TRANSLOCATION PROPOSAL
Quartz-Loving Synaphea
Synaphea quartzitica A.S. George (Proteaceae)

1. SUMMARY

Synaphea quartzitica was first collected in 1908 by J. B. Cleland near Moora. No further collections were made until 1993, when A.S. George made a collection from this species North of Moora. Subsequently three new populations were discovered in Watheroo National Park. *Synaphea quartzitica* is a small shrub in the family Proteaceae. It is generally less than 50cm in height (Harding *et al*. 2003) and has small yellow flowers, which appear between July and August.

The species response to fire has not been determined. However, many *Synaphea* species have the ability to resprout from underground stems following fire (Stack and English 2003). The population dynamics of the species are difficult to assess given that new plants are produced clonally (via underground stems). This causes difficulties in assessing what constitutes an individual plant. Counts of population numbers recorded less than 200 plants in 1999 (Stack and English 1999), between 204 and 346 individuals in 2001 and 245 individuals in 2003. Differences in survey technique may account for some of the discrepancies in numbers and as such, it is difficult to ascertain whether the populations are increasing, decreasing or stable.

Attempts have been made to collect seed from the species in 1997 and 1998 (Stack and English 2003). However, due to low seed set (fruit set averaging 4% was recorded for the species, Harding *et al.* 2003) there are currently no seed in long-term storage at CALM's Threatened Flora Seed Center (A. Crawford pers. comm.).

S. quartzitica was declared as Rare Flora in July 1998 due to its restricted distribution, small population size and specialized habitat. It was ranked as Critically Endangered in November 1998, due to threats from grazing, mining activities, track maintenance activities and inappropriate fire regimes (Stack and English 2003). With the recent reservation of one of the largest populations the level of threat to the species is believed to have reduced and the species was re-ranked as Endangered in 2004.

The aim of this translocation proposal is to conserve the wild genetic stock of the species by establishing at least one more viable population of *S. quartzitica.* This will be achieved by translocating this species to a new, secure location. This translocation proposal outlines the need for translocation of the endangered *S. quartzitica*, the site selection process, the design of the translocation site and the provisions for monitoring. In addition it outlines the criteria for success or failure of this proposed translocation.

2. PROPONENTS

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3. BACKGROUND

3.1 History, Taxonomy and Status

Synaphea quartzitica was first collected by J.B. Cleland in 1908 near Moora. No further collections were made of this species until the 1990's. Botanist Alex George collected the species north of Moora in 1993. He subsequently named the species in his treatment of the genus *Synaphea* for the Flora of Australia (George 1995). The name "quartzitica" refers to the species occurring on a quartzite hill. In 1998 further surveys located another three populations.

Synaphea quartzitica is a small shrub generally less than 50cm in height (Harding *et al*. 2003). Stems are up to 7cm in length, branched and silky (George 1995). The leaves are lobed, with 2 or 3 pairs of lobes along the length. Leaves are between 6.5 and 8 cm in length, 8 – 9 cm in width with a petiole 6 – 15cm in length. Flowers are widely spaced on an inflorescence spike of 6 – 18cm in length. Flowers are yellow, small (less than 5mm) and occur between July and August.

Response to fire has not been determined. However, many *Synaphea* species have the ability to resprout from underground stems following fire (Stack and English 2003). New growth has been observed on plants of *S. quartzitica* that were presumed to be dead, so it is likely that the species has the ability to resprout following fire (Stack and English 2003). Seedlings have been recorded at the populations, in the absence of fire (Stack and English 2003), although presence of these seedlings has not been confirmed and they may in fact be new plants produced from underground runners.

It is difficult to assess the population dynamics of the species given that new plants are often produced clonally (via underground stems). This causes difficulties in assessing what constitutes an individual plant. In addition tagged plants scored as dead have been observed in subsequent surveys to have resprouted. Counts of population numbers recorded less than 200 plants in 1999 (Stack and English 1999). In 2001 the population counts are between 204 and 346 individuals (Stack and English 2003). They note that whilst 346 individuals were counted, due to the clonal nature of the species, these are likely to represent closer to 204 genetically distinct plants. A subsequent survey in 2003 recorded 245 individuals (Unpublished CALM Internal Documents). Differences in survey technique may account for some of the discrepancies in numbers and as such, it is difficult to ascertain whether the populations are increasing, decreasing or stable.

Fruit set averaging 4% was recorded for the species (Harding *et al.* 2003). Pollen transfer was considered to be the major limiting factor for seed set. Attempts were made to collect seed from the species in 1997 and 1998 (Stack and English 2003). It was noted on the second seed collection attempt, that most seed had aborted and consequently a collection of just one seed was made. This seed germinated after treatment with giberellic acid and the seed coat was manually nicked, however, the resulting germinant died. There are currently no seed in long-term storage at CALM's Threatened Flora Seed Center (A. Crawford pers. comm.).

