INTERIM RECOVERY PLAN NO. 40

PINNATE-LEAVED EREMOPHILA

(EREMOPHILA PINNATIFIDA MS*)*

INTERIM RECOVERY PLAN

1999-2001

by

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Photograph: A.P. Brown

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Natural Heritage Trust
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Department of Conservation and Land Management

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This Interim Recovery Plan will operate from June 1999 to May 2002 but will remain in force until withdrawn or replaced. It is intended that, unless the taxon is no longer ranked as Critically Endangered, this IRP will be replaced by a full Recovery Plan after three years.

This IRP was approved by the Director of Nature Conservation on 1 September 1999. The 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 June 1999.

SUMMARY

Scientific Name: ***Eremophila pinnatifida* ms**
Common Name: Pinnate-Leaved Eremophila
Family: Myoporaceae
Flowering Period: September - late January
CALM Region: Wheatbelt
CALM District: Merredin
Shire: Dalwallinu
Recovery Team: Merredin District Threatened Flora Recovery Team (MDTFRT)

Illustrations and/or further information: Brown, A., Thomson-Dans, C. and Marchant, N. (eds.). (1998). *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia; Chinnock, R.J. (in prep.). Taxonomic Description of *Eremophila pinnatifida* ms.

Eremophila pinnatifida ms is an erect rounded shrub to approximately 1 m tall. Leaves are in whorls of three and are deeply lobed - the source of the specific name. The flower tube is pale purple and pubescent outside, and white with pale purple spots inside. Like *E. ternifolia*, it has leaves in whorls of three and a similarly structured fruit, but differs in its deeply lobed leaves and the prominent pubescence of its branches and leaves.

Current status: *Eremophila pinnatifida* ms was Declared as Rare Flora in November 1997, and ranked in November 1998 as Critically Endangered (CR). It currently meets World Conservation Union (IUCN) Red List Criteria B1+2c, C2a and D (IUCN 1994), due to there being just three small highly fragmented populations, a decline in the quality of its habitat (mainly on highly disturbed road reserves), a continuing decline in the number of individual plants and the low number of adult plants (21 plants known). The main threats are road maintenance, weeds, degraded habitat and inappropriate fire regimes.

Habitat requirements: *E. pinnatifida* ms occurs in tall open *Eucalyptus salmonophloia* and *E. loxophleba* woodland over sparse mixed shrubland of *Santalum acuminatum*, *Eremophila drummondii* and *Acacia* species over mixed chenopods and perennial grass on brown clay loams. Plants occur in highly disturbed situations on road verges and on a Shire Reserve. *E. pinnatifida* ms is endemic to the Dalwallinu area of Western Australia.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented.
1. Surveys for new populations have been and are continuing to be conducted.
2. Land managers have been notified of the presence of *E. pinnatifida* ms.
3. Declared Rare Flora (DRF) markers have been installed.
4. Seed has been collected and stored at CALM's Threatened Flora Seed Centre (TFSC).
5. Several live plants are maintained in cultivation.
6. Weed control has commenced at Populations 1 and 2.
7. A temporary fence has been installed at Population 2.
8. All populations are regularly monitored.

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

Recovery criteria
Criterion for success: The number of individuals within populations and/or the number of populations have increased.
Criterion for failure: The number of individuals within populations and/or the number of populations have decreased.

Recovery actions

1. Implement weed control.	7. Develop a fire management strategy.
2. Stimulate germination of soil stored seed.	8. Obtain biological and ecological information.
3. Rehabilitate habitat.	9. Develop a translocation proposal.
4. Collect seed and cutting material.	10. Promote awareness.
5. Monitor populations.	11. Write a full Recovery Plan.
6. Conduct further surveys.	

1. BACKGROUND

History

R. Chinnock first discovered this species near Dalwallinu in 1990 and counted a total of 35 plants. Despite further searches over several years no more plants were found until 1996, when G. Richmond conducted a survey in the Dalwallinu townsite on behalf of Main Roads Western Australia (MRWA), with reference to a proposed Dalwallinu By-pass. He found an additional population of 2 plants within the Dalwallinu townsite, in an area where roadworks were proposed. In January 1997, Merredin District staff and G. Richmond surveyed existing populations and all similar habitat on road and other reserves within a 15 km radius of Dalwallinu. They did not find any more plants, but established that the original population had declined from 35 to 6 plants (2 plants in 1999). A third population was found in October 1998 by A. Brown of the Western Australian Threatened Species and Communities Unit (WATSCU). This road reserve population contains 16 healthy plants in very degraded habitat.

