

TRANSLOCATION PROPOSAL

Cunderdin *Daviesia* - *Daviesia cunderdin* Crisp and G. Chandler (Papilionaceae) and Tangled Wattle - *Acacia volubilis* F. Muell. (Mimosaceae)

1. SUMMARY

The aim of this translocation is to conserve the wild genetic stock of two species, *Daviesia cunderdin* and *Acacia volubilis* by translocation to a secure site and by augmenting one of the known sites of *A. volubilis*.

Daviesia cunderdin was first collected in 1991 and subsequently named in 1997 after the town near which it was found – Cunderdin. It is an erect shrub to 1.6 m with dull red to red-orange pea-shaped flowers occurring during May and June (Crisp and Chandler 1995).

Response to fire was assessed with a controlled burn in 1998 and a total of nine seedlings resulted from this action, of which 4 survived to reproductive age. A second fire response trial in 2000 resulted in approximately 30 seedlings, however only three survived. Response to smoke or mechanical disturbance is unknown. Only 263 seed has been collected from *D. cunderdin* and initial germination tests resulted in germination between 33 and 67% (A. Crawford pers. comm). It grows in soils of sandy clay with lateritic gravel

The species was declared rare in November 1997 and was ranked as Critically Endangered in November 1998. *D. cunderdin* is known from a single population of only 5 adult and 7 juvenile plants on a very narrow, weed infested road verge. The population is in decline and is threatened by inappropriate fire regimes, weed invasion, road maintenance activities and spray drift from the adjacent farm. The lack of genetic diversity within the population also threatens the long term survival of the species.

The second species, *A. volubilis*, was first described Baron Ferdinand von Mueller in 1877 from a specimen sent by Julia Wells from “Boxvale”. The species was considered to be extinct until 1996 when Brendan Lepschi and Terena Lally found a plant of *A. volubilis* growing across the road from *D. cunderdin*. The name “volubilis” means twining. It is a shrub to approximately 0.5 m with terete, tangled and glabrous branchlets and insignificant phyllodes (Mueller 2001). Inflorescences are golden, globular, and occur in June. It grows in soils of sandy clay with lateritic gravel. Population 1 co-occurs with *D. cunderdin*.

Response to fire or smoke is unknown, however after the controlled burns undertaken on *D. cunderdin*, two seedlings of *A. volubilis* were found. Both *A. volubilis* and *D. cunderdin* were accidentally sprayed with herbicide by local farmers between 1995 and 1997 whilst they were eradicating weeds from road verges. No seed has been collected from *A. volubilis* for long term storage.

A. volubilis was elevated from the presumed extinct list in 1997 and listed as Declared Rare Flora. It was subsequently ranked as Critically Endangered due to the small number of plants (89) and populations (11) occurring mainly on narrow, degraded road reserves. The populations are threatened by inappropriate fire regimes, weed invasion, road maintenance activities and drift from sprays used in the adjacent farm. The small size and fragmented nature of the populations also suggest that lack of genetic diversity may also threaten the long term survival of the species.

This translocation proposal outlines the need for translocation of the critically endangered *D. cunderdin* and *A. volubilis*, the site selection process, the design of the translocation and the provisions for monitoring. In addition it outlines the criteria for success or failure of this proposed translocation.

2. PROPONENTS

Mrs Amanda Godfrey
Land Conservation Co-ordinator
Cunderdin/Tammin Land
Conservation District Committee
CUNDERDIN WA 6151
(08) 9635 1040

Mrs Faye Christison
Land Conservation Co-ordinator
Cunderdin/Tammin Land
Conservation District Committee
CUNDERDIN WA 6151
(08) 9635 1040

Ms Leonie Monks
Research Scientist
Department of Conservation
and Land Management
KENSINGTON WA 6151
(08) 9334 0495

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3. BACKGROUND

3.1 History, Taxonomy and Status

Daviesia cunderdin

Daviesia cunderdin was first collected in 1991 by Joanna Seabrook. It was subsequently named in 1997 after the town near which it was found – Cunderdin. It is an erect compact to open divaricate shrub to 1.6 m (Crisp and Chandler 1995). Phyllodes are angled at 45° to the stem and are elliptical to ovate, 10 to 20mm in length, 4 to 9 mm in width, with an acuminate, pungent apex. The dull red to red-orange pea-shaped flowers occur singularly or in pairs in the phyllode axis during May and June (Crisp and Chandler 1995).

