

INTERIM RECOVERY PLAN NO. 128

# QUARTZ-LOVING SYNAPHEA (*SYNAPHEA QUARTZITICA*)

## INTERIM RECOVERY PLAN

**2003-2008**

Gillian Stack & Val English



Photograph: Gillian Stack

January 2003

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

## 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 replaces number 50 *Synaphea quartzitica* (G. Stack, and V. English, 1999). It incorporates current information on factors such as population, land tenure plant numbers and threats that, if changed from the previous plan, may affect appropriate recovery actions. In addition, it provides an update of which recovery actions have occurred.

This Interim Recovery Plan will operate from January 2003 to December 2007 but will remain in force until withdrawn or replaced.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 on 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 at January 2003.

## SUMMARY

<b>Scientific Name:</b>	<i>Synaphea quartzitica</i>	<b>Common Name:</b>	Quartz-loving Synaphea
<b>Family:</b>	Proteaceae	<b>Flowering Period:</b>	July – August
<b>Dept Region:</b>	Midwest	<b>Dept District:</b>	Moora
<b>Shire:</b>	Moora	<b>Recovery Team:</b>	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; George, A. S. (1995). *Synaphea*. *Flora of Australia* 16: 271-315; Harding, M.G. and Lamont, B.B. (2001) *Conservation biology of the rare Synaphea quartzitica and common Synaphea spinulosa*. Department of Environmental Biology, Curtin University of Technology, Western Australia.

**Current status:** *Synaphea quartzitica* was declared as Rare Flora in July 1998, and was ranked as Critically Endangered in Western Australia in November 1998. There has since been a perceived decline in level of threat to the species due to reservation of the biggest population and it is now recommended for listing as Endangered (EN under criterion D (World Conservation Union (IUCN) 2000)) due to the low number of plants. *Synaphea quartzitica* is also listed as Endangered under the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The species is known from four populations, with a total of less than 350 plants, many of which form part of clumps that are assumed to be clones, so it is likely that there are fewer than 200 genetically distinct individuals. The species is threatened by grazing, inappropriate fire regimes and possibly mining.

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

Population 1 of *Synaphea quartzitica* occurs within a plant community listed as Endangered in Western Australia. This IRP will therefore be implemented in conjunction with the IRP for the community described as 'Heath dominated by one or more of *Regelia megacephala*, *Kunzea praestans* and *Allocasuarina campestris* on ridges and slopes of the chert hills of the Coomberdale Floristic Region' (Hamilton Brown 1999), in which Population 1 of *Synaphea quartzitica* occurs.

**Critical habitat:** The critical habitat for *Synaphea quartzitica* comprises the area of occupancy of the known populations; similar habitat within 200 metres of known populations; remnant vegetation that links populations and additional nearby occurrences of similar habitat that do not currently contain the species but may have done so in the past and may be suitable for translocations.

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

Given that this species is listed as Critically Endangered it is considered that all known habitat for wild and translocated populations is habitat critical.

### Benefits to other species/ecological communities

Population 1 is located within an occurrence of a Threatened Ecological Community (TEC), and other Declared Rare Flora (DRF) (*Acacia aristulata* (DRF), *Daviesia dielsii* (DRF)) also occur in the vicinity of Population 1. *Acacia aristulata* is listed as Endangered, and *Daviesia dielsii* as Vulnerable under the EPBC Act. Recovery actions implemented to improve the quality or security of the habitat of *Synaphea quartzitica* Population 1 are likely to improve the status of the TEC in which this population is located, and populations of other listed species that occur in the same habitat.

### 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 *Synaphea quartzitica* 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

The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts. There are mineral leases over the area that contains population 1 of *Synaphea quartzitica*, however, an agreement has been negotiated

with the mining company with regard to the future management of the area that contains the habitat of the population. Recovery actions refer to continued liaison between stakeholders with regard to this area.

