INTERIM RECOVERY PLAN NO. 34

ABBA BELL

(*DARWINIA* SP. WILLIAMSON)

INTERIM RECOVERY PLAN

1999-2002

by

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Photograph: G. Keighery

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FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos. 44 and 50.

IRPs outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or ecological communities, and begin the recovery process.

CALM is committed to ensuring that Critically Endangered taxa are conserved through the preparation and implementation of Recovery Plans or Interim Recovery Plans and by ensuring that conservation action commences as soon as possible and always within one year of endorsement of that rank by the Minister.

This Interim Recovery Plan will operate from July 1999 to June 2002 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Critically Endangered, this IRP will be 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 July 1999.

SUMMARY

Scientific Name: ***Darwinia* sp. Williamson**
Common Name: Abba Bell
Family: Myrtaceae
Flowering Period: October
CALM Region: Central Forest
CALM District: South West Capes
Shire: Busselton
Recovery Team: Central Forest Region Threatened Flora Recovery Team (CFRFRT)

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.; Western Australian Herbarium (1999). FloraBase - Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia. http://www.calm.wa.gov.au/science/

Current status: *Darwinia* sp. Williamson was declared as Rare Flora in October 1996 and was ranked in November 1998 as Critically Endangered (CR). It currently meets World Conservation Union (IUCN) Red List category 'CR' under criteria B1+2c and C2b (IUCN 1994), as it is only known from a single population comprised of less than 250 mature individuals, with continued decline in the quality of the habitat from dieback disease (caused by *Phytophthora cinnamomi*).

This IRP will be implemented in conjunction with the IRP for the 'Shrublands on southern Swan Coastal Plain Ironstones' (English 1999) and with IRPs for other CR taxa that occur at the same locality.

Habitat requirements: *Darwinia* sp. Williamson is known from a single location at the base of the Whicher Range, in a winter-wet area of shrubland over shallow red clay over ironstone. A fire in 1993 resulted in the death of almost all mature individuals, however, 100 seedlings were located at the site in October 1994. Associated species are *Hakea varia*, *Loxocarya magna* and *Chamelaucium roycei.* The plant community in which the species occurs is one of 13 occurrences of the Critically Endangered Threatened Ecological Community (TEC) 'Shrublands on southern Swan Coastal Plain Ironstones' (English 1999). There are six priority species and six additional Declared Rare Flora (DRF) in the ironstone community in the vicinity of *Darwinia* sp. Williamson. Three of these DRF are ranked Critically Endangered.

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

1. All adjacent landowners and relevant government agencies have been informed of the presence of the species.
2. Seed has been collected and germination tests indicate a high rate of germination.
3. Cuttings have been collected and plants propagated by Kings Park and Botanical Garden (KPBG).
4. There has been experimental application of phosphite to the area since 1996.
5. A map delimiting the areas not available for commercial wildflower picking has been developed to ensure that pickers do not enter the area where the species occurs.
6. Implementation of the recovery actions outlined in the IRP for the threatened ecological community in which the taxon exists have commenced.
7. The Central Forest Region Threatened Flora Recovery Team (CFRTFRT) is overseeing the implementation of this IRP.
8. Staff from CALM's South West Capes District regularly monitor the population.

IRP Objective: The objective of this Interim Recovery Plan (IRP) 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. Coordinate recovery actions.
2. Implement dieback treatment.
3. Monitor the effect of phosphite application.
4. Implement disease hygiene measures.
5. Develop and implement a fire management strategy.
6. Liaise with tenement holder and adjacent land managers.
7. Monitor the population.
8. Collect seed and cutting material.

9. Obtain biological and ecological information.
10. Start translocation process.
11. Promote awareness.
12. Write full Recovery Plan.

1. BACKGROUND

History

G.J. Keighery made the first collection of *Darwinia* sp. Williamson from the base of the Whicher Range in November 1991. N. Gibson and other botanists undertook floristic and vegetation surveys of the Swan Coastal Plain in 1994 (Gibson *et al.* 1994) but located no additional populations of the species. A hot fire burnt through the population in 1993 and resulted in the death of almost all the mature individuals. Approximately 100 *Darwinia* sp. Williamson seedlings were then located at the site of the original population during a survey in 1994, and some of these plants flowered in 1995.

Dieback disease caused by the plant pathogen *Phytophthora cinnamomi* is known to exist immediately upslope of *Darwinia* sp. Williamson. To date the dieback disease front does not appear to have reached the population of *Darwinia* sp. Williamson. However, the site was sprayed with phosphite three times in 1996 and again in April 1998 and December 1998. CALM District staff are assessing the effectiveness of this treatment by monitoring the local key dieback indicator species; *Lambertia* sp. and *Dryandra nivea* (personal communication, R. Smith[1]).

