INTERIM RECOVERY PLAN NO 37

CUNDERDIN DAVIESIA

(*DAVIESIA CUNDERDIN*)

INTERIM RECOVERY PLAN

1999-2002

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This Interim Recovery Plan will operate from June 1999 to May 2002 but will remain in force until withdrawn or replaced.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: ***Daviesia cunderdin***
Common Name: Cunderdin Daviesia
Family: Papilionaceae
Flowering Period: April-June
CALM Region: Wheatbelt
CALM District: Merredin
Shire: Cunderdin
Recovery Team: Merredin 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; Crisp, M.D. and Chandler, G. (1997). *Australian Systematic Botany 10:322-324*. Elliot, W.R. and Jones, D.L. (1984). *Encyclopaedia of Australian Plants Suitable for Cultivation* 3: pp. 200, Lothian Publishing Co., Melbourne.

Current status: *Daviesia cunderdin* was Declared as Rare Flora in November 1997 and ranked as Critically Endangered in November 1998. It currently meets World Conservation Union (IUCN) Red List Criteria B1+2ce, C2b and D. Despite intensive surveys only one highly threatened population, consisting of four adult plants, has been found on a road reserve less than four meters wide. The population is in decline and is threatened by fire, weed invasion, road maintenance, farming activities and trampling. The lack of genetic diversity within the population and the degraded habitat in which it occurs also threaten the long term survival of the species.

Habitat requirements: The species appears to be restricted to the Cunderdin area. The only known population grows on a narrow road reserve in lateritic sandy-clay soil on a slight rise. Grassy weeds dominate the degraded habitat but some associated native species have survived and include *Allocasuarina campestris*, *A. humilis*, *Hakea* sp. and *Acacia acuminata*. Surveys in areas containing similar vegetation and soil type have not resulted in the discovery of further populations.

Existing Recovery Actions: The following recovery actions have been or are currently being implemented:
1. Appropriate land managers have been notified of the presence of *Daviesia cunderdin*.
2. Declared Rare Flora (DRF) markers have been installed at the population.
3. An information sheet has been developed in order to promote public awareness of the species.
4. Staff of the Threatened Flora Seed Centre (TFSC) collected seed in 1996, 1997 and 1998.
5. Cutting material has been collected for Kings Park and Botanic Garden (KPBG).
6. Material is being obtained for tissue culture and cryostorage.
7. Weed control methods are being researched at the population site.
8. Experimental regeneration techniques are currently being researched at the population site.
9. Merredin District Staff regularly monitor the population.

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
1. **Criterion for success:** The number of individuals within populations and/or the number of populations have increased.
2. **Criterion for failure:** The number of individuals within populations and/or the number of populations have decreased.

Recovery actions

1. Monitor the population.	7. Acquire a strip of adjoining farmland and rehabilitate habitat.
2. Implement weed control.	8. Disseminate information.
3. Construct a barrier around plants.	9. Conduct further surveys.
4. Collect seed and cutting material.	10. Obtain biological and ecological information.
5. Develop a fire management strategy.	11. Develop a translocation proposal.
6. Stimulate germination of soil stored seed.	12. Write Recovery Plan.

BACKGROUND

History

J. Seabrook made the first known collection of *Daviesia cunderdin* in 1991 (Population 1), which then consisted of 14 plants. The specimen was subsequently lost and N. Marchant, J. Seabrook and R. Cranfield collected further material from the same location in 1993. These specimens are housed at the Western Australian Herbarium. There are two other collections of the species, both from the same population. Many surveys have been conducted in areas of similar soil and vegetation type, however, no further plants have been found, and the known population has declined to just 4 adult plants and 8 recently germinated seedlings.

Description

Daviesia cunderdin was named after the town of Cunderdin, which is near the only known population of the species. *D. cunderdin* is an erect, compact to open, spreading shrub to 1.2-1.6 m high and approx. 1.5 wide. The flattened phyllodes are scattered along the stem at right angles and are elliptical to ovate in shape with a pungent tip. The pea-shaped flowers, which lack a peduncle, are usually solitary, rarely paired, and emerge from the axils. These flowers are red to orange-red in colour, remain partly closed and are somewhat larger than related species, being up to 18 mm across. The species is closely related to *D. cardiophylla, D. euryloba* and *D. umbonata* but differs in having larger flowers with two deltoid appendages at the base of the standard-petal, which remains partly folded at anthesis.

