IMPLEMENTATION OF INTERIM RECOVERY PLANS for 13 CRITICALLY ENDANGERED WESTERN AUSTRALIAN PLANT TAXA

PROJECT NUMBER 6441

FINAL REPORT
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INTRODUCTION

In Western Australia, the ranking of Declared Rare Flora into the categories Critically Endangered (CR), Endangered (EN) and Vulnerable (VU), using World Conservation Union (IUCN) criteria and the Department of Conservation and Land Management's (CALM) ranking policy 50, began in 1995, with a draft circulated in 1994. At present (January 2000), 104 plant taxa are ranked as CR.

The Natural Heritage Trust Endangered Species Program has provided funding for the implementation of recovery actions for 13 of these CR flora. This report details progress made since the beginning of the project.

One species, *Grevillea dryandroides,* has been split into two subspecies, of which only *G. dryandroides* subsp. *dryandroides* is CR and is being covered by this project. Additionally, five of the 13 plant taxa for which CALM received funding are no longer ranked CR. *Grevillea christineae, Restio abortivus* (now *Chordifex abortivus*), *Verticordia harveyi* and *V. pityrhops* have been down listed as a result of the discovery of new populations in protected areas, which were found during surveys conducted during the project. *Eucalyptus graniticola* was also downlisted due to the successful completion of recovery actions, during the first year of the project. These taxa have been replaced with five new CR plant taxa for 1999-2000. They are *Chamelaucium* sp. Gingin, *Chorizema humile, Lasiopetalum pterocarpum, Symonanthus bancroftii* and *Daviesia euphorbioides.*

Draft Interim Recovery Plans (IRPs) have been completed for six of the 13 CR plant taxa, while the remaining seven species are at final draft stage and will be completed shortly. These plans have been written following assessment of known information, and consultation with land managers and scientists. During preparation, draft copies are being presented for comment to relevant staff of the Department of Conservation and Land Management (CALM) including regional and district offices, CALMScience, Wildlife Branch, Western Australian Threatened Species and Communities Unit (WATSCU), and relevant Shires, Landowners and community groups, and are being amended where necessary. Recovery actions are also being implemented as the Interim Recovery Plans are developed.

The project commenced in March 1998 with the appointment of a Project Officer, Robyn Phillimore, who has seen the project through to January 2000.

The project's objective is to coordinate and ensure that essential and, where possible, desirable recovery actions for 13 CR Western Australian plant taxa are implemented to prevent extinctions. The plant taxa are:

Acacia sciophanes, Adenanthos pungens subsp. *effusus, Chamelaucium* sp. Gingin, *Chorizema humile, Daviesia euphorbioides, Drakaea isolata* ms, *Epiblema grandiflorum* var. *cyanea, G. dryandroides subsp. dryandroides, Lambertia echinata* subsp. *echinata, Lasiopetalum pterocarpum, Rulingia* sp. Trigwell Bridge, *Symonanthus bancroftii* and *Verticordia staminosa* subsp. *staminosa.*

PROGRESS TO DATE FOR SCOPE ITEMS

2000.01 Recovery actions as per draft Interim Recovery Plans for *Acacia sciophanes, Adenanthos pungens* subsp. *effusus, Drakaea isolata, Epiblema grandiflorum* var. *cyanea* ms, *Grevillea dryandroides* subsp. *dryandroides, Lambertia echinata* subsp. *echinata, Rulingia* sp. Trigwell Bridge, *Verticordia staminosa* subsp. *staminosa, Chamelaucium* sp. *Gingin, Chorizema humile, Lasiopetalum pterocarpum, Symonanthus bancroftii* and *Daviesia euphorbioides* are progressively being implemented.

2000.02 A consultant, Robyn Phillimore, was appointed to coordinate the following actions in March 1998.

2000.03 Between July 1999 and January 2000, populations of plant taxa listed above were surveyed to obtain up to date population and threat information (see individual species for information). This information has been included in IRP's being prepared.

2000.04 During the preparation of IRP's, recovery actions have been listed and prioritised for taxa listed above.

2000.05 CALM regional staff, land managers, and local authorities have been consulted and are involved in implementing recovery actions as per recommendations in IRP's for above taxa.

2000.06 Between July 1999 and January 2000 information on the taxonomy, biology and ecology of all plant taxa listed above was obtained from Herbarium records, departmental files, literature searches, regional and district officers and by talking to appropriate land managers and scientists. This information has now been included in IRP's being prepared.

PLANT TAXA COVERED BY THE PROJECT IN 1999/2000

Acacia sciophanes, Wundowlin Wattle

While the common name refers to the area in which it grows, the species' name *sciophanes* refers to its very diffuse, open habit. When mature, this species develops into a diffuse, openly branched, wispy shrub up to 2.5 m tall. Its zig-zagging branches are mostly pendulous, circular in cross-section, and slightly resinous. The phyllodes are coarsely thread-like, 9-15 cm long, 1-2 mm wide. They are curved, spreading, very slightly resinous, have 4 prominent ribs, and are hooked at the apex. Globular bright yellow flower heads are held on stalks 5-6 mm long. Linear pods, up to 10 cm long and 1-2 mm wide, are circular in cross-section. They are sometimes twisted, and the margins are slightly contracted between the seeds. The species is known from only two localities between Mukinbudin and Bencubbin, growing in yellow sandplain in scrub of *Acacia* spp. and *Allocasuarina acutivalvis*. Wundowlin wattle is extremely rare, with only 160 plants known in the wild and hence has been ranked Critically Endangered.

