)ING GREVILLEA

(GRE[illegible]ILLEA HUMIFUSA)

INTERIM RECOVERY PLAN

1999-2002

by

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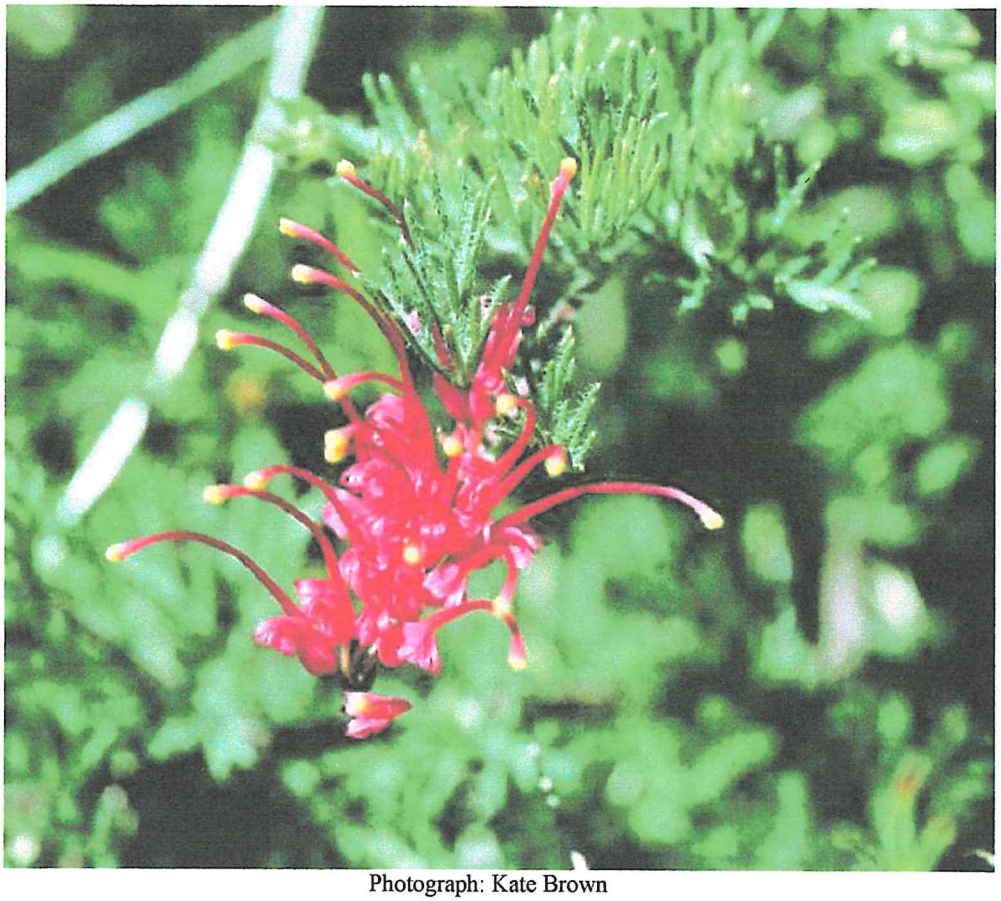

Photograph: Kate Brown

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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This Interim Recovery Plan will operate from April 1999 to March 2002 but will remain in force until withdrawn or replaced.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 30 August 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 April 1999.

SUMMARY

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

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

Current status: *Grevillea humifusa* was Declared as Rare Flora in October 1996 and ranked as Critically Endangered (CR) in November 1998. It currently meets World Conservation Union (IUCN) Red List Category 'CR' under Criterion B1+2c (IUCN 1994). There are currently 609 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, inappropriate fire regimes and road and firebreak maintenance activities.

Habitat requirements: *G. 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 endemic to the Eneabba area of Western Australia.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented -
1. Surveys for new populations conducted.
2. Land managers notified of presence of *G. humifusa*.
3. Declared Rare Flora (DRF) markers installed.
4. Stock-exclusion fence erected.
5. Seed collected and stored.
6. Several live plants maintained in cultivation.
7. All populations regularly monitored.

IRP Objective: 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.

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. Undertake weed control.
2. Develop guidelines for slashing of habitat.
3. Develop a fire management strategy.
4. Monitor the population.
5. Obtain biological and ecological information.
6. Start translocation process.
7. Conduct further surveys.
8. Disseminate information.
9. Rehabilitate habitat at existing population.
10. Write full Recovery Plan.

1. BACKGROUND

History

G. 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, which occurred 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. A survey for additional populations of *G. humifusa* was conducted in 1997 without success.

