# TRANSLOCATION PROPOSAL

## SPLIT-LEAVED GREVILLEA
## *Grevillea althoferorum* Olde & Marriott (1993)
## (PROTEACEAE)

## 1. SUMMARY

*Grevillea althoferorum* is a low, compact spreading shrub to 0.3-0.5m high and 0.5-1.0m wide with flexuose, spreading branches. Its branchlets are terete, scabrous to sparsely hirsute. Leaves are 1.5-2 cm long, ascending to spreading, shortly petiolate and twice divided, lobes broadly triangular with recurved, pungent points and are light blue-green in colour on both surfaces. Its conflorescence is 2-5 cm long and 1.5cm wide, terminal, erect and sessile, growing in a cylindrical shape and held within or slightly exceeding the foliage. The perianth is reddish when young, maturing to a pale yellow colour with a creamy yellow style, and the inner surface is hairy or papillose. Flowering occurs from September to early November. The grooved, oblong fruit, produced only in the Bullsbrook population, are 12-15 mm long and 3-4 mm wide.

The species is restricted to two small and considerably disjunct extant known populations 200 km apart, one south of Eneabba (Population 1, 147 plants) and the other near Bullsbrook (Population 2, 151 plants). The species had been previously collected from two other sites near Perth, which have since been cleared for sand mining (Olde and Marriott, 1995).

This proposal seeks to preserve the genetics of the northern population of the species, located south of the townsite of Eneabba. Unlike its southern population, it can only reproduce asexually and is not afforded the protection of growing in conservation estate. The Eneabba population is restricted to a shire vested road reserve, adjoining cleared farm paddocks and faces a number of key threatening processes such as weed invasions, feral animal damage, as well as the heightened risks of chemical drift, damage by stock and road maintenance. Burne *et al.* (2003) recommended preservation of the adult plants should be the focus for management. Thus translocation to a secure site will help achieve this aim.

An Interim Recovery Plan has been endorsed for this species (Hamilton-Brown & English 1999), which recommends commencing the translocation process and identifying a suitable site for translocation, preferably in conservation estate. The failure to locate any new populations in excess of Population 1 and 2 after exhaustive survey effort, as well as the difficulties in successfully managing threats in a weedy road verge environment and the clonal nature of Population 1 leads us to believe that translocation is the best way to recover this species. Translocation of cuttings produced from plant material from the northern population is proposed to a secure locality in South Eneabba Nature Reserve.

## 2. PROPONENTS

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# 3. BACKGROUND

## 3.1 History, Taxonomy and Status

*Grevillea althoferorum* is a low, compact spreading shrub to 0.3-0.5m high and 0.5-1.0m wide with flexuose, spreading branches. Its branchlets are terete, scabrous to sparsely hirsute. Leaves are 1.5-2 cm long, ascending to spreading, shortly petiolate and twice divided, lobes broadly triangular with recurved pungent points and are light blue-green in colour on both surfaces. Its confloresence is 2-5 cm long and 1.5cm wide, terminal, erect and sessile, growing in a cylindrical shape and held within or slightly exceeding the foliage. The perianth is reddish when young, maturing to a pale yellow colour with a creamy yellow style, and the inner surface is hairy or papillose. Flowering occurs from September to early November. The grooved, oblong fruit, produced only in the southern population, are 12-15 mm long and 3-4 mm wide.

The species was named after a former curator of the Burrendong Arboretum in N.S.W., Peter McDowell Althofer and his wife Hazel, who was the head propagator for the Arboretum. Originally named *Grevillea althoferi*, after some conjecture the specific epithet was renamed in its plural form, *althoferorum*. It was first collected by Ted Griffin in 1978, the type collection was taken in 1991 (then known as *Grevillea* sp. Eneabba [aff rudis]) and its description was published in 1993 (Olde and Marriott, 1993). To date there have been eleven collections from the two current known populations and a third (now destroyed) population, all of which are lodged at the WA Herbarium.

Out of four similar species with unusual inflorescence morphology, it is most closely related to *G. rudis* from which it differs in having less deeply-divided (pinnatifid) leaves that may have secondary toothing but lack deep secondary division, denser many-flowered conflorescences held above and clear of foliage and inner surface of the perianth glabrous and smooth.

