TRANSLOCATION PROPOSAL
Three Springs Daviesia,
Daviesia bursarioides Crisp. (Fabaceae)

1. SUMMARY

Daviesia bursarioides is a member of the family Fabaceae. It is a straggling shrub to 2 m tall. The branchlets are divaricate (spreading widely in different directions), terete and spiny with a waxy bloom. The phyllodes are scattered, 3 - 20 mm, narrowly obovate, fleshy and jointed with a sharp point at the tip. The flowers, which are produced between July and September, are small, typically pea-shaped, yellow and maroon. The fruit is a triangular pod, 9 mm x 10 mm.

D. bursarioides was first collected by W.E. Blackall between Coorow and Arrino in 1932. By 1978 only one surviving population, with three adult plants, was known. Since 1990, Three Springs Shire gardener, Charles Strahan has located four new populations, and CALM Consultant Diana Papenfus has found one new population, bringing the total number of populations to six.

D. bursarioides is probably a disturbance opportunist, as are many species of the genus *Daviesia* (Schwarten 1995). Schwarten (1995) recommends some form of disturbance every 6 - 8 years as a management technique. The response of *D. bursarioides* to a disturbance event such as fire is unknown. Experiments by Schwarten (1995) showed several *Daviesia* species had a significant decrease in germination after treatment with various levels of smoke. He speculated that it was the heat, rather than the smoke of a fire which promoted germination of *Daviesia* species.

A. Cochrane (pers. comm.) observed germination in the laboratory of between 6 and 77% for *D. bursarioides.* Schwarten (1995) found that this species has a low seed set, with around 98% of ovules being aborted. Of the seeds set, a germination of 7% was recorded. In addition seed that was lightly buried rapidly lost viability. Viability was 100% after being buried for six months, but was only 65% after being buried for 12 months, which means it is unlikely that there is a significant soil stored seed bank. Schwarten (1995) found that *D. bursarioides* has a multi-aged stand, with most plants declining after 6 years and dying after 8 - 10 years.

Daviesia bursarioides is endemic to the Three Springs area occurring over a range of just seven kilometres. It is known from six populations with a combined total of around 123 plants. It is found growing in shallow soils of brown sandy loams with extensive lateritic gravel that supports open shrub mallee habitat.

Due to the low number of plants and the threats associated with growing on narrow, degraded road reserves or near areas that are disturbed often, *D. bursarioides* was declared as Rare Flora in September 1987 and then ranked as Critically Endangered in September 1995.

The aim of this translocation is to conserve the wild genetic stock of the species by restocking the most secure population of *D. bursariodes.* This translocation proposal outlines the need for translocation of the critically endangered *D. bursariodes,* the site selection process, the design of the translocation site and the provisions for monitoring. In addition it outlines the criteria for success or failure of this proposed translocation.

2. PROPONENTS

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3. BACKGROUND

3.1 History, Taxonomy and Status

Daviesia bursarioides Crisp. is a member of the family Fabaceae, commonly known as the pea family. It is a straggling shrub to 2 m tall. The branchlets are divaricate (spreading widely in different directions), terete and spiny with a waxy bloom. The phyllodes are scattered, small (3 - 20 mm), narrowly obovate, fleshy and jointed with a sharp point at the tip. The flowers, which are produced between July and September, are small, typically pea-shaped, yellow and maroon. The fruit is a triangular pod, 9 mm x 10 mm. The name *bursarioides* refers to the resemblance of this species, when not in flower, to members of the genus *Bursaria.*

D. bursarioides was first collected by W.E. Blackall between Coorow and Arrino in 1932. By 1978 only one surviving population (population 1) with three adult plants was known. Attempts by Dr M. Crisp in 1979 to save this species by propagation from cuttings did not succeed. This population was severely damaged by construction of a fence adjacent to the area in 1979, fortunately several plants regenerated and recruitment of seedlings occurred following this disturbance. Since 1990, Three Springs Shire gardener, Charles Strahan has located four new populations, and CALM Consultant Diana Papenfus has found one new population, bringing the total number of populations to six with 123 individuals.

