INTERIM RECOVERY PLAN NO. 288

NYINGARN WATTLE

(*Acacia unguicula*)

INTERIM RECOVERY PLAN

2009-2014

June 2008

Department of Environment and Conservation
Kensington

Government of Western Australia

Department of Environment and Conservation
Our environment, our future

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. Note: the Department of CALM formally became the Department of Environment and Conservation (DEC) in July 2006. DEC will continue to adhere to these Policy Statements until they are revised and reissued.

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.

DEC 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This Interim Recovery Plan will operate from June 2008 to May 2013 but will remain in force until withdrawn or replaced.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 June 2009 and approved by the Director of Nature Conservation on 31 July 2009. The allocation of staff time and provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting DEC, as well as the need to address other priorities.

Information in this IRP was accurate as at July 2009.

IRP PREPARATION

This IRP was prepared by Rebecca Hayes[1] and Catherine Page[2].

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ACKNOWLEDGMENTS

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

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Amanda Shade	Assistant Curator (Nursery), Botanic Gardens and Parks Authority
Andrew Brown	Threatened Flora Coordinator, DEC Species and Communities Branch
Andrew Crawford	Principal Technical Officer (Threatened Flora Seed Centre) DEC Science Division
Anne Cochrane	Senior Research Scientist (Threatened Flora Seed Centre), DEC Science Division
Bridgitte Long	Technical Officer (DRF Database), DEC Species and Communities Branch
Craig Stevens	Mt Gibson Sanctuary Manager, Australian Wildlife Conservancy
Pindiddy Aboriginal Corporation	Ninghan Station IPA Managers
Victoria Cunningham	Technical Officer (Threatened Flora Seed Centre), DEC Science Division

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

Cover photograph by Rebecca Hayes (DEC).

CITATION

This IRP should be cited as:

Department of Environment and Conservation (2009) *Acacia unguicula* Interim Recovery Plan 2009-2014. Interim Recovery Plan No. 288. Department of Environment and Conservation, Western Australia.

SUMMARY

Scientific Name:	*Acacia unguicula*	**Common Name:**	Nyingarn Wattle
Family:	Mimosaceae	**Flowering Period:**	August - September
DEC Region:	Midwest	**DEC District:**	Geraldton
Shire:	Yalgoo	**Recovery Team:**	Geraldton District Threatened Flora Recovery Team

Illustrations and/or further information: Patrick, S. (2001) *Declared Rare and Poorly Known Flora in the Geraldton District*, Department of Conservation and Land Management, Western Australia; Paul Armstrong and Associates (2004) *Vegetation Assessment and Rare Flora Search Between Perenjori and Mt Gibson Conducted September and October 2003*, for Mt Gibson Iron Limited; Vital Options Consulting, *Ninghan Indigenous Protected Area Plan of Management 2004.* Western Australian Herbarium (2008) *Florabase – The Western Australian Flora*, Department of Environment and Conservation. http://florabase.dec.wa.gov.au;

Current status: *Acacia unguicula* was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in April 2002 and is currently ranked as Critically Endangered (CR) under World Conservation Union (IUCN 2001) Red List criteria B1ab(iii)+2ab(iii); C2a(i); D due to a continuing decline in the area, extent, quality of habitat and number of mature individuals. The main threats are grazing by feral goats, track maintenance, wildfire, drought and poor recruitment. *Acacia unguicula* is listed as Critically Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Description: *Acacia unguicula* is an erect, open shrub to 2 m tall (or tree to 3 m) with smooth grey bark and phyllodes clustered towards the ends of branches. Phyllodes are olive-green, rigid, erect, narrowly oblong, up to 40 mm long and 4 mm wide with 14-16 prominent nerves, and end in a stiff, sharp tip. There are two persistent appendages at the base of each phyllode, or stipules, these forming spines 0.7-1.2 mm long that curve outwards. The flower heads are deep golden, globular, 5-6 mm in diameter, on stalks 7-11 mm long. The pods are linear, becoming coiled, to 60 mm long, 2 mm wide

Habitat requirements: *Acacia unguicula* is currently known from a small area between Wubin and Paynes Find, approximately 280 km south east of Geraldton. The extent of occurrence is estimated to be approximately 1.0 km^2, and the area of occupancy is approximately 0.00048 km^2. It grows on the upper slopes and summit amongst open scrub, in rocky clay, brown clayey sand or brown loam with dolerite. Associated species include *Allocasuarina tesselata, Allocasuarina campestris, Micromyrtus racemosa* and *Brachysema aphylla*.

