INTERIM RECOVERY PLAN NO 156

HAIRY-STEMMED ZIG-ZAG WATTLE (*ACACIA SUBFLEXUOSA* SUBSP. *CAPILLATA*)

INTERIM RECOVERY PLAN

2003-2008

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Photo: Anne Cochrane

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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This Interim Recovery Plan will operate from October 2003 to September 2008 but will remain in force until withdrawn or replaced.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 Shade	Horticulturist, Botanic Garden and Parks Authority
Kate Brunt	Conservation Officer, CALM's Merredin District
Leonie Monks	Research Scientist, CALM's Science Division
Rob Davis	Botanist, CALM's WA Herbarium

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

SUMMARY

Scientific Name:	*Acacia subflexuosa* ssp. *capillata*	**Common Name:**	Hairy-Stemmed Zig-Zag Wattle
Family:	*Mimosaceae*	**Flowering Period:**	August to November
Dept Region:	Wheatbelt	**Dept District:**	Merredin
Shires:	Tammin, Quairading and Cunderdin	**Recovery Team:**	Merredin Threatened Flora Recovery Team (MDTFRT)

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, Perth, Western Australia; Cowan, R.S. and Maslin, B.R. (1999) Acacia miscellany 17. *Nuytsia* 12 (3): 413-452; Cowan, R.S. and Maslin, B. (2001). *Acacia subflexuosa* subsp. *capillata. Flora of Australia,* 11A: 62.

Current status: The first collection of *Acacia subflexuosa* subsp. *capillata* was made by Basil Smith in September 1982. Three more subpopulations were subsequently located close by. However all were small and highly threatened. In July 1998 the subspecies was declared as Rare Flora and ranked as Critically Endangered (CR). It currently meets CR under World Conservation Union (IUCN 2000) Red List criteria D due to its small population size and is also listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). The main threats are direct damage and habitat destruction during road maintenance, weed invasion, inappropriate fire regimes and grazing.

A draft Interim Recovery Plan was prepared for the taxon in 1998 (Roberts 1998). Information from it and additional information collected since then has been incorporated into the final plan.

Description: *Acacia subflexuosa* subsp. *capillata* is a rounded shrub to 1 m tall with thickened, sharply-pointed phyllodes, 3 to 4 cm long and 1 to 1.5 mm wide. Flowers are in yellow globular heads on 4 to 6 mm long stalks and appear from August to November. Pods are narrow and coiled, 4 cm long and 2 mm wide.

Habitat requirements: *Acacia subflexuosa* subsp. *capillata* is currently known from a range of less than 5 km in an area south of Tammin where it grows on weedy road verges on grey sands with laterite in shrub heath. Associated species include *Acacia* sp., *Calothamnus* sp., *Leptospermum erubescens, Melaleuca* sp. and *Hakea aculeata* - another species of Endangered Declared Rare Flora (DRF) that is found on the road verge near population 1b of *Acacia subflexuosa* subsp. *capillata*.

Critical habitat: The critical habitat for *Acacia subflexuosa* subsp. *capillata* 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 taxon but may have done so in the past and may be suitable for translocations.

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

Benefits to other species or ecological communities: *Acacia subflexuosa* subsp. *capillata* occurs with *Hakea aculeata* (currently listed as Endangered under the *Wildlife Conservation Act* 1950 and Vulnerable under the EPBC Act 1999) at one site and *Acacia ataxiphylla* subsp. *magna* (currently listed as Critically Endangered under the *Wildlife Conservation Act* 1950 and Endangered under the EPBC Act 1999) and *Grevillea roycei*, a Priority three species, at another site. Recovery actions implemented to improve the quality or security of the habitat of *A. subflexuosa* subsp. *capillata* will also improve the status of these other species.

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 subflexuosa* subsp. *capillata*, and this is discussed in the recovery actions.

Social and economic impact: It is not anticipated that any adverse social or economic impacts will eventuate as a result of the implementation of this plan. All subpopulations are found on shire road reserves and are managed by local government authorities.