### Evaluation of the Plans 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.

**Habitat requirements:** *Synaphea quartzitica* is currently known from a range of approximately 40 linear km in the Moora - Watheroo area. It grows on the slopes of chert hills in open heath with *Melaleuca radula* and *Kunzea* species, adjacent to tall shrubland of *Allocasuarina campestris*. At Population 1, this species occurs with *Acacia aristulata* (DRF), *Daviesia dielsii* (DRF), *Acacia congesta* subsp. *cliftoniana* (Priority 1), *Baeckea* sp. Moora (Priority 3) and *Regelia megacephala* (Priority 4) and is part of the Endangered Heath community on the chert hills of the Coomberdale Floristic Region (Hamilton-Brown 2000).

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

1. All appropriate people have been made aware of the location and threatened status of the species.
2. Declared Rare Flora (DRF) markers have been installed at Population 2.
3. Dashboard stickers and posters describing the significance of DRF markers have been produced and distributed.
4. Negotiations to acquire the area on which Population 1 occurs as a Nature Reserve are well advanced.
5. Staff of the Department's Threatened Flora Seed Centre (TFSC) attempted, largely unsuccessfully, to collect seed in 1997 and again in 1998.
6. An information sheet that describes and illustrates the species has been produced.
7. Staff from the Department's Moora District regularly monitor populations of the species.
8. Detailed investigations have been undertaken into the species' population sizes, reproductive biology and growth rates
9. The Moora District Threatened Flora Recovery Team is overseeing the implementation of this IRP and will include information on progress in an annual report to the Department's Corporate Executive and funding bodies.

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

### Recovery criteria

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

### Recovery actions

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Coordinate recovery actions</li> <li>2. Preserve genetic diversity of the species</li> <li>3. Map critical habitat</li> <li>4. Undertake hand-pollination trials</li> <li>5. Undertake disturbance and watering trials</li> <li>6. Install DRF markers</li> <li>7. Control rabbits</li> <li>8. Seek to transfer care, control and management</li> </ol> | <ol style="list-style-type: none"> <li>9. Conduct further surveys</li> <li>10. Monitor populations</li> <li>11. Liaise with land managers</li> <li>12. Obtain biological and ecological information</li> <li>13. Develop and implement fire management strategy</li> <li>14. Promote awareness</li> <li>15. Review the need for a full Recovery Plan</li> </ol> |
|---|---|

## 1. BACKGROUND

### History

The first known collection of *Synaphea quartzitica* was from the Moora area in October 1908 by Dr. J. Burton Cleland and this specimen is now housed in New South Wales. Surveys conducted in August 1997 resulted in collection of a *Synaphea* specimen initially thought to be *Synaphea spinulosa*. However, this was positively identified as *S. quartzitica* by a taxonomist working on the genus. Surveys conducted in August 1998 located three additional populations nearby. However, all of the known populations are relatively small and isolated.

The wider habitat of Population 1 also contains populations of *Acacia aristulata* (DRF), *Daviesia dielsii* (DRF), *Acacia congesta* subsp. *cliftoniana* (Priority 1), *Baeckea* sp. Moora (Priority 3) and *Regelia megacephala* (Priority 4). It is part of the Heath community on the chert hills of the Coomberdale Floristic Region, which is ranked as Endangered (Hamilton-Brown 2000). This area has been subject to a mineral exploration lease, with interest focussed on the chert as a source of silicon. However, the process of transferring the care, control and management of this land to the Conservation Commission as a Nature Reserve is now well advanced, the mining company, Simcoa Operations Pty Ltd, has voluntarily relinquished its lease over this area and no mining is now likely to occur in the immediate vicinity of *Synaphea quartzitica*.

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

### Description

The genus *Synaphea* is endemic to the south-west of Western Australia. Fifty species are currently recognised, but taxonomic work is continuing on the resolution of various complexes. The genus consists of low shrubs that have small yellow tubular flowers, and strikingly varied leaf morphology (George 1995).