Habitat critical to the survival of the species, and important populations: Habitat critical to the survival of the species includes the area of occupancy of important populations, areas of similar habitat surrounding important populations (i.e. upper slopes and summit amongst open scrub, in rocky clay, brown clayey sand or brown loam with dolerite), additional occurrences of similar habitat and the local catchment for the surface and/or groundwater that maintains the habitat of the species. Given that *Acacia unguicula* is ranked as CR, it is considered that all known habitat for wild populations is critical to the survival of the species and that all wild populations are important populations.

Benefits to other species or ecological communities: Recovery actions implemented to improve the quality or security of the habitat of *Acacia unguicula* will also improve the status of the associated native vegetation. Additionally, two Critically Endangered and four Priority Flora occur in association with *Acacia unguicula*. *Acacia unguicula* does not occur in a Threatened Ecological Community (TEC).

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. *Acacia unguicula* is not specifically listed under any international treaty, and this plan does not affect Australia's obligations under any other international agreements.

Role and interests of indigenous people: A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register has identified that there are no sites of Aboriginal significance at or near populations of *Acacia unguicula*. However, involvement of the Indigenous community has been sought through the Pindiddy Aboriginal Corporation (PAC) to determine whether there are any issues or interests identified in the plan. Recovery actions identified within this plan refer to continued liaison and cooperation with the managers of the land and this refers to the PAC.

Social and economic impact: All populations of *Acacia unguicula* occur on a pastoral lease and negotiations will continue with regard to the future management of these populations. A mineral exploration tenement also covers the area where *A. unguicula* is known to occur. The implementation of this recovery plan therefore has the potential to have some limited social and economic impact. Recovery actions refer to continued liaison between stakeholders with regard to populations.

Affected interests: Protection of the species potentially impacts on the management of a pastoral lease. Mining tenement holders may also be affected by actions referred to in this plan. Other potentially affected interests include Telstra, Department of Aviation, Department of Industry and Resources and Department of Environment and Conservation.

Evaluation of the plan's performance: DEC, in conjunction with the Geraldton District Threatened Flora Recovery Team (GDTFRT) 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 within five years of implementation.

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 removal of major threats resulting in the number of individuals within populations and/or the number of populations increasing by 20 percent or more over the term of the plan.
Criteria for failure: The continuation of major threats resulting in the number of individuals within populations and/or the number of populations decreasing by 20 percent or more over the term of the plan.

Completed Recovery Actions

1. The managers of the pastoral lease containing populations of *Acacia unguicula* have been notified and advised of the locations and their legislative responsibilities to protect the species. The Geraldton District Flora Conservation Officer has liaised with the managers of the lease.
2. Part of Ninghan Station was declared an Indigenous Protected Area in October 2006. Through this declaration, funds are being provided by the Department of Environment, Water, Heritage and the Arts to conduct a range of conservation initiatives, including the erection of a goat proof fence along the western, northern and northeastern border, this being completed in 2006.
3. Sue Patrick conducted surveys for *Acacia unguicula* and other rare flora over 11.5 days from April 1992 to April 2001. These surveys covered much of the habitat of *Acacia unguicula*, similar habitat close by, and hills west and north of its habitat.
4. DEC's Threatened Flora Seed Centre currently holds two collections of *Acacia unguicula* seed in storage at –18°C. One collection contains 1,247 seeds from Population 2, and the other contains 18 seeds from Population 3. Both were collected in November 2004.

Ongoing and future recovery actions

1. Feral goat control is occurring on both Ninghan and Mt Gibson Stations, with approximately 1640 goats removed in total since the installation of the goat proof fence. 1300 of these have been removed from within the fenced area on Ninghan Station, and the remaining 340 goats were removed from the southern 'unfenced' border of the Indigenous Protected Area, from within the Mt Gibson Station.
2. Staff from DEC's Geraldton District regularly monitor populations of the species. Population 1 has been regularly monitored since 1992, whilst Populations 2 and 3 have been regularly monitored since 2001.
3. The Geraldton District Threatened Flora Recovery Team is overseeing the implementation of this IRP.

Recovery actions

1. Coordinate recovery actions	8. Conduct further surveys
2. Liaise with relevant land managers and Indigenous groups	9. Collect further seed
3. Develop and implement a feral goat control strategy	10. Monitor the level of weeds impacting populations and undertake weed control if considered necessary
4. Monitor populations	11. Promote awareness
5. Develop and implement a fire management strategy	12. Start the translocation process, if necessary
6. Map habitat critical to the survival of *Acacia unguicula*	13. Review the IRP and the need for further recovery actions
7. Obtain biological and ecological information	

1. BACKGROUND

History

A member of the Mimosaceae family, *Acacia* comprises some 1350 species throughout the world with close to 1000 of these found in Australia. Commonly known as wattle, *Acacia* is the largest genus of vascular plants in Australia. The first collection of *Acacia unguicula* was made by C.A. Gardner in 1953 and the species was described by Cowan and Maslin in 1990.