Recovery Actions undertaken:

- Surveys were undertaken in 1994 but were unsuccessful in locating further populations. Other surveys were undertaken in 1998 by CALMScience and a new population was discovered. It is possible that this population was missed in previous surveys due to subsequent gravel extraction has that opened this area for closer observation.
- Land managers have been made aware of the threatened nature of the species and its location.
- Roadside DRF markers were first placed at Subpopulation 1b in 1994. Westrail and CALM staff have subsequently installed markers on all other subpopulations of Population 1.
- Dashboard stickers and posters have been produced and distributed. These illustrate DRF markers, inform of their purpose and provide a contact telephone number to use if such a marker is encountered.
- A flyer describing the species and its habitat has been distributed through the CALM's Merredin District office to local farmers and residents in the Shires of Mukinbudin, Beacon and Bencubbin. These flyers aim to provide information about species, the recovery process, and a

contact name and number. It is hoped that by targeting residents of specific areas new populations of critically endangered species can be located.

- An information sheet for the species is being produced. This includes a description of the plant, its habitat type, threats, management actions, and photographs. This sheet will be distributed to the public through CALM's Merredin District office.
- Some 2,500 seeds were collected in January 1996 and stored in CALM's Threatened Flora Seed Centre (TFSC). An initial germination rate of 88% was recorded and the germination rate after one year was higher at 93%.
- In 1996 Botanic Gardens and Parks Authority (BGPA) had one clone and three plants all subsequently die.
- Research by CALMScience has been undertaken on *Acacia sciophanes* titled 'Comparative study of levels of genetic diversity between a rare and more widespread species of *Acacia*'. The research has found that *Acacia sciophanes* is not as complex genetically as it's closely aligned species *Acacia anfractuosa.* This genetic analysis also helped verified that the plants at the second population were *Acacia sciophanes*. Analysis of the results is ongoing and further information will be available shortly (personal communication, D. Coates[1]).
- Other research has also been undertaken by CALMScience titled 'Ecological characteristics of critically endangered *Acacia* spp. and the factors limiting the growth of populations'. This research aims to investigate population structure, habitat specificity, description of current habitat, controlled environment experiments, transplant experiments, reproductive biology, seed bank dynamics, seed morphology, anatomy, and germination physiology.
- The Merredin District Threatened Flora Recovery Team (MDTFRT) is overseeing the implementation of this IRP and reports annually to CALM's Corporate Executive.
- CALM staff from the Merredin District Office regularly monitor the populations.

***Adenanthos pungens* subsp. *effusus*, Sprawling Spiky Adenanthos**

Adenanthos pungens is a shrub with rigid, terete leaves with sharp tips. These leaves are up to 3 cm long and are usually divided into 3 segments. In Spring, numerous flowers are clustered on the ends of branchlets. Two subspecies of *A. pungens* are recognised - *A. pungens* subsp. *pungens* and *A. pungens* subsp. *effusus*. *Adenanthos pungens* subsp. *effusus* is a low, spreading shrub, to 5 m in diameter and rarely more than 25 cm in height. Although similar in leaf and flower shape, the prostrate habit and pale pink flowers of *A. pungens* subsp. *effusus* distinguish it from the type which has an erect habit and dark pink to red flowers.

Adenanthos pungens subsp. *effusus* is endemic to Western Australia where it is confined to the Katanning - Tambellup area. It is known from two populations containing approximately 200 plants and has been ranked as Critically Endangered.

Recovery Actions undertaken:

- All land managers and adjacent landowners have been made aware of the threatened nature of the subspecies and its location.
- Both subspecies were thought to be showing the effects of *Phytophthora* infection as early as 1973 and recent tests have proven that plant death at Subpopulation 1b of *Adenanthos pungens* subsp *effusus* is due, at least in part, to this disease.
- Weeds on the road verge Subpopulation 1a have proven a continuing problem with traffic vision. After liaison between CALM's Katanning District Staff, and Main Roads Western Australia (MRWA) permission was granted for MRWA to conduct weed control. Therefore, in 1991, herbicides were applied by MRWA staff under the supervision by CALM staff to the site of Subpopulation 1a. Much care was taken with no apparent risk to the DRF.
- DRF markers were put in place at Population 1a by MRWA in early 1987.

[1] Dave Coates, Principal Research Scientist, CALMScience.