Response to fire was assessed in 1998, when two dead plants were burnt. A total of nine seedlings resulted from this action, of which 4 survived to reproductive age. A second trial in 2000, where a further two dead plants were burnt, resulted in approximately 30 seedlings, however due to drought conditions in the area only three survived. Response to smoke or mechanical disturbance is unknown. Only a small amount of seed has been collected from *D. cunderdin* (263 seed) and this is currently in long term storage at the Threatened Flora Seed Centre at the WA Herbarium. Initial germination tests undertaken prior to storage resulted in germination between 33 and 67% (A. Crawford pers. comm).

Extensive surveys were undertaken for this species in 1995 and 1996. Targeted surveys of the road verges and nature reserves in a 40 km radius around the only known population by Claire Welbon (formerly CALM Conservation Officer, Merredin) in 1995 and Nick Woolfrey (formerly CALM Conservation Officer, Merredin) in 1996 failed to locate any new populations. Further surveys specifically for this taxon east of Goomalling in 1996 by Robert and Beth Boase (Rare Flora Volunteers) and around Wongan Hills in 1996 by Mike Fitzgerald (CALM District Manager, Merredin) also failed to locate any new populations.

The species was Declared Rare in November 1997. It was ranked as Critically Endangered in November 1998 because 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 inappropriate fire regimes, weed invasion, road maintenance activities and spray drift from the adjacent farm. The lack of genetic diversity within the population also threatens the long-term survival of the species.

Acacia volubilis

A. volubilis was first described by Baron Ferdinand von Mueller in 1877 from a specimen sent by Julia Wells from “Boxvale”, a location thought to be in the vicinity of Quairading. Subsequently the species became confused taxonomically with *A. carens* and *A. cummingiana*. This confusion was only cleared up in 1990, however, in the absence of any live specimens turning up from this well collected area since the type was collected the species was thought to be extinct. In 1996 Brendan Lepschi and Terena Lally found a plant of *A. volubilis* growing across the road from the recently discovered and equally rare *D. cunderdin*.

The name *volubilis* means twining – which refers to the tangled, twining habit of the species. It is a shrub to approximately 0.5 m with terete, tangled and glabrous branchlets (Mueller 2001). Stipules 0.5-1mm long, recurved, subspinose on basal portion of branches otherwise toothlike projections at most nodes (Mueller 2001). Few phyllodes which resemble branchlets. Inflorescences are golden, globular, with approximately 10 – 17 flowers and occur in June. Petals are striate.

Response to fire or smoke is unknown, however, after controlled burns were undertaken on *D. cunderdin*, two seedlings of *A. volubilis* were found growing where adults had not previously been seen. Both *A. volubilis* and *D. cunderdin* were accidentally sprayed with herbicide by local farmers between 1995 and 1997 whilst they were eradicating weeds from road verges adjoining their property. It is not known what effect this had on the species. Response of *A. volubilis* to mechanical disturbance is unknown. No seed has been collected from *A. volubilis* for long term storage due to successive years of extremely poor seed set. Seed viability is therefore unknown.

Several surveys have been undertaken specifically for this species. In 1997 Brendan Lepschi and Terena Lally surveyed the area around the population found in 1996. They located two new populations. A subsequent survey by Terena Lally and Kate Brown, also in 1997, located a further two populations. Karen Bettink,

formerly Conservation Officer at CALM Merredin, surveyed road verges and reserves around the Cunderdin Shire. Five new populations were located as part of this survey program.

A. volubilis was elevated from the presumed extinct list in 1997 and listed as Declared Rare. It was subsequently ranked as Critically Endangered because only a small number of populations, consisting of only a few plants each, had been found. The populations are threatened by inappropriate fire regimes, weed invasion, road maintenance activities and drift from sprays in the adjacent farm. The small size and fragmented nature of the populations also suggest that lack of genetic diversity may also threaten the long-term survival of the species.

3.2 Distribution and Habitat

Daviesia cunderdin

The species is known from a single population north of Cunderdin. There are only 5 adult and 7 juvenile plants remaining on a very narrow, weed infested shire road verge (Table 1). It grows in soils of light brown sandy clay with lateritic gravel and co-occurs with Population 1 of *Acacia volubilis* over a distance of less than 50 metres. The single population of *D. Cunderdin* occurs in undifferentiated kwongan communities with *Casuarina campestris** thickets and *Eucalyptus loxophleba* and *E. salmonophloia* woodlands (Beard 1980).