When *Acacia unguicula* was inspected by CALM staff in April 1992 there was evidence that plants were being grazed by goats (S. Patrick[1]). In 1993, the pastoral lease was purchased for the Pindiddy Aboriginal Corporation by the former Aboriginal and Torres Strait Islander Commission (ATSIC). In August 2000, high numbers of goats were recorded and the habitat of *Acacia unguicula* was seen to be denuded of vegetation. DEC staff noted that *Acacia unguicula* plants which were 1m tall in 1993 had been grazed down to 20cm stumps by 2001. It was also observed at that time that mature plants were only able to flower and fruit when they grow through other shrubs and put out flowering branches above the grazing line. The drought conditions experienced from 2001 to 2004 resulted in the grazing impact being particularly prominent over the range.

Acacia unguicula is currently known from three populations together containing a total of 77 mature individuals. All populations are located on a pastoral lease. Surveys for the species were conducted between 1992 and 2001, and again in 2007, but no other populations were found. Plants in all three populations are in poor condition, with many heavily grazed by feral goats. Only a small number of plants in each population have reached maturity, reducing the chance of natural recruitment.

Description

Acacia unguicula is an erect, open shrub to 2 m tall (or tree to 3 m), with smooth grey bark and olive-green, rigid, erect, narrowly oblong phyllodes, 40 mm long and 4 mm wide, clustered towards the ends of branches. Phyllodes have 14-16 prominent nerves and end in a stiff, sharp tip. There are two persistent appendages at the base of each phyllode, these forming spines 0.7-1.2 mm long that curve outwards. The flower heads are deep golden, globular, 5-6 mm in diameter, on stalks 7-11 mm long. The pods are linear, becoming coiled, to 60 mm long, 2 mm wide (Cowan & Maslin 1990). The Latin name *unguicula* (nail, claw or talon) refers to the stipules. The common name, Nyingarn Wattle, is derived from the Aboriginal name for the Mt Singleton Range, and means echidna (DEWHA 2007b).

Acacia unguicula is related to *A. multilineata*, differing in its persistent outward curved spiny stipules, longer inflorescence stalk and prominent nerves.

Distribution and habitat

Acacia unguicula is known from a small area between Wubin and Paynes Find, where it grows amongst open scrub, in rocky clay, brown clayey sand or brown loam with dolerite. Associated species include *Allocasuarina tessellata*, *A. campestris*, *Acacia imitans*, *A. acuminata*, *Micromyrtus racemosa* var. *mucronata* and *Brachysema aphylla*. All populations are high in the landscape. The extent of occurrence is approximately 1km^2 and the area of occupancy approximately 0.02km^2. There are currently three populations (four subpopulations) totaling 77 mature plants.

Summary of population land vesting, purpose and manager

Pop. No. & Location	DEC District	Shire	Vesting	Purpose	Manager
1. Southwest of Paynes Find	Geraldton	Yalgoo	Pastoral Lease	Pastoral	Pindiddy Aboriginal Corporation
2. Southwest of Paynes Find	Geraldton	Yalgoo	Pastoral Lease	Pastoral	Pindiddy Aboriginal Corporation
3a. Southwest of Paynes Find	Geraldton	Yalgoo	Pastoral Lease	Pastoral	Pindiddy Aboriginal Corporation
3b. Southwest of Paynes Find	Geraldton	Yalgoo	Pastoral Lease	Pastoral	Pindiddy Aboriginal Corporation

Populations in **bold text** are considered to be Important Populations.

[1] Sue Patrick, former Research Scientist, CALM

Biology and ecology

Acacia unguicula is a member of the Mimosaceae family and is likely to have a similar biology and ecology to other members. Germination of *Acacia unguicula* is thought to be triggered by natural disturbance events (physical or fire), which may explain why many plants are located in disturbed areas.

When mature, *Acacia unguicula* is a tall shrub to 2m tall (or tree to 3m), however many plants have been heavily grazed, forming small shrubs up to 30cm in height. Under current grazing pressure, it seems *Acacia unguicula* is only able to fruit if it puts out flowering branches above the grazing line (1.5m high). Very few plants have been able to reach this stage, and as a result recruitment levels are expected to be very low.