Although the Eneabba population produces notably more inflorescences in a flowering season than the Bullsbrook population, it is sterile and reproduces asexually via underground stems. The southern population produces on average 0.5 fruit per plant in a reproductive season (Burne *et al.*, 2003) and there are currently 79 seed from the southern population in long-term storage at CALM's Threatened Flora Seed Centre (A. Crawford pers. comm.). However, there have been no recorded observations seedling recruitment in the southern population and asexual reproduction (from a shared lignotuber) has been noted (Burne *et al.* 2003). Lack of seedling recruitment in the Bullsbrook population may be due to long periods in the absence of fire, preventing appropriate conditions for seed germination, or it is due to factors that limit the production of viable seed in the first instance. Lack of seedling recruitment in the Eneabba population is due to sterility of the pollen (Burne *et al*. 2003). It is thought that *G. althoferorum* may resprout from a lignotuber, or underground roots after fire (Hamilton-Brown & English, 1999) and it is known to be highly susceptible to dieback disease cause by *Phytophthora cinamomi* (pers. comm. Colin Crane).

After considerable survey effort in the Northern Sandplains in the 1980's, in the Moora District and southern Swan Coastal Plain between 1992-4 and again in 1995-6, only a second population, (Population 2) was found. As a result, *Grevillea althoferorum* was upgraded from a Priority 1 flora species to Declared Rare Flora in 1997 and is currently ranked as Critically Endangered due to threats associated with small population size, small number of populations, road maintenance, weed invasion and mining activity.

## 3.2 Distribution and Habitat

Grevillea althoferorum is currently restricted to two small and considerably disjunct extant known populations 200 km apart, one south of Eneabba (Population 1, 147 plants) and the other near Bullsbrook (Population 2, 151 plants). The species had been previously collected from two other sites near Perth, which have since been cleared for sand mining (Olde and Marriott, 1995).

The northern Eneabba population (Population 1) occurs in low heath on grey sand with laterite, on the crest of a low rise, upslope from a minor easterly drainage line. It forms a part of the mid-dense shrub layer with *Grevillea integrifolia, G. shuttleworthiana, Verticordia grandis, Viminaria juncea, Hakea prostrata* and other shrub species typical of northern heathlands. The population occurs on a 12 m wide road verge and is threatened by weed invasion, road maintenance and agricultural activities, grazing, general ground disturbance by rabbits and foxes, and inappropriate fire regimes (Hamilton-Brown & English, 1999).

Population 2 occurs in Banksia low woodland on yellow/grey sand at the base of the Darling Scarp**.** It comprises part of the shrub layer in a *Banksia menziesii* and *B. attenuata* woodland assorted shrub above herbs. The population is in a conservation reserve which is known to contain dieback disease caused by the plant pathogen *Phytophthora* spp. The population is thought to be at risk from firebreak maintenance, inappropriate fire regimes and possibly herbicide or fertilizer drift associated with agricultural activity on adjacent land (Hamilton-Brown & English, 1999)

It is difficult to assess the population dynamics of the species, given that even in the seeding population (population 2), new plants may also be produced clonally (via underground stems). This causes difficulties in assessing what constitutes an individual plant. For example Population 2 was recorded as 30 plants in 1995, 30 plants in January 1997, 100+ plants in November 1997 and 151 plants in 1999. Similarly, Population 1 was recorded as 75 plants in 1999, 60 plants in 2000, 147 plants in 2001 and 67 clumps in 2004.

Table 1. Number of plants of *Grevillea althoferorum* in each population, the land tenure where they occur and date of last survey.

| Population number | CALM District | Number of individuals | Land tenure | Date of last survey |
|---|---|---|---|---|
| 1 | Moora | 67 clumps (inferred genets) [168 plants (genets and ramets) counted in May 2001] | Shire road verge | 15 Sept 2004 |
| 2 | Swan Coastal | 260 plants (genets and ramets) | Nature reserve | May 2001 |

# 4. THE TRANSLOCATION

### 4.1 The Need to Translocate

The total number of extant plants is low and the only known populations are not secure from threats. These threats include damage from feral animals, disease, road and/or track maintenance, adjoining land management activities and weed invasion. Weeds have the potential to out-compete *G. althoferorum* for nutrients and water and in addition can alter the fire regime by annually providing a highly combustible fuel layer. Translocating this species to a site where these threats are not present will buffer the taxon against random loss of a population due to catastrophic or other unpredictable environmental events and will help to secure the long term future of the species (Guerrant 1996).