Evaluation of the plan's performance: The Department of Conservation and Land Management, 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 subspecies.
2. Surveys have been conducted to locate new populations.
3. Markers that define populations have been installed and maintained.
4. Approximately 442 seeds were collected in December 1998 and are stored in the Department of Conservation and Land Management's (CALM's) Threatened Flora Seed Centre at –18°C.
5. Road maintenance activities within the habitat of *Acacia subflexuosa* subsp. *capillata* have been discussed with the Tammin Shire Works Supervisor.
6. Staff from CALM's Merredin District regularly monitor populations of the subspecies.
7. 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 subspecies 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
1. Coordinate recovery actions
2. Map critical habitat
3. Notify land managers
4. Liaise with relevant land managers
5. Develop and implement a weed control strategy
6. Develop and implement a fire management strategy
7. Develop and implement a rabbit control strategy
8. Collect seed and cutting material
9. Investigate techniques for habitat regeneration
10. Develop guidelines for road maintenance
11. Develop a Translocation Proposal
12. Obtain biological and ecological information
13. Promote community awareness
14. Conduct further surveys
15. Monitor populations
16. Review the need for a full Recovery Plan

1. BACKGROUND

History

The first collection of *Acacia subflexuosa* subsp. *capillata* was made by Basil Smith in September 1982. However, at that time it was determined as *Acacia leptoneura.* This changed when the specimen was informally identified as a new subspecies by Cowan and Maslin in 1990 (Herbarium database records). *A. subflexuosa* subsp. *capillata* was formally described in *Nuytsia* in 1999 (Cowan and Maslin 1999).

Surveys undertaken in 1994, 1997 and 2001 located two new subpopulations and relocated another that was previously known only from herbarium records. All subpopulations occur on disturbed, weedy road verges over a range of less than 5 km. The largest (Subpopulation 1a) currently contains 37 plants, while 1b, 1c and 1d contain five, one and three plants respectively. A total of 46 live plants are currently known.

The Department of Conservation and Land Management (CALM) has notified the Shire of Tammin and adjoining private property owners about the locations of *Acacia subflexuosa* subsp. *capillata*. Although Declared Rare Flora markers were installed, disturbance to Subpopulation 1a during road maintenance was documented in 2000. Weed competition and inappropriate fire regimes also have an impact on populations of *A. subflexuosa* subsp. *capillata* and its habitat.

A draft Interim Recovery Plan (IRP) was prepared for the subspecies in 1998 (Roberts 1998). Information from that draft and further information collected since that that time has been incorporated into this Plan.

Description

The subspecific epithet from the Latin *capillatus* (hairy) refers to the indumentum on many parts of the plant (Cowan and Maslin 1999).

Acacia subflexuosa subsp. *capillata* is a rounded shrub to 1 m tall with thickened, sharply-pointed phyllodes, 3 to 4 cm long and 1 to 1.5 mm wide. Flowers are in yellow globular heads, on 4 to 6 mm long stalks and appear from August to November. Pods are narrow and coiled, 4 cm long and 2 mm wide.

Distribution and habitat

Acacia subflexuosa subsp. *capillata* is endemic to the Cunderdin-Tammin area of Western Australia where it occurs over a range of less than 5 km. It is currently known from a single population comprising four subpopulations that contain a total of 46 mature plants. All subpopulations occur on disturbed linear road reserves on laterite over grey sands in shrub heath. Associated species include *Acacia* sp., *Melaleuca* sp., *Calothamus* sp., *Hakea aculeata* (DRF), and *Acacia ataxiphylla* subsp. *magna* (DRF).

Biology and ecology

Acacia is the largest genus in Australia, comprised of 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). Due to their adaptability, many are important horticultural and commercial plants.

Very little is known about the ecology of *Acacia subflexuosa* subsp. *capillata*, however it is thought that it responds to ground disturbance. In 1998 two mature plants were recorded in Subpopulation 1a. However, a survey undertaken following road works in 1999 recorded 32 seedlings ‘growing perilously close to the road’. Human activities involving clearing or destruction of areas of natural vegetation clearly have the potential to influence *Acacia* distributions (Janzen 1974). Within the habitat of *Acacia subflexuosa* subsp. *capillata* competition from weeds has been regularly noted as well as disturbance to the soil by rabbits. The overall long-term response to these disturbances is unknown.

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. Some *Acacia* species are ‘soft-seeded’ and are damaged

by fire (Cavanagh 1987). No specific information is available about the response of *Acacia subflexuosa* subsp. *capillata* to fire. However, from the response of other predominantly single stemmed, non lignotuberous acacias occupying a similar ecological niche, it is likely that *A. subflexuosa* subsp. *capillata* would be killed by fire. In non-sprouting species that rely on post-fire germination to persist, fire intervals that exceed the longevity of both the plants and their associated seed banks may contribute to local population decline and possible extinction (Yates and Broadhurst 2002). No specific information is available about the response of *A. subflexuosa* subsp. *capillata* to fire.

