

**TARAWI NATURE RESERVE
PLAN OF MANAGEMENT**

**NSW National Parks and Wildlife Service
April, 2001**

This plan of management was adopted by the Minister for the Environment on 18th April 2001.

Acknowledgments

This plan of management is based on a draft plan prepared by staff of the Lower Darling District and Field Services Division of the NPWS.

Considerable consultation was undertaken with members of the community during preparation of the plan and information and assistance provided is gratefully acknowledged.

Photograph of Scotia mallee by Ray Dayman.

NSW National Parks and Wildlife Service

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FOREWORD

Tarawi Nature Reserve is located in south-western NSW, 100 km north-west of Wentworth adjacent to the South Australian border. It was dedicated in 1996 and is 33,573 hectares in size.

The reserve is located within the Murray-Darling Depression Bioregion and comprises extensive areas of flat to undulating red sandy plains and sand dunes in the Scotia Mallee region. It contains relatively large areas of four main plant communities: mallee with *Triodia* understorey, mallee with mixed shrub understorey, belah/rosewood woodland and chenopod shrubland.

Several of the reserve's plant communities have a restricted occurrence and the reserve has several biogeographically significant plant species. Two species are listed as endangered in the *Threatened Species Conservation Act 1995*.

Eighteen endangered or threatened species of native animals have been recorded in the reserve. Of particular importance are the population of malleefowl and the discovery of Bolam's mouse in 1995. The reserve is of very high significance for both these species.

A number of extensive Aboriginal sites have been recorded in the reserve and it is probable that survey will reveal more. Post-contact cultural heritage in the reserve includes a homestead complex, ground tanks and brush breaks (stock yards). The latter are regionally significant and will be protected from disturbance and fire.

The management emphasis in the reserve will be on protection and enhancement of the natural and cultural resources. Research is given a high priority. Public use will generally be restricted to access along public roads. A limited number of organised public visits will be arranged such as Discovery Programs and neighbour field days. No facilities will be provided apart from interpretive information. Community involvement in management programs such as malleefowl monitoring will be encouraged.

This plan of management establishes the scheme of operations for Tarawi Nature Reserve. In accordance with Section 76 of the *National Parks and Wildlife Act 1974*, this plan of management is hereby adopted

BOB DEBUS

MINISTER FOR THE ENVIRONMENT

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1. INTRODUCTION

The *National Parks and Wildlife Act 1974*, requires that a plan of management be prepared for each nature reserve. A plan of management is a legal document that outlines how the area will be managed in the years ahead.

The procedures for the adoption of a plan of management for a nature reserve are specified in the Act:

- * Where a plan of management has been prepared, the Director-General is required to refer the plan to the National Parks and Wildlife Advisory Council for its consideration and advice.
- * The Director-General then submits the plan to the Minister, together with any comments or suggestions from the Advisory Council.
- * The Minister may adopt the plan without alteration or with such alterations as he/she may think fit, or may refer it back to the Director- General and Council for further consideration.

Once a plan has been adopted by the Minister, no operations may be undertaken within the nature reserve except in accordance with the plan.

Although not a requirement under the Act, a draft plan of management for Tarawi Nature Reserve was placed on public exhibition from February to May 2000. All comments received were considered by the Advisory Council and the Minister before adopting this plan.

The planning process leading to the development of this plan has involved the collection and use of information, which for reasons of document size, has not been included in the plan. For additional information or enquires about Tarawi Nature Reserve contact the Service's Lower Darling Area Office, corner Sturt Highway and Melaleuca Street, Buronga or by phone on (03) 5021 8900.

2. MANAGEMENT CONTEXT

2.1 NATURE RESERVES IN NEW SOUTH WALES

Nature reserves in New South Wales were originally called faunal reserves. Faunal reserves were first established under the *Fauna Protection Act 1948*. Under the *National Parks and Wildlife Act 1967* faunal reserves were reclassified as nature reserves. The 1967 National Parks and Wildlife Act was subsequently replaced by the *National Parks and Wildlife Act 1974*.

Under the National Parks and Wildlife Act, nature reserves are areas of special scientific interest containing wildlife or natural environments and natural phenomena. The purposes of nature reserves are defined in the Act as:

- (a) the care, propagation, preservation, and conservation of wildlife;
- (b) the care, preservation and conservation of natural environments and natural phenomena;
- (c) the study of wildlife, natural environments and natural phenomena; and
- (d) the promotion of the appreciation and enjoyment of wildlife, natural environments and natural phenomena.

Nature reserves are valuable refuge areas, where natural processes, phenomena and wildlife can be studied. They differ from national parks which include as a major objective the provision of appropriate recreational opportunities.

2.2 TARAWI NATURE RESERVE

2.2.1 Location, Gazettal and Regional Setting

Tarawi Nature Reserve is located approximately 100 km north-west of Wentworth, in the south-west of NSW adjacent to the South Australian border. The reserve is located within the Murray-Darling Depression Bioregion. It covers a large area (33,573 ha) and was gazetted in 1996.

The reserve lies within Wentworth Shire and the nearest sizeable towns are Wentworth, Mildura and Renmark. The surrounding district is used mainly for sheep grazing.

Danggali Conservation Park in South Australia borders the reserve to the west and Scotia Sanctuary (a private reserve managed for conservation purposes) borders Tarawi to the north (see Summary Map).

2.2.2 The Importance of Tarawi Nature Reserve

Tarawi Nature Reserve conserves a large area of sand dune and sand plain country in south-western NSW. Its location adjacent to extensive protected lands to the north and west results in a very large and significant conservation area. The importance of Tarawi Nature Reserve is further recognised through listing on the Register of the National Estate. The main values of the reserve are outlined below. More detail is provided in sections 4.1 and 4.2.

Biological values

The native vegetation communities of western NSW have declined markedly because of clearing and grazing, resulting in widespread habitat loss. Tarawi Nature

Reserve is very important for protection of a range of vegetation communities and species in far western NSW (Porteners, 1998).

The reserve was dedicated primarily to protect significant Scotia mallee and associated woodland communities which are restricted to the south-west of NSW and north-eastern South Australia. Scotia mallee has a dense and rich understorey compared to other mallee areas.

Significant vegetation associations within the reserve include:

- long unburnt yorrell (*Eucalyptus gracilis*) shrubland with a mixed shrub understorey; this is very species rich and contains a different composition to that found on other NSW mallee reserves;
- long unburnt red mallee (*Eucalyptus socialis*) shrubland with a spinifex (*Triodia scariosa*) understorey, of high significance as malleefowl habitat;
- belah (*Casuarina pauper*) woodland with a rich understorey, not commonly found elsewhere because of grazing pressure; and
- Wilga (*Geijera parviflora*) woodland, an uncommon community which is poorly conserved.

Two of the reserve's plant species are listed as endangered in the Threatened Species Conservation Act.

- bluebush daisy (*Cratystylis conocephala*); and
- bladder senna (*Swainsona colutooides*).

A number of biogeographically significant plant species occur in the reserve:

- mulga (*Acacia aneura*), white cypress pine (*Callitris glaucophylla*), mallee pine (*Callitris verrucosa*) and mallee box (*Eucalyptus porosa*) have restricted distributions in south western NSW;
- desert spider-flower (*Grevillea pterosperma*) is restricted in NSW to the far south-western corner;
- needlewood (*Hakea leucoptera*) and hooked needlewood (*H. tephrosperma*) are regionally depleted;
- the occurrence of Sturt desert pea (*Swainsona formosa*) in the reserve is unusually far south; and
- western rosewood (*Alectryon oleifolius* ssp *canescens*) populations in the reserve are significant as they occur in large patches rather than as scattered clumps.