Distribution and habitat

Despite extensive surveys, *Daviesia cunderdin* is currently known from only one population in the Cunderdin area, over a known range of about 200 m along the length of a 4 m wide road reserve. In this area, it grows on a slight rise in lateritic sandy clay. Grassy weeds dominate the road reserve, but native associated species include *Allocasuarina campestris*, dwarf sheoak (*A. humilis*), *Hakea* sp. and Jam (*Acacia acuminata*).

The species is likely to be geographically restricted. Although its colourful flowers are readily identifiable the species remained undiscovered until quite recently. Survey work has concentrated on the vegetation types that carry a similar range of species as those found at the population site. These vegetation types are restricted to the common ‘reworked sandplains’ soil type named ‘Ulva’, which is described as yellow and white sand containing locally abundant limonite pebbles on upper slopes in the central and eastern Wheatbelt. To date, there is little of this habitat left in the near vicinity that has not already been surveyed. There is, however, some private land that has not been surveyed.

Biology and ecology

While the biology of many *Daviesia* species is well researched, the biology of *D. cunderdin* is poorly known. Most *Daviesia* species seem to have a relatively short life cycle, produce seeds after three years and germinate following disturbance such as fire. Given the small number of adult *Daviesia cunderdin* plants, recruitment from seed is thought to be low.

Fire is believed to be an important component of the life cycles of *Daviesia* species, therefore *D. cunderdin* probably needs occasional fires to reproduce. Recent research by F. Obbens (Consultant, Western Australian Herbarium) suggests that fire is required for germination of *Daviesia cunderdin*. However, burning at the wrong time of year or before regenerating or juvenile plants have reached maturity and replenished the soil seed bank could be deleterious.

Small flies have been seen to visit *Daviesia cunderdin* during flowering, however, there is no evidence to suggest these were acting as pollinators (Schwarten, 1995). *Daviesia* seeds have an elaisome (a small outgrowth on the surface of the seed), that is common to many members of Papilionaceae and attracts ants that disperse the seed. There is some field evidence to suggest that ants may also predate the seed.

A rapid reduction in seed viability may also affect the recovery of the species. Research indicates that the viability of *Daviesia* seed decreases rapidly over 14 months. However, this is contrary to the nature of most hard

seeded species, where seed can remain viable in the soil for many years (personal communication, A. Cochrane[1]). Poor viability would limit seedling recruitment from soil stored seed.

Threats

Daviesia cunderdin was Declared as Rare Flora in November 1997 and ranked as Critically Endangered in November 1998. It currently meets World Conservation Union (IUCN) Red List Criteria B1+2ce, C2b and D. Despite intensive surveys only one highly threatened population, consisting of four adult plants, has been found on a road reserve less than four meters wide. The population is in decline and is threatened by fire, weed invasion, road maintenance, farming activities and trampling. The lack of genetic diversity within the population and the degraded habitat in which it occurs also threaten the long term survival of the species.

- **Weeds** are a major threat to the population. Weeds are invading the road verge from adjacent farmland and are likely to compete with recruitment from soil stored seed. *Daviesia cunderdin* exists as a narrow linear population on a road reserve and is therefore extremely prone to weed invasion from adjacent land.

- **Road maintenance** is a threat to the species. Grading and other road maintenance, such as mowing the road reserve vegetation and spraying of herbicides, may affect the known population of *Daviesia cunderdin*. Relevant authorities need to carry out appropriate protective measures, primarily by informing staff operating in the area of the need to protect the species and its habitat.

- **Farming activities** such as **f**ence and firebreak maintenance may damage or destroy plants that are growing close to fence line. The population of *Daviesia cunderdin* is also close enough to adjacent farmland to be affected by herbicide and fertiliser overspray. This threat is highlighted by the recent death of weeds near the fence (personal communication, L. Monks[2]). Chemical drift is also thought to be the cause of the death of a plant in 1996.