Threats

Acacia unguicula was declared as Rare Flora under the Western Australian *Wildlife Conservation Act 1950* in April 2002 and is currently ranked as Critically Endangered (CR) under World Conservation Union (IUCN 2001) criteria B1ab(iii)+2ab(iii); C2a(i) and D, due to a continuing decline in the area, extent and quality of habitat and number of mature individuals. Plants are threatened by severe grazing pressure, and unless remedial action is taken, there will be a continuing decline in the area, extent and quality of habitat and number of individuals. Other major threats include poor recruitment, track maintenance, mineral exploration, small population size, inappropriate fire regimes, drought and mining operations. *Acacia unguicula* is listed as Critically Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Grazing is a serious threat to all populations of *Acacia unguicula*. Most plants are heavily grazed by goats, and very few plants reach flowering size. One plant that was photographed at 1m tall in 1993 was grazed down to a 30cm stump in 2001. It has been observed that plants are only able to flower when they grow through other shrubs. Soil disturbance, weed invasion and the addition of nutrients are secondary effects of animal movement in areas inhabited by the species.

Poor recruitment is a major threat to the species. Due to severe grazing, the majority of mature plants are unable to produce seed and, when recruitment does occur, most new seedlings are also grazed. Natural disturbance (physical or fire) is thought to trigger germination, and a lack of suitable disturbance may also result in poor recruitment.

Track maintenance threatens all populations. Past track maintenance may have been a germination trigger, as many plants are located in areas which have been graded in the past. However, track maintenance will need to be monitored to ensure plants have time to mature and set seed in between disturbance events, and are not grazed while in a vulnerable state.

Mineral exploration is a potential threat to populations of *Acacia unguicula*. All are located in an area covered by a mining tenement, with a mineral exploration licence pending approval.

Small population size increases the likelihood of populations being adversely impacted on by a single event. As *Acacia unguicula* populations are very small, the likelihood of the species being adversely impacted by chance demographic or environmental events is increased. Small populations are also at a greater risk of loss of genetic diversity and inbreeding depression.

Inappropriate fire regimes may affect the viability of populations. As seeds of *Acacia unguicula* are thought to germinate following fire, it is likely that occasional fires are needed for recruitment. A lack of fire may therefore result in population senescence and rapid decline.

Drought is a threat to all populations of *Acacia unguicula*, and has the potential to increase grazing impact as animals become more desperate for food.

The intent of this plan is to provide actions that deal with immediate threats to *Acacia unguicula*. Although climate change may have a long-term effect on the species, actions taken directly to prevent the impact of climate change are beyond the scope of this plan.

Summary of population information and threats

Pop. No. & Location	Year	No. plants	Condition	Threats
1. Southwest of Paynes Find	1992	ca. 50+	Moderate	Grazing, track maintenance, fire, drought
	2001	7	Poor	
	2004	5	Poor	
	2007	3	Moderate	
2. Southwest of Paynes Find	2001	41	Poor	Grazing, track maintenance, fire, drought
	2007	38	Moderate	
3a. Southwest of Paynes Find	2001	43	Poor	Grazing, track maintenance, fire, drought
	2006	17*	Poor	
	2007	36*	Moderate	
3b. Southwest of Paynes Find	2001	22	Poor	Grazing, track maintenance, fire, drought
	2006	17*	Poor	
	2007	36*	Moderate	

Populations in **bold text** are considered to be important populations, * = total for both subpopulations combined (DEC 2007).

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 unguicula* will require assessment. On-ground works should not be approved unless the proponents can demonstrate that they will not have a negative impact on the species, its habitat or potential habitat or on the local surface hydrology.

Habitat critical to the survival of the species, and important populations

Habitat critical to the survival of the species includes:

- The area of occupancy of important populations.
- Areas of similar habitat surrounding important populations (i.e. open scrub, in rocky clay, brown clayey sand or brown loam with dolerite - these provide potential habitat for natural population expansion and possible future translocation).
- Natural vegetation that surrounds and links populations (this is necessary to allow pollinators to move between populations).
- Additional occurrences of similar habitat that may contain the species.

Given that *Acacia unguicula* is listed as Critically Endangered, it is considered that all known habitat for wild populations is critical to its survival, and that all populations are important populations.

Benefits to other species or ecological communities

Recovery actions implemented to improve the quality or security of the habitat of *Acacia unguicula* will also improve the status of associated native vegetation, including two Critically Endangered and 4 Priority Flora. These taxa are listed in the table below.

Conservation-listed flora species occurring in habitat of *Acacia unguicula*

Species Name	Conservation Status (Western Australia)	Conservation Status (EPBC Act 1999)
Acacia imitans	Critically Endangered	-
Hybanthus cymulosus	Critically Endangered	-
Allocasuarina tessellata	Priority 1	-
Grevillea subtiliflora	Priority 1	-
Micromyrtis racemosa var. *mucronata*	Priority 1	-
Grevillea scabrida	Priority 3	-

For a description of Priority categories see Atkins (2008).