Description

Darwinia sp. Williamson is an erect or sometimes spreading shrub, up to 70 cm tall by 40 cm wide, and often uses other shrubs for support. The green linear leaves, 3 to 5 mm long, are triangular in cross section, are crowded at the ends of branches, and bend backwards. This feature of the leaves distinguishes the species from *Darwinia oederoides.* The inflorescence is nodding or (in young plants) rarely erect. The flowers are enclosed by red and green bracts that are arranged in several rows. The ribbed floral tube is brown, 3 mm long, with small triangular calyx lobes. The petals are about 1 mm long, and there is a red, curved style, 10 to 16 mm long (Brown *et al.* 1998).

Distribution and habitat

Darwinia sp. Williamson is known from a single location at the base of the Whicher Range, in a winter-wet area of shrubland over shallow red clay over ironstone. The plant community in which the species grows was ranked as Critically Endangered in 1995. This plant assemblage occurs on ironstone soils that are highly restricted in distribution. The site in which this taxon occurs is one of 13 occurrences of this species-rich plant community located on seasonal wetlands on ironstone and heavy clay soils on the Swan Coastal Plain near Busselton (English 1999). Associated species include *Hakea varia, Loxocarya magna* and *Chamelaucium roycei.* Much of the species diversity in the community comes from annuals and geophytes. Typical and common native species are the shrubs *Kunzea* aff. *micrantha, Pericalymma ellipticum, Hakea* sp. Williamson, *Hemiandra pungens* and *Viminaria juncea,* and the herbs *Aphelia cyperoides* and *Centrolepis aristata* (Gibson *et al*. 1994).

There are six additional Declared Rare Flora (DRF), three of which are ranked Critically Endangered, that occur on the ironstone soils in the vicinity of *Darwinia* sp. Williamson. DRF and Priority flora that occur near *Darwinia* sp. Williamson are outlined in the table below.

DRF and Priority flora found near *Darwinia* sp. Williamson
(Source: Western Australian Herbarium, 1999)

SPECIES	STATUS	RANK
Andersonia ferricola ms	Priority	1
Schoenus pennisetis	Priority	1
Hakea oldfieldii	Priority	2
Isopogon formosus subsp. *dasylepis*	Priority	3
Stylidium mimeticum	Priority	3
Synaphea whicherensis	Priority	3
Brachysema papilio	DRF	CR
Lambertia echinata subsp. *occidentalis*	DRF	CR
Petrophile latericola ms	DRF	CR
Dryandra nivea subsp. *uliginosa*	DRF	EN

[1] Russell Smith Ecologist, Phosphite Program, CALM Bunbury

Chamelaucium roycei ms	DRF	VU
Dryandra squarrosa subsp. *argillacea*	DRF	VU

The IRPs for all of the Critically Endangered taxa that occur with *Darwinia* sp. Williamson will be implemented in conjunction with the IRP that is currently being completed for the 'Shrublands on southern Swan Coastal Plain Ironstones' community (English 1999).

Biology and ecology

Little is known about the biology and ecology of *Darwinia* sp. Williamson. The species appears to be killed by fire, although one adult plant was recorded as surviving the 1993 fire. *Darwinia* species are generally considered to be fire-sensitive with post-fire regeneration occurring mainly from seed. Approximately 100 seedlings germinated after the 1993 fire, and a few of these flowered in October 1995. The species is presumed to be dieback susceptible.

A number of *Darwinia* species are cultivated for their ornamental bell-like flower heads. Propagation of *Darwinia* species is achieved through cuttings, as seed germination is often low even under generally favourable conditions (Turnbull and Doran 1987). Further investigations of germination techniques are necessary.

There is currently limited information about pollinators, predators of flowers and fruit, germination triggers, response to *Phytophthora* infection, herbicide application and increasing salinity. This information is necessary to the future management of *Darwinia* sp. Williamson.

Threats

Darwinia sp. Williamson was declared as Rare Flora in October 1996 and was ranked in November 1998 as Critically Endangered (CR). It currently meets IUCN Red List Category 'CR' under Criteria B1+2c and C2b (IUCN 1994), as it is only known from a single population comprised of less than 250 mature individuals, with continued decline in the quality of the habitat from dieback disease.

- **Disease** is a serious threat to Population 1 and is known to occur immediately uphill of, and adjacent to the species. *Darwinia* sp. Williamson is suspected to be susceptible to *Phytophthora* species. As this is the only *in situ* population, protecting the habitat from dieback is imperative. There have been deaths of the DRF species *Dryandra nivea* subsp. *uliginosa* at the locality, and these are likely to have been caused by canker (probably *Armillaria luteobubalina).* The susceptibility of *Darwinia* sp. Williamson to this plant pathogen is unknown.