Table 1. Population details for *Daviesia cunderdin*.

Population no.	Number of individuals	Land tenure
1	5 (plus 7 juveniles)	Shire road verge

Acacia volubilis

A. volubilis is endemic to an area near Cunderdin where it is known to occur over a range of just 40 kilometres (Table 2). Eleven populations consisting of a mere 89 mature plants occur on extremely narrow, degraded road reserves with two populations extending into private property (Table 2). It grows in soils of sandy clay with lateritic gravel. All populations occur in undifferentiated kwongan communities with *Casuarina campestris* thickets and *Eucalyptus loxophleba* and *E. salmonophloia* woodlands (Beard 1980).

Table 2. Population details for *Acacia volubilis*.

Population no.	Number of individuals	Land tenure
1	5	Shire road verge
2	24	Shire road verge and Private Property
3	8	Shire road verge
4	1	Shire road verge
5	36	Shire road verge
6	1	Shire road verge
7	4	Shire road verge
8	3	Shire road verge and Private Property
9	3	Shire road verge
10	1	Shire road verge
11	3	Shire road verge

4. THE TRANSLOCATION

4.1 The Need to Translocate

Daviesia cunderdin

The only known population of *D. cunderdin* is extremely small and is in decline (Table 3). Without the intervention of CALM staff in 1998 and 2000, who undertook small scale burns of dead plants, it is likely that this species would now be presumed extinct in the wild. The species occurs on a narrow (< 10 m) weed infested road verge, where it is vulnerable to accidental damage from road maintenance activities. In 1997 it was discovered adjoining landowners had been spraying herbicides along the road verges including the *D. cunderdin* population for the past three years. This practice has now stopped, however there is still a concern that herbicide spraying in the adjacent farmland may still be effecting the population. Due to the highly

Now *Allocasuarina campestris*

precarious nature of the location of the only known population, translocation to a site where these threats are not present appears to be the best method of securing the long term future of this species.

Table 3. Population numbers for *Daviesia cunderdin*

Population no.	Number of individuals
1	14 (1991)
	5 or 6 (1993)
	7 (1995)
	6 (1996)
	4 (1998)
	4 (plus 8 seedlings*) (2000)
	5 (plus 7 juveniles*) (2001)

* Seedlings the result of research burns undertaken in 1998 and 2000

Survey to locate suitable translocation sites is recommended in the Interim Recovery Plan for *D. cunderdin* (Evans and Brown 1999), whilst the actual translocation is recommended to be considered under a full recovery plan. The failure to locate any new populations and the extremely small chance of *D. cunderdin* persisting at the natural site without intervention leads us to believe that translocation is now crucial to the recovery of this species.

Acacia volubilis

A. volubilis is known from just 89 plants in 11 populations, of which most are located in narrow, degraded road verges. The populations are subject to the same threats as those described for *D. cunderdin* – competition from weeds, vulnerable to accidental damage from road maintenance activities and spray and chemical drift from the adjoining farm. Most populations are small (only two populations have more than ten plants) and are therefore likely to be subject to problems associated with small population size (such as inbreeding depression). In addition a recent survey of the populations (5 Nov 2002) revealed that a large proportion of the plants are sick or dying.

The Interim Recovery Plan for *A. volubilis* recommends survey to locate suitable translocation sites (Evans and Brown, Draft). The actual translocation is recommended under a full recovery plan, however due to the small number of plants, the precarious nature of the degraded road verges where they occur, and the current decline in the health of the plants, the need for translocation is considered to be urgent. Translocation should therefore be an immediate priority and is considered essential to the recovery of this species.

4.2 Translocation Site Selection

A search was made on 27th May 2002 of areas around where these species are currently known to occur. The search focussed on areas that had similar vegetation and soil type to the known populations and there was some long term security over the site. Three areas have been chosen as suitable translocation sites. None are located on conservation reserves. This is due to the almost total clearing (97.4% Weaving (1995)) of native vegetation in the Cunderdin Shire resulting in no suitable habitat available on conservation reserves. In the first year the idea is to focus on site 1, with a few plants (<5) of each species being planted in the museum site for educational purposes. Site 2 will be planted in the second year of the translocation. In this way a network of populations (metapopulation) will be developed on secure sites without over stretching the limited propagation resources.

A map of the proposed translocation sites in relation to the known populations is shown in Appendix 1. Endorsement for the use of these sites has been received from the CALM Merredin District, CALM Wheatbelt Region, Shire of Dowerin and Mr and Mrs Christison (Appendix 3).