*Synaphea quartzitica* is a low sub-shrub with several stems. The flattened leaves have 6-15 cm long petioles, and are pinnately divided with two or three pairs of lobes to 6 mm wide. The flowering spikes carry many bright yellow flowers, are 6-18 cm long and are often only a little taller than the foliage. This species can be distinguished by the leaf shape, the length of flower spikes and the very narrow stigma (George 1995).

### Distribution and habitat

*Synaphea quartzitica* is endemic to the Moora - Watheroo area of Western Australia. It is known from four populations that contain a total of less than 350 plants, although the species is clonal and there appears to be fewer than 200 genetically distinct individuals. The species occurs on the slopes of chert hills in open heath with *Melaleuca radula* and *Kunzea* species, adjacent to tall shrubland of *Allocasuarina campestris*.

### 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*).

The critical habitat for *Synaphea quartzitica* comprises:

- the area of occupancy of known populations;
- areas of similar habitat within 200 metres of known populations, i.e. open heath associated with chert hills (these provide potential habitat for natural range extension);
- remnant vegetation that surrounds and links several populations (this is necessary to allow pollinators to move between populations); 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 listed as Critically Endangered it is considered that all known habitat for wild and any translocated populations is habitat critical.

### **Benefits to other species/ecological communities**

Population 1 is located within an occurrence of a Threatened Ecological Community (TEC), and other Declared Rare Flora (DRF) (*Acacia aristulata* (DRF), *Daviesia dielsii* (DRF)), also occur in the wider habitat of Population 1. *Acacia aristulata* is listed as Endangered, and *Daviesia dielsii* as Vulnerable under the EPBC Act. Recovery actions implemented to improve the quality or security of the habitat of *Synaphea quartzitica* Population 1 are likely to improve the status of the TEC in which this population is located, and populations of other listed species that occur in the same habitat.

### **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 *Synaphea quartzitica* 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**

The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts. There are mineral leases over the area that contains population 1 of *Synaphea quartzitica*, however an agreement has been negotiated with the mining company with regard the future management of the area that contains the habitat of the population. Recovery actions refer to continued liaison between stakeholders with regard this area.

### **Evaluation of the Plans 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**

Some *Synaphea* species have fire-tolerant rootstock that allows regeneration in the absence of seed. New growth has been observed resprouting from otherwise apparently dead plants of *Synaphea quartzitica*, so it is likely that this species would also resprout after fire. *Synaphea quartzitica* also produces suckers, and can use this mechanism to reproduce. This means that of the apparently total number of plants in any population, a smaller number will be genetically distinct individuals. Genetic diversity is important to enable the species as a whole to adapt to changing environments.

Seed set is low in most *Synaphea* species, including many that are fire-sensitive. Staff of the Department's Threatened Flora Seed Centre (TFSC) noted in October 1998 that virtually all the potential seed produced after flowering in August-September had aborted. The single *Synaphea quartzitica* seed collected at that time germinated approximately 10 weeks after treatment with gibberellic acid and nicking of the seed coat. Unfortunately, the seedling died before reaching maturity. The more frequent occurrence of this species along existing tracks and on long overgrown tracks suggests that disturbance stimulates germination. Alternatively, germination in these areas may relate to increased moisture. However, as it appears to set very little seed, this alone will not ensure success of the species.

The pollinators of *Synaphea* species are unknown, but are thought to be insects. Research suggests that pollen transfer appears to be the major factor limiting seed set in *Synaphea quartzitica* (Harding and Lamont 2001). On that basis, further research into the success of hand-pollination is a high priority, as is the discovery of the identity and requirements of pollinators of this species, which is crucial for its longer term management.