- **Inappropriate fire regimes** would affect the viability of the population, as *Darwinia* sp. Williamson appears to be an obligate seeder that germinates following fire. If this is the case, the soil seed bank would rapidly be depleted if fires recurred before regenerating or juvenile plants reached maturity and replenished the soil seed bank. However, it is likely that occasional fires are needed for reproduction of the species.

- **Mineral sand exploration** and extraction leases exist over the area of State Forest in which *Darwinia* sp. Williamson occurs.

- **Waterlogging and salinity** may in future become threats to the population (Tille and Lantzke 1990). Extensive clearing for agriculture in the area is likely to have increased surface runoff and recharge of the groundwater. Neither waterlogging nor salinity are immediate threats, but require monitoring. Hirschberg (1989) measured levels of salinity in the groundwater in the South West Capes area, and found the water near this population to range between 200-400 per litre total dissolved solids, which is reasonably fresh.

Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1. Whicher Range	State Forest	1991 Common 1992 27 1993 1 1994 1 (*ca*100) 1997 5 (*ca*100)	Healthy	Disease, inappropriate fire regimes, mineral sands exploration and extraction, waterlogging and salinity

Note: Numbers of plants shown = number of mature individuals (numbers of juvenile plants)

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

The Department of Minerals and Energy was formally notified of the presence of *Darwinia* sp. Williamson in October 1996. The adjacent private property owners were notified in February 1999. These notifications detailed the Declared Rare status of the species and associated legal obligations. The mining company with a tenement over this area was notified of the presence of two other Critically Endangered species *(Petrophile latericola* and *Brachysema papilio)* in October 1994, and of the occurrence of *Darwinia* sp. Williamson in June 1999.

Seed was collected from five plants during December 1995, with a total of 56 seeds (taken from 87 fruits) being stored at –18^{o}C at CALM's Threatened Flora Seed Centre (TFSC). The TFSC tests germination of the seed initially, after one year in storage, and again after five years. The initial germination rate of this seed was 60%. Approximately 300 seeds (from 792 fruits) were collected from 30 plants in December 1997. The initial germination rate was 86%.

Cuttings were collected from ten plants in December 1995 by staff of the TFSC. These have been cultivated by KPBG and the success rate of these cuttings has been excellent. In May 1997, KPBG held approximately 20 plants grown from cuttings in its nursery.

Experimental application of phosphite to the TEC that contains *Darwinia* sp. Williamson commenced in 1996. The ironstone community was sprayed three times in 1996, in May, June and again in spring. Follow-up spraying occurred in April and December 1998. The spread and impact of the disease are being monitored.

Implementation of the recovery actions outlined in the IRP for the community 'Shrublands on southern Swan Coastal Plain Ironstones' (English 1999) has commenced.

CALM's South West Capes District has developed a map delimiting the areas not available for commercial wildflower picking to help ensure that pickers do not enter the area in which *Darwinia* sp. Williamson occurs.

The CFRTFRT is overseeing the implementation of this IRP and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

Staff from CALM's South West Capes District regularly monitor the population.

Future recovery actions

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

1. Coordinate recovery actions

The CFRTFRT will continue to oversee the implementation of the recovery actions for *Darwinia* sp. Williamson and will include information on progress in its annual report to CALM's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: CALM (South West Capes District) through the CFRTFRT
Cost: $6,200 per year.

2. Implement dieback treatment

Research conducted from 1992 to 1997 indicates that phosphite application is a very effective tool in controlling the impact of dieback disease (Murray, 1997). On that basis, aerial spraying of phosphite has occurred over the community that contains *Darwinia* sp. Williamson. Further dieback control measures will be implemented as required.

Acton: Implement dieback treatment

Responsibility: CALM (South West Capes District, Dieback Disease Coordinator) through the CFRTFRT
Cost: $3,800 in the first and third years.

3. Monitor the effect of phosphite application

The impact of phosphite treatment on *Darwinia* sp. Williamson and its effectiveness in controlling *Phytophthora* species will be monitored.

Action: Monitor the effect of phosphite application
Responsibility: CALM (South West Capes District, Dieback Disease Coordinator) through the CFRTFRT
Cost: $500 per year.

4. Implement disease hygiene measures

Dieback disease is known to be present immediately upslope of *Darwinia* sp. Williamson. The area is inundated over the winter months, and this favours the establishment and spread of *Phytophthora* species. Many flora species in the plant community are presumed susceptible to this disease, including *Darwinia* sp. Williamson. It is necessary to maintain disease hygiene measures, to reduce the likelihood of introducing or amplifying the impacts of the disease. Access to the area will be restricted, especially when the soil is moist. A locked gate will be constructed across the access track to prevent vehicular access. A sign advising of the dieback risk will be posted at this site.

Action: Implement disease hygiene measures
Responsibility: CALM (South West Capes District, WATSCU) through the CFRTFRT
Cost: $2,000 in the first year.

