

INTERIM RECOVERY PLAN NO. 158

TANGLE WATTLE (*ACACIA VOLUBILIS*)

INTERIM RECOVERY PLAN 2003-2008

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Photo: Bruce Maslin

October 2003

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FOREWORD

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

IRP's 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This Interim Recovery Plan will operate from October 2003 to September 2008 but will remain in force until withdrawn or replaced.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 reviewed after five years and the need for a full Recovery Plan assessed.

This IRP was given regional approval on 3 February 2004 and was approved by the Director of Nature Conservation on 22 July 2004. The allocation of staff time and 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 in October 2003.

ACKNOWLEDGMENTS

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

Andrew Crawford	Manager, CALM's Threatened Flora Seed Centre
Amanda Godfrey	Land Conservation Coordinator, Cunderdin/Tammin LCDC
Amanda Shade	Horticulturist, Botanic Garden and Parks Authority
Kate Brunt	Conservation Officer, CALM's Merredin District
Leonie Monks	Research Scientist, CALM's Science Division

Thanks also to the staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and CALM's Wildlife Branch for assistance.

SUMMARY

Scientific Name:	<i>Acacia volubilis</i>	Common Name:	Tangle Wattle
Family:	<i>Mimosaceae</i>	Flowering Period:	June and July
Dept Region:	Wheatbelt	Dept District:	Merredin
Shires:	Cunderdin and Tammin	Recovery Team:	Merredin Threatened Flora Recovery Team (MDTFRT)

Illustrations and/or further information: Maslin, B.R. (1995). *Acacia* Miscellany No. 13 - *Nuytsia* 10 (2): 177-178; A. Brown, C. Thomson-Dans and N. Marchant (Eds) (1998) *Western Australia's Threatened Flora* Department of Conservation and Land Management, Western Australia; Mueller F. (2001) *Acacia volubilis*. *Flora of Australia*, 11A: 525.

Current status: *Acacia volubilis* was presumed extinct until botanist Brenden Lepschi, formerly with the Department of Conservation and Land Management, located a small population near Cunderdin in June 1996. Further populations were subsequently found; however, as all of these were small and highly threatened, the species was declared as Rare Flora in October 1996 and ranked as Critically Endangered in December 1997. It currently meets World Conservation Union (IUCN 2000) Red List Category 'CR' under criteria B1ab(iii,v)+2ab(iii,v); C2a(i), due to severe fragmentation of populations all of which contain less than 50 mature individuals, and a continuing decline in the area, extent and quality of habitat and the number of mature individuals. *Acacia volubilis* is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The main threats are road maintenance, weed invasion, inappropriate fire regimes, herbicide drift, and grazing.

A draft Interim Recovery Plan was prepared for the species in 1998 (Evans and Brown 1998). Additional information collected since then has been incorporated into this plan and this plan replaces that document.

Description: *Acacia volubilis* is a small dome-shaped shrub 40 cm high by up to 1 m wide. It has twisted branchlets with parallel ridges running their length. The phyllodes (flattened leaf stalks that resemble leaves) are widely separated, 9 mm long and 1 mm wide, resemble the branchlets in shape and are straight or only shallowly curved. Bright yellow globular inflorescences are borne during June and July.

Habitat requirements: *Acacia volubilis* occurs over a range of 15 km west and north of Cunderdin where it is mainly confined to degraded weedy road verges. Habitat is shrubland over laterite or sheet granite with soils grading from sand or sandy loam to loamy clays. Associated taxa include species of *Allocasuarina*, *Acacia*, *Grevillea*, *Actinostrobus* and *Hakea*.

One population of *Acacia volubilis* is located within an uncleared portion of private property where it is growing in shallow sandy loams over spongolite in kwongan vegetation consisting of *Grevillea*, *Hypocalymma*, *Leucopogon*, *Astralaria* and *Melaleuca* shrubs.

Critical habitat: The critical habitat for *Acacia volubilis* comprises the area of occupancy of the known populations; similar habitat within 200 metres of known populations; corridors of remnant vegetation that link populations and additional nearby occurrences of similar habitat that do not currently contain the species but may have done so and may be suitable for translocations.

Habitat critical to the survival of the species, and important populations: Given that this species is listed as Critically Endangered it is considered that all known habitat for wild and translocated populations is habitat critical for the species' survival, and that all wild and translocated populations are important populations.

Benefits to other species or ecological communities: *Acacia volubilis* occurs with *Daviesia cunderdin* (currently listed as Critically Endangered under the *Wildlife Conservation Act 1950* and Endangered under the EPBC Act 1999) at one site and recovery actions implemented to improve the quality or security of the habitat for that population of *Acacia volubilis* will also improve the status of *Daviesia cunderdin*.

International obligations: This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that convention. The taxon is not listed under any specific international treaty, however, and therefore this IRP does not affect Australia's obligations under any other international agreements.

Role and interests of indigenous people: There are no listed indigenous sites in the vicinity of the taxon. Input and involvement will be sought from any indigenous groups that have an active interest in areas that are habitat for *Acacia volubilis*, and this is discussed in the recovery actions.