## Threats

Due to the species' restricted distribution and threats associated with growing in a specialised habitat, *Synaphea quartzitica* was declared as Rare Flora in July 1998, and ranked as Critically Endangered in November 1998, because of the low number of plants, scattered distribution within and between populations, and threats associated with growing in a specialised habitat over a restricted range. The species is known from four populations, with a total of less than 350 plants, many of which form part of clumps that are assumed to be clones. It is likely that there are only about 200 genetically distinct individuals. It is now recommended for listing as Endangered (EN) under criterion D (World Conservation Union (IUCN) 2000)) because the perceived level of threat has declined since 1998 due to research that indicates the species is capable of resprouting following disturbance. In addition one of the main populations is now unlikely to be impacted by mining as a consequence of negotiations that will result in conservation management of the site. When that process is concluded all populations will be on conservation land.

*Synaphea quartzitica* occurs in an unusual habitat associated with chert hills of low fertility, and is therefore likely to be naturally restricted. Its rarity has been exacerbated by the mining of chert as the raw material for silicon production, and extensive clearing for agriculture that has occurred in the Moora - Watheroo area, including clearing of the known habitat. In addition, the known populations are small and threatened by grazing, track maintenance activities, and inappropriate fire regimes.

- **Grazing** by rabbits (*Oryctolagus cuniculus*) has had an impact on the plants at Population 1. In addition, disturbance of soil by rabbit warren construction, increased nutrient levels and the introduction of weeds from their droppings are impacting on the habitat of the species. Grazing would have an impact on the establishment of young shoots of *Synaphea quartzitica* thereby limiting natural recruitment.
- **Track maintenance activities** have the potential to threaten plants and habitat at Populations 2, 3 and 4. Threats include grading, chemical spraying, construction of drainage channels and the mowing of vegetation alongside tracks. Several of these activities also encourage weed invasion.
- **Inappropriate fire regimes** may affect the viability of populations. Mature plants probably respond to fire by resprouting from lignotubers, and frequent fire would therefore deplete lignotuber reserves, as well as degrade the surrounding habitat. *Synaphea quartzitica* also produces very small quantities of seed, which may germinate following fire. Therefore, occasional fires may aid recruitment.
- **Very low level of seed production** threatens the species in the long term as the genetic diversity declines in all populations, leading to a decline in ability to adapt to changing conditions. This low seed set has been attributed to ineffective pollen transfer (Harding and Lamont 2001). This may be a natural characteristic as it applies to many species of *Synaphea*, but threatens this species because of the low total number of plants, due in part to clearing of much of the specialised habitat.

## Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1. North of Moora	Private property, soon to become a nature reserve.	1996 45 1998 69 (10) [19] 2001 91 (6) <b>2001 68 genets</b>	Good	Grazing, inappropriate fire regimes
2a. Watheroo Nat Park	National Park	1998 75+ 2000 146 (20) [5] 2001 194 (16) <b>2001 97 genets</b>	Good	Track maintenance, inappropriate fire regimes
2b. Watheroo Nat Park	National Park	2000 5	Good	Track maintenance, inappropriate fire regimes
3. Watheroo Nat Park	National Park	1998 3 2000 2 (3) [1]	Good	Track maintenance, inappropriate fire regimes
4. Watheroo Nat Park	National Park	1998 29 [11]	Good	Track maintenance, inappropriate fire regimes

Numbers in brackets = number of juveniles; numbers in square brackets = number of dead. Bold = number of genets (genetically distinct individuals). All other numbers refer to the number of ramets (clumps of plants assumed to be part of a clone).

## Guide for decision-makers

Section 1 provides details of current and possible future threats. Developments in the immediate vicinity of the population or within the defined critical habitat of *Synaphea quartzitica* require assessment. No developments should be approved unless the proponents can demonstrate that they will have no significant impact on the species, or 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 land managers have been notified of the location and threatened status of the species. The notification details the Declared Rare status of *Synaphea quartzitica* and the legal responsibility to protect it.

Declared Rare Flora (DRF) markers have been installed at Population 2. These serve to alert people working in the vicinity to the presence of DRF, and the need to avoid work that may damage plants or their habitat. Dashboard stickers and posters describing the significance of DRF markers have been produced and distributed.