- Dashboard stickers and posters have been produced and distributed. These illustrate DRF markers, inform of their purpose and provide a contact telephone number to use if such a marker is encountered.
- An information sheet for the subspecies is being produced. This includes a description of the plant, its habitat type, threats, management actions, and photographs. This sheet will be distributed to the public through CALM's Katanning District office.
- Staff from the TFSC have collected seed from Population 1 in December 1992, January 1994 and again in December 1997.
- BGPA have achieved excellent results with cuttings with a strike rate from 30% to 100%. In October 1997, BGPA held 63 plants in its Nursery Collection Frames.
- Weed control trials were conducted by CALMScience at Population 1 during 1998. A weedy area was sprayed with Fusilade for grass weeds and broad leaf weeds were hand weeded or wicked with Roundup or hand weeded.
- A trial burn was also conducted in April 1998 at Population 1 in order to establish the regenerative characteristics of the subspecies. Three plots (2m x 2m), containing one to two dead plants, where covered with dry litter then subjected to the burn treatment. Death of seedlings has been attributed to dieback disease. Monitoring will continue to establish seedling survival rates.
- The Katanning District Threatened Flora Recovery Team is overseeing the implementation of this IRP, in its annual report to CALM's Corporate Executive.
- CALM staff from the Katanning District Office are regularly monitoring the populations.

***Chamelaucium* sp. Gingin, Gingin Wax**

The Gingin wax is an open straggly shrub 1 to 2 meters tall with many slender stiff branches that bear numerous 5 to 20 mm long axillary shoots. Its erect, glandular, bright green leaves are 5.4-11.5 mm long by 1.2-1.4 mm wide, and are scattered along the main branches, but are mostly crowded on numerous short axillary shoots. Leaves are attached to a 0.5-1.5 mm long petiole, which is frequently appressed to the stem. The inflorescence is composed of a small head on short axillary shoots or sometimes a larger flower head at the end of main branches. The 6.6 – 9.2 mm flowers occur in groups of two to nine in small heads on axillary shoots. Up to 20 flowers are held in clusters at the end of main branches. The flowers are pale pinkish-white, and the buds are tinged a deeper pink. The calyx lobes are erect, ovate, glandular, 2-2.8 mm long and have margins that are irregularly denticulate and ciliate. The erect corolla lobes are 4.6-6 mm long, and are covered with fine scattered glands. The corolla margins are irregularly denticulate and very sparsely but finely ciliate.

Chamelaucium sp. Gingin is endemic to Western Australia and is apparently confined to the Gingin area. It is known from a range of only 3 km. The five known populations contain a total of approximately 1000 plants. The species occurs on white/yellow sand supporting open low woodland over open scrub.

Recovery actions undertaken:

- All appropriate people have been made aware of the existence of this species and where it occurs.
- Population 5 has been fenced, in conjunction with the landowner.
- The owners of the property on which Population 1a occurs were fostering the species as an attractive native garden plant before the species was declared as rare, and have made and shared many observations regarding this taxon's biology and ecology. This land was purchased jointly by CALM and EA from the landholder in 1999. Population 1a also occurs in the Threatened Ecological Community, '*Banksia attenuata* woodlands over species rich dense shrublands'.

- DRF (Declared Rare Flora) markers have been placed at all roadside populations and the Shire of Gingin and the Shire of Chittering have been informed of the placement of these markers and their importance in the conservation of this species.
- Dashboard stickers and posters have been produced and distributed. These illustrate DRF markers, inform of their purpose and provide a contact telephone number to use if such a marker is encountered.
- An information sheet for *Chamelaucium* sp. Gingin has been produced and distributed. This includes a description of the plant, its habitat type, threats, management actions, and photographs. This sheet has been distributed to the public through CALM's District office, and the Shire of Gingin and Chittering offices and library. Copies were also be supplied to the Bush Fire Brigade (BFB), Westrail and Agriculture WA (AgWA) to raise awareness of the plant and its appearance.
- Seed was collected from Populations 1c, 1b and 3 by the TFSC and germination results have been variable. Most of these seed collections are a bulk of seed taken from 50 to 80 adult plants, with the exception of the 1995 collection where seed was taken from 10 individual plants. The seed numbers in each collection range from 200 to 400 with 1650 seeds collected in total. All seed is stored at -18° and germination rates are assessed initially, after one year in storage, then again after five years.
- The species was successfully cultivated by several nurseries, however due to lack of commercial interest it only exists as stock plants in several gardens. *Chamelaucium* sp. Gingin grows successfully from both cuttings and from seed and BGPA hold 26 mature plants grown from rooted cuttings or seed.
- CALM Swan Region staff regularly monitor the populations.
- The Swan Region Threatened Flora and Communities Recovery Team (SRTFCRT) is overseeing the implementation of this IRP and will include information on progress it in its annual report to CALM's Corporate Executive.

***Chorizema humile*, Prostrate Flame Flower**

Chorizema humile is a small, prostrate shrub to approximately 60 cm in diameter, with many slender stems radiating from a central root that are ridged with scattered hairs. It has obovate leaves that are 4-16 mm long and 2.5-5 mm wide, tapering at the base into a short petiole. The flowers occur at the ends of the stems in racemes up to 18 cm long with up to 30 flowers in each. The petals are yellow with red-brown markings. The standard petal is up to 9 mm long, the winged petals are gently curved to 8 mm long and the keel is almost as long as the wings.