Social and economic impact: Populations 2b and 8b of *Acacia volubilis* occur on private land and there is some potential for limited social and economic impact. However, recovery actions also refer to liaison and cooperation with all stakeholders, and both populations are already fenced. Population 8b is located on an area of private property that is to be managed for conservation through a covenant placed on the title. It is therefore unlikely that the implementation of this recovery plan will have any social or economic impact in relation to that population.

Evaluation of the Plan's Performance: CALM, in conjunction with the Merredin District Threatened Flora Recovery Team, will evaluate the performance of this IRP. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan will be reviewed following five years of implementation.

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

1. Relevant land managers have been made aware of the location and threatened status of the species.
2. Surveys have been conducted to locate new populations.
3. Markers that define populations have been installed and maintained.
4. Populations 2b and 8b have been fenced.
5. Approximately 227 seeds collected from Subpopulation 2a in November 2002 are stored in CALM's Threatened Flora Seed Centre at -18°C.
6. The Botanic Garden and Parks Authority currently have 65 plants of *Acacia volubilis* from 20 accessions including cuttings and seeds taken from 18 plants and 6 populations.
7. An information sheet that describes and illustrates the species and calls for information on any further sightings has been produced and distributed.
8. A media statement, written and posted onto CALM's 'Naturebase' website, provides information on the rediscovery of *Acacia volubilis*.
9. An article about the history and rediscovery of the species was published in CALM's winter 1998 edition of 'Landscape' magazine.
10. A Translocation Proposal was prepared in March 2003.
11. Staff from CALM's Merredin District regularly monitor populations of the species.
12. The Merredin District Threatened Flora Recovery Team is overseeing the implementation of this IRP and will include information on progress in an annual report to CALM's Corporate Executive and funding bodies.

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

Recovery criteria

Criteria for success: The numbers of individuals within populations and/or the number of populations have increased by ten percent or more over the period of the plan's adoption under the EPBC Act.

Criteria for failure: The numbers of individuals within populations and/or the number of populations have decreased by ten percent or more over the period of the plan's adoption under the EPBC Act.

Recovery actions

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|---|---|
| <ol style="list-style-type: none"> 1. Coordinate recovery actions 2. Map critical habitat 3. Seek long-term protection of habitat 4. Maintain fences around subpopulations 2b and 8b 5. Implement Translocation Proposal 6. Collect seed and cutting material 7. Develop and implement a rabbit control strategy 8. Develop and implement a weed control strategy | <ol style="list-style-type: none"> 9. Develop and implement a fire management strategy 10. Rehabilitate degraded habitat 11. Obtain biological and ecological information 12. Promote community awareness 13. Monitor populations 14. Conduct further surveys 15. Liaise with relevant land managers 16. Review the need for a full Recovery Plan |
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1. BACKGROUND

History

Acacia volubilis was described in 1877 by F. von Mueller from a specimen collected from 'Boxvale' by Julia Wells. The precise location of the collection is not known however, according to Erickson (1988) 'Boxvale' was the name of a property owned by John R.F. Wells and may have been an earlier name for a property known as 'Coraling', located about 12 km southeast of Quairading. The species was subsequently confused with *Acacia cummingiana* and *A. carens* and it was not until 1990 that it was again recognised as distinct.

As no extant populations were known, the species was listed as Presumed Extinct until rediscovered in June 1996 by former CALM botanist Brendan Lepschi. Surveys undertaken in 1997, 1998, 2000 and 2001 resulted in the discovery of a further ten populations and four subpopulations, including two on private property. The largest populations contain 36 and 22 plants respectively while the remaining ten populations and three subpopulations contain between one and six plants each. Most of these populations occur in highly degraded habitat. A total of 88 live plants are currently known.

The Department of Conservation and Land Management (CALM) has provided relevant land managers with information on the locations of populations and DRF markers have been installed along roadsides where required. However, damage to several populations during road maintenance and fence construction was documented in 1998 and 2001. Weed control, grazing, rabbit digging, and inappropriate fire regimes also impact on populations of *Acacia volubilis* and its habitat.

A draft Interim Recovery Plan (IRP) was written for the species in 1998 (Evans and Brown 1998). Information from that draft and additional information collected since then has been incorporated into this Interim Recovery Plan.

Description

The specific epithet *volubilis* means twining, referring to the tangled, twining habit of the plant (Mueller 2001).

Acacia volubilis is a small dome-shaped shrub 40 cm high by up to 1 m wide. It has twisted branchlets with parallel ridges running their length. The phyllodes (flattened leaf stalks that resemble leaves) are widely separated, are 9 mm long and 1 mm wide and resemble the branchlets in shape. They are pentagonal-terete and are straight or only shallowly curved. The circular gland situated on the upper margin of the phyllode between the two adaxial nerves is not prominent. Bright yellow globular inflorescences are borne during June and July.

