was burnt in 1995, prior to notification of the location of the population in 1996. However, many native species including *G. humifusa* are regenerating well, particularly since all plants on private property were fenced from stock in 1997. Less than 40% of the population is located on the private land, with the remainder on a road verge that is very vulnerable to road maintenance activities.

An Interim Recovery Plan was developed for the species in 1999 (Stack and English 1999). Information collected since that plan was completed has been incorporated into this plan, and this document now replaces Stack and English (1999).

Description

Grevillea humifusa is a lignotuberous prostrate shrub with trailing stems to 3 m long and angular branchlets with long soft hairs. The grey-green leaves are 1.5-2 cm long and are ascending to spreading. The inflorescences are 2 cm long and occur at the end of the branches. The flowers are pink to red, and the style is pink to red with a yellow tip. The grooved, oblong fruit is 12-15 mm long and 3-4 mm wide. *G. delta* and *G. preissii* are closely related to *G. humifusa*, but neither of these species has a trailing habit. *G. delta* also differs in its less crowded flowers and its hairier flower tube and flower stalk.

Distribution and habitat

Grevillea humifusa is endemic to the Eneabba area, where it is known from a single population of almost 1,500 plants. A major portion of this population is located on private property, in a pasture paddock. This area was fenced to exclude stock in 1997. It was burnt in 1995, but the plants have regenerated well. The remainder of the population occurs on adjacent Shire road reserves. The species occurs on an undulating plain of gravelly loam that supports very disturbed open low *Eucalyptus loxophleba* and *E. wandoo* woodland over species including *Kennedia prostrata*, *Jacksonia* sp. and *Dianella revoluta*.

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 (*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)).

The critical habitat for *Grevillea humifusa* comprises:

- the area of occupancy of the known population;
- areas of similar habitat within 200 metres of the known population, i.e. open low *Eucalyptus loxophleba* and *E. wandoo* woodland on gravelly loam soils (these provide potential habitat for natural range extension);
- corridors of remnant vegetation that link subpopulations (these are necessary to allow pollinators to move between subpopulations and are usually road and rail reserves); and
- additional occurrences of similar habitat that do not currently contain the species but may have done so in the past (these represent possible translocation sites).

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

Given that this species is Critically Endangered it is considered that all known habitat is habitat critical. There is only one known population, and this is therefore crucial to the survival of the species.

Benefits to other species/ecological communities

There are no other known threatened species or ecological communities in the immediate vicinity of *Grevillea humifusa*. However, recovery actions implemented to improve the quality or security of the habitat of the species, such as weed control and rehabilitation, will benefit the entire plant assemblage.

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. However, as *Grevillea humifusa* is not listed under any international agreement, the implementation of other international environmental responsibilities is not affected by this plan.

Role and interests of indigenous people

There are no known indigenous communities involved in the management of areas affected by this plan. Therefore no role has been identified for indigenous communities in the recovery of this species.

Social and economic impacts

There are not likely to be any major social or economic impacts associated with the implementation of this plan. There are subpopulations located on private land and Shire managed road reserves. Recovery actions refer to continued negotiations between stakeholders with regard these areas.

Evaluation of the Plan's Performance

The Department of Conservation and Land Management, in conjunction with the Recovery Team, will evaluate the performance of this IRP. In addition to annual reporting on progress with listed actions and comparison against the criteria for success and failure, the plan is to be reviewed within five years of its implementation.

Biology and ecology

Grevillea humifusa has a lignotuber and regenerates after fire. The occurrence of juvenile plants within Population 1b in July 1998 after the fire in 1995 suggests that seed germination may also be stimulated by fire.

While the pollinators of *G. humifusa* are unknown, a number of insects have been noted on the flowers, including meat ants, black bull ants, and honeybees. Olde and Marriott (1995) suggest that this species is probably pollinated by birds, but no birds were seen during field research into biology and ecology of this species (personal communication A. Harris[1]). They also noted that it set seed prolifically in its only known location. This has not been supported by the current research, and the difference may be due to variations in climate as 2002 was a very dry year. Alternatively, the difference in observations may be due to the length of time since fire occurred as fire can increase vigor, and stimulate flowering and fruit-set of existing plants that resprout from a lignotuber, as well as stimulate germination of soil-stored seed. Olde and Marriott's attempts to propagate this species led to the observations that germination could be improved by nicking the seed coat before sowing, and that it grows readily from firm, young-growth cuttings taken during most seasons (Olde and Marriott 1995).