The flowering period for *Acacia subflexuosa* subsp. *capillata* is from August to November. Threatened Flora Seed Centre (TFSC) officers collected 442 seeds from five plants in December 1998. Germination trials undertaken in 1998 and 2000 produced only 8% and 12.5% success rates respectively. From these results it was reasoned that the collection has a high proportion of non-viable seed and that of the 442 seed in storage only 45 are likely to be viable (unpublished data A. Crawford[1]). The reasons for this are unknown. Bees and many other insects as possible pollinators have been noted during surveys, either on the plants or in the habitat.

Threats

Acacia subflexuosa subsp. *capillata* was declared as Rare Flora and ranked as Critically Endangered (CR) in July 1998. It is currently ranked as CR under World Conservation Union (IUCN 2000) Red List criteria D due to its small population size. *Acacia subflexuosa* subsp. *capillata* is listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act). The main threats are road maintenance, weed invasion and inappropriate fire regimes.

- **Road maintenance** threatens all subpopulations; however, it is the most significant threat to Subpopulation 1a where a school bus turnaround bay is located. Threats include grading, chemical spraying and the construction of drainage channels. Several of these actions also encourage weed invasion.

- **Weed invasion** has been recorded as a threat to all subpopulations, especially Subpopulation 1d. 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 subflexuosa* subsp. *capillata* probably germinate following fire the soil seed bank would be rapidly depleted if frequent fires occurred before regenerating or juvenile plants reached maturity. However, it is likely that occasional fires are needed for reproduction of this taxon.

- **Poor recruitment** threatens three of the four subpopulations as no seedlings have been recorded in them.

- **Restricted habitat** through past clearing for agriculture threatens all subpopulations, which now occur on linear road reserves within a 5 km range. The habitat at two of the sites has been highly disturbed.

- **Grazing** by rabbits, kangaroos or stock threatens populations of *Acacia subflexuosa* subsp. *capillata*. In addition to grazing, rabbits also impact on populations by encouraging invasion of weeds through soil digging, erosion, the addition of nutrients to soil and introduction of weed seeds. The high levels of palatable weeds near these populations and in adjacent farming properties attract herbivorous animals, which are often unselective in their grazing.

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

Summary of population information and threats

Pop. No. & Location	Land Status	Month/Year - No. plants	Condition	Threats
1a. SW of Tammin	Shire Road Reserve	9/1994 4 11/1998 2 8/1999 2 (32) 8/2001 36 (1)	Healthy	Road maintenance, weed invasion, inappropriate fire, restricted habitat, grazing,
1b. SW of Tammin	Shire Road Reserve	8/1997 5 11/1998 9 8/2001 5 [3]	Poor	Road maintenance, weed invasion, inappropriate fire, poor recruitment, restricted habitat, grazing
1c. SW of Tammin	Shire Road Reserve	1982 1 8/2001 1	Poor	Road maintenance, weed invasion, inappropriate fire, poor recruitment, grazing
1d. SW of Tammin	Shire Road Reserve	8/1999 1 8/2000 3 8/2001 3	Moderate	Road maintenance, weed invasion, inappropriate fire, poor recruitment, restricted habitat, grazing

( ) = number of 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 subflexuosa* subsp. *capillata* will require assessment. On-ground works should not be approved unless the proponents can demonstrate that they will not have an impact on the taxon, its habitat or potential habitat, or on the local surface hydrology such that drainage in the habitat of the taxon 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 subflexuosa subsp. *capillata* is listed as Critically Endangered, and it is therefore 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 metres of known populations, i.e. laterite over grey sands in shrub 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 subspecies 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 subspecies is listed as Critically Endangered it is considered that all known habitat for wild and translocated populations is habitat critical for the subspecies' survival, and that all wild and translocated populations are important populations.

Benefits to other species or ecological communities

Acacia subflexuosa subsp. *capillata* occurs with *Hakea aculeata* (currently listed as Endangered under the *Wildlife Conservation Act* 1950 and Vulnerable under the EPBC Act 1999) at one site and *Acacia ataxiphylla* subsp. *magna* (currently listed as Critically Endangered under the *Wildlife Conservation Act* 1950 and Endangered under the EPBC Act 1999) and *Grevillea roycei*, a Priority Three species, at another site. Recovery actions implemented to improve the quality or security of the habitat of *Acacia subflexuosa* subsp. *capillata* will also improve the status of these other species.