Description

Eremophila pinnatifida ms is an erect rounded shrub to approximately 1 m tall. Leaves are in whorls of three and are deeply lobed - the source of the specific name. The flower tube is pale purple and pubescent outside, and white with pale purple spots inside. The species is allied to *E. ternifolia*. Like *E. ternifolia*, it has leaves in whorls of three and a similarly structured fruit, but differs it and other related species such as *E. sargentii* and *E. verticillata* by its diagnostic lobed leaves and the prominent pubescence on its branches and leaves.

Distribution and habitat

E. pinnatifida ms appears to be endemic to the Dalwallinu area where it is known from only 3 populations with a combined total of 21 plants. The species occurs in tall open *Eucalyptus salmonophloia* and *E. loxophleba* woodland over sparse mixed shrubland of *Santalum acuminatum*, *Eremophila drummondii* and *Acacia* species over mixed chenopods and perennial grass on brown clay loams.

Biology and ecology

Very little is known about the biology and ecology of the species. (personal communication G. Richmond[1]) has suggested that it may have a short life cycle (approximately 10 years). It appears to be a disturbance opportunist, with germination stimulated by fire or earth movement. A resident of Dalwallinu does not recall a fire occurring in the Reserve containing Population 1 within the last 10 years. It seems likely that the decline of Population 1 since its discovery is a result of the existing plants reaching the end of their life cycle and not being replaced due to a lack of appropriate disturbance.

Seed was collected by A. Cochrane of CALM's Threatened Flora Seed Centre (TFSC) in July 1997, and this had an extremely low seed to fruit ratio. In 100 fruits four seeds were found, none of which germinated under laboratory conditions before going mouldy. It has been suggested this was possibly because they were not taken completely out of an extremely hard coating (personal communication A. Cochrane[2]). This low rate of seed production is likely to be due to the low genetic diversity of the population and the age of the plants. Fruit produced earlier when there were more plants in the population may have had a higher seed to fruit ratio.

Threats

Eremophila pinnatifida ms was Declared as Rare Flora on 28 November 1997, and ranked as in November 1998 as Critically Endangered (CR). It currently meets World Conservation Union (IUCN) Red List Criteria B1+2c, C2a and D (IUCN 1994), due to there being just three small highly fragmented populations, a decline in the quality of its habitat (mainly on highly disturbed road reserves), a continuing decline in the number of individual plants and the low number of adult plants (21 plants known). The main threats are road maintenance, weeds, lack of disturbance at Population 1, degraded habitat and inappropriate fire regimes.

- **Road maintenance** such as grading, construction of drainage channels, mechanical trimming of vegetation and weed spraying pose a threat to Populations 2 and 3. The proposed Dalwallinu bypass road may also threaten Population 2. The population was discovered during a biological survey conducted for MRWA for the proposed bypass and, although the route has been modified to account for the species, construction activities will be close-by and may have an impact on the species.

- **Weed**s are a major threat to Populations 1 and 2, where wild oats (*Avena fatua*) constitute the dominant understorey. Although weeds do not appear to pose a threat to existing plants, they are vigorous and inhibit natural recruitment. Population 2 has been invaded by a range of grass and broadleaf weeds, including soursob (*Oxalis pes-caprae*) and several medic species (*Medicago* spp). Populations 2 and 3 occur on the upper lips of roadside ditches and are subject to modified hydrology in addition to weed invasion.

- **Lack of disturbance** is a threat to Population 1 where all the plants appear to have grown in response to a single disturbance event prior to 1990. The plants have now reached senescence and all but two are dead.

- **Degraded habitat** represents a threat to all three populations. The lack of associated native vegetation makes it more likely that pollinators will be infrequent or absent. In addition, the lack of available habitat for recruitment is of major concern. Two of the three populations occur on narrow road reserves with cleared land beyond.