- **Inappropriate fire regimes** would adversely affect the viability of populations. Seeds of *Daviesia cunderdin* probably germinate following fire. Given this, the soil seed bank would rapidly be depleted if fires recurred before regenerating or juvenile plants reached maturity and had time to replenish the soil seed bank. Conversely, it is likely that occasional fire or soil disturbance is needed for recruitment of the species.

- **Degraded habitat:** The population of *Daviesia cunderdin* occurs in degraded road reserve where there is little associated native vegetation to support pollinating insects (bees?) and seed dispersers (ants).

- **Genetic diversity:** There are only four adult plants known from the wild, limiting the genetic diversity of the species.
- **Poor reproductive capacity** is likely to have a dramatic effect on the ability of the species to survive the current threatening processes. To date, there has been no natural recruitment and mature plants are senescing.

Summary of population information and threats

Pop. No & Location.	Land Status	Year/No. plants		Condition	Threats
1. North of Cunderdin	Shire road verge	1991 1995 1996 1998	14 7 6 4 (8)	Poor	Senescence, poor recruitment, chemical drift, road maintenance, weed invasion, inappropriate fire regimes

( ) = seedlings

[1] Anne Cochrane, Western Australian Herbarium, CALM
[2] Leonie Monks, CALMScience, CALM

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

Appropriate parties have been made aware of the location of *Daviesia cunderdin*. The Shire of Cunderdin was formally notified in January 1998. Adjacent land managers have also been informed of the presence of this species.

Declared Rare Flora markers have been installed at the population. The significance of these markers is being promoted to relevant parties such as Shires, Main Roads Western Australia (MRWA), Westrail, Western Power and the Bush Fires Board through the distribution of dashboard stickers and posters that illustrate DRF markers, inform of their purpose, and provide a contact telephone number to use if markers are encountered.

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

Staff from the TFSC collected seed from population one in 1996, 1997 and 1998. Over 232 seeds taken from four plants are in storage. The viability of the seed has been found to vary between 33% and 50%.

Cuttings collected by Frank Obbens in March and October 1998 have been given to Kings Park and Botanic Garden (KPBG). The first collection had a poor strike rate, with only seven strikes from 20 cuttings. Results are not yet available from the second collection of 12 cuttings. In November 1998, KPBG held five plants in its Nursery. These plants are relatively healthy and are growing well.

Attempts are currently under way to retrieve material from the population for tissue culture and possibly also cryostorage.

Weed control methodology is currently being researched at the population site of the population. F. Obbens is using part of the population to illustrate the potential benefit of herbicide control and weed exclusion shelters. To date, the experiment has appeared successful, as grasses are no longer dominant within the enclosed area. Outside the enclosure, spot weeding (ie. hand pulling and wick application of glyphosate) continues periodically.

Experimental regeneration techniques, including soil disturbance and fire to encourage germination of soil stored seed, are being conducted by F. Obbens. In July 1998 two dead plants inside the enclosure were burnt, resulting in 8 seedlings that were hand watered to aid survival over summer. At the same time, the area immediately around the three plants outside the weed exclusion shelter was raked after weed control had been implemented. There has not yet been any germination of seed following the treatment.

CALM's Merredin District Staff is regularly conducting monitoring of the population.

The Merredin District Threatened Flora Recovery team oversees the implementation of recovery actions prescribed in this IRP, and reports 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 before recovery actions being undertaken.

1. Monitor the population

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

Action: Monitor the population
Responsibility: CALM (Merredin District), Cunderdin Landcare Officer through the Merredin District Threatened Flora Recovery Team (MDTFRT)
Cost: $1,000 per year.

2. Implement weed control

Although partial (experimental) weed control has been implemented at the site of *Daviesia cunderdin*, a full program is now required as the habitat is extremely degraded and weedy. CALM will implement a weed control program in consultation with the Shire of Cunderdin that will involve:

1. Selection of an appropriate herbicide after determining what weeds are present.
2. Controlling invasive weeds by hand removal and spot spraying when weeds first emerge.
3. Construction of a barrier to arrest weed invasion (see 2).
4. Scheduling to include weed spraying of other Declared Rare Flora populations requiring weed control within Moora and Merredin Districts.