C. humile is endemic to Western Australia and has historically been collected from Cue to Dowerin. It is currently known from three populations, all of which occur in the Carnamah – Moora area on red loam or brown sandy clay plains in scrub or open tree mallee.

Recovery actions undertaken:

- All appropriate people have been made aware of the existence of this species and where it occurs.
- Declared Rare Flora markers were installed at Populations 2 and 3 in September 1996.
- Dashboard stickers and posters have been produced and distributed. These illustrate DRF markers, inform of their purpose and provide a contact telephone number to use if such a marker is encountered.
- An information sheet for the species is being produced. This includes a description of the plant, its habitat type, threats, management actions, and photographs. This sheet will be distributed to the public through CALM's Moora District office.
- Population 1 was fenced from stock in 1975. Kangaroos have continued to have a serious impact on the population through grazing and trampling, drastically reducing plant condition and seed set. In August 1998, to address this problem, small wire cages were constructed over

47 individual plants at this population. This was completed with the aid of a team from the Australian Trust for Conservation Volunteers (ATCV).

- Sixteen steel mesh cages were installed over ten plants at Population 3a in July and November 1998, to prevent damage from stock.
- A stock-exclusion fence was erected around Subpopulation 3b in 1997.
- In October 1998, wire netting cages were installed over all seven *C. humile* plants at Subpopulation 3b.
- Staff from the TFSC collected nearly 100 seeds from 10 plants at Population 1, and almost 3 600 seeds from 10 plants at Population 3 in November 1996. The initial germination rate of this seed was found to vary from 50% to 72%, and after one year in storage, from 71% to 88%. Just over 1 500 seeds were collected from 11 plants at Population 3 in November 1997. This material had an initial germination rate of 84%. Most recently, almost 300 seeds were collected from 19 plants at Population 1 in November 1998. This material is still being processed so the overall germination rate is not yet known, but will be higher than 80%. In February 1998, 1000 seeds of those collected from Population 3 in 1996 were sent to BGPA as a duplicate collection.
- The species is in cultivation at the National Botanic Gardens, Canberra. They provided cutting material to BGPA in July 1984. The success rate of cuttings taken from this cultivated material has been excellent, with between 70 and 100% of cuttings developing roots. In February 1999, KPBG held four plants in its nursery.
- Surveys in 1999 by a local landowner resulted in the discovery of another 2 populations including 18 plants. Another survey undertaken in 1999 by Waddy Forest LCD resulted in the discovery of a new population of 100 plants on private property. The owners have agreed to fence off the area to prevent stock grazing on the plants.
- CALM's Moora District staff regularly monitor all populations.
- The Moora District Threatened Flora Recovery Team (MDTFRT) is overseeing the implementation of this IRP and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

***Daviesia euphorbioides*, Wongan Cactus**

Daviesia euphorbioides is an erect leafless and hairless shrub to 80 cm high with very thick cylindrical branches of a pithy texture inside. The smaller branches are erect, several centimetres in length and 6 to 10 mm in diameter. The leaves are minute, scattered, prickly, conical scales less than 2 mm long. Flowers are yellow and maroon (pea-like), 7 to 8 mm in diameter, with several borne in very short racemes or clusters arising from the leaf axils along the stems. The fruit is an inflated triangular pod about 1 cm long with a large beak at one end. Flowering occurs from September to October.

Daviesia euphorbioides is endemic to the Merredin District, and is confined to areas from Wongan Hills to south of Dowerin, over a geographic range of 85 km.

Recovery actions undertaken:

- Most local Shires and private property owners have been formally notified of the presence of populations of *Daviesia euphorbioides* on their lands.
- Declared Rare Flora (DRF) markers have been installed at most road and rail populations.
- Dashboard stickers and posters have been produced and distributed. These illustrate DRF markers, inform of their purpose and provide a contact telephone number to use if such a marker is encountered.
- An information sheet for the species is being produced. This includes a description of the plant, its habitat type, threats, management actions, and photographs. This sheet will be distributed to the public through CALM's Merredin District office.
- Collections of 84 seed were made in 1997 from Population 2, and 122 seed from Populations 1 and 2 in 1999. These are currently being stored in CALM's Threatened Flora Seed Centre at -18°C.

- Thirteen cuttings have been taken from the wild and other ex situ sources. The success rate of these cuttings has been average to low up to 50 % success. Of the two clones that were collected from wild populations, eight plants have been produced by BGPA. One clone was recently repropagated from cuttings by BGPA and has resulted in eight more plants.
- Research was undertaken on several Endangered species of *Daviesia*, including *euphorbioides*, in 1995 by CALM Science and BGPA. Investigations included habitat requirements, seed longevity, life history and germination requirements.
- CALM Science undertook an experimental burn in August 1998, on two dead plants at Population 7. Sixteen seedlings germinated as a result of the burn.
- Weed control research is being conducted at Population 7 by CALMScience. Fusilade, roundup wicking, hand weeding and fencing with shade cloth are the treatments being tested.
- The gravel pit at Subpopulation 1b was closed and the area deep ripped in 1998. The track leading into the pit from the road was also closed and deep ripped.
- The Merredin District Threatened Flora Recovery Team is overseeing the implementation of this IRP and will include information on progress in annual reports to CALM's Corporate Executive and funding bodies.
- CALM's Merredin District Office staff regularly monitor all populations.