The native vegetation of the reserve supports a diverse array of native animals and the reserve is a major area of habitat for several threatened species, particularly those which rely on mature mallee. Threatened species recorded are listed in the table below. The reserve is particularly rich in reptiles including several arid and semi arid zone species which have a limited distribution within NSW such as the jewelled gecko (*Diplodactylus elderi*), *Delma australis*, *Ctenotus brachyonyx* and mallee dragon (*Ctenophorus fordi*).

The reserve is important for malleefowl (*Leipoa ocellata*) conservation. Since European colonisation there has been a dramatic decline in the malleefowl population over its former range because of habitat clearing and degradation, and predation by introduced species. Surveys to date indicate that Tarawi Nature Reserve has a relatively high density of mounds but unknown population.

Bolam's mouse (*Pseudomys bolami*) has been recorded in NSW only in Tarawi Nature Reserve and nearby private property. Because of its specialist ecological requirements it is extremely vulnerable to habitat damage by agricultural activities.

Threatened Native Animal Species in Tarawi Nature Reserve

Endangered species (Schedule 1)	Vulnerable species (Schedule 2)
Malleefowl (<i>Leipoa ocellata</i>)	Grey falcon (<i>Falco hypoleucos</i>)
Red-lored whistler (<i>Pachycephala rufogularis</i>)	Shy hylacola (<i>Sericornis cautus</i>)
Regent parrot (<i>Polytelis anthopeplus</i>)	Pied honeyeater (<i>Certhionyx variegatus</i>)
Bolam's mouse (<i>Pseudomys bolami</i>)	Gilberts whistler (<i>Pachycephala inornata</i>)
	Chestnut quail-thrush (<i>Cinclosoma castanotum</i>)
	Pink cockatoo (<i>Cacatua leadbeateri</i>)
	Purple-crowned lorikeet (<i>Glossopsitta porphyrocephala</i>)
	Striated grasswren (<i>Amytornis striatus</i>)
	Southern scrub-robin (<i>Drymodes brunneopygia</i>)
	Southern ningai (<i>Ningai yvonneae</i>)
	Sandy inland mouse (<i>Pseudomys hermannsburgensis</i>)
	Little pied bat (<i>Chalinolobus picatus</i>)
	Inland epitesicus (<i>Vespadelus baverstocki</i>)
	Western bluetongue (<i>Tiliqua occidentalis</i>)
	Gunther's skink (<i>Cyclodomorphus branchialis</i>)

Cultural values

While little is yet known about former Aboriginal use of Tarawi, limited survey has found a number of Aboriginal sites, including a very large artefact scatter. The reserve has the potential to add to knowledge about Aboriginal use of mallee areas away from the major rivers.

The reserve protects structures of regional and local historic significance remaining from former stock grazing use, including several brush breaks (yards) which are a rare feature in the district.

Research values

Because of its species richness and significant areas of long unburnt mallee, the reserve has high value for scientific research into the ecology of the plants and animals of south-western NSW. Tarawi Nature Reserve also contains significant historical structures from past grazing practices along with Aboriginal sites which may provide valuable research opportunities in understanding and improving our knowledge of past Aboriginal and non-Aboriginal land use.

3. OBJECTIVES OF MANAGEMENT

3.1 GENERAL OBJECTIVES FOR NATURE RESERVES

The following general objectives relate to the management of nature reserves in New South Wales:

- * protection and preservation of scenic and natural features, including significant geological and geomorphological features;
- * conservation of wildlife, including maintenance of biodiversity and populations of threatened species;
- * maintenance of natural processes as far as is possible;
- * preservation of catchment values;
- * preservation of Aboriginal sites and an improvement in knowledge regarding past Aboriginal use of the area in consultation with the Aboriginal community;
- * conservation of non-Aboriginal historic features in consultation with the community;
- * the promotion of the appreciation and enjoyment of wildlife, natural environments and natural phenomena; and
- * encouragement of scientific and educational enquiry into environmental features and processes.

3.2 SPECIFIC OBJECTIVES FOR TARAWI NATURE RESERVE

In addition, the following specific objectives relate to the management of Tarawi Nature Reserve:

- * protection of a sample of the Scotia mallee country of south-western NSW;
- * maintenance of the old growth status of much of the reserve and improvement of knowledge about the management of old growth mallee;
- * protection of the threatened and restricted native plant and animal species and uncommon vegetation communities found in the reserve;
- * improvement of knowledge about past Aboriginal use of the area;
- * conservation of structures remaining from former pastoral activities in Tarawi; and
- * promotion of community appreciation of the importance of the reserve's conservation values.

3.3 OVERALL STRATEGY

Management of the reserve will concentrate on maintaining its high natural values, particularly areas of old growth mallee and populations of significant plant and animal species. Two major management programs will be implemented to achieve this:

- control of introduced animals, particularly goats, foxes and rabbits; and
- fire management accompanied by research to establish appropriate fire regimes.

Survey will be progressively undertaken for Aboriginal sites and historic places will be recorded. Historic features will be protected from disturbance and buildings in the homestead area will be maintained.

Public access to the reserve will be limited to use of the public roads and a limited number of organised visits such as Discovery Programs. The values of the reserve and the importance and purpose of management programs will be promoted within the local community.

Liaison will be undertaken as needed with neighbours, Wentworth Shire Council and relevant government agencies.

4. POLICIES AND FRAMEWORK FOR MANAGEMENT

This section contains policies and a framework for the management of Tarawi Nature Reserve together with relevant background information. Policies are summarised under the following section headings:

- 4.1 NATURE CONSERVATION
- 4.2 CULTURAL HERITAGE
- 4.3 USE OF THE AREA

Natural heritage, cultural heritage and use are presented individually for clarity. In practice, however, they are strongly inter-related and together form the landscape of an area. Much of the Australian environment has been influenced by past Aboriginal and non-Aboriginal land use practices and the activities of modern day Australians continue to influence bushland through recreational use, cultural practices, the presence of introduced plants and animals and in some cases air and water pollution.

The policies established in this plan of management will provide the framework for management consistent with anticipated resources available to the Service over the next five to ten years.

The actions identified are those to which priority will be given in the future. Other management actions may be developed over the life span of this plan consistent with the policies set out in the plan.

Where not specifically provided for in this plan, management will also be in accordance with the National Parks and Wildlife Act and with general Service policies.

4.1 NATURE CONSERVATION

Natural heritage comprises all aspects of the natural environment including physical features such as geology and soils, plants and animals and the relationship between these. For convenience, management of fire is also considered in this section.

4.1.1 Landform and Soils

Tarawi Nature Reserve is located in the centre of the sand sheets which make up the Murray-Darling Depression Bioregion. It consists of dunefield and sand plain country.

Approximately 65% of the reserve lies within the Scotia Landsystem. This system is characterised by moderately high (up to 15m) continuous linear dunes and broad to narrow swales. There are also sand plain areas, particularly in the north-west of the reserve. The slopes of the dunes may reach 15 percent and the dunes generally run in an east/west direction, stretching for several kilometres before meeting adjacent crests in a V - shaped configuration (Mabbutt et al, 1982). The dunes are formed of red siliceous sands. Sediments in the swales contain more clay and carbonate.

