A Management Program

for

Waddy-Wood
Acacia peuce

in the Northern Territory of Australia

Draft

15 April 2003

1. INTRODUCTION

This Management Program was prepared by staff of the Department of Infrastructure, Planning and Environment, Northern Territory Government.

1.1 Species subject to Management

Species:	*Acacia peuce* (F.Muell.)
Common names:	Waddy-wood, Waddy, Waddi, Birdsville wattle, Casuarina wattle.
Family:	Mimosaceae
Class:	Dicotyledonones (dicots)
Division:	Anthophyta (angiosperms)

1.2 Responsible Authority

Parks and Wildlife Service,
Department of Infrastructure, Planning and Environment,
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1.3 Legislation and International Obligations

1.3.1 Northern Territory

This management program for the conservation of Waddy-wood was developed in accordance with the requirements of Section 32 of the *Territory Parks and Wildlife Conservation Act 2000*. It is also consistent with the conservation strategy set out in the document *A Strategy for the Conservation of Threatened Species and Ecological Communities in the Northern Territory of Australia* (Parks and Wildlife Service of the Northern Territory, undated).

The Waddy-wood population in the Northern Territory is the smallest of three known populations. The Mac Clarke (*Acacia peuce*) Conservation Reserve (MCCR), set aside to protect this Northern Territory population of Waddy-wood, lies 230 kms south-east of Alice Springs on the western fringe of the Simpson desert. Two populations occur in Queensland.

The regional conservation category (IUCN 2001, Bowland and Kerrigan 2002) for the NT population is Endangered [B1ab(iv,v) + 2ab(iv,v)] and thus Waddy-wood is defined as such under Section 29 of the *Territory Parks and Wildlife Conservation Act 2000*. As with all protected wildlife, a permit, issued by the Director of the Parks and Wildlife Service (PWS), is required to take or interfere with Waddy-wood plants or plant material from the wild.

As well as the requirements for permits or licences for taking Waddy-wood, provisions exist for support by PWS in the off-park management of population fragments. The legislative basis for such support under the *Territory Parks and Wildlife Conservation Act 2000* is by agreement with the landowner relating to measures for protection and conservation of wildlife under the following sections:

- Section 35: co-operative management agreements for management of wildlife;
- Section 37: declaration of areas of essential habitat;

- Section 74: agreements regarding protection of wildlife and natural features of private land; and

- Section 75: formulation and implementation of programs for protection, conservation, management, and control of wildlife.

MCCR was declared a Heritage Place under section 26(1)(a) of the *Heritage Conservation Act* of the Northern Territory. Under Section 33, Ministerial consent is needed to remove a tree or part of a tree and only approved work may be carried out. All works described in the 'The Plan of Management / Conservation Management Plan' for the Reserve have been approved under the *Heritage Conservation Act*.

This Management Program is consistent with the Plan of Management / Conservation Management Plan (Anon. 1997). Each of the above processes can be invoked during the life of this Management Program if considered necessary for the conservation of Waddy-wood.

Section 122 of the *Territory Parks and Wildlife Conservation Act 2000* provides for traditional use of Waddy-wood for food or ceremonial or religious purposes by Aboriginal people.

1.3.2 Other States and Territories

The distribution of Waddy-wood has retracted, in recent times, to three disjunct populations on the fringes of the Simpson Desert. Two populations in the east, 300 kms apart, occur at Boulia and Birdsville in Queensland and the third is on the western fringes of the Simpson Desert in the Northern Territory.

1.3.3 Commonwealth

Waddy-wood is listed as Vulnerable by the Australia and New Zealand Environment Conservation Council (ANZECC) (1991) and Vulnerable by the Commonwealth of Australia *Environmental Protection and Biodiversity Conservation Act 1999.*

1.3.4 International

Waddy-wood is listed as Vulnerable by the World Conservation Union (IUCN) (1998).