***Drakaea isolata*, Lonely Hammer Orchid, Chinocup Hammer Orchid**

Drakaea isolata ms grows 10 to 30 cm high. Its stem arises from a single, dull green, heart-shaped, densely hairy leaf that is 1-2 cm long and 0.8-1.2 cm wide. The single flower, which appears between September and early October, is 2-3 cm long and 3-4 mm wide. The labellum, or "hammer" is a uniform reddish colour and the flower is much smaller than that of its closest relative, *Drakaea confluens*.

The species is known from a single location near Chinocup in the southern wheatbelt of Western Australia. In this area it grows in patches of bare white, sandy-clay soil among low shrubs and mallee eucalypts, on slight rise above a salt lake, often with *Paracaleana triens* ms.

Recovery Actions undertaken:

- Appropriate land managers have been made aware of the location and Declared Threatened status of this species. A mining company working in a nearby area has also been informed of its presence and discussions have taken place to ensure that the species is protected from future mining operations.
- CALM, along with members of the Western Australian native Orchid Study and Conservation Group have undertaken several surveys for the species but no new populations have been found.
- The Katanning District Conservation Officer, in conjunction with WATSCU and BGPA, undertook a full survey of the area in 1999. Sixty-two flowering orchids and 77 seedlings were counted.
- Leaf material was collected in 1999 for DNA analysis. This is part of the *Caladenia* and allied genera revision being undertaken by the Department of Botany at Oklahoma University, U.S.A.
- Water tables are being monitored to detect any rise and increased salinity.
- Material was collected by BPGA in 1999 for propagation.
- The Albany District and Katanning District Threatened Flora Recovery Teams (ADTFRT and KDTFRT) are overseeing the implementation of this IRP and will include it in its annual report.

***Epiblema grandiflorum* var. *cyanea*, Blue Babe-in-the-Cradle Orchid**

Epiblema grandiflorum var. *cyanea* is an extremely rare pure blue coloured variety of the more common babe-in-a-cradle orchid (*E. grandiflorum* var. *grandiflorum*), which has purple to mauve flowers. The orchid reaches 25-80 cm high on a slender, erect stem with a basal, linear leaf 20-25

cm long and two shorter, erect stem bracts. There are usually up to six stalked flowers in a loose inflorescence. Each flower is 2-4 cm in circumference and appears between November and December. The spreading sepals and lateral petals are almost equal in size. The labellum (lip) is egg-shaped with a distinct claw and a tuft of linear calli (glands) at the base. The column is short with thin, erect lobes.

Epiblema grandiflorum var. *cyanea* ms grows with the typical variety in a single population on private land near Perth. A total of 29 plants were recorded in the past but the population may contain more than 100 plants, as a number of immature non-flowering plants of unknown status occur nearby. No flowering plants have been seen in recent years until recently. The variety is ranked as Critically Endangered.

Recovery Actions undertaken:

- The landowner has been made aware of the location and Declared Rare status of this variety.
- A cyclone fence was installed around the swamp habitat of this species in late 1996 to maintain the security of the population and prevent accidental damage. A pine bollard fence was erected at the same time around the perimeter of the public open space which surrounds the orchid habitat on three sides. This fence is expected to prevent vehicles entering the area.
- The habitat of the orchid has a management program in place to protect it from impacts of changes in its water table. A system has been developed to control the amount of water entering the swamp to prevent excessive flooding and drying out.
- Trees have been planted on the northern, western and southern side of the orchid habitat. It is anticipated with the recent housing development there would be a rise in the water table after a five year period. Trees were planted in 1996 to alleviate this potential problem.
- Extensive searches of the swamp in which the variety occurs, were carried out by CALM and BGPA staff in 1997 and 1998, but no flowering plants were recorded. A survey undertaken, also by BGPA and CALM, in 1999 found one plant flowering.
- The Swan Region Threatened Flora Recovery Team is overseeing the implementation of this IRP and will include it in its annual report.

***Grevillea dryandroides subsp. dryandroides,* Phalanx Grevillea**

Flowering between September and March, this bird pollinated subspecies is usually found in colonies of what appear to be many individual plants, but which are in fact numerous suckers from underground stems. Two subspecies of *Grevillea dryandroides* have recently been described with *G. dryandroides* subsp. *dryandroides* differing from *G. dryandroides* subsp. *hirsutus* in having smooth leaves with lobes that are less than 12 mm long. *G. dryandroides* subsp. *dryandroides* is a lightly suckering shrub to 50 cm tall, with dull yellow-green leaves, each with lobes that are 5-15 mm long. The inflorescence is 3-4 cm long, and pedicles are 1-1.5 mm long. Individual flowers are pink to orange-pink with a grey-green limb. The style is red or pink with a green tip. The perianth is 6-7 mm long and the pistil 17-18 mm long.

