

INTERIM RECOVERY PLAN NO. 179

# **ENEABBA MALLEE**

## **(*EUCALYPTUS IMPENSA*)**

### **INTERIM RECOVERY PLAN**

**2004-2009**

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Photograph: Phil Roberts

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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This Interim Recovery Plan will operate from June 2004 to May 2009 but will remain in force until withdrawn or replaced.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 assessed.

This IRP was given regional approval on 12 August, 2004 and 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 in June 2004.

## ACKNOWLEDGMENTS

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

Eric Bunn	Senior Research Scientist (Propagation Science), Botanic Garden & Parks Authority
Rebecca Carter	Program Leader Nature Conservation, CALM's Moora District
Andrew Crawford	Technical Officer, CALM's Threatened Flora Seed Centre
Amanda Shade	Horticulturalist, Botanic Garden and Parks Authority

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

## SUMMARY

<b>Scientific Name:</b>	<i>Eucalyptus impensa</i>	<b>Common Name:</b>	Eneabba Mallee
<b>Family:</b>	Myrtaceae	<b>Flowering Period:</b>	June – July
<b>CALM Region:</b>	Midwest	<b>CALM District:</b>	Moora
<b>Shire:</b>	Coorow	<b>Recovery Team:</b>	Moora District Threatened Flora 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; Brooker, M.I.H. and Hopper, S.D. (1993) New series, subseries, species and subspecies of *Eucalyptus* (Myrtaceae) from Western Australia and from South Australia. *Nuytsia* 9(1), 1-68.

**Current status:** *Eucalyptus impensa* was declared as Rare Flora in July 1989. It is ranked as Critically Endangered (CR) under the *Wildlife Conservation Act 1950* according to World Conservation Union (IUCN) Red List criterion D (IUCN 2000), due to the very low number of mature individuals. *E. impensa* is listed as Endangered under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The few known individuals are threatened by insect damage, inappropriate fire regimes, firebreak maintenance and disease, while the species as a whole is threatened by the lack of recruitment of new individuals and the restricted range of populations. All populations that have been monitored recently are in poor health.

**Description:** *Eucalyptus impensa* is a straggly mallee to 1.5 m tall. Its smooth stems are coloured grey over pale copper. Mature leaves are pale to yellow-green, and have short, stout stalks. Leaves are large and stiff, up to 14 cm long and 8 cm wide, and usually in opposite pairs. Pink flowers are held in the leaf axils, on a thick stalk up to 2 cm long. The hemispherical bud has a slightly ribbed, beaked cap. It is up to 2.5 cm across and 5 cm long including the stalk. The hemispherical fruit, up to 6 cm wide and 2.5 cm long, has a conspicuous raised disc and 5 protruding valves. The brown seeds are an asymmetrical pyramid shape. The large fruits are similar to those of *E. macrocarpa*, but *E. impensa* has leaves on short stalks, with no whitish bloom, and plants are smaller than those of *E. macrocarpa* (Brooker and Hopper 1993; Brown *et al.* 1998).

**Habitat requirements:** *Eucalyptus impensa* is restricted to six populations that occur south east of Eneabba over a range of about 3 km. It inhabits very open shrub mallee over low heath, on grey gravelly sand on undulating plains and low breakaway slopes. Associated species include *Eucalyptus pleurocarpa*, *E. todtiana* and *E. macrocarpa* subsp. *elecantha*, with *Hakea*, *Banksia* and *Dryandra* species.

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

**Habitat critical to the survival of the species, and important populations:** Given that this species is listed as Critically Endangered, it is considered that all known habitat for wild and translocated populations is habitat critical to its survival, and that all wild and translocated populations are important populations.

**Benefits to other species or ecological communities:** *Eucalyptus johnsoniana* and *Tetratheca aphylla* (Declared Rare Flora listed as Vulnerable under the *Wildlife Conservation Act 1950* and the EPBC Act) both occur in the habitat of *E. impensa*. Recovery actions such as monitoring the health of *E. impensa* populations may also highlight management needs of the ecological community in which the populations are located.