Acacia unguicula does not occur within a Threatened Ecological Community (TEC).

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. *Acacia unguicula* is not specifically listed under any international treaty, and therefore this plan does not affect Australia's obligations under any other international agreements.

Indigenous consultation

A search of the Department of Indigenous Affairs Aboriginal Heritage Sites Register has identified that there are no sites of Aboriginal significance at or near populations of *Acacia unguicula*. However, involvement of the Indigenous community has been sought through the Pindiddy Aboriginal Corporation (PAC) to determine whether there are any issues or interests identified in the plan.

The PAC manages Ninghan Station, and together with Vital Options Consulting, has produced a comprehensive plan of Management for the Indigenous Protected Area (IPA), which recognizes the values of this and other species of rare flora within the IPA, and sets out management objectives to assist with the conservation of these species (Vital Options Consulting 2004). A 480 sq km area on Ninghan Station was declared as an Indigenous Protected Area in October 2006 (DEWHA 2007b). This area also includes all known populations of *Acacia unguicula* within its boundaries. The Indigenous Protected Areas (IPA) program is part of Australia's National Reserve System Program which aims to establish a network of protected areas which includes a representative sample of all types of ecosystems across the country. With support from the IPA program, Indigenous landowners commit themselves to manage their lands for the protection of natural and cultural features in accordance with internationally recognised standards and guidelines (DEWHA 2007a). Recovery actions identified within this plan refer to continued liaison and cooperation with the managers of the land, and this refers to the PAC.

Social and economic impact

The implementation of this recovery plan has the potential to have some limited social and economic impact. All populations of *Acacia unguicula* occur in a pastoral lease and negotiations will continue with regard to the future management of these populations. A mineral exploration tenement also covers the area where *A. unguicula* is known to occur, and there is potential for some economic impact should the owners of this licence wish to explore the area. Recovery actions refer to continued liaison between stakeholders with regard to populations located on the pastoral lease.

Affected interests

Protection of this species potentially impacts on the management of the pastoral lease. Mining tenement holders may also be affected by actions referred to in this plan. Other parties that may be affected include Telstra, Department of Aviation, Department of Industry and Resources and Department of Environment and Conservation.

Evaluation of the plan's performance

The DEC in conjunction with the Geraldton District Threatened Flora Recovery Team (GDTFRT) 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.

2. RECOVERY OBJECTIVE AND CRITERIA

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.

Criteria for success: The removal of major threats resulting in the number of individuals within populations and/or the number of populations increasing by 20 percent or more over the term of the plan.

Criteria for failure: The continuation of major threats resulting in the number of individuals within populations and/or the number of populations decreasing by 20 percent or more over the term of the plan.

3. RECOVERY ACTIONS

Completed recovery actions

The managers of the pastoral leases have been made aware of the threatened nature of this species, its locations and their legal obligations to protect it.

The Geraldton District Flora Conservation Officer has liaised with the managers to raise awareness of the threatened flora values and encourage destocking and fencing areas containing rare flora. This liaison has also involved discussions with staff from the WA Department of Agriculture and Food regarding levels of grazing.

A large area, including habitat containing *Acacia unguicula*, was declared an Indigenous Protected Area (IPA) in October 2006 under World Conservation Union (IUCN 2001) *Category III – Natural Monument: Protected Area managed for conservation of specific natural features* (700 hectares) and *Category IV – Habitat/Species Management Area: Protected Area managed mainly for conservation through management intervention* (47000 hectares). A proposal to fence the area was developed, and the Central Agricultural and Pastoral Aboriginal Corporation (CAPAC) assisted the Pindiddy Aboriginal Corporation in preparing an application for funds through the Indigenous Protection Program. In 2006, $200,000 was granted to Ninghan Station IPA through the Australian Government's Natural Heritage Trust towards the fencing of a 50,000 hectare area (NHT 2005). A goat proof fence was erected along the western, northern and northeastern border of the IPA. This funding is also being used for portable goat trap yards to aid the ongoing removal of goats and other feral animals (DEWHA 2007b). A DEC Flora Conservation Officer liaised with the Central Agricultural and Pastoral Aboriginal Corporation (CAPAC) and provided assistance.

In October 1993, observations recorded a reduced level of grazing pressure as aerial mustering was being undertaken in the area. According to a Department of the Environment and Water Resources report, pastoralists reduced sheep stocking levels from 18,000 in 1993 to c. 2,300 by 2004. A survey conducted in December 2001 estimated 10,000 goats and 10,000 sheep remained. Around 9,000 feral goats were removed from the Station over a 10 year period from 1997 to 2007, with 1300 of those being removed since the installation of the goat proof fence (A. Bell[3] pers. comm.).

