INTERIM RECOVERY PLAN NO. 180

SWAMP STARFLOWER

(*CALYTRIX BREVISETA* SUBSP. *BREVISETA*)

INTERIM RECOVERY PLAN

2004-2009

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Photograph: Andrew Brown

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DEPARTMENT OF Conservation AND LAND MANAGEMENT
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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 replaces number 16 Swamp Starflower (*Calytrix breviseta* subsp. *breviseta*) (K. Kershaw *et al*. 1997).

This Interim Recovery Plan will operate from May 2004 to April 2009 but will remain in force until withdrawn or replaced.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 given regional approval on 30 August 2004 and was approved by the Director of Nature Conservation on 24 September 2004. The allocation of staff time and 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 May 2004.

ACKNOWLEDGMENTS

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

Anne Cochrane	Manager, CALM's Threatened Flora Seed Centre
Colin Crane	Senior Technical Officer, CALM's Science Division
Andrew Crawford	Technical Officer, CALM's Threatened Flora Seed Centre
Rebecca Evans	Conservation Officer, CALM's Swan Region
Leonie Monks	Research Scientist, CALM's Science Division
Diana Papenfus	Project Officer, CALM's WA Threatened Species and Communities Unit
Amanda Shade	Horticulturalist, Botanic Gardens and Parks Authority
Andrea Zappacosta	Department of Planning and Infrastructure

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

SUMMARY

Scientific Name:	*Calytrix breviseta* Lindl. subsp. *breviseta*	**Common Name:**	Swamp Starflower
Family:	Myrtaceae	**Flowering Period:**	September to November
CALM Region:	Swan	**CALM District:**	Swan Coastal
Shire:	Gosnells	**Recovery Team:**	Swan Region Threatened Flora and Communities Recovery Team

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; Evans, R. and Willers, N. (2003) Swan Region Threatened Flora Management Program (in draft), Department of Conservation and Land Management, Perth; Curry, S. and Kelly, A. (1993) Endangered! The Swamp Starflower *Landscope* 8 (4), 27; Western Australian Herbarium (1998) FloraBase - Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia. http://www.calm.wa.gov.au/science/.

Current status: *Calytrix breviseta* subsp. *breviseta* was declared as Rare Flora in May 1991 under the Western Australian *Wildlife Conservation Act 1950* and ranked as Critically Endangered (CR) in September 1995. The taxon is also listed as Endangered under the Commonwealth *Environmental Protection and Biodiversity Conservation* Act 1999 (EPBC Act). It currently meets World Conservation Union (IUCN 2000) Red List Category 'CR' under criteria B1ab(iii)+2ab(iii) as it is only known from one location and there is continuing decline in the quality of habitat. The main threats are weed invasion, firebreak maintenance, rabbits, inappropriate fire regimes, hydrological change including salinisation, rubbish dumping, grazing and trampling by horses, and dieback disease.

Critical habitat: The critical habitat for *Calytrix breviseta* subsp. *breviseta* comprises the area of occupancy of the known populations; similar habitat within 200 metres of known populations; remnant vegetation that links populations; additional nearby occurrences of similar habitat that do not currently contain the taxon but may have done so in the past and may be suitable for translocations; and the local catchment for the surface and possibly ground waters that provide the winter-wet habitat of the taxon.

Habitat critical to the survival of the species, and important populations: Given that this taxon is listed as Declared Rare Flora it is considered that all known habitat for wild and translocated populations is habitat critical and that all populations, including translocated populations, are important.

Benefits to other species/ecological communities: The taxon is not located within any Threatened Ecological Communities (TECs). The habitat supports *Grevillea thelemanniana* (Priority 4), and has the potential to support the Endangered *Diuris purdiei*.

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. Brixton Street and associated wetlands were also listed in the Australian Register of Significant Wetlands in November 2000.

Role and interests of indigenous people: According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register, Aboriginal artefacts have been discovered nearby but these data are unreliable. Input and involvement will be sought from any indigenous groups that have an active interest in the areas that are habitat for *Calytrix breviseta* subsp. *breviseta*, and this is discussed in the recovery actions.

Social and economic impacts: The implementation of this recovery plan is unlikely to have any major social and economic impact.

Evaluation of the Plans Performance: CALM, in conjunction with the Recovery Team will evaluate the performance of this IRP. The plan is to be reviewed within five years of its implementation.

Habitat requirements: *Calytrix breviseta* subsp. *breviseta* grows on low lying, sandy clay flats among low heath of *Verticordia acerosa*, *Verticordia plumosa*, *Calothamnus hirsutus* and *Melaleuca uncinata*, over very open low sedges.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented:
1. Land managers have been notified of the location and threatened status of the taxon.
2. Declared Rare Flora (DRF) markers have been installed along the firebreaks at Subpopulations 1a and 2.
3. Dashboard stickers and posters describing the significance of DRF markers have been produced and distributed.