The remainder of the reserve is referred to as the Ennisvale land system. This is found primarily in the south-western and north-eastern parts of the reserve. It consists of relatively low-lying sand plains with a thin veneer of sand over clay, forming solonized brown soils.

There is little surface runoff but moisture accumulates in the swales and open flats where the soil texture is heavier. Remnants of a relict drainage line can be found in the eastern part of the reserve, where there are unstable undulating dunes with slight depressions (Porteners, 1998).

Soil erosion is evident in small areas of the reserve, as a result of past grazing practices such as the establishment of ground tanks and associated catch drains. Major erosion gullies have formed adjacent to Canegrass and Nappies tanks. These have been treated by contour furrowing and will be monitored.

Policies

- * All activities in the reserve will be designed and undertaken in a manner which minimises soil erosion.
- * Where erosion occurs as a result of human or feral animal disturbance it will be controlled and monitored.
- * The Service will seek representation on any landcare group formed which includes the reserve.

Action

- * Photographic monitoring points established at major erosion points will be photographed twice a year.

4.1.2 Native and Introduced Plants

The vegetation of the reserve can be divided into two major groups - mallee shrublands and casuarina woodlands, with the mallee being the most extensive. Vegetation of the Scotia land system consists primarily of dense mallee and/or belah (*Casuarina pauper*), moderate to dense shrubs and spinifex, and seasonally abundant grasses and forbs. The Ennisvale land system is differentiated by the domination of belah and the presence of black bluebush (*Maireana pyramidata*) (Soil Conservation Service, 1985).

The nature reserve contains extensive areas of four main vegetation communities:

- mallee (red mallee *Eucalyptus socialis*, congoo mallee *Eucalyptus dumosa*) shrubland on relatively infertile sandy soil of dune crests and interdune swales. In addition to the dominant eucalypts small clumps of mallee pine (*Callitris verrucosa*) occur, predominantly on the taller dune crests. The understorey consists primarily of spinifex or porcupine grass (*Triodia scariosa*).
- tall shrubland of mallee (yorrell *Eucalyptus gracilis*, *Eucalyptus socialis*) with a diverse understorey dominated by *Maireana* species, *Zygophyllum* species and *Scleroleana* species. Other notable species include *Acacia colleteoides* which forms dense thickets in some areas, comb spider-flower (*Grevillia huegellii*), showy daisy bush (*Olearia pimeleoides*), smooth wallaby-bush (*Beyeria opaca*) and *Eremophila* species. This community occurs mainly on dune swales and sand plains in the western part of the reserve.
- low open woodland consisting of belah and rosewood (*Alectryon oliefolius* sub species *canescens*). This community mainly occurs on the heavier solonized brown soils in the south-western and north-eastern parts of the reserve, and also in small patches in low lying dune swales. In areas which were not

subjected to heavy grazing pressure an open shrub layer is evident, often comprising species such as quandong (*Santalum acuminatum*), turpentine (*Eremophila sturtii*), ruby saltbush (*Enchylaena tomentosa*) and erect mallee bluebush (*Maireana pentatropis*).

- low open shrubland/woodland comprising pearl bluebush (*Maireana sedifolia*), bladder saltbush (*Atriplex vesicaria*) and/or black bluebush in low lying areas. These areas have been heavily grazed by sheep, goats and at times kangaroos and this has led to an increase in the non-palatable species such as desert cassia (*Senna artemisioides*). Patches of narrow-leaf hopbush (*Dodonea viscosa*) and turpentine (*Eremophila sturtii*) occur where grazing pressures have been particularly high. Ground layer species are generally very sparse or absent. Overstorey species include belah, mallee trees and patches of wilga (*Geigeria parviflora*).

Due to the nature of the vegetation, certain communities have been differentially impacted by total grazing pressure. The woodland and chenopod shrublands have been particularly impacted by grazing. Also areas close to artificial watering points have been subject to high grazing pressures. Feral animal control and decommissioning of ground tanks (sections 4.1.3 and 4.3.3) will over time lead to a reduction in grazing pressure and aid the re-establishment of native vegetation communities. Native herbivores, particularly kangaroos, may also have an accumulative grazing effect and other measures to reduce total grazing pressure may prove necessary. Photographic monitoring points have been set up to monitor vegetation changes, particularly around closed tanks. Badly disturbed areas will be actively revegetated.

Significant species

Threatened and regionally significant species found in the reserve are listed in section 2.2.2. The distribution and immediate management needs of each species have been identified (Porteners, 1998). All the significant plants are threatened by grazing by introduced herbivores, particularly stands of mulga and white cypress pine. Pest control and construction of exclosures in the most vulnerable sites are needed. Most of the significant species appear to be vulnerable to fire, although bladder senna and desert spider-flower appear to require fire. Monitoring and seed germination trials of each species and study of their fire management needs will be necessary.

Under the Threatened Species Conservation Act a recovery plan must be prepared for endangered (Schedule 1) and vulnerable (Schedule 2) flora and fauna. The purpose of a recovery plan is to promote the recovery of a threatened species, population or ecological community to a position of viability in nature. Recovery plans for species listed on Schedule 1 must be prepared within five years from December 1995 and within 10 years for species listed on Schedule 2. Recovery plans will be implemented in Tarawi Nature Reserve when prepared.

Introduced species

An introduced species is defined as any plant or animal species not native to the area. Introduced species within the reserve and on adjoining land are of concern because they have the potential to have detrimental effects on ecological values and can spread to and from neighbouring land. Introduced plant species may be declared under the *Noxious Weeds Act* 1993. The Act places an obligation upon public authorities to control noxious weeds on land that they occupy to the extent necessary to prevent such weeds spreading to adjoining lands.

Introduced plant species in the reserve include pattersons curse (*Echium plantagineum*), bathurst burr (*Xanthium spinosum*), horehound (*Marrubium vulgare*), wild sage (*Salvia verbenaca*), tree tobacco (*Nicotiana glauca*), onion weed (*Asphodelus fistulosus*) and various pasture species. They predominantly occur as scattered individuals and small patches along fire trails, roads, buildings and particularly around ground tanks. Weeds are treated where necessary by spraying.

The removal of stock and closing of ground tanks, combined with treatment programs, will reduce the occurrence of weed species in the reserve.

Policies

- * Native vegetation will be managed to:
 - maintain or achieve floristic and structural diversity;
 - conserve rare and threatened plant species and communities;
 - maintain habitat values for those native animal species which depend upon the reserve, particularly threatened species.
- * Measures included in recovery plans for threatened species occurring in the reserve will be implemented.
- * Introduced plants will be controlled where they pose a significant risk of further spread or habitat degradation or have been declared noxious.
- * Contractors and Service staff using heavy plant will be required to thoroughly clean machinery prior to entering the reserve, to avoid introducing weeds.