2. AIM AND OBJECTIVES

The aim of this Management Program is to maintain a viable population of Waddy-wood in the Northern Territory. The objectives of the management program are to:

- Exclude large domestic and feral herbivores from *A. peuce* habitat by construction and maintenance of appropriate fencing.
- Implement a fire management strategy that prevents fire in plant communities containing Waddy-wood, but that does not threaten other natural values of MCCR, specifically its importance as a refuge site for the endangered Plains Rat and a roosting and breeding site of the Letter-winged Kite.
- Monitor and research critical aspects of Waddy-wood biology including threatening processes. Cover such topics as incidence and frequency of lightning strikes and other mortality factors, habitat fragmentation, germination events, and the development of a population model.
- Engage the neighbouring landholder in the conservation and effective management of population fragments occurring on the adjacent pastoral lease. Encourage and assist the pastoralist to seek external funding to fence off-park fragments; to relocate bore/s as needed and erect shade-shelters for cattle if needed.
- Include appropriate conservation management actions in future Plans of Management.
- Promote public awareness and education.

3. MANAGEMENT STRATEGIES

Waddy-wood is an endangered arid zone tall tree; it is vulnerable to the activities of cattle, habitat fragmentation, fire and lightning strikes. The range of Waddy-wood in the NT is restricted, it only occurs in MCCR and on the adjacent pastoral property 'Andado'. The fragmented population is scattered over 300 km^2 with less than 70% contained in a 475 ha fenced area. Implementation of the strategy is via management milestones listed in Table 1.

3.1 Cattle Management

Food, water and shade are important requirements for cattle in this arid area. Most of the observed impact on Waddy-wood by cattle is physical damage. Generally, Waddy-wood is of little importance to cattle as a food source, however they do crop new growth whilst this is soft and palatable, thus creating a hedge effect and stunting the growth of, or killing, smaller trees. Seedlings are vulnerable to browsing and trampling.

North-bore is located on the western boundary of MCCR in close proximity to the largest group of Waddy-wood trees. Many cattle pads traverse the area as the animals move between grazing areas and watering points.

Cattle congregate at the base of trees in search of shade. Apart from the concentration of droppings and urine, the herb layer is completely removed while lateral roots of Waddy-wood trees are exposed through soil loss initiated by the intensive trampling. All trees of sufficient size experience bark damage as they are used as rubbing posts.

The proposed outcome of the Management Program is the exclusion of cattle from Waddy-wood habitat except under controlled circumstances (See fire management). The management actions are to construct and maintain appropriate fencing of both MCCR and the off-park fragments; relocate watering points away from fragments; provide alternative shade for cattle if needed; and, take action to restore soil layer at the base of trees affected by cattle activity (e.g. rock-packing).

3.2 Fire Management

In 1976 a wildfire swept through the northern-most population fragment, about 200 trees (all with DBH >30mm) succumbed to the blaze. Nine trees survived, of which only two are reproductively active.

The outcome of the Management Program is a reduction of risk of further loss of Waddy-wood population fragments through wildfire. The management action is to keep the fuel load at a safe level through controlled grazing. This fuel reduction method is confined to times of exceptional grass/herb biomass in high rainfall years and will not be utilised when germination has occurred or other natural values will be adversely affected.

3.3 Lightning Strikes

Lightning strikes of mature Waddy-wood trees are common and appear to be the primary mortality factor. Although some trees survive, many die. The outcome of the Management Program is a model that will indicate the long term implications of lightning strikes and other mortality factors on the survival of the NT Waddy-wood population. Management actions are to record and quantify past damage and mortality from lightning strikes and other factors, and to monitor at six monthly intervals the incidence and frequency of current lightning strikes. This information will be used to construct and refine a population model, should lightning be perceived to threaten the persistence of the population, invoke mitigating measures (e.g. erect lightning conductors).