Harding *et al.* (2003) suggests habitat specificity is likely to account for the rarity of the species. It is likely that past widespread clearing for agricultural and mining for chert (the rocky substrate on which this species is confined) have contributed to the species' rarity (Stack and English 2003). Due to its restricted distribution and specialised habitat the species was declared as Rare Flora in July 1998 (Stack and English 2003). It was ranked as Critically Endangered in November 1998 due to threats associated with small population size, small number of populations, specialised habitat requirements, restricted distribution, mining, grazing, track maintenance and inappropriate fire regimes. With the recent reservation of one of the largest populations the level of threat to the species is believed to have reduced and the species was re-ranked as Endangered in 2004.

3.2 Distribution and Habitat

Synaphea quartzitica is restricted to the chert hills north of Moora. It is known from four populations of approximately 268 adult individuals (Table 1). It is known to occur in three habitat sub-types; dense heath dominated by *Regelia megacephala* or *Allocasuarina campestris* on exposed chert ridges; dense heath or open woodland over dense to mid-dense heath dominated by *Kunzea praestans; Allocasuarina campestris* on shallow loamy rocky soil over chert on the slopes and ridges (Hamilton-Brown 2000). These habitat sub-types are listed as part of a Threatened Ecological Community – "Heath dominated by one or more of *Regelia megacephala, Kunzea praestans* and *Allocasuarina campestris* on ridges and slopes of the chert hills of the Coomerdale Floristic Region". This community has been ranked as Endangered.

The soil type in which the species is found is a creamy brown sandy loam with varying amounts of chert rocks. Underlying geology is listed as Noondine Chert formation (Carter and Lipple 1982).

The species occurs in the open areas of habitat where associated vegetation density has less than 20% cover and leaf litter is low (less than 35% cover) (Harding *et. al* 2003). Common associated species include *Allocasuarina campestris, Melaleuca radula, M. scabra, M*. species, *Kunzea praestans, Regelia megacephala, Dryandra fraseri* var. *fraseri, Calytrix leschenaultia, Hakea scoparia* subsp. *scoparia* and a Rush/Sedge species.

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

Population number	Number of individuals	Land tenure	Date of last survey
1	91 + 6 seedlings	Nature Reserve	9 April 2001
2A.	123	National Park	12 June 2003
2B.	34	National Park	12 June 2003
3.	2 + 3 seedlings	National Park	25 July 2000
4.	18 + 1 seedling	National Park	12 June 2003

4. THE TRANSLOCATION

4.1 The Need to Translocate

There are only four known populations of this species, with just 268 adult individuals. Despite regular surveys in the past few years, different methodologies make it difficult to ascertain whether the species is in decline, stable or increasing.

It is believed that disturbance events that occur at too frequent intervals are the most likely catastrophic events to potentially affect *Synaphea quartzitica*. There is a possibility that fire can occur at a frequency, which may deplete the seed bank and detrimentally affect the plants ability to resprout from underground stems. There are also concerns about the effect rabbit grazing is having on the plants. Illegal gravel extraction has occurred from the area adjacent to where population 1 occurs. Despite the area where population 1 occurs now being declared a nature reserve, there is still potential for illegal gravel extraction to occur, that has the potential to damage or destroy plants. Translocation is therefore considered to be a precautionary measure to ensure long-term survival of *S. quartzitica* in the wild.

The Interim Recovery Plan for this species notes "no seed of *Synaphea quartzitica* has yet been stored, due to the extremely low seed set. It will therefore be necessary to preserve the genetic diversity of this species through the use of other techniques such as cuttings, tissue culture and maintenance of living plants in cultivation" (Stack and English 2003). Whilst the Plan does not specifically recommend translocation, the small number of plants and the small number of populations, most of which occur fairly close together, lead us to believe that a catastrophic event

could jeopardise the long-term viability of these populations. Translocation to a secure wild site, rather than a living collection is considered the preferred option as it allows the species to undergo normal biological processes in the presence of selection pressures similar to those experienced by the natural populations. It is therefore argued that translocation to another secure site is important for the long-term survival of the species.

4.2 Translocation Site Selection

A search was made of conservation reserves around the known populations on 6th January 2005 to locate a suitable translocation site. The search focused on areas with similar soil and associated vegetation, which were on secure tenure and separated from the natural populations by a sufficient barrier to reduce the risk of a catastrophic event affecting the translocated and natural populations at the same time. An area in the north western section of Reserve (#) near Gunyidi was chosen as the translocation site. A map of the proposed translocation site in relation to the known populations is shown in Appendix 1. As *Synaphea quartzitica* has not previously been recorded from this site 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 (Vallee *et al.* 2004). Endorsement for the use of this site was received from the Midwest Region (Appendix 3).