Actions

- * Populations of significant plant species will be monitored, with priority to bladder senna and bluebush daisy.
- * Selected stands of mulga and white cypress pine will be fenced to encourage seedling growth.
- * Seed collection and germination trials of significant plant species will be undertaken.
- * Photo points set up to monitor vegetation changes will be checked bi-annually.
- * Options for reducing total grazing pressure will be investigated.
- * The distribution and density of introduced plants causing significant environmental impact will be mapped and monitored.
- * Weed infestations will continue to be treated, with priority to Pattersons curse, Bathurst burr and horehound.
- * Degraded and eroded areas will be revegetated using local seed sources.

4.1.3 Native and Introduced Animals

Tarawi Nature Reserve has a diverse native animal fauna, with 127 species of native birds, 16 mammal species, 48 reptiles and 2 amphibians recorded.

Many species of birds are abundant in the reserve, particularly species such as the spiny-cheeked honeyeater (*Acanthagenys rufogularis*), white-fronted honeyeater

(*Phylidonyris albifrons*), yellow-plumed honeyeater (*Lichenostomus ornatus*) and the crested bellbird (*Oreoica gutturalis*).

Half of the mammal species recorded are bats including the white-striped mastiff-bat (*Nyctinomus australis*), little broad-nosed bat (*Scotorepens greyii*) and the two threatened species listed in section 2.2.2. The reserve has large populations of the western grey kangaroo *Macropus fuliginosus*.

As stated in section 2.2.2 the reserve is particularly rich in reptiles. Common species include the striped skink (*Ctenotus schomburgkii*), tree dtella (*Gehyria variegata*), beaded gecko (*Lucasium damaeum*) and painted dragon (*Ctenophorus pictus*).

While the natural systems of the reserve are in good condition, habitat values in some areas have been degraded as a result of grazing by domestic stock and introduced pests. Management of native plants and animals is made difficult by the lack of comprehensive data on populations and information about the ecology of many species. It is evident, however, that protection of habitats from frequent fire, regeneration of previously cleared areas and control of introduced animals will greatly benefit most native animals within the reserve.

Pitfall traps have been set up in a number of different vegetation communities for use in survey and research.

Threatened species

Eighteen threatened native animal species have been recorded in the reserve. These are listed in section 2.2.2. Other threatened species have been recorded in similar habitat in Victoria and it is possible that they could be found in Tarawi. These are Mitchell's hopping mouse (*Notomys mitchelli*), silky mouse (*Pseudomys apodemoides*), mallee emu wren (*Stipiturus ruficeps*) and slender billed thornbill (*Acanthiza iredalei*).

The main requirements for management of most of the threatened species in the reserve are protection of old growth mallee from fire and control of introduced animal species. Recovery plans will be progressively prepared for threatened species (see section 4.1.2) and these will be implemented where relevant to Tarawi. A recovery plan involving NSW, Victorian, South Australian and Commonwealth agencies is currently being prepared for the management of malleefowl in Australia.

In 1995 the Service instigated a series of malleefowl surveys within Tarawi Nature Reserve in order to determine the abundance and density of mounds in the area. At present only a small section of the reserve has been surveyed but the density of mounds appears to be relatively high. Actual malleefowl populations are unknown. Survey and monitoring of populations will continue.

Introduced species

Introduced animals of particular concern are foxes (*Vulpes vulpes*), feral goats (*Capra hircus*), rabbits (*Oryctolagus cuniculus*) and cats (*Felis catus*).

Foxes are considered a major pest species in Tarawi because of the significant impact they have on native fauna including threatened species. Small mammals and ground nesting birds such as the malleefowl, southern scrub robin (*Drymodes brunneopygia*) and chestnut quail thrush (*Cinclosoma castanotum*) are extremely vulnerable to predation by foxes and cats. Fox baiting has been carried out in the reserve since early 1995 and has significantly reduced numbers. Control will be ongoing due to the highly mobile nature of foxes, which often results in rapid re-population of poisoned areas. Baiting is an effective and environmentally safe

control method particularly if done in key areas such as malleefowl mounds, roads and ground tanks. Fox baiting is specifically aimed at increasing malleefowl chick survival rates.

Rabbits occur in the reserve mainly in areas of chenopodshrubland and belah woodland. Rabbits can accelerate erosion by removing plant cover and are an important cause in the reduction of many species of native plants, particularly the cypress pine and mulga populations. Ripping of warrens has been undertaken in the main area of infestation, adjacent to Canegrass bore.

A coordinated approach to fox and rabbit control is needed as it is believed that in the absence of effective fox control, removal of rabbit prey can result in higher predation by foxes on native fauna. To this end fox baiting will be increased in areas where rabbit control has been undertaken.

Goats are a significant management problem in many parts of western NSW due to their highly nomadic nature and rapid breeding cycle. Feral goats can have effects on native vegetation including threatened species, and can introduce weeds. Current goat control within the reserve is mainly by licensed contractors, the license being reviewed on an annual basis in the light of performance, climatic and market conditions. Goat traps are located at selected ground tanks within the reserve and are effective in reducing numbers particularly in the warmer summer months when goat activity is concentrated around watering points. Large numbers of goats enter the reserve from the south and it is intended to erect a goat proof fence along the boundary (see section 4.3.3).

Cats can impact heavily on native fauna. Control of feral cats in large areas such as Tarawi Nature Reserve is, however, currently impractical. Trapping and shooting have limited effect and are extremely labour intensive. Shooting at night with spotlights appears to be the most effective method at present although this technique is hampered by the dense vegetation cover over much of the reserve. Preliminary work has been undertaken to develop specially designed cat baiting stations and subject to further research and approvals from the Department of Agriculture this technique may be useful in Tarawi Nature Reserve. Effective biological control of feral cats has not been developed but current research may provide agents for such control in the longer term.

Wild dogs occur in low numbers in the reserve and populations are kept low by on-going fox baiting programs. Wild dogs can be divided into three groups - dingos, hybrids with domestic dogs, and feral dogs. The Service considers the dingo to be part of the native fauna of NSW which it has a responsibility to conserve. The dingo is not a declared noxious species under the *Rural Lands Protection Act 1989* as long as it remains on Service land. The Service recognises, however, that wild dogs from Service lands sometimes impact on livestock on adjacent areas and accepts the need for management to minimise their attacks on stock. It is Service policy to remove feral dogs from its lands.

Policies

- * Priority will be given to management of habitats for conservation of threatened native animals.
- * Research which will lead to a greater understanding of diversity, distribution, ecology and management needs of native animals in the reserve will be encouraged.
- * Introduced animals will be controlled and where possible eliminated. Priority will be given to control of foxes, rabbits and goats.

- * Feral animal control programs will be coordinated with neighbouring landholders and the Wentworth Rural Lands Board whenever possible.

Actions

- * Malleefowl surveys will be carried out in order to determine species density and direct pest control programs.
- * On-going control of foxes will be undertaken with the aim of achieving levels which will not threaten the survival of populations of malleefowl and other threatened species.
- * On-going feral goat control will be undertaken and may include trapping, mustering and removal by contractor, aerial and ground shooting and the investigation and trialing of new methods of control such as electric fencing, and goat proof boundary fencing.
- * Control of rabbits will be undertaken as required and will involve ripping warrens, fumigation, poisoning and blasting with explosives.
- * Pest species causing significant environmental damage will be monitored.

4.1.4 Fire Management

Fire is an integral part of the Australian environment. It plays a major role in determining the vegetation structure and species composition of the reserve and has long term positive and at times negative effects on fauna populations.

Fire History

The Aboriginal and post European settlement fire regimes for semi-arid mallee and woodland communities are not well known or documented.