Distribution and habitat

Acacia volubilis is endemic to the Cunderdin-Tammin area of Western Australia where it occurs over a range of approximately 15 km. It is currently known from 11 populations and four subpopulations together totaling 88 plants. Two subpopulations are located on private property, one within a fenced remnant and the other on the edge of a disused sandmine with reasonably intact native vegetation. All other populations occur on degraded linear road reserves bordered by mostly cleared farmland. Habitat is shrubland over laterite or sheet granite in disturbed mallee shrublands or heath. Soils where the species occurs vary from brown loamy-clay to red-brown sandy loam to yellow-white sand or white-grey sandy-loams. Associated species include *Allocasuarina humilis*, *Daviesia cunderdin* (DRF), *Grevillea hookeriana*, *Actinostrobus arenarius*, *Hakea* spp. and *Leptospermum erubescens*.

Biology and ecology

Acacia is the largest genus in Australia, comprising some 700 named species and many more un-named. Commonly known as wattles, *Acacia* species are found in all states of Australia and in a broad range of environmental conditions (Elliot and Jones 1982). Because of their adaptability, many are important horticultural and commercial plants.

No specific information is available about the ecology of *Acacia volubilis*, however, notes taken while surveying some populations suggest that it may be a disturbance opportunist. In 1997 up to ten young plants in

one population and four in another were located growing directly on the road edge where grading had occurred. Human activities involving clearing or destruction of areas of natural vegetation clearly have the potential to influence acacia distributions (Janzen 1974). Direct examples of competition between species without human interference are perhaps relatively rare – few have been detected, and distribution of many species appears to be more directly influenced by edaphic or climatic factors (New 1984). Within the habitat of *Acacia volubilis* competition from weeds has been continually noted as well as disturbance of the soil by rabbits. Herbicide applications by adjacent and controlling land managers have also been undertaken at some of the populations. The overall response to these disturbances is unknown.

While species counts were being made in five of the populations it was observed that the plants appeared to grow by means of root suckers (or rhizomes), and this indicates clonal regeneration. A survey in September 2003 confirmed this method of recruitment and in fact both seed and root stock regeneration was observed to be employed by individual plants with the new recruits growing within or close by the canopy perimeter.

Many Australian species of *Acacia* are highly adapted to surviving fires, which are a regular occurrence in most Australian habitats. Germination of *Acacia* seed is often stimulated by fire but germination also depends on factors such as fire intensity and seed depth in the soil. No specific information is available about the response of *Acacia volubilis* to fire. However, burn trials undertaken on another Critically Endangered DRF, *Daviesia cunderdin*, which shares the same habitat as one of the *A. volubilis* populations, resulted in the germination of *A. volubilis* seedlings.

In 1997, CALM Officers observed that there was no fruit set in populations 1a and 4 following flowering in the winter months of June and July. However, 100% germination has been attained from seed collected in 2002 by Threatened Flora Seed Centre (TFSC) staff. These variations are not uncommon in wild populations of native plants although the reasons for this are not clear. In September 2003 it was noted that although some plants had produced abundant flowers, there were no fruits visible on the outside canopy. However, many immature pods were observed underneath the canopy. No pollinators have been recorded during surveys although many ants have been observed within the *Acacia volubilis* habitat.

Cuttings taken by TFSC staff from 19 accessions over a two-year period have achieved between 0% and 61% strike rate. Reasons for the failed strikes have not been determined, however, seed germination trials undertaken in 2002 obtained 100% success rate. Twenty four seedlings grown from the germination trials and 41 clones from the cuttings are being grown at the Botanic Garden and Parks Authority (BGPA).

Threats

Acacia volubilis was declared as Rare Flora in October 1996 and ranked as Critically Endangered in December 1997. It currently meets World Conservation Union (IUCN 2000) Red List Category 'CR' under criteria B1ab(iii,v)+2ab(iii,v); C2a(i), due to severe fragmentation of populations, all of which contain fewer than 50 mature individuals, and a continuing decline in the area, extent and quality of habitat and the number of mature individuals. The main threats are road maintenance, weed invasion, inappropriate fire regimes, herbicide drift, degraded habitat, poor recruitment and grazing.

- **Road maintenance** threatens all road reserve populations. Threats include grading, chemical spraying, construction of drainage channels and the mowing of roadside vegetation. Several of these actions also encourage weed invasion.
- **Weed invasion** is a major threat to all populations. Weeds suppress early plant growth by competing for soil moisture, nutrients and light. They also exacerbate grazing pressure and increase the fire hazard due to the easy ignition of high fuel loads, which are produced annually by many grass weed species.
- **Inappropriate fire regimes** may affect the viability of populations as seeds of *Acacia volubilis* have been observed to germinate following fire. The soil seed bank would therefore be rapidly depleted if fires recurred before regenerating or juvenile plants reached maturity and replenished the soil seed bank. Regeneration from root suckers has been recorded, and this may help to buffer the species from the impacts of too frequent fire. However, it is likely that occasional fires are needed for reproduction of this species from seed.