Grevillea dryandroides subsp. *dryandroides* is confined to the Ballidu area. Habitat is open heathland and banksia woodland, usually in yellow sandy-loam over laterite.

Recovery actions undertaken:

- Local Shires and private property owners have been formally notified of the presence of populations on their lands.
- Declared Rare Flora (DRF) markers have been installed at populations 2 and 4, and subpopulations 1a, 1b, 3a and 5a.
- Dashboard stickers and posters have been produced and distributed. These illustrate DRF markers, inform of their purpose and provide a contact telephone number to use if such a marker is encountered.

- An information sheet for the subspecies is being produced. This includes a description of the plant, its habitat type, threats, management actions, and photographs. This sheet will be distributed to the public through CALM's Merredin District office.
- A reply paid postal drop illustrating *Grevillea dryandroides* subsp. *dryandroides* and describing its distinctive features and habitat was distributed by CALM's Merredin District office to local farmers and residents in the Wongan-Ballidu Shire in 1999. These aim to provide information about threatened species and a contact name and number. It is hoped that by targeting residents of specific areas new populations will be located.
- Subpopulation 1b was fenced following the destruction of ten plants during firebreak grading and weedicide activities in 1991.
- Subpopulation 3b was fenced in 1999 to reduce the risk of plants being trampled.
- Seed was collected from populations 1 and 5 in November 1996, 1997, 1998 and 1999 and stored in CALM's Threatened Flora Seed Centre. A total of 604 seeds have been collected from approximately 20 plants and these are being stored at -18°C. The initial germination rate of seed was found to range between 40 and 100%. A sample germinated after one year in storage gave an 80% germination rate.
- Eighteen cuttings were collected by BGPA in 1994 and a further ten in 1997. The success rate of these cuttings has been low with only six plants from the first batch and one plant from the second batch surviving. Material was also collected by BGPA for tissue culture in 1997. The TFSC propagated six seedlings in 1997, with three still alive.
- Thirty cuttings were taken in 1999 and are currently being propagated at BGPA for a potential translocation.
- Smoke trials undertaken by BGPA in 1995, on two adult plants resulted in 50 to 60 seedlings germinating in a 15 metre radius around the plants.
- The Merredin District Threatened Flora Recovery Team is overseeing the implementation of this IRP and will include information on progress in annual reports to CALM's Corporate Executive and funding bodies.
- CALM's Merredin District Office staff regularly monitor all populations.

***Lambertia echinata* subsp. *echinata*, Prickly Honeysuckle**

Flowering between August and October, *Lambertia echinata* subsp. *echinata* is a hairy stemmed, many branched shrub to 1 m tall with leaves to 4 cm long, arranged in whorls of three. The leaves, which are usually divided into five sharply pointed lobes, taper toward the stem and have prominent veins underneath. Dark pink to red, trumpet-shaped flowers, up to 5 cm long, have an outer floral whorl with four segments that unite to form a long tube (5 cm) that is broad at the top. As the flowers open, the segments coil down, spirally enclosing the stamens. The woody fruits are grey, shiny and nearly 2 cm long, including the beak. Other subspecies are *L. echinata* subsp. *occidentalis* and the more common *L. echinata* subsp. *chrysantha*. *L. echinata* subsp. *echinata* differs from both in having pink-red flowers, rather that yellow flowers

Lambertia echinata subsp. *echinata* is known from one site east of Esperance where it grows on laterite and granite sheeting on a windswept coastal slope amongst rich coastal heath, dominated by *Dryandra* and *Calothamnus* species. Until recently this subspecies was known from just one population of three adult and two transplanted seedlings, on two small uncleared 'islands' in a gravel pit no longer used for gravel extraction. Another locality, only 500 m away, had seven plants in undisturbed vegetation which died several years ago, probably due to dieback (*Phytophthora*). In 1998 19 new plants had appeared in this area.

Recovery Actions undertaken:

- Staff from CALM's Threatened Flora Seed Centre (TFSC) collected a total of 812 seed over five sampling periods from 1993 to 1999. Initial germination was between 75 and 100%. This seed is now in storage at -18°C.
- An experimental translocation by CALMScience staff and with Esperance District and WATSCU staff, started in 1998. Plants grown from seed collected in 1994 and 1997 were germinated at the TFSC, grown on at BGPA, and translocated into the site of Subpopulation 1a. The treatments being examined are watering, shading, and a control treatment. To date the success rate has been low (39%). Monitoring of the translocation occurs four times a year and a further planting of 99 seedlings, grown for seed collected from Subpopulation 1a in 1998, took place in June 1999.
- *Phytophthora* (dieback disease) was isolated from translocated plants that died after the 1998 translocation. All translocated seedlings are, therefore, being sprayed every eight to 12 weeks with a 0.2% solution of Phosphite to reduce the likelihood of death resulting from dieback infection. Subpopulation 1a was also sprayed from the air in autumn 1998 with 15 l/ha of phosphite at 400 g/l concentration.
- The gravel pit at Subpopulation 1a is no longer operational and was deep ripped and left to regenerate naturally. The access road to the quarry has also been ripped and barricaded.
- Survey for the subspecies has occurred in the following areas: Mississippi Hill and walk track to Rossiter Bay, south west of known population to Lucky Bay Road, west of Thistle Cove, north east of Hellfire Bay day-use area and east of Hellfire Bay Road, east of Cape Le Grand Road one kilometre from the beach, a small hill south of Lucky Bay Road and 300 metres east of Cape Le Grand Road. To date no new populations have been located.
- An information sheet for *Lambertia echinata* subsp. *echinata* has been produced and distributed. This includes a description of the plant, its habitat type, threats, management actions, and photographs. This sheet is being distributed to the public through CALM's Esperance District office.
- Staff from CALM's Esperance District are overseeing the implementation of this IRP and are regularly monitoring the population.