The area of Population 1 supports an unusual habitat that is listed as an Endangered Ecological Community. The community contains populations of an additional two taxa of Declared Rare Flora - *Acacia aristulata* and *Daviesia dielsii* (ranked Endangered and Vulnerable respectively). The Department is in the process of acquiring this area through negotiations with stakeholders, with the ultimate goal of having this area declared an A Class Nature Reserve.

Staff of the Department's Threatened Flora Seed Centre (TFSC) attempted to collect seed in 1997 and again in 1998, without much success. Like most *Synaphea* species, *Synaphea quartzitica* sets almost no viable seed. The single seed collected germinated, but the seedling died before reaching maturity (personal communication A. Cochrane<sup>1</sup>).

<sup>1</sup> Anne Cochrane, Manager, the Department's Threatened Flora Seed Centre



Growth of *Synaphea quartzitica* from cuttings has not yet been attempted. Some *Synaphea spinulosa* plants have been successfully grown from cuttings by the Botanic Garden and Parks Authority (BGPA) nursery, despite an extremely low strike rate. BGPA staff have also successfully grown *Synaphea stenoloba* in tissue cultured.

A double-sided information sheet was produced in 2002, and includes a description of the plant, its habitat, threats, recovery actions and photos.

Staff from the Department's Moora District regularly monitor all populations of this species.

Detailed investigations have been undertaken into the species' population sizes, reproductive biology and growth rates (Harding and Lamont 2001).

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 continue to coordinate recovery actions for *Synaphea quartzitica* and other Declared Rare Flora in the district. 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:** \$400 per year

#### 2. Preserve genetic diversity of the species

Preservation of germplasm is essential to guard against extinction if wild populations are lost. Such collections are also needed to propagate plants for translocations. Despite several attempts to collect seed of *Synaphea quartzitica*, none has been stored due to its extremely low rate of 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. There is currently no germplasm of this species held in storage.

**Action:** Preserve genetic diversity of the species  
**Responsibility:** The Department (Moora District), BGPA through MDTFRT  
**Cost:** \$6,100 per year in first, second and third years

#### 3. 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

#### 4. Undertake hand-pollination trials

Harding and Lamont (2001) found that pollen transfer was the major factor limiting seed set in this species. Seed-set in many Proteaceous species is naturally low, but is likely to be limiting the resilience of this species. Hand-pollination of flowers will be trialed to ascertain whether this will increase the level of viable seed set. Reproduction by seed provides greater genetic diversity than is possible by vegetative means, and should be fostered if possible. Greater genetic diversity provides the species with greater ability to deal with change.

**Action:** Undertake hand-pollination trials  
**Responsibility:** The Department (Moora District) through the MDTFRT  
**Cost:** \$1,500 in second, third and fourth years

#### 5. Undertake disturbance and watering trials

The occurrence of greater numbers of plants near tracks in Watheroo National Park suggests that disturbance and/or moisture levels are a factor in germination. Disturbance and watering trials will be conducted to assess the germination response of soil-stored seed.

**Action:** Undertake disturbance and watering trials  
**Responsibility:** The Department (Moora District) through the MDTFRT  
**Cost:** \$1,500 in third, fourth and fifth years

#### 6. Install Declared Rare Flora markers

Declared Rare Flora (DRF) markers are required for Populations 3 and 4 that occur in Watheroo National Park. Their purpose is to alert people operating in the area (e.g. the Department's operational staff, the Bush Fire Brigade and Shire staff and contractors) to the presence of DRF to help prevent accidental damage.