Following the erection of the goat proof fence bordering the west, north and northeast boundary of the Ninghan IPA, in February 2007 340 goats were removed from the northern boundary of Mt Gibson Station (southern border of the Ninghan IPA), contributing to the feral goat control measures carried out within the IPA. The mustering program for feral goats is ongoing in this area (C. Stevens[2] pers. comm.).

The installation of the Goat Proof Fence in 2006 and goat musters appear to be having a positive effect on *Acacia unguicula* recruitment. In the 2004 surveys, only 43 mature plants were counted and by 2007, the number had increased to 77 mature plants. Future monitoring will confirm if this was a direct effect of goat control measures, or if it is the result of a natural fluctuation.

Sue Patrick, from CALM, conducted surveys for *Acacia unguicula* and other rare flora over 11.5 days from April 1992 to April 2001. These surveys covered all of the species' known range, similar habitat close by, and hills west and north of the area. Further surveys and monitoring were conducted in 2007 by DEC staff and volunteers throughout the species' range.

The Threatened Flora Seed Centre currently holds two collections of *Acacia unguicula* seed in storage at -18°C. One collection from Population 2 contains 1247 seeds, and the other, from Population 3, contains only 18 seeds (A. Crawford[4] pers. comm).

[3] Ashley Bell, Pindiddy Aboriginal Corporation
[4] Andrew Crawford, Threatened Flora Seed Centre, DEC

Ongoing and future recovery actions

Staff from DEC's Geraldton District regularly monitor all populations of this species.

The Geraldton District Threatened Flora Recovery Team is overseeing the implementation of this IRP. Permission has been/will be sort from the appropriate land managers prior to any recovery actions being undertaken on their land. The following recovery actions are roughly in order of descending priority, influenced by their timing over the term of the plan. However this should not constrain addressing any recovery action if funding is available and other opportunities arise.

1. Coordinate recovery actions

The GDTFRT will coordinate the implementation of recovery actions for *Acacia unguicula* and other Declared Rare Flora in their district and will include information on progress in their annual report to DEC's Corporate Executive and funding bodies.

Action: Coordinate recovery actions
Responsibility: DEC (Geraldton District) through the GDTFRT
Cost: $1,400 annually.

2. Liaise with relevant land managers and Indigenous groups

Staff from DEC's Geraldton District will liaise with appropriate land managers to ensure that populations of *Acacia unguicula* are not accidentaly damaged or destroyed. Input and involvement will also be sought from Indigenous groups that have an active interest in areas that are habitat of the species.

Action: Liaise with relevant land managers and Indigenous groups
Responsibility: DEC (Geraldton District) through the GDTFRT
Cost: $1,000 annually.

3. Develop and implement a feral goat control strategy

Grazing by goats (*Capra hircus*) threatens all populations of *Acacia unguicula.* Although aerial mustering is proving to be most successful in their control, a range of factors are inhibiting their eradication. One possible option may include fencing of populations most at risk from grazing. Methods of controlling grazing will be investigated and a control strategy developed, implemented and monitored for success.

Action: Develop and implement a feral goat control strategy
Responsibility: DEC (Geraldton District) through the GDTFRT, in partnership with land managers
Cost: $6,000 in year 1 for development and implementation; $3,700 in years 2-5 for implementation thereafter

4. Monitor populations

Monitoring of factors such as weed invasion, grazing, habitat degradation, population stability (expansion or decline), pollinator activity, seed production, recruitment, and longevity is essential. Populations will be inspected annually and Rare Flora Report Forms completed.

Action: Monitor populations
Responsibility: DEC (Geraldton District) through the GDTFRT
Cost: $2,200 annually.

5. Develop and implement a fire management strategy

Evidence suggests that *Acacia unguicula* seed germination may be triggered by fire. However, frequent fire may result in the death of immature plants before they are able to provide sufficient soil-stored seed for recruitment. Fire also promotes the introduction and proliferation of weed species. Fire should therefore be prevented from occurring in the area of populations, except where it is being used as a recovery tool. A fire management

strategy will be developed in consultation with land managers, and will include recommendations on prescription fire frequency and intensity; precautions to prevent fire; a strategy for reacting to wild fire; and the need, method of construction, and maintenance of firebreaks. The Australian Wildlife Conservancy (AWC) has consulted with DEC's Fire Management Services Branch and is currently preparing a Fire Management Plan for the Mt Gibson Station. Opportunities may exist for DEC to work with AWC in the preparation and application of this plan over a wider area, including the Ninghan IPA.