Site 1

The main site is proposed to be located in remnant vegetation on the private property where population 8 of *Acacia volubilis* occurs. Clearly as live plants of *A. volubilis* have been found at the site, the conditions are suitable for this species. *D. cunderdin* occurs in soils of light brown sandy clay with laterite gravel, which is different to the yellow clayey sands over laterite that are present at the proposed translocation site. However, as in nature *D. cunderdin* co-occurs with population one of *A. volubilis* it is highly likely that this soil type will also suit *D. cunderdin*. Associated vegetation is similar between the proposed translocation and the natural *D.*

cunderdin site (Table 4). The proposed site occurs in undifferentiated kwongan communities with *Casurina campestris* thickets (Beard 1980), similar to the natural populations of both species, which occur in undifferentiated kwongan communities with *Casuarina campestris* thickets and *Eucalyptus loxophleba* and *E. salmonophloia* woodlands (Beard 1980).

Whilst the site is not a conservation reserve long term security is assured as the area will be managed for conservation by the Christison family. The Christison's are currently in the process of having a covenant placed on the title of the land. They have recently received funding from Envirofund (Environment Australia) to upgrade the fencing of this block of land. Mrs Faye Christison is also one of the proponents of this translocation. This site therefore is considered the most suitable, combining security with appropriate habitat. As only *A. volubilis* currently occurs naturally at this site the translocation can be considered an introduction for *D. cunderdin* and an augmentation or restocking for *A. volubilis* under the Guidelines for Translocation of Threatened Plants in Australia (1997) and Policy Statement 29.

Table 4. Associated vegetation at the natural populations of *Daviesia cunderdin* and *Acacia volubilis* and the two proposed introduction sites.

<i>Daviesia cunderdin</i> natural population	<i>Acacia volubilis</i> natural populations	Translocation site 1	Translocation site 2
<i>Acacia acuminata</i> <i>Actinostrobus</i> sp. <i>Allocasuarina humilis</i>	<i>Acacia acuminata</i> <i>Actinostrobus</i> sp. <i>Allocasuarina humilis</i> <i>Allocasuarina campestris</i> <i>Daviesia decurrens</i>	<i>Actinostrobus</i> sp. <i>Allocasuarina humilis</i>	<i>Allocasuarina humilis</i>
<i>Dianella revoluta</i> <i>Dryandra fraserii</i> <i>Gastrolobium spinosum</i> <i>Grevillea hookeriana</i>	<i>Dianella revoluta</i> <i>Dryandra armata</i> <i>Gastrolobium spinosum</i> <i>Grevillea hookeriana</i> <i>Hakea incrassata</i> <i>Hakea scoparia</i> <i>Hakea lissocarpha</i>	<i>Dianella revoluta</i> <i>Dryandra</i> sp. <i>Grevillea hookeriana</i> <i>Hakea</i> sp	<i>Dryandra</i> sp. <i>Gastrolobium spinosum</i> <i>Grevillea hookeriana</i> <i>Hakea</i> sp
<i>Leptospermum erubescens</i>	<i>Leptospermum erubescens</i>	<i>Leptospermum erubescens</i>	<i>Leptospermum erubescens</i>

Site 2

The second site is a reserve vested in the Shire of Dowerin. The site has the soils of white/ grey clayey sand with lateritic gravel which is similar to that of the natural populations. There are several species of associated vegetation in common between Site 2 and the natural population of both species (Table 4), as well as the Beard (1980) vegetation type of *Eucalyptus loxophleba* and *E. salmonophloia* woodlands occurring at both the translocation site and two of the *A. volubilis* sites. The habitat at the reserve is in good condition with no evidence of weed invasion. There is a sufficient barrier of natural vegetation between the proposed translocation site and any surrounding farms to eliminate any spray drift. This reserve therefore has the ideal combination of suitable habitat, absence of threatening processes and secure tenure. As these species have not previously been recorded from this reserve this translocation can be considered an introduction under the definitions provided by Policy Statement 29 and the Guidelines for Translocation of Threatened Plants in Australia (1997).

Site 3

The third site is in the gardens of the museum in the Cunderdin town site. This project has been initiated by the local community in Cunderdin, and it seems appropriate that a few plants (<5) of each species are planted in a prominent place for education purposes. It is proposed to have signage near the plants to describe the project and outline the importance of conserving rare species. This will hopefully generate more interest in conserving these and other rare plant species. Although this site is different from the habitat in which both species naturally occur, museum staff have agreed to care for the plants and ensure their survival. This site can therefore be considered a conservation introduction site under the Guidelines for Translocation of Threatened Plants in Australia (1997) and Policy Statement 29.