- **Herbicide drift** from chemicals applied by land managers and adjacent private property owners threatens populations of *Acacia volubilis* growing within road reserves. While spray is aimed at eradicating weeds it is not known what effect herbicides have on the species.
- **Grazing** by rabbits, kangaroos or stock has been noted at four *Acacia volubilis* populations. In addition to grazing, rabbits also impact on populations by encouraging invasion of weeds through digging, erosion, the addition of nutrients and introduction of weed seeds. The high levels of palatable weeds near these populations and in adjacent farming properties attract herbivorous animals that are often unselective of species when grazing.
- **Degraded habitat** represents a threat to all but one population. The lack of associated native vegetation makes it more likely that pollinators will be infrequent or absent. In addition, the lack of available habitat for recruitment is of concern. Only two of the 15 populations and sub-populations occur outside narrow linear road reserves.
- **Poor recruitment** threatens most populations with few juvenile plants being observed.

Summary of population information and threats

Pop. No. & Location	Land Status	Month/Year - No. plants	Condition	Threats
1a. N of Cunderdin	Shire Road Reserve	6/1996 <5 5/1997 ~4 6/1997 3 (1) 8/1997 3 4/1998 1 1/2001 1 clump 10/2001 1 (2)	Moderate	Road maintenance, weed invasion, inappropriate fire, herbicide drift, degraded habitat, poor recruitment
1b. N of Cunderdin	Shire Road Reserve	1/2001 3 clumps 10/2001 3	Poor	Road maintenance, weed invasion, fencing maintenance, inappropriate fire, edge effects, herbicide drift, poor recruitment
1c. N of Cunderdin	Shire Road Reserve	6/2000 1	Disturbed	Road maintenance, weed invasion, chemical spray drift, inappropriate fire, poor recruitment
2a. N of Cunderdin	Shire Road Reserve	5/1997 8-10 4/1998 32 1/2001 22	Moderate	Road maintenance, weed invasion, grazing, herbicide drift, inappropriate fire
2b. N of Cunderdin	Private property	5/1997 not counted 4/1998 2 1/2001 2	Healthy	Vehicle traffic, disease, grazing, firebreak maintenance, inappropriate fire, poor recruitment
3. N of Cunderdin	Shire Road Reserve	6/1997 ~5 8/1997 not counted 7/2000 8 [4] 10/2001 6	Moderate	Road maintenance, weed invasion, chemical spray drift, inappropriate fire, poor recruitment
4. N of Cunderdin	Shire Road Reserve	8/1997 20 6/2000 34 (2) [3]	Moderate	Road maintenance, weed invasion, herbicide drift, inappropriate fire
5. N of Cunderdin	Shire Road Reserve	6/1997 1 8/1997 1 6/2000 1	Disturbed	Road maintenance, weed invasion, herbicide drift, inappropriate fire, poor recruitment
6. SW of Cunderdin	Shire Road Reserve	7/1998 1 8/2000 1 1/2001 1 8/2001 1	Healthy	Weed invasion, inappropriate fire, poor recruitment
7. NE of Cunderdin	Shire Road Reserve	4/2000 4	Moderate	Road maintenance, weed invasion, grazing, inappropriate fire, poor recruitment
8a. NE of Cunderdin	Shire Road Reserve	4/2000 1	Disturbed	Road maintenance, weed invasion, inappropriate fire, poor recruitment
8b. NE of Cunderdin	Private property	3/2001 1	Moderate	Weed invasion, mining, rabbits (erosion), inappropriate fire, poor recruitment
9. NE of Cunderdin	Shire Road Reserve	4/2000 3	Disturbed	Road maintenance, weed invasion, chemical spray drift, inappropriate fire, poor recruitment
10. N of Cunderdin	Shire Road Reserve	1/2001 1 10/2001 1	Poor	Road maintenance, weed invasion, herbicide drift, inappropriate fire, poor recruitment

Pop. No. & Location	Land Status	Month/Year - No. plants	Condition	Threats
11. N of Cunderdin	Shire Road Reserve	1/2001 3 10/2001 3	Moderate	Road maintenance, weed invasion, herbicide drift, degraded habitat, inappropriate fire, poor recruitment

() = seedlings; [] = number of dead plants.

Guide for decision-makers

Section 1 provides details of current and possible future threats. Any on-ground works (clearing, firebreaks, roadworks etc) in the immediate vicinity of *Acacia volubilis* will require assessment. On-ground works should not be approved unless the proponents can demonstrate that they will not have an impact on the species, its habitat or potential habitat or on the local surface hydrology such that drainage in the habitat of the species would be altered.

Critical habitat

Critical habitat is habitat identified as being critical to the survival of a listed threatened species or listed threatened ecological community. Habitat is defined as the biophysical medium or media occupied (continuously, periodically or occasionally) by an organism or group of organisms or once occupied (continuously, periodically or occasionally) by an organism, or group of organisms, and into which organisms of that kind have the potential to be reintroduced (*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)).