**Action:** Install DRF markers  
**Responsibility:** The Department (Moora District) through the MDTFRT  
**Cost:** \$400 in first year

#### 7. Control rabbits

Population 1 is affected by rabbits. There is evidence of grazing on the plants themselves, and young shoots are extremely vulnerable to grazing. In addition, the soil is being disturbed by rabbit warren construction, and this combined with the increased nutrient levels and the presence of weed seed in their droppings is introducing weeds into the habitat. Baiting will be undertaken in and around this area.

**Action:** Control rabbits  
**Responsibility:** The Department (Moora District) through the MDTFRT  
**Cost:** \$1,100 per year in second and third years

#### 8. Seek to transfer care, control and management of habitat of Population 1

Negotiations into transferring the care control and management of the habitat of Population 1 to the Conservation Commission for the purpose of conservation are well advanced. These negotiations will continue.

**Action:** Seek to transfer care, control and management of habitat of Population 1  
**Responsibility:** The Department (Land Administration, Moora District) through the MDTFRT  
**Cost:** \$500 in second year

#### 9. Conduct further surveys

Further surveys will be conducted for this species during its flowering period (July-August) in appropriate habitat in Watheroo National Park, and on private lands wherever possible. For example, an area of private property adjacent to Population 1 has been identified as suitable habitat. Areas considered suitable for

translocation will also be noted. Volunteers from the local community, Wildflower Societies and Naturalist Clubs will be encouraged to be involved in surveys supervised by CALM staff.

**Action:** Conduct further surveys  
**Responsibility:** The Department (Moora District) through the MDTFRT  
**Cost:** \$2,400 per year in second and fourth years

## 10. Monitor populations

Annual monitoring of factors such as habitat degradation (including weed invasion, plant diseases such as *Phytophthora cinnamomi* and salinity), population stability (expansion or decline), pollinator activity, seed production, recruitment, longevity and predation is essential. For Populations 2, 3 and 4, monitoring will include inspection of the visibility of DRF markers. The paint on markers may become dull with time, or vegetation growth may obscure markers, rendering them ineffective.

**Action:** Monitor populations  
**Responsibility:** The Department (Moora District) through the MDTFRT  
**Cost:** \$500 per year

## 11. Liaise with land managers

Staff from the Department's Moora District will continue liaising with National Park rangers and others to ensure that populations are not accidentally damaged or destroyed by operational staff from the Department, Bush Fires Brigade, Shire or other groups.

**Action:** Liaise with land managers  
**Responsibility:** The Department (Moora District) through the MDTFRT  
**Cost:** \$700 per year

## 12. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Synaphea quartzitica* will provide a better scientific basis for its management in the wild. An understanding of the following is particularly necessary for effective management:

1. Soil seed bank dynamics and the role of various disturbances (including fire), competition, rainfall and grazing in germination and recruitment.
2. The identity and requirements of pollinators.
3. The reproductive strategies, phenology and seasonal growth of the species.
4. The population genetic structure, levels of genetic diversity and minimum viable population size.

**Action:** Obtain biological and ecological information  
**Responsibility:** The Department (Science Division, Moora District) through the MDTFRT  
**Cost:** \$20,900 per year in second, third and fourth years

## 13. Develop and implement a fire management strategy

*S. quartzitica* can resprout from root suckers, and this may help plants survive disturbances such as fire. There may also be some recruitment from soil-stored seed. However, frequent fires may be detrimental to the long-term survival of the species, through depletion of lignotuber reserves. Fire also promotes the introduction of weed species, degrading associated habitat.

A fire management strategy will be developed in consultation with relevant parties to determine recommendations for fire intensity and frequency and fire control measures.

**Action:** Develop and implement a fire management strategy  
**Responsibility:** The Department (Moora District) through the MDTFRT  
**Cost:** \$2,600 in first year and \$1,000 in subsequent years

#### 14. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of wild populations of *Synaphea quartzitica* will 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.

A reply paid postal drop illustrating *S. quartzitica* and describing its distinctive features and habitat will be produced and distributed by the Department's Moora District office to residents of Shires containing possible habitat of the species. Postal drops aim to stimulate interest, provide information about threatened species and provide a name and number to contact if new populations are found by members of the community.