Grevilleas generally have a low seed set relative to the number of flowers in each inflorescence. However, with the large number of flowers on each individual plant, seed set is still substantial for most species. The seed is protected in a hard follicle that splits to release the seed when mature. *Grevillea spp.* seed can be difficult to germinate. Techniques that have been found to enhance germination in some species include scarifying the seed, soaking the seed in water and removing the testa, and treating the seed with potassium nitrate (Fox *et al*. 1987). The long-term viability of seed varies between species, but can range from under a year to several years under natural conditions (Fox *et al*. 1987).

Threats

[1] Anne Harris, Consultant botanist, the Department's W.A. Threatened Species and Communities Unit

Grevillea humifusa was declared as Rare Flora under the Western Australian *Wildlife Conservation Act* 1950 in October 1996 and ranked as Critically Endangered (CR) in November 1998. It currently meets World Conservation Union (IUCN, 2000) Red List category 'CR' under criteria B1ab(iii)+2ab(iii) (IUCN 2000) as it is only known from a single population, with continuing decline in the condition of its habitat. The species is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act).There are approximately 1500 plants known from one population. This population occurs in a highly disturbed area and the species is affected by loss and fragmentation of habitat. The main threats are weed competition, road and firebreak maintenance activities, rabbit grazing, and inappropriate fire regimes.

- **Weed competition** from introduced grasses and clovers is a threat to Population 1a and 1b. Many weeds in the habitat of Population 1b remain from the time the area was paddock. Although adult plants appear to be able to compete successfully, weeds may smother *G. humifusa* seedlings. They also exacerbate the threat of fire by increasing the fuel load.

- **Road maintenance activities** such as grading, chemical spraying and construction of drainage channels pose a significant threat to Population 1a, as many plants occur near the roads edge. Mowing of road reserve vegetation could also affect the habitat of this species. These disturbance events can stimulate seed germination, but also often encourage weed invasion. Any bitumen upgrade of the road would have a massive impact, and may only be avoided by realignment through private property to the south.

- **Firebreak maintenance** is an issue that affects Population 1b on private land, as *G. humifusa* plants occur along the firebreaks.

- **Grazing** by rabbits is evident in the population. Although the adult plants appear able to cope with grazing, the effect on recruitment of seedlings is likely to be significant. In addition to grazing, rabbits also impact on populations by encouraging invasion of weeds by digging, addition of nutrients to soil and introduction of weed seeds in their droppings. There is widespread subsoil collapse evident in Population 1b, which is possibly related to rabbit burrows. However, this disturbance may actually aid germination and may, in itself, be a minor issue.

- **Inappropriate fire regimes** are a threat to *G. humifusa*. Adult plants regrow from a lignotuber after fire, and seed germination is presumed to be stimulated by fire. However, *Grevillea* seed generally has a short lifespan, and if fire recurred before adult plants could replenish the seedbank and re-establish lignotuber reserves, the only known population could be seriously threatened. Grassy weeds can create a large fuel load, increasing the heat of fires. In addition, fires allow the weed species present to increase in density.

- **Lack of associated habitat** represents a threat to the population. The lack of associated native vegetation makes it more likely that pollinators will be infrequent or absent. In addition, the lack of available habitat for recruitment is of concern, as the population occurs on a road reserve and private land with cleared land adjacent.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1a. South of Eneabba	Shire road reserve	1996 150 * 1998 295 2002 920 (ca 40)	Disturbed but healthy	Weed competition, road maintenance, inappropriate fire regimes, grazing
1b. South of Eneabba	Private property	1996 * 1998 314 2002 572 (ca 20)	Disturbed but healthy	Weed competition, firebreak maintenance, inappropriate fire regimes, grazing

Numbers in brackets = number of juveniles. * = total for both subpopulations combined.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Any on-ground works (clearing, firebreaks, roadworks etc) in the immediate vicinity of *Grevillea humifusa* will require assessment. On-ground works should not be approved unless the proponents can demonstrate that they will not have an impact on the species, 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 by ten percent or more.
Criteria for failure: The number of individuals within populations and/or the number of populations have decreased by ten percent or more.

3. RECOVERY ACTIONS

Existing recovery actions

All relevant land managers have been notified of the location and threatened status of the species. The Shire of Dandaragan and the private property owners were formally notified of the presence of *Grevillea humifusa* populations on their lands in October 1996. The notification details the Declared Rare status of *G. humifusa* and the associated legal responsibilities.