3.4 Habitat Fragmentation

Habitat fragmentation ranks among the most serious causes of the erosion of biodiversity and has become an important element of biological conservation. This Waddy-wood population, dispersed over an area of about 300km^2, is broken up into several fragments. The three smallest fragments, with one, two and 12 individuals respectively, and large sections of the other fragments are not fenced and are vulnerable to the impact of large herbivores (Bowland and Clifford, *In prep.*). This, along with constraints in recruitment and loss of mature trees through lightning strikes, are important factors in the persistence of *A. peuce* on the western fringes of the Simpson Desert in Australia.

3.5 Off-Park Management

Off-park fragments of the Waddy-wood population are vulnerable to numerous processes, the outcome of the Management Program would be the long-term conservation of the NT Waddy-wood population. Management action is to enter into a management partnership with the neighbouring pastoralist where the threatening processes of habitat fragmentation, cattle impact and wildfire are appropriately managed. Initiatives include the relocation of watering points; fencing Waddy-wood fragments; provision of alternative shade (if needed); and construction of a stockcamp/rangers bushcamp which is convenient to the Reserve but away from any Waddy-wood trees. The camp should be similar to the one recently constructed on the Reserve by the pastoralist, but needs to be moved.

3.6 Public Awareness

The outcome of the Management Program would be a greater understanding of the ecology and conservation of Waddy-wood, and the role of PWS and the pastoralist in this. Management actions call for the upgrade of interpretive signage at MCCR to include interesting and important features of Waddy-wood ecology and conservation that have been recently revealed (e.g. germination events, longevity, local ecological processes such as lightning strikes and fragmentation) and the partnership between the pastoralist and PWS.

4. MONITORING AND RESEARCH

An adaptive management approach has been adopted where prescriptions for the conservation of Waddy-wood and its habitat will be refined in the light of experience. Monitoring and research are key components of the process to evaluate management actions and to develop future management prescriptions.

4.1 Population size and demography

At intervals of 5 years, sample Waddy-wood groves with the count plot method used by Deveson (1980) and Bowland (*In prep.*.). Compare density and demography information with earlier studies (Deveson, 1980; Bowland, *In prep.*), and examine trends to identify further research needs or management actions.

4.2 Germination and Seedling establishment

Every summer and autumn, scan MCCR for germination, images of new seedlings are shown in Bowland and Heywood (2002). In the event of germination, record the intensity of such and develop an appropriate monitoring program if one is to be implemented.

4.3 Mortality

Apart from monitoring mortality in regeneration plots, record all cases of mortality in larger trees every six months. Information collected should include DBH, height, and cause of mortality (e.g. lightning strike, wind fell). All trees killed by lightning will be marked with a 5 foot picket knocked into the ground within 2 metres of the tree, labelled "LS" and the year, eg LS 2003, trees killed before 2003 will be marked LS 2002&PRE. A GPS reading should also be taken and stored on Park Arcview and in hard copy on file at Head Office. For other mortalities the letters MO (mortality – other) should be used in stead of LS with the same numbering system.

4.4 Habitat Fragmentation

At intervals of five years, survey habitat fragments per Bowland and Clifford (*In prep.*) and compare trends. In the event of further deterioration in the demography and tree density of fragments, develop and implement mitigating management actions.

4.5 Population Model

Develop a population model for the species based on survivorship and growth. The model will be used to predict the outcome of various threatening processes, and climatic and management scenarios. Use information from ongoing monitoring to refine the model and identify mitigating management actions.

5. REPORTING

Progress with this Management Program will be recorded in the annual report of PWS. Information to be provided will include:

1. any change in conservation status or distribution of Waddy-wood in the Northern Territory;
2. changes to the management of wild populations of Waddy-wood;
3. summaries of the results of the monitoring and research programs.

6. COMPLIANCE

Permits to take or keep or move interstate are issued under the *Territory Parks and Wildlife Conservation Act 2000*. Conditions are included on permits, and permits will be cancelled by the Director if those conditions are contravened. Conservation officers (appointed under the *Territory Parks and Wildlife Conservation Act 2000*) and officers of the Northern Territory Police Force will enforce wildlife regulations and permit or licence conditions.