The known fire history of the reserve is characterised by a very irregular fire occurrence with a relatively low fire frequency. The last major fire is believed to have been in 1918 (John Martin, pers. comm.). Since then most fires have been in the last 20 years and mostly in the mallee-spinifex vegetation community. In recent times portions of the reserve have been burnt for research purposes by CSIRO, and by previous owners to increase the availability of palatable species as fodder for sheep. Since 1979 approximately 24% of the mallee-spinifex and mallee-sandplain communities in the reserve have been burnt. Significant areas of the reserve have remained unburnt for over 80 years.

The majority of wild fires are started by lightning strikes. Fire risk is greatest in the mallee communities when strong winds and high temperatures allow flames to bridge the gaps between canopy and flammable understorey. The mallee-spinifex communities of the dune crests are the most fire prone. The dune swales and below woodlands have a less dense understorey and therefore a lower fire potential, except following above average rainfall when there has been good growth of flammable speargrass (*Stipa* spp). The variations in fuel levels make mallee wildfires highly unpredictable and irregular in occurrence. Generally fires are small and restricted to the mallee-spinifex communities but in seasons of abundant fuel mallee fires have historically been large, intense with a fast rate of spread and very difficult to suppress.

Ecological requirements

The effect of recent fire on the current vegetation pattern can be clearly seen. The effect of fire on the biota as a whole is still largely unknown, however, including the fire response of significant plant species. Many species of plants and animals are most suited to a specific stage of post-fire regeneration and different time frames between fires will favour different species. Mallee pine for example can survive for 150 - 200 years if not threatened by fire for the first 50 years of its life (Bradstock 1989). Twenty five percent of bird species may be lost from mallee-spinifex communities if burning intervals are less than 20 - 30 years (Meredith 1984). In contrast studies conducted within Round Hill Nature Reserve have shown many reptiles are most favoured by a 6 - 25 year fire regime due to the promotion of growth of spinifex (Caughley 1985).

A number of native animal species such as the threatened chestnut quail-thrush and malleefowl depend upon mature mallee for their survival. The biodiversity of long unburnt mallee communities (>100 years) is, largely, unknown. Some plant and animal populations may decline if no fire occurs after many years. The Service will conduct and encourage research in order to develop guidelines for management of these areas.

Fire intensity and extent are also important factors. Intense fires often kill sensitive species such as *Callitris* and *Acacia* but result in greater germination and seedling establishment than may otherwise occur in the absence of fire. After fire there is usually a flush of short lived ephemeral grasses and herbs, enabling them to top up their soil-stored seed banks. Some perennial species also rely on fire for seed germination; in the absence of fire seedling establishment occurs at low rates. Seedling grazing after fire is usually much higher when the burnt area is small especially in dry seasons. Repeated patchy low intensity fires could over time result in a decrease in shrub and ground cover diversity and density. Frequent fires may also lead to higher predation of native animals by introduced predators because of the short to medium term loss of vegetation cover.

It is believed that longer spans between fires (20 - 30 years) will generally result in greater fauna diversity in the reserve and it appears desirable that the reserve's vegetation communities should generally not be burnt more often than every 20 - 30 years. Some areas should remain free from fire for as long as possible as available data indicates that optimal fire frequency for malleefowl conservation is likely to be in excess of 60 years (Benshemesh 1989). It is desirable, however, for all post fire stages to occur in some part of the reserve in order to provide habitat diversity.

A fire management plan has been developed for the reserve which outlines policies and strategies required for the conservation of biodiversity. It sets out the following biodiversity guidelines:

- consecutive fires should be a minimum of 20 years apart in any one area;
- the current range of age classes should be maintained, with up to 50% of each community less than 40 years old and the remainder more than 40 years old; and
- patchiness during wildfire should be promoted in order to assist protection of fire sensitive restricted populations, recolonisation and post-fire diversity.

Current and planned research projects related to fire management in the reserve include:

- comparison of vegetation characteristics and fauna diversity in old and young mallee;
- monitoring the effects of grazing by native and feral herbivores following fire;
- monitoring growth rates and other responses to fire of significant and other selected plant species; and
- monitoring of vegetation regeneration after prescribed burns.

Strategies and cooperative arrangements

The Service is a recognised fire authority under the *Rural Fires Act 1997*. It is responsible for containing fires on Service estate and ensuring that they do not cause damage to life, property or the environment. This responsibility includes the implementation of fuel management programs. The Service may also assist with the control and suppression of fires adjacent to reserves.

A boundary fire trail is maintained around the reserve and internal fire trails divide the reserve into four separate units. Fire suppression will aim to restrict wildfire to within a unit. The draft fire management plan sets out a range of fire management strategies including prescribed burning adjacent to fire trails, prescribed burning in areas of high speargrass fuel loads and slashing of ground fuels around infrastructure and cultural heritage features. Prescribed burning may also be undertaken to promote particular species. Research and monitoring will guide review of the fire management plan.

The Service regards cooperative fire management as essential for both the protection of property and of the natural resources of estate under its control. An important part of the Services fire management is participation as a member of the Wentworth Bush Fire Management Committee in the implementation of the district plan of operations and bush fire risk management plan.

Policies

- * Fire will be managed to ensure:
 - protection of life and property;
 - that fire regimes are compatible with conservation of biodiversity, particularly of threatened species; and
 - protection of Aboriginal sites, historic places, research sites and management facilities.
- * All wildfires will be suppressed and managed in accordance with policies detailed in the reserve fire management plan. Where possible and without excessively increasing fire size, wildfires will be contained by existing roads and trails, previously burnt sections and natural low fuel areas in preference to the construction of control lines by heavy plant.
- * Prescribed burning may be used for fuel and habitat management and will generally be timed to approximate the desirable natural fire cycle. It will be designed to protect areas of significant species.
- * In seasons of high spear grass growth, measures such as slashing will be taken to protect significant historic features, particularly the brush breaks, and management infrastructure.

- * Use of heavy equipment off existing roads and tracks will be avoided where possible, particularly in the vicinity of significant plant species, malleefowl nest locations, Aboriginal sites and historic structures and along sandy dune crests.
- * Liaison will be maintained with Department of Bushfire Services, Wentworth Bush Fire Management Committee, fire brigades and neighbours to ensure co-ordination in fuel management and suppression of wildfire in the reserve and adjoining land.
- * Records of fire occurrence, patterns and effects will be maintained and post fire regeneration will be monitored.
- * All internal and perimeter fire trails will be maintained.
- * Fire management strategies will take into account fire history on neighbouring properties and the Scotia mallee region as a whole.

Actions

- * A full review of the fire management plan will be conducted every 5 years and in response to major wildfires, research findings and other significant events.
- * Prescribed burning programs will be prepared as needed and implemented as far as conditions allow.
- * Research and monitoring will continue to be undertaken into the effects of fire on the reserve's ecosystems and the fire management needs of significant plant species.

4.2 CULTURAL HERITAGE

The cultural heritage of an area is an important component of the environment that may have aesthetic, historic, scientific and social significance to present and future generations. Cultural heritage includes both Aboriginal and non-Aboriginal history.

4.2.1 Aboriginal Heritage

The area of the reserve is within the tribal area of the Danggali Aboriginal people, a dialectic sub-group of the Barkindji. The reserve is now in the area of the Dareton Local Aboriginal Land Council but Aboriginal people from other areas may have an interest in management of Aboriginal heritage in the reserve.