**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. *Eucalyptus impensa* is not specifically listed under any international treaty, and therefore this plan does not affect Australia's obligations under any other international agreements.

**Role and interests of indigenous people:** The Aboriginal Sites Register maintained by the Department of Indigenous Affairs does not list any significant sites in the vicinity of populations of *Eucalyptus impensa*. Input and involvement will be sought from any indigenous groups that have an active interest in the areas that are habitat for *E. impensa*, and this is discussed in the recovery actions.

**Social and economic impact:** One population of *Eucalyptus impensa* occurs on private land and negotiations will continue with regard to the future management of this population. The implementation of this interim recovery plan has the potential to have some limited social and economic impact, where populations are located on private property. Recovery actions refer to continued liaison between stakeholders with regard to these areas.

**Evaluation of the plan's performance:** The Department of Conservation and Land Management (CALM) will evaluate the performance of this IRP in conjunction with the Moora District Threatened Flora Recovery Team. In addition to annual reporting on progress with listed actions and comparison against the criteria for success and failure, the plan is to be reviewed within five years of its implementation.

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

1. Relevant land managers have been made aware of the location and threatened status of the species.
2. Markers are in place at several populations that occur near tracks.
3. Seed was collected from eight plants in 2002 and is stored in CALM's Threatened Flora Seed Centre.
4. The Botanic Garden and Parks Authority (BGPA) currently hold 24.6g of seed in cryostorage, collected in 1994.
5. One clone of *E. impensa* has been tissue cultured and several plants produced. One plant is still held at the BGPA nursery, but the others have died.
6. An information sheet that describes and illustrates the species has been prepared and will be printed in the near future.
7. Staff from CALM's Moora District regularly monitor populations of the species.
8. The Moora District Threatened Flora Recovery Team is overseeing the implementation of this IRP.

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

#### Recovery criteria

**Criteria for success:** The number of individuals within populations and/or the number of populations have remained stable or 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. Liaise with relevant land managers
4. Mark individuals of *E. impensa*
5. Monitor populations
6. Adjust fire management strategy
7. Conduct further surveys
8. Collect seed
9. Propagate translocates
10. Undertake and monitor translocation
11. Promote awareness
12. Obtain biological and ecological information
13. Review the need for a full Recovery Plan

## 1. BACKGROUND

### History

*Eucalyptus impensa* was discovered in 1987, but was not seen in flower until July 1991. Seed was first collected in 1994. The taxonomic description was published in 1993, and the species was named 'impensa' from the Latin (*impensus* – large, strong), alluding to the leaves and fruit. Five populations are known from a Nature Reserve, and one from private property, over a range of approximately 3 km.

All populations are known to have been burnt in recent years. Population 1 was burnt in 1990 or 1991. Population 3 was burnt in 1993. This population occurs in buffer vegetation which is currently prescription burnt approximately every 12 years. Populations 4, 5 and 6 burnt in summer 1995. An intense fire in December 2002 burnt all populations. Regeneration through resprouting has been noted on plants in Population 3, and in March 2004 was approximately 40 cm high and insect damaged. Almost all shoots were eaten or damaged, and almost all leaves have suffered insect damage. Charred stems remain and bear some burnt fruits, indicating that the species flowers within 10 years post-fire. It is not known, however, if these fruits contained seed. Eight fruits collected in November 2002 contained seven seeds in poor condition. Their viability has not been tested as there are so few in storage.