Lasiopetalum pterocarpum, Wing-Fruited Lasiopetalum

The winged membranous fruit is the main distinguishing feature of *Lasiopetalum pterocarpum* ms. The fruit has six to twelve elongated wings that usually consists of five large and several smaller wings. The fruit splits open when mature. The leaves are more obviously lobed than any other species of the genus *Lasiopetalum*. The bracteoles are linear and there are no petals or stipules. The apex of the style contains stalked star-shaped hairs.

Recovery Actions undertaken:

- All appropriate people have been made aware of the existence of this species and its locations. The National Park Rangers are familiar with the location of this species and its management needs.
- Surveys conducted in 1999 resulted in the discovery of another 11 plants. Other surveys have been undertaken in 2000, upstream and downstream of the known population and in other similar habitat close to the population, but no further plants have been found.
- Weed control has been undertaken yearly to attempt to control the blackberry and watsonia, which endanger the *Lasiopetalum*. In particular, a project, which involved applying herbicide to the watsonia, was undertaken in conjunction with students from TAFE.
- Seed was collected in December 1998 and again in 1999 and stored in CALM's Threatened Flora Seed Centre (TFSC). More than 2,000 seeds are stored at -18°C. The initial viability of these collections was 84%.

- An information sheet for the species is being produced. This includes a description of the plant, its habitat type, threats, management actions, and photographs. This sheet will be distributed to the public through CALM's Mundaring District office.
- Fire went through the National Park in January 1999 and destroyed Subpopulations 1a and 1b. Recovery is being monitored, but as yet there is no evidence of regeneration of the species.
- Staff from CALM's Mundaring District regularly monitor the population.
- The Swan Region Threatened Flora Recovery Team (SRTFRT) is overseeing the implementation of this IRP and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

***Rulingia* sp. (Trigwell Bridge), Trigwell's Rulingia**

Rulingia sp. Trigwell Bridge is a small shrub or undershrub to 1.5 m high and m across. Star-shaped hairs are visible on its leaves which are entire. Stipules are deciduous, narrow, with the upper stipules often divided into slender lobes. A terminal inflorescence of creamy-white flowers appears in August. The petals are shorter than or as long as the sepals, with a short broad base embracing the stamens and a linear or broad upper portion known as the ligule. The species is known from a single population of three plants in the West Arthur area, with a known range of less than 1 km.

Recovery Actions undertaken:

- The landowner has been formally notified of the presence of the species and the associated legal responsibilities.
- An information sheet for the species is being produced. This includes a description of the plant, its habitat type, threats, management actions, and photographs. This sheet will be distributed to the public through CALM's Central Forest Region office.
- A total of 608 seeds were collected from 4 plants in Population 1 in November 1994 and are being stored in CALM's TFSC at -18°C. After 12 months storage, the material collected had a germination rate of 95%. Another 20,000 seeds were collected from the wild population and translocated sites in October and November 1998. These seeds had a viability of over 95% and an initial germination rate of 56-85%. CALM's TFSC now has over 13,000 seeds stored at 4°C available for direct seeding trials at translocation sites, and over 7,000 seeds in long-term storage at -20°C.
- BGPA conducted smoke and smoke water germination trials at Population 1 in April 1995. The sites were inspected in October 1995, but there was no evidence of germination.
- The presence of dieback was suspected on the northwest slopes of Population 1 in April 1995. Two samples were sent for dieback analysis, but results were negative. Recent research by CALMScience staff to determine the species' susceptibility to *Phytophthora* spp. indicates that *Rulingia* sp. Trigwell Bridge is not susceptible to this plant pathogen.
- Soil samples were collected from the wild population in 1995, and sent to the WA Chemistry Centre for analysis. The analysis indicated that the soil is very high in organic content, with levels of nitrogen and phosphorus higher than those expected in the locality. This is attributed to the fact that the plants grow in deep fissures in laterite outcrops, that accumulate leaf litter. Soil samples were collected from the proposed *ex situ* sites in 1996, for comparison with samples taken from the site of the wild population. The results were consistent with average nutrient levels for most southwestern soils.
- A ringlock fence was erected around Population 1 in 1992, to exclude sheep from the north west corner of the paddock. A netting cage was also erected over and around the existing plants in 1994 to protect them from rabbits, sheep and 'twenty eight' parrots.
- In May 1999, BGPA held 12 plants in excellent condition in its nursery. The rooting success rate of cuttings taken from Population 1 was over 70%.