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

G. humifusa is endemic to the Eneabba area, where it is known from a single population of just over 600 plants. A major portion of this population is located on private property, in a pasture paddock. This area has recently been fenced to exclude stock. It was deliberately 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*.

Biology and ecology

Little is known about the biology and ecology of this species. *G. 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 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. They also noted that it set seed prolifically in its only known location. Their 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 whole 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* 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

This species is currently ranked as Critically Endangered under IUCN Red List Criterion B1+2c (IUCN 1994) due to the single population and the continuing decline in the condition of its habitat. The main threats are weed competition, inappropriate fire regimes and road and firebreak maintenance activities.

- **Weed competition** from introduced grasses and clovers is a threat to Population 1b. These remain from the time the area was paddock. The weeds are growing densely as the understorey, and although adult plants appear to be coping, the weeds may smother *G. humifusa* seedlings. They also exacerbate the threat of fire by increasing the fuel load.

- **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, the only known population could be seriously threatened. Accumulation of annual weeds can create a large fuel load, increasing the heat of fires. In addition, fires allow the weed species present to increase in density.

- **Road maintenance activities** such as grading and construction of drainage channels pose a threat to Population 1a. 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.

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

Summary of population information and threats

Pop. No. & Location	Land Status	Date / No. of Plants	Condition	Threats
1a. South of Eneabba	Shire road reserve	1996 150 * 07.98 295	Disturbed	Weed invasion, road maintenance, prescribed burning
1b. South of Eneabba	Private property	1996 * 07.98 314	Disturbed	Weed invasion, firebreak maintenance, prescribed burning

* Applies to both subpopulations

2. RECOVERY OBJECTIVES AND CRITERIA

Objective

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

All appropriate people have been made aware of the existence of this species and its locations. The Shire of Dandaragan and the private property owners were formally notified of the presence of *G. humifusa* populations on their lands in October 1996. These notifications detailed the Declared Rare status of the species and the associated legal responsibilities.

Declared Rare Flora (DRF) markers have been installed at Population 1. 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, Main Roads Western Australia (MRWA) and Westrail. 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.

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.

Seed was collected in October 1996 and in October 1997 from the only known population, and stored in CALM's Threatened Flora Seed Centre (TFSC). These collections resulted in a combined total of over 1500 seeds being stored at -18°C. The TFSC test the viability of the seed initially, after one year in storage and again after five years. The initial viability of these collections has ranged between 64% and 92%. After storage for 12 months at -18°C, both seed lots gave over 90% germination, indicating that low temperature and low moisture storage of this species will be successful in the long term. Cuttings were collected in August 1996 and again in 1997, and the rooting success rate has been very good. Thus, in May 1997, KPBG held seven plants in its Nursery Collection Frames, in condition that varied from excellent to adequate. Germplasm is being stored as a genetic resource, ready for use as stock for translocation purposes and as an *ex situ* genetic 'blueprint' of the species. It is intended that in addition to seed, the germplasm stored will includecryostored tissue material and live plants in cultivation if possible.

CALM's Moora District staff 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 CALM's Corporate Executive and funding bodies.

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. Undertake weed control

Part of the only known *G. humifusa* population exists on a recently fenced-off paddock, and introduced pasture species persist. They occur as a dense understorey, and while adult *G. humifusa* plants are coping with the competition from weeds, a greater threat is the effect on recruitment. This will need to be monitored, and action taken where necessary. Effective weed control with the use of herbicides and hand pulling will be undertaken at this population. The tolerance of native plant species to herbicides at *G. humifusa* sites is unknown, so caution is necessary. A weed control program for these populations is required and will involve:

1. Accurately mapping the boundaries of the weed species.
2. Selection of an appropriate herbicide or other method of weed control after determining which weeds are present.
3. Control of invasive weed by hand removal or spot spraying around individual *G. humifusa* plants when weeds first emerge.
4. Scheduling weed spraying to accommodate other DRF populations in the area that require weed control.

A weed control program will be developed in consultation with the Shire of Dandaragan and the managers of the private property on which Population 1 is located.

Action:	Undertake weed control
Responsibility:	CALM (Moora District), relevant land managers, through the MDTFRT
Cost:	$2000 per year.

2. 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 it. 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:	CALM (CALMScience, Moora District), Shire of Dandaragan through the MDTFRT
Cost:	$300 for year 1.

3. Develop a fire management strategy

As *G. humifusa* has a lignotuber, it is presumed that it regenerates from this after fire. In addition, it is likely that the species requires occasional fire for recruitment from soil stored seed, but frequent fires may be detrimental to the long-term survival of the species. Fire also promotes the introduction and proliferation of weed species.

A fire management strategy will be developed by CALM'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 MDTFRT.