### Description

*Eucalyptus impensa* is a straggly mallee to 1.5 m tall. It has smooth stems which are coloured grey over pale copper. Mature leaves are pale green to yellow-green, and have short, stout stalks up to 1 cm long. Leaves are large and stiff, up to 14 cm long and 8 cm wide, and usually in opposite pairs. Pink flowers are held in the leaf axils, on a thick stalk up to 2 cm long. The bud has a hemispherical floral tube and beaked cap, which is slightly ribbed. Buds are up to 2.5 cm across and 5 cm long, including the stalk. Hemispherical fruits, up to 2.5 cm long and 6 cm wide have a conspicuous raised disc and 5 protruding valves. The brown seeds are an asymmetrical pyramid shape. The large fruits are similar to those of *E. macrocarpa*, but *E. impensa* has leaves on short stalks, with no whitish bloom, and the plants are smaller than those of *E. macrocarpa* (Brooker and Hopper 1993; Brown *et al.* 1998).

### Distribution and habitat

*Eucalyptus impensa* is restricted to six populations that occur south east of Eneabba over a range of about 3 km. There are currently 36 mature plants known. It inhabits very open shrub mallee over low heath, on grey gravelly sand on undulating plains and low breakaway slopes (Brown *et al.* 1998). Five populations occur on a Nature Reserve, and the sixth is on private property. Associated species include *Eucalyptus pleurocarpa*, *E. todiana*, *E. macrocarpa* subsp. *elecantha*, *Hakea incrassata*, *H. conchifolia*, *Calothamnus quadrifidus*, *Xanthorrhoea* sp., *Kingia australis*, *Banksia* species and *Dryandra* species.

### Biology and ecology

*Eucalyptus* species are typically highly adapted to surviving fires, which are a regular occurrence in many Australian habitats. Seedlings tend to be slow-growing, as much energy is channeled into the production of a lignotuber. After fire has removed or damaged above-ground parts of an established plant, a number of replacement stems are initiated from the lignotuber, producing the mallee form. This adaptation applies to *E. impensa*, which typically occurs as a mallee. Fire often also stimulates germination of *Eucalyptus* seed. All populations are known to have been burnt in recent years, but no seedlings were seen after fires in the 1990s or in 2002.

Some evidence is available about the length of time taken to flower post-fire. Plants at Populations 5 and 6 were burnt in 1995. Three flowers were present at Population 5 when surveyed in June 2000, although none were present at Population 6. It often takes a year or two after first flowering for plants to produce viable seed. No flowers were evident at Populations 3, 5 or 6 when monitored in June 2001, possibly due to the long dry summer beforehand. Eight fruit were collected from Population 3 in November 2002, nine years after the 1993 fire, and shortly before the December 2002 fire. These

yielded only seven unhealthy-looking seeds. Germination trials were not run due to the low number of seeds, so it is not known if any population produced viable seed in the interval between fires. The seed collector<sup>1</sup> commented that it was difficult to locate fruit as it was so sparse, and that seed set across the species is extremely low. He suggested that this species may rely on resprouting for survival.

This species seems to be favored by grazing insects both *in situ* and *ex situ*. At both locations it is subject to greater levels of damage than its other eucalypt neighbours, possibly because it is more palatable, or because it is already more stressed than those neighbours and is therefore more vulnerable to attack.

### Threats

*Eucalyptus impensa* was declared as Rare Flora under the *Wildlife Conservation Act* 1950 in July 1989. It currently meets World Conservation Union (IUCN) Red List Category 'CR' (IUCN 2000) under criterion D due to the very low number of mature individuals. It is also listed as Endangered under the *Commonwealth Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). The few individuals of the species are threatened by insect damage, inappropriate fire regimes, firebreak maintenance, and disease, while the species as a whole is threatened by the lack of recruitment of new individuals and the restricted range of populations. All populations monitored recently were in poor health.