4. Private land that contains populations of *Calytrix breviseta* subsp. *breviseta* has been purchased by the State Planning Commission.
5. Research on the reproductive biology of the taxon is currently being undertaken by staff from CALM's Science Division.
6. A Fire Management Strategy was developed for the site in January 2000.
7. Shade cloth was erected at Subpopulation 1a in 1997 to help prevent weed seed entering, and in 1999 and 2000, the area was also sprayed with Fusilade.
8. Weed control plots were installed by staff from CALM's Science Division, and monitored in May and September/October 1996.
9. Collections of seed were made in 1994 and 1995, but the material was infertile. Further collections in 1996 had an initial germination rate of 100%, and 96% after one year in storage.
10. A preliminary hydrological study of the wetlands that contain *Calytrix breviseta* subsp. *breviseta* was completed in 2001.
11. The Friends of Brixton St wetlands have undertaken monthly hydrological monitoring since 2001.
12. The Botanic Gardens and Parks Authority (BGPA) currently have 21 plants in their nursery from four different clones.
13. An A4 sized poster, that provides a description of the subspecies and information about threats and recovery actions, has been developed for *Calytrix breviseta* subsp. *breviseta*.
14. The Swan Region Threatened Flora Recovery Team (SRTFCRT) is overseeing the implementation of this IRP and will include information on progress in their annual report to CALM's Corporate Executive and funding bodies.
15. Staff from CALM's Swan Coastal District regularly monitor all populations of this taxon.

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 taxon 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 over the period of the plan's adoption under the EPBC Act.

Criteria for failure: The number of individuals within populations and/or the number of populations have decreased by ten percent or more over the period of the plan's adoption under the EPBC Act.

Recovery actions

1. Coordinate recovery actions.
2. Map critical habitat.
3. Transfer care, control and management to Conservation Commission.
4. Undertake weed control.
5. Install DRF markers.
6. Fence populations.
7. Continue hydrological monitoring
8. Redirect drainage and fill in culvert.
9. Remove rubbish.
10. Collect seed and cutting material.
11. Develop and implement a Translocation Proposal
12. Monitor populations.
13. Implement fire management strategy
14. Stimulate the germination of soil-stored seed.
15. Conduct further surveys.
16. Control rabbits.
17. Maintain disease hygiene.
18. Promote awareness.
19. Obtain biological and ecological information.
20. Review the need for a full Recovery Plan.

1. BACKGROUND

History

The first known collection of *Calytrix breviseta* subsp. *breviseta*, housed at the Western Australian Herbarium, was made in 1901 by C. Andrews, near Bellevue. A further collection was made from Gosnells in 1915. The taxon was then thought to be extinct until 1990 when rediscovered by CALM staff.

Numerous surveys for this taxon have been undertaken by CALM staff in the Bellevue area, Ellen Brook Nature Reserve, heath near the Mundijong Road-Kargotich Road junction, Tonkin Highway, Railway Marshalling Yard, Guildford Cemetery, Hartfield Country Club in Forrestfield, areas near Forrestdale Lake, Keane Road and Passmore Road in Gosnells, Turner Road in Byford and the junction of High and Nicholson Roads in Canning Vale, but have not been successful. A population believed to be *Calytrix breviseta* subsp. *breviseta* was found in Ellis Brook Valley in 2000 by a volunteer. However this specimen was later identified as *C. variabilis*. Very little of the habitat suitable for the taxon still exists in the known distribution, and the probability of finding new viable populations of the taxon is low. Currently, *Calytrix breviseta* subsp. *breviseta* is known from two populations consisting of approximately 3520 plants.

An Interim Recovery Plan (IRP) for this taxon was published in 1997 for the period 1996 to 1999 (Kershaw *et al*. 1997). A review undertaken in 2001 (Burbidge *et al*. 2001) found that although there were still a number of recovery actions yet to be implemented, including land reservation, research and translocation planning, the overall threat to the taxon had declined. This was mainly due to increased security of tenure of some of the land on which populations occur. A full Recovery Plan was not warranted as the taxon was close to being moved to a lower category of threat, therefore a new IRP was recommended and was to include the actions listed above as a high priority.

The location containing *Calytrix breviseta* subsp. *breviseta* is a Bush Forever site (Number 387) because it is an area of 'regional significance bushland to be retained and protected forever' (State of Western Australia 2000). As part of the implementation of the Plan, a number of lots, including all those that contain populations of the *Calytrix*, have been purchased for conservation.