The proposed translocation site is located within an old gravel pit north of the Gunyidi-Wubin Road. This gravel pit was deep ripped in 2003 and rehabilitated using tube stock grown from seed collected in the reserve. It is proposed to integrate the translocation into the rehabilitation program for the gravel pit. This has been discussed with the manager of the gravel pit rehabilitation program, Maria Lee, Project Officer with CALM, Midwest Region, and one of the proponents for this translocation. The translocation will, therefore, assist in the rehabilitation of the gravel pit and not cause any disturbance to the natural vegetation. A visual check for *Phytophthora cinnamomi* and other fungal pathogens indicate that these threats are not present at the translocation site (M. Lee, pers. comm.), this has been confirmed by soil sampling (M. Lee pers. comm.).

The site has a pale brown to cream sandy loam with chert and quartz rocks. Vegetation surrounding the gravel pit matches that of the habitat of the natural populations, namely, *Allocasuarina campestris* on shallow loamy rocky soil over chert on the slopes and ridges (Hamilton-Brown 2000). Associated species in the vegetation surrounding the gravel pit is listed below in Table 2.

The proposed translocation site was chosen because the environmental attributes of soil type, vegetation structure and associated vegetation are similar to the known populations of this species. It is also located on secure tenure (C Class nature reserve), and processes threatening the natural populations (mining activities and track maintenance activities) are absent.

Table 1. Associated vegetation at the proposed translocation site for *Synaphea quartzitica*.

Associated species at the proposed translocation site
**Allocasuarina campestris*
Astroloma serratifolium
**Dryandra fraseri* var. *fraseri*
**Hakea scoparia* subsp. *scoparia*
Melaleuca cordata
**Melaleuca radula*
**Melaleuca scabra*
Melaleuca sp.
Melaleuca uncinata
*Rush/Sedge species

* - denotes species also found at natural populations of *Synaphea quartzitica.*

4.3 Translocation Design

It is aimed to raise at least 100 plants of *Synaphea quartzitica* for this year's translocation. Plants have been raised via tissue culture in the laboratory and accredited nursery facilities at Kings Park and Botanic Gardens and therefore are considered disease free. The species response to *Phytophthora cinnamomi* is unknown, however, many Proteaceous species are highly susceptible to the disease. 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. 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 (see Table 2). Treatments will be randomly assigned to half the plants in each grid (see Appendix 2 for site diagram). An irrigation system, using water supplied from the Water Corporation, will be set up in October 2005 to water weekly those plants assigned to the watering treatment (see Table 2).

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 see whether watering enhances survival.

Each plant will be permanently tagged so that each individual will always be identifiable. A small cage of rabbit netting will be placed around each plant to prevent large herbivores from grazing on the plants. This cage will be pegged to the ground using long steel tent pegs

Monitoring of the translocated population will be undertaken every six months, commencing after planting. 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, number of inflorescences and fruits, whether second generation plants are present, whether ramet (new plants produced via underground runners) production has occurred and general health of the plants.

Monitoring of the original populations will also occur every six months in conjunction with monitoring of the translocated populations. 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, number of inflorescences and fruits and general health of the plants.

4.4 Source of Plants

Plants have been grown using tissue culture techniques from leaf shoot material. Shoot material has been collected from plants in population 2A and represents 17 clones. Tissue culture of the shoot material was undertaken by Dr Eric Bunn, at the laboratory facilities at Kings Park. Only a small number of clones were taken for this current proposal, to enable for refinement of tissue culture techniques. Once plants are successfully cultured and established they will be transferred to the accredited nursery at Kings Park. It is envisaged that future plantings will occur to increase the number of plants at the translocation site. Further collections of clones from population 2a and 2b will be made at this stage and these will represent geneotypes not currently represented in the *ex-situ* collection. In addition where possible seed resources will be utilised to produce seedlings for translocation.

4.5 Criteria for Success or Failure

Criteria for Success

- **Short Term:**

- establishment of translocated plants
- production of flowers and seed at similar levels to naturally occurring plants
- production of ramets at similar levels to naturally occurring plants (methodology for ramet identification as per Harding *et al*. (2003)).

- **Long Term:**

- the number of individuals is sustained by natural recruitment and ramet production.

Criteria for Failure

- **Short Term:**

- failure of translocated plants to establish
- failure of plants to produce flowers and seed or produce ramets.

- **Long Term:**

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

5. TIMETABLE

Time	Action
August 2003	Leaf material collected and propagated at Kings Park.
January 2005	Translocation site selected.
May 2005	Translocation proposal submitted for review.
June – July 2005	Planting
July 2005- June 2006	Monitoring and maintenance of translocation site.
October 2005	Setting up of irrigation system.
April 2006	Progress report.
June 2006 – May 2008	Monitoring and maintenance of translocation site.
May 2008	Progress Report

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 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.

7. REFERENCES

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Appendices One and Three may be available on contacting the authors

Appendix 2.

Site Diagram for Proposed Translocation of *Synaphea quartzitica*

The aim is to propagate around 100 plants of *Synaphea quartzitica*.
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**