Translocation is likely to be essential for the conservation of this species, in particular for preserving the genetics of the northern population. The northern population is considered to be at a greater risk of extinction than the southern population due to the lack of sexual reproduction. This is because if the adult plants are destroyed in the northern population there is no potential for the population to regenerate. Maintenance of the adult plants is, therefore, of particular importance to conserve the genetic diversity contained in this population. (Burne *et al.* 2003). If adult plants in the southern population are destroyed there is still a potential, albeit small, for natural regeneration to occur

through seedling recruitment. As such it is of greater urgency to protect the northern population and translocation to a second, secure location is seen as the best way of ensuring this.

The northern population is currently threatened by weed invasion, and control is difficult due to reinvasion from adjacent agricultural land. Chemical drift from adjacent agricultural land and road maintenance are also current threats at the site. An access track to the adjacent farm runs through the population and there is concern that maintenance of this track could result in damage to the population. In addition the adjacent road and agricultural land provides an easy conduit for introduction of *P. cinnamomi*, although this is not known to be currently at the site.

An Interim Recovery Plan has been endorsed for this species (Stack and English, 2003) and this recommends commencing with the translocation process and identifying a suitable site for translocation, preferably in conservation estate. The failure to locate any new populations in addition to Population 1 and 2 after exhaustive survey effort, as well as the difficulties in successfully managing threats in a weedy road verge environment and the clonal nature of Population 1 leads us to believe that translocation is the best way to recover this species.

**4.2 Translocation Site Selection**

Given the geographical isolation of the two known populations, it was decided to concentrate the search for potential translocation sites to areas of suitable habitat around the population where propagation material is sourced (the Eneabba population). This population is considered to be at greater risk of extinction than the southern population because it does not reproduce sexually. It is essential to maintain live adult plants to maintain the genetic diversity of this population, and translocation to a new and secure site is seen as an essential factor in ensuring this occurs.

A detailed desktop study was undertaken to ascertain areas of similar soils, drainage, topography and vegetation complex in the target area around the northern population. Land 10km or more to the east is dominated by deep white sands on gravel in low-lying areas between lateritic ridgelines. Also, 5km to the west occurs a chain of northeast – southwest saline wetlands with peaty soils interspersed with sandy loams. The target area was therefore reduced to a 15km wide area of suitable drainage and soils. The search was complicated by the surrounding land uses of the area. Most of the preferred habitat had been cleared for agriculture and the larger areas of remnant vegetation are either under active or inactive mining leases or tenements.

After establishing potentially suitable areas of vegetation and soils, these were then prioritized on the basis of land tenure security. Three reserves were identified as the preferred sites of greatest potential suitability and were visited on-ground to establish soils and flora species on a finer scale. These site visits showed that only one of these areas exhibited grey sands over gravel supporting a suite of similar flora species and as luck would have it, this same location is the only part of the larger reserve (Reserve #) that is not under mining lease.

As *G. althoferorum* has not previously been recorded from this reserve this translocation can be considered an introduction under the definitions provided by Policy Statement 29 and the Guidelines for Translocation of Threatened Plants in Australia (Valle *et al*. 2004). A map of the proposed translocation site in relation to the known population is shown in Appendix 1. Endorsement for the use of this site was received from the CALM Midwest Region (Appendix 3).

The proposed translocation site was chosen as it has similar soil and associated vegetation to the natural northern population (Table 1). Plants will be placed into the existing vegetation at the translocation site. The vegetation has no evidence of disturbance and every effort will be made to limit the disturbance to the surrounding vegetation from translocation activities. The site is afforded protection under its vesting as nature reserve and lacks the threats associated with mining leases and

the adjoining land uses of agriculture or roadside maintenance. The translocated site is free of weeds and is not directly accessible from public roads, private property or mining leases. As part of the ongoing monitoring of the site, observations as to whether this weed-free status is maintained will be made. In the event of weed species being identified at the site, a weed control program will be implemented following liaison with CALM, Moora District and the adjoining landowners.