Description

Calytrix breviseta Lindl. subsp. *breviseta* is an erect or spreading shrub that can grow up to 40 cm high. The leaves are widely spaced, linear to narrowly elliptic, 2 to 10 mm long and 0.4 to 1.1 mm wide and are arranged alternately along the stem. The taxon has purplish-blue flowers that contain numerous stamens (Brown *et al*. 1998).

The taxon is distinguished from *Calytrix breviseta* subsp. *stipulosa* (which is found in mallee and heath communities east of the Darling Range) in having longer, usually linear leaves, longer petals, a greater number of stamens, equal rather than unequal bracteoles and a swampy clay-flat habitat (Brown *et al*. 1998).

Distribution and habitat

Calytrix breviseta subsp. *breviseta* is endemic to Western Australia and although originally recorded from Gosnells and Bellevue the taxon is now apparently confined to the Kenwick area. The taxon is found on low lying, sandy clay flats among low heath of *Hypocalymma angustifolium*, *Actinostrobus pyramidalis*, *Kunzea recurva*, *Pericalymma ellipticum*, *Viminaria juncea*, *Burchardia multiflora*, *Meeboldina cana*, *Diuris longifolia*, *Verticordia acerosa*, *Verticordia plumosa*, *Calothamnus hirsutus* and *Melaleuca uncinata*, over very open low sedges.

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

Given that this taxon is listed as Declared Rare Flora it is considered that all known habitat is habitat critical. In addition all populations, including translocated populations, are considered important to the survival of the taxon. Recovery actions include survey for further populations that may lead to the identification of additional habitat critical.

Benefits to other species/ecological communities

The taxon is not located within any Threatened Ecological Communities. The habitat supports *Grevillea thelemanniana* (Priority 4), and has the potential to support the Endangered *Diuris purdiei*.

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. Brixton Street and associated wetlands were also listed in the Australian Register of Significant Wetlands in November 2000.

Role and interests of indigenous people

According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register, Aboriginal artefacts have been discovered nearby but these data are unreliable. Input and involvement will be sought from any indigenous groups that have an active interest in the areas that are habitat for *Calytrix breviseta* subsp. *breviseta*, and this is discussed in the recovery actions.

Social and economic impacts

The implementation of this recovery plan is unlikely to have any major social or economic impacts.

Evaluation of the Plan's Performance

CALM, in conjunction with the Swan Region Threatened Flora and Communities Recovery Team will evaluate the performance of this Interim Recovery Plan. The plan is to be reviewed within five years of its implementation. Any changes to management or recovery actions will be documented accordingly.

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 *Calytrix breviseta* subsp. *breviseta* comprises:

- the area of occupancy of known populations;
- areas of similar habitat within 200 metres of known populations, ie. low lying, sandy clay flats among low heath, over very open low sedges (these provide potential habitat for natural range extension);
- remnant vegetation that surrounds or links populations (this is necessary to allow pollinators to move between populations);
- additional occurrences of similar habitat that do not currently contain the taxon but may have done so in the past (these represent possible translocation sites); and
- the local catchment for the surface and possibly ground waters that provide the winter-wet habitat of the taxon (the taxon occurs on clay flats that are seasonally inundated and whose occurrence depends on the maintenance of local hydrology).

Biology and ecology

Very little is known about the biology and ecology of *Calytrix breviseta* subsp. *breviseta*. The subsequent germination of numerous seedlings following a fire at Subpopulation 1a in January 1994 indicates that germination of the taxon is likely to be stimulated by fire or smoke. In addition, population monitoring in 2003 revealed that there were many seedlings of various ages in Subpopulation 1a, despite the absence of

any obvious disturbances such as fire or grading, since 1994. This indicates the taxon is also capable of germinating from soil-stored seed in the absence of obvious disturbance.

Although dieback disease has been identified at the site, results of testing indicate that *Calytrix breviseta* subsp. *breviseta* is not susceptible to dieback disease caused by *Phytophthora* spp. Out of 46 individuals that were inoculated with the pathogen, no deaths occurred (pers comm. C. Crane[1]).

Threats

Calytrix breviseta subsp. *breviseta* was declared as Rare Flora in May 1991 under the Western Australian *Wildlife Conservation Act 1950* and ranked as Critically Endangered (CR) in September 1995. The taxon is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation* Act 1999 (EPBC Act). It currently meets World Conservation Union (IUCN 2000) Red List Category 'CR' under criteria B1ab(iii)+2ab(iii) as it is only known from one location and there is a continuing decline in the quality of habitat. The main threats are weed invasion, firebreak maintenance, poor regeneration, rabbits, inappropriate fire regimes, altered hydrology, rubbish dumping, grazing and trampling by horses, and dieback disease.