Action: Develop and implement a fire management strategy
Responsibility: DEC (Geraldton District and FMSB) through the GDTFRT, and relevant authorities
Cost: $2,100 in year 1 for development; $1,500 in years 2-5 for implementation.

6. Map habitat critical to the survival of *Acacia unguicula*

It is a requirement of the EPBC Act that spatial data relating to habitat critical to the survival of *Acacia unguicula* be determined. Although this is described in Section 1, it has not yet been mapped and will be addressed under this action. If additional populations are located, then habitat critical to the survival of the species will be determined and mapped for these locations also.

Action: Map habitat critical to the survival of *Acacia unguicula*
Responsibility: DEC (Geraldton District) and SCB through the GDTFRT
Cost: $2,500 in year 1.

7. Obtain biological and ecological information

Improved knowledge of the biology and ecology of *Acacia unguicula* will provide a scientific basis for its management in the wild. An understanding of the following is necessary for effective management:

- The pollination biology of the species.
- The requirements of pollinators.
- Soil seed bank dynamics, including seedbank location and viability.
- The role of natural disturbances (fire and physical), competition, rainfall and grazing in germination and recruitment.
- The reproductive strategies, phenology and seasonal growth of the species.
- The population genetic structure, levels of genetic diversity and minimum viable population size.
- Longevity of plants and time taken to reach maturity.

Action: Obtain biological and ecological information
Responsibility: DEC (Science Division, Geraldton District) through the GDTFRT
Cost: $12,000 in years 2-5.

8. Conduct further surveys

Areas of potential habitat (i.e. open scrub, in rocky clay, brown clayey sand or brown loam with dolerite) will be surveyed for the presence of *Acacia unguicula* during its flowering period. All surveyed areas will be recorded and the presence or absence documented to increase survey efficiency and reduce the possibility of duplication. Surveys should focus on areas between Wubin and Paynes Find. Where possible, volunteers from the local community, wildflower societies and naturalists clubs should be involved in surveys, supervised by DEC staff.

Action: Conduct further surveys
Responsibility: DEC (Geraldton District) through the GDTFRT
Cost: $2,500 in year 1, 3 and 5.

9. Collect further seed

Germplasm should be stored as an insurance against extinction in the wild. Some seed has been collected from Populations 2 and 3 but additional collections are required to maintain adequate representation of the genetic diversity of this species. The patterns of viability that emerge from standard tests on seed collected may indicate the need for other recovery actions. Germinants from seed testing at the TFSC should be used to enhance the living collection at BGPA. The "Germplasm Conservation Guidelines for Australia" produced by the Australian Network for Plant Conservation (ANPC) should be used as a minimum standard to guide this process (ANPC 1997).

Action: Collect further seed
Responsibility: DEC (TFSC, Geraldton District) through the GDTFRT
Cost: $4,000 annually, if required.

10. Monitor the level of weeds impacting populations and undertake weed control if considered necessary

The current level of threat from weeds is low at all populations. However, if weed numbers increased, i.e. following fire, they would impact on *Acacia unguicula* by competing for resources, degrading habitat, exacerbating grazing pressure, and increasing the risk and severity of fire. If during monitoring it is deemed that the threat from weeds has increased, weed control will be undertaken in consultation with land managers: Actions will include:

1. Monitor all populations for weed invasion.
2. Select appropriate herbicides after determining which weeds are present.
3. Control invasive weeds by hand removal or spot spraying around plants of the *Acacia imitans* when weeds first emerge.
4. Schedule weed control to include spraying at other threatened flora populations within the area.
5. Regularly monitor weeds and implement additional weed control if required.

The tolerance of associated native plant species to herbicides at the site of *Acacia imitans* is not known and weed control programs will be undertaken in conjunction with research and in a manner that minimises negative impacts on associated native flora.

Action: Monitor the level of weeds impacting populations and undertake weed control if considered necessary
Responsibility: DEC (Geraldton District, Science Division) through the GDTFRT
Cost: $1,500 annually if required.

11. Promote awareness

The importance of biodiversity conservation and the need for the long-term protection of wild populations of this species will be promoted to the community through poster displays and the 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 DEC's Geraldton District offices and at the offices and libraries in the Shires of Yalgoo, Mt Marshall, Perenjori and Dalwallinu. Such information distribution may lead to the discovery of new populations.

Action: Promote awareness
Responsibility: DEC (Geraldton District) through the GDTFRT
Cost: $1,700 in year 1, and $1,000 in years 2-5.