Action: Implement weed control
Responsibility: CALM (Merredin District, CALMScience), the Shire of Cunderdin through the MDTFRT
Cost: $1,500 per year.

3. Construct a barrier around plants

Weed control research has shown that the construction of a barrier around *Daviesia cunderdin* plants following weed control has prevented the re-invasion of weeds (see also existing recovery actions above and 3 below). This barrier also protects plants from chemical drift from surrounding agricultural land. It is recommended that a similar barrier be constructed around the 3 adult plants that are outside the current enclosure, incorporating dead plants if deemed desirable.

Action: Construct a barrier around plants
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $600 once.

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 12).

Action: Collect seed and cutting material
Responsibility: CALM (TFSC, Merredin District), KPBG though the MDTFRT
Cost: $1,600 once for tissue culture and $1,900 per year for seed preservation.

5. Develop a fire management strategy

It is highly likely that *Daviesia cunderdin* requires occasional fire for recruitment from soil stored seed, but frequent fires during the flowering and seeding phase (April-September) may be detrimental to its long-term survival.

Action: Develop a fire management strategy

Responsibility: CALM (Merredin District), relevant authorities through the MDTFRT
Cost: $1,100 in the first year.

6. Stimulate germination of soil stored seed

Germination of soil-stored seed by burning the areas where plants previously occurred has proven successful with some 8 seedling now present. It is recommended that this action be extended into other parts of the population.

Action: Stimulate germination of soil stored seed
Responsibility: CALM (CALMScience and Merredin District) through the MDTFRT
Cost: $2,000 in the first year.

7. Acquire a strip of adjoining farmland and rehabilitate habitat

Restoration of the habitat of *Daviesia cunderdin* by the control of weeds and the re-introduction of plant species native to the site is essential for the continued survival of the species. However, this will not be possible without the acquisition of a strip of adjoining farmland to widen the road reserve and increase potential habitat for the expansion of the population. It is recommended that a strip of land be purchased and a rehabilitation strategy written and implemented.

Action: Acquire a strip of adjoining farmland and rehabilitate habitat
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $2,600 once for the acquisition of the buffer strip, $5,800 once for rehabilitation.

8. Disseminate information

The importance of biodiversity conservation and the protection of *Daviesia cunderdin* will be promoted to the public. This will be achieved through an information campaign using the local print and electronic media and by developing an information sheet, which includes a description of the plant, its habitat type, threats and management actions. This is especially important as the only known population of the species is small and highly threatened, and increased awareness may result in the discovery of others. Formal links with local naturalist groups and interested individuals will also be encouraged.

Action: Disseminate information
Responsibility: CALM (Corporate relations Division, WATSCU and Merredin District) through the MDTFRT
Cost: $2,000 once.

9. Conduct further surveys

Further surveys supervised by CALM staff with the assistance of local conservation groups, wildflower society and naturalist club will be conducted for *Daviesia cunderdin* during its flowering period (April- June).

Action: Conduct further surveys
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $1,600 per year.

10. Obtain biological and ecological information

Research designed to increase understanding of the biology of the species will provide a scientific base for management of *Daviesia cunderdin* in the wild. Research will include:

1. The effects of weeds on recruitment and establishment.
2. Response of *Daviesia cunderdin* and its habitat to fire.
3. Longevity of plants, and time taken to reach maturity.
4. Factors determining level of flower and fruit abortion.
5. Level of invertebrate grazing of seed pods.
6. Amount of soil-stored seed.

7. Seed germination requirements.
8. Genetic variability within and between populations.

Action: Obtain biological and ecological information
Responsibility: CALM (CALMScience and Merredin District) through the MDTFRT
Cost: $15,600 per year.

11. 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 population and translocation to more secure sites be investigated with the former given priority.

Although translocations are generally undertaken under full Recovery Plans, it is possible to develop a translocation proposal, search for suitable translocation sites 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: $1,600 once.