- **Inappropriate fire regimes** could adversely affect the long-term viability of populations. Seed of *Eremophila pinnatifida* ms probably germinates following fire and the soil seed bank would be depleted if fires recurred before regenerating or juvenile plants reached maturity. Conversely, it is likely that occasional fires are needed for recruitment. A resident of Dalwallinu does not recall a fire occurring in the reserve containing Population 1 over the last 10 years (see "lack of disturbance" above).

Summary of population information and threats

Pop. No. & Location	Land Status	Date / No. of Plants	Condition	Threats
1. Dalwallinu	Shire Reserve	1990 35 1997 6 1998 2	Poor	Lack of disturbance, weeds, degraded habitat, inappropriate fire regimes
2. Dalwallinu	Shire Road Verge	1997 2 1998 3	Healthy	Road maintenance, weeds, degraded habitat, inappropriate fire regimes
3. Dalwallinu	MRWA Road Verge	1998 16	Healthy	Road maintenance, weeds, degraded habitat, inappropriate fire regimes

2. RECOVERY OBJECTIVE AND CRITERIA

Objective

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

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

Criterion for failure: The number of individuals within populations and/or the number of populations have decreased.

3. RECOVERY ACTIONS

Existing recovery actions

All appropriate parties have been made aware of the existence of *Eremophila pinnatifida* and its location. The Shire of Dalwallinu and MRWA were formally notified in January 1998. MRWA and the adjacent private property owner were notified of the new population (Population 3) in December 1998.

Declared Rare Flora (DRF) markers have been installed at Populations 2 and 3. Awareness of the significance of these markers is being promoted to relevant bodies such as Shires, MRWA and the Bush Fires Board by the distribution of dashboard stickers and posters that illustrate DRF markers, inform of their purpose and provide a contact telephone number if such a marker is encountered.

Merredin District staff collected 333 fruits from 3 plants in July 1997. These were sent to CALM's TFSC and a total of 46 seeds extracted with 20% germination. All germinants were given to Kings Park and Botanic Garden (KPBG). Further seed was collected in November 1998 from 13 plants in Population 3. This yielded 921 fruits and approximately 230 seeds. The initial test of this material resulted in 29% germination.

Guy Richmond collected five cuttings in 1997. The development of roots on these cuttings ranged from poor to very good. In June 1998, KPBG held 3 plants in its Nursery. Cutting material was taken from 5 more plants in August 1998 and provided to KPBG for propagation. This material was used for cuttings, grafting and tissue culture.

Weed control was commenced at Populations 1 and 2 in September 1998.

Major road construction work is scheduled to take place near Population 2 during 1999. MRWA have installed a fence designed to be a visual rather than a physical barrier around the population. This will remain in place for the duration of the roadworks and will be removed after the work is completed.

CALM Merredin District staff regularly monitor all populations.

The Merredin District Threatened Flora Recovery Team (MDTFRT) oversees the implementation of recovery actions prescribed in this IRP, and will report annually to CALM's Corporate Executive.

Future recovery actions

Where populations occur on lands other than those managed by CALM, permission has been or will be sought from the appropriate land managers prior to recovery actions being undertaken.

1. Implement weed control

A weed control program is required as the habitat of Populations 1 and 2 are badly infested by weeds. CALM will implement a weed control program in consultation with the relevant land managers that will involve:

1. Selection of an appropriate herbicide after determining which weeds are present.
2. Controlling invasive weeds by hand removal and spot spraying when weeds first emerge.
3. Scheduling to include weed spraying of other DRF populations requiring weed control within the Merredin District.

Action: Implement weed control
Responsibility: CALM (Merredin District) through the MDTFRT, relevant land managers
Cost: $1,700 p.a.

2. Stimulate germination of soil stored seed

Eremophila pinnatifida ms is likely to be a disturbance opportunist with a relatively short lifespan (approximately 10 years). Its seeds are contained in extremely hard fruits and it is likely that soil-stored seed is able to remain viable for a long period. An attempt to stimulate germination of soil-stored seed will be made in areas where plants previously occurred (Population 1 and in the near vicinity of Populations 2 and 3) by undertaking smoke treatment and disturbance trials. This will be conducted in conjunction with weed control so that any *E. pinnatifida* ms germinants are not overwhelmed by competition. The results of trials will be monitored regularly.