Acacia volubilis is listed as Critically Endangered, and as such it is considered that all known habitat for wild and translocated populations is critical habitat. This includes:

- the area of occupancy of known populations;
- areas of similar habitat within 200 m of known populations, i.e. brown loamy clay over laterite or yellow-white sandy soils over granite in mallee shrubland or heath (these provide potential habitat for natural range extension);
- corridors of remnant vegetation that link populations (these are necessary to allow pollinators to move between populations and are usually road and rail verges); and
- additional occurrences of similar habitat that do not currently contain the species but may have done so in the past (these represent possible translocation sites).

Habitat critical to the survival of the species, and important populations: Given that this species is listed as Critically Endangered it is considered that all known habitat for wild and translocated populations is habitat critical for the species' survival, and that all wild and translocated populations are important populations.

Benefits to other species or ecological communities

Acacia volubilis occurs with *Daviesia cunderdin* (currently listed as Critically Endangered under the *Wildlife Conservation Act 1950* and Endangered under the EPBC Act 1999) at one site and recovery actions implemented to improve the quality or security of the habitat of *Acacia volubilis* will also improve the status of *Daviesia cunderdin*.

International obligations

This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that convention. The taxon is not listed under any specific international treaty, however, and therefore this IRP does not affect Australia's obligations under any other international agreements.

Role of indigenous people and their knowledge

There are no listed indigenous sites in the vicinity of the taxon. Input and involvement will be sought from any indigenous groups that have an active interest in areas that are habitat for *Acacia volubilis*, and this is discussed in the recovery actions.

Social and economic impacts

Populations 2b and 8b of *Acacia volubilis* occur on private land and there is some potential for limited social and economic impact. However, recovery actions also refer to liaison and cooperation with all stakeholders, and both populations are already fenced. Population 8b is located on an area of private property that is to be managed for conservation through a covenant placed on the title. It is therefore unlikely that the implementation of this recovery plan will have any social or economic impact in relation to that population.

Evaluation of the plan's performance

CALM, in conjunction with the Merredin District Threatened Flora Recovery Team will evaluate the performance of this IRP. In addition to annual reporting on progress and evaluation against the criteria for success and failure, the plan is to be reviewed following five years of implementation.

2. RECOVERY OBJECTIVE AND CRITERIA

Objectives

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

Criteria for success: The numbers of individuals within populations and/or the number of populations have increased by ten percent or more over the period of the plan's adoption under the EPBC Act.

Criteria for failure: The numbers of individuals within populations and/or the number of populations have decreased by ten percent or more over the period of the plan's adoption under the EPBC Act.

3. RECOVERY ACTIONS

Existing recovery actions

The Shires of Cunderdin and Tammin, and relevant private property owners have been notified about populations of *Acacia volubilis* that occur on lands that they manage. These notifications detailed the Declared Rare status of the species and the associated legal obligations.

Surveys undertaken by CALM Officers between 1996 (when the species was first re-discovered) and 2001, have resulted in the discovery of a further 10 populations and 4 subpopulations.

Declared Rare Flora (DRF) markers have been installed at all road reserve populations. The markers alert people working in the vicinity to the presence of DRF, and the need to avoid work that may damage vegetation in the area. The significance of these markers is being promoted to relevant bodies such as Shires and Main Roads WA through posters, dashboard stickers and stubby holders that illustrate DRF markers and explain their purpose.

Populations 2b and 8b are within fenced areas of private property. Regular liaison between CALM staff and land managers is ensuring that these fences are maintained.

Approximately 227 seeds (from 5 plants) collected from Subpopulation 2a in November 2002 are stored in CALM's Threatened Flora Seed Centre (TFSC) at -18°C . TFSC staff test the viability of seed soon after collection, after one year in storage and again after five years. The initial germination rate of *Acacia volubilis* seed was 100% (unpublished data A. Crawford¹). Germinants from these trials are provided to BGPA nursery.

The BGPA currently hold 65 plants of *Acacia volubilis*. These plants have been propagated from a mixture of cuttings, and seedlings obtained from germination trials. Strike rates for cuttings range from 0% to 61% (personal communication A. Shade²).

¹ Andrew Crawford, Technical Officer, the Department's Threatened Flora Seed Centre

² Amanda Shade, Horticulturist, Botanic Garden and Parks Authority

A media statement about the *Acacia volubilis* rediscovery has been written and posted onto CALM's 'Naturebase' website. Also, an information sheet that describes *Acacia volubilis* and its habitat has been produced. Photographs of the species and also detachable tabs with local CALM office phone numbers were included to encourage the local community to provide CALM with information on any further sightings. An article about the history and rediscovery of the species was also published in CALM's winter 1998 edition of 'Landscape' magazine.

A Translocation Proposal for *Acacia volubilis* and *Daviesia cunderdin*, another Critically Endangered species that grows in the same area as *Acacia volubilis*, was jointly prepared in March 2003 by CALM officers and the Cunderdin/Tammin Landcare Group. The proposal describes the need for the translocation, and how it is designed, and also describes the process of site selection for translocation. Plants to be used in the trial have been grown by the BGPA.