D. bursarioides is probably a disturbance opportunist, as are many species of the genus *Daviesia* (Schwarten 1995*)*. In the largest population, plants that are growing in a disused gravel pit are more abundant and vigorous than those observed in the adjoining remnant vegetation. Schwarten (1995) recommends some form of disturbance every 6 - 8 years as a management technique.

The response of *D. bursarioides* to a disturbance event such as fire is unknown. Fire is usually a stimulus for regeneration from seed for most Australian legumes (Crisp 1985). Experiments by Schwarten (1995) showed several *Daviesia* species had a significant decrease in germination after treatment with various levels of smoke. He speculated that it was the heat, rather than the smoke of a fire which promoted germination of *Daviesia* species.

Schwarten (1995) found that *D. bursarioides* has a low seed set, with a fruit: flower ratio of 3.8% and a seed: ovule ratio of 1.9%. Around 98% of ovules were aborted and this may be due to insufficient numbers of pollinators in the area. Of seeds set, a germination of 7% was recorded (Schwarten 1995). Germination of between 6 and 70% has been observed for *D. bursarioides* (A. Cochrane pers. comm). Schwarten (1995) found that seed that was lightly buried rapidly lost viability over a six month period. Viability was 100% after being buried for six months, but was only 65% after being buried for 12 months (Schwarten 1995), which means it is unlikely that there is a significant soil stored seed bank.

Schwarten (1995) found that *D. bursarioides* has a multi-aged stand, with most plants declining after 6 years and dying after 8 - 10 years.

Due to the low number of plants and the threats associated with growing on narrow, degraded road reserves or near areas that are disturbed often, *D. bursarioides* was declared as Rare Flora in September 1987 and then ranked as Critically Endangered in September 1995.

3.2 Distribution and Habitat

Daviesia bursarioides is endemic to the Three Springs area occurring over a range of just seven kilometres. It is known from six populations with a combined total of around 123 plants (see Table 1).

D. bursarioides is found growing in shallow soils of brown sandy loams with extensive lateritic gravel that supports an open shrub mallee habitat dominated by *Eucalyptus gittinsii* and *Allocasuarina campestris*, *Dryandra* sp., *Hakea* sp., and *Grevillea* sp.

Table 1. Population details for *Daviesia bursarioides*.

Population no.	Number of individuals	Land tenure
1	19	Shire road verge
2	11	Shire road verge
3	17	Shire road verge
4	12	MRD road verge
5	60	Private property
6	4	Nature reserve

4. THE TRANSLOCATION

4.1 The Need to Translocate

The rarity of *D. bursarioides* is probably due to a lack of available habitat due to land clearing and as a result it is exposed to threats associated with a small population size and a highly restricted distribution. In addition, most of the populations of *D. bursarioides* occur on narrow degraded road verges and are exposed to weed invasion from surrounding farmland. Populations are also vulnerable to accidental destruction from road maintenance activities. Several incidents involving road maintenance activities have resulted in damaged plants, despite ongoing liaison and cooperation with the Shire of Three Springs.

Crisp (1985) recommended translocation to a "better protected locality nearby" as the only long term solution for the survival of this species. In addition an Interim Recovery Plan has been written for this species (Papenfus, Brown and Bunny, in prep) and this plan recommends the restocking of the known population or translocation to another site. Due to the extremely small population sizes of this species, and the numerous threats to these populations, translocation is considered to be urgent.

4.2 Translocation Site Selection

A site in the north east corner of Reserve # was chosen as the translocation site. This is the site where population six already occurs, so soil type and associated vegetation type and structure is suitable for this species. As the species already occurs at this site this translocation can be considered a restocking under the definitions provided by Policy Statement 29 and the Guidelines for Translocation of Threatened Plants in Australia.