- **Weed invasion** is a major threat to all populations. Weeds recorded at populations include *Watsonia meriana* (Bulbil watsonia), *Sparaxis bulbifera*, *Echium plantagineum* (Paterson's curse), *Gladiolus* sp., *Parentucellia viscosa* (sticky bartsia), *Romulea rosea* (Guildford grass), *Asphodelus fistulosus* (onion weed) and *Trifolium campestre* (hop clover), and grasses such as *Avena* sp. (oats), *Eragrostis curvula* (African lovegrass), and *Vulpia myuros* (rat's tail fescue) (Obbens 1997). Weeds suppress early plant growth by competing for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of high fuel loads, which are produced annually by many weed species.

- **Firebreak maintenance activities** threaten Subpopulations 1a and 1c, and Population 2. Threats include grading, chemical spraying, construction of drainage channels and the mowing of roadside vegetation. Several of these actions also encourage weed invasion.

- **Rabbits** (*Oryctolagus cuniculus*) have been observed at all populations and although there is no evidence that the *Calytrix breviseta* subsp. *breviseta* is being grazed, rabbits are impacting on the habitat by causing soil disturbance. Increased nutrient levels in the soil from rabbit droppings can also occur, and result in increased weed invasion. Grazing could have an impact on the establishment of young shoots of *C. breviseta* subsp. *breviseta* thereby limiting natural recruitment.

- **Inappropriate fire regimes** may affect the viability of populations of *Calytrix breviseta* subsp. *breviseta*. It is thought that the taxon is killed by fire and germinates from soil stored seed as regeneration was observed at Subpopulation 1a following a fire in 1994. Too frequent fire may destroy populations before regenerating or juvenile plants reach maturity and replenish the soil seed bank.

- **Hydrological change including salinisation** may be impacting the taxon. Salinisation can occur as a consequence of evaporation of increased levels of surface water resulting in salt residues on the soil. This appears to be impacting on the taxon and leading to degradation of its habitat. If not addressed, this decline appears likely to continue in the medium to long term. In particular, a drainage channel constructed on an adjacent property is draining into the centre of the location containing Subpopulation 1b. Salinity in the area appears to have increased, with salt tolerant species such as *Sarcocornia* sp. now occurring at the edge of the location. Although *Calytrix breviseta* subsp. *breviseta* plants had been previously recorded at the site, none were located during a recent survey.

  A report by V & C Semeniuk Research Group states that the hydrology of the area known as the Greater Brixton St Wetlands has been altered by local drains, tracks and possibly landuses in the broader catchment (V & C Semeniuk Research Group 2001). Additional hydrological monitoring will help to

[1] Colin Crane, Senior Technical Officer, CALM's Science Division

provide more information on which to base recommendations for future management of the catchment that would be favourable for *Calytrix breviseta* subsp. *breviseta* and its habitat.

- **Rubbish dumping** along the road verge and in the reserve that contains *Calytrix breviseta* subsp. *breviseta* is a minor threat to all populations. Apart from visual impacts, rubbish, in particular garden waste, introduces weed seeds into the bushland and increases the risk of fire.

- **Grazing and trampling by horses** is a threat to most populations of *Calytrix breviseta* subsp. *breviseta*. In the past horse riding activity has been recorded along the firebreaks in all areas that contain populations of the subspecies. Horses exacerbate the deterioration of the bushland through the spread of weeds and disease, and the trampling of vegetation. Adequate fencing of the reserves will prevent access by horses.

- **Dieback disease** is a threat to the habitat at all populations of *Calytrix breviseta* subsp. *breviseta*. Dieback disease (*Phytophthora* spp.) is a pathogen that causes the roots to rot and results in susceptible plants dying of drought stress. Although it appears the taxon is not susceptible to the disease, other species in the habitat are susceptible and there are signs of infestation at Subpopulation 1a.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1A. Kenwick	State Planning Commission	1990 100+ 1991 200+ 1992 500+ 1995 (300+) 1996 (300+) 1997 (100+) 2001 665 2003 2723 (78)	Healthy	Weeds, rabbits, firebreak maintenance, inappropriate fire regimes, salinity, rubbish dumping, horses
1B. Kenwick	State Planning Commission	1992 200+ 1995 130 (5) 1997 321+ 2003 201	Moderate	Inappropriate fire regimes, rabbits, poor regeneration, weeds, salinity, rubbish dumping, horses
1C. Kenwick	State Planning Commission	1997 50 (20) 2003 293	Healthy	Firebreak maintenance, inappropriate fire regimes, rabbits, weeds, poor regeneration, salinity, horses, rubbish dumping
2. Kenwick	State Planning Commission	1992 100+ 1995 270 (30) 2003 303	Moderate	Firebreak maintenance, weeds, inappropriate fire regimes, poor regeneration, rabbits, salinity, rubbish dumping, horses

Numbers in brackets = number of seedlings.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Developments in the immediate vicinity of the populations or within the defined critical habitat of *Calytrix breviseta* subsp. *breviseta* require assessment. No developments should be approved unless the proponents can demonstrate that they will have no significant impact on the taxon, its habitat or potential habitat, or the local surface or ground water hydrology.