12. Start the translocation process, if necessary

Translocation may be deemed desirable for the conservation of this species if attempts to control the feral goat population are not successful. If deemed necessary, a translocation proposal will be developed and suitable translocation sites selected. Information on the translocation of threatened plants and animals in the wild is

provided in DEC's Policy Statement No. 29 *Translocation of Threatened Flora and Fauna* (CALM 1995). All translocation proposals require endorsement by DEC's Director of Nature Conservation. Monitoring of translocations is essential and will be included in the timetable developed for the Translocation Proposal.

Action: Start the translocation process, if necessary
Responsibility: DEC (Geraldton District) through the GDTFRT
Cost: $2,200 in year 5.

13. Review the IRP and the need for further recovery actions

At the end of the its five-year term this Interim Recovery Plan will be reviewed and the need for further recovery actions assessed.

Action: Review the IRP and the need for further recovery actions
Responsibility: DEC (Species and Communities Branch, Geraldton District) through the GDTFRT
Cost: $2000 in year 5.

Summary of recovery actions

Recovery Actions	Priority	Responsibility	Completion date
Coordinate recovery actions	High	Geraldton District, GDTFRT	Ongoing
Liaise with relevant land managers and Indigenous groups	High	Geraldton District, GDTFRT	Ongoing
Develop and implement a feral goat control strategy	High	Geraldton District, GDTFRT, land managers	Ongoing
Monitor populations	High	Geraldton District, GDTFRT	Ongoing
Develop and implement a fire management strategy	Medium	Geraldton District, GDTFRT, relevant authorities	Ongoing
Map habitat critical to the survival of *Acacia unguicula*	Medium	Species and Communities Branch, Geraldton District, GDTFRT	2009
Obtain biological and ecological information	Medium	Science Division, Geraldton District, GDTFRT	2009
Conduct further surveys	Medium	Geraldton District, GDTFRT	Ongoing
Collect further seed	Medium	Threatened Flora Seed Centre, Geraldton District, GDTFRT	2009
Monitor the level of weeds impacting populations and undertake weed control if considered necessary	Low	Science Division, Geraldton District, GDTFRT	Ongoing
Start the translocation process, if necessary	Low	Species and Communities Branch, Geraldton District, GDTFRT	Ongoing
Promote awareness	Low	Geraldton District, GDTFRT	2009
Review the IRP and the need for further recovery actions	Low	Species and Communities Branch, Geraldton District, GDTFRT	2013

4. TERM OF PLAN

This Interim Recovery Plan will operate from June 2008 to May 2013 but will remain in force until withdrawn or replaced. If the species is still ranked CR after five years, the need for further recovery actions and an update of this IRP will be assessed.

5. REFERENCES

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6. TAXONOMIC DESCRIPTION

Excerpt from: Maslin, B.R. and Cowan, R.S. (1990) *Acacia* Miscellany 4. Three new Western Australian species with affinities to *A. wilhelmiana* (Leguminosae: Mimosoideae: Section *Plurinerves*) from Western Australia. *Nuytsia* 7(2), 221-228.

Acacia unguicula Cowan & Maslin, sp. nov.

Openly branched *shrubs* 1-2 m or tree (?) to 3 m tall. *Bark* grey, fibrous and somewhat fissured at base of trunks, smooth on branches. *New shoots* sparsely appressed puberulous, hairs white, shoots arising from within axil of paired peduncles at anthesis. *Branchlets* with several low ridges, glabrous except appressed puberulous in axils of phyllodes. *Stipules* persistent, spinescent, more or less recurved, 0.7-1.2 mm long. *Phyllodes* narrowly oblong to oblong-oblanceolate or elliptic, abruptly and often excentrically short-cuspidate, pungent, (14-)20-40 mm long, 3-4 mm wide, rigid, erect, straight or slightly curved, glabrous except appressed puberulous basally on adaxial surface, olive-green; 14-16 main nerves strongly salient, few strong anastomoses evident, stomata distinct, not strongly raised. *Glands* 1 or 2 on upper margin of phyllode, lowest one in basal half of phyllode, upper one (when present) near apex. *Peduncles* 7-11 mm long, 2 per axil, glabrous; basal peduncular bract caducous, cucullate, rostrate. *Flower-heads* globular, deep golden, 5-6 mm diam., 24-34-flowered. *Bracteoles* linear or linear-spathulate. *Flowers* 5-merous. *Sepals* less than ½ petal length, free, linear-spathulate. *Petals* free, glabrous. *Legumes* (immature) linear, to 60 mm long, 2 mm wide, slightly raised over and scarcely constricted between seeds, old valves coiled, sparsely appressed puberulous. *Seeds* not seen.