The proposed restocking site is only 4 km in a direct line from population five, from where the seed was sourced. Due to the short distance between sites it is unlikely that there are significant genetic differences between population 5 and population 6 (D. Coates pers. comm).

The area where the species occurs is managed by CALM, as it occurs within the boundaries of a Reserve, and so no conflict of interest over land use is anticipated. Endorsement of this translocation was received from the CALM Midwest Region (Appendix four).

4.3 Translocation Design

A total of 205 seedlings of *D. bursarioides* have been raised for this years restocking from seed. Seed was sourced from a bulk collection from 30 adult plants within population 5.

At the proposed restocking site four replicates of 14m x 4m each will be measured. Plots will not be cleared of vegetation, instead seedlings will be planted in gaps in the vegetation, adhering as close as possible to the grid pattern presented in this proposal. In this way there will be minimal disturbance to the natural vegetation. There appears to be no reason that there would be adverse effects on the conservation values of the reserve from this translocation.

Each replicate will be divided into a grid of 51 holes, arranged in three rows of 13, and one row of 12, with 1m between each hole (see Appendix two for site diagram).

A total of four treatments will be tested: control, watered and mulched, mulched or watered (see Table 2). Treatments will be randomly assigned to one row in the grid (see Appendix two for site diagram).

Seedlings have been raised at the accredited nursery at Kings Park and Botanic Gardens and therefore are considered disease free. All equipment used during seedling planting will be maintained under strict disease hygiene.

Table 2. Description of experimental treatments.

Treatment	Description of Treatment
Control	Plants not given any treatment.
Mulched	A layer of mulch is placed around the plant to see whether it enhances survival by increasing water retention.
Watered	Plants will be watered with a set amount of water once a week for 24 weeks from the start of November to the end of April to see whether watering over the first summer enhances survival
Watered and mulched	A layer of mulch is placed around the plant and in addition plants will be watered with a set amount of water once a week for 24 weeks from the start of November to the end of April to see whether it is a combination of both watering and mulching that enhances survival.

An irrigation system will be set up during planting out of the seedlings to water those plants assigned to the watering treatment (see Table 2). A soil wetting agent will be added to the soil around these plants.
Each plant will be permanently tagged so that each individual will always be identifiable. A small cage of rabbit netting will be placed around each plant to prevent predation of the seedlings by large herbivores.

Monitoring of the restocked population will be undertaken every second month commencing one month after the planting out of the seedlings. Monitoring will include counting the number of surviving germinants, height of the surviving seedlings, width of the crown of the surviving seedlings in two directions (so that crown volume can be calculated), reproductive state, number of flowers and pods, whether second generation plants are present and general health of the plants. A set photo point will be allocated for each plot and a photo will be taken each time monitoring takes place.

Monitoring of the original populations will also occur every second month in conjunction with monitoring of the restocked population. This will provide essential baseline data for assessing the performance of the translocated population. Monitoring will include counting the number of individuals, height and crown width of the individuals, reproductive state, number of flowers and pods and general health of the plants.

4.4 Source of Plants

Seed was collected under guidelines outlined in Appendix three. Seed has been sourced from population 5 from a bulk collection from 30 plants for planting at the translocation site in 1998. Seedlings are being raised at Kings Park and Botanic Gardens nursery after being germinated at the Threatened Flora Seed Centre.

4.5 Criteria for Success or Failure

Criteria for Success

- Short Term: establishment of translocated seedlings
  production of flowers and seed
  after one generation the number of individuals is sustained by natural recruitment
- Long Term: after two or more generations the number of individuals is sustained by natural recruitment, and a soil stored seed bank has been established.
- The production of guidelines for the establishment of future translocations of related species.