Declared Rare Flora (DRF) markers have been installed at Population 1. These serve to alert people working in the vicinity to the presence of DRF, and the need to avoid work that may damage vegetation in the area.

The population on private land was fenced in mid 1997 to protect it from grazing by stock and to allow natural habitat to regenerate. Many native species are present, although pasture species do persist.

There have been a number of surveys, but these have not been successful in locating additional populations to date.

Seed was collected in October 1996 and in October 1997 from the only known population, and stored in the Department's Threatened Flora Seed Centre (TFSC). These collections resulted in a combined total of over 1500 seeds being stored at -18°C. Staff of the TFSC test the viability of seed soon after collection and again after one year in storage. The initial viability of these collections ranged from 64% to 92%. After storage for 12 months at -18°C, over 90% germination occurred in both seed lots (unpublished data A. Cochrane[2]), indicating that low temperature and low moisture storage of this species is likely to be successful in the long term. Germinants from these trials are delivered to Botanic Garden and Parks Authority (BGPA) nursery for maturation into full plants.

The BGPA currently have 131 plants of *Grevillea humifusa* from seven clones, derived from both seed and cuttings. Many of these have been propagated for planting in Kings Park, and will not be retained in the Nursery. Generally they hold up to six plants of each clone in the Nursery (personal communication A. Shade[3]). Typically, those individuals planted into the Garden become healthier and more vigorous than those retained in pots in the nursery, and still represent a genetic resource for propagation material for translocation purposes and as *ex situ* genetic material.

Research into the biology of this species was begun in September 2002. Preliminary work indicates that flowering is more profuse in open areas, but that all plants have low levels of fruit set (personal communication A. Harris). Three 5x5m plots have been established on road reserves and one on private land, within the population. Accurate numbers of plants in plots have been determined. 100 plants within these plots have been permanently marked with metal tags and the plant height, and widths in two dimensions measured. Information collected for 21 of the tagged plants in 2002 also included numbers of flowers, and the success of fruiting.

[2] Anne Cochrane, Manager, the Department's Threatened Flora Seed Centre
[3] Amanda Shade, Horticulturalist, Botanic Garden and Parks Authority

A double-sided information sheet has been produced, and includes a description of *Grevillea humifusa*, its habitat, threats, recovery actions and photos. This is being distributed to the local community through libraries, wildflower shows and other avenues. It is hoped that this may result in the discovery of new populations.

Staff from the Department's Moora District regularly monitor the population.

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 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 appropriate land managers prior to recovery actions being undertaken.

1. Coordinate recovery actions

The Moora District Threatened Flora Recovery Team (MDTFRT) will coordinate recovery actions for *G. humifusa* and other Declared Rare Flora in the region. They 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: $1,000 per year

2. Rehabilitate habitat as necessary

Rehabilitation of *G. humifusa* habitat could offer long-term protection from weed invasion and buffer extant plants from chemical drift. Population 1b was first cleared in the early 1990s, and has been regenerating well after the stock exclusion fence was erected in mid 1997. Given the natural regeneration occurring at the site, rehabilitation could best be achieved by increasing the rate of establishment of plant species native to the site. Subsequent weed control will enhance this, and smoking of the soil may stimulate additional germination of native species if required. Vegetation dense enough to buffer *Grevillea humifusa* from windblown weed seed and chemical drift is desirable around the perimeter of the population, but heavy canopy cover is not desirable in a planted buffer as this is likely to reduce vigor and flowering.

Action: Rehabilitate habitat as necessary
Responsibility: The Department (Moora District) through the MDTFRT
Cost: $2,100 in second and fourth years and $1,000 in fifth years.

3 Undertake weed control

Part of the only *G. humifusa* population exists on a 'retired' paddock, and pasture species persist in addition to other species that have invaded. A number of (mostly grassy) weeds also occur on the road reserve. While adult *G. humifusa* plants are mostly able to successfully compete with the weeds, the effect on recruitment is a greater threat. Weed control will be undertaken in consultation with the land managers. This will be by hand weeding or localised application of herbicide during the appropriate season to minimise the effect of herbicide on the species and the surrounding native vegetation. All applications of weed control will be followed by a report on the method, timing and success of the treatment against weeds, and the effect on *G. humifusa* and associated native plant species.

Action: Undertake weed control
Responsibility: The Department (Moora District) through the MDTFRT
Cost: $2000 per year

4. Map critical habitat

It is a requirement of the EPBC Act that spatial data relating to critical habitat be determined. Although critical habitat is described in Section 1, the areas as described have not yet been mapped and that will be done under this action. If any additional populations are located, then critical habitat will also be determined and mapped for these locations.