Staff from the CALM's Merredin District regularly monitor all populations of this species.

The Merredin District Threatened Flora Recovery Team (MDTFRT) is overseeing the implementation of this IRP and will include information on progress in its annual report to CALM's Corporate Executive and other funding bodies.

Future recovery actions

Where populations occur on lands other than those managed by CALM, permission has been or will be sought from appropriate land managers prior to recovery actions being undertaken. The following recovery actions are roughly in order of descending priority; however this should not constrain addressing any of the priorities if funding is available for 'lower' priorities and other opportunities arise.

1. Coordinate recovery actions

The Merredin District Threatened Flora Recovery Team (MDTFRT) will coordinate recovery actions for *Acacia volubilis* and other Declared Rare Flora in the region. They will include information on progress in their annual report to CALM's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$1,000 per year.

2. Map critical habitat

It is a requirement of the EPBC Act that spatial data relating to critical habitat be determined. Although critical habitat is described in Section 1, the areas as described have not yet been mapped and that will be done under this action. If any additional populations are located, then critical habitat will also be determined and mapped for these locations.

Action: Map critical habitat
Responsibility: CALM (Merredin District, WATSCU) through the MDTFRT
Cost: \$2000 in the first year.

3. Seek long-term protection of habitat

Staff from CALM's Merredin District, are liaising with both land managers and landowners to ensure that populations are not accidentally damaged or destroyed. In addition, methods of improving the security of populations and their habitat within private property will be investigated. This may include conservation covenants with a range of agencies, the Land for Wildlife scheme, and possibly land acquisition. Two subpopulations currently occur within private property. The owner of the land on which population 8b occurs is currently in the process of having a covenant placed on the title.

Action: Seek long-term protection of habitat

Responsibility: CALM (Merredin District) and landowners through the MDTFRT
Cost: \$500 per year for liaison.

4. Maintain fences around Subpopulations 2b and 8b

Fences around Subpopulations 2b and 8b will be maintained to prevent the threat of grazing by stock and damage to remnant vegetation by vehicles and trespassers. The location of Subpopulation 8b has been selected as a suitable translocation site, therefore fencing is essential to ensure the security of the *Acacia volubilis* plants. Funding has been received from Envirofund (Environment Australia) to contribute to the upgrading of the fencing around this site. Further funds will be sought from various sources.

Action: Maintain fences around Subpopulations 2b and 8b
Responsibility: CALM (Merredin District) and private land-owner through the MDTFRT
Cost: \$1000 per year

5. Implement Translocation Proposal

Although translocations are generally undertaken under full Recovery Plans, as the number of extant plants is low and populations are not secure from threats, a translocation was deemed desirable for the conservation of this species. A Translocation Proposal has been developed, suitable sites selected and plants grown from seed and cutting stock. The translocation will be coordinated by the MDTFRT. Information on the translocation of threatened plants and animals in the wild is provided in CALM's Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*. All Translocation Proposals require endorsement by CALM's Director of Nature Conservation.

Monitoring of the translocation is essential and will be undertaken according to the timetable developed for the Translocation Proposal.

Action: Implement Translocation Proposal
Responsibility: CALM (Science Division, Merredin District) through the MDTFRT
Cost: \$7,000 in second year \$7,500 in third, then \$4,500 per year thereafter.

6. Collect seed and cutting material

Preservation of germplasm is essential to prevent extinction if the wild population is lost. Seed and cuttings will be collected for storage and to propagate plants for translocations. A small quantity of *Acacia volubilis* seed collected from Subpopulation 2a is currently held in CALM's TFSC and 65 plants are held in the nursery at BGPA. Further seed and cutting collections from as many plants as possible are needed, however, to maximise the genetic diversity of the material for storage and for use in translocations.

Action: Collect seed and cutting material
Responsibility: CALM (TFSC, Merredin District) BGPA through the MDTFRT
Cost: \$2,000 per year.

7. Develop and implement a rabbit control strategy

Rabbits are thought to be severely affecting Population 1a and CALM staff have noted that grazing threatens a number of other populations. Rabbits are known to preferentially graze soft young growth, and it seems likely that they will either reduce or prevent recruitment by grazing on young seedlings. In addition to grazing, rabbits also impact on populations by encouraging the invasion of weeds through soil digging, erosion, addition of nutrients and the introduction of weed seeds.

Control strategies will be developed and implemented in consultation with relevant land managers.

Action: Develop and implement a rabbit control strategy
Responsibility: CALM (Merredin District) and land managers through the MDTFRT

Cost: \$800 in first year then \$600 for second and third years.

8. Develop and implement a weed control strategy

Weeds are a serious threat to one private property population (Population 8b) and all populations located on narrow road reserves. Weeds impact on the species by competing for resources, degrading habitat, exacerbating grazing pressure, and increasing the risk and severity of fire.

Weed control undertaken in consultation with relevant land managers will be by hand weeding or localised application of herbicide. Any weed control will be followed by a report on the method, timing and success of the treatment, and the effect on *A. volubilis* and associated native plant species. It is anticipated that a number of native species will regenerate after weed competition is removed.