Table 1. Associated vegetation at the proposed translocation site for *Grevillea althoferorum* compared to that found at the naturally occurring northern population.

| Associated species at the natural northern population site | Associated species at the proposed translocation site |
|---|---|
| *Adenanthos cygnorum* | *Adenanthos cygnorum* |
| | *Banksia menziesii* |
| *Banksia sphaerocarpa* | *Banksia sphaerocarpa* |
| *Burchardia umbellata* | *Burchardia umbellata* |
| *Conospermum sp.* | *Conospermum sp.* |
| *Eremaea pauciflora* | *Eremaea pauciflora* |
| *Eucalyptus tetragona* | |
| *Gastrolobium spp.* | *Gastrolobium spp.* |
| *Grevillea integrifolia* | |
| *Grevillea shuttleworthiana* | |
| *Hakea incrassata* | *Hakea incrassata* |
| *Hakea prostrata* | *Hakea prostrata* |
| *Isopogon sp* | *Isopogon sp* |
| *Lambertia multiflora* | |
| *Melaleuca sp.* | *Melaleuca sp.* |
| *Synaphea sp.* | *Synaphea sp.* |
| *Verticordia grandis* | *Verticordia grandis* |
| *Xanthorrhoea sp.* | *Xanthorrhoea sp.* |
| Asstd. sedges | Asstd. sedges |

There are no records of feral pigs or goats in the block nor were any tracks or traces of feral animals observed during site visits. The location containing the translocation site also contains a Threatened Ecological Community to the north and therefore this location is excluded from any future prescribed burns. The proximity of the site to a well maintained access track and the proximity of a nearby water standpipe will allow for a relative ease of exclusion from prescribed burning activities to prevent destruction of watering systems and killing plants that have not yet developed rhizomes. As inappropriate fire regimes are considered a threat to this species (Stack and English, 2003), attempts will be made to suppress wildfire events in the locality as well. District staff involved in prescribed burning and wildfire suppression will be made aware of the location of the translocation site so that its protection becomes part of the planning process in such instances. Fire will be excluded until research evidence supports the use of fire in maintaining population health and dynamics and the population has successfully established.

There is no evidence of dieback caused by *Phytophthora spp*. at the proposed translocation site. However, to achieve a degree of certainty about the presence or absence of such species, the site and its immediate surrounds will be interpreted prior to the translocation. The long-term likelihood of *Phytophthora spp*. infecting the site is difficult to predict, however several features of the site suggest it is unlikely. The site sits at the headwaters of a minor drainage line, therefore, if *Phytophthora spp* infections occur in the catchment surrounding the site they are likely to spread downstream and therefore away from the site. Road access to the site is limited to CALM maintenance vehicles only, and CALM employees in the Jurien District are all aware of the need for vehicular hygiene.

The risk of hybridisation between *G. althroferorum* and other Grevillea species at the translocation site is considered to be small. The source population of material for this translocation does not produce viable pollen therefore there is no risk that another species will produce hybrid seed with pollen from the *G. althroferorum* planted at the translocation site. No Grevillea species were identified in the immediate vicinity of the proposed translocation site. However, given the sterile nature of the source population if seed is produced on *G. althroferorum* plants at the translocation site it will be treated as of suspected hybrid origin. Any seedlings will therefore be monitored closely, and if proven to be of hybrid origin, removed from the site.

The proposed translocation site therefore combines suitable habitat, similar to that of the northern population with security of tenure, is free from processes threatening the natural (Eneabba) population and is only 5.1 km from the natural population.

**4.3 Translocation Design**

It is aimed to raise at least 100 plants of *G. althoferorum* for this year's translocation. Plants are being raised at the accredited nursery facilities at Kings Park and therefore are considered disease free. To confirm this disease free status, testing of the soil in which the plants are being grown is currently being undertaken. If testing confirms presence of *Phytophthora cinamomi* then plants will be destroyed and new propagation undertaken in disease free soil. The species is highly susceptible to *Phytophthora cinamomi* (pers. comm. Colin Crane). Therefore, as a precautionary measure to protect both the species to be translocated and the vegetation at the translocation site, all equipment used during planting will be maintained under strict disease hygiene. Vehicles and footwear will be cleaned of soil before entering the natural populations and translocation site.

At the proposed translocation site five replicates of 4m x 3m each will be measured. Plots will not be cleared of vegetation; instead plants will be planted in gaps in the vegetation, adhering as close as possible to the grid pattern presented in this proposal. In this way there will be minimal disturbance to the natural vegetation. There appears to be no reason that there would be adverse effects on the conservation values of the nature reserve from this translocation. Each replicate will be divided into a grid of 20 holes, arranged in four rows of five, with 1m between each hole. A total of two treatments will be tested: watered and not watered (Table 2). Treatments will be randomly assigned to half the plants in each grid (Appendix 2). An irrigation system, using water supplied from the Water Corporation, will be set up in May 2005 and activated in October 2005 to water weekly those plants assigned to the watering treatment (Table 2). Each plant will be permanently tagged so that each individual will always be identifiable.