Action: Map critical habitat
Responsibility: The Department (Moora District, WATSCU) through the MDTFRT
Priority: Moderate
Cost: $2000 in the first year

5. Develop guidelines for slashing of habitat

Vegetation at Population 1a requires periodic slashing to maintain visibility for road users. Although this would not result in the cutting of the prostrate *G. humifusa*, falling leaves and broken branches could smother plants. In addition, if the habitat deteriorates, weed invasion may increase and become a threat to *G. humifusa* plants and seedlings. Guidelines will be developed to prescribe methods of carrying out this necessary road maintenance that will minimise the damage caused to *G. humifusa* and its habitat.

Action: Develop guidelines for slashing habitat
Responsibility: The Department (Moora District), Roadside Conservation Committee, Shire of Dandaragan through the MDTFRT
Cost: $1,000 in first year

6. Undertake rabbit control

Rabbits appear to occur in large numbers in the area and there is evidence of rabbit grazing in the habitat of *Grevillea humifusa* (personal communication A. Harris). Although the adult plants are coping with the current level of grazing, the effect on recruitment is likely to be more severe. Rabbits will be controlled, using 1080 oats if appropriate, in consultation with relevant landholders.

Action: Undertake rabbit control
Responsibility: The Department (Moora District) through the MDTFRT
Cost: $300 per year

7. Develop and implement a fire management strategy

A fire management strategy will be developed by the Department's Moora District in consultation with relevant land managers (including the private property managers at Population 1, the Shire of Dandaragan and adjacent landholders) and the Moora District Threatened Flora Recovery Team. The species' response to fire will be taken into account when developing this strategy, which will include recommendations on fire frequency, intensity, and methods of fire control. The information will then be passed on to relevant bodies, including the Bush Fire Brigade.

Action: Develop and implement a fire management strategy
Responsibility: The Department (Moora District), relevant land managers through the MDTFRT
Cost: $900 in first year and $700 in subsequent years

8. Seek long-term protection of habitat

Staff from the Department's Moora District will continue to liaise with land managers and landowners to ensure that populations are not accidentally damaged or destroyed. In addition, ways and means of improving the security of the population and its habitat will be investigated. This may include conservation covenants with a range of agencies, the Land for Wildlife scheme, and possibly land acquisition.

Action: Seek long-term protection of habitat
Responsibility: The Department (Moora District) through the MDTFRT
Cost: $1,000 in first year and $500 per year in subsequent years

9. Monitor population

Annual monitoring of factors such as habitat degradation (including weed invasion, salinity and plant diseases such as *Phytophthora cinnamomi*), population stability (expansion or decline), pollination activity, seed production, recruitment, longevity and predation is essential. For Population 1a on a road reserve, the visibility of DRF markers will also be monitored and maintained.

Action: Monitor population
Responsibility: The Department (Moora District) through the MDTFRT
Cost: $1,000 per year

10. Conduct further surveys

Community volunteers will be encouraged to be involved in further surveys supervised by Departmental staff that will be conducted during the flowering period of the species (June to September). Suggested survey locations include the Hill River Nature Reserve and the area around the Jurien Bay – Watheroo turnoff.

Action: Conduct further surveys
Responsibility: The Department (Moora District) through the MDTFRT
Cost: $1,500 per year in first, third and fifth years

11. Collect germplasm

Preservation of germplasm is essential to guard against extinction if wild populations are lost. Such collections are also needed to propagate plants for translocations. Approximately 1500 seeds have already been collected from Population 1 but further collections are required to ensure sufficient material is available for propagation of translocates as well as maintaining a collection in storage.

Action: Collect germplasm
Responsibility: The Department (TFSC, Moora District) through the MDTFRT
Cost: $1,500 per year

12. Undertake and monitor translocation

Translocation is essential for the conservation of this species, as the population is not secure from threats including weed competition, grazing, fire and physical destruction, and the single location means the species is vulnerable to extinction from a single catastrophic event. A translocation proposal will be developed and suitable translocation sites selected. Plants will also be propagated in readiness for translocation, and when appropriate, these will be planted in accordance with the approved Translocation Proposal. This will be coordinated by the MDTFRT. Information on the translocation of threatened plants and animals in the wild is provided in the Department's Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. All Translocation Proposals require endorsement by the Department's Director of Nature Conservation.

Monitoring of the translocation is essential and will be undertaken according to the timetable developed for the Translocation Proposal.