**Action:** Promote awareness  
**Responsibility:** The Department (Moora District, Corporate Relations) through the MDTFRT  
**Cost:** \$1,100 in first and second years and \$700 in subsequent 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 (WA Threatened Species and Communities Unit, Moora District) through the MDTFRT  
**Cost:** \$20,300 in fifth year (if full Recovery Plan required)

## 4. TERM OF PLAN

This Interim Recovery Plan will operate from January 2002 to December 2007 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:

Ryonen Butcher	Ph.D. Student - taxonomy of <i>Synaphea</i> , University of Western Australia
Martin Caldwell	Geologist
Anne Cochrane	Manager, the Department's Threatened Flora Seed Centre
Melanie Harding	previously Honours student – conservation biology of <i>S. quartzitica</i> , Curtin University
Diana Papenfus	Botanist, previously W.A. Herbarium
Robert Powell	Acting Land Acquisitions Officer, the Department's Land Administration Unit

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*. Department of Conservation and Land Management, Western Australia.

- Department of Conservation and Land Management (1994) Policy Statement No. 50 *Setting Priorities for the Conservation of Western Australia's Threatened Flora and Fauna*. Department of Conservation and Land Management, Western Australia.
- Department of Conservation and Land Management (1995) Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. Department of Conservation and Land Management, Western Australia.
- Department of Conservation and Land Management (1998) Western Australian Herbarium FloraBase – Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia. <http://www.calm.wa.gov.au/science/>
- George, A.S. (1995). *Synaphea*. *Flora of Australia* 16: 271-315. Australian Government Publishing Service, Canberra.
- Hamilton-Brown, S. (2000) *Interim Recovery Plan - Heath dominated by one or more of Regelia megacephala, Kunzea praestans and Allocasuarina campestris on ridges and slopes of the chert hills of the Coomberdale Floristic Region*. Department of Conservation and Land Management, Western Australia.
- Harding, M.G. and Lamont, B.B. (2001) *Conservation biology of the rare Synaphea quartzitica and common Synaphea spinulosa*. Department of Environmental Biology, Curtin University of Technology, Western Australia.
- Stack, G. and English, V. (1999) Interim Recovery Plan number 50, 1999-2002 *Synaphea quartzitica*. 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

George, A. S. (1995). *Synaphea*. *Flora of Australia* 16: 271-315. Australian Government Publishing Service, Canberra.

### **Synaphea quartzitica**

Stems several, to 7 cm long, branched, silky but covered by leaf bases. Leaves pinnatipartite with 2 or 3 pairs of lobes, gently undulate; petiole 6-15 cm long, pilose, glabrescent; lamina 6.5-8 cm long, 8-9 cm wide, pilose to pubescent, glabrescent; primary lobes 3-6 mm wide, tripartite, the upper ones simple; ultimate lobes triangular, abruptly pungent; reticulation very fine, shallow. Inflorescence not or shortly exceeding foliage; spikes 6-18 cm long; flowers rather openly spaced; peduncle 2-10 cm long, branched, tomentose to puberulous, prominently striate; rachis puberulous; bracts ascending, 1-2 mm long, broad, acute, puberulous to hirsute in lower half. Perianth spreading, opening moderately widely, glabrous; adaxial tepal 4.5-5 mm long, 1.5-2 mm wide, strongly curved; abaxial tepal 2.5-3.5 mm long. Stigma narrowly oblong, slightly broadened at base, emarginate, 0.8-1 mm long, 0.3-0.4 mm wide, straight to gently sigmoid, thick; ovary pubescent. Fruit narrowly obovoid, 4 mm long, pubescent.

Flowers July-Aug.

Distinguished by the leaf shape, long spikes, prominently curved adaxial tepal with much shorter abaxial tepal and very narrow stigma. The tip of the abaxial tepal is slightly recurved.