- **Insect damage** is apparent at all populations that were monitored recently. Even an *ex situ* plant at the Botanic Garden and Parks Authority (BGPA) has been noted to be targeted by insects more than adjacent plants. Some level of insect damage is natural, and the health of plants is not usually unduly affected. However, when plants are stressed by drought and relatively frequent fire, for example, it has been noted that the level of insect damage increases.
- **Inappropriate fire regimes** could affect the viability of populations as *Eucalyptus impensa* resprouts following fire. The lignotubers may be depleted if fires recur before plants can re-establish reserves. Frequent fire is also likely to degrade the supporting ecological community, changing species composition as well as fostering weed invasion and erosion. This species may require fire for recruitment of new individuals, but the fire interval would need to be long enough to allow for the development of sufficient levels of soil-stored seed.
- **Disease** may be a threat to Population 3. In 2000, 30-40% of the crown leaves were greying with a purple speckle effect in the grey. The cause is unknown, but could include a virus, fungus or bacteria. This was not evident in March 2004, and the causative agent may have been killed by the fire in 2002.
- **Poor recruitment** is apparent at all populations, with no seedlings being observed recently. The time taken to produce fruit after fire is not known. The amount of seed produced, and the viability of the seed are also not known. However, it seems likely that the fire interval populations of *Eucalyptus impensa* have experienced recently (7 to 10 years) is too short for effective seed production.
- **Firebreak maintenance** threatens Populations 1 and 3, including burning of the vegetation buffer between double firebreaks.
- **Mining** is a potential threat as mineral sands and other mineral commodities exist in this area. Most populations occur within a C Class Nature Reserve that does not provide a particularly high level of protection.

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<sup>1</sup> Andrew Crawford, Technical Officer, CALM's Threatened Flora Seed Centre

- **Drought stress** is not a direct human-associated impact, but is a serious threat to all populations. Eucalypts can generally cope with drought, frequent fire or insect damage individually, but these three factors are compounded at all populations, and threaten the survival of this species.

#### Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1. South of Eneabba	Nature Reserve	1988 10-20 1989 15+ 1992 12 1996 2 clumps 1998 7	Poor	Firebreak maintenance (including burning of buffer between double firebreaks), insect damage, drought stress, inappropriate fire regime
2. South of Eneabba	Private property	1989 6	Healthy (1989)	Drought stress, inappropriate fire regime
3. South of Eneabba	Nature Reserve	1989 1 clump 1998 1 clump 2000 11 clumps 2001 11 clumps	Poor	Firebreak maintenance (including burning of buffer between double firebreaks), insect damage, drought stress, disease.
4. South of Eneabba	Nature Reserve	1989 40 1996 1 clump	Moderate	Drought stress, inappropriate fire regime
5. South of Eneabba	Nature Reserve	1989 6+ ; 1 clump 1994 1 1996 1 clump 2000 11 2001 11	Poor	Insect damage, drought stress, inappropriate fire regime
6. South of Eneabba	Nature Reserve	1989 10+ 1996 1 clump 2000 0 (13) 2001 0 (13)	Poor	Insect damage, drought stress, inappropriate fire regime

Number in brackets = Number of plants regenerating after fire.

#### Guide for decision-makers

Section 1 provides details of current and possible future threats. Any on-ground works (clearing, firebreaks, roadworks etc) in the immediate vicinity of *Eucalyptus impensa* will require assessment. On-ground works should not be approved unless the proponents can demonstrate that they will not have an impact on the species, or on its habitat or potential habitat.

#### 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 (EPBC Act).

*Eucalyptus impensa* is listed as Critically Endangered, and as such it is considered that all known habitat for wild and translocated populations is critical habitat. This includes:

- the area of occupancy of populations;
- areas of similar habitat within 200 metres of populations, i.e. open shrub mallee over low heath on grey gravelly sand on undulating plains and low breakaways (these provide potential habitat for natural range extension);
- corridors of remnant vegetation that link populations (these are necessary to allow pollinators to move between populations and are usually road and rail verges); and
- additional occurrences of similar habitat that do not currently contain the species but may have done so in the past (these represent possible translocation sites).

#### Benefits to other species or ecological communities

*Eucalyptus johnsoniana* and *Tetratheca aphylla* (Declared Rare Flora listed as Vulnerable under the *Wildlife Conservation Act* and the EPBC Act) both occur in the habitat of *E. impensa*. Recovery

actions such as monitoring the health of *E. impensa* populations may also highlight management needs of the ecological community in which the populations are located.