Action:	Develop a fire management strategy
Responsibility:	CALM (Moora District) through the MDTFRT, relevant land managers
Cost:	$900 for year 1

4. Monitor population

Monitoring of factors such as weed densities, habitat degradation, population stability (expansion or decline), pollination activity, seed production, recruitment and longevity is essential. For Population 1a on the road reserve, the visibility of DRF markers will also be monitored. The paint may become dull, and weed or other vegetation growth may obscure markers, rendering them ineffective. Their visual prominence will be maintained so that they remain effective.

Populations will be inspected annually.

Action:	Monitor population
Responsibility:	CALM (Moora District) through the MDTFRT
Cost:	$500 per year.

5. Obtain biological and ecological information

Increased knowledge of the biology and ecology of the species will provide a scientific basis for management of *G. humifusa* in the wild. Investigations will include:

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

Action:	Obtain biological and ecological information
Responsibility:	CALM (CALMScience, Moora District) through the MDTFRT
Cost:	$17,100 per year.

6. Start translocation process

Translocation is essential for the conservation of this species, as the road reserve and private property on which the single population occurs are not secure from threats including weeds, fire and physical destruction. Although translocations are generally undertaken under full Recovery Plans, it is possible to develop a translocation

proposal and start propagating the plants necessary within the timeframe of an Interim Recovery Plan. This will be coordinated by the MDTFRT. 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.

Action: Start translocation process
Responsibility: CALM (Moora District), KPBG, through the MDTFRT
Cost: $6,200 for year 3.

7. Conduct further surveys

Further surveys for *G. humifusa* will be undertaken during its flowering period on a systematic basis in areas of suitable habitat. Appropriate habitat on private lands will be surveyed with the landholders' permission. Areas considered to be suitable habitat for the species will be noted and considered for translocation. Volunteers from the local community, Wildflower Societies, Naturalist Clubs and other community-based groups will be invited to be involved in surveys supervised by CALM staff.

Suggested survey locations include the Hill River Nature Reserve and the area around the Jurien Bay – Watheroo turnoff.

Action: Conduct further surveys
Responsibility: CALM (Moora District) through the MDTFRT
Cost: $1,500 for years 1 and 2.

8. Disseminate information

The importance of biodiversity conservation, the preservation of critically endangered species generally and *G. humifusa* in particular will be promoted to the public. Awareness will be encouraged in the community through a publicity campaign using the local print and electronic media and poster displays. Formal links with local naturalist groups and interested individuals will also be encouraged. A poster illustrating all critically endangered flora taxa in Moora District will be prepared and displayed at Shire Offices and shopping centres. An information sheet for *G. humifusa* will also be produced. This will include photographs, a description of the plant, its habitat type, threats and management actions. The exact location of this species will remain confidential. The information sheets will be distributed to the public through CALM's Moora District office and at the office and library of the Shire of Dandaragan. Copies will also be supplied to the Fire and Rescue Service, Westrail, MRWA and Agriculture Western Australia (AgWA) to raise their awareness of the plant and its appearance. Such activities may lead to the discovery of new populations of the species.

Action: Disseminate information
Responsibility: CALM (Moora District, Corporate Relations Division) through the MDTFRT
Cost: $2,300 for year 1.

9. Rehabilitate habitat at Population 1

Rehabilitation of *G. humifusa* habitat will lead to long-term protection from weed invasion and buffer extant plants from chemical drift. Population 1 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. Smoking of the soil may stimulate additional germination of native species. Regeneration of this site will also be enhanced by weed control.

Action: Rehabilitate habitat at Population 1
Responsibility: CALM (Moora District, CALMScience) through the MDTFRT
Cost: $2,100 for year 2.

10. Write 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 must be written to describe action required for long-term maintenance of the taxon.

Action:	Write full Recovery Plan
Responsibility:	CALM (Moora District) through the MDTFRT
Cost:	$19,400 for year 3.

4. TERM OF PLAN

This Interim Recovery Plan will operate from April 1999 to March 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:

Rebecca Carter (nee Wolstenholm)	previously Conservation Officer, CALM Moora District
Emma Holland	Botanist, previously CALM W.A. Threatened Species and Communities Unit
Sophie Juszkiewicz	Propagator, Kings Park and Botanic Garden
Kim Kershaw	Botanist, previously CALM W.A. Threatened Species and Communities Unit
Sue Patrick	Senior Research Scientist, CALMScience
Eng Pin Tay	Botanist, Kings Park Herbarium

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

6. REFERENCES

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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,

* Excluding Myrtaceae, Fabales and Gramineae.

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.

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 -3°C 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 idealspill-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*.