5. Develop and implement a fire management strategy

Fire appears to kill adult plants of the species, and regeneration is likely to be largely from seed. Frequent fire may prevent the accumulation of sufficient soil stored seed to allow regeneration of the population. As there was a fire in 1993, no planned burns will occur in this area for at least the term of this plan. A fire management strategy will be developed to determine fire control measures and fire frequency.

Action: Develop and implement a fire management strategy
Responsibility: CALM (South West Capes District) through the CFRTFRT
Cost: $1,400 in the first year, and $900 in subsequent years.

6. Liaise with tenement holder and adjacent land managers

Staff from CALM's South West Capes District will continue to liaise with the tenement holder and the adjacent landowners to ensure the population is not accidentally damaged or destroyed.

Action: Liaise with tenement holder and adjacent land managers
Responsibility: CALM (South West Capes District) through the CFRTFRT
Cost: $500 per year.

7. Monitor the population

Monitoring of factors such as weed invasion, habitat degradation, salinity levels and population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity is essential. The population will be inspected annually.

Action: Monitor the population
Responsibility: CALM (South West Capes District) through the CFRTFRT
Cost: $500 per year.

8. Collect seed and cutting material

A small quantity of seed has been collected from Population 1. Additional seed will be collected as required. Cuttings will also be collected to establish a living collection of genetic material at KPBG.

Action: Collect seed and cutting material
Responsibility: CALM (South West Capes District, TFSC) and KPBG, through the CFRTFRT
Cost: $2,800 in the second year and $3,900 in the third year.

9. Obtain biological and ecological information

Increased knowledge of the biology and ecology of the species will provide a scientific basis for management of *Darwinia* sp. Williamson in the wild. Investigations will include:

1. Study of the soil seed bank dynamics and the role of various factors including disturbance, competition, rainfall, grazing in recruitment and seedling survival.
2. Determination of reproductive strategies, phenology and seasonal growth.
3. Investigation of the mating system and pollination biology.
4. Investigation of population genetic structure, levels of genetic diversity and minimum viable population size.
5. Investigation of the impacts of dieback disease and control techniques on *Darwinia* sp. Williamson and its habitat.
6. The impact of changes in the level of salinity in the habitat.

Action: Obtain biological and ecological information
Responsibility: CALM (CALMScience, South West Capes District) through the CFRTFRT
Cost: $17,200 per year.

10. Start translocation process

Translocation is essential for the conservation of this species, as the total number of extant plants is low, and the only known population is not secure from threats including disease and fire. Although translocations are generally undertaken under full Recovery Plans, it is possible to develop a Translocation Proposal and start propagating plants within the time frame of an Interim Recovery Plan. This will be coordinated by the CFRTFRT. 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.* All Translocation Proposals require endorsement by the Director of Nature Conservation.

Action: Start translocation process
Responsibility: CALM (CALMScience, South West Capes District) through the CFRTFRT
Cost: $2,600 once in the third year.

11. Promote awareness

The importance of biodiversity conservation and the protection of the Critically Endangered *Darwinia* sp. Williamson will be promoted to the public. An information sheet, that includes a description of the plant, its habitat type, threats and management actions, and photos will be produced. Formal links with local naturalist groups and interested individuals will also be encouraged.

Action: Promote awareness
Responsibility: CALM (South West Capes District, Corporate Relations) through the CFRTFRT
Cost: $500 once in the second year.

12. Write 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 developed to describe action required for long-term management.

Action: Write full Recovery Plan
Responsibility: CALM (WATSCU, South West Capes District) through the CFRTFRT
Cost: $19,000 once in the third year.

4. TERM OF PLAN

This Interim Recovery Plan will operate from July 1999 to June 2002 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Critically Endangered, this IRP will be replaced by a full Recovery Plan after three years.

5. ACKNOWLEDGMENTS

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

Neil Gibson Senior Research Scientist, CALMScience

Greg Keighery	Senior Research Scientist, CALMScience
Meredith Soutar	Conservation Officer, South West Capes District
Andrew Webb	Formerly Conservation Officer, South West Capes
Kim Williams	Program Leader, Nature Conservation, Central Forest Region
Russell Smith	Ecologist, Phosphite Program, CALM Bunbury

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6. REFERENCES

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7. TAXONOMIC DESCRIPTION

Brown *et al*. (1998).

***Darwinia* sp. Williamson**

This erect or spreading shrub, up to 70 cm tall and 40 cm wide, often uses other shrubs for support. Green linear leaves, three to five mm long, are triangular in cross section. They are crowded at the ends of branches, and bend backwards. The inflorescence is nodding or (in young plants) rarely erect. Red and green bracts are arranged in several rows, enclosing the flowers. The brown floral tube, three mm long, is ribbed, with small triangular calyx lobes. Petals are about one mm long. There is a long, red curved style, 10 to 16 mm long.