Table 2. Description of experimental treatments.

| Treatment | Description of Treatment |
|---|---|
| Control | Plants not given any treatment. |
| Watered | Plants will be watered once a week over the first summer to assess whether watering enhances survival. |

Monitoring of the translocated population will be undertaken every six months commencing after planting out of the seedlings. Monitoring will include counting the number of surviving plants, height of the surviving plants, width of the crown of the surviving plants in two directions, reproductive state, production of ramets and general health of the plants.

Monitoring of the natural (Eneabba) population will also occur every six months in conjunction with monitoring of the translocated population. This will provide essential baseline data for assessing the performance of the translocated population. Monitoring will include counting the number of individuals, height and crown width of the individuals, reproductive state, whether ramet production has occurred, and general health of the plants.

### 4.4 Source of Plants

Cutting material was sourced from the northern clonal population near Eneabba, following the appropriate licence conditions for *CALM Permit To Take DRF*. Following the preliminary results of an investigation into the genetics within the population[1], tip cuttings were taken from a selection of those plants tagged and sampled as part of the research project. Individual plants were randomly chosen from those which occurred along a north-south transect in order to ensure genetic diversity in the translocated population and to be able to specifically track individual plants and ramets back to the parent plants. A total of 10 clones are currently being grown at the Kings Park nursery and will be ready for planting in winter 2005.

### 4.5 Criteria for Success or Failure

**Criteria for Success**

- **Short Term:**

- establishment of translocated plants
- production of ramets at similar levels to naturally occurring plants in population 1

- **Long Term:**

- the number of individuals is sustained by ramet production at similar levels to the naturally occurring plants in population 1

**Criteria for Failure**

- **Short Term:**

- failure of translocated plants to establish
- failure of translocated plants to produce ramets at similar levels as the naturally occurring plants in population 1

- **Long Term:**

- there is a significant decline in the size of the translocated population due to lack of ramet production.

[1] At present there is research underway to determine the genetics of the Eneabba population, in particular whether, given its sterility, it is a single clone or if different individual plants comprise the population. Preliminary result show that, of the plants sampled along the length of a transect; only two share the same genes and most of the plants are genetically distinct individuals.

## 5. TIMETABLE

| Time | Action | Officers |
|---|---|---|
| November 2004 | Cutting material collected and propagated at Kings Park. | District Conservation Officer and Botanic Gardens and Parks Authority |
| January 2005 | Translocation site selected. | District Conservation Officer with assistance from Translocation Research Scientist |
| March 2005 | Translocation proposal submitted for review. | Translocation Research Scientist with assistance from District Conservation Officer |
| May – June 2005 | Irrigation system setup | Translocation Research Scientist and District Conservation Officer |
| June – July 2005 | Planting | Translocation Research Scientist and District Conservation Officer |
| July 2005-June 2006 | Monitoring and maintenance of translocation site. | Translocation Research Scientist and District Conservation Officer |
| September - October 2005 | Initiation of irrigation system. | Translocation Research Scientist and District Conservation Officer |
| April 2006 | Progress report. | District Conservation Officer |
| June 2006 – May 2008 | Monitoring and maintenance of translocation site. | Translocation Research Scientist and District Conservation Officer |
| May 2008 | Progress Report | Translocation Research Scientist |

## 6. FUNDING

This project received initial funding through the Natural Heritage Trust project *Conservation of Nine Critically Endangered Plant Taxa in the Moora District* (Project #24333) and is now supported by the Natural Heritage Trust Biodiversity Hotspots project number RCC033089N05DCLM31. One of the proponents, Gina Broun, has ongoing funding (through CALM) for her position as Conservation Officer based at Jurien Bay. The proponents are therefore willing to make a commitment to monitor the translocation beyond the availability of the National Heritage Trust funding. In addition, CALM Policy 9, requires regular monitoring of populations of threatened flora. As such, once the translocated population is established it will be incorporated into the regular monitoring program undertaken by the Department.

## 7. TAXONOMIC DESCRIPTION

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

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

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Appendices One and Three may be available on contacting the authors

## Appendix 2

## Site Diagram for Proposed Translocation of *Grevillea althoferorum*

The aim is to propagate around 100 plants of *Grevillea althoferorum*.
These will be planted as shown in the diagram below, with one plant at each point marked with asterix or plus symbols.
The two treatments of watered and not watered will be assigned as per the diagram below.

| **Legend** |
|---|
| + = watered |
| * = not watered |

**Scale:** **1 m**