12. Write a full Recovery Plan

At the end of the second year 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 the Interim Recovery Plan.

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

4 TERM OF PLAN

This Interim Recovery Plan will operate from April 1999 to March 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. ACKNOWLEDGMENTS

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

Mr Alex Agafonoff	Conservation Officer, Merredin District, CALM
Mr Eric Bunn	Research Botanist, Kings Park and Botanic Garden
Ms Anne Cochrane	Manager, Threatened Flora Seed Centre, CALM
Ms Sophie Juszkiewicz	Propagator, Kings Park and Botanic Garden
Dr Neil Lantzke	Development Officer, Agriculture Western Australia
Mr Frank Obbens	Consultant, Western Australian Herbarium, CALM
Ms Gillian Stack	Project Officer, W.A. Threatened Species and Communities Unit, CALM

We would like to thank the staff of the W.A. Herbarium for allowing us access to Herbarium databases and specimen information, and CALM's Wildlife Branch for their assistance.

6. REFERENCES

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7. TAXONOMIC DESCRIPTION (Crisp and Chandler (1997)

Daviesia cunderdin is an erect, compact to open, divaricate shrub, to 1.2-1.6 m high and c. 1.5 wide, minutely hispid on branchlets and pedicels. *Branchlets* at c. 45°, prominently ribbed, with a pedestal at each node. *Phyllodes* scattered, at c. 45° to the stem, elliptical to ovate or narrowly so, ± flat, with an acuminate (to 3-4 mm long) pungent apex, rounded and articulate at base with 3 node-like thickenings on nerves, (6-) 10-20 x 4-9 mm rigid and sometimes slightly wrinkled on drying, dull green. *Unit inflorescences* solitary or in pairs (rare) in the axils, 1-flowered; *peduncle* nil; *subtending bracts* oblong, keeled, 1-1.5 mm long. *Pedicels* 3-5 mm long; hispid. *Calyx* 5-7 mm long including the c. 1.5 mm receptacle, minutely hispid; upper 2 lobes united in a truncate recurved lip with outcurved tips, 2 mm long; lower 3 lobes triangular, 2 mm long; a small dark-coloured bulge just below each sinus (except between the upper 2 lobes). *Corolla* red to orange-red; *standard* remaining partly folded and only tardily opening out, broadly obovate to elliptical with a broad shallow sinus at apex, 12-15 x 12-14 mm including 3-4 mm claw, c. 0.6-0.7 mm high, red with a dark red centre, claw with two raised deltoid appendages (calli) converging at its apex; *wings* elliptical to narrowly so, rounded at apex, auriculate, 13-17 x 4-5 mm including 4-5 mm claw, darker red towards base; *keel* half broadly transverse-obovate, curved through c. 120°, acute, 16-18 x 4-5 including 8-8.5 mm claw, petals fully joined from base of lamina to tip, claws free. *Stamens* strongly dimorphic, inner whorl of five with shorter, rounder, versatile anthers with confluent thecae; outer whorl of five with shorter, broader filaments and longer, 2-celled, basifixed anthers. *Ovary* slightly obovate. *Style* curving gradually through c. 120°. *Pod* and *seed* not seen.

In general aspect, plants of *Daviesia cunderdin* are larger and coarser than in any of *D. cardiophylla*, *D. euryloba* or *D. umbonata*. However, it is most readily distinguished by the flowers, which are red and much larger than the more conventional yellow and red flowers of the other three species. Moreover, *D. cunderdin* has a unique standard-petal, 12-15 mm long, which remains partly folded and bears a pair of deltoid appendages at the base. The other species have a fully opening standard < 10 mm long, with only slightly raised calli. In *D. cunderdin*, the base of the phyllodes is rounded, not cordate as in *D. cardiophylla* nor cuneate like *D. umbonata*. Those of *D. euryloba* are similar in outline to those in *D. cunderdin*, but more or less longitudinally folded up, or at least adaxially concave. There are bulges below the sinuses of the calyx in both *D. cunderdin* and *D. umbonata*, but these are rare in *D. cardiophylla* and absent in *D. euryloba*.