### **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. *Eucalyptus impensa* is not specifically listed under any international treaty, and therefore this plan does not affect Australia's obligations under any other international agreements.

### **Role and interests of indigenous people**

The Aboriginal Sites Register maintained by the Department of Indigenous Affairs does not list any significant sites in the vicinity of these populations. Input and involvement will be sought from any indigenous groups that have an active interest in the areas that are habitat for *Eucalyptus impensa*, and this is discussed in the recovery actions.

### **Social and economic impacts**

One population of *Eucalyptus impensa* occurs on private land and negotiations will continue with regard to the future management of this population. The implementation of this interim recovery plan has the potential to have some limited social and economic impact, where populations are located on private property. Recovery actions refer to continued liaison between stakeholders with regard to these areas.

### **Evaluation of the plan's performance**

CALM will evaluate the performance of this IRP in conjunction with the Moora District Threatened Flora Recovery Team. In addition to annual reporting on progress with listed actions and comparison against the criteria for success and failure, the plan is to be reviewed within five years of its implementation.

## **2. RECOVERY OBJECTIVE AND CRITERIA**

### **Objectives**

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

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

All relevant land managers have been notified of the location and threatened status of the species. The notification details the Declared Rare status of *Eucalyptus impensa* and the associated legal obligations.

Marker pegs were installed on the tracks near Populations 3, 5 and 6 in July 2000. These help to locate the populations when not in flower, and serve to alert people working in the vicinity to the presence of DRF, and the need to take care to avoid damage to the plants.

CALM's Threatened Flora Seed Centre (TFSC) collected seed from 8 plants in Population 3 in November 2002. Only seven seeds were obtained, and they do not appear healthy. Germination testing will not be conducted due to the very small number of seeds available.

Propagation from seed has been undertaken at BGPA. Approximately 20% germination of seed was obtained, and most seedlings died within 8 months. Two plants survived more than 3 years, and were



taken to an unrecorded destination in 2000. BGPA also hold 24.6 g of seed in cryostorage, collected from Populations 1 and 5 in September 1994 (A. Shade<sup>2</sup>, personal communication).

One clone of *E. impensa* has been successfully tissue cultured, and several plants were produced. One of these is still alive, and is kept at the BGPA Nursery. New growth on this plant is often attacked by grubs, believed to be from a native moth (E. Bunn<sup>3</sup>, personal communication).

A double-sided information sheet has been prepared, and includes a description of *E. impensa*, its habitat, threats, recovery actions and photos. This will be printed, and then distributed to the community through local libraries, wildflower shows and other avenues. It is hoped that this may result in the discovery of new populations.

Staff from CALM's Moora District regularly monitor all populations of this species. Growth measurements and reproductive data were collected in July 2000 for Populations 3 (11 clumps), 5 (13 clumps) and 6 (13 clumps). The clumps were marked with metal tags. It is intended that the measurements and data will be recorded annually to improve knowledge of this species.

The Moora District Threatened Flora Recovery Team is overseeing the implementation of this IRP and includes information on progress in its annual report to CALM's Corporate Executive and funding bodies.

### **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, influenced by their timing over the life of the Plan. 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 Moora District Threatened Flora Recovery Team will coordinate recovery actions for *Eucalyptus impensa* and other Declared Rare Flora in their district. They will include information on progress in their annual report to CALM's Corporate Executive and funding bodies.