Requirements of the *Heritage Conservation Act* regulates all activities. Section 33 states that: A person shall not, except as prescribed in accordance with a conservation management plan-

(a) carry out work of any sort on, or damage, demolish, destroy, desecrate or alter, a heritage place or heritage object;

(b) remove from a heritage place a heritage object or an object associated with the place declared under section 26(1)(a) to be part of the Northern Territory heritage; or

(c) remove a heritage object from the Territory;

without the consent in writing of the Minister or the Minister's delegate under section 39(k).

The Chief Executive of the Department of Infrastructure, Planning and Environment has the Minister's delegation under section 39(k) of the *Heritage Conservation Act.*

6.1 Permits to Take

Permits to take or remove from the wild will be restricted to Waddy-wood seeds as part of an approved propagation program.

6.2 Permits to Keep

No permits to keep Waddy-wood will be issued, the assumption is that all plants made available to the general public originate from permitted seed collection.

6.3 Scientific Research

Appropriate permits for scientific research may be issued for non-destructive field research programs if this research is in accordance with the Management Program.

7. REVIEW OF PROGRAM

As an adaptive management approach to the conservation of Waddy-wood, management prescriptions may be altered should monitoring and research provide new knowledge to improve management. Such changes should comply with the Plan of Management/ Conservation Management Plan, or require permission of the Director of PWS.

A full review of the program, as set out under Section 32 of the *Territory Parks and Wildlife Conservation Act 2000*, will be carried out within five years of the Management Program being approved.

8. BACKGROUND

8.1 Conservation Status

Waddy-wood, *A. peuce*, a relict species of a desert environment (Crocker & Wood, 1947), is classified as endangered (restricted distribution, population reduction) in terms of the principal IUCN criteria (IUCN, 2001).

8.2 Distribution

With northerly migration of Simpson Desert dunefields and the consequent expansion of unsuitable habitat from the south (Crocker & Wood, 1947) Waddy-wood has retracted to three disjunct populations on the fringes of the Simpson Desert. Two populations in the east, 300 kms apart, occur at Boulia and Birdsville in Queensland. The smallest population is situated 400 kms west in the Mac Clarke (*Acacia peuce*) Conservation Reserve (MCCR) 230 kms south-east of Alice Springs, Northern Territory.

8.3 Biology

8.3.1 Introduction

A. peuce is usually an erect tree able to reach heights of up to 18 metres. It is slow growing and is estimated to live 500 years or longer (Chuk, 1982a; Schabort, 2000). Foliage can be variable, pale yellow flowers are solitary and often inconspicuous, and, pods are large and flattened (up to 5x20 cm). Bark is grey-brown and fibrous, timber is very dense with dark red heart-wood. Under laboratory conditions *A. peuce* germinates readily after most treatments, heat, acid, scarification etc. which not only softens the seed coat but leaches out inhibitors if present. However, survival of thus germinated seedlings for longer than one year is extremely low.

In the 1950s and 1960s there was national and international interest in developing *A. peuce* as an arid zone forest tree (Green, 1979). Seeds were collected and distributed to forestry research centres where germination was readily induced but limited success was gained in seedling establishment (Pryor, 1967; Lothian, 1968; Chinner, 1977 Heywood *pers. comm.*). As a relict of former climatic regimes and a more contiguous distribution, conditions conducive to germination and seedling establishment probably occur very infrequently in present times.

Any decline in the *A. peuce* population would likely result in significant losses in biodiversity - it is a keystone species in the local ecosystem and a prominent species in the Andado site of botanical significance (White *et al.* 2000). The shade of *A. peuce* is essential for water and energy conservation of several animal and plant species, the tree also provides food and shelter for many desert animals. At least 13 rare and threatened plants species are known to occur in this area. Letter-winged kites *Elanus scriptus* roost, nest and breed in the trees, the endangered plains rat *Pseudomys australis* erupted here during the good season 1999-2002.