4.3 Translocation Design

The aim is to raise at least 100 individuals of each species for the first years translocation. The design outlined below will be used for both species.

At the proposed translocation site five plots of 12m x 9m each will be measured. Each plot will be divided into a grid of 20 holes, arranged in four rows of five, with 3m between each hole. Plots will not be cleared of vegetation; instead plants 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. Two treatments will be tested: watered or not watered (see Table 2). Treatments will be randomly assigned to one row in the grid (see Appendix two for site diagram). An irrigation system will be set up in November 2003 to water weekly those plants assigned to the watering treatment (see Table 2).

Table 2. Description of experimental treatments.

Treatment	Description of Treatment
Not watered	Plants not given any treatment.
Watered	Plants will be watered with a set amount of water once a week from the start of October to the end of April (or whenever the break of season occurs) to see whether watering over the first summer enhances survival.

Plants have been raised at the accredited nursery at Kings Park and Botanic Gardens and therefore are considered disease free. All equipment used during planting will be maintained under strict disease hygiene. 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 large herbivores from eating the plants.

Monitoring of the translocated population will be undertaken every six months commencing after planting. Monitoring will include counting the number of surviving plants, height of the surviving plants, width of the crown of the surviving plants in two directions, reproductive state, number of flowers and pods, whether second generation plants are present and general health of the plants.

Monitoring of the original populations will also occur every six months in conjunction with monitoring of the translocated populations. 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

Seedlings of *D. cunderdin* were sent to Kings Park in 1995 and cutting material was collected in 1998. The plants grown from these collections have been retained in pots at the Kings Park nursery for use as stock plants for cutting material for the proposed translocation. A total of 5 clones and one seedling collection are represented in the collection. However, cutting striking has been low and disproportionately more cuttings have struck from the plants originally grown from seed. The intention is to plant these in the current year and then seek permission next year for a further translocation using material not currently represented.

A total of 18 clones of *Acacia volubilis* were collected in November 2001 (Table 5) and cutting are currently being grown from this collection. Plants of both species are being raised at the accredited nursery at Kings Park (Botanic Gardens and Parks Authority).

Table 5. Origin and number of clones of *Acacia volubilis* collected for propagation.

Population of Origin	Number of plants in the population	Number of Clones Collected
1	5	1
2	24	8
3	8	3
7	4	3
8	3	2
9	3	1

4.5 Criteria for Success or Failure

*Criteria valid for both species

Criteria for Success

- Short Term: establishment of translocated plants
production of flowers and seed
after one generation the population is sustained by natural recruitment
- Long Term: after two or more generations the population is sustained by natural recruitment, and an adequate soil stored seed bank for natural recruitment has been established.

Criteria for Failure

- Short Term: failure of translocated plants 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 and a soil stored seed bank fails to establish.

5. TIMETABLE

Time	Action
May 2002	Translocation sites selected.
November 2002	Cutting material of <i>D. cunderdin</i> and <i>A. volubilis</i> propagated at the Kings Park nursery.
January 2003	Translocation proposal submitted for review.
May - June 2004	Translocation of plants into the translocation site.
June 2004 - May 2005	Monitoring and maintenance of translocation site.
November 2004	Setting up of irrigation system.
November 2004	Seek further funding for second years planting
April 2005	Progress report.

6. FUNDING

A Threatened Species Network Grant to the Cunderdin/Tammin Land Care District has funded this project for one year. One of the proponents, Amanda Godfrey, lives close to the proposed translocation sites and is willing to commit to monitoring and maintenance of the translocation beyond the availability of the funding.

7. REFERENCES

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

Appendix Two.

Site Diagram for Proposed Translocation of *Daviesia cunderdin* and *Acacia volubilis*

- The aim is to propagate a total of 100 plants each of *Daviesia cunderdin* and *Acacia volubilis*.
- These will be planted as shown in the diagram below, with one plant at each point marked with an asterisk (*). The grid pattern presented in this proposal will be adhered to as close as possible. However as plots will not be cleared of vegetation, plants will be planted in gaps in the vegetation. Therefore the diagram below is a simply a representation of planting layout for the purpose of this proposal.
- The treatments of watered and not watered will be assigned as per the diagram below.