**Action:** Coordinate recovery actions  
**Responsibility:** CALM (Moora District) through the MDTFRT  
**Cost:** \$1,500 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 redressed 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 (Moora District, WATSCU) through the MDTFRT  
**Cost:** \$2,000 in the first year

#### **3. Liaise with relevant land managers**

<sup>2</sup> Amanda Shade, Horticulturalist, Botanic Garden and Parks Authority

<sup>3</sup> Eric Bunn, Senior Research Scientist (Propagation Science), Botanic Garden and Parks Authority

Staff from CALM's Moora District will continue to liaise with relevant land managers and landowners to ensure that populations are not accidentally damaged or destroyed. Input and involvement will also be sought from any indigenous groups that have an active interest in areas that are habitat for *Eucalyptus impensa*.

**Action:** Liaise with relevant land managers  
**Responsibility:** CALM (Moora District) through the MDTFRT  
**Cost:** \$1,100 per year

#### 4. Mark individuals of *E. impensa*

Populations 3, 5 and 6 have been marked with stakes on the track nearby, and individual plants are labelled with numbered tags. This will be done at all other populations when next monitored to allow the condition of individual plants to be tracked.

**Action:** Mark individuals of *E. impensa*  
**Responsibility:** CALM (Moora District) through the MDTFRT  
**Cost:** \$600 in first year

#### 5. Monitor populations

Annual monitoring of factors such as habitat degradation (including the impact of plant diseases such as *Phytophthora cinnamomi*, weed invasion and salinity), population stability (expansion or decline), pollination activity, seed production, recruitment, longevity and predation is essential.

Information on plant dimensions and reproductive data was collected from Populations 3, 5 and 6 in July 2000. All populations were burnt in an intense fire in December 2002. Monitoring of regeneration is necessary at these populations, and plant size and reproductive data (flower and fruit timing and abundance) will again be recorded. These types of data will be gathered periodically at all populations.

During this monitoring, a detailed list of associated species will be compiled.

**Action:** Monitor populations  
**Responsibility:** CALM (Moora District) through the MDTFRT  
**Cost:** \$700 in first, second and third years, and \$1,400 in fourth and fifth years

#### 6. Adjust fire management strategy

Too frequent fire appears to be acting in concert with drought and insect damage to leave existing adult plants under great stress. CALM's Moora District operations will therefore aim to minimise the occurrence of fires in populations of this species. Due to the nature of the vegetation and its topography, the part of the Nature Reserve that contains most populations of *E. impensa* appears to be prone to lightning strikes and resultant wildfires. The area of known occupancy of the species is small (<3km at its widest point) which makes maintaining differences in fuel ages difficult and costly. Further, the close proximity of several other DRF species in the area complicates the construction and maintenance of a suitable buffer exclusion system within the reserve itself. A fire management strategy exists for the Nature Reserve that describes the maintenance of buffer areas around the boundary of the reserve and maintenance of strategic internal tracks. Where populations exist within or adjoining these buffers, they will be excluded from prescription burning by methods such as the laying of foam fire retardant 'breaks' around the populations at the time of burning. Fire management in relation to Population 2 will need to be discussed with the landholder to determine fire control measures.

**Action:** Adjust fire management strategy  
**Responsibility:** CALM (Moora District) with relevant land managers through the MDTFRT  
**Cost:** \$3,700 in first year, and \$1,400 in subsequent years

## 7. Conduct further surveys

Community volunteers will be encouraged to be involved with further surveys supervised by CALM staff during the flowering period of the species (June-July). Records of areas surveyed will be sent to Wildlife Branch and retained at the District, even if *E. impensa* is not located.

**Action:** Conduct further surveys  
**Responsibility:** CALM (Moora District) through the MDTFRT  
**Cost:** \$2,000 per year

## 8. Collect seed

It is necessary to store germplasm as a genetic resource, ready for use in translocations and as an *ex situ* genetic 'blueprint' of the species. The germplasm stored will include seed and tissue culture material. Some seed has been collected from Populations 1, 3 and 5. All populations were burnt in 2002, and it may be some years before seed is produced again. When possible, additional collections of seed will be made.