Action: Develop and implement a weed control strategy
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$2,000 in first year then \$1,800 per year

9. Develop and implement a fire management strategy

It is likely that *Acacia volubilis* requires occasional fire for recruitment from soil-stored seed. Regeneration from root suckers has been recorded, and this may help to buffer the species from the impacts of too frequent fire such as preventing accumulation of sufficient soil-stored seed. Fire promotes the invasion and proliferation of weed species, however, and should be prevented from occurring in the habitat of populations, except where it is being used as a recovery tool.

A fire management strategy will be developed in consultation with relevant authorities and land managers to determine fire control measures, timing, intensity and fire frequency. This strategy should incorporate other priority and threatened flora species in the District wherever possible.

Action: Develop and implement a fire management strategy
Responsibility: CALM (Merredin District) and relevant authorities through the MDTFRT
Cost: \$4,200 in first year and \$2,000 in second and third years.

10. Rehabilitate degraded habitat

Acacia volubilis habitat will be rehabilitated through the re-introduction of plant species native to the site to benefit the long-term survival of populations by reducing the impact of edge effects created within narrow linear road reserves. This action would ideally include acquisition of a strip of adjoining land to widen the road reserve and increase potential habitat for the species. Site rehabilitation would then extend beyond the current boundary of the populations to discourage weed invasion and buffer extant plants from chemical drift, water stress and soil disturbance.

The habitat of population 1 of *Acacia volubilis* will be rehabilitated. This will include the addition of local provenance seeds and seedlings of species native to that site, particularly if such species attract pollinators. Regeneration of native vegetation using smoke and disturbance trials will also be trialed. Rehabilitation will be monitored to determine success, and the results will be used as a guide for future work in the habitat of this species.

Action: Rehabilitate degraded habitat
Responsibility: CALM (Merredin District, WATSCU) through the MDTFRT
Cost: \$ 10,800 in first year, then \$3,000 per year.

11. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Acacia volubilis* will provide a better scientific basis for its management in the wild. Some of this information can be obtained while monitoring the results of methods used for rehabilitating habitat. An understanding of the following is particularly necessary for effective management:

1. Soil seed bank dynamics and the role of various disturbances (including fire), competition, rainfall and grazing on germination and recruitment.
2. The pollination biology of the species.
3. The requirements of pollinators.
4. The reproductive strategies, phenology and seasonal growth of the species.
5. The population genetic structure, levels of genetic diversity and minimum viable population size.
6. The impact of herbicide treatments on *Acacia volubilis* and its habitat.

Action: Obtain biological and ecological information
Responsibility: CALM (Science Division, Merredin District) through the MDTFRT
Cost: \$20,000 in second and third years then \$11,500 in fourth year.

12. Promote community awareness

Articles have been produced and displayed within the community through posters, CALM's Landscape magazine and through electronic media that briefly describe *Acacia volubilis* and its habitat, inform of its rediscovery and show photographs of the species. Awareness of the importance of biodiversity conservation and the need for the long-term protection of wild populations of this species will continue to be promoted throughout the community. Formal links with local naturalist groups and interested individuals will also be encouraged.

An information sheet will be produced, and will include a description of the plant, its habitat, threats, recovery actions and photos. This will be distributed to the public through CALM's Merredin District Office and at the offices and libraries of the Shires of Cunderdin and Tammin. Such information distribution may lead to the discovery of new populations.

Action: Promote community awareness
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$2,800 in first year, \$1,400 in second year and \$1,100 per year thereafter.

13. Monitor populations

Annual monitoring of factors such as habitat degradation including weed invasion, salinity and plant diseases, population stability (expansion or decline), pollination activity, seed production, recruitment, longevity and predation is essential.

Action: Monitor populations
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$1,400 per year

14. Conduct further surveys

Volunteers from the local community, Wildflower Societies, Naturalist Clubs and other community-based groups will be encouraged to be involved in surveys for *Acacia volubilis* supervised by CALM staff. Surveys will be undertaken during the species' flowering period (June and July).

Action: Conduct further surveys
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$1700 per year

15. Liaise with relevant land managers

Staff from CALM's Merredin District will continue to liaise with managers and owners of land on which populations of *Acacia volubilis* occur, and with managers of adjacent lands. This will help prevent accidental damage or destruction of the plants. Input and involvement will also be sought from any indigenous groups that have an active interest in areas that are habitat for *A. volubilis*.

Action: Liaise with relevant land managers
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: \$500 per year

16. Review the need for further recovery actions and/or a full Recovery Plan

This Interim Recovery Plan will operate from September 2003 to August 2008 when it will be reviewed and the need for further recovery actions assessed. It will, however, remain in force until withdrawn or replaced and if the species is still ranked as Critically Endangered at that time a full Recovery Plan may be required.