8.3.2 Flowering and seed set

The arid and semi-arid climates, where rainfall is erratic, are relatively recent developments. The breeding systems of very few arid zone angiosperms have been investigated. Flowering is not necessarily an annual event, some species, both perennial and annual, flower at any time of the year after rain, *e.g. A.aneura* (Beadle, 1981). In the case of *A. peuce*, flowering and the consequent seed set coincide with the period during the year when most rainfall is expected, *viz.* October to March.

The dynamics of a viable seed bank involves the optimal balance between rates of input (seed rain) and rates at which seeds are lost through germination, predation, and senescence. An important feature of seed bank strategy is the length of time which seeds remain viable in the soil (Fenner, 1985). The longevity of seeds in arid zone plants is variable and can be surprisingly short (Auld, 1995), acacia seeds in arid zones live for c.20 years compared with c. 50-60 years in humid regions (Beadle, 1981). The infrequency of germination events in *A. peuce* compels the species to continually replenish its seed bank as seed longevity is probably far less than time between germination events. Annual seed production is required to maintain the seed bank so that favourable germination conditions, when they arise, may be fully exploited.

8.3.3 Germination

Seed dormancy is a major factor in the success of many species in a range of environments and is most common in arid areas (Fenner, 1985; Langkamp, 1987). A widespread cause of seed dormancy is the presence of a hard seed coat which may be impermeable to water and/or

gases, may restrain the embryo, or contain inhibitors (Mott & Groves, 1981; Langkamp, 1987). Few native species have been found to have seed coats which act in ways other than by restricting water entry (Langkamp, 1987). *Acacia* seeds characteristically have hard, water-impermeable coats, a simple and effective means of delaying germination (Langkamp, 1987; Clemens *et al*., 1977; Auld, 1986 & 1995).

Breakdown of the seed coat, facilitating germination, may occur by temperature fluctuations and weathering, microbial decay, ingestion by animals, abrasion from soil disturbance, unsuccessful seed predation, or fire (Floyd, 1966; Christensen & Kimber, 1975; Mott & Groves, 1981; Glyphis *et al*., 1981; Gill, 1985; Auld, 1986; Baker, 1989; Baskin & Baskin, 1989). For species with coat-imposed dormancy, scarification generally releases seed from dormancy (Baker, 1989; Wilson & Witkowski, 1998; Teketay, 1998).

Infrequent germination in arid and semi-arid acacias is not uncommon. Germination in *A.aneura* was estimated to occur once every nine years (Preece, 1971) and in *A. papyrocarpa* it may be as infrequent as five times per century (Lange & Purdie, 1976). Evidence suggests that germination in *A. peuce* is also uncommon. Boyland (1979) commented that regeneration was rare in both *A. peuce* stands in Queensland and probably required a large winter rainfall followed by early spring rains to happen. Latz (1977), following a close inspection of the MCCR in April 1977, concluded that no sign of regeneration was evident. Chinner (1977) reported an observation made by Clark, a former owner of Andado station, of no regeneration since the 1950s and no seedlings appearing even after recent good seasons and high rainfall, no cattle in the area, and no rabbits due to the hard stoney nature of the ground.

The only recorded germination event in 50 years began in 1978, at the end of five years of very high rainfall and lasted four years until 1981 when it tapered off (Bowland *In prep.*). Prior to that there had been, with two minor exceptions, 16 years of below average rainfall. The advent of *A. peuce* germination was likely facilitated by repeated soaking and attendant soil abrasion during 5 extremely wet years prior to 1980 which contributed to the permeability of seed coats and leaching of inhibitors if present (Bowland *In prep.*).

In 1976, following exceptional rainfall in the western fringe of the Simpson Desert and consequent high fuel loads, a fire swept through a stand of *A. peuce* 20kms north of MCCR (Latz *pers.comm.*) killing at least 200 individuals with only nine surviving (Bowland *pers. obs.*). No seed germination occurred here during the following years when conditions in the area initiated the 1978/81 germination event. This indicates that mature *A. peuce* trees are fire sensitive and it is unlikely that fire triggers *A. peuce* germination as it does in some *Acacia* species.