**Action:** Collect seed  
**Responsibility:** CALM (TFSC, Moora District) through the MDTFRT  
**Cost:** \$1,400 in the fourth and fifth years

## 9. Propagate translocates

Collections of tissue culture material are required from as many (tagged and traceable) individuals as possible from all populations, to establish the best representation of the remaining genetic diversity of this species. It is essential that the genetic diversity of translocates is maximised to give any translocated population the best possible chance of survival in the long term. Plantlets suitable for translocation will eventually be produced from that material. It is envisaged that production of translocates should be possible over a three to four year time frame. The collection and processing of tissue culture material will be done through BGPA, as that is where skilled micropropagation staff are based. It is possible that some economies of scale may be achieved during this resource-intensive recovery action if other eucalypt species, also critically endangered due to the low number of plants and restricted distribution, are included in this project (for example, *E. dolorosa* and *E. leprophloia*).

**Action:** Propagate translocates  
**Responsibility:** BGPA through the MDTFRT  
**Cost:** \$18,100 in second year, \$15,900 in third year and \$7,500 in the fourth and fifth years

## 10. Undertake and monitor translocation

Translocation is necessary for the conservation of this species, as the populations are so close together that the species is highly vulnerable to localised threats including disease and intense fire. A translocation proposal will be developed and a suitable translocation site selected. This may be within the same Nature Reserve, but at some distance away, perhaps with a major road acting as a natural firebreak between natural and translocated populations. Plants will be propagated from tissue culture and from seed. Plants previously propagated from tissue culture have been more vigorous than those grown from seed, but seedlings may add to the genetic pool of the translocated population. These will be planted in accordance with an approved Translocation Proposal. Information on the translocation of

threatened plants and animals in the wild is provided in CALM's Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. All translocation proposals require endorsement by CALM's Director of Nature Conservation.

Monitoring of the translocation is essential and will be undertaken according to the timetable developed for the Translocation Proposal.

It is important to begin this recovery action as soon as possible, due to the increasing fire risk after fuel age exceeds five years (2008). Ideally, the seedlings should be in the ground as long as possible before fire, to allow the establishment of a lignotuber.

**Action:** Undertake and monitor translocation  
**Responsibility:** CALM (Moora District, TFSC) and BGPA through the MDTFRT  
**Cost:** \$14,800 in the fourth year and \$12,500 in the fifth year

### 11. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of wild populations of this species 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. An information sheet has been developed, that includes a description of the plant, its habitat, threats, recovery actions and photos. This will be printed and distributed to the public through CALM's Moora District office and at the office and library of the Shire of Coorow. Such information distribution may lead to the discovery of new populations, and raise community awareness of the value of rare flora.

**Action:** Promote awareness  
**Responsibility:** CALM (Moora District) through the MDTFRT  
**Cost:** \$1,700 in first year, and \$1,100 per year thereafter

### 12. Obtain biological and ecological information

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

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

**Action:** Obtain biological and ecological information  
**Responsibility:** CALM (Science Division, Moora District) through the MDTFRT  
**Cost:** \$12,000 per year in the second, third and fourth years

### 13. Review the need for a full Recovery Plan

At the end of the fourth year of its five-year term this Interim Recovery Plan will be reviewed and the need for further recovery actions will be assessed. If the species is still ranked as Critically Endangered at that time a full Recovery Plan may be required.

**Action:** Review the need for a full Recovery Plan

**Responsibility:** CALM (WATSCU, Moora District) through the MDTFRT  
**Cost:** \$20,300 in the fifth year (if full Recovery Plan required)

#### 4. TERM OF PLAN

This Interim Recovery Plan will operate from June 2004 to May 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

- Brooker, M.I.H. and Hopper, S.D. (1993) New series, subseries, species and subspecies of *Eucalyptus* (Myrtaceae) from Western Australia and from South Australia. *Nuytsia* 9(1), 1-68.
- Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia.
- CALM (1992) Policy Statement No. 44 *Wildlife Management Programs*. Perth, Western Australia.
- CALM (1994) Policy Statement No. 50 *Setting Priorities for the Conservation of Western Australia's Threatened Flora and Fauna*. Perth, Western Australia.
- CALM (1995) Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. Perth, Western Australia.
- CALM (2003 onwards) *Western Australian Herbarium FloraBase 2 – Information on the Western Australian Flora*. Perth, Western Australia. Accessed 2003. <http://www.calm.wa.gov.au/science/>
- IUCN (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