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 subflexuosa* subsp. *capillata*, and this is discussed in the recovery actions.

Social and economic impacts

It is not anticipated that any adverse impacts will eventuate as a result of the implementation of this plan. The extant subpopulations of *Acacia subflexuosa* subsp. *capillata* are all located on shire road reserves managed by local government authorities.

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 its 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 taxon 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 Shire of Tammin and private property owners that adjoin the road reserves where *Acacia subflexuosa* subsp. *capillata* occurs have been notified of the presence of the taxon. These notifications detail the Declared Rare status of the taxon and the associated legal responsibilities.

Surveys undertaken by CALM officers have resulted in the discovery of three new subpopulations, all on road reserves. Declared Rare Flora (DRF) markers have been installed at 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. Awareness of the significance of these markers is being promoted to relevant bodies such as Shires and Main Roads WA. To this end, posters, dashboard stickers and drink holders have been produced and distributed. These illustrate DRF markers and inform of their purpose.

Approximately 442 seeds (from 5 plants) were collected in December 1998 and 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 subflexuosa* subsp. *capillata* seed was 8% and the subsequent subsample was 12.5% (unpublished data A. Crawford).

CALM staff have had discussions with the Tammin Shire Works Supervisor regarding road maintenance activities within the habitat of *Acacia subflexuosa* subsp. *capillata* populations. The species status and the need to protect the populations from vehicle damage through any road maintenance were highlighted.

CALM Merredin District officers regularly monitor all populations of this taxon and have undertaken very limited weed control at Subpopulation 1a.

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 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 subflexuosa* subsp. *capillata* and other Declared Rare flora in the region. They will include information on progress in their annual report to the Department's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $800 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: $500 in the first year

3. Notify land managers

Staff from CALM's Merredin District will notify the Shire of Cunderdin and Quairading of the subpopulations of *Acacia subflexuosa* subsp. *capillata* that occur on road reserves managed by them.

Action: Notify relevant land managers
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $200 in first year

4. Liaise with relevant land managers

Ongoing liaison with all relevant land managers will be undertaken to help prevent accidental damage or destruction of the plants. Adjoining land-owners will be consulted, and provided with information, and practices of stock transport and grazing along the road reserves where subpopulations of *Acacia subflexuosa* subsp. *capillata* occur will be reviewed. Input and involvement will also be sought from any indigenous groups that have an active interest in areas that are habitat for *A. subflexuosa* subsp. *capillata.*

Action: Liaise with relevant land managers
Responsibility: CALM (Merredin District) through the MDTFRT

Cost: $500 per year

5. Develop and implement a weed control strategy

Weeds are threatening all subpopulations of *Acacia subflexuosa* subsp. *capillata*. Weeds impact on the taxon by competing for resources, degrading habitat, exacerbating grazing pressure, and increasing the risk and severity of fire.

Some very limited weed control by selective hand-pulling has been undertaken by CALM Officers at Subpopulation 1a. Effective weed control with the use of herbicides and hand-pulling is required and will be undertaken in consultation with the land managers. Methods will involve:

1. Accurately mapping the boundaries of populations.
2. Assessment of weeds present.
3. Selection of an appropriate herbicide or other method of weed control.
4. Controlling invasive weeds along the roadside and into the remnants by hand weeding or localised application of herbicide during the appropriate season to minimise the effect of herbicide on the taxon and the surrounding native vegetation.

All applications of weed control will be followed by a report on the method, timing and success of the treatment, and the effect on *Acacia subflexuosa* subsp. *capillata* and associated native plant species.

Action: Develop and implement a weed control strategy
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $2000 in first year, then $1,800 per year thereafter

6. Develop and implement a fire management strategy

It is likely that *Acacia subflexuosa* subsp. *capillata* requires occasional fire for recruitment from soil-stored seed, however fire is known to kill adult plants and frequent fires and may prevent the accumulation of sufficient soil-stored seed for recruitment to occur. Fire also promotes the introduction and proliferation of weed species and should therefore be prevented from occurring in the habitat of populations, except where it is being used experimentally as a recovery tool.