Many Aboriginal sites have been recorded adjacent to major rivers in the region such as the Murray and Darling, providing evidence that these riverine areas supported a large population of Aboriginal people. In areas such as Tarawi which are located a considerable distance from any major water source, Aboriginal sites are generally restricted to sand dune locations near a soak or claypan. It is probable that the lack of water and the relative poverty of the mallee sandridge country mitigated against significant Aboriginal use of areas away from the rivers.

At present little is known about Aboriginal occupation of the Tarawi area. Hearth stones and artefact scatters have been found in several locations, primarily near ground tanks and bores since these were formerly the sites of soaks, but also in areas a considerable distance from known water sources. A very large site is located near Canegrass tank. This is a low-lying run-on area and may formerly have had a spring. Survey and recording are needed to determine the extent of known

sites and to sample other areas of the reserve. It is possible that burials are located in the reserve.

Aboriginal groups inhabited the scotia region until the late 1800's. One such group, known colloquially as "Nhaanya's mob" is known to have lived at Popiltah station between approximately 1850 and 1860 before moving into the scrub west of the Darling Anabranh. Nhaanya and his family stayed in the scotia mallee for in excess of 30 years hiding from white people and living a traditional lifestyle. Over the ensuing years the group grew to over 30 people and consisted of Nhaanya's descendants as well as other people who married into the group. It is believed that Nhaanya's family mingled with groups from across the South Australian border, in particular the Danggali group of the Barkindji, until the turn of the century when drought forced their relocation into fringe camps. Nhaanya's family moved into a camp at Pooncarie in 1898 as the scotia region was in the process of being "opened up" through the installation of fences and dams. Many Barkindji people today are descended from "Nhaanya's mob".

Aboriginal people were involved in the pastoral operations of many stations in Western NSW during the early 1900's. Aboriginal workers within Nulla station would have passed through the scotia area and Tarawi while grazing sheep through this "back country". The Mitchell family are known to have resided at a place called Waterjelly which at the time was part of Lake Victoria station and now part of Warwick station south east of Tarawi. Aboriginal people are not known to have been involved in pastoral activities within Tarawi after it was established as a grazing lease in its own right in 1926, although people were still involved in the pastoral industry at Lake Victoria, along the Great Darling Anabranh leases and further north.

The strong attachment of Aboriginal people to the land has been acknowledged. Archaeological sites are important to Aboriginal communities as they are a testament to their culture's great antiquity. Aboriginal people may also have traditional spiritual links with an area and hold knowledge which is important for nature conservation. While the Service presently has legal responsibility for the protection of Aboriginal sites it acknowledges the right of Aboriginal people to make decisions about their own heritage. It is therefore policy that Aboriginal communities be consulted about decisions regarding the management of Aboriginal sites and related issues and how the Aboriginal culture and history of an area controlled by the Service will be promoted and presented.

Policies

- * The Dareton Local Aboriginal Land Council and other relevant Aboriginal community organisations and individuals will be consulted and actively involved in all aspects of management of Aboriginal sites and values in the reserve.
- * The Service will support the Dareton Local Aboriginal Land Council and other relevant Aboriginal community groups in the preservation, continuance and promotion of their cultural lore. Aboriginal people will be encouraged to facilitate activities in the reserve related to maintenance of Aboriginal culture. Any such activities must comply with the objectives and policies of this plan of management and have minimal environmental impact.
- * Aboriginal sites will be protected from disturbance or damage by human activities.
- * All works with the potential to impact on Aboriginal sites will be preceded by an archaeological assessment.

- * The location of Aboriginal sites will not be publicised except where:
 - the agreement of the Dareton Local Aboriginal Land Council and other relevant Aboriginal community organisations has been obtained;
 - a conservation study has been prepared and any management works necessary to protect the site from damage have been implemented; and
 - the site will be interpreted to promote public knowledge and appreciation of Aboriginal culture.

Actions

- * Survey and recording of Aboriginal sites will be progressively undertaken in consultation with local land councils and the wider Aboriginal community. Any burials found will be protected and other site types will be actively conserved where required.
- * The Service will initiate and establish programs to promote community consultation and collaboration regarding all aspects of Aboriginal site management.

4.2.2 Post-contact History

Much of the historical information below has been provided by John Martin, a former owner of Tarawi.

The earliest European construction work on Tarawi was the establishment of the South Australian/New South Wales border fence which began in 1883. The majority of the work was carried out in winter when the chance of water being available was greatest. Supplementary water was gained through the placement of large square steel containers (originally used to carry crockery from England to Australia) into the ground at intervals along the fence to catch water. None are known to be located within the reserve but there is one adjacent on Danggali Conservation Park. A small, shallow earth tank south of Jubilee Track was dug by hand to further store water.

Prior to 1926, the Tarawi area was used occasionally for grazing by Nulla and Belmore stations. After this time grazing began on Tarawi Station in its own right. The original owners were Vic Williams and Harry O'Flynn. In 1944 Lindsay Martin bought Tarawi Station and he and later his son, John Martin continued to manage the place as a sheep station until May 1985 when the property was sold to former Tasmanian dairy farmers, Trevor and Mignon Brown. In September 1994 the property was purchased by the Service and it was later gazetted as Tarawi Nature Reserve.

As is the case with many of the grazing properties in Western New South Wales the success or failure of farming is directly related to the provision of water. To this end all the owners of Tarawi Station spent a considerable amount of time and resources establishing artificial watering points throughout the property. Tarawi Bore was established in 1927. The water quality was quite poor and as a result John Martin installed a desalinator in 1983. The bore supplied water to a small tank, from which it passed through the desalinator and was then piped to Woop Woop watering point further north. The bough shed which was built to keep the desalinator shaded still stands.

Canegrass bore in the eastern section of the reserve was established in August 1924 and provided a valuable water source in this section of the property. Wentworth Shire Council upgraded the facility in 1983 for the use of neighbours through Government drought funding. A 1 ha area surrounding the bore is owned by the Council.

Numerous ground tanks were constructed throughout the property with mixed results. Tanks such as Nappies and Spring failed to hold water for any length of time.

Brush breaks are found in several locations in the reserve. These were constructed by shepherds to hold stock overnight and probably date from early this century. There are few remaining in the district and those in the reserve are historically significant.

Old post and rail yards are found in several locations. These include yards near White Elephant tank, goat yards adjacent to West Tank (probably built prior to acquisition of the property by O'Flynn and Williams), horse paddocks adjacent to Canegrass South tank (probably constructed 1904/05) and sheep yards south of Jubilee tank.

Several old shepherds or fencers camps are located in the reserve, consisting of remains such as bottles, crockery, fuel cans and other items. Some have brush breaks or yards nearby. A shepherds hut was formerly located near Tarawi Bore.

A homestead was built by Williams and O'Flynn, situated between the current house and the house tank. It was destroyed by fire in the 1930's and only a few remnants of the house remain. The present homestead was established approximately 200 m further south on slightly higher ground in 1936. It consists of a brick house which has been extended or altered at various times, adjacent meathouse, water tanks, milking yards, tennis court (built in 1955), barbecue area and garden. All are in good condition apart from the tennis court, which is in disrepair. Renovation of the house has been undertaken and it has been painted in colours similar to the originals.