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 taxon 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 over the period of the plan's adoption under the EPBC Act.
Criteria for failure: The number of individuals within populations and/or the number of populations have decreased by ten percent or more over the period of the plan's adoption under the EPBC Act.

3. RECOVERY ACTIONS

Existing recovery actions

Land managers have been notified of the location and threatened status of the taxon. The notification details the Declared Rare status of *Calytrix breviseta* subsp. *breviseta* and the legal responsibility to protect it.

Declared Rare Flora (DRF) markers have been installed along the firebreaks at Subpopulations 1a and 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 also been produced and distributed.

Private properties that contain populations of *Calytrix breviseta* subsp. *breviseta* have been purchased by the State Planning Commission. This land will eventually be transferred to the care, control and management of the Conservation Commission of Western Australia. A number of these lots were surveyed for additional populations of the taxon in 2003 by CALM staff, however no new populations have been located.

Research on the reproductive biology of the taxon is currently being undertaken by staff from CALM's Science Division.

A Fire Management Strategy was developed for the site in January 2000 by CALM staff, in consultation with all relevant stakeholders, including Friends Groups, Fire and Emergency Services and City of Gosnells. This plan aims to help maintain the high conservation values of the site through controlling fire frequency and using fire control methods that promote regeneration of the bushland.

Shade cloth was erected at Subpopulation 1a in 1997 by staff from the Swan Coastal District in an attempt to reduce weed seed blowing in from a nearby paddock. In 1999 and 2000, this area was also sprayed with Fusilade to reduce African Lovegrass (*Eragrostis curvula*) invasion.

Two ten by ten metre plots were installed and monitored in May (before rain) and on September/October 1996 (after rain) by staff from CALM's Science Division. The plots were installed for weed control trials, but spraying did not take place as the site was still inundated. There was a significant difference between the two plots in the percentage of native and total plant cover, and this was mainly due to differences in the proportions of sedges and shrubs. Seedling mortality recorded in the plots in 1996 was 10% and 12.9%. Fruit set was estimated to be 90% or more (Obbens 1997).

Collections of seed were made by CALM staff in 1994 and 1995, but material collected was infertile. Approximately 1261 seeds were collected from Subpopulation 1a in November 1996 and stored in CALM's Threatened Flora Seed Centre (TFSC) at –18°C. The TFSC test the viability of the seed initially and after one year in storage. The initial germination rate of *Calytrix breviseta* subsp. *breviseta* seed was found to be 100%, and after one year in storage was 96% (unpublished data, A. Cochrane[2]).

A hydrological study of the Greater Brixton St Wetlands was commissioned by the Friends of Brixton St in 2001 (V & C Semeniuk Research Group 2001). The study provides preliminary information about the hydrology of the habitat of *Calytrix breviseta* subsp. *breviseta.* The Friends of Brixton Street Wetlands group have monitored groundwater and surface water along a number of transects monthly since 2001.

The Botanic Gardens and Parks Authority (BGPA) currently have 21 plants in their nursery. These plants are from four different clones, two of which were from cuttings taken in 1991 and 1994, and two from seed collected in 1996 (pers comm. A. Shade[3]).

An A4 sized poster, that provides a description of the subspecies and information about threats and recovery actions, has been developed for *Calytrix breviseta* subsp. *breviseta*. It is hoped that the poster will result in the discovery of new populations.

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

The Swan Region Threatened Flora and Communities Recovery Team (SRTFCRT) is overseeing the implementation of this IRP and will include information on progress in their annual report to CALM's Corporate Executive and funding bodies.

Staff from CALM's Swan Coastal District regularly monitor all populations of this taxon.

Future recovery actions

Where populations occur on lands other than those managed by CALM, permission has been or will be sought from appropriate land managers prior to recovery actions being undertaken. The following recovery actions are roughly in order of descending priority; however this should not constrain addressing any of the priorities if funding is available for 'lower' priorities and other opportunities arise.

1. Coordinate recovery actions

The SRTFCRT will continue to coordinate recovery actions for *Calytrix breviseta* subsp. *breviseta* and other Declared Rare Flora in their region. They will include information on progress in their annual report to CALM's Corporate Executive and funding bodies. Input and involvement will also be sought from any indigenous groups that have an active interest in areas that are habitat for *C. breviseta* subsp. *breviseta*.

Action: Coordinate recovery actions
Responsibility: CALM (Swan Coastal District) through the SRTFCRT
Cost: $1,600 per year.

2. 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: CALM (Swan Coastal District, WATSCU) through the SRTFCRT
Cost: $2,000 in the first year

3. Transfer Care, Control and Management to Conservation Commission

The land that contains *Calytrix breviseta* subsp. *breviseta* will be transferred to the care, control and management of the Conservation Commission of Western Australia as an A class reserve for the purpose of 'Conservation of Flora and Fauna'. The land will then be managed by CALM on behalf of the Conservation Commission.

Action: Transfer care, control and management to Conservation Commission
Responsibility: CALM (Swan Coastal District; Land Administration Section) through the SRTFCRT
Cost: $2,000 in the first year

4. Undertake weed control

Weed control will be undertaken as required in populations of *Calytrix breviseta* subsp. *breviseta*, in consultation with the land managers. Appropriate methods of weed control are found in Brown and Brooks (2002) and may include hand weeding or localised application of herbicide. All applications of weed control will be followed by a report on the method, timing and success of the treatment, and the effect on *Calytrix breviseta* subsp. *breviseta* and associated native plant species. It is anticipated that native species in the habitat will regenerate after weed competition is removed.

Action: Undertake weed control
Responsibility: CALM (Swan Coastal District) through the SRTFCRT
Cost: $500 per year.

5. Install Declared Rare Flora markers

Declared Rare Flora (DRF) markers are required along the firebreak at Subpopulation 1c. Their purpose is to alert people operating in the area to the presence of DRF and to help prevent habitat disturbance.

Action: Install DRF markers
Responsibility: CALM (Swan Coastal District) through the SRTFCRT
Cost: $400 in first year.

6. Fence populations

Boundary fencing may need to be replaced and/or installed at a number of populations. It should include a buffer of surrounding habitat, to protect *Calytrix breviseta* subsp. *breviseta* from grazing and trampling by horses.

Action: Fence populations
Responsibility: CALM (Swan Coastal District) through the SRTFCRT
Cost: $10,000 in first year.

7. Continue hydrological monitoring

Studies by V & C Semeniuk Research Group (2001) recommend further monitoring of the greater Brixton St Wetlands. Data will include monthly monitoring of groundwater and surface water along a number of transects. This information will help in the formulation of future recommendations for management of the catchment that will help maintain the wetlands habitat of *Calytrix breviseta* subsp. *breviseta*.

Action: Continue hydrological monitoring
Responsibility: CALM (Swan Coastal District) through the SRTFCRT
Cost: $2,800 per year.

8. Redirect drainage and fill in culvert

The drainage culvert constructed on the adjacent property to drain into the location containing Subpopulation 1b will be redirected and the remaining culvert filled in.

Action: Redirect drainage and fill in culvert
Responsibility: CALM (Swan Coastal District) through the SRTFCRT
Cost: $700 in first year.

9. Remove rubbish

Rubbish dumped in the reserve at all populations will be removed and disposed of correctly. The City of Gosnells will also be contacted to remove any rubbish dumped on the road.

Action: Remove rubbish
Responsibility: CALM (Swan Coastal District) through the SRTFCRT
Cost: $200 per year.

10. Collect seed and cutting material

Preservation of germplasm is essential to guard against extinction if wild populations are lost. Such collections are also needed for plants for translocations. Seed is required from all populations to maximise the genetic diversity of the *ex situ* material. Cuttings will also be obtained to establish a living collection at the BGPA.

Action: Collect seed and cutting material
Responsibility: CALM (TFSC) and BGPA, through the SRTFCRT
Cost: $4,100 in first year and $2,700 in second and third years.

11. Develop and implement a Translocation Proposal

Although translocations are generally undertaken under full Recovery Plans, the threats to all known wild populations of *Calytrix breviseta* subsp. *breviseta* requires the implementation of a Translocation Proposal within the time frame of this IRP. Information on the translocation of threatened animals and plants in the wild is provided in CALM's Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. All Translocation Proposals must be approved by CALM's Director of Nature Conservation.

Action: Develop and implement a Translocation Proposal
Responsibility: CALM (Science Division, Swan Coastal District) through BGPA and the SRTFCRT
Cost: $9,100 in the second and third years; and $1,700 in the third and fourth years.

12. Monitor populations

Annual monitoring of factors such as habitat degradation (including weed invasion and plant diseases), population stability (expansion or decline), pollination activity, seed production, recruitment, longevity and predation is essential. All populations will be inspected annually with special attention given to any impacts from salinity. In areas where salinity is a problem, soil salinity and pH readings will be taken annually during winter and summer.

Action: Monitor populations
Responsibility: CALM (Swan Coastal District) through the SRTFCRT
Cost: $500 per year.

13. Implement fire management strategy

A fire management strategy developed for the Greater Brixton Street Wetlands area will be implemented and updated as necessary. Fire will be prevented from occurring in the habitat of populations, except where it is being used experimentally as a recovery tool.

Action: Implement fire management strategy for Greater Brixton Street Wetlands
Responsibility: CALM (Swan Coastal District) through the SRTFCRT
Cost: $1,000 per year.

14. Stimulate the germination of soil-stored seed

Burning, smokewater and soil disturbance may be effective in stimulating the germination of soil-stored seed. Trials will be conducted near existing populations in areas newly cleared of weeds, and/or in areas where *Calytrix breviseta* subsp. *breviseta* was known to occur previously. After treatment, annual monitoring will include recording the time to first flowering, seed production and the age at which senescence is reached. This will enable formulation of a recommended interval time between disturbances to maintain populations.

Action: Stimulate the germination of soil-stored seed
Responsibility: CALM (Swan Coastal District) through the SRTFCRT
Cost: $3,500 in second, third and fourth years.

15. Conduct further surveys

Further surveys will be conducted for this taxon in appropriate habitat, and on private lands wherever possible, during the flowering period (September to November). Volunteers from the local community, Wildflower Societies and Naturalist Clubs will be encouraged to be involved in surveys supervised by CALM staff. Areas considered suitable for translocation will also be noted.

Action: Conduct further surveys
Responsibility: CALM (Swan Coastal District) through the SRTFCRT
Cost: $1,300 per year.

16. Control rabbits

All populations are affected by rabbits. Although there is no evidence of grazing on the plants themselves, young shoots are extremely vulnerable to grazing. In addition, the soil is being disturbed, and this combined with the increased nutrient levels and the presence of weed seed in rabbit droppings is introducing weeds into the habitat. Baiting or trapping will be undertaken in and around the habitat of *Calytrix breviseta* subsp. *breviseta*.

Action: Control rabbits
Responsibility: CALM (Swan Coastal District) through the SRTFCRT

Cost: $500 in first, second and third years.

17. Maintain disease hygiene

The habitat of *Calytrix breviseta* subsp. *breviseta* is inundated over the winter months, and these conditions favour the establishment and spread of *Phytophthora* species. Plant species in the community may be susceptible to this disease. Dieback hygiene (outlined in Department of Conservation and Land Management 2003) will therefore be adhered to for activities such as installation and maintenance of firebreaks and walking into the population in wet soil conditions. Purpose built signs advising of the dieback risk and high conservation values of the sites will be installed as required.

Action: Maintain disease hygiene
Responsibility: CALM (Swan Coastal District) through the SRTFCRT
Cost: $700 for the first year.

18. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of wild populations of this taxon 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.

Action: Promote awareness
Responsibility: CALM (Swan Coastal District) through the SRTFCRT
Cost: $600 per year.

19. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Calytrix breviseta* subsp. *breviseta* will provide a better scientific basis for management of the wild populations. 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 pollination biology of the taxon, and the requirements of pollinators.
3. The reproductive strategies, phenology and seasonal growth of the taxon.
4. The population genetic structure, levels of genetic diversity and minimum viable population size.
5. The impact of salinity on *Calytrix breviseta* subsp. *breviseta* and its habitat.
6. Investigation of the impacts of dieback disease and control techniques on *Calytrix breviseta* subsp. *breviseta* and its habitat.

Action: Obtain biological and ecological information
Responsibility: CALM (Science Division, Swan Coastal District) through the SRTFCRT
Cost: $17,800 per year for the first three years.

20. Review the need for a full Recovery Plan

At the end of the fourth year of the five-year term of this Interim Recovery Plan, the need for further recovery will be assessed. If the taxon is still ranked Critically Endangered at that time the need for further recovery actions, a full Recovery Plan, or to update this IRP will be assessed.

Action: Review the need for a full Recovery Plan
Responsibility: CALM (WATSCU, Swan Coastal District) through the SRTFCRT
Cost: $22,700 in the fifth year (if required).

4. TERM OF PLAN

This Interim Recovery Plan will operate from May 2004 to April 2009 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. REFERENCES

Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Perth.

Brown, K. and Brooks, K. (2002) *Bushland weeds; a practical guide to their management*. Environmental Weeds Action Network (Inc), Western Australia.

Burbidge, A., Brown, A., English, V. and Blyth, J. (2001) Review of implementation of Interim Recovery Plans approved in 1996 and 1997. *Wildlife Management Program No. 34.* Department of Conservation and Land Management, Perth.

Craven, L.A. (1987) A taxonomic revision of *Calytrix* Labill. (Myrtaceae). *Brunonia* 10, 1-138.