A fire management strategy will be developed in consultation with relevant authorities and land managers to determine fire control measures, and fire intensity, timing and frequency. This strategy will 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: $3,000 in first year and $1,500 in the second and third years.

7. Develop and implement a rabbit control strategy

Rabbits have been recorded at all subpopulations and were particularly abundant at Subpopulation 1b. Rabbits are known to preferentially graze soft young growth therefore it seems likely that they will impact on recruitment of plants by grazing on seedlings. In addition to grazing, rabbits also impact on populations by encouraging invasion of weeds through soil digging, erosion, addition of nutrients to soil and introduction of weed seeds.

Control strategies will be developed and implemented in consultation with relevant land managers. This may include using the naturally occurring chemical 1080 in an oat mixture, which will decrease both rabbit and fox numbers.

Action: Develop and implement a rabbit control strategy
Responsibility: CALM (Merredin District) and land managers through the MDTFRT
Cost: $800 in first year, then $500 in the second and third years

8. 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 for use in propagating plants for translocations. A small quantity of *Acacia subflexuosa* subsp. *capillata* seed has been collected and is currently held in CALM's TFSC. Germination trials have returned very low results of 8% and 12.5%, therefore further collections from as many plants as possible are essential to maintain adequate representation of the remaining genetic diversity of this taxon.

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

9. Investigate techniques for habitat regeneration

CALM Officers will investigate techniques that can be applied to populations of *Acacia subflexuosa* subsp. *capillata* in disturbed habitat. Techniques and methods to be investigated will include some or all of: burning; smoke-water treatment to stimulate germination of soil-stored seed; soil disturbance; direct seeding and planting; and purchasing adjoining land to decrease the impact of edge effects and increase the security of the subpopulations.

Soil stored seed may remain viable for a considerable period. This is a characteristic feature of many plants typical of 'disturbed' areas and one that increases the chances of successful establishment after irregular disturbance (New 1984). Germination also depends on other factors such as seed depth in the soil. Any investigation into habitat regeneration will be undertaken in conjunction with weed control, as weed germination will also be stimulated by treatments.

Following the investigations, techniques that are considered feasible for the area will be applied.

Action: Investigate techniques for habitat regeneration
Responsibility: CALM (Science Division, Merredin District) through the MDTFRT
Cost $500 in first year, $2,000 per year for the second and third years, then $1000 per year thereafter.

10. Develop guidelines for road maintenance

Merredin District personnel will hold an on-site meeting with representatives from relevant authorities, land managers and adjacent landowners to outline the problems associated with inappropriate road maintenance and develop a road maintenance strategy to maximize effective protection. This will involve the restricted maintenance of the road verges where *Acacia subflexuosa* subsp. *capillata* occurs, and avoiding any further clearing of the schoolbus turnaround bay at Subpopulation 1a. Discussions between CALM staff and the Tammin Shire Works Supervisor have already taken place.

Action: Develop guidelines for road maintenance
Responsibility: CALM (Merredin District) and relevant authorities through the MDTFRT
Cost $800 in first year

11. Develop a Translocation Proposal

Translocation is desirable for the conservation of this taxon, as the number of extant plants is low and populations are not secure from threats. Information on the translocation of threatened plants and animals in the wild is provided in the Department's Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*.

Translocations are generally undertaken under full Recovery Plans, however, due to the high level of threat to remaining populations a Translocation Proposals will be developed and plants will be grown for future planting within the timeframe of this Interim Recovery Plan. All Translocation Proposals require endorsement by CALM's Director of Nature Conservation.

Action: Develop a Translocation Proposal
Responsibility: CALM (Science Division, Merredin District) through the MDTFRT
Cost: $4,000 in the third year

12. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Acacia subflexuosa* subsp. *capillata* will provide a better scientific basis for its management in the wild. 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 taxon.
3. The requirements of pollinators.
4. The reproductive strategies, phenology and seasonal growth of the taxon.
5. The population genetic structure, levels of genetic diversity and minimum viable population size.
6. The impact of herbicide treatments on *Acacia subflexuosa* subsp. *capillata* and its habitat.

Action: Obtain biological and ecological information
Responsibility: CALM (Science Division, Merredin District) through the MDTFRT
Cost: $15,500 per year for first three years

13. Promote community awareness

Awareness of the importance of biodiversity conservation and the need for the long-term protection of wild populations of this taxon will continue to be promoted throughout the community using poster displays, local print and electronic media. 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. Information sheets aim to stimulate interest, provide information about threatened species and provide a contact name and number to report any new populations located by community members.