Action: Review the need for further recovery actions and/or a full Recovery Plan
Responsibility: CALM (WATSCU, Merredin District) through the MDTFRT
Cost: \$15,000 in the fifth year (if full Recovery Plan is required)

4. TERM OF PLAN

This Interim Recovery Plan will operate from October 2003 to September 2008 but will remain in force until withdrawn or replaced. If the taxon is still ranked Critically Endangered after five years, the need to review this IRP or to replace it with a full Recovery Plan will be determined.

5. REFERENCES

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6. TAXONOMIC DESCRIPTION

Maslin, B.R. (1995). *Acacia* Miscellany No. 13 - *Nuytsia* 10(2): 177-178

Acacia volubilis

Branchlets tortuous, having the appearance of *Alexgeorgea nitens* (RESTIONACEAE), terete, glabrous or sparsely-appressed-puberulous, obscurely and finely tuberculate, striate, ribs slightly raised. *Stipules* c. 0.5 mm long, recurved, sub-spinose, only the thickened basal portions remaining as blunt tooth-like projections at most nodes. *Phyllodes* distant, resembling branchlets but not continuous with them, the basal articulation difficult to observe, pulvinus absent, rudimentary (<1 mm long) to 9 mm long, 1 mm wide, pentagonal-terete, thick, straight or shallowly curved, mucronate; 5-nerved in all, midrib prominent and raised on each face, upper margin 2-nerved, flat and 0.5 mm wide, lower margin 1-nerved. *Gland* not prominent, circular, situated on upper margin of phyllode between the two adaxial nerves, c. 2 mm above the base on longest phyllodes. *Inflorescences*: see discussion below.

Typification. Both the holotype at MEL and the isotype at K are annotated “*Acacia volubilis* F. v. M. Boxvale. Julia Wells” by Mueller and comprise a single sheet supporting a number of small pieces of sterile stems together with detached flowers in a packet. While the stems appear to represent the same taxon, the flowers on these two sheets are significantly different and most probably represent different species. On both specimens the heads were probably globular and c. 10-flowered (judging from the receptacles), the flowers 5-merous and rather large, the calyx divided to c. 1/2 its length into triangular, fimbriate lobes, and the calyx tube is glabrous. They differ, however, in the following ways.

(a) MEL specimen. *Peduncles* appressed-puberulous, the hairs short and shallowly curved; *calyx* scarcely 1/2 length of corolla, tube obscurely 5-nerved; *petals* 2.5 mm long, sparsely puberulous at apices, flabelliform-striate.

(b) The K specimen flowers. *Peduncles* densely hispidulous, hairs spreading, rather long and straight; *calyx* slightly exceeding 1/2 length of corolla, tube rather prominently 5-nerved; *petals* 3 mm long, glabrous, with a single, thickened, central nerve.

The protologue clearly describes the flowers of the MEL specimen and it seems most likely that the flowers on the K specimen belong to a species other than *A. volubilis*.

SUMMARY OF RECOVERY ACTIONS AND COSTS

Recovery Action	Year 1			Year 2			Year 3			Year 4			Year 5		
	Dept	Other	Ext.	Dept	Other	Ext.	Dept	Other	Ext.	Dept	Other	Ext.	Dept	Other	Ext.
Coordinate recovery actions	500	500		500	500		500	500		500	500		500	500	
Map critical habitat	1,500		500												
Seek long-term protection of habitat	100		400	100		400	100		400	100		400	100		400
Maintain fences around Subpopulations 2b and 8b	100		900	100		900	100		900	100		900	100		900
Implement translocation proposal				3,000	2,500	1,500	5,000		2,500	3,000		1,500	3,000		1,500
Collect seed and cutting material	1,000		1,000	1,000		1,000	1,000		1,000	1,000		1,000	1,000		1,000
Develop and implement a rabbit control strategy	400		400	200		400	200		400						
Develop and implement a weed control strategy	1,000		1,000	900		900	900		900	900		900	900		900
Develop and implement a fire management strategy	2,500	1,000	700	1,000		1,000	1,000		1,000						
Rehabilitate degraded habitat				500	1500	8,800	1,000	500	1,500	1,000	500	1,500	1,000	500	1,500
Obtain biological and ecological information				10,000		10,000	10,000		10,000	5,500		6,000			
Promote community awareness	1,100		1,700	1,100		300	1,100			1,100			1,100		
Monitor populations	800	200	400	800	200	400	800	200	400	800	200	400	800	200	400
Conduct further surveys	500	200	1,000	500	200	1,000	500	200	1,000	500	200	1,000	500	200	1,000
Liaise with relevant land managers	500			500			500			500			500		
Review the need for a full Recovery Plan													5,000		10,000
Total	10,000	1,900	8,000	20,200	4,900	26,600	22,700	1,400	20,000	15,000	1,400	13,600	14,500	1,400	17,600
Yearly Total		19,900			51,700			44,100			30,000			33,500	

Ext = External funding (funding to be sought). Other = funds contributed by NHT, in-kind contribution and BGPA.

Total Department: \$ 82,400
Total Other: \$ 11,000
Total External Funding: \$ 85,800
Total costs: \$ 179,200