Excerpts from: Brooker, M.I.H. and Hopper, S.D. (1993) New series, subseries, species and subspecies of *Eucalyptus* (Myrtaceae) from Western Australia and from South Australia. *Nuytsia* 9(1), 1-68.

##### *Eucalyptus impensa*

Straggly mallee to 1.5 m tall with grey over pale coppery smooth stems. *Juvenile leaves* petiolate, opposite for many pairs, ovate, to 11 x 6 cm, blue-green to glaucous. Shoots of new growth green, not glaucous. *Leaves* on mature plant on short stout petioles, opposite to sub-opposite, ovate, to 14 x 8 cm, concolorous, pale green to yellow-green, stiff. *Inflorescences* axillary with a single flower on a thick peduncle to 2 cm long. *Bud* on stout pedicel, hypanthium hemispherical, operculum strongly beaked, slightly ribbed, to 5 x 2.5 cm including pedicel. *Stamens* all fertile; anthers versatile, dorsifixed, oblong, opening by broad lateral slits. *Flowers* pink. *Fruits* sessile, on thick pedicels to 2 cm long, hemispherical (not including the disc), to 2.5 x 6 cm; disc conspicuous, ascending; valves 5, exserted. *Seed* brown, pyramidal though asymmetrical, with ribs ascending to the ventral hilum.

*Distribution:* Known only from the type locality (Figure 11) and another near Moora.

*Flowering period:* June-July.

*Etymology:* From the Latin *impensus* – large, strong alluding to the leaves and fruit.

*Notes:* *E. impensa* at the type locality consists of about 10 plants on a sandplain south-west of Eneabba. The large fruit are reminiscent of *E. macrocarpa* but the shortly petiolate, non-glaucous leaves, both juvenile and adult, are distinctive. It occurs in association with *E. tetragona* and *E. macrocarpa* subsp. *macrocarpa*, both of which exceed the depauperate *E. impensa* in stature. Following a fire that destroyed the above-ground specimens, the mallees are regenerating from the lignotubers and producing coppice of light green, petiolate leaves.

## 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	1,000	500		1,000	500		1,000	500		1,000	500		1,000	500	
Map critical habitat	1,500		500												
Liaise with land managers	400		700	400		700	400		700	400		700	400		700
Mark <i>E. impensa</i> individuals	300		300												
Monitor populations	500		200	500		200	1,000		400	1,000		400	1,000		400
Adjust fire management strategy	1,200	100	2,400	800	100	500	800	100	500	800	100	500	800	100	500
Conduct further surveys	500	1,000	500	500	1,000	500	500	1,000	500	500	1,000	500	500	1,000	500
Collect seed										600		800	600		800
Propagate translocates					7,000	11,100		7,000	8,900		2,800	4,700		2,800	4,700
Undertake translocation										6,900		7,900	7,400		5,100
Promote awareness	1,100		600	1,100			1,100			1,100			1,100		
Obtain biological and ecological information				5,000		7,000	5,000		7,000	5,000		7,000			
Review the need for a full Recovery Plan													11,200		9,100
<b>Total</b>	6,500	1,600	5,200	9,300	8,600	20,000	9,800	8,600	18,000	17,300	4,400	22,500	24,000	4,400	21,800
<b>Yearly Total</b>		<b>13,300</b>			<b>37,900</b>			<b>36,400</b>			<b>44,200</b>			<b>50,200</b>	

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

Total CALM: \$66,900  
 Total Other: \$27,600  
 Total External Funding: \$87,500  
**Total Costs: \$182,000**