Criteria for Failure

- Short Term: failure of translocated seedlings to establish
  failure of plants to produce flowers and seed
- Long Term: there is a significant decline in the size of the translocated population due to lack of natural recruitment

5. TIMETABLE

Time	Action
October 1997	Seeds collected
October 1997	Seeds put down for germination. Resulting seedlings raised at Kings Park and Botanic Gardens.
March 1998	Translocation site selected.
April 1998	Translocation proposal submitted for review and approval.
July - August 1998	Translocation of seedlings into Sweetman Nature Reserve, where population 6 occurs.
August - September 1998	Follow up monitoring and maintenance of translocation site.
September 1998 - May 1999	Monitoring and maintenance of translocation site.
October 1998	Translocation proposal for 1999 translocation submitted for review.
November 1998	Second batch of seeds put down for germination. Resulting seedlings raised at Kings Park and Botanic Gardens.
April 1999	Progress report.
May - June 1999	Further translocation of seedlings into population 6.
June - July 1999	Follow up monitoring and maintenance of translocation site.
August 1999 - May 2001	Monitoring and maintenance of translocation site.
May 2001	Final Report

6. FUNDING

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7. ACKNOWLEDGMENTS

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8. REFERENCES

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Papenfus D., Brown A. and Bunny F. (In Prep). Three Springs Daviesia (*Daviesia bursarioides*) Interim Recovery Plan. Department of Conservation and Land Management. Perth WA.

Schwarten T. (1995) The Biology and Ecology of Threatened *Daviesia* Species in Western Australia. Final Report to Australian Nature Conservation Authority. Perth Western Australia.

Appendices One, Three and Four may be available on contacting the authors.

Appendix Two.

Site Diagram for Proposed Restocking of *Daviesia bursarioides* population 6.

There is a total of 205 seedlings of *Daviesia bursarioides* available.
These will be planted as shown in the diagram below, with one seedling at each point marked with an asterix (*).
The four treatments of control, watered and mulched, watered and mulched will be assigned as per the diagram below.

Replicate 1

Watered	*	*	*	*	*	*	*	*	*	*	*	*	*
Control	*	*	*	*	*	*	*	*	*	*	*	*	
Watered and Mulched	*	*	*	*	*	*	*	*	*	*	*	*	*
Mulched	*	*	*	*	*	*	*	*	*	*	*	*	*

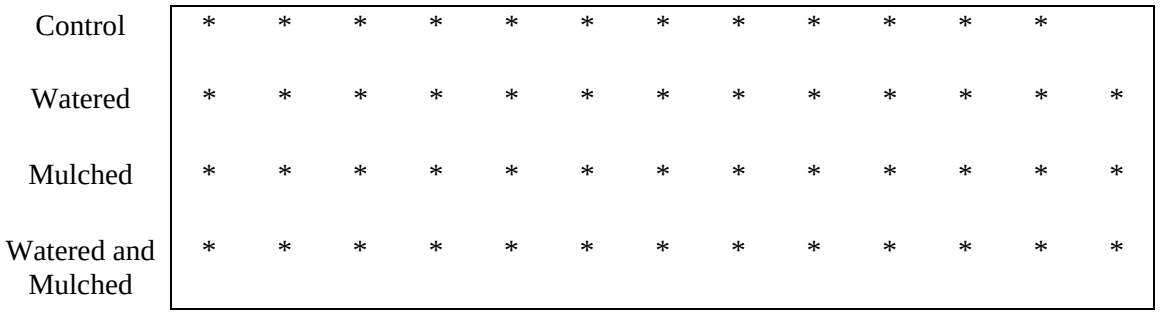
Replicate 2

Watered and Mulched	*	*	*	*	*	*	*	*	*	*	*	*	
Mulched	*	*	*	*	*	*	*	*	*	*	*	*	*
Control	*	*	*	*	*	*	*	*	*	*	*	*	*
Watered	*	*	*	*	*	*	*	*	*	*	*	*	*

Replicate 3

Mulched	*	*	*	*	*	*	*	*	*	*	*	*	*
Watered and Mulched	*	*	*	*	*	*	*	*	*	*	*	*	*
Watered	*	*	*	*	*	*	*	*	*	*	*	*	*
Control	*	*	*	*	*	*	*	*	*	*	*	*	

Replicate 4



Scale: 1 m