Action: Undertake and monitor translocation
Responsibility: The Department (Moora District, TFSC) and BGPA through the MDTFRT
Cost: $11,000 in the second year and $7,500 in subsequent years

13. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of wild populations of this species will continue to be promoted to the community through poster displays and the local print and electronic media. Formal links with local naturalist groups and interested individuals will also be encouraged. An information sheet has been produced, and contains a description of the plant, its habitat, threats, recovery

actions and photos. This will continue to be distributed to the public through the Department's Moora District office, and at the office and library of the Shire of Dandaragan. Staff of the Moora District will also work with local Community Support Officers towards increasing awareness of the species.

Action: Promote awareness
Responsibility: The Department (Moora District) through the MDTFRT
Cost: $500 per year

14. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *G. humifusa* will provide a better scientific basis for its management in the wild. Research has already begun, and information will continue to be gathered on the following aspects of the biology of the species.

1. Soil seed bank dynamics and the role of various disturbances (including fire), competition, rainfall and grazing in germination and recruitment.
2. The pollination biology of the species.
3. The requirements of pollinators.
4. The reproductive strategies, phenology and seasonal growth of the species.
5. The population genetic structure, levels of genetic diversity and minimum viable population size.
6. The impact of herbicide on *G. humifusa* and its habitat.

Much of this information will be obtained through bi-annual monitoring of numbers of plants in permanently established plots, by measuring growth rates, flowering, and fruiting success for tagged plants in plots.

Action: Obtain biological and ecological information
Responsibility: The Department (Science Division, Moora District) through the MDTFRT
Cost: $18,000 per year in the second, third and fourth years

15. Review the need for a full Recovery Plan

At the end of the fourth year of its five-year term this Interim Recovery Plan will be reviewed and the need for further recovery actions will be assessed. If the species is still ranked as Critically Endangered at that time a full Recovery Plan may be required.

Action: Review the need for further recovery actions and/or a full Recovery Plan
Responsibility: The Department (WATSCU, Moora District) through the MDTFRT
Cost: $20,300 in the fifth year (if full Recovery Plan required)

4. TERM OF PLAN

This Interim Recovery Plan will operate from May 2003 to April 2008 but will remain in force until withdrawn or replaced. If the taxon is still ranked Critically Endangered after five years, the need to review this IRP or to replace it with a full Recovery Plan will be determined.

5. ACKNOWLEDGMENTS

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

Gina Broun	Conservation Officer, the Department's Moora District
Rebecca Carter	Program Leader Nature Conservation, the Department's Moora District
Anne Cochrane	Manager, the Department's Threatened Flora Seed Centre
Anne Harris	Consultant, the Department's W.A. Threatened Species and Communities Unit
Amanda Shade	Horticulturalist, Botanic Garden and Parks Authority

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

6. REFERENCES

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*. Perth, 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*. Perth, Western Australia.

Department of Conservation and Land Management (1995) Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. Perth, Western Australia.

Department of Conservation and Land Management (1998) Western Australian Herbarium FloraBase – Information on the Western Australian Flora. Perth, Western Australia. http://www.calm.wa.gov.au/science/

Fox, J., Dixon, B. and Monk, D. (1987). Germination in Other Plant Families*. Pp. 83-97 *in* P.L. Langkamp (ed.). *Germination of Australian Native Plant Seed*. Inkata Press, Melbourne.

Olde, P.M. and Marriott, N.R. (1995). *The Grevillea Book* 2: 203-204. Kangaroo Press, Kenthurst N.S.W.

Stack, G. and English, V. (1999) Interim Recovery Plan number 25, 1999-2002 *Grevillea humifusa*. Department of Conservation and Land Management, Perth.

World Conservation Union (2000) *IUCN red list categories prepared by the IUCN Species Survival Commission, as approved by the 51st meeting of the IUCN Council*. Gland, Switzerland.

7. TAXONOMIC DESCRIPTION

Olde, P.M. and Marriott, N.R. (1995). *The Grevillea Book* 2: 203-204. Kangaroo Press, Kenthurst N.S.W.

Grevillea humifusa
Specific epithet from the Latin *humifusus* (spread along the ground), in reference to the habit.