8.3.4 Seedling establishment

Once seeds have germinated, conditions need to favour seedling establishment if there is to be any recruitment to the population. In unpredictable environments such as those of arid Australia, germination represents a high-risk event as rainfall sufficient to allow germination may be insufficient for seedling establishment (Mott & Groves, 1981; Jurado & Westoby, 1992; Wilson & Witkowski, 1998). In a brief investigation of the relationship between rainfall and seedling emergence/mortality the response of *A. peuce* was unclear (Bowland *In prep.*). Seedling emergence did not always result from good rains and conversely low rainfall did not necessarily increase seedling mortality, in fact highest mortality was recorded during times of high rainfall. In the case of few or no emergents it may well be that the number of non-dormant seeds in the seed bank had been exhausted. It is likely that the main contributing factor to mortality was seedlings being completely buried by silt from storm-water run-off in a highly erodable substrate. In germination trials silt washed onto emergents during watering resulted in seedling mortality (Bowland *In prep.*).

In arid environments a large seed size appears to be an adaptation for avoiding desiccation by conferring on the seedling the ability to make rapid early root growth to reach moist layers below the surface (Fenner, 1985; Baker, 1989). *A. peuce* seedlings quickly develop a long tap root, an excavated seedling less than 15 cm high had a taproot of one metre (Chuk, 1982b). Rainfall after the 1978/81 germination event oscillated moderately about the mean each year with no prolonged wet or dry cycle. These conditions probably favoured *A. peuce* for seedling establishment where in the absence of a prolonged dry cycle, especially in the early years of seedling to sapling transformation, soil moisture remained within reach of the young plant's long tap root.

8.3.5 Sapling growth rate

Young *A. peuce* trees generally grow slowly (13.24 cms p.a.), however one tagged sapling showed an annual growth rate of 30 cms p.a. between 1972 and 1980 (Chuk, 1982a). Growth rate can be very variable and is probably determined primarily by the constitution of the substrate. The positive correlation of height and growth rate suggests that early development focuses on underground development until a consistent moisture supply is reached. Thereafter resources are redirected to aboveground development and stem growth rate accelerates.

8.3.6 Density and Population Structure

The marked increase in tree density from 1980 to 2001 resulted from the successful recruitment event of 1978/81. Not only was there a large number of trees under 30 cms high in 1980 but the subsequent moderate attrition rate meant a significant contribution to the population twenty years on. All height classes increased in density between 1980 and 2001. In the absence of germination since 1981 height class 1 declined while the rest increased as trees migrated to taller height classes. The significance of a single germination event in 50 years to this population of *A. peuce* is reflected by tree density increasing twofold.

8.4 Potential threatening processes

8.4.1 Cattle

Food and shade are two important requirements for cattle in this arid area. Most of the observed impact on Waddy-wood by cattle is physical damage (Bowland and Heywood 2002). Generally, Waddy-wood is of little importance to cattle as a food source, however they do crop new shoots whilst these are still soft and palatable, thus creating a hedge effect and stunting the growth of smaller trees.

Cattle congregate at the base of trees in search of shade. Apart from the concentration of droppings and urine, the herb layer is completely removed, while lateral roots are exposed through soil loss initiated by the intensive trampling, and dry conditions with high wind conditions. Large trees experience bark damage as they are used as rubbing posts, while smaller trees experience physical damage by bullocks using them as sparring partners. During germination, or vegetatively propagated events, seedlings / suckers are at risk from browsing and trampling.

8.4.2 Fire Management

In 1976 a wildfire swept through the northern-most sub population, about 200 trees (all with DBH >30mm) succumbed to the blaze, nine survived, of which only two are reproductively active. No seed germination occurred here in following years when local conditions initiated the 1978/81 germination event. This suggests that fire, an extremely rare event (Chuk, 1982a), may not act as a cue for germination, as it does in some *Acacia* species, but could in fact be

regarded as a threat to *A. peuce.* In high rainfall periods the biomass of grass and herbs reaches levels where wildfire may pose a risk of further loss of Waddy-wood population fragments.