Action: Promote community awareness
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $2,500 in first year, $1,200 in second year then $500 per year thereafter.

14. Conduct further surveys

Volunteers from the local community, Wildflower Societies, Naturalist Clubs and other community-based groups will be encouraged to participate in surveys for *Acacia subflexuosa* subsp. *capillata* supervised by CALM staff, to be undertaken during the species' flowering period (August to November).

Action: Conduct further surveys
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $1,700 per year

15. 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. All known *Acacia subflexuosa* subsp. *capillata* plants occur on road reserves with Subpopulation 1a growing close to a schoolbus turnaround bay, therefore it is also essential to monitor all DRF markers to ensure that they remain in place and visible.

Action: Monitor populations
Responsibility: CALM (Merredin District) through the MDTFRT
Cost: $600 per year

16. Review the need for further recovery 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 sub-species is still ranked as Critically Endangered at that time, a full Recovery Plan may be required.

Action: Review the need for further recovery and/or a full Recovery Plan
Responsibility: CALM (WATSCU, Merredin District) through the MDTFRT
Cost: $15,700 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.

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6. TAXONOMIC DESCRIPTION

Acacia subflexuosa (Maiden 2001)

Rounded shrub 0.3-1m high. Branchlets terete, ±nerveless, puberulous or appressed-puberulous, sometimes glabrescent. Stipules ±persistent, 1-2 mm long. Phyllodes commonly widely spreading, ±irregularly and shallowly to strongly curved or sigmoid, terete to almost flat, 3.5-7 cm long, 1-2 mm diam., commonly with

curved-mucronate to subuncinate tip, puberulous or glabrous, with 8 distant strongly raised nerves with distinct furrows between, 3-nerved per face when ±flat; gland 2-6 mm above pulvinus; pulvinus ±smooth and slightly flared at base. Inflorescences simple, 2 per axil; peduncles 2-6 mm long, puberulous to glabrous; heads globular, 3.5-4 mm diam., 15-22 flowered, golden; bracteoles slightly exserted in buds. Flowers 5-merous; sepals free. Pods linear to submoniliform, raised over seeds, curved, to 8 cm long, 2-2.5 mm wide, firmly chartaceous, subglossy, sparsely puberulous or glabrous. Seeds longitudinal, broadly elliptic, 2.5 mm long, dull, brown, often obscurely mottled; aril crested.

Occurs as two .

Branchlets and peduncles with (often sparse) minute appressed hairs; phyllodes glabrous except appressed-hairy at base
subsp. *subflexuosa*
Branchlets and peduncles with dense spreading short hairs; phyllodes with sparse to moderately dense spreading hairs
subsp. *capillata*

Acacia subflexuosa* subsp. *capillata (Cowan and Maslin 2001)

Branchlets densely puberulous with patent hairs. Phyllodes sparsely to moderately puberulous with patent hairs. Peduncles 3-6 mm long, densely puberulous with patent hairs.

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	400	400		400	400		400	400		400	400		400	400	
Map critical habitat	250		250												
Notify land managers	200														
Liaise with relevant land managers	500			500			500			500			500		
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	800		2,200	900		600	900		600						
Develop and implement rabbit control strategies	400		400	200		300	200		300						
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
Investigate techniques for habitat regeneration	500			1,000		1,000	1,000		1,000	500		500	500		500
Develop guidelines for road maintenance	300	500													
Develop a translocation proposal							2,300		1,700						
Obtain biological and ecological information	7,500		8,000	7,500		8,000	7,500		8,000						
Promote community awareness	1,000		1,500	1,000		200	500			500			500		
Conduct further surveys	500	500	700	500	500	700	500	500	700	500	500	700	500	500	700
Monitor populations	300	100	200	300	100	200	300	100	200	300	100	200	300	100	200
Review the need for a full Recovery Plan													6,600		9,100
Total	14,650	1,500	15,250	14,200	1,000	12,900	16,000	1,000	14,400	4,600	1,000	3,300	11,200	1,000	12,400
Yearly Total		**31,400**			**28,100**			**31,400**			**8,900**			**24,600**	

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

Total Department: $ 60,650
Total Other: $ 5,500
Total External Funding: $ 58,250
Total costs: $ 124,400