Lignotuberous **shrub** with trailing stems to 3 m long. **Branchlets** angular, openly villous, the hairs to 2.5 mm long. **Leaves** 1.5-2 cm long, ascending to spreading, shortly petiolate, bipinnatisect; rachis straight to strongly recurved; lobes 0.5-1 cm long, 0.5 mm wide, narrowly linear, ascending to spreading; upper surface pilose, midvein evident to obscure; margins loosely revolute; lower surface partially exposed, pilose, midvein protuberant. **Conflorescence** 2 cm long, erect or decurved, pedunculate, terminal, simple, conico-secund, dense; peduncle and rachis pilose; bracts 1.5 mm long, ovate, acuminate, villous outside, falling before anthesis. **Flower colour:** perianth pink to pale red with cream limb; style pink, red or orange-red with yellow tip. **Flowers** acroscopic; pedicels 3-5 mm long, glabrous; torus c. 1 mm across, oblique; nectary cushion-like, prominent; **perianth** 5-7 mm long, 1.8-2 mm wide, ovoid, dilated at base, glabrous outside, pubescent inside near curve and along tepal margins, cohering except along dorsal suture; limb revolute, spheroidal-subglobose, silky, not ribbed; **pistil** 22-24 mm long, glabrous; stipe 3.5 mm long, flattened, incurved; ovary triangular; style before anthesis exserted at curve and looped upwards, afterwards gently incurved; style end slightly expanded, exposed before anthesis; pollen presenter 1-1.2 mm long, oblique, convex, ellipsoidal to orbicular. **Fruit** 12-15 mm long, 3-4 mm long, erect, oblong, acuminate, with strong basal ridging, grooved; pericarp 0.5 mm thick. **Seed** not examined.

Distribution W.A., in a small area inland from Jurien. *Climate* Summer hot, dry; winter cold, wet. Rainfall c. 500 mm.

Ecology Grows in brown, gravelly loam in or near woodland. Flowers autumn-spring. Regenerates from seed or lignotuber. Presumably pollinated by birds.

Major distinguishing features Prostrate habit; branchlets angular, pilose with long white hairs; leaves bipinnatisect, pilose; conflorescence conico-secund; bracts > 1 mm long; perianth zygomorphic, glabrous outside except limb, hairy inside; pistil glabrous; ovary triangular on incurved, flattened stipe; pollen presenter oblique; fruit with strong basal ridging.

* Excluding Myrtaceae, Fabales and Gramineae.

Related or confusing species Group 14, especially *G. delta* and *G. preissii*, neither of which has a prostrate trailing habit. *G. delta* also differs in its more hairy perianth and pedicels and in its less crowded flowers. *G. preissii* also differs in its glabrous to sparsely silky or densely tomentose-villous branchlets.

Variation A morphologically uniform species.

Conservation status 2E. Extremely rare, known from one population of c. 50 plants, beside a road in mostly cleared country.

Cultivation *G. humifusa* has been cultivated and appreciated widely since the 1960s (as *G. thelemanniana* Grey-leaf prostrate form). It appears to have been introduced by H. Demarz, collector for Kings Park, Perth, until recently the only collector of the species. It has proved easy to grow in drier, inland as well as coastal climates but is sometimes short-lived in summer rainfall areas. It endures frost to at least -3ºC and extended dry conditions without damage. It grows best in well-drained but moist acidic to slightly alkaline sand, sandy loam or gravelly loam in full sun. Partial shade is also tolerated. Rarely requires pruning except to restrict spread, and is an excellent pot plant using a standard, well-drained soil mix with light dressings of low-phosphorus, slow-release fertiliser. Native plant nurseries sometimes carry this species.

Propagation *Seed* Sets prolific seed in the wild. Germination is improved by nicking the testa before sowing. *Cutting* Grows readily from firm, young growth cuttings taken at most seasons. *Grafting* Untested.

Horticultural features *G. humifusa* is one of the most popular species in the *G. thelemanniana* complex and is valued for its dense, ground-covering habit, its hoary, grey-green foliage, and bright, pink-red, yellow-tipped flowers covering the plant in autumn and winter. Its trailing habit makes it an ideal spill-over plant for rockeries and walls and it is an excellent contrast or feature plant in the landscape. It is both long-lived and attractive and could be used more frequently in landscaping than it currently is. It is popular in gardens of people interested in native plants.

General comments *G. humifusa* is recognised as distinct because of its unique habit and distinctive branchlet and leaf indumentum. It appears closely related to *G. preissii* but shares many important features with *G. delta*. Until its relationships can be properly assessed, it is here recognised as a distinct species. The name *G. humifusa* P.M. Olde & N.R. Marriott has no association with *G. humifusa* A. Cunningham, a nomen nudum which Bentham (1870: 436) placed under *G. laurifolia*.