8.4.3 Lightning Strikes

As prominent sentinels of the flat gibber plains in the area, mature *A. peuce* trees are frequently struck by lightning. There is plenty of evidence in the population that many trees have been struck and, significantly, not all survive. Lightning is an important mortality factor confronting the mature trees of this population of *A. peuce*; this process needs to be better understood. Apart from the direct impact on mature trees, lightning is a prime cause of wildfires when sufficient fuel-loads are present. Along with constraints of infrequent recruitment and severe habitat fragmentation, lightning may be a prominent factor in the possible extinction process.

8.4.4 Habitat Fragmentation

Habitat fragmentation ranks among the most serious causes of the erosion of biodiversity (Harris & Silva-Lopez, 1992; Schemske *et al.,* 1994) and has become an important element of biological conservation (Young & Clarke, 2000). In plants, the negative effects of fragmentation in small, isolated fragments include reduced pollination, low seed production and recruitment, and increased inbreeding depression (Lennartsson, 2002). The NT population, dispersed over an area of about 300km^2, is broken up into several fragments (Bowland & Clifford *In prep.*). Further, the three smallest fragments, with two, three, and 12 individuals respectively, and large sections of the other fragments are not fenced and are vulnerable to the activities of large herbivores (Bowland & Heywood, 2002). This, along with constraints in recruitment and loss of mature trees through lightning strikes, are important factors in the persistence of *A. peuce* on the western fringes of the Simpson Desert in Australia. Off-park fragments of the Waddy-wood population are vulnerable to extirpation (Bowland and Clifford 2002).

Table 1. Milestone matrix for Waddy-wood management program

Milestone		Action Officer	Year				
			2002/3	2003/4	2004/5	2005/6	2006/7
1.	Cattle Management: Negotiations on future management options with pastoralist complete.	CDR	Mar 03				
2.	Cattle Management: Fencing of population fragments on park complete.	CDR				Oct 05	
3.	Off-Park Management: Partnership agreement in place.	CDR		June 04			
4.	Off-Park Management: External funding application by pastoralist/BushCare for fencing, bore relocation and bush camp submitted.	CDR/ Bushcare Coordinator		Nov 03			
5.	Off-Park Management: Bore relocated	CDR			Nov 04		
6.	Off-Park Management: Fragments fenced	CDR/Bushcare/pastoralist				Nov 05	
7.	Population size and demography: Assessment and review complete.	Principal Scientist					Sep 07
8.	Fire Management: Biomass measured, prescription decision made, fire risk minimised.	CDR		Aug 03	Aug 04	Aug 05	Aug 06
9.	Lightning Strikes: Dead tree inventory and tagging complete	CDR	Apr 03				
10.	Lightning Strikes: Six monthly assessment complete			Oct 03 Apr 04	Oct 04 Apr 05	Oct 05 Apr 06	Oct 06 Apr 07
11.	Population Model complete	Principal Scientist	Jun 03				
12.	Population Model reviewed and level of threats evaluated.	Principal Scientist		Dec 03	Dec 04	Dec 05	Dec 06
13.	Germination event: Assessment complete, if positive revision of milestones complete	CDR	Jan 03 Apr 03	Jan 04 Apr 04	Jan 05 Apr 05	Jan 06 Apr 06	Jan 07 Apr 07
14	Park Plan of Management/ Conservation Management Plan revised	CDR	Jun 03				
15	Interpretation signage: Funding applied for.	CDR	Oct 02	Oct 03	Oct 04		
16	Interpretation: Replacement of existing sign complete	CDR		Jul 03			
17.	Arrest soil erosion at tree bases by rock packing.	CDR/Bushcare/Pastoralist			Jul 04		
18.	Interpretation: Additional signage installed	CDR			Jul 04	Jul 05	

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