A machinery shed/workshop, garage and killing pen are located near the house. A silt scoop found near one of the ground tanks has been relocated adjacent to the shed to protect it from sand accumulation.

Shearers quarters were constructed near the house by Harry O'Flynn, consisting of living quarters, an ablutions block and cookhouse. Additions and renovations were undertaken in the late 1950's and early 60's aided by a significant increase in wool prices at the time. These included the present kitchen/dining room, 2ft extension of the living quarters (required under legislation of the time) and a cement building which was used by the cooks and wool classer. A meat house is nearby. All the buildings are in fair condition.

An old shearing shed was formerly located in the western part of the reserve near Tarawi Bore. The shearing shed which replaced it was of modern construction and was sold and removed upon acquisition of the reserve. The yards remain.

Other remaining historic features in the reserve are fences, vehicle tracks and water troughs.

Policies

- * The historic structures and places within Tarawi Nature Reserve will be conserved in compliance with the Australia ICOMOS Charter for the

Conservation of Places of Cultural Significance (the Burra Charter) and the *Heritage Act 1977*.

- * No buildings, structures, relics or other features will be removed, altered or disturbed except in accordance with a conservation assessment which examines their cultural significance and conservation needs. Items will be fully recorded before alteration or removal.
- * The Service will seek to promote community involvement in regard to heritage management within the reserve.
- * New elements will not be introduced without assessment of their affect on the cultural value of the precinct.
- * Fence strainers and corner posts will be retained.

Actions

- * The buildings, gardens, brush breaks, camps, stock yards and desalination plant area will be fully recorded.
- * The historic value and conservation needs of the tennis court and remains of the desalination plant area will be assessed, and restoration work will be undertaken if appropriate.
- * The existing garden elements of the homestead will be retained. Species composition of the garden will be subject to a conservation assessment and species that have potential to invade into other areas of the reserve will be closely monitored and removed if necessary.
- * The cultural significance of the NSW/SA border fence will be investigated.

4.3 USE OF THE RESERVE

Certain public and private uses may be appropriate in Service areas provided that they do not conflict with the primary purpose of conservation of natural and cultural heritage and are consistent with the objectives and strategy of the plan of management. All use must be ecologically sustainable and conservation takes priority over use.

The major categories of use that can be appropriate in Service areas are:

- education and promotion of the area, the Service and the conservation of natural and cultural resources;
- involvement of the public in aspects of management;
- certain types of recreation;
- research; and
- management operations by the Service and other authorities with statutory responsibilities in the area.

The extent to which these categories of use will be provided for in Tarawi Nature Reserve is indicated in the following sections.

4.3.1 Promotion and Public Use

The primary purpose of nature reserves is conservation of wildlife and natural environments. Research, educational use, nature study and some forms of recreation are appropriate uses when they do not conflict with conservation. Tarawi Nature Reserve has very high conservation values and provides important habitat for a large number of threatened species. The reserve also contains important cultural heritage aspects such as Aboriginal occupation sites and examples of structures associated with early European grazing history. It is an isolated and very dry area with low relief and landscape diversity and little recreational attraction. For these reasons public use of the reserve will be limited.

Other conservation areas in the region cater for tourism and recreation. These areas include the privately owned Scotia Sanctuary and Mungo and Kinchega National Parks in NSW, Hattah-Kulkyne, Murray-Sunset and Wyperfield National Parks in Victoria and Danggali Conservation Park in South Australia. The adjacent Scotia Sanctuary and Danggali Conservation park both provide camping areas, accommodation and ecotourism activities.

The Renmark/Broken Hill Road passes through the south-eastern corner of the reserve and a shire road enters the reserve from the southern boundary adjacent to the homestead and continues in a north-east direction to Canegrass Bore. The Renmark/Broken Hill Road provides opportunities to view the mallee and woodland vegetation communities of the reserve. Interpretive information may be provided at the reserve entrances if warranted by the amount of public interest but no other facilities will be provided. Visitors will not be encouraged to the homestead area because of problems of security and invasion of the privacy of the Service officer living in the house. Other western reserves such as Willandra National Park provide opportunities to view pastoral homesteads.

Camping and public use of management tracks will not generally be permitted except for research purposes (see section 4.3.2) in order to avoid disturbance of significant plant and animal communities and risk of weed invasion and fire. Opportunities for the public to visit the reserve may be organised, however, through such means as Discovery Programs and neighbour field days.

Policies

- * Opportunities for visitation to the nature reserve will generally be limited to use of the public roads. Public vehicle use will not be permitted on management tracks except under special arrangements as below.
- * A limited number of organised public visits to the reserve may be arranged, such as neighbour field days and Discovery Programs.
- * Prior approval by the Service is required for access to the reserve by other visitors.
- * Recreational camping will not be permitted in the reserve.
- * No visitor facilities will be provided other than interpretive information if warranted by the number of visitors.
- * Information will be provided to the local community through suitable media about the values of the reserve and management programs being undertaken.

Action

- * Signs will be erected to discourage visitors to the homestead and use of management tracks.

4.3.2 Research

The purpose of scientific study in the reserve is to improve understanding of natural and cultural resources and the processes which affect them. Research establishes the requirements for management of particular communities, species and cultural features.

Service research efforts must be directed towards the areas of greatest need. The Western Region Biodiversity project carried out two surveys of Tarawi during 1995 and it is planned to supplement this with further biodiversity work in the future. On-going malleefowl survey is carried out with support from Sunraysia Venturer and Rover Scouts, local TAFE students and the Malleefowl Preservation Society (see section 4.1.3). A number of research and monitoring projects are underway with regard to vegetation recovery and the fire management needs of the reserve (see sections 4.1.2 and 4.1.4).

Research by other organisations, students and interested members of the community may also provide valuable information for management. CSIRO and the Department of Agriculture are carrying out research into the movements of kangaroo and feral goat populations in the reserve and the effects of ground tank decommissioning, and the University of Ballarat is conducting on-going enclosure and flora research. These projects are supported by the Service and assistance is provided where feasible.

Policies

- * The Service will carry out and encourage research relevant to the management of Tarawi Nature Reserve. Priority will be given to:
 - plant and animal survey, particularly for threatened species;
 - detailed mapping of the reserve's vegetation communities;
 - impacts of fencing on the movement of native animals;
 - Aboriginal site survey;
 - fire ecology research; and
 - European historical heritage.
- * The Service will continue to liaise with the University of Ballarat and other institutions regarding research which will aid reserve management.
- * The management tracks may be used by researchers.
- * The shearers quarters will be available for accommodation during research programs.
- * Research structures and long term markers must be removed upon completion of the research.

4.3 3 Management Operations

Management facilities in the reserve consist of vehicle tracks, ground tanks, an airstrip, the homestead, associated sheds and shearers quarters. The former woolshed yards are used occasionally during feral goat mustering. A Telstra communications tower is located adjacent to the house.

The track system is based on the pattern of roads constructed by former leaseholders. Some of these tracks are not needed for reserve management and will be closed to promote regeneration and habitat improvement. Tracks maintained for management purposes are shown on the Summary Map.