Action: Stimulate germination of soil-stored seed
Responsibility: CALM (Merredin District), KPBG, through the MDTFRT
Cost: $2,700 in year 2.

3. Rehabilitate habitat

The habitat of Population 1 will be rehabilitated in order to provide conditions more conducive to the long-term survival of the species. Rehabilitation will include reducing weed competition and fostering the regeneration of native vegetation using smoke and disturbance trials.

Action: Rehabilitate habitat
Responsibility: CALM (Merredin District), KPBG through the MDTFRT
Cost: $10,400 in year 2.

4. Collect seed and cutting material

Preservation of germplasm is essential to guard against extinction if wild populations are lost. Seed and cutting collections are needed to propagate plants for translocations (see 9).

Action: Collect seed and cutting material
Responsibility: CALM (TFSC, Merredin District), KPBG through the MDTFRT
Cost: $3,700 p.a.

5. Monitor populations

Monitoring of factors such as weed densities, habitat degradation, population stability (expansion or decline), pollination activity, seed production, recruitment and longevity is essential.

Action: Monitor populations
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $600 p.a.

6. Conduct further surveys

Further surveys supervised by CALM staff, and with the help of volunteers from the local community, wildflower societies and naturalist clubs, will be conducted for *Eremophila pinnatifida* ms during its flowering period (September-January).

Action: Conduct further surveys
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $1,800 p.a.

7. Develop a fire management strategy

Little is known about the effects of fire on this species. It is likely that it requires occasional fire for recruitment from soil-stored seed, but frequent fires during the flowering and seeding phase may be detrimental to the long-term survival of the species. Fire also promotes the introduction and proliferation of weed species. Fire will therefore be prevented from occurring in the area of the population on a too-frequent basis.

Action: Develop a fire management strategy
Responsibility: CALM (Merredin District), relevant land managers through the MDTFRT
Cost: $1,700 in year 1.

8. Obtain biological and ecological information

Increased knowledge of the biology and ecology of the species will provide a scientific base for management of *Eremophila pinnatifida* ms in the wild. Research will include:

1. The effects of weeds on recruitment and establishment.
2. Seed germination requirements.
3. Longevity of plants, and time taken to reach maturity.
4. Response of *Eremophila pinnatifida* ms and its habitat to fire.
5. Genetic variability within and between populations.
6. Investigation of the impacts of herbicide on habitat.

Action: Obtain biological and ecological information
Responsibility: CALM (CALMScience, Merredin District) through the MDTFRT
Cost: $15,900 p.a.

9. Develop a translocation proposal

Background information on the translocation of threatened animals and plants in the wild is provided in CALM Policy Statement No 29 *Translocation of Threatened Flora and Fauna*. Translocation is considered as desirable for the conservation of a species if populations are in rapid decline. It is recommended that restocking the existing populations and translocation to a more secure site be investigated with the former given priority.

Although translocations are generally undertaken under full Recovery Plans, in this case it is clearly vital to commence this course of action before a full Recovery Plan is written as it is possible to develop translocation proposals and start growing plants within the timeframe of an Interim Recovery Plan. All translocation proposals require endorsement by the Director of Nature Conservation.

Action: Develop a translocation proposal
Responsibility: CALM (Merredin District), KPBG through the MDTFRT
Cost: $4,000 in year 3.

10. Promote awareness

The importance of biodiversity conservation and the protection of *Eremophila pinnatifida* ms will be promoted to the public. This will be achieved through an information campaign using the local print and electronic media and by setting up poster displays. This is especially important as all populations of the species are small and highly threatened, and increased awareness may result in the discovery of others.

An information sheet, which includes a description of the plant, its habitat type, threats and management actions will be produced. The preparation of a poster illustrating all Critically Endangered flora species in the District is recommended. Formal links with local naturalist groups and interested individuals will be encouraged.

Action: Promote awareness
Responsibility: CALM (Merredin District, Corporate Relations Division) through the MDTFRT
Cost: $500 in year 1.

11. Write a full Recovery Plan

At the end of the three-year term of this Interim Recovery Plan, the need for further recovery will be assessed. If the species is still ranked Critically Endangered a full Recovery Plan will be prepared with the benefit of knowledge gained over the period of this Interim Recovery Plan.