Department of Conservation and Land Management (1992) Policy Statement No. 44 *Wildlife Management Programs*. Department of Conservation and Land Management, Perth.

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, Perth.

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

Department of Conservation and Land Management (2003) *Phytophthora cinnamomi* and disease caused by it Volume 1 – Management Guidelines. Department of Conservation and Land Management, Perth.

Evans, R. and Willers, N. (2003) *Draft Swan Region Threatened Flora Management Program.* Department of Conservation and Land Management, Perth.

Kershaw, K., Holland, E. and Brown, A. (1997) *Calytrix breviseta* subsp. *breviseta* Interim Recovery Plan No 16, 1996 – 1999. Department of Conservation and Land Management, Perth.

Obbens, F. (1997) *Monitoring and preliminary weed control on populations of Critically Endangered flora*. Department of Conservation and Land Management, Perth.

State of Western Australia (2000) *Bush Forever*. Western Australian Planning Commission, Perth.

V & C Semeniuk Research Group (2001) Hydrologcal Study of the Greater Brixton St Wetlands. Unpublished report to Friends of Brixton St Wetlands Inc. Warwick.

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

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.

6. TAXONOMIC DESCRIPTION

Craven, L.A. (1987) A taxonomic revision of *Calytrix* Labill. (Myrtaceae). *Brunonia* 10, 1-138.

Calytrix breviseta subsp. *breviseta*: Leaves widely spaced, spreading-ascending; stipules to 1.25 mm long; petiole 0.1-0.75mm long; blade linear, linear-lanceolate, lanceolate, or narrowly elliptic, 2-9 mm long, 0.5-1.25 mm wide, slightly incurved, or straight or slightly recurved, in transverse section obtriangular. Inflorescences scattered. Cheiridium narrowly funnel-shaped, 7-11 mm long; lobes elliptic to obovate, 5-7 mm long (the lobes ± equal in length), the apex rounded and mucronate, recurved. Hypanthium 6.5-10 mm long, the ovarian region 0.5-0.6 mm wide, the adnate region 0.4 mm wide, the staminal disc slightly prominent. Calyx segments with the blade depressed obovate to shortly ovate, 1.75-2.5 mm long, 2-2.8mm wide, the apex produced into an awn to 11 mm long, the awn ± straight to sinuous in bud. Petals (colour unknown) elliptic to lanceolate, 7.25-10 mm long, 3-3.8 mm wide, the apex acute. Stamens c. 40-65, ± regularly 3- or 4-seriate (when 3-seriate sometimes partly 2- or 4-seriate in one flower), the filaments (colour unknown) 2-6 mm long. Style 4-5 mm long.

SUMMARY OF RECOVERY ACTIONS AND COSTS

Recovery Action	Year 1			Year 2			Year 3			Year 4			Year 5		
	CALM	Other	Ext.	CALM	Other	Ext.	CALM	Other	Ext.	CALM	Other	Ext.	CALM	Other	Ext.
Coordinate recovery actions	1200	300	100	1200	300	100	1200	300	100	1200	300	100	1200	300	100
Map critical habitat	500		1500												
Transfer vesting of reserve to Conservation Commission	2000														
Undertake weed control	300		200	300		200	300		200	300		200	300		200
Install DRF markers	200		200												
Fence populations	500		9500												
Continue hydrological monitoring	2400		400	2400		400	2400		400	2400		400	2400		400
Redirect drainage and fill in culvert	200		500												
Remove rubbish	100		100	100		100	100		100	100		100	100		100
Collect seed and cutting material	1400		2700	1400		1300	1400		1300						
Develop and implement a translocation proposal.				3300		5800	3300		5800	1000		700	1000		700
Monitor populations	300		200	300		200	300		200	300		200	300		200
Implement fire management strategy for Greater Brixton Street Wetlands	200		800	200		800	200		800	200		800	200		800
Stimulate the germination of soil-stored seed				500		3000	500		3000	500		3000			
Conduct further surveys	500	500	300	500	500	300	500	500	300	500	500	300	500	500	300
Control rabbits	200		300	200		300	200		300						
Maintain disease hygiene	200		500												
Promote awareness	600			600			600			600			600		
Obtain biological and ecological information	10800		7000	10800		7000	10800		7000						
Review the need for a full Recovery Plan													15300		7400
Total	21600	800	24300	21800	800	19500	21800	800	19500	7100	800	5800	21900	800	10200
Yearly Total		**46,700**			**42,100**			**42,100**			**13,700**			**32,900**	

NHT = External funding (funding to be sought), Other = funds contributed by NHT, in-kind contribution and BGPA.

Total CALM:	$94,200
Total Other:	$4,000
Total External Funding:	$79,300
TOTAL COSTS:	**$177,500**