Ground tanks can have unacceptable ecological consequences in an arid environment by concentrating wildlife and grazing pressures, displacing native arid zone animals with species which would not otherwise survive there and promoting feral animals. Accordingly, ground tanks not needed for reserve management have been de-commissioned. Gradual decrease in water availability will lessen the impact on native species (Bracken and Gorman, 1987) as this will allow native species to relocate or find alternative natural water sources. Vegetation recovery around the closed ground tanks is being monitored (section 4.1.2).

House Tank and 3 by 2 Tank are being retained in order to provide a reliable water supply to the homestead and for fire management purposes. Both tanks have been fenced to exclude all grazing animals. Water will also continue to be available from Tarawi and Canegrass bores.

A one hectare square block of land surrounding Canegrass Bore was surrendered by previous owner, John Martin and vested to the Wentworth Shire Council in 1985 under a drought relief scheme. Maintenance of the bore and infrastructure remains the responsibility of the Council. A private pipeline was installed by Mr Geoff Rodda (owner of Wenba station) in 1987 from the bore to Amoskeg tank on Wenba station to the south of the reserve. This pipeline was installed to provide stock water during drought conditions. The service will continue to allow access along the "pipeline track" to the current owners. Future owners access to the area will be negotiated on a case by case basis.

The nature reserve is bounded by Western Lands Leases (Belmore, Wenba and Belvedere) to the south and east. The Lease land is primarily used for sheep grazing. Some sections of the reserve boundary fences are in good condition while other sections will require extensive work in the near future. Fencing agreements will be drawn up with neighbours when the fences need replacing. Fences will be upgraded to goat proof standard as finances allow. Fences are not needed on the western and northern boundaries with Danggali Conservation Park and Scotia Sanctuary. The northern boundary fence is presently in a state of disrepair and will not be maintained. Strainer posts will be left in place to identify the exact boundary position. The status of the state border fence is unclear and the need for its retention will be investigated.

Internal fencing is not needed for management purposes, apart from fences around ground tanks and exclosures. The wire of fences not needed for management will be removed to facilitate native animal movement.

A Service officer lives in the homestead and the shearers quarters are used for visiting staff undertaking management programs. These buildings will be maintained in accordance with the policies set out in section 4.2.2.

Cooperative arrangements

Good working relationships with neighbours and the managers of adjacent Scotia Sanctuary and Danggali Conservation Park are essential for effective and efficient management of the reserve. Policies regarding cooperative pest control and fire management are set out in previous sections.

A Memorandum of Understanding has been signed by the State and Commonwealth governments and implemented by the Murray Mallee Partnership Committee comprising NSW NPWS, SA NPWS, Parks Victoria, Victorian Dept of Natural Resources and Environment and Environment Australia. The partnership will provide for cooperative programs such as information sharing, research, pest control and the provision of tourism information.

Danggali Conservation Park, other reserves in the area and some private land are included in the Bookmark Biosphere Reserve. Biosphere reserves are multiple function conservation areas designated under the UNESCO Man and the Biosphere program. They are representative of important ecosystems and contain both natural areas which are protected from disturbance and actively managed areas which have been modified by human activity. Consideration is being given to including Tarawi Nature Reserve in the Bookmark Biosphere Reserve.

Policies

- * No new roads or vehicular tracks will be constructed. Tracks to be maintained are shown on the Summary Map. Tracks that have been closed and those proposed for closure are also indicated on the Summary Map.
- * Vehicles will not be used off the management track system unless essential and unavoidable.
- * The airstrip will be maintained.
- * House tank and 3 by 2 tank will be maintained.
- * The homestead and shearers quarters buildings will be maintained in accordance with the policies in section 4.2.2.
- * The shearers quarters may be used by Service staff, researchers and other authorised visitors.
- * The Scotia Sanctuary/reserve boundary fence will not be maintained.
- * Fencing agreements will be drawn up when sections of the boundary fence require replacement. Fences will be upgraded to goat proof standard when possible.
- * The service will continue to allow the current owners of Wenba station access to the Canegrass Bore pipeline for maintenance works.
- * The Service will continue to participate in cooperative management programs organised by the Murray Mallee Partnership Committee.
- * Regular liaison will be maintained with the managers of Danggali Conservation Park, Scotia Sanctuary and neighbouring graziers, and cooperative management programs may be instituted where appropriate.

Actions

- * Vehicle tracks not needed for management purposes will be closed and allowed to regenerate.
- * Internal fences which do not serve a management purpose will be removed with the exception of strainers and corner posts.
- * Liaison will be undertaken with a view to removing or modifying the NSW/SA boundary fence between Tarawi Nature Reserve and Danggali Conservation Reserve to make it no longer a barrier to wildlife.
- * Monitoring will be undertaken into the impact of goat proof fences on the movement of native animals.
- * Should ownership of Wenba change hands then access rights along the Canegrass Bore pipeline will be negotiated on a case by case basis with the new owners.

5. PLAN IMPLEMENTATION

This plan of management is part of a system of management developed by the National Parks and Wildlife Service. The system includes the National Parks and Wildlife Act, management policies, established conservation and recreation philosophies and strategic planning at corporate, regional and district levels.

The implementation of this plan will be undertaken within the annual programmes of the Service's Lower Darling District. Priorities, determined in the context of district and regional strategic planning, will be subject to the availability of necessary staff and funds and to any special requirements of the Director-General or Minister.

District programs are subject to ongoing review, within which, works and other activities carried out in Tarawi Nature Reserve are evaluated in relation to the objectives laid out in this plan.

The environmental impact of all development proposals will continue to be assessed at all stages of the development and any necessary investigations undertaken in accordance with established environmental assessment procedures.

Section 81 of the Act requires that this plan shall be carried out and given effect to, and that no operations shall be undertaken in relation to the reserve unless they are in accordance with the plan.

No term is proposed for this plan of management. If after adequate investigation, operations not included in the plan are found to be justified, this plan may be amended in accordance with section 76(6) of the Act.

As a guide to the implementation of this plan, relative priorities for identified activities are summarised below:

ACTIONS	PLAN REF
High Priority	
* Undertake on-going weed control	4.1.2
* Control goats, foxes and rabbits	4.1.3
* Survey and monitor malleefowl population	4.1.3
* Finish fire management plan	4.1.4
* Implement prescribed burning and fire ecology research programs	4.1.4
* Fence selected areas of mulga and white cypress pine	4.1.2
* Record historic features	4.2.2
* Liaise with a view to removing or modifying the NSW/SA boundary fence to make it no longer a barrier to wildlife	4.3.3
Medium Priority	
* Monitor erosion and vegetation recovery	4.1.1, 4.1.2
* Undertake revegetation in degraded areas	4.1.2

*	Map distribution and density of significant weed species	4.1.2
*	Monitor populations of significant plant species	4.1.2
*	Seed germination trials of significant plant species	4.1.2
*	Monitor introduced animal populations	4.1.3
*	Survey and record Aboriginal sites	4.2.1
*	Assess tennis court and desalination plant shelter	4.2.2
*	Erect signs discouraging visitors to homestead and use of management tracks	4.3.1
*	Monitoring will be undertaken into the impact of the goat proof fence on the movement of native animals	4.3.3

Low Priority

*	Investigate options for reducing total grazing pressure	4.1.2
*	Close unnecessary vehicle tracks	4.1.2
*	Remove internal fences	4.3.3
*	Establishment of programs promoting community involvement in heritage management	4.1.2
*	Investigate cultural significance of NSW/SA border fence	4.2.2

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