Action: Write a full Recovery Plan
Responsibility: CALM (Merredin District, WATSCU) through the MDTFRT
Cost: $19,400 in year 3.

4. TERM OF PLAN

This Interim Recovery Plan will operate from June 1999 to May 2002 but will remain in force until withdrawn or replaced. It is intended that, unless the taxon is no longer ranked as Critically Endangered, this IRP will be replaced by a full Recovery Plan after three years.

5. ACKNOWLEGEMENTS

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

Mr. Alex Agafonoff	Conservation Officer, CALM Merredin District
Mr. Eric Bunn	Research Botanist, Kings Park and Botanic Garden
Ms. Anne Cochrane	Manager, CALM Threatened Flora Seed Centre
Dr. Kingsley Dixon	Assistant Director, Kings Park and Botanic Garden
Ms. Rebecca Evans	Project Officer, CALM W.A. Threatened Species and Communities Unit
Ms. Sophie Juszkiewicz	Propagator, Kings Park and Botanic Garden
Ms. Robyn Phillimore	Project Officer, CALM W.A. Threatened Species and Communities Unit
Mr. Larry Trinder	Roadside Management Officer, MRWA Wheatbelt North Region

We would also like to thank CALMScience staff for providing access to Herbarium databases and specimen information, and the staff of CALM's Wildlife Branch for assistance.

6. REFERENCES

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

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CALM (1994). Policy Statement No. 50 *Setting Priorities for the Conservation of Western Australia's Threatened Flora and Fauna.* Department of Conservation and Land Management, Western Australia.

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

Chinnock, R.J. (unpublished reference). *Taxonomic Description of Eremophila pinnatifida*.

World Conservation Union (1994). *IUCN Red List Categories* prepared by the IUCN Species Survival Commission, as approved by the 40th meeting of the IUCN Council. Gland, Switzerland.

7. TAXONOMIC DESCRIPTION (Draft R.J. Chinnock)

Although this description has not yet been published it is included with the kind permission of R.J. Chinnock of the Adelaide Herbarium.

*Eremophila pinnatifida is an e*rect spreading rounded aromatic shrub 0.6-1 m rarely to 1.3 m tall. *Branches* terete, obscured by leaves, non-tuberculate, densely pubescent, hairs consisting of short yellow gland tipped and longer setose eglandular ones. *Leaves* in whorls of 3, erect, imbricate, obscuring branches, ovate to oblong, deeply pinnately lobed, lobes obtuse sometimes toothed at base, lamina irregularly undulate or flattened, 5.0-9.5 x 2.5-4.5 mm, densely glandular-pubescent on both surfaces with numerous long white hairs on adaxial surface but abaxial surface lacking these hairs or occurring scattered or restricted to lower part on midrib, resinous. *Flowers* 1 per axil, sessile. *Sepals* 5, valvate, equal, linear-lanceolate, acute, 5.0-8.0 x 1.0-1.8 mm, outer surface densely pubescent consisting of short glandular and longer setose eglandular hairs, inner surface glandular-pubescent towards apex and appressed setose hairs below occasionally with some scattered glandular hairs, green. *Corolla* 18-25 mm long, pale purple, inside of tube white, pale purple spotted, outside surface pubescent, hairs long, eglandular; inside surface of lobes glabrous, tube sparsely villous throughout; lobes obtuse. *Stamens* 4, included, glabrous. *Ovary* ovoid-conical, 4-locular with 1 ovule per locule, densely villous but

glabrous towards the base; style glabrous. *Fruit* dry, woody, broadly ovoid, 3.5-4.0 x 2.4-3.2 mm; exocarp adhering to endocarp, densely villous. *Seed* ovoid-oblong, c. 2.5 x 0.7 mm, very pale buff. *Chromosome number* unknown.

Eremophila pinnatifida is allied to *E. ternifolia* and related species. Like *E. ternifolia* it has leaves in whorls of three and a similarly structured fruit but differs from this species and other allied ones like *E. sargentii* and *E. verticillata* by the diagnostic pinnate leaves and the prominent pubescence of the branches and leaves.

Derivation of epithet. Latin *pinnatifida*, lobed in a pinnate manner, the lobes cut half to about three-quarters of the way to the midrib.