- During 1997, BGPA undertook research into micropropagation, *in vitro* physiology, slow growth, germplasm maintenance and cryostorage. They have had success in propagation of the species through tissue culture, cuttings and grafting. Propagated plants were also transferred into the soil successfully. There is clonal material in cryostorage at BGPA, as well as some seed-derived stock.
- A Translocation Proposal was prepared by CALM (Bunbury District) in September 1997. The aim of the Translocation Proposal is to establish self-sustaining populations at up to six locations. For Phase 1, *Rulingia* sp. Trigwell Bridge seedlings were translocated into 4 plots. Plot 1 occurs alongside the only known wild population. Plots 2 and 3 occur on a nature reserve and Plot 4 occurs in a Conservation Park near Population 1.
- Phase 2 of the Translocation Proposal involved more plantings in June 1998. In addition to further supplementing the wild population and the previously established populations on a Nature Reserve and a Conservation Park, another population was established near Population 1. Phase 2 is now complete and the third phase of monitoring and additional planting has commenced.
- The CFRTFRT is overseeing the implementation of this IRP and will include information on progress in its annual report to CALM's Corporate Executive.
- Staff from CALM's Central Forest Region regularly monitor the wild and translocated populations.

***Symonanthus bancroftii*, Bailey's Symonanthus**

Symonanthus bancroftii is a low, erect, many stemmed herbaceous undershrub to 25 cm. The leaves are stalkless, 5-17 mm long and up to 3 mm wide. They are egg-shaped to narrow, more or less spreading, hairy and some-what warty and are rolled over at the margins. Plants are dioecious. Male and female plants have flowers, small, hairy, white, streaked with violet inside. Fruit nearly globular capsule, 3-4 mm long, 2.5-4 mm wide, 3-5 seeds. Seeds are *ca* 2 mm long, 1 mm wide. Flowering is from June to early September.

Recovery actions undertaken:

- Land managers have been formally notified and shown the species and its location.
- Over sixty plants from population 1A (male) have been propagated from tissue culture by BGPA. Tissue culture collections of subpopulation 1B (female) have been taken and successfully micropropagated, with four plants now established in soil. Pollen samples from the male plant are held in cryostorage.
- The Narrogin District Threatened Flora Recovery Team (NDTFRT) is overseeing the implementation of this IRP and will include it in its annual report to CALM's Corporate Executive and funding bodies.
- Bruce Rock Land Conservation District Committee is regularly monitoring the populations every two months, and monthly through the flowering period.
- Populations 1a has been fenced with ringlock and population 1b has been fenced with rabbit netting.
- Declared Rare Flora markers are erected at Population 1b.
- Dashboard stickers and posters have been produced and distributed. These illustrate DRF markers, inform of their purpose and provide a contact telephone number to use if such a marker is encountered.
- Two large community surveys were conducted by the Bruce Rock Land Conservation District Committee. Surveys were carried out in 1997 with funding from the Gordon Reid Foundation. Further surveys were carried out in 1998 with funding from World Wide Fund for Nature Australia.

***Verticordia staminosa* subsp. *staminosa*, Wongan Featherflower**

Flowering between June and August *Verticordia staminosa* subsp. *staminosa* is a small spreading, much branched shrub. Its branchlets are hairy, with very narrow more or less stalkless leaves, up to 1.5 cm long, crowded at their tips. Flowers are about 5 mm long. Sterile stamens do not protrude from the flower and the style is not hairy. The subspecies is distinguished by its ten very long protruding stamens that are bright red with yellow tips. Below these are yellow, very feathery sepals and two bright red persistent bracts. *V. staminosa* subsp. *staminosa* differs from *V. staminosa* subsp. *cylindracea* in having larger flowers, a shorter staminal tube, longer stamens and staminodes that are outside the staminal tube, rather than inserted between the staminal filaments.

Recovery actions undertaken:

- Land managers have been formally notified and shown the species and its location.
- Seed was collected in October and November 1995 from Population 1, and stored in CALM's TFSC. Approximately 2,250 seeds were collected from 35 plants, and are being stored at -18°C. The initial germination rate was found to be 65% and 32% after one year in storage. Seed was collected again in October 1996 from the same location. Approximately 700 seeds were collected from 50 plants with an initial germination rate of 72%.
- The fence around the plant population was repaired and partly replaced in 1999 to stop stock grazing on the plants.
- An information sheet for the subspecies is being produced. This includes a description of the plant, its habitat type, threats, management actions, and photographs. This sheet will be distributed to the public through CALM's Merredin District office.
- CALMScience is undertaking research on six *Verticordia* species, including *Verticordia staminosa* subsp. *staminosa* and is investigating aspects of *Verticordia* biology and ecology.
- Staff from the Merredin District Office regularly monitors the population.
- The Merredin District Threatened Flora Recovery Team (MDTFRT) is overseeing the implementation of this IRP and will include it in its annual